**3GPP TSG-SA5 Meeting #145-eS5-225560**

**e-meeting, 15 - 24 August 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **28.541** | **CR** | **0782** | **rev** | **-** | **Current version:** | **16.13.0** |  |
|  |
| *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:***  | Clarify and update state management for network slicing |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | S5 |
|  |  |
| ***Work item code:*** | NETSLICE |  | ***Date:*** | 2022-08-04 |
|  |  |  |  |  |
| ***Category:*** | **A** |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | The use of operationalState and adminstrativeState attributes as part of the network slicing solution is not clear following reasons:* It is not clear how state management could be implemented for network slicing
* The definitions of operationalState and adminstrativeState are not applicable to NSI and NSSI as they represent groupings of shared functions
* The use case and requirements for state management of network slice and network slice subnet are missing.
* There is no support in the network slicing procedures for the states. For example, if I have allocated a network slice why should the administrative state be Locked and operational state be disabled? This would mean additional actions are needed before the network slice can actually be used.
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| ***Summary of change:*** | * 6.3.1.2, 6.3.2.2, 6.4.1 Remove adminstrativeState and operationalState attributes from NetworkSlicing definitions
* Annex B remove content and make Void
* Annex I.4.3 sliceNrm XML
* Annex J.4.3 sliceNrm OpenAPI
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| ***Consequences if not approved:*** | Incompatible implementation of network slice and network slice subnet MnS.  |
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| ***Clauses affected:*** |  |
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|  | **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 · TS28.541\_Rel-16\_CR\_0782\_Clarify\_and\_update\_state\_management\_for\_network\_slicing\_yaml · SA5 – Management & Orchestration and Charging / Management and Orchestration APIs · GitLab (3gpp.org)](https://forge.3gpp.org/rep/sa5/MnS/-/tree/TS28.541_Rel-16_CR_0782_Clarify_and_update_state_management_for_network_slicing_yaml)a168e14a |
|  |  |
| ***This CR's revision history:*** |  |

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| **First change** |

## 6.3 Class definitions

### 6.3.1 NetworkSlice

#### 6.3.1.1 Definition

This IOC represents the properties of a network slice in a 5G network. For more information about the network slice, see 3GPP TS 28.530 [69].

#### 6.3.1.2 Attributes

The NetworkSlice IOC includes attributes inherited from Top IOC (defined in 3GPP TS 28.622 [30]) and the following attributes:

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| Attribute name | S | isReadable | isWritable | isInvariant | isNotifyable |
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|  |  |  |  |  |  |
| serviceProfileList | M | T | T | F | T |
| **Attribute related to role** |  |  |  |  |  |
| networkSliceSubnetRef | M | T | F | F | T |

#### 6.3.1.3 Attribute constraints

None.

#### 6.3.1.4 Notifications

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

### 6.3.2 NetworkSliceSubnet

#### 6.3.2.1 Definition

This IOC represents the properties of a network slice subnet instance in a 5G network. For more information about the network slice subnet instance, see 3GPP TS 28.530 [69].

#### 6.3.2.2 Attributes

The NetworkSliceSubnet IOC includes attributes inherited from Top IOC (defined in 3GPP TS 28.622 [30]) and the following attributes:

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| Attribute name | S | isReadable | isWritable | isInvariant | isNotifyable |
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|  |  |  |  |  |  |
| nsInfo | CM | T | F | F | T |
| sliceProfileList | M | T | T | F | T |
| priorityLabel | O | T | T | F | T |
| **Attribute related to role** |  |  |  |  |  |
| managedFunctionRef | M | T | F | F | T |
| networkSliceSubnetRef | M | T | F | F | T |
| epTransportRef | O | T | T | F | T |

#### 6.3.2.3 Attribute constraints

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| Name | Definition |
| nsInfo S | Condition: It shall be supported if the NSS instance is realized in the virtualized environment. Otherwise this attribute shall be absent. |

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| **Second 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 3GPP TS 22.261 [28]. | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: True |
| serviceProfileId | A unique identifier of property of network slice related requirement should be supported by the network slice. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
| sliceProfileId | A unique identifier of the property of network slice subnet related requirement should be supported by the network slice subnet. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
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| nsInfo | This attribute contains the NsInfo of the NS instance corresponding to the network slice subnet instance. The NsInfo is described in clause 8.3.3.2.2 of ETSI GS NFV-IFA 013 [29]. | type: NsInfomultiplicity: 1isOrdered: N/AisUnique: TruedefaultValue: No default valueisNullable: True |
| nSInstanceId | This attribute specifies the identifier of NS instance corresponding to the network slice subnet instance.See clause 8.3.3.2.2 of ETSI GS NFV-IFA 013 [29]. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: TruedefaultValue: No default valueisNullable: True |
| nsName | This attribute specifies the name of NS instance corresponding to the network slice subnet instance.See clause 8.3.3.2.2 of ETSI GS NFV-IFA 013 [29]. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: TruedefaultValue: No default valueisNullable: True |
| description | This attribute specifies the description of NS instance corresponding to the network slice subnet instance.See clause 8.3.3.2.2 of ETSI GS NFV-IFA 013 [29]. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: TruedefaultValue: No default valueisNullable: True |
| category | This attribute specifies the category of a service requirement/attribute of GST (see GSMA NG.116 [50]).allowedValues: character, scalability | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/A isNullable: False |
| tagging | This attribute specifies the tagging of a service requirement/attribute of GST in character category (see GSMA NG.116 [50]).allowedValues: performance, function, operation | type: ENUMmultiplicity: 1…3isOrdered: FalseisUnique: TruedefaultValue: NoneallowedValues: N/A isNullable: False |
| exposure | This attribute specifies exposure mode of a service requirement/attribute of GST (see GSMA NG.116 [50]).allowedValues: API, KPI | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/A isNullable: False |
| perfReq | This parameter specifies the requirements to the network slice subnet in terms of the scenarios defined in the 3GPP TS 22.261 [28] and 3GPP TS 22.104 [51], i.e. the "performance requirements for high data rate and traffic density scenarios" in 3GPP TS 22.261 [28], "periodic deterministic communication, aperiodic deterministic communication, non-deterministic communication, and mixed traffic" in 3GPP TS 22.104 [51].It is a structure containing the following elements:- list of perfReqDepending on the sST value, the list of perfReq will be- list of eMBBPerfReqor- list of uRLLCPerfReqor- list of mIoTPerfReqNOTE 1: the list of mIoTPerfReq is not addressed in the present document.allowedValues:- list of eMBBPerfReq is a list of entries where an entry identifies the performance requirements to the network slice subnet in terms of the scenarios defined in the Table 7.1-1 of 3GPP TS 22.261 [28]. An entry has the following attributes: expDataRateDL (Integer), expDataRateUL (Integer), areaTrafficCapDL (Integer), areaTrafficCapUL (Integer), overallUserDensity (Integer), activityFactor (Integer), (see table 7.1-1 of 3GPP TS 22.261 [28]).- list of uRLLCPerfReq is a list of entries where an entry identifies the performance requirements to the network slice subnet in terms of the scenarios defined in clauses 5.2 through 5.5 of 3GPP TS 22.104 [51]. An entry has the following attributes: cSAvailabilityTarget (Float), cSReliabilityMeanTime (String), , expDataRate (Integer), msgSizeByte (String), transferIntervalTarget (String), survivalTime (String), (see table 5.2-1, table 5.3-1, table 5.4-1 and table 5.5-1 of 3GPP TS 22.104 [51]).NOTE 2: Limitation on attribute values in SliceProfile is not addressed in the present document.NOTE 3: The attributes inside perfReq here need further breaking down to define requirements for each subnetwork under different SST values. | type: PerfReqmultiplicity: \*1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| maxNumberofUEs | An attribute specifies the maximum number of UEs may simultaneously access the network slice. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| coverageAreaTAList | An attribute specifies a list of Tracking Areas for the network slice .allowedValues:Legacy TAC and Extended TAC are defined in clause 9.3.3.10 of 3GPP TS 38.413 [5]. | type: Integermultiplicity: 1..\*isOrdered: FalseisUnique: TruedefaultValue: NoneallowedValues: N/AisNullable: False |
| latency | An attribute specifies the packet transmission latency (millisecond) through the RAN, CN, and TN part of 5G network and is used to evaluate utilization performance of the end-to-end network slice. See clause 6.3.1 of 3GPP TS 28.554 [27]. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| uEMobilityLevel | An attribute specifies the mobility level of UE accessing the network slice. See 6.2.1 of 3GPP TS 22.261 [28].allowedValues: stationary, nomadic, restricted mobility, fully mobility. | type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: True |
| serviceProfile. networkSliceSharingIndicator | The attribute specifies whether a service, defined by the ServiceProfile, can share a NetworkSlice instance with other services or not. If "non-shared" the service needs a dedicated NetworkSlice instance. If "shared" the service may share a NetworkSlice instance with other service(s).allowedValues: shared, non-shared. | type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
| serviceProfile.pLMNInfoList | It defines which PLMN and S-NSSAI combinations that are assigned for the service to satisfy service requirements represented by the ServiceProfile in case of network slicing feature is supported.allowedValues: Not applicable. | type: PLMNInfomultiplicity: 1..\*isOrdered: FalseisUnique: TruedefaultValue: NoneisNullable: False |
| sliceProfile.pLMNInfoList | It defines which PLMN and S-NSSAI combinations that are served by the SliceProfile in case of network slicing feature is supported.allowedValues: Not applicable. | type: PLMNInfomultiplicity: 1..\*isOrdered: FalseisUnique: TruedefaultValue: NoneisNullable: False |
| sliceProfile.resourceSharingLevel | An attribute specifies whether the resources to be allocated to the network slice subnet may be shared with another network slice subnet(s).allowedValues: shared, non-shared. | type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: YesisNullable: True |
| serviceProfileList | An attribute specifies a list of ServiceProfile (see clause 6.3.3) supported by the network slice  | type: ServiceProfilemultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: NoneallowedValues: N/AisNullable: False |
| sliceProfileList | An attribute specifies a list of SliceProfile (see clause 6.3.4) supported by the network slice subnet  | type: SliceProfilemultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: NoneallowedValues: N/AisNullable: False |
| sST | This parameter specifies the slice/service type in a ServiceProfile to be supported by a network slice.See clause 5.15.2 of 3GPP TS 23.501 [2]. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| delayTolerance | An attribute specifies the properties of service delivery flexibility, especially for the vertical services that are not chasing a high system performance. See clause 4.3 of 3GPP TS 22.104 [51]. | type: DelayTolerancemultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| DelayTolerance.support | An attribute specifies whether or not the network slice supports service delivery flexibility, especially for the vertical services that are not chasing a high system performance.allowedValues:"NOT SUPPORTED", "SUPPORTED". | type: <<enumeration>>multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| deterministicComm | An attribute specifies the properties of the deterministic communication for periodic user traffic, see clause 4.3 of 3GPP TS 22.104 [51]. | type: DeterministicCommmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| DeterministicComm.availability | An attribute specifies whether or not the network slice supports deterministic communication for period user traffic.allowedValues:"NOT SUPPORTED", "SUPPORTED". | type: <<enumeration>>multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| DeterministicComm.periodicityList | An attribute specifies a list of periodicities supported by the network slice for deterministic communication. | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| dLThptPerSlice | This attribute defines achievable data rate of the network slice in downlink that is available ubiquitously across the coverage area of the slice, refer NG.116 [50]. | type: DLThptmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| dLThptPerUE | This attribute defines data rate supported by the network slice per UE, refer NG.116 [50].  | type: DLThptmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| guaThpt | This attribute describes the guaranteed data rate. | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| maxThpt | This attribute describes the maximum data rate. | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| uLThptPerSlice | This attribute defines achievable data rate of the network slice in uplink that is available ubiquitously across the coverage area of the slice, refer NG.116 [50].  | type: ULThptmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| uLThptPerUE | This attribute defines data rate supported by the network slice per UE, refer NG.116 [50].  | type: ULThptmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| maxPktSize | This parameter specifies the maximum packet size supported by the network slice, refer NG.116 [50].  | type: MaxPktSizemultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| MaxPktSize.maxsize | This parameter specifies the maximum packet size supported by the network slice, refer NG.116 [50].  | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| maxNumberofConns | This parameter defines the maximum number of concurrent sessions supported by the network slice, refer NG.116 [50].  | type: MaxNumberofConnsmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| MaxNumberofConns.nOofConn | This parameter defines the maximum number of concurrent sessions supported by the network slice, refer NG.116 [50].  | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneallowedValues: N/AisNullable: False |
| kPIMonitoring | An attribute specifies the name list of KQIs and KPIs available for performance monitoring. | type: KPIMonitoringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| KPIMonitoring. kPIList | An attribute specifies the name list of KQIs and KPIs available for performance monitoring. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| userMgmtOpen | An attribute specifies whether or not the network slice supports the capability for the NSC to manage their users or groups of users' network services and corresponding requirements. | type: UserMgmtOpenmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| UserMgmtOpen.support | An attribute specifies whether or not the network slice supports the capability for the NSC to manage their users or groups of users' network services and corresponding requirements.allowedValues:"NOT SUPPORTED", "SUPPORTED". | type: <<enumeration>>multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| v2XCommModels | An attribute specifies whether or not the V2X communication mode is supported by the network slice. | type: V2XCommModemultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| V2XCommMode.v2XMode | An attribute specifies whether or not the V2X communication mode is supported by the network slice.allowedValues:"NOT SUPPORTED", "SUPPORTED BY NR". | type: <<enumeration>>multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: False |
| coverageArea | An attribute specifies the coverage area of the network slice, i.e. the geographic region where a 3GPP communication service is accessible, see Table 7.1-1 of 3GPP TS 22.261 [28]) and NG.116 [50]. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| termDensity | An attribute specifies the overall user density over the coverage area of the network slice. See Table 7.1-1 of 3GPP TS 22.261 [28]). | type: TermDensitymultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| TermDensity.density | An attribute specifies the overall user density over the coverage area of the network slice. See Table 7.1-1 of 3GPP TS 22.261 [28]). | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| 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 3GPP TS 22.261 [28]). | type: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| uESpeed | An attribute specifies the maximum speed (in km/hour) supported by the network slice at which a defined QoS can be achieved. See Table 7.1-1 of 3GPP TS 22.261 [28]). | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| jitter | An attribute specifies the deviation from the desired value to the actual value when assessing time parameters. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| survivalTime | An attribute specifies the time that an application consuming a communication service may continue without an anticipated message. See clause 5 of 3GPP TS 22.104 [51]). | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| reliability | An attribute specifies in the context of network layer packet transmissions, percentage value of the amount of sent network layer packets successfully delivered to a given system entity within the time constraint required by the targeted service, divided by the total number of sent network layer packets, see 3GPP TS 22.261 [28] and 3GPP TS 22.104 [51]. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: FalseisNullable: True |
| NetworkSlice.networkSliceSubnetRef | This holds a DN of NetworkSliceSubnet relating to the NetworkSlice instance. | type: DNmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| NetworkSliceSubnet.networkSliceSubnetRef | This holds a list of DN of constituent NetworkSliceSubnet supporting NetworkSliceSubnet instance  | type: DNmultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: NoneisNullable: False |
| managedFunctionRef | This holds a list of DN of ManagedFunction instances supporting the NetworkSliceSubnet instance. | type: DNmultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: NoneallowedValues: N/AisNullable: False |
| ipAddress | This parameter specifies the IP address assigned to a logical transport interface/endpoint. It can be an IPv4 address (See RFC 791 [37]) or an IPv6 address (See RFC 2373 [38]).See note 1 | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| logicInterfaceId | This parameter specifies the identify of a logical transport interface. It could be VLAN ID (See IEEE 802.1Q [39]), MPLS Tag or Segment ID. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| nextHopInfoList | This parameter is used to identify ingress transport node. Each node can be identified by any of combination of IP address of next-hop router of transport network, system name, port name, IP management address of transport nodes. | type: Stringmultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: NoneisNullable: True |
| qosProfileRefList | This parameter specifies reference to QoS Profile for a logical transport interface. A QoS profile includes a set of parameters which are locally provisioned on both sides of a logical transport interface. | type: Stringmultiplicity: \*isOrdered: N/AisUnique: TruedefaultValue: NoneisNullable: True |
| epApplicationRef | This parameter specifies a list of application level EPs associated with the logical transport interface.See note 2. | type: DNmultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: NoneisNullable: False |
| epTransportRef | This parameter specifies a list of transport level EPs associated with the application level EP (i.e. EP\_N3 or EP\_NgU) or network slice subnet. | type: DNmultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: NoneisNullable: True |
| priorityLabel | An attribute specifies a label that consumer would assign a value on an instance of network slice subnet. The management system takes the value of this attribute into account. The effect of this attribute value to the subject managed entity is not standardizedallowedValues: N/A | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: 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: Application level EP represents EP\_RP defined in 3GPP TS 28.622 [30]. E.g. including EP\_NgC, EP\_N3, etc. |

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| **Third change** |

Annex B (normative):
Void

# B.1 Void

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# B.2 Void

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| **Fourth change** |

## I.4.3 XML schema "sliceNrm.xsd"

<?xml version="1.0" encoding="UTF-8"?>

<!--

 3GPP TS 28.541 network slice Network Resource Model

 XML schema definition

 sliceNrm.xsd

-->

<schema xmlns="http://www.w3.org/2001/XMLSchema"

xmlns:xn="http://www.3gpp.org/ftp/specs/archive/28\_series/28.623#genericNrm"

xmlns:sl="http://www.3gpp.org/ftp/specs/archive/28\_series/28.541#sliceNrm"

xmlns:nn="http://www.3gpp.org/ftp/specs/archive/28\_series/28.541#nrNrm"

xmlns:ngc="http://www.3gpp.org/ftp/specs/archive/28\_series/28.541#ngcNrm"

xmlns:en="http://www.3gpp.org/ftp/specs/archive/28\_series/28.659#eutranNrm"

xmlns:sm="http://www.3gpp.org/ftp/specs/archive/28\_series/28.626#stateManagementIRP"

targetNamespace="http://www.3gpp.org/ftp/specs/archive/28\_series/28.541#sliceNrm" elementFormDefault="qualified">

 <import namespace="http://www.3gpp.org/ftp/specs/archive/28\_series/28.623#genericNrm"/>

 <import namespace="http://www.3gpp.org/ftp/specs/archive/28\_series/28.541#nrNrm"/>

 <import namespace="http://www.3gpp.org/ftp/specs/archive/28\_series/28.541#ngcNrm"/>

 <import namespace="http://www.3gpp.org/ftp/specs/archive/28\_series/28.659#eutranNrm"/>

 <import namespace="http://www.3gpp.org/ftp/specs/archive/28\_series/28.626#stateManagementIRP"/>

 <simpleType name="MobilityLevel">

 <restriction base="string">

 <enumeration value="STATIONARY"/>

 <enumeration value="NOMADIC"/>

 <enumeration value="RESTRICTED MOBILITY"/>

 <enumeration value="FULLY MOBILITY"/>

 </restriction>

 </simpleType>

 <simpleType name="SharingLevel">

 <restriction base="string">

 <enumeration value="SHARED"/>

 <enumeration value="NON-SHARED"/>

 </restriction>

 </simpleType>

 <simpleType name="Category">

 <restriction base="string">

 <enumeration value="character"/>

 <enumeration value="scalability"/>

 </restriction>

 </simpleType>

 <simpleType name="Tagging">

 <restriction base="string">

 <enumeration value="performance"/>

 <enumeration value="function"/>

 <enumeration value="operation"/>

 </restriction>

 </simpleType>

 <simpleType name="Exposure">

 <restriction base="string">

 <enumeration value="API"/>

 <enumeration value="KPI"/>

 </restriction>

 </simpleType>

 <complexType name="ServAttrCom">

 <sequence>

 <element name="category" type="sl:Category"/>

 <element name="tagging" type="sl:Tagging" minOccurs="0" maxOccurs="3"/>

 <element name="exposure" type="sl:Exposure" minOccurs="0"/>

</sequence>

</complexType >

 <simpleType name="DelayToleranceSupport">

 <restriction base="string">

 <enumeration value="NOT SUPPORTED"/>

 <enumeration value="SUPPORTED"/>

 </restriction>

 </simpleType>

 <simpleType name="DeterministicCommAvailability">

 <restriction base="string">

 <enumeration value="NOT SUPPORTED"/>

 <enumeration value="SUPPORTED"/>

 </restriction>

 </simpleType>

 <simpleType name="UserMgmtOpenSupport">

 <restriction base="string">

 <enumeration value="NOT SUPPORTED"/>

 <enumeration value="SUPPORTED"/>

 </restriction>

 </simpleType>

 <simpleType name="V2XCommModelsV2XMode">

 <restriction base="string">

 <enumeration value="NOT SUPPORTED"/>

 <enumeration value="SUPPORTED BY NR"/>

 </restriction>

 </simpleType>

 <complexType name="DelayTolerance">

 <sequence>

 <element name="servAttrCom" type="sl:ServAttrCom"/>

 <element name="support" type="sl:DelayToleranceSupport"/>

 </sequence>

 </complexType>

 <complexType name="DeterministicComm">

 <sequence>

 <element name="servAttrCom" type="sl:ServAttrCom"/>

 <element name="availability" type="sl:DeterministicCommAvailability"/>

 <element name="periodicityList" type="string"/>

 </sequence>

 </complexType>

 <complexType name="DLThpt">

 <sequence>

 <element name="servAttrCom" type="sl:ServAttrCom"/>

 <element name="guaThpt" type="float"/>

 <element name="maxThpt" type="float"/>

 </sequence>

 </complexType>

 <complexType name="ULThpt">

 <sequence>

 <element name="servAttrCom" type="sl:ServAttrCom"/>

 <element name="guaThpt" type="float" minOccurs="0"/>

 <element name="maxThpt" type="float" minOccurs="0"/>

 </sequence>

 </complexType>

 <complexType name="MaxPktSize">

 <sequence>

 <element name="servAttrCom" type="sl:ServAttrCom"/>

 <element name="maxsize" type="integer"/>

 </sequence>

 </complexType>

 <complexType name="KPIMonitoring">

 <sequence>

 <element name="servAttrCom" type="sl:ServAttrCom"/>

 <element name="kPIList" type="string"/>

 </sequence>

 </complexType>

 <complexType name="UserMgmtOpen">

 <sequence>

 <element name="servAttrCom" type="sl:ServAttrCom"/>

 <element name="support" type="sl:UserMgmtOpenSupport"/>

 </sequence>

 </complexType>

 <complexType name="V2XCommMode">

 <sequence>

 <element name="servAttrCom" type="sl:ServAttrCom"/>

 <element name="v2XMode" type="sl:V2XCommModelsV2XMode"/>

 </sequence>

 </complexType>

 <complexType name="TermDensity">

 <sequence>

 <choice minOccurs="1" maxOccurs="1">

 <element name="servAttrCom" type="sl:ServAttrCom"/>

 <element name="density" type="integer"/>

 </choice>

 </sequence>

 </complexType>

 <complexType name="ServiceProfile">

 <sequence>

 <element name="serviceProfileId" type="string"/>

 <element name="sNSSAIList" type="ngc:SnssaiList"/>

 <element name="pLMNIdList" type="en:PLMNIdList"/>

 <element name="maxNumberofUEs" type="long" minOccurs="0"/>

 <element name="latency" type="integer" minOccurs="0"/>

 <element name="uEMobilityLevel" type="integer" minOccurs="0"/>

 <element name="resourceSharingLevel" type="integer" minOccurs="0"/>

 <element name="sst" type="ngc:Sst"/>

 <element name="availability" type="float" minOccurs="0"/>

 <element name="delayTolerance" type="sl:DelayTolerance" minOccurs="0"/>

 <element name="deterministicComm" type="sl:DeterministicComm" minOccurs="0"/>

 <element name="dLThptPerSlice" type="sl:DLThpt" minOccurs="0"/>

 <element name="dLThptPerUE" type="sl:DLThpt" minOccurs="0"/>

 <element name="uLThptPerSlice" type="sl:ULThpt" minOccurs="0"/>

 <element name="uLThptPerUE" type="sl:ULThpt" minOccurs="0"/>

 <element name="maxPktSize" type="sl:MaxPktSize" minOccurs="0"/>

 <element name="maxNumberofConns" type="sl:MaxNumberofConns" minOccurs="0"/>

 <element name="kPIMonitoring" type="sl:KPIMonitoring" minOccurs="0"/>

 <element name="userMgmtOpen" type="sl:UserMgmtOpen" minOccurs="0"/>

 <element name="v2XCommModels" type="sl:V2XCommMode" minOccurs="0"/>

 <element name="coverageArea" type="string" minOccurs="0"/>

 <element name="termDensity" type="sl:TermDensity" minOccurs="0"/>

 <element name="activityFactor" type="float" minOccurs="0"/>

 <element name="uESpeed" type="integer" minOccurs="0"/>

 <element name="jitter" type="integer" minOccurs="0"/>

 <element name="survivalTime" type="string" minOccurs="0"/>

 <element name="reliability" type="string" minOccurs="0"/>

 </sequence>

 </complexType>

 <complexType name="ServiceProfileList">

 <sequence>

 <element name="serviceProfile" type="sl:ServiceProfile"/>

 </sequence>

 </complexType>

 <complexType name="SliceProfile">

 <sequence>

 <element name="sliceProfileId" type="string"/>

 <element name="sNSSAIList" type=" ngc:SnssaiList"/>

 <element name="pLMNIdList" type="en:PLMNIdList"/>

 <element name="perfReq" type="sl:PerfReq"/>

 <element name="maxNumberofUEs" type="long" minOccurs="0"/>

 <element name="coverageAreaTAList" type="ngc:NrTACList" minOccurs="0"/>

 <element name="latency" type="integer" minOccurs="0"/>

 <element name="uEMobilityLevel" type="sl:MobilityLevel" minOccurs="0"/>

 <element name="resourceSharingLevel" type="integer" minOccurs="0"/>

 </sequence>

 </complexType>

 <complexType name="SliceProfileList">

 <sequence>

 <element name="sliceProfile" type="sl:SliceProfile"/>

 </sequence>

 </complexType>

 <complexType name="NsInfo">

 <!-- Refer to definitions in subclause 8.3.3.2.2 of ETSI NFV IFA013 -->

 <sequence>

 <element name="nsInstanceId" type="string"/>

 <element name="nsName" type="string"/>

 <element name="description" type="string"/>

 </sequence>

 </complexType>

 <element name="NetworkSlice" substitutionGroup="xn:SubNetworkOptionallyContainedNrmClass">

 <complexType>

 <complexContent>

 <extension base="xn:NrmClass">

 <sequence>

 <element name="attributes">

 <complexType>

 <all>

 <!-- Inherited attributes from SubNetwork -->

 <element name="dnPrefix" type="string" minOccurs="0"/>

 <element name="userLabel" type="string"/>

 <element name="userDefinedNetworkType" type="string"/>

 <element name="setOfMcc" type="string" minOccurs="0"/>

 <element name="measurements" type="xn:MeasurementTypesAndGPsList" minOccurs="0"/>

 <!-- End of inherited attributes from SubNetwork -->

 <element name="serviceProfileList" type="sl:ServiceProfileList"/> <element *name*="networkSliceSubnetRef" *type*="xn:dn"/>

 </all>

 </complexType>

 </element>

 <choice minOccurs="0" maxOccurs="unbounded">

 <element ref="xn:MeasurementControl"/>

 </choice>

 </sequence>

 </extension>

 </complexContent>

 </complexType>

 </element>

 <element name="NetworkSliceSubnet" substitutionGroup="xn:SubNetworkOptionallyContainedNrmClass">

 <complexType>

 <complexContent>

 <extension base="xn:NrmClass">

 <sequence>

 <element name="attributes">

 <complexType>

 <all>

 <!-- Inherited attributes from SubNetwork -->

 <element name="dnPrefix" type="string" minOccurs="0"/>

 <element name="userLabel" type="string"/>

 <element name="userDefinedNetworkType" type="string"/>

 <element name="setOfMcc" type="string" minOccurs="0"/>

 <element name="measurements" type="xn:MeasurementTypesAndGPsList" minOccurs="0"/>

 <!-- End of inherited attributes from SubNetwork -->

 <element name="nsInfo" type="sl:NsInfo" minOccurs="0"/>

 <element name="sliceProfileList" type="sl:SliceProfileList"/>

 <element *name*="managedFunctionRef" *type*="xn:dnlist"/>

 <element *name*="networkSliceSubnetRef" *type*="xn:dnlist"/>

 </all>

 </complexType>

 </element>

 <choice minOccurs="0" maxOccurs="unbounded">

 <element ref="xn:MeasurementControl"/>

 </choice>

 </sequence>

 </extension>

 </complexContent>

 </complexType>

 </element>

</schema>

|  |
| --- |
| **Fifth change** |

## J.4.3 OpenAPI document "TS28541\_SliceNrm.yaml"

openapi: 3.0.1

info:

 title: Slice NRM

 version: 16.11.0

 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

 SharingLevel:

 type: string

 enum:

 - SHARED

 - NON-SHARED

 NetworkSliceSharingIndicator:

 type: string

 enum:

 - SHARED

 - NON-SHARED

 PerfReqEmbb:

 type: object

 properties:

 expDataRateDL:

 type: number

 expDataRateUL:

 type: number

 areaTrafficCapDL:

 type: number

 areaTrafficCapUL:

 type: number

 userDensity:

 type: number

 activityFactor:

 type: number

 PerfReqEmbbList:

 type: array

 items:

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

 PerfReqUrllc:

 type: object

 properties:

 cSAvailabilityTarget:

 type: number

 cSReliabilityMeanTime:

 type: string

 expDataRate:

 type: number

 msgSizeByte:

 type: string

 transferIntervalTarget:

 type: string

 survivalTime:

 type: string

 PerfReqUrllcList:

 type: array

 items:

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

 PerfReq:

 oneOf:

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

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

 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

 DLThptPerSlice:

 type: object

 properties:

 servAttrCom:

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

 guaThpt:

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

 maxThpt:

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

 DLThptPerUE:

 type: object

 properties:

 servAttrCom:

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

 guaThpt:

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

 maxThpt:

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

 ULThptPerSlice:

 type: object

 properties:

 servAttrCom:

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

 guaThpt:

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

 maxThpt:

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

 ULThptPerUE:

 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

 MaxNumberofConns:

 type: object

 properties:

 servAttrCom:

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

 nOofConn:

 type: integer

 KPIMonitoring:

 type: object

 properties:

 servAttrCom:

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

 kPIList:

 type: string

 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

 ServiceProfile:

 type: object

 properties:

 serviceProfileId:

 type: string

 plmnInfoList:

 $ref: 'TS28541\_NrNrm.yaml#/components/schemas/PlmnInfoList'

 maxNumberofUEs:

 type: number

 latency:

 type: number

 uEMobilityLevel:

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

 sst:

 $ref: 'TS28541\_NrNrm.yaml#/components/schemas/Sst'

 networkSliceSharingIndicator:

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

 availability:

 type: number

 delayTolerance:

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

 deterministicComm:

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

 dLThptPerSlice:

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

 dLThptPerUE:

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

 uLThptPerSlice:

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

 uLThptPerUE:

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

 maxPktSize:

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

 maxNumberofConns:

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

 kPIMonitoring:

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

 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

 SliceProfile:

 type: object

 properties:

 sliceProfileId:

 type: string

 plmnInfoList:

 $ref: 'TS28541\_NrNrm.yaml#/components/schemas/PlmnInfoList'

 perfReq:

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

 maxNumberofUEs:

 type: number

 coverageAreaTAList:

 $ref: 'TS28541\_5GcNrm.yaml#/components/schemas/TACList'

 latency:

 type: number

 uEMobilityLevel:

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

 resourceSharingLevel:

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

 IpAddress:

 oneOf:

 - $ref: 'TS28623\_ComDefs.yaml#/components/schemas/Ipv4Addr'

 - $ref: 'TS28623\_ComDefs.yaml#/components/schemas/Ipv6Addr'

 ServiceProfileList:

 type: array

 items:

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

 SliceProfileList:

 type: array

 items:

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

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

 MnS:

 oneOf:

 - type: object

 properties:

 SubNetwork:

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

# - type: object

# properties:

# ManagedElement:

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

 SubNetwork-Single:

 allOf:

 - $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

 - type: object

 properties:

 attributes:

 allOf:

 - $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/SubNetwork-Attr'

 - $ref: 'TS28623\_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: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

 - type: object

 properties:

 attributes:

 allOf:

 - type: object

 properties:

 networkSliceSubnetRef:

 $ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

 serviceProfileList:

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

 NetworkSliceSubnet-Single:

 allOf:

 - $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

 - type: object

 properties:

 attributes:

 allOf:

 - type: object

 properties:

 managedFunctionRefList:

 $ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

 networkSliceSubnetRefList:

 $ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

 nsInfo:

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

 sliceProfileList:

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

 epTransportRefList:

 $ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

 priorityLabel:

 type: integer

 EP\_Transport-Single:

 allOf:

 - $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

 - type: object

 properties:

 attributes:

 type: object

 properties:

 ipAddress:

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

 logicInterfaceId:

 type: string

 nextHopInfo:

 type: string

 qosProfile:

 type: string

 epApplicationRefs:

 $ref: 'TS28623\_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/MnS'

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

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

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

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

|  |
| --- |
| **End of changes** |