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(54) **Title**: METHOD FOR DOWNLOADING PROGRAM ON MOBILE DEVICE

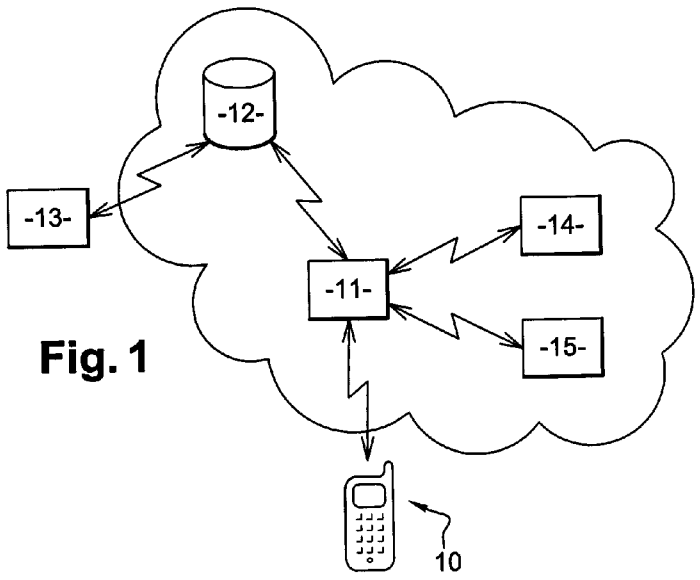

Fig. 1

(57) **Abstract**: The invention relates to a method for downloading at least one program embedded in a mobile device attached to a communication network, the mobile device comprising a first conformance certificate indicating the conformance of the mobile device and a current program with a management policy of the communication network, the method comprising the following steps executed by a communication equipment of the communication network : - receiving a request for downloading a program on the mobile device from a database of the network comprising at least a program, said request comprising at least a first parameter representing a configuration of the program to be downloaded, - receiving a message comprising a second parameter representing a configuration of the mobile device, - determining the compatibility comparing the first parameter and the second parameter, - when the first parameter and the second parameter are compatible, transmitting, to the database comprising at least a program, a message authorizing the download of the program, - receiving from the mobile device a second conformance certificate indicating the conformance of the mobile device and the downloaded program with the management policy of the communication network.

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METHOD FOR DOWNLOADING PROGRAM ON MOBILE DEVICE

The present invention generally relates to conformance certificates and more particularly to a method for obtaining such a certificate.

A conformance certificate is the result of conformance tests. A conformance test consists in determining whether a product, for example a mobile device such as a Smartphone, a laptop, a tablet, etc. meets the requirements of a standard that has been developed for efficiency and interoperability. Many test procedures have been developed, either by the standard's maintainers or external organizations.

When the tested products meet the requirement of the standard, they are advertised as being certified as complying with the standard and a conformance certificate is issued for the tested product.

In the field of telecommunication, a telecommunication operator managing a communication network requires that a product, such as a mobile phone, meet certain requirements before they can be sold and used in the communication network.

Standards for telecommunication products are edited by standards organizations such as 3GPP (3rd Generation Partnership Project), ETSI (European Telecommunications Standards Institute), etc. Such standards have certain criteria that a product must meet before compliance is recognized and a conformance certificate is issued for the product.

Furthermore, product manufacturers set their own requirements to ensure product quality, sometimes with levels much higher than what is required by the standards. A conformance certificate is then issued after the product passes a series of tests without the occurrence of some specified levels of failure. Levels of failures are usually set depending on the usage intended for the tested product.

A compliance test for a telecommunication device includes for example emissions tests, and Emissions tests ensure that the product will not emit a radio signal beyond a certain transmission power level.

During the use of the telecommunication device, programs embedded in the telecommunication device such as firmware or software can be upgraded or replace by a new downloadable version of the program.

The execution of the upgraded program may reconfigure the telecommunication device. In some cases, the reconfiguration of the mobile device with the updated program could have some impact on the telecommunication device functionality, such as the radio spectrum characteristics

etc. In these circumstances, the conformance certificate associated to the telecommunication device is no longer valid.

It is an objective of the present invention to overcome disadvantages and/or make improvements in the prior art.

To that extend, the present invention relates to a method for downloading at least one program embedded in a mobile device attached to a communication network, the mobile device comprising a first conformance certificate indicating the conformance of the mobile device and a current program with a management policy of the communication network, the method comprising the following steps executed by a communication equipment of the communication network :

- receiving a request for downloading a program on the mobile device from a database of the network comprising at least a program, said request comprising at least a first parameter representing a configuration of the program to be downloaded,
- receiving a message comprising a second parameter representing a configuration of the mobile device,
- determining the compatibility comparing the first parameter and the second parameter,
- when the first parameter and the second parameter are compatible, transmitting, to the database comprising at least a program, a message authorizing the download of the program,
- receiving from the mobile device a second conformance certificate indicating the conformance of the mobile device and the downloaded program with the management policy of the communication network.

The method of the invention enables the mobile device to get a valid conformance certificate after a reconfiguration of the mobile device.

In this case, a user of a mobile device is allowed to upgrade or reconfigure their mobile device by downloading a new version of a program or a new program only if a conformance certificate is available for the pair mobile device/new program. In this case, the telecommunication operator managing the communication network knows that the mobile device embedding the new program or the new version of the program is compliant with the managing policy of the communication network.

A management policy is for example a standard, rules defined by the telecommunication operator managing the network, etc.

The method of the invention guarantees that the mobile device is still compliant with the managing policy even after a reconfiguration by making sure that the configuration the mobile

device and the configuration of the program to be downloaded are compatible. If so the program can be downloaded on the mobile device along side with a conformance certificate associated to the mobile device and the downloaded program.

According to another characteristic of the invention, the method for downloading a program further comprises the steps :

- receiving a message from a database of the network storing the conformance certificates associated to a pair consisting of a mobile device and a program, comprising a conformance certificate associated to a given mobile device and a given program indicating the conformance of the mobile device and the program with the management policy of the communication network,
- authorizing the storing of the program associated to the received conformance certificate in the database of the network comprising at least a program.

A database is setup to store conformance certificates for the mobile devices with the different types of programs which can be installed on the mobile device.

The communication equipment checks the database to see if it contains a conformance certificate for the mobile device and the program.

Another object of the invention is a communication equipment of a communication network comprising at least a mobile device comprising a first conformance certificate indicating the conformance of the mobile device and a current program embedded in the mobile device with a management policy of the communication network, the communication equipment comprising means for :

- receiving a request for downloading a program on the mobile device from a database of the network comprising at least a program, said request comprising at least a first parameter representing a configuration of the program to be downloaded,
- receiving a message comprising a second parameter representing a configuration of the mobile device,
- determining the compatibility comparing the first parameter and the second parameter,
- when the first parameter and the second parameter are compatible, transmitting, to the database comprising at least a program, a message authorizing the download of the program,
- receiving from the mobile device a second conformance certificate indicating the conformance of the mobile device and the downloaded program with the management policy of the communication network.

The invention concerns a system comprising a mobile device attached to a communication network, the mobile device comprising a first conformance certificate indicating the conformance of the mobile device and a current program with a management policy of the communication network, the system comprising a communication equipment, and a database comprising at least one program, the communication equipment comprising means for :

- receiving a request for downloading a program on the mobile device from the, said request comprising at least a first parameter representing a configuration of the program to be downloaded,

- receiving a message comprising a second parameter representing a configuration of the mobile device,

- determining the compatibility comparing the first parameter and the second parameter,

- when the first parameter and the second parameter are compatible, transmitting, to the database comprising at least a program, a message authorizing the download of the program,

receiving from the mobile device a second conformance certificate indicating the conformance of the mobile device and the downloaded program with the management policy of the communication network.

Finally, one object of the invention concerns computer programs, in particular computer programs on or in an information medium or memory, suitable for implementing the methods of communication object of the invention. This programs can use any programming language, and be in the form of source code, binary code, or of code intermediate between source code and object code such as in a partially compiled form, or in any other desirable form for implementing the communication methods according to the invention.

The information medium may be any entity or device capable of storing the program. For example, the medium can comprise a storage means, such as a ROM, for example a CD ROM or a microelectronic circuit ROM, or else a magnetic recording means, for example a diskette (floppy disk) or a hard disk.

Moreover, the information medium may be a transmissible medium such as an electrical or optical signal, which may be conveyed via an electrical or optical cable, by radio or by other means. The programs according to the invention may in particular be downloaded from a network of Internet type.

The present system and method are explained in further detail, and by way of example, with reference to the accompanying drawings wherein:

FIG. 1 represents a system in which the method for downloading a program object of the invention is executed,

FIG. 2 represents the different steps of the method for downloading a program.,

FIG. 3 represents a communication equipment capable of running the method for downloading a program according to the invention

Figure 1 represents a system in which the method for downloading a program object of the invention is executed.

A mobile device 10, such as a mobile phone, a Smartphone, a tablet, etc. is connected to a communication network N. The communication network N uses a radio technology to communicate with the mobile device 10. Such a radio technology can be for example, UMTS (Universal Mobile Telecommunication System), WiFi (Wireless Fidelity), etc.

The mobile device 10 embeds a plurality of programs such as firmware or software in order to provide services to the user of the mobile device 10.

Those programs can impact the radio spectrum characteristics of the mobile device 10 fro example by modifying the transmission frequency band or the transmission power of the mobile device 10.

A telecommunication operator managing the communication network N requires that a product, such as the mobile device 10, meet certain requirements before they can be sold and used in the communication network N due to the fact that the programs embedded in the mobile device 10 have an impact on the radio spectrum characteristics of the mobile device 10 and consequently have an impact on the functioning of the communication network N.

A conformance certificate is issued for the mobile device 10 when the mobile device 10 successfully meets the requirements of a standard that has been developed for efficiency and interoperability or a managing policy of the telecommunication operator managing the communication network N.

However, during the use of the mobile device 10, the programs embedded in the mobile device 10 can be upgraded or replaced by newest versions. The user of the mobile device 10 is then asked to download an upgraded version of a program or a new program. The execution of these upgraded versions of the programs on the mobile device 10, also called reconfiguration of the mobile device 10, can modify the radio functionalities of the mobile device 10 making the conformance certificate issued prior to the selling of the mobile device 10 obsolete.

The invention proposes a solution enabling the issuance of an up to date conformance certificate to the mobile device 10 when an upgraded version of the programs embedded in the mobile device 10 are downloaded and executed on the mobile device 10.

Once a program intended to be downloaded and executed on a mobile device is developed, the program is submitted to an entity entitled to run conformance tests on this program. Such an entity is for example a conformance organization 13 housed by a standard organization. Different versions of the program can developed for different types of mobile devices. A version of a program is associated to a type of mobile device.

A conformance certificate is issued for a pair program/mobile device when the program passes the series of tests without the occurrence of some levels of failure specified in the

managing policy defined by the telecommunication operator managing the communication network N.

The conformance certificate issued for the upgraded version of a program is stored with the upgraded version of the program in a database 12 intended to store the conformance certificates for the programs which meet the requirements of the managing policy of the communication network N.

The database 12 is connected to a communication equipment 11, such as a server. The communication equipment 11 is connected to a database 14 storing the programs for which a conformance certificate is issued. The communication equipment 11 is also connected to a database 15 storing for a given mobile device, such as the mobile device 10, the associated conformance certificate.

When the user of the mobile device 10 decides to upgrade a program on the mobile device 10, the method for downloading a program according to the invention is executed. Figure 2 represents the different steps of the method for downloading a program.

In a step E1, different versions of a program are developed. Each version of the program is specific to a type of mobile device, for example there is a version of the program for a tablet and another version of the program for a Smartphone, etc. These different versions of the program are delivered to the conformance organization 13 alongside with the different mobile devices types in which the program is intended to be embedded in.

In a step E2, the conformance tests are run on the program. If the program meets the requirements specified in a reference document such as a managing policy of a communication network or a standard, a conformance certificate is issued for the pair program/mobile device for which the conformance test was run.

In a step E3, the different versions of the program and their associated conformance certificates are stored in the database 12. The database 12 comprises an entry for a certain type of mobile device. For each type of mobile devices, the configuration of the radio functionalities of the mobile device are stored such as the transmission power, the frequency of transmission, etc. Entries for different programs are associated to the entries of the mobile devices when a version of a program is available for the mobile devices. These entries comprise information related to the configuration required by the program, for example in term of power of transmission, etc. Furthermore, the database 12 comprises for each pair program/mobile device the corresponding conformance certificate and information regarding the geographical region for which the conformance certificate is issued. For example a conformance certificate is only valid for Europe or for China.

During a step E4, the communication equipment 11 is informed by the developers of the program that a new version of the program has passed the conformance tests. In a step E5, the communication equipment 11 request from the database 12 to transmit the conformance certificate associated to a given pair program/mobile device.

In a step E6, the communication equipment 11 receives message from the database 12 the requested conformance certificate indicating the conformance of a mobile device and the program with the management policy of the communication network.

Upon reception of the requested conformance certificate, the communication equipment 11 authorizes the storing of the program in the database 14 in a step E7.

If no conformance certificate is received by the communication equipment 11 for a given program, that means the program has not passed the conformance test.

In a step E8, the program and its conformance certificate are then stored in the database 14. The database 14 comprises for each program store therein the following information concerning the configuration of the program : the version of the program, the communication protocol to be used by the mobile device, the operating system of the mobile device, the geographical region in which the program can be downloaded, the type of mobile devices for which the program was developed, etc.

In a step E9, the mobile device 10 sends a request to the database 14 for downloading a program on the mobile device. The request comprises an identifier of the program intended to be downloaded and an identifier of the mobile device 10.

In a step E10, the database 14 sends a request to the communication equipment 11 for authorizing the downloading of the program on the mobile device 10. Said request comprises the identifier of the program intended to be downloaded and the identifier of the mobile device 10. The request sent to the communication equipment comprises also information concerning the configuration of the program.

In a step E11, the communication equipment sends a request for obtaining information concerning the configuration of the mobile device 10. This request can be sent to the mobile device 10 in a first embodiment of the invention or to the database 15 in a second embodiment of the invention.

The following description is made in regard of the first embodiment of the invention.

In a step E12, the mobile device 10 sends the information concerning its configuration to the communication equipment 11. information concerning the configuration of the mobile device 10 comprises : information related to the identification of the mobile device 10, e.g. IMEI number, name of the telecommunication operator managing the network, information related to the hardware of the mobile device 10, e.g. capability of the processor, of the memory, etc, radio technologies supported by the mobile device 10, e.g. 3G, WiFi, etc, radio functionalities, firmware versions, geographical region in which the mobile device 10 can be used, and conformance certificates associated to the pairs mobile device 10/program embedded in the mobile device 10. All these information are stored in the mobile device 10 and more particularly in the BIOS component (Basic Input Output System) of the mobile device 10.

In a step E13, the communication equipment 11 determines the compatibility of the program intended to be downloaded and the mobile device 10 by comparing the information concerning the configuration of the program intended to be downloaded and the information concerning the configuration of the mobile device 10.

If the communication equipment 11 determines that the information concerning the configuration of the program intended to be downloaded and the configuration of the mobile device 10 are compatible, the communication equipment 11 checks in a step E14 the current location of the mobile device 10.

Then in a step E15, the communication equipment 11 compares the current location of the mobile device 10 with the geographical region in which the program can be downloaded. If the mobile device 10 is currently located in the geographical region in which the program can be downloaded, the communication equipment 11 transmits to the database 14 a message authorizing the downloading of the program on the mobile device 10 in a step E16. In a step E17, the program is downloaded on the mobile device 10.

In a step E18 the mobile device 10 updates the BIOS of the mobile device 10 with the information concerning its configuration, especially the conformance certificate associated with the downloaded program.

In a step E19, the mobile device 10 transmits the updated information concerning its configuration to the communication equipment 11. The communication equipment 11 then stores this information in the database 15 in an entry dedicated to the mobile device 10 in a step E20.

In an embodiment of the invention, the mobile device 10 is connected to an intermediate equipment, such as a personal computer (not represented on the figures) which communicates with the communication equipment 11 and the databases 14 and 15 instead of the mobile device 10.

Figure 3 represents a communication equipment 11 capable of running the method for downloading a program according to the invention.

The communication equipment 11 comprises means 110 receiving a request from the database 12 to transmit the conformance certificate associated to a given pair program/mobile device.

Connected to the means 110 for receiving a conformance certificate, the communication equipment comprises means 111 for authorizing the storing of the program in the database 14. The means for authorizing 111 are connected to means 112 for communicating with the database 14.

The communication equipment 11 comprises means 113 for communicating with the mobile device 10. Means 113 for communicating with the mobile device 10 are connected to means 112 for communicating with database 14.

The communication equipment 11 comprises also means 114 for communicating with database 15. The means 114 for communicating with database 15 are connected to means 113 for communicating with the mobile device 10.

The communication equipment 11 comprises means 115 for determining the compatibility of the program intended to be downloaded and the mobile device 10 by comparing the information concerning the configuration of the program intended to be

downloaded and the information concerning the configuration of the mobile device 10. The means for comparing 115 are connected to the means for communicating 112, 113 and 114.

Connected to the means 115 for comparing, the communication equipment 11 comprises means 116 for checking the current location of the mobile device 10 and means 117 for comparing the current location of the mobile device 10 with the geographical region in which the program can be downloaded.

CLAIMS

1. A method for downloading at least one program embedded in a mobile device attached to a communication network, the mobile device comprising a first conformance certificate indicating the conformance of the mobile device and a current program with a management policy of the communication network, the method comprising the following steps executed by a communication equipment of the communication network :

- receiving a request for downloading a program on the mobile device from a database of the network comprising at least a program, said request comprising at least a first parameter representing a configuration of the program to be downloaded,
- receiving a message comprising a second parameter representing a configuration of the mobile device,
- determining the compatibility comparing the first parameter and the second parameter,
- when the first parameter and the second parameter are compatible, transmitting, to the database comprising at least a program, a message authorizing the download of the program,
- receiving from the mobile device a second conformance certificate indicating the conformance of the mobile device and the downloaded program with the management policy of the communication network.

2. The method of claim 1 first comprising the steps of :

- receiving a message from a database of the network storing the conformance certificates associated to a pair consisting of a mobile device and a program, comprising a conformance certificate associated to a given mobile device and a given program indicating the conformance of the mobile device and the program with the management policy of the communication network,
- authorizing the storing of the program associated to the received conformance certificate in the database of the network comprising at least a program.

3. A communication equipment of a communication network comprising at least a mobile device comprising a first conformance certificate indicating the conformance of the mobile device and a current program embedded in the mobile device with a management policy of the communication network, the communication equipment comprising means for :

- receiving a request for downloading a program on the mobile device from a database of the network comprising at least a program, said request comprising at least a first parameter representing a configuration of the program to be downloaded,
- receiving a message comprising a second parameter representing a configuration of the mobile device,

- determining the compatibility comparing the first parameter and the second parameter,
- when the first parameter and the second parameter are compatible, transmitting, to the database comprising at least a program, a message authorizing the download of the program,
- receiving from the mobile device a second conformance certificate indicating the conformance of the mobile device and the downloaded program with the management policy of the communication network.

4. System comprising a mobile device attached to a communication network, the mobile device comprising a first conformance certificate indicating the conformance of the mobile device and a current program with a management policy of the communication network, the system comprising a communication equipment, and a database comprising at least one program, the communication equipment comprising means for :

- receiving a request for downloading a program on the mobile device from the, said request comprising at least a first parameter representing a configuration of the program to be downloaded,
- receiving a message comprising a second parameter representing a configuration of the mobile device,
- determining the compatibility comparing the first parameter and the second parameter,
- when the first parameter and the second parameter are compatible, transmitting, to the database comprising at least a program, a message authorizing the download of the program,
- receiving from the mobile device a second conformance certificate indicating the conformance of the mobile device and the downloaded program with the management policy of the communication network.

5. Computer program characterized in that it comprises program code instructions for the implementation of the steps of the method for downloading a program as claimed in claim 1 when the program is executed by a processor.

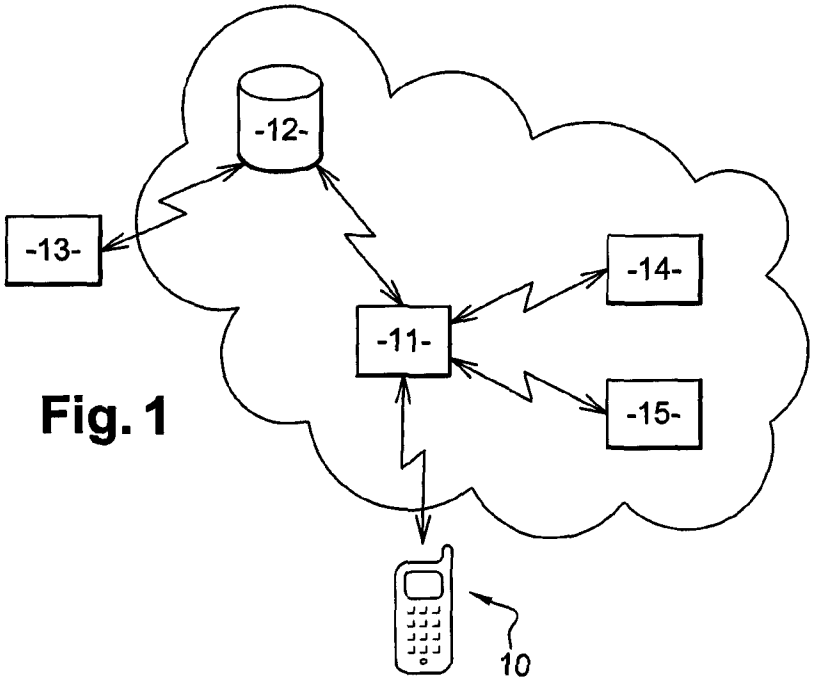


Fig. 1

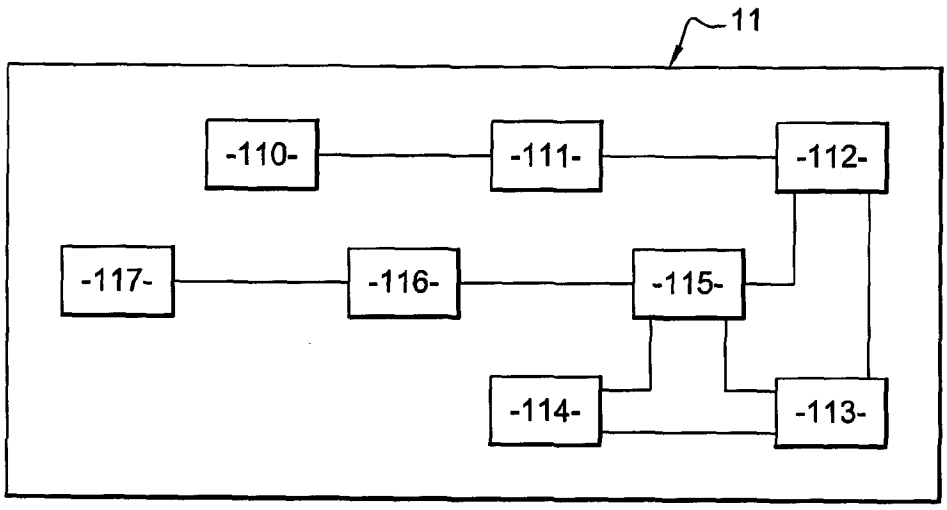
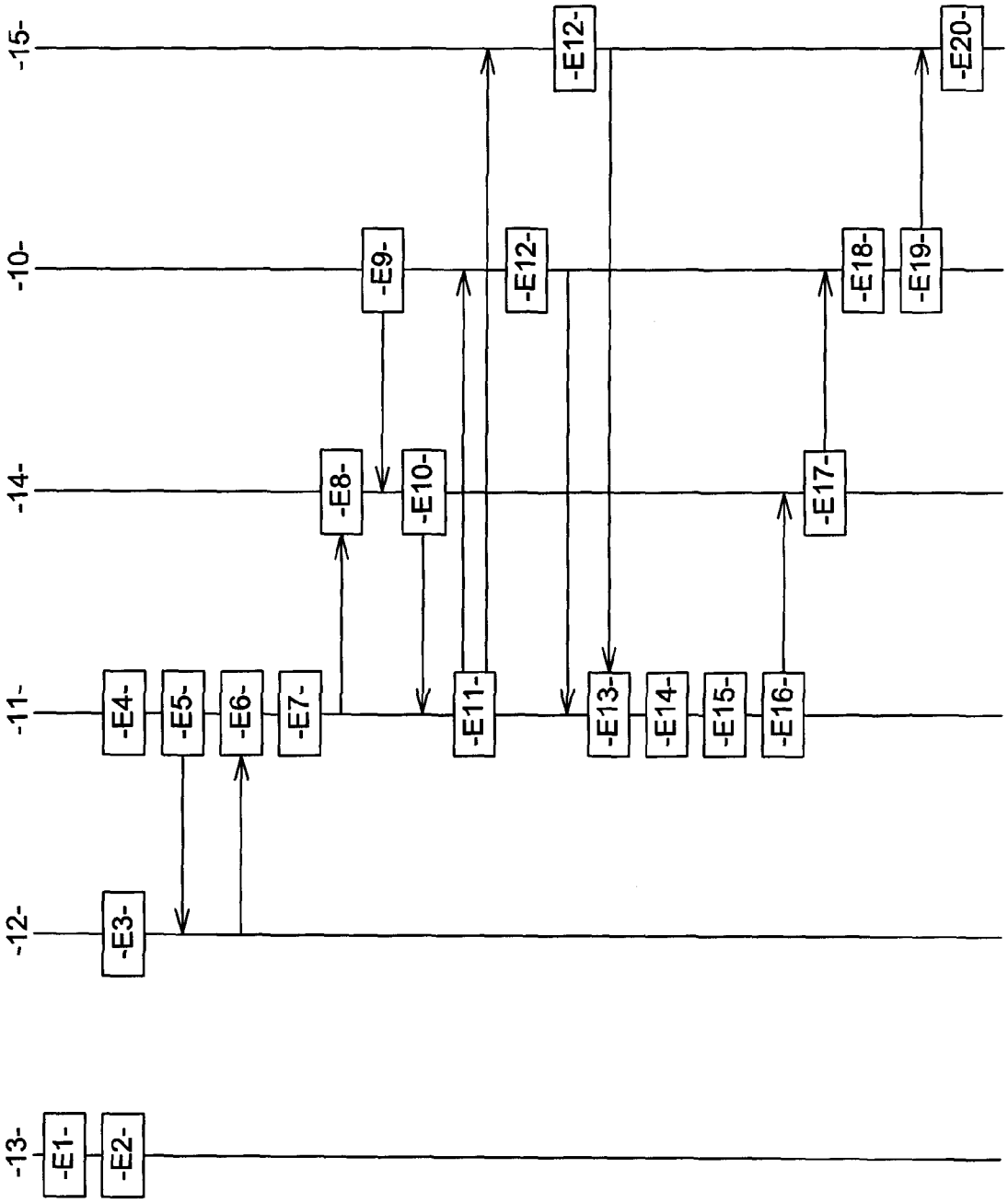


Fig. 3

Fig. 2


-15-
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-E17-
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-E20-

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/077868

A. CLASSIFICATION OF SUBJECT MATTER

H04W 28/00 (2009.01) i

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: H04W, H04L, G06F

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)

WPI, EPODOC, CNPAT, IEEE: download, device, compatible, program, application, code, software

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 101568104 A (QUALCOMM INC.) 28 Oct.2009 (28.10.2009) description, page 7, paragraph 2 to page 11, paragraph 4, claim 24, figures 1-6	1-5
A	CN 102129380 A (YULONG COMPUTER TELECOM TECHNOLOGY (SHENZHEN) CO., LTD.) 20 Jul. 2011 (20.07.2011) the whole document	1-5
A	WO 0167785 A2 (MOTOROLA INC.) 13 Sept. 2001 (13.09.2001) the whole document	1-5

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"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

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"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

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Date of the actual completion of the international search	Date of mailing of the international search report
12 Mar. 2013 (12.03.2013)	**04 Apr. 2013 (04.04.2013)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer ZHANG, Wen Telephone No. (86-10)62413978

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Information on patent family members

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