**3GPP TSG-CT WG4 Meeting #111-eC4-224xyz**

**E-Meeting, 18th – 26th August 2022 (was C4-224324)**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **29.510** | **CR** | **0756** | **rev** | **1** | **Current version:** | **17.6.0** |  |
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| *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)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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| ***Title:*** | Allowed Operations per NF Type or NF Instance | | | | | | | | | |
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| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | CT4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | SBIProtoc18 | | | | |  | ***Date:*** | | | 2022-07-20 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The attributes "allowedOperationsPerNfType" and "allowedOperationsPerNfInstance" in the NFService type are used to indicate whether a given consumer is allowed to invoke a certain operation on a certain resource, indicated by the OAuth 2.0 scope required for such operation/resource.  The consumer may be indicated either by its NF type or by its NF Instance ID.  In the current specification, a given scope requested by a consumer is granted/allowed if such scope is included either in the "allowedOperationsPerNfType" or "allowedOperationsPerNfInstance" attributes, for the NF type and NF Instance ID of the NF service consumer.  This means that it is not possible to have a given NF Instance ID having narrower access rights than its corresponding NF type.  E.g., in current specification, if NF type UDM is defined as having access to scope A of the UDR API, while a specific UDM Instance is defined as having access to scope B of the UDR API, then such UDM instance will always have access to scopes A and B, and it is not possible to restrict the specific UDM instance to ONLY have access to scope B.  It seems useful to have the option to define scopes in such a way that "allowedOperationsPerNfInstance" have higher precedence over the scopes indicated for the corresponding NF type of such instance in "allowedOperationsPerNfType". This way, it is possible to define general access rights for a given NF Type and restrict access rights to certain NF instances.  To keep backwards compatibility with the current interpretation and semantics of the existing attributes, a boolean flag is defined to indicate whether the scopes per NF Instance ID should override the scopes per NF Type (with default to false). | | | | | | | | |
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| ***Summary of change:*** | | Introduce a new boolean flag that, when enabled, allows to specify that the scopes included in "allowedOperationsPerNfInstance" have precedence over (i.e. override) the scopes included in "allowedOperationsPerNfType" when the NF type of the NF Instance in the former attribute is also included in the latter. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | It is not possible to restrict access to operations/resources to a given NF Instance ID, compared with the access granted due to its NF type. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.1.6.2.3, 6.2.6.2.4, A.2, A.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 backwards-compatible new features on the following APIs:  - TS29510\_Nnrf\_NFManagement.yaml  - TS29510\_Nnrf\_NFDiscovery.yaml | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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

##### 6.1.6.2.3 Type: NFService

Table 6.1.6.2.3-1: Definition of type NFService

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| serviceInstanceId | string | M | 1 | Unique ID of the service instance within a given NF Instance |
| serviceName | ServiceName | M | 1 | Name of the service instance (e.g. "nudm-sdm") |
| versions | array(NFServiceVersion) | M | 1..N | The API versions supported by the NF Service and if available, the corresponding retirement date of the NF Service.  The different array elements shall have distinct unique values for "apiVersionInUri", and consequently, the values of "apiFullVersion" shall have a unique first digit version number. |
| scheme | UriScheme | M | 1 | URI scheme (e.g. "http", "https") |
| nfServiceStatus | NFServiceStatus | M | 1 | Status of the NF Service Instance (NOTE 3) (NOTE 12) |
| fqdn | Fqdn | O | 0..1 | FQDN of the NF Service Instance (NOTE 1) (NOTE 8) (NOTE 14)  The FQDN provided as part of the NFService information has precedence over the FQDN and IP addresses provided as part of the NFProfile information (see clause 6.1.6.2.2). |
| interPlmnFqdn | Fqdn | O | 0..1 | If the NF service needs to be discoverable by other NFs in a different PLMN, then an FQDN that is used for inter PLMN routing as specified in 3GPP TS 23.003 [12] may be registered with the NRF (NOTE 1) (NOTE 6).  A change of this attribute shall result in triggering a "NF\_PROFILE\_CHANGED" notification from NRF towards subscribing NFs located in the same or a different PLMN, but in the latter case the new value shall be notified as a change of the "fqdn" attribute. |
| ipEndPoints | array(IpEndPoint) | O | 1..N | IP address(es) and port information of the Network Function (including IPv4 and/or IPv6 address) where the service is listening for incoming service requests (NOTE 1) (NOTE 7) (NOTE 14).  IP addresses provided in ipEndPoints have precedence over IP addresses provided as part of the NFProfile information and, when using the HTTP scheme, over FQDN provided as part of the NFProfile information (see clause 6.1.6.2.2). |
| apiPrefix | string | O | 0..1 | Optional path segment(s) used to construct the {apiRoot} variable of the different API URIs, as described in 3GPP TS 29.501 [5], clause 4.4.1 |
| defaultNotificationSubscriptions | array(DefaultNotificationSubscription) | O | 1..N | Notification endpoints for different notification types.  (See also NOTE 10 in clause 6.1.6.2.2) |
| allowedPlmns | array(PlmnId) | O | 1..N | PLMNs allowed to access the service instance (NOTE 5).  The absence of this attribute indicates that any PLMN is allowed to access the service instance.  When included, the allowedPlmns attribute needs not include the PLMN ID(s) registered in the plmnList attribute of the NF Profile, i.e. the PLMN ID(s) registered in the NF Profile shall be considered to be allowed to access the service instance.  This attribute shall not be included in profile change notifications to subscribed NFs. (NOTE 13) |
| allowedSnpns | array(PlmnIdNid) | O | 1..N | SNPNs allowed to access the service instance.  If this attribute is present in the NFService and in the NF profile, the attribute from the NFService shall prevail.  The absence of this attribute in both the NFService and in the NF profile indicates that no SNPN, other than the SNPN(s) registered in the snpnList attribute of the NF Profile, is allowed to access the service instance.  When included, the allowedSnpns attribute needs not include the PLMN ID/NID(s) registered in the snpnList attribute of the NF Profile, i.e. the SNPNs registered in the NF Profile shall be considered to be allowed to access the service instance.  This attribute shall not be included in profile change notifications to subscribed NFs. (NOTE 13) |
| allowedNfTypes | array(NFType) | O | 1..N | Type of the NFs allowed to access the service instance (NOTE 5).  The absence of this attribute indicates that any NF type is allowed to access the service instance.  This attribute shall not be included in profile change notifications to subscribed NFs. (NOTE 13) |
| allowedNfDomains | array(string) | O | 1..N | Pattern (regular expression according to the ECMA-262 dialect [8]) representing the NF domain names within the PLMN of the NRF allowed to access the service instance (NOTE 5).  The absence of this attribute indicates that any NF domain is allowed to access the service instance.  This attribute shall not be included in profile change notifications to subscribed NFs. (NOTE 13) |
| allowedNssais | array(ExtSnssai) | O | 1..N | S-NSSAI of the allowed slices to access the service instance (NOTE 5).  The absence of this attribute indicates that any slice is allowed to access the service instance.  This attribute shall not be included in profile change notifications to subscribed NFs. (NOTE 13) |
| allowedOperationsPerNfType | map(array(string)) | O | 1..N(1..M) | Map of allowed operations on resources for each type of NF; the key of the map is the NF Type, and the value is an array of scopes.  The scopes shall be any of those defined in the API that defines the current service (identified by the "serviceName" attribute).  (NOTE 11) |
| allowedOperationsPerNfInstance | map(array(string)) | O | 1..N(1..M) | Map of allowed operations on resources for a given NF Instance; the key of the map is the NF Instance Id, and the value is an array of scopes.  The scopes shall be any of those defined in the API that defines the current service (identified by the "serviceName" attribute).  (NOTE 11) |
| allowedOperationsPerNfInstanceOverrides | boolean | O | 0..1 | This IE, when present and set to true, indicates that the scopes defined in attribute "allowedOperationsPerNfInstance" for a given NF Instance ID take precedence over the scopes defined in attribute "allowedOperationsPerNfType" for the corresponding NF type of the NF Instance associated to such NF Instance ID.  If the IE is not present, or set to false (default), it indicates that the allowed scopes are any of the scopes present either in "allowedOperationsPerNfType" or in "allowedOperationsPerNfInstance" for the NF Type and NF Instance ID of the NF Service Consumer.  (NOTE 11) |
| priority | integer | O | 0..1 | Priority (relative to other services of the same type) in the range of 0-65535, to be used for NF Service selection; lower values indicate a higher priority. (NOTE 2).  The NRF may overwrite the received priority value when exposing an NFProfile with the Nnrf\_NFDiscovery service. |
| capacity | integer | O | 0..1 | Static capacity information in the range of 0-65535, expressed as a weight relative to other services of the same type. (NOTE 2). |
| load | integer | O | 0..1 | Dynamic load information, ranged from 0 to 100, indicates the current load percentage of the NF Service. |
| loadTimeStamp | DateTime | O | 0..1 | It indicates the point in time in which the latest load information (sent by the NF in the "load" attribute of the NF Service) was generated at the NF Service Instance.  If the NF did not provide a timestamp, the NRF should set it to the instant when the NRF received the message where the NF provided the latest load information. |
| recoveryTime | DateTime | O | 0..1 | Timestamp when the NF service was (re)started (NOTE 3) (NOTE 4) |
| supportedFeatures | SupportedFeatures | O | 0..1 | Supported Features of the NF Service instance |
| nfServiceSetIdList | array(NfServiceSetId) | C | 1..N | NF Service Set ID (see clause 28.13 of 3GPP TS 23.003 [12])  At most one NF Service Set ID shall be indicated per PLMN-ID or SNPN of the NF.  This information shall be present if available.  (NOTE 15) |
| sNssais | array(ExtSnssai) | O | 1..N | S-NSSAIs of the NF Service. This may be a subset of the S-NSSAIs supported by the NF (see sNssais attribute in NFProfile).  When present, this IE shall represent the list of S-NSSAIs supported by the NF Service in all the PLMNs listed in the plmnList IE and it shall prevail over the list of S-NSSAIs supported by the NF instance. |
| perPlmnSnssaiList | array(PlmnSnssai) | O | 1..N | S-NSSAIs of the NF Service per PLMN. This may be a subset of the S-NSSAIs supported per PLMN by the NF (see perPlmnSnssaiList attribute in NFProfile).  This IE may be included when the list of S-NSSAIs supported by the NF Service for each PLMN it is supporting is different. When present, this IE shall include the S-NSSAIs supported by the NF Service for each PLMN and it shall prevail over the list of S-NSSAIs supported per PLMN by the NF instance. When present, this IE shall override the sNssais IE. (NOTE 9) |
| vendorId | VendorId | O | 0..1 | Vendor ID of the NF Service instance, according to the IANA-assigned "SMI Network Management Private Enterprise Codes" [38]. |
| supportedVendorSpecificFeatures | map(array(VendorSpecificFeature)) | O | 1..N(1..M) | Map of Vendor-Specific features, where the key of the map is the IANA-assigned "SMI Network Management Private Enterprise Codes" [38]. The string used as key of the map shall contain 6 decimal digits; if the SMI code has less than 6 digits, it shall be padded with leading digits "0" to complete a 6-digit string value.  The value of each entry of the map shall be a list (array) of VendorSpecificFeature objects.  (NOTE 10) |
| oauth2Required | boolean | O | 0..1 | It indicates whether the NF Service Instance requires Oauth2-based authorization.  Absence of this IE means that the NF Service Producer has not provided any indication about its usage of Oauth2 for authorization. |
| perPlmnOauth2ReqList | PlmnOauth2 | O | 0..1 | When present, this IE shall include the Oauth2-based authorization requirement supported by the NF Service Instance per PLMN of the NF Service Consumer.  This IE may be included when the Oauth2.0 authorization requirement supported by the NF Service Instance for different PLMN is different. When the requester PLMN Id is available in perPlmnOauth2ReqList IE, this IE shall override the oauth2Required IE. If the requester PLMN ID is not present in perPlmnOauth2ReqList IE, then the value of oauth2Required IE shall be applicable if available. |
| NOTE 1: The NF Service Consumer will construct the API URIs of the service using:  - For intra-PLMN signalling: If TLS is used, the FQDN present in the NF Service Profile, if any; otherwise, the FQDN present in the NF Profile. If TLS is not used, the FQDN should be used if the NF Service Consumer uses Indirect Communication via an SCP; the FQDN or the IP address in the ipEndPoints attribute may be used if the NF Service Consumer uses Direct Communication. - For inter-PLMN signalling: the interPlmnFqdn present in the NF Service Profile, if any; otherwise, the interPlmnFqdn present in the NF Profile. See Table 6.2.6.2.4-1.  NOTE 2: The capacity and priority parameters, if present, are used for NF selection and load balancing. The priority and capacity attributes shall be used for NF selection in the same way that priority and weight are used for server selection as defined in IETF RFC 2782 [23].  NOTE 3: The NRF shall notify NFs subscribed to receiving notifications of changes of the NF profile, if the recoveryTime or the nfServiceStatus is changed. See clause 6.2 of 3GPP TS 23.527 [27].  NOTE 4: A requester NF subscribed to NF status changes may consider that all the resources created in the NF service before the NF service recovery time have been lost. This may be used to detect a restart of a NF service and to trigger appropriate actions, e.g. release local resources. See clause 6.2 of 3GPP TS 23.527 [27].  NOTE 5: If this attribute is present in the NFService and in the NF profile, the attribute from the NFService shall prevail. The absence of this attribute in the NFService and in the NFProfile indicates that there is no corresponding restriction to access the service instance. If this attribute is absent in the NF Service, but it is present in the NF Profile, the attribute from the NF Profile shall be applied.  NOTE 6: Other NFs are in a different PLMN if they belong to none of the PLMN ID(s) configured for the PLMN of the NRF.  NOTE 7: If multiple ipv4 addresses and/or ipv6 addresses are included in the NF Service, the NF Service Consumer of the discovery service shall select one of these addresses randomly, unless operator defined local policy of IP address selection, in order to avoid overload for a specific ipv4 address and/or ipv6 address.  NOTE 8: If the URI scheme registered for the NF service is "https" then FQDN shall be provided in the NF Service profile or in NF Profile (see clause 6.1.6.2.2).  NOTE 9: This is for the use case where an NF (e.g. AMF) supports multiple PLMNs and the slices supported in each PLMN are different. See clause 9.2.6.2 of 3GPP TS 38.413 [29].  NOTE 10: When present, this attribute allows the NF requesting NF discovery (e.g. an NF Service Consumer) to determine which vendor-specific extensions are supported in a given NF (e.g. an Service Producer) in order to select an appropriate NF, or to include or not include the vendor-specific attributes (see 3GPP TS 29.500 [4] clause 6.6.3) required for a given feature in subsequent service requests towards a certain service instance of the NF Service Producer. One given vendor-specific feature shall not appear in both NF Profile and NF Service Profile. If one vendor-specific feature is service related, it shall only be included in the NF Service Profile.  NOTE 11: These attributes are used in order to determine whether a given resource/operation-level scope shall be granted to an NF Service Consumer that requested an Oauth2 access token with a specific scope. If attribute "allowedOperationsPerNfInstanceOverrides" is absent, or set to false, the NRF shall grant such scope in the access token, if the scope is present in either "allowedOperationsPerNfType", for the specific NF type of the NF Service Consumer, or in "allowedOperationsPerNfInstance", for the specific instance ID of the NF Service Consumer; if attribute "allowedOperationsPerNfInstanceOverrides" is present and set to true, the NRF shall grant such scope in the access token, if the scope is included in the "allowedOperationsPerNfInstance" attribute for the NF Instance ID of the NF Service Consumer.  NOTE 12: The nfServiceStatus also indicate the Status of the NF service instance as NF Service Consumer for notification delivery. When a notification is to be delivered to the NF service instance and the NF Service Producer (or SCP) has been aware that the NF service instance is not operative from the nfServiceStatus in the NF profile, the NF Service producer (or SCP) shall reselect another NF Service Consumer as target if possible, e.g. using binding indication or discovery factors previously provided for the notification. When selecting or reselecting an NF Service Consumer for notification delivery, not operative NF (service) instances shall not be selected as target.  NOTE 13: A change of this attribute shall trigger a "NF\_PROFILE\_CHANGED" notification from NRF, if the change of the NF Profile results in that the NF Instance starts or stops being authorized to be accessed by an NF having subscribed to be notified about NF profile changes.  NOTE 14: For API URIs constructed with an FQDN, the NF Service Consumer may use the FQDN in the target URI to do a DNS query and obtain the IP address(es) to setup the TCP connection, and ignore the IP addresses that may be present in the ipEndPoints attribute; alternatively, the NF Service Consumer may use those IP addresses to setup the TCP connection, if the NF Service Consumer supports to indicate specific IP address(es) to establish an HTTP/2 connection with an FQDN in the target URI.  NOTE 15: The NF service Instance shall be removed from an NF service set or re-assigned to another NF service set ONLY when there is NO ongoing resource/context associated with the NF service instance. | | | | |

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

##### 6.2.6.2.4 Type: NFService

Table 6.2.6.2.4-1: Definition of type NFService

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| serviceInstanceId | string | M | 1 | Unique ID of the service instance within a given NF Instance |
| serviceName | ServiceName | M | 1 | Name of the service instance (e.g. "udm-sdm") |
| versions | array(NFServiceVersion) | M | 1..N | The API versions supported by the NF Service and if available, the corresponding retirement date of the NF Service.  The different array elements shall have distinct unique values for "apiVersionInUri", and consequently, the values of "apiFullVersion" shall have a unique first digit version number. |
| scheme | UriScheme | M | 1 | URI scheme (e.g. "http", "https") |
| nfServiceStatus | NFServiceStatus | M | 1 | Status of the NF Service Instance |
| fqdn | Fqdn | O | 0..1 | FQDN of the NF Service Instance (see NOTE 1, NOTE 3, NOTE 9).  The FQDN provided as part of the NFService information has precedence over the FQDN and IP addresses provided as part of the NFProfile information (see clause 6.1.6.2.2). |
| interPlmnFqdn | Fqdn | C | 0..1 | If the requester-plmn-list query parameter is absent in the NF Discovery request, or if is present and the requester's PLMN is the same as the PLMN of the discovered NF Service, then this attribute shall be included by the NRF and it shall contain the interPlmnFqdn value registered for the NF Service during NF registration (see clause 6.1.6.2.3), if the interPlmnFqdn attribute was registered for the NF Service in the NF profile.  This attribute shall be absent if the requester-plmn in the query parameter is different from the PLMN of the discovered NF Service.  (NOTE 3, NOTE 10) |
| ipEndPoints | array(IpEndPoint) | O | 1..N | IP address(es) and port information of the Network Function (including IPv4 and/or IPv6 address) where the service is listening for incoming service requests (see NOTE 1, NOTE 5, NOTE 6, NOTE 9).  IP addresses provided in ipEndPoints have precedence over IP addresses provided as part of the NFProfile information and, when using the HTTP scheme, over FQDN provided as part of the NFProfile information (see clause 6.2.6.2.3). |
| apiPrefix | string | O | 0..1 | Optional path segment(s) used to construct the {apiRoot} variable of the different API URIs, as described in 3GPP TS 29.501 [5], clause 4.4.1 (optional deployment-specific string that starts with a "/" character) |
| defaultNotificationSubscriptions | array(DefaultNotificationSubscription) | O | 1..N | Notification endpoints for different notification types.  (See also NOTE 10 in clause 6.1.6.2.2) |
| capacity | integer | O | 0..1 | Static capacity information within the range 0 to 65535, expressed as a weight relative to other services of the same type. (See NOTE 2) |
| load | integer | O | 0..1 | Latest known load information of the NF Service, within the range 0 to 100 in percentage. (See NOTE 4) |
| loadTimeStamp | DateTime | O | 0..1 | It indicates the point in time in which the latest load information of the NF Service Instance was sent from the NF to the NRF. |
| priority | integer | O | 0..1 | Priority (relative to other services of the same type) within the range 0 to 65535, to be used for NF Service selection; lower values indicate a higher priority. (See NOTE 2) |
| recoveryTime | DateTime | O | 0..1 | Timestamp when the NF service was (re)started |
| supportedFeatures | SupportedFeatures | O | 0..1 | Supported Features of the NF Service instance |
| nfServiceSetIdList | array(NfServiceSetId) | C | 1..N | NF Service Set ID (see clause 28.13 of 3GPP TS 23.003 [12])  At most one NF Service Set ID shall be indicated per PLMN-ID or SNPN of the NF.  This information shall be present if available. |
| sNssais | array(ExtSnssai) | O | 1..N | S-NSSAIs of the NF Service. This may be a subset of the S-NSSAIs supported by the NF (see sNssais attribute in NFProfile).  When present, this IE represents the list of S-NSSAIs supported by the NF Service in all the PLMNs listed in the plmnList IE. |
| perPlmnSnssaiList | array(PlmnSnssai) | O | 1..N | S-NSSAIs of the NF Service per PLMN. This may be a subset of the S-NSSAIs supported per PLMN by the NF (see perPlmnSnssaiList attribute in NFProfile).  This IE may be included when the list of S-NSSAIs supported by the NF Service for each PLMN it is supporting is different. When present, this IE shall include the S-NSSAIs supported by the NF Service for each PLMN. When present, this IE shall override the sNssais IE. |
| vendorId | VendorId | O | 0..1 | Vendor ID of the NF Service instance, according to the IANA-assigned "SMI Network Management Private Enterprise Codes" [38]. |
| supportedVendorSpecificFeatures | map(array(VendorSpecificFeature) | O | 1..N(1..M) | Map of Vendor-Specific features, where the key of the map is the IANA-assigned "SMI Network Management Private Enterprise Codes" [38]. The string used as key of the map shall contain 6 decimal digits; if the SMI code has less than 6 digits, it shall be padded with leading digits "0" to complete a 6-digit string value.  The value of each entry of the map shall be a list (array) of VendorSpecificFeature objects.  (NOTE 7) |
| oauth2Required | boolean | O | 0..1 | It indicates whether the NF Instance requires Oauth2-based authorization.  Absence of this IE means that the NF Service Producer has not provided any indication about its usage of Oauth2 for authorization.  (See NOTE 11) |
| allowedOperationsPerNfType | map(array(string)) | O | 1..N(1..M) | Map of allowed operations on resources for each type of NF; the key of the map is the NF Type, and the value is an array of scopes.  The scopes shall be any of those defined in the API that defines the current service (identified by the "serviceName" attribute).  (NOTE 8) |
| allowedOperationsPerNfInstance | map(array(string)) | O | 1..N(1..M) | Map of allowed operations on resources for a given NF Instance; the key of the map is the NF Instance Id, and the value is an array of scopes.  The scopes shall be any of those defined in the API that defines the current service (identified by the "serviceName" attribute).  (NOTE 8) |
| allowedOperationsPerNfInstanceOverrides | boolean | O | 0..1 | This IE, when present and set to true, indicates that the scopes defined in attribute "allowedOperationsPerNfInstance" for a given NF Instance ID take precedence over the scopes defined in attribute "allowedOperationsPerNfType" for the corresponding NF type of the NF Instance associated to such NF Instance ID.  If the IE is not present, or set to false (default), it indicates that the allowed scopes are any of the scopes present either in "allowedOperationsPerNfType" or in "allowedOperationsPerNfInstance". |
| NOTE 1: The NF Service Consumer shall construct the API URIs of the service using:  - For intra-PLMN signalling: If TLS is used, the FQDN present in the NF Service Profile, if any; otherwise, the FQDN present in the NF Profile. If TLS is not used, the FQDN should be used if the NF Service Consumer uses Indirect Communication via an SCP; the FQDN or the IP address in the ipEndPoints attribute may be used if the NF Service Consumer uses Direct Communication. - For inter-PLMN signalling: the FQDN present in the NF Service Profile, if any; otherwise, the FQDN present in the NF Profile (see NOTE 3).  NOTE 2: The capacity and priority parameters, if present, are used for service selection and load balancing. The priority and capacity attributes shall be used for NF selection in the same way that priority and weight are used for server selection as defined in IETF RFC 2782 [23].  NOTE 3: If the requester-plmn in the query parameter is different from the PLMN of the discovered NF Service, then the fqdn attribute value, if included shall contain the interPlmnFqdn value registered by the NF Service during NF registration (see clause 6.1.6.2.3). The requester-plmn is different from the PLMN of the discovered NF Service if it belongs to none of the PLMN ID(s) configured for the PLMN of the NRF.  NOTE 4: The usage of the load parameter by the NF service consumer is implementation specific, e.g. be used for NF service selection and load balancing, together with other parameters.  NOTE 5: If the NF Service Consumer, based on the FQDN and IP address related attributes of the NFProfile and NFService, determines that it needs to use an FQDN to establish the HTTP connection with the NF Service Producer, it shall use such FQDN for DNS query and, in absence of any port information in the ipEndPoints attribute of the NF Service, it shall use the default HTTP port number, i.e. TCP port 80 for "http" URIs or TCP port 443 for "https" URIs as specified in IETF RFC 7540 [9] when invoking the service.  NOTE 6: If multiple ipv4 addresses and/or ipv6 addresses are included in the NF Service, the NF Service Consumer shall select one of these addresses randomly, unless operator defined local policy of IP address selection, in order to avoid overload for a specific ipv4 address and/or ipv6 address.  NOTE 7: When present, this attribute allows the NF requesting NF discovery (e.g. an NF Service Consumer) to determine which vendor-specific extensions are supported in a given NF (e.g. an Service Producer) in order to select an appropriate NF, or to include or not include the vendor-specific attributes (see 3GPP TS 29.500 [4] clause 6.6.3) required for a given feature in subsequent service requests towards a certain service instance of the NF Service Producer. One given vendor-specific feature shall not appear in both NF Profile and NF Service Profile. If one vendor-specific feature is service related, it shall only be included in the NF Service Profile.  NOTE 8: These attributes are used by the NF Service Consumer in order to discover the additional scopes (resource/operation-level scopes) that might be required to invoke a certain service operation, based on the authorization information registered in NRF by the NF Service Producer in its NF profile.  NOTE 9: For API URIs constructed with an FQDN, the NF Service Consumer may use the FQDN in the target URI to do a DNS query and obtain the IP address(es) to setup the TCP connection, and ignore the IP addresses that may be present in the ipEndPoints attribute; alternatively, the NF Service Consumer may use those IP addresses to setup the TCP connection, if the NF Service Consumer supports to indicate specific IP address(es) to establish an HTTP/2 connection with an FQDN in the target URI.  NOTE 10: This attribute may be used by the requester NF or SCP e.g. to build the authority of the Location header in 3xx response or to set the 3gpp-Sbi-apiRoot header in a response message (see clause 6.10.4 of 3GPP TS 29.500 [4]), when the NF redirects a request issued by a consumer from a different PLMN towards the discovered NF service, or when the SCP has reselected the discovered NF service for such a request.  NOTE 11: If PLMN specific value is registered for the PLMN ID of the requester NF, the NRF shall set the oauth2Required attribute with the PLMN specific values (see description of perPlmnOauth2ReqList in clause 6.1.6.2.3). | | | | |

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

# A.2 Nnrf\_NFManagement API

*(... text not shown for clarity ...)*

NFService:

description: >

Information of a given NF Service Instance; it is part of the NFProfile of an NF Instance

type: object

required:

- serviceInstanceId

- serviceName

- versions

- scheme

- nfServiceStatus

properties:

serviceInstanceId:

type: string

serviceName:

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

versions:

type: array

items:

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

minItems: 1

scheme:

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

nfServiceStatus:

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

fqdn:

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

interPlmnFqdn:

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

ipEndPoints:

type: array

items:

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

minItems: 1

apiPrefix:

type: string

defaultNotificationSubscriptions:

type: array

items:

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

minItems: 1

allowedPlmns:

type: array

items:

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

minItems: 1

allowedSnpns:

type: array

items:

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

minItems: 1

allowedNfTypes:

type: array

items:

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

minItems: 1

allowedNfDomains:

type: array

items:

type: string

minItems: 1

allowedNssais:

type: array

items:

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

minItems: 1

allowedOperationsPerNfType:

description: A map (list of key-value pairs) where NF Type serves as key

type: object

additionalProperties:

type: array

items:

type: string

minItems: 1

minProperties: 1

allowedOperationsPerNfInstance:

description: A map (list of key-value pairs) where NF Instance Id serves as key

type: object

additionalProperties:

type: array

items:

type: string

minItems: 1

minProperties: 1

allowedOperationsPerNfInstanceOverrides:

type: boolean

default: false

priority:

type: integer

minimum: 0

maximum: 65535

capacity:

type: integer

minimum: 0

maximum: 65535

load:

type: integer

minimum: 0

maximum: 100

loadTimeStamp:

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

recoveryTime:

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

supportedFeatures:

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

nfServiceSetIdList:

type: array

items:

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

minItems: 1

sNssais:

type: array

items:

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

minItems: 1

perPlmnSnssaiList:

type: array

items:

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

minItems: 1

vendorId:

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

supportedVendorSpecificFeatures:

description: >

A map (list of key-value pairs) where IANA-assigned SMI Network Management

Private Enterprise Codes serves as key

type: object

additionalProperties:

type: array

items:

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

minItems: 1

minProperties: 1

oauth2Required:

type: boolean

perPlmnOauth2ReqList:

$ref: '#/components/schemas/PlmnOauth2'

*(... text not shown for clarity ...)*

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

# A.3 Nnrf\_NFDiscovery API

*(... text not shown for clarity ...)*

NFService:

description: >

Information of a given NF Service Instance; it is part of the NFProfile

of an NF Instance discovered by the NRF

type: object

required:

- serviceInstanceId

- serviceName

- versions

- scheme

- nfServiceStatus

properties:

serviceInstanceId:

type: string

serviceName:

$ref: 'TS29510\_Nnrf\_NFManagement.yaml#/components/schemas/ServiceName'

versions:

type: array

items:

$ref: 'TS29510\_Nnrf\_NFManagement.yaml#/components/schemas/NFServiceVersion'

minItems: 1

scheme:

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

nfServiceStatus:

$ref: 'TS29510\_Nnrf\_NFManagement.yaml#/components/schemas/NFServiceStatus'

fqdn:

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

interPlmnFqdn:

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

ipEndPoints:

type: array

items:

$ref: 'TS29510\_Nnrf\_NFManagement.yaml#/components/schemas/IpEndPoint'

minItems: 1

apiPrefix:

type: string

defaultNotificationSubscriptions:

type: array

items:

$ref: 'TS29510\_Nnrf\_NFManagement.yaml#/components/schemas/DefaultNotificationSubscription'

minItems: 1

capacity:

type: integer

minimum: 0

maximum: 65535

load:

type: integer

minimum: 0

maximum: 100

loadTimeStamp:

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

priority:

type: integer

minimum: 0

maximum: 65535

recoveryTime:

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

supportedFeatures:

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

nfServiceSetIdList:

type: array

items:

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

minItems: 1

sNssais:

type: array

items:

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

minItems: 1

perPlmnSnssaiList:

type: array

items:

$ref: 'TS29510\_Nnrf\_NFManagement.yaml#/components/schemas/PlmnSnssai'

minItems: 1

vendorId:

$ref: 'TS29510\_Nnrf\_NFManagement.yaml#/components/schemas/VendorId'

supportedVendorSpecificFeatures:

description: >

The key of the map is the IANA-assigned SMI Network Management Private Enterprise Codes

type: object

additionalProperties:

type: array

items:

$ref: 'TS29510\_Nnrf\_NFManagement.yaml#/components/schemas/VendorSpecificFeature'

minItems: 1

minProperties: 1

oauth2Required:

type: boolean

allowedOperationsPerNfType:

description: A map (list of key-value pairs) where NF Type serves as key

type: object

additionalProperties:

type: array

items:

type: string

minItems: 1

minProperties: 1

allowedOperationsPerNfInstance:

description: A map (list of key-value pairs) where NF Instance Id serves as key

type: object

additionalProperties:

type: array

items:

type: string

minItems: 1

minProperties: 1

allowedOperationsPerNfInstanceOverrides:

type: boolean

default: false

*(... text not shown for clarity ...)*

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