As the below named inventors, we hereby declare that:

Our residence, post office address and citizenship are as stated below next to our names;

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We believe we are the original, first and joint inventors of the subject matter which is claimed and for which a patent is sought on the invention entitled <u>AN AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE</u> <u>DOMAIN NAMES</u>, the specification of which

- is attached hereto.
 - was filed on _____as Application Serial Number _____and was amended on _____ (if applicable).
- was filed under the Patent Cooperation Treaty (PCT) and accorded International Application No. ______, filed _____, and amended on ______ (if any).

We hereby state that we have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

We hereby acknowledge the duty to disclose information which is material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Prior Foreign Application(s)

We hereby claim foreign priority benefits under Title 35. United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application(s) for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

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Prior United States Provisional Application(s)

We hereby claim priority benefits under Title 35, United States Code, §119(e)(1) of any U.S. provisional application listed below:

	U.S. Provisional Application No.	Date of Filing (day month year)	Eriority Claimed Under 35 U.S.C. SI 19(c)(1)
	60/106,261	30 October 1998	Yes
l	60/137,704	7 June 1999	Yes

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Page 1 of 2

Rev 1.1 10-09-2001



Application Serial:No	Date of Filing (Day, Month, Year)	Status — Patented Pending, Abandoned
09/558,210	26 April 2000	Pending
09/504,783	15 February 2000	Patented
09/429,643	29 October 1999	Pending

Power of Attorney

And we hereby appoint, both jointly and severally, as our attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith the practitioners at:

Customer Number: 22907 (WDC)

Please address all correspondence and telephone communications to the address and telephone number for this Customer Number.

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signature Vista torm		Date	11/15/2003
Full Name of First Inventor	Larson	Victor	-injanj
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Page 2 of 2

Rev 1.1 10-09-2001

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JOINT DECLARATION FOR PATENT APPLICATION

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Signature		Date	
Full Name of First Inventor	Larson	Victor	
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Full Name of Second Inventor	Short, III	Robert	Dunham
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Signature	Munger	Date	Colby
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Simature		Data	
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Page 2 of 2

Rev 1.1 10-09-2001

Attorney Docket No.: 077580-0177

U.S. PATENT APPLICATION FOR

AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES

Inventors: Victor LARSON, a citizen of the United States, residing at 12026 Lisa Marie Court, Fairfax, Virginia 22033

Robert Dunham SHORT, III, a citizen of the United States, residing at 38710 Goose Creek Lane, Leesburg, Virginia 20175

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DM_US 38877810-1.077580.0177

AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from and is a continuation of a co-pending U.S. Application No. 13/049,552, filed March 16, 2011, which is a continuation of U.S. Application No. 11/840,560, filed August 17, 2007, now U.S. Patent No. 7,921,211, issued April 5, 2011, which is a continuation of U.S. Application No. 10/714,849, filed November 18, 2003, now U.S. Patent No. 7,418,504, issued August 26, 2008, which is a continuation of U.S. Application No. 09/558,210, filed April 26, 2000, now abandoned, which is a continuation-inpart of U.S. Application No. 09/504,783, filed on February 15, 2000, now U.S. Patent No. 6,502,135, issued December 31, 2002, which claims priority from and is a continuation-in-part patent application of previously-filed U.S. Application No. 09/429,643, filed on October 29, 1999, now U.S. Patent No. 7,010,604, issued March 07, 2006, all of which are hereby incorporated by reference in their entirety for all purposes. The subject matter of U.S. application serial number 09/429,643 derives from provisional U.S. Application Nos. 60/106,261 (filed October 30, 1998) and 60/137,704 (filed June 7, 1999), all of which are hereby incorporated by reference in their entirety for all purposes. The present application is also related to U.S. application serial number 09/558,209, filed April 26, 2000, now abandoned, which is hereby incorporated by reference in its entirety for all purposes.

BACKGROUND OF THE INVENTION

[0002] A tremendous variety of methods have been proposed and implemented to provide security and anonymity for communications over the Internet. The variety stems, in part, from the different needs of different Internet users. A basic heuristic framework to aid in discussing these different security techniques is illustrated in FIG. 1. Two terminals, an originating terminal 100 and a destination terminal 110 are in communication over the Internet. It is desired for the communications to be secure, that is, immune to eavesdropping. For example, terminal 100 may transmit secret information to terminal 110 over the Internet 107. Also, it may be desired to prevent an eavesdropper from discovering that terminal 100 is in communication with terminal 110. For example, if terminal 100 is a user and terminal 110 hosts a web site, terminal 100's user may not want anyone in the intervening networks to know what

web sites he is "visiting." Anonymity would thus be an issue, for example, for companies that want to keep their market research interests private and thus would prefer to prevent outsiders from knowing which websites or other Internet resources they are "visiting." These two security issues may be called data security and anonymity, respectively.

[0003] Data security is usually tackled using some form of data encryption. An encryption key 48 is known at both the originating and terminating terminals 100 and 110. The keys may be private and public at the originating and destination terminals 100 and 110, respectively or they may be symmetrical keys (the same key is used by both parties to encrypt and decrypt). Many encryption methods are known and usable in this context.

[0004] To hide traffic from a local administrator or ISP, a user can employ a local proxy server in communicating over an encrypted channel with an outside proxy such that the local administrator or ISP only sees the encrypted traffic. Proxy servers prevent destination servers from determining the identities of the originating clients. This system employs an intermediate server interposed between client and destination server. The destination server sees only the Internet Protocol (IP) address of the proxy server and not the originating client. The target server only sees the address of the outside proxy. This scheme relies on a trusted outside proxy server. Also, proxy schemes are vulnerable to traffic analysis methods of determining identities of transmitters and receivers. Another important limitation of proxy servers is that the server knows the identities of both calling and called parties. In many instances, an originating terminal, such as terminal A, would prefer to keep its identity concealed from the proxy, for example, if the proxy server is provided by an Internet service provider (ISP).

[0005] To defeat traffic analysis, a scheme called Chaum's mixes employs a proxy server that transmits and receives fixed length messages, including dummy messages. Multiple originating terminals are connected through a mix (a server) to multiple target servers. It is difficult to tell which of the originating terminals are communicating to which of the connected target servers, and the dummy messages confuse eavesdroppers' efforts to detect communicating pairs by analyzing traffic. A drawback is that there is a risk that the mix server could be compromised. One way to deal with this risk is to spread the trust among multiple mixes. If one mix is compromised, the identities of the originating and target terminals may remain concealed.

This strategy requires a number of alternative mixes so that the intermediate servers interposed between the originating and target terminals are not determinable except by compromising more than one mix. The strategy wraps the message with multiple layers of encrypted addresses. The first mix in a sequence can decrypt only the outer layer of the message to reveal the next destination mix in sequence. The second mix can decrypt the message to reveal the next mix and so on. The target server receives the message and, optionally, a multi-layer encrypted payload containing return information to send data back in the same fashion. The only way to defeat such a mix scheme is to collude among mixes. If the packets are all fixed-length and intermixed with dummy packets, there is no way to do any kind of traffic analysis.

[0006] Still another anonymity technique, called 'crowds,' protects the identity of the originating terminal from the intermediate proxies by providing that originating terminals belong to groups of proxies called crowds. The crowd proxies are interposed between originating and target terminals. Each proxy through which the message is sent is randomly chosen by an upstream proxy. Each intermediate proxy can send the message either to another randomly chosen proxy in the "crowd" or to the destination. Thus, even crowd members cannot determine if a preceding proxy is the originator of the message or if it was simply passed from another proxy.

[0007] ZKS (Zero-Knowledge Systems) Anonymous IP Protocol allows users to select up to any of five different pseudonyms, while desktop software encrypts outgoing traffic and wraps it in User Datagram Protocol (UDP) packets. The first server in a 2+-hop system gets the UDP packets, strips off one layer of encryption to add another, then sends the traffic to the next server, which strips off yet another layer of encryption and adds a new one. The user is permitted to control the number of hops. At the final server, traffic is decrypted with an untraceable IP address. The technique is called onion-routing. This method can be defeated using traffic analysis. For a simple example, bursts of packets from a user during low-duty periods can reveal the identities of sender and receiver.

[0008] Firewalls attempt to protect LANs from unauthorized access and hostile exploitation or damage to computers connected to the LAN. Firewalls provide a server through which all access to the LAN must pass. Firewalls are centralized systems that require

administrative overhead to maintain. They can be compromised by virtual-machine applications ("applets"). They instill a false sense of security that leads to security breaches for example by users sending sensitive information to servers outside the firewall or encouraging use of modems to sidestep the firewall security. Firewalls are not useful for distributed systems such as business travelers, extranets, small teams, etc.

SUMMARY OF THE INVENTION

[0009] A secure mechanism for communicating over the internet, including a protocol referred to as the Tunneled Agile Routing Protocol (TARP), uses a unique two-layer encryption format and special TARP routers. TARP routers are similar in function to regular IP routers. Each TARP router has one or more IP addresses and uses normal IP protocol to send IP packet messages ("packets" or "datagrams"). The IP packets exchanged between TARP terminals via TARP routers are actually encrypted packets whose true destination address is concealed except to TARP routers and servers. The normal or "clear" or "outside" IP header attached to TARP IP packets contains only the address of a next hop router or destination server. That is, instead of indicating a final destination in the destination field of the IP header, the TARP packet's IP header always points to a next-hop in a series of TARP router hops, or to the final destination. This means there is no overt indication from an intercepted TARP packet of the true destination.

[0010] Each TARP packet's true destination is concealed behind a layer of encryption generated using a link key. The link key is the encryption key used for encrypted communication between the hops intervening between an originating TARP terminal and a destination TARP terminal. Each TARP router can remove the outer layer of encryption to reveal the destination router for each TARP packet. To identify the link key needed to decrypt the outer layer of encryption of a TARP packet, a receiving TARP or routing terminal may identify the transmitting terminal by the sender/receiver IP numbers in the cleartext IP header.

[0011] Once the outer layer of encryption is removed, the TARP router determines the final destination. Each TARP packet 140 undergoes a minimum number of hops to help foil traffic analysis. The hops may be chosen at random or by a fixed value. As a result, each TARP

packet may make random trips among a number of geographically disparate routers before reaching its destination. Each trip is highly likely to be different for each packet composing a given message because each trip is independently randomly determined. This feature is called *agile routing*. The fact that different packets take different routes provides distinct advantages by making it difficult for an interloper to obtain all the packets forming an entire multi-packet message. The associated advantages have to do with the inner layer of encryption discussed below. Agile routing is combined with another feature that furthers this purpose; a feature that ensures that any message is broken into multiple packets.

[0012] The IP address of a TARP router can be changed, a feature called *IP agility*. Each TARP router, independently or under direction from another TARP terminal or router, can change its IP address. A separate, unchangeable identifier or address is also defined. This address, called the TARP address, is known only to TARP routers and terminals and may be correlated at any time by a TARP router or a TARP terminal using a Lookup Table (LUT). When a TARP router or terminal changes its IP address, it updates the other TARP routers and terminals which in turn update their respective LUTs.

[0013] The message payload is hidden behind an inner layer of encryption in the TARP packet that can only be unlocked using a session key. The session key is not available to any of the intervening TARP routers. The session key is used to decrypt the payloads of the TARP packets permitting the data stream to be reconstructed.

[0014] Communication may be made private using link and session keys, which in turn may be shared and used according to any desired method. For example, public/private keys or symmetric keys may be used.

[0015] To transmit a data stream, a TARP originating terminal constructs a series of TARP packets from a series of IP packets generated by a network (IP) layer process. (Note that the terms "network layer," "data link layer," "application layer," etc. used in this specification correspond to the Open Systems Interconnection (OSI) network terminology.) The payloads of these packets are assembled into a block and chain-block encrypted using the session key. This assumes, of course, that all the IP packets are destined for the same TARP terminal. The block is

then interleaved and the interleaved encrypted block is broken into a series of payloads, one for each TARP packet to be generated. Special TARP headers IP_T are then added to each payload using the IP headers from the data stream packets. The TARP headers can be identical to normal IP headers or customized in some way. They should contain a formula or data for deinterleaving the data at the destination TARP terminal, a time-to-live (TTL) parameter to indicate the number of hops still to be executed, a data type identifier which indicates whether the payload contains, for example, TCP or UDP data, the sender's TARP address, the destination TARP address, and an indicator as to whether the packet contains real or decoy data or a formula for filtering out decoy data if decoy data is spread in some way through the TARP payload data.

[0016] Note that although chain-block encryption is discussed here with reference to the session key, any encryption method may be used. Preferably, as in chain block encryption, a method should be used that makes unauthorized decryption difficult without an entire result of the encryption process. Thus, by separating the encrypted block among multiple packets and making it difficult for an interloper to obtain access to all of such packets, the contents of the communications are provided an extra layer of security.

[0017] Decoy or dummy data can be added to a stream to help foil traffic analysis by reducing the peak-to-average network load. It may be desirable to provide the TARP process with an ability to respond to the time of day or other criteria to generate more decoy data during low traffic periods so that communication bursts at one point in the Internet cannot be tied to communication bursts at another point to reveal the communicating endpoints.

[0018] Dummy data also helps to break the data into a larger number of inconspicuously-sized packets permitting the interleave window size to be increased while maintaining a reasonable size for each packet. (The packet size can be a single standard size or selected from a fixed range of sizes.) One primary reason for desiring for each message to be broken into multiple packets is apparent if a chain block encryption scheme is used to form the first encryption layer prior to interleaving. A single block encryption may be applied to a portion, or entirety, of a message, and that portion or entirety then interleaved into a number of separate packets. Considering the agile IP routing of the packets, and the attendant difficulty of

reconstructing an entire sequence of packets to form a single block-encrypted message element, decoy packets can significantly increase the difficulty of reconstructing an entire data stream.

[0019] The above scheme may be implemented entirely by processes operating between the data link layer and the network layer of each server or terminal participating in the TARP system. Because the encryption system described above is insertable between the data link and network layers, the processes involved in supporting the encrypted communication may be completely transparent to processes at the IP (network) layer and above. The TARP processes may also be completely transparent to the data link layer processes as well. Thus, no operations at or above the Network layer, or at or below the data link layer, are affected by the insertion of the TARP stack. This provides additional security to all processes at or above the network layer, since the difficulty of unauthorized penetration of the network layer (by, for example, a hacker) is increased substantially. Even newly developed servers running at the session layer leave all processes below the session layer vulnerable to attack. Note that in this architecture, security is distributed. That is, notebook computers used by executives on the road, for example, can communicate over the Internet without any compromise in security.

[0020] IP address changes made by TARP terminals and routers can be done at regular intervals, at random intervals, or upon detection of "attacks." The variation of IP addresses hinders traffic analysis that might reveal which computers are communicating, and also provides a degree of immunity from attack. The level of immunity from attack is roughly proportional to the rate at which the IP address of the host is changing.

[0021] As mentioned, IP addresses may be changed in response to attacks. An attack may be revealed, for example, by a regular series of messages indicating that a router is being probed in some way. Upon detection of an attack, the TARP layer process may respond to this event by changing its IP address. In addition, it may create a subprocess that maintains the original IP address and continues interacting with the attacker in some manner.

[0022] Decoy packets may be generated by each TARP terminal on some basis determined by an algorithm. For example, the algorithm may be a random one which calls for the generation of a packet on a random basis when the terminal is idle. Alternatively, the algorithm

may be responsive to time of day or detection of low traffic to generate more decoy packets during low traffic times. Note that packets are preferably generated in groups, rather than one by one, the groups being sized to simulate real messages. In addition, so that decoy packets may be inserted in normal TARP message streams, the background loop may have a latch that makes it more likely to insert decoy packets when a message stream is being received. Alternatively, if a large number of decoy packets is received along with regular TARP packets, the algorithm may increase the rate of dropping of decoy packets rather than forwarding them. The result of dropping and generating decoy packets in this way is to make the apparent incoming message size different from the apparent outgoing message size to help foil traffic analysis.

[0023] In various other embodiments of the invention, a scalable version of the system may be constructed in which a plurality of IP addresses are preassigned to each pair of communicating nodes in the network. Each pair of nodes agrees upon an algorithm for "hopping" between IP addresses (both sending and receiving), such that an eavesdropper sees apparently continuously random IP address pairs (source and destination) for packets transmitted between the pair. Overlapping or "reusable" IP addresses may be allocated to different users on the same subnet, since each node merely verifies that a particular packet includes a valid source/destination pair from the agreed-upon algorithm. Source/destination pairs are preferably not reused between any two nodes during any given end-to-end session, though limited IP block sizes or lengthy sessions might require it.

[0024] Further improvements described in this continuation-in-part application include: (1) a load balancer that distributes packets across different transmission paths according to transmission path quality; (2) a DNS proxy server that transparently creates a virtual private network in response to a domain name inquiry; (3) a large-to-small link bandwidth management feature that prevents denial-of service attacks at system chokepoints; (4) a traffic limiter that regulates incoming packets by limiting the rate at which a transmitter can be synchronized with a receiver; and (5) a signaling synchronizer that allows a large number of nodes to communicate with a central node by partitioning the communication function between two separate entities.

[0025] The present invention provides key technologies for implementing a secure virtual Internet by using a new agile network protocol that is built on top of the existing Internet

protocol (IP). The secure virtual Internet works over the existing Internet infrastructure, and interfaces with client applications the same way as the existing Internet. The key technologies provided by the present invention that support the secure virtual Internet include a "one-click" and "no-click" technique to become part of the secure virtual Internet, a secure domain name service (SDNS) for the secure virtual Internet, and a new approach for interfacing specific client applications onto the secure virtual Internet. According to the invention, the secure domain name service interfaces with existing applications, in addition to providing a way to register and serve domain names and addresses.

[0026] According to one aspect of the present invention, a user can conveniently establish a VPN using a "one-click" or a "no-click" technique without being required to enter user identification information, a password and/or an encryption key for establishing a VPN. The advantages of the present invention are provided by a method for establishing a secure communication link between a first computer and a second computer over a computer network, such as the Internet. In one embodiment, a secure communication mode is enabled at a first computer without a user entering any cryptographic information for establishing the secure communication mode of communication, preferably by merely selecting an icon displayed on the first computer. Alternatively, the secure communication mode of communication can be enabled by entering a command into the first computer. Then, a secure communication link is established between the first computer and a second computer over a computer network based on the enabled secure communication mode of communication. According to the invention, it is determined whether a secure communication software module is stored on the first computer in response to the step of enabling the secure communication mode of communication. A predetermined computer network address is then accessed for loading the secure communication software module when the software module is not stored on the first computer. Subsequently, the proxy software module is stored in the first computer. The secure communication link is a virtual private network communication link over the computer network. Preferably, the virtual private network can be based on inserting into each data packet one or more data values that vary according to a pseudo-random sequence. Alternatively, the virtual private network can be based on a computer network address hopping regime that is used to pseudorandomly change computer network addresses or other data values in packets transmitted between the first computer and the

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second computer, such that the second computer compares the data values in each data packet transmitted between the first computer and the second computer to a moving window of valid values. Yet another alternative provides that the virtual private network can be based on a comparison between a discriminator field in each data packet to a table of valid discriminator fields maintained for the first computer.

[0027] According to another aspect of the invention, a command is entered to define a setup parameter associated with the secure communication link mode of communication. Consequently, the secure communication mode is automatically established when a communication link is established over the computer network.

[0028] The present invention also provides a computer system having a communication link to a computer network, and a display showing a hyperlink for establishing a virtual private network through the computer network. When the hyperlink for establishing the virtual private network is selected, a virtual private network is established over the computer network. A non-standard top-level domain name is then sent over the virtual private network communication to a predetermined computer network address, such as a computer network address for a secure domain name service (SDNS).

[0029] The present invention provides a domain name service that provides secure computer network addresses for secure, non-standard top-level domain names. The advantages of the present invention are provided by a secure domain name service for a computer network that includes a portal connected to a computer network, such as the Internet, and a domain name database connected to the computer network through the portal. According to the invention, the portal authenticates a query for a secure computer network address, and the domain name database stores secure computer network addresses for the computer network. Each secure computer network address is based on a non-standard top-level domain name, such as .scom, .sorg, .snet, .snet, .sedu, .smil and .sint.

[0030] The present invention provides a way to encapsulate existing application network traffic at the application layer of a client computer so that the client application can securely communicate with a server protected by an agile network protocol. The advantages of

the present invention are provided by a method for communicating using a private communication link between a client computer and a server computer over a computer network, such as the Internet. According to the invention, an information packet is sent from the client computer to the server computer over the computer network. The information packet contains data that is inserted into the payload portion of the packet at the application layer of the client computer and is used for forming a virtual private connection between the client computer and the server computer. The modified information packet can be sent through a firewall before being sent over the computer network to the server computer and by working on top of existing protocols (i.e., UDP, ICMP and TCP), the present invention more easily penetrates the firewall. The information packet is received at a kernel layer of an operating system on the server side. It is then determined at the kernel layer of the operating system on the host computer whether the information packet contains the data that is used for forming the virtual private connection. The server side replies by sending an information packet to the client computer that has been modified at the kernel layer to containing virtual private connection information in the payload portion of the reply information packet. Preferably, the information packet from the client computer and the reply information packet from the server side are each a UDP protocol information packet. Alternative, both information packets could be a TCP/IP protocol information packet, or an ICMP protocol information packet.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] FIG. 1 is an illustration of secure communications over the Internet according to a prior art embodiment.

[0032] FIG. 2 is an illustration of secure communications over the Internet according to an embodiment of the invention.

[0033] FIG. 3A is an illustration of a process of forming a tunneled IP packet according to an embodiment of the invention.

[0034] FIG. 3B is an illustration of a process of forming a tunneled IP packet according to another embodiment of the invention.

[0035] FIG. 4 is an illustration of an OSI layer location of processes that may be used to implement the invention.

[0036] FIG. 5 is a flow chart illustrating a process for routing a tunneled packet according to an embodiment of the invention.

[0037] FIG. 6 is a flow chart illustrating a process for forming a tunneled packet according to an embodiment of the invention.

[0038] FIG. 7 is a flow chart illustrating a process for receiving a tunneled packet according to an embodiment of the invention.

[0039] FIG. 8 shows how a secure session is established and synchronized between a client and a TARP router.

[0040] FIG. 9 shows an IP address hopping scheme between a client computer and TARP router using transmit and receive tables in each computer.

[0041] FIG. 10 shows physical link redundancy among three Internet Service Providers (ISPs) and a client computer.

[0042] FIG. 11 shows how multiple IP packets can be embedded into a single "frame" such as an Ethernet frame, and further shows the use of a discriminator field to camouflage true packet recipients.

[0043] FIG. 12A shows a system that employs hopped hardware addresses, hopped IP addresses, and hopped discriminator fields.

[0044] FIG. 12B shows several different approaches for hopping hardware addresses, IP addresses, and discriminator fields in combination.

[0045] FIG. 13 shows a technique for automatically re-establishing synchronization between sender and receiver through the use of a partially public sync value.

[0046] FIG. 14 shows a "checkpoint" scheme for regaining synchronization between a sender and recipient.

[0047] FIG. 15 shows further details of the checkpoint scheme of FIG. 14.

[0048] FIG. 16 shows how two addresses can be decomposed into a plurality of segments for comparison with presence vectors.

[0049] FIG. 17 shows a storage array for a receiver's active addresses.

[0050] FIG. 18 shows the receiver's storage array after receiving a sync request.

[0051] FIG. 19 shows the receiver's storage array after new addresses have been generated.

[0052] FIG. 20 shows a system employing distributed transmission paths.

[0053] FIG. 21 shows a plurality of link transmission tables that can be used to route packets in the system of FIG. 20.

[0054] FIG. 22A shows a flowchart for adjusting weight value distributions associated with a plurality of transmission links.

[0055] FIG. 22B shows a flowchart for setting a weight value to zero if a transmitter turns off.

[0056] FIG. 23 shows a system employing distributed transmission paths with adjusted weight value distributions for each path.

[0057] FIG. 24 shows an example using the system of FIG. 23.

[0058] FIG. 25 shows a conventional domain-name look-up service.

[0059] FIG. 26 shows a system employing a DNS proxy server with transparent VPN creation.

[0060] FIG. 27 shows steps that can be carried out to implement transparent VPN creation based on a DNS look-up function.

[0061] FIG. 28 shows a system including a link guard function that prevents packet overloading on a low-bandwidth link LOW BW.

[0062] FIG. 29 shows one embodiment of a system employing the principles of FIG. 28.

[0063] FIG. 30 shows a system that regulates packet transmission rates by throttling the rate at which synchronizations are performed.

[0064] FIG. 31 shows a signaling server 3101 and a transport server 3102 used to establish a VPN with a client computer.

[0065] FIG. 32 shows message flows relating to synchronization protocols of FIG. 31.

[0066] FIG. 33 shows a system block diagram of a computer network in which the "one-click" secure communication link of the present invention is suitable for use.

[0067] FIG. 34 shows a flow diagram for installing and establishing a "one-click" secure communication link over a computer network according to the present invention.

[0068] FIG. 35 shows a flow diagram for registering a secure domain name according to the present invention.

[0069] FIG. 36 shows a system block diagram of a computer network in which a private connection according to the present invention can be configured to more easily traverse a firewall between two computer networks.

[0070] FIG. 37 shows a flow diagram for establishing a virtual private connection that is encapsulated using an existing network protocol.

DETAILED DESCRIPTION OF THE INVENTION

[0071] Referring to FIG. 2, a secure mechanism for communicating over the internet employs a number of special routers or servers, called TARP routers 122-127 that are similar to regular IP routers 128-132 in that each has one or more IP addresses and uses normal IP protocol to send normal-looking IP packet messages, called TARP packets 140. TARP packets 140 are identical to normal IP packet messages that are routed by regular IP routers 128-132 because each TARP packet 140 contains a destination address as in a normal IP packet. However, instead of indicating a final destination in the destination field of the IP header, the TARP packet's 140 IP header always points to a next-hop in a series of TARP router hops, or the final destination, TARP terminal 110. Because the header of the TARP packet contains only the next-hop destination, there is no overt indication from an intercepted TARP packet of the true destination of the TARP packet 140 since the destination could always be the next-hop TARP router as well as the final destination, TARP terminal 110.

[0072] Each TARP packet's true destination is concealed behind an outer layer of encryption generated using a link key 146. The link key 146 is the encryption key used for encrypted communication between the end points (TARP terminals or TARP routers) of a single link in the chain of hops connecting the originating TARP terminal 100 and the destination TARP terminal 110. Each TARP router 122-127, using the link key 146 it uses to communicate with the previous hop in a chain, can use the link key to reveal the true destination of a TARP packet. To identify the link key needed to decrypt the outer layer of encryption of a TARP packet, a receiving TARP or routing terminal may identify the transmitting terminal (which may indicate the link key used) by the sender field of the clear IP header. Alternatively, this identity may be hidden behind another layer of encryption in available bits in the clear IP header. Each TARP router, upon receiving a TARP message, determines if the message is a TARP message by using authentication data in the TARP packet. This could be recorded in available bytes in the TARP packet's IP header. Alternatively, TARP packets could be authenticated by attempting to decrypt using the link key 146 and determining if the results are as expected. The former may have computational advantages because it does not involve a decryption process.

[0073] Once the outer layer of decryption is completed by a TARP router 122-127, the TARP router determines the final destination. The system is preferably designed to cause each TARP packet 140 to undergo a minimum number of hops to help foil traffic analysis. The time to live counter in the IP header of the TARP message may be used to indicate a number of TARP router hops yet to be completed. Each TARP router then would decrement the counter and determine from that whether it should forward the TARP packet 140 to another TARP router 122-127 or to the destination TARP terminal 110. If the time to live counter is zero or below zero after decrementing, for an example of usage, the TARP router receiving the TARP packet 140 may forward the TARP packet 140 to the destination TARP router receiving the TARP router receiving the TARP packet 140 may forward the TARP packet 140 to the destination TARP router receiving the TARP router receiving the TARP packet 140 may forward the TARP packet 140 to the destination TARP router receiving the TARP router receiving the TARP packet 140 may forward the TARP packet 140 to a TARP router 122-127 that the current TARP terminal chooses at random. As a result, each TARP packet 140 is routed through some minimum number of hops of TARP routers 122-127 which are chosen at random.

[0074] Thus, each TARP packet, irrespective of the traditional factors determining traffic in the Internet, makes random trips among a number of geographically disparate routers before reaching its destination and each trip is highly likely to be different for each packet composing a given message because each trip is independently randomly determined as described above. This feature is called *agile routing*. For reasons that will become clear shortly, the fact that different packets take different routes provides distinct advantages by making it difficult for an interloper to obtain all the packets forming an entire multi-packet message. Agile routing is combined with another feature that furthers this purpose, a feature that ensures that any message is broken into multiple packets.

[0075] A TARP router receives a TARP packet when an IP address used by the TARP router coincides with the IP address in the TARP packet's IP header IPc. The IP address of a TARP router, however, may not remain constant. To avoid and manage attacks, each TARP router, independently or under direction from another TARP terminal or router, may change its IP address. A separate, unchangeable identifier or address is also defined. This address, called the TARP address, is known only to TARP routers and terminals and may be correlated at any time by a TARP router or a TARP terminal using a Lookup Table (LUT). When a TARP router

or terminal changes its IP address, it updates the other TARP routers and terminals which in turn update their respective LUTs. In reality, whenever a TARP router looks up the address of a destination in the encrypted header, it must convert a TARP address to a real IP address using its LUT.

[0076] While every TARP router receiving a TARP packet has the ability to determine the packet's final destination, the message payload is embedded behind an inner layer of encryption in the TARP packet that can only be unlocked using a session key. The session key is not available to any of the TARP routers 122-127 intervening between the originating 100 and destination 110 TARP terminals. The session key is used to decrypt the payloads of the TARP packets 140 permitting an entire message to be reconstructed.

[0077] In one embodiment, communication may be made private using link and session keys, which in turn may be shared and used according any desired method. For example, a public key or symmetric keys may be communicated between link or session endpoints using a public key method. Any of a variety of other mechanisms for securing data to ensure that only authorized computers can have access to the private information in the TARP packets 140 may be used as desired.

[0078] Referring to FIG. 3A, to construct a series of TARP packets, a data stream 300 of IP packets 207a, 207b, 207c, etc., such series of packets being formed by a network (IP) layer process, is broken into a series of small sized segments. In the present example, equal-sized segments 1-9 are defined and used to construct a set of interleaved data packets A, B, and C. Here it is assumed that the number of interleaved packets A, B, and C formed is three and that the number of IP packets 207a-207c used to form the three interleaved packets A, B, and C is exactly three. Of course, the number of IP packets spread over a group of interleaved packets may be any convenient number as may be the number of interleaved packets over which the incoming data stream is spread. The latter, the number of interleaved packets over which the data stream is spread, is called the *interleave window*.

[0079] To create a packet, the transmitting software interleaves the normal IP packets 207a *et. seq, to* form a new set of interleaved payload data 320. This payload data 320 is then

encrypted using a session key to form a set of session-key-encrypted payload data 330, each of which, A, B, and C, will form the payload of a TARP packet. Using the IP header data, from the original packets 207a-207c, new TARP headers IPT are formed. The TARP headers IPT can be identical to normal IP headers or customized in some way. In a preferred embodiment, the TARP headers IPT are IP headers with added data providing the following information required for routing and reconstruction of messages, some of which data is ordinarily, or capable of being, contained in normal IP headers:

1. A window sequence number — an identifier that indicates where the packet belongs in the original message sequence.

2. An interleave sequence number — an identifier that indicates the interleaving sequence used to form the packet so that the packet can be deinterleaved along with other packets in the interleave window.

3. A time-to-live (TTL) datum — indicates the number of TARP-router-hops to be executed before the packet reaches its destination. Note that the TTL parameter may provide a datum to be used in a probabilistic formula for determining whether to route the packet to the destination or to another hop.

4. Data type identifier — indicates whether the payload contains, for example, TCP or UDP data.

5. Sender's address — indicates the sender's address in the TARP network.

6. Destination address — indicates the destination terminal's address in the TARP network.

7. Decoy/Real — an indicator of whether the packet contains real message data or dummy decoy data or a combination.

[0080] Obviously, the packets going into a single interleave window must include only packets with a common destination. Thus, it is assumed in the depicted example that the IP headers of IP packets 207a-207c all contain the same destination address or at least will be

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received by the same terminal so that they can be deinterleaved. Note that dummy or decoy data or packets can be added to form a larger interleave window than would otherwise be required by the size of a given message. Decoy or dummy data can be added to a stream to help foil traffic analysis by leveling the load on the network. Thus, it may be desirable to provide the TARP process with an ability to respond to the time of day or other criteria to generate more decoy data during low traffic periods so that communication bursts at one point in the Internet cannot be tied to communication bursts at another point to reveal the communicating endpoints.

[0081] Dummy data also helps to break the data into a larger number of inconspicuously-sized packets permitting the interleave window size to be increased while maintaining a reasonable size for each packet. (The packet size can be a single standard size or selected from a fixed range of sizes.) One primary reason for desiring for each message to be broken into multiple packets is apparent if a chain block encryption scheme is used to form the first encryption layer prior to interleaving. A single block encryption may be applied to a portion, or the entirety, of a message, and that portion or entirety then interleaved into a number of separate packets.

[0082] Referring to FIG. 3B, in an alternative mode of TARP packet construction, a series of IP packets are accumulated to make up a predefined interleave window. The payloads of the packets are used to construct a single block 520 for chain block encryption using the session key. The payloads used to form the block are presumed to be destined for the same terminal. The block size may coincide with the interleave window as depicted in the example embodiment of FIG. 3B. After encryption, the encrypted block is broken into separate payloads and segments which are interleaved as in the embodiment of Fig 3A. The resulting interleaved packets A, B, and C, are then packaged as TARP packets with TARP headers as in the Example of FIG. 3A. The remaining process is as shown in, and discussed with reference to, FIG. 3A.

[0083] Once the TARP packets 340 are formed, each entire TARP packet 340, including the TARP header IPT, is encrypted using the link key for communication with the first-hop-TARP router. The first hop TARP router is randomly chosen. A final unencrypted IP header IPc is added to each encrypted TARP packet 340 to form a normal IP packet 360 that can be transmitted to a TARP router. Note that the process of constructing the TARP packet 360

does not have to be done in stages as described. The above description is just a useful heuristic for describing the final product, namely, the TARP packet.

[0084] Note that, TARP header IP_T could be a completely custom header configuration with no similarity to a normal IP header except that it contain the information identified above. This is so since this header is interpreted by only TARP routers.

[0085] The above scheme may be implemented entirely by processes operating between the data link layer and the network layer of each server or terminal participating in the TARP system. Referring to FIG. 4, a TARP transceiver 405 can be an originating terminal 100, a destination terminal 110, or a TARP router 122-127. In each TARP Transceiver 405, a transmitting process is generated to receive normal packets from the Network (IP) layer and generate TARP packets for communication over the network. A receiving process is generated to receive normal IP packets containing TARP packets and generate from these normal IP packets which are "passed up" to the Network (IP) layer. Note that where the TARP Transceiver 405 is a router, the received TARP packets 140 are not processed into a stream of IP packets 415 because they need only be authenticated as proper TARP packets and then passed to another TARP router or a TARP destination terminal 110. The intervening process, a "TARP Layer" 420, could be combined with either the data link layer 430 or the Network layer 410. In either case, it would intervene between the data link layer 430 so that the process would receive regular IP packets containing embedded TARP packets and "hand up" a series of reassembled IP packets to the Network layer 410. As an example of combining the TARP layer 420 with the data link layer 430, a program may augment the normal processes running a communications card, for example, an Ethernet card. Alternatively, the TARP layer processes may form part of a dynamically loadable module that is loaded and executed to support communications between the network and data link layers.

[0086] Because the encryption system described above can be inserted between the data link and network layers, the processes involved in supporting the encrypted communication may be completely transparent to processes at the IP (network) layer and above. The TARP processes may also be completely transparent to the data link layer processes as well. Thus, no

operations at or above the network layer, or at or below the data link layer, are affected by the insertion of the TARP stack. This provides additional security to all processes at or above the network layer, since the difficulty of unauthorized penetration of the network layer (by, for example, a hacker) is increased substantially. Even newly developed servers running at the session layer leave all processes below the session layer vulnerable to attack. Note that in this architecture, security is distributed. That is, notebook computers used by executives on the road, for example, can communicate over the Internet without any compromise in security.

[0087] Note that IP address changes made by TARP terminals and routers can be done at regular intervals, at random intervals, or upon detection of "attacks." The variation of IP addresses hinders traffic analysis that might reveal which computers are communicating, and also provides a degree of immunity from attack. The level of immunity from attack is roughly proportional to the rate at which the IP address of the host is changing.

[0088] As mentioned, IP addresses may be changed in response to attacks. An attack may be revealed, for example, by a regular series of messages indicates that a router is being probed in some way. Upon detection of an attack, the TARP layer process may respond to this event by changing its IP address. To accomplish this, the TARP process will construct a TARPformatted message, in the style of Internet Control Message Protocol (ICMP) datagrams as an example; this message will contain the machine's TARP address, its previous IP address, and its new IP address. The TARP layer will transmit this packet to at least one known TARP router; then upon receipt and validation of the message, the TARP router will update its LUT with the new IP address for the stated TARP address. The TARP router will then format a similar message, and broadcast it to the other TARP routers so that they may update their LUTs. Since the total number of TARP routers on any given subnet is expected to be relatively small, this process of updating the LUTs should be relatively fast. It may not, however, work as well when there is a relatively large number of TARP routers and/or a relatively large number of clients; this has motivated a refinement of this architecture to provide scalability; this refinement has led to a second embodiment, which is discussed below.

[0089] Upon detection of an attack, the TARP process may also create a subprocess that maintains the original IP address and continues interacting with the attacker. The latter may

provide an opportunity to trace the attacker or study the attacker's methods (called "fishbowling" drawing upon the analogy of a small fish in a fish bowl that "thinks" it is in the ocean but is actually under captive observation). A history of the communication between the attacker and the abandoned (fishbowled) IP address can be recorded or transmitted for human analysis or further synthesized for purposes of responding in some way.

[0090] As mentioned above, decoy or dummy data or packets can be added to outgoing data streams by TARP terminals or routers. In addition to making it convenient to spread data over a larger number of separate packets, such decoy packets can also help to level the load on inactive portions of the Internet to help foil traffic analysis efforts.

[0091] Decoy packets may be generated by each TARP terminal 100, 110 or each router 122-127 on some basis determined by an algorithm. For example, the algorithm may be a random one which calls for the generation of a packet on a random basis when the terminal is idle. Alternatively, the algorithm may be responsive to time of day or detection of low traffic to generate more decoy packets during low traffic times. Note that packets are preferably generated in groups, rather than one by one, the groups being sized to simulate real messages. In addition, so that decoy packets may be inserted in normal TARP message streams, the background loop may have a latch that makes it more likely to insert decoy packets when a message stream is being received. That is, when a series of messages are received, the decoy packet generation rate may be increased. Alternatively, if a large number of decoy packets is received along with regular TARP packets, the algorithm may increase the rate of dropping of decoy packets rather than forwarding them. The result of dropping and generating decoy packets in this way is to make the apparent incoming message size different from the apparent outgoing message size to help foil traffic analysis. The rate of reception of packets, decoy or otherwise, may be indicated to the decoy packet dropping and generating processes through perishable decoy and regular packet counters. (A perishable counter is one that resets or decrements its value in response to time so that it contains a high value when it is incremented in rapid succession and a small value when incremented either slowly or a small number of times in rapid succession.) Note that destination TARP terminal 110 may generate decoy packets equal in number and size to those TARP packets received to make it appear it is merely routing packets and is therefore not the destination terminal.

[0092] Referring to FIG. 5, the following particular steps may be employed in the above- described method for routing TARP packets.

- S0. A background loop operation is performed which applies an algorithm which determines the generation of decoy IP packets. The loop is interrupted when an encrypted TARP packet is received.
- S2. The TARP packet may be probed in some way to authenticate the packet before attempting to decrypt it using the link key. That is, the router may determine that the packet is an authentic TARP packet by performing a selected operation on some data included with the clear IP header attached to the encrypted TARP packet contained in the payload. This makes it possible to avoid performing decryption on packets that are not authentic TARP packets.
- S3. The TARP packet is decrypted to expose the destination TARP address and an indication of whether the packet is a decoy packet or part of a real message.
- S4. If the packet is a decoy packet, the perishable decoy counter is incremented.
- S5. Based on the decoy generation/dropping algorithm and the perishable decoy counter value, if the packet is a decoy packet, the router may choose to throw it away. If the received packet is a decoy packet and it is determined that it should be thrown away (S6), control returns to step S0.
- S7. The TTL parameter of the TARP header is decremented and it is determined if the TTL parameter is greater than zero.
- S8. If the TTL parameter is greater than zero, a TARP address is randomly chosen from a list of TARP addresses maintained by the router and the link key and IP address corresponding to that TARP address memorized for use in creating a new IP packet containing the TARP packet.

- S9. If the TTL parameter is zero or less, the link key and IP address corresponding to the TARP address of the destination are memorized for use in creating the new IP packet containing the TARP packet.
- S 10. The TARP packet is encrypted using the memorized link key.
- S 11. An IP header is added to the packet that contains the stored IP address, the encrypted TARP packet wrapped with an IP header, and the completed packet transmitted to the next hop or destination.

[0093] Referring to FIG. 6, the following particular steps may be employed in the above- described method for generating TARP packets.

- S20. A background loop operation applies an algorithm that determines the generation of decoy IP packets. The loop is interrupted when a data stream containing IP packets is received for transmission.
- S21. The received IP packets are grouped into a set consisting of messages with a constant IP destination address. The set is further broken down to coincide with a maximum size of an interleave window The set is encrypted, and interleaved into a set of payloads destined to become TARP packets.
- S22. The TARP address corresponding to the IP address is determined from a lookup table and stored to generate the TARP header. An initial TTL count is generated and stored in the header. The TTL count may be random with minimum and maximum values or it may be fixed or determined by some other parameter.
- S23. The window sequence numbers and interleave sequence numbers are recorded in the TARP headers of each packet.
- S24. One TARP router address is randomly chosen for each TARP packet and the IP address corresponding to it stored for use in the clear IP header. The link key corresponding to this router is identified and used to encrypt TARP packets containing interleaved and encrypted data and TARP headers.

• S25. A clear IP header with the first hop router's real IP address is generated and added to each of the encrypted TARP packets and the resulting packets.

[0094] Referring to FIG. 7, the following particular steps may be employed in the above- described method for receiving TARP packets.

- S40. A background loop operation is performed which applies an algorithm which determines the generation of decoy IP packets. The loop is interrupted when an encrypted TARP packet is received.
- S42. The TARP packet may be probed to authenticate the packet before attempting to decrypt it using the link key.
- S43. The TARP packet is decrypted with the appropriate link key to expose the destination TARP address and an indication of whether the packet is a decoy packet or part of a real message.
- S44. If the packet is a decoy packet, the perishable decoy counter is incremented.
- S45. Based on the decoy generation/dropping algorithm and the perishable decoy counter value, if the packet is a decoy packet, the receiver may choose to throw it away.
- S46. The TARP packets are cached until all packets forming an interleave window are received.
- S47. Once all packets of an interleave window are received, the packets are deinterleaved.
- S48. The packets block of combined packets defining the interleave window is then decrypted using the session key.
- S49. The decrypted block is then divided using the window sequence data and the IP_T headers are converted into normal IP_C headers. The window sequence numbers are integrated in the IP_C headers.
- S50. The packets are then handed up to the IP layer processes.

1. SCALABILITY ENHANCEMENTS

[0095] The IP agility feature described above relies on the ability to transmit IP address changes to all TARP routers. The embodiments including this feature will be referred to as "boutique" embodiments due to potential limitations in scaling these features up for a large network, such as the Internet. (The "boutique" embodiments would, however, be robust for use in smaller networks, such as small virtual private networks, for example). One problem with the boutique embodiments is that if IP address changes are to occur frequently, the message traffic required to update all routers sufficiently quickly creates a serious burden on the Internet when the TARP router and/or client population gets large. The bandwidth burden added to the networks, for example in ICMP packets, that would be used to update all the TARP routers could overwhelm the Internet for a large scale implementation that approached the scale of the Internet. In other words, the boutique system's scalability is limited.

[0096] A system can be constructed which trades some of the features of the above embodiments to provide the benefits of IP agility without the additional messaging burden. This is accomplished by IP address-hopping according to shared algorithms that govern IP addresses used between links participating in communications sessions between nodes such as TARP nodes. (Note that the IP hopping technique is also applicable to the boutique embodiment.) The IP agility feature discussed with respect to the boutique system can be modified so that it becomes decentralized under this scalable regime and governed by the above-described shared algorithm. Other features of the boutique system may be combined with this new type of IPagility.

[0097] The new embodiment has the advantage of providing IP agility governed by a local algorithm and set of IP addresses exchanged by each communicating pair of nodes. This local governance is session-independent in that it may govern communications between a pair of nodes, irrespective of the session or end points being transferred between the directly communicating pair of nodes.

[0098] In the scalable embodiments, blocks of IP addresses are allocated to each node in the network. (This scalability will increase in the future, when Internet Protocol addresses are

increased to 128-bit fields, vastly increasing the number of distinctly addressable nodes). Each node can thus use any of the IP addresses assigned to that node to communicate with other nodes in the network. Indeed, each pair of communicating nodes can use a plurality of source IP addresses and destination IP addresses for communicating with each other.

[0099] Each communicating pair of nodes in a chain participating in any session stores two blocks of IP addresses, called netblocks, and an algorithm and randomization seed for selecting, from each netblock, the next pair of source/destination IP addresses that will be used to transmit the next message. In other words, the algorithm governs the sequential selection of IP-address pairs, one sender and one receiver IP address, from each netblock. The combination of algorithm, seed, and netblock (IP address block) will be called a "hopblock." A router issues separate transmit and receive hopblocks to its clients. The send address and the receive address of the IP header of each outgoing packet sent by the client are filled with the send and receive IP addresses generated by the algorithm. The algorithm is "clocked" (indexed) by a counter so that each time a pair is used, the algorithm turns out a new transmit pair for the next packet to be sent.

[00100] The router's receive hopblock is identical to the client's transmit hopblock. The router uses the receive hopblock to predict what the send and receive IP address pair for the next expected packet from that client will be. Since packets can be received out of order, it is not possible for the router to predict with certainty what IP address pair will be on the next sequential packet. To account for this problem, the router generates a range of predictions encompassing the number of possible transmitted packet send/receive addresses, of which the next packet received could leap ahead. Thus, if there is a vanishingly small probability that a given packet will arrive at the router ahead of 5 packets transmitted by the client before the given packet, then the router can generate a series of 6 send/receive IP address pairs (or "hop window") to compare with the next received packet. When a packet is received, it is marked in the hop window as such, so that a second packet with the same IP address pair will be discarded. If an out-of-sequence packet does not arrive within a predetermined timeout period, it can be requested for retransmission or simply discarded from the receive table, depending upon the protocol in use for that communications session, or possibly by convention.

[00101] When the router receives the client's packet, it compares the send and receive IP addresses of the packet with the next N predicted send and receive IP address pairs and rejects the packet if it is not a member of this set. Received packets that do not have the predicted source/destination IP addresses falling with the window are rejected, thus thwarting possible hackers. (With the number of possible combinations, even a fairly large window would be hard to fall into at random.) If it is a member of this set, the router accepts the packet and processes it further. This link-based IP-hopping strategy, referred to as "IHOP," is a network element that stands on its own and is not necessarily accompanied by elements of the boutique system described above. If the routing agility feature described in connection with the boutique embodiment is combined with this link-based IP-hopping strategy, the router's next step would be to decrypt the TARP header to determine the destination TARP router for the packet and determine what should be the next hop for the packet. The TARP router would then forward the packet to a random TARP router or the destination TARP router with which the source TARP router has a link-based IP hopping communication established.

Figure 8 shows how a client computer 801 and a TARP router 811 can [00102] establish a secure session. When client 801 seeks to establish an IHOP session with TARP router 811, the client 801 sends "secure synchronization" request ("SSYN") packet 821 to the TARP router 811. This SYN packet 821 contains the client's 801 authentication token, and may be sent to the router 811 in an encrypted format. The source and destination IP numbers on the packet 821 are the client's 801 current fixed IP address, and a "known" fixed IP address for the router 811. (For security purposes, it may be desirable to reject any packets from outside of the local network that are destined for the router's known fixed IP address.) Upon receipt and validation of the client's 801 SSYN packet 821, the router 811 responds by sending an encrypted "secure synchronization acknowledgment" ("SSYN ACK") 822 to the client 801. This SSYN ACK 822 will contain the transmit and receive hopblocks that the client 801 will use when communicating with the TARP router 811. The client 801 will acknowledge the TARP router's 811 response packet 822 by generating an encrypted SSYN ACK ACK packet 823 which will be sent from the client's 801 fixed IP address and to the TARP router's 811 known fixed IP address. The client 801 will simultaneously generate a SSYN ACK ACK packet; this SSYN ACK packet, referred to as the Secure Session Initiation (SSI) packet 824, will be sent with the first {sender, receiver}

IP pair in the client's transmit table 921 (FIG. 9), as specified in the transmit hopblock provided by the TARP router 811 in the SSYN ACK packet 822. The TARP router 811 will respond to the SSI packet 824 with an SSI ACK packet 825, which will be sent with the first {sender, receiver} IP pair in the TARP router's transmit table 923. Once these packets have been successfully exchanged, the secure communications session is established, and all further secure communications between the client 801 and the TARP router 811 will be conducted via this secure session, as long as synchronization is maintained. If synchronization is lost, then the client 801 and TARP router 802 may re-establish the secure session by the procedure outlined in Figure 8 and described above.

[00103] While the secure session is active, both the client 901 and TARP router 911 (FIG. 9) will maintain their respective transmit tables 921, 923 and receive tables 922, 924, as provided by the TARP router during session synchronization 822. It is important that the sequence of IP pairs in the client's transmit table 921 be identical to those in the TARP router's receive table 924; similarly, the sequence of IP pairs in the client's receive table 922 must be identical to those in the router's transmit table 923. This is required for the session synchronization to be maintained. The client 901 need maintain only one transmit table 921 and one receive table 922 during the course of the secure session. Each sequential packet sent by the client 901 will employ the next {send, receive} IP address pair in the transmit table, regardless of TCP or UDP session. The TARP router 911 will expect each packet arriving from the client 901 to bear the next IP address pair shown in its receive table.

[00104] Since packets can arrive out of order, however, the router 911 can maintain a "look ahead" buffer in its receive table, and will mark previously-received IP pairs as invalid for future packets; any future packet containing an IP pair that is in the look-ahead buffer but is marked as previously received will be discarded. Communications from the TARP router 911 to the client 901 are maintained in an identical manner; in particular, the router 911 will select the next IP address pair from its transmit table 923 when constructing a packet to send to the client 901, and the client 901 will maintain a look-ahead buffer of expected IP pairs on packets that it is receiving. Each TARP router will maintain separate pairs of transmit and receive tables for each client that is currently engaged in a secure session with or through that TARP router.
[00105] While clients receive their hopblocks from the first server linking them to the Internet, routers exchange hopblocks. When a router establishes a link-based IP-hopping communication regime with another router, each router of the pair exchanges its transmit hopblock. The transmit hopblock of each router becomes the receive hopblock of the other router. The communication between routers is governed as described by the example of a client sending a packet to the first router.

While the above strategy works fine in the IP milieu, many local networks that [00106] are connected to the Internet are Ethernet systems. In Ethernet, the IP addresses of the destination devices must be translated into hardware addresses, and vice versa, using known processes ("address resolution protocol," and "reverse address resolution protocol"). However, if the link- based IP-hopping strategy is employed, the correlation process would become explosive and burdensome. An alternative to the link-based IP hopping strategy may be employed within an Ethernet network. The solution is to provide that the node linking the Internet to the Ethernet (call it the border node) use the link-based IP-hopping communication regime to communicate with nodes outside the Ethernet LAN. Within the Ethernet LAN, each TARP node would have a single IP address which would be addressed in the conventional way. Instead of comparing the {sender, receiver} IP address pairs to authenticate a packet, the intra-LAN TARP node would use one of the IP header extension fields to do so. Thus, the border node uses an algorithm shared by the intra-LAN TARP node to generate a symbol that is stored in the free field in the IP header, and the intra-LAN TARP node generates a range of symbols based on its prediction of the next expected packet to be received from that particular source IP address. The packet is rejected if it does not fall into the set of predicted symbols (for example, numerical values) or is accepted if it does. Communications from the intra-LAN TARP node to the border node are accomplished in the same manner, though the algorithm will necessarily be different for security reasons. Thus, each of the communicating nodes will generate transmit and receive tables in a similar manner to that of Figure 9; the intra-LAN TARP nodes transmit table will be identical to the border node's receive table, and the intra-LAN TARP node's receive table will be identical to the border node's transmit table.

[00107] The algorithm used for IP address-hopping can be any desired algorithm. For example, the algorithm can be a given pseudo-random number generator that generates numbers of the range covering the allowed IP addresses with a given seed. Alternatively, the session participants can assume a certain type of algorithm and specify simply a parameter for applying the algorithm. For example the assumed algorithm could be a particular pseudo-random number generator and the session participants could simply exchange seed values.

[00108] Note that there is no permanent physical distinction between the originating and destination terminal nodes. Either device at either end point can initiate a synchronization of the pair. Note also that the authentication/synchronization-request (and acknowledgment) and hopblock-exchange may all be served by a single message so that separate message exchanges may not be required.

[00109] As another extension to the stated architecture, multiple physical paths can be used by a client, in order to provide link redundancy and further thwart attempts at denial of service and traffic monitoring. As shown in Figure 10, for example, client 1001 can establish three simultaneous sessions with each of three TARP routers provided by different ISPs 1011, 1012, 1013. As an example, the client 1001 can use three different telephone lines 1021, 1022, 1023 to connect to the ISPs, or two telephone lines and a cable modem, etc. In this scheme, transmitted packets will be sent in a random fashion among the different physical paths. This architecture provides a high degree of communications redundancy, with improved immunity from denial-of- service attacks and traffic monitoring.

2. FURTHER EXTENSIONS

[00110] The following describes various extensions to the techniques, systems, and methods described above. As described above, the security of communications occurring between computers in a computer network (such as the Internet, an Ethernet, or others) can be enhanced by using seemingly random source and destination Internet Protocol (IP) addresses for data packets transmitted over the network. This feature prevents eavesdroppers from determining which computers in the network are communicating with each other while permitting the two communicating computers to easily recognize whether a given received data packet is legitimate

or not. In one embodiment of the above-described systems, an IP header extension field is used to authenticate incoming packets on an Ethernet.

[00111] Various extensions to the previously described techniques described herein include: (1) use of hopped hardware or "MAC" addresses in broadcast type network; (2) a self synchronization technique that permits a computer to automatically regain synchronization with a sender; (3) synchronization algorithms that allow transmitting and receiving computers to quickly re-establish synchronization in the event of lost packets or other events; and (4) a fast-packet rejection mechanism for rejecting invalid packets. Any or all of these extensions can be combined with the features described above in any of various ways.

A. Hardware Address Hopping

[00112] Internet protocol-based communications techniques on a LAN—or across any dedicated physical medium—typically embed the IP packets within lower-level packets, often referred to as "frames." As shown in FIG. 11, for example, a first Ethernet frame 1150 comprises a frame header 1101 and two embedded IP packets IP1 and IP2, while a second Ethernet frame 1160 comprises a different frame header 1104 and a single IP packet IP3. Each frame header generally includes a source hardware address 1101 A and a destination hardware address 1101 B; other well-known fields in frame headers are omitted from FIG. 11 for clarity. Two hardware nodes communicating over a physical communication channel insert appropriate source and destination hardware addresses to indicate which nodes on the channel or network should receive the frame.

[00113] It may be possible for a nefarious listener to acquire information about the contents of a frame and/or its communicants by examining frames on a local network rather than (or in addition to) the IP packets themselves. This is especially true in broadcast media, such as Ethernet, where it is necessary to insert into the frame header the hardware address of the machine that generated the frame and the hardware address of the machine to which frame is being sent. All nodes on the network can potentially "see" all packets transmitted across the network. This can be a problem for secure communications, especially in cases where the communicants do not want for any third party to be able to identify who is engaging in the

information exchange. One way to address this problem is to push the address-hopping scheme down to the hardware layer. In accordance with various embodiments of the invention, hardware addresses are "hopped" in a manner similar to that used to change IP addresses, such that a listener cannot determine which hardware node generated a particular message nor which node is the intended recipient.

[00114] FIG. 12A shows a system in which Media Access Control ("MAC") hardware addresses are "hopped" in order to increase security over a network such as an Ethernet. While the description refers to the exemplary case of an Ethernet environment, the inventive principles are equally applicable to other types of communications media. In the Ethernet case, the MAC address of the sender and receiver are inserted into the Ethernet frame and can be observed by anyone on the LAN who is within the broadcast range for that frame. For secure communications, it becomes desirable to generate frames with MAC addresses that are not attributable to any specific sender or receiver.

[00115] As shown in FIG. 12A, two computer nodes 1201 and 1202 communicate over a communication channel such as an Ethernet. Each node executes one or more application programs 1203 and 1218 that communicate by transmitting packets through communication software 1204 and 1217, respectively. Examples of application programs include video conferencing, e-mail, word processing programs, telephony, and the like. Communication software 1204 and 1217 can comprise, for example, an OSI layered architecture or "stack" that standardizes various services provided at different levels of functionality.

[00116] The lowest levels of communication software 1204 and 1217 communicate with hardware components 1206 and 1214 respectively, each of which can include one or more registers 1207 and 1215 that allow the hardware to be reconfigured or controlled in accordance with various communication protocols. The hardware components (an Ethernet network interface card, for example) communicate with each other over the communication medium. Each hardware component is typically pre-assigned a fixed hardware address or MAC number that identifies the hardware component to other nodes on the network. One or more interface drivers control the operation of each card and can, for example, be configured to accept or reject packets from certain hardware addresses. As will be described in more detail below, various

embodiments of the inventive principles provide for "hopping" different addresses using one or more algorithms and one or more moving windows that track a range of valid addresses to validate received packets. Packets transmitted according to one or more of the inventive principles will be generally referred to as "secure" packets or "secure communications" to differentiate them from ordinary data packets that are transmitted in the clear using ordinary, machine-correlated addresses.

[00117] One straightforward method of generating non-attributable MAC addresses is an extension of the IP hopping scheme. In this scenario, two machines on the same LAN that desire to communicate in a secure fashion exchange random-number generators and seeds, and create sequences of quasi-random MAC addresses for synchronized hopping. The implementation and synchronization issues are then similar to that of IP hopping.

[00118] This approach, however, runs the risk of using MAC addresses that are currently active on the LAN—which, in turn, could interrupt communications for those machines. Since an Ethernet MAC address is at present 48 bits in length, the chance of randomly misusing an active MAC address is actually quite small. However, if that figure is multiplied by a large number of nodes (as would be found on an extensive LAN), by a large number of frames (as might be the case with packet voice or streaming video), and by a large number of concurrent Virtual Private Networks (VPNs), then the chance that a non-secure machine's MAC address could be used in an address-hopped frame can become non-trivial. In short, any scheme that runs even a small risk of interrupting communications for other machines on the LAN is bound to receive resistance from prospective system administrators. Nevertheless, it is technically feasible, and can be implemented without risk on a LAN on which there is a small number of machines, or if all of the machines on the LAN are engaging in MAC-hopped communications.

[00119] Synchronized MAC address hopping may incur some overhead in the course of session establishment, especially if there are multiple sessions or multiple nodes involved in the communications. A simpler method of randomizing MAC addresses is to allow each node to receive and process every incident frame on the network. Typically, each network interface driver will check the destination MAC address in the header of every incident frame to see if it matches that machine's MAC address; if there is no match, then the frame is discarded. In one

embodiment, however, these checks can be disabled, and every incident packet is passed to the TARP stack for processing. This will be referred to as "promiscuous" mode, since every incident frame is processed. Promiscuous mode allows the sender to use completely random, unsynchronized MAC addresses, since the destination machine is guaranteed to process the frame. The decision as to whether the packet was truly intended for that machine is handled by the TARP stack, which checks the source and destination IP addresses for a match in its IP synchronization tables. If no match is found, the packet is discarded; if there is a match, the packet is unwrapped, the inner header is evaluated, and if the inner header indicates that the packet is destined for that machine then the packet is forwarded to the IP stack—otherwise it is discarded.

[00120] One disadvantage of purely-random MAC address hopping is its impact on processing overhead; that is, since every incident frame must be processed, the machine's CPU is engaged considerably more often than if the network interface driver is discriminating and rejecting packets unilaterally. A compromise approach is to select either a single fixed MAC address or a small number of MAC addresses (e.g., one for each virtual private network on an Ethernet) to use for MAC-hopped communications, regardless of the actual recipient for which the message is intended. In this mode, the network interface driver can check each incident frame against one (or a few) pre-established MAC addresses, thereby freeing the CPU from the task of physical- layer packet discrimination. This scheme does not betray any useful information to an interloper on the LAN; in particular, every secure packet can already be identified by a unique packet type in the outer header. However, since all machines engaged in secure communications would either be using the same MAC address, or be selecting from a small pool of predetermined MAC addresses, the association between a specific machine and a specific MAC address is effectively broken.

[00121] In this scheme, the CPU will be engaged more often than it would be in nonsecure communications (or in synchronized MAC address hopping), since the network interface driver cannot always unilaterally discriminate between secure packets that are destined for that machine, and secure packets from other VPNs. However, the non-secure traffic is easily eliminated at the network interface, thereby reducing the amount of processing required of the CPU. There are boundary conditions where these statements would not hold, of course—e.g., if all of the traffic on the LAN is secure traffic, then the CPU would be engaged to the same degree as it is in the purely-random address hopping case; alternatively, if each VPN on the LAN uses a different MAC address, then the network interface can perfectly discriminate secure frames destined for the local machine from those constituting other VPNs. These are engineering tradeoffs that might be best handled by providing administrative options for the users when installing the software and/or establishing VPNs.

[00122] Even in this scenario, however, there still remains a slight risk of selecting MAC addresses that are being used by one or more nodes on the LAN. One solution to this problem is to formally assign one address or a range of addresses for use in MAC-hopped communications. This is typically done via an assigned numbers registration authority; e.g., in the case of Ethernet, MAC address ranges are assigned to vendors by the Institute of Electrical and Electronics Engineers (IEEE). A formally-assigned range of addresses would ensure that secure frames do not conflict with any properly-configured and properly-functioning machines on the LAN.

[00123] Reference will now be made to FIGS. 12A and 12B in order to describe the many combinations and features that follow the inventive principles. As explained above, two computer nodes 1201 and 1202 are assumed to be communicating over a network or communication medium such as an Ethernet. A communication protocol in each node (1204 and 1217, respectively) contains a modified element 1205 and 1216 that performs certain functions that deviate from the standard communication protocols. In particular, computer node 1201 implements a first "hop" algorithm 1208X that selects seemingly random source and destination IP addresses (and, in one embodiment, seemingly random IP header discriminator fields) in order to transmit each packet to the other computer node. For example, node 1201 maintains a transmit table 1208 containing triplets of source (S), destination (D), and discriminator fields (DS) that are inserted into outgoing IP packet headers. The table is generated through the use of an appropriate algorithm (e.g., a random number generator that is seeded with an appropriate seed) that is known to the recipient node 1202. As each new IP packet is formed, the next sequential entry out of the sender's transmit table 1208 is used to populate the IP source, IP destination, and

IP header extension field (e.g., discriminator field). It will be appreciated that the transmit table need not be created in advance but could instead be created on-the-fly by executing the algorithm when each packet is formed.

[00124] At the receiving node 1202, the same IP hop algorithm 1222X is maintained and used to generate a receive table 1222 that lists valid triplets of source IP address, destination IP address, and discriminator field. This is shown by virtue of the first five entries of transmit table 1208 matching the second five entries of receive table 1222. (The tables may be slightly offset at any particular time due to lost packets, misordered packets, or transmission delays). Additionally, node 1202 maintains a receive window W3 that represents a list of valid IP source, IP destination, and discriminator fields that will be accepted when received as part of an incoming IP packet. As packets are received, window W3 slides down the list of valid entries, such that the possible valid entries change over time. Two packets that arrive out of order but are nevertheless matched to entries within window W3 will be accepted; those falling outside of window W3 will be rejected as invalid. The length of window W3 can be adjusted as necessary to reflect network delays or other factors.

[00125] Node 1202 maintains a similar transmit table 1221 for creating IP packets and frames destined for node 1201 using a potentially different hopping algorithm 1221 X, and node 1201 maintains a matching receive table 1209 using the same algorithm 1209X. As node 1202 transmits packets to node 1201 using seemingly random IP source, IP destination, and/or discriminator fields, node 1201 matches the incoming packet values to those falling within window WI maintained in its receive table. In effect, transmit table 1208 of node 1201 is synchronized (i.e., entries are selected in the same order) to receive table 1222 of receiving node 1202. Similarly, transmit table 1221 of node 1202 is synchronized to receive table 1209 of node 1201. It will be appreciated that although a common algorithm is shown for the source, destination and discriminator fields in FIG. 12A (using, e.g., a different seed for each of the three fields), an entirely different algorithm could in fact be used to establish values for each of these fields. It will also be appreciated that one or two of the fields can be "hopped" rather than all three as illustrated.

[00126] In accordance with another aspect of the invention, hardware or "MAC" addresses are hopped instead of or in addition to IP addresses and/or the discriminator field in order to improve security in a local area or broadcast-type network. To that end, node 1201 further maintains a transmit table 1210 using a transmit algorithm 1210X to generate source and destination hardware addresses that are inserted into frame headers (e.g., fields 1101A and 1101 B in FIG. 11) that are synchronized to a corresponding receive table 1224 at node 1202. Similarly, node 1202 maintains a different transmit table 1223 containing source and destination hardware addresses that is synchronized with a corresponding receive table 1211 at node 1201. In this manner, outgoing hardware frames appear to be originating from and going to completely random nodes on the network, even though each recipient can determine whether a given packet is intended for it or not. It will be appreciated that the hardware hopping feature can be implemented at a different level in the communications protocol than the IP hopping feature (e.g., in a card driver or in a hardware card itself to improve performance).

[00127] FIG. 12B shows three different embodiments or modes that can be employed using the aforementioned principles. In a first mode referred to as "promiscuous" mode, a common hardware address (e.g., a fixed address for source and another for destination) or else a completely random hardware address is used by all nodes on the network, such that a particular packet cannot be attributed to any one node. Each node must initially accept all packets containing the common (or random) hardware address and inspect the IP addresses or discriminator field to determine whether the packet is intended for that node. In this regard, either the IP addresses or the discriminator field or both can be varied in accordance with an algorithm as described above. As explained previously, this may increase each node's overhead since additional processing is involved to determine whether a given packet has valid source and destination hardware addresses.

[00128] In a second mode referred to as "promiscuous per VPN" mode, a small set of fixed hardware addresses are used, with a fixed source/destination hardware address used for all nodes communicating over a virtual private network. For example, if there are six nodes on an Ethernet, and the network is to be split up into two private virtual networks such that nodes on one VPN can communicate with only the other two nodes on its own VPN, then two sets of

hardware addresses could be used: one set for the first VPN and a second set for the second VPN. This would reduce the amount of overhead involved in checking for valid frames since only packets arriving from the designated VPN would need to be checked. IP addresses and one or more discriminator fields could still be hopped as before for secure communication within the VPN. Of course, this solution compromises the anonymity of the VPNs (i.e., an outsider can easily tell what traffic belongs in which VPN, though he cannot correlate it to a specific machine/person). It also requires the use of a discriminator field to mitigate the vulnerability to certain types of DoS attacks, (For example, without the discriminator field, an attacker on the LAN could stream frames containing the MAC addresses being used by the VPN; rejecting those frames could lead to excessive processing overhead. The discriminator field would provide a low-overhead means of rejecting the false packets.)

[00129] In a third mode referred to as "hardware hopping" mode, hardware addresses are varied as illustrated in FIG. 12A, such that hardware source and destination addresses are changed constantly in order to provide non-attributable addressing. Variations on these embodiments are of course possible, and the invention is not intended to be limited in any respect by these illustrative examples.

B. Extending the Address Space

[00130] Address hopping provides security and privacy. However, the level of protection is limited by the number of addresses in the blocks being hopped. A hopblock denotes a field or fields modulated on a packet-wise basis for the purpose of providing a VPN. For instance, if two nodes communicate with IP address hopping using hopblocks of 4 addresses (2 bits) each, there would be 16 possible address-pair combinations. A window of size 16 would result in most address pairs being accepted as valid most of the time. This limitation can be overcome by using a discriminator field in addition to or instead of the hopped address fields. The discriminator field would be hopped in exactly the same fashion as the address fields and it would be used to determine whether a packet should be processed by a receiver.

[00131] Suppose that two clients, each using four-bit hopblocks, would like the same level of protection afforded to clients communicating via IP hopping between two A blocks (24

address bits eligible for hopping). A discriminator field of 20 bits, used in conjunction with the 4 address bits eligible for hopping in the IP address field, provides this level of protection. A 24-bit discriminator field would provide a similar level of protection if the address fields were not hopped or ignored. Using a discriminator field offers the following advantages: (1) an arbitrarily high level of protection can be provided, and (2) address hopping is unnecessary to provide protection. This may be important in environments where address hopping would cause routing problems.

C. Synchronization Techniques

[00132] It is generally assumed that once a sending node and receiving node have exchanged algorithms and seeds (or similar information sufficient to generate quasi-random source and destination tables), subsequent communication between the two nodes will proceed smoothly. Realistically, however, two nodes may lose synchronization due to network delays or outages, or other problems. Consequently, it is desirable to provide means for re-establishing synchronization between nodes in a network that have lost synchronization.

[00133] One possible technique is to require that each node provide an acknowledgment upon successful receipt of each packet and, if no acknowledgment is received within a certain period of time, to re-send the unacknowledged packet. This approach, however, drives up overhead costs and may be prohibitive in high-throughput environments such as streaming video or audio, for example.

[00134] A different approach is to employ an automatic synchronizing technique that will be referred to herein as "self-synchronization." In this approach, synchronization information is embedded into each packet, thereby enabling the receiver to re-synchronize itself upon receipt of a single packet if it determines that is has lost synchronization with the sender. (If communications are already in progress, and the receiver determines that it is still in sync with the sender, then there is no need to re-synchronize.) A receiver could detect that it was out of synchronization by, for example, employing a "dead-man" timer that expires after a certain period of time, wherein the timer is reset with each valid packet. A time stamp could be hashed into the public sync field (see below) to preclude packet-retry attacks.

[00135] In one embodiment, a "sync field" is added to the header of each packet sent out by the sender. This sync field could appear in the clear or as part of an encrypted portion of the packet. Assuming that a sender and receiver have selected a random-number generator (RNG) and seed value, this combination of RNG and seed can be used to generate a random-number sequence (RNS). The RNS is then used to generate a sequence of source/destination IP pairs (and, if desired, discriminator fields and hardware source and destination addresses), as described above. It is not necessary, however, to generate the entire sequence (or the first N-1 values) in order to generate the Nth random number in the sequence; if the sequence index N is known, the random value corresponding to that index can be directly generated (see below). Different RNGs (and seeds) with different fundamental periods could be used to generate the source and destination IP sequences, but the basic concepts would still apply. For the sake of simplicity, the following discussion will assume that IP source and destination address pairs (only) are hopped using a single RNG sequencing mechanism.

[00136] In accordance with a "self-synchronization" feature, a sync field in each packet header provides an index (i.e., a sequence number) into the RNS that is being used to generate IP pairs. Plugging this index into the RNG that is being used to generate the RNS yields a specific random number value, which in turn yields a specific IP pair. That is, an IP pair can be generated directly from knowledge of the RNG, seed, and index number; it is not necessary, in this scheme, to generate the entire sequence of random numbers that precede the sequence value associated with the index number provided.

[00137] Since the communicants have presumably previously exchanged RNGs and seeds, the only new information that must be provided in order to generate an IP pair is the sequence number. If this number is provided by the sender in the packet header, then the receiver need only plug this number into the RNG in order to generate an IP pair — and thus verify that the IP pair appearing in the header of the packet is valid. In this scheme, if the sender and receiver lose synchronization, the receiver can immediately re-synchronize upon receipt of a single packet by simply comparing the IP pair in the packet header to the IP pair generated from the index number. Thus, synchronized communications can be resumed upon receipt of a single packet, making this scheme ideal for multicast communications. Taken to the extreme, it could

obviate the need for synchronization tables entirely; that is, the sender and receiver could simply rely on the index number in the sync field to validate the IP pair on each packet, and thereby eliminate the tables entirely.

[00138] The aforementioned scheme may have some inherent security issues associated with it — namely, the placement of the sync field. If the field is placed in the outer header, then an interloper could observe the values of the field and their relationship to the IP stream. This could potentially compromise the algorithm that is being used to generate the IP-address sequence, which would compromise the security of the communications. If, however, the value is placed in the inner header, then the sender must decrypt the inner header before it can extract the sync value and validate the IP pair; this opens up the receiver to certain types of denial-of-service (DoS) attacks, such as packet replay. That is, if the receiver must decrypt a packet before it can validate the IP pair, then it could potentially be forced to expend a significant amount of processing on decryption if an attacker simply retransmits previously valid packets. Other attack methodologies are possible in this scenario.

[00139] A possible compromise between algorithm security and processing speed is to split up the sync value between an inner (encrypted) and outer (unencrypted) header. That is, if the sync value is sufficiently long, it could potentially be split into a rapidly-changing part that can be viewed in the clear, and a fixed (or very slowly changing) part that must be protected. The part that can be viewed in the clear will be called the "public sync" portion and the part that must be protected will be called the "private sync" portion.

[00140] Both the public sync and private sync portions are needed to generate the complete sync value. The private portion, however, can be selected such that it is fixed or will change only occasionally. Thus, the private sync value can be stored by the recipient, thereby obviating the need to decrypt the header in order to retrieve it. If the sender and receiver have previously agreed upon the frequency with which the private part of the sync will change, then the receiver can selectively decrypt a single header in order to extract the new private sync if the communications gap that has led to lost synchronization has exceeded the lifetime of the previous private sync. This should not represent a burdensome amount of decryption, and thus

should not open up the receiver to denial-of-service attack simply based on the need to occasionally decrypt a single header.

[00141] One implementation of this is to use a hashing function with a one-to-one mapping to generate the private and public sync portions from the sync value. This implementation is shown in FIG. 13, where (for example) a first ISP 1302 is the sender and a second ISP 1303 is the receiver. (Other alternatives are possible from FIG. 13.) A transmitted packet comprises a public or "outer" header 1305 that is not encrypted, and a private or "inner" header 1306 that is encrypted using for example a link key. Outer header 1305 includes a public sync portion while inner header 1306 contains the private sync portion. A receiving node decrypts the inner header using a decryption function 1307 in order to extract the private sync portion. This step is necessary only if the lifetime of the currently buffered private sync has expired. (If the currently-buffered private sync is still valid, then it is simply extracted from memory and "added" (which could be an inverse hash) to the public sync, as shown in step 1308.) The public and decrypted private sync portions are combined in function 1308 in order to generate the combined sync 1309. The combined sync (1309) is then fed into the RNG (1310) and compared to the IP address pair (1311) to validate or reject the packet.

[00142] An important consideration in this architecture is the concept of "future" and "past" where the public sync values are concerned. Though the sync values, themselves, should be random to prevent spoofing attacks, it may be important that the receiver be able to quickly identify a sync value that has already been sent — even if the packet containing that sync value was never actually received by the receiver. One solution is to hash a time stamp or sequence number into the public sync portion, which could be quickly extracted, checked, and discarded, thereby validating the public sync portion itself.

[00143] In one embodiment, packets can be checked by comparing the source/destination IP pair generated by the sync field with the pair appearing in the packet header. If (1) they match, (2) the time stamp is valid, and (3) the dead-man timer has expired, then re-synchronization occurs; otherwise, the packet is rejected. If enough processing power is available, the dead-man timer and synchronization tables can be avoided altogether, and the receiver would simply resynchronize (e.g., validate) on every packet.

[00144] The foregoing scheme may require large-integer (e.g., 160-bit) math, which may affect its implementation. Without such large-integer registers, processing throughput would be affected, thus potentially affecting security from a denial-of-service standpoint. Nevertheless, as large integer math processing features become more prevalent, the costs of implementing such a feature will be reduced.

D. Other Synchronization Schemes

[00145] As explained above, if W or more consecutive packets are lost between a transmitter and receiver in a VPN (where W is the window size), the receiver's window will not have been updated and the transmitter will be transmitting packets not in the receiver's window. The sender and receiver will not recover synchronization until perhaps the random pairs in the window are repeated by chance. Therefore, there is a need to keep a transmitter and receiver in synchronization whenever possible and to re-establish synchronization whenever it is lost.

[00146] A "checkpoint" scheme can be used to regain synchronization between a sender and a receiver that have fallen out of synchronization. In this scheme, a checkpoint message comprising a random IP address pair is used for communicating synchronization information. In one embodiment, two messages are used to communicate synchronization information between a sender and a recipient:

- 1. SYNC_REQ is a message used by the sender to indicate that it wants to synchronize; and
- 2. SYNC_ACK is a message used by the receiver to inform the transmitter that it has been synchronized.

[00147] According to one variation of this approach, both the transmitter and receiver maintain three checkpoints (see FIG. 14):

 In the transmitter, ckpt_o ("checkpoint old") is the IP pair that was used to re-send the last SYNC_REQ packet to the receiver. In the receiver, ckpt_o ("checkpoint old") is the IP pair that receives repeated SYNC_REQ packets from the transmitter.

- 2. In the transmitter, ckpt_n ("checkpoint new") is the IP pair that will be used to send the next SYNC_REQ packet to the receiver. In the receiver, ckpt_n ("checkpoint new") is the IP pair that receives a new SYNC_REQ packet from the transmitter and which causes the receiver's window to be re-aligned, ckpt_o set to ckpt_n, a new ckpt_n to be generated and a new ckpt_r to be generated.
- 3. In the transmitter, ckpt_r is the IP pair that will be used to send the next SYNC_ACK packet to the receiver. In the receiver, ckpt_r is the IP pair that receives a new SYNC_ACK packet from the transmitter and which causes a new ckpt_n to be generated. Since SYNC_ACK is transmitted from the receiver ISP to the sender ISP, the transmitter ckpt_r refers to the ckpt_r of the receiver and the receiver ckpt_r refers to the ckpt_r of the transmitter (see FIG. 14).

When a transmitter initiates synchronization, the IP pair it will use to transmit the next data packet is set to a predetermined value and when a receiver first receives a SYNC_REQ, the receiver window is updated to be centered on the transmitter's next IP pair. This is the primary mechanism for checkpoint synchronization.

[00148] Synchronization can be initiated by a packet counter (e.g., after every N packets transmitted, initiate a synchronization) or by a timer (every S seconds, initiate a synchronization) or a combination of both. See FIG. 15. From the transmitter's perspective, this technique operates as follows: (1) Each transmitter periodically transmits a "sync request" message to the receiver to make sure that it is in sync. (2) If the receiver is still in sync, it sends back a "sync ack" message. (If this works, no further action is necessary). (3) If no "sync ack" has been received within a period of time, the transmitter retransmits the sync request again. If the transmitter reaches the next checkpoint without receiving a "sync ack" response, then synchronization is broken, and the transmitter should stop transmitting. The transmitter will continue to send sync_reqs until it receives a sync_ack, at which point transmission is reestablished.

[00149] From the receiver's perspective, the scheme operates as follows: (1) when it receives a "sync request" request from the transmitter, it advances its window to the next checkpoint position (even skipping pairs if necessary), and sends a "sync ack" message to the

transmitter. If sync was never lost, then the "jump ahead" really just advances to the next available pair of addresses in the table (i.e., normal advancement).

[00150] If an interloper intercepts the "sync request" messages and tries to interfere with communication by sending new ones, it will be ignored if the synchronization has been established or it will actually help to re-establish synchronization.

[00151] A window is realigned whenever a re-synchronization occurs. This realignment entails updating the receiver's window to straddle the address pairs used by the packet transmitted immediately after the transmission of the SYNC_REQ packet. Normally, the transmitter and receiver are in synchronization with one another. However, when network events occur, the receiver's window may have to be advanced by many steps during resynchronization. In this case, it is desirable to move the window ahead without having to step through the intervening random numbers sequentially. (This feature is also desirable for the auto-sync approach discussed above).

E. Random Number Generator with a Jump-Ahead capability

[00152] An attractive method for generating randomly hopped addresses is to use identical random number generators in the transmitter and receiver and advance them as packets are transmitted and received. There are many random number generation algorithms that could be used. Each one has strengths and weaknesses for address hopping applications.

[00153] Linear congruential random number generators (LCRs) are fast, simple and well characterized random number generators that can be made to jump ahead *n* steps efficiently. An LCR generates random numbers $X_1, X_2, X_3 \dots Xk$ starting with seed X_0 using a recurrence

$$X_{i} = (a X_{i-1} + b) \mod c,$$
 (1)

where a, b and c define a particular LCR. Another expression for X_i,

$$X_i = ((a^i(X_0+b)-b)/(a-1)) \mod c$$
 (2)

enables the jump-ahead capability. The factor a^i can grow very large even for modest i if left unfettered. Therefore some special properties of the modulo operation can be used to control the size and processing time required to compute (2). (2) can be rewritten as:

$$X_i = (a^i(X_0(a-1)+b)-b)/(a-1) \mod c.$$
 (3)

It can be shown that:

 $(a^{i}(X_{0}(a-1)+b)-b)/(a-1) \mod c =$

 $((a^{i} \mod((a-1)c)(X_{0}(a-1)+b) -b) / (a-1)) \mod c$ (4).

[00154] $(X_0(a-1)+b)$ can be stored as $(X_0(a-1)+b) \mod c$, b as b mod c and compute $a^i \mod((a-1)c)$ (this requires $O(\log(i))$ steps).

[00155] A practical implementation of this algorithm would jump a fixed distance, n, between synchronizations; this is tantamount to synchronizing every *n* packets. The window would commence *n* IP pairs from the start of the previous window. Using X_j^w , the random number at the jth checkpoint, as X_0 and *n* as *i*, a node can store aⁿmod((a-1)c) once per LCR and set

$$[00156] X_{j+1} = X_{n(j+1)} = ((a^n \mod((a-1)c) (X_j^w (a-1)+b)-b)/(a-1)) \mod c, (5)$$

to generate the random number for the j+1th synchronization. Using this construction, a node could jump ahead an arbitrary (but fixed) distance between synchronizations in a constant amount of time (independent of n).

[00157] Pseudo-random number generators, in general, and LCRs, in particular, will eventually repeat their cycles. This repetition may present vulnerability in the IP hopping scheme. An adversary would simply have to wait for a repeat to predict future sequences. One way of coping with this vulnerability is to create a random number generator with a known long cycle. A random sequence can be replaced by a new random number generator before it repeats. LCRs can be constructed with known long cycles. This is not currently true of many random number generators.

[00158] Random number generators can be cryptographically insecure. An adversary can derive the RNG parameters by examining the output or part of the output. This is true of LCGs. This vulnerability can be mitigated by incorporating an encryptor, designed to scramble the output as part of the random number generator. The random number generator prevents an adversary from mounting an attack—e.g., a known plaintext attack—against the encryptor.

F. Random Number Generator Example

[00159] Consider a RNG where a=31,b=4 and c=15. For this case equation (1) becomes:

 $X_i = (31 X_{i-1} + 4) \mod 15.$ (6)

If one sets $X_0=1$, equation (6) will produce the sequence 1, 5, 9, 13, 2, 6, 10, 14, 3, 7, 11, 0, 4, 8, 12. This sequence will repeat indefinitely. For a jump ahead of 3 numbers in this sequence $a^n = 31^3=29791$, $c^*(a-1)=15*30=450$ and $a^n \mod((a-1)c) = 31^3 \mod(15*30)=29791 \mod(450)=91$. Equation (5) becomes:

 $((91 (X_i 30+4)-4)/30) \mod 15 (7).$

Table 1 shows the jump ahead calculations from (7) . The calculations start at 5 and jump ahead 3.

Ι	X _i	(X _i 30+4)	91 (X _i 30+4)-4	((91 (X _i 30+4)-4)/30	X _{i+3}
1	5	154	14010	467	2
4	2	64	5820	194	14
7	14	424	38580	1286	11
10	11	334	30390	1013	8
13	8	244	22200	740	5

TABLE 1

G. Fast Packet Filter

[00160] Address hopping VPNs must rapidly determine whether a packet has a valid header and thus requires further processing, or has an invalid header (a hostile packet) and should be immediately rejected. Such rapid determinations will be referred to as "fast packet filtering." This capability protects the VPN from attacks by an adversary who streams hostile packets at the receiver at a high rate of speed in the hope of saturating the receiver's processor (a so-called "denial of service" attack). Fast packet filtering is an important feature for implementing VPNs on shared media such as Ethernet.

[00161] Assuming that all participants in a VPN share an unassigned "A" block of addresses, one possibility is to use an experimental "A" block that will never be assigned to any machine that is not address hopping on the shared medium. "A" blocks have a 24 bits of address that can be hopped as opposed to the 8 bits in "C" blocks. In this case a hopblock will be the "A" block. The use of the experimental "A" block is a likely option on an Ethernet because:

- 4. The addresses have no validity outside of the Ethernet and will not be routed out to a valid outside destination by a gateway.
- 5. There are 2²⁴ (~16 million) addresses that can be hopped within each "A" block. This yields >280 trillion possible address pairs making it very unlikely that an adversary would guess a valid address. It also provides acceptably low probability of collision between separate VPNs (all VPNs on a shared medium independently generate random address pairs from the same "A" block).
- 6. The packets will not be received by someone on the Ethernet who is not on a VPN (unless the machine is in promiscuous mode) minimizing impact on non-VPN computers.

[00162] The Ethernet example will be used to describe one implementation of fast packet filtering. The ideal algorithm would quickly examine a packet header, determine whether the packet is hostile, and reject any hostile packets or determine which active IP pair the packet header matches. The problem is a classical associative memory problem. A variety of techniques have been developed to solve this problem (hashing, B—trees etc). Each of these approaches has

its strengths and weaknesses. For instance, hash tables can be made to operate quite fast in a statistical sense, but can occasionally degenerate into a much slower algorithm. This slowness can persist for a period of time. Since there is a need to discard hostile packets quickly at all times, hashing would be unacceptable.

H. Presence Vector Algorithm

[00163] A presence vector is a bit vector of length 2^n that can be indexed by *n*-bit numbers (each ranging from 0 to 2^n -1). One can indicate the presence of *k n*-bit numbers (not necessarily unique), by setting the bits in the presence vector indexed by each number to 1. Otherwise, the bits in the presence vector are 0. An *n*-bit number, *x*, is one of the *k* numbers if and only if the *x*th bit of the presence vector is 1. A fast packet filter can be implemented by indexing the presence vector and looking for a 1, which will be referred to as the "test."

[00164] For example, suppose one wanted to represent the number 135 using a presence vector. The 135th bit of the vector would be set. Consequently, one could very quickly determine whether an address of 135 was valid by checking only one bit: the 135th bit. The presence vectors could be created in advance corresponding to the table entries for the IP addresses. In effect, the incoming addresses can be used as indices into a long vector, making comparisons very fast. As each RNG generates a new address, the presence vector is updated to reflect the information. As the window moves, the presence vector is updated to zero out addresses that are no longer valid.

[00165] There is a trade-off between efficiency of the test and the amount of memory required for storing the presence vector(s). For instance, if one were to use the 48 bits of hopping addresses as an index, the presence vector would have to be 35 terabytes. Clearly, this is too large for practical purposes. Instead, the 48 bits can be divided into several smaller fields. For instance, one could subdivide the 48 bits into four 12-bit fields (see FIG. 16). This reduces the storage requirement to 2048 bytes at the expense of occasionally having to process a hostile packet. In effect, instead of one long presence vector, the decomposed address portions must match all four shorter presence vectors before further processing is allowed. (If the first part of

the address portion doesn't match the first presence vector, there is no need to check the remaining three presence vectors).

[00166] A presence vector will have a 1 in the y^{th} bit if and only if one or more addresses with a corresponding field of y are active. An address is active only if each presence vector indexed by the appropriate sub-field of the address is 1.

[00167] Consider a window of 32 active addresses and 3 checkpoints. A hostile packet will be rejected by the indexing of one presence vector more than 99% of the time. A hostile packet will be rejected by the indexing of all 4 presence vectors more than 99.9999995% of the time. On average, hostile packets will be rejected in less than 1.02 presence vector index operations.

[00168] The small percentage of hostile packets that pass the fast packet filter will be rejected when matching pairs are not found in the active window or are active checkpoints. Hostile packets that serendipitously match a header will be rejected when the VPN software attempts to decrypt the header. However, these cases will be extremely rare. There are many other ways this method can be configured to arbitrate the space/speed tradeoffs.

I. Further Synchronization Enhancements

[00169] A slightly modified form of the synchronization techniques described above can be employed. The basic principles of the previously described checkpoint synchronization scheme remain unchanged. The actions resulting from the reception of the checkpoints are, however, slightly different. In this variation, the receiver will maintain between OoO ("Out of Order") and 2xWINDOW_SIZE+OoO active addresses (1 \leq OoO \leq WINDOW_SIZE and WINDOW_SIZE \geq 1). OoO and WINDOW_SIZE are engineerable parameters, where OoO is the minimum number of addresses needed to accommodate lost packets due to events in the network or out of order arrivals and WINDOW_SIZE is the number of packets transmitted before a SYNC_REQ is issued. FIG. 17 depicts a storage array for a receiver's active addresses.

[00170] The receiver starts with the first 2xWINDOW_SIZE addresses loaded and active (ready to receive data). As packets are received, the corresponding entries are marked as

"used" and are no longer eligible to receive packets. The transmitter maintains a packet counter, initially set to 0, containing the number of data packets transmitted since the last *initial* transmission of a SYNC_REQ for which SYNC_ACK has been received. When the transmitter packet counter equals WINDOW_SIZE, the transmitter generates a SYNC_REQ and does its initial transmission. When the receiver receives a SYNC_REQ corresponding to its current CKPT_N, it generates the next WINDOW_SIZE addresses and starts loading them in order starting at the first location after the last active address wrapping around to the beginning of the array after the end of the array has been reached. The receiver's array might look like FIG. 18 when a SYNC_REQ has been received. In this case a couple of packets have been either lost or will be received out of order when the SYNC_REQ is received.

[00171] FIG. 19 shows the receiver's array after the new addresses have been generated. If the transmitter does not receive a SYNC_ACK, it will re-issue the SYNC_REQ at regular intervals. When the transmitter receives a SYNC_ACK, the packet counter is decremented by WINDOW_SIZE. If the packet counter reaches 2xWINDOW_SIZE — OoO then the transmitter ceases sending data packets until the appropriate SYNC_ACK is finally received. The transmitter then resumes sending data packets. Future behavior is essentially a repetition of this initial cycle. The advantages of this approach are:

- 7. There is no need for an efficient jump ahead in the random number generator,
- 8. No packet is ever transmitted that does not have a corresponding entry in the receiver side
- 9. No timer based re-synchronization is necessary. This is a consequence of 2.
- 10. The receiver will always have the ability to accept data messages transmitted within OoO messages of the most recently transmitted message.

J. Distributed Transmission Path Variant

[00172] Another embodiment incorporating various inventive principles is shown in FIG. 20. In this embodiment, a message transmission system includes a first computer 2001 in communication with a second computer 2002 through a network 2011 of intermediary

computers. In one variant of this embodiment, the network includes two edge routers 2003 and 2004 each of which is linked to a plurality of Internet Service Providers (ISPs) 2005 through 2010. Each ISP is coupled to a plurality of other ISPs in an arrangement as shown in FIG. 20, which is a representative configuration only and is not intended to be limiting. Each connection between ISPs is labeled in FIG. 20 to indicate a specific physical transmission path (e.g., AD is a physical path that links ISP A (element 2005) to ISP D (element 2008)). Packets arriving at each edge router are selectively transmitted to one of the ISPs to which the router is attached on the basis of a randomly or quasi-randomly selected basis.

[00173] As shown in FIG. 21, computer 2001 or edge router 2003 incorporates a plurality of link transmission tables 2100 that identify, for each potential transmission path through the network, valid sets of IP addresses that can be used to transmit the packet. For example, AD table 2101 contains a plurality of IP source/destination pairs that are randomly or quasi-randomly generated. When a packet is to be transmitted from first computer 2001 to second computer 2002, one of the link tables is randomly (or quasi-randomly) selected, and the next valid source/destination address pair from that table is used to transmit the packet through the network. If path AD is randomly selected, for example, the next source/destination IP address pair (which is pre-determined to transmit between ISP A (element 2005) and ISP B (element 2008)) is used to transmit the packet. If one of the transmission paths becomes degraded or inoperative, that link table can be set to a "down" condition as shown in table 2105, thus preventing addresses from being selected from that table. Other transmission paths would be unaffected by this broken link.

3. CONTINUATION-IN-PART IMPROVEMENTS

[00174] The following describes various improvements and features that can be applied to the embodiments described above. The improvements include: (1) a load balancer that distributes packets across different transmission paths according to transmission path quality; (2) a DNS proxy server that transparently creates a virtual private network in response to a domain name inquiry; (3) a large-to-small link bandwidth management feature that prevents denial-of-service attacks at system chokepoints; (4) a traffic limiter that regulates incoming packets by limiting the rate at which a transmitter can be synchronized with a receiver; and (5) a signaling

synchronizer that allows a large number of nodes to communicate with a central node by partitioning the communication function between two separate entities. Each is discussed separately below.

A. Load Balancer

[00175] Various embodiments described above include a system in which a transmitting node and a receiving node are coupled through a plurality of transmission paths, and wherein successive packets are distributed quasi-randomly over the plurality of paths. See, for example, FIGS. 20 and 21 and accompanying description. The improvement extends this basic concept to encompass distributing packets across different paths in such a manner that the loads on the paths are generally balanced according to transmission link quality.

[00176] In one embodiment, a system includes a transmitting node and a receiving node that are linked via a plurality of transmission paths having potentially varying transmission quality. Successive packets are transmitted over the paths based on a weight value distribution function for each path. The rate that packets will be transmitted over a given path can be different for each path. The relative "health" of each transmission path is monitored in order to identify paths that have become degraded. In one embodiment, the health of each path is monitored in the transmitter by comparing the number of packets transmitted to the number of packet acknowledgements received. Each transmission path may comprise a physically separate path (e.g., via dial-up phone line, computer network, router, bridge, or the like), or may comprise logically separate paths contained within a broadband communication medium (e.g., separate channels in an FDM, TDM, CDMA, or other type of modulated or unmodulated transmission link).

[00177] When the transmission quality of a path falls below a predetermined threshold and there are other paths that can transmit packets, the transmitter changes the weight value used for that path, making it less likely that a given packet will be transmitted over that path. The weight will preferably be set no lower than a minimum value that keeps nominal traffic on the path. The weights of the other available paths are altered to compensate for the change in the affected path. When the quality of a path degrades to where the transmitter is turned off by the synchronization function (i.e., no packets are arriving at the destination), the weight is set to zero. If all transmitters are turned off, no packets are sent.

[00178] Conventional TCP/IP protocols include a "throttling" feature that reduces the transmission rate of packets when it is determined that delays or errors are occurring in transmission. In this respect, timers are sometimes used to determine whether packets have been received. These conventional techniques for limiting transmission of packets, however, do not involve multiple transmission paths between two nodes wherein transmission across a particular path relative to the others is changed based on link quality.

[00179] According to certain embodiments, in order to damp oscillations that might otherwise occur if weight distributions are changed drastically (e.g., according to a step function), a linear or an exponential decay formula can be applied to gradually decrease the weight value over time that a degrading path will be used. Similarly, if the health of a degraded path improves, the weight value for that path is gradually increased.

[00180] Transmission link health can be evaluated by comparing the number of packets that are acknowledged within the transmission window (see embodiments discussed above) to the number of packets transmitted within that window and by the state of the transmitter (i.e., on or off). In other words, rather than accumulating general transmission statistics over time for a path, one specific implementation uses the "windowing" concepts described above to evaluate transmission path health.

[00181] The same scheme can be used to shift virtual circuit paths from an "unhealthy" path to a "healthy" one, and to select a path for a new virtual circuit.

[00182] FIG. 22A shows a flowchart for adjusting weight values associated with a plurality of transmission links. It is assumed that software executing in one or more computer nodes executes the steps shown in FIG. 22A. It is also assumed that the software can be stored on a computer-readable medium such as a magnetic or optical disk for execution by a computer.

[00183] Beginning in step 2201, the transmission quality of a given transmission path is measured. As described above, this measurement can be based on a comparison between the

number of packets transmitted over a particular link to the number of packet acknowledgements received over the link (e.g., per unit time, or in absolute terms). Alternatively, the quality can be evaluated by comparing the number of packets that are acknowledged within the transmission window to the number of packets that were transmitted within that window. In yet another variation, the number of missed synchronization messages can be used to indicate link quality. Many other variations are of course possible.

[00184] In step 2202, a check is made to determine whether more than one transmitter (e.g., transmission path) is turned on. If not, the process is terminated and resumes at step 2201.

[00185] In step 2203, the link quality is compared to a given threshold (e.g., 50%, or any arbitrary number). If the quality falls below the threshold, then in step 2207 a check is made to determine whether the weight is above a minimum level (e.g., 1%). If not, then in step 2209 the weight is set to the minimum level and processing resumes at step 2201. If the weight is above the minimum level, then in step 2208 the weight is gradually decreased for the path, then in step 2206 the weights for the remaining paths are adjusted accordingly to compensate (e.g., they are increased).

[00186] If in step 2203 the quality of the path was greater than or equal to the threshold, then in step 2204 a check is made to determine whether the weight is less than a steady-state value for that path. If so, then in step 2205 the weight is increased toward the steady-state value, and in step 2206 the weights for the remaining paths are adjusted accordingly to compensate (e.g., they are decreased). If in step 2204 the weight is not less than the steady-state value, then processing resumes at step 2201 without adjusting the weights.

[00187] The weights can be adjusted incrementally according to various functions, preferably by changing the value gradually. In one embodiment, a linearly decreasing function is used to adjust the weights; according to another embodiment, an exponential decay function is used. Gradually changing the weights helps to damp oscillators that might otherwise occur if the probabilities were abruptly.

[00188] Although not explicitly shown in FIG. 22A the process can be performed only periodically (e.g., according to a time schedule), or it can be continuously run, such as in a background mode of operation. In one embodiment, the combined weights of all potential paths should add up to unity (e.g., when the weighting for one path is decreased, the corresponding weights that the other paths will be selected will increase).

[00189] Adjustments to weight values for other paths can be prorated. For example, a decrease of 10% in weight value for one path could result in an evenly distributed increase in the weights for the remaining paths. Alternatively, weightings could be adjusted according to a weighted formula as desired (e.g., favoring healthy paths over less healthy paths). In yet another variation, the difference in weight value can be amortized over the remaining links in a manner that is proportional to their traffic weighting.

[00190] FIG. 22B shows steps that can be executed to shut down transmission links where a transmitter turns off. In step 2210, a transmitter shut-down event occurs. In step 2211, a test is made to determine whether at least one transmitter is still turned on. If not, then in step 2215 all packets are dropped until a transmitter turns on. If in step 2211 at least one transmitter is turned on, then in step 2212 the weight for the path is set to zero, and the weights for the remaining paths are adjusted accordingly.

[00191] FIG. 23 shows a computer node 2301 employing various principles of the above- described embodiments. It is assumed that two computer nodes of the type shown in FIG. 23 communicate over a plurality of separate physical transmission paths. As shown in FIG. 23, four transmission paths X1 through X4 are defined for communicating between the two nodes. Each node includes a packet transmitter 2302 that operates in accordance with a transmit table 2308 as described above. (The packet transmitter could also operate without using the IP-hopping features described above, but the following description assumes that some form of hopping is employed in conjunction with the path selection mechanism.). The computer node also includes a packet receiver 2303 that operates in accordance with a receive table 2309, including a moving window W that moves as valid packets are received. Invalid packets having source and destination addresses that do not fall within window W are rejected.

[00192] As each packet is readied for transmission, source and destination IP addresses (or other discriminator values) are selected from transmit table 2308 according to any of the various algorithms described above, and packets containing these source/destination address pairs, which correspond to the node to which the four transmission paths are linked, are generated to a transmission path switch 2307. Switch 2307, which can comprise a software function, selects from one of the available transmission paths according to a weight distribution table 2306. For example, if the weight for path X1 is 0.2, then every fifth packet will be transmitted on path X1. A similar regime holds true for the other paths as shown. Initially, each link's weight value can be set such that it is proportional to its bandwidth, which will be referred to as its "steady-state" value.

[00193] Packet receiver 2303 generates an output to a link quality measurement function 2304 that operates as described above to determine the quality of each transmission path. (The input to packet receiver 2303 for receiving incoming packets is omitted for clarity). Link quality measurement function 2304 compares the link quality to a threshold for each transmission link and, if necessary, generates an output to weight adjustment function 2305. If a weight adjustment is required, then the weights in table 2306 are adjusted accordingly, preferably according to a gradual (e.g., linearly or exponentially declining) function. In one embodiment, the weight values for all available paths are initially set to the same value, and only when paths degrade in quality are the weights changed to reflect differences.

[00194] Link quality measurement function 2304 can be made to operate as part of a synchronizer function as described above. That is, if resynchronization occurs and the receiver detects that synchronization has been lost (e.g., resulting in the synchronization window W being advanced out of sequence), that fact can be used to drive link quality measurement function 2304. According to one embodiment, load balancing is performed using information garnered during the normal synchronization, augmented slightly to communicate link health from the receiver to the transmitter. The receiver maintains a count, MESS_R(W), of the messages received in synchronization window W. When it receives a synchronization request (SYNC_REQ) corresponding to the end of window W, the receiver includes counter MESS_R in the resulting synchronization acknowledgement (SYNC_ACK) sent back to the transmitter. This

allows the transmitter to compare messages sent to messages received in order to asses the health of the link.

[00195] If synchronization is completely lost, weight adjustment function 2305 decreases the weight value on the affected path to zero. When synchronization is regained, the weight value for the affected path is gradually increased to its original value. Alternatively, link quality can be measured by evaluating the length of time required for the receiver to acknowledge a synchronization request. In one embodiment, separate transmit and receive tables are used for each transmission path.

[00196] When the transmitter receives a SYNC_ACK, the MESS_R is compared with the number of messages transmitted in a window (MESS_T). When the transmitter receives a SYNC_ACK, the traffic probabilities will be examined and adjusted if necessary. MESS_R is compared with the number of messages transmitted in a window (MESS_T). There are two possibilities:

1. If MESS_R is less than a threshold value, THRESH, then the link will be deemed to be unhealthy. If the transmitter was turned off, the transmitter is turned on and the weight P for that link will be set to a minimum value MIN. This will keep a trickle of traffic on the link for monitoring purposes until it recovers. If the transmitter was turned on, the weight P for that link will be set to:

P'= αx MIN +(1- α)xP (1)

Equation 1 will exponentially damp the traffic weight value to MIN during sustained periods of degraded service.

2. If MESS_R for a link is greater than or equal to THRESH, the link will be deemed healthy. If the weight P for that link is greater than or equal to the steady state value S for that link, then P is left unaltered. If the weight P for that link is less than THRESH then P will be set to:

P'= β x S +(1- β)xP (2)

where β is a parameter such that $0 \le \beta \le 1$ that determines the damping rate of P.

[00197] Equation 2 will increase the traffic weight to S during sustained periods of acceptable service in a damped exponential fashion.

[00198] A detailed example will now be provided with reference to FIG. 24. As shown in FIG. 24, a first computer 2401 communicates with a second computer 2402 through two routers 2403 and 2404. Each router is coupled to the other router through three transmission links. As described above, these may be physically diverse links or logical links (including virtual private networks).

[00199] Suppose that a first link L1 can sustain a transmission bandwidth of 100 Mb/s and has a window size of 32; link L2 can sustain 75 Mb/s and has a window size of 24; and link L3 can sustain 25 Mb/s and has a window size of 8. The combined links can thus sustain 200Mb/s. The steady state traffic weights are 0.5 for link L1; 0.375 for link L2, and 0.125 for link L3. MIN=1Mb/s, THRESH =0.8 MESS_T for each link, α =.75 and β =.5. These traffic weights will remain stable until a link stops for synchronization or reports a number of packets received less than its THRESH. Consider the following sequence of events:

1. Link L1 receives a SYNC_ACK containing a MESS_R of 24, indicating that only 75% of the MESS_T (32) messages transmitted in the last window were successfully received. Link 1 would be below THRESH (0.8). Consequently, link L1's traffic weight value would be reduced to 0.12825, while link L2's traffic weight value would be increased to 0.65812 and link L3's traffic weight value would be increased to 0.217938.

2. Link L2 and L3 remained healthy and link L1 stopped to synchronize. Then link L1's traffic weight value would be set to 0, link L2's traffic weight value would be set to 0.75, and link L33's traffic weight value would be set to 0.25.

3. Link L1 finally received a SYNC_ACK containing a MESS_R of 0 indicating that none of the MESS_T (32) messages transmitted in the last window were successfully received. Link L1 would be below THRESH. Link L1's traffic weight value would be increased to .005,

link L2's traffic weight value would be decreased to 0.74625, and link L3's traffic weight value would be decreased to 0.24875.

4. Link Ll received a SYNC_ACK containing a MESS_R of 32 indicating that 100% of the MESS_T (32) messages transmitted in the last window were successfully received. Link L1 would be above THRESH. Link L1's traffic weight value would be increased to 0.2525, while link L2's traffic weight value would be decreased to 0.560625 and link L3's traffic weight value would be decreased to .186875.

5. Link L1 received a SYNC_ACK containing a MESS_R of 32 indicating that 100% of the MESS_T (32) messages transmitted in the last window were successfully received. Link L1 would be above THRESH. Link L1's traffic weight value would be increased to 0.37625; link L2's traffic weight value would be decreased to 0.4678125, and link L3's traffic weight value would be decreased to 0.1559375.

6. Link L1 remains healthy and the traffic probabilities approach their steady state traffic probabilities.

B. Use of a DNS Proxy to Transparently Create Virtual Private Networks

[00200] A second improvement concerns the automatic creation of a virtual private network (VPN) in response to a domain-name server look-up function.

[00201] Conventional Domain Name Servers (DNSs) provide a look-up function that returns the IP address of a requested computer or host. For example, when a computer user types in the web name "Yahoo.com," the user's web browser transmits a request to a DNS, which converts the name into a four-part IP address that is returned to the user's browser and then used by the browser to contact the destination web site.

[00202] This conventional scheme is shown in FIG. 25. A user's computer 2501 includes a client application 2504 (for example, a web browser) and an IP protocol stack 2505. When the user enters the name of a destination host, a request DNS REQ is made (through IP protocol stack 2505) to a DNS 2502 to look up the IP address associated with the name. The DNS returns the IP address DNS RESP to client application 2504, which is then able to use the

IP address to communicate with the host 2503 through separate transactions such as PAGE REQ and PAGE RESP.

[00203] In the conventional architecture shown in FIG. 25, nefarious listeners on the Internet could intercept the DNS REQ and DNS RESP packets and thus learn what IP addresses the user was contacting. For example, if a user wanted to set up a secure communication path with a web site having the name "Target.com," when the user's browser contacted a DNS to find the IP address for that web site, the true IP address of that web site would be revealed over the Internet as part of the DNS inquiry. This would hamper anonymous communications on the Internet.

[00204] One conventional scheme that provides secure virtual private networks over the Internet provides the DNS server with the public keys of the machines that the DNS server has the addresses for. This allows hosts to retrieve automatically the public keys of a host that the host is to communicate with so that the host can set up a VPN without having the user enter the public key of the destination host. One implementation of this standard is presently being developed as part of the FreeS/WAN project(RFC 2535).

[00205] The conventional scheme suffers from certain drawbacks. For example, any user can perform a DNS request. Moreover, DNS requests resolve to the same value for all users.

[00206] According to certain aspects of the invention, a specialized DNS server traps DNS requests and, if the request is from a special type of user (e.g., one for which secure communication services are defined), the server does not return the true IP address of the target node, but instead automatically sets up a virtual private network between the target node and the user. The VPN is preferably implemented using the IP address "hopping" features of the basic invention described above, such that the true identity of the two nodes cannot be determined even if packets during the communication are intercepted. For DNS requests that are determined to not require secure services (e.g., an unregistered user), the DNS server transparently "passes through" the request to provide a normal look-up function and return the IP address of the target web server, provided that the requesting host has permissions to resolve unsecured sites. Different users who make an identical DNS request could be provided with different results.

[00207] FIG. 26 shows a system employing various principles summarized above. A user's computer 2601 includes a conventional client (e.g., a web browser) 2605 and an IP protocol stack 2606 that preferably operates in accordance with an IP hopping function 2607 as outlined above. A modified DNS server 2602 includes a conventional DNS server function 2609 and a DNS proxy 2610. A gatekeeper server 2603 is interposed between the modified DNS server and a secure target site 2704. An "unsecure" target site 2611 is also accessible via conventional IP protocols.

[00208] According to one embodiment, DNS proxy 2610 intercepts all DNS lookup functions from client 2605 and determines whether access to a secure site has been requested. If access to a secure site has been requested (as determined, for example, by a domain name extension, or by reference to an internal table of such sites), DNS proxy 2610 determines whether the user has sufficient security privileges to access the site. If so, DNS proxy 2610 transmits a message to gatekeeper 2603 requesting that a virtual private network be created between user computer 2601 and secure target site 2604. In one embodiment, gatekeeper 2603 creates "hopblocks" to be used by computer 2601 and secure target site 2604 for secure communication. Then, gatekeeper 2603 communicates these to user computer 2601. Thereafter, DNS proxy 2610 returns to user computer 2601 the resolved address passed to it by the gatekeeper (this address could be different from the actual target computer) 2604, preferably using a secure administrative VPN. The address that is returned need not be the actual address of the destination computer.

[00209] Had the user requested lookup of a non-secure web site such as site 2611, DNS proxy would merely pass through to conventional DNS server 2609 the look-up request, which would be handled in a conventional manner, returning the IP address of non-secure web site 2611. If the user had requested lookup of a secure web site but lacked credentials to create such a connection, DNS proxy 2610 would return a "host unknown" error to the user. In this manner, different users requesting access to the same DNS name could be provided with different look-up results.

[00210] Gatekeeper 2603 can be implemented on a separate computer (as shown in FIG. 26) or as a function within modified DNS server 2602. In general, it is anticipated that

gatekeeper 2703 facilitates the allocation and exchange of information needed to communicate securely, such as using "hopped" IP addresses. Secure hosts such as site 2604 are assumed to be equipped with a secure communication function such as an IP hopping function 2608.

[00211] It will be appreciated that the functions of DNS proxy 2610 and DNS server 2609 can be combined into a single server for convenience. Moreover, although element 2602 is shown as combining the functions of two servers, the two servers can be made to operate independently.

[00212] FIG. 27 shows steps that can be executed by DNS proxy server 2610 to handle requests for DNS look-up for secure hosts. In step 2701, a DNS look-up request is received for a target host. In step 2702, a check is made to determine whether access to a secure host was requested. If not, then in step 2703 the DNS request is passed to conventional DNS server 2609, which looks up the IP address of the target site and returns it to the user's application for further processing.

[00213] In step 2702, if access to a secure host was requested, then in step 2704 a further check is made to determine whether the user is authorized to connect to the secure host. Such a check can be made with reference to an internally stored list of authorized IP addresses, or can be made by communicating with gatekeeper 2603 (e.g., over an "administrative" VPN that is secure). It will be appreciated that different levels of security can also be provided for different categories of hosts. For example, some sites may be designated as having a certain security level, and the security level of the user requesting access must match that security level. The user's security level can also be determined by transmitting a request message back to the user's computer requiring that it prove that it has sufficient privileges.

[00214] If the user is not authorized to access the secure site, then a "host unknown" message is returned (step 2705). If the user has sufficient security privileges, then in step 2706 a secure VPN is established between the user's computer and the secure target site. As described above, this is preferably done by allocating a hopping regime that will be carried out between the user's computer and the secure target site, and is preferably performed transparently to the user (i.e., the user need not be involved in creating the secure link). As described in various

embodiments of this application, any of various fields can be "hopped" (e.g., IP source/destination addresses; a field in the header; etc.) in order to communicate securely.

[00215] Some or all of the security functions can be embedded in gatekeeper 2603, such that it handles all requests to connect to secure sites. In this embodiment, DNS proxy 2610 communicates with gatekeeper 2603 to determine (preferably over a secure administrative VPN) whether the user has access to a particular web site. Various scenarios for implementing these features are described by way of example below:

[00216] Scenario #1: Client has permission to access target computer, and gatekeeper has a rule to make a VPN for the client. In this scenario, the client's DNS request would be received by the DNS proxy server 2610, which would forward the request to gatekeeper 2603. The gatekeeper would establish a VPN between the client and the requested target. The gatekeeper would provide the address of the destination to the DNS proxy, which would then return the resolved name as a result. The resolved address can be transmitted back to the client in a secure administrative VPN.

[00217] Scenario #2: Client does not have permission to access target computer. In this scenario, the client's DNS request would be received by the DNS proxy server 2610, which would forward the request to gatekeeper 2603. The gatekeeper would reject the request, informing DNS proxy server 2610 that it was unable to find the target computer. The DNS proxy 2610 would then return a "host unknown" error message to the client.

[00218] Scenario #3: Client has permission to connect using a normal non-VPN link, and the gatekeeper does not have a rule to set up a VPN for the client to the target site. In this scenario, the client's DNS request is received by DNS proxy server 2610, which would check its rules and determine that no VPN is needed. Gatekeeper 2603 would then inform the DNS proxy server to forward the request to conventional DNS server 2609, which would resolve the request and return the result to the DNS proxy server and then back to the client.

[00219] <u>Scenario #4</u>: Client does not have permission to establish a normal/non-VPN link, and the gatekeeper does not have a rule to make a VPN for the client to the target site. In
this scenario, the DNS proxy server would receive the client's DNS request and forward it to gatekeeper 2603. Gatekeeper 2603 would determine that no special VPN was needed, but that the client is not authorized to communicate with non-VPN members. The gatekeeper would reject the request, causing DNS proxy server 2610 to return an error message to the client.

C. Large Link to Small Link Bandwidth Management

[00220] One feature of the basic architecture is the ability to prevent so-called "denial of service" attacks that can occur if a computer hacker floods a known Internet node with packets, thus preventing the node from communicating with other nodes. Because IP addresses or other fields are "hopped" and packets arriving with invalid addresses are quickly discarded, Internet nodes are protected against flooding targeted at a single IP address.

[00221] In a system in which a computer is coupled through a link having a limited bandwidth (e.g., an edge router) to a node that can support a much higher-bandwidth link (e.g., an Internet Service Provider), a potential weakness could be exploited by a determined hacker. Referring to FIG. 28, suppose that a first host computer 2801 is communicating with a second host computer 2804 using the IP address hopping principles described above. The first host computer is coupled through an edge router 2802 to an Internet Service Provider (ISP) 2803 through a low bandwidth link (LOW BW), and is in turn coupled to second host computer 2804 through parts of the Internet through a high bandwidth link (HIGH BW). In this architecture, the ISP is able to support a high bandwidth to the internet, but a much lower bandwidth to the edge router 2802.

[00222] Suppose that a computer hacker is able to transmit a large quantity of dummy packets addressed to first host computer 2801 across high bandwidth link HIGH BW. Normally, host computer 2801 would be able to quickly reject the packets since they would not fall within the acceptance window permitted by the IP address hopping scheme. However, because the packets must travel across low bandwidth link LOW BW, the packets overwhelm the lower bandwidth link before they are received by host computer 2801. Consequently, the link to host computer 2801 is effectively flooded before the packets can be discarded.

[00223] According to one inventive improvement, a "link guard" function 2805 is inserted into the high-bandwidth node (e.g., ISP 2803) that quickly discards packets destined for a low-bandwidth target node if they are not valid packets. Each packet destined for a low-bandwidth node is cryptographically authenticated to determine whether it belongs to a VPN. If it is not a valid VPN packet, the packet is discarded at the high-bandwidth node. If the packet is authenticated as belonging to a VPN, the packet is passed with high preference. If the packet is a valid non-VPN packet, it is passed with a lower quality of service (e.g., lower priority).

[00224] In one embodiment, the ISP distinguishes between VPN and non-VPN packets using the protocol of the packet. In the case of IPSEC [rfc 2401], the packets have IP protocols 420 and 421. In the case of the TARP VPN, the packets will have an IP protocol that is not yet defined. The ISP's link guard, 2805, maintains a table of valid VPNs which it uses to validate whether VPN packets are cryptographically valid. According to one embodiment, packets that do not fall within any hop windows used by nodes on the low-bandwidth link are rejected, or are sent with a lower quality of service. One approach for doing this is to provide a copy of the IP hopping tables used by the low-bandwidth nodes to the high-bandwidth node, such that both the high-bandwidth and low-bandwidth nodes track hopped packets (e.g., the high-bandwidth node moves its hopping window as valid packets are received). In such a scenario, the high-bandwidth node discards packets that do not fall within the hopping window before they are transmitted over the low-bandwidth link. Thus, for example, ISP 2903 maintains a copy 2910 of the receive table used by host computer 2901. Incoming packets that do not fall within this receive table are discarded. According to a different embodiment, link guard 2805 validates each VPN packet using a keyed hashed message authentication code (HMAC) [rfc 2104].

[00225] According to another embodiment, separate VPNs (using, for example, hopblocks) can be established for communicating between the low-bandwidth node and the high-bandwidth node (i.e., packets arriving at the high-bandwidth node are converted into different packets before being transmitted to the low-bandwidth node).

[00226] As shown in FIG. 29, for example, suppose that a first host computer 2900 is communicating with a second host computer 2902 over the Internet, and the path includes a high

bandwidth link HIGH BW to an ISP 2901 and a low bandwidth link LOW BW through an edge router 2904. In accordance with the basic architecture described above, first host computer 2900 and second host computer 2902 would exchange hopblocks (or a hopblock algorithm) and would be able to create matching transmit and receive tables 2905, 2906, 2912 and 2913. Then in accordance with the basic architecture, the two computers would transmit packets having seemingly random IP source and destination addresses, and each would move a corresponding hopping window in its receive table as valid packets were received.

[00227] Suppose that a nefarious computer hacker 2903 was able to deduce that packets having a certain range of IP addresses (e.g., addresses 100 to 200 for the sake of simplicity) are being transmitted to ISP 2901, and that these packets are being forwarded over a low-bandwidth link. Hacker computer 2903 could thus "flood" packets having addresses falling into the range 100 to 200, expecting that they would be forwarded along low bandwidth link LOW BW, thus causing the low bandwidth link to become overwhelmed. The fast packet reject mechanism in first host computer 3000 would be of little use in rejecting these packets, since the low bandwidth link was effectively jammed before the packets could be rejected. In accordance with one aspect of the improvement, however, VPN link guard 2911 would prevent the attack from impacting the performance of VPN traffic because the packets would either be rejected as invalid VPN packets or given a lower quality of service than VPN traffic over the lower bandwidth link. A denial-of- service flood attack could, however, still disrupt non-VPN traffic.

[00228] According to one embodiment of the improvement, ISP 2901 maintains a separate VPN with first host computer 2900, and thus translates packets arriving at the ISP into packets having a different IP header before they are transmitted to host computer 2900. The cryptographic keys used to authenticate VPN packets at the link guard 2911 and the cryptographic keys used to encrypt and decrypt the VPN packets at host 2902 and host 2901 can be different, so that link guard 2911 does not have access to the private host data; it only has the capability to authenticate those packets.

[00229] According to yet a third embodiment, the low-bandwidth node can transmit a special message to the high-bandwidth node instructing it to shut down all transmissions on a particular IP address, such that only hopped packets will pass through to the low-bandwidth

node. This embodiment would prevent a hacker from flooding packets using a single IP address. According to yet a fourth embodiment, the high-bandwidth node can be configured to discard packets transmitted to the low-bandwidth node if the transmission rate exceeds a certain predetermined threshold for any given IP address; this would allow hopped packets to go through. In this respect, link guard 2911 can be used to detect that the rate of packets on a given IP address are exceeding a threshold rate; further packets addressed to that same IP address would be dropped or transmitted at a lower priority (e.g., delayed).

D. Traffic Limiter

[00230] In a system in which multiple nodes are communicating using "hopping" technology, a treasonous insider could internally flood the system with packets. In order to prevent this possibility, one inventive improvement involves setting up "contracts" between nodes in the system, such that a receiver can impose a bandwidth limitation on each packet sender. One technique for doing this is to delay acceptance of a checkpoint synchronization request from a sender until a certain time period (e.g., one minute) has elapsed. Each receiver can effectively control the rate at which its hopping window moves by delaying "SYNC_ACK" responses to "SYNC_REQ" messages.

[00231] A simple modification to the checkpoint synchronizer will serve to protect a receiver from accidental or deliberate overload from an internally treasonous client. This modification is based on the observation that a receiver will not update its tables until a SYNC_REQ is received on hopped address CKPT_N. It is a simple matter of deferring the generation of a new CKPT_N until an appropriate interval after previous checkpoints.

[00232] Suppose a receiver wished to restrict reception from a transmitter to 100 packets a second, and that checkpoint synchronization messages were triggered every 50 packets, A compliant transmitter would not issue new SYNC_REQ messages more often than every 0.5 seconds. The receiver could delay a non-compliant transmitter from synchronizing by delaying the issuance of CKPT_N for 0.5 second after the last SYNC_REQ was accepted.

[00233] In general, if M receivers need to restrict N transmitters issuing new SYNC_REQ messages after every W messages to sending R messages a second in aggregate,

each receiver could defer issuing a new CKPT_N until MxNxW/R seconds have elapsed since the last SYNC_REQ has been received and accepted. If the transmitter exceeds this rate between a pair of checkpoints, it will issue the new checkpoint before the receiver is ready to receive it, and the SYNC_REQ will be discarded by the receiver. After this, the transmitter will re-issue the SYNC_REQ every T1 seconds until it receives a SYNC_ACK. The receiver will eventually update CKPT_N and the SYNC_REQ will be acknowledged. If the transmission rate greatly exceeds the allowed rate, the transmitter will stop until it is compliant. If the transmitter exceeds the allowed rate by a little, it will eventually stop after several rounds of delayed synchronization until it is in compliance. Hacking the transmitter's code to not shut off only permits the transmitter to lose the acceptance window. In this case it can recover the window and proceed only after it is compliant again.

[00234] Two practical issues should be considered when implementing the above scheme:

7. The receiver rate should be slightly higher than the permitted rate in order to allow for statistical fluctuations in traffic arrival times and non-uniform load balancing.

8. Since a transmitter will rightfully continue to transmit for a period after a SYNC_REQ is transmitted, the algorithm above can artificially reduce the transmitter's bandwidth. If events prevent a compliant transmitter from synchronizing for a period (e.g. the network dropping a SYNC_REQ or a SYNC_ACK) a SYNC_REQ will be accepted later than expected. After this, the transmitter will transmit fewer than expected messages before encountering the next checkpoint. The new checkpoint will not have been activated and the transmitter will have to retransmit the SYNC_REQ. This will appear to the receiver as if the transmitter is not compliant. Therefore, the next checkpoint will be accepted late from the transmitter's perspective. This has the effect of reducing the transmitter's allowed packet rate until the transmitter transmits at a packet rate below the agreed upon rate for a period of time.

[00235] To guard against this, the receiver should keep track of the times that the last C SYNC_REQs were received and accepted and use the minimum of MxNxW/R seconds after the last SYNC_REQ has been received and accepted, 2xMxNxW/R seconds after next to the last

SYNC_REQ has been received and accepted, CxMxNxW/R seconds after (C-1)th to the last SYNC_REQ has been received, as the time to activate CKPT_N. This prevents the receiver from inappropriately limiting the transmitter's packet rate if at least one out of the last C SYNC_REQs was processed on the first attempt.

[00236] FIG. 30 shows a system employing the above-described principles. In FIG. 30, two computers 3000 and 3001 are assumed to be communicating over a network N in accordance with the "hopping" principles described above (e.g., hopped IP addresses, discriminator values, etc.). For the sake of simplicity, computer 3000 will be referred to as the receiving computer and computer 3001 will be referred to as the transmitting computer, although full duplex operation is of course contemplated. Moreover, although only a single transmitter is shown, multiple transmitters can transmit to receiver 3000.

[00237] As described above, receiving computer 3000 maintains a receive table 3002 including a window W that defines valid IP address pairs that will be accepted when appearing in incoming data packets. Transmitting computer 3001 maintains a transmit table 3003 from which the next IP address pairs will be selected when transmitting a packet to receiving computer 3000. (For the sake of illustration, window W is also illustrated with reference to transmit table 3003). As transmitting computer moves through its table, it will eventually generate a SYNC_REQ message as illustrated in function 3010. This is a request to receiver 3000 to synchronize the receive table 3002, from which transmitter 3001 expects a response in the form of a CKPT_N (included as part of a SYNC_ACK message). If transmitting computer 3001 transmits more messages than its allotment, it will prematurely generate the SYNC_REQ message. (If it has been altered to remove the SYNC_REQ message generation altogether, it will fall out of synchronization since receiver 3000 will quickly reject packets that fall outside of window W, and the extra packets generated by transmitter 3001 will be discarded).

[00238] In accordance with the improvements described above, receiving computer 3000 performs certain steps when a SYNC_REQ message is received, as illustrated in FIG. 30. In step 3004, receiving computer 3000 receives the SYNC_REQ message. In step 3005, a check is made to determine whether the request is a duplicate. If so, it is discarded in step 3006. In step 3007, a check is made to determine whether the SYNC_REQ received from transmitter 3001 was

received at a rate that exceeds the allowable rate R (i.e., the period between the time of the last SYNC_REQ message). The value R can be a constant, or it can be made to fluctuate as desired. If the rate exceeds R, then in step 3008 the next activation of the next CKPT_N hopping table entry is delayed by W/R seconds after the last SYNC_REQ has been accepted.

[00239] Otherwise, if the rate has not been exceeded, then in step 3109 the next CKPT_N value is calculated and inserted into the receiver's hopping table prior to the next SYNC_REQ from the transmitter 3101. Transmitter 3101 then processes the SYNC_REQ in the normal manner.

E. Signaling Synchronizer

[00240] In a system in which a large number of users communicate with a central node using secure hopping technology, a large amount of memory must be set aside for hopping tables and their supporting data structures. For example, if one million subscribers to a web site occasionally communicate with the web site, the site must maintain one million hopping tables, thus using up valuable computer resources, even though only a small percentage of the users may actually be using the system at any one time. A desirable solution would be a system that permits a certain maximum number of simultaneous links to be maintained, but which would "recognize" millions of registered users at any one time. In other words, out of a population of a million registered users, a few thousand at a time could simultaneously communicate with a central server, without requiring that the server maintain one million hopping tables of appreciable size.

[00241] One solution is to partition the central node into two nodes: a signaling server that performs session initiation for user log-on and log-off (and requires only minimally sized tables), and a transport server that contains larger hopping tables for the users. The signaling server listens for the millions of known users and performs a fast-packet reject of other (bogus) packets. When a packet is received from a known user, the signaling server activates a virtual private link (VPL) between the user and the transport server, where hopping tables are allocated and maintained. When the user logs onto the signaling server, the user's computer is provided with hop tables for communicating with the transport server, thus activating the VPL. The VPLs can be torn down when they become inactive for a time period, or they can be torn down upon

user log-out. Communication with the signaling server to allow user log-on and log-off can be accomplished using a specialized version of the checkpoint scheme described above.

[00242] FIG. 31 shows a system employing certain of the above-described principles. In FIG. 31, a signaling server 3101 and a transport server 3102 communicate over a link. Signaling server 3101 contains a large number of small tables 3106 and 3107 that contain enough information to authenticate a communication request with one or more clients 3103 and 3104. As described in more detail below, these small tables may advantageously be constructed as a special case of the synchronizing checkpoint tables described previously. Transport server 3102, which is preferably a separate computer in communication with signaling server 3101, contains a smaller number of larger hopping tables 3108, 3109, and 3110 that can be allocated to create a VPN with one of the client computers.

[00243] According to one embodiment, a client that has previously registered with the system (e.g., via a system administration function, a user registration procedure, or some other method) transmits a request for information from a computer (e.g., a web site). In one variation, the request is made using a "hopped" packet, such that signaling server 3101 will quickly reject invalid packets from unauthorized computers such as hacker computer 3105. An "administrative" VPN can be established between all of the clients and the signaling server in order to ensure that a hacker cannot flood signaling server 3101 with bogus packets. Details of this scheme are provided below.

[00244] Signaling server 3101 receives the request 3111 and uses it to determine that client 3103 is a validly registered user. Next, signaling server 3101 issues a request to transport server 3102 to allocate a hopping table (or hopping algorithm or other regime) for the purpose of creating a VPN with client 3103. The allocated hopping parameters are returned to signaling server 3101 (path 3113), which then supplies the hopping parameters to client 3103 via path 3114, preferably in encrypted form.

[00245] Thereafter, client 3103 communicates with transport server 3102 using the normal hopping techniques described above. It will be appreciated that although signaling server 3101 and transport server 3102 are illustrated as being two separate computers, they could of

course be combined into a single computer and their functions performed on the single computer. Alternatively, it is possible to partition the functions shown in FIG. 31 differently from as shown without departing from the inventive principles.

[00246] One advantage of the above-described architecture is that signaling server 3101 need only maintain a small amount of information on a large number of potential users, yet it retains the capability of quickly rejecting packets from unauthorized users such as hacker computer 3105. Larger data tables needed to perform the hopping and synchronization functions are instead maintained in a transport server 3102, and a smaller number of these tables are needed since they are only allocated for "active" links. After a VPN has become inactive for a certain time period (e.g., one hour), the VPN can be automatically torn down by transport server 3102 or signaling server 3101.

[00247] A more detailed description will now be provided regarding how a special case of the checkpoint synchronization feature can be used to implement the signaling scheme described above.

[00248] The signaling synchronizer may be required to support many (millions) of standing, low bandwidth connections. It therefore should minimize per-VPL memory usage while providing the security offered by hopping technology. In order to reduce memory usage in the signaling server, the data hopping tables can be completely eliminated and data can be carried as part of the SYNC_REQ message. The table used by the server side (receiver) and client side (transmitter) is shown schematically as element 3106 in FIG. 31.

[00249] The meaning and behaviors of CKPT_N, CKPT_O and CKPT_R remain the same from the previous description, except that CKPT_N can receive a combined data and SYNC_REQ message or a SYNC_REQ message without the data.

[00250] The protocol is a straightforward extension of the earlier synchronizer. Assume that a client transmitter is on and the tables are synchronized. The initial tables can be generated "out of band." For example, a client can log into a web server to establish an account over the Internet. The client will receive keys etc encrypted over the Internet. Meanwhile, the server will set up the signaling VPN on the signaling server.

[00251] Assuming that a client application wishes to send a packet to the server on the client's standing signaling VPL:

9. The client sends the message marked as a data message on the inner header using the transmitter's CKPT_N address. It turns the transmitter off and starts a timer T1 noting CKPT_O. Messages can be one of three types: DATA, SYNC_REQ and SYNC_ACK. In the normal algorithm, some potential problems can be prevented by identifying each message type as part of the encrypted inner header field. In this algorithm, it is important to distinguish a data packet and a SYNC_REQ in the signaling synchronizer since the data and the SYNC_REQ come in on the same address.

10. When the server receives a data message on its CKPT_N, it verifies the message and passes it up the stack. The message can be verified by checking message type and other information (i.e., user credentials) contained in the inner header It replaces its CKPT_O with CKPT_N and generates the next CKPT_N. It updates its transmitter side CKPT_R to correspond to the client's receiver side CKPT_R and transmits a SYNC_ACK containing CKPT_O in its payload.

11. When the client side receiver receives a SYNC_ACK on its CKPT_R with a payload matching its transmitter side CKPT_O and the transmitter is off, the transmitter is turned on and the receiver side CKPT_R is updated. If the SYNC_ACK's payload does not match the transmitter side CKPT_O or the transmitter is on, the SYNC_ACK is simply discarded.

12. T1 expires: If the transmitter is off and the client's transmitter side CKPT_O matches the CKPTO associated with the timer, it starts timer T1 noting CKPT_O again, and a SYNC_REQ is sent using the transmitter's CKPT_O address. Otherwise, no action is taken.

13. When the server receives a SYNC_REQ on its CKPT_N, it replaces its CKPT_O with CKPT_N and generates the next CKPT_N. It updates its transmitter side CKPT_R to

correspond to the client's receiver side CKPT_R and transmits a SYNC_ACK containing CKPT_O in its payload.

14. When the server receives a SYNC_REQ on its CKPT_O, it updates its transmitter side CKPT_R to correspond to the client's receiver side CKPT_R and transmits a SYNC_ACK containing CKPT_O in its payload.

[00252] FIG. 32 shows message flows to highlight the protocol. Reading from top to bottom, the client sends data to the server using its transmitter side CKPT_N. The client side transmitter is turned off and a retry timer is turned off. The transmitter will not transmit messages as long as the transmitter is turned off. The client side transmitter then loads CKPT_N into CKPT_O and updates CKPT_N. This message is successfully received and a passed up the stack. It also synchronizes the receiver i.e., the server loads CKPT_N into CKPT_O and generates a new CKPT_N, it generates a new CKPT_R in the server side transmitter and transmits a SYNC_ACK containing the server side receiver's CKPT_O the server. The SYNC_ACK is successfully received at the client. The client side receiver's CKPT_R is updated, the transmitter is turned on and the retry timer is killed. The client side transmitter is ready to transmit a new data message.

[00253] Next, the client sends data to the server using its transmitter side CKPT_N. The client side transmitter is turned off and a retry timer is turned off. The transmitter will not transmit messages as long as the transmitter is turned off. The client side transmitter then loads CKPT_N into CKPT_O and updates CKPT_N. This message is lost. The client side timer expires and as a result a SYNC_REQ is transmitted on the client side transmitter's CKPT_O (this will keep happening until the SYNC_ACK has been received at the client). The SYNC_REQ is successfully received at the server. It synchronizes the receiver i.e., the server loads CKPT_N into CKPT_O and generates a new CKPT_N, it generates an new CKPT_R in the server side transmitter and transmits a SYNC_ACK containing the server side receiver's CKPT_O the server. The SYNC_ACK is successfully received at the client. The client side receiver's CKPT_R is updated, the transmitter is turned off and the retry timer is killed. The client side transmitter is ready to transmit a new data message.

[00254] There are numerous other scenarios that follow this flow. For example, the SYNC_ACK could be lost. The transmitter would continue to re-send the SYNC_REQ until the receiver synchronizes and responds.

[00255] The above-described procedures allow a client to be authenticated at signaling server 3201 while maintaining the ability of signaling server 3201 to quickly reject invalid packets, such as might be generated by hacker computer 3205. In various embodiments, the signaling synchronizer is really a derivative of the synchronizer. It provides the same protection as the hopping protocol, and it does so for a large number of low bandwidth connections.

F. One-Click Secure On-line Communications and Secure Domain Name Service

[00256] The present invention provides a technique for establishing a secure communication link between a first computer and a second computer over a computer network. Preferably, a user enables a secure communication link using a single click of a mouse, or a corresponding minimal input from another input device, such as a keystroke entered on a keyboard or a click entered through a trackball. Alternatively, the secure link is automatically established as a default setting at boot-up of the computer (i.e., no click). FIG. 33 shows a system block diagram 3300 of a computer network in which the one-click secure communication method of the present invention is suitable. In FIG. 33, a computer terminal or client computer 3301, such as a personal computer (PC), is connected to a computer network 3302, such as the Internet, through an ISP 3303. Alternatively, computer 3301 can be connected to computer network 3302 through an edge router. Computer 3301 includes an input device, such as a keyboard and/or mouse, and a display device, such as a monitor. Computer 3301 can communicate conventionally with another computer 3304 connected to computer network 3302 over a communication link 3305 using a browser 3306 that is installed and operates on computer 3301 in a well-known manner.

[00257] Computer 3304 can be, for example, a server computer that is used for conducting e-commerce. In the situation when computer network 3302 is the Internet, computer 3304 typically will have a standard top-level domain name such as .com, .net, .org, .edu, .mil or .gov.

[00258] FIG. 34 shows a flow diagram 3400 for installing and establishing a "oneclick" secure communication link over a computer network according to the present invention. At step 3401, computer 3301 is connected to server computer 3304 over a non-VPN communication link 3305. Web browser 3306 displays a web page associated with server 3304 in a well-known manner. According to one variation of the invention, the display of computer 3301 contains a hyperlink, or an icon representing a hyperlink, for selecting a virtual private network (VPN) communication link ("go secure" hyperlink) through computer network 3302 between terminal 3301 and server 3304. Preferably, the "go secure" hyperlink is displayed as part of the web page downloaded from server computer 3304, thereby indicating that the entity providing server 3304 also provides VPN capability.

[00259] By displaying the "go secure" hyperlink, a user at computer 3301 is informed that the current communication link between computer 3301 and server computer 3304 is a non-secure, non-VPN communication link. At step 3402, it is determined whether a user of computer 3301 has selected the "go secure" hyperlink. If not, processing resumes using a non-secure (conventional) communication method (not shown). If, at step 3402, it is determined that the user has selected the "go secure" hyperlink, flow continues to step 3403 where an object associated with the hyperlink determines whether a VPN communication software module has already been installed on computer 3301. Alternatively, a user can enter a command into computer 3301 to "go secure."

[00260] If, at step 3403, the object determines that the software module has been installed, flow continues to step 3407. If, at step 3403, the object determines that the software module has not been installed, flow continues to step 3404 where a non-VPN communication link 3307 is launched between computer 3301 and a website 3308 over computer network 3302 in a well- known manner. Website 3308 is accessible by all computer terminals connected to computer network 3302 through a non-VPN communication link. Once connected to website 3308, a software module for establishing a secure communication link over computer network 3302 can be downloaded and installed. Flow continues to step 3405 where, after computer 3301 connects to website 3308, the software module for establishing a communication link is downloaded and installed in a well-known manner on computer terminal 3301 as software

module 3309. At step 3405, a user can optionally select parameters for the software module, such as enabling a secure communication link mode of communication for all communication links over computer network 3302. At step 3406, the communication link between computer 3301 and website 3308 is then terminated in a well-known manner.

[00261] By clicking on the "go secure" hyperlink, a user at computer 3301 has enabled a secure communication mode of communication between computer 3301 and server computer 3304. According to one variation of the invention, the user is not required to do anything more than merely click the "go secure" hyperlink. The user does not need to enter any user identification information, passwords or encryption keys for establishing a secure communication link. All procedures required for establishing a secure communication link between computer 3301 and server computer 3304 are performed transparently to a user at computer 3301.

[00262] At step 3407, a secure VPN communications mode of operation has been enabled and software module 3309 begins to establish a VPN communication link. In one embodiment, software module 3309 automatically replaces the top-level domain name for server 3304 within browser 3406 with a secure top-level domain name for server computer 3304. For example, if the top-level domain name for server 3304 is .com, software module 3309 replaces the .com top- level domain name with a .scom top-level domain name, where the "s" stands for secure. Alternatively, software module 3409 can replace the top-level domain name of server 3304 with any other non-standard top-level domain name.

[00263] Because the secure top-level domain name is a non-standard domain name, a query to a standard domain name service (DNS) will return a message indicating that the universal resource locator (URL) is unknown. According to the invention, software module 3409 contains the URL for querying a secure domain name service (SDNS) for obtaining the URL for a secure top-level domain name. In this regard, software module 3309 accesses a secure portal 3310 that interfaces a secure network 3311 to computer network 3302. Secure network 3311 includes an internal router 3312, a secure domain name service (SDNS) 3313, a VPN gatekeeper 3314 and a secure proxy 3315. The secure network can include other network services, such as e-mail 3316, a plurality of chatrooms (of which only one chatroom 3317 is shown), and a standard

domain name service (STD DNS) 3318. Of course, secure network 3311 can include other resources and services that are not shown in FIG. 33.

When software module 3309 replaces the standard top-level domain name for [00264] server 3304 with the secure top-level domain name, software module 3309 sends a query to SDNS 3313 at step 3408 through secure portal 3310 preferably using an administrative VPN communication link 3319. In this configuration, secure portal 3310 can only be accessed using a VPN communication link. Preferably, such a VPN communication link can be based on a technique of inserting a source and destination IP address pair into each data packet that is selected according to a pseudo-random sequence; an IP address hopping regime that pseudorandomly changes IP addresses in packets transmitted between a client computer and a secure target computer; periodically changing at least one field in a series of data packets according to a known sequence; an Internet Protocol (IP) address in a header of each data packet that is compared to a table of valid IP addresses maintained in a table in the second computer; and/or a comparison of the IP address in the header of each data packet to a moving window of valid IP addresses, and rejecting data packets having IP addresses that do not fall within the moving window. Other types of VPNs can alternatively be used. Secure portal 3310 authenticates the query from software module 3309 based on the particular information hopping technique used for VPN communication link 3319.

[00265] SDNS 3313 contains a cross-reference database of secure domain names and corresponding secure network addresses. That is, for each secure domain name, SDNS 3313 stores a computer network address corresponding to the secure domain name. An entity can register a secure domain name in SDNS 3313 so that a user who desires a secure communication link to the website of the entity can automatically obtain the secure computer network address for the secure website. Moreover, an entity can register several secure domain names, with each respective secure domain name representing a different priority level of access in a hierarchy of access levels to a secure website. For example, a securities trading website can provide users secure access so that a denial of service attack on the website will be ineffectual with respect to users subscribing to the secure website service. Different levels of subscription can be arranged based on, for example, an escalating fee, so that a user can select a desired level of guarantee for

connecting to the secure securities trading website. When a user queries SDNS 3313 for the secure computer network address for the securities trading website, SDNS 3313 determines the particular secure computer network address based on the user's identity and the user's subscription level.

[00266] At step 3409, SDNS 3313 accesses VPN gatekeeper 3314 for establishing a VPN communication link between software module 3309 and secure server 3320. Server 3320 can only be accessed through a VPN communication link. VPN gatekeeper 3314 provisions computer 3301 and secure web server computer 3320, or a secure edge router for server computer 3320, thereby creating the VPN. Secure server computer 3320 can be a separate server computer from server computer 3304, or can be the same server computer having both non-VPN and VPN communication link capability, such as shown by server computer 3322. Returning to FIG. 34, in step 3410, SDNS 3313 returns a secure URL to software module 3309 for the .scom server address for a secure server 3320 corresponding to server 3304.

[00267] Alternatively, SDNS 3313 can be accessed through secure portal 3310 "in the clear", that is, without using an administrative VPN communication link. In this situation, secure portal 3310 preferably authenticates the query using any well-known technique, such as a cryptographic technique, before allowing the query to proceed to SDNS 3319. Because the initial communication link in this situation is not a VPN communication link, the reply to the query can be "in the clear." The querying computer can use the clear reply for establishing a VPN link to the desired domain name. Alternatively, the query to SDNS 3313 can be in the clear, and SDNS 3313 and gatekeeper 3314 can operate to establish a VPN communication link to the querying computer for sending the reply.

[00268] At step 3411, software module 3309 accesses secure server 3320 through VPN communication link 3321 based on the VPN resources allocated by VPN gatekeeper 3314. At step 3412, web browser 3306 displays a secure icon indicating that the current communication link to server 3320 is a secure VPN communication link. Further communication between computers 3301 and 3320 occurs via the VPN, e.g., using a "hopping" regime as discussed above. When VPN link 3321 is terminated at step 3413, flow continues to step 3414 where software module 3309 automatically replaces the secure top-level domain name with the

corresponding non-secure top-level domain name for server 3304. Browser 3306 accesses a standard DNS 3325 for obtaining the non-secure URL for server 3304. Browser 3306 then connects to server 3304 in a well-known manner. At step 3415, browser 3306 displays the "go secure" hyperlink or icon for selecting a VPN communication link between terminal 3301 and server 3304. By again displaying the "go secure" hyperlink, a user is informed that the current communication link is a non-secure, non-VPN communication link.

[00269] When software module 3309 is being installed or when the user is off-line, the user can optionally specify that all communication links established over computer network 3302 are secure communication links. Thus, anytime that a communication link is established, the link is a VPN link. Consequently, software module 3309 transparently accesses SDNS 3313 for obtaining the URL for a selected secure website. In other words, in one embodiment, the user need not "click" on the secure option each time secure communication is to be effected.

[00270] Additionally, a user at computer 3301 can optionally select a secure communication link through proxy computer 3315. Accordingly, computer 3301 can establish a VPN communication link 3323 with secure server computer 3320 through proxy computer 3315. Alternatively, computer 3301 can establish a non-VPN communication link 3324 to a non-secure website, such as non-secure server computer 3304.

[00271] FIG. 35 shows a flow diagram 3500 for registering a secure domain name according to the present invention. At step 3501, a requester accesses website 3308 and logs into a secure domain name registry service that is available through website 3308. At step 3502, the requestor completes an online registration form for registering a secure domain name having a top-level domain name, such as .com, .net, .org, .edu, .mil or .gov. Of course, other secure top-level domain name corresponding to the equivalent secure domain name that is being requested. For example, a requester attempting to register secure domain name "website.scom" must have previously registered the corresponding non-secure domain name "website.com".

[00272] At step 3503, the secure domain name registry service at website 3308 queries a non- secure domain name server database, such as standard DNS 3322, using, for example, a

whois query, for determining ownership information relating to the non-secure domain name corresponding to the requested secure domain name. At step 3504, the secure domain name registry service at website 3308 receives a reply from standard DNS 3322 and at step 3505 determines whether there is conflicting ownership information for the corresponding non-secure domain name. If there is no conflicting ownership information, flow continues to step 3507, otherwise flow continues to step 3506 where the requestor is informed of the conflicting ownership information. Flow returns to step 3502.

[00273] When there is no conflicting ownership information at step 3505, the secure domain name registry service (website 3308) informs the requestor that there is no conflicting ownership information and prompts the requestor to verify the information entered into the online form and select an approved form of payment. After confirmation of the entered information and appropriate payment information, flow continues to step 3508 where the newly registered secure domain name sent to SDNS 3313 over communication link 3326.

[00274] If, at step 3505, the requested secure domain name does not have a corresponding equivalent non-secure domain name, the present invention informs the requestor of the situation and prompts the requestor for acquiring the corresponding equivalent non-secure domain name for an increased fee. By accepting the offer, the present invention automatically registers the corresponding equivalent non-secure domain name with standard DNS 3325 in a well-known manner. Flow then continues to step 3508.

<u>G. Tunneling Secure Address Hopping Protocol Through</u> <u>Existing Protocol Using Web Proxy</u>

[00275] The present invention also provides a technique for implementing the field hopping schemes described above in an application program on the client side of a firewall between two computer networks, and in the network stack on the server side of the firewall. The present invention uses a new secure connectionless protocol that provides good denial of service rejection capabilities by layering the new protocol on top of an existing IP protocol, such as the ICMP, UDP or TCP protocols. Thus, this aspect of the present invention does not require changes in the Internet infrastructure.

[00276] According to the invention, communications are protected by a client-side proxy application program that accepts unencrypted, unprotected communication packets from a local browser application. The client-side proxy application program tunnels the unencrypted, unprotected communication packets through a new protocol, thereby protecting the communications from a denial of service at the server side. Of course, the unencrypted, unprotected communication packets can be encrypted prior to tunneling.

[00277] The client-side proxy application program is not an operating system extension and does not involve any modifications to the operating system network stack and drivers. Consequently, the client is easier to install, remove and support in comparison to a VPN. Moreover, the client- side proxy application can be allowed through a corporate firewall using a much smaller "hole" in the firewall and is less of a security risk in comparison to allowing a protocol layer VPN through a corporate firewall.

[00278] The server-side implementation of the present invention authenticates valid field-hopped packets as valid or invalid very early in the server packet processing, similar to a standard virtual private network, for greatly minimizing the impact of a denial of service attempt in comparison to normal TCP/IP and HTTP communications, thereby protecting the server from invalid communications.

[00279] FIG. 36 shows a system block diagram of a computer network 3600 in which a virtual private connection according to the present invention can be configured to more easily traverse a firewall between two computer networks. FIG. 37 shows a flow diagram 3700 for establishing a virtual private connection that is encapsulated using an existing network protocol.

[00280] In FIG. 36 a local area network (LAN) 3601 is connected to another computer network 3602, such as the Internet, through a firewall arrangement 3603. Firewall arrangement operates in a well-known manner to interface LAN 3601 to computer network 3602 and to protect LAN 3601 from attacks initiated outside of LAN 3601.

[00281] A client computer 3604 is connected to LAN 3601 in a well-known manner. Client computer 3604 includes an operating system 3605 and a web browser 3606. Operating

system 3605 provides kernel mode functions for operating client computer 3604. Browser 3606 is an application program for accessing computer network resources connected to LAN 3601 and computer network 3602 in a well-known manner. According to the present invention, a proxy application 3607 is also stored on client computer 3604 and operates at an application layer in conjunction with browser 3606. Proxy application 3607 operates at the application layer within client computer 3604 and when enabled, modifies unprotected, unencrypted message packets generated by browser 3606 by inserting data into the message packets that are used for forming a virtual private connection between client computer 3604 and a server computer connected to LAN 3601 or computer network 3602. According to the invention, a virtual private network. A virtual private connection can be conveniently authenticated so that, for example, a denial of service attack can be rapidly rejected, thereby providing different levels of service that can be subscribed to by a user.

[00282] Proxy application 3607 is conveniently installed and uninstalled by a user because proxy application 3607 operates at the application layer within client computer 3604. On installation, proxy application 3607 preferably configures browser 3606 to use proxy application for all web communications. That is, the payload portion of all message packets is modified with the data for forming a virtual private connection between client computer 3604 and a server computer. Preferably, the data for forming the virtual private connection contains field-hopping data, such as described above in connection with VPNs. Also, the modified message packets preferably conform to the UDP protocol. Alternatively, the modified message packets can conform to the TCP/IP protocol or the ICMP protocol. Alternatively, proxy application 3606 can be selected and enabled through, for example, an option provided by browser 3606. Additionally, proxy application 3607 can be enabled so that only the payload portion of specially designated message packets is modified with the data for forming a virtual private connection between client connection between client computer 3604 and a designated host computer. Specially designated message packets can be, for example, selected predetermined domain names.

[00283] Referring to FIG. 37, at step 3701, unprotected and unencrypted message packets are generated by browser 3606. At step 3702, proxy application 3607 modifies the

payload portion of all message packets by tunneling the data for forming a virtual private connection between client computer 3604 and a destination server computer into the payload portion. At step, 3703, the modified message packets are sent from client computer 3604 to, for example, website (server computer) 3608 over computer network 3602.

[00284] Website 3608 includes a VPN guard portion 3609, a server proxy portion 3610 and a web server portion 3611. VPN guard portion 3609 is embedded within the kernel layer of the operating system of website 3608 so that large bandwidth attacks on website 3608 are rapidly rejected. When client computer 3604 initiates an authenticated connection to website 3608, VPN guard portion 3609 is keyed with the hopping sequence contained in the message packets from client computer 3604, thereby performing a strong authentication of the client packet streams entering website 3608 at step 3704. VPN guard portion 3609 can be configured for providing different levels of authentication and, hence, quality of service, depending upon a subscribed level of service. That is, VPN guard portion 3609 can be configured to let all message packets through until a denial of service attack is detected, in which case VPN guard portion 3609 would allow only client packet streams conforming to a keyed hopping sequence, such as that of the present invention.

[00285] Server proxy portion 3610 also operates at the kernel layer within website 3608 and catches incoming message packets from client computer 3604 at the VPN level. At step 3705, server proxy portion 3610 authenticates the message packets at the kernel level within host computer 3604 using the destination IP address, UDP ports and discriminator fields. The authenticated message packets are then forwarded to the authenticated message packets to web server portion 3611 as normal TCP web transactions.

[00286] At step 3705, web server portion 3611 responds to message packets received from client computer 3604 in accordance with the particular nature of the message packets by generating reply message packets. For example, when a client computer requests a webpage, web server portion 3611 generates message packets corresponding to the requested webpage. At step 3706, the reply message packets pass through server proxy portion 3610, which inserts data into the payload portion of the message packets that are used for forming the virtual private connection between host computer 3608 and client computer 3604 over computer network 3602.

Preferably, the data for forming the virtual private connection is contains field-hopping data, such as described above in connection with VPNs. Server proxy portion 3610 operates at the kernel layer within host computer 3608 to insert the virtual private connection data into the payload portion of the reply message packets. Preferably, the modified message packets sent by host computer 3608 to client computer 3604 conform to the UDP protocol. Alternatively, the modified message packets can conform to the TCP/IP protocol or the ICMP protocol.

[00287] At step 3707, the modified packets are sent from host computer 3608 over computer network 3602 and pass through firewall 3603. Once through firewall 3603, the modified packets are directed to client computer 3604 over LAN 3601 and are received at step 3708 by proxy application 3607 at the application layer within client computer 3604. Proxy application 3607 operates to rapidly evaluate the modified message packets for determining whether the received packets should be accepted or dropped. If the virtual private connection data, then the received packets are accepted. Otherwise, the received packets are dropped.

[00288] While the present invention has been described in connection with the illustrated embodiments, it will be appreciated and understood that modifications may be made without departing from the true spirit and scope of the invention.

CLAIMS

What is claimed is:

1. A method of transparently creating an encrypted communications channel between a client device and a target device, each device being configured to allow audio video communications between the client device and the target device over the encrypted communications channel once the encrypted communications channel is created, the method comprising:

(1) receiving from the client device a request for a network address associated with the target device;

(2) determining whether the request transmitted in step (1) is requesting access to a device that accepts an encrypted channel connection with the client device; and

(3) in response to determining that the address request in step (2) is requesting access to a device that accepts an encrypted communications channel connection with the client device, providing provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device such that the encrypted communications channel supports secure audio/video communications transmitted between the two devices.

2. The method of claim 1, wherein providing the provisioning information required to initiate the encrypted communications channel is based on a determination that the target device is a device with which an encrypted communications channel can be established when the address request corresponds to a target device identified in an network address lookup.

3. The method of claim 1, wherein the encrypted communications channel is a virtual private network link.

4. The method of claim 1, wherein the address request includes a secure domain name.

5. The method of claim 1, wherein the encrypted communications channel is a broadband connection.

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6. The method of claim 1, wherein the encrypted communications channel is a unmodulated transmission link.

7. The method of claim 1, wherein the encrypted communications channel is a umodulated transmission link.

8. The method of claim 1, wherein the encrypted communications channel supports at least one of the following: FTM, TDM and CDMA.

9. The method of claim 1, wherein the client device is a phone.

10. The method of claim 9, wherein providing the provisioning information required to initiate the encrypted communications channel is based on a determination that the target device is a device with which an encrypted communications channel can be established when the address request corresponds to a target device identified in an network address lookup

11. The method of claim 9, wherein the encrypted communications channel is a virtual private network link.

12. The method of claim 9, wherein the address request includes a secure domain name.

13. The method of claim 9, wherein the encrypted communications channel is a broadband connection.

14. The method of claim 9, wherein the encrypted communications channel is a unmodulated transmission link.

15. The method of claim 9, wherein the encrypted communications channel is a modulated transmission link.

16. The method of claim 9, wherein the encrypted communications channel supports at least one of the following: FTM, TDM and CDMA.

17. The method of claim 9, wherein the target device is a server.

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18. The method of claim 9, wherein the target device is a phone.

19. A system for transparently creating an encrypted communications channel between a client device and a target device, each device being configured to allow audio video communications therebetween over an encrypted communications channel once the encrypted communications channel is created, the system including a server configuration arranged to:

(1) receive from the client device a request for a network address associated with the target device;

(2) determine whether the request transmitted in step (1) is requesting access to a device that accepts an encrypted channel connection with the client device; and

(3) in response to determining that the address request in step (2) is requesting access to a device that accepts an encrypted communications channel connection with the client device, provide provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device such that the encrypted communications channel supports secure audio/video communications transmitted between the two devices.

20. A system according to claim 19, wherein the encrypted communications channel supports a plurality of services comprising a plurality of communication protocols, a plurality of application programs, multiple sessions, or a combination thereof.

ABSTRACT

A method is used to transparently create an encrypted communications channel between a client device and a target device. Each device is configured to allow audio video communications between the client device and the target device over the encrypted communications channel once the encrypted communications channel is created. The method comprises: (1) receiving from the client device a request for a network address associated with the target device; (2) determining whether the request transmitted in step (1) is requesting access to a device that accepts an encrypted channel connection with the client device; and (3) in response to determining that the address request in step (2) is requesting access to a device that accepts an encrypted communications channel connection with the client device, providing provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device such that the encrypted communications channel supports secure audio/video communications transmitted between the two devices.











FIG. 4



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Petitioner Apple Inc. - Exhibit 1002, p. 106





FIG.9








FIG. 12A

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FIG. 12B

Mode Or Embodiment	HARDWARE ADDRESSES	IP ADDRESSES	DISCRIMINATOR FIELD VALUES
1. PROMISCUOUS	SAME FOR ALL NODES OR COMPLETELY RANDOM	CAN BE VARIED IN SYNC	CAN BE VARIED IN SYNC
2. PROMISCUOUS	FIXED FOR EACH VPN	CAN BE VARIED	CAN BE VARIED
Per VPN		In Sync	IN SYNC
3. HARDWARE	CAN BE VARIED	CAN BE VARIED	CAN BE VARIED
Hopping	IN SYNC	IN SYNC	IN SYNC



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FIG. 14











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Petitioner Apple Inc. - Exhibit 1002, p. 122









FIG. 25 (PRIOR ART) .



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Petitioner Apple Inc. - Exhibit 1002, p. 131















· ;*

Electronic Patent Application Fee Transmittal						
Application Number:						
Filing Date:						
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECUDOMAIN NAMES				TIONS USING SECURE	
First Named Inventor/Applicant Name:	Vic	tor LARSON				
Filer:	Tob	oy H. Kusmer./Kimil	a Carraway			
Attorney Docket Number:	077580-0177					
Filed as Large Entity						
Utility under 35 USC 111(a) Filing Fees						
Description		Fee Code	Quantity	Amount	Sub-Total in USD(\$)	
Basic Filing:						
Utility application filing		1011	1	380	380	
Utility Search Fee		1111	1	620	620	
Utility Examination Fee		1311	1	250	250	
Pages:						
Claims:						
Miscellaneous-Filing:						
Petition:						
Patent-Appeals-and-Interference:						

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
	Tot	al in USD) (\$)	1250

Electronic Acl	knowledgement Receipt
EFS ID:	13742625
Application Number:	13615557
International Application Number:	
Confirmation Number:	1089
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES
First Named Inventor/Applicant Name:	Victor LARSON
Customer Number:	23630
Filer:	Toby H. Kusmer./Kimila Carraway
Filer Authorized By:	Toby H. Kusmer.
Attorney Docket Number:	077580-0177
Receipt Date:	13-SEP-2012
Filing Date:	
Time Stamp:	23:27:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes				
·					
Payment Type	Deposit Account				
Payment was successfully received in RAM	\$1250				
DAM confirmation Number	0010				
RAM CONTINUED NUMBER	8918				
Deposit Account	501133				
Authorized User					
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:					
Charge any Additional Factor required under 27 CFD. Costion 1.16 (Netional application films, exactly, and evention factor)					
Charge any Additional Fees required under 37 C.F.K. Section 1.16 (National application filing, search, and examination fees)					
Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)					

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

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Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing	g:							
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)			
1		077580-0177_Continuation_Ap	1703386	ves	143			
		plication.pdf	bd95cc617981435b1b18687ff4fa2ceb0ff2f e59	,				
	Multipart Description/PDF files in .zip description							
	Document Des	scription	Start	End				
	Application Da	ta Sheet	1		5			
	Oath or Declara	Oath or Declaration filed						
	Specificat	ion	12	12 99				
	Claims		100 102					
	Abstrac	t	103	03				
	Drawings-only black and v	white line drawings	104 143					
Warnings:			· · · ·					
Information:								
2	Fee Worksheet (SB06)	fee-info.pdf	33236	no	2			
_			7e406a30389737976bb02fd59c248f8eac08 e954		-			
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		Total Files Size (in bytes)	17.	36622				

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	077580-0177				
		Application Number					
Title of Invention	adile Network Protocol For Secure Communications USING Secure Domain NAMES						
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the							

bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Applicant Information:

Applic	ant 1	I							1		
Applicant Authority Inventor				al Representative under 35 U.S.C. 117				7 OParty of Interest under 35 U.S.C			C. 118
Prefix	x Given Name			Middle Na	Middle Name			Family Name			Suffix
	Victor					LAR	SON				
Resid	ence Informatio	n (Select C) (US Residenc	у	O No	on US Res	sidency O Active US Military Service			
City	Fairfax			State/Province	, \	VA	Countr	try of Residence US			
Citizer	nship under 37 C	FR 1.41(b))	US							
Mailing	g Address of Ap	plicant:									
Addre	ss 1	12026 Lisa	a Marie	e Court							
Addre	ss 2										
City	Fairfax					Stat	e/Provir	ice	VA		
Postal	Code	22033			Со	untriy	US				
Applic	$\frac{1}{2}$			al Representativ	euno	ler 35 I	ISC 11	7		terest under 35 U.S.	C 118
Applic	Given Name			Middle Na	Middle Name			Eamily Name			Suffix
TIENA				Durchare							Junix
Booid		n (Salaat C)no) (SHU			
City				State/Province	y \\\	VA Country of Bosidered US					
			i '		Country of Residence 05						
Citizer	nsnip under 37 C	FR 1.41(D))	05							
Mailing	g Address of Ap	plicant:									
Addres	ss 1	38710 Goo	ose Cre	eek Lane							
Addre	ss 2										
City	Leesburg				State/Provin			ice VA			
Postal	Code	20175			Co	untry	US				
Applicant 3											
Applic	Applicant Authority Inventor Clegal Representative under 35 U.S.C. 117 Party of Interest under 35 U.S.C. 118							C. 118			
Prefix Given Name			Middle Na	Middle Name			Family Name			Suffix	
	Edmund			Colby				MUN	IGER		
Resid	ence Informatio	n (Select C	Dne) (US Residenc	US Residency O Non US Re			sidency O Active US Military Service			
City	Crownsville			State/Province	MD Count			ry of Residence US			
PTO/SB/14 (11-08) Approved for use through 01/31/2014. OMB 0651-0032 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76				Attorney Docket Number			077580-0177							
				Application Number										
Title of	Inve	ention	AGI	LE NETWO	ORK PR	отос	DL FOR S	ECUR	E CON	IMUNICA	ATIONS I	USING SEC	CURE DOMAIN NAM	1ES
Citizen	nship	p under	37 C	FR 1.41(b)	US								
Mailing	g Ad	ldress c	of Ap	plicant:										
Addres	ss 1			1101 Op	αса Сοι	urt								
Addres	ss 2													
City		Crowns	ville						State	e/Provin	ice	MD		
Postal	Coc	le		21032				Cou	ntry	US				
Applic	ant 4	4												
Applic	ant	Authori	ty 🖲	Inventor	OLee	gal Rep	resentativ	e unde	er 35 L	J.S.C. 11 ⁻	7 ()Party of In	terest under 35 U.S	.C. 118
Prefix	Giv	/en Nan	ne			Mi	Middle Name Fa			Family	y Name		Suffix	
	Mic	hael							WILLIAMSON					
Resid	ence	e Inform	natio	n (Select	One)	US Residency O Non US Re			n US Res	sidency O Active US Military Service			;	
City	Soι	uth Riding	g			State/	Province	• V.	A	Countr	try of Residence US			
Citizen	nshir	p under	37 C	FR 1.41(b)	US								
Mailing	g Ad	ldress c	of Ap	plicant:										
Address 1 26203 Ocala Circl				cle										
Address 2														
City South Riding							State	e/Provin	ice	VA				
Postal Code 20152							Cou	ntry	US					
All Inv genera	ento Ited \	ers Must within th	t Be iis for	Listed - m by sele	Addition cting the second seco	onal Ir ne Add	ventor li button.	nform	ation	blocks i	may be		Add	

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).							
An Address is being provided for the correspondence Information of this application.							
Customer Number	23630						
Email Address		Add Email	Remove Email				

Application Information:

Title of the Invention	AGILE NETWORK NAMES	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES					
Attorney Docket Number	077580-0177		Small Entity Status Claimed				
Application Type	Nonprovisional						
Subject Matter	Utility						
Suggested Class (if any)			Sub Class (if any)				
Suggested Technology C	enter (if any)	2453					
Total Number of Drawing	Sheets (if any)	40	Suggested Figure for Publication (if any)				

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Da	ta Sheet 37 CER 1 76	Attorney Docket Number	077580-0177
		Application Number	
Title of Invention	AGILE NETWORK PROTOCO	DL FOR SECURE COMMUNIC	ATIONS USING SECURE DOMAIN NAMES

Publication Information:

Request Early Publication (Fee required at time of Request 37 CFR 1.219)

Request Not to Publish. I hereby request that the attached application not be published under 35 U.S. C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.

Please Select One:	Oustomer Number	O US Patent Practitioner	O Limited Recognition (37 CFR 11.9)
Customer Number	23630		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.

Prior Application	on Status	Pending		Remove			
Application N	umber	Continuity Type		Prior Application Number		r Filing Date (YYYY-MM-DD)	
		Continuation of		13049552		2011-03-16	
Prior Application	on Status	Patented		Remove			
Application Number	Cont	inuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		ent Number	Issue Date (YYYY-MM-DD)
13049552	Continuat	tion of	11840560	2007-08-17	79	21211	2011-04-05
Prior Application	on Status	Patented		Remove			nove
Application Number Con		inuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		ent Number	Issue Date (YYYY-MM-DD)
11840560	Continuat	tion of	10714849	2003-11-18	7418504		2008-08-26
Prior Application	on Status	Abandoned		Remove			nove
Application N	umber	Continuity Type		Prior Application Number Filing Date (YYYY-MM		te (YYYY-MM-DD)	
10714849		Continuation of		09558210 2000-04-26			
Prior Application Status		Patented		Remove		nove	
Application Number Cont		inuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)		ent Number	Issue Date (YYYY-MM-DD)
09558210 Continuat		tion in part of	09504783	2000-02-15	6502135		2002-12-31
Prior Application	on Status	Patented				Rer	nove

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PTO/SB/14 (11-08) Approved for use through 01/31/2014. OMB 0651-0032 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CER 1 76	Attorney Docket Number	077580-0177
Application Data Sheet S7 CFR 1.70	Application Number	

Title of Invention AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES

Application Number Cont		inuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number		Issue Date (YYYY-MM-DD)
09504783	Continuat	tion in part of	09429643	1999-10-29	7010604		2006-03-07
Prior Application	on Status	Expired		Remave			
Application N	lumber	Continuity Type		Prior Application Number		Filing Date (YYYY-MM-DD)	
09429643		non provisional of		60137704		99-06-07	
Prior Application Status		Expired				Rer	nove
Application Number		Continuity Type		Prior Application Number		r Filing Date (YYYY-MM-DD)	
09429643		non provisional of		60106261 1998-10-30			
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.							

Foreign Priority Information:

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

		Re	nove							
Application Number	Country ⁱ	Parent Filing Date (YYYY-MM-DD)	Priority Claimed							
			🔿 Yes 💿 No							
Additional Foreign Priority Add button.	Additional Foreign Priority Data may be generated within this form by selecting the Add button									

Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1

If the Assignee is an Organization check here.									
Organization Name	VIRNETX, INC.	RNETX, INC.							
Mailing Address Information:									
Address 1	P.O. Box 439	P.O. Box 439							
Address 2									
City	Zephyr Cove	Zephyr Cove		NV					
Country US			Postal Code	89448					
Phone Number			Fax Number						
Email Address									
Additional Assignee Data may be generated within this form by selecting the Add button.									

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.

PTO/SB/14 (11-08) Approved for use through 01/31/2014. OMB 0651-0032 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76			Attorney Docket Number 077580-0177		
			Application Number		
Title of Invention		AGILE NETWORK PROTOCO	DL FOR SECURE COMMUNICA	ATIONS USING SECURE D	OMAIN NAMES
Signature /Toby H. Kusmar/				Date (YYYY-MM-DD)	2012-09-13

Signature	/Toby H. Kusmar/		Date (YYYY-MM-DD)	2012-09-13	
First Name	Toby H.	Last Name	Kusmar	Registration Number	26418

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

UNITED STA	ites Patent and Trademar	RK OFFICE UNITED STA' United States Address: COMMIS PO Box I Alexandria www.usyt	TES DEPARTMENT OF COMMERCE Patent and Trademark Office SIONER FOR PATENTS 450 Virginia 22313-1450 Norma 22313-1450
APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/615,557	09/13/2012	Victor Larson	077580-0177
			CONFIRMATION NO. 1089
23630		FORMALI	TIES LETTER
McDermott Will & Emery			
The McDermott Building			
500 North Capitol Street, N	1.W.	~(JC00000056885489*
Washington, DC 20001			

Date Mailed: 10/04/2012

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Filing Date Granted

An application number and filing date have been accorded to this application. The application is informal since it does not comply with the regulations for the reason(s) indicated below. Applicant is given TWO MONTHS from the date of this Notice within which to correct the informalities indicated below. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

The required item(s) identified below must be timely submitted to avoid abandonment:

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
 - The drawings must be reasonably free from erasures and must be free from alterations, overwriting, interlineations, folds, and copy marks. See Figure(s) all.
- A replacement abstract not exceeding 150 words in length and commencing on a separate sheet in compliance with 37 CFR 1.72(b) and 37 CFR 1.121 is required.

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

Replies should be mailed to:

Mail Stop Missing Parts Commissioner for Patents P.O. Box 1450 Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web. <u>https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html</u>

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/ebanaybanay/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

page 2 of 2

	ΡΑΤ	ENT APPLI	Application or Docket Number 13/615,557								
	APP	LICATION A	S FILEI	D - PART I (Col	umn 2)		SMALL	ENTITY	OR	OTHER THAN ORSMALL ENTITY	
	FOR	NUMBE	R FILE		NUMBER EXTRA		RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BAS (37 C	SIC FEE FR 1.16(a), (b), or (c))	N	/A	Ν	J/A		N/A			N/A	380
SEA (37 C	RCH FEE FR 1.16(k), (i), or (m))	N	/A	N	J/A		N/A			N/A	620
EXA (37 C	MINATION FEE FR 1.16(o), (p), or (q))	N	/A	١	J/A		N/A]	N/A	250
TOT (37 C	AL CLAIMS FR 1.16(i))	20	minus	20= *					OR	× 60 =	0.00
INDE (37 C	EPENDENT CLAII FR 1.16(h))	^{MS} 2	minus	3 = *]	× 250 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s)) (37 CFR 1.16(s)) (37 CFR 1.16(s)) (37 CFR 1.16(s)) (37 CFR 1.16(s))			and drawings e e application si all entity) for ea on thereof. See CFR 1.16(s).	xceed 100 ze fee due is ch additional 35 U.S.C.						0.00	
MUL	TIPLE DEPENDE	ENT CLAIM PRE	SENT (3	7 CFR 1.16(j))							0.00
* If t	he difference in co	olumn 1 is less th	an zero,	enter "0" in colur	nn 2.	•	TOTAL		1	TOTAL	1250
	APPLICATION AS AMENDED - PART II OTHER THAN (Column 1) (Column 2) (Column 3) SMALL ENTITY OR SMALL ENTITY								THAN ENTITY		
NT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
ME	Total (37 CFR 1.16(i))	÷	Minus	**	=		X =		OR	x =	
END	Independent (37 CFR 1.16(h))	*	Minus	***	=		x =		OR	x =	
AM	Application Size Fe	ee (37 CFR 1.16(s))			•						
	FIRST PRESENT	TION OF MULTIPL	E DEPEN	DENT GLAIM (37 C	CFR 1.16(j))				OR		
							TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
		(Column 1)		(Column 2)	(Column 3)				-		
NT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
ME	Total (37 CFR 1.16(i))	*	Minus	**	=		X =		OR	x =	
END	Independent (37 CFR 1.16(h))	*	Minus	***	=		x =		OR	x =	
AM	Application Size Fe	ee (37 CFR 1.16(s))			•						
	FIRST PRESENT	TION OF MULTIPL	E DEPEN	DENT CLAIM (37 C	CFR 1.16(j))				OR		
							TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
*	 If the entry in co If the "Highest N If the "Highest Nu The "Highest Num 	lumn 1 is less th lumber Previous umber Previously I ber Previously Paid	an the er ly Paid Fo Paid For" For" (Tota	try in column 2, or" IN THIS SPA IN THIS SPACE is Il or Independent) is	write "0" in col CE is less thar s less than 3, er the highest four	umr n 20 nter nd ir	n 3.), enter "20". "3". the appropriate box	in column 1.	-		

	United State	<u>s Patent</u>	and Tradema	NRK OFFICE UNITED STATES United States Pat Address: COMMISSIC PC. Box 1450 Alexandria, Virgi www.uspto.gov	DEPARTMENT OF CC ent and Trademark C VER FOR PATENTS nia 22313-1450	OMMERCE Office
APPLICATION	FILING or	GRP ART				
NUMBER	371(c) DATE	UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/615,557	09/13/2012	2431	1250	077580-0177	20	2
				CC	ONFIRMATION	NO. 1089
23630				FILING REC	EIPT	
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500 North Can	ital Street NIM	1			000000056885488	
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Washington, D	C 20001					

Date Mailed: 10/04/2012

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections

Inventor(s)

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Applicant(s)

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Assignment For Published Patent Application

VIRNETX, INC., Zephyr Cove, NV

Power of Attorney: The patent practitioners associated with Customer Number 22907

Domestic Priority data as claimed by applicant

This application is a CON of $13/049,552\ 03/16/2011$ which is a CON of $11/840,560\ 08/17/2007\ PAT\ 7921211$ which is a CON of $10/714,849\ 11/18/2003\ PAT\ 7418504$ which is a CON of $09/558,210\ 04/26/2000\ ABN$ which is a CIP of $09/504,783\ 02/15/2000\ PAT\ 6502135$ which is a CIP of $09/429,643\ 10/29/1999\ PAT\ 7010604$ which claims benefit of $60/106,261\ 10/30/1998$ and claims benefit of $60/137,704\ 06/07/1999$

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page 1 of 3

If Required, Foreign Filing License Granted: 10/02/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/615,557**

Projected Publication Date: To Be Determined - pending completion of Corrected Papers

Non-Publication Request: No

Early Publication Request: No Title

AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES

Preliminary Class

713

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Subst. f	for form 14	149/PTO		Complete if Known			
				Application Number	13/615,557		
INFO	RMAT	ION DISCLOSUR	RE	Filing Dates	September 13, 2012		
STA	TEMEN	IT BY APPLICAN	IT	First Named Inventor	Victor Larson		
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				Examinar Nama	2431		
ļ				Examiner Name	Not Yet Assigned		
				Docket Number 7	7580-177 (VRNK-0001CP3CON8)		
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Petitioner Apple Inc. - Exhibit 1002, p. 155

Subst. f	for form 144	9/PTO			Complete if Known
				Application Number	13/615.557
INFO	RMATI	ON DISCLOSU	RE	Filing Dates	September 13, 2012
STAT	LEWEN.	T BY APPLICAN	T	First Named Inventor	Victor Larson
(Use as	s many she	ets as necessary)		Art Unit	2431
				Examiner Name	Z431
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ļ				Docket Number	//580-1// (VRNK-0001CP3CON8)
			U.	S. PATENTS	
EXAMI NER'S INITIA LS	CITE NO.	Patent Number	Publication/Pat ent Date	Name of Patentee or Applic Cited Document	ant of Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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Subst. f	or form 144	19/PTO		Complete if Known				
				Application Number	13/615,557			
INFO	RMATI	ON DISCLOSUR	RE	Filing Dates	September 13, 2012			
STAT	FEMEN	T BY APPLICAN	IT	First Named Inventor	Victor Larson			
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				Examiner Name	Not Vet Assigned			
		<u> </u>		Docket Number	77590 477 (VDNK 0004CD2CON0)			
					(VRNR-0001CP3CON8)			
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EXAMI	CITE	Patent Number	Publication/Pat	Name of Patentee or Applica	nt of Pages, Columns, Lines, Where Relevant			
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Petitioner Apple Inc. - Exhibit 1002, p. 157

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			RE	Filing Dates		September 13, 2012		
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				Examiner Name		Not Yet Assigned		
				Docket Number	77580-177 (VRNK-0001CP3CON8)			
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				Application Number		13/615,557		
INFO	RMA	FION DISCLOSUR	E	Filing Date	September 13, 2012			
STA	ГЕМЕ	NT BY APPLICAN	Т	First Named Inventor		Victor Larson		
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				Applic	ation Number	1	3/615,557				
INFOF	RMAT	ION DISCLOSU	RE	Filing Date First Named Inventor Art Unit		Septe	mber 13, 2	012			
STAT	EMEN	T BY APPLICA	NT			Victor Larson 2431					
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INFORM	ATION D	ISCLOSU	JRE	Filing Date	September 13, 2012		
STATEM	IENT BY A	APPLICA	NT	First Named Inventor	Victor Larson	n	
(Use as man	y sheets as n	ecessary)		Art Unit	2431		
				Examiner Name	Not Vet Assign	ad	
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D313	Appendix E 2011	3: DNS Refe	rences to Defendan	ts' Preliminary Joint Inval	lidity Contentions dated July 1,		
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D316	Exhibit 2, II Claims of th	ETF RFC 20 he '504 Pate	65: Domain Name S nt	System Security Extensio	ns; Published January 1997 vs.		
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STATEMENT BY APPLICANT	First Named Inventor	Victor Larson
(Use as many sheets as necessary)	Art Unit	2431
	Examiner Name	Not Vet Assigned
		//580-1// (VRNK-0001CP3CON8)
D329 Exhibit 15, RFC 2487 vs. Claims of the '13	5 Patent	
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D330 Exhibit 22, IPASS vs. Claims of the 211 Pa		
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D336 Exhibit 24, US 034 VS. Claims of the 135	024") vo. Cloimo of the (2)	11 Detect
D339 Exhibit 26, US Patent No. 6,453,034 (US	034) vs. Claims of the 2	04 Detent
D340 Exhibit 20, 03 Faterit No. 0,453,034 (03	Dotant	
D341 Exhibit 28 US '287 vs. Claims of the '211 P	Patent	
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STATEM	ENT BY APPLICANT	First Named Inventor	Victor Larson
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D377	Exhibit 64, RFC 2401 vs. Claims of the '135	5 Patent	
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			F	Examiner Name	Not Yet Assigne	d
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D508	Exhibit 195	Exhibit 195, Aventail Connect 3.1/2.6 Administrator's Guide vs. Claims of the '135 Patent						
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D510	Exhibit 197, Aventail Connect 3.1/2.6 vs. Claims of the '180 Patent							
D511	D511 Exhibit 198, Aventail Connect 3.1/2.6 vs. Claims of the '759 Patent							
D512	Exhibit 199, BinGO! User's User's Guide/Extended Features Reference vs. Claims of the '151 Patent							
D513	Exhibit 200 Patent	, BinGO! Us	er's User's Guide/E>	ktended Features Refere	nce vs. Claims of the '135			
D514	Exhibit 201	, BinGO! vs.	Claims of the '180 F	Patent				
D515	Exhibit 202	, BinGO! vs.	Claims of the '759 F	Patent				

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INFORM.	ATION D	ISCLOSU	IRE	Filing Date	September 13, 2	012	
STATEMENT BY APPLICANT				First Named Inventor	Victor Larson)	
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				Examiner Name	Not Yet Assign	ed	
	<u></u>	ľ	[Docket Number	77580-177 (VRNK-0001)	CP3CON8)	
D510	Euclidit 00) December	l d Eanna Tachaired E				
0516	Patent	3, Broadband	a Forum Technical F	(eport TR-025 (Issue 1.0	1/5.0) vs. Claims of the '135		
D517	Exhibit 204	4, Domain N	ame System (DNS)	Security vs. Claims of the	e '211 Patent		
D518	Exhibit 20	5, Domain N	ame System (DNS)	Security vs. Claims of the	e '504 Patent		
D519	Exhibit 200	6, RFC 2230	, Key Exchange Del	egation Record for the D	NS vs. Claims of the '211 Patent		
D520	Exhibit 20	7, RFC 2230	, Key Exchange Del	egation Record for the D	NS vs. Claims of the '504 Patent	-	
D521	Exhibit 208 '211 Pater	8, RFC 2538 nt	, Storing Certificates	in the Domain Name Sy	ystem (DNS) vs. Claims of the		
D522	Exhibit 209 '504 Pater	9, RFC 2538 nt	, Storing Certificates	in the Domain Name Sy	ystem (DNS) vs. Claims of the		
D523	Exhibit 210 vs. Claims	0, IETF RFC of the '504 f	2065: Domain Nam Patent	e System Security Exten	isions; Published January 1997		
D524	Exhibit 21 ² vs. Claims	1, IETF RFC of the '211 F	2065: Domain Name Patent	e System Security Exten	isions; Published January 1997		
D525	Exhibit 212 L2TP" vs. (2, RFC 2486 Claims of the	, RFC 2661, RFC 24 e '135 Patent	01, and Internet-Draft, "	Secure Remote Access with		
D526	Exhibit 213 6,496,867	3, U.S. Pater vs. Claims o	nt No. 7,100,195 in C f the '135 Patent	combination with RFC 24	401 and U.S. Patent No.		
D527	Exhibit 214 6,496,867	4, U.S. Pater vs. Claims of	it No. 7,100,195 in C f the '151 Patent	combination with RFC 24	101 and U.S. Patent No.		
D528	Exhibit 215	5, U.S. Pater	it No. 6,643,701 vs.	Claims of the '135 Paten	t		
D529	Exhibit 216	Exhibit 216, U.S. Patent No. 6,643,701 vs. Claims of the '151 Patent					
D530	Exhibit 217	7, U.S. Pater	it No. 6,496,867 in C	ombination with RFC 24	01 vs. Claims of the '151 Patent		
D531	Exhibit 218	3, U.S. Pater	it No. 6,496,867 in C	ombination with RFC 24	01 vs. Claims of the '135 Patent		
D532	Exhibit 219), U.S. Pater	t No. 6,496,867 vs. (Claims of the '211 Paten	t		
D533	Exhibit 220), U.S. Paten	t No. 6,496,867 vs. (Claims of the '504 Paten	t		
D534	Exhibit 221 L2TP" vs. (l, RFC 2486, Claims of the	RFC 2661, RFC 24 '151 Patent	01, and Internet-Draft, "S	Secure Remote Access with		
D535	Exhibit 222	2, U.S. Paten	t No. 6,557,037 vs. (Claims of the '211 Paten	t		
D536	Exhibit 223	3, U.S. Paten	t No. 6,557,037 vs. (Claims of the '504 Paten	t		
D537	Exhibit 224	, RFC 2230,	Key Exchange Dele	egation Record for the DI	NS vs. Claims of the '135 Patent		
D538	Exhibit 225	5, RFC 2230,	Key Exchange Dele	egation Record for the DI	NS vs. Claims of the '151 Patent		
D539	Exhibit Cis	co-1, Cisco's	Prior Art Systems v	s. Claims of the '135 Pat	tent		
D540	Exhibit Cis	co-2, Cisco's	Prior Art Systems v	s. Claims of the '151 Pai	tent		
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D543	Exhibit Cise	co-5, Cisco's	Prior Art Systems v	s. Claims of the '504 Pat	tent		
D544	Exhibit Cise	co-6, Cisco's	Prior Art Systems v	s. Claims of the '759 Pat	tent		
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D546	Exhibit A:	Copy of U.S.	Patent No. 6,502,13	35			
D547	Exhibit A:	Copy of U.S.	Patent No. 7,490,15	51			
D548	Exhibit B: (Patent No.	Certificate of . 6,502,135)	Service to Request	For Inter Partes Reexan	nination Under 35 U.S.C. § 311		
D549	Exhibit B: (Patent No.	Exhibit B: Certificate of Service to Request For Inter Partes Reexamination Under 35 U.S.C. § 311 (Patent No. 7,490,151)					
D550	Exhibit B-1	File History	of U.S. Patent 6,50	2,135			
D551	Exhibit B-2: Reexamination Record No. 95/001,269						
D552	Exhibit C1:	Claim Char	t – Aventail Connect	v3.1 (Patent No. 6,502,	135)		
D553	Exhibit C2:	Claim Char	t Aventail Connect V	3.01 (Patent No. 6,502,1	135)		
D554	Exhibit C-1	: Copy of U.	S. Patent No. 7,010,	604			
D555	Exhibit C2:	xhibit C2: Claim Chart Aventail Autosocks (Patent No. 7,490,151)					

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STATEN	IENT BY APPLICANT	First Named Inventor	Victor Larson					
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D556	Exhibit C1: Claim Chart Aventail Connect	v3.01 (Patent No. 7,490,	151)					
D557	Exhibit C-2: Provisional Application 60/106	0,261						
D556	Exhibit C3: Claim Chart Aventali AutoSOC	KS (Patent No. 6,502,13	5)					
D559	Exhibit C3: Claim Chart BinGO (Patent No	7,490,151)						
D561	Exhibit C4: Claim Chart, Wang (Patent No	6 502 125)						
D562	Exhibit C4: Claim Chart Beser (Patent No	7 490 151)						
D563	Exhibit C5: Claim Chart Beser (Patent No.	6 502 135)						
D564	Exhibit C5: Claim Chart Wang (Patent No	7 490 151)						
D565	Exhibit C6: Claim Chart BinGO (Patent No	2, 6, 502, 135		· · · · · · · · · · · · · · · · · · ·				
D566	Exhibit D: Memorandum Opinion in Vimet	K v. Microsoft.						
D567	Exhibit D-1: Takahiro Kiuchi and Shigekoto Closed HPPT-Based Network on the Intern	o Kaihara, "C-HTTP – Th et." Published in the Pro	e Development of a Secure, ceedings of SNDSS 1996					
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D577	Exhibit D-9: Copy of U.S. Pat. No. 7,764,231							
D578	Exhibit E-1: Claim Charts Applying Kiuchi and Other References to Claims of the '135 Patent.							
D579	Exhibit E1: Declaration of Chris Hopen (Pa	Exhibit E1: Declaration of Chris Hopen (Patent No. 6,502,135)						
D580	Exhibit E1: Declaration of Chris Hopen (Patent No. 7,490,151)							
D581	Exhibit E-2: Claim Charts Applying Wesinger and Other References to Claims of the '135 Patent.							
D582	Exhibit E2: Declaration of Michael Fratto (F	Patent No. 6,502,135)						
D583	Exhibit E2: Declaration of Michael Fratto (Patent No. 7,490,151)							
D584	Exhibit E-3: Claim Charts Applying Solana and Other References to Claims of the '135 Patent.							
D585	Exhibit E3: Declaration of James Chester (Patent No. 6,502,135)							
D586	Exhibit E.3: Declaration of James Chester (Patent No. 7,490,151)							
	Exhibit 21: Aventail Connect Administrator's Guide v2 1/v2 6 DD 1 20 (1006 1000)							
D500	Exhibit X10: Conv of LLS Patent No. 4.885.778							
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D390	Exhibit X2: Aventail Connect Administrator	,357						
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D593	Exhibit X4: Reed et al. "Proxies for Anonyr	nous Routine " 12th Ann	wary Computer Security					
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STATEMENT BY APPLICANT				First Named Inventor	Victor Larso	n		
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				Examiner Name	Not Yet Assign	ned.		
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D594	Exhibit X5	Wang The	Broadband Forum	L Technical Penert "TP 0	25 Core Notwork Architecture			
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D596	Exhibit X7 Reference	BinGO! Us	er's Guide Incorpora	ating by Reference BinG	O! Extended Feature			
D597	Exhibit X7 Request fo	Kent et al., or Comments	"Security Architectu (RFC) 2401, pp 1-7	ire for the Internet Protoc 70 (1998).	col, " Network Working Group			
D598	Exhibit X8	Copy of U.	S. Patent No. 6,182	,141		-		
D599	Exhibit X9	BinGO! Us	er's Guide v1.6 (199	99).				
D600	Exhibit Y1:	Aventail Ex	dranet Server 3.0 Ad	dministrator's Guide.				
D601	Exhibit Y10 Accessbile	0: Hanks, S. at http://ww	, et al., RFC1701, "(w.ietf.org/rfc/rfc1701	Generic Routing Encapsi Ltxt.	ulation (GRE)," 1994, Is			
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D615	Exhibit Y4: No. 1 (June	Exhibit Y4: Ferguson, P. and Huston, G., "What Is a VPN", The Internet Protocol Journal, Vol 1., No. 1 (June 1998 ("Ferguson").						
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D622	Form PTO/S New Questi	SB/42, Listin on of Patent	g Each Patent and F ability (Patent No. 6	Printed Publication Relied ,502,135)	d Upon to Provide a Substantial			
D623	Form PTO/S New Questi	SB/42, Listin on of Patent	g Each Patent and F ability (Patent No. 7	Printed Publication Relied ,490,151)	d Upon to Provide a Substantial			
D624	Request for	Inter Partes	Reexamination (Pa	tent No. 6,502,135)				
D625	Request for Inter Partes Reexamination Transmittal Form (PTO/SB/58) (Patent No. 6,502,135)							

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D626	Request for	or Inter Parte	s Reexamination Tr	ansmittal Form (PTO/SB	/58) (Patent No. 7,490,151)			
D627	Request for	Request for Inter Partes Reexamination Under 35 U.S.C. § 311 (Patent No. 6,502,135)						
D628	Request for	or Inter Parte	s Reexamination U	nder 35 U.S.C. § 311 (Pa	itent No. 7,490,151)			
D629	Transmitta	al Letter (Pate	ent No. 6,502,135)					
D630	Transmitta	Transmittal Letter (Patent No. 7,490,151)						
D631	Joint Clain	n Constructio	n and Prehearing S	Statement				
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D634	Exhibit C;	VirnetX's Pro	posed Construction	n of Claim Terms and Su	pporting Evidence			
D635	Exhibit D;	Defendants'	Intrinsic and Extrins	sic Support; P.R. 4-3 Join	t Claim Construction and			
	Prehearing	g Statement						
D636	U.S. Pater	nt 6,839,759	·····					
D637	Exhibit B-4 Summary	i; VirnetX, In Judgment of	c. v. Microsoft Corp. Invalidity of U.S. Pa	., Case No. 6:07-cv-80, N atent No. 6,839,759 (E.D	ficrosoft's Motion for Partial . Tex. Dec. 18, 2009)			
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D646	Exhibit E-1; Claim Charts Applying Kiuchi as a Primary Reference to the '759 Patent.							
D647	Exhibit E-2; Claim Charts Applying Kent as a Primary Reference to the '759 Patent							
D648	Exhibit E-3	; Claim Char	ts Applying Aziz as	a Primary Reference to t	he '759 Patent			
D649	Exhibit E-4; Claim Charts Applying Kent in view of Caronni as a Primary Combination of References to the '759 Patent							
D650	Exhibit D-5; Edwards et al., "High Security Web Servers and Gateways," Computer Networks and ISDN System 29, pages 927-938 (Sept. 1997)							
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D652	Exhibit E-3; Claim Charts Applying Blum to Claims of the '151 Patent							
D653	Exhibit B-1, File History of U.S. Patent 7,490,151							
D654	Exhibit E-1, Claim Charts Applying Kiuchi, and Kiuchi and Martin to Claims of the '151 Patent							
D655	Exhibit E-2	, Claim Char	ts Applying Wesing	er, and Wesinger and Ma	Intin to Claims of the '151 Patent			
D656	Exhibit E-4 the '151 Pa	Exhibit E-4, Claim Charts Applying Aziz and Edwards, and Aziz, Edwards, and Martin to Claims of the 151 Patent						
D657	Exhibit E-6 Claims of th	, Claim Char ne '151 Patei	s Applying Wesinge	er and Edwards, and We	singer, Edwards, and Martin to			
D658	VirnetX Inc	., V. Mitel Ne	tworks Corp.; Defer	ndants' Joint Invalidity Co	ontentions			
D659	Exhibit 37,	RFC 2661 vs	. Claims of the '135	Patent				
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STATEM	ENT BY APPLICANT	First Named Inventor	Victor Larson					
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D660	Exhibit 38, RFC 2661 vs. Claims of the '2'	11 Patent						
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D665	Exhibit 43, SFS-HTTP vs. Claims of the '1	135 Patent						
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D683	Exhibit 64, RFC 2401 vs. Claims of the '13	35 Patent						
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D686	Exhibit 67, US '072 vs. Claims of the '135	Patent						
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D689	Exhibit 70 Understanding IPSec vs. Claims	s of the '135 Patent						
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D692	Exhibit 73, US '820 vs. Claims of the '135	Patent						
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D695	Exhibit 76, US '019 vs. Claims of the '211 I	Patent						
D696	Exhibit 77, US '019 vs. Claims of the '504 I	Patent						
D697	Exhibit 78, US '049 vs. Claims of the '135 I	Patent						
D698	Exhibit 79, US '049 vs. Claims of the '211 I	Patent						
D699	Exhibit 80, US '049 vs. Claims of the '504 F	Patent						
D700	Exhibit 81, US '748 vs. Claims of the '135 F	Exhibit 81, US '748 vs. Claims of the '135 Patent						
D701	Exhibit 82, US '261 vs. Claims of the '135 F	Patent						
D702	Exhibit 83, US '261 vs. Claims of the '211 F	Exhibit 83, US '261 vs. Claims of the '211 Patent						
D703	Exhibit 84, US '261 vs. Claims of the '504 F	Patent						
D704	Exhibit 85, US '900 vs. Claims of the '135 F	Patent						
D705	Exhibit 86, US '900 vs. Claims of the '211 F	Patent						
D706	Exhibit 87, US '900 vs. Claims of the '504 F	Patent						
D707	Exhibit 88, US '671 vs. Claims of the '135 F	Patent						

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D70	08 Exhibit 8	9, US '671 vs	. Claims of the '211 F	Patent				
D70	09 Exhibit 9	0, US '671 vs	. Claims of the '504 F	Patent				
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D75	5 Exhibit 2	0, BinGO! U	ser's Guide/Extende	d Features Reference vs.	Claims of the '135 Patent			

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INFORMATION DISCLOSURE			IRE	Filing Date	September 13, 2	012		
STATEMENT BY APPLICANT			NT	First Named Inventor	Victor Larson	· ·		
(Use as many	r sheets as ne	ecessary)		Art Init	2421			
				Art Onit		4		
				Examiner Name	Not yet Assigned	ea		
			77580-177 (VRNK-00010	CP3CON8)				
D756	Exhibit 203 Patent	3, Broadband	d Forum Technical F	Report TR-025 (Issue 1.0	/5.0) vs. Claims of the '135			
D757	Exhibit 206	Exhibit 206, RFC 2230, Key Exchange Delegation Record for the DNS vs. Claims of the '211 Patent						
D758	Exhibit 207	7, RFC 2230	, Key Exchange Del	egation Record for the D	NS vs. Claims of the '504 Patent			
D759	Exhibit 208 '211 Paten	3, RFC 2538 t	, Storing Certificates	in the Domain Name Sy	vstem (DNS) vs. Claims of the			
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D761	Exhibit 212 L2TP' vs. C	2, RFC 2486 Claims of the	, RFC 2661, RFC 24 135 Patent	401 and Internet-Draft, "S	Secure Remote Access with			
D762	Exhibit 218	3, U.S. Pater	nt No. 6,496,867 in c	ombination with RFC 24	01' vs. Claims of the '135 Patent			
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D768	Exhibit 228	s, U.S. 588 v	s. Claims of the '211	Patent (Final)				
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D772	Exhibit XX,	Microsoft V	PN vs. Claims of the	: '504 Patent				
D773	Exhibit Cise	co-1, Cisco's	s Prior Art System vs	. Claims of the '135 Pate	ent			
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D781	Exhibit 235	, Microsoft \	PN vs. Claims of the	e '504 Patent				
D782	Exhibit 1, IB Claims of th	ETF RFC 20 he '211 Pate	65: Domain Name S int	System Security Extension	ns; published January 1997 vs.			
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STATEM	ENT BY APPLICANT	First Named Inventor	Victor Larson				
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		Examiner Name	Not Yet Assign	ed			
		Docket Number	77580-177 (VRNK-00010				
		Docket Humber					
D799	Exhibit 18, RFC 2595 vs. Claims of the '13	5 Patent					
D800	Exhibit 21, iPass vs. Claims of the 135 Pat	hibit 21, iPass vs. Claims of the 135 Patent					
D801	Exhibit 22, iPass vs. Claims of the 211 Pat	hibit 22, iPass vs. Claims of the '211 Patent					
D802	Exhibit 23, IPass Vs. Claims of the 504 Pat						
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D804	Exhibit 25, U.S. Patent No. 6,453,034 (034	Patent) vs. Claims of the	he 211 Patent				
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D807	Exhibit 20, U.S. Patent No. 6,223,287 (28)	7 Patent) vs. Claims of t	he 211 Patent				
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D809	Exhibit 36, RFC 1928 vs. Claims of the '50						
D810	Exhibit 106, Gauglet System and Gauglet E	Peterences vs. Claims of	the '135 Patent				
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D820	Exhibit 162, Wesinger vs. Claims of the '13	5 Patent					
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D824	Exhibit 191, Aventail Connect 3.01/2.51 ("A	ventail Connect") vs. Cla	aims of the 135 Patent				
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D826	Exhibit 204, Domain Name System (DNS) \$	Security vs. Claims of the	e '211 Patent				
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D828	Exhibit 210, Lendenmann vs. Claims of the	'211 Patent					
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D830	Exhibit 213, U.S. Patent No. 7,100,195 in c 6,496,867 vs. Claims of the '135 Patent	ombination with RFC 24	01 and U.S. Patent No.				
D831	Exhibit 215, Aziz vs. Claims of the '135 Pate	ent		ļ			
D832	Cisco '180, Efiling Acknowledgment						
D833	Exhibit A, U.S. Patent 7,188,180						
D834	Exhibit B1, File History of U.S. Patent 7,188	3,180					
D835 D836	Exhibit B2, File History of U.S. Patent Appli Exhibit B3, File History of Reexamination C	cation No. 09/588,209 ontrol No. 95/001,270, R	Reexamination of U.S. 7,188,180				
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D837	Exhibit D1, "Lendenmann": Rolf Lendenman International Technical Support Organizatio	n, Understanding OSF D in (Oct. 1995).	ULE 1.1 For AIX and OS/2, IBM				
D838	Exhibit D5, "Schneier": Bruce Schneier, App	blied Cryptography (1996					
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STATEM	ENT BY	APPLICA	NT	First Named Inventor	Victor Larson			
(Use as many	/ sheets as n	ecessary)		Art Unit	2431	-		
				Examiner Name	Not Yet Assign	ed		
			[Docket Number	77580-177 (VRNK-0001)	CP3CON8)		
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D841	Exhibit D8 (1993)	Exhibit D8, "Rosenberry"; Ward Rosenberry, David Kenney, and Gerry Fisher, Understanding DCE (1993)						
D842	Exhibit D9, Masys; Daniel R. Masys & Dixie B. Baker, "Protecting Clinical Data on Web Client Computers: The PCASSO Approach," Proceedings of the AMIA '98 Annual Symposium, Orlando, Florida (Nov. 7-11, 1998)							
D843	Exhibit E1	, Claim Char	ts Applying Lendenn	nann as a Primary Refer	ence to the '180 Patent.			
D844	Exhibit E2	, Claim Char	ts Applying Kiuchi a	s a Primary Reference to	the '180 Patent			
D845	Exhibit E3	, Claim Char	ts Applying Solana a	as a Primary Reference t	o the '180 Patent			
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D848	Modified P	TO Form 14	49	/ ',				
D849	Request fo	or Inter Parte	s Reexamination Tra	ansmittal Form No. 7,188	3,180			
D850	Exhibit A;	U.S. Patent	7,921,211 with Term	inal Disclaimer				
D851	Exhibit B, ((Patent No	Certificate of . 7,921,211)	Service to Request	For Inter Partes Reexan	nination Under 35 U.S.C. § 311			
D852	Exhibit C1 920, Reed	, Claim Char and Beser	t – USP 7,921,211 F	Relative to Solana, Alone	and in Conjunction with RFC			
D853	Exhibit C2, conjunctior	Exhibit C2, Claim Chart – USP 7,921,211 Relative to Solana in view of RFC 2504 and Further in conjunction with RFC 920, Reed, and Beser						
D854	Exhibit C3, 920, Reed	, Claim Char , and Beser)	t – USP 7,921,211 F	Relative to Provino, Alone	e and in Conjunction with RFC			
D855	Exhibit C4, Conjunctio	, Claim Char n with RFC 9	t – USP 7,921,211 F 920, Reed and Bese	Relative to Provino in view r	w of RFC 2230 and Further in			
D856	Exhibit C5, Conjunctio	, Claim Char n with RFC 9	t – USP 7,921,211 R 920, Reed and Bese	Relative to Provino in view r	w of RFC 2504 and in Further			
D857	Exhibit C6, 920, RFC 2	, Claim Char 2401, and Re	t – USP 7,921,211 R eed	Relative to Beser, Alone a	and in Conjunction with RFC			
D858	Exhibit C7, RFC 920, F	, Claim Char RFC 2401, F	t – USP 7,921,211 R leed, and Beser	Relative to RFC 2230, Ald	one and in Conjunction with			
D859	Exhibit C8, RFC 920, F	, Claim Char RFC 2401, F	t – USP 7,921,211 R leed, Beser, and RF	elative to RFC 2538, Ald C 2065	one and in Conjunction with			
D860	Exhibit D1, Cisco Syste America ar	Asserted Cl ems, Inc., Ap nd Aastra US	aim and Infringemer ople Inc., Aastra Tec SA, Inc., Civ. Act 6:20	nt Contentions by Plaintif hnologies Ltd, NEC Con 010cv00417 (E.D. Tex)	f VirnetX, Inc. in <i>VirnetX, Inc. v.</i> poration, NEC Corporation of			
D861	Exhibit D2, based on 7	Asserted Cl ,921,211 Pa	aims and Infringeme tent	ent Contentions by Plaint	iff VirnetX, Inc. against Apple			
D862	Exhibit X1, Domains"	Solana, E. e	et al. "Flexible Interne	et Secure Transactions E	Based on Collaborative			
D863	Exhibit X2,	U.S. Patent	6,557,037					
D864	Exhibit X4, (November	Exhibit X4, Atkinson, R., IETF RFC 2230, "Key Exchange Delegation Record for the DNS" (November 1997)						
D865	Exhibit X6, 1998) Is Ac	Kent, et al., ccessible at:	IETF RFC 2401, "Se http://www.ietf.org/rf	ecurity Architecture for th	e Internet Protocol" (November			
D866	Exhibit X7, (January 19	Eastlake, D 997) Is Acce	et al., IETF RFC 20 ssible at: http://www	65, "Domain Name Syst .ietf.org/rfc/rfc2065.txt	em Security Extensions"			
D867	Exhibit X9, Accessible	Guttman, E. At: http://ww	et al., IETF RFC 25 w.ietf.org/rfc/rfc2504	04, "Users' Security Har 4.txt	dbook" (February 1999) Is			
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STATEM	ENT BY APPLICANT	First Named Inventor	Victor Larson					
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		Examiner Name	Not Yet Assigne	d				
		Docket Number	77580-177 (VRNK-0001C	P3CON8)				
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	Accessible At: http://www.ietf.org/rfc/rfc182	5.txt						
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D871	Exhibit A, U.S. Patent 7,418,504							
D872	Exhibit B, Certificate of Service to Request (Patent No. 7,418,504)	For Inter Partes Reexam	nination Under 35 U.S.C. § 311					
D873	Exhibit C1, Claim Chart – USP 7,418,504 F 920, Reed, and Beser	Relative to Solana, Alone	and in Conjunction with RFC					
D874	Exhibit C2, Claim Chart – USP 7,418,504 F Conjunction with RFC 920, Reed, and Bese	Relative to Solana in view er	of RFC 2504 and Further in					
D875	Exhibit C3, Claim Chart – USP 7,418,504 F 920, Reed, and Beser	Relative to Provino, Alone	e and in Conjunction with RFC					
D876	Exhibit C4, Claim Chart – USP 7,418,504 R Conjunction with RFC 920, Reed and Bese	Relative to Provino in View	w of RFC 2230 and Further in					
D877	Exhibit C5, Claim Chart – USP 7,418,504 R Conjunction with RFC 920, Reed, and Bese	Relative to Provino in Viev er	w of RFC 2504 and in Further					
D878	Exhibit C6, Claim Chart – USP 7,418,504 F 920, RFC 2401, and Reed	Relative to Beser, Alone a	and in Conjunction with RFC					
D879	Exhibit C7, Claim Chart – USP 7,418,504 R RFC 920, RFC 2401, Reed, and Beser	Relative to RFC 2230, Alc	one and in Conjunction with					
D880	Exhibit C8, Claim Chart – USP 7,418,504 R RFC 920, RFC 2401, Reed, Beser, and RF	Relative to RFC 2538, Alc C 2065	one and in Conjunction with					
D881	Exhibit D1, Asserted Claims and Infringeme Cisco Systems, Inc., Applce, Inc, Aastra Te America and Aastra USA, Inc., Civ. Act. 6:2	ent Contentions by Plaint echnologies Ltd., NEC Co 2010cv00417 (E.D. Tex)	iff VirnetX Inc. in VimetX, Inc. v. orporation, NEC Corporation of					
D882	Exhibit D2, Asserted Claims and Infringeme Inc. Based on the 7,418,504	ent Contentions by Plaint	iff VirnetX Inc. against Apple					
D883	Exhibit X5, Eastlake, D., et al., IETF RFC 2 (DNS)" (March 1999)	538, "Storing Certificates	in the Domain Name System					
D884	Exhibit X6, Kent, S. IETF RFC 2401, "Secul (November1998) http://www.ietf.org/rfc/rfc2	rity Architecture for the Ir 401.txt	nternet Protocol,					
D885	Exhibit X8, Postel, J. et al., IETF RFC 920, http://www.ietf.org/rfc/rfc920.txt	"Domain Requirements"	(October 1984) Is Accessible at	· · · · · · · · · · · · · · · · · · ·				
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D887	Request for Inter Partes Reexamination Tra	ansmittal form						
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D890	Exhibit D-7, "Thomas": Brian Thomas, "Rec Dec. 1997)	ipe for E-Commerce, IEE	E Internet Computing, (Nov					
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D892	Exhibit C1, Claim Chart – USP 7,921,211 R 920, Reed and Beser (Came from Inval. Cis	elative to Solana, Alone sco dtd 11/18/11)	and in Conjunction with RFC					
D893	Exhibit C2, Claim Chart – USP 7,921,211 R Conjunction with RFC 920, Reed, and Bese	elative to Solana in View er	of RFC 2504 and Further in					
D894	Exhibit C3, Claim Chart – USP 7,921,211 R 920, Reed, and Beser	elative to Provino, Alone	and in Conjunction with RFC					
D895	Exhibit C4, Claim Chart – USP 7,921,211 R Conjunction with RFC 920, Reed and Beser	elative to Províno in Viev	v of RFC 2230 and Further in					
D896	Exhibit C5, Claim Chart – USP 7,921,211 R Conjunction with RFC 920, Reed and Beser	elative to Provino in Viev	v of RFC 2504 and in Further					

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INFORM	ATION DI	SCLOSU	IRE	Filing Date	September 13, 2012			
STATEM				First Named Inventor	Victor Larso	n		
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Examiner Name				2431				
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D897	Exhibit C6, 920, RFC 2	Claim Char 2401, and R	t – USP 7,921,211 F eed	Relative to Beser, Alone a	and in Conjunction with RFC			
D898	Exhibit C7, RFC 920,	hibit C7, Claim Chart – USP 7,921,211 Relative to RFC 2230, Alone and in Conjunction with C 920, Reed, and Beser						
D899	Exhibit C8, RFC 920, F	xhibit C8, Claim Chart – USP 7,921,211 Relative to RFC 2538, Alone and in Conjunction with FC 920, RFC 2401, Reed, Beser, and RFC 2065						
D900	211 Reque	st for Inter F	artes Reexaminatio	n				
D901	Exhibit C1, 920, Reed	Claim Char and Beser	t – USP 7,418,504 F	Relative to Solana, Alone	and in Conjunction with RFC			
D902	Exhibit C2, Conjunctio	Claim Char n with RFC !	t – USP 7,418,504 F 920, Reed, and Bes	Relative to Solana in Viev er	v of RFC 2504 and Further in			
D903	Exhibit C3, 920, Reed,	Claim Char and Beser	t – USP 7,418,504 F	Relative to Províno, Alone	e and in Conjunction with RFC			
D904	Exhibit C5, Conjunctior	Claim Char n with RFC 9	t – USP 7,418,504 F 920, Reed and Bese	Relative to Provino in Vie er	w of RFC 2504 and in Further			
D905	Exhibit C6, and Reed	USP 7,418,	504 Relative to Bes	er, Alone and in Conjunc	tion with RFC 920, RFC 2401,			
D906	Exhibit C7, RFC 920, F	Claim Char RFC 2401, F	t – USP 7,418,504 F Reed, and Beser	Relative to RFC 2230, Ald	one and in Conjunction with			
D907	Exhibit C8, RFC 920, F	Claim Char RFC 2401, F	t – USP 7,418,504 F Reed, Beser, and RF	Relative to RFC 2538, Ald C 2065	one and in Conjunction with			
D908	504 Reque	st for Inter F	artes Reexaminatio	n				
D909	Defendants	s' Suppleme	ntal Joint Invalidity (Contentions				
D910	Exhibit 226	, Securing V	Veb Access with DC	E vs. Claims of the '135	Patent			
D911	Exhibit 227	, Securing V	Veb Access with DC	E vs. Claims of the '151	Patent			
D912	Exhibit 228	, Understan	ding OSF DCE 1.1 f	or AIX and OS/2 vs. Cla	ims of the '135 Patent			
D913	Exhibit 229	, Understan	ding OSF DCE 1.1 f	or AIX and OS/2 vs. Cla	ims of the '151 Patent			
D914	Exhibit 230	, Understan	ding OSF DCE 1.1 f	or AIX and OS/2 vs. Cla	ims of the '180 Patent			
D915	Exhibit 231	, Understan	ding OSF DCE 1.1 f	or AIX and OS/2 vs. Clai	ims of the '211 Patent			
D916	Exhibit 232	, Understan	ding OSF DCE 1.1 f	or AIX and OS/2 vs. Clai	ims of the '504 Patent	-		
D917	Exhibit 233	, Understand	ding OSF DCE 1.1 f	or AIX and OS/2 vs. Clai	ims of the '759 Patent			
D918	Exhibit 234	, U.S. '648 v	s. Claims of the '13	5 Patent				
D919	Exhibit 235	, U.S. '648 v	s. Claims of the '21'	1 Patent				
D920	Exhibit 236	, U.S. '648 v	vs. Claims of the '50	4 Patent				
D921	Exhibit 237	, U.S. '648 v	s. Claims of the '13	5 Patent				
D922	Exhibit 238	, Gauntlet S	ystem vs. Claims o	f the '211 Patent				
D923	Exhibit 239	Gauntlet S	vstem vs. Claims o	f the '504 Patent	#***#***#*****************************			
D924	Exhibit 240	Gauntlet S	vstem vs. Claims o	f the '135 Patent				
D925	Exhibit 241	U.S '588 v	vs. Claims of the '21	1 Patent				
D926	Exhibit 242	U.S. '588 v	s Claims of the '50	4 Patent				
D927	Exhibit 243	-Amble 242, 0.0. Job VS. Claims of the '135 Patent						
D928	Exhibit 244	Exhibit 243, Microsoft VPN, vs. Claims of the '211 Patent						
D929	Exhibit 245	Exhibit 244, Wild USUIL VEN VS. Claims of the '504 Patent						
D930	Exhibit 246	Exhibit 246, Microsoft VFN, VS. Claims of the 504 Patent						
D031	Exhibit 240	115 '202 v	s Claime of the '12	5 Patent	atont	+		
0033	Exhibit 249	The Miller	Annlication ve Clair	n 13 of the '135 Datent				
D932	Exhibit 240,	Gauntlet S	stem ve Claime of	the '151 Patent				
0333	Exhibit 250	ITH T Stop	dardization Activition	e ve Claime of the 14E4 1	Datant			
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (We as many sheets as necessary) Application Number 13/815,557 First Named Inventor September 13, 2012 First Named Inventor Victor Larson Art Unit 2431 First Named Inventor Victor Larson D937 Exhibit 253, U.S. Patent No. 8324, 644 vs. Claims of the 151 Patent Docket Number 77580-177 (VRNK-0001CP3CON8) D938 Exhibit 254, U.S. Patent No. 8327, 072 vs. Claims of the 151 Patent Docket Number 77580-177 (VRNK-0001CP3CON8) D939 Exhibit 25, N.S. Patent No. 8327, 072 vs. Claims of the 151 Patent Docket Number 77580-177 (VRNK-0001CP3CON8) D949 Exhibit 3, InfoWord, "Avental Peess Release, May 2, 1997 Dodd Exhibit 4, Avental Press Release, Quest 4, 1988 D944 Exhibit 3, Avental Press Release, Quest 5, 1999 D944 Exhibit 4, Avental Press Release, Quest 5, 1999 D944 Exhibit 4, Avental Extanket Center 3.1: Security with Solid Management, Network Computing, June 28, 1999 De44 D944 Exhibit 4, Contridate of Service to Request for Inter Partes Reexamination De45 D945 Exhibit 4, Claim Chart Avental Connect v3.1 De46 D946 Exhibit C, Claim Chart Avental Connect v3.1	Subst. for form	1 1449/PTO	Complete if Known				
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D980 Exhibit E-4, Claim Charts Applying Aziz and Edwards, and Aziz, Edwards, and Martin to Claims of the '151 Patent	D980	Exhibit E-4, Claim Charts Applying Aziz and the '151 Patent	Edwards, and Aziz, Edw	vards, and Martin to Claims of			

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D983	Exhibit A,	U.S. Patent 6,839,759			
D984	Exhibit C-1	1, U.S. Patent 6,502,135			
D985	Exhibit E-1	1, Claim Charts Applying Kiuch	ni, as Primary Reference to	the '759 Patent	
D986	Exhibit E-2	2, Claim Charts Applying Kent	as a Primary Reference to	the '759 Patent	
D987	Exhibit E-3	3, Claim Charts Applying Aziz	as a Primary Reference to	the '759 Patent	
D988	Exhibit E-4 Reference	4, Claim Charts Applying Kent is to the '759 Patent	in View of Caronni as a Pri	mary Combination of	
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D993	Request for	or Inter Partes Reexamination			
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D997	Exhibit C1, 920, Reed	, Claim Chart – USP 7,921,211 and Beser	1 Relative to Solana, Alone	and in Conjunction with RFC	
D998	Exhibit C2, conjunctior	, Claim Chart – USP 7,921,211 n with RFC 920, Reed, and Be	1 Relative to Solana in view eser	of RFC 2504 and Further in	
D999	Exhibit C3, 920, Reed,	, Claim Chart – USP 7,921,211 , and Beser	1 Relative to Provino, Alone	e and in Conjunction with RFC	
D1000	Exhibit C4, Conjunctio	, Claim Chart – USP 7,921,211 n with RFC 920, Reed and Be	1 Relative to Provino in viev ser	v of RFC 2230 and Further in	
D1001	Exhibit C5, Conjunctio	, Claim Chart – USP 7,921,211 n with RFC 920, Reed and Be	1 Relative to Provino in viev ser	v of RFC 2504 and in Further	
D1002	Exhibit C6, 920, RFC 2	, Claim Chart – USP 7,921,211 2401, and Reed	Relative to Beser, Alone a	and in Conjunction with RFC	
D1003	Exhibit C7, RFC 920, F	, Claim Chart – USP 7,921,211 RFC 2401, Reed, and Beser	Relative to RFC 2230, Alc	one and in Conjunction with	
D1004	Exhibit C8, RFC 920, F	Claim Chart – USP 7,921,211 RFC 2401, Reed, Beser, and F	l Relative to RFC 2538, Alc RFC 2065	one and in Conjunction with	
D1005	Exhibit D1, Cisco Syste America ar	Asserted Claim and Infringem ems, Inc., Apple Inc., Aastra T ad Aastra USA, Inc., Civ. Act 6	nent Contentions by Plaintif echnologies Ltd, NEC Corp :2010cv00417 (E.D. Tex)	f VirnetX, Inc. in <i>VimetX, Inc. v.</i> poration, NEC Corporation of	
D1006	Exhibit D2, based on 7	Asserted Claims and Infringer (921,211 Patent	ment Contentions by Plainti	iff VirnetX, Inc. against Apple	
D1007	Exhibit B1,	File History of U.S. Patent 7,4	18,504		
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(Use as many sheets as necessary) Art Unit 2431 Examiner Nome Not Yet Acciment									
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D1024	Exhibit F-1, Claim Charts applying Lendenr	nann as a Primary Refe	rence to the '504 Patent.						
D1025	Exhibit F-2, Claim Charts applying Aziz as a Primary Reference to the '504 Patent								
D1026	Exhibit F-3, Claim Charts applying Kiuchi a Patent	nd Pfaffenberger as Prin	nary References to the '504						
D1027	Exhibit E-2, First Page of U.S. Patent No. 5 the Lendenmann reference as a prior art re	5,913,217 published June ference	e 15, 1999 and citing a portion of						
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D1037	PTO Form 1449								
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D1039	Exhibit C2, Claim Chart – USP 7,921,211 r conjunction with RFC 920, Reed, and Bese	elative to Solana in view r	of RFC 2504 and further in						
D1040	Exhibit C3, Claim Chart – USP 7,921,211 r 920, Reed, and Beser	elative to Provino, alone	and in conjunction with RFC						
D1041	Exhibit C4, Claim Chart – USP 7,921,211 re conjunction with RFC 920, Reed and Beser	elative to Provino in view	of RFC 2230 and further in						
D1042	Exhibit C5, Claim Chart – USP 7,921,211 re conjunction with RFC 920, Reed and Beser	elative to Provino in view	of RFC 2504 and in further						

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STATEM	ENT BY A	APPLICA	NT	First Named Inventor	Victor Larson	n		
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D1043	RFC 2401	, Claim Char , and Reed	t – USP 7,921,211r	elative to Beser, Alone ar	nd in conjunction with RFC 920,			
D1044	Exhibit C7 2401, Ree	Exhibit C7, Claim Chart – USP 7,921,211 relative to RFC 2230, alone and in conjunction with RFC 2401, Reed, and Beser						
D1045	Exhibit C8 920, RFC	Exhibit C8, Claim Chart – USP 7,921,211 relative to RFC 2538, alone and in conjunction with RFC 920, RFC 2401, Reed, Beser, and RFC 2065						
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D1047	Exhibit C1 920, Reed	, Claim Char and Beser	t – USP 7,418,504 i	relative to Solana, alone a	and in conjunction with RFC			
D1048	Exhibit C2, conjunctior	, Claim Char h with RFC 9	t – USP 7,418,504 i 20, Reed, and Bese	relative to Solana in view er	of RFC 2504 and further in			
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D1051	Exhibit C6, and Reed	, USP 7,418,	504 relative to Bese	er, alone and in conjunction	on with RFC 920, RFC 2401,			
D1052	Exhibit C7, 920, RFC 2	, Claim Char 2401, Reed,	t – USP 7,418,504 r and Beser	relative to RFC 2230, alor	ne and in conjunction with RFC			
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D1094	Exhibit 2, Letter and attac Counsel for Cisco System	hment from Ram s (June 23, 2011	zi Khazen, Counsel for V)	irnetX, to Dmitriy Kheyfits,				
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D1099	Declaration of John P. J. I	Kelly, Ph.D						
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D1110	European Search Report f 0142)	rom correspondir	ng EP Application Numbe	er 11005789 (Our Ref.: 077580-				
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D1119	Hopen Transcript dated A	pril 11, 2012	4 I					
D1120	VirnetX Claim Construction Opinion							
D1121	Declaration of Angelos D. Keromytic, Ph.D.							
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D1123	Exhibit A-1, Verdict Form	from VirnetX, Inc.	. v. Microsoft Corp., No. 6	3:07-CV-80 (E.D. Tex.)				
D1124	Exhibit A-3, Declaration of	Jason Nieh, Ph.	D. (Control No. 95/001,20	69)				
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D1148	Exhibit 255, Schulzrinne ¹ vs. Claims of the '135 Patent ²							

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D1185	Exhibit 27, U.S. Patent No. 6,119,234 (hereinafter "Aziz") and RFC 2401 ² vs. Claims of the '151 Patent							
D1186	Exhibit 28	Exhibit 28						
D1187	Exhibit 29, The Altiga S	Bystem ¹ vs. Claims c	of the '135 Patent	анан түрөндүн байна алаан алаан түрөүн улуна түрөөн түрөөн түрөөн түрөөн түрөөн түрөөн түрөөн түрөөн түрөөн түр				
D1188	Exhibit 30, The Altiga S	System ¹ vs. Claims c	of the '504 Patent					
D1189	Exhibit 31. The Altiga S	System ¹ vs. Claims c	of the '211 Patent					
D1190	Exhibit 32 The Altiga S	System ¹ vs. Claims o	of the '759 Patent					
D1191	Exhibit 33 LLS Patent	No. 6 496 867 ("Ber	r^{*}	Claima of the (125 Detect				
D1192	Exhibit 34, U.S. Patent	No. 6 496 867 ("Be	Ser) and RFC 2401 VS.	Claims of the 135 Patent				
D1193	Exhibit 34, U.S. Patent	No. 0,490,007 (Be	$\frac{1}{10000000000000000000000000000000000$	Claims of the 504 Patent				
D1104	Exhibit 35, U.S. Patent	NO. 6,496,867 ("Bes	ser) and RFC 2401 ⁻ vs.	Claims of the '211 Patent				
D1105	Exhibit 36, U.S. Patent	No. 6,496,867 ("Bes	ser") and RFC 2401 ² vs.	Claims of the '151 Patent				
D1195	Exhibit 37, U.S. Patent	No. 6,496,867 ("Bes	ser") and RFC 2401 ² vs.	Claims of the '180 Patent				
D1196	Exhibit 38, Kent' vs. Cl	aims of the '759 Pat	ent					
D1197	Exhibit 39, RFC 2538, Storing Certificates in the Domain Name System (DNS) ¹ vs. Claims of the '504 Patent ²							
D1198	Exhibit 40, RFC 2538, 5 '211 Patent ²	Storing Certificates i	n the Domain Name Syst	tem (DNS) ¹ vs. Claims of the				
D1199	Exhibit 41, Aziz ('646) ¹	vs. Claims of the '75	9 Patent					
D1200	Exhibit 42, The PIX Fire	ewall ¹ vs. Claims of t	he '759 Patent					
D1201	Exhibit A-1, Kiuchi ¹ vs.	Claims of the '135 P	atent ²					
D1202	Exhibit B-1, Kiuchi ¹ vs.	Claims of the '211 P	atent ²					
D1203	Exhibit C-1, Kiuchi ¹ vs.	Claims of the '504 P	atent ²	<u> </u>				
D1204	Exhibit D, Materials Cor	nsidered	and a second	a to to the second s				
D1205	Exhibit E, Expert Repor	t of Stuart G. Stubbl	ebine. Ph.D.					
D1206	Exhibit F, Expert Repor	t of Stuart G. Stubble	ebine. Ph.D.					
D1207	Exhibit G, Opening Exp and '504 Patents	ert Report of Dr. Stu	art Stubblebine Regardir	ng Invalidity of the '135, '211,				
D1208	Cisco Comments and P	etition for Reexamin	ation 95/001,679 dated	June 14, 2012				
D1209	Exhibit S, Declaration or	f Nathaniel Polish, P	h.D.					
D1210	Exhibit R, Excerpts from	Exhibit R, Excerpts from Patent Owner & Plaintiff VirnetX Inc.'s First Amended P.R. 3-1 and 3-2						
D1211	Third Party Requester (Third Party Paguater Commante dated June 25, 2010 - After New Start Office And Action Free Start Office						
D1212	Reexam Affidavit/Declar	ration/Exhibit Filed b	w 3rd Party on June 25 (
D1213	Extended Europeen Car	anoh Dopost datad 0		2012 (30/001,788)				
	Number 11005793.2 (07	7580-0144)	orcorrespond	Ing ⊏uropean Application				
D1214	Bergadano, et al., "Secu Proceedings of the 3rd I	ire WWW Transactio JSENIX Workshop o	ons Using Standard HTT on Electronic Commerce,	P and Java Applets," 1998				
D1215	Alexander Invalidity Expert Report dtd May 22, 2012 with Exhibits							

Subst. for form 1449/PTO		Complete if Known						
		Application Number	13/615,557					
			Filing Date	September 13, 2	012			
STATEMENT BT APPLICANT (Use as many sheets as necessary)			First Named Inventor	Victor Larsor	l			
(000 40 1141)	sheets as neeessary)		Art Unit	2431				
			Examiner Name	Not Yet Assign	ed			
			Docket Number	77580-177 (VRNK-0001	CP3CON8)			
D1216	Deposition of Peter Alexand	ler dtd July 27,	2012					
D1217	Cisco '151 Comments by Third Party Requester dtd August 17, 2012 with Exhibits							
D1218	Cisco '151 Petition to Waive Page Limit Requirement for Third Party Comments dtd August August 17, 2012							
D1219	Deposition of Stuart Stubble	bine dtd Augus	st 22, 2012					
D1220	Defendants' Motion For Rec Link," 7 pages, June 2012	consideration of	f the Construction of the	Term "Secure Communication				
D1221	Green, "Cisco Leverages Al http://www.crn.com/news/ch vpns.htm	tiga Technolog annel-program	y for VPN's," 2 pages, 20 s/18807923/cisco-levera)00 ges-altiga-technology-for-				
D1222	Altiga Networks Archived at http://web.archive.org/web/2 the Wayback Machine	000082302343	37/http:/www.altiga.com/p	products/ 1999 and Retrieved by				
D1223	Kiuchi, "C-HTTP The Develo Department of Epidemiology	opment of a Se and Biostatist	cure, Closed HTTP-Base ics, Faculty of Medicine,	ed Network on the Internet," University of Tokyo, Japan				
D1224	Lee et al., "Uniform Resourc 1994 (25 pages)	e Locators (UF	RL)," Network Working G	roup, RFC 1738, December				
D1225	VPN 3000 Concentrator Ser	ies, User Guide	e; Release 2.5 July 2000	(489 pages)				
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D1227	Fratto, Altiga Concentrates o March 22, 1999 (2 pages)	on VPN Securit	y (Hardware Review Eva	luation), Network Computing,				
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D1229	Altiga Proves Multi-Vendor I Significant Development in t	nteroperability he VPN Market	for Seamless VPN Deplo	yment; VPN Workshop Marks				
D1230	Altiga VPN Concentrator Se 4500, VPN Tunneling compe	ries (C50) Vers etitive Evaluatio	us Nortel Networks Cont on, 1999 (6 pages)	ivity Extranet Switch 4000 and				
D1231	VPN 3000 Client User Guide	. Release 2.5.	July 2000 (94 pages)					
D1232	Digital Certificates Design Su	pecification for	Release 2.0 May 17 19	99 (21 pages)				
D1233	Altiga IPSec Client Architect	ure Revision 1	0 April 5 1999 (34 page	(<u>-</u> , pogoo) 				
D1234	Altiga IPSec Functional Spec	cification Revie	sion 2.1 (17 names)					
D1235	Altiga Product Requirements	Revision 1 7	May 26, 1008 (17 pages)					
D1236	Altiga Network Lists Feature	Functional Sec	acification Revision 1.0	(7 00000)				
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D1239	Altiga IPSec LAN to LAN Tur	Pages) Altiga IPSec LAN to LAN Tunnel Autodiscovery Functional Specification. (5 pages)						
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D1241	Altiga VPN Concentrator Get	ting Started, R	evision 1, March 1999 (1	16 pages)	·····			
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D1244	Altina VPN Concentrator Get	Alliga VEN Concentrator Getting Started, Version 3, December 1999 (130 pages)						
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	Aitiga VPN Concentrator User Guide, Revision 1, March 1999 (304 pages)							

Subst. for form 1449/PTO INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)				Complete if Known					
				Application Number	13/615,557				
			JRE	Filing Date	September 13, 2	012			
				First Named Inventor	Victor Larsor	l .			
				Art Unit	2431	• • • • • • • • • • • • • • • • • • •			
				Examiner Name	Not Yet Assign	ed			
				Docket Number	77580-177 (VRNK-0001	CP3CON8)			
D1246	Altiga VPN	Altiga VPN Concentrator User Guide, Revision 1.1, March 1999 (304 pages)							
D1247	Altiga VPN Concentrator User Guide, Version 3, June 1999 (478 pages)								
D1248	Altiga VPN Concentrator User Guide, Version 4, December 1999 (472 pages)								
D1249	Altiga VPN	Altiga VPN Concentrator User Guide, Version 5, March 2000 (606 pages)							
D1250	Altiga VPN	Altiga VPN Client Installation and User Guide, Version 2, July 1999 (92 pages)							
D1251	Altiga VPN pages)	Altiga VPN Concentrator VPN Client Installation and User Guide, Version 3, December 1999 (113 pages)							
D1252	Altiga VPN pages)	Altiga VPN Concentrator VPN Client Installation and User Guide, Version 4, March 2000 (118 pages)							
D1253	Altiga Netv Testing, ar	Altiga Networks VPN Concentrator and VPN Client, as well as their Public Demonstrations and Testing, are also Described in Marketing Materials and Publications (4 pages)							

Subst. for form 1449/PTO	Complete if Known			
	Application Number	13/615,557		
INFORMATION DISCLOSURE	Filing Date	September 13, 2012		
STATEMENT BY APPLICANT	First Named Inventor	Victor Larson		
(Use as many sheets as necessary)	Art Unit	2431		
	Examiner Name	Not Yet Assigned		
	Docket Number	77580-177 (VRNK-0001CP3CON8)		

CERTIFICATION STATEMENT

[X] Under 37 C.F.R. 1.98(d), copies of all patent, publication, pending U.S. application or other information that was previously submitted to, or cited by the USPTO in an earlier application are not required. Applicant will provide copies of the previously submitted references at the Examiner's request.

This application claims priority from and is a continuation of a co-pending U.S. Application No. 13/049,552, filed March 16, 2011, which is a continuation of U.S. Application No. 11/840,560, filed August 17, 2007, now U.S. Patent No. 7,921,211, issued April 5, 2011, which is a continuation of U.S. Application No. 10/714,849, filed November 18, 2003, now U.S. Patent No. 7,418,504, issued August 26, 2008, which is a continuation of U.S. Application No. 09/558,210, filed April 26, 2000, now abandoned, which is a continuation-in-part of U.S. Application No. 09/504,783, filed on February 15, 2000, now U.S. Patent No. 6,502,135, issued December 31, 2002, which claims priority from and is a continuation-in-part patent application of previously-filed U.S. Application No. 09/429,643, filed on October 29, 1999, now U.S. Patent No. 7,010,604, issued March 07, 2006.

Please See 37 CFR 1.97 and 1.98 to make the appropriate selection(s)

- [X] Information Disclosure Statement is being filed with the filing of the application or before the receipt of a first office action.
- [] That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or
- [] That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.
- [] The Commissioner is hereby authorized to charge the fee pursuant to 37 CFR 1.17(P) in the amount of \$180.00, or further fees which may be due, to Deposit Account 50-1133.
- [] Information Disclosure Statement is being filed with the Request for Continued Examination. The Commissioner is hereby authorized to charge the fee pursuant to 37 CFR 1.17(P) in the amount of \$810.00, or further fees which may be due, to Deposit Account 50-1133.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Toby H. Kusmer;Reg. No.:26,418 McDermott Will & Emery L.L.P. 28 State Street Boston, MA 02109 Tel. (617) 535-4000 Fax (617) 535-3800 Date: October 22, 2012

Electronic Acknowledgement Receipt					
EFS ID:	14053382				
Application Number:	13615557				
International Application Number:					
Confirmation Number:	1089				
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES				
First Named Inventor/Applicant Name:	Victor Larson				
Customer Number:	23630				
Filer:	Toby H. Kusmer./Kerrie Jones				
Filer Authorized By:	Toby H. Kusmer.				
Attorney Docket Number:	077580-0177				
Receipt Date:	23-OCT-2012				
Filing Date:	13-SEP-2012				
Time Stamp:	14:33:26				
Application Type:	Utility under 35 USC 111(a)				

Payment information:

Submitted with Payment			no				
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Document Number	Document Description		File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)	
1	Information Disclosure Statement (IDS) Form (SB08)		IDS.pdf	1730115	no	44	
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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	: Customer Number: 2363	
Victor Larson, et al.	:	Confirmation Number: 1089
Application No.: 13/615,557	:	Group Art Unit: 2447
Filed: September 13, 2012	:	Examiner: Not yet assigned

For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES

Mail Stop Missing Parts Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

Sir:

In response to the Notice To File Corrected Application Papers dated October 4, 2012, submitted herewith are the following for filing in the above-referenced application:

- 1. Replacement Abstract; and
- Replacement Drawings (clean without copy marks) for Figures 1-37 for filing in the above-referenced application. No new matter is believed to have been added to the application by way of the Replacement Drawings.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 501133 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP

Date: <u>November 21, 2012</u>

/Toby H. Kusmer/ Toby H. Kusmer, P.C., Reg. No. 26,418 Customer No. 23630 28 State Street Boston, MA 02109-1775 Telephone: (617) 535-4000 Facsimile : (617)535-3800 E-mail: tkusmer@mwe.com

REPLACEMENT ABSTRACT

A method is used to transparently create an encrypted communications channel between a client device and a target device. Each device is configured to allow audio/video communications between the client and target devices over the encrypted communications channel once the encrypted communications channel is created. The method comprises receiving from the client device a request for a network address associated with the target device, determining whether the request is requesting access to a device that accepts an encrypted channel connection with the client device, and in response to determining that the request is requesting access to a device to a device that accepts an encrypted communication with the client device, providing provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device such that the encrypted communications channel supports secure audio/video communications transmitted between the two devices.



4









FIG. 4



Petitioner Apple Inc. - Exhibit 1002, p. 208





FIG. 7



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FIG. 9

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MODE OR EMBODIMENT	HARDWARE ADDRESSES	IP ADDRESSES	DISCRIMINATOR FIELD VALUES
1. PROMISCUOUS SAME FOR ALL NODES OR COMPLETELY RANDOM		CAN BE VARIED IN SYNC	CAN BE VARIED IN SYNC
2. PROMISCUOUS		CAN BE VARIED	CAN BE VARIED
PER VPN FIXED FOR EACH V		IN SYNC	IN SYNC
3. HARDWARE	CAN BE VARIED	CAN BE VARIED	CAN BE VARIED
Hopping	IN SYNC	IN SYNC	IN SYNC

FIG. 12B


Petitioner Apple Inc. - Exhibit 1002, p. 217



FIG. 14









FIG. 18







FIG. 21



FIG. 22A Petitioner Apple Inc. - Exhibit 1002, p. 226





FIG. 23



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Petitioner Apple Inc. - Exhibit 1002, p. 231























Electronic Acl	Electronic Acknowledgement Receipt					
EFS ID:	14292943					
Application Number:	13615557					
International Application Number:						
Confirmation Number:	1089					
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES					
First Named Inventor/Applicant Name:	Victor Larson					
Customer Number:	23630					
Filer:	Toby H. Kusmer./Kimila Carraway					
Filer Authorized By:	Toby H. Kusmer.					
Attorney Docket Number:	077580-0177					
Receipt Date:	21-NOV-2012					
Filing Date:	13-SEP-2012					
Time Stamp:	21:11:40					
Application Type:	Utility under 35 USC 111(a)					

Payment information:

Submitted wi	th Payment	no			
File Listin	g:				
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		077580-0177_Response_Notice _File_Corrected_Application_P apers.pdf	3302771 7c1dce8a42dd3a150c16fa4a4182bb7bb64 6c7b0	yes	42

	Multipart Description/PDF files in .zip description							
	Document Description	Start	End					
	Applicant Response to Pre-Exam Formalities Notice	1	1					
	Abstract	2	2					
	Drawings-only black and white line drawings	3	42					
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National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875									Applica 13/61	tion or Docket Nurr 5,557	ber
	APPLICATION AS FILED - PART I (Column 1) (Column 2) SMALL ENTITY								OR	OTHER THAN ORSMALL ENTITY	
	FOR NUMBER FILED NUMBER EXTRA			RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)		
BAS (37 C	SIC FEE FR 1.16(a), (b), or (c))	N	/A	١	J/A	N/A				N/A	390
SEA (37 C	RCH FEE FR 1.16(k), (i), or (m))	N	/A	١	J/A	N/A				N/A	620
EXA (37 C	MINATION FEE FR 1.16(0), (p), or (q))	N	/A	٨	J/A	N/A				N/A	250
TOT (37 C	AL CLAIMS FR 1.16(i))	20	minus	20= *					OR	× 62 =	0.00
IND (37 C	EPENDENT CLAI FR 1.16(h))	^{MS} 2	minus	3 = *						× 250 =	0.00
APPLICATION SIZE If the specification and drawings exceed 100 FEE \$310 (\$155 for small entity) for each additional (37 CFR 1.16(s)) 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). 41(a)(1)(G)									0.00		
Μυι	TIPLE DEPENDE	ENT CLAIM PRE	SENT (3	7 CFR 1.16(j))							0.00
*lft	he difference in co	olumn 1 is less th	an zero,	enter "0" in colur	nn 2.	TOTAI	-			TOTAL	1260
	APPLIC	CATION AS A	MEND	ED - PART I	I		-		•	•	
		(Column 1)		(Column 2)	(Column 3)	SN	1ALL E	ENTITY	OR	OTHEF SMALL	ENTITY
NT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(S	5)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
μ	Total (37 CFR 1.16(i))	×	Minus	**	=	x	=		OR	x =	
U N N N	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=		OR	x =	
AM	Application Size Fe	ee (37 CFR 1.16(s))									
	FIRST PRESENT	TION OF MULTIPL	E DEPEN	DENT CLAIM (37 C	CFR 1.16(j))				OR		
						TOTA ADD'L F	- EE		OR	TOTAL ADD'L FEE	
		(Column 1)		(Column 2)	(Column 3)				_		
NT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$	3)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
ΜË	Total (37 CFR 1.16(i))	*	Minus	**	=	x	=		OR	x =	
BND	Independent (37 CFR 1.16(h))	*	Minus	***	=	x	=		OR	x =	
AM	Application Size Fe	ee (37 CFR 1.16(s))			•						
	FIRST PRESENT	TION OF MULTIPL	E DEPEN	DENT CLAIM (37 C	CFR 1.16(j))				OR		
						TOTAI ADD'L F	- EE		OR	TOTAL ADD'L FEE	
*	ADD'L FEE The "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.										

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APPLICATION	FILING or	GRP ART			
NUMBER	371(c) DATE	UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS IND CLAIMS
13/615,557	09/13/2012	2431	1250	077580-0177	20 2
				(CONFIRMATION NO. 1089
23630				UPDATED	FILING RECEIPT
McDermott Wi	ll & Emerv				
The McDermo	tt Building				
500 North Can	vital Straat NIM	1			DC00000057854810*
Suo Nonin Cap	nioi Sileei, N.W	ν.			
Washington, D	C 20001				

Date Mailed: 12/03/2012

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections

Inventor(s)

Victor Larson, Fairfax, VA; Robert Dunham Short III, Leesburg, VA; Edmund Colby Munger, Crownsville, MD; Michael Williamson, South Riding, VA;

Applicant(s)

Victor Larson, Fairfax, VA; Robert Dunham Short III, Leesburg, VA; Edmund Colby Munger, Crownsville, MD; Michael Williamson, South Riding, VA;

Assignment For Published Patent Application

VIRNETX, INC., Zephyr Cove, NV

Power of Attorney: The patent practitioners associated with Customer Number 22907

Domestic Priority data as claimed by applicant

This application is a CON of $13/049,552\ 03/16/2011$ which is a CON of $11/840,560\ 08/17/2007\ PAT\ 7921211$ which is a CON of $10/714,849\ 11/18/2003\ PAT\ 7418504$ which is a CON of $09/558,210\ 04/26/2000\ ABN$ which is a CIP of $09/504,783\ 02/15/2000\ PAT\ 6502135$ which is a CIP of $09/429,643\ 10/29/1999\ PAT\ 7010604$ which claims benefit of $60/106,261\ 10/30/1998$ and claims benefit of $60/137,704\ 06/07/1999$

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <u>http://www.uspto.gov</u> for more information.) - None.

page 1 of 3

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

If Required, Foreign Filing License Granted: 10/02/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/615,557**

Projected Publication Date: 03/14/2013

Non-Publication Request: No

Early Publication Request: No

Title

AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES

Preliminary Class

713

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this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

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UNITED STA	tes Patent and Tradem	ARK OFFICE UNITED STA United State: Address: COMMI PO. Box Alexandri www.uspt	TES DEPARTMENT OF COMMERCE s Patent and Trademark Office SSIONER FOR PATENTS 1450 a, Virginia 22313-1450 ogov
APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/615,557	09/13/2012	Victor Larson	077580-0177
23630		PUBLICA	CONFIRMATION NO. 1089
McDermott Will & Emery The McDermott Building 500 North Capitol Street, N Washington, DC 20001	I.W.		OC000000059856436*

Title:AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES

Publication No.US-2013-0067224-A1 Publication Date:03/14/2013

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

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Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

page 1 of 1

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					Art Unit :			24	153	
					Examiner Name Krisna Lim					
			Docket Number		077580-01	77 (VRI	NK-0001CP	3CON8)		
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APPLIC	ANT	JISCEUS	IUNE STAT		Filing Date	09-13-2012		
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					Art Unit	2453		
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					Art Unit	2453	
			**************************************		Examiner Name	Krisna Lim	
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(Use as m	any sheets	as necessary)	First Named Inventor	Victor Larson			
			Art Unit	2453			
			Examiner Name	Krisna Lim			
			Docket Number	077580-0177 (VRNK-0001CP3CON8)			
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		DE STATEMENT DV	Application Number	13/615,557	
APPLICANT	1302030	RE STATEWIENT DT	Filing Date	09-13-2012	
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			Art Unit	2453	
			Examiner Name	Krisna Lim	
			Docket Number	077580-0177 (VRNK-0001CP3CO	N8)
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D1412	Office Action 2011-0834	on dated December 13, 2012 f 15	rom Corresponding Japa	nese Patent Application Number	
	EXAMI	NER		DATE CONSIDERED	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

Subst. for form 1449/PTO			Complete if Known		
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)			Application Number	13/615,557	
			Filing Date	09-13-2012	
			First Named Inventor	Victor Larson	
			Art Unit	2453	
		Examiner Name	Krisna Lim		
			Docket Number	077580-0177 (VRNK-0001CP3CON8)	
		CERTIFI	CATION STATEMENT		

[X] Under 37 C.F.R. 1.98(d), copies of all patent, publication, pending U.S. application or other information that was previously submitted to, or cited by the USPTO in an earlier application are not required. Applicant will provide copies of the previously submitted references at the Examiner's request.

Please See 37 CFR 1.97 and 1.98 to make the appropriate selection(s)

- [X] Information Disclosure Statement is being filed with the filing of the application or before the receipt of a first office action.
- [] That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement.
- [] That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § <u>1.56(c)</u> more than three months prior to the filing of the information disclosure statement.
- [] The Commissioner is hereby authorized to charge any required fees to Deposit Account 50-1133.
- [] Information Disclosure Statement is being filed with the Request for Continued Examination. The Commissioner is hereby authorized to charge the fee pursuant to 37 CFR 1.17(P) in the amount of \$930.00, or further fees which may be due, to Deposit Account 50-1133.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

<u>/Toby H. Kusmer/</u> Toby H. Kusmer; Reg. No.:26,418 McDermott Will & Emery LLP 28 State Street Boston, MA 02109 Tel. (617) 535-4000 Fax (617) 535-3800 Date: April 9, 2013

DM_US 42160652-1.077580.0177

Electronic Acl	Electronic Acknowledgement Receipt				
EFS ID:	15467015				
Application Number:	13615557				
International Application Number:					
Confirmation Number:	1089				
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES				
First Named Inventor/Applicant Name:	Victor Larson				
Customer Number:	23630				
Filer:	Toby H. Kusmer./Kerrie Jones				
Filer Authorized By:	Toby H. Kusmer.				
Attorney Docket Number:	077580-0177				
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Filing Date:	13-SEP-2012				
Time Stamp:	11:23:01				
Application Type:	Utility under 35 USC 111(a)				

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

	ed States Paten	t and Trademark Office	UNITED STATES DEPAR United States Patent and Address: COMMISSIONER F P.O. Box 1450 Alexandria, Virginia 22 www.uspto.gov	TMENT OF COMMERCE Trademark Office FOR PATENTS 313-1450	
APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.	
13/615,557	09/13/2012	Victor Larson	077580-0177	1089	
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			08/01/2013	ELECTRONIC	

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mweipdocket@mwe.com

Application No.Applicant(s)13/615,557LARSON ET AL.					
Office Action Summary Exam	niner NA LIM	Art Unit 2453	AIA (First Inventor to File) Status No		
The MAILING DATE of this communication appears of Period for Reply	n the cover sheet with the o	correspondent	ce address		
 A SHORTENED STATUTORY PERIOD FOR REPLY IS SE WHICHEVER IS LONGER, FROM THE MAILING DATE OF Extensions of time may be available under the provisions of 37 CFR 1.136(a). In after SIX (6) MONTHS from the mailing date of this communication. If NO period for reply is specified above, the maximum statutory period will apply a Failure to reply within the set or extended period for reply will, by statute, cause th Any reply received by the Office later than three months after the mailing date of t earned patent term adjustment. See 37 CFR 1.704(b). 	ET TO EXPIRE <u>3</u> MONTH F THIS COMMUNICATION no event, however, may a reply be tir and will expire SIX (6) MONTHS from the application to become ABANDONE his communication, even if timely file	(S) OR THIRT N. mely filed n the mailing date of ED (35 U.S.C. § 13: d, may reduce any	TY (30) DAYS, this communication. 3).		
Status 1) Responsive to communication(s) filed on <u>13 Septemble</u> A deploration(s) (affidavit(s) under 37 CEP 1 130/b)	ber 2012.				
A declaration(s)/andavit(s) under 37 CFR 1.130(b)					
2a) This action is FINAL . $2b)$ This action 3	a restriction requirement	set forth durin	na the interview on		
. the restriction requirement and election have	been incorporated into this	s action			
4) Since this application is in condition for allowance exc	cept for formal matters, pro	osecution as t	o the merits is		
closed in accordance with the practice under Ex parte	<i>Quayle</i> , 1935 C.D. 11, 4	53 O.G. 213.			
Disposition of Claims					
 5) ∑ Claim(s) <u>1-20</u> is/are pending in the application. 5a) Of the above claim(s) is/are withdrawn from 6) ☐ Claim(s) is/are allowed. 7) ∑ Claim(s) <u>1-20</u> is/are rejected. 8) ☐ Claim(s) is/are objected to. 9) ☐ Claim(s) are subject to restriction and/or election * If any claims have been determined <u>allowable</u>, you may be eligible to participating intellectual property office for the corresponding application http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquisited to by the Examiner. 11) ☐ The specification is objected to by the Examiner. 11) ☐ The drawing(s) filed on is/are: a) ☐ accepted of Applicant may not request that any objection to the drawing Replacement drawing sheet(s) including the correction is reference. 	n consideration. on requirement. b benefit from the Patent Pro on. For more information, plea uiry to <u>PPHfeedback@uspto.</u> or b) dojected to by the g(s) be held in abeyance. Se equired if the drawing(s) is ob	esecution High ase see gov. Examiner. e 37 CFR 1.850 ojected to. See s	way program at a (a). 37 CFR 1.121(d).		
Priority under 35 U.S.C. § 119 12) ☐ Acknowledgment is made of a claim for foreign priority Certified copies: a) ☐ All b) ☐ Some * c) ☐ None of the: 1. ☐ Certified copies of the priority documents have 2. ☐ Certified copies of the priority documents have 3. ☐ Copies of the certified copies of the priority documents have application from the International Bureau (PCT * See the attached detailed Office action for a list of the certified copies	y under 35 U.S.C. § 119(a e been received. e been received in Applica cuments have been receiv Rule 17.2(a)). tified copies not received.	.)-(d) or (f). tion No ved in this Nat	 ional Stage		
Attachment(s)	_				
1) LI Notice of References Cited (PTO-892)	3) Interview Summary	/ (PTO-413)			
2) Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date	4) Other:	/ale			

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Part of Paper No./Mail Date 20130725

Petitioner Apple Inc. - Exhibit 1002, p. 262

1. Claims 1-20 are presented for examination.

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3. Claims 1-20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-18 of U.S. Patent No. 7,933,990.

Although the conflicting claims are not identical, they are not patentably distinct from each other because they all directed to a method of transparently creating an encrypted communication channel (i.e. **automatically initiating** an encrypted communication channel) between a client device and a target device based on a

determination that a request access to a device that accepts an encrypted communication channel. The difference is the current application claimed language of "supports secure communications audio/video". It would have been obvious to one of ordinary skill in the art to recognize that such additional claimed language" supports communications audio/video" would have been a matter of use and such feature is well known and it would not be a patentably distinguishable feature.

4. Claims 1-20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-3, 5-9 and 11-15 of U.S. Patent No. 7,490,151.

Although the conflicting claims are not identical, they are not patentably distinct from each other because they are directed to a method **of transparently creating** an encrypted communication channel (i.e. **automatically initiating** an encrypted communication channel) between a client device and a target device based on a determination that a request access to a device that accepts an encrypted communication channel. The difference is the current application claimed language of "**supports secure communications audio/video**". It would have been obvious to one of ordinary skill in the art to recognize that such additional claimed language" **supports communications audio/video**" would have been a matter of use and such feature is well known and it would not be a patentably distinguishable feature.

5. Claims 1-19 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9 of U.S. Patent No. 6,502,135.

Although the conflicting claims are not identical, they are not patentably distinct from each other because they are directed to a method of transparently creating an encrypted communication channel (i.e. **transparently creating a virtual private network**) between a client device and a target device based on a determination that a request access to a device that accepts an encrypted communication channel. The difference is the current application claimed language of **"supports secure communications audio/video**". It would have been obvious to one of ordinary skill in

the art to recognize that such additional claimed language" **supports communications audio/video**" would have been a matter of use and such feature is well known and it would not be a patentably distinguishable feature.

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained through the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in Graham v. John Deere Co., 383 U.S. 1, 148

USPQ 459 1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

- 1. Determining the scope and contents of the prior art.
- 2. Ascertaining the differences between the prior art and the claims at issue.
- 3. Resolving the level of ordinary skill in the pertinent art.
- 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 1-20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wesinger [U.S. Patent No. 5,898,830].

9. Wesinger disclosed the invention substantially as claimed. Taking claims 1-4, 10-12 and 19-20 as exemplary claims, the reference disclose a client device comprising: a) memory configured and arranged to facilitate a connection (i.e., see Internet 120 of Fig. 1) of the client device (i.e. a client C) with a target device (i.e. a host D) over a secure communication link created (i.e., at 12:23-27 Wesinger disclosed "... combining encryption capabilities allows for the creation of virtual private networks-networks in which two remote machine communicate securely ...") based on (i) an address request generated by the client device (i.e., see 9:1-25), and (ii) a

determination as a result of the address request that the target device is a device with which a <u>secure communication link can be established</u> (i.e. at 12:4-47, Wesinger disclosed channel processing may be used to perform virus protection.... Encryption and decryption are particularly important to **Internet and network communication** ... encryption could be performed") when the requested address is identified in an address lookup (i.e. at 8:25-9:25, Wesinger disclosed "... DNS is a ... system that translates host name address to IP address and IP address to host name ... stored in DNS tables ... When client C tries to initiates a connection to host D The DNS server for D returns the network address D ... from which it receives the look up request ..."

wherein the establishment of the secure communication link (i.e., at 12:23-27 Wesinger disclosed "... combining encryption capabilities allows for the creation of virtual private networks-networks in which two remote machine communicate securely ...") is based on a determination being made by a proxy module (i.e., a proxy server) that the target device is a device with which a secure communication link can be established when the address request corresponds to a target device identified in a DNS lookup table (i.e. Wesinger disclosed at col. 8 (line 25) to col. 9 (line 25) " ... DNS is a ... system that translates host name address to IP address and IP address to host name ... stored in DNS tables ... When client C tries to initiates a connection to host D The DNS server for D returns the network address D ... from which it receives the look up request ..." Moreover, see col. 8 (lines 33-48), col. 8 (line 65) to col. 9 (line 2), col. 9 (lines 19-25), col. 16 (line 57) to col. 17 (line 5) and col. 12 (lines 23-27)),

wherein the address lookup is a network address lookup (i.e. Wesinger disclosed at col. 8 (line 25) to col. 9 (line 25) " ... DNS is a ... system that translates host name address to IP address and IP address to host name ... stored in DNS tables ... When client C tries to initiates a connection to host D The DNS server for D returns the network address D ... from which it receives the look up request ...";

wherein the secure communication link is a virtual private network link (i.e., Wesinger at col. 12 (lines 23-27) disclosed "... combining encryption capabilities

allows for the creation of virtual private networks-networks in which two remote machine communicate securely ..."); and

wherein the address request includes a secure domain name (i.e., see DNS of figure 1 and columns 8-9).

10. Wesinger did not explicitly mention a specific application program configured and arranged so as to allow participation in audio/video communications with the target device over the secure communication link, it would however have been obvious to one of ordinary skill in the art at the time the invention was made to recognize that having such audio/video application to communicate over the secure communication link would have been a matter of choice, and it would not be a patentably distinguishable feature.

11. As to claims 5-9 and 13-18, those features (i.e., a computer, a server, a phone, a broadband connection, TCP/IP protocols support, using modulation based on FDM, TDM, or CDMA, etc.) are well known the art at the time the invention was made and they are not patentably distinguishable features.

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) days from the mail date of this letter.

Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.

If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.

Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Any reply received by the Office later than three months after the mailing date of

this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krisna Lim whose telephone number is 571-272-3956 The examiner can normally be reached on Tuesday to Friday from 7:10 AM to 5:40 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Krista Zele, can be reached on 571-272-7288. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (In USA or Canada) or 571-272-100.

KI July 25, 2013

/Krisna Lim/ Primary Examiner Art Unit 2453

	Application/Control No.	Applicant(s)/Patent Under Reexamination
Search Notes	13615557	LARSON ET AL.
	Examiner	Art Unit
	KRISNA LIM	2453

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED						
Symbol	Date	Examiner				

US CLASSIFICATION SEARCHED							
Class	Subclass	Date	Examiner				
709	222-227	07/25/2013	kl				

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	07/25/2013	kl

INTERFERENCE SEARCH						
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner			

U.S. Patent and Trademark Office

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Part of Paper No. : 20130725

Subst. for fo	rm 1449/F	то					Со	mplete if h	(nown		
INCODM				EMENT DV		Application Number			13/61	5,557	
APPLICANT				ſ	Filing Date			09-13	09-13-2012		
(Use as many sheets as necessary)						First Named Inventor Victor L		Larson			
						Art Unit			24	53	
						Examiner Name			Krisn	a Lim	
						Docket Number		077580-017	77 (VRN	IK-0001CP	3CON8)
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				Art Unit	2453
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(Use as many sheets as necessary)				First Named Inventor	Victor Larson	
				Art Unit	2453	
		T T		Examiner Name	Krisna Lim	
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APPLICA	APPLICANT		Filing Date	09-13-2012		
(Use as ma	any sheets	s as necessary)		First Named Inventor	Victor Larson	
				Art Unit	2453	
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APPLICANT (Use as many sheets as necessary)			Filing Date	09-13-2012			
(Use as many she	ets as necessary)		First Named Inventor	Victor Larson			
			Art Unit	2453			
			Examiner Name	Krisna Lim			
<u> </u>			Docket Number	077580-0177 (VRNK-0001CP3	CON8)		
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

All references with no date, there are no date provided. /K.L./

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			Art Unit	2453			
			Examiner Name	Krisna Lim			
			Docket Number	077580-0177 (VRNK-0001CP3CON8)			
		CERTIF	ICATION STATEMENT				

[X] Under 37 C.F.R. 1.98(d), copies of all patent, publication, pending U.S. application or other information that was previously submitted to, or cited by the USPTO in an earlier application are not required. Applicant will provide copies of the previously submitted references at the Examiner's request.

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SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

<u>/Toby H. Kusmer/</u> Toby H. Kusmer; Reg. No.:26,418 McDermott Will & Emery LLP 28 State Street Boston, MA 02109 Tel. (617) 535-4000 Fax (617) 535-3800

DM_US 42160652-1.077580.0177

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				Application Number		13/615,557			
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				First Named Inventor	Victor Larson	
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D341	Exhibit 27, US '287 vs. Claims of the '13	35 Patent		
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D443	Exhibit 130, Overview of Access VPNs a '135 Patent	ind Tunneling Technologies ("Overview") vs. Claims of the	
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		First Named Inventor	Victor Larson	
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		Examiner Name	Not Yet Assigned	
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e as many	sheets as necessary)	Art Unit	2431
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		Docket Number	77590 177 (V/DNK 0001CD2CONP)
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D588 D589 D590 D591	Exhibit X11: Copy of U.S. Patent No. 6 Exhibit X2: Aventail Connect Administ	5,615,357 rator's Guide v3.01/v2.51., PP	1-116 (1996-1999)
D588 D589 D590 D591 D592	Exhibit X11: Copy of U.S. Patent No. 6 Exhibit X2: Aventail Connect Administ Exhibit X3: Aventail AutoSOCKS Adm	6,615,357 rator's Guide v3.01/v2.51., PP inistration & User's Guide v2.1.	1-116 (1996-1999) , PP 1-70 (1996-1999)

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		Application Number	13/615.557	
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D626	Request for Inter Partes Reexamination Tr	ansmittal Form (PTO/SB/	58) (Patent No. 7,490,151)	
D627	Request for Inter Partes Reexamination Ur	nder 35 U.S.C. § 311 (Pat	ent No. 6,502,135)	
D628	Request for Inter Partes Reexamination Ur	nder 35 U.S.C. § 311 (Pat	ent No. 7,490,151)	
D629	Transmittal Letter (Patent No. 6,502,135)			
D630	I ransmittal Letter (Patent No. 7,490,151)			
D631	Joint Claim Construction and Prehearing S	tatement		
D632	Exhibit A: Agreed Upon Terms; P.R. 4-3 Jo	bint Claims Construction a	Ind Prehearing Statement	
D633	Exhibit B: Disputed Claim Terms; P.R. 4-3	Joint Claim Construction	and Prehearing Statement	
D634	Exhibit C; VirnetX's Proposed Construction	of Claim Terms and Sup	porting Evidence	
D635	Prehearing Statement	ic Support; P.R. 4-3 Joint	Claim Construction and	
D636	U.S. Patent 6,839,759	<u> </u>		
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D647	Exhibit E-2; Claim Charts Applying Kent as			
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		Application Number	13/615 557	
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STATEM	ENT BY APPLICANT	First Named Inventor	Victor Lamon	12
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		Art Offic	2431	
		Examiner Name	Not Yet Assigne	d
		Docket Number	77580-177 (VRNK-0001C	P3CON8)
D660	Exhibit 38, RFC 2661 vs. Claims of the	'211 Patent		
D661	Exhibit 39, RFC 2661 vs. Claims of the	'504 Patent		
D662	Exhibit 40, SecureConnect vs. Claims c	of the '135 Patent		
D663	Exhibit 41, SecureConnect vs. Claims c	of the '211 Patent		
D664	Exhibit 42, SecureConnect vs. Claims c	of the '504 Patent		
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D666	Exhibit 44, SFS-HTTP vs. Claims of the	e '211 Patent		
D667	Exhibit 45, SFS-HTTP vs. Claims of the	· 504 Patent		
D668	Exhibit 46, US '883 vs. Claims of the '13	35 Patent		
D669	Exhibit 47, US '883 vs. Claims of the '2'	11 Patent		
D670	Exhibit 48, US '883 vs. Claims of the '50	04 Patent		
D671	Exhibit 49, Chuah vs. Claims of the '135	5 Patent		
D672	Exhibit 50, Chuah vs. Claims of the '211	Patent		
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D677	Exhibit 58, BorderManager vs. Claims o	f the '135 Patent		
D678	Exhibit 59, BorderManager vs. Claims o	of the '211 Patent		
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D680	Exhibit 61, Prestige 128 Plus vs. Claims	of the '135 Patent		
D681	Exhibit 62, Prestige 128 Plus vs. Claims	of the '211 Patent		
D682	Exhibit 63, Prestige 128 Plus vs. Claims	of the '504 Patent		
D683	Exhibit 64, RFC 2401 vs. Claims of the '	135 Patent		
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D687	Exhibit 68, RFC 2486 vs. Claims of the '	211 Patent		
D688	Exhibit 69, RFC 2486 vs. Claims of the '	504 Patent		
D689	Exhibit 70 Understanding IPSec vs. Clai	ms of the '135 Patent		
D690	Exhibit 71, Understanding IPSec vs. Cla	ims of the '211 Patent		
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D693	Exhibit 74, US '820 vs. Claims of the '21	1 Patent		
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D696	Exhibit 77, US '019 vs. Claims of the '50	4 Patent		
D697	Exhibit 78, US '049 vs. Claims of the '13	5 Patent		
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D699	Exhibit 80, US '049 vs. Claims of the '50	4 Patent		
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D701	Exhibit 82, US '261 vs. Claims of the '13	5 Patent		
D702	Exhibit 83, US '261 vs. Claims of the '21	1 Patent		
D703	Exhibit 84, US '261 vs. Claims of the '50	4 Patent		
D704	Exhibit 85, US '900 vs. Claims of the '13	5 Patent		
D705	Exhibit 86, US '900 vs. Claims of the '21'	1 Patent		
D706	Exhibit 87, US '900 vs. Claims of the '50	4 Patent		
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			Application Number	13/615.	557
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D708	Exhibit 89, US '671 v	s. Claims of the '	211 Patent		
D709	Exhibit 90, US '671 v	s. Claims of the '	504 Patent		
D710	Exhibit 91, JP '704 vs	. Claims of the "	35 Patent		
D711	Exhibit 92, JP '704 vs	. Claims of the '2	211 Patent		
D712	Exhibit 93, JP '704 vs	. Claims of the 's	504 Patent		
D713	Exhibit 94, GB '841 v	s. Claims of the '	135 Patent		
D714	Exhibit 95, GB '841 v	s. Claims of the '	211 Patent		
D715	Exhibit 96, GB '841 v	s. Claims of the '	504 Patent		
D716	Exhibit 97, US '318 vs	s. Claims of the	135 Patent		
D717	Exhibit 98, US '318 vs	s. Claims of the	211 Patent		
	EXHIBIT 99, US 318 vs	s. Claims of the	DU4 Patent		
D700	Exhibit 100, VPN/VLA	AN VS. Claims of	ine 135 Patent		
D720	Exhibit 101, Nikkei vs	. Claims of the 1	35 Patent		
D721	Exhibit 102, Nikkei vs	. Claims of the 2			
D722	Exhibit 103, Nikkei Vs	. Claims of the 5	ing of the 1425 Detect		
D724	Exhibit 104, Special A	Anthology Vs. Cla	ims of the 135 Patent		
D724	Exhibit 106-A, Gaunti	et System vs. Cla	aims of the 135 Patent		
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D720	Exhibit 116 IntraPort	System vs. Clair	ns of the '504 Patent		
D730	Exhibit 118 Altiga VP	N System vs. Clair	aims of the '135 Patent		
D731	Exhibit 121 Altiga VP	N System vs. Cl	aims of the '211 Patent		
D732	Exhibit 122, Altiga VP	N System vs. Cl	aims of the '504 Patent		
D733	Exhibit 124, Kiuchi vs.	Claims of the '1	35 Patent		
D734	Exhibit 127, Kiuchi vs	Claims of the '2	11 Patent		
D735	Exhibit 128 Kiuchi vs	Claims of the '5	04 Patent		
D736	Exhibit 137, Schulzrin	ne vs. Claims of	the '135 Patent		
D737	Exhibit 137, Schulzrin	ine vs. Claims of	the '135 (Final) Patent		
D738	Exhibit 140, Schulzrin	ine vs. Claims of	the '211 Patent	· · · · · · · · · · · · · · · · · · ·	
D739	Exhibit 141, Schulzrin	ne vs. Claims of	the '504 Patent		
D740	Exhibit 143, Solana vs	s. Claims of the '	135 Patent	***************************************	
D741	Exhibit 146, Solana ve	s. Claims of the "	211 Patent		
D742	Exhibit 147, Solana vs	s. Claims of the '	504 Patent		
D743	Exhibit 155, Marino vs	s. Claims of the "	135 Patent		
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D746	Exhibit 168, Aziz vs. C	Claims of the '135	5 Patent		
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D749	Exhibit 175, Valencia	vs. Claims of the	'135 Patent		
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D753	Exhibit 184, Davison v	vs. Claims of the	211 Patent		
D754	Exhibit 185, Davison v	vs. Claims of the	'504 Patent		

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D756	Exhibit 203, Broadbani Patent	d Forum Technica	il Report TR-025 (Issue 1.0/	(5.0) vs. Claims of the '135	
D757	Exhibit 206 REC 2230		Delegation Record for the D	NS vs. Claims of the '211 Patent	
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D759	Exhibit 208, REC 2538	Storing Certifica	tes in the Domain Name Sv	stem (DNS) vs. Claims of the	
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D760	Exhibit 209, RFC 2538 '504 Patent	, Storing Certifica	tes in the Domain Name Sy	stem (DNS) vs. Claims of the	
D761	Exhibit 212, RFC 2486 L2TP' vs. Claims of the	, RFC 2661, RFC e '135 Patent	2401 and Internet-Draft, "S	ecure Remote Access with	
D762	Exhibit 218, U.S. Pater	nt No. 6,496,867 i	n combination with RFC 240	01' vs. Claims of the '135 Patent	
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D765	Exhibit 222, U.S. Pater	nt No. 6,557,037 v	s. Claims of the '211 Paten	t	
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D767	Exhibit 224, RFC 2230	, Key Exchange D	Delegation Record for the DI	NS vs. Claims of the '135 Patent	
D768	Exhibit 228, U.S. 588 v	s. Claims of the '2	211 Patent (Final)		
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D771	Exhibit 231, Microsoft	VPN vs. Claims of	the '211 Patent (Final)		
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D773	Exhibit Cisco-1, Cisco'	s Prior Art System	vs. Claims of the '135 Pate	ent	
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D776	Exhibit 225, US 1037 vs	s. Claims of the 1	35 Patent	N 4	
D770	Exhibit 226, 110-1 Star	Qlaima of the (1)	Ities vs. Claims of the 135 F		
D770	Exhibit 222, US 393 VS	Application vo. Cl	of the 12 of the 125 Detect		
D790	Exhibit 233, The Miller	Application vs. Ch	ministratoria Guida ("Augett	ail Connect") ve. Claime of the	
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D781	Exhibit 235, Microsoft V	VPN vs. Claims of	the '504 Patent		
D782	Exhibit 1, IETF RFC 20 Claims of the '211 Pate	065: Domain Name	e System Security Extensio	ns; published January 1997 vs.	
D783	Exhibit 2, IETF RFC 20 Claims of the '504 Pate	065: Domain Nam ent	e System Security Extensio	ns; published January 1997 vs.	
D784	Exhibit 3, RFC 2543 vs	. Claims of the '13	35 Patent		
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	ibit 27, iPass vs. C	laims of the 135 Pa			
D802 Evt	ibit 22, iPass vs. C	laims of the '504 P			
D803 Ext	ibit 23, il assivs. C	t No. 6 453 034 ('03	A Patent") vs. Claims of th	pe 135 Patent	
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D806 Exh	ibit 27, U.S. Paten	t No. 6 223 287 (*28	87 Patent") vs. Claims of t	he 135 Patent	· · · · · · · · · · · · · · · · · · ·
D807 Exh	ibit 28, U.S. Paten	t No. 6 223 287 (*28	87 Patent") vs. Claims of t	he 211 Patent	
D808 Fyh	ibit 29, U.S. Paten	t No. 6 223 287 (*28	87 Patent") vs. Claims of t	he 504 Patent	
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D811 Exh	bit 106. Gaunlet S	system and Gaunlet	References vs. Claims of	the '135 Patent	
D812 Fxh	bit 109, Gaunlet S	system and Gaunlet	References vs. Claims of	the '211 Patent	
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D814 Exh	bit 130, Overview Patent	of Access VPNs an	nd Tunneling Technologies	("Overview") vs. Claims of the	
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D817 Exh	bit 149, Atkinson v	s. Claims of the '13	35 Patent		
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D830 Exh 6,49	bit 213, U.S. Pater 6,867 vs. Claims c	nt No. 7,100,195 in of the '135 Patent	combination with RFC 240	01 and U.S. Patent No.	
D831 Exh	bit 215, Aziz vs. C	laims of the '135 Pa	itent		
D832 Cisc	o '180, Efiling Ack	nowledgment			
D833 Exhi	bit A, U.S. Patent	7,188,180			
D834 Exhi	bit B1, File History	of U.S. Patent 7,18	38,180		
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D843	Exhibit E1,	Claim Char	ts Applying Lender	mann as a Primary Referen	ence to the '180 Patent.	
D844	Exhibit E2,	Claim Char	ts Applying Kiuchi a	as a Primary Reference to	the '180 Patent	
D845	Exhibit E3,	Claim Char	ts Applying Solana	as a Primary Reference to	o the '180 Patent	
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D847	Request fo	r Inter Parte	s Reexamination o	f Patent No. 7,188,180		
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D850	Exhibit A: l	J.S. Patent 7	7,921,211 with Terr	ninal Disclaimer	·	
D851	Exhibit B, (Certificate of	Service to Reques	t For Inter Partes Reexam	nination Under 35 U.S.C. § 311	
D852	Exhibit C1,	Claim Char	t – USP 7,921,211	Relative to Solana, Alone	and in Conjunction with RFC	
D853	Exhibit C2,	Claim Char	t – USP 7,921,211	Relative to Solana in view	of RFC 2504 and Further in	
D854	Exhibit C3,	Claim Char	t – USP 7,921,211	Relative to Provino, Alone	e and in Conjunction with RFC	
D855	Exhibit C4,	Claim Char	t – USP 7,921,211	Relative to Provino in viev	v of RFC 2230 and Further in	
D856	Exhibit C5,	Claim Char	t – USP 7,921,211	Relative to Provino in viev	v of RFC 2504 and in Further	
D857	Exhibit C6,	Claim Char	t – USP 7,921,211	Relative to Beser, Alone a	and in Conjunction with RFC	
D858	Exhibit C7,	Claim Charl	t – USP 7,921,211 eed, and Beser	Relative to RFC 2230, Alc	one and in Conjunction with	
D859	Exhibit C8, RFC 920. F	Claim Charl RFC 2401. R	t – USP 7,921,211 eed, Beser, and R	Relative to RFC 2538, Alc FC 2065	one and in Conjunction with	
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D861	Exhibit D2, based on 7	Asserted Cl ,921,211 Pa	aims and Infringerr tent	ent Contentions by Plaint	iff VirnetX, Inc. against Apple	
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D878 Exhibit C6, Claim Chart – USP 7,418,504 Relative to Beser, Alone and in Conjunction with I 920, RFC 2401, and Reed	RFC
D879 Exhibit C7, Claim Chart – USP 7,418,504 Relative to RFC 2230, Alone and in Conjunction v RFC 920, RFC 2401, Reed, and Beser	vith
D880 Exhibit C8, Claim Chart – USP 7,418,504 Relative to RFC 2538, Alone and in Conjunction v RFC 920, RFC 2401, Reed, Beser, and RFC 2065	vith
D881 Exhibit D1, Asserted Claims and Infringement Contentions by Plaintiff VirnetX Inc. in VimetX Cisco Systems, Inc., Applce, Inc, Aastra Technologies Ltd., NEC Corporation, NEC Corpora America and Aastra USA, Inc., Civ. Act. 6:2010cv00417 (E.D. Tex)	(, Inc. v. tion of
D882 Exhibit D2, Asserted Claims and Infringement Contentions by Plaintiff VirnetX Inc. against A Inc. Based on the 7,418,504	pple
D883 Exhibit X5, Eastlake, D., et al., IETF RFC 2538, "Storing Certificates in the Domain Name S (DNS)" (March 1999)	ystem
D884 Exhibit X6, Kent, S. IETF RFC 2401, "Security Architecture for the Internet Protocol, (November1998) http://www.ietf.org/rfc/rfc2401.txt	
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D888 Transmittal Letter	
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D890 Exhibit D-7, "Thomas": Brian Thomas, "Recipe for E-Commerce, IEEE Internet Computing, (Dec. 1997)	Nov
D891 Exhibit D-9, "Kent II": Stephen Kent & Randall Atkinson, "IP Encapsulating Security Payload Internet Engineering Task Force, Internet Draft (Feb. 1998)	(ESP),"
D892 Exhibit C1, Claim Chart – USP 7,921,211 Relative to Solana, Alone and in Conjunction with 920, Reed and Beser (Came from Inval. Cisco dtd 11/18/11)	RFC
D893 Exhibit C2, Claim Chart – USP 7,921,211 Relative to Solana in View of RFC 2504 and Furth Conjunction with RFC 920, Reed, and Beser	er in
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D895 Exhibit C4, Claim Chart – USP 7,921,211 Relative to Provino in View of RFC 2230 and Furth Conjunction with RFC 920, Reed and Beser	ner in
D896 Exhibit C5, Claim Chart – USP 7,921,211 Relative to Provino in View of RFC 2504 and in Fu Conjunction with RFC 920, Reed and Beser	rther

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			Application Number	13/615,557	
FORM	ATION DISCLOSU	JRE	Filing Date	September 13, 2	2012
ATEM	ENT BY APPLICA	NT	First Named Inventor	Victor Larson	<u> </u>
e as many	sheets as necessary)		Art Unit	2431	
			Examiner Name	Not Yet Assign	ed
т		1	Docket Number	77580-177 (VRNK-0001	CP3CON8)
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D897	920, RFC 2401, and R	r – USP 7,921,211 eed	Relative to Beser, Alone a	and in Conjunction with RFC	
D898	Exhibit C7, Claim Chart – USP 7,921,211 Relative to RFC 2230, Alone and in Conjunction with RFC_920, Reed, and Beser				
D899	Exhibit C8, Claim Chai RFC 920, RFC 2401, F	t – USP 7,921,211 Reed, Beser, and R	Relative to RFC 2538, Alo FC 2065	one and in Conjunction with	
D900	211 Request for Inter F	Partes Reexaminati	on		
D901	Exhibit C1, Claim Char 920, Reed and Beser	t – USP 7,418,504	Relative to Solana, Alone	and in Conjunction with RFC	
D902	Exhibit C2, Claim Char Conjunction with RFC	t – USP 7,418,504 920, Reed, and Be	Relative to Solana in Viev ser	v of RFC 2504 and Further in	
D903	Exhibit C3, Claim Char 920, Reed, and Beser	t – USP 7,418,504	Relative to Provino, Alone	e and in Conjunction with RFC	
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D905	Exhibit C6, USP 7,418 and Reed	,504 Relative to Be	ser, Alone and in Conjunc	tion with RFC 920, RFC 2401,	······································
D906	Exhibit C7, Claim Chart – USP 7,418,504 Relative to RFC 2230, Alone and in Conjunction with REC 920, REC 2401, Reed, and Beser				
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D909	Defendants' Supplemental Joint Invalidity Contentions				
D910	Exhibit 226, Securing V	Veb Access with D	CE vs. Claims of the '135	Patent	
D911	Exhibit 227, Securing V	Veb Access with De	CE vs. Claims of the '151	Patent	
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D916	Exhibit 232, Understan	ding OSF DCE 1.1	for AIX and OS/2 vs. Clai	ms of the '504 Patent	
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D921	Exhibit 237, U.S. '648	vs. Claims of the '1	35 Patent		
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D030	Exhibit 247, U.S. 393 M	Application of the 1.			
D932	Exhibit 248, The Miller	Application vs. Clai	f the 115 OF THE 135 Patent		
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D935	Exhibit 251, U.S. Paten	T NO. 5,940,393 VS	Uaims of the 151 Paten	τ	
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D937	Exhibit 253, U.S. Patent No.6,324	648 vs. Claims of the '151 Patent				
D938	Exhibit 254, U.S. Patent No.6,857	072 vs. Claims of the '151 Patent				
D939	Exhibit A, Aventail Press Release,	May 2, 1997				
D940	Exhibit B, InfoWorld, "Aventail Del 64D, (1997)	vers Highly Secure, Flexible VPN	Solution," InfoWorld, page			
D941	Exhibit C, Aventail AutoSOCKS v2	.1 Administrator's Guide				
D942	Exhibit D, Aventail Press Release,	October 12, 1998				
D943	Exhibit G, Aventail Press Release	May 26, 1999				
D944	Exhibit H, Aventail Press Release,	August 9, 1999				
D945	Exhibit J, "Aventail ExtraNet Cente June 28, 1999	r 3.1: Security with Solid Managen	nent, Network Computing,			
D946	Petition in Opposition to Patent Ov Determination on Certain Prior Art	ner's Petition to Vacate Inter Parte	es ReExamination			
D947	Request for Inter Partes Reexamir	ation Under 35 U.S.C. § 311				
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D949	Exhibit C1, Claim Chart Aventail C	Exhibit C1, Claim Chart Aventail Connect v3.1				
D950	Exhibit C2, Claim Chart Aventail C	onnect v3.01				
D951	Exhibit C3, Claim Chart Aventail AutoSOCKS					
D952	Exhibit C4, Claim Chart Wang					
D953	Exhibit C5, Claim Chart Beser					
D954	Exhibit C6, Claim Chart BINGO					
D955	Exhibit X6, U.S. Patent 6,496,867					
D956	Exhibit X10, U.S. Patent 4,885,778					
D957	Exhibit X11, U.S. Patent 6,615,357					
D958	Exhibit Y3, U.S. Patent 5,950,519					
D959	Request for Inter Partes Reexamir	ation Transmittal Form	· · · · · · · · · · · · · · · · · · ·			
D960	Transmittal Letter					
D961	Exhibit D, v3.1 Administrator's Gui	de				
D962	Exhibit E-1, Claim Charts Applying	Kiuchi to Various Claims of the '13	35 Patent			
D963	Exhibit E-2, Claim Charts Applying	Wesinger to Various Claims of the	e '135 Patent			
D964	Exhibit E-3, Claim Charts Applying	Solana to Various Claims of the '1	35 Patent			
D965	Exhibit E-4, Claim Charts Applying	Aziz to Various Claims of the '135	Patent			
D966	Request for Inter Partes Reexamin	ation Transmittal Form				
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D970	Exhibit E-2, Claim Charts Applying	Blum to Claims of the '151 Detect				
D080	Exhibit E-4, Claim Charts Applying	Aziz and Edwards and Aziz Edw	ards, and Martin to Claims of			
	the '151 Patent		aree, and martin to Claims Of			

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D981	Exhibit E-5, C	Laim Char atent	rts Applying Kiuch	i and Edwards, and Kiuchi,	Edwards, and Martin to Claims	
D982	Exhibit E-6, C Claims of the	Claim Char 151 Pate	rts Applying Wesir ent	iger and Edwards, and We	singer, Edwards, and Martin to	
D983	Exhibit A, U.S	S. Patent 6	5,839,759			
D984	Exhibit C-1, L	J.S. Paten	t 6,502,135			
D985	Exhibit E-1, C	Claim Char	ts Applying Kiuch	, as Primary Reference to	the '759 Patent	
D986	Exhibit E-2, C	Claim Char	ts Applying Kent a	as a Primary Reference to t	the '759 Patent	
D987	Exhibit E-3, C	Claim Char	ts Applying Aziz a	s a Primary Reference to t	he '759 Patent	
D988	Exhibit E-4, C References to	Claim Char o the '759	ts Applying Kent i Patent	n View of Caronni as a Prir	mary Combination of	
D989	Request for I	nter Partes	s Reexamination 1	ransmittal Form		
D990	Request for Ir	nter Partes	s Reexamination		· · · ·	
D991	PTO Form 14	49				
D992	Certificate of	Service to	Request for Inter	Partes Reexamination Unc	der 35 U.S.C. § 311	
D993	Request for Ir	Request for Inter Partes Reexamination				
D994	Request for Ir	Request for Inter Partes Reexamination Transmittal Form				
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D997	Exhibit C1, Cl 920, Reed an	Exhibit C1, Claim Chart – USP 7,921,211 Relative to Solana, Alone and in Conjunction with RFC 920, Reed and Beser				
D998	Exhibit C2, Cl conjunction w	Exhibit C2, Claim Chart – USP 7,921,211 Relative to Solana in view of RFC 2504 and Further in conjunction with RFC 920, Reed, and Beser				
D999	Exhibit C3, Cl 920, Reed, ar	laim Chart nd Beser	– USP 7,921,211	Relative to Provino, Alone	and in Conjunction with RFC	
D1000	Exhibit C4, Cl Conjunction w	aim Chart vith RFC 9	– USP 7,921,211 20, Reed and Bes	Relative to Provino in view er	v of RFC 2230 and Further in	
D1001	Exhibit C5, Cl Conjunction w	aim Chart vith RFC 9	– USP 7,921,211 20, Reed and Bes	Relative to Provino in view er	v of RFC 2504 and in Further	
D1002	Exhibit C6, Cl 920, RFC 240	aim Chart)1, and Re	– USP 7,921,211 ed	Relative to Beser, Alone a	nd in Conjunction with RFC	
D1003	Exhibit C7, Cl RFC 920, RFC	aim Chart C 2401, R	– USP 7,921,211 eed, and Beser	Relative to RFC 2230, Alo	ne and in Conjunction with	
D1004	Exhibit C8, CI RFC 920, RFC	aim Chart C 2401, Re	– USP 7,921,211 eed, Beser, and R	Relative to RFC 2538, Alo FC 2065	ne and in Conjunction with	
1005	Exhibit D1, As Cisco System America and A	sserted Cla is, Inc., Ap Aastra US,	aim and Infringem ple Inc., Aastra Te A, Inc., Civ. Act 6:	ent Contentions by Plaintiff echnologies Ltd, NEC Corp 2010cv00417 (E.D. Tex)	VirnetX, Inc. in VimetX, Inc. v. poration, NEC Corporation of	
D1006	Exhibit D2, As based on 7,92	sserted Cla 21,211 Pat	aims and Infringen ent	nent Contentions by Plainti	ff VirnetX, Inc. against Apple	
D1007	Exhibit B1, Fil	e History o	of U.S. Patent 7,4	18,504		
D1008	Exhibit B2, Fil	e History o	of U.S. Patent App	lication No. 09/558,210		
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D1012	Exhibit D-13, I	Pallen, "Th	ne World Wide We	b," British Medical Journal,	, Vol. 311 at 1554 (Dec. 1995)	
D1013	Exhibit D-14, I Cryptosystem	Rivest et a s," Commu	I., "A Method for C unications of the A	Obtaining Digital Signatures CM, 21:120-126 (Feb. 197	s and Public-Key 8)	
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		Application Number	13/615,557			
		Filing Date	September 13, 2012			
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-		Art Unit	2431			
		Examiner Name	Not Yet Assigned			
		Docket Number	77580-177 (VRNK-0001CP3CON8)			
D1015	Exhibit D-17, Pfaffenberger, Netscape I Academic Press (1996)	Navigator 3.0: Surfing the Wi	eb and Exploring the Internet,			
D1016	Exhibit D-18, Gittler et al., "The DCE Se (Dec. 1995)	ecurity Service," Hewlett-Pac	kard Journal, pages 41-48			
D1017	Exhibit D-6, Copy of U.S. Patent No. 5,	689,641				
D1018	Exhibit D-9, Lawton, "New Top-Level De 1996	omains Promise Descriptive	Names," Sunworld Online,			
D1019	Exhibit E-1, Copy of Catalog Listing by to the <i>Lendenmann</i> reference. The link on December 7, 1998 and retrieved by	IBM for RS/6000 Redbooks to the <i>Lendenmann</i> referen the Wayback Machine	Collection which includes a Link ce was archived at archive.org			
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D1025	Exhibit F-2, Claim Charts applying Aziz	Exhibit F-2, Claim Charts applying Aziz as a Primary Reference to the '504 Patent				
D1026	Exhibit F-3, Claim Charts applying Kiuchi and Pfaffenberger as Primary References to the '504 Patent					
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D1040	Exhibit C3, Claim Chart – USP 7,921,21	1 relative to Provino, alone	and in conjunction with RFC			
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D1041	Exhibit C4, Claim Chart – USP 7,921,21 conjunction with RFC 920, Reed and Be Exhibit C5, Claim Chart – USP 7 921,21	1 relative to Provino in view eser 1 relative to Provino in view	of RFC 2504 and in further			

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				Examiner Name	Not Yet Assign	ed
				Docket Number	77580-177 (VRNK-0001	CP3CON8)
D1043	Exhibit C6 RFC 2401	5, Claim Char , and Reed	t – USP 7,921,21 ⁻	Irelative to Beser, Alone and	d in conjunction with RFC 920,	
D1044	Exhibit C7 2401, Ree	, Claim Char	t – USP 7,921,21 ⁻ r	I relative to RFC 2230, alon	e and in conjunction with RFC	
D1045	Exhibit C8 920, RFC	Exhibit C8, Claim Chart – USP 7,921,211 relative to RFC 2538, alone and in conjunction with RFC 920, RFC 2401, Reed, Beser, and RFC 2065				
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D1049	Exhibit C3 920, Reed	, Claim Char , and Beser	t – USP 7,418,504	relative to Provino, alone a	nd in conjunction with RFC	
D1050	Exhibit C5 conjunctio	, Claim Char n with RFC 9	t – USP 7,418,504 20, Reed and Bes	relative to Provino in view over	of RFC 2504 and in further	
D1051	Exhibit C6 and Reed	Exhibit C6, USP 7,418,504 relative to Beser, alone and in conjunction with RFC 920, RFC 2401, and Reed				
D1052	Exhibit C7 920, RFC (Exhibit C7, Claim Chart – USP 7,418,504 relative to RFC 2230, alone and in conjunction with RFC 920, RFC 2401, Reed, and Beser				
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		Examiner Name	Not Yet Assigne	ed		
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			Art Unit	2431	
			Examiner Name	Not Yet Assigned	20010
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	First Named Inventor	Victor Larson				
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D1223	Kiuchi, "C-HTTP The Development of Department of Epidemiology and Bios	a Secure, Closed HTTP-Based statistics, Faculty of Medicine, L	d Network on the Internet," Iniversity of Tokyo, Japan		
D1224	Lee et al., "Uniform Resource Locator 1994 (25 pages)	_ee et al., "Uniform Resource Locators (URL)," Network Working Group, RFC 1738, December 1994 (25 pages)			
D1225	VPN 3000 Concentrator Series, User	2N 3000 Concentrator Series, User Guide; Release 2.5 July 2000 (489 pages)			
D1226	PN 3000 Concentrator Series, Getting Started; Release 2.5 July 2000 (122 pages)				
D1227	Fratto, Altiga Concentrates on VPN Security (Hardware Review Evaluation), Network Computing, March 22, 1999 (2 pages)				
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D1229	Altiga Proves Multi-Vendor Interopera Significant Development in the VPN N	bility for Seamless VPN Deploy larket, July 12, 1999 (2 pages)	ment; VPN Workshop Marks		
D1230	Altiga VPN Concentrator Series (C50) 4500, VPN Tunneling competitive Eva	Versus Nortel Networks Contiv Iluation, 1999 (6 pages)	vity Extranet Switch 4000 and		
D1231	VPN 3000 Client User Guide, Release	e 2.5, July 2000 (94 pages)			
D1232	Digital Certificates Design Specification	on for Release 2.0, May 17, 199	9 (21 pages)		
D1233	Altiga IPSec Client Architecture, Revis	sion 1.0, April 5, 1999 (34 pages	s)		
D1234	Altiga IPSec Functional Specification,	Revision 2.1, (17 pages)			
D1235	Altiga Product Requirements, Revisio	n 1.7, May 26, 1998 (17 pages)			
D1236	Altiga Network Lists Feature Function	al Specification, Revision 1.0, (7	7 pages)		
D1237	Altiga Split Tunneling Functional/Desig	gn Specification, (15 pages)			
D1238	Altiga Digital Certificate Support for IP pages)	Sec Client V2.1 Functional Spe	cification, August 12, 1999 (24		
D1239	Altiga IPSec LAN to LAN Tunnel Auto	discovery Functional Specificati	on, (5 pages)		
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D1241	Altiga VPN Concentrator Getting Start	ed, Revision 1, March 1999 (11	6 pages)		
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Subst. for form 1449/PTO				Complete if Known	7-GAU: 2		
			Application Number	13/615,557	7		
INFORMATION DISCLOSURE			Filing Date	September 13, 2)12		
STATEN	IENT BY APPLICA	NT	First Named Inventor	Victor Larson	<u></u>		
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		Examiner Name	Not Yet Assigned				
	Docket Number 77580-177 (VRNK-000		77580-177 (VRNK-0001)	CP3CON8)			
D124	6 Altiga VPN Concentrat	Altiga VPN Concentrator User Guide, Revision 1.1, March 1999 (304 pages)					
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D1249	9 Altiga VPN Concentrate	or User Guide, Ve	rsion 5, March 2000 (606 pa	iges)			
D1250	0 Altiga VPN Client Insta	llation and User G	uide, Version 2, July 1999 (92 pages)			
D125	Altiga VPN Concentrate pages)	Altiga VPN Concentrator VPN Client Installation and User Guide, Version 3, December 1999 (113 pages)					
D1252	2 Altiga VPN Concentrate pages)	Altiga VPN Concentrator VPN Client Installation and User Guide, Version 4, March 2000 (118 pages)					
D1253	³ Altiga Networks VPN C Testing, are also Descr	oncentrator and Vibed in Marketing	/PN Client, as well as their P Materials and Publications (Public Demonstrations and (4 pages)			

All references with no date, there are no date provided. /K.L./

/Krisna Lim/

07/24/2013

Subst. for form 1449/PTO	Complete if Known		
	Application Number	13/615,557	
INFORMATION DISCLOSURE	Filing Date	September 13, 2012	
STATEMENT BY APPLICANT	First Named Inventor	Victor Larson	
(Use as many sheets as necessary)	Art Unit	2431	
	Examiner Name	Not Yet Assigned	
	Docket Number	77580-177 (VRNK-0001CP3CON8)	

CERTIFICATION STATEMENT

[X] Under 37 C.F.R. 1.98(d), copies of all patent, publication, pending U.S. application or other information that was previously submitted to, or cited by the USPTO in an earlier application are not required. Applicant will provide copies of the previously submitted references at the Examiner's request.

This application claims priority from and is a continuation of a co-pending U.S. Application No. 13/049,552, filed March 16, 2011, which is a continuation of U.S. Application No. 11/840,560, filed August 17, 2007, now U.S. Patent No. 7,921,211, issued April 5, 2011, which is a continuation of U.S. Application No. 10/714,849, filed November 18, 2003, now U.S. Patent No. 7,418,504, issued August 26, 2008, which is a continuation of U.S. Application No. 09/558,210, filed April 26, 2000, now abandoned, which is a continuation-in-part of U.S. Application No. 09/504,783, filed on February 15, 2000, now U.S. Patent No. 6,502,135, issued December 31, 2002, which claims priority from and is a continuation-in-part patent application of previously-filed U.S. Application No. 09/429,643, filed on October 29, 1999, now U.S. Patent No. 7,010,604, issued March 07, 2006.

Please See 37 CFR 1.97 and 1.98 to make the appropriate selection(s)

- [X] Information Disclosure Statement is being filed with the filing of the application or before the receipt of a first office action.
- [] That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or
- [] That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.
- [] The Commissioner is hereby authorized to charge the fee pursuant to 37 CFR 1.17(P) in the amount of \$180.00, or further fees which may be due, to Deposit Account 50-1133.
- [] Information Disclosure Statement is being filed with the Request for Continued Examination. The Commissioner is hereby authorized to charge the fee pursuant to 37 CFR 1.17(P) in the amount of \$810.00, or further fees which may be due, to Deposit Account 50-1133.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

lL

Toby H. Kusmer;Reg. No.:26,418 McDermott Will & Emery L.L.P. 28 State Street Boston, MA 02109 Tel. (617) 535-4000 Fax (617) 535-3800 Date: October 22, 2012
Subst. for form 1449/PTO				Complete if Known						
INFORM	ATION DI	SCLOSURE STATEME	NT BY	Ap	plication Number		13/6	15,557		
APPLICA	NT			Fili	Filing Date First Named Inventor			3-2012	****	
(Use as ma	ny sheets a	s necessary)		Fir				Larson		
				Art	Unit		24	453		
				Ex	aminer Name		Kris	na Lim		
				Do	ocket Number	77580-177	(VRN	K-0001CP	3CON8)	
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EXAMINER' S INITIALS	CITE NO.	Patent Number	Publication Da	ate	Name of Patentee o Cited Docu	r Applicant of ment	Page Relev	es, Columns, Li vant Passages Figures App	nes, Where or Relevant bear	
	A170	6,434,600	08/13/200	2	Waite et	al.				
	A171	7,225,249	05/29/200	7	Barry et	al.				
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	D1414	Office Action dated Augu	ust 19, 2013 fro	om C	orresponding U.S. A	pplication Num	ber 13/9	903 788	1	
		EXAMINER				DATE CONSID	ERED			
MANNED				<u> </u>						

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.
 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

Application Number	13/615,557
Ciling Data	
Filing Date	09-13-2012
First Named Inventor	Victor Larson
Art Unit	2453
Examiner Name	Krisna Lim
Docket Number	77580-177 (VRNK-0001CP3CON8)
	First Named Inventor Art Unit Examiner Name Docket Number

CERTIFICATION STATEMENT

Please See 37 CFR 1.97 and 1.98 to make the appropriate selection(s)

- [] Information Disclosure Statement is being filed with the filing of the application or before the receipt of a first office action.
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- [X] That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § <u>1.56(c)</u> more than three months prior to the filing of the information disclosure statement.
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- [] Information Disclosure Statement is being filed with the Request for Continued Examination. The Commissioner is hereby authorized to charge the fee pursuant to 37 CFR 1.17(P) in the amount of \$810.00, or further fees which may be due, to Deposit Account 50-1133.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Date: September 30, 2013

<u>/Toby H. Kusmer/</u> Toby H. Kusmer; Reg. No.:26,418 McDermott Will & Emery LLP 28 State Street Boston, MA 02109 Tel. (617) 535-4000 Fax (617) 535-3800

DM_US 45414536-1.077580.0177

Electronic Acl	knowledgement Receipt
EFS ID:	16990580
Application Number:	13615557
International Application Number:	
Confirmation Number:	1089
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES
First Named Inventor/Applicant Name:	Victor Larson
Customer Number:	23630
Filer:	Toby H. Kusmer./Kerrie Jones
Filer Authorized By:	Toby H. Kusmer.
Attorney Docket Number:	077580-0177
Receipt Date:	30-SEP-2013
Filing Date:	13-SEP-2012
Time Stamp:	15:00:00
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment			no			
File Listin	g:					
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1	Information Disclosure Statement (IDS) Form (SB08)		177.pdf	124933 f0e27726a4e6205613ebdcef28d203a5601 68afa	no	2
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APPLICA	NT	00000				F	iling Date	Date 09-13-2012					
(Use as ma	ny sheets a	s neces	sary)			F	First Named Inventor Victor Larson						
						A	Art Unit 2453						
					E	Examiner Name Krisna Lim							
						ocket Number		77580-177	7 (VRNI	K-0001CF	230	CON8)	
U.S.							ATENTS						
EXAMINER' S INITIALS	CITE NO.		Patent Number		Publication Da	te	Name of Patentee of Cited Docu	or A me	pplicant of nt	Page Relev	s, Columns, I ant Passage Figures Ap	Lines s or opea	s, Where Relevant r
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.
 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

Subst. for form 1449/PTO	Complete if Known			
INFORMATION DISCLOSURE STATEMENT BY	Application Number	13/615,557		
APPLICANT	Filing Date	09-13-2012		
(Use as many sheets as necessary)	First Named Inventor	Victor Larson		
	Art Unit	2453		
	Examiner Name	Krisna Lim		
	Docket Number	77580-177 (VRNK-0001CP3CON8)		
CERTIFI	CATION STATEMENT			

Please See 37 CFR 1.97 and 1.98 to make the appropriate selection(s)

- [] Information Disclosure Statement is being filed with the filing of the application or before the receipt of a first office action.
- [] That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or
- [X] That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § <u>1.56(c)</u> more than three months prior to the filing of the information disclosure statement.
- [] The Commissioner is hereby authorized to charge any required fees to Deposit Account 50-1133.
- [] Information Disclosure Statement is being filed with the Request for Continued Examination. The Commissioner is hereby authorized to charge the fee pursuant to 37 CFR 1.17(P) in the amount of \$810.00, or further fees which may be due, to Deposit Account 50-1133.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Date: September 30, 2013

<u>/Toby H. Kusmer/</u> Toby H. Kusmer; Reg. No.:26,418 McDermott Will & Emery LLP 28 State Street Boston, MA 02109 Tel. (617) 535-4000 Fax (617) 535-3800

DM_US 45488253-1.077580.0177

Electronic Acl	knowledgement Receipt
EFS ID:	17040648
Application Number:	13615557
International Application Number:	
Confirmation Number:	1089
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES
First Named Inventor/Applicant Name:	Victor Larson
Customer Number:	23630
Filer:	Toby H. Kusmer.
Filer Authorized By:	
Attorney Docket Number:	077580-0177
Receipt Date:	04-OCT-2013
Filing Date:	13-SEP-2012
Time Stamp:	16:44:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment			no			
File Listin	g:					
Document Number	Document Description		File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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APPLICA	NT				Fi	iling Date	09-13-2012			
(Use as ma	ny sheets a	s necessary)			First Named Inventor Victor Larson					
					Art Unit 2453					
					Examiner Name Krisna Lim					
					D	ocket Number	77580-177	(VRNI	<-0001CP	3CON8)
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EXAMINER' S INITIALS	CITE NO.	CITE NO. Patent Number Publication Date		te	Name of Patentee o Cited Docur	r Applicant of nent	Pages, Columns, Line Relevant Passages or Figures Appea		nes, Where or Relevant ear	
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		EXAMINER					DATE CONSIE	DERED	<u> </u>	

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(Use as many sheets as necessary)	First Named Inventor	Victor Larson			
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	Examiner Name	Krisna Lim			
	Docket Number	77580-177 (VRNK-0001CP3CON8)			
CEDTIFI	CATION CTATEMENT				

CERTIFICATION STATEMENT

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SIGNATURE

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Date: October 16, 2013

<u>Toby H. Kusmer/</u> Toby H. Kusmer; Reg. No.:26,418 McDermott Will & Emery LLP 28 State Street Boston, MA 02109 Tel. (617) 535-4000 Fax (617) 535-3800

DM_US 45906357-1.077580.0177

Electronic Acl	knowledgement Receipt
EFS ID:	17139233
Application Number:	13615557
International Application Number:	
Confirmation Number:	1089
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES
First Named Inventor/Applicant Name:	Victor Larson
Customer Number:	23630
Filer:	Toby H. Kusmer./Kerrie Jones
Filer Authorized By:	Toby H. Kusmer.
Attorney Docket Number:	077580-0177
Receipt Date:	16-OCT-2013
Filing Date:	13-SEP-2012
Time Stamp:	15:19:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment no								
File Listing:								
Document Number	Document Description		File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)		
1	Information Disclosure Statement (IDS) Form (SB08)		177.pdf	54300 27fe8865ef9a2e342039779af1877cd52f93 bafe	no	2		
Warnings:								
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2	Non Patent Literature	OAdta 10101 strom 198.pdf	d56153c9d55e745fc982c7e8ebe2743382f4 7380	no		
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Victor Larson, <i>et al</i> .	:	
Serial No.: 13/615,557	:	Confirmation No. 1089
Filed: September 13, 2012	:	Group Art Unit: 2453
Customer Number: 23630	·	Examiner: Lim, Krisna

For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES

Mail Stop Amendment Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450

AMENDMENT

Dear Commissioner:

In response to the Office Action mailed from the United States Patent and Trademark Office on August 1, 2013, please enter and consider the following:

Claims begin on page 2 of this paper.

Remarks begin on page 7 of this paper.

AMENDMENTS TO THE CLAIMS

This listing of the claims will replace all prior versions and listings of claims in the application:

 (Currently Amended) A method of transparently creating an encrypted communications channel between a client device and a target device, each device being configured to allow <u>audio video secure data</u> communications between the client device and the target device over the encrypted communications channel once the encrypted communications channel is created, the method comprising:

(1) <u>receiving intercepting</u> from the client device a request <u>for a networkto look up</u> <u>an Internet Protocol (IP)</u> address <u>corresponding to a domain name</u> associated with the target device;

(2) determining whether the request to look up the IP address transmitted in step
 (1) is requesting accesscorresponds to a device that accepts an encrypted channel
 connection with the client device; and

(3) in response to determining, in step (2), that the address-request to look up the <u>IP address</u> in step (2) is requesting access<u>corresponds</u> to a device that accepts an encrypted communications channel connection with the client device, providing provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device such that the encrypted communications channel supports secure <u>audio/videodata</u> communications transmitted between the two devices, the client device being a device at which a user accesses the encrypted communications channel.

- 2. (Currently Amended) The method of claim 1, wherein providing the provisioning information required to initiate the encrypted communications channel is based on a determination that the target device is a device with which an encrypted communications channel can be established when the <u>IP</u> address request corresponds to a target device identified in an network address lookup.
- 3. (Canceled)

- 4. (Currently Amended) The method of claim 1, wherein the address request includes<u>domain</u> <u>name is</u> a secure domain name.
- 5. (Original) The method of claim 1, wherein the encrypted communications channel is a broadband connection.
- 6. (Original) The method of claim 1, wherein the encrypted communications channel is an unmodulated transmission link.
- (Currently Amended) The method of claim 1, wherein the encrypted communications channel is a <u>umodulated modulated</u> transmission link.
- 8. (Currently Amended) The method of claim 1, wherein the encrypted communications channel supports at least one of the following: <u>FDMFTM</u>, TDM and CDMA.
- 9. (Original) The method of claim 1, wherein the client device is a phone.
- 10. (Currently Amended) The method of claim 9, wherein providing the provisioning information required to initiate the encrypted communications channel is based on a determination that the target device is a device with which an encrypted communications channel can be established when the <u>IP</u> address request corresponds to a target device identified in an network address lookup.
- 11. (Canceled)
- (Currently Amended) The method of claim 9, wherein the address request includes<u>domain</u> <u>name is</u> a secure domain name.
- 13. (Canceled)
- 14. (Original) The method of claim 9, wherein the encrypted communications channel is an unmodulated transmission link.
- (Original) The method of claim 9, wherein the encrypted communications channel is a modulated transmission link.

- (Currently Amended) The method of claim 9, wherein the encrypted communications channel supports at least one of the following: FTMFDM, TDM and CDMA.
- 17. (Currently Amended) The method of claim 9claim 1, wherein the target device is a server.
- 18. (Currently Amended) The method of claim 9claim 1, wherein the target device is a phone.
- 19. (Currently Amended) A system for transparently creating an encrypted communications channel between a client device and a target device, each device being configured to allow audio videosecure data communications therebetween over an encrypted communications channel once the encrypted communications channel is created, the system including a memory storing instructions, and a server configuration arranged to:

(1) receive intercept from the client device a request to look up an Internet Protcol (IP)for a network address corresponding to a domain name associated with the target device;

(2) determine whether the request <u>to look up the IP address</u> transmitted in step (1) is requesting access<u>corresponds</u> to a device that accepts an encrypted channel connection with the client device; and

(3) in response to determining, in step (2), that the <u>request to look up the IP</u> address request in step (2) is requesting access<u>corresponds</u> to a device that accepts an encrypted communications channel connection with the client device, provide provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device such that the encrypted communications channel supports secure audio/video <u>data</u> communications transmitted between the two devices, the client device being a device at which a user accesses the encrypted communications channel.

 (Currently Amended) A system according to claim 19, wherein the encrypted communications channel supports a plurality of services-comprising a plurality of communication protocols, a plurality of application programs, multiple sessions, or a combination thereof.

- 21. (New) The system according to claim 19, wherein the plurality of services comprises a plurality of communication protocols, a plurality of application programs, multiple sessions, or a combination thereof.
- 22. (New) The system according to claim 21, wherein the plurality of other application programs comprises at least one of the following: e-mail, a word processing program, and telephony.
- (New) The system according to claim 19, wherein the domain name is a secure domain name.
- 24. (New) The system according to claim 19, wherein the encrypted communications channel is a broadband connection.
- 25. (New) The system according to claim 19, wherein the encrypted communications channel is an unmodulated transmission link.
- 26. (New) The system according to claim 19, wherein the encrypted communications channel is a modulated transmission link.
- 27. (New) The system according to claim 19, wherein the encrypted communications channel supports at least one of the following: FDM, TDM and CDMA.
- 28. (New) The system according to claim 19, wherein the client device is a phone.
- 29. (New) The system according to claim 19, wherein the target device is a server.
- 30. (New) The system according to claim 19, wherein the target device is a phone.
- 31. (New) The system according to claim 19, wherein intercepting the request consists of the system receiving the request to determine whether the target device accepts an encrypted channel connection with the client device.
- 32. (New) The system according to claim 19, wherein intercepting the request occurs within another device that is separate from the client device.

- 33. (New) The method according to claim 1, wherein intercepting the request consists of receiving the request to determine whether the target device accepts an encrypted channel connection with the client device.
- 34. (New) The method according to claim 1, wherein the intercepting the request occurs within another device that is separate from the client device.
- 35. (New) The method according to claim 1, wherein the encrypted communications channel supports a plurality of services.
- 36. (New) The method according to claim 35, wherein the plurality of services comprises a plurality of communication protocols, a plurality of application programs, multiple sessions, or a combination thereof.
- 37. (New) The method according to claim 36, wherein the plurality of other application programs comprises at least one of the following: e-mail, a word processing program, and telephony.

REMARKS

After entry of the foregoing amendments, claims 1, 2, 4-10, and 12, 14-37 are pending in the application, with claims 1 and 19 being the independent claims. Claims 3, 11, 13 are canceled without prejudice or disclaimer of subject matter. Claims 1, 2, 4, 7, 8, 10, 12, and 16-20 are amended, and new dependent claims 21-37 are added. No new matter is believed to have been added herein.

Claim Rejection – Double Patenting

Claims 1-20 are rejected on the ground of nonstatutory obviousness-type double patenting over various claims of U.S. Patent Nos. 7,933,990 and 7,490,151, and claims 1-19 are rejected on the ground of nonstatutory obviousness-type double patenting over various claims of U.S. Patent No. 6,502,135. Without conceding the correctness of the double patenting rejections, Applicants respectfully request reconsideration and withdrawal of the double patenting rejections in view of the foregoing claim amendments. Additionally or in the alternative, Applicants request that the requirement to file a terminal disclaimer be held in abeyance until the claims are indicated to be otherwise allowable.

Claim Rejection – 35 U.S.C. § 103

Claims 1-20 are rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 5,898,830 ("*Wesinger*"). Reconsideration and withdrawal of the § 103 rejections are respectfully requested in view of the following remarks.

As an initial matter, the analysis provided by the Office Action does not address the language of the claims. For example, regarding claim 1, the Office Action contends that *Wesinger* discloses "a memory configured and arranged to facilitate a connection . . . of the client device . . . with a target device . . . over a secure communication link created . . . based on (i) an <u>address request generated by the client device</u> . . . and (ii) a determination as a result of the address request that the target device is a device with which a <u>secure communication link can be established</u>." (Office Action at 4-5 (emphasis in original).) However, original claim 1 does not recite these features, or other features used to support the rejection. Since the Office Action has not addressed the claim language of original claim 1, the Office Action has not provided

sufficient evidence to establish a *prima facie* case of obviousness with respect to original claim 1. Accordingly, the rejection of claim 1 is deficient.

Wesinger teaches a firewall system that is configured as two or more sets of virtual hosts, with DNS mappings between the virtual hosts and respective remote hosts to be accessed through network interfaces of the firewall. (*Wesinger* Abstract.) The virtual hosts and DNS mappings enable transparent communications through the firewall. Each firewall "selectively allows 'acceptable' computer transmissions to pass through it and disallows other non-acceptable computer transmissions." (*Id.* at 1:8-12.)

In *Wesinger*, "[w]hen a connection request is received, the firewall spawns a process, or execution thread, to create a virtual host VHn to handle that connection request." (*Id.* at 15:9-12.) "Each virtual host has a separate configuration sub-file (sub-database) C1, C2, etc., that may be derived from a master configuration file, or database, 510. The configuration sub-files are text files that may be used to enable or disable different functions for each virtual host, specify which connections and types of traffic will be allowed and which will be denied, etc." (*Id.* at 14:46-52.) "Also as part of the configuration file of each virtual host, an access rules database is provided governing access to and through the virtual host, i.e., which connections will be allowed and which connections will be denied." (*Id.* at 15:24-28.) The virtual host process in *Wesinger* uses the access rules database to "allow only a connection from a specified secure client." (*Id.* at 10:14-16.)

In addition to connection requests, which trigger the virtual host process, *Wesinger* also separately discusses processing of DNS requests:

When client C tries to initiate a connection to host D using the name of D, DNS **operates in the usual manner** to propagate a name request to successive levels of the network until D is found. The DNS server for D returns the network address of D to a virtual host on the firewall 155. The virtual host returns its network address to the virtual host on the firewall 157 from which it received the lookup request, and so on, until a virtual host on the firewall 105 returns its network address (instead of the network address of D) to the client C.

(*Wesinger* 9:16-24 (emphasis added).) Accordingly, when client C uses a name of D in a DNS request, C gets back an address for a virtual host of firewall 105, which faces C (*See* Fig. 1).

The presently-claimed subject matter is patentable over Wesinger's approach, as discussed below.

Independent claim 1 is a representative claim.

Without conceding the correctness of the rejection, independent claim 1 has been amended to

recite, inter alia:

a method of transparently creating an encrypted communications channel between a client device and a target device, each device being configured to allow secure data communications between the client device and the target device over the encrypted communications channel once the encrypted communications channel is created, the method comprising:

(1) intercepting from the client device a request to look up an Internet Protocol (IP) address corresponding to a domain name associated with the target device;

(2) determining whether the request to look up the IP address transmitted in step (1) corresponds to a device that accepts an encrypted channel connection with the client device; and

(3) in response to determining, in step (2), that the request to look up the IP address in step (2) corresponds to a device that accepts an encrypted communications channel connection with the client device, providing provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device such that the encrypted communications channel between the two devices, the client device being a device at which a user accesses the encrypted communications channel.

With regard to claim 1, *Wesinger* is not seen to disclose or suggest the feature "(2) determining whether the request to look up the IP address transmitted in step (1) corresponds to a device that accepts an encrypted channel connection with the client device." (*See* Office Action at 4-5.) As discussed above, *Wesinger*'s virtual host process checks parameters of a requested connection to determine whether a given connection should be allowed or denied. But this process acts upon a <u>connection request</u> and is not a "determin[ation] whether the request to look up the IP address transmitted in step (1) corresponds to a device that accepts an encrypted channel connection with the client device," as recited by independent claim 1. This is because, in *Wesinger*, "[w]hen a <u>connection request</u> is received, the firewall spawns a process, or execution thread, to create a virtual host VHn to handle that connection request." (*Wesinger* at 15:9-12, emphasis added.) *Wesinger*'s DNS processing, on the other hand, "**operates in the usual manner**" to return an IP address (*Wesinger* 9:17), and is not seen to perform the virtual host process, or a "determin[ation] whether the request to look up the IP address transmitted in

step (1) corresponds to a device that accepts an encrypted channel connection with the client device." Accordingly, *Wesinger* is not seen to disclose or suggest the features of claim 1.

Additionally, *Wesinger* is not concerned with "determining whether the request to look up the IP address . . . corresponds to a device that accepts an encrypted channel connection with the client device," as recited by claim 1. *Wesinger* merely discloses that encryption may be used after a connection is established. (*See Wesinger* at 4:39-42; 12:22-28.) For this additional reason, *Wesinger* is not seen to disclose or suggest the claimed "determining" feature.

Claim 1 additionally recites "(3) in response to determining, in step (2), that the request to look up the IP address in step (2) corresponds to a device that accepts an encrypted communications channel connection with the client device, providing provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device" *Wesinger* is not seen to disclose or suggest this feature for at least two reasons.

First, since *Wesinger* is not understood to disclose the claimed "determining" step, *Wesinger* also cannot disclose the "providing" step, which is "in response to determining." Second, *Wesinger* states that, "[o]nce a connection has been allowed, the virtual host process invokes code that performs . . . channel processing (encryption . . .)." (*Id.* at 17:1-7.) But a review of *Wesinger* does not reveal that performing encryption involves providing any provisioning information required to initiate the creation of an encrypted channel, much less doing so in response to a determination from a request to look up an IP address. Indeed, *Wesinger* only briefly mentions encryption and is not seen to describe the particulars of how it might be implemented. Accordingly, *Wesinger* is not seen to to disclose or suggest the "providing" feature of claim 1.

To support an obvious rejection, "<u>all of the claim limitations</u> must be taught or suggested by the prior art applied and that <u>all words</u> in a claim must be considered in judging the patentability of that claim against the prior art." *Ex Parte Karl Burgess*, Appeal 2008-2820, 2009 WL 291172 (B.P.A.I. 2009), at *3 (citing *In re Royka*, 490 F.2d 981, 984-85 (CCPA 1974), *In re Wilson*, 424 F.2d 1382, 1385 (CCPA 1970)) (emphasis added). A rejection based on obviousness "cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR Int'l Co. v. Teleflex Inc.*, 126 S. Ct. 1727, 1741 (2007) (citing *In re Kahn*, 441 F.3d at 988).

Since *Wesinger* is not seen to teach or suggest all of the claimed elements, a *prima facie* case of obviousness has not been established with respect to claim 1. Amended independent claim 19 is different in scope but contains similar features to those discussed above for claim 1. Accordingly, for reasons similar to those identified above for claim 1, *Wesinger* is not seen to teach or suggest all of the claimed elements of claim 19.

The other claims currently under consideration in the application (claims 2, 4-10, 12, 18, and 20-37) are dependent from their respective independent claims discussed above and therefore are believed to be allowable for at least similar reasons. Additionally, the dependent claims are allowable for the additional reason that one or more features recited therein are not disclosed or suggested by the cited references. Because each dependent claim is deemed to define an additional aspect of the invention, individual consideration of each on its own merits is respectfully requested. Accordingly, reconsideration and withdrawal of the rejection of dependent claims 2, 4-10, 12, 18, and 20 are respectfully requested.

CONCLUSION

Applicants respectfully submit that all of the pending claimsare in condition for allowance. If any questions remain, or should the present response not place the claims in condition for allowance, Applicants respectfully invite the Examiner to contact the undersigned attorney so that any such matters may be promptly resolved.

Any remarks in support of patentability of one claim should not be imputed to any other claim, even if similar terminology is used. Any remarks referring to only a portion of a claim should not be understood to base patentability on that portion; rather, patentability rests on each claim taken as a whole. The absence of a reply to a specific rejection, issue, or comment does not signify agreement with or concession of that rejection, issue, or comment. In addition, because the arguments made above may not be exhaustive, there may be other reasons for patentability of any or all claims that have not been expressed. Finally, nothing in this paper should be construed as intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment or cancellation of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment or cancellation.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 501133 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP /Kenneth C. Cheney/

Kenneth C. Cheney Registration No. 61,841

Please recognize our Customer No. 23630 as our correspondence address

4 Park Plaza, Suite 1700 Irvine, CA 92614-2559 Phone: (949) 851-0633 Facsimile: (949) 851-9348 KCC:kcc **Date: November 1, 2013**

Electronic Patent Application Fee Transmittal							
Application Number:	130	515557					
Filing Date:	13.	Sep-2012					
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES						
First Named Inventor/Applicant Name:	Victor Larson						
Filer:	Kenneth C. Cheney/Kimila Carraway						
Attorney Docket Number:	07	7580-0177					
Filed as Large Entity							
Utility under 35 USC 111(a) Filing Fees							
Description		Fee Code	Quantity	Amount	Sub-Total in USD(\$)		
Basic Filing:							
Pages:							
Claims:							
Claims in Excess of 20		1202	14	80	1120		
Miscellaneous-Filing:							
Petition:							
Patent-Appeals-and-Interference:							
Post-Allowance-and-Post-Issuance:							
Extension-of-Time:							

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
	Tot	al in USD:) (\$)	1120

Electronic Acknowledgement Receipt						
EFS ID:	17298435					
Application Number:	13615557					
International Application Number:						
Confirmation Number:	1089					
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES					
First Named Inventor/Applicant Name:	Victor Larson					
Customer Number:	23630					
Filer:	Kenneth C. Cheney/Kimila Carraway					
Filer Authorized By:	Kenneth C. Cheney					
Attorney Docket Number:	077580-0177					
Receipt Date:	01-NOV-2013					
Filing Date:	13-SEP-2012					
Time Stamp:	22:30:00					
Application Type:	Utility under 35 USC 111(a)					

Payment information:

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Payment was successfully received in RAM	\$1120				
RAM confirmation Number	6804				
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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:					
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)			
1	077580-0177 Amendment.pdf		137957	ves	12			
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	Multip	oart Description/PDF files in .:	zip description					
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	Amendment/Req. Reconsiderati	1		1				
	Claims	2		6				
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Warnings:								
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2	Fee Worksheet (SB06)	fee-info.pdf	30373	no	2			
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		Total Files Size (in bytes):	16	58330				
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.								
Acknowledgement Receipt Will establish the filing date of the application. National Stage of an International Application under 35 U.S.C. 371 If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.								

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	APPLICATION SIZE FEE (37 CFR 1.16(s)) If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
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process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450, DO NOT SEND FEES OR COMPLETED FORMS TO THIS

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.		
13/615,557	09/13/2012	Victor Larson	077580-0177	1089		
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Washington, D	C 20001		ART UNIT	PAPER NUMBER		
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			11/13/2013	ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mweipdocket@mwe.com

	Application No. 13/615,557	Applicant(s) LARSON ET AL.		
Office Action Summary	Examiner KRISNA LIM	Art Unit 2453	AIA (First Inventor to File) Status No	
The MAILING DATE of this communication app Period for Reply	bears on the cover sheet with the c	correspondenc	ce address	
 A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION. Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication. If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication. Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any extended period for CFR 1.204(b) 				
Status 1) Responsive to communication(s) filed on 11/01	1/2013.			
A declaration(s)/affidavit(s) under 37 CFR 1.1	30(b) was/were filed on .			
2a) This action is FINAL $2b$ This	action is non-final			
3 An election was made by the applicant in resp	onse to a restriction requirement	set forth durin	na the interview on	
the restriction requirement and election	have been incorporated into this	action		
4) Since this application is in condition for allowar	nce except for formal matters pro	osecution as t	o the merits is	
closed in accordance with the practice under <i>F</i>	Ex parte Quayle 1935 C.D. 11. 4	53 O G 213		
		55 5.G. 210.		
Disposition of Claims 5) ∑ Claim(s) <u>1,2,4-10,12 and 14-37</u> is/are pending in the application. 5a) Of the above claim(s) is/are withdrawn from consideration. 6) ☐ Claim(s) is/are allowed. 7) ∑ Claim(s) <u>1,2,4-10,12 and 14-37</u> is/are rejected. 8) ☐ Claim(s) is/are objected to. 9) ☐ Claim(s) are subject to restriction and/or election requirement. * If any claims have been determined allowable, you may be eligible to benefit from the Patent Prosecution Highway program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov. Application Papers 10) ☐ The specification is objected to by the Examiner. 11) ☐ The drawing(s) filed on is/are: a) ☐ accepted or b) ☐ objected to by the Examiner. Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).				
Priority under 35 U.S.C. § 119 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).				
 a) All b) Some * c) None of the: 1. Certified copies of the priority documents have been received. 2. Certified copies of the priority documents have been received in Application No 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)). * See the attached detailed Office action for a list of the certified copies not received. 				
Attachment(s) 1) Notice of References Cited (PTO-892)	3) 🔲 Interview Summary	y (PTO-413)		
2) X Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date	Paper No(s)/Mail D 4)	ate		
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PTOL-326 (Rev. 08-13	6)

Part of Paper No./Mail Date 20131106

Petitioner Apple Inc. - Exhibit 1002, p. 355

1. The present application is being examined under the pre-AIA first to invent provisions.

2. Claims 1-2, 4-10, 12 and 14-00 are still pending for examination. Claims 21-37 are newly added for examination. Claims 3, 11 and 13 have been canceled.

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re LongL* 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Omum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321 (c) or 1.321 (d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1, 2, 4-10, 12 and 14-37 are rejected on the ground of nonstatutory obviousness-type

double patenting as being unpatentable over claims 1-18 of U.S. Patent No. 7,933,990.

Although the conflicting claims are not identical, they are not patentably distinct from each other because they all directed to a method of transparently creating an encrypted communication channel (i.e. automatically initiating an encrypted communication channel) between a client device and a target device based on a

determination that a request access to a device that accepts an encrypted communication channel. The difference is the current application claimed language of "supports secure communications audio/video". It would have been obvious to one of ordinary skill in the art to recognize that such additional claimed language" supports communications audio/video" would have been a matter of use and such feature is well known and it would not be a patentably distinguishable feature.

5. Claims 1, 2, 4-10, 12 and 14-37 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-3, 5-9 and 11-15 of U.S. Patent No. 7,490,151.

Although the conflicting claims are not identical, they are not patentably distinct from each other because they are directed to a method of **transparently creating** an encrypted communication channel (i.e. automatically initiating an encrypted communication channel) between a client device and a target device based on a determination that a request access to a device that accepts an encrypted communication channel. The difference is the current application claimed language of **"supports secure communications audio/video".** It would have been obvious to one of ordinary skill in the art to recognize that such additional claimed language" **supports communications** audio/video" would have been a matter of use and such feature is well known and it would not be a patentably distinguishable feature.

6. Claims 1, 2, 4-10, 12 and 14-37 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9 of U.S. Patent No. 6,502,135.

Although the conflicting claims are not identical, they are not patentably distinct from each other because they are directed to a method of transparently creating an encrypted communication channel (i.e. **transparently creating a virtual private network**) between a client device and a target device based on a determination that a request access to a device that accepts an encrypted communication channel. The difference is the current application claimed language of "**supports secure communications audio/video**". It would have been obvious to one of ordinary skill in the art to recognize that such additional claimed language" supports communications audio/video" would have been a matter of use and such feature is well known and it would not be a patentably distinguishable feature.

7. In response to the above rejection, applicants request that the terminal disclaimer be held in abeyance until the claims are indicated to be allowable. Claims 1-2, 4-10, 12 and 14-37 would be allowable when the terminal disclaimers are submitted and approved.

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krisna Lim whose telephone number is 571-272-3956 The examiner can normally be reached on Tuesday to Friday from 7:10 AM to 5:40 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Krista Zele, can be reached on 571-272-7288. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (In USA or Canada) or 571-272-100.

KI November 06, 2013

/Krisna Lim/ Primary Examiner Art Unit 2453

	Application/Control No.	Applicant(s)/Patent Under Reexamination
Search Notes	13615557	LARSON ET AL.
	Examiner	Art Unit
	KRISNA LIM	2453

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED			
Symbol	Date	Examiner	

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
709	222-227	07/25/2013	kl

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	07/25/2013	kl

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

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U.S. Patent and Trademark Office

Part of Paper No. : 20130725
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				A	art Unit		24	153			
				E	xaminer Name		Kris	na Lim			
				D	ocket Number	77580-177	' (VRNI	K-0001CP	3CON8)		
	U.S. PATENTS										
EXAMINER' S INITIALS	CITE NO.	NO. Patent Number Publication			Name of Patentee or Cited Docur	Applicant of nent	Page Relev	s, Columns, Li vant Passages Figures App	nes, Where or Relevant ear		
	A170	6,434,600	08/13/200	2	Waite et	al.					
	A171	7,225,249	05/29/200	7	Barry et a	al.					
U.S. PATENT APPLICATION PUBLICATIONS											
EXAMINER' S INITIALS	CITE NO.	Patent Number	Publication Da	ite	Name of Patentee or Cited Docum	or Applicant of Pages, Columns, Line ument Relevant Passages or Figures Appe			nes, Where or Relevant ear		
	B23	US2002/0004826	01/10/2002	2	Waite et a	al.					
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EXAMINER' S INITIALS	CITE NO.	Foreign Patent Document Country Codes -Number 4-Kind Codes (<i>if known</i>)	Publication Dat	te	Name of Patentee or Applicant of Cited Documer	Pages, Columr t Where Rele Figures Ap	ns, Lines evant pear	Tran	slation		
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EXAMINER /Krisna Lim/ DATE CONSIDERED 11/05/2013							13				

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

Subst. for form 1449/PTO	Complete if Known				
INFORMATION DISCLOSURE STATEMENT BY	Application Number	13/615,557			
APPLICANT	Filing Date	09-13-2012			
(Use as many sheets as necessary)	First Named Inventor	Victor Larson			
	Art Unit	2453			
	Examiner Name	Krisna Lim			
	Docket Number	77580-177 (VRNK-0001CP3CON8)			
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CERTIFICATION STATEMENT

Please See 37 CFR 1.97 and 1.98 to make the appropriate selection(s)

- [] Information Disclosure Statement is being filed with the filing of the application or before the receipt of a first office action.
- [] That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or
- [X] That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § <u>1.56(c)</u> more than three months prior to the filing of the information disclosure statement.
- [] The Commissioner is hereby authorized to charge any required fees to Deposit Account 50-1133.
- [] Information Disclosure Statement is being filed with the Request for Continued Examination. The Commissioner is hereby authorized to charge the fee pursuant to 37 CFR 1.17(P) in the amount of \$810.00, or further fees which may be due, to Deposit Account 50-1133.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Date: September 30, 2013

<u>/Toby H. Kusmer/</u> Toby H. Kusmer; Reg. No.:26,418 McDermott Will & Emery LLP 28 State Street Boston, MA 02109 Tel. (617) 535-4000 Fax (617) 535-3800

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				7	Art Unit		24	153	
				F	Examiner Name		Kris	na Lim	
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EXAMINER' S INITIALS	CITE NO.	Patent Numbe	r Publication	Date	Name of Patentee o Cited Docu	r Applicant of ment	Page Relev	is, Columns, Li vant Passages Figures App	nes, Where or Relevant bear
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	A174	8,504,69	7 08/06/20	013	Larson et	al.	1		
	A175	6,335,966	6 01/01/20)02	Toyoda	1	1		
	A176	6,195,67	7 02/27/20	001	Utsum	1	1		
	A177	6,959,184	4 10/25/20	005	Byers et	al.			
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

Subst. for	form 1449/PTO			Complete if Known					
INCODE				Application Number	13/615,557				
APPLICANT (Use as many sheets as necessary)				Filing Date	09-13-2012				
				First Named Inventor	Victor Larson				
				Art Unit	2453				
		Examiner Name	Krisna Lim						
		Docket Number	77580-177 (VRNK-0001CP3CON8)						
	CERTIFICATION STATEMENT								

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- [X] That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § <u>1.56(c)</u> more than three months prior to the filing of the information disclosure statement.
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

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SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Date: October 16, 2013

<u>Toby H. Kusmer/</u> Toby H. Kusmer; Reg. No.:26,418 McDermott Will & Emery LLP 28 State Street Boston, MA 02109 Tel. (617) 535-4000 Fax (617) 535-3800

DM_US 45906357-1.077580.0177

RESPONSE UNDER 37 CFR 1.116 - EXPEDITED PROCEDURE TECHNOLOGY CENTER 2400

Docket No.: 077580-0177 (PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Victor LARSON, et al.	: Customer Number: 23630
Application No.: 13/615,557	Confirmation No. 1089
Filed: September 13, 2012	: Group Art Unit: 2453
For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES	: Examiner: Krisna Lim :

Mail Stop AF Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450

<u>RESPONSE AFTER FINAL REJECTION</u> <u>UNDER 37 CFR § 1.116</u>

Commissioner:

In response to the final Office Action dated November 13, 2013, please enter and consider the following:

A Listing of the Claims is provided on page 2 of this paper.

Remarks begin on page 8 of this paper.

DM_US 49719017-1.077580.0177

IN THE CLAIMS

This listing of claims is provided for the sole convenience of the Examiner. No claims have been amended herein.

LISTING OF CLAIMS:

1. (Previously Presented) A method of transparently creating an encrypted communications channel between a client device and a target device, each device being configured to allow secure data communications between the client device and the target device over the encrypted communications channel once the encrypted communications channel is created, the method comprising:

(1) intercepting from the client device a request to look up an Internet Protocol (IP) address corresponding to a domain name associated with the target device;

(2) determining whether the request to look up the IP address transmitted in step (1) corresponds to a device that accepts an encrypted channel connection with the client device; and

(3) in response to determining, in step (2), that the request to look up the IP address in step (2) corresponds to a device that accepts an encrypted communications channel connection with the client device, providing provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device such that the encrypted communications channel supports secure data communications transmitted between the two devices, the client device being a device at which a user accesses the encrypted communications channel.

2. (Previously Presented) The method of claim 1, wherein providing the provisioning information required to initiate the encrypted communications channel is based on a determination that the target device is a device with which an encrypted communications channel can be established when the IP address request corresponds to a target device identified in an network address lookup.

3. (Canceled)

4. (Previously Presented) The method of claim 1, wherein the domain name is a secure domain name.

5. (Original) The method of claim 1, wherein the encrypted communications channel is a broadband connection.

6. (Original) The method of claim 1, wherein the encrypted communications channel is an unmodulated transmission link.

7. (Previously Presented) The method of claim 1, wherein the encrypted communications channel is a modulated transmission link.

8. (Previously Presented) The method of claim 1, wherein the encrypted communications channel supports at least one of the following: FDM, TDM and CDMA.

9. (Original) The method of claim 1, wherein the client device is a phone.

10. (Previously Presented) The method of claim 9, wherein providing the provisioning information required to initiate the encrypted communications channel is based on a determination that the target device is a device with which an encrypted communications channel can be established when the IP address request corresponds to a target device identified in an network address lookup.

11. (Canceled)

12. (Previously Presented) The method of claim 9, wherein the domain name is a secure domain name.

13. (Canceled)

Docket No.: 077580-0177

14. (Original) The method of claim 9, wherein the encrypted communications channel is an unmodulated transmission link.

15. (Original) The method of claim 9, wherein the encrypted communications channel is a modulated transmission link.

16. (Previously Presented) The method of claim 9, wherein the encrypted communications channel supports at least one of the following: FDM, TDM and CDMA.

17. (Previously Presented) The method of claim 1, wherein the target device is a server.

18. (Previously Presented) The method of claim 1, wherein the target device is a phone.

19. (Previously Presented) A system for transparently creating an encrypted communications channel between a client device and a target device, each device being configured to allow secure data communications therebetween over an encrypted communications channel once the encrypted communications channel is created, the system including a memory storing instructions, and a server configuration arranged to:

(1) intercept from the client device a request to look up an Internet Protcol (IP) address corresponding to a domain name associated with the target device;

(2) determine whether the request to look up the IP address transmitted in step (1) corresponds to a device that accepts an encrypted channel connection with the client device; and

(3) in response to determining, in step (2), that the request to look up the IP address corresponds to a device that accepts an encrypted communications channel connection with the client device, provide provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device such that the encrypted communications channel supports secure data communications transmitted between the two

devices, the client device being a device at which a user accesses the encrypted communications channel.

20. (Previously Presented) A system according to claim 19, wherein the encrypted communications channel supports a plurality of services.

21. (Previously Presented) The system according to claim 19, wherein the plurality of services comprises a plurality of communication protocols, a plurality of application programs, multiple sessions, or a combination thereof.

22. (Previously Presented) The system according to claim 21, wherein the plurality of other application programs comprises at least one of the following: e-mail, a word processing program, and telephony.

23. (Previously Presented) The system according to claim 19, wherein the domain name is a secure domain name.

24. (Previously Presented) The system according to claim 19, wherein the encrypted communications channel is a broadband connection.

25. (Previously Presented) The system according to claim 19, wherein the encrypted communications channel is an unmodulated transmission link.

26. (Previously Presented) The system according to claim 19, wherein the encrypted communications channel is a modulated transmission link.

27. (Previously Presented) The system according to claim 19, wherein the encrypted communications channel supports at least one of the following: FDM, TDM and CDMA.

28. (Previously Presented) The system according to claim 19, wherein the client device is a phone.

29. (Previously Presented) The system according to claim 19, wherein the target device is a server.

30. (Previously Presented) The system according to claim 19, wherein the target device is a phone.

31. (Previously Presented) The system according to claim 19, wherein intercepting the request consists of the system receiving the request to determine whether the target device accepts an encrypted channel connection with the client device.

32. (Previously Presented) The system according to claim 19, wherein intercepting the request occurs within another device that is separate from the client device.

33. (Previously Presented) The method according to claim 1, wherein intercepting the request consists of receiving the request to determine whether the target device accepts an encrypted channel connection with the client device.

34. (Previously Presented) The method according to claim 1, wherein the intercepting the request occurs within another device that is separate from the client device.

35. (Previously Presented) The method according to claim 1, wherein the encrypted communications channel supports a plurality of services.

36. (Previously Presented) The method according to claim 35, wherein the plurality of services comprises a plurality of communication protocols, a plurality of application programs, multiple sessions, or a combination thereof.

37. (Previously Presented) The method according to claim 36, wherein the plurality of other application programs comprises at least one of the following: e-mail, a word processing program, and telephony.

REMARKS

Claims 1, 2, 4-10, 12, and 14-37 are pending in the application, with claims 1 and 19 being the independent claims. No claims have been amended. However, a listing of the pending claims is provided herewith for the Examiner's convenience. Reconsideration and withdrawal of the rejections are respectfully requested.

Claim Rejection – Double Patenting

Claims 1, 2, 4-10, 12, and 14-37 are rejected on the ground of nonstatutory obviousnesstype double patenting over various claims of U.S. Patent Nos. 7,933,990, 7,490,151, and 6,502,135. Without conceding the correctness of the double patenting rejections, to expedite the allowance of this application, Applicants are submitting Terminal Disclaimers for the '990, '151, and '135 patents to obviate the double patenting rejections. Applicants note that the filing of a terminal disclaimer is not an admission of the propriety of the rejection. M.P.E.P. § 804.02 *citing Quad Environmental Technologies Corp. v. Union Sanitary District*, 946 F.2d 870, 20 USPQ2d 1392 (Fed. Cir. 1991).

Since the double patenting rejections are the sole remaining issues in the Office Action the application is believed to be in condition for allowance and such action is respectfully requested.

CONCLUSION

Applicants respectfully submit that all of the pending claims are in condition for allowance. If any questions remain, or should the present response not place the claims in condition for allowance, Applicants respectfully invite the Examiner to contact the undersigned attorney so that any such matters may be promptly resolved.

Any remarks in support of patentability of one claim should not be imputed to any other claim, even if similar terminology is used. Any remarks referring to only a portion of a claim should not be understood to base patentability on that portion; rather, patentability rests on each claim taken as a whole. The absence of a reply to a specific rejection, issue, or comment does not signify agreement with or concession of that rejection, issue, or comment. In addition,

because the arguments made above may not be exhaustive, there may be other reasons for patentability of any or all claims that have not been expressed. Finally, nothing in this paper should be construed as intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment or cancellation of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment or cancellation.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 501133 and please credit any excess fees to such deposit account.

> Respectfully submitted, McDERMOTT WILL & EMERY LLP

/Kenneth C. Cheney/

Kenneth C. Cheney Registration No. 61,841

Please recognize our Customer No. 23630 as our correspondence address

4 Park Plaza, Suite 1700 Irvine, CA 92614-2559 Phone: (949) 851-0633 Facsimile: (949) 851-9348 KCC:kcc **Date: February 13, 2014**

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TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT	Docket Number (Optional) 077580-0177								
In re Application of: Victor LARSON, et al.									
Application No.: 13/615,557									
Filed: September 13, 2012									
For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN	NAMES								
The owner [*] , <u>VirnetX. Inc.</u> , of, of, of, percent interest in except as provided below, the terminal part of the statutory term of any patent granted on the instant a the expiration date of the full statutory term of prior patent No. <u>6,502,135</u> as the term of s by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application during such period that it and the prior patent are commonly owned. This agreement runs with any patent is binding upon the grantee, its successors or assigns.	the instant application hereby disclaims, application which would extend beyond aid prior patent is presently shortened ation shall be enforceable only for and atent granted on the instant application								
In making the above disclaimer, the owner does not disclaim the terminal part of the term of any pater would extend to the expiration date of the full statutory term of the prior patent , "as the term of said pr terminal disclaimer," in the event that said prior patent later: expires for failure to pay a maintenance fee; is held unenforceable; is found invalid by a court of competent jurisdiction; is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;	In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later: expires for failure to pay a maintenance fee; is held unenforceable; is found invalid by a court of competent jurisdiction; is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321; has all claims canceled by a reexamination certificate:								
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I hereby declare that all statements made herein of my own knowledge are true and that all s belief are believed to be true; and further that these statements were made with the knowledge that w made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United Sta statements may jeopardize the validity of the application or any patent issued thereon.	tatements made on information and iliful false statements and the like so ates Code and that such willful false								
2. The undersigned is an attorney or agent of record. Reg. No. <u>61,841</u>									
Kenneth C. Chennyd	February 13, 2014								
Signature	Date								
Karaath O. Ohanaa									
Typed or printed name									
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Electronic Patent Application Fee Transmittal										
Application Number:	13	615557								
Filing Date:	13	-Sep-2012								
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECU DOMAIN NAMES									
First Named Inventor/Applicant Name:	Victor Larson									
Filer:	Kenneth C. Cheney/Kimila Carraway									
Attorney Docket Number:	07	7580-0177								
Filed as Large Entity										
Utility under 35 USC 111(a) Filing Fees										
Description		Fee Code	Quantity	Amount	Sub-Total in USD(\$)					
Basic Filing:										
Pages:										
Claims:										
Miscellaneous-Filing:										
Petition:										
Patent-Appeals-and-Interference:										
Post-Allowance-and-Post-Issuance:										
Extension-of-Time:	_									

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Statutory or Terminal Disclaimer	1814	3	160	480
	Tot	al in USD)(\$)	480

Electronic Acknowledgement Receipt				
EFS ID:	18202047			
Application Number:	13615557			
International Application Number:				
Confirmation Number:	1089			
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES			
First Named Inventor/Applicant Name:	Victor Larson			
Customer Number:	23630			
Filer:	Kenneth C. Cheney/Kimila Carraway			
Filer Authorized By:	Kenneth C. Cheney			
Attorney Docket Number:	077580-0177			
Receipt Date:	13-FEB-2014			
Filing Date:	13-SEP-2012			
Time Stamp:	20:36:36			
Application Type:	Utility under 35 USC 111(a)			

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Payment was successfully received in RAM	\$480			
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1		077580-0177_Response_After_	6502891	ves	12	
		Final_Rejection.pdf	2b56caad62b7b7584b8a67bd6145b99308 7c906d	,		
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	Response After Fi	1		1		
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	Applicant Arguments/Remarks	8	9			
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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

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TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT	Docket Number (Optional) 077580-0177			
In re Application of: Victor LARSON, et al.				
Application No.: 13/615,557				
Filed: September 13, 2012				
For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN	NAMES			
The owner*, <u>VirnetX. Inc.</u> , of, of, of percent interest in except as provided below, the terminal part of the statutory term of any patent granted on the instant a the expiration date of the full statutory term of prior patent No. <u>7,490,151</u> as the term of s by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant applica during such period that it and the prior patent are commonly owned. This agreement runs with any part and is binding upon the grantee, its successors or assigns.	the instant application hereby disclaims, application which would extend beyond aid prior patent is presently shortened ation shall be enforceable only for and atent granted on the instant application			
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is in any manner terminated prior to the expiration of its full statutory term as presently shorted	ened by any terminal disclaimer.			
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I hereby declare that all statements made herein of my own knowledge are true and that all s belief are believed to be true; and further that these statements were made with the knowledge that w made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United Statements may jeopardize the validity of the application or any patent issued thereon.	tatements made on information and iliful false statements and the like so ates Code and that such willful false			
2. The undersigned is an attorney or agent of record. Reg. No. <u>61,841</u>				
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Kenneth C. Cheney Typed or printed name				
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REJECTION OV	ER A "PRIOR" PATENT		011080-0111		
In re Application of: Victor LARSON, et al.					
Application No.: 13/615,557					
Filed: September 13, 2012					
For: AGILE NETWORK PROTOCOL FOR SE	ECURE COMMUNICATIONS USING S	ECURE DOMAIN I	NAMES		
The owner*, <u>VirnetX, inc.</u> except as provided below, the terminal part of the expiration date of the full statutory term of by any terminal disclaimer. The owner hereby during such period that it and the prior pater and is binding upon the grantee, its successo	, of <u>100</u> of the statutory term of any patent gran prior patent No. <u>7,933,990</u> y agrees that any patent so granted on at are commonly owned. This agreeme rs or assigns.	percent interest in t ted on the instant a as the term of sa the instant applica int runs with any pa	he instant application hereby disclaims, pplication which would extend beyond aid prior patent is presently shortened tion shall be enforceable only for and tent granted on the instant application		
In making the above disclaimer, the owner do would extend to the expiration date of the full terminal disclaimer," in the event that said pri expires for failure to pay a maintena is held unenforceable; is found invalid by a court of compe is statutorily disclaimed in whole or has all claims canceled by a reexan is reissued; or is in any manner terminated prior to	bes not disclaim the terminal part of the statutory term of the prior patent , "as or patent later: ance fee; etent jurisdiction; terminally disclaimed under 37 CFR 1. nination certificate; to the expiration of its full statutory term	e term of any paten the term of said pri 321; as presently shorte	t granted on the instant application that or patent is presently shortened by any ned by any terminal disclaimer.		
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1. For submissions on behalf of a busin etc.), the undersigned is empowered	ness/organization (e.g., corporation, par to act on behalf of the business/organ	rtnership, university ization.	r, government agency,		
I hereby declare that all statements i belief are believed to be true; and further that made are punishable by fine or imprisonment statements may jeopardize the validity of the	made herein of my own knowledge are these statements were made with the t, or both, under Section 1001 of Title 1 application or any patent issued thereo	e true and that all si knowledge that wi 8 of the United Sta n.	tatements made on information and Iful false statements and the like so tes Code and that such willful false		
2. The undersigned is an attorney or a	gent of record. Reg. No. <u>61,841</u>				
	Warrath O. Charavi		Echnigny 12, 2014		
	Signature		Pebruary 13, 2014 Date		
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This collection of information is required by 37 CFR to process) an application. Confidentiality is govern- including gathering, preparing, and submitting the c on the amount of time you require to complete this and Trademark Office, U.S. Department of Comme ADDRESS. SEND TO: Commissioner for Patents	1.321. The information is required to obtain ed by 35 U.S.C. 122 and 37 CFR 1.11 and completed application form to the USPTO. T form and/or suggestions for reducing this bu rce, P.O. Box 1450, Alexandria, VA 22313- , P.O. Box 1450, Alexandria, VA 22313-148	or retain a benefit by 1.14. This collection ime will vary dependi irden, should be sent 1450. DO NOT SENE 50.	the public which is to file (and by the USPTO is estimated to take 12 minutes to complete, ing upon the individual case. Any comments to the Chief Information Officer, U.S. Patent D FEES OR COMPLETED FORMS TO THIS		

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P	PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875 Application or Docket Number 13/615,557 Filing Date 09/13/2012								
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* If i	he difference in colu	umn 1 is less tha	n zero, ente	r "0" in column 2.			TOTAL		
		(Column 1)		(Column 2)	ION AS AMEN (Column 3	IDED – PA	RT II		
NT	02/13/2014	CLAIMS REMAINING AFTER AMENDMENT	Γ	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EX	TRA	RATE (\$)	ADDITIC	DNAL FEE (\$)
ME	Total (37 CFR 1.16(i))	* 34	Minus	** 34	= 0		x \$80 =		0
END	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0		x \$420 =		0
AMI	Application Si	ize Fee (37 CFR	1.16(s))						
		NTATION OF MULT	IPLE DEPEN	DENT CLAIM (37 CFF	R 1.16(j))				
		(Column 1)		(Column 2)	(Column 3)	TOTAL ADD'L FE	E	0
L		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EX	TRA	RATE (\$)	ADDITIC	ONAL FEE (\$)
ΕN	Total (37 CFR 1.16(i))	*	Minus	**	=		X \$ =		
IDM	Independent (37 CFR 1.16(h))	*	Minus	***	=		X \$ =		
	Application Si	ize Fee (37 CFR	1.16(s))						
AN	FIRST PRESEN	NTATION OF MULT	IPLE DEPEN	DENT CLAIM (37 CFF	R 1.16(j))				
* If ** If *** I The This o	 * If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". /DEBORAH NASH/ *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1. 								
proce	ss) an application. (Confidentiality is	governed by	35 U.S.C. 122 an	d 37 CFR 1.14. Th	is collection is	estimated to take 12	minutes to complete	, including gathering,

propersing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450, DO NOT SEND FEES OR COMPLETED FORMS TO THIS

ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Application Number	Application/Control No.		Applicant(s)/Patent under Reexamination	
	13/615,557		LARSON ET AL.	
Document Code - DISQ	Internal D	ocument – DC	NOT MAIL	

TERMINAL DISCLAIMER		
Date Filed : 2/13/14	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:

The person who signed the terminal disclaimer:

- [] has failed to state his/her capacity to sign for the business entity. (See FP 14.28)
- [] is not recognized as an officer of the assignee. (See FP 14.29)
 [x] does not have power of attorney. (FP 14.29.01)

No fee is requried. Jean Proctor

U.S. Patent and Trademark Office

	ed States Paten	t and Trademark Office	UNITED STATES DEPAR United States Patent and Address: COMMISSIONER F P.O. Box 1450 Alexandria, Virginia 22. www.uspto.gov	TMENT OF COMMERCE Trademark Office 'OR PATENTS 313-1450	
APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.	
13/615,557	09/13/2012	Victor Larson	077580-0177	1089	
23630 McDermott Wi	7590 02/25/2014 Il & Emerv	4	EXAMINER		
The McDermot	t Building tol Street, N W		LIM, KRISNA		
Washington, DC 20001			ART UNIT	PAPER NUMBER	
			2453		
			NOTIFICATION DATE	DELIVERY MODE	
			02/25/2014	ELECTRONIC	

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mweipdocket@mwe.com

	AL.						
Office Action Summary	Examine KRISNA L	IM	Art Unit 2453	AIA (First Inventor to File) Status No			
The MAILING DATE of this communication appears on the cover sheet with the correspondence address							
 Period for Reply A SHORTENED STATUTORY PERIOD FOR REPLY THIS COMMUNICATION. Extensions of time may be available under the provisions of 37 CFR 1.1 after SIX (6) MONTHS from the mailing date of this communication. If NO period for reply is specified above, the maximum statutory period N Failure to reply within the set or extended period for reply will, by statute Any reply received by the Office later than three months after the mailing earned patent term adjustment. See 37 CFR 1.704(b). 	Y IS SET T 36(a). In no ev will apply and w b, cause the app g date of this co	O EXPIRE <u>3</u> MONTHS ent, however, may a reply be tim ill expire SIX (6) MONTHS from lication to become ABANDONE mmunication, even if timely filed	S FROM THE hely filed the mailing date of D (35 U.S.C. § 133 , may reduce any	MAILING DATE OF			
Status 1) Responsive to communication(s) filed on <u>02/1.</u>	<u>3/2014</u> .						
A declaration(s)/affidavit(s) under 37 CFR 1.1	130(b) was	were filed on					
2a) I his action is FINAL . $2b)$ I his $3)$ An election was made by the applicant in resp.	onse to a r	on-final.	set forth durin	a the interview on			
; the restriction requirement and election	n have beer	n incorporated into this	action.	g the interview off			
4) Since this application is in condition for alloward closed in accordance with the practice under E	nce except E <i>x parte Qu</i>	for formal matters, pro <i>layle</i> , 1935 C.D. 11, 45	secution as to 53 O.G. 213.	o the merits is			
Disposition of Claims*							
5) Claim(s) <u>1,2,4-10,12 and 14-37</u> is/are pending	in the app	ication.					
5a) Of the above claim(s) is/are withdray	wn trom co	nsideration.					
7) Claim(s) 1. 2. 4-10. 12 and 14-37 is/are rejected	ed.						
8) Claim(s) is/are objected to.							
9) Claim(s) are subject to restriction and/o	r election r	equirement.					
* If any claims have been determined <u>allowable</u> , you may be el	ligible to ber	efit from the Patent Pros	secution High	way program at a			
participating intellectual property office for the corresponding a	pplication. F	or more information, plea	ise see				
http://www.uspto.gov/patents/int_events/ppi/index.jsp of send	i an inquiry i	0 PPHIEedback@usplo.c	<u>lov</u> .				
Application Papers $10\sqrt{\Box}$ The specification is objected to by the Examine	ar						
11) The drawing(s) filed on is/are: a) acc	epted or b)	objected to by the E	Examiner.				
Applicant may not request that any objection to the	drawing(s) k	e held in abeyance. See	e 37 CFR 1.85(a).			
Replacement drawing sheet(s) including the correct	tion is requir	ed if the drawing(s) is obj	ected to. See 3	37 CFR 1.121(d).			
Priority under 35 U.S.C. § 119							
12) Acknowledgment is made of a claim for foreign	priority un	der 35 U.S.C. § 119(a)	-(d) or (f).				
Certified copies:							
a) All b) Some c) None of the:	ts have he	en received					
2. Certified copies of the priority documen	ts have be	en received in Applicat	ion No.				
3. Copies of the certified copies of the price	ority docum	ents have been receiv	ed in this Nati	- ional Stage			
application from the International Bureau	u (PCT Rul	e 17.2(a)).					
** See the attached detailed Office action for a list of the certific	ed copies no	ot received.					
Attachment(s)							
1) Notice of References Cited (PTO-892)		3) 🔲 Interview Summarv	(PTO-413)				
2) Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SPAper No(s)/Mail Date	SB/08b)	Paper No(s)/Mail Da 4) Other:	ate				
U.S. Patent and Trademark Office PTOL-326 (Rev. 11-13) Office Action	Summary		Part of Paper No	./Mail Date 20140219			

Petitioner Apple Inc. - Exhibit 1002, p. 389

1. The present application is being examined under the pre-AIA first to invent provisions.

2. Claims 1-2, 4-10, 12 and 14-00 are still pending for examination. Claims 21-37 are newly added for examination. Claims 3, 11 and 13 have been canceled.

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re LongL* 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Omum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321 (c) or 1.321 (d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1, 2, 4-10, 12 and 14-37 are rejected on the ground of nonstatutory obviousness-type

double patenting as being unpatentable over claims 1-18 of U.S. Patent No. 7,933,990.

Although the conflicting claims are not identical, they are not patentably distinct from each other because they all directed to a method of transparently creating an encrypted communication channel (i.e. automatically initiating an encrypted communication channel) between a client device and a target device based on a

determination that a request access to a device that accepts an encrypted communication channel. The difference is the current application claimed language of "supports secure communications audio/video". It would have been obvious to one of ordinary skill in the art to recognize that such additional claimed language" supports communications audio/video" would have been a matter of use and such feature is well known and it would not be a patentably distinguishable feature.

5. Claims 1, 2, 4-10, 12 and 14-37 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-3, 5-9 and 11-15 of U.S. Patent No. 7,490,151.

Although the conflicting claims are not identical, they are not patentably distinct from each other because they are directed to a method of **transparently creating** an encrypted communication channel (i.e. automatically initiating an encrypted communication channel) between a client device and a target device based on a determination that a request access to a device that accepts an encrypted communication channel. The difference is the current application claimed language of **"supports secure communications audio/video".** It would have been obvious to one of ordinary skill in the art to recognize that such additional claimed language" **supports communications** audio/video" would have been a matter of use and such feature is well known and it would not be a patentably distinguishable feature.

6. Claims 1, 2, 4-10, 12 and 14-37 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9 of U.S. Patent No. 6,502,135.

Although the conflicting claims are not identical, they are not patentably distinct from each other because they are directed to a method of transparently creating an encrypted communication channel (i.e. **transparently creating a virtual private network**) between a client device and a target device based on a determination that a request access to a device that accepts an encrypted communication channel. The difference is the current application claimed language of **"supports secure communications audio/video".** It would have been obvious to one of ordinary skill in the art to recognize that such additional claimed language" supports communications audio/video" would have been a matter of use and such feature is well known and it would not be a patentably distinguishable feature.

7. On February 13, 2014, in response to the above rejection, applicants submitted 3 terminal disclaimers but they have not been approved. Claims 1-2, 4-10, 12 and 14-37 would be allowable when the terminal disclaimers are submitted and approved.

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krisna Lim whose telephone number is 571-272-3956 The examiner can normally be reached on Tuesday to Friday from 7:10 AM to 5:40 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Krista Zele, can be reached on 571-272-7288. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (In USA or Canada) or 571-272-100.

KI February 19, 2014

/Krisna Lim/ Primary Examiner Art Unit 2453

	Application/Control No.	Applicant(s)/Patent Under Reexamination
Search Notes	13615557	LARSON ET AL.
	Examiner	Art Unit
	KRISNA LIM	2453

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED								
Symbol	Date	Examiner						

US CLASSIFICATION SEARCHED									
Class	Subclass	Date	Examiner						
709	222-227	07/25/2013	kl						

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	07/25/2013	kl

INTERFERENCE SEARCH										
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner							

U.S. Patent and Trademark Office

				Ap	Application/Control No.					Applicant(s)/Patent Under Reexamination					
	Ind	lex of (Claim	is	13	13615557					LARSON ET AL.				
					Ex	aminer				Art Ur	nit				
					KF	RISNA LIM				2453					
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= Allowed ÷					Res	tricted		I	Interfe	rence		0	Obje	cted	
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	CLA	IM							DATE						
Fi	nal	Original	07/25/2	013 11	1/06/2013	02/19/2014									
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		3	✓		-										
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U.S. Patent and Trademark Office

						Application/Control No.				Applicant(s)/Patent Under Reexamination					
Index of Claims						13615557				LARSC	N E	T AL.			
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						KRISNA LIM			2453						
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=	= Allowed ÷		R	Restricted I Interfere			rence O Object			jected					
	Claims renumbered in the same order as presented by applicant														
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F	inal	Original	07/25/2	013	11/06/20	013 02/19/2014									
		37			\checkmark	~									
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PO	POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO							
I hereby re 37 CFR 3.	evoke all previous powers of attorney (73(b).	given in the	appl	cation identified in th	ne attac	ched statement under		
l hereby a	ppoint:							
Practit	ioners associated with the Customer Number:			23630				
	······		- 4- 1-					
Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):								
	Name	Registration Number		Name		Registration Number		
as attorney(s any and all pa attached to th) or agent(s) to represent the undersigned befc atent applications assigned <u>only</u> to the undersig nis form in accordance with 37 CFR 3.73(b).	re the United S gned according	tates to the	Patent and Trademark O USPTO assignment reco	ffice (US ords or a	PTO) in connection with ssignment documents		
Please chan	be the correspondence address for the applicat	ion identified in	the a	ttached statement under	37 CFR	3.73(b) to:		
OR The	e address associated with Customer Number:							
Address	or dual Name							
City		State			Zi	р		
Country								
Telephone				Email				
Assignee Na	me and Address:							
VirnetX, In	C. Court Suite 200							
Zephyr Co	ve, Nevada 89448							
A copy of t	his form, together with a statement un	der 37 CFR 3	.73(k) (Form PTO/SB/96 o	r equiva	alent) is required to be		
filed in eac	h application in which this form is used	d. The state	nent	under 37 CFR 3.73(b) may b	e completed by one of		
and must i	oners appointed in this form if the app dentify the application in which this Po	wer of Attor	tione 1ey i:	er is authorized to act s to be filed.	on ber	haif of the assignee,		
	SIGNA The individual whose siscenture and title	FURE of Assig is supplied bel	nee o ow is	of Record authorized to act on beha	alf of the	e assignee		
Signature	Chine Call L			Dat	e	1/30/2013		
Name	Samoor Ma	thur			phone	775_548_1785		
Title	Vice Presiden	t - Cornorate		elopment and Mark	etina	110 040-1100		
This collection	of information is required by 37 CFR 1.31, 1.32 and 1	1.33. The inform	ation is	required to obtain or retain a	a benefit t	by the public which is to file (and		

In scollection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

STATEMENT UNDER 37 CFR 3.73(b)					
Applicant/Patent Owner: Victor LARSON, et al.					
Application No./Patent No.: 13/615,557 Filed/Issue Date: Septe	ember 13, 2012				
Titled: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING	SECURE DOMAIN NAMES				
VirnetX, Inc. , a Corporation					
(Name of Assignee) (Type of Assignee, e.g., corporation, partne	ership, university, government agency, etc.				
states that it is:					
1. X the assignee of the entire right, title, and interest in;					
2. an assignee of less than the entire right, title, and interest in (The extent (by percentage) of its ownership interest is%); or					
3. the assignee of an undivided interest in the entirety of (a complete assignment from o	one of the joint inventors was made)				
the patent application/patent identified above, by virtue of either:					
A. An assignment from the inventor(s) of the patent application/patent identified above. the United States Patent and Trademark Office at Reel, Frame	The assignment was recorded in , or for which a				
OR					
B. X A chain of title from the inventor(s), of the patent application/patent identified above, the	o the current assignee as follows:				
1. From: Victor Larson, et al. To: Science App	lications International Corporation				
The document was recorded in the United States Patent and Trademark Of Reel 027613 , Frame 0163 , or for white	ffice at ch a copy thereof is attached.				
2. From: Science Applications International Corporation To: VirnetX, Inc.					
The document was recorded in the United States Patent and Trademark O	ffice at				
Reel 027613 , Frame 0168 , or for white	ch a copy thereof is attached.				
3. From: To:					
The document was recorded in the United States Patent and Trademark O	ffice at				
Reel, Frame, or for white	ch a copy thereof is attached.				
Additional documents in the chain of title are listed on a supplemental sheet(s).					
As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from to or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.	the original owner to the assignee was,				
[NOTE: A separate copy (<i>i.e.</i> , a true copy of the original assignment document(s)) must accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. Set	be submitted to Assignment Division in ee MPEP 302.08]				
The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.					
/Toby H. Kusmer/	April 8, 2014				
Signature	Date				
Toby H. Kusmer, Registration No. 26,418	Attorney for Assignee				
Printed or Typed Name	Title				
This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the p process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimate application and public the process of the information form to the UPDTO.	ublic which is to file (and by the USPTO to ed to take 12 minutes to complete, including				

gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer. U.S. Patent and Trademark Office. U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Electronic Acknowledgement Receipt						
EFS ID:	18710002					
Application Number:	13615557					
International Application Number:						
Confirmation Number:	1089					
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES					
First Named Inventor/Applicant Name:	Victor Larson					
Customer Number:	23630					
Filer:	Toby H. Kusmer./Kimila Carraway					
Filer Authorized By:	Toby H. Kusmer.					
Attorney Docket Number:	077580-0177					
Receipt Date:	08-APR-2014					
Filing Date:	13-SEP-2012					
Time Stamp:	21:18:37					
Application Type:	Utility under 35 USC 111(a)					

Payment information:

Submitted with Payment no					
File Listin	g:				
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		077580-0177_POA.pdf	581324	yes	2
			ecfda7acbf055a8dbf449b55c66d94e47848 6d0f		

	Multipart Description/PDF files in .zip description							
	Document Description	Start	End					
	Power of Attorney	1	1					
	Assignee showing of ownership per 37 CFR 3.73.	2	2					
Warnings:								
Information								
	Total Files Size (in bytes):	51	81324					
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. New Applications Under 35 U.S.C. 111 If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Asknowledgement Perceipt will establish the filing date of the application								
National Stage of an International Application under 35 U.S.C. 371 If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.								
<u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number								

an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE UNITED STATES DEPARTMENT OF COMMERCE United States Patent and Trademark Office Address: COMMISSIONER FOR PATENTS PO Box 1450 Alexandria, Virginia 22313-1450 www.uspto.gov								
APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE					
13/615,557	09/13/2012	Victor Larson	077580-0177					
23630 McDermott Will & Emery The McDermott Building 500 North Capitol Street, N Washington, DC 20001	I.W.		CONFIRMATION NO. 1089 EPTANCE LETTER					

Date Mailed: 04/15/2014

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/08/2014.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/zabraha/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE UNITED STATES DEPARTMENT OF COMMERCE United States Patent and Trademark Office Address: COMMISSIONER FOR PATENTS PO. Box 1450 Alexandria, Virginia 22313-1450 www.uspto.gov								
APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE					
13/615,557	09/13/2012	Victor Larson	077580-0177					
23630 McDermott Will & Emery The McDermott Building 500 North Capitol Street, N. Washington, DC 20001	W.	POWER O	CONFIRMATION NO. 1089 F ATTORNEY NOTICE					

Date Mailed: 04/15/2014

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/08/2014.

• The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/zabraha/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

	REQ	JEST FO	R CONTINUED	D EXAMINATIC I Only via EFS	DN(RCE)TRANSMITTA -Web)	L		
Application Number	13/615,557	Filing Date	2012-09-13	Docket Number (if applicable)	077580-0177	Art Unit	2453	
First Named Inventor	Victor LARSON	1		Examiner Name	Krisna Lim		1	
This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application. Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV								
		S	UBMISSION REQ	UIRED UNDER 37	' CFR 1.114			
Note: If the RO in which they entered, appli	CE is proper, any were filed unless a cant must request	previously fi applicant ins non-entry c	led unentered amen structs otherwise. If a of such amendment(s	dments and amendn applicant does not wi s).	nents enclosed with the RCE w sh to have any previously filed	ill be ente unentered	red in the order d amendment(s)	
Previously submission	r submitted. If a fi n even if this box	nal Office ac is not check	otion is outstanding, a ked.	any amendments file	d after the final Office action m	nay be cor	nsidered as a	
Co	nsider the argume	ents in the A	ppeal Brief or Reply	Brief previously filed	on			
Oth	ier							
Enclosed								
🖂 An	nendment/Reply							
info	ormation Disclosu	re Statemer	nt (IDS)					
Aff	davit(s)/ Declarat	ion(s)						
⊠ Ot	ner An Informa	tion Disclos	ure Statement is beir	ng submitted by mail	concurrently with this filing.			
			MIS	CELLANEOUS				
Suspensi (Period c	on of action on the f suspension sha	e above-idei Il not exceed	ntified application is d 3 months; Fee und	requested under 37 er 37 CFR 1.17(i) re	CFR 1.103(c) for a period of m quired)	nonths _		
Other								
				FEES				
The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed. Image: The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 501133								
	\$	SIGNATUR	RE OF APPLICANT	F, ATTORNEY, OF	R AGENT REQUIRED			
Patent	Practitioner Sign ant Signature	ature						

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner						
Signature	/Toby H. Kusmer/	Date (YYYY-MM-DD)	2014-05-27			
Name	Toby H. Kusmer	Registration Number	26418			

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Docket No.: 077580-0177 (PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Victor LARSON, et al.	: Customer Number: 23630
Application No.: 13/615,557	Confirmation No. 1089
Filed: September 13, 2012	: Group Art Unit: 2453
For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES	: Examiner: Krisna Lim : :

Mail Stop RCE Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450

<u>RESPONSE SUBMITTED WITH</u> <u>REQUEST FOR CONTINUED EXAMINATION</u>

Commissioner:

In response to the final Office Action dated February 25, 2014, please enter and consider the following:

Remarks begin on page 2 of this paper.

DM_US 52503637-1.077580.0177

REMARKS

Claims 1, 2, 4-10, 12, and 14-37 are pending in the application, with claims 1 and 19 being the independent claims. No claims have been amended. Reconsideration and withdrawal of the rejections are respectfully requested.

Claim Rejection – Double Patenting

Claims 1, 2, 4-10, 12, and 14-37 are rejected on the ground of nonstatutory obviousnesstype double patenting over various claims of U.S. Patent Nos. 7,933,990, 7,490,151, and 6,502,135. Applicants filed a Response on February 13, 2014, together with three Terminal Disclaimers. The Terminal Disclaimers were rejected because a proper Power of Attorney was not on file for the application. A Power of Attorney was submitted on April 8, 2014, and was accepted by the Office on April 15, 2014.

Applicants are re-submitting Terminal Disclaimers for the '990, '151, and '135 patents to obviate the double patenting rejections. Applicants note that the filing of a terminal disclaimer is not an admission of the propriety of the rejection. M.P.E.P. § 804.02 *citing Quad Environmental Technologies Corp. v. Union Sanitary District*, 946 F.2d 870, 20 USPQ2d 1392 (Fed. Cir. 1991).

Since the double patenting rejections are the sole remaining issues in the Office Action the application is believed to be in condition for allowance and such action is respectfully requested.

CONCLUSION

Applicants respectfully submit that all of the pending claims are in condition for allowance. If any questions remain, or should the present response not place the claims in condition for allowance, Applicants respectfully invite the Examiner to contact the undersigned attorney so that any such matters may be promptly resolved.

Any remarks in support of patentability of one claim should not be imputed to any other claim, even if similar terminology is used. Any remarks referring to only a portion of a claim should not be understood to base patentability on that portion; rather, patentability rests on each claim taken as a whole. The absence of a reply to a specific rejection, issue, or comment does

not signify agreement with or concession of that rejection, issue, or comment. In addition, because the arguments made above may not be exhaustive, there may be other reasons for patentability of any or all claims that have not been expressed. Finally, nothing in this paper should be construed as intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment or cancellation of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment or cancellation.

Please charge any fees associated with filing the Terminal Disclaimers under 37 C.F.R. 1.20(d) to Deposit Account 50-1133.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 50-1133 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP

Date: <u>May 27, 2014</u>

/Toby H. Kusmer/

Toby H. Kusmer, P.C., Reg. No. 26,418 Customer No. 23630 28 State Street Boston, MA 02109-1775 Telephone: (617) 535-4000 Facsimile: (617) 535-3800 E-mail: tkusmer@mwe.com

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information of	unless it displays a valid OMB control number.					
TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING	Docket Number (Optional) 077580-0177					
	011000 0111					
In re Application of: Victor LARSON, et al.						
Application No.: 13/615,557						
Filed: September 13, 2012						
For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN	NAMES					
The owner [*] , <u>VirnetX, inc.</u> , of,	the instant application hereby disclaims, application which would extend beyond aid prior patent is presently shortened ation shall be enforceable only for and atent granted on the instant application ht granted on the instant application that for patent is presently shortened by any ened by any terminal disclaimer.					
Check either box 1 or 2 below, if appropriate.						
 For submissions on behalf of a business/organization (e.g., corporation, partnership, universite etc.), the undersigned is empowered to act on behalf of the business/organization. I hereby declare that all statements made herein of my own knowledge are true and that all selief are believed to be true; and further that these statements were made with the knowledge that w made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United Statement 	y, government agency, statements made on information and illful false statements and the like so ates Code and that such willful false					
statements may jeopardize the validity of the application or any patent issued thereon.						
2. ✓ The undersigned is an attorney or agent of record. Reg. No. <u>26,418</u>						
/Toby H. Kusmer/	May 27, 2014					
Toby H. Kusmer						
Typed of printed name						
	(617) 535-4000 Telephone Number					
✓ Terminal disclaimer fee under 37 CFR 1.20(d) included.						
WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.						
*Statement_under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP § 324.						
This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depend on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sen and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SENI ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.	the public which is to file (and by the USPTO is estimated to take 12 minutes to complete, ling upon the individual case. Any comments it to the Chief Information Officer, U.S. Patent D FEES OR COMPLETED FORMS TO THIS					

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal						
Application Number:	13	13615557				
Filing Date:	13	-Sep-2012				
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES					
First Named Inventor/Applicant Name:	Victor Larson					
Filer:	То	by H. Kusmer./Kimil	a Carraway			
Attorney Docket Number:	07	7580-0177				
Filed as Large Entity						
Utility under 35 USC 111(a) Filing Fees						
Description		Fee Code	Quantity	Amount	Sub-Total in USD(\$)	
Basic Filing:						
Pages:						
Claims:						
Miscellaneous-Filing:						
Petition:						
Patent-Appeals-and-Interference:						
Post-Allowance-and-Post-Issuance:						
Extension-of-Time:						

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Request for Continued Examination	1801	1	1200	1200
Total in USD (\$)				1200

Electronic Acknowledgement Receipt						
EFS ID:	19138109					
Application Number:	13615557					
International Application Number:						
Confirmation Number:	1089					
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES					
First Named Inventor/Applicant Name:	Victor Larson					
Customer Number:	23630					
Filer:	Toby H. Kusmer./Kimila Carraway					
Filer Authorized By:	Toby H. Kusmer.					
Attorney Docket Number:	077580-0177					
Receipt Date:	27-MAY-2014					
Filing Date:	13-SEP-2012					
Time Stamp:	19:55:07					
Application Type:	Utility under 35 USC 111(a)					

Payment information:

Submitted with Payment	yes			
Payment Type	Deposit Account			
, ,,	-			
Payment was successfully received in RAM	\$1200			
RAM confirmation Number	7446			
Deposit Account	501133			
Authorized User				
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:				
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Charge any Additional Fees required under 37 C.F.R. See	ction 1.17 (Patent application and reexamination processing fees)			

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File Listing	g:						
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)		
1		077580-0177_RCE_Response.	2540288	ves	8		
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	Multip	zip description					
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	Request for Continued E	1	:	2			
	Amendment Submitted/Entere	3	3				
	Applicant Arguments/Remarks	Applicant Arguments/Remarks Made in an Amendment					
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Warnings:			· · · · · ·				
Information:							
2	Fee Worksheet (SB06)	fee-info.pdf	30566		2		
			fd902e5ed8c64984b23e8cbcd104a958be7 d8146				
Warnings:							
Information:			1				
		Total Files Size (in bytes)	: 25	70854			

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information of	unless it displays a valid OMB control number.
TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING	Docket Number (Optional) 077580-0177
	011000 0111
In re Application of: Victor LARSON, et al.	
Application No.: 13/615,557	
Filed: September 13, 2012	
For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN	NAMES
The owner [*] , <u>VirnetX, inc.</u> , of <u>100</u> percent interest in except as provided below, the terminal part of the statutory term of any patent granted on the instant a the expiration date of the full statutory term of prior patent No. <u>7,933,990</u> as the term of so by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant applied during such period that it and the prior patent are commonly owned. This agreement runs with any part and is binding upon the grantee, its successors or assigns. In making the above disclaimer, the owner does not disclaim the terminal part of the term of any pater would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior terminal disclaimer," in the event that said prior patent later: expires for failure to pay a maintenance fee; is held unenforceable; is found invalid by a court of competent jurisdiction; is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321; has all claims canceled by a reexamination certificate; is reissued; or is in any manner terminated prior to the expiration of its full statutory term as presently shorted.	the instant application hereby disclaims, application which would extend beyond said prior patent is presently shortened ation shall be enforceable only for and atent granted on the instant application nt granted on the instant application that for patent is presently shortened by any ened by any terminal disclaimer.
Check either box 1 or 2 below, if appropriate.	
1. For submissions on behalf of a business/organization (e.g., corporation, partnership, universit	y, government agency,
I hereby declare that all statements made herein of my own knowledge are true and that all statements made herein of my own knowledge are true and that all statements belief are believed to be true; and further that these statements were made with the knowledge that w made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United Statements may jeopardize the validity of the application or any patent issued thereon. 2. If the undersigned is an attorney or agent of record. Reg. No. <u>26,418</u>	statements made on information and iliful false statements and the like so ates Code and that such willful false
/Toby H Kuemer/	May 27 2014
Signature	Date
Table 11 Magaza	
Toby H. Kusmer Typed or printed name	
	(617) 535-4000 Telephone Number
✓ Terminal disclaimer fee under 37 CFR 1.20(d) included.	
WARNING: Information on this form may become public. Credit card inform be included on this form. Provide credit card information and authorization	nation should not non PTO-2038.
*Statement_under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP § 324.	
This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depend on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sen and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SENI ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.	the public which is to file (and by the USPTO is estimated to take 12 minutes to complete, ding upon the individual case. Any comments it to the Chief Information Officer, U.S. Patent D FEES OR COMPLETED FORMS TO THIS

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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information u	inless it displays a valid OMB control number.				
TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING	Docket Number (Optional) 077580-0177				
	011000-0111				
In re Application of: Victor LARSON, et al.					
Application No.: 13/615,557					
Filed: September 13, 2012					
For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN	NAMES				
The owner*, <u>VirnetX. Inc.</u> , of <u>100</u> percent interest in except as provided below, the terminal part of the statutory term of any patent granted on the instant a the expiration date of the full statutory term of prior patent No. <u>7,490,151</u> as the term of s by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant applica during such period that it and the prior patent are commonly owned. This agreement runs with any patent is binding upon the grantee, its successors or assigns.	the instant application hereby disclaims, application which would extend beyond aid prior patent is presently shortened tion shall be enforceable only for and atent granted on the instant application				
In making the above disclaimer, the owner does not disclaim the terminal part of the term of any pater would extend to the expiration date of the full statutory term of the prior patent , "as the term of said pr terminal disclaimer," in the event that said prior patent later: expires for failure to pay a maintenance fee; is held unenforceable; is found invalid by a court of competent jurisdiction; is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321; has all claims canceled by a reexamination certificate; is reissued; or is in any manner terminated prior to the expiration of its full statutory term as presently shorted	nt granted on the instant application that ior patent is presently shortened by any ened by any terminal disclaimer.				
Check either box 1 or 2 below, if appropriate.					
1. For submissions on behalf of a business/organization (e.g., corporation, partnership, university etc.), the undersigned is empowered to act on behalf of the business/organization.	y, government agency,				
I hereby declare that all statements made herein of my own knowledge are true and that all s belief are believed to be true; and further that these statements were made with the knowledge that w made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United Sta statements may jeopardize the validity of the application or any patent issued thereon.	tatements made on information and illful false statements and the like so ates Code and that such willful false				
2. The undersigned is an attorney or agent of record. Reg. No. 26,418					
	May 27, 2014				
Signature	May 27, 2014 Date				
Toby H. Kusmer Typed or printed name					
	(617) 535-4000 Telephone Number				
✓ Terminal disclaimer fee under 37 CFR 1.20(d) included.					
WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.					
*Statement_under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP § 324.					
This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depend on the amount of time you require to complete th is form and/or suggestions for reducing this burden, should be sen and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SENI ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.	the public which is to file (and by the USPTO is estimated to take 12 minutes to c omplete, ing upon the individual case. Any comments t to the Chief Information Officer, U.S. Patent D FEES OR COMPLETED FORMS TO THIS				

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P	ATENT APPL	ICATION Substitute	FEE DETE	ERMINATION TO-875	N RECORD	Applicatic 13	on or Docket Number 3/615,557	Filing Date 09/13/2012	To be Mailed
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				APPLIC	ATION AS FIL	ED – PAF	RTI		
			(Column 1)	(Column 2)				
	FOR		NUMBER FIL	.ED	NUMBER EXTRA		RATE (\$)	F	EE (\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c)) N/A					N/A		N/A		
	SEARCH FEE (37 CFR 1.16(k), (i),	or (m))	N/A		N/A		N/A		
	EXAMINATION FE (37 CFR 1.16(o), (p),	E or (q))	N/A		N/A		N/A		
TO (37	TAL CLAIMS CFR 1.16(i))		34 min	us 20 = *			X \$ =		
IND (37	EPENDENT CLAIM CFR 1.16(h))	IS	2 mi	nus 3 = *			X \$ =		
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* If t	he difference in colu	umn 1 is less t	han zero, ente	r "0" in column 2.			TOTAL		
		(Column 1)	APPLICAT (Column 2)	ION AS AMEN (Column 3	IDED – P /	ART II		
NT	05/27/2014	CLAIMS REMAINING AFTER AMENDMEI	G NT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EX	TRA	RATE (\$)	ADDITIC	ONAL FEE (\$)
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ND	Independent (37 CFR 1.16(h))	* 2	Minus	***3	=	=			
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`		NTATION OF MU	JLTIPLE DEPEN	DENT CLAIM (37 CFI	R 1.16(j))				
							TOTAL ADD'L FE	E	
		(Column 1)	(Column 2)	(Column 3)			
		CLAIMS REMAININ AFTER AMENDMEI	G NT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EX	TRA	RATE (\$)	ADDITIC	ONAL FEE (\$)
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	FORM		First Named Inventor	Victor La	arson	
			Art Unit	2453		
(to be used fo	or all correspondence after initia	l filing)	Examiner Name	Krisna Lir	im	
Total Number	of Pages in This Submission		Attorney Docket Number	77580-17	77	
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Amenda	nent/Reply		Petition		Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)	
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Firm Name Signature Printed name Date	SIGNA McDermott, Will @ Emen /Toby H. Kusmer/ Toby H. Kusmer May 27, 2014		F APPLICANT, ATTO	RNEY, C	26,418	
Firm Name Signature Printed name Date I hereby certify th sufficient postage	SIGNA McDermott, Will @ Emer /Toby H. Kusmer/ Toby H. Kusmer May 27, 2014 C nat this correspondence is b e as first class mail in an en	ERTIFIC.	F APPLICANT, ATTO	RNEY, C Reg. No. ION/MAI	26,418 ILING sited with the United States Postal Service v P.O. Box 1450, Alexandria, VA 22313-1450	vith
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process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450, DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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INFORMATION DISCLOSURE STATEMENT NO	Application Number	13/615,557		
APPLICANT	Filing Date	09-13-2012		
(Use as many sheets as necessary) (MAY 2 7 2011	First Named Inventor	Victor Larson		
	Art Unit	2453		
	Examiner Name	Krisna Lim		
TRADEMART	Docket Number	77580-177 (VRNK-0001CP3CON8)		

CERTIFICATION STATEMENT

Please See 37 CFR 1.97 and 1.98 to make the appropriate selection(s)

- [] That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or
- [] That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § <u>1.56(c)</u> more than three months prior to the filing of the information disclosure statement.
- [] The Commissioner is authorized to charge any required fees to Deposit Account 50-1133.
- [X] Information Disclosure Statement is being filed with the Request for Continued Examination, which was electronically filed on May 27, 2014 and at that time, all fees due, were paid. However, the Commissioner is hereby authorized to charge any further fees which may be due, to Deposit Account 50-1133.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Date: May 27, 2014

/Toby H. Kusmer/ Toby H. Kusmer; Reg. No.:26,418 McDermott Will & Emery LLP 28 State Street Boston, MA 02109 Tel. (617) 535-4000 Fax (617) 535-3800

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				Exami	ner Name	Kı	risna Lim	
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		OSORE STATEMENT VS.	Filing Date	09-13-2012	
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	1 7 7 2014 5		Examiner Name	Krisna Lim	
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APPLICANT	LOSURE STATEMENT VS.	Filing Date	09-13-2012		
(Use as many sheets as ne	ecessary)	First Named Inventor	Victor Larson		
		Art Unit	2453		
		Examiner Name	Krisna Lim		
		Docket Number	77580-177 (VRNK-0001CP3C	ON8)	
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D1452	IPR2013-00348; Inter Partes Review Petitioner Apple Inc., – Exhibit 1051;	v of Patent Number 6,50 Nieh Declaration, 8 pag	2,135 filed on June 12, 2013, ges (2010)		
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	OCUDE STATEMENT VS	Application Number	13/615,557	
	USURE STATEMENT VS.	Filing Date	09-13-2012	
(Use as many sheets as ne	cessary)	First Named Inventor	Victor Larson	
		Art Unit	2453	
		Examiner Name	Krisna Lim	
		Docket Number	77580-177 (VRNK-0001CP3CON8	3)
D1455	IPR2013-00348; Inter Partes Review	v of Patent Number 6,50	2,135 filed on June 12, 2013,	
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D1457	IPR2013-00349; Inter Partes Review Petitioner Apple Inc., – Petition for Ir	v of Patent Number 6,50 nter Partes Review, 73 p	2,135 filed on June 12, 2013, ages	
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	ISCL	USURE STATEMENT VS.	Filing Date	09-13-2012		
(Use as many sheets	as neo	cessary)	First Named Inventor	Victor Larson		
				2453		
			Examiner Name	Krisna Lim		
			Docket Number	77580-177 (VRNK-0001CP3C	ON8)	
	1473	IPR2013-00375: Inter Partes Review	v of Patent Number 6.50	2 135 filed on June 23, 2013		
	1470	Petitioner New Bay Capital, LLC., – November 1, 2012, 146 pages	Petitioner New Bay Capital, LLC., – Exhibit 1014: Trial Transcript (Morning Session) of November 1, 2012, 146 pages			
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D1	1475	IPR2013-00375; Inter Partes Review of Patent Number 6,502,135 filed on June 23, 2013, Petitioner New Bay Capital, LLC., – Exhibit 1018: Virnetx Reply Claim Construction, 13 pages				
D1	1476	IPR2013-00376; Inter Partes Review Petitioner New Bay Capital, LLC. – F 7,490,151, 68 pages	v of Patent Number 7,49 Petition for Inter Partes F	0,151 filed on June 23, 2013, Review of U.S. Patent Number		
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D1	1481	IPR2013-00393; Inter Partes Review Petitioner Apple Inc., – Petition for Ir	v of Patent Number 7,41 hter Partes Review of US	8,504 filed on July 1, 2013, 5 Patent No 7,418,504, 62 pages		
D1	1482	IPR2013-00393; Inter Partes Review Petitioner Apple Inc., – Exhibit 1003;	v of Patent Number 7,41 Declaration of Michael	8,504 filed on July 1, 2013, Fratto, 182 pages (2013)		
D1	1483	IPR2013-00393; Inter Partes Review Petitioner Apple Inc., – Exhibit 1005;	v of Patent Number 7,41 Declaration of Chris Ho	8,504 filed on July 1, 2013, open, 25 pages (2013)		
D1	1484	IPR2013-00393; Inter Partes Review Petitioner Apple Inc., – Exhibit 1006;	v of Patent Number 7,41 Declaration of James C	8,504 filed on July 1, 2013, Chester , 26 pages (2013)		
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		Application Number	13/615,557	
	USURE STATEMENT VS.	Filing Date	09-13-2012	
Use as many sheets as ne	cessary)	First Named Inventor	Victor Larson	······
		Art Unit	2453	
		Examiner Name	Krisna Lim	
		Dockot Number	77580 177 (VPNK 0001CP3CC	
D1405	LIDB2012 00207: Inter Barton Bovie	of Patent Number 7.02	1 211 fled op July 1 2012	
D1495	Petitioner Apple Inc Exhibit 1006:	Declaration of James C	hester, 26 pages (2013)	
D1496	IPR2013-00398; Inter Partes Review	v of Patent Number 7,92	1,211 filed on July 1, 2013,	
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	Petitioner Apple Inc., Exhibit 1003: L	Declaration of Michael Fi	ratto regarding Patent Number	
D1498	IPR2013-00398: Inter Partes Review	v of Patent Number 7 92	1 211 filed on July 1 2013	
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D1500	IPR2014-00176; Inter Partes Review Petitioner RPX Corporation; Petition	v of Patent Number 7,41 for Inter Partes Review	8,504 filed on November 20, 2013, , 60 pages	
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D1502	Petitioner RPX Corporation; Exhibit	1005; Declaration of Ch	rist Hopen, 25 pages (2013)	
D1503	IPR2014-00176; Inter Partes Review of Patent Number 7,418,504 filed on November 20, 2013, Petitioner RPX Corporation: Exhibit 1006: Declaration of James Chester, 26 pages (2013)			
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D1506	IPR2014-00174; Inter Partes Review	v of Patent Number 7,41	8,504 filed on November 20, 2013,	
D4507	Petitioner RPX Corporation; Exhibit	1005: Declaration of Chi	ris Hopen, 25 pages (2013)	
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D1508	IPR2014-00172; Inter Partes Review Petitioner RPX Corporation: Petition	v of Patent Number 6,50	2,135 filed on November 20, 2013,	
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	Petitioner RPX Corporation; Exhibit	1006: Declaration of Jan	nes Chester, 26 pages (2013)	
D1512	IPR2014-00171; Inter Partes Review Petitioner RPX Corporation: Petition	v of Patent Number 6,50 for Inter Partes Review	2,135 filed on November 20, 2013, 73 pages	
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01514	Petitioner RPX Corporation: Exhibit	1005: Declaration of Chi	is Hopen Regarding Prior Art and	
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DAGAO	Petitioner RPX Corporation; Exhibit	1006: Declaration of Jan	nes Chester, 26 pages (2013)	
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	OCUDE STATEMENT VO	Application Number	13/615,557	
APPLICANT	USURE STATEMENT VS.	Filing Date	09-13-2012	
(Use as many sheets as ne	cessary)	First Named Inventor	Victor Larson	
		Art Unit	2453	
		Examiner Name	Krisna Lim	
· ··· · · · · · · · · · · · · · · · ·		Docket Number	77580-177 (VRNK-0001CP3CON8)	
D1517	IPR2014-00173: Inter Partes Review	v of Patent Number 7.49	0.151 filed on November 20, 2013.	
	Petitioner RPX Corporation; Exhibit	1003:Declaration of Mic	hael Fratto Regarding U.S. Patent	
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D1518	Patitioner PPX Corporation: Exhibit	v of Patent Number 7,48	90,151 filed on November 20, 2013,	
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D1519	IPR2014-00173; Inter Partes Review	v of Patent Number 7,49	00,151 filed on November 20, 2013,	
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	Petitioner RPX Corporation; Exhibit	1003:Declaration of Mic	hael Fratto Regarding U.S. Patent	
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D1522	IPR2014-00175; Inter Partes Review	v of Patent Number 7,92	1,211 filed on November 20, 2013,	
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D1523	IPR2014-00175; Inter Partes Review	v of Patent Number 7,92	1,211 filed on November 20, 2013,	
	Petitioner RPX Corporation; Exhibit	1006: Declaration of Jar	nes Chester, 26 pages (2013)	
D1524	IPR2014-00177; Inter Partes Review of Patent Number 7,418,504 filed on November 20, 2013,			
D1525	IPR2014-00177: Inter Partes Review	of Patent Number 7 41	8 504 filed on November 20, 2013	
01020	Petitioner RPX Corporation; Exhibit	1003:Declaration of Mic	hael Fratto Regarding U.S. Patent	
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D1526	IPR2014-00177; Inter Partes Review	v of Patent Number 7,41	8,504 filed on November 20, 2013,	
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D1527	IPR2014-00177; Inter Partes Review	of Patent Number 7,41	8,504 filed on November 20, 2013,	
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01020	Apple Inc.; Exhibit 1003: Declaration	of Michael Fratto Rega	rding U.S. Patent Number	
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	LOSURE STATEMENT VS.	Filing Date	09-13-2012		
(Use as many sheets as ne	ecessary)	First Named Inventor	Victor Larson		
		Art Unit	2453		
		Examiner Name	Krisna Lim		
	<u> </u>	Docket Number	77580-177 (VRNK-0001CP3CON8)		
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D1546	IPR2014-00401; Inter Partes Review Petitioner Microsoft Corporation., – I	v of Patent Number 7,18 Petition for Inter Partes F	8,180 filed on February 4, 2014, Review, 62 pages		
D1547	IPR2014-00401; Inter Partes Review of Patent Number 7,188,180 filed on February 4, 2014, Petitioner Microsoft Corporation., - Exhibit 1005: Guillen et al., "An Architecture for Virtual Circuit/QoS Routing," Brussels University, 8 pages (1993)				
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APPLICANT	DISCL	USURE STATEMENT VS.	Filing Date	09-13-2012	
(Use as many sheet	ts as ne	cessary)	First Named Inventor	Victor Larson	
			Art Unit	2453	
			Examiner Name	Krisna Lim	
			Docket Number	77580-177 (VRNK-0001CP3CON8)	
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APPLICANT	OSORE STATEMENT VS.	Filing Date	09-13-2012	
(Use as many sheets as ne	cessary)	First Named Inventor	Victor Larson	
		Art Unit	2453	
		Examiner Name	Krisna Lim	
		Docket Number	77580-177 (VRNK-0001CP3CON8)	
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(Use as many sheets as	necessary)	First Named Inventor	Victor Larson			
		Art Unit	2453			
		Examiner Name	Krisna Lim			
		Docket Number	77580-177 (VRNK-0001CP3CON8)			
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		Art Unit	2453
		Examiner Name	Krisna Lim
		Docket Number	77580-177 (VRNK-0001CP3CON8)
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		Examiner Name	Krisna Lim	
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		Art Unit	2453	
		Examiner Name	Krisna Lim	
		Docket Number	77580-177 (VRNK-0001CP3CON8)	
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			Art Unit	2453		
			Examiner Name	Krisna Lim		
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	D1719	Microsoft Claim Chart of U.S. Paten	t 6,502,135; vs. RFC 22	30 (November 1997) U.S. Patent	T	
		No. 5,511,122 (April 23, 1996)				
	D1720	Microsoft Claim Chart of U.S. Paten	t 6,502,135; vs. Check F	Point FW as described in: Goncalves		
		http://www.books24x7.com/book/id	762/viewer r.asp?book	id=762&chunkid=410651062		
		(Goncalves, Check Point FW); Chec	k Point Software Techn	ologies Ltd. (1999) (Check Point		
		FW)				
	D1721	Microsoft Claim Chart of U.S. Paten	t 6,502,135; vs. CIS/DC ect Model_references (1	OM as described in: Microsoft Corp., 996-1999)		
	D1722	Microsoft Claim Chart of U.S. Paten	t 6,502,135; vs. Bhattac	harya et al., "An LDAP Schema for		
		Configuration and Administration of	IPSec Based Virtual Priv	vate Networks (VPNs)", IETF		
	0.1700	Internet Draft (October 1999) ("LDAI	P Schema for IPSec bas	sed VPNs publication")		
	D1/23	1999	t 6,502,135; vs. Onion R	couting references (1996, 1997,		
	D1724	Microsoft Claim Chart of U.S. Paten	t 6,502,135; vs. Aventail	references (1997-1999)		
	D1725	Microsoft Claim Chart of U.S. Paten Control Protocol." Version 1.0 (May	t No. 6,502,135; vs. C. F 5. 1998) ("SGCP")	luitema et al., "Simple Gateway		
	D1726	Microsoft Claim Chart of U.S. Paten	t No. 6,502,135; vs. Mic	rosoft VPN Technology references		
	D1727	Microsoft Claim Chart of U.S. Patent	No. 6 502 135' vs. Dvn	amic VPN ("DVPN") references		
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	D1728	Microsoft Claim Chart of U.S. Patent	t No. 6,502,135; vs. R.G	Moskowitz, "Network Address		
		("Moskowitz")	net Draπ, Internet Engin	eering Task Force, February 6, 1998		
	D1729	Microsoft Claim Chart of U.S. Patent	t No. 6,502,135; vs. F-S	ecure VPN and F-Secure VPN		
	D 4 7 0 0	references (1996, 1998, 1999)				
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	D1731	Microsoft Claim Chart of U.S. Patent	t No. 6,502,135; vs. RFC	2543 and Internet Drafts (1999)		
	D1732	Microsoft Claim Chart of U.S. Patent Firewall references (1997, 1998)	t No. 6,502,135; vs. Alta	Vista Tunnel and/or the AltaVista		
	D1733	Microsoft Claim Chart of U.S. Patent	No. 6,502,135; vs. Hen	ning Schulzrinne, Personal Mobility		
		for multimedia Services in the Intern Distributed Multimedia Systems and	et, Proceedings of the E Services (1996) ("Schul	uropean Workshop on Interactive		
	D1734	Microsoft Claim Chart of U.S. Patent	No. 6.502.135: vs. Sch	ulzrinne U.S. Pat. No. 6 937 597		
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	D1735	Microsoft Claim Chart of U.S. Patent	No. 6,502,135; vs. J.M.	Galvin, "Public Key Distribution		
		with Secure DNS," Proceedings of th	ie Sixth USENIX UNIX S	Security Symposium, San Jose,		
	D1736	Microsoft Claim Chart of U.S. Patent	No. 6.502 135 vs. Nac	anand Doraswamy Implementation		
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		1997) ("Doraswamy")				
	D1737	Microsoft Claim Chart of U.S. Paten	No. 6,502,135; vs. Free	S/WAN references (1996)		
	D1738	Microsoft Claim Chart of U.S. Patent	No. 6,502,135; vs. H. C	Orman et al., Re: 'Re: DNS? Was		
		Re: Key Management, Anyone?, IET	F IPSec Working Group	Mailing List Archive (8/96 - 9/96)		
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	D1739	Microsoft Claim Chart of U.S. Patent	No. 6,502,135; vs. the	Automotive Network exchange		
		("ANX) references (1997, 1999)				

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(Use as many			First Named Inventor	Victor Larson	
			Art Unit	2453	
			Examiner Name	Krisna Lim	
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	D1740	Microsoft Claim Chart of U.S. Paten	t No. 6,502,135; vs. The	Defense Information Systems	
		Agency, Secret Internet Protocol rou	uter Network (SIPRNET)	references (1998, 2000)	
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	D1742	Microsoft Claim Chart of U.S. Paten	t No. 6,839,759; vs. R. A	Atkinson, "An Internetwork	
		Authentication Architecture," Naval	Research Laboratory, C	enter for High Assurance Computing	
·	D1742	Systems (8/5/93) ("Atkinson NRL")	t No. 6 839 759: vs. Dor	ald Fastlake, Domain Name System	
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		http://www.watersprings.org/pub/id/o	draft-ietf-dnssec-secext2	<u>-07.txt</u> ("DNSSEC-7")	
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		("Goldschlag I")	ry, Center for High Assu	rance Computer Systems (1997)	
	D1745	Microsoft Claim Chart of U.S. Paten	t No. 6,839,759; vs. Gol	dschlag et al., "Hiding Routing	
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	D1746	Microsoft Claim Chart of U.S. Paten	t No. 6,839,759; vs. Gol	dschlag et al., "Onion Routing for rch Laboratony, Center for High	
		Anonymous and Private internet Co Assurance Computer Systems (Jan	uarv 28. 1999) ("Goldsci	hlag III)	
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	D1740	Dec. 9-13, 1996 ("Reed") Microsoft Claim Chart of U.S. Paten	t No. 6 839 759: vs. D. M	AacDonald et al "PE KEY Key	
	D1740	Management API, Version 2," Netwo	ork Working Group, RFC	2367 (July 1998) ("RFC 2367")	
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		Selection Algorithms," available at <u>h</u>	ttp://www.onion-router.n	et/Archives/Route/index.html	
	D1750	Microsoft Claim Chart of U.S. Paten	t No. 6.839.759: vs. Sco	tt et al., Virtual Private Networks,	
	Diroc	O'Reilly and Associates, Inc., 2nd e	d. (Jan. 1999) ("Scott VF	PNs")	
	D1751	Microsoft Claim Chart of U.S. Paten	t No. 6,839,759; vs. Syv	erson et al., "Private Web	
		Browsing," Naval Research Laborat	ory, Center for High Ass	urance Computer Systems (June 2,	
	D1752	Microsoft Claim Chart of U.S. Paten	t No. 6,839,759; vs. Saf	eNet VPN Products ("SafeNet VPN	
		Products,") (1999-2000)	· · ·		
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	D1757	Microsoft Claim Chart of U.S. Paten	t No. 6,839,759; vs. Glo	bal VPN references (1999)	
	D1758	Microsoft Claim Chart of U.S. Paten Making Security Work on VPNs Inte	t No. 6,839,759; vs. Kau ranets and Extranets ((Ifman et al., Implementing IPsec:	
		IPsec")			

¹ SIPRNET is a U.S. Government Internet Protocol network for the transport of information classified as SECRET. SIPRNET was built starting in 1995, and contains domain names bearing the ".smil" designation. Microsoft has subpoenaed information from the Department of Defense and others relationg to SIPRNET, and reserves the right to amend its contentions to take any additional information about SIPRNET that it receives into account.Department of Defense and others relationg to SIPRNET, and reserves the right to amend its contentions to take any additional information about SIPRNET that it receives into account.Department of Defense and others relationg to SIPRNET, and reserves the right to amend its contentions to take any additional information about SIPRNET that it receives into account.

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(Use as many sheets as ne	ecessary)	First Named Inventor	Victor Larson	
		Art Unit	2453	
		Examiner Name	Krisna Lim	<u> </u>
		Docket Number	77580-177 (VRNK-0001CP3CON8)	;)
D1759	Microsoft Claim Chart of U.S. Paten Through the VPN Maze (1999) ("PG	t No. 6,839,759; vs. PGP P")	P Security, Finding Your Way	
D1760	Microsoft Claim Chart of U.S. Paten World Wide Web Connection, IBM In Surfing")	t No. 6,839,759); vs. Sat nt'l Technical Support O	fe Surfing: How to Build a Secure rganization (March 1996) ("Safe	
D1761	Microsoft Claim Chart of U.S. Paten 60/134,547 (filed May 17,1999) ("Sh	t No. 6,839,759; vs. U.S eymov")	. Provisional Patent Application No.	
D1762	Microsoft Claim Chart of U.S. Paten VPN+ Publication")	t No. 6,839,759; vs. Data	a Fellows F-Secure VPN ("F-Secure	
D1763	Microsoft Claim Chart of U.S. Paten Patent'")	t No. 6,839,759; vs. U.S	. Pat. No. 5,950,195 ("Stockwell '195	
D1764	Microsoft Claim Chart of U.S. Paten IPSEC Tunnel Mode, "IPSEC Worki	t No. 6,839,759; vs. B. P ng Group, Internet Draft	Patel et al., "DHCP Configuration of 02 (10/15/1999) ("Patel")	
D1765	Microsoft Claim Chart of U.S. Paten (1996-1997)	t No. 6,839,759; vs. SSL	VPNs ("SSL VPNs") references	
D1766	Microsoft Claim Chart of U.S. Patent references (19995, 1996, 1999)	t No. 6,839,759; vs. Gau	Intlet Firewall ("Gauntlet FW")	
D1767	Microsoft Claim Chart of U.S. Paten 5,822,434 October 13, 1998 (filed Ju	t No. 6,839,759; vs. Caro ine 18, 1996) ("'434 pate	onni et al., U.S. Patent No. ent)	
D1768	Microsoft Claim Chart of U.S. Patent	No. 6,839,759; vs. U.S.	. Pat. No. 5,311,593 ("'593 patent")	
D1769	Microsoft Claim Chart of U.S. Patent 5,511,122 (April 23, 1996)	No. 6,839,759; RFC 22	230 (November 1997) U.S. Pat. No.	
D1770	Microsoft Claim Chart of U.S. Patent Goncalves et al., Check Point FireW available at <u>http://www.books24x7.com/book/id</u> (Goncalves, Check Point FW); Chec	: No. 6,839,759; vs. Che all-1 Administration Guid <u>762/viewer_r.asp?booki</u> k Point Software Techno	ck Point FW as described in: de, McGraw-Hill Companies (2000) <u>d=762&chunkid=410651062</u> blogies Ltd. (1999) (Checkpoint FW)	
D1771	Microsoft Claim Chart of U.S. Patent 1998, 1999)	No. 6,839,759; vs. CIS/	/DCOM references (1996, 1997,	
D1772	Microsoft Claim Chart of U.S. Patent for Configuration and Administration Internet Draft (October 1999) ("LDAF	No. 6,839,759; vs. Bha of IPSec Based Virtual Schema for IPSec bas	ttacharya et al., "An LDAP Schema Private Networks (VPNs)", IETF ed VPNs publication")	
D1773	Microsoft Claim Chart of U.S. Patent 1999)	No. 6,839,759; vs. Onic	on Routing references (1996, 1997,	
D1774	Microsoft Claim Chart of U.S. Patent	No. 6,839,759; vs. Ave	ntail references (1996, 1997, 1999)	
D1775	Microsoft Claim Chart of U.S. Patent Control Protocol," Version 1.0 (May	No. 6,839,759; vs. C. H 5, 1998) ("SGCP")	luitema et al., "Simple Gateway	
D1776	Microsoft Claim Chart of U.S. Patent (1997-1999)	No. 6,839,759; vs. Micr	osoft VPN Technology references	
D1777	Microsoft Claim Chart of U.S. Patent (1997-2001)	No. 6,839,759; vs. Dyna	amic VPN ("DVPN") references	
D1778	Microsoft Claim Chart of U.S. Patent Translation Issues with IPsec," Interr ("Moskowitz")	No. 6,839,759; vs. R.G. net Draft, Internet Engine	. Moskowitz, "Network Address eering Task Force, February 6, 1998	
D1779	Microsoft Claim Chart of U.S. Patent Server and Citrix MetaFrame (New F	No. 6,839,759; vs. Ted Riders 1999) ("Windows	Harwood, Windows NT Terminal NT Harwood")	
D1780	Microsoft Claim Chart of U.S. Patent Genoway, Windows NT Thin Client S MetaFrame (Macmillan Technical Pu	No. 6,839,759; vs. Tode Solutions: Implementing Iblishing 1999) ("Window	d W. Mathers and Shawn P. Terminal Server and Citrix vs NT Mathers")	
D1781	Microsoft Claim Chart of U.S. Patent references (1996-1999)	No. 6,839,759; vs. F-Se	ecure VPN and F-Secure VPN+	
D1782	Microsoft Claim Chart of U.S. Patent Secure VPNs" (1998) ("TimeStep")	No. 6,839,759; vs. Time	eStep, "The Business Case for	

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(Use as many sheets as r	ecessary)	First Named Inventor	Victor Larson
		Art Unit	2453
		Examiner Name	Krisna Lim
		Docket Number	77580-177 (VRNK-0001CP3CON8)
D178	3 Microsoft Claim Chart of U.S. Pater the Internet Protocol," Network Wor	it No. 6,839,759; vs. Atki king Group, RFC 2401 (l	nson et al., "Security Architecture for November 1998) ("RFC_2401")
D178	4 Microsoft Claim Chart of U.S. Paten Patent")	it No. 6,839,759; vs. U.S	. Pat. No. 6,079,020 ("VPNet '020
D178	5 Microsoft Claim Chart of U.S. Paten Patent")	it No. 6,839,759; vs. U.S	. Pat. No. 6,173,399 ("VPNet '399
D178	6 Microsoft Claim Chart of U.S. Paten Patent")	it No. 6,839,759; vs. U.S	. Pat. No. 6,226,748 ("VPNet '748
D178	7 Microsoft Claim Chart of U.S. Paten Patent")	t No. 6,839,759; vs. U.S	. Pat. No. 6,226,751 ("VPNet '751
D178	B Microsoft Claim Chart of U.S. Paten IPSEC," PPPEXT Working Group, I	t No. 6,839,759; vs. Abo nternet Draft (February 2	ba et al., "Securing L2TP using 2, 1999) ("L2TP/IPSEC")
D178	9 Microsoft Claim Chart of U.S. Paten Firewall references (1997, 1998)	t No. 6,839,759; vs. Alta	Vista Tunnel and/or the AltaVista
D179	Microsoft Claim Chart of U.S. Paten for Multimedia Services in the Intern Distributed Multimedia Systems and	t No. 6,839,759; vs. Hen het, Proceedings of the E I Services (1996) ("Schu	ning Schulzrinne, Personal Mobility uropean Workshop on Interactive Izrinne 96")
D179	1 Microsoft Claim Chart of U.S. Paten Patent")	t No. 6,839,759; vs. U.S	. Pat. No. 6,701,437 ("VPNet '437
D1792	2 Microsoft Claim Chart of U.S. Paten	t No. 6,839,759; vs. Wat	chGuard references (2000)
D1793	3 Microsoft Claim Chart of U.S. Paten with Secure DNS," Proceedings of the California (July 1996) ("Galvin")	t No. 6,839,759; vs. J.M. he Sixth USENIX UNIX (. Galvin, "Public Key Distribution Security Symposium, San Jose,
D1794	4 Microsoft Claim Chart of U.S. Paten of Virtual Private Network (VPNs) w 1997) ("Doraswamy")	t No. 6,839,759; vs. Nag ith IP Secrity [sic.] <draft< td=""><td>anand Doraswamy, Implementation -ietf-ipsec-vpn-00.txt> (March 12,</td></draft<>	anand Doraswamy, Implementation -ietf-ipsec-vpn-00.txt> (March 12,
D179	5 Microsoft Claim Chart of U.S. Paten	t No. 6,839,759; vs. Free	eS/WAN references (1996)
D1796	Microsoft Claim Chart of U.S. Paten Re: Key Management, anyone?, IET ("Orman DNS"); J. Gilmore et al., Re Working Group Mailing List Archive	t No. 6,839,759; vs. H. C IF IPSec Working Group e: Key Management, any (8/96 – 9/96)	Orman et al., Re: 'Re: DNS? Was O Mailing List Archive (8/96 – 9/96) vone? (DNS keying) IETF IPSec
D1797	7 Microsoft Claim Chart of U.S. Paten Agency, Secret Internet Protocol Ro	t No. 6,839,759; vs. The uter Network (SIPRNET	Defense Information Systems) references (1998, 2000)
D1798	Microsoft Claim Chart of U.S. Paten Security Extensions, IETF DNS Sec <u>http://www.watersprings.org/pub/id/c</u>	t No. 7,188,180; vs. Don unty Working Group (De traft-ietf-dnssec-secext2	ald Eastlake, Domain Name System cember 1998), available at - <u>07/txt</u> ("DNSSEC-7")
D1799	 Microsoft Claim Chart of U.S. Paten Internet," Naval Research Laborator ("Goldschlag I") 	t No. 7,188,180; vs. Gold y, Center for High Assur	dschlag et al., "Privacy on the ance Computer Systems (1997)
D1800) Microsoft Claim Chart of U.S. Paten Information," Workshop on Informati	t No. 7,188,180; vs. Gold on Hiding, Cambridge, L	dschlag et al., "Hiding Routing JK (May 1996) ("Goldschlag II")
D180'	Microsoft Claim Chart of U.S. Paten Anonymous and Private Internet Con Assurance Computer Systems (Janu	t No. 7,188,180; vs. Gold nnection," Naval Resear uary 28, 1999) ("Goldsch	Ischlag et al., "Onion Routing for ch Laboratory, Center for High ilag III")
D1802	Anonymous Routing," 12th Annual C Dec. 9-13, 1996 ("Reed")	t No. 7,188,180; vs. M.G Computer Security Applic	. Reed, et al. "Proxies for ations Conference, San Diego, CA
D1803	Microsoft Claim Chart of U.S. Paten Management API, Version 2," Netwo	t No. 7,188,180; vs. D. N ork Working Group, RFC	lcDonald et al., "PF_KEY Key 2367 (July 1998) ("RFC 2367")
D1804	Microsoft Claim Chart of U.S. Patent Selection Algorithms," available at <u>h</u> ("Route Selection")	t No. 7,188,180; vs. Onic ttp://www.onion-router.ne	on Routing, "Investigation of Route et/Archives/Route/index.html

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(Use as many shee	ets as ne	cessary)	First Named Inventor	Victor Larson	
			Art Unit	2453	
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	-		Docket Number	77580-177 (VRNK-0001CP3CO	N8)
	D1805	Microsoft Claim Chart of U.S. Paten O'Reilly and Associates, Inc., 2nd ed	t No. 7,188,180; vs. Sco d. (Jan. 1999) ("Scott VF	tt et al., Virtual Private Networks, PNs")	
	D1806	Microsoft Claim Chart of U.S. Paten	t No. 7,188,180; vs. Syv	erson et al., "Private Web	
		Browsing," Naval Research Laborate 1997) ("Syverson")	ory, Center of High Assu	irance Computer Systems (June 2,	
	D1807	Microsoft Claim Chart of U.S. Patent Working Group Meeting Notes, <u>http:</u>	t No. 7,188,180; vs. "IPS //sandleman.ca/ipsec/19	Sec Minutes from Montreal," IPSEC 996/08/msg00018.html (June 1996)	
	D1808	Microsoft Claim Chart of U.S. Paten	t No. 7,188,180; vs. "Bui	Iding a Microsoft VPN: A	
		Comprehensive Collection of Micros Microsoft VPN publication")	oft Resources," FirstVPI	N, (Jan 2000) ("First VPN Building a	
	D1809	Microsoft Claim Chart of U.S. Patent	t No. 7,188,180; vs. DNS	S SRV references (1996, 1998,	
	D1810	Microsoft Claim Chart of U.S. Patent	t No. 7,188,180; vs. U.S	. Pat. No. 5,898,830 ("Wesigner '830	
	D1811	Microsoft Claim Chart of U.S. Patent Making Security Work on VPNS, Inter (Prec [*])	t No. 7,188,180; vs. Kau ranets, and Extranets (C	fman et al., Implementing IPsec: opyright 1999) ("Implementing	
	D1812	Microsoft Claim Chart of U.S. Patent World Wide Web Connection, IBM Ir Surfing")	t No. 7,188,180; vs. Safe nt'l Technical Support Or	e Surfing: How to Build a Secure rganization (March 1996) ("Safe	
	D1813	Microsoft Claim Chart of U.S. Patent 60/134.547 (filed May 17, 1999) ("St	t No. 7,188,180; vs. U.S. nevmov")	Provisional Patent Application No.	
	D1814	Microsoft Claim Chart of U.S. Patent VPN+ Publication)	t No. 7,188,180; vs. Data	a Fellows F-Secure VPN ("F-Secure	
	D1815	Microsoft Claim Chart of U.S. Patent Patent")	t No. 7,188,180; vs. U.S.	. Pat. No. 5,950,195 ("Stockwell '195	
	D1816	Microsoft Claim Chart of U.S. Patent IPSEC Tunnel Mode," IPSEC Working	t No. 7,188,180; vs. B. P ng Group, Internet Draft	atel et al., "DHCP Configuration of 02 (10/15/1999) ("Patel")	
	D1817	Microsoft Claim Chart of U.S. Patent (1996, 1999)	t No. 7,188,180; vs. SSL	VPNs ("SSL VPNs") references	
	D1818	Microsoft Claim Chart of U.S. Patent references (1995, 1996, 1999)	t No. 7,188,180; vs. Gau	intlet Firewall ("Gauntlet FW")	
	D1819	Microsoft Claim Chart of U.S. Patent	No. 7,188,180; vs. U.S.	. Pat. No. 6,199,171 ("'171 patent")	
	D1820	Microsoft Claim Chart of U.S. Patent 5,822,434 October 13, 1998 (filed Ju	t No. 7,188,180; vs. Caro une 18, 1996) ("'434 pate	onni et al., U.S. Patent No. ent")	
	D1821	Microsoft Claim Chart of U.S. Patent	No. 7,188,180; vs. U.S.	. Pat. No. 6,005,574 ("'574 patent")	
	D1822	Microsoft Claim Chart of U.S. Patent Records"); U.S. Pat. No. 5,511,122 (t No. 7,188,180; vs. RFC (April 23, 1996)	2230 (November 1997) ("KX	
	D1823	Microsoft Claim Chart of U.S. Patent Goncalves et al., Check Point FireW available at http://www.books24x7.com/book/id (Goncalves, Check Point FW); Chec	t No. 7,188,180; vs. Che 'all -1 Administration Gui <u>762/viewer r.asp?booki</u> k Point Software Techno	ck Point FW as described in: ide, McGraw-Hill Companies (2000) <u>d=762&chunkid=410651062</u> blogies Ltd. (1999) (Checkpoint FW)	
	D1824	Microsoft Claim Chart of U.S. Patent for Configuration and Administration Internet Draft (October 1999) ("LDAR	No. 7,188,180; vs. Batt of IPSec Based Virtual Schema for IPSec bas	acharya et al., "An LDAP Schema Private Networks (VPNs)", IETF ed VPNs publication")	
	D1825	Microsoft Claim Chart of U.S. Patent 1999)	t No. 7,188,180; vs. Onic	on Routing references (1996, 1997,	
	D1826	Microsoft Claim Chart of U.S. Patent	No. 7,188,180; vs. Ave	ntail references (1997, 1999)	
	D1827	Microsoft Claim Chart of U.S. Patent (1997-1999)	: No. 7,188,180; vs. Micr	osoft VPN Technology references	

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			Art Unit	2453	
			Examiner Name	Krisna Lim	
		•	Docket Number	77580-177 (VRNK-0001CP3CON8))
	D1828	Microsoft Claim Chart of U.S. Paten Translation Issues with IPsec," Inter ("Moskowitz")	t No. 7,188,180; vs. R.G net Draft, Internet Engin	a. Moskowitz, "Network Address eering Task Force, February 6, 1998	
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		Filing Date	09-13-2012		
(Use as many sh	eets as ne	cessary)	First Named Inventor	Victor Larson	
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			Examiner Name	Krisna Lim	
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*EXAMINER: Initial if Reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

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Espacenet

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Method for controlling a firewall

No documents available for this priority number.

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Classification:	- international: <i>G06F13/00; H04L12/56; H04L12/66; H04L29/06;</i> (IPC1-7): H04L9/32 - cooperative: <u>H04L29/06; H04L63/0263; H04L63/0272;</u> <u>H04L63/029; H04W8/26; H04W80/04</u>
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Abstract of GB2316841 (A)

When a mobile terminal 21 connected to an Internet service provider (ISP) 30 intends to access an inner network 20 within a firewall 22 via the Internet 10, the ISP sends terminal user information to the inner network. An agent host 32 investigates the Internet protocol (IP) address and the account of the terminal and determines whether the mobile terminal is a terminal moved from the inner network based on this information. If this is the case, a host 23 managing the firewall sets a filter in the



firewall allowing telecommunication between the mobile terminal and the inner network. The communication between the terminal and inner network may be by means of a twoway IP tunnel 40. Espacenet - Bibliographic data

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(31) 08227969 (32) 29.08.1996 (33) JP (71) Applicant(s) Kokusai Denshin Denwa Co Ltd (Incorporated in Japan)	H4L LDSC (56) Documents Cited INSPEC Abstract No.89502-6210L-059, C9502-5620W-012 & Tenth Comp. Sec. Conference,1994,IEEE,pp212-18
3-2 Nishishinjuku 2-chome, Shinjuku-ku, Tokyo 163, Japan (72) Inventor(s) Ayumu Kubota Kazuki Katagishi Tohru Asami	(58) Field of Search UK CL (Edition O) H4P PPEB INT CL ⁶ H04L 9/32 12/22 29/06 Online:- WPL INSPEC, JAPIO
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(54) Method for controlling a firewall

(57) When a mobile terminal 21 connected to an Internet service provider (ISP) 30 intends to access an inner network 20 within a firewall 22 via the Internet 10, the ISP sends terminal user information to the inner network. An agent host 32 investigates the Internet protocol (IP) address and the account of the terminal and determines whether the mobile terminal is a terminal moved from the inner network based on this information. If this is the case, a host 23 managing the firewall sets a filter in the firewall allowing telecommunication between the mobile terminal and the inner network. The communication between the terminal and the inner network.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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2316841

Specification

TITLE OF THE INVENTION

Method for dynamically controlling a firewall

FIELD OF THE INVENTION

This invention relates to a method for dynamically controlling a firewall.

BACKGROUND OF THE INVENTION

In a case of connecting a private network with the Internet, it is necessary to prevent a dishonest access from the Internet. However, if perfectly shut down a telecommunication between an internal network and an external network, it is impossible for a user of the internal network to access to his home network via the Internet.

Therefore, it is necessary to construct a firewall which selectively permits a telecommunication from an outside via the Internet.

In a prior art of a firewall, out of all data packets between the internal network and the external network, a previously permitted packet is only passed, but, another packet is shut down by using a filter.

Generally, such a filter is set by designating an IP (Internet Protokol) address of a terminal sending a packet, an IP address of a terminal receiving the packet, a kind of used protokol and a port number etc. For example, in a case of a telecommunication from an specific external IP address to any internal host (terminal) by using TCP (Transmission Control Protokol), a telecommunication using a specific port number (for example, 110) is permitted.

Wherein, the port number is an identifier for indicating a process of an upper layer in TCP or UDP (User Datagram Protokol).

However, it is difficult to obtain a pertinent filtering when a

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user accesses to his home network, by a dial-up or ppp connection via an ISP (Internet Service Provider) at outside of the home network, by using a mobile computer such as a note-type personal computer (a note-type PC), because upper 4 digits indicates a network with which the mobile PC is connected and lower 4 digits indicates an identifier of the mobile PC in the network, while the IP address used in the Internet telecommunication is indicated by 4 bytes number.

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Namely, in a case of dial-up connection by a mobile host (MH) moved from its home network, the IP address assigned to the mobile host is different every connection, then it is impossible to take a telecommunication using an IP address assigned in its home network.

Therefore, it is difficult to set a filter in the firewall by designating an IP (Internet Protokol) address of the terminal sending a data packet and an IP address of the terminal receiving the data packet, because an IP address of a moved terminal is not constant in the dailup connection.

Furthermore, it is not always possible for the user to use inner resources (a disk, data base and WWW etc.) of the home network to which he usually accesses, even if the filter of the firewall is pertinently set and it is possible only for an authorized mobile host and its user to permit an access from outside to the home network, because an access to the inner resources is individually limited and the access is permitted or is not permitted based on an IP address of a client terminal.

Next, referring to Fig.3, a mobile-IP address is explained, the mobile-IP is under work for standardization.

The mobile IP is a technique which enables to use a same IP address to the mobile terminal which moves anywhere, whenever the mobile terminal connects the Internet.

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However, now, the mobile-IP is not adaptive to a network having the firewall.

In Fig.3, 100 denotes the Internet, 200 denotes a home network of a mobile terminal 201, 202 denotes a home agent (HA) on the home network 200, 203 denotes a router, 300 denotes an ISP, 400 denotes another network and 401 denotes a terminal on the network 400.

In Fig.3, an IP address of the home network 200 to which the mobile terminal 201 is usually connected is [133.128.8.0], an IP address of the mobile terminal 201 on the home network 200 is [133.128.8. 81], an IP address of the home agent 202 is [133.128.8.100], and, an IP address of the mobile terminal 201 is [130.54.20.199] which is assigned by the ISP when the terminal 201 connects to the ISP by dial-up connection.

Generally, when a packet is sent from the terminal 401 on the network 400 to the terminal 201, as a rout 501 shown in Fig.3, the packet is transferred to the home network 200 to which the terminal 201 is usually connected. Therefore, when the terminal has been moved to another network, for example the ISP 300, it is necessary to transfer the packet to the network 300.

For transferring the packet, in the mobile-IP, an agent host is respectively provided to the network from which the mobile terminal is moved and the network to which the mobile terminal is moved. The agent in the network from which the mobile terminal is moved is called as a home agent and the agent in the network to which the mobile terminal is moved is called as a foreign agent. It is possible that the mobile terminal has a function of the foreign agent. In Fig.3, the mobile terminal 201 has a function of the foreign agent.

When the terminal 201 moved from its home network 200 connects to the ISP 300 by dial-up connection 301, a temporary IP address [130.54.2

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0.199] is assigned to the terminal 201 by the ISP.

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The IP address [130.54.20.199] of the mobile terminal 201 and its IP address [133.128.8.81] in the home network 200 are informed to the home agent 202 in the home network 200 via the ISP and the Internet100. Then, the home agent 202 records that the terminal 201 having the IP [133.

128.8.81] is moving and its temporary IP address is [130.54.20.199] in its data base, based on the received information.

When a packet is sent from the terminal 401 in the network 400 to the terminal 201 by using the usual IP address [133.128.8.81], as shown by route 502, the home agent 202 receives the packet instead of the mobile terminal 201. Then, as shown by the route 503, the home agent 202 transfers the packet from the terminal 401 to the mobile terminal 201 via the Internet 100 and the ISP 300 to the mobile terminal 201, by embedding the packet from the terminal 401 into a packet forwarded to the temporary IP address [130.54.20.199]. The mobile terminal 201 obtains the original packet of the terminal 401 from the received packet, if necessary, as shown by the route 504, any packet to the terminal 401 via the ISP and the Internet.

As mentioned-above, in the mobile-IP, it is possible to a packet from the terminal 401 to the mobile terminal 201 by using the usual IP address [133.128.8.81].

However, the telecommunication using the temporary IP address [130. 54.20.199] is necessary between the mobile terminal 201 and the home agent 202.

Namely, in the mobile-IP, since any process is not applied to the packet send from the mobile terminal 201, an usual routing is necessary.

Therefore, it is impossible for the mobile terminal 201 to another terminal inside the home network 200 except for the home agent 202 under the above-mentioned firewall, because only the telecommunication

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between the mobile terminal 201 and the home agent 202 is allowed. This means that the mobile terminal 201 is limited to access to the resource of its home network 200.

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An object of the present invention is to provide a method for dynamically controlling a firewall which enables to set a filter pertinent to the mobile terminal being connected with the ISP (Internet Service Provider) by the dial-up connection and its user.

An object of embodiments of the present invention is to provide a method for dynamically controlling a firewall which enables to pertinently permit that said mobile terminal and its user access to the resource of the home network from outside.

The present invention enables to set a pertinent filter by obtaining a user information from an Internet service provider. Embodiments of the present invention resolve an limitation of an access to a resource of a home network by combining the filter setting with a mobile-IP.

According to the present invention there is provided a method for enabling a pertinent filter comprising the steps of:

a step for sending a user information of a terminal being connected to an internet service provider by dial-up connection to an inner network inside a firewall from said internet service provider when said terminal accesses to said inner network via the Internet. a step that said inner network determines whether said terminal is a

mobile terminal moved from said inner network, based on said user information;

a step for setting a filter of said firewall to permit a telecommunication between said terminal when said terminal is said mobile terminal moved from said inner network.

In a method embodying the present invention, for resolving an limitation of an access, further an

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IP tunnel is used after setting of said filter for a telecommunication between said terminal and inner network.

In another embodiment for resolving an limitation of an access, said user information is transferred between an agent host provided in said internet service provider and a host for managing said firewall which sets said filter of said firewall provided in said inner network, and said telecommunication using said IP tunnel is done between said terminal and a home agent provided in said inner network.

BRIEF DESCRIPTION OF THE DRAWINGS

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Fig. 1 shows a configuration of a system to which a method embodying the present invention is applied.

Fig. 2 shows a mobile-IP which is adaptive to a firewall.

Fig. 3 shows an prior art mobile-IP which is not adaptive to a firewall.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

An embodiment of the present invention will be explained referring to the drawings.

In Fig. 1, 10 denotes the Internet, 20 denotes an inner network having plural home networks 20A, 20B and 20C, 21 denotes a mobile terminal which is usually connected to the inner network 20, 22 denotes a firewall, 23 denotes a host for managing the firewall, 24 denotes a home agent provided in each of home networks 20A, 20B and 20C,

30 denotes an ISP (Internet Service Provider), 31 denotes a server for authentication in the ISP, 32 denotes an agent host in the ISP.

The mobile terminal 21 has a function of a foreign agent for mobile-IP. The mobile terminal 21 is intended to connect the inner network 20 via the Internet, by dial-up connection to the ISP at any location after moving from the home network.

In this embodiment, a mechanism for controlling the firewall based

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on a user information obtained from the ISP and a mobile-IP mechanism adaptive to the firewall are provided.

The mechanism for controlling the firewall 22 based on the user information obtained from ISP 30 will be explained referring to Fig.1.

A user account (ID) and a pass word are input to the ISP 30, when a user of the mobile terminal 21 intends to connect to the ISP 30 by the dial-up connection. In the ISP 30, the authentication server 31 determines whether the user input data are proper or not. Only when the user input data are proper, an IP address is assigned to the mobile terminal 21, then the mobile terminal 21 is connected to the Internet 100. For this purpose, the ISP 30 can always grasp which user is connecting to the ISP 30 based on the user information and which IP address is assigned to the mobile terminal 21.

When the inner network 20 can know the user and an IP address used by the user, by obtaining the user information from the ISP 30, it is possible to properly set the filter. Then, it is possible to permit a telecommunication from a user who is previously allowed to access to the inner network 20 and to exclude an access from a user who has not authority for the access.

In Fig.1, a mechanism for adding and/or deleting a filter is provided, by providing the host 23 for managing the firewall within the inner network 20. Further, the agent host 32 is provided within the ISP so that only the telecommunication between the agent host 32 and the host 23 for managing the firewall can be allowed. Since the hosts 23 and 32 can use a fixed IP address for this telecommunication, there is no problem on setting the filter for the firewall.

Concretely, the filter is set by the following steps $(1) \sim (7)$. The step (n) corresponds to an symbol (n) in Fig,1. (1) When the mobile terminal 21 intends to access to the inner network

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20 from outside of it, the mobile terminal 21 requests an establishment of the connection between the mobile terminal 21 and the inner network 20 via the the agent host 32 in the ISP.

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(2) The agent host 32 investigates an IP address and an account at dialup connection of the mobile terminal 21.

(3) The agent host 32 relays a message from the mobile terminal 21 to the host 23 for managing the firewall, only when the mobile terminal 21 is connected by using a specific account which is allowed to access inside the firewall 22.

(4) An authentication is done by end-to-end method between the mobile terminal 21 and the home agent 24 via the host 23 for managing the firewall, because, in mobile-IP, an authentication must be done between the mobile terminal and the home agent.

(5) If the authentication is successful, the home agent sends a message of the success to the host 23 for managing the firewall.

(6) Then, the host 23 for managing the firewall changes the setting of the firewall 22 so as to permit the telecommunication between the mobile terminal 21 and the home agent 24.

(7) At the time when the host 23 for managing the firewall enables the telecommunication between the mobile terminal 21 and the home agent 24 by changing the setting of the firewall 22, the host 23 informs it to the home agent 24 and the host 23 informs it to the mobile terminal 21 via the agent host 32. After receiving the message, the home agent 24 sets an IP tunnel to the mobile terminal 21 and the mobile terminal 21 and the home agent 24 sets an IP tunnel to the home agent 24, then a two-way IP tunnel 40 is set.

By using the two-way IP tunnel 40, the mobile terminal 21 telecommunicates with each terminal of the inner network 20. Wherein, the mobile terminal 21 periodically sends a message for maintaining the

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connection to the host 23 for managing the firewall. When the message for maintaining the connection from a certain mobile terminal stops, the host 23 for managing the firewall automatically deletes the filter setting to the mobile terminal.

As mentioned above, it is possible to set the firewall 22 only within a necessary term and only for the telecommunication of which start point and end point are distinctly restricted.

A specification of the mobile-IP which is under work for standardization is not adaptive to the network 20 having the firewall 22.

Then, the mobile-IP is improved to adapt to the firewall 22 as follows, and the improved mobile-IP is combined with the abovementioned filter setting.

An combination of the mobile-IP and the dynamic firewall control will be explained referring to Fig.2.

As a route 52 shown in Fig.2, a packet from the mobile terminal 21 to the terminal 25 inside the firewall 22 is embedded in a packet to the home agent 24, then sent out. The home agent 24 obtains an original packet out of the received packet. The home agent 24 sends the obtained packet to the inner terminal 25, as a route 53 shown in Fig.2, by sends again the obtained packet to the Internet. In Fig.2, 26 denotes a router. When the mobile terminal exist in the inner network 20, the mobile terminal 21 telecommunicates with the inner terminal 25 via a route 51.

As mentioned-above, even if an authority is individually allowed in the inner network 20, it is possible to permit the access based on the IP address of the mobile terminal 21 which is usually connected with the network 20 by using the two-way tunnel between the mobile terminal 21 and the home agent 24. Therefore, it is possible to

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communicate between the mobile terminal 21 and the inner terminal 25.

According to the present invention, it is possible to set the firewall so as to permit the communication from the specific user in connection with the ISP by dail-up connection.

Further, according to embodiments of the present invention, because of an improvement and an combination of the mobile-IP, it is possible to access to the resources of the inner network from outside as same as connected with the inner network.

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1. A method for dynamically controlling a firewall comprising steps of:

a step for sending a user information of a terminal being connected to an internet service provider by dial-up connection to an inner network inside a firewall from said internet service provider when said terminal accesses to said inner network via the Internet;

a step that said inner network determines whether said terminal is a mobile terminal moved from said inner network, based on said user information;

a step for setting a filter of said firewall to permit a telecommunication between said terminal when said terminal is said mobile terminal moved from said inner network.

2. The method claimed in claim 1 wherein, an IP tunnel is used after setting of said filter for a telecommunication between said terminal and said inner network.

3. The method claimed in claim 2 wherein, said user information is transferred between an agent host provided in said internet service provider and a host for managing said firewall which sets said filter of said firewall provided in said inner network, and said telecommunication using said IP tunnel is done between said terminal and a home agent provided in said inner network.

4. A method for dynamically controlling a firewall substantially as hereinbefore described with reference to the accompanying drawings.

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Application No:GB 9718374.3Claims searched:1-4

Examiner: Date of search: Matthew Nelson 20 November 1997

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Other: Online:- WPI, JAPIO, INSPEC

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Category	y Identity of document and relevant passage			
x	INSPEC Abstract No. B9502-6210L-059, C9502-5620W-012 & "Tenth Annual Computer Security Applications Conference", published 1994, IEEE, pp212-18, Goldberg "The MITRE security perimeter" (see abstract).			

х	Document indicating lack of novelty or inventive step	٨	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined	P	Document published on or after the declared priority date but before
	with one or more other documents of same category.		the filing date of this invention.
		Ε	Patent document published on or after, but with priority date earlier
&	Member of the same patent family		than, the filing date of this application.

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(21)Application number : 08-073001	(71)Applicant : HITACHI LID
(22)Date of filing : 28.03.1996	(72)Inventor: SAWADA SUNAU SUGAWARA MASAKATSU NISHIKAWA JIKAI

(54) ADDRESS INFORMATION MANAGEMENT EQUIPMENT AND NETWORK SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent an illicit user from acquiring a correct address by reporting other wrong address to be camouflaged as a normal address to the illicit user.

SOLUTION: Upon the receipt of a packet requesting an address of an LES, an ATM interface driver 21 gives the packet to packet check section 22. The packet check section 22 checks the content of the packet and discriminates it to be valid when the content is in matching with a preset range or to be an illicit request when not and reports the result of discrimination to a LECS protocol processing section 24 with the packet. When the result of discrimination indicates a valid packet, the LECS protocol processing section 24 retrieves an LES table 23 and generates an address notice packet including the LES address and reports the packet to a request source via the ATM interface driver 21. When the discrimination results indicates an illicit request, the processing section 24 reports an address



notice packet including an address for hacker countermeasure terminal equipment to the request source via the driver 21.

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(54)【発明の名称】 アドレス情報管理装置およびネットワークシステム

(57)【要約】

【課題】不正な要求元に対してアドレス情報の通知を拒否したことを知られることなく正しいアドレス情報を渡すことを防ぎ、不正なアクセスの記録を取ることを可能にするアドレス情報管理方法を提供する。 【解決手段】アドレス情報管理装置1は通信手段21、

認証手段22. アドレステーブル23. アドレス通知手段24より構成される。





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(51)Int.Cl.	H04L 12/66
	H04L 12/28
(21)Application number : 08-203015 (22)Date of filing : 12.07.1996	(71)Applicant : NEC CORP (72)Inventor : TOMOIKE HIROMOTO

(54) VIRTUAL PRIVATE NETWORK CONSTITUTING METHOD IN MOBILE DATA COMMUNICATION

(57)Abstract:

PROBLEM TO BE SOLVED: To execute a data communication by one IP address by connecting a public mobile data network constituting a virtual private network with private branch LAN through a gate way so as to convert data to a mobile terminal to an address. SOLUTION: When a data terminal 3a connected to the subordinate of the LAN emulation server 32 of private branch LAN 3 stops connection with a LAN switch 331 and connects with a mobile equipment 5, the call control part of the mobile equipment 5 is informed of the address of the data terminal 3a. The mobile terminal 5 houses the informed address in a memory to form a mobile data terminal 6 accessable to the public mobile data network 2 and receives the kind of service, the number of the virtual private network and the node number from a location register 23. The server 32 retrieves address information of the terminal 3a and converts data to the mobile terminal 5 to an address to execute data communication by one IP address.



(12)公開特許公報(A)

(19)日本国特許庁 (JP)

(11)特許出顧公開各号

特開平10-32610

(43)公開日 平成10年(1998)2月3日

(51) Int.CL		1	織別記号	庁内整理書号	ΡI		4	技術表示會所
H04L	12/66			9744—5K	H04L	LI/20	В	
	12/46					11/00	810C	
	12/28						310B	

審査請求 有 請求項の数5 FD (全14 頁)

(21)出劇番号	坊顧平9-203015	(71) 出願人	000004237 日本俄気株式会社
(22)出题日	平成8年(1996)7月12日		東京都港区芝五丁目7番1号
		(72) 発明者	友強 裕元 東京都港区芝五丁目7番1号 日本電気株 式会社内
		(74)代樹人	弁理社 加藤 朝道

(54)【発明の名称】 移動データ通信における仮想私設制の構成方法

(57)【夢約】

【課題】インターネット接続を許容する移動データ通信 網を利用した仮想私設網を構築する際に問題となる、! Pルーティングの問題を無くし、標内しAN端末が公衆 移動データ網へアクセスしている移動環境においても構 内しANに接続されている端末と自由に通信可能となる ような仮想私設鋼サービスの提供。

【解決手段】しANエミュレーションサーバを有する構 内しANと公衆移動データ観とをしANエミュレーショ ンクライアント機能を有する仮想私設観ゲートウェイを 介して接続し、該ゲートウェイは、IPアドレスと公衆 移動データ網内アドレスとの変換機能を値える。公衆移 動データ網は移動データ端末からの位置登録要求受信時 に該移動データ端末が層するゲートウェイに該移動デー タ端末が移動した旨通知する機能を備える。



(11)Publication number :11-355271(43)Date of publication of application :24.12.1999

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	H04L	12/56		
(21)Application number : (22)Date of filing :	11-126562 (71) 07.05.1999 (72)	Applicant : Inventor :	: LUCENT TECHNOL CHUAH MOOI CHOO RAI GIRISH	Inc

(30)Priority

Priority number : 98 74582 Priority date : 08.05.1998 Priority country : US

(54) MOBILE POINT-TO-POINT PROTOCOL

(57)Abstract:

PROBLEM TO BE SOLVED: To incorporate a hand-off function of transferring an existing PPP connection from one network access server(NAS) to another NAS by establishing a call through a tunnel to a first packet server connected to a user in response to a call request message, transmitting a disconnection message and disconnecting the tunnel used before. SOLUTION: When providing a virtual private network service for an employee at a distant place to perform access through a network server(NS) 135 to the network of a company by an internet service provider(ISP) A, for example, the remote user is sometimes located at a section to become the object of the service of an ISP B temporarily. At such a time, in response to the call request message, a serve LAC 115 establishes the call through the tunnel to an anchor LAC 155 connected to the user. Then, the disconnection message is transmitted and the tunnel used before is disconnected for supporting a call from the user.



(12) 公開特許公報(A)

(19)日本国特許庁(JP)

(11)特許出願公開發号

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(43)公開日 平成11年(1999)12月24日

(51) Int.CL		織別記号	PI		
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	12/56			11/20	102A

審査請求 未請求 請求項の数15 OL (全 19 頁)

(21)出顧書号	坊顧平11−126562	(71)出顧人	596092698
(22)出翻日	平成11年(1999)5月7日		ルーモント テクノロシース インコーホ レーテッド アメリカ合衆国 0797d-0638 ニュージ
(31)優先機主張書号 (32)優先日	09/074582 1998年5月8日		ヤーシィ、マレイ ヒル、マウンテン ア ヴェニュー 600
(33) 優先權主張国	米国(US)	(72) 発明者	ムーイ ヂョー ヂュー アメリカ合衆国 07724 ニュージャーシ イ、イートンタウン、イートンクレスト ドライヴ 148ビー
		(74)代理人	弁理士 岡部 正夫 (外11名)
			最終頁に続く

(54)【発明の名称】 移動ポイント・ツー・ポイント・プロトコル

(57)【要約】

【課題】 本発明は、通信におけるパケット通信システ ムに関し、特に無線環境における仮想私設網(Vertual P rivate Network)に関する技術を提供する。 【解決手段】 本発明は、呼要求メッセージに応動し

「AFK FAZ」 年元514: 51 & ステンソビ シ ににあり て、ユーザに接続された第1のパケット・サーバヘトン ネルを介して呼を確立し、そして、切断メッセージを他 のパケット・サーバに送信して、該ユーザからの該呼を サポートするために以前使用されていたトンネルを切断 する、パケット・サーバからなることを特徴とする。こ れにより、ネットワークアクセスサーバが既存のPPP 接続を1つのNASから別のNASに移転できる「ハン ドオフ」機能がネットワーク・アクセス・サーバに組み 込まれる。



http://www4.ipdl.inpit.go.jp/Tokujitu/tjcontentpaj.ipdl?NPQQQti3h&NQQQAtINGEEnEE\$Qbit 10(822,0).4485-

(11)Publication number :	10-070576
(43)Date of publication of application :	10.03.1998

(51)Int.Cl.		H04L 12/66 G06F 13/00
		G06F 13/00 H04L 12/24 H04L 12/26
(21)Application number	: 08-227969	(71)Applicant : KOKUSAI DENSHIN DENWA CO LTD <kdd></kdd>
(22)Date of filing :	29.08.1996	(72)Inventor : KUBOTA AYUMI KATAGISHI KAZUOKI ASAMI TORU

(54) FIRE WALL DYNAMIC CONTROL METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To properly execute the filter setting of a fire wall to a moving terminal dial-upconnected to an internet service provider(ISP) and its user and to properly permit access to a home network resource.

SOLUTION: When the terminal 21 dial-up-connected to ISP 30 access to an internal network 20 within the fire wall 22 through the internet 10, user information of the terminal 21 is sent from ISP 30 to judge whether the terminal 21 is a moving terminal moved from the internal network 20 based on this user information. When it is the moving terminal, the filter of the fire wall 22 is set to permit communication between the terminal 21 and the internal network 20, and communication between the terminal 21 and the internal network 20 is executes through an IP tunnel.



(12) 公開特許公報(A)

(11)特許出顧公問母号

特開平10-70576

(43)公開日 平成10年(1998)3月10日

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(51) Int.CL		織別記号	庁内整理番号	ΡI				技術を	え示僧	腑
H04L	12/66		97445K	H04L	11/20	1	В			
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		3 5 7				357	7	/		
H04L	12/24		9744-5K	H04L	11/08					
	12/28									
				審査部	水 就家	菌求項の数3	OL	(全	7 J	禹)
(21)出顧書		将顯平8-227969	•	(71)出頭	A 0000012	214				

(22)出験日	平成8年(1995)8月29日	()	国際電信電話株式会社 東京都新宿区画新宿2丁目3番2号	
		(12)元明有	建国の準備での設備にて見る必須量	
			电信电话株式会社内	35 0
		(72) 発明者	片岸 —起	
			京京都新宿区西新宿二丁目3番2号	国際
			電信電話株式会社内	
		(72) 発明者	浅見 徴	
			東京都斯宿区西新宿二丁目3番2号	周期
			龟信龟岩株式会社内	
		(74)代理人	弁理士 光石 俄郎 (外2名)	

(54)【発明の名称】 ファイアウォール働的制御方法

(57)【要約】

(19)日本国特許庁 (JP)

【課題】 インターネットサービスプロバイダ(IS P)にダイヤルアップ接続中の移動端末及びそのユーザ に対してファイアウォールのフィルタ設定を適切に行 い、更に、ホームネットワーク資源へのアクセスを適切 に許可できること。

【解決手段】 ISP30にダイアルアップにより接続 中の端末21がインターネット10を経由してファイア ウォール22内の内部ネットワーク20にアクセスする 限に、ISP30から端末21のユーザ情報を送り、こ のユーザ情報を基に端末21が内部ネットワーク20か ら移動した移動端末であるか否かを判断し、移動端末で ある場合に、同端末21と内部ネットワーク20との通 信を許可するようにファイアウォール22のフィルタを 設定し、更に、同端末21と内部ネットワーク20との 通信を1Pトンネル40により行う。



(51)Int.Cl.	H04M 3/42
	H04L 12/46
	H04L 12/28
	H04L 12/66
	H04M 3/00
	H04Q 3/545
	H04Q 3/58
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(21)Application number : 10-061200	(71)Applicant : FUJITSU LTD
(22)Date of filing : 12.03.1998	(72)Inventor: WAKIMOTO TAKESHI
	OHASHI MASAHIKO

(11)Publication number :11-261704(43)Date of publication of application :24.09.1999

(54) CONNECTION METHOD FOR VIRTUAL NETWORK AND GATEWAY EXCHANGE

(57)Abstract:

PROBLEM TO BE SOLVED: To realize a connection method connected by means of the function of a gateway exchange without revising a numbering plan in the case of connecting prescribed business offices in plural private networks by a virtual network connected by the gateway exchanges as of the connection method and the gateway exchanges in the virtual network where the prescribed business offices in the plural private networks are connected by the gateway exchanges. SOLUTION: This gateway exchange discriminates whether or not an enterprise, an office and an extension number of a caller are registered in a virtual network from an incoming trunk identification number and a caller number of a call (STEP1), discriminates whether or not the connection to an incoming call number is allowed to correspond to the enterprise, the office and the extension number of the caller (STEP2), converts the incoming call number into an incoming call number in a private network by referencing a database when the



Petitioner Apple Inc. - Exhibit 1002, p. 488

connection to the incoming call number is allowed (STEP3) and acquires an outgoing trunk and sends the incoming call number thereto (STEP4).

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Petitioner Apple Inc. - Exhibit 1002, p. 489

(12) 公開特許公報(A)

(19)日本国特許庁(JP)

(11)特許出顧公問發号

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(43)公開日 平成11年(1989)9月24日

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H04M	3/42			H04	łM	3/42		E	
HOAL	12/46					3/00		B	
	12/28			HO 4	1Q	3/515			
	12/66					3/58		106	
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(21)出劇番	 ₱	将蝦平10−61200		(71)	出願人	. 000005	223		
		•				會士道	株式会	社	
(22)出験日		平成10年(1998)3月12日				神奈川	県川崎	市中原区上小	田中4丁目1番
				1		1号			
				(72)	発明者	脑本	Ra		
						凝如源	名古屋	作束区束核一	丁目13番3号
						會士遺	名古屋	遺信システム	朱式会社内
				(72)	発明者	1 大樹	正彦		
				1		果吐受	名古屋	市東区東桜一	丁目13日33号
						當士道	名古屋	通信システム	朱式会社内
				(74)	代理人	、弁理士	并桁	貞一	
			•						
				1					

(54)【発明の名称】 仮想ネットワークの接続方法およびゲートウェイ交換機

【課題】 本発明は、複数の私設編の所定の享業所をゲー トウェイ交換機で接続した仮想ネットワークにおける接 続方法、およびゲートウェイ交換機に関し、複数の私設 網の所定の享業所をゲートウェイ交換機で接続した仮想 ネットワークで接続を行うとき、香号計画の変更を行う ことなく、ゲートウェイ交換機の機能で接続する接続方 法を実現することを目的とする。

【解決手段】ステップ1でゲートウェイ交換機は発酵し てきた入トランク識別香号。発信香号から、発信者の企 業。事業所、内容香号が仮想ネットワークに登録されて いるかを判定し、ステップ2で発信者の企業、事業所、 内容番号対応に着信香号への接続が許容されているかを 判定し、ステップ3で着信番号への接続が許容の場合、 着信番号をデータベースと参照して、私設網の着信香号 に変換し、ステップ4で出トランクを搞捉して着信香号 を送出するように構成する。 本発明の第1の原理を説明する図



^{(57)【}要約】

(11)Publication number : 10-126440
(43)Date of publication of application : 15.05.1998

(51)Int.Cl.		H04L 12/56 G06F 13/00 H04L 12/46 H04L 12/28 H04L 12/24 H04L 12/26 H04L 29/06
(21)Application number	er : 08-275809	(71)Applicant : HITACHI LTD
(22)Date of filing :	18.10.1996	(72)Inventor : KAYASHIMA MAKOTO TERADA MASATOSHI FUJIYAMA TATSUYA OGINO TAKAAKI

(54) NETWORK COMMUNICATION METHOD AND EQUIPMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a virtual network environment in which communication is attained without notifying a relay path in the network communication system where communication between a client and a server is conducted in an environment in which a plurality of fire walls are interposed.

SOLUTION: A communication relay program that relays a communication client program on a client 303 and a communication server program of servers 301, 302 is started on servers 304, 305, 306 such as a fire wall, a relay path control table is provided to the client 303 and the relay servers 304–306, the communication client program is connected to the relay program of the relay server communicated by the client selected from the table in the connection processing to a server whose direct connection is unable due to a fire wall to request the relay of communication with the communication server program on the server to the relay server.



(12) 公開特許公報(A)

(11)特許出顧公開發号

• NO 13 01 - T

特開平10-126440

(43) 公開日 平成10年(1998) 5 月15日

(51) Int.CL4		織別記号		ΡI					
H04L	12/56			HO	4 L	11/20		102D	
G 0 6 F	13/00	355		G 0	6 F	13/00		355	
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	12/28					11/08			
	12/24					13/00		805B	
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(21)出顧書	7	祢樹平9−275309		(71)	拙願	A 000005	108		
						株式会	杜日立	製作所	
(22)出職日		平成8年(1996)10月18日				東京都	千代田	区种田胶河台	四丁目6番池
		i -		(72)	発明	者 登島	信		
						神奈川	県川崎	市麻生区王禅	守1099番迫株式
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						神奈川	県川崎	你麻生区王禅	· 1099合地称式
						会社日	立與作	所システム開	苑研究所内
				(74)	代理	人 介理士	小川	勝男	
									最終頁に続く

(54)【発明の名称】 ネットワーク通信方法および装置

(57)【要約】 (修正有)

【課題】 複数のファイアウォールが介在する環境でクラ イアントとサーバとの運信を行なうネットワーク通信シ ステムにおいて、中継経路を意識せずに運信できる仮想 ネットワーク環境を得る。

【解決手段】クライアント303上の適信クライアント プログラムと、サーバ301,302の通信サーバブロ グラムの通信を中継する適信中継ブログラムをファイア ウォール等中継サーバ304,305,306上で起動 し、クライアントおよび中継サーバには中継経路創御テ ーブルを待たせ、通信クライアントプログラムは、ファ イアウォールにより直接鉄銃できないサーバへの接続処 題において、前記テーブルより選択したクライアントか ら通信可能な中継サーバの中継ブログラムに接続し、通 信サーバブログラムとの通信の中継を依頼する。更に、 サーバへの接続処理において、クライアントの通信クラ イアントプログラムと同様に、中継サーバにサーバ上の 通信サーバブログラムと同様に、中継サーバにサーバ上の 通信サーバブログラムとの通信の中継を依頼する。 233



(51)Int.Cl.		H04L 12/22	ann, an saona a' canan na manana ann saona an saona an saona an 'S ann a' Stain an Stain an Stain an Stain an S
		H04L 12/56	
(21)Application number : (22)Date of filing :	11-126563 07.05.1999	(71)Applican (72)Inventor	: : LUCENT TECHNOL INC CHUAH MOOI CHOO RAI GIRISH

(30)Priority

Priority number : 98 74745 Priority date : 08.05.1998 Priority country : US

(54) MULTIPLE HOP POINT-TO-POINT PROTOCOL

(57)Abstract:

PROBLEM TO BE SOLVED: To enable a remote user to perform access through an internet service provider(ISP) under visiting to a virtual private network in addition to a home ISP by establishing a multiple hop packet tunnel with another packet terminal and repeating a message with the other packet terminal through the multiple hop packet tunnel.

SOLUTION: A communication system 100 shows the multiple hop tunnel, one hop comes from an ISP B network to an ISP A network and the other hop comes from the ISP A network to the network of a company. The tunnel and call are established between a serve LAC 115 and an anchor LAC 155. Similarly, the tunnel and call are established between the anchor LAC 155 and an LSN 135. When the tunnel is established, a lot of control message transactions are generated and a point-to-point protocol is set.



(12)公開特許公報(A)

(19)日本国特許庁 (JP)

(11)特許出顧公開番号 特開平11-355272

(43)公開日 平成11年(1999)12月24日 ΡI (51) Int CL⁴ 織別配号 H04L 11/26 H04L 12/22

12/56

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102A

(21)出顧書号	特職平11-126563	(71)出嗔人	596092698
			ルーセント テクノロジーズ インコーボ
(22)出験日	平成11年(1989)5月7日		レーアッド アメリカ合衆国。07974-0636 ニュージ
(31)優先檔主張番号	09/074745		ャーシィ, マレイ ヒル, マウンテン ア
(32)優先日	1998年5月8日		ヴェニュー 600
(33)優先機主張国	米国 (US)	(72)発明者	ムーイ チョー チュー
			アメリカ合衆国 07724 ニュージャーシ
			ィ,イートンタウン,イートンクレスト
			ドライヴ 148ビー
		(74)代理人	弁理士 岡部 正夫 (外11名)
			en als serve att a
			放殺貝に続く

(54) 【発明の名称】 多盒ホップ・ポイント・ツー・ポイント・プロトコル

【課題】 本発明は、通信におけるパケット通信システ ムに関し、特に多重トンネルによる私設網への遠隔アク セスを可能にする仮想私設額(VPN)サービスに関す る技術を提供する。

【解決手段】 本発明は、パケット・サーバで使用され る方法であって、他のパケット終端間に多重ホップ・パ ケット・トンネルを確立する段階と、該多重ホップ・パ ケット・トンネルを通じて該他のパケット終端間でメッ セージを中継する段階とからなることを特徴とする。こ れにより、多数のインターネット・サービス・プロバイ ダ(ISP)を通じて仮想ダイヤルアップ・サービスが 提供され、特に、遠隔ユーザはサーブISPへの接続を 確立することによって仮想ダイヤルアップ・サービスに アクセスする。サーブ ISPは、アンカ ISPへの第1 トンネルを確立する。アンカISPは、例えば、私設イ ントラネットへのトンネルを確立する。その結果、多重 トンネルによる私設網への遠隔アクセスを可能にする仮 想私設網(VPN)サービスが提供される。



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^{(57)【}要約】

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(22)Date of filing :	05.04.1996	(72)Inventor :	MURAYAMA JUNICHI TANIMOTO SHIGEAKI ISHIHARA FUMIAKI OZAWA KAZUYUKI

(54) ADDRESS SOLUTION PROCESSING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an address solution processing method in which an intensified security function and high speed communication are made compatible.

SOLUTION: In the method for solving a physical address of a non-multiple address wide area network 10 from an internet address by an address solution server 7 used to build up an internet on the non-multiple address wide area network 10, in the case of receiving an address solution request with respect to a same destination internet address, a reply is made or not by a different physical address depending on the internet address of a request source for address solution. In the embodiment, based on information registered in advance, a reply is made by a physical address of a destination host with respect to an address solution request from a host whose communication is allowed and no reply is made to an address solution request from a host whose communication is not allowed, and reply is made with a



physical address of a router having a security function with respect to an address solution request from a host whose communication permission is not definitely decided.

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(54)【発明の名称】 アドレス解決処理方法

(57)【要約】

【課題】 セキュリティ機能の強化と高速通信とが両立 したアドレス解決処理方法を提供する。

【解決手段】 非同報型広域網上にインタネットを構築 する際に用いるアドレス解決サーバで、インタネットア ドレスから非同報型広域網の物理アドレスを解決する方 法において、同一宛先インタネットアドレスに対するア ドレス解決要求受信時に、アドレス解決の要求元のイン タネットアドレスに応じて異なる物理アドレスで応答す るか又は応答しないようにする。一例では、予め登録さ れた情報に基づき、通信許可済のホストからのアドレス 解決要求に対しては宛先ホストの物理アドレスで応答 し、通信不許可のホストからのアドレス解決要求に対し ては応答せず、通信許可又は不許可を一律に決められな いホストからのアドレス解決要求に対してはセキュリテ ィ機能を有する中継ルータの物理アドレスで応答する。



Petitioner Apple Inc. - Exhibit 1002, p. 496

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【特許請求の範囲】

【請求項1】 非同報型広域網上にインタネットを構築 する際に用いられるアドレス解決サーバで、インタネッ トで用いられるインタネットアドレスから非同報型広域 網で用いられる物理アドレスを解決するアドレス解決処 理方法において、同一宛先インタネットアドレスに対す るアドレス解決要求受信時に、アドレス解決の要求元の インタネットアドレスに応じて異なる物理アドレスで応 答するか又は応答しないことを特徴とするアドレス解決 処理方法。

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【請求項2】 予め登録された情報に基づき、通信を許 可されているホストからのアドレス解決要求に対しては 宛先ホストの物理アドレスで応答し、通信を許可されて いないホストからのアドレス解決要求に対しては応答せ ず、通信の許可又は不許可を一律に決められないホスト からのアドレス解決要求に対してはセキュリティ機能を 有する中継ルータの物理アドレスで応答することを特徴 とする請求項1に記載のアドレス解決処理方法。 【発明の詳細な説明】

[0001]

【発明の属する技術分野】本発明は、非同報型広域網上 にインタネットを構築する際に用いられるアドレス解決 サーバに用いて好適なアドレス解決処理方法に関するも のである。

【0002】 非同報型広域網上でのアドレス解決処理 は、非同報型広域網上の異なるサブネットに帰属するホ スト間で、中継ルータを介さない高速パケット通信経路 を設定するために必要な処理である。これを実現する従 来のアドレス解決処理方法では、同一宛先インタネット アドレスに対するアドレス解決要求に対しては、アドレ 30 ス解決の要求元のインタネットアドレスに関わりなく、 同一の物理アドレスで応答していた。

[0003]

【発明が解決しようとする課題】非同報型広域網上に構 築されたインタネットでは、異なるサブネットに帰属す るホスト間通信でも中継ルータを介さない通信が可能で あるため、同一宛先インタネットアドレスに対するアド レス解決要求に対して、アドレス解決の要求元のインタ ネットアドレスに関わりなく同一の物理アドレスで応答 すると、常に中継ルータを介しない通信が行われてしま 40 う。中継ルータを介さない通信が行われると、パケット 中継処理遅延を削減できるものの、パケット転送路上で ファイアウォールと呼ばれるようなパケット中継装置を 用いてパケットフィルタリングを行うことが不可能にな る。

【0004】一方この問題を解決するために、常に中継 ルータを介した通信を行うこともできるが、この場合、 パケット転送路上でパケットフィルタリングを行うこと が可能になるものの、常にパケット中継処理遅延が増加 する。従って、このような従来のアドレス解決処理方法 50 【0011】先ず、ルータを介さない通信を許可する場

では、セキュリティ機能の弱い高速通信又はセキュリテ ィ機能の強い低速通信のいずれかしか実現できないとい う欠点があった。

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【0005】そこで、本発明はこの問題を解決し、セキ ュリティ機能の強化と高速通信とを両立させるアドレス 解決処理方法を提供することを目的とする。

[0006]

【課題を解決するための手段】本発明のアドレス解決処 理方法は、上述の目的を達成するために行われた発明で

10 あって、パケット転送に先立つアドレス解決処理時に、 同一宛先インタネットアドレスに対するアドレス解決要 求受信時でも、アドレス解決の要求元のインタネットア ドレスに応じて異なる物理アドレスで応答するか又は応 答しないことを特徴とする。

【0007】このような本発明においては、アドレス解 決処理時に、例えば、予め登録された情報に基づき、通 信を許可されているホストからのアドレス解決要求に対 しては直接宛先ホストの物理アドレスで応答し、通信を 許可されていないホストからのアドレス解決要求に対し 20 ては応答せず、通信の許可又は不許可を一律に決められ ないホストからのアドレス解決要求に対してはセキュリ ティ機能を有する中継ルータの物理アドレスで応答する ようにすることができる。

【0008】このようにすれば、通信を許可されている ホストとは高速通信が実現され、通信を許可されていな いホストからのアクセスが防止され、通信の許可又は不 許可を一律に決められないホストとは、セキュリティ機 能を有する中継ルータを介した通信が実現され、セキュ リティ機能の強化と高速通信とを両立させることができ る。

[0009]

【発明の実施の形態】次に図面を用いて、本発明の実施 例を説明する。図1は本発明を実施するためのネットワ ークモデルを示す図、図2はアドレス解決サーバでの本 発明におけるアドレス解決処理を説明するフローチャー トである。

【0010】図1のネットワークモデルは広域ATM網 10を示しており、この広域ATM網10は、端末1を含む サブネット11、端末2を含むサブネット12、端末3を含 むサブネット13、並びに、端末4、端末5、ルータ6及 びアドレス解決サーバ7を含むサブネット14から構成さ れている。図中のIP.a.b. はインタネットアドレスを示 し、ATM.a.b.は非同報型広域網の物理アドレスを意味 し、aの部分はサブネット部、bの部分はホスト部を表 す。また、図中のxは任意の正の整数を表す。このよう な構成において、例えば、アドレス解決サーバ7には、 予め、ルータ6を介さない通信を許可するサブネットと してサブネットロを、通信を許可しないサブネットとし てサブネット13を登録する。

合について説明する。サブネット11の端末1がサブネット14の端末1と通信しようとした場合、端末1はアドレス解決サーバ7にアドレス解決要求パケットを送信する。アドレス解決サーバ7は、アドレス解決要求パケット受信処理を行い(図2のステップ22)、この後ソース アドレス解析処理を行い(ステップ23)端末1の1P.1. 1.を特定する。IP.1.1.はルータを介さない通信を許可 するサブネット1 (IP.1.x)に帰属するため、宛先端末 アドレス解析処理を行い(ステップ24)、ATM.4.2 を解 決する。

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【0012】この後アドレス解決応答パケット送信処理 を行い(ステップ27)、アドレス解決要求パケット送信 元の端末1に対してATM.4.2を解決したアドレス解決応 答パケットを送り返す。アドレス解決終了後、端末1は IPパケットをATM.4.2を付与した内部転送用フレームに カプセル化し、これを直接端末4に転送する。なお、図 2のステップ21及び28は、それぞれ開始及び終了のステ ップである。

【0013】次に、通信を許可しない場合について説明 する。サブネット13の端末3がサブネット14の端末4と 20 通信しようとした場合、端末3はアドレス解決サーバ7 にアドレス解決要求パケットを送信する。アドレス解決 サーバ7は、アドレス解決要求パケット受信処理を行い (図2のステップ22)、この後ソースアドレス解析処理 を行い(ステップ23)、端末1のIP.4.2.を特定する。 IP.4.2.は通信を許可しないサブネット13(IP.4.x)に 帰属するため、無応答処理を行い(ステップ26)、ここ で処理が終了する。ここでは、アドレス解決が行われな いため、端末3はIPパケットを端末4に向けて送信でき ない。 30

【0014】最後に通信の許可又は不許可が不明な場合 について説明する。サブネット12の端末2がサブネット 14の端末4と通信しようとした場合、端末2はアドレス 解決サーバ7にアドレス解決要求パケットを送信する。 アドレス解決サーバ7は、アドレス解決要求パケット受 信処理を行い(図2のステップ22)、この後ソースアド レス解析処理を行い(ステップ23)、端末1のIP.2.2. を特定する。IP.2.2.の端末に関しては許可又は不許可 が不明のため、中継ルータアドレス解決処理を行い(ス テップ25)、ATM.4.1 を解決する。

【0015】この後アドレス解決応答パケット送信処理 を行い(ステップ27)、アドレス解決要求パケット送信 元の端末2に対してATM.4.1を解決したアドレス解決応 答パケットを送り返す。アドレス解決終了後、端末2は IPパケットをATM.4.1を付与した内部転送用フレームに カプセル化し、これを中継ルータ6に転送する。中継ル ータ6では、中継パケットのソースIPアドレス又は TCP ポート番号等を基にしてパケットフィルタリングを行

10 い、必要なパケットのみを端末4に転送する。
 【0016】
 【発明の効果】上述のように、本発明によれば、アドレス解決処理時におけるセキュリティ機能及びパケット転送時におけるセキュリティ機能が効果的に発揮される。
 即ち、アドレス解決処理時におけるセキュリティ機能が効果的に発揮される。
 即ち、アドレス解決処理時におけるセキュリティ機能になって、通信を許可されているホストとは中継ルータを介さない高速通信が実現され、通信を許可されていないホストからのアクセスが防止され、通信の許可又は不許可を一律に決められないホストとはセキュリティ機能を

20 有する中継ルータを介した通信が実現される。また、パケット転送時のセキュリティ機能によって、通信の許可又は不許可を一律に決められないホストとの通信時に、中継ルータにおいて、中継パケットのソースIPアドレス又はTCPポート番号等を基にしてパケットフィルタリングを行うことができる。従って、セキュリティ機能の強化と高速通信とを両立させることができる。 【図面の簡単な説明】

【図1】本発明を実施するためのネットワークモデルを 示す図である。

- 【図2】アドレス解決サーバでの本発明におけるアドレ ス解決処理を説明するフローチャートである。 【符号の説明】
- 1、2、3、4、5 端末
- 6 ルータ
- 7 アドレス解決サーバ
- 10 広域ATM網
- 11、12、13、14 サブネット
- 21~28 フローチャートの各ステップ

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フロントページの続き

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(57) Abstract						
A method and apparatus for transparently processing internet protocol (IP) address that maps to the host name process the address and domain name information. DNS client requests a name server to translate a domain name in network router until a name server that maintains the desir but merely forward the information along the pathway to t for updated routers that recognize when the information cc any), and then continues to forward the desired information similar address information is forwarded to a router, the rc to a distant name server. In this manner, routers intercept name servers to benefit from the cached information. Such	g DNS must l traffic nto an l ed info the dest onsists n back outer ca t DNS update	traffic. To access information on the internet using a domain name, the e determined. The host name system (DNS) is utilized to transmit and comprises approximately 10 % of the internet network traffic. When a P address, the requests are forwarded from one network router to another rmation is reached. The network routers do not examine the information, ination name server. One or more embodiments of the invention provide of DNS traffic, parses the information, caches the address information (if o the client of the name service. Consequently, when another request for n provide the response to the requestor instead of forwarding the request traffic and cache DNS information, allowing clients that utilize different d routers reduce the latency in DNS responses and reduce network traffic.				

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METHOD AND APPARATUS FOR TRANSPARENTLY PROCESSING DNS TRAFFIC

BACKGROUND OF THE INVENTION

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1. FIELD OF THE INVENTION

This invention relates to the field of computer software, and, more specifically, to caching DNS information.

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2. BACKGROUND ART

In a computer network environment and the internet, computers on the network (clients or servers) are assigned unique identifiers that may be 25 mapped to a textual name referred to as a domain name. Computer users often only have knowledge of the domain name and not the unique identifier. To communicate with a computer on the network, the unique identifier of the computer you are contacting must be ascertained. To

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ascertain the unique identifier, network routers forward the identifier request to other routers until a domain name server that maintains the desired information is located. Existing schemes can waste time forwarding the identifier request from one router to another router resulting in an increase

5 of traffic on the network and slowing down the time it takes to access and retrieve any information on the internet. These problems can be understood by reviewing networks, internets, and how they work.

<u>Networks</u>

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In modern computing environments, it is commonplace to employ multiple computers or workstations linked together in a network to communicate between, and share data with, network users. A network also may include resources, such as printers, modems, file servers, etc., and may also include services, such as electronic mail.

A network can be a small system that is physically connected by cables (a local area network or "LAN"), or several separate networks can be connected together to form a larger network (a wide area network or

- 20 "WAN"). Other types of networks include the internet, tel-com networks, the World Wide Web, intranets, extranets, wireless networks, and other networks over which electronic, digital, and/or analog data may be communicated.
- 25 Computer systems sometimes rely on a server computer system to provide information to requesting computers on a network. When there are a large number of requesting computers, it may be necessary to have more than one server computer system to handle the requests. In prior art systems,

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there is a problem in efficiently directing requests to the correct server in a multiple server system.

One area where this has been a problem is on the internet. The 5 problem can be better understood by reviewing the structure and operation of the internet below.

<u>The Internet</u>

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The Internet is a worldwide network of interconnected computers. An Internet client accesses a computer on the network via an Internet provider. An Internet provider is an organization that provides a client (e.g., an individual or other organization) with access to the Internet (via analog

15 telephone line or Integrated Services Digital Network line, for example). A client can, for example, read information from, download a file from or send an electronic mail message to another computer/client using the Internet.

To retrieve a file or service on the Internet, a client must search for the 20 file or service, make a connection to the computer on which the file or service is stored, and download the file or service. Each of these steps may involve a separate application and access to multiple, dissimilar computer systems. The World Wide Web (WWW) was developed to provide a simpler, more uniform means for accessing information on the Internet.

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The components of the WWW include browser software, network links, servers. and WWW protocols. The browser software, or browser, is a user-friendly interface (i.e., front-end) that simplifies access to the Internet. A
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browser allows a client to communicate a request without having to learn a complicated command syntax, for example. A browser typically provides a graphical user interface (GUI) for displaying information and receiving input. Examples of browsers currently available include Mosaic, Netscape Navigator and Communicator, Microsoft Internet Explorer, and Cello.

Information servers maintain the information on the WWW and are capable of processing a client request. Hypertext Transport Protocol (HTTP) is the standard protocol for communication with an information server on the WWW. HTTP has communication methods that allow clients to request

data from a server and send information to the server.

To submit a request, the client contacts the HTTP server and transmits the request to the HTTP server. The request contains the communication

- 15 method requested for the transaction (e.g., GET an object from the server or POST data to an object on the server). The HTTP server responds to the client by sending a status of the request and the requested information. The connection is then terminated between the client and the HTTP server.
- 20 A client request therefore, consists of establishing a connection between the client and the HTTP server, performing the request, and terminating the connection. The HTTP server does not retain any information about the request after the connection has been terminated. HTTP is, therefore, a stateless protocol. That is, a client can make several
- 25 requests of an HTTP server, but each individual request is treated independent of any other request. The server has no recollection of any previous request.

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An addressing scheme is employed to identify Internet resources (e.g., HTTP server, file or program). This addressing scheme is called Uniform Resource Locator (URL). A URL contains the protocol to use when accessing the server (e.g., HTTP), the Internet domain name of the site on which the server is running, the port number of the server, and the location of the resource in the file structure of the server.

The WWW uses a concept known as hypertext. Hypertext provides the ability to create links within a document to move directly to other information. To activate the link, it is only necessary to click on the hypertext link (e.g., a word or phrase). The hypertext link can be to information stored on a different site than the one that supplied the current information. A URL is associated with the link to identify the location of the additional information. When the link is activated, the client's browser uses the link to

15 access the data at the site specified in the URL.

If the client request is for a file, the HTTP server locates the file and sends it to the client. An HTTP server also has the ability to delegate work to gateway programs. The Common Gateway Interface (CGI) specification

- 20 defines a mechanism by which HTTP servers communicate with gateway programs. A gateway program is referenced using a URL. The HTTP server activates the program specified in the URL and uses CGI mechanisms to pass program data sent by the client to the gateway program. Data is passed from the server to the gateway program via command-line arguments, standard
- 25 input, or environment variables. The gateway program processes the data and returns its response to the server using CGI (via standard input, for example). The server forwards the data to the client using the HTTP.

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A browser displays information to a client/user as pages or documents (referred to as "web pages" or "web sites"). A language is used to define the format for a page to be displayed in the WWW. The language is called Hypertext Markup Language (HTML). A WWW page is transmitted to a

5 client as an HTML document. The browser executing at the client parses the document and displays a page based on the information in the HTML document.

HTML is a structural language that is comprised of HTML elements that are nested within each other. An HTML document is a text file in which certain strings of characters, called tags, mark regions of the document and assign special meaning to them. These regions are called HTML elements. Each element has a name, or tag. An element can have attributes that specify properties of the element. Blocks or components include unordered list, text

15 boxes, check boxes, radio buttons, for example. Each block has properties such as name, type, and value. The following provides an example of the structure of an HTML document:

<html></html>
<head></head>
element(s) valid in the document head
<body></body>
element(s) valid in the document body

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Each HTML element is delimited by the pair of characters "<" and ">". The name of the HTML element is contained within the delimiting characters. The combination of the name and delimiting characters is

30 referred to as a marker, or tag. Each element is identified by its marker. In most cases, each element has a start and ending marker. The ending marker

is identified by the inclusion of an another character, "/" that follows the "<" character.

HTML is a hierarchical language. With the exception of the HTML element, all other elements are contained within another element. The HTML element encompasses the entire document. It identifies the enclosed text as an HTML document. The HEAD element is contained within the HTML element and includes information about the HTML document. The BODY element is contained within the HTML. The BODY element contains all of the text and other information to be displayed. Other HTML elements are described in HTML reference manuals.

Domain Name Server

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A computer user navigates the internet or web from a browser on a computer system. To access a web site, the user enters the host name (or domain name) of the web site into the browser. This can be accomplished by clicking on a link, by activating a tool bar button, or by manually entering a name or address into a location field and pressing "enter". The names that a

- 20 name or address into a location new und proof of browser client uses are known as host names, such as www.sun.com for example. The name that is entered is not the actual Internet Protocol (IP) address of the intended web server. The actual IP address is a string of numbers that uniquely locate the web server that provides the web site data.
- 25 A worldwide distributed database system, called the "Domain Name System (DNS)" provides the mapping between server names and the associated IP addresses.

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Each client (or host) is configured with, or otherwise learns about, a name server that is willing to answer its queries (for mapping a domain name to an IP address, or vice versa). Such a name server is referred to as the "local name server" for that host. Client application software, such as a web

- 5 browser, also use a local library, called the "DNS resolver" to obtain the translation from server name to IP address. The resolver in turn contacts a predetermined local DNS name server to obtain the translation. DNS name servers can maintain caches of previously resolved names. More specifically, name resolution processes typically require two hosts on the client side.
- 10 Consider a user working on "asha.eng.sun.com" that wants to get the address of "whitehouse.gov". The client browser will talk with a local resolver (a library attached to the browser process itself, in the current example running on asha.eng.sun.com). The local resolver will go to one of a relatively small number of local name servers, e.g. "ns.sun.com". Here ns.sun.com is called
- 15 the client side name server. The client side name server will communicate with the outside world to determine the IP address of whitehouse.gov, and forward this information to the resolver that is part of the browser process.

DNS is a global network of servers that translate host names into numerical addresses (known as Internet Protocol, or IP addresses) and provides IP address to name mapping as well. A DNS server consists of a

name server and a resolver. The name server provides responses to resolver requests when it can by supplying the correct address for the host name supplied by the resolver. Referring to Figure 1, at step 100, the user enters the

25 domain name into the browser. At step 102, the browser requests the DNS Resolver to translate the domain name into the IP address. At step, 104, the resolver searches its cache to see if it already has a valid (unexpired) mapping available. If the cache has a valid mapping, it returns the IP address to the

browser at step 116. If the mapping is not in cache, the resolver forwards the request to the local name server at step 106.

All name servers know about at least one other name server that provides the DNS service for the root (.) domain. Thus, at step 108, the local name server contacts the name server for the any known domain. For example, if the host name is "www.java.sun.com", and the local name server does not know the address for the name server "java.sun.com", it will check to see if it knows the next level domain, i.e., the address for "sun.com". If the

- 10 local name server does not know the address for "sun.com", it will check to see if it knows the address of next level domain, i.e., ".com". If the local name server does not know the address for ".com", it will contact the root name server ".". At step 110, the local name server will obtain the address for the complete domain from the name server contacted (if that name server
- 15 knows the address). Otherwise, at step 110, the local name server will obtain the address for the next level of the domain from the contacted name server. For example, if the local name server contacted the name server for ".com" and that name server does not know the full address, the ".com" name server will return the domain address for "sun.com". Steps 108 and 110 are then
- 20 repeated until the complete domain address is obtained. Continuing with the above example, the local name server would contact the "java.com" name server and obtain the address for "java.sun.com". The local name server would then contact the name server for "java.sun.com" and obtain the address for "www.java.sun.com". When a request is made to a name server,
- 25 there are often many network routers ("routers") that forward the request from one location to another until it reaches the desired name server.

Once an intermediate or complete IP address is obtained, the address is saved in cache so that a future request may be serviced entirely from local cache at step 114. Thus, if a request for an alternative domain is received (e.g., a request for "ftp.sun.com"), the local name server can contact the name server (e.g., "sun.com") directly, without repeating the communication with the root domain server or with intermediate name servers (e.g., the ".com" name server). At step, 116, the IP address is returned to the browser. Once the IP address is known, the browser communicates with the web server at that address to retrieve the requested web page or other information.

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The operation of the DNS network is described in:

P.V. Mockapetris "Domain names - concepts and facilities", RFC 1034. Nov 1987.

P.V. Mockapetris "Domain names - implementation and specification", RFC 1035. Nov 1987.

DNS Server Problems

When DNS information is cached in a local name server, the cached information is only available to the clients that access that particular local name server (e.g., clients of the same internet service provider, or members of the same organization). Thus, if two users access different local name servers and each user requests the same IP address, both requests will have to go up the chain of name servers through the various routers, to obtain the needed information.

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For example, if two users in different universities in New Zealand were to query the DNS for the IP address of www.sun.com, both of the requests would be serviced by the local name server at ns.sun.com in the United States without any local caching benefit. Figure 2 provides another example of the prior art. Clients Cl1 212 and Cl2 214 are part of the SUN network 200 that utilizes local name server DNS1 220. Clients Cl3 216 and Cl4 218 are part on the NSCP network 204 that utilizes local name server DNS2 222. If client Cl1 212 requests information regarding an IP address on the SYDNEY 2000 network 208 in Sydney, Australia, the request is processed at

the SYDNEY 2000 208 network's local name server ns.syd.au 224. Routers 210 would forward the request from Cl1 to the local name servers 220 that forwards the request through routers 210 on the internet 206 until it reaches the SYDNEY 2000 network 208 and name server 224. The request is then transmitted back along the same route through routers 210 until it returns
back to local name server 220 where it is cached.

Only clients that access that same local DNS name server benefit from the caching information. Thus, in the above example, only Cl₂ benefits from the Cl₁ request and its resulting cached information. If Cl₄ requests a DNS translation for www.syd.au, it does not benefit from the cached information, and the information is requested and transmitted all the way to Australia and back. Thus, both DNS₁ and DNS₂ would obtain the relevant information from Australia creating traffic on the individual networks 200 204 and 208 and internet 206.

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Networks may be divided up into layers. For example, one layer may provide for the forwarding of information from one location to another, referred to as the network layer, and another layer may provide for the WO 00/14938

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parsing and processing of the information passed across the network, referred to as the application layer. Name resolution as provided by the domain name system (DNS) is an application layer protocol. Network routers 210 are only concerned with the network layer protocol and forward the DNS request

5 to its desired destination. Consequently, routers 210 don't parse or process the information that they forward in packets.

Network Traffic Reduction

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Prior art methods for reducing network traffic have provided methods for caching web pages and HTML information. Two such prior art methods are referred to as Active Networks and Transparent Proxies.

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<u>Active Networks</u>

Routers are dedicated machines for forwarding and switching traffic as quickly as possible. In an Active Network, specific routers are configured to 20 process packets of web and other non-DNS information. Specific geographic locations are chosen to place the specially configured routers. Consequently, the performance of an Active Network is based on the placement strategy of the updated routers.

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Transparent Proxies

Transparent Proxies are used mostly by large corporations and internet service providers for reducing their web traffic. In a typical set-up, the domain administrator configures the routers so that all of the web requests (identified by a port number, e.g., 80) are automatically diverted to a proxy server ("transparent proxy"). A proxy server (or proxy) is a server that carries out requests transmitted to it (i.e., from a client), keeping copies of fetched documents or information for some time so that they can be accessed more

- 10 quickly in the future, speeding up access for commonly requested information. This storing and retrieval of information and fetched documents by the proxy is referred to as caching and the information maintained in the proxy is referred to as a cache or proxy cache. If the proxy does not have the desired information, the proxy sends a request to the
- 15 appropriate web server (which may be processed through several routers) that then returns the information to the proxy for caching. When the proxy gets the desired information, it provides this information to the requesting client.

The prior art methods do not provide any method for optimizing DNS

- 20 traffic. Approximately 10% of the traffic on the internet is currently comprised of DNS traffic. Further, since DNS information does not change often (IP addresses often remain the same even when computers on a network are moved), the validity of a DNS entry may be much longer than that of data transmitted through the web. Consequently, an efficient method
- 25 for optimizing and processing DNS traffic is needed.

SUMMARY OF THE INVENTION

A method and apparatus for transparently processing DNS traffic. To access information on the internet using a domain name, the internet 5 protocol (IP) address that maps to the domain name must be determined. The domain name system (DNS) is utilized to transmit and process the address and domain name information. DNS traffic comprises approximately 10% of the internet network traffic.

10 When a client requests a name server to translate a domain name into an IP address, the requests are forwarded from one network router to another network router until a name server that maintains the desired information is located. The network routers do not examine the information, but merely forward the information along the pathway to the destination name server.

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One or more embodiments of the invention provide for updated routers that recognize when the information consists of DNS traffic, parses the information, caches the address information (if any), and then continues to forward the desired information back to the name server. Consequently,

20 when another request for similar address information is forwarded to a router, the router can provide the response to the requestor instead of forwarding the request to a distant name server. In this manner, routers intercept DNS traffic and cache DNS information, allowing clients that utilize different name servers to benefit from the cached information. Such updated

25 routers reduce the latency in DNS responses and reduce network traffic.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates a prior art method for processing DNS information.

5 Figure 2 demonstrates the relationship between several networks.

Figure 3 is a block diagram of one embodiment of a computer system capable of providing a suitable execution environment for one or more embodiments of the invention.

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Figure 4 demonstrates the relationship between several networks and the path of DNS traffic according to one or more embodiments of the invention.

15 Figure 5 illustrates the steps executed by an updated router according to one or more embodiments of the invention.

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DETAILED DESCRIPTION OF THE INVENTION

The invention is a method and apparatus for transparently caching DNS traffic. In the following description, numerous specific details are set forth to provide a more thorough description of embodiments of the invention. It is apparent, however, to one skilled in the art, that the invention may be practiced without these specific details. In other instances, well known features have not been described in detail so as not to obscure the invention.

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Embodiment of Computer Execution Environment (Hardware)

An embodiment of the invention can be implemented as computer software in the form of computer readable code executed on a general

- 15 purpose computer such as computer 300 illustrated in Figure 3, or in the form of bytecode class files running on such a computer. A keyboard 310 and mouse 311 are coupled to a bi-directional system bus 318. The keyboard and mouse are for introducing user input to the computer system and communicating that user input to processor 313. Other suitable input devices
- 20 may be used in addition to, or in place of, the mouse 311 and keyboard 310.
 I/O (input/output) unit 319 coupled to bi-directional system bus 318
 represents such I/O elements as a printer, A/V (audio/video) I/O, etc.

Computer 300 includes a video memory 314, main memory 315 and mass storage 312, all coupled to bi-directional system bus 318 along with keyboard 310, mouse 311 and processor 313. The mass storage 312 may include both fixed and removable media, such as magnetic, optical or magnetic optical storage systems or any other available mass storage

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technology. Bus 318 may contain, for example, thirty-two address lines for addressing video memory 314 or main memory 315. The system bus 318 also includes, for example, a 32-bit data bus for transferring data between and among the components, such as processor 313, main memory 315, video memory 314 and mass storage 312. Alternatively, multiplex data/address lines may be used instead of separate data and address lines.

In one embodiment of the invention, the processor 313 is a microprocessor manufactured by Motorola, such as the 680X0 processor or a

- 10 microprocessor manufactured by Intel, such as the 80X86, or Pentium processor, or a SPARC microprocessor from Sun Microsystems, Inc. However, any other suitable microprocessor or microcomputer may be utilized. Main memory 315 is comprised of dynamic random access memory (DRAM). Video memory 314 is a dual-ported video random access memory.
- One port of the video memory 314 is coupled to video amplifier 316. The video amplifier 316 is used to drive the cathode ray tube (CRT) raster monitor 317. Video amplifier 316 is well known in the art and may be implemented by any suitable apparatus. This circuitry converts pixel data stored in video memory 314 to a raster signal suitable for use by monitor 317. Monitor 317 is
 a type of monitor suitable for displaying graphic images.

Computer 300 may also include a communication interface 320 coupled to bus 318. Communication interface 320 provides a two-way data communication coupling via a network link 321 to a local network 322. For

25 example, if communication interface 320 is an integrated services digital network (ISDN) card or a modem, communication interface 320 provides a data communication connection to the corresponding type of telephone line, which comprises part of network link 321. If communication interface 320 is

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a local area network (LAN) card, communication interface 320 provides a data communication connection via network link 321 to a compatible LAN. Wireless links are also possible. In any such implementation, communication interface 320 sends and receives electrical, electromagnetic or

5 optical signals which carry digital data streams representing various types of information.

Network link 321 typically provides data communication through one or more networks to other data devices. For example, network link 321 may
provide a connection through local network 322 to local server computer 323 or to data equipment operated by an Internet Service Provider (ISP) 324. ISP 324 in turn provides data communication services through the world wide packet data communication network now commonly referred to as the "Internet" 325. Local network 322 and Internet 325 both use electrical,

15 electromagnetic or optical signals which carry digital data streams. The signals through the various networks and the signals on network link 321 and through communication interface 320, which carry the digital data to and from computer 300, are exemplary forms of carrier waves transporting the information.

20

Computer 300 can send messages and receive data, including program code, through the network(s), network link 321, and communication interface 320. In the Internet example, remote server computer 326 might transmit a requested code for an application program through Internet 325,

25 ISP 324, local network 322 and communication interface 320.

The received code may be executed by processor 313 as it is received, and/or stored in mass storage 312, or other non-volatile storage for later

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execution. In this manner, computer 300 may obtain application code in the form of a carrier wave.

Application code may be embodied in any form of computer programproduct. A computer program product comprises a medium configured to store or transport computer readable code, or in which computer readable code may be embedded. Some examples of computer program products are CD-ROM disks, ROM cards, floppy disks, magnetic tapes, computer hard drives, servers on a network, and carrier waves.

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The computer systems described above are for purposes of example only. An embodiment of the invention may be implemented in any type of computer system or programming or processing environment.

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Embodiment of Software Apparatus for Transparently Caching DNS Traffic

One or more embodiments of the invention may be described by examining the layered model of networking and the peer relationships

- 20 between the different layers. At the network layer, a peer relationship exists between each router that is connected by some type of wire. At the higher application layer, DNS entities (e.g., DNS resolvers and the local name servers) have a peer relationship with multiple hops in between (e.g., the routers). The routers at the network layer (the hops of the network layer) do
- 25 not examine the information from application layer protocols. The routers merely transparently transfer the information between DNS clients and DNS servers.

In one or more embodiments of the invention, the layering model of networks is violated. DNS traffic is communicated from one machine to another machine through the use of name service ports. DNS traffic commonly arrives from and is transmitted to a specific DNS port (e.g., port 53). Consequently, based on the port information that is present in all IP packets, the routers have the ability to identify when DNS traffic is being

When an intermediate router (or hop in the network protocol layer) 10 identifies that DNS information is in the packet it is transmitting across the internet, the routers violate the layering model and examine the information in the packet as if the router were a member of the application protocol. The information is then parsed and cached. Thus, the routers snoop on the DNS replies from a name-server and cache the intercepted replies. The routers

transmitted versus when web or other traffic is being transmitted.

15 also intercept DNS requests, and determine if the request can be served from the cache. If the cache contains the requested information, the router provides the response to the DNS query. If the cache does not contain the requested information, the router forwards the request to the next router or hop along the path to the name server.

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Referring to the prior art system of Figure 1, at step 106, the resolver forwards the request to the local name server, and at step 108, the name server of the lowest level domain name is contacted. In one or more embodiments of the invention, the forwarding step 106 and the contacting

25 step 108 are processed through routers that may intercept the transmissions. The routers examine the packet of information from the intercepted transmissions and store any necessary information in cache. Further, when the information is obtained from the name server and transmitted back to

the local name server at step 110, in one or more embodiments of the invention, the routers again intercept the transmission, parse the information, and cache the address information as it passes by on its way to the local name server.

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Figure 5 demonstrates the process performed by an updated router according to one or more embodiments of the invention. The process starts at step 500. At step 502, the router examines the port information to determine if the current information is DNS traffic or some other type of

10 traffic (e.g., web traffic). If the information is not DNS traffic, the router merely performs as normal and forwards the request to the next hop to its destination at step 512.

If the information is DNS traffic, the router parses the information at step 504. At step 506, the router determines if the parsed information (e.g., the requested address information) is in its cache. If the information is not in its cache, the router stores the relevant information (if any) in its cache at step 510 and forwards the request to the next hop in the information's path at step 512. If the information is in the router's cache, the router returns the requested information to the requestor at step 508. In this manner, the

updated routers maintain their own cache and are capable of processing DNS translation requests.

Alternatively, between step 502 and step 504, if the information is DNS traffic, the router will automatically forward the DNS information to a preconfigured host. Routers are currently configured to recognize types of internet traffic and forward specified types of internet traffic to a specific location or host. Once the host receives the information, the host executes

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the remaining steps 504-514. For example, the host parses the information at step 504 and searches its own cache for valid information at step 506. If there is any information to store in the cache (i.e., the DNS information is being returned), the information is stored in the host's cache at step 510. In such an embodiment, the router classifies and diverts packets to the configured host, and the host performs all additional functionality.

Referring to Figure 4, in one or more embodiments of the invention, one or more of the routers 210 may be modified as defined in Figure 4, to 10 intercept, parse, and cache DNS information. For example, routers 404 and 406 may be updated. Consequently, when Cl1 212 requests a DNS translation from ns.syd.au 224, the request is forwarded through route 400 along routers 210 and updated routers 404 and 406. However, updated router 404 determines that it is DNS traffic, violates its network layer, and intercepts the

- 15 request. Router 404 parses the requested information and determines if it is in its cache. If the requested information is in its cache, router 404 returns the result back to Cl1 212 (along route 400). If the requested information is not in its cache, it merely forwards the request to the next hop in pathway 400. Router 406, upon determining that the transmission is DNS traffic, intercepts
- 20 the request and searches its cache. Upon determining that the relevant information is not in its cache, router 406 forwards the request to the next hop in pathway 400. The request is forwarded until it reaches the local name server ns.syd.au 224. Alternatively, as described above, in one or more embodiments, the router forwards the request (if it is DNS traffic) to a
- 25 configured host that maintains the cache and processing capabilities.

The request is processed by ns.syd.au 224 and returned back to Cl₁ 212 along path 400. When the information reaches router 406 on its way back to

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Cl1 212, router 406 intercepts the request, the router or configured host parses the address information, and stores the address information in cache. Router 406 then forwards the results to the next hop along path 400. Each updated router or configured host along path 400 will store the result in its cache.

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Subsequent to the above request, if Cl4 requests a similar DNS translation, the request would be forwarded along route 402. However, router 406 would identify the request as DNS traffic, router 406 intercepts the request, router 406 or a configured host parses the request, searches cache, and

10 returns the requested information back to the previous hop on pathway 402. Consequently, the request by Cl4 is serviced locally at router 406 or the configured host and does not need to be serviced in Australia at ns.syd.au 224.

As described above, according to one or more embodiments of the

15 invention, the updated routers perform additional processing from other routers. The processing by the routers as described above and illustrated in Figure 5, includes viewing a portion of the DNS traffic, parsing the information, maintaining a database for cache storage, and searching cache for the information.

20

Some DNS name servers return different answers for client requests for the same host name. Such a response may be based on load-balancing considerations (e.g., the attempt to balance network traffic across multiple servers), or it may be chosen to direct the clients to "nearby" hosts. Use of

25 such schemes may be less effective with the transparent DNS caching according to one or more embodiments of the invention. Some schemes provide for strategic geographic placement of cacheable data (e.g., routers that may cache web traffic) in order to provide the information for the highest

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number of clients possible. The geographical scheme described in pending patent application number 09/081,860 entitled "Method and Apparatus for Effective Traffic Localization Through Domain Name System" which is hereby incorporated by reference, works well when used to determine which

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- 5 network routers are to be updated in accordance with one or more embodiments of the invention. In such a geographic scheme, the information returned is deliberately provided to be applicable to a large number of (if not all) DNS clients, with client-side computation to still achieve the load-balancing and traffic localization goals desired. Such a
- 10 scenario reduces the network load as well as the latency observed in DNS translations.

Thus, a method and apparatus for encoding content characteristics for the retrieval of information is described in conjunction with one or more

15 specific embodiments. The invention is defined by the claims and their full scope of equivalents.

25

<u>CLAIMS</u>

 A method for transparently processing DNS traffic comprising: transmitting a request for information to a network router;
 parsing said transmitted request; searching cache for said requested information; and returning said requested information if said requested information is in said cache.

 2. The method of claim 1 further comprising: forwarding said request to a next hop of said request if said requested information is not in said cache;

receiving said requested information;

parsing said requested information;

storing said requested information in said cache; and forwarding said requested information to a next hop of said requested information.

The method of claim 1 wherein said information is internet
 protocol address information.

4. The method of claim 1 wherein said network router is applicable to one or more DNS clients based on geographical placement.

25 5. The method of claim 2 wherein said receiving step comprises transmitting said requested information from a name server.

6. A system comprising

a processor;

a memory coupled to said processor;

code executed by said processor configured to transparently process

5 DNS traffic;

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said code comprising:

a method transmitting a request for information to a network router;

a method parsing said transmitted request;

a method searching cache for said requested information; and a method returning said requested information if said requested information is in said cache.

7. The system of claim 6 wherein said code further comprises:

a method forwarding said request to a next hop of said request if said requested information is not in said cache;

a method receiving said requested information;

a method parsing said requested information;

a method storing said requested information in said cache; and

a method forwarding said requested information to a next hop of said requested information.

8. The system of claim 6 wherein said information is internet protocol address information.

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9. The system of claim 6 wherein said network router is applicable to one or more DNS clients based on geographical placement.

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10. The system of claim 7 wherein said code for a method receiving said requested information comprises a method transmitting said requested information from a name server.

11. A computer program product comprising

a computer usable medium having computer readable program code embodied therein configured to transparently process DNS traffic, said computer program product comprising:

computer readable code configured to cause a computer to transmit a 10 request for information to a network router;

computer readable code configured to cause a computer to parse said transmitted request;

computer readable code configured to cause a computer to search cache for said requested information; and

15 computer readable code configured to cause a computer to return said requested information if said requested information is in said cache.

 The computer program product of claim 11 further comprising: computer readable code configured to cause a computer to forward said request to a next hop of said request if said requested information is not in said cache;

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computer readable code configured to cause a computer to receive said requested information;

computer readable code configured to cause a computer to parse said requested information;

computer readable code configured to cause a computer to store said 10 requested information in said cache; and

computer readable code configured to cause a computer to forward said requested information to a next hop of said requested information.

13. The computer program product of claim 11 wherein said15 information is internet protocol address information.

14. The computer program product of claim 11 wherein said network router is applicable to one or more DNS clients based on geographical placement.

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15. The computer program product of claim 12 wherein said computer readable code configured to cause a computer to receive comprises computer readable code configured to cause a computer to transmit said requested information from a name server.

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16. The method of claim 1 wherein said cache is maintained by said network router.

17. The method of claim 1 wherein said cache is maintained by a configured host.

18. The system of claim 6 wherein said cache is maintained by said5 network router.

19. The system of claim 6 wherein said cache is maintained by a configured host.

10 20. The computer program product of claim 11 wherein said cache is maintained by said network router.

21. The computer program product of claim 11 wherein said cache is maintained by a configured host.

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FIG. 1

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FIG. 5

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(54) METHOD AND DEVICE FOR CLIENT/HOST COMMUNICATION USING COMPUTER NETWORK

(57)Abstract:

PROBLEM TO BE SOLVED: To protect plural hosts on a private network wherein intermediate devices are placed behind an allowed client in a topology state by dynamically constituting the allowed client with the use of the address of a protection host and the keys and addresses of the intermediate devices (ciphering firewall, ciphering route, source gateway).

SOLUTION: A registered name server of a domain 100 is so constituted as to return a new resource address type (SX record) in response to a request for information needed for a secure communication with a protection host 140 placed in the domain 100. A resolver placed on (or related to) an allowed client 210 dynamically updates information used by the client to perform secure communication by using data in the SX record.



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(54)【発明の名称】 コンピュータ・ネットワークを利用したクライアント/ホスト間の通信方法と装置

(57)【要約】

(19)日本国特許庁 (JP)

【課題】 保護ホストのアドレスおよび中間デバイス (暗号化ファイアウォール、暗号化ルータ、セキュア・ ゲートウェイ)のキーとアドレスを使用して許可クライ アントを動的に構成し、中間デバイスがその背後にトポ ロジ状に置かれている私用ネットワーク上の複数のホス トを保護すること。

【解決手段】 ドメインの登録ネーム・サーバはそのド メインに置かれた保護ホストとのセキュア・コミュニケ ーションのために必要な情報の要求に応答して、新規の リソース・アドレス・タイプ(SXレコード)を戻すよ うに構成されている。許可クライアントに置かれている (さもなければ、それと関連づけられている)リゾルバ はSXレコード内のデータを使用して、セキュア・コミ ュニケーションを処理するためにクライアントによって 使用された情報を動的に更新する。



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【特許請求の範囲】

【請求項1】 第1マシンによって使用される情報を動 的に更新して前記第1マシンによる第2マシンへのセキ ュア・アクセスを容易化するための方法であって、

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(a)前記第2マシンを収容しているドメインに関する 照会を受信し、

(b)前記照会に応答するために必要な情報を要求する ために前記ドメインの第1ネーム・サーバに連絡し、

(c)前記第1ネーム・サーバから第1応答を受信し、

(d)前記第2マシンに対応するセキュア・エクスチェ 10 ンジャのIDを、前記第1応答の中のリソース・レコー ドから抜き出し、

(e)該第1マシンによって使用される第1データ構造 を前記IDを使用して更新して該第2マシンへのセキュ ア・アクセスを容易化するためのステップを含むことを 特徴とする方法。

【請求項2】 請求項1に記載の方法において、前記照 会を生成するアプリケーション・プログラムによって実 行されることを特徴とする方法。

【請求項3】 請求項1に記載の方法において、前記第 20 1データ構造を更新する前記ステップは前記マシンのア ドレスを記録することを含むことを特徴とする方法。

【請求項4】 請求項1に記載の方法において、前記第 1データ構造を更新する前記ステップは前記セキュア・ エクスチェンジャの前記1Dを記録することを含むこと を特徴とする方法。

【請求項5】 請求項1に記載の方法において、前記第 1データ構造を更新する前記ステップは前記セキュア・ エクスチェンジャの暗号データ項目を記録することを含 むことを特徴とする方法。

【請求項6】 請求項5に記載の方法において、前記セ キュア・エクスチェンジャの前記暗号データ項目は暗号 キーであることを特徴とする方法。

【請求項7】 請求項5に記載の方法において、前記セキュア・エクスチェンジャの前記暗号データ項目はセキュアDNS KEYリソース・レコードから取得されることを特徴とする方法。

【請求項8】 請求項5に記載の方法において、前記セ キュア・エクスチェンジャの前記暗号データ項目は暗号 アルゴリズムであることを特徴とする方法。

【請求項9】 請求項1に記載の方法において、前記第 1データ構造を更新する前記ステップは前記セキュア・ エクスチェンジャに関係するオリジナル・データベース 名を記録することを含むことを特徴とする方法。

【請求項10】 請求項9に記載の方法において、前記 オリジナル・データベース名は前記第1応答の中の前記 リソース・レコードに対応するシグネーチャ・リソース ・レコードからラベル・カウントを使用して導き出され ることを特徴とする方法。

【請求項11】 請求項9に記載の方法において、前記 50 ナル・データベース名を導き出し、

オリジナル・データベース名は前記第1応答の中の前記 リソース・レコードからの所有者名であることを特徴と する方法。

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【請求項12】 請求項1に記載の方法において、前記 第2マシンは前記照会のサブジェクトであることを特徴 とする方法。

【請求項13】 請求項12に記載の方法において、前 記照会を受信する前記ステップは前記第2マシンのアド レスの要求を受信することを含むことを特徴とする方

法。

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【請求項14】 請求項1に記載の方法において、前記 第2マシンは前記ドメインに関係する第2ネーム・サー バであることを特徴とする方法。

【請求項15】 請求項1に記載の方法において、前記 セキュア・エクスチェンジャの前記1Dは該セキュア・ エクスチェンジャの名前であることを特徴とする方法。 【請求項16】 請求項15に記載の方法において、前 記セキュア・エクスチャンジャの前記名前はDNS名で あることを特徴とする方法。

(請求項17) 請求項1に記載の方法において、前記 セキュア・エクスチェンジャの前記1Dは該セキュア・ エクスチェンジャのアドレスであることを特徴とする方 法。

【請求項18】 請求項1に記載の方法において、前記 セキュア・エクスチェンジャは前記第2マシンを保護す るファイアウォールであることを特徴とする方法。 【請求項19】 請求項1に記載の方法において、前記 セキュア・エクスチェンジャは前記第2セキュア・マシ

ンであることを特徴とする方法。 【請求項20】 請求項1に記載の方法において、前記

第1データ構造はアクセス・コントロール・リストであ ることを特徴とする方法。 【請求項21】 請求項1に記載の方法において、前記

第1データ構造はトンネル・マップであることを特徴と する方法。

【請求項22】 請求項1に記載の方法において、前記 第1データ構造を更新する前記ステップは該第1データ 構造内に少なくとも1つのデータ・セットを作成するこ とを含むことを特徴とする方法。

【請求項23】 請求項22に記載の方法において、 (a)前記第1応答を受信する前記ステップは前記第2 マシンのアドレスを該第1応答から抜き出すことを含 み、そこでは該第2マシンは前記照会のサブジェクトと なっており、

 (b)前記データ・セットを作成する前記ステップは、
 (i)前記セキュア・エクスチェンジャの前記1Dを使用して、該セキュア・エクスチェンジャのパラメータを 導き出し、

(ii)該セキュア・エクスチェンジャに関係するオリジ ナル・データベース名を導き出し、

キュア・エクスチェンジャの前記パラメータ、および c)前記オリジナル・データベース名を該データ・セッ トとしてストアすることを含むことを特徴とする方法。 【請求項24】 請求項23に記載の方法において、前 記セキュア・エクスチェンジャの前記パラメータを導き 出す前記ステップは前記第1応答から該パラメータを抜 き出すことを含むことを特徴とする方法。

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【請求項25】 請求項23に記載の方法において、前 記セキュア・エクスチェンジャの前記パラメータを導き 10 出す前記ステップは該パラメータに関して追加の照会を 行うことを含むことを特徴とする方法。

【請求項26】 請求項23に記載の方法において、前 記パラメータを導き出す前記ステップは該パラメータを 前記IDと等しいものと定義することを含むことを特徴 とする方法。

【請求項27】 請求項23に記載の方法において、前 記パラメータは前記セキュア・エクスチェンジャの暗号 データ項目であることを特徴とする方法。

【請求項28】 請求項22に記載の方法において、 (a) 前記第1応答を受信する前記ステップは前記ドメ インに関係する第2ネーム・サーバのアドレスを導き出 すことを含み、前記第2ネーム・サーバは該第1応答の 中に指定されており、

(b) 前記データ・セットを作成する前記ステップは、

(i)前記セキュア・エクスチェンジャの前記 IDを使 用して、該セキュア・エクスチェンジャのパラメータを 導き出し、

(ii) 該セキュア・エクスチェンジャに関係するオリジ ナル・データベース名を導き出し、

(iii) a)前記第2マシンの前記アドレス、b)該セ キュア・エクスチェンジャの前記パラメータ、および c) 前記オリジナル・データベース名を第1データ・セ ットとしてストアすることを含むことを特徴とする方 法。

【請求項29】 請求項28に記載の方法において、前 記第2ネーム・サーバの前記アドレスを導き出す前記ス テップは前記第1応答から該アドレスを抜き出すことを 含むことを特徴とする方法。

【請求項30】 請求項28に記載の方法において、前 40 記第2ネーム・サーバの前記アドレスを導き出す前記ス テップは該アドレスに関して追加の照会を行うことを含 むことを特徴とする方法。

【請求項31】 請求項28に記載の方法において、前 記セキュア・エクスチェンジャの前記パラメータを導き 出す前記ステップは該パラメータを前記第1応答から抜 き出すことを含むことを特徴とする方法。

【請求項32】 請求項28に記載の方法において、前 記セキュア・エクスチェンジャの前記パラメータを導き

行うことを含むことを特徴とする方法。

【請求項33】 請求項28に記載の方法において、前 記第2マシンは前記ドメインに関係する前記第2ネーム ・サーバであることを特徴とする方法。

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【請求項34】 請求項28に記載の方法において、さ らに、

(a) 前記第1データ・セットを使用して、前記照会に 対する第2応答を取得し、

(b)前記第2マシンのアドレスを前記第2応答から抜 き出し、

(c)該第2マシンの名前に最良に合致する既存のオリ ジナル・データベース名を収めている既存のデータ・セ ットを前記第1データ構造から判断し、

(d) 前記既存のデータ・セットを使用して、(i) 該 第2マシンの前記アドレス、(ii)前記セキュア・エク スチェンジャの既存のパラメータ、および(iii)前記 既存のオリジナル・データベース名を第2データ・セッ トにストアするステップを含むことを特徴とする方法。

【請求項35】 請求項34に記載の方法において、前 20 記照会に対する前記第2応答を取得する前記ステップ は、

(a)ネーム・サーバの応答性に関する情報を収めてい る第2データ構造を更新して、前記第2ネーム・サーバ を次に照会するネーム・サーバとして含めておき、

(b) 前記第2データ構造を使用して、該照会をリダイ レクトし、

(c)該照会に対する第2応答を受信するステップを含 むことを特徴とする方法。

【請求項36】 請求項35に記載の方法において、前 記第2データ構造はSLISTであることを特徴とする 30 方法。

【請求項37】 請求項34に記載の方法において、前 記既存のデータ・セットを使用する前記ステップは該既 存のデータ・セットからのデータ項目を指し示すことを 含むことを特徴とする方法。

【請求項38】 請求項34に記載の方法において、前 記既存のデータ・セットを使用する前記ステップは該既 存のデータ・セットからデータ項目をコピーすることを 含むことを特徴とする方法。

【請求項39】 請求項22に記載の方法において、前 記データ・セットはa)前記第2マシンのアドレスおよ びb)前記セキュア・エクスチェンジャのパラメータを 含むことを特徴とする方法。

【請求項40】 請求項1に記載の方法において、前記 ドメインの前記第1ネーム・サーバに連絡する前記ステ ップは前記照会を該第1ネーム・サーバに転送すること を含むことを特徴とする方法。

【請求項41】 請求項1に記載の方法において、前記 ドメインの前記第1ネーム・サーバに連絡する前記ステ 出す前記ステップは該パラメータに関して追加の照会を 50 ップは前記セキュア・エクスチェンジャの前記 IDを要
5 求することを含むことを特徴とする方法。

【請求項42】 第1マシンによって使用される情報を 動的に更新して、前記第1マシンによる第2マシンへの セキュア・アクセスを容易化するための方法であって、 (a)前記第2マシンのアドレスを取得し、

(b) 該第2マシンへのセキュア・アクセスを容易化す るために該第1マシンによって使用されるデータ構造を 使用して、該第2マシンの名前に最良に合致する既存の オリジナル・データベース名を収めている既存のデータ ・セットを前記データ構造から判断し、

(c)前記既存のデータ・セットを使用して、(i)該 第2マシンの前記アドレス、(ii) セキュア・エクスチ ェンジャの既存のパラメータ、および(iii) 前記既存 のオリジナル・データベース名を第2データ・セットに ストアするステップを含んでいることを特徴とする方 法。

【請求項43】 請求項42に記載の方法において、前 記既存のデータ・セットを使用する前記ステップは該既 存のデータ・セットからのデータ項目を指し示すことを 含むことを特徴とする方法。

【請求項44】 請求項42に記載の方法において、前 記既存のデータ・セットを使用する前記ステップは該既 存のデータ・セットからデータ項目をコピーすることを 含むことを特徴とする方法。

【請求項45】 請求項42に記載の方法において、前 記第2マシンの前記アドレスを取得する前記ステップ は、

(a) 前記アドレスの照会を受信し、

(b)前記照会を該第2マシンのドメインのネーム・サ ーバに転送し、

(c)前記ネーム・サーバから応答を受信し、

(d) 前記応答から該アドレスを抜き出すステップを含 むことを特徴とする方法。

【請求項46】 第1マシンによる第2マシンへのセキ ュア・アクセスを容易化するための方法であって、

(a)前記第2マシンを収容しているドメインに関係す る前記第1マシンからの照会を第1ネーム・サーバで受 信し、

(b)該第2マシンに対応するセキュア・エクスチェン ジャのIDを取得し、

(c)前記IDを含んでいる応答を生成し、

(d)該第1マシンのために前記応答を送信し、該応答 は該第2マシンへのセキュア・アクセスを容易化するた めに該第1マシンによって使用可能であることを特徴と する方法。

【請求項47】 請求項46に記載の方法において、前 記照会は前記第2マシンのアドレスの要求を含んでいる ことを特徴とする方法。

【請求項48】 請求項46に記載の方法において、前 記応答は前記第2マシンへのセキュア・アクセスのため 50 めておくステップを含むことを特徴とする方法。

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に使用される情報を前記第1マシンが動的に更新するこ とを可能にすることを特徴とする方法。

【請求項49】 請求項48に記載の方法において、前 記1Dを取得する前記ステップは前記第2マシンに該当 するデータベースから該IDを取得することを含むこと を特徴とする方法。

【請求項50】 請求項49に記載の方法において、前 記応答を生成する前記ステップは、

(a) 前記セキュア・エクスチェンジャのパラメータを 10 取得し、

(b) 前記パラメータを該応答に含めておくステップを 含むことを特徴とする方法。

【請求項51】 請求項50に記載の方法において、前 記セキュア・エクスチェンジャの前記パラメータは該セ キュア・エクスチェンジャのアドレスを含むことを特徴 とする方法。

【請求項52】 請求項50に記載の方法において、前 記セキュア・エクスチェンジャの前記パラメータは該セ キュア・エクスチェンジャの暗号データ項目を含むこと 20 を特徴とする方法。

【請求項53】 請求項52に記載の方法において、前 記セキュア・エクスチェンジャの前記暗号データ項目は 暗号キーであることを特徴とする方法。

【請求項54】 請求項52に記載の方法において、前 記セキュア・エクスチェンジャの暗号データ項目は暗号 アルゴリズムであることを特徴とする方法。

【請求項55】 請求項49に記載の方法において、前 記セキュア・エクスチェンジャは第3マシンであること を特徴とする方法。

【請求項56】 請求項55に記載の方法において、前 30 記第3マシンは前記第2マシンを保護するファイアウォ ールであることを特徴とする方法。

【請求項57】 請求項49に記載の方法において、前 記セキュア・エクスチェンジャは前記第2マシンである ことを特徴とする方法。

【請求項58】 請求項49に記載の方法において、前 記セキュア・エクスチェンジャの前記IDは該セキュア ・エクスチェンジャの名前であることを特徴とする方 法。

40 【請求項59】 請求項49に記載の方法において、前 記セキュア・エクスチェンジャの前記IDは該セキュア ・エクスチェンジャのアドレスであることを特徴とする 方法。

【請求項60】 請求項49に記載の方法において、前 記照会に対する返答は前記データベースに存在せず、前 記応答を生成する前記ステップは、

(a) 前記第2マシンを収容している前記ドメインに関 係する第2ネーム・サーバのIDを取得し、

(b)前記第2ネーム・サーバの前記1Dを該応答に含

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【請求項61】 請求項60に記載の方法において、前 記応答を生成する前記ステップは前記第2ネーム・サー バのアドレスを前記応答に入れて提供することをさらに 含むことを特徴とする方法。

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【請求項62】 請求項49に記載の方法において、前 記照会に対す返答は前記データベースに存在し、前記応 答を生成する前記ステップは

(a) 該照会に対する前記返答を取得し、

(b)該照会に対する該返答を該応答に含めておくステ ップを含むことを特徴とする方法。

【請求項63】 第1マシンによる第2マシンへのセキ ュア・アクセスを容易化するためのシステムであって、 (a)前記第2マシンを収容しているドメインに関する

照会を受信するように構成された制御ロジックと、 (b)前記ドメインの第1ネーム・サーバに連絡して、

前記照会に応答するために必要な情報を要求するように 構成された制御ロジックと、

(c)前記第1ネーム・サーバから第1応答を受信する ように構成された制御ロジックと、

(d)該第2マシンに対応するセキュア・エクスチェン 20 ジャのIDを、前記第1応答の中のリソース・レコード から抜き出すように構成された制御ロジックと、

(e)該第2マシンへのセキュア・アクセスを容易化す るために前記第1マシンによって使用される第1データ 構造を前記IDを使用して更新するように構成された制 御ロジックであって、前記第1データ構造は該第2マシ ンに対応するデータ・セットを含んでいるものとを備え ていることを特徴とするシステム。

【請求項64】 請求項63に記載のシステムにおい て、前記照会を生成するように、および前記生成された 30 照会を該照会を受信する前記ロジックに与えるように構 成されたソフトウェア・アプリケーション・プログラム 内に具現化されていることを特徴とするシステム。

【請求項65】 第1マシンによる第2マシンへのセキ ュア・アクセスを容易化するためのデータ構造を含んで いるコンピュータ可読媒体であって、前記データ構造 は、

(a)前記第2マシンのアドレス、

(b) 該第2マシンに対応するセキュア・エクスチェン ジャのパラメータ、および

(c)前記セキュア・エクスチェンジャに関係するオリジナル・データベース名をもつトンネル・マップを含んでいることを特徴とするコンピュータ可読媒体。

【請求項66】 請求項65に記載のコンピュータ可読 データ構造において、前記オリジナル・データベース名 は前記セキュア・エクスチェンジャを示すリソース・レ コードに対応するシグネーチャ・リソース・レコードか らラベル・カウントを使用して導き出されることを特徴 とするコンピュータ可読データ構造。

【請求項67】 請求項65に記載のコンピュータ可読 50 号。

データ構造において、前記オリジナル・データベース名 は前記セキュア・エクスチェンジャを示すリソース・レ コードからの所有者名であることを特徴とするコンピュ ータ可読データ構造。

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【請求項68】 請求項65に記載のコンピュータ可読 データ構造において、前記第1マシンに関連づけられた リゾルバ・プログラムによって生成されることを特徴と するコンピュータ可読データ構造。

 【請求項69】 第1マシンによる第2マシンへのセキ
 ュア・アクセスを容易化するためのソフトウェア・プロ グラムを具現化しているコンピュータ可読媒体であっ て、前記ソフトウェア・プログラムは、
 (a)前記第2マシンを収容しているドメインに関する

(a)前に第2、シング収存しているドスインに関する 照会を受信するように構成されたプログラム・コード と、

(b)前記ドメインの第1ネーム・サーバに連絡して、 前記照会に応答するために必要な情報を要求するように 構成されたプログラム・コードと、

(c)前記第1ネーム・サーバから第1応答を受信する ように構成されたプログラム・コードと、

(d)該第2マシンに対応するセキュア・エクスチェン ジャのIDを、前記第1応答の中のリソース・レコード から抜き出すように構成されたプログラム・コードと、 (e)該第2マシンへのセキュア・アクセスを容易化す るために前記第1マシンによって使用される第1データ 構造を前記IDを使用して更新するように構成されたプ ログラム・コードであって、前記第1データ構造は該第 2マシンに対応するデータ・セットを含んでいるものと を備えていることを特徴とするコンピュータ可読媒体。

【請求項70】 搬送波に具現化されていて、第1マシンによる第2マシンへのセキュア・アクセスを容易化するためのコンピュータ・データ信号であって、該データ信号は、

 (a)前記第2マシンを収容しているドメインに関する 照会を受信するように構成されたコード・セグメントと
 (b)前記ドメインの第1ネーム・サーバに連絡して、
 前記照会に応答するために必要な情報を要求するように 構成されたコード・セグメントと、

(c)前記第1ネーム・サーバから第1応答を受信する40 ように構成されたコード・セグメントと、

(d) 該第2マシンに対応するセキュア・エクスチェン ジャのIDを、前記第1応答の中のリソース・レコード から抜き出すように構成されたコード・セグメントと、 (e) 該第2マシンへのセキュア・アクセスを容易化す るために前記第1マシンによって使用される第1データ 構造を前記IDを使用して更新するように構成されたコ ード・セグメントであって、前記第1データ構造は該第 2マシンに対応するデータ・セットを含んでいるものと を含んでいることを特徴とするコンピュータ・データ信 号

Petitioner Apple Inc. - Exhibit 1002, p. 542

[0001]

【発明の属する技術分野】本発明は一般的にはコンピュ ータ・ネットワークに関し、具体的には、コンピュータ ・ネットワークを利用する許可(authorized)クライアン トと保護ホスト間のセキュア・コミュニケーションに関 する。

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[0002]

【従来の技術】A ネットワーク・アドレス

コンピュータは相互に接続されてネットワークを形成 し、これらのネットワークは他のネットワークに接続さ れてインターネットを形成している。「Internet(イン ターネット)」と呼ばれる世界的規模のインターネット の利用は、会議室(down the hall) にだけではなく、海 外に置かれたホスト・コンピュータと通信する必要のあ るクライアント・マシン上でプログラムを実行させる人 が増加するのに伴って急激に増加している。Internet上 の各ホストはwww.whitehouse.govといった固有の名前、 および128.102.252.1.といった対応する ネットワーク・アドレスをもっている。US Postal Serv 20 ice (米国郵便サービス)を通してレターを郵送する人 が受取人の住所を知っている必要があるのと同じよう に、ネットワークを通してホストと通信するクライアン トはホストのネットワーク・アドレスを知っている必要 がある。しかし、通常は、クライアントはホストの名前 だけを知っている。

【0003】Internetの世界では、ホストの名前とアド レスは世界の各国に置かれているコンピュータ上のデー タベースにストアされている。これらのデータベースの 1つをもち、ホスト・アドレスの照会(queries) に応答 30 するコンピュータは、「ドメイン・ネーム・サーバ(Dom ain Name Server)」または単純に「ネーム・サーバ」を 含めて、種々の名前で知らされている。非常に多数のホ スト・コンピュータはInternetアドレスをもっているの で、すべてのホストの名前とアドレス情報を1つのデー タベースに保存しておくことは実用的でない。その代わ

りに、このような情報は世界各国のInternetドメイン・ ネーム・サーバ間に分散されている。 【0004】ドメイン・ネーム・サーバおよびそれらに 関連づけられた名前とアドレス・データベースは、アド 40 レス照会に応答するために使用される1つのシステムに すぎない(「リゾルビングアドレス(resolving address es)」とも呼ばれる)。「ディレクトリ・サービス」、 「ディレクトリ・システム」、「DS」といった用語や その他の用語は、一般に、オンライン・データベースか ら情報を取り出してネットワーク経由で照会に応答する システムを指すために使用されている。例えば、X50 0ディレクトリ・システム標準に準拠して実現されてい る分散データベースには、ネットワーク・アドレス以外 にも、他の多数の種類の情報(例えば、人の名前とアド 50 特開平11-167536 10

レス、プリンタの名前とロケーション、電話番号とファ ックス番号)を含めることが可能になっている。X50 0の詳細は当業者には周知であるので、ここで詳細に説 明することは省略する。参考文献としては、例えば、Uy less D. Black 著「OSI:A Model for Computer Com munication Standards (OSI:コンピュータ通信標準 モデル)」、Prentice-Hall (1991), pp. 38 8-89がある。

【0005】ある企業がInternetに接続するときは、そ 10 の企業はそのドメイン名(例えば、sun.com)を登録す

る。これは第2レベル・ドメインと呼ばれている。企業 は第2レベル・ドメインのすべてのアドレス照会がInte rnetドメイン・ネーム・システムによって送られる先の 公開ネーム・サーバを少なくとも2つ指名し、登録しな ければならない。これらのサーバは、以下では、ドメイ ンの「登録」ネーム・サーバと呼ぶことにする。企業は そのドメインをもっと小さなセグメントに分割すること がよくあり、これらのセグメントは「ゾーン」と呼ばれ ている(例えば、eng.sun.com およびcorp.sun.com)。

当業者ならば理解されるように、「ゾーン」という用語 はドメインを任意に分割したものを指す場合があり、こ の中にはドメイン全体自体も含まれる。企業はそれぞれ のゾーンだけで「権限をもつ」ネーム・サーバを指名す ることができる。この場合、各ゾーンは独自のデータベ ース(「ゾーン・データベース」)をもち、そこには、 そのゾーンに置かれているマシンの名前、アドレス、お よびその他の情報が収容されている。説明の便宜上、 「ネーム・サーバ」という用語は、以下では、サーバの

データベース(例えば、ドメイン・ネーム・サーバまた はディレクトリ・サーバ)内の情報の照会に応答するサ ーバを意味するために使用され、「ゾーン・データベー ス」という用語は、それが第2レベル・ドメインを包含 するか、もっと小さなゾーンを包含するかに関係なく、 そのデータベースを意味するために使用されている。当 業者ならば理解されるように、「データベース」という 用語は編成された情報の集まり一切を意味することがで きる。

【0006】企業があるゾーン内のマシンのアドレスを 公開して、見えるようにすることを選択していれば、そ のゾーンを収めている第2レベル・ドメインの登録ネー ム・サーバはそのゾーン内のマシンのアドレス照会を権 限をもつゾーン・ネーム・サーバに送るように構成され ている。しかし、企業がゾーンのネットワーク・トポロ ジを隠す必要があるときは、登録ネーム・サーバはゾー ン・ネーム・サーバに関するどの情報ももたないように 構成され、そのゾーン内のマシンだけが照会をゾーン・ ネーム・サーバに送るように構成されている。このよう な可視制限ゾーン(visibility-limited zone)は「保護 ゾーン」と呼ぶことができ、そこに置かれたマシンは 「保護マシン(protected machines)」と呼ぶことができ

る。従って、マシンのアドレスが公開されて、見えるよ うにされたかどうかは、ネットワーク上で稼働している プログラム相互間のやりとり(interaction) に影響する ことになる。

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【0007】上述したように、クライアント上で実行さ れているアプリケーション・プログラムが別のロケーシ ョンに置かれたホストに連絡する必要があるときは、そ のアプリケーションはそのホストのアドレスを必要とす る。一般に、アプリケーション・プログラムは照会を 「リゾルバ(resolver)」プログラム(これもクライアン 10 ト上で実行されている)に送って、アドレスを要求する ことがある。リゾルバ・プログラムはローカル・ファイ ルをチェックし、ホスト・アドレスを要求するためのデ フォルト・ネーム・サーバが分かると、その照会をデフ ォルト・ネーム・サーバに渡すことになる。説明の便宜 上、このデフォルト・ネーム・サーバは、以下ではクラ イアントの「ローカルNS」と呼ぶことにする。ローカ ルNSは要求されたアドレスをすでにもっている場合も あれば、そのアドレスをもつサーバ (例えば、第2レベ ル・ドメインの登録ネーム・サーバまたはゾーンの権限 20 をもつネーム・サーバ)に到達するまで、必要に応じて 他のネーム・サーバに連絡していく場合もある。ローカ ルNSが照会に対する応答を受信すると、ローカルNS はその応答をリゾルバに戻し、リゾルバは応答を処理 し、アドレスをクライアントに引き渡す。Internetドメ イン・ネーム・システムおよびリゾルバの上記説明とそ の他の詳細は当業者には周知であるので、ここでは詳し く説明することは省略する。参考文献としては、例え ば、Sidnie Feit 著「TCP/IP」、McGraw-Hill (1997)があり、第12章に詳しく説明されてい る。

【0008】B 許可クライアント 現在のテクノロジは、ネットワークを利用したコミュニ

ケーションをいくつかの側面から見たとき、十分に解決 していない側面がいくつかある。企業のネットワーク・ ポリシを実現するためには、上述したように、ネットワ ーク管理者は、保護マシンのアドレスを他の保護マシン だけに見えるようにすることによってネットワーク・ト ポロジを隠すようにゾーンをセットアップすることがで きる。しかし、ネットワーク管理者は保護ゾーンの外に 40 いる許可クライアントが、保護ゾーンの内側にいるホス トと通信できるようにしたい場合もある。ネットワーク 管理者は許可クライアントが通信できる保護ホストのア ドレスを、そのクライアント上の1つまたは2つ以上の 静的構成ファイルにストアしておくこともできる。その 場合には、これらの構成ファイルは保護ホストのアドレ スが変更されるたびに、すべての許可クライアント側で 更新する必要がある。ネットワーク管理者は置換ファイ ルをすべての許可クライアントに送ることができるが、 別の方法として、ネットワーク管理者は変更された情報 50 イアントからのコミュニケーションがファイアウォール

を、許可クライアントへのアクセス権をもつ人に配布し て「手操作(マニュアル)」で入力させることもでき る。このような人は構成ファイルを直接に編集すること も、プログラム(例えば、コマンドライン・プログラム またはグラフィカル・ユーザ・インタフェース)を使用 して変更情報を入力することもできる。 【0009】 クライアントの数と移動性が増加するに伴 い、これらの構成ファイルを最新に保つことは、不可能 ではないにしても、煩わしい作業である。ネットワーク 管理者は保護ホストのアドレスを使用して許可クライア ントを構成し、人間の介入なしですべての許可クライア ント上の構成ファイルを変更できるようにする方法を必 要としている。本発明の種々実施例が提供する解決方法

- によれば、許可クライアントは中央ロケーションにスト アされ、維持されている情報を使用して各自のファイル を動的に更新することができる。その場合、ネットワー ク管理者はすべての許可クライアント上のファイルを更 新しなくても、容易にアクセス可能なロケーションに置 かれている情報を更新するだけですむことになる。
- 【0010】C セキュア・コミュニケーション 許可クライアントはコミュニケーションを確立するため に、保護ホストのアドレス以上のものを必要とすること がよくある。このようなことは、クライアントとホスト がコミュニケーションが「セキュア(安全保護)」であ るかを確かめたいときに起こっている。セキュア・コミ ュニケーションには、プライバシ、保全性、および認証 という問題が含まれている。ここでプライバシとは、あ るクライアントがネットワークを利用して機密情報を送 信するとき、意図するホストだけがそれを読み取り、理 30 解できることを意味する。保全性(integrity)とは、送 信中にだれもがメッセージを変更しなかったことを意味 する。認証(authentification)とは、そのメッセージが メッセージが要求するクライアントからのものであるこ とがホストに保証されることを意味する。標準的暗号手 法としては、DESやRSAなどのアルゴリズム、およ びディジタル・シグネーチャ、ディジタル証明、SKI Pなどの、他のテクノロジやプロトコルがある。必要に 応じて、これらの暗号手法(または同等のセキュリティ 手法)は種々側面から見たプライバシ、保全性、および 認証を保証するために使用されているのが普通である。
- 【0011】保護ホストのアドレスを許可クライアント に提供するのと同じように、セキュア・コミュニケーシ ヨンはネットワークを利用したコミュニケーションの1 つの側面であり、この側面も現在のテクノロジでは十分 に解決されていない。ある種のネットワーク構成では、 ネットワーク・セキュリティ・システムであるファイア ウォール(firewall)が保護マシンへのアクセスを管理し ている。許可クライアントが保護マシンと機密に通信で きるようにするためには、ファイアウォールはそのクラ

を経由するように構成されていなければならない。さら に、保護ホストとセキュア・コミュニケーションを行う ためには、ホストのアドレスのほかに、許可クライアン トは追加の情報を必要とする。この追加情報としては、 (1) 保護ホストのために暗号化を行うファイアウォー ルのアドレスとキー、および(2)使用される暗号アル ゴリズム(および他の必要な暗号手法)がある。 【0012】許可クライアントがこの追加情報を取得す ると、その追加情報はホスト・アドレスと一緒に、暗号 化オペレーションを処理するクライアントのコンポーネ 10 ント(例えば、アプリケーション・プログラム、オペレ ーティング・システム、またはハードウェアの暗号プロ セッサ)によって使用されるデータ構造にストアされる のが一般である。例えば、SKIPテクノロジでは、こ のような「アウトバウンド・セキュア・メッセージ」は インバウンド・アクセス情報と一緒に、クライアントの アクセス・コントロール・リストにストアされている。 しかし、当業者ならば理解されるように、アウトバウン ド・メッセージ情報は適切なデータ構造であれば、どの データ構造にもストアすることが可能である。 【0013】 アウトバウンド・セキュア・メッセージ情 報を収めているデータ構造はホストのアドレスまたは暗

号情報が変更されるたびに、すべての許可クライアント 側で更新する必要がある。この場合も、本発明の種々の 実施例によれば、許可クライアントは中央ロケーション にストアされ、維持されている情報を使用して各自のデ ータ構造を動的に更新することができる。説明の便宜 上、「許可クライアント」という用語は、ここでは、本 発明を使用するように構成され、許可クライアントが通 信する保護ホストのファイアウォールを経由してコミュ 30 ニケーションが許されているクライアントを意味するも のとして用いられている。

[0014]

【発明の要約】本発明によれば、保護ホストのアドレス および中間デバイス(例えば、暗号化ファイアウォー ル、暗号化ルータ、セキュア・ゲートウェイ)のキーと アドレスを使用して許可クライアントを動的に構成し、 その中間デバイスがその中間デバイスの背後にトポロジ 状に置かれている私用(private) ネットワークトの複数 のホストを保護するようした方法および装置が提供され 40 ている。ドメインの登録ネーム・サーバはそのドメイン に置かれた保護ホストとのセキュア・コミュニケーショ ンに必要な情報の要求に応答して、新規のリソース・レ コード・タイプ(ここでは、SXレコードと名づけてい) る)を戻すように構成されている。許可クライアントに 置かれた(さもなければ、それと関連づけられた)リゾ ν バ(resolver)はSXレコード内のデータを 使用して、セキュア・コミュニケーションを処理するた めにクライアントによって使用される情報を動的に更新 するように構成されている。

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【0015】本発明のいくつかの実施例を使用すると、 多数の利点が得られる。そのような利点としては、保護 ホストのアドレスを使用してクライアントを動的に構成 するシステム、保護ホストとのセキュア・コミュニケー ションのためにクライアントを動的に構成するシステ ム、およびネットワーク管理者がセキュア・コミュニケ ーションのために必要なアドレスと暗号情報を中央で管 理できるようにするシステムがあるが、本発明はこれら に限定されるものではない。本発明のいくつかの実施例 の上記利点およびその他の利点は、下述する詳細な説明 の中で明らかにする。

[0016]

【発明の実施形態】以下、本発明の1つまたはいくつか の実施例の理解を容易にするために、添付図面を参照し て本発明について詳しく説明する。

【0017】ネットワークは種々構成が可能であり、そ の構成はローカル・エリア・ネットワーク(LAN)、 広域ネットワーク(WAN)、イントラネット、インタ ーネット、およびInternetといったように、多彩な名前 20 が付けられている。代表的なインターネット構成は私用 LANおよび公衆(public) Internetの一部を含む、任意 の数のネットワークで構成されている。任意の数のコン ピュータをこれらのネットワークに接続することができ る。これらのコンピュータは様々な機能に利用すること ができが、特定の機能を反映する用語で表されることが よくある。1つの例では、ある人は別のコンピュータと 通信する必要のあるパーソナル・コンピュータ (PC) 上でプログラムを実行している。この場合のPCはクラ イアントと呼ばれ、他方のコンピュータはサーバまたは ホストと呼ばれている。別の例では、2つのネットワー クを接続するコンピュータはゲートウェイと呼ばれてい る。これらの例におけるコンピュータはいずれも、単純 にマシンと呼ばれることもある。当業者ならば理解され るように、本発明はネットワークおよびそこに接続され たコンピュータのどちらの場合も、特定の構成を要求す るものではない。従って、以下では、ある特定の構成 (インターネットを利用したクライアントとホスト間の コミュニケーション)を参照して本発明を説明している が、以下の説明は任意のネットワーク・タイプ上で動作 する、どのコンピュータにも適用されることはもちろん である。 【0018】A 本発明が実施される環境

図1は、本発明の実施例を実施できる代表的なインター ネット構成を示したものである。この構成には、ファイ アウォール110によって公衆(public)ネットワーク1 90に接続されているドメイン100(例えば、sun.co m)が含まれている。ドメイン100は保護ゾーン18 0(「ファイアウォールの内側」と呼ばれることもあ る)を含み、保護ゾーンは任意の数のマシンを任意の構 50 成で含むことができる。この例では、内側ホスト14

0、LAN160、内側クライアント150、および内 側NS130はすべて保護ゾーン180に置かれてい る。外側NSI20はドメインI00の登録ネーム・サ ーバであり、内側NSI30は保護ゾーン180の権限 をもつネーム・サーバである。

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【0019】ほとんど無制限の数のマシンとネットワー クが公衆ネットワーク190に接続されている。図1に 示すように、代表的な構成には、外側クライアント18 2、外側ホスト184、LAN186、ローカルNS2 50、および許可クライアント210が含まれている。 図2、図3および図4を参照して以下で明らかにするよ うに、代表的な許可クライアント210には、アプリケ ーション215、そのローカルNS250を示している 構成ファイル220、リゾルバ225、暗号プロセッサ 230、オペレーティング・システム235、およびト ンネル・マップ500が含まれている(詳細は後述す る)。代表例として、これらのコンポーネントは許可ク ライアント210側の1つまたは2つ以上のコンピュー タ可読媒体またはメモリに置かれている。

【0020】B 問題

上述したシステム・アーキテクチャが与えられていると き、許可クライアント210で実行されているアプリケ ーション210が保護ゾーン180内の保護ホスト14 0と機密に通信する必要が起こったとき、どのようなこ とが行われるか。アプリケーション215がそれを行う ためには、その前に、アウトバウンド・セキュア・メッ セージ情報が必要になる。この情報は許可クライアント 210にストアされており、情報としては、内側ホスト 140のアドレス、ファイアウォール110のアドレス

とキー、および使用される暗号プロトコルがある。クラ 30 イアントの数と移動性が増加するに伴い、人間の介入に 頼ってアウトバウンド・セキュア・メッセージ情報を最 新に保つことは煩雑な作業であり、あるいは不可能であ る。本発明の種々実施例によれば、この問題は許可クラ イアントが中央ロケーションにストアされ、維持されて いる情報を使用して、各自のアウトバウンド・セキュア ・メッセージ情報を動的に更新できるようにすることに よって解決されている。以下のセクションでは、クライ アントとネーム・サーバ間のメッセージの構造と内容、 仲介の働きをするリゾルバ・プログラム、およびシステ 40 ムがどのように構成されているか、について詳しく説明 する。

【0021】C. ネーム・サーバ・メッセージおよびリ ソース・レコード

ネーム・サーバ・メッセージはヘッダと4つのセクショ ン(1)照会(query)、(2)返答(answer)、(3)権 限(authority)、(4)追加(additional)から構成され ている。返答、権限、および追加セクションは、ネーム ・サーバが照会に応答して送信するリソース・レコード を収めている。リソース・レコード・タイプは多数存在 50 ュア・エクスチェンジャ(secure exchanger)」のID

し、各々はそのレコード・タイプのデータを収めている データ・フィールドを含んでいる。例えば、要求された ホストのアドレスはAレコードのデータ・フィールドに 入って戻され、権限をもつネーム・サーバの名前はNS レコードのデータ・フィールドに入って戻される。 【0022】セキュア・コミュニケーションの必要性を サポートするために、Internetドメイン・ネーム・シス テム(「セキュアDNS」)のあるバージョンはKEY とSIGリソース・レコード・タイプを含む、セキュリ ティ拡張機能(extensions)を使用している。KEYリソ 10 ース・レコードは公開キーと関連情報を配布するために 使用できる。つまり、KEYレコードはキー、キー名、 またはアルゴリズムを収めることができる。SIG、つ まり、「シグネーチャ」リソース・レコードは他のリソ ース・レコードに入っているデータを認証するために使 用できる。SIGレコードのデータ・フィールドの1つ は「ラベル(labels)」フィールドである。このフィール ドは、オリジナルSIGレコード所有者名がゾーン・デ ータベースに置かれているときラベルがいくつあるかを 20 カウントしたものである(例えば、*,sun.comが2つの

ラベルをもっているのは、ルートを表すヌル・ラベル (".")とワイルドカード("*")はカウントに含 まれないためである)。従って、このラベル・カウント はワイルドカード置換の結果としてリトリーブされたレ コードのオリジナル名を導き出すために使用される(詳 細は後述する)。このオリジナル名は、例えば、ディジ タル・シグネーチャを検証するために必要になる。 【0023】本発明の一実施例では、セキュアDNSに

よって提供されるKEYとSIGリソース・レコードを 使用している。セキュアDNSの詳細は当業者には周知 であるので、ここでは、これ以上詳しく説明することは 省略する。参考文献としては、例えば、RFC 206 5—「Domain Name System-Security Extensions (ドメ イン・ネーム・システムーセキュリティ拡張機能」(1 997)がある。当業者ならば理解されるように、本発 明の一実施例では、セキュアDNS機能を利用している が(例えば、レコードのオリジナル名を導き出し、シグ ネーチャを検証するために)、すべての実施例がこの機 能を必要とするとは限らない(つまり、これらは十分な 能力をもつ他のシステムを使用して実現することが可能

である)。 【0024】D SXレコード セキュリティ拡張機能で上に示したように、Internetド

メイン・ネーム・システムはユーザが新規のリソース・ レコード・タイプを自由に作成できる点でオープンエン ド(open-ended)になっている。本発明の種々実施例によ れば、さらに、SXレコードと名づけた別の新規レコー ド・タイプが追加されている。SXレコードのデータ・ フィールドは、そのレコードの所有者に関連する「セキ

(例えば、名前またはアドレス)を収めている。セキュ ア・エクスチェンジャはセキュア・コミュニケーション を自身のために、または別のマシンのために処理するマ シンである(例えば、暗号化または解読を実行する)。 この機能を実行するために、セキュア・エクスチェンジ ャは暗号データ(例えば、キーまたはアルゴリズム)を 使用する。セキュア・エクスチェンジャの1Dと暗号デ ータはセキュア・エクスチェンジャの1Dと暗号デ ータはセキュア・エクスチェンジャのパラメータと総称 することができる。ファイアウォールはセキュア・エク スチェンジャ機能を頻繁に実行するので、「ファイアウ 10 オール110」という用語は、ここでは、セキュア・エ クスチェンジャを意味するために用いられている。当業 者ならば理解されるように、該当の暗号化機能を持つマ シンならば、どのマシンでもセキュア・エクスチェンジ ャとして機能させることができる。

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【0025】また、当業者ならば理解されるように、 「SX」は任意のレコード・タイプIDであり、SXレ コード・タイプが定義されていれば、クライアントは明 示的にそのタイプのレコードをネーム・サーバに要求す ることができる。別の方法として、ネーム・サーバは他 20 のレコードの照会に対する返答を含む応答に入れてSX レコードを戻すように構成することも可能である。例え ば、クライアントがホスト・アドレスについて照会する と、ネーム・サーバはホスト・アドレスを応答セクショ ンに、SXレコードを追加セクションに入れて応答を送 信することになる。本発明の他の実施例には、SXレコ ードを追加または権限セクションに入れて戻し、応答の 返答セクションは空のままにしておくようにネーム・サ ーバの振舞をカストマイズすることを含めることも可能 である。言い換えれば、応答は未要求のリソース・レコ 30

ードだけを含むことになる。上述した説明から明らかな ように、当業者ならば理解されるように、本発明はSX レコードが応答のどの特定セクションに入って送られる かには左右されない。SXレコード内のデータは、保護 ホストとのセキュア・コミュニケーションのためにクラ イアントによって使用された情報を更新するために、リ ゾルバと呼ばれるプログラムによって使用される。

【0026】 E リゾルバの概要

リゾルバは、ネーム・サーバと、クライアント上で実行 されているアプリケーション・プログラムとの間の仲介 40 役をするプログラムである。リゾルバは情報の照会をア プリケーション・プログラムから受信し、その照会を該 当のネーム・サーバに送信し、もしあれば、応答を要求 側アプリケーションに戻す。照会のタイプとしては、所 与のホスト名のホスト・アドレス、所与のホスト・アド レスのホスト名、およびネーム・サーバ・データベース にストアされている情報の全体的ルックアップがある。 リゾルバは一般的に照会の処理を次の4ステップで行 う。(1)照会に対する返答がローカルにあれば、その 返答を戻し、返答がなければ(2)返答を要求する最良 50

- のサーバを見つけ、(3)いずれかが応答するまでその サーバに照会を送信し、(4)返答を処理する。 【0027】ステップ(2)で照会するのに最良のサー バを見つけるために、リゾルバはサーバ名とゾーンのリ ストを、SLISTと名づけた構造に保存している。S LISTはデフォルト・サーバで初期化される。そのあ とで、リゾルバはサーバとやりとりするたびに、リゾル バはどのサーバが必要とする情報をもっているかのリゾ ルバの「最良の推量(best guess)」でSLISTを更新 する。この「最良の推量」は所与のマシンに関する照会 に対する各サーバの応答性がどの程度であるか(例え ば、応答時間またはサーバが応答した頻度)に基づいて 行われることがよくある。従って、過去の実績に基づく 応答性は将来の照会用にSLISTを最適化するために 使用されている。当業者ならば理解されるように、リゾ ルバはこの基準または他の基準に従ってSLISTを維 持するようにプログラムすることが可能である。 【0028】上述した説明は、リゾルバが実行する機
- 能、およびその機能の実現方法を高度にカストマイズで きることを示す一例である。リゾルバのこれらの説明お よび他の詳細は当業者には周知であるので、ここで詳し く説明することは省略する。参考文献としては、例え ば、RFC1034-「Domain Names-Concepts and Fa cilities(ドメイン名-概念と機能)」(1987)お よびRFC1035-「Domain Names-Implementation and Specification (ドメイン名-実現方法と仕様)」 (1987)がある。
- 【0029】F リゾルバの機能
- 本発明の種々実施例は、保護ホストとのセキュア・コミ ュニケーションのために使用される情報(つまり、アウ トバウンド・セキュア・メッセージ情報)を収めてい る、クライアント側のデータ構造を動的に更新するよう にリゾルバ機能をカストマイズすることによって実現さ れている。このようなデータ構造はデータ・セットから 構成され、そのフィールドは「トンネル情報」(例え ば、デスティネーションとセキュア・エクスチェンジャ ・アドレス)と関連暗号データ(例えば、セキュア・エ クスチェンジャのキーまたはアルゴリズム)を収めてい るのが代表的である。ここで、「トンネル・マップ」と 40 いう用語はそのようなデータ構造を意味するために用い られ、「トンネル・マップ・エントリ」という用語はデ ータ・セットの1つを意味するために用いられている。 【0030】本発明の一実施例によれば、トンネル・マ ップ・エントリはネーム・サーバ・メッセージからのS Xレコードに入っているセキュア・エクスチェンジャの カバレッジ有効範囲(scope of coverage) を示すフィー ルドも含んでいるが、このフィールドは現在この分野で は使用されていないものである。言い換えれば、この新 規フィールドはエントリ内のセキュア・エクスチェンジ ャが暗号化メッセージを、どのマシンに「トンネルから

通過」させるかを示している。詳細は後述するが、この フィールドを使用すると、既存のものから新規のトンネ ル・マップ・エントリを作成できるので、エントリ作成 プロセスを効率化することができる。しかし、本発明の すべての実施例がこのフィールドを必要とするとは限ら ないので、これはトンネル・マップ・エントリから省く ことも可能である。このような実施例の1つは「その他 の実施例」のセクションに示されている。

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【0031】図9はフィールド4 540を含むトンネ ル・マップ・エントリ500を示す概略図である。図9 10 る。 に示すように、行(row) 1はエントリのフィールドの内 容を概略記述し、行2と行3-4は本発明の2実施例の 場合のフィールド・データを具体的に記述している。ト ンネル・マップ・エントリ500がどのように作成さ れ、使用されるかの詳細は、「許可クライアントで実現 される発明」のセクションの後で説明することにする。 本発明の種々実施例では、トンネル・マップ情報はIP SECやSKIPなどの、標準トンネル・プロトコルと 関連づけて使用されている。当業者ならば理解されるよ うに、本発明はトンネル・マップ内の情報の内容または 20 ロケーションに行った変更を容易に受け入れることがで きる。

【0032】当業者には公知であるように、リソース・ レコードは存続時間(time-to-live(TTL))フィー ルドを含んでおり、これはレコードの情報がいつまで信 頼できるかを示している。SXレコード内のTTLフィ ールドはそのレコードから導き出されたトンネル・マッ プ・エントリの寿命を判断するために使用できる。しか し、マシンのリブート時にトンネル・マップを再初期化 するといった他の手法を用いて、トンエル・マップを最 30 新に保つことも可能である。本発明はどの特定手法にも 限定されないが、本発明によれば、これらの手法および この分野で公知の他の手法を用いてトンネル・マップの 正確性を保つことが可能である。

【0033】 G リゾルバのロケーション リゾルバの機能をカストマイズできるだけではなく、そ の機能を1つまたは2つ以上のコンポーネントの中で実 現することも可能である。リゾルバ225という用語 は、ここでは、本発明によって提供される全機能を意味 するために用いられており、かかる機能を実現するため 40 ない限り他の構成を使用することも可能である。 に使用されるコンポーネントの数またはそのコンポーネ ントが置かれるロケーションは無関係である。図2、図 3および図4は許可クライアント210の構成例を示し ている。各構成において、許可クライアント210のア ドレスは例えば199.200.1.9に、そのローカ ルNS250のアドレスは例えば199.200.1. 2になっている。従って、リゾルバ225によって使用 される構成ファイル220は、ローカルNS250のア ドレスを収めている。アプリケーション215は許可ク ライアント210にインストールされている。暗号プロ 50

20 セッサ230が必要であれは、これも許可クライアント 210にインストールされる。

【0034】図2に示す構成では、リゾルバの全機能は 1つのコンポーネントに実現されている。このケースで は、アプリケーション215はその照会をリゾルバ22 5に送付する。リゾルバ225は構成ファイル220か らのローカルNS250のアドレスを読み取り、照会を ローカルNS250に転送する。リゾルバ225は応答 を受信すると、ここで説明したようにその応答を処理す

【0035】図3は、クライアントのリゾルバを変更す ることが望ましくないか、または可能でないとき実現で きる構成を示したものである(例えば、クライアントで はWicrosoft Windows が実行されている)。このケース では、標準スタブ・リゾルバ226が許可クライアント 自体へのループバックと共に使用される。リゾルバ22 5は許可クライアント210にインストールされている ネーム・サーバ・ソフトウェアに組み込まれている。ル ープバックを実現するために、リゾルバ225は構成フ ァイル220を読み取り、ローカルNS250のアドレ スを許可クライアント210のアドレスで置き換える。 リゾルバ225はローカルNS250のアドレスを自身

で使用するために保存しておく。このケースでは、アプ リケーション215はその照会をスタブ・リゾルバ22 6へ送付し、リゾルバ226は変更された構成ファイル 220を読み取り、照会をリゾルバ225へ送る。リゾ ルバ225は照会を受信すると、オリジナル構成ファイ ル220に残しておいたアドレスを使用して、その照会 をオリジナル・ローカルNSであるローカルNS250 に転送する。なんらかの応答がリゾルバ225に戻され ると、リゾルバ225はここで説明したように応答を処 理する。

【0036】図4に示す第3の構成では、アプリケーシ ョン215はリゾルバ225と一体になるように変更さ れている。従って、照会を行うには、アプリケーション 215は構成ファイル220を読み取り、照会をローカ ルNS250に送付する。変更されたアプリケーション 215は応答を受信すると、それを処理する。当業者な らば理解されるように、本発明の精神と範囲から逸脱し

【0037】 H システム・セットアップの概要 SXレコードとリゾルバは上述したとおりであるが、そ の説明を前提として、このセクションではシステムの一 実施例がどのようにセットアップされるかの概要を説明 する。以下の概要では、図1がレファレンスとして使用 され、「ネットワーク管理者」という用語はシステム・ セットアップ・タスクのいずれかを実行する一切の個人 を含むように広義に用いられている。これらの個人はネ ットワーク管理者とは別の名称をもっている場合がある (例えば、システム管理者、LAN管理者、データベー

ス管理者、またはゾーン管理者)。実際には、エンドユ ーザおよびプログラマがこれらのタスクの一部を実行す る場合もある。さらに、当業者ならば理解されるよう に、システム・セットアップ・タスクは一人の個人で実 行されるとは限らない。システムをセットアップするこ とは、システムの3つの部分、つまり、(1)外側NS 120である、ドメイン100の登録ネーム・サーバ、 (2) ファイアウォール110、および(3) 許可クラ イアント210を構成することと見ることができる。 【0038】外側NS120を構成するためにネットワ 10 ーク管理者が実行するタスクとしては、SXリソース・ レコードを定義し、該当のレコードを外側NSI20用 のネーム・サーバ・データベースに追加することがあ る。この構成には、「登録ネーム・サーバで実現される 発明」のセクションで詳しく説明されているように、外 側NS120をカストマイズすることも含まれる。 【0039】ファイアウォール110を構成することに は、許可クライアント120と保護ゾーン180内側の マシン間の暗号化コミュニケーションを処理するように ファイルウォールをセットアップすることが含まれる。 また、許可クライアント210からのコミュニケーショ

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ンを認識し、許可するようにファイアウォール1102 を構成することも含まれる。当業者に周知であって、こ れらの結果を達成できる手法ならば、どの手法でもファ イアウォール110を構成するために使用することがで きる。

【0040】本発明に従って動作するように許可クライ アント210を構成するためには、次の2つの基本カテ ゴリに属するコンポーネントが必要である。第1のカテ ゴリには、リゾルバ225を実現するコンポーネントが 30 含まれる。リゾルバ・コンポーネントの詳しい説明は 「リゾルバのロケーション」のセクションに記載されて いる。第2のカテゴリには、許可クライアント210の ために暗号オペレーションを実行するコンポーネント (以下では、暗号プロセッサ230と総称する)が含ま れている。暗号オペレーションには、当業者ならば理解 されるように、暗号化、解読、ハッシング(hashing)、 ディジタル証明、ディジタル・シグネーチャ、その他が ある。従って、暗号コンポーネントには、暗号化/解読 ソフトウェアまたは暗号化機能を持つPCMCIAを含 40 めることができるが、いかなる場合も、これらに限定さ れるものではない。

【0041】 1 登録ネーム・サーバで実現される発明 上述した概要セクションを背景として使用して、このセ クションでは本発明の一実施例を実現する詳細について 説明する。以下の説明では、留意すべき点が3つある。 第一は、ネーム・サーバは任意のタイプのレコードを応 答の特定のセクションに入れるのが代表的であるが、本 発明によれば、そのような要件が必ずしも課されないこ

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って送られるのが代表的であるが、本発明の実施例で は、追加セクションが使用される。第二は、ネーム・サ ーバがリソース・レコードを応答に追加するとき、該当 のSIGとKEYレコードも追加されることが暗黙にな っていることである(つまり、各レコード・タイプとレ コード所有者名の組み合わせごとに1つのSIGレコー ド、およびSIGレコードを生成するために使用される K E Y V J - F) 。 z S F C E Y V J - F C受信時に署名済みレコードを検証するために使用される ことが暗黙になっている。第三は、レコードを応答に追 加する実行ステップがオプションとして記述されている ときは、これらのレコードは追加の照会を行うことでク ライアント側で取得できることを意味することである。 これらの基本点を留意して、図5は、ドメイン100の 登録ネーム・サーバで実行されるときの本発明の一実施 例のフローチャートを示したものである。以下の説明に おいて、外側NS120は図1に示すようにドメイン1 00の登録ネーム・サーバである。

【0042】実行は、外側NS120がドメイン100 に置かれているホスト(「登録ホスト」)のアドレスの 20 照会を受信したときステップ305からスタートする。 ステップ310で、外側NS120は要求されたホスト 名に一致する所有者名をもつSXレコードがそのゾーン ・データベースにあるかどうかをチェックする。そのよ うなレコードがデータベースになければ、実行はステッ プ320にジャンプする。データベースにレコードがあ れば、ステップ315で、外側NS120は要求された ホストのセキュア・エクスチェンジャを示すSXレコー ドを応答に追加する。

【0043】ステップ320で、外側NS120は要求 されたホストのAレコードがそのゾーン・データベース にあるかどうかを確かめるためにチェックする。要求さ れたホストのAレコードがデータベースにあれば(つま り、要求されたホストのアドレスが公開され、見えるよ うになっている)、外側NS120はステップ335で ホストのAレコードを応答に追加し、ステップ340に 進む。データベースにAレコードがなければ(つまり、 要求されたホストが保護ゾーン180に置かれてい る)、ステップ325で、外側NS120は照会すべき 他のネーム・サーバがあれば、それを示しているNSレ コード(または複数のレコード)を応答に追加する。外 側NS120はステップ330で示すように、オプショ ンとしてこれらのネーム・サーバのA レコードを追加し

てから、ステップ340から続けることができる。 【0044】SXレコードがステップ315で応答に追 加されたときは、ステップ340で外側NS120はオ プションとしてSXレコードのデータ・フィールドに入 っているセキュア・エクスチェンジャのAレコードとK EYレコードを応答に追加することも可能である。最後 とである。例えば、NSレコードは権限セクションに入 50 に、ステップ345で外側NSI20は応答をリクエス

タに送付する。図10は、要求されたホストのアドレス が公開され、見えるようになっている場合の応答の例を 示す図である。図11は、要求されたホストが保護ゾー ンに置かれている場合の応答の例を示す図である。 【0045】」 許可クライアントで実現される発明 図6、図7および図8は許可クライアント210で実行 されるときの発明の種々実施例のフローチャートを示す 図である。当業者ならば理解されるように、ここで説明 している機能はハードウェアで実現することも、ソフト ウェアで実現することもできる。前者の場合、このハー 10 ドウェアには、汎用プロセッサ、マイクロプロセッサ、 プログラム・ロジック・アレイ、アプリケーション専用 集積回路、およびここで説明している機能を実行するの に十分な処理能力をもつ他のデバイスを含めることが可 能である。後者の場合、このソフトウェアは任意の該当 ハードウェア・プラットフォーム上で実行させることが 可能であり、オブジェクト指向または手続き型プログラ ミング言語を含む、任意の該当プログラミング言語を使 用して実現することが可能である。

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【0046】以下のセクションでは、本発明の2つの実 20 施例を詳しく検討しているが、そこでは許可クライアン ト210上で実行されているアプリケーション215は 内側ホスト140のアドレスの照会を行っている。最初 の実施例では、ドメイン100の1つのネーム・サーバ を使用し、ネットワーク・トポロジは隠されていない (つまり、内側ホスト140のアドレスは1サーバ実施 例では公開され、見えるようになっている)。言い換え れば、登録ネーム・サーバのデータベースは内側ホスト 140のAアドレスを含んでいる。第2の実施例では、

ゾーンはネットワーク・トポロジを隠すように定義され 30 レコードを含んでいる。従って、図6のステップ415 ており(つまり、内側ホスト140は保護ゾーン180 に置かれている)、登録ネーム・サーバのデータベース は内側ホスト140のAレコードをもっていない。その 代わりに、このAレコードは第2のサーバによって使用 されるゾーン・データベースに置かれている。これらの 実施例はフローチャートを通る異なった経路をたどって いくが、どちらもステップ405-425からスタート する。

【0047】ステップ405で、リゾルバ225はアプ リケーション215から照会を受信する。ステップ41 40 0で、リゾルバ225は内側ホスト140のドメインの ネーム・サーバまでレフェラルチェーン(referral chai n)をたどっていくことができるが、ローカル・サーバが 再帰的サービスをサポートしていれば、照会をローカル NS250に渡すことも可能である。いずれの場合も、 リゾルバ225にはその後で、ステップ415で照会に 対する応答が戻される。

【0048】ステップ420で、リゾルバ225は応答 にSXレコードがあるかどうかをチェックして確かめ る。これらの実施例のどちらの場合も、要求されたホス 50 サ230によって使用される。

ト名に一致する所有者名をもつSXレコードが登録ネー ム・サーバのデータベースに含まれていれば、リゾルバ が受信する最初の応答(つまり、登録ネーム・サーバか らの応答)にはSXレコードが入っている。これらの実 施例の以下の説明では、このようなSXレコードが存在 し、応答に含まれているものと想定している。当業者な らば理解されるように、セキュリティ上の目的から、S Xレコードは署名され、そのシグネーチャ(署名)は受 信時に受信側で検証されるのが一般である。図10は要 求されたホストのアドレスが公開されて、見えるように なっている場合の応答例を示す図であり、図11は要求 されたホストが保護ゾーンに置かれている場合の応答例 を示す図である。

【0049】実行はステップ425から続けられ、そこ でリゾルバ225は内側ホスト140のAレコードが応 答にあるかどうかをチェックして確かめる。2実施例が 異なる経路をたどっていくのはこのステップからであ る。応答にAレコードがなければ、実行はステップ44 0にジャンプするが、その詳細は「2サーバ実施例」の セクションで下述する。Aレコードがあれば、実行はス テップ430から続けられるが、その詳細は以下の「」 サーバ実施例」のセクションで説明する。

[0050]

【実施例】1.1サーバ実施例

要約して説明すると、この実施例では、1ネーム・サー バが使用され、ネットワーク・トポロジは隠されていな い。図1を参照して説明すると、内側NS130は必要 でなく、外側NSI20のデータベースは内側ホスト1 40を含めて、ドメイン100に置かれているマシンの では、アプリケーション215からのアドレス照会に対 してリゾルバ225が受信する最初の応答には、内側ホ スト140のAレコードと、ファイアウォール110を 対応するセキュア・エクスチェンジャとして示している SXレコードが含まれている。図10はこの応答の例を 示す図である。

【0051】「登録ネーム・サーバで実現される発明」 のセクションで上述したように、応答はファイアウォー ル110のAレコードとKEYレコードを含んでいる場 合もある。これらの追加レコードが応答になければ、リ ゾルバ225は必要に応じて追加の照会を行う(図6に は図示せず)。また、上述したように、すべての該当S 【Gレコードが応答に含まれている(つまり、各レコー ド・タイプとレコード所有者名の組み合わせごとに1つ のSIGレコード)。リゾルバ225がこれらのレコー ドをすべて受信すると、実行がステップ430から続け れ、そこでリゾルバ225は図5に示すようなトンネル ・マップ・エントリ500を作成し、これは内側ホスト 140へのメッセージを暗号化するために暗号プロセッ

【0052】次に、図9の行2を参照して説明すると、 トンネル・マップ・エントリ500を作成するために、 リゾルバ225は内側ホスト140のAレコード内のデ ータをフィールド1 510内のデスティネーション・ アドレスとして使用する。リゾルバ225は、それぞれ SXレコードに示されているセキュア・エクスチェンジ ャ(つまり、ファイアウォール110)のAレコードと KEYレコード内のデータを使用してフィールド2 5 20とフィールド3 530を埋める。「リゾルバの機 40はSXレコードに示されているセキュア・エクスチ ェンジャのカバレッジ有効範囲を示すために使用され る。これは、ゾーン・データベースに置かれているとき のSXレコードのオリジナル名を導き出し、それをフィ ールド4 540にストアすることによって行われる。 従って、「オリジナル・データベース名」という用語は ここでは、フィールド4 540の内容を意味するもの として用いられ、以下では、リゾルバ225がどのよう にしてこの名前を導き出すかについて説明する。 【0053】 リゾルバ225はSXレコードのSIGレ コードのラベル・フィールドに入っているカウントを使

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用して、応答の中で送られたレコードの所有者名からラ ベルをいくつ残しておくべきかを判断する。例えば、S Xレコード(およびその関連SIGレコード)の所有者 名がeng. sun.com. であり、ラベル・フィールド・カ ウントが2であれば、オリジナル・データベース名は *.sun.com. となる。カウントが3であれば、応答の中 で送られるオリジナル・データベース名とレコードの所 有者名はどちらもeng.sun.com.となる。ゾーン・データ ベースではワイルドカード名が使用されるのが代表的で 30 あるが、当業者ならば理解されるように、ワールドカー ド名は必須ではない。ソーン・データベースにワイルド カードを使用していない本発明の実施例では、リゾルバ 225はこれに代わる方法として、応答の中で送られた SXまたはSIGレコードから名前を抜き出すといった ように、他の方法でオリジナル・データベース名を導き 出すこともできる。フィールド4 540にオリジナル ・データベース名が満たされると、トンネル・マップ・ エントリ500は完成する。「リゾルバの機能」のセク ションで説明したように、フィールド4 540はデー 40 タ構造の中の新規フィールドであり、そこにはアウトバ ウンド・セキュア・メッセージ情報が収められており、 本発明の一実施例では、この情報を使用してSXレコー ドに示されたセキュア・エクスチェンジャのカバレッジ 有効範囲を示している。

【0054】次に、図6を参照して説明すると、トンネ ル・マップ・エントリ500を作成した後、リゾルバ2 25はステップ435で内側ホスト140のアドレスを アプリケーション215に戻す。実行がここで終わる と、トンネル・マップ・エントリ500には、暗号プロ 50 1つの516レコード)。リゾルバ225がこれらのレ

セッサ230が内側ホスト140へのメッセージを暗号 化するために必要な一切の情報が入っているので、アプ リケーション215は内側ホスト140と機密に通信す ることが可能になる。1ネーム・サーバが使用され、ネ ットワーク・トポロジが隠されていない場合の実施例で は、以上によって実行が完了する。

【0055】2.2サーバ実施例

- ネットワーク・トポロジが隠されている場合の実施例 は、2ネーム・サーバを使用して実現することができ
- 能」のセクションで説明したように、フィールド4~5~10~る。図1を参照して説明すると、外側NSI20はドメ イン100の登録ネーム・サーバとなり、ドメイン・デ ータベースは内側ホスト140のAレコードを含まない ことになる。その代わりに、このレコードは保護ゾーン 180の権限をもつネーム・サーバである、内側NS1 30によって使用されるゾーン・データベースに置かれ ることになる。従って、この実施例では、内側ホスト1 40のアドレスに関するアプリケーション215からの 照会に対する最初の応答は外側NS120から送信され る。図11は、この応答の例を示す図である。外側NS 120のデータベースは内側ホスト140のAレコード 20 を含んでいないので、リゾルバ225がステップ415 で受信した最初の応答には A レコードが入っていない。 しかし、この実施例では、応答にはファイアウォール1 10をセキュア・エクスチェンジャとして示すSXレコ ードと、内側NSI30をゾーンの権限をもつネーム・
 - サーバとして示す、少なくとも1つのNSレコードが入 っている。従って、リゾルバ225がステップ425で Aレコードがあるかどうか応答をチェックしても、Aレ コードは見つからないので実行はステップ440にジャ ンプする。

【0056】次に、図7を参照して説明すると、ステッ プ440でリゾルバ225はまだ照会されていないネー ム・サーバ、つまり、外側NS120以外のネーム・サ ーバを収めているNSレコードがあるかどうか応答をチ ェックする。従って、この実施例では、実行がステップ 440まで初めて到達すると、リゾルバ225は内側N S130を示すNSレコードとファイアウォール110 を示すSXレコードを応答から探す。なお、この時点で NSレコードがなければ、エラーが発生しているので、 実行は終了する。

【0057】「登録ネーム・サーバで実現される発明」 のセクションで上述したように、応答には内側NS13 0のAレコードのほかに、ファイアウォール110のA レコードとКЕҮレコードも含まれている場合がある。 これらの追加レコードが応答になければ、リゾルバ22 5は必要に応じて追加の照会(図8には示していない) を行う。また、上述したように、すべての該当S1Gレ コードはいずれかの応答に含まれている(つまり、各レ コード・タイプとレコード所有者名の組み合わせごとに

コードすべてを受信すると、実行はステップ445から 続行され、そこでリゾルバ225は図9に示すようにト ンネル・マップ・エントリ500を作成する。 【0058】次に、図9の行3を参照して説明すると、

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トンネル・マップ・エントリ500を作成するために、 リゾルバ225は内側NSI30のAレコードに入って いるデータをフィールド1 510内のデスティネーシ ョン・アドレスとして使用する。リゾルバ225は、そ れぞれSXレコードに示されたセキュア・エクスチェン ジャ(つまり、ファイアウォール110)のAレコード 10 とKEYレコードに入っているデータを使用してフィー ルド2 520とフィールド3 530を埋める。フィ ールド4 540を埋めるために、リゾルバ225はゾ ーン・データベースに置かれているときのSXレコード のオリジナル名を導き出す。リゾルバ225がどのよう にしてこのオリジナル・データベース名を導き出すかの 詳しい説明は「1サーバ実施例」のセクションに記載さ れている。

【0059】次に、図7を参照して説明すると、トンネ ル・マップ・エントリ500を作成した後、ステップ4 20 50でリゾルバ225は処理したばかりのNSレコード からのネーム・サーバ (つまり、内側NSI30) を 「最良の推量」としてSLIST構造に挿入する。SL ISTの詳細は「リゾルバの機能」のセクションに説明 されている。次に、図6を参照して説明すると、実行は ステップ410にジャンプし、そこでネーム・サーバま でのレフェラルチェインは内側NSI30(内側ホスト 140のゾーンのネーム・サーバ) に通じることにな る。そのあと、内側ホスト140のアドレスに関するア プリケーション215からの照会は最後のトンネル・マ 30 ップ・エントリ500のフィールド1 510、フィー ルド2 520、およびフィールド3 530を使用し

て暗号プロセッサ230によって暗号化される。照会が 内側NS130に到達すると、サーバは標準応答(例え ば、Aレコードおよび対応するSIGレコード)をリク エスタに送信する。図12はこの応答の例を示す図であ る。

【0060】ステップ415で、リゾルバ225は応答 を受信し、ステップ420で、リゾルバ225はSXレ コードがあるかどうかをチェックする。 SXレコードが 40 なければ、実行はステップ455にジャンプし(図8参 照)、そこでリゾルバ225は内側ホスト140のAレ コードがあるかどうかをチェックする。そのような A レ コードがなければ、実行は終了する。そうでなければ、 ステップ460で、リゾルバ225はSXレコードによ って作成され、そのオリジナル・データベース名が内側 ホスト140の名前に一致しているエントリがトンネル ・マップにあるかどうかをチェックする。そのようなエ ントリがなければ、ステップ465でリゾルバ225は ホストのアドレスをアプリケーションに戻し、実行は終 50 から保護ネーム・サーバへの照会はホストのアドレス以

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了する。一致するエントリがあれば、ステップ470で リゾルバ225は別のトンネル・マップ・エントリ50 0を追加する。

【0061】次に、図9の行4を参照して説明すると、 リゾルバ225は内側ホスト140のAレコード内のデ ータをフィールド1 510内のデスティネーション・ アドレスとして使用する。他のフィールドを完成するた めに、リゾルバ225は、フィールド4 540内のオ リジナル・データベース名が内側ホスト140の名前に

- 最も多くの一致ラベルをもっている、既存のトンネル・ マップ・エントリ500を使用する。例えば、eng.sun. com が内側ホスト140の名前であれば、eng.sun.com は*sun.com.よりも多くの一致ラベルをもつことにな る。リゾルバ225は既存エントリからのフィールドを 使用して、様々な方法で新規エントリを作成することが できる。例えば、リゾルバ225はエントリを既存エン トリから新規エントリにコピーすることも、あるいはリ ソルバ225は単純にポインタを使用することもでき る。
- 【0062】トンネル・マップ・エントリ500を作成 した後、リゾルバ225はステップ475で内側ホスト 140のアドレスをアプリケーション215に戻す。実 行がここで終了していれば、アプリケーション215 は、暗号プロセッサ230が内側ホスト140へのメッ セージを暗号化するために必要とするすべての情報がト ンネル・マップ・エントリに入っているので、内側ホス ト140と機密に通信することが可能になる。2ネーム ・サーバが使用され、ネットワーク・トポロジが隠され ている場合の実施例では、以上により実行が完了する。
- 【0063】K その他の実施例 本発明は上述してきた2つの実施例に限定されるもので はない。例えば、本発明は複数のゾーンを含むドメイン で実現することが可能である。そのような実施例では、 登録ネーム・サーバは照会を、権限をもつ複数のゾーン ・ネーム・サーバに送ることができる。 【0064】別の実施例では、本発明は私用ネットワー ク内のセキュリティを保証するように実現することが可

能である。当業者に公知であるように、ネーム・サーバ ・ソフトウェアはスタンドアローン・ネットワークにイ ンストールすることができる。そのような実施例では、

該当のネーム・サーバは上述した登録ネーム・サーバと 権限をもつネーム・サーバの機能を実行するように構成 されることになる。

【0065】さらに別の実施例では、リゾルバはホスト のAレコードを要求する前にSXレコードを要求するこ とも可能である。そのような実施例では、SXレコード は登録ネーム・サーバによって自動的に送信されないこ とになる。

【0066】さらに別の実施例では、許可クライアント

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外の情報に対するものにすることが可能である。この実施例では、登録ネーム・サーバからの応答は保護ネーム ・サーバのゾーン・データベース内の情報に関するセキ ュア照会を送信するために使用できる。この実施例で は、セキュア・エクスチェンジャのカバレッジ有効範囲 を示すオリジナル・データベース名は、ネーム・サーバ のトンネル・マップ・エントリだけが使用されるので必 要でない。

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【0067】リゾルバ機能がアプリケーションに組み込まれているときは他の実施例も可能である。例えば、ア 10 プリケーションが作成するトンネル・マップはプログラムが実行中のときだけ存在させることができる。別の方法として、トンネル・マップを存続させるが、プログラムだけがアクセス可能にすることもできる(例えば、オペレーティング・システム235にはそのことを知らせないようにする)。

【0068】さらに、開示した実施例の種々ステップは 他の組み合わせで組み合わせることが可能である。登録 ネーム・サーバからの応答が要求されたホストのアドレ スを含み、トンネル・マップが既存エントリを含んでい 20 て、オリジナル・データベース名が要求されたホストの 名前と一致している場合には、そのような実施例は実現 可能である。この実施例では、新規のトンネル・マップ ・エントリは既存エントリを使用して、要求されたホス トのために作成されることになる。

【0069】当業者ならば理解されるように、これまで に説明してきた本発明の精神と範囲から逸脱しない限 り、本発明はさらに別の実施例で実現することも可能で ある。なお、かかる実施例は請求の範囲に記載されてい る本発明の範囲内に属することはもちろんである。 【図面の簡単な説明】

【図1】本発明の実施例を実行させることができる代表 的なインターネット構成を示す図である。

【図 2】本発明が実現されているクライアントの構成例 を示す図である。

【図3】本発明が実現されているクライアントの構成例 を示す図である。

【図4】本発明が実現されているクライアントの構成例

を示す図である。

【図5】ドメインの登録ネーム・サーバで実行されると きの本発明の一実施例のフローチャートである。 【図6】クライアントで実行されるときの本発明の一実 施例のフローチャートである。 【図7】 クライアントで実行されるときの本発明の一実 施例のフローチャートである。 【図8】 クライアントで実行されるときの本発明の一実 施例のフローチャートである。 【図9】本発明の一実施例によって使用されるトンネル ・マップの例を示す図である。 【図10】 クライアントからのアドレス照会に対する応 答の例を示す図である。 【図11】クライアントからのアドレス照会に対する応 答の例を示す図である。 【図12】 クライアントからのアドレス照会に対する応 答の例を示す図である。 【符号の説明】 100 ドメイン 110 ファイアウォール 120 外側NS 130 内側NS 140 保護ホスト 150 内側クライアント 160 LAN 180 保護ゾーン 182 外側クライアント 184 外側ホスト 186 LAN 190 公衆ネットワーク 210 許可クライアント 215 アプリケーション 220 構成ファイル 225 リゾルバ 230 暗号プロセッサ 250 U-D/VNS

500 トンネル・マップ・エントリ



(17)





(18)



(19)



(20)



(21)





【図6】

(22)

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	フィールド1 510	フィールド2 520	·フィールド3 530	7 1 - JL K 4 540
行 1 (内容の配述)	デスティネーション・ アドレス	ファイアウォールの アドレス	公開キー または 公開キー名	このエントンを存成したSXレコードの基金氏したSXレコードの場象圧はたたオリンナル・
行 2 (1 サーバ実施例)	Aレコード内にあって 要求されたホストの ホスト・プドレスを 使用する	SXレコード内の ファイアウォールの Aレコードを使用する	SXVコード戌の ファイアウォールの KEYレコードを 使用する	SX レコードのSIG レコード内のラベル・ カウントを使用して ワイルドカード名を 単成する
行 3 (2サーバ楽施例の 第1エントリ)	Aレコード内にあって NSレコード内のネーム・ サーバに一致する キーム・サーバ・ アドレスを使用する	SXレコード内の ファイアウォールの Aレコードを使用する	レィーブド4月の纏む多くの一致レインドキタの纏むとしたいやもつ既存エントリを使用し、それをコピーン、それをコピーン、それをコピーン、それを話し示す、など	SXVコードのSiG Vコード内のラベル・ カウントを使用して ワイルドカード名作 生成する
行 4 (2サーバ実施図の 第2エントリ)	Aレコード内にあって 要求されたホストの オスト・アドレス	レィールド4内の最も 多くの一致ラベルを もし既存エントリを 使用し、それをコピーし、 それを指し示す、など	レィールド44名の 働め多くの一投しバー をもつ既存エイトした 承用し、それをコピーし、 それをゴニーし、	レィールド4克の最も 多くの一致しんどを もつ既存エントリか 使用し、たちをコピーし、 やたや指しボナ、など

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エントリ・マップ・エントリ 500

Petitioner Apple Inc. - Exhibit 1002, p. 562

(25)

【図9】

セクション	所有者名	レコード・タイプ	データ
ヘツダ		< ~ <i>y\$</i> >	····
照会		<股会>	
	<内側ホス140>	A	<内側ホスト140のアドレス>
	<内側ホス140>	SIG	<sigデータ></sigデータ>
権限	<内側ホス140>	SX	<ファイアウォール110のID>
	<内側ホス140>	SIG	<sigデータ;ラベル・カウント=2></sigデータ;ラベル・カウント=2>
追加。	<ファイアウォール110	> A	<ファイアウォール110のアドレス>
	<ファイアウォール110	> SIG	<sigデータ></sigデータ>
	<ファイアウォール110	> KEY	<ファイアウォール110のキー・データ>
	<ファイアウォール110	> SIG	<sigデータ></sigデータ>

【図10】

【図11】

セクション	所有者名	レコード・タイフ	ゲータ
ヘツダ		< ヘッ ダ>	
照会		<照会>	
返答		<ブランク>	
植眼	<ドメイン100> <ドメイン100> <内側ホスト140> <内側ホスト140>	NS SIG SX SIG	<内側NS 130の名前> <sigデータ> <ファイアウォール110のID> <sigデータ;ラベル・カウント=2></sigデータ;ラベル・カウント=2></sigデータ>
追加	<内側NS 130> <内側NS 130> <ファイアウォール110 <ファイアウォール110 <ファイアウォール110 <ファイアウォール110	A SIG > A > SIG > KEY > SIG	<内側NS 130のアドレス> <sigデータ> <ファイアウォール110のアドレス> <sigデータ> <ファイアウォール110のキー・データ> <sigデータ></sigデータ></sigデータ></sigデータ>

[【]図12】

セクション	所有者名	レコード・タイプ	データ
ヘツダ		<ヘッダ>	
照会		〈照会〉	
返答	<内側ホスト140> <内側ホスト140>	A SIG	<内側ホスト140のアドレス> <sigデータ></sigデータ>
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- (51) Int.Cl.⁶ 識別記号 FI HO4L 12/56
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 州 サン マテオ マウンヅ ロード 30
 アパートメント 206

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Under the P	Paperwork Reduction Act of 1995	5. no perso	ns are required to respond to a col Application Number	lection of in	formation unless it displays a valid OMB control nu
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	FORM		First Named Inventor	Victor La	rson
			Art Unit	2453	
(to be used fo	or all correspondence after initia	filing)	Examiner Name	Krisna Lir	m
Total Number	of Pages in This Submission		Attorney Docket Number	77580-17	7
		ENC	LOSURES (Check all	that ann	
				ulat appl	After Allowance Communication to
Fee Tra	nsmittal Form		Drawing(s)		
	Fee Attached		Licensing-related Papers		of Appeals and Interferences
	ment/Denly		Petition		Appeal Communication to TC
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	After Final		Provisional Application Power of Attorney, Revocatio	n	
	Affidavits/declaration(s)		Change of Correspondence A	\ddress	Other Enclosure(s) (please Identif
Extensio	on of Time Request		Terminal Disclaimer		below):
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✓ Information	tion Disclosure Statement		CD, Number of CD(s)		
			Landscape Table on CE)	
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Reply to	Missing Parts/	12 Box	ed Examination is being elect	ronically f	iled on May 27, 2014 and all fees due will be
	lete Application Reply to Missing Parts	at the ti	me of the RCE filing.		
	under 37 CFR 1.52 or 1.53				
Firm Nome	SIGNA		OF APPLICANT, ATTO	RNEY,	OR AGENT
Firm Name	McDermott, Will @ Emer	у			
Signature	/Toby H. Kusmer/				
Printed name	Toby H. Kusmer				··· ··
Date	May 27, 2014			Reg. No.	26,418

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Typed or printed name

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Date



Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

- The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
- A record from this system of records may be disclosed, as a routine use, in the course of
 presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to
 opposing counsel in the course of settlement negotiations.
- 3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
- 4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
- 5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
- A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
- 7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
- 8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
- A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Application Number	Application/Control No.		Applicant(s)/Patent under Reexamination	
	13/615,557		LARSON ET AL.	
Document Code - DISQ		Internal D	ocument – DC	NOT MAIL

TERMINAL DISCLAIMER		
Date Filed : 05-27-2014	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:

Dorethea Lawrence --3-- approved

U.S. Patent and Trademark Office

UNITED STATES PATENT AND TRADEMARK OFFICE



UNITED STATES DEPARTMENT OF COMMERCE United States Patent and Trademark Office Address: COMMISSIONER FOR PATENTS P.O. Box 1450 Alexandria, Virginia 22313-1450 www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

23630 7590 06/10/2014 McDermott Will & Emery The McDermott Building 500 North Capitol Street, N.W. Washington, DC 20001 EXAMINER LIM, KRISNA

ART UNIT PAPER NUMBER
2453

DATE MAILED: 06/10/2014

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/615,557	09/13/2012	Victor Larson	077580-0177	1089

TITLE OF INVENTION: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	09/10/2014

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. <u>PROSECUTION ON THE MERITS IS CLOSED</u>. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN <u>THREE MONTHS</u> FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. <u>THIS STATUTORY PERIOD CANNOT BE EXTENDED</u>. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

Petitioner Apple Inc. - Exhibit 1002, p. 568

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: <u>Mail</u> Mail Stop ISSUE FEE Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450

or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23630 7590 06/10/2014 McDermott Will & Emery The McDermott Building 500 North Capitol Street, N.W. Washington, DC 20001

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's nar	ne)
(Signati	ire)
(Da	ite)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/615.557	09/13/2012	Victor Larson	077580-0177	1089

TITLE OF INVENTION: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	09/10/2014
EXAM	INER	ART UNIT	CLASS-SUBCLASS			
LIM, K	RISNA	2453	713-162000			
 Change of corresponde CFR 1.363). Change of corresp Address form PTO/SI "Fee Address" ind PTO/SB/47; Rev 03-C Number is required. ASSIGNEE NAME A PLEASE NOTE: Unl recordation as set fort (A) NAME OF ASSIC 	ence address or indicatio ondence address (or Cha 3/122) attached. ication (or "Fee Address 22 or more recent) attach ND RESIDENCE DATA less an assignee is ident h in 37 CFR 3.11. Comp GNEE	n of "Fee Address" (37 nge of Correspondence " Indication form ed. Use of a Customer A TO BE PRINTED ON 7 ified below, no assignee oletion of this form is NO	 2. For printing on the p (1) The names of up to or agents OR, alternativ (2) The name of a singly registered attorney or a 2 registered patent attolisted, no name will be THE PATENT (print or typ data will appear on the patent a substitute for filing and (B) RESIDENCE: (CITY 	atent front page, list 3 registered patent attorn rely, e firm (having as a memb gent) and the names of u rneys or agents. If no nam- printed. be) tent. If an assignee is ic assignment. and STATE OR COUNT Individual Corporati	heys 1 per a 2 p to te is 3 dentified below, the doct (RY)	ument has been filed for
4a. The following fee(s) : Issue Fee Publication Fee (N Advance Order - #	are submitted: To small entity discount p t of Copies	41 Dermitted)	 D. Payment of Fee(s): (Plea A check is enclosed. Payment by credit car The Director is hereby overpayment, to Depo 	se first reapply any prev d. Form PTO-2038 is attaa authorized to charge the r sit Account Number	viously paid issue fee sho ched. required fee(s), any defic (enclose an e	own above) iency, or credits any xtra copy of this form).
 5. Change in Entity Status (from status indicated above) Applicant certifying micro entity status. See 37 CFR 1.29 Applicant asserting small entity status. See 37 CFR 1.27 Applicant changing to regular undiscounted fee status. NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), fee payment in the micro entity amount will not be accepted at the risk of application abandom NOTE: If the application was previously under micro entity status, checking this box will be to be a notification of loss of entitlement to micro entity status. 			SB/15A and 15B), issue plication abandonment. g this box will be taken ment to small or micro			
NOTE: This form must b	e signed in accordance v	vith 37 CFR 1.31 and 1.3	3. See 37 CFR 1.4 for signa	ature requirements and cer	tifications.	
Authorized Signature				Date		
Typed or printed name	e			Registration No.		

Page 2 of 3

PTOL-85 Part B (10-13) Approved for use through 10/31/2013.

OMB 0651-0033 Petitioner Apple Lore - UExhibit MOO2, por 569CE

UNITED STATES PATENT AND TRADEMARK OFFICE United States Patent and Trademark Office Address: COMMISSIONER FOR PATENTS P.O. Box 1450 Alexandria, Virginia 22313-1450 www.uspto.gov					
APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.	
13/615,557	09/13/2012	Victor Larson	077580-0177	1089	
23630 75	90 06/10/2014		EXAM	IINER	
McDermott Will The McDermott Bi	& Emery		LIM, K	RISNA	
500 North Capitol	Street, N.W.		ART UNIT	PAPER NUMBER	
Washington, DC 20	0001		2453		
			DATE MAILED: 06/10/201	4	

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

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The information provided by you in this form will be subject to the following routine uses:

- 1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
- 2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
- 3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
- 4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
- 5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
- 6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
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- 8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
- 9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

	Application No.	Applicant(s)
Notice of Allowability	Examiner KRISNA LIM	Art Unit 2453	AL. AIA (First Inventor to File) Status No
The MAILING DATE of this communication apper All claims being allowable, PROSECUTION ON THE MERITS IS herewith (or previously mailed), a Notice of Allowance (PTOL-85) NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RI of the Office or upon petition by the applicant. See 37 CFR 1.313	ars on the cover sheet with the co (OR REMAINS) CLOSED in this app or other appropriate communication GHTS. This application is subject to and MPEP 1308.	prrespondenc olication. If not will be mailed withdrawal fro	e address included in due course. THIS om issue at the initiative
1. This communication is responsive to <u>the RCE filed 05/27/20</u>	<u>14</u> . /were filed on <u>.</u>		
2. An election was made by the applicant in response to a rest requirement and election have been incorporated into this ac	riction requirement set forth during th stion.	ne interview or	; the restriction
 3. X The allowed claim(s) is/are <u>1,2,4-10,12 and 14-37</u>. As a result of the prosecution Highway program at a participating intellectual please see <u>http://www.uspto.gov/patents/init_events/pph/ind</u> 	ult of the allowed claim(s), you may b I property office for the correspondin <u>ex.jsp</u> or send an inquiry to <u>PPHfeec</u>	be eligible to b g application. dback@uspto.e	enefit from the Patent For more information, <u>nov</u> .
4. Acknowledgment is made of a claim for foreign priority unde	r 35 U.S.C. § 119(a)-(d) or (f).		
Certified copies:			
a) 🔲 Allb) 🗋 Some _*c) 🔲 None of the:			
1. Certified copies of the priority documents have	been received.		
2. Cortified copies of the priority documents have	been received in Application No		application from the
3. Copies of the certified copies of the priority doc	cuments have been received in this r	lational stage	application from the
* Certified copies not received:			
Applicant has THREE MONTHS FROM THE "MAILING DATE" of noted below. Failure to timely comply will result in ABANDONM THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.	of this communication to file a reply of ENT of this application.	complying with	the requirements
		~~ ~	
including changes required by the attached Examiner's Paper No./Mail Date	Amendment / Comment or in the O	ffice action of	(not the back) of
each sheet. Replacement sheet(s) should be labeled as such in the	he header according to 37 CFR 1.121(c	igs in the nont i).	(not the back) of
6. DEPOSIT OF and/or INFORMATION about the deposit of B attached Examiner's comment regarding REQUIREMENT FC	IOLOGICAL MATERIAL must be su R THE DEPOSIT OF BIOLOGICAL	bmitted. Note MATERIAL.	he
Attachment(s)	5.	ment/Commen	t
2. ☐ Information Disclosure Statements (PTO/SB/08),	6. 🛛 Examiner's Stateme	ent of Reasons	for Allowance
Paper No./Mail Date 3. Examiner's Comment Regarding Requirement for Deposit	7. 🔲 Other		
4. Interview Summary (PTO-413), Paper No./Mail Date			
/KRISNA LIM/			
Primary Examiner, Art Unit 2453			
U.S. Patent and Trademark Office			

Application/Control Number: 13/615,557 Art Unit: 2453

1. The present application is being examined under the pre-AIA first to invent provisions.

2. Pursuant to 37 C.F.R 1.109 and M.P.E.P 1302.14, the following is an Examiner's Statement of Reasons for Allowance:

Kiuchi discloses that the C-HTTP name server stores the IP address and public key of a particular computer in a data structure that maps the name of the particular computer to the corresponding IP address and public key. Kiuchi discloses that the client-side proxy sends a request to the C-HTTP, where the request is asking the C-HTTP server for permission to establish a connection with a server-side proxy.

Wesinger describes a system in which a configuration file is stored on a series of firewalls. The configuration files store security information by domain name and use the domain name to determine if a particular request is to be allowed. Moreover, Wesinger discloses the following sequence: (i) a request is received by the firewall/DNS server, (ii) the domain name in the request is looked up in the configuration file, (iii) if the connection is allowed, then the firewall/DNS server may invoke code that performs channel processing, which includes encryption.

Wesinger discloses that DNS propagation happens in a normal manner, but also teaches that the DNS propagation happens through the firewall servers, and the DNS propagation is subject to the allowance or denies connection rules.

In Examiner's opinion, both Kiuchi and Wesinger may not clearly disclose the feature of " (1) intercepting from the client device a request to look up an IP address corresponding to a domain name associated; (2) determining whether the request to look up the IP address transmitted in step (1) corresponds to a device that accepts an encrypted channel connection with the client device; and in response to determining, in

Application/Control Number: 13/615,557 Art Unit: 2453

step (2), that the request to look up the IP address in step (2) corresponds to a device that accepts an encrypted communications channel connection with the client device, providing provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device such that the encrypted communications channel supports secure data communications transmitted between the two devices, the client device being a device at which a user accesses the encrypted communications channel."

Examiner considers the applicants' claims 1-2, 4-10, 12, 14-37 to be allowable based on Examiner's understanding and Examiner's opinion should not be imputed to the concession of the prior arts and the exhaustion of the prior arts for determining the patentability of any or all claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krisna Lim whose telephone number is 571-272-3956 The examiner can normally be reached on Tuesday to Friday from 7:10 AM to 5:40 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Krista Zele, can be reached on 571-272-7288. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (In USA or Canada) or 571-272-100. Application/Control Number: 13/615,557 Art Unit: 2453

KI May 29, 2014

/Krisna Lim/ Primary Examiner Art Unit 2453

	Application/Control No.	Applicant(s)/Patent Under Reexamination
Search Notes	13615557	LARSON ET AL.
	Examiner	Art Unit
	KRISNA LIM	2453

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED				
Symbol	Date	Examiner		

US CLASSIFICATION SEARCHED

Class	Subclass	Date	Examiner
709	222-227	07/25/2013	kl
709	222-227	05/29/2013	kl

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	07/25/2013	kl
Inventors	05/29/2014	kl

INTERFERENCE SEARCH					
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner		
709	222-227	05/29/2014	kl		



Part of Paper No.: 20140529
	Application/Control No.	Applicant(s)/Patent Under Reexamination
Issue Classification	13615557	LARSON ET AL.
	Examiner	Art Unit
	KRISNA LIM	2453

CPC					
Symbol			Туре	Version	
H04L	61	1511	Ι	2013-01-01	
H04L	29 /	12216	I	2013-01-01	
H04L	61	303	I	2013-01-01	
H04L	63	0272	Ι	2013-01-01	
H04L	29 /	12066	Ι	2013-01-01	
H04L	29	12594	Ι	2013-01-01	
H04L	63	04	I	2013-01-01	
H04L	45	24	I	2013-01-01	
H04L	29	12783	I	2013-01-01	
H04L	63 /	1408	Ι	2013-01-01	
H04L	63 /	1458	Ι	2013-01-01	
H04L	29	1232	Ι	2013-01-01	
H04L	63	164	А	2013-01-01	
H04L	41	00	Ι	2013-01-01	
H04L	45	00	I	2013-01-01	
H04L	61	2092	Ι	2013-01-01	
H04L	61 /	35	I	2013-01-01	
H04L	61	2007	I	2013-01-01	
H04L	63 /	08	Ι	2013-01-01	
H04L	63 /	0428	Ι	2013-01-01	
H04L	61 /	2076	Ι	2013-01-01	
H04L	67	14	F	2013-01-01	
H04L	45	28	1	2013-01-01	
H04L	63	0407	I	2013-01-01	
G06F	21	606	Ι	2013-01-01	
H04L	63	0227	I	2013-01-01	
H04L	29	12301	I	2013-01-01	
H04L	63	1416	Ι	2013-01-01	
H04L	63	1466	Ι	2013-01-01	
H04L	29	12801	Ι	2013-01-01	
H04L	63	105	А	2013-01-01	
NONE		Total Clair	ns Allowed:		
(Assistant Exami	iner)	(Date)	34		
/KRISNA LIM/ Primary Examine	er.Art Unit 2453	05/29/2014	O.G. Print Claim(s)	O.G. Print Figure	
(Primary Examin	er)	(Date)	(Date) 1		

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Issue Classification	Application/Control No.	Applicant(s)	nt(s)/Patent Under Reexamination					
	Examiner KRISNA LIM	Art Unit 2453						
H04L 61 6004			I	2013-01-01				

CPC Combination Sets													
Symbol	Туре	Set	Ranking	Version									

NONE	Total Claims Allowed:						
(Assistant Examiner)	(Date)	34					
/KRISNA LIM/ Primary Examiner.Art Unit 2453	05/29/2014	O.G. Print Claim(s)	O.G. Print Figure				
(Primary Examiner)	(Date)	1	26, 27				
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	Application/Control No.	Applicant(s)/Patent Under Reexamination
Issue Classification	13615557	LARSON ET AL.
	Examiner	Art Unit
	KRISNA LIM	2453

	US OR	GINAL CL	ASSIFIC/	ATION		INTERNATIONAL CLASSIFICATION									
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CROSS REFERENCE(S)															
CLASS	CLASS SUBCLASS (ONE SUBCLASS PER BLOCK)														
709	223	223	224	225	226										
709	227														

NONE	Total Claims Allowed:					
(Assistant Examiner)	(Date)	3	4			
/KRISNA LIM/ Primary Examiner.Art Unit 2453	05/29/2014	O.G. Print Claim(s)	O.G. Print Figure			
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	Application/Control No.	Applicant(s)/Patent Under Reexamination
Issue Classification	13615557	LARSON ET AL.
	Examiner	Art Unit
	KRISNA LIM	2453

	Claims renumbered in the same order as presented by applicant								🗌 CPA 🛛 T.D. 🗌 R.1.47					47	
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
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NONE	Total Claims Allowed:					
(Assistant Examiner)	(Date)	34				
/KRISNA LIM/ Primary Examiner.Art Unit 2453	05/29/2014	O.G. Print Claim(s)	O.G. Print Figure			
(Primary Examiner)	(Date)	1	26, 27			
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Part of Paper No. 20140529

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					Application/Control No.			Applicant(s)/Patent Under Reexamination									
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Part of Paper No.: 20140529

	ed States Paten	T AND TRADEMARK OFFICE	UNITED STATES DEPAR United States Patent and Address: COMMISSIONER F P.O. Box 1450 Alexandria, Virginia 22 www.uspto.gov	TMENT OF COMMERCE Trademark Office OR PATENTS 313-1450	
APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.	
13/615,557	09/13/2012	Victor Larson	077580-0177	1089	
23630 McDermott Wi	7590 07/09/2014 II & Emery	4	EXAMINER		
The McDermot	t Building		LIM, K	RISNA	
Washington, D	\mathbb{C} 20001		ART UNIT	PAPER NUMBER	
			2453		
			NOTIFICATION DATE	DELIVERY MODE	
			07/09/2014	ELECTRONIC	

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mweipdocket@mwe.com

Our stand	Application No.	Applicant(s)
Supplemental Notice of Allowability	13/615,557 Examiner	Art Unit	AL.
Notice of Anowability	KRISNA LIM	2453	File) Status
			INO
The MAILING DATE of this communication apper All claims being allowable, PROSECUTION ON THE MERITS IS herewith (or previously mailed), a Notice of Allowance (PTOL-85) NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RI of the Office or upon petition by the applicant. See 37 CFR 1.313	COR REMAINS) CLOSED in OR REMAINS) CLOSED in or other appropriate comm GHTS. This application is and MPEP 1308.	ith the correspondence in this application. If not unication will be mailed subject to withdrawal fro	te address t included in due course. THIS om issue at the initiative
1. X This communication is responsive to the RCE filed 05/27/20	<u>114</u> .		
A declaration(s)/affidavit(s) under 37 CFR 1.130(b) was	/were filed on <u> </u>		
2. An election was made by the applicant in response to a rest requirement and election have been incorporated into this ac	riction requirement set forth ction.	n during the interview or	n; the restriction
 3. X The allowed claim(s) is/are <u>1,2,4-10,12 and 14-37</u>. As a rest Prosecution Highway program at a participating intellectua please see <u>http://www.uspto.gov/patents/init_events/pph/ind</u> 	ult of the allowed claim(s), y I property office for the corr <u>ex.jsp</u> or send an inquiry to	rou may be eligible to b esponding application. <u>PPHfeedback@uspto.</u>	enefit from the Patent For more information, <u>gov</u> .
4. 🔲 Acknowledgment is made of a claim for foreign priority unde	r 35 U.S.C. § 119(a)-(d) or	(f).	
Certified copies:			
a) 🔲 All b) 🗌 Some *c) 🗌 None of the:			
1. Certified copies of the priority documents have	been received.		
2. Certified copies of the priority documents have	been received in Application	on No	opplication from the
3. Copies of the certified copies of the priority doc	cuments have been receive	d in this national stage	application from the
* Certified copies not received:			
Applicant has THREE MONTHS FROM THE "MAILING DATE" noted below. Failure to timely comply will result in ABANDONM THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.	of this communication to file ENT of this application.	a reply complying with	the requirements
5.	be submitted.		
including changes required by the attached Examiner's Paper No./Mail Date	s Amendment / Comment o	r in the Office action of	
Identifying indicia such as the application number (see 37 CFR 1. each sheet. Replacement sheet(s) should be labeled as such in t	84(c)) should be written on t ne header according to 37 Cl	he drawings in the front FR 1.121(d).	(not the back) of
6. DEPOSIT OF and/or INFORMATION about the deposit of B attached Examiner's comment regarding REQUIREMENT FC	IOLOGICAL MATERIAL m IN THE DEPOSIT OF BIOL	ust be submitted. Note OGICAL MATERIAL.	the
Attachment(s)			
1. Notice of References Cited (PTO-892)	5. 🗌 Examiner's	s Amendment/Commen	t
2. ☑ Information Disclosure Statements (PTO/SB/08),	6. 🔀 Examiner's	s Statement of Reasons	s for Allowance
3. Examiner's Comment Regarding Requirement for Deposit	7. 🔲 Other		
of Biological Material 4. □ Interview Summary (PTO-413).			
Paper No./Mail Date			
/KRISNA LIM/			
Primary Examiner, Art Unit 2453			
U.S. Patent and Trademark Office			

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Notice of Allowability

Part of Paper No./Mail Date 20140701

Application/Control Number: 13/615,557 Art Unit: 2453

1. The present application is being examined under the pre-AIA first to invent provisions.

2 Pursuant to 37 C.F.R 1.109 and M.P.E.P 1302.14, the following is an Examiner's Statement of Reasons for Allowance:

Kiuchi discloses that the C-HTTP name server stores the IP address and public key of a particular computer in a data structure that maps the name of the particular computer to the corresponding IP address and public key. Kiuchi discloses that the client-side proxy sends a request to the C-HTTP, where the request is asking the C-HTTP server for permission to establish a connection with a server-side proxy. Wesinger describes a system in which a configuration file is stored on a series of firewalls. The configuration files store security information by domain name and use the domain name to determine if a particular request is to be allowed.

Moreover, Wesinger discloses the following sequence: (i) a request is received by the firewall/DNS server, (ii) the domain name in the request is looked up in the configuration file, (iii) if the connection is allowed, then the firewall/DNS server may invoke code that performs channel processing, which includes encryption.

Wesinger discloses that DNS propagation happens in a normal manner, but also teaches that the DNS propagation happens through the firewall servers, and the DNS propagation is subject to the allowance or denies connection rules.

In Examiner's opinion, both Kiuchi and Wesinger may not clearly disclose the feature of"

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(1) intercepting from the client device a request to look up an IP address corresponding to a domain name associated; (2) determining whether the request to look up the IP address transmitted in step (1) corresponds to a device that accepts an encrypted channel connection with the client device; and in response to determining, in step (2), that the request to look up the IP address in step (2) corresponds to a device that accepts an encrypted communications channel connection with the client device; providing provisioning information required to initiate the creation of the encrypted communications channel supports secure data communications transmitted between the two devices, the client device being a device at which a user accesses the encrypted communications channel."

Examiner considers the applicants' claims 1-2, 4-10, 12, 14-37 to be allowable based on Examiner's understanding and Examiner's opinion should not be imputed to the concession of the prior arts and the exhaustion of the prior arts for determining the patentability of any or all claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krisna Lim whose telephone number is 571-272-3956 The examiner can normally be reached on Tuesday to Friday from 7:10 AM to 5:40 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's Application/Control Number: 13/615,557 Art Unit: 2453

supervisor, Krista Zele, can be reached on 571-272-7288. The fax phone number for the organization where this application or proceeding is assigned is 571-273- 8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR)system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free) If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (In USA or Canada) or 571-272-100.

Kl July 01, 2014

/Krisna Lim/ Primary Examiner Art Unit 2453 Page 4

Subst. for form 1449/PTO	Complete if Known			
INFORMATION DISCLOSURE STATERENTYS	Application Number	13/615,557		
APPLICANT	Filing Date	09-13-2012		
(Use as many sheets as necessary) (MAY 2 7 2011	First Named Inventor	Victor Larson		
	Art Unit	2453		
	Examiner Name	Krisna Lim		
TRADEMART	Docket Number	77580-177 (VRNK-0001CP3CON8)		

CERTIFICATION STATEMENT

Please See 37 CFR 1.97 and 1.98 to make the appropriate selection(s)

- [] That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or
- [] That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § <u>1.56(c)</u> more than three months prior to the filing of the information disclosure statement.
- [] The Commissioner is authorized to charge any required fees to Deposit Account 50-1133.
- [X] Information Disclosure Statement is being filed with the Request for Continued Examination, which was electronically filed on May 27, 2014 and at that time, all fees due, were paid. However, the Commissioner is hereby authorized to charge any further fees which may be due, to Deposit Account 50-1133.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Date: May 27, 2014

/Toby H. Kusmer/ Toby H. Kusmer; Reg. No.:26,418 McDermott Will & Emery LLP 28 State Street Boston, MA 02109 Tel. (617) 535-4000 Fax (617) 535-3800

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EXAMINER'S INITIALS	CITE NO.	Patent Number	Publication Da	ate Name of Pate of Cited	entee or Applicant d Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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	A181	5,420,926	05/30/199	5 Lo	w et al.	
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	A183	5.455.861	10/03/199	5 Fau	cher et al.	<u> </u>
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				Applica	ation Number	1:	3/615,557	
APPLICAN		USURE STATEMENT VS	•	Filing [Date	09	9-13-2012	
(Use as many	y sheets as ne	cessary)		First N	amed Inventor	Vic	tor Larson	
				Art Unit		2453		
				Examiner Name		Krisna Lim		
				Docke	et Number	77580-177 (V	RNK-0001CP3CON8)	
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/Krisna Lim/

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			Application Number	13/615,557	
		OSORE STATEMENT VS.	Filing Date	09-13-2012	
(Use as man	stieles as ne	cessary)	First Named Inventor	Victor Larson	
	1 ALIMAN		Art Unit	2453	
	7 7 2014 5		Examiner Name	Krisna Lim	
	ž.		Docket Number	77580-177 (VRNK-0001CP3CON	V8)
ÊM	The search of th	OTHER ART (Including Autho	r, Title, Date, Pertine	ent Pages, Etc.)	
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		Application Number	13/615,557			
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(Use as many sheets as r	ecessary)	First Named Inventor	Victor Larson			
		Art Unit	2453			
		Examiner Name	Krisna Lim			
		Docket Number	77580-177 (VRNK-0001CP3CON8))		
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		Application Number	13/615,557				
	USURE STATEMENT VS.	Filing Date	09-13-2012				
(Use as many sheets as ne	cessary)	First Named Inventor	Victor Larson				
		Art Unit	2453				
		Examiner Name	Krisna Lim				
		Docket Number	77580-177 (VRNK-0001CP3C	ON8)			
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			Application Number	13/615,557				
	HUN DISCL	USURE STATEMENT VS.	Filing Date	09-13-2012				
(Use as many	y sheets as ne	cessary)	First Named Inventor	Victor Larson				
			Art Unit	2453				
			Examiner Name	Krisna Lim				
			Docket Number	77580-177 (VRNK-0001CP3C0	DN8)			
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	CUPE STATEMENT VS	Application Number	13/615,557	
APPLICANT		Filing Date	09-13-2012	
(Use as many sheets as nece	essary)	First Named Inventor	Victor Larson	
		Art Unit	2453	
		Examiner Name	Krisna Lim	
		Docket Number	77580-177 (VRNK-0001CP3CON8)
D1495	IPR2013-00397: Inter Partes Review	of Patent Number 7.92	1.211 filed on July 1, 2013.	<u> </u>
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(Use as many sheets as ne	cessary)	First Named Inventor	Victor Larson
		Art Unit	2453
		Examiner Name	Krisna Lim
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D1517	IPR2014-00173; Inter Partes Review	v of Patent Number 7,49	0,151 filed on November 20, 2013,
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Subst. for form 1449/PTO		Complete if Known		
		Application Number	13/615,557	
APPLICANT		Filing Date	09-13-2012	
(Use as many sheets as necessary)			First Named Inventor	Victor Larson
			Art Unit	2453
			Examiner Name	Krisna Lim
		······································	Docket Number	77580-177 (VRNK-0001CP3CON8)
	D1559	VirnetX v. Microsoft; Defendant's Pro	eliminary Invalidity Cont	entions dated 11/14/2013, 43 pages
	D1560	VirnetX v. Microsoft; Defendant's Pro	eliminary Invalidity Cont	entions dated 11/14/2013; Exhibit
	D1561	VirnetX v. Microsoft, Defendant's Pro 41: SFS-HTTP vs. Claims of the '15'	eliminary Invalidity Cont Patent, 10 pages	entions dated 11/14/2013; Exhibit
	D1562	VirnetX v. Microsoft; Defendant's Pre 48: U.S. '132 vs. Claims of the '151	eliminary Invalidity Cont Patent, 15 pages	entions dated 11/14/2013; Exhibit
	D1563	VirnetX v. Microsoft, Defendant's Pre 55: B&M VPNs vs. Claims of the '15	eliminary Invalidity Cont 1 Patent, 12 pages	entions dated 11/14/2013; Exhibit
	D1564	VirnetX v. Microsoft, Defendant's Pre 59: BorderManager vs. Claims of the	eliminary Invalidity Conte 151 Patent, 18 pages	entions dated 11/14/2013; Exhibit
	D1565	VirnetX vs. Microsoft; Defendant's P 79: Valencia (019) vs. Claims of the	reliminary Invalidity Con '274 Patent, 12 pages	tentions dated 11/14/2013; Exhibit
	D1566	VirnetX vs. Microsoft; Defendant's P 85: U.S. '748 vs. Claims of the '151 I	reliminary Invalidity Con Patent, 8 pages	tentions dated 11/14/2013; Exhibit
	D1567	VirnetX vs. Microsoft; Defendant's P 99: Araujo vs. Claims of the '135 Pat	reliminary Invalidity Con ent, 19 pages	tentions dated 11/14/2013; Exhibit
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	D1569	VirnetX vs. Microsoft; Defendant's P 101: NetMeeting vs. Claims of the '1	reliminary Invalidity Con 35 Patent, 81 pages	tentions dated 11/14/2013; Exhibit
	D1570	VirnetX vs. Microsoft; Defendant's P 102: NetMeeting vs. Claims of the '1	reliminary Invalidity Con 51 Patent, 53 pages	tentions dated 11/14/2013; Exhibit
	D1571	VirnetX vs. Microsoft; Defendant's P 103: NetMeeting vs. Claims of the '1	reliminary Invalidity Con 80 Patent, 35 pages	tentions dated 11/14/2013; Exhibit
	D1572	VirnetX vs. Microsoft; Defendant's P 104: NetMeeting vs. Claims of the '2	reliminary Invalidity Con 11 Patent, 47 pages	tentions dated 11/14/2013; Exhibit
	D1573	VirnetX vs. Microsoft; Defendant's P 105: NetMeeting vs. Claims of the '2	reliminary Invalidity Con 74 Patent, 26 pages	tentions dated 11/14/2013; Exhibit
	D1574	VirnetX vs. Microsoft; Defendant's P 106: NetMeeting vs. Claims of the '5	reliminary Invalidity Con 04 Patent, 48 pages	tentions dated 11/14/2013; Exhibit
	D1575	VirnetX vs. Microsoft; Defendant's P 107: EverLink vs. Claims of the '151	reliminary Invalidity Con Patent, 39 pages	tentions dated 11/14/2013; Exhibit
	D1576	VirnetX vs. Microsoft; Defendant's Pa 108: Special Anthology vs. Claims of	reliminary Invalidity Con the '135 Patent, 4 page	tentions dated 11/14/2013; Exhibit es
	D1577	VirnetX vs. Microsoft; Defendant's Pr 109: Gauntlet for IRIX vs. Claims of t	reliminary Invalidity Con he '135 Patent, 62 page	tentions dated 11/14/2013; Exhibit
	D1578	VirnetX vs. Microsoft; Defendant's Pr 110: Gauntlet for IRIX vs. Claims of t	reliminary Invalidity Con he '211 Patent, 111 pag	tentions dated 11/14/2013; Exhibit jes
	D1579	VirnetX vs. Microsoft; Defendant's Pr 111: Gauntlet for IRIX vs. Claims of t	reliminary Invalidity Con he '504 Patent, 119 pag	tentions dated 11/14/2013; Exhibit jes
	D1580	VirnetX vs. Microsoft; Defendant's Pr 112: Gauntlet System vs. Claims of t	reliminary Invalidity Con he '135 Patent, 24 page	tentions dated 11/14/2013; Exhibit
	D1581	VirnetX vs. Microsoft; Defendant's Pr 113: Gauntlet System vs. Claims of t	reliminary Invalidity Con he '151 Patent, 23 page	tentions dated 11/14/2013; Exhibit
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	D1584	VirnetX vs. Microsoft; Defendant's Pr 116: Gauntlet Systems vs. Claims of	reliminary Invalidity Con the '504 Patent, 69 pag	tentions dated 11/14/2013; Exhibit es
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Subst. for form	1449/PTO			Complete if Known
			Application Number	13/615,557
APPLICAN	T	OSURE STATEMENT VS.	Filing Date	09-13-2012
(Use as many	(Use as many sheets as necessary)		First Named Inventor	Victor Larson
			Art Unit	2453
			Examiner Name	Krisna Lim
			Docket Number	77580-177 (VRNK-0001CP3CON8)
	D1586	VirnetX vs. Microsoft; Defendant's P	reliminary Invalidity Con	tentions dated 11/14/2013; Exhibit
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	D1588	VirnetX vs. Microsoft; Defendant's P 135: Schulzrinne vs. Claims of the '2	reliminary Invalidity Con 74 Patent, 14 pages	itentions dated 11/14/2013; Exhibit
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	D1593	VirnetX vs. Microsoft; Defendant's P 166: Davison vs. Claims of the '274	reliminary Invalidity Con Patent, 11 pages	tentions dated 11/14/2013; Exhibit
	D1594	VirnetX vs. Microsoft; Defendant's P 170: AutoSOCKS vs. Claims of the "	reliminary Invalidity Con 274 Patent, 14 pages	tentions dated 11/14/2013; Exhibit
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	OSLIDE STATEMENT VS	Application Number	13/615,557
APPLICANT	COURT STATEMENT V3.	Filing Date	09-13-2012
(Use as many sheets as ne	ecessary)	First Named Inventor	Victor Larson
		Art Unit	2453
		Examiner Name	Krisna Lim
	V	Docket Number	77580-177 (VRNK-0001CP3CON8)
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APPLICANT	APPLICANT		Filing Date	09-13-2012
(Use as many sheets	(Use as many sheets as necessary)		First Named Inventor	Victor Larson
			Art Unit	2453
			Examiner Name	Krisna Lim
			Docket Number	77580-177 (VRNK-0001CP3CON8)
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			Application Number	13/615,557
	IT DISCL	USURE STATEMENT VS.	Filing Date	09-13-2012
(Use as many	, sheets as ne	cessary)	First Named Inventor	Victor Larson
			Art Unit	2453
			Examiner Name	Krisna Lim
			Docket Number	77580-177 (VRNK-0001CP3CON8)
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	INFORMATION DISCLOSURE STATEMENT VS.		Application Number	13/615,557	
APPLICAN		OSORE STATEMENT VS.	Filing Date	09-13-2012	
(Use as man	sheets as ne	cessary)	First Named Inventor	Victor Larson	
			Art Unit	2453	
			Examiner Name	Krisna Lim	
			Docket Number	77580-177 (VRNK-0001CP3C	ON8)
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		Filing Date	09-13-2012	
		First Named Inventor	Victor Larson	
		Art Unit	2453	
		Examiner Name	Krisna Lim	
	<u> </u>	Docket Number	77580-177 (VRNK-0001CP3C0	ON8)
D1719	Microsoft Claim Chart of U.S. Paten No. 5,511,122 (April 23, 1996)	t 6,502,135; vs. RFC 22	30 (November 1997) U.S. Patent	
D1720	Microsoft Claim Chart of U.S. Paten et al., Check Point Firewall -1 Admir http://www.books24x7.com/book/id (Goncalves, Check Point FW); Chec FW)	t 6,502,135; vs. Check P iistration Guide, McGraw 762/viewer_r.asp?booki k Point Software Techno	oint FW as described in: Goncalves µ-Hill Companies (2000) available at <u>d=762&chunkid=410651062</u> plogies Ltd. (1999) (Check Point	
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D1723	Microsoft Claim Chart of U.S. Patent 1999	t 6,502,135; vs. Onion R	outing references (1996, 1997,	
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D1725	Microsoft Claim Chart of U.S. Patent Control Protocol," Version 1.0 (May	t No. 6,502,135; vs. C. H 5, 1998) ("SGCP")	luitema et al., "Simple Gateway	
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Subst. for form 1449/PTO			Complete if Known	
INFORMATION DICCL		Application Number	13/615,557	
APPLICANT	USURE STATEMENT VS.	Filing Date	09-13-2012	
(Use as many sheets as ne	cessary)	First Named Inventor	Victor Larson	
		Art Unit	2453	
		Examiner Name	Krisna Lim	
		Docket Number	77580-177 (VRNK-0001CP3C0	DN8)
D1740	Microsoft Claim Chart of U.S. Patent	No. 6,502,135; vs. The ter Network (SIPRNET)	Defense Information Systems ¹ references (1998, 2000)	
D1741	Microsoft Claim Chart of U.S. Patent	t No. 6,839,759; vs. U.S.	. Patent Application No. 09/399,753	
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D1749	Microsoft Claim Chart of U.S. Patent Selection Algorithms," available at h	t No. 6,839,759; vs. Onio ttp://www.onion-router.n	on Routing, "Investigation of Route et/Archives/Route/index.html	
	("Route Selection")			
D1750	Microsoft Claim Chart of U.S. Patent O'Reilly and Associates, Inc., 2nd ec	t No. 6,839,759; vs. Sco J. (Jan. 1999) ("Scott VF	tt et al., Virtual Private Networks, PNs")	
D1751	Microsoft Claim Chart of U.S. Patent	t No. 6,839,759; vs. Syv	erson et al., "Private Web	
	Browsing," Naval Research Laborate 1997) ("Syverson")	ory, Center for High Ass	urance Computer Systems (June 2,	
D1752	Microsoft Claim Chart of U.S. Patent Products,") (1999-2000)	t No. 6,839,759; vs. Safe	eNet VPN Products ("SafeNet VPN	
D1753	Microsoft Claim Chart of U.S. Patent Comprehensive Collection of Micros	t No. 6,839,759; vs. "Bui oft Resources." FirstVPI	lding a Microsoft VPN: A N. (Jan 2000) ("First VPN Building a	
	Microsoft VPN publication")			
D1754	Microsoft Claim Chart of U.S. Patent Correspondence dated September 7 Correspondence")	t No. 6,839,759; vs. Pub 7, 1993 to September 20	licly Available DNS-Related), 1993 ("DNS-related	
D1755	Microsoft Claim Chart of U.S. Patent 1999, 2000)	t No. 6,839,759; vs. DNS	S SRV references (1996, 1998,	
D1756	Microsoft Claim Chart of U.S. Patent Patent")	t No. 6,839,759; vs. U.S	. Pat. No. 5,898,830 ("Wesinger '830	
D1757	Microsoft Claim Chart of U.S. Paten	t No. 6,839,759; vs. Glol	bal VPN references (1999)	
D1758	Microsoft Claim Chart of U.S. Paten Making Security Work on VPNs, Intr IPsec")	t No. 6,839,759; vs. Kau anets, and Extranets, (C	fman et al., Implementing IPsec: Copyright 1999) ("Implementing	

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Petitioner Apple Inc. - Exhibit 1002, p. 606

¹ SIPRNET is a U.S. Government Internet Protocol network for the transport of information classified as SECRET. SIPRNET was built starting in 1995, and contains domain names bearing the ".smil" designation. Microsoft has subpoenaed information from the Department of Defense and others relationg to SIPRNET, and reserves the right to amend its contentions to take any additional information about SIPRNET that it receives into account.Department of Defense and others relationg to SIPRNET, and reserves the right to amend its contentions to take any additional information about SIPRNET that it receives into account. ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.L./

Subst. for form	1449/PTO	in the second in		Complete if Known	
			Application Number	13/615,557	
APPLICAN		OSORE STATEMENT VS.	Filing Date	09-13-2012	
(Use as many	sheets as ne	cessary)	First Named Inventor	Victor Larson	
			Art Unit	2453	
			Examiner Name	Krisna Lim	
			Docket Number	77580-177 (VRNK-0001CP3CC	DN8)
	D1759	Microsoft Claim Chart of U.S. Patent	No. 6,839,759; vs. PGI	P Security, Finding Your Way	
	D1760	Through the VPN Maze (1999) ("PG	P")	fo Surfing: How to Ruild a Soouro	
	01700	World Wide Web Connection, IBM Ir Surfing")	nt'l Technical Support O	rganization (March 1996) ("Safe	
	D1761	Microsoft Claim Chart of U.S. Patent 60/134,547 (filed May 17,1999) ("Sh	: No. 6,839,759; vs. U.S eymov")	Provisional Patent Application No.	
	D1762	Microsoft Claim Chart of U.S. Patent VPN+ Publication")	No. 6,839,759; vs. Data	a Fellows F-Secure VPN ("F-Secure	
	D1763	Microsoft Claim Chart of U.S. Patent Patent'")	No. 6,839,759; vs. U.S	. Pat. No. 5,950,195 ("Stockwell '195	
	D1764	Microsoft Claim Chart of U.S. Patent IPSEC Tunnel Mode, "IPSEC Workir	No. 6,839,759; vs. B. F ng Group, Internet Draft	atel et al., "DHCP Configuration of 02 (10/15/1999) ("Patel")	
	D1765	Microsoft Claim Chart of U.S. Patent (1996-1997)	No. 6,839,759; vs. SSL	. VPNs ("SSL VPNs") references	
	D1766	Microsoft Claim Chart of U.S. Patent references (19995, 1996, 1999)	No. 6,839,759; vs. Gau	Intlet Firewall ("Gauntlet FW")	
	D1767	Microsoft Claim Chart of U.S. Patent 5,822,434 October 13, 1998 (filed Ju	No. 6,839,759; vs. Car ine 18, 1996) ("434 pate	onni et al., U.S. Patent No. ent)	
	D1768	Microsoft Claim Chart of U.S. Patent	No. 6,839,759; vs. U.S	. Pat. No. 5,311,593 ("'593 patent")	
	D1769	Microsoft Claim Chart of U.S. Patent 5,511,122 (April 23, 1996)	No. 6,839,759; RFC 2	230 (November 1997) U.S. Pat. No.	
	D1770	Microsoft Claim Chart of U.S. Patent Goncalves et al., Check Point FireW available at <u>http://www.books24x7.com/book/id</u> (Goncalves, Check Point FW); Chec	No. 6,839,759; vs. Che all-1 Administration Guid 7 <u>62/viewer_r.asp?booki</u> k Point Software Techno	ck Point FW as described in: de, McGraw-Hill Companies (2000) <u>d=762&chunkid=410651062</u> blogies Ltd. (1999) (Checkpoint FW)	
	D1//1	Microsoft Claim Chart of U.S. Patent 1998, 1999)	No. 6,839,759; vs. CIS/	DCOM references (1996, 1997,	
	D1772	for Configuration and Administration Internet Draft (October 1999) ("LDAF	No. 6,839,759; vs. Bha of IPSec Based Virtual 2 Schema for IPSec bas	ttacharya et al., "An LDAP Schema Private Networks (VPNs)", IETF ed VPNs publication")	
	D1773	Microsoft Claim Chart of U.S. Patent 1999)	No. 6,839,759; vs. Onio	on Routing references (1996, 1997,	
	D1774	Microsoft Claim Chart of U.S. Patent	No. 6,839,759; vs. Ave	ntail references (1996, 1997, 1999)	
-	D1775	Microsott Claim Chart of U.S. Patent Control Protocol," Version 1.0 (May 5	No. 6,839,759; vs. C. H 5, 1998) ("SGCP")	uitema et al., "Simple Gateway	
	D1776	Microsoft Claim Chart of U.S. Patent (1997-1999)	No. 6,839,759; vs. Micr	osoft VPN Technology references	
	D1777	Microsoft Claim Chart of U.S. Patent (1997-2001)	No. 6,839,759; vs. Dyn	amic VPN ("DVPN") references	
	D1778	Microsoft Claim Chart of U.S. Patent Translation Issues with IPsec," Intern ("Moskowitz")	No. 6,839,759; vs. R.G let Draft, Internet Engine	Moskowitz, "Network Address eering Task Force, February 6, 1998	
	D1779	Microsoft Claim Chart of U.S. Patent Server and Citrix MetaFrame (New R	No. 6,839,759; vs. Ted Riders 1999) ("Windows	Harwood, Windows NT Terminal NT Harwood")	
	D1780	Microsoft Claim Chart of U.S. Patent Genoway, Windows NT Thin Client S	No. 6,839,759; vs. Tode Solutions: Implementing	d W. Mathers and Shawn P. Terminal Server and Citrix	
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			Filing Date	09-13-2012	
(Use as many sheets as necessary)			First Named Inventor	Victor Larson	
			Art Unit	2453	
			Examiner Name	Krisna Lim	
			Docket Number	77580-177 (VRNK-0001CP3CON8)	
	D1783	Microsoft Claim Chart of U.S. Patent	No. 6,839,759; vs. Atki	nson et al., "Security Architecture for	
	D1784	Microsoft Claim Chart of U.S. Patent	t No. 6,839,759; vs. U.S	. Pat. No. 6,079,020 ("VPNet '020	
	D1785	Patent") Microsoft Claim Chart of U.S. Patent No. 6,839,759; vs. U.S. Pat. No. 6,173,399 ("VPNet '399			
	D4700	Patent")			
	D1786	Microsoft Claim Chart of U.S. Patent No. 6,839,759; vs. U.S. Pat. No. 6,226,748 ("VPNet '748 Patent")			
	D1787	Microsoft Claim Chart of U.S. Patent Patent")	: No. 6,839,759; vs. U.S	. Pat. No. 6,226,751 ("VPNet '751	
	D1788	Microsoft Claim Chart of U.S. Patent No. 6,839,759; vs. Aboba et al., "Securing L2TP using IPSEC," PPPEXT Working Group, Internet Draft (February 2, 1999) ("L2TP/IPSEC")			
	D1789	Microsoft Claim Chart of U.S. Patent No. 6,839,759; vs. AltaVista Tunnel and/or the AltaVista Firewall references (1997, 1998)			
	D1790	Microsoft Claim Chart of U.S. Patent No. 6,839,759; vs. Henning Schulzrinne, Personal Mobility for Multimedia Services in the Internet, Proceedings of the European Workshop on Interactive Distributed Multimedia Systems and Services (1996) ("Schulzrinne 96")			
	D1791	Microsoft Claim Chart of U.S. Patent Patent")	No. 6,839,759; vs. U.S.	. Pat. No. 6,701,437 ("VPNet '437	
	D1792	Microsoft Claim Chart of U.S. Patent	No. 6,839,759; vs. Wat	chGuard references (2000)	
	D1793	Microsoft Claim Chart of U.S. Patent with Secure DNS," Proceedings of th California (July 1996) ("Galvin")	No. 6,839,759; vs. J.M. le Sixth USENIX UNIX S	Galvin, "Public Key Distribution Security Symposium, San Jose,	
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	D1795	Microsoft Claim Chart of U.S. Patent No. 6,839,759; vs. FreeS/WAN references (1996)			
	D1796	Microsoft Claim Chart of U.S. Patent No. 6,839,759; vs. H. Orman et al., Re: 'Re: DNS? Was Re: Key Management, anyone?, IETF IPSec Working Group Mailing List Archive (8/96 – 9/96) ("Orman DNS"); J. Gilmore et al., Re: Key Management, anyone? (DNS keying) IETF IPSec Working Group Mailing List Archive (8/96 – 9/96)			
	D1797	Microsoft Claim Chart of U.S. Patent Agency, Secret Internet Protocol Rou	No. 6,839,759; vs. The uter Network (SIPRNET	Defense Information Systems) references (1998, 2000)	
	D1798	Microsoft Claim Chart of U.S. Patent Security Extensions, IETF DNS Secu http://www.watersprings.org/pub/id/d	No. 7,188,180; vs. Don unty Working Group (De raft-ietf-dnssec-secext2	ald Eastlake, Domain Name System cember 1998), available at -07/txt ("DNSSEC-7")	
	D1799	Microsoft Claim Chart of U.S. Patent Internet," Naval Research Laboratory ("Goldschlag I")	No. 7,188,180; vs. Gold , Center for High Assur	Ischlag et al., "Privacy on the ance Computer Systems (1997)	
	D1800	Microsoft Claim Chart of U.S. Patent Information," Workshop on Information	No. 7,188,180; vs. Goldon Hiding, Cambridge, L	Ischlag et al., "Hiding Routing IK (May 1996) ("Goldschlag II")	
	D1801	Microsoft Claim Chart of U.S. Patent Anonymous and Private Internet Cor Assurance Computer Systems (Janu	No. 7,188,180; vs. Gold inection," Naval Researd ary 28, 1999) ("Goldsch	Ischlag et al., "Onion Routing for ch Laboratory, Center for High lag III")	
	D1802	Microsoft Claim Chart of U.S. Patent Anonymous Routing," 12th Annual C Dec. 9-13, 1996 ("Reed")	No. 7,188,180; vs. M.G omputer Security Applic	. Reed, et al. "Proxies for ations Conference, San Diego, CA	
	D1803	Microsoft Claim Chart of U.S. Patent Management API, Version 2," Netwo	No. 7,188,180; vs. D. M rk Working Group, RFC	lcDonald et al., "PF_KEY Key 2367 (July 1998) ("RFC_2367")	
	D1804	Microsoft Claim Chart of U.S. Patent Selection Algorithms," available at <u>htt</u> ("Route Selection")	No. 7,188,180; vs. Onic tp://www.onion-router.ne	on Routing, "Investigation of Route et/Archives/Route/index.html	

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INFORMATION DISCLOSURE STATEMENT VS. APPLICANT			Application Number	13/615,557	
			Filing Date	09-13-2012	
(Use as many sheets as necessary)			First Named Inventor	Victor Larson	
			Art Unit	2453	
			Examiner Name	Krisna Lim	
		Docket Number	77580-177 (VRNK-0001CP3CON8)		
	D1805	Microsoft Claim Chart of U.S. Patent	No. 7,188,180; vs. Sco	tt et al., Virtual Private Networks,	
	D1806	O Reliny and Associates, Inc., 2nd ed Microsoft Claim Chart of U.S. Patent	No. 7 188 180' vs. Svv	rns) erson et al "Private Web	
	21000	Browsing," Naval Research Laborato 1997) ("Syverson")	ory, Center of High Assu	irance Computer Systems (June 2,	
	D1807	Microsoft Claim Chart of U.S. Patent Working Group Meeting Notes, <u>http:</u>	: No. 7,188,180; vs. "IPS //sandleman.ca/ipsec/19	Sec Minutes from Montreal," IPSEC 096/08/msg00018.html (June 1996)	
	D1808	Microsoft Claim Chart of U.S. Patent No. 7,188,180; vs. "Building a Microsoft VPN: A Comprehensive Collection of Microsoft Resources," FirstVPN, (Jan 2000) ("First VPN Building a			
	D1809	Microsoft VPN publication") Microsoft Claim Chart of U.S. Patent No. 7,188,180; vs. DNS SRV references (1996, 1998, 1999, 2000)			
	D1810	Microsoft Claim Chart of U.S. Patent No. 7,188,180; vs. U.S. Pat. No. 5,898,830 ("Wesigner '830 Patent")			
	D1811	Microsoft Claim Chart of U.S. Patent No. 7,188,180; vs. Kaufman et al., Implementing IPsec: Making Security Work on VPNS, Intranets, and Extranets (Copyright 1999) ("Implementing IPsec")			
	D1812	Microsoft Claim Chart of U.S. Patent World Wide Web Connection, IBM Ir Surfing")	No. 7,188,180; vs. Safe t'l Technical Support O	e Surfing: How to Build a Secure rganization (March 1996) ("Safe	
	D1813	Microsoft Claim Chart of U.S. Patent 60/134,547 (filed May 17, 1999) ("Sh	: No. 7,188,180; vs. U.S neymov")	. Provisional Patent Application No.	
	D1814	Microsoft Claim Chart of U.S. Patent VPN+ Publication)	No. 7,188,180; vs. Data	a Fellows F-Secure VPN ("F-Secure	
	D1815	Microsoft Claim Chart of U.S. Patent Patent")	No. 7,188,180; vs. U.S	. Pat. No. 5,950,195 ("Stockwell '195	
	D1816	Microsoft Claim Chart of U.S. Patent No. 7,188,180; vs. B. Patel et al., "DHCP Configuration of IPSEC Tunnel Mode," IPSEC Working Group, Internet Draft 02 (10/15/1999) ("Patel")			
	D1817	Microsoft Claim Chart of U.S. Patent No. 7,188,180; vs. SSL VPNs ("SSL VPNs") references (1996, 1999)			
	D1818	Microsoft Claim Chart of U.S. Patent references (1995, 1996, 1999)	No. 7,188,180; vs. Gau	Intlet Firewall ("Gauntlet FW")	
	D1819	Microsoft Claim Chart of U.S. Patent	No. 7,188,180; vs. U.S	. Pat. No. 6,199,171 ("'171 patent")	
	D1820	Microsoft Claim Chart of U.S. Patent 5,822,434 October 13, 1998 (filed Ju	No. 7,188,180; vs. Caro ne 18, 1996) ("'434 pate	onni et al., U.S. Patent No.	
	D1821	Microsoft Claim Chart of U.S. Patent	No. 7,188,180; vs. U.S	. Pat. No. 6,005,574 ("'574 patent")	
	D1822	Microsoft Claim Chart of U.S. Patent Records"); U.S. Pat. No. 5,511,122 (No. 7,188,180; vs. RF0 April 23, 1996)	C 2230 (November 1997) ("KX	
	D1823	Microsoft Claim Chart of U.S. Patent Goncalves et al., Check Point FireW available at <u>http://www.books24x7.com/book/id</u> (Goncalves, Check Point FW); Chec	No. 7,188,180; vs. Che all -1 Administration Gui 7 <u>62/viewer_r.asp?booki</u> k Point Software Techno	ck Point FW as described in: ide, McGraw-Hill Companies (2000) <u>d=762&chunkid=410651062</u> plogies Ltd. (1999) (Checkpoint FW)	
	D1824	Microsoft Claim Chart of U.S. Patent for Configuration and Administration Internet Draft (October 1999) ("LDAF	No. 7,188,180; vs. Batt of IPSec Based Virtual Schema for IPSec bas	acharya et al., "An LDAP Schema Private Networks (VPNs)", IETF ed VPNs publication")	
	D1825	Microsoft Claim Chart of U.S. Patent 1999)	No. 7,188,180; vs. Onio	on Routing references (1996, 1997,	
	D1826	Microsoft Claim Chart of U.S. Patent	No. 7,188,180; vs. Ave	ntail references (1997, 1999)	
	D1827	Microsoft Claim Chart of U.S. Patent (1997-1999)	No. 7,188,180; vs. Micr	rosoft VPN Technology references	

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INFORMATION DISCLOSURE STATEMENT VS			Application Number	13/615,557	
APPLICANT			Filing Date	09-13-2012	
(Use as many sheets as necessary)			First Named Inventor	Victor Larson	
			Art Unit	2453	
			Examiner Name	Krisna Lim	
			Docket Number	77580-177 (VRNK-0001CP3CON8	8)
	D1828	Microsoft Claim Chart of U.S. Patent Translation Issues with IPsec," Interi ("Moskowitz")	t No. 7,188,180; vs. R.G net Draft, Internet Engin	. Moskowitz, "Network Address eering Task Force, February 6, 1998	
	D1829	Microsoft Claim Chart of U.S. Patent No. 7,188,180; vs. RFC 2543 and Internet Drafts (1999)			
	D1830	Microsoft Claim Chart of U.S. Patent No. 7,188,180; vs. AltaVista Tunnel and/or the AltaVista Firewall references (1997); Birrell et al., U.S. Pat. No. 5,805,803, Sep. 8, 1998 (filed May 13, 1997)			
	D1831	Microsoft Claim Chart of U.S. Patent No. 7,188,180; vs. Henning Schulzrinne, Personal Mobility for Multimedia Services in the Internet, Proceedings of the European Workshop on Interactive Distributed Multimedia Systems and Services (1996) ("Schulzrinne 96")			
	D1832	Microsoft Claim Chart of U.S. Patent No. 7,188,180; vs. J. M. Gavin, "Public Key Distribution with Secure DNS," Proceedings of the Sixth USENIX UNIX Security Symposium, San Jose, California (July 1996) ("Galvin")			
	D1833	Microsoft Claim Chart of U.S. Patent No. 7,188,180; Naganand Doraswamy, Implementation of Virtual Private Networks (VPNs) with IP Secrity [sic.] <draft-ietf-ipsec-vpn-00.txt> (March 12, 1997) ("Doraswamy")</draft-ietf-ipsec-vpn-00.txt>			
	D1834	Microsoft Claim Chart of U.S. Patent	No. 7,188,180; vs. Free	S/WAN references (1996)	
	D1835	Microsoft Claim Chart of U.S. Patent No. 7,188,180; vs. H. Orman et al., Re: 'Re: DNS? Was Re: Key Management, anyone?, IETF IPSec Working Group Mailing List Archive (9/96 – 9/96) ("Orman DNS"); J. Gilmore et al., Re: Key Management, anyone? (DNS keying) IETF IPSec Working Group Mailing List Archive (8/96 - 9/96)			
	D1836	Microsoft Claim Chart of U.S. Patent No. 7,188,180; vs. The Defense Information Systems Agency, Secret Internet Protocol Router Network (SIPRNET) references (1998, 2000)			
	D1837	Microsoft Claim Chart of U.S. Patent (1997-2001)	No. 7,188,180; vs. Dyn	amic VPN ("DVPN") reference	
	D1838	Pereira, "Extended Authentication W Draft (1998)	ithin ISAKMP/Oakley," I	P Security Working Group, Internet	
	D1839	Patel et al., "Revised SA Negotiation Internet Draft (1997)	n Mode for ISAKMP/Oak	kley," IP Security Working Group,	
	D1840	Pereira et al., "The ISAKMP Configu	ration Method," IP Secu	rity Working Group (1998)	
	D1841	Piper, "A GSS-API Authentication Mo	ode for ISAKMP/Oakley	"Internet Draft (1997)	
	D1842	Rescorla, "HTTP Over TLS," Internet	t Draft (1999)		
	D1843	Lottor, "Domain Administrators Operation	ations Guide," RFC 103	3 (1987)	
	D1844	Everhart et al., "New DNS RR Definit	tions," RFC 1183 (1990)		
	D1845	Hardcastle-Kille, "X.500 and Domain	s, RFC 1279 (1991)		
	D1846	Manning, "DNS NSAP RRS," RFC 13	348 (1992)		
	D1847	Huitema, "An Experiment in DNS Ba	sed IP Routing," RFC 1:	383 (1992)	
	D1848	Eastlake, "Physical Link Security Typ	be of Service," RFC 145	5 (1993)	
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	D1850	Kastenholz, "The Definitions of Mana Protocol," RFC 1472 (1993)	aged Objects for the Sec	urity Protocols of the Point to Point	
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	····	· · · · · · · · · · · · · · · · · · ·	Docket Number	77580-177 (VRNK-0001CP3C0	DN8)
	D1854	Postel, "Domain Name System Strue	cture and Delegation," R	FC 1591 (1994)	
	D1855	Austein et al., "DNS Server MIB Exte	ension," RFC 1611 (199	4)	
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	D1860	Farrell et al., "DNS Encoding of Geographical Location," RFC 1712 (1994)			
	D1861	Brisco, "DNS Support for Load Balancing," RFC 1794 (1995)			
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	D1864	Metzger, "IP Authentication Using Keyed MDS," RFC 1828 (1995)			
	D1865	Davis et al., "A Means for Expressing 1876 (1996)	g Location Information in	the Domain Name System," RFC	
	D1866	Cobb, "PPP Internet Protocol Extensions for Name Server Addresses," RFC 1877 (1995)			
	D1867	Thomson et al., "DNS Extensions to Support IP Version 6," RFC 1886 (1995)			
	D1868	Linn, "Generic Security Service Application Program Interface, Version 2," RFC 2078 (1997)			
	D1869	Vixie et al., "Dynamic Updates in the Domain Name System (DNS Update)," RFC 2136 (1997)			
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	D1871	Rigney et al., "Remote Authentication Dial in User Service (Radius)," RFC 2138 (1997)			
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	D1873	Allocchio, "Using the Internet DNS to RFC 2163 (1998)	Distribute Mixer Confor	mant Global Address Mapping,"	
	D1874	Daniel et al., "Resolution of Uniform (1997)	Identifiers Using the Dor	nain Name System," RFC 2168	
	D1875	Elz et al., "Clarifications to the DNS S	Specification," RFC 2181	(1997)	
	D1876	Hamilton et al., "Use of DNS Aliases	for Network Services," F	RFC 2219 (1997)	
	D1877	Kille et al., "Using Domains in LDAP/	X.500 Distinguished Na	mes," RFC 2247 (1998)	
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	D1879	Moats et al., "Building Directories fro	m DNS: Experiences fro	m WWWSeeker," RFC 2517 (1999)	
	D1880	Eastlake, "RSA/MD5 Keys and Sigs	in the Domain Name Sy	stem (DNS)," RFC 2537 (1999)	
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	D1882	Eastlake, "DNS Security Operational	Considerations," RFC 2	541 (1999)	
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			Examiner Name	Krisna Lim	
		Docket Number	77580-177 (VRNK-0001CP3CON	18)	
	D1885	Vixie, "Extensions Mechanisms for D	ONS (EDNSO)," RFC 26	71 (1999)	
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Search Notes	13615557	LARSON ET AL.
	Examiner	Art Unit
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CPC- SEARCHED		
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US CLASSIFICATION SEARCHED				
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SEARCH NOTES		
Search Notes	Date	Examiner
InventorsInventors	07/25/201305/2	kiki
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NONE	Total Claims Allowed:							
(Assistant Examiner)	(Date)	34						
/KRISNA LIM/ Primary Examiner.Art Unit 2453	07/01/2014	O.G. Print Claim(s)	O.G. Print Figure					
(Primary Examiner)	(Date)	1	26, 27					
U.S. Patent and Trademark Office Part of Paper No. 20140								

Petitioner Apple Inc. - Exhibit 1002, p. 633

2013-01-01

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	Application/Control No.	Applicant(s)/Patent Under Reexamination
Issue Classification	13615557	LARSON ET AL.
	Examiner	Art Unit
	KRISNA LIM	2453

	US ORIGINAL CLASSIFICATION									INTERNATIONAL CLASSIFICATION								
	CLASS			SUBCLASS		CLAIMED						NON-CLAIMED						
709 222						G	0	6	F	15 / 173 (2006.01.01)								
CROSS REFERENCE(S)																		
CLASS SUBCLASS (ONE SUBCLASS PER BLOCK)																		
709	223	223	224	225	226													
709	227																	

NONE	Total Claims Allowed:									
(Assistant Examiner)	(Date)	34								
/KRISNA LIM/ Primary Examiner.Art Unit 2453	07/01/2014	O.G. Print Claim(s)	O.G. Print Figure							
(Primary Examiner)	(Date)	1	26, 27							

Part of Paper No. 20140701

	Application/Control No.	Applicant(s)/Patent Under Reexamination
Issue Classification	13615557	LARSON ET AL.
	Examiner	Art Unit
	KRISNA LIM	2453

	Claims renumbered in the same order as presented by applican								CPA 🛛 T.D. 🗌 R.1.47						
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
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2	2	15	18	17	34										
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NONE	Total Claims Allowed:					
(Assistant Examiner)	(Date)	34				
/KRISNA LIM/ Primary Examiner.Art Unit 2453	07/01/2014	O.G. Print Claim(s)	O.G. Print Figure			
(Primary Examiner)	(Date)	1	26, 27			
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Part of Paper No. 20140701

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Part of Paper No. : 20140529

						Application/Control No.					Applic Reexa	Applicant(s)/Patent Under Reexamination					
Index of Claims						13615557				LARSC	LARSON ET AL.						
						Examiner				Art Un	Art Unit						
					KRISNA LIM				2453	2453							
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Part of Paper No.: 20140529

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Victor LARSON, et al.	: Customer Number: 23630
Application No.: 13/615,557	Confirmation No. 1089
Filed: September 13, 2012	: Group Art Unit: 2453 :
For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES	: Examiner: Krisna Lim : :
Mail Stop Issue Fee	

Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450

AMENDMENT UNDER 37 C.F.R. § 1.312 AND COMMENTS ON EXAMINER'S STATEMENT OF REASONS FOR ALLOWANCE

Commissioner:

Further to a Notice of Allowance mailed on June 10, 2014 ("Notice of Allowance"), and without withdrawing the application from issue, please enter the following amendments under 37 C.F.R. § 1.312 and remarks.

Amendments to the Claims begin on page 2 of this paper.

Remarks begin on page 8 of this paper.

DM_US 54881365-1.077580.0177

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows. This listing of the claims replaces all prior listings of the claims.

1. (Currently Amended) A method of transparently creating an encrypted communications channel between a client device and a target device, each device being configured to allow secure data communications between the client device and the target device over the encrypted communications channel once the encrypted communications channel is created, the method comprising:

(1) intercepting from the client device a request to look up an Internet Protocol (IP) address corresponding to a domain name associated with the target device;

(2) determining whether the request to look up the IP address transmitted intercepted in step (1) corresponds to a device that accepts an encrypted channel connection with the client device; and

(3) in response to determining, in step (2), that the request to look up the IP address in step (2) corresponds to a device that accepts an encrypted communications channel connection with the client device, providing provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device such that the encrypted communications channel supports secure data communications transmitted between the two devices, the client device being a device at which a user accesses the encrypted communications channel.

2. (Previously Presented) The method of claim 1, wherein providing the provisioning information required to initiate the encrypted communications channel is based on a determination that the target device is a device with which an encrypted communications channel can be established when the IP address request corresponds to a target device identified in an network address lookup.

3. (Canceled)

4. (Previously Presented) The method of claim 1, wherein the domain name is a secure domain name.

5. (Original) The method of claim 1, wherein the encrypted communications channel is a broadband connection.

6. (Original) The method of claim 1, wherein the encrypted communications channel is an unmodulated transmission link.

7. (Previously Presented) The method of claim 1, wherein the encrypted communications channel is a modulated transmission link.

8. (Previously Presented) The method of claim 1, wherein the encrypted communications channel supports at least one of the following: FDM, TDM and CDMA.

9. (Original) The method of claim 1, wherein the client device is a phone.

10. (Previously Presented) The method of claim 9, wherein providing the provisioning information required to initiate the encrypted communications channel is based on a determination that the target device is a device with which an encrypted communications channel can be established when the IP address request corresponds to a target device identified in an network address lookup.

11. (Canceled)

12. (Previously Presented) The method of claim 9, wherein the domain name is a secure domain name.

13. (Canceled)

14. (Original) The method of claim 9, wherein the encrypted communications channel is an unmodulated transmission link.

15. (Original) The method of claim 9, wherein the encrypted communications channel is a modulated transmission link.

16. (Previously Presented) The method of claim 9, wherein the encrypted communications channel supports at least one of the following: FDM, TDM and CDMA.

17. (Previously Presented) The method of claim 1, wherein the target device is a server.

18. (Previously Presented) The method of claim 1, wherein the target device is a phone.

19. (Currently Amended) A system for transparently creating an encrypted communications channel between a client device and a target device, each device being configured to allow secure data communications therebetween over an encrypted communications channel once the encrypted communications channel is created, the system including a memory storing instructions, and a server configuration arranged to:

(1) intercept from the client device a request to look up an Internet Protocol (IP) address corresponding to a domain name associated with the target device;

(2) determine whether the request to look up the IP address transmitted intercepted in step (1) corresponds to a device that accepts an encrypted channel connection with the client device; and

(3) in response to determining, in step (2), that the request to look up the IP address corresponds to a device that accepts an encrypted communications channel connection with the client device, provide provisioning information required to initiate the creation of the encrypted communications channel between the client device and the target device such that the encrypted communications channel supports secure data communications transmitted between the two

devices, the client device being a device at which a user accesses the encrypted communications channel.

20. (Previously Presented) A system according to claim 19, wherein the encrypted communications channel supports a plurality of services.

21. (Previously Presented) The system according to claim 19, wherein the plurality of services comprises a plurality of communication protocols, a plurality of application programs, multiple sessions, or a combination thereof.

22. (Previously Presented) The system according to claim 21, wherein the plurality of other application programs comprises at least one of the following: e-mail, a word processing program, and telephony.

23. (Previously Presented) The system according to claim 19, wherein the domain name is a secure domain name.

24. (Previously Presented) The system according to claim 19, wherein the encrypted communications channel is a broadband connection.

25. (Previously Presented) The system according to claim 19, wherein the encrypted communications channel is an unmodulated transmission link.

26. (Previously Presented) The system according to claim 19, wherein the encrypted communications channel is a modulated transmission link.

27. (Previously Presented) The system according to claim 19, wherein the encrypted communications channel supports at least one of the following: FDM, TDM and CDMA.

28. (Previously Presented) The system according to claim 19, wherein the client device is a phone.

29. (Previously Presented) The system according to claim 19, wherein the target device is a server.

30. (Previously Presented) The system according to claim 19, wherein the target device is a phone.

31. (Previously Presented) The system according to claim 19, wherein intercepting the request consists of the system receiving the request to determine whether the target device accepts an encrypted channel connection with the client device.

32. (Previously Presented) The system according to claim 19, wherein intercepting the request occurs within another device that is separate from the client device.

33. (Previously Presented) The method according to claim 1, wherein intercepting the request consists of receiving the request to determine whether the target device accepts an encrypted channel connection with the client device.

34. (Previously Presented) The method according to claim 1, wherein the intercepting the request occurs within another device that is separate from the client device.

35. (Previously Presented) The method according to claim 1, wherein the encrypted communications channel supports a plurality of services.

36. (Previously Presented) The method according to claim 35, wherein the plurality of services comprises a plurality of communication protocols, a plurality of application programs, multiple sessions, or a combination thereof.

37. (Previously Presented) The method according to claim 36, wherein the plurality of other application programs comprises at least one of the following: e-mail, a word processing program, and telephony.

REMARKS

Claims 1, 2, 4-10, 12, and 14-37 remain pending in the application and stand allowed, with claims 1 and 19 being the independent claims. Independent claims 1 and 19 are amended to address formal matters relating to self-evident corrections, without changing the scope of the claims. The amendments should be entered under 37 C.F.R. § 1.312 without withdrawing the application from issue. M.P.E.P. § 714.16.

The Notice of Allowance is accompanied by a Notice of Allowability containing a statement of the Examiner's reasons for allowance, which characterizes the allowed claims and cited references (Kiuchi and Wesinger). (*See* Notice of Allowability at 2-3.) Applicants agree with the Examiner's conclusion that the claims are allowable, but do not necessarily agree with the Examiner's characterizations or all of the Examiner's reasoning. For instance, Applicant submits that each of the allowed claims is patentable based on the subject matter defined by the claim language and the combination of recitations within the claims, and not based solely on the recitations highlighted by the Examiner. Additionally, Applicants maintain that the claims are patentable over the cited references for reasons discussed in Applicants' prior responses, not only for the reasons mentioned by the Examiner.

CONCLUSION

Applicants respectfully request entry of the above-discussed amendments to independent claims 1 and 19 under 37 C.F.R. § 1.312 without withdrawing the application from issue, as well as entry of Applicants' above comments on the Examiner's statement of reasons for allowance. If necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 501133, and please credit any excess fees to the deposit account.

The Examiner is encouraged to call the undersigned attorney should he wish to resolve any outstanding issues in connection with the present application.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP

Date: September 8, 2014

/Toby H. Kusmer/ Toby H. Kusmer, PC McDermott Will & Emery LLP 28 State Street Boston, MA 02109 Reg. No. 26,418 DD Telephone: (617) 535-4065 Fax: (617) 535-3800 E-mail: tkusmer@mwe.com

Electronic Acl	knowledgement Receipt
EFS ID:	20085502
Application Number:	13615557
International Application Number:	
Confirmation Number:	1089
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES
First Named Inventor/Applicant Name:	Victor Larson
Customer Number:	23630
Filer:	Toby H. Kusmer./Tricia Tedesco
Filer Authorized By:	Toby H. Kusmer.
Attorney Docket Number:	077580-0177
Receipt Date:	09-SEP-2014
Filing Date:	13-SEP-2012
Time Stamp:	14:12:43
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted wi	th Payment	no								
File Listing:										
Document Number	Document Description		File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)				
1	Amendment after Notice of Allowance (Rule 312)		Amendment.pdf	147725 2a95382469ccb300e10390055de2dc98dfe beb37	no	9				
Warnings:										
Information:										

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.
PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: <u>Mail</u> Mail Stop ISSUE FEE **Commissioner for Patents** P.O. Box 1450 Alexandria, Virginia 22313-1450

or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23630 7590 06/10/2014 McDermott Will & Emery The McDermott Building 500 North Capitol Street, N.W. Washington, DC 20001

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name
(Signature
(Date

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/615.557	09/13/2012	Victor Larson	077580-0177	1089

TITLE OF INVENTION: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	09/10/2014
EXA	MINER	ART UNIT	CLASS-SUBCLASS			
LIM, I	KRISNA	2453	713-162000	1		
 Change of correspon CFR 1.363). Change of corres Address form PTO/S "Fee Address" in PTO/SB/47; Rev 03 Number is required ASSIGNEE NAME . PLEASE NOTE: U recordation as set fo (A) NAME OF ASS VirnetX, Inc. 	dence address or indicatio pondence address (or Cha SB/122) attached. dication (or "Fee Address -02 or more recent) attach 1. AND RESIDENCE DAT/ nless an assignee is ident rth in 37 CFR 3.11. Comp IGNEE	n of "Fee Address" (37 nge of Correspondence " Indication form ed. U se of a Customer A TO BE PRINTED ON ified below, no assignee oletion of this form is NC	 For printing on the p The names of up to or agents OR, alternativ (2) The name of a singl registered attorney or a 2 registered patent atto listed, no name will be THE PATENT (print or typ data will appear on the p. T a substitute for filing an (B) RESIDENCE: (CITY Zephyr Cove, NV 	atent front page, list > 3 registered patent attorr yely, le firm (having as a memb igent) and the names of u rneys or agents. If no nam printed. ==) atent. If an assignee is ic assignment. ' and STATE OR COUNT	er a 2 p to le is 3 dentified below, the docr	Will & Emery LLF
Please check the approp 4a. The following fee(s X Issue Fee □ Publication Fee (□ Advance Order -	oriate assignee category or) are submitted: No small entity discount p # of Copies	categories (will not be p 4 permitted)	 rinted on the patent): b. Payment of Fee(s): (Plea A check is enclosed. Payment by credit car The Director is hereby overayment to Deno 	Individual A Corporations Ise first reapply any prevent d. Form PTO-2038 is attact authorized to charge the former 50-	on or other private group iously paid issue fee sh ched. required fee(s), any defic 1133 (enclose an e	ciency, or credits any
 5. Change in Entity Status (from status indicated above) Applicant certifying micro entity status. See 37 CFR 1.29 Applicant asserting small entity status. See 37 CFR 1.27 Applicant changing to regular undiscounted fee status. NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A ar fee payment in the micro entity amount will not be accepted at the risk of application of Norre Entity status, checking this box to be a notification of loss of entitlement to micro entity status. NOTE: Checking this box will be taken to be a notification of loss of entitlement to si entity status, as applicable. 					SB/15A and 15B), issue oplication abandonment. g this box will be taken ment to small or micro	
NOTE: This form must	be signed in accordance v	vith 37 CFR 1.31 and 1.3	3. See 37 CFR 1.4 for signa	ature requirements and cer	tifications.	
Authorized Signatur	e_/Toby H. Kusmer/_			Date September	9, 2014	
Typed or printed name						

Page 2 of 3

PTOL-85 Part B (10-13) Approved for use through 10/31/2013.

OMB 0651-0033 Petitioner Apple Horce - UExhibit MOO2, por 649CE

Electronic Patent Application Fee Transmittal						
Application Number:	13615557					
Filing Date:	13.	13-Sep-2012				
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES					
First Named Inventor/Applicant Name:	Vic	tor Larson				
Filer:	То	by H. Kusmer./Tricia	Tedesco			
Attorney Docket Number:	07	7580-0177				
Filed as Large Entity						
Utility under 35 USC 111(a) Filing Fees						
Description		Fee Code	Quantity	Amount	Sub-Total in USD(\$)	
Basic Filing:						
Pages:						
Claims:						
Miscellaneous-Filing:						
Petition:						
Patent-Appeals-and-Interference:						
Post-Allowance-and-Post-Issuance:						
Utility Appl Issue Fee		1501	1	960	960	
Extension-of-Time:						

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
	Tot	al in USD:) (\$)	960

Electronic Acknowledgement Receipt					
EFS ID:	20091337				
Application Number:	13615557				
International Application Number:					
Confirmation Number:	1089				
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES				
First Named Inventor/Applicant Name:	Victor Larson				
Customer Number:	23630				
Filer:	Toby H. Kusmer./Tricia Tedesco				
Filer Authorized By:	Toby H. Kusmer.				
Attorney Docket Number:	077580-0177				
Receipt Date:	09-SEP-2014				
Filing Date:	13-SEP-2012				
Time Stamp:	17:44:18				
Application Type:	Utility under 35 USC 111(a)				

Payment information:

Submitted with Payment	yes			
Payment Type	Deposit Account			
Payment was successfully received in RAM	\$960			
RAM confirmation Number	2223			
Deposit Account	501133			
Authorized User				
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:				
Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)				
Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)				

Charge any Additiona	l Fees required under	37 C.F.R. Section	1.19 (Document supply fees)
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Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:							
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)		
1	lssue Fee Payment (PTO-85B)	IssueFeePayment.pdf _	87956	no	1		
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Warnings:							
Information:		•					
2	Fee Worksheet (SB06)	fee-info ndf	30508	no	2		
			317610be3b79b65877473537a1e53cabf3e 11a5e				
Warnings:							
Information:							
		Total Files Size (in bytes)	11	8464			
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.							
<u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.							
New Internat If a new inter an internatio and of the In national secu the applicati	tional Application Filed with the USF mational application is being filed a onal filing date (see PCT Article 11 an ternational Filing Date (Form PCT/R urity, and the date shown on this Ack on.	<u>PTO as a Receiving Office</u> nd the international applicat id MPEP 1810), a Notification O/105) will be issued in due c knowledgement Receipt will d	ion includes the nece of the International <i>i</i> ourse, subject to pres establish the internat	ssary comp Application scriptions co ional filing	onents for Number oncerning date of		

OK TO ENTER: /K.L./

09/12/2014

Docket No.: 077580-0177 (PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Victor LARSON, et al.	: Customer Number: 23630
Application No.: 13/615,557	: Confirmation No. 1089 :
Filed: September 13, 2012	: Group Art Unit: 2453 :
For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES	: Examiner: Krisna Lim : :
Mail Stop Issue Fee	

Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450

AMENDMENT UNDER 37 C.F.R. § 1.312 AND COMMENTS ON EXAMINER'S STATEMENT OF REASONS FOR ALLOWANCE

Commissioner:

Further to a Notice of Allowance mailed on June 10, 2014 ("Notice of Allowance"), and without withdrawing the application from issue, please enter the following amendments under 37 C.F.R. § 1.312 and remarks.

Amendments to the Claims begin on page 2 of this paper.

Remarks begin on page 8 of this paper.

DM_US 54881365-1.077580.0177

	ed States Paten	t and Trademark Office	UNITED STATES DEPAR United States Patent and Address: COMMISSIONER F P.O. Box 1450 Alexandria, Virginia 22. www.uspto.gov	TMENT OF COMMERCE Trademark Office FOR PATENTS 313-1450	
APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.	
13/615,557	09/13/2012	Victor Larson	077580-0177	1089	
23630 McDermott Wi	7590 09/25/2014 Il & Emerv	4	EXAMINER		
The McDermot	t Building		LIM, KRISNA		
Washington, D	C 20001		ART UNIT	PAPER NUMBER	
			2453		
			NOTIFICATION DATE	DELIVERY MODE	
			09/25/2014	ELECTRONIC	

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mweipdocket@mwe.com

		Application No.	Applicant(s)					
Response to Rule 312 Communication		13/615,557	LARSON ET AL.					
		Examiner	Art Unit					
		KRISNA LIM	2453					
	The MAILING DATE of this communication appears on the cover sheet with the correspondence address –							
1. 🛛 The a) 🖂	amendment filed on <u>09 September 2014</u> under 37 entered.	CFR 1.312 has been conside	red, and has been:					
b) 🛛	entered as directed to matters of form not affecting	g the scope of the invention.						
c) 🗌	disapproved because the amendment was filed af Any amendment filed after the date the issue for and the required fee to withdraw the application	fter the payment of the issue ee is paid must be accompan n from issue.	fee. ied by a petition under 37 CFR 1.313(c)(1)					
d) 🗌	disapproved. See explanation below.							
e) 🗖	entered in part. See explanation below.							
Superviso	ZELE/ pry Patent Examiner, Art Unit 2453	/KRISNA LIM/ Primary Examiner	Art Unit 2453					

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		Application Number 13/615,557						
	SCECSORE STATEMENT BT	Filing Date	Filing Date 09-13-2012					
ny sheets	as necessary)	First Named Inventor Victor Larson						
		Art Unit	2453					
		Examiner Name	Krisna Lim					
		Docket Number 077580-0177 (VRNK-0001CP3CONB)						
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13615557 - GAU: 2453

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				Application Number 13			3/615,557	
	TION DISCLO	OPAD	Š.	Filing Date 09 First Named Inventor Vic		09-	-13-2012	
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			ω	Exami	ner Name	Kr	Crisna Lim	
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/Krisna Lim/

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Petitioner Apple Inc. - Exhibit 1002, p. 658

13615557 - GAU: 2453

Subst. for form 1449/PTO						Complete if Known			
						Application Number 13/615,557		13/615,557	
						Filing Date September 13,		September 13, 2012	
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						Examiner Name		Not Yet Assigned	
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				Art Unit	2431
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				Docket Number	77580-177 (VRNK-0001CP3CON8)
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CTAT	RMATIC	N DISCLOSU	RE	Application Number	13/615,557			
STATEMENT BY APPLICANT				Filing Dates	September 13, 2012			
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				Examiner Name	Not Yet Assigned			
				Docket Number	77580-177 (VRNK-0001CP3CON8)			
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		ISCLOSURE STATEMENT BY	Filing Date	09-13-2012		
(Use as many	i v sheets	as necessary)	First Named Inventor	Victor Larson		
(Art Unit	2453		
			Examiner Name	Krisna Lim		
			Docket Number	077580-0177 (VRNK-0001CP3CON8		
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ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

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