CLAIMS

1. A method by an access and mobility management function (AMF):

generating allowed network slice selection assistance information identifying one or more network slices that were authorized by at least one of a service provider, which is associated with the AMF, or an external provider;

generating pending network slice selection assistance information identifying one or more network slices for which a slice-specific secondary authentication procedure is pending;

generating rejected network slice selection assistance information identifying one or more network slices that have not been authorized; and

sending to the user equipment device the allowed network slice selection assistance information, the pending network slice selection assistance information, and the rejected network slice selection assistance information.

2. The method of claim 1, wherein generating the rejected network slice selection assistance information identifying the one or more network slices that have not been authorized comprises generating network slice selection assistance information that:

identifies one or more network slices that have not been authorized by at least one or more of the service provider or the external provider; and

includes a rejection cause value for each network slice that identifies a reason each network slice has not been authorized.

3. The method of claim 1, wherein generating the allowed network slice selection assistance information identifying the one or more network slices that were authorized by at least one of the service provider or the external provider comprises generating an allowed one or more network slice selection assistance information information-element (Allowed NSSAI IE) that identifies the network slices that were authorized by at least one of the service provider or the external provider.

4. The method of claim 3, wherein generating the rejected network slice selection assistance information identifying the one or more network slices that have not been authorized comprises generating rejected network slice selection assistance information that identifies one or more network slices that have not been authorized by at least one or more of the service provider or the external provider.

5. A method performed by a processor in a user equipment device for accessing network slices that are associated with a service provided by an external provider for access and use by the user equipment device connected to a network via a network component that is associated with a service provider, the method comprising

receiving from a network server allowed network slice selection assistance information identifying network slices that were authorized by at least one of the service provider or the external provider;

receiving from the network server rejected network slice selection assistance information identifying network slices that have not been authorized;

adding a network slice included in the rejected network slice selection assistance information to a requested network slice selection assistance information information-element (Requested NSSAI IE);

sending, by the processor in the user equipment device, the Requested NSSAI IE to a network server;

receiving the allowed network slice selection assistance information identifying the network slices that were authorized by at least one of the service provider or the external provider comprises receiving an allowed network slice selection assistance information information-element (Allowed NSSAI IE) that identifies the network slices that were authorized by at least one of the service provider or the external provider;

receiving from the network server rejected network slice selection assistance information identifying the network slices that have not been authorized comprises receiving rejected network slice selection assistance information that identifies network slices that have not been authorized by at least one or more of the service provider or the external provider; and

forgoing re-registration attempts for the network slices included in the rejected network slice selection assistance information until a network slice-specific authorization procedure has completed.

6. The method of claim 5, further comprising:

determining whether the network slice-specific authorization procedure has completed; and

adding to the Requested NSSAI IE a network slice included in the rejected network slice selection assistance information in response to determining that the network slice-specific authorization procedure has completed, a network slice can now be authorized, or that the network slice should be resubmitted for authorization by the external provider.

7. The method of claim 5, further comprising:

determining whether a network slice included in the rejected network slice selection assistance information should be resubmitted for authorization by the external provider.

8. A network server, comprising:

a processor configured with processor-executable instructions to:

by an access and mobility management function (AMF), generate allowed network slice selection assistance information identifying one or more network slices that were authorized by at least one of a service provider, which is associated with the AMF, or an external provider;

by the AMF, generate pending network slice selection assistance information identifying one or more network slices for which a slice-specific secondary authentication procedure is pending;

by the AFM, generate rejected network slice selection assistance information identifying one or more network slices that have not been authorized; and

send to a user equipment device the allowed network slice selection assistance information, the pending network slice selection assistance information, and the rejected network slice selection assistance information.

9. The network server of claim 8, wherein the processor is configured with processor-executable instructions to generate rejected network slice selection assistance information identifying the one or more network slices that have not been authorized by generating network slice selection assistance information that:

identifies one or more network slices that have not been authorized by at least one or more of the service provider or the external provider; and

includes a rejection cause value for each network slice that identifies a reason each network slice has not been authorized.

10. The network server of claim 8, wherein the processor is further configured with processor-executable instructions to generate the allowed network slice selection assistance information identifying one or more network slices that were authorized by at least one of the service provider or the external provider by generating an allowed network slice selection assistance information information-element (Allowed NSSAI IE) that identifies the one or more network slices that were authorized by at least one of the service provider or the external provider.

11. The network server of claim 10, wherein the processor is further configured with processor-executable instructions to generate rejected network slice selection assistance information identifying the one or more network slices that have not been authorized by generating rejected network slice selection assistance information that identifies one or more network slices that have not been authorized by at least one or more of the service provider or the external provider.

12. A user equipment device, comprising:

a processor configured with processor-executable instructions to:

receive from a network server allowed network slice selection assistance information identifying network slices that were authorized by at least one of a service provider or an external provider;

receive from the network server rejected network slice selection assistance information identifying network slices that have not been authorized;

add a network slice included in the rejected network slice selection assistance information to a requested network slice selection assistance information information-element (Requested NSSAI IE);

send the Requested NSSAI IE to a network server;

receive the allowed network slice selection assistance information identifying network slices that were authorized by at least one of the service provider or the external provider by receiving an allowed network slice selection assistance information information-element (Allowed NSSAI IE) that identifies network slices that were authorized by at least one of the service provider or the external provider;

receive the rejected network slice selection assistance information identifying the network slices that have not been authorized by receiving rejected network slice selection assistance information that identifies network slices that have not been authorized by at least one or more of the service provider or the external provider; and

forgo re-registration attempts for the network slices included in the rejected network slice selection assistance information until a network slice-specific authorization procedure has completed.

13. The user equipment device of claim 12, wherein the processor is further configured with processor-executable instructions to:

determine whether the network slice-specific authorization procedure has completed; and

add to the Requested NSSAI IE a network slice included in the rejected network slice selection assistance information in response to determining that the network slice-specific authorization procedure has completed, a network slice can

now be authorized, or that the network slice should be resubmitted for authorization by the external provider.

14. The user equipment device of claim 12, wherein the processor is further configured with processor-executable instructions to determine whether a network slice included in the rejected network slice selection assistance information should be resubmitted for authorization by the external provider.

15. A non-transitory processor-readable storage medium having stored thereon processor-executable instructions configured to cause a processor of a network server to perform operations comprising:

by an access and mobility management function (AMF):

generating allowed network slice selection assistance information identifying one or more network slices that were authorized by at least one of a service provider, which is associated with the AMF, or an external provider;

generating pending network slice selection assistance information identifying one or more network slices for which a slice-specific secondary authentication procedure is pending;

generating rejected network slice selection assistance information identifying one or more network slices that have not been authorized; and

sending to the user equipment device the allowed network slice selection assistance information, the pending network slice selection assistance information, and the rejected network slice selection assistance information.

16. The non-transitory processor-readable storage medium of claim 15, wherein the stored processor-executable instructions are configured to cause the processor to perform operations such that generating the rejected network slice selection assistance information identifying the one or more network slices that have not been authorized comprises generating network slice selection assistance information that:

identifies one or more network slices that have not been authorized by at least one or more of the service provider or the external provider; and

includes a rejection cause value for each network slice that identifies a reason each network slice has not been authorized.

17. The non-transitory processor-readable storage medium of claim 15, wherein the stored processor-executable instructions are configured to cause the processor to perform operations such that generating the allowed network slice selection assistance information identifying the one or more network slices that were authorized by at least one of the service provider or the external provider comprises generating an allowed network slice selection assistance information information-element (Allowed NSSAI IE) that identifies the one or more network slices that were authorized by at least one of the service provider or the external provider.

18. The non-transitory processor-readable storage medium of claim 17, wherein the stored processor-executable instructions are configured to cause the processor to perform operations such that generating the rejected network slice selection assistance information identifying the one or more network slices that have not been authorized comprises generating rejected network slice selection assistance information that identifies one or more network slices that have not been authorized by at least one or more of the service provider or the external provider.

19. A non-transitory processor-readable storage medium having stored thereon processor-executable instructions configured to cause a processor of a user equipment device to perform operations for accessing network slices that are associated with a service provided by an external provider for access and use by the user equipment device connected to a network via a network component that is associated with a service provider, the operations comprising

receiving from a network server allowed network slice selection assistance information identifying network slices that were authorized by at least one of the service provider or the external provider;

receiving from the network server rejected network slice selection assistance information identifying network slices that have not been authorized;

adding a network slice included in the rejected network slice selection assistance information to a requested network slice selection assistance information information-element (Requested NSSAI IE);

sending, by the processor in the user equipment device, the Requested NSSAI IE to a network server;

receiving the allowed network slice selection assistance information identifying the network slices that were authorized by at least one of the service provider or the external provider comprises receiving an allowed network slice selection assistance information information-element (Allowed NSSAI IE) that identifies the network slices that were authorized by at least one of the service provider or the external provider;

receiving from the network server rejected network slice selection assistance information identifying the network slices that have not been authorized comprises receiving rejected network slice selection assistance information that identifies network slices that have not been authorized by at least one or more of the service provider or the external provider; and

forgoing re-registration attempts for the network slices included in the rejected network slice selection assistance information until a network slice-specific authorization procedure has completed.

20. The non-transitory processor-readable storage medium of claim 19, wherein the stored processor-executable instructions are configured to cause the processor to perform operations further comprising:

determining whether the network slice-specific authorization procedure has completed; and

adding to the Requested NSSAI IE a network slice included in the rejected network slice selection assistance information in response to determining that the network slice-specific authorization procedure has completed, a network slice can now be authorized, or that the network slice should be resubmitted for authorization by the external provider.

21. The non-transitory processor-readable storage medium of claim 19, wherein the stored processor-executable instructions are configured to cause the processor to perform operations further comprising determining whether a network slice included in the rejected network slice selection assistance information should be resubmitted for authorization by the external provider.

22. A network server, comprising:

by an access and mobility management function (AMF):

means for generating allowed network slice selection assistance information identifying one or more network slices that were authorized by at least one of a service provider, which is associated with the AMF or an external provider;

means for generating pending network slice selection assistance information identifying one or more network slices for which a slice-specific secondary authentication procedure is pending;

means for generating rejected network slice selection assistance information identifying one or more network slices that have not been authorized; and

means for sending to a user equipment device the allowed network slice selection assistance information, the pending network slice selection assistance information, and the rejected network slice selection assistance information.

23. The network server of claim 21, wherein means for generating rejected network slice selection assistance information identifying one or more network slices that have not been authorized comprises means for generating network slice selection assistance information that:

identifies one or more network slices that have not been authorized by at least one or more of the service provider or the external provider; and

includes a rejection cause value for each network slice that identifies a reason each network slice has not been authorized.

24. The network server of claim 21, wherein means for generating the allowed network slice selection assistance information identifying one or more network slices

that were authorized by at least one of the service provider or the external provider comprises means for generating an allowed network slice selection assistance information information-element (Allowed NSSAI IE) that identifies one or more network slices that were authorized by at least one of the service provider or the external provider.

25. The network server of claim 24, wherein means for generating rejected network slice selection assistance information identifying the one or more network slices that have not been authorized comprises means for generating rejected network slice selection assistance information that identifies one or more network slices that have not been authorized by at least one or more of the service provider or the external provider.

26. A user equipment device, comprising

means for receiving from a network server allowed network slice selection assistance information identifying network slices that were authorized by at least one of a service provider or an external provider;

means for receiving from the network server rejected network slice selection assistance information identifying network slices that have not been authorized;

means for adding a network slice included in the rejected network slice selection assistance information to a requested network slice selection assistance information information-element (Requested NSSAI IE);

means for sending the Requested NSSAI IE to a network server;

means for receiving the allowed network slice selection assistance information identifying network slices that were authorized by at least one of the service provider or the external provider comprises means for receiving an allowed network slice selection assistance information information-element (Allowed NSSAI IE) that identifies network slices that were authorized by at least one of the service provider or the external provider;

means for receiving the rejected network slice selection assistance information identifying the network slices that have not been authorized comprises means for

receiving rejected network slice selection assistance information that identifies network slices that have not been authorized by at least one or more of the service provider or the external provider; and

means for forgoing re-registration attempts for the network slices included in the rejected network slice selection assistance information until a network slice-specific authorization procedure has completed.

27. The user equipment device of claim 26, further comprising:

means for determining whether the network slice-specific authorization procedure has completed; and

means for adding to the Requested NSSAI IE a network slice included in the rejected network slice selection assistance information in response to determining that the network slice-specific authorization procedure has completed, a network slice can now be authorized, or that the network slice should be resubmitted for authorization by the external provider.

28. The user equipment device of claim 26, further comprising means for determining whether a network slice included in the rejected network slice selection assistance information should be resubmitted for authorization by the external provider.