**3GPP TSG-SA5 Meeting #134e *S5-206045***

**e-meeting 16th - 25st November 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **28.536** | **CR** | **0013** | **rev** | **-**  | **Current version:** | **16.1.0** |  |
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| *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 Annex on state management |
|  |  |
| ***Source to WG:*** | Ericsson, Deutsche Telekom |
| ***Source to TSG:*** | S5 |
|  |  |
| ***Work item code:*** | COSLA |  | ***Date:*** | 2020-11-02 |
|  |  |  |  |  |
| ***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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | The purpose of an AssuranceClosedControlLoop (ACCL) is to automatically adjust the network resources in case the goal is not met. The MnS consumer needs the ability to examine and be notified of changes in state, to monitor the overall operability (ability to keep a system in a safe and reliable functioning condition) and usage of ACCL, and to control the availability of specific ACCL. State management for ACCLs provides for the reporting of changes in state attributes, reading of state attributes and changing of state attributes. The generic state management attributes are described by ITU-T in X.731 and adopted by 3GPP in TS 28.625.The following text describes how the state management attributes can be used as instrumentation tool for communication service assurance using assurance closed control loops. Currently the AssuranceClosedControlLoop IOC includes the operational state and administrative state attributes as shown in the Table below.

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

The operational state attribute is single-valued and read-only. It can have one of the following values.– disabled: The AssuranceClosedControlLoop is totally inoperable and unable to provide service to the consumer(s).– enabled: The AssuranceClosedControlLoop is partially or fully operable and available for use.The administrative state attribute is single valued and read-write. It can have one of the following values, not all ofthem are applicable to every class of managed object:– locked: The resource is administratively prohibited from performing services for its consumers.– unlocked: The resource is administratively permitted to perform services for its consumers. This is independent of its inherent operability.The purpose of an ACCL is to automatically adjust the network resources in case the goal is not met. When an ACCL stops working there is no output to automatically adjust the network resources and there may be no immediate impact on the performance for the consumers (for whom the goal was set) using the network resources. Over time the performance for those consumers may deteriorate as the AssuranceControlLoop is not adjusting the network resources.  |
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| ***Summary of change:*** | New Annex is added to describe state management |
|  |  |
| ***Consequences if not approved:*** | There may be misunderstanding when state transitions take place, potentially leading to interoperability issues |
|  |  |
| ***Clauses affected:*** |  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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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".

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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 |
| TS 28.622 [5], IOC, SubNetwork | SubNetwork |
| TS 28.622 [6], ProxyClass, ManagedEntity | ManagedEntity |
| TS 28.541 [6], dataType, ServiceProfile  | ServiceProfile |
| TS 28.541 [6], dataType, SliceProfile | SliceProfile |

#### 4.1.2.2 Class diagram

#### 4.1.2.2.1 Relationships



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 AssuranceControlLoop

4.1.2.3.1.1 Definition

This IOC represents the capabilities of a control loop, these include:

- to automatically adjust a ManagedEntity (for example a network slice) to meet the objective described in AssuranceControlLoopGoal

- to report the effectiveness of an AssuranceControlLoop

- state management of an AssuranceControlLoop

- to keep track of the lifecycle of an AssuranceControlLoop

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 |
| observationTimePeriod | M | T | T | F | T |
| assuranceGoalStatus | M | T | F | 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 AssuranceGoalStatus

4.1.2.3.2.1 Definition

This class represents the status of the controlLoopGoal at the end of an observationPeriod. The status can be reported as actual status and predicted status. Data that is monitored by an assuranceControlLoop and includes measurements [x] and KPI's [y] and predictions that are applicable to the assuranceControlLoopGoals.

An assuranceGoalStatus holds the value of the observation and where applicable the value of a prediction. Depending on the AssuranceGoal the type of the AssuranceGoalStatusObserved and AssuranceGoalStatusPredicted can be different for different AssuranceGoalStatus MOIs.

4.1.2.3.2.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable | isWritable | isInvariant | isNotifyable |
| AssuranceGoalStatusObserved | M | T | T | F | T |
| AssuranceGoalStatusPredicted | O | T | T | F | T |

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4.1.2.3.2.3 Attribute constraints

No constraints have been defined for this document.

4.1.2.2.3.4 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 AssuranceControlLoopGoal <<ProxyClass>>

4.1.2.3.3.1 Definition

This IOC represents the <<dataType>> ServiceProfile and <<dataType>> SliceProfile, defined in network slice NRM in [6].

4.1.2.3.3.2 Attributes

The attributes are defined in network slice NRM in [6].

4.1.2.3.3.3 Attribute constraints

The attribute constraints are defined in network slice NRM in [6].

4.1.2.3.3.4 Notifications

The notifications of IOCs using the <<dataType>> ServiceProfile or <<dataType>> SliceProfile are defined in network slice NRM in [6].

##### 4.1.2.3.4 ObservationTimePeriod <<dataType>>

4.1.2.3.4.1 Definition

This datatype represents the time that a goal is observed which can be specified in seconds, minutes, hours or days depending on the goal that is being observed.

4.1.2.3.4.2 Attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable | isWritable | isInvariant | isNotifyable |
| observationTime | M | T | T | F | T |
| timeUnit | M | T | T | F | T |

4.1.2.3.3.3 Attribute constraints

No constraints have been defined for this document.

4.1.2.3.3.4 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 ControlLoop. AllowedValues: Preparation, Commissioning, Operation and Decommissioning.  | type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
|  |  |  |
| observationTimePeriod | It indicates the time duration over which a controlLoopGoal is observed. During the observation period various observation data is collected to assess if the controlLoopGoal has been met The observation time is expressed in timeUnits. | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| timeUnit | It indicates the unit of time used to express the observationTimeAllowedValues: second, minute, hour, day | type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| observationTime | It indicates the observation time expressed in number of timeUnit.  | type: Integer multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| assuranceGoalStatus | It reports the status of the controlLoopGoal at the end of an observationPeriod. The status can be reported as actual status or predicted status.  | type: <<dataType>> multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| assuranceGoalStatusObserved | It indicates the actual value of the controlLoopGoal at the end of an observation period | type: AssuranceGoalStatusObserved multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| assuranceGoalStatusPredicted | It indicates the predicted value of the controlLoopGoal at the end of an observation period see note 1, or of a future observation period, see note 2.  | type: AssuranceGoalStatusPredictedmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: 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/DisabledallowedValues: "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: Enabled, DisabledisNullable: 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/UnlockedallowedValues: "LOCKED", "UNLOCKED".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: LockedallowedValues: Locked, UnlockedisNullable: False |
| NOTE 1: The predictive capability is provided by using a different population for assessment than the population for which measurements are available.NOTE 2: The predictive capability is provided by using a method for predicting the most likely status in the future. |

##### 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.

##### 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.

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| **Third change** |

Annex X (normative):
AssuranceClosedControlLoop state management

An AssuranceClosedControlLoop is a logical object in the management system that represents complex interaction between the assurance information and configuration information of a grouping of resources. At any time, the management system needs to know the state of an AssuranceClosedControlLoop.

The ITU-T X.731 [y], to which [x] refers, has defined the inter-relation between the administrative state and operational state of systems in general. Figure X.1 shows the state diagram of an AssuranceClosedControlLoop, where the number in the Figure identify the state changes. The explanations for the state changes are described in Table X.1.



Figure X.1: AssuranceClosedControlLoop state diagram

In an AssuranceClosedControlLoop deployment scenario, the interactions between various management services allow the reconfiguration of the resources controlled by the AssuranceClosedControlLoop based on predefined goal(s). The interactions specified under the column "The state transition events and actions" of Table X.1 shall be present for the state transition.

Table X.1: The AssuranceClosedControlLoop state transition table

|  |  |  |
| --- | --- | --- |
| Trigger number | The state transition events and actions | State |
| 0 | The Assurance MnS producer responds positively to the “create ACCL" message, the ACCL is created and the state is set to Locked  | Locked & Disabled |
| 1 | The Assurance MnS producer responds positively to the “ACCL is created” message and the administrative state is set to Enabled. | Locked & Enabled |
| 2 | The Assurance MnS consumer suspends operation of the ACCL by setting the adminstrative state to Locked  | Locked (Enabled or Disabled) |
| 3 | The Assurance MnS consumer resumes operation of the ACCL by setting the administrative state to Unlocked. | Unlocked(Enabled or Disabled) |
| 4 | The Assurance MnS producer does not have any assurance goals to fulfil and suspends operation by setting the operational state to Disabled  | Disabled(Locked or Unlocked) |
| 5 | The Assurance MnS producer responds positively to the “delete ACCL" message, the ACCL is deleted, and the state is set to NULL (the Initial and Final state) | NULL |

NOTE: The trigger numbers in the first column represent the state changes in Figure X.1