



**GROUP SPECIFICATION**

## **Network Functions Virtualisation (NFV) Release 6; Architecture; Part 1: Architectural Framework for Telco Cloud**

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# Contents

Intellectual Property Rights .....	5
Foreword.....	5
Modal verbs terminology.....	5
Introduction .....	5
1 Scope .....	7
2 References .....	7
2.1 Normative references .....	7
2.2 Informative references.....	7
3 Definition of terms, symbols and abbreviations.....	8
3.1 Terms.....	8
3.2 Symbols.....	8
3.3 Abbreviations .....	8
4 Telco Cloud Architectural Framework.....	9
4.1 General architecture overview.....	9
4.2 Constructs.....	9
4.2.1 Telco Cloud Infrastructure resource .....	9
4.2.2 Telco Cloud Application (TCA) .....	10
4.2.3 Telco Appliance (TAP).....	10
4.2.4 Telco Cloud Link (TCL).....	10
4.2.5 Telco Cloud Connectivity Graph (TCCG).....	11
4.2.6 Telco Cloud service .....	11
4.3 Architecture diagram.....	11
4.4 Architectural blocks .....	11
4.4.1 Telco Cloud Orchestration.....	11
4.4.2 Telco Cloud Platform.....	12
4.4.3 Telco Cloud Infrastructure.....	13
4.4.4 Telco Cloud Application.....	14
4.5 Functions .....	14
4.5.1 Telco Cloud Management Data Analytics Function .....	14
4.5.2 Telco Cloud Intent Management .....	14
4.5.3 Telco Cloud Certificate Management Function.....	14
4.5.4 Telco Cloud Application Lifecycle Management .....	14
4.5.5 Telco Cloud Application Telemetry Management.....	14
4.5.6 Telco Cloud Platform Repository Management .....	15
4.5.7 Telco Cloud Application Configuration Management.....	15
4.5.8 Telco Cloud Infrastructure Lifecycle Management .....	15
4.5.9 Telco Cloud Infrastructure Telemetry Management.....	15
4.5.10 Telco Cloud Infrastructure Repository Management.....	16
4.6 Service interfaces .....	16
4.6.1 Interfaces approach.....	16
4.6.2 Categories of service interfaces .....	16
4.6.2.1 Overview.....	16
4.6.2.2 Category of orchestration service interfaces .....	16
4.6.2.3 Category of platform service interfaces .....	16
4.6.2.4 Category of infrastructure service interfaces.....	17
4.7 Reference points .....	17
4.7.1 Overview .....	17
4.7.2 Tca-Tcp reference point.....	18
4.7.3 Tca-Tci reference point.....	18
4.7.4 Tco-Tcp reference point.....	18
4.7.5 Tco-Tci reference point .....	18
4.7.6 Tcp-Tci reference point .....	18
<b>Annex A (informative): Conceptual mappings with legacy NFV-MANO.....</b>	<b>19</b>

**Annex B (informative):**    **Change history** .....21  
History .....22

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# Foreword

This Group Specification (GS) has been produced by ETSI Industry Specification Group (ISG) Network Functions Virtualisation (NFV).

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# Modal verbs terminology

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# Introduction

In legacy networks, Network Function (NF) implementations were tightly coupled with the infrastructure they ran on. Network Functions Virtualisation (NFV) added new capabilities to communications networks and required a new set of management and orchestration functions to support operations, administration, maintenance and provisioning in an NFV environment.

NFV decoupled software implementations of NFs from the physical resources offered by the hardware they use, such as computation, storage, and networking. Virtualisation technology insulates the NFs from those physical resources through a virtualisation layer which partitions them to create virtualisation containers. Virtualisation containers are defined in ETSI GR NFV 003 [i.1].

Up to ETSI ISG NFV Release 5, the software and infrastructure decoupling exposed a new set of network entities, the Virtualised Network Functions (VNFs), and a new set of relationships between them and the NFV Infrastructure (NFVI). The VNFs can be chained with other VNFs and/or Physical Network Functions (PNFs) to realize a Network Service (NS).

The virtualisation principle stimulates a multi-vendor ecosystem where the different components of the NFVI, the VNF software, and their management and orchestration functions could follow different lifecycles (e.g. on procurement, upgrading, etc.). This required interoperable standardized interfaces and proper resource abstraction among them.

The Telco ecosystem around NFV has evolved, with many new technologies based on cloud-native principles, automation and Artificial Intelligence (AI), offering additional paths and opportunities for NFV to grow further.

In NFV Release 6 to better support future network generations, such as 6G, the primary areas of improvement in the evolution of NFV towards the design of the Telco Cloud architecture and standard interfaces and components related to the tooling, systems, and frameworks used by network operators for Lifecycle Management (LCM) and Operations, Administration and Management (OAM) purposes, and the adoption of cloud-native and AI-native principles, practices and relevant technologies.

The present document focuses on the architectural aspects of the Telco Cloud and specifies the architectural blocks, functions and service interfaces accommodated by the Telco Cloud architectural framework, enabling management and orchestration of Telco Cloud Applications (TCA) and the Telco Cloud Infrastructure (TCI).

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# 1 Scope

The present document specifies the architectural framework for the Telco Cloud including its architectural blocks and corresponding service interfaces. The Telco Cloud comprises infrastructure, platform, management and orchestration functionality for Telco Cloud applications and Telco Cloud infrastructure.

The present document also describes the relationship between the Telco Cloud architecture and the NFV architectural framework of Release 5.

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## 2 References

### 2.1 Normative references

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- [i.1] ETSI GR NFV 003: "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".
- [i.2] ETSI GS NFV 006: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Architectural Framework Specification".
- [i.3] ETSI GS NFV-IFA 049: "Network Functions Virtualisation (NFV) Release 5; Architectural Framework; VNF generic OAM functions and other PaaS Services specification".

## 3 Definition of terms, symbols and abbreviations

### 3.1 Terms

For the purposes of the present document, the terms given in ETSI GR NFV 003 [i.1] and the following apply:

**Telco Appliance:** implementation of an NF via a tightly coupled software and hardware system

NOTE: The definition of the Telco Appliance corresponds to the definition of the PNF in ETSI GR NFV 003 [i.1].

**Telco Cloud Application:** software implementation which realizes an application that can be deployed on the Telco Cloud Infrastructure

EXAMPLE: Examples of the Telco Cloud Application include network functions (defined in ETSI GR NFV 003 [i.1]), AI/ML applications like intelligent agents, edge computing applications, digital twins, video and audio processing.

**Telco Cloud Application Component:** atomic software building block of a TCA, representing a modular, independently managed object that can be deployed in the Telco Cloud Infrastructure

**Telco Cloud Infrastructure:** totality of hardware and software components that build up the fundamental resource environment in which Telco Cloud Applications are deployed, and the set of infrastructure services used to manage these components

**Telco Cloud Infrastructure Point of Presence (TCI-PoP):** location of the TCI where a TCA can be deployed

**Telco Cloud Orchestration:** collection of orchestration functionality and automation services that enables service assurance and provides a network-level reconciliation between the intents of service requirements and the management requests towards the Telco Cloud

**Telco Cloud Platform:** platform with a collection of modular services within the Telco Cloud that enables the development, deployment and management of Telco Cloud Applications

### 3.2 Symbols

Void.

### 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI GR NFV 003 [i.1] and the following apply:

NOTE: An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in ETSI GR NFV 003 [i.1].

TAP	Telco Appliance
TCA	Telco Cloud Application
TCAC	Telco Cloud Application Component
TCCG	Telco Cloud Connectivity Graph
TCI	Telco Cloud Infrastructure
TCL	Telco Cloud Link
TCO	Telco Cloud Orchestration
TCP	Telco Cloud Platform

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## 4 Telco Cloud Architectural Framework

### 4.1 General architecture overview

The Telco Cloud provides an architectural framework that bridges the intersection between the infrastructure and the deployment, management and orchestration of various Telco Cloud Applications (TCAs). This framework consists of architectural blocks that implement service capabilities, which are supported by the Telco Cloud. These blocks represent grouping of services and functionality with a related scope, avoiding strict layers, complex interactions and dependencies between functional entities. The Telco Cloud architectural framework provides flexibility and scalability in managing Telco Cloud Applications.

The following architectural blocks shall be part of the Telco Cloud architectural framework:

- Telco Cloud Infrastructure
- Telco Cloud Platform
- Telco Cloud Orchestration
- Telco Cloud Applications

A series of service interfaces are exposed by the Telco Cloud architectural blocks, which are invoked by consumers within the Telco Cloud and/or consumers outside the Telco Cloud. The consumers within the Telco Cloud include:

- Telco Cloud Platform:
  - Functions in the Telco Cloud Platform block consumes service interfaces produced by functions in the Telco Cloud Infrastructure.
- Telco Cloud Orchestration:
  - Functions in the Telco Cloud Orchestration block consumes service interfaces produced by functions in the Telco Cloud Infrastructure.
  - Functions in the Telco Cloud Orchestration block consumes service interfaces produced by functions in the Telco Cloud Platform.
- Telco Cloud Application:
  - The Telco Cloud Application consumes service interfaces produced by functions in the Telco Cloud Platform.
  - The Telco Cloud Application consumes service interfaces produced by functions in the Telco Cloud Infrastructure.

The consumers outside the Telco Cloud include:

- Other OSS/BSS, which consume service interfaces produced by Telco Cloud Applications and functions in the Telco Cloud Infrastructure, Telco Cloud Platform, and the Telco Cloud Orchestration.

### 4.2 Constructs

#### 4.2.1 Telco Cloud Infrastructure resource

A Telco Cloud Infrastructure resource is either a compute (including acceleration), storage or network resource, or a combination of any of these, provided by the Telco Cloud Infrastructure.

A Telco Cloud Infrastructure resource can be mapped to the following legacy NFV-MANO constructs as well as accommodates more types of infrastructure resources provided by new virtualisation forms:

- Virtualised resource, refer to ETSI GR NFV 003 [i.1].

- Physical resource, refer to ETSI GR NFV 003 [i.1].
- Managed Container Infrastructure Object, refer to clause 4.1.8 of ETSI GS NFV 006 [i.2].
- Managed CIS Cluster Object (MCCO), refer to clause 4.1.7 of ETSI GS NFV 006 [i.2].
- Container Infrastructure Service cluster, refer to clause 4.1.6 of ETSI GS NFV 006 [i.2].

## 4.2.2 Telco Cloud Application (TCA)

A Telco Cloud Application (TCA) is a software implementation which realizes an application that can be deployed on the Telco Cloud Infrastructure. Applications include typical network functions, but not only. It is managed by the telco operator as a single logical entity and is deployed in a designated cloud layer such as a CIS cluster or a virtual machine cluster.

The TCA is composed of one or multiple TCA Components (TCAC). A TCAC has the following characteristics:

- A TCAC can be composed of multiple sub-units of different types.
- Lifecycle of TCAC can be managed independently:
  - Can be replaced or updated or scaled during TCA lifecycle.
  - All TCACs are terminated during TCA termination.

EXAMPLE: A TCAC in Kubernetes can be a pod plus config map plus PVC.

A TCAC can be mapped to the following legacy NFV-MANO constructs:

- Virtualised Network Function Component (VNFC), refer to clause 4.1.2 of ETSI GR NFV 003 [i.1].

From the Telco Cloud perspective, the deployment and operational behaviour requirements of each TCA are captured as declarative targets in a TCA Descriptor (TCAD), which is on-boarded as part of a file archive known as a TCA Package. The TCAD describes the management targets necessary to realize an instance of the TCA and captures, in an abstracted declarative manner, the requirements to manage its lifecycle.

A TCA can be mapped to the following NFV-MANO constructs as well as accommodates additional types of applications.

- Virtualised Network Function (VNF), refer to clause 4.1.2 of ETSI GS NFV 006 [i.2].

## 4.2.3 Telco Appliance (TAP)

A Telco Appliance (TAP) is a physical network device that is connected to the TCA(s) in the Telco Cloud. From the Telco Cloud perspective, only the description of the TAP's connectivity to the TCA(s) is captured in a TAP Descriptor (TAPD), which is on-boarded as part of a file archive.

A TAP can be mapped to the following legacy NFV-MANO constructs:

- Physical Network Function (PNF), refer to clause 4.1.5 of ETSI GS NFV 006 [i.2].

## 4.2.4 Telco Cloud Link (TCL)

The Telco Cloud Link (TCL) construct is defined similarly to the VL in ETSI GR NFV 003 [i.1]. It abstracts the connectivity type and properties between any two or more of the following: TCA, TCAC, and TAP.

A TCL can span across one or more Wide Area Networks (WANs) when the connectivity requirements are fulfilled between different TCI-PoPs.

## 4.2.5 Telco Cloud Connectivity Graph (TCCG)

The Telco Cloud Connectivity Graph (TCCG) is defined as a set of Telco Cloud Links that are used to connect two or more of TCA, TCAC and TAP constructs. A set of VLs that build networking topology of an NS instance can be mapped to a TCCG. VLs and NS are defined in ETSI GR NFV 003 [i.1].

## 4.2.6 Telco Cloud service

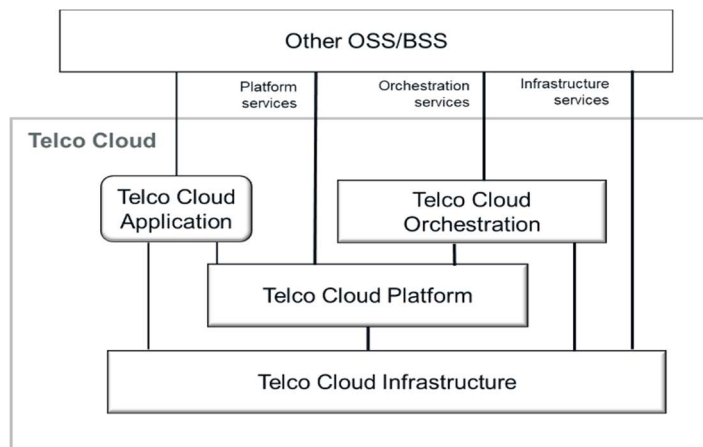
Telco Cloud services can be used to enable telecom operators to manage Telco Cloud applications, optimize resource management and accelerate service deployment through software-defined infrastructures.

In contrast to general-purpose cloud infrastructures, a Telco Cloud is uniquely characterized by its adherence to specialized telecom requirements, encompassing ultra-low latency operations, carrier-grade reliability and distributed edge processing.

In the context of Telco Cloud architecture, Telco Cloud services are categorized into Telco Cloud Infrastructure services, Telco Cloud Platform services and Telco Cloud Orchestration services.

## 4.3 Architecture diagram

The Telco Cloud architecture specified in the present document has evolved from the NFV architectural framework specified in the Release 5 version of ETSI GS NFV 006 [i.2]. A high-level Telco Cloud architectural framework defined in the present document is illustrated in figure 4.3-1.



**Figure 4.3-1: Telco Cloud architectural framework (high-level)**

The Telco Cloud architectural framework (high-level) is composed of the following architectural blocks: Telco Cloud Orchestration, Telco Cloud Platform and Telco Cloud Infrastructure, which produce Orchestration services, Platform services and Infrastructure services respectively. The present architectural framework also includes an architectural block of Telco Cloud Application, which consumes the services produced by the Telco Cloud Platform and Telco Cloud Infrastructure respectively.

**NOTE:** The functionality of the Telco Cloud Application and what services are produced by the Telco Cloud Application are out of the scope of the present document.

## 4.4 Architectural blocks

### 4.4.1 Telco Cloud Orchestration

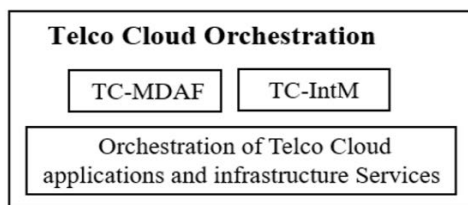
The Telco Cloud Orchestration is an architectural block encompassing the network-level orchestration functionality for the Telco Cloud. It focuses on providing a network-level reconciliation between the intents of service requirements, and the management service requests towards the Telco Cloud for end to end automated network operation.

The Telco Cloud Orchestration consists of a group of functionalities in respect to automation and service level orchestration for the Telco Cloud, as depicted in figure 4.4.1-1:

- Analytics, with its functionality provided by the Telco Cloud Management Data Analytics Function (TC-MDAF) (refer to clause 4.5.1);
- Intent Management (IM), with its functionality provided by the Telco Cloud Intent Management function (TC-IntM) (refer to clause 4.5.2).
- Orchestration of Telco Cloud applications and infrastructure services.

NOTE 1: In the present version of the document, the TC-MDAF, TC-IntM and orchestration of Telco Cloud applications and infrastructure services are main functionalities accommodated by the Telco Cloud Orchestration architectural block. Details of the functions to support orchestration of Telco Cloud applications and infrastructure services, which may include inventory, registry, topology services, are not specified in the present document version.

NOTE 2: The relationship between Telco Cloud Orchestration and legacy NFV-MANO functionality of service orchestration provided by the NFVO is not specified in the present document version.



**Figure 4.4.1-1: Telco Cloud Orchestration block**

## 4.4.2 Telco Cloud Platform

The Telco Cloud Platform is an architectural block encompassing a modular platform of services, including LifeCycle Management (LCM) services and Operations, Administration and Management (OAM) services. These services are generalized to fulfil any type of LCM and OAM related operations for the Telco Cloud Applications, simplify the management of carrier-grade software on a cloud infrastructure and facilitate the portability of applications on a distributed infrastructure.

The Telco Cloud Platform consists of a group of functionalities in respect to generalized service of platform, as depicted in figure 4.4.2-1:

- LCM, fulfilled by the Telco Cloud Application Lifecycle Management function (see clause 4.5.4):
  - It can be mapped to the following legacy NFV-MANO functionality provided by the lifecycle management part of the VNFM (refer to clause 5.3.2 of ETSI GS NFV 006 [i.2]) and PSM (refer to clause 5.5.7 of ETSI GS NFV 006 [i.2]);
- OAM, fulfilled by the Telco Cloud Application Telemetry Management (see clause 4.5.5) and Telco Cloud Application Configuration Management functions (see clause 4.5.7):
  - It can be mapped to the following legacy NFV-MANO with its functionality provided by the configuration management, performance management, fault management part of the VNFM (refer to clause 5.3.2 of ETSI GS NFV 006 [i.2]), and VNF generic OAM/PaaS Services (refer to ETSI GS NFV-IFA 049 [i.3]);
- Repository Management (RM), fulfilled by the Telco Cloud Platform Repository Management (see clause 4.5.6).

Other services include:

- Certificate Management (CertM), fulfilled by the Telco Cloud Certificate Management Function (see clause 4.5.3):
  - It can be mapped to the following legacy NFV-MANO functionality provided by the certificate management of CMF for Telco application (refer to clause 5.5.6 of ETSI GS NFV 006 [i.2]).
- Data and control plane network services, comprised of platform services dedicated to data and control plane aspects, like service mesh connectivity, load balancing, etc.

NOTE: In the present version of the document, other services are about Certificate Management. Additional services and functionalities are not specified in the present document version.

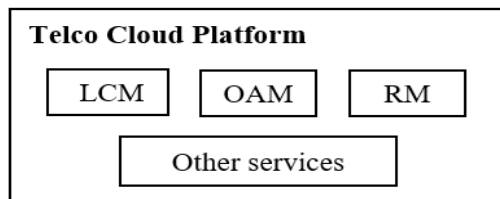


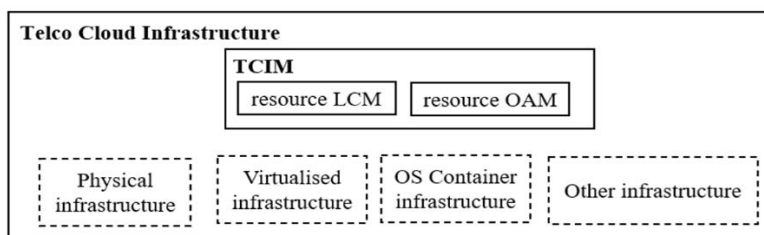
Figure 4.4.2-1: Telco Cloud Platform block

### 4.4.3 Telco Cloud Infrastructure

The Telco Cloud Infrastructure is an architectural block encompassing various infrastructure services of the Telco Cloud, including the services from physical infrastructure, virtualised infrastructure, OS container infrastructure and any new type of infrastructure. It serves as a highly distributed foundation for the deployment and operation of Telco Cloud Applications, spanning across access networks, edge environment and central cloud regions. The Telco Cloud Infrastructure Management (TCIM) is a collection of services supporting infrastructure management functionalities, which provides an abstracted view of different types of infrastructures.

The Telco Cloud Infrastructure consists of a group of functionalities in respect to infrastructure services, as depicted in figure 4.4.3-1:

- Resource LCM, fulfilled by the Telco Cloud Infrastructure Lifecycle Management function (see clause 4.5.8):
  - It can be mapped to the following legacy NFV-MANO functionality provided by the lifecycle management part of the PIM function (refer to clause 5.5.9 of ETSI GS NFV 006 [i.2]), VIM function (refer to clause 5.3.3 of ETSI GS NFV 006 [i.2]), WIM function (refer to clause 5.3.5 of ETSI GS NFV 006 [i.2]), CCM (refer to clause 5.5.3 of ETSI GS NFV 006 [i.2]), CISM function (refer to clause 5.5.1 of ETSI GS NFV 006 [i.2]).
- Resource OAM, fulfilled by the Telco Cloud Infrastructure Telemetry Management (see clause 4.5.9):
  - It can be mapped to the following legacy NFV-MANO functionality provided by the configuration management, performance management, fault management part of the PIM function (refer to clause 5.5.9 of ETSI GS NFV 006 [i.2]), VIM function (refer to clause 5.3.3 of ETSI GS NFV 006 [i.2]), WIM function (refer to clause 5.3.5 of ETSI GS NFV 006 [i.2]), CCM (refer to clause 5.5.3 of ETSI GS NFV 006 [i.2]) and CISM function (refer to clause 5.5.1 of ETSI GS NFV 006 [i.2]) and VNF generic OAM/PaaS Services (refer to ETSI GS NFV-IFA 049 [i.3]).
- Others:
  - Repository Management (RM), fulfilled by the Telco Cloud Infrastructure Repository Management (see clause 4.5.10).



**Figure 4.4.3-1: Telco Cloud Infrastructure block**

#### 4.4.4 Telco Cloud Application

The Telco Cloud Application is an architectural block representing the network functions and other applications deployed and operated on the Telco Cloud.

### 4.5 Functions

#### 4.5.1 Telco Cloud Management Data Analytics Function

The Telco Cloud Management Data Analytics Function (TC-MDAF) is a function that processes and analyses management data to provide analytics outputs associated to an analytics subject in the scope of the Telco Cloud.

#### 4.5.2 Telco Cloud Intent Management

The Telco Cloud Intent Management (TC-IntM) is a function that manages intents related to the Telco Cloud capabilities.

#### 4.5.3 Telco Cloud Certificate Management Function

The Telco Cloud Certificate Management Function (TC-CMF) is responsible to perform certificate management in the Telco Cloud.

#### 4.5.4 Telco Cloud Application Lifecycle Management

The Telco Cloud Application Lifecycle Management function (TCA-LCM) is a function responsible for the lifecycle management of Telco Cloud Applications, and their constituents Telco Cloud Application Components (TCACs).

Its main capabilities are handling lifecycle operations, including:

- instantiation, update, healing, scaling, termination and information query (e.g. the metadata, connectivity information) of TCAs and TCACs.

NOTE: The Telco Cloud Application Lifecycle Management operations are generic and independent of the types of Telco Cloud Applications.

#### 4.5.5 Telco Cloud Application Telemetry Management

The Telco Cloud Application Telemetry Management function (TCA-TM) is a function responsible for the performance management, fault management and logs management of TCAs.

Its main capabilities are the handling of:

- TCA performance management, which includes the management of TCA related performance jobs to collect performance data and exposure of collected performance data.
- TCA fault management, which includes the management of TCA related alarms.

- TCA logs management, which includes the management of TCA related logging jobs to collect logging data and exposure of collected logging data.

#### 4.5.6 Telco Cloud Platform Repository Management

The Telco Cloud Platform Repository Management (TCP-RM) is a function responsible for the management of the various descriptors, configuration files and artifacts for TCAs.

Its main capabilities are the handling of:

- TCA descriptor management, including uploading descriptors, deleting descriptors, updating descriptor info, querying descriptor info of TCAs.
- TCA package management, including fetching packages, querying packages, subscription/notification to package updates of TCAs.

#### 4.5.7 Telco Cloud Application Configuration Management

The Telco Cloud Application Configuration Management (TCA-CM) is a function responsible for the configuration management of TCAs and their constituents TCACs.

Main capabilities are related to:

- TCA configuration management, which includes managing configuration information for one or more TCA instances.

#### 4.5.8 Telco Cloud Infrastructure Lifecycle Management

The Telco Cloud Infrastructure Lifecycle Management (TCI-LCM) is a function responsible for the lifecycle management of Telco Cloud Infrastructure resources, including the creation, update, query and deletion of respective Telco Cloud Infrastructure resources.

Its main capabilities are the handling of:

- Virtualised Resource LCM: Lifecycle management of virtualised resources (virtual compute, virtual network, virtual storage).
- Container Resource LCM: Lifecycle management of containerized workload resources.
- Physical Resource LCM: Provisioning and lifecycle management of physical infrastructure resources.

#### 4.5.9 Telco Cloud Infrastructure Telemetry Management

The Telco Cloud Infrastructure Telemetry Management (TCI-TM) is a function responsible for the collection, analysis and exposure of various telemetry data, including performance, fault and logging data, associated to the Telco Cloud Infrastructure.

Its main capabilities are the handling of:

- Telco Cloud Infrastructure performance management, which includes the management of performance jobs to collect performance data and exposure of collected TCI related performance data;
- Telco Cloud Infrastructure fault management, which includes the management of TCI related alarms;
- Telco Cloud Infrastructure logs management, which includes the management of TCI related logging jobs to collect logging data and exposure of collected logging data.

## 4.5.10 Telco Cloud Infrastructure Repository Management

The Telco Cloud Infrastructure Repository Management (TCI-RM) is a function responsible for the management of artifacts used in the Telco Cloud Infrastructure, like software images of various kinds of infrastructure resources (e.g. virtual, physical, container).

Its main capabilities are the handling of:

- Telco Cloud Infrastructure software image management, including addition, update, information query and deletion of Telco Cloud Infrastructure software images.

## 4.6 Service interfaces

### 4.6.1 Interfaces approach

The concept of service interface is introduced in the Telco Cloud architectural framework. It specifies an interface from the viewpoint of the producer of the interface (i.e. a function residing in an architectural block of the Telco Cloud).

NOTE 1: In the present document version, there is no assumption of the consumers of the services interfaces described.

NOTE 2: The present document version does not exhaustively describe the list of services in all the service categories.

### 4.6.2 Categories of service interfaces

#### 4.6.2.1 Overview

Categories of service interfaces produced by the architectural blocks in the Telco Cloud architectural framework are described in the subsequent sub-clauses under clause 4.6.2.

#### 4.6.2.2 Category of orchestration service interfaces

Orchestration service interfaces produced by functions residing in the Telco Cloud Orchestration provide to a consumer network-level orchestration services within the Telco Cloud.

The management services produced by the functions in the Telco Cloud Orchestration described in clause 4.5 are as follows.

Service interfaces produced by Telco Cloud Management Data Analytics Function:

- The data analytics service interface provides the capability to a consumer to manage data analytics processes.

Service interfaces produced by Telco Cloud Intent Management:

- The intent management service interface provides the capability to a consumer (e.g. other OSS/BSS) to manage intents.

#### 4.6.2.3 Category of platform service interfaces

Platform service interfaces produced by functions residing in the Telco Cloud Platform provide to a consumer generalized platform services to fulfil operations like LCM and OAM for any type of applications running on the Telco Cloud. Specially, the management services produced by the functions in the Telco Cloud Platform described in clause 4.5 are as follows.

Service interfaces produced by Telco Cloud Application Lifecycle Management:

- Telco Cloud Application lifecycle management services provide the capability to a consumer to manage the lifecycle of TCAs.

Service interfaces produced by Telco Cloud Application Telemetry Management:

- Telco Cloud Application performance management services provide the capability to a consumer to request performance management related to TCAs;
- Telco Cloud Application fault management services provide the capability to a consumer to request fault management related to TCAs;
- Telco Cloud Application log management services provide the capability to a consumer to request log management related to TCAs.

Service interfaces produced by Telco Cloud Platform Repository Management:

- TCA descriptor management services provide the capability to a consumer to manage TCA descriptors;
- TCA package management services provide the capability to a consumer to manage TCA packages.

Service interfaces produced by Telco Cloud Application Configuration Management:

- TCA configuration management services provide the capability to a consumer to request configuration management related to TCAs.

Service interfaces produced by Telco Cloud Certificate Management:

- The certificate management services provide the capability to a consumer to manage certificates.

#### 4.6.2.4 Category of infrastructure service interfaces

Infrastructure service interfaces produced by the Telco Cloud Infrastructure provide to a consumer, infrastructure services of the Telco Cloud, including the services from physical infrastructure, virtualised infrastructure, OS container infrastructure and any new type of infrastructure, concerning to compute, acceleration, storage and networking. Specially, the management services produced by the functions in the Telco Cloud Infrastructure are as follows:

Service interfaces produced by Telco Cloud Infrastructure Lifecycle Management:

- Telco Cloud Infrastructure resource lifecycle management services provide the capability to a consumer to manage the lifecycle of Telco Cloud Infrastructure resources, including the lifecycle management of virtualised resources, containerized workload resources, container clusters and physical resources.

Service interfaces produced by Telco Cloud Infrastructure Telemetry Management:

- Telco Cloud Infrastructure resource performance management services provide the capability to a consumer to request performance management related to Telco Cloud Infrastructure resources;
- Telco Cloud Infrastructure resource fault management services provide the capability to a consumer to request fault management related to Telco Cloud Infrastructure resources;
- Telco Cloud Infrastructure resource log management services provide the capability to a consumer to request log management related to Telco Cloud Infrastructure resources.

Service interfaces produced by Telco Cloud Infrastructure Repository Management:

- Telco Cloud Infrastructure software image management services provide the capability to a consumer to manage Telco Cloud Infrastructure software images.

## 4.7 Reference points

### 4.7.1 Overview

The "reference point" concept used in the context of Telco Cloud architecture, targets to represent interaction points between architectural blocks in the Telco Cloud architecture. It provides a deeper understanding of how service interfaces provided by a producer (i.e. a function residing in an architectural block) are exposed to other consumers residing inside the same or another architectural block.

#### 4.7.2 Tca-Tcp reference point

The Tca-Tcp reference point enables the information exchanges between the Telco Cloud Application and the Telco Cloud Platform architectural block.

#### 4.7.3 Tca-Tci reference point

The Tca-Tci reference point enables the information exchanges between the Telco Cloud Application and the Telco Cloud Infrastructure architectural block.

#### 4.7.4 Tco-Tcp reference point

The Tco-Tcp reference point enables the information exchanges between the Telco Cloud Orchestration and the Telco Cloud Platform architectural block.

#### 4.7.5 Tco-Tci reference point

The Tco-Tci reference point enables the information exchanges between the Telco Cloud Orchestration and the Telco Cloud Infrastructure architectural block.

#### 4.7.6 Tcp-Tci reference point

The Tcp-Tci reference point enables the information exchanges between the Telco Cloud Platform and the Telco Cloud Infrastructure architectural block.

## Annex A (informative): Conceptual mappings with legacy NFV-MANO

The following tables describe the mappings and correspondence between concepts, constructs and objects described in the legacy NFV architecture specified in ETSI GS NFV 006 [i.2] Release 5 with those in the present document.

Table A-1 defines the mapping and correspondences of constructs.

**Table A-1: Constructs mapping**

NFV-MANO construct	Telco Cloud construct	Comment
VNF	TCA	Conceptually VNFs and TCAs refer to the same thing, deployment and management application software running in the Telco Cloud.
VNFC	TCAC	Both terms are used to characterize the minimum deployment unit that can be managed, irrelevant of the deployment environment (VMs, OS containers etc).
PNF	TAP	The concept is the same.
VNF package	TCA package	In both cases the TCA Package and the VNF package contain all the required files and metadata and descriptors required to validate and instantiate an application on the Telco Cloud.
VNFD	TCAD	In general, a descriptor is used to describe the infrastructure resource requirements, deployment constraints, dependencies, and the operational behaviour, including lifecycle events related to a managed object. The TCAD provides a separation between declarative targets for the TCAs and the management of the data to reconcile into an actual TCA object.
VL	TCL	The concept is the same.
VNFFG	TCCG	A TCCG can be mapped to the set of VLS that build networking topology of an NS instance. In TCCG there are no forwarding paths defined.
Virtualised resource, physical resource, CIS cluster, MCCO, MCIO	TCI resource	A TCI resource can be mapped to either managed objects of virtual resource, physical resource, CIS cluster, MCCO and MCIO.
NFVI-PoP	TCI-PoP	The concept is the same.

Table A-2 defines the mapping and correspondence between the management functions and functional blocks specified in the legacy NFV architecture to the functions defined in the present document.

**Table A-2: Management functions/functional blocks mapping**

NFV-MANO functional entity	Telco Cloud function	Description
VNFM	TCA-LCM	Similar functionality is expected as provided by the VNFM.
VNFM or VNF Generic OAM Functions	TCA-TM	Similar functionality is expected as provided by the VNFM or VNF Generic OAM Functions defined in ETSI GS NFV-IFA 049 [i.3].
VNFM or VNF Generic OAM Functions	TCA-CM	Similar functionality is expected as provided by the VNFM or VNF Generic OAM Functions defined in ETSI GS NFV-IFA 049 [i.3] when it comes to the configuration of VNFs.
NFVO, PSR	TCP-RM	Similar functionality is expected as provided by the PSR or VNF package management provided by the NFVO.
PIM, CCM, WIM, CISM, VIM	TCI-LCM	Similar functionality is expected as provided by the PIM, CCM, WIM, CISM, VIM.
CIR	TCI-RM	Similar functionality is expected as provided by the CIR.
VNF Generic OAM Functions, PIM, WIM, CISM, VIM	TCI-TM	Similar functionality is expected as provided by VNF Generic OAM Functions defined in ETSI GS NFV-IFA 049 [i.3], the PIM, CCM, WIM, CISM and VIM.
NFV-MDAF	TC-MDAF	Similar functionality is expected as provided by the NFV-MDAF.
IM	TC-IntM	Similar functionality is expected as provided by the Intent Management.
CMF	TC-CMF	Similar functionality is expected as provided by the CMF.

NOTE: Mappings on the interface level between the NFV-MANO and Telco Cloud are not specified in this version of the present document.

## Annex B (informative): Change history

Date	Version	Information about changes
September 2025	0.0.1	Initial draft with skeleton and scope.
October 2025	0.1.0	Copy the content of NFV006ed611 GS draft v6.0.6 to respective clauses of the present document (in NFVIFA(25)000239).
October 2025	0.2.0	Incorporates approved contributions: <ul style="list-style-type: none"> <li>NFVIFA(25)000211r1_FEAT39_NFV006ed611_Refining_the_organization_of_functions_clause</li> <li>NFVIFA(25)000241r1_FEAT39_NFV00xed611_Mapping_CCM_functionality_and_managed_objetscs</li> <li>NFVIFA(25)000242r1_FEAT39_NFV00xed611_Editor_s_note_resolution_related_to_Repository_Management</li> <li>NFVIFA(25)000243r1_FEAT39_NFV00xed611_4.5.14_Editor's_note_resolution</li> <li>NFVIFA(25)000244_FEAT39_NFV00xed611_Editor's_note_resolution_related_to_Telemetry_Management_and_Configuration_Management</li> <li>NFVIFA(25)000245_FEAT39_NFV00xed611_Editor's_note_resolution_related_to_IFA010_requirement_reference</li> <li>NFVIFA(25)000246r1_FEAT39_NFV00xed611_4.2.5_Editor's_note_resolution</li> <li>NFVIFA(25)000252_FEAT39_NFV00xed611_Removal_of_NFV_service_interfaces</li> <li>NFVIFA(25)000254_FEAT39_NFV00xed611_4.7.6_Editor's_note_resolution</li> <li>NFVIFA(25)000255r1_FEAT39_NFV00xed611_4.4.1_Editor's_note_resolution</li> <li>NFVIFA(25)000256_FEAT39_NFV00xed611_4.5.4_Editor's_note_resolution</li> </ul>
October 2025	0.3.0	Incorporates approved contributions: <ul style="list-style-type: none"> <li>NFVIFA(25)000266r2_FEAT39_NFV00xed611_revisions_and_additions_for_clarification</li> <li>NFVIFA(25)000267_FEAT39_NFV008-1ed611_4.5.18_Editor's_note_resolution</li> <li>NFVIFA(25)000268_FEAT39_NFV008-1ed611_4.2.6_Editor's_note_resolution</li> </ul>
November 2025	0.4.0	Incorporates approved contributions: <ul style="list-style-type: none"> <li>NFVIFA(25)000277r1_FEAT39_NFV008-1ed611_editorial_clean-up</li> <li>NFVIFA(25)000278_FEAT39_NFV008-1ed611_4_2_4_4_6_3_Editor_s_note_resolution</li> <li>NFVIFA(25)000279r2_FEAT39_NFV008-1ed611_technical_clean-up</li> <li>NFVIFA(25)000300r1_FEAT39_NFV008-1_Architecture_figure_update</li> <li>NFVIFA(25)000301r1_FEA39_NFV008-1_Connectivity_graphs</li> </ul>
November 2025	0.5.0	Incorporates approved contributions: <ul style="list-style-type: none"> <li>NFVIFA(25)000284r1_FEAT39_NFV008-1ed611_4_2_4_Editor_s_note_resolution</li> <li>NFVIFA(25)000333r1_FEAT39_NFV008-1ed611_TC_connectivity_description_alignment</li> <li>NFVIFA(25)000336_FEAT39_NFV008-1ed611_editorial_clean-up</li> <li>NFVIFA(25)000337_FEAT39_NFV008-1ed611_MANO_mapping_fixes</li> <li>NFVIFA(25)000344r1_FEAT39_NFV008-1ed611_final_clean-up</li> <li>NFVIFA(25)000345r1_FEAT39_NFV008-1ed611_stable_draft_review_comments</li> </ul>
November 2025	0.6.0	Incorporates approved contributions: <ul style="list-style-type: none"> <li>NFVIFA(25)000354r2_FEAT39_NFV008-1ed611_Clarifying_the_Telco_Cloud_Orchestration's_role</li> </ul>

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## History

<b>Version</b>	<b>Date</b>	<b>Status</b>
V6.1.1	January 2026	Publication