Claims

What is claimed is:

~~1. A method comprising:~~

~~receiving, at an element or function in a communication network from user equipment of the communication network, a message comprising one or more privacy indicators; and~~

~~determining one or more privacy features for processing the message based on the one or more privacy indicators.~~

~~2. The method of claim 1, wherein the message comprises an attach request comprising a subscription identifier for a subscriber of the communication network associated with the user equipment, the one or more privacy indicators comprising a flag indicating whether the subscription identifier in the attach request is privacy protected.~~

~~3. The method of claim 2, wherein the privacy protected subscription identifier comprises at least a portion of a permanent subscription identifier of the subscriber.~~

~~4. The method of claim 2, wherein determining the one or more privacy features for processing the message based on the one or more privacy indicators comprises, responsive to the flag indicating that the subscription identifier is privacy protected, removing privacy protection from the subscription identifier in the attach request.~~

~~5. The method of claim 4, wherein the element or function in the communication network comprises a Server Location Function (SLF) that utilizes the subscription identifier to map the attach request to a Home Subscriber Server (HSS) or User Data Management (UDM) function.~~

~~6. The method of claim 2, wherein the privacy protected identifier that is encrypted utilizing a public key of a home network operator of the subscriber in the communication network.~~

~~7. An apparatus comprising a processor operatively coupled to a memory and configured to perform the method of claim 1.~~

~~8. A method comprising:~~

~~determining, at an element or function in a communication network, one or more privacy features supported by the communication network;~~

~~generating, at the element or function in the communication network, a message comprising one or more privacy indicators selected based on the determined one or more privacy features; and~~

~~sending, from the element or function in the communication network to user equipment of the communication network, the generated message comprising the one or more privacy indicators.~~

~~9. A method comprising:~~

~~determining, at user equipment of a communication network, one or more privacy features for processing a message;~~

~~adding one or more privacy indicators to the message based on the determined one or more privacy features; and~~

~~sending the message with the one or more privacy indicators from the user equipment to an element or function in the communication network.~~

~~10. A method comprising:~~

~~receiving, at user equipment of a communication network from an element or function in the communication network, a message comprising one or more privacy indicators; and~~

~~determining one or more privacy features supported by the communication network utilizing the one or more privacy indicators.~~

1. A method comprising:

receiving, at an element or function in a communication network, from user equipment of the communication network, a message comprising one or more privacy indicators, wherein the message comprises a registration request comprising a subscription

identifier for a subscriber of the communication network associated with the user equipment, the one or more privacy indicators comprising a field indicating whether the subscription identifier in the registration request is privacy-protected; and

in an instance in which the field indicates that the subscription identifier in the registration request is privacy-protected, processing the registration request in the message to remove privacy protection from the subscription identifier in the registration request.

2. The method of claim 1, further comprising:

identifying, based at least on the subscription identifier, after removing privacy protection from the subscription identifier in the registration request, at least one of a Home Subscriber Server (HSS) or a User Data Management (UDM) function to which to provide the registration request.

3. The method of claim 1, wherein the privacy-protected subscription identifier comprises at least a portion of a permanent subscription identifier of the subscriber.

4. The method of claim 1, wherein determining the one or more privacy features for processing the message based on the one or more privacy indicators comprises, responsive to the field indicating that the subscription identifier is privacy-protected, removing privacy protection from the subscription identifier in the registration request.

5. The method of claim 1, wherein the privacy-protected identifier that is encrypted utilizing a public key of a home network operator of the subscriber in the communication network.

6. An apparatus comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the apparatus to perform at least:

receiving, from user equipment, in a communication network, a message comprising one or more privacy indicators, wherein the message comprises a registration request comprising a subscription identifier for a subscriber of the communication network associated with the user equipment, the one or more privacy indicators comprising a field indicating whether the subscription identifier in the registration request is privacy-protected; and

in an instance in which the field indicates that the subscription identifier in the registration request is privacy-protected, processing the registration request in the message to remove privacy protection from the subscription identifier in the registration request.

7. The apparatus of claim 6, wherein the instructions, when executed by the at least one processor, further cause the apparatus to perform at least:

identifying, based at least on the subscription identifier, after removing privacy protection from the subscription identifier in the registration request, at least one of a Home Subscriber Server (HSS) or a User Data Management (UDM) function to which to provide the registration request.

8. The apparatus of claim 6, wherein the privacy-protected subscription identifier comprises at least a portion of a permanent subscription identifier of the subscriber.

9. The apparatus of claim 6, wherein determining the one or more privacy features for processing the message based on the one or more privacy indicators comprises, responsive to the field indicating that the subscription identifier is privacy-protected, removing privacy protection from the subscription identifier in the registration request.

10. The apparatus of claim 6, wherein the privacy-protected identifier that is encrypted utilizing a public key of a home network operator of the subscriber in the communication network.

11. The apparatus of claim 10, wherein the privacy-protected subscription identifier comprises at least a portion of a permanent subscription identifier of the subscriber.

12. The apparatus of claim 10, wherein determining the one or more privacy features for processing the message based on the one or more privacy indicators comprises, responsive to the field indicating that the subscription identifier is privacy-protected, removing privacy protection from the subscription identifier in the registration request.

13. The apparatus of claim 10, wherein the privacy-protected identifier that is encrypted utilizing a public key of a home network operator of the subscriber in the communication network.

14. An apparatus comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the apparatus to perform at least:

generating a message comprising a registration request, the message comprising a subscription identifier for a subscriber associated with the apparatus;

determining whether the subscription identifier in the message is to be privacy protected;

in an instance in which the subscription identifier in the message is to be privacy protected, privacy protecting the subscription identifier in the message, wherein the message comprises two or more privacy indicators that indicates whether the subscription identifier in the message is privacy protected, wherein at least one of the two or more privacy indicators resides in the algorithm scheme used, and wherein a first value of the privacy indicator indicates that the subscription identifier in the message is privacy protected;

in an instance in which the subscription identifier in the message is not to be privacy protected, refraining from privacy protecting the subscription identifier in the message, wherein the message comprises two or more privacy indicators that indicates whether the subscription identifier in the message in the registration request is privacy

protected, wherein at least one of the privacy indicators resides in the algorithm scheme used, wherein, a second value of the privacy indicator indicating that the subscription identifier in the message is not privacy protected; and wherein the second value is different from the first value, and

sending the message comprising the registration request to a network entity in a communication network.

15. The apparatus of claim 14, wherein the message is a second message, and wherein the instructions, when executed by the at least one processor, further cause the apparatus to perform:

receiving, from the network entity, a first message comprising an indication of whether the network entity or the communication network is configured to handle privacy-protected subscription identifiers;

determining, based at least upon the first message, whether the network entity in the communication network is configured for handling privacy-protected subscription identifiers; and

determining, based on whether the network entity is configured for handling privacy-protected subscription identifiers, whether the subscription identifier in the second message is to be privacy protected.

16. The apparatus of claim 15, wherein the instructions, when executed by the at least one processor, further cause the apparatus to perform:

prohibiting the apparatus from responding to a request for a real identity of a subscriber of the communication network associated with the apparatus based on whether the first message indicates that network entity is configured to handle privacy-protected subscription identifiers.

17. The apparatus of claim 16, wherein the request for the real identity of the subscriber comprises an International Mobile Subscriber Identity (IMSI) paging request.

18. The apparatus of claim 14, wherein the network entity in the communication network comprises one of: a Server Location Function (SLF), a Home Subscriber Server (HSS), or a User Data Management (UDM) function.

19. The apparatus of claim 15, wherein the first message comprises a System Information Message comprising a Master Information Block or a System Information Block, wherein one of the Master Information Block or the System Information Block comprises the indication of whether the network entity or the communication network is configured to handle privacy-protected subscription identifiers.

20. The apparatus of claim 14, wherein the message is operable to cause the network entity of the communication network to either remove privacy protection prior to identifying one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the registration request, or refrain from removing privacy protection prior to identifying one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the registration request.

21. The apparatus of claim 14, wherein the apparatus comprises a user equipment.

22. A method comprising:

generating, at a user equipment, a message comprising a registration request, the message comprising a subscription identifier for a subscriber associated with the user equipment;

determining whether the subscription identifier in the message is to be privacy protected;

in an instance in which the subscription identifier in the message is to be privacy protected, privacy protecting the subscription identifier in the message, wherein the message comprises two or more privacy indicators that indicates whether the subscription identifier in the message is privacy protected, wherein at least one of the two or more privacy indicators

resides in the algorithm scheme used, and wherein a first value of the privacy indicator indicates that the subscription identifier in the message is privacy protected;

in an instance in which the subscription identifier in the message is not to be privacy protected, refraining from privacy protecting the subscription identifier in the message, wherein the message comprises two or more privacy indicators that indicates whether the subscription identifier in the message in the registration request is privacy protected, wherein at least one of the privacy indicators resides in the algorithm scheme used, wherein, a second value of the privacy indicator indicating that the subscription identifier in the message is not privacy protected; and wherein the second value is different from the first value, and

sending the message comprising the registration request from the user equipment to a network entity in a communication network.

23. The method of claim 22, wherein the message is a second message, and wherein the method further comprises:

receiving, at the user equipment, from the network entity, a first message comprising an indication of whether the network entity or the communication network is configured to handle privacy-protected subscription identifiers;

determining, based at least upon the first message, whether the network entity in the communication network is configured for handling privacy-protected subscription identifiers; and

determining, based on whether the network entity is configured for handling privacy-protected subscription identifiers, whether the subscription identifier in the second message is to be privacy protected.

24. The method of claim 23, further comprising:

prohibiting the user equipment from responding to a request for a real identity of a subscriber of the communication network associated with the user equipment based on whether the first message indicates that network entity is configured to handle privacy-protected subscription identifiers.

25. The method of claim 24, wherein the request for the real identity of the subscriber comprises an International Mobile Subscriber Identity (IMSI) paging request.

26. The method of claim 22, wherein the network entity in the communication network comprises one of: a Server Location Function (SLF), a Home Subscriber Server (HSS), or a User Data Management (UDM) function.

27. The method of claim 23, wherein the first message comprises a System Information Message comprising a Master Information Block or a System Information Block, wherein one of the Master Information Block or the System Information Block comprises the indication of whether the network entity or the communication network is configured to handle privacy-protected subscription identifiers.

28. The method of claim 22, wherein the message is operable to cause the network entity of the communication network to either remove privacy protection prior to identifying one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the registration request, or refrain from removing privacy protection prior to identifying one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the registration request.

29. A method comprising:

determining, at a user equipment, based on a first message received at the user equipment from a network entity of a communication network, whether the network entity is configured to handle privacy-protected subscription identifiers in registration request messages;

generating, at the user equipment, a second message comprising a registration request, the second message comprising a subscription identifier for a subscriber of the communication network associated with the user equipment;

determining, based on the first message, whether the subscription identifier in the second message is to be privacy protected;

in an instance in which the subscription identifier in the second message is to be privacy protected,

privacy protecting the subscription identifier in the second message,

adding, to the second message, two or more privacy indicators comprising a field that indicates whether the subscription identifier in the second message is privacy protected, and

adding a first value to the field in the second message, the first value indicating that the subscription identifier in the second message is privacy protected;

in an instance in which the subscription identifier in the second message is not to be privacy protected,

refraining from privacy protecting the subscription identifier in the second message,

adding, to the second message, the two or more privacy indicators comprising the field that indicates whether the subscription identifier in the second message in the registration request is privacy protected, and

adding a second value to the field in the second message, the second value indicating that the subscription identifier in the second message is not privacy protected; and

sending the second message comprising the registration request from the user equipment to the network entity in the communication network.

30. The method of claim 29, wherein the message is a second message, the method further comprising:

receiving, at the user equipment, from the network entity, a first message comprising an indication of whether the network entity is configured to handle privacy-protected subscription identifiers;

determining, based at least upon the first message, whether the network entity in the communication network is configured for handling privacy-protected subscription identifiers; and

determining, based on whether the network entity is configured for handling privacy-protected subscription identifiers, whether the subscription identifier in the second message is

to be privacy protected.

31. The method of claim 29, further comprising:

prohibiting the user equipment from responding to a request for a real identity of a subscriber of the communication network associated with the user equipment based on whether the first message indicates that network entity is configured to handle privacy-protected subscription identifiers.

32. The method of claim 31, wherein the request for the real identity of the subscriber comprises an International Mobile Subscriber Identity (IMSI) paging request.

33. An apparatus comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the apparatus to perform at least:

determining, based on a first message received at the apparatus from a network entity of a communication network, whether the network entity is configured to handle privacy-protected subscription identifiers in registration request messages;

generating a second message comprising a registration request, the second message comprising a subscription identifier for a subscriber of the communication network associated with the apparatus;

determining, based on the first message, whether the subscription identifier in the second message is to be privacy protected;

in an instance in which the subscription identifier in the second message is to be privacy protected,

privacy protecting the subscription identifier in the second message,

adding, to the second message, two or more privacy indicators comprising a field that indicates whether the subscription identifier in the second message is privacy protected, and

adding a first value to the field in the second message, the first value

indicating that the subscription identifier in the second message is privacy protected;

in an instance in which the subscription identifier in the second message is not to be privacy protected,

refraining from privacy protecting the subscription identifier in the second message,

adding, to the second message, the two or more privacy indicators comprising the field that indicates whether the subscription identifier in the second message in the registration request is privacy protected, and

adding a second value to the field in the second message, the second value indicating that the subscription identifier in the second message is not privacy protected; and

sending the second message comprising the registration request to the network entity in the communication network.

34. The apparatus of claim 33, wherein the message is a second message, and wherein the instructions, when executed by the at least one processor, further cause the apparatus to perform at least:

receiving, from the network entity, a first message comprising an indication of whether the network entity is configured to handle privacy-protected subscription identifiers;

determining, based at least upon the first message, whether the network entity in the communication network is configured for handling privacy-protected subscription identifiers; and

determining, based on whether the network entity is configured for handling privacy-protected subscription identifiers, whether the subscription identifier in the second message is to be privacy protected.

35. The apparatus of claim 33, wherein the instructions, when executed by the at least one processor, further cause the apparatus to perform at least:

prohibiting the apparatus from responding to a request for a real identity of a subscriber of the communication network associated with the apparatus based on whether the

first message indicates that network entity is configured to handle privacy-protected subscription identifiers.

36. The apparatus of claim 35, wherein the request for the real identity of the subscriber comprises an International Mobile Subscriber Identity (IMSI) paging request.

37. A method comprising:

receiving, at a user equipment, from a network entity of a new radio standalone network, a system information message, the system information message indicating whether the network entity is configured to handle privacy-protected subscription identifiers in registration request messages;

determining, at the user equipment, based on the system information message received from the network entity, whether the network entity is configured to handle privacy-protected subscription identifiers in registration request messages;

generating, at the user equipment, a registration request message comprising a registration request and a subscription identifier for a subscriber of the new radio standalone network associated with the user equipment;

determining whether the subscription identifier in the registration request message is to be privacy protected;

in an instance in which the subscription identifier in the registration request message is to be privacy protected:

privacy protecting the subscription identifier in the registration request message,

adding a privacy indicator field to the registration request message that indicates whether the subscription identifier in the registration request message is privacy protected, and

setting the privacy indicator field to a first value that indicates that the subscription identifier in the registration request message is privacy protected in the registration request message;

in an instance in which the subscription identifier in the registration request message

is not to be privacy protected:

refraining from privacy protecting the subscription identifier in the registration request message,

adding the privacy indicator field to the registration request message that indicates whether the subscription identifier in the registration request message is privacy protected, and

setting the privacy indicator field to a second value that indicates that the subscription identifier in the registration request message is not privacy protected; and

sending, from the user equipment, to the network entity in the new radio standalone network, the registration request message comprising the registration request, the subscription identifier, and the privacy indicator field indicating whether the subscription identifier in the registration request message is privacy protected.

38. An apparatus comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the apparatus to perform at least:

receiving, from a network entity of a new radio standalone network, a system information message, the system information message indicating whether the network entity is configured to handle privacy-protected subscription identifiers in registration request messages;

determining, based on the system information message received from the network entity, whether the network entity is configured to handle privacy-protected subscription identifiers in registration request messages;

generating a registration request message comprising a registration request and a subscription identifier for a subscriber of the new radio standalone network associated with the apparatus;

determining whether the subscription identifier in the registration request message is to be privacy protected;

in an instance in which the subscription identifier in the registration request

message is to be privacy protected:

privacy protecting the subscription identifier in the registration request message,

adding a privacy indicator field to the registration request message that indicates whether the subscription identifier in the registration request message is privacy protected, and

setting the privacy indicator field to a first value that indicates that the subscription identifier in the registration request message is privacy protected in the registration request message;

in an instance in which the subscription identifier in the registration request message is not to be privacy protected:

refraining from privacy protecting the subscription identifier in the registration request message,

adding the privacy indicator field to the registration request message that indicates whether the subscription identifier in the registration request message is privacy protected, and

setting the privacy indicator field to a second value that indicates that the subscription identifier in the registration request message is not privacy protected; and

sending, to the network entity in the new radio standalone network, the registration request message comprising the registration request, the subscription identifier, and the privacy indicator field indicating whether the subscription identifier in the registration request message is privacy protected.

39. A method comprising:

determining, at a user equipment, based on a first message received at the user equipment from a network entity of a communication network, whether the communication network is configured to handle concealed subscription identifiers in registration request messages;

generating, at the user equipment, a second message comprising a registration request,

the second message comprising a subscription identifier for a subscriber of the communication network associated with the user equipment;

determining, at the user equipment, based on the first message received from the network entity, whether the subscription identifier in the second message is to be a concealed subscription identifier;

in an instance in which the subscription identifier in the second message is to be a concealed subscription identifier,

encrypting the subscription identifier in the second message,

adding, to the second message, two or more privacy indicators comprising a field, the field indicating whether the subscription identifier in the second message is a concealed subscription identifier, and

adding a first value to the field in the second message, the first value indicating that the subscription identifier in the second message is a concealed subscription identifier;

in an instance in which the subscription identifier in the second message is not to be a concealed subscription identifier,

refraining from encrypting the subscription identifier in the second message,

adding, to the second message, the two or more privacy indicators comprising the field that indicates whether the subscription identifier in the second message in the registration request is a concealed subscription identifier, and

adding a second value to the field in the second message, the second value indicating that the subscription identifier in the second message is not a concealed subscription identifier; and

sending the second message comprising the registration request to the network entity in the communication network.

40. An apparatus comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the apparatus to perform at least:

determining, based on a first message received at the apparatus from a network entity of a communication network, whether the network entity is configured to handle concealed subscription identifiers in registration request messages;

generating a second message comprising a registration request, the second message comprising a subscription identifier for a subscriber of the communication network associated with the apparatus;

determining, based on the first message, whether the subscription identifier in the second message is to be a concealed subscription identifier;

in an instance in which the subscription identifier in the second message is to be a concealed subscription identifier,

encrypting the subscription identifier in the second message,

adding, to the second message, two or more privacy indicators comprising a field, the field indicating whether the subscription identifier in the second message is a concealed subscription identifier, and

adding a first value to the field in the second message, the first value indicating that the subscription identifier in the second message is a concealed subscription identifier;

in an instance in which the subscription identifier in the second message is not to be a concealed subscription identifier,

refraining from encrypting the subscription identifier in the second message,

adding, to the second message, the two or more privacy indicators comprising the field that indicates whether the subscription identifier in the second message in the registration request is a concealed subscription identifier, and

adding a second value to the field in the second message, the second value indicating that the subscription identifier in the second message is not a concealed subscription identifier; and

sending the second message comprising the registration request to the network entity in the communication network.

41. A method comprising:

determining, at a network entity in a communication network, one or more privacy features supported by the communication network, the one or more privacy features comprising an indication of whether the communication network is configured to handle privacy-protected subscription identifiers;

generating, at the network entity in the communication network, a System Information Message comprising a Master Information Block or a System Information Block, the System Information Message further comprising one or more privacy indicators selected based on the determined one or more privacy features, the one or more privacy indicators comprising a field indicating whether the communication network is configured to handle the privacy-protected subscription identifiers;

sending, from the network entity, to the plurality of user equipment, the System Information Message comprising the one or more privacy indicators;

receiving, in response to the System Information Message, at the network entity, from at least a portion of the plurality of user equipment, one or more registration requests comprising respective privacy-protected subscription identifiers;

processing the one or more registration requests to determine respective subscription identifiers; and

identifying one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the one or more registration requests.

42. An apparatus comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the apparatus to perform at least:

determining one or more privacy features supported by a communication network in which the apparatus operates, the one or more privacy features comprising an indication of whether the communication network is configured to handle privacy-protected subscription identifiers;

generating a System Information Message comprising a Master Information

Block or a System Information Block, the System Information Message further comprising one or more privacy indicators selected based on the determined one or more privacy features, the one or more privacy indicators comprising a field indicating whether the communication network is configured to handle the privacy-protected subscription identifiers;

sending, to user equipment of the communication network, the System Information Message comprising the one or more privacy indicators;

receiving, in response to the System Information Message, from at least a portion of the user equipment, one or more registration requests comprising respective privacy-protected subscription identifiers;

processing the one or more registration requests to determine respective subscription identifiers of the user equipment; and

identifying one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the one or more registration requests.

43. A non-transitory processor-readable storage medium having embodied therein executable program code that when executed by a processor causes the processor to at least:

determine, at a network entity in a communication network, one or more privacy features supported by the communication network, the one or more privacy features comprising an indication of whether the network entity is configured to handle privacy-protected subscription identifiers;

generate, at the network entity in the communication network, a System Information Message comprising a Master Information Block or a System Information Block, the System Information Message further comprising one or more privacy indicators selected based on the determined one or more privacy features, the one or more privacy indicators comprising a field indicating whether the communication network is configured to handle the privacy-protected subscription identifiers;

send, from the network entity in the communication network to the plurality of user equipment of the communication network, the System Information Message comprising the

one or more privacy indicators;

receive, in response to the System Information Message, at the network entity, from at least a portion of the plurality of user equipment, one or more registration requests comprising respective privacy-protected subscription identifiers;

process the one or more registration requests to determine respective subscription identifiers; and

identify one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the one or more registration requests.

44. A method comprising:

receiving, from a network entity in a communication network, at user equipment of the communication network, a first message comprising an indication of one or more privacy features of the communication network, wherein the indication of one or more privacy features of the communication network comprises a first field indicating whether the communication network is configured to handle privacy-protected subscription identifiers;

determining, at the user equipment of the communication network, based at least on the indication comprising the first field, the one or more privacy features of the communication network for processing a second message, the second message comprising a registration request and a subscription identifier for a subscriber of the communication network associated with the user equipment;

in an instance in which the first field in the first message indicates that the communication network is not configured to handle privacy-protected subscription identifiers, refraining from privacy protecting the subscription identifier in the second message;

in an instance in which the first field in the first message indicates that the communication network is configured to handle privacy-protected subscription identifiers, privacy-protecting the subscription identifier in the second message;

adding one or more privacy indicators to the second message based on the determined one or more privacy features of the communication network, the one or more privacy indicators comprising a second field indicating whether the subscription identifier in the

registration request is privacy-protected,

wherein, in an instance in which the second field comprises a first value, the second field indicates that the subscription identifier in the registration request is not privacy-protected, and, in an instance in which the second field comprises a second value, the second field indicates that the subscription identifier in the registration request is privacy-protected; and

sending the second message from the user equipment to the network entity in the communication network.

45. An apparatus comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the apparatus to perform at least:

receiving, from a network entity in a communication network, a first message comprising an indication of one or more privacy features of the communication network, wherein the indication of one or more privacy features of the communication network comprises a first field indicating whether the communication network is configured to handle privacy-protected subscription identifiers;

determining, based at least on the indication comprising the first field, the one or more privacy features of the communication network for processing a second message, the second message comprising a registration request and a subscription identifier for a subscriber of the communication network associated with the user equipment;

in an instance in which the first field in the first message indicates that the communication network is not configured to handle privacy-protected subscription identifiers, refraining from privacy protecting the subscription identifier in the second message;

in an instance in which the first field in the first message indicates that the communication network is configured to handle privacy-protected subscription identifiers, privacy-protecting the subscription identifier in the second message;

adding one or more privacy indicators to the second message based on the

determined one or more privacy features of the communication network, the one or more privacy indicators comprising a second field indicating whether the subscription identifier in the registration request is privacy-protected,

wherein, in an instance in which the second field comprises a first value, the second field indicates that the subscription identifier in the registration request is not privacy-protected, and, in an instance in which the second field comprises a second value, the second field indicates that the subscription identifier in the registration request is privacy-protected; and

sending the second message from the user equipment to the network entity in the communication network.

46. A non-transitory processor-readable storage medium having embodied therein executable program code that when executed by a processor causes the processor to at least:

receiving, from a network entity in a communication network, at user equipment of the communication network, a first message comprising an indication of one or more privacy features of the communication network, wherein the indication of one or more privacy features of the communication network comprises a first field indicating whether the communication network is configured to handle privacy-protected subscription identifiers;

determining, at the user equipment of the communication network, based at least on the indication comprising the first field, the one or more privacy features of the communication network for processing a second message, the second message comprising a registration request and a subscription identifier for a subscriber of the communication network associated with the user equipment;

in an instance in which the first field in the first message indicates that the communication network is not configured to handle privacy-protected subscription identifiers, refraining from privacy protecting the subscription identifier in the second message;

in an instance in which the first field in the first message indicates that the communication network is configured to handle privacy-protected subscription identifiers, privacy-protecting the subscription identifier in the second message;

adding one or more privacy indicators to the second message based on the determined one or more privacy features of the communication network, the one or more privacy indicators comprising a second field indicating whether the subscription identifier in the registration request is privacy-protected,

wherein, in an instance in which the second field comprises a first value, the second field indicates that the subscription identifier in the registration request is not privacy-protected, and, in an instance in which the second field comprises a second value, the second field indicates that the subscription identifier in the registration request is privacy-protected; and

sending the second message from the user equipment to the network entity in the communication network.

47. A method comprising:

receiving, at user equipment of a communication network, from a network entity in the communication network, a System Information Message comprising a Master Information Block or a System Information Block, the System Information Message further comprising an indication of whether the network entity requests or requires that subscription identifiers be privacy-protected in registration request messages transmitted to the network entity;

generating, at the user equipment, a registration request message comprising a registration request and a subscription identifier for a subscriber of the communication network associated with the user equipment;

in an instance in which the indication in the System Information Message is that the network entity requests or requires that subscription identifiers be privacy-protected in registration request messages to the network entity, privacy protecting the subscription identifier in the registration request message; or

in an instance in which the indication in the System Information Message is that subscription identifiers in registration request messages to the network entity need not be privacy-protected, refraining from privacy protecting the subscription identifier in the registration request message; and

transmitting the registration request message towards the network entity in the communication network.

48. An apparatus comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the apparatus to perform at least:

receiving, from a network entity in a communication network, a System Information Message comprising a Master Information Block or a System Information Block, the System Information Message further comprising an indication of whether the network entity requests or requires that subscription identifiers in registration request messages to the network entity be privacy-protected;

generating a registration request message comprising a registration request and a subscription identifier for a subscriber of the communication network associated with the apparatus;

in an instance in which the indication in the System Information Message is that the network entity requests or requires that subscription identifiers be privacy-protected in registration request messages to the network entity, privacy protecting the subscription identifier in the registration request message; or

in an instance in which the System Information Message comprises an indication that subscription identifiers in registration request messages to the network entity need not be privacy-protected, refraining from privacy protecting the subscription identifier in the registration request message; and

transmitting the registration request message towards the network entity in the communication network.

49. A non-transitory processor-readable storage medium having embodied therein executable program code that, when executed by a processor, causes the processor to perform at least:

receiving, at user equipment of a communication network, from a network entity in

the communication network, a System Information Message comprising a Master Information Block or a System Information Block, the System Information Message further comprising an indication of whether the network entity requests or requires that subscription identifiers in registration request messages to the network entity be privacy-protected;

generating, at the user equipment, a registration request message comprising a registration request and a subscription identifier for a subscriber of the communication network associated with the user equipment;

in an instance in which the System Information Message comprises an indication that the network entity requests or requires that subscription identifiers in registration request messages to the network entity be privacy-protected, privacy protecting the subscription identifier in the registration request message; or

in an instance in which the System Information Message comprises an indication that subscription identifiers in registration request messages to the network entity need not be privacy-protected, refraining from privacy protecting the subscription identifier in the registration request message; and

transmitting the registration request message towards the network entity in the communication network.

50. A method comprising:

receiving, at user equipment, from a network entity in a communication network, a first message comprising one or more privacy indicators, the one or more privacy indicators comprising a first field, the first field indicating whether the network entity is configured to handle privacy-protected subscription identifiers;

determining, in an instance in which the first field in the first message comprises a first value, that the network entity is configured to handle privacy-protected subscription identifiers; or

determining, in an instance in which the first field in the first message comprises a second value, that the network entity is not configured to handle privacy-protected subscription identifiers;

generating a second message comprising a registration request and one or more

subscription identifiers;

in an instance in which the first field in the first message comprises the first value and indicates that the network entity is configured to handle privacy-protected subscription identifiers, privacy protecting the one or more subscription identifiers in the second message; or

in an instance in which the first field in the first message comprises the second value and indicates that the network entity is not configured to handle privacy-protected subscription identifiers, refraining from privacy protecting the one or more subscription identifiers in the second message;

adding, to the second message, a second field, the second field indicating whether the one or more subscription identifiers in the second message are privacy protected; and

transmitting, from the user equipment, towards the network entity, the second message comprising the registration request, the one or more subscription identifiers, and the second field indicating whether the one or more subscription identifiers are privacy protected.

51. An apparatus comprising:

a processor; and

a memory, the processor being operatively coupled to the memory and configured to at least:

receive, from a network entity in a communication network, a first message comprising one or more privacy indicators, the one or more privacy indicators comprising a first field, the first field indicating whether the network entity is configured to handle privacy-protected subscription identifiers;

determine, in an instance in which the first field in the first message comprises a first value, that the network entity is configured to handle privacy-protected subscription identifiers; or

determine, in an instance in which the first field in the first message comprises a second value, that the network entity is not configured to handle privacy-protected subscription identifiers;

generate a second message comprising a registration request and one or more

subscription identifiers;

in an instance in which the first field in the first message indicates that the network entity is configured to handle privacy-protected subscription identifiers, privacy protect the one or more subscription identifiers in the second message; or

in an instance in which the first field in the first message indicates that the network entity is not configured to handle privacy-protected subscription identifiers, refrain from privacy protecting the one or more subscription identifiers in the second message;

add, to the second message, a second field that indicates whether the one or more subscription identifiers in the second message are privacy protected; and

transmit, towards the network entity, the second message comprising the registration request, the one or more subscription identifiers, and the second field indicating whether the one or more subscription identifiers are privacy protected.

52. A non-transitory processor-readable storage medium having embodied therein executable program code that, when executed by a processor, causes the processor to at least:

receive, at user equipment, from a network entity in a communication network, a first message comprising one or more privacy indicators, the one or more privacy indicators comprising a first field, the first field indicating whether the network entity is configured to handle privacy-protected subscription identifiers;

determine, in an instance in which the first field in the first message comprises a first value, that the network entity is configured to handle privacy-protected subscription identifiers; or

determine, in an instance in which the first field in the first message comprises a second value, that the network entity is not configured to handle privacy-protected subscription identifiers;

generate a second message comprising a registration request and one or more subscription identifiers;

in an instance in which the first field in the first message indicates that the network entity is configured to handle privacy-protected subscription identifiers, privacy protect the one or more subscription identifiers in the second message; or

in an instance in which the first field in the first message indicates that the network entity is not configured to handle privacy-protected subscription identifiers, refrain from privacy protecting the one or more subscription identifiers in the second message; and

transmit, from the user equipment, towards the network entity, the second message comprising the registration request, the one or more subscription identifiers, and the second field indicating whether the one or more subscription identifiers are privacy protected.

53. A method comprising:

determining, at a network entity in a communication network, whether the network entity is configured to handle privacy-protected subscription identifiers;

generating, at the network entity, a System Information Message comprising one or more privacy indicators, the one or more privacy indicators comprising a field, the field comprising a first value if the network entity is configured to handle privacy-protected subscription identifiers or a second value if the network entity is not configured to handle privacy-protected subscription identifiers;

sending, from the network entity, towards user equipment in the communication network, the System Information Message comprising the one or more privacy indicators;

receiving, at the network entity, from a particular user equipment, a registration request comprising a subscription identifier for a subscriber associated with the particular user equipment;

in an instance in which the field in the System Information Message comprises the first value and the subscription identifier in the registration request is privacy-protected, processing the registration request to determine the subscription identifier; and

identifying one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the registration request; or

in an instance in which the field in the System Information Message comprises the second value and the subscription identifier in the registration request is privacy-protected, providing a registration reject message to the particular user equipment.

54. The method of claim 53, wherein, in an instance in which the field in the System

Information Message comprises the first value, the subscription identifier in the registration request is expected by the network entity to be privacy-protected.

55. The method of claim 53, wherein, in an instance in which the field in the System Information Message comprises the second value, the subscription identifier in the registration request is expected by the network entity to be privacy unprotected.

56. An apparatus comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the apparatus to perform at least:

determining whether a communication network in which the apparatus operates is configured to handle privacy-protected subscription identifiers from user equipment;

generating a System Information Message comprising one or more privacy indicators, the one or more privacy indicators comprising a field, the field comprising a first value if the communication network is configured to handle privacy-protected subscription identifiers or a second value if the communication network is not configured to handle privacy-protected subscription identifiers;

sending, to the user equipment in the communication network, the System Information Message comprising the one or more privacy indicators;

receiving, from a particular user equipment, a registration request comprising a subscription identifier for a subscriber associated with the particular user equipment;

in an instance in which the field in the System Information Message comprises the first value and the subscription identifier in the registration request is privacy-protected, processing the registration request to determine the subscription identifier for the subscriber associated with the particular user equipment; and

identifying one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the registration request; or

in an instance in which the field in the System Information Message comprises

the second value and the subscription identifier in the registration request is privacy-protected, providing a registration reject message to the particular user equipment.

57. The apparatus of claim 56, wherein, in an instance in which the field in the System Information Message comprises the first value, the apparatus is configured to expect the subscription identifier in the registration request to be privacy-protected.

58. The apparatus of claim 56, wherein, in an instance in which the field in the System Information Message comprises the second value, the apparatus is configured to expect the subscription identifier in the registration request to be privacy unprotected.

59. A non-transitory processor-readable storage medium having embodied therein executable program code that when executed by a processor causes the processor to perform at least:

determining whether a communication network is configured to handle privacy-protected subscription identifiers;

generating a System Information Message comprising one or more privacy indicators, the one or more privacy indicators comprising a field, the field comprising a first value if the communication network is configured to handle privacy-protected subscription identifiers or a second value if the communication network is not configured to handle privacy-protected subscription identifiers;

transmitting, towards user equipment in the communication network, the System Information Message comprising the one or more privacy indicators;

receiving, from a particular user equipment, a registration request comprising a subscription identifier for a subscriber associated with the particular user equipment;

in an instance in which the field in the System Information Message comprises the first value and the subscription identifier in the registration request from the particular user equipment is privacy-protected, processing the registration request to determine the subscription identifier; and

identifying one or more Home Subscriber Servers (HSS) or one or more User Data

Management (UDM) functions to which to provide the registration request; or

in an instance in which the field in the System Information Message comprises the second value and the subscription identifier in the registration request is privacy-protected, provide a registration reject message to the particular user equipment.

60. The non-transitory processor-readable storage medium of claim 59, wherein, in an instance in which the field in the System Information Message comprises the first value, the subscription identifier in the registration request is expected to be privacy protected.

61. The non-transitory processor-readable storage medium of claim 59, wherein, in an instance in which the field in the System Information Message comprises the second value, the subscription identifier in the registration request is expected to be privacy unprotected.

62. A method comprising:

generating, at a user equipment, a message comprising a registration request and one or more subscription identifiers associated with the user equipment;

adding, to the message, two or more privacy indicators, the two or more privacy indicators comprising a field that indicates whether subscription identifiers in the message are privacy protected;

in an instance in which the user equipment determines that the one or more subscription identifiers should be privacy protected in the message, privacy protecting the one or more subscription identifiers in the message and setting a value of the field to a first value indicating that the one or more subscription identifiers in the message are privacy protected; or

in an instance in which the user equipment determines that the one or more subscription identifiers should not be privacy protected in the message, refraining from privacy protecting the one or more subscription identifiers in the message and setting the value of the field to a second value indicating that the one or more subscription identifiers in the message are not privacy protected; and

transmitting, from the user equipment, towards a network entity of the communication

system, the message comprising the registration request, the one or more subscription identifiers, and the two or more privacy indicators comprising the field indicating whether the one or more subscription identifiers in the message are privacy protected.

63. An apparatus comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the apparatus to perform at least:

generating a message comprising a registration request and one or more subscription identifiers associated with the apparatus;

adding, to the message, two or more privacy indicators, the two or more privacy indicators comprising a field that indicates whether subscription identifiers in the message are privacy protected;

in an instance in which the apparatus determines that the one or more subscription identifiers should be privacy protected in the message, privacy protecting the one or more subscription identifiers in the message and setting a value of the field to a first value indicating that the one or more subscription identifiers in the message are privacy protected; or

in an instance in which the apparatus determines that the one or more subscription identifiers should not be privacy protected in the message, refraining from privacy protecting the one or more subscription identifiers in the message and setting the value of the field to a second value indicating that the one or more subscription identifiers in the message are not privacy protected; and

transmitting, towards a network entity of the communication system, the message comprising the registration request, the one or more subscription identifiers, and the two or more privacy indicators comprising the field indicating whether the one or more subscription identifiers in the message are privacy protected.

64. A non-transitory processor-readable storage medium having embodied therein executable program code that, when executed by a processor, causes the processor to at least:

generating, at a user equipment, a message comprising a registration request and one or more subscription identifiers associated with the user equipment;

adding, to the message, two or more privacy indicators, the two or more privacy indicators comprising a field that indicates whether subscription identifiers in the message are privacy protected;

in an instance in which the user equipment determines that the one or more subscription identifiers should be privacy protected in the message, privacy protecting the one or more subscription identifiers in the message and setting a value of the field to a first value indicating that the one or more subscription identifiers in the message are privacy protected; or

in an instance in which the user equipment determines that the one or more subscription identifiers should not be privacy protected in the message, refraining from privacy protecting the one or more subscription identifiers in the message and setting the value of the field to a second value indicating that the one or more subscription identifiers in the message are not privacy protected; and

transmitting, from the user equipment, towards a network entity of the communication system, the message comprising the registration request, the one or more subscription identifiers, and the two or more privacy indicators comprising the field indicating whether the one or more subscription identifiers in the message are privacy protected.

65. An apparatus comprising:

at least one processor; and

at least one memory storing instructions that, when executed by the at least one processor, cause the apparatus to perform at least:

generating a message comprising a registration request, the message comprising a subscription identifier for a subscriber associated with the apparatus;

determining whether the subscription identifier in the message is to be privacy protected;

in an instance in which the subscription identifier in the message is to be privacy protected, privacy protecting the subscription identifier in the message, wherein the

message comprises two or more privacy indicators that indicates whether the subscription identifier in the message is privacy protected, wherein at least one of the two or more privacy indicators resides in the algorithm scheme used, and wherein a first value of the privacy indicator indicates that the subscription identifier in the message is privacy protected;

in an instance in which the subscription identifier in the message is not to be privacy protected, refraining from privacy protecting the subscription identifier in the message, wherein the message comprises two or more privacy indicators that indicates whether the subscription identifier in the message in the registration request is privacy protected, wherein at least one of the privacy indicators resides in the algorithm scheme used, wherein, a second value of the privacy indicator indicating that the subscription identifier in the message is not privacy protected; and wherein the second value is different from the first value, and

sending the message comprising the registration request to a network entity in a communication network.

66. The apparatus of claim 65, wherein the message is a second message, and wherein the instructions, when executed by the at least one processor, further cause the apparatus to perform:

receiving, from the network entity, a first message comprising an indication of whether the network entity or the communication network is configured to handle privacy-protected subscription identifiers;

determining, based at least upon the first message, whether the network entity in the communication network is configured for handling privacy-protected subscription identifiers; and

determining, based on whether the network entity is configured for handling privacy-protected subscription identifiers, whether the subscription identifier in the second message is to be privacy protected.

67. The apparatus of claim 66, wherein the instructions, when executed by the at least one processor, further cause the apparatus to perform:

prohibiting the apparatus from responding to a request for a real identity of a subscriber of the communication network associated with the apparatus based on whether the first message indicates that network entity is configured to handle privacy-protected subscription identifiers.

68. The apparatus of claim 67, wherein the request for the real identity of the subscriber comprises an International Mobile Subscriber Identity (IMSI) paging request.

69. The apparatus of claim 65, wherein the network entity in the communication network comprises one of: a Server Location Function (SLF), a Home Subscriber Server (HSS), or a User Data Management (UDM) function.

70. The apparatus of claim 66, wherein the first message comprises a System Information Message comprising a Master Information Block or a System Information Block, wherein one of the Master Information Block or the System Information Block comprises the indication of whether the network entity or the communication network is configured to handle privacy-protected subscription identifiers.

71. The apparatus of claim 65, wherein the message is operable to cause the network entity of the communication network to either remove privacy protection prior to identifying one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the registration request, or refrain from removing privacy protection prior to identifying one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the registration request.

72. The apparatus of claim 65, wherein the apparatus comprises a user equipment.

73. A method comprising:

generating, at a user equipment, a message comprising a registration request, the message comprising a subscription identifier for a subscriber associated with the user equipment;

determining whether the subscription identifier in the message is to be privacy protected;

in an instance in which the subscription identifier in the message is to be privacy protected, privacy protecting the subscription identifier in the message, wherein the message comprises two or more privacy indicators that indicates whether the subscription identifier in the message is privacy protected, wherein at least one of the two or more privacy indicators resides in the algorithm scheme used, and wherein a first value of the privacy indicator indicates that the subscription identifier in the message is privacy protected;

in an instance in which the subscription identifier in the message is not to be privacy protected, refraining from privacy protecting the subscription identifier in the message, wherein the message comprises two or more privacy indicators that indicates whether the subscription identifier in the message in the registration request is privacy protected, wherein at least one of the privacy indicators resides in the algorithm scheme used, wherein, a second value of the privacy indicator indicating that the subscription identifier in the message is not privacy protected; and wherein the second value is different from the first value, and

sending the message comprising the registration request from the user equipment to a network entity in a communication network.

74. The method of claim 73, wherein the message is a second message, and wherein the method further comprises:

receiving, at the user equipment, from the network entity, a first message comprising an indication of whether the network entity or the communication network is configured to handle privacy-protected subscription identifiers;

determining, based at least upon the first message, whether the network entity in the communication network is configured for handling privacy-protected subscription identifiers; and

determining, based on whether the network entity is configured for handling privacy-protected subscription identifiers, whether the subscription identifier in the second message is to be privacy protected.

75. The method of claim 74, further comprising:

prohibiting the user equipment from responding to a request for a real identity of a subscriber of the communication network associated with the user equipment based on whether the first message indicates that network entity is configured to handle privacy-protected subscription identifiers.

76. The method of claim 75, wherein the request for the real identity of the subscriber comprises an International Mobile Subscriber Identity (IMSI) paging request.

77. The method of claim 73, wherein the network entity in the communication network comprises one of: a Server Location Function (SLF), a Home Subscriber Server (HSS), or a User Data Management (UDM) function.

78. The method of claim 74, wherein the first message comprises a System Information Message comprising a Master Information Block or a System Information Block, wherein one of the Master Information Block or the System Information Block comprises the indication of whether the network entity or the communication network is configured to handle privacy-protected subscription identifiers.

79. The method of claim 73, wherein the message is operable to cause the network entity of the communication network to either remove privacy protection prior to identifying one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the registration request, or refrain from removing privacy protection prior to identifying one or more Home Subscriber Servers (HSS) or one or more User Data Management (UDM) functions to which to provide the registration request.