**3GPP TSG-SA5 Meeting #135e *S5-211152***

**e-meeting 25th January - 3rd February 2021**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **28.536** | **CR** | **0021** | **rev** | **-** | **Current version:** | **16.2.1** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **x** | Core Network | **x** |

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|  | | | | | | | | | | |
| ***Title:*** | Add assurance report for closed control loop | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | eCOSLA | | | | |  | ***Date:*** | | | 2021-01-08 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | In addition to the assurance goal fulfillment result for an observationTime period, the authorized consumer of a closed control loop should be allowed to monitor some ACCL related actions in an assurance report based on service exposure agreements. Reasons or root causes for the actionsmay also be included. The consumer may have more hints on how to adjust the assurance goal, assurance policies or configurations for the ACCL according to the assurance report.  In TS 28.535, REQ-CSA\_CSA-FUN-02 defines that *the 5GS shall have the capabilities to monitor, and* ***report*** *to CSP the fulfilment of committed CS requirements* ***and******actions*** *taken to adjust for deviations*. REQ-CSA-CON-15 defines that *the 3GPP management system shall have the capability to take* ***actions*** *such as network configuration and perform network resource reallocation according to the network prediction results.* REQ-CSA-CON-13 defines the requirement of obtaining SLS assurance progress information and fulfil information of the ACCL.  In TS 28.536, ACCL fulfillment information is defined in AssuranceGoal, however the related actions are not defined. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduce assurance report of closed control loops to convey some actions of a closed control loop according to service exposure agreements between the MnS producer and the consumer. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | If the consumer can only monitor the end result of assurance goal fulfillment status without any actions and possible reasons or root causes information, it is not sufficient for better governance of the closed control loop. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.1.2.2.1, 4.1.2.2.2, 4.1.2.3.1.1, 4.1.2.3.x (new), 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:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| **1st of changes** |

### 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 |

##### 4.1.2.1.2 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 [16], 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 [16], attribute, operationalState | operationalState |
| TS 28.623 [16], 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.

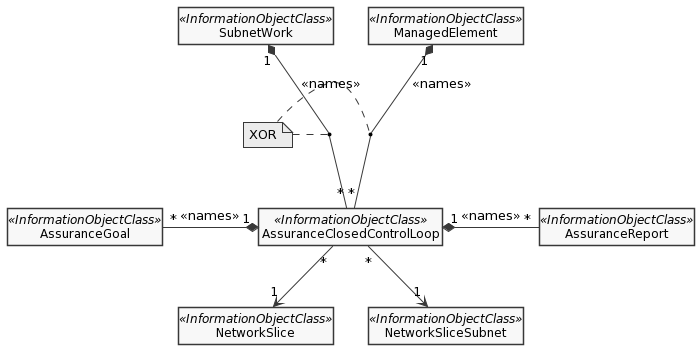


Figure 4.1.2.2.1.1: Assurance management NRM fragment

#### 4.1.2.2.2 Inheritance

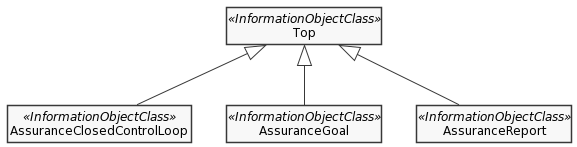


Figure 4.1.2.2.2.1: Assurance management inheritance relationships

#### 4.1.2.3 Class definitions

##### 4.1.2.3.1 AssuranceClosedControlLoop

4.1.2.3.1.1 Definition

This IOC represents assurance closed control loop, an assurance closed control loop monitors and adjusts 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 achievement of the goal fulfilment of an AssuranceClosedControlLoop

- to report actions and possibly the corresponding reasons or root causes to trigger the actions for an AssuranceClosedControlLoop

- state management of an AssuranceClosedControlLoop

- to keep track of the lifecycle of an AssuranceClosedControlLoop

A consumer can check the effectiveness of the assuranceClosedControlLoop 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 |

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 |
| 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 |
| **Attributes related to role** |  |  |  |  |  |
| networkSliceRef | CM | T | T | F | T |
| networkSliceSubnetRef | CM | T | T | 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 |

4.1.2.3.2.4 Notifications

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

##### 4.1.2.3.3 Void

##### 4.1.2.3.4 Void

##### 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 clause 4.1.2.5 are valid for the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

##### 4.1.2.3.x AssuranceReport

4.1.2.3.x.1 Definition

This class represents the attributes (typically characteristics attributes) of assurance report, e.g, actions such as configure, allocate, deallocate, inform, scale in and scale out etc according to the analytics results to achieve AssuranceGoal for the AssuranceClosedControlLoop. Corresponding reasons or root causes for the actions may also be included.

Editor’s NOTE: One or multiple AssuranceReport may be related to the assurance goal fulfilment result. It is FFS whether AssuranceGoalStatusObserved and AssuranceGoalStatusPredicted should be moved from AssuranceGoal IOC to this IOC.

4.1.2.3.x.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**Editor’s NOTE 1:** The generic attributes of this IOC may include reportId, reportType and reportContent etc.

**Editor’s NOTE 2:** The reportType identifies a name of one report type. It can be used to classify different report scenarios. The reportContent identifies the content of an ACCL report. It may include actions performed for the managed object of an ACCL. Some examples of reportContent may be the following according to some use cases and requirements in the present document:

- The fulfilment of ACCL goal and adjustment **actions** taken to fulfil the ACCL goal, e.g. actions of scaling up of resources upon potential service load increase beyond a certain threshold;

- The actions of the ACCL goal adjustment;

- Report SLS assurance progress information and fulfill information of the ACCL;

- The actions such as network configuration and network resource reallocation according to the network resource utilization prediction results;

- The actions to adjust or select AI/ML models or algorithms in support of the ACCL;

There may be more information in the AssuranceReport defined based on different scenarios.

**Editor’s NOTE 3**: This will be revisited according to introduction of new use cases on different reports for the closed control loop.

4.1.2.3.x.3 Attribute constraints

Editor’s NOTE: The AssuranceReport may be extended according to new use cases and requirements, FFS for constraints to be applied.

4.1.2.3.x.4 Notifications

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

#### 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 AssuranceClosedControlLoop instance.  AllowedValues: Preparation, Commissioning, Operation and Decommissioning. | type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: NULL  isNullable: False |
| assuranceTargetName | The name of the attribute which is part of a name-value-pair in the AssuranceTargetList.  The assuranceTargetName shall be equal to the name of an attribute in the relevant ServiceProfile or SliceProfile. The relevant ServiceProfile or SliceProfile is identified by the attribute serviceProfileId or sliceProfileId in the AssuranceGoal. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| assuranceTargetValue | The value of the attribute which is part of a name-value-pair in the AssuranceTargetList | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| assuranceTargetList | This is an attribute containing a list of name-value-pairs that are part of an AssuranceTargetList | type: Attribute name/value pair  multiplicity: 1..\*  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| observationTime | It indicates the time duration over which an AssuranceGoal is observed.  The observation time is expressed in seconds. | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| 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 [14] and ITU-T X.731 [15]. | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: Disabled  allowedValues: N/A  isNullable: 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 [14] and ITU-T X.731 [15]. | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: Locked  allowedValues: N/A  isNullable: False |
| assuranceGoalStatusObserved | It holds the status of the observed goal fulfilment to the assuranceGoal  allowedValues: "FULFILLED", “NOT\_FULFILLED | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| assuranceGoalStatusPredicted | It holds the status of the predicted future goal fulfilment to the assuranceGoal  allowedValues: "FULFILLED", “NOT\_FULFILLED" | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| networkSliceRef | It holds the reference to the NetworkSlice instance subject to assurance requirements | type: Dn  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| networkSliceSubnetRef | It holds the reference to the NetworkSliceSubnet instance subject to assurance requirements | type: Dn  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
|  |  |  |
| operationalState | It indicates the operational state of the AssuranceClosedControlLoop instance. It describes whether the resource is installed and partially or fully operable (Enabled) or the resource is not installed or not operable (Disabled).  Allowed values; Enabled/Disabled  allowedValues: "ENABLED", "DISABLED".  The meaning of these values is as defined in 3GPP TS 28.625 [14] and ITU-T X.731 [15]. | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: Disabled  allowedValues: Enabled, Disabled  isNullable: False |
| administrativeState | It indicates the administrative state of the AssuranceClosedControlLoop instance. It describes the permission to use or the prohibition against using the AssuranceClosedControlLoop instance. The administrative state is set by the MnS consumer.  Allowed values; Locked/Unlocked  allowedValues: "LOCKED", "UNLOCKED".  The meaning of these values is as defined in 3GPP TS 28.625 [14] and ITU-T X.731 [15]. | type: ENUM  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: Locked  allowedValues: Locked, Unlocked  isNullable: False |
| NOTE 1: Void  NOTE 2: Void | | |

##### 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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| **2nd of changes** |

Annex B (normative):  
OpenAPI definition of the COSLA NRM

# B.1 General

This annex contains the OpenAPI definition of the COSLA NRM in YAML format.

The Information Service (IS) of the COSLA NRM is defined in clause 4.

Mapping rules to produce the OpenAPI definition based on the IS are defined in TS 32.160 [10].

# B.2 Solution Set (SS) definitions

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

Editor’s NOTE: Stage 3 of the IOC AssurancePolicy will be introduced later when its stage 2 is stable.

openapi: 3.0.2

info:

title: coslaNrm

version: 16.4.0

description:

OAS 3.0.1 specification of the Cosla NRM

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

All rights reserved.

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:

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'

AssuranceTargetList:

type: array

items:

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

#-------- 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:

AssuranceClosedControlLoop:

$ref: '#/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:

AssuranceClosedControlLoop:

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

AssuranceClosedControlLoop-Single:

allOf:

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

- type: object

properties:

attributes:

type: object

properties:

operationalState:

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

administrativeState:

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

controlLoopLifeCyclePhase:

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

AssuranceGoal:

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

AssuranceGoal-Single:

allOf:

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

- type: object

properties:

attributes:

allOf:

- type: object

properties:

observationTime:

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

assuranceTargetList:

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

assuranceGoalStatusObserved:

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

assuranceGoalStatusPredicted:

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

serviceProfileId:

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

sliceProfileId:

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

networkSliceRef:

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

networkSliceSubnetRef:

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

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

AssuranceClosedControlLoop-Multiple:

type: array

items:

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

AssuranceGoal-Multiple:

type: array

items:

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

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

resources-coslaNrm:

oneOf:

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

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

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

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

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