Paper 14 Date: November 12, 2013

#### UNITED STATES PATENT AND TRADEMARK OFFICE

#### BEFORE THE PATENT TRIAL AND APPEAL BOARD

NEW BAY CAPITAL, LLC
Petitioner

v.

VIRNETX, INC. Patent Owner

Case IPR2013-00377 (Patent 7,418,504 B2)

Before SALLY C. MEDLEY, MICHAEL P. TIERNEY, KARL D. EASTHOM, and STEPHEN C. SIU, *Administrative Patent Judges*.

MEDLEY, Administrative Patent Judge.

JUDGMENT
Termination of the Proceeding
37 C.F.R. § 42.73

On November 6, 2013, Petitioner New Bay Capital, LLC ("New Bay") filed an unopposed motion to terminate this proceeding, representing that New Bay is abandoning the contest. Paper 13 at 1. New Bay's abandonment of the contest is construed as a request for entry of adverse judgment. 37 C.F.R. § 42.73(b)(4) );

see also 35 U.S.C. § 325(d) (describing effects of "the same or substantially the same prior art or arguments previously . . . presented to the Office").

This case is in the preliminary proceeding stage; no institution of a trial has been made.<sup>1</sup> Based on the facts of this case, it is appropriate to enter judgment.<sup>2</sup> Therefore, the motion to terminate the proceeding is *granted*.

Accordingly, it is

ORDERED that New Bay's unopposed motion to terminate is *granted*; FURTHER ORDERED that the proceeding is *terminated*.

For PETITIONER:

Robert M. Asher rasher@sunsteinlaw.com

Jeffrey T. Klayman jklayman@sunsteinlaw.com

For PATENT OWNER:

Joseph E. Palys joseph.palys@finnegan.com

Naveen Modi naveen.modi@finnegan.com

<sup>&</sup>lt;sup>1</sup> A preliminary proceeding begins with the filing of a petition for instituting a trial and ends with a written decision as to whether a trial will be instituted. 37 C.F.R. § 42.2.

<sup>&</sup>lt;sup>2</sup> A judgment means a final written decision by the Board, or a termination of a proceeding. 37 C.F.R. § 42.2.

AO 120 (Rev. 08/10)

TO:

# Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450

#### REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance	e with 35 U.S.C. § 290 and/o				ction has been			
filed in the U.S. Distr	rict Court E	astern Dist	rict of Texas Tyler Divis		on the following			
☐ Trademarks or <b>✓</b>	Patents. (  the patent	action involve	es 35 U.S.C. § 292.):					
DOCKET NO. 6:13-cv-00351	DATE FILED 4/22/2013	U.S. DI	STRICT COURT Eastern Distric	t of Texas Tyl	er Division			
PLAINTIFF			DEFENDANT					
VirnetX Inc. and Science Corporation	Applications Internation	onal	Microsoft Corporatio	n				
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK		HOLDER OF P	ATENT OR TR	ADEMARK			
1 6,502,135	12/31/2002	Virn	etX Inc.		Manus Control of the			
2 7,188,180	3/6/2007	Virn	etX Inc.					
3 7,418,504	8/26/2008	Virn	etX Inc.					
4 7,490,151	2/10/2009	Virn	VirnetX Inc.					
5 7,921,211	4/5/2011	Virn	VirnetX Inc.					
	In the above—entitled case.	, the following	g patent(s)/ trademark(s) hav	e been included				
DATE INCLUDED	INCLUDED BY	Amendment_	☐ Answer ☐ €	Cross Bill	Other Pleading			
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK		HOLDER OF P	ATENT OR TR	ADEMARK			
1 7.987,274								
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v	ve—entitled case, the follow	ina decisios I	as been randered or judgom	ent icenad				
DECISION/JUDGEMENT	/e—entitied case, the follow	ing decision i	ias been rendered of Judgeth	ent issued.				
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CLERK	T.	(BY) DEPUT	Y CLERK		DATE			

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

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AO 120 (Rev. 08/10)

TO:

## Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450

#### REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

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filed in the U.S. Dis	strict Court E	astern Dist	1116 you are hereby advised that a courtrict of Texas Tyler Division	action has been on the following		
	✓ Patents. (  the patent a		, , , , , , , , , , , , , , , , , , ,			
DOCKET NO. 6:13-cv-00351	DATE FILED 4/22/2013	U.S. DI	STRICT COURT  Eastern District of Texas T	vler Division		
PLAINTIFF			DEFENDANT	ylor Division		
VirnetX Inc. and Scienc Corporation	ce Applications Internation	nal	Microsoft Corporation			
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK		HOLDER OF PATENT OR T	RADEMARK		
1 6,502,135	12/31/2002	Virn	etX Inc.			
2 7,188,180	3/6/2007	Virne	etX Inc.	44		
3 7,418,504	8/26/2008	Virne	etX Inc.			
4 7,490,151	2/10/2009	Virne	etX Inc.			
5 7,921,211	4/5/2011	Virne	etX Inc.			
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DATE INCLUDED	INCLUDED BY	•	patent(s) trademark(s) have been mention	a:		
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TRADEMARK NO.	OR TRADEMARK		HOLDER OF PATENT OR T	RADEMARK		
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In the abov	ve—entitled case, the followin	o decision ha	s been rendered or judgement issued:			
DECISION/JUDGEMENT			or judgement issued.			
CLERK		Y) DEPUTY				

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy



#### United States Patent and Trademark Office

UNITED STATES DEPARTMENT OF COMMERCE United States Patent and Trademark Office Address: COMMISSIONER FOR PATENTS PALEXANDRA Virginia 22313-1450 www.usplo.gov

APPLICATION NUMBER FILING OR 371(C) DATE FIRST NAMED APPLICANT

ATTY. DOCKET NO./TITLE 077580-0063

11/840,560

08/17/2007

Victor Larson

(VRNK-1CP3CN2

**CONFIRMATION NO. 1537 POWER OF ATTORNEY NOTICE** 

Date Mailed: 12/04/2012

23630 McDermott Will & Emery The McDermott Building 500 North Capitol Street, N.W. Washington, DC 20001

#### NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 12/03/2012.

• 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).

/rbell/

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 PALEXANDRA Virginia 22313-1450 www.usplo.gov

APPLICATION NUMBER FILING OR 371(C) DATE FIRST NAMED APPLICANT ATTY. DOCKET NO./TITLE 077580-0063

11/840,560 08/17/2007 Victor Larson (VRNK-1CP3CN2

> **CONFIRMATION NO. 1537 POA ACCEPTANCE LETTER**

22852 FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER 901 NEW YORK AVENUE, NW WASHINGTON, DC 20001-4413

Date Mailed: 12/04/2012

#### NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 12/03/2012.

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.

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

#### IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re I	Inter Partes Reexamination of:	)
Victor	r LARSON et al.	) Control Nos.: 95/001,856; 95/001,789
U. S.	Patent No. 7,921,211	) Group Art Unit: 3992
Issued	l: April 5, 2011	) Examiner: Roland G. Foster
For:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES	) Confirmation Nos. 4051; 6053 )
	Stop <i>Inter Partes</i> Reexam nissioner for Patents	
	Box 1450	
Alexa	ndria, VA 22313-1450	

Dear Commissioner:

#### REVOCATION OF POWER OF ATTORNEY, STATEMENT UNDER 37 C.F.R. § 3.73(b), AND GRANT OF NEW POWER OF ATTORNEY

The undersigned, a representative authorized to sign on behalf of the assignee owning all of the interest in U.S. Patent No. 7,921,211 ("the '211 patent"), hereby revokes all previous powers of attorney or authorization of agent granted in the '211 patent before the date of execution hereof.

In compliance with 37 C.F.R. § 3.73(b), the undersigned verifies that VirnetX Inc. is the assignee of the entire right, title, and interest in the '211 patent by virtue of an assignment recorded in the U.S. Patent and Trademark Office at Reel 019722, Frame 0525 on August 21, 2007.

The undersigned representative of the assignee hereby grants its power of attorney to the patent practitioners associated with Finnegan, Henderson, Farabow, Garrett & Dunner,

Attorney Docket Nos. 11798.0008; 11798.0012 Control Nos. 95/001,856; 95/001,789

L.L.P., Customer Number 22,852, to transact all business in the Patent and Trademark Office connected with the '211 patent, including the reexamination proceedings assigned control nos. 95/001,856 and 95/001,789, and in any other proceedings involving the '211 patent.

Please also send all future correspondence concerning the '211 patent to the address associated with Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P., Customer Number 22,852.

Dated:	11/30/12	Bv:	
Datea.	***************************************		

Sameer Mathur
Vice President Corporate Developmen

Vice President, Corporate Development and Product Marketing VirnetX Inc.

Electronic Acknowledgement Receipt						
EFS ID:	14368873					
Application Number:	11840560					
International Application Number:						
Confirmation Number:	1537					
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES					
First Named Inventor/Applicant Name:	Victor Larson					
Customer Number:	23630					
Filer:	Joseph Edwin Palys./connie sisk					
Filer Authorized By:	Joseph Edwin Palys.					
Attorney Docket Number:	077580-0063 (VRNK-1CP3CN2					
Receipt Date:	03-DEC-2012					
Filing Date:	17-AUG-2007					
Time Stamp:	16:08:20					
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	Power of Attorney		Patent POA 211.pdf	56074	no	2	
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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.



## 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, Vignina 22313-1450 www.uspto.gov

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Bib Data Sheet

**CONFIRMATION NO. 1537** 

SERIAL NUMBE 11/840,560	FILING OR 371(c)  DATE  08/17/2007  RULE		L <b>ASS</b> 709	GRO	OUP ART UNIT 2453		ATTORNEY DOCKET NO. 077580-0063 (VRNK-1CP3CN2	
Robert Dunh Edmund Coll	n, Fairfax, VA; am Short III, Leesburg, VA by Munger, Crownsville, N amson, South Riding, VA;	1D;						
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**POA ACCEPTANCE LETTER** 

APPLICATION NUMBER FILING OR 371(C) DATE FIRST NAMED APPLICANT ATTY. DOCKET NO./TITLE

077580-0063

11/840,560 08/17/2007 (VRNK-1CP3CN2 Victor Larson

**CONFIRMATION NO. 1537** 

22852 FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER 901 NEW YORK AVENUE, NW WASHINGTON, DC 20001-4413

Date Mailed: 02/08/2012

#### NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/06/2012.

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.

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



23630

#### UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE United States Patent and Trademark Office Address: COMMISSIONER FOR PATENTS PALEXANDRA Virginia 22313-1450 www.usplo.gov

APPLICATION NUMBER

FILING OR 371(C) DATE

FIRST NAMED APPLICANT

ATTY. DOCKET NO./TITLE 077580-0063

11/840,560

McDermott Will & Emery 600 13th Street, NW

Washington, DC 20005-3096

08/17/2007

Victor Larson

(VRNK-1CP3CN2

**CONFIRMATION NO. 1537 POWER OF ATTORNEY NOTICE** 

Date Mailed: 02/08/2012

#### NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/06/2012.

• 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).

/sdstevenson/

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

Document code: WFEE

United States Patent and Trademark Office Sales Receipt for Accounting Date: 04/15/2011

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#### 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

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/840.560	04/05/2011	7921211	077580-0063 (VRNK-1CP3CN2	1537

23630 7590

03/16/2011

McDermott Will & Emery 600 13th Street, NW Washington, DC 20005-3096

#### **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 701 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):

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

IR103 (Rev. 10/09)

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					Art Unit Examiner Name			157	<del></del>
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Sheet	1		of	17	Docket Number	077580-0	0063 (V	KNK-1	CP3CN2)
				U.S. PATE	NT DOCUMENTS				
EXAMINER'S INITIALS	CITE NO.		Document Number nber-Kind Codez (# (2000m))	Publication Da MM-DD-YYYY	Name of Patentee of Cited Doo				s, Lines, Where ges or Relevant Appear
	A1000		5,311,593	05/10/1994	Carmi		-		<del></del>
	A1001		5,511,122	04/23/1996	Atkinson				
	A1003		5,805,803	09/08/1998					
	A1004		5,822,434	10/13/1998	Caronni et al.				
<del> </del>	A1005		5,898,830	04/27/1999	11100				
	A1006		60/134,547	05/17/1999			<u> </u>		
	A1007 A1008		60/151,563	08/31/1999					
	A1008		5,950,195 6,119,171	09/07/1999			-		
<del></del>	A1010		6,937,597	08/30/2005					
····	A1011		7,072,964	07/04/2006					
	A1012		09/399,753	09/22/1998					
	A1013		6,079,020	06/20/2000					
	A1014		6,173,399	01/09/2001	Gilbrech				
	A1015		6,226,748	05/01/2001	Bots et al.				
	A1016		6,226,751	05/01/2001	Arrow et al.				
	A1017		6,701,437	03/02/2004					
	A1018 A1019		6,055,574	04/25/2000		•			
	Alula		6,246,670	06/12/2001	Karlsson, et al.				
	J.,		•	FOREIGN PA	TENT DOCUMENTS				
EXAMINER'S INITIALS	CITE		reign Patent Document http://documental.com/	Publication Date MM-DD-YYYY		Pages, Colum nt Where Rel			ranslation
	NO.		Codes (if known)			Figures Ap	pear		
	B1000	1 2 8	WO 001/17775	03-30-2000	Science Applications International Corporation			Yes	No
	B1001		WO 00/70458	11-23-2000	Comsec Corporation				
	B1002		WO 01/016766	03-08-2001	Science Applications				
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<sup>\*</sup>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.

DEC 1 4 2009 Subst. for form 1449/PTO Complete if Known SUPPLEMENTAL 11/840,560 Application Number INFORMATION DISCLOSURED August 17, 2007 Filing Date **APPLICANT** Victor Larson First Named Inventor (Use as many sheets as necessary) Art Unit 2157 VU, Kim Y. **Examiner Name** 077580-0063 (VRNK-1CP3CN2) **Docket Number** Sheet of U.S. PATENT DOCUMENTS Pages, Columns, Lines, Where **EXAMINER'S** CITE Document Number Publication Date MM-DD-YYYY Name of Patentee or Applicant Relevant Passages or Relevant INITIALS NO. Number-Kind Codes at known of Cited Document Figures Appear A1020 US 7,461,334 12/02/08 Lu, et al. A1021 US 7,353,841 04/08/08 Kono, et al. McKeeth, James A. A1022 US 7,188,175 03/06/07 7,167,904 01/23/07 Devarajan, et al. A1023 US 05/02/06 Van Gunter, et al. 7,039,713 A1024 US Parekh, et al. 06/29/04 6,757,740 A1025 US Lull, et al. 06/22/04 A1026 US 6,752,166 6,687,746 02/03/04 Shuster, et al. A1027 US 01/08/02 Schneider, Eric A1028 US 6,338,082 McMillin, et al. A1029 US 6,333,272 12/25/01 11/06/01 Abbott, et al. A1030 US 6,314,463 10/02/01 Mann, et al. US 6,298,341 A1031 Mogul, Jeffrey C. 07/17/01 A1032 US | 6,262,987 Wilson, Stephen K. 312(U) US 6,199,112 03/06/04 A1033 A1034 US 6,052,788 04/18/00 Wesinger, et al 07/21/59 Garland Roper Charles, et al. A1035 US 2,895,502 2001/0049741 12/06/01 Skene, et al. A1036 US **FOREIGN PATENT DOCUMENTS** Translation Name of Patentee or Pages, Columns, Lines **Publication Date EXAMINER'S** Foreign Patent Document Applicant of Cited Document Where Relevant INITIALS Country Codes -Number 4-Kind Codes (if known) MM-DD-YYYY CITE Figures Appear No Yes OTHER ART (Including Author, Title, Date, Pertinent Pages, Etc.) Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item **EXAMINER'S** (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, INITIALS CITE city and/or country where published. NO. David Kosiur, "Building and Managing Virtual Private Networks" (1998) C1240 P. Mockapetris, "Domain Names - Implementation and Specification," Network Working Group, RFC 1035 C1241 (November 1987) Request for Inter Partes Reexamination of Patent No. 6,502,135, dated Nov. 25, 2009. C1242 Request for Inter Partes Reexamination of Patent No. 7,188,180, dated Nov. 25, 2009. C1243 DATE CONSIDERED **EXAMINER** 03/14/2010 /Krisna Lim/

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /K.L./

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.

1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

Include copy of this form with next communication to applicant.

BST99 1638591-1.077580,0063

#### PART B - FEE(S) TRANSMITTAL

#### Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

			OI FAX (S	71)-275-2000				
INSTRUCTIONS: This appropriate. All further indicated unless correct maintenance fee notifica	form should be used f correspondence including ad below or directed oth tions.	or transmitting the ISSU ing the Patent, advance or nerwise in Block 1, by (a					ould be completed where orrespondence address as ate "FEE ADDRESS" for	
CURRENT CORRESPOND	ENCE ADDRESS (Note: Use BI	ock I for any change of address)	Fe pa	e(s) Transmittal. In pers. Each additiona	is certit I paper	can only be used for icate cannot be used fo such as an assignmen ling or transmission.	domestic mailings of the r any other accompanying t or formal drawing, must	
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McDermott W. 600 13th Street, Washington, DC	NW		I t St ad tra	saraby cortify that th	ie Foots	Transmittal is being	deposited with the United class mail in an envelope bove, or being facsimile te indicated below.	
							(Depositor's name)	
							(Signature)	
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APPLICATION NO.	FILING DATE		FIRST NAMED INVENTO	)R	ATTO	RNEY DOCKET NO.	CONFIRMATION NO.	
11/840,560	08/17/2007		Victor Larson			077580-0063	1537	
TITLE OF INVENTION	í: AGILE NETWORK P	ROTOCOL FOR SECUR	E COMMUNICATIONS	S USING SECURE I	OOMÄ	NAMES CN2		
APPLN, TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUI	E PREV. PAID ISSU	E FEE	TOTAL FEE(S) DUE	DATE DUE	
nonprovisional	NO	\$1510	\$300	\$0		\$1810	04/19/2011	
EXAM	IINER	ART UNIT	CLASS-SUBCLASS					
LIM, K	RISNA	2453	709-223000					
L Change of correspond	ence address or indication	on of "Fee Address" (37	2. For printing on the			1		
CFR 1.363).  Change of corresp	ondence address (or Cha B/122) attached.	inge of Correspondence	(1) the names of up or agents OR, alterna	tively,		McDermot	Will & Emery LLP	
☐ "Fee Address" ind	lication (or "Fee Address 32 or more recent) attack	" Indication form	(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.					
		A TO BE PRINTED ON						
PLEASE NOTE: Un recordation as set fort	less an assignee is ident th in 37 CFR 3.11. Com	tified below, no assignee pletion of this form is NO	data will appear on the T a substitute for filing a	patent. If an assigr n assignment.	iee is ic	lentified below, the do	cument has been filed for	
(A) NAME OF ASSI			(B) RESIDENCE: (CIT	TY and STATE OR O	COUNT	RY)		
VirnetX, Inc.			Scotts Valley, 0	CA				
Please check the appropr	riate assignee category of	r categories (will not be p	rinted on the patent):	Individual 🗹 C	orporati	on or other private gro	up entity Government	
4a. The following fee(s)	are submitted:	4	b. Payment of Fee(s): (Pl		ny prev	iously paid issue fee s	hown above)	
Issue Fee	No small entity discount	ittad)	Payment by credit c		2 ic atta	ched		
Advance Order -	•	permitted)					iciency, or credit any extra copy of this form).	
5. Change in Entity Sta	itus (from status indicate	ed above)						
a. Applicant claim	is SMALL ENTITY state	us. See 37 CFR 1.27.	b. Applicant is no lo	-				
NOTE: The Issue Fee an interest as shown by the	nd Publication Fee (if req records of the United Sta	uired) will not be accepte ates Patent and Trademark	ed from anyone other than c Office.	the applicant; a reg	istered :	attorney or agent; or the	assignee or other party in	
Authorized Signature	/Toby H. Kusmer	1		DateF	ebrua	ry 9, 2011		
,	Toby H. Kusmer			Paristration A	ďa.	26418		

This collection of information 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 information of time you require to complete the formation of time you require to complete the year of the formation of time you require to complete the year of the

OMB 0651-0033

Registration No.

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.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Typed or printed name

Electronic Patent Application Fee Transmittal								
Application Number:	11:	11840560						
Filing Date:	17-	-Aug-2007						
Title of Invention:	AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURDOMAIN NAMES							
First Named Inventor/Applicant Name:	Victor Larson							
Filer:	Toby H. Kusmer./Kelly Ciarmataro							
Attorney Docket Number:	077580-0063 (VRNK-1CP3CN2							
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	1510	1510			
Publ. Fee- early, voluntary, or normal		1504	1	300	300			

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1810

Electronic Acknowledgement Receipt					
EFS ID:	9405577				
Application Number:	11840560				
International Application Number:					
Confirmation Number:	1537				
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./Kelly Ciarmataro				
Filer Authorized By:	Toby H. Kusmer.				
Attorney Docket Number:	077580-0063 (VRNK-1CP3CN2				
Receipt Date:	09-FEB-2011				
Filing Date:	17-AUG-2007				
Time Stamp:	11:33:22				
Application Type:	Utility under 35 USC 111(a)				

## **Payment information:**

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$1810
RAM confirmation Number	9049
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 Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

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	Issue Fee Payment (PTO-85B)	PartB.pdf	113503 5fd038c90d96c57d6f112f24c1e339dd413d 5a89	no	1

#### Warnings:

The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing

#### Information:

,	For Montels and (DTO 075)	fee-info.pdf	32043		2
2	Fee Worksheet (PTO-875)	· ·	7c9c7e1faa235598f10ff3d335e5dfec56315 1ea	no	2

#### Warnings:

#### Information:

·	1
ement Receipt evidences receipt on the noted date by the USPTO of the indicated documents,	

145546

Total Files Size (in bytes):

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.

01/19/2011

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	/:	90	
McDermott	Will	&	Emery

600 13th Street, NW Washington, DC 20005-3096 EXAMINER

LIM, KRISNA

ART UNIT PAPER NUMBER

2453 DATE MAILED: 01/19/2011

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/840,560	08/17/2007	Victor Larson	077580-0063	1537

TITLE OF INVENTION: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN VALUES  $^{1}$ CONTROLLED AND SECURE DOMAIN VALUE  $^{1}$ CONTROLLED AND SECURE DOMAI

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1510	\$300	\$0	\$1810	04/19/2011

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. 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 THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. 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 SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

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.

Page 1 of 3

#### PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail

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

maintenance fee notifica	tions.	herwise in Block 1, by (	a) specifying a new c		•				
		lock 1 for any change of address)		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.					
23630 McDermott W:		9/2011		T 1	Cer	tificate	e of Mailing or Trans	mission	
600 13th Street,				State	es Postal Service v	vith suf	s) Transmittal is being fficient postage for firs ISSUE FEE address (1) 273-2885, on the d	t class mail in an enve	
Washington, DC	20005-3096			trans	smitted to the USP	TO (57	(1) 273-2885, on the d	ate indicated below.	
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APPLICATION NO.	FILING DATE		FIRST NAMED INVEN	ITOR		ATTC	RNEY DOCKET NO.	CONFIRMATION NO	
11/840,560	08/17/2007	ROTOCOL FOR SECUR	Victor Larson	NIC I	ICING CECURE I	>0.4V	077580-0063 RNK-1GP3CN2	1537	
TITLE OF INVENTION	: AGILE NETWORK P	ROTOCOL FOR SECUR	E COMMUNICATIO	)NS (	JSING SECURE I	JOMA	IN NAMES		
APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE I	DUE	PREV. PAID ISSU	E FEE	TOTAL FEE(S) DUE	DATE DUE	
nonprovisional	NO	\$1510	\$300		\$0		\$1810	04/19/2011	
EXAM	IINER	ART UNIT	CLASS-SUBCLASS	s					
LIM, K	RISNA	2453	709-223000						
1. Change of correspond	ence address or indicatio	on of "Fee Address" (37	2. For printing on	the p	atent front page, lis	st			
CFR 1.363).  Change of corresp	oondence address (or Cha B/122) attached.	ange of Correspondence	(1) the names of u or agents OR, alter			t attori	neys 1		
	B/122) attached. lication (or "Fee Address		(2) the name of a	f a single firm (having as a member a 2					
	02 or more recent) attach		2 registered patent listed, no name wi	t attoi	neys or agents. If	no nan	ne is 3		
		A TO BE PRINTED ON	I THE PATENT (print o	or typ	e)				
		ified below, no assignee pletion of this form is NO	•	• •		ee is i	dentified below, the de	ocument has been file	
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Please check the appropr	rate assignee category or	r categories (will not be p	rinted on the patent):		Individual 🖵 Co	orporat	ion or other private gro	up entity  Govern	
4a. The following fee(s)	are submitted:	4	<b>—</b> '	,	se first reapply a	ny prev	viously paid issue fee	shown above)	
☐ Issue Fee☐ Publication Fee (N	No small entity discount	permitted)	A check is enclosed.  Payment by cred:		d. Form PTO-2038	is atta	ached.		
Advance Order -			The Director is he	ereby	authorized to char	ge the	required fee(s), any de (enclose a	ficiency, or credit any	
5. Change in Entity Sta	tus (from status indicate	d above)	overpayment, to I	Беро	Sit i teedant i tamot		(enclose a	- Carra copy of this for	
**	s SMALL ENTITY state		* *	•	, ,		TITY status. See 37 Cl	0, 1,	
NOTE: The Issue Fee an interest as shown by the	d Publication Fee (if req records of the United Sta	uired) will not be accepte ites Patent and Trademark	d from anyone other the Office.	han tl	ne applicant; a regi	stered	attorney or agent; or th	e assignee or other par	
Authorized Signature					Date				
This collection of inform	nation is required by 37 C	CFR 1.311. The information	on is required to obtain	n or r	etain a benefit by t	he pub	lic which is to file (and	by the USPTO to pro	
an application. Confiden submitting the completed this form and/or suggest	tiality is governed by 35 d application form to the ions for reducing this bu	CFR 1.311. The information U.S.C. 122 and 37 CFR to USPTO. Time will vary rden, should be sent to the DNOT SEND FEES OR	1.14. This collection is depending upon the e Chief Information C	is est indiv Office	imated to take 12 idual case. Any cor, U.S. Patent and	minute mmen Trader	s to complete, including ts on the amount of time mark Office, U.S. Department	g gathering, preparing ne you require to com- artment of Commerce,	
BOX 1450, Alexandria, V	/irginia 22313-1450. DC	) NOT SEND FEES OR	COMPLETED FORM	15 TC	THIS ADDRESS	s. SEN	D 10: Commissioner	or Patents, P.O. Box	

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

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#### 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

APPLICATION NO.		FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/840,560		08/17/2007	Victor Larson	077580-0063 (VRNK-1CP3CN2	1537
23630	7590	01/19/2011		EXAM	IINER
McDermott Wi	ll & E1	mery		LIM, K	RISNA
600 13th Street,	NW	•		ART UNIT	PAPER NUMBER
Washington, DC	20005-	-3096		2453	
				DATE MAILED: 01/19/201	1

#### Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 470 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 470 day(s).

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 Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 (571)-272-4200.

	Application No	Applicant(s)					
	Application No.						
Notice of Allowability	11/840,560 <b>Examiner</b>	LARSON ET AL.  Art Unit					
,							
	Krisna Lim	2453					
The MAILING DATE of this communication appeal 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 RIOF the Office or upon petition by the applicant. See 37 CFR 1.313	(OR REMAINS) CLOSED in this app or other appropriate communication GHTS. This application is subject to	olication. If not included will be mailed in due course. <b>THIS</b>					
1. $\boxtimes$ This communication is responsive to $\underline{\textit{the amendment filed}}$	<u>1/10/2011</u> .						
2. X The allowed claim(s) is/are <u>4-63</u> .							
<ul> <li>3. Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).</li> <li>a) All b) Some* c) None of the:</li> <li>1. Certified copies of the priority documents have been received.</li> <li>2. Certified copies of the priority documents have been received in Application No</li> <li>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)).</li> <li>* Certified copies not received:</li> </ul>							
Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.							
4. A SUBSTITUTE OATH OR DECLARATION must be subm INFORMAL PATENT APPLICATION (PTO-152) which give							
5. CORRECTED DRAWINGS ( as "replacement sheets") mus  (a) including changes required by the Notice of Draftspers  1) hereto or 2) to Paper No./Mail Date  (b) including changes required by the attached Examiner's  Paper No./Mail Date  Identifying indicia such as the application number (see 37 CFR 1 each sheet. Replacement sheet(s) should be labeled as such in the	on's Patent Drawing Review (PTO-solution)  s Amendment / Comment or in the O  84(c)) should be written on the drawin	office action of					
6. DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.							
Attachment(s)  1. Notice of References Cited (PTO-892)  2. Notice of Draftperson's Patent Drawing Review (PTO-948)  3. Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 4. Examiner's Comment Regarding Requirement for Deposit of Biological Material  5. Notice of Informal Patent Application  6. Interview Summary (PTO-413), Paper No./Mail Date  7. Examiner's Amendment/Comment  8. Examiner's Statement of Reasons for Allowance							
/Krisna Lim/ Primary Examiner, Art Unit 2453							

U.S. Patent and Trademark Office PTOL-37 (Rev. 08-06)

Notice of Allowability

Part of Paper No./Mail Date 20110111

Art Unit: 2453

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:

The prior arts of record do not teach or suggest a domain name service system configured and arranged to be connected to a communication network, to store a plurality of domain names and corresponding network addresses, to receive a query for a network address, and to indicate in response to the query whether the domain name service system supports establishing a secure communication link.

The examiner considers the applicants' claims 4-63 to be allowable based on the claim interpretation and the aforesaid prior arts of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the Issue Fee and, to avoid processing delays, should preferably **accompany** the Issue Fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

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

Application/Control Number: 11/840,560 Page 3

Art Unit: 2453

Business Center (EBC) at 866-217-9197 (toll-free).

ΚI

January 11, 2011

/Krisna Lim/

Primary Examiner, Art Unit 2453

	Application/Control No.	Applicant(s)/Patent Under Reexamination
Index of Claims	11840560	LARSON ET AL.
	Examiner	Art Unit
	Krisna Lim	2453

<b>✓</b>	Rejected	-	Cancelled	N	Non-Elected	Α	Appeal
=	Allowed	÷	Restricted	ı	Interference	0	Objected

☐ Claims r	enumbered	in the same	order as pr	esented by a	applicant		☐ CPA	D. 🗆	R.1.47
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Final	Original	03/14/2010	10/19/2010	01/11/2011					
	1	✓	-	-					
	2	✓	-	-					
	3	✓	-	-					
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31	34		✓	=					
32	35		✓	=					
33	36		✓	=					

U.S. Patent and Trademark Office

	Application/Control No.	Applicant(s)/Patent Under Reexamination		
Index of Claims	11840560	LARSON ET AL.		
	Examiner	Art Unit		
	Krisna Lim	2453		

✓ Rejected		_	Car	celled	N	Non-	Elected	A	Ap	peal
=   4	Allowed	÷ Restricted		I	I Interference		0	Obje	ected	
] Claims	renumbered	in the same	e order as pr	esented by ap	plicant		□ СРА	<u></u>	.D. 🗆	R.1.47
CL	AIM					DATE				
Final	Original	03/14/2010	10/19/2010	01/11/2011						
34	37		✓	=						
35	38		✓	=						
36	39		<b>√</b>	=						
37	40		✓	=						
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42	45		✓	=						
43	46		✓	=						
44	47		✓	=						
45	48		✓	=						
46	49		✓	=						
47	50		✓	=						
48	51		✓	=						

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	Application/Control No.	Applicant(s)/Patent Under Reexamination
Issue Classification	11840560	LARSON ET AL.
	Examiner	Art Unit
	Krisna Lim	2453

ORIGINAL							INTERNATIONAL CLASSIFICATION								
	CLASS SUBCLASS								С	LAIMED			N	ON-	CLAIMED
709 226			G	0	6	F	15 / 173 (2006.0)								
CROSS REFERENCE(S)															
CLASS	SUB	CLASS (ONE	SUBCLAS	S PER BLO	CK)										
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	Claims renumbered in the same order as presented by applicant								СР	A [2	₫ T.D.		R.1.	47	
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1	14	17	30	33	46	49								
	2	15	18	31	34	47	50								
	3	16	19	32	35	48	51								
1	4	17	20	33	36	49	52								
2	5	18	21	34	37	50	53								
3	6	19	22	35	38	51	54								
4	7	20	23	36	39	52	55								
5	8	21	24	37	40	53	56								
6	9	22	25	38	41	54	57								
7	10	23	26	39	42	55	58								
8	11	24	27	40	43	56	59								
9	12	25	28	41	44	57	60								
10	13	26	29	42	45	58	61								
11	14	27	30	43	46	59	62								
12	15	28	31	44	47	60	63								
13	16	29	32	45	48										

NONE		Total Claims Allowed:		
(Assistant Examiner)	(Date)	6	0	
/Krisna Lim/ Primary Examiner.Art Unit 2453	1/11/2011	O.G. Print Claim(s)	O.G. Print Figure	
(Primary Examiner)	(Date)	1	26	

U.S. Patent and Trademark Office Part of Paper No. 20110111

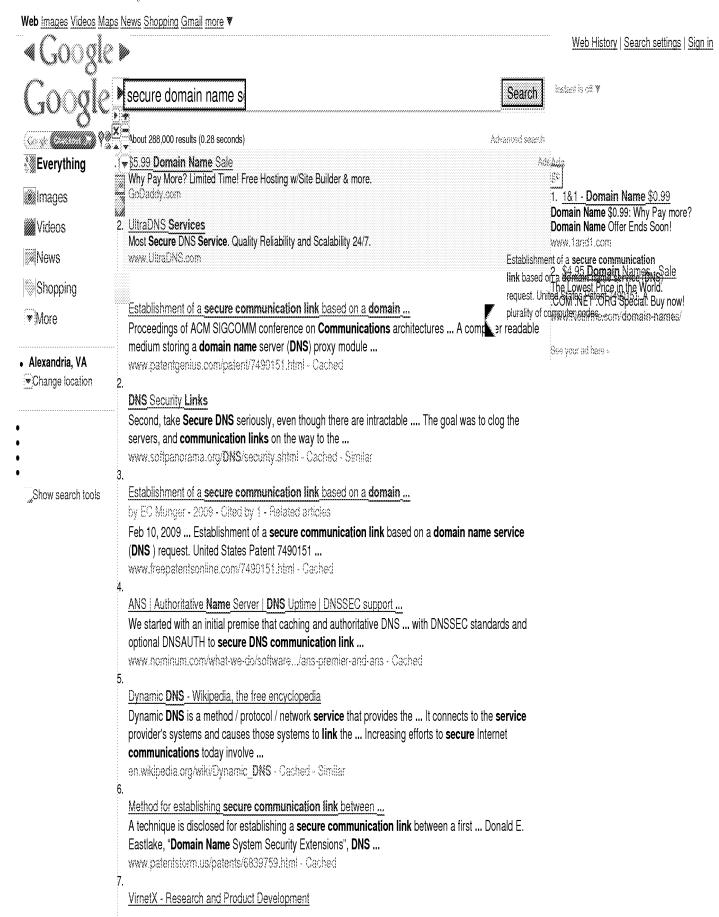
# Search Notes

Application/Control No.	Applicant(s)/Patent Under Reexamination					
11840560	LARSON ET AL.					
Examiner	Art Unit					
Krisna Lim	2453					

	SEARCHED									
Class	Subclass	Date	Examiner							
709	226, 221	3/14/2010	kl							
726	15	3/14/2010	kl							
709	226, 221	1/11/2011	kl							
726	15	1/11/2011	kl							

SEARCH NOTES		
Search Notes	Date	Examiner
EAST, Inventors	3/14/2010	kl
EAST, Inventors, google	1/11/2011	kl

		INTERFERENCE SEA	RCH	
Class		Subclass	Date	Examiner
709	226		1/11/2011	kl



**Secure domain name** registrar **service**: Customers, including **service** ... query request **services**, enforcement of policies and support for **communication** with ...

www.virrietx.com/products.php - Cached

8.

#### Building Secure ASP.NET Applications: Authentication ...

For message-level security, use the Web **Services** Development Kit to build ... Demand, Role=@"**DomainName**\WindowsGroup")] // Demand that the caller is a specific user .... Use a combination of SSL and IPSec to **secure communication links**. ...

msdn.microsoft.com/en-us/library/ff649362.aspx - Cached

9.

#### Vantio™ Base System - Nominum

These features combine to allow network owners to leverage DNS for more than ... Full DNSSEC support with optional DNSAUTH to secure DNS communication links ...

64.50.170.202/~nominum/what-we-do/../vantio-base-server - Cached

10.

#### Sunbelt Software Secure DNS Enters Beta | News & Opinion | PCMag.com

Sep 17, 2010 ... The **Domain Name** System (**DNS**) translates a human-readable **link** like I\_am\_dangerous.com into a numeric IP address for network **communication**. ... www.pcmag.com/article2/0,2817,2369279,00.asp - Cached



secure domain name s

Search

Search within results Search Help Give us feedback

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#### **EAST Search History**

#### **EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	49	((VICTOR) near2 (LARSON)). INV.	US-PGPUB; USPAT; USOCR	OR	ON	2011/01/11 10:25
L2	172	((ROBERT) near2 (SHORT)). INV.	US-PGPUB; USPAT; USOCR	OR	ON	2011/01/11 10:25
L3	27	((EDMUND) near2 (MUNGER)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2011/01/11 10:26
L4	80	((MICHAEL) near2 (WILLIAMSON)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2011/01/11 10:26
L5	199	l1 or l2 or l3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:26
L6	258	15 or 14	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:26
L7	90	l6 and (DNS domain name service)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:27
L8	76	I7 and (secure communication network)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:27
L9	12631	709/226, "221".ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:28
L10	664	726/15.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:29

L11	13261	l10 or l9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:29
L12	9	l11 and I8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:30
L13	8006063	(secure domain name service)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:52
L14	2777986	113 and (secure communication)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:58
L15	3577	l14 and DNS.ti,ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:58
L16	283	115 and @ad<="19990607"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:58
L17	28	116 and (19 or 110)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 10:59
L18	0	l17 and secure.ti,ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 11:06
L19	0	l17 and secure\$4.ti,ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 11:07

L20	912	I13 and (secure same domain same name same service)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 11:07
L21	192	I20 and (secure same communication same link)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 11:08
L22	2	21 and @ad<="19990607"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2011/01/11 11:08
S1	59654	(network adj4 interface).ti, ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/03/09 14:44
S2	1046	S1 and (network same utilization same information)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/03/09 14:45
<b>S</b> 4	59985	(network adj4 interface).ti, ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/03/21 23:35
<b>S</b> 5	1054	S4 and (network same utilization same information)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/03/21 23:35
S6	8683	(interface same definitions). ti,ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/04/25 16:26
S7	6	(("6973298") or ("7359894") or ("20070244633")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/09/15 11:26

S8	3	((BRADLY) near2 (BILLMAN)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2010/09/15 14:26
S9	2	("6973298").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/09/15 15:07
S10	0	\$9 and ( accept\$4 or reject \$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/09/15 15:07
S11	36	(("5796393") or ("6256648") or ("6389372") or ("6421678") or ("6442567") or ("6594673") or ("20020116466") or ("20020124053") or ("20030020977") or ("20030050977") or ("20040042599") or ("20040042599") or ("20040122803") or ("20050198031") or ("20050209999") or ("20050210409") or ("20050267766") or ("20060004789")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON THE	2010/09/15 15:23
S12	12	(("5479482") or ("5797093") or ("6233445") or ("6240285") or ("6295454") or ("6819929")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/09/15 15:31
S13	2288911	(social network roadside assistance)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/09/15 15:59
S14	804240	\$13 and (assistance request \$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/09/15 15:59
S15	703679	S14 and (members network)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/09/15 16:00

S16	276219	S15 and (accept\$4 reject\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/09/15 16:03
S17	2306651	(social network roadside assistance)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/10/13 14:08
S18	19	((RODGER) near2 (ERICKSON)).INV.	US-PGPUB; USPAT; USOCR	OR	ON	2010/12/10 13:51
S19	12452	(proxy same servers).ti,ab, clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/12/10 14:25
S20	3056	S19 and ((state or status) same information)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/12/10 14:26
S21	0	S20 and (each same cache)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/12/10 14:26
S22	1117	S20 and cache	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/12/10 14:26
S23	1108	S22 and (session or communication or establish \$4 or connect\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/12/10 14:27
S24	1108	S23 and servers.ti,ab,clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/12/10 14:28

S25	1108	S24 and (establish\$4 new session proxy server)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/12/10 14:28
S26	38	S24 and (establish\$4 same new same session same proxy same server)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/12/10 14:29
S27	950724	(proxy servers (load adj4 balance))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/12/10 15:41
S28	1108	S27 and S25	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/12/10 15:41
S29	111	"5566297"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/12/10 15:53
<b>S</b> 30	2	("5566297").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/12/10 15:53
S31	2	S30 and ( servers or (( first adj5 server) and (second adj5 server)) and (state same information and cache))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/12/10 15:55
S32	108	("5566297").URPN.	USPAT	OR	ON	2010/12/10 15:56
S33	110	S32 or S29	USPAT	OR	ON	2010/12/10 15:56
S34	104	S33 and ( servers or (( first adj5 server) and (second adj5 server)) and (state same information and cache))	USPAT	OR	ON	2010/12/10 15:57

<b>S</b> 35	58	S34 and (servers or ((first adj5 server) and (second adj server)) and (state same information and cache)).ti, ab,clm.	USPAT	OR	ON	2010/12/10 15:58
S36	2	S35 and (proxy adj3 server)	USPAT	OR	ON	2010/12/10 15:59
S37	7	S35 and (proxy same servers)	USPAT	OR	ON	2010/12/10 15:59

## **EAST Search History (Interference)**

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#### 1/11/11 11:20:05 AM

 $\textbf{C:} \ \textbf{Documents and Settings} \\ \ \textbf{klim} \\ \ \textbf{My Documents} \\ \ \textbf{EAST} \\ \ \textbf{Workspaces} \\ \ \textbf{11685142.wsp}$ 



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# **BIB DATA SHEET**

## **CONFIRMATION NO. 1537**

SERIAL NUMI	BER	FILING OF			CLASS	GR	OUP ART	UNIT	ATTC	RNEY DOCKET
11/840,560	0	08/17/2			709		2453			77580-0063
		RUL	<b>=</b>						(VF	RNK-1CP3CN2
APPLICANTS Victor Larson, Fairfax, VA; Robert Dunham Short III, Leesburg, VA; Edmund Colby Munger, Crownsville, MD; Michael Williamson, South Riding, VA;										
This appli whi whi whi whi and	This application is a CON of 10/714,849 11/18/2003 PAT 7,418,504 which is a CON of 09/558,210 04/26/2000 ABN which is a CIP of 09/504,783 02/15/2000 PAT 6,502,135 which is a CIP of 09/429,643 10/29/1999 PAT 7,010,604 which claims benefit of 60/106,261 10/30/1998 and claims benefit of 60/137,704 06/07/1999  ** FOREIGN APPLICATIONS ************************************									
		M/	Met af Allowa	ter nce	STATE OR COUNTRY VA		HEETS AWINGS 40	TOTA CLAII		INDEPENDENT CLAIMS 3
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TITLE										
AGILE NE	ETWOR	K PROTOC	DL FOR S	ECUR	E COMMUNICA	TION	S USING	SECUR	E DOI	MAIN NAMES
							☐ All Fe	es		
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FILING FEE RECEIVED 3366  FEES: Authority has been given in Paper to charge/credit DEPOSIT ACCOUNT No for following:						ocessi	ng Ext. of time)			
						☐ 1.18 F	ees (lss	ue)		
							☐ Other			
							☐ Credit	t		

BIB (Rev. 05/07).

Application Number	Application/Control No.  11/840,560		Applicant(s)/Patent under Reexamination  LARSON ET AL.		
Document Code - DISQ		Internal D	ocument – DC	NOT MAIL	

TERMINAL DISCLAIMER	⊠ APPROVED	□ DISAPPROVED
Date Filed : 12/22/10	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:
Janice Ford

U.S. Patent and Trademark Office

617.535.4065 Telephone Number

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.

## Docket Number (Optional) TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING **REJECTION OVER A "PRIOR" PATENT** In re Application of: Victor Larson et al. Application No.: 11/840,560 Filed: August 17, 2007 For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING SECURE DOMAIN NAMES percent interest in the instant application hereby disclaims, The owner\*, <u>VirnetX, Inc.</u>, of <u>100</u> percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term **prior patent** No. 7,418,504 as the term of said prior patent is defined in 35 U.S.C. 154 and 173, and as the term of said **prior patent** is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application 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 patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 and 173 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; is in any manner terminated prior to the expiration of its full statutory term as presently shortened 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, university, government agency, 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 statements made on in formation 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 punis hable by fine or imprisonment, or both, under Se ction 1001 of Title 18 of the United States Code and that such 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. 26418 /Toby H. Kusmer/ 12/22/2010 Signature Date Toby H. Kusmer Typed or printed name

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Terminal disclaimer fee under 37 CFR 1.20(d) included.

This collection of information is required by 37 CFR 1.321. 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 but reen, 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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- 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)).
- 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.

Electronic Patent Application Fee Transmittal					
Application Number:	118	340560			
Filing Date:	17-Aug-2007				
Title of Invention:	I .	ILE NETWORK PROT MAIN NAMES	OCOL FOR SEC	URE COMMUNICA'	TIONS USING SECURE
First Named Inventor/Applicant Name:	Vic	tor Larson			
Filer:	То	by H. Kusmer./Kelly	Ciarmataro		
Attorney Docket Number:	07	7580-0063 (VRNK-10	CP3CN2		
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	1	140	140
	Tot	al in USD	(\$)	140

Electronic Acl	knowledgement Receipt
EFS ID:	9099025
Application Number:	11840560
International Application Number:	
Confirmation Number:	1537
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./Kelly Ciarmataro
Filer Authorized By:	Toby H. Kusmer.
Attorney Docket Number:	077580-0063 (VRNK-1CP3CN2
Receipt Date:	22-DEC-2010
Filing Date:	17-AUG-2007
Time Stamp:	15:31:29
Application Type:	Utility under 35 USC 111(a)

# **Payment information:**

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$140
RAM confirmation Number	2428
Deposit Account	501133
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# File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		AmendB.pdf	49491	yes	11
		3b0dee6667f821a6bd8ee9e540aba56d23c 6331e	yes	""	
	Multip	part Description/PDF files in .	zip description	•	
	Document De	scription	Start	E	nd
	Amendment A	fter Final	1		1
	Claims		2		9
	Applicant Arguments/Remarks	Made in an Amendment	10	11	
Warnings:					
Information:					
2	Terminal Disclaimer Filed	TermDisc.pdf	209736	no	2
1	Terrima Diseamer Files	rembisepai	b6aaed797b9c4f603904c0347c2f0abe4aff3 9f0	,,,,	-
Warnings:					
Information:					
3	Fee Worksheet (PTO-875)	fee-info.pdf	30252	no	2
	, as worksheet (170 or 3)	ice inicipal	42f90678323829c262ba0a902124fa19d214 f990	110	<b>-</b>
Warnings:					
Information:					
		Total Files Size (in bytes)	28	39479	

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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.

Docket No.: 077580-0063 (VRNK-1CP3CN2) PATENT

#### IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Victor Larson et al. : Customer Number: 23630

:

Confirmation Number: 1537

Application No.: 11/840,560 : Group Art Unit: 2453

:

Filed: August 17, 2007 : Examiner: Lim, Krisna

: Examiner: Lim, Krisna

For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING

SECURE DOMAIN NAMES

#### **AMENDMENT "B"**

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

Sir:

In response to the Office action dated October 21, 2010, please amend the aboveidentified application and consider the accompanying remarks as follows:

Amendments to the claims begin on page 2 of this paper

Remarks begin on page 10 of this paper.

Amendments to the claims:

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

1-3. (Cancelled)

4. (Previously Presented) A system for providing a domain name service for

establishing a secure communication link, the system comprising:

a domain name service system configured and arranged to be connected to a

communication network, store a plurality of domain names and corresponding

network addresses, receive a query for a network address, and indicate in response

to the query whether the domain name service system supports establishing a

secure communication link.

5. (Previously Presented) The system of claim 4, wherein at least one of the plurality

of domain names comprises a top-level domain name.

6. (Previously Presented) The system of claim 5, wherein the top-level domain

name is a non-standard top-level domain name.

7. (Previously Presented) The system of claim 6, wherein the non-standard top-level

domain name is one of .scom, .sorg, .snet, .sgov, .sedu, .smil and .sint.

8. (Previously Presented) The system of claim 5, wherein the domain name service

system is configured to authenticate the query using a cryptographic technique.

9. (Previously Presented) The system of claim 4, wherein the communication

network includes the Internet.

10. (Previously Presented) The system of claim 4, wherein the domain name service

system comprises an edge router.

11. (Previously Presented) The system of claim 4, wherein the domain name service

system is connectable to a virtual private network through the communication network.

(2)

12. (Previously Presented) The system of claim 11, wherein the virtual private

network is one of a plurality of secure communication links in a hierarchy of secure

communication links.

13. (Previously Presented) The system of claim 11, wherein the virtual private

network is based on inserting into each data packet communicated over a secure communication

link one or more data values that vary according to a pseudo-random sequence.

14. (Previously Presented) The system of claim 11, wherein the virtual private

network is based on a network address hopping regime that is used to pseudorandomly change

network addresses in packets transmitted between a first device and a second device.

15. (Previously Presented) The system of claim 11, wherein the virtual private

network is based on comparing a value in each data packet transmitted between a first device and

a second device to a moving window of valid values.

16. (Previously Presented) The system of claim 11, wherein the virtual private

network is based on a comparison of a discriminator field in a header of each data packet to a

table of valid discriminator fields maintained for a first device.

17. (Previously Presented) The system of claim 4, wherein the domain name service

system is configured to respond to the query for the network address.

18. (Previously Presented) The system of claim 4, wherein the domain name service

system is configured to provide, in response to the query, the network address corresponding to a

domain name from the plurality of domain names and the corresponding network addresses.

19. (Previously Presented) The system of claim 4, wherein the domain name service

system is configured to receive the query initiated from a first location, the query requesting the

network address associated with a domain name, wherein the domain name service system is

configured to provide the network address associated with a second location, and wherein the

domain name service system is configured to support establishing a secure communication link

between the first location and the second location.

(3)

20. (Previously Presented) The system of claim 4, wherein the domain name service

system is connected to a communication network, stores a plurality of domain names and

corresponding network addresses, and comprises an indication that the domain name service

system supports establishing a secure communication link.

21. (Previously Presented) The system of claim 4, wherein at least one of the plurality

of domain names is reserved for secure communication links.

22. (Previously Presented) The system of claim 4, wherein the domain name service

system comprises a server.

23. (Previously Presented) The system of claim 22, wherein the domain name service

system further comprises a domain name database, and wherein the domain name database stores

the plurality of domain names and the corresponding network addresses.

24. (Previously Presented) The system of claim 4, wherein the domain name service

system comprises a server, wherein the server comprises a domain name database, and wherein

the domain name database stores the plurality of domain names and the corresponding network

addresses.

25. (Previously Presented) The system of claim 4, wherein the domain name service

system is configured to store the corresponding network addresses for use in establishing secure

communication links.

26. (Previously Presented) The system of claim 4, wherein the domain name service

system is configured to authenticate the query for the network address.

27. (Previously Presented) The system of claim 4, wherein at least one of the plurality

of domain names comprises an indication that the domain name service system supports

establishing a secure communication link.

28. (Previously Presented) The system of claim 4, wherein at least one of the plurality

of domain names comprises a secure name.

29. (Previously Presented) The system of claim 4, wherein at least one of the plurality

**(4)** 

of domain names enables establishment of a secure communication link.

30. (Previously Presented) The system of claim 4, wherein the domain name service

system is configured to enable establishment of a secure communication link between a first

location and a second location transparently to a user at the first location.

31. (Previously Presented) The system of claim 4, wherein the secure communication

link uses encryption.

32. (Previously Presented) The system of claim 4, wherein the secure communication

link is capable of supporting a plurality of services.

33. (Previously Presented) The system of claim 32, wherein the plurality of services

comprises a plurality of communication protocols, a plurality of application programs, multiple

sessions, or a combination thereof.

34. (Previously Presented) The system of claim 33, wherein the plurality of

application programs comprises items selected from a group consisting of the following: video

conferencing, e-mail, a word processing program, and telephony.

35. (Previously Presented) The system of claim 32, wherein the plurality of services

comprises audio, video, or a combination thereof.

36. (Previously Presented) The system of claim 4, wherein the domain name service

system is configured to enable establishment of a secure communication link between a first

location and a second location.

37. (Previously Presented) The system of claim 36, wherein the query is initiated

from the first location, wherein the second location comprises a computer, and wherein the

network address is an address associated with the computer.

38. (Previously Presented) The system of claim 4, wherein the domain name service

system comprises a domain name database connected to a communication network and storing a

plurality of domain names and corresponding network addresses for communication, wherein the

domain name database is configured so as to provide a network address corresponding to a

(5)

domain name in response to a query in order to establish a secure communication link.

39. (Currently Amended) A <u>non-transitory</u> machine-readable medium comprising

instructions executable in a domain name service system, the instructions comprising code for:

connecting the domain name service system to a communication network; storing a plurality of

domain names and corresponding network addresses; receiving a query for a network address;

and indicating in response to the query whether the domain name service system supports

establishing a secure communication link.

40. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the instructions comprise code for storing the plurality of domain names and

corresponding network addresses including at least one top-level domain name.

41. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the instructions comprise code for responding to the query for the network address.

42. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the instructions comprise code for providing, in response to the query, the network

address corresponding to a domain name from the plurality of domain names and the

corresponding network addresses.

43. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the instructions comprise code for receiving the query for a network address associated

with a domain name and initiated from a first location, and providing a network address

associated with a second location, and establishing a secure communication link between the first

location and the second location.

44. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the instructions comprise code for indicating that the domain name service system

supports the establishment of a secure communication link.

45. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the instructions comprise code for reserving at least one of the plurality of domain

names for secure communication links.

(6)

46. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the code resides on a server.

47. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the instructions comprise code for storing a plurality of domain names and

corresponding network addresses so as to define a domain name database.

48. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the code resides on a server, and the instructions comprise code for creating a domain

name database configured to store the plurality of domain names and the corresponding network

addresses.

49. (Currently Amended) The non-transitory machine-readable medium of claim 39,

wherein the instructions comprise code for storing the corresponding network addresses for use

in establishing secure communication links.

50. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the instructions comprise code for authenticating the query for the network address.

51. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein at least one of the plurality of domain names includes an indication that the domain

name service system supports the establishment of a secure communication link.

52. (Currently Amended) The non-transitory machine-readable medium of claim 39,

wherein at least one of the plurality of domain names includes a secure name.

53. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein at least one of the plurality of domain names is configured so as to enable establishment

of a secure communication link.

54. (Currently Amended) The non-transitory machine-readable medium of claim 39,

wherein the domain name service system is configured to enable establishment of a secure

communication link between a first location and a second location transparently to a user at the

first location.

(7)

55. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the secure communication link uses encryption.

56. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the secure communication link is capable of supporting a plurality of services.

57. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 56,

wherein the plurality of services comprises a plurality of communication protocols, a plurality of

application programs, multiple sessions, or a combination thereof.

58. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 57,

wherein the plurality of application programs comprises items selected from a group consisting

of the following: video conferencing, e-mail, a word processing program, and telephony.

59. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 56,

wherein the plurality of services comprises audio, video, or a combination thereof.

60. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the domain name service system is configured to enable establishment of a secure

communication link between a first location and a second location.

61. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 60,

wherein the instructions include code for receiving a query initiated from the first location,

wherein the second location comprises a computer, and wherein the network address is an

address associated with the computer.

62. (Currently Amended) The <u>non-transitory</u> machine-readable medium of claim 39,

wherein the domain name service system comprises a domain name database connected to a

communication network and storing a plurality of domain names and corresponding network

addresses for communication, wherein the domain name database is configured so as to provide a

network address corresponding to a domain name is response to the query in order to establish a

secure communication link.

63. (Currently Amended) A method of providing a domain name service for

(8)

establishing a secure communication link, the method comprising:

connecting a domain name service system to a communication network[[,]];

storing a plurality of domain names and corresponding network addresses; and

upon receiving a query for a network address for communication, indicating whether the

domain name service system supports establishing a secure communication link.

REMARKS

Claims 4-63 are in the application. Claims 4-38 are being resubmitted as previously

presented, and Claims 39-63 have been amended in order to more clearly define the invention.

Claims 39-62 have been rejected under 35 U.S.C. § 101 for claiming non-statutory

subject matter. Claims 4-63 have been rejected on the ground of nonstatutory obviousness-type

double patenting as being unpatentable over claims 1-59 of U.S. Patent No. 7,418,504. These

rejections are respectfully traversed and reconsideration is requested in view of the foregoing

amendments and following remarks

35 U.S.C. § 101

Claims 39-62 have been rejected under 35 U.S.C. § 101 for claiming non-statutory

subject matter. The Office Action recommends that the term "non-transitory" be added to the

claims to overcome this rejection. The Applicant has amended claims 39-62 accordingly. The

Applicant respectfully requests withdrawal of this rejection.

Double-Patenting

Claims 4-63 have been rejected on the ground of nonstatutory obviousness-type double

patenting as being unpatentable over claims 1-59 of U.S. Patent No. 7,418,504. The Applicant

concurrently submits a terminal disclaimer to overcome this rejection. Accordingly, the

Applicant respectfully request withdrawal of this rejection and submits that the claims are in

condition for allowance.

Typographical Error

The Office Action noted a typographical error in claim 63 – a comma and semicolon were

together. The Applicant has amended claim 63 to correct this typographical error.

(10)

#### **CONCLUSION**

Claims 4-63, the remaining claims in the application are now considered in condition for allowance. An early and favorable action thereon is therefore earnestly solicited.

Please charge the Terminal Disclaimer Fee and any shortage of fees due in connection with the filing of this paper, to Deposit Account 50-1133 and please credit any excess fees to such deposit account.

Respectfully submitted,

McDERMOTT WILL & EMERY LLP

/Toby H. Kusmer/ Toby H. Kusmer Registration No. 26,418

28 State Street Please recognize our Customer No. 23,630
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Facsimile: 617.535.3800 E-mail address: tkusmer@mwe.com

Date: December 22, 2010

	Under the Pa	nanwark Paduction	Act of 10	05 no noreone aro	required to respon			nd Trademark Off	ice; U.S	. DEPARTME	PTO/SB/06 (07-06) 007. OMB 0651-0032 ENT OF COMMERCE OMB control number.
P	ATENT APPL		E DETI	ERMINATION			Application or Docket Number 11/840,560			ing Date 17/2007	To be Mailed
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	SEARCH FEE (37 CFR 1.16(k), (i), (i)	or (m))	N/A		N/A		N/A			N/A	
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	AL CLAIMS	o), or (q))  minus 20 = *					x \$ =		OR	x \$ =	
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Ш	MULTIPLE DEPEN	IDENT CLAIM PR	ESENT (3	7 CFR 1.16(j))							
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	APP	(Column 1)	AMEND	DED — PART II (Column 2)	(Column 3)	_	SMAL	L ENTITY	OR		ER THAN ALL ENTITY
NT	12/22/2010	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)		RATE (\$)	ADDITIONAL FEE (\$)
ME	Total (37 CFR 1.16(i))	* 60	Minus	** 60	= 0	1	x \$ =		OR	X \$52=	0
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ΑN	FIRST PRESEN	NTATION OF MULTIF	LE DEPEN	DENT CLAIM (37 CFF	R 1.16(j))				OR		
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This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the ublimit 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, 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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# Courtesy Reminder for Application Serial No: 11/840,560

Attorney Docket No: 077580-0063

(VRNK-1CP3CN2

Customer Number: 23630

Date of Electronic Notification: 10/21/2010 This is a courtesy reminder that new correspondence is available for this application. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.	
11/840,560	08/17/2007	Victor Larson	077580-0063 (VRNK-1CP3CN2	1537	
23630 McDermott Wi	7590 10/21/201 ll & Emerv	0	EXAM	IINER	
600 13th Street	, NW	LIM, KRISNA			
Washington, D	2 20005-3096		ART UNIT	PAPER NUMBER	
			2453		
			NOTIFICATION DATE	DELIVERY MODE	
			10/21/2010	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)
		11/840,560	LARSON ET AL.
	Office Action Summary	Examiner	Art Unit
		Krisna Lim	2453
Period fo	The MAILING DATE of this communication app or Reply	pears on the cover sheet with the c	orrespondence address
WHIC - Exter after - If NO - Failu Any r	ORTENED STATUTORY PERIOD FOR REPLY CHEVER IS LONGER, FROM THE MAILING DATE OF THE OF THE OF THE OF THE MAILING DATE OF THE OF THE OF THE OF THE OF	ATE OF THIS COMMUNICATION 36(a). In no event, however, may a reply be tin will apply and will expire SIX (6) MONTHS from , cause the application to become ABANDONE	N. nely filed the mailing date of this communication. D (35 U.S.C. § 133).
Status			
1)🖂	Responsive to communication(s) filed on <u>06 A</u>	<u>ugust 2010</u> .	
2a)⊠	This action is <b>FINAL</b> . 2b) ☐ This	action is non-final.	
3)	Since this application is in condition for alloward	nce except for formal matters, pro	secution as to the merits is
	closed in accordance with the practice under E	Ex parte Quayle, 1935 C.D. 11, 45	53 O.G. 213.
Dispositi	on of Claims		
4)🛛	Claim(s) 4-63 is/are pending in the application		
	4a) Of the above claim(s) is/are withdra	wn from consideration.	
5)	Claim(s) is/are allowed.		
•	Claim(s) <u>4-63</u> is/are rejected.		
-	Claim(s) is/are objected to.		
8)[_]	Claim(s) are subject to restriction and/o	r election requirement.	
Applicati	on Papers		
9)□	The specification is objected to by the Examine	er.	
10)	The drawing(s) filed on is/are: a)∏ acc	epted or b)□ objected to by the B	Examiner.
	Applicant may not request that any objection to the	drawing(s) be held in abeyance. See	∋ 37 CFR 1.85(a).
	Replacement drawing sheet(s) including the correct	= : :	•
11)[	The oath or declaration is objected to by the Ex	caminer. Note the attached Office	Action or form PTO-152.
Priority u	ınder 35 U.S.C. § 119		
a)[	Acknowledgment is made of a claim for foreign  All b) Some * c) None of:  1. Certified copies of the priority document  2. Certified copies of the priority document  3. Copies of the certified copies of the priority document  application from the International Bureau  See the attached detailed Office action for a list	s have been received. s have been received in Applicati rity documents have been receive u (PCT Rule 17.2(a)).	on No ed in this National Stage
2) Notic	e of References Cited (PTO-892) e of Draftsperson's Patent Drawing Review (PTO-948)	4) ☐ Interview Summary Paper No(s)/Mail Da	ate
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U.S. Patent and Trademark Office PTOL-326 (Rev. 08-06)

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1. Claims 4-63 are newly added for examination, and claims 1-3 was canceled.

- 2. As required by M.P.E.P. 609(C), the applicant's submissions of the Information Disclosure Statement dated 4/02/2010, 08/04/2010, 12/14/2009, 11/06/2009, 09/08/2009, 05/19/2009, 02/24/2009, 01/22/2009 and 12/16/2008 is acknowledged by the examiner and the cited references have been considered in the examination of the claims now pending. As required by M.P.E.P 609 C(2), a copy of the PTOL-1449 initialed and dated by the examiner is attached to the instant office action.
- 3. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01 (o). Correction of the following is required: The specification does not mention or define "computer readable medium" which is found in claims 39-62. Depending on the definition given "computer readable medium" may include embodiments that are not statutory in view of 35 USC § 101. Therefore, the applicant should amend the specification giving "computer machine readable medium" a definition that would be available to one having ordinary skill in the art at the time of the invention so that it can be determined if the limitations are statutory.
- 4. In claim 63, line 3, there is a typographical error because a comma and a semicolon are together.
- 5. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. Claims 39-62 are rejected under 35 U.S.C. §101 because they are rejected under 35 US.C. § 101 as on-statutory subject matter.

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The broadest reasonable interpretation of a claim drawn to a computer readable medium (also called machine readable medium and other such variations) typically covers forms of non-transitory tangible media and transitory propagating signals per se in view of the ordinary and customary meaning of computer readable media, particularly when the specification is silent. See MPEP 2111.01. See In re Nuijten, 500 F.3d 1346, 1356-57 (Fed. Cir. 2007) (transitory embodiments are not directed to statutory subject matter) and Interim Examination Instructions for Evaluating Subject Matter Eligibility under 35 U.S.C. § 101, Aug. 24, 2009; p. 2.

Note: Applicants are recommended to change "computer readable medium" to "non-transitory computer readable medium" to the claim. By adding "non-transitory" language would not raise the issue of new matter even the specification is silent because the broadest reasonable interpretation relies on the ordinary and customary meaning that includes signal per se.

7. 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

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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).

8. Claims 4-63 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-59 of U.S. Patent No. 7,418,504.

Although the conflicting claims are not identical, they are not patentably distinct from each other because they are directed to a system for providing a domain name service for establishing a secure communication link and having similar components and functions. The differences are the modifications of the claimed languages. For example, in claim 4 of the present application uses the language of "a domain name"

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service system configured <u>and arranged</u> to be connected" while the claim 1 of the patent uses the similar language without "and arranged". Another example, in claim 39 of the present application uses the language of "indicating in response to the query whether the domain name service system supports establishing a secure communication link" while the claim 36 of the patent uses the language of "supporting an indication that the domain name service system supports establishing a secure communication link" instead. And another example is the difference between claim 63 of the present application and claim 60 of the patent. The difference is the present application uses the language of "the domain name service system comprises an indication that the domain name service system supports establishing a secure communication link" at the beginning of step while claim 63 of the present application uses the language of "indicating whether the domain name service system supports establishing a secure communication link".

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). 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

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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 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).

ΚI

October 19, 2010

/Krisna Lim/

Primary Examiner, Art Unit 2453

	Application/Control No.	Applicant(s)/Patent Under Reexamination
Index of Claims	11840560	LARSON ET AL.
	Examiner	Art Unit
	Krisna Lim	2453

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	Application/Control No.	Applicant(s)/Patent Under Reexamination
Index of Claims	11840560	LARSON ET AL.
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	Krisna Lim	2453

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	B1004	EP0814589	12/29/19	997	AT&T Corp.						
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	B 1000	VVO96/2/783	06/25/19	198	Northern Telecom Limited						
	B1007	WO99/11019	03/04/19	999	V One Corp						
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/Krisna Lim/

10/17/2010

Subst. for form 1449/PTO	Complete if Known				
INFORMATION DISCLOSURE STATEMENT BY	Application Number	11/840,560			
APPLICANT	Filing Date	08-17-2007			
(Use as many sheets as necessary)	First Named Inventor	Victor Larson			
	Art Unit	2453			
	Examiner Name	Krisna Lim			
	Docket Number	077580-0063			

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/Krisna Lim/

10/17/2010

Doc code: IDS

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Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 12/31/2008. OMB 0651-0031

Ormation Disclosure Statement (IDS) Filed

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 Number		11840560
	Filing Date		2007-08-17
INFORMATION DISCLOSURE	First Named Inventor	Larso	n, et al.
STATEMENT BY APPLICANT ( Not for submission under 37 CFR 1.99)	Art Unit		
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	Attorney Docket Numb	er	077580-063(VRNK-1CP3CN2)

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## 11840560 - GAU: 2453 Application Number 11840560 Filing Date 2007-08-17 INFORMATION DISCLOSURE First Named Inventor Larson, et al. STATEMENT BY APPLICANT Art Unit ( Not for submission under 37 CFR 1.99) **Examiner Name** Attorney Docket Number 077580-063(VRNK-1CP3CN2) FASBENDER, A., et al., Variable and Scalable Security: Protection of Location Information in Mobile IP, IEEE VTS, 1 46th, 1996, 5 pp. If you wish to add additional non-patent literature document citation information please click the Add button

Examiner Signature /Krisna Lim/ Date Considered 03/14/2010

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

<sup>&</sup>lt;sup>1</sup> See Kind Codes of USPTO Patent Documents at <u>www.USPTO.GOV</u> or MPEP 901.04. <sup>2</sup> Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). <sup>3</sup> For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. <sup>4</sup> Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. <sup>5</sup> Applicant is to place a check mark here if English language translation is attached.

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<sup>\*</sup>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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<sup>\*</sup>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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		Microsoft Cor	poration's Fourth	Amended Invalidity Conte	entions dated Jan. 5, 2009,					
	C998	VirnetX Inc. a	nd Science Appli	cations International Corp	. v. Microsoft Corporation,					
	C999	Jan. 5, 2009.	pendix A of the Microsoft Corporation's Fourth Amended Invalidity Contentions dated n. 5, 2009.  procordance Table For the References Cited in Tables on pages 6-15, 71-80 and 116-							
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	C1000	2009.	-tria "DNC Engag	ding of Natural Names or	nd Other Types," Network					
	04004	1. P. Wockap	etris, DNS Ericot	oril 1989) (RFC1101, DNS	SRV)					
	C1001	DNS-related	correspondence (	lated September 7, 1993	to September 20, 1993. (Pre KX,					
		KX Records)	correspondence	acted coptombol 1, 1000						
	C1002	Due to diffic	ulty locating thi	s reference, a copy has	not been provided]					
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	Ì	Protocol for I	p., WICTOSOIL VIIIL	iai Private Networking. Us Remote Access Across f	the Internet (1996) (printed from					
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	24040	Freier	, et al. "Th	e SSL Protocol	Version 3.0," Transport I IDERLYING SECURITY	ayer Security Working Group	
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						ntail.com/prod/autosk2ds.html	
				OCKS, Aventail)			
	C1019				reference, a copy has	not been provided]	
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		Aven	all Corp.,	Directed VPN V	/s. Tunnel," available at	tail.com/educate/directvpn.html	
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					5," Aventail Whitepaper,		
						tail.com/educate/whitepaper/soc	
		kswp	html (199	7). (Socks, Aven	itail)	not been neovided?	
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•	C1026				<i>uring and Using PPTP</i> icrosoft Prior Art VPN T	with Microsoft Clients and echnology)			
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	C1038	Aven	tail Corp., '	'Aventail Annour		ion to Assure Interoperability st VPN, Aventail)			
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•	,	Syve	son, et al	. "Private W	Veb Brow	vsing," Naval Researc	h Laboratory, Center for High 8
	C1039					ne 2, 1997). (Syverso	
							Requirements for ANX Release
					ions Proj	ject Team and Bellcor	e (June 16, 1997). (AIAG
	C1040	Requ	irements,	ANX)	- 5 0-1	b ( 1 - 1 1 1	in - Tl- F Internat
						nooler, internet Engin ernet Draft 3)	eering Task Force, Internet
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	C1042					2230, KX Records)	orto, moment working croup,
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		Draft,	(11/11/19	997). (RFC	2543 Int	ernet Draft 4)	
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							D ("1998 PDC DVD-ROM")
							d as MSFTVX 00018827-
	C1044					t Prior Art VPN Techn	
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	C1045						iere at Seattle Mini-Camp
							capabilities of Windows NT 5.0
						crosoft.com/presspass	
	C1046					soft Prior Art VPN Te	
		"Wha	at ports do	es SSL us	e" availa	ble at stason.org/TUL	ARC/security/ssl-talk/3-4-What-
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	l _						d Simple," Press Release,
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	C1049					is Translation Issues V February 6, 1998. (Mo	with IPsec," Internet Draft,
	C1049						ition," Proceedings of IEEE
							tions, Vol. 2 ( March 29 – April 2,
	C1050			ay, Schulzri		January John Mariloa	asis, ron a ( moron as 7 pm a)
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•	C1051	C. Huitema, 45 al. "Simple Gateway Control Protocol," Version 1.0 (May 5, 1998). (SGCP)								
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		M. Handley, H. Schulzrinne, E. Schooler, Internet Engineering Task Force, Internet Draft, (06/17/1998). (RFC 2543 Internet Draft 6)								
	C1054	[Due to difficulty locating this reference, a copy has not been provided]								
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							eering Task Forc	e, Internet		
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		M. Handley, H. Schulzrinne, E. Schooler, Internet Engineering Task Force, Internet Draft, (11/12/1998). (RFC 2543 Internet Draft 10) 9								
							not boon neovid	la al T		
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				98). (RFC 2543			g . dok i 010	J,		
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•	C1064	Administrator 3. [Due to difficul	1, Aventail) ty locating this r	reference, a copy has					
		Aventail)			(1999). (Aventail User 3.1,				
	C1065			reference, a copy has	rator's Guide," (1999). (Aventail				
		ExtraWeb 3.2, A		SD OCIVEL VO.2 Administ	rator 5 Cuide, (1000). (Avertian				
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	C1078	DNS <draft-eitf-< td=""><td></td><td></td><td>9). (Hornstein, DNS SRV)</td></draft-eitf-<>			9). (Hornstein, DNS SRV)				
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	C1090	Aventail Corp	'Aventail AutoSOC	CKS the Client Key to N	Network Security," Aventail				
	C1091			k Security, Aventail)	total occurry, Aventum				
				ks: Secret Internet Pro	tocol Router Network				
	C1092	(SIPRNet)." (Mo							
	C1093	Data Fellows F-	Secure VPN+ (F-S	Secure VPN+)					
	C1094	"Interim Operational Systems Doctrine for the Remote Access Security Program (RASP) Secret Dial-In Solution. (RASP, SIPRNET)							
				oute Selection Algorith					
	C1095				Route Selection, Onion Routing)				
	C1096	Secure Comput SIPRNET)		ng an Army Net," Wash	nington Technology. (Secure,				
		EXAMINER	/Krisna Lim/		DATE CONSIDERED 03/14/2010				

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					Art Unit	2157				
					Examiner Name	VU, Kim Y.				
Sheet	9		of	17	Docket Number	077580-0063 (VRNK-1CP3CN2)				
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·EXAMINE INITIAL		(book,	magazine, jou	author (in CAPITAL Li irnal, serial, symposiu here published.	ETTERS), title of the article m, catalog, etc.), date, page	(when appropriate), title of the item e(s), volume-issue number(s), publisher,				
•	C1097	SPAF	PARTA "Dynamic Virtual Private Network." (Sparta, VPN SYSTEMS)							
	C1098		andard Operation Procedure for Using the 1910 Secure Modems. (Standard, PRNET)							
	C1099	MSF	ublically available emails relating to FreeS/WAN (MSFTVX00018833- SFTVX00019206). (FreeS/WAN emails, FreeS/WAN)							
	C1100	Kaufr	aufman et al., "Implementing IPsec," (Copyright 1999) (Implementing IPsec)							
			letwork Associates Gauntlet Firewall For Unix User's Guide Version 5.0 (1999).							
	C1101			Guide - Unix, Fire		Getting Started Guide Version				
	C1102				ed Guide – NT, Firewa					
						Started Guide Version 5.0 (1999)				
	C1103	(Gau	ork Associa	etting Started Gu	ide, Firewall Products	) r Unix 5.0 (March 19, 1999)				
	C1104			elease Notes, Fir		0/11/X 3.0 (Walcii 13, 1333)				
						Administrator's Guide Version				
	C1105				ator's Guide, Firewall	wall Firewall-to-Firewall				
	C1106	I _				to-Firewall, Firewall Products)				
		Netw	ork Associa	tes Gauntlet Fire	wall Global Virtual Priv	rate Network User's Guide for				
	C1107				Gauntlet NT GVPN, G					
	C1108				wall For UNIX Global \ et Unix GVPN, GVPN)	Virtual Private Network User's				
	C1109					2000) (Sterne DVPN, DVPN)				
	C1110		ell Kindred <i>L</i> N, DVPN)	Dynamic Virtual P	rivate Networks (DVPI	V) (December 21, 1999) (Kindred				
	C1111	Dan s	Sterne <i>et.al</i>		curity Perimeter Rese y Perimeter, DVPN)	arch Project Demonstration				
	C1112	Darre	Il Kindred L		rivate Networks Capal	pility Description (January 5,				
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	C1113	1808-1811) (Tu	October 7, and 28 1997 email from Domenic J. Turchi Jr. (SPARTA00001712-1714, 808-1811) (Turchi DVPN email, DVPN)							
	C1114	Quickstart, DVF	PN)		ate (February 5, 1997) (Security					
	C1115	(DVPN Demons	Virtual Private Network Demonstration dated March 21, 1998 (SPARTA00001844-54) (DVPN Demonstration, DVPN)							
	C1116	Integrated Feas	ibility Demonstra	tion (IFD) 1.1 Plan (Mar	mation Assurance Program ch 10, 1998) (IFD 1.1, DVPN)					
		Microsoft Corp. Windows NT Server Product Documentation: Administration Guide – Connection Point Services, available at http://www.microsoft.com/technet/archive/winntas/proddocs/inetconctservice/cpsops.ms px (Connection Point Services) (Although undated, this reference refers to the operation of prior art versions of Microsoft Windows. Accordingly, upon information and belief, this								
	C1117									
		Connection Ma http://www.micr (Connection Ma	nager, <i>available a</i> osoft.com/techne inager) (Although	a <i>t</i> t/archive/winntas/prodd	ocs/inetconctservice/cmak.mspx e refers to the operation of prior					
	C1118			ence is prior art to the pa						
	C1119	(Autodial Heuris	stics) (Although u osoft Windows s	ndated, this reference re	pport.microsoft.com/kb/164249 efers to the operation of prior art . Accordingly, upon information t)					
	101110				Model, (1996) available at					
	C1120	http://msdn2.mi	crosoft.com/en-u	s/library/ms809332(prin	ter).aspx (Cariplo I)					
				es (Apr. 23, 1999), <i>avail</i>						
	C1121			s/library/ms809302(prin						
	C1122	http://msdn2.mi	crosoft.com/en-u	s/library/ms809311(prin						
	C1123			ess Overview (Apr. 199 s/library/ms809320(prin	7), available at ter).aspx (DCOM Business					
	C1124	Microsoft Corp.		al Overview (Nov. 1996) s/library/ms809340(prin	ter).aspx (DCOM Technical					
	C1125			ture White Paper (1998)	available in PDC DVD-ROM					
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EXAMINER'S INITIALS	CITE NO.	(book, magazine,		nposium		(when appropriate), title of the item (s), volume-issue number(s), publisher,				
•		Microsoft Corp	icrosoft Corp, DCOM – The Distributed Component Object Model, A Business							
	ļ		verview White Paper (Microsoft 1997) available in PDC DVD-ROM (DCOM Business							
	C1126	Overview II)								
		Microsoft Corp., DCOM—Cariplo Home Banking Over The Internet White Paper (Microsoft 1996) available in PDC DVD-ROM (Cariplo II)								
	C1127									
	04400					(Microsoft 1996) available in				
	C1128		M (DCOM Solu			r (Microsoft 1996) available 12				
	C1129					(WICTOSOIT 1990) available 12				
	01123	in PDC DVD-ROM (DCOM Technical Overview II)  125. Scott Suhy & Glenn Wood, DNS and Microsoft Windows NT 4.0, (1996) available at http://msdn2.microsoft.com/en-us/library/ms810277(printer).aspx (Suhy)								
	C1130									
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	C1131	(Essential Win	•			, , ,				
				nfiguri	ng, and Using PPTP	with Microsoft Clients and				
		Servers, (1998								
	C1132					er).aspx (Using PPTP)				
						AS, Standard Edition,				
	C1133		onnection Servi		rcnive/winntas/prodd	ocs/inetconctservice/bcgstart.ms				
	01133				Services for RAS (	Commercial Edition, available				
						Idocs/inetconctservice/bcgstrtc.				
	C1134		Connection Se			de de la constant de				
	1					ent Guide – Appendix B:Enabling				
		Connections w	ith the Connec	ction M	anager Administratio	n Kit, available at				
				hnet/p	rodtechnol/ ie/deploy/	/deploy5/appendb.mspx (IE5				
	C1135	Corporate Dev								
						2 (6th ed., January 15,				
	C1136		ng Windows N			.0 371-473 (Microsoft Press				
	C1137	Hands On, Se   1998) (Hands		rig ior	Supporting version 4	.0 37 1-473 (Microsoft Press				
	101137			Point 7	Funneling Protocol (V	Vindows NT 4.0), available at				
						ain/featusability/pptpwp3.mspx				
	C1138	(MS PPTP)								
	C1139	Kenneth Greg			ndows NT Server Ad de 1999) (Gregg)	ministrator's Bible 173-206, 883-				
	C1140	Microsoft Corp	., Remote Acc	ess (V		http://msdn2.microsoft.com/en-s)				
		EXAMINER	/Krisna Lim/			DATE CONSIDERED 03/14/2010				

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			http:// PPTF version	/www.micro PNT 4) (Alt ons of Micro	osoft.com/technologh hough undated, osoft Windows	et/arcl , this r such a	reference refers to as Windows NT 4.0	ptpudst.mspx (Under the operation of prior . Accordingly, upon ir	art	
		C1141					the patents-in-sui			
		C1142	Microsoft Corp., Windows NT 4.0: Virtual Private Networking, available at http://www.microsoft.com/technet/archive/winntas/ deploy/confeat/vpntwk.mspx (NT4 VPN) (Although undated, this reference refers to the operation of prior art versions of Microsoft Windows such as Windows NT 4.0. Accordingly, upon information and belief, this reference is prior art to the patents-in-suit.)							
		C1143	Anthony Northrup, NT Network Plumbing: Routers, Proxies, and Web Services 299-399 (IDG Books Worldwide 1998) (Network Plumbing)							
		C1144	Rements	ote Access /www.micro RAS) (Altho osoft Windo	Service, Availa psoft.com/techn rugh undated, th	ible at let/arc nis refe ndows	hive/winntas/prodd erence refers to the NT 4.0. According	FRouting with Routing cost rras40/rrasch01. coperation of prior and ly, upon information a	mspx (Intro t versions of	
		C1145	Micro Large http:/ (Larg	e-Scale Co /www.micro le-Scale Co art version	Windows NT S nfigurations, ava osoft.com/techn onfigurations) (A s of Microsoft W	Server ailable et/arc Althoug Vindov	Product Document e at hive/winntas/prodd gh undated, this re	ation: Chapter 5 – Plate ocs/rras40/rrasch05.reference refers to the cost NT 4.0. Accordingly atents-in-suit	mspx operation of	
			F-Se	cure, F-Sec	cure Evaluation	Kit (N	lay 1999) (FSECU	RE 00000003) (Evalunot been provided]	ation Kit 3)	
		C1146	F-Se					CURE 00000003) (Na	ameSurfer	
		C1147 C1148		cure, <i>F-Sec</i> ecure VPN		nistrat	or's Guide (May 19	99) (from FSECURE	00000003)	
		C1149	F-Se 0000	cure, <i>F-Sec</i> 0003) (SSI	cure SSH User's H Guide 3)			e (May 1999) (from F		
		C1150			cure SSH2.0 for H 2.0 Guide 3)	r Wind	lows NT and 95 (M	ay 1999) (from FSEC	URE	
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					Art Unit	2157				
					Examiner Name	VU, Kim Y.				
Sheet	13	of		17	Docket Number	077580-0063 (VRNK-1CP3CN2)				
		OTHER	ART	(Including Autho	or, Title, Date, Pertin	ent Pages, Etc.)				
EXAMINER'S INITIALS	CITE NO.		e, joui	rnal, serial, symposium		when appropriate), title of the item (s), volume-issue number(s), publisher,				
•	C1151		Secure, F-Secure VPN+ Administrator's Guide (May 1999) (from FSECURE 0000003) (VPN+ Guide 3)							
	C1152				99) (from FSECURE 0	0000006) (VPN+ 4.1 Guide 6)				
	C1153	F-Secure, F-	-Seci	ure SSH (1996) (fr	rom FSECURE 00000	006) (F-Secure SSH 6)				
	C1154		F-Secure, F-Secure SSH 2.0 for Windows NT and 95 (1998) (from FSECURE 00000006) (F-Secure SSH 2.0 Guide 6)							
	C1155	F-Secure Evaluation Kit (Sept. 1998) (FSECURE 00000009) (Evaluation Kit 9) [Due to difficulty locating this reference, a copy has not been provided]								
	C1156	00000009) (	SSH	Guide 9)		(Sept. 1998) (from FSECURE				
	C1157	00000009) (	F-Se	cure SSH 2.0 Gui	de 9)	ept. 1998) (from FSECURE				
	C1158	F-Secure, F	-Seci	ure VPN+ (Sept. 1	998) (from FSECURE	00000009) (VPN+ Guide 9)				
	C1159			ure Management Cure Managemen		Guide (1999) (from FSECURE				
	C1160	(FSecure De	eskto	p User's Guide)	, , ,	FSECURE 00000009)				
	C1161	SafeNet, Inc.	, VPN	Policy Manager (Ja	nuary 2000) (VPN Polic	y Manager)				
	C1162	F-Secure, F (FSecure VI		ure VPN+ for Wind	dows NT 4.0 (1998) (f	rom FSECURE 00000009)				
	C1163	[Due to diff	iculty	/ locating this re	March 28, 2000) (Soft-Pl ference, a copy has	not been provided]				
	C1164	[Due to diffic	ulty I	ocating this refere	nce, a copy has not be					
	C1165	IRE, Inc., Saf Addendum)	eNet	/ Security Center Te	echnical Reference Adde	ndum (June 22, 1999) (Safenet				
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					Examiner Name	VU, Kim Y.				
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	C11				VPN Policy Manager a tem Description)	nd SafeNet/SoftPK (March 30,				
		IRE,	Inc., About			About Safenet VPN Policy				
	C11	c1167 Manager) IRE, Inc., SafeNet/VPN Policy Manager Quick Start Guide Version 1 (1999) (Sa								
		VPN	Policy Man	ager)	-					
	C11				reference, a copy has					
						wall, Firewall Product Functional				
	C11				let Functional Summary ., Running the Gauntle					
		Adm	inistrator's C	Buide to Gauntle	t Version 3.0 (May 31, 1	1995) (Running the Gauntlet				
	C11	70 Inter	net Firewall)		<u> </u>					
	C11	1	Harwood, <i>N</i> dows NT Ha		ninal Server and Citrix N	Metaframe (New Riders 1999)				
		Todo	W. Matehr	s and Shawn P.	Genoway, Windows N7	Thing Client Solutions:				
	C11	Impl	emetning Te	rminal Server ar NT Mathers)	nd Citrix MetaFrame (M	acmillan Technial Publishing				
	C11	Dann			2TP using IPSEC (Feb.	ruary 2, 1999)				
	C11	156			the VPN Maze (1999) (					
	C11	Linu	FreeS/WA	N Overview (199	99) (Linux FreeS/WAN)	Overview)				
	C11	Time	Step, The E	Business Case fo	or Secure VPNs (1998)	("TimeStep")				
.,		, ,	•			ystem Powerpoint (2000)				
	C11	77   [Due	to difficult	y locating this	reference, a copy has	not been provided]				
		Wate	hGuard Te	chnologies, Inc.,	MSS Firewall Specifica	tions (1999)				
	C11	78   Due	bGuard Te	y locating this	reference, a copy has	not been provided and the security Services (2000)				
	C11	79 IDue	to difficult	y locating this	reference, a copy has	not been provided]				
		Wate		chnologies, Inc.,		Distributed Enterprise, White				
	C11	80 Due	to difficult	y locating this	reference, a copy has	not been provided]				
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		OTHER ART	(Including Autho	or, Title, Date, Pertin	ent Pages, Etc.)				
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,	C1181	WatchGuard Ted 2000)	chnologies, Inc., И	/atchGuard LiveSecui	rity for MSS Powerpoint (Feb. 14				
		WatchGuard Technologies, Inc., MSS Version 2.5, Add-On for WatchGuard SOHO Releaset Notes (July 21, 2000)  [Due to difficulty locating this reference, a copy has not been provided]							
	C1182								
	C1183	Air Force Research Laboratory, Statement of Work for Information Assurance System Architecture and Integration, PR No. N-8-6106 (Contract No. F30602-98-C-0012) (January 29, 1998)							
	C1184	Integrated Feasi	bility Demonstration	on (IFD) 1.2 Report, R	mation Assurance Program ev. 1.0 (September 21, 1998)				
	C1185	30, 1998)			Status Report (March 16-April				
	C1186			letwork (VPN) Powerp					
	C1187		•		eport (March 16-April 30, 1998)				
	C1188	Characterization	(January 30, 200	rivate Networks (DVP 1)					
	C1189	Virtual Private N	etworking Counter	measure Characteriz	ation (March 30, 2000)				
	C1190	Virtual Private N	letwork Demonstra	tion (March 21, 1998)					
	C1191	Integrated Secu	rity Management (	2000)	e Networks (VPNs) and				
	C1192	Information Assu	urance/NAI Labs, (	Create/Add DVPN En	clave (2000)				
<del> </del>	C1193	NAI Labs, IFE 3	1 Integration Dem	o (2000)					
	C1194	Information Assu	urance, Science Fa	air Agenda (2000)					
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					Examiner Name	VU, Kim Y.				
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3	C1195	Darrel	Kindred e	et al., Proposed Th	reads for IFE 3.1 (Jar	nuary 13, 2000)				
	C1196	IFE 3.	1 Technol	ogy Dependencies	(2000)					
	C1197	IFE 3.	1 Topolog	y (February 9, 200	0)					
		Inform	ation Assi	rance, Information	n Assurance Integration	on: IFE 3.1, Hypothesis & Thread				
	C1198		Development (January 10-11, 2000)							
	C1199			<u> </u>		e Networks Presentation (2000)				
	C1200	(2000)	1	,		e Networks Presentation v.2				
		(2000)	)	·		e Networks Presentation v.3				
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	C1202			/ <i>irtual Private Net</i> v he Internet (Augus		arging and Accounting				
	C1203	Netwo Private	rk Associa Network	ates Products – <i>Po</i> s (1999)	GP Total Network Sec	urity Suite, Dynamic Virtual				
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	C1205	Prior A	Art VPN Te	echnology)		er 2.0 (1999) (Johnson, Microsoft				
	C1206	Micros CD lat Techn	Microsoft Corporation, Setting Server Parameters (1997 (copied from Proxy Server 2.0 CD labeled MSFTVX00157288) (Setting Server Parameters, Microsoft Prior Art VPN Technology)							
	C1207	Techn	ology)			, Microsoft Prior Art VPN				
·	C1208		ozell et. al 'N Techno		rver 2 Study Guide (1	998) (Rozell, Microsoft Prior 15				
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				Art Unit	2157					
				Examiner Name	VU, Kim Y.					
Sheet	17	of	17	Docket Number	077580-0063 (VRNK-1CP3CN2)					
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	04044	John Savill, <i>The</i>   Prior Art VPN Te		Vindows 2000 Answei	r Book (1999) (Savill, Microsoπ					
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	B1002	WO 01/016766	03-08-2001	Science Applications International Corporation					
		examiner /Krisn	a Lim/		DATE CONSID	ERED (	)3/14/201	0	

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					Examiner Name	VU, Kim Y.		
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		M. Ha	andley, H. S	Schulzrinne, E. Sc	nooler, Internet Enging	eering Task Force, Internet	
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				Examiner Name	VU, Kim Y.	
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		Aventail Corp., 'ExtraWeb 3.2, A	'Aventail ExtraWe Aventail)	eb Server v3.2 Adminis reference, a copy has	trator's Guide," (1999). (Aventail	
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	C1082	FirstVPN, (Jan 2000). (F	FIRSTVPN MI	Crosoπ) IS DD for apocifying:	the location of sonices (DNS			
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	C1097	SPAR	TA "Dynar	nic Virtual Privat	e Network." (Sparta, VF	N SYSTEMS)	
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		http://msdn2.microsoft.com/en	alle33 Overview (Apr. 16	nter).aspx (DCOM Business	1
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	C1123	Microsoft Corp., DCOM Techr	nical Overview (Nov. 199	6), available at	
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<sup>\*</sup>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.

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SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use as many sheets as necessary)					Application Number 11/840,560		
					Filing Date	August 17, 2007	
					First Named Inventor	Victor Larson	
					Art Unit	2157	
					Examiner Name	VU, Kim Y.	
Sheet	13 of 17			17	Docket Number	077580-0063 (VRNK-1CP3CN2)	
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		F-Secure, F-Secure VPN+ Administrator's Guide (May 1999) (from FSECURE					
	C1151	00000003) (VPN+ Guide 3)					
	C1152	F-Secure, F-Secure VPN+ 4.1 (1999) (from FSECURE 00000006) (VPN+ 4.1 Guide 6)					
	C1153	F-Secure, F-Secure SSH (1996) (from FSECURE 00000006) (F-Secure SSH 6)					
	C1154	F-Secure, F-Secure SSH 2.0 for Windows NT and 95 (1998) (from FSECURE 00000006) (F-Secure SSH 2.0 Guide 6)					
	C1155	F-Secure, F-Secure Evaluation Kit (Sept. 1998) (FSECURE 00000009) (Evaluation Kit 9) [Due to difficulty locating this reference, a copy has not been provided]					
	C1156	F-Secure, F-Secure SSH User's & Administrator's Guide (Sept. 1998) (from FSECURE 00000009) (SSH Guide 9)					
	C1157	F-Secure, F-Secure SSH 2.0 for Windows NT and 95 (Sept. 1998) (from FSECURE					
	C1158	F-Secure, F-Secure VPN+ (Sept. 1998) (from FSECURE 00000009) (VPN+ Guide 9)					
	C1159	F-Secure, F-Secure Management Tools, Administrator's Guide (1999) (from FSECURE 00000003) (F-Secure Management Tools)					
	101139	F-Secure, F-Secure Desktop, User's Guide (1997) (from FSECURE 00000009)					
	C1160	(FSecure Desktop User's Guide)					
	C1161	SafeNet, Inc., VPN Policy Manager (January 2000) (VPN Policy Manager)					
	C1162	F-Secure, F-Secure VPN+ for Windows NT 4.0 (1998) (from FSECURE 00000009) (FSecure VPN+)					
	1	IRE Inc. SafeNet/Soft-PK Version 4 (March 28, 2000) (Soft-PK Version 4)					
	C1163	[Due to difficulty locating this reference, a copy has not been provided]					
	C1164	IRE/SafeNet Inc., VPN Technologies Overview (March 28, 2000) (Safenet VPN Overview) [Due to difficulty locating this reference, a copy has not been provided]					
	C1165	IRE, Inc., SafeNet / Security Center Technical Reference Addendum (June 22, 1999) (Safenet Addendum)					
	1-00		AMINER	/Krisna Lim/		DATE CONSIDERED 03/14/2	2010

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		C1166	OUUV VADVI D	olicy Manager S	Svstem	Description)	and SafeNet/SoftPK (Ma	
		C1166	IRE, Inc., Abo	ut SafeNet / VP	N Polic	cy Manager (1999)	(About Safenet VPN Po	
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		C1169	Summary (Ju	ly 22, 1996) (Ga	auntlet	Functional Summa	ot Internet Firewall. An	
			Administrator	's Guide to Gau	i, inc., r intlet V	ersion 3.0 (May 31,	et Internet Firewall, An 1995) (Running the Ga	untlet
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			Astin dame NIT	' Harwood\ 70				
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	• ! • ½	C1172	Implemetning	Terminal Serv	er and	Citrix Meta-rame (	Viacimilari Techniari ub	lishing
			Bernard Abol	oa et al., Securi	ing L2T	P using IPSEC (Fe	bruary 2, 1999)	
		C1173	156. Findina	Your Way Thro	ugh the	<i>VPN Maze</i> (1999)	("PGP")	
		C1174	Linux FreeS/	WAN Overview	(1999)	(Linux FreeS/WAN	I) Overview)	
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		Poloscot No	Palasset Notes (Tuly 21, 2000)								
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	1	Architecture	rchitecture and Integration, PR No. N-8-6106 (Contract No. F30602-98-C-0012)								
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	C1103	OTT Library busing & DRN Technologies DARPA Information Assurance Program									
	C1184	Integrated Feasibility Demonstration (IFD) 1.2 Report, Rev. 1.0 (September 21, 1998)  BBN Information Assurance Contract, TIS Labs Monthly Status Report (March 16-April									
		BBN Informa	ation Assu	rance Contra	act, TIS Labs Monthi	y Status Report (March 10-April					
	C1185	30, 1998)	1. 10.4	und Drivete M	Intwork (VPN) Power	rooint					
	C1186	DARPA, <i>Dy</i>	namic Viπ	Jai Private iv	letwork (VPN) Power	Poport (March 16-April 30, 1998)					
	C1187	GTE Interne	tworking,	Contractors	Program Progress P	Report (March 16-April 30, 1998)	<u> </u>				
		Darrell Kind	red, <i>Dynai</i>	mic Virtual P	rivate Networks (DVI	PN) Countermeasure					
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	C1191	Integrated S	Security M.	anagement (	2000)	ate Networks (VPNs) and					
	C1192	Information	Assurance	e/NAI Labs,	Create/Add DVPN E	11Clave (2000)	-				
	C1193	NAI Labs, /	FE 3.1 Inte	egration Dem	10 (2000)		<del> </del>				
	C1194	Information	Assuranc	e, Science F	air Agenda (2000)		<u> </u>				
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	C1196	FE 3.1 Technology Dependencies (2000)										
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		(2000) [Due to difficulty locating this reference, a copy has not been provided]										
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	C1202	Technology for the Internet (Aug	ust 1, 1999) (VPNA)									
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	C1204	Prior Art VPN Technology)	o Microsoft Provy Sen	er 2.0 (1999) (Johnson, Microsoft								
	04005	Prior Art VPN Technology)	O WILCHOSOIL FTOXY SELV	6/ 2.0 (1000) (0011110011; 11110100011	1							
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	C1206	Technology)										
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·	C1207	Technology)	Conver 2 Study Guide (	1998) (Rozell, Microsoft Prior 15								
	C1200	Erik Rozell et. al., MCSE Proxy S Art VPN Technology)	Server 2 Study Guide (	1000) (102011, 14110100011 1 1101 10								
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	C1209	Prior Art VPN Te	echnology)		Server 2 (1999) (Stigler, Microsoft						
	C1210	VPN Technology	/)		998) (Schaer, Microsoft Prior Art						
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	C1213	Network Associates Gauntlet Firewall For UNIX Global Virtual Private Network User's Guide Version 5.0 (1999) (Gauntlet Unix GVPN, GVPN)									
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	C1218			Technology, Administr I 762/viewer r.asp?bo	alion Guide, 12/19/07, okid=762&chunked=41065062						
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		Accessware - T		Network Security, Cond	clave from Internet Dynamics;						
		Extended System	m Press Release,		ed VPN Uses The Internet to	<u> </u>					
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	C1225	Extranets; Sept.	15, 1997; http://w	eb.archive.org/web/199	ons for Enterprise Intranets and 980210014150/interdyn.com						
	C1226	Emails from vari	ous individuals to	Linux IPsec re: DNS-LI	DAP Splicing						
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	A1019	6,246,670	06/12/2001	Karlsson, et al.					
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			FOREIGN PA	TENT DOCUMENTS					
EXAMINER'S		Foreign Patent Document	Publication Date	Name of Patentee or	Pages, Column	s, Lines	Tra	nslation	
INITIALS	CITE NO.	Country Codes -Number 4 -Kind Codes (if known)	MM-DD-YYYY	Applicant of Cited Document	Where Rele Figures App				
	B1000	WO 001/17775	03-30-2000	Science Applications International Corporation			Yes	No	
	B1001	WO 00/70458	11-23-2000	Comsec Corporation					
	B1002	WO 01/016766	03-08-2001	Science Applications International Corporation					
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a	C1012	Arnt Gulbrands SRV), IETF RF	en & Paul Vixie, A C 2052 (October	A DNS RR for specifyin 1996). (RFC 2052, DN	g the location of services (DNS S SRV)								
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	101013					eering Task Force, Internet		
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	C1015	Appli	cations Co	nference, San D	iego, CA, Dec. 9-13, 19	96. (Reed, Onion Routing)		
		Kenn	eth F. Alde	n & Edward P. V	rvobber, <i>The AltaVista T</i> gital Technical Journal (1	unnel: Using the Internet to		
	C1016	Auto	native Indi	etry Action Grou	in "ANY Release 1 Doc	ument Publication," AIAG	_	
	C1017		7). (AIAG, A		ip, ANA Nelease i Doc	ument rubilication, 7070		
	01017	Auto	mative Indu	stry Action Grou	p, "ANX Release 1 Dra	ft Document Publication," AIAG		
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					<u>70212013409/www.aver</u>	ntail.com/prod/autosk2ds.html		
	ĺ	(199	7). (AutoSC	OCKS, Aventail)	fa a conv boo	not been provided		
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	İ	http:/	/www.arch	ive org/weh/199	70212013043/www.avei	ntail.com/prod/vpndata.html	•	
	C1020			eet, Aventail)	1021201001011111111			
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						tail.com/educate/directvpn.html		
	C1021	(199	7). (Directe	d VPN, Aventail	)			
					orate Access to the Inte	rnet," Aventail AutoSOCKS		
	1	vvnit	e Paper <i>av</i>	aliable at ve orahveb/1997	/062003030312/www.aven	tail.com/educate/whitepaper/ip		
	C1022			'). (Corporate Ac		tall.com//cddcatc/w/mcpape//p		
	101022	Aver	tail Corp	Socks Version	5," Aventail Whitepaper,	available at		
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	C1024		• .			" (1997). (VPN, Aventail)		
						arch Laboratory, Center for High		
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	C 1028		Microsoft Prior Art VPN Technology) Microsoft Corp., Routing and Remote Access Service for Windows NT Server										
			NewOpportunities Today and Looking Ahead (1997) (printed from 1998 PDC DVD-										
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							AltaVista Firewall, Digital						
	C1031			ial (1997). (S									
							Networks (VPNs) with						
	C1032					.txt> (March 12, 1997							
							eering Task Force, Internet						
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	0.1004			l "Analysis o	of the S	SSL 3.0 Protocol." (Ar	ril 15, 1997). (Analysis,						
	C1035			SECURITY T			,, (,,						
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	C1037					tification, ANX)							
	0.45==						ion to Assure Interoperability						
	C1038			ig Security Pi	OTOCO	ls," June 2, 1997. (Fir	00/11/00/10						
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	C1043	Due to difficul	ty locating this re	eference, a copy has	not been provided]							
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					(1998) (printed from 1998 PDC							
	C1045	DVD-ROM) (Ov	erview, Microsoft	Prior Art VPN Technol	ogy)	هو مورسات د د						
		Microsoft Corp.	Windows N I 5.0	Beta Has Public Prem	niere at Seattle Mini-Camp							
		Seminar attende	ees gel III'sl 100K a	icrosoft.com/presspass	capabilities of Windows NT 5.0							
	01046	10nt5 menynffri	e at hap //www.ini	osoft Prior Art VPN Te	echnology)							
	C1046	"What norts do	es SSL use" avail	able at stason org/TUL	ARC/security/ssl-talk/3-4-What-							
	C1047		ise.html (1998). (F		survey seems and a seems of the							
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C1054   [Due to diffic	ulty locating this re	ference, a copy has	not been provided]			
	et al. "PF_KEY Key 367 (July 1998). (RF		rsion 2," Network Working			
			eering Task Force, Internet			
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		ference, a copy has				
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C1057 [Due to diffic	Company Focuse	e on Quality and Cust	omer Feedback (August 18,			
	, Microsoft Prior Art \		omer reedback (August 10,			
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C1059 [Due to diffic	ulty locating this re	ference, a copy has	not been provided]			
1			otocol," Network Working Group,			
			S SECURITY TECHNOLOGIES)			
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	C1065	Aventail) [Due to difficulty locating this reference, a copy has not been provided]											
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		Extra	Web 3.2, A	ventail)									
	C1066	[Due to difficulty locating this reference, a copy has not been provided]											
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		C1091				vork Security, Aventail)							
		C1092			DISN Data Networan, SIPRNET)		rotocol Router Network						
		C1093				F-Secure VPN+)							
		C1094	Secr	et Diaİ-In S	olution. (RASP,	SIPRNET)	e Access Security Program (RASP)						
		C1095	Onio	<i>n Routing</i> , //www.onio	"Investigation on number of the state of the	f Route Selection Algor hives/Route/index.htm	I. (Route Selection, Onion Routing)						
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							uide Version 5.0 (1999).		
	C1101 (Gauntlet User's Guide – Unix,						0.41.40.14.17.		
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	1	Microsoft Corp. Windows NT	Server Product Document	ation: Administration Guide -	
		Connection Point Services, a	ivaliable al ibnot/orchive/winntas/prodd	ocs/inetconctservice/cpsops.ms	
		http://www.microsoit.com/lec	(Although undated, this	reference refers to the operation	
	1	of prior art versions of Micros	soft Windows. Accordingly,	upon information and belief, this	
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	101117	Microsoft Corp. Windows NT	Server Product Document	ation: Administration Kit Guide –	
		Connection Manager availal	ble at		
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	C1127	Microsoft Corp.,	DCOM—Cariplo	Home Banking Over T DVD-ROM (Cariplo II)	he Internet White Paper		
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	01131	Microsoft Corp. Servers, (1998)	Installing, Configu	uring, and Using PPTP	with Microsoft Clients and		
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		Microsoft Corp http://www.mic	. MS Point-to-Poi	nt Tunneling Protocol ( t/archive/winntas/main	Windows NT 4.0), available at tain/featusability/pptpwp3.mspx		
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Subst. for form 1449/PTO Complete if Known SUPPLEMENTAL Application Number 11/840,560 INFORMATION DISCLOSURES ATEMENT BY August 17, 2007 Filing Date **APPLICANT** First Named Inventor Victor Larson (Use as many sheets as necessary) Art Unit 2157 VU, Kim Y. **Examiner Name** 077580-0063 (VRNK-1CP3CN2) of 17 **Docket Number** Sheet U.S. PATENT DOCUMENTS **EXAMINER'S Publication Date** Pages, Columns, Lines, Where CITE Document Number Name of Patentee or Applicant MM-DD-YYYY Relevant Passages or Relevant INITIALS NO. Number-Kind Code2 (# 1000) of Cited Document Figures Appear A1000 5,311,593 05/10/1994 Carmi A1001 5,511,122 04/23/1996 Atkinson A1003 5,805,803 09/08/1998 Birrell et al. A1004 Caronni et al. 10/13/1998 5,822,434 04/27/1999 Wesinger, Jr. et al. A1005 5,898,830 Victor Sheymov A1006 60/134,547 05/17/1999 A1007 08/31/1999 **Bryan Whittles** 60/151,563 A1008 09/07/1999 Stockwell et al. 5,950,195 A1009 6,119,171 09/12/2000 Alkhatib Rosenberg et al. A1010 6,937,597 08/30/2005 A1011 7,072,964 07/04/2006 Whittle et al. A1012 09/399,753 09/22/1998 Graig Miller et al. A1013 6,079,020 06/20/2000 Liu A1014 6.173.399 01/09/2001 Gilbrech A1015 Bots et al. 6,226,748 05/01/2001 A1016 05/01/2001 6,226,751 Arrow et al. A1017 6,701,437 03/02/2004 Hoke et al. A1018 6,055,574 04/25/2000 Smorodinsky et al. A1019 6,246,670 06/12/2001 Karlsson, et al. FOREIGN PATENT DOCUMENTS **EXAMINER'S** Foreign Patent Document Publication Date Name of Patentee or Pages, Columns, Lines Translation INITIALS CITE Country Codes -Number 4 -Kind Codes (if known) Applicant of Cited Document Where Relevant MM-DD-YYYY Figures Appear B1000 WO 001/17775 03-30-2000 Science Applications Yes Νo International Corporation B1001 WO 00/70458 11-23-2000 Comsec Corporation Science Applications 03-08-2001 B1002 WO 01/016766 International Corporation **EXAMINER** DATE CONSIDERED 03/14/2010 /Krisna Lim/

<sup>\*</sup>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.

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	C1050	1998). (Gatewa	y, Schulzrinne)								
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	C1051	(SGC	P)	•		ersion 1.0 (May 5, 1998).		
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	1	M. Ha	andley, H. S	Schulzrinne, E. S	Schooler, Internet Engine	eering Task Force, Internet		
	04555	Draft,	(U5/14/199	98). (RFC 2543	Internet Draft 5) reference, a copy has	not been provided?		
	C1053	LDue	to difficult	Sobulations E	Schooler Internet Engine	eering Task Force, Internet		
					Internet Draft 6)	sering rask roice, internet		
	C1054	IDue	to difficult	ty locating this	reference, a copy has	not been provided]		
	01034	[Due to difficulty locating this reference, a copy has not been provided]  D. McDonald, et al. "PF_KEY Key Management API, Version 2," Network Working						
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	1	M. H	andley, H.	Schulzrinne, E. S	Schooler, Internet Engine	eering Task Force, Internet		
		Draft	(07/16/19	98). (RFC 2543	Internet Draft 7)	lour was a		
	C1056	[Due	to difficul	ty locating this	reference, a copy has	not been provided]		
						eering Task Force, Internet		
	İ	Draft	(08/07/19	98). (RFC 2543	Internet Draft 8)	unt harm provided?		
	C1057	Due	to difficul	ty locating this	reference, a copy has	not been provided	<u> </u>	
	04050				rt VPN Technology)	omer Feedback (August 18,		
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	C1059	Due	to difficul	ty locating this	reference, a copy has	not been provided]		
	1	Atkin	son, et al.	Security Archite	cture for the Internet Pro	otocol," Network Working Group,		
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	C1061	[Due	to difficul	ty locating this	reference, a copy has	not been provided]		
						sions, IETF DNS Security		
	C1062			(December 1998				
						eering Task Force, Internet		
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	(	C1064	Aventail Corp., "Aventail Connect 3.1/2.6Administrator's Guide," (1999). (Aventail Administrator 3.1, Aventail) [Due to difficulty locating this reference, a copy has not been provided]  Aventail Corp., "Aventail Connect 3.1/2.6 User's Guide," (1999). (Aventail User 3.1,							
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-		C1071	1999	). (Scott VF	Ns)		sociates, Inc., 2nd ed. (Jan.	:		
		C1072	Draf	t, (01/15/19	99). (RFC 2543	internet Draft 12)  reference, a copy has	eering Task Force, Internet			
			Gold	schlag, et a al Research	I., "Onion Routir	ng for Anonymous and I nter for High Assurance	Private Internet Connections," Computer Systems (January 28,			
		C1073 C1074	H. S Com	chulzrinne, puter Netw	"Internet Telephorks, Vol. 31, No	ony: architecture and process. 3 (February 1999). (T	rotocols – an IETF perspective," elephony, Schulzrinne)			
		C1075	M. H and	landley, et a Internet Dra	al. "SIP: Session afts (12/96-3/99).	Initiation Protocol," Net (Handley, RFC 2543)	work Working Group, RFC 2543			
		C1076	(Fre	eS/WAN Co	mpatibility Guid	S/WAN Compatibility G e, FreeS/WAN)				
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		C1078	DNS	<draft-eitf-< p=""></draft-eitf-<>			CDC and Realm Information with 99). (Hornstein, DNS SRV)			
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		C1079	Base (Bhat	Bhattacharya et. al. "An LDAP Schema for Configuration and Administration of IPSec Based Virtual Private Networks (VPNs)", IETF Internet Draft (October 1999). (Bhattcharya LDAP VPN) B. Patel, et al. "DHCP Configuration of IPSEC Tunnel Mode," IPSEC Working Group,							
		C1080			0HCP Configu (10/15/1999)			Mode," IPSEC Work	king Group,		
			Gono (2000	alves, et al. )). (Goncalv	. <i>Check Point</i> es, Checkpoi	FireV	Vall -1 Administrati V)	on Guide, McGraw-			
		C1081	[Due	to difficult	y locating th	Comp	rehence, a copy na	ns not been provide	eal		
		C1082		"Building a Microsoft VPN: A Comprehensive Collection of Microsoft Resources," FirstVPN, (Jan 2000). (FirstVPN Microsoft)							
		C1083	Gulbi	andsen, Vi	xie, & Esibov,	A DI	NS RR for specifyir 000). (RFC 2782, I	ng the location of sei DNS SRV)	vices (DNS		
		C1084	MITR	E Organiza	ation, "Technic	cal De	escription," Collabo	rative Operations in 2000). (MITRE, SIP			
			H. Sc	hulzrinne,	et al. "Applica	tion-L	ayer Mobility Usin	SIP," Mobile Comp	outing and		
		C1085	Com	munications	Review, Vol	. 4, N	o. 3. pp. 47-57 (Ju	y 2000). (Application tation and Experien	n, SIP)		
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		C1092			ran, SIPRNE						
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		C1094			ional Systems olution. (RAS			e Access Security P	rogram (RASP)		
			Onio	n Routing, '	'Investigation	of Ro	ute Selection Algo	rithms," <i>available at</i>			
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		C1096		re Computi NET)	ing, "Bullet-Pr	oofing	g an Army Net," W	ashington Technolog	gy. (Secure,		
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		C1097	SPAF	RTA "Dynar	nic Virtual Private	Network." (Sparta, VF	N SYSTEMS)	
		C1098	Stand	•	ion Procedure for	Using the 1910 Secu	re Modems. (Standard,	
		C1099	MSF1	ſVX000192	06). (FreeS/WAN	to FreeS/WAN (MSF emails, FreeS/WAN)		
	C1100 Kaufman et al., "Implementing IPsec," (Copyright 1999) (Implementing IPsec)							
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		C1102	Netwo	ork Associa 1999) (Gau	ates <i>Gauntlet Fire</i> ntlet Getting Start	<i>wall For Windows NT</i> ed Guide – NT, Firewa	Getting Started Guide Version III Products)	
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			Microsoft Corp.	Windows NT Se	rver Product Document	ation: Administration Guide –						
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			Marc Levy, CC	M Internet Service	ces (Apr. 23, 1999), ava	allable at	[					
		C1121	http://msdn2.m	icrosoft.com/en-u	us/library/ms809302(pri	mer).aspx (Levy)	+-					
			Markus Horstn	nann and Mary K	irtiand, DCOM Architec	ture (July 23, 1997), available at						
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		125. Scott Suhy & Glenn Wood,	DNS and Microsoft Win	dows NT 4.0, (1996) available at								
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<sup>\*</sup>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.

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			Sominar attend	, vviiluows ivi 5. ees aet first look	at the performance and	I capabilities of Windows NT 5.0	•					
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	C1089	1 ''	Products. (Assu		( k						
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	10.000				Network Security," Aventail						
	C1091	Corporation Wh	ite Paper. (Netw	ork Security, Aventail)	·						
				orks: Secret Internet Pro	tocol Router Network						
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	C1093	1	Secure VPN+ (F								
	C1094	Secret Dial-In S	olution. (RASP,	SIPRNET)	Access Security Program (RASP)						
	04005			Route Selection Algorith	nms," available at (Route Selection, Onion Routing)						
	C1095 C1096				nington Technology. (Secure,						
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<sup>\*</sup>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.

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	C109		PARTA "Dynamic Virtual Private Network." (Sparta, VPN SYSTEMS)							
	C1098	1	andard Operation Procedure for Using the 1910 Secure Moderns. (Standard, PRNET)							
					to FreeS/WAN (MSF	TVX00018833-				
<u>-</u>	C1099	MSF	TVX000192	206). (FreeS/WAN	emails, FreeS/WAN)					
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						uide Version 5.0 (1999).				
	C110	(Gau	ntlet User's	Guide - Unix, Fire	ewall Products)	Getting Started Guide Version				
	C110	Netw	ORK ASSOCI 1999) (Gau	ates G <i>auntiet Firev</i> ntlet Getting Starte	ed Guide – NT, Firewa	all Products)				
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	C110	ı (Gau	ntlet Unix F	Release Notes, Firewall Products)						
•		Netw	ork Associ	ates Gauntlet Fire	wall For Windows NT	Administrator's Guide Version				
	C110	5 5.0 (	1999) (Gau	ntlet N1 Administr	ator's Guide, Firewall	Products)				
		Trus	ted Informa	tion Systems, Inc.	Gauntiet Internet Fire	wall Firewall-to-Firewall to-Firewall, Firewall Products)				
	C110	5 Encr	yption Guid	etos Countlet Eiro	wall Clobal Virtual Private	vate Network User's Guide for				
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		Don	Sterne Dvr	namic Virtual Priva	te Networks (May 23.	2000) (Sterne DVPN, DVPN)				
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	- 10,111			I. TIS Dynamic Se	curity Perimeter Rese	arch Project Demonstration				
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		James Just & D	an Sterne Security N)	Quickstart Task Upd	ate (February 5, 1997) (S			
	C1114	Virtual Private N (DVPN Demons	etwork Demonstra	tion dated March 21,	1998 (SPARTA00001844	-54)		
	C1115	GTE Internetwo	rking & BBN Techt	nologies DARPA Infor	mation Assurance Progra ch 10, 1998) (IFD 1.1, DV	m /PN)		
	C1116	Integrated Feas	Mindows NT Con	or Product Document	ation: Administration Guic	le –		
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	-   .	ny (Connection	Point Services) (A	(Although undated, this reference refers to the operation				
		of prior art versi	ons of Microsoft W	indows. Accordingly,	upon information and beli	ief, this		
	C1117	reference is prid	or art to the patents	s-insuit.)				
	1	Microsoft Corp.	Windows NT Serv	er Product Document	ation: Administration Kit (	Suide -		
	1	Connection Ma	nager <i>available at</i>			l l		
		http://www.micr	osoft.com/technet/	archive/winntas/prodo	locs/inetconctservice/cma	of prior		
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		art versions of I	Vicrosoft Windows	such as windows in i	4.0. Accordingly, upon	1		
	C1118	information and	Deller, this referen	ice is prior art to the p	upport.microsoft.com/kb/1	64249		
	İ	Microson Corp.	Autodiai Hedristic	dated this reference	refers to the operation of	prior art		
	1	(Autodial neuri	rosoft Windows su	ch as Windows NT 4.	0. Accordingly, upon infor	mation		
•	04440	and helief this	reference is prior a	art to the patents-in-su	uit.)			
	C1119	Microsoft Corn	Cariplo: Distribute	ed Component Object	Model, (1996) available	at		
	C1120	http://msdn2.m	icrosoft.com/en-us	/library/ms809332(pri	nter).aspx (Cariplo I)			
	101120	Marc Levy CO	M Internet Service	s (Apr. 23, 1999), <i>ava</i>	ilable at			
	C1121	http://medn2.m	icrosoft.com/en-us	/librarv/ms809302(pri	nter).aspx (Levy)			
	101121	Markus Horstm	ann and Mary Kirt	land, DCOM Architect	ure (July 23, 1997), avail	able at		
	C1122	http://msdn2.m	icrosoft.com/en-us	/library/ms809311(pri	nter).aspx (Horstmann)			
	- 01,122	Microsoft Corp	DCOM: A Busine	ess Overview (Apr. 19	97), available at			
		http://msdn2.m	icrosoft.com/en-us	/library/ms809320(pri	nter).aspx (DCOM Busine	ess		
	C1123	Overview I)						
		Microsoft Corp	., DCOM Technica	l Overview (Nov. 199	6), available at			
		http://msdn2.m	icrosoft.com/en-us	/library/ms809340(pri	nter).aspx (DCOM Techn	ıcaı		
	C1124	Overview I)						
	C1125	Microsoft Corp	., DCOM Architect ecture)	ure White Paper (199	8) available in PDC DVD-	KUW		
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	NO.	Microsoft Corp. DCOM – The Distributed Component Object Model, A Business									
	1	Overview White Paper (Microsoft 1997) available in PDC DVD-ROM (DCOM Business									
	C1126	Overview II)		( )							
	0.120	Microsoft Corp., DCOM—Ca	ariplo Home Banking Over	The Internet White Paper							
	C1127	(Microsoft 1996) available in	PDC DVD-ROM (Cariplo I	1)							
	1	Microsoft Corp., DCOM Solu	utions in Action White Pape	r (Microsoft 1996) available in							
	C1128	PDC DVD-ROM (DCOM So	lutions in Action)								
		Microsoft Corp., DCOM Tec	hnical Overview White Pap	er (Microsoft 1996) available 12							
	C1129	in PDC DVD-ROM (DCOM	Technical Overview II)								
		125. Scott Suhy & Glenn We	ood, DNS and Microsoft Wi	ndows NT 4.0, (1996) available at							
	C1130	http://msdn2.microsoft.com/	en-us/library/ms810277(pri	nter).aspx (Suhy)							
	. ~		ntial WinInet 313-423 (Add	son Wesley Longman 1998)							
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•	1.	Microsoft Corp. Installing, C		P with Microsoft Clients and							
	•	Servers, (1998) available at		eter) conv (Heine DDTD)							
	C1132	http://msdn2.microsoft.com/	enus/library/ms8110/8(piii	NAS Standard Edition							
		Microsoft Corp., Internet Connection Services for MS RAS, Standard Edition, http://www.microsoft.com/technet/archive/winntas/proddocs/inetconctservice/bcgstart.ms									
	منبور	px (Internet Connection Services I)									
	C1133	Microsoft Corp. Internet Co	nnection Services for RAS	Commercial Edition, available							
		athth://www.microsoft.com/	technet/archive/winntas/pro	oddocs/inetconctservice/bcgstrtc.							
	C1134	mspx (Internet Connection S									
	1	Microsoft Corp. Internet Ex	plorer 5 Corporate Deployr	nent Guide – Appendix B:Enabling							
		Connections with the Conne	ection Manager Administrat	ion Kit, <i>available at</i>							
		http://www.microsoft.com/te	chnet/prodtechnol/ ie/deplo	py/deploy5/appendb.mspx (IE5							
	C1135	Corporate Development)									
		Mark Minasi, Mastering Win	ndows NT Server 4 1359-14	142 (6th ed., January 15,							
	C1136	1999)(Mastering Windows N	NT Server)								
			ning for Supporting Version	4.0 371-473 (Microsoft Press							
	C1137	1998) (Hands On)		OUT A DIT ( D)							
	1	Microsoft Corp., MS Point-to	o-Point Tunneling Protocol	(Windows NT 4.0), available at							
			ecnnet/archive/winntas/mail	ntain/featusability/pptpwp3.mspx							
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				Administrator's Bible 173-206, 883-							
	C1139	911, 974-1076 (IDG Books	vvoriawiae 1999) (Gregg)	of http://medn2.microsoft.com/on							
		Wilcrosoft Corp., Remote Ad	cess (vvindows), available	at http://msdn2.microsoft.com/en-							
	C1140	us/library/bb545687(VS.85,	primer).aspx (Remote Acce								
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	C1142	Anthony Northri	n NT Network Plus	mbing: Routers, Prox	cies, and Web Services 299-399	
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		Remote Access http://www.micr to RRAS) (Altho Microsoft Windo	s Service, Available osoft.com/technet/a ough undated, this rows such as Windows prior art to the pate	at irchive/winntas/prodo eference refers to th ws NT 4.0. According ents-in-suit ) 13	T Routing with Routing and docs/ rras40/rrasch01 mspx (Intro e operation of prior art versions of gly, upon information and belief,	
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		F-Secure, F-Sec	ecure, F-Secure VPN+ Administrator's Guide (May 1999) (from FSECURE								
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	C1152	F-Secure, F-Sec	-Secure, F-Secure VPN+ 4.1 (1999) (from FSECURE 00000006) (VPN+ 4.1 Guide 6)								
	C1153	F-Secure, F-Sec	ure SSH (1996)	(from FSECURE 00000	0006) (F-Secure SSH 6)						
	C1154	F-Secure, F-Secure SSH 2.0 for Windows NT and 95 (1998) (from FSECURE									
		F-Secure, F-Secure Evaluation Kit (Sept. 1998) (FSECURE 00000009) (Evaluation Kit 9)  [Due to difficulty locating this reference, a copy has not been provided]									
	C1155	F-Secure, F-Secure SSH User's & Administrator's Guide (Sept. 1998) (from FSECURE									
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		F-Secure, F-Se	cure Desktop, Us	er's Guide (1997) (fron	n FSECURE 00000009)						
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	C1162	(ESecure VPN+	)	4	from FSECURE 00000009)						
	1	IRE Inc. SafeNe	t/Soft-PK Version	4 (March 28, 2000) (Soft-F	PK Version 4)						
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		C1169	Trusted Info	rma	tion Systems I	nc. Running the G	Sauntle	t Internet Firewall, An		
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		C1172	Bernard Ab	oba	et al Securing	L2TP using IPSE	C (Feb	ruary 2, 1999)		
		C1173	156 Findin	a Yo	ur Way Throug	h the VPN Maze (	1999) (	("PGP")		
		C1174	Linux Free	SANIA	N Overview (1	999) (Linux FreeS	(NAW	Overview)		
		C1175	TimeStee	Tho	Rusiness Case	for Secure VPNs	(1998)	("TimeStep")		
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<sup>\*</sup>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.

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	B1000	WO 001/17775	03-30-2000	International Corporation	n		Yes	No
	B1001	WO 00/70458	11-23-2000	Comsec Corporation				
	B1002	WO 01/016766	03-08-2001	Science Applications International Corporation	n			
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<sup>\*</sup>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.

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		Microsoft Corp, DCOM – The Distributed Component Object Model, A Business								
		Overview White Paper (Microsoft 1997) available in PDC DVD-ROM (DCOM Business								
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		Microsoft Corp., Internet Co	onnectioi Mochaet	archive/winntas/pro/	ddocs/inetconctservice/bcgstrtc.					
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<sup>\*</sup>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.

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			http://www.micro PPTP NT 4) (All versions of Micro	icrosoft Corp., Understanding PPTP (Windows NT 4.0), available at tp://www.microsoft.com/technet/archive/winntas/plan/pptpudst.mspx (Understanding PTP NT 4) (Although undated, this reference refers to the operation of prior art ersions of Microsoft Windows such as Windows NT 4.0. Accordingly, upon information and belief, this reference is prior art to the patents-in-suit.)				
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			http://www.micr VPN) (Although Microsoft Windo	osoft.com/techn undated, this re ows such as Wir	et/archive/winntas/ depi eference refers to the op ndows NT 4.0. According patents-in-suit )	eration of prior art versions of gly, upon information and belief,		
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		F-Secure, F-Secure VPN+ Administrator's Guide (May 1999) (from FSECURE							
	C1151	00000003) (VPN+ Guide 3)							
	C1152	F-Secure, <i>F-Secure VPN+ 4.1</i> (1999) (from FSECURE 00000006) (VPN+ 4.1 Guide 6) F-Secure, <i>F-Secure SSH</i> (1996) (from FSECURE 00000006) (F-Secure SSH 6)							
	C1153	F-Secure, F-Sec	ure SSH (1996) (	from FSECURE 00000	0006) (F-Secure SSH 6)				
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С	101134	F-Secure F-Sec	ure Evaluation K	it (Sept. 1998) (FSECU	JRE 00000009) (Evaluation Kit 9)				
	C1155	[Due to difficulty locating this reference, a copy has not been provided]							
	C1156	F-Secure, F-Secure SSH User's & Administrator's Guide (Sept. 1998) (from FSECURE 00000009) (SSH Guide 9)							
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a series er a de la dela de	C1157	00000009) (F-Secure SSH 2.0 Guide 9)							
	C1158	F-Secure, F-Sec	F-Secure, F-Secure VPN+ (Sept. 1998) (from FSECURE 00000009) (VPN+ Guide 9)						
		F-Secure, F-Sec	cure Managemen	t Tools, Administrator's	Guide (1999) (from FSECURE	_			
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		F-Secure, F-Se	cure Desktop, Us	ers Guide (1997) (fron	1 FSECURE 00000009)	- Au			
	C1160	(FSecure Deskt	op User's Guide)	January 2000) (VPN Poli	cy Manager)				
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	C1162	(FSecure VPN+	)		from FSECURE 00000009)				
		IRE, Inc., SafeNe	t/Soft-PK Version 4	(March 28, 2000) (Soft-F	PK Version 4)				
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	0.4400	FD 4	PN Policy Manager) Due to difficulty locating this reference, a copy has not been provided]							
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		Implei	ww. waten metnina T	erminal Server a	and Citrix MetaFrame (N	Nacmillan Technial Publishing				
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	C1173	Berna	rd Aboba	et al., Securing	L2TP using IPSEC (Feb	oruary 2, 1999)				
	C1174	156. F	inding Yo	ur Way Through	the VPN Maze (1999)	("PGP")				
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	C1175	Times	Step The	Business Case	for Secure VPNs (1998)	("TimeStep")				
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	110.	Watch	VatchGuard Technologies, Inc., WatchGuard LiveSecurity for MSS Powerpoint (Feb. 14							
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	C1182	Due	Force Research Laboratory Statement of Work for Information Assurance System							
c	İ	Archit	chitecture and Integration, PR No. N-8-6106 (Contract No. F30602-98-C-0012)							
	C1183	1/1	January 20, 1008)							
		GTE	CTE Interpetworking & BBN Technologies DARPA Information Assurance Program							
	C1184	Integr	Integrated Feasibility Demonstration (IFD) 1.2 Report, Rev. 1.0 (September 21, 1998)  BBN Information Assurance Contract, TIS Labs Monthly Status Report (March 16-April							
	04405	30, 19		n Assurance Com	lact, 110 Labs Month,					
	C1185	DAR	PA Dynan	nic Virtual Private	Network (VPN) Power	point	_			
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	C1187	Darre	II Kindred	Dynamic Virtual	Private Networks (DVI	PN) Countermeasure				
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	C1195	Darrell Kindred	Parrell Kindred et al., Proposed Threads for IFE 3.1 (January 13, 2000)							
	C1196		FE 3.1 Technology Dependencies (2000)							
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	C1201	T Braun et al	T. Braun et al., Virtual Private Network Architecture, Charging and Accounting							
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	C1203	Private Network	s (1999)		V (Daniel Carrier 2 0 Microsoft	<del>                                     </del>				
	1	Microsoft Corpo	ration, Microsoft	Proxy Server 2.0 (1997	7) (Proxy Server 2.0, Microsoft	} `				
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Complete if Known Subst. for form 1449/PTO 11/840,560 Application Number SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT BY August 17, 2007 Filing Date Victor Larson APPLICANT First Named Inventor (Use as many sheets as necessary) 2157 Art Unit VU, Kim Y. **Examiner Name** 077580-0063 (VRNK-1CP3CN2) Docket Number 17 of 17 Sheet OTHER ART (Including Author, Title, Date, Pertinent Pages, Etc.) Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or **EXAMINER'S** INITIALS CITE country where published. M. Shane Stigler & Mark A Linsenbardt, IIS 4 and Proxy Server 2 (1999) (Stigler, Microsoft NO Prior Art VPN Technology) David G. Schaer, MCSE Test Success: Proxy Server 2 (1998) (Schaer, Microsoft Prior Art C1209 C1210 VPN Technology) John Savill, The Windows NT and Windows 2000 Answer Book (1999) (Savill, Microsoft Prior Art VPN Technology) Network Associates Gauntlet Firewall Global Virtual Private Network User's Guide for C1211 Windows NT Version 5.0 (1999) (Gauntlet NT GVPN, GVPN) Network Associates Gauntlet Firewall For UNIX Global Virtual Private Network User's Guide Version 5.0 (1999) (Gauntlet Unix GVPN, GVPN) File History for U.S. Application Serial No. 09/653,201, Applicant(s): Whittle Bryan, et al., C1213 C1214 Filing Date 08/31/2000. AutoSOCKS v2.1, Datasheet, C1215 http://web.archive.org/web/19970212013409/www.aventail.com/prod/autoskds.html Ran Atkinson, Use of DNS to Distribute Keys, 7 Sept. 1993, http://ops.ietf.org/lists/namedroppers/namedroppers.199x/msg00945.html - --FirstVPN Enterprise Networks, Overview Chapter 1: Introduction to Firewall Technology, Administration Guide; 12/19/07, http://www.books24x7.com/book/id\_762/viewer\_r.asp?bookid=762&chunked=41065062 The TLS Protocol Version 1.0; January 1999; page 65 of 71. C1219 Elizabeth D. Zwicky, et al., Building Internet Firewalls, 2nd Ed. C1220 Virtual Private Networks – Assured Digital Incorporated – ADI 4500; http://web.archive.org/web/19990224050035/www.assured-C1221 digital.com/products/prodvpn/adia4500.htm Accessware - The Third Wave in Network Security, Conclave from Internet Dynamics; http://web.archive.org/web/11980210013830/interdyn.com/Accessware.html Extended System Press Release, Sept. 2, 1997; Extended VPN Uses The Internet to C1222 Create Virtual Private Networks, www.extendedsystems.com Socks Version 5; Executive Summary; http://web.archive.org/web/199970620031945/www.aventail.com/educate/whitepaper/socks wp.html Internet Dynamics First to Ship Integrated Security Solutions for Enterprise Intranets and C1224 Extranets; Sept. 15, 1997; http://web.archive.org/web/19980210014150/interdyn.com Emails from various individuals to Linux IPsec re: DNS-LDAP Splicing C1226 DATE CONSIDERED EXAMINER 03/14/2010 /Krisna Lim/ 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.

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	any sheets as	s necessary)		First Named Inventor	Victor Larson				
				Art Unit 2157					
				Examiner Name	VU, Kim Y.				
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	Application Number		11840560
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Application Number		11840560
Filing Date		2007-08-17
First Named Inventor	Larso	n, et al.
Art Unit		
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	Filing Date		2007-08-17
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Filing Date		2007-08-17	
First Named Inventor	Larso	n, et al.	
Art Unit			
Examiner Name			
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APPLICANT	Filing Date	08-17-2007				
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	Art Unit	2453				
	Examiner Name	Krisna Lim				
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	C1240	Davi	d Kosiur, "Bu	ilding a	nd Managing	Virtual Private Netwo	rks" (1	1998)				
	C1241	(Nov	ember 1987)			entation and Specification						
	C1242					on of Patent No. 6,502						
	C1243	Req	uest for Inter	Partes	Reexamination	on of Patent No. 7,188	,180,	dated Nov. 2	25, 2009			
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	I	E)	KAMINER	Krisna	 a Lim/			DATE CONSID	ERED (	3/14/20	10	

<sup>\*</sup>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.

BST99 1638591-1.077580.0063

# Search Notes Application/Control No. Applicant(s)/Patent Under Reexamination LARSON ET AL. Examiner Krisna Lim Art Unit 2453

SEARCHED								
Class	Subclass	Date	Examiner					
709	226, 221	3/14/2010	kl					
726	15	3/14/2010	kl					

SEARCH NOTES		
Search Notes	Date	Examiner
EAST, Inventors	3/14/2010	kl

INTERFERENCE SEARCH								
Class	Subclass	Date	Examiner					

1

Docket No.: 077580-0063 (VRNK-1CP3CN2) **PATENT** 

#### IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Victor Larson et al. Customer Number: 23,630

Confirmation Number: 1537

Application No.: 11/840,560 Group Art Unit: 2453

Filed: August 17, 2007 Examiner: Lim, Krisna

For: AGILE NETWORK PROTOCOL FOR SECURE COMMUNICATIONS USING

SECURE DOMAIN NAMES

#### **REVISED AMENDMENT "A"**

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

Sir:

In response to the Advisory Office action dated July 15, 2010, and the substantive Office action on the merits dated March 19, 2010, please amend the above-identified application and consider the accompanying remarks as follows:

Amendments to the specification begin on page 2 of this paper.

Amendments to the claims begin on page 3 of this paper

Remarks begin on page 10 of this paper.

BST99 1655790-1.077580.0063

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#### Amendments to the specification:

Please delete paragraph [0001] in its entirety, and substitute therefor:

[0001] This application claims priority from and is a continuation of a co-pending U.S. application serial number 10/714,849, filed November 18, 2003, now U.S. Patent No. 7,418,504, which is a continuation of U.S. application serial number 09/558,210, filed April 26, 2000, now abandoned, which in turn is a continuation-in-part of previously-filed U.S. application serial number 09/504,783, filed on February 15, 2000, now U.S. Patent No. 6,502,135, issued December 31, 2002, which in turn claims priority from and is a continuation-in-part patent application of previously-filed U.S. application serial number 09/429,643, filed on October 29, 1999, now U.S. Patent No. 7,010,604, issued March 07, 2006. The subject matter of U.S. application serial number 09/429,643, now U.S. Patent No. 7,010,604, which is bodily incorporated herein, derives from provisional U.S. application numbers 60/106,261 (filed October 30, 1998) and 60/137,704 (filed June 7, 1999), both now abandoned. The present application is also related to U.S. application serial number 09/558,209, filed April 26, 2000, now abandoned, and which is incorporated by reference herein.

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Amendments to the claims:

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

1.-3. (Cancelled)

(New) A system for providing a domain name service for establishing a secure

communication link, the system comprising:

a domain name service system configured and arranged to be connected to a

communication network, store a plurality of domain names and corresponding

network addresses, receive a query for a network address, and indicate in response

to the query whether the domain name service system supports establishing a

secure communication link.

5. (New) The system of claim 4, wherein at least one of the plurality of domain

names comprises a top-level domain name.

(New) The system of claim 5, wherein the top-level domain name is a non-6.

standard top-level domain name.

7. (New) The system of claim 6, wherein the non-standard top-level domain name is

one of .scom, .sorg, .snet, .sgov, .sedu, .smil and .sint.

8. (New) The system of claim 5, wherein the domain name service system is

configured to authenticate the query using a cryptographic technique.

9. (New) The system of claim 4, wherein the communication network includes the

Internet.

10. (New) The system of claim 4, wherein the domain name service system

comprises an edge router.

11. (New) The system of claim 4, wherein the domain name service system is

connectable to a virtual private network through the communication network.

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12. (New) The system of claim 11, wherein the virtual private network is one of a plurality of secure communication links in a hierarchy of secure communication links.

13. (New) The system of claim 11, wherein the virtual private network is based on inserting into each data packet communicated over a secure communication link one or more data values that vary according to a pseudo-random sequence.

14. (New) The system of claim 11, wherein the virtual private network is based on a network address hopping regime that is used to pseudorandomly change network addresses in packets transmitted between a first device and a second device.

15. (New) The system of claim 11, wherein the virtual private network is based on comparing a value in each data packet transmitted between a first device and a second device to a moving window of valid values.

16. (New) The system of claim 11, wherein the virtual private network is based on a comparison of a discriminator field in a header of each data packet to a table of valid discriminator fields maintained for a first device.

17. (New) The system of claim 4, wherein the domain name service system is configured to respond to the query for the network address.

18. (New) The system of claim 4, wherein the domain name service system is configured to provide, in response to the query, the network address corresponding to a domain name from the plurality of domain names and the corresponding network addresses.

19. (New) The system of claim 4, wherein the domain name service system is configured to receive the query initiated from a first location, the query requesting the network address associated with a domain name, wherein the domain name service system is configured to provide the network address associated with a second location, and wherein the domain name service system is configured to support establishing a secure communication link between the first location and the second location.

20. (New) The system of claim 4, wherein the domain name service system is

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connected to a communication network, stores a plurality of domain names and corresponding network addresses, and comprises an indication that the domain name service system supports establishing a secure communication link.

- 21. (New) The system of claim 4, wherein at least one of the plurality of domain names is reserved for secure communication links.
- 22. (New) The system of claim 4, wherein the domain name service system comprises a server.
- 23. (New) The system of claim 22, wherein the domain name service system further comprises a domain name database, and wherein the domain name database stores the plurality of domain names and the corresponding network addresses.
- 24. (New) The system of claim 4, wherein the domain name service system comprises a server, wherein the server comprises a domain name database, and wherein the domain name database stores the plurality of domain names and the corresponding network addresses.
- 25. (New) The system of claim 4, wherein the domain name service system is configured to store the corresponding network addresses for use in establishing secure communication links.
- 26. (New) The system of claim 4, wherein the domain name service system is configured to authenticate the query for the network address.
- 27. (New) The system of claim 4, wherein at least one of the plurality of domain names comprises an indication that the domain name service system supports establishing a secure communication link.
- 28. (New) The system of claim 4, wherein at least one of the plurality of domain names comprises a secure name.
- 29. (New) The system of claim 4, wherein at least one of the plurality of domain names enables establishment of a secure communication link.

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- 30. (New) The system of claim 4, wherein the domain name service system is configured to enable establishment of a secure communication link between a first location and a second location transparently to a user at the first location.
- 31. (New) The system of claim 4, wherein the secure communication link uses encryption.
- 32. (New) The system of claim 4, wherein the secure communication link is capable of supporting a plurality of services.
- 33. (New) The system of claim 32, wherein the plurality of services comprises a plurality of communication protocols, a plurality of application programs, multiple sessions, or a combination thereof.
- 34. (New) The system of claim 33, wherein the plurality of application programs comprises items selected from a group consisting of the following: video conferencing, e-mail, a word processing program, and telephony.
- 35. (New) The system of claim 32, wherein the plurality of services comprises audio, video, or a combination thereof.
- 36. (New) The system of claim 4, wherein the domain name service system is configured to enable establishment of a secure communication link between a first location and a second location.
- 37. (New) The system of claim 36, wherein the query is initiated from the first location, wherein the second location comprises a computer, and wherein the network address is an address associated with the computer.
- 38. (New) The system of claim 4, wherein the domain name service system comprises a domain name database connected to a communication network and storing a plurality of domain names and corresponding network addresses for communication, wherein the domain name database is configured so as to provide a network address corresponding to a domain name in response to a query in order to establish a secure communication link.

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39. (New) A machine-readable medium comprising instructions executable in a domain name service system, the instructions comprising code for: connecting the domain name service system to a communication network; storing a plurality of domain names and corresponding network addresses; receiving a query for a network address; and indicating in response to the query whether the domain name service system supports establishing a secure communication link.

40. (New) The machine-readable medium of claim 39, wherein the instructions comprise code for storing the plurality of domain names and corresponding network addresses including at least one top-level domain name.

41. (New) The machine-readable medium of claim 39, wherein the instructions comprise code for responding to the query for the network address.

42. (New) The machine-readable medium of claim 39, wherein the instructions comprise code for providing, in response to the query, the network address corresponding to a domain name from the plurality of domain names and the corresponding network addresses.

43. (New) The machine-readable medium of claim 39, wherein the instructions comprise code for receiving the query for a network address associated with a domain name and initiated from a first location, and providing a network address associated with a second location, and establishing a secure communication link between the first location and the second location.

44. (New) The machine-readable medium of claim 39, wherein the instructions comprise code for indicating that the domain name service system supports the establishment of a secure communication link.

45. (New) The machine-readable medium of claim 39, wherein the instructions comprise code for reserving at least one of the plurality of domain names for secure communication links.

46. (New) The machine-readable medium of claim 39, wherein the code resides on a server.

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47. (New) The machine-readable medium of claim 39, wherein the instructions comprise code for storing a plurality of domain names and corresponding network addresses so as to define a domain name database.

- 48. (New) The machine-readable medium of claim 39, wherein the code resides on a server, and the instructions comprise code for creating a domain name database configured to store the plurality of domain names and the corresponding network addresses.
- 49. (New) The machine-readable medium of claim 39, wherein the instructions comprise code for storing the corresponding network addresses for use in establishing secure communication links.
- 50. (New) The machine-readable medium of claim 39, wherein the instructions comprise code for authenticating the query for the network address.
- 51. (New) The machine-readable medium of claim 39, wherein at least one of the plurality of domain names includes an indication that the domain name service system supports the establishment of a secure communication link.
- 52. (New) The machine-readable medium of claim 39, wherein at least one of the plurality of domain names includes a secure name.
- 53. (New) The machine-readable medium of claim 39, wherein at least one of the plurality of domain names is configured so as to enable establishment of a secure communication link.
- 54. (New) The machine-readable medium of claim 39, wherein the domain name service system is configured to enable establishment of a secure communication link between a first location and a second location transparently to a user at the first location.
- 55. (New) The machine-readable medium of claim 39, wherein the secure communication link uses encryption.
- 56. (New) The machine-readable medium of claim 39, wherein the secure communication link is capable of supporting a plurality of services.

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57. (New) The machine-readable medium of claim 56, wherein the plurality of services comprises a plurality of communication protocols, a plurality of application programs, multiple sessions, or a combination thereof.

- 58. (New) The machine-readable medium of claim 57, wherein the plurality of application programs comprises items selected from a group consisting of the following: video conferencing, e-mail, a word processing program, and telephony.
- 59. (New) The machine-readable medium of claim 56, wherein the plurality of services comprises audio, video, or a combination thereof.
- 60. (New) The machine-readable medium of claim 39, wherein the domain name service system is configured to enable establishment of a secure communication link between a first location and a second location.
- 61. (New) The machine-readable medium of claim 60, wherein the instructions include code for receiving a query initiated from the first location, wherein the second location comprises a computer, and wherein the network address is an address associated with the computer.
- 62. (New) The machine-readable medium of claim 39, wherein the domain name service system comprises a domain name database connected to a communication network and storing a plurality of domain names and corresponding network addresses for communication, wherein the domain name database is configured so as to provide a network address corresponding to a domain name is response to the query in order to establish a secure communication link.
- 63. (New) A method of providing a domain name service for establishing a secure communication link, the method comprising: connecting a domain name service system to a communication network, ; storing a plurality of domain names and corresponding network addresses; and upon receiving a query for a network address for communication, indicating whether the domain name service system supports establishing a secure communication link.

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#### REMARKS

The response filed 28 June 2010 is being resubmitted with the amendment to the specification, paragraph [0001], marked to indicate the changes made. This response is therefore now compliant with the requirements of 37 C.F.R. §§ 1.121 and 1.4.

Claims 4-63 remain in the application. Claims 1-3 have been cancelled, subject to refilling those claims in a continuation application of the present application. Claims 4-63 have been added by this amendment. The Examiner's attention is directed to the parent application, Applicant's patent, U.S. Patent No. 7,418,504 (the "'504 Patent"). Pending claims 4-63 are similar to claims 1-59 of the '504 Patent, except that they have been modified to add the limitation in independent claim 4 (and similar limitations to claims 39 and 63) that there is an indication in response to a query whether the domain name service system supports establishing a secure communication link. New claim 19 (corresponding to claim 16 of the '504 Patent) has also been amended with minor changes.

In the Official action on the merits of March 19, 2010, the Examiner has objected to the disclosure because the first paragraph of the specification needs to be updated. The Examiner has also indicated that the information disclosure statement filed May 19, 2009 fails to comply with 37 C.F.R. § 1.98(a)(3) because it does not include a concise explanation of the relevance of each of the cited references. Claims 1 has been rejected under 35 U.S.C. §112, second paragraph, as indefinite, while claims 2-3 have been rejected under 35 U.S.C. §112, second paragraph, as being incomplete for omitting essential steps. Claim 2 has also been rejected under 35 U.S.C. §112, first paragraph, because one skilled in the art clearly would not know how to use the claimed invention. Claims 1-3 have been rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 7,418,504 (from which the current applications claims priority). Finally claims 1-3 have been rejected under 35 U.S.C. § 102(e) as being anticipated by Shrader (US Patent No 5,864,666). The objections and rejections are traversed and reconsideration is respectfully requested in view of the foregoing amendments and following remarks.

Regarding the Examiner's objection to the specification, the Examiner has requested that applicants indicate the current status of the applications identified in paragraph [0001].

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Applicants accordingly have amended paragraph [0001] to comply with the Examiner's request. Accordingly, the objection should be withdrawn.

The Examiner has indicated that the information disclosure statement filed May 19, 2009 fails to comply with 37 C.F.R. § 1.98(a)(3) because it does not include a concise explanation of the relevance. As stated in applicants' document:

All of the documents herein submitted have been produced by Microsoft Corp. in VirnetX Inc. and Science Applications International Corp. v. Microsoft Corp. civil action currently pending before the U.S. District Court for the Eastern District of Texas. Although the undersigned attorney has not reviewed these documents to assess their materiality, these documents are submitted under the assumption that they may be material to the patentability of the claims pending in this application.

While applicants' regret the large number of documents cited in the litigation by the opposing party, the inability to review the documents, and therefore the inability to assess the materiality of the references, nevertheless applicants felt compelled to cite the references in the file history of the present application, because the two patents in the cited litigation (US Patent Nos. 6,502,135 B1 and 7,188,180 B2) and that of the present application all relate to secure communications. The present application claims priority from a chain of applications, including the one that issued as U.S. Patent No. 6,502,135. U.S. Patent No. 7,188,180 claims priority from a chain of applications, including the same one that issued as U.S. Patent No. 6,502, 135. Accordingly, the applicants request that the Examiner reconsider his position, and review and enter the information disclosure statement of May 19, 2010.

Regarding the rejection of Claims 1 has been rejected under 35 U.S.C. §112, second paragraph, as indefinite, the Examiner states that "it is unclear from where a query is sent", "it is unclear from where the query message is requesting a secure computer network address," "it is unclear how a portal authenticates a query," and finally "the interrelationship or interfunction between a portal and a domain name database is unclear." It is submitted that these cited limitations do <u>not</u> make the claims indefinite. The source of the query message can be from any source in communication with the system for providing a domain name service. As recited in new claim 4, the domain name service system is configured and arranged to be (1) connected to a communication network, (2) store a plurality of domain names and corresponding network

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addresses, (3) receive a query for a network address, and (4) indicate in response to the query whether the domain name service system supports establishing a secure communication link. All four limitations are required by the claim.

The Examiner also finds fault since there is no express recitation of the interrelationship between the portal and domain database. While the applicants disagree with this rejection, none of the currently presented claims include the limitation of "the portal." Accordingly, this objection is believed to be overcome.

The Examiner also believed that original claim 2-3 were incomplete for "omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections." Claims 4-63 recite adequate limitations to satisfy the statutory requirements of 35 U.S.C. §112.

Claim 4 recites the restrictive limitations of a domain name service system required to be "configured and arranged to be connected to a communication network, store a plurality of domain names and corresponding network addresses, receive a query for a network address, and indicate in response to the query whether the domain name service system supports establishing a secure communication link."

Claim 39 recites "a machine-readable medium comprising instructions executable in a domain name service system, the instructions comprising code for: connecting the domain name service system to a communication network; storing a plurality of domain names and corresponding network addresses; receiving a query for a network address; and indicating in response to the query whether the domain name service system supports establishing a secure communication link." This clearly provides limitations acceptable under 35 U.S.C. §112.

Finally, claim 63 recites "a method of providing a domain name service for establishing a secure communication link, the method comprising: connecting a domain name service system to a communication network; storing a plurality of domain names and corresponding network addresses; and upon receiving a query for a network address for communication, indicating whether the domain name service system supports establishing a secure communication link."

Claim 63 recites method steps that clearly recite method limitations within the requirements of

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35 U.S.C. §112.

Finally, original claim 2 was also rejected under 35 U.S.C. §112, first paragraph, is not supported by an "undue breadth ... asserted utility or a well established utility." Applicants disagree. New claim 4 recites that the system provides "a domain name service for establishing a secure communication link." New claim 39 recites a "machine-readable medium comprising instructions executable in a domain name service system, the instructions comprising code for connecting the domain name service system to a communication network; storing a plurality of domain names and corresponding network addresses; receiving a query for a network address; and indicating in response to the query whether the domain name service system supports establishing a secure communication link."

Claims 1-3 have been rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 7,418,504 (from which the current applications claims priority). Applicants agree to submit a terminal disclaimer should the Examiner maintain this rejection against new claims 4-63.

Finally claims 1-3 have been rejected under 35 U.S.C. § 102(e) as being anticipated by Shrader (US Patent No 5,864,666). The latter patent describes a system for administering tunneling on a firewall computer between a secure computer network and a nonsecure computer network (col. 1, lines 40 and 41). The system includes a user interface. The user interface is presented having a first pane in which a tunnel definition can be entered. A query is run on an entered tunnel definition to determine whether any existing tunnel definitions match the entered tunnel definition. The results of the query are then displayed on a scatter bar in another pane in the user interface. Locations of matching tunnel definitions are then indicated by lines through the scatter bar. A small bar is displayed proximate to the scatter bar. The small bar indicates the position of the displayed list of tunnel definitions relative to a complete list of tunnel definitions represented by the scatter bar. At this point, an action may be performed on a selected definition. (col 1., lines 53-65).

The patent reference also describes the use of an Internet firewall product that allows administrators to create a physical firewall between a secure network and an unsecured network. The firewall product is described as providing a number of functions including "specialized".

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domain name services." (col. 2, lines 11-18). However "IP tunneling is a feature provided by internet firewalls which is the primary subject of the present invention."

The "IP Tunnel Query Page" is shown in detail in Figs. 6 and 7, and is described in detail in col. 7, line 34-col. 10, line 46. Clearly the page is used by a human administrator to determine tunnel definitions.

The reference thus describes a system to allow a human network administrator to administer tunneling on a firewall computer between a secure computer network and a nonsecure computer network. The system includes an interface that provides graphical depictions of tunnels between addresses in the networks as lines connecting icons representing network addresses. The system allows the user to display a selected tunnel definition in response to the user input. The only apparent query that the system responds to is a "query on an entered tunnel definition to determine whether any existing tunnel definitions match the entered tunnel definition." Clearly the system of Shrader does not provide a domain name service system "configured and arranged to be connected to a communication network, store a plurality of domain names and corresponding network addresses, receive a query for a network address, and indicate in response to the query whether the domain name service system supports establishing a secure communication link", as recited in applicants' claim 4, nor a "machine-readable medium comprising instructions executable in a domain name service system, the instructions comprising code for: connecting the domain name service system to a communication network; storing a plurality of domain names and corresponding network addresses; receiving a query for a network address; and indicating in response to the query whether the domain name service system supports establishing a secure communication link," as recited in applicants claim 39, nor a "method of providing a domain name service for establishing a secure communication link, the method comprising: connecting a domain name service system to a communication network, ; storing a plurality of domain names and corresponding network addresses; and upon receiving a query for a network address for communication, indicating whether the domain name service system supports establishing a secure communication link," as recited in applicants' claim 63.

In summary therefore, the remaining claims 4-63, the remaining claims in the application, are believed to be in condition for allowance. An early and favorable action thereon is therefore

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earnestly solicited.

The Examiner is invited to call the undersigned agent if there are any questions.

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

/Toby H. Kusmer/ Toby H. Kusmer Registration No. 26,418

28 State Street Boston, MA 02109 Phone: 617.535.4065 Facsimile: 617.535,3800

e-mail address: tkusmer@mwe.com

**Date: August 6, 2010** 

Please recognize our Customer No. 23630 as our correspondence address.

Electronic Acknowledgement Receipt					
EFS ID:	8170141				
Application Number:	11840560				
International Application Number:					
Confirmation Number:	1537				
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:	077580-0063 (VRNK-1CP3CN2				
Receipt Date:	06-AUG-2010				
Filing Date:	17-AUG-2007				
Time Stamp:	14:02:12				
Application Type:	Utility under 35 USC 111(a)				

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Document Number	Document Description		File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)	
1			Revised_Amend_A.pdf	63480 3cc214c315164e9f489f5d9391330507a63f 86dd	yes	15	

	Multipart Description/PDF files in .zip description						
	Document Description	Start	End				
	Amendment/Req. Reconsideration-After Non-Final Reject	1	2				
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	Applicant Arguments/Remarks Made in an Amendment	10	15				
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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.

PTO/SB/06 (07-06)
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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 displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 11/840,560		Filing Date 08/17/2007		To be Mailed	
	Al	PPLICATION A		OTHER THAN SMALL ENTITY OR SMALL ENTITY							
(Column 1) (Column 2)  FOR NUMBER FILED NUMBER EXTRA						RATE (\$)	FEE (\$)	I	RATE (\$)	FEE (\$)	
	BASIC FEE (37 CFR 1.16(a), (b),		N/A		N/A		N/A	1 == (+)	1	N/A	. == (+/
	SEARCH FEE (37 CFR 1.16(k), (i),		N/A		N/A		N/A		1	N/A	
	EXAMINATION FE (37 CFR 1.16(o), (p),	Ε	N/A		N/A		N/A		1	N/A	
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Ш	MULTIPLE DEPEN										
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	APP	(Column 1)	AMEND	(Column 2)	(Column 3)		SMAL	L ENTITY	OR		ER THAN ALL ENTITY
AMENDMENT	08/06/2010	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)		RATE (\$)	ADDITIONAL FEE (\$)
ME	Total (37 CFR 1.16(i))	* 60	Minus	** 60	= 0		x \$ =		OR	X \$52=	0
Ϊ	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0		x \$ =		OR	X \$220=	0
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AM	Application Size Fee (37 CFR 1.16(s))  FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR			
* If	the entry in column	1 is less than the e	ntry in col	umn 2, write "0" ir	n column 3.	•	TOTAL ADD'L FEE	nstrument Ex	OR (amin	TOTAL ADD'L FEE er:	
***	** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". /BRENDA L. TURNER/  *** 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.										

This collection of information is required by 37 CFR 1.16. 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, 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.

<b>077580-0057</b> Subst. for form 1449/PTO	Complete if Known			
	Application Number	11/840,560		
INFORMATION DISCLOSURE STATEMENT BY	Filing Date	08-17-2007		
APPLICANT (Use as many sheets as necessary)	First Named Inventor	Victor Larson		
(See as many shoots as necessary)	Art Unit	2453		
	Examiner Name	Krisna Lim		
	Docket Number	077580-0063		
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#### **CERTIFICATION STATEMENT**

Please See	37 CFR	1.97 and	1.98 to make	the appro	opriate selection(s

[	]	Information Disclosure Statement is being filed before the receipt of a first office action.
[	]	Items contained in this Information Disclosure Statement were first cited in any communication from a foreign patent office in a counterpart foreign application.
[	]	No item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the undersigned, after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of this Information Disclosure Statement
[X]	]	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.
[X]	]	None

#### **SIGNATURE**

Date: August 3, 2010

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.

Atabak R. Royaee, Reg. No.: 59,037

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	B1007	WO99/11019	03/04/199	9	V One Corp					
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Subst. for form 1449/PTO	Complete if Known			
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(Use as many sheets as necessary)	First Named Inventor	Victor Larson		
	Art Unit	2453		
	Examiner Name	Krisna Lim		
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#### (54)Pseudo network adapter for frame capture, encapsulation and encryption

A new pseudo network adapter provides an interface for capturing packets from a local communications protocol stack for transmission on the virtual private network, and includes a Dynamic Host Configuration Protocol (DHCP) server emulator, and an Address Resolution Protocol (ARP) server emulator. The new system indicates to the local communications protocol stack that nodes on a remote private network are reachable through a gateway that is in turn reachable through the pseudo network adapter. A transmit path in the system processes data packets from the local communications protocol stack for transmission through the pseudo network adapter. An encryption engine encrypts the data packets and an encapsulation engine encapsulates the encrypted data packets into tunnel data frames. The network adapter further includes an interface into a transport layer of the local communications protocol stack for capturing received data packets from the remote server node, and a receive path for processing received data packets captured from the transport layer of the local communications protocol stack. The receive path includes a decapsulation engine, and a decryption engine, and passes the decrypted, decapsulated data packets back to the local communications protocol stack for delivery to a user.

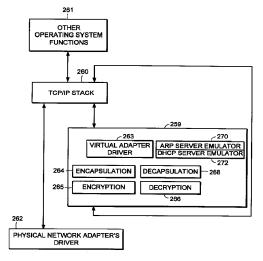


FIG. 15

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#### Description

#### **FIELD OF THE INVENTION**

The invention relates generally to establishing secure virtual private networks. The invention relates specifically to a pseudo network adapter for capturing, encapsulating and encrypting messages or frames.

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#### **BACKGROUND**

In data communications it is often required that secure communications be provided between users of network stations (also referred to as "network nodes") at different physical locations. Secure communications must potentially extend over public networks as well as through secure private networks. Secure private networks are protected by "firewalls", which separate the private network from a public network. Firewalls ordinarily provide some combination of packet filtering, circuit gateway, and application gateway technology, insulating the private network from unwanted communications with the public network.

One approach to providing secure communications is to form a virtual private network. In a virtual private network, secure communications are provided by encapsulating and encrypting messages. Encapsulated messaging in general is referred to as "tunneling". Tunnels using encryption may provide protected communications between users separated by a public network, or among a subset of users of a private network.

Encryption may for example be performed using an encryption algorithm using one or more encryption "keys". When an encryption key is used, the value of the key determines how the data is encrypted and decrypted. When a public-key encryption system is used, a key pair is associated with each communicating entity. The key pair consists of an encryption key and a decryption key. The two keys are formed such that it is unfeasible to generate one key from the other. Each entity makes its encryption key public, while keeping its decryption key secret. When sending a message to node A, for example, the transmitting entity uses the public key of node A to encrypt the message, and then the message can only be decrypted by node A using node A's private key.

In a symmetric key encryption system a single key is used as the basis for both encryption and decryption. An encryption key in a symmetric key encryption system is sometimes referred to as a "shared" key. For example, a pair of communicating nodes A and B could communicate securely as follows: a first shared key is used to encrypt data sent from node A to node B, while a second shared key is to be used to encrypt data sent from node B to node A. In such a system, the two shared keys must be known by both node A and node B. More examples of encryption algorithms and keyed encryption are disclosed in many textbooks, for example

"Applied Cryptography - Protocols, Algorithms, and Source Code in C", by Bruce Schneier, published by John Wiley and Sons, New York, New York, copyright 1994.

Information regarding what encryption key or keys are to be used, and how they are to be used to encrypt data for a given secure communications session is referred to as "key exchange material". Key exchange material may for example determine what keys are used and a time duration for which each key is valid. Key exchange material for a pair of communicating stations must be known by both stations before encrypted data can be exchanged in a secure communications session. How key exchange material is made known to the communicating stations for a given secure communications session is referred to as "session key establishment".

A tunnel may be implemented using a virtual or "pseudo" network adapter that appears to the communications protocol stack as a physical device and which provides a virtual private network. A pseudo network adapter must have the capability to receive packets from the communications protocol stack, and to pass received packets back through the protocol stack either to a user or to be transmitted.

A tunnel endpoint is the point at which any encryption/decryption and encapsulation/decapsulation provided by a tunnel is performed. In existing systems, the tunnel end points are pre-determined network layer addresses. The source network layer address in a received message is used to determine the "credentials" of an entity requesting establishment of a tunnel connection. For example, a tunnel server uses the source network layer address to determine whether a requested tunnel connection is authorized. The source network layer address is also used to determine which cryptographic key or keys to use to decrypt received messages.

Existing tunneling technology is typically performed by encapsulating encrypted network layer packets (also referred to as "frames") at the network layer. Such systems provide "network layer within network layer" encapsulation of encrypted messages. Tunnels in existing systems are typically between firewall nodes which have statically allocated IP addresses. In such existing systems, the statically allocated IP address of the firewall is the address of a tunnel end point within the firewall. Existing systems fail to provide a tunnel which can perform authorization based for an entity which must dynamically allocate its network layer address. This is especially problematic for a user wishing to establish a tunnel in a mobile computing environment, and who requests a dynamically allocated IP address from an Internet Service Provider (ISP).

Because existing virtual private networks are based on network layer within network layer encapsulation, they are generally only capable of providing connectionless datagram type services. Because datagram type services do not quarantee delivery of packets, existing tunnels can only easily employ encryption methods over the data contained within each transmitted packet. Encryption based on the contents of multiple packets is desirable, such as cipher block chaining or stream ciphering over multiple packets. For example, encrypted data would advantageously be formed based not only on the contents of the present packet data being encrypted, but also based on some attribute of the connection or session history between the communicating stations. Examples of encryption algorithms and keyed encryption are disclosed in many textbooks, for example "Applied Cryptography - Protocols, Algorithms, and Source Code in C", by Bruce Schneier, published by John Wiley and Sons, New York, New York, copyright 1994.

Thus there is required a new pseudo network adapter providing a virtual private network having a dynamically determined end point to support a user in a mobile computing environment. The new pseudo network adapter should appear to the communications protocol stack of the node as an interface to an actual physical device. The new pseudo network adapter should support guaranteed, in-order delivery of frames over a tunnel to conveniently support cipher block chaining mode or stream cipher encryption over multiple packets.

#### **SUMMARY OF THE INVENTION**

A new pseudo network adapter is disclosed providing a virtual private network. The new system includes an interface for capturing packets from a local communications protocol stack for transmission on the virtual private network. The interface appears to the local communications stack as a network adapter device driver for a network adapter.

The invention, in its broad form, includes a pseudo network adapter as recited in claim 1, providing a virtual network and a method therefor as recited in claim 9.

The system as described hereinafter further 40 includes a Dynamic Host Configuration Protocol (DHCP) server emulator, and an Address Resolution Protocol (ARP) server emulator. The new system indicates to the local communications protocol stack that nodes on a remote private network are reachable through a gateway that is in turn reachable through the pseudo network adapter. The new pseudo network adapter includes a transmit path for processing data packets from the local communications protocol stack for transmission through the pseudo network adapter. The transmit path includes an encryption engine for encrypting the data packets and an encapsulation engine for encapsulating the encrypted data packets into tunnel data frames. The pseudo network adapter passes the tunnel data frames back to the local communications protocol stack for transmission to a physical network adapter on a remote server node.

Preferably, as described hereinafter, the pseudo

network adapter includes a digest value in a digest field in each of the tunnel data frames. A keyed hash function is a hash function which takes data and a shared cryptographic key as inputs, and outputs a digital signature referred to as a digest. The value of the digest field is equal to an output of a keyed hash function applied to data consisting of the data packet encapsulated within the tunnel data frame concatenated with a counter value equal to a total number of tunnel data frames previously transmitted to the remote server node. In another aspect of the system, the pseudo network adapter processes an Ethernet header in each one of the captured data packets, including removing the Ethernet header.

The new pseudo network adapter further includes an interface into a transport layer of the local communications protocol stack for capturing received data packets from the remote server node, and a receive path for processing received data packets captured from the transport layer of the local communications protocol stack. The receive path includes a decapsulation engine, and a decryption engine, and passes the decrypted, decapsulated data packets back to the local communications protocol stack for delivery to a user.

Thus there is disclosed a new pseudo network adapter providing a virtual private network having dynamically determined end points to support users in a mobile computing environment. The new pseudo network adapter provides a system for capturing a fully formed frame prior to transmission. The new pseudo network adapter appears to the communications protocol stack of the station as an interface to an actual physical device. The new pseudo network adapter further includes encryption capabilities to conveniently provide secure communications between tunnel end points using stream mode encryption or cipher block chaining over multiple packets.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

A more detailed understanding of the invention may be had from the following description of a preferred embodiment, given by way of example and to be understood in conjunction with the accompanying drawing in

- Fig. 1 is a block diagram showing the Open Systems Interconnection (OSI) reference model;
- Fig. 2 is a block diagram showing the TCP/IP internet protocol suite;
- Fig. 3 is a block diagram showing an examplary embodiment of a tunnel connection across a public network between two tunnel servers;
- Fig. 4 is a flow chart showing an examplary embodiment of steps performed to establish a tunnel con-

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nection:

- Fig. 5 is a flow chart showing an examplary embodiment of steps performed to perform session key management for a tunnel connection;
- Fig. 6 is a block diagram showing an examplary embodiment of a relay frame;
- Fig. 7 is a block diagram showing an examplary embodiment of a connection request frame;
- Fig. 8 is a block diagram showing an examplary embodiment of a connection response frame;
- Fig. 9 is a block diagram showing an examplary embodiment of a data frame;
- Fig. 10 is a block diagram showing an examplary embodiment of a close connection frame;
- Fig. 11 is a state diagram showing an examplary embodiment of a state machine forming a tunnel connection in a network node initiating a tunnel connection;
- Fig. 12 is a state diagram showing an examplary embodiment of a state machine forming a tunnel connection in a server computer;
- Fig. 13 is a state diagram showing an examplary embodiment of a state machine forming a tunnel connection in a relay node;
- Fig. 14 is a block diagram showing an examplary embodiment of a tunnel connection between a client computer (tunnel client) and a server computer (tunnel server);
- Fig. 15 is a block diagram showing an examplary embodiment of a pseudo network adapter;
- Fig. 16 is a block diagram showing an examplary embodiment of a pseudo network adapter;
- Fig. 17 is a flow chart showing steps performed by an examplary embodiment of a pseudo network adapter during packet transmission;
- Fig. 18 is a flow chart showing steps performed by an examplary embodiment of a pseudo network adapter during packet receipt;
- Fig. 19 is a data flow diagram showing data flow in an examplary embodiment of a pseudo network adapter during packet transmission;
- Fig. 20 is a data flow diagram showing data flow in

an examplary embodiment of a pseudo network adapter during packet receipt;

- Fig. 21 is a diagram showing the movement of encrypted and unencrypted data in an examplary embodiment of a system including a pseudo network adapter;
- Fig. 22 is a diagram showing the movement of encrypted and unencrypted data in an examplary embodiment of a system including a pseudo network adapter; and
- Fig. 23 is a flow chart showing steps initialization of an examplary embodiment of a system including a pseudo network adapter.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now with reference to Fig. 1 there is described for purposes of explanation, communications based on the Open Systems Interconnection (OSI) reference model. In Fig. 1 there is shown communications 12 between a first protocol stack 10 and a second protocol stack 14. The first protocol stack 10 and second protocol stack 14 are implementations of the seven protocol layers (Application layer, Presentation layer, Session layer, Transport layer, Network layer, Data link layer, and Physical layer) of the OSI reference model. A protocol stack implementation is typically in some combination of software and hardware. Descriptions of the specific services provided by each protocol layer in the OSI reference model are found in many text books, for example "Computer Networks", Second Edition, by Andrew S. Tannenbaum, published by Prentice-Hall, Englewood Cliffs, New Jersey, copyright 1988.

As shown in Fig. 1, data 11 to be transmitted from a sending process 13 to a receiving process 15 is passed down through the protocol stack 10 of the sending process to the physical layer 9 for transmission on the data path 7 to the receiving process 15. As the data 11 is passed down through the protocol stack 10, each protocol layer prepends a header (and possibly also appends a trailer) portion to convey information used by that protocol layer. For example, the data link layer 16 of the sending process wraps the information received from the network layer 17 in a data link header 18 and a data link layer trailer 20 before the message is passed to the physical layer 9 for transmission on the actual transmission path 7.

Fig. 2 shows the TCP/IP protocol stack. Some protocol layers in the TCP/IP protocol stack correspond with layers in the OSI protocol stack shown in Fig. 1. The detailed services and header formats of each layer in the TCP/IP protocol stack are described in many texts, for example "Internetworking with TCP/IP, Vol. 1: Principles, Protocols, and Architecture", Second Edi-

tion, by Douglas E. Comer, published by Prentice-Hall, Englewood Cliffs, New Jersey, copyright 1991. The Transport Control Protocol (TCP) 22 corresponds to the Transport layer in the OSI reference model. The TCP protocol 22 provides a connection-oriented, end to end transport service with guaranteed, in-sequence packet delivery. In this way the TCP protocol 22 provides a reliable, transport layer connection.

The IP protocol 26 corresponds to the Network layer of the OSI reference model. The IP protocol 26 provides no guarantee of packet delivery to the upper layers. The hardware link level and access protocols 32 correspond to the Data link and Physical layers of the OSI reference model.

The Address Resolution Protocol (ARP) 28 is used to map IP layer addresses (referred to as "IP addresses") to addresses used by the hardware link level and access protocols 32 (referred to as "physical addresses" or "MAC addresses"). The ARP protocol layer in each network station typically contains a table of mappings between IP addresses and physical addresses (referred to as the "ARP cache"). When a mapping between an IP address and the corresponding physical address is not known, the ARP protocol 28 issues a broadcast packet (an "ARP request" packet) on the local network. The ARP request indicates an IP address for which a physical address is being requested. The ARP protocols 28 in each station connected to the local network examine the ARP request, and if a station recognizes the IP address indicated by the ARP request, it issues a response (an "ARP response" or "ARP reply" packet) to the requesting station indicating the responder's physical address. The requesting ARP protocol reports the received physical address to the local IP layer which then uses it to send datagrams directly to the responding station. As an alternative to having each station respond only for its own IP address, an ARP server may be used to respond for a set of IP addresses it stores internally, thus potentially eliminating the requirement of a broadcast 40 request. In that case, the ARP request can be sent directly to the ARP server for physical addresses corresponding to any IP address mappings stored within the ARP server.

At system start up, each station on a network must determine an IP address for each of its network interfaces before it can communicate using TCP/IP. For example, a station may need to contact a server to dynamically obtain an IP address for one or more of its network interfaces. The station may use what is referred to as the Dynamic Host Configuration Protocol (DHCP) to issue a request for an IP address to a DHCP server. For example, a DHCP module broadcasts a DHCP request packet at system start up requesting allocation of an IP address for an indicated network interface. 55 Upon receiving the DHCP request packet, the DHCP server allocates an IP address to the requesting station for use with the indicated network interface. The

requesting station then stores the IP address in the response from the server as the IP address to associate with that network interface when communicating using TCP/IP.

Fig. 3 shows an example configuration of network nodes for which the presently disclosed system is applicable. In the example of Fig. 3, the tunnel server A is an initiator of the tunnel connection. As shown in Fig. 3, the term "tunnel relay" node is used to refer to a station which forwards data packets between transport layer connections (for example TCP connections).

For example, in the present system a tunnel relay may be dynamically configured to forward packets between transport layer connection 1 and transport layer connection 2. The tunnel relay replaces the header information of packets received over transport layer connection 1 with header information indicating transport layer connection 2. The tunnel relay can then forward the packet to a firewall, which may be conveniently programmed to pass packets received over transport layer connection 2 into a private network on the other side of the firewall. In the present system, the tunnel relay dynamically forms transport layer connections when a tunnel connection is established. Accordingly the tunnel relay is capable of performing dynamic load balancing or providing redundant service for fault tolerance over one or more tunnel servers at the time the tunnel connection is established.

Fig. 3 shows a Tunnel Server A 46 in a private network N1 48, physically connected with a first Firewall 50. The first Firewall 50 separates the private network N1 48 from a public network 52, for example the Internet. The first Firewall 50 is for example physically connected with a Tunnel Relay B 54, which in turn is virtually connected through the public network 52 with a Tunnel Relay C. The connection between Tunnel Relay B and Tunnel Relay C may for example span multiple intervening forwarding nodes such as routers or gateways through the public network 52.

The Tunnel Relay C is physically connected with a second Firewall 58, which separates the public network 52 from a private network N2 60. The second Firewall 58 is physically connected with a Tunnel Server D 62 on the private network N2 60. During operation of the elements shown in Fig. 3, the Tunnel Server D 62 provides routing of IP packets between the tunnel connection with Tunnel Server A 46 and other stations on the private network N2 60. In this way the Tunnel Server D 62 acts as a router between the tunnel connection and the private network N2 60.

During operation of the elements shown in Fig. 3, the present system establishes a tunnel connection between the private network N1 48 and the private network N2 60. The embodiment of Fig. 3 thus eliminates the need for a dedicated physical cable or line to provide secure communications between the private network 48 and the private network 60. The tunnel connection between Tunnel Server A 46 and Tunnel Server D 62 is

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composed of reliable, pair-wise transport layer connections between Tunnel Server A 46 (node "A"), Tunnel Relay B 54 (node "B"), Tunnel Relay C 56 (node "C"), and Tunnel Server D 62 (node "D"). For example, such pair-wise connections may be individual transport layer connections between each node A and node B, node B and node C, and node C and node D. In an alternative embodiment, as will be described below, a tunnel connection may alternatively be formed between a standalone PC in a public network and a tunnel server within a private network.

Fig. 4 and Fig. 5 show an example embodiment of steps performed during establishment of the tunnel connection between Tunnel Server A 46 (node "A") and Tunnel Server D 62 (node "D") as shown in Fig. 3. Prior to the steps shown in Fig. 4, node A selects a tunnel path to reach node D. The tunnel path includes the tunnel end points and any intervening tunnel relays. The tunnel path is for example predetermined by a system administrator for node A. Each tunnel relay along the tunnel path is capable of finding a next node in the tunnel path, for example based on a provided next node name (or "next node arc"), using a predetermined naming convention and service, for example the Domain Name System (DNS) of the TCP/IP protocol suite.

During the steps shown in Fig. 4, each of the nodes A, B and C perform the following steps:

- resolve the node name of the next node in the tunnel path, for example as found in a tunnel relay frame:
- establish a reliable transport layer (TCP) connection to the next node in the tunnel path;
- forward the tunnel relay frame down the newly formed reliable transport layer connection to the next node in the tunnel path.

As shown for example in Fig. 4, at step 70 node A establishes a reliable transport layer connection with node B. At step 72 node A identifies the next downstream node to node B by sending node B a tunnel relay frame over the reliable transport layer connection between node A and node B. The tunnel relay frame contains a string buffer describing all the nodes along the tunnel path (see below description of an example tunnel relay frame format). At step 74, responsive to the tunnel relay frame from node A, node B searches the string buffer in the relay frame to determine if the string buffer includes node B's node name. If node B finds its node name in the string buffer, it looks at the next node name in the tunnel path.

Node B establishes a reliable transport layer connection with the next node in the tunnel path, for example node C. Node B further forms an association between the reliable transport layer connection between

Node A and Node B, over which the relay frame was received, and the newly formed reliable transport layer connection between Node B and Node C, and as a result forwards subsequent packets received over the reliable transport layer connection with Node A onto the reliable transport layer connection with Node C, and vice versa. At step 76 node B forwards the tunnel relay frame on the newly formed reliable transport layer connection to node C.

At step 78, responsive to the relay frame forwarded from node B, node C determines that the next node in the tunnel path is the last node in the tunnel path, and accordingly is a tunnel server. Node C may actively determine whether alternative tunnel servers are available to form the tunnel connection. Node C may select one of the alternative available tunnel servers to form the tunnel connection in order to provide load balancing or fault tolerance. As a result node C may form a transport layer connections with one of several available tunnel servers, for example a tunnel server that is relatively underutilized at the time the tunnel connection is established. In the example embodiment, node C establishes a reliable transport layer connection with the next node along the tunnel path, in this case node D.

Node C further forms an association between the reliable transport layer connection between Node B and Node C, over which the relay frame was received, and the newly formed reliable transport layer connection between Node C and Node D, and as a result forwards subsequent packets received over the reliable transport layer connection with Node B to the reliable transport layer connection with Node D, and vice versa. At step 80 node C forwards the relay frame to node D on the newly formed reliable transport layer connection.

Fig. 5 shows an example of tunnel end point authentication and sharing of key exchange material provided by the present system. The present system supports passing authentication data and key exchange material through the reliable transport layer connections previously established on the tunnel path. The following are provided by use of a key exchange/authentication REQUEST frame and a key exchange/authentication RESPONSE frame:

- a) mutual authentication of both endpoints of the tunnel connection;
- b) establishment of shared session encryption keys and key lifetimes for encrypting/authenticating subsequent data sent through the tunnel connection;
- d) agreement on a shared set of cryptographic transforms to be applied to subsequent data; and
- e) exchange of any other connection-specific data between the tunnel endpoints, for example strength and type of cipher to be used, any compression of the data to be used, etc. This data can also be used

by clients of this protocol to qualify the nature of the authenticated connection.

At step 90 a key exchange/authentication request frame is forwarded over the reliable transport layer connections formed along the tunnel path from node A to node D. At step 92, a key exchange/authentication response frame is forwarded from node D back to node A through the reliable transport layer connections. The attributes exchanged using the steps shown in Fig. 5 may be used for the lifetime of the tunnel connection. In an alternative embodiment the steps shown in Fig. 5 are repeated as needed for the tunnel end points to exchange sufficient key exchange material to agree upon a set of session parameters for use during the tunnel connection such as cryptographic keys, key durations, and choice of encryption/decryption algorithms.

Further in the disclosed system, the names used for authentication and access control with regard to node A and node D need not be the network layer address or physical address of the nodes. For example, in an alternative embodiment where the initiating node sending the tunnel relay frame is a stand-alone PC located within a public network, the user's name may be used for authentication and/or access control purposes. This provides a significant improvement over existing systems which base authorization on predetermined IP addresses.

Fig. 6 shows the format of an example embodiment of a tunnel relay frame. The tunnel frame formats shown in Figs. 6, 7, 8 and 9 are encapsulated within the data portion of a transport layer (TCP) frame when transmitted. Alternatively, another equivalent, connection-oriented transport layer protocol having guaranteed, insequence frame delivery may be used. The example TCP frame format, including TCP header fields, is conventional and not shown.

The field 100 contains a length of the frame. The field 102 contains a type of the frame, for example a type of RELAY. The field 104 contains a tunnel protocol version number. The field 106 contains an index into a string buffer field 112 at which a name of the originating node is located, for example a DNS host name of the node initially issuing the relay frame (node A in Fig. 3). The fields following the origin index field 106 contain indexes into the string buffer 112 at which names of nodes along the tunnel path are located. For example each index may be the offset of a DNS host name within the string buffer 112. In this way the field 108 contains the index of the name of the first node in the tunnel path, for example node B (Fig. 3). The field 110 contains the index of the name of the second node in the tunnel path, etc. The field 112 contains a string of node names of nodes in the tunnel path.

During operation of the present system, the initiating node, for example node A as shown in Fig. 3, transmits a tunnel relay frame such as the tunnel relay frame shown in Fig. 6. Node A sends the tunnel relay frame to

the first station along the tunnel path, for example node B (Fig. 3), over a previously established reliable transport layer connection. Node B searches the string buffer in the tunnel relay frame to find its node name, for example its DNS host name. Node B finds its node name in the string buffer indexed by path index 0, and then uses the contents of path index 1 110 to determine the location within the string buffer 112 of the node name of the next node along the tunnel path. Node B uses this node name to establish a reliable transport layer connection with the next node along the tunnel path. Node B then forwards the relay frame to the next node. This process continues until the end node of the tunnel route, for example tunnel server D 62 (Fig. 3) is reached.

Fig. 7 shows the format of an example embodiment of a key exchange/key authentication request frame. The field 120 contains a length of the frame. The field 122 contains a type of the frame, for example a type of REQUEST indicating a key exchange/key authentication request frame. The field 124 contains a tunnel protocol version number. The field 126 contains an offset of the name of the entity initiating the tunnel connection, for example the name of a user on the node originally issuing the request frame. This name and key exchange material in the request frame are used by the receiving tunnel end point to authenticate the exchange/authentication REQUEST. The name of the entity initiating the tunnel connection is also use to authorize any subsequent tunnel connection, based on predetermined security policies of the system. The field 128 contains an offset into the frame of the node name of the destination node, for example the end node of the tunnel shown as node D 62 in Fig. 3.

The field 130 contains an offset into the frame at which key exchange data as is stored, for example within the string buffer field 138. The key exchange data for example includes key exchange material used to determine a shared set of encryption parameters for the life of the tunnel connection such as cryptographic keys and any validity times associated with those keys. The key exchange data, as well as the field 132, further include information regarding any shared set of cryptographic transforms to be used and any other connection-specific parameters, such as strength and type of cipher to be used, type of compression of the data to be used, etc. The field 134 contains flags, for example indicating further information about the frame. The field 136 contains client data used in the tunnel end points to configure the local routing tables so that packets for nodes reachable through the virtual private network are sent through the pseudo network adapters. In an example embodiment, the string buffer 138 is encrypted using a public encryption key of the receiving tunnel end point.

During operation of the present system, one of the end nodes of the tunnel sends a key exchange/authentication REQUEST frame as shown in Fig. 7 to the other end node of the tunnel in order to perform key exchange and authentication as described in step 90 of Fig. 5.

Fig. 8 shows the format of an example embodiment of a key exchange/key authentication response frame, referred to as a connection RESPONSE frame. The field 150 contains a length of the frame. The field 152 contains a type of the frame, for example a type of connection RESPONSE indicating a key exchange/key authentication request frame. The field 154 contains a tunnel protocol version number.

The field 156 contains an offset into the frame at which key exchange data as is stored, for example within the string buffer field 163. The key exchange data for example includes key exchange material to be used for encryption/decryption over the life of the tunnel connection and any validity times associated with that key exchange material. The key exchange data, as well as the field 158, further includes information regarding any shared set of cryptographic transforms to be applied to subsequent data and any other connection-specific parameters, such as strength and type of cipher to be used, any compression of the data to be used, etc. The field 160 contains flags, for example indicating other information about the frame. The client data field 162 contains data used by the pseudo network adapters in the tunnel end points to configure the local routing tables so that packets for nodes in the virtual private network are sent through the pseudo network adapters. The string buffer includes key exchange material. The string buffer is for example encrypted using a public encryption key of the receiving tunnel end point, in the this case the initiator of the tunnel connection.

During operation of the present system, one of the end nodes of the tunnel sends a key exchange/authentication RESPONSE frame as shown in Fig. 7 to the other end node of the tunnel in order to perform key exchange and authentication as described in step 92 of Fig. 5.

Fig. 9 shows the format of an example embodiment of an tunnel data frame used to communicate through a tunnel connection. Fig. 9 shows how an IP datagram may be encapsulated within a tunnel frame by the present system for secure communications through a virtual private network. The field 170 contains a length of the frame. The field 172 contains a type of the frame, for example a type of DATA indicating a tunnel data frame. The field 174 contains a tunnel protocol version number.

The fields 176, 178 and 182 contain information regarding the encapsulated datagram. The field 180 contains flags indicating information regarding the frame. The field 184 contains a value indicating the length of the optional padding 189 at the end of the frame. The frame format allows for optional padding in the event that the amount of data in the frame needs to be padded to an even block boundary for the purpose of being encrypted using a block cipher. The field 186 contains a value indicating the length of the digest field 187.

The data frame format includes a digital signature generated by the transmitting tunnel end point referred

to as a "digest". The value of the digest ensures data integrity, for example by detecting invalid frames and replays of previously transmitted valid frames. The digest is the output of a conventional keyed cryptographic hash function applied to both the encapsulated datagram 190 and a monotonically increasing sequence number. The resulting hash output is passed as the value of the digest field 187. The sequence number is not included in the data frame. In the example embodiment, the sequence number is a counter maintained by the transmitter (for example node A in Fig. 3) of all data frames sent to the receiving node (for example node D in Fig. 3) since establishment of the tunnel connection.

In order to determine if the data frame is invalid or a duplicate, the receiving node decrypts the encapsulated datagram 190, and applies the keyed cryptographic hash function (agreed to by the tunnel end nodes during the steps shown in Fig. 5) to both the decrypted encapsulated datagram and the value of a counter indicating the number of data frames received from the transmitter since establishment of the tunnel connection. For example the keyed hash function is applied to the datagram concatenated to the counter value. If the resulting hash output matches the value of the digest field 187, then the encapsulated datagram 190 was received correctly and is not a duplicate. If the hash output does not match the value of the digest field 187, then the integrity check fails, and the tunnel connection is closed. The field 188 contains an encrypted network layer datagram, for example an encrypted IP datagram.

The encapsulated datagram may be encrypted using various encryption techniques. An example embodiment of the present system advantageously encrypts the datagram 190 using either a stream cipher or cipher block chaining encryption over all data transmitted during the life of the tunnel connection. This is enabled by the reliable nature of the transport layer connections within the tunnel connection. The specific type of encryption and any connection specific symmetric encryption keys used is determined using the steps shown in Fig. 5. The fields in the tunnel data frame other than the encapsulated datagram 188 are referred to as the tunnel data frame header fields.

Fig. 10 is a block diagram showing an example embodiment of a "close connection" frame. The field 190 contains the length of the frame. The field 191 contains a frame type, for example having a value equal to CLOSE. Field 192 contains a value equal to the current protocol version number of the tunnel protocol. The field 193 contains a status code indicating the reason the tunnel connection is being closed.

During operation of the present system, when end point of a tunnel connection determines that the tunnel connection should be closed, a close connection frame as shown in Fig. 10 is transmitted to the other end point of the tunnel connection. When a close connection close frame is received, the receiver closes the tunnel

connection and no further data will be transmitted or received through the tunnel connection.

Fig. 11 is a state diagram showing an example embodiment of forming a tunnel connection in a node initiating a tunnel connection. In Fig. 11, Fig. 12, and Fig. 13, states are indicated by ovals and actions or events are indicated by rectangles. For example the tunnel server node A as shown in Fig. 3 may act as a tunnel connection initiator when establishing a tunnel connection with the tunnel server node D. Similarly the client system 247 in Fig. 14 may act as a tunnel connection initiator when establishing a tunnel connection with the tunnel server. The tunnel initiator begins in an idle state 194. Responsive to an input from a user indicating that a tunnel connection should be established, the tunnel initiator transitions from the idle state 194 to a TCP Open state 195. In the TCP Open state 195, the tunnel initiator establishes a reliable transport layer connection with a first node along the tunnel path. For example, the tunnel initiator opens a socket interface associated with a TCP connection to the first node along the tunnel path. In Fig. 3 node A opens a socket interface associated with a TCP connection with node B.

Following establishment of the reliable transport layer connection in the TCP Open state 195, the tunnel initiator enters a Send Relay state 197. In the Send Relay state 197, the tunnel initiator transmits a relay frame at 198 over the reliable transport layer connection. Following transmission of the relay frame, the tunnel initiator enters the connect state 199. If during transmission of the relay frame there is a transmission error, the tunnel initiator enters the Network Error state 215 followed by the Dying state 208. In the Dying state 208, the tunnel initiator disconnects the reliable transport layer connection formed in the TCP Open state 195, for example by disconnecting a TCP connection with Node B. Following the disconnection at 209, the tunnel initiator enters the Dead state 210. The tunnel initiator subsequently transitions back to the Idle state 194 at a point in time predetermined by system security configuration parameters.

In the Connect state 199, the tunnel initiator sends a key exchange/authentication REQUEST frame at 200 to the tunnel server. Following transmission of the key exchange/authentication REQUEST frame 200, the tunnel initiator enters the Response Wait state 201. The tunnel initiator remains in the Response Wait state 201 until it receives a key exchange/authentication RESPONSE frame 202 from the tunnel server. After the key exchange/authentication RESPONSE frame is received at 202, the tunnel initiator enters the Authorized state 203, in which it may send or receive tunnel data frames. Upon receipt of a CLOSE connection frame at 216 in the Authorized state 203, the tunnel initiator transitions to the Dying state 208.

Upon expiration of a session encryption key at 211, the tunnel initiator enters the Reconnect state 212, and sends a CLOSE connection frame at 213 and discon-

nects the TCP connection with the first node along the tunnel path at 214. Subsequently the tunnel initiator enters the TCP Open state 195.

If during the authorized state 203, a local user issues an End Session command at 204, or there is a detection of an authentication or cryptography error in a received data frame at 205, the tunnel initiator enters the Close state 206. During the Close state 206 the tunnel initiator sends a CLOSE connection frame at 207 to the tunnel server. The tunnel initiator then enters the Dying state at 208.

Figure 12 is a state diagram showing the states within an example embodiment of a tunnel server, for example node D in Fig. 3 or tunnel server 253 in Fig. 14. The tunnel server begins in an Accept Wait state 217. In the Accept Wait state 217, the tunnel server receives a request for a reliable transport layer connection, for example a TCP connection reguest 218 from the last node in the tunnel path prior to the tunnel server, for example Node C in Fig. 3. In response to a TCP connection request 218 the tunnel server accepts the request and establishes a socket interface associated with the resulting TCP connection with Node C.

Upon establishment of the TCP connection with the last node in the tunnel path prior to the tunnel server, the tunnel server enters the Receive Relay state 219. In the Receive Relay state 219, the tunnel server waits to receive a relay frame at 220, at which time the tunnel server enters the Connect Wait state 221. If there is some sort of network error 234 during receipt of the relay frame at 219, the tunnel server enters the Dying state 230. During the Dying state 230 the tunnel server disconnects at 231 the transport layer connection with the last node in the tunnel path prior to the tunnel server. After disconnecting the connection, the tunnel server enters the Dead state 232.

In the Connect Wait state 221, the tunnel server waits for receipt of a key exchange/authentication REQUEST frame at 222. Following receipt of the key exchange/authentication REQUEST frame at 222, the tunnel server determines whether the requested tunnel connection is authorized at step 223. The determination of whether the tunnel connection is authorized is based on a name of the tunnel initiator, and the key exchange material within the key exchange/authentication REQUEST frame.

If the requested tunnel connection is authorized the tunnel server sends a key exchange/authentication RESPONSE frame at 224 back to the tunnel initiator. If the requested tunnel connection is not authorized, the tunnel server enters the Close state 228, in which it sends a close connection frame at 229 to the tunnel client. Following transmission of the CLOSE connection frame at 229, the tunnel server enters the Dying state 230.

If the requested tunnel connection is determined to be authorized at step 223, the tunnel server enters the Authorized state 225. In the Authorized state, the tunnel server transmits and receives tunnel data frames between itself and the tunnel initiator. If during the Authorized state 225, the tunnel server receives a CLOSE connection frame at 233, the tunnel server transitions to the Dying state 230. If during the authorized state 225, the tunnel server receives an end session command from a user at 226, then the tunnel server transitions to the Close state 228, and transmits a close connection frame at 229 to the tunnel initiator. If the tunnel server in the Authorized state 225 detects an integrity failure in a received packet, the tunnel server transitions to the Close state 228. In the close state 228 the tunnel server sends a CLOSE connection frame at 229 and subsequently enters the Dying state 230.

Fig. 13 is a state diagram showing an example embodiment of a state machine within a tunnel relay node. The tunnel relay node begins in an Accept Wait state 235. When a request is received to form a reliable transport layer connection at 236, a reliable transport layer connection is accepted with the requesting node. For example, a TCP connection is accepted between the relay node and the preceding node in the tunnel path.

The relay node then transitions to the Receive Relay state 237. During the Receive Relay state 237, the relay node receives a relay frame at 238. Following receipt of the relay frame at 238, the relay node determines what forwarding address should be used to forward frames received from the TCP connection established responsive to the TCP connect event 236. If the next node in the tunnel path is a tunnel server, the forwarding address may be selected at 239 so as to choose an underutilized tunnel server from a group of available tunnel servers or to choose an operational server where others are not operational.

Following determination of the forwarding address or addresses in step 239, the relay node enters the Forward Connect state 240. In the Forward Connect state 240, the relay node establishes a reliable transport layer connection with the node or nodes indicated by the forwarding address or addresses determined in step 239.

Following establishment of the new connection at event 241, the tunnel relay enters the Forward state 242. During the Forward state 242, the relay node forwards all frames between the connection established at 236 and those connections established at 241. Upon detection of a network error or receipt of a frame indicating a closure of the tunnel connection at 243, the tunnel relay enters the Dying state 244. Following the Dying state 244, the relay node disconnects any connections established at event 241. The relay node then enters the Dead state 246.

Fig. 14 shows an example embodiment of a virtual private network 249 formed by a pseudo network adapter 248 and a tunnel connection between a tunnel client 247 and a tunnel server 253 across a public network 251. The tunnel server 253 and tunnel client 247 are for example network stations including a CPU or

microprocessor, memory, and various I/O devices. The tunnel server 253 is shown physically connected to a private LAN 256 including a Network Node 1 257 and a Network Node 2 258, through a physical network adapter 254. The tunnel server 253 is further shown physically connected with a firewall 252 which separates the private LAN 256 from the public network 251. The firewall 252 is physically connected with the public network 251. The tunnel server 253 is further shown including a pseudo network adapter 255. The client system 247 is shown including a physical network adapter 250 physically connected to the public network 251.

During operation of the elements shown in Fig. 14, nodes within the virtual private network 249 appear to the tunnel client 247 as if they were physically connected to the client system through the pseudo network adapter 248. Data transmissions between the tunnel client and any nodes that appear to be within the virtual private network are passed through the pseudo network adapter 248. Data transmissions between the tunnel client 247 and the tunnel server 253 are physically accomplished using a tunnel connection between the tunnel client 247 and the tunnel server 253.

Fig. 15 shows elements in an example embodiment of a pseudo network adapter such as the pseudo network adapter 248 in Fig. 14. In an example embodiment the elements shown in Fig. 15 are implemented as software executing on the tunnel client 247 as shown in Fig. 14. In Fig. 15 there is shown a pseudo network adapter 259 including a virtual adapter driver interface 263, an encapsulation engine 264, an encryption engine 265, a decapsulation engine 268, and a decryption engine 266. Further shown in the pseudo network adapter 259 are an ARP server emulator 270 and a Dynamic Host Configuration Protocol (DHCP) server emulator.

The pseudo network adapter 259 is shown interfaced to a TCP/IP protocol stack 260, through the virtual adapter driver interface 260. The TCP/IP protocol stack 260 is shown interfaced to other services in an operating system 261, as well as a physical network adapter's driver 262. The physical network adapter's driver 262 is for example a device driver which controls the operation of a physical network adapter such as physical network adapter 250 as shown in Fig. 14.

During operation of the elements shown in Fig. 15, the pseudo network adapter 259 registers with the network layer in the TCP/IP stack 260 that it is able to reach the IP addresses of nodes within the virtual private network 249 as shown in Fig. 14. For example, the pseudo network adapter on the client system registers that it can reach the pseudo network adapter on the server. Subsequently, a message from the tunnel client addressed to a node reachable through the virtual private network will be passed by the TCP/IP stack to the pseudo network adapter 259. The pseudo network adapter 259 then encrypts the message, and encapsulates the message into a tunnel data frame. The pseudo network adapter 259 then passes the tunnel data frame

back to the TCP/IP protocol stack 260 to be sent through to the physical network adapter in the tunnel server. The tunnel server passes the received data frame to the pseudo network adapter in the server, which de-encapsulates and decrypts the message.

Fig. 16 shows a more detailed example embodiment of a pseudo network adapter 280. The pseudo network adapter 280 includes a virtual network adapter driver interface 288. The transmit path 290 includes an encryption engine 292, and an encapsulation engine 294. The encapsulation engine 294 is interfaced with a TCP/IP transmit interface 312 within a TCP/IP protocol stack, for example a socket interface associated with the first relay node in the tunnel path, or with the remote tunnel end point if the tunnel path includes no relays.

In the example embodiment of Fig. 16, the pseudo network adapter 280 appears to the TCP/IP protocol stack 282 as an Ethernet adapter. Accordingly, ethernet packets 286 for a destination addresses understood by the TCP/IP protocol stack to be reachable through the virtual private network are passed from the TCP/IP protocol stack 282 to the virtual network adapter interface 288 and through the transmit path 290. Similarly, ethernet packets 284 received through the pseudo network adapter 280 are passed from the receive path 296 to the virtual network adapter interface 288 and on to the TCP/IP protocol stack 282.

Further shown in the pseudo network adapter 280 of Fig. 16 is a receive path 296 having a decryption engine 298 interfaced to the virtual network adapter interface 288 and a decapsulation engine 300. The decapsulation engine 300 in turn is interfaced to a TCP/IP receive function 314 in the TCP/IP protocol stack 282, for example a socket interface associated with the first relay in the tunnel path, or with the remote tunnel end point if the tunnel path includes no relays. The pseudo network adapter 280 further includes an ARP server emulator 304 and a DHCP server emulator 306. ARP and DHCP request packets 302 are passed to the ARP server emulator 304 and DHCP server emulator 306 respectively. When a received packet is passed from the receive path 296 to the TCP/IP stack 282, a receive event must be indicated to the TCP/IP stack 282, for example through an interface such the Network Device Interface Specification (NDIS), defined by Microsoft™ Corporation.

Also in Fig. 16 is shown is an operating system 310 coupled with the TCP/IP protocol stack 282. The TCP/IP protocol stack 282 is generally considered to be a component part of the operating system. The operating system 310 in Fig. 16 is accordingly the remaining operating system functions and procedures outside the TCP/IP protocol stack 282. A physical network adapter 308 is further shown operated by the TCP/IP protocol stack 282.

During operation of the elements shown in Fig. 16, a user passes data for transmission to the TCP/IP protocol stack 282, and indicates the IP address of the

node to which the message is to be transmitted, for example through a socket interface to the TCP layer. The TCP/IP protocol stack 282 then determines whether the destination node is reachable through the virtual private network. If the message is for a node that is reachable through the virtual private network, the TCP/IP protocol stack 282 an ethernet packet 286 corresponding to the message to the pseudo network adapter 280. The pseudo network adapter 280 then passes the ethernet packet 286 through the transmit path, in which the ethernet packet is encrypted and encapsulated into a tunnel data frame. The tunnel data frame is passed back into the TCP/IP protocol stack 282 through the TCP/IP transmit function 312 to be transmitted to the tunnel server through the tunnel connection. In an example embodiment, a digest value is calculated for the tunnel data frame before encryption within the transmit path within the pseudo network adapter.

Further during operation of the elements shown in Fig. 16, when the TCP/IP protocol stack 282 receives a packet from the remote endpoint of the TCP/IP tunnel connection, for example the tunnel server, the packet is passed to the pseudo network adapter 280 responsive to a TCP receive event. The pseudo network adapter 280 then decapsulates the packet by removing the tunnel header. The pseudo network adapter further decrypts the decapsulated data and passes it back to the TCP/IP protocol stack 282. The data passed from the pseudo network adapter 280 appears to the TCP/IP protocol stack 282 as an ethernet packet received from an actual physical device, and is the data it contains is passed on to the appropriate user by the TCP/IP protocol stack 282 based on information in the ethernet packet header provided by the pseudo network adapter.

Fig. 17 is a flow chart showing steps performed by an example embodiment of a pseudo network adapter during packet transmission, such as in the transmit path 290 of Fig. 14. The TCP/IP protocol stack determines that the destination node of a packet to be transmitted is reachable through the virtual LAN based on the destination IP address of the packet and a network layer routing table. At step 320 the packet is passed to the pseudo network adapter from the TCP/IP protocol stack. As a result, a send routine in the pseudo adapter is triggered for example in the virtual network adapter interface 288 of Fig. 16.

At step 322 the pseudo network adapter send routine processes the Ethernet header of the packet provided by the TCP/IP stack, and removes it. At step 324, the send routine determines whether the packet is an ARP request packet. If the packet is an ARP request packet for an IP address of a node on the virtual LAN, such as the pseudo network adapter of the tunnel server, then step 324 is followed by step 326. Otherwise, step 324 is followed by step 330.

At step 326, the ARP server emulator in the pseudo network adapter generates an ARP reply packet. For example, if the ARP request were for a physical address corresponding to the IP address of the pseudo network adapter on the tunnel server, the ARP reply would indicate a predetermined, reserved physical address to be associated with that IP address. At step 328 the pseudo network adapter passes the ARP response to the virtual network adapter interface. The virtual network adapter interface then indicates a received packet to the TCP/IP protocol stack, for example using an NDIS interface. The TCP/IP protocol stack then processes the ARP response as if it had been received over an actual physical network.

At step 330 the send routine determines whether the packet is a DHCP request packet requesting an IP address for the pseudo network adapter. If so, then step 330 is followed by step 332. Otherwise, step 330 is followed by step 334.

At step 334, the DHCP server emulator in the pseudo network adapter generates a DHCP response. The format of DHCP is generally described in the DHCP RFC. At step 328 the pseudo network adapter passes the DHCP response to the virtual network adapter interface, for example indicating an IP address received from the tunnel server in the client data field of the key exchange/authentication RESPONSE frame. The virtual network adapter interface then indicates a received packet to the TCP/IP protocol stack. The TCP/IP protocol stack then processes the DHCP response as if it had been received over an actual physical network.

At step 334 the pseudo network adapter encrypts the message using an encryption engine such that only the receiver is capable of decrypting and reading the message. At step 336 the pseudo network adapter encapsulates the encrypted message into a tunnel data frame. At step 338 the pseudo network adapter transmits the tunnel data frame through the tunnel connection using the TCP/IP protocol stack.

Fig. 18 is a flow chart showing steps performed by an example embodiment of a pseudo network adapter during packet receipt, such as in the receive path 296 of Fig. 14.

At step 350, the pseudo network adapter is notified that a packet has been received over the tunnel connection. At step 352 the pseudo network adapter decapsulates the received message by removing the header fields of the tunnel data frame. At step 354 the pseudo network adapter decrypts the decapsulated datagram from the tunnel data frame. At step 356, in an example embodiment, the pseudo network adapter forms an Ethernet packet from the decapsulated message. At step 358 the pseudo network adapter indicates that an Ethernet packet has been received to the TCP/IP protocol stack through the virtual network adapter interface. This causes the TCP/IP protocol stack to behave as if it had received an Ethernet packet from an actual Ethernet adapter.

Fig. 19 shows the data flow within the transmit path in an example embodiment of a pseudo network adapter. At step 1 370, an application submits data to be

transmitted to the TCP protocol layer 372 within the TCP/IP protocol stack. The application uses a conventional socket interface to the TCP protocol layer 372 to pass the data, and indicates the destination IP address the data is to be transmitted to. The TCP protocol layer 372 then passes the data to the IP protocol layer 374 within the TCP/IP protocol stack. At step 2 376, the TCP/IP protocol stack refers to the routing table 378 to determine which network interface should be used to reach the destination IP address.

Because in the example the destination IP address is of a node reachable through the virtual private network, the IP layer 374 determines from the routing table 378 that the destination IP address is reachable through pseudo network adapter. Accordingly at step 3 380 the TCP/IP protocol stack passes a packet containing the data to the pseudo network adapter 382.

At step 4 384, the pseudo network adapter 382 encrypts the data packets and encapsulates them into tunnel data frames.

The pseudo network adapter 382 then passes the tunnel data frames packets back to the TCP protocol layer 372 within the TCP/IP protocol stack through a conventional socket interface to the tunnel connection with the first node in the tunnel path.

The TCP protocol layer 372 then forms a TCP layer packet for each tunnel data frame, having the tunnel data frame as its data. The TCP frames are passed to the IP layer 374. At step 5 386 the routing table 378 is again searched, and this time the destination IP address is the IP address associated with the physical network adapter on the tunnel server, and accordingly is determined to be reachable over the physical network adapter 390. Accordingly at step 6 388 the device driver 390 for the physical network adapter is called to pass the packets to the physical network adapter. At step 7 392 the physical network adapter transmits the data onto the physical network 394.

Fig. 20 is a data flow diagram showing data flow in an example embodiment of packet receipt involving a pseudo network adapter. At step 1 410 data arrives over the physical network 412 and is received by the physical network adapter and passed to the physical network driver 414. The physical network driver 414 passes the data at step 2 418 through the IP layer 420 and TCP layer 422 to the pseudo network adapter 426 at step 3 424, for example through a conventional socket interface. At step 4 428 the pseudo network adapter 426 decrypts and decapsulates the received data and passes it back to the IP layer of the TCP/IP protocol stack, for example through the TDI (Transport Layer Dependent Interface API) of the TCP/IP stack. The data is then passed through the TCP/IP protocol stack and to the user associated with the destination IP address in the decapsulated datagrams at step 5 430.

Fig. 21 shows data flow in an example embodiment of packet transmission involving a pseudo network adapter. Fig. 21 shows an example embodiment for use

on a Microsoft<sup>™</sup> Windows 95<sup>™</sup> PC platform. In Fig. 21 a user application 450 passes unencrypted data to an interface into the TCP layer of the TCP/IP protocol, for example the WinSock API 452. The user indicates a destination IP address associated with a node reachable through a virtual private network accessible through the pseudo network adapter.

The TCP layer 454 passes the data to the IP layer 456, which in turn passes the data to the Network Device Interface Specification Media Access Control (NDIS MAC) interface 458. The pseudo network adapter 459 has previously registered with the routing layer (IP) that it is able to reach a gateway address associated with the destination IP address for the user data. Accordingly the IP layer uses the NDIS MAC layer interface to invoke the virtual device driver interface 460 to the pseudo network adapter 459. The pseudo network adapter 459 includes a virtual device driver interface 460, an ARP server emulator 462, and a DHCP server emulator 464.

In the example embodiment of Fig. 19, the pseudo network adapter 459 passes the data to a tunnel application program 466. The tunnel application program 466 encrypts the IP packet received from the IP layer and encapsulates it into a tunnel data frame. The tunnel application then passes the tunnel data frame including the encrypted data to the WinSock interface 452, indicating a destination IP address of the remote tunnel end point. The tunnel data frame is then passed through the TCP layer 454, IP layer 456, NDIS MAC layer interface 458, and physical layer 468, and transmitted on the network 470. Since the resulting packets do not contain a destination IP address which the pseudo network adapter has registered to convey, these packets will not be diverted to the pseudo network adapter.

Fig. 22 is a data flow diagram showing data flow in an example embodiment of packet transmission involving a pseudo network adapter. The embodiment shown in Fig. 22 is for use on a UNIX platform. In Fig. 20 a user application 472 passes unencrypted data to a socket interface to the TCP/IP protocol stack in the UNIX socket layer 474, indicating a destination IP address of a node reachable through the virtual private network.

The UNIX socket layer 474 passes the data through the TCP layer 476 and the IP layer 478. The pseudo network adapter 480 has previously registered with the routing layer (IP) that it is able to reach a gateway associated with the destination IP address for the user data. Accordingly the IP layer 478 invokes the virtual device driver interface 482 to the pseudo network adapter 480. The IP layer 478 passes the data to the pseudo network adapter 480. The pseudo network adapter 480 includes a virtual device driver interface 482, and a DHCP server emulator 484.

In the example embodiment of Fig. 22, the pseudo network adapter 480 passes IP datagrams to be transmitted to a UNIX Daemon 486 associated with the tunnel connection. The UNIX Daemon 486 encrypts the IP packet(s) received from the IP layer 478 and encapsulates them into tunnel data frames. The UNIX Daemon 486 then passes the tunnel data frames to the UNIX socket layer 474, through a socket associated with the tunnel connection. The tunnel data frames are then processed by the TCP layer 476, IP layer 478, data link layer 488, and physical layer 490 to be transmitted on the network 492. Since the resulting packets are not addressed to an IP address which the pseudo network adapter 480 has registered to convey, the packets will not be diverted to the pseudo network adapter 480.

Fig. 23 is a flow chart showing steps to initialize a example embodiment of a virtual private network. The steps shown in Fig. 23 are performed for example in the tunnel client 247 as shown in Fig. 14. At step 500 a tunnel application program executing in the tunnel client sends a tunnel relay frame to the tunnel server. At step 502 the tunnel application program sends a tunnel key exchange/authentication REQUEST frame to the tunnel server. The tunnel application in the tunnel server ignores the contents of the client data field in the tunnel key exchange/authentication REQUEST frame. The tunnel application in the tunnel server fills in the client data field in the tunnel key exchange/authentication RESPONSE frame with Dynamic Host Configuration Protocol (DHCP) information, for example including the following information in standard DHCP format:

- 1) IP Address for tunnel client Pseudo Network Adapter
- 2) IP Address for tunnel server Pseudo Network Adapter
- 3) Routes to nodes on the private network physically connected to the tunnel server which are to be reachable over the tunnel connection.

At step 504 the tunnel application receives a tunnel key exchange/authentication RESPONSE frame from the tunnel server. The client data field 508 in the tunnel connection response is made available to the pseudo network adapter in the tunnel client. The tunnel application in the tunnel client tells the TCP/IP stack that the pseudo network adapter in the tunnel client is active. The pseudo network adapter in the tunnel client is active and ready to be initialized at step 510.

The tunnel client system is configured such that it must obtain an IP address for the tunnel client pseudo network adapter dynamically. Therefore the TCP/IP stack in the tunnel client broadcasts a DHCP request packet through the pseudo network adapter. Accordingly, at step 512 the pseudo network adapter in the client receives a conventional DHCP request packet from the TCP/IP stack requesting a dynamically allocated IP address to associate with the pseudo network adapter. The pseudo network adapter passes the DHCP request packet to the DHCP server emulator within the pseudo network adapter, which forms a DHCP response based on the client data 508 received from the tunnel applica-

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tion. The DHCP response includes the IP address for the client pseudo adapter provided by the tunnel server in the client data. At step 514 the pseudo network adapter passes the DHCP response to the TCP/IP stack.

At step 520, the tunnel application modifies the routing tables within the tunnel client TCP/IP stack to indicate that the routes to the nodes attached to the private network to which the tunnel server is attached all are reachable only through the pseudo network adapter in the tunnel server. The IP address of the pseudo network adapter in the tunnel server provided in the client data is in this way specified as a gateway to the nodes on the private network to which the tunnel server is attached. In this way those remote nodes are viewed by the TCP/IP stack as being reachable via the virtual private network through the client pseudo network adapter.

At step 516 the pseudo network adapter in the tunnel client receives an ARP request for a physical address associated with the IP address of the pseudo network adapter in the tunnel server. The pseudo network adapter passes the ARP request to the ARP server emulator, which forms an ARP reply indicating a reserved physical address to be associated with the IP address of the pseudo network adapter in the tunnel server. At step 518 the pseudo network adapter passes the ARP response to the TCP/IP stack in the tunnel client. In response to the ARP response, the TCP/IP stack determines that packets addressed to any node on the virtual private network must be initially transmitted through the pseudo network adapter.

In an example embodiment the present system reserves two physical addresses to be associated with the pseudo network adapter in the client and the pseudo network adapter in the server respectively. These reserved physical addresses are used in responses to ARP requests passed through the pseudo network adapter for physical addresses corresponding to the IP addresses for the pseudo network adapter in the client and the pseudo network adapter in the server respectively. The reserved physical addresses should have a high likelihood of not being used in any actual network interface.

While the invention has been described with reference to specific example embodiments, the description is not meant to be construed in a limiting sense. Various modifications of the disclosed embodiments, as well as other embodiments of the invention, will be apparent to persons skilled in the art upon reference to this description. Specifically, while various embodiments have been described using the TCP/IP protocol stack, the invention may advantageously be applied where other communications protocols are used. Also, while various flow charts have shown steps performed in an example order, various implementations may use altered orders of step in order to apply the invention. And further, while certain specific software and/or hardware platforms

have been used in the description, the invention may be applied on other platforms with similar advantage. It is therefore contemplated that the appended claims will cover any such modifications or embodiments which fall within the scope of the invention.

#### Claims

 A pseudo network adapter providing a virtual private network, comprising:

an interface for capturing packets from a local communications protocol stack for transmission on said virtual private network, said interface appearing to said local communications protocol stack as a network adapter device driver for a network adapter connected to said virtual private network;

a first server emulator, providing a first reply packet responsive to a first request packet captured by said interface for capturing packets from said local communications protocol stack for transmission on said virtual private network, said first request packet requesting a network layer address for said pseudo network adapter, said first reply indicating a network layer address for said pseudo network adapter; and a second server emulator, providing a second reply packet responsive to an second request packet captured by said interface for capturing packets from said local communications protocol stack for transmission on said virtual private network, said second request packet requesting a physical address corresponding to a network layer address of a second pseudo network adapter, said second pseudo network adapter located on a remote server node, said second reply indicating a predetermined, reserved physical address.

- 2. The pseudo network adapter of claim 1, further comprising a means for indicating to said local communications protocol stack that said predetermined, reserved physical address is reachable through said pseudo network adapter, wherein said means for indicating modifies a data structure in said local communications protocol stack indicating which nodes or networks are reachable through each network interface of the local system.
- 3. The pseudo network adapter of claim 1, further comprising a means for indicating to said local communications protocol stack that one or more nodes on a remote private network connected to said remote server node are reachable through a gateway node equal to said second pseudo network adapter on said remote server node.

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- 4. The pseudo network adapter of claim 1, further comprising:
  - a transmit path for processing data packets captured by said interface for capturing packets 5 from said local communications protocol stack for transmission on said virtual private network; an encryption engine, within said transmit path, for encrypting said data packets;
  - an encapsulation engine, within said transmit 10 path, for encapsulating said encrypted data packets into tunnel data frames; and
  - a means for passing said tunnel data frames back to said local communications protocol stack for transmission to a physical network 15 adapter on said remote server node.
- 5. The pseudo network adapter of claim 4, wherein said transmit path further includes means for storing a digest value in a digest field in each of said tunnel data frames, said digest value equal to an output of a keyed hash function applied to said data packet encapsulated within said tunnel data frame concatenated with a counter value equal to a total number of tunnel data frames previously transmitted to said remote server node.
- 6. The pseudo network adapter of claim 4, wherein said transmit path further includes means for processing an Ethernet header in each one of said captured data packets, said processing of said Ethernet header including removing said Ethernet header.
- 7. The pseudo network adapter of claim 1, further 35 comprising:
  - an interface into a transport layer of said local communications protocol stack for capturing received data packets from said remote server 40 node.
- 8. The pseudo network adapter of claim 7, further comprising:
  - a receive path for processing received data packets captured by said interface into said transport layer of said local communications protocol stack for capturing received data packets from said remote server node;
  - an decapsulation engine, within said receive path, for decapsulating said received data packets by removing a tunnel frame header; an decryption engine, within said receive path, for decrypting said received data packets; and a means for passing said received data packets back to said local communications protocol stack for delivery to a user.

 A method for providing a pseudo network adapter for a virtual private network, comprising the steps of:

capturing packets from a local communications protocol stack for transmission on said virtual private network, said capturing through an interface appearing to said local communications stack as a network adapter device driver for a network adapter connected to said virtual private network;

issuing a first reply packet responsive to a first request packet captured by said interface for capturing packets from said local communications protocol stack for transmission on said virtual private network, said first request packet requesting a network layer address for said pseudo network adapter, said first reply indicating a network layer address for said pseudo network adapter; and

issuing a second reply packet responsive to a second request packet captured by said interface for capturing packets from said local communications protocol stack for transmission on said virtual private network, said second request packet requesting a physical address corresponding to a network layer address of a second pseudo network adapter, said second pseudo network adapter located on a remote server node, said ARP Reply indicating a predetermined, reserved physical address.

- 10. The method of claim 9, further comprising indicating to said local communications protocol stack that said predetermined, reserved physical address is reachable through said pseudo network adapter, wherein said step of indicating to said local communications protocol stack modifies a data structure in said local communications protocol stack indicating which nodes or networks are reachable through each network interface of the local system.
- 11. The method of claim 9, further comprising indicating to said local communications protocol stack that one or more nodes on a remote private network connected to said remote server node are reachable through a gateway node equal to said second pseudo network adapter on said remote server node, wherein said step of indicating to said local communications protocol stack that one or more nodes on said remote private network connected to said remote server node are reachable through a gateway node equal to said second pseudo network adapter on said remote server node modifies a network layer routing table in said local communications protocol stack.
- 12. The method of claim 9, further comprising:

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processing data packets captured by said interface for capturing packets from said local communications protocol stack for transmission on said virtual private network in a transmit data path;

encrypting said data packets in an encryption engine, within said transmit path; encapsulating said encrypted data packets into tunnel data frames by an encapsulation engine, within said transmit path; and

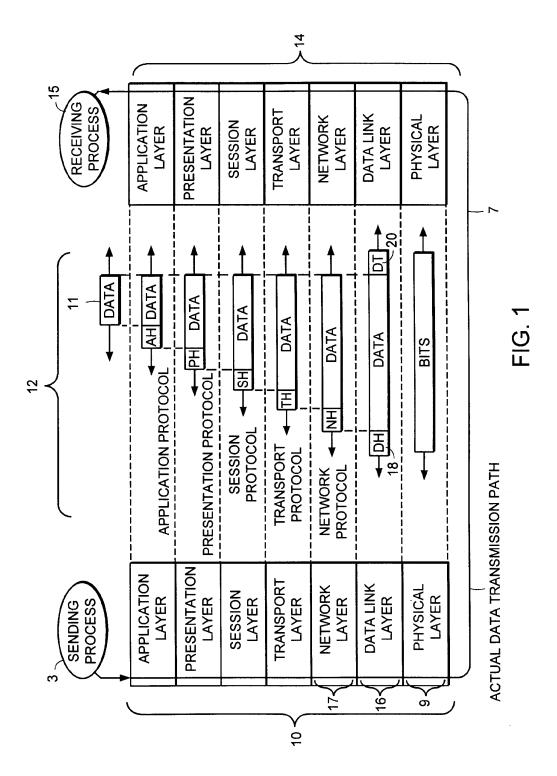
passing said tunnel data frames back to said local communications protocol stack for transmission to a physical network adapter on said remote server node, wherein said transmit path further includes storing a digest value in a digest field in each of said tunnel data frames, said digest value equal to an output of a keyed hash function applied to said data packet encapsulated within said tunnel data frame concatenated with a counter value equal to a 20 total number of tunnel data frames previously transmitted to said remote server node.

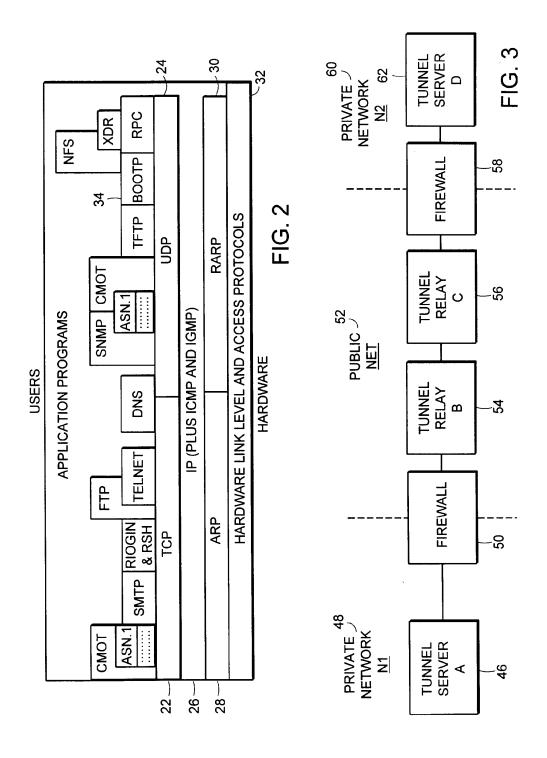
- 13. The method of claim 12, wherein said transmit path further includes processing an Ethernet header in 25 each one of said captured data packets, said processing of said Ethernet header including removing said Ethernet header.
- 14. The method of claim 9, further comprising capturing received data packets from said remote server node through an interface into a transport layer of said local communications protocol stack, further comprising:

processing received data packets captured by said interface into said transport layer of said local communications protocol stack for capturing received data packets from said remote server node in a receive path; decapsulating said received data packets by removing a tunnel frame header in an decapsulation engine, within said receive path; decrypting said received data packets in a decryption engine within said receive path; and 45 passing said received data frames packets back to said local communications protocol stack for delivery to a user.

15. The method of claim 9, wherein said network layer address for said pseudo network adapter and said predetermined, reserved physical address is communicated to said pseudo network adapter from said remote server node as client data in a connection response frame.

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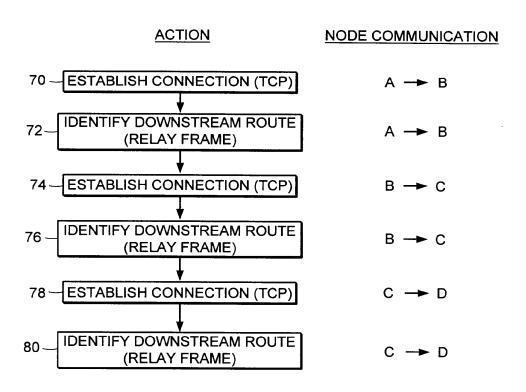


FIG. 4

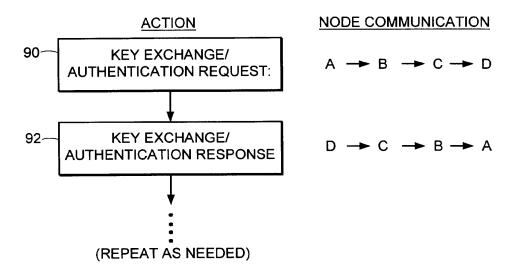


FIG. 5

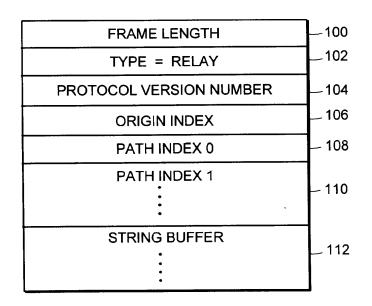


FIG. 6

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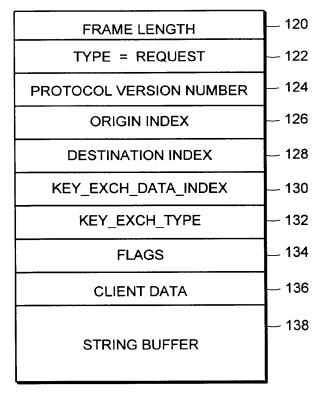


FIG. 7

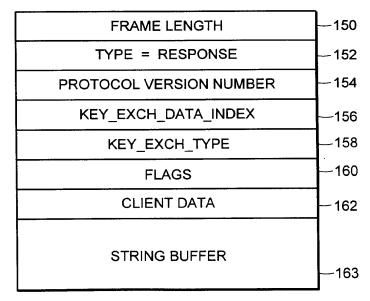


FIG. 8

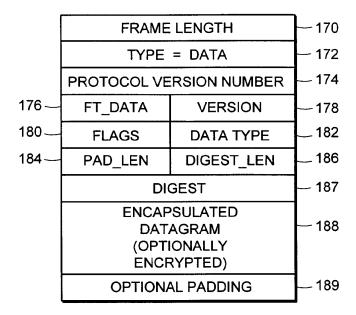


FIG. 9

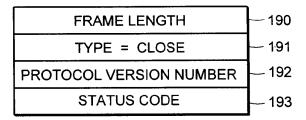
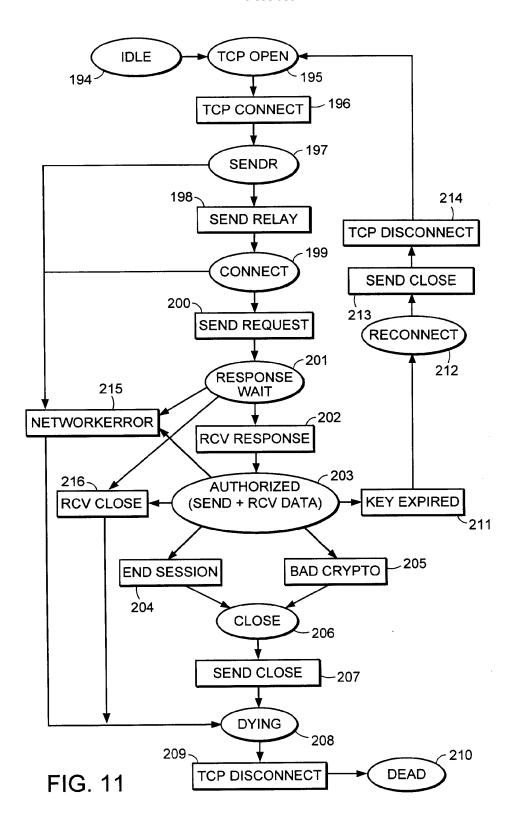
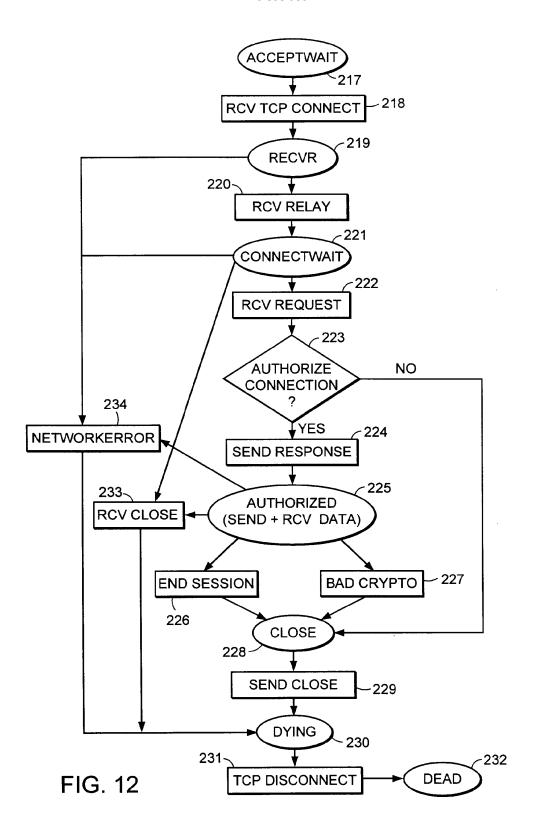


FIG. 10





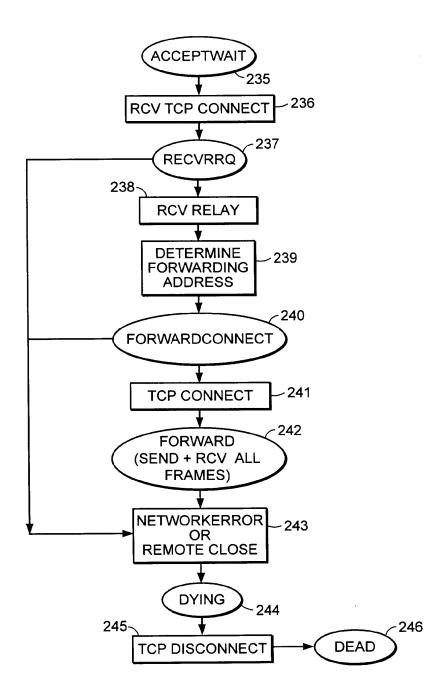
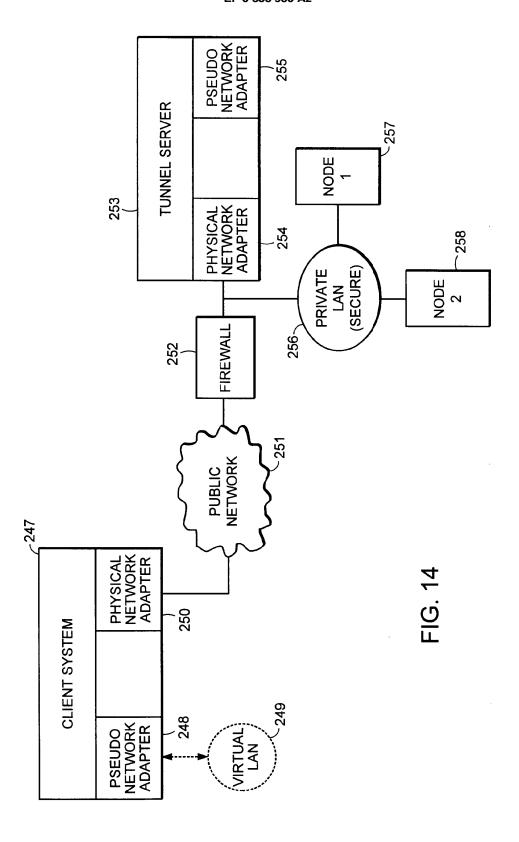


FIG. 13



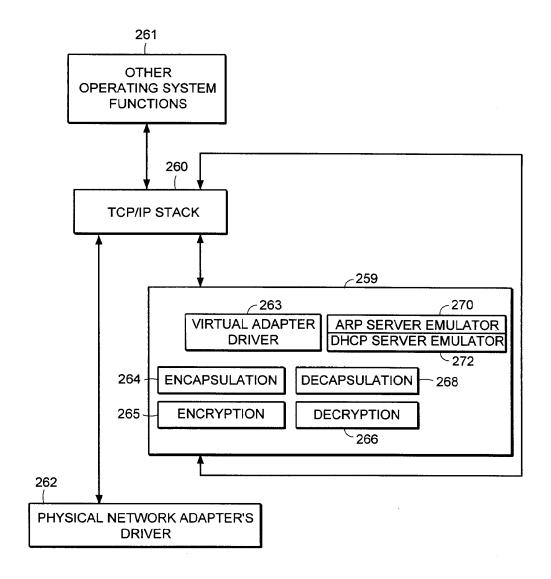
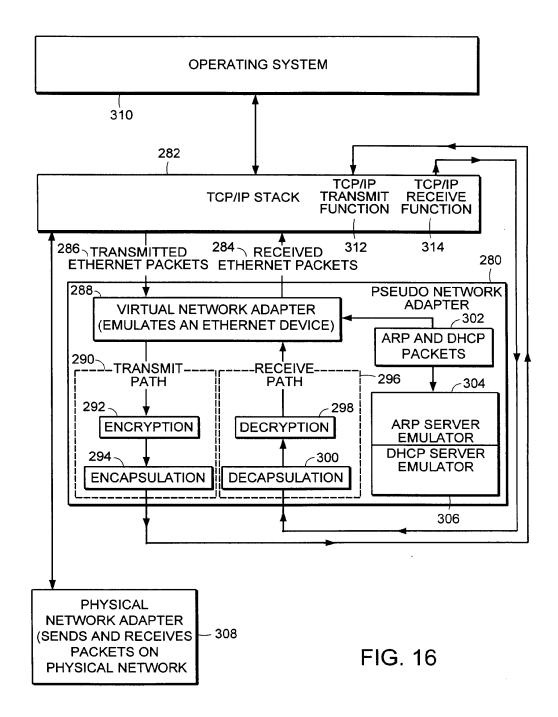
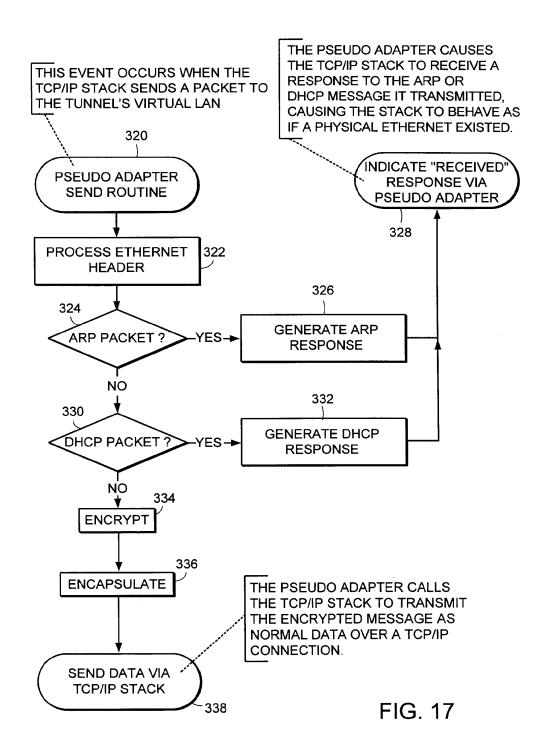


FIG. 15





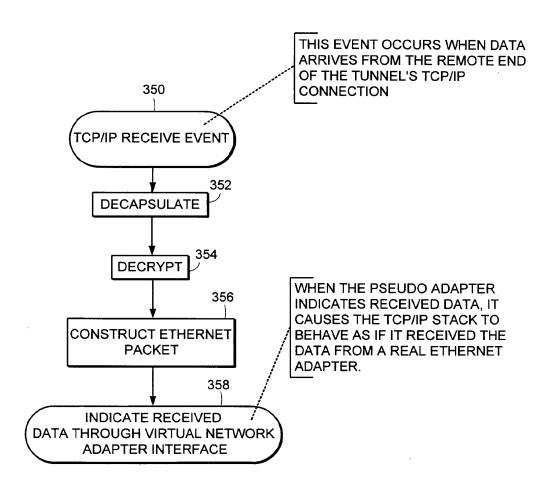


FIG. 18

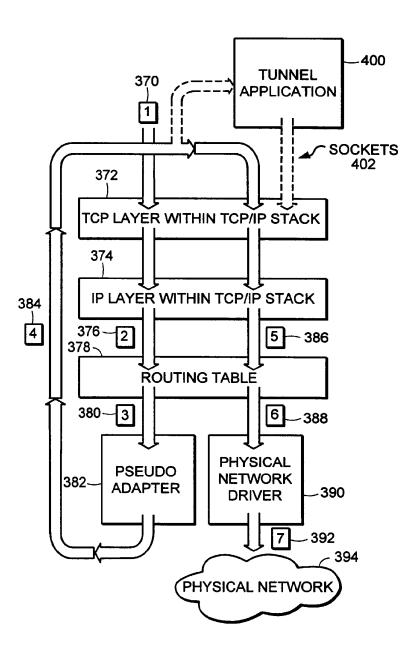


FIG. 19

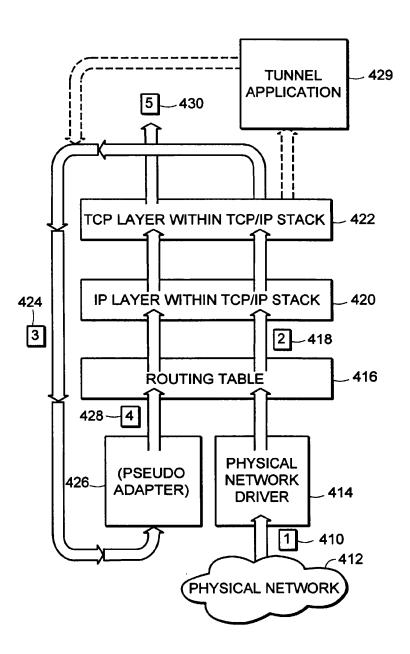


FIG. 20

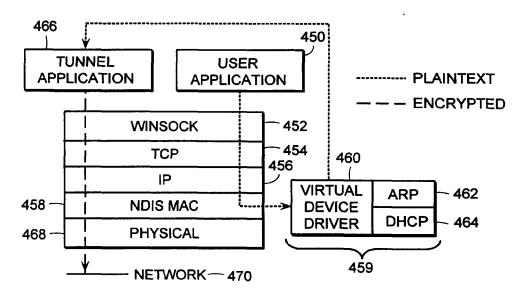


FIG. 21

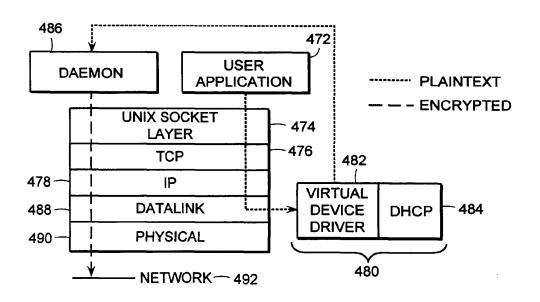


FIG. 22

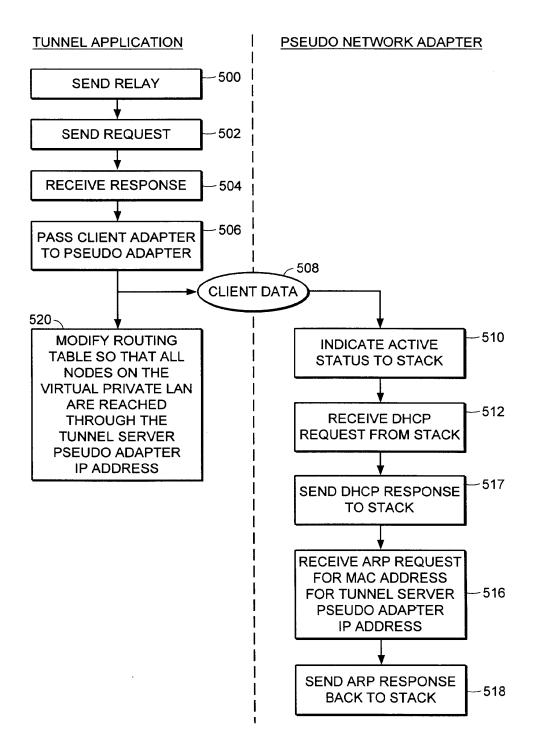


FIG. 23



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EP 0 814 589 A2 (11)

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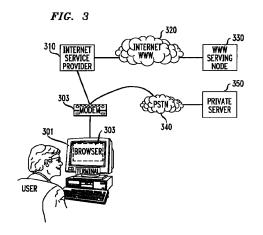
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#### (54)System and method for automated network reconfiguration

(57)A method is disclosed for providing an enhanced level of security for sensitive or proprietary information associated with information transactions in a public network, such as the Internet. In carrying out that method, an on-line information transaction is bifurcated between a generalized information access portion of such a transaction and an exchange of sensitive user information. With such a bifurcation, the generalized information access portion of the transaction, which generally would constitute the more substantial (in terms of network resources) portion of the transaction, would be handled via a non-secure network, usually a public network such as the Internet. The portion of the transaction involving sensitive user information, on the other hand, would be handled by a separate secure connection, such as a private network, or intranetwork. An important characteristic of this bifurcation arrangement is the provision of a means for automated reconfiguration of a user terminal as between accessing the Ageneralized information via the non-secure network and access to the secure communications network for the exchange of sensitive user information. Such an automated reconfiguration will be carried out without the necessity for any action on the part of the user, and indeed will be largely invisible to the user.



## Description

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#### FIELD OF THE INVENTION

This invention is related to the field of data communications, and more particularly to a method and means for establishing an automatic reconfiguration of a user terminal among alternative tasks.

#### **BACKGROUND OF THE INVENTION**

With the increasing popularity of personal computers over the last several years has come a striking growth in transaction-oriented computer-to-computer communications (as opposed to bulk-data transfers among such computers). For convenience herein such transaction-oriented computer-to-computer communications will be described by the shorthand term "information transaction". That growth in the use of computers for such information transactions has unquestionably been fueled by the existence of an international infrastructure for implementing such data communications, known as the Internet. And, driven by the burgeoning demand for such information transaction services, the Internet has itself experienced explosive growth in the amount of traffic handled.

At least partly in response to that demand, a new level of accessibility to various information sources has recently been introduced to the Internet, known as the World Wide Web ("WWW"). The WWW allows a user to access a universe of information which combines text, audio, graphics and animation within a hypermedia document. Links are contained within a WWW document which allow simple and rapid access to related documents. Using a system known as the HyperText Markup Language ("HTML"), pages of information in the WWW contain pointers to other pages, those pointers typically being a key word (commonly known as a hyperlink word). When a user selects one of those key words, a hyperlink is created to another information layer (which may be in the same, or a different information server), where typically additional detail related to that key word will be found.

In order to facilitate implementation of the WWW on the Internet, new software tools have been developed for user terminals, usually known as Web Browsers, which provide a user with a graphical user interface means for accessing information on the Web, and navigating among information layers therein. A commonly used such Web Browser is that provided by Netscape.

The substantial growth in the use of computer networks, and particularly the WWW, for such information transactions, has predictably led to significant commercialization of this communications medium. For example, with the WWW, a user is not only able to access numerous information sources, some public and some commercial, but is also able to access "catalogs" of merchandise, where individual items from such a catalog can be identified and ordered, and is able to carry out a number of banking and other financial transactions. As will be obvious, such commercial transactions will typically involve sensitive and proprietary information, such as credit card numbers and financial information of a user. Thus, with the growth of commercial activity in the Internet, has also come a heightened concern with security.

It is well known that there are persons with a high level of skill in the computer arts, commonly known as "hackers", who have both the ability and the will to intercept communications via the Internet. Such persons are thereby able to gain unauthorized access to various sensitive user information, potentially compromising or misappropriating such information.

The vulnerability of such sensitive user information to misuse when so transmitted via the Internet is a phenomena which has only recently received wide public attention. Unless such security concerns can be quickly addressed and alleviated, the commercial development of this new communications medium may be slowed or even stalled altogether.

# **SUMMARY OF THE INVENTION**

Accordingly, it is an object of the invention to provide an acceptable level of security for sensitive or proprietary information associated with information transactions in a public network, such as the Internet. That object is realized through an arrangement whereby an on-line information transaction is bifurcated between a generalized information access portion of such a transaction and an exchange of sensitive user information. With such a bifurcation, the generalized information access portion of the transaction, which generally would constitute the more substantial (in terms of network resources) portion of the transaction would be handled via a non-secure network, usually a public network such as the Internet. The portion of the transaction involving sensitive user information, on the other hand, would be handled by a separate secure connection, such as a private network, or intranetwork. An important characteristic of this bifurcation arrangement is the provision of a means for automated reconfiguration of a user terminal as between accessing the generalized information via the non-secure network and access to the secure communications network for the exchange of sensitive user information. Such an automated reconfiguration will be carried out without the necessity for any action on the part of the user, and indeed will be largely invisible to the user. In a further embodiment of the invention, a transfer of data is provided from a public to a private network, wherein data selected by a user from a public net-

work site may be arranged and displayed at a user terminal and, subject to further user selection/confirmation activity, thereafter transferred to a private network.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Figure 1 depicts an illustrative case of information transactions carried out via a public network such as the Internet. Figure 2 shows the architecture of a browser as would typically be applied for accessing a hypermedia web page.

Figure 3 illustrates the primary elements of the reconfigurable dual-path method of the invention.

Figure 4 depicts in flow chart form the basic jump capability of the methodology of the invention.

Figures 5A & 5B (generally designated collectively herein as "Figure 5") depict in flow chart form the "shopping cart" capability of the methodology of the invention.

Figure 6A & 6B (generally designated collectively herein as "Figure 6") depict in flow chart form the stored configuration capability of the methodology of the invention.

Figure 7A & 7B (generally designated collectively herein as "Figure 7") depict in flow chart form the off-line form capability of the methodology of the invention.

#### **DETAILED DESCRIPTION**

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For clarity of explanation, the illustrative embodiment of the present invention is presented as comprising individual functional blocks. The functions these blocks represent may be provided through the use of either shared or dedicated hardware, including, but not limited to, hardware capable of executing software.

Figure 1 depicts an illustrative case of information transactions carried out via the Internet. As seen in the figure, an exemplary user obtains access to the Internet by First connecting, via a Terminal 110 having an associated Browser 111, to an Internet Service Provider 112 selected by the user. That connection between the user and the Internet Service Provider will typically be made via the Public Switched Telephone Network (PSTN) from a modern associated with the user's Terminal to a network node in the Internet maintained by the selected Internet Service Provider.

Once the user has obtained access to the selected Internet Service Provider, an address is provided for connection to another user or other termination site and such a connection is made via the Internet to that destination location. As can be seen from the figure, communication via the Internet may be either user-to-user, as from Terminal 110 to Terminal 130, or from a user to a node representing an information source accessed via the Internet, such as Public Site 120.

It will of course be understood that the Internet provides service to a large number of users and includes a large number of such Public Sites, but the illustration provides the essential idea of the communication paths established for such Internet communication. It will also be understood that a number of service classifications are supported by the Internet, with the World Wide Web service, which represents a preferred embodiment for the public network aspect of the method of the invention, being one of the currently most heavily trafficked of such services.

The Web Browser, such as depicted at 111, can be seen as a software application operating in conjunction with a user terminal (such as Terminal 110) which provides an interface between such a user terminal and the particular functionality of the WWW information site. The architecture of such a browser is generally described in terms of three main components, as illustrated in Figure 2. At the top level is the Browser 201, which enables the acquisition of information pages from a WWW server (beginning, in all cases, with the "home page" for that server), for display at a display device associated with the terminal. The Browser also provides the necessary interface for the terminal with the HTML functionality used by the server to provide access to other linked information layers.

The second level of the browser architecture is the TCP/IP Stack 202, which handles the communications protocols used for connecting the terminal to the WWW server. The bottom level of this architecture is the Dialer 203, which typically handles the function of providing dialing and setup digits to a modem, as illustrated at 204, such a modem generally being a part of the terminal. Normally, upon receiving dialing and other setup information from the dialer, the modem would cause a connection to be made via the PSTN to the Internet Service Provider selected for that terminal.

After a connection is established in this manner to the Internet Service Provider, an address would be provided for the WWW information node sought to be contacted, a connection to that node made through the Internet, and the home page for that node caused to be displayed at the terminal's display device. A user would then select a key word in that home page, typically by clicking on the word with a mouse or similar device, and, upon transmission of that selection signal to the WWW server, a hyperlink would be created to the linked information layer and the open page of that layer would be caused to be displayed at the user terminal.

As explained above, serious questions have been raised in respect to the security of communications via the public Internet. (Note, that the discussion herein is focused on the Internet, and particularly the WWW functionality of the Internet, as a preferred embodiment of such public data communication networks generally, but the methodology of the invention will be applicable to any such network.) To address this problem, the methodology of the invention begins with a bifurcation of the information transaction between a user and the selected information transaction provider into a por-

tion related to sensitive or proprietary user information, and other information comprising that transaction. With such a bifurcation, it becomes possible to provide substantial security for that proprietary information by use of an alternative communications path for that separated portion of the transaction via a private network, or intranetwork -- *i.e.*, a connection between a user's terminal and a secure serving node on that private network. It is anticipated that a coordination means will be established in respect to the management of information among the public and private network elements of the bifurcated information transaction.

In its basic form, this methodology may be carried out by the user terminal initiating a call via the Internet to a selected WWW node, and upon establishing connection to that node, proceeding with the desired information transaction up to the point where an exchange of sensitive or proprietary information were required. At that point the user terminal would be instructed by the WWW server to terminate that connection (*i.e.*, hangup) and to place a new call to an identified private network server for the necessary exchange of sensitive information.

However, in order to accomplish such a dual-path transaction, it is necessary that the browser at the user terminal be reconfigured to provide the dialing, authorization (*i.e.*, login and password), and other needed information for accessing the alternative private network, in order to implement the proprietary portion of the transaction. It will also usually be the case that, upon completion of that private-network transaction, the original dialer, stack and browser configurations will need to be restored, in order for the terminal to retain its normal Internet access functionality. Such a reconfiguration and subsequent restoral of the necessary parameters in the browser, stack and dialer is likely to be well beyond the capabilities of the average user.

Accordingly, as a further embodiment of the inventive methodology, an automated browser reconfiguration means is provided which interoperates with the browser. This browser reconfiguration means is described in detail hereafter and will be referred to as the "Bridging Software".

Figure 3 provides an illustration of the primary elements of the reconfigurable dual-path method of the invention. As seen in the figure, a first path comparable to the Internet link shown in Figure 1, between User Terminal 301 and WWW Serving Node 330 (via Browser 302, Modem 303, Internet Service Provider 310, and Internet 320) is provided. However, an alternative path is now provided from the output of Modem 303 to Private Server 350. That path is illustrated as being via the PSTN, which is generally regarded as being highly secure, but an alternative dedicated or other more-secure path between the User Terminal 301 and the Private Server 350 could as well be provided. In keeping with the discussion above, Browser 302 shown in Figure 3 would also include the Bridging Software installed as a helper application for implementing the automatic reconfiguration of the Browser.

In the operation of this system, a user would normally make an initial connection to an Internet application, such as the application represented by WWW Serving Node 330, which, e.g., might be a shopping application, a financial transaction, or the provision of an enrollment form for off-line preparation. After conducting all, or some portion of an information transaction short of an exchange of sensitive or proprietary information, including a capture by the user's terminal of needed information from the public site, a user provides a signal indicative of an end to that portion of that transaction. During the course of the public portion of the information transaction, specially configured files are sent from the WWW serving node to the Bridging Software associated with Browser 302. Such files contain instructions for the Bridging Software to store information-like products -- e.g., for selected items from a catalog, forms for enrollment, or non-secure portions of a financial transaction, and reconfiguration information for dialing and logging into the private portion of the transaction. The Bridging Software then hangs up the Internet connection, edits the user terminal's browser, stack and dialer files to reconfigure the terminal to connect to the private server. Prior to automatic redialing of the new private site for the user, the Bridging Software may be instructed by the application operating at WWW Server Node 330 to display items chosen for purchase, or to display a form for the end-user to complete off-line before dialing the private application. Upon connecting to the private application and completing the transaction as to the user sensitive information in a private environment, the Bridging Software then restores the end-user software to the dialing and authorization parameters required to dial to the public Internet.

A particularly advantageous application of the automated reconfiguration and information transfer methodology of the Bridging Software is that it adds value to certain WWW servers which do not possess the Common Gateway Interface ("CGI") capability -- i.e., a provision of specialized functions on the server beyond just displaying HTML files, and are accordingly unable to accomplish any transactional processing in respect to items selected by a user. In effect, such a non-CGI server, on its own, can only serve as a "billboard" for the items represented in its database.

However, with the collection and redelivery process of the Bridging Software, a data capture and processing mechanism can be implemented for servers operating in a non-CGI environment -- such servers being incapable of more than the simple delivery of static data packets corresponding to available items. The data set enabled by the Bridging Software is a mechanism for augmenting such limited server capabilities by defining a flexible mechanism for the receipt, display, and delivery of arbitrary data from one site to another.

In such a scenario, the Bridging Software receives a "shopping cart" item list from the host as a data-set defined with a static MIME data packet associated with the Bridging Software. This information comprising the data-set may be updated, displayed to the user in a "read-only" fashion, or presented to the user for order selection.

During the process of interacting with the WWW server, a user may trigger HTML links resulting in additional MIME packets for the Bridging Software being delivered to the client. These packets allow items to be added and/or removed from the specified data set or presented to the user for local confirmation. The user will interact with a pop-up screen provided by the Bridging Software which presents the items available with product information, such as part number, description, unit cost, etc. The user identifies those items which are to be placed into the "shopping cart" and the quantity of items desired. Upon completion of the form, the Bridging Software stores the order in a format suitable for subsequent delivery to the private server site.

An additional feature provided by the methodology of the Bridging Software is an automated mechanism for providing compatibility with user terminals not previously having the Bridging Software included with the terminal's browser. To that end, the Bridging Software located at an accessed public network site initially checks to see if the browser counterpart for that software is loaded at the calling user terminal. If yes, the heretofore described processes of the Bridging Software go forward. If not however, a request is sent through the public host to download the Bridging Software to the calling terminal. After such a download, a helper application loads the Bridging Software to the terminal's browser.

#### 15 I. Illustrative Embodiments

A variety of browser reconfiguration applications are supported by the automated browser reconfiguration means of the invention. Four essentially diverse capabilities of this invention, which support such applications, are described hereafter as illustrative embodiments of the invention.

# A. Basic Jump Capabilities

In this configuration, which is illustrated in flow chart form in Figure 4, an end-user is connected to a chosen WWW serving node (where a desired information product is made available) via a modem and an Internet browser associated with the user's terminal (Step 401 of Figure 4). After conducting an information transaction with the selected WWW serving node for some interval (determined in relation to the specific application accessed), the user clicks on a hypertext link, or picture, to begin an automated process which will cause that public session to be terminated and a new connection established to an alternate private data network (Step 402).

In response to that user action, a data message containing parameter reconfiguration instructions is passed from the WWW server application to the Bridging Software at the user's terminal (Step 403). Upon receiving such instructions, the Bridging Software edits the user's on-line communications software parameters, reconfiguring that software to dial the alternate data network (Step 404). This reconfiguration is fully automatic and transparent to the user, and includes parameters such as modern dial number, login, password, and TCP/IP addresses. At that point, the Bridging Software causes the modern to disconnect the current data network connection, shutting down the browser, and to then dial the alternate private data network (Step 405).

With the establishment of a connection to the private server on the alternate data network, the user interacts with the alternate data network application as appropriate (Step 406), and after an interval completes his activity with the alternate data network and provides an indication of such completion (Step 407). A data message containing parameter reconfiguration instructions is then passed from the alternate data network application to the Bridging Software (Step 408).

At that point, the Bridging Software again edits the user's on-line communications software parameters, reconfiguration them to dial the original public data network, or another preselected network (**Step 409**). As with the first reconfiguration, this configuration is automatic and includes parameters such as modem dial number, login, password, and TCP/IP addresses. The Bridging Software automatically causes the current private data network to be disconnected by the modem (**Step 410**), and if appropriate, causes the original public data network to be redialed (**Step 411**). When such a reconnection to the public data network is established, the end-user would then continue his application in the public data network.

# B. "Shopping Cart" Capability

With this configuration, illustrated in flow chart form in Figure 5, a user begins by establishing a connection to a WWW application (assuming for the moment that the application is non-CGI enabled) at a serving node for that application, using the Internet browser and modem associated with the user's terminal (Step 501 of Figure 5). Upon finding an item in that application to be saved, or remembered for later consideration, or purchase, the user clicks on a hypertext link, or picture, representing that item (Step 502). That application then sends a data message to the Bridging Software containing information about the items selected (Step 503) and such information is stored by the Bridging Software containing information.

ware in the "shopping cart" file in the user's terminal (Step 504). Such selection download and storage steps (*i.e.*, steps 502, 503 & 504) are repeated for as many items as the user chooses to select. At any point after the Bridging Software has received the first set of item selection information, the user can instruct the Bridging Software to cause those selected items about which such information has been received to be displayed locally (at the user's terminal), where the user may review or edit (including deletion if desired) the collection of items theretofore selected. The application may also control display characteristics such as color and font for such locally displayed items. Note that in the case of a CGI-enabled application, the application itself will keep track of the items selected by the user and only download the totality of the selected items at the end of the selection process, and accordingly, the described local display option will not be applicable to such a CGI-enabled application.

At the point of completion of his "shopping", the user clicks on a hyper-text link or picture to "check out" (Step 505), which will begin a process of causing a jump to an alternate data network for the completion of sensitive portions of the transaction. To that end, a data message containing parameter reconfiguration instructions is passed from the WWW application to the Bridging Software (Step 506). It is to be noted that, as a security measure, information such as the new dial number, IP address, home page, configuration data (e.g., login, password, DNS address) may be passed over the public network in encrypted form.

Upon receiving such reconfiguration instructions, the Bridging Software edits the user's on-line communications software parameters, reconfiguring that software to dial the alternate data network (**Step 507**). This reconfiguration is fully automatic and transparent to the user, and includes parameters such as modem dial number, login, password, and TCP/IP addresses. At that point, the Bridging Software causes the modem to disconnect the current data network connection, shutting down the browser, and to then dial the alternate data network (**Step 508**).

The Bridging Software passes the stored "shopping cart" data captured from the WWW application to the alternate network application (Step 509), where that data may be displayed for the user, permitting the user to confirm and/or modify the data (Step 510). The user interacts with the alternate data network application as appropriate, and after an interval completes his activity with the alternate data network (Step 511) and thus, by providing an appropriate completion signal to the application, completing the private portion of the information transaction (Step 512). A data message containing parameter reconfiguration instructions is then passed from the alternate data network application to the Bridging Software (Step 513).

The Bridging Software, at this point, again edits the user's on-line communications software parameters, reconfiguration them to dial the original (or another pre-defined) data network (Step 514). As with the first reconfiguration, this configuration is automatic and includes parameters such as modem dial number, login, password, and TCP/IP addresses. The Bridging Software automatically causes the current private data network to be disconnected by the modem (Step 515), and if appropriate, causes the original public data network to be redialed (Step 516). When such a reconnection is established to the point in the public data network where the user had left off to handle the secured aspects of his information transaction, the user would then continue his application in the public data network.

# C. Stored Configuration Capabilities

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For this configuration, depicted in flow chart form in Figure 6, an end-user is connected to a chosen WWW serving node (where a desired information product is made available) via a modem and an Internet browser associated with the user's terminal (Step 601 of Figure 6). The user selects a hypertext link or picture associated with the WWW application by clicking on such link or picture (Step 602). A data message containing parameter reconfiguration instructions and an application icon (related to the selected hypertext link or picture) is passed from the WWW application to the Bridging Software (Step 603).

The Bridging Software creates an icon for display at the user's terminal, and saves a Bridging Software configuration file that is associated with that icon (**Step 604**). Such Bridging Software actions are automatic and multiple selections may be captured in this manner. At this point the user may continue the on-line session, or, if all desired selections have been made, a signal is provided from the user that the session should be discontinued (**Step 605**). The Bridging Software then automatically disconnects the current data network connection (**Step 606**).

After disconnecting from the WWW application, and following an interval determined by the user, a new application is selected by the user by clicking on the appropriate new icon displayed at the user's terminal (Step 607). The Bridging Software receives the reconfiguration instructions from the file associated with the selected icon (Step 608).

The Bridging Software edits the user's on-line communications software parameters, reconfiguring that software to dial the alternate data network (Step 609). The Bridging Software then automatically starts the user's Internet browser software and causes the alternate network application to be dialed by the modern associated with that terminal (Step 610). Upon establishing a connection to the alternate network, the user interacts with that application and completes the transaction to the user's satisfaction (Step 611). After a signal is sent to the alternate network indicating such completion of the user's activity (Step 612), a data message containing parameter reconfiguration instructions is passed from the alternate data network application to the Bridging Software (Step 613). That Software then causes the user's

terminal configuration parameters to be reset (Step 614) and the alternate data network to be automatically disconnected (Step 615).

## D. Off-Line Form Capability

In this configuration, depicted in flow chart form in Figure 7, an end-user is connected to a chosen WWW serving node (where a desired information product is made available) via a modem and an Internet browser associated with the user's terminal (Step 701 of Figure 7). The user selects a hypertext link or picture associated with an off-line form application -- an exemplary such form being an HTML-based form -- by clicking on such link or picture (Step 702). A data message containing parameter reconfiguration instructions for the Bridging Software, the selected off-line-form application, and an optional icon (related to the selected hypertext link or picture) is passed from the WWW application to the Bridging Software (Step 703). Note that the selected off-line form may be for either single or multiple use.

In the case of a delayed or multiple use of the selected form, the Bridging Software may create an icon for display at the user's terminal, and will save a Bridging Software configuration file that is associated with that icon (Step 704). The form in question is also saved on the user's terminal. Such Bridging Software actions are automatic. At this point the user may continue the on-line session, or, if all desired selections have been made, a signal is provided from the user that the session should be discontinued (Step 705). The Bridging Software then automatically disconnects the current data network connection (Step 706).

After disconnecting from the WWW application, two cases are to be considered as to the further processing of the selected form: (1) an immediate single use of the form and (2) either a delayed or multiple use of the form. In the first case, the Bridging Software edits the user's on-line communications software parameters, reconfiguring that software to dial the alternate data network. The Bridging Software then automatically starts the user's Internet browser software which is caused to display the off-line form. The user then completes the off-line form and chooses a "Submit Form" button displayed at his terminal.

In the second case, the Bridging Software will have created an icon for display at the user's terminal and saved a Bridging Software configuration file associated with that icon. Following an interval determined by the user, the off-line-form application is started by the user by clicking on the new form icon displayed at the user's terminal (Step 707). The Bridging Software receives the reconfiguration instructions from the file associated with the selected icon (Step 708).

The Bridging Software edits the user's on-line communications software parameters, reconfiguring that software to dial the alternate data network (Step 709). The Bridging Software then automatically starts the user's Internet browser software which is caused to display the off-line form (Step 710). The user then completes the off-line form and chooses a "Submit Form" button displayed at his terminal (Step 711).

In either the first or second case, following activation of the "Submit Form" button, the alternate network application is then caused to be dialed by the Bridging Software. Upon establishing a connection to the alternate network, the form data is passed to the alternate network (Step 712). The user then interacts with that application and completes the application (Step 713). After a signal is sent to the alternate network indicating such completion of the user's activity (Step 714), a data message containing parameter reconfiguration instructions is passed from the alternate data network application to the Bridging Software (Step 715). That Software then causes the user's terminal configuration parameters to be reset (Step 716) and the alternate data network to be automatically disconnected (Step 717).

## CONCLUSION

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A system and method has been described for the automatic switching of an information transaction between two or more alternate networks. This functionality, which incorporates a reconfiguration means designated herein as the Bridging Software, supports the movement of application specific data from one on-line environment to another. Among potential applications of this process for passing data between different environments are: selected items for purchase ("shopping cart"), captured data from forms, and other server captured data such as web pages visited.

The Bridging Software reconfiguration means is intended to work with various Web Browser software implementations, including the Netscape Personal Edition (NPE) Software for Windows 3.1 and 3.11, and which represents a working embodiment for the invention. The Bridging Software installs itself as a helper application within the browser application and utilizes a special MIME type configuration file to pass reconfiguration and "shopping cart" information from the server to the client software.

When an application requires a user to re-connect to a private application, a reconfiguration file is passed to the Bridging Software helper application via a CGI script or simple hyper-text link. The helper application disconnects the current data connection, reconfigures the dial parameters (dial #, login password, DNS address, and home page) and initiates the dial program so the end-user can access the private application.

When the end-user connects to the private application, the Bridging Software reconfiguration means provides the new "private server" application with data collected from the "public server", and the application resumes in a private.

secure environment.

The Bridging Software allows both short term and long term storage of dial configurations. Configurations passed to the Bridging Software can be designated as single use configurations and discarded after the application has terminated, or saved and displayed to the end-user as a dial choice by the Bridging Software.

Although the present embodiment of the invention has been described in detail, it should be understood that various changes, alterations and substitutions can be made therein without departing from the spirit and scope of the invention as defined by the appended claims. In particular, it is noted that, while the invention has been primarily described in terms of a preferred embodiment based on an automatic reconfiguration between a public and a private data network, any the methodology of the invention will be equally applicable to any set of alternate networks.

#### Claims

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- 1. A method for managing a transaction via a communications path between a terminal device and a serving node in a data network, said method comprising the steps of:
  - establishing an initial communications path via a first connection between said terminal device and a serving node in a first data network;
  - receiving information from said serving node in said first data network for effecting a reconfiguration of said communications path for said transaction from said first connection in said first data network to a second connection in a second data network; and
  - automatically connecting said terminal device to a serving node in said second data network via said second connection.
- 2. A method for managing a transaction via a communications path between a terminal device and a serving node in a data network, said method comprising the steps of:
  - establishing an initial communications path via a first connection between said terminal device and a serving node in a first data network:
  - selecting at least one information item from a data base of said information items provided at said serving node in said first data network;
  - causing said selected information items to be downloaded to said terminal device via said first connection; receiving information from said serving node in said first data network for effecting a reconfiguration of said communications path for said transaction from said first connection in said first data network to a second connection in a second data network; and
  - automatically connecting said terminal device to a serving node in said second data network via said second connection.
  - 3. A method for managing a transaction via a communications path between a terminal device and a serving node in a data network, said method comprising the steps of:
    - establishing an initial communications path via a first connection between said terminal device and a serving node in a first data network;
    - identifying at least one data network application from a data base of said data network applications provided at said serving node in said first data network;
    - receiving information from said serving node in said first data network for reconfiguring said terminal device for implementation of a communication path via an alternate connection between said terminal device and at least one of said identified data network applications in a second data network; and
    - in response to a selection signal from a user, automatically connecting said terminal device to a selected one of said identified data network applications via said alternate connection.
  - 4. A method for managing a transaction via a communications path between a terminal device and a serving node in a data network, said method comprising the steps of:
    - establishing an initial communications path via a first connection between said terminal device and a serving node in a first data network;
    - selecting an off-line form application from a data base provided at said serving node in said first data network; receiving information from said serving node in said first data network for reconfiguring said terminal device for implementation of a communication path via a second connection between said terminal device and said

selected off-line form application in a second data network; and in response to, a selection signal from a user, automatically connecting said terminal device to said selected off-line form application.

- 5. The method for managing a transaction of Claim 1 or 2 including the further step of recognizing a signal to reconfigure said communications path from said first connection to said second connection.
  - 6. The method for managing a transaction of Claim 3 wherein said selected data network application is operated at a serving node in said second data network.
  - 7. The method for managing a transaction of Claim 4 wherein said selected off-line form application is operated at a serving node in said second data network.
- 8. The method for managing a transaction of one of the Claims 1, 2, 6 or 7 wherein said serving nodes in said first and said second data networks are manifested in a common node.
  - 9. The method for managing a transaction of Claim 1 or 2 wherein said step of receiving information includes the further step of effecting said reconfiguration of said communications path.
- 20 **10.** The method for managing a transaction of Claim 1 or 2 wherein said step of automatically connecting includes the step of automatically disconnecting said first connection prior to implementation of said second connection.
  - 11. The method for managing a transaction of Claim 1 or 2 including the further steps of:

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- automatically disconnecting said second connection in response to a user signal; and reconfiguring said terminal device to enable, in response to user instruction, an implementation of a connection via an identified data network.
- **12.** The method for managing a transaction of Claim 11 wherein said step of automatically reconfiguring said terminal device includes the step of effecting said implementation of said connection via said identified data network.
  - 13. The method for managing a transaction of Claim 2 wherein said step of causing said selected information items to be downloaded includes the further step of causing said selected information items to be displayed at said terminal device
  - 14. The method for managing a transaction of Claim 13 wherein said displayed selected items can be edited by a user at said terminal device.
  - 15. The method for managing a transaction of Claim 13 wherein display characteristics for said displayed selected items can be controlled at said terminal device.
  - 16. The method for managing a transaction of Claim 2 wherein said step of automatically connecting includes the step of uploading said selected information items from said terminal device to said service provider via said second connection.
  - 17. The method for managing a transaction of Claim 3 including the further steps of:
    - automatically disconnecting said alternate connection in response to a user signal; and reconfiguring said terminal device to enable implementation of a pre-selected connection between said terminal device and an identified data network.
  - **18.** The method for managing a transaction of Claim 17 wherein said step of automatically reconfiguring said terminal device includes the further step of effecting said implementation of said pre-selected connection.
- 55 19. The method for managing a transaction of Claim 4 including the further step of downloading from said serving node in said first data network to said terminal device of an off-line form related to said off-line form application.
  - 20. The method for managing a transaction of Claim 4 including the further step of uploading said downloaded off-line

form from said terminal device to said selected off-line form application, after processing by a user.

21. The method for managing a transaction of Claim 4 including the further steps of:

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- 5 automatically disconnecting said connection to said selected off-line form application in response to a user signal; and
  - reconfiguring said terminal device to enable implementation of a pre-selected connection between said terminal device and an identified data network.
- 22. The method for managing a transaction of Claim 21 wherein said step of automatically reconfiguring said terminal device includes the further step of effecting said implementation of said pre-selected connection.
  - 23. A method for managing connections between a terminal device and at least one information source/processor wherein at least two of said connections are implemented via separate communications networks, comprising the steps of:
    - recognizing a signal for connection to an information source/processor via a communications network other than a communications network for which a predetermined connection is configured;
    - causing said terminal device to implement a connection to said information source/processor via said other communications network; and
    - upon termination of said information source/processor connection via said other communications network, automatically reconfiguring a connection criteria in said terminal device to enable said terminal device to implement, in response to user instruction, a connection via an alternative one of said communications networks.
- 25 24. The method for managing connections of Claim 23 wherein said recognizing step occurs at a point when said terminal device is connected to a given source/processor.
  - 25. The method for managing connections of Claim 23 wherein information items may be selected by a user at said terminal device from said given source/processor, and including the further step of causing said selected information items to be downloaded from said source/processor to said terminal device.
  - 26. The method for managing connections of Claim 25 wherein said step of effecting connection includes the further step of uploading said selected information items from said terminal device to said other information source/processor.
  - 27. The method for managing connections of Claim 26 wherein said selected information items are processed by said user at said terminal device prior to uploading to said other information source/processor.
  - 28. The method for managing connections of Claim 24 including the further step of causing said given source/processor to download to said terminal device configuration data for enabling said step of effecting connection to said other information source/processor.
  - 29. The method for managing connections of Claim 24 including the further step of causing said other source/processor to download to said terminal device configuration data for enabling said step of automatically restoring a prior connection criteria in said terminal device.
  - 30. A method for enhancing security of certain data in an on-line information transaction comprising the steps of:
- bifurcating said information transaction into a first portion comprising said certain data and a remaining portion, wherein said remaining portion is carried out via a public on-line communications connection between a terminal device and a public information server;
  - causing said first portion to be carried out via a secure private on-line communications connection between said terminal device and a private information server; and
- automatically reconfiguring network access means in said terminal device to switch between said public connection and said private connection.

FIG. 1

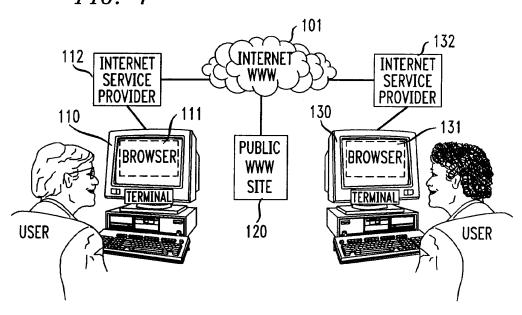
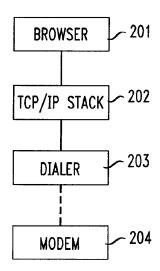
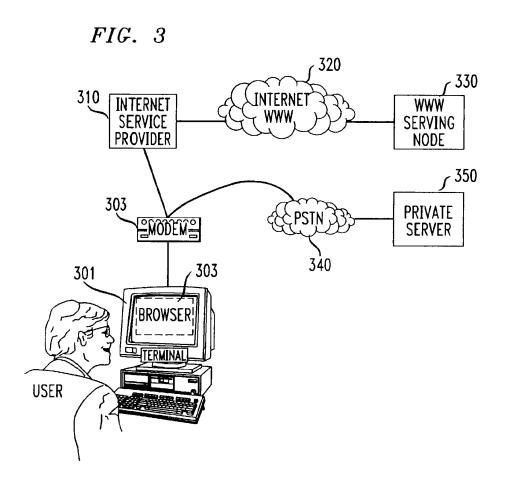
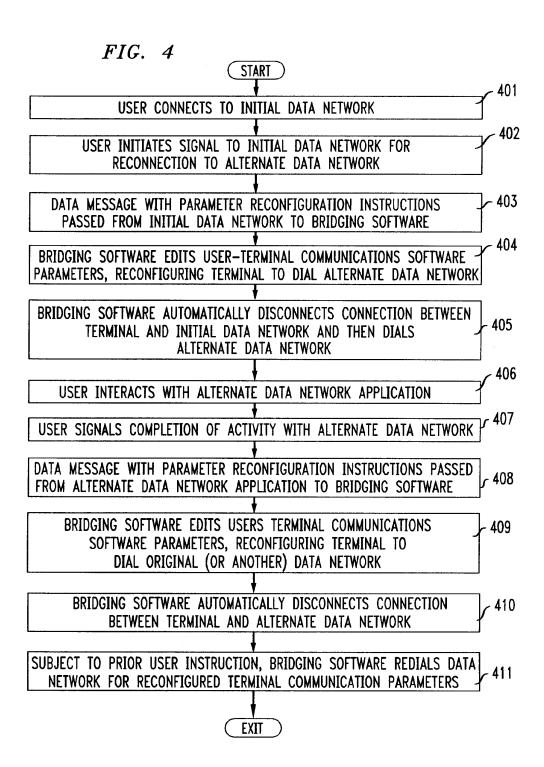
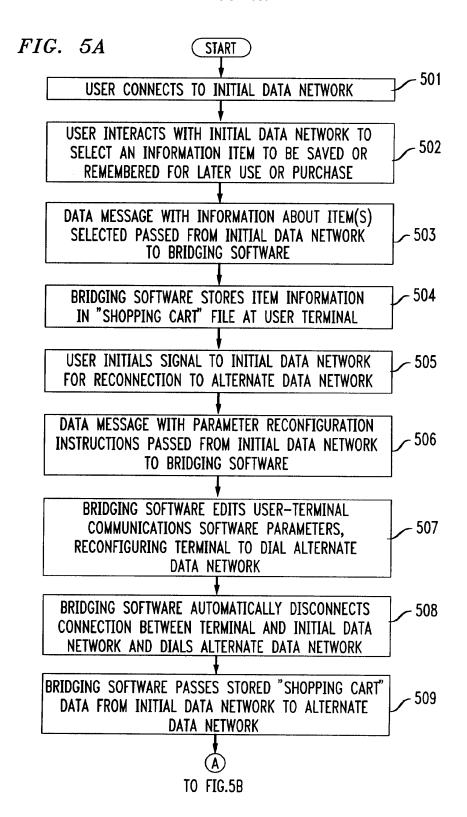


FIG. 2

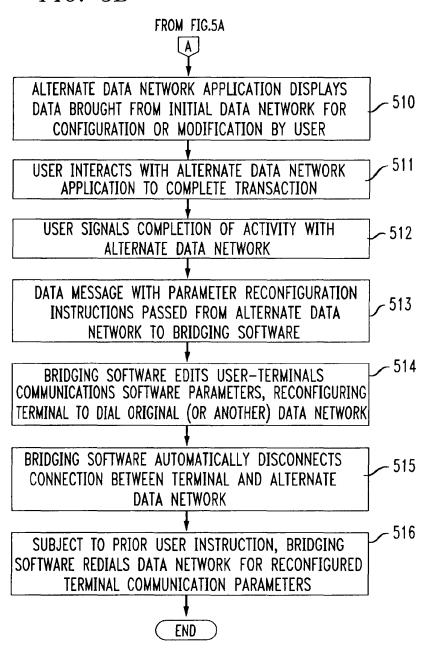


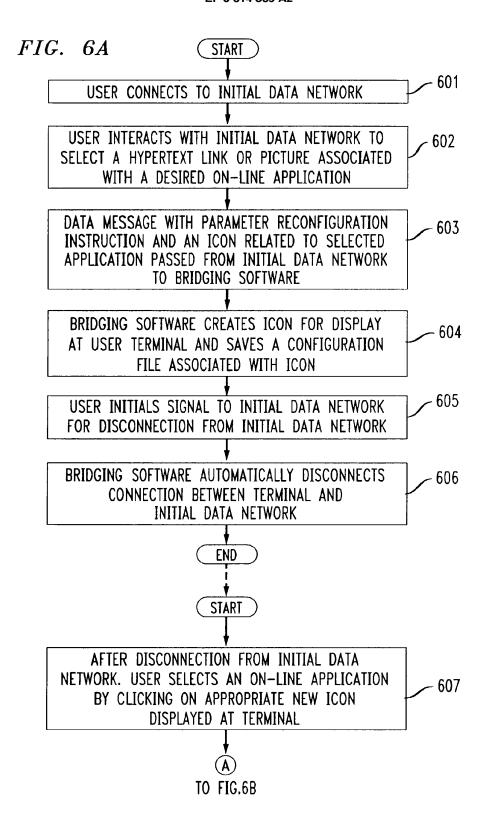


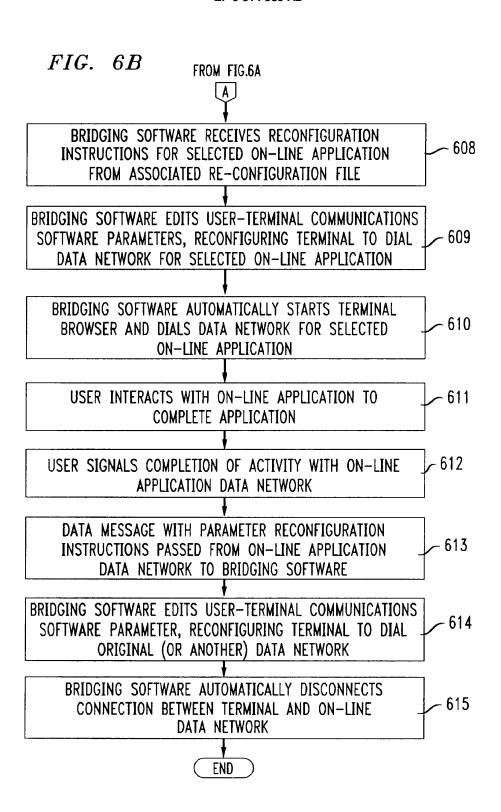




# FIG. 5B







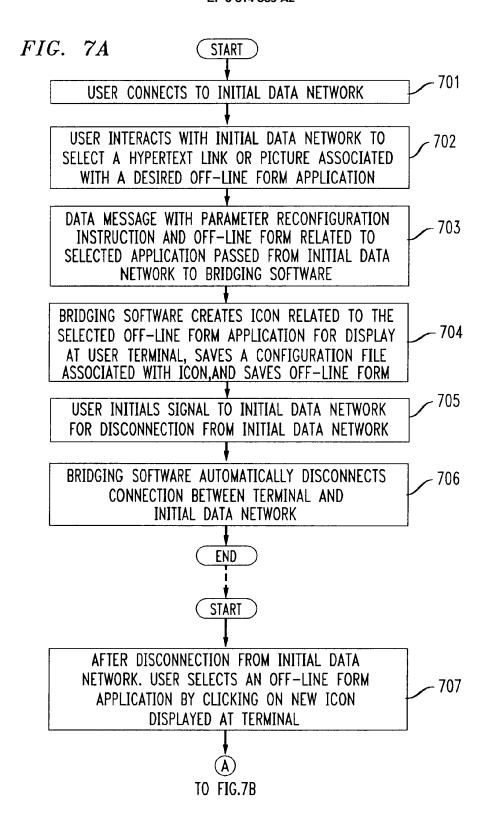


FIG. $7B$ FROM FIG.7A	
A	
<u> </u>	
BRIDGING SOFTWARE RECEIVES RECONFIGURATION	08
INSTRUCTIONS FOR SELECTED OFF-LINE FORM AFFLICATION	υo
FROM ASSOCIATED RE-CONFIGURATION FILE	
BRIDGING SOFTWARE EDITS USER-TERMINAL COMMUNICATIONS	_
SOFTWARE PARAMETERS, RECONFIGURING TERMINAL TO DIAL   70	9
DATA NETWORK FOR SELECTED OFF-LINE FORM APPLICATION	
•	
BRIDGING SOFTWARE AUTOMATICALLY STARTS TERMINAL	
BROWSER AND DIALS DATA NETWORK FOR SELECTED 71	0
OFF-LINE FORM APPLICATION	
•	
USER COMPLETES OFF-LINE FORM AND CHOOSES	,
"SUBMIT FORM" BUTTON ON DISPLAY 71	1
BRIDGING SOFTWARE AUTOMATICALLY DIALS OFF-LINE 712	
FORM APPLICATION DATA NETWORK AND PASSES FORM	
DATA TO THAT NETWORK	
USER INTERACTS WITH OFF-LINE FORM APPLICATION 713	3
TO COMPLETE APPLICATION	
USER SIGNALS COMPLETION OF ACTIVITY WITH OFF-LINE 71	4
FORM APPLICATION DATA NETWORK	
PATA MESSAGE MITH PARAMETER PERSONETOURATION 71	
DATA MESSAGE WITH PARAMETER RECONFIGURATION 71	J
INSTRUCTIONS PASSED FROM OFF-LINE FORM APPLICATION	
DATA NETWORK TO BRIDGING SOFTWARE	
DDIDOING COSTUADE EDITE HEED TEDUTAH COMMINIONITONIC	
BRIDGING SOFTWARE EDITS USER-TERMINAL COMMUNICATIONS 71	6
SOFTWARE PARAMETER, RECONFIGURING TERMINAL TO DIAL	
ORIGINAL (OR ANOTHER) DATA NETWORK	
DDIDGING COLLMAN AUTOMATICALLY DISCOMMENTS COMMENTALLY	7
BRIDGING SOFTWARE AUTOMATICALLY DISCONNECTS CONNECTION 71	1
BETWEEN TERMINAL AND OFF-LINE FORM APPLICATION DATA NETWORK	
(END)	

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UK CL (Edition P) H4P PDCSA PDCSC PPEB INT CL<sup>6</sup> H04L 9/00 9/32 29/06 29/08 Online: WPI, INSPEC

# (54) Virtual Private Network for encrypted firewall

(57) A system (10) for regulating the flow of messages through a firewall (18) having a network protocol stack, wherein the network protocol stack includes an Internet Protocol (IP) layer where if the message is not encrypted, it passes the unencrypted message up the network protocol stack to an application level proxy (50), and if the message is encrypted, it decrypts the message and passes the decrypted message up the network protocol stack to the application level proxy. The step of decrypting the message includes the step of executing a process at the IP layer to decrypt the message.

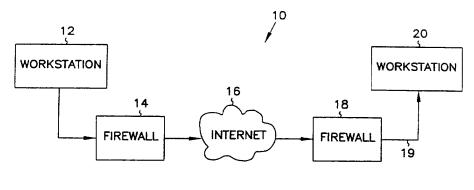
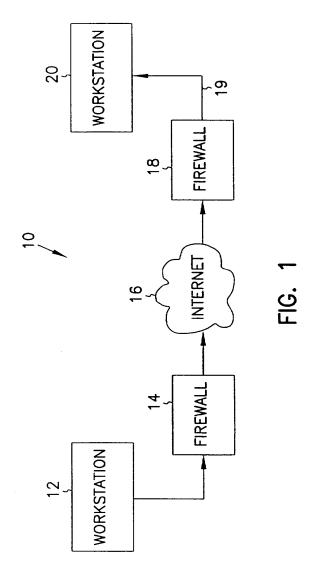
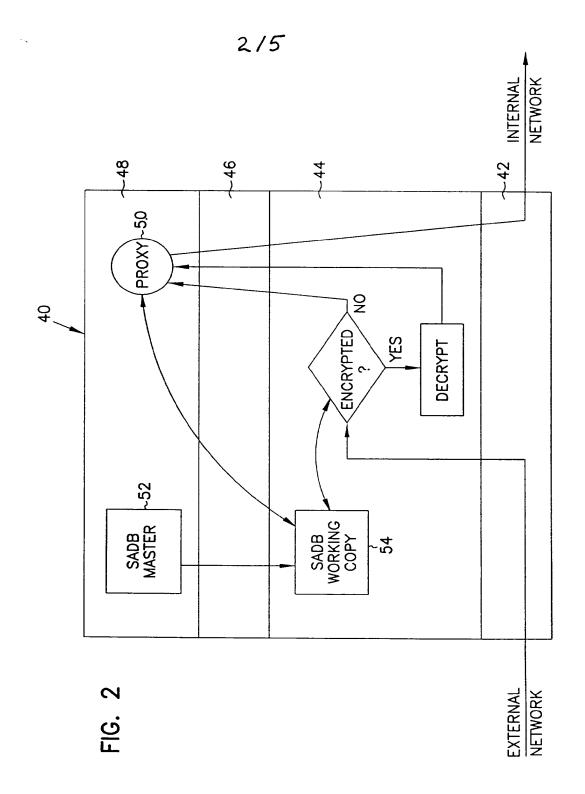


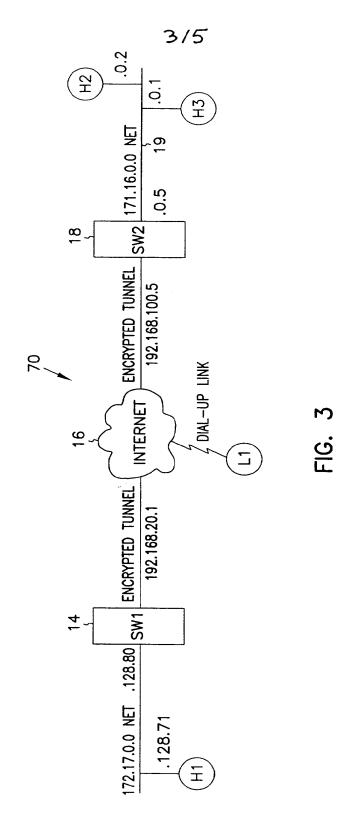
FIG. 1

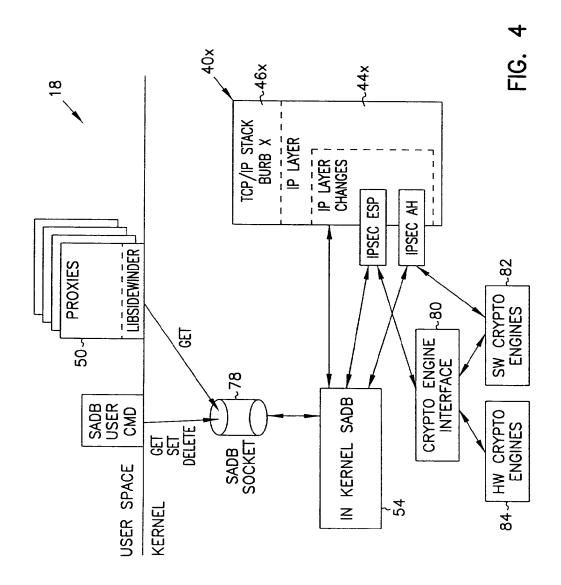
GB 2317792

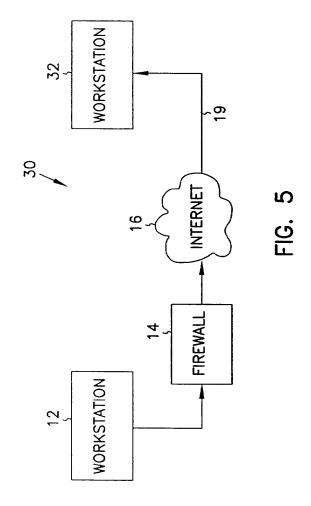
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.











# VIRTUAL PRIVATE NETWORK ON APPLICATION GATEWAY

## Background of the Invention

## Field of the Invention

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The present invention pertains generally to network communications, and in particular to a system and method for securely transferring information between firewalls over an unprotected network.

# 10 Background Information

Firewalls have become an increasingly important part of network design. Firewalls provide protection of valuable resources on a private network while allowing communication and access with systems located on an unprotected network such as the Internet. In addition, they operate to block attacks on a private network arriving from the unprotected network by providing a single connection with limited services. A well designed firewall limits the security problems of an Internet connection to a single firewall computer system. This allows an organization to focus their network security efforts on the definition of the security policy enforced by the firewall. An example of a firewall is given in "SYSTEM AND METHOD FOR PROVIDING SECURE INTERNETWORK SERVICES" by Boebert et al. (PCT Published Application No. WO 96/13113, published on May 2, 1996), the description of which is hereby incorporated by reference. Another description of a firewall is provided by Dan Thomsen in "Type Enforcement: the new security model", Proceedings: Multimedia: Full-Service Impact on Business, Education, and the Home, SPIE Vol. 2617, p. 143. August 1996. Yet another such system is described in "SYSTEM AND METHOD FOR ACHIEVING NETWORK SEPARATION" by Gooderum et al. (PCT Published Application No. WO 97/29413, published on August 14, 1997), the description of which is hereby incorporated by reference. All the above systems are examples of application level gateways. Application level gateways use proxies or other such mechanisms operating at the application layer to process traffic through the firewall. As such, they can review not only the

message traffic but also message content. In addition, they provide authentication and identification services, access control and auditing.

Data to be transferred on unprotected networks like the Internet is susceptible to electronic eavesdropping and accidental (or deliberate) corruption. Although a firewall can protect data within a private network from attacks launched from the unprotected network, even that data is vulnerable to both eavesdropping and corruption when transferred from the private network to an external machine. To address this danger, the Internet Engineering Task Force (IETF) developed a standard for protecting data transferred between firewalls over an unprotected network. The Internet Protocol Security (IPSEC) standard calls for encrypting data before it leaves the first firewall, and then decrypting the data when it is received by the second firewall. The decrypted data is then delivered to its destination, usually a user workstation connected to the second firewall. For this reason IPSEC encryption is sometimes called firewall-to-firewall encryption (FFE) and the connection between a workstation connected to the first firewall and a client or server connected to the second firewall is

The two main components of IPSEC security are data encryption and sender authentication. Data encryption increases the cost and time required for the eavesdropping party to read the transmitted data. Sender authentication ensures that the destination system can verify whether or not the encrypted data was actually sent from the workstation that it was supposed to be sent from. The IPSEC standard defines an encapsulated payload (ESP) as the mechanism used to transfer encrypted data. The standard defines an authentication header (AH) as the mechanism for establishing the sending workstation's identity.

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Through the proper use of encryption, the problems of eavesdropping and corruption can be avoided; in effect, a protected connection is established from the internal network connected to one firewall through to an internal network connected to the second firewall. In addition, IPSEC can be used to provide a protected connection to an external computing system such as a portable personal computer.

IPSEC encryption and decryption work within the IP layer of the network protocol stack. This means that all communication between two IP addresses will be protected because all interfirewall communication must go through the IP layer. Such an approach is preferable over encryption and decryption at higher levels in the network protocol stack since when encryption is performed at layers higher than the IP layer more work is required to ensure that all supported communication is properly protected. In addition, since IPSEC encryption is handled below the Transport layer, IPSEC can encrypt data sent by any application. IPSEC therefore becomes a transparent add-on to such protocols as TCP and UDP.

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Since, however, IPSEC decryption occurs at the IP layer, it can be difficult to port IPSEC to an application level gateway while still maintaining control at the proxy over authentication, message content, access control and auditing. Although the IPSEC specification in RFC 1825 suggests the use of a mandatory access control mechanism in a multi-level secure (MLS) network to compare a security level associated with the message with the security level of the receiving process, such an approach provides only limited utility in an application level gateway environment. In fact, implementations on application level gateways to date have simply relied on the fact that the message was IPSEC-encrypted as assurance that the message is legitimate and have simply decoded and forwarded the message to its destination. This creates, however, a potential chink in the firewall by assuming that the encrypted communication has access to all services.

What is needed is a method of handling IPSEC messages within an

application level gateway which overcomes the above deficiencies. The method should allow control over access by an IPSEC connection to individual services within the internal network.

# Summary of the Invention

The present invention is a system and method for regulating the flow of messages through a firewall having a network protocol stack, wherein the network protocol stack includes an Internet Protocol (IP) layer, the method

comprising the steps of determining, at the IP layer, if a message is encrypted, if the message is not encrypted, passing the unencrypted message up the network protocol stack to an application level proxy, and if the message is encrypted, decrypting the message and passing the decrypted message up the network protocol stack to the application level proxy, wherein the step of decrypting the message includes the step of executing a procedure at the IP layer to decrypt the message.

According to another aspect of the present invention, a system and method is described for authenticating the sender of a message within a computer system having a network protocol stack, wherein the network protocol stack includes an Internet Protocol (IP) layer, the method comprising the steps of determining, at the IP layer, if the message is encrypted, if the message is encrypted, decrypting the message, wherein the step of decrypting the message includes the step of executing a procedure at the IP layer to decrypt the message, passing the decrypted message up the network protocol stack to an application level proxy, determining an authentication protocol appropriate for the message, and executing the authentication protocol to authenticate the sender of the message.

# Brief Description of the Drawings

In the following detailed description of example embodiments of the invention, reference is made to the accompanying drawings which form a part hereof, and which is shown by way of illustration only, specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

In the drawings, where like numerals refer to like components throughout the several views:

Figure 1 is a functional block diagram of an application level gatewayimplemented firewall-to-firewall encryption scheme according to the present invention;

Figure 2 is a block diagram showing access control checking of both encrypted and unencrypted messages in network protocol stack according to the present invention;

Figure 3 is a block diagram of a representative application level gatewayimplemented firewall-to-firewall encryption scheme;

Figure 4 is a block diagram of one embodiment of a network-separated protocol stack implementing IPSEC according to the present invention; and

Figure 5 is a functional block diagram of a firewall-to-workstation encryption scheme according to the present invention.

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# Description of the Preferred Embodiments

In the following detailed description of the preferred embodiment, references made to the accompanying drawings which form a part hereof, and in which is shown by way of illustration specific preferred embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that structural, logical, physical, architectural, and electrical changes may be made without departing from the spirit and scope of the present invention. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is defined only by the appended claims and their equivalents.

A system 10 which can be used for firewall-to-firewall encryption (FFE) is shown in Figure 1. In Figure 1, system 10 includes a workstation 12 communicating through a firewall 14 to an unprotected network 16 such as the Internet. System 10 also includes a workstation 20 communicating through a firewall 18 to unprotected network 16. In one embodiment, firewall 18 is an application level gateway.

As noted above, IPSEC encryption and decryption work within the IP layer of the network protocol stack. This means that all communications between two IP addresses will be protected because all interfirewall communication must pass through the IP layer. IPSEC takes the standard

Internet packet and converts it into a carrier packet. The carrier packet is designed to do two things: to conceal the contents of the original packet (encryption) and to provide a mechanism by which the receiving firewall can verify the source of the packet (authentication). In one embodiment of the present invention, each IPSEC carrier packet includes both an authentication header used to authenticate the sending machine and an encapsulated payload containing encrypted data. The authentication header and the encapsulated payload features of IPSEC can, however, be used independently. As required in RFC 1825, DES-CBC is provided for use in encrypting the encapsulated payload while the authentication header uses keyed MD5.

To use IPSEC, you must create a security association (SA) for each destination IP address. In one embodiment, each SA contains the following information:

- Security Parameters Index (SPI) The index used to find a SA on receipt of an IPSEC datagram.
  - Destination IP address The address used to find the SA and trigger use of IPSEC processing on output.
  - The peer SPI The SPI value to put on a IPSEC datagram on output.
- The peer IP address The destination IP address to be put into the packet header if IPSEC Tunnel mode is used.
  - The Encryption Security Payload (ESP) algorithm to be used.
  - The ESP key to used for decryption of input datagrams.
  - The ESP key to used for encryption of output datagrams.
- The authentication (AH) algorithm to be used.

- The AH key to be used for validation of input packets.
- The AH key to be used for generation of the authentication data for output datagrams.
- The combination of a given Security Parameter Index and Destination IP address uniquely identifies a particular "Security Association." In one

embodiment, the sending firewall uses the sending userid and Destination Address to select an appropriate Security Association (and hence SPI value). The receiving firewall uses the combination of SPI value and Source address to obtain the appropriate Security Association.

A security association is normally one-way. An authenticated communications session between two firewalls will normally have two Security Parameter Indexes in use (one in each direction). The combination of a particular Security Parameter Index and a particular Destination Address uniquely identifies the Security Association.

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More information on the specifics of an IPSEC FFE implementation can be obtained from the standards developed by the IPSEC work group and documented in *Security Architecture for IP* (RFC 1825) and in RFC's 1826-1829.

When a datagram is received from unprotected network 16 or is to be transmitted to a destination across unprotected network 16, the firewall must be able to determine the algorithms, keys, etc. that must be used to process the datagram correctly. In one embodiment, this information is obtained via a security association lookup. In one such embodiment, the lookup routine is passed several arguments: the source IP address if the datagram is being received from network 16 or the destination IP address if the datagram is to be transmitted across network 16, the SPI, and a flag that is used to indicate whether the lookup is being done to receive or transmit a datagram.

When an IPSEC datagram is received by firewall 18 from unprotected network 16, the SPI and source IP address are determined by looking in the datagram. In one embodiment a Security Association Database (SADB) stored within firewall 18 is searched for the entry with a matching SPI. In one such embodiment, security associations can be set up based on network address as well as a more granular host address. This allows the network administrator to create a security association between two firewalls with only a couple of lines in a configuration file on each machine. For such embodiments, the entry in the Security Association Database that has both the matching SPI and the longest

address match is selected as the SA entry. In another such embodiment, each SA has a prefix length value associated with the address. An address match on a SA entry means that the addresses match for the number of bits specified by the prefix length value.

There are two exceptions to this search process. First, when an SA entry is set marked as being dynamic it implies that the user of this SA may not have a fixed IP address. In this case the match is fully determined by the SPI value. Thus it is necessary that the SPI values for such SA entries be unique in the SADB. The second exception is for SA entries marked as tunnel mode entries.

10 ' In this case it is normally the case that the sending entity will hide its source address so that all that is visible on the public wire is the destination address. In this case, like in the case where the SA entries are for dynamic IP addresses, the search is done exclusively on the basis of the SPI.

When transmitting a datagram across unprotected network 16 the SADB is searched using only the destination address as an input. In this case the entry which has the longest address match is selected and returned to the calling routine.

In one embodiment, if firewall 18 receives datagrams which are identified as either an IP\_PROTO\_IPSEC\_ESP or IP\_PROTO\_IPSEC\_AH protocol datagram, there must be a corresponding SA in the SADB or else firewall 18 will drop the packet and an audit message will be generated. Such an occurrence might indicate a possible attack or it might simply be a symptom of an erroneous key entry in the Security Association Database.

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In a system such as system 10, application level gateway firewall 18 acts
25 as a buffer between unprotected network 16 and workstations such as
workstation 20. Messages coming from unprotected network 16 are reviewed
and a determination is made as to whether execution of an authentication and
identification protocol is warranted. In contrast to previous systems, system 10
also performs this same determination on IPSEC-encrypted messages. If
30 desired, the same authentication and identification can be made on messages to
be transferred from workstation 20 to unprotected network 16. Figure 2

illustrates one way of authenticating both encrypted and unencrypted messages in a system such as system 10.

In the system of Figure 2 a network protocol stack 40 includes a physical layer 42, an Internet protocol (IP) layer 44, a Transport layer 46 and an application layer 48. Such a protocol stack exists, for instance on application level gateway firewall 18 of Figure 1. An application executing in application layer 48 can communicate to an application executing on another system by preparing a message and transmitting it through one of the existing transport services executing on transport layer 46. Transport layer 46 in turn uses a process executing in IP layer 44 to continue the transfer. Physical layer 42 provides the software needed to transfer data through the communication hardware (e.g., a network interface card or a modem). As noted above, IPSEC executes within IP layer 44. Encryption and authentication is transparent to the host as long as the network administrator has the Security Association Database correctly configured and a key management mechanism is in place on the firewall.

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In application level gateway firewall 18, a proxy 50 operating within application layer 48 processes messages transferred between internal and external networks. All network-to-network traffic must pass through one of the proxies within application layer 48 before being the transfer across networks is allowed. A message arriving from external network 16 is examined at IP layer 44 and an SADB is queried to determine if the source address and SPI are associated with an SA. In the embodiment shown in Figure 2, an SADB Master copy 52 is maintained in persistent memory at application layer 48 while a copy 54 of SADB is maintained in volatile memory within the kernel. If the message is supposed to be encrypted, the message is decrypted based on the algorithm and key associated with the particular SA and the message is transferred up through transport layer 46 to proxy 50. Proxy 50 examines the source and destination addresses and the type of service desired and decides whether authentication of the sender is warranted. If so, proxy 50 initiates an authentication protocol. The protocol may be as simple as requesting a user

name and password or it may include a challenge/response authentication process. Proxy 50 also looks to see whether the message coming in was encrypted or not and may factor that into whether a particular type of authentication is needed. In Telnet, for instance, user name/password authentication may be sufficient for an FFE link while the security policy may dictate that a more stringent challenge/response protocol is needed for unencrypted links. In that case, proxy 50 will be a Telnet proxy and it will base its authentication protocol on whether the link was encrypted or not.

Since IPSEC executes within IP layer 44 there is no need for host firewalls to update their applications. Users that already have IPSEC available on their own host machine will, however, have to request that the firewall administrator set up SA's in the SADB for their traffic.

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In the embodiment shown in Figure 2, a working copy 54 of the Security Association Database consisting of all currently active SA's is kept resident in memory for ready access by IP layer processing as datagrams are received and transmitted. In addition, a working master copy 52 of the SADB is maintained in a file in nonvolatile memory. During system startup and initialization processing the content of all of the required SA's in master SADB 52 is added to the working copy 54 stored in kernel memory.

In one embodiment, firewall 18 maintains different levels of security on internal and external network interfaces. It is desirable for a firewall to have different levels of security on both the internal and external interfaces. In one embodiment, firewall 18 supports three different levels, numbered 0 through 2. These levels provide a simple policy mechanism that controls permission for both in-bound and out-bound packets.

Level 0 - do not allow any in-bound or out-bound traffic unless there is a security association between the source and destination.

- Level 1 Allow both in-bound and out-bound non-IPSEC traffic but force the use of IPSEC if a SA exists for the address. (To support this firewall 18 must look for a SA for each in-bound datagram.)
- Level 2 allow NULL security associations to exist. NULL associations are just like normal security associations, except no encryption or authentication transform is performed on in-bound or out-bound packets that correspond to this NULL association. With Level 2 enabled, the machine will still receive unprotected traffic, but it will not transmit unless Level 1 is enabled.

The default protection level established when the Security Association

Database (SADB) is initialized at boot time is 1 for in-bound traffic and 2 for out-bound traffic.

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An Access Control List, or ACL, is a list of rules that regulate the flow of Internet connections through a firewall. These rules control how a firewall's servers and proxies will react to connection attempts. When a server or proxy receives an incoming connection, it performs an ACL check on that connection.

An ACL check compares a set of parameters associated with the connection against a list of ACL rules. The rules determine whether the connection is allowed or denied. A rule can also have one or more side effects. A side effect causes the proxy to change its behavior in some fashion. For example, a common side effect is to redirect the destination IP address to an alternate machine. In addition to IP connection attempts, ACL checks can also made on the console logins and on logins made from serial ports. Finally, ACL checks can also be made on behalf of IP access devices, such as a Cisco box, through the use of the industry standard TACACS+ protocol.

In one embodiment, the ACL is managed by an acld daemon running in the kernel of firewalls 10 and 30. The acld daemon receives two types of requests, one to query the ACL and one to administer it. In one such embodiment, the ACL is stored in a relational database such as the Oracle database for fast access. By using such a database, query execution is asynchronous and many queries can be executing concurrently. In addition, these types of databases are designed to manipulate long lists of rules quickly

and efficiently. These qualities ensure that a given query cannot hang up the process that issued the query for any appreciable time (> 1-2 seconds).

In one such embodiment, the database can hold up to 100,000 users and up to 10,000 hosts but can be scaled up to the capacity of the underlying

database engine. The results of an ACL check is cached, allowing repeated checks to be turned around very quickly.

Applications on firewalls 10 and 30 can query acld to determine if a given connection attempt should be allowed to succeed. In one embodiment, the types of applications (i.e. "agents") that can make ACL queries can be divided into four classes:

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- 1) Proxies. These allow connections to pass through firewall 10 or 30 in order to provide access to a remote service. They include tnauthp (authenticated telnet proxy), pftp (FTP proxy), httpp (HTTP proxy), and tcpgsp (TCP generic service proxy).
- 15 2) Servers. These provide a service on the firewall itself. They include ftpd and httpd.
- Unix shell. It is not considered a server because it cannot receive IP connections. One example is /usr/bin/login when used to create a dialup session or a console session on firewall 10 or 30. Another example is the command srole.
  - 4) Network Access Servers (NAS). NAS is a remote IP access device, typically a dialup box manufactured by such companies as Cisco or Bridge. The NAS usually provides dialup telnet service and may also provide SLIP or PPP service.

Proxies, servers, login agents, and NASes make queries to acld to determine if a given connection attempt should be allowed to succeed. All of the agents except NAS make their queries directly. NAS, because it is remote, must communicate via an auxiliary daemon that typically uses an industry standard protocol such as RADIUS or TACACS+. The auxiliary daemon (e.g., tacradd) in turn forwards the query to local acld.

As a side effect of the query, acld tells the agent if authentication is needed. If no authentication is needed, the connection proceeds immediately. Otherwise acld provides (as another side effect) a list of allowed authentication methods that the user can choose from. The agent can present a menu of choices 5 or simply pick the first authentication method by default. Typical authentication methods include plain password, SNK DSS, SDI SecurID, LOCKout DES, and LOCKout FORTEZZA. In one embodiment, the list of allowed authentication methods varies depending on the host name, user name, time of day, or any combination thereof.

In the case of a Level 0 policy, it would be safe to assume that all incoming traffic is encrypted or authenticated. In the case of Levels 1 through 2, a determination must be made whether or not a security association exists for a given peer. Otherwise an application may believe that in-bound traffic has been authenticated when it really has not. (That is why it is necessary to look for an SA on input of each non-IPSEC datagram.)

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In one embodiment, a flag which accompanies the message as it is sent from IP layer 44 to proxy 50 indicates whether the incoming message was or was not encrypted. In another embodiment, proxy 50 accesses Security Association Database 54 (the table in the kernel can be queried via an SADB routing socket 20 (PF-SADB)) to determine whether or not a security association exists for a given peer.. The SADB socket is much like a routing socket found in the stock BSD 4.4 kernel (protocol family PF-ROUTE) except that PF-SADB sockets are used to maintain the Security Association Database (SADB) instead of the routing table. Because the private keys used for encryption, decryption, and keyed authentication are stored in this table, access must be strictly prohibited and allowed to only administrators and key management daemons. Care must be taken when allowing user-level daemons access to /dev/mem or /dev/kmem as well, since the keys are stored in kernel memory and could be exposed with some creative hacking.

In one embodiment, a command-line tool called sadb is used to support the generation and maintenance of in-kernel version 54 of SADB. The primary

interface between this tool and the SADB is the PF-SADB socket. The kernel provides socket processing to receive client requests to add, update, or change entries in in-kernel SADB 54. As noted above, the default protection level established when the Security Association Database (SADB) is initialized at boot time is 1 for in-bound traffic and 2 for out-bound traffic. This may be changed by the use of the sadb command.

The existing sadb command was derived from the NIST implementation of IPSEC. As noted above, this tool is much like route in that it uses a special socket to pass data structures in and out of the kernel. There are three commands recognized by the sadb command: get, set, delete. The following simple shell script supports adding and removing a single SA entry to SADB 54. It shows one embodiment of a parameter order for adding a SA to the SADB.

```
# ! /bin/sh
15 if [ $# -ne 1 ]
    then
         echo "usage: $0 <on> | <off>" >&2
         exit 1
    fi
20 ONOFF=$1
   addsa ()
   IPADDRESS=$2
25 PEERADDRESS=0.0.0.0
   PREFIXLEN=0
                             # Num of bits, 0 => full 32
   bit match
   LOCALADDRESS=0.0.0.0
   REALADDRESS=0.0.0.0
30 PORT=0
   PROTOCOL=0
   UID=0
   DESALG=1
                             \# I = DES-CBC
   IVLEN=4
                             # bytes
35 DESKEY=0b0b0b0b0b0b0b0b
   DESKEYLEN=8
                             # bytes
   AHALG=1
                             #1 = MD5
   AHKEY=30313233343536373031323334353637
   AHKEYLEN=16
                             # bytes
40 LOCAL_SPI=$1
```

```
PEER SPI=$1
    TUNNEL MODE=0
    AHRESULTLEN=4
    COMBINED MODE=1
                               # On output, 1 = ESP, then
 5 AH; 0 = AH, then ESP
    DYNAMIC_FLAG=0
    if [ "$ONOFF" = "on"
10
          ./sadb add dst $IPADDRESS $PREFIXLEN $LOCAL SPI
    $UID $PEERADDRESS $PEER_SPI $TUNNEL_MODE $LOCALADDRESS
    $REALADDRESS $PROTOCOL $PORT $DESALG $IVLEN $DESKEYLEN
    SDESKEY SDESKEYLEN SDESKEY SAHALG SAHKEYLEN SAHKEY
    $AHKEYLEN $AHKEY $AHRESULTLEN $COMBINED MODE
15 $DYNAMIC_FLAG
    else
          ./sadb delete dst $IPADDRESS $LOCAL-SPI
    fi
20
         Get down to work:
    addsa 500 172.17.128.115
                                          # number6.sctc.com
    The current status of in-kernel SADB 54 can be obtained with the sadb
25 command. The get option allows dumping the entire SADB or a single entry. In
    one embodiment, the complete dump approach uses /dev/kmem to find the
    information. The information may be presented as follows:
    # sadb get dst
30
    Local-SPI Address-Family Destination-Addr
    Preflx length UID
         Peer-Address Peer-SPI Transport-Type
         Local-Address Real-Address
35
         Protocol Port
         ESP_Alg_ID ESP_IVEC_Length
              ESP_Enc_Key_length ESP_Enc_ESP_Key
              ESP_Dec_Key_length ESP_Dec_ESP_Key
         AH_Alg_ID AH_Data_Length
40
              AH_Gen_Key_Length AH Gen Key
              AH_Check_Key_Length AH_Check_Key
         Combined Mode Dynamic Flag
```

```
500 INET: number6.sctc.com 0 0
         0.0.0.0
                    500 Transport(0) 0
5
         0.0.0.0 0.0.0.0
         None None
         DES/CBC-RFC1829(1) 4
               8 0b0b0b0b0b0b0b0b
               8 0b0b0b0b0b0b0b0b
10
         MD5-RFC1828(1) 4
               16 30313233343536373031323334353637
               16 30313233343536373031323334353637
         ESP+AH(1) 0
    501 INET: spokes.sctc.com 0 0
15
         0.0.0.0
                    501 Transport (0) 0
         0.0.0.0.0.0.0.0
         None None
         DES/CBC-RFC1829(1) 4
               8 0b0b0b0b0b0b0b0b
20
               8 0b0b0b0b0b0b0b
         MD5-RFC1828(1) 4
               16 30313233343536373031323334353637
               16 303132333435363730313233334353637
         ESP+AH(1) 0
25
    End of list.
```

When a new entry is added to in-kernel SADB 54, the add process first checks to see that no existing entry will match the values provided in the new entry. If no match is found then the entry is added to the end of the existing SADB list.

To illustrate the use and administration of an FFE, we'll go through an example using FFE 70 in Figure 3. Firewalls 14 and 18 are both application level gateway firewalls implemented according to the present invention.

Workstations H2 and H3 both want to communicate with Hl. For the administrator of firewalls 14 and 18, this is easy to accomplish. The administrator sets up a line something like this (we'll only show the IP address part and SPI parts of the SA, since they're the trickiest values to configure. Also, assume that we are using tunnel mode):

# Hypothetical SW1 Config File