Title: CHANGING BANDWIDTH CAPACITY FOR A USER EQUIPMENT

Abstract: The present disclosure deals with a method performed by a network node (40; 57) of a communication network for changing bandwidth capacity for a beneficiary user equipment, UE, (10) having a subscribed bandwidth capacity. The method comprises receiving (102) a request for sharing of bandwidth capacity between at least one sharing UE (20; 30) having a subscribed bandwidth capacity and the beneficiary UE (10) and receiving information (112) of the at least one sharing UE (20; 30), the information including an identity of the at least one sharing UE and a shareable BW capacity that the sharing UE can share to the beneficiary UE. The method further comprises receiving information (114) of the beneficiary UE (10); the information including an identity of the beneficiary UE and a beneficiary UE subscribed bandwidth capacity. The method further comprises evaluating (116) the received information to determine a subscribed bandwidth capacity portion to be transferred to the beneficiary UE (10) from the at least one sharing UE (20; 30); and triggering updating (120) of subscribed bandwidth capacity for the beneficiary UE (10) and the at least one sharing UE (20; 30) according to the determined subscribed bandwidth capacity. The disclosure also deals with a corresponding network node, and with a corresponding method performed by a user equipment, and with a user equipment.
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Changing bandwidth capacity for a user equipment

Technical field

[0001] The present disclosure relates generally to methods, network nodes, user equipments and computer programs of a communication network for changing bandwidth capacity for a user equipment.

Background

[0002] A user equipment, UE, of a communication network has a subscription card, such as a Subscriber identity Module, SIM, card connected to an individual subscription at an operator of the communication network. The subscription gives the subscriber access to different services, e.g. voice, SMS, MMS, and mobile broadband access. The owner of the subscription is called the subscriber and may be the primary user of the UE. Although, there may be several users using the services provided through the UE.

[0003] The speed or transfer rate of a service such as mobile broadband access is measured in bits per second which is a measure of available or consumed data communication resources. It will hereinafter be referred to as bandwidth.

[0004] A subscriber may subscribe to a certain maximum bandwidth, referred to as subscribed bandwidth capacity. This is the maximum bandwidth that according to the subscription may be used for downloading services to the UE.

[0005] Different services require different bandwidth in order to function properly, e.g. to give the user of the UE a satisfactory experience of the service. For example, streaming video requires a higher bandwidth than downloading a file.

[0006] Although, situations may occur when a subscriber would like to use a service requiring more bandwidth than its subscribed bandwidth capacity. Consequently, from a subscriber point of view it would be advantageous if the subscriber temporary could be able to use more bandwidth than its subscribed bandwidth capacity.
Summary

[0007] It is an object of the invention to address at least some of the problems and issues outlined above. It is possible to achieve these objects and others by using a method and an apparatus as defined in the attached independent claims.

[0008] According to one aspect, a method is provided performed by a network node of a communication network for changing bandwidth capacity for a beneficiary UE having a subscribed bandwidth capacity. The method comprises receiving a request for sharing of bandwidth capacity between at least one sharing UE having a subscribed bandwidth capacity and the beneficiary UE, and receiving information of the at least one sharing UE, the information including an identity of the at least one sharing UE and a shareable bandwidth capacity that the sharing UE can share to the beneficiary UE. The method further comprises receiving information of the beneficiary UE; the information including an identity of the beneficiary UE and a beneficiary UE subscribed bandwidth capacity. The method further comprises evaluating the received information to determine a subscribed bandwidth capacity portion to be transferred to the beneficiary UE from the at least one sharing UE, and triggering updating of subscribed bandwidth capacity for the beneficiary UE and the at least one sharing UE according to the determined subscribed bandwidth capacity portion.

[0009] According to a second aspect, a method is provided performed by a UE of a communication network for changing bandwidth capacity for a beneficiary UE, the beneficiary UE having a subscribed bandwidth capacity. The method comprises sending, to the network node, information of the UE, the information including UE identity. The method further comprises receiving from the network node information of an updated subscribed bandwidth capacity for the UE, and using the updated subscriber bandwidth capacity for communication in the communication network.

[00010] According to a third aspect, a network node of a communication network is provided, configured for changing bandwidth capacity for a beneficiary UE having a subscribed bandwidth capacity. The network node comprises a receiving
unit configured to receive a request for sharing of bandwidth capacity between at least one sharing UE having a subscribed bandwidth capacity and the beneficiary UE, and configured to receive information of the at least one sharing UE, the information including identity of the at least one sharing UE and a shareable bandwidth capacity that the sharing UE can share to the beneficiary UE, and configured to receive information of the beneficiary UE, the information including identity of the beneficiary UE and the beneficiary UE subscribed bandwidth capacity. The steps further comprise for the transmitting triggering sharing subscribed computer capacity for the network node further comprises an evaluation unit configured to evaluate the received information to determine subscribed bandwidth capacity to be transferred to the beneficiary UE from the at least one sharing UE, and a triggering unit for triggering updating of subscribed bandwidth capacity for the beneficiary UE and the at least one sharing UE according to the determined subscribed bandwidth capacity to be transferred to the beneficiary UE.

[0001] According to a fourth aspect, a UE of a communication network is provided, configured for changing bandwidth capacity for a beneficiary UE, the beneficiary UE having a subscribed bandwidth capacity. The UE comprises a transmitting unit for sending to the network node information of the UE, the information including UE identity. The UE further comprises a receiving unit for receiving from the network node, information of an updated subscribed bandwidth capacity for the UE, and a control unit for using the updated subscriber bandwidth capacity for communication in the communication network.

[00012] According to a fifth aspect, a computer program is provided comprising computer readable code means, which when run in a network node causes the network node to perform the steps below. The steps comprise receiving a request for sharing of bandwidth capacity between at least one sharing UE having a subscribed bandwidth capacity and a beneficiary UE, and receiving information of the at least one sharing UE, the information including an identity of the at least one sharing UE and a shareable bandwidth capacity that the sharing UE can share to the beneficiary UE. The steps further comprise receiving information of the beneficiary UE, the information including an identity of the beneficiary UE and the beneficiary UE subscribed bandwidth capacity. The steps further comprise
evaluating the received information to determine a subscribed bandwidth capacity portion to be transferred to the beneficiary UE from the at least one sharing UE, and triggering updating of subscribed bandwidth capacity for the beneficiary UE (10) and the at least one sharing UE (20, 30) according to the determined subscribed bandwidth capacity portion.

[00013] According to a sixth aspect, a computer program is provided comprising computer readable code means, which when run in a UE causes the UE to perform the steps below. The steps comprise sending to the network node information of the UE, the information including UE identity. The steps further comprise receiving from the network node information of an updated subscribed bandwidth capacity for the UE, and using the updated subscribed bandwidth capacity for communication in the communication network.

[00014] The above method and apparatus may be configured and implemented according to different optional embodiments. Further possible features and benefits of this solution will become apparent from the detailed description below.

Brief description of drawings

[00015] The solution will now be described in more detail by means of exemplary embodiments and with reference to the accompanying drawings, in which:

[00016] Fig. 1 is a schematic block diagram of an exemplary communication network in which embodiments of the present invention can be used.

[00017] Figs 2-3 are signaling diagrams illustrating examples of methods according to possible embodiments.

[00018] Fig. 4 is a schematic block diagram illustrating a part of the communication network of fig. 1 in more detail, according to possible embodiments.

[00019] Figs. 5-7 are flow charts illustrating methods in network nodes and UEs, respectively, according to possible embodiments.
Fig. 8 is a schematic block diagram illustrating a network node, according to possible embodiments.

Fig. 9 is a schematic block diagram illustrating a UE, according to possible embodiments.

Fig. 10 is a schematic block diagram illustrating an arrangement of a network node in more detail, according to further possible embodiments.

Fig. 11 is a schematic block diagram illustrating an arrangement of a UE in more detail, according to further possible embodiments.

**Detailed description**

Briefly described, a solution is provided to temporary increase subscribed bandwidth, BW, capacity for a UE. This is achieved by sharing subscribed BW capacity between different UEs, such that a sharing UE temporary offers another UE, called a beneficiary UE to use a part of its subscribed BW capacity. The UEs may belong to the same or different end users. For sharing subscribed BW capacity, a solution is provided in a network node that in a first step receives information from the involved UEs regarding how much subscribed BW the sharing UE can share to the beneficiary UE, how much BW the beneficiary UE subscribes to today and how much BW the beneficiary UE requests. The network node then calculates subscribed BW to transfer to the beneficiary UE based on the information received. Further, the network node may control that the BW capability of the beneficiary UE is not exceeded. In other words, the calculation may also take into account the BW capability of the beneficiary UE. Thereafter, updated subscribed BW capacities are calculated for the beneficiary UE and the sharing UE, taking into account the transferred subscribed BW capacity. The updated subscribed BW capabilities for the beneficiary UE and the sharing UE are then set in the network and communicated to the respective UEs. The UEs are then ready to use its respective updated subscribed BW capacity.

The BW provided for different subscriptions are normally set in a network node, such as the operator's Home Subscriber Server, HSS. The updated
subscribed BW capacities for the beneficiary UE and the sharing UE are therefore set in the network by being communicated to a network node, such as the HSS or a Policy and Charging Rules Function, PCRF.

[00026] A sharing UE is a UE that may share a portion of its subscribed BW capacity to a beneficiary UE. By sharing a portion of its subscribed BW is meant to, at least temporary, transfer rights to use a part of a sharing UEs subscribed BW capacity to a beneficiary UE. The beneficiary UE is a UE that may receive a subscribed BW capacity portion from one or more sharing UEs.

[00027] A UE may be e.g. a mobile phone, a computer modem, a router etc.

[00028] Subscribed BW capacity is the amount of BW that the UE is maximally allowed to use according to the subscription between the owner of the UE and the operator.

[00029] UE BW capability is the maximum BW that the UE can handle, e.g. that the hardware and/or software of the UE can handle.

[00030] Figure 1 describes an exemplary communication network arranged to interconnect UEs 10, 20, 30, an application server 40, a HSS 60 and a Policy and Charging Control, PCC, system 50 comprising a PCRF 55. The UEs may for example be mobile terminals, as UEs 10 and 20, or a computer such as a PC or workstation, as UE 30. In the following, the UE 10 is a beneficiary UE that is arranged to receive a subscribed BW capacity portion from a sharing UE, which may be any or both of UEs 20 and 30. Even if the beneficiary UE 10 is illustrated as a mobile terminal it may be any kind of UE. Even if the sharing UEs 20, 30 are a mobile terminal and a PC, they may be any kind of UE. Also, the sharing UEs may only be one UE, or more than two UEs.

[00031] Figure 2 describes a communication scenario according to an exemplary embodiment. In the communication scenario, the sharing UE 20, which may be only one UE to simplify the example, sends a sharing request 1.1 to the application server 40, offering to share a portion or all of its subscribed BW capacity to the beneficiary UE 10. The sharing request may comprise an identity,
ID, of the sharing UE 20 and an ID of the beneficiary UE 10. The sharing request may also comprise the portion of its subscribed BW that the sharing UE 20 can offer to share to the beneficiary UE 10, and a time duration during which the sharing UE can share the offered portion. The sharing request may also comprise a requested BW from the beneficiary UE. The application server 40 may then optionally request location information 1.2 of the beneficiary UE 10 and the sharing UE 20, and receive location information 1.3 from the beneficiary UE 10 and the sharing UE 20. Based on the received location information, the application server 40 checks 1.4 if the beneficiary UE and/or the sharing UE are in a geographical area where they are allowed to use the sharing-of-BW service.

[00032] When the beneficiary UE 10 and/or the sharing UE 20 are in an allowed geographical area, the scenario proceeds by requesting confirmation 1.5 from the beneficiary UE 10 and the sharing UE 20 that they approve to share and receive, respectively, subscribed BW. According to an alternative, when the sharing request came from the sharing UE, only the beneficiary UE may be requested for confirmation, although, to e.g. detect fraud, both beneficiary UE and sharing UE may be requested for confirmation. Alternatively, only the sharing UE may be requested for confirmation. After a confirmation is received 1.6 from the beneficiary UE 10 and/or the sharing UE 20, the application server 40 sends a request 1.7 for beneficiary UE subscribed BW capacity and possibly also for beneficiary UE BW capability. The beneficiary UE subscribed BW capacity and the beneficiary UE BW capability may be requested from the operator, such as from the HSS/PCRF, as shown in figure 2. Alternatively, they may be requested from the beneficiary UE.

[00033] After receiving 1.8 beneficiary UE subscribed BW capacity and possibly also the beneficiary UE BW capability, the application server 40 determines 1.9 a subscribed BW capacity portion that is to be transferred from the sharing UE to the beneficiary UE. The application server 40 determines the subscribed BW capacity portion to be transferred based on beneficiary UE requested BW beneficiary UE subscribed BW capacity and offered sharing UE BW capacity. The application server may also take into account the beneficiary UE BW capability. If the
beneficiary UE subscribed BW capacity is the same as the beneficiary UE BW capability, i.e. if the beneficiary UE already has a subscription with maximum possible BW, no subscribed BW is transferred from the sharing UE. If the beneficiary UE BW capability is higher than the beneficiary UE subscribed BW capacity but lower than the beneficiary UE subscribed BW capacity added with the offered subscribed BW capacity, a subscribed BW portion is transferred from the sharing UE that makes the beneficiary UE subscribed BW capacity equal to its BW capability. If the beneficiary UE BW capability is higher than the beneficiary UE subscribed BW capacity added with the offered subscribed BW capacity, the offered subscribed BW capacity is transferred from the sharing UE to the beneficiary UE. Alternatively, the beneficiary UE BW capability is not received and therefore not taken into account. In such a case, the subscribed BW capacity portion to be transferred is only determined based on the beneficiary UE subscribed BW, a beneficiary UE requested BW and/or the offered sharing UE BW capacity. Further, the application server determines updated subscribed BW capacity settings for the beneficiary UE and the sharing UE by adding the determined BW capacity to be transferred to the beneficiary UE's BW capacity before transfer and by subtracting the determined BW capacity to be transferred from the sharing UE's BW capacity before transfer.

[00034] Thereafter, the HSS 60 or the PCRF 55 may be updated 1.10 with the new settings for the beneficiary UE 10 and the sharing UE 20. The HSS/PCRF may also be informed of the time during which sharing of BW is to take place. The HSS/PCRF responds 1.11 that it has updated its registers. The application server 40 sends a notification 1.12 to the sharing UE 20 and the beneficiary UE 10 of the updated BW settings.

[00035] Below is a first numerical example of sharing of bandwidth: Sharing UE 20 has a subscribed BW capacity of 8 Mbit/s, of which 7 Mbit/s is a shareable BW capacity that the sharing UE offers to share to the beneficiary UE. The beneficiary UE 10 has a subscribed BW capacity of 5 Mbit/s. A user of the beneficiary UE would like to see a streamed video for example. Then he would like 12 Mbit/s to get the best possible quality. Although the BW capability of the beneficiary UE is
10 Mbit/s. Consequently, the beneficiary UE cannot handle more than 10 Mbit/s. The BW capacity to transfer is then calculated to 10-5 = 5 Mbit/s. Consequently, the updated subscribed BW capacity of the beneficiary UE is then 5+5 = 10 Mbit/s, equal to the BW capability of the beneficiary UE. The updated BW capacity of the sharing UE is then 8-5 = 3 Mbit/s.

[00036] In another example, the beneficiary UE has a BW capability of 15 Mbit/s. In that case, the sharing UE can share its whole shareable BW of 7 Mbit/s to the beneficiary UE. Consequently, the updated subscribed BW capacity of the beneficiary UE will be 12 Mbit/s and the updated subscribed BW capacity of the sharing UE will be 1 Mbit/s. If, on the other hand, the beneficiary UE had a BW capability of only 5 Mbit/s, no BW capacity could have been transferred from the sharing UE.

[00037] In another example, there are two sharing UEs involved. If, in the streaming video example above a first sharing UE has a BW capacity of 8 Mbit/s, and a possibility to share 3 Mbit/s, and a second sharing UE has a BW capacity of 8 Mbit/s, and a possibility to share 4 Mbit/s, the beneficiary UE, in the case that it has enough BW capability, receives 3 Mbit/s from the first sharing UE and 4 Mbit/s from the second sharing UE.

[00038] In an embodiment, a UE may have a subscription with a first subscribed BW capacity for a first service and a second subscribed BW capacity for a second service. For example, the UE may have 10 Mbit/s subscribed BW capacity for Media streaming and 3 Mbit/s subscribed BW capacity for web surfing. In this case, BW capacity could be transferred and used for both services or only for one service. E.g. the capacity for Media streaming is increased to 15 Mbit/s and the capacity for web surfing is increased to 8 Mbit/s after BW capacity transfer, or the capacity for media streaming is kept at 10 Mbit/s while the capacity for web surfing is increased to 8 Mbit/s.

[00039] According to an alternative embodiment, other conditions may be taken into consideration, such as time of day, roaming, weekday or weekend, etc. For example, a family may have four UEs with 1Mbit/s subscribed BW each. There is
also a mobile broadband modem with 8 Mbit/s. Between 8.00 - 16.00 weekdays, when there is no one at home, the family has decided that the subscribed BW of the mobile broadband is to be distributed to the four UEs such that all UEs are upgraded to 3 Mbit/s. Then after 16.00 the mobile broadband capacity is transferred back to 8 Mbit/s.

[00040] According to another embodiment, subscribers may rent their BW to other users. For this reason a market place may be set up. The operator providing the service may act as a broker.

[00041] Figure 3 describes a communication scenario according to an exemplary embodiment. In this communication scenario, the beneficiary UE 20 sends a sharing request 2.1 to the application server 40, wherein the beneficiary UE 10 requests subscribed BW capacity from the sharing UE 20. The sharing request may comprise an ID of the sharing UE 20 and an ID of the beneficiary UE 10. The sharing request may also comprise the requested subscribed BW, and a time duration during which the beneficiary UE would like to get access to more subscribed BW. The application server 40 may then optionally request location information 2.2 of the beneficiary UE 10 and the sharing UE 20, and receive location information 2.3 from the beneficiary UE 10 and the sharing UE 20. Based on the received location information, the application server 40 checks if the beneficiary UE and/or the sharing UE are in a geographical area where they are allowed to use the sharing of BW service.

[00042] When the beneficiary UE 10 and/or the sharing UE 20 are in an allowed geographical area, the scenario proceeds by requesting confirmation 2.5 from the beneficiary UE 10 and the sharing UE 20 that they approve to share and receive, respectively, subscribed BW. According to an alternative, when the sharing request came from the beneficiary UE, only the sharing UE may be requested for confirmation, although, to e.g. detect fraud, both first and sharing UE may be requested for confirmation. The sharing UE 20 may confirm 2.6 the confirmation request by sending information of its shareable BW capacity to the application server 40. Thereafter, the application server 40 possibly sends a request 2.7 for beneficiary UE subscribed BW capacity and possibly also for beneficiary UE BW
capability, and receives 2.8 the subscribed BW capacity and BW capability, if not already received in the sharing request 2.1. The beneficiary UE subscribed BW capacity and the beneficiary UE BW capability may be requested from the operator, such as from the HSS/PCRF, as shown in figure 2. Alternatively, they may be requested from the beneficiary UE.

[00043] The application server 40 then determines 2.9 a subscribed BW capacity portion that is to be transferred from the sharing UE to the beneficiary UE. The application server determines the subscribed BW capacity portion to be transferred based on beneficiary UE subscribed BW capacity, beneficiary UE requested BW and offered sharing UE BW capacity. The application server may also take into account the beneficiary UE BW capability. If the beneficiary UE subscribed BW capacity is the same as the beneficiary UE BW capability, i.e. if the beneficiary UE already has a subscription with maximum possible BW, no subscribed BW is transferred from the sharing UE. If the beneficiary UE BW capability is higher than the beneficiary UE subscribed BW capacity but lower than the beneficiary UE subscribed BW capacity added with the offered subscribed BW capacity, a subscribed BW portion is transferred from the sharing UE that makes the beneficiary UE subscribed BW capacity equal to its BW capability. If the beneficiary UE BW capability is higher than the beneficiary UE subscribed BW capacity added with the offered subscribed BW capacity, the offered subscribed BW capacity is transferred from the sharing UE to the beneficiary UE. Alternatively, the beneficiary UE BW capability is not received and therefore not taken into account. In such a case, the subscribed BW capacity portion to be transferred is only determined based on the beneficiary UE subscribed BW, a beneficiary UE requested BW and/or the offered sharing UE BW capacity. Further, the application server determines updated subscribed BW capacity settings for the beneficiary UE and the sharing UE by adding the determined BW capacity to be transferred to the beneficiary UE’s BW capacity before transfer and by subtracting the determined BW capacity to be transferred from the sharing UE’s BW capacity before transfer.
Thereafter, the HSS 6 or the PCRF 55 may be updated 2.10 with the new settings for the beneficiary UE 10 and the sharing UE 20. The HSS/PCRF may also be informed of the time during which sharing of BW is to take place. The HSS/PCRF responds 2.11 that it has updated its registers. The application server 40 sends a notification 2.12 to the sharing UE 20 and the beneficiary UE 10 of the updated BW settings.

Figure 4 shows a PCC system in more detail, according to e.g. 3GPP TS 23.203 V11.6.0 (2012-06). The PCC system 50 comprises the PCRF 55, an Online Charging System (OCS) 57 and a Policy and Charging Enforcement Function (PCEF) 58. The PCRF 55 is connected to the application server 40 via for example an Rx interface or a HTTP interface. The PCRF 55 is also connected to the OCS 57 via a Sy interface. The PCRF 55 is further connected to the PCEF 58 via a Gx interface. The PCEF 58 is connected to the OCS 57 via a Gy interface. The PCRF 55 may temporary change BW capacity for a user. In the PCC system, the PCRF 55 controls the PCEF 58, which could be seen as a tap for providing BW capacity. The PCRF 55 may control the PCEF according to instructions received from the application server. In an alternative embodiment, the method of the invention may be implemented in the OCS 57. I.e. the steps performed by the application server 40 in figures 2 and 3 may as well be performed by the OCS. When updating of subscribed BW capacity for a sharing end user and a first end user is performed to the PCRF 55, the beneficiary UE may have the beneficiary UE subscribed BW capacity and possibly also the beneficiary UE BW capability set in the PCRF 55. The updated subscribed BW capacity after a transfer has been performed from the sharing UE 20 is set in the PCRF, where after when in use, the PCRF controls the used BW. Between the application server 40 and the UEs 10, 20, 30 there may be any kind of application interface, such as a HTTP, USSD or SMS interface.

Figure 5 describes a flow chart of a method according to an embodiment performed by a network node of a communication network for changing BW capacity for a beneficiary UE 10 having a subscribed BW capacity. The method comprises receiving 102 a request for sharing of BW capacity between at least
one sharing UE 20, 30 having a subscribed BW capacity and the beneficiary UE 10. The method further comprises receiving information 112 of the at least one sharing UE 20, 30, the information including an ID of the at least one sharing UE and a shareable BW capacity that the sharing UE can share to the beneficiary UE. The method further comprises receiving information 114 of the beneficiary UE 10; the information including an ID of the beneficiary UE and a beneficiary UE subscribed BW capacity. The method further comprises evaluating 116 the received information to determine a subscribed BW capacity portion to be transferred to the beneficiary UE 10 from the at least one sharing UE 20, 30. The method further comprises triggering updating 120 of subscribed BW capacity for the beneficiary UE 10 and the at least one sharing UE 20, 30 according to the determined subscribed BW capacity portion.

[00047] According to an embodiment, the information of the beneficiary UE that is received 114 may also comprise a requested BW capacity.

[00048] According to an embodiment, the information of the beneficiary UE that is received 114 may also comprise a beneficiary UE BW capability.

[00049] According to an embodiment, the request for sharing of BW capacity may be received 102 from the beneficiary UE 10 or from any of the at least one sharing UEs 20, 30. Alternatively, the request may be received from a third UE, different from the beneficiary UE and the at least one sharing UE, such as e.g. a stationary computer. The user may use a stationary computer interface for sending the sharing request. Thereafter, the network node may communicate with the beneficiary UE and the sharing UEs as defined above.

[00050] According to an embodiment, the method further comprises receiving 104 information of the location of the beneficiary UE 10 and the at least one sharing UE 20, 30. The method may further comprise comparing 106 the location of the beneficiary UE and the at least one sharing UE towards a location restriction requirement for usage of the method. If the comparing 106 of the location towards the location restriction requirement shows that the beneficiary UE and the at least one sharing UE are in an allowed location 108, the rest of the method is
performed. If the comparing 106 of the location towards the location restriction requirement shows that any of the beneficiary UE or the at least one sharing UE are in a location 108 outside an allowed area, the method is ended 109. Alternatively, only the location of the beneficiary UE or only the location of the at least one sharing UEs are compared with a location restriction requirement. An allowed location may be e.g. the respective UE being connected to the home communication network of the beneficiary UE, i.e. the operator's network.

[00051] According to another embodiment, the method further comprises setting 110 a time period for which the updated subscribed BW capacity for the beneficiary UE 10 and the at least one sharing UE 20, 30 are valid. In other words, the time period defines for how long time the at least one sharing UE is to share BW to the first UE.

[00052] According to another embodiment, the method further comprises determining 118 the updated subscribed BW capacity for the beneficiary UE 10 and the at least one sharing UE 20, 30. The updated BW capacity for the beneficiary UE and the at least one sharing UE may be performed as follows: the updated subscriber BW capacity for the beneficiary UE = the beneficiary UE subscribed BW capacity + the subscribed BW capacity portion to be transferred to the beneficiary UE; and the updated subscriber BW capacity for the at least one sharing UE = the at least one sharing UE subscribed BW capacity - the subscribed BW capacity portion to be transferred to the beneficiary UE.

[00053] According to another embodiment, the method further comprises informing 122 the beneficiary UE 10 and the at least one sharing UE 20, 30 of the updated subscribed BW capacity for the beneficiary UE and the at least one sharing UE.

[00054] According to another embodiment, the triggering of updating 120 is performed by sending an update message comprising the updated subscribed BW capacity for the beneficiary UE 10 and the at least one sharing UE 20, 30 to a Home Subscriber Server, HSS 60.
[00055] According to another embodiment, the triggering of updating 120 is performed by sending an update message comprising the updated subscribed BW capacity for the beneficiary UE 10 and the at least one sharing UE 20, 30 to a Policy and Charging Rules Function, PCRF 55. By updating the PCRF it is facilitated for the operator to charge the beneficiary UE and/or the sharing UE for the service, and possibly also for the time the service is used. Also, a flexible set-up at configuration of the service may be achieved.

[00056] According to an embodiment, the triggering of updating 120 of subscribed BW capacity may be performed by calculating the updated BW capacities for the beneficiary UE and the at least one sharing UE in the network node and sending an update message to the HSS or the PCRF comprising the updated BW capacities for the beneficiary UE and the at least one sharing UE. According to another embodiment, the triggering of updating 120 of subscribed BW capacity may be performed by sending information of the subscribed BW to be transmitted to the beneficiary UE, i.e. a delta value of BW capacity, and the calculation of updated BW capacities is performed by the PCRF. The PCRF may then take any other possible rules for BW into consideration.

[00057] According to another embodiment, evaluating 116 the received information to determine the subscribed BW capacity portion to be transferred to the beneficiary UE comprises comparing the requested BW capacity with the shareable BW capacity, the beneficiary UE subscribed BW capacity and possibly also the beneficiary UE BW capability to determine the subscribed BW capacity portion to be transferred to the beneficiary UE.

[00058] According to another embodiment, the network node is a node in a PCC system 50, such as an OCS node 57. According to another embodiment, the network node is an application server 40 at an operator.

[00059] Figure 6 is a flow chart describing a method according to an embodiment performed by a beneficiary UE 10 of a communication network for increasing BW capacity for the beneficiary UE, the beneficiary UE having a subscribed BW capacity. The method comprises, in the beneficiary UE, sending 144 to the
network node 40; 57 information of the beneficiary UE 10, the information
including the UE identity, and possibly also a requested BW capacity. The
information of the beneficiary UE may also include the beneficiary UE subscribed
BW capacity and a beneficiary UE BW capability. The step of sending 144 may be
performed in response to a request from the network node. The method further
comprises receiving 146 from the network node 40; 57 information of an updated
subscribed BW capacity for the beneficiary UE. The method further comprises
using 148 the updated subscriber BW capacity for communication in the
communication network. The method may also comprise sending 142 to a network
node 40; 57 a request for sharing of BW capacity between at least one sharing UE
20, 30 having a subscribed BW capacity and the beneficiary UE 10. Information
regarding ID of the beneficiary UE and ID of the at least one sharing UE may be
sent in the request. Further, information such as the requested BW capacity, the
beneficiary UE subscribed BW capacity and the beneficiary UE BW capability may
be sent in such a request. The request may alternatively be sent by a sharing UE
instead of the beneficiary UE.

[00060] Figure 7 is a flow chart describing a method performed by a sharing UE
20 of a communication network for increasing BW capacity for a beneficiary UE 10
having a subscribed BW capacity. The method comprises sending 164 to the
network node 40; 57 information of the sharing UE 20, the information including
the UE identity. The information may also include a shareable BW capacity that
the sharing UE 20 can share to the beneficiary UE 10. The step of sending 164
may be performed in response to a request from the network node. The method
further comprises receiving 166 from the network node 40; 57 information of an
updated subscribed BW capacity for the sharing UE. The method further
comprises using 168 the updated subscriber BW capacity for communication in
the communication network. The method may also comprise sending 162 to a
network node 40; 57 a request for sharing of BW capacity between the sharing UE
20, 30 having a subscribed BW capacity and the beneficiary UE. Information
regarding ID of the beneficiary UE and ID of the at least one sharing UE may be
sent in the request. Further, information such as the shareable BW capacity may
be sent in such a request. The request may alternatively be sent by the beneficiary UE instead of a sharing UE.

[00061] Figure 8 describes an exemplary network node 40 or 57 of a communication network configured for changing BW capacity for a beneficiary UE 10 having a subscribed BW capacity. The network node 40; 57 comprises a receiving unit 202 configured to receive a request for sharing of BW capacity between at least one sharing UE 20, 30 having a subscribed BW capacity and the beneficiary UE 10. The receiving unit 202 is further configured to receive information of the at least one sharing UE 20, 30, the information including ID of the at least one sharing UE and a shareable BW capacity that the sharing UE can share to the beneficiary UE. The receiving unit 202 is further configured to receive information of the beneficiary UE 10, the information including ID of the beneficiary UE and the beneficiary UE subscribed BW capacity. The network node 40; 57 further comprises an evaluation unit 204 configured to evaluate the received information to determine subscribed BW capacity to be transferred to the beneficiary UE 10 from the at least one sharing UE 20, 30. The network node 40; 57 further comprises a triggering unit 206 for triggering updating of subscribed BW capacity for the beneficiary UE 10 and the at least one sharing UE 20, 30 according to the determined subscribed BW capacity to be transferred to the beneficiary UE. The network node 40; 57 may further comprise a radio communication unit 210, which may be considered to comprise conventional means for wireless communication from and/or to UEs, such as one or more transceivers. The network node 40; 57 may further comprise other functional units (not shown) for providing e.g. regular network node functions. The network node 40; 57 may further comprise one or more storage units 212.

[00062] The receiving unit 202, the evaluation unit 204 and the triggering unit 206 may be arranged in an arrangement 301. The arrangement 301 could be implemented e.g. by one or more of: a processor or a micro processor and adequate software and storage therefore, a Programmable Logic Device (PLD) or other electronic component(s)/processing circuit(s) configured to perform the actions, or methods, mentioned above. According to an embodiment, the
information of the beneficiary UE 10 that the receiving unit 202 is configured to receive may further include requested BW capacity.

[00063] According to an embodiment, the information of the beneficiary UE 10 that the receiving unit 202 is configured to receive may further include a beneficiary UE BW capability.

[00064] According to an embodiment, the network node may comprise a transmitting unit 208 for sending information informing the beneficiary UE 10 and the at least one sharing UE 20, 30 of the updated subscribed BW capacity.

[00065] According to an embodiment, the triggering unit 206 may be arranged to trigger updating of subscribed BW capacity by sending an update message comprising the updated subscribed BW capacity for the beneficiary UE 10 and the at least one sharing UE 20, 30 to a Home Subscriber Server, HSS 60.

[00066] According to another embodiment, the triggering unit 206 may be arranged to trigger updating of subscribed BW capacity by sending an update message comprising the updated subscribed BW capacity for the beneficiary UE 10 and the at least one sharing UE 20, 30 to a Policy and Charging Rules Function, PCRF 55.

[00067] According to another embodiment, the evaluation unit 204 may be configured to evaluate the received information to determine the subscribed BW capacity portion to be transferred to the beneficiary UE by comparing the requested BW capacity with the shareable BW capacity, the beneficiary UE subscribed BW capacity and possibly also the beneficiary UE BW capability to determine the subscribed BW capacity portion to be transferred to the beneficiary UE.

[00068] According to another embodiment, the evaluation unit 204 is further arranged to determine the updated subscribed BW capacity for the beneficiary UE 10 and the at least one sharing UE 20, 30 as follows: the updated subscriber BW capacity for the beneficiary UE = the beneficiary UE subscribed BW capacity + the subscribed BW capacity portion to be transferred to the beneficiary UE, and
the updated subscriber BW capacity for the at least one sharing UE = the at least one sharing UE subscribed BW capacity - the subscribed BW capacity portion to be transferred to the beneficiary UE.

[00069] The network node may be an Online Charging System (OCS) node 57. The network node may be an application server 40 at an operator.

[00070] Figure 9 describes an exemplary UE 10, 20, 30 of a communication network configured for changing bandwidth, BW, capacity for a beneficiary UE, the beneficiary UE having a subscribed BW capacity. The UE comprises a transmitting unit 308 for sending to the network node 40; 57 information of the UE 10, the information including UE identity. The UE further comprises a receiving unit 302 for receiving from the network node 40; 57 information of an updated subscribed BW capacity for the UE; and a control unit 304 for using the updated subscriber BW capacity for communication in the communication network.

[00071] According to an embodiment, the UE may also comprise a triggering unit 306 for triggering sending to a network node 40; 57 a request for sharing of BW capacity between at least one sharing UE 20, 30 having a subscribed BW capacity and the beneficiary UE 10.

[00072] The UE 10, 20, 30 may be the beneficiary UE 10, i.e. a UE that is arranged for (temporary) receiving BW capacity from another UE called a sharing UE. When the UE is the beneficiary UE, the information of the UE may include a requested BW capacity of the beneficiary UE. Further, when the UE is a beneficiary UE 10, the beneficiary UE 10 may comprise a triggering unit 306 for triggering sending to a network node 40; 57 a request for sharing of BW capacity between at least one sharing UE 20, 30 having a subscribed BW capacity and the beneficiary UE 10. The beneficiary UE 10 may further comprise a transmitting unit 308 for sending to the network node 40; 57 information of the beneficiary UE 10, the information including a UE identity and possibly also a requested BW capacity, and/or the beneficiary UE subscribed BW capacity and/or a beneficiary UE BW capability. The beneficiary UE 10 may further comprise a receiving unit 302 for receiving from the network node 40; 57 information of an updated subscribed BW
capacity for the beneficiary UE. The beneficiary UE 10 may further comprise a control unit 304 for using the updated subscriber BW capacity for communication in the communication network.

[00073] The UE 10, 20, 30 may be a sharing UE 20, 30, i.e. a UE that is arranged for sharing at least a part of its subscribed BW capacity to another UE called a beneficiary UE. When the UE is a sharing UE 10, the sharing UE 20, 30 may comprise a transmitting unit 308 for sending to the network node 40; 57 information of the sharing UE 20, the information including a sharing UE identity. The information may further include a shareable BW capacity that the sharing UE 20 can share to the beneficiary UE 10. The sharing UE 20, 30 may further comprises a receiving unit 302 for receiving from the network node 40; 57 information of an updated subscribed BW capacity for the sharing UE. The sharing UE 20, 30 may further comprise a control unit 304 for using the updated subscriber BW capacity for communication in the communication network.

[00074] According to an embodiment, the sharing UE may comprise a triggering unit 306 for triggering sending to a network node 40; 57 of a request for sharing of BW capacity between the sharing UE 20, 30 having a subscribed BW capacity and the beneficiary UE 10.

[00075] The UE 10, 20, 30 may further comprise a radio communication unit 310, which may be considered to comprise conventional means for wireless communication from and/or to network nodes, such as one or more transceivers. The UE 10, 20, 30 may further comprise other functional units (not shown) for providing e.g. regular UE functions. The UE 10, 20, 30 may further comprise one or more storage units 312.

[00076] The receiving unit 302, the control unit 304, the triggering unit 306 and the transmitting unit 308 may be arranged in an arrangement 301. The arrangement 301 could be implemented e.g. by one or more of: a processor or a micro processor and adequate software and storage therefore, a Programmable Logic Device (PLD) or other electronic component(s)/processing circuit(s) configured to perform the actions, or methods, mentioned above.
Figure 10 schematically shows an embodiment of an arrangement 800 for use in a network node 40; 57, which also can be an alternative way of disclosing an embodiment of the arrangement 201 in a network node 40; 57 illustrated in figure 8. Comprised in the arrangement 800 is a processing unit 806, e.g. with a Digital Signal Processor (DSP). The processing unit 806 may be a single unit or a plurality of units to perform different actions of procedures described herein. The arrangement 800 may also comprise an input unit 802 for receiving signals from other entities, and an output unit 804 for providing signal(s) to other entities. The input unit 802 and the output unit 804 may be arranged as an integrated entity.

Furthermore, the arrangement 800 comprises at least one computer program product 808 in the form of a non-volatile or volatile memory, e.g. an Electrically Erasable Programmable Read-only Memory (EEPROM), a flash memory, a disk drive or a Random-access memory (RAM). The computer program product 808 comprises a computer program 810, which comprises code means, which when executed in the processing unit 806 in the arrangement 800 causes the arrangement and/or the RBS to perform the actions of any of the procedures described earlier in conjunction with figure 5.

The computer program 810 may be configured as a computer program code structured in computer program modules. Hence, in an exemplifying embodiment, the code means in the computer program 810 of the arrangement 800 comprises a first receiving module 810a for receiving a request for sharing of BW capacity between at least one sharing UE 20, 30 having a subscribed BW capacity and the beneficiary UE 10. The computer program further comprises a second receiving module 810b for receiving information of the at least one sharing UE 20, 30, the information including an ID of the at least one sharing UE and a shareable BW capacity that the sharing UE can share to the beneficiary UE. The computer program further comprises a third receiving module 810c for receiving information of the beneficiary UE 10, the information including an ID of the beneficiary UE and a beneficiary UE subscribed BW capacity. The computer program further comprises an evaluation module 810d for evaluating the received
information to determine a subscribed BW capacity portion to be transferred to the
beneficiary UE 10 from the at least one sharing UE 20, 30. The computer program
further comprises a triggering module 810e for triggering updating of subscribed
BW capacity for the beneficiary UE 10 and the at least one sharing UE 20, 30
according to the determined subscribed BW capacity portion.

[00080] Figure 11 schematically shows an embodiment of an arrangement 900
for use in a UE, which also can be an alternative way of disclosing an embodiment
of the arrangement 301 in a UE 10, 20, 30 illustrated in figure 9. Comprised in the
arrangement 900 is a processing unit 906, e.g. with a Digital Signal Processor
(DSP). The processing unit 906 may be a single unit or a plurality of units to
perform different actions of procedures described herein. The arrangement 900
may also comprise an input unit 902 for receiving signals from other entities, and
an output unit 904 for providing signal(s) to other entities. The input unit 902 and
the output unit 904 may be arranged as an integrated entity.

[00081] Furthermore, the arrangement 900 comprises at least one computer
program product 908 in the form of a non-volatile or volatile memory, e.g. an
Electrically Erasable Programmable Read-only Memory (EEPROM), a flash
memory, a disk drive or a Random-access memory (RAM). The computer program
product 908 comprises a computer program 910, which comprises code means,
which when executed in the processing unit 906 in the arrangement 900 causes
the arrangement and/or the RBS to perform the actions of any of the procedures
described earlier in conjunction with figures 6 or 7.

[00082] The computer program 910 may be configured as a computer program
code structured in computer program modules. Hence, in an embodiment, the
code means in the computer program 910 of the arrangement 900 comprises a
transmitting module 910b for sending to the network node information of the UE,
the information including a UE identity. The computer program further comprises a
receiving module 910c for receiving from the network node information of an
updated subscribed BW capacity for the UE. The computer program further
comprises a control module 910d for using the updated subscribed BW capacity
for communication in the communication network. The computer program may
further comprise a triggering module 910a for triggering sending to a network node, of a request for sharing of BW capacity between at least one sharing UE having a subscribed BW capacity and a beneficiary UE 10.

[00083] The processing units 806, 906 may each, or one of them, be single Central processing unit, CPU, but they could also comprise two or more processing units. For example, the processing units may include general purpose microprocessors; instruction set processors and/or related chips sets and/or special purpose microprocessors such as Application Specific Integrated Circuits (ASIC). The processor may also comprise board memory for caching purposes. The computer programs may be carried by a computer program product connected to the processor. The computer program products may comprise a computer readable medium on which the computer program is stored. For example, the computer program product may be a flash memory, a RAM, a Read-only Memory (ROM) or an EEPROM, and the computer program modules described above could in alternative embodiments be distributed on different computer program products in the form of memories within the network node.

[00084] Although the code means in the embodiments disclosed above in conjunction with figures 10 and 11 are implemented as computer program modules which when executed in the processing unit causes the arrangement and/or the RBS to perform the actions described above in the conjunction with figures mentioned above, at least one of the code means may in alternative embodiments be implemented at least partly as hardware circuits.

[00085] By the methods, the network nodes, the UEs and the computer programs described above, the following advantages may be achieved. All family members individual UEs may be connected to share broadband capacity. Thereby, the overall BW of the family will be increased. Also, the need for a separate mobile broadband connection or a fixed mobile broadband connection to the house will be lower since a similar BW capacity can be achieved by concatenating the BW capacity from the individual UEs.
[00086] A group of users, for example a family, can transfer the BW of their individual mobile broadband subscriptions to one UE so that when they all are at home one UE has all broadband capacity. Thereby, it may be possible to, for example watch HD IP-TV via the one UE that has all broadband capacity.

[00087] The need for a higher BW capacity can be limited to a shorter time period. Such an alternative may be cheaper for the user than signing up for a subscription with higher BW capacity.

[00088] When not using a subscribed BW capacity for a period of time, for example when travelling abroad, it may be possible to give the subscribed BW capacity to another user, such as a family member or a friend.

[00089] For an operator, new revenue streams and competitive advantage can be gained.

[00090] Although the description above contains a plurality of specificities, these should not be construed as limiting the scope of the concept described herein but as merely providing illustrations of some exemplifying embodiments of the described concept. It will be appreciated that the scope of the presently described concept fully encompasses other embodiments which may become obvious to those skilled in the art, and that the scope of the presently described concept is accordingly not to be limited. Reference to an element in the singular is not intended to mean "one and only one" unless explicitly so stated, but rather "one or more." All structural and functional equivalents to the elements of the above-described embodiments that are known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed hereby. Moreover, it is not necessary for a network node, UE or method to address each and every problem sought to be solved by the presently described concept, for it to be encompassed hereby.
CLAIMS

1. A method performed by a network node (40; 57) of a communication network for changing bandwidth capacity for a beneficiary user equipment, UE, (10) having a subscribed bandwidth capacity, the method comprising:
   receiving (102) a request for sharing of bandwidth capacity between at least one sharing UE (20, 30) having a subscribed bandwidth capacity and the beneficiary UE (10);
   receiving information (112) of the at least one sharing UE (20, 30), the information including an identity of the at least one sharing UE and a shareable BW capacity that the sharing UE can share to the beneficiary UE;
   receiving information (114) of the beneficiary UE (10), the information including an identity of the beneficiary UE and a beneficiary UE subscribed bandwidth capacity;
   evaluating (116) the received information to determine a subscribed bandwidth capacity portion to be transferred to the beneficiary UE (10) from the at least one sharing UE (20, 30); and
   triggering updating (120) of subscribed bandwidth capacity for the beneficiary UE (10) and the at least one sharing UE (20, 30) according to the determined subscribed bandwidth capacity portion.

2. Method according to claim 1, wherein the information in the receiving (114) of information of the beneficiary UE also includes a requested bandwidth capacity.

3. Method according to claim 1 or 2, wherein the information in the receiving (114) of information of the beneficiary UE also includes a beneficiary UE bandwidth capability.

4. Method according to any of claims 1-3, further comprising informing (122) the beneficiary UE (10) and the at least one sharing UE (20, 30) of the updated subscribed bandwidth capacity for the beneficiary UE and the at least one sharing UE.
5. Method according to any of the preceding claims, wherein the triggering of updating (120) is performed by sending an update message comprising the updated subscribed bandwidth capacity for the beneficiary UE (10) and the at least one sharing UE (20, 30) to a Home Subscriber Server, HSS (60).

6. Method according to any of the preceding claims, wherein the triggering of updating (120) is performed by sending an update message comprising the updated subscribed bandwidth capacity for the beneficiary UE (10) and the at least one sharing UE (20, 30) to a Policy and Charging Rules Function, PCRF (55).

7. Method according to any of the preceding claims, wherein evaluating (116) the received information to determine the subscribed bandwidth capacity portion to be transferred to the beneficiary UE comprises comparing the requested bandwidth capacity with the shareable bandwidth capacity, the beneficiary UE subscribed bandwidth capacity, and possibly also the beneficiary UE bandwidth capability to determine the subscribed bandwidth capacity portion to be transferred to the beneficiary UE.

8. Method according to any of the preceding claims, further comprising determining (118) the updated subscribed bandwidth capacity for the beneficiary UE (10) and the at least one sharing UE (20, 30) as follows:

   the updated subscriber bandwidth capacity for the beneficiary UE = the beneficiary UE subscribed bandwidth capacity + the subscribed bandwidth capacity portion to be transferred to the beneficiary UE; and

   the updated subscriber bandwidth capacity for the at least one sharing UE = the at least one sharing UE subscribed bandwidth capacity - the subscribed bandwidth capacity portion to be transferred to the beneficiary UE.

9. Method according to any of the preceding claims, further comprising:

   receiving (104) information of the location of the beneficiary UE and the at least one sharing UE;

   comparing (106) the location of the beneficiary UE and the at least one sharing UE towards a location restriction requirement for usage of the method, and
only performing the method if the comparing of the location towards the location restriction requirement shows that the beneficiary UE and the at least one sharing UE are in an allowed location (108).

10. Method according to any of the preceding claims, wherein the network node (40; 57) is an Online Charging System (OCS) node (57) or an application server (40) at an operator.

11. Method according to any of the preceding claims, further comprising:

setting (110) a time period for which the updated subscribed bandwidth capacity for the beneficiary UE and the at least one sharing UE are valid.

12. A method performed by a user equipment, UE, (10, 20, 30) of a communication network for changing bandwidth capacity for a beneficiary UE, the beneficiary UE having a subscribed bandwidth capacity, the method comprising:

sending (144) to the network node (40; 57) information of the UE (10, 20, 30), the information including UE identity;

receiving (146) from the network node (40; 57) information of an updated subscribed bandwidth capacity for the UE; and

using (148) the updated subscribed bandwidth capacity for communication in the communication network.

13. Method according to claim 12, further comprising sending (142) to a network node (40; 57) a request for sharing of bandwidth capacity between at least one sharing UE (20, 30) having a subscribed bandwidth capacity and the beneficiary UE (10);

14. Method according to claim 12 or 13, wherein the UE (10, 20, 30) is the beneficiary UE (10), and wherein the information of the UE includes an identity of the beneficiary UE and a requested bandwidth capacity of the beneficiary UE.

15. Method according to claim 12 or 13, wherein the UE (10, 20, 30) is a sharing UE (20, 30), and wherein the information of the UE includes an identity of the sharing UE and a shareable bandwidth capacity of the sharing UE (20, 30) that the sharing UE can share to the beneficiary UE (10).
16. A network node (40; 57) of a communication network configured for changing bandwidth capacity for a beneficiary user equipment, UE, (10) having a subscribed bandwidth capacity, the network node (40; 57) comprising:

- a receiving unit (202) configured to receive a request for sharing of bandwidth capacity between at least one sharing UE (20, 30) having a subscribed bandwidth capacity and the beneficiary UE (10); and configured to receive information of the at least one sharing UE (20, 30), the information including identity of the at least one sharing UE and a shareable bandwidth capacity that the sharing UE can share to the beneficiary UE; and configured to receive information of the beneficiary UE (10), the information including identity of the beneficiary UE and the beneficiary UE subscribed bandwidth capacity;

- an evaluation unit (204) configured to evaluate the received information to determine subscribed bandwidth capacity to be transferred to the beneficiary UE (10) from the at least one sharing UE (20, 30);

- a triggering unit (206) for triggering updating of subscribed bandwidth capacity for the beneficiary UE (10) and the at least one sharing UE (20, 30) according to the determined subscribed bandwidth capacity to be transferred to the beneficiary UE.

17. Network node according to claim 16, wherein the information of the beneficiary UE received at the receiving unit (202) also includes requested bandwidth capacity.

18. Network node according to claim 16 or 17, wherein the information of the beneficiary UE received at the receiving unit (202) also includes a beneficiary UE bandwidth capability.

19. Network node (40; 57) according to any of claims 16-18, further comprising a transmitting unit (208) for sending information informing the beneficiary UE (10) and the at least one sharing UE (20, 30) of the updated subscribed bandwidth capacity.

20. Network node (40; 57) according to any of claims 16-19, wherein the triggering unit (206) is arranged to trigger updating of subscribed bandwidth capacity.
capacity by sending an update message comprising the updated subscribed
bandwidth capacity for the beneficiary UE (10) and the at least one sharing UE
(20, 30) to a Home Subscriber Server, HSS (60) or to a Policy and Charging Rules
Function, PCRF (55).

21. Network node (40; 57) according to any of claims 16-20, wherein the
evaluation unit (204) is configured to evaluate the received information to
determine the subscribed bandwidth capacity portion to be transferred to the
beneficiary UE by comparing the requested bandwidth capacity with the shareable
bandwidth capacity, the beneficiary UE subscribed bandwidth capacity and
possibly also the beneficiary UE bandwidth capability to determine the subscribed
bandwidth capacity portion to be transferred to the beneficiary UE.

22. Network node (40; 57) according to any of claims 16-21, wherein the
evaluation unit (204) is further arranged to determine the updated subscribed
bandwidth capacity for the beneficiary UE (10) and the at least one sharing UE
(20, 30) as follows:

   the updated subscribed bandwidth capacity for the beneficiary UE = the
   beneficiary UE subscribed bandwidth capacity + the subscribed bandwidth
   capacity portion to be transferred to the beneficiary UE; and

   the updated subscribed bandwidth capacity for the at least one
   sharing UE = the at least one sharing UE subscribed bandwidth capacity - the
   subscribed bandwidth capacity portion to be transferred to the beneficiary UE.

23. Network node (40; 57) according to any of claims 16-22, wherein the
network node is an Online Charging System (OCS) node (57) or an application
server (40) at an operator.

24. A user equipment, UE, (10, 20, 30) of a communication network
configured for changing bandwidth capacity for a beneficiary UE, the beneficiary
UE having a subscribed bandwidth capacity, the UE (10, 20, 30) comprising:

   a transmitting unit (308) for sending to the network node (40; 57)
information of the UE (10, 20, 30), the information including UE identity;
a receiving unit (302) for receiving from the network node (40; 57) information of an updated subscribed bandwidth capacity for the UE; and
a control unit (304) for using the updated subscriber bandwidth capacity for communication in the communication network.

25. User equipment (10, 20, 30) according to claim 24, further comprising a triggering unit (306) for triggering sending to a network node (40; 57) a request for sharing of bandwidth capacity between at least one sharing UE (20, 30) having a subscribed bandwidth capacity and the beneficiary UE (10).

26. User equipment (10, 20, 30) according to claim 24 or 25, wherein the UE is the beneficiary UE (10), and wherein the information of the UE includes a requested bandwidth capacity of the beneficiary UE.

27. User equipment (10, 20, 30) according to claim 24 or 25, wherein the UE is a sharing UE (20, 30), and wherein the information of the UE includes a shareable bandwidth capacity of the sharing UE (20, 30) that the sharing UE can share to the beneficiary UE (10).

28. A computer program (81 0) comprising computer readable code means, which when run in a network node (40; 57) causes the network node (40; 57) to perform the following steps:

- receiving a request for sharing of bandwidth capacity between at least one sharing UE (20, 30) having a subscribed bandwidth capacity and a beneficiary UE (10);
- receiving information of the at least one sharing UE (20, 30), the information including an identity of the at least one sharing UE and a shareable bandwidth capacity that the sharing UE can share to the beneficiary UE;
- receiving information of the beneficiary UE (10), the information including an identity of the beneficiary UE and a beneficiary UE subscribed bandwidth capacity;
- evaluating the received information to determine a subscribed bandwidth capacity portion to be transferred to the beneficiary UE (10) from the at least one sharing UE (20, 30); and
triggering updating of subscribed bandwidth capacity for the beneficiary
UE (10) and the at least one sharing UE (20, 30) according to the determined
subscribed bandwidth capacity portion.

29. A computer program product (808), comprising computer readable
medium and a computer program (810) according to claim 28 stored on the
computer readable medium.

30. A computer program (910) comprising computer readable code means,
which when run in a UE (10) causes the UE (10; 20; 30) to perform the following
steps:
   sending to the network node (40; 57) information of the UE (10), the
   information including UE identity;
   receiving from the network node (40; 57) information of an updated
   subscribed bandwidth capacity for the UE; and
   using the updated subscribed bandwidth capacity for communication
   in the communication network.

31. A computer program product (908), comprising computer readable
medium and a computer program (910) according to claim 30 stored on the
computer readable medium.
Fig. 2

1.1 Sharing request
1.2 Requesting location
1.3 Receiving location
1.4 Checking allowance
1.5 Confirmation request
1.6 Request confirmed
1.7 Request BW subscription and capability
1.8 Receive BW subscription and capability
1.9 Determine BW capacity to be transferred
1.10 Update BW settings for first and sharing UE
1.11 Response
1.12 Notification of updated BW settings

Beneficiary UE
Sharing UE
Application Server
HSS/PCRF
Fig. 4
Flowchart:

1. Receiving a sharing request
2. Receiving location information
3. Comparing location information to restriction requirement
4. Allowed location?
   - Yes: Setting a validation time period
   - No: End
5. Receiving information of the at least one sharing UE
6. Receiving information of the beneficiary UE
7. Evaluating the received information to determine bandwidth capacity to transfer to the beneficiary UE from the at least one sharing UE
8. Determining updated bandwidth capacity
9. Triggering updating of bandwidth capacity in HSS/PCRF
10. Informing beneficiary UE and sharing UE of updated bandwidth capacity

Fig. 5
Fig. 6

Sending a sharing request

Sending information of the beneficiary UE

Receiving information of updated bandwidth capacity for the beneficiary UE

Using the updated subscriber bandwidth capacity for communication

Fig. 7

Sending a sharing request

Sending information of the sharing UE

Receiving information of updated bandwidth capacity for the sharing UE

Using the updated subscriber bandwidth capacity for communication
**INTERNATIONAL SEARCH REPORT**

**PCT/SE2012/051288**

### A. CLASSIFICATION OF SUBJECT MATTER

**IPC:** see extra sheet

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:** H04L, H04W

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

SE, DK, FI, NO classes as above

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

EPO-Internal, PAJ, WPI data, COMPENDEX, INSPEC

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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[X] Further documents are listed in the continuation of Box C.  
[ ] See patent family annex.

*A* 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
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- "O" document referring to an oral disclosure, use, exhibition or other means
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- "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
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**Date of the actual completion of the international search**  
19-1 2-201 3

**Date of mailing of the international search report**  
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Patent och registreringsverket  
Box 5055  
S-1 02 42, STOCKHOLM  
Facsimile No. +46 8 666 02 86

**Authorized officer**  
Per Sundstrom  
Telephone No. +46 8 782 25 00

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International Patent Classification (IPC)

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H04L 12/14 (2006.01)
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Form PCT/ISA/210 (patent family annex) (July 2009)