**3GPP TSG-SA3 Meeting #115 *S3-240681-r1***

Athens, Greece, 26th February - 1st March 2024

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  |  | **CR** | **1957** | **rev** |  | **Current version:** |  |  |
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| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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| ***Title:***  | at NRF  |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | S3 |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** | 2024-02-19 |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | In the TS 33.501 clause 13.4.1.1.2 step 1a it is said that "the NRF may verify that the NF Service Consumer can serve a slice which is included in the allowed slices for the NF Service Producer". It is not clear if this check is performed based on NF profile of NF service producer or something else. If based on NF profile of NF servcie producer, it is not possible because the token request is for NFType and not for a specific NF service producer instance. Besides, this check does not exist in the clause 13.4.1.1.2 step 1b for NF instance access token.It sounds strange to say that "NF Service Consumer can serve a slice". It is better to use "the slice of the NF Service Consumer" following same approach as "sNssais" definitions in the NF profile as defined in the TS 29.510.It does not add value to include list of S-NSSAIs or NSI IDs for the expected NF service producer in the access token for a specific NF instance. |
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| ***Summary of change:*** | Clarify the slice check for NRF authorization, cover both NFType and NF instance access token.Clarify the meaning of absence of slice information in the access token claims.Clarify list of S-NSSAIs or NSI IDs for the expected NF service producer maybe included in the access token for NF type but not for a specific NF instance.Clarify NF Set ID for the expected NF service producer maybe included in the access token for NF type but not for a specific NF instance, align with TS 29.510. |
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| ***Consequences if not approved:*** |  Ambiguous specification about slice authorization for NFType access token and NF instance access token. |
|  |  |
| ***Clauses affected:*** | 13.4.1.1.2, 14.3.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\*\*\* BEGIN OF CHANGES 1 \*\*\*

#####  13.4.1.1.2 Service Request Process

The complete service request is a two-step process including requesting an access token by NF Service Consumer (Step 1, i.e. 1a or 1b), and then verification of the access token by NF Service Producer (Step 2).

NOTE: The service request process regarding the enabler for network automation is specified in Annex X.

**Step 1: Access token request**

Pre-requisite:

- The NF Service consumer (OAuth2.0 client) is registered with the NRF (Authorization Server).

- The NF Service Producer (OAuth2.0 resource server) is registered with the NRF (Authorization Server) with optionally "additional scope" information per NF type.

- The NRF and NF Service Producer share the required credentials.

- The NRF and NF have mutually authenticated each other – where the NF Service Consumer is identified by the NF Instance ID of the public key certificate of the NF Service Consumer..

**1a. Access token request** **for** **accessing services of NF Service Producers of a specific NF type**

The following procedure describes how the NF Service Consumer obtains an access token before service access to NF Service Producers of a specific NF type.



Figure 13.4.1.1.2-1: NF Service Consumer obtaining access token before NF Service access

1. The NF Service Consumer shall request an access token from the NRF in the same PLMN using the Nnrf\_AccessToken\_Get request operation. The message shall include the NF Instance Id(s) of the NF Service Consumer, the requested "scope" including the expected NF Service name(s) and optionally "additional scope" information (i.e. requested resources and requested actions (service operations) on the resources), NF type of the expected NF Service Producer instance and NF Service Consumer. The NF Service Consumer may also include a list of NSSAIs or list of NSI IDs for the expected NF Service Producer instances.

The message may include the NF Set ID and/or NF Service Set Id of the expected NF Service Producer instances.

The message may include a list of S-NSSAIs of the NF Service Consumer.

The message may also include the PLMN ID(s) of the NF Service Consumer.

2. The NRF shall verify that the input parameters NF Instance ID and NF type as well as PLMN ID(s), if available, in the access token request match with the corresponding ones in the public key certificate of the NF Service Consumer or those in the NF profile of the NF Service Consumer. If the verification of the parameters in the access token request fails, the access token request is not further processed. The NRF may additionally verify the S-NSSAIs of the NF Service Consumer based on the NRF’s local policy on issuing NF type level access tokens — the local policy may include constraints such as an NFc of a certain type from a certain slice can/cannot access and NFp of a certain type in a certain slice. The NRF checks whether the NF Service Consumer is authorized to access the requested service(s). If the NF Service Consumer is authorized, the NRF shall then generate an access token with appropriate claims included. The NRF shall digitally sign the generated access token based on a shared secret or private key as described in RFC 7515 [45]. If the NF Service Consumer is not authorized, the NRF shall not issue an access token to the NF Service Consumer.

The claims in the token shall include the NF Instance Id of NRF (issuer), NF Instance Id of the NF Service Consumer (subject), NF type of the NF Service Producer (audience), expected service name(s), (scope), expiration time (expiration) and optionally "additional scope" information (allowed resources and allowed actions (service operations) on the resources). The claims may include a list of NSSAIs or NSI IDs for the expected NF Service Producer type that the NF Service consumer is allowed to access. The claims may include the NF Set ID and/or NF Service Set Id of the expected NF Service Producer instances.

NOTE X: If the claims in the access token do not include a list of S-NSSAIs or NSI IDs for the expected NF Service Producer type, it implies the access token can be used to access any slices served by the expected NF Service Producer.

3. If the authorization is successful, the NRF shall send access token to the NF Service Consumer in the Nnrf\_AccessToken\_Get response operation, otherwise it shall reply based on Oauth 2.0 error response defined in RFC 6749 [43]. The other parameters (e.g., the expiration time, allowed scope) sent by NRF in addition to the access token are described in TS 29.510 [68].

The NF Service Consumer may store the received token(s). Stored tokens may be re-used for accessing service(s) from NF Service Producer NF type listed in claims (scope, audience) during their validity time.

**1b. Access token request for accessing services of a specific NF Service Producer instance / NF Service Producer service instance**

The following steps describes how the NF Service Consumer obtains an access token before service access to a specific NF Service Producer instance / NF Service Producer service instance. 1. The NF Service Consumer shall request an access token from the NRF for a specific NF Service Producer instance / NF Service Producer service instance. The request shall include the NF Instance Id(s) of the requested NF Service Producer, the expected NF Service name, optionally "additional scope" information (allowed resources and allowed actions (service operations) on the resources) and NF Instance Id of the NF Service Consumer. The request may also include the PLMN ID(s) of the NF Service Consumer.

2. The NRF shall verify that the input parameters in the access token request, i.e. NF Instance ID and, if available, PLMN ID(s) and NF type, match with the corresponding ones in the public key certificate of the NF Service Consumer or those in the NF profile of the NF Service Consumer. If the verification of the parameters in the access token request fails, the access token request is not further processed.

The NRF checks whether the NF Service Consumer is authorized to access the requested services from the NF Service Producer instance/NF Service Producer service instance. If the expected NF Service Producer instance/NF Service Producer service instance serves a list of S-NSSAIs or NSI IDs, the NRF shall additionally verify the S-NSSAIs of the NF Service Consumer. For example, the NRF verifies that at least one of the slices in the NF profile of the NF Service Consumer is included in the allowed S-NSSAIs of NF profile for the NF Service Producer instance/NF Service Producer service instance. If the NF Service Consumer is authorized, the NRF proceeds to generate an access token with the appropriate claims included. If the NF Service Consumer is not authorized, the NRF shall not issue an access token to the NF Service Consumer.

The claims in the token shall include the NF Instance Id of NRF (issuer), NF Instance Id of the NF Service Consumer (subject), NF Instance Id or several NF Instance Id(s) of the requested NF Service Producer (audience), expected service name(s) (scope), optionally "additional scope" information (allowed resources and allowed actions (service operations) on the resources), and expiration time (expiration).

3. The token shall be included in the Nnrf\_AccessToken\_Get response sent to the NF Service Consumer. The NF Service Consumer may store the received token(s). Stored tokens may be re-used for accessing service(s) from NF Instance Id or several NF Instance Id(s) of the requested NF Service Producer instance listed in claims (scope, audience) during their validity time.

**Step 2: Service access request based on token verification**

The following figure and procedure describe how authorization is performed during Service request of the NF Service Consumer. Prior to the request, the NF Service Consumer may perform Nnrf\_NFDiscovery\_Request operation with the requested additional scopes to select a suitable NF Service Producer (resource server) which is able to authorize the Service Access request.



Figure 13.4.1.1.2-2: NF Service Consumer requesting service access with an access token

Pre-requisite: The NF Service Consumer is in possession of a valid access token before requesting service access from the NF Service Producer.

1. The NF Service Consumer requests service from the NF Service Producer. The NF Service Consumer shall include the access token.

The NF Service Consumer and NF Service Producer shall authenticate each other following clause 13.3.

2. The NF Service Producer shall verify the token as follows:

 - The NF Service Producer ensures the integrity of the token by verifying the signature using NRF’s public key or checking the MAC value using the shared secret.

- If integrity check is successful, the NF Service Producer shall verify the claims in the token as follows: -

 In the direct communication case, it checks that the NF Instance ID in the subject claim within the access token matches the NF Instance ID in the subjectAltName in the NF Service Consumer's TLS client certificate.

NOTE: Void.

- It checks that the audience claim in the access token matches its own identity or the type of NF Service Producer. If a list of NSSAIs or list of NSI IDs is present, the NF Service Producer shall check that it serves the corresponding slice(s). If applicable (e.g., when the request is for information related to a specific UE), the NF Service Producer may check that the NF Service Consumer is allowed to access (as indicated by the NF Service Producer’s NSSAIs in the access token presented by the NF Service Consumer) at least one of the slice(s) that the UE is currently registered to, e.g., by verifying that the UE’s allowed NSSAI(s) intersect with the NF Service Producer's NSSAIs in the access token.

- If an NF Set ID present, the NF Service Producer shall check the NF Set ID in the claim matches its own NF Set ID.

 If an NF Service Set ID present, the NF Service Producer shall check if the NF Service Consumer is authorized to access the requested service according to NF Service Producer Service Set ID in the access token claim.

- If scope is present, it checks that the scope matches the requested service operation.

- If the access token contains "additional scope" information (i.e. allowed resources and allowed actions (service operations) on the resources), it checks that the additional scope matches the requested service operation.

- It checks that the access token has not expired by verifying the expiration time in the access token against the current data/time.

- If the CCA is present in the service request, it may verify the CCA as specified in clause 13.3.8.3 and that the subject claim (i.e., the NF Instance Id of the NF Service Consumer) in the access token matches the subject claim in the CCA.

3. If the verification is successful, the NF Service Producer shall execute the requested service and responds back to the NF Service Consumer. Otherwise, it shall reply based on Oauth 2.0 error response defined in RFC 6749 [43].

\*\*\* END OF CHANGES 1 \*\*\*

\*\*\* BEGIN OF CHANGES 2 \*\*\*

### 14.3.2 Nnrf\_AccessToken\_Get Service Operation

**Service Operation name:** Nnrf\_AccessToken\_Get.

**Description:** NF Service Consumer requests NRF to provide an Access Token.

**Inputs, Required:** the NF Instance Id of the NF Service Consumer, the requested "scope" including the expected NF service name(s).

**Inputs, Optional:** PLMN ID (or SNPN ID) of the requester NF Service Consumer, PLMN ID (or SNPN ID)of the requested NF Service Producer, NF Instance Id(s) of the requested NF Service Producer, NF type of the expected NF Service Producer instance and NF Service Consumer, "additional scope" information (i.e. requested resources and requested actions (service operations) on the resources), list of NSSAIs or list of NSI IDs for the expected NF Service Producer type, NF Set ID of the expected NF Service Producer instances, list of S-NSSAIs of the NF Service Consumer.

**Outputs, Required:** Access Token with appropriate claims, where the claims shall include NF Instance Id of NRF (issuer), NF Instance Id of the NF Service Consumer potentially appended with its PLMN ID (or SNPN ID) (subject), NF type of the NF Service Producers or NF Instance Id or several NF Instance Id(s) of the requested NF Service Producer, potentially appended with PLMN ID (or SNPN ID) (audience), expected service name (scope), optionally "additional scope" information (allowed resources and allowed actions (service operations) on the resources) and expiration time (expiration), may include list of NSSAIs or NSI IDs for the expected NF Service Producer type, and may include the NF Set ID for the expected NF Service Producer type.

**Outputs, Optional:** None.

\*\*\* END OF CHANGES 2 \*\*\*