

ETSI NFV Announcement on the Evolution of Its Release 2

The work program of ETSI NFV ISG for 2015 was very ambitious, with a majority of activities committed to conclude during this first year of the ISG two-year renewed term, and intended to produce the set of normative documents that were generally referred as ETSI NFV Release 2. Many of these activities are completed or just awaiting the completion of the last procedural steps to be officially published. This announcement provides a brief report on these accomplishments, structured around an introduction to the completed (informative) reports and a preview of the Release 2 description, which we expect to publish by May 2016.

As a result of the decision taken by the ISG at the beginning of the past year, all draft documents produced by ETSI NFV have been publicly available, thus facilitating the feedback from all organizations and individuals interested in the NFV technologies, and a more direct interaction with other external bodies, both SDOs and open-source projects. We believe this has greatly increased the quality of the ISG results and the openness of the document development process.

The interaction with external bodies has translated in two aspects we think are worth noting. First, the continuous identification of gaps between the NFV ISG normative work and other relevant (formal and de-facto) standards, that are being properly documented and in most cases addressed in collaboration with the corresponding external body. Second, a workshop on NFV Information Modeling was organized under the auspices of the ISG, where fourteen organizations shared information and agreed on the risk of fragmentation and some next immediate steps to address it.

Reports Completed or Close to Completion

EVE003 - Report on NFVI Node Physical Architecture Guidelines for Multi-Vendor Environment

Virtualized Network Functions (VNFs) have to reside and operate on physical hardware. The telecommunications industry is moving away from specialized, sophisticated, and possibly proprietary hardware; instead the goal is to move towards commercially available off-the-shelf products in terms of processors, disks, racks, and other physical elements. This document provides guidance for an ecosystem of generic and commonly available sets of physical products and components for the industry. The guidelines will be beneficial to telecommunication equipment providers and other vendors as well as service providers in the development and acquisition of desired components for building NFVI Nodes.

EVE004 – Report on the application of Different Virtualization Technologies

Although the NFV architecture is not tied to hypervisor-based solutions, the current detailed specifications (e.g. GS NFV MAN 001) are biased towards these solutions. The hypervisor approach has some cost in terms of efficiency and the scalability may not be sufficient for cases where a huge number of virtualization containers need to be deployed and managed. This document intends to identify the impact of using alternative virtualization technologies (e.g. Linux containers) on the NFV architectural framework and specifications, and provide an analysis of the pros and cons of these alternative technologies.

EVE005 - Report on SDN Usage in the NFV Architectural Framework

This document provides a technical report on the use of SDN in an NFV architectural framework, including guidance with a number of design patterns and recommendations for potential requirements and further work in the ETSI NFV ISG. EVE005 leverages existing work from ETSI ISG NFV, especially SWA, MANO and INF documents from Phase 1. It identifies use cases and defines typical design patterns on the usage of SDN within an NFV architecture framework, including position of SDN resources, SDN controller and SDN applications and the different combinations and associated reference points. This includes SDN Controller as a VNF, SDN Controller as a realization of the Infrastructure network controller, or SDN controller in the tenant domain. Network domains to be covered include datacenter SDN, datacenter-WAN interworking, access network and WAN. ETSI NFV PoC teams have been invited to study this topic and their feedback is included as an annex. A comparison of open-source network controllers has also been performed to identify the scope of an SDN controller.

This technical report supports discussions with other SDO and open-source projects such as IETF, OPNFV, ONF, OpenStack, OpenDaylight and others as appropriate. The report also makes recommendations as to whether normative work should be initiated as a follow-up activity.

REL003 – Report on Models and Features for E2E Reliability

This technical report provides models and methods for estimating end-to-end service reliability and availability, including high level implications of software upgrade, in NFV environments. In such an environment, there are several key points which need to be considered in the estimation of service reliability and availability as compared to traditional networks composed exclusively of PNFs. By investigating reliability-related topics including fault management from the viewpoint of lifecycle management, several conclusions can be made but there still remains a lot of work that needs to be done to more precisely estimate service reliability and availability.

In addition, some high level descriptions for software upgrade in an NFV environment are provided; the goal is to maintain high service availability and reliability during such upgrades. The report concludes with a method for utilizing data representing the service resilience requirements that provides the possibility for end-to-end service availability operation and management with service differentiation.

REL004 - Report on Active Monitoring and Failure Detection

This technical report proposes a framework for active monitoring and fault isolation for NFV environments. The document discusses the pertinent uses cases of fault isolation, periodic performance monitoring and capacity planning and the need to augment traditional active monitoring techniques with passive monitoring and NFVI analytics. The key focus is on describing methods that take into account the increased variability that multi-tenancy and multi-vendor scenarios introduce in NFV.

The report proposes two management entities as part of the active monitoring system – Test Controller and Test Result Analysis Module. It also defines the recommendations for implementation of these two entities and proposes the use of virtual test agents for increased network visibility and maintaining the monitoring point of presence in NFV based networks. Additionally, the document also takes concepts from E2E service monitoring in cloud environment and discusses its applicability to NFV. At the same time, it presents the need to characterize SP centric services in terms of NFVI resource usage and to understand the performance impact of multiple services in a multi-tenant environment. Key aspects for QoE measurement are discussed and example methodologies for QoE measurement of E2E services are described as well.

REL005 - Report on Quality Accountability Framework

The NFV Quality Accountability Framework supports the quality management principles around customer focus, mutually beneficial supplier relationships, and use a factual approach to decision making. Clearly defining roles, responsibilities and demarcations is a quality management best practice because it clarifies accountabilities which permit any quality impairments to be rapidly localized, root causes to be identified and appropriate corrective actions to be determined that promptly restore service and drive continuous quality improvement. This document defines key roles including NFV cloud service customer, provider(s) of NFV management, orchestration and/or infrastructure services, and their VNF suppliers and integrators.

SEC006 – Report on Security Aspects and Regulatory Concerns

A guide to assist with addressing the security aspects and regulatory concerns of NFV related documents and applications. This includes a template to assist the development of ETSI NFV deliverables and broader guidance for developers, architects and designers of hardware and software.

SEC009 – Report on Use Cases and Technical Approaches for Multi-Layer Host Administration

SEC009 addresses one of the enduring issues within complex administration domains: the provision of multi-layer administration within a single host.

Several different use cases have been identified, and currently exist in various stages of detail. These include operator-service related use cases (e.g. multi-tenant hosting and IaaS as a service), security sensitive or security network monitoring functions, and compliance-related use cases such as Retained Data, Lawful Interception and customer data privacy. The document describes recommendations, maps the use cases to the recommendations, and then describes some measures that could be used to meet these recommendations. The final section provides a description of three approaches to meeting the recommendations, addressing advantages and disadvantages.

SEC010 – Report on Retained Data Problem Statement and Requirements

The aim of this document is to provide a problem statement and articulate the existing requirements for Retained Data in the context of NFV. It examines the core underlying requirements for Retained Data such as those presented by ETSI TC LI (TS 102 656 and TS 102 657), and aims to identify solutions or mitigations to the problems identified.

TST001 - Pre-Deployment Testing; Report on Validation of NFV Environments and Services

This document is committed to provide recommendations for lab validation of VNFs, their interaction with the NFV functional blocks and the NFV blocks themselves, including guidelines for user and control plane performance validation along with reliability and availability features.

The TST001 report identifies the peculiarities of testing virtual network functions in an NFV environment with respect to their physical counterparts, discussing the impact of virtualization on testing methods and assuring that the System Under Test (SUT) and Test Environments are properly identified for the cases where either the NFV Infrastructure, the VNFs, the Network Service (NS) or the own NFV MANO stack are under test. Additionally, the report provides step-by-step methodologies for common VNF and NS tests (e.g. VNF instantiation testing, data plane benchmarking, speed of activation of a NS, auto-scaling validation, etc.), which augment others commonly used in traditional physical environments.

TST002 - Report on Interoperability Testing Methodology

The goal of TST002 is to study how interoperability test methodology can be applied to NFV by analyzing the functional blocks and interfaces defined within the NFV architecture and the NFV capabilities enabled by the current release.

The TST002 report provides methodology guidelines for interoperability testing for NFV, including a review of basic concepts for interoperability testing and their fit in an NFV environment, and a methodology for the development of interoperability test specifications that is illustrated with examples related to NFV operations on specified interfaces. The report is completed by an overview of basic System Under Test (SUT) configurations and interoperability features enabled by the current release. TST002 can be considered stable, only pending some alignment with the latest development of requirements for NFV interfaces.

Preview of the NFV Release 2 Description

The ETSI NFV Release 2 Definition identified a set of capabilities to be supported by NFV solutions (not limited to):

- Management and orchestration functions to support dynamic creation of VNF instances and maintenance of the VNF instance during its lifecycle.
- Support of monitoring and report of fault and performance information at different levels, from virtualized resources up to Network Service level.
- Management and exposure of hardware-independent acceleration.

NFV Release 2 does not include any architectural changes and the list of capabilities part of the Release are thus aligned with the ETSI NFV Architectural Framework.

NFV Release 2 comprised originally 13 normative Group Specifications. At present, some of the deliverables have been finalized, or are currently under approval by the Technical Body. The remaining deliverables are expected to be completed and ready for publication by middle of 2016.

Following is a list of the deliverables that have been finalized or are currently under approval by the ISG part of the NFV Release 2, with a short description of the capabilities covered.

IFA002 - Acceleration Technologies; Part 2: VNF Interfaces Specification

IFA002 specifies the requirements enabling the exposure of hardware and software accelerators to VNFs in an implementation independent way and giving means to control acceleration within a VNF. Acceleration encompasses network traffic optimizations between VNFs of a single VNF, network features offloads (e.g. IPSec), compute offloads (e.g. compression, cryptographic operations) or storage access acceleration.

An acceleration model has been defined around the concept of Extensible Para-virtualized Device (EPD) which is derived from an extension of the Virtio device model specified by the OASIS group. An EPD and its associated device driver are located in Virtualization Containers and communicate with a hypervisor domain backend that helps adapting to hardware or software implementation of the accelerated function. The EPD may receive software plugin and resources from the hypervisor domain to allow the most direct access to acceleration while preserving portability.

IFA003 - Acceleration Technologies; Part 3: vSwitch Benchmarking and Acceleration Specification

IFA003 specifies performance-benchmarking metrics for virtual switching, with the goal that the metrics will adequately quantify performance gains achieved through virtual switch acceleration conforming to the associated requirements specified herein. The acceleration-related requirements are applicable to common virtual switching functions across usage models such as packet delivery into VNFs, network overlay and tunnel termination, stateful Network Address Translators (NAT), service chaining, load balancing and, in general, match-action based policies/flows applied to traffic going to/from the VMs. The document provides deployment scenarios with applicability to multiple vendor implementations, and recommendations for follow-on proof of concept activities.

IFA004 – Acceleration Technologies; Part 4: Management aspects Specification

IFA004 provides requirements for the interfaces exposed by the NFVI to the VIM on the Nf-Vi reference point for NFV acceleration from an infrastructure management perspective. The set of requirements covered includes the controlling and management of acceleration resources, e.g. dynamic allocation, modification, release, reclamation of acceleration resources.

IFA005 - Management and Orchestration; Or-Vi Reference Point – Interface and Information Model Specification

The IFA005 deliverable specifies the requirements and the message flows and related information elements of the interfaces exposed by the VIM towards the NFVO over the Or-Vi reference point. The deliverable covers a number of capabilities defined in the NFV Release 2 Definition, shortly:

- Management of virtualized resources supporting the necessary operations on compute, storage and network virtualized resources, e.g., allocation, scaling, termination, etc., in order to instantiate and maintain VNFs during their lifecycle.
- Fault and performance management of virtualized resources supporting functions for the retrieval and notifications related to fault and performance of virtualized resources supporting VNF instances.
- Management of virtualized resources information supporting the retrieval of information about consumable virtualized resources.
- Management of software images, including functions that enable adding, deleting, updating, querying and copying software images in the image repository controlled by the VIM(s).
- Management of virtualized resources capacity, supporting functions to retrieve information about the total capacity of the resources managed by a VIM instance, the consumable capacity available for new virtualized resources, and the utilization of the capacity, both on VIM global level and per resource zone.
- Management of virtualized resource reservations supporting function to create, update and terminate reservations for various types of virtualized resources, including compute, network and storage.
- Management of virtualized resource quotas supporting function to create, update and terminate quotas for various types of virtualized resources, including compute, network and storage.

IFA006 - Management and Orchestration; Vi-Vnfm Reference Point – Interface and Information Model Specification

The IFA006 deliverable specifies the requirement and the message flows and related information elements of the interfaces exposed by the VIM towards the VNFM over the Vi-Vnfm reference point. The deliverable covers a number of capabilities defined in the NFV Release 2 Definition, shortly:

- Management of virtualized resources supporting the necessary operations on compute, network and storage virtualized resources, e.g., allocation, scaling, termination, etc., in order to instantiate and maintain VNFs during their lifecycle.
- Fault and performance management of virtualized resources supporting functions for the retrieval and notifications related to fault and performance of virtualized resources supporting VNF instances.
- Query of information about consumable virtualized resources.
- Query of software image information in the image repository controlled by the VIM(s).
- Query of information about virtualized resource reservations and quotas.

IFA010 - Management and Orchestration; Functional Requirements Specification

IFA010 specifies functional requirements for the three Management and Orchestration functional blocks: NFVO, VNFM and VIM. These requirements are related to the set of capabilities further specified on the interface and acceleration related specifications. The deliverable also specifies general guidelines and requirements for NFV management and orchestration interface design.

The set of capabilities covered by IFA010 in terms of functional requirements is as identified in the NFV Release 2 Definition, including at large all capabilities related to management of virtualized resources, including fault, performance, reservation and quota; the management of VNF lifecycle, performance and fault; and the management of Network Services, including fault and performance.