US007417970B2

(12) **United States Patent**
Shaheen

(10) **Patent No.: US 7,417,970 B2**
(45) **Date of Patent: Aug. 26, 2008**

(54) **CONFIGURING AN INTERWORKING WIRELESS LOCAL AREA NETWORK USER EQUIPMENT TO ACCESS A 3GPP SYSTEM**

(75) Inventor: **Kamel M. Shaheen**, King of Prussia, PA (US)

(73) Assignee: **InterDigital Technology Corporation**, Wilmington, DE (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 421 days.

(21) Appl. No.: **11/096,141**

(22) Filed: **Mar. 31, 2005**

(65) **Prior Publication Data**

US 2005/0271013 A1 Dec. 8, 2005

Related U.S. Application Data

(60) Provisional application No. 60/576,698, filed on Jun. 2, 2004.

(51) **Int. Cl.**

H04Q 7/00	(2006.01)
H04Q 7/24	(2006.01)
H04L 1/14	(2006.01)
H04L 12/66	(2006.01)

(52) **U.S. Cl.** **370/331**; 370/338; 370/231; 370/329; 370/352; 370/356

(58) **Field of Classification Search** 370/331, 370/338, 231, 329, 352, 356

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2004/0066769	A1 *	4/2004	Ahmavaara et al.	370/338
2004/0097232	A1	5/2004	Haverinen	
2005/0025164	A1 *	2/2005	Kavanagh et al.	370/401
2006/0050667	A1 *	3/2006	Verma et al.	370/338
2006/0165027	A1 *	7/2006	Heden	370/328
2006/0209768	A1 *	9/2006	Yan et al.	370/338

FOREIGN PATENT DOCUMENTS

WO	03/105493	12/2003
WO	04/006447	1/2004

OTHER PUBLICATIONS

3GPP TS 23.234, "Technical Specification Group Services and System Aspects; 3GPP System to Wireless Local Area Network (WLAN) Interworking; System Description"; 3rd Generation Partnership Project; V6.0.0; Release 6; Mar. 2004; pp. 1-83.

Third Generation Partnership Project, "Technical Specification Group Services and System Aspects; 3GPP system to Wireless Local Area Network (WLAN) interworking; System description (Release 6)," 3GPP TS 23.234 V6.4.0 (Mar. 2005).

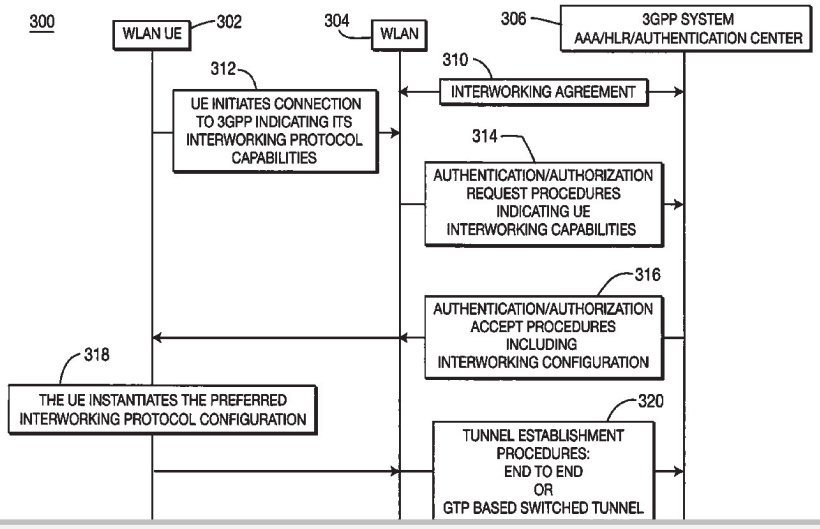
* cited by examiner

Primary Examiner—Barry W Taylor
(74) *Attorney, Agent, or Firm*—Volpe and Koenig, P.C.

(57) **ABSTRACT**

A method for configuring an interworking wireless local area network (I-WLAN) user equipment (UE) to access a third generation partnership project (3GPP) system begins by initiating a connection from a UE to the 3GPP system, the initiating step including indicating the UE's interworking protocol capabilities. Authentication and authorization of the UE connection by the WLAN to the 3GPP system is requested, including indicating the UE's interworking protocol capabilities. The 3GPP system determines whether to accept the UE's request, including examining the UE's interworking protocol capabilities. An interworking protocol is instantiated at the UE, whereby the UE is configured to interwork with the 3GPP system.

9 Claims, 3 Drawing Sheets



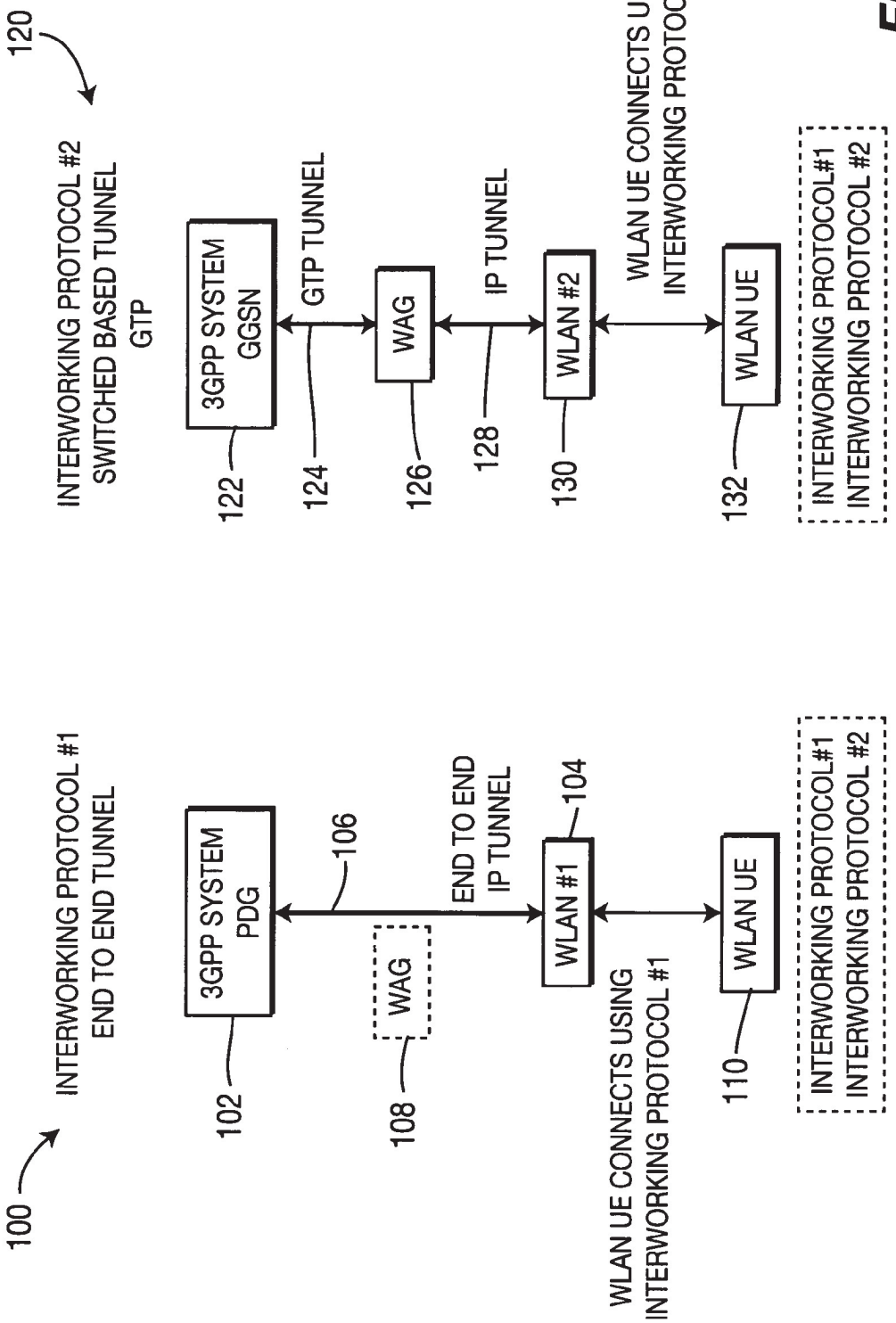


FIG. 1
PRIOR ART

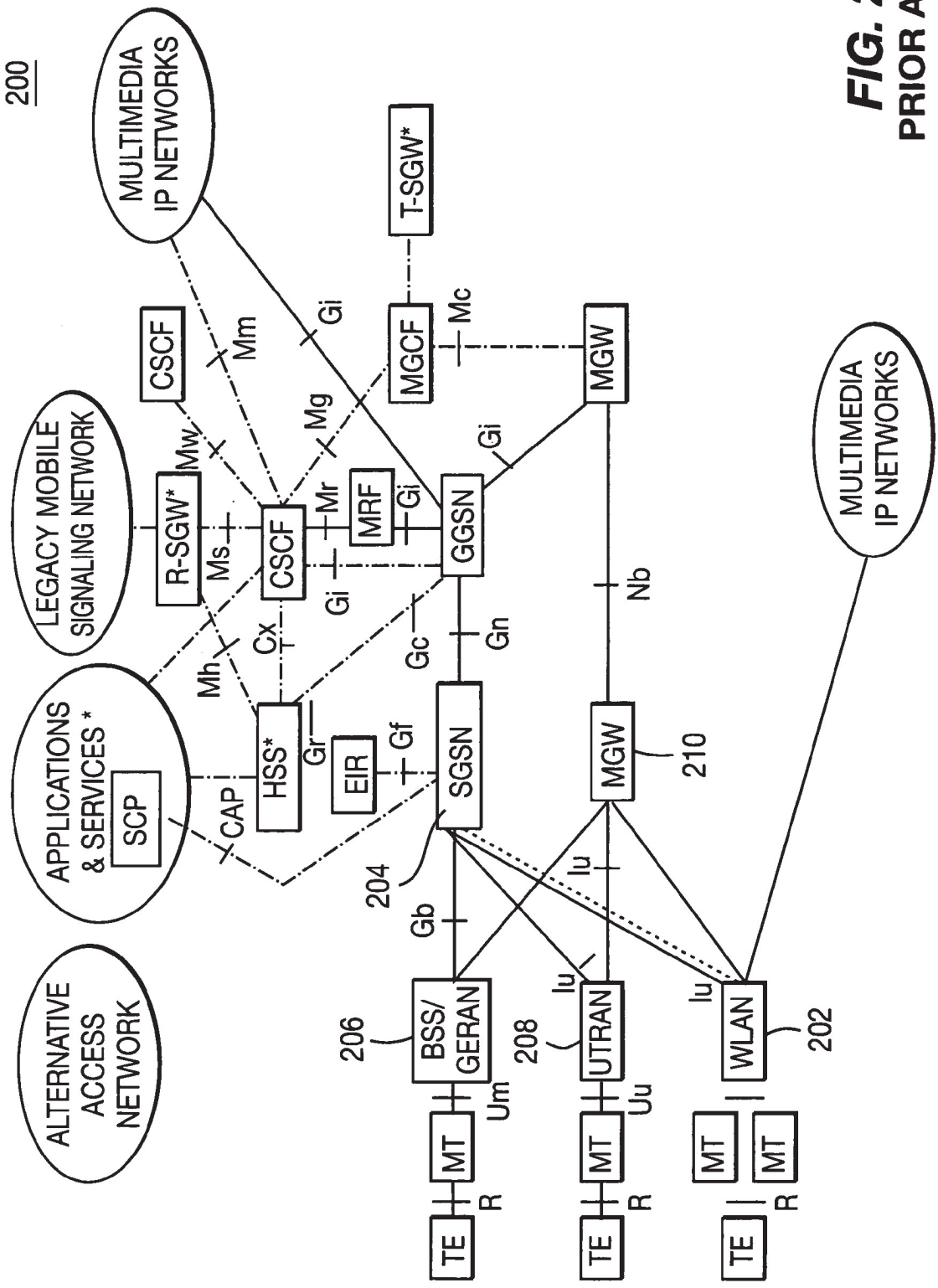


FIG. 2
PRIOR ART

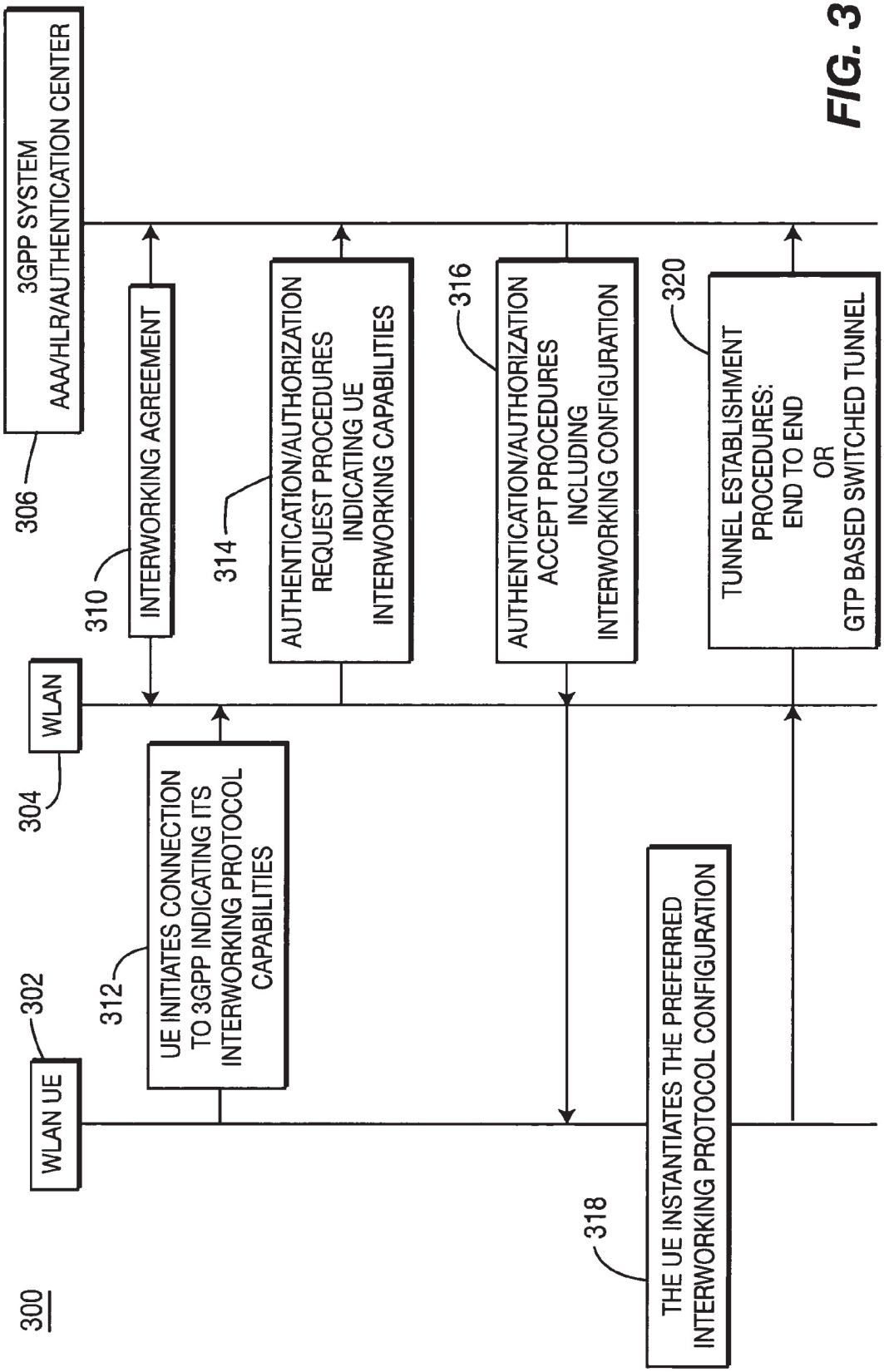


FIG. 3

CONFIGURING AN INTERWORKING WIRELESS LOCAL AREA NETWORK USER EQUIPMENT TO ACCESS A 3GPP SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application Ser. No. 60/576,698, filed Jun. 2, 2004, which is incorporated by reference as if fully set forth herein.

FIELD OF INVENTION

The present invention relates to configuring an interworking wireless local area network (I-WLAN) user equipment (UE). More particularly, the present invention relates to a method and an apparatus for configuring an I-WLAN UE to access a 3GPP based packet switched (PS) system via an I-WLAN.

BACKGROUND

Currently, there are several WLAN interworking schemes with 3GPP systems (UMTS). In one scheme, the end to end tunnel approach, the UE establishes a tunnel with the 3GPP based system ending at a Packet Data Gateway (PDG). The tunnel goes through a WLAN Gateway (WAG) without being terminated at the WAG (and is transparent to the WAG). This scheme has been standardized as a preferred configuration that all I-WLAN UEs must implement.

The second scheme is the switched tunneling approach, which involves establishing two tunnels between the PDG and the UE at the WAG. The first tunnel between the WAG and the PDG uses existing 3GPP based general packet radio service (GPRS) tunneling protocol (GTP) and the second tunnel follows the normal IP tunneling protocol.

A third interworking scheme is the Generic Access approach, which involves the tunneling of the traffic from the 3GPP system to the 3GPP-based UE via the I-WLAN. In this scheme, the I-WLAN acts as a pseudo 3GPP Node B interworking with the 3GPP system at the radio access network (RAN) level. The traffic passes through the I-WLAN access point (AP) to the I-WLAN UE which decodes the traffic back to 3GPP formats and passes it to the 3GPP-based terminal.

The existence of these schemes creates potential conflicts regarding the preferred mode of operation. For example: 1) the UE is capable of supporting all of the configurations, but does not know what configuration is supported by the network; 2) the UE is only capable of supporting one scheme (for example, the end to end tunneling architecture), but the network is configured to use another interworking scheme (for example, the switched tunneling solution); 3) the UE and the network are capable of supporting all schemes, but currently there is no way to communicate the preferred mode of operation between the two sides.

These schemes are different in terms of operational protocols and parameters. The end result is that multiple techniques or schemes may be used to support I-WLAN interworking with 3GPP systems (cellular in general), which mandates that the UE should either support all of these schemes or some mechanism to decide which scheme is being supported at the infrastructure level and then configures the UE to operate in accordance with the supported scheme. During the set-up, there should be procedures to inform the

SUMMARY

According to the present invention, a UE initiates connection to a 3GPP system via an I-WLAN while indicating the UE's interworking configuration capabilities. An I-WLAN indicates the UE's interworking configuration capabilities to the 3GPP system while requesting authentication and authorization. The 3GPP system informs the UE regarding the use of interworking configurations. The UE chooses a preferred interworking configuration of the 3GPP system.

A method for configuring an interworking wireless local area network (I-WLAN) user equipment (UE) to access a third generation partnership project (3GPP) system begins by initiating a connection from a UE to the 3GPP system, the initiating step including indicating the UE's interworking protocol capabilities. Authentication and authorization of the UE connection by the WLAN to the 3GPP system is requested, including indicating the UE's interworking protocol capabilities. The 3GPP system determines whether to accept the UE's request, including examining the UE's interworking protocol capabilities. An interworking protocol is instantiated at the UE, whereby the UE is configured to interwork with the 3GPP system.

A system for configuring an interworking wireless local area network (I-WLAN) user equipment (UE) to access a third generation partnership project (3GPP) system includes a UE, a WLAN, and a 3GPP system. The UE includes initiating means for initiating a connection request to the 3GPP system; first indicating means for indicating the interworking protocol capabilities of the UE to the WLAN; and instantiating means for instantiating a selected interworking protocol. The WLAN includes second indicating means for indicating the interworking protocol capabilities of the UE to the 3GPP system. The 3GPP system includes first determining means for determining whether to accept a connection request from the UE; second determining means for determining the interworking protocol capabilities of the UE and the 3GPP system; and selecting means for selecting an interworking protocol to be used between the UE and the WLAN.

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 drawings, wherein:

FIG. **1** is a block diagram of two interworking protocols by which an I-WLAN UE can access a 3GPP system;

FIG. **2** is a diagram of a third interworking scheme by which an I-WLAN UE can access a 3GPP system; and

FIG. **3** is a flow diagram a method for configuring an I-WLAN UE to access a 3GPP system in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereafter, a user equipment (UE) includes, but is not limited to, a wireless transmit/receive unit (WTRU), a mobile station, a fixed or mobile subscriber unit, a pager, or any other type of device capable of operating in a wireless environment. When referred to hereafter, a base station includes, but is not limited to, a Node B, a site controller, an access point, or any other type of interfacing device in a wireless environment.

FIG. **1** is a block diagram of two systems using interwork-

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.