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Filed on 14 December 2001 (14.12.2001)

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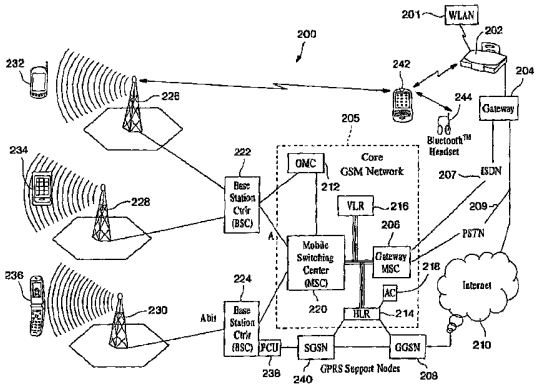
[Continued on next page]

(54) Title: AUTOMATIC SEAMLESS VERTICAL ROAMING BETWEEN WIRELESS LOCAL AREA NETWORKS AND WIRELESS WIDE AREA NETWORKS



(57) Abstract: A Mobile Station (MS) is able to vertically roam in either direction between two different network, i.e. WWAN and WLAN. The MS is equipped with a dual mode Radio for WWAN and WLAN transmissions. The WLAN Radio is linked to a WLAN Enterprise Gateway Controller (EGC) via a first air link and the WWAN Radio is linked to a WWAN Base Transceiver Station (BTS) via a second air link. The EGC is connected to a Mobile Switching Center (MSC) which is in turn connected to the BTS. An outgoing VoIP call from the WLAN Radio to a remote party on the WWAN will transition or seamlessly switch over to a WWAN connection when the MS detects packet error rates, frequent scale back or consistent signal degradation. Upon such conditions, the WLAN Radio requests the EGC to request an Explicit Call Transfer via the MSC to the MS integrated WWAN Radio portion which automatically accepts the call based on referenced information stored in the user's subscriber identification module (SIM). Once the WWAN Radio is confirmed connected to the remote party on the WWAN, the WLAN Radio drops the WLAN connection. An incoming call between the MS and a remote user via the WWAN will transition to the WLAN Radio when the MS enters WLAN coverage. The MS issues an ECT to the WLAN. After user verification by the WLAN Radio and the EGC signals acceptance of the call, the WWAN Radio connection is dropped and the call is now established between the WLAN Radio and the remote party on the WWAN.

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Declaration under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, 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, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

Published:

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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.

INTERNATIONAL SEARCH REPORT

Intern il Application No
PCT/US 01/45874

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/38

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)
IPC 7 H04Q

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 practical, search terms used)
EPO-Internal, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO 00 28762 A (NORTEL NETWORKS CORP) 18 May 2000 (2000-05-18) page 5, line 16 -page 14, line 23; figures 1-4	1-3,7,10 4-6,9,11-24
X Y	WO 00 76145 A (NOKIA NETWORKS OY ;ALLAHWERDI NOURI (FI)) 14 December 2000 (2000-12-14) page 7, line 1 -page 11, line 26 page 22, line 6-29 figures 1,2	1-3,7,10 4-6,9,11-24
Y	GB 2 288 301 A (MOTOROLA INC) 11 October 1995 (1995-10-11) page 4, line 34 -page 9, line 23	4,11-15,18,19,21-24

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in 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 document 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	Date of mailing of the international search report
13 June 2002	18.06.02

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Kreppel, J

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 99 25146 A (ERICSSON GE MOBILE INC) 20 May 1999 (1999-05-20) page 5, line 3 -page 6, line 25; figures 2,3	4,11-15, 18,19, 21-24
P,X	US 6 243 581 B1 (JAWANDA JASTINDER) 5 June 2001 (2001-06-05)	1-3,7,10
P,Y	column 2, line 38 -column 6, line 10; figures 1,4	4-6, 11-19, 21-24
A	CROW B P ET AL: "IEEE 802.11 WIRELESS LOCAL AREA NETWORKS" IEEE COMMUNICATIONS MAGAZINE, IEEE SERVICE CENTER. PISCATAWAY, N.J, US, vol. 35, no. 9, 1 September 1997 (1997-09-01), pages 116-126, XP000704431 ISSN: 0163-6804 the whole document	1,7,18, 19
Y	US 5 943 333 A (GIBBS JONATHAN ALASTAIR ET AL) 24 August 1999 (1999-08-24) the whole document	5,6,16, 17
Y	EP 0 701 337 A (MITSUBISHI ELECTRIC CORP) 13 March 1996 (1996-03-13) page 4, line 13 -page 6, line 20 page 17, line 18 -page 18, line 38 figures 38-40	5,6,16, 17
Y	BLEFARI-MELAZZI N ET AL: "Dimensioning of play-out buffers for real-time services in a B-ISDN" COMPUTER COMMUNICATIONS, ELSEVIER SCIENCE PUBLISHERS BV, AMSTERDAM, NL, vol. 21, no. 11, 10 August 1998 (1998-08-10), pages 980-995, XP004138770 ISSN: 0140-3664 page 982, line 9 -page 983, line 17 figure 1	9,20
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 01/45874

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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 fee, this Authority did not invite payment of any additional fee.

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.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ 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: 1-4,7,8,10-15,18,19,21-24

   A communication system, method and corresponding program and storage medium for seamless handover between a wide area wireless network and and a local area wireless network. A second connection to the dual-mode mobile station is established using the call transfer functionality of the wide area wireless network. The first connection is then dropped.

2. Claims: 5,6,16,17

   A system and method for time division multiplexing of traffic and control signals of local and wide area wireless networks.

3. Claims: 9,20

   System and method for streaming of packet data during handover between wide area and local area wireless networks.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Interna al Application No
PCT/US 01/45874

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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