

binding, as discussed above. However, repeating the method 400 each time that the UE context is moved from one AMF to another AMF may be resource intensive, especially at the UE 402. Therefore, there is a need for improved methods for changing (e.g., adjusting, or hand off between) AMFs without changing an associated RAN when the UE is in connected mode.

SUMMARY ~~OF THE INVENTION~~

[0024] The exemplary embodiments disclosed herein are directed to solving the issues relating to one or more of the problems presented in the prior art, as well as providing additional features that will become readily apparent by reference to the following detailed description when taken in conjunction with the accompany drawings. In accordance with various embodiments, exemplary systems, methods, devices and computer program products are disclosed herein. It is understood, however, that these embodiments are presented by way of example and not limitation, and it will be apparent to those of ordinary skill in the art who read the present disclosure that various modifications to the disclosed embodiments can be made while remaining within the scope of the invention.

[0025] In ~~one embodiment~~first aspect, the present disclosure provides a method ~~includes~~comprising: receiving, by a second access and mobility management function (AMF), a radio access network (RAN)-user equipment (UE) identifier from a first ~~access and mobility management function (AMF)~~, the RAN-UE identifier configured to identify a UE for a RAN; producing, by the second AMF, an AMF-UE identifier, the AMF-UE identifier configured to identify the UE for a first interface between the second AMF and the RAN within the second AMF; selecting, by the second AMF, a transport network layer association (TNLA) link to the RAN; and sending, by the second AMF, the AMF-UE identifier to the RAN.

[0026] In an ~~an further embodiment~~second aspect, the present disclosure provides a method ~~includes~~comprising: receiving, by a second access and mobility management function (AMF), a message including a first ~~access and mobility management function (AMF)~~-user equipment (UE) identifier ~~that configured to identify~~ies a UE for a first AMF from the radio access network (RAN); retrieving, by the second AMF, UE context information

from a data store using the first AMF-UE identifier; producing, by the second AMF, a second AMF-UE identifier, the second AMF-UE identifier configured to identify the UE for a first interface between the second AMF and the RAN within the second AMF; and sending, by the second AMF, the second AMF-UE identifier to the RAN.

5 [0027] In ~~another-a third~~embodiment aspect, the present disclosure provides an apparatus includescomprising: a receiver configured to receive a radio access network (RAN)-user equipment (UE) identifier from a first access and mobility management function (AMF), the RAN-UE identifier configured to identify a UE for a RAN; at least one processor configured to: produce an AMF-UE identifier, the AMF-UE identifier configured to identify the UE for a first
10 interface between the second AMF and the RAN within a second AMF; and select a transport network layer association (TNLA) link to the RAN; and a transmitter configured to send the AMF-UE identifier to the RAN.

[0028] In ~~yet-another-embodiment~~a fourth aspect, the present disclosure provides an apparatus includescomprising: a receiver configured to receive a message including a first access
15 and mobility management function (AMF)-user equipment (UE) identifier ~~that-configured to~~ identify~~ies~~ a UE for a first AMF from the radio access network (RAN); at least one processor configured to: retrieve UE context information from a data store using the first AMF-UE identifier; and produce a second AMF-UE identifier, the second AMF-UE identifier configured to identify the UE for a first interface between the second AMF and the RAN within a second
20 AMF; and a transmitter configured to send the second AMF-UE identifier to the RAN.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] Various exemplary embodiments of the invention are described in detail below with reference to the following Figures. The drawings are provided for purposes of illustration only

and merely depict exemplary embodiments of the invention to facilitate the reader's understanding of the invention. Therefore, the drawings presented herein should not be

CLAIMS

What is claimed is:

5 1. A method, comprising:

receiving, by a second access and mobility management function (AMF), a radio access network (RAN)-user equipment (UE) identifier from a first ~~access and mobility management function (AMF)~~, the RAN-UE identifier configured to identify a UE for a RAN;

10 producing, by the second AMF, an AMF-UE identifier, the AMF-UE identifier configured to identify the UE for a first interface between the second AMF and the RAN within the second AMF;

selecting, by the second AMF, a transport network layer association (TNLA) link to the RAN; and

15 sending, by the second AMF, the AMF-UE identifier to the RAN.

2. The method of claim 1, comprising:

sending the AMF-UE identifier to the RAN via the TNLA link.

3. The method of claim 1, wherein:

20 the RAN-UE identifier is further configured to identify a UE context for the RAN,

the AMF-UE identifier is further configured to identify the UE context for the second AMF, and

the UE context is associated with UE context information, wherein the UE context information comprises information selected from the group consisting of: a UE identifier, a UE security state parameter, a UE mobile state parameter, and a UE mobility parameter.

5 4. The method of claim 1, wherein the RAN-UE identifier is a RAN UE N2AP ID.

5. The method of claim 1, wherein the AMF-UE identifier is an AMF UE N2AP ID.

6. A method, comprising:

10 receiving, by a second access and mobility management function (AMF), a message including a first ~~access and mobility management function (AMF)~~-user equipment (UE) identifier ~~that configured to~~ identify ^{ies} a UE for a first AMF from a radio access network (RAN);
retrieving, by the second AMF, UE context information from a data store using the first AMF-UE identifier;

15 producing, by the second AMF, a second AMF-UE identifier, the second AMF-UE identifier configured to identify the UE for a first interface between the second AMF and the
RAN within the second AMF; and

sending, by the second AMF, the second AMF-UE identifier to the RAN.

20 7. The method of claim 6, comprising sending a N2 message via an N2 interface to the RAN, the N2 message comprising the second AMF-UE identifier.

8. The method of claim 6, wherein the second AMF-UE identifier is an AMF UE N2AP ID.

9. The method of claim 6, wherein:

the first AMF-UE identifier is further configured to identify ~~ies~~ a UE context for the first AMF ~~from the RAN~~,

the second AMF-UE identifier is further configured to identify the UE context for the second AMF, and

the UE context information comprises information selected from the group consisting of: a UE identifier, a UE security state parameter, a UE mobile state parameter, and a UE mobility parameter.

10. An apparatus, comprising:

a receiver configured to receive a radio access network (RAN)-user equipment (UE) identifier from a first access and mobility management function (AMF), the RAN-UE identifier configured to identify a UE for a RAN;

at least one processor configured to:

produce an AMF-UE identifier, the AMF-UE identifier configured to identify the UE for a first interface between the second AMF and the RAN within a second AMF; and

select a transport network layer association (TNLA) link to the RAN; and

a transmitter configured to:

send the AMF-UE identifier to the RAN.

11. The apparatus of claim 10, wherein:

the transmitter is further configured to:

send the AMF-UE identifier to the RAN via the TNLA link.

12. The apparatus of claim 10, wherein:

the RAN-UE identifier is further configured to identify a UE context for the RAN,

5 the AMF-UE identifier is further configured to identify the UE context for the second AMF, and

the UE context is associated with UE context information, and wherein the UE context information comprises information selected from the group consisting of: a UE identifier, a UE security state parameter, a UE mobile state parameter, and a UE mobility parameter.

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13. The apparatus of claim 10, wherein the RAN-UE identifier is a RAN UE N2AP ID.

14. The apparatus of claim 10, wherein the AMF-UE identifier is an AMF UE N2AP ID.

15 15. An apparatus, comprising:

a receiver configured to receive a message including a first access and mobility

management function (AMF)-user equipment (UE) identifier ~~that configured to identify~~ a UE
for a first AMF from a radio access network (RAN);

at least one processor configured to:

20 retrieve UE context information from a data store using the first AMF-UE identifier; and

produce a second AMF-UE identifier, the second AMF-UE identifier configured to identify the UE for a first interface between the second AMF and the RAN within a second AMF; and
a transmitter configured to send the second AMF-UE identifier to the RAN.

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16. The apparatus of claim 15, wherein the transmitter is further configured to send a N2 message via a N2 interface to the RAN, the N2 message comprising the second AMF-UE identifier.

10 17. The apparatus of claim 15, wherein the second AMF-UE identifier is an AMF UE N2AP ID.

18. The apparatus of claim 15, wherein:

the first AMF-UE identifier is further configured to identify ~~ies~~ a UE context for the first
15 AMF ~~from the RAN~~,

the second AMF-UE identifier is further configured to identify the UE context for the second AMF, and

the UE context information comprises information selected from the group consisting of:
a UE identifier, a UE security state parameter, a UE mobile state parameter, and a UE mobility
20 parameter.