

# ETSI ISG NFV: Work Program and Releases Overview

Presented by: **XXX, YYY**

For: **XXX**

# Outline

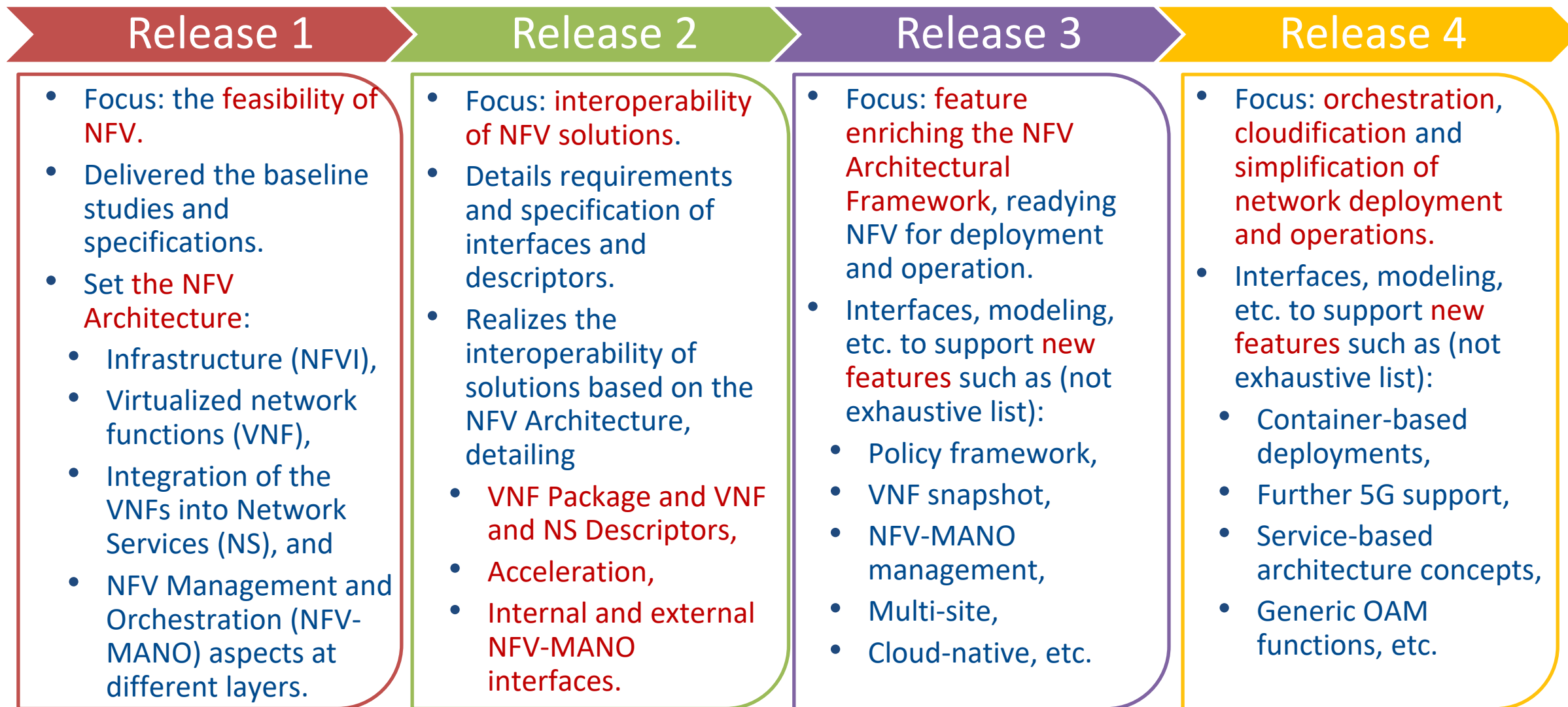
- ✓ PART 1: ETSI ISG NFV Overview
  - ✓ ETSI NFV Releases overview
  - ✓ ETSI NFV ongoing work
- ✓ PART 2: NFV Release 2
  - ✓ What does it contain?
  - ✓ Maintenance, API development, etc.
- ✓ PART 3: NFV Release 3
  - ✓ Overview
  - ✓ Features and specification work
- ✓ PART 4: NFV Release 4
  - ✓ Overview
  - ✓ Features and specification work





# Part 1: ETSI ISG NFV overview

# ETSI NFV Releases overview



# ETSI NFV current work

## Release 2 (closed):

- ✔ Stage 2 maintenance is frozen after the completion of 1H2019 maintenance.
- ✔ Stage 3 maintenance also frozen after completion of the 1H2020 round (v2.8.1).

## Release 3 (frozen):

- ✔ Stage 2 is completed after delivering 1H2019 specifications (drop #3).
  - ✔ 10 new features completed at stage 2 level from 1H2018 (aka drop #1), 2H2018 (aka drop #2), and 1H2019 (aka drop #3).
- ✔ Stage 3 normative work is ongoing considering all completed stage 2. First “drop” of features completed in 1H2020 (v3.3.1), and next round will be 2H2020 (to be v3.5.1).

## Release 4 (open):

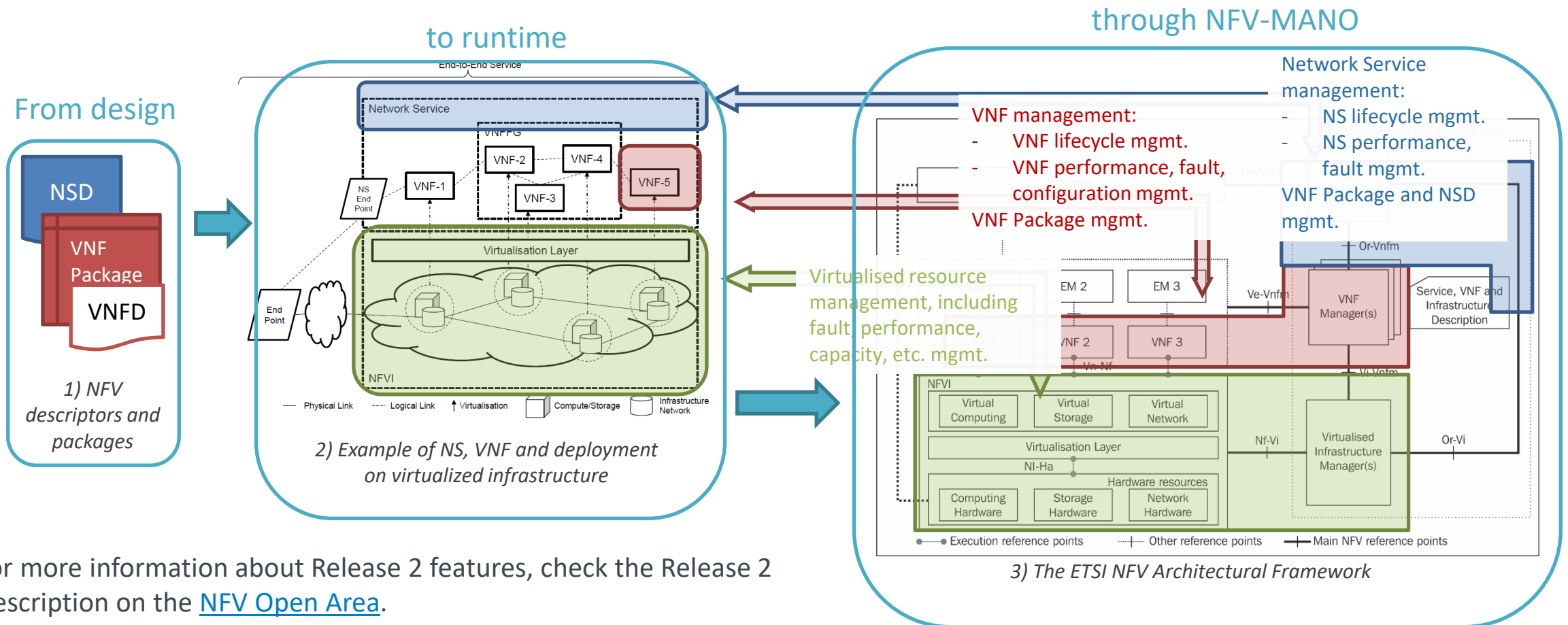
- ✔ Few informative work items started in May 2019. Additional work items (including normative) started at NFV#27 (Sep. 2019).
- ✔ Normative work of carried-over Rel. 3 studies is ongoing as part of Rel. 4.
- ✔ Published a first drop (Oct/Nov) with part of feature “cloud-native & container” and feature “security management”.



# Part 2: NFV Release 2

# Release 2: what does it contain?

Release 2 specifications set up the NFV framework with essential capabilities related to NS, VNF and VR management.

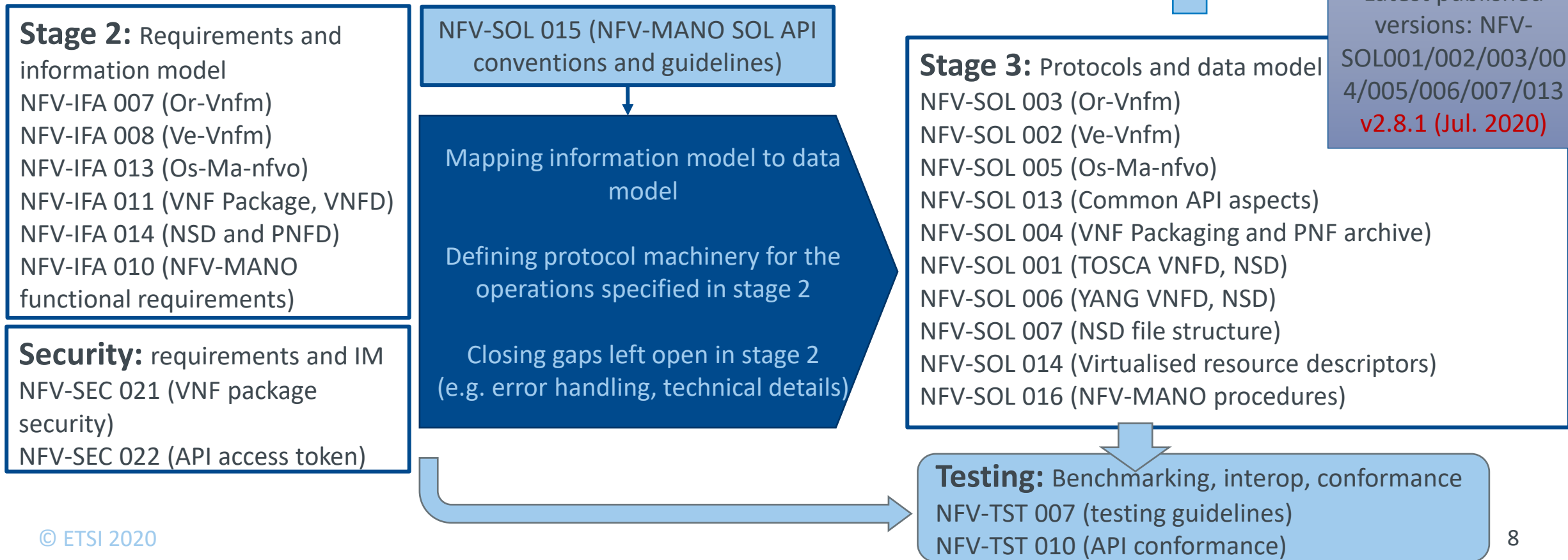


For more information about Release 2 features, check the Release 2 Description on the [NFV Open Area](#).

# Release 2: protocols and data model standardization

The content of the NFV-SOL APIs is based on the related NFV-IFA and NFV-SEC specifications. The NFV-SOL specifications are **implementable representations** of the design defined in the stage 2 specifications, **not alternative solutions**.

**OpenAPI** descriptions for all APIs specified in GS NFV-SOL 002/003/005 (v2.7.1)  
[https://nfvwiki.etsi.org/index.php?title=SOL\\_Open\\_API\\_Representations](https://nfvwiki.etsi.org/index.php?title=SOL_Open_API_Representations)  
**GS NFV-SOL 001/006 supporting files** on ETSI Forge:  
[https://nfvwiki.etsi.org/index.php?title=Deployment\\_Templates\\_and\\_Packaging\\_specifications](https://nfvwiki.etsi.org/index.php?title=Deployment_Templates_and_Packaging_specifications)





# Release 2: maintenance work



6 rounds completed (1H2017, published as [v2.3.1](#); 2H2017, published as [v2.4.1](#); 1H2018, published as [v2.5.1](#), 2H2018 published as [v2.6.1](#), 2H2018 published as [v2.7.1](#), 1H2020 published as [v2.8.1](#)).

✔ 6<sup>th</sup> round focused on [stage 3 specifications \(NFV-SOL specs\)](#). Additional stage 2 specification on security has been considered for maintenance as well.

## Main [aspects addressed \(so far\) as part of maintenance](#):

- ✔ Correction of bugs and feedback from deployments and development: remove ambiguities, enhance APIs, etc.
- ✔ Alignment in between Stage 2 and 3 specifications.
- ✔ Security enhancements related to interfaces, descriptors and other artefacts.
- ✔ Extending constructs of VNF packaging for archiving files and artifacts of PNF.
- ✔ Improving and clarifying normative provisions in NFV-MANO APIs (improve testability...).
- ✔ Feedback from open source projects, e.g., OpenStack gap analysis and alignment to NFV-IFA005 and NFV-IFA006, OSM information model feedback to NFV-IFA011 and NFV-IFA014, contributions to NFV-IFA011 and NFV-SOL004 by companies participating in ONAP providing feedback, etc.

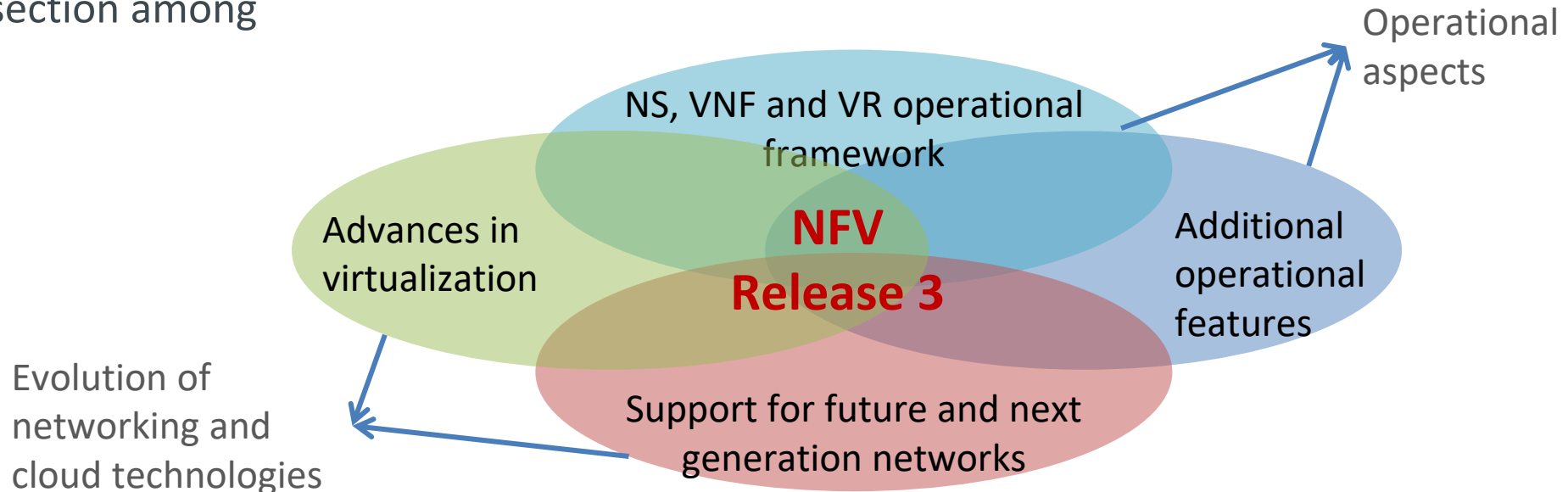
# Part 3: NFV Release 3

# Release 3: overview

## Main focus:

- ✔ Enriching the NFV Architectural Framework, readying NFV for **expansive deployment**, **enhanced operation**, taking into account the **evolution of networking and cloud technologies**.
- ✔ In commercial deployments, operational aspects are critical!

## The intersection among



# Release 3: specification status

Release 3 Description documentation available on the [NFV Open Area](#).



## Stage 1 and 2:

- Stage 1 and 2 work has been completed, but some candidate features were closed or carried over to Release 4.
- First round of stage 2 maintenance was completed in 1H2020 (published as v3.4.1).

## Stage 3:

- Stage 3 work is progressing to specify the full set of stage 2 completed features.
- New specifications as part of Release 3 had been completed and published:
  - ETSI GS NFV-SOL 009 v3.3.1 (for FEAT11 on NFV-MANO management)
  - ETSI GS NFV-SOL 011 v3.3.1 (for FEAT08 on NS across multi-domain).
  - ETSI GS NFV-SOL 010 v3.3.1 (for FEAT15 on VNF snapshotting), and
  - ETSI GS NFV-SOL 012 v3.4.1 (for FEAT07 on Policy Framework).
- First versions of evolved (from Rel. 2) NFV-SOL specs had been completed in 1H2020. First “dropping” of stage 3 work includes: (part of) FEAT02 on VNF software modification, FEAT04 on host reservation, (part of) FEAT10 on multi-site connectivity, (part of) FEAT15 on VNF snapshotting, and FEAT16 on service availability level (SAL).

Table 5.1-1: Release 3 features

Feature name	Acronym	Id (from the Definition document (1))	FEAT id (from Annex B of the Definition (1))	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	HYPERS	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	Partially completed. See note 2.
Policy management framework	POLICY	R03.F14	FEAT07	Completed. See note 4.
NFV-MANO admin domains	MANOMD	R03.F18	FEAT08	Completed. See note 1.
Host reservation	HOSTRSV	N/A	FEAT04	Completed. See note 1.
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 3.
VNF software modification	SWUP (VNF)	R03.F10	FEAT02	Partially completed. See note 2.
Network slicing in NFV	NFVSLICE	R03.F21	FEAT05	Ongoing
NFVI software modification	SWUP (NFVI)	R03.F10	FEAT03	Ongoing
Service availability level (SAL)	SAL	R03.F22	FEAT16	Completed. See note 1.

NOTE 1: The completion of the feature was realized in version v3.3.1 of the corresponding specifications.  
 NOTE 2: The “new interface exposed by EM/VNF to support the coordination in VNF LCM operations” is not specified in the first published version (v3.3.1) of the specification.  
 NOTE 3: NFV-MANO APIs and NFV Descriptors are completed. Profiling of “protocol and data models” for the interfaces exposed by WIM is ongoing.  
 NOTE 4: The completion of the feature was realized in version v3.4.1 of the corresponding specifications.

# Release 3: stage 1&2 completed features

Coloured in blue: more information on  
the backup slides



## Completed in 1H2018 (aka drop #1)

- ✓ Compute Host Reservation
- ✓ NFV-MANO Policy Management Framework
- ✓ VNF Snapshots
- ✓ Management of NFV-MANO
- ✓ Network Service (NS) across multiple administrative domains
- ✓ Enhancement of acceleration related features:
  - ✓ Hardware-independent acceleration
  - ✓ Network acceleration for VNF
- ✓ Virtualization technologies:
  - ✓ Hypervisor-based virtualisation
  - ✓ Hardware environment for NFV

## NFV-IFA specification versions:

- Drop 1H2018 (drop #1) → v3.1.1
- Drop 2H2018 (drop #2) → v3.2.1
- Drop 1H2019 (drop #3) → v3.3.1

## Completed in 2H2018 (aka drop #2)

- ✓ VNF software modification
- ✓ Support of network slicing
- ✓ Management and connectivity for multi-site services.

## Completed in 1H2019 (aka drop #3)

- ✓ NFVI software modification
- ✓ Service Availability Level (SAL)

# Release 3: stage 3 completed features



## Completed in 1H2020 (aka drop #1)

- ✔ Compute Host Reservation
- ✔ VNF Snapshots (partially)
- ✔ Management of NFV-MANO
- ✔ Network Service (NS) across multiple administrative domains
- ✔ VNF software modification (partially)
- ✔ Management and connectivity for multi-site services (partially)
- ✔ Service Availability Level (SAL)
- ✔ NFV-MANO Policy Management Framework

## NFV-SOL specification versions:

- Drop 1H2020 (drop #1) → v3.3.1 and v3.4.1 (for NFV-SOL012)

# Part 4: NFV Release 4

# Release 4: feature-based specification

Release 4 Definition documentation  
available on the [NFV Open Area](#).



15 candidate features, including technical and security enhancements (see following slides).

## Approach:

- ✔ Main activity is now on informative work (studies).
- ✔ Release 4 specification progress and plans are publicly available on the [NFV Public Wiki](#).



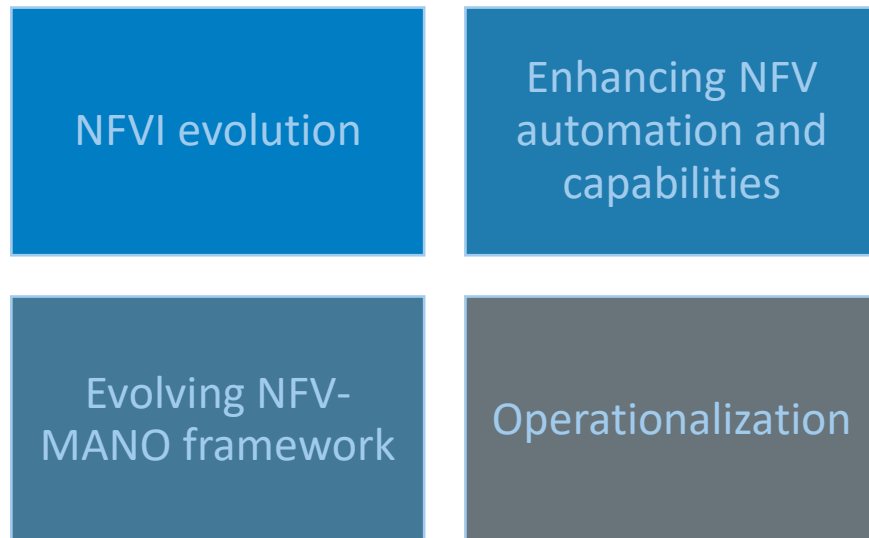
# Release 4: overview



[Release 4 Definition](#) available since NFV#29. It documents about the new features for Release 4. Second version available on the [NFV Open Area](#).

4 main technical areas and 15 features (8 new features, 5 carried-over from Release 3, and 2 enhancement features comprising “specific technical enhancements” and security aspects).

## Technical areas



## Features in the Release 4 definition

### New features

- Network connectivity integration and operationalization
- Multi-tenancy enhancements for NFV-MANO
- NFV-MANO automation and autonomous networks
- SBA for NFV-MANO
- NFV enhancements for 5G
- VNF common management functions
- Continuous VNF integration
- Policy management models

### Enhancement features

- NFV security hardening
- Specific technical enhancements

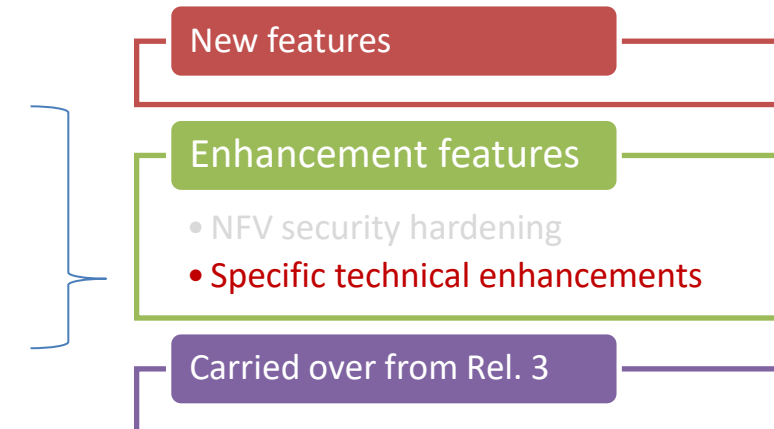
### Carried over from Rel. 3

- NFV-MANO upgrade
- MEC in NFV
- Licensing management
- Cloud-native VNFs and Container Infrastructure management
- Security management

# Release 4: overview

Enhancement features framework is being used extensively. Already 5 small technical enhancements are under development in the IFA WG.

- ✓ ENH02.01: SDN integration
- ✓ ENH02.02: NS feasibility check
- ✓ ENH02.03: Data flow mirroring
- ✓ ENH02.04: Invariant identifiers of NS constituents
- ✓ ENH02.05: Scalable VNF instantiation



# Release 4: work items and features: studies and stage 1&2 perspective

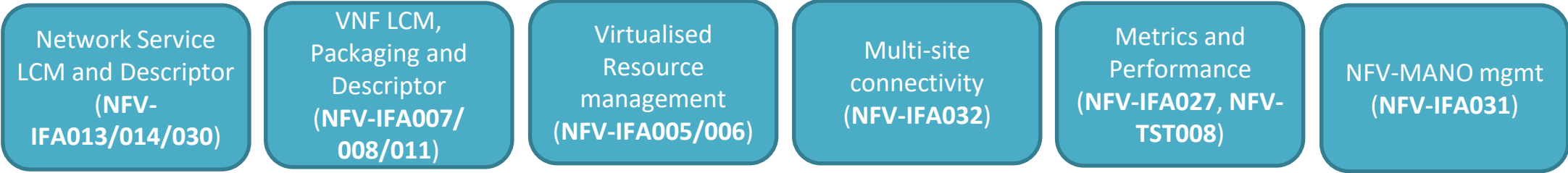
Completed: underlined  
Ongoing/not fully completed: *italics*  
Evolved: in **bold**

(\*\*): other normative work is part of evolved work items

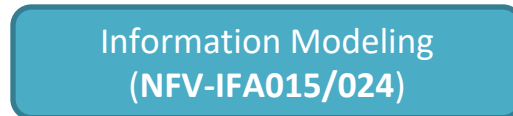
**NOTE:** might not be a full complete list due to lack of space



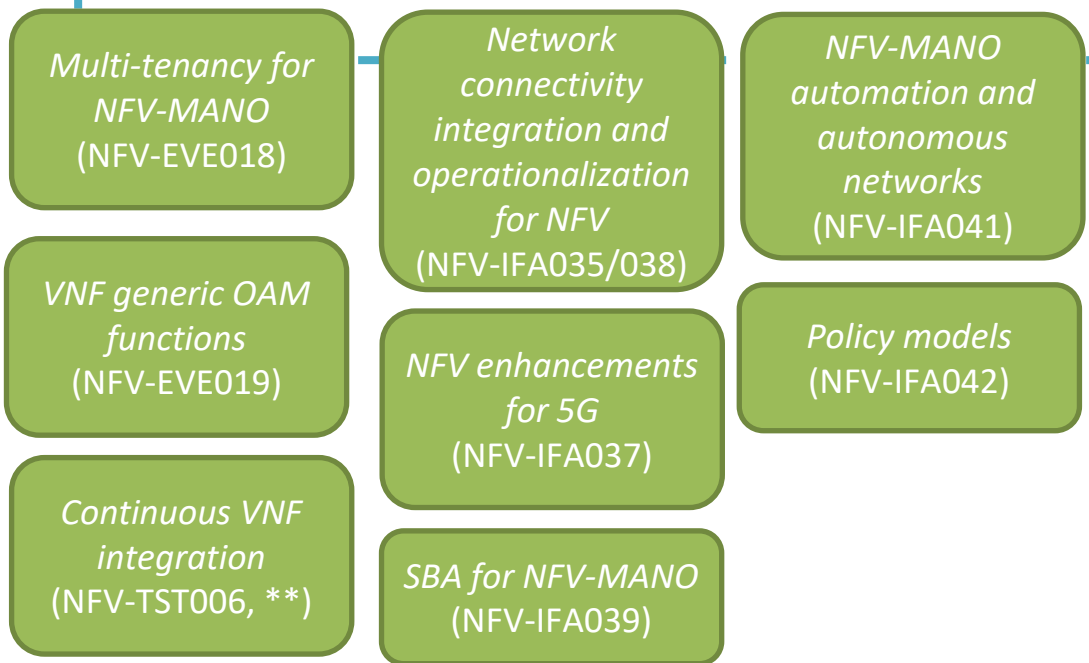
Status as of Jan. 2021



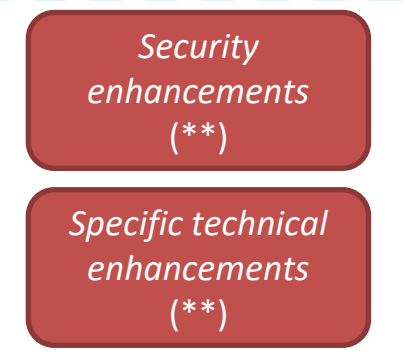
## 1) Framework from past releases



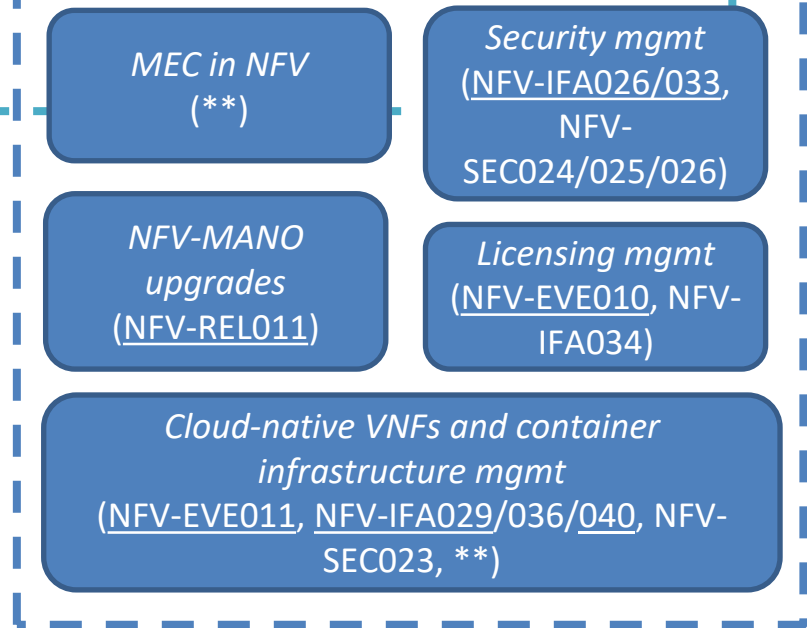
## 2) New features



## 3) Technical enhancements



## 4) Carried-over from Rel. 3



# Conclusion

# Conclusion

---

## Release 2 documentation is fully complete (closed).

- ✔ Maintenance has been performed since 2017. Maintenance has been frozen in mid-2020. Maintenance might be done in “reactive mode”.

## Release 3 close to finalize stage 3 specification work (stage 2 frozen).

- ✔ A pipeline of features has been delivered every 6 months. 10 new features had been completed since summer 2019.
- ✔ Completing now stage 3 normative specification work. First drop of stage 3 specifications completed in 1H2020. Work will continue through 2020.

## Release 4 under development (open).

- ✔ With 2 new normative work items on container-based deployments, 10 new informative work items on various technical areas, and 2 normative work items on security aspects.
- ✔ Scope: 8 new features, 2 enhancement features on specific technical enhancements and security, and 5 features carried over from Release 3 are considered.

# More information

NFV Technology Page (information / main website)

<http://www.etsi.org/nfv>

NFV Portal (working area)

<http://portal.etsi.org/nfv>

NFV Proofs of Concept (information)

<http://www.etsi.org/nfv-poc>

NFV Plugtest (information & registration)

<http://www.etsi.org/nfvplugtest>

NFV Registries

[https://nfvwiki.etsi.org/index.php?title=NfV\\_Registries](https://nfvwiki.etsi.org/index.php?title=NfV_Registries)

Open Area and other tools:

✓ [Published Documents](#)

✓ [Working Drafts](#)

✓ [Issue tracker](#)

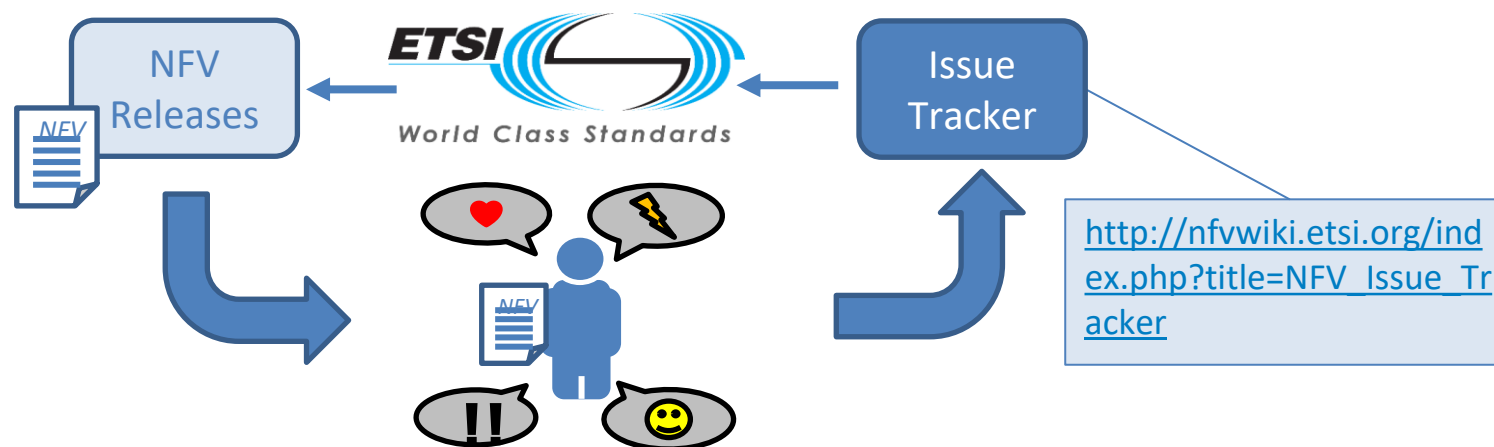
✓ Releases documentation: [Rel. 2 Description](#), [Rel. 3 Description](#), [Rel. Definition](#)

✓ Detailed [Release 3 and 4 specification progress wiki pages](#):

✓ [OpenAPI representations](#) of GS NFV-SOL NFV-MANO APIs

✓ [GS NFV-SOL 001/006 supporting files](#) on ETSI Forge

✓ [GS NFV-TST 010 Robot API test files](#)



Backup slides

Release 2  
specification  
summary

# Release 2: specification summary



Status as of Jan. 2021

## Published documents

Release 2, published documentation (32): 27 Group Specification (GS) and 5 Group Report (GR).

- ✔ 16 stage 2 GS (12 from IFA, 1 from TST, 2 from SEC, 1 ISG on NFV-MANO architecture).
- ✔ 4 stage 2 GR (IFA).
- ✔ 10 stage 3 GS (SOL).
- ✔ 2 testing (1 GR and 1 GS) (TST) .

## Active work items

None.

Refer to regular updates of the Release 2 Description (latest version [v1.11.0](#), Jul. 2020).

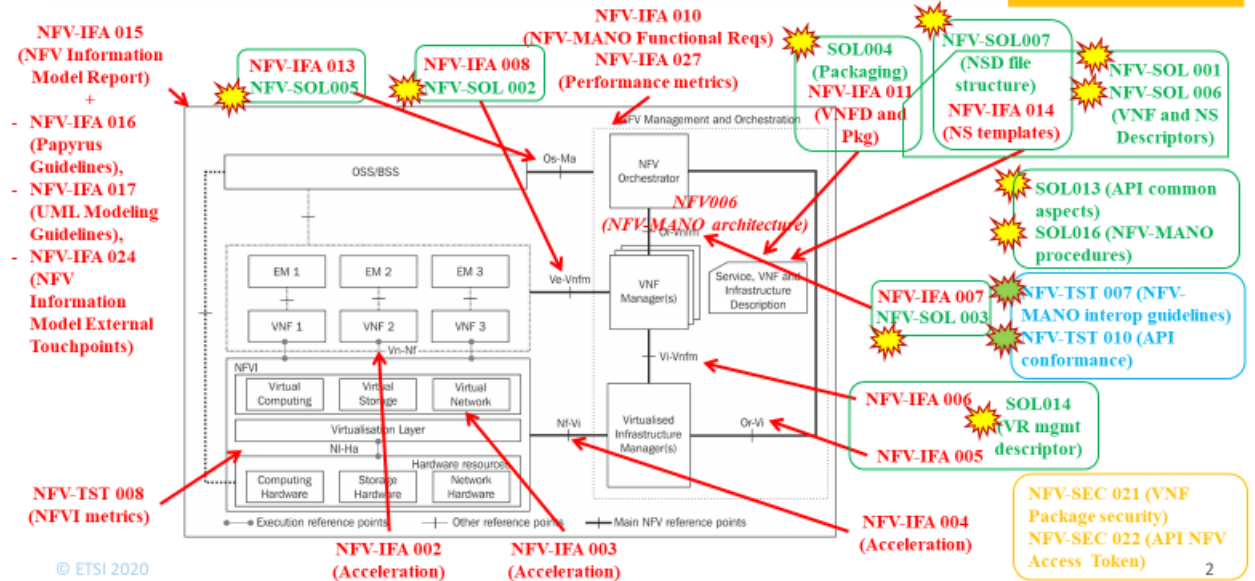
## Release 2: specification summary

Published! Stage 3

Testing

*Italics: in draft status*

Status as of Dec. 2020



© ETSI 2020

6 rounds of maintenance have been completed (1H2017, 2H2017, 1H2018, 2H2018, 1H2019, and 1H2020):

- ✔ Versioning: 1st round: v2.3.1; 2nd round: v2.4.1; 3rd round: v2.5.1 (some specs without maintenance remain in v2.4.1); 4th round: v2.6.1 (some specs w/o maintenance remain in v2.4.1 or v2.5.1); 5th round: v2.7.1; 6th round (only stage 3) v2.8.1.



# Release 2: specification summary

Published!  
Stage 3

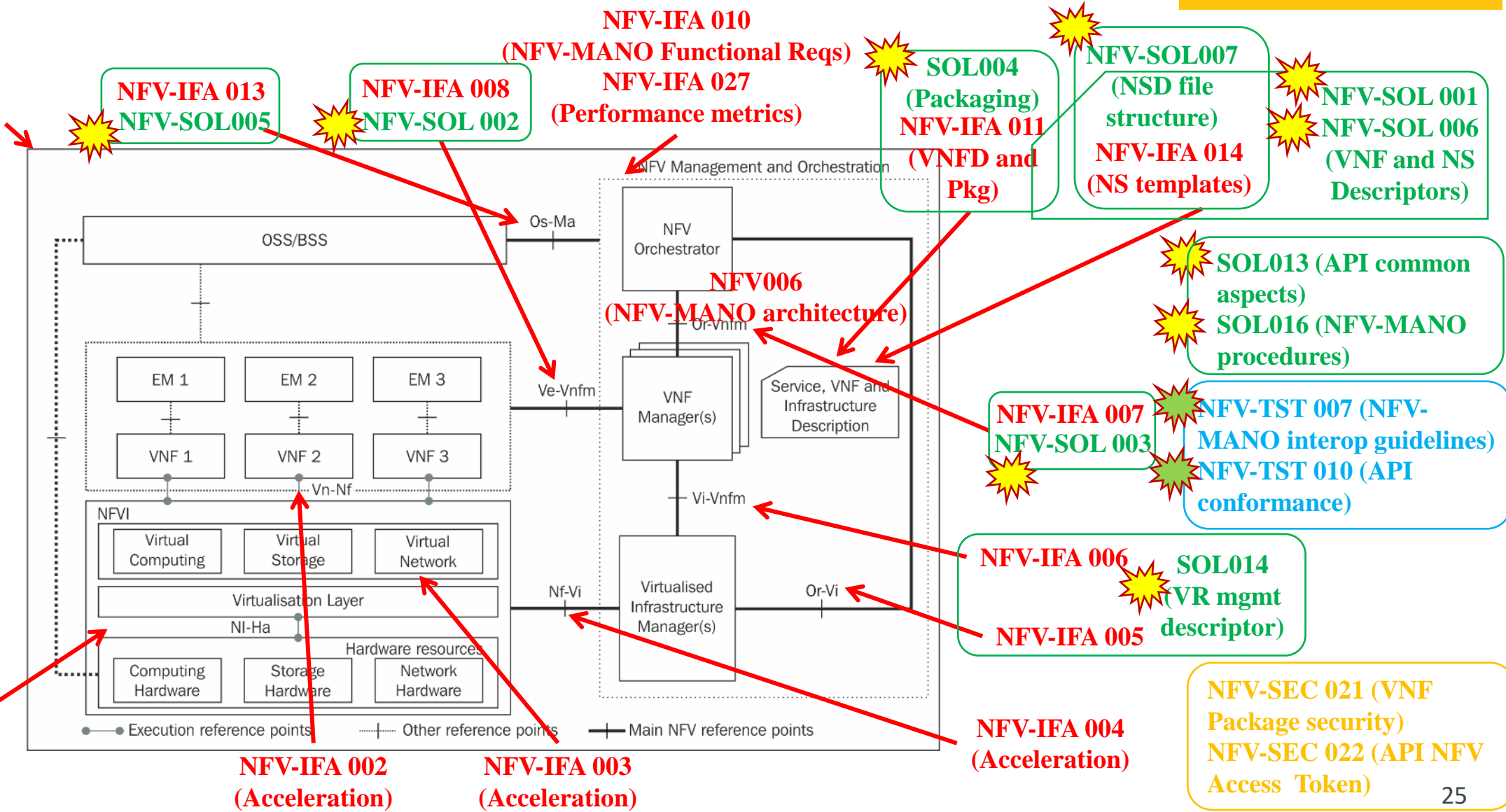
Published!  
Testing



Status as of Jan. 2021

*Italics: in draft status*

- NFV-IFA 015 (NFV Information Model Report) +
- NFV-IFA 016 (Papyrus Guidelines),
- NFV-IFA 017 (UML Modeling Guidelines),
- NFV-IFA 024 (NFV Information Model External Touchpoints)



NFV-TST 008 (NFVI metrics)

NFV-IFA 002 (Acceleration)

NFV-IFA 003 (Acceleration)

NFV-IFA 004 (Acceleration)

NFV-SEC 021 (VNF Package security)  
NFV-SEC 022 (API NFV Access Token)

# Release 2: stage 2 published documents (for reference)



Status as of Jan. 2021

ID	Title
<b>Architectural framework</b>	
ETSI GS NFV 006 v2.1.1	MANO; Architectural Framework Specification
<b>Functional requirements</b>	
ETSI GS NFV-IFA 010 v2.7.1	MANO; Functional requirements specification
<b>Acceleration (with interfaces)</b>	
ETSI GS NFV-IFA 002 v2.4.1	Acceleration Technologies; VNF Interfaces Specification
ETSI GS NFV-IFA 003 v2.4.1	Acceleration Technologies; vSwitch Benchmarking and Acceleration Specification
ETSI GS NFV-IFA 004 v2.4.1	Acceleration Technologies; Management aspects Specification
<b>NFV-MANO reference points and interfaces</b>	
ETSI GS NFV-IFA 005 v2.7.1	MANO; Or-Vi reference point - Interface and Information Model Specification
ETSI GS NFV-IFA 006 v2.7.1	MANO; Vi-Vnfm reference point - Interface and Information Model Specification
ETSI GS NFV-IFA 007 v2.7.1	MANO; Or-Vnfm reference point - Interface and Information Model Specification
ETSI GS NFV-IFA 008 v2.7.1	MANO; Ve-Vnfm reference point - Interface and Information Model Specification
ETSI GS NFV-IFA 013 v2.7.1	MANO; Os-Ma-Nfvo reference point - Interface and Information Model Specification

# Release 2: stage 2 published documents (for reference)



Status as of Jan. 2021

ID	Title
<b>Descriptors and artefacts</b>	
ETSI GS NFV-IFA 011 v2.7.1	MANO; VNF Descriptor and Packaging Specification
ETSI GS NFV-IFA 014 v2.7.1	MANO; Network Service Templates Specification
<b>Information modeling</b>	
ETSI GR NFV-IFA 015 v2.5.1	MANO; Report on NFV Information Model
ETSI GR NFV-IFA 016 v2.5.1	IM; Papyrus Guidelines
ETSI GR NFV-IFA 017 v2.5.1	IM; UML Modeling Guidelines
ETSI GR NFV-IFA 024 v2.1.1	IM; Report on External Touchpoints related to NFV Information Model
<b>Metrics, measurements</b>	
ETSI GS NFV-TST 008 v2.5.1	Testing; NFVI Compute and Network Metrics Specification
ETSI GS NFV-IFA 027 v2.7.1	MANO; Performance Measurements Specification

# Release 2: stage 3 published documents (for reference)



Status as of Jan. 2021

ID	Title
<b>NFV-MANO APIs</b>	
ETSI GS NFV-SOL 002 v2.8.1	Protocols and Data Models; RESTful protocols specification for the Ve-Vnfm Reference Point
ETSI GS NFV-SOL 003 v2.8.1	Protocols and Data Models; RESTful protocols specification for the Or-Vnfm Reference Point
ETSI GS NFV-SOL 005 v2.8.1	Protocols and Data Models; RESTful protocols specifications for the Os-Ma-nfvo Reference Point
ETSI GS NFV-SOL 013 v2.8.1	Protocols and Data Models; Specification of common aspects of RESTful NFV-MANO APIs
<b>Artifacts</b>	
ETSI GS NFV-SOL 001 v2.8.1	Protocols and Data Models; NFV descriptors based on TOSCA specification
ETSI GS NFV-SOL 004 v2.8.1	Protocols and Data Models; VNF Package and PNFD Archive specification
ETSI GS NFV-SOL 006 v2.8.1	Protocols and Data Models; NFV descriptors based on YANG specification
ETSI GS NFV-SOL 007 v2.8.1	Protocols and Data Models; Network Service Descriptor File Structure Specification
ETSI GS NFV-SOL 014 v2.8.1	Protocols and Data Models; YAML data model specification for descriptor-based virtualised resource management
<b>Procedures</b>	
ETSI GS NFV-SOL 016 v2.8.1	Protocols and Data Models; NFV-MANO procedures

# Release 2: other published documents (for reference)



Status as of Jan. 2021

ID	Title
<b>Testing</b>	
ETSI GR NFV-TST 007 v2.6.1	Testing; Guidelines on Interoperability Testing for MANO
ETSI GS NFV-TST 010 v2.6.1	Testing; API Conformance Testing Specification
<b>Security</b>	
ETSI GS NFV-SEC 021 v2.6.1	Security; VNF Package Security Specification
ETSI GS NFV-SEC 022 v2.8.1	Security; Access Token Specification for API Access

# Release 2: maintenance work (1/2)



6 rounds completed (1H2017, published as [v2.3.1](#); 2H2017, published as [v2.4.1](#); 1H2018, published as [v2.5.1](#), 2H2018 published as [v2.6.1](#), 2H2018 published as [v2.7.1](#), 1H2020 published as [v2.8.1](#)).

- ✔ 6<sup>th</sup> round focus on [stage 3 specifications \(NFV-SOL specs\)](#). Additional stage 2 specification on security has been considered for maintenance as well.

## Main [aspects addressed \(so far\) as part of maintenance](#):

- ✔ Correction of bugs and feedback from deployments and development: remove ambiguities, enhance APIs, etc.
- ✔ Alignment in between Stage 2 and 3 specifications.
- ✔ Security enhancements related to interfaces, descriptors and other artefacts.
- ✔ Extending constructs of VNF packaging for archiving files and artifacts of PNF.
- ✔ Improving and clarifying normative provisions in NFV-MANO APIs (improve testability...).
- ✔ Feedback from open source projects, e.g., OpenStack gap analysis and alignment to NFV-IFA005 and NFV-IFA006, OSM information model feedback to NFV-IFA011 and NFV-IFA014, contributions to NFV-IFA011 and NFV-SOL004 by companies participating in ONAP providing feedback, etc.

# Release 2: maintenance work (2/2)



**Capability changes and enhancements** developed during maintenance (not an exhaustive list) since first published version of the specs (i.e., v2.1.1 and v2.2.1):

- ✔ Adding support for compute flavour management.
- ✔ Merging of VNF and NS lifecycle change notifications into VNF and NS LCM interfaces, respectively.
- ✔ Merging of VNF configuration and instance information mgmt. into VNF LCM interface.
- ✔ Adding support for changing the external VNF connectivity.
- ✔ Enhancements and consistency to alarm management within the fault management interfaces.
- ✔ Enhancements in the information and data modelling of network connectivity.
- ✔ Adding support for flexible upload of VNF package's software images externally to the main VNF package.
- ✔ Adding support for security groups, trunking, etc.
- ✔ Merging the subscription to PM notifications into the creation of PmJobs and Thresholds.

Backup slides

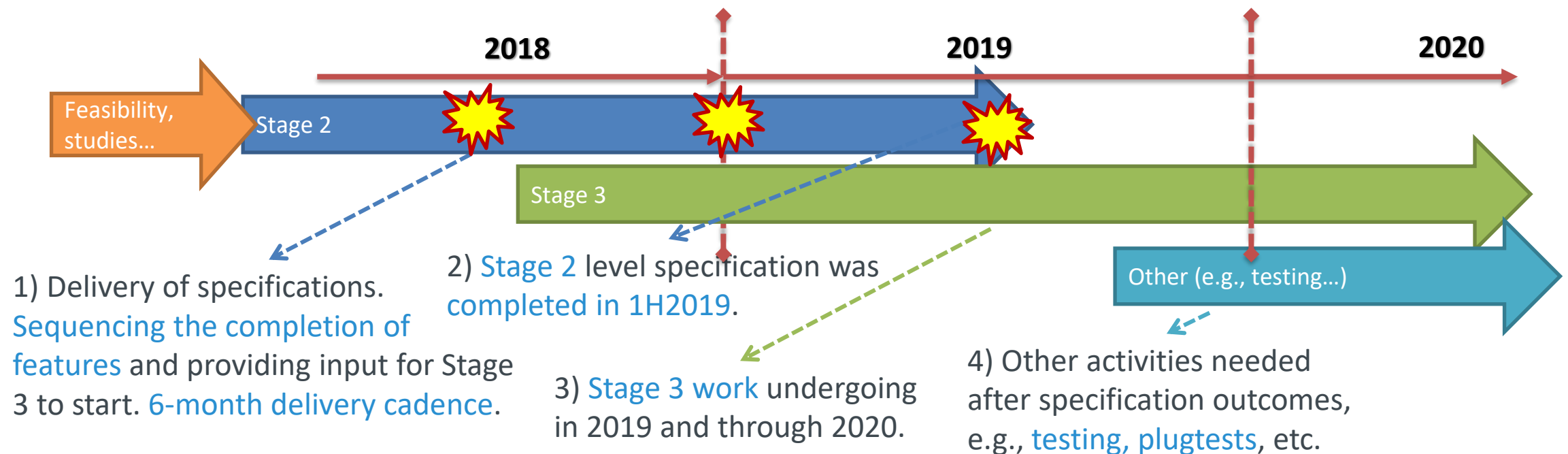
Release 3  
specification  
summary



# Release 3: feature-based specification

- Following a **feature-based specification approach**.
- 18+ candidate features were considered**.
- “stage 2 level” specification has been completed, and now closing “stage 3 level” work.

Release specification progress and plans are publicly available on the [NFV Public Wiki](#).  
List of completed features is available in the Release 3 Description (latest [v0.7.0](#), Nov. 2020). See also backup slides.



# Release 3: specification summary



Status as of Jan. 2021

## Published documents

Release 3, published documentation (50): 35 Group Specification (GS) and 15 Group Report (GR).

- ✔ 4 stage 1/2 GS (NFV-EVE001/007/011, NFV-REL006).
- ✔ 18 stage 2 specs:
  - ✔ 5 new stage 2 GS (NFV-IFA018/019/030/031/032).
  - ✔ 13 stage 2 specs evolved from Release 2: 9 GS (NFV-IFA005/006/007/008/010/011/013/014 and NFV-TST008) and 4 GR (NFV-IFA015/016/017/024).
- ✔ 10 stage 3 specs:
  - ✔ 4 new stage 3 GS (NFV-SOL009/010/011/012).
  - ✔ 8 stage 3 GS evolved from Rel. 2 deliverables: NFV-SOL001/002/003/004/005/006/007/013.
- ✔ 4 security GS (NFV-IFA026, NFV-SEC012/013/014).
- ✔ 1 testing/benchmarking GS (NFV-TST009).
- ✔ 11 GR (NFV-EVE008/010/012, NFV-IFA012/021/022/023/028/029, NFV-TST005, NFV-REL010).

## Active work items

Release 3, ongoing unpublished work items (refer to Release 3 Description): 3 WI.

- ✔ 1 GS drafts on security (NFV-SEC020).
- ✔ Evolved Rel. 2 deliverables from testing: 1 GS (NFV-TST010).
- ✔ 1 GR draft on stage 3 (NFV-SOL017).

Release 3, ongoing “maintenance work”: 13 WI.

- ✔ Propagated/evolved Rel. 2 deliverable drafts: 9 Stage 2 GS (NFV-IFA005/006/007/008/010/011/013/014/027).
- ✔ Newly added by Release 3: 4 Stage 2 GS (NFV-IFA026/030/031/032).

Refer to regular updates of the Release 3 Description (latest version is [v0.7.0](#), Nov. 2020).

# Release 3: specification summary

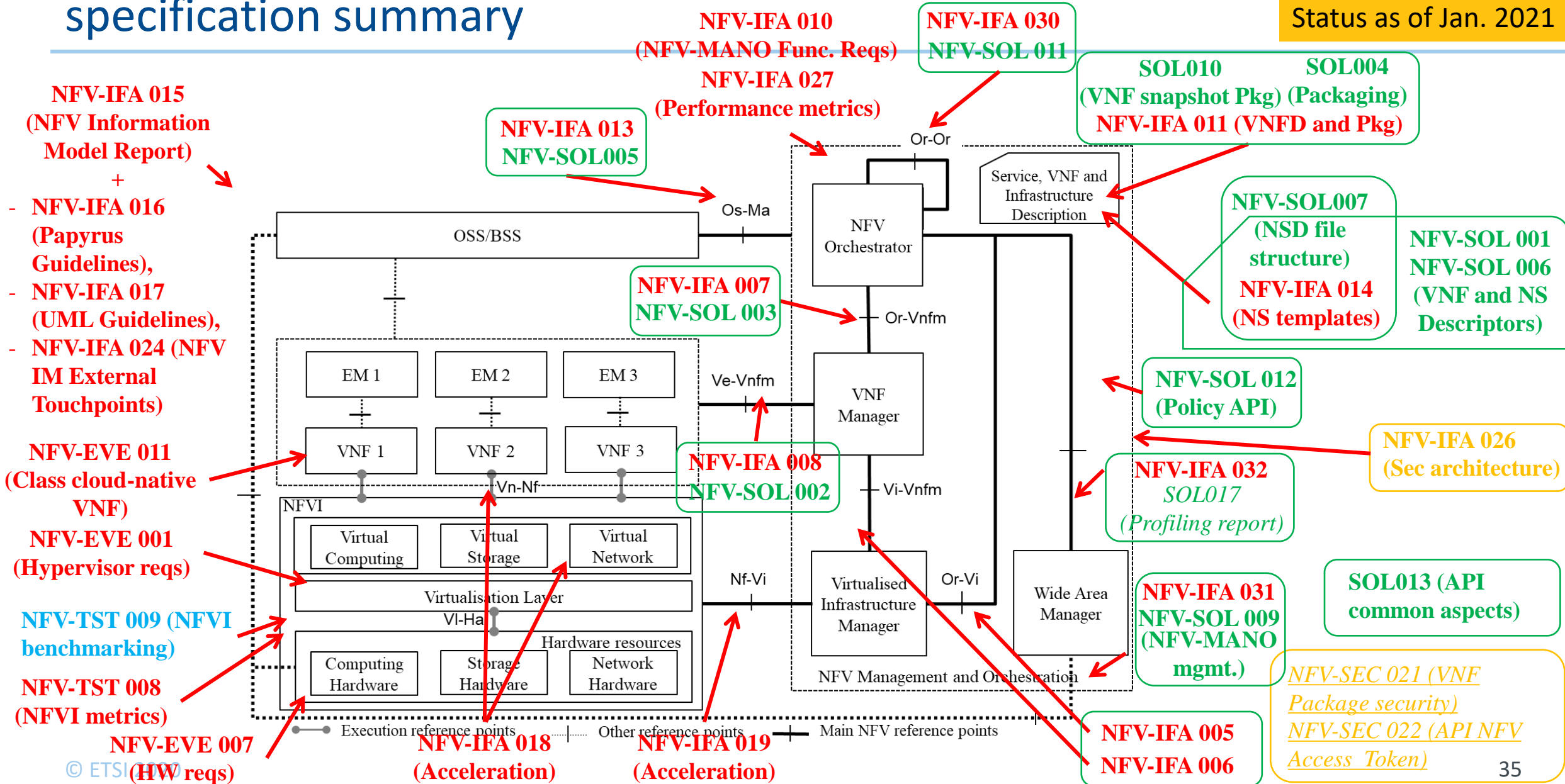
*Italics: in draft status* **Bold: published**

Underlined:  
published testing

*Underlined + italics:*  
*referenced from other Rel.*



Status as of Jan. 2021



# Release 3: work items and features from stage 1&2 perspective

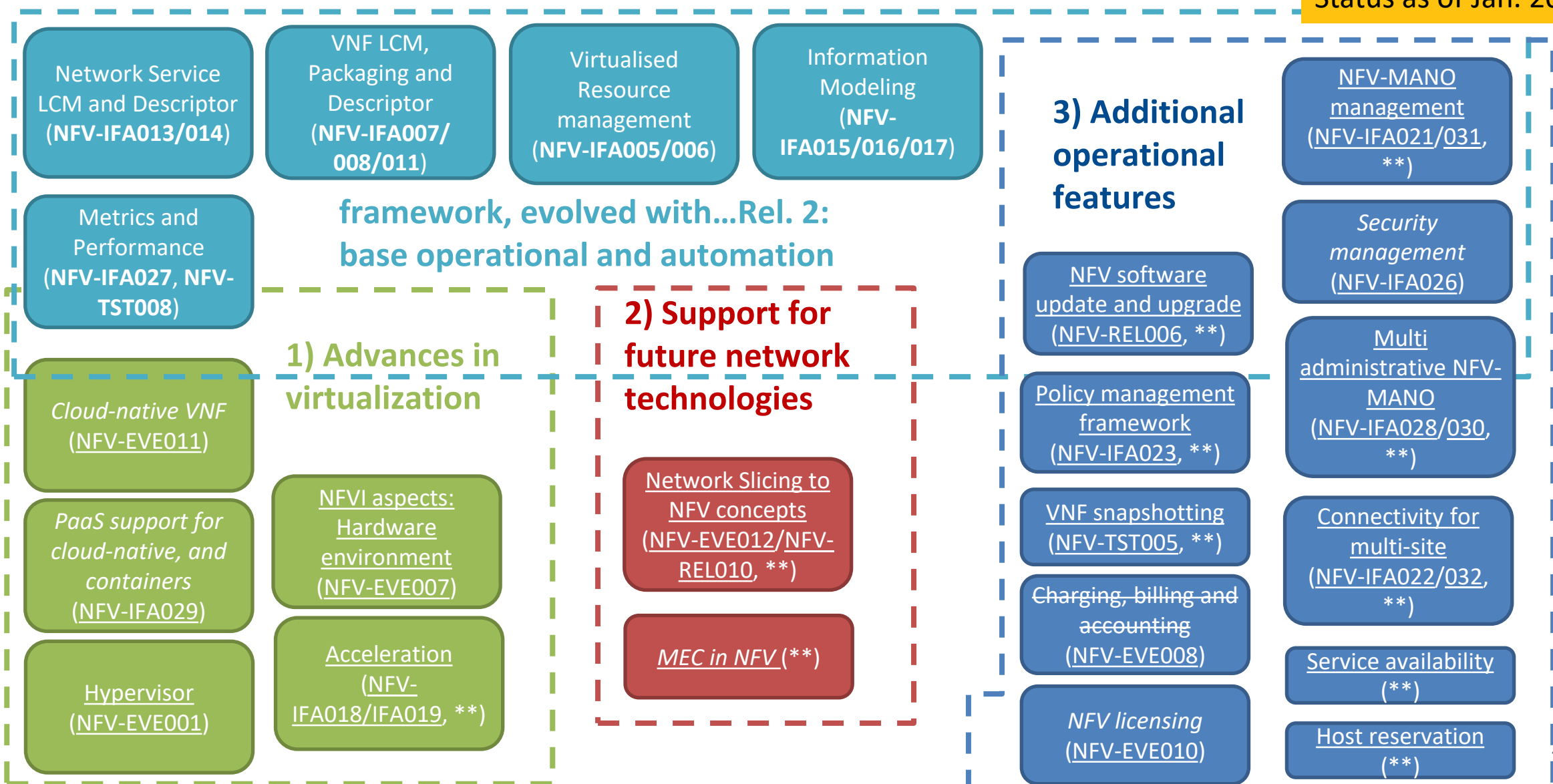
Completed: underlined  
 Ongoing/not fully completed: *italics*  
 Evolved: in **bold**  
 Abandoned: ~~strikethrough~~

(\*\*): other normative work is part of evolved work items

**NOTE:** might not be a full complete list due to lack of space



Status as of Jan. 2021



# Release 3: stage 2 published documents (for reference)



Status as of Jan. 2021

ID	Title
<b>Functional requirements</b>	
ETSI GS NFV-IFA 010 v3.4.1	MANO; Functional requirements specification
<b>NFV-MANO reference points and interfaces</b>	
ETSI GS NFV-IFA 005 v3.4.1	MANO; Or-Vi reference point - Interface and Information Model Specification
ETSI GS NFV-IFA 006 v3.4.1	MANO; Vi-Vnfm reference point - Interface and Information Model Specification
ETSI GS NFV-IFA 007 v3.4.1	MANO; Or-Vnfm reference point - Interface and Information Model Specification
ETSI GS NFV-IFA 008 v3.4.1	MANO; Ve-Vnfm reference point - Interface and Information Model Specification
ETSI GS NFV-IFA 013 v3.4.1	MANO; Os-Ma-Nfvo reference point - Interface and Information Model Specification
ETSI GS NFV-IFA 030 v3.4.1	MANO; Multiple Administrative Domain Aspect Interfaces
ETSI GS NFV-IFA 032 v3.4.1	MANO; Interface and Information Model Specification for Multi-Site Connectivity Services
<b>Descriptors and artefacts</b>	
ETSI GS NFV-IFA 011 v3.4.1	MANO; VNF Descriptor and Packaging Specification
ETSI GS NFV-IFA 014 v3.4.1	MANO; Network Service Templates Specification

# Release 3: stage 2 published documents (for reference)



Status as of Jan. 2021

ID	Title
<b>Acceleration (with interfaces), virtualization technologies and NFVI</b>	
ETSI GS NFV-EVE 001 v3.1.1	Virtualisation Technologies; Hypervisor Domain Requirements specification
ETSI GS NFV-EVE 007 v3.1.2	NFV Evolution and Ecosystem, Hardware Interoperability Requirements Specification
ETSI GS NFV-IFA 018 v3.1.1	Acceleration Technologies; Network Acceleration Interface Specification
ETSI GS NFV-IFA 019 v3.1.1	Acceleration Technologies; Acceleration Resource Management Interface Specification
<b>Information modeling</b>	
ETSI GR NFV-IFA 015 v3.4.1	MANO; Report on NFV Information Model
ETSI GR NFV-IFA 016 v3.4.1	IM; Papyrus Guidelines
ETSI GR NFV-IFA 017 v3.4.1	IM; UML Modeling Guidelines
ETSI GR NFV-IFA 024 v3.2.1	IM; Report on External Touchpoints related to NFV Information Model
<b>Metrics, measurements</b>	
ETSI GS NFV-TST 008 v3.3.1	Testing; NFVI Compute and Network Metrics Specification
<b>NFV-MANO management</b>	
ETSI GS NFV-IFA 031 v3.4.1	Management and Orchestration; Requirements and interfaces specification for management of NFV-MANO

# Release 3: stage 3 published documents (for reference)



Status as of Jan. 2021

ID	Title
<b>NFV-MANO APIs</b>	
ETSI GS NFV-SOL 002 v3.3.1	Protocols and Data Models; RESTful protocols specification for the Ve-Vnfm Reference Point
ETSI GS NFV-SOL 003 v3.3.1	Protocols and Data Models; RESTful protocols specification for the Or-Vnfm Reference Point
ETSI GS NFV-SOL 005 v3.3.1	Protocols and Data Models; RESTful protocols specifications for the Os-Ma-nfvo Reference Point
ETSI GS NFV-SOL 011 v3.3.1	Protocols and Data Models; RESTful protocols specification for the Or-Or Reference Point
ETSI GS NFV-SOL 012 v3.4.1	Protocols and Data Models; RESTful protocols specification for the Policy Management Interface
ETSI GS NFV-SOL 013 v3.3.1	Protocols and Data Models; Specification of common aspects of RESTful NFV-MANO APIs
<b>NFV-MANO management APIs</b>	
ETSI GS NFV-SOL 009 v3.3.1	Protocols and Data Models; RESTful protocols specification for the management of NFV-MANO
<b>Artifacts</b>	
ETSI GS NFV-SOL 001 v3.3.1	Protocols and Data Models; NFV descriptors based on TOSCA specification
ETSI GS NFV-SOL 004 v3.3.1	Protocols and Data Models; VNF Package and PNFD Archive specification
ETSI GS NFV-SOL 006 v3.3.1	Protocols and Data Models; NFV descriptors based on YANG specification
ETSI GS NFV-SOL 007 v3.3.1	Protocols and Data Models; Network Service Descriptor File Structure Specification
ETSI GS NFV-SOL 010 v3.3.1	Protocols and Data Models; VNF Snapshot Package specification

# Release 3: other areas, published documents (for reference)



Status as of Jan. 2021

ID	Title
<b>Testing</b>	
ETSI GR NFV-TST 009 v3.3.1	Testing; Specification of Networking Benchmarks and Measurements
<b>Security</b>	
ETSI GS NFV-IFA 026 v3.4.1	MANO; Architecture enhancement for Security Management Specification
ETSI GS NFV-SEC 012 v3.1.1	Security; system architecture specification for execution of sensitive components
ETSI GS NFV-SEC 013 v3.1.1	Security; Security Management and Monitoring specification
ETSI GS NFV-SEC 014 v3.1.1	NFV Security; Security Specification for MANO Components and Reference Points
<b>Reliability</b>	
ETSI GS NFV-REL 006 v3.1.1	Reliability; Maintaining Service Availability and Continuity Upon Software Modification
<b>Other non-functional requirements</b>	
ETSI GS NFV-EVE 011 v3.1.1	Virtualised Network Function; Specification of the Classification of Cloud Native VNF implementations



# Release 3: published reports (for reference)



Status as of Jan. 2021

ID	Title
<b>Reports</b>	
ETSI GR NFV-EVE 012 v3.1.1	Evolution and Ecosystem; Report on Network Slicing Support with ETSI NFV Architecture Framework
ETSI GR NFV-IFA 021 v3.1.1	MANO; Report on management of NFV-MANO and automated deployment of EM and other OSS functions
ETSI GR NFV-IFA 022 v3.1.1	MANO; Report on Management and Connectivity for Multi-Site Services
ETSI GR NFV-IFA 023 v3.1.1	MANO; Report on Policy Management in MANO
ETSI GR NFV-IFA 028 v3.1.1	MANO; Report on architecture options to support multiple administrative domains
ETSI GR NFV-IFA 029 v3.3.1	Architecture; Report on the Enhancements of the NFV architecture towards "Cloud-native" and "PaaS"
ETSI GR NFV-REL 010 v3.1.1	Reliability; Report on NFV Resiliency for the Support of Network Slicing
ETSI GR NFV-TST 005 v3.1.1	Continuous Development and Integration; Report on use cases and recommendations for VNF Snapshot

Backup slides

Release 3  
features

# Release 3 features: VNF software modification (FEAT02)

**Objective:** Minimize the impact of VNF software modification on service continuity.

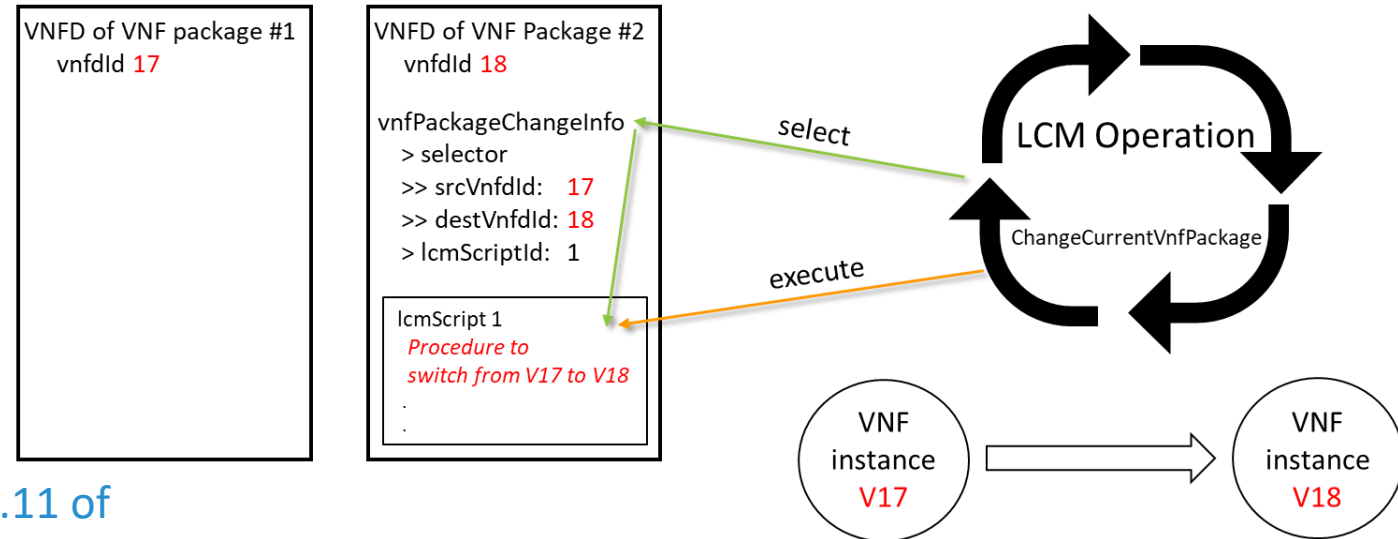
## Use cases:

- ✔ Change software version of deployed VNF.
- ✔ See also use cases documented in published report [ETSI GS NFV-REL 006](#).

## Specification outcomes (more details in clause 5.2.11 of [Release 3 Description](#)):

- ✔ Extending functional requirements, interfaces and information model specified in ETSI GS NFV-IFA 010/007/008/010/013 to support a new LCM operation to change VNF Package LCM.
- ✔ Descriptor information model in ETSI GS NFV-IFA 011.
- ✔ Protocols and data models specification in ETSI GS NFV-SOL 002/003/005.
- ✔ Descriptor data model in ETSI GS NFV-SOL 001/006.

## VNF software modification



## Other information:

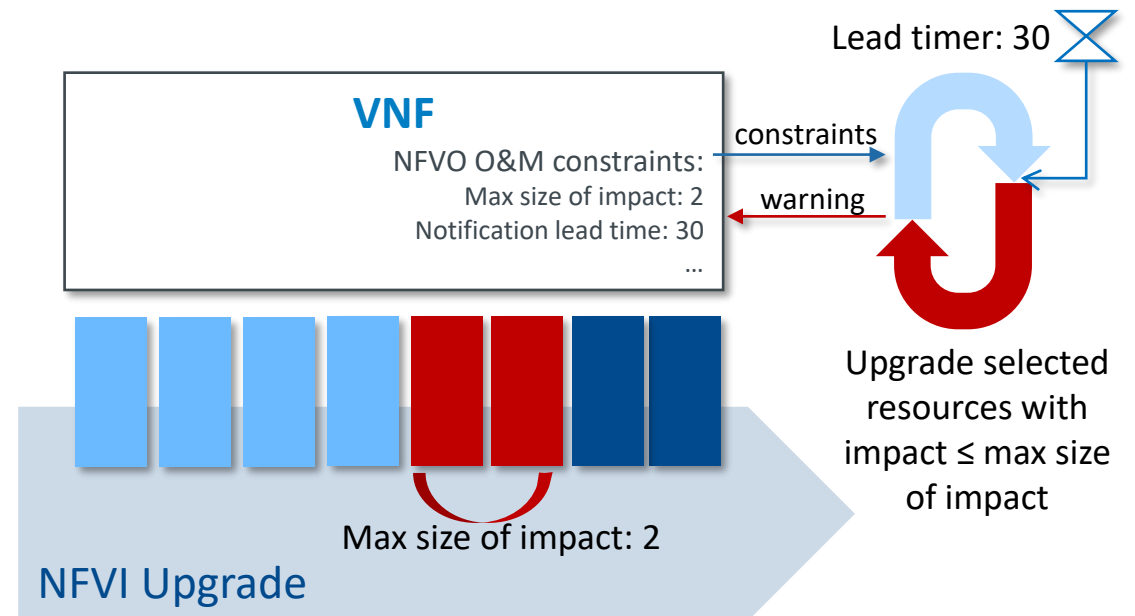
- ✔ The LCM supports the change of a VNF Package to allow for upgrade and downgrade of VNF instances.

# Release 3 features: NFVI software modification (FEAT03)

**Objective:** Minimize the impact of NFVI operation and maintenance (O&M), e.g. upgrade, on service continuity.

## Use cases:

- ✔ Allow VNFs to prepare for upcoming impacts due to NFVI O&M on virtualised resources they use.
- ✔ See also use cases documented in the published [ETSI GS NFV-REL 006](#) specification.



## Specification outcomes (more details in clause 5.2.13 of [Release 3 Description](#)):

- ✔ Functional requirements specified in ETSI GS NFV-IFA 010 with support for NFVI O&M constraints and for advanced notification of VNF instances about upcoming impacts.
- ✔ Extension of the VNFD information model and policy management interface specified in ETSI GS NFV-IFA 005/006/008/011 to include NFVI O&M constraints
- ✔ Extension of the fault management/resource change interfaces specified in ETSI GS NFV-IFA 005/006/008 to allow for notifications for upcoming impacts due to NFVI O&M.

# Release 3 features: Host reservation (FEAT04)

**Objective:** Enable reservation of physical compute hosts in the NFVI by „authorized consumers of NFVI administration“.

## Use cases:

- ✔ Secure NFVI resource availability during maintenance processes.
- ✔ Hardware interoperability requirements (see [ETSI GS NFV-EVE 007](#)).
- ✔ Security regulations (see [ETSI GS NFV-SEC 012](#)).
- ✔ See also OPNFV’s Promise project: [wiki.opnfv.org/display/promise/](http://wiki.opnfv.org/display/promise/)

## Specification outcomes (more details in clause 5.2.9 of [Release 3 Description](#)):

- ✔ Requirements, interfaces and information models in ETSI GS NFV-IFA 010/005/007/013 and GR NFV-IFA 015.
- ✔ Protocols and data models specification in ETSI GS NFV-SOL 003 and GS NFV-SOL 005.



## Other information:

- ✔ Aligned with (Resource reservation service): <https://docs.openstack.org/blazar/> which supports reservation of virtual compute(s) and physical compute host(s).

# Release 3 features: Network slicing in NFV (FEAT05)

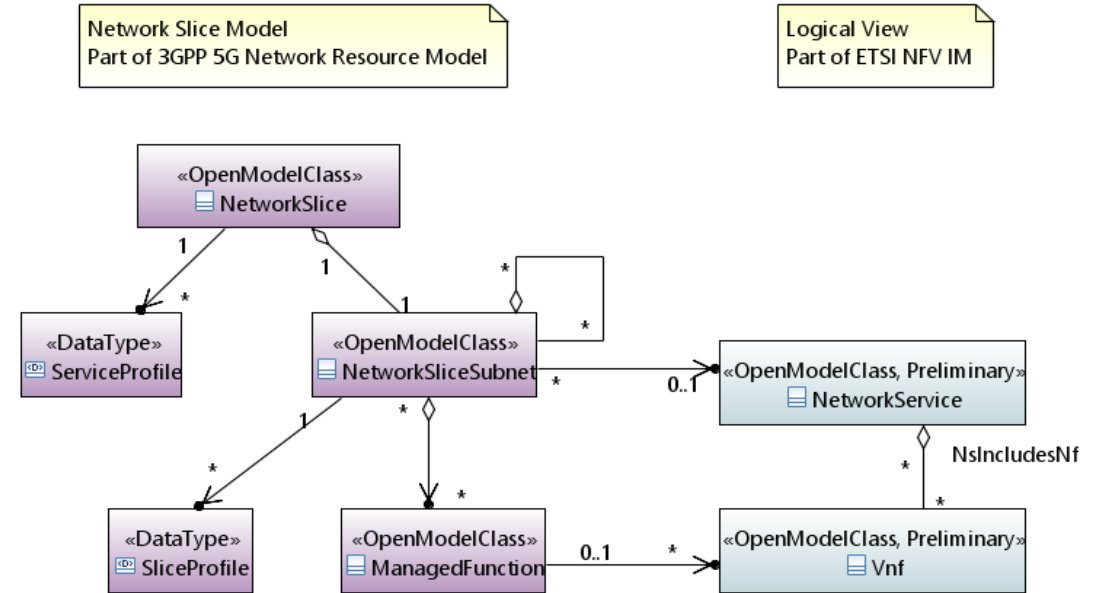
**Objective:** Support Network Slicing by defining the necessary requirements and enhancements of interfaces and descriptors.

## Use cases:

- ✔ NFV network services as constituents for network slices.
- ✔ See also use cases documented in the published report [ETSI GR NFV-EVE 012](#).

## Specification outcomes (more details in clause 5.2.12 of [Release 3 Description](#)):

- ✔ New touchpoint in ETSI GR NFV-IFA 024.
- ✔ Updates to NS descriptor information model in ETSI GS NFV-IFA 014.
- ✔ Requirements and interface specification in ETSI GS NFV-IFA 010/013.



## Other information:

- ✔ Mgmt. of Network Services already supports most requirements for the use network slice management functions (e.g. multi-tenancy, nested NSs).
- ✔ Main new requirement: Priority attribute for Network Service instances to be used to resolve conflicts during resource allocation

# Release 3 features: NFV-MANO Policy Management Framework (FEAT07)

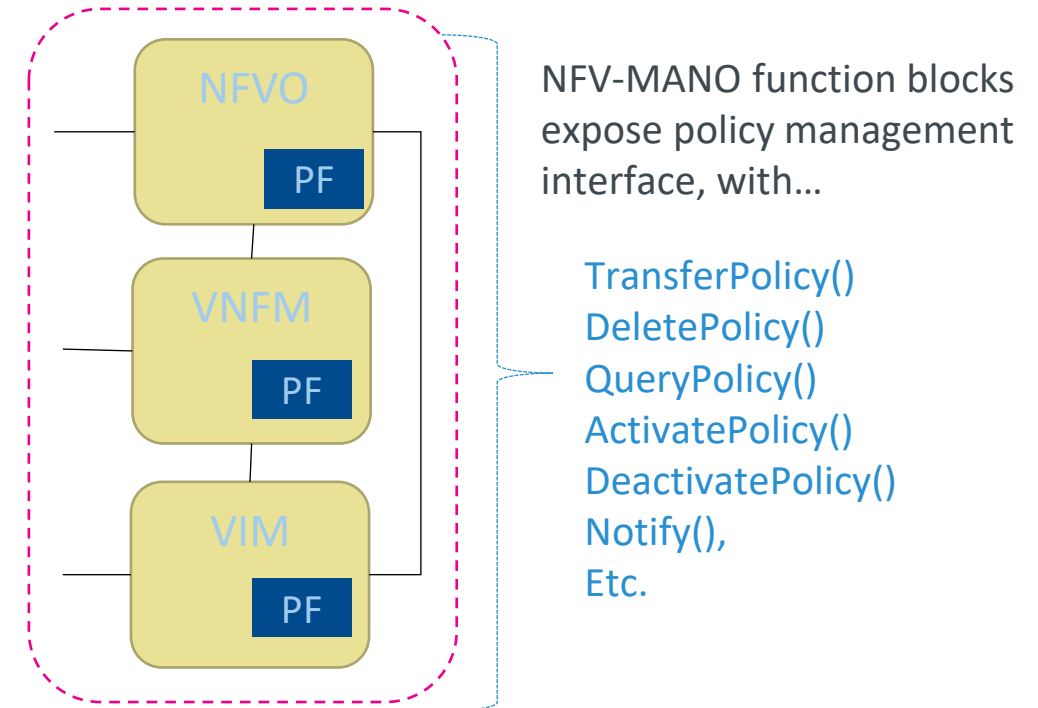
**Objective:** Create a policy management framework to further enhance the flexibility in NFV Management and Orchestration.

## Use cases:

- ✔ Change the behaviour of VNF, NS and VR lifecycle and orchestration based on policies.
- ✔ See also use cases documented in the published report [ETSI GR NFV-IFA 023](#).

## Specification outcomes (more details in clause 5.2.7 of [Release 3 Description](#)):

- ✔ A new policy management interface is added for each reference point, which includes operations of policy transfer, deletion, query, activation and deactivation. Specified from v3.1.1 versions of ETSI GS NFV-IFA 010/005/006/007/008/013 and GR NFV-IFA 015.
- ✔ Protocols and data models specification in ETSI GS NFV-SOL 012.



## Other information:

- ✔ NFV-MANO FB (i.e., NFVO, VNFM and VIM) act as Policy Functions (PF) to enforce policies. NFV-MANO FB can also act as Policy Administration Points (PAP).

# Release 3 features: NS across multiple administrative domains (FEAT08)

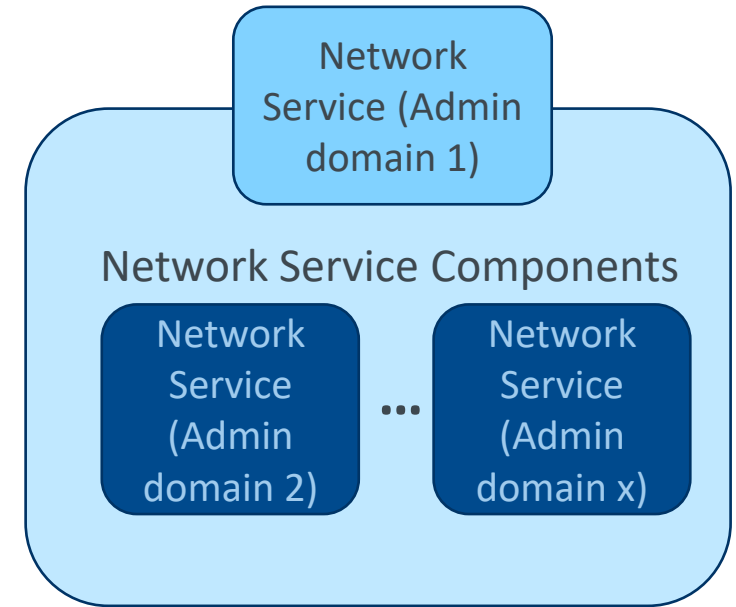
**Objective:** Enable different business models where the NFV infrastructure or Network Services are provided by another administrative domain.

## Use cases:

- ✓ NS provisioning and lifecycle management require coordination between two NFVOs in different administrative domains.
- ✓ See also use cases documented in the published report [ETSI GR NFV-IFA 028](#).

## Specification outcomes (more details in clause 5.2.8 of [Release 3 Description](#)):

- ✓ Enable a new reference point Or-Or with the functionality mainly referencing to the existing ETSI GS NFV-IFA 013 operations and information model ETSI GR NFV-IFA 015. Developed in the ETSI GS NFV-IFA 030.
- ✓ Protocols and data models specification in ETSI GS NFV-SOL



## Other information:

- ✓ None



# Release 3 features: Management & Connectivity of Multi-Site Services (FEAT10)

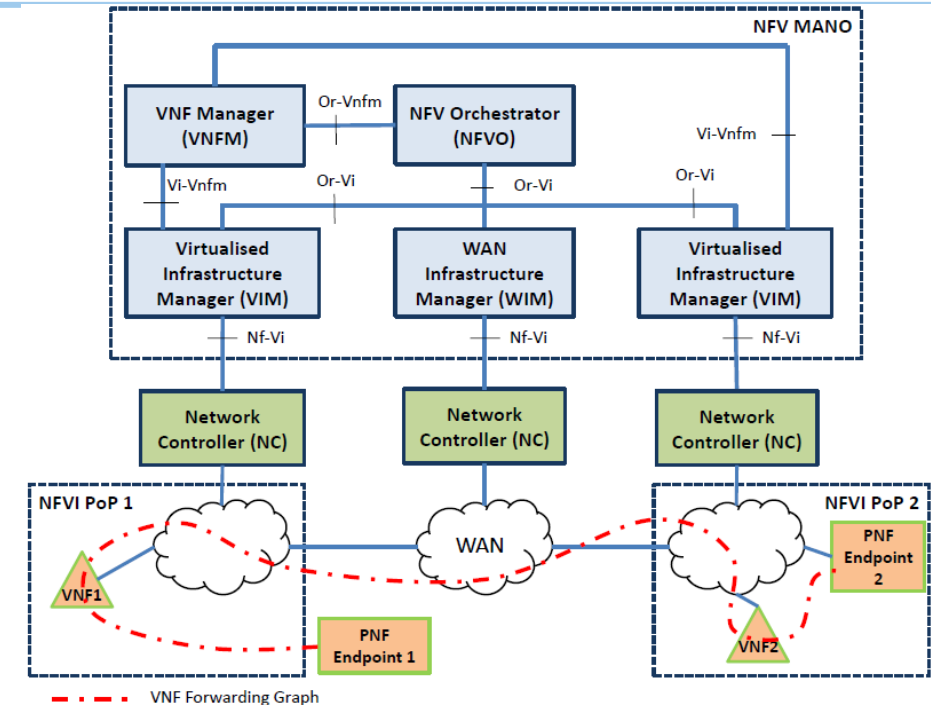
**Objective:** Specify management aspects for enabling inter-connectivity between, and management of network services across, multiple NFVI-PoPs over WAN infrastructure.

## Use cases:

- ✔ A set of requirements, interfaces and information models for the WAN Infrastructure Manager (WIM).
- ✔ See also use cases documented in the published report [ETSI GR NFV-IFA 022](#).

## Specification outcomes (more details in clause 5.2.10 of [Release 3 Description](#)):

- ✔ New interfaces specified in ETSI GS NFV-IFA 032.
- ✔ Updates on ETSI GS NFV-IFA 005/007/010/013/014 to expose multi-site service connectivity information.
- ✔ Protocols and data models in ETSI GS NFV-SOL003/005.
- ✔ Extensions to descriptor data models in ETSI GS NFV-SOL 001/006.



## Other information:

- ✔ 4 new management interfaces (Multi-site connectivity service, Capacity, Performance, Fault management) to provision and manage multi-site connectivity services.
- ✔ PoC#42: Mapping ETSI-NFV onto Multi-Vendor, Multi-Domain Transport SDN 4. Report available on <https://www.etsi.org/technologies/nfv/nfv-poc>.
- ✔ Study/informative profiling is currently being performed as part of [DGR/NFV-SOL017](#).

# Release 3 features: Management of NFV-MANO (FEAT11)

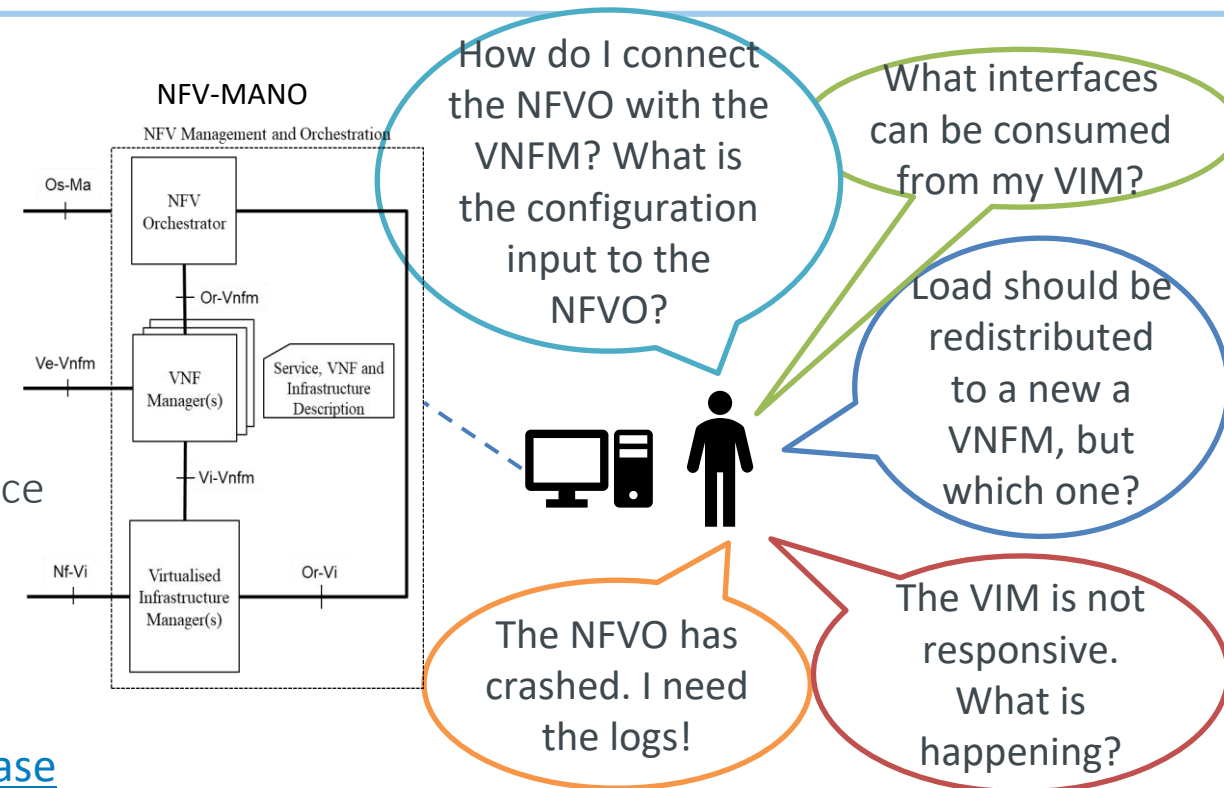
**Objective:** Create a framework for flexible NFV-MANO management to ease the integration/interworking of NFV-MANO system with network operators support systems.

## Use cases:

- NFV-MANO functions need to be configured for interworking and monitored against fault and performance issues.
- See also use cases documented in the published report [ETSI GR NFV-IFA 021](#).

## Specification outcomes (more details in clause 5.2.5 of [Release 3 Description](#)):

- Set of requirements, interfaces and information model for the operation, management and maintenance of NFV-MANO in ETSI GS NFV-IFA 010/031 and GR NFV-IFA 015.
- Protocols and data models specification in ETSI GS NFV-SOL 009.



## Other information:

none



Fault management



Configuration management



Performance management



State management



Log management

# Release 3 features: VNF Snapshots (FEAT15)

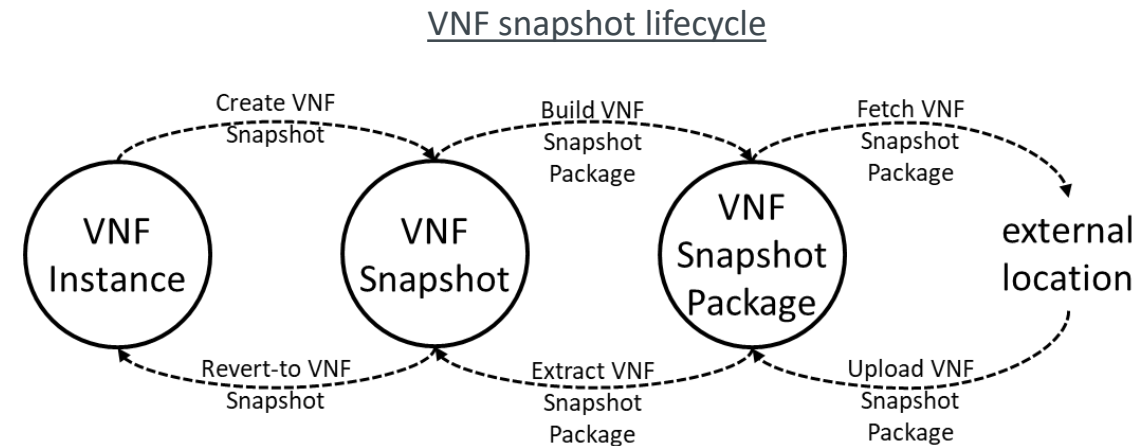
**Objective:** Solution to manage, store and transfer a snapshot of a VNF.

## Use cases:

- ✔ Testing, troubleshooting, as fall-back in LCM procedures, e.g., quick VNF recovery.
- ✔ See also use cases documented in the published report [ETSI GR NFV-TST 005](#).

## Specification outcomes (more details in clause 5.2.6 of [Release 3 Description](#)):

- ✔ Requirements, interfaces and information models in ETSI GS NFV-IFA 010/005/007/008/013 and GR NFV-IFA 015 to support new LCM operations regarding VNF snapshotting and VNF snapshot package mgmt.
- ✔ Descriptor information model in ETSI GS NFV-IFA 011.
- ✔ Protocols and data models specification in ETSI GS NFV-SOL 002/003/005.
- ✔ Descriptor data model in ETSI GS NFV-SOL 001/006.
- ✔ VNF snapshot packaging in ETSI GS NFV-SOL 010.



## Other information:

- ✔ None

# Release 3 features: Service availability level (SAL) (FEAT16)

**Objective:** Enable the NFV system to select the optimal resources to achieve a given level of availability.

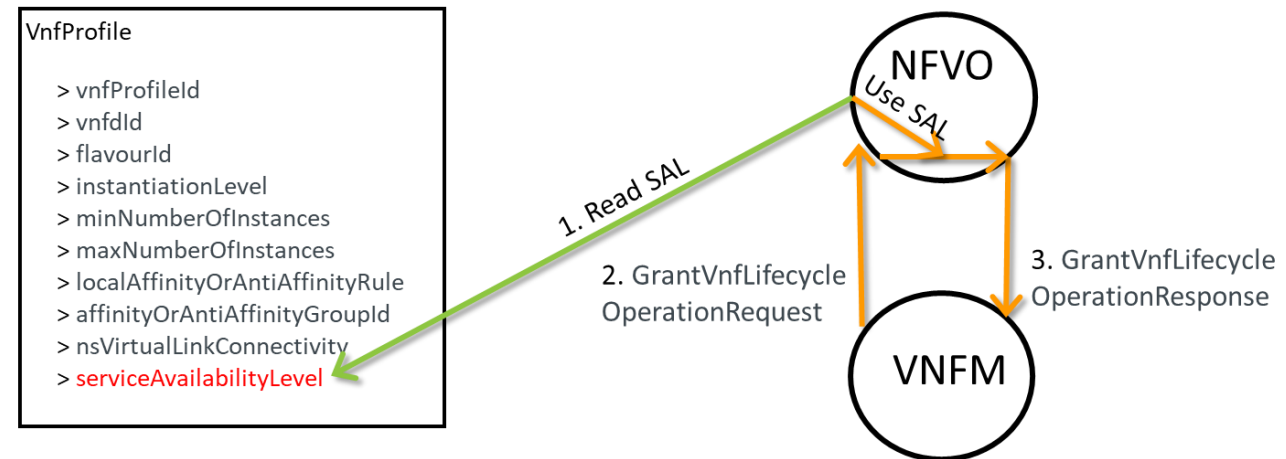
## Use cases:

- During instantiation of a network service, virtualised resources are assigned. Expected service availability level is taken into account for this resource assignment.

## Specification outcomes (more details in clause 5.2.14 of Release 3 Description):

- Extending functional requirements for selection of a SAL in ETSI GS NFV-IFA 010.
- Descriptor information model extension to include SAL value into VNFD and NS deployment flavour in ETSI GS NFV-IFA 014.
- Descriptor data models in ETSI GS NFV-SOL 001/006.

## Service availability level



## Other information:

- The mechanisms how to include SAL value in the selection of the virtualized resource have not been specified in Release 3.

Backup slides

Release 4  
specification  
summary

# Release 4: specification summary



Status as of Jan. 2021

## Published documents

Release 4, published documentation (5): 4 Group Specification (GS) and 1 Group Report (GR).

- ✓ 4 stage 2 specs:
  - ✓ 2 new stage 2 GS: NFV-IFA033/040.
  - ✓ 2 Propagated/evolved from Rel. 3: NFV-IFA010/011.
- ✓ 1 GR: NFV-REL011

## Active work items

Release 4, ongoing unpublished work items (refer to Release 4 Definition): 33 WI.

- ✓ 10 GR drafts (NFV-EVE018/019, NFV-IFA034/035/037/038/039/041/042, NFV-REL013).
- ✓ 1 stage 2 GS draft (NFV-IFA036).
- ✓ 1 stage 3 GS draft (NFV-SOL018).
- ✓ 4 GS drafts (NFV-SEC023/024/025/026) and 1 GR draft (NFV-SEC027) on security.
- ✓ Propagate/evolved Rel. 3 deliverables: 16 WI:
  - ✓ 12 stage 2 GS (NFV-IFA005/006/007/008/010/011/013/014/026/030/031/032),
  - ✓ 2 GR (NFV-IFA015/024),
  - ✓ 1 stage 3 GS (NFV-SOL001) and
  - ✓ 1 security GS (NFV-SEC012).

Release 4, ongoing “maintenance work”: 3 WI.

- ✓ 3 stage 2 GS (NFV-IFA010/011/040).

Refer to Release 4 Definition available on the [NFV Open Area](#).

# Release 4: ongoing work items for new documents



Status as of Jan. 2021

Id	Title	Type	Feature mapping
DGR/NFV-EVE018	Evolution and Ecosystem; Report on Multi-tenancy in NFV	GR	Multi-tenancy enhancements for NFV-MANO (M-Tenant, FEAT22)
DGR/NFV-EVE019	Architectural Framework; Report on VNF generic OAM functions	GR	VNF common management functions (VNF-OAM, FEAT24)
DGR/NFV-IFA034	Management and Orchestration; Report on Architectural enhancement for VNF License Management support and use of VNF licenses	GR	License management (FEAT13 [carried over from Rel. 3])
DGR/NFV-IFA035	Architectural Framework; Report on network connectivity integration and operationalization for NFV	GR	Network connectivity integration and operationalization for NFV (NFV-Connect, FEAT19)
DGS/NFV-IFA036	Management and Orchestration; Specification of requirements for the management and orchestration of container cluster nodes	GS	Cloud native VNFs and container infrastructure management (FEAT17 [carried over from Rel. 3])

# Release 4: ongoing work items for new documents



Status as of Jan. 2021

Id	Title	Type	Feature mapping
DGR/NFV-IFA037	Architectural Framework; Report on further NFV support for 5G	GR	NFV enhancements for 5G (5GNFV, FEAT21)
DGR/NFV-IFA038	Architectural Framework; Report on network connectivity for container based VNF	GR	Network connectivity integration and operationalization for NFV (NFV-Connect, FEAT19)
DGR/NFV-IFA039	Architectural Framework; Report on Service Based Architecture (SBA) design	GR	SBA for NFV-MANO (MANO-SBA, FEAT23)
DGR/NFV-IFA041	Management and Orchestration; Report on enabling autonomous management in NFV-MANO	GR	NFV-MANO automation and autonomous networks (Auto, FEAT20)
DGR/NFV-IFA042	Management and Orchestration; Report on policy information and data models for NFV-MANO	GR	Policy management models (Policy-models, FEAT26)
DGS/NFV-SOL018	Protocols and Data Models; Profiling specification of protocol and data model solutions for OS container management and orchestration	GS	Cloud native VNFs and container infrastructure management (FEAT17 [carried over from Rel. 3])



# Release 4: ongoing work items for new documents



Status as of Jan. 2021

Id	Title	Type	Feature mapping
DGR/NFV-REL013	Reliability; Report on cognitive use of operations data for reliability	GR	N/A
DGS/NFV-SEC023	Security; Container Security Specification	GS	Cloud native VNFs and container infrastructure management (FEAT17 [carried over from Rel. 3]) Security management (FEAT18)
DGS/NFV-SEC024	Security; Security Management Specification	GS	Security management (FEAT18 [carried over from Rel. 3])
DGS/NFV-SEC025	Security: Secure End-to-End VNF and NS management specification	GS	Security management (FEAT18 [carried over from Rel. 3])
DGS/NFV-SEC026	Security: Isolation and trust domain specification	GS	Security management (FEAT18 [carried over from Rel. 3])
DGR/NFV-SEC027	Security; Report on security assurance of NFVI	GR	N/A

# Release 4: stage 2 published documents (for reference)



Status as of Jan. 2021

ID	Title
<b>Functional requirements</b>	
ETSI GS NFV-IFA 010 v4.1.1	MANO; Functional requirements specification
<b>NFV-MANO reference points and interfaces</b>	
ETSI GS NFV-IFA 040 v4.1.1	MANO; Requirements for service interfaces and object model for OS container management and orchestration specification
<b>Descriptors and artefacts</b>	
ETSI GS NFV-IFA 011 v4.1.1	MANO; VNF Descriptor and Packaging Specification

# Release 4: other areas, published documents (for reference)



Status as of Jan. 2021

ID	Title
<b>Testing</b>	
<b>Security</b>	
ETSI GS NFV-IFA 033 v4.1.1	MANO; Or-Vi reference point - Interface and Information Model Specification
<b>Reliability</b>	
<b>Other non-functional requirements</b>	

# Release 4: published reports (for reference)



Status as of Jan. 2021

ID	Title
<b>Reports</b>	
ETSI GR NFV-REL 011 v4.1.1	MANO; Report on NFV-MANO software modification

Backup slides

Release 4  
features

# Release 4 features: NFV-MANO Upgrade (FEAT01)

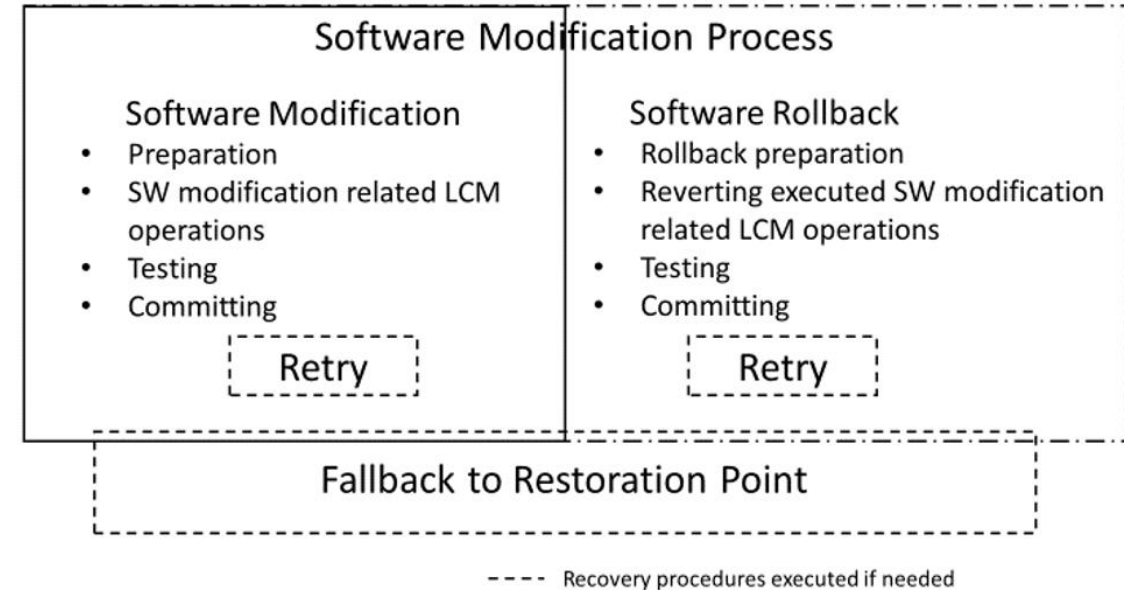
**Objective:** Provide APIs and mechanisms to allow modification of NFV-MANO software while maintaining service availability and continuity.

## Use cases:

- ✔ Updating one or more NFV-MANO functional entities while maintaining service availability and continuity.
- ✔ Change of the NFV-MANO deployed architecture, e.g., from S-VNFM to G-VNFM.
- ✔ See also use cases documented in the published report [ETSI GR NFV-REL 011](#).

## Specification outcomes:

- ✔ None, in progress.



## Other information:

- ✔ Handles failures during upgrade and the respective recovery procedures.
- ✔ Addresses characteristics of containerised architectures.

# Release 4 features: Licensing management (FEAT13)



**Objective:** Analyze the enhancements required in the architectural framework of NFV-MANO and in the existing IFA specifications for the VNF License Management support and use of VNF Licenses.

## Use cases:

- ✓ Analysis of the different VNF License management activities and their interaction with NFV-MANO, during the on-boarding of VNF packages and VNF lifecycle.
- ✓ LM-related security threat analysis and recommendations for the NFV-MANO interfaces.
- ✓ See analysis documented in the draft report [ETSI GR NFV-IFA 034](#).

## Specification outcomes:

- ✓ None, in progress.

## Other information:

- ✓ Informative/study work is being developed as part of the [DGR/NFV-IFA034](#) work item.
- ✓ Impact on NFV-MANO interfaces is under study.
- ✓ With input from [ETSI GR NFV-EVE 010](#) published in Release 3.

# Release 4 features: Cloud-Native VNFs and Container Infrastructure management (FEAT17)



**Objective:** NFV Architecture to support for VNFs which follow “cloud-native” design principles. Enhance NFV-MANO capabilities for container and container infrastructure management and orchestration.

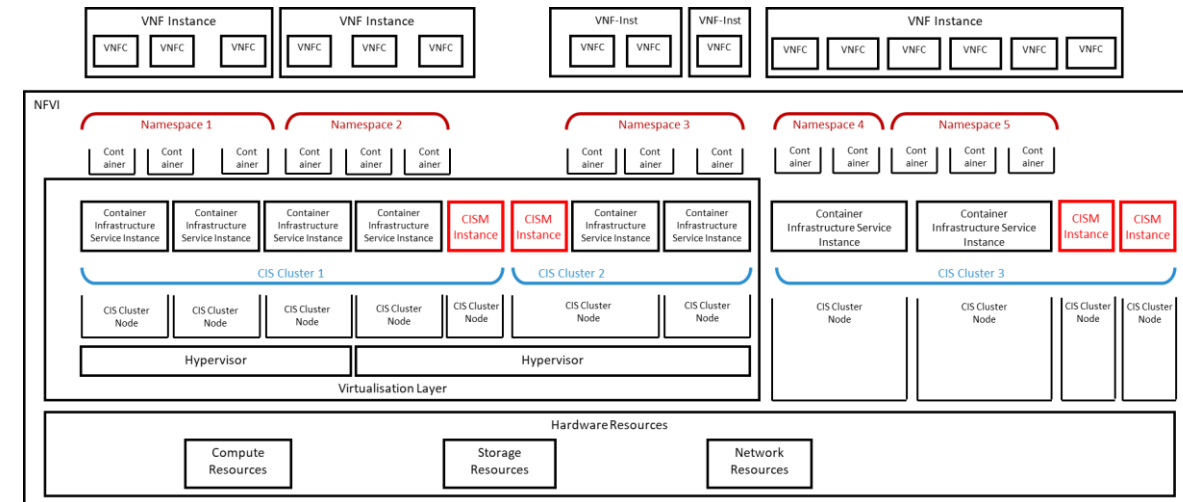
## Use cases:

- ✔ Lifecycle management of containerized VNFs, including OS container resource management.
- ✔ Lifecycle management of container infrastructure service clusters and their nodes.

## Specification outcomes:

- ✔ Functional requirements on new functions CISM and CIR and on VNFM and NFVO on how to consume them: [ETSI GS NFV-IFA 010 V4.1.1](#).
- ✔ Enhanced VNFD information model for containerized VNFs: [ETSI GS NFV-IFA 011 V4.1.1](#).
- ✔ Abstract NFV object model for container mgmt. and requirements on management services for CISM and CIR:

© ETSI 2020. [ETSI GS NFV-IFA 040](#).



## Other information:

- ✔ The normative phase is based upon the study report [ETSI GR NFV-IFA 029](#).
- ✔ The work on CIS Cluster Management is ongoing for the work item [DGR/NFV-IFA036](#).
- ✔ Further impacts on the information models of the NFV-MANO specified interfaces are expected (ongoing).



# Release 4 features: Network connectivity integration and operations for NFV (FEAT19)

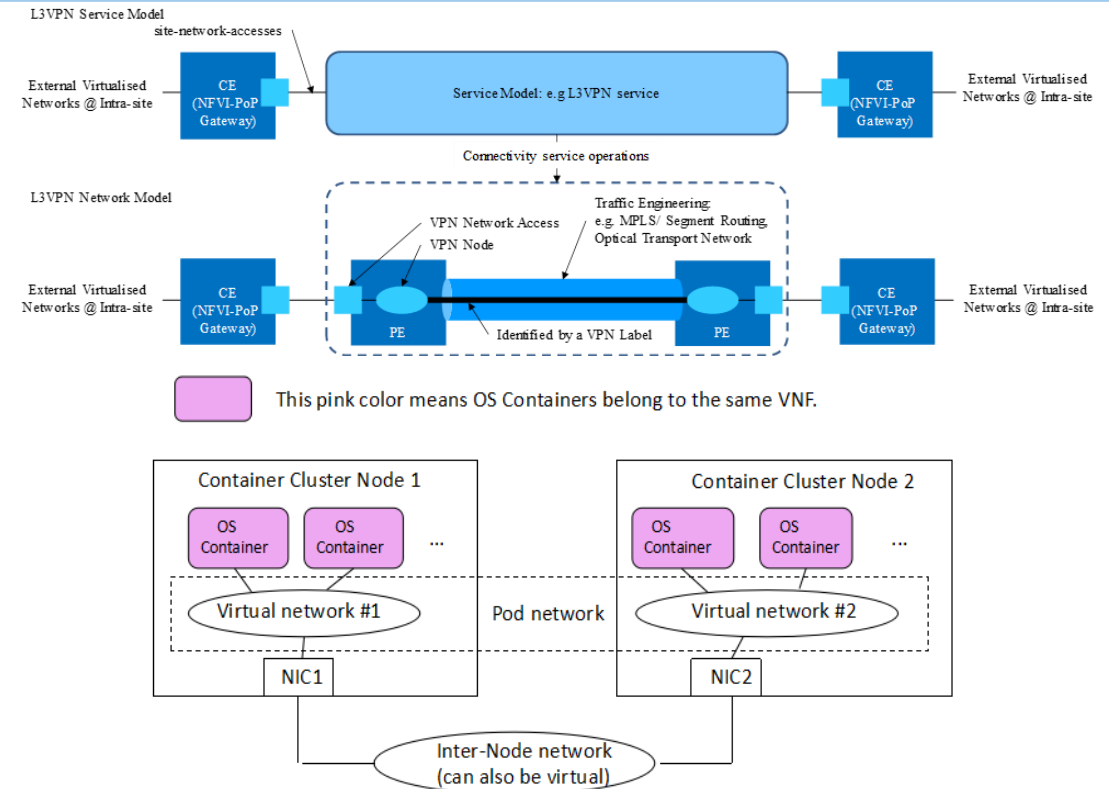
**Objective:** Capture recent advances in network connectivity techniques and of SDN capabilities, and explore their applicability in the context of NFV.

## Use cases:

- ✔ Inter-site connectivity services based on L2VPN/L3VPN service.
- ✔ Intra-site connectivity service based on VLAN/VXLAN.
- ✔ Gateways for connecting intra/inter-site virtualized network resources.
- ✔ Network connectivity for OS containers among VNFs.
- ✔ Network connectivity of OS containers for MCIOs within or across CIS cluster nodes.
- ✔ Network connectivity between MCIOs and multiple networks.

## Specification outcomes:

- ✔ None, in progress



## Other information:

- ✔ Study work is being developed as part of the WI:
  - ✔ [DGR/NFV-IFA035](#) - Report on network connectivity integration and operationalization for NFV
  - ✔ [DGR/NFV-IFA038](#) - Report on network connectivity for container based VNF

# Release 4 features: NFV-MANO automation and autonomous networks (FEAT20)

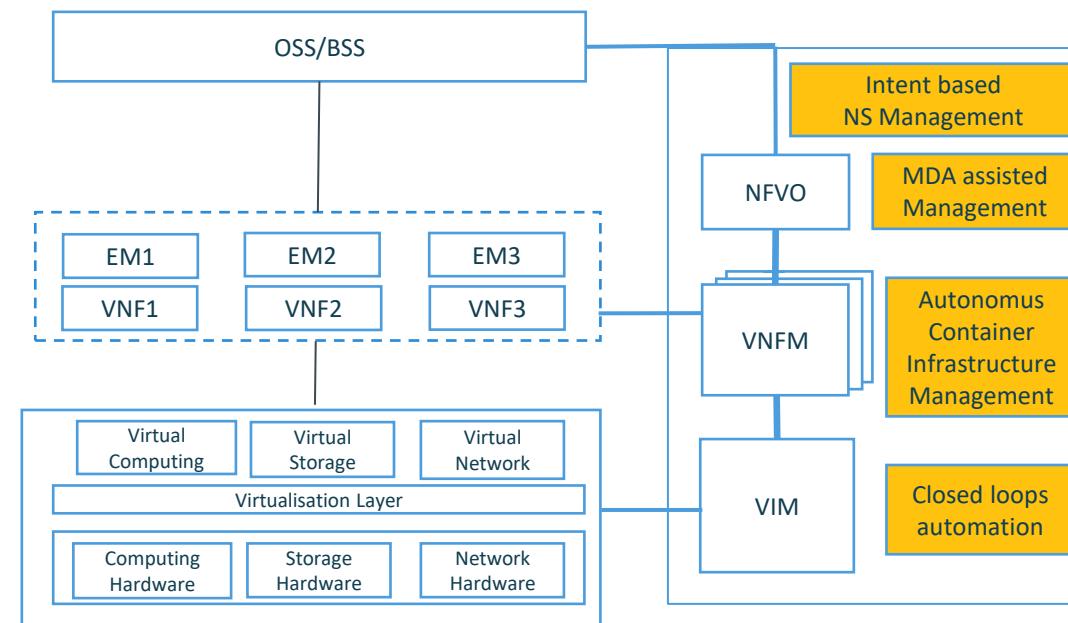
**Objective:** Enable possible enhancements to NFV-MANO to improve its automation capabilities and introduce autonomous network mechanisms.

## Use cases:

- ✔ Intent based NS management.
- ✔ Management Data Analytics (MDA) assisted management.
- ✔ Autonomous container infrastructure management.
- ✔ Closed loops automation applied to NFV framework.
- ✔ See also use cases documented in the report [ETSI GR NFV-IFA 041](#) (under development).

## Specification outcomes:

- ✔ None, in progress



## Other information:

- ✔ Informative/study work is being developed as part of the [DGR/NFV-IFA041](#) work item.
- ✔ Align with automation related work in SDOs such as TM Forum, 3GPP SA5, ETSI ISG ZSM and ETSI ISG ENI.

# Release 4 features: NFV enhancements for 5G (FEAT21)

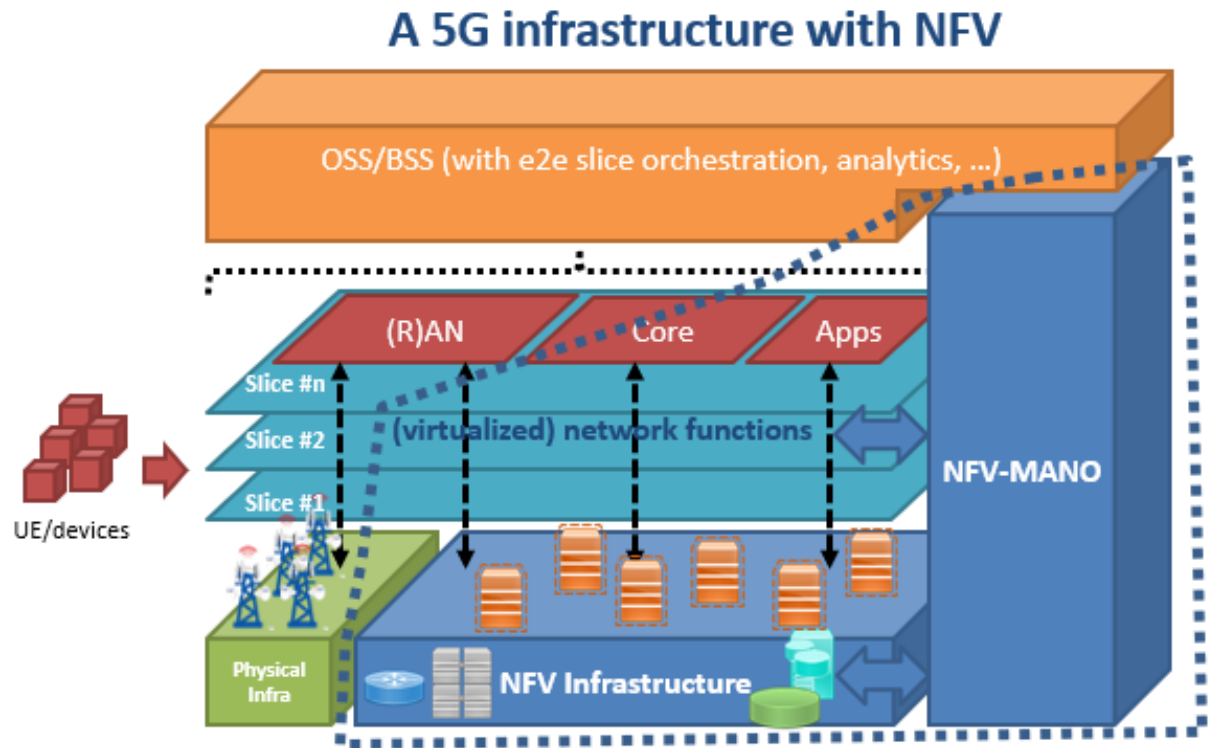
**Objective:** profile and enhance NFV capabilities to support the deployment of 5G networks.

## Use cases:

- ✔ How VNF and NS constructs can be used to realize 5G network functions.
- ✔ How the NS construct can be used to realize network slicing.
- ✔ VNF componentization and compute, network and storage resources management as a means to facilitate separation of data processing from state.
- ✔ And many others...

## Specification outcomes:

- ✔ None, in progress.



## Other information:

- ✔ Informative/study work is being developed as part of the [DGR/NFV-IFA037](#) work item.

# Release 4 features: Multi-tenancy enhancements for NFV-MANO (FEAT22)

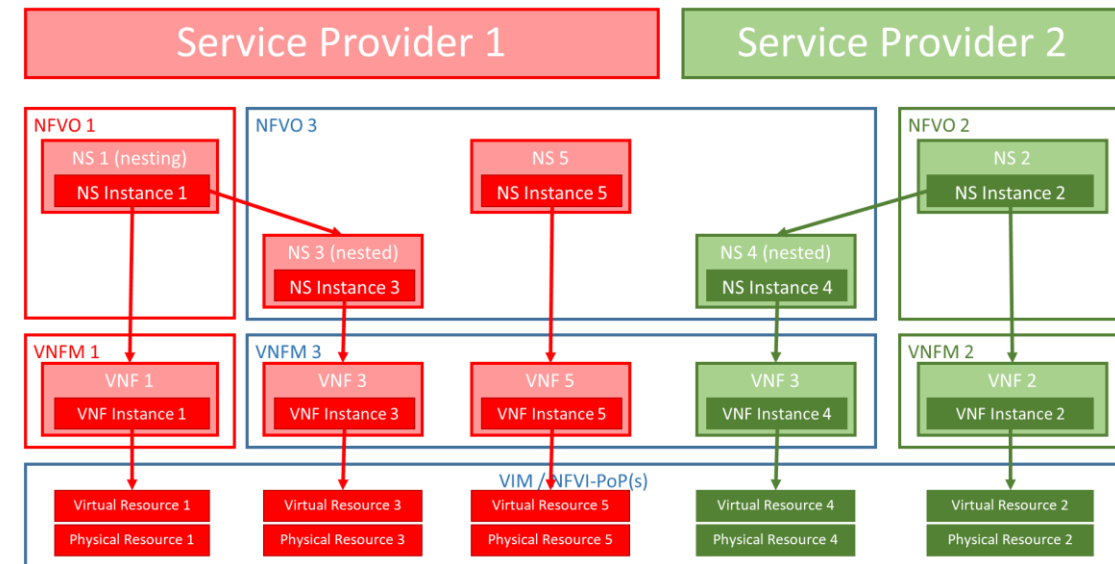
**Objective:** Enable NFV to manage and isolate network services of multiple consumers.

## Use cases:

- Study different configurations of the relation between consumers of the network services and the NFV-MANO components, including network slicing.
- Study various requirements on isolation, e.g. management isolation, resource isolation on different levels.

## Specification outcomes:

- None, in progress.



## Other information:

- Requirements by 3GPP, e.g., 3GPP TR 28.804 will be addressed.
- Provide ETSI GR NFV-EVE 018 study, identify gaps and propose solutions.
- Extend NFV-IFA concepts for tenant management and affinity/anti-affinity groups for the use of multi-tenancy.

# Release 4 features: SBA for NFV-MANO (FEAT23)

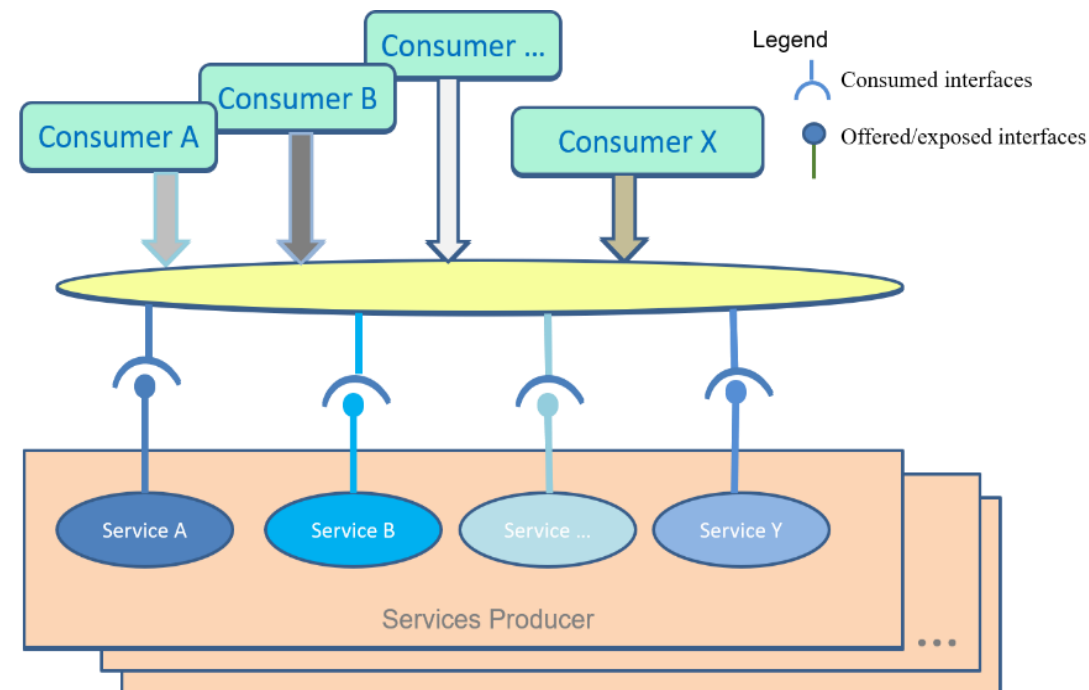
**Objective:** Enable the application of a Service-Based Architecture (SBA) design style to the NFV architectural framework.

## Use cases:

- ✔ Supporting following transformation targets:
  - ✔ Minimal Service-based evolution.
  - ✔ Service-based Interfaces (SBI) consolidation.
  - ✔ Full SBA.

## Specification outcomes:

- ✔ None, in progress.



## Other information:

- ✔ Informative/study work is being developed as part of the [DGR/NFV-IFA039](#) work item.

# Release 4 features: VNF generic management functions (FEAT24)

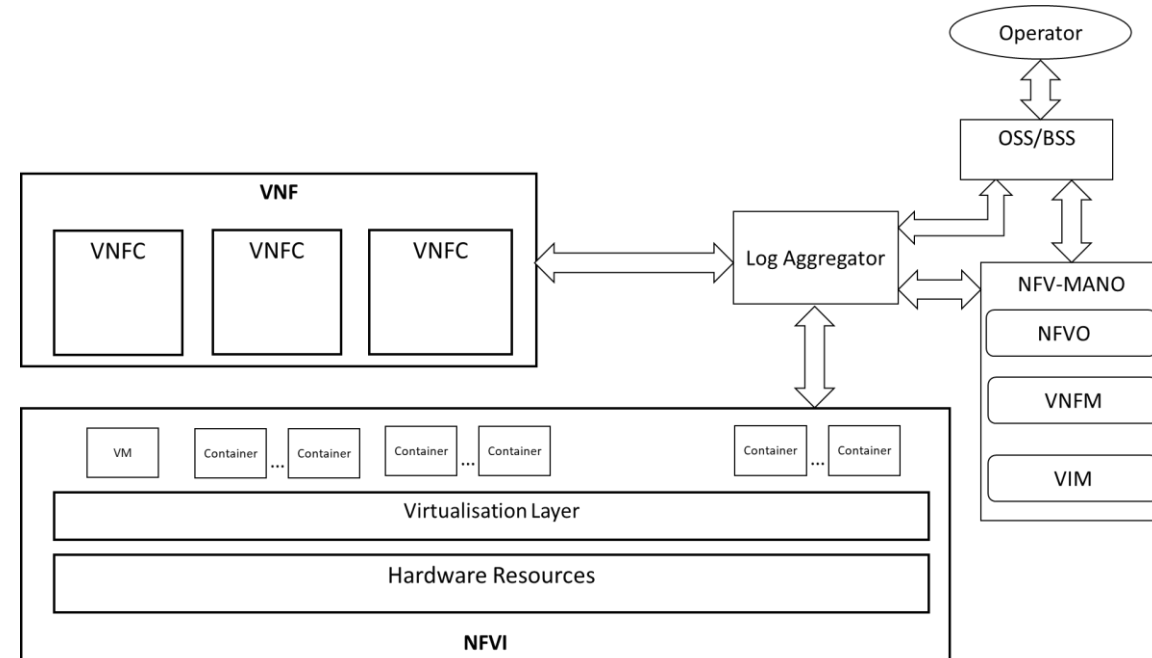
**Objective:** Simplify the deployment of VNF instances by including into the ETSI NFV framework generic OAM functions that provide OAM capabilities applicable to any kind of VNFs.

## Use cases:

- ✔ Lifecycle management and characteristics of generic OAM functions
- ✔ Different types of VNF generic OAM functions to ease the management of VNF on aspects such as logging, configuration, traffic management, etc.

## Specification outcomes:

- ✔ None, in progress



## Other information:

- ✔ Informative/study work is being developed as part of the [DGR/NFV-EVE019](#) work item.

# Release 4 features: Continuous VNF integration (VNF-CI) (FEAT25)

**Objective:** Analyze and define how to implement a “Joint Pipeline” to provide DevOps & CI/CD processes between VNF providers and VNF operators. The feature will also determine possible extensions of NFV-MANO to realize such DevOps process.

## Use cases:

- ✔ Multiple VNF Providers to single VNF Operator, Joint Pipeline is established between the VNF Providers and the VNF Operator.
- ✔ Multiple VNF Providers, single VNF Validator to single VNF Operator, Joint Pipeline is established between the VNF Providers and the VNF Validator and between the VNF Validator and the VNF Operator.

## Specification outcomes:

- ✔ None, in progress

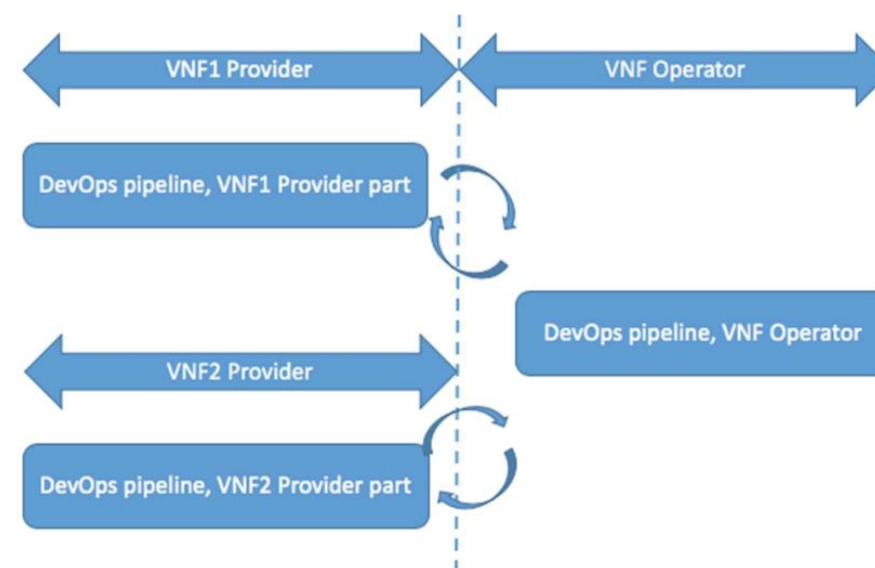


Illustration of example for joint pipeline

## Other information:

- ✔ Informative/study work just started as revision of TST006(work item [RGR/NFV-TST006ed121](#))

# Release 4 features: Policy Management Models (FEAT26)

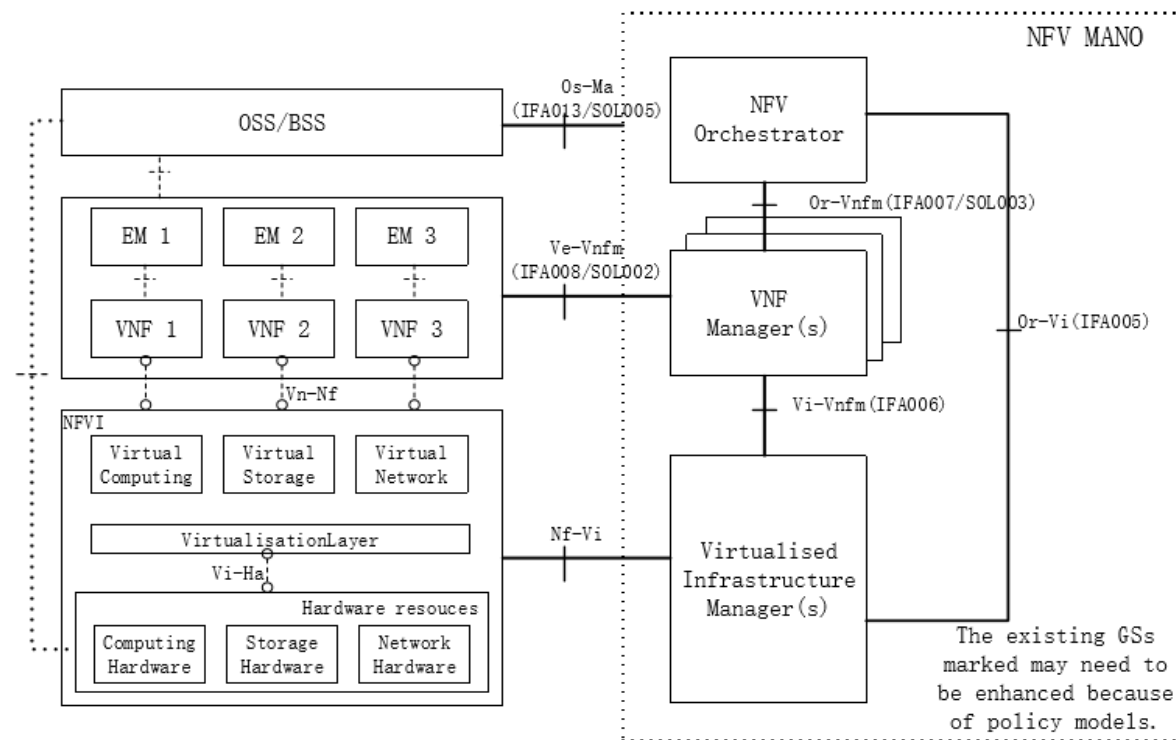
**Objective:** Analyze existing policy information and data models and identify solutions that potentially could be applied to NFV-MANO; clarify the main alternatives for policy management (between NFV-MANO and OSS/BSS); determine the objectives and management alternatives for policy management applicable to NFV-MANO; identify policy expression information model(s) applicable to NFV-MANO; identify policy expression data model(s) applicable to NFV-MANO.

## Use cases:

- ✔ VNF auto-scaling policy.
- ✔ NS self-healing policy.
- ✔ Optimization policy of NFVI-PoPs resource utilization
- ✔ See also use cases documented in the report [ETSI GR NFV-IFA 023](#).

## Specification outcomes:

- ✔ None, in progress.



## Other information:

- ✔ [ETSI GR NFV-IFA 023](#) (published in Release 3).
- ✔ Informative/study work is being developed as part of the [DGR/NFV-IFA042](#) work item.
- ✔ Collaboration with other organizations about policy models such as 3GPP SA5, ETSI ISG ZSM, ETSI ISG ENI, ONAP and ETSI OSM.