DISABLING N1 MODE UPON RECEIVING A 5GMM CAUSE VALUE MESSAGE

FIELD

[0001] Various example embodiments relate generally to wireless networks and, more particularly, to disabling N1 mode upon receiving a 5G mobility management (5GMM) cause value message.

BACKGROUND

[0002] In order to engage in 5G mobility management (5GMM), a user equipment (UE) registers with the network using non-access stratum (NAS) protocol by transmitting a registration request message. The network informs the UE whether network slices are available, and allows registration of the UE if there are network slices available. If no network slices are available, the network responds to a request to register by the UE with a registration reject message, in which case the UE may disable N1 mode capability. However, unless another radio access technology (RAT) is provided to the UE, the UE will continue to re-enable N1 mode capability, and send the registration request to the same network indefinitely, potentially causing an excess of resources to be utilized.

SUMMARY

[0002A] In one aspect, the present disclosure provides a method, comprising: transmitting, by a user equipment (UE), a registration request message to a network node, the network node comprising an access and mobility function (AMF), and the registration request message including a request for access to a first network according to a non-access stratum (NAS) protocol and a request for one or more single-network slice selection assistance informations (S-NSSAIs); receiving, by the UE, a registration reject message from the network node, the registration reject message including an indication of no network slice being available to service access to the first network requested by the UE; disabling, by the UE, a capability to access networks using the NAS protocol based upon the receiving the registration reject message, wherein the disabling the capability to access networks using the NAS protocol includes disabling an N1 mode capability; storing, by the UE, an identity of the first network; and after storing, exploiting the stored identity of the first network, by the UE, during a network selection process; wherein the indication of no

network slice being available is a 5G system mobility management (5GMM) cause value #62 “no network slices available” indication; wherein the registration reject message includes as a cause for no network slices available the cause "S-NSSAI not available in the current PLMN or SNPN"; the method further comprising: deleting, by the UE, the stored identity of the first network based upon an occurrence of a first event comprising receiving, by the UE, a third message from the network node, the third message including an indication that a network slicing subscription is changed.

[0003] In an example of the present disclosure, a method includes transmitting, by a user equipment (UE), a first message to a network node, the first message including a request for access to a first network according to a non-access stratum (NAS) protocol. The UE receives a second message from the network node, the second message including an indication of no network slice being available to service access to the first network requested by the UE. The UE disables a capability to access networks using the NAS protocol based upon the receiving the second message, stores an identity of the first network, and after storing, exploits the stored identity of the first network, by the UE, during a network selection process.

[0004] In an example of the method, the first message is a registration request message.

[0005] In an example of the method, the registration request message includes a request for one or more single-network slice selection assistance informations (S-NSSAIs).

[0006] In an example of the method, the second message is a registration reject message.

[0007] In an example of the method, the indication of no network slice being available is a 5G system mobility management (5GMM) cause value #62 “no network slices available” indication.

[0008] In an example of the method, the disabling the capability to access networks using the NAS protocol includes disabling an N1 mode capability.

[0009] In an example of the method, the method includes discarding, by the UE, the first network during the network selection process.

[0010] In an example of the method, the method includes deleting, by the UE, the stored identity of the first network based upon an occurrence of a first event.

[0011] In an example of the method, the first event includes an expiration of a timer.

[0012] In an example of the method, the UE starts the timer after disabling the capability to access networks using the NAS protocol.

[0013] In an example of the method, the first event includes receiving, by the UE, a third message from the network node.

[0014] In an example of the method, the third message includes an indication that registration with the first network is available for access by the UE.

[0015] In an example of the method, the third message includes an indication that a network slicing subscription is changed.

[0016] In an example of the method, the first event includes the UE being switched off.

[0017] In an example of the method, the first event includes removal of a universal subscriber identity module from the UE.

[0018] In an example of the method, the first event includes a modification in a list of subscriber data.

[0019] In an example of the method, the identity that was stored is associated with an entry of a list of subscriber data.

[0020] In an example of the method, the network node includes an access and mobility function (AMF).

[0021] In an example of the present disclosure, a user equipment includes at least one processor, and at least one memory storing instructions which, when executed by the at least one processor, cause the user equipment at least to perform at least to perform any of the foregoing methods.

[0022] In an example of the present disclosure, a processor-readable medium storing instructions which, when executed by at least one processor of an apparatus, cause the apparatus at least to perform any of the foregoing methods.

[0023] According to some examples, there is provided the subject matter of the independent claims. Some further examples are defined in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] Some example embodiments will now be described with reference to the accompanying drawings.

[0025] FIG. 1 is a diagram of an example embodiment of wireless networking between a network system and a user equipment (UE), according to one illustrated aspect of the disclosure;

[0026] FIG. 2 is a diagram of example components of a network system, according to one illustrated aspect of the disclosure;

[0027] FIG. 3 is a diagram of an example embodiment of signals and operations among a UE and an AMF, according to one illustrated aspect of the disclosure; and

[0028] FIG. 4 is a diagram of an example embodiment of components of a UE or of a network apparatus, according to one illustrated aspect of the present disclosure.

DETAILED DESCRIPTION

[0029] In the following description, certain specific details are set forth in order to provide a thorough understanding of disclosed aspects. However, one skilled in the relevant art will recognize that aspects may be practiced without one or more of these specific details or with other methods, components, materials, etc. In other instances, well-known structures associated with transmitters, receivers, or transceivers have not been shown or described in detail to avoid unnecessarily obscuring descriptions of the aspects.

[0030] Reference throughout this specification to “one aspect” or “an aspect” means that a particular feature, structure, or characteristic described in connection with the aspect is included in at least one aspect. Thus, the appearances of the phrases “in one aspect” or “in an aspect” in various places throughout this specification are not necessarily all referring to the same aspect. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more aspects.

WHAT IS CLAIMED IS:

1. A method, comprising:

transmitting, by a user equipment (UE), a registration request message to a network node, the network node comprising an access and mobility function (AMF), and the registration request message including a request for access to a first network according to a non-access stratum (NAS) protocol and a request for one or more single-network slice selection assistance informations (S-NSSAIs);

receiving, by the UE, a registration reject message from the network node, the registration reject message including an indication of no network slice being available to service access to the first network requested by the UE;

disabling, by the UE, a capability to access networks using the NAS protocol based upon the receiving the registration reject message, wherein the disabling the capability to access networks using the NAS protocol includes disabling an N1 mode capability;

storing, by the UE, an identity of the first network; and after storing,

exploiting the stored identity of the first network, by the UE, during a network selection process;

wherein the indication of no network slice being available is a 5G system mobility management (5GMM) cause value #62 “no network slices available” indication;

wherein the registration reject message includes as a cause for no network slices available the cause "S-NSSAI not available in the current PLMN or SNPN";

the method further comprising:

deleting, by the UE, the stored identity of the first network based upon an occurrence of a first event comprising receiving, by the UE, a third message from the network node, the third message including an indication that a network slicing subscription is changed.

2. The method of claim 1, wherein the third message is a registration accept message containing a network slicing indication information element (IE) that includes a network slicing subscription change indication set to “network slicing subscription changed”.

3. The method as in any of claims 1 to 2, further comprising discarding, by the UE, the first network during the network selection process.

4. The method of claim 1, wherein the third message includes an indication that registration with the first network is available for access by the UE.

5. The method of claim 1, wherein the identity that was stored is associated with an entry of a list of subscriber data.

6. A user equipment (UE), comprising:

at least one processor; and

at least one memory storing instructions which, when executed by the at least one processor, cause the user equipment at least to perform a method as in any of claims 1-5.

7. A processor-readable medium storing instructions which, when executed by at least one processor of an apparatus, cause the apparatus at least to perform a method as in any one of claims 1-5.