**3GPP TSG-SA5 Meeting #135-e *S5-211349***

**Online, , 25th Jan 2021 - 3rd Feb 2021**

|  |
| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **28.541** | **CR** | **0452** | **rev** | **-** | **Current version:** | **16.7.0** |  |
|  |
| *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 |  |

|  |
| --- |
|  |
| ***Title:***  | YANG NRM for Network Slicing |
|  |  |
| ***Source to WG:*** | Cisco Systems Belgium |
| ***Source to TSG:*** | S5 |
|  |  |
| ***Work item code:*** | eNRM |  | ***Date:*** | 2021-01-27 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***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 Network Slice NRM stage2 is mapped to stage3 for the JSON and XML solution sets, but this part of the corresponding YANG is missing. In order to give the SA5 supported solution sets equal functionality, the missing part of the YANG mapping needs to be filled in.Several consumers of the SA5 standards have indicated interest in using the missing YANG solution set. One such consumer is the O-RAN organization, which sent LS S5-211030 to SA5 inqiuiring about the missing YANG modules. |
|  |  |
| ***Summary of change:*** | Fill in missing part of stage3 YANG solution set, for the Network Slice NRM. |
|  |  |
| ***Consequences if not approved:*** | Without a YANG solution set for Network Slice management, SA5 consumers will not be able to operate their 5G networks using their model based YANG tooling, unless they resort to proprietary YANG modules rather than SA5 standardized/controlled ones.There would be a mismatch between stage 2 and 3, and the SA5 management solution sets would not have equal functionality. |
|  |  |
| ***Clauses affected:*** | *Annex E.X (new)* |
|  |  |
|  | **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:*** | Stage 3 YANG for Network Slice NRM.Checked all modules locally with pyang --3gpp, comes out cleanChecked in to Forge, branch “S1-211349” |
|  |  |
| ***This CR's revision history:*** |  |

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

# E.X Modules

## E.X.1 module \_3gpp-ns-nrm-networkslice.yang

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 2020-01-16 {

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

 reference "CR-0452";

 }

 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;

 }

}

## E.X.2 module \_3gpp-ns-nrm-networkslicesubnet.yang

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; }

 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 2020-01-16 {

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

 reference "CR-0452";

 }

 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";

 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;

 }

 }

}

## E.X.3 module \_3gpp-ns-nrm-perfreq.yang

module \_3gpp-ns-nrm-perfreq {

 yang-version 1.1;

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

 prefix perf3gpp;

 organization "3GPP SA5";

 contact

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

 description "The performance requirements for the NSI in terms of the

 scenarios defined in the 3GPP TS 22.261, such as experienced data rate,

 area traffic capacity (density) information of UE density.";

 reference "3GPP TS 28.541

 Management and orchestration;

 5G Network Resource Model (NRM);

 Information model definitions for network slice NRM (chapter 6)

 ";

 revision 2020-01-16 {

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

 reference "CR-0452";

 }

 typedef data-rate {

 type uint32;

 units kbits/s;

 }

 typedef integer-percentage {

 type uint8 {

 range 0..100;

 }

 units percent;

 }

 typedef reliability-string {

 description "Mean time between failures.

 E.g. '1 day', or '3 months'";

 type string {

 pattern "[0-9]+ (day|week|month|year)s?";

 }

 reference "3GPP TS 22.104 clause 5.2-5.5";

 }

 typedef message-size-string {

 description "Message size in bytes.

 E.g. '80', or '250-2000'";

 type string {

 pattern '[0-9]+(-[0-9]+)?';

 }

 units bytes;

 reference "3GPP TS 22.104 clause 5.2-5.5";

 }

 typedef transfer-interval-string {

 description "Transfer interval time. If multiple values are given,

 the first value is the application requirement, the other values are

 the requirement with multiple transmission of the same information

 two or three times, respectively).

 E.g. '40ms', or '0ms-5ms,0ms-2.5ms,0ms-1.7ms'";

 type string {

 pattern '[0-9]+(\.[0-9]+)?m?s-[0-9]+(\.[0-9]+)?m?s' +

 '(,[0-9]+(\.[0-9]+)?m?s-[0-9]+(\.[0-9]+)?){0,2}';

 }

 reference "3GPP TS 22.104 clause 5.2-5.5";

 }

 typedef survival-time-string {

 description "Survival time in milliseconds (ms) or in multiples of

 the transfer interval (x). If multiple values are given,

 the first value is the application requirement, the other values are

 the requirement with multiple transmission of the same information

 two or three times, respectively).

 E.g. '12ms', or '0x,2x'";

 type string {

 pattern '[0-9]+(x|ms)(,[0-9]+(x|ms)){0,2}';

 }

 reference "3GPP TS 22.104 clause 5.2-5.5";

 }

 grouping PerfReqGrp {

 //Stage2 issue: The perfReq object does not have any proper definition

 // in 28.541 chapter 6.

 //Stage2 issue: The text that exists on the perfReq mentions an sST

 // element. There is no sST element in SliceProfile which

 // references perfReq, nor in perfReq itself. There is

 // one in ServiceProfile, but the connection from a slice

 // profile to a ServiceProfile is not unique, and it's not

 // clear how the reference to sST should be constructed.

 // eMBB leafs, SST = 1

 leaf expDataRateDL {

 description "User experienced data rate over downlink";

 //TODO: add when 'somepath/sST = 1';

 type data-rate;

 reference "3GPP TS 22.261 clause 7.1, table 7.1-1";

 }

 leaf expDataRateUL {

 description "User experienced data rate over uplink";

 //TODO: add when 'somepath/sST = 1';

 type data-rate;

 reference "3GPP TS 22.261 clause 7.1, table 7.1-1";

 }

 leaf areaTrafficCapDL {

 description "Area traffic capacity over downlink";

 //TODO: add when 'somepath/sST = 1';

 type data-rate;

 units kbits/s/km2;

 reference "3GPP TS 22.261 clause 7.1, table 7.1-1";

 }

 leaf areaTrafficCapUL {

 description "Area traffic capacity over uplink";

 //TODO: add when 'somepath/sST = 1';

 type data-rate;

 units kbits/s/km2;

 reference "3GPP TS 22.261 clause 7.1, table 7.1-1";

 }

 leaf overallUserDensity {

 //Stage2 issue: This is called userDensity in YAML. Which is correct?

 description "Overall user density";

 //TODO: add when 'somepath/sST = 1';

 type uint32;

 units users/km2;

 reference "3GPP TS 22.261 clause 7.1, table 7.1-1";

 }

 leaf activityFactor {

 description "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.";

 //TODO: add when 'somepath/sST = 1';

 type integer-percentage;

 reference "3GPP TS 22.261 clause 7.1, table 7.1-1";

 }

 // uRLLC leafs, SST = 2

 leaf cSAvailabilityTarget {

 description "Reliability uptime target";

 //TODO: add when 'somepath/sST = 2';

 type decimal64 {

 fraction-digits 6; // E.g. 99.999999

 range 0..100;

 }

 reference "3GPP TS 22.104 clause 5.2-5.5";

 }

 leaf cSReliabilityMeanTime {

 description "Mean time between failures";

 //TODO: add when 'somepath/sST = 2';

 type reliability-string;

 }

 leaf expDataRate {

 description "User experienced data rate";

 //TODO: add when 'somepath/sST = 2';

 type data-rate;

 reference "3GPP TS 22.104 clause 5.2-5.5";

 }

 leaf msgSizeByte {

 description "PDU size";

 //TODO: add when 'somepath/sST = 2';

 type message-size-string;

 }

 leaf transferIntervalTarget {

 description "Time difference between two consecutive transfers

 of application data from an application via the service interface

 to 3GPP system";

 //TODO: add when 'somepath/sST = 2';

 type transfer-interval-string;

 }

 leaf survivalTime {

 //Stage2 issue: This is missing in YAML. What is correct?

 description "The time that an application consuming a communication

 service may continue without an anticipated message";

 //TODO: add when 'somepath/sST = 2';

 type survival-time-string;

 }

 }

}

## E.X.4 module \_3gpp-ns-nrm-serviceprofile.yang

submodule \_3gpp-ns-nrm-serviceprofile {

 yang-version 1.1;

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

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

 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 2020-01-16 {

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

 reference "CR-0452";

 }

 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 Category-enum {

 type enumeration {

 enum character;

 enum scalability;

 }

 }

 typedef Tagging-enum {

 type enumeration {

 enum performance;

 enum function;

 enum operation;

 }

 }

 typedef Exposure-enum {

 type enumeration {

 enum API;

 enum KPI;

 }

 }

 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;

 }

 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;

 }

 leaf exposure {

 description "This attribute specifies exposure mode of a service

 requirement/attribute of GST";

 type Exposure-enum;

 }

 }

 typedef DeterminCommAvailability {

 type Support-enum;

 }

 grouping DLThptGrp {

 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 V2XMode-enum {

 type enumeration {

 enum NOT\_SUPPORTED;

 enum SUPPORTED\_BY\_NR;

 }

 }

 grouping ServiceProfileGrp {

 leaf serviceProfileId {

 description "Service profile identifier.";

 type types3gpp:DistinguishedName;

 }

 leaf-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;

 type types3gpp: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;

 }

 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 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 Support-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 ServAttrComGrp;

 }

 leaf availability {

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

 // uses DeterminCommAvailability

 config false;

 type 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 DLThptGrp;

 }

 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 DLThptGrp;

 }

 list uLThptPerSlic {

 //Stage2 issue: Likely spelling mistake: should be 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 DLThptGrp;

 }

 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 DLThptGrp;

 }

 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 ServAttrComGrp;

 }

 leaf maxSize {

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

 type uint32;

 units bytes;

 }

 }

 list maxNumberofConns {

 //Stage2 note: Changes name in Rel-17

 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 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 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 ServAttrComGrp;

 }

 leaf support {

 type 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 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 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;

 }

 }

}

## E.X.5 module \_3gpp-ns-nrm-sliceprofile.yang

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-ns-nrm-perfreq { prefix perf3gpp; }

 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 2020-01-16 {

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

 reference "CR-0452";

 }

 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;

 }

 leaf-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.";

 type types3gpp: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;

 }

 //Stage2 issue: The perfReq object does not have any proper definition

 // in 28.541 chapter 6.

 //Stage2 issue: The text that exists on the perfReq mentions an sST

 // element. There is no sST element in SliceProfile which

 // references perfReq, nor in perfReq itself. There is

 // one in ServiceProfile, but the connection from a

 // SliceProfile to a ServiceProfile is not unique, and it's

 // not clear how the reference to sST should be constructed.

 list perfReq {

 description "The performance requirements for the NSI in terms of the

 scenarios defined in the 3GPP TS 22.261, such as experienced data

 rate, area traffic capacity (density) information of UE density.";

 key idx; //this list uses a grouping/choice and has no obvious key

 leaf idx { type uint32; }

 uses perf3gpp:PerfReqGrp;

 }

 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;

 }

 }

}

|  |
| --- |
| **Next Change** |

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