**3GPP TSG-CT WG4 Meeting #107-eC4-216xxx**

**E-Meeting, 15th – 23rd November 2021 *Was C4-216230***

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **29.510** | **CR** | **0615** | **rev** | **1** | **Current version:** | **17.3.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | NRF Hierarchy | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Hewlett Packard Enterprise | | | | | | | | | |
| ***Source to TSG:*** | CT4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | SBIProtoc17 | | | | |  | ***Date:*** | | | 2021-11-03 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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 can be 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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | NRF Hierarchy should be transparent to NFs. If an NRF does not have sufficient information to fulfil the discovery or subscription request, the NRF should forward the request to another NRF of the next level.  The NF consumer may want to discover a set of NF profiles which are registered in different NRFs, then all applicable NF profiles should be returned to the NF consumer.  For example; HSS profiles of HSS group 1 are registered in NRF1 and HSS profiles of HSS group 2 are registered in NRF2. When the UDM discovers the HSS profiles of HSS group 1 and HSS group 2, all HSS profiles of both HSS group 1 and HSS group 2 should be returned to the UDM.  In addition, for subscription, C4-202387 defined NfInstanceIdListCond to allow a batch subscription to a list of NF instances. The same reason applies for NF service name and NF group Id.  Currently, the NF consumer can only use less efficient way to subscribe to a list of NFs, e.g. a) request multiple subscriptions to each individual NF Instance, or b) request a batch subscription using NfTypeCond, NfSetCond, etc. However, a batch subscription using NfTypeCond or NfSetCond may result in too many NF Profile changes returned. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | In order to to allow discovery across regional NRF instances, it is clarified that based on operator policy, the NRF should forward the discover or subscription request to another NRF of the next level in deployments where NRFs deployed in e.g. regions.  In order to improve efficiency of subscriptions, it is proposed to define a subscription condition for a list of NF service names and a list of NF group ids. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The current specification does not give a clear directive for the NRF to determine when to forward discover/subscription requests to another NRF. This means NF Consumers cannot consistently rely on the NRF to return the correct information in e.g. large networks where for example NRFs are deployed in a hierarchical manner.  No efficient way for the NF Consumer to subscribe to NFInstances based on service name or group. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.2.2.5.4, 5.3.2.2.5, 6.1.6.1, 6.1.6.2.35, 6.1.6.2.64, 6.1.6.2.xx, 6.1.6.2.yy, A2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 introduces backward compatible changes to the OpenAPI file TS29510\_Nnrf\_NFManagement. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**\*\*\*\*\*\*\***

\* \* \* First Change \* \* \* \*

##### 5.2.2.5.4 Subscription to NF Instances with intermediate forwarding NRF

When multiple NRFs are deployed in one PLMN, an NF Instance can subscribe to changes of NF Instances registered in an NRF to which it is not directly interacting. The subscription message is forwarded by an intermediate NRF to which the subscribing NF instance is directly interacting.

For that, step 1 in clause 5.2.2.5.2 is executed (send a POST request to the NRF-1 in the Serving PLMN); this request shall include the SubscriptionData parameter in the request body.

Then, steps 1-4 in Figure 5.2.2.5.4-1 are executed between NF Service Consumer in Serving PLMN, NRF-1 in Serving PLMN and NRF-2 in Serving PLMN. In thest steps, NRF-1 sends the subscription request to a pre-configured NRF-2. NRF-2 requests corresponding NRF (e.g. the NF Service Producer registered NRF) and returns a subscriptionID identifying the created subscription and this subscriptionID is sent to the NF Service Consumer via NRF-1.

Finally, step 2 in clause 5.2.2.5.2 is executed; the subscriptionID shall be sent to the NF Service Consumer.



Figure 5.2.2.5.4-1: Subscription with intermediate forwarding NRF

1. NRF-1 receives a subscription request and sends the subscription request to a pre-configured NRF-2. This may for example include cases where NRF-1 does not have sufficient information as determined by the operator policy to fulfill the request locally.

2. Upon receiving a subscription request, based on the SubscriptionData contained in the subscription request (e.g.NF type) and locally stored information (see clause 5.2.2.2.3), NRF-2 shall identify the next hop NRF and forward the subscription request to that NRF (i.e. NF Service Producer registered NRF).

3a. On success, "201 Created" shall be returned by NRF-2.

3b. On failure, i.e. if the creation of the subscription fails, the NRF-2 shall return "4XX/5XX" response.

3c. In the case of redirection, the NRF shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another NRF service instance.

4a. NRF-1 forwards the success response to NF Service Consumer. The payload body of the POST response shall contain the representation describing the status of the request and the "Location" header shall be present and shall contain the URI of the created resource. The authority and/or deployment-specific string of the apiRoot of the created resource URI may differ from the authority and/or deployment-specific string of the apiRoot of the request URI received in the POST request.

4b. On failure, NRF-1 forwards the error response to NF Service Consumer.

4c. In the case of redirection, the NRF shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another NRF service instance.

\* \* \* Next Change \* \* \* \*

##### 5.3.2.2.5 Service Discovery with intermediate forwarding NRF

When multiple NRFs are deployed in one PLMN, one NRF may query the "nf-instances" resource in a different NRF so as to fulfil the service discovery request from a NF service consumer. The query between these two NRFs is forwarded by a third NRF.



Figure 5.3.2.2.5-1: Service Discovery with intermediate forwarding NRF

1. NRF-1 receives a service discovery requestand send the service discovery request to a pre-configured NRF-2. This may for example include cases where NRF-1 does not have sufficient information as determined by the operator policy to fulfill the request locally.

2a. Upon receiving a service discovery request, based on the information contained in the service discovery request (e.g. the "supi" query parameter in the URI) and locally stored information, NRF-2 shall identify the next hop NRF (see clause 5.2.2.2.3), and forward the service discovery request to that NRF (i.e. NRF-3 in this example) similarly to steps 1 and 2 in Figure 5.3.2.2.2-1 where the originator of the service invocation is NRF-2 and the recipient of the service invocation is NRF-3. The locally stored information in NRF-2 may:

a) be preconfigured; or

b) registered by other NRFs (see clause 5.2.2.2.3).

2b. if NRF-2 does not have enough information to forward the service discovery request, then it responds with 404 Not Found, and the rest of the steps are omitted.

3a. Upon success, NRF-3 returns the search result.

3b. On failure or redirection:

- If the NF Service Consumer is not allowed to discover the NF services for the requested NF type provided in the query parameters, the NRF shall return "403 Forbidden" response.

- If the discovery request fails at the NRF due to errors in the input data in the URI query parameters, the NRF shall return "400 Bad Request" status code with the ProblemDetails IE providing details of the error.

- If the discovery request fails at the NRF due to NRF internal errors, the NRF shall return "500 Internal Server Error" status code with the ProblemDetails IE providing details of the error.

- In the case of redirection, the NRF shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another NRF service instance.

4a. NRF-2 forwards the success response to NRF-1.

4b. On failure or redirection:

- NRF-2 forwards the error response to NRF-1.

- In the case of redirection, the NRF shall return 3xx status code, which shall contain a Location header with an URI pointing to the endpoint of another NRF service instance.

NOTE: It is not assumed that there can only be two NRF hierarchies, i.e. the NRF-3 can go on to forward the service discovery request to another NRF.

\* \* \* Next Change \* \* \* \*

#### 6.1.6.1 General

This clause specifies the application data model supported by the API.

Table 6.1.6.1-1 specifies the data types defined for the Nnrf\_NFManagement service-based interface protocol.

Table 6.1.6.1-1: Nnrf\_NFManagement specific Data Types

|  |  |  |
| --- | --- | --- |
| Data type | Clause defined | Description |
| NFProfile | 6.1.6.2.2 | Information of an NF Instance registered in the NRF. |
| NFService | 6.1.6.2.3 | Information of a given NF Service Instance; it is part of the NFProfile of an NF Instance. |
| DefaultNotificationSubscription | 6.1.6.2.4 | Data structure for specifying the notifications the NF service subscribes by default along with callback URI. |
| IpEndPoint | 6.1.6.2.5 | IP addressing information of a given NFService; it consists on, e.g. IP address, TCP port, transport protocol... |
| UdrInfo | 6.1.6.2.6 | Information of an UDR NF Instance. |
| UdmInfo | 6.1.6.2.7 | Information of an UDM NF Instance. |
| AusfInfo | 6.1.6.2.8 | Information of an AUSF NF Instance. |
| SupiRange | 6.1.6.2.9 | A range of SUPIs (subscriber identities), either based on a numeric range, or based on regular-expression matching. |
| IdentityRange | 6.1.6.2.10 | A range of subscriber identities, either based on a numeric range, or based on regular-expression matching. |
| AmfInfo | 6.1.6.2.11 | Information of an AMF NF Instance. |
| SmfInfo | 6.1.6.2.12 | Information of an SMF NF Instance. |
| UpfInfo | 6.1.6.2.13 | Information of an UPF NF Instance. |
| SnssaiUpfInfoItem | 6.1.6.2.14 | Set of parameters supported by UPF for a given S-NSSAI. |
| DnnUpfInfoItem | 6.1.6.2.15 | Set of parameters supported by UPF for a given DNN. |
| SubscriptionData | 6.1.6.2.16 | Information of a subscription to notifications to NRF events, included in subscription requests and responses. |
| NotificationData | 6.1.6.2.17 | Data sent in notifications from NRF to subscribed NF Instances. |
| NFServiceVersion | 6.1.6.2.19 | Contains the version details of an NF service. |
| PcfInfo | 6.1.6.2.20 | Information of a PCF NF Instance. |
| BsfInfo | 6.1.6.2.21 | Information of a BSF NF Instance. |
| Ipv4AddressRange | 6.1.6.2.22 | Range of IPv4 addresses. |
| Ipv6PrefixRange | 6.1.6.2.23 | Range of IPv6 prefixes. |
| InterfaceUpfInfoItem | 6.1.6.2.24 | Information of a given IP interface of an UPF. |
| UriList | 6.1.6.2.25 | Set of URIs following 3GPP hypermedia format (containing a "\_links" attribute). |
| N2InterfaceAmfInfo | 6.1.6.2.26 | AMF N2 interface information |
| TaiRange | 6.1.6.2.27 | Range of TAIs (Tracking Area Identities). |
| TacRange | 6.1.6.2.28 | Range of TACs (Tracking Area Codes). |
| SnssaiSmfInfoItem | 6.1.6.2.29 | Set of parameters supported by SMF for a given S-NSSAI. |
| DnnSmfInfoItem | 6.1.6.2.30 | Set of parameters supported by SMF for a given DNN. |
| NrfInfo | 6.1.6.2.31 | Information of an NRF NF Instance, used in hierarchical NRF deployments. |
| ChfInfo | 6.1.6.2.32 | Information of a CHF NF Instance. |
| PlmnRange | 6.1.6.2.34 | Range of PLMN IDs. |
| SubscrCond | 6.1.6.2.35 | Condition to determine the set of NFs to monitor under a certain subscription in NRF. |
| NfInstanceIdCond | 6.1.6.2.36 | Subscription to a given NF Instance Id. |
| NfTypeCond | 6.1.6.2.37 | Subscription to a set of NFs based on their NF Type. |
| ServiceNameCond | 6.1.6.2.38 | Subscription to a set of NFs based on their support for a given Service Name. |
| AmfCond | 6.1.6.2.39 | Subscription to a set of AMFs, based on AMF Set Id and/or AMF Region Id. |
| GuamiListCond | 6.1.6.2.40 | Subscription to a set of AMFs, based on their GUAMIs. |
| NetworkSliceCond | 6.1.6.2.41 | Subscription to a set of NFs, based on the slices (S-NSSAI and NSI) they support . |
| NfGroupCond | 6.1.6.2.42 | Subscription to a set of NFs based on their Group Id. |
| NotifCondition | 6.1.6.2.43 | Condition (list of attributes in the NF Profile) to determine whether a notification must be sent by NRF. |
| PlmnSnssai | 6.1.6.2.44 | List of network slices (S-NSSAIs) for a given PLMN ID. |
| NwdafInfo | 6.1.6.2.45 | Information of a NWDAF NF Instance. |
| LmfInfo | 6.1.6.2.46 | Information of an LMF NF Instance. |
| GmlcInfo | 6.1.6.2.47 | Information of a GMLC NF Instance. |
| NefInfo | 6.1.6.2.48 | Information of an NEF NF Instance. |
| PfdData | 6.1.6.2.49 | List of Application IDs and/or AF IDs managed by a given NEF Instance. |
| AfEventExposureData | 6.1.6.2.50 | AF Event Exposure data managed by a given NEF Instance. |
| WAgfInfo | 6.1.6.2.51 | Information of the W-AGF endpoints. |
| TngfInfo | 6.1.6.2.52 | Information of the TNGF endpoints. |
| PcscfInfo | 6.1.6.2.53 | Information of a P-CSCF NF Instance. |
| NfSetCond | 6.1.6.2.54 | Subscription to a set of NFs based on their Set Id. |
| NfServiceSetCond | 6.1.6.2.55 | Subscription to a set of NFs based on their Service Set Id. |
| NfInfo | 6.1.6.2.56 | Information of a generic NF Instance. |
| HssInfo | 6.1.6.2.57 | Information of an HSS NF Instance. |
| ImsiRange | 6.1.6.2.58 | A range of IMSIs (subscriber identities), either based on a numeric range, or based on regular-expression matching. |
| InternalGroupIdRange | 6.1.6.2.59 | A range of Group IDs (internal group identities), either based on a numeric range, or based on regular-expression matching. |
| UpfCond | 6.1.6.2.60 | Subscription to a set of NF Instances (UPFs), able to serve a certain service area (i.e. SMF serving area or TAI list). |
| TwifInfo | 6.1.6.2.61 | Addressing information (IP addresses, FQDN) of the TWIF. |
| VendorSpecificFeature | 6.1.6.2.62 | Information about a vendor-specific feature |
| UdsfInfo | 6.1.6.2.63 | Information related to UDSF |
| ScpInfo | 6.1.6.2.65 | Information of an SCP Instance |
| ScpDomainInfo | 6.1.6.2.66 | SCP domain information |
| ScpDomainCond | 6.1.6.2.67 | Subscription to an SCP domain |
| OptionsResponse | 6.1.6.2.68 | Communication options of the NRF |
| NwdafCond | 6.1.6.2.69 | Subscription to a set of NF Instances (NWDAFs), identified by Analytics ID(s), S-NSSAI(s) or NWDAF Serving Area information, i.e. list of TAIs for which the NWDAF can provide analytics. |
| NefCond | 6.1.6.2.70 | Subscription to a set of NF Instances (NEFs), identified by Event ID(s) provided by AF, S-NSSAI(s), AF Instance ID, Application Identifier, External Identifier, External Group Identifier, or domain name. |
| SuciInfo | 6.1.6.2.71 | SUCI information containing Routing Indicator and Home Network Public Key ID. |
| SeppInfo | 6.1.6.2.72 | Information of a SEPP Instance |
| AanfInfo | 6.1.6.2.73 | Information of an AAnF NF Instance. |
| 5GDdnmfInfo | 6.1.6.2.74 | Information of a 5G DDNMF NF Instance. |
| MfafInfo | 6.1.6.2.75 | Information of the MFAF NF Instance. |
| NwdafCapability | 6.1.6.2.76 | Indicates the capability supported by the NWDAF. |
| DccfInfo | 6.1.6.2.80 | Information of a DCCF NF Instance. |
| NsacfInfo | 6.1.6.2.81 | Information of an NSACF NF Instance. |
| NsacfCapability | 6.1.6.2.82 | NSACF service capability. |
| DccfCond | 6.1.6.2.83 | Subscription to a set of NF Instances (DCCFs), identified by NF types, NF Set Id(s) or DCCF Serving Area information, i.e. list of TAIs served by the DCCF. |
| MlAnalyticsInfo | 6.1.6.2.84 | ML Analytics Filter information supported by the Nnwdaf\_MLModelProvision service |
| MbSmfInfo | 6.1.6.2.85 | Information of a MB-SMF NF Instance |
| TmgiRange | 6.1.6.2.86 | Range of TMGIs |
| MbsSession | 6.1.6.2.87 | MBS Session served by an MB-SMF |
| SnssaiMbSmfInfoItem | 6.1.6.2.88 | Parameters supported by an MB-SMF for a given S-NSSAI |
| DnnMbSmfInfoItem | 6.1.6.2.89 | Parameters supported by an MB-SMF for a given DNN |
| MbsAreaSession | 6.1.6.2.90 | MBS Session in a specific MBS Service Area |
| TsctsfInfo | 6.1.6.2.91 | Information of a TSCTSF NF Instance. |
| SnssaiTsctsfInfoItem | 6.1.6.2.92 | Set of parameters supported by TSCTSF for a given S-NSSAI. |
| DnnTsctsfInfoItem | 6.1.6.2.93 | Set of parameters supported by TSCTSF for a given DNN. |
| ServiceNameListCond | 6.1.6.2.xx | Subscription to a set of NF Instances that offer a service name in the Service Name list. |
| NfGroupListCond | 6.1.6.2.yy | Subscription to a set of NF Instances, identified by a NF Group Identity in the NF Group Identity list. |
| Fqdn | 6.1.6.3.2 | Fully Qualified Domain Name. |
| NefId | 6.1.6.3.2 | Identity of the NEF. |
| VendorId | 6.1.6.3.2 | Vendor ID of the NF Service instance (Private Enterprise Number assigned by IANA) |
| WildcardDnai | 6.1.6.3.2 | Wildcard DNAI |
| NFType | 6.1.6.3.3 | NF types known to NRF. |
| NotificationType | 6.1.6.3.4 | Types of notifications used in Default Notification URIs in the NF Profile of an NF Instance. |
| TransportProtocol | 6.1.6.3.5 | Types of transport protocol used in a given IP endpoint of an NF Service Instance. |
| NotificationEventType | 6.1.6.3.6 | Types of events sent in notifications from NRF to subscribed NF Instances. |
| NFStatus | 6.1.6.3.7 | Status of a given NF Instance stored in NRF. |
| DataSetId | 6.1.6.3.8 | Types of data sets stored in UDR. |
| UPInterfaceType | 6.1.6.3.9 | Types of User-Plane interfaces of the UPF. |
| ServiceName | 6.1.6.3.11 | Service names known to NRF. |
| NFServiceStatus | 6.1.6.3.12 | Status of a given NF Service Instance of an NF Instance stored in NRF. |
| AnNodeType | 6.1.6.3.13 | Access Network Node Type (gNB, ng-eNB...). |
| ConditionEventType | 6.1.6.3.14 | Indicates whether a notification is due to the NF Instance to start or stop being part of a condition for a subscription to a set of NFs |
| IpReachability | 6.1.6.3.15 | Indicates the type(s) of IP addresses reachable via an SCP. |

Editor's Note: A general solution of NRF handling towards absent attributes (not registered by the NF or not supported by NF with early version) is FFS.

Table 6.1.6.1-2 specifies data types re-used by the Nnrf\_NFManagement service-based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nnrf\_NFManagement service-based interface.

Table 6.1.6.1-2: Nnrf\_NFManagement re-used Data Types

|  |  |  |
| --- | --- | --- |
| Data type | Reference | Comments |
| N1MessageClass | 3GPP TS 29.518 [6] | The N1 message type |
| N2InformationClass | 3GPP TS 29.518 [6] | The N2 information type |
| IPv4Addr | 3GPP TS 29.571 [7] |  |
| IPv6Addr | 3GPP TS 29.571 [7] |  |
| IPv6Prefix | 3GPP TS 29.571 [7] |  |
| Uri | 3GPP TS 29.571 [7] |  |
| Dnn | 3GPP TS 29.571 [7] |  |
| SupportedFeatures | 3GPP TS 29.571 [7] |  |
| Snssai | 3GPP TS 29.571 [7] |  |
| PlmnId | 3GPP TS 29.571 [7] |  |
| Guami | 3GPP TS 29.571 [7] |  |
| Tai | 3GPP TS 29.571 [7] |  |
| NfInstanceId | 3GPP TS 29.571 [7] |  |
| LinksValueSchema | 3GPP TS 29.571 [7] | 3GPP Hypermedia link |
| UriScheme | 3GPP TS 29.571 [7] |  |
| AmfName | 3GPP TS 29.571 [7] |  |
| DateTime | 3GPP TS 29.571 [7] |  |
| Dnai | 3GPP TS 29.571 [7] |  |
| ChangeItem | 3GPP TS 29.571 [7] |  |
| DiameterIdentity | 3GPP TS 29.571 [7] |  |
| AccessType | 3GPP TS 29.571 [7] |  |
| NfGroupId | 3GPP TS 29.571 [7] | Network Function Group Id |
| AmfRegionId | 3GPP TS 29.571 [7] |  |
| AmfSetId | 3GPP TS 29.571 [7] |  |
| PduSessionType | 3GPP TS 29.571 [7] |  |
| AtsssCapability | 3GPP TS 29.571 [7] | Capability to support procedures related to Access Traffic Steering, Switching, Splitting. |
| Nid | 3GPP TS 29.571 [7] |  |
| PlmnIdNid | 3GPP TS 29.571 [7] |  |
| NfSetId | 3GPP TS 29.571 [7] | NF Set ID (see clause 28.12 of 3GPP TS 23.003 [12]) |
| NfServiceSetId | 3GPP TS 29.571 [7] | NF Service Set ID (see clause 28.13 of 3GPP TS 23.003 [12]) |
| GroupId | 3GPP TS 29.571 [7] | Internal Group Identifier |
| RatType | 3GPP TS 29.571 [7] | RAT Type |
| DurationSec | 3GPP TS 29.571 [7] |  |
| RedirectResponse | 3GPP TS 29.571 [7] | Response body of the redirect response message. |
| ExtSnssai | 3GPP TS 29.571 [7] |  |
| AreaSessionId | 3GPP TS 29.571 [7] | Area Session Identifier used for an MBS session with location dependent content |
| MbsSessionId | 3GPP TS 29.571 [7] | MBS Session Identifier |
| MbsServiceArea | 3GPP TS 29.571 [7] | MBS Service Area |
| IpAddr | 3GPP TS 29.571 [7] | IP Address |
| EventId | 3GPP TS 29.520 [32] | Defined in Nnwdaf\_AnalyticsInfo API. |
| NwdafEvent | 3GPP TS 29.520 [32] | Defined in Nnwdaf\_EventsSubscription API. |
| ExternalClientType | 3GPP TS 29.572 [33] |  |
| LMFIdentification | 3GPP TS 29.572 [33] | LMF Identification |
| AfEvent | 3GPP TS 29.517 [35] | Defined in Naf\_EventExposure API |
| SupportedGADShapes | 3GPP TS 29.572 [33] | Supported GAD Shapes |

\* \* \* Next Change \* \* \* \*

##### 6.1.6.2.35 Type: SubscrCond

Table 6.1.6.2.35-1: Definition of type SubscrCond as a list of mutually exclusive alternatives

|  |  |  |
| --- | --- | --- |
| Data type | Cardinality | Description |
| NfInstanceIdCond | 1 | Subscription to a given NF Instance |
| NfInstanceIdListCond | 1 | Subscription to a list of NF Instances |
| NfTypeCond | 1 | Subscription to a set of NF Instances, identified by their NF Type |
| ServiceNameCond | 1 | Subscription to a set of NF Instances that offer a certain service name |
| ServiceNameListCond | 1 | Subscription to a set of NF Instances that offer a service name in the Service Name list. |
| AmfCond | 1 | Subscription to a set of NF Instances (AMFs), belonging to a certain AMF Set and/or belonging to a certain AMF Region. |
| GuamiListCond | 1 | Subscription to a set of NF Instances (AMFs), identified by their Guamis. |
| NetworkSliceCond | 1 | Subscription to a set of NF Instances, identified by S-NSSAI(s) and NSI ID(s). |
| NfGroupCond | 1 | Subscription to a set of NF Instances, identified by a NF (UDM, AUSF, PCF, CHF, HSS or UDR) Group Identity. |
| NfGroupListCond | 1 | Subscription to a set of NF Instances, identified by a NF Group Identity in the NF Group Identity list. |
| NfSetCond | 1 | Subscription to a set of NF Instances belonging to a certain NF Set. |
| NfServiceSetCond | 1 | Subscription to a set of NF Service Instances, or to a set of equivalent NF Service Instances. |
| UpfCond | 1 | Subscription to a set of NF Instances (UPFs), able to serve a certain service area (i.e. SMF serving area or TAI list). |
| ScpDomainCond | 1 | Subscription to a set of NF, SCP or SEPP instances belonging to certain SCP domains. |
| NwdafCond | 1 | Subscription to a set of NF Instances (NWDAFs), identified by Analytics ID(s), S-NSSAI(s) or NWDAF Serving Area information, i.e. list of TAIs for which the NWDAF can provide analytics. |
| NefCond | 1 | Subscription to a set of NF Instances (NEFs), identified by Event ID(s) provided by AF, S-NSSAI(s), AF Instance ID, Application Identifier, External Identifier, External Group Identifier, or domain name. |
| DccfCond | 1 | Subscription to a set of NF Instances (DCCFs), identified by NF types, NF Set Id(s) or DCCF Serving Area information, i.e. list of TAIs served by the DCCF. |

\* \* \* Next Change \* \* \* \*

##### 6.1.6.2.42 Type: NfGroupCond

Table 6.1.6.2.42-1: Definition of type NfGroupCond

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| nfType | string | M | 1 | NF type (UDM, AUSF, PCF, UDR, HSS or CHF) of the NF Instances whose status is requested to be monitored. |
| nfGroupId | NfGroupId | M | 1 | Group ID of the NF Instances whose status is requested to be monitored. |

\* \* \* Next Change \* \* \* \*

##### 6.1.6.2.64 Type: NfInstanceIdListCond

Table 6.1.6.2.64-1: Definition of type NfInstanceIdListCond

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| nfInstanceIdList | array(NfInstanceId) | C | 1..N | A list of NF Instances whose status is requested to be monitored. |

\* \* \* Next Change \* \* \* \*

##### 6.1.6.2.xx Type: ServiceNameListCond

Table 6.1.6.2.xx-1: Definition of type ServiceNameListCond

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| serviceNameList | array(ServiceName) | M | 1..N | Service names offered by the NF Instances whose status is requested to be monitored. |

\* \* \* Next Change \* \* \* \*

##### 6.1.6.2.yy Type: NfGroupListCond

Table 6.1.6.2.yy-1: Definition of type NfGroupListCond

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| conditionType | string | M | 1 | This attribute serves as discriminator, to make all data types defined in Table 6.1.6.2.35-1 mutually exclusive.  In this data type, it shall take the value "GROUP\_COND". |
| nfType | string | M | 1 | NF type (UDM, AUSF, PCF, UDR, HSS or CHF) of the NF Instances whose status is requested to be monitored. |
| nfGroupIdList | array(NfGroupId) | M | 1..N | Group IDs of the NF Instances whose status is requested to be monitored. |

\* \* \* Next Change \* \* \* \*

## A.2 Nnrf\_NFManagement API

<…skip…>

SubscriptionData:

description: Information of a subscription to notifications to NRF events, included in subscription requests and responses

type: object

required:

- nfStatusNotificationUri

- subscriptionId

properties:

nfStatusNotificationUri:

type: string

reqNfInstanceId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/NfInstanceId'

subscrCond:

oneOf:

- $ref: '#/components/schemas/NfInstanceIdCond'

- $ref: '#/components/schemas/NfInstanceIdListCond'

- $ref: '#/components/schemas/NfTypeCond'

- $ref: '#/components/schemas/ServiceNameCond'

- $ref: '#/components/schemas/ServiceNameListCond'

- $ref: '#/components/schemas/AmfCond'

- $ref: '#/components/schemas/GuamiListCond'

- $ref: '#/components/schemas/NetworkSliceCond'

- $ref: '#/components/schemas/NfGroupCond'

- $ref: '#/components/schemas/NfGroupListCond'

- $ref: '#/components/schemas/NfSetCond'

- $ref: '#/components/schemas/NfServiceSetCond'

- $ref: '#/components/schemas/UpfCond'

- $ref: '#/components/schemas/ScpDomainCond'

- $ref: '#/components/schemas/NwdafCond'

- $ref: '#/components/schemas/NefCond'

- $ref: '#/components/schemas/DccfCond'

subscriptionId:

type: string

pattern: '^([0-9]{5,6}-)?[^-]+$'

readOnly: true

validityTime:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

reqNotifEvents:

type: array

items:

$ref: '#/components/schemas/NotificationEventType'

minItems: 1

plmnId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/PlmnId'

nid:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Nid'

notifCondition:

$ref: '#/components/schemas/NotifCondition'

reqNfType:

$ref: '#/components/schemas/NFType'

reqNfFqdn:

$ref: '#/components/schemas/Fqdn'

reqSnssais:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Snssai'

minItems: 1

reqPerPlmnSnssais:

type: array

items:

$ref: '#/components/schemas/PlmnSnssai'

minItems: 1

reqPlmnList:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/PlmnId'

minItems: 1

reqSnpnList:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/PlmnIdNid'

minItems: 1

servingScope:

type: array

items:

type: string

minItems: 1

requesterFeatures:

writeOnly: true

allOf:

- $ref: 'TS29571\_CommonData.yaml#/components/schemas/SupportedFeatures'

nrfSupportedFeatures:

readOnly: true

allOf:

- $ref: 'TS29571\_CommonData.yaml#/components/schemas/SupportedFeatures'

hnrfUri:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uri'

NfInstanceIdCond:

description: Subscription to a given NF Instance Id

type: object

required:

- nfInstanceId

properties:

nfInstanceId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/NfInstanceId'

NfInstanceIdListCond:

description: Subscription to a list of NF Instances

type: object

required:

- nfInstanceIdList

properties:

nfInstanceIdList:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/NfInstanceId'

minItems: 1

NfTypeCond:

description: Subscription to a set of NFs based on their NF Type

type: object

required:

- nfType

not:

required: [ nfGroupId ]

properties:

nfType:

$ref: '#/components/schemas/NFType'

ServiceNameCond:

description: Subscription to a set of NFs based on their support for a given Service Name

type: object

required:

- serviceName

properties:

serviceName:

$ref: '#/components/schemas/ServiceName'

ServiceNameListCond:

description: Subscription to a set of NFs based on their support for a Service Name in the Servic Name list

type: object

required:

- serviceNameList

properties:

serviceNameList:

type: array

items:

$ref: '#/components/schemas/ServiceName'

minItems: 1

AmfCond:

description: Subscription to a set of AMFs, based on AMF Set Id and/or AMF Region Id

type: object

anyOf:

- required: [ amfSetId ]

- required: [ amfRegionId ]

properties:

amfSetId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/AmfSetId'

amfRegionId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/AmfRegionId'

GuamiListCond:

description: Subscription to a set of AMFs, based on their GUAMIs

type: object

required:

- guamiList

properties:

guamiList:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Guami'

NetworkSliceCond:

description: Subscription to a set of NFs, based on the slices (S-NSSAI and NSI) they support

type: object

required:

- snssaiList

properties:

snssaiList:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Snssai'

nsiList:

type: array

items:

type: string

NfGroupCond:

description: Subscription to a set of NFs based on their Group Id

type: object

required:

- nfType

- nfGroupId

properties:

nfType:

type: string

enum:

- UDM

- AUSF

- UDR

- PCF

- CHF

- HSS

nfGroupId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/NfGroupId'

NfGroupListCond:

description: Subscription to a set of NFs based on their Group Ids

type: object

required:

- conditionType

- nfType

- nfGroupIdList

properties:

conditionType:

type: string

enum: [ GROUP\_COND ]

nfType:

type: string

enum:

- UDM

- AUSF

- UDR

- PCF

- CHF

- HSS

nfGroupIdList:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/NfGroupId'

minItems: 1

NotifCondition:

description: Condition (list of attributes in the NF Profile) to determine whether a notification must be sent by NRF

type: object

not:

required: [ monitoredAttributes, unmonitoredAttributes ]

properties:

monitoredAttributes:

type: array

items:

type: string

minItems: 1

unmonitoredAttributes:

type: array

items:

type: string

minItems: 1

<…skip…>

\* \* \* End of Changes \* \* \* \*