ETSI GR NFV 007 V3.7.1 (2023-11)

Network Functions Virtualisation (NFV); Release Description; Release 3

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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

In the present document "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document describes the NFV Release 3 and in particular its version 3.7.1. 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 3.7.1 and is intended to help the user as an entry point to ETSI NFV documentation.

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: 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 GS NFV 006: "Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Architectural Framework Specification".

[i.4] ETSI Work Programme (EWP).

[i.5] ETSI Search and Browse Standards.

[i.6] ETSI GS NFV-PER 001: "Network Functions Virtualisation (NFV); NFV Performance & Portability Best Practises".

[i.7] ETSI GS NFV-SOL 005: "Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; RESTful protocols specification for the Os-Ma-nfvo Reference Point ".

[i.8] ETSI GS NFV-IFA 005: "Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Or-Vi reference point - Interface and Information Model Specification".

[i.9] ETSI GS NFV-SOL 015: "Network Functions Virtualisation (NFV); Protocols and Data Models; Specification of Patterns and Conventions for RESTful NFV-MANO APIs".

[i.10] ETSI GS NFV-SOL 002: "Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; RESTful protocols specification for the Ve-Vnfm Reference Point".

[i.11] ETSI GS NFV-SOL 003: "Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; RESTful protocols specification for the Or-Vnfm Reference Point".

[i.12] ETSI GS NFV-SOL 009: "Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models: RESTful protocols specification for the management of NFV-MANO".

[i.13] ETSI GS NFV-SOL 011: "Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; RESTful protocols specification for the Or-Or Reference Point".

[i.14] ETSI GS NFV-SOL 012: "Network Functions Virtualisation (NFV) Release 3; Protocols and Data Models; RESTful protocols specification for the Policy Management Interface".

NOTE: The release description includes tables, figures 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.

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.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: 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

Void.

3.3 Abbreviations

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

GR	Group Report
GS	Group Specification
ISG	Industry Specification Group
WI	Work Item

4 Release overview

4.1 Introduction

ETSI ISG NFV Release 3 (hereinafter referred also as Release 3 or the present Release) builds on top and leverages the results of ETS ISG NFV documents published by the end of 2014. The NFV Release 2 did not include any architectural changes and the list of capabilities part of the Release were thus aligned with the ETSI NFV Architectural Framework, see ETSI GS NFV 006 [i.3]. The Release 3 introduces new features on top of the Release 2 specified capabilities.

A high-level description of the main outcomes of the Release 3 are provided in clause 5. Clause 4.2 provides a statistical summary of the Release 3 in terms of number of specifications and reports. Clause 4.3 describes the capabilities that have been specified in past Releases, namely the Release 2. Clause 6 lists the published GS comprising the present Release.

4.2 Overview

At the time the present Description document version is delivered, the Release 3 is comprised of:

- 45 Group Specifications, among which:
  - 20 new specifications.
  - 25 specifications evolved from Release 2.
- 13 Group Reports, among which:
  - 9 new reports.
  - 4 reports evolved from Release 2.

4.3 Summary of past Releases

The Release 3 is built upon the capabilities and features specified as part of the NFV Release 2. The Release 2 specified requirements, information models, data models and interface protocols to enable interoperable implementations of the NFV Architectural Framework, see ETSI GS NFV 002 [i.1].

The NFV Release 2 specified in the following categories:

- Functional requirements applicable to the Virtualised Infrastructure Manager (VIM), VNF Manager (VNFM) and Network Functions Virtualisation Orchestrator (NFVO) functional blocks of NFV-MANO identified by the NFV Architectural Framework.
- Requirements applicable to the reference points Or-Vi, Vi-Vnfm, Or-Vnfm, Os-Ma-nfvo, Ve-Vnfm-vnf and Ve-Vnfm-em identified by the NFV Architectural Framework and NFV-MANO Architectural Framework, see ETSI GS NFV 006 [i.3].
- Requirements, specification of interfaces and protocols defined at the reference points Or-Vi, Vi-Vnfm, Or-Vnfm, Os-Ma-nfvo and Ve-Vnfm identified by the NFV Architectural Framework and NFV-MANO Architectural Framework, including:
  - virtualised resources information management;
  - virtualised resources management and change notification;
  - virtualised resources reservation management and change notification;
  - virtualised resources quota management and change notification;
  - virtualised resources fault, performance and capacity management;
  - VNF Packaging and software image management;
  - Network Forwarding Path (NFP) management;
  - VNF lifecycle management and change notification;
  - granting of VNF lifecycle operation(s);
  - VNF fault, performance and configuration management;
  - VNF indicator(s);
  - Network Service (NS) lifecycle management and change notification; and

- NS fault and performance management.

- Requirements, information model specification and data models of Network Service Descriptor (NSD).
- Requirements for VNF Packaging and requirements, information model specification and data models of VNF Descriptor (VNFD).
- Requirements for hardware-independent acceleration and virtual switch acceleration.
- Requirements related to the security aspects concerning the specified capabilities.

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.	Closed	None.
Stages 1 and 2	Normative work: Service and business requirements Architecture, interfaces and information models.	Closed	All work within this stage has been completed. V3.7.1 is the latest published version of relevant specifications, if applicable. For more information, refer to clause 6.2.
Stage 3	Normative work on protocols and data models. Informative work on studying potential profiling of existing solutions.	Closed	The majority of the work within this stage has been completed. Remaining parts of one feature have been carried over to Release 4. See details in Table 5.1-1. V3.7.1 is the latest published version of relevant specifications, if applicable. For more information, refer to clause 6.3.
Stage 4	Normative work on testing specifications for protocols and data models.	Open	All work within this stage has been completed. V3.6.1 is the latest published version of relevant specifications, if applicable. For more information, refer to clause 6.4.2.

5 Release 3 features

5.1 Overview

The new features introduced as part of the Release 3 are listed in Table 5.1-1.

Table 5.1-1 lists only the Release 3 features whose specification has been completed with normative provisions at least from an architecture, functional and information model perspective (stage 2). The table also lists the status of the specification of normative provisions concerning protocols and data models (stage 3).

Table 5.1-1: Release 3 features

Feature name	Acronym	Id (from the Definition document see annex D)	FEAT id (from the Definition document see clause D.6))	Stage 3 status
Hardware-independent acceleration	ACCEL	R02.CAP12	N/A	N/A
Network Acceleration for VNF	FASTSWITCH	R03.F07	N/A	N/A
Hypervisor-based virtualisation	HYPER	R03.F16	N/A	N/A
Hardware environment for NFV	HWENV	R03.F13	N/A	N/A
Management of NFV-MANO	NFV_M&Ms	R03.F04	FEAT11	Completed. See note 1.
VNF Snapshotting	VNF_PHOTO	R03.F11	FEAT15	Completed.
Policy management framework	POLICY	R03.F14	FEAT07	Completed. See note 3.
NFV-MANO admin domains	MANOMD	R03.F18	FEAT08	Completed. See note 1.
Host reservation	HOSTRSV	N/A	FEAT04	Partially completed. See note 7.
Secure sensitive components in NFV Framework	SEC4SNC	R03.F09	N/A	N/A
Security management and monitoring for NFV	SECMM	R03.F08	FEAT18	N/A
Management and connectivity of multi-site services	NFVWAN (MCMSS)	R03.F05	FEAT10	Partially completed. See note 2.
VNF software modification	SWUP (VNF)	R03.F10	FEAT02	Completed.
Network slicing in NFV	NFVSLICE	R03.F21	FEAT05	Completed. See note 4.
NFVI software modification	SWUP (NFVI)	R03.F10	FEAT03	Completed. See note 6.
Service availability level (SAL)	SAL	R03.F22	FEAT16	Completed. See note 1.
Enhancements support for MEC in NFV deployments See note 5.	MECinNFV	N/A	FEAT12	Completed. See note 4.

NOTE 1: The completion of the feature was realized in version V3.3.1 of the corresponding specifications.
NOTE 2: NFV-MANO APIs and NFV Descriptors are completed. Normative profiling of "protocol and data models" for the interfaces exposed by WIM is in Release 4. See clause 5.2.10.4.
NOTE 3: The completion of the feature was realized in version V3.4.1 of the corresponding specifications.
NOTE 4: The completion of the feature was realized in version V3.5.1 of the corresponding specifications.
NOTE 5: Additional enhancements related to this feature were also carried over to Release 5.
NOTE 6: The completion of the feature was realized in version V3.6.1 of the corresponding specifications.
NOTE 7: Host reservation is completed. Capacity management is completed except for the case of using descriptor based resource management. Normative profiling of descriptor based resource capacity management is in Release 4. See clause 5.2.9.4.

5.2 Functional features

5.2.1 Hardware-independent acceleration (ACCEL)

5.2.1.1 Description

The feature provides NFV related management and orchestration operations to flexibly allocate VNFs to available NFVI and acceleration components by exposing acceleration capabilities instead of specific acceleration resource characteristics.

Four interfaces support the exchanges between the NFVI and VIM regarding acceleration resource management:

- acceleration Resource Discovery;
- acceleration Resource Lifecycle Management;
- acceleration Resource Fault Management; and

- acceleration Image Management.

5.2.1.2 Architecture scope

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

- Functional blocks: NFVI and VIM.
- Reference points: Nf-Vi.

5.2.1.3 Specification results

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 document.

Table 5.2.1.3-1: Specification results of feature "Hardware-independent acceleration"

Document Id.	Stage	Description of the feature specification
ETSI GS NFV-IFA 019	Stage 2	Functional requirements to support acceleration related interfaces on the Nf-Vi reference point. Functional requirements for the acceleration related interfaces: Acceleration Resource Discovery, Acceleration Resource Lifecycle Management, Acceleration Resource Fault Management and Acceleration Image Management. Functional and information model description of four new interfaces listed above.

5.2.2 Network acceleration for VNF (FASTSWITCH)

5.2.2.1 Description

The feature encompasses the interaction (e.g. interfaces) between the virtualization layer and switching accelerator drivers to enable network acceleration transparent to the VNF and to be independent of any accelerator vendor and type. The feature specification is built on the use of the Dynamic Optimization of Packet Flow Routing (DOPFR) mechanism which offers the capability to accelerate the data plane processing of a VNF on a dedicated switch.

Three interfaces exposed by the switches support the exchanges between the VNF and the dedicated switch:

- forwarding table configuration;
- performance monitoring; and
- unmatched packets forward notification.

5.2.2.2 Architecture scope

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

- Functional blocks: NFVI and VNF.
- Reference points: Vn-Nf.

5.2.2.3 Specification results

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 document.

Table 5.2.2.3-1: Specification results of feature "network acceleration for VNF"

Document Id.	Stage	Description of the feature specification
ETSI GS NFV-IFA 018	Stage 2	Functional and information model description of the Forwarding Table Configuration, Performance Monitoring and Unmatched Packets Forward Notification interfaces exposed by the dedicated switch towards the VNF at the Vn-Nf reference point.

5.2.3 Hypervisor-based virtualisation (HYPER)

5.2.3.1 Description

A hypervisor mediates the resources of the compute domain to the virtual machines of the software appliances and offers one of the virtualization environment solutions for the instantiation of VNFs. The hypervisor itself is a software environment which partitions the underlying physical resources and creates VMs and isolates the VMs from each other.

The present feature covers hypervisor-related functions needed to support NFV use cases. Focus areas of specification concern to:

- real-time guest support;
- networking, in particular regarding virtual switch resiliency;
- NFV acceleration support;
- security;
- energy efficiency; and
- performance management.

5.2.3.2 Architecture scope

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

- Functional blocks: NFVI.
- Reference points: Nf-Vi.

5.2.3.3 Specification results

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 document.

Table 5.2.3.3-1: Specification results of feature "Hypervisor-based virtualisation"

Document Id.	Stage	Description of the feature specification
ETSI GS NFV-EVE 001	Stages 1 and 2	Service and functional requirements in the areas of: real-time guest support, virtual switch resiliency, NFV acceleration, security, energy efficiency and performance management.

5.2.4 Hardware environment for NFV (HWENV)

5.2.4.1 Description

The feature deals with providing a reference framework for interoperable hardware ecosystem and telecommunications physical environment to support NFV deployments. The reference framework enables compatibility between hardware equipment provided by different hardware vendors and suppliers.

The feature scope encompasses the definition of requirements in the areas of: operations, environmental, mechanical, cabling, maintenance and security.

5.2.4.2 Architecture scope

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

- Functional blocks: NFVI.
- Reference points: none.

5.2.4.3 Specification results

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 document.

Table 5.2.4.3-1: Specification results of feature "Hardware environment for NFV"

Document Id.	Stage	Description of the feature specification
ETSI GS NFV-EVE 007	Stages 1 and 2	Service and functional requirements in the areas of: racks/frames, processors and storage, power, interconnections, cooling, hardware platform management, hardware security, radiated emissions and electromagnetic compliance, climatic and acoustic considerations, timing and synchronization issues and reliability.

5.2.5 Management of NFV-MANO (NFV_M&Ms)

5.2.5.1 Description

The feature enables the management of the NFV-MANO framework, thus providing the capabilities to configure and monitor NFV-MANO functional entities. The framework for the management of NFV-MANO is based on the definition and exposure of a set of management interfaces by the NFV-MANO functional entities. The set of interfaces can be consumed in two ways:

a) by an external entity beyond NFV-MANO and/or;

b) by an NFV-MANO functional entity.

As part of the feature, the present Release specifies interface requirements, the interfaces and the necessary information elements enabling the fault, configuration and information, performance, state and log management of NFV-MANO functional entities.

5.2.5.2 Architecture scope

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

- Functional blocks: NFVO, VNFM, VIM.
- Reference points: certain interfaces/operations may be exposed over Os-Ma-nfvo, Or-Vnfm, Or-Vi and Vi-Vnfm.

5.2.5.3 Specification results

The feature has been specified in the specifications and reports listed in table 5.2.5.3-1. Refer to clause 6 for the latest version available of the referred documents.