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(54) **Title:** METHOD FOR PROVIDING COMMUNICATION SERVICES OF A MOBILE COMMUNICATION NETWORK TO A PLURALITY OF TELECOMMUNICATION DEVICES, MOBILE COMMUNICATION NETWORK, TELECOMMUNICATION DEVICE, SYSTEM, PROGRAM AND COMPUTER PROGRAM PRODUCT

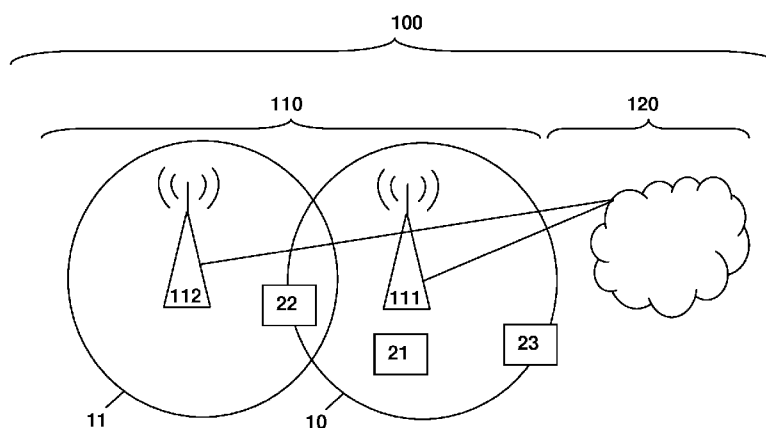


Fig. 1

(57) **Abstract:** The invention relates to a method for providing communication services of a mobile communication network to a plurality of telecommunication devices, wherein the mobile communication network comprises an access network and a core network, wherein the mobile communication network is able to offer a plurality of available service capabilities to the plurality of telecommunication devices or to a subset of the plurality of telecommunication devices, the available service capabilities including at least - the mobile communication network providing mobility functionality, - the mobile communication network providing a defined quality of service level, - the mobile communication network providing security mechanisms, - the mobile communication network providing identity mechanisms, wherein the method comprises the step of establishing a connection or initiating an exchange of data between the mobile communication network and the plurality telecommunication devices, wherein upon the establishment of the connection or upon the initiation of the exchange of data a service capability information is sent from the mobile communication network to the telecommunication devices of the plurality of telecommunication devices, wherein the service capability information indicates at least part of the available service capabilities to the telecommunication devices of the plurality of telecommunication devices.

Method for providing communication services of a mobile communication network to a plurality of telecommunication devices, mobile communication network, telecommunication device, system, program and computer program product

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BACKGROUND

[0001] The present invention relates to a method for providing communication services of a mobile communication network to a plurality of telecommunication devices, wherein the mobile communication network is able to offer a plurality of available service capabilities to the plurality of telecommunication devices or to a subset of the plurality of
10 telecommunication devices, the available service capabilities corresponding to groups of service capabilities such that the mobile communication network provides a varying degree of mobility functionality and/or a different quality of service levels and/or different levels of security measures and/or a varying degree of identity handling.

[0002] Furthermore, the present invention relates to a mobile communication
15 network for providing communication services to a plurality of telecommunication devices, wherein the mobile communication network is able to offer a plurality of available service capabilities to the plurality of telecommunication devices or to a subset of the plurality of telecommunication devices, the available service capabilities corresponding to groups of service capabilities such that the mobile communication network provides a varying
20 degree of mobility functionality and/or a different quality of service levels and/or different levels of security measures and/or a varying degree of identity handling.

[0003] Additionally, the present invention relates to a telecommunication device adapted to be used in connection with such a mobile communication network, and to a system comprising a mobile communication network and a plurality telecommunication
25 devices.

[0004] Furthermore, the present invention relates to a program and to a computer program product for providing communication services of a mobile communication network to a plurality of telecommunication devices.

[0005] Within the framework of the fifth generation of mobile networks or mobile
30 communication networks, a mobile communication network has to fulfill a broad range of requirements beyond what has been required for previous generations of mobile communication networks.

[0006] The range of requirements includes the support of efficient usage of bandwidth beginning from a data rate of a few kilobits per second up to a data rate of several Gigabits per second, from highly demanding latency requirements down to 1ms to far less stringent delay requirements for some application like machine-to-machine communication (M2M-communication) where only several bytes per day need to be transferred in a not very time critical manner.

[0007] Mobility requirements range from stationary or almost stationary scenarios with millions of connected devices (Internet of Things) to highest speed mobile broadband connection in fast moving cars or trains.

10 **[0008]** Given this broad range of applicable requirements, it is a challenge to provide a mobile communication network that fulfills these very different requirements still in a very efficient manner.

SUMMARY

15 **[0009]** An object of the present invention is to provide a technically simple, effective and especially cost effective solution for providing communication services of a mobile communication network to a plurality of telecommunication devices such that a differentiation of providing the communication services according to the respective requirements of the telecommunication devices is possible, especially with regard to
20 service capabilities of the mobile communication network corresponding to groups of service capabilities such that the mobile communication network provides a varying degree of mobility functionality and/or a different quality of service levels and/or different levels of security measures and/or a varying degree of identity handling. A solution according to the present invention should provide a possibility to allow a mobile radio
25 network (or mobile communication network), especially a fifth generation mobile radio network, to expose its network service capabilities to the outside world and further to allow on-demand provision of network services (or service capabilities) to telecommunication devices.

[0010] The object of the present invention is achieved by a method for providing
30 communication services of a mobile communication network to a plurality of telecommunication devices, wherein the mobile communication network comprises an access network and a core network, the access network comprising a plurality of radio cells of the mobile communication network, wherein the mobile communication network is

able to offer a plurality of available service capabilities to the plurality of telecommunication devices or to a subset of the plurality of telecommunication devices, the available service capabilities corresponding to groups of service capabilities, the groups of service capabilities including at least

- 5 -- the mobile communication network providing a varying degree of mobility functionality,
- the mobile communication network providing different quality of service levels,
 - the mobile communication network providing different levels of security measures,
 - the mobile communication network providing a varying degree of identity handling,

10 wherein the method comprises the step of establishing a connection or initiating an exchange of data between the mobile communication network and the plurality of telecommunication devices, wherein prior to or upon

- the establishment of the connection or
- the initiation of the exchange of data

15 a service capability information is sent from the mobile communication network to at least part of the telecommunication devices of the plurality of telecommunication devices, wherein the service capability information indicates at least part of the available service capabilities – within the groups of service capabilities – to the telecommunication devices of the plurality of telecommunication devices.

20 **[0011]** It is thereby advantageously possible according to the present invention that a flexible method for providing communication services of a mobile communication network is provided such that the mobile communication network offers and is able to provide a plurality of available service capabilities in groups of service capabilities, and thereby offering or being able to provide a varying degree of mobility functionality and/or a
25 different quality of service levels and/or different levels of security measures and/or a varying degree of identity handling.

[0012] Depending on the use case of the telecommunication device, different network service capabilities can be exposed to particular (mobile) devices which in turn, depending on their use case, can book such services (or service capabilities) and be
30 provisioned with the related service capabilities.

[0013] The main advantage of the method and/or the mobile communication network and/or system according to the present invention compared to current methods and/or systems is that – depending on the use case and depending on the specific set of service capabilities used by a specific telecommunication device – procedures can be skipped
35 due to the fact that they are unnecessary for this given use case. It is thereby

advantageously possible, that the system definition and implementation can be significantly simplified.

[0014] A simple scenario according to the present invention is the applicability of different mobility-related capabilities of the mobile communication network of
5 telecommunication devices with no data loss. E.g. while it is clear that a mobile device like a smartphone requires full mobility support (as the user might use the device while travelling with full speed), a stationary metering sensor typically has no mobility requirements at all – thus, regarding the group of mobility-related service capabilities of the mobile communication network, different service capabilities should be applied to
10 different telecommunication devices when providing communication services to such devices.

[0015] In all conventionally known cellular systems (e.g. of the third generation mobile communication networks and/or of the fourth generation mobile communication networks), the underlying assumption has always been that there is typically no
15 differentiation in terms of support of generic features like mobility, link layer reliability by for example retransmission, authentication and security requirements.

[0016] In this regard, a set of given network features (or set of service capabilities of the conventionally known mobile communication networks) for the above mentioned application scenario have always been utilized by all different telecommunication devices
20 for any of the requested service.

[0017] Capabilities of the mobile communication network have – in conventionally known mobile communication networks – never been exposed in this sense to the telecommunication devices as the underlying assumption has always been that the terminal (or telecommunication device) has to utilize the network features typically
25 always.

[0018] According to the present invention however, the method comprises the step of establishing a connection or initiating an exchange of data between the mobile communication network and the plurality telecommunication devices such that – prior to or upon either the establishment of the connection or the initiation of the exchange of
30 data – a service capability information is sent from the mobile communication network to at least part of the telecommunication devices of the plurality of telecommunication devices, wherein the service capability information indicates at least part of the available service capabilities – within the groups of service capabilities – to the telecommunication devices of the plurality of telecommunication devices.

[0019] Thereby, it is advantageously possible that there is an exchange of information between the mobile communication network and the telecommunication device such that a differentiation of the service capabilities of the mobile communication network towards this telecommunication device (with respect to the service capabilities of the mobile communication network towards other telecommunication devices within the mobile communication network) is possible.

[0020] According to a preferred embodiment of the present invention, the service capability information is transmitted, by an entity or by a network node of the access network of the mobile communication network, especially by means of a dedicated signalization or on a broadcast control channel (BCCH) such that the broadcast control channel is received by the respective telecommunication device of the plurality of telecommunication devices.

[0021] Thereby, it is advantageously possible that the transmission of the service capability information is by means of a dedicated signalization, i.e. the transmission is provided specifically for a specific telecommunication device. Alternatively or cumulatively, it is also possible according to the present invention that the transmission of the service capability information is provided by means of a broadcast such as on a broadcast control channel (BCCH); the broadcast control channel being typically received by a plurality of telecommunication devices (this plurality of telecommunication devices comprising the respective telecommunication device).

[0022] According to the present invention it is furthermore preferred that a service capability selection information is sent to the access network by at least a first telecommunication device of the plurality of telecommunication devices, the service capability selection information at least implicitly indicating one or a plurality of service capabilities in at least one group of service capabilities.

[0023] It is thereby advantageously possible that the telecommunication device transmits a choice regarding the offered service capabilities of the mobile communication network by means of transmitting the service capability selection information.

[0024] It is possible and preferred according to the present invention that by means of transmitting the service capability selection information, a set of choices (regarding different groups of service capabilities) of the telecommunication device is transmitted to the mobile communication network. However, it is also possible and preferred that the service capability selection information only relates to the choice of a service capability in one of the groups of service capabilities.

[0025] According to the present invention it is preferred that either the service capability information includes a charging information, the charging information being related to different service capabilities and especially the charging information indicating different charging levels for different available service capabilities.

5 **[0026]** It is thereby advantageously possible to provide not only the possible service capabilities (within the groups of service capabilities) available to the telecommunication device but also additional information such as corresponding charging information indicating different charging levels for different available service capabilities.

[0027] According to a preferred embodiment of the present invention, the group of
10 service capabilities related to the mobile communication network providing a varying degree of mobility functionality to at least part of the telecommunication devices includes one or a plurality out of the following:

- no mobility support,
- best effort mobility support,
- 15 -- support of context forwarding,
- full mobility support without target radio cell preparation,
- full mobility support with target radio cell preparation,
- full mobility support without target radio cell preparation also in case that the target radio cell is congested.

20 **[0028]** Thereby, it is advantageously possible to provide a broad range of different service capabilities related to mobility functionality.

[0029] According to a further preferred embodiment of the present invention, the group of service capabilities related to the mobile communication network providing different quality of service levels to at least part of the telecommunication devices
25 includes one or a plurality out of the following:

- no defined Quality of Service ("best effort"),
- guaranteed bitrate,
- minimum bitrate,
- priority of data handling low,
- 30 -- priority of data handling normal,
- priority of data handling high,
- maximum packet delay allowed.

[0030] Thereby, it is advantageously possible to provide a broad range of different service capabilities related to different quality of service levels.

[0031] According to a further preferred embodiment of the present invention, the group of service capabilities related to the mobile communication network providing different levels of security measures to at least part of the telecommunication devices includes one or a plurality out of the following:

- 5 -- no security support at all,
-- low level security support,
-- high level security support,
-- high integrity protection security support.

[0032] Thereby, it is advantageously possible to provide a broad range of different
10 service capabilities related to different levels of security measures.

[0033] According to a further preferred embodiment of the present invention, wherein the group of service capabilities related to the mobile communication network providing a varying degree of identity handling to at least part of the telecommunication devices includes one or a plurality out of the following:

- 15 -- no identity support by the mobile communication network,
-- identity supported by the mobile communication network.

[0034] Thereby, it is advantageously possible to provide a broad range of different service capabilities related to different levels of identity handling.

[0035] According to still a further embodiment of the present invention, subsequent
20 to the service capability information, being sent in a first situation of the mobile communication network, a further service capability information is sent from the mobile communication network to at least part of the telecommunication devices of the plurality of telecommunication devices, wherein the further service capability information – compared to the service capability information –

- 25 -- either indicates different available service capabilities within the groups of service capabilities, especially reflecting the situation – especially the network load – of the mobile communication network at the time of the further service capability information,
-- or indicates a different charging information related to different available service capabilities within the groups of service capabilities, especially reflecting the situation –
30 especially the network load – of the mobile communication network at the time of the further service capability information.

[0036] Thereby it is advantageously possible according to the present invention to flexibly adapt the communication of service capabilities, by the mobile communication network, to the telecommunication devices, especially reflecting different situations of the

mobile communication network, especially different network load situations of the mobile communication network.

[0037] Furthermore, the present invention relates to a mobile communication network for providing communication services to a plurality of telecommunication devices, wherein the mobile communication network comprises an access network and a core network, the access network comprising a plurality of radio cells of the mobile communication network, wherein the mobile communication network is able to offer a plurality of available service capabilities to the plurality of telecommunication devices or to a subset of the plurality of telecommunication devices, the available service capabilities corresponding to groups of service capabilities, the groups of service capabilities including at least

- the mobile communication network providing a varying degree of mobility functionality,
- the mobile communication network providing different quality of service levels,
- 15 -- the mobile communication network providing different levels of security measures,
- the mobile communication network providing a varying degree of identity handling,

wherein the mobile communication network is configured such that – between the mobile communication network and the plurality telecommunication devices – a connection is established or an exchange of data is initiated, wherein prior to or upon

- 20 -- the establishment of the connection or
- the initiation of the exchange of data

a service capability information is sent from the mobile communication network to at least part of the telecommunication devices of the plurality of telecommunication devices, wherein the service capability information indicates at least part of the available service capabilities – within the groups of service capabilities – to the telecommunication devices of the plurality of telecommunication devices.

[0038] Thereby, it is advantageously possible to provide a mobile communication network such that more flexibility is achieved for providing communication services of the mobile communication network such that the mobile communication network offers and is able to provide a plurality of available service capabilities in groups of service capabilities, and thereby offering or being able to provide a varying degree of mobility functionality and/or a different quality of service levels and/or different levels of security measures and/or a varying degree of identity handling.

[0039] According to a further preferred embodiment of the present invention – especially with respect to the inventive mobile communication network –, a service

capability selection information is received by the access network from at least a first telecommunication device of the plurality of telecommunication devices, the service capability selection information at least implicitly indicating one or a plurality of service capabilities in at least one group of service capabilities.

5 [0040] Thereby, it is advantageously possible according to the present invention that an exchange of service capability information and a corresponding choice (by means of the service capability selection information) is possible in order to provide a finer granularity regarding the provision of communication services to different (kinds of) telecommunication devices.

10 [0041] Furthermore, the present invention relates to a telecommunication device adapted to be used in connection with a mobile communication network that provides communication services to a plurality of telecommunication devices, wherein the telecommunication device and the plurality of telecommunication devices are configured to communicate with the mobile communication network via an access network of the
15 mobile communication network, the access network comprising a plurality of radio cells, wherein the mobile communication network is able to offer a plurality of available service capabilities to the telecommunication device and the plurality of telecommunication devices or to a subset of the plurality of telecommunication devices, the available service capabilities corresponding to groups of service capabilities, the groups of service
20 capabilities including at least

- the mobile communication network providing a varying degree of mobility functionality,
- the mobile communication network providing different quality of service levels,
- the mobile communication network providing different levels of security measures,
- 25 -- the mobile communication network providing a varying degree of identity handling, wherein the telecommunication device is configured to establish a connection or to initiate an exchange of data with the mobile communication network, wherein prior to or upon
 - the establishment of the connection or
 - the initiation of the exchange of data

30 a service capability information is received, by the telecommunication device, from the mobile communication network, wherein the service capability information indicates at least part of the available service capabilities – within the groups of service capabilities – to the telecommunication device, and
wherein a service capability selection information is sent by the telecommunication device
35 to the access network, the service capability selection information at least implicitly

indicating one or a plurality of service capabilities in at least one group of service capabilities.

[0042] Thereby, it is advantageously possible to provide a mobile communication network such that more flexibility is achieved for providing communication services of the
5 mobile communication network such that the mobile communication network offers and is able to provide a plurality of available service capabilities in groups of service capabilities, and thereby offering or being able to provide a varying degree of mobility functionality and/or a different quality of service levels and/or different levels of security measures and/or a varying degree of identity handling.

10 **[0043]** Furthermore, the present invention relates to a system for providing communication services of a mobile communication network to a plurality of telecommunication devices, wherein the system comprises a mobile communication network and a plurality of telecommunication device, wherein the mobile communication network comprises an access network and a core network, the access network
15 comprising a plurality of radio cells of the mobile communication network, wherein the mobile communication network is able to offer a plurality of available service capabilities to the plurality of telecommunication devices or to a subset of the plurality of telecommunication devices, the available service capabilities corresponding to groups of service capabilities, the groups of service capabilities including at least
20 -- the mobile communication network providing a varying degree of mobility functionality,
-- the mobile communication network providing different quality of service levels,
-- the mobile communication network providing different levels of security measures,
-- the mobile communication network providing a varying degree of identity handling,
25 wherein the system is configured such that – between the mobile communication network and the plurality telecommunication devices – a connection is established or an exchange of data is initiated, wherein prior to or upon
-- the establishment of the connection or
-- the initiation of the exchange of data
30 a service capability information is sent from the mobile communication network to at least part of the telecommunication devices of the plurality of telecommunication devices, wherein the service capability information indicates at least part of the available service capabilities – within the groups of service capabilities – to the telecommunication devices of the plurality of telecommunication devices.

[0044] Thereby, it is advantageously possible to provide a system such that more flexibility is achieved for providing communication services of the mobile communication network to telecommunication devices such that the mobile communication network offers and is able to provide a plurality of available service capabilities in groups of 5 service capabilities, and thereby offering or being able to provide a varying degree of mobility functionality and/or a different quality of service levels and/or different levels of security measures and/or a varying degree of identity handling.

[0045] Additionally, the present invention relates to a program comprising a computer readable program code which, when executed on a computer and/or on a 10 network node or on a plurality of network nodes of a mobile communication network and/or on a telecommunication device, or in part on a network node or on a plurality of network nodes of a mobile communication network and in part on a telecommunication device, causes the computer and/or network node or the plurality of network nodes and/or the telecommunication device to perform the inventive method.

15 **[0046]** Still additionally, the present invention relates to a computer program product for providing communication services of a mobile communication network to a plurality of telecommunication devices, the computer program product comprising a computer program stored on a storage medium, the computer program comprising program code which, when executed on a computer and/or on a network node or on a plurality of 20 network nodes of a mobile communication network and/or on a telecommunication device, or in part on a network node or on a plurality of network nodes of a mobile communication network and in part on a telecommunication device, causes the computer and/or network node or the plurality of network nodes and/or the telecommunication device to perform the inventive method.

25 **[0047]** These and other characteristics, features and advantages of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention. The description is given for the sake of example only, without limiting the scope of the invention. The reference figures quoted below refer to the 30 attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0048] Figure 1 schematically illustrate a mobile communication network and a plurality of telecommunication devices.

[0049] Figure 2 schematically illustrates the exchange of information between the mobile communication network and the telecommunication devices.

DETAILED DESCRIPTION

5 **[0050]** The present invention will be described with respect to particular embodiments and with reference to certain drawings but the invention is not limited thereto but only by the claims. The drawings described are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes.

10 **[0051]** Where an indefinite or definite article is used when referring to a singular noun, e.g. "a", "an", "the", this includes a plural of that noun unless something else is specifically stated.

[0052] Furthermore, the terms first, second, third and the like in the description and in the claims are used for distinguishing between similar elements and not necessarily for
15 describing a sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

[0053] In Figure 1, a mobile communication network 100, especially a public land
20 mobile network 100, is schematically shown, the mobile communication network 100 comprising an access network 110 and a core network 120. The mobile communication network 100 is preferably a cellular telecommunications network comprising typically a plurality of network cells (or radio cells), wherein two neighboring network cells (or radio cells) are represented in Figure 1 by means of reference signs 10 and 11. The mobile
25 communication network 100 typically comprises a plurality of user equipments or telecommunication devices. The plurality of user equipments or of telecommunication devices are referred to by means of reference signs 21, 22, 23, wherein reference sign 21 refers to a first user equipment or a first telecommunication device, reference sign 22 refers to a second user equipment or a second telecommunication device, reference sign
30 23 refers to a third user equipment or a third telecommunication device. The access network 110 of the mobile communication network 100 comprises, in the exemplary representation of Figure 1, a first base station entity 111, serving the (first) radio cell 10. Furthermore, a neighbor (second) base station entity 112, serving the neighbor (second)

radio cell 11, is schematically shown. The base transceiver stations 111, 112 are typically base stations or base station entities, e.g. a NodeB or an eNodeB base transceiver station.

[0054] In order for the mobile communication network 100 to provide communication services to the telecommunication devices 21, 22, 23, it is necessary that a connection is established between the mobile communication network 100 and one or a plurality of the telecommunication devices 21, 22, 23 and/or that an exchange of data is initiated between the mobile communication network 100 and one or a plurality of the telecommunication devices 21, 22, 23.

10 According to the present invention, prior to the establishment of a connection between one of the telecommunication devices 21, 22, 23 with the mobile communication network 100, or upon the establishment of a connection between one (or a plurality) of the telecommunication devices 21, 22, 23 with the mobile communication network 100, a service capability information (hereinafter designated by means of reference sign 201, cf. 15 Figure 2) is sent from the mobile communication network 100 to the one (or the plurality) of the telecommunication devices 21, 22, 23, the service capability information 201 indicating at least part of the available service capabilities of the mobile communication network 100 – within the groups of service capabilities – to the one (or the plurality) of the telecommunication devices 21, 22, 23.

20 Alternatively or cumulatively, prior to the initiation of the exchange of data between one of the telecommunication devices 21, 22, 23 with the mobile communication network 100, or upon the initiation of the exchange of data between one (or a plurality) of the telecommunication devices 21, 22, 23 with the mobile communication network 100, a service capability information 201 is sent from the mobile communication network 100 to 25 the one (or the plurality) of the telecommunication devices 21, 22, 23, the service capability information 201 indicating at least part of the available service capabilities of the mobile communication network 100 – within the groups of service capabilities – to the one (or the plurality) of the telecommunication devices 21, 22, 23.

[0055] The mobile communication network 100 is able to offer a plurality of available 30 service capabilities, either to all of the telecommunication devices 21, 22, 23 or to a subset of the telecommunication devices 21, 22, 23. The available service capabilities correspond to groups of service capabilities. According to the present invention, the groups of service capabilities include at least the mobile communication network 100 providing a varying degree of mobility functionality and/or the mobile communication 35 network 100 providing different quality of service levels and/or the mobile communication

network 100 providing different levels of security measures and/or the mobile communication network 100 providing a varying degree of identity handling.

[0056] Preferably, the service capability information 201 is transmitted by means of a dedicated signalization or on a broadcast control channel (BCCH) such that the broadcast control channel is received by at least part of the telecommunication devices 21, 22, 23. The service capability information 201 is preferably transmitted using SIBs (System Information Blocks) of the broadcast control channel (typically by means of specific broadcast messages that are capable of providing this information on the broadcast control channel). Alternatively or cumulatively, the service capability information 201 can be transmitted by means of dedicated signalization (e.g. context activation of specific telecommunication devices 21, 22, 23).

[0057] It is furthermore preferred that a service capability selection information (hereinafter designated by means of reference sign 202, cf. Figure 2) is sent to the access network 110 by at least one of the telecommunication devices 21, 22, 23 (e.g. the first telecommunication device 21 or the second telecommunication device 22). The service capability selection information 202 at least implicitly indicates one or a plurality of service capabilities in at least one group of service capabilities that the (first or second) telecommunication device 21, 22 chooses (or books).

[0058] In Figure 2, the exchange of information between the mobile communication network 100 and the telecommunication devices 21, 22, 23 (or at least part thereof, i.e. the first and/or the second and/or the third telecommunication device 21, 22, 23) is schematically shown by means of a communication diagram. At a given first point in time, the service capability information 201 is transmitted from the mobile communication network 100 (i.e. a network node of the mobile communication network, typically a network node of the access network 110) to the telecommunication devices 21, 22, 23 (or at least part thereof, i.e. the first and/or the second and/or the third telecommunication device 21, 22, 23). At a given second point in time, the service capability selection information 202 is transmitted from at least one of the telecommunication devices 21, 22, 23 to the mobile communication network 100, typically a network node of the access network 110. The first given point in time can be equal for all the telecommunication devices 21, 22, 23 within a radio cell 10, 11 and the service capability information 201 transmitted by means of a broadcast transmission within the radio cell 10, 11. The second given point in time can vary for each telecommunication device 21, 22, 23 individually, i.e. the transmission of the service capability selection information 202 might occur at different points in time for different telecommunication devices 21, 22, 23.

[0059] The bookable services or service capabilities (within certain groups of service capabilities) typically vary according the use case and/or the access mode (such as mobile access, WLAN hot spot access or machine-to-machine use cases. It is likewise possible and preferred according to the present invention that for specific classes of telecommunication devices 21, 22, 23 (such as, e.g., machine-to-machine enabled devices such as smart meters, sensors or the like) different service capabilities and/or different groups of service capabilities (e.g. only service capabilities of the group of service capabilities providing different degrees of identity handling for machine-to-machine enabled telecommunication device) are offered (by means of the service capability information 201) by the mobile communication network 100 – compared to other classes of telecommunication devices 21, 22, 23 (such as, e.g., smart phones for which all groups of service capabilities are offered by the service capability information 201). Additionally or cumulatively, it is possible and preferred that a selection of suitable service capabilities is performed by the telecommunication devices 21, 22, 23.

[0060] A first example of possible use cases relates to smart metering by means of machine-to-machine communication, i.e. using machine type communication enabled telecommunication devices 21, 22, 23. For this use case, the group of service capabilities providing a varying degree of identity handling should be offered by the mobile communication network 100 and/or selected by the telecommunication devices 21, 22, 23.

[0061] Another example of possible use cases relates to container tracking by means of machine-to-machine communication, i.e. using machine type communication enabled telecommunication devices 21, 22, 23. For this use case, the groups of service capabilities providing

- a varying degree of mobility functionality,
- different levels of security measures, and
- a varying degree of identity handling

should be offered by the mobile communication network 100 and/or selected by the telecommunication devices 21, 22, 23.

[0062] Still another example of possible use cases relates to the usage of smart phones. For this use case, the groups of service capabilities providing

- a varying degree of mobility functionality,
- different quality of service levels,
- different levels of security measures, and
- a varying degree of identity handling

should be offered by the mobile communication network 100 and/or selected by the telecommunication devices 21, 22, 23.

[0063] Examples of the group of service capabilities related to the mobile communication network 100 providing a varying degree of mobility functionality includes one or a plurality out of the following:

- no mobility support (e.g. the user equipment or telecommunication device has to select the next radio cell if the serving radio cell is left autonomously) ,
- best effort mobility support (e.g. the mobile communication network 100 provides candidate radio cells for cell selection, other mobility related functionality is terminal based),
- support of context forwarding (e.g. once the user equipment or telecommunication device has picked up a new radio cell, no new registration is required (unlike for the above mentioned scenarios), but available context is fetched from the previous radio cell),
- 15 -- full mobility support (e.g. controlled by the mobile communication network 100) without target radio cell preparation,
- full mobility support (e.g. controlled by the mobile communication network 100) with target radio cell preparation,
- full mobility support (e.g. controlled by the mobile communication network 100) without target radio cell preparation also in case that the target radio cell is congested (in order to guarantee seamless handover without packet loss).

[0064] Examples of the group of service capabilities related to the mobile communication network 100 providing different quality of service levels includes one or a plurality out of the following:

- 25 -- no defined Quality of Service ("best effort"),
- guaranteed bitrate,
- minimum bitrate,
- priority of data handling low,
- priority of data handling normal,
- 30 -- priority of data handling high,
- maximum packet delay allowed.

[0065] Examples of the group of service capabilities related to the mobile communication network 100 providing different levels of security measures includes one or a plurality out of the following:

- 35 -- no security support at all (e.g. no ciphering and integrity protected by the network

provided),

- low level security support (e.g. 64bits ciphering provided by the network provided),
- high level security support (e.g. 512bits ciphering provided by the network provided),
- high integrity protection security support (e.g. all messages and user data is integrity
5 protected to avoid fake messages and data on a connection).

[0066] Examples of the group of service capabilities related to the mobile communication network 100 providing a varying degree of identity handling includes one or a plurality out of the following:

- no identity support by the mobile communication network 100,
- 10 -- identity supported by the mobile communication network 100 (e.g. the network operator guaranties the identity of a telecommunication device (customer/device)).

[0067] According to the present invention, the service capabilities or groups of service capabilities offered by the mobile communication network 100 are selected by the telecommunication device 21, 22, 23 per connection and/or per application used by the
15 telecommunication device 21, 22, 23. Furthermore according to the present invention, the service capabilities or groups of service capabilities offered by the mobile communication network 100 depend on the situation of the mobile communication network 100, typically on the current load of the mobile communication network 100, e.g. cyphering functionalities offered by the mobile communication network 100 could be offered at
20 different rates depending on the current network load of the mobile communication network 100 (i.e. during off-peak times strong encryption might be offered cheaply).

PATENT CLAIMS

1. Method for providing communication services of a mobile communication network (100) to a plurality of telecommunication devices (21, 22, 23), wherein the mobile communication network (100) comprises an access network (110) and a core network (120), the access network (110) comprising a plurality of radio cells (10, 11) of the mobile communication network (100), wherein the mobile communication network (100) is able to offer a plurality of available service capabilities to the plurality of telecommunication devices (21, 22, 23) or to a subset of the plurality of telecommunication devices (21, 22, 23), the available service capabilities corresponding to groups of service capabilities, the groups of service capabilities including at least
- the mobile communication network (100) providing a varying degree of mobility functionality,
 - the mobile communication network (100) providing different quality of service levels,
 - the mobile communication network (100) providing different levels of security measures,
 - the mobile communication network (100) providing a varying degree of identity handling,
- wherein the method comprises the step of establishing a connection or initiating an exchange of data between the mobile communication network (100) and the plurality telecommunication devices (21, 22, 23), wherein prior to or upon
- the establishment of the connection or
 - the initiation of the exchange of data
- a service capability information (201) is sent from the mobile communication network (100) to at least part of the telecommunication devices (21, 22, 23) of the plurality of telecommunication devices (21, 22, 23), wherein the service capability information (201) indicates at least part of the available service capabilities – within the groups of service capabilities – to the telecommunication devices (21, 22, 23) of the plurality of telecommunication devices (21, 22, 23).
2. Method according to claim 1, wherein the service capability information (201) is transmitted, by an entity or by a network node of the access network (110) of the mobile communication network (100), especially by means of a dedicated signalization or on a broadcast control channel (BCCH) such that the broadcast

control channel is received by the respective telecommunication device (21, 22, 23) of the plurality of telecommunication devices (21, 22, 23).

3. Method according to one of the preceding claims, wherein a service capability selection information (202) is sent to the access network (110) by at least a first telecommunication device (21) of the plurality of telecommunication devices (21, 22, 23), the service capability selection information (202) at least implicitly indicating one or a plurality of service capabilities in at least one group of service capabilities.
4. Method according to one of the preceding claims, wherein either the service capability information (201) includes a charging information, the charging information being related to different service capabilities and especially the charging information indicating different charging levels for different available service capabilities.
5. Method according to one of the preceding claims, wherein the group of service capabilities related to the mobile communication network (100) providing a varying degree of mobility functionality to at least part of the telecommunication devices (21, 22, 23) includes one or a plurality out of the following:
 - no mobility support,
 - best effort mobility support,
 - support of context forwarding,
 - full mobility support without target radio cell preparation,
 - full mobility support with target radio cell preparation,
 - full mobility support without target radio cell preparation also in case that the target radio cell is congested.
6. Method according to one of the preceding claims, wherein the group of service capabilities related to the mobile communication network (100) providing different quality of service levels to at least part of the telecommunication devices (21, 22, 23) includes one or a plurality out of the following:
 - no defined Quality of Service ("best effort"),
 - guaranteed bitrate,
 - minimum bitrate,
 - priority of data handling low,
 - priority of data handling normal,

- priority of data handling high,
- maximum packet delay allowed.

- 5 7. Method according to one of the preceding claims, wherein the group of service capabilities related to the mobile communication network (100) providing different levels of security measures to at least part of the telecommunication devices (21, 22, 23) includes one or a plurality out of the following:
- no security support at all,
 - low level security support,
 - 10 -- high level security support,
 - high integrity protection security support.
- 15 8. Method according to one of the preceding claims, wherein the group of service capabilities related to the mobile communication network (100) providing a varying degree of identity handling to at least part of the telecommunication devices (21, 22, 23) includes one or a plurality out of the following:
- no identity support by the mobile communication network (100),
 - identity supported by the mobile communication network (100).
- 20 9. Method according to one of the preceding claims, wherein subsequent to the service capability information (201), being sent in a first situation of the mobile communication network (100), a further service capability information is sent from the mobile communication network (100) to at least part of the telecommunication devices (21, 22, 23) of the plurality of telecommunication devices (21, 22, 23),
- 25 wherein the further service capability information – compared to the service capability information (201) –
- either indicates different available service capabilities within the groups of service capabilities, especially reflecting the situation – especially the network load – of the mobile communication network (100) at the time of the further
 - 30 service capability information,
 - or indicates a different charging information related to different available service capabilities within the groups of service capabilities, especially reflecting the situation – especially the network load – of the mobile communication network (100) at the time of the further service capability information.
- 35 10. Mobile communication network (100) for providing communication services to a plurality of telecommunication devices (21, 22, 23), wherein the mobile

communication network (100) comprises an access network (110) and a core network (120), the access network (110) comprising a plurality of radio cells (10, 11) of the mobile communication network (100), wherein the mobile communication network (100) is able to offer a plurality of available service capabilities to the plurality of telecommunication devices (21, 22, 23) or to a subset of the plurality of telecommunication devices (21, 22, 23), the available service capabilities corresponding to groups of service capabilities, the groups of service capabilities including at least

-- the mobile communication network (100) providing a varying degree of mobility functionality,

-- the mobile communication network (100) providing different quality of service levels,

-- the mobile communication network (100) providing different levels of security measures,

-- the mobile communication network (100) providing a varying degree of identity handling,

wherein the mobile communication network (100) is configured such that – between the mobile communication network (100) and the plurality of telecommunication devices (21, 22, 23) – a connection is established or an exchange of data is initiated, wherein prior to or upon

-- the establishment of the connection or

-- the initiation of the exchange of data

a service capability information (201) is sent from the mobile communication network (100) to at least part of the telecommunication devices (21, 22, 23) of the plurality of telecommunication devices (21, 22, 23), wherein the service capability information (201) indicates at least part of the available service capabilities – within the groups of service capabilities – to the telecommunication devices (21, 22, 23) of the plurality of telecommunication devices (21, 22, 23).

11. Mobile communication network (100) according to claim 10, wherein a service capability selection information (202) is received by the access network (110) from at least a first telecommunication device (21) of the plurality of telecommunication devices (21, 22, 23), the service capability selection information (202) at least implicitly indicating one or a plurality of service capabilities in at least one group of service capabilities.

12. Telecommunication device adapted to be used in connection with a mobile communication network (100) that provides communication services to a plurality of telecommunication devices (21, 22, 23), wherein the telecommunication device and the plurality of telecommunication devices (21, 22, 23) are configured to communicate with the mobile communication network (100) via an access network (110) of the mobile communication network (100), the access network (110) comprising a plurality of radio cells (10, 11), wherein the mobile communication network (100) is able to offer a plurality of available service capabilities to the telecommunication device and the plurality of telecommunication devices (21, 22, 23) or to a subset of the plurality of telecommunication devices (21, 22, 23), the available service capabilities corresponding to groups of service capabilities, the groups of service capabilities including at least
- the mobile communication network (100) providing a varying degree of mobility functionality,
 - the mobile communication network (100) providing different quality of service levels,
 - the mobile communication network (100) providing different levels of security measures,
 - the mobile communication network (100) providing a varying degree of identity handling,
- wherein the telecommunication device is configured to establish a connection or to initiate an exchange of data with the mobile communication network (100), wherein prior to or upon
- the establishment of the connection or
 - the initiation of the exchange of data
- a service capability information (201) is received, by the telecommunication device, from the mobile communication network (100), wherein the service capability information (201) indicates at least part of the available service capabilities – within the groups of service capabilities – to the telecommunication device, and
- wherein a service capability selection information (202) is sent by the telecommunication device to the access network (110), the service capability selection information (202) at least implicitly indicating one or a plurality of service capabilities in at least one group of service capabilities.
13. System for providing communication services of a mobile communication network (100) to a plurality of telecommunication devices (21, 22, 23), wherein the system

comprises a mobile communication network (100) and a plurality of telecommunication device (21, 22, 23), wherein the mobile communication network (100) comprises an access network (110) and a core network (120), the access network (110) comprising a plurality of radio cells (10, 11) of the mobile communication network (100), wherein the mobile communication network (100) is able to offer a plurality of available service capabilities to the plurality of telecommunication devices (21, 22, 23) or to a subset of the plurality of telecommunication devices (21, 22, 23), the available service capabilities corresponding to groups of service capabilities, the groups of service capabilities including at least

- the mobile communication network (100) providing a varying degree of mobility functionality,
- the mobile communication network (100) providing different quality of service levels,
- the mobile communication network (100) providing different levels of security measures,
- the mobile communication network (100) providing a varying degree of identity handling,

wherein the system is configured such that – between the mobile communication network (100) and the plurality telecommunication devices (21, 22, 23) – a connection is established or an exchange of data is initiated, wherein prior to or upon

- the establishment of the connection or
- the initiation of the exchange of data

a service capability information (201) is sent from the mobile communication network (100) to at least part of the telecommunication devices (21, 22, 23) of the plurality of telecommunication devices (21, 22, 23), wherein the service capability information (201) indicates at least part of the available service capabilities – within the groups of service capabilities – to the telecommunication devices (21, 22, 23) of the plurality of telecommunication devices (21, 22, 23).

14. Program comprising a computer readable program code which, when executed on a computer and/or on a network node or on a plurality of network nodes of a mobile communication network (100) and/or on a telecommunication device (21, 22, 23), or in part on a network node or on a plurality of network nodes of a mobile communication network (100) and in part on a telecommunication device (21, 22, 23), causes the computer and/or network node or the plurality of network nodes

and/or the telecommunication device (21, 22, 23) to perform a method according one of claims 1 to 9.

15. Computer program product for providing communication services of a mobile
5 communication network (100) to a plurality of telecommunication devices (21, 22,
23), the computer program product comprising a computer program stored on a
storage medium, the computer program comprising program code which, when
executed on a computer and/or on a network node or on a plurality of network
10 nodes of a mobile communication network (100) and/or on a telecommunication
device (21, 22, 23), or in part on a network node or on a plurality of network nodes
of a mobile communication network (100) and in part on a telecommunication
device (21, 22, 23), causes the computer and/or network node or the plurality of
network nodes and/or the telecommunication device (21, 22, 23) to perform a
15 method according one of claims 1 to 9.

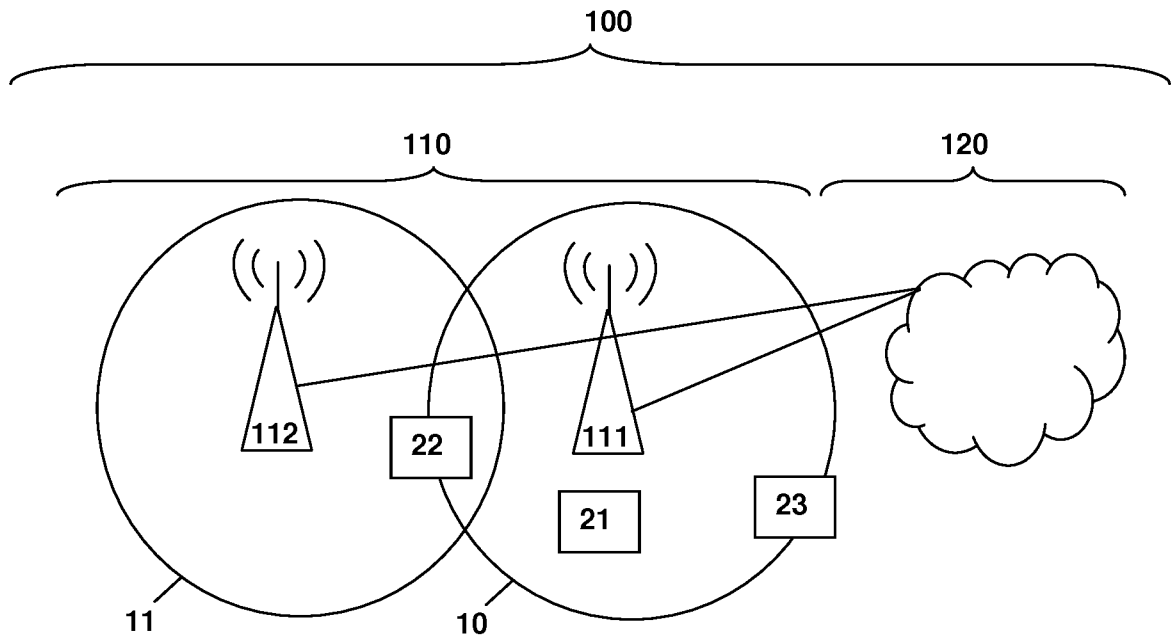


Fig. 1

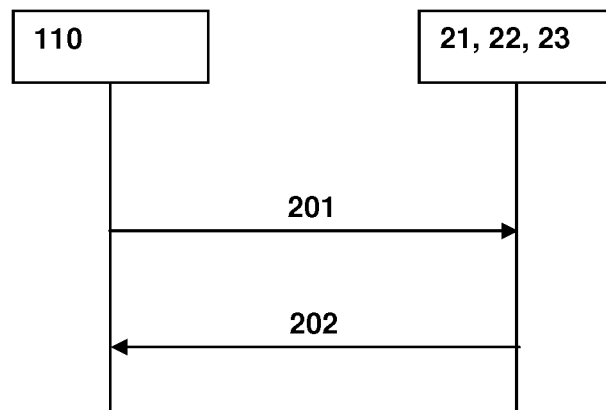


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/065940

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W4/24
ADD.

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

B. FIELDS SEARCHED

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

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

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

EPO-Internal, INSPEC, WPI Data

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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

25 August 2015

Date of mailing of the international search report

31/08/2015

Name and mailing address of the ISA/

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Heinrich, Dietmar

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/065940

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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