



US009078236B2

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

(10) **Patent No.:** US 9,078,236 B2
(45) **Date of Patent:** Jul. 7, 2015

(54) **RANDOM ACCESS SCHEME FOR PREVENTING UNNECESSARY RETRANSMISSION AND USER EQUIPMENT FOR THE SAME**

(75) Inventors: **Sung Duck Chun**, Anyang-Si (KR); **Sung Jun Park**, Anyang-Si (KR); **Seung June Yi**, Anyang-Si (KR)

(73) Assignee: **LG Electronics Inc.**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 415 days.

(21) Appl. No.: **12/670,773**

(22) PCT Filed: **Jan. 5, 2010**

(86) PCT No.: **PCT/KR2010/000036**

§ 371 (c)(1),

(2), (4) Date: **Jul. 8, 2011**

(87) PCT Pub. No.: **WO2010/077122**

PCT Pub. Date: **Jul. 8, 2010**

(65) **Prior Publication Data**

US 2011/0261763 A1 Oct. 27, 2011

Related U.S. Application Data

(60) Provisional application No. 61/142,613, filed on Jan. 5, 2009.

(30) **Foreign Application Priority Data**

Dec. 24, 2009 (KR) 10-2009-0130622

(51) **Int. Cl.**

H04W 74/00 (2009.01)

H04W 56/00 (2009.01)

H04W 74/08 (2009.01)

(52) **U.S. Cl.**

CPC **H04W 74/008** (2013.01); **H04W 56/0005**

(2013.01); **H04W 56/0045** (2013.01); **H04W 74/0833** (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,594,240 B1 7/2003 Chuah et al.
6,785,548 B2 8/2004 Mousley et al.

(Continued)

FOREIGN PATENT DOCUMENTS

CN 1315099 A 9/2001
CN 101188852 A 5/2008

(Continued)

OTHER PUBLICATIONS

Nokia Siemens Networks, Nokia, "Triggers for Power Headroom Reports in EUTRAN Uplink," Agenda Item 6.3.2, Discussion/Decision, 3GPP TSG RAN WG1 Meeting #52bis, Shenzhen, China, R1-081464, Mar. 31-Apr. 4, 2008, One page.

(Continued)

Primary Examiner — Alpus H Hsu

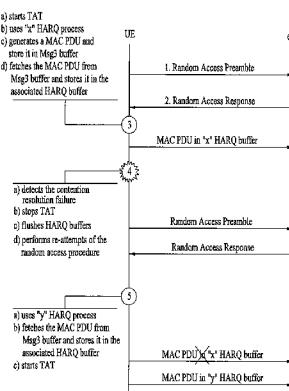
Assistant Examiner — Hooman Houshmand

(74) *Attorney, Agent, or Firm* — Birch, Stewart, Kolasch & Birch, LLP

(57) **ABSTRACT**

A random access scheme for preventing unnecessary retransmission and a user equipment for the same are disclosed. If a Contention Resolution (CR) timer expires in contention resolution during a random access procedure or if a Physical Downlink Control Channel (PDCCCH) signal or a Physical Downlink Shared Channel (PDSCH) signal associated with the PDCCCH signal does not match an identifier of a terminal, a Hybrid Automatic Repeat Request (HARQ) buffer for storing a Medium Access Control Packet Data Unit (MAC PDU) transmitted in the random access procedure is flushed such that unnecessary data retransmission can be prevented.

13 Claims, 10 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

6,836,469 B1	12/2004	Wu
6,950,417 B2	9/2005	Soliman
7,075,971 B2	7/2006	Parsa et al.
7,848,346 B2	12/2010	Park et al.
7,957,298 B2	6/2011	Yi et al.
7,986,946 B2	7/2011	Pettersson
8,223,708 B2	7/2012	Guo
8,274,969 B2 *	9/2012	Wu 370/354
8,908,570 B2 *	12/2014	Yu et al. 370/278
2001/0043582 A1	11/2001	Nakada
2002/0009067 A1	1/2002	Sachs et al.
2002/0154653 A1	10/2002	Benveniste
2002/0167920 A1	11/2002	Miyazaki et al.
2003/0095534 A1	5/2003	Jiang
2004/0185892 A1	9/2004	Iacono et al.
2005/0014508 A1	1/2005	Moulsley et al.
2005/0078641 A1	4/2005	Kim
2005/0117675 A1	6/2005	Das et al.
2005/0120097 A1	6/2005	Walton et al.
2005/0141436 A1	6/2005	Dick et al.
2005/0249123 A1	11/2005	Finn
2006/0013182 A1	1/2006	Balasubramanian et al.
2006/0013268 A1	1/2006	Terry
2006/0280145 A1	12/2006	Revel et al.
2007/0076679 A1	4/2007	Lee
2007/0140178 A1	6/2007	Jung et al.
2007/0171933 A1	7/2007	Sammour et al.
2007/0206531 A1	9/2007	Pajukoski et al.
2008/0008212 A1	1/2008	Wang et al.
2008/0043771 A1	2/2008	Cho et al.
2008/0096563 A1	4/2008	Fischer et al.
2008/0098234 A1	4/2008	Driscoll et al.
2008/0186892 A1	8/2008	Damjanovic
2008/0188247 A1	8/2008	Worrall
2008/0192766 A1	8/2008	Ranta-Aho et al.
2008/0207150 A1	8/2008	Malladi et al.
2008/0232317 A1	9/2008	Jen
2008/0294958 A1	11/2008	Lee et al.
2008/0310396 A1 *	12/2008	Park et al. 370/350
2008/0313300 A1	12/2008	Alanara et al.
2008/0316961 A1	12/2008	Bertrand et al.
2009/0046641 A1 *	2/2009	Wang et al. 370/329
2009/0052388 A1	2/2009	Kim et al.
2009/0086671 A1 *	4/2009	Pelletier et al. 370/329
2009/0088195 A1	4/2009	Rosa et al.
2009/0156194 A1	6/2009	Meylan
2009/0163211 A1	6/2009	Kitazoe et al.
2009/0175187 A1	7/2009	Jersenis et al.
2009/0186624 A1	7/2009	Cave et al.
2009/0196208 A1 *	8/2009	Yu et al. 370/311
2009/0213968 A1	8/2009	Tormalahto
2009/0225711 A1	9/2009	Sammour et al.
2009/0232058 A1	9/2009	Lee et al.
2009/0232076 A1 *	9/2009	Kuo 370/329
2009/0238141 A1	9/2009	Damjanovic et al.
2009/0239545 A1	9/2009	Lee et al.
2009/0259910 A1	10/2009	Lee et al.
2009/0279495 A1 *	11/2009	Yoo 370/329
2009/0300457 A1 *	12/2009	Kuo 714/749
2009/0303954 A1	12/2009	Guo
2009/0305665 A1	12/2009	Kennedy et al.
2009/0316586 A1	12/2009	Yi et al.
2009/0316593 A1	12/2009	Wang et al.
2010/0027511 A1	2/2010	Terry
2010/0034162 A1 *	2/2010	Ou et al. 370/329
2010/0080181 A1	4/2010	Yamada et al.
2010/0093386 A1	4/2010	Damjanovic et al.
2010/0111067 A1 *	5/2010	Wu 370/345
2010/0172299 A1	7/2010	Fischer et al.
2010/0202288 A1	8/2010	Park et al.
2010/0226325 A1	9/2010	Chun et al.
2010/0260136 A1	10/2010	Fan et al.
2010/0281486 A1	11/2010	Lu et al.

2011/0103499 A1 *	5/2011	Cheng et al. 375/260
2011/0116364 A1	5/2011	Zhang et al.
2011/0216705 A1	9/2011	Lee et al.
2011/0216706 A1	9/2011	Lee et al.
2014/0092851 A1 *	4/2014	Wang et al. 370/329

FOREIGN PATENT DOCUMENTS

EP	1755355 A1	2/2007
EP	1973281 A2	9/2008
EP	1976170 A1	10/2008
EP	2020821 A1	2/2009
EP	2094053 A1	8/2009
JP	2000-341204 A	12/2000
JP	2007-266733 A	10/2007
JP	2009-525655 A	7/2009
JP	2009-303213 A	12/2009
JP	2010-518724 A	5/2010
JP	2011-508538 A	3/2011
JP	2011-509049 A	3/2011
KR	1020050057926 A	6/2005
KR	10-0567211 B1	4/2006
KR	10-2006-0115175 A	11/2006
KR	10-2007-0107619 A	11/2007
KR	10-2007-0108300 A	11/2007
KR	10-2007-0109313 A	11/2007
KR	10-2008-0016367	2/2008
KR	10-2008-0026583 A	3/2008
KR	10-0816598 A	3/2008
KR	10-2008-0039177 A	5/2008
KR	10-2008-0039294 A	5/2008
KR	10-2008-0049596 A	6/2008
KR	10-2008-0065880 A	7/2008
KR	10-2008-0112649 A	12/2008
KR	10-2009-0014937 A	2/2009
KR	10-2009-0016402 A	2/2009
KR	10-2009-0084690 A	8/2009
KR	10-0938102 B1	1/2010
RU	2233546 C2	7/2004
RU	2332802 C2	1/2008
WO	WO-2004-056009 A1	7/2004
WO	WO 2006/118427 A2	11/2006
WO	WO-2007/082407 A1	7/2007
WO	WO-2007/083230 A2	7/2007
WO	2007/088465 A2	8/2007
WO	WO 2007/091831 A2	8/2007
WO	WO-2007/128204 A1	11/2007
WO	WO-2007/143916 A1	12/2007
WO	WO-2008/024628 A2	2/2008
WO	WO-2008/042967 A2	4/2008
WO	WO-2008/054112 A2	5/2008
WO	WO-2008/097023 A1	8/2008
WO	WO-2008/097030 A1	8/2008
WO	WO 2008/100009 A1	8/2008
WO	WO-2008/131401 A1	10/2008
WO	WO-2008/155469 A1	12/2008
WO	WO-2009/005429 A1	1/2009
WO	WO-2009/023470 A2	2/2009
WO	WO 2009/086188 A2	7/2009
WO	WO-2009/088858 A1	7/2009
WO	WO 2009/096195 A1	8/2009

OTHER PUBLICATIONS

- 3GPP TS 36.523-1, V8.0.0 (Dec. 2008), 3rd Generation Partnership Project, Technical Specification Group Radio Access Network, Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC), User Equipment (UE) Conformance Specification, Part 1: Protocol Conformance Specification, Release 8, 497 pages.
- LG Electronics Inc., "Correction to MAC PDU Format for Random Access Response," 3GPP TSG-RAN2 Meeting #62bis, R2-083370, Change Request 36.321, Version 8.x.0, Jun. 30-Jul. 4, 2008, Warsaw, Poland, 4 pages.
- 3GPP TS 36.321 V8.3.0 "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal

(56)

References Cited**OTHER PUBLICATIONS**

- Huawei, "Corrections to Random Access Procedure," 3GPP TSG-RAN WG 2 Meeting #64, R2-0087042, Change Request 36.321 CR-189 Rev., Version 8.3.0, Nov. 10-14, 2008, Prague, Czech Republic, 4 pages.
- LG Electronics Inc., et al., "Reflection of RAN1 LS on Timing Adjust and Addition of MAC Padding in Random Access Response," 3GPP TSG-RAN2 Meeting #64, R2-086374, Change Request 36.321 CR 0128r1 Rev Version 8.3.0, Nov. 10-14, 2008, Prague, Czech Republic, 7 pages.
- Ericsson, "Correction to UE transmission power headroom report for LTE", R2-083897, pp. 18-22, May 2008, Including 3GPP "Change Request", TSG-RAN2 36.321 V8.2.0, R2-083897, Meeting #63, Jeju Island, Korea, May 18-22, 2008.
- ETSI TS 136 300 V8.4.0. "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRAN); Overall description; Stage 2", 3GPP TS 36.300, Version 8.4.0 Release 8, Apr. 2008.
- LG Electronics Inc. et al., "Counter Proposal to R2-090969 on Management for HARQ Buffer with TAT," 3GPP TSG-RAN2 Meeting #65, R2-091232, Feb. 9-13, 2009, Athens, Greece, 3 pages.
- LG Electronics Inc., "Management for HARQ Buffer with TAT," 3GPP TSG-RAN2 Meeting #65, R2-090969, Feb. 9-13, 2009, Athens, Greece, 2 pages.
- Nokia Corporation et al., "Message 3 Definition," 3GPP TSG-RAN2 Meeting #64, R2-086077, Oct. 10-14, 2008, Prague, Czech Republic, 8 pages.
- Dahlman et al., "3G Evolution: HSPA and LTE for Mobile Broadband," Elsevier, Edition 2, 2008, pp. 441, Cover page, and, p. 441.
- LG Electronics Inc., "Correction to RACH Procedure," 3GPP TSG-RAN2, Meeting #64, R2-087070, Change Request, 36.321 CR 157, Rev. 1, Version 8.3.0, Prague, Czech Republic, Nov. 10-14, 2008, 6 pages.
- 3GPP "Medium Access Control (MAC) Protocol Specification (Release 8)", TS 36.321 V8.1.0 (Mar. 2008).
- 3GPP, "Evolved Universal Terrestrial Radio Access (E-UTRA)", TS 36.321 V8.1.0 (Mar. 2008).
- 3GPP Draft; R2-081035 LTE RACH_M2_V1, 3rd Generation Partnership Project (3GPP), Mobile Competence Centre; 650, Route Des Lucioles; F=06921 Sophia-Antipolis Cedex; France, vol. RAN WG2, No. Sorrento, Italy; Feb. 5, 2008, XP050138825.
- 3GPP Draft; R2-0810189 LTE_RA_BO_RO, 3GPP, Mobile Competence Centre, 650, Route Des Lucioles; F-06921 Sophia-Antipolis Cedex; France, vol. RAN WG2, No. Sevilla, Spain, Jan. 7, 2008, XP050138064, R2-080189.
- NTT Docomo et al.: "RA response format" 3GPP Draft; R2-080451, 3GPP, Mobile Competence Centre; 650, Route Des Lucioles; F-06921 Sophia-Antipolis Cedex; France, vol. RAN WG2, No. Sevilla, Spain; Jan. 8, 2008, XP050138299.
- LG Electronics Inc.: "Missing condition for unsuccessful reception of Msg2" 3GPP Draft; R2-090323 Proposed CR to 36.321 on Missing Condition for Unsuccessful Reception of MSG2, 3GPP, Mobile Competence Centre; 650, Route Des Lucioles; F-06921 Sophia-Antipolis Cedex, France, No. Ljubljana; Jan. 6, 2009, XP050322312.
- MAC Rapporteurs (Qualcomm Europe et al.: "E-UTRA MAC protocol specification update" 3GPP Draft; R2-081389 CR0001 to 36321-800, 3GPP, Mobile Competence Centre; 650, Route des Lucioles; F-06921 Sophia-Antipolis cedex; France, vol. RAN WG2, Sorento, Italy, Feb. 23, 2008, XP050139110.
- Panasonic: "Clarification on a Active Time a definition" 3GPP Draft; R2-082225, 3GPP, Mobile Competence Centre; 650, Route des Lucioles; F-06921 Sophia-antipolis cedex, France, vol. RAN WG2, No. Kansas City, USA; Apr. 29, 2008, XP050139994.
- 3GPP Draft; R2-0802509 Restriction to PDCCH for Contention Resolution RO, 3GPP, Mobile Competence Centre; 650, Route des Lucioles; F-06921 Sophia-Antipolis cedex; France, vol. RAN WG2,
- 3GPP Draft; R2-074787_DL_Grant_MSG2_RO, 3GPP, Mobile Competence Centre; 650, Route des Lucioles; F-06921 Sophia-Antipolis cedex; France, vol. RAN WG2, No. Jeju:Nov. 5, 2007, Oct. 20, 2007, pp. 1-3, XP050137299.
- "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRAN); Overall description; Stage 2 (3GPP TS 36.300 version 8.4.0 Release 8); ETSI TS 136 300" ETSI Standards, LIS, Sophia antipolis cedex, France, vol. 3-R2, No. V8.4.0, (Apr. 1, 2008), XP014041816.
- Sunplus Mmobile Inc: "Align the DRX Active Time with RA procedure" 3GPP Draft; R2-083428, 3GPP, Mobile Competence Centre; 650, Route des Lucioles; F-06921 Sophia-Antipolis cedex; France, vol. RAN WG2, No. Warsaw, Poland, Jun. 23, 2008, XP050140819.
- LG Electronics Inc: "Correction to DRX" 3GPP Draft; R2-083274 Proposed CR to 36.321 [REL-8] Correction to DRX, 3GPP, Mobile Competence Centre; 650, Route des Lucioles; F-06921 Sophia-Antipolis cedex; France, vol. RAN WG2, No. Warsaw, Poland; Jun. 23, 2008, XP050140694.
- MAC Rapporteurs (Qualcomm Europe et al: "E-UTRA MAN protocol specification update" 3GPP Draft; R2-081719 E-UTRA MAC Protocol Specification Update (CR), 3rd Generation Partnership Project (3GPP), Mobile Competence Centre; 650, Route des Lucioles; F-06921 Sophia-Antipolis cedex; France, vol. RAN WG2, No. Shenzhen, China; Mar. 25, 2008, XP050139431.
- LG Electronics: "Corrections to the Random Access Response reception" 3GPP Draft; R2-082447 LTE-RACH_RESP_RO, 3GPP, Mobile Competence Centre; 650, Route Des Lucioles; F-06921 Sophia-Antipolis Cedex; France, vol. RAN WG2, No. Kansas City, USA: Apr. 28, 2008, XP050140134.
- LG Electronics Inc: "Correction to RACH Procedure" 3GPP Draft; R2-086137 [REL-8] Proposed CR to 36.321 Correction to RACH Procedure, 3rd Generation Partnership Project (3GPP) Mobile Competence Centre; 650, Route des Lucioles; F-06921 Sophia-Antipolis cedex; France, No. Prague, Czech Republic; Nov. 10, 2008, pp. 1-6, XP050321188.
- Handover Failure Handling, 3GPP Draft; R2-081054, -3rd Generation Partnership Project (3GPP), Mobile Competence Centre; 65, route des Lucioles; F-06921 Sophia-Antipolis Cedex; France, Feb. 4, 2008.
- Ghosh et al., "Random Access Design for UMTS Air-Interface Evolution," IEEE 65th Vehicular Technology Conference, Apr. 22, 2007, pp. 1041-1045.
- 3GPP TS 36.321 V8.2.0(May 2008); Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) Medium Access Control (MAC) protocol specification (Release 8), p. 1-33.
- Panasonic: "Priority handling of MAC Control Elements" Internet Citation, May 5, 2008, XP002537451.
- MAC Rapporteurs (Qualcomm Europe et al: "36.321 CR covering agreements of RAN2 #61bis and RAN2#62"); R2-082902, XP050140449, May 2008.
- "BSR priority" 3GPP Draft, R2-081589 BSR Priority, 3GPP, Mobile Competence centre; 650, Route des Lucioles; F-06921 Sophia-Antipolis cedex; France. RAN WG2, No. Shenzhen, China; Mar. 24, 2008, XP050139321.
- Infineon: "TP for the UL Logical channel prioritization" 3GPP Mobile Competence centre; 650, Route des Lucioles; F-06921 Sophia-Antipolis cedex; France, vol. RAN WG2, No. Kansas City, WAS, Apr. 29, 2008, XP050140185, R2-082504.
- LG Electronics Inc: "Correction to Multiplexing Procedure for BSR" 3GPP Draft; R2-083275, 3GPP, vol. RAN WG2, No. Warsaw, Poland: May 23, 2008, XP050140695.
- 3GPP Draft; R2-082049 See whole document esp. section 5.1 and subsections thereof and subsections 5.4.3.1 and 5.4.3.2, Mar. 2008, XP 050139679.
- 3GPP Draft; R2-091633cr273r1-R2-090988, See whole document esp. subsections 5.4.3.1 and 5.4.3.2 Feb. 2009, XP 050323507.
- Alcatel-Lucent: "TP on Power Headroom reporting" 3GPP Draft; R2-082224_PH Text Proposal, 3GPP Mobile Competence centre; 650, Route des Lucioles; F-06921 Sophia-Antipolis cedex; France,

(56)

References Cited

OTHER PUBLICATIONS

Nokia Siemens Networks: "Power Headroom Reporting" Internet Citation, May 5, 2008, pp. 1-4, XP002537452, R2-082197.
Ericsson: "UE transmission power headroom report for LTE" 3GPP TSG RAN WG2 #62, R2-082147, May 5, 2008, pp. 1-4, XP002539839 (Aug. 4, 2009).
Nokia Siemens Networks et al: "Triggers for Power Headroom Reports in EUTRAN Uplink" 3GPP Draft; R1-080947, 3GPP, Mobile Competence centre: 650, Route des Lucioles; F-06921

Sophia-Antipolis cedex; France, vol. RAN WG1, No. Sorrento, Italy; Feb. 5, 2008, XP050109419.

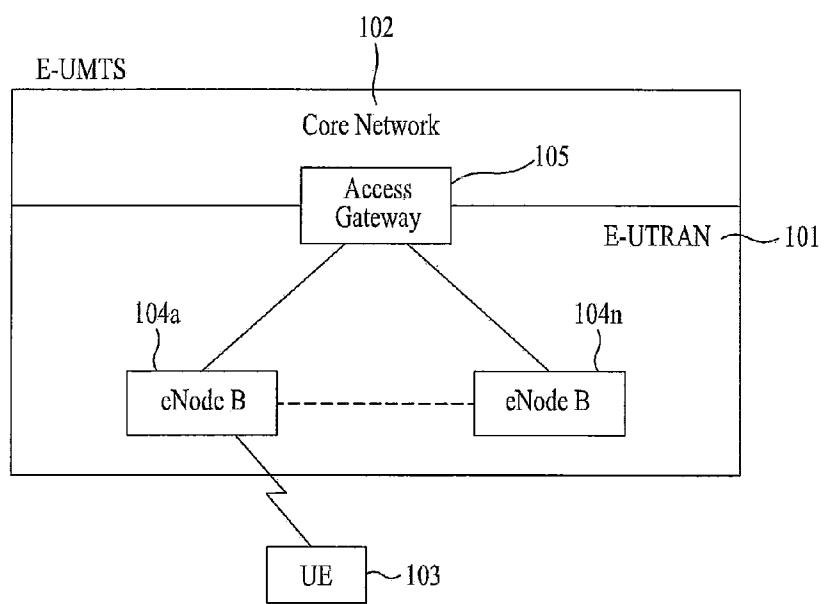
Nokia: "Scheduling Information for E-UTRAN Uplink" Oct. 8, 2007-Oct. 12, 2007, vol. TSG-RAN WG2 Meeting #59BIS, No. R2-073909, pp. 1-3, Oct. 2007, XP002522064.

Ericsson et al., "Prioritization of MAC control elements", 3GPP TSG-RAN WG2 Meeting #64, Nov. 10-14, 2008, R2-087413, 3 pages.

Huawei, "Discussion of Message 3", 3GPP TSG RAN2 #60bis, Jan. 14-18, 2008, R2-080239, pp. 1-3.

* cited by examiner

FIG. 1



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.