

ETSI NFV Announcement after NFV#19: work progress and Release 2 and Release 3 updates

In 2017, the ETSI ISG on Network Functions Virtualisation (NFV) started its third 2-year period (the extension of the ISG for a third two-year period was agreed unanimously at NFV#14 Plenary in May 2016). Since its foundation, more than 80 deliverables have been published, and at present, the ISG NFV has more than 50 active work items.

In the previous ETSI NFV announcement [1] (March 2017), we reported about a few updates of NFV Release 2 specifications corresponding to information models and interfaces, and the start of the NFV Release 2 maintenance work. We also reported about new Stage 3 work items (developing protocols and data models) corresponding to NFV Release 2 capabilities. Since the NFV#17 Plenary, which took place in February 2017 in Bilbao, Spain, additional work items have been added to the NFV Release 2. But maybe, the most significant milestone has been the completion of three work items defining the VNF Packaging and the APIs of interfaces produced by the VNFM (as defined in the NFV Architectural Framework). More information is provided latter in this document.

The NFV Release 3 work has also progressed substantially in terms of completing or mostly completing many work items that report about new Release 3 technical features. More information about the NFV Release 3 is also provided latter in this document.

The remaining of this announcement document is as follows: section 1 provides updates about the status of the NFV Release 2. Section 2 gives an update about the recent achievements and ongoing work as part of NFV Release 3. Section 3 presents some of the work items that are close to completion or that have been completed since our last announcement after NFV#17. Finally, section 4 lists the deliverables that have been completed and published as part of NFV Release 2 and 3.

1. NFV Release 2 Updates

As part of the NFV Release 2, the ISG NFV has specified functional requirements for the VIM, VNFM and NFVO functional blocks composing of the NFV Management and Orchestration (MANO) of the NFV Architectural Framework. The NFV Release 2 also specifies requirements applicable to the reference points identified in the same framework, as well as requirements, interfaces and information models related to the diverse NFV Release 2 capabilities such as VNF lifecycle management (LCM), Network Service (NS) LCM and virtualized resource management.

One of the main milestones with respect to NFV Release 2 performed in the first half of 2017 has been the republication of NFV Release 2 specifications, which we categorize as Stage 2 (requirements, interfaces and information models), after the first round of maintenance work was completed, also referred as 1H2017 maintenance. Around 150 change request (CR) contributions were approved in the 1H2017 maintenance period.

All maintenance work items have been republished as version v2.3.1, including as well the newly published Stage 3 specifications completed in the same timeframe (see more below). This was made in order to keep republication versions aligned among all work items, also because the Stage 3 specifications were completed by aligning them to the performed maintenance.

The other key milestone related to Release 2 has been the completion of a set of specification which detail the REST APIs between an NFV Orchestrator (NFVO) and a VNFM Manager (VNFM), and between a VNFM and a VNF or its Element Manager, respectively ETSI GS NFV-SOL 003 and ETSI GS NFV-SOL 002. These specification were completed in July 2017. Additional specifications of the APIs exposed by an NFVO to other Operations Support Systems (OSS) will be completed by the end of 2017. An OpenAPI representation of the specified APIs will also be made available on the [ETSI forge server](#). Furthermore, the specification ETSI GS NFV-SOL 004 of the format and structure (based on the OASIS TOSCA Cloud Service Archive (CSAR)) of a VNF Package (i.e. the file archive that

contains the VNF software images and associated metadata such as the VNF descriptor) was completed in June 2017.

As of October 2017, the only remaining Release 2 work items currently under progress are NFV-IFA027, NFV-SOL001 and NFV-SOL005. Furthermore, the TST working group is developing the specifications corresponding to test case suites of Release 2 capabilities. For further information, refer to NFV-TST007.

More information and details about the set of capabilities provided by NFV Release 2 is available in the NFV Release 2 Description document, which has been updated to version v1.3 [2].

An updated list of deliverables part of Release 2 is available in section 4.1. As usual (and announced in past announcements) all ongoing working drafts being developed by the ISG NFV are publicly available on the NFV Open Area [3].

2. NFV Release 3 Updates

NFV Release 3 is under way and the work has progressed substantially, including the completion of the work items leading to the publication of ETSI GS NFV-EVE 001, ETSI GS NFV-IFA 018, ETSI GS NFV-IFA 019, and ETSI GR NFV-IFA 023. Since the last NFV Announcement, work has also focused on planning the next steps for specifying the normative provisions of Release 3 features. More information will be provided in subsequent NFV Announcements once the set of new Work Items is defined by the ISG NFV towards the end of 2017.

Currently, the NFV Release 3 Definition is comprised of 23 Features. Many of these features are seen (with feedback from the NFV ISG Network Operator Council) as critical for NFV to become a reality at the operational level. And since our last announcement, three new features have been added to NFV Release 3 Definition:

- NFV support for Network Slicing.
- NFV reliability and availability.
- Identity management.

The corresponding work items addressing the above three features are NFV-EVE012, NFV-REL009, and NFV-SEC020, respectively.

Also, one feature that was originally a candidate for Release 3, the “Service Orchestration and Network Service Orchestration” on analyzing the functional decomposition of the NFVO, has been voided since the ISG NFV approved at the NFV#19 Plenary to stop its associated work item (NFV-IFA020). The NFV-IFA020 did not progress for some time and the feature had been superseded by the feature “NFV-MANO admin domains” and its associated work item NFV-IFA028.

More information and details about the set of features under development as part of NFV Release 3 is publicly available in the NFV Release 3 Definition document, which has been updated to version 0.8.0 [4].

An updated list of published deliverables part of Release 3 is available in section 4.2.

3. Summary of Specifications and Reports Completed or Close to Completion

ETSI GR NFV-EVE008 – Report on usage metering and charging

The NFV-EVE008 on Usage Metering and Charging Use Cases and Architectural Study reports about how to enable service providers to monetize their cloud network infrastructure. The report defines use cases for usage metering of virtualised resources and architectural changes needed to support real-time charging for NFV Infrastructure as a Service and VNF as a Service models in the NFV environment. It describes two new functional components - Charging Quota Tracker and Charging Triggering Point - needed to trigger charging requests to BSS domain.

ETSI GR NFV-EVE010 – Report on license management for NFV

The NFV-EVE010 document of “Report on License Management for NFV” studies the features needed within the NFV-MANO Framework to support VNF Licenses requirements.

The report takes few use cases related to licensing within the NFV environment as baseline, which are described, analyzed and used to understand the issues. Based on this, the report delivers a set of recommendations regarding support for license management within the NFV Architectural and MANO frameworks.

The recommendations indicate the need to perform additional normative specification work in terms of interface, functionality, descriptor, security, and reliability.

ETSI GR NFV-EVE012 – Report on network slicing support in NFV

The NFV-EVE012 analyses use cases related to Network Slicing as defined in SDOs and industry fora, and describes how these use cases could be mapped to current NFV concepts and supported by the ETSI NFV Architectural Framework and NFV-MANO Architectural Framework. The report provides a set of recommendations which enable to support Network Slicing feature with the NFV constructs. The recommendations indicate the need to perform additional normative specification work in terms of interface, functionality, descriptor, security, and reliability.

ETSI GS NFV-IFA 018 – Network acceleration interface Specification [COMPLETED]

This document specifies the interfaces and information model between a VNF and a dedicated switch in the NFVI (Vn-Nf reference point) to enable configuration of packet handling associated with Dynamic Optimization of Packet Flow Routing (DOPFR). With this approach, a VNF uses the exposed API to configure packet forwarding on a dedicated switch rather than performing the packet-forwarding task within its own compute resources. The result is higher performance packet forwarding due to the greater utilisation of optimised switching resources.

ETSI GS NFV-IFA 019 – Acceleration resource management interface Specification [COMPLETED]

This document specifies the interfaces and information model used for acceleration resource management on the VIM to NFVI (Nf-Vi reference point). It covers aspects such as resource discovery, lifecycle management, fault management and image management associated with acceleration resources.

ETSI GS NFV-REL006 – Service availability and continuity during software update/upgrade Specification

This work item defines requirements to the NFV system so that all parts of software in this system (Infrastructure, VNF and MANO) can be modified without impacting the availability of the running services. An informative annex proposes procedures for software modification that supports the defined requirements

ETSI GS NFV-SOL 002 – Ve-Vnfm RESTful protocol Specification [COMPLETED]

This document specifies a set of RESTful protocols and data models (also known as RESTful APIs) fulfilling the requirements specified in ETSI GS NFV-IFA 008 for the interfaces used over the Ve-Vnfm reference point. This enables multi-vendor interoperability between VNFMs and the VNFs of which they manage the lifecycle and between VNFMs and the EMs associated to these VNFs.

ETSI GS NFV-SOL 003 – Or-Vnfm RESTful protocol Specification [COMPLETED]

This document specifies a set of RESTful protocols and data models (also known as RESTful APIs) fulfilling the requirements specified in ETSI GS NFV-IFA 007 for the interfaces used over the Or-Vnfm reference point. This enables multi-vendor interoperability between an NFVO and the VNFMs to which it delegates the management of the lifecycle of the constituent VNFs of a network service.

ETSI GS NFV-SOL 004 – VNF Packaging (Stage 3) [COMPLETED]

This document defines a standard way for VNF providers to deliver VNFs to service providers as a file archive. This enables VNFs to be interoperable with independently developed NFV management and orchestration systems. The VNF package specification leverages the TOSCA YAML CSAR archive format by adding all necessary integrity and authenticity features.

ETSI GS NFV-SOL005 – Os-Ma-nfvo RESTful protocol Specification

As part of the NFV-SOL005 work item, a set of RESTful protocols and data models (also known as RESTful APIs) fulfilling the requirements specified in ETSI GS NFV-IFA 013 for the interfaces exposed by an NFVO over the Or-Vnfm reference point is being specified. This will enable multi-vendor interoperability between an NFVO and independently developed operation support systems.

ETSI GR NFV-TST007 – Guidelines on Interoperability Testing for MANO

This work item outlines an interoperability test plan for the main components of the ETSI NFV architecture: VNF, MANO and NFVI-VIM. The resulting deliverable will provide a collection of detailed test descriptions that validate the interoperability of components for VNF lifecycle management, onboarding, NS lifecycle management and other functionalities of NFV. Furthermore, it provides a test implementer the methodology, the preconditions, test steps and expected results as a full test plan.

4. Completed and published Release deliverables

4.1. NFV Release 2

As of October 2017, the NFV Release 2 comprises of the following set of published Group Specifications and Group Reports:

- Stage 2 (requirements, interfaces and information models):
 - [ETSI GS NFV-IFA 002](#) (v2.3.1): Network Functions Virtualisation (NFV); Acceleration Technologies; VNF Interfaces Specification
 - [ETSI GS NFV-IFA 003](#) (v2.3.1): Network Functions Virtualisation (NFV); Acceleration Technologies; vSwitch Benchmarking and Acceleration Specification
 - [ETSI GS NFV-IFA 004](#) (v2.3.1): Network Functions Virtualisation (NFV); Acceleration Technologies; Management aspects Specification
 - [ETSI GS NFV-IFA 005](#) (v2.3.1): Network Functions Virtualisation (NFV); Management and Orchestration; Or-Vi reference point – Interface and Information Model Specification
 - [ETSI GS NFV-IFA 006](#) (v2.3.1): Network Functions Virtualisation (NFV); Management and Orchestration; Vi-Vnfm reference point – Interface and Information Model Specification
 - [ETSI GS NFV-IFA 007](#) (v2.3.1): Network Functions Virtualisation (NFV); Management and Orchestration; Or-Vnfm reference point – Interface and Information Model Specification
 - [ETSI GS NFV-IFA 008](#) (v2.3.1): Network Functions Virtualisation (NFV); Management and Orchestration; Ve-Vnfm reference point – Interface and Information Model Specification
 - [ETSI GS NFV-IFA 010](#) (v2.3.1): Network Functions Virtualisation (NFV); Management and Orchestration; Functional requirements specification
 - [ETSI GS NFV-IFA 011](#) (v2.3.1): Network Functions Virtualisation (NFV); Management and Orchestration; VNF Packaging Specification
 - [ETSI GS NFV-IFA 013](#) (v2.3.1): Network Functions Virtualisation (NFV); Management and Orchestration; Os-Ma-nfvo reference point – Interface and Information Model Specification
 - [ETSI GS NFV-IFA 014](#) (v2.3.1): Network Functions Virtualisation (NFV); Management and Orchestration; Network Service Templates Specification
 - [ETSI GS NFV-IFA 015](#) (v2.3.1): Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Report on NFV Information Model
 - [ETSI GR NFV-IFA 016](#) (v2.1.1): Network Functions Virtualisation (NFV) Release 2; Information Modeling; Papyrus Guidelines

- [ETSI GR NFV-IFA 017](#) (v2.1.1): Network Functions Virtualisation (NFV) Release 2; Information Modeling; UML Modeling Guidelines
- [ETSI GR NFV-IFA 024](#) (v2.1.1): Network Functions Virtualisation (NFV) Release 2; Information Modeling; Report on External Touchpoints related to NFV Information Model
- [ETSI GS NFV-TST 008](#) (v2.1.1): Network Functions Virtualisation (NFV) Release 2; Testing; NFVI Compute and Network Metrics Specification
- Stage 3 (protocols and data models):
 - [ETSI GS NFV-SOL 002](#) (v2.3.1): Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; RESTful protocols specification for the Ve-Vnfm Reference Point
 - [ETSI GS NFV-SOL 003](#) (v2.3.1): Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; RESTful protocols specification for the Or-Vnfm Reference Point
 - [ETSI GS NFV-SOL 004](#) (v2.3.1): Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; VNF Package specification

4.2. NFV Release 3

As of October 2017, the list of completed and published NFV Release 3 deliverables comprises:

- [ETSI GS NFV-EVE 001](#) (v3.1.1): Network Functions Virtualisation (NFV) Release 3; Virtualisation Technologies; Hypervisor Domain Requirements Specification
- [ETSI GS NFV-EVE 007](#) (v3.1.2): Network Functions Virtualisation (NFV) Release 3; Evolution and Ecosystem; Hardware Interoperability Requirements Specification
- [ETSI GS NFV-IFA 018](#) (v3.1.1): Network Functions Virtualisation (NFV); Acceleration Technologies; Network Acceleration Interface Specification
- [ETSI GS NFV-IFA 019](#) (v3.1.1): Network Functions Virtualisation (NFV); Acceleration Technologies; Acceleration Resource Management Interface Specification; Release 3
- [ETSI GR NFV-IFA 023](#) (v3.1.1): Network Functions Virtualisation (NFV); Management and Orchestration; Report on Policy Management in MANO; Release 3
- [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 GR NFV-TST 005](#) (v3.1.1): Network Functions Virtualisation (NFV); Continuous Development and Integration; Report on use cases and recommendations for VNF Snapshot

References

- [1] ETSI ISG NFV, "ETSI NFV Announcement after NFV#17: work progress and Release 2 and Release 3 updates," [Online] available at: [https://docbox.etsi.org/ISG/NFV/Open/Other/NFV\(17\)000081_ETSI_NFV_Announcement_post_NFV_17.pdf](https://docbox.etsi.org/ISG/NFV/Open/Other/NFV(17)000081_ETSI_NFV_Announcement_post_NFV_17.pdf)
- [2] ETSI ISG NFV, "NFV Release 2 Description," NFV(16)000274r7. Version 1.3. [Online] available at: [https://docbox.etsi.org/ISG/NFV/Open/Other/NFV\(16\)000274r7_NFV_Release_2_Description_v13.pdf](https://docbox.etsi.org/ISG/NFV/Open/Other/NFV(16)000274r7_NFV_Release_2_Description_v13.pdf)
- [3] ETSI ISG NFV, Open Area. [Online] available at: <https://docbox.etsi.org/ISG/NFV/Open/Drafts/>
- [4] ETSI ISG NFV, "NFV Release 3 Definition," NFV(16)000229r9. Version 0.8.0. [Online] available at: [https://docbox.etsi.org/ISG/NFV/Open/Other/NFV\(16\)000229r9_NFV_Release_3_Definition_v080.pdf](https://docbox.etsi.org/ISG/NFV/Open/Other/NFV(16)000229r9_NFV_Release_3_Definition_v080.pdf)