

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
1 September 2005 (01.09.2005)

PCT

(10) International Publication Number
WO 2005/081458 A1

(51) International Patent Classification⁷: **H04L 12/28**,
12/56, H04Q 7/38

(74) Agent: **WILLIAMS, David, John**; Page White & Farrer,
54 Doughty Street, London WC1N 2LS (GB).

(21) International Application Number:
PCT/IB2005/000376

(22) International Filing Date: 9 February 2005 (09.02.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0402893.2 10 February 2004 (10.02.2004) GB

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(71) Applicant (for all designated States except US): **NOKIA CORPORATION** [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI).

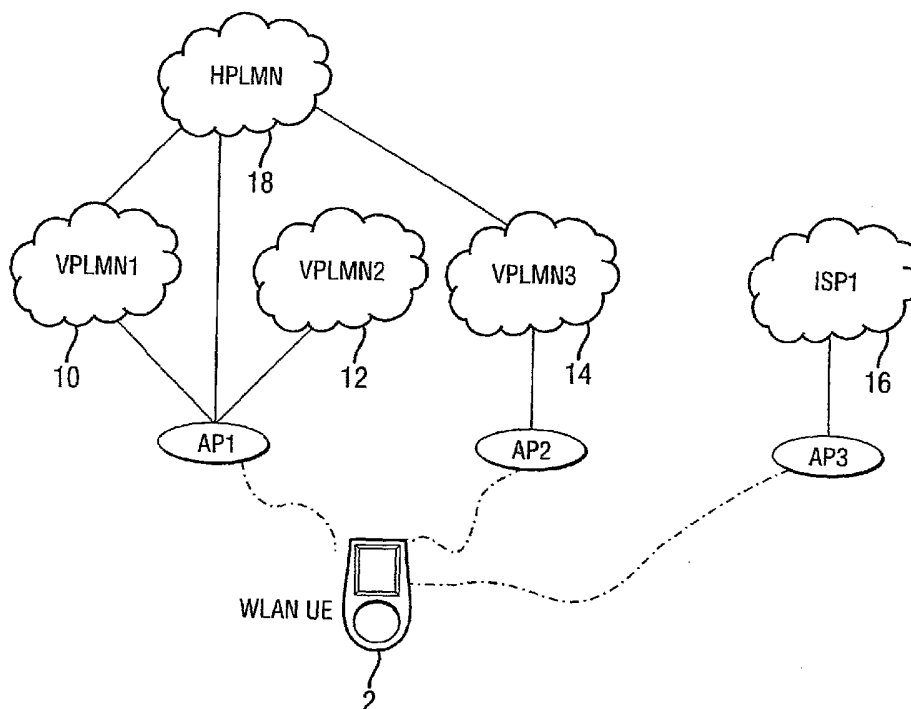
(72) Inventor; and

(75) Inventor/Applicant (for US only): **CARRION-RODRIGO, Immaculada** [ES/FI]; Fredrinkinkatu 68 B26, FIN-00100 Helsinki (FI).

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: A METHOD OF PROBING A NODE



(57) Abstract: There is disclosed a method and apparatus for probing a node, said method comprising the steps of: sending a request to said node comprising part of network identity information; and determining at said node network identity information containing said part of the identity information.



Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A METHOD OF PROBING A NODE

Field of the invention

5 The present invention relates to a method of probing a node, and in particular but not exclusively to a method of probing an access node.

Background of the Invention

10

The communication system is a facility that enables communication between two more entities such as user terminal equipment and/or network entities and other nodes associated with the communication system. The communication
15 may comprise, for example, a communication of voice, electronic mail (email), text messages, data, multimedia and so on.

A communication may be provided by a fixed line and/or
20 wireless communication interfaces. A feature of wireless communication system is that they provide mobility for the users thereof. An example of communication systems providing wireless communication is a public land mobile network (PLMN). An example of the fixed line system is a
25 public switched telephone network (PSTN).

The communication system typically operates in accordance with a given standard or specification which sets out what the various elements of a system are permitted to do and how
30 that should be achieved. For example, the standard or specification may define if the user or more precisely user equipment is provided with a circuit switched server or a

packet switched server or both. Communication protocols and/or parameters, which should be used for the connection, are also typically defined. For example, the manner in which communication is implemented between the user equipment and the elements of the communication network is typically based on a predefined communication protocol. In other words, a specific set of rules on which the communication can be based needs to be defined to enable the user equipment to communicate via the communication system.

10

The 3G partnership project (3GPP) is defining a reference architecture for the universal mobile telecommunication system (UMTS) core network which will provide the users of user equipment with access to services. The term "service" used in this document should be understood to broadly cover any services or goods which a user may desire, require or be provided with. The term is to be understood to cover the provision of complementary services. In particular, but not exclusively, the term "service" will be understood to include internet protocol multimedia IM services, conferencing, telephoning, gaming, rich call, presence, e-commerce, messaging and instant messaging.

20

Reference will be made to the 3GPP technical specification TS24.234 and TS23.234, both documents, which are hereby incorporated by reference. Both of these documents relate to WLAN (wireless local area network) inter working. WLAN inter working is inter working between a proposed 3GPP system and the WLAN family of standards. Examples of WLAN radio network type technology include Bluetooth, the IEEE standards 802.11B, 802.11G, 802.11A and HIPERLan-2. The wireless local area network inter working allows a WLAN UE

25

30

(user equipment) to connect to a WLAN and from there to either a visited PLMN or the home HPLMN. The PLMNs are 3G communication systems. A WLAN UE is all the user equipment, which can be used to allow a 3GPP subscriber to access the
5 WLAN inter working. This may include, for example a computer. It should be appreciated that the WLAN UE may be capable of WLAN access only or may be capable of WLAN and 3GPP system access. A WLAN UE is only one example of a client.

10

In the proposed specification, the network selection procedure consists of two parts. The first part is radio selection. This is the first phase of network selection and always takes place before VPLMN (visited PLMN) selection.
15 In this phase the WLAN UE selects an access point AP and associates itself with it. The parameter used for the selection of the access point is the SSID (service set ID). In the second part, the VPLMN is selected. After selecting an access point, that is after completion of the radio
20 selection, the WLAN UE may need to select a PLMN through which to authenticate, if more than one is available behind the chosen WLAN. This is called VPLMN selection in the WLAN inter working.

25 IEEE specifications such as 802.11 currently have two alternatives for probing. In one of these alternatives, a WLAN client (for example a WLAN UE) is able to probe for a particular SSID. In the other of the alternatives, broadcast is used where all the SSIDs supported by WLAN access node
30 are probed.

However, the inventor has appreciated that the known probing arrangements are not particularly flexible and do not, for example permit a certain type of SSIDs to be probed.

5 Summary of the Invention

According to a first aspect in the present invention there is provided a method of probing a node, said method comprising the steps of sending a request to said node
10 comprising part of network identity information and determining at said node network identity information containing said part of the identity information.

According to a second aspect in the present invention there
15 is provided a system comprising at least one node and at least one client, one of said client arranged to send a request to said node comprising part of network identity information; and said node is arranged to determine network identity information containing said part of the identity
20 information.

According to a third aspect in the present invention, there is provided a client in a system comprising at least one node and at least one client, said client arranged to send a
25 request to said node comprising part of network identity information.

According to a fourth aspect in the present invention, there is provided a node in a system comprising at least one node
30 and at least one client, comprising means for receiving from one of said clients a request comprising part of network identity information, said node being is arranged to

determine network identity information containing said part of the identity information.

According to a fifth aspect in the present invention, there
5 is provided a method of probing a node, said method comprising the steps of sending a request to said node identifying at least one group, said group comprising a plurality members having different network identity information and determining at said node at least one member
10 of said group.

Brief Description of the Drawings

For a better understanding of the present invention and as
15 to how the same may be carried into effect, reference will now be made by way of example only to the accompanying drawings in which:

Figure 1 shows schematically an environment in which
20 embodiments of the present invention can be implemented; and Figure 2 shows a flow diagram for a method embodying the present invention.

Detailed Description of Preferred Embodiments of the 25 Invention

It should be appreciated that whilst embodiments of the present invention are described in the context of a 3GPP WLAN, embodiments of the present invention have broad
30 application and can be used in the context of any WLAN environment. Thus embodiments of the invention may only be

applicable to 802.11 networks or the like or may apply across a plurality of different standards.

SSID is short for *service set identifier*, a 32-character
5 unique identifier attached to the header of packets sent
over a WLAN that acts as a password when a mobile device
tries to connect to the BSS. The SSID differentiates one
WLAN from another, so all access points and all devices
attempting to connect to a specific WLAN must use the same
10 SSID. A device will not be permitted to join the BSS unless
it can provide the unique SSID.

An SSID is also referred to as a *network name* because it is
a name that identifies a wireless network.

15 Reference is made to figure 1, which shows an environment in
which embodiments of the present invention can be
implemented. WLAN user equipment 2 is shown. As mentioned
previously, WLAN UE 2 can be arranged to communicate just
20 with WLANs or with both WLANs and 3GPP networks. The UE
includes all equipment that is in possession of the end
user, such as a computer, WLAN radio interface adapter etc.
The UE may for example be a personal digital assistant
(PDA), portable computer, fixed computer, mobile telephone
25 or combinations thereof.

The WLAN UE is arranged to make a connection with an access
point (AP). In the arrangement shown in figure 1, three
access points, AP1, AP2 and AP3 are shown. All of these
30 access points are provided in different WLANs. It should be
appreciated that some embodiments of the present invention,
a WLAN may have more than one access point and where there

is more than one access point, the WLAN UE may be capable of accessing more than one access point of a given WLAN. The same access point can allow access to more than one different WLAN.

5

The respective WLAN access networks, of which the three APs, AP1-3 form a part are not shown but may also include intermediate AAA (authentication, authorisation and accounting) elements. A WLAN may include other devices such as routers.

10

The first access point AP1 is connected to a first VPLMN 10 and a second VPLMN 12.

15 The first access point AP1 is also connected to a second VPLMN 12. However, this second VPLMN 12 is not able to make a connection to the HPLMN 18. This may for example because for example there is no appropriate roaming agreement with the HPLMN 18. Finally the first access point is also

20

The second access point AP2 is connected to a third VPLMN 14. The third VPLMN 14 has a connection to the HPLMN 18.

25 The third access point AP3 is connected to an internet service provider 16. This allows the user to access the Internet.

In embodiments of the invention the WLAN UE, is able to request information in a probe request about the support of SSIDs containing a particular string. Reference is made to

30

Figure 2 which shows a flow diagram of a method embodying the present invention.

In this document access node should be interpreted broadly.

5 An access point is one example of an access node.

The access node AN or nodes to which the probe request has been sent responds by giving a list of SSIDs which include the particular string. The SSID may give information as to
10 the network, domain or the like to which the AN is connectable.

For example the client requests information about the support of SSIDs containing 3G as part of the SSID. For
15 example, the request may be probe_request with "*3G*". The request may thus contain part of the string that is included in the SSID. In step S1, the request is formed by the client, for example the WLAN UE. The WLAN UE or client may store in its memory the criteria for requests such as
20 described in step S1. Examples of possible criteria are -a list of strings preferred by the operator or user and stored in the WLAN UE; or a predefined group of SSIDs (in order to save signalling) stored in the WLAN UE.

25 In alternative or additionally, the SSIDs could be divided into groups. The different groups may have different characteristics such different operators, different tariffs, different standards or the like. Thus the probe request may be for a string '*3g*' or a probe request for a group of
30 SSIDs 'group 1', where 'group1' could be for example 'group1: SSID1;SSID2; ...; SSIDn'. The grouping may be

predefined in both the WLAN UE and the AN or only in one of them.

In step S2, the request is sent to the AN.

5

In S3, the AN determines which SSIDs contain the partial or complete string contained in the request. In this embodiment, the SSIDs containing the string 3G are identified and formulated into one or more responses to the client. Thus the AN is able to perform SSID searches or screening according to the parameters in the probe request in order to find a match between the keywords or the group of SSIDs indicated in the request; and the SSIDs the AP supports. This may be done at the MAC (media access control) level or above.

15

In step S4 the response(s) including the SSIDs matched in the search/screening is/are sent to the client. This may be sent in a probe response. The format used may be similar to that used for responses to broadcast probe requests. Separate responses may be provided for each SSID meeting the criteria or more preferably, the SSID information elements (described in more detail later) are included in the response.

25

In step S5, the client selects one of the SSID supported by the AN and included in the response(s) and proceeds with the known network or the like selection procedures. Thus the client is able to receive responses from the AN.

30

In one alternative embodiment, in step S3, the first SSID containing the identified string or partial string to be

identified is sent to the client rather than a list. In this modification, a list may not be produced. In another modification, a selection is made in step S3 as to which SSID or SSIDs is or are to be sent to the client. This means
5 that the AN rather than the client would be doing the SSID selection. In yet another embodiment of the invention, the client and the AN would be involved in the decision to select the SSID. It should be appreciated that in some embodiments of the invention, the decision about the SSID to
10 be selected can be made in a node different to the client and the AN.

In one alternative, the AN may respond in a wildcarded format. This indicates to the client that it may select any
15 SSID which includes a certain string; or in the case of grouping that it may select any SSID from the mentioned group.

In the IEEE standard 802.11 clause 7.3.2.1, the SSID element
20 is defined. The SSID element has a first octet containing the element identity. This is followed by a second octet containing length information. It should be appreciated that a 0 length information field indicates the broadcast SSID. This is followed by the SSID itself. The SSID information
25 field is between 0 and 32 octets.

In embodiments of the invention, the SSID information contained in the information field is compared with the part of the string contained in the probe request.
30

Embodiments of the present invention may be used in conjunction with the known probe requests, that is for a

particular SSID or a broadcast request for all SSIDs which are supported.

Embodiments may be used where the SSID information contains
5 some characteristic information such as the type of networking supported eg 3G or about the network operator for example Orange.

In practice the information may comprise coding so the
10 request would include the coding associated with the required information or the information itself. In the latter case, the AN would need to translate the "3G" information to the required coding and then find the SSIDs containing the required coding. Where coding is used, the
15 position of the code in the SSID information may be important. In that case a masking or a matching technique could be used to identify the required SSIDs.

The described preferred embodiments of the invention have
20 been described in the context of inter-working with a 3G network. Embodiments of the invention may also be applied to other types of network including the Internet and other types of communication network, which may be based on wired or wireless technologies.

25 Embodiments of the invention are not just applicable to the SSID but can be used with any information element which is used to provide network support information.

30 In embodiments of the invention probe requests and responses are described. Embodiments of the invention are applicable to any other message sequence.

CLAIMS

1. A method of probing a node, said method comprising the steps of:
- 5 sending a request to said node comprising part of network identity information; and
- determining at said node network identity information containing said part of the identity information.
- 10 2. A method as claimed in claim 1, wherein said part of network identity information comprises at least one of network characteristic information, network operator information.
- 15 3. A method as claimed in any preceding claim, further comprising the step of formulating said request containing said part of network identity information.
4. A method as claimed in any preceding claim, wherein
- 20 said node is an access node.
5. A method as claimed in any preceding claim, wherein said determining step comprises determining a plurality of network identity information containing said part of the
- 25 identity information.
6. A method as claimed in claim 5, comprising the step of sending a plurality of said determined network identity information to a sender of said request.
- 30 7. A method as claimed in claim 6, comprising the step of selecting one of the network identity information.

8. A method as claimed in claim 6 or 7, wherein said selecting step is carried out by one of said sender of said request and said access node.

5

9. A method as claimed in any preceding claim, comprising the step of making a connection with a network identified in said determining step by said network identity information.

10 10. A method as claimed in any preceding claim, wherein said network identity information comprises a SSID.

11. A system comprising at least one node and at least one client, one of said client arranged to send a request to
15 said node comprising part of network identity information; and said node is arranged to determine network identity information containing said part of the identity information.

20 12. A system as claimed in claim 11, wherein said part of network identity information comprises at least one of network characteristic information and network operator information.

25 13. A system as claimed in any of claims 10 to 12, wherein said client is arranged to formulate said request containing said part of network identity information.

14. A system as claimed in any of claims 10 to 13, wherein
30 said node is an access node.

15. A system as claimed in any of claims 10 to 14, wherein said node is arranged to determine a plurality of network identity information containing said part of the identity information.

5

16. A system as claimed in claim 15, wherein the node has means for sending a plurality of said determined network identity information to said client.

10 17. A system as claimed in claim 15 or 16, wherein the client or the node is arranged to select one of the network identity information.

15 18. A system as claimed in any of claims 10 to 17, wherein the client is arranged to be connected with a network identified by said network identity information.

19. A system as claimed in any of claims 10 to 18, wherein said network identity information comprises a SSID.

20

20. A client in a system comprising at least one node and at least one client, said client arranged to send a request to said node comprising part of network identity information.

25

21. A node in a system comprising at least one node and at least one client, comprising means for receiving from one of said clients a request comprising part of network identity information, said node being is arranged to determine
30 network identity information containing said part of the identity information.

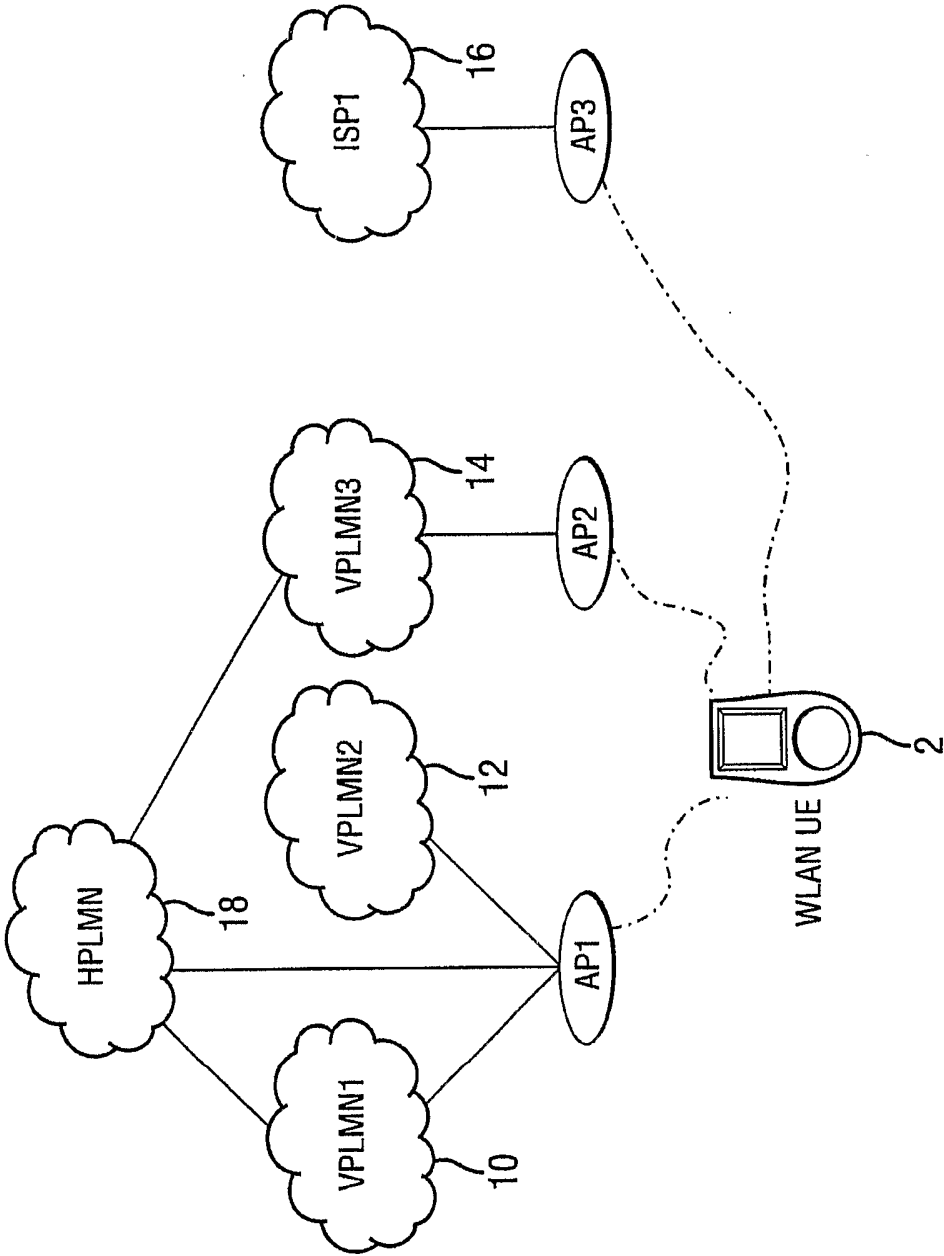
22. A method of probing a node, said method comprising the steps of:

 sending a request to said node identifying at least one group, said group comprising a plurality members having
5 different network identity information; and
 determining at said node at least one member of said group.

23. A method or system or node or client as claimed in any
10 preceding claim, wherein at least one of said node or client is a WLAN entity.

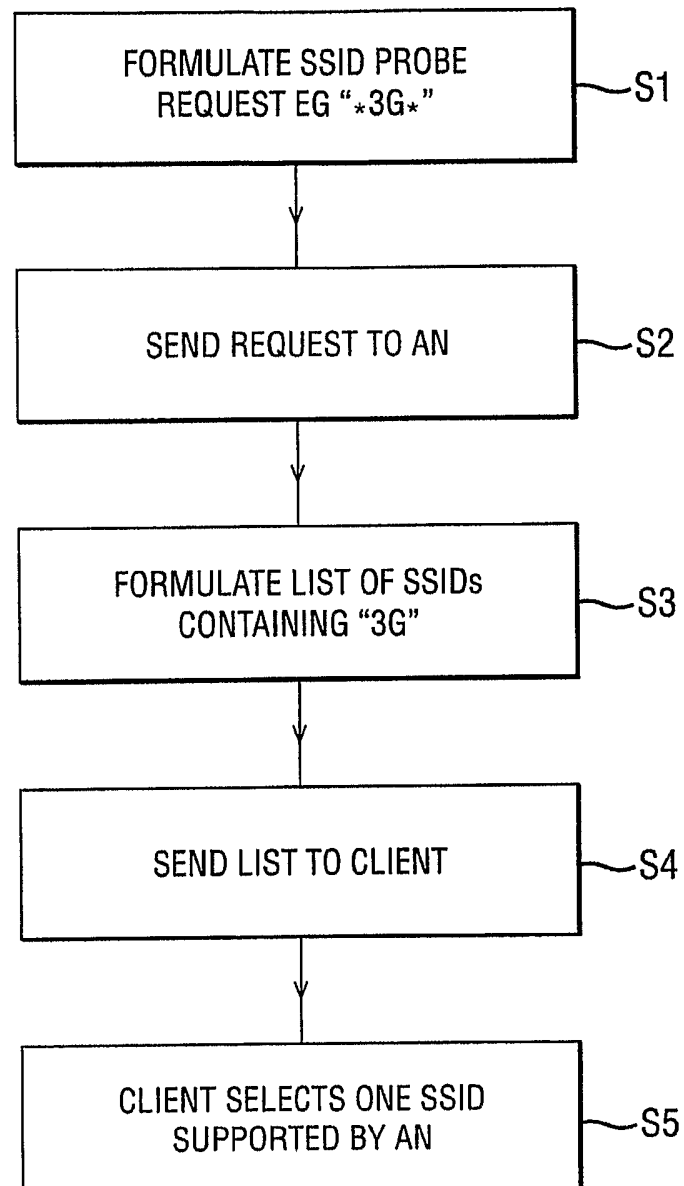
24. A method or system or node or client as claimed in any preceding claim, wherein said network identity
15 information comprises WLAN identity information.

FIG. 1



2/2

FIG. 2



INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 2005/000376

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04L 12/28, H04L 12/56, H04Q 7/38

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)

IPC7: H04L, H04Q

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	3GPP TS 24.234 V1.0.0: 3rd Generation Partnership Project; Technical Specification Group Core Network; 3GPP System to WLAN Interworking; UE to Network protocols; Stage 3 (Release 6) [on line] December 2003 [Retrieved on 2005-05-18]. Retrieved from the internet <URL: http://www.3gpp.org/ftp/Specs/html-info/24234.htm >, see subclause 5.2.1 - 5.4, cited in the application --	1-24
P,X	US 20040248557 A1 (MURATSU, F.), 9 December 2004 (09.12.2004), claims 1-29, abstract --	1-24

☒ 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

"B" 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

18 May 2005

Date of mailing of the international search report

25 -05- 2005

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Roger Bou Faisal /OGU

Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 2005/000376

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 20030221006 A1 (KUAN, C-C. ET AL), 27 November 2003 (27.11.2003), paragraphs 0023-0027, claims 1-22 --	1-24
Y	EP 1307003 A2 (NEC INFRONTIA CORPORATION), 2 May 2003 (02.05.2003), claims 1-5, abstract --	1-24
A	US 20030163558 A1 (CAO, J. ET AL), 28 August 2003 (28.08.2003), claims 1-27, abstract --	1-24
A	US 20030081583 A1 (KOWALSKI, J.), 1 May 2003 (01.05.2003), claims 1-41, abstract --	1-24
A	WO 03088578 A1 (NOKIA CORPORATION), 23 October 2003 (23.10.2003), claims 1-28, abstract -- -----	1-24

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/04/2005

International application No.

PCT/IB 2005/000376

US	20040248557	A1	09/12/2004	JP	2004363878	A	24/12/2004
US	20030221006	A1	27/11/2003	AU	2003224807	A	00/00/0000
				CA	2479792	A	16/10/2003
				EP	1490785	A	29/12/2004
				WO	03085544	A	16/10/2003
EP	1307003	A2	02/05/2003	CA	2410250	A	29/04/2003
				JP	3612528	B	19/01/2005
				JP	2003204335	A	18/07/2003
				JP	2004266870	A	24/09/2004
				TW	582149	B	00/00/0000
				US	20030115339	A	19/06/2003
US	20030163558	A1	28/08/2003	JP	2003324470	A	14/11/2003
US	20030081583	A1	01/05/2003	NONE			
WO	03088578	A1	23/10/2003	AU	2002307887	A	00/00/0000
				AU	2002346784	A	00/00/0000
				EP	1466443	A	13/10/2004
				EP	1495586	A	12/01/2005
				US	20030177267	A	18/09/2003
				US	20040029580	A	12/02/2004
				WO	03061203	A	24/07/2003