**3GPP TSG-SA5 Meeting #133-e *S5-206333***

**Online, , 12th Oct 2020 - 21st Oct 2020**

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| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **28.536** | **CR** |  | **rev** |  | **Current version:** | **16.1.0** |  |
|  |
| *For* [***HELP***](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:***  | Implement Assurance Closed Loop model changes |
|  |  |
| ***Source to WG:*** | Ericsson LM, Deutsche Telekom, NEC, Huawei |
| ***Source to TSG:*** | SA5 |
|  |  |
| ***Work item code:*** | COSLA |  | ***Date:*** | 2020-10-02 |
|  |  |  |  |  |
| ***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 following issues where identified in discussion paper XXX- The association relationship between SubNetwork and AssuranceControlLoop.- The relationship between the AssuranceControlLoop and Managed Entities- The difference between AssuranceGoalStatus and AssuranceGoal- attribute definitions for operationalState and administrativeState are missing |
|  |  |
| ***Summary of change:*** | - added association relationship between SubNetwork and AssuranceControlLoop - added assicioation between NetworkSlice and AssuranceControlLoop- removed AssuranceGoalStatus and added new description for AssuranceGoal- updated attribute definitions accordingly- added attribute definitions for operationalState and administrativeState |
|  |  |
| ***Consequences if not approved:*** | The model is ambiguous and open to misinterpretation leading to potentially faulty implementations |
|  |  |
| ***Clauses affected:*** | 2, 4.1.2.1.1, 4.1.2.2.1, 4.1.2.2.1, 4.1.2.3.1.1, 4.1.2.3.2, 4.1.2.3.2.1, 4.1.2.3.2.2, 4.1.2.3.2.3, 4.1.2.3.2.44.1.2.3.3, 4.1.2.3.3.1, 4.1.2.3.3.2, 4.1.2.3.3.3, 4.1.2.3.3.44.1.2.3.4, 4.1.2.3.4.1, 4.1.2.3.4.44.1.2.4.1, B.2.1 |
|  |  |
|  | **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:*** | <https://forge.3gpp.org/rep/sa5/MnS/tree/S5-206049_-_COSLA_-_draf_CR_Implement_assurance_closed_loop_model_changes> |
|  |  |
| ***This CR's revision history:*** | S5-205244rev4 converted to draftCR as input to CR for #134eS5-206049rev5 S5-206333 input to draftCR for #134e |

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| **First change** |

# 2 References

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

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

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

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

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

[2] ETSI GS ZSM 002 (V1.1.1) (2019-08): "Zero-touch network and Service Management (ZSM); Reference Architecture".

[3] 3GPP TS 28.550: "Management and orchestration; Performance assurance".

[4] 3GPP TS 28.545: "Management and orchestration; Fault Supervision (FS)".

[5] 3GPP TS 28.622: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[6] 3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".

[7] 3GPP TS 28.532: "Management and orchestration; Generic management services".

[8] 3GPP TS 32.302: "Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP); Information Service (IS)".

[9] 3GPP TS 28.531: "Management and orchestration; Provisioning".

[10] 3GPP TS 32.160: "Management and orchestration; Management service template".

[11] 3GPP TS 29.520: "5G System; Network Data Analytics Services; Stage 3".

[12] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[13] 3GPP TS 28.554: "Management and orchestration; 5G end to end Key Performance Indicators (KPI)".

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

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

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

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| **Second change** |

### 4.1.2 Model

#### 4.1.2.1 Imported and associated information entities

##### 4.1.2.1.1 Imported information entities and local labels

|  |  |
| --- | --- |
| Label reference | Local label  |
| TS 28.622 [5], IOC, Top | Top |
|  |  |
|  |  |
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##### 4.1.2.1.1 Associated information entities and local labels

|  |  |
| --- | --- |
| Label reference | Local label  |
|  |  |
| TS 28.622 [5], IOC, SubNetwork | SubNetwork |
| TS 28.541 [6], IOC, NetWorkSlice | NetworkSlice |
| TS 28.541 [6], IOC, NetWorkSliceSubnet | NetworkSliceSubnet |
| TS 28.622 [5], IOC, ManagedElement | ManagedElement |
| TS 28.623 [z], datatype, AttributeNameValuePairSet | AttributeNameValuePairSet |
| TS 28.541 [6], dataType, ServiceProfile  | ServiceProfile |
| TS 28.541 [6], dataType, SliceProfile | SliceProfile |
| TS 28.541 [6], attribute, serviceProfileId | serviceProfileId |
| TS 28.541 [6], attribute, sliceProfileId | sliceProfileId |
| TS 28.623 [z], attribute, operationalState | operationalState |
| TS 28.623 [z], attribute, administrativeState | administrativeState |

#### 4.1.2.2 Class diagram

#### 4.1.2.2.1 Relationships

This clause depicts the set of classes that encapsulates the information relevant for this MnS. This clause provides an overview of the relationships between relevant classes in UML.



Figure 4.1.2.2.1.1: Assurance management NRM fragment

#### 4.1.2.2.2 Inheritance



Figure 4.1.2.2.2.1: Assurance management inheritance relationships

#### 4.1.2.3 Class definitions

##### 4.1.2.3.1 AssuranceClosedControlLoop

4.1.2.3.1.1 Definition

This IOC represents an assurance closed control loop,an assurance closed control loop monitors the adjustments of the resources associated with a NetworkSlice or NetworkSliceSubnet in order to meet the objectives described by one or more assurance goals. The capabilities include:to report the achievement of the goal fulfilment of an AssuranceClosedControlLoop

- state management of an AssuranceClosedControlLoop

- to keep track of the lifecycle of an AssuranceClosedControlLoop

A consumer can check the effectiveness of the assuranceControlLoop by consulting the performance measurements [12] and KPI’s [13] associated with the target and comparing values of the targets with the values of the characteristics related attributes reported by the performance assurance service.

4.1.2.3.1.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable | isWritable | isInvariant | isNotifyable |
| operationalState | M | T | F | F | T |
| administrativeState | M | T | T | F | T |
| controlLoopLifeCyclePhase | M | T | T | F | T |
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4.1.2.3.1.3 Constraints

No constraints have been defined for this document.

4.1.2.3.1.4 Notifications

The common notifications defined in clause 4.1.2.5 are valid for this IOC, without exceptions or additions.

##### 4.1.2.3.2 AssuranceGoal

4.1.2.3.2.1 Definition

This class represents the subset of attributes (typically characteristics attributes) from an SLS, i.e. a ServiceProfile or a SliceProfile, that are subject to assurance requirements. A single instance of AssuranceGoal represents a list of assurance targets. The assurance goal includes information about the time a goal should be observed and the status of the the goal fulfilment

NOTE: A NetworkSlice or NetworkSliceSubnet can support multiple instances of AssuranceGoal.

4.1.2.3.2.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable | isWritable | isInvariant | isNotifyable |
|  |  |  |  |  |  |
| assuranceTargetList | M | T | F | F | T |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| networkSlice | CM | T | T | F | T |
| networkSliceSubnet | CM | T | T | F | T |
| sliceProfileId | CM | T | T | F | T |
| serviceProfileId | CM | T | T | F | T |
| observationTime | M | T | T | F | T |
| assuranceGoalStatusObserved | O | T | F | F | T |
| assuranceGoalStatusPredicted | O | T | F | F | T |

4.1.2.3.2.3 Attribute constraints

|  |  |
| --- | --- |
| Name | Definition |
| sliceProfileId | Condition: the AssuranceGoal applies to a NetworkSliceSubNet |
| serviceProfileId | Condition: the AssuranceGoal applies to a NetworkSlice |
| networkSliceSubnet | Condition: the AssuranceGoal applies to a NetworkSliceSubNet |
| networkSlice | Condition: the AssuranceGoal applies to a NetworkSlice |

4.1.2.2.3.4 Notifications

The common notifications defined in subclause 4.1.2.5 are valid for the <<IOC>>, without exceptions or additions.

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##### 4.1.2.3.5 AssuranceTarget <<dataType>>

4.1.2.3.5.1 Definition

This data type represents a single attribute name-value-pair of which one or more are included in an AssuranceGoal.

4.1.2.3.5.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable | isWritable | isInvariant | isNotifyable |
| assuranceTargetname-value-pair | M | T | F | F | T |

4.1.2.3.5.3 Attribute constraints

No constraints have been defined for this document.

4.1.2.3.5.4 Notifications

The common notifications defined in subclause 4.1.2.5 are valid for the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

#### 4.1.2.4 Attribute definitions

##### 4.1.2.4.1 Attribute properties

The following table defines the properties of attributes that are specified in the present document.

Table 4.1.2.4.1.1

| Attribute Name | Documentation and Allowed Values | Properties |
| --- | --- | --- |
| controlLoopLifeCyclePhase | It indicates the lifecycle phase of the AssuranceControlLoop instance. AllowedValues: Preparation, Commissioning, Operation and Decommissioning.  | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NULL isNullable: False |
| assuranceTargetName | The name of the attribute which is part of a name-value-pair in the AssuranceGoal | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
| assuranceTargetValue | The value of the attribute which is part of a name-value-pair in the AssuranceGoal | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
| assuranceTargetList | This is an attribute containing a list of key-value-pairs that are part of an AssuranceGoal | type: Attribute name/value pairmultiplicity: 1..\*isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
|  |  |  |
|  |  |  |
| observationTime | It indicates the time duration over which a controlLoopGoal is observed. observation time expressed in seconds  | type: Integer multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
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| operationalState | It indicates the operational state of the assurance control loop. It describes whether the resource is physically installed and working.allowedValues: "ENABLED", "DISABLED".The meaning of these values is as defined in 3GPP TS 28.625 [x] and ITU-T X.731 [y]. | type: ENUM multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: DisabledallowedValues: N/AisNullable: False |
| administrativeState | It indicates the administrative state of the assurance control loop. It describes the permission to use or prohibition against using the instance, imposed through the OAM services.allowedValues: “LOCKED”, “UNLOCKED”, The meaning of these values is as defined in 3GPP TS 28.625 [x] and ITU-T X.731 [y]. | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: LockedallowedValues: N/A isNullable: False |
| assuranceGoalObserved | It holds the status of the observed goal fulfilment to the assuranceControlLoopGoals allowedValues: "FULFILLED", “NOT\_FULFILLED" | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: N/AallowedValues: N/A isNullable: False |
| assuranceGoalPredicted | It holds the status of the predicted future goal fulfilment to the assuranceControlLoopGoals allowedValues: "FULFILLED", “NOT\_FULFILLED" | type: ENUMmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: LockedallowedValues: N/A isNullable: False |

##### 4.1.2.4.2 Constraints

No constraints have been identified for this document.

##### 4.1.2.4.3 Notifications

This subclause presents a list of notifications, defined in [7], that provisioning management service consumer can receive. The notification parameter objectClass/objectInstance, defined in [10], would capture the DN of an instance of an IOC defined in the present document.

#### 4.1.2.5 Common notifications

##### 4.1.2.5.1 Alarm notifications

This clause presents a list of notifications, defined in TS 28.532 [7], that an MnS consumer may receive. The notification header attribute objectClass/objectInstance, defined in TS 32.302 [8], shall capture the DN of an instance of a class defined in the present document.

| Name | Qualifier | Notes |
| --- | --- | --- |
| notifyNewAlarm | M | -- |
| notifyClearedAlarm | M | -- |
| notifyAckStateChanged | M | -- |
| notifyAlarmListRebuilt | M | -- |
| notifyChangedAlarm | O | -- |
| notifyCorrelatedNotificationChanged | O | -- |
| notifyChangedAlarmGeneral | O | -- |
| notifyComments | O | -- |
| notifyPotentialFaultyAlarmList | O | -- |

##### 4.1.2.5.2 Configuration notifications

This clause presents a list of notifications, defined in TS 28.532 [7], that an MnS consumer may receive. The notification header attribute objectClass/objectInstance, defined in TS 32.302 [8], shall capture the DN of an instance of a class defined in the present document.

| Name | Qualifier | Notes |
| --- | --- | --- |
| notifyMOICreation | O | -- |
| notifyMOIDeletion | O | -- |
| notifyMOIAttributeValueChanges | O | -- |
| notifyEvent | O | -- |

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| **Second change** |

# B.2 Solution Set (SS) definitions

## B.2.1 OpenAPI document "coslaNrm.yml"

openapi: 3.0.2

info:

 title: coslaNrm

 version: 16.4.0

 description:

 OAS 3.0.1 specification of the Cosla NRM

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externalDocs:

 description: 3GPP TS 28.536 V16.4.0; 5G NRM, Slice NRM

 url: http://www.3gpp.org/ftp/Specs/archive/28\_series/28.536/

paths: {}

components:

 schemas:

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

 ControlLoopLifeCyclePhase:

 type: string

 enum:

 - PREPARATION

 - COMMISSIONING

 - OPERATION

 - DECOMMISSIONING

 ObservationTime:

 allOf:

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

 - type: object

 properties:

 observationTime:

 type: integer

 AssuranceGoalStatusObserved:

 type: string

 enum:

 - FULFILLED

 - NOT\_FULFILLED

 AssuranceGoalStatusPredicted:

 type: string

 enum:

 - FULFILLED

 - NOT\_FULFILLED

 AssuranceTarget:

 type: array

 items:

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

#-------- 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: 'genericNrm.yaml#/components/schemas/SubNetwork-Multiple'

 ManagedElement:

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

 ExternalAmfFunction:

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

 ExternalNrfFunction:

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

 ExternalNssfFunction:

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

 AmfSet:

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

 AmfRegion:

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

 Configurable5QISet:

 $ref: 'genericNrm.yaml#/components/schemas/Configurable5QISet-Multiple'

 Dynamic5QISet:

 $ref: 'genericNrm.yaml#/components/schemas/Dynamic5QISet-Multiple'

 AssuranceClosedControlLoop:

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

 ManagedElement-Single:

 allOf:

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

 - type: object

 properties:

 attributes:

 allOf:

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

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

 - type: object

 properties:

 AmfFunction:

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

 SmfFunction:

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

 UpfFunction:

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

 N3iwfFunction:

 $ref: 'genericNrm.yaml#/components/schemas/N3iwfFunction-Multiple'

 PcfFunction:

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

 AusfFunction:

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

 UdmFunction:

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

 UdrFunction:

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

 UdsfFunction:

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

 NrfFunction:

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

 NssfFunction:

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

 SmsfFunction:

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

 LmfFunction:

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

 NgeirFunction:

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

 SeppFunction:

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

 NwdafFunction:

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

 ScpFunction:

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

 NefFunction:

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

 Configurable5QISet:

 $ref: 'genericNrm.yaml#/components/schemas/Configurable5QISet-Multiple'

 Dynamic5QISet:

 $ref: 'genericNrm.yaml#/components/schemas/Dynamic5QISet-Multiple'

 AssuranceClosedControlLoop:

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

 SubNetwork-ncO:

 type: object

 properties:

 ManagementNode:

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

 MeContext:

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

 PerfMetricJob:

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

 ThresholdMonitor:

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

 NtfSubscriptionControl:

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

 TraceJob:

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

 AlarmList:

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

 AssuranceClosedControlLoop:

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

 ManagedElement-ncO:

 type: object

 properties:

 PerfMetricJob:

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

 ThresholdMonitor:

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

 NtfSubscriptionControl:

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

 TraceJob:

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

 AlarmList:

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

 AssuranceClosedControlLoop:

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

 AssuranceClosedControlLoop-Single:

 allOf:

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

 - type: object

 properties:

 attributes:

 type: object

 oneOf:

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

 - type: object

 properties:

 operationalState:

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

 administrativeState:

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

 closedControlLoopLifeCyclePhase:

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

 assuranceGoalList:

 type: array

 items:

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

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

 - type: object

 properties:

 operationalState:

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

 administrativeState:

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

 closedControlLoopLifeCyclePhase:

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

 assuranceGoalList:

 type: array

 items:

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

 AssuranceClosedControlLoop-Multiple:

 type: array

 items:

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

 AssuranceGoal:

 allOf:

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

 - type: object

 properties:

 attributes:

 allOf:

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

 - type: object

 properties:

 observationTime:

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

 assuranceTargetList:

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

 assuranceGoalStatusObserved:

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

 assuranceGoalStatusPredicted:

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

 serviceProfileId:

 $ref: 'sliceNrm.yaml#/components/schemas/ServiceProfileId'

 sliceProfileId:

 $ref: 'sliceNrm.yaml#/components/schemas/SliceProfileId'

 networkSlice:

 $ref: 'sliceNrm.yaml#/components/schemas/NetworkSlice'

 networkSliceSubnet:

 $ref: 'sliceNrm.yaml#/components/schemas/NetworkSliceSubnet'

#------------ Definitions in TS 28.541 for TS 28.623 -----------------------------

 resources-coslaNrm:

 oneOf:

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

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