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

**E-Meeting, 18th – 26th August 2022**  *Revision of C4-224159*

|  |
| --- |
| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  |  | **CR** |  | **rev** | **1** | **Current version:** |  |  |
|  |
| *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:***  | Locality based NF Discovery enhancements |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** | CT4 |
|  |  |
| ***Work item code:*** | SBIProtoc18 |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** |  |
|  | *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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | The NFDiscovery API does not enable an NFc or SCP to perform an NF Discovery request indicating multiple preferences for the location of the NFp and/or multiple location granularities of a preferred locality (e.g. one or more data centers, cities, regions) and their relative precedences/priorities. Example: NFc prefers to discover an NFp in data center "dc-123" as first priority, in data center "dc-456" as second priority, in the city of Los Angeles as 3rd priority otherwise in the state of California). Likewise, the NFManagement API does not enable an NFp to register different granularities of its locality, apart from concatening all location granularities info in a single string with an operator/vendor specific encoding and interpretation of the string.The above limits the possibility for an NFc or SCP to discover an NFp that best matches its preference and limits the possibility for the NRF to prioritize candidate NFp profiles based on the respective location of the candidate NFps and the preference of the NFc / SCP.Likewise, this limits the NFc and SCP to do similar prioritization based on the cached profiles they have discovered. The NRF, NFc and SCP can only check whether the NFp’s locality string matches or not the preferred- ocality of NFc.  |
|  |  |
| ***Summary of change:*** | A new ext-preferred-locality query parameter is defined for the NF Discovery procedure that enables the requester (NFc or SCP) to express a preferred locality for candidate NFps comprising multiple locatity descriptions (of same or different type/granularity), with their relative precedence/priority. A new extLocality attribute is defined in the NFProfile to enable an NF to register a locality, comprising multiple location descriptions (of different type / granularity).This enables the NRF to prioritize candidate NFps to return in an NF Discovery response based on the preferences expressed by the NFc or SCP and the multiple locatity descriptions registered in the NFp profile. |
|  |  |
| ***Consequences if not approved:*** | An NFp cannot register different locality types/granularities in its profile other than by concatening them info in a single string with operator / vendor specific interpretation of the string, which restricts open interoperability in deployments with NFs and NRF from different vendors.This limits the possibility for an NFc and SCP to discover an NFp that best matches its preferrences and this limits the possibility for the NRF to prioritize candidate NF profiles based on the respective location of candidate NFps and the preferences expressed by the NFc/SCP, especially when the NFp’s locality string does not fully match the preferred-locality query parameter of NFc.  |
|  |  |
| ***Clauses affected:*** | 6.1.6.1, 6.1.6.2.2, 6.1.6.2.16, 6.1.6.2.x (new), 6.1.6.3.x (new), 6.2.3.2.3.1, 6.2.6.1, 6.2.6.2.3, 6.2.6.2.6, 6.2.9, 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 new backward compatible features to the OpenAPI definition of the NFManagement API and NFDiscovery API. |
|  |  |
| ***This CR's revision history:*** | Rev. 1: the definition of the query parameter enables to encode a preferred locality as a set of locality description items to match with an "AND" relationship, e.g. to express a preference for NF profiles that are located in a given city and state.  |

\* \* \* First 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 |
| 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. |
| MbUpfInfo | 6.1.6.2.94 | Information of a MB-UPF NF Instance. |
| UnTrustAfInfo | 6.1.6.2.95 | Information of a untrusted AF Instance. |
| TrustAfInfo | 6.1.6.2.96 | Information of a trusted AF Instance |
| SnssaiInfoItem | 6.1.6.2.97 | Set of parameters supported by NF for a given S-NSSAI. |
| DnnInfoItem | 6.1.6.2.98 | Set of parameters supported by NF for a given DNN. |
| CollocatedNfInstance | 6.1.6.2.99 | Information related to collocated NF type(s) and corresponding NF Instance(s) when the NF is collocated with NFs supporting other NF types. |
| ServiceNameListCond | 6.1.6.2.100 | Subscription to a set of NF Instances that offer a service name in the Service Name list. |
| NfGroupListCond | 6.1.6.2.101 | Subscription to a set of NF Instances, identified by a NF Group Identity in the NF Group Identity list. |
| PlmnOauth2 | 6.1.6.2.102 | Per PLMN Oauth2.0 indication. |
| V2xCapability | 6.1.6.2.103 | Indicate the supported V2X Capability by the PCF. |
| NssaafInfo | 6.1.6.2.104 | Information of a NSSAAF NF Instance. |
| ProSeCapability | 6.1.6.2.105 | Indicate the supported ProSe Capability by the PCF. |
| SharedDataIdRange | 6.1.6.2.106 |  |
| SubscriptionContext | 6.1.6.2.107 | Context data related to a created subscription, to be included in notifications sent by NRF. |
| IwmscInfo | 6.1.6.2.108 | Information of a SMS-IWMSC NF Instance. |
| MnpfInfo | 6.1.6.2.109 | Information of an MNPF Instance. |
| LocalityDescriptionItem | 6.1.6.2.x | Description of locality information item |
| LocalityDescription | 6.1.6.2.y | Description of locality information comprising one or more locality information items |
| 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. |
| CollocatedNfType | 6.1.6.3.17 | Possible NF types supported by a collocated NF. |
| LocalityType | 6.1.6.3.x | Type of Locality description item |

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 |
| MbsServiceAreaInfo | 3GPP TS 29.571 [7] | MBS Service Area Information for Location dependent MBS session |
| Fqdn | 3GPP TS 29.571 [7] | Fully Qualified Domain Name |
| 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 |
| NetworkNodeDiameterAddress | 3GPP TS 29.503 [36] | Diameter Address of a Network Node |

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

##### 6.1.6.2.2 Type: NFProfile

Table 6.1.6.2.2-1: Definition of type NFProfile

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| nfInstanceId | NfInstanceId | M | 1 | Unique identity of the NF Instance. |
| nfType | NFType | M | 1 | Type of Network Function |
| nfStatus | NFStatus | M | 1 | Status of the NF Instance (NOTE 5) (NOTE 16) |
| collocatedNfInstances | array(CollocatedNfInstance) | O | 1..N | Information related to collocated NF type(s) and corresponding NF Instances when the NF is collocated with NFs supporting other NF types.(NOTE 21)In this release of the specification, following collocation scenarios are supported (see clause 6.1.6.2.99):- a MB-SMF collocated with a SMF;- a MB-UPF collocated with a UPF. |
| nfInstanceName | string | O | 0..1 | Human readable name of the NF Instance |
| heartBeatTimer | integer | C | 0..1 | Time in seconds expected between 2 consecutive heart-beat messages from an NF Instance to the NRF.It may be included in the registration request. When present in the request it shall contain the heartbeat time proposed by the NF service consumer.It shall be included in responses from NRF to registration requests (PUT) or in NF profile updates (PUT or PATCH). If the proposed heartbeat time is acceptable by the NRF based on the local configuration, it shall use the same value as in the registration request; otherwise the NRF shall override the value using a preconfigured value. |
| plmnList | array(PlmnId) | C | 1..N | PLMN(s) of the Network Function (NOTE 7).This IE shall be present if this information is available for the NF.If not provided, PLMN ID(s) of the PLMN of the NRF are assumed for the NF. |
| snpnList | array(PlmnIdNid) | C | 1..N | SNPN(s) of the Network Function.This IE shall be present if the NF pertains to one or more SNPNs.  |
| sNssais | array(ExtSnssai) | O | 1..N | S-NSSAIs of the Network Function.If not provided, and if the perPlmnSnssaiList attribute is not present, the NF can serve any S-NSSAI.When present this IE represents the list of S-NSSAIs supported in all the PLMNs listed in the plmnList IE.If the sNSSAIs attribute is provided in at least one NF Service, the S-NSSAIs supported by the NF Profile shall be the set or a superset of the S-NSSAIs of the NFService(s). |
| perPlmnSnssaiList | array(PlmnSnssai) | O | 1..N | This IE may be included when the list of S-NSSAIs supported by the NF for each PLMN it is supporting is different. When present, this IE shall include the S-NSSAIs supported by the Network Function for each PLMN supported by the Network Function. When present, this IE shall override sNssais IE. (NOTE 9)If the perPlmnSnssaiList attribute is provided in at least one NF Service, the S-NSSAIs supported per PLMN in the NF Profile shall be the set or a superset of the perPlmnSnssaiList of the NFService(s). |
| nsiList | array(string) | O | 1..N | NSI identities of the Network Function.If not provided, the NF can serve any NSI. |
| fqdn | Fqdn | C | 0..1 | FQDN of the Network Function (NOTE 1) (NOTE 2) (NOTE 18). For AMF, the FQDN registered with the NRF shall be that of the AMF Name (see 3GPP TS 23.003 [12] clause 28.3.2.5). |
| interPlmnFqdn | Fqdn | C | 0..1 | If the NF 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] shall be registered with the NRF (NOTE 8).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. |
| ipv4Addresses | array(Ipv4Addr) | C | 1..N | IPv4 address(es) of the Network Function (NOTE 1) (NOTE 2) (NOTE 18) |
| ipv6Addresses | array(Ipv6Addr) | C | 1..N | IPv6 address(es) of the Network Function (NOTE 1) (NOTE 2) (NOTE 18) |
| allowedPlmns | array(PlmnId) | O | 1..N | PLMNs allowed to access the NF instance.If not provided, any PLMN is allowed to access the NF.This attribute shall not be included in profile change notifications to subscribed NFs. (NOTE 17) |
| allowedSnpns | array(PlmnIdNid) | O | 1..N | SNPNs allowed to access the NF 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.This attribute shall not be included in profile change notifications to subscribed NFs. (NOTE 17) |
| allowedNfTypes | array(NFType) | O | 1..N | Type of the NFs allowed to access the NF instance.If not provided, any NF type is allowed to access the NF.This attribute shall not be included in profile change notifications to subscribed NFs. (NOTE 17) |
| 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 NF instance.If not provided, any NF domain is allowed to access the NF.This attribute shall not be included in profile change notifications to subscribed NFs. (NOTE 17) |
| allowedNssais | array(ExtSnssai) | O | 1..N | S-NSSAI of the allowed slices to access the NF instance.If not provided, any slice is allowed to access the NF.This attribute shall not be included in profile change notifications to subscribed NFs. (NOTE 17) |
| priority | integer | O | 0..1 | Priority (relative to other NFs of the same type) within the range 0 to 65535, to be used for NF selection; lower values indicate a higher priority. Priority may or may not be present in the nfServiceList parameters, xxxInfo parameters and in this attribute. Priority in the nfServiceList has precedence over the priority in this attribute (NOTE 4).Priority in xxxInfo parameter shall only be used to determine the relative priority among NF instances with the same priority at NFProfile/NFService.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 within the range 0 to 65535, expressed as a weight relative to other NF instances of the same type; if capacity is also present in the nfServiceList parameters, those will have precedence over this value. (NOTE 4). |
| load | integer | O | 0..1 | Dynamic load information, within the range 0 to 100, indicates the current load percentage of the NF. |
| 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 Profile) was generated at the NF 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. |
| locality | string | O | 0..1 | Operator defined information about the location of the NF instance (e.g. geographic location, data center) (NOTE 3) |
| extLocality | map(string) | O | 1..N | Operator defined information about the location of the NF instance. (NOTE 3)The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters, representing a type of locality as defined in clause 6.1.6.3.x. Example: { "DATA\_CENTER": "dc-123",  "CITY": "Los Angeles",  "STATE": "California"} |
| udrInfo | UdrInfo | O | 0..1 | Specific data for the UDR (ranges of SUPI, group ID …) |
| udrInfoList | map(UdrInfo) | O | 1..N | Multiple entries of UdrInfo. This attribute provides additional information to the udrInfo. udrInfoList may be present even if the udrInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| udmInfo | UdmInfo | O | 0..1 | Specific data for the UDM (ranges of SUPI, group ID…) |
| udmInfoList | map(UdmInfo) | O | 1..N | Multiple entries of UdmInfo. This attribute provides additional information to the udmInfo. udmInfoList may be present even if the udmInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| ausfInfo | AusfInfo | O | 0..1 | Specific data for the AUSF (ranges of SUPI, group ID…) |
| ausfInfoList | map(AusfInfo) | O | 1..N | Multiple entries of AusfInfo. This attribute provides additional information to the ausfInfo. ausfInfoList may be present even if the ausfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| amfInfo | AmfInfo | O | 0..1 | Specific data for the AMF (AMF Set ID, …) |
| amfInfoList | map(AmfInfo) | O | 1..N | Multiple entries of AmfInfo. This attribute provides additional information to the amfInfo. amfInfoList may be present even if the amfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| smfInfo | SmfInfo | O | 0..1 | Specific data for the SMF (DNN's, …).(NOTE 12) |
| smfInfoList | map(SmfInfo) | O | 1..N | Multiple entries of SmfInfo. This attribute provides additional information to the smfInfo. smfInfoList may be present even if the smfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters.(NOTE 12) |
| upfInfo | UpfInfo | O | 0..1 | Specific data for the UPF (S-NSSAI, DNN, SMF serving area, interface…) |
| upfInfoList | map(UpfInfo) | O | 1..N | Multiple entries of UpfInfo. This attribute provides additional information to the upfInfo. upfInfoList may be present even if the upfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| pcfInfo | PcfInfo | O | 0..1 | Specific data for the PCF. |
| pcfInfoList | map(PcfInfo) | O | 1..N | Multiple entries of PcfInfo. This attribute provides additional information to the pcfInfo. pcfInfoList may be present even if the pcfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| bsfInfo | BsfInfo | O | 0..1 | Specific data for the BSF. |
| bsfInfoList | map(BsfInfo) | O | 1..N | Multiple entries of BsfInfo. This attribute provides additional information to the bsfInfo. bsfInfoList may be present even if the bsfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| chfInfo | ChfInfo | O | 0..1 | Specific data for the CHF. |
| chfInfoList | map(ChfInfo) | O | 1..N | Multiple entries of ChfInfo. This attribute provides additional information to the chfInfo. chfInfoList may be present even if the chfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| nefInfo | NefInfo | O | 0..1 | Specific data for the NEF. |
| nrfInfo | NrfInfo | O | 0..1 | Specific data for the NRF. |
| udsfInfo | UdsfInfo | O | 0..1 | Specific data for the UDSF. |
| udsfInfoList | map(UdsfInfo) | O | 1..N | Multiple entries of udsfInfo. This attribute provides additional information to the udsfInfo. udsfInfoList may be present even if the udsfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| nwdafInfo | NwdafInfo | O | 0..1 | Specific data for the NWDAF. |
| nwdafInfoList | map(NwdafInfo) | O | 1..N | Multiple entries of nwdafInfo. This attribute provides additional information to the nwdafInfo. nwdafInfoList may be present even if the nwdafInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| pcscfInfoList | map(PcscfInfo) | O | 1..N | Specific data for the P-CSCF.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters.(NOTE 11) |
| hssInfoList | map(HssInfo) | O | 1..N | Specific data for the HSS.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| customInfo | object | O | 0..1 | Specific data for custom Network Functions |
| recoveryTime | DateTime | O | 0..1 | Timestamp when the NF was (re)started (NOTE 5) (NOTE 6) |
| nfServicePersistence | boolean | O | 0..1 | - true: If present, and set to true, it indicates that the different service instances of a same NF Service in this NF instance, supporting a same API version, are capable to persist their resource state in shared storage and therefore these resources are available after a new NF service instance supporting the same API version is selected by a NF Service Consumer (see 3GPP TS 23.527 [27]).- false (default): Otherwise, it indicates that the NF Service Instances of a same NF Service are not capable to share resource state inside the NF Instance. |
| nfServices | array(NFService) | O | 1..N | List of NF Service Instances. It shall include the services produced by the NF that can be discovered by other NFs, if any. (NOTE 15)This attribute is deprecated; the attribute "nfServiceList" should be used instead. |
| nfServiceList | map(NFService) | O | 1..N | Map of NF Service Instances, where the "serviceInstanceId" attribute of the NFService object shall be used as the key of the map. (NOTE 15)It shall include the services produced by the NF that can be discovered by other NFs, if any. |
| nfProfileChangesSupportInd | boolean | O | 0..1 | NF Profile Changes Support Indicator.See Annex B.This IE may be present in the NFRegister or NFUpdate (NF Profile Complete Replacement) request and shall be absent in the response.true: the NF Service Consumer supports receiving NF Profile Changes in the response.false (default): the NF Service Consumer does not support receiving NF Profile Changes in the response.Write-Only: true |
| nfProfileChangesInd | boolean | O | 0..1 | NF Profile Changes Indicator.See Annex B.This IE shall be absent in the request to the NRF and may be included by the NRF in NFRegister or NFUpdate (NF Profile Complete Replacement) response.true: the NF Profile contains NF Profile changes.false (default): complete NF Profile.Read-Only: true |
| defaultNotificationSubscriptions | array(DefaultNotificationSubscription) | O | 1..N | Notification endpoints for different notification types.(NOTE 10) |
| lmfInfo | LmfInfo | O | 0..1 | Specific data for the LMF. |
| gmlcInfo | GmlcInfo | O | 0..1 | Specific data for the GMLC. |
| nfSetIdList | array(NfSetId) | C | 1..N | NF Set ID defined in clause 28.12 of 3GPP TS 23.003 [12].At most one NF Set ID shall be indicated per PLMN-ID or SNPN of the NF.This information shall be present if available.(NOTE 22) (NOTE 23) |
| servingScope | array(string) | O | 1..N | The served area(s) of the NF instance.The absence of this attribute does not imply that the NF instance can serve every area in the PLMN.(NOTE 13) |
| lcHSupportInd | boolean | O | 0..1 | This IE indicates whether the NF supports Load Control based on LCI Header (see clause 6.3 of 3GPP TS 29.500 [4]). - true: the NF supports the feature. - false (default): the NF does not support the feature. |
| olcHSupportInd | boolean | O | 0..1 | This IE indicates whether the NF supports Overload Control based on OCI Header (see clause 6.4 of 3GPP TS 29.500 [4]). - true: the NF supports the feature. - false (default): the NF does not support the feature. |
| nfSetRecoveryTimeList | map(DateTime) | O | 1..N | Map of recovery time, where the key of the map is the *NfSetId* of NF Set(s) that the NF instance belongs to.When present, the value of each entry of the map shall be the recovery time of the NF Set indicated by the key. |
| serviceSetRecoveryTimeList | map(DateTime) | O | 1..N | Map of recovery time, where the key of the map is the *NfServiceSetId* of the NF Service Set(s) configured in the NF instance.When present, the value of each entry of the map shall be the recovery time of the NF Service Set indicated by the key. |
| scpDomains | array(string) | O | 1..N | When present, this IE shall carry the list of SCP domains the SCP belongs to, or the SCP domain the NF (other than SCP) or the SEPP belongs to.(NOTE 14) |
| scpInfo | ScpInfo | O | 0..1 | Specific data for the SCP. |
| seppInfo | SeppInfo | O | 0..1 | Specific data for the SEPP. |
| vendorId | VendorId | O | 0..1 | Vendor ID of the NF 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 19) |
| aanfInfoList | map(AanfInfo) | O | 1..N | Multiple entries of AanfInfo.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| 5gDdnmfInfo | 5GDdnmfInfo | O | 0..1 | Specific data for the 5G DDNMF (5G DDNMF ID, …) |
| mfafInfo | MfafInfo | O | 0..1 | Specific data for the MFAF |
| easdfInfoList | map(EasdfInfo) | O | 1..N | EASDF specific data.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters.(NOTE 20) |
| dccfInfo | DccfInfo | O | 0..1 | Specific data for the DCCF. |
| nsacfInfoList | map(NsacfInfo) | O | 1..N | Specific data for the NSACF.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| mbSmfInfoList | map(MbSmfInfo) | O | 1..N | MB-SMF specific data.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| tsctsfInfoList | map(TsctsfInfo) | O | 1..N | Specific data for the TSCTSF.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| mbUpfInfoList | map(MbUpfInfo) | O | 1..N | MB-UPF specific data.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| trustAfInfo | TrustAfInfo | O | 0..1 | Specific data for the trusted AF. |
| nssaafInfo | NssaafInfo | O | 0..1 | Specific data for the NSSAAF. |
| hniList | arrary(Fqdn) | C | 1..N | Identifications of Credentials Holder or Default Credentials Server.This IE shall be present if the NFs are available for the case of access to an SNPN using credentials owned by a Credentials Holder or for the case of SNPN Onboarding using a DCS.  |
| iwmscInfo | IwmscInfo | O | 0..1 | Specific data for the SMS-IWMSC. |
| mnpfInfo | MnpfInfo | O | 0..1 | Specific data for the MNPF. |
| NOTE 1: At least one of the addressing parameters (fqdn, ipv4address or ipv6adress) shall be included in the NF Profile. If the NF supports the NF services with "https" URI scheme (i.e use of TLS is mandatory), then the FQDN shall be provided in the NF Profile or the NF Service profile (see clause 6.1.6.2.3) and it shall be used to construct the target URI (unless overriden by a NFService-specific FQDN). See NOTE 1 of Table 6.1.6.2.3-1 for the use of these parameters. If multiple ipv4 addresses and/or ipv6 addresses are included in the NF Profile, 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 2: If the type of Network Function is UPF or MB-UPF, the addressing information is for the UPF N4 interface or MB-UPF N4mb interface respectively. If the type of Network Function is a P-CSCF and if no Gm FQDN or IP addresses are registered in the pcscfInfoList attribute, the addressing information is also used for the P-CSCF Gm interface.NOTE 3: A requester NF may use this information to select a NF instance (e.g. a NF instance preferably located in the same data center).NOTE 4: 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 5: The NRF shall notify NFs subscribed to receiving notifications of changes of the NF profile, if the NF recoveryTime or the nfStatus is changed. See clause 6.2 of 3GPP TS 23.527 [27].NOTE 6: A requester NF may consider that all the resources created in the NF before the NF recovery time have been lost. This may be used to detect a restart of a NF and to trigger appropriate actions, e.g. release local resources. See clause 6.2 of 3GPP TS 23.527 [27].NOTE 7: A NF may register multiple PLMN IDs in its profile within a PLMN comprising multiple PLMN IDs. If so, all the attributes of the NF Profile shall apply to each PLMN ID registered in the plmnList. As an exception, attributes including a PLMN ID, e.g. IMSI-based SUPI ranges, TAIs and GUAMIs, are specific to one PLMN ID and the NF may register in its profile multiple occurrences of such attributes for different PLMN IDs (e.g. the UDM may register in its profile SUPI ranges for different PLMN IDs).NOTE 8: 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 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: For notification types that may be associated with a specifc service of the NF Instance receiving the notification (see clause 6.1.6.3.4), if notification endpoints are present both in the profile of the NF instance (NFProfile) and in some of its NF Services (NFService) for a same notification type, the notification endpoint(s) of the NF Services shall be used for this notification type. The defaultNotificationSubscriptions attribute may contain multiple default subscriptions for a same notification type; in that case, those default subscriptions are used as alternative notification endpoints so, for each notification event that needs to be sent, the NF Service Consumer shall select one of such subscriptions and use it to send the notification.NOTE 11: The absence of the pcscfInfoList attribute in a P-CSCF profile indicates that the P-CSCF can be selected for any DNN and Access Type, and that the P-CSCF Gm addressing information is the same as the addressing information registered in the fqdn, ipv4Addresses and ipv4Addresses attributes of the NF profile.NOTE 12: The absence of both the smfInfo and smfInfoList attributes in an SMF profile indicates that the SMF can be selected for any S-NSSAI listed in the sNssais and perPlmnSnssaiList IEs, or for any S-NSSAI if neither the sNssais IE nor the perPlmnSnssaiList IE are present, and for any DNN, TAI and access type.NOTE 13: The servingScope attribute may indicate geographical areas, It may be used e.g. to discover and select NFs in centralized Data Centers that are expected to serve users located in specific region(s) or province(s). It may also be used to reduce the large configuration of TAIs in the NF instances.NOTE 14: An NF (other than a SCP) can register at most one SCP domain in NF profile, i.e. the NF can belong to only one SCP domain. If an NF (other than a SCP) includes this information in its profile, this indicates that the services produced by this NF should be accessed preferably via an SCP from the SCP domain the NF belongs to.NOTE 15: If the NF Service Consumer that issues an NF profile retrieval request indicates support for the "Service-Map" feature, the NRF shall return in the NF profile retrieval response the list of NF Service Instances in the "nfServiceList" map attribute. Otherwise, the NRF shall return the list of NF Service Instances in the "nfServices" array attribute.NOTE 16: The nfStatus also indicate the Status of the NF instance as NF Service Consumer for notification delivery. When a notification is to be delivered to the NF instance and the NF Service Producer (or SCP) has been aware that the NF instance is not operative from the nfStatus in its 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 instances shall not be selected as target.NOTE 17: 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 18: For API URIs constructed with an FQDN, the NF Service Consumer may use the FQDN of 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 NFProfile; alternatively, the NF Service Consumer may use those IP addresses to setup the TCP connection, if no service-specific FQDN or IP address is provided in the NFService data and 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 19: When present, this attribute allows an 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 NF Service Producer), so as to select an appropriate NF with specific capability, or to include or not the vendor-specific attributes (see 3GPP TS 29.500 [4] clause 6.6.3) required for a given feature in subsequent messages towards a certain NF. 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 20: The absence of the easdfInfoList attribute in an EASDF profile indicates that the EASDF can be selected for any S-NSSAI, DNN, DNAI or PSA UPF N6 IP address.NOTE 21: The NF service consumer when invoking NF services offered by collocated NF service producers shall follow the respective service API in the same manner as if they were not collocated with any other NF type. The NF service consumer shall not assume any optimization of signaling between the NF service consumer and the collocated NF service producers.NOTE 22: The nfSetIdList attribute shall be present only if all NF service instance(s) of the NF instance are redundant at NF Set level. I.e. any NF service instance shall be redundant (i.e. functionally equivalent, inter-changeable and sharing contexts) with equivalent service instance(s) of every other NF instance(s) within the indicated NF Set or, if the NF service instance belongs to an NF service set, it shall be redundant with NF service instance(s) in an equivalent NF service set of every other NF instance(s) within the indicated NF set.NOTE 23: The NF Instance shall be removed from an NF set or re-assigned to another NF set ONLY when there is NO ongoing resource/context associated with the NF instance. |

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

##### 6.1.6.2.16 Type: SubscriptionData

Table 6.1.6.2.16-1: Definition of type SubscriptionData

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| nfStatusNotificationUri | Uri | M | 1 | Callback URI where the NF Service Consumer will receive the notifications from NRF. |
| reqNfInstanceId | NfInstanceId | O | 0..1 | If present, this IE shall contain the NF instance id of the NF service consumer. |
| subscrCond | SubscrCond | O | 0..1 | If present, this attributed shall contain the conditions identifying the set of NF Instances whose status is requested to be monitored. If this attribute is not present, it means that the NF Service Consumer requests a subscription to all NFs in the NRF (NOTE 1). |
| subscriptionId | string | C | 0..1 | Subscription ID for the newly created resource. This parameter shall be absent in the request to the NRF and shall be included by NRF in the response to the subscription creation request.Read-Only: truePattern: "^([0-9]{5,6}-)?[^-]+$" |
| validityTime | DateTime | C | 0..1 | Time instant after which the subscription becomes invalid. This parameter may be sent by the client, as a hint to the server, but it shall be always sent back by the server (regardless of the presence of the attribute in the request) in the response to the subscription creation request. |
| reqNotifEvents | array(NotificationEventType) | O | 1..N | If present, this attribute shall contain the list of event types that the NF Service Consumer is interested in receiving.If this attribute is not present, it means that notifications for all event types are requested. |
| reqNfType | NFType | C | 0..1 | An NF Service Consumer complying with this version of the specification shall include this IE.If included, this IE shall contain the NF type of the NF Service Consumer that is requesting the creation of the subscription. The NRF shall use it for authorizing the request, in the same way as the "requester-nf-type" is used in the NF Discovery service (see Table 6.2.3.2.3.1-1).When the subscription is for a set of NF Instances, the subscription may be accepted by NRF, but it shall only generate notifications from NF Instances whose authorization parameters allow the NF Service Consumer to access their services (NOTE 2). |
| reqNfFqdn | Fqdn | O | 0..1 | This IE may be present for a subscription request within the same PLMN as the NRF.If included, this IE shall contain the FQDN of the NF Service Consumer that is requesting the creation of the subscription. The NRF shall use it for authorizing the request, in the same way as the "requester-nf-instance-fqdn" is used in the NF Discovery service (see Table 6.2.3.2.3.1-1).This IE shall be ignored by the NRF if it is received from a requester NF belonging to a different PLMN.When the subscription is for a set of NF Instances, the subscription may be accepted by NRF, but it shall only generate notifications from NF Instances whose authorization parameters allow the NF Service Consumer to access their services (NOTE 2). |
| reqSnssais | array(Snssai) | O | 0..1 | If included, this IE shall contain the list of S-NSSAIs of the NF Service Consumer that is requesting the creation of the subscription. If this IE is included in a subscription request in a different PLMN, the requester NF shall provide S-NSSAI values of the target PLMN, that correspond to the S-NSSAI values of the requester NF. The NRF shall use it for authorizing the request, in the same way as the "requester-snssais" is used in the NF Discovery service (see Table 6.2.3.2.3.1-1).When the subscription is for a set of NF Instances, the subscription may be accepted by NRF, but it shall only generate notifications from NF Instances whose authorization parameters allow the NF Service Consumer to access their services (NOTE 2). |
| reqPerPlmnSnssais | array(PlmnSnssai) | O | 1..N | If included, this IE shall indicate the list of S-NSSAIs supported by the NF Service Consumer in each of the PLMNs it supports. The NRF shall use it for authorizing the request, in the same way as the "per-plmn-requester-snssais" is used in the NF Discovery service (see Table 6.2.3.2.3.1-1).When the subscription is for a set of NF Instances, the subscription may be accepted by NRF, but it shall only generate notifications from NF Instances whose authorization parameters allow the NF Service Consumer to access their services (NOTE 2). |
| plmnId | PlmnId | O | 0..1 | If present, this attribute contains the target PLMN ID of the NF Instance(s) whose status is requested to be monitored.(NOTE 7) |
| nid | Nid | O | 0..1 | If present, this attribute contains the target NID that, together with the plmnId attribute, identifies the SNPN of the NF Instance(s) whose status is requested to be monitored.  |
| onboardingCapability | boolean | O | 0..1 | If present, this attribute indicates the NF Instance(s) whose status is requested to be monitored support SNPN Onboarding capability. |
| notifCondition | NotifCondition | O | 0..1 | If present, this attribute contains the conditions that trigger a notification from NRF; this attribute shall only be present if the NF Service Consumer has subscribed to changes on the NF Profile (i.e., reqNotifEvents contains the value "NF\_PROFILE\_CHANGED", or reqNotifEvents attribute is absent) (NOTE 3).If this attribute is absent, it means that the NF Service Consumer does not indicate any restriction, or condition, on which attributes of the NF Profile shall trigger a notification from NRF.(NOTE 5). |
| reqPlmnList | array(PlmnId) | C | 1..N | This IE shall be included when subscribing to NF services in a different PLMN. When included, this IE shall contain the PLMN ID(s) of the requester NF.(NOTE 2) |
| reqSnpnList | array(PlmnIdNid) | C | 1..N | This IE shall be included when the subscribing NF belongs to one or several SNPNs and it subscribes to NF services of a specific SNPN. When included, this IE shall contain the SNPN ID(s) of the requester NF.When the subscription is for a set of NF Instances, the subscription may be accepted by NRF, but it shall only generate notifications from NF Instances whose authorization parameters allow the NF Service Consumer to access their services.(NOTE 2) |
| servingScope | array(string) | O | 1..N | If present, this attribute indicates the target served area(s) of the NF instance(s) whose status is required to be monitored. (NOTE 4) |
| requesterFeatures | SupportedFeatures | C | 0..1 | Nnrf\_NFManagement features supported by the NF Service Consumer that is invoking the Nnrf\_NFManagement service. See clause 6.1.9.This IE shall be included if at least one feature is supported by the NF Service Consumer.Write-Only: true(NOTE 6) |
| nrfSupportedFeatures | SupportedFeatures | C | 0..1 | Features supported by the NRF in the Nnrf\_NFManagement service. See clause 6.1.9.This IE shall be included if at least one feature is supported by the NRF.Read-Only: true |
| hnrfUri | Uri | C | 0..1 | If included, this IE shall contain the API URI of the NFManagement Service (see clause 6.1.1) of the home NRF.It shall be included if the NF Service Consumer has previously received such API URI from the NSSF in the home PLMN (see clause 6.1.6.2.11 of 3GPP TS 29.531 [42]). |
| targetHni | Fqdn | O | 0..1 | If present, this attribute shall contain the identification of the Default Credentials Server or the identification of the Credentials Hoder. |
| preferredLocality | string | O | 0..1 | Preferred target NF location (e.g. geographic location, data center).When present, the NRF should set a priority for the monitored NF instance in the notification as specified in the description of the preferred-locality in Table 6.2.3.2.3.1-1. |
| extPreferredLocality | map(array(LocalityDescription)) | O | 1..N(1..M) | Preferred target NF location (e.g. geographic location, data center).The key of the map shall represent the relative priority, for the requester, of each locality description among the list of locality descriptions in this attribute, encoded as "1" (highest priority"), "2", "3", …, "n" (lowest priority). See examples in the description of the ext-preferred-locality in Table 6.2.3.2.3.1-1.When present, the NRF should set a priority for the monitored NF instance in the notification as specified in the description of the ext-preferred-locality in Table 6.2.3.2.3.1-1. |
| NOTE 1: The "subscription to all NFs" may be quite demanding in terms of resources in NRF and also in terms of network traffic of the resulting notifications, so it should be authorized by NRF under very strict policies (e.g. only to a specific requesting NF, as indicated by reqNfType and reqNfFqdn attributes).NOTE 2: The authorization parameters in NF Profile are those used by NRF to determine whether a given NF Instance / NF Service Instance can be discovered by an NF Service Consumer in order to consume its offered services (e.g. "allowedNfTypes", "allowedNfDomains", etc.). Based on operator's policies, a subscription request not including the requester's information necessary to validate the authorization parameters in NF Profiles may be rejected or may be accepted but with only generating notifications from NF Instances whose authorization parameters allow any NF Service Consumer to access their services.NOTE 3: The subscription to load changes may be quite demanding in terms of network traffic of the resulting notifications, thus it may be limited by the NRF via appropriate configuration (e.g. granularity threshold)NOTE 4: An NF instance may explicitly indicate the served areas in the NF profile when registered to NRF. When this IE is present, the NRF shall only monitor the NF instance(s) indicating at least one of the served areas in the list. If an NF instance has not indicated any served area in its NF profile, it shall not be monitored.NOTE 5: If the attributes to be monitored or excluded from monitoring, included as part of the "notifCondition" attribute, refer to a specific element of an array (e.g. they refer to a specifc array index of the "nfServices" attribute of the NFProfile), the NRF shall apply the same condition to all elements of the same array.NOTE 6: If the NF Service Consumer that issued the subscription request indicated support for the "Service-Map" feature, the NRF shall send notifications of profile changes (see clause 6.1.6.2.17) affecting the list of NF Service Instances, as modifications of specific attributes of the "nfServiceList" map. Otherwise, the NRF shall send those notifications as a complete replacement of the "nfServices" array attribute.NOTE 7: The PLMN ID should be used by the NRF as an additional subscription condition to monitor the change of target NF profile, unless the subscription is specific to one or a list of NF(s) explicitly indicated by their NF Instance ID(s), e.g. using the NfInstanceIdCond or NfInstanceIdListCond, in which case the NRF shall not use the PLMN ID provided in the subscription (if any) as an additional subscription condition to monitor the change of target NF profile. |

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

##### 6.1.6.2.x Type: LocalityDescriptionItem

Table 6.1.6.2.x-1: Definition of type LocalityDescriptionItem

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| localityType | LocalityType | M | 1 | Type of locality description |
| localityValue | string | M | 1 | Locality value |

##### 6.1.6.2.y Type: LocalityDescription

Table 6.1.6.2.y-1: Definition of type LocalityDescription

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| localityType | LocalityType | M | 1 | Type of locality description |
| localityValue | string | M | 1 | Locality value |
| addlLocDescrItems | array(LocalityDescriptionItem) | O | 0..1 | Additional locality description itemsThis IE may be present to express a preferred locatity as a set of locality description items to match with an "AND" relationship, e.g. to express a preference for NF profiles that are located in a given city and state. This may be used e.g. when a locality value of a given locality type may not be unique within the PLMN, such as cities with the same name in different states.  |

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

##### 6.1.6.3.x Enumeration: LocalityType

Table 6.1.6.3.x-1: Enumeration LocalityType

|  |  |
| --- | --- |
| Enumeration value | Description |
| "DATA\_CENTER" | Data center |
| "CITY" | City |
| "COUNTY" | County |
| "DISTRICT" | District |
| "STATE" | State |
| "CANTON" | Canton |
| "REGION" | Region |
| "PROVINCE" | Province |
| "PREFECTURE" | Prefecture |
| "COUNTRY" | Country |
| NOTE 1: An operator may define custom locality types other than those defined in this table. The NRF and NFs shall accept locality types defined with custom locality type values. NOTE 2: The NRF needs not understand the semantic of the LocalityType enumeration values. The LocalityType information is used by the NRF to correlate a locality description received in the ext-preferred-locality query parameter with a locality description registered in the extLocality attribute of NFProfile with a matching LocalityType. |

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

6.2.3.2.3.1 GET

This operation retrieves a list of NF Instances, and their offered services, currently registered in the NRF, satisfying a number of filter criteria, such as those NF Instances offering a certain service name, or those NF Instances of a given NF type (e.g., AMF).

Table 6.2.3.2.3.1-1: URI query parameters supported by the GET method on this resource

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description | Applicability |
| target-nf-type | NFType | M | 1 | This IE shall contain the NF type of the target NF being discovered. |  |
| requester-nf-type | NFType | M | 1 | This IE shall contain the NF type of the Requester NF that is invoking the Nnrf\_NFDiscovery service. |  |
| preferred-collocated-nf-types | array(CollocatedNfType) | O | 1..N | The IE may be present to indicate desired collocated NF type(s) when the NF service consumer wants to discover candidate NFs matching the target NF Type that are preferentially collocated with other NF types. (NOTE 19) | Collocated-NF-Selection |
| requester-nf-instance-id | NfInstanceId | O  | 0..1 | If included, this IE shall contain the NF instance id of the Requester NF.  | Query-Params-Ext2 |
| service-names | array(ServiceName) | O | 1..N | If included, this IE shall contain an array of service names for which the NRF is queried to provide the list of NF profiles.The NRF shall return the NF profiles that have at least one NF service matching the NF service names in this list.The NF services returned by the NRF (inside the nfServices or nfServiceList attributes) in each matching NFProfile shall be those services whose service name matches one of the service names included in this list.If not included, the NRF shall not filter based on service name.This array shall contain unique items.Example:NF1 supports services: A, B, CNF2 supports services: C, D, ENF3 supports services: A, C, ENF4 supports services: B, C, DConsumer asks for service-names = [A, E]NRF returns:NF1 containing service ANF2 containing service ENF3 containing services A, ENF4 is not returned |  |
| requester-nf-instance-fqdn | Fqdn | O | 0..1 | This IE may be present for an NF discovery request within the same PLMN as the NRF.If included, this IE shall contain the FQDN of the Requester NF that is invoking the Nnrf\_NFDiscovery service.The NRF shall use this to return only those NF profiles that include at least one NF service containing an entry in the "allowedNfDomains" list (see clause 6.1.6.2.3) that matches the domain of the requester NF.This IE shall be ignored by the NRF if it is received from a requester NF belonging to a different PLMN.(NOTE 12) |  |
| target-plmn-list | array(PlmnId) | C | 1..N | This IE shall be included when NF services in a different PLMN, or NF services of specific PLMN ID(s) in a same PLMN comprising multiple PLMN IDs, need to be discovered. When included, this IE shall contain the PLMN ID of the target NF. If more than one PLMN ID is included, NFs from any PLMN ID present in the list matches the query parameter.This IE shall also be included in SNPN scenarios, when the entity owning the subscription, the Credentials Holder (see clause 5.30.2.9 in 3GPP TS 23.501 [2]) is a PLMN.For inter-PLMN service discovery, at most 1 PLMN ID shall be included in the list; it shall be included in the service discovery from the NF in the source PLMN sent to the NRF in the same PLMN, while it may be absent in the service discovery request sent from the source NRF to the target NRF. In such case, if the NRF receives more than 1 PLMN ID, it shall only consider the first element of the array, and ignore the rest. |  |
| requester-plmn-list | array(PlmnId) | C | 1..N | This IE shall be included when NF services in a different PLMN need to be discovered. It may be present when NF services in the same PLMN need to be discovered. When included, this IE shall contain the PLMN ID(s) of the requester NF. (NOTE 12) |  |
| requester-snpn-list | array(PlmnIdNid) | C | 1..N | This IE shall be included when the Requester NF belongs to one or several SNPNs, and NF services of a specific SNPN need to be discovered.When present, this IE shall contain the SNPN ID(s) of the requester NF.The NRF shall use this to return only those NF profiles of NF Instances allowing to be discovered from the SNPNs identified by this IE, according to the "allowedSnpns" list in the NF Profile and NF Service (see clauses 6.1.6.2.2 and 6.1.6.2.3). | Query-Params-Ext2 |
| target-nf-instance-id | NfInstanceId | O | 0..1 | Identity of the NF instance being discovered. |  |
| target-nf-fqdn | Fqdn | O | 0..1 | FQDN of the target NF instance being discovered. |  |
| hnrf-uri | Uri | C | 0..1 | If included, this IE shall contain the API URI of the NFDiscovery Service (see clause 6.2.1) of the home NRF. It shall be included if the Requester NF has previously received such API URI to be used for service discovery (e.g., from the NSSF in the home PLMN as specified in clause 6.1.6.2.11 of 3GPP TS 29.531 [42]). |  |
| snssais | array(Snssai) | O | 1..N | If included, this IE shall contain the list of S-NSSAIs that are served by the NF (Service) Instances being discovered. The NRF shall return those NF profiles/NF services of NF (Service) Instances that have at least one of the S-NSSAIs in this list. The S-NSSAIs included in the NF profiles/NF services of NF (Service) Instances returned by the NRF shall be an interclause of the S-NSSAIs requested and the S-NSSAIs supported by those NF (Service) Instances. (NOTE 10)When the NF Profile of the NF Instances being discovered has defined the list of supported S-NSSAIs in the "perPlmnSnssaiList", the discovered NF Instances shall be those having any of the S-NSSAIs included in this "snssais" parameter in any of the PLMNs included in the "target-plmn-list" attribute, if present; if the "target-plmn-list" is not included, the NRF shall assume that the discovery request is for any of the PLMNs it supports. |  |
| requester-snssais | array(Snssai) | O | 1..N | If included, this IE shall contain the list of S-NSSAI of the requester NF. If this IE is included in a service discovery in a different PLMN, the requester NF shall provide S-NSSAI values of the target PLMN, that correspond to the S-NSSAI values of the requester NF.The NRF shall use this to return only those NF profiles of NF Instances allowing to be discovered from at least one network slice identified by this IE, according to the "allowedNssais" list in the NF Profile and NF Service (see clause 6.1.6.2.2 and 6.1.6.2.3). (NOTE 12) |  |
| plmn-specific-snssai-list | array(PlmnSnssai) | O | 1..N | If included, this IE shall contain the list of S-NSSAI that are served by the NF service being discovered for the corresponding PLMN provided. The NRF shall use this to identify the NF services that have registered their support for the S-NSSAIs for the corresponding PLMN given. The NRF shall return the NF profiles that have at least one S-NSSAI supported in any of the PLMNs provided in this list. The per PLMN list of S-NSSAIs included in the NF profile returned by the NRF shall be an interclause of the list requested and the list registered in the NF profile. (NOTE 10). |  |
| requester-plmn-specific-snssai-list | array(PlmnSnssai) | O | 1..N | If included, this IE shall contain the list of S-NSSAI of the requester NF, for each of the PLMNs it supports. The NRF shall use this to return only those NF profiles of NF Instances allowing to be discovered from at least one network slice identified by this IE, according to the "allowedNssais" and "allowedPlmns" attributes in the NF Profile and NF Service (see clause 6.1.6.2.2 and 6.1.6.2.3). (NOTE 12) | Query-Params-Ext3 |
| nsi-list | array(string) | O | 1..N | If included, this IE shall contain the list of NSI IDs that are served by the services being discovered. |  |
| dnn | Dnn | O | 0..1 | If included, this IE shall contain the DNN for which NF services serving that DNN is discovered. DNN may be included if the target NF type is e.g. "BSF", "SMF", "PCF", "PCSCF", "UPF", "EASDF", "TSCTSF", "MB-UPF" or "MB-SMF".The DNN shall contain the Network Identifier and it may additionally contain an Operator Identifier. (NOTE 11).If the Snssai(s) are also included, the NF services serving the DNN shall be available in the network slice(s) identified by the Snssai(s). |  |
| smf-serving-area | string | O | 0..1 | If included, this IE shall contain the serving area of the SMF. It may be included if the target NF type is "UPF". |  |
| mbsmf-serving-area | string | O | 0..1 | If included, this IE shall contain the serving area of the MB-SMF. It may be included if the target NF type is "MB-UPF". | Query-MBS |
| tai | Tai | O | 0..1 | Tracking Area Identity. (NOTE 22). |  |
| amf-region-id | AmfRegionId | O | 0..1 | AMF Region Identity. |  |
| amf-set-id | AmfSetId | O | 0..1 | AMF Set Identity. |  |
| guami | Guami | O | 0..1 | Guami used to search for an appropriate AMF.(NOTE 1) |  |
| supi | Supi | O | 0..1 | If included, this IE shall contain the SUPI of the requester UE to search for an appropriate NF. SUPI may be included if the target NF type is e.g. "PCF", "CHF", "AUSF", "BSF", "UDM", "TSCTSF", "NSSAAF" or "UDR". |  |
| ue-ipv4-address | Ipv4Addr | O | 0..1 | The IPv4 address of the UE for which a BSF or P-CSCF needs to be discovered. |  |
| ip-domain | string | O | 0..1 | The IPv4 address domain of the UE for which a BSF needs to be discovered. |  |
| ue-ipv6-prefix | Ipv6Prefix | O | 0..1 | The IPv6 prefix of the UE for which a BSF or P-CSCF needs to be discovered. |  |
| pgw-ind | boolean | O | 0..1 | When present, this IE indicates whether a combined SMF/PGW-C or a standalone SMF needs to be discovered.true: A combined SMF/PGW-C is requested to be discovered;false: A standalone SMF is requested to be discovered.(See NOTE 2, NOTE 21) |  |
| preferred-pgw-ind | boolean | O | 0..1 | When present, this IE indicates whether combined PGW-C+SMF(s) or standalone SMF(s) are preferred.true: Combined PGW-C+SMF(s) are preferred to be discovered;false: Standalone SMF(s) are preferred to be discovered.(See NOTE 2, NOTE 20, NOTE 21) | Query-SBIProtoc17 |
| pgw | Fqdn | O | 0..1 | If included, this IE shall contain the PGW FQDN which is used by the AMF to find the combined SMF/PGW-C. |  |
| pgw-ip | IpAddr | O | 0..1 | If included, this IE shall contain the PGW IP Address used by the AMF to find the combined SMF/PGW-C. | Query-SBIProtoc17 |
| gpsi | Gpsi | O | 0..1 | If included, this IE shall contain the GPSI of the requester UE to search for an appropriate NF. GPSI may be included if the target NF type is "CHF", "PCF", "BSF", "UDM", "TSCTSF" or "UDR". |  |
| external-group-identity | ExtGroupId | O | 0..1 | If included, this IE shall contain the external group identifier of the requester UE to search for an appropriate NF. This may be included if the target NF type is "UDM", "UDR", "HSS" or "TSCTSF". |  |
| pfd-data | PfdData | O | 0..1 | When present, this IE shall contain the application identifiers and/or application function identifiers in PFD management. This may be included if the target NF type is "NEF".The NRF shall return those NEF instances which can provide the PFDs for at least one of the provided application identifiers, or for at least one of the provided application function identifiers. | Query-Params-Ext2 |
| data-set | DataSetId | O | 0..1 | Indicates the data set to be supported by the NF to be discovered. May be included if the target NF type is "UDR". |  |
| routing-indicator | string | O | 0..1 | Routing Indicator information that allows to route network signalling with SUCI (see 3GPP TS 23.003 [12]) to an AUSF, AAnF and UDM instance capable to serve the subscriber. May be included if the target NF type is "AUSF", "AANF" or "UDM".Pattern: "^[0-9]{1,4}$" |  |
| group-id-list | array(NfGroupId) | O | 1..N | Identity of the group(s) of the NFs of the target NF type to be discovered. May be included if the target NF type is "UDR", "UDM", "HSS", "PCF", "AUSF", "BSF" or "CHF". |  |
| dnai-list | array(Dnai) | O | 1..N | If included, this IE shall contain the Data network access identifiers. It may be included if the target NF type is "UPF", "SMF", "EASDF" or "NEF". |  |
| upf-iwk-eps-ind | boolean | O | 0..1 | When present, this IE indicates whether a UPF supporting interworking with EPS needs to be discovered.true: A UPF supporting interworking with EPS is requested to be discovered;false: A UPF not supporting interworking with EPS is requested to be discovered.(NOTE 3) |  |
| chf-supported-plmn | PlmnId | O | 0..1 | If included, this IE shall contain the PLMN ID that a CHF supports (i.e., in the PlmnRange of ChfInfo attribute in the NFProfile). This IE may be included when the target NF type is "CHF".When an SMF discovers CHF(s) for a PDU session, the SMF shall set the value of this IE as specified in clause 5.1.9.2 of 3GPP TS 32.255 [46]. |  |
| preferred-locality | string | O | 0..1 | Preferred target NF location (e.g. geographic location, data center).When present, the NRF shall prefer NF profiles with a locality attribute that matches the preferred-locality.The NRF may return additional NFs in the response not matching the preferred target NF location, e.g. if no NF profile is found matching the preferred target NF location.The NRF should set a lower priority for any additional NFs on the response not matching the preferred target NF location than those matching the preferred target NF location. In addition, based on operator's policy, the NRF may set different priorities based on the localities of the NFs.(NOTE 6) |  |
| ext-preferred-locality | map(array(LocalityDescription)) | O | 1..N(1..M) | Preferred target NF location (e.g. geographic location, data center).The key of the map shall represent the relative priority, for the requester, of each locality description among the list of locality descriptions in this query parameter, encoded as "1" (highest priority"), "2", "3", …, "n" (lowest priority). When present, the NRF shall prefer NF profiles with an extLocality attribute that matches at least one LocalityDescription of the ext-preferred-locality, with the highest possible priority.The NRF may return additional NFs in the response not matching the preferred target NF location, e.g. if no NF profile is found matching the preferred target NF location.The NRF should set the priority of each NF profile returned in the response based on the priority associated with the matching locality description of the ext-preferred-locality. The NRF should set a lower priority for any additional NFs in the response not matching the preferred target NF location than those matching the preferred target NF location. In addition, based on operator's policy, the NRF may set different priorities based on the localities of the NFs.(NOTE 6)Example 1 indicating a preference to discover an NFp in the data center "dc-123" as a first choice, otherwise in the city of Los Angeles or San Diego as a second choice, otherwise in the state of California as a third choice.{ "1": [{localityType: DATA\_CENTER, localityValue: "dc-123"}],  "2": [{localityType: CITY, localityValue: "Los Angeles"},  {localityType: CITY, localityValue: "San Diego"}],  "3": [{localityType: STATE, localityValue: "California"}]}Example 2 indicating a preference to discover an NFp in the data center "dc-123" as a first choice, otherwise in the data center "dc-456" or "dc-789" as a second choice.{ "1": [{localityType: DATA\_CENTER, localityValue: "dc-123"}],  "2": [{localityType: DATA\_CENTER, localityValue: "dc-456"},  {localityType: {DATA\_CENTER, localityValue: "dc-789"}]}Example 3 indicating a preference to discover an NFp in the city of Bath and in the state of Virginia as a first choice, otherwise in the state of Virginia as a second choice.{ "1": [{localityType: CITY, localityValue: "Bath",  addlLocDescrItems: [{localityType: STATE, localityValue:  "Virginia"}]],  "2": [{localityType: STATE, localityValue: "Virginia"}} | Query-SBIProtoc18 |
| access-type | AccessType | C | 0..1 | If included, this IE shall contain the Access type which is required to be supported by the target Network Function (i.e. SMF). |  |
| supported-features | SupportedFeatures | O | 0..1 | List of features required to be supported by the target Network Function.This IE may be present only if the service-names attribute is present and if it contains a single service-name. It shall be ignored by the NRF otherwise.(NOTE 4) |  |
| required-features | array(SupportedFeatures) | O | 1..N | List of features required to be supported by the target Network Function, as defined by the supportedFeatures attribute in NFService (see clauses 6.1.6.2.3 and 6.2.6.2.4).This IE may be present only if the service-names attribute is present.When present, the required-features attribute shall contain as many entries as the number of entries in the service-names attribute. The nth entry in the required-features attribute shall correspond to the nth entry in the service-names attribute. An entry corresponding to a service for which no specific feature is required shall be encoded as "0". | Query-Params-Ext1 |
| complex-query | ComplexQuery | O | 0..1 | This query parameter is used to override the default logical relationship of query parameters. | Complex-Query |
| limit | integer | O | 0..1 | Maximum number of NFProfiles to be returned in the response.Minimum: 1 | Query-Params-Ext1 |
| max-payload-size | integer | O | 0..1 | Maximum payload size (before compression, if any) of the response, expressed in kilo octets.When present, the NRF shall limit the number of NF profiles returned in the response such as to not exceed the maximum payload size indicated in the request.Default: 124. Maximum: 2000 (i.e. 2 Mo). | Query-Params-Ext1 |
| max-payload-size-ext | integer | O | 0..1 | Maximum payload size (before compression, if any) of the response, expressed in kilo octets.When present, the NRF shall limit the number of NF profiles returned in the response such as to not exceed the maximum payload size indicated in the request.This query parameter is used when the consumer supports payload size bigger than 2 million octets.Default: 124 | Query-Params-Ext2 |
| pdu-session-types | array(PduSessionType) | O | 1..N | List of the PDU session type (s) requested to be supported by the target Network Function (i.e UPF). | Query-Params-Ext1 |
| event-id-list | array(EventId) | O | 1..N | If present, this attribute shall contain the list of events requested to be supported by the Nnwdaf AnalyticsInfo Service, the NRF shall return NF which support all the requested events. | Query-Param-Analytics |
| nwdaf-event-list | array(NwdafEvent) | O | 1..N | If present, this attribute shall contain the list of events requested to be supported by the Nnwdaf\_EventsSubscription service, the NRF shall return NF which support all the requested events. | Query-Param-Analytics |
| atsss-capability | AtsssCapability | O | 0..1 | When present, this IE indicates the ATSSS capability of the target UPF needs to be supported. | MAPDU |
| upf-ue-ip-addr-ind | boolean | O | 0..1 | When present, this IE indicates whether a UPF supporting allocating UE IP addresses/prefixes needs to be discovered.true: a UPF supporting UE IP addresses/prefixes allocation is requested to be discovered;false: a UPF not supporting UE IP addresses/prefixes allocation is requested to be discovered. | Query-Params-Ext2 |
| client-type | ExternalClientType | O | 0..1 | When present, this IE indicates that NF(s) dedicatedly serving the specified Client Type needs to be discovered. This IE may be included when target NF Type is "LMF" and "GMLC".If no NF profile is found dedicately serving the requested client type, the NRF may return NF(s) not dedicatedly serving the request client type in the response. | Query-Params-Ext2 |
| lmf-id | LMFIdentification | O | 0..1 | When present, this IE shall contain LMF identification to be discovered.This may be included if the target NF type is "LMF". | Query-Params-Ext2 |
| an-node-type | AnNodeType | O | 0..1 | If included, this IE shall contain the AN Node type which is required to be supported by the target Network Function (i.e. LMF). | Query-Params-Ext2 |
| rat-type | RatType | O | 0..1 | If included, this IE shall contain the RAT type which is required to be supported by the target Network Function (i.e. LMF). | Query-Params-Ext2 |
| target-snpn | PlmnIdNid | C | 0..1 | This IE shall be included when NF services of a specific SNPN need to be discovered. When included, this IE shall contain the PLMN ID and NID of the target NF.This IE shall also be included in SNPN scenarios, when the entity owning the subscription, the Credentials Holder (see clause 5.30.2.9 in 3GPP TS 23.501 [2]) is an SNPN. | Query-Params-Ext2 |
| af-ee-data | AfEventExposureData | O | 0..1 | When present, this shall contain the application events, and optionally application function identifiers, application identifiers of the AF(s). This may be included if the target NF type is "NEF". | Query-Params-Ext2 |
| w-agf-info | WAgfInfo | O | 0..1 | If included, this IE shall contain the W-AGF identifiers of N3 terminations which is received by the SMF to find the combined W-AGF/UPF. | Query-Params-Ext2 |
| tngf-info | TngfInfo | O | 0..1 | If included, this IE shall contain the TNGF identifiers of N3 terminations which is received by the SMF to find the combined TNGF/UPF. | Query-Params-Ext2 |
| twif-info | TwifInfo | O | 0..1 | If included, this IE shall contain the TWIF identifiers of N3 terminations which is received by the SMF to find the combined TWIF/UPF. | Query-Params-Ext2 |
| target-nf-set-id | NfSetId | O | 0..1 | When present, this IE shall contain the target NF Set ID (as defined in clause 28.12 of 3GPP TS 23.003 [12]) of the NF instances being discovered. | Query-Params-Ext2 |
| target-nf-service-set-id | NfServiceSetId | O | 0..1 | When present, this IE shall contain the target NF Service Set ID (as defined in clause 28.13 of 3GPP TS 23.003 [12]) of the NF service instances being discovered.If this IE is provided together with the target-nf-set-id IE, the NRF shall return service instances of the NF Service Set indicated in the request and should additionally return equivalent ones, if any. | Query-Params-Ext2 |
| preferred-tai | Tai | O | 0..1 | When present, the NRF shall prefer NF profiles that can serve the TAI, or the NRF shall return NF profiles not matching the TAI if no NF profile is found matching the TAI.(NOTE 5) | Query-Params-Ext2 |
| nef-id | NefId | O | 0..1 | When present, this IE shall contain the NEF ID of the NEF to be discovered. This may be included if the target NF type is "NEF". (NOTE 7) | Query-Params-Ext2 |
| preferred-nf-instances | array(NfInstanceId) | O | 1..N | When present, this IE shall contain a list of preferred candidate NF instance IDs. (NOTE 8) | Query-Params-Ext2 |
| notification-type | NotificationType | O | 0..1 | If included, this IE shall contain the notification type of default notification subscriptions that shall be registered in the NFProfile or NFService of the NF Instances being discovered. The NF profiles returned by the NRF shall contain all the registered default notification subscriptions, including the one corresponding to the notification-type parameter.(NOTE 9) | Query-Params-Ext2 |
| n1-msg-class | N1MessageClass | O | 0..1 | This IE may be included when "notification-type" IE is present with value "N1\_MESSAGES".When included, this IE shall contain the N1 message class of default notification subscriptions that shall be registered in the NFProfile or NFService of the NF Instances being discovered. The NF profiles returned by the NRF shall contain all the registered default notification subscriptions, including the one corresponding to the n1-msg-class parameter.(NOTE 9) | Query-Params-Ext3 |
| n2-info-class | N2InformationClass | O | 0..1 | This IE may be included when "notification-type" IE is present with value "N2\_INFORMATION".If included, this IE shall contain the notification type of default notification subscriptions that shall be registered in the NFProfile or NFService of the NF Instances being discovered. The NF profiles returned by the NRF shall contain all the registered default notification subscriptions, including the one corresponding to the n2-info-class parameter.(NOTE 9) | Query-Params-Ext3 |
| serving-scope | array(string) | O | 1..N | If present, this attribute shall contain the list of areas that can be served by the NF instances to be discovered. The NRF shall return NF profiles of NFs which can serve all the areas requested in this query parameter.(NOTE 18) | Query-Params-Ext2 |
| imsi | string | O | 0..1 | If included, this IE shall contain the IMSI of the requester UE to search for an appropriate NF. IMSI may be included if the target NF type is "HSS".pattern: "^[0-9]{5,15}$" | Query-Params-Ext2 |
| ims-private-identity | string | O | 0..1 | If included, this IE shall contain the IMS Private Identity of the requester UE to search for an appropriate NF. IMS Private Identity may be included if the target NF type is "HSS". | Query-Params-Ext3 |
| ims-public-identity | string | O | 0..1 | If included, this IE shall contain the IMS Public Identity of the requester UE to search for an appropriate NF. IMS Public Identity may be included if the target NF type is "HSS". | Query-Params-Ext3 |
| msisdn | string | O | 0..1 | If included, this IE shall contain the MSISDN of the requester UE to search for an appropriate NF. IMS Public Identity may be included if the target NF type is "HSS". | Query-Params-Ext3 |
| internal-group-identity | GroupId | O | 0..1 | If included, this IE shall contain the internal group identifier of the UE to search for an appropriate NF. This may be included if the target NF type is "UDM", "NSSAAF" or "TSCTSF". | Query-Params-Ext2 |
| preferred-api-versions | map(string) | O | 1..N | When present, this IE indicates the preferred API version of the services that are supported by the target NF instances. The key of the map is the ServiceName (see clause 6.1.6.3.11) for which the preferred API version is indicated. Each element carries the API Version Indication for the service indicated by the key. The NRF may return additional NFs in the response not matching the preferred API versions, e.g. if no NF profile is found matching the preferred-api-versions.An API Version Indication is a string formatted as {operator}+{API Version}.The following operators shall be supported:"=" match a version equals to the version value indicated.">" match any version greater than the version value indicated">=" match any version greater than or equal to the version value indicated"<" match any version less than the version value indicated"<=" match any version less than or equal to the version value indicated"^" match any version compatible with the version indicated, i.e. any version with the same major version as the version indicated.Precedence between versions is identified by comparing the Major, Minor, and Patch version fields numerically, from left to right.If no operator or an unknown operator is provided in API Version Indication, "=" operator is applied.Example of API Version Indication:Case1: "=1.2.4.operator-ext" or "1.2.4.operator-ext" means matching the service with API version "1.2.4.operator-ext"Case2: ">1.2.4" means matching the service with API versions greater than "1.2.4"Case3: "^2.3.0" or "^2" means matching the service with all API versions with major version "2". | Query-Params-Ext2 |
| v2x-support-ind | boolean | O | 0..1 | When present, this IE indicates whether a PCF supporting V2X Policy/Parameter provisioning needs to be discovered.true: a PCF supporting V2X Policy/Parameter provisioning is requested to be discovered;false: a PCF not supporting V2X Policy/Parameter provisioning is requested to be discovered. | Query-Params-Ext2 |
| redundant-gtpu | boolean | O | 0..1 | When present, this IE indicates whether a UPF supporting redundant GTP-U path needs to be discovered.true: a UPF supporting redundant GTP-U path is requested to be discovered;false: a UPF not supporting redundant GTP-U path is requested to be discovered. | Query-Params-Ext2 |
| redundant-transport | boolean | O | 0..1 | When present, this IE indicates whether a UPF supporting redundant transport path on the transport layer in the corresponding network slice needs to be discovered.true: a UPF supporting redundant transport path on the transport layer is requested to be discovered;false: a UPF not supporting redundant transport path on the transport layer is requested to be discovered.If the Snssai(s) are also included, the UPF supporting redundant transport path on the transport layer shall be available in the network slice(s) identified by the Snssai(s). | Query-Params-Ext2 |
| ipups | boolean | O | 0..1 | When present, this IE indicates whether a UPF which is configured for IPUPS is requested to be discovered.true: a UPF which is configured for IPUPS is requested to be discovered;false: a UPF which is not configured for IPUPS is requested to be discovered. | Query-Params-Ext2 |
| scp-domain-list | array(string) | O | 1..N | When present, this IE shall contain the SCP domain(s) the target NF, SCP or SEPP belongs to. The NRF shall return NF, SCP or SEPP profiles that belong to all the SCP domains provided in this list.  | Query-Params-Ext2 |
| address-domain | Fqdn | O | 0..1 | If included, this IE shall contain the address domain that shall be reachable through the SCP. This IE may be included when the target NF type is "SCP". | Query-Params-Ext2 |
| ipv4-addr | Ipv4Addr | O | 0..1 | If included, this IE shall contain the IPv4 address that shall be reachable through the SCP. This IE may be included when the target NF type is "SCP". | Query-Params-Ext2 |
| ipv6-prefix | Ipv6Prefix | O | 0..1 | If included, this IE shall contain the IPv6 prefix that shall be reachable through the SCP. This IE may be included when the target NF type is "SCP". | Query-Params-Ext2 |
| served-nf-set-id | NfSetId | O | 0..1 | When present, this IE shall contain the NF Set ID that shall be reachable through the SCP. This IE may be included when the target NF type is "SCP". | Query-Params-Ext2 |
| remote-plmn-id | PlmnId | O | 0..1 | If included, this IE shall contain the remote PLMN ID that shall be reachable through the SCP or SEPP. This IE may be included when the target NF type is "SCP" or "SEPP". | Query-Params-Ext2 |
| remote-snpn-id | PlmnIdNid | O | 0..1 | If included, this IE shall contain the remote SNPN ID that shall be reachable through the SCP or SEPP. This IE may be included when the target NF type is "SCP" or "SEPP". | Query-ENPN |
| data-forwarding | boolean | O | 0..1 | This may be included if the target NF type is "UPF". (NOTE 13)When present, the IE indicates whether UPF(s) configured for data forwarding needs to be discovered.true: UPF(s) configured for data forwarding is requested to be discovered;false: UPF(s) not configured for data forwarding is requested to be discovered. | Query-Params-Ext2 |
| preferred-full-plmn | boolean | O | 0..1 | When present, the NRF shall prefer NF profile(s) that can serve the full PLMN (i.e. can serve any TAI in the PLMN), or the NRF shall return other NF profiles if no NF profile serving the full PLMN is found:- true: NF instance(s) serving the full PLMN is preferred;- false: NF instance(s) serving the full PLMN is not preferred.(NOTE 14) | Query-Params-Ext2 |
| requester-features | SupportedFeatures | C | 0..1 | Nnrf\_NFDiscovery features supported by the Requester NF that is invoking the Nnrf\_NFDiscovery service.This IE shall be included if at least one feature is supported by the Requester NF. |  |
| realm-id | string | O | 0..1 | May be included if the target NF type is "UDSF". If included, this IE shall contain the realm-id for which a UDSF shall be discovered. | Query-Params-Ext4 |
| storage-id | string | O | 0..1 | May be included if the target NF type is "UDSF" and realm-id is included. If included, this IE shall contain the storage-id for the realm-id indicated in the realm-id IE for which a UDSF shall be discovered. | Query-Params-Ext4 |
| vsmf-support-ind | boolean | O | 0..1 | If included, this IE shall indicate that target SMF(s) that support V-SMF Capability are preferred.This IE may be included when the target NF type is "SMF".(NOTE 15) | Query-Param-vSmf-Capability |
| ismf-support-ind | boolean | O | 0..1 | If included, this IE shall indicate that target SMF(s) that support I-SMF Capability are preferred.This IE may be included when the target NF type is "SMF".(NOTE 15) | Query-Param-iSmf-Capability |
| nrf-disc-uri | Uri | C | 0..1 | If included, this IE shall contain the API URI of the NFDiscovery Service (see clause 6.2.1) of the NRF holding the NF Profile.It shall be included if:- the target-nf-instance-id is present;- the NF Service Consumer has previously received such API URI in an earlier NF service discovery, i.e. if the target NF instance was provided in the nfInstanceList attribute in SearchResult (see clause 6.2.6.2.2) and the nrfDiscApiUri attribute was present in the NfInstanceInfo (see clause 6.2.6.2.7); and- the service discovery request is addressed to a different NRF than the NRF holding the NF profile. | Enh-NF-Discovery |
| preferred-vendor-specific-features | map(map(array(VendorSpecificFeature))) | O | 1..N(1..M(1..L)) | When present, this IE indicates the list of preferred vendor-specific features supported by the target Network Function, as defined by the supportedVendorSpecificFeatures attribute in NFService (see clauses 6.1.6.2.3 and 6.2.6.2.4). NF profiles that support all the preferred features, or by default, NF profiles that contain at least one service supporting the preferred features, should be preferentially returned in the response; NF profiles in the response may not support the preferred features.The key of the external map is the ServiceName (see clause 6.1.6.3.11) for which the preferred vendor-specific features is indicated. Each element carries the preferred vendor-specific features for the service indicated by the key.The key of the internal map is the IANA-assigned "SMI Network Management Private Enterprise Codes" [38]. The string used as key of the internal 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.The NF profiles returned by the NRF shall include the full list of vendor-specific-features and not just the interclause of supported and preferred vendor-specific features. | Query-SBIProtoc17 |
| preferred-vendor-specific-nf-features | map(array(VendorSpecificFeature)) | O | 1..N(1..M) | When present, this IE indicates the list of preferred vendor-specific features supported by the target Network Function, as defined by the supportedVendorSpecificFeatures attribute in NF profile (see clause 6.1.6.2.2 and 6.2.6.2.3). NF profiles that support all the preferred features should be preferentially returned in the response. NF profiles in the response may not support the preferred features.The key of the map is the IANA-assigned "SMI Network Management Private Enterprise Codes" [38]. The value of each entry of the map shall be a list (array) of VendorSpecificFeature objects.The NF profiles returned by the NRF shall include the full list of vendor-specific features and not just the interclause of supported and preferred vendor-specific features. | Query-SBIProtoc17 |
| required-pfcp-features | string | O | 0..1 | List of features required to be supported by the target UPF or MB-UPF (when selecting a UPF or a MB-UPF), encoded as defined for the supportedPfcpFeatures attribute in UpfInfo (see clause 6.1.6.2.13).(NOTE 16) | Query-Upf-Pfcp |
| home-pub-key-id | integer | O | 0..1 | When present, this IE shall indicate the Home Network Public Key ID which shall be able to be served by the NF instance.May be included if the target NF type is "AUSF" or "UDM". This query parameter may only be present if the routing-indicator query parameter is also present.(NOTE 17) | Query-SBIProtoc17 |
| prose-support-ind | boolean | O | 0..1 | When present, this IE indicates whether supporting ProSe capability by PCF needs to be discovered.true: a PCF supporting ProSe capability is requested to be discovered;false: a PCF not ProSe capability is requested to be discovered. | Query-5G-ProSe |
| analytics-aggregation-ind | boolean | O | 0..1 | If included, this IE shall contain the analytics aggregation capability indication of the NF being discovered. This IE may be included when the target NF type is "NWDAF". | Query-eNA-PH2 |
| analytics-metadata-prov-ind | boolean | O | 0..1 | If included, this IE shall contain the analytics metadata provisioning capability indication of the NF being discovered. This IE may be included when the target NF type is "NWDAF". | Query-eNA-PH2 |
| serving-nf-set-id | NfSetId | O | 0..1 | When present, this IE shall contain the NF Set ID that is served by the DCCF, NWDAF or MFAF. This IE may be included when the target NF type is "DCCF" or "NWDAF" or "MFAF". | Query-eNA-PH2 |
| serving-nf-type | NFType | O | 0..1 | When present, this IE shall contain the NF type that is served by the DCCF, NWDAF or MFAF. This IE may be included when the target NF type is "DCCF" or "NWDAF" or "MFAF". | Query-eNA-PH2 |
| ml-analytics-info-list | array(MlAnalyticsInfo) | O | 1..N | If present, this attribute shall contain the list of ML Analytics Filter information per Analytics ID(s) requested to be supported by the Nnwdaf\_MLModelProvision Service. The NRF shall return NWDAF profiles that support at least one of the MlAnalyticsInfo in this list. | Query-eNA-PH2 |
| nsacf-capability | NsacfCapability | O | 0..1 | When present, this IE indicates the service capability that the target NSACF needs to support. | NSAC |
| mbs-session-id-list | array(MbsSessionId) | O | 0..1 | This IE may be present if the target NF type is "MB-SMF".When present, it shall contain the list of MBS Session ID(s) for which MB-SMF(s) are to be discovered.When present, for each mbs-session-id in the list, the NRF shall determine whether an MB-SMF supporting the mbs-session-id and complying with the other query parameters (if any) exists. An MB-SMF shall be considered to support the mbs-session-id if: - the mbs-session-id contains a TMGI that is part of a TMGI range (see tmgiRangeList attribute in clause 6.1.6.2.85) registered by the MB-SMF and, if the tai query parameter is present:- if the TAI indicated in the tai query parameter can be served by the MB-SMF (see taiList and taiRangeList attributes in clause 6.1.6.2.85);or- the mbs-session-id contains a TMGI or an SSM address, that is part of the list of MBS sessions currently served by the MB-SMF (see mbsSessionList attribute in clause 6.1.6.2.85) and, if the tai query parameter is present and the MBS session is registered with an MBS Service Area (see mbsServiceArea in clause 6.1.6.2.90):- if the TAI indicated in the tai query parameter is supported by the MBS Service Area of the MBS session.If so, the NRF shall return the profile of this MB-SMF. If no MB-SMF supporting the mbs-session-id and complying with the other query parameters exists, the NRF shall return an empty response.See clause 7.1.2 of 3GPP TS 23.247 [43]. | Query-MBS |
| area-session-id | AreaSessionId | O | 0..1 | This IE may be present if the target NF type is "MB-SMF", the mbs-session-id-list IE is present and contains only one MBS Session ID. When present, the IE shall contain the Area Session ID, for the MBS session indicated in the mbs-session-id-list IE, for which an MB-SMF is to be discovered. When this IE is present, the NRF shall return an MB-SMF profile that currently serves the MBS Session ID and Area Session ID (see mbsSessionList attribute in clause 6.1.6.2.85).If no MB-SMF supports the MBS Session ID and Area Session ID, the NRF shall return an empty response.See clause 7.1.2 of 3GPP TS 23.247 [43]. | Query-MBS |
| gmlc-number | string | O | 0..1 | If included, this IE shall contain the GMLC Number of which should supported by the target GMLC. It may be included if the target NF type is "GMLC".Pattern: "^[0-9]{5,15}$" | Query-eLCS |
| upf-n6-ip | IpAddr | O | 0..1 | If included, this IE shall contain the N6 IP address of PSA UPF.It may be included if the target NF type is "EASDF". | Query-eEDGE-5GC |
| tai-list | array(Tai) | O | 1..N | If included, this IE shall contain the Tracking Area Identities requested to be supported by the NFs being discovered. The NRF shall return NFs which support all the TAIs in the list. It may be included if the target NF type is "NEF". | Query-eEDGE-5GC |
| preferences-precedence | array(string) | O | 2..N | This IE may be present when multiple query parameters expressing a preference are included in the discovery request.When present, this IE shall indicate the relative precedence of these query parameters (from higher precedence to lower precedence). The NRF shall use the indicated precedence to prioritize the candidate NFs in the search result, among the candidate NFs partially matching the different preference query parameters, candidate matching the higher precedence preference query parameter should have higher priority.This IE may include any query parameter named "preferred-xxx" (e.g. preferred-locality, preferred-tai).Example:preferences-precedence=[preferred-tai, preferred-vendor-specific-features]The above value indicates that the "preferred-tai" parameter has higher precedence than the "preferred-vendor-specific-features" parameter. | Query-SBIProtoc17 |
| support-onboarding-capability | boolean | O | 0..1 | If present, this attribute indicates the target AMF or SMF instances support SNPN Onboarding. If the target is an SMF, this indicates the SMF also supports User Plane Remote Provisioning. This is used for the case of Onboarding of UEs for SNPNs (see 3GPP TS 23.501 [2], clauses 5.30.2.10 and 6.2.6.2). | Query-ENPN |
| uas-nf-functionality-ind | boolean | O | 0..1 | If included, this IE shall contain the UAS NF functionality indication of the NF being discovered. This IE may be included when the target NF type is "NEF". | Query-ID\_UAS |
| v2x-capability | V2xCapability | O | 0..1 | When present, this IE indicates the V2X capability that the target PCF needs to support.When the v2x-capability is provided as the query parameter, NRF shall return the PCF instances which support all the V2X capabilities requested. | Query-SBIProtoc17 |
| prose-capability | ProSeCapability | O | 0..1 | When present, this IE indicates the ProSe capability that the target PCF needs to support.When the prose-capability is provided as the query parameter, NRF shall return the PCF instances which support all the ProSe capabilities requested. | Query-5G-ProSe |
| shared-data-id | SharedDataId | O | 0..1 | Identifies the shared data that is stored in the NF (UDR) to be discovered. May be included if the target NF type is "UDR" | Query-SBIProtoc17 |
| target-hni | Fqdn | O | 0..1 | If included, this IE shall contain the Home Network Identifier. | Query-ENPN |
| target-nw-resolution | boolean | O | 0..1 | If included and set to true, the NRF shall determine the identity of the target PLMN to which the NFDiscovery request shall be directed, based on the MSISDN of the UE included in the "gpsi" query parameter, as described in 3GPP TS 23.540 [48].If included and set to false, this IE shall be ignored. | Query-Nw-Resolution |
| NOTE 1: If this parameter is present and no AMF supporting the requested GUAMI is available due to AMF Failure or planned AMF removal, the NRF shall return in the response AMF instances acting as a backup for AMF failure or planned AMF removal respectively for this GUAMI (see clause 6.1.6.2.11). The NRF can detect if an AMF has failed, using the Heartbeat procedure. The NRF will receive a de-registration request from an AMF performing a planned removal.NOTE 2: If the combined SMF/PGW-C is requested to be discovered, the NRF shall return in the response the SMF instances registered with the SmfInfo containing pgwFqdn.NOTE 3: If a UPF supporting interworking with EPS is requested to be discovered, the NRF shall return in the response the UPF instances registered with the upfInfo containing iwkEpsInd set to true.NOTE 4: This attribute has a different semantic than what is defined in clause 6.6.2 of 3GPP TS 29.500 [4], i.e. it is not used to signal optional features of the Nnrf\_NFDiscovery Service API supported by the requester NF.NOTE 5: The AMF may perform the SMF discovery based on the dnn, snssais and preferred-tai during a PDU session establishment procedure, and the NRF shall return the SMF profiles matching all if possible, or the SMF profiles only matching dnn and snssais. If the SMF profiles only matching dnn and snssais are returned, the AMF shall insert an I-SMF. An SMF may also perform a UPF discovery using this parameter.NOTE 6: The SMF may select the P-CSCF close to the UPF by setting the preferred-locality to the value of the locality of the UPF.NOTE 7: During EPS to 5GS idle mobility procedure, the Requester NF (i.e. SMF) discovers the anchor NEF for NIDD using the SCEF ID received from EPS as the value of the NEF ID, as specified in clause 4.11.1.3.3 of 3GPP TS 23.502 [3].NOTE 8: The service consumer may include a list of preferred-nf-instance-ids in the query. If so, the NRF shall first check if the NF profiles of the preferred NF instances match the other query parameters, and if so, then the NRF shall return the corresponding NF profiles; otherwise, the NRF shall return a list of candidate NF profiles matching the query parameters other than the preferred-nf-instance-ids. For example, the target AMF may set this query parameter to the SMF Instance ID and I-SMF Instance ID during an inter AMF mobility procedure to select an I-SMF.NOTE 9: This parameter may be used by the SCP (with other query parameters) to discover and select a NF service consumer with a default notification subscription supporting the notification type of a notification request (see clause 6.10.3.3 of 3GPP TS 29.500 [4]).NOTE 10: An S-NSSAI value used in discovery request query parameters shall be considered as matching the S-NSSAI value in the NF Profile or NF Service of a given NF Instance if both the SST and SD components are identical (i.e. an S-NSSAI value where SD is absent, shall not be considered as matching an S-NSSAI where SD is present, regardless if SST is equal in both).NOTE 11: The dnn query parameter shall be considered as matching a DNN attribute in the NF Profile of a given NF Instance if: - both contain the same Network Identifier and Operator Identifier; - both contain the same Network Identifier and none contains an Operator Identifier; - the dnn query parameter contains the Network Identifier only, the DNN value in the NF Profile contains both the Network Identifier and Operator Identifier, and both contain the same Network Identifier; or- the dnn query parameter contains both the Network Identifier and Operator Identifier, the DNN value in the NF Profile contains the Network Identifier only, both contain the same Network Identifier and the Operator Identifier matches one PLMN of the NF (i.e. plmnList of the NF Profile).NOTE 12: Based on operator's policies, a discovery request not including the requester's information necessary to validate the authorization parameters in NF Profiles may be rejected or accepted but with only returning in the discovery response NF Instances whose authorization parameters allow any NF Service Consumer to access their services. The authorization parameters in NF Profile are those used by NRF to determine whether a given NF Instance / NF Service Instance can be discovered by an NF Service Consumer in order to consume its offered services (e.g. "allowedNfTypes", "allowedNfDomains", etc.).NOTE 13: Different UPF instances for data forwarding may be configured in the network e.g. for different serving areas. The SMF may use this query parameter together with others (like SMF Serving Area or TAI) in discovery to select the UPF candidate for data forwarding.NOTE 14: For HR roaming, if the V-PLMN requires Deployments Topologies with specific SMF Service Areas (DTSSA) but no H-SMF can be selected supporting V-SMF change, AMF may use this query parameter to select a V-SMF serving the full VPLMN if available.NOTE 15: The AMF may perform discovery with this parameter to find V-SMF(s)/I-SMF(s), and the NRF shall return the SMF profiles that explicitly indicated support of V-SMF/I-SMF(s) capability. When performing discovery, the AMF shall use other query parameters together with this IE to ensure the required configurations and/or features are supported by the V-SMF/I-SMF(s), e.g. required Slice for the PDU session, support of DTSSA feature if V-SMF change is required for PDU Session, etc. If no SMF instances that explicitly indicated support of V-SMF/I-SMF(s) capability can be matched for the discovery, the NRF shall return matched SMF instances not indicating support of V-SMF/I-SMF(s) capability explicitly, i.e. the SMF instances not registered vsmfSupportInd/ismfSupportInd IE in the NF profile but matched to the rest query parameters, if available.NOTE 16: When required-pfcp-features is used as query parameter, the NRF shall return a list of candidate UPFs supporting all the required PFCP features. The NRF may also return UPF profiles not including the "SupportedPfcpFeatures" attribute (e.g. pre-Rel-17 UPFs) but matching the other query parameters. The NF Service Consumer, e.g. a SMF, when using required-pfcp-features as query parameter, shall also include the query parameter corresponding to the UPF features (atsss-capability, upf-ue-ip-addr-ind, redundant-gtpu) which correspond to the PFCP feature flags MPTCP and ATSSS\_LL, UEIP, and RTTL respectively, if the corresponding PFCP feature is required. For example an SMF, that wishes to select a UPF supporting UE IP Address Allocation by the UP function, shall set the UEIP flag to "1" in the required-pfcp-features and also include the upf-ue-ip-addr-ind parameter set to "true".NOTE 17: This may only be used by the HPLMN in roaming scenarios in this release of the specification, i.e. an AMF in a visited network does not use the Home Network Public Key ID for AUSF/UDM selection.NOTE 18: The NF service consumer may derive the serving scope from e.g. the TAI of the UE, using local configuration. This parameter may be used to discover any NF that registers to the NRF, e.g. a 5GC NF or a P-CSCF.NOTE 19: If the NRF supports the "Collocated-NF-Selection" feature and the NF service consumer has included the "preferred-collocated-nf-types" attribute, the NRF shall return a list of candidates NFs (for the target-nf-type) matching the discovery query parameters and preferentially supporting CollocatedNfType(s) as indicated in the preferred-collocated-nf-types.NOTE 20: If the NRF supports this IE and the NF service consumer has included this IE with the value "true" in discovery request, the NRF shall look up and return PGW-C+SMF instances matching the other query parameters. If no matching is found, the NRF shall return a list of standalone SMF instances matching the other query parameters. If the NRF supports this IE and the NF service consumer has included this IE with the value "false" in discovery request, the NRF shall look up and return standalone SMF instances matching the other query parameters. If no matching is found, the NRF shall return a list of PGW-C+SMF instances matching the other query parameters.NOTE 21: Either pgw-ind IE or preferred-pgw-ind IE may be included in the discovery request.NOTE 22: MB-SMF may use an NRF to discover the AMF(s) serving an MBS service area (see clause 7.3.1 in 3GPP TS 23.247 [43]. For this purpose, the MB-SMF may use query parameters specified in this table, e.g. 'tai' and 'service-names', or 'snssais', or any other parameters. |

The default logical relationship among the query parameters is logical "AND", i.e. all the provided query parameters shall be matched, with the exception of the "preferred-locality", "ext-preferred-locality", "preferred-nf-instances", "preferred-tai", "preferred-api-versions", "preferred-full-plmn", "preferred-collocated-nf-types", "preferred-pgw-ind" and "mbs-session-id" query parameters (see Table 6.2.3.2.3.1-1).

The NRF may support the Complex query expression as defined in 3GPP TS 29.501 [5] for the NF Discovery service. If the "complexQuery" query parameter is included, then the logical relationship among the query parameters contained in "complexQuery" query parameter is as defined in 3GPP TS 29.571 [7].

A NRF not supporting Complex query expression shall reject a NF service discovery request including a complexQuery parameter, with a ProblemDetails IE including the cause attribute set to INVALID\_QUERY\_PARAM and the invalidParams attribute indicating the complexQuery parameter.

This method shall support the request data structures specified in table 6.1.3.2.3.1-2 and the response data structures and response codes specified in table 6.1.3.2.3.1-3.

Table 6.2.3.2.3.1-2: Data structures supported by the GET Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| n/a |  |  |  |

Table 6.2.3.2.3.1-3: Data structures supported by the GET Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Responsecodes | Description |
| SearchResult | M | 1 | 200 OK | The response body contains the result of the search over the list of registered NF Instances. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | The response shall be used when the intermediate NRF redirects the service discovery request.The NRF shall include in this response a Location header field containing a URI pointing to the resource located on the redirect target NRF.If an SCP redirects the message to another SCP then the location header field shall contain the same URI or a different URI pointing to the endpoint of the NF service producer to which the request should be sent. |
| ProblemDetails | O | 0..1 | 400 Bad Request | The response body contains the error reason of the request message.If the query parameter used to match the authorization parameter is required but not provided in the NF discovery request, the "cause" attribute shall be set to "MANDATORY\_QUERY\_PARAM\_MISSING", and the missing query parameter shall be indicated. |
| ProblemDetails | O | 0..1 | 403 Forbidden | This response shall be returned if the Requester NF is not allowed to discover the NF Service(s) being queried. |
| ProblemDetails | O | 0..1 | 404 Not Found | This response shall be returned if the requested resource URI as defined in clause 6.2.3.2.2 (query parameter not considered) is not found in the server.It may also be sent in hierarchical NRF deployments when the NRF needs to forward/redirect the request to another NRF but lacks information in the request to do so; similarly, the NRF shall return this response code when it is received from the upstream NRF. |
| ProblemDetails | O | 0..1 | 500 Internal Server Error | The response body contains the error reason of the request message. |

Table 6.2.3.2.3.1-4: Headers supported by the GET method on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| If-None-Match | string | C | 0..1 | Validator for conditional requests, as described in IETF RFC 7232 [19], clause 3.2 |

Table 6.2.3.2.3.1-5: Headers supported by the 200 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Cache-Control | string | C | 0..1 | Cache-Control containing max-age, described in IETF RFC 7234 [20], clause 5.2 |
| ETag | string | C | 0..1 | Entity Tag containing a strong validator, described in IETF RFC 7232 [19], clause 2.3 |

Table 6.2.3.2.3.1-6: Headers supported by the 307 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | The URI pointing to the resource located on the redirect target NRF |

Table 6.2.3.2.3.1-7: Links supported by the 200 Response Code on this endpoint

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Resource name | HTTP method or custom operation | Parameters table | Description |
| search | Stored Search (Document) | GET | 6.2.3.2.3.1-8 | The 'searchId' parameter returned in the response can be used as the 'searchId' parameter in the GET request to '/searches/{searchId}' |
| completeSearch | Complete Stored Search (Document) | GET | 6.2.3.2.3.1-9 | The 'searchId' parameter returned in the response can be used as the 'searchId' parameter in the GET request to '/searches/{searchId}/complete' |

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

#### 6.2.6.1 General

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

Table 6.2.6.1-1 specifies the data types defined for the Nnrf service based interface protocol.

Table 6.2.6.1-1: Nnrf\_NFDiscovery specific Data Types

|  |  |  |
| --- | --- | --- |
| Data type | Clause defined | Description |
| SearchResult | 6.2.6.2.2 | Contains the list of NF Profiles returned in a Discovery response. |
| NFProfile | 6.2.6.2.3 | Information of an NF Instance discovered by the NRF. |
| NFService | 6.2.6.2.4 | Information of a given NF Service Instance; it is part of the NFProfile of an NF Instance discovered by the NRF. |
| StoredSearchResult | 6.2.6.2.5 | Contains a complete search result (i.e. a number of discovered NF Instances), stored by NRF as a consequence of a prior search result. |
| PreferredSearch | 6.2.6.2.6 | Contains information on whether the returned NFProfiles match the preferred query parameters. |
| NfInstanceInfo | 6.2.6.2.7 | Contains information on an NF profile matching a discovery request. |
| ScpDomainRoutingInfo | 6.2.6.2.8 | SCP Domain Routing Information |
| ScpDomainConnectivity | 6.2.6.2.9 | SCP Domain Routing Information |
| ScpDomainRoutingInfoSubscription | 6.2.6.2.10 | SCP Domain Routing Information Subscription  |
| ScpDomainRoutingInfoNotification | 6.2.6.2.11 | Notification for SCP Domain Routing Information Update |

Table 6.2.6.1-2 specifies data types re-used by the Nnrf\_NFDiscovery 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\_NFDiscovery service-based interface.

Table 6.2.6.1-2: Nnrf\_NFDiscovery re-used Data Types

|  |  |  |
| --- | --- | --- |
| Data type | Reference | Comments |
| Snssai | 3GPP TS 29.571 [7] |  |
| PlmnId | 3GPP TS 29.571 [7] |  |
| Dnn | 3GPP TS 29.571 [7] |  |
| Tai | 3GPP TS 29.571 [7] |  |
| SupportedFeatures | 3GPP TS 29.571 [7] |  |
| NfInstanceId | 3GPP TS 29.571 [7] |  |
| Uri | 3GPP TS 29.571 [7] |  |
| Gpsi | 3GPP TS 29.571 [7] |  |
| GroupId | 3GPP TS 29.571 [7] |  |
| Guami | 3GPP TS 29.571 [7] |  |
| IPv4Addr | 3GPP TS 29.571 [7] |  |
| IPv6Addr | 3GPP TS 29.571 [7] |  |
| UriScheme | 3GPP TS 29.571 [7] |  |
| Dnai | 3GPP TS 29.571 [7] |  |
| NfGroupId | 3GPP TS 29.571 [7] | Identifier of a NF Group |
| PduSessionType | 3GPP TS 29.571 [7] |  |
| AtsssCapability | 3GPP TS 29.571 [7] |  |
| PlmnIdNid | 3GPP TS 29.571 [7] |  |
| NfSetId | 3GPP TS 29.571 [7] |  |
| NfServiceSetId | 3GPP TS 29.571 [7] |  |
| ExtSnssai | 3GPP TS 29.571 [7] |  |
| DurationSec | 3GPP TS 29.571 [7] |  |
| RedirectResponse | 3GPP TS 29.571 [7] | Response body of the redirect response message. |
| MbsSessionId | 3GPP TS 29.571 [7] | MBS Session Identifier |
| IpAddr | 3GPP TS 29.571 [7] | IP Address |
| AreaSessionId | 3GPP TS 29.571 [7] | Area Session Identifier used for an MBS session with location dependent content |
| Fqdn | 3GPP TS 29.571 [7] | Fully Qualified Domain Name |
| EventId | 3GPP TS 29.520 [32] | Defined in Nnwdaf\_AnalyticsInfo API. |
| NwdafEvent | 3GPP TS 29.520 [32] | Defined in Nnwdaf\_EventsSubscription API. |
| ExtGroupId | 3GPP TS 29.503 [36] |  |
| SharedDataId | 3GPP TS 29.503 [36] |  |
| ExternalClientType | 3GPP TS 29.572 [33] |  |
| SupportedGADShapes | 3GPP TS 29.572 [33] | Supported GAD Shapes |
| DefaultNotificationSubscription | 3GPP TS 29.510 | See clause 6.1.6.2.4 |
| IPEndPoint | 3GPP TS 29.510 | See clause 6.1.6.2.5 |
| NFType | 3GPP TS 29.510 | See clause 6.1.6.3.3 |
| UdrInfo | 3GPP TS 29.510 | See clause 6.1.6.2.6 |
| UdmInfo | 3GPP TS 29.510 | See clause 6.1.6.2.7 |
| AusfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.8 |
| SupiRange | 3GPP TS 29.510 | See clause 6.1.6.2.9 |
| AmfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.11 |
| SmfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.12 |
| UpfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.13 |
| PcfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.20 |
| BsfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.21 |
| ChfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.32 |
| NFServiceVersion | 3GPP TS 29.510 | See clause 6.1.6.2.19 |
| PlmnSnssai | 3GPP TS 29.510 | See clause 6.1.6.2.44 |
| NwdafInfo | 3GPP TS 29.510 | See clause 6.1.6.2.45 |
| NFStatus | 3GPP TS 29.510 | See clause 6.1.6.3.7 |
| DataSetId | 3GPP TS 29.510 | See clause 6.1.6.3.8 |
| ServiceName | 3GPP TS 29.510 | See clause 6.1.6.3.11 |
| NFServiceStatus | 3GPP TS 29.510 | See clause 6.1.6.3.12 |
| LmfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.46 |
| GmlcInfo | 3GPP TS 29.510 | See clause 6.1.6.2.47 |
| NefInfo | 3GPP TS 29.510 | See clause 6.1.6.2.48 |
| PfdData | 3GPP TS 29.510 | See clause 6.1.6.2.49 |
| AfEventExposureData | 3GPP TS 29.510 | See clause 6.1.6.2.50 |
| PcscfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.53 |
| HssInfo | 3GPP TS 29.510 | See clause 6.1.6.2.57 |
| ImsiRange | 3GPP TS 29.510 | See clause 6.1.6.2.58 |
| VendorSpecificFeature | 3GPP TS 29.510 | See clause 6.1.6.2.62 |
| ScpInfo | 3GPP TS 29.510 | See clause 6.1.6.2.65 |
| NefId | 3GPP TS 29.510 | See clause 6.1.6.3 |
| VendorId | 3GPP TS 29.510 | See clause 6.1.6.3 |
| AnNodeType | 3GPP TS 29.510 | See clause 6.1.6.3.13 |
| SuciInfo | 3GPP TS 29.510 | See clause 6.1.6.2.71 |
| SeppInfo | 3GPP TS 29.510 | See clause 6.1.6.2.72 |
| NsacfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.81 |
| NsacfCapability | 3GPP TS 29.510 | See clause 6.1.6.2.82 |
| MlAnalyticsInfo | 3GPP TS 29.510 | See clause 6.1.6.2.84 |
| MbSmfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.85 |
| TsctsfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.91 |
| MbUpfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.94 |
| TrustAfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.96 |
| CollocatedNfInstance | 3GPP TS 29.510 | See clause 6.1.6.2.99 |
| NssaafInfo | 3GPP TS 29.510 | See clause 6.1.6.2.104 |
| IwmscInfo | 3GPP TS 29.510 | See clause 6.1.6.2.108 |
| MnpfInfo | 3GPP TS 29.510 | See clause 6.1.6.2.109 |
| LocalityDescriptionItem | 3GPP TS 29.510 | See clause 6.1.6.2.x |
| LocalityDescription | 3GPP TS 29.510 | See clause 6.1.6.2.y |
| LocalityType | 3GPP TS 29.510 | See clause 6.1.6.3.x |

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

##### 6.2.6.2.3 Type: NFProfile

Table 6.2.6.2.3-1: Definition of type NFProfile

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| nfInstanceId | NfInstanceId | M | 1 | Unique identity of the NF Instance. |
| nfType | NFType | M | 1 | Type of Network Function |
| nfStatus | NFStatus | M | 1 | Status of the NF Instance |
| collocatedInstances | array(CollocatedNfInstance) | O | 1..N | Information related collocated NF type(s) and corresponding NF Instance(s) when the NF is collocated with NFs supporting other NF types |
| nfInstanceName | string | O | 0..1 | Human readable name of the NF Instance |
| plmnList | array(PlmnId) | C | 1..N | PLMN(s) of the Network Function (NOTE 5). This IE shall be present if this information is available for the NF. If this information was not provided by the NF during registration, the NRF should return the list of PLMN ID(s) of the PLMN of the NRF. If this IE is absent in the response, PLMN ID(s) of the PLMN of the NRF are assumed for the NF. |
| sNssais | array(ExtSnssai) | O | 1..N | S-NSSAIs of the Network Function.If not provided, and if the perPlmnSnssaiList attribute is not present, the NF can serve any S-NSSAI.If the sNSSAIs attribute is provided in at least one NF Service, the sNssais attribute in the NF Profile shall be present and be the set or a superset of the sNSSAIs of the NFService(s). |
| perPlmnSnssaiList | array(PlmnSnssai) | O | 1..N | The per-PLMN list of S-NSSAI(s) supported by the Network Function.If the perPlmnSnssaiList attribute is provided in at least one NF Service, the perPlmnSnssaiList attribute in the NF Profile shall be present and be the set or a superset of the perPlmnSnssaiList of the NFService(s). |
| nsiList | array(string) | O | 1..N | List of NSIs of the Network Function.If not provided, the NF can serve any NSI. |
| fqdn | Fqdn | C | 0..1 | FQDN of the Network Function (NOTE 1, NOTE 3, NOTE 11) |
| 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, then this attribute shall be included by the NRF and it shall contain the interPlmnFqdn value registered by the NF during NF registration (see clause 6.1.6.2.2), if the interPlmnFqdn attribute was registered 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.(NOTE 3, NOTE 14) |
| ipv4Addresses | array(Ipv4Addr) | C | 1..N | IPv4 address(es) of the Network Function (NOTE 1, NOTE 11) |
| ipv6Addresses | array(Ipv6Addr) | C | 1..N | IPv6 address(es) of the Network Function (NOTE 1, NOTE 11) |
| capacity | integer | O | 0..1 | Static capacity information within the range 0 to 65535, expressed as a weight relative to other NF instances of the same type; if capacity is also present in the nfServiceList parameters, those will have precedence over this value. (See NOTE 2) |
| load | integer | O | 0..1 | Latest known load information of the NF 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 Instance was sent from the NF to the NRF. |
| locality | string | O | 0..1 | Operator defined information about the location of the NF instance (e.g. geographic location, data center) |
| extLocality | map(string) | O | 1..N | Operator defined information about the location of the NF instance. (NOTE 3)The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters, representing a type of locality as defined in clause 6.1.6.3.x. Example: { "DATA\_CENTER": "dc-123",  "CITY": "Los Angeles",  "STATE": "California"} |
| priority | integer | O | 0..1 | Priority (relative to other NFs of the same type) within the range 0 to 65535, to be used for NF selection; lower values indicate a higher priority. Priority may or may not be present in the nfServiceList parameters, xxxInfo parameters and in this attribute. Priority in the nfServiceList has precedence over the priority in this attribute.(NOTE 2)Priority in xxxInfo parameter shall only be used to determine the relative priority among NF instances with the same priority at NFProfile/NFService. |
| udrInfo | UdrInfo | O | 0..1 | Specific data for the UDR (ranges of SUPI, …) |
| udrInfoList | map(UdrInfo) | O | 1..N | Multiple entries of UdrInfo. This attribute provides additional information to the udrInfo. udrInfoList may be present even if the udrInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| udmInfo | UdmInfo | O | 0..1 | Specific data for the UDM |
| udmInfoList | map(UdmInfo) | O | 1..N | Multiple entries of UdmInfo. This attribute provides additional information to the udmInfo. udmInfoList may be present even if the udmInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| ausfInfo | AusfInfo | O | 0..1 | Specific data for the AUSF |
| ausfInfoList | map(AusfInfo) | O | 1..N | Multiple entries of AusfInfo. This attribute provides additional information to the ausfInfo. ausfInfoList may be present even if the ausfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| amfInfo | AmfInfo | O | 0..1 | Specific data for the AMF (AMF Set ID, …) |
| amfInfoList | map(AmfInfo) | O | 1..N | Multiple entries of AmfInfo. This attribute provides additional information to the amfInfo. amfInfoList may be present even if the amfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| smfInfo | SmfInfo | O | 0..1 | Specific data for the SMF (DNN's, …).(NOTE 8) |
| smfInfoList | map(SmfInfo) | O | 1..N | Multiple entries of SmfInfo. This attribute provides additional information to the smfInfo. smfInfoList may be present even if the smfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters.(NOTE 8) |
| upfInfo | UpfInfo | O | 0..1 | Specific data for the UPF (S-NSSAI, DNN, SMF serving area, …) |
| upfInfoList | map(UpfInfo) | O | 1..N | Multiple entries of UpfInfo. This attribute provides additional information to the upfInfo. upfInfoList may be present even if the upfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| pcfInfo | PcfInfo | O | 0..1 | Specific data for the PCF |
| pcfInfoList | map(PcfInfo) | O | 1..N | Multiple entries of PcfInfo. This attribute provides additional information to the pcfInfo. pcfInfoList may be present even if the pcfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| bsfInfo | BsfInfo | O | 0..1 | Specific data for the BSF |
| bsfInfoList | map(BsfInfo) | O | 1..N | Multiple entries of BsfInfo. This attribute provides additional information to the bsfInfo. bsfInfoList may be present even if the bsfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| chfInfo | ChfInfo | O | 0..1 | Specific data for the CHF |
| chfInfoList | map(ChfInfo) | O | 1..N | Multiple entries of ChfInfo. This attribute provides additional information to the chfInfo. chfInfoList may be present even if the chfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| udsfInfo | UdsfInfo | O | 0..1 | Specific data for the UDSF |
| udsfInfoList | map(UdsfInfo) | O | 1..N | Multiple entries of udsfInfo. This attribute provides additional information to the udsfInfo. udsfInfoList may be present even if the udsfInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| nefInfo | NefInfo | O | 0..1 | Specific data for the NEF |
| nwdafInfo | NwdafInfo | O | 0..1 | Specific data for the NWDAF |
| nwdafInfoList | map(NwdafInfo) | O | 1..N | Multiple entries of nwdafInfo. This attribute provides additional information to the nwdafInfo. nwdafInfoList may be present even if the nwdafInfo is absent.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| pcscfInfoList | map(PcscfInfo) | O | 1..N | Specific data for the P-CSCF.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters.(NOTE 7) |
| hssInfoList | map(HssInfo) | O | 1..N | Specific data for the HSS.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| customInfo | object | O | 0..1 | Specific data for custom Network Functions |
| recoveryTime | DateTime | O | 0..1 | Timestamp when the NF was (re)started |
| nfServicePersistence | boolean | O | 0..1 | - true: If present, and set to true, it indicates that the different service instances of a same NF Service in the NF instance, supporting a same API version, are capable to persist their resource state in shared storage and therefore these resources are available after a new NF service instance supporting the same API version is selected by a NF Service Consumer (see 3GPP TS 23.527 [27]).- false (default): Otherwise, it indicates that the NF Service Instances of a same NF Service are not capable to share resource state inside the NF Instance. |
| nfServices | array(NFService) | O | 1..N | List of NF Service Instances.(NOTE 10)This attribute is deprecated; the attribute "nfServiceList" should be used instead. |
| nfServiceList | map(NFService) | O | 1..N | Map of NF Service Instances, where the "serviceInstanceId" attribute of the NFService object shall be used as the key of the map.(NOTE 10) |
| defaultNotificationSubscriptions | array(DefaultNotificationSubscription) | O | 1..N | Notification endpoints for different notification types.(NOTE 6)(See also NOTE 10 in clause 6.1.6.2.2) |
| lmfInfo | LmfInfo | O | 0..1 | Specific data for the LMF |
| gmlcInfo | GmlcInfo | O | 0..1 | Specific data for the GMLC |
| snpnList | array(PlmnIdNid) | C | 1..N | SNPN(s) of the Network Function.This IE shall be present if the NF pertains to one or more SNPNs. |
| nfSetIdList | array(NfSetId) | C | 1..N | NF Set ID defined in clause 28.12 of 3GPP TS 23.003 [12].At most one NF Set ID shall be indicated per PLMN-ID or SNPN of the NF.This information shall be present if available. |
| servingScope | array(string) | O | 1..N | The served area(s) of the NF instance.The absence of this attribute does not imply the NF instance can serve every area. |
| lcHSupportInd | boolean | O | 0..1 | This IE indicates whether the NF supports Load Control based on LCI Header (see clause 6.3 of 3GPP TS 29.500 [4]). - true: the NF supports the feature. - false (default): the NF does not support the feature. |
| olcHSupportInd | boolean | O | 0..1 | This IE indicates whether the NF supports Overload Control based on OCI Header (see clause 6.4 of 3GPP TS 29.500 [4]). - true: the NF supports the feature. - false (default): the NF does not support the feature. |
| nfSetRecoveryTimeList | map(DateTime) | O | 1..N | Map of recovery time, where the key of the map is the NfSetId of NF Set(s) that the NF instance belongs to.When present, the value of each entry of the map shall be the recovery time of the NF Set indicated by the key. |
| serviceSetRecoveryTimeList | map(DateTime) | O | 1..N | Map of recovery time, where the key of the map is the NfServiceSetId of the NF Service Set(s) configured in the NF instance.When present, the value of each entry of the map shall be the recovery time of the NF Service Set indicated by the key. |
| scpDomains | array(string) | O | 1..N | When present, this IE shall carry the list of SCP domains the SCP belongs to, or the SCP domain the NF (other than SCP) or the SEPP belongs to.(NOTE 9) |
| scpInfo | ScpInfo | O | 0..1 | Specific data for the SCP. |
| seppInfo | SeppInfo | O | 0..1 | Specific data for the SEPP. |
| vendorId | VendorId | O | 0..1 | Vendor ID of the NF 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 12) |
| aanfInfoList | map(AanfInfo) | O | 1..N | Specific data for the AAnF.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| mfafInfo | MfafInfo | O | 0..1 | Specific data for the MFAF. |
| easdfInfoList | map(EasdfInfo) | O | 1..N | Specific data for the EASDF.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters.(NOTE 13) |
| dccfInfo | DccfInfo | O | 0..1 | Specific data for the DCCF. |
| nsacfInfoList | map(NsacfInfo) | O | 1..N | Specific data for the NSACF.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| mbSmfInfoList | map(MbSmfInfo) | O | 1..N | MB-SMF specific data.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| tsctsfInfoList | map(TsctsfInfo) | O | 1..N | Specific data for the TSCTSF.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| mbUpfInfoList | map(MbUpfInfo) | O | 1..N | MB-UPF specific data.The key of the map shall be a (unique) valid JSON string per clause 7 of IETF RFC 8259 [22], with a maximum of 32 characters. |
| trustAfInfo | TrustAfInfo | O | 0..1 | Specific data for the trusted AF. |
| nssaafInfo | NssaafInfo | O | 0..1 | Specific data for the NSSAAF. |
| hniList | arrary(Fqdn) | C | 1..N | Identifications of Credentials Holder or Default Credentials Server.This IE shall be present if the NFs are available for the case of access to an SNPN using credentials owned by a Credentials Holder or for the case of SNPN Onboarding using a DCS.  |
| iwmscInfo | IwmscInfo | O | 0..1 | Specific data for the SMS-IWMSC. |
| mnpfInfo | MnpfInfo | O | 0..1 | Specific data for the MNPF. |
| NOTE 1: At least one of the addressing parameters (fqdn, ipv4address or ipv6adress) shall be included in the NF Profile. See NOTE 1 of Table 6.2.6.2.4-1 for the use of these parameters. If multiple ipv4 addresses and/or ipv6 addresses are included in the NF Profile, 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 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: If the requester-plmn in the query parameter is different from the PLMN of the discovered NF, then the fqdn attribute value shall contain the interPlmnFqdn value registered by the NF during NF registration (see clause 6.1.6.2.2). The requester-plmn is different from the PLMN of the discovered NF 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 selection and load balancing, together with other parameters.NOTE 5: An NF may register multiple PLMN IDs in its profile within a PLMN comprising multiple PLMN IDs. If so, all the attributes of the NF Profile shall apply to each PLMN ID registered in the plmnList. As an exception, attributes including a PLMN ID, e.g. IMSI-based SUPI ranges, TAIs and GUAMIs, are specific to one PLMN ID and the NF may register in its profile multiple occurrences of such attributes for different PLMN IDs (e.g. the UDM may register in its profile SUPI ranges for different PLMN IDs).NOTE 6: For notification types that may be associated with a specifc service of the NF Instance receiving the notification (see clause 6.1.6.3.4), if notification endpoints are present both in the profile of the NF instance (NFProfile) and in some of its NF Services (NFService) for a same notification type, the notification endpoint(s) of the NF Services shall be used for this notification type.NOTE 7: The absence of the pcscfInfoList attribute in a P-CSCF profile indicates that the P-CSCF can be selected for any DNN and Access Type, and that the P-CSCF Gm addressing information is the same as the addressing information registered in the fqdn, ipv4Addresses and ipv4Addresses attributes of the NF profile.NOTE 8: The absence of both the smfInfo and smfInfoList attributes in an SMF profile indicates that the SMF can be selected for any S-NSSAI listed in the sNssais and perPlmnSnssaiList IEs, or for any S-NSSAI if neither the sNssais IE nor the perPlmnSnssaiList IE are present, and for any DNN, TAI and access type.NOTE 9: If an NF (other than a SCP or SEPP) includes this information in its profile, this indicates that the services produced by this NF should be accessed preferably via an SCP from the SCP domain the NF belongs to.NOTE 10: If the NF Service Consumer that issued the discovery request indicated support for the "Service-Map" feature, the NRF shall return in the discovery response the list of NF Service Instances in the "nfServiceList" map attribute. Otherwise, the NRF shall return the list of NF Service Instances in the "nfServices" array attribute.NOTE 11: For API URIs constructed with an FQDN, the NF Service Consumer may use the FQDN of 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 NFProfile; alternatively, the NF Service Consumer may use those IP addresses to setup the TCP connection, if no service-specific FQDN or IP address is provided in the NFService data and 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 12: When present, this attribute allows an 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 NF Service Producer), so as to select an appropriate NF with specific capability, or to include or not the vendor-specific attributes (see 3GPP TS 29.500 [4] clause 6.6.3) required for a given feature in subsequent messages towards a certain NF. 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 13: The absence of the easdfnfoList attributes in an EASDF profile indicates that the EASDF can be selected for any S-NSSAI, DNN, DNAI or PSA UPF N6 IP address.NOTE 14: 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, or when the SCP has reselected the discovered NF for such a request. |

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

##### 6.2.6.2.6 Type: PreferredSearch

Table 6.2.6.2.6-1: Definition of type PreferredSearch

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description |
| preferredTaiMatchInd | boolean | C | 0..1 | Indicates whether all the returned NFProfiles match or do not match the query parameter preferred-tai.true: Matchfalse (default): Not Match |
| preferredFullPlmnMatchInd | boolean | O | 0..1 | Indicates whether all the returned NFProfiles match or do not match the query parameter preferred-full-plmn.true: Matchfalse (default): Not Match |
| preferredApiVersionsMatchInd | boolean | O | 0..1 | Indicates whether the search result includes at least one NF Profile that matches all the preferred API versions indicated in the query parameter preferred-api-versions.true: Matchfalse: Not Match |
| otherApiVersionsInd | boolean | O | 0..1 | This IE may be present if the preferred-api-versions query parameter is provided in the discovery request.When present, this IE indicates whether there is at least one NF Profile with other API versions, i.e. that does not match all the preferred API versions indicated in the preferred-api-versions, returned in the response or not.true: Returnedfalse: Not returned |
| preferredLocalityMatchInd | boolean | O | 0..1 | Indicates whether the search result includes at least one NFProfile that match the query parameter preferred-locality or ext-preferred-locality.true: Matchfalse (default): Not Match |
| otherLocalityInd | boolean | O | 0..1 | This IE may be present if the preferred-locality or ext-preferred-locality query parameter is provided in the discovery request.When present, this IE indicates whether there is at least one NFProfile with another locality, i.e. not matching the preferred-locality or ext-preferred-locality, returned in the response or not.true: Returnedfalse (default): Not returned |
| preferredVendorSpecificFeaturesInd | boolean | O | 0..1 | Indicates whether all the returned NFProfiles match (or do not match) the query parameter preferred-vendor-specific-features (i.e. whether they support all the preferred vendor-specific-features).true: Matchfalse (default): Not Match |
| preferredCollocatedNfTypeInd | boolean | O | 0..1 | Indicates whether all the returned NFProfiles match (or do not match) the query parameter preferred-collocated-nf-types.true: Matchfalse (default): Not Match |
| preferredPgwMatchInd | boolean | O | 0..1 | This IE may be present if preferred-pgw-ind query parameter is provided in the discovery request.When present, this IE shall indicate whether all the returned NFProfiles match or do not match the query parameter preferred-pgw-ind.true: Matchfalse: Not Match |

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

### 6.2.9 Features supported by the NFDiscovery service

The syntax of the supportedFeatures attribute is defined in clause 5.2.2 of 3GPP TS 29.571 [7].

The following features are defined for the Nnrf\_NFDiscovery service.

Table 6.2.9-1: Features of supportedFeatures attribute used by Nnrf\_NFDiscovery service

|  |  |  |  |
| --- | --- | --- | --- |
| Feature Number | Feature | M/O | Description |
| 1 | Complex-Query | O | Support of Complex Query expression (see clause 6.2.3.2.3.1)  |
| 2 | Query-Params-Ext1 | O | Support of the following query parameters:- limit- max-payload-size- required-features- pdu-session-types |
| 3 | Query-Param-Analytics  | O | Support of the query parameters for Analytics identifier:- event-id-list- nwdaf-event-list |
| 4 | MAPDU | O | This feature indicates whether the NRF supports selection of UPF with ATSSS capability. |
| 5 | Query-Params-Ext2 | O | Support of the following query parameters:- requester-nf-instance-id- upf-ue-ip-addr-ind- pfd-data- target-snpn- af-ee-data- w-agf-info- tngf-info- twif-info- target-nf-set-id- target-nf-service-set-id- preferred-tai- nef-id- preferred-nf-instances- notification-type- serving-scope- internal-group-identity- preferred-api-versions- v2x-support-ind- redundant-gtpu- redundant-transport- lmf-id- an-node-type- rat-type- ipups- scp-domain-list- address-domain- ipv4-addr- ipv6-prefix- served-nf-set-id- remote-plmn-id- data-forwarding- preferred-full-plmn- requester-snpn-list- max-payload-size-ext- client-type |
| 6 | Service-Map | M | This feature indicates whether it is supported to identify the list of NF Service Instances as a map (i.e. the "nfServiceList" attribute of NFProfile is supported). |
| 7 | Query-Params-Ext3 | O | Support of the following query parameters:- ims-private-identity- ims-public-identity- msisdn- requester-plmn-specific-snssai-list- n1-msg-class- n2-info-class |
| 8 | Query-Params-Ext4 | O | Support of the following query parameters:- realm-id- storage-id |
| 9 | Query-Param-vSmf-Capability | O | Support of the query parameters for V-SMF Capability:- vsmf-support-ind |
| 10 | Enh-NF-Discovery | O | Enhanced NF DiscoveryThis feature indicates whether it is supported to return the nfInstanceList IE in the NF Discovery response.  |
| 11 | Query-SBIProtoc17 | O | Support of the following query parameters, for Service Based Interface Protocol Improvements defined in 3GPP Rel-17::- preferred-vendor-specific-features- preferred-vendor-specific-nf-features- home-pub-key-id- pgw-ip- preferences-precedence- preferred-pgw-ind- v2x-capability- shared-data-id |
| 12 | SCPDRI | O | SCP Domain Routing InformationAn NRF supporting this feature shall allow a service consumer (i.e. a SCP) to get the SCP Domain Routing Information and subscribe/unsubscribe to the change of SCP Domain Routing Information with following service operations:- SCPDomainRoutingInfoGet (see clause 5.3.2.3)- SCPDomainRoutingInfoSubscribe (see clause 5.3.2.4)- SCPDomainRoutingInfoUnsubscribe (see clause 5.3.2.6)A service consumer (i.e. a SCP) supporting this feature shall be able to handle SCPDomainRoutingInfoNotify as specified in clause 5.3.2.5, if subscribed to the change of SCP Domain Routing Information in the NRF. |
| 13 | Query-Upf-Pfcp | O | This feature indicates whether the NRF supports selection of UPF with required UP function features as defined in 3GPP TS 29.244 [21]. |
| 14 | Query-5G-ProSe | O | Support of the following query parameters, for Proximity based Services in 5GS defined in 3GPP Rel-17:- prose-support-ind- prose-capability |
| 15 | NSAC | O | This feature indicates the NSACF service capability.Support of the following query parameters:- nsacf-capability |
| 16 | Query-MBS | O | Support of the following query parameters, for Multicast and Broadcast Services defined in 3GPP Rel-17:- mbs-session-id-list- mbsmf-serving-area- area-session-id |
| 17 | Query-eNA-PH2 | O | Support of the following query parameters, for Enhanced Network Automation Phase 2 defined in 3GPP Rel-17:- analytics-aggregation-ind- serving-nf-set-id- serving-nf-type- ml-analytics-info-list- analytics-metadata-prov-ind |
| 18 | Query-eLCS | O | Support of the following query parameters, for 5G LCS service:- gmlc-number |
| 19 | Query-eEDGE-5GC | O | Support of the following query parameters, for enhancement of support for Edge Computing in 5GC defined in 3GPP Rel-17:- upf-n6-ip- tai-list |
| 20 | Collocated-NF-Selection | O | Support of selecting a collocated NF supporting multiple NF types.  |
| 21 | Query-ENPN | O | Support of the following query parameter for the enhanced support of Non-Public Networks defined in 3GPP Rel-17:- support-onboarding-capability- target-hni- remote-snpn-id |
| 22 | Query-ID\_UAS | O | Support of the following query parameters, for remote Identification of Unmanned Aerial Systems defined in 3GPP Rel-17:- uas-nf-functionality-ind |
| 23 | NRFSET | O | NRF Set featureAn NRF supporting this feature shall allow a NF Service Consumer to get the NRF Set Information and subscribe/unsubscribe to the change of NRF Set Information:A NF Service Consumer supporting this feature shall be able to handle Notify of the NRF status change, if subscribed to the change of NRF set information. |
| 24 | Query-Nw-Resolution | O | Support for the following query parameters:- target-nw-resolution |
| 25 | Query-Param-iSmf-Capability | O | Support of the query parameters for I-SMF Capability:- ismf-support-ind |
| X | Query-SBIProtoc18 | O | Support of the following query parameters, for Service Based Interface Protocol Improvements defined in 3GPP Rel-18:- ext-preferred-locality |
| Feature number: The order number of the feature within the supportedFeatures attribute (starting with 1).Feature: A short name that can be used to refer to the bit and to the feature.M/O: Defines if the implementation of the feature is mandatory ("M") or optional ("O").Description: A clear textual description of the feature.NOTE 1: An NRF that advertises support of a given feature shall support all the query parameters associated with the feature. An NRF may support none or a subset of the query parameters of features that it does not advertise as supported.NOTE 2: For a release under development, it is recommended to define new features for new query parameters by grouping them per 3GPP work item. Any definition of new query parameters in a frozen release requires a new feature definition. |

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

# A.2 Nnrf\_NFManagement API

openapi: 3.0.0

info:

 version: '1.2.0'

 title: 'NRF NFManagement Service'

 description: |

 NRF NFManagement Service.

 © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

 All rights reserved.

[…]

 NFProfile:

 description: Information of an NF Instance registered in the NRF

 type: object

 required:

 - nfInstanceId

 - nfType

 - nfStatus

 anyOf:

 - required: [ fqdn ]

 - required: [ ipv4Addresses ]

 - required: [ ipv6Addresses ]

 properties:

 nfInstanceId:

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

 nfInstanceName:

 type: string

 nfType:

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

 nfStatus:

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

 collocatedNfInstances:

 type: array

 items:

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

 minimum: 1

 heartBeatTimer:

 type: integer

 minimum: 1

 plmnList:

 type: array

 items:

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

 minItems: 1

 snpnList:

 type: array

 items:

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

 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

 nsiList:

 type: array

 items:

 type: string

 minItems: 1

 fqdn:

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

 interPlmnFqdn:

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

 ipv4Addresses:

 type: array

 items:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv4Addr'

 minItems: 1

 ipv6Addresses:

 type: array

 items:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv6Addr'

 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

 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'

 locality:

 type: string

 extLocality:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string serves

 as key representing a type of locality

 type: object

 additionalProperties:

 type: string

 minProperties: 1 udrInfo:

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

 udrInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of UdrInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 udmInfo:

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

 udmInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of UdmInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 ausfInfo:

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

 ausfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of AusfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 amfInfo:

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

 amfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of AmfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 smfInfo:

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

 smfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of SmfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 upfInfo:

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

 upfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of UpfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 pcfInfo:

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

 pcfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of PcfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 bsfInfo:

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

 bsfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of BsfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 chfInfo:

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

 chfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of ChfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 nefInfo:

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

 nrfInfo:

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

 udsfInfo:

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

 udsfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of UdsfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 nwdafInfo:

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

 nwdafInfoList:

 type: object

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of NwdafInfo

 additionalProperties:

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

 minProperties: 1

 pcscfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of PcscfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 hssInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of HssInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 customInfo:

 type: object

 recoveryTime:

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

 nfServicePersistence:

 type: boolean

 default: false

 nfServices:

 deprecated: true

 type: array

 items:

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

 minItems: 1

 nfServiceList:

 description: >

 A map (list of key-value pairs) where serviceInstanceId serves as key of NFService

 type: object

 additionalProperties:

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

 minProperties: 1

 nfProfileChangesSupportInd:

 type: boolean

 default: false

 writeOnly: true

 nfProfileChangesInd:

 type: boolean

 default: false

 readOnly: true

 defaultNotificationSubscriptions:

 type: array

 items:

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

 lmfInfo:

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

 gmlcInfo:

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

 nfSetIdList:

 type: array

 items:

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

 minItems: 1

 servingScope:

 type: array

 items:

 type: string

 minItems: 1

 lcHSupportInd:

 type: boolean

 default: false

 olcHSupportInd:

 type: boolean

 default: false

 nfSetRecoveryTimeList:

 description: A map (list of key-value pairs) where NfSetId serves as key of DateTime

 type: object

 additionalProperties:

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

 minProperties: 1

 serviceSetRecoveryTimeList:

 description: >

 A map (list of key-value pairs) where NfServiceSetId serves as key of DateTime

 type: object

 additionalProperties:

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

 minProperties: 1

 scpDomains:

 type: array

 items:

 type: string

 minItems: 1

 scpInfo:

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

 seppInfo:

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

 vendorId:

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

 minItems: 1

 minProperties: 1

 aanfInfoList:

 type: object

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of AanfInfo

 additionalProperties:

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

 minProperties: 1

 5gDdnmfInfo:

 $ref: '#/components/schemas/5GDdnmfInfo'

 mfafInfo:

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

 easdfInfoList:

 type: object

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of EasdfInfo

 additionalProperties:

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

 minProperties: 1

 dccfInfo:

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

 nsacfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of NsacfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 mbSmfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of MbSmfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 tsctsfInfoList:

 type: object

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of TsctsfInfo

 additionalProperties:

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

 minProperties: 1

 mbUpfInfoList:

 type: object

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of MbUpfInfo

 additionalProperties:

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

 minProperties: 1

 trustAfInfo:

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

 nssaafInfo:

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

 hniList:

 type: array

 items:

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

 minItems: 1

 iwmscInfo:

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

 mnpfInfo:

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

[…]

 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:

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

 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: 'TS29571\_CommonData.yaml#/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'

 onboardingCapability:

 type: boolean

 default: false

 targetHni:

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

 preferredLocality:

 type: string

 extPreferredLocality:

 description: >

 A map (list of key-value pairs) where the key of the map represents the relative

 priority, for the requester, of each locality description among the list of locality

 descriptions in this query parameter, encoded as "1" (highest priority"), "2", "3", …,

 "n" (lowest priority)

 type: object

 additionalProperties:

 type: array

 items:

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

 minItems: 1

 minProperties: 1

[…]

 MnpfInfo:

 description: Information of an MNPF Instance

 type: object

 properties:

 msisdnRanges:

 type: array

 items:

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

 minItems: 1

 required:

 - msisdnRanges

 LocalityDescriptionItem:

 description: Locality description item

 type: object

 properties:

 localityType:

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

 localityValue:

 type: string

 required:

 - localityType

 - localityValue

 LocalityDescription:

 description: Locality description

 type: object

 properties:

 localityType:

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

 localityValue:

 type: string

 addlLocDescrItems:

 type: array

 items:

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

 minItems: 1

 required:

 - localityType

 - localityValue

 LocalityType:

 description: >

 Type of locality description. An operator may define custom locality type values other

 than those listed in this enumeration.

 anyOf:

 - type: string

 enum:

 - DATA\_CENTER

 - CITY

 - COUNTY

 - DISTRICT

 - STATE

 - CANTON

 - REGION

 - PROVINCE

 - PREFECTURE

 - COUNTRY

 - type: string

[…]

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

# A.3 Nnrf\_NFDiscovery API

openapi: 3.0.0

info:

 version: '1.2.0'

 title: 'NRF NFDiscovery Service'

 description: |

 NRF NFDiscovery Service.

 © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

 All rights reserved.

[…]

paths:

 /nf-instances:

 get:

 summary: Search a collection of NF Instances

 operationId: SearchNFInstances

 tags:

 - NF Instances (Store)

 parameters:

 - name: Accept-Encoding

 in: header

 description: Accept-Encoding, described in IETF RFC 7231

 schema:

 type: string

 - name: target-nf-type

 in: query

 description: Type of the target NF

 required: true

 schema:

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

[…]

 - name: preferred-locality

 in: query

 description: preferred target NF location

 schema:

 type: string

 - name: ext-preferred-locality

 in: query

 description: >

 preferred target NF location

 A map (list of key-value pairs) where the key of the map represents the relative

 priority, for the requester, of each locality description among the list of locality

 descriptions in this query parameter, encoded as "1" (highest priority"), "2", "3", …,

 "n" (lowest priority)

 content:

 application/json:

 schema:

 type: object

 additionalProperties:

 type: array

 items:

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

 minItems: 1

 minProperties: 1

 - name: access-type

 in: query

 description: AccessType supported by the target NF

 schema:

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

[…]

 NFProfile:

 description: Information of an NF Instance discovered by the NRF

 type: object

 required:

 - nfInstanceId

 - nfType

 - nfStatus

 properties:

 nfInstanceId:

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

 nfInstanceName:

 type: string

 nfType:

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

 nfStatus:

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

 collocatedNfInstances:

 type: array

 items:

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

 minimum: 1

 plmnList:

 type: array

 items:

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

 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

 nsiList:

 type: array

 items:

 type: string

 minItems: 1

 fqdn:

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

 interPlmnFqdn:

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

 ipv4Addresses:

 type: array

 items:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv4Addr'

 minItems: 1

 ipv6Addresses:

 type: array

 items:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv6Addr'

 minItems: 1

 capacity:

 type: integer

 minimum: 0

 maximum: 65535

 load:

 type: integer

 minimum: 0

 maximum: 100

 loadTimeStamp:

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

 locality:

 type: string

 extLocality:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string serves

 as key representing a type of locality

 type: object

 additionalProperties:

 type: string

 minProperties: 1

 priority:

 type: integer

 minimum: 0

 maximum: 65535

 udrInfo:

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

 udrInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of UdrInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 udmInfo:

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

 udmInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of UdmInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 ausfInfo:

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

 ausfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of AusfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 amfInfo:

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

 amfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of AmfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 smfInfo:

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

 smfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of SmfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 upfInfo:

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

 upfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of UpfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 pcfInfo:

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

 pcfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of PcfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 bsfInfo:

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

 bsfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of BsfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 chfInfo:

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

 chfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of ChfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 udsfInfo:

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

 udsfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of UdsfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 nwdafInfo:

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

 nwdafInfoList:

 type: object

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of NwdafInfo

 additionalProperties:

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

 minProperties: 1

 nefInfo:

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

 pcscfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of PcscfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 hssInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of HssInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 customInfo:

 type: object

 recoveryTime:

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

 nfServicePersistence:

 type: boolean

 default: false

 nfServices:

 deprecated: true

 type: array

 items:

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

 minItems: 1

 nfServiceList:

 description: >

 A map (list of key-value pairs) where serviceInstanceId serves as key of NFService

 type: object

 additionalProperties:

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

 minProperties: 1

 defaultNotificationSubscriptions:

 type: array

 items:

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

 lmfInfo:

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

 gmlcInfo:

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

 snpnList:

 type: array

 items:

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

 minItems: 1

 nfSetIdList:

 type: array

 items:

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

 minItems: 1

 servingScope:

 type: array

 items:

 type: string

 minItems: 1

 lcHSupportInd:

 type: boolean

 default: false

 olcHSupportInd:

 type: boolean

 default: false

 nfSetRecoveryTimeList:

 description: A map (list of key-value pairs) where NfSetId serves as key of DateTime

 type: object

 additionalProperties:

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

 minProperties: 1

 serviceSetRecoveryTimeList:

 description: >

 A map (list of key-value pairs) where NfServiceSetId serves as key of DateTime

 type: object

 additionalProperties:

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

 minProperties: 1

 scpDomains:

 type: array

 items:

 type: string

 minItems: 1

 scpInfo:

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

 seppInfo:

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

 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

 aanfInfoList:

 type: object

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of AanfInfo

 additionalProperties:

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

 minProperties: 1

 mfafInfo:

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

 easdfInfoList:

 type: object

 description: >

 A map(list of key-value pairs) where a (unique) valid JSON string

 serves as key of EasdfInfo

 additionalProperties:

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

 minProperties: 1

 dccfInfo:

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

 nsacfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of NsacfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 mbSmfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of MbSmfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 tsctsfInfoList:

 type: object

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of TsctsfInfo

 additionalProperties:

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

 minProperties: 1

 mbUpfInfoList:

 description: >

 A map (list of key-value pairs) where a (unique) valid JSON string

 serves as key of MbUpfInfo

 type: object

 additionalProperties:

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

 minProperties: 1

 trustAfInfo:

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

 nssaafInfo:

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

 hniList:

 type: array

 items:

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

 minItems: 1

 iwmscInfo:

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

 mnpfInfo:

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

[…]

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