**3GPP TSG-SA5 Meeting #144-eS5-224284**

**e-meeting, 27 June - 1 July 2022**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **28.541** | **CR** | **-** | **rev** | **-** | **Current version:** | **17.6.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network | **X** |

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|  | | | | | | | | | | |
| ***Title:*** | Add network slice rules to NRM | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson, Deutsche Telekom | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NSRULE | | | | |  | ***Date:*** | | | 2022-04-29 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The introduction of network slice rules requires the NRM to be updated to represent this information in the model. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The serviceProfile and sliceProfile are updated to be able to hold the rules information. The introduction of instance sharing rules negates the need for the attribute networkSliceSharingIndicator as equivalent constraints can be expressed using sharing rules, this attribute is removed.  A new datatype is introduced to be able to create a list of rules  New attributes are introduced to hold the information for a rule including grouping. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Insufficient capabilities to provisioning of network slice and network slice subnet. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.3.3.2, 6.3.4.2,  6.3.X (new), 6.3.X.1, 6.3.X.2, 6.3.X.3, 6.3.X.4  6.4.1,  Annex 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:*** | | [Files · 28.541\_Rel-18\_224284\_draftCR\_Add\_network\_slice\_rules\_to\_NRM\_yaml · SA5 – Management & Orchestration and Charging / Management and Orchestration APIs · GitLab (3gpp.org)](https://forge.3gpp.org/rep/sa5/MnS/-/tree/28.541_Rel-18_224284_draftCR_Add_network_slice_rules_to_NRM_yaml)  efb68586  <https://forge.3gpp.org/rep/sa5/MnS/-/tree/groenendijk-Rel17-draft-patch-39526>  57c9ab51. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| **Start of 1st Change** |

### 6.3.3 ServiceProfile <<dataType>>

#### 6.3.3.1 Definition

This data type represents the properties of the network slice related requirements that should be supported by a NetworkSlice instance in a 5G network. The network slice related requirements apply to a one-to-one relationship between a Network Slice Customer (NSC) and a Network Slice Provider (NSP). A network slice can be tailored based on the specific requirements adhered to an SLA agreed between NSC and NSP, see clause 2 of [50]. An NSP may add additional requirements not directly derived from SLA’s, associated to the NSP internal [business] goals. The GST defined by GSMA (see [50]) and the service performance requirements defined in 3GPP TS 22.261 [28] and TS 22.104 [51] are all considered as input for the network slice related requirements.

#### 6.3.3.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | S | isReadable | isWritable | isInvariant | isNotifyable |
| serviceProfileId | M | T | F | T | T |
| pLMNInfoList | M | T | F | F | T |
| maxNumberofUEs | O | T | T | F | T |
| coverageArea | O | T | T | F | T |
| dLLatency | O | T | T | F | T |
| uLLatency | O | T | T | F | T |
| uEMobilityLevel | O | T | T | F | T |
|  |  |  |  |  |  |
| sST | M | T | T | F | T |
| availability | O | T | T | F | T |
| delayTolerance | O | T | T | F | T |
| dLDeterministicComm | O | T | T | F | T |
| uLDeterministicComm | O | T | T | F | T |
| dLThptPerSlice | O | T | T | F | T |
| dLThptPerUE | O | T | T | F | T |
| uLThptPerSlice | O | T | T | F | T |
| uLThptPerUE | O | T | T | F | T |
| dLMaxPktSize | O | T | T | F | T |
| uLMaxPktSize | O | T | T | F | T |
| maxNumberofPDUSessions | O | T | T | F | T |
| kPIMonitoring | O | T | T | F | T |
| userMgmtOpen | O | T | T | F | T |
| v2XCommModels | O | T | T | F | T |
| termDensity | O | T | T | F | T |
| activityFactor | O | T | T | F | T |
| uESpeed | O | T | T | F | T |
| jitter | O | T | T | F | T |
| survivalTime | O | T | T | F | T |
| radioSpectrum | O | T | T | F | T |
| reliability | O | T | T | F | T |
| maxDLDataVolume | O | T | T | F | T |
| maxULDataVolume | O | T | T | F | T |
| nBIoT | O | T | T | F | T |
| synchronicity | O | T | T | F | T |
| positioning | O | T | T | F | T |
| sliceSimultaneousUse | O | T | T | F | T |
| energyEfficiency | O | T | T | F | T |
| nssaaSupport | O | T | T | F | T |
| n6Protection | O | T | T | F | T |
| provisioningRuleList | O | T | T | F | T |

NOTE: The attributes in ServiceProfile represent mapped requirements from an NSC (e.g. an enterprise) to an NSP

#### 6.3.3.3 Attribute constraints

None.

#### 6.3.3.4 Notifications

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

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| **Start of 2nd Change** |

### 6.3.4 SliceProfile <<dataType>>

#### 6.3.4.1 Definition

This data type represents the properties of network slice subnet related requirement that should be supported by the NetworkSliceSubnet instance in a 5G network.

#### 6.3.4.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | S | isReadable | isWritable | isInvariant | isNotifyable |
| sliceProfileId | M | T | F | T | T |
| pLMNInfoList | M | T | T | F | T |
| CNSliceSubnetProfile | CM | T | T | F | T |
| RANSliceSubnetProfile | CM | T | T | F | T |
| TopSliceSubnetProfile | CM | T | T | F | T |
| provisioningRuleList | O | T | T | F | T |

#### 6.3.4.3 Attribute constraints

|  |  |
| --- | --- |
| Name | Definition |
| CNSliceSubnetProfile S | Condition: It shall be present when the slice profile defines requirements for CN domain |
| RANSliceSubnetProfile S | Condition: It shall be present when the slice profile defines requirements for RAN domain. |
| TopSliceSubnetProfile  S | Condition: It shall be present when the slice profile is for top/root network slice subnet |

#### 6.3.4.4 Notifications

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

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| **Start of 3rd Change** |

### 6.3.X ProvisioningRule <<dataType>>

#### 6.3.X.1 Definition

This data type represents the information that is captured in a provisioning rule from a network slice or network slice subnet provisioning MnS consumer. Provisioing rules are associated with a particular ServiceProfile or SliceProfile and are part of the complete set of requirements to be fulfilled by network slice or network slice subnet MnS producer.

The following types of rules are defined:

- Instance sharing rules provide additional input regarding under what condition the MnS producer may share an NSI or NSSI between multiple allocation requests and profiles. To specify an instance sharing rule, the value of ruleType shall be INSTANCE\_SHARING\_RULE. Additionally, the sharingPolicy needs to be specified. The sharingGroup also needs to be specified by the MnS consumer if and only if sharingPolicy is SELECTIVELY\_SHARED:

- If sharingPolicy is NOT\_SHARED, the MnS producer is not allowed to use an existing NSI or NSSI. Additionally, the new instance is dedicated for this allocation request meaning that it cannot be used to satisfy any other future allocation requests.

- If sharingPolicy is SHARED, the MnS producer may use a shared (but not selectively shared) NSI or NSSI in case a matching instance exists that can support the requested requirements, possibly with modification. An NSI or NSSI is considered shared if it contains one or more profiles with sharingPolicy value SHARED. A new instance may still be created by the MnS producer if a suitable existing instance cannot be found.

- sharingPolicy is SELECTIVELY\_SHARED, the MnS producer may use a selectively shared NSI or NSSI in case a matching instance exists that can support the requested requirements, possibly with modification. An NSI or NSSI is considered selectively shared if it contains one or more profiles with sharingPolicy value SELECTIVELY\_HARED. In addition, to be considered a matching instance for selective sharing, the value of sharingGroup in the allocation request must be equal to the value of sharingGroup in all profiles in the existing selectively shared NSI or NSSI. A new instance may still be created by the MnS producer if a suitable existing instance cannot be found.

NOTE: The value of sharingGroup is only used for equality comparisons by the MnS producer and is thus treated as an opaque identifier.

#### 6.3.X.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | S | isReadable | isWritable | isInvariant | isNotifyable |
| ruleType | M | T | T | F | T |
| sharingPolicy | M | T | T | F | T |
| sharingGroup | CM | T | T | F | T |

#### 6.3.X.3 Attribute constraints

|  |  |
| --- | --- |
| **Name** | **Definition** |
| sharingGroup S | Condition: This attribute shall be supported if selective sharing is supported. |

#### 6.3.X.4 Notifications

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

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| **Start of 4th Change** |

## 6.4 Attribute definition

### 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: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: True |
| serviceProfileId | A unique identifier of property of network slice related requirement should be supported by the network slice. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| sliceProfileId | A unique identifier of the property of network slice subnet related requirement should be supported by the network slice subnet. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: 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: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: 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: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: LOCKED  allowedValues: 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: NsInfo  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: No default value  isNullable: 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: String  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: No default value  isNullable: 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: String  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: No default value  isNullable: 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: String  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: No default value  isNullable: True |
| category | This attribute specifies the category of a service requirement/attribute of GST (see GSMA NG.116 [50]).  allowedValues: character, scalability | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: 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: ENUM  multiplicity: 1…3  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: 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: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| maxNumberofUEs | An attribute specifies the maximum number of UEs may simultaneously access the network slice or network slice subnet instance. | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: 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: Integer  multiplicity: 1..\*  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| dLLatency | An attribute specifies the DL 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: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| uLLatency | An attribute specifies the UL 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: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| topSliceSubnetProfile.dLLatency | An attribute specifies the DL 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: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| topSliceSubnetProfile.uLLatency | An attribute specifies the UL 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: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| CNSliceSubnetProfile.dLLatency | An attribute specifies the DL 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 DL packet on N3/N6 interface of UPF and successfully sent out the packet on N6/N3 interface. | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| CNSliceSubnetProfile.uLLatency | An attribute specifies the UL 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 packet on N3/N6 interface of UPF and successfully sent out the packet on N6/N3 interface. | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| RANSliceSubnetProfile.dLLatency | An attribute specifies the DL 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 DL packet on air interface/NgU of gNB and successfully sent out the packet on NgU/air interface of the gNB. | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| RANSliceSubnetProfile.uLLatency | An attribute specifies the UL 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 packet on air interface/NgU of gNB and successfully sent out the packet on NgU/air interface of the gNB. | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: 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: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: 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: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: 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: PLMNInfo  multiplicity: 1..\*  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: 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: PLMNInfo  multiplicity: 1..\*  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: 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: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: Yes  isNullable: True |
| serviceProfileList | An attribute specifies a list of ServiceProfile (see clause 6.3.3) supported by the network slice | type: ServiceProfile  multiplicity: \*  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| sliceProfileList | An attribute specifies a list of SliceProfile (see clause 6.3.4) supported by the network slice subnet.  All members of the list, instances of SliceProfile, shall contain the same datatype representing slice profile requirements: TopSliceSubnetProfile, RANSliceSubnetProfile or CNSliceSubnetProfile. E.g. the sliceProfileList may contain only instances of sliceProfile containing RANSliceSubnetProfile datatype; the sliceProfileList may not contain instances of sliceProfile containing RANSliceSubnetProfile and CNSliceSubnetProfile datatypes  Members of the list may contain TopSliceSubnetProfile datatype only when this attribute (sliceProfileList) belongs to a NetworkSliceSubnet that is directly referenced by a NetworkSlice | type: SliceProfile  multiplicity: \*  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: 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: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: 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: DelayTolerance  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: False |
| dLDeterministicComm | An attribute specifies the properties of the deterministic communication in downlink for periodic user traffic, see clause 4.3 of TS 22.104 [51]. | type: DeterministicComm  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: False |
| uLDeterministicComm | An attribute specifies the properties of the deterministic communication in uplink for periodic user traffic, see clause 4.3 of TS 22.104 [51]. | type: DeterministicComm  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: False |
| DeterministicComm.periodicityList | An attribute specifies a list of periodicities supported by the network slice for deterministic communication. | type: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: XLThpt  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: 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: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| dLThptPerUE | This attribute defines data rate supported by the network slice per UE, refer NG.116 [50]. | type: XLThpt  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| guaThpt | This attribute describes the guaranteed data rate. | type: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: True |
| maxThpt | This attribute describes the maximum data rate. | type: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: XLThpt  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| uLThptPerUE | This attribute defines data rate supported by the network slice per UE, refer NG.116 [50]. | type: XLThpt  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: 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: XLThpt  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| dLMaxPktSize | This parameter specifies the maximum packet size supported by the network slice or the network slice subnet, in downlink refer NG.116 [50]. | type: MaxPktSize  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| uLMaxPktSize | This parameter specifies the maximum packet size supported by the network slice or the network slice subnet in uplink, refer NG.116 [50]. | type: MaxPktSize  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| MaxPktSize.maxsize | This parameter specifies the maximum packet size supported by the network slice, refer NG.116 [50]. | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| maxNumberofPDUSessions | This parameter defines the maximum number of concurrent PDU sessions supported by the network slice, refer NG.116 [50]. | type: MaxNumberofPDUSessions  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| MaxNumberofPDUSessions.nOofPDUSessions | This parameter defines the maximum number of concurrent PDU sessions supported by the network slice, refer NG.116 [50]. | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| kPIMonitoring | An attribute specifies the name list of KQIs and KPIs available for performance monitoring. | type: KPIMonitoring  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: True |
| KPIMonitoring. kPIList | An attribute specifies the name list of KQIs and KPIs available for performance monitoring. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: True |
| nBIoT | An attribute specifies whether NB-IoT is supported in the RAN in the network slice, see NG.116 [50]. | type: NBIoT  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: Synchronicity  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: False |
| Synchronicity.accuracy | An attribute specifies the accuracy of the synchronicity, see NG.116 [50]. | type: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: SynchronicityRANSubnet  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: False |
| SynchronicityRANSubnet.accuracy | An attribute specifies the accuracy of the synchronicity in the RAN domain, see NG.116 [50]. | type: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: UserMgmtOpen  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: False |
| v2XCommModels | An attribute specifies whether or not the V2X communication mode is supported by the network slice. | type: V2XCommMode  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: TermDensity  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: Positioning  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: ENUM  multiplicity: 1..6  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: PositioningRANSubnet  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: ENUM  multiplicity: 1..6  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: True |
| jitter | An attribute specifies the deviation from the desired value to the actual value when assessing time parameters. | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: 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: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: True |
| NetworkSlice.networkSliceSubnetRef | This holds a DN of NetworkSliceSubnet relating to the NetworkSlice instance. | type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| NetworkSliceSubnet.networkSliceSubnetRef | This holds a list of DN of constituent NetworkSliceSubnet supporting NetworkSliceSubnet instance | type: DN  multiplicity: \*  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| managedFunctionRef | This holds a list of DN of ManagedFunction instances supporting the NetworkSliceSubnet instance. | type: DN  multiplicity: \*  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| ipAddress | This parameter specifies the IP address assigned to a logical transport interface/endpoint which is part of a RAN or CN SubNetwork.  It can be an IPv4 address (See RFC 791 [37]) or an IPv6 address (See RFC 2373 [38]).  See note 1 | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| logicInterfaceInfo | This parameter specifies the information of a logical transport interface (LogicalInterfaceInfo), which includes logicInterfaceType and logicInterfaceId. | type: LogicalInterfaceInfo  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| logicInterfaceType | This parameter specifies the type of a logical transport interface. It could be VLAN, MPLS or Segment.  Allowed Value: VLAN,MPLS,Segment | type:Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| logicInterfaceId | This parameter specifies the identify of a logical transport interface which is part of a RAN or CN SubNetwork. It could be VLAN ID (See IEEE 802.1Q [39]), MPLS Tag or Segment ID.  In case logical transport interface is VLAN, it is VLAN Id (See IEEE 802.1Q [39]).  In case logical transport interface is MPLS, it is MPLS Tag.  In case logical transport interface is Segment, it is Segment ID. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| nextHopInfoList | This parameter is used to identify ingress node (s) which are part of a transport network. Each node can be identified by any of a combination of  - IP address of next-hop router (the ingress node) in the transport network,  - system name,  - port name,  - IP management address of transport nodes. | type: String  multiplicity: \*  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| qosProfile | This parameter specifies the 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.  An example of the parameter value could be “DSCP” (See RFC 8436 [74]) | type: String  multiplicity: 1  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: 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: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: 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: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: False |
| radioSpectrum | This attribute represents the radio spectrum in which the network slice should be supported (see clause 3.4.21 of GSMA NG.116 [50]). | type: RadioSpectrum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| nROperatingBands | This attribute represents which 5G NR frequency bands can be used to access the network slice. 5G NR operating bands are defined in 3GPP TS 38.101-1 [42]. | type: String  multiplicity: \*  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| serviceType | An attribute specifies the standardized network slice type.  allowedValues: eMBB, URLLC, MIoT, V2X. | type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  allowedValues: N/A  isNullable: True |
| epApplicationRef | This parameter specifies a list of application level EPs (i.e. EP\_N3 or EP\_NgU or EP\_F1U) associated with the logical transport interface. | type: DN  multiplicity: \*  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: 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: DN  multiplicity: \*  isOrdered: N/A  isUnique: True  defaultValue: None  isNullable: 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: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: False |
| energyEfficiency | An attribute which describes the energy efficiency of a network slice, i.e. the ratio between the performance of a network slice and its energy consumption (EC) when assessed during the same time frame, see clause 3.4.7 of NG.116 [50]. | type: EnergyEfficiency  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| EnergyEfficiency.performance | Depending on the sST value, EnergyEfficiency.performance will be  - eMBBEEPerfReq  or  - uRLLCEEPerfReq  or  - mIoTEEPerfReq  allowedValues:  - eMBBEEPerfReq identifies the requirement in terms of energy efficiency, i.e. the performance per consumed Joule in type Real, where performance can take one of the following forms (type: ENUM):  - number of bits (Integer) (see TS 28.554 [27] clause 6.7.2.2).  - number of bits (Integer) for RAN-based network slice (see TS 28.554 [27] clause 6.7.2.2a).  - uRLLCEEPerfReq identifies the requirement in terms of energy efficiency, i.e. the performance per consumed Joule in type Real, where performance can take one of the following forms (type: ENUM):  - inverse of the latency in 0.1ms (Real) (see TS 28.554 [27] clause 6.7.2.3.2).  - number of bits multiplied by the inverse of the latency in 0.1ms (Real) (see TS 28.554 [27] clause 6.7.2.3.3).  - mIoTEEPerfReq identifies the requirement in terms of energy efficiency, i.e. the performance per consumed Joule in type Real, where performance can take one of the following forms (type: ENUM):  - 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: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| 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: EnergyEfficiency  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| 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: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| 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: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| nssaaSupport | An attribute specifies whether for the Network Slice, devices need to be also authenticated and authorized by a AAA server using additional credentials different than the ones used for  the primary authentication, see clause 3.4.37 of NG.116 [50].  allowedValues: N/A | type: NSSAASupport  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: False |
| nssaaSupport.support | An attribute specifies whether or not the Network Slice, devices need to be also authenticated and authorized by a AAA server using additional credentials different than the ones used for  the primary authentication.  allowedValues:  "NOT SUPPORTED", "SUPPORTED". | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: False  isNullable: False |
| ServiceProfile.n6Protection | An attribute which includes required security functions and corresponding rules of each function for network slice N6 interface protection.  allowedValues: N/A | type: N6Protection  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| CNSliceSubnetProfile. n6Protection | An attribute which includes required security functions and corresponding rules of each function for network slice N6 interface protection.  allowedValues: N/A | type: N6Protection  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| secFuncList | An attribute which holds the list of security control functions/features required by the Network Slice or Network Slice Subnet consumer.  allowedValues: N/A | type: SecFunc  multiplicity: 1..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| secFunId | An attribute which identifies a security function.  allowedValues: N/A | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| secFunType | An attribute which describes the type of the security function. E.g. Firewall, NAT, antimalware, parental control, DDoS protection function, etc.  allowedValues: N/A | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| secRules | An attribute which could be configured on each function. If it's absent, the default rules could be applied.  allowedValues: N/A | type: String  multiplicity: 0..\*  isOrdered: False  isUnique: N/A  defaultValue: None  isNullable: False |
| networkSliceSubnetType | An attribute indicating type of network slice subnet, including:  - Top network slice subnet  - RAN network slice subnet  - CN network slice subnet  Allowed Value:  TOP\_SLICESUBNET,RAN\_SLICESUBNET,CN\_SLICESUBNET | type:Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| provisioningRuleList | An attribute that holds the list of network slice or network slice subnet provisioning rules. | type:ProvisioningRule  multiplicity: 0..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| ruleType | This attribute specifies the type of provisioning rule.  allowedValues: INSTANCE\_SHARING\_RULE | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| sharingPolicy | This attribute specifies the sharing policy for an instancesharing rule.  In case of selectively-shared the sharingGroup needs to be provided.  allowedValues: SHARED, NOT\_SHARED or SELECTIVELY\_SHARED | type:ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| sharingGroup | This attribute indicates the group associated with a rule in case of selective sharing.  The group name is chosen by the MnS consumer and is treated as an opaque value by the MnS producer. | type: String  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: 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: void  NOTE 3: energy efficiency requirement for V2X is not part of the current document. | | |

|  |
| --- |
| **Start of Change** |

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

openapi: 3.0.1

info:

title: Slice NRM

version: 17.6.0

description: >-

OAS 3.0.1 specification of the Slice NRM

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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

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'

RadioSpectrum:

type: object

properties:

servAttrCom:

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

nROperatingBands:

type: string

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: object

properties:

kpiType:

type: string

enum:

- NUMOFBITS

- NUMOFBITS\_RANBASED

req:

type: number

UrllcEEPerfReq:

type: object

properties:

kpiType:

type: string

enum:

- INVOFLATENCY

- NUMOFBITS\_MULTIPLIED\_INVOFLATENCY

req:

type: number

MIoTEEPerfReq:

type: object

properties:

kpiType:

type: string

enum:

- MAXREGSUBS

- MEANACTIVEUES

req:

type: number

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'

NSSAASupport:

type: object

properties:

servAttrCom:

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

support:

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

SecFunc:

type: object

properties:

secFunId:

type: string

secFunType:

type: string

secRules:

type: array

items:

type: string

N6Protection:

type: object

properties:

servAttrCom:

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

secFuncList:

type: array

items:

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

CNSliceSubnetProfile:

type: object

properties:

maxNumberofUEs:

type: integer

dLLatency:

type: integer

uLLatency:

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'

dLMaxPktSize:

type: integer

uLMaxPktSize:

type: integer

delayTolerance:

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

synchronicity:

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

sliceSimultaneousUse:

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

reliability:

type: string

energyEfficiency:

type: number

dLDeterministicComm:

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

uLDeterministicComm:

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

survivalTime:

type: string

nssaaSupport:

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

n6Protection:

$ref: '#/components/schemas/N6Protection'

RANSliceSubnetProfile:

type: object

properties:

coverageAreaTAList:

type: integer

dLLatency:

type: integer

uLLatency:

type: integer

uEMobilityLevel:

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

resourceSharingLevel:

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

maxNumberofUEs:

type: integer

activityFactor:

type: integer

dLThptPerSliceSubnet:

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

dLThptPerUE:

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

uLThptPerSliceSubnet:

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

uLThptPerUE:

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

uESpeed:

type: integer

reliability:

type: string

serviceType:

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

dLMaxPktSize:

type: integer

uLMaxPktSize:

type: integer

nROperatingBands:

type: string

delayTolerance:

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

positioning:

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

sliceSimultaneousUse:

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

energyEfficiency:

type: number

termDensity:

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

survivalTime:

type: string

synchronicity:

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

dLDeterministicComm:

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

uLDeterministicComm:

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

TopSliceSubnetProfile:

type: object

properties:

dLLatency:

type: integer

uLLatency:

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'

dLMaxPktSize:

type: integer

uLMaxPktSize:

type: integer

maxNumberOfPDUSessions:

type: integer

nROperatingBands:

type: string

sliceSimultaneousUse:

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

energyEfficiency:

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

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'

dLDeterministicComm:

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

uLDeterministicComm:

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

survivalTime:

type: string

ProvisioningRule:

type: object

properties:

ruleType:

type: string

enum:

- INSTANCE\_SHARING\_RULE

sharingPolicy:

type: string

enum:

- SHARED

- NOT\_SHARED

- SELECTIVELY\_SHARED

sharingGroup:

type: string

ProvisioningRuleList:

type: array

items:

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

ServiceProfile:

type: object

properties:

serviceProfileId:

type: string

plmnInfoList:

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

maxNumberofUEs:

type: number

dLLatency:

type: number

uLLatency:

type: number

uEMobilityLevel:

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

sst:

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

availability:

type: number

delayTolerance:

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

dLDeterministicComm:

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

uLDeterministicComm:

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

dLThptPerSlice:

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

dLThptPerUE:

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

uLThptPerSlice:

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

uLThptPerUE:

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

dLMaxPktSize:

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

uLMaxPktSize:

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

maxNumberofPDUSessions:

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

kPIMonitoring:

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

nBIoT:

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

radioSpectrum:

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

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'

nssaaSupport:

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

n6Protection:

$ref: '#/components/schemas/N6Protection'

provisioningRuleList:

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

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'

provisioningRuleList:

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

IpAddress:

oneOf:

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

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

LogicInterfaceInfo:

type: object

properties:

logicalInterfceType:

type: string

enum:

- VLAN

- MPLS

- Segment

logicalInterfceId:

type: string

ServiceProfileList:

type: array

items:

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

SliceProfileList:

type: array

items:

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

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

SubNetwork-Single:

allOf:

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

- 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'

NetworkSlice-Single:

allOf:

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

- type: object

properties:

attributes:

allOf:

- type: object

properties:

networkSliceSubnetRef:

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

operationalState:

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

administrativeState:

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

serviceProfileList:

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

NetworkSliceSubnet-Single:

allOf:

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

- type: object

properties:

attributes:

allOf:

- type: object

properties:

managedFunctionRefList:

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

networkSliceSubnetRefList:

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

operationalState:

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

administrativeState:

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

nsInfo:

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

sliceProfileList:

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

epTransportRefList:

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

priorityLabel:

type: integer

networkSliceSubnetType:

type: string

enum:

- TOP\_SLICESUBNET

- RAN\_SLICESUBNET

- CN\_SLICESUBNET

EP\_Transport-Single:

allOf:

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

- type: object

properties:

attributes:

type: object

properties:

ipAddress:

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

logicInterfaceInfo:

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

nextHopInfo:

type: string

qosProfile:

type: string

epApplicationRefs:

$ref: 'comDefs.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'

#------------ 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'

|  |
| --- |
| **Second Change** |

# N.2 Modules

## N.2.1 module \_3gpp-ns-nrm-networkslice.yang

<CODE BEGINS>

module \_3gpp-ns-nrm-networkslice {

yang-version 1.1;

namespace urn:3gpp:sa5:\_3gpp-ns-nrm-networkslice;

prefix ns3gpp;

import \_3gpp-ns-nrm-networkslicesubnet { prefix nss3gpp; }

import \_3gpp-common-subnetwork { prefix subnet3gpp; }

import \_3gpp-common-yang-types { prefix types3gpp; }

import \_3gpp-common-top { prefix top3gpp; }

include \_3gpp-ns-nrm-serviceprofile;

organization "3GPP SA5";

contact

"https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "A network slice instance in a 5G network.";

reference "3GPP TS 28.541

Management and orchestration;

5G Network Resource Model (NRM);

Information model definitions for network slice NRM (chapter 6)

";

revision 2020-06-02 {

reference "CR-0485, CR-0508";

}

revision 2020-02-19 {

description "Introduction of YANG definitions for network slice NRM";

reference "CR-0458";

}

grouping NetworkSliceGrp {

uses subnet3gpp:SubNetworkGrp; // Inherits from SubNetwork

leaf operationalState {

description "The operational state of the network slice instance.

It describes whether or not the resource is physically installed

and working.";

config false;

type types3gpp:OperationalState;

}

leaf administrativeState {

description "The administrative state of the network slice instance.

It describes the permission to use or prohibition against

using the instance, imposed through the OAM services.";

type types3gpp:AdministrativeState;

}

list serviceProfileList {

description "A list of service profiles supported by the network

slice instance.";

key serviceProfileId;

uses ServiceProfileGrp;

}

leaf networkSliceSubnetRef {

type leafref {

path /nss3gpp:NetworkSliceSubnet/nss3gpp:id;

}

description "The NetworkSliceSubnet that the NetworkSlice is

associated with.";

}

}

list NetworkSlice {

description "Represents the properties of a network slice instance in

a 5G network.";

key id;

container attributes {

uses NetworkSliceGrp;

}

uses top3gpp:Top\_Grp;

}

}

<CODE ENDS>

## N.2.2 module \_3gpp-ns-nrm-networkslicesubnet.yang

<CODE BEGINS>

module \_3gpp-ns-nrm-networkslicesubnet {

yang-version 1.1;

namespace urn:3gpp:sa5:\_3gpp-ns-nrm-networkslicesubnet;

prefix nss3gpp;

import \_3gpp-common-yang-types { prefix types3gpp; }

import \_3gpp-common-subnetwork { prefix subnet3gpp; }

import \_3gpp-common-measurements { prefix meas3gpp; }

import \_3gpp-common-top { prefix top3gpp; }

// import \_3gpp-ns-nrm-common { prefix ns3cmn; }

include \_3gpp-ns-nrm-sliceprofile;

organization "3GPP SA5";

contact

"https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "This IOC represents the properties of a network slice subnet

instance in a 5G network.";

reference "3GPP TS 28.541

Management and orchestration;

5G Network Resource Model (NRM);

Information model definitions for network slice NRM (chapter 6)

";

revision 2021-05-05 {

description "replace perfReq with 3 new datatypes xxxSliceSubnetProfile";

reference "CR-0485";

}

revision 2020-02-19 {

description "Introduction of YANG definitions for network slice NRM";

reference "CR-0458";

}

revision 2019-06-07 {

description "initial revision";

reference "Based on

3GPP TS 28.541 V15.X.XX";

}

feature MeasurementsUnderNetworkSliceSubnet {

description "The MeasurementSubtree shall be contained under

NetworkSliceSubnet.";

}

typedef ETSI-GS-NFV-Identifier {

type string;

reference "ETSI GS NFV-IFA 013";

}

grouping EPTransportGrp {

leaf ipAddress {

description "This parameter specifies the IP address assigned to a

logical transport interface/endpoint. It can be an IPv4 address

(See RFC 791) or an IPv6 address (See RFC 2373).";

mandatory true;

type string;

}

leaf logicInterfaceId {

description "This parameter specifies the identify of a logical

transport interface. It could be VLAN ID (See IEEE 802.1Q),

MPLS Tag or Segment ID.";

mandatory true;

type string;

}

leaf-list nextHopInfo {

description "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 string;

}

leaf-list qosProfile {

description "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 string;

}

leaf-list epApplicationRef {

description "This parameter specifies a list of application level

EPs associated with the logical transport interface.";

min-elements 1;

type types3gpp:DistinguishedName;

}

uses top3gpp:Top\_Grp;

}

grouping NsInfoGrp {

description "The NsInfo of the NS instance corresponding to the network

slice subnet instance.";

//suport condition: It shall be supported if the NSS instance is

//realized in the virtualized environment.

// Otherwise this attribute shall be absent.

reference "ETSI GS NFV-IFA 013 clause 8.3.3.2.2, which can be found at

https://www.etsi.org/deliver/etsi\_gs/NFV-IFA/001\_099/013

/03.04.01\_60/gs\_NFV-IFA013v030401p.pdf page 123-124";

leaf nSInstanceId {

description "Uniquely identifies the NS instance.";

config false;

type ETSI-GS-NFV-Identifier;

}

leaf nsName {

description "Human readable name of the NS instance.";

type string;

config false;

}

leaf description {

description "Human readable description of the NS instance.";

config false;

type string;

}

}

grouping NetworkSliceSubnetGrp {

uses subnet3gpp:SubNetworkGrp;

uses EPTransportGrp;

leaf operationalState {

description "The operational state of the network slice instance.

It describes whether or not the resource is physically installed

and working.";

mandatory true;

config false;

type types3gpp:OperationalState;

}

leaf administrativeState {

description "The administrative state of the network slice instance.

It describes the permission to use or prohibition against

using the instance, imposed through the OAM services.";

mandatory true;

type types3gpp:AdministrativeState;

}

list nsInfo {

description "This list represents the properties of network service

information corresponding to the network slice subnet instance.";

reference "ETSI GS NFV-IFA 013 clause 8.3.3.2.2";

config false;

key nSInstanceId;

max-elements 1;

uses NsInfoGrp;

}

list sliceProfileList {

description "List of SliceProfiles supported by the network slice

subnet instance. All members of the list, instances of SliceProfile,

shall contain the same datatype representing slice profile requirements:

TopSliceSubnetProfile, RANSliceSubnetProfile or CNSliceSubnetProfile.

Members of the list may contain TopSliceSubnetProfile datatype

only when this attribute (sliceProfileList) belongs to

a NetworkSliceSubnet that is directly referenced by a NetworkSlice";

key sliceProfileId;

uses SliceProfileGrp;

}

list managedFunctionRef {

description "The managed functions that the NetworkSliceSubnet is

associated with.";

key aggregatedManagedFunction;

leaf aggregatedManagedFunction {

type instance-identifier;

}

}

leaf-list networkSliceSubnetRef {

type leafref {

path /NetworkSliceSubnet/id;

}

description "Lists the NetworkSliceSubnet instances associated with

this NetworkSliceSubnet.";

}

}

list NetworkSliceSubnet {

description "Represents the properties of a network slice subnet

instance in a 5G network.";

key id;

container attributes {

uses NetworkSliceSubnetGrp;

leaf-list parents {

description "Reference to direct parent NetworkSliceSubnet

instances.

If NetworkSliceSubnets form a containment hierarchy this is

modeled using references between the child NetworkSliceSubnet

and the parent NetworkSliceSubnet.

This reference MUST NOT be present for the top level

NetworkSliceSubnet and MUST be present for other

NetworkSliceSubnets.";

type leafref {

path "/NetworkSliceSubnet/id";

}

}

leaf-list containedChildren {

description "Reference to all directly contained NetworkSliceSubnet

instances. If NetworkSliceSubnets form a containment hierarchy

this is modeled using references between the child

NetworkSliceSubnet and the parent NetworkSliceSubnet.";

type leafref {

path "/NetworkSliceSubnet/id";

}

}

}

uses top3gpp:Top\_Grp;

uses meas3gpp:MeasurementSubtree {

if-feature MeasurementsUnderNetworkSliceSubnet;

}

}

}

<CODE ENDS>

## N.2.3 Void

## N.2.4 module \_3gpp-ns-nrm-serviceprofile.yang

<CODE BEGINS>

submodule \_3gpp-ns-nrm-serviceprofile {

yang-version 1.1;

belongs-to \_3gpp-ns-nrm-networkslice { prefix ns3gpp; }

import \_3gpp-common-yang-types { prefix types3gpp; }

import \_3gpp-5g-common-yang-types { prefix types5g3gpp; }

import \_3gpp-ns-nrm-common { prefix ns3cmn; }

organization "3GPP SA5";

contact

"https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "A network slice instance in a 5G network.";

reference "3GPP TS 28.541

Management and orchestration;

5G Network Resource Model (NRM);

Information model definitions for network slice NRM (chapter 6)

";

revision 2020-06-02 {

reference "CR-0485, CR-0508";

}

revision 2020-02-19 {

description "Introduction of YANG definitions for network slice NRM";

reference "CR-0458";

}

revision 2019-06-23 {

description "Initial revision";

reference "3GPP TS 28.541 V15.X.XX";

}

typedef availability-percentage {

description "

Percentage value of the amount of time the end-to-end communication

service is delivered according to an agreed QoS, divided by the amount

of time the system is expected to deliver the end-to-end service

according to the specification in a specific area.";

reference "3GPP TS 22.261 3.1";

type decimal64 {

fraction-digits 4; // E.g. 99.9999

range 0..100;

}

}

typedef V2XMode-enum {

type enumeration {

enum NOT\_SUPPORTED;

enum SUPPORTED\_BY\_NR;

}

}

grouping ServiceProfileGrp {

leaf serviceProfileId {

description "Service profile identifier.";

type types3gpp:DistinguishedName;

}

list sNSSAIList {

description "The S-NSSAI list to be supported by the new NSI to be

created or the existing NSI to be re-used.";

min-elements 1;

key idx;

unique "sst sd";

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses types5g3gpp:SNssai;

}

list pLMNIdList {

description "List of PLMN IDs.";

min-elements 1;

key "mcc mnc";

ordered-by user;

uses types3gpp:PLMNId;

}

leaf maxNumberofUEs {

description "The maximum number of UEs that may simultaneously

access the network slice instance.";

mandatory true;

type uint64;

}

leaf-list coverageArea {

min-elements 1;

description "A list of TrackingAreas where the NSI can be selected.";

type types3gpp:Tac;

}

leaf latency {

description "The packet transmission latency (milliseconds) through

the RAN, CN, and TN part of 5G network, used to evaluate utilization

performance of the end-to-end network slice instance.";

reference "3GPP TS 28.554 clause 6.3.1";

mandatory true;

type uint16;

units milliseconds;

}

leaf uEMobilityLevel {

description "The mobility level of UE accessing the network slice

instance.";

reference "3GPP TS 22.261 clause 6.2.1";

type types3gpp:UeMobilityLevel;

}

leaf resourceSharingLevel {

description "Specifies whether the resources to be allocated to the

network slice instance may be shared with another network slice

instance(s).";

type types3gpp:ResourceSharingLevel;

}

//Stage2 issue: The sNSSAIList above specifies one or potentially

// several sST objects for the service profile.

// How do they relate?

leaf sST {

description "Specifies the slice/service type. See 3GPP TS 23.501

for defined values.";

mandatory true;

type uint32;

reference "3GPP TS 23.501 5.15.2.2";

}

leaf availability {

description "The availability requirement for a network slice

instance, expressed as a percentage.";

type availability-percentage;

}

list delayTolerance {

description "An attribute specifies the properties of service delivery

flexibility, especially for the vertical services that are not

chasing a high system performance.";

reference "TS 22.104 clause 4.3";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn:ServAttrComGrp;

}

leaf support {

description "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.";

type ns3cmn:Support-enum;

}

}

list deterministicComm {

//Stage2 issue: deterministicComm is not defined in 28.541 chapter 6,

// but I guess deterministicComm is meant

description "This list represents the properties of the deterministic

communication for periodic user traffic. Periodic traffic refers to the

type of traffic with periodic transmissions.";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn:ServAttrComGrp;

}

leaf availability {

//Stage2 issue: Defined differently in 28.541 chapter 6, but XML

// uses DeterministicCommAvailability

config false;

type ns3cmn:DeterminCommAvailability;

}

leaf periodicityList {

//Stage2 issue: Not defined in 28.541 chapter 6. XML and YAML

// says "string".

type string;

}

}

list dLThptPerSlice {

description "This attribute defines achievable data rate of the

network slice in downlink that is available ubiquitously across

the coverage area of the slice";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn:XLThptGrp;

}

list dLThptPerUE {

description "This attribute defines data rate supported by the network

slice per UE";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn:XLThptGrp;

}

list uLThptPerSlice {

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

description "This attribute defines achievable data rate of the

network slice in uplink that is available ubiquitously across

the coverage area of the slice";

uses ns3cmn:XLThptGrp;

}

list uLThptPerUE {

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

description "This attribute defines data rate supported by the

network slice per UE";

uses ns3cmn:XLThptGrp;

}

list maxPktSize {

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

description "This parameter specifies the maximum packet size

supported by the network slice";

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn:ServAttrComGrp;

}

leaf maxSize {

//Stage2 issue: Not defined in 28.541, guessing integer bytes

type uint32;

units bytes;

}

}

list maxNumberofPDUSessions {

description "Represents the maximum number of

concurrent PDU sessions supported by the network slice";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn:ServAttrComGrp;

}

leaf nOofPDUSessions {

//Stage2 issue: Not defined in 28.541, guessing integer

type uint32;

}

}

list kPIMonitoring {

description "Represents performance monitoring";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn:ServAttrComGrp;

}

leaf kPIList {

//Stage2 issue: Data format not specified, low interoperability

description "An attribute specifies the name list of KQIs and KPIs

available for performance monitoring";

type string;

}

}

list userMgmtOpen {

description "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.";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn:ServAttrComGrp;

}

leaf support {

type ns3cmn:Support-enum;

}

}

list v2XCommModels {

description "An attribute specifies whether or not the V2X

communication mode is supported by the network slice.";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn:ServAttrComGrp;

}

leaf v2XMode {

type V2XMode-enum;

}

}

list termDensity {

description "An attribute specifies the overall user density over

the coverage area of the network slice";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn:ServAttrComGrp;

}

leaf density {

type uint32;

units users/km2;

}

}

leaf activityFactor {

//Stage2 issue: This is modeled as writable/config true in 28.542,

// but that does not appear to match the description

description "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";

reference "TS 22.261 Table 7.1-1";

type decimal64 {

fraction-digits 1;

}

}

leaf uESpeed {

//Stage2 issue: This is modeled as writable/config true in 28.542,

// but that does not appear to match the description

description "An attribute specifies the maximum speed (in km/hour)

supported by the network slice at which a defined QoS can be

achieved";

type uint32;

units km/h;

}

leaf jitter {

//Stage2 issue: This is modeled as writable/config true in 28.542,

// but that does not appear to match the description

description "An attribute specifies the deviation from the desired

value to the actual value when assessing time parameters";

reference "TS 22.104 clause C.4.1";

type uint32;

units microseconds;

}

leaf survivalTime {

description "An attribute specifies the time that an application

consuming a communication service may continue without an

anticipated message.";

reference "TS 22.104 clause 5";

type string;

}

leaf reliability {

description "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.";

reference "TS 22.261, TS 22.104";

type string;

}

leaf maxDLDataVolume {

//Stage2 issue: Not defined in 28.541. XML and YAML says "string"

type string;

}

leaf maxULDataVolume {

//Stage2 issue: Not defined in 28.541. XML and YAML says "string"

type string;

}

list nBIoT {

description "An attribute specifies whether NB-IoT is supported in

the RAN in the network slice";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn:ServAttrComGrp;

}

leaf support {

description "An attribute specifies whether NB-IoT is supported

in the RAN in the network slice";

type ns3cmn:Support-enum;

}

list provisioningRuleList {

description "A list of network slice or network slice subnet

provisioning rules.";

key idx;

leaf idx {

type uint32;

}

}

}

}

}

<CODE ENDS>

## N.2.5 module \_3gpp-ns-nrm-sliceprofile.yang

<CODE BEGINS>

submodule \_3gpp-ns-nrm-sliceprofile {

yang-version 1.1;

belongs-to \_3gpp-ns-nrm-networkslicesubnet { prefix nss3gpp; }

import \_3gpp-common-yang-types { prefix types3gpp; }

import \_3gpp-5g-common-yang-types { prefix types5g3gpp; }

// import \_3gpp-ns-nrm-networkslice { prefix ns3gpp; }

import \_3gpp-ns-nrm-common { prefix ns3cmn3gpp; }

organization "3GPP SA5";

contact

"https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Represents the properties of network slice subnet related

requirement that should be supported by the network slice subnet

instance in a 5G network.";

reference "3GPP TS 28.541

Management and orchestration;

5G Network Resource Model (NRM);

Information model definitions for network slice NRM (chapter 6)

";

revision 2021-07-16 { reference CR-0566 ; }

revision 2021-05-05 {

description "replace perfReq with 3 new datatypes xxxSliceSubnetProfile";

reference "CR-0485";

}

revision 2020-02-19 {

description "Introduction of YANG definitions for network slice NRM";

reference "CR-0458";

}

revision 2019-05-27 {

description "initial revision.";

reference "Based on

3GPP TS 28.541 V15.X.XX";

}

typedef SliceSimultaneousUse-enum {

type enumeration {

enum ZERO;

enum ONE;

enum TWO;

enum THREE;

enum FOUR;

}

}

typedef ServiceType-enum {

type enumeration {

enum eMBB;

enum URLLC;

enum MIoT;

enum V2X;

}

}

grouping PositioningGrp {

description "Represents positioning support.";

reference "Clause 3.4.20 of GSMA NG.116 ";

uses ns3cmn3gpp:ServAttrComGrp ;

leaf-list availability {

type enumeration {

enum CIDE\_CID ;

enum OTDOA;

enum RF\_FINGERPRINTING;

enum AECID;

enum HYBRID\_POSITIONING;

enum NET\_RTK;

}

min-elements 1;

config false;

description "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. Values allowed: are

CIDE-CID (LTE and NR), OTDOA (LTE and NR), RF fingerprinting, AECID,

Hybrid positioning, NET-RTK.";

}

leaf predictionfrequency {

type enumeration {

enum PERSEC;

enum PERMIN;

enum PERHOUR;

}

mandatory true;

description "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.

If leaf-list availability is empty, the value has no meaning.";

reference "NG.116";

}

leaf accuracy {

type decimal64 {

fraction-digits 2;

}

units meter;

mandatory true;

description "Specifies the accuracy of the location information.

Accuracy depends on the respective positioning solution applied in the

RAN domain of the network slice.";

reference "NG.116";

}

}

grouping TopSliceSubnetProfileGrp {

leaf-list coverageArea {

min-elements 1;

description "A list of TrackingAreas where the NSI can be selected.";

type types3gpp:Tac;

}

leaf latency {

description "The packet transmission latency (milliseconds) through

the RAN, CN, and TN part of 5G network, used to evaluate

utilization performance of the end-to-end network slice instance.";

reference "3GPP TS 28.554 clause 6.3.1";

//optional support

mandatory true;

type uint16;

units milliseconds;

}

leaf maxNumberofUEs {

description "Specifies the maximum number of UEs may simultaneously

access the network slice instance.";

//optional support

mandatory true;

type uint64;

}

list dLThptPerSliceSubnet {

description "This attribute defines achievable data rate of the

network slice subnet in downlink that is available ubiquitously

across the coverage area of the slice";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:XLThptGrp;

}

list dLThptPerUE {

description "This attribute defines data rate supported by the

network slice per UE, refer NG.116.";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:XLThptGrp;

}

list uLThptPerSliceSubnet {

description "This attribute defines achievable data rate of the

network slice subnet in uplink that is available ubiquitously

across the coverage area of the slice";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:XLThptGrp;

}

list uLThptPerUE {

description "This attribute defines data rate supported by the

network slice per UE, refer NG.116";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:XLThptGrp;

}

list maxPktSize {

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

description "This parameter specifies the maximum packet size

supported by the network slice";

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf maxSize {

//Stage2 issue: Not defined in 28.541, guessing integer bytes

type uint32;

units bytes;

}

}

list maxNumberofPDUSessions {

description "Represents the maximum number of

concurrent PDU sessions supported by the network slice";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf nOofPDUSessions {

//Stage2 issue: Not defined in 28.541, guessing integer

type uint32;

}

}

leaf sliceSimultaneousUse {

description "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.";

type SliceSimultaneousUse-enum;

}

list delayTolerance {

description "An attribute specifies the properties of service delivery

flexibility, especially for the vertical services that are not

chasing a high system performance.";

reference "TS 22.104 clause 4.3";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf support {

description "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.";

type ns3cmn3gpp:Support-enum;

}

}

list termDensity {

description "An attribute specifies the overall user density over

the coverage area of the network slice";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf density {

type uint32;

units users/km2;

}

}

leaf activityFactor {

//Stage2 issue: This is modeled as writable/config true in 28.542,

// but that does not appear to match the description

description "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";

reference "TS 22.261 Table 7.1-1";

type decimal64 {

fraction-digits 1;

}

}

leaf-list coverageAreaTAList {

description "A list of TrackingAreas where the NSI can be selected.";

//optional support

min-elements 1;

type types3gpp:Tac;

}

leaf uEMobilityLevel {

description "The mobility level of UE accessing the network slice

instance.";

//optional support

type types3gpp:UeMobilityLevel;

}

leaf resourceSharingLevel {

description "Specifies whether the resources to be allocated to the

network slice subnet instance may be shared with another network

slice subnet instance(s).";

//optional support

type types3gpp:ResourceSharingLevel;

}

leaf uESpeed {

//Stage2 issue: This is modeled as writable/config true in 28.542,

// but that does not appear to match the description

description "An attribute specifies the maximum speed (in km/hour)

supported by the network slice at which a defined QoS can be

achieved";

type uint32;

units km/h;

}

leaf reliability {

description "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.";

reference "TS 22.261, TS 22.104";

type string;

}

leaf serviceType {

description "An attribute specifies the standardized network slice type.

allowedValues: eMBB, URLLC, MIoT, V2X.";

type ServiceType-enum;

}

list deterministicComm {

//Stage2 issue: deterministicComm is not defined in 28.541 chapter 6,

// but I guess determinComm is meant

description "This list represents the properties of the deterministic

communication for periodic user traffic. Periodic traffic refers to the

type of traffic with periodic transmissions.";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf availability {

//Stage2 issue: Defined differently in 28.541 chapter 6, but XML

// uses DeterminCommAvailability

config false;

type ns3cmn3gpp:DeterminCommAvailability;

}

leaf periodicityList {

//Stage2 issue: Not defined in 28.541 chapter 6. XML and YAML

// says "string".

type string;

}

}

leaf survivalTime {

description "An attribute specifies the time that an application

consuming a communication service may continue without an

anticipated message.";

reference "TS 22.104 clause 5";

type string;

}

list positioning {

key predictionfrequency;

min-elements 1;

max-elements 1;

description "Specifies whether the network slice provides

geo-localization methods or supporting methods";

reference "Clause 3.4.20 of NG.116";

uses PositioningGrp;

}

}

grouping CNSliceSubnetProfileGrp {

leaf-list coverageArea {

min-elements 1;

description "A list of TrackingAreas where the NSI can be selected.";

type types3gpp:Tac;

}

leaf latency {

description "The packet transmission latency (milliseconds) through

the RAN, CN, and TN part of 5G network, used to evaluate

utilization performance of the end-to-end network slice instance.";

reference "3GPP TS 28.554 clause 6.3.1";

//optional support

mandatory true;

type uint16;

units milliseconds;

}

leaf maxNumberofUEs {

description "Specifies the maximum number of UEs may simultaneously

access the network slice instance.";

//optional support

mandatory true;

type uint64;

}

list dLThptPerSliceSubnet {

description "This attribute defines achievable data rate of the

network slice subnet in downlink that is available ubiquitously

across the coverage area of the slice";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:XLThptGrp;

}

list dLThptPerUE {

description "This attribute defines data rate supported by the

network slice per UE, refer NG.116.";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:XLThptGrp;

}

list uLThptPerSliceSubnet {

description "This attribute defines achievable data rate of the

network slice subnet in uplink that is available ubiquitously

across the coverage area of the slice";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:XLThptGrp;

}

list uLThptPerUE {

description "This attribute defines data rate supported by the

network slice per UE, refer NG.116";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:XLThptGrp;

}

list maxPktSize {

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

description "This parameter specifies the maximum packet size

supported by the network slice";

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf maxSize {

//Stage2 issue: Not defined in 28.541, guessing integer bytes

type uint32;

units bytes;

}

}

list maxNumberofPDUSessions {

description "Represents the maximum number of

concurrent PDU sessions supported by the network slice";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf nOofPDUSessions {

//Stage2 issue: Not defined in 28.541, guessing integer

type uint32;

}

}

leaf sliceSimultaneousUse {

description "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.";

type SliceSimultaneousUse-enum;

}

list delayTolerance {

description "An attribute specifies the properties of service delivery

flexibility, especially for the vertical services that are not

chasing a high system performance.";

reference "TS 22.104 clause 4.3";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf support {

description "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.";

type ns3cmn3gpp:Support-enum;

}

}

leaf-list coverageAreaTAList {

description "A list of TrackingAreas where the NSI can be selected.";

//optional support

min-elements 1;

type types3gpp:Tac;

}

leaf resourceSharingLevel {

description "Specifies whether the resources to be allocated to the

network slice subnet instance may be shared with another network

slice subnet instance(s).";

//optional support

type types3gpp:ResourceSharingLevel;

}

list deterministicComm {

//Stage2 issue: deterministicComm is not defined in 28.541 chapter 6,

// but I guess determinComm is meant

description "This list represents the properties of the deterministic

communication for periodic user traffic. Periodic traffic refers to the

type of traffic with periodic transmissions.";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf availability {

//Stage2 issue: Defined differently in 28.541 chapter 6, but XML

// uses DeterminCommAvailability

config false;

type ns3cmn3gpp:DeterminCommAvailability;

}

leaf periodicityList {

//Stage2 issue: Not defined in 28.541 chapter 6. XML and YAML

// says "string".

type string;

}

}

}

grouping PositioningRANSubnetGrp {

description "Represents positioning support in RAN domain";

leaf-list availability {

type enumeration {

enum CIDE\_CID ;

enum OTDOA;

enum RF\_FINGERPRINTING;

enum AECID;

enum HYBRID\_POSITIONING;

enum NET\_RTK;

}

config false;

description "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. Values allowed: are

CIDE-CID (LTE and NR), OTDOA (LTE and NR), RF fingerprinting, AECID,

Hybrid positioning, NET-RTK.";

}

leaf predictionfrequency {

type enumeration {

enum PERSEC;

enum PERMIN;

enum PERHOUR;

}

mandatory true;

description "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.

If leaf-list availability is empty, the value has no meaning.";

reference "NG.116";

}

leaf accuracy {

type decimal64 {

fraction-digits 2;

}

units meter;

mandatory true;

description "Specifies the accuracy of the location information.

Accuracy depends on the respective positioning solution applied in the

RAN domain of the network slice.";

reference "NG.116";

}

}

grouping RANSliceSubnetProfileGrp {

description "Represents the RANSliceSubnetProfile datatype";

leaf latency {

description "The packet transmission latency (milliseconds) through

the RAN, CN, and TN part of 5G network, used to evaluate

utilization performance of the end-to-end network slice instance.";

reference "3GPP TS 28.554 clause 6.3.1";

//optional support

mandatory true;

type uint16;

units milliseconds;

}

leaf maxNumberofUEs {

description "Specifies the maximum number of UEs may simultaneously

access the network slice instance.";

//optional support

mandatory true;

type uint64;

}

list dLThptPerSliceSubnet {

description "This attribute defines achievable data rate of the

network slice subnet in downlink that is available ubiquitously

across the coverage area of the slice";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:XLThptGrp;

}

list dLThptPerUE {

description "This attribute defines data rate supported by the

network slice per UE, refer NG.116.";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:XLThptGrp;

}

list uLThptPerSliceSubnet {

description "This attribute defines achievable data rate of the

network slice subnet in uplink that is available ubiquitously

across the coverage area of the slice";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:XLThptGrp;

}

list uLThptPerUE {

description "This attribute defines data rate supported by the

network slice per UE, refer NG.116";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:XLThptGrp;

}

list maxPktSize {

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

description "This parameter specifies the maximum packet size

supported by the network slice";

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf maxSize {

//Stage2 issue: Not defined in 28.541, guessing integer bytes

type uint32;

units bytes;

}

}

list delayTolerance {

description "An attribute specifies the properties of service delivery

flexibility, especially for the vertical services that are not

chasing a high system performance.";

reference "TS 22.104 clause 4.3";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf support {

description "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.";

type ns3cmn3gpp:Support-enum;

}

}

leaf sliceSimultaneousUse {

description "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.";

type SliceSimultaneousUse-enum;

}

list termDensity {

description "An attribute specifies the overall user density over

the coverage area of the network slice";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf density {

type uint32;

units users/km2;

}

}

leaf activityFactor {

//Stage2 issue: This is modeled as writable/config true in 28.542,

// but that does not appear to match the description

description "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";

reference "TS 22.261 Table 7.1-1";

type decimal64 {

fraction-digits 1;

}

}

leaf-list coverageAreaTAList {

description "A list of TrackingAreas where the NSI can be selected.";

//optional support

min-elements 1;

type types3gpp:Tac;

}

leaf uEMobilityLevel {

description "The mobility level of UE accessing the network slice

instance.";

//optional support

type types3gpp:UeMobilityLevel;

}

leaf resourceSharingLevel {

description "Specifies whether the resources to be allocated to the

network slice subnet instance may be shared with another network

slice subnet instance(s).";

//optional support

type types3gpp:ResourceSharingLevel;

}

leaf uESpeed {

//Stage2 issue: This is modeled as writable/config true in 28.542,

// but that does not appear to match the description

description "An attribute specifies the maximum speed (in km/hour)

supported by the network slice at which a defined QoS can be

achieved";

type uint32;

units km/h;

}

leaf reliability {

description "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.";

reference "TS 22.261, TS 22.104";

type string;

}

leaf serviceType {

description "An attribute specifies the standardized network slice type.

allowedValues: eMBB, URLLC, MIoT, V2X.";

type ServiceType-enum;

}

list deterministicComm {

//Stage2 issue: deterministicComm is not defined in 28.541 chapter 6,

// but I guess determinComm is meant

description "This list represents the properties of the deterministic

communication for periodic user traffic. Periodic traffic refers to the

type of traffic with periodic transmissions.";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ns3cmn3gpp:ServAttrComGrp;

}

leaf availability {

//Stage2 issue: Defined differently in 28.541 chapter 6, but XML

// uses DeterminCommAvailability

config false;

type ns3cmn3gpp:DeterminCommAvailability;

}

leaf periodicityList {

//Stage2 issue: Not defined in 28.541 chapter 6. XML and YAML

// says "string".

type string;

}

}

leaf survivalTime {

description "An attribute specifies the time that an application

consuming a communication service may continue without an

anticipated message.";

reference "TS 22.104 clause 5";

type string;

}

list positioning {

min-elements 1;

max-elements 1;

description "Specifies whether the RAN domain of the network slice

provides geo-localization methods or supporting methods.";

reference "Clause 3.4.20 of NG.116 [50].";

uses PositioningRANSubnetGrp;

}

}

grouping SliceProfileGrp {

leaf sliceProfileId {

description "A unique identifier of the property of network slice

subnet related requirement should be supported by the network

slice subnet instance.";

type types3gpp:DistinguishedName;

}

list sNSSAIList {

description "List of S-NSSAIs the managed object is capable of

supporting. (Single Network Slice Selection Assistance Information)

An S-NSSAI has an SST (Slice/Service type) and an optional SD

(Slice Differentiator) field.";

key idx;

unique "sst sd";

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses types5g3gpp:SNssai;

}

list pLMNIdList {

description "List of at most six entries of PLMN Identifiers, but at

least one (the primary PLMN Id). The PLMN Identifier is composed

of a Mobile Country Code (MCC) and a Mobile Network Code (MNC).";

min-elements 1;

max-elements 6;

key "mcc mnc";

ordered-by user;

uses types3gpp:PLMNId;

}

leaf maxNumberofUEs {

description "Specifies the maximum number of UEs may simultaneously

access the network slice instance.";

//optional support

mandatory true;

type uint64;

}

leaf-list coverageAreaTAList {

description "A list of TrackingAreas where the NSI can be selected.";

//optional support

min-elements 1;

type types3gpp:Tac;

}

leaf latency {

description "The packet transmission latency (milliseconds) through

the RAN, CN, and TN part of 5G network, used to evaluate

utilization performance of the end-to-end network slice instance.";

reference "3GPP TS 28.554 clause 6.3.1";

//optional support

mandatory true;

type uint16;

units milliseconds;

}

leaf uEMobilityLevel {

description "The mobility level of UE accessing the network slice

instance.";

//optional support

type types3gpp:UeMobilityLevel;

}

leaf resourceSharingLevel {

description "Specifies whether the resources to be allocated to the

network slice subnet instance may be shared with another network

slice subnet instance(s).";

//optional support

type types3gpp:ResourceSharingLevel;

}

list CNSliceSubnetProfile {

description " This represents the requirements for the top slice associated with the

network slice. ";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses TopSliceSubnetProfileGrp;

}

list RANSliceSubnetProfile {

description " This represents the requirements for the top slice associated with the

network slice. ";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses TopSliceSubnetProfileGrp;

}

list TopSliceSubnetProfile {

description " This represents the requirements for the top slice associated with the

network slice. ";

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses TopSliceSubnetProfileGrp;

}

list provisioningRuleList {

description "A list of network slice or network slice subnet

provisioning rules.";

key idx;

leaf idx {

type uint32;

}

}

}

}

<CODE ENDS>

## N.2.6 module \_3gpp-ns-nrm-common.yang

<CODE BEGINS>

module \_3gpp-ns-nrm-common {

yang-version 1.1;

namespace urn:3gpp:sa5:\_3gpp-ns-nrm-common;

prefix ns3cmn3gpp;

// import \_3gpp-common-subnetwork { prefix subnet3gpp; }

// import \_3gpp-common-yang-types { prefix types3gpp; }

// import \_3gpp-common-top { prefix top3gpp; }

organization "3GPP SA5";

contact

"https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Common network slice definitions";

reference "3GPP TS 28.541

Management and orchestration;

5G Network Resource Model (NRM);

Information model definitions for network slice NRM (chapter 6)

";

revision 2021-07-16 { reference CR-0566 ; }

revision 2021-05-17 {

description "Introduction of Common Data types";

reference "CR-0485";

}

grouping XLThptGrp {

list servAttrCom {

description "This list represents the common properties of service

requirement related attributes.";

reference "GSMA NG.116 corresponding to Attribute categories,

tagging and exposure";

config false;

key idx;

max-elements 1;

leaf idx {

description "Synthetic index for the element.";

type uint32;

}

uses ServAttrComGrp;

}

leaf guaThpt {

description "This attribute describes the guaranteed data rate.";

type uint64;

units kbits/s;

}

leaf maxThpt {

description "This attribute describes the maximum data rate.";

type uint64;

units kbits/s;

}

}

typedef Tagging-enum {

type enumeration {

enum performance;

enum function;

enum operation;

}

}

typedef Exposure-enum {

type enumeration {

enum API;

enum KPI;

}

}

typedef Category-enum {

type enumeration {

enum character;

enum scalability;

}

}

typedef Support-enum {

type enumeration {

enum NOT\_SUPPORTED;

enum SUPPORTED;

}

}

grouping ServAttrComGrp {

leaf category {

description "This attribute specifies the category of a service

requirement/attribute of GST";

type Category-enum;

config false;

}

leaf-list tagging {

description "This attribute specifies the tagging of a service

requirement/attribute of GST in character category";

when "../category = 'character'";

type Tagging-enum;

config false;

}

leaf exposure {

description "This attribute specifies exposure mode of a service

requirement/attribute of GST";

type Exposure-enum;

config false;

}

}

typedef DeterminCommAvailability {

type Support-enum;

}

grouping ProvisioningRuleGrp {

description " represents the information that is captured in a

provisioning rule from a network slice or network slice subnet

provisioning MnS consumer. Provisioing rules are associated with

a particular ServiceProfile or SliceProfile and are part of the

complete set of requirements to be fulfilled by network slice or

network slice subnet MnS producer.";

leaf ruleType {

description "This attribute specifies the type of provisioning rule.";

mandatory true;

type enumeration {

enum INSTANCE\_SHARING\_RULE;

}

leaf sharingPolicy {

description "This attribtue specifies the sahring policy for an instance

sharing rule. In case of selectively shared sharingGroup also needs to be

provided";

mandatory true;

type enumeration;

enum SHARED;

enum NOT\_SHARED;

enum SELECTIVILY\_SHARED;

}

leaf sharingGroup {

description "This attribute indicates the group associated with a rule in

case of selectivility sharing. The group name is chosen by the MnS consumer

and is treated as an opaque value by the MnS producer.";

type string;

}

}

}

<CODE ENDS>

|  |
| --- |
| **End of Changes** |