

CLAIMS

1. A method of obtaining location services, comprising:
communicating with a Radio Access Network (RAN) via Long Term Evolution (LTE) access by a User Equipment (UE); and
exchanging at least one Non-Access Stratum (NAS) message between the UE and a Mobility Management Entity (MME) to transport at least one message for location services for the UE.
2. The method of claim 1, wherein the at least one message for location services comprises at least one LTE Positioning Protocol (LPP) message, or at least one message for a Mobile Originated Location Request (MO-LR), or at least one message for a Mobile Terminated Location Request (MT-LR), or at least one message for Network Induced Location Request (NI-LR).
3. The method of claim 1, wherein each of the at least one NAS message comprises a protocol discriminator (PD) field that is set to a designated value to identify each NAS message transporting one or more messages for location services for the UE.
4. The method of claim 1, wherein each of the at least one NAS message comprises a routing identifier (ID) associated with a location session maintained by the MME for the UE.
5. An apparatus for obtaining location services, comprising:
means for communicating with a Radio Access Network (RAN) via Long Term Evolution (LTE) access by a User Equipment (UE); and
means for exchanging at least one Non-Access Stratum (NAS) message between the UE and a Mobility Management Entity (MME) to transport at least one message for location services for the UE.
6. The apparatus of claim 5, wherein the at least one message for location services comprises at least one LTE Positioning Protocol (LPP) message, or at least one message for a Mobile Originated Location Request (MO-LR), or at least one message

for a Mobile Terminated Location Request (MT-LR), or at least one message for Network Induced Location Request (NI-LR).

7. The apparatus of claim 5, wherein each of the at least one NAS message comprises a routing identifier (ID) associated with a location session maintained by the MME for the UE.

8. An apparatus for obtaining location services, comprising:
at least one processing unit configured to communicate with a Radio Access Network (RAN) via Long Term Evolution (LTE) access by a User Equipment (UE), and to exchange at least one Non-Access Stratum (NAS) message between the UE and a Mobility Management Entity (MME) to transport at least one message for location services for the UE.

9. The apparatus of claim 8, wherein the at least one message for location services comprises at least one LTE Positioning Protocol (LPP) message, or at least one message for a Mobile Originated Location Request (MO-LR), or at least one message for a Mobile Terminated Location Request (MT-LR), or at least one message for Network Induced Location Request (NI-LR).

10. The apparatus of claim 8, wherein each of the at least one NAS message comprises a routing identifier (ID) associated with a location session maintained by the MME for the UE.

11. A computer program product, comprising:
a non-transitory computer-readable medium comprising:
code to cause at least one computer to communicate with a Radio Access Network (RAN) via Long Term Evolution (LTE) access by a User Equipment (UE), and
code to cause the at least one computer to exchange at least one Non-Access Stratum (NAS) message between the UE and a Mobility Management Entity (MME) to transport at least one message for location services for the UE.

12. A method of supporting location services, comprising:

identifying a User Equipment (UE) communicating with a Radio Access Network (RAN) via Long Term Evolution (LTE) access; and

exchanging at least one Non-Access Stratum (NAS) message between a Mobility Management Entity (MME) and the UE to transport at least one message for location services for the UE.

13. The method of claim 12, wherein the at least one message for location services comprises at least one LTE Positioning Protocol (LPP) message, or at least one message for a Mobile Originated Location Request (MO-LR), or at least one message for a Mobile Terminated Location Request (MT-LR), or at least one message for Network Induced Location Request (NI-LR).

14. The method of claim 12, wherein each of the at least one NAS message comprises a protocol discriminator (PD) field that is set to a designated value to identify each NAS message transporting one or more messages for location services for the UE.

15. The method of claim 12, further comprising:

communicating with an Evolved Serving Mobile Location Center (E-SMLC) for a location session between the MME and the E-SMLC to provide location services for the UE; and

assigning a routing identifier (ID) for communication between the MME and the UE and related to the location session between the MME and the E-SMLC, wherein each of the at least one NAS message exchanged between the MME and the UE comprises the routing ID to associate each NAS message with the location session between the MME and the E-SMLC.

16. An apparatus for supporting location services, comprising:

means for identifying a User Equipment (UE) communicating with a Radio Access Network (RAN) via Long Term Evolution (LTE) access; and

means for exchanging at least one Non-Access Stratum (NAS) message between a Mobility Management Entity (MME) and the UE to transport at least one message for location services for the UE.

17. The apparatus of claim 16, wherein the at least one message for location services comprises at least one LTE Positioning Protocol (LPP) message, or at least one message for a Mobile Originated Location Request (MO-LR), or at least one message for a Mobile Terminated Location Request (MT-LR), or at least one message for Network Induced Location Request (NI-LR).

18. The apparatus of claim 16, further comprising:

means for communicating with an Evolved Serving Mobile Location Center (E-SMLC) for a location session between the MME and the E-SMLC to provide location services for the UE; and

means for assigning a routing identifier (ID) for communication between the MME and the UE and related to the location session between the MME and the E-SMLC, wherein each of the at least one NAS message exchanged between the MME and the UE comprises the routing ID to associate each NAS message with the location session between the MME and the E-SMLC.

19. A method of obtaining location services, comprising:

receiving a first message sent by a first network entity to a User Equipment (UE), the first message comprising a routing identifier (ID) associated with a location session between the first network entity and a second network entity to provide location services for the UE; and

sending a second message comprising the routing ID from the UE to the first network entity, the routing ID being included in the second message by the UE and used by the first network entity to associate the second message with the location session between the first and second network entities.

20. The method of claim 19, further comprising:

sending a Mobile Originated Location Request (MO-LR) request message comprising a first ID from the UE to the first network entity, wherein the routing ID is determined based on the first ID.

21. The method of claim 19, further comprising:

receiving a privacy notification message for a Mobile Terminated Location Request (MT-LR) from the first network entity, wherein the privacy notification message comprises the routing ID.

22. The method of claim 19, wherein the first and second messages comprise Non-Access Stratum (NAS) messages transporting at least one message for location services for the UE.

23. The method of claim 19, wherein the first network entity comprises a Mobility Management Entity (MME) and the second network entity comprises an Evolved Serving Mobile Location Center (E-SMLC).

24. An apparatus for obtaining location services, comprising:
means for receiving a first message sent by a first network entity to a User Equipment (UE), the first message comprising a routing identifier (ID) associated with a location session between the first network entity and a second network entity to provide location services for the UE; and

means for sending a second message comprising the routing ID from the UE to the first network entity, the routing ID being included in the second message by the UE and used by the first network entity to associate the second message with the location session between the first and second network entities.

25. The apparatus of claim 24, further comprising:
means for sending a Mobile Originated Location Request (MO-LR) request message comprising a first ID from the UE to the first network entity, wherein the routing ID is determined based on the first ID.

26. The apparatus of claim 24, further comprising:
means for receiving a privacy notification message for a Mobile Terminated Location Request (MT-LR) from the first network entity, wherein the privacy notification message comprises the routing ID.

27. A method of supporting location services, comprising:

determining a routing identifier (ID) associated with a location session between a first network entity and a second network entity to provide location services for a User Equipment (UE);

sending a first message comprising the routing ID from the first network entity to the UE;

receiving a second message comprising the routing ID from the UE at the first network entity; and

associating the second message from the UE with the location session between the first and second network entities based on the routing ID included in the second message.

28. The method of claim 27, wherein the determining the routing ID comprises assigning the routing ID by the first network entity.

29. The method of claim 27, wherein the determining the routing ID comprises

receiving a first ID for a Mobile Originated Location Request (MO-LR) from the UE, and

assigning the routing ID by the first network entity based on the first ID.

30. The method of claim 27, further comprising:

sending a privacy notification message comprising the routing ID for a Mobile Terminated Location Request (MT-LR) to the UE.

31. The method of claim 27, further comprising:

receiving a third message sent by the second network entity to the first network entity for the location session, wherein the first message is sent in response to receiving the third message; and

sending a fourth message from the first network entity to the second network entity for the location session, wherein the fourth message is sent in response to receiving the second message.

32. The method of claim 31, wherein the third and fourth messages exchanged between the first and second network entities include either the routing ID or another ID associated with the location session.

33. The method of claim 27, wherein the first network entity comprises a Mobility Management Entity (MME) and the second network entity comprises an Evolved Serving Mobile Location Center (E-SMLC).

34. The method of claim 27, wherein the first and second messages comprise Non-Access Stratum (NAS) messages transporting at least one message for location services for the UE.

35. An apparatus for supporting location services, comprising:

means for determining a routing identifier (ID) associated with a location session between a first network entity and a second network entity to provide location services for a User Equipment (UE);

means for sending a first message comprising the routing ID from the first network entity to the UE;

means for receiving a second message comprising the routing ID from the UE at the first network entity; and

means for associating the second message from the UE with the location session between the first and second network entities based on the routing ID included in the second message.

36. The apparatus of claim 35, wherein the means for determining the routing ID comprises means for assigning the routing ID by the first network entity.

37. The apparatus of claim 35, wherein the means for determining the routing ID comprises:

means for receiving a first ID for a Mobile Originated Location Request (MO-LR) from the UE, and

means for assigning the routing ID by the first network entity based on the first ID.

38. The apparatus of claim 35, further comprising:

means for sending a privacy notification message comprising the routing ID for a Mobile Terminated Location Request (MT-LR) to the UE.

39. The apparatus of claim 35, further comprising:

means for receiving a third message sent by the second network entity to the first network entity for the location session, wherein the first message is sent in response to receiving the third message; and

means for sending a fourth message from the first network entity to the second network entity for the location session, wherein the fourth message is sent in response to receiving the second message.

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1. A method of obtaining location services, including:
communicating with a Radio Access Network (RAN) via Long Term Evolution (LTE) access by a User Equipment (UE); and
exchanging at least one Non-Access Stratum (NAS) message between the UE and a Mobility Management Entity (MME) to transport at least one message for location services for the UE;
wherein each of the at least one NAS message includes a routing identifier (ID) for associating the at least one NAS message with a location session between the MME and a location center to provide the location services, and wherein the routing ID is maintained by the MME for the UE.
2. The method of claim 1, wherein the at least one message for location services includes at least one LTE Positioning Protocol (LPP) message, or at least one message for a Mobile Originated Location Request (MO-LR), or at least one message for a Mobile Terminated Location Request (MT-LR), or at least one message for Network Induced Location Request (NI-LR).
3. The method of claim 1, wherein each of the at least one NAS message includes a protocol discriminator (PD) field that is set to a designated value to identify each NAS message transporting one or more messages for location services for the UE.
4. An apparatus for obtaining location services, the apparatus including:
means for communicating with a Radio Access Network (RAN) via Long Term Evolution (LTE) access by the apparatus; and
means for exchanging at least one Non-Access Stratum (NAS) message between the UE and a Mobility Management Entity (MME) to transport at least one message for location services for the apparatus,
wherein each of the at least one NAS message includes a routing identifier (ID) for associating the at least one NAS message with a location session between the MME and a location center to provide the location services, and wherein the routing ID is maintained by the MME for the apparatus.
5. The apparatus of claim 4, wherein the at least one message for location services includes at least one LTE Positioning Protocol (LPP) message, or at least one message for a Mobile Originated Location Request (MO-LR), or at least one message for a Mobile

Terminated Location Request (MT-LR), or at least one message for Network Induced Location Request (NI-LR).

6. An apparatus for obtaining location services, including:

at least one processing unit configured to communicate with a Radio Access Network (RAN) via Long Term Evolution (LTE) access by the apparatus, and to exchange at least one Non-Access Stratum (NAS) message between the apparatus and a Mobility Management Entity (MME) to transport at least one message for location services for the apparatus,

wherein each of the at least one NAS message includes a routing identifier (ID) for associating the at least one NAS message with a location session between the MME and a location center to provide the location services, and wherein the routing ID is maintained by the MME for the apparatus.

7. The apparatus of claim 6, wherein the at least one message for location services includes at least one LTE Positioning Protocol (LPP) message, or at least one message for a Mobile Originated Location Request (MO-LR), or at least one message for a Mobile Terminated Location Request (MT-LR), or at least one message for Network Induced Location Request (NI-LR).

8. A method of supporting location services, including:

identifying a User Equipment (UE) communicating with a Radio Access Network (RAN) via Long Term Evolution (LTE) access; and

exchanging at least one Non-Access Stratum (NAS) message between a Mobility Management Entity (MME) and the UE to transport at least one message for location services for the UE,

wherein each of the at least one NAS message includes a corresponding routing identifier (ID) for associating the at least one NAS message with a location session between the MME and a location center to provide the location services, and wherein the corresponding routing ID is maintained by the MME for the UE.

9. The method of claim 8, wherein the at least one message for location services includes at least one LTE Positioning Protocol (LPP) message, or at least one message for a Mobile Originated Location Request (MO-LR), or at least one message for a Mobile Terminated Location Request (MT-LR), or at least one message for Network Induced Location Request (NI-LR).

10. The method of claim 8, wherein each of the at least one NAS message includes a protocol discriminator (PD) field that is set to a designated value to identify each NAS message transporting one or more messages for location services for the UE.
11. The method of claim 8, further including:
 - communicating with an Evolved Serving Mobile Location Center (E-SMLC) for a location session between the MME and the E-SMLC to provide location services for the UE; and
 - assigning the corresponding routing identifier (ID), wherein the corresponding routing ID is further related to the location session between the MME and the E-SMLC, and wherein the corresponding routing ID further associates its corresponding NAS message with the location session between the MME and the E-SMLC.
12. An apparatus for supporting location services, the apparatus including:
 - means for identifying a User Equipment (UE) communicating with a Radio Access Network (RAN) via Long Term Evolution (LTE) access; and
 - means for exchanging at least one Non-Access Stratum (NAS) message between the apparatus and the UE to transport at least one message for location services for the UE, wherein each of the at least one NAS message includes a corresponding routing identifier (ID) for associating the at least one NAS message with a location session between the MME and a location center to provide the location services, and wherein the corresponding routing ID is maintained by the apparatus for the UE.
13. The apparatus of claim 12, wherein the at least one message for location services includes at least one LTE Positioning Protocol (LPP) message, or at least one message for a Mobile Originated Location Request (MO-LR), or at least one message for a Mobile Terminated Location Request (MT-LR), or at least one message for Network Induced Location Request (NI-LR).
14. The apparatus of claim 12, further including:
 - means for communicating with an Evolved Serving Mobile Location Center (E-SMLC) for a location session between the MME and the E-SMLC to provide location services for the UE; and
 - means for assigning the corresponding routing identifier (ID), wherein the corresponding routing ID is further related to the location session between the MME and the E-SMLC, and wherein the corresponding routing ID further associates its corresponding NAS message with the location session between the MME and the E-SMLC.

15. A method of obtaining location services, including:

receiving a first message sent by a first network entity to a User Equipment (UE), the first message including a routing identifier (ID) for associating the first message with a location session between the first network entity and a second network entity to provide location services for the UE; and

sending a second message including the routing ID from the UE to the first network entity, the routing ID being included in the second message by the UE and used by the first network entity to associate the second message with the location session between the first and second network entities,

wherein the first and second messages include at least one Non-Access Stratum (NAS) message, and wherein the at least one NAS message includes the routing ID.

16. The method of claim 15, further including:

sending a Mobile Originated Location Request (MO-LR) request message including a first ID from the UE to the first network entity, wherein the routing ID is determined based on the first ID.

17. The method of claim 15, further including:

receiving a privacy notification message for a Mobile Terminated Location Request (MT-LR) from the first network entity, wherein the privacy notification message includes the routing ID.

18. The method of claim 15, wherein the first network entity includes a Mobility Management Entity (MME) and the second network entity includes an Evolved Serving Mobile Location Center (E-SMLC).

19. An apparatus for obtaining location services, including:

means for receiving a first message sent by a first network entity to a User Equipment (UE), the first message including a routing identifier (ID) for associating the first message with a location session between the first network entity and a second network entity to provide location services for the UE; and

means for sending a second message including the routing ID from the UE to the first network entity, the routing ID being included in the second message by the UE and used by the first network entity to associate the second message with the location session between the first and second network entities,

wherein the first and second messages include at least one Non-Access Stratum (NAS) message, and wherein the at least one NAS message includes the routing ID.

20. The apparatus of claim 19, further including:

means for sending a Mobile Originated Location Request (MO-LR) request message including a first ID from the UE to the first network entity, wherein the routing ID is determined based on the first ID.

21. The apparatus of claim 19, further including:

means for receiving a privacy notification message for a Mobile Terminated Location Request (MT-LR) from the first network entity, wherein the privacy notification message includes the routing ID.

22. A method of supporting location services, including:

determining a routing identifier (ID) associated with a location session between a first network entity and a second network entity to provide location services for a User Equipment (UE);

sending a first message including the routing ID from the first network entity to the UE;

receiving a second message including the routing ID from the UE at the first network entity; and

associating the second message from the UE with the location session between the first and second network entities based on the routing ID included in the second message,

wherein the first and second messages include at least one Non-Access Stratum (NAS) message, and wherein the at least one NAS message includes the routing ID.

23. The method of claim 22, wherein the determining the routing ID includes assigning the routing ID by the first network entity.

24. The method of claim 22, wherein the determining the routing ID includes

receiving a first ID for a Mobile Originated Location Request (MO-LR) from the UE, and

assigning the routing ID by the first network entity based on the first ID.

25. The method of claim 22, further including:

sending a privacy notification message including the routing ID for a Mobile Terminated Location Request (MT-LR) to the UE.

26. The method of claim 22, further including:
 receiving a third message sent by the second network entity to the first network entity for the location session, wherein the first message is sent in response to receiving the third message; and
 sending a fourth message from the first network entity to the second network entity for the location session, wherein the fourth message is sent in response to receiving the second message.
27. The method of claim 26, wherein the third and fourth messages exchanged between the first and second network entities include either the routing ID or another ID associated with the location session.
28. The method of claim 22, wherein the first network entity includes a Mobility Management Entity (MME) and the second network entity includes an Evolved Serving Mobile Location Center (E-SMLC).
29. An apparatus for supporting location services, including:
 means for determining a routing identifier (ID) associated with a location session between a apparatus and a network entity to provide location services for a User Equipment (UE);
 means for sending a first message including the routing ID from the apparatus to the UE;
 means for receiving a second message including the routing ID from the UE at the apparatus; and
 means for associating the second message from the UE with the location session between the apparatus and the network entity, the associating being done based on the routing ID included in the second message,
 wherein the first and second messages include at least one Non-Access Stratum (NAS) message, and wherein the at least one NAS message includes the routing ID.
30. The apparatus of claim 29, wherein the means for determining the routing ID includes means for assigning the routing ID by the apparatus.
31. The apparatus of claim 29, wherein the means for determining the routing ID includes:
 means for receiving a first ID for a Mobile Originated Location Request (MO-LR) from the UE, and
 means for assigning the routing ID by the apparatus based on the first ID.

32. The apparatus of claim 29, further including:
means for sending a privacy notification message including the routing ID for a Mobile Terminated Location Request (MT-LR) to the UE.
33. The apparatus of claim 29, further including:
means for receiving a third message sent by the network entity to the apparatus for the location session, wherein the first message is sent in response to receiving the third message;
and
means for sending a fourth message from the apparatus to the network entity for the location session, wherein the fourth message is sent in response to receiving the second message.
34. A computer program product, including:
a non-transitory computer-readable medium including code for causing a computer to perform the method of any one of claims 1 to 3, 8 to 11, 15 to 18 and 22 to 28.