ETSI GR NFV 007 V5.0.1 (2024-01)

Network Functions Virtualisation (NFV);

Release Description;

Release 5

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# Foreword

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

# Modal verbs terminology

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# 1 Scope

The present document describes the NFV Release 5 and in particular its version 5.1.1. It lists and defines the features forming this release and their relation to work items. It also documents the versions of the related published specifications and reports. The present document provides an overview of version 5.1.1 and is intended to help the user as an entry point to ETSI NFV documentation.

Editor’s note: The present version serves as Release description of the Release 5.

# 2 References

## 2.1 Normative references

Normative references are not applicable in the present document.

## 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non‑specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE 1: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI GS NFV 002: "Network Functions Virtualisation (NFV); Architectural Framework".

[i.2] ETSI GR NFV 003: "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".

[i.3] ETSI GR NFV 007 (V4.5.1): "Network Functions Virtualisation (NFV); Release Description; Release 4".

[i.4] void (was Feature tracking: ENH01)

[i.5] void (was Feature tracking: ENH02)

[i.6] void (was ETSI GS NFV-PER 001)

[i.7] void (was ETSI GR NFV-REL 011)

[i.8] void (was ETSI GR NFV-EVE 010)

[i.9] void (was ETSI GR NFV-IFA 034)

[i.10] ETSI GR NFV-TST 006: "Network Functions Virtualisation (NFV); Testing; Report on CICD and DevOps".

NOTE 2: The release description includes tables, figure and lists of documents to define the versions of the documents comprising the release. In these cases the documents are not listed as references in this clause.

[i.11] ETSI GR NFV-SEC 005: "Network Functions Virtualisation (NFV); Trust; Report on Certificate Management"

[i.12] ETSI GS NFV-SOL 002: "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; RESTful protocols specification for the Ve-Vnfm Reference Point"

[i.13] ETSI GS NFV-SOL 003: "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; RESTful protocols specification for the Or-Vnfm Reference Point".

[i.14] ETSI GS NFV-SOL 005: "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; RESTful protocols specification for the Os-Ma-nfvo Reference Point"

[i.15] ETSI GS NFV-SOL 009: "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; RESTful protocols specification for the management of NFV-MANO"

[i.16] ETSI GS NFV-SOL 011: "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; RESTful protocols specification for the Or-Or Reference Point"

[i.17] ETSI GS NFV-SOL 012: "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; RESTful protocols specification for the Policy Management Interface"

[i.18] ETSI GS NFV 006: "Network Functions Virtualisation (NFV); Management and Orchestration; Architectural Framework Specification".

[i.19] ETSI NFV: "[Feature tracking](https://nfvwiki.etsi.org/index.php?title=Feature_Tracking)". (wiki)

NOTE 3: Available at <https://nfvwiki.etsi.org/index.php?title=Feature_Tracking>

# 3 Definition of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms and definitions in ETSI GR NFV 003 [i.2], and the following apply:

**capability:** ability of an item to perform an action under given internal conditions in order to meet some demand

**feature:** functionality which represents added value to the system for a defined set of users

NOTE: A user could be a network operator, service provider, VNF provider, or some other defined actor.

**function:** the abstract concept of a particular piece of functionality in a device, entity or service

**functionality:** sum of actions or any aspect an item can do

NOTE: Functionality can be associated to diverse items, including devices, entities, services and/or features.

**release:** set of deliverables that specify a well-defined, stable and internally consistent set of functions

NOTE: A Release differs from the previous Release by having added and/or improved functionality introduced as a result of standardization work.

**release definition:** ensemble of Features of a particular Release

**release description:** description of specification outputs delivered by the Release

## 3.2 Symbols

None.

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations in ETSI GR NFV 003 [i.2], and the following apply:

GR Group Report

GS Group Specification

ISG Industry Specification Group

# 4 Release overview

## 4.1 Introduction

ETSI ISG NFV Release 5 (hereinafter referred also as Release 5 or the present Release) builds on top and leverages the results of ETS ISG NFV documents published as part of the Release 4. The Release 5 introduces new features on top of the specified capabilities and features in previous Releases and continues features not completed in Release 4.

A high-level description of the main outcomes of the Release 5 are provided in clause 5. A high-level definition for each of the features which are considered during the development of current Release 5 work is also provided in Annex C. Clause 4.2 provides a statistical summary of the Release 5 in terms of number of specifications and reports published to date. Clause 4.3 summarizes the capabilities and features that have been specified in past Releases and clause 4.4 summarizes the specification work state at each of the specification stages. Clause 6 lists the published GR and GS comprising Release 5.

## 4.2 Overview

At the time the present Description document version is delivered, the Release 5 is comprised of the following number of published deliverables:

* x Group Specifications, among which:
* x new specifications.
* x specifications evolved from earlier Releases.
* x Group Reports, among which:
* x new reports.
* x report evolved from earlier Releases.

## 4.3 Summary of past Releases

Editor’s note: Release 4 Summary to be provided.

ETSI GR NFV 007 V4.5.1 [i.3] provides details about the capabilities that had been specified in the Release 4.

## 4.4 Specification work state

Table 4.4-1 summarizes the status of the specification work at different stages. Annex B describes the meaning of the "state" of the specification work.

Table 4.4-1: Specification work state within the present Release

| Stage | Meaning | State | Additional notes |
| --- | --- | --- | --- |
| Informative (stage 0) | Informative work within a Release used to study new use cases and technical features. | Ongoing | None |
| Stage 1/2 | Normative work:  Service and business requirements  Architecture, interfaces and information models. | Open | None |
| Stage 3 | Normative work on protocols and data models.  Informative work on studying potential profiling of existing solutions. | Open | None |
| Stage 4 | Normative work on testing specifications for protocols and data models. | Open | None |

# 5 Release 5 features

## 5.1 Overview

The features introduced as part of the Release 5 are listed in Table 5.1-1.

Table 5.1-1: Release 5 features

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **FEAT Id** | **Title** | **History** | **Studies etc.** | **Stage 2 status** | **Stage 3 status** |
| FEAT19a | Enhanced container networking | Extended from Release 4 | IFA043 | started |  |
| FEAT19b | NFV-Connect - connectivity integration and operationalization | Carry over from Release 4 | IFA035 | started |  |
| FEAT20 | Auto | Main parts in Release 4 | IFA041, IFA047, IFA050 | Stage 2 parts completed in Release 4 |  |
| FEAT21 | 5G | Main parts in Release 4 | IFA037 | started |  |
| FEAT22 | M-Tenant | Carry over from Release 4 | EVE018 | not yet started |  |
| FEAT24 | VNF generic management functions | Extended from Release 4 | EVE019, IFA049 | started |  |
| FEAT26 | Policy Management Models | Extended from Release 4 | IFA042, IFA048 | Stage 2 parts completed in Release 4 |  |
| FEAT27 | NFV for vRAN | New | IFA046 | started |  |
| FEAT29 | Green NFV | New | EVE021 | started |  |
| FEAT30 | VNF configuration | New | EVE022 | started |  |
| FEAT31 | Flexible VNF deployment | New, see note. | IFA044 | started |  |
| FEAT33 | Physical Infrastructure Management | New | - | ongoing |  |
| FEAT35 | VNF management gaps with Open Source | New | IFA051 | ongoing |  |
| NOTE: The feature was planned newly in Release 5, some parts were already published in Release 4. | | | | | |

Table 5.1-2 lists the Release 5 enhancement features (specific technical or security enhancements).

Table 5.1-2: Release 5 enhancement features

|  |  |  |  |
| --- | --- | --- | --- |
| **Feature name** | **ENH id** | **Stage 2 status** | **Stage 3 status** |
|  |  |  |  |

Table 5.1-3 lists the Release 5 security features.

Table 5.1-3: Release 5 security features

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **FEAT Id** | **Title** | **History** | **Studies etc.** | **Stage 2 status** | **Stage 3 status** |
| ENH01.01 | Security Enhancements | Extended from Release 4 | IFA026, IFA033 | started |  |

Several features are delivered in multiple packages (also known as drops or editions). The following clauses describe the features and content provided in various drops. The present document describes up to edition 5.1.1; planning for later drops is also provided.

## 5.2 Functional features

### 5.2.1 FEAT19a: Network connectivity integration and operationalization for NFV - container networking (NFV-Connect-container)

Editor’s note: Feature Prime: Manchang Ju

#### 5.2.1.1 Description

The feature enhances the NFV architectural framework to provide support for multiple networks connectivity for OS container-based VNF.

More precisely, the feature enhances the NFV descriptors and NFV-MANO functional blocks/functions and exposed interfaces to enable the management of secondary container cluster networks, and connectivity of OS container-based VNF to such networks.

The feature is a continuation and evolution of FEAT19 on "Network connectivity integration and operationalization for NFV".

NOTE: This work has been started as ETSI GR NFV-IFA 038.

#### 5.2.1.2 Architecture scope

The feature concerns the following main functional blocks and references points:

- Functional blocks and functions: NFVO, VNFM, CISM, CCM.

- Reference points and interfaces: Os-Ma-nfvo, Or-Vnfm, CISM service interfaces, CCM service interfaces.

- Artefacts: VNFD.

#### 5.2.1.3 Documentation results in Release 4

The feature has been specified in the specifications and reports listed in table 5.2.1.3-1. Refer to clause 6 for the latest version available of the referred documents.

Table 5.2.1.3-1: Documentation results Release 4 of feature "Network connectivity integration and operationalization for NFV - container networking"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GR NFV-IFA 038 | Info | Report on network connectivity for container based VNF. |
| ETSI GS NFV-IFA 010 | Stages 1 and 2 | Functional requirements for the NFVO to support requesting the creation of secondary container cluster network management and providing information about such networks in VNF LCM procedures to the VNFM.  Functional requirements for the VNFM to support processing resource requirements related to network resources for secondary container cluster networks. Functional requirements for the VNFM to support requesting attachment of groups of one or more OS containers of container-based VNF to secondary container cluster networks.  Functional requirements for the CISM to support the capabilities to management the attachment to secondary container cluster networks. |
| ETSI GS NFV-IFA 007 | Stage 2 | Additional attributes in VNF Lifecycle Management interface to signal information about network attachment definition resources used to signal the attachment to secondary container cluster networks, and exposure of relevant runtime information. |
| ETSI GS NFV-IFA 008 | Stage 2 | Additional attributes in VNF Lifecycle Management interface to signal information about network attachment definition resources used to signal the attachment to secondary container cluster networks, and exposure of relevant runtime information. |
| ETSI GS NFV-IFA 040 | Stage 2 | Add secondary networks. |
| ETSI GS NFV-SOL 002 | Stage 3 | Additional data type attributes in VNF Lifecycle Management API to signal information about network attachment definition resources used to signal the attachment to secondary container cluster networks, and exposure of relevant runtime information. |
| ETSI GS NFV-SOL 003 | Stage 3 | Additional data type attributes in VNF Lifecycle Management API to signal information about network attachment definition resources used to signal the attachment to secondary container cluster networks, and exposure of relevant runtime information. |
| ETSI GS NFV-SOL 018 | Stage 3 | Add secondary networks. |

#### 5.2.1.4 Parts carried over to Release 5

The feature was not completed in Release 4. The following parts of the feature are carried over to Release 5:

- Analyse complex telecom specific use cases and solution for container networking, and profile open source container solutions.

- Enhance multiple network support and add more automation into container network management.

- Specify enhancements to support network policies for container networking.

#### 5.2.1.5 Documentation result in Release 5

The feature has been specified in the specifications and reports listed in table 5.2.1.5-1. Refer to clause 6 for the latest version available of the referred documents.

Table 5.2.1.5-1: Documentation results Release 5 of feature "Network connectivity integration and operationalization for NFV - container networking"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GR NFV-IFA 043 | Info  V5.1.1 work ongoing | Report on enhanced container networking |

### 5.2.2 FEAT19b: NFV-Connect - connectivity integration and operationalization (NFV-Connect-container)

Editor’s note: Feature Prime: Hammad Zafar

#### 5.2.2.1 Description

The feature covers the following areas:

* A “flatter” networking to remove complex L1 and L2 network layering dependencies for the network functions.
* Exposure of high-performance overlay network capabilities to network functions.
* Support of dynamic routing capabilities in the network.
* Enable more dynamic network provisioning and reconfiguration “end-to-end”, within and across sites.
* Minimize manual intervention for network provisioning, while increasing automation.

#### 5.2.2.2 Architecture scope

The feature concerns the following main functional blocks and references points:

- Functional blocks and functions: VIM, WIM, PIM (not yet a function).

- Reference points and interfaces: Or-Wi, Or-Vi, Vi-Vnfm.

- Artefacts: VNFD.

#### 5.2.2.3 Documentation result in Release 5

The feature has been specified in the specifications and reports listed in table 5.2.2.3-1. Refer to clause 6 for the latest version available of the referred documents.

Table 5.2.2.3-1: Documentation results of feature "Network connectivity integration and operationalization for NFV - container networking"

| Document Id. | Stage | Description of the feature result |
| --- | --- | --- |
| ETSI GR NFV-IFA 035 | Info  V5.1.1 | Report on network connectivity integration and operationalization for NFV |
| ETSI GS NFV-IFA 010 | Stage 2  V5.1.1 (work ongoing) | Add functional requirements for the NFV architectural framework to support the capabilities regarding network connectivity and integration according to recommendations derived in ETSI GR NFV-IFA 035 V5.1.1. |
| ETSI GS NFV-IFA 006 | Stage 2  V5.1.1 (work ongoing) | Add enhancements in the relevant interfaces and information elements based on the gaps identified in ETSI GR NFV-IFA 035 V5.1.1. |
| ETSI GS NFV-IFA 005 | Stage 2  V5.1.1 (work ongoing) | Add enhancements in the relevant interfaces and information elements based on the gaps identified in ETSI GR NFV-IFA 035 V5.1.1. |
| ETSI GS NFV-IFA 032 | Stage 2  V5.1.1 (work ongoing) | Add enhancements in the relevant interfaces and information elements based on the gaps identified in ETSI GR NFV-IFA 035 V5.1.1. |
| ETSI GS NFV-IFA 011 | Stage 2  V5.1.1  (work ongoing) | Enhance NFV descriptors to carry information related to networking management based on the gaps identified in ETSI GR NFV-IFA 035 V5.1.1. |
| ETSI GS NFV-SOL 014 | Stage 3  V5.1.1  (planned) |  |

### 5.2.3 FEAT20: NFV-MANO automation and autonomous networks (Auto)

Editor’s note: Feature Prime: Haitao Xia

#### 5.2.3.1 Description

The scope of the feature covers the following areas:

- NFV-MANO support for managing autonomous networks.

- Enabling higher level of automation for NFV-MANO.

- Intent-based principles for external exposure network services management.

#### 5.2.3.2 Architecture scope

The feature concerns the following main functional blocks (or functions) and service interfaces:

- Functional blocks and functions: NFVO, MDAF (new), Intent Management (new).

- Service interfaces: MDAF service interfaces, Intent Management service interfaces.

#### 5.2.3.3 Documentation results in Release 4

The feature has been specified in the specifications and reports listed in table 5.2.3.3-1. Refer to clause 6 for the latest version available of the referred documents.

Table 5.2.3.3-1: Documentation results Release 4 of feature "NFV-MANO automation and autonomous networks"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GS NFV-IFA 010 | Stages 1 and 2 | Add functional requirements for the MDAF and the Intent Management.  Add functional requirements for the NFVO, related to MDAF and Intent Management. |
| ETSI GS NFV-IFA 047 | Stage 2 | Specify the service requirements for the Management Data Analytics (MDA) Function (MDAF), corresponding service interfaces produced by the MDAF, and related information elements. |
| ETSI GS NFV-IFA 050 | Stage 2 | Specify the intent management service interface, including interface requirements, service requirements, operations and their associated information model. Specify the information model of intents which is specific to NFV-MANO domain. |
| ETSI GS NFV-SOL 009 | Stage 3 | Add MDAF into NFV-MANO mgmt interfaces |

#### 5.2.3.4 Parts carried over to Release 5

The feature was not completed in Release 4. Stage 2 was completed; main part of stage 3 is provided in Release 5.

#### 5.2.3.5 Documentation result in Release 5

The feature has been specified in the specifications and reports listed in table 5.2.3.5-1. Refer to clause 6 for the latest version available of the referred documents.

**Table 5.2.3.5-1: Documentation results Release 5 of feature "NFV-MANO automation and autonomous networks"**

|  |  |  |
| --- | --- | --- |
| **Document Id.** | **Stage** | **Description of the feature result** |
| ETSI GS NFV-SOL 021 | Stage 3  ongoing | a RESTful protocol and data model specification fulfilling the requirements specified in the ETSI GS NFV-IFA 050 for the intent management service interface integrated with NFV-MANO framework. |

### 5.2.4 FEAT21: NFV enhancements for 5G (5GNFV)

Editor’s note: Feature Prime: Joan Triay

#### 5.2.4.1 Description

The feature enhances the NFV architectural framework to further support 5G network deployments.

The feature comprises several types of enhancements including:

- Enhancements to the NSD processing and flexible handling of NS constituents (e.g. version dependencies) to support the deployment and continuous update of 5G services delivered by constituent VNFs.

- PaaS Services management.

- Various enhancements on interfaces and descriptors related to networking aspects.

#### 5.2.4.2 Architecture scope

The feature concerns the following main functional blocks and references points:

- Functional blocks and functions: NFVO, VNFM, PSM and PSR, and VNF generic OAM/PaaS framework.

- Reference points and interfaces: Os-Ma-nfvo, Or-Vnfm, and NB-M, NB-F, SB-V, SB-F of the VNF generic OAM/PaaS framework.

- Artefacts: NSD, VNFD.

#### 5.2.4.3 Documentation results in Release 4

The feature has been specified in the specifications and reports listed in table 5.2.4.3-1. Refer to clause 6 for the latest version available of the referred documents.

Table 5.2.4.3-1: Documentation results Release 4 of feature "NFV enhancements for 5G"

| Document Id. | Stage | Description of the feature result |
| --- | --- | --- |
| ETSI GS NFV-IFA 010 | Stages 1 and 2 | Functional requirements for the NFVO to process and maintain information about version dependencies in NSD constituents.  Functional requirements for the PaaS Service Management, the PaaS Services Repository and related Functional requirements for the NFVO and VNFM. |
| ETSI GS NFV-IFA 007 | Stage 2 | Extensions to the granting interface to support PaaS Service assignments. Enhancement of the related interface and information model specification, including runtime information.  Extensions for the modelling to support domain naming. |
| ETSI GS NFV-IFA 008 | Stage 2 | Extensions to the runtime information of PaaS Services used by the VNF.  Extensions for the modelling to support domain naming. |
| ETSI GS NFV-IFA 011 | Stage 2 | Extensions to the VNFD for the modeling of the PaaS Service requests.  Extensions for the modelling to support domain naming. |
| ETSI GS NFV-IFA 013 | Stage 2 | Extensions to the NS Lifecycle Management interface to support the provisioning and handling of versions dependencies between NSD constituents. Enhancement of the related interface and information model specification, including runtime information.  Extensions to the runtime information elements to model PaaS Services used by the NS and VNF instances.  Extensions to the modelling to support domain naming, information about external L2 networks, and further qualifying location constraints. |
| ETSI GS NFV-IFA 014 | Stage 2 | Extensions to the NSD information modelling to support the indication of version dependencies between NSD constituents and information to determine the constraints of onboarding of packaging associated to the constituents.  Extensions to the NSD information modelling to support PaaS Services.  Extensions to the NSD information modelling to support additional VL capabilities. |
| ETSI GS NFV-SOL 001 | Stage 3 | Extensions with new properties in datatypes and node types of the NSD data model to support the indication of version dependencies between NSD constituents and information to determine the constraints of onboarding of packaging associated to the constituents.  VNFD PaaS Service modeling refinements  NSD modelling to use PaaS Services |
| ETSI GS NFV-SOL 002 | Stage 3 | New attributes on NS Lifecycle Management API |
| ETSI GS NFV-SOL 003 | Stage 3 | New attributes on NS Lifecycle Management API and granting, modified semantics and permitted attribute values. |
| ETSI GS NFV-SOL 005 | Stage 3 | Extensions to the NS Lifecycle Management API to support the provisioning and handling of versions dependencies between NSD constituents. Enhancement of the related interface and information model specification, including runtime information.  New attributes on NS Lifecycle Management API. |
| ETSI GS NFV-SOL 016 | Stage 3 | Addition of PaaS |

#### 5.2.4.4 Parts carried over to Release 5

The feature was not completed in Release 4. The following parts of the feature are carried over to Release 5:

* PaaS Services management service interface requirement and interface specification.
* PaaS Services descriptors.
* Some enhancements on interfaces and descriptors related to networking aspects, e.g., connection points lifecycle management, and aspects related to resources sharing.

#### 5.2.4.5 Documentation result in Release 5

Editor’s note: Specification still in progress can optionally be listed with a note that this is in progress.

### 5.2.5 FEAT22: Multi-tenancy enhancements for NFV-MANO (M-Tenant)

Editor’s note: Feature Prime: Ulrich Kleber

#### 5.2.5.1 Description

The scope of the feature covers the following areas:

- Multi-tenancy technology to share IT resources securely among multiple tenants that use the cloud.

- Virtualization-based features as a means to isolate tenants.

- Association/disassociation of tenancy and NFV-MANO objects.

- Definition of isolation expectations of tenants

- Management of tenants

#### 5.2.5.2 Architecture scope

The feature concerns the following main functional blocks and references points:

- Functional blocks and functions: all

- Reference points and interfaces: all

#### 5.2.5.3 Documentation result in Release 5

The feature has been specified in the specifications and reports listed in table 5.2.5.5-1. Refer to clause 6 for the latest version available of the referred documents.

Table 5.2.5.5-1: Documentation results of feature "Multi-tenancy enhancements for NFV-MANO"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GR NFV-EVE 18 | work ongoing on V5.1.1 | Report on Multi-tenancy in NFV |

### 5.2.6 FEAT24: VNF generic management functions (VNF-OAM)

Editor’s note: Feature prime: Kostas Katsalis

#### 5.2.6.1 Description

The feature analyses and defines the type of OAM functions for VNFs that can be generalized and be provided as a "generic function" supporting the provisioning, connectivity, configuration, testing and monitoring of VNFs on a virtualized platform.

The feature also enhances the NFV architectural framework to further support VNF Generic OAM functions. Interactions with other NFV-MANO entities like MDAF are also delineated.

The feature also determines possible solutions to realize such generic OAM functions, e.g. by leveraging PaaS capabilities, the interfaces exposed by the VNF generic OAM functions and the relevant information elements.

The result includes, if necessary, recommendations for requirements and architectural enhancements to support PaaS Services management.

#### 5.2.6.2 Architecture scope

The feature concerns interactions between VNF generic OAM functions and other Paas Services with the main functional blocks and references points:

- Functional blocks and functions: NFV-MANO, OSS/BSS and NFVI.

- Artefacts: PSD, VNFD and NSD (via PaaS Services enhancements of FEAT21).

#### 5.2.6.3 Documentation results in Release 4

The feature has been specified in the specifications and reports listed in table 5.2.6.3-1.

Table 5.2.6.3-1: Documentation results Release 4 of feature "VNF Generic OAM functions"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GR NFV-EVE 019 | Info  ongoing work in V5.1.1  Old:  V4.1.1 | Network Functions Virtualisation (NFV) Release 5;  Architectural Framework;  Report on VNF generic OAM functions |
| ETSI GS NFV-IFA 049 | Stage 2  ongoing work in V5.1.1  Old:  V4.4.1 | Definition of interfaces and information elements, description of the VNF generic OAM functions architectural model. |

#### 5.2.6.4 Parts carried over to Release 5

The feature was not completed in Release 4. The following parts of the feature are carried over to Release 5:

- Relationship between VNF generic OAM functions and MDAF

- Notfications management for VNF generic OAM functions

The stage 3 specification is to be developed as part of the Release 5.

#### 5.2.6.5 Documentation result in Release 5

The feature has been specified in the specifications and reports listed in table 5.2.6.5-1.

Table 5.2.6.5-1: Documentation results Release 5 of feature "VNF Generic OAM functions"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GR NFV-EVE 019 | Info  V5.1.1  Old:  V4.1.1 | Report on VNF generic OAM functions |
| ETSI GS NFV-IFA 049 | Stage 2  Ongoing work in V5.1.1 | Specifes functional requirements and interfaces of new VNF generic OAM functions like “Testing manager”, “Policy agent”, “Notifications manager”, and enhancements to support service mesh connectivity. |

### 5.2.7 FEAT26: Policy management models (Policy-model)

Editor’s note: Feature Prime: Lingli Deng, Feature proposal in NFV(20)000143

#### 5.2.7.1 Description

The feature defines the models necessary for policy management, while the architectural enhancements for the introduction of the policy framework and the specification of a policy engine, with its procedures, interfaces and handling of the input events, goals and output/actions is not in scope of this feature.

The scope of the feature covers the following areas:

- Analyse existing policy information and data models and identify solutions that potentially could be applied to NFV-MANO.

- Clarify the main alternative for policy management (between NFV-MANO and OSS/BSS).

- Determine the objectives and management alternatives for policy management applicable to NFV-MANO.

- Identify policy expression information model applicable to NFV-MANO.

- Identify policy expression data model applicable to NFV-MANO.

#### 5.2.7.2 Architecture scope

The feature does not introduce architectural changes. The main functional block affected by the feature is the NFVO.

#### 5.2.7.3 Documentation results in Release 4

The feature has been specified in the specifications and reports listed in table 5.2.7.3-1. Refer to clause 6 for the latest version available of the referred documents.

Table 5.2.7.3-1: Documentation results Release 4 of feature "NFV enhancements for 5G"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GS NFV-IFA 048 | Stage 2 | Specifies the structure and content of the NFV-MANO policy information model |
| ETSI GS NFV-IFA 005 | Stage 2 | Specifies enhancements according to the policy information model |
| ETSI GS NFV-IFA 006 | Stage 2 | Specifies enhancements according to the policy information model |
| ETSI GS NFV-IFA 007 | Stage 2 | Specifies enhancements according to the policy information model |
| ETSI GS NFV-IFA 008 | Stage 2 | Specifies enhancements according to the policy information model |
| ETSI GS NFV-IFA 013 | Stage 2 | Specifies enhancements according to the policy information model |
| ETSI GS NFV-SOL 012 | Stage 3 | Specifies the structure and content of the NFV-MANO policy information model |

#### 5.2.7.4 Parts carried over to Release 5

The feature was not completed in Release 4. Stage 2 was completed; main part of stage 3 is provided in Release 5. Specification of additional alarms can take place in future releases too.

#### 5.2.7.5 Documentation result in Release 5

Editor’s note: Specification still in progress can optionally be listed with a note that this is in progress.

### 5.2.8 FEAT27: NFV for vRAN

#### 5.2.8.1 Description

The scope of this feature covers the following areas:

* study the advances concerning the virtualization of the RAN and profile the NFV framework to determine how it can support virtualized RAN (vRAN) use cases,
* identify key technical challenges relevant to architectural, operational and management aspects, in case the NFV architectural framework is leveraged to support virtualization of the RAN,
* provide recommendations for enhancements to the NFV architectural framework and its functionality, aiming to provide further support for vRAN use cases,
* based on the recommendations, enhance when needed the overall NFV-MANO framework, existing NFV-MANO interfaces and descriptors.

#### 5.2.8.2 Architecture scope

The feature investigates profling of NFV-MANO to the architecture defined by the O-RAN Alliance. It also considers physical infrastructure management aspects for NFV-MANO.

#### 5.2.8.3 Documentation result in Release 5

The feature has been specified in the specifications and reports listed in table 5.2.8.3-1. Refer to clause 6 for the latest version available of the referred documents.

Table 5.2.8.3-1: Documentation results of feature "NFV for vRAN"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GR NFV-IFA 046 | Info  V5.1.1 | Report on NFV support for virtualisation of RAN |

### 5.2.9 FEAT29: Green NFV

Editor’s note: Feature Prime: Joan Triay, Feature proposal in NFV(21)000137r3

#### 5.2.9.1 Description

The scope of the feature covers the following areas:

* Analyse aspects of NFV (VNF design, NFV-MANO and VNF operation, deployment configuration of NFV-MANO, NFVI, etc.) that have impact on energy consumption and those that can enable smart energy NFV and power saving features.
* Identify design guidelines needed for optimizing energy consumption.
* Specify enhancements to specifications on interfaces and information model, augment exposed KPIs and metrics to enable resources orchestration and VNF/NS LCM to operate following power saving policies.

#### 5.2.9.2 Architecture scope

No new architectural elements are foreseen.

#### 5.2.9.3 Documentation result in Release 5

Editor’s note: Specification still in progress can optionally be listed with a note that this is in progress.

The feature has been specified in the specifications and reports listed in table 5.2.9.3-1. Refer to clause 6 for the latest version available of the referred documents.

Table 5.2.9.3-1: Documentation results of feature "Green NFV"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GR NFV-EVE 021 | Info  V5.1.1 | Report on energy efficiency aspects for NFV |

### 5.2.10 FEAT30: VNF configuration

Editor’s note: Feature Prime: Bruno Chatras, Joan Triay, Feature proposal in NFV(21)000138r1.

#### 5.2.10.1 Description

The scope of this feature covers the following areas:

* Provide guidelines on the use of the configuration options available in the NFV framework and the types of configuration data applicable to each of these options.
* Specify related enhancements to the set of ETSI NFV specifications needed to improve interoperability between VNFs and independently-developed VNF configuration management functions and further facilitate automation of VNF configuration.

#### 5.2.10.2 Architecture scope

Editor’s Note: A generic Configuration Server PaaS Service function as described in ETSI GR NFV-EVE 022 might be added.

#### 5.2.10.3 Documentation result in Release 5

Editor’s note: Specification still in progress can optionally be listed with a note that this is in progress.

The feature has been specified in the specifications and reports listed in table 5.2.10.3-1. Refer to clause 6 for the latest version available of the referred documents.

Table 5.2.10.3-1: Documentation results of feature "VNF configuration"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GR NFV-EVE 022 | Info  V5.1.1 | Report on VNF configuration |

### 5.2.11 FEAT31: Flexible VNF deployment

Editor’s note: Feature Prime: Arturo Martin de Nicolas, Feature proposal in NFV(21)000139r1.

#### 5.2.11.1 Description

The feature has two parts: deployable modules and dynamic capacity.

The feature was planned for Release 5, but the deployable modules part was added late to Release 4.

The dynamic capacity part of the FEAT 31 Flexible VNF deployment introduces support for parameterizing the VDU attributes related to capacity in the interfaces.

Dynamic capacity allows the VNF vendor to define which VDU attributes related to capacity can be configured in run time as well as providing a range of valid values, and the service provider to decide at deployment time the values for those attributes, as well as modifying the values during the life time of the VNF instance, i.e. to perform a vertical scaling operation.

#### 5.2.11.2 Architecture scope

The feature concerns the following main functional blocks and references points:

- Functional blocks and functions: NFVO, VNFM.

- Reference points and interfaces: Os-Ma-nfvo, Or-Vnfm, Ve-Vnfm.

- Artefacts: NSD, VNFD.

NOTE: All changes related to Os-Ma-nfvo reference point were completed in Release 4.

#### 5.2.11.3 Documentation Results in Release 4

The feature has been specified in the specifications and reports listed in table 5.2.11.3-1. Refer to clause 6 for the latest version available of the referred documents.

**Table 5.2.11.3-1: Documentation results Release 4 of feature “Flexible VNF deployment”**

| **Document Id.** | **Stage** | **Description of the feature result** |
| --- | --- | --- |
| ETSI GR NFV-IFA 044 | Info  V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Report on Flexible VNF Deployment |
| ETSI GS NFV-IFA 010 | Stage 1 and 2 | Functional requirements for the support of vertical scaling added to the VNFM during VNF lifecycle management. |
| ETSI GS NFV-IFA 007 | Stage 2 | Extensions of the instantiate VNF, change VNF DF, change current VNF package, scale VNF operations and grant request to support indication of values for capacity related VDU attributes. |
| ETSI GS NFV-IFA 008 | Stage 2 | Extensions of the instantiate VNF, change VNF DF, change current VNF package and scale VNF operations to support indication of values for capacity related VDU attributes.. |
| ETSI GS NFV-IFA 011 | Stage 2 | Extensions of the VDU descriptors to support the marking of attributes related to capacity that can be configured in run time and the specification of valid values. |
| ETSI GS NFV-IFA 013 | Stage 2 | Extensions of modelling and LCM operations to values for capacity related VDU attributes. |
| ETSI GS NFV-IFA 014 | Stage 2 | Extensions of the VNF profile to support further control for the service provider on which attributes can be modified. |
| ETSI GS NFV-SOL 001 | Stage 3 | Extensions of the VDU descriptors to support the marking of attributes related to capacity that can be configured in run time and the specification of valid values. |
| ETSI GS NFV-SOL 002 | Stage 3 | New attributes and data types on LCM interface. |
| ETSI GS NFV-SOL 003 | Stage 3 | New attributes and data types on LCM interface. |
| ETSI GS NFV-SOL 005 | Stage 3 | New attributes and data types on LCM interface. |

#### 5.2.11.4 Parts carried over to Release 5

The deployable modules part of the feature was completed in Release 4. The dynamic capacity part, independent of the deployable modules part, is kept in Release 5, as originally planned.

#### 5.2.11.5 Documentation result in Release 5

The feature has been specified in the specifications and reports listed in table 5.2.11.5-1. Refer to clause 6 for the latest version available of the referred documents.

**Table 5.2.11.5-1: Documentation results Release 5 of feature “Flexible VNF deployment”**

| Document Id. | Stage | Description of the feature result |
| --- | --- | --- |
| ETSI GR NFV-IFA 044 | Info  V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Report on Flexible VNF Deployment |
| ETSI GS NFV-IFA 010 | Stage 1 and 2  V5.1.1  work ongoing | Functional requirements for the support of vertical scaling added to the VNFM during VNF lifecycle management. |
| ETSI GS NFV-IFA 007 | Stage 2  V5.1.1  work ongoing | Extensions of the instantiate VNF, change VNF DF, change current VNF package, scale VNF operations and grant request to support indication of values for capacity related VDU attributes. |
| ETSI GS NFV-IFA 008 | Stage 2  V5.1.1  work ongoing | Extensions of the instantiate VNF, change VNF DF, change current VNF package and scale VNF operations to support indication of values for capacity related VDU attributes.. |
| ETSI GS NFV-IFA 011 | Stage 2  V5.1.1  work ongoing | Extensions of the VDU descriptors to support the marking of attributes related to capacity that can be configured in run time and the specification of valid values. |
| ETSI GS NFV-IFA 014 | Stage 2  V5.1.1  work ongoing | Extensions of the VNF profile to support further control for the service provider on which attributes can be modified. |
| ETSI GS NFV-SOL 001 | Stage 3  V5.1.1  work ongoing | Extensions of the VDU descriptors to support the marking of attributes related to capacity that can be configured in run time and the specification of valid values. |
| ETSI GS NFV-SOL 002 | Stage 3  V5.1.1  work ongoing | New attributes and data types on LCM interface. |
| ETSI GS NFV-SOL 003 | Stage 3  V5.1.1  work ongoing | New attributes and data types on LCM interface. |

### 5.2.12 FEAT33: Physical Infrastructure Management

Editor’s note: Feature Prime: Hammad Zafar

#### 5.2.12.1 Description

The scope of FEAT33 covers the following areas:

* define requirements for physical infrastructure management in the NFV-MANO framework
* provide a common information model for describing hardware attributes and statuses, and specify operations for managing infrastructure hardware with respect to life cycle and FCAPS of physical resources
* profile existing solutions related to hardware management

#### 5.2.12.2 Architecture scope

Architectural analysis is on-going in DGS NFV-IFA 053.

#### 5.2.12.3 Documentation result in Release 5

The feature has been specified in the specifications and reports listed in table 5.2.12-1. Refer to clause 6 for the latest version available of the referred documents.

Table 5.2.12-1: Documentation results of feature "Physical Infrastructure Management"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GS NFV-IFA 053 | work ongoing  V5.1.1 | Requirements and information modelingfor Physical Infrastructure Management |

### 5.2.13 FEAT35: VNF management gaps with Open Source

Editor’s note: Feature prime: Shitao Li.

The feature has been specified in the specifications and reports listed in table 5.2.13-1. Refer to clause 6 for the latest version available of the referred documents.

Table 5.2.13-1: Documentation results of feature "VNF management gaps with Open Source"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GR NFV-IFA 051 | V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Architectural framework;  Report on VNF management gap analysis with open source projects |

## 5.3 Enhancement features

There are currently no enhancement features for Release 5.

## 5.4 Security features

### 5.4.1 ENH01.01: Certificate Management

Editor’s note: Feature Prime: Yuya Kuno

#### 5.4.1.1 Description

The security enhancement provides a capability to support certificate management by introducing CMF (Certificate Management Function) within the NFV MANO architecture and is enhancing the NFV-MANO reference points and functional blocks. CMF enhances "Operator Certificate Enrolment Server" as defined in ETSI GR NFV-SEC 005 [i.11].

#### 5.4.1.2 Architecture scope

The feature concerns the following main functional blocks and references points:

- Functional blocks: Certificate Management Function (CMF), NFVO, VNFM, VIM, CISM.

- Reference points: all,

+ Security reference point Cm-Vnfm for certificate management.

#### 5.4.1.3 Documentation results in Release 4

The feature has been specified in the specifications and reports listed in table 5.4.1.3-1. Refer to clause 6 for the latest version available of the referred documents.

**Table 5.4.1.3-1: Documentation results Release 4 of enhancement feature "Certificate Management"**

|  |  |  |
| --- | --- | --- |
| **Document Id.** | **Stage** | **Description of the feature result** |
| ETSI GS NFV-IFA 006 | Stage 2 | Add modelling for certificate data. |
| ETSI GS NFV-IFA 007 | Stage 2 | Add requirements, parameters and attributes for certificates. |
| ETSI GS NFV-IFA 008 | Stage 2 | Add requirements, parameters and attributes for certificates. |
| ETSI GS NFV-IFA 010 | Stage 2 | Add general requiremens for certificate management |
| ETSI GS NFV-IFA 011 | Stage 2 | Add modelling for certificate data. |
| ETSI GS NFV-IFA 013 | Stage 2 | Add requirements and modelling for certificate management. |
| ETSI GS NFV-IFA 026 | Stage 2 | Add use case and requirements for certificate management. Specify the Certificate Management Architecture, functions and reference points. |
| ETSI GS NFV-IFA 031 | Stage 2 | Add management for the Certificate Management Function. |
| ETSI GS NFV-IFA 033 | Stage 2 | Specify the Certificate Management Function, its requirements, reference points, interfaces and information model. |
| ETSI GS NFV-IFA 040 | Stage 2 | Add note on certificate data in MCIO configurations. |
| ETSI GS NFV-SOL 001 | Stage 3 | Add CertificateDesc  Update mapping table and add CertSubjectData |
| ETSI GS NFV-SOL 002 | Stage 3 | Modified description semantics, new attributes on VNF LCM interface |
| ETSI GS NFV-SOL 003 | Stage 3 | Modified description semantics, new attributes on VNF LCM interface |
| ETSI GS NFV-SOL 005 | Stage 3 | New attributes on VNF and NS Lifecycle Management APIs and NVF config API, modified attribute and description semantics on NS Lifecycle Management APIs. |
| ETSI GS NFV-SOL 009 | Stage 3 | Add certificate mgmgt mode |
| ETSI GS NFV-SOL 014 | Stage 3 | Add certificateData |
| ETSI GS NFV-SOL 016 | Stage 3 | Add of certificate management |

#### 5.4.1.4 Parts carried over to Release 5

The feature was not completed in Release 4. The following parts of the feature are carried over to Release 5:

* usecase of renewal and revoke for certificate management of direct mode/delegation mode.
* MANO certificates specified in IFA026 further specified.

#### 5.4.1.5 Documentation result in Release 5

Editor’s note: Specification still in progress can optionally be listed with a note that this is in progress.

## 5.5 Testing

### 5.5.1 API Conformance Testing

5.5.1.1 Description

Editor’s note: Following text from Release 3 may need update

This test suite provides methodologies and conformance tests including Test Descriptions for NFV implementations with interfaces specified in NFV specifications: ETSI GS NFV-SOL 002 [i.12] for the *Ve-Vnfm* reference point, ETSI GS NFV-SOL 003 [i.13] for the *Or-Vnfm* reference point and ETSI GS NFV‑SOL 005 [i.14] for the *Os‑Ma‑Nfvo* reference point. Furthermore, the following specifications are also supported for conformance: ETSI GS NFV‑SOL 009 [i.15] for the management of NFV-MANO, ETSI GS NFV-SOL 011 [i.16] for the *Or-Or* reference point and ETSI GS NFV-SOL 012 [i.17] for the policy management interface.

5.5.1.2 Architecture scope

The feature concerns the following main functional blocks, references points and artefacts:

* Functional blocks: VNFM, NFVO.
* Reference points: Ve-Vnfm Or-Vnfm, Os-Ma-Nfvo, Or-Or, policy management, NFV-MANO management.
* Artefacts: None.

5.5.1.3 Documentation results

The feature has been specified in the specifications and reports listed in table 5.5.1.3-1. Refer to clause 6 for the latest version available of the referred documents.

**Table 5.5.1.3-1: Documentation results of API Conformance Testing**

|  |  |  |
| --- | --- | --- |
| **Document Id.** | **Stage** | **Description of the feature result** |
| ETSI GS NFV-TST 010 | Stage 4 | API Conformance Testing Specification |

# 6 NFV Release 5 published deliverables

## 6.1 Introduction

The present clause 6 lists the published deliverables (Group Specifications and Group Reports) associated to the Release 5. The NFV Release 5 is comprised of multiple specification and reports, which can be categorized according to different specification stages (stage 1, stage 2, etc.) and compliance (normative or informative).

NOTE: The versions among the different deliverables may differ, e.g. a deliverable may have been updated and published with a newer version due to maintenance, whereas some other deliverable not. The latest available published version of each deliverable is indicated in the following tables.

## 6.2 Group Reports of Release 5

6.2.1 New Group Reports

The new reports associated to the Release 5 are listed in Table 6.2.1-1.

**Table 6.2.1-1: New Group Reports Release 5**

| **Id.** | **Version(s)** | **Title** | **Related feature(s)** |
| --- | --- | --- | --- |
| ETSI GR NFV-EVE 18 | work ongoing on V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Evolution and Ecosystem;  Report on Multi-tenancy in NFV | FEAT22 |
| ETSI GR NFV-EVE 020 | V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Evolution and Ecosystem;  Report on NFV support for Network Function Connectivity eXtensions | No normative provisions in Release 5 |
| ETSI GR NFV-EVE 021 | V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Evolution and Ecosystem;  Report on energy efficiency aspects for NFV | FEAT29 |
| ETSI GR NFV-EVE 022 | V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Architectural Framework;  Report on VNF configuration | FEAT30 |
| ETSI GR NFV-IFA 035 | V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Architectural Framework;  Report on network connectivity integration and operationalization for NFV | FEAT19b |
| ETSI GR NFV-IFA 039 | V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Architectural Framework;  Report on Service Based Architecture (SBA) design | No normative provisions in Release 5 |
| ETSI GR NFV-IFA 043 | work ongoing on V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Architectural Framework;  Report on enhanced container networking | FEAT19a |
| ETSI GR NFV-IFA 044 | V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Report on Flexible VNF Deployment | FEAT31 |
| ETSI GR NFV-IFA 046 | V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Architectural Framework;  Report on NFV support for virtualisation of RAN | FEAT27 |
| ETSI GR NFV-IFA 051 | V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Architectural framework;  Report on VNF management gap analysis with open source projects | FEAT35 |
| ETSI GR NFV-REL 013 | V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Reliability;  Report on cognitive use of operations data for reliability | No normative provisions in Release 5 |
| ETSI GR NFV-REL 014 | V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Reliability;  Report on evaluating reliability for cloud-native VNFs | No normative provisions in Release 5 |

6.2.2 Evolved/propagated Group Reports

The group reports associated to the Release 5 that have been evolved/propagated from a previous Release are listed in table 6.2.2-1.

Table 6.2.2-1: Updated/propagated Group Reports

| **Id.** | **Version(s)** | **Title** | **Related feature(s)** |
| --- | --- | --- | --- |
| ETSI GR NFV-EVE 019 | work ongoing on V5.1.1,  Old:  V4.1.1 | Network Functions Virtualisation (NFV) Release 5;  Architectural Framework;  Report on VNF generic OAM functions | FEAT24 |

## 6.3 Stage 1 and stage 2 Group Specifications of Release 5

### 6.3.1 New Group Specifications

The published new specifications associated to the Release 5 are listed in table 6.3.1-1.

Table 6.3.1-1: Newly published stage 1 and stage 2 Group Specifications

| Id. | Version(s) | Title | Related feature(s) |
| --- | --- | --- | --- |
| ETSI GS NFV-IFA 053 | work ongoing on V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Requirements and interface specification for Physical Infrastructure Management | FEAT27, FEAT29, FEAT33 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

### 6.3.2 Evolved/propagated published deliverables from a previous Release

The published deliverables associated to the Release 5 that have been evolved/propagated from a previous Release are listed in table 6.3.2-1.

Table 6.3.2-1: Published stage 1 and stage 2 deliverables evolved/propagated from a previous Release

| Id. | Version(s) | Title | Related feature(s) |
| --- | --- | --- | --- |
| ETSI GS NFV 006 | not open yet | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Architectural Framework Specification |  |
| ETSI GS NFV-IFA 005 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Or-Vi reference point - Interface and Information Model Specification | FEAT19b, FEAT27, FEAT29 |
| ETSI GS NFV-IFA 006 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Vi-Vnfm reference point - Interface and Information Model Specification | FEAT19b, FEAT27, FEAT29, ENH01.01 |
| ETSI GS NFV-IFA 007 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Or-Vnfm reference point - Interface and Information Model Specification | FEAT29 |
| ETSI GS NFV-IFA 008 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Ve-Vnfm reference point - Interface and Information Model Specification | FEAT29, ENH01.01 |
| ETSI GS NFV-IFA 010 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Functional requirements specification | FEAT24, FEAT27, FEAT29, FEAT30 |
| ETSI GS NFV-IFA 011 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  VNF Descriptor and Packaging Specification | FEAT19b, FEAT27, FEAT29, FEAT30 |
| ETSI GS NFV-IFA 013 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Os-Ma-Nfvo reference point - Interface and Information Model Specification | FEAT29, FEAT30 |
| ETSI GS NFV-IFA 014 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration  Network Service Templates Specification | FEAT27 |
| ETSI GS NFV-IFA 027 | work ongoing on V5.1.1 | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Performance Measurements Specification | FEAT29 |
| ETSI GS NFV-IFA 030 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Multiple Administrative Domain Aspect Interfaces Specification |  |
| ETSI GS NFV-IFA 031 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Requirements and interfaces specification for management of NFV-MANO | FEAT29 |
| ETSI GS NFV-IFA 032 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Interface and Information Model Specification for Multi-Site Connectivity Services | FEAT19b |
| ETSI GS NFV-IFA 036 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Requirements for service interfaces and object model for container cluster management and orchestration specification | FEAT27, FEAT29 |
| ETSI GS NFV-IFA 040 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Requirements for service interfaces and object model for OS container management and orchestration specification | FEAT27, FEAT29 |
| ETSI GS NFV-IFA 045 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5  Management and Orchestration;  Fault and alarms modelling specification |  |
| ETSI GS NFV-IFA 047 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Management data analytics Service Interface and Information Model Specification | FEAT24 |
| ETSI GS NFV-IFA 048 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Policy Information Model Specification | FEAT24, FEAT27, FEAT29, FEAT30 |
| ETSI GS NFV-IFA 049 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Architectural Framework;  VNF generic OAM functions specification |  |
| ETSI GS NFV-IFA 050 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5; Management and Orchestration;  Intent Management Service Interface and Information Model Specification | FEAT27, FEAT29 |
| ETSI GS NFV-IFA 052 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5; Management and Orchestration;  CCM-VIM Interoperability Interface and Information Model Specification |  |
| ETSI GS NFV-REL 015 | work ongoing | Network Functions Virtualisation (NFV) Release 5;  Reliability;  Specification of availability and reliability requirements in NFV automation | FEAT20 |
| NOTE: The specification has been updated into the present Release 5, but without outcomes of specific Release 5 features (e.g., maintenance). | | | |

### 6.3.3 Stage 2 publication packages

As indicated in Annex A of ETSI GR NFV 007 V3.7.1 [i.3], ETSI ISG NFV publishes deliverables in rounds, also referred as "drops" or "packages". Some documents are also not re-published if no technical changes or maintenance are performed. Clause A.3.3 describes guidelines and rules related to version alignments and inter-stage relationships.

The present clause lists the "Packages" of stage 2 deliverables to guide the readers and consumers of the specifications about consistently specified sets of deliverables. In the package tables, the tag "Not republished" applies when a deliverable is not republished with a new version and a previously published version is considered to be part of the package.

## 6.4 Stage 3 Group Specifications

### 6.4.1 New Group Specifications

The published new specifications associated to the Release 5 are listed in table 6.4.1-1.

Table 6.4.1-1: Newly published stage 3 Group Specifications

| Id. | Version(s) | Title | Related feature(s) |
| --- | --- | --- | --- |
| ETSI GS NFV-SOL 021 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Protocols and Data Models  Specification of protocols and data models for Intent Management |  |
| ETSI GS NFV-SOL 022 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5  Protocols and Data Models  Policy descriptor |  |

### 6.4.2 Evolved/propagated published deliverables from a previous Release

The published deliverables associated to the Release 5 that have been evolved/propagated from a previous Release are listed in table 6.4.2-1.

Table 6.4.2-1: Published stage 3 deliverables evolved/propagated from a previous Release

| Id. | Version(s) | Title | Related feature(s) |
| --- | --- | --- | --- |
| ETSI GS NFV-SOL 001 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Protocols and Data Models;  NFV descriptors based on TOSCA specification |  |
| ETSI GS NFV-SOL 002 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 3;  Protocols and Data Models;  RESTful protocols specification for the Ve-Vnfm Reference Point |  |
| ETSI GS NFV-SOL 003 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 3;  Protocols and Data Models;  RESTful protocols specification for the Or-Vnfm Reference Point |  |
| ETSI GS NFV-SOL 004 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 3;  Protocols and Data Models;  VNF Package and PNFD Archive specification |  |
| ETSI GS NFV-SOL 005 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Protocols and Data Models;  RESTful protocols specification for the Os-Ma-nfvo Reference Point |  |
| ETSI GS NFV-SOL 007 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Protocols and Data Models;  Network Service Descriptor File Structure Specification |  |
| ETSI GS NFV-SOL 009 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Protocols and Data Models;  RESTful protocols specification for the management of NFV-MANO |  |
| ETSI GS NFV-SOL 010 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Protocols and Data Models;  VNF Snapshot Package specification |  |
| ETSI GS NFV-SOL 012 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Protocols and Data Models;  RESTful protocols specification for  the Policy Management Interface |  |
| ETSI GS NFV-SOL 013 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Protocols and Data Models;  Specification of common aspects for RESTful NFV MANO APIs |  |
| ETSI GS NFV-SOL 014 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Protocols and Data Models;  YAML data model specification for descriptor-based virtualised resource management |  |
| ETSI GS NFV-SOL 016 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Protocols and Data Models;  NFV-MANO procedures specification |  |
| ETSI GS NFV-SOL 018 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Protocols and Data Models;  Profiling specification of protocol and data model solutions for OS Container management and orchestration |  |
| ETSI GS NFV-SOL 020 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Protocols and Data Models  Specification of protocols and data models for Container Infrastructure Service Cluster Management |  |
| NOTE: The specification has been updated into the present Release 5, but without outcomes of specific Release 5 features (only including e.g. maintenance performed in previous specification versions). | | | |

### 6.4.3 Stage 3 publication packages

As indicated in Annex A of ETSI GR NFV 007 v3.7.1 [i.3], ETSI ISG NFV publishes deliverables in rounds, also referred as "drops" or "packages". Some documents are also not re-published if no technical changes or maintenance are performed. Clause A.3.3 describes guidelines and rules related to version alignments and inter-stage relationships.

The present clause lists the "Packages" of stage 3 deliverables to guide the readers and consumers of the specifications about consistently specified sets of deliverables. In the package tables, the tag "Not republished" applies when a deliverable is not republished with a new version and a previously published version is considered to be part of the package.

## 6.5 Security Specifications

6.5.1 Newly published Security Specifications

The published new security specifications associated to the Release 5 are listed in table 6.5.1-1.

**Table 6.5.1-1: Newly published security specifications**

| Id. | Version(s) | Title | Related feature(s) |
| --- | --- | --- | --- |
| ETSI GS NFV-SEC 023 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Security;  Container Security Specification |  |
| ETSI GS NFV-SEC 029 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Security;  Security Assurance Specification (SCAS) for VIM |  |
| ETSI GS NFV-SEC 030 | V5.1.1 start of work | Network Function Virtualisation (NFV) Release 5;  Security;  Security Assurance Specification (SCAS) for VNFM |  |
| ETSI GS NFV-SEC 031 | V5.1.1 start of work | Network Function Virtualisation (NFV) Release 5;  Security;  Security Assurance Specification (SCAS) for NFVO |  |

6.5.2 Evolved/propagated published Security Specifications

The deliverables associated to the Release 5 that have been evolved/propagated from a previous Release are listed in table 6.5.2-1.

Table 6.5.2-1: Published stage 3 deliverables evolved/propagated from a previous Release

| Id. | Version(s) | Title | Related feature(s) |
| --- | --- | --- | --- |
| ETSI GS NFV-IFA 026 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Security Architecture enhancements for NFV Specification |  |
| ETSI GS NFV-IFA 033 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5;  Management and Orchestration;  Reference points related to Security Manager and Certificate Management Function - Interface and Information Model Specification |  |
| ETSI GS NFV-SEC 028 | V5.1.1 start of work | Network Functions Virtualisation (NFV) Release 5; Security; Security Assurance Specification (SCAS) for Generic NFV-MANO |  |

6.5.3 Release independent Security Specifications

The release independent deliverables relevant for Release 5 are listed in table 6.5.3-1.

Table 6.5.3-1: Release independent Security Specifications

| **Id.** | **Version(s)** | **Title** |
| --- | --- | --- |
| ETSI GS NFV-SEC 001 | V1.1.1 | Network Functions Virtualisation (NFV);  NFV Security; Problem Statement |
| ETSI GS NFV-SEC 002 | V1.1.1 | Network Functions Virtualisation (NFV);  NFV Security;  Cataloguing security features in management software |
| ETSI GS NFV-SEC 003 | V1.2.1 | Network Functions Virtualisation (NFV);  NFV Security;  Security and Trust Guidance |
| ETSI GS NFV-SEC 004 | V1.1.1 | Network Functions Virtualisation (NFV);  NFV Security; Privacy and Regulation;  Report on Lawful Interception Implications |
| ETSI GS NFV-SEC 006 | V1.1.1 | Network Functions Virtualisation (NFV);  Security Guide;  Report on Security Aspects and Regulatory Concerns |
| ETSI GS NFV-SEC 020 | work ongoing | Network Functions Virtualisation (NFV);  Security;  Identity Management and Security Specification |
| ETSI GS NFV-SEC 024 | work ongoing | Network Functions Virtualisation (NFV)  Security;  Security Management Specification |
| ETSI GS NFV-SEC 025 | work ongoing | Network Functions Virtualisation (NFV) ;  Security;  Secure End-to-End VNF and NS management specification |
| ETSI GS NFV-SEC 026 | work ongoing | Network Functions Virtualisation (NFV);  Security;  Isolation and trust domain specification |

Table 6.5.3-2 lists security specifications from earlier releases that are considered valid in Release 5 without change:

Table 6.5.3-2: Other security specifications valid in Release 5

| **Id.** | **Version(s)** | **Title** |
| --- | --- | --- |
| ETSI GS NFV-SEC 012 | V3.1.1 | Network Functions Virtualisation (NFV) Release 3;  Security;  System architecture specification for execution of sensitive NFV components |
| ETSI GS NFV-SEC 013 | V3.1.1 | Network Functions Virtualisation (NFV) Release 3;  Security ;  Security Management and Monitoring specification |
| ETSI GS NFV-SEC 014 | V3.1.1 | Network Functions Virtualisation (NFV) Release 3;  NFV Security;  Security Specification for MANO Components and Reference points |

## 6.6 Testing specifications

The newly published deliverables of Release 5 specifying testing aspects are listed in table 6.4.2-1.

Table 6.6-1: Published deliverables related to testing

| Id. | Version(s) | Title | Related feature(s) |
| --- | --- | --- | --- |
| ETSI GS NFV-TST 010 |  | Network Functions Virtualisation (NFV) Release 5;  Testing;  API Conformance Testing Specification |  |

## 6.7 Other documentation

The release independent documents valid in Release 4 are listed in table 6.7-1.

**Table 6.7-1: Release independent documents**

| **Id.** | **Version(s)** | **Title** | **Description** |
| --- | --- | --- | --- |
| ETSI GR NFV 003 | V1.8.1 | Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV | It includes terminology used across several NFV Releases. As a result, a number of terms and acronyms introduced in Release 4 are added in the newest version. |
| ETSI GS NFV-SOL 015 | V1.2.1 | NFV; Protocols and Data Models; Specification of Patters and Conventions for RESTful NFV-MANO APIs | It defines patterns and conventions for RESTful NFV-MANO API specifications, gives recommendations on API versioning and provides an API specification template. This document is followed by the ETSI NFV when creating RESTful NFV-MANO API specifications. |
| ETSI GR NFV-TST 006 | V1.2.1 | Network Functions Virtualisation (NFV); Testing; Report on CICD and DevOps | It provides guidance and recommendations on how to leverage DevOps and CI/CD techniques. |

Table 6.7-2 lists specifications from earlier releases that are considered valid in Release 5 without change:

Table 6.7-2: Other specifications valid in Release 5

| **Id.** | **Version(s)** | **Title** |
| --- | --- | --- |
| ETSI GS NFV-REL 006 | V3.1.1 | Network Functions Virtualisation (NFV) Release 3; Reliability;  Maintaining Service Availability and Continuity Upon Software Modification |
| ETSI GS NFV-IFA 018 | V3.1.1 | Network Functions Virtualisation (NFV);  Acceleration Technologies;  Network Acceleration Interface Specification; Release 3 |
| ETSI GS NFV-IFA 019 | V3.1.1 | Network Functions Virtualisation (NFV);  Acceleration Technologies;  Acceleration Resource Management Interface Specification; Release 3 |

## 6.8 Map of ETSI NFV specifications and the NFV Architectural Framework

NFV Release 4 documentation is, to a great extend, structured according to the NFV Architectural Framework, with some specifications mapping one to one to the reference points and functional blocks identified in the framework.

Figure 6.8-1 is based on the Figure 5.2-3 in ETSI GS NFV 006 [i.18] and illustrates a mapping of ETSI NFV specifications to the reference points and service interfaces shown in the NFV Architectural Framework diagram.

* specifications with requirements, information models and architecture (as known as Stages 1 and 2) are depicted in red;
* specifications related to protocols and data models (as known as Stage 3) are depicted in green;
* specifications and work items related to security enhancements are depicted in yellow.

The following specifications are not shown in the diagram:

* + NFV 006 (NFV-MANO architecture)
  + NFV-IFA 010 (NFV-MANO functional requirements
  + NFV-IFA 024 (GR, external touchpoints
  + NFV-IFA 026 (Security Architecture enhancements
  + NFV-IFA 027 (Performance metrics)
  + NFV-IFA 033 (Security Manager and Certificate Management Function)
  + NFV-IFA 045 (Fault and alarm models)
  + NFV-IFA 047 (Management data analytics Service)
  + NFV-IFA 048 (Policy Information Model)
  + NFV-IFA 049 (VNF generic OAM functions specification)
  + NFV-IFA 050 (Intent Management Service)
  + NFV-SOL 012 (Policy Management)
  + NFV-SOL 013 (API common aspects)
  + NFV-SOL 015 (Patters and Conventions for APIs
  + NFV-SOL 016 (NFV-MANO procedures)
  + NFV-SEC 022 (Access Token Specification)
  + NFV-SEC 028 (Security Assurance Specification)
  + NFV-TST 010 (API Conformance Testing)
  + Other Release 3 specifications and release independent specifications valid in Release 4 and listed in tables 6.7-2, 6.7-3, 6.7-4.

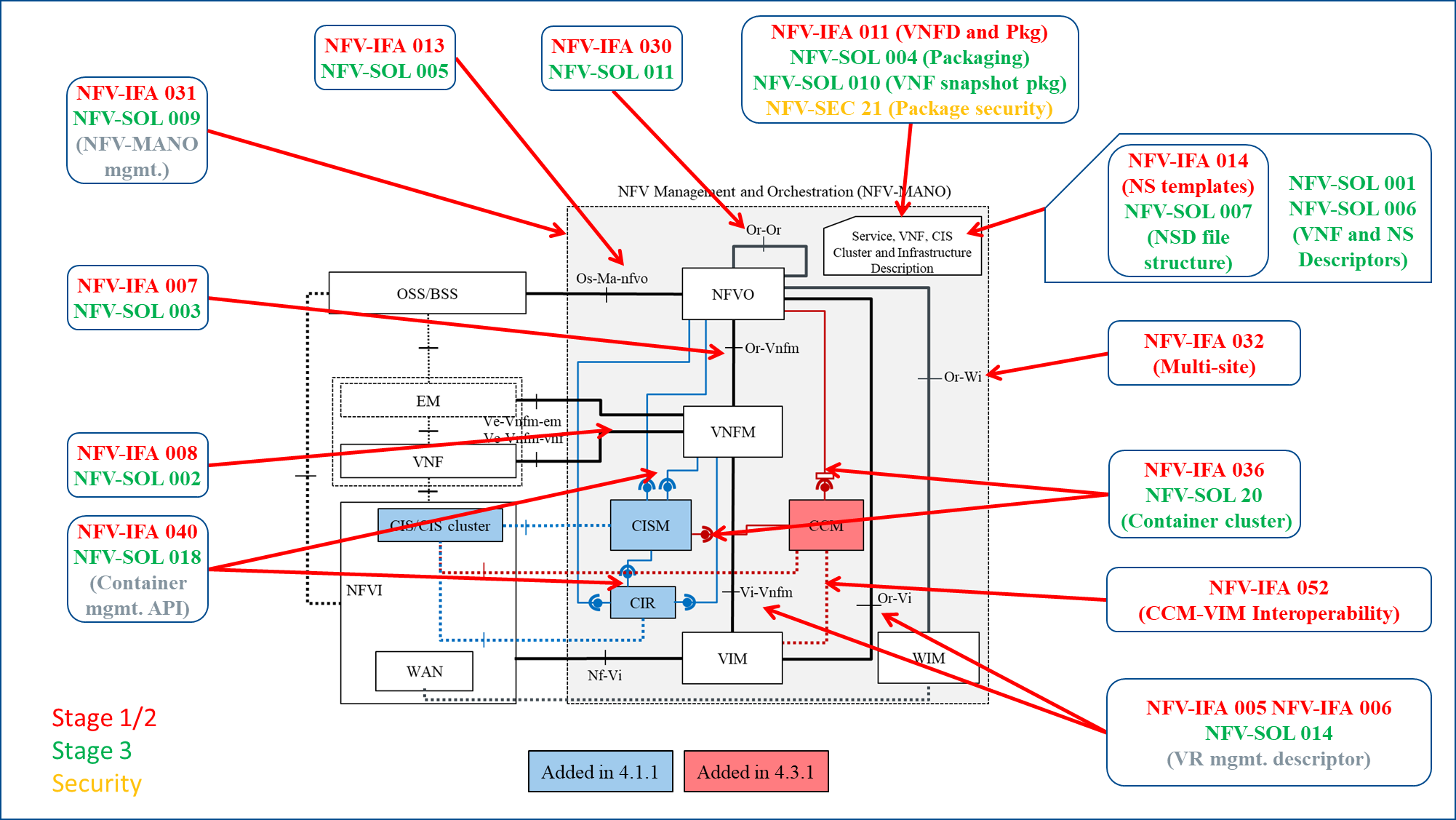


Figure 6.8-1: Map of ETSI NFV specifications and the NFV Architectural Framework

Annex A:  
Versioning of published deliverables

# A.1 Introduction

The present Annex A provides information about the versioning of the deliverables published by the ETSI ISG NFV. The purpose is to ease the understanding about the version semantics and the alignments/relationships between published deliverables depending on their versions.

# A.2 Types of specifications/reports produced by the ETSI ISG NFV

By using the Release process, the ETSI ISG NFV differentiates between four categories of deliverables:

- **Release-dependent GS (normative) deliverable:** this is a specification that contains normative provisions and specifies features that become part of an NFV Release. By making a deliverable Release-dependent, the ISG foresees that such deliverable will be part of an NFV Release. Features are specified consistently across other NFV Release-dependent GS deliverables. The deliverables that are Release-dependent are included in the NFV Release Description.

- **Release-independent GS (normative) deliverable:** this is a specification that contains normative provisions, but is not associated to any specific Release. This can be either because the specification was published as pre-Release (i.e. when a Release system was not established yet), or the specification is used or referred across many different Releases. A GS deliverable that is Release-independent can be included in the NFV Release Description when it is referred or directly used by some other Release-dependent deliverable(s).

- **Release-dependent GR (informative) deliverable:** this is a report that contains informative elements used to document different aspects of a feature or set of features part of an NFV Release. For instance, it fulfils the purposes of documenting use cases and potential solutions to support the feature or set of features. The deliverables that are Release-dependent are included in the NFV Release Description.

- **Release-independent GR (informative) deliverable:** this is a report that contains informative elements used to report about aspects of NFV that are related to features of several NFV Releases, related to future Releases, or independent of Releases. A GR deliverable that is Release-independent can be included in the NFV Release Description when it is referred or directly used by some other Release-dependent deliverable(s).

# A.3 Deliverables naming and version semantics

## A.3.1 Deliverables naming and numbering

All ETSI ISG NFV GS/GR deliverables follow the following naming and numbering scheme:

**ETSI GS NFV[-XXX] YYY**

**ETSI GR NFV[-XXX] YYY**

Where:

- XXX: optionally identifies the working group of the ISG that has produced the deliverable;

- YYY: stands for the chronological number from 000 to 999, which is unique within the namespace of the ISG or the working group identified by XXX;

EXAMPLE: ETSI GS NFV-IFA 001 v1.1.1

## A.3.2 Deliverables versioning

All published ISG NFV GS/GR deliverables follow a versioning scheme:

**ETSI GS NFV[-XXX] YYY vm.a.b**

**ETSI GR NFV[-XXX] YYY vm.a.b**

The "m.a.b" stands for the version number where:

- "m", or first digit. It identifies a major version, and it is used to identify the Release number of Release-dependent deliverables. The value "m = 1" indicates that the deliverable is Release-independent and/or pre-Release (i.e. set of deliverables published when a Release system was not established yet).

- "a", or second digit. It typically stands for new publication with technical changes, which is incremented every time a (set of) technical change is introduced.

- "b", or third digit. It typically stands for an editorial version, which is incremented every time a (set of) purely editorial change is introduced. The digit is reset to "1" every time "a" is incremented.

Table A.3.2-1 summarizes the deliverable versioning "m.a.b" of published deliverables.

Table A.3.2-1: Summary deliverable versioning

|  |  |  |
| --- | --- | --- |
|  | Type of deliverable | |
| **Release-dependent** | **Release-independent and/or pre-Release** |
| **On first publication** | "m" = Release number  "a" = 1  "b" = 1  (see note 1) | "m" = 1  "a" = 1  "b" = 1 |
| **On subsequent publication after first publication** | "m" = Release number  "a" = incremented with (expected) technical changes.  "b" = 1.  (see note 2) | "m" = 1  "a" = incremented with (expected) technical changes.  "b" = incremented only with editorial changes. |
| **Specific naming guidelines** | The first title uses the tag "Release #", indicating the Release to which the deliverable belongs to. | Not applicable. |
| NOTE 1: Due the sequencing in the specification work and the inter-stage alignment (e.g. in between stage 2 and stage 3), the second digit "a" of the first publication version can differ from the one indicated in the present table. For instance, if stage 3 specifications already target the first publication providing an alignment with specifications of stage 2 published as V3.3.1, it is recommended that the first publication version of the stage 3 equivalence is also V3.3.1, and not V3.1.1.  NOTE 2: During drafting of subsequent versions of a published deliverable within a Release, the third digit "b" is used to track new draft versions which can include technical and/or editorials changes. | | |

## A.3.3 Version alignments and relations

Aiming at identifying the technical alignment between specifications stages, principally stage 2 (architecture, interfaces and information model), stage 3 (protocols and data models) and stage 4 (testing), the following rules and guidelines are followed for determining the target publications versions.

**Guideline #1:**

As part of the Release development and while the Release feature work is still "open" within a particular specification stage, certain features or technical changes are completed first than others. Furthermore, the ETSI ISG NFV typically publishes documents twice per year. Consequently, for Release-dependent deliverables within a Release, the second digit "a" of the published version of a deliverable denotes the "drop" or publication package.

EXAMPLE 1: Version 3.1.1 of a published deliverable denotes the publication within "drop #1" (version digit "a = 1"). Version 3.2.1 of a published deliverable denotes the publication within "drop #2".

**Guideline #2:**

Inter-stages specification alignment is important for keeping traceability of requirements across the different specification stages. During the development of the technical features of a Release, different specification publication "drops" can occur. In addition, a feature that has been completed at a specific drop can also be further maintained for corrections, improvements or clarifications, whose outcomes are reflected in subsequent specification publication drops.

To show the correspondence of requirements across different specification stages, higher (or subsequent) stages (e.g. stage 3 compared to stage 2) target same publication version as lower (or prequel) stages.

EXAMPLE 2: Table A.3.3-1 illustrates and example.

Table A.3.3-1: Example 2

|  |  |
| --- | --- |
| Stage 2 | Stage 3 |
| **Drop #1: publications as V3.1.1**  Feature #1 and #2 are completed.  Feature #3 is partially completed. | No publication. |
| **Drop #2: publications as V3.2.1**  Feature #3 is completed.  Feature #4 and #5 are completed.  Feature #1 is updated with maintenance | **Package #A: publications as V3.2.1**  Feature #1 and #3 is completed.  Stage 3 aligns with requirements and maintenance done in stage 2 drop #2 of completed features in this package. |
| **Drop #3: publications as V3.3.1**  Feature #6 is completed.  No more features are to be specified within the Release.  Feature #1, #2 and #5 are updated with maintenance. | **Package #B: publications as V3.3.1**  Feature #2, #4, #5 are completed.  Stage 3 aligns with requirements and maintenance done in stage 2 drop #3 of completed features in this package. |
| **First round of full maintenance: publications as V3.4.1**  Feature #1 and #6 are updated with maintenance. | **Package #C: publications as V3.4.1**  Feature #6 is completed.  Stage 3 aligns with requirements and maintenance done in the first round of full maintenance in stage 2. |
| **Second round of full maintenance: publications as V3.5.1** | **First round of full maintenance: publications as V3.5.1**  Stage 3 aligns with requirements and maintenance done in the second round of full maintenance in stage 2. |

**Guideline #3:**

Within a specification stage, all associated Release-dependent deliverables are expected to be published with new version as part of specification publication drops. However, in some cases a deliverable might not be re-published if no technical changes or maintenance are performed. In such a case, differences in the latest published version of a specification can occur among the set of Release-dependent deliverables.

Normative and informative cross-references among deliverables published by the ETSI ISG NFV are typically present in deliverables without specifying a concrete version, only the "Release #". In such a case, the following guideline applies:

- If a deliverable X published with version "m.a.b" contains a reference to a deliverable Y that is published with same version "m.a.b", the applicable referenced version is thus "m.a.b" of deliverable Y.

- If a deliverable X published with version "m.a.b" contains a reference to a deliverable Y that is not published with same version "m.a.b", the applicable reference version is the latest version published of deliverable Y. For instance, the latest published version of deliverable Y might be "m.a-1.b".

Annex B:  
Release specification states

# B.1 Overview

The meaning of the specification states of the specification stages is provided in table B.1-1.

Table B.1-1: Meanings of specification work states

|  |  |
| --- | --- |
| State | Meaning |
| Not started | Specification work has not started. |
| Open | Specification work is ongoing and the specifications/reports are being either newly created or updated to incorporate new technical features or modify existing ones. |
| Frozen | Specification work to incorporate new technical features or modify existing ones is completed. Only maintenance work can be performed. |
| Closed | Specification work is completed and the specifications are not further maintained. If corrections are necessary, these are handled on a case by case basis. |

The release specification state transitions is as follows:

"Not started" 🡪 "Open" 🡪 "Frozen" 🡪 "Closed"

Release specification states are associated to the specification stages, so while a Release can be in one state at an earlier specification stage, it can be in another state at a later specification stage.

EXAMPLE: Stage 2 specification work can be "frozen" while the stage 3 specification work can be still in development, i.e. "open".

Annex C:   
Release 5 planning and definition

# C.1 Introduction

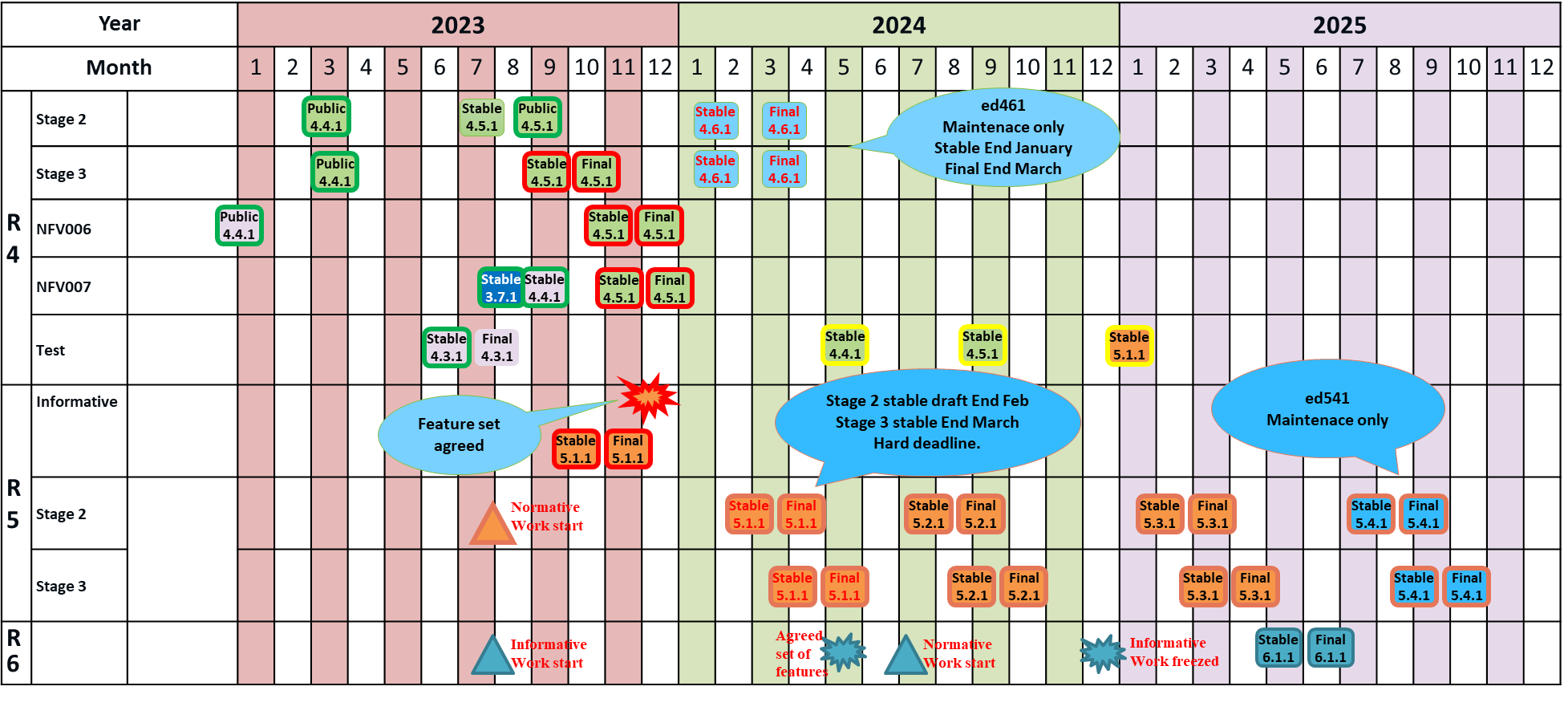
The following clauses describe the planning and definition of the Release 5.

Feature details are not repeated but described here only for features not included in release 5.

Feature progress can be monitored via the feature wiki [i.19] which is updated more frequently than this document.

# C.2 Schedule

The figure C.2-1 shows the schedule of Release 5 in context of Release 4 and Release 6.



**Figure C.2-1 Schedule of Release 5**

# C.3 Feature overview

During release definition of Release 5 there were 11 features started from Release 4 and 7 new feature proposals.

Table C.3-1 shows the features considered during planning of Release 5.

**Table C.3-1: Features considered for Release 5.**

| Id | History | Title | Studies etc. | Remark |
| --- | --- | --- | --- | --- |
| FEAT19a | Extended Rel.4 | Enhanced container networking | IFA043 |  |
| FEAT19b | Carry over Rel.4 | NFV-Connect - connectivity integration and operationalization | IFA035 (published) |  |
| FEAT20 | Main parts in Rel.4 | Auto | IFA041, IFA047, IFA050 |  |
| FEAT21 | Main parts in Rel.4 | 5G | IFA037 |  |
| FEAT22 | Carry over Rel.4 | M-Tenant | EVE018 |  |
| FEAT23 | Carry over Rel.4 | MANO-SBA | IFA039 | The normative work is postponed and is to be considered within Release 6 scope in the context of possible evolution of NFV-MANO architecture. |
| FEAT24 | Extended Rel.4 | VNF generic management functions | EVE019, IFA049 |  |
| FEAT25 | Not started in Rel.4 | VNF-CI | TST006 | No normative work in Release 5. |
| FEAT26 | Extended Rel.4 | Policy Management Models | IFA042, IFA048 (published) |  |
| FEAT27 | New | NFV for vRAN | IFA046 (published) |  |
| FEAT28 | New | Fault Management Models | IFA045 | The feature was planned for Release 5, but then added late to Release 4. No normative work in Release 5. |
| FEAT29 | New | Green NFV | EVE021 (final draft) |  |
| FEAT30 | New | VNF configuration | EVE022 (published) |  |
| FEAT31 | New | Flexible VNF deployment (Rel. 5 extensions) | IFA044 (published) |  |
| FEAT32 | New | Reliability for cloud-native VNF | REL014 (final draft) | No normative work in Release 5 |
| FEAT33 | New | Physical Infrastructure Management | No study, IFA053 started |  |
| FEAT35 | New | Follow-up from IFA051? | IFA051 (final draft) |  |
| ENH02.06 | Extended Rel.4 | Support for parameter mapping artifacts for MCIOP input |  | The feature was completed in Release 4. |
| ENH01.01 | Extended Rel.4 | Security Enhancements | IFA026, IFA033 (published) |  |

Release 4 features not included in table C.3-1 are closed. Further work related to them can be done like maintenance work or a small enhancement is added.

No normative work expected as follow-up of the following studies:

* REL013, Report on cognitive use of operations data for reliability
* EVE020, Report on NFV support for Network Function Connectivity eXtensions

No further feature proposals expected for Release 5

# C.4 Feature details

### C.4.1 FEAT23: SBA for NFV-MANO (MANO-SBA)

Editor’s note: Feature Prime: Janusz Pieczerak, Feature proposal in NFV(21)000130r1

#### C.4.1.1 Description

The scope of the feature covers the following areas:

- Service exposure to 3rd party access for selected NFV-MANO services.

- Assess steps in the SBA transformation (different steps have different levels of complexity), such as NFV­MANO service independence, modularization, data separation/split, exposure, dynamic registration and discovery of services.

- Optimal routing of service requests to NFV-MANO service instances, including load balancing and failover management.

- Enabling new interface consumers (e.g. policy engines, license managers, AI-based systems, etc.).

#### C.4.1.2 Architecture scope

The scope of the feature covers possible evolution of NFV-MANO architecture depending on the applied transformation target, as described in ETSI GR NFV-IFA 039.

#### C.4.1.3 Documentation result

The feature has been specified in the report listed in table 5.2.5.6-1. The normative work is postponed and is to be considered within Release 6 scope in the context of possible evolution of NFV-MANO architecture.

Table C.4.1.5-1: Documentation results of feature "SBA for NFV-MANO"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GR NFV-IFA 039 | Info  V5.1.1 | Report on Service Based Architecture (SBA) design |

### C.4.2 FEAT25: Continuous VNF integration (VNF-CI)

Editor’s note: Feature Prime: Huzhong Ling, linghuzhong@chinamobile.com, Feature proposal in NFV(19)000148

The feature was studied in ETSI GR NFV-TST 006 [i.10].

The scope of the feature covers the following areas:

- Optimization of the VNF Package structure and VNF.

- Test execution of test functions and feedback to VNF provider/developer.

- VNF/VNFC software component update/upgrade supporting continuous development and integration paradigms.

The "technical areas" covered by this feature are: A.2), D.1), and D.2).

This feature analyses and defines how to implement a "Joint Pipeline" to provide DevOps process beween VNF providers and VNF operators. The feature also determines possible extentions of NFV MANO to realize such DevOps process.

### C.4.3 FEAT28: Fault management models (FM-models)

Editor’s note: Feature Prime: WANG Chen, Joan TRIAY, Feature proposal in NFV(21)000136r4

#### C.4.3.1 Description

The feature was planned for Release 5, but parts of it were added late to Release 4.

The scope of the feature covers the following areas:

- Extend the information and data model of Alarms to address unspecified model elements and define applicable values to ensure proper processing of failure information and interoperability in between producers and consumers of the alarms.

- Enrich the fault management interfaces to exchange fault related closed loops information/results between different layers.

- Enable automated fault detection and performance degradation analysis with standardized metrics.

#### C.4.3.2 Architecture scope

#### C.4.3.3 Documentation Results

The feature has been specified in the specifications and reports listed in table C.4.3.3-1. Refer to clause 6 for the latest version available of the referred documents.

**Table C.4.3.3-1: Documentation results of feature “Fault management models”**

|  |  |  |
| --- | --- | --- |
| **Document Id.** | **Stage** | **Description of the feature result** |
| ETSI GS NFV-IFA 045 | Stage 1 and 2 | Specify an information model for alarms associated to the objects that are managed by NFV-MANO. Provide related use cases, illustrating also the correlation of fault information and the use of the information in fault management processes. |

### C.4.4 FEAT32: Reliability for cloud-native VNF

Editor’s note: Feature prime: Brendan Hassett, Feature proposal NFV(21)000160r5.

#### C.4.4.1 Description

This feature provides study and guidelines on evaluating measurable reliability aspects of cloud-native VNFs during VNF management processes. Corresponding functional and non-functional requirements are derived for guiding reliability management during the operations and maintenance of cloud-native VNFs.

#### C.4.4.2 Architecture scope

This feature is foreseen to bring no new architectural elements in the NFV-MANO framework.

#### C.4.4.3 Documentation result

The feature has been specified in the specifications and reports listed in table C.4.4.3-1. Refer to clause 6 for the latest version available of the referred documents.

Table C.4.4.3-1: Documentation results of feature "Reliability for cloud-native VNF"

|  |  |  |
| --- | --- | --- |
| Document Id. | Stage | Description of the feature result |
| ETSI GR NFV-REL 014 | Info:  V5.1.1 | Report on evaluating reliability for cloud-native VNFs |

There are no normative provisions in Release 5.

Annex D:  
Change history

| Document history | | |
| --- | --- | --- |
| Version | Date | Changes |
| V5.0.1 | January 2024 | First version of Release 5  All feature content updated.  Rebased on NFV007ed451 version 444. |

# History

|  |  |  |
| --- | --- | --- |
| **Document history** | | |
| V4.4.1 | November 2023 | Publication |
|  |  |  |
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