**3GPP TSG-SA5 Meeting #141-e *S5-221161***

**e-meeting, 17 - 24 January 2022**

|  |
| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **28.541** | **CR** | **0538** | **rev** | **2** | **Current version:** | **17.5.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
|  |

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

|  |
| --- |
|  |
| ***Title:***  | Add tenant IOC to support multiple tenant environment |
|  |  |
| ***Source to WG:*** | Huawei |
| ***Source to TSG:*** | S5 |
|  |  |
| ***Work item code:*** |  eMEMTANE |  | ***Date:*** | 2021-11-03 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | It was endorsed to enhance NRM with a tenant IOC associated to S-NSSAI list to support multiple tenant environment in 3GPP management system in last meeting (S5-203134). But the definition of tenant IOC is missing in 3GPP specification. |
|  |  |
| ***Summary of change:*** | Add a tenant IOC for description of tenant information in TS 28.541. |
|  |  |
| ***Consequences if not approved:*** | The definition of tenant IOC is missing in 3GPP specification. |
|  |  |
| ***Clauses affected:*** | 2, 6.2, 6.3.X(new), 6.4.1, J.4.3 |
|  |  |
|  | **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:*** | Forge link: <https://forge.3gpp.org/rep/sa5/MnS/tree/28.541_Rel17_CR0538_Add_tenant_IOC_to_support_multiple_tenant_environment> |
|  |  |
| ***This CR's revision history:*** | S5-215089 is the revision of S5-214218.S5-216228 is the revision of S5-215089. S5-22xxxx is the revision of S5-216228. |

|  |
| --- |
| **1st Change** |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System Architecture for the 5G System".

[3] 3GPP TS 38.300: "NR; Overall description; Stage-2".

[4] 3GPP TS 38.401: "NG-RAN; Architecture description".

[5] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".

[6] 3GPP TS 38.420: "NG-RAN; Xn general aspects and principles".

[7] 3GPP TS 38.470: "NG-RAN; F1 general aspects and principles".

[8] 3GPP TS 38.473: "NG-RAN; F1 application protocol (F1AP)".

[9] 3GPP TS 37.340: "NR; Multi-connectivity; Overall description; Stage 2".

[10] 3GPP TS 28.540: "Management and orchestration; 5G Network Resource Model (NRM);Stage 1".

[11] 3GPP TS 28.662: "Telecommunication management; Generic Radio Access Network (RAN) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS) ".

[12] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".

[13] 3GPP TS 23.003: "Numbering, Addressing and Identification".

[14] 3GPP TS 36.410: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 general aspects and principles".

[15] 3GPP TS 36.423: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 application protocol".

[16] 3GPP TS 36.425: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 interface user plane protocol".

[17] 3GPP TS 28.625: "State Management Data Definition Integration Reference Point (IRP); Information Service (IS)".

[18] ITU-T Recommendation X.731: "Information technology - Open Systems Interconnection - Systems Management: State management function".

[19] 3GPP TS 28.658: "Telecommunications management; Evolved Universal Terrestrial Radio Access Network (E-UTRAN) Network Resource Model (NRM) Integration Reference Point (IRP): Information Service (IS)".

[20] 3GPP TS 28.702: "Core Network (CN) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[21] 3GPP TS 28.708: "Telecommunication management; Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP): Information Service (IS)".

[22] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS)".

[23] 3GPP TS 29.510: "5G system; Network Function Repository Services; Stage 3".

[24] 3GPP TS 29.531: "5G System; Network Slice Selection Services Stage 3".

[25] Void.

[26] 3GPP TS 28.531: "Management and orchestration; Provisioning".

[27] 3GPP TS 28.554: "Management and orchestration; 5G End to end Key Performance Indicators (KPI)".

[28] 3GPP TS 22.261: "Service requirements for next generation new services and markets".

[29] ETSI GS NFV-IFA 013 V2.4.1 (2018-02) "Network Function Virtualisation (NFV); Management and Orchestration; Os-Ma-nfvo Reference Point - Interface and Information Model Specification".

[30] 3GPP TS 28.622: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[31] Void.

[32] 3GPP TS 38.211: "NR; Physical channels and modulation".

[33] 3GPP TS 32.616: "Telecommunication management; Configuration Management (CM); Bulk CM Integration Reference Point (IRP); Solution Set (SS) definitions".

[34] 3GPP TS 28.623: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions".

[35] 3GPP TS 28.532: "Management and orchestration; Management services".

[36] Void.

[37] IETF RFC 791: "Internet Protocol".

[38] IETF RFC 2373: "IP Version 6 Addressing Architecture".

[39] IEEE 802.1Q: "Media Access Control Bridges and Virtual Bridged Local Area Networks".

[40] ETSI GR NFV-IFA 015 (V2.4.1): "Network Function Virtualisation (NFV) Release 2; Management and Orchestration; Report on NFV Information Model".

[41] 3GPP TS 38.213: "NR; Physical layer procedures for control".

[42] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[43] 3GPP TS 32.156: "Telecommunication management; Fixed Mobile Convergence (FMC) model repertoire".

[44] IETF RFC 4122: "A Universally Unique IDentifier (UUID) URN Namespace".

[45] IETF RFC 8528: "YANG Schema Mount".

[46] Void

[47] 3GPP TS 32.160: "Management and orchestration; Management Service Template".

[48] 3GPP TS 38.463: "NG-RAN; E1 application protocol (E1AP)".

[49] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in Idle mode and RRC Inactive state".

[50] GSMA NG.116 - Generic Network Slice Template Version 3.0 (2020-05-22).

[51] 3GPP TS 22.104: "Service requirements for cyber-physical control applications in vertical domains; Stage 1".

[52] 3GPP TS 33.501: "Security architecture and procedures for the 5G System".

[53] 3GPP TS 38.901: "Study on channel model for frequencies from 0.5 to 100 GHz ".

[54] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".

[55] 3GPP TS 38.215: "NR; Physical layer measurements".

[56] 3GPP TS 29.244: "Technical Specification Group Core Network and Terminals; Interface between the Control Plane and the User Plane Nodes; Stage 3".

[57] 3GPP TS 28.313: "Self-Organizing Networks (SON) for 5G networks".

[58] 3GPP TS 38.423: "NR; Xn application protocol (XnAP)".

[59] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System; Stage 2".

[60] 3GPP TS 29.512: "5G System; Session Management Policy Control Service; Stage 3".

[61] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[62] 3GPP TS 29.214: "Policy and Charging Control over Rx reference point".

[63] IETF RFC 7042: "IANA Considerations and IETF Protocol and Documentation Usage for IEEE 802 Parameters".

[64] IEEE 802.3-2015: "IEEE Standard for Ethernet".

[65] IEEE 802.1Q-2014: "Bridges and Bridged Networks".

[66] IETF RFC 4301: "Security Architecture for the Internet Protocol".

[67] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

[68] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace; Trace control and configuration management".

[69] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[70] 3GPP TS 28.530: "Management and orchestration; Concepts, use cases and requirements".

[71] 3GPP TS 28.310: "Management and orchestration; Energy efficiency of 5G".

[xx] 3GPP TS 28.533: "Management and orchestration; Architecture framework".

|  |
| --- |
| **2nd Change** |

## 6.2 Class diagram

### 6.2.1 Relationships

Figure 6.2.1-1: Network slice NRM fragment relationship

NOTE 1: The <<OpenModelClass>> NetworkService and <<OpenModelClass>> VNF are defined in [40].

NOTE 2: The target Network Service (NS) instance represents a group of VNFs and PNFs that are supporting the source network slice subnet instance.

NOTE 3: The instance tree of this NRM fragment would not contain the instances of NetworkService and VNF. However, the NetworkSliceSubNet instances would have an attribute holding the identifiers of NetworkService instances and the ManagedFunction instance would have an attribute holding identifiers of VNF instances.



Figure 6.2.1-2: Transport EP NRM fragment relationship

Figure 6.2.1-3: containment relationship for network slice fragment



Figure 6.2.1-x: Tenant NRM fragment relationship

### 6.2.2 Inheritance



Figure 6.2.2-1: Network slice inheritance relationship



Figure 6.2.2-x: Tenant inheritance relationship

|  |
| --- |
| **3rd Change** |

### 6.3.x Tenant

#### 6.3.x.1 Definition

This IOC represents the information of a tenant, related management capability and information related to a particular communication service consumer (e.g. an enterprise user) in 3GPP management system. The tenant IOC in 3GPP management system allows management capability exposure governance to governance management services to a tenant. For more information on the management capability exposure governance, see 3GPP TS 28.533 [xx].

#### 6.3.x.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable | isWritable | isInvariant | isNotifyable |
| tenantId | M | T | F | F | F |
| administrativeState | M | T | F | F | F |
| sNSSAIList | M | T | F | F | F |
| serviceProfileInfoList | M | T | F | F | F |
| ManagementServiceExposedList | M | T | F | F | F |

#### 6.3.x.3 Notifications

The common notifications defined in subclause 6.5 are valid for this IOC, without exceptions or additions.

|  |
| --- |
| **4th Change** |

### 6.3.y serviceProfileInfo <<dataType>>

#### 6.3.y.1 Definition

This <<data type>> represents the service profile information assosiated to network slice for the tenant supported by the tenant IOC in clause 6.3.x.

#### 6.3.y.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable | isWritable | isInvariant | isNotifyable |
| networkSliceRef | M | T | F | F | T |
| serviceProfileId | M | T | F | F | F |

#### 6.3.y.3 Attribute constraints

None.

#### 6.3.y.4 Notifications

The clause 6.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

## 6.4 Attribute definitions

### 6.4.1 Attribute properties

| Attribute Name | Documentation and Allowed Values | Properties |
| --- | --- | --- |
| availability | This parameter specifies the communication service availability requirement, expressed as a percentage. The communication service availability is defined in clause 3.1 of TS 22.261 [28]. | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: True |
| serviceProfileId | A unique identifier of property of network slice related requirement should be supported by the network slice. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
| sliceProfileId | A unique identifier of the property of network slice subnet related requirement should be supported by the network slice subnet. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
| operationalState | It indicates the operational state of the network slice or the network slice subnet. It describes whether or not the resource is physically installed and working.allowedValues: "ENABLED", "DISABLED".The meaning of these values is as defined in 3GPP TS 28.625 [17] and ITU-T X.731 [18]. | type: ENUM multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| administrativeState | It indicates the administrative state of the network slice or the network slice subnet. It describes the permission to use or prohibition against using the managed object instance, imposed through the OAM services.allowedValues: “LOCKED”, “UNLOCKED”, SHUTTINGDOWN” The meaning of these values is as defined in 3GPP TS 28.625 [17] and ITU-T X.731 [18]. | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: LOCKEDallowedValues: N/A isNullable: False |
| nsInfo | This attribute contains the NsInfo of the NS instance corresponding to the network slice subnet instance. The NsInfo is described in clause 8.3.3.2.2 of ETSI GS NFV-IFA 013 [29]. | type: NsInfomultiplicity: 1isOrdered: N/AisUnique: TruedefaultValue: No default valueisNullable: True |
| nSInstanceId | This attribute specifies the identifier of NS instance corresponding to the network slice subnet instance.See clause 8.3.3.2.2 of ETSI GS NFV-IFA 013 [29]. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: TruedefaultValue: No default valueisNullable: True |
| nsName | This attribute specifies the name of NS instance corresponding to the network slice subnet instance.See clause 8.3.3.2.2 of ETSI GS NFV-IFA 013 [29]. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: TruedefaultValue: No default valueisNullable: True |
| description | This attribute specifies the description of NS instance corresponding to the network slice subnet instance.See clause 8.3.3.2.2 of ETSI GS NFV-IFA 013 [29]. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: TruedefaultValue: No default valueisNullable: True |
| category | This attribute specifies the category of a service requirement/attribute of GST (see GSMA NG.116 [50]).allowedValues: character, scalability | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/A isNullable: False |
| tagging | This attribute specifies the tagging of a service requirement/attribute of GST in character category (see GSMA NG.116 [50]).allowedValues: performance, function, operation | type: ENUMmultiplicity: 1…3isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/A isNullable: False |
| exposure | This attribute specifies exposure mode of a service requirement/attribute of GST (see GSMA NG.116 [50]).allowedValues: API, KPI | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/A isNullable: False |
| sNSSAIList | This parameter specifies the S-NSSAI list to be supported by the network slice new to be created or the existing network slice to be re-used.sNSSAList is defined in subclause 4.4.1 |  |
| maxNumberofUEs | An attribute specifies the maximum number of UEs may simultaneously access the network slice or network slice subnet instance. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| coverageAreaTAList | An attribute specifies a list of Tracking Areas for the network slice .allowedValues:Legacy TAC and Extended TAC are defined in clause 9.3.3.10 of TS 38.413 [5]. | type: Integermultiplicity: 1..\*isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| latency | An attribute specifies the packet transmission latency (millisecond) through the RAN, CN, and TN part of 5G network and is used to evaluate utilization performance of the end-to-end network slice. See clause 6.3.1 of 28.554 [27]. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| topSliceSubnetProfile.latency | An attribute specifies the packet transmission latency (millisecond) through all domains of the network slice and is used to evaluate utilization performance of the end-to-end network slice. See clause 6.3.1 of 28.554 [27]. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| CNSliceSubnetProfile.latency | An attribute specifies the packet transmission latency (millisecond) through CN domain of the network slice and is used to evaluate the delay in CN domain, e.g. time between received UL/DL packet on N3/N6 interface of UPF and successfully sent out the packet on N6/N3 interface.  | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| RANSliceSubnetProfile.latency | An attribute specifies the packet transmission latency (millisecond) through RAN domain of the network slice and is used to evaluate the delay in RAN domain, e.g. time between received UL/DL packet on air interface/NgU of gNB and successfully sent out the packet on NgU/air interface of the gNB.  | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| uEMobilityLevel | An attribute specifies the mobility level of UE accessing the network slice. See 6.2.1 of TS 22.261 [28].allowedValues: stationary, nomadic, restricted mobility, fully mobility. | type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: True |
| serviceProfilenetworkSlice.SharingIndicator | The attribute specifies whether a service, defined by the ServiceProfile, can share a NetworkSlice instance with other services or not. If “non-shared” the service needs a dedicated NetworkSlice instance. If “shared” the service may share a NetworkSlice instance with other service(s).allowedValues: shared, non-shared. | type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
| serviceProfile.pLMNInfoList | It defines which PLMN and S-NSSAI combinations that are assigned for the service to satisfy service requirements represented by the ServiceProfile in case of network slicing feature is supported.allowedValues: Not applicable. | type: PLMNInfomultiplicity: 1..\*isOrdered: N/AisUnique: TruedefaultValue: NoneisNullable: False |
| sliceProfile.pLMNInfoList | It defines which PLMN and S-NSSAI combinations that are served by the SliceProfile in case of network slicing feature is supported.allowedValues: Not applicable. | type: PLMNInfomultiplicity: 1..\*isOrdered: N/AisUnique: TruedefaultValue: NoneisNullable: False |
| sliceProfile.resourceSharingLevel | An attribute specifies whether the resources to be allocated to the network slice subnet may be shared with another network slice subnet(s).allowedValues: shared, non-shared. | type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: YesisNullable: True |
| serviceProfileList | An attribute specifies a list of ServiceProfile (see clause 6.3.3) supported by the network slice  | type: ServiceProfilemultiplicity: \*isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| sliceProfileList | An attribute specifies a list of SliceProfile (see clause 6.3.4) supported by the network slice subnet  | type: SliceProfilemultiplicity: \*isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| sST | This parameter specifies the slice/service type in a ServiceProfile to be supported by a network slice.See clause 5.15.2 of 3GPP TS 23.501 [2]. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| delayTolerance | An attribute specifies the properties of service delivery flexibility, especially for the vertical services that are not chasing a high system performance. See clause 4.3 of TS 22.104 [51]. | type: DelayTolerancemultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| DelayTolerance.support | An attribute specifies whether or not the network slice supports service delivery flexibility, especially for the vertical services that are not chasing a high system performance.allowedValues:"NOT SUPPORTED", "SUPPORTED". | type: <<enumeration>>multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| deterministicComm | An attribute specifies the properties of the deterministic communication for periodic user traffic, see clause 4.3 of TS 22.104 [51]. | type: DeterministicCommmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| DeterministicComm.availability | An attribute specifies whether or not the network slice supports deterministic communication for period user traffic.allowedValues:"NOT SUPPORTED", "SUPPORTED". | type: <<enumeration>>multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| DeterministicComm.periodicityList | An attribute specifies a list of periodicities supported by the network slice for deterministic communication. | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| dLThptPerSlice | This attribute defines achievable data rate of the network slice in downlink that is available ubiquitously across the coverage area of the slice, refer NG.116 [50]. | type: XLThptmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| dLThptPerSliceSubnet | This attribute defines achievable data rate of the network slice subnet in downlink that is available ubiquitously across the coverage area of the slice. | type: XDLThpt multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| dLThptPerUE | This attribute defines data rate supported by the network slice per UE, refer NG.116 [50].  | type: XLThptmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| guaThpt | This attribute describes the guaranteed data rate. | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| maxThpt | This attribute describes the maximum data rate. | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| uLThptPerSlice | This attribute defines achievable data rate of the network slice in uplink that is available ubiquitously across the coverage area of the slice, refer NG.116 [50].  | type: XLThptmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| uLThptPerUE | This attribute defines data rate supported by the network slice per UE, refer NG.116 [50].  | type: XLThptmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| uLThptPerSliceSubnet | This attribute defines achievable data rate of the network slice subnet in uplink that is available ubiquitously across the coverage area of the slice. | type: XLThptmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| maxPktSize | This parameter specifies the maximum packet size supported by the network slice or the network slice subnet, refer NG.116 [50].  | type: MaxPktSizemultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| MaxPktSize.maxsize | This parameter specifies the maximum packet size supported by the network slice, refer NG.116 [50].  | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| maxNumberofPDUSessions | This parameter defines the maximum number of concurrent PDU sessions supported by the network slice, refer NG.116 [50].  | type: MaxNumberofPDUSessionsmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| MaxNumberofPDUSessions.nOofPDUSessions | This parameter defines the maximum number of concurrent PDU sessions supported by the network slice, refer NG.116 [50].  | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| kPIMonitoring | An attribute specifies the name list of KQIs and KPIs available for performance monitoring. | type: KPIMonitoringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| KPIMonitoring. kPIList | An attribute specifies the name list of KQIs and KPIs available for performance monitoring. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| nBIoT | An attribute specifies whether NB-IoT is supported in the RAN in the network slice, see NG.116 [50]. | type: NBIoTmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| NBIoT.support | An attribute specifies whether NB-IoT is supported in the RAN in the network slice, see NG.116 [50].allowedValues:"NOT SUPPORTED", "SUPPORTED". | type: <<enumeration>>multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| synchronicity | An attribute specifies whether synchronicity of communication devices is supported, Two cases are most important in this context, see clause 3.4.29 of NG.116 [50]:- Synchronicity between a base station and a mobile device and- Synchronicity between mobile devices. | type: Synchronicitymultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| Synchronicity.availability | An attribute specifies whether synchronicity of communication devices is supported, see NG.116 [50].allowedValues:"NOT SUPPORTED", "BETWEEN BS AND UE", "BETWEEN BS AND UE & UE AND UE". | type: <<enumeration>>multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| Synchronicity.accuracy | An attribute specifies the accuracy of the synchronicity, see NG.116 [50]. | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| RANSliceSubnetProfile.synchronicity | An attribute specifies whether synchronicity of communication devices is supported in the RAN domain, Two cases are most important in this context, see clause 3.4.29 of NG.116 [50]:- Synchronicity between a base station and a mobile device and- Synchronicity between mobile devices. | type: SynchronicityRANSubnetmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| SynchronicityRANSubnet.availability | An attribute specifies whether synchronicity of communication devices is supported in the RAN domain, see NG.116 [50].allowedValues:"NOT SUPPORTED", "BETWEEN BS AND UE", "BETWEEN BS AND UE & UE AND UE". | type: <<enumeration>>multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| SynchronicityRANSubnet.accuracy | An attribute specifies the accuracy of the synchronicity in the RAN domain, see NG.116 [50]. | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| userMgmtOpen | An attribute specifies whether or not the network slice supports the capability for the NSC to manage their users or groups of users’ network services and corresponding requirements. | type: UserMgmtOpenmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| UserMgmtOpen.support | An attribute specifies whether or not the network slice supports the capability for the NSC to manage their users or groups of users’ network services and corresponding requirements.allowedValues:"NOT SUPPORTED", "SUPPORTED". | type: <<enumeration>>multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| v2XCommModels | An attribute specifies whether or not the V2X communication mode is supported by the network slice. | type: V2XCommModemultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| V2XCommMode.v2XMode | An attribute specifies whether or not the V2X communication mode is supported by the network slice.allowedValues:"NOT SUPPORTED", "SUPPORTED BY NR". | type: <<enumeration>>multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| coverageArea | An attribute specifies the coverage area of the network slice, i.e. the geographic region where a 3GPP communication service is accessible, see Table 7.1-1 of TS 22.261 [28]) and NG.116 [50]. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| termDensity | An attribute specifies the overall user density over the coverage area of the network slice. See Table 7.1-1 of TS 22.261 [28]). | type: TermDensitymultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| TermDensity.density | An attribute specifies the overall user density over the coverage area of the network slice. See Table 7.1-1 of TS 22.261 [28]). | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| positioning | An attribute specifies whether the network slice provides geo-localization methods or supporting methods, see clause 3.4.20 of NG.116 [50]. | type: Positioningmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| Positioning.availability | An attribute specifies if this attribute is provided by the network slice and contains a list of positioning methods provided by the slice. If the list is empty this attribute is not available in the network slice and the other parameters might be ignored, see NG.116 [50]. Comma separated multiple values are allowed:CIDE-CID (LTE and NR), OTDOA (LTE and NR), RF fingerprinting, AECID, Hybrid positioning, NET-RTK. | type: ENUMmultiplicity: 1..6isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| Positioning.predictionfrequency | An attribute specifies how often location information is provided. This parameter simply defines how often the customer is allowed to request location information. This is not related to the time it takes to determine the location, which is a characteristic of the positioning method, see NG.116 [50].allowedValues:"PERSEC", "PERMIN", "PERHOUR". | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| Positioning.accuracy | An attribute specifies the accuracy of the location information. Accuracy depends on the respective positioning solution applied in the network slice, see NG.116 [50]. | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| RANSliceSubnetProfile.positioning | An attribute specifies whether the RAN domain of the network slice provides geo-localization methods or supporting methods, see clause 3.4.20 of NG.116 [50]. | type: PositioningRANSubnetmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| PositioningRANSubnet.availability | An attribute specifies if this attribute is provided by the RAN domain of the network slice and contains a list of positioning methods provided by the RAN domain. If the list is empty this attribute is not available in the RAN domain and the other parameters might be ignored, see NG.116 [50]. Comma separated multiple values are allowed:CIDE-CID (LTE and NR), OTDOA (LTE and NR), RF fingerprinting, AECID, Hybrid positioning, NET-RTK. | type: ENUMmultiplicity: 1..6isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| PositioningRANSubnet.predictionfrequency | An attribute specifies how often location information is provided. This parameter simply defines how often the customer is allowed to request location information. This is not related to the time it takes to determine the location, which is a characteristic of the positioning method, see NG.116 [50].allowedValues:"PERSEC", "PERMIN", "PERHOUR". | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| PositioningRANSubnet.accuracy | An attribute specifies the accuracy of the location information. Accuracy depends on the respective positioning solution applied in the RAN domain of the network slice, measurement unit is meter, see NG.116 [50]. | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| activityFactor | An attribute specifies the percentage value of the amount of simultaneous active UEs to the total number of UEs where active means the UEs are exchanging data with the network. See Table 7.1-1 of TS 22.261 [28]). | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| uESpeed | An attribute specifies the maximum speed (in km/hour) supported by the network slice or network slice subnet at which a defined QoS can be achieved. See Table 7.1-1 of TS 22.261 [28]). | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| jitter | An attribute specifies the deviation from the desired value to the actual value when assessing time parameters, see clause C.4.1 of TS 22.104 [51]. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| survivalTime | An attribute specifies the time that an application consuming a communication service may continue without an anticipated message. See clause 5 of TS 22.104 [51]). | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| reliability | An attribute specifies in the context of network layer packet transmissions, percentage value of the amount of sent network layer packets successfully delivered to a given system entity within the time constraint required by the targeted service, divided by the total number of sent network layer packets, see TS 22.261 [28] and TS 22.104 [51]. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| NetworkSlice.networkSliceSubnetRef | This holds a DN of NetworkSliceSubnet relating to the NetworkSlice instance. | type: DNmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| NetworkSliceSubnet.networkSliceSubnetRef | This holds a list of DN of constituent NetworkSliceSubnet supporting NetworkSliceSubnet instance  | type: DNmultiplicity: \*isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| managedFunctionRef | This holds a list of DN of ManagedFunction instances supporting the NetworkSliceSubnet instance. | type: DNmultiplicity: \*isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| ipAddress | This parameter specifies the IP address assigned to a logical transport interface/endpoint. It can be an IPv4 address (See RFC 791 [37]) or an IPv6 address (See RFC 2373 [38]).See note 1 | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| logicInterfaceId | This parameter specifies the identify of a logical transport interface. It could be VLAN ID (See IEEE 802.1Q [39]), MPLS Tag or Segment ID. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| nextHopInfoList | This parameter is used to identify ingress transport node. Each node can be identified by any of combination of IP address of next-hop router of transport network, system name, port name, IP management address of transport nodes. | type: Stringmultiplicity: \*isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
| qosProfileRefList | This parameter specifies reference to QoS Profile for a logical transport interface. A QoS profile includes a set of parameters which are locally provisioned on both sides of a logical transport interface. | type: Stringmultiplicity: \*isOrdered: N/AisUnique: TruedefaultValue: NoneisNullable: True |
| maxDLDataVolume | An attribute specifies the maximum DL PDCP data volume supported by the network slice instance (performance measurement definition see in TS 28.552[69]). The unit is MByte/day. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| maxULDataVolume | An attribute specifies the maximum UL PDCP data volume supported by the network slice instance (performance measurement definition see in TS 28.552[69]). The unit is MByte/day. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| serviceType | An attribute specifies the standardized network slice type.allowedValues: eMBB, URLLC, MIoT, V2X. | type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: True |
| epApplicationRef | This parameter specifies a list of application level EPs (i.e. EP\_N3 or EP\_NgU) associated with the logical transport interface. | type: DNmultiplicity: \*isOrdered: N/AisUnique: TruedefaultValue: NoneisNullable: False |
| epTransportRef | This parameter specifies a list of transport level EPs associated with the application level EP (i.e. EP\_N3 or EP\_NgU) or network slice subnet. | type: DNmultiplicity: \*isOrdered: N/AisUnique: TruedefaultValue: NoneisNullable: True |
| sliceSimultaneousUse | This attribute describes whether a network slice can be simultaneously used by a device together with other network slices and if so, with which other classes of network slices.allowedValues: “0”, “1”, “2”, “3”, “4”.“0”: Can be used with any network slice“1”: Can be used with network slices with same SST value“2”: Can be used with any network slice with same SD value“3”: Cannot be used with another network slice“4”: Cannot be used by a UE in a specific location | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| energyEfficiency | An attribute which describes the energy efficiency, i.e. the ratio between the performance and the energy consumption (EC) when assessed during the same time frame, see clause 3.4.7 of NG.116 [50]. | type: EnergyEfficiencymultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
| EnergyEfficiency.performance | Depending on the sST value, EnergyEfficiency.performance will be- eMBBEEPerfReqor- uRLLCEEPerfReqor- mIoTEEPerfReqallowedValues:- eMBBEEPerfReq identifies the requirement in terms of energy efficiency, i.e. the performance per consumed Joule, where performance can take the following forms: - number of bits (Integer) (see TS 28.554 [27] clause 6.7.2.2).- uRLLCEEPerfReq identifies the requirement in terms of energy efficiency, i.e. the performance per consumed Joule, where performance can take the following forms: - latency in 0.1ms (Integer) (see TS 28.554 [27] clause 6.7.2.3).- mIoTEEPerfReq identifies the requirement in terms of energy efficiency, i.e. the performance per consumed Joule, where performance can take the following forms: - maximum number of registered subscribers (Integer) (see TS 28.554 [27] clause 6.7.2.4.1), - mean number of active UEs (Integer) (see TS 28.554 [27] clause 6.7.2.4.2).See NOTE 3. | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| topSliceSubnetProfile.energyEfficiency | An attribute which describes the energy efficiency through all domains of the network slice, i.e. the ratio between the performance and the energy consumption (EC) when assessed during the same time frame, see clause 3.4.7 of NG.116 [50]. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| CNSliceSubnetProfile. energyEfficiency | An attribute which describes the energy efficiency through CN domain of the network slice, i.e. the ratio between the performance and the energy consumption (EC) when assessed during the same time frame, see clause 3.4.7 of NG.116 [50]. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| RANSliceSubnetProfile. energyEfficiency | An attribute which describes the energy efficiency through RAN domain of the network slice, i.e. the ratio between the performance and the energy consumption (EC) when assessed during the same time frame, see clause 3.4.7 of NG.116 [50]. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| Tenant.tenantId | It is identifier which is allocated by network operator to identify a tenant. | type: stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| Tenant.administrativeState | It indicates the administrative state of the network slice or the network slice subnet offered to the tenant. It describes the permission to use or prohibition against using the managed object instance, imposed through the OAM services.allowedValues: “LOCKED”, “UNLOCKED”, SHUTTINGDOWN” The meaning of these values is as defined in 3GPP TS 28.625 [17] and ITU-T X.731 [18]. | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: LOCKEDallowedValues: N/A isNullable: False |
| Tenant.ManagementServiceExposedList | The managementServiceExposed indicates the management services exposed to the tenant (identified by tenantId). The precise semantics of this attribute is not specified in the present document. | type: stringmultiplicity: \*isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| Tenant.sNSSAIList | This parameter specifies the S-NSSAI list associated to the network slice(s) offered to the tenant by network slice provider.  | type: DNmultiplicity: \*isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| Tenant.serviceProfileId | A unique identifier of property of network slice related requirement should be supported by the network slice associated to the tenant. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
| Tenant.networkSliceRef | This parameter specifies the network slice(s) offered to the tenant by network slice provider.   | type: DNmultiplicity: \*isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| NOTE 1: There is no direct relationship between localAddress/remoteAddress in EP\_RP and ipAddress in EP\_transport. While the localAddress/remoteAddress in EP\_RP could be exchanged as part of signalling between GTP-u tunnel end points, ipAddress in EP\_transport is used for transport routing. NOTE 2: voidNOTE 3: energy efficiency requirement for V2X is not part of the current document. |

|  |
| --- |
| **5th Change** |

## J.4.3 OpenAPI document "sliceNrm.yaml"

openapi: 3.0.1

info:

 title: Slice NRM

 version: 17.3.0

 description: >-

 OAS 3.0.1 specification of the Slice NRM

 @ 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

 All rights reserved.

externalDocs:

 description: 3GPP TS 28.541; 5G NRM, Slice NRM

 url: http://www.3gpp.org/ftp/Specs/archive/28\_series/28.541/

paths: {}

components:

 schemas:

#------------ Type definitions ---------------------------------------------------

 Float:

 type: number

 format: float

 MobilityLevel:

 type: string

 enum:

 - STATIONARY

 - NOMADIC

 - RESTRICTED MOBILITY

 - FULLY MOBILITY

 SynAvailability:

 type: string

 enum:

 - NOT SUPPORTED

 - BETWEEN BS AND UE

 - BETWEEN BS AND UE & UE AND UE

 PositioningAvailability:

 type: array

 items:

 type: string

 enum:

 - CIDE-CID

 - OTDOA

 - RF FINGERPRINTING

 - AECID

 - HYBRID POSITIONING

 - NET-RTK

 Predictionfrequency:

 type: string

 enum:

 - PERSEC

 - PERMIN

 - PERHOUR

 SharingLevel:

 type: string

 enum:

 - SHARED

 - NON-SHARED

 NetworkSliceSharingIndicator:

 type: string

 enum:

 - SHARED

 - NON-SHARED

 ServiceType:

 type: string

 enum:

 - eMBB

 - RLLC

 - MIoT

 - V2X

 SliceSimultaneousUse:

 type: string

 enum:

 - ZERO

 - ONE

 - TWO

 - THREE

 - FOUR

 Category:

 type: string

 enum:

 - CHARACTER

 - SCALABILITY

 Tagging:

 type: array

 items:

 type: string

 enum:

 - PERFORMANCE

 - FUNCTION

 - OPERATION

 Exposure:

 type: string

 enum:

 - API

 - KPI

 ServAttrCom:

 type: object

 properties:

 category:

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

 tagging:

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

 exposure:

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

 Support:

 type: string

 enum:

 - NOT SUPPORTED

 - SUPPORTED

 DelayTolerance:

 type: object

 properties:

 servAttrCom:

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

 support:

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

 DeterministicComm:

 type: object

 properties:

 servAttrCom:

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

 availability:

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

 periodicityList:

 type: string

 XLThpt:

 type: object

 properties:

 servAttrCom:

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

 guaThpt:

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

 maxThpt:

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

 MaxPktSize:

 type: object

 properties:

 servAttrCom:

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

 maxsize:

 type: integer

 MaxNumberofPDUSessions:

 type: object

 properties:

 servAttrCom:

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

 nOofPDUSessions:

 type: integer

 KPIMonitoring:

 type: object

 properties:

 servAttrCom:

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

 kPIList:

 type: string

 NBIoT:

 type: object

 properties:

 servAttrCom:

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

 support:

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

 Synchronicity:

 type: object

 properties:

 servAttrCom:

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

 availability:

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

 accuracy:

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

 SynchronicityRANSubnet:

 type: object

 properties:

 availability:

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

 accuracy:

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

 Positioning:

 type: object

 properties:

 servAttrCom:

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

 availability:

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

 predictionfrequency:

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

 accuracy:

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

 PositioningRANSubnet:

 type: object

 properties:

 availability:

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

 predictionfrequency:

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

 accuracy:

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

 UserMgmtOpen:

 type: object

 properties:

 servAttrCom:

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

 support:

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

 V2XCommModels:

 type: object

 properties:

 servAttrCom:

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

 v2XMode:

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

 TermDensity:

 type: object

 properties:

 servAttrCom:

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

 density:

 type: integer

 NsInfo:

 type: object

 properties:

 nsInstanceId:

 type: string

 nsName:

 type: string

 EmbbEEPerfReq:

 type: integer

 UrllcEEPerfReq:

 type: integer

 MIoTEEPerfReq:

 type: object

 properties:

 KpiType:

 type: string

 enum:

 - MAXREGSUBS

 - MEANACTIVEUES

 Req:

 type: integer

 EEPerfReq:

 oneOf:

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

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

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

 EnergyEfficiency:

 type: object

 properties:

 servAttrCom:

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

 performance:

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

 CNSliceSubnetProfile:

 type: object

 properties:

 maxNumberofUEs:

 type: integer

 latency:

 type: integer

 dLThptPerSliceSubnet:

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

 dLThptPerUE:

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

 uLThptPerSliceSubnet:

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

 uLThptPerUE:

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

 maxNumberOfPDUSessions:

 type: integer

 coverageAreaTAList:

 type: integer

 resourceSharingLevel:

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

 maxPktSize:

 type: integer

 delayTolerance:

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

 synchronicity:

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

 sliceSimultaneousUse:

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

 reliability:

 type: string

 energyEfficiency:

 type: integer

 deterministicComm:

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

 RANSliceSubnetProfile:

 type: object

 properties:

 coverageAreaTAList:

 type: integer

 uEMobilityLevel:

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

 resourceSharingLevel:

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

 maxNumberofUEs:

 type: integer

 activityFactor:

 type: integer

 dLThptPerUE:

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

 uLThptPerUE:

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

 uESpeed:

 type: integer

 reliability:

 type: string

 serviceType:

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

 maxPktSize:

 type: integer

 delayTolerance:

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

 positioning:

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

 sliceSimultaneousUse:

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

 energyEfficiency:

 type: integer

 termDensity:

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

 survivalTime:

 type: string

 synchronicity:

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

 deterministicComm:

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

 TopSliceSubnetProfile:

 type: object

 properties:

 coverageArea:

 type: string

 latency:

 type: integer

 maxNumberofUEs:

 type: integer

 dLThptPerSliceSubnet:

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

 dLThptPerUE:

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

 uLThptPerSliceSubnet:

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

 uLThptPerUE:

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

 maxPktSize:

 type: integer

 maxNumberOfPDUSessions:

 type: integer

 sliceSimultaneousUse:

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

 energyEfficiency:

 type: integer

 synchronicity:

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

 delayTolerance:

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

 positioning:

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

 termDensity:

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

 activityFactor:

 type: integer

 coverageAreaTAList:

 type: integer

 resourceSharingLevel:

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

 uEMobilityLevel:

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

 uESpeed:

 type: integer

 reliability:

 type: string

 serviceType:

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

 deterministicComm:

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

 survivalTime:

 type: string

 ServiceProfile:

 type: object

 properties:

 serviceProfileId:

 type: string

 plmnInfoList:

 $ref: 'nrNrm.yaml#/components/schemas/PlmnInfoList'

 maxNumberofUEs:

 type: number

 latency:

 type: number

 uEMobilityLevel:

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

 sst:

 $ref: 'nrNrm.yaml#/components/schemas/Sst'

 networkSliceSharingIndicator:

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

 availability:

 type: number

 delayTolerance:

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

 deterministicComm:

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

 dLThptPerSlice:

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

 dLThptPerUE:

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

 uLThptPerSlice:

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

 uLThptPerUE:

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

 maxPktSize:

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

 maxNumberofPDUSessions:

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

 kPIMonitoring:

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

 nBIoT:

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

 synchronicity:

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

 positioning:

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

 userMgmtOpen:

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

 v2XModels:

 $ref: '#/components/schemas/V2XCommModels'

 coverageArea:

 type: string

 termDensity:

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

 activityFactor:

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

 uESpeed:

 type: integer

 jitter:

 type: integer

 survivalTime:

 type: string

 reliability:

 type: string

 maxDLDataVolume:

 type: string

 maxULDataVolume:

 type: string

 sliceSimultaneousUse:

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

 energyEfficiency:

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

 SliceProfile:

 type: object

 properties:

 serviceProfileId:

 type: string

 plmnInfoList:

 $ref: 'nrNrm.yaml#/components/schemas/PlmnInfoList'

 cNSliceSubnetProfile:

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

 rANSliceSubnetProfile:

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

 topSliceSubnetProfile:

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

 IpAddress:

 oneOf:

 - $ref: 'genericNrm.yaml#/components/schemas/Ipv4Addr'

 - $ref: 'genericNrm.yaml#/components/schemas/Ipv6Addr'

 ServiceProfileList:

 type: array

 items:

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

 SliceProfileList:

 type: array

 items:

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

 ManagementServiceExposedList:

 type: array

 items:

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

 ManagementServiceExposed:

 type: string

#------------ Definition of concrete IOCs ----------------------------------------

 SubNetwork-Single:

 allOf:

 - $ref: 'genericNrm.yaml#/components/schemas/Top-Attr'

 - type: object

 properties:

 attributes:

 allOf:

 - $ref: 'genericNrm.yaml#/components/schemas/SubNetwork-Attr'

 - $ref: 'genericNrm.yaml#/components/schemas/SubNetwork-ncO'

 - type: object

 properties:

 SubNetwork:

 $ref: '#/components/schemas/SubNetwork-Multiple'

 NetworkSlice:

 $ref: '#/components/schemas/NetworkSlice-Multiple'

 NetworkSliceSubnet:

 $ref: '#/components/schemas/NetworkSliceSubnet-Multiple'

 EP\_Transport:

 $ref: '#/components/schemas/EP\_Transport-Multiple'

 tenant:

 $ref: '#/components/schemas/tenant-Multiple'

 NetworkSlice-Single:

 allOf:

 - $ref: 'genericNrm.yaml#/components/schemas/Top-Attr'

 - type: object

 properties:

 attributes:

 allOf:

 - type: object

 properties:

 networkSliceSubnetRef:

 $ref: 'genericNrm.yaml#/components/schemas/Dn'

 operationalState:

 $ref: 'genericNrm.yaml#/components/schemas/OperationalState'

 administrativeState:

 $ref: 'genericNrm.yaml#/components/schemas/AdministrativeState'

 serviceProfileList:

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

 NetworkSliceSubnet-Single:

 allOf:

 - $ref: 'genericNrm.yaml#/components/schemas/Top-Attr'

 - type: object

 properties:

 attributes:

 allOf:

 - type: object

 properties:

 managedFunctionRefList:

 $ref: 'genericNrm.yaml#/components/schemas/DnList'

 networkSliceSubnetRefList:

 $ref: 'genericNrm.yaml#/components/schemas/DnList'

 operationalState:

 $ref: 'genericNrm.yaml#/components/schemas/OperationalState'

 administrativeState:

 $ref: 'genericNrm.yaml#/components/schemas/AdministrativeState'

 nsInfo:

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

 sliceProfileList:

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

 epTransportRefList:

 $ref: 'genericNrm.yaml#/components/schemas/DnList'

 EP\_Transport-Single:

 allOf:

 - $ref: 'genericNrm.yaml#/components/schemas/Top-Attr'

 - type: object

 properties:

 attributes:

 type: object

 properties:

 ipAddress:

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

 logicInterfaceId:

 type: string

 nextHopInfo:

 type: string

 qosProfile:

 type: string

 epApplicationRefs:

 $ref: 'genericNrm.yaml#/components/schemas/DnList'

 tenant-Single:

 allOf:

 - $ref: genericNrm.yaml#/components/schemas/Top

 - type: object

 properties:

 attributes:

 type: object

 properties:

 tenantId:

 type: string

 administrativeState:

 $ref: genericNrm.yaml#/components/schemas/AdministrativeState

 snssaiList:

 $ref: 'nrNrm.yaml#/components/schemas/SnssaiList'

 ManagementServiceExposedList:

 type: string

 serviceProfileInfo:

 type: object

 properties:

 serviceProfileID:

 type: string

 networkSliceRef:

 $ref: genericNrm.yaml#/components/schemas/DnList

#-------- Definition of JSON arrays for name-contained IOCs ----------------------

 SubNetwork-Multiple:

 type: array

 items:

 $ref: '#/components/schemas/SubNetwork-Single'

 NetworkSlice-Multiple:

 type: array

 items:

 $ref: '#/components/schemas/NetworkSlice-Single'

 NetworkSliceSubnet-Multiple:

 type: array

 items:

 $ref: '#/components/schemas/NetworkSliceSubnet-Single'

 EP\_Transport-Multiple:

 type: array

 items:

 $ref: '#/components/schemas/EP\_Transport-Single'

 tenant-Multiple:

 type: array

 items:

 $ref: '#/components/schemas/tenant-Single'

#------------ Definitions in TS 28.541 for TS 28.532 -----------------------------

 resources-sliceNrm:

 oneOf:

 - $ref: '#/components/schemas/SubNetwork-Single'

 - $ref: '#/components/schemas/NetworkSlice-Single'

 - $ref: '#/components/schemas/NetworkSliceSubnet-Single'

 - $ref: '#/components/schemas/EP\_Transport-Single'

 - $ref: '#/components/schemas/tenant-Single'

|  |
| --- |
| **6th Change** |

# Annex X: Information model definition for Tenant(informative)

## X.1 Relationship UML diagram for Tenant(Figure 6.2.1-x)

@startuml

hide circle

hide methods

hide members

skinparam class {

 AttributeIconSize 0

 BackgroundColor white

 BorderColor black

 ArrowColor black

}

skinparam Shadowing false

skinparam Monochrome true

skinparam ClassBackgroundColor White

class “<<InformationObjectClass>> \n SubNetwork ” as SubNetwork{}

class “<<InformationObjectClass>>\n Tenant ” as Tenant {}

class “<<InformationObjectClass>>\n NetworkSlice” as NetworkSlice{}

SubNetwork "1" \*-- "\*" Tenant

Tenant "\*"--> "\*" NetworkSlice

@enduml

## X.2 Inheritance relationship UML diagram for Tenant(Figure 6.2.2-x)

@startuml

hide circle

hide methods

hide members

skinparam class {

 AttributeIconSize 0

 BackgroundColor white

 BorderColor black

 ArrowColor black

}

skinparam Shadowing false

skinparam Monochrome true

skinparam ClassBackgroundColor White

class “<<InformationObjectClass>> \n Top ” as Top{}

class “<<InformationObjectClass>>\n Tenant ” as Tenant {}

Top <|-- Tenant

@enduml

|  |
| --- |
| **End of Change** |