



US006862622B2

(12) **United States Patent**
Jorgensen

(10) **Patent No.:** **US 6,862,622 B2**
(45) **Date of Patent:** ***Mar. 1, 2005**

(54) **TRANSMISSION CONTROL PROTOCOL/
INTERNET PROTOCOL (TCP/IP)
PACKET-CENTRIC WIRELESS POINT TO
MULTI-POINT (PTMP) TRANSMISSION
SYSTEM ARCHITECTURE**

(75) Inventor: **Jacob W. Jorgensen**, Folsom, CA (US)

(73) Assignee: **Van Drebber Mariner LLC**, Los Altos, CA (US)

(*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 536 days.

(21) Appl. No.: **09/349,477**

(22) Filed: **Jul. 9, 1999**

(65) **Prior Publication Data**

US 2002/0099854 A1 Jul. 25, 2002

Related U.S. Application Data

(60) Provisional application No. 60/092,452, filed on Jul. 10, 1998.

(51) **Int. Cl.**⁷ **G06F 15/173**

(52) **U.S. Cl.** **709/226; 709/229; 709/223;**
370/338; 370/351

(58) **Field of Search** **709/104, 229,**
709/217-219, 250, 226, 223; 370/351, 328,
338

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,742,512 A 5/1988 Akashi et al.

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

CA 2064975 7/1999

(List continued on next page.)

OTHER PUBLICATIONS

Cheng et. al., "Wireless Intelligent ATM Network and Protocol Design for Future Personal Communication Systems", IEEE 1997.*

(List continued on next page.)

Primary Examiner—Hosain Alam

Assistant Examiner—Philip B. Tran

(74) *Attorney, Agent, or Firm*—Fulbright & Jaworski L.L.P.

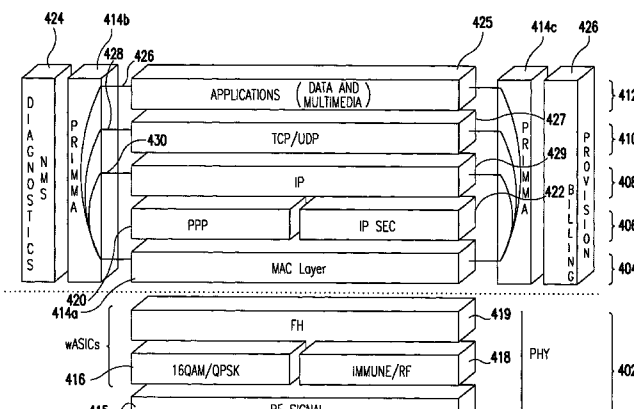
(57)

ABSTRACT

A packet-centric wireless point to multi-point telecommunications system includes: a wireless base station communicating via a packet-centric protocol to a first data network; one or more host workstations communicating via the packet-centric protocol to the first data network; one or more subscriber customer premise equipment (CPE) stations coupled with the wireless base station over a shared bandwidth via the packet-centric protocol over a wireless medium; and one or more subscriber workstations coupled via the packet-centric protocol to each of the subscriber CPE stations over a second network. The packet-centric protocol can be transmission control protocol/internet protocol (TCP/IP). The packet-centric protocol can be a user datagram protocol/internet protocol (UDP/IP). The system can include a resource allocation means for allocating shared bandwidth among the subscriber CPE stations. The resource allocation is performed to optimize end-user quality of service (QoS). The wireless communication medium can include at least one of: a radio frequency (RF) communications medium; a cable communications medium; and a satellite communications medium. The wireless communication medium can further include a telecommunications access method including at least one of: a time division multiple access (TDMA) access method; a time division multiple access/time division duplex (TDMA/TDD) access method; a code division multiple access (CDMA) access method; and a frequency division multiple access (FDMA) access method.

The first data network includes at least one of: a wireline network; a wireless network; a local area network (LAN); and a wide area network (WAN). The second network includes at least one of: a wireline network; a wireless network; a local area network (LAN); and a wide area network (WAN).

22 Claims, 41 Drawing Sheets



Intellectual Ventures I LLC

Exhibit 2011

ERICSSON v. IV I

IPR2018-00727

U.S. PATENT DOCUMENTS

| | | | | | | | |
|---------------|---------|--------------------------|----------|-----------------|---------|-------------------|---------|
| 4,907,224 A | 3/1990 | Scoles et al. | 370/85.2 | 6,038,451 A * | 3/2000 | Syed et al. | 455/445 |
| 5,282,222 A | 1/1994 | Fattouche et al. | | 6,038,452 A | 3/2000 | Strawczynski | |
| 5,337,313 A | 8/1994 | Buchholz et al. | | 6,041,051 A | 3/2000 | Doshi et al. | |
| 5,420,851 A | 5/1995 | Seshadri et al. | 370/29 | 6,046,980 A | 4/2000 | Packer | |
| 5,442,625 A | 8/1995 | Gitlin et al. | | 6,052,594 A | 4/2000 | Chuang et al. | |
| 5,444,718 A | 8/1995 | Ejzak et al. | | 6,058,114 A | 5/2000 | Sethuram et al. | |
| 5,493,569 A | 2/1996 | Buchholz et al. | 370/85.7 | 6,064,649 A | 5/2000 | Johnston | |
| 5,497,504 A | 3/1996 | Acampora et al. | | 6,072,790 A | 6/2000 | Neumiller et al. | |
| 5,499,243 A | 3/1996 | Hall | | 6,075,787 A | 6/2000 | Bobeck et al. | |
| 5,515,363 A | 5/1996 | Ben-Nun et al. | | 6,075,792 A | 6/2000 | Ozluturk | |
| 5,570,355 A | 10/1996 | Dail et al. | | 6,081,524 A | 6/2000 | Chase et al. | |
| 5,572,528 A | 11/1996 | Shuen | | 6,081,536 A | 6/2000 | Gorsuch et al. | |
| 5,581,544 A | 12/1996 | Hamada et al. | | 6,084,867 A | 7/2000 | Meier | |
| 5,602,836 A | 2/1997 | Papadopoulos et al. | 370/280 | 6,091,959 A | 7/2000 | Soussi et al. | |
| 5,610,910 A * | 3/1997 | Focsaneanu et al. | 370/351 | 6,092,113 A | 7/2000 | Maeshima et al. | |
| 5,613,198 A | 3/1997 | Ahmadi et al. | | 6,097,707 A | 8/2000 | Hodzic et al. | |
| 5,625,877 A | 4/1997 | Dunn et al. | | 6,097,722 A | 8/2000 | Graham et al. | |
| 5,638,371 A | 6/1997 | Raychaudhuri et al. | | 6,097,733 A | 8/2000 | Basu et al. | |
| 5,640,395 A | 6/1997 | Hamalainen et al. | | 6,104,721 A | 8/2000 | Hsu | |
| 5,644,576 A | 7/1997 | Bauchot et al. | | 6,111,863 A | 8/2000 | Rostoker et al. | |
| 5,648,969 A | 7/1997 | Pasternak et al. | | 6,115,357 A | 9/2000 | Packer et al. | |
| 5,684,791 A | 11/1997 | Raychaudhuri et al. | | 6,115,370 A | 9/2000 | Struhsaker et al. | |
| 5,701,302 A | 12/1997 | Geiger | | 6,115,390 A | 9/2000 | Chuah | |
| 5,717,689 A | 2/1998 | Ayanoglu | | 6,131,012 A | 10/2000 | Struhsaker et al. | |
| 5,724,513 A | 3/1998 | Ben-Nun et al. | | 6,131,027 A | 10/2000 | Armbruster et al. | |
| 5,729,542 A | 3/1998 | Dupont | | 6,131,117 A | 10/2000 | Clark et al. | |
| 5,732,077 A | 3/1998 | Whitehead | | 6,151,300 A | 11/2000 | Hunt et al. | |
| 5,734,833 A | 3/1998 | Chiu et al. | | 6,151,628 A | 11/2000 | Xu et al. | |
| 5,742,847 A | 4/1998 | Knoll et al. | | 6,154,643 A | 11/2000 | Cox | |
| 5,751,708 A | 5/1998 | Eng et al. | | 6,160,793 A | 12/2000 | Ghani et al. | |
| 5,752,193 A | 5/1998 | Scholefield et al. | | 6,163,532 A | 12/2000 | Taguchi et al. | |
| 5,758,281 A * | 5/1998 | Emery et al. | 455/428 | 6,175,860 B1 | 1/2001 | Gaucher | |
| 5,774,461 A | 6/1998 | Hyden et al. | | 6,188,671 B1 | 2/2001 | Chase et al. | |
| 5,787,077 A | 7/1998 | Kuehnel et al. | | 6,192,029 B1 | 2/2001 | Averbuch et al. | |
| 5,787,080 A | 7/1998 | Hulyalkar et al. | | 6,195,565 B1 | 2/2001 | Dempsey et al. | |
| 5,790,551 A | 8/1998 | Chan | | 6,201,811 B1 | 3/2001 | Larsson et al. | |
| 5,793,416 A | 8/1998 | Rostoker et al. | | 6,208,620 B1 | 3/2001 | Sen et al. | |
| 5,802,465 A | 9/1998 | Hamalainen et al. | | 6,215,769 B1 | 4/2001 | Ghani et al. | |
| 5,828,666 A | 10/1998 | Focsaneanu et al. | | 6,219,713 B1 | 4/2001 | Ruutu et al. | |
| 5,828,677 A | 10/1998 | Sayeed et al. | | 6,235,300 B1 | 5/2001 | Ahmed | |
| 5,831,971 A | 11/1998 | Bonomi et al. | | 6,236,656 B1 | 5/2001 | Westerberg et al. | |
| 5,831,975 A | 11/1998 | Chen et al. | | 6,247,058 B1 | 6/2001 | Miller et al. | |
| 5,838,670 A | 11/1998 | Billström | | 6,252,857 B1 | 6/2001 | Fendick et al. | |
| 5,841,777 A | 11/1998 | Cohen | | 6,262,980 B1 * | 7/2001 | Leung et al. | 370/336 |
| 5,864,540 A | 1/1999 | Bonomi et al. | | 6,272,333 B1 | 8/2001 | Smith | |
| 5,889,816 A | 3/1999 | Agrawal et al. | | 6,295,285 B1 * | 9/2001 | Whitehead | 370/329 |
| 5,907,822 A | 5/1999 | Prieto, Jr. | | 6,304,564 B1 | 10/2001 | Monin et al. | |
| 5,909,550 A | 6/1999 | Shankar et al. | | 6,310,886 B1 | 10/2001 | Barton | |
| 5,920,705 A | 7/1999 | Lyon et al. | | 6,320,846 B1 | 11/2001 | Jamp et al. | |
| 5,930,472 A * | 7/1999 | Smith | 709/219 | 6,324,184 B1 | 11/2001 | Hou et al. | |
| 5,936,949 A | 8/1999 | Pasternak et al. | | 6,330,244 B1 | 12/2001 | Swartz et al. | |
| 5,953,328 A | 9/1999 | Kim et al. | | 6,330,451 B1 | 12/2001 | Sen et al. | |
| 5,953,344 A | 9/1999 | Dail et al. | | 6,331,986 B1 | 12/2001 | Mitra et al. | |
| 5,956,330 A | 9/1999 | Kerns | | 6,363,053 B1 | 3/2002 | Schuster et al. | |
| 5,959,999 A | 9/1999 | An | | 6,363,209 B2 | 3/2002 | Sako et al. | |
| 5,960,000 A | 9/1999 | Ruszczyk et al. | | 6,377,548 B1 | 4/2002 | Chuah | |
| 5,966,378 A | 10/1999 | Hamalainen | | 6,377,782 B1 | 4/2002 | Bishop et al. | |
| 5,970,059 A | 10/1999 | Ahopelto et al. | | 6,400,722 B1 | 6/2002 | Chuah et al. | |
| 5,970,062 A | 10/1999 | Bauchot | | 6,412,006 B2 | 6/2002 | Naudus | |
| 5,974,028 A | 10/1999 | Ramakrishnan | | 6,442,158 B1 | 8/2002 | Beser | |
| 5,974,085 A | 10/1999 | Smith | | 6,452,915 B1 | 9/2002 | Jorgensen | |
| 5,991,292 A | 11/1999 | Focsaneanu et al. | | 6,459,682 B1 | 10/2002 | Elleson et al. | |
| 6,002,935 A | 12/1999 | Wang | | 2002/0099949 A1 | 7/2002 | Fries et al. | |
| 6,005,868 A | 12/1999 | Ito | | 2002/0163933 A1 | 11/2002 | Benveniste | |
| 6,014,377 A * | 1/2000 | Gillespie | 370/351 | | | | |
| 6,016,311 A | 1/2000 | Gilbert et al. | | | | | |
| 6,021,158 A | 2/2000 | Schurr et al. | | | | | |
| 6,031,832 A | 2/2000 | Turina | | | | | |

FOREIGN PATENT DOCUMENTS

| | | | | |
|----|------------|--------|-------|-----------|
| EP | 702 462 A1 | 3/1996 | | H04B/7/08 |
| EP | 841 763 A1 | 5/1998 | | H04B/7/26 |
| EP | 848 563 A2 | 6/1998 | | H04O/7/20 |

| | | | | |
|----|----------------|---------|-------|------------|
| WO | WO 96/10320 | 4/1996 | | H04Q/7/22 |
| WO | WO 98/37670 | 8/1998 | | H04L/12/56 |
| WO | WO 98/37706 | 8/1998 | | |
| WO | WO 99/26430 | 5/1999 | | H04Q/7/20 |
| WO | WO 0072626 A1 | 11/2000 | | |
| WO | WO 00/79722 | 12/2000 | | |
| WO | WO 02/39710 A1 | 5/2002 | | |

OTHER PUBLICATIONS

Kim et al. "The AT&T Labs Broadband Fixed Wireless Field Experiment", IEEE Communications Magazine, Oct. 1999, pp. 56–62.

Iera et al. "Wireless Broadband Applications: The Teleservice Model and Adaptive QoS Provisioning", IEEE Communications Magazine, Oct. 1999, pp. 71–75.

Celidonio et al. "A Wideband Two-Layer Radio Access Network Using DECT Technology in the Uplink", IEEE Communications Magazine, Oct. 1999, pp. 76–81.

Yoon et al. "A Wireless Local Loop System Based on Wideband CDMA Technology", IEEE Communications Magazine, Oct. 1999, pp. 128–135.

Balakrishnan et al. "Improving Reliable Transport and Handoff Performance in Cellular Wireless Networks", <http://www.cs.berkeley.edu/~ss/papers/wunet/html/winet.html>, Computer Science Div., Dept. of Electrical Engineering and Computer Science, Univ. of California at Berkeley, Berkeley, CA 94720–1776, Nov. 1995, pp 1–18.

Bianchi, et al. "C-PRMA: A Centralized Packet Reservation Multiple Access for Local Wireless Communications" in IEEE Transactions on Vehicular Technology, vol. 46, No. 2 pp. 422–436, May 1997.

"A Cellular Wireless Local Area Network with QoS Guarantees for Heterogeneous Traffic", Author(s): Sunghyun Choi and Kang G. Shin, *Technical Report CSE-TR-300-96*, Aug. 1996, pp. 1–24.

"The GSM System", Authors: Michel Mouly, Marie-Bernadette Pautet, pp. 272–277, XP-002154762.

"A Comparison of Mechanisms for Improving TCP Performance over Wireless Links" Author(s): Hari Balakrishnan, Venkata N. Padmanabhan, Srinivasan Seshan, and Randy H. Katz; XF000734405 *IEEE/ACM Transactions on Networking*, vol. 5, No. 6, Dec. 1997, pp. 756–769.

"Improving TCP/IP Performance Over Wireless Networks"; Author(s): Hari Balakrishnan, Srinivasan Seshan, Elan Amire and Randy H. Katz; *In Proc. 1st ACM Int'l Conf. On Mobile Computing and Networking (Mobicom)*, Nov. 1995, XP-002920962.

International Search Report; Date: Dec. 14, 2000; International Appln. No. PCT/US 00/18531 for (36792–164878).

International Search Report; Date: Feb. 14, 2000; International Appln. No. PCT/US 00/18584 for (36792–164879).

International Search Report; Date: Dec. 14, 2000; International Appln. No. PCT/US 00/18585 for (36792–164880).

International Search Report; Date: Dec. 22, 2000; International Appln. No. PCT/US 00/18666 for (36792–164881).

Zahedi, A. et al. "Voice and Data Integration on TCP/IP Wireless Networks" Personal, Indoor and Mobile Radio Communication Sep. 1–4, 1997, vol. 2, pp. 678–682.

Madhow, U. "Dynamic Congestion Control and Error Recovery over a Heterogeneous Internet" Decision and Control, Dec. 10–12, 1997, vol. 3, pp. 2368–2374.

Kitchin, D. et al. "IEEE P802.11 Wireless LANs—Wireless Multimedia Enhancements (WME)", doc: IEEE 802.11-02/592r0, IEEE Sep. 11, 2002.

IEEE Std 802.11e/D3.3, Oct. 2002 (Draft Supplement to IEEE Std 802.11, 1999 Edition) Draft Supplement to STANDARD FOR Telecommunications and Information Exchange Between Systems—LAN/MAN Specific Requirements— Part 11: Wireless Medium Access Control (MAC) and Physical Layer (PHY) specifications: Medium Access Control (MAC) Enhancements for Quality of Service (QoS), IEEE Oct. 2002.

Jerry D. Gibson, "The Communications Handbook", CRC Press, Inc., first edition, p. 630 and 631.

Cisco White Paper, Policy-Based Routing, 1996 pp. 1–7.

* cited by examiner

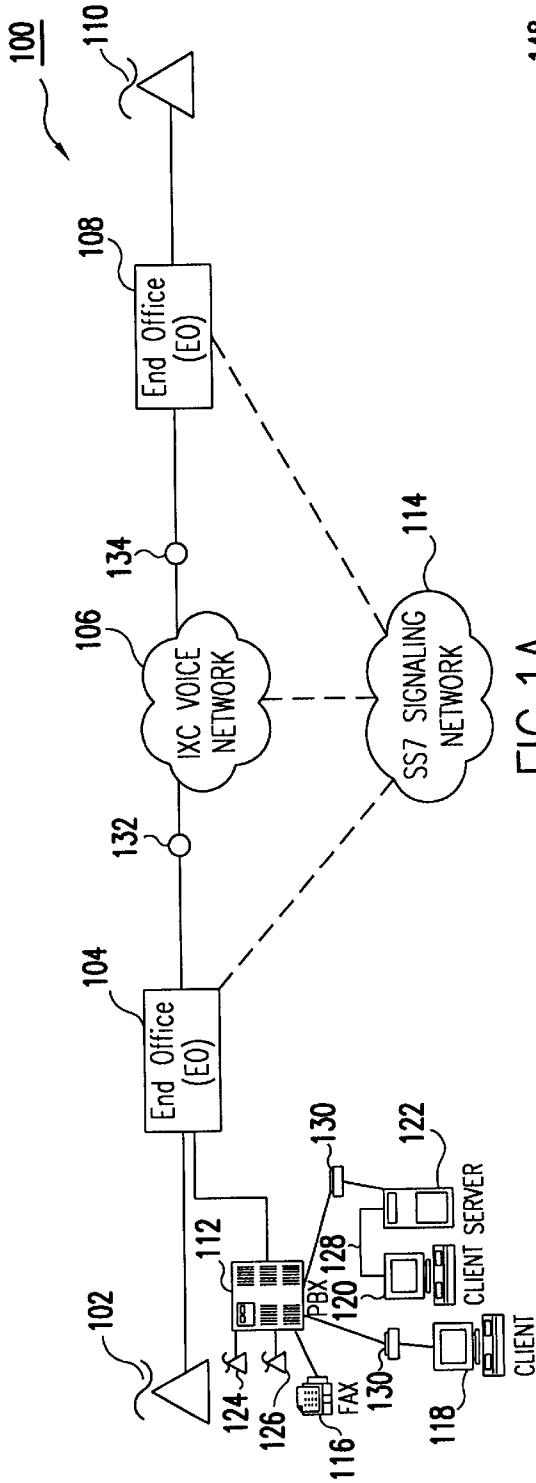


FIG. 1A

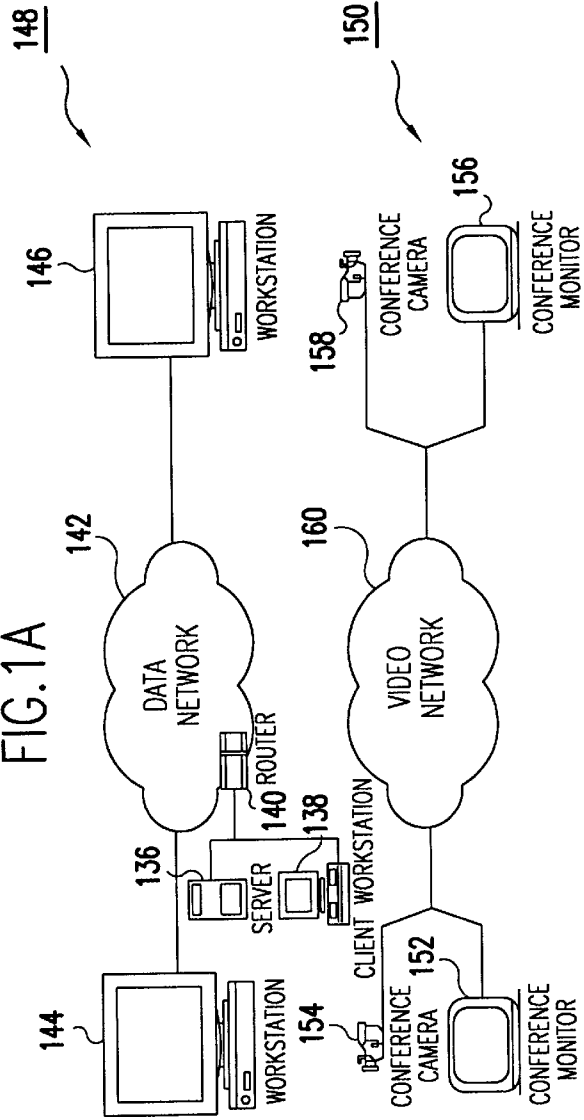


FIG. 1B

FIG. 1C

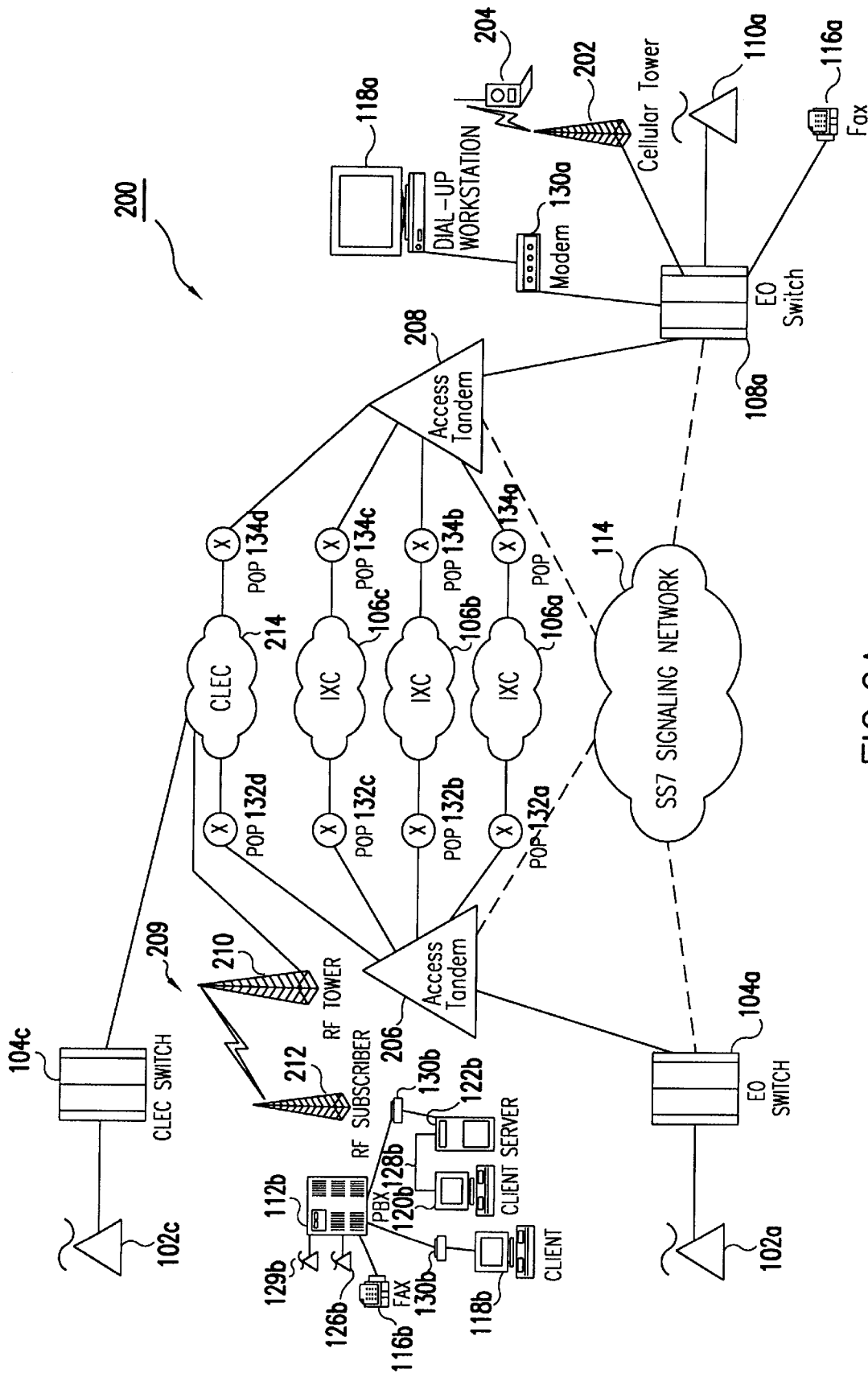


FIG. 2A

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.