3GPP TSG SA WG5 Meeting 137-e TDoc S5-213438

electronic meeting, online, 10 - 19 May 2021

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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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:*** | Update management control loops with lifecycle description | | | | | | | | | |
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| ***Source to WG:*** | S5 | | | | | | | | | |
| ***Source to TSG:*** | Ericsson, Deutsche Telekom | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | Cosla | | | | |  | ***Date:*** | | | 2021-04-20 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **A** |  | | | | | ***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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
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| ***Reason for change:*** | | The description of the lifecycle of a closed control loop is missing in the specification. The associated specification level requirement is also missing. | | | | | | | | |
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| ***Summary of change:*** | | Description of lifecycle of closed control loop has been added to clause 4.2.1, two new su-clauses are are added 4.2.1.1 for the existing text and 4.2.1.2 for the new text. Figure numbering has been updated.  Missing requirement has been added to clause 6.2  New line before **REQ-CSA-CON-17** (editorial) | | | | | | | | |
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| ***Consequences if not approved:*** | | Stage 1 description does not reflect stage 2 capabilities in TS 28.536. | | | | | | | | |
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| ***Clauses affected:*** | | 4.2.x (new), 6.2 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
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| ***Other comments:*** | | This CR is the mirror of S5-213xxx | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

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| **1st change** |

## 4.2 Management control loops

### 4.2.1 Overview

For communication service assurance one can identify two interactions of management control loops:

1) Between the CSC and the CSP: In this case, the CSC provides the requirements for an assured communication service to the CSP, the CSP provides the corresponding communication service, the CSP also provides feedback to the CSC. The CSP adjusts the resources used by a communication service or the CSC adjusts the SLS continuously to achieve the assured requirements.

2) Between the CSP and the NSP: the communication service provided by CSP requires the network capabilities. For example, the CSP requires a certain network latency. The NSP management system adjusts the network or CSP adjusts the latency requirement continuously to satisfy the latency requirement.



Figure 4.2.1.1: Communication service closed control loop assurance

Figure 4.2.1.1 gives a high level description of interaction process involved in the management closed control loop.

Generally, the management control loop for CSA consists of the steps Monitoring, Analysis, Decision and Execution. The adjustment of the resources used for the communication service is completed by the continuous iteration of the steps in a management control loop. As described in clause 4.1, the management closed control loop for the resources used for the communication service is deployed in the preparation phase and takes effect during the preparation phase and operation phase.

Figure 4.2.1.2 shows the overall process of communication service assurance using a management control loop.



Figure 4.2.1.2: Management Control Loop

### 4.2.2 Control loops

A control loop is a building block for management of networks and services. The basic principle of any control loop is to adjust the value of a measured or observed variable (expressed as for example an attribute) to equal the value of a desired goal (expressed as for example an attribute). The producer of the measurements or observations, the control service, and the controlled entity are all required to create a control loop.

For the control loop to act on input in the context of the set goal, the control loop provided through following four steps that continuously consume and produce information from each other in a loop in the following sequence monitor, analyse, decide and execute.

A control loop can be an open control loop in which case a human operator or other management entity intervenes inside the loop A control loop can be closed and operates without human operator or other management entity involvement inside the loop other than possibly the initial configuration of the measurement producer and configuration of control loop.

### 4.2.3 Open control loops

In an open control loop, the human operator intervenes in one or more of the process steps inside the loop, see Figure 4.2.3.1. The human operator is in control of the steps in the control loop, including decisions taken in the loop. The management system collects, analyses and presents the data to the operator, but the operator decides which action to take. In this case, the completion time for control loop is dependent on availability and reaction time of a human operator or other management entity.



Figure 4.2.3.1: Open control loop entities

### 4.2.4 Closed control loops

#### 4.2.4.1 Description

In a closed control loop, there is no direct involvement of a human operator or other management entity in the control loop, the control loop is fully automated. As shown in Figure 4.2.4.1.1 the human operator or management entity is not directly controlling the details inside the process steps but provides control outside the loop. For example, configuring goals for the control loop to make autonomous decisions within the boundaries of the set goal. Once the control loop is configured with the goal, the controlled entity is adjusted according to the set goals.

In a closed control loop the input to the control loop provided by human operator or other management entity may include the goal or policies. The output of the closed control loop may include closed control loop status to a human operator or other management entity.

Typically, the goal is set within certain parameter boundaries, the closed control loop can automatically adjust the output based on the input within the parameter boundaries. Once a control loop cannot automatically adjust, the human operator or other management entity needs to be informed. The human operator or other management entity may decide to change the management of closed control loop so that it becomes an open control loop, where decisions are made by the human operator or other management entity and not by the closed control loop.



Figure 4.2.4.1.1: Closed control loop entities

#### 4.2.4.2 Lifecycle phases

Communication service assurance is enabled by closed control loops which have their own lifecycle. The lifecycle phases for closed control loops are preparation, commissioning, operation and decommissioning.

- **Preparation phase:**

Providing a closed control loop starts with preparation, which includes control loop design, collection of relevant goal information from an SLS and preparing the required network configuration for measurement collection. The result of the preparation phase is a closed control loop design.

- **Commissioning phase:**

Once a closed control loop is prepared, one instance of the closed control loop design is instantiated by configuring the measurement collection and the goals in the network. During this phase the closed control loop may be deployed to allow the network to converge to a state where the communication service assurance is stable and within the boundaries of the SLS. The instantiation activity results in a closed control loop that is ready for operation.

- **Operation phase:**

After the commissioning phase, the closed control loop is operational. The activation includes actions that make a closed control loop run to pursuit its goal(s). It may include subscription to relevant management services. In the operation phase the closed control loop is first activated. The monitor activity typically includes the real-time or periodic calculation of KPIs that are relevant to the closed control loop and comparison with the goal(s) assigned to the given closed control loop. This activity may result in further actions that involve the other activities in the operation phase, e.g. evaluate and update & upgrade, in order to change the closed control loop settings and improve its performance. The evaluate activity also includes the evaluation of results of Execution step of closed control loops by e.g. investigating differences between the current traffic data and the data taken before the execution. The criteria of this evaluation can be done by specific values such as SLS. The update & upgrade activity includes actions that change the settings of the closed control loop instance to change its behaviour and improve its performance to pursue the assigned goal(s). The update may include changes in the parameters of the management functions that constitute the closed control loop (e.g. changing data sources, KPIs being calculated, models, policies, etc.). The upgrade may include changes in the software version of the management functions. These activities can be executed dynamically while the closed control loop is regularly operating and executing actions, or they can be executed upon a request received from an authorized consumer. The deactivation activity includes actions that make the closed control loop stop to run.

- **Decommissioning phase:**

When the closed control loop is no longer needed, after being deactivated the closed control loop is decommissioned and after that the lifecycle of the closed control loop is completed.

Figure 4.2.4.2.1 highlights the lifecycle phase sequence involved in the closed control loop assurance.

Preparation

Commissioning

Operation

Decommissioning

Figure 4.2.4.2.1: Lifecycle phases of a closed control loop

### 4.2.5 Closed control loop governance and monitoring

#### 4.2.5.1 Overview

The closed control loop can be viewed as an entity to be managed, which means the implementation of the internal capabilities and internal interactions between the steps could not be externally visible. However, some management capabilities (e.g. closed control loop governance and closed control loop monitoring) will exposed by the MnS producer, implementing the closed control loops, to enable the MnS consumer to manage the closed control loops.



Figure 4.2.5.1 Closed control loop governance and monitoring

#### 4.2.5.2 Closed control loop governance

Closed control loop governance describes a set of capabilities to allow MnS consumer to govern closed control loop, including:

- Lifecycle management of closed control loop, including create, modify,activate/deactivate,delete closed control loop.

- Configure goals for closed control loop.

#### 4.2.5.3 Closed control loop monitoring

Closed control loop monitoring describes a set of capabilities to allow MnS consumer to monitoring the progress and result of closed control loop, including:

Monitor the goal fulfillment of the closed control loop.

Editor’s Note: the content needs to be checked when R16 COSLA work is finished.

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| **2nd change** |

## 6.2 Requirements

**REQ-CSA-CON-01** The 3GPP management system shall have the capability to take actions for a set of communication services serving certain group of UEs based on the target SLS.

**REQ-CSA-CON-02** The 3GPP management system shall have the capability to collect service experience information.

**REQ-CSA-CON-03** The 3GPP management system shall have the capability to analyse the performance information related to the set of communication services serving certain group of UEs.

**REQ-CSA-CON-04** The 3GPP management system shall have the capability to modify the configuration parameters related to the set of communication services serving certain group of UEs.

**REQ-CSA-CON-05** The 3GPP management system shall have the capability to collect NSI related data from one or more 5GC NF(s).

NOTE 1: An example for NSI related data may be QoE data.

**REQ-CSA-CON-06** The 3GPP management system shall have the capability to derive which communication service is associated to the QoE data from the collected NSI related QoE data.

**REQ-CSA-CON-07** The 3GPP management system shall have the capability to ascertain SLS breach.

**REQ-CSA-CON-08** The 3GPP management system shall have the capability to perform the root cause analysis (e.g., identifying the underlying reason) for an SLS breach.

**REQ-CSA-CON-09** The 3GPP management system shall have the capability to take corrective actions to ensure the target goal.

**REQ-CSA-CON-10** The 3GPP management system shall have the capability to translate network slice requirements to cross domain network slicesubnet SLS goal and single domain network slicesubnet SLS goal.

**REQ-CSA-CON-11** The 3GPP management system shall have the capability to collect single domain SLS analysis as input to cross domain SLS analysis.

**REQ-CSA-CON-12** The 3GPP management system shall have the capability to allow its authorized consumer to control the SLS assurance (e.g. specify the SLS to be assured, enable/disable, specify the assurance time and update the SLS assurance requirements).

**REQ-CSA-CON-13** The 3GPP management system shall have the capability to allow its authorized consumer to obtain the SLS assurance fulfilment status information.

NOTE 2: The management system refers to the producer of management service for SLS assurance.

**REQ-CSA-CON-14** The 3GPP management system shall have the capability to do network prediction (e.g. network resource usage and network performance) by analysing the network operation information in special scenarios.

**REQ-CSA-CON-15** The 3GPP management system shall have the capability to take actions such asnetwork configuration and perform network resource reallocation according to the network prediction results.

**REQ-CSA-CON-16** The 3GPP management system shall have the capability to allow its authorized consumer to limit the set of action capabilities executable by an assurance closed loop.

**REQ-CSA-CON-17** The 3GPP management system shall allow an authorized consumer to set a condition to enable/disable an ACCL.

**REQ-LCM-CON-01** The 3GPP management system shall have the capability of lifecycle management of a closed control loop.

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| **End of changes** |