



(12) **United States Patent**
Beser et al.

(10) **Patent No.:** **US 6,496,867 B1**
(45) **Date of Patent:** **Dec. 17, 2002**

(54) **SYSTEM AND METHOD TO NEGOTIATE PRIVATE NETWORK ADDRESSES FOR INITIATING TUNNELING ASSOCIATIONS THROUGH PRIVATE AND/OR PUBLIC NETWORKS**

6,381,646 B2 * 4/2002 Zhang et al. 709/227
6,400,722 B1 * 6/2002 Chuah et al. 370/401

OTHER PUBLICATIONS

Lee et al., "The Next Generation of the Internet: Aspects of the Internet Protocol Version 6", IEEE Network, Jan./Feb. 1988, pp. 28-33.*
"Internet Engineering Task Force", Request for Comments 791, Internet Protocol, Sep. 1981, pp. 1 to 45.
"Internet Engineering Task Force", Request for Comments 1853, IP in IP Tunneling, Oct. 1995, pp. 1 to 8.
"Internet Engineering Task Force", Request for Comments 1701, Generic Routing Encapsulation (GRE), Oct. 1994, pp. 1 to 8.
"Internet Engineering Task Force", Request for Comments 1241, A Scheme for an Internet Encapsulation Protocol, Jul. 1991, pp. 1 to 17.

(List continued on next page.)

(75) Inventors: **Nurettin B. Beser**, Evanston, IL (US);
Michael Borella, Naperville, IL (US)

(73) Assignee: **3Com Corporation**, Santa Clara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/384,120**

(22) Filed: **Aug. 27, 1999**

(51) **Int. Cl.**⁷ **G06F 15/16**; G06F 15/173

(52) **U.S. Cl.** **709/245**; 709/227; 709/225

(58) **Field of Search** 709/220, 222, 709/225, 226, 227, 228, 229, 245, 218, 217; 370/401, 349; 713/201

Primary Examiner—Le Hien Luu

(74) *Attorney, Agent, or Firm*—McDonnell, Boehnen, Hulbert & Berghoff

(57) **ABSTRACT**

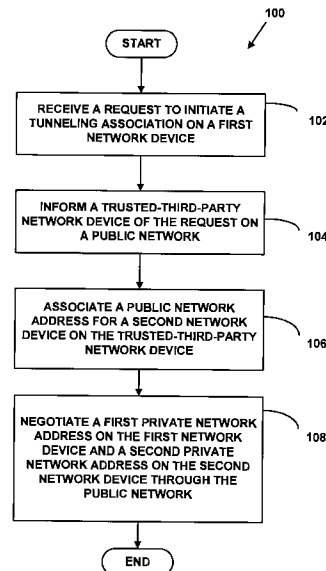
A method for initiating a tunneling association in a data network. The method includes negotiating private addresses, such as private Internet Protocol addresses, for the ends of the tunneling association. The negotiation is performed on a public network, such as the Internet, through a trusted-third-party without revealing the private addresses. The method provides for hiding the identity of the originating and terminating ends of the tunneling association from the other users of the public network. Hiding the identities may prevent interception of media flow between the ends of the tunneling association or eavesdropping on Voice-over-Internet-Protocol calls. The method increases the security of communication on the data network without imposing a computational burden on the devices in the data network.

41 Claims, 17 Drawing Sheets

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,159,592	A	10/1992	Perkins	
5,227,778	A	7/1993	Vacon et al.	
5,550,984	A	8/1996	Gelb	
5,636,216	A	6/1997	Fox et al.	
5,708,655	A	1/1998	Toth et al.	
5,793,763	A	8/1998	Mayes et al.	
5,812,819	A	9/1998	Rodwin et al.	
5,867,660	A	2/1999	Schmidt et al.	
5,872,847	A	2/1999	Boyle et al.	
6,018,767	A *	1/2000	Fijolek et al.	709/218
6,236,652	B1 *	5/2001	Preston et al.	370/349
6,253,327	B1 *	6/2001	Zhang et al.	713/201
6,377,982	B1 *	4/2002	Rai et al.	709/217



OTHER PUBLICATIONS

- “ITU-T Recommendation H.323”, Series H: Audiovisual and Multimedia Systems (Systems and Terminal Equipment for audiovisual Services), Telecommunication Standardization Sector of ITU, International Telecommunication Union, Feb. 1998, 125 pages.
- “ITU-T Recommendation H.255.0”, Series H: Audiovisual and Multimedia Systems (Transmission Multiplexing and Synchronization), Telecommunication Standardization Sector of ITU, International Telecommunication Union, Feb. 1998, 157 pages.
- “Internet Engineering Task Force”, Request for Comments 2663, IP Network Address Translator (NAT) Terminology and Considerations, Aug. 1999, pp. 1 to 30.
- “Internet Engineering Task Force”, Request for Comments 1631, The IP Network Address Translator (NAT), May 1994, pp. 1 to 10.
- “Internet Engineering Task Force”, Internet Draft, Negotiated AddressReuse (NAR), May 1998, pp. 1 to 22.
- “Internet Engineering Task Force”, Internet-Draft, NAT Bypass for End 2 End ‘Sensitive’ Applications, Jan. 1998, pp. 1 to 5.
- “Internet Engineering Task Force”, Internet-Draft, Network Address Translation—Protocol Translation (NAT-PT), Jan. 1999, pp. 1 to 15.
- “Internet Engineering Task Force”, Internet-Draft, IP Host Network Address (and Port) Translation, Nov. 1998, pp. 1 to 14.
- “Internet Engineering Task Force”, Internet Draft, Distributed Network Address Translation, Oct. 1998, pp. 1 to 24.
- “Internet Engineering Task Force”, Internet-Draft, DNS Extensions to Network Address Translators (DNS_ALG), Oct. 1998, pp. 1 to 27.
- “Internet Engineering Task Force”, Internet-Draft, Security for IP Network Address Translator (NAT) Domains, Nov. 1998, pp. 1 to 11.
- “Internet Engineering Task Force”, Internet-Draft, The IP Network Address Translator (NAT), Feb. 1998, pp. 1 to 24.
- “Internet Engineering Task Force”, Internet-Draft, Traditional IP Network Address Translator (Traditional NAT), Oct. 1998, pp. 1 to 17.
- “Internet Engineering Task Force”, Internet-Draft, IP Network Address Translator (NAT) Terminology and Considerations, Oct. 1998, pp. 1 to 28.
- “Internet Engineering Task Force”, Internet Draft, A Multihoming solution using NATs, Nov. 1998, pp. 1 to 32.
- “Internet Engineering Task Force”, Internet Draft, Network Address Translation Issues with IPsec, Feb. 1998, pp. 1 to 12.
- “Internet Engineering Task Force”, Internet Draft, IP Security, Nov. 1997, pp. 1 to 12.
- “Internet Engineering Task Force”, Internet Draft, Architectural Implications of NAT, Oct. 1998, pp. 1 to 14.
- “Internet Engineering Task Force”, Internet Draft, IP Relocation Through Twice Network Address Translators (RAT), Feb. 1999, pp. 1 to 20.
- “Internet Engineering Task Force”, Internet Draft, Reverse Twice Network Address Translators (RAT), Dec. 1998, pp. 1 to 24.
- “Internet Engineering Task Force”, Internet Draft, Implications of NATs on the TCP/IP Architecture, Feb. 1999, pp. 1 to 7.
- “Internet Engineering Task Force”, Internet Draft, Mobile IP Extension for Private Internets Support, Feb. 1999, pp. 1 to 24.

* cited by examiner

FIG. 1

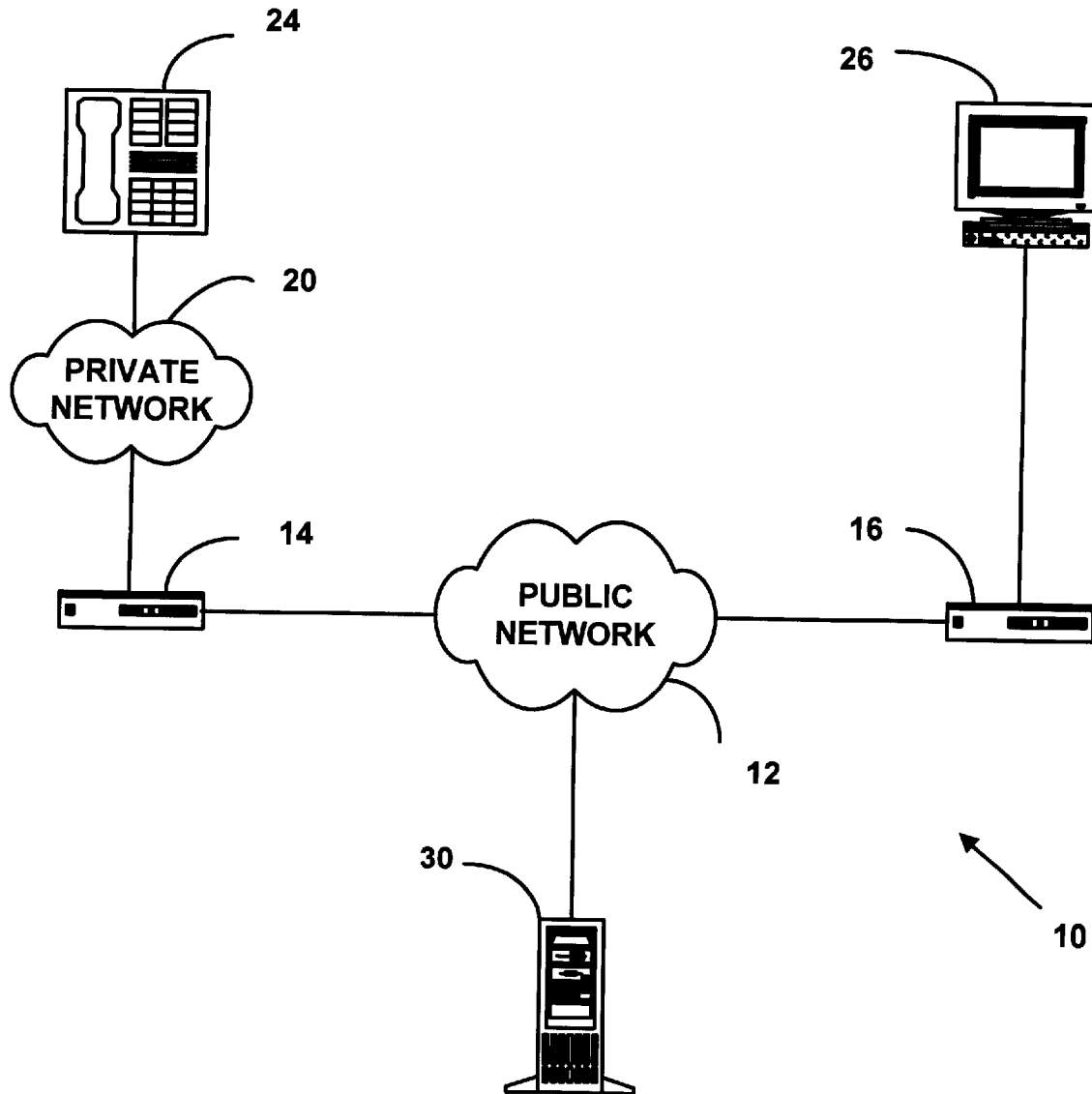


FIG. 2

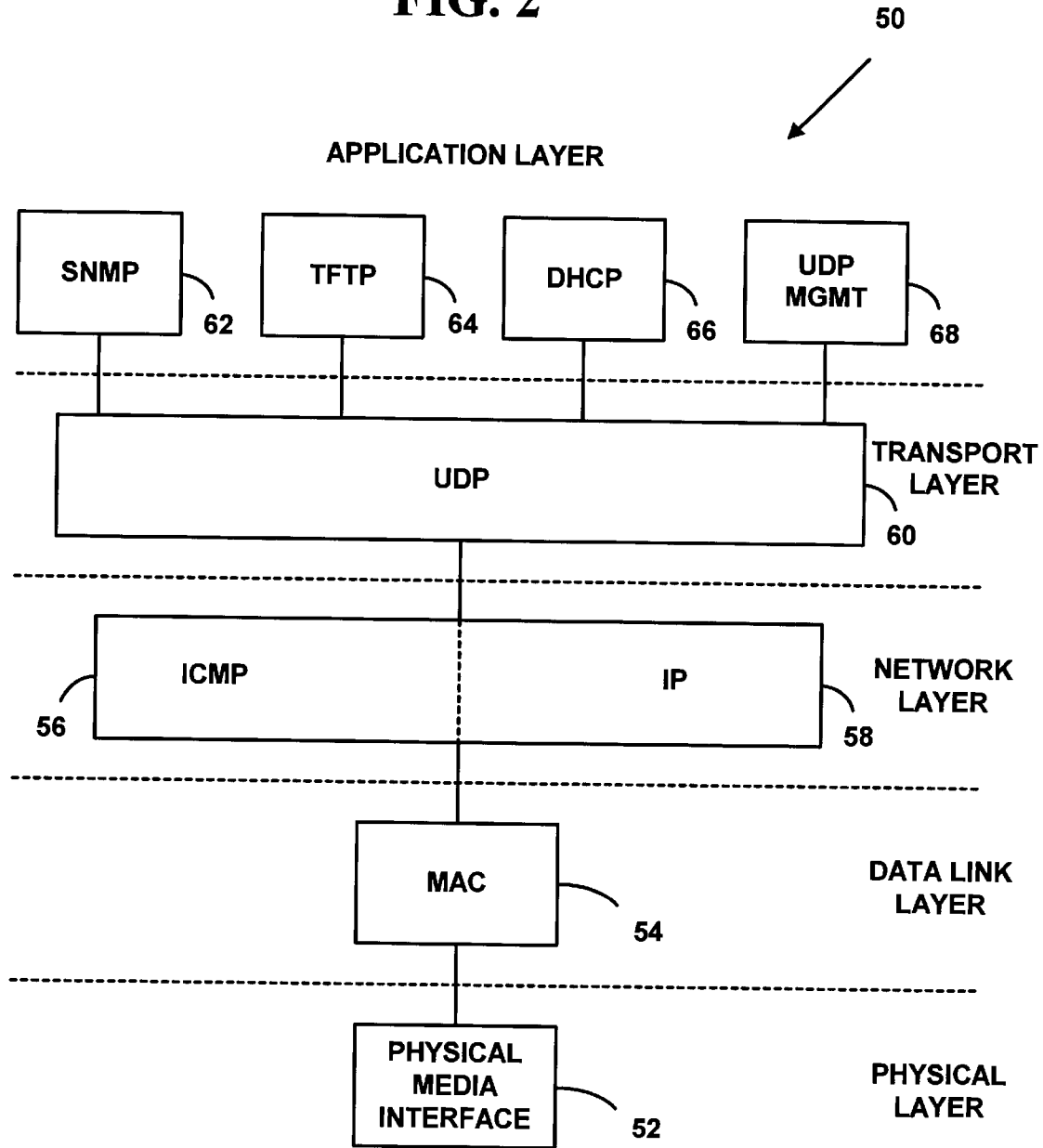
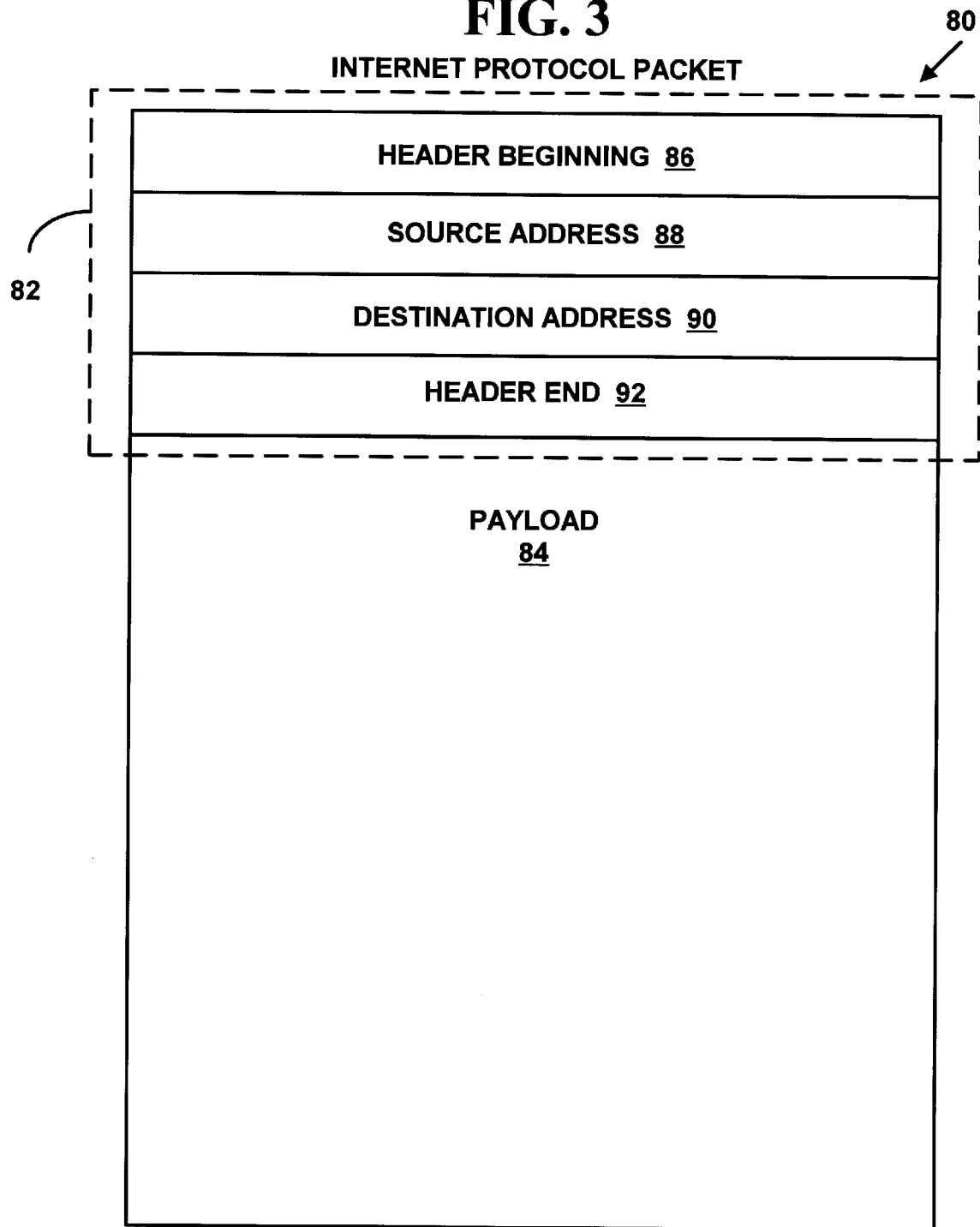


FIG. 3



Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.