



(51) International Patent Classification:

H04L 12/755 (2013.01)

(21) International Application Number:

PCT/US2017/032870

(22) International Filing Date:

16 May 2017 (16.05.2017)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/337,100 16 May 2016 (16.05.2016) US

(71) Applicant: **INTERDIGITAL PATENT HOLDINGS, INC.** [US/US]; 200 Bellevue Parkway, Suite 300, Wilmington, Delaware 19809 (US).(72) Inventors: **SUN, Li-Hsiang**; 2 Huntington Quadrangle, 4th Floor, South Wing, Melville, New York 11747 (US).
WANG, Xiaofei; 2 Huntington Quadrangle, 4th Floor, South Wing, Melville, New York 11747 (US).(74) Agent: **KELLNER, Steven M.**; Volpe and Koenig, P.C., United Plaza, 30 S. 17th Street, Suite 1800, Philadelphia, Pennsylvania 19103 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) Title: ENHANCEMENTS FOR IEEE 802.11AH RELAYS

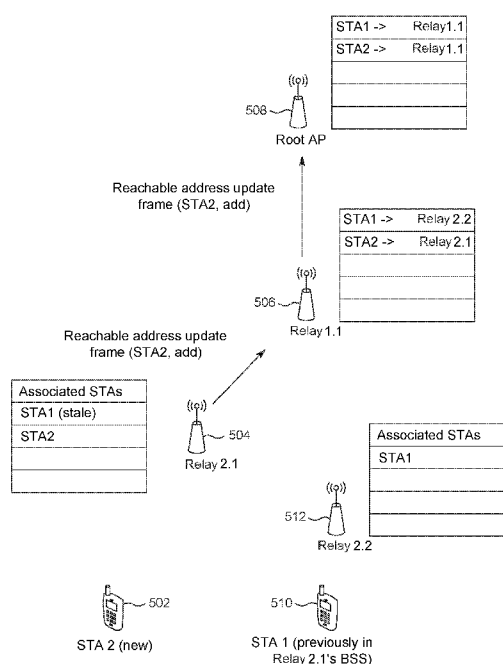


FIG. 5

(57) Abstract: Methods, systems, and apparatuses are disclosed for reachable address updates in wireless systems. A reachable address table may be stored in a forwarding database of a relay. The reachable address table may include routing information for one or more stations (STAs) and one or more relays associated with the relay. A change in association status of a STA may be determined and the reachable address table may be updated to include updated routing information of with the STA. A reachable address update may be sent to an upstream relay. The reachable address update may include the updated routing information for only the changed STA, such that the upstream relay does not overwrite routing information for the one or more STAs and the one or more relays in its own forwarding database.

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:

28 December 2017 (28.12.2017)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/032870

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L12/755
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04L H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2014/341105 A1 (VARDHAN ANURAG K [US]) 20 November 2014 (2014-11-20)	1,5
Y	paragraph [0002] - paragraph [0007] paragraph [0041] - paragraph [0043] paragraph [0056]	2-4,6
X	WO 2005/099189 A1 (ERICSSON TELEFON AB L M [SE]; AXELSSON LEIF [SE]; RIOMAR HENRIK [SE]) 20 October 2005 (2005-10-20)	1,5
Y	page 1, line 7 - page 11, line 22 page 13, line 21 - page 14, line 16	2-4,6
X	WO 2005/041483 A1 (SIEMENS AG [DE]; LYONS ELMER [US]) 6 May 2005 (2005-05-06)	1,5
Y	page 1, line 6 - page 5, line 19	2-4,6
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

11 September 2017

Date of mailing of the international search report

13/11/2017

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Vaskimo, Kimmo

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2017/032870

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 7 787 396 B1 (NALAWADE GARGI [US] ET AL) 31 August 2010 (2010-08-31)	1,5
Y	column 1, line 7 - column 5, line 56 -----	2-4,6
Y	EP 1 587 282 A2 (MICROSOFT CORP [US]) 19 October 2005 (2005-10-19)	2,3
A	paragraph [0001] - paragraph [0011] paragraph [0043] -----	1
Y	WO 2007/066866 A1 (KT CORP [KR]; SEOUL NAT UNIV IND FOUNDATION [KR]; PAIK EUN-KYOUNG [KR]) 14 June 2007 (2007-06-14)	4,6
A	page 1, line 5 - page 7, line 4 page 14, line 27 - page 15, line 11 -----	1
A	US 2004/001485 A1 (FRICK JOHN KEVIN [US] ET AL) 1 January 2004 (2004-01-01) paragraph [0001] - paragraph [0013] paragraph [0023] -----	1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2017/032870

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-6

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-6

A method for use in a wireless network, where an address table is stored, where changes of association are determined, where the address table is updates, and where an update is sent to an upstream relay for only the devices with changed association.

2. claims: 7-11

A method for use in a wireless network, where an address table is stored, where an update is received, where the received update information is compared with information in the address table, and where the system determines whether to send an upstream update needs to be sent to an upstream station.

3. claims: 12-24

A method for use in a wireless network, where forwarding table information is compared a message is received from an upstream station in order to initiate removal of stations from a forwarding database.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2017/032870

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2014341105	A1	20-11-2014	NONE
WO 2005099189	A1	20-10-2005	CN 1926820 A 07-03-2007
			CN 1926835 A 07-03-2007
			EP 1733516 A1 20-12-2006
			EP 1733528 A1 20-12-2006
			JP 4571666 B2 27-10-2010
			JP 2007532058 A 08-11-2007
			US 2008137580 A1 12-06-2008
			WO 2005099189 A1 20-10-2005
			WO 2005099222 A1 20-10-2005
WO 2005041483	A1	06-05-2005	NONE
US 7787396	B1	31-08-2010	NONE
EP 1587282	A2	19-10-2005	AT 369693 T 15-08-2007
			CN 1708026 A 14-12-2005
			DE 602005001883 T2 20-12-2007
			EP 1587282 A2 19-10-2005
			JP 4750457 B2 17-08-2011
			JP 2005353039 A 22-12-2005
			KR 20060045788 A 17-05-2006
			US 2005243740 A1 03-11-2005
WO 2007066866	A1	14-06-2007	KR 20070059489 A 12-06-2007
			WO 2007066866 A1 14-06-2007
US 2004001485	A1	01-01-2004	NONE