US007477624B2

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

(10) **Patent No.: US 7,477,624 B2**
(45) **Date of Patent: *Jan. 13, 2009**

(54) **APPROACH FOR MANAGING THE USE OF COMMUNICATIONS CHANNELS BASED ON PERFORMANCE**

(75) Inventors: **Hongbing Gan**, Carlton North (AU); **Bijan Treister**, Kew (AU); **Efstratios Skafidas**, Coburg (AU)

(73) Assignee: **Bandspeed, Inc.**, Austin, TX (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 189 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/397,443**

(22) Filed: **Apr. 3, 2006**

(65) **Prior Publication Data**

US 2006/0176850 A1 Aug. 10, 2006

**Related U.S. Application Data**

(63) Continuation of application No. 09/948,488, filed on Sep. 6, 2001, now Pat. No. 7,027,418.

(60) Provisional application No. 60/264,594, filed on Jan. 25, 2001.

(51) **Int. Cl.**
***H04Q 7/00*** (2006.01)

(52) **U.S. Cl.** ..... **370/329**

(58) **Field of Classification Search** ..... 370/328–339
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,716,573 A 12/1987 Bergstrom et al.
4,780,885 A 10/1988 Paul et al.
5,317,568 A 5/1994 Bixby et al.
5,323,447 A 6/1994 Gillis et al.
5,394,433 A 2/1995 Bantz et al.
5,418,839 A 5/1995 Knuth et al.
5,541,954 A 7/1996 Emi

(Continued)

FOREIGN PATENT DOCUMENTS

GB 2 401 512 A1 11/2004

(Continued)

OTHER PUBLICATIONS

Lawrey et al., Adaptive Frequency Hopping for Multiuser OFDM, pp. 1-5, ICICS'99.*

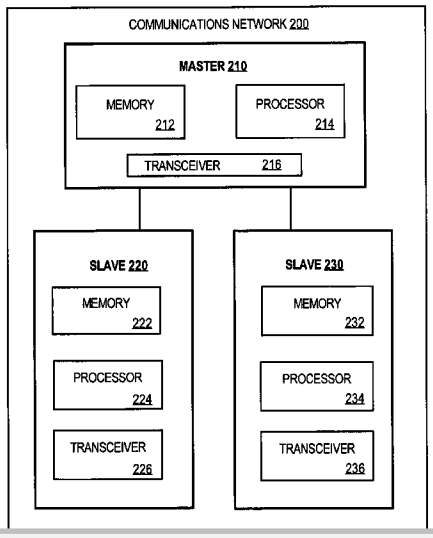
(Continued)

*Primary Examiner*—Frank Duong
(74) *Attorney, Agent, or Firm*—Hickman Palermo Truong & Becker LLP

(57) **ABSTRACT**

An approach for selecting sets of communications channels involves determining the performance of communications channels. A set of channels is selected based on the results of performance testing and specified criteria. The participant generates data that identifies the selected set of channels and provides that data to other participants of the communications network. The participants communicate over the set of channels, such as by using a frequency hopping protocol. When a specified time expires or monitoring of the performance of the channel set identifies poor performance of the set of channels, the participant selects another set of channels for use in communications based on additional performance testing. By selecting channels based on the initial performance testing and performance monitoring, the communications network adaptively avoids channels with poor performance.

**29 Claims, 11 Drawing Sheets**




Marvell Semiconductor, Inc.
MediaTek Inc.
MediaTek USA, Inc.

U.S. PATENT DOCUMENTS

| | | | | |
|---|---|---|---|---|
| 5,574,979 | A | 11/1996 | West | |
| 5,649,291 | A | 7/1997 | Tayloe | |
| 5,726,978 | A * | 3/1998 | Frodigh et al. | 370/252 |
| 5,774,808 | A | 6/1998 | Särkioja et al. | |
| 5,781,861 | A | 7/1998 | Kang et al. | |
| 5,844,522 | A | 12/1998 | Sheffer et al. | |
| 5,873,036 | A | 2/1999 | Vucetic | |
| 5,898,928 | A | 4/1999 | Karlsson et al. | |
| 5,956,642 | A | 9/1999 | Larsson et al. | |
| 6,009,332 | A | 12/1999 | Haartsen | |
| 6,169,761 | B1 | 1/2001 | Marcoccia et al. | |
| 6,240,126 | B1 | 5/2001 | Ohashi et al. | |
| 6,549,784 | B1 | 4/2003 | Kostic et al. | |
| 6,601,101 | B1 | 7/2003 | Lee et al. | |
| 6,633,761 | B1 | 10/2003 | Singhal et al. | |
| 6,650,872 | B1 | 11/2003 | Karlsson | |
| 6,687,239 | B1 | 2/2004 | Koprivica | |
| 6,694,147 | B1 | 2/2004 | Viswanath et al. | |
| 6,700,875 | B1 | 3/2004 | Schroeder et al. | |
| 6,704,346 | B1 | 3/2004 | Mansfield | |
| 6,745,034 | B2 | 6/2004 | Wang et al. | |
| 6,751,249 | B1 | 6/2004 | Cannon et al. | |
| 6,760,317 | B1 | 7/2004 | Honkanen et al. | |
| 7,027,418 | B2 * | 4/2006 | Gan et al. | 370/329 |
| 2002/0122462 | A1 | 9/2002 | Batra et al. | |
| 2005/0020271 | A1 | 1/2005 | Fukuda et al. | |
| 2005/0223115 | A1 | 10/2005 | Hanson et al. | |

FOREIGN PATENT DOCUMENTS

| | | |
|---|---|---|
| WO | WO 96/34468 A1 | 10/1996 |
| WO | WO 00/60896 | 10/2000 |
| WO | WO 01/03379 A1 | 1/2001 |

OTHER PUBLICATIONS

Zander, J. PHd and G. Malmgren MSc, IEEE Proc.-Commun., vol. 142, No. 2, Apr. 1995, entitled "Adaptive frequency hopping in HF communications", (pp. 99-105).

Fifth International Symposium on Signal Processing and its Applications, ISSPA '99 Brisbane, Australia, Aug. 22-25, 1999, entitled "Multiuser OFDM", by E. Lawrey, (pp. 761-764).

Walter L. Davis, "A MAC Layer submission for the High Rate 802.15.3 Standard," Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs), Sep. 2000, XP 00220853, pp. 1-57.

Jeyhan Karaoguz "Multi-Rate QAM Physical Layer (8-40 Mbps) Proposal for High Rate WPAN," Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs), Oct. 20, 2000 XP002220854, pp. 1-39.

Johnsson, HiperLAN/2-The Broadband Radio Transmission Technology Operating in the 5 GHz Frequency Band, pp. 1-22 1999.

European Patent Office, "Communication pursuant to Article 96(2) EPC," Jun. 22, 2004, 5 pages.

"Clean Version of Amended Claims for Response to Official Comm. From Patent Examiner," EPO Patent Application No. 02709170.1, pp. 1-15, 2004.

Lawrey et al. n Adaptive Frequency Hopping for Multiuser OFDM, pp. 1-5, ICICS '99.

Gan et al, Adaptive Frequency Hopping Implementation Proposals for IEEE 802.15 ½ WPAN, pp. 1-28, Nov. 2000, downloaded at http://grouper.ieee.org/groups/802/15/pub/2000/Nov00/00367r0P802-15_ TG2-Adaptive-Frequency -Hopping.ppt.

The International Bureau of WIPO, "Notification Concerning Transmittal of Copy of Internaitonal Preliminary Report on Patentability (Chapter 1 of the Patent Cooperation Treaty" International application No. PCT/US2006/027206, received Jan. 31, 2008, 7 pages.

Claims, International application No. PCT/US2006/027206, 6 pages.

* cited by examiner

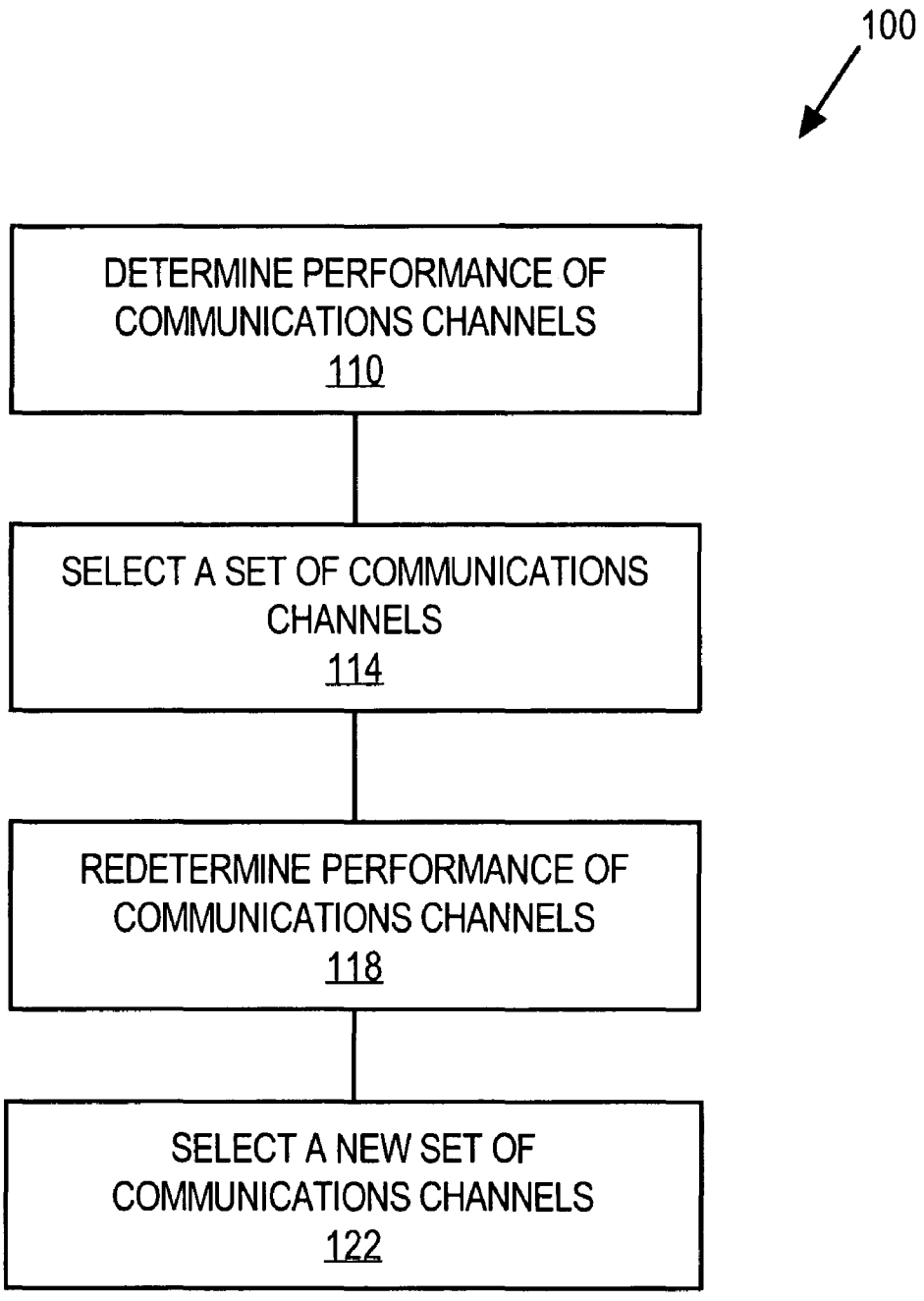



FIG. 1A

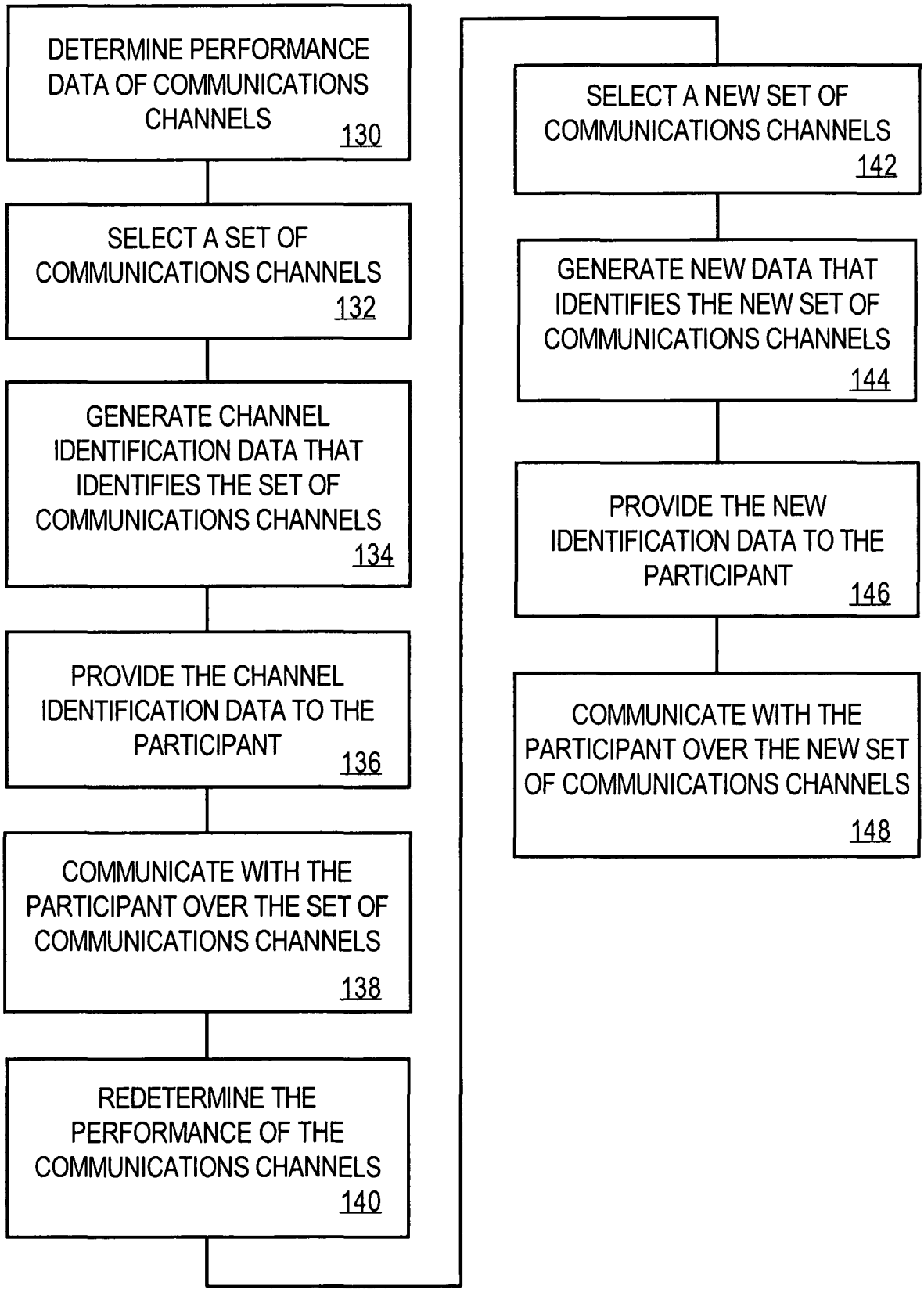



FIG. 1B

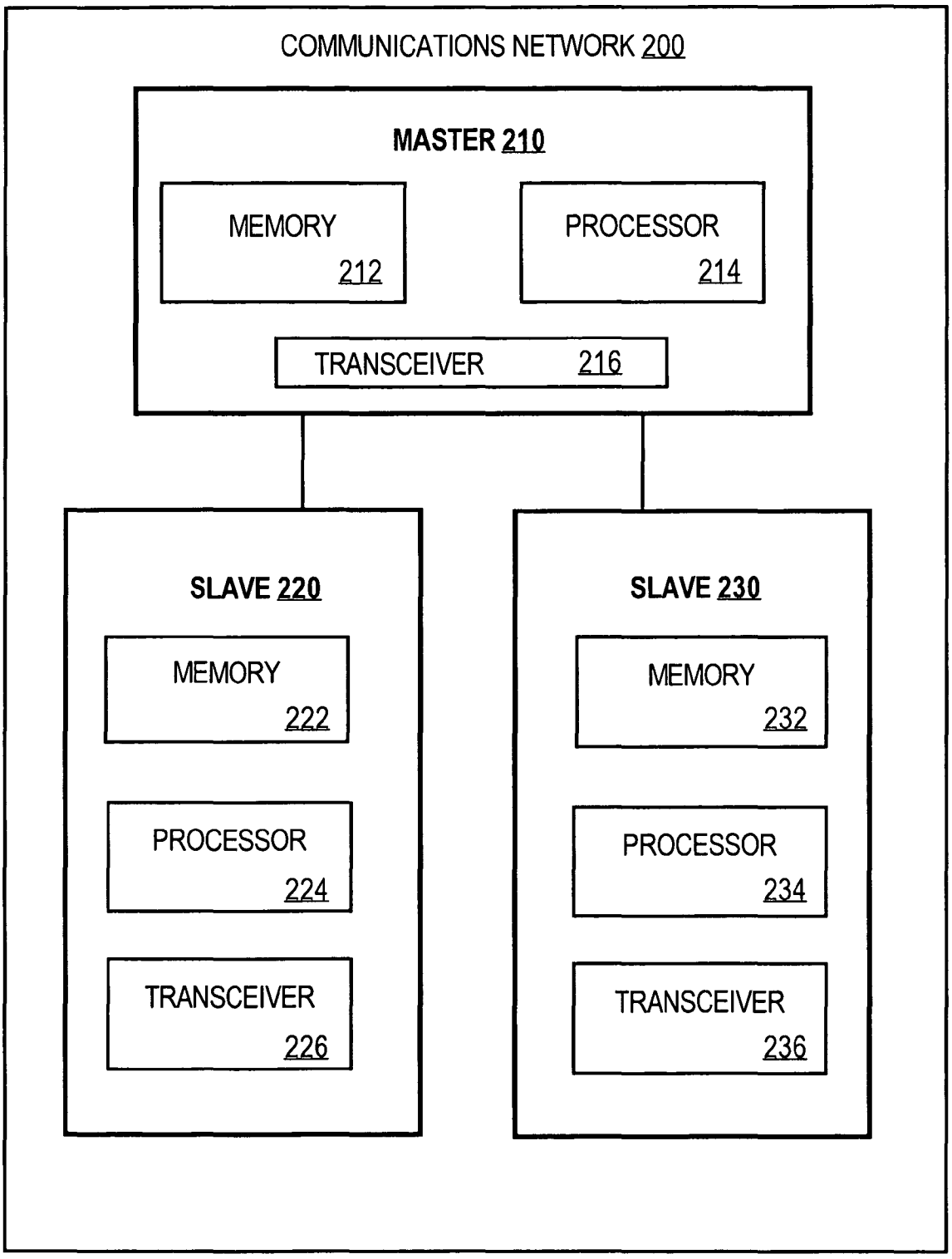



FIG. 2

DOCKET ALARM

# 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.