

What is claimed is:

1. A method implemented by a Wireless Transmit/Receive Unit (WTRU), comprising:
performing a first registration with a network entity (NE), the WTRU indicating that the WTRU is operating in a Mobile Initiated Communication Only (MICO) mode;
determining whether the WTRU is registered in an "all PLMN" registration area;
on condition that the WTRU operating in the MICO mode is not registered in the "all PLMN" registration area, determining whether the WTRU is outside of a registration area associated with the first registration based on any of: (1) location related information associated with the WTRU received after the first registration of the WTRU, or (2) a network provided flag;
sending, by the WTRU, a Service Request (SR); and
performing a second registration or a registration update prior to the SR, on condition that the WTRU is determined to be outside the registration area.
2. The method, of claim 1, further comprising:
obtaining, by the WTRU, information indicating that the WTRU is to initiate the second registration or the registration update prior to the sending of the SR,
wherein the performing of the second registration or the registration update includes sending a registration request in accordance with the obtained information.
3. The method of any one of the preceding claims, wherein the obtaining of the information to initiate the second registration or the registration update includes obtaining the information via a preconfiguration or via network signaling.
4. The method of any one of the preceding claims, further comprising:
determining that the WTRU is registered to an "all PLMN" registration area;
on condition that the WTRU is registered to the "all PLMN" registration area, determining whether an "always register" indication is set; and
on condition that an "always register" indication is set, sending a registration request to perform the second registration prior to the SR.
5. The method of any one of the preceding claims, further comprising obtaining a Tracking Area (TA) identifier of a TA of the WTRU indicated in a broadcast signal,
wherein the determining of whether the WTRU is outside of the registration area is based on whether the obtained TA identifier matches a stored TA identifier associated with a NE last serving the WTRU such that the performing of the second registration or the registration update is conditioned on the obtained TA identifier not matching the stored TA.
6. The method of any one of the preceding claims, further comprising obtaining an identifier associated with a registration area of the WTRU indicated in a broadcast signal,
wherein the determining of whether the WTRU is outside of the registration area is based on whether the obtained identifier matches a stored identifier associated with a NE last serving the WTRU such that the performing of the second registration or the registration update is conditioned on the obtained identifier not matching the stored identifier.

7. The method of claim 6, wherein the identifier is one of: (1) a Tracking area identifier; or (2) an AMF identifier.

8. The method of claim 5 or claim 7, wherein on condition that the obtained TA identifier matches the stored TA identifier, sending the SR without any second registration or registration update prior to sending the SR.

9. A method implemented by a WTRU operating in a Mobile Initiated Communication Only (MICO) mode and registered in a first registration area, comprising:

determining whether the WTRU is outside of the first registration area based on any of: (1) location related information associated with the WTRU received after the registration of the WTRU or (2) a network provided flag;

performing a registration update, on condition that the WTRU is determined to be outside the first registration area; and

sending, by the WTRU, a Service Request (SR) after the registration update.

10. A method implemented by a Wireless Transmit/Receive Unit (WTRU), comprising:

performing a first registration with a network entity (NE), the WTRU indicating that the WTRU is operating in a Mobile Initiated Communication Only (MICO) mode;

determining whether the WTRU is registered in an "all PLMN" registration area;

selectively performing, prior to the sending of a Service Request (SR), a second registration or a registration update based on the WTRU not being registered in an "all PLMN" registration area and the WTRU being outside of a registration area associated with the first registration; and

sending, by the WTRU, the SR.

11. A method, implemented by a Wireless Transmit/Receive Unit (WTRU), the method comprising:

sending, by the WTRU, a Service Request (SR) that includes WTRU-specific information, the WTRU-specific information including: (1) an indication that the WTRU is operating in MICO mode; and (2) a Temporary User Identifier (TUID) of the WTRU; and

receiving by the WTRU, a Connection Reconfiguration message and a WTRU Configuration message including a new TUID, different from the TUID in the SR.

12. A method implemented by Wireless Transmit/Receive Unit (WTRU), the method comprising:

receiving, by the WTRU, a broadcast signal indicating a Network Entity (NE) identifier associated with a NE currently serving the WTRU;

receiving a connection request from a higher layer;

determining, by a second layer, whether the WTRU is operating in Mobile Initiated Communication Only (MICO) mode;

on condition that the WTRU is operating in the MICO mode, determining, by the WTRU, whether the received NE identifier matches a stored NE identifier associated with a NE last serving the WTRU; and

on condition that the received NE identifier matches the stored NE identifier, sending a Service Request (SR) including WTRU-specific information.

13. The method of claim 12, further comprising on condition that the received NE identifier does not match the stored NE identifier, sending a new registration or a registration update prior to sending a SR.

14. A method implemented by a Wireless Transmit/Receive Unit (WTRU), the method comprising:

obtaining, by the WTRU, information indicating that the WTRU is to initiate registration prior to sending a Service Request (SR);

sending a registration request in accordance with the obtained information; and

sending the SR after registering with a Network Entity (NE).

15. The method of claim 14, wherein the obtaining of the information may include obtaining the information via a preconfiguration or via network signaling.

16. The method of claim 14 or claim 15, further comprising:

determining whether the WTRU is operating in a Mobile Initiated Communication Only (MICO) mode; and

sending the registration request prior to the SR on condition that the WTRU is operating in the Mobile Initiated Communication Only (MICO) mode.

17. The method of any one of claims 14 to 16, further comprising:

determining whether the WTRU is registered to an "all PLMN" registration area; and

sending the registration request prior to the SR on condition that the WTRU is registered to an "all PLMN" registration area.

18. The method of any one of claims 14 to 17, further comprising:

receiving, by the WTRU, a broadcast signal indicating a Tracking Area (TA) identifier of a TA of the WTRU;

receiving a connection request from a higher layer;

determining, by a second layer, whether the WTRU is operating in Mobile Initiated Communication Only (MICO) mode;

on condition that the WTRU is operating in MICO mode, determining, by the WTRU, at least whether the indicated TA identifier matches a stored TA identifier associated with a Network Entity (NE) last serving the WTRU; and

on condition that the indicated TA identifier matches the stored TA identifier, sending the SR.

19. The method of claim 18, further comprising on condition that the indicated TA identifier does not match the stored TA identifier, sending a new registration or a registration update prior to sending a SR.

20. A method implemented by a Wireless Transmit/Receive Unit (WTRU) in Mobile Initiated Communication Only (MICO) mode, the method comprising:

receiving, by the WTRU from a Network Entity (NE), a Connection Release;

determining, by the WTRU whether or not to accept the Connection Release;

on condition that the WTRU accepts the Connection Release: (1) sending, by the WTRU, a Connection Release Complete, and (2) entering, by the WTRU, into idle mode; and

on condition that the WTRU does not accept the Connection Release: (1) sending, by the WTRU, a Connection Release Reject with a cause code indicating that the WTRU is operating in the MICO mode, and (2) remaining, by the WTRU in connected mode.

21. A method implemented by a Wireless Transmit/Receive Unit (WTRU), the method comprising:

sending, by the WTRU to a Network Entity (NE), a first message;

obtaining, by the WTRU from the NE, information indicating that the WTRU is to initiate registration; and

sending a registration request in accordance with the obtained information.

22. The method of claim 21, wherein the obtained information is a cause code or an indication included in a second message from the NE.

23. The method of claim 21 or claim 22, wherein:

the first message is a service request; and

the second message is a service accept message or a service reject message.

24. The method of any one of claims 21-23, further comprising:

performing, by the WTRU, a registration update;

updating, by the WTRU, configuration parameters based on the performed registration update.

25. A method, implemented by a Network Entity (NE), the method comprising:

sending, by the NE, information indicating that the WTRU is to initiate registration prior to sending a Service Request (SR);

receiving, by the NE, a registration request in accordance with the obtained information; and

receiving, by the NE, a SR after the WTRU is registered.

26. A method implemented by Network Entity (NE) in communication with a Wireless Transmit/Receive Unit (WTRU) that is in a connected state, the method comprising:

determining, by the NE, whether the WTRU is operating in a Mobile Initiated Communication Only (MICO) mode; and

on condition that the WTRU is operating in the MICO WTRU mode, any of: (1) setting an inactivity timer for a period which is longer than a period for a WTRU not in MICO mode; (2) preventing a connection release of the WTRU for inactivity of the WTRU; or (3) negotiating with the WTRU so that the WTRU is configured to autonomously release the connection with the NE.

27. A method implemented by a Network Entity (NE), the method comprising:

receiving, by the NE, a message requesting a connection of a Wireless Transmit/Receive Unit (WTRU) including WTRU-specific information;

determining, by the NE from the WTRU-specific information, another NE that last served the WTRU; and

sending, by the NE to the other NE, an information request for information to connect the WTRU with the NE.

28. The method of claim 27, further comprising:

receiving, by the NE from the other NE, the requested information to connect the WTRU; and

authenticating and connecting, by the NE, the WTRU based on the information received from the other NE.

29. The method of claim 27 or claim 28, wherein the WTRU-specific information includes any of: (1) an indication that the WTRU is operating in MICO mode; or (2) a Temporary User Identifier (TUID) of the WTRU.

30. A method, implemented by Network Entity (NE), the method comprising:

receiving, by the NE, a registration request to register a Wireless Transmit/Receive Unit (WTRU) including an indication that the WTRU is operating in a Mobile Initiated Communication Only (MICO) mode;

receiving, by the NE from the WTRU after registration, a Service Request (SR) including a preference for WTRU-initiated connection release of the WTRU;

receiving from one of: the WTRU or a Radio Access Network (RAN) entity, a request to release the WTRU; and

releasing, by the NE, a connection toward the WTRU.

31. The method of claim 30, further comprising:

determining, by the NE, whether to accept the preference; and

sending to the RAN entity serving the WTRU that the preference is accepted.

32. The method of claim 30 or claim 31, wherein the determining of whether to accept the preference includes checking any of: (1) a WTRU profile; or (2) a WTRU mobility pattern.

33. A method implemented by a Network Entity (NE), the method comprising:

receiving, by the NE from a Wireless Transmit/Receive Unit (WTRU), a first message;

determining, by the NE, that the WTRU is to initiate a registration;

sending, by the NE to the WTRU, information indicating that the WTRU is to initiate the registration; and

receiving a registration request in accordance with the sent information.

34. The method of claim 33, wherein the sent information is a cause code or an indication included in a second message from the NE.

35. The method of claim 33 or claim 34, wherein:

the first message is a service request; and

the second message is a service accept message or a service reject message.

36. A method implemented by a RAN Entity (RE) to serve a Wireless Transmit/Receive Unit (WTRU), a registration of the WTRU with the Network Entity (NE) indicating that the WTRU is operating in a Mobile Initiated Communication Only (MICO) mode, the method comprising:

receiving, by the RE, a message including a Service Request (SR) for the WTRU;

sending, by the RE to the NE, the SR; and

receiving, by the RE from the NE, a message including information that the WTRU is operating in the MICO mode;

storing, by the RE, the information that the WTRU is operating in the MICO mode in a context of the WTRU; and

halting, by the RE, a trigger of a change to an RRC inactive state for the WTRU based on the stored information in the context of the WTRU.

37. A Wireless Transmit/Receive Unit (WTRU) comprising: a processor, a transmitter and a receiver operatively communicating, and configured to execute the method of any one of claims 1 to 24.

38. A Network Entity (NE) comprising: a processor, a transmitter and a receiver operatively communicating, and configured to execute the method of any one of claims 25-35, wherein the NE includes any of: an AMF, a UPF, an SMF or a DN.

39. The RE comprising: a processor, a transmitter and a receiver operatively communicating, and configured to execute the method of claim 36, wherein the RE includes a gNB.