

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
9 December 2004 (09.12.2004)

PCT

(10) International Publication Number
WO 2004/107667 A1

(51) International Patent Classification⁷: **H04L 12/28**, 12/66

(21) International Application Number:
PCT/SE2004/000838

(22) International Filing Date: 28 May 2004 (28.05.2004)

(25) Filing Language: Swedish

(26) Publication Language: English

(30) Priority Data:
0301600-3 2 June 2003 (02.06.2003) SE

(71) Applicant (for all designated States except US): **FÄLT COMMUNICATIONS AB** [SE/SE]; Umestans Företagspark, S-903 47 Umeå (SE).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **LÅNGSTRÖM, Mikael** [SE/SE]; Klövernägen 40, S-903 52 Umeå (SE).

(74) Agent: **KURT LAUTMANN'S PATENTBYRÅ AB**; Box 245, S-691 25 Karlskoga (SE).

(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.

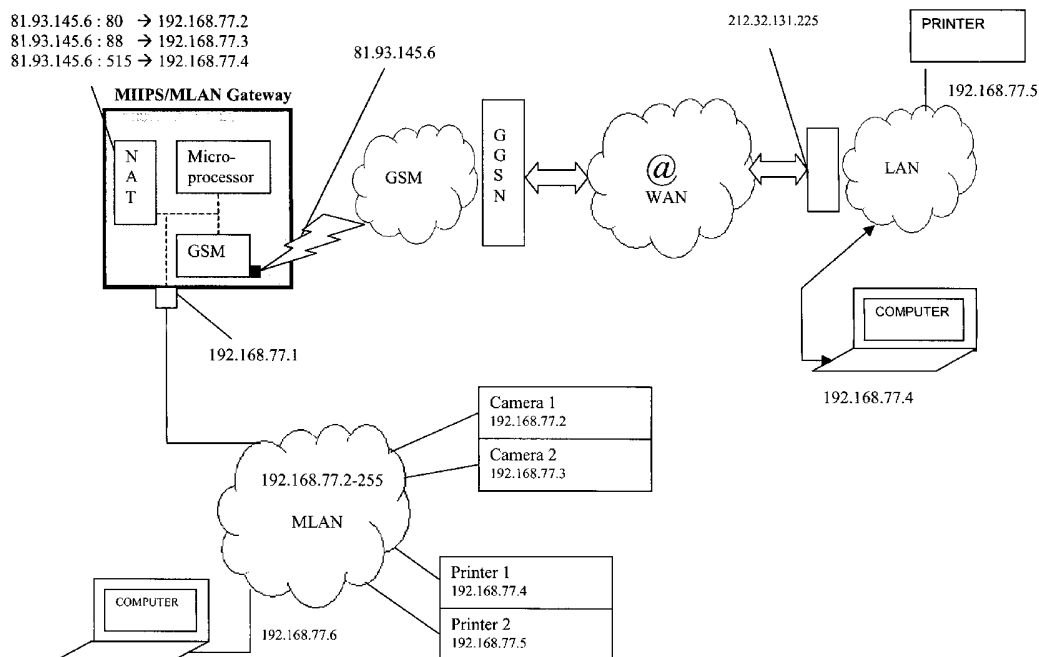
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, 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).

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.

(54) Title: MOBILE DATA COMMUNICATION



(57) Abstract: The invention comprises a device for connecting computer networks via wireless communication. At least one local data network communicates with other data networks via a mobile LAN gateway, the local data network then functioning as an extension of the combined data networks.

WO 2004/107667 A1

MOBILE DATA COMMUNICATION

BACKGROUND

- 5 The present invention is based on a device for a mobile network or, more precisely, a device that, in a transparent manner, and by means of a wireless connection, connects a local network with another network.

The internet is now an established means of communication. To a large extent,
10 internet communication is between stationary LAN networks. Wireless communication over the internet requires a wireless communication module that provides local access to the internet. WLAN is such a module. Using it, communication with the internet is possible if the user is within the area covered by the WLAN communication node. Mobile communication can here be achieved by
15 connecting a GSM telephone to a computer. This solution gives computer users the possibility of mobile communication over the internet.

There is often a great need for wireless communication in, for example, long-distance coaches where several people may need to connect to the internet or to their
20 companies' LANs.

A mobile LAN gateway in contact with the internet solves this problem by creating a local network (intranet) in the vehicle. All users can communicate over this network and, furthermore, do not require their own, individual communication modules to do
25 so.

The difference between WLAN and mobile LAN is that WLAN is a static communication point that enables local communication, whereas mobile LAN offers mobile communication via a mobile LAN gateway.
30

There are also cases where it is desired to have control over radio interference, e.g. in an aircraft (where interference makes it impossible to use, for example, GSM telephones for communication with a mobile LAN gateway). The airline company can itself site the necessary antenna and equipment and thus gain control over radiation
35 values while still offering network communication to air passengers.

Telematic/telemetry solutions use, to a great extent, proprietary communication methods. Existing communication gateways provide communication via, for example, SMS, GSM data and GPRS. Communication to these gateways is via, for example, RS232, Can, etc. For an industrial computer to be able to communicate with its
5 server, data has to be sent (using a protocol) to the communication gateway. As there is no accepted standard for the communication protocol, communication protocols have to be changed when emigrating to a different communication gateway. This procedure involves considerable expense.

10 US 5771459 describes a communication system where a network in a mobile vehicle can, using wireless communication, connect to another network. The invention in that patent uses a so-called proprietary communication method as outlined above. This means, for example, that if new units are to be added to the network in the mobile vehicle, then the protocols have to be adapted. This entails expensive and time-
15 consuming procedures.

DESCRIPTION OF THE INVENTION

The present invention has the advantage that, as regards communication between
20 networks, it does not require a conversion procedure between different protocols. The result is a so-called transparent system rather than a proprietary communication method. Because communication with a mobile LAN gateway as per the present invention is completely transparent, integration/emigration of units in the local network (the mobile LAN) can take place without adaptation of the protocols. In other
25 words, the mobile network becomes an extension of the global network and units in the mobile network can be addressed from the exterior.

This is an extremely flexible and cost-efficient system. It has the advantage that standard units can be used in the system and, consequently, the mobile LAN is not
30 tied to certain particular brands. Cameras, GPS units, printers, computers, etc. of all makes can be connected to the network without it being necessary to install any special software. Thus, the system can be quickly and effortlessly set up, maintained and adapted for the situation in question.

The system comprises a microcomputer system with various communication carriers. A wireless IP carrier (e.g. GSM, GPRS, UMTS, etc.) is used for communication to/from the internet. Ethernet or a wireless IP carrier is used for communication to/from the mobile LAN (intranet).

5

The invention is made up of a number of individual, known components put together to form a combination that has new properties. The combination brings together a wireless module (e.g. a GSM module or a 3G module), a network module and a control processor. This creates a mobile network that is transparent and, via the wireless module, able to communicate with outside networks.

10

The communication carrier that is in contact with the internet is allocated or has a static IP number. Via NAT, the units connected to the mobile LAN (intranet) use the external communication carrier's IP number.

15

The mobile LAN is physically connected to the mobile LAN gateway. Those units in the LAN that wish to communicate over the internet give the mobile LAN gateway as the default gateway.

20

When the mobile LAN gateway receives incoming communication (i.e. traffic addressed to the default gateway), it checks whether the traffic is to be routed to the internet or if the traffic is addressed to the mobile LAN. If the traffic is routed to the internet, the mobile LAN gateway constructs a table listing the sender. If the traffic is from the internet, then the mobile LAN gateway checks whether any unit in the mobile LAN is waiting for a reply.

25

The mobile LAN gateway can also administer incoming traffic by, for example, setting that port 80 is to go to unit x in the mobile LAN. If no port is open, then no traffic will be allowed through.

30

The mobile LAN gateway can also be set to allow only certain destinations' IP numbers to be allowed through.

Modern vehicles have some form of network, e.g. CAN for the vehicle's electronics and MOST for controlling the vehicle's stereo, etc. Common to these networks is that they exist only locally in the vehicle. Thus, if a garage is to carry out diagnostic tests, the vehicle has to be in the garage so that the service personnel can connect up to the relevant network. Certain car manufacturers arrange for inward communication to be sent when an airbag is deployed during an accident. However, garages/workshops cannot use this route to access the diagnostic measurements they require. Extra communication modules that provide drivers/passengers with supplementary communication possibilities can be ordered. In certain applications, 3 or more communication modules are required:

communication module 1 – for the vehicle's electronics,
communication module 2 for the driver/passenger, and
communication module 3 for service providers, e.g. alarm services.

The mobile LAN gateway solves the problem by creating an intranet in the vehicle. This intranet is connected to the internet via a mobile LAN gateway. Any equipment that needs to communicate with the outside world over the internet is connected to the mobile LAN gateway's intranet. The greatest advantage is that, instead of each unit requiring its own communication module, several units communicate through one communication gateway (the mobile LAN gateway).

Via mobile LAN, drivers/passengers with IP connected computers can connect to the internet and access information in the usual way.

Drivers/passengers can access their company networks, e.g. a salesperson can use his/her company's accounting system in real time.

Games that are IP enabled can communicate with other game units (or download new games) through mobile LAN.

Via mobile LAN, a vehicle's electronics/computers can communicate with a garage and, for example, order a service or spare parts. Through the same route, a garage can monitor vehicle status and faults.

Currently, there is no possibility of internet communication for airline passengers. This is because GSM modems and the suchlike interfere with aircraft electronics. The mobile LAN gateway solves the problem by creating an intranet in the aircraft. This intranet is connected to the internet via the mobile LAN gateway. Any equipment that
5 can communicate via IP can reach the outside world via the mobile LAN. Aircraft manufacturers can position the mobile LAN gateway so that radio interference does not affect the aircraft.

Via mobile LAN, passengers with an IP connected computer can access the internet
10 and its information.

SHORT DESCRIPTION OF THE DRAWINGS

Figure 1 is an overview of a global network that includes a mobile LAN.

15 Figure 2 shows a mobile LAN gateway.

Figure 3 is a sketch of a mobile LAN system.

Figure 4 is an overview of a mobile LAN for a terrestrial vehicle.

Figure 5 is an overview of a mobile LAN for an aircraft.

Figure 6 is an overview of a global network with an example of a mobile network that
20 uses known technology.

Making reference to the drawings, a possible design of the invention is detailed below.

25 Figure 1 is an overview of a global network that includes a mobile LAN. The latter is connected to global networks via MIIPS. MIIPS (mobile internet IP server) is another name for mobile LAN gateway. The MIIPS/MLAN here includes a GSM module for mobile communication over a mobile network, a NAT module (this allocates internal addresses to the MLAN units and checks whether external communication is to be
30 routed onwards or if any of the units is being addressed from the outside) and a microprocessor that controls connections between the various modules. The GSM module communicates with the mobile network via, for example, GPRS, EDGE or UMTS. Via the mobile network's GGSN, the mobile network can be connected to, for example, the internet or other wide area network (WAN). GGSN (gateway GPRS
35 support node) is an interface between external IP networks and a mobile communication network. Several local networks are, in their turn, connected to the

WAN and are allocated an IP address. This means that the LAN can be addressed from the WAN. In the same way, the MIIPS is allocated an IP address. Consequently, the MIIPS can be addressed from the WAN. By addressing the MIIPS, a computer connected to the LAN (far right of figure 1) can, for example, print out a document using a printer on the MLAN or control a camera on the MLAN. In the example in figure 1, the MIIPS has the external address 81.93.145.6 and ports 80 and 88 are open (going to, respectively, one of the cameras and one of the printers). Which ports are to be open is determined by the MIIPS. It is also possible to close all ports to incoming communication and, instead, exclusively send out camera pictures to an internet address, e.g. 212.32.131.225 (the LAN in this figure).

Figure 2 is an overview of the MLAN gateway and its constituent components.

Figure 3, a sketch of the system, can be studied in conjunction with figure 1.

Figures 4 and 5 shows a mobile LAN in, respectively, a terrestrial vehicle and an aircraft.

Figure 6 is an overview of a global network in which a local network is connected to the global network via a GSM unit. This is an example of a common technical solution prior to the present invention. Using an adapted proprietary protocol, the GSM unit communicates with, for example, a PDA. This protocol is adapted to suit the unit that is being connected. Units that are being connected require specially developed software. In this example, communication with the external network is via SMS. This gives limited transmission capacity and is a costly procedure.

ABBREVIATIONS

	CAN	Controller area network
	GSM	Global system for mobile communication
5	LAN	Local area network
	NAT	Network address translation/translator
	WLAN	Wireless local area network
	WAN	Wide area network

PATENT CLAIMS

A communication system including at least one local network and at least one mobile communication network connected to at least one other network, preferably a WAN,
5 such as the internet,
characterised by: a mobile LAN gateway that has means for creating a local network;
and, by units, which have network cards, being connected to said mobile LAN
gateway, said gateway including means for external wireless communication, these
means for external data communication connecting up said gateway to another
0 network (preferably a WAN such as the internet) via a mobile communication
network, the connection taking place in what is, for the network, a transparent
manner, transparency here entailing that the local network functions as a traditional
local network (LAN), but with the difference that the external communication is
wireless and that emigration and integration of units in the mobile LAN can take place
5 without any need to adapt protocols.

Figure 1

81.93.145.6 : 80 → 192.168.77.2
81.93.145.6 : 88 → 192.168.77.3
81.93.145.6 : 515 → 192.168.77.4

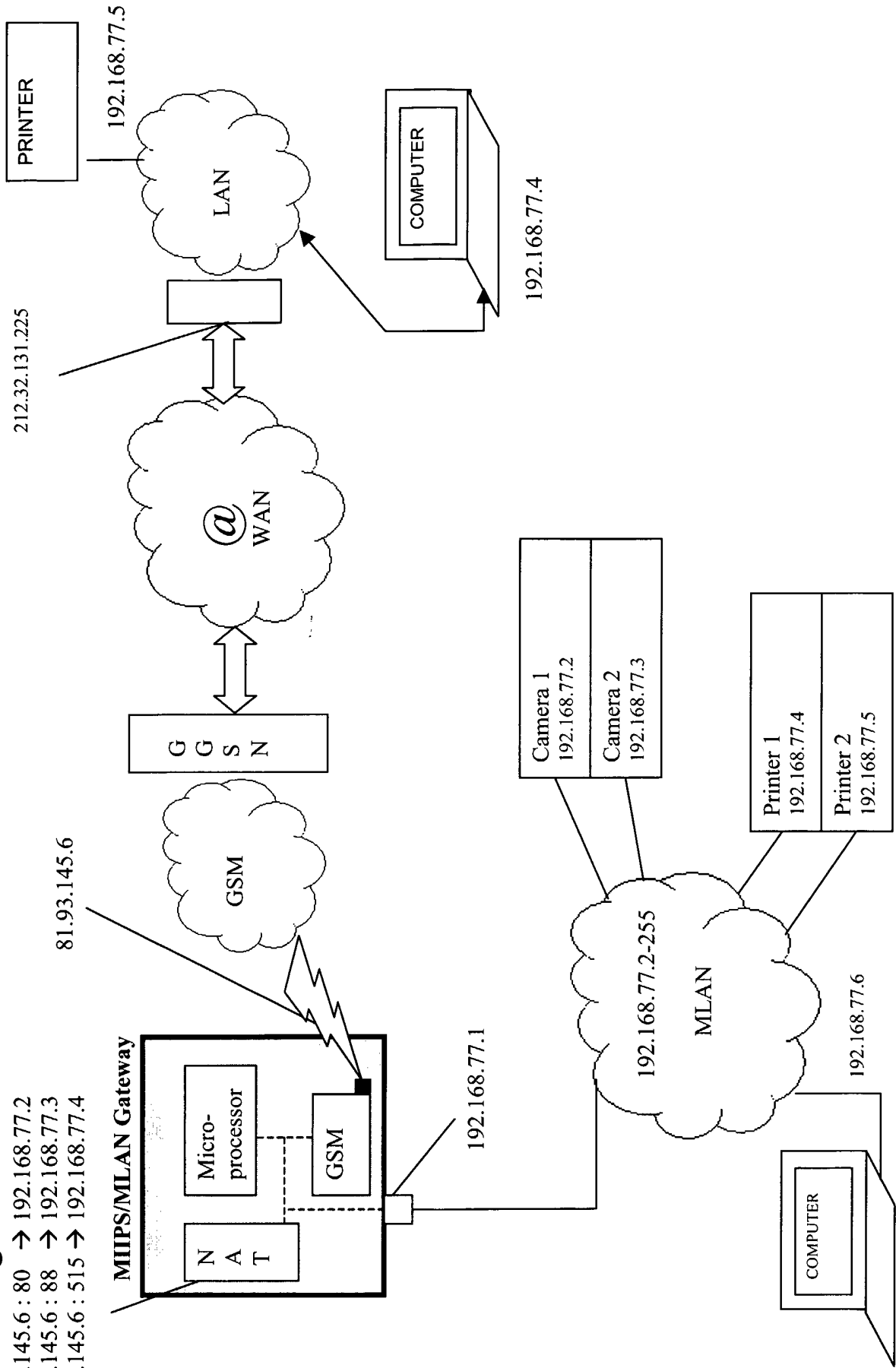
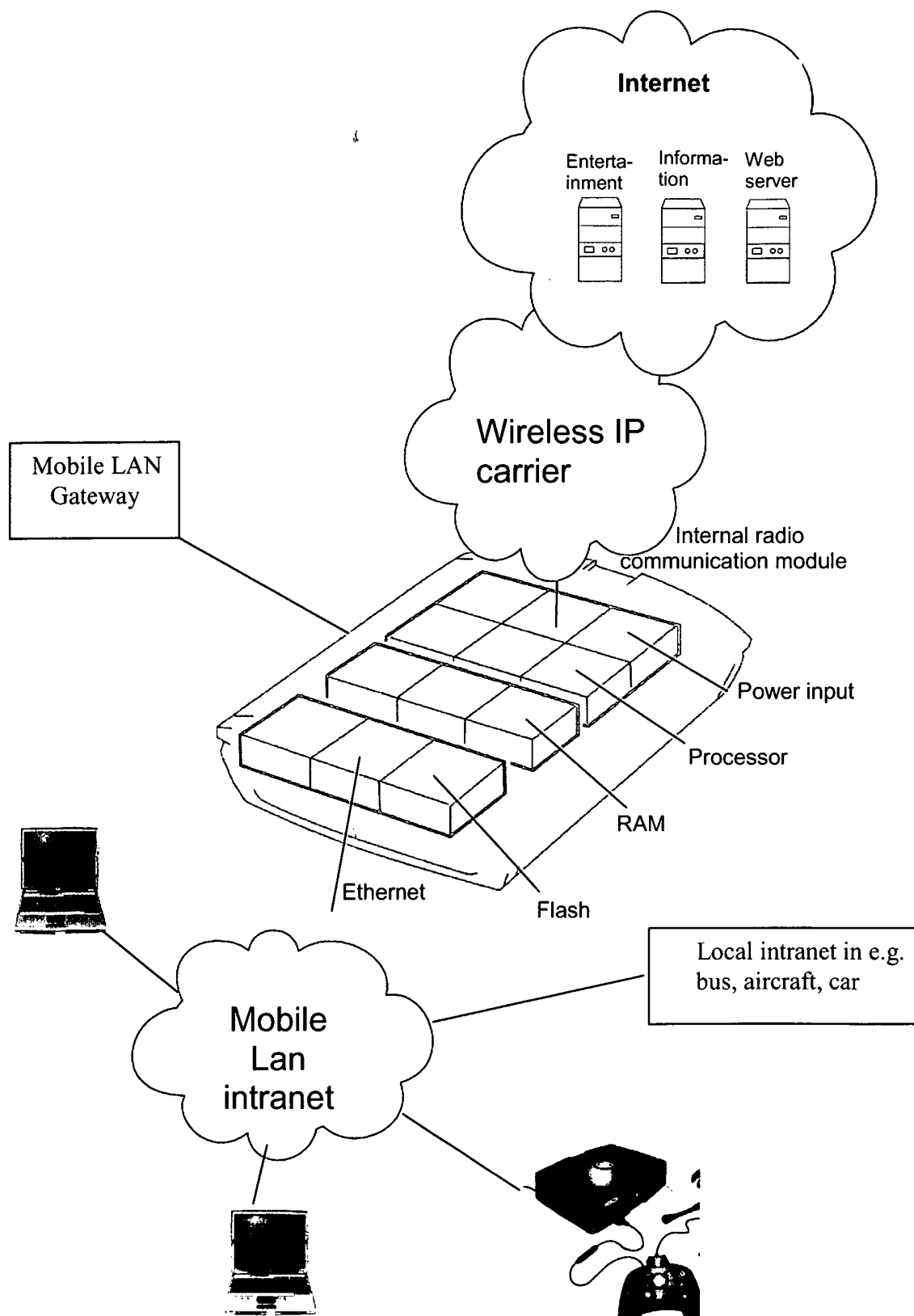


Figure 2
Mobile LAN Gateway



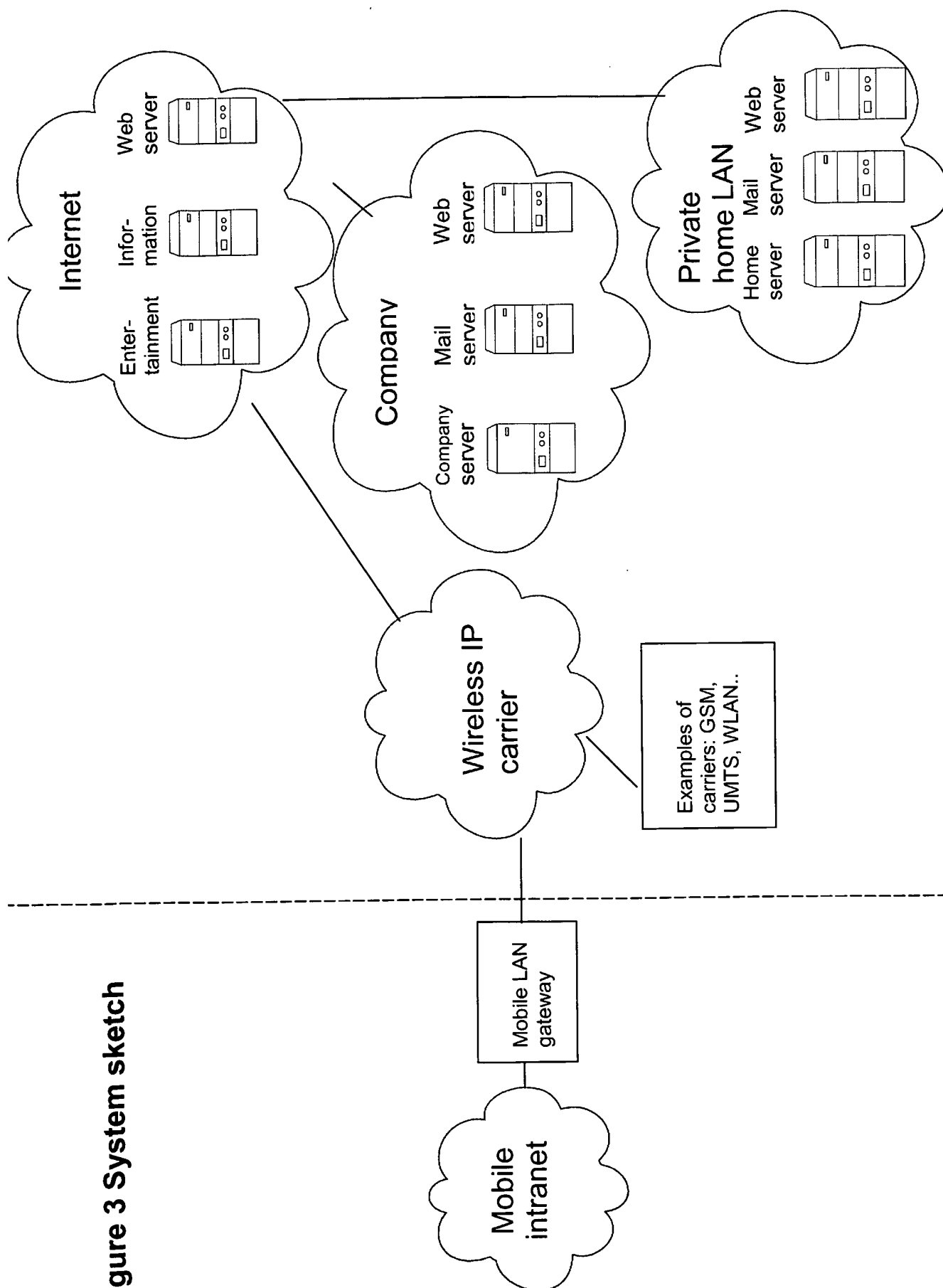


Figure 3 System sketch

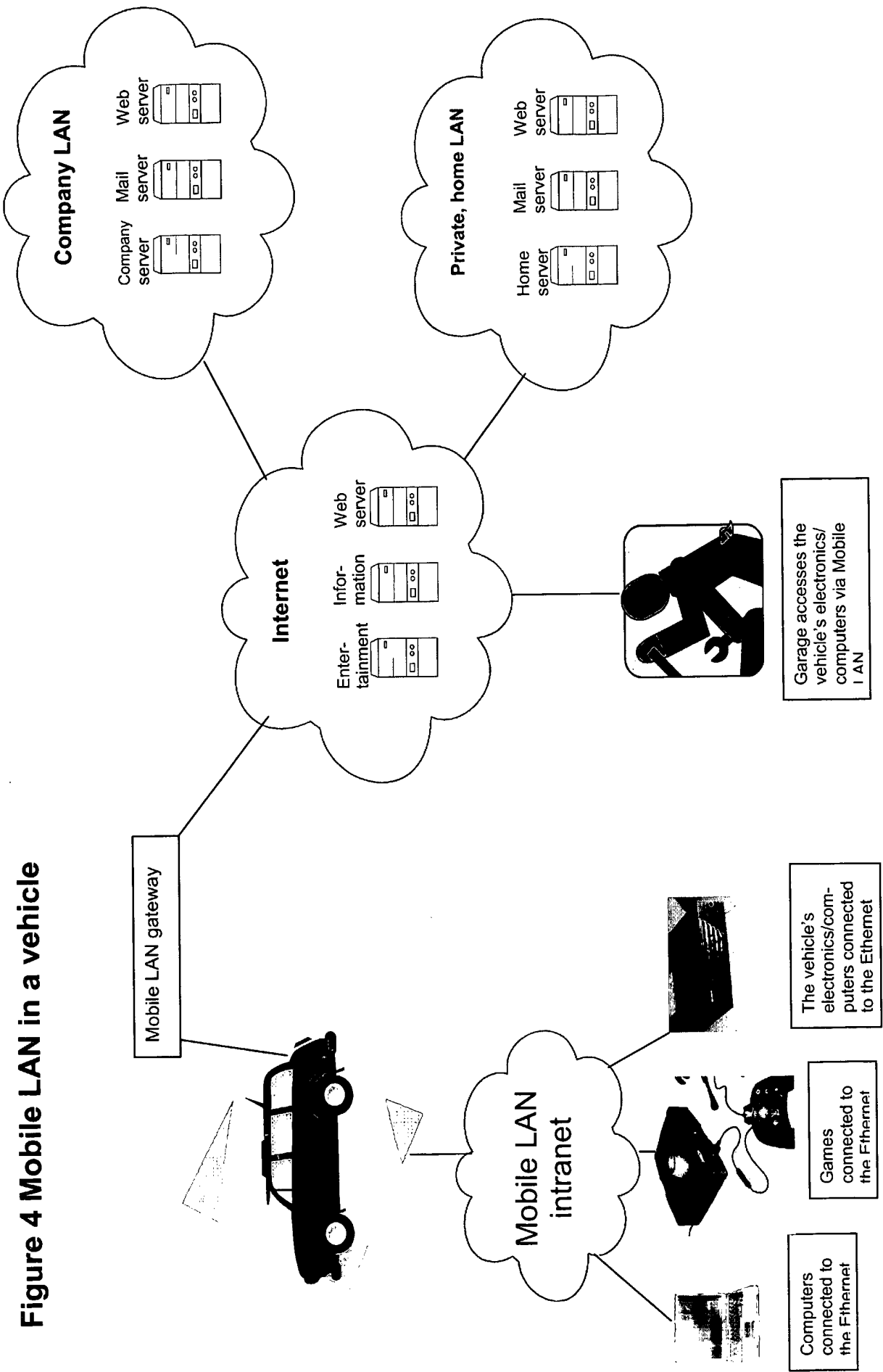
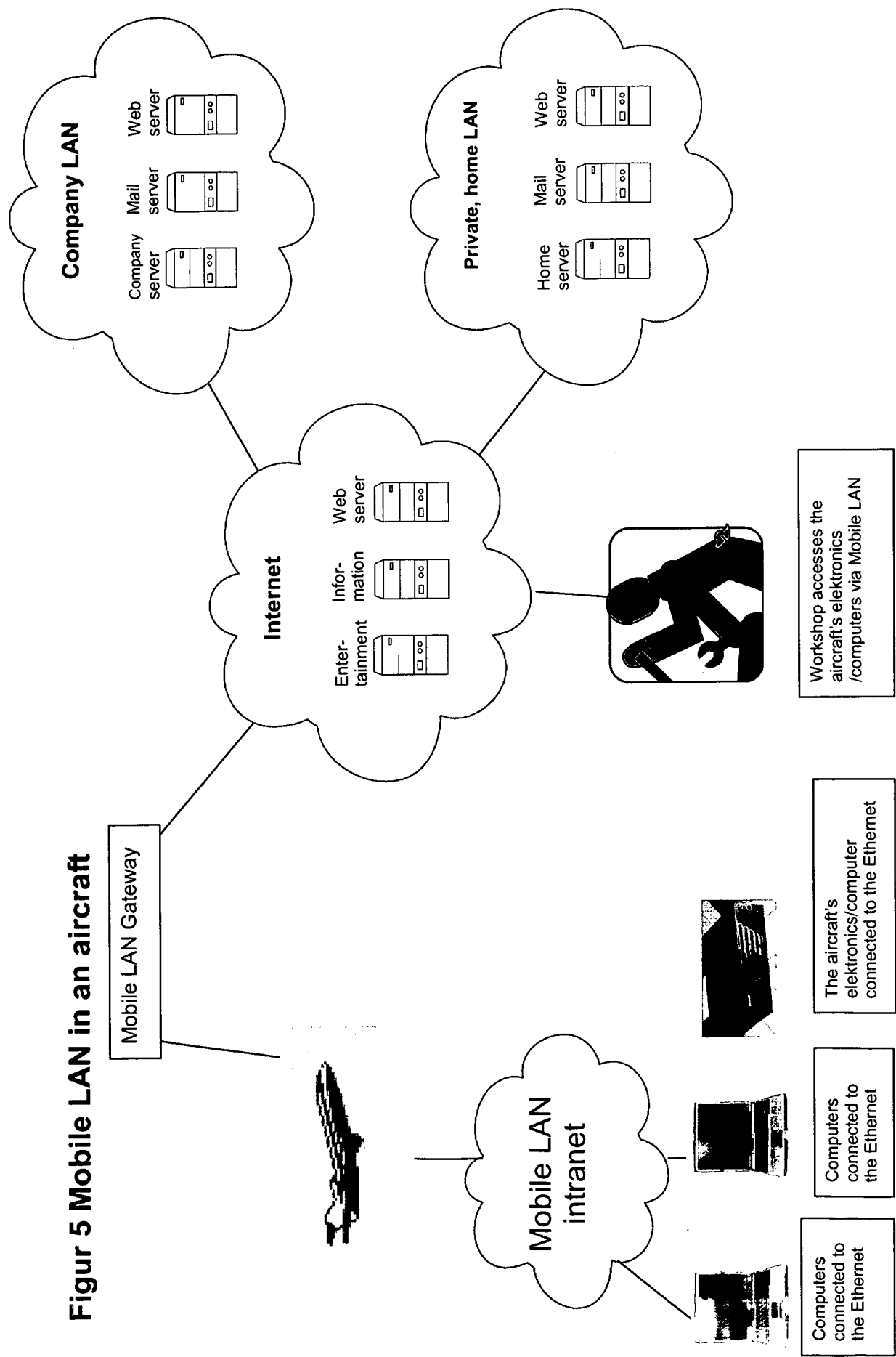
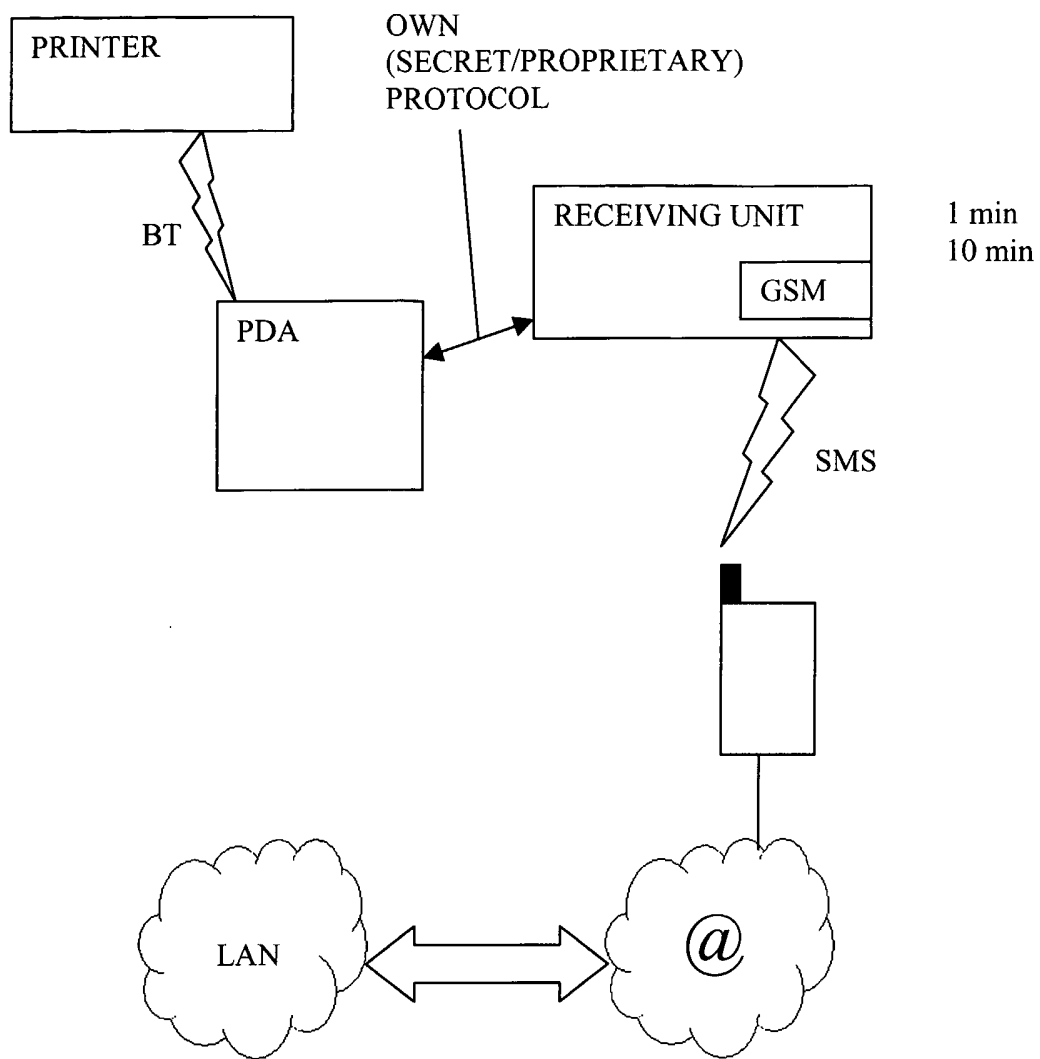


Figure 4 Mobile LAN in a vehicle



Figur 5 Mobile LAN in an aircraft

Figure 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2004/000838

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04L 12/28, H04L 12/66

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

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, INERNET

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5771459 A (DEMERY, D A), 23 June 1998 (23.06.1998), column 3, line 10 - column 4, line 46, figures 1-2, abstract --	1
X	EP 1282295 A2 (DEUTSCHE TELEKOM AG), 5 February 2003 (05.02.2003), column 34 - column 40, figure 2, abstract --	1



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

17 Sept 2004

Date of mailing of the international search report

20 -09- 2004

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

Nabil Sebaa /LR
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2004/000838

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>LIN, K-D et al: Communications and entertainment onboard a high-speed public transport system In: Wireless Communications, IEEE[see also IEEE Personal Communications]. Publication Date: Feb. 2002. On page(s): 84- 89, Volume: 9, Issue: 1 ISSN: 1536-1284. Retrieved from the Internet: <a +84&ared="+89&arAuthor=Kun-De+Lin%3B+Jin-Fu+Chan" href="http://ieeexplore.ieee.org/iel5/7742/21255/00986463.pdf?isNumber=21255&arnumber=986463&prod=JNL&arSt=">http://ieeexplore.ieee.org/iel5/7742/21255/00986463.pdf?isNumber=21255&arnumber=986463&prod=JNL&arSt="+84&ared="+89&arAuthor=Kun-De+Lin%3B+Jin-Fu+Chan See columns 84,1.1; 84,1.2; 87, 1.1 and abstract</p> <p>--</p>	1
X	<p>EP 0766427 A2 (NOKIA MOBILE PHONES LTD), 2 April 1997 (02.04.1997), figures 2-3, claims 1-15, abstract</p> <p>--</p>	1
X	<p>US 20020061024 A1 (MALKEMES, R C ET AL), 23 May 2002 (23.05.2002), figure 1, claim 1, abstract, paragraphs [0006]-[0007]</p> <p>--</p>	1
X	<p>WO 02103970 A1 (BROADWAY, INC), 27 December 2002 (27.12.2002), page 25, line 1 - page 30, line 20, figures 1-3, claims 1-15,22</p> <p>--</p> <p>-----</p>	1

INTERNATIONAL SEARCH REPORT)

International application No.

PCT/SE 2004/000838

US	5771459	A	23/06/1998	NONE		
<hr/>						
EP	1282295	A2	05/02/2003	DE	10138059 A	13/02/2003
<hr/>						
EP	0766427	A2	02/04/1997	FI	105740 B	00/00/0000
				FI	954638 A	30/03/1997
				JP	9135479 A	20/05/1997
				US	5949775 A	07/09/1999
<hr/>						
US	20020061024	A1	23/05/2002	AU	7492801 A	03/12/2001
				US	6647015 B	11/11/2003
				US	20010055351 A	27/12/2001
				WO	0191312 A	29/11/2001
				AU	6490601 A	03/12/2001
				US	6754872 B	22/06/2004
				US	20010037485 A	01/11/2001
				US	20010047503 A	29/11/2001
				US	20020054655 A	09/05/2002
				WO	0191331 A	29/11/2001
<hr/>						
WO	02103970	A1	27/12/2002	CA	2450434 A	27/12/2002
				EP	1405475 A	07/04/2004
				US	20020191575 A	19/12/2002
<hr/>						