(evolved Node B) in an LTE network. The access point (e.g., gNB/eNB) is illustratively part of an access network of the communication system. For example, in a 5G network, the access network is referred to as a 5G System and is described in 5G Technical Specification (TS) 23.501, V0.4.0, entitled "Technical Specification Group Services and System Aspects; System Architecture for the 5G System," the disclosure of which is incorporated by reference herein in its entirety. In an LTE network, the access network is an Evolved Universal Terrestrial Radio Access Network (E-UTRAN). In general, the access point (e.g., gNB/eNB) provides access for the UE to a core network (CN), which then provides access for the UE to other UEs and/or a data network such as a packet data network (e.g., Internet).

Privacy is an important consideration in any communication system. Privacy is broadly addressed in 5G Technical Report (TR) 33.899, V1.1.0, entitled "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Study on the security aspects of the next generation system (Release 14)," the disclosure of which is incorporated by reference herein in its entirety. In particular, TR 33.899 identifies subscription (UE) privacy as one of the most important security areas to be addressed in 5G networks.

Summary

Illustrative embodiments provide one or more privacy indicators for controlling authentication requests in communication systems.

In an aspect, there is a method comprising:

receiving, at an element or function in a fifth-generation (5G) communication network from user equipment of the 5G 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,

wherein the message comprises a registration request comprising a subscription identifier for a subscriber of the 5G 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, 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 Flome Subscriber Server (HSS) or User Data Management (UDM) function. In an aspect, there is a method comprising:

determining, at an element or function in a fifth-generation (5G) communication network, one or more privacy features supported by the 5G communication network, the one or more privacy features indicative of whether the element or function is configured to handle privacy-protected subscription identifiers;

generating, at the element or function in the 5G communication network, a broadcast message 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 element or function is configured to handle privacy-protected subscription identifiers; and

sending, from the element or function in the 5G communication network, to a plurality of user equipment of the communication network, the generated broadcast message comprising the one or more privacy indicators , 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 Flome Subscriber Server (HSS) or User Data Management (UDM) function. In an aspect, there is a method comprising:

receiving, from an element or function in a fifth-generation (5G) communication network, at user equipment of the 5G communication network, a broadcast message comprising one or more indications of one or more privacy features of the 5G communication network;

determining, at the user equipment, based upon the broadcast message, the one or more privacy features for processing a message, the one or more privacy features being indicative of whether the element or function in the 5G communication network is configured to handle privacy-protected subscription identifiers, the message comprising a registration request comprising a subscription identifier for a subscriber of the 5G communication network associated with the user equipment;

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

sending the message with the one or more privacy indicators from the user equipment to the element or function in the 5G communication network ,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 Flome Subscriber Server (HSS) or User Data Management (UDM) function. In an aspect, there is a method comprising:

receiving, at user equipment of a fifth-generation (5G) communication network from an element or function in the 5G communication network, a broadcast message comprising one or more privacy indicators, said one or more privacy indicators comprising a field indicating whether the network entity in the 5G communication network is configured to handle privacy-protected subscription identifiers;

determining, based at least upon the one or more privacy indicators in the broadcast message, one or more privacy features supported by the 5G communication network, the one or more privacy features comprising an ability of the 5G communication network to handle privacy-protected subscription identifiers;

in an instance in which the 5G communication network is configured to handle privacy-protected subscription identifiers, adding, to a message comprising a registration request comprising a subscription identifier for a subscriber of the 5G communication network associated with the user equipment, an indication that the subscription identifier in the registration request is privacy-protected; and

sending the message from the user equipment to the element or function in the 5G communication network, 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 Flome Subscriber Server (HSS) or User Data Management (UDM) function.

For example, in one embodiment, a method comprises 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.

The message may comprise 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. The privacy-protected subscription identifier may comprise at least a portion of a permanent subscription identifier of the subscriber.

Claims

What is claimed is:

1. A method comprising:

receiving, at an element or function in a fifth-generation (5G) communication network from user equipment of the 5G 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,

wherein the message comprises a registration request comprising a subscription identifier for a subscriber of the 5G 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, 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 Flome Subscriber Server (HSS) or User Data Management (UDM) function.

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

3. 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.

4. The method of claim 3, wherein the element or function in the 5G communication network comprises a Server Location Function (SLF) that utilizes the subscription identifier to map the registration request to a Home Subscriber Server (HSS) or User Data Management (UDM) function.

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 5G communication network.

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

7. A method comprising:

determining, at an element or function in a fifth- generation (5G) communication network, one or more privacy features supported by the 5G communication network, the one or more privacy features indicative of whether the element or function is configured to handle privacy-protected subscription identifiers;

generating, at the element or function in the 5G communication network, a broadcast message 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 element or function is configured to handle privacy-protected subscription identifiers; and

sending, from the element or function in the 5G communication network, to a plurality of user equipment of the 5G communication network, the generated broadcast message comprising the one or more privacy indicators ,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 Flome Subscriber Server (HSS) or User Data Management

(UDM) function.

8. The method of claim 7, further comprising:

receiving, in response to the generated broadcast message, at the element or function, from one or more 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, based on the processed one or more registration requests, 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.

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

10. A method comprising:

receiving, from an element or function in a fifth-generation communication network, at user equipment of the communication network, a broadcast message comprising one or more indications of one or more privacy features of the 5G communication network;

determining, at the user equipment, based upon the broadcast message, the one or more privacy features for processing a message, the one or more privacy features being indicative of whether the element or function in the 5G communication network is configured to handle privacy-protected subscription identifiers, the message comprising a registration request comprising a subscription identifier for a subscriber of the 5G communication network associated with the user equipment;

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

sending the message with the one or more privacy indicators from the user equipment to the element or function in the 5G communication network, 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 Flome Subscriber Server (HSS) or User Data Management (UDM) function.

11. An apparatus comprising a processor operatively coupled to a memory and configured to perform the method of claim 10.

12. A method comprising:

receiving, at user equipment of a fifth-generation (5G) communication network from an element or function in the 5G communication network, a broadcast message comprising one or more privacy indicators, said one or more privacy indicators comprising a field indicating whether the network entity in the 5G communication network is configured to handle privacy-protected subscription identifiers;

determining, based at least upon the one or more privacy indicators in the broadcast message, one or more privacy features supported by the 5G communication network, the one or more privacy features comprising an ability of the 5G communication network to handle privacy-protected subscription identifiers;

in an instance in which the 5G communication network is configured to handle privacy-protected subscription identifiers, adding, to a message comprising a registration request comprising a subscription identifier for a subscriber of the 5G communication network associated with the user equipment, an indication that the subscription identifier in the registration request is privacy-protected; and

sending the message from the user equipment to the element or function in the 5G communication network, 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 Flome Subscriber Server (HSS) or User Data Management (UDM) function.

13. The method of claim 12, further comprising:

in an instance in which the 5G communication network is not configured to handle privacy-protected subscription identifiers, adding, to the message comprising the registration request comprising the subscription identifier for the subscriber of the 5G communication network associated with the user equipment, an indication that the subscription identifier in the registration request is not privacy protected.

14. The method of claim 12, further comprising:

in an instance in which said one or more privacy indicators indicate that the 5G communication network is not configured for handling privacy-protected subscription

identifiers, refraining from sending the registration request comprising privacy-protected subscription identifiers to the element or function in the 5G communication network.

15. The method of claim 12, wherein the registration request comprises a request for the user equipment to register with a core network of a first type via a radio access network of a second type.

16. The method of claim 15, wherein the core network of the first type comprises a fourth-generation (4G) core network and the radio access network of the second type comprises a fifth-generation (5G) radio access network.

17. The method of claim 12, wherein the element or function comprises one of: a Mobility Management Entity (MME), an Application and Mobility Management Function (AMF), a Server Location Function (SLF), a Home Subscriber Server (HSS), or a User Data Management (UDM) function.

18. The method of claim 12, wherein the privacy-protected subscription identifier is encrypted utilizing a public key of a serving network operator of the subcarrier in the 5G communication network.

19. The method of claim 12, wherein the field in the registration request is operable to indicate to the element or function whether to route the message directly to a correct recipient entity or use a public or private key to decrypt the subscription identifier in the registration request before routing the message to the correct recipient entity.

20. An apparatus comprising a processor operatively coupled to a memory and configured to perform the method of claim 12.