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5G;  
Management and orchestration;  
Management services for communication service assurance;  
Requirements  
(3GPP TS 28.535 version 18.1.0 Release 18)**

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# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
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In the present document, modal verbs have the following meanings:

- shall** indicates a mandatory requirement to do something
- shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

- should** indicates a recommendation to do something
- should not** indicates a recommendation not to do something
- may** indicates permission to do something
- need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

- can** indicates that something is possible
- cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

- will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

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## Introduction

The present document describes closed control loop assurance solution enabling a service provider or an operator to continuously deliver the requested level of communication service quality to the customer and is part of a TS-family covering the 3rd Generation Partnership Project Technical Specification Group Services and System Aspects Management and orchestration of networks, as identified below:

**TS 28.535: Management Services for Communication Service Assurance; Requirements**

TS 28.536: Management Services for Communication Service Assurance; Stage 2 and stage 3

The solution described builds upon the management services specifications as identified below:

TS 28.530: Management and orchestration; Concepts, use cases and requirements

TS 28.533: Management and orchestration; Architecture framework

TS 28.532: Management and orchestration; Generic management services

TS 28.540: Management and orchestration; 5G Network Resource Model (NRM); Stage 1

TS 28.541: Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3

TS 28.531: Management and orchestration; Provisioning

TS 28.111: Management and orchestration; Fault Management (FM)

TS 28.550: Management and orchestration; Performance assurance

TS 28.552: Management and orchestration; 5G performance measurements

TS 28.554: Management and orchestration; 5G End to end Key Performance Indicators (KPI)

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# 1 Scope

The present document describes, concepts and background, and specifies use cases and requirements for closed control loop communication service assurance solution that adjusts and optimizes the services provided by NG-RAN and 5GC.

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## 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] 3GPP TS 22.261: "Service requirements for the 5G system".
- [3] 3GPP TS 28.550: "Management and orchestration; Performance assurance".
- [4] 3GPP TS 28.531: "Management and orchestration; Provisioning".
- [5] ETSI GS ZSM 002 (V1.1.1) (2019-08): "Zero-touch network and Service Management (ZSM); Reference Architecture".
- [6] 3GPP TS 28.111: "Management and orchestration; Fault (FM)".
- [7] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".
- [8] 3GPP TS 28.554: "Management and orchestration; 5G end to end Key Performance Indicators (KPI)".
- [9] 3GPP TS 28.532: "Management and orchestration; Generic management services".
- [10] 3GPP TS 23.003: "Numbering, addressing and identification".
- [11] ETSI GS ZSM 009-1 (V1.1.1) (2021-06): "Zero-touch network and Service Management (ZSM); Closed-Loop Automation; Part 1: Enablers".

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## 3 Definitions of terms, symbols and abbreviations

### 3.1 Terms

For the purposes of the present document, the terms given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**communication services:** subset of 3GPP defined services. Examples of 3GPP services (e.g. 5G LAN, URLLC) can be found in TS 22.261 [2].

**service level specification:** specification of the minimum acceptable standard of service.

**SLA requirements:** service and network requirements derived from SLAs.

NOTE: A provider can add additional requirements not directly derived from SLA's, associated to provider internal [business] goals.

## 3.2 Symbols

Void.

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

CN	Core Network
CS	Communication Service
CSA	Communication Service Assurance
CSC	Communication Service Customer
CSP	Communication Service Provider
eMBB	enhanced Mobile BroadBand
KPI	Key Performance Indicator
MDAS	Management Data Analytics Service
MnS	Management Service
NF	Network Function
NSI	NetworkSlice Instance
NSSI	NetworkSlice Subnet Instance
NSP	NetworkSlice Provider
NWDAF	Network Data Analytics Function
QoE	Quality of Experience
SD	Slice Differentiator
SLA	Service Level agreement
SLS	Service Level Specification
S-NSSAI	Single Network Slice Selection Assistance Information
SST	Slice/ServiceType

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## 4 Concepts and background (2024-07)

### 4.1 Void

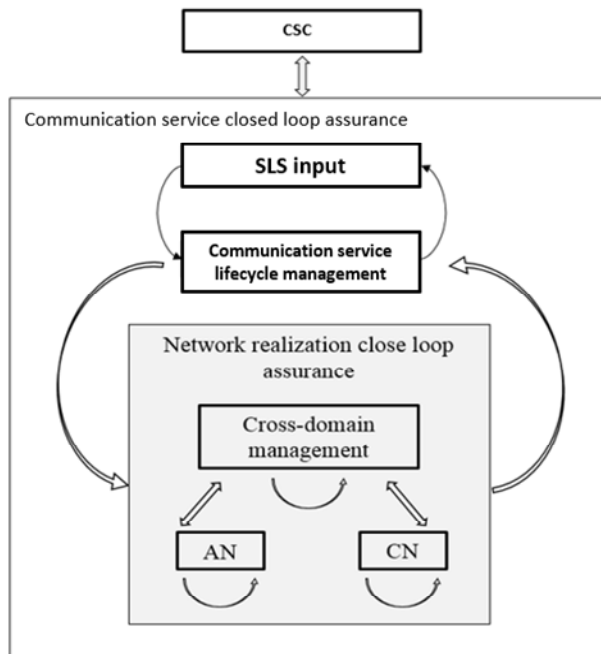
### 4.2 Management control loops

#### 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.



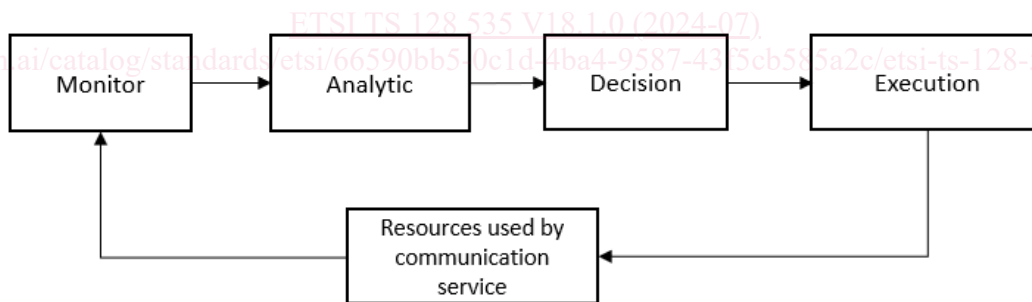


**Figure 4.2.1.1: Communication service closed control loop assurance**

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 4.2.4.2, 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.

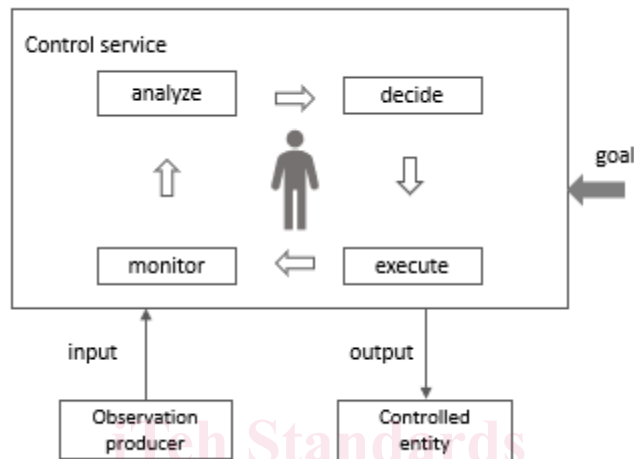


Figure 4.2.3.1: Open control loop entities

### 4.2.4 Closed control loops

#### 4.2.4.1 Description ETSI TS 128 535 V18.1.0 (2024-07)

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 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.