

CLAIMS

1. ~~— A method for wireless communication, comprising:~~

~~obtaining positioning information for a target device by a location server via a common positioning protocol, the location server residing at one of a plurality of possible entities and using the common positioning protocol regardless of where the location server resides, and the target device being one of the plurality of possible entities; and~~

~~determining location information for the target device by the location server.~~

2. ~~— The method of claim 1, wherein the positioning information comprises measurements for at least one reference source, and wherein the location information comprises a location estimate for the target device determined by the location server based on the measurements.~~

3. ~~— The method of claim 1, wherein the positioning information is indicative of location of the target device, and wherein the location information comprises assistance data determined by the location server based on the positioning information.~~

4. ~~— The method of claim 1, wherein the positioning information comprises measurements of reference sources that can be received at location of the target device, and wherein the location information comprises assistance data determined by the location server based on the positioning information.~~

5. ~~— The method of claim 1, wherein the location information comprises assistance data, and wherein the positioning information comprises measurements obtained based on the assistance data.~~

6. ~~— The method of claim 1, wherein the positioning information for the target device comprise measurements for at least one signal from at least one satellite, or at least one base station, or at least one terminal, or the target device, or a combination thereof.~~

7. ~~— The method of claim 1, wherein the location server resides in a network entity.~~

8. — ~~The method of claim 1, wherein the location server is co-located with the target device.~~

9. — ~~The method of claim 1, wherein the positioning information for the target device is obtained by a positioning unit residing at one of a second plurality of possible entities, the target device being one of the second plurality of possible entities.~~

10. — ~~The method of claim 9, further comprising:
communicating with the positioning unit by the location server via the common positioning protocol.~~

11. — ~~The method of claim 9, further comprising:
exchanging capabilities, or assistance data, or location information, or a combination thereof with the positioning unit via the common positioning protocol.~~

12. — ~~An apparatus for wireless communication, comprising:
means for obtaining positioning information for a target device by a location server via a common positioning protocol, the location server residing at one of a plurality of possible entities and using the common positioning protocol regardless of where the location server resides, and the target device being one of the plurality of possible entities; and
means for determining location information for the target device by the location server.~~

13. — ~~The apparatus of claim 12, wherein the positioning information for the target device is obtained by a positioning unit residing at one of a second plurality of possible entities, the target device being one of the second plurality of possible entities.~~

14. — ~~The apparatus of claim 13, further comprising:
means for exchanging capabilities, or assistance data, or location information, or a combination thereof with the positioning unit via the common positioning protocol.~~

15. — ~~An apparatus for wireless communication, comprising:~~

at least one processing unit configured to obtain positioning information for a target device by a location server via a common positioning protocol, and to determine location information for the target device by the location server, the location server residing at one of a plurality of possible entities and using the common positioning protocol regardless of where the location server resides, and the target device being one of the plurality of possible entities.

16.—The apparatus of claim 15, wherein the positioning information for the target device is obtained by a positioning unit residing at one of a second plurality of possible entities, the target device being one of the second plurality of possible entities.

17.—The apparatus of claim 16, wherein the at least one processing unit is configured to exchange capabilities, or assistance data, or location information, or a combination thereof with the positioning unit via the common positioning protocol.

18.—A computer readable medium, comprising:

~~code to cause at least one computer to obtain positioning information for a target device by a location server via a common positioning protocol, the location server residing at one of a plurality of possible entities and using the common positioning protocol regardless of where the location server resides, and the target device being one of the plurality of possible entities, and~~

~~code to cause the at least one computer to determine location information for the target device by the location server.~~

19.—A method for wireless communication, comprising:

~~sending positioning information for a target device to a location server via a common positioning protocol, the location server residing at one of a plurality of possible entities and using the common positioning protocol regardless of where the location server resides, the target device being one of the plurality of possible entities; and~~

~~receiving location information for the target device from the location server.~~

20.—The method of claim 19, wherein the sending positioning information and the receiving location information are performed by the target device.

21.—The method of claim 19, wherein the sending positioning information and the receiving location information are performed by a positioning unit external to the target device.

22.—~~The method of claim 19, further comprising:~~

~~measuring at least one signal from at least one reference source at the target device to obtain measurements for the target device, the at least one reference source comprising at least one satellite, or at least one base station, or at least one terminal, or a combination thereof, and the positioning information comprising the measurements.~~

23.—~~The method of claim 19, further comprising:~~

~~measuring a signal from the target device at a positioning unit to obtain measurements for the target device, the positioning unit being external to the target device, and the positioning information comprising the measurements.~~

24.—~~An apparatus for wireless communication, comprising:~~

~~means for sending positioning information for a target device to a location server via a common positioning protocol, the location server residing at one of a plurality of possible entities and using the common positioning protocol regardless of where the location server resides, the target device being one of the plurality of possible entities; and~~

~~means for receiving location information for the target device from the location server.~~

25.—~~The apparatus of claim 24, further comprising:~~

~~means for measuring at least one signal from at least one reference source at the target device to obtain measurements for the target device, the at least one reference source comprising at least one satellite, or at least one base station, or at least one terminal, or a combination thereof, and the positioning information comprising the measurements.~~

26.—~~The apparatus of claim 24, further comprising:~~

~~means for measuring a signal from the target device at a positioning unit to obtain measurements for the target device, the positioning unit being external to the target device, and the positioning information comprising the measurements.~~

27.—~~A method for wireless communication, comprising:~~

~~exchanging a plurality of positioning messages transported together in one message transaction; and~~

performing positioning based on the plurality of positioning messages.

28.—~~The method of claim 27, wherein the exchanging the plurality of positioning messages comprises sending the plurality of positioning messages as linked messages or in a single container message.~~

29.—~~The method of claim 27, wherein the exchanging the plurality of positioning messages comprises receiving the plurality of positioning messages sent as linked messages or in a single container message.~~

30.—~~The method of claim 27, wherein the plurality of positioning messages are sent with a mobile-originated location request (MO-LR) message by a target device to initiate positioning.~~

31.—~~The method of claim 27, wherein the plurality of positioning messages are sent by a location server and comprise a first positioning message carrying assistance data and a second positioning message requesting for location information.~~

32.—~~The method of claim 27, wherein the plurality of positioning messages are sent to a location server and comprise a first positioning message requesting for assistance data and a second positioning message carrying measurements.~~

33.—~~The method of claim 27, wherein each of the plurality of positioning messages is of one of a plurality of message types, the plurality of message types comprising a request capabilities message type, a provide capabilities message type, a request assistance data message type, a provide assistance data message type, a request location information message type, and a provide location information message type.~~

34.—~~The method of claim 27, wherein the plurality of positioning messages comprise positioning messages of at least two message types.~~

35.—~~An apparatus for wireless communication, comprising:
means for exchanging a plurality of positioning messages transported together in one message transaction; and~~

means for performing positioning based on the plurality of positioning messages.

~~36.—The apparatus of claim 35, wherein the means for exchanging the plurality of positioning messages comprises means for sending the plurality of positioning messages as linked messages or in a single container message.~~

~~37.—The apparatus of claim 35, wherein the means for exchanging the plurality of positioning messages comprises means for receiving the plurality of positioning messages sent as linked messages or in a single container message.~~

~~38.—The apparatus of claim 35, wherein the plurality of positioning messages are sent with a mobile originated location request (MO-LR) message by a target device to initiate positioning.~~

39.—A method for wireless communication, comprising:

exchanging a positioning message comprising a first part and a second part for a particular transaction type, the first part comprising first information for positioning defined by a first organization, and the second part comprising second information for positioning defined by a second organization; and

performing positioning based on the positioning message.

~~40.—The method of claim 39, wherein the exchanging the positioning message comprises sending the positioning message from a target device to a location server or from the location server to the target device.~~

~~41.—The method of claim 39, wherein the exchanging the positioning message comprises receiving the positioning message by a location server from a target device or by the target device from the location server.~~

~~42.—The method of claim 39, wherein the first organization comprises “3rd Generation Partnership Project” (3GPP), and wherein the second organization comprises “3rd Generation Partnership Project 2” (3GPP2), or Open Mobile Alliance (OMA), or Internet Engineering Task Force (IETF), or Institute of Electrical and Electronics Engineers (IEEE), or a network operator, or an equipment vendor.~~

43. — ~~An apparatus for wireless communication, comprising:~~

~~means for exchanging a positioning message comprising a first part and a second part for a particular transaction type, the first part comprising first information for positioning defined by a first organization, and the second part comprising second information for positioning defined by a second organization; and~~

~~means for performing positioning based on the positioning message.~~

44. — ~~The apparatus of claim 43, wherein the means for exchanging the positioning message comprises means for sending the positioning message from a target device to a location server or from the location server to the target device.~~

45. — ~~The apparatus of claim 43, wherein the means for exchanging the positioning message comprises means for receiving the positioning message by a location server from a target device or by the target device from the location server.~~

46. — ~~A method for wireless communication, comprising:~~

~~exchanging a measurement data unit applicable for a plurality of positioning methods, each of the plurality of positioning methods being associated with a different set of applicable measurement data units; and~~

~~performing positioning based on the exchanged measurement data unit and in accordance with a positioning method, the positioning method being one of the plurality of positioning methods.~~

47. — ~~A method for wireless communication, comprising:~~

~~exchanging an assistance data unit applicable for a plurality of positioning methods, each of the plurality of positioning methods being associated with a different set of applicable assistance data units; and~~

~~performing positioning based on the exchanged assistance data unit and in accordance with a positioning method, the positioning method being one of the plurality of positioning methods.~~

1. A method for positioning a target device, comprising: transmitting a Request Assistance Data message to a location server, the Request Assistance Data message indicating at least a first positioning method and a second positioning method from a plurality of supported positioning methods, wherein the Request Assistance Data message comprises a first field containing

information specific to the first positioning method, the second field containing common parameters, and a third field containing information specific to the second positioning method, wherein the common parameters are applicable to the first positioning method and the second positioning method and also applicable to all positioning methods indicated in the Request Assistance Data message, and wherein the common parameters comprise a serving cell identifier; receiving assistance data for the first positioning method and the second positioning method, the assistance data being sent in response to the Request Assistance Data message; and performing positioning based on the received assistance data.

2. The method of claim 1, wherein performing positioning based on the received assistance data comprises determining a location of the target device based on the received assistance data.

3. The method of claim 2, wherein the location of the target device is determined from at least one signal measurement performed based on the received assistance data.

4. The method of claim 3, wherein in response to receiving the Request Assistance Data message, the location server sends the assistance data to a device that performs the at least one signal measurement, and wherein the device that performs the at least one signal measurement is the target device or a positioning unit in communication with the target device.

5. The method of claim 3, wherein the assistance data is applicable for a serving cell identified by the serving cell identifier.

6. The method of claim 5, wherein the at least one signal measurement is performed with respect to a reference source associated with the identified serving cell.

7. The method of claim 1, wherein the plurality of supported positioning methods includes two or more of the following: an uplink time difference based positioning method, a downlink time difference based positioning method, a propagation time based positioning method, a signal direction based positioning method, a path loss based positioning method, and a radio frequency pattern matching positioning method.

8. The method of claim 1, wherein the Request Assistance Data message is one of a plurality of positioning messages exchanged between the location server and a sender of the Request Assistance Data message, and wherein the plurality of positioning messages comprises one or more of: a Request Capabilities message to request capabilities of a receiving entity for a positioning protocol and positioning methods, a Provide Capabilities message to provide capabilities of a sending entity for a positioning protocol and positioning methods, and a Provide Assistance Data message to provide assistance data.

9. The method of claim 8, further comprising: receiving a Request Capabilities message from the location server; and transmitting, in response to the Request Capabilities positioning message, capabilities of the target device to the location server in a Provide Capabilities message.

10. The method of claim 9, wherein the capabilities include an indication of one or more positioning methods supported by the target device and the capabilities of the target device for each positioning method supported by the target device.

11. The method of claim 1, wherein the common parameters included in the Request Assistance Data message further comprise an indication of whether periodic assistance data is requested, an indication of whether triggered assistance data is requested, a neighboring cell identifier, or a combination thereof.

12. An apparatus for positioning a target device, comprising: at least one processing unit; and a memory coupled to the at least one processing unit, the memory storing instructions that when executed by the at least one processing unit cause the at least one processing unit to: transmit a Request Assistance Data message to a location server, the Request Assistance Data message indicating at least a first positioning method and a second positioning method from a plurality of supported positioning methods, wherein the Request Assistance Data message comprises a first field containing information specific to the first positioning method, the second field containing common parameters, and a third field containing information specific to the second positioning method, wherein the common parameters are applicable to the first positioning method and the second positioning method and also applicable to all positioning methods indicated in the Request Assistance Data message, and wherein the common parameters comprise a serving cell identifier; receive assistance data for the first positioning method and the second positioning method, the assistance data being sent in response to the Request Assistance Data message; and perform positioning based on the received assistance data.

13. The apparatus of claim 12, wherein performing positioning based on the received assistance data comprises determining a location of the target device based on the received assistance data.

14. The apparatus of claim 13, wherein the location of the target device is determined from at least one signal measurement performed with respect to a reference source associated with a serving cell identified by the serving cell identifier.

15. The apparatus of claim 12, wherein the plurality of supported positioning methods includes two or more of the following: an uplink time difference based positioning method, a downlink time difference based positioning method, a propagation time based positioning method, a signal direction based positioning method, a path loss based positioning method, and a radio frequency pattern matching positioning method.

16. The apparatus of claim 12, wherein the Request Assistance Data message is one of a plurality of positioning messages exchanged between the location server and a sender of the Request Assistance Data message, and wherein the plurality of positioning messages comprises one or more of: a Request Capabilities message to request capabilities of a receiving entity for a positioning protocol and positioning methods, a Provide Capabilities message to provide

capabilities of a sending entity for a positioning protocol and positioning methods, and a Provide Assistance Data message to provide assistance data.

17. A non-transitory computer-readable medium storing instructions for positioning a target device, wherein the instructions when executed by the one or more processors cause the one or more processors to: transmit a Request Assistance Data message to a location server, the Request Assistance Data message indicating at least a first positioning method and a second positioning method from a plurality of supported positioning methods, wherein the Request Assistance Data message comprises a first field containing information specific to the first positioning method, the second field containing common parameters, and a third field containing information specific to the second positioning method, wherein the common parameters are applicable to the first positioning method and the second positioning method and also applicable to all positioning methods indicated in the Request Assistance Data message, and wherein the common parameters comprise a serving cell identifier; receive assistance data for the first positioning method and the second positioning method, the assistance data being sent in response to the Request Assistance Data message; and perform positioning based on the received assistance data.

18. The non-transitory computer-readable medium of claim 17, wherein performing positioning based on the received assistance data comprises determining a location of the target device based on the received assistance data.

19. The non-transitory computer-readable medium of claim 18, wherein the location of the target device is determined from at least one signal measurement performed with respect to a reference source associated with a serving cell identified by the serving cell identifier.

20. The non-transitory computer-readable medium of claim 17, wherein the plurality of supported positioning methods includes two or more of the following: an uplink time difference based positioning method, a downlink time difference based positioning method, a propagation time based positioning method, a signal direction based positioning method, a path loss based positioning method, and a radio frequency pattern matching positioning method.