



## **Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV**

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650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° 7803/88

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## Foreword

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

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## Modal verbs terminology

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

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# 1 Scope

The present document provides terms and definitions for conceptual entities within the scope of the ISG NFV, in order to achieve a "common language" across all the ISG NFV working groups.

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## 2 References

### 2.1 Normative references

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

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The following referenced documents are necessary for the application of the present document.

- [1] ETSI Directives: Annex 1: "Definitions in relation to the member categories of ETSI".
- [2] ETSI TR 121 905: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Vocabulary for 3GPP Specifications (3GPP TR 21.905)".
- [3] IETF RFC 2330: "Framework for IP Performance Metrics".
- [4] IETF RFC 6390: "Guidelines for Considering New Performance Metric Development".
- [5] ISO/IEC 15939:2007: "Systems and software engineering -- Measurement process".
- [6] NIST Special Publication 500-307: "Cloud Computing Service Metrics Description".

NOTE: Available at <http://www.nist.gov/itl/cloud/upload/RATAX-CloudServiceMetricsDescription-DRAFT-20141111.pdf>.

### 2.2 Informative references

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Not applicable.

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## 3 Terms and definitions

### 0-9

Void.

### A to B

Void.

### C

**Central Processing Unit (CPU):** device in the compute node that provides the primary container interface

**compute domain:** domain within the NFVI that includes servers and storage

**compute node:** abstract definition of a server

### D to H

Void.

### I

**infrastructure network domain:** domain within the NFVI that includes all networking that interconnects compute/storage infrastructure

NOTE: It pre-exists the realization of VNFs.

### J to K

Void.

### L

**lifecycle management:** set of functions required to manage the instantiation, maintenance and termination of a VNF or NS

### M

**measurement:** set of operations having the object of determining a Measured Value or Measurement Result. The actual instance or execution of operations leading to a Measured Value. (Based on the definition of Measurement in [5], as cited in [6]).

**metric:** standard definition of a quantity, produced in an assessment of performance and/or reliability of the network, which has an intended utility and is carefully specified to convey the exact meaning of a measured value

NOTE: This definition is consistent with that of Performance Metric in [3] and [4]. Examples - packet transfer performance or reliability of a network.

## N

**network controller:** functional block that centralizes some or all of the control and management functionality of a network domain and may provide an abstract view of its domain to other functional blocks via well-defined interfaces

**network forwarding path:** ordered list of connection points forming a chain of NFs, along with policies associated to the list

**Network Function (NF):** functional block within a network infrastructure that has well-defined external interfaces and well-defined functional behaviour

NOTE: In practical terms, a Network Function is today often a network node or physical appliance.

**Network Functions Virtualisation (NFV):** principle of separating network functions from the hardware they run on by using virtual hardware abstraction

**Network Functions Virtualisation Infrastructure (NFVI):** totality of all hardware and software components that build up the environment in which VNFs are deployed

NOTE: The NFV-Infrastructure can span across several locations, e.g. places where data centres are operated. The network providing connectivity between these locations is regarded to be part of the NFV-Infrastructure. NFV-Infrastructure and VNF are the top-level conceptual entities in the scope of Network Function Virtualization. All other components are sub-entities of these two main entities.

**Network Functions Virtualisation Infrastructure (NFVI) components:** NFVI hardware resources that are not field replaceable, but are distinguishable as COTS components at manufacturing time

**Network Functions Virtualisation Infrastructure Node (NFVI-Node):** physical device[s] deployed and managed as a single entity, providing the NFVI Functions required to support the execution environment for VNFs

**Network Function Virtualisation Infrastructure Point of Presence (NFVI-PoP):** N-PoP where a Network Function is or could be deployed as Virtual Network Function (VNF)

**Network Functions Virtualisation Management and Orchestration (NFV-MANO):** functions collectively provided by NFVO, VNFM, and VIM

**Network Functions Virtualisation Management and Orchestration Architectural Framework (NFV-MANO Architectural Framework):** collection of all functional blocks (including those in NFV-MANO category as well as others that interwork with NFV-MANO), data repositories used by these functional blocks, and reference points and interfaces through which these functional blocks exchange information for the purpose of managing and orchestrating NFV

**Network Functions Virtualisation Orchestrator (NFVO):** functional block that manages the Network Service (NS) lifecycle and coordinates the management of NS lifecycle, VNF lifecycle (supported by the VNFM) and NFVI resources (supported by the VIM) to ensure an optimized allocation of the necessary resources and connectivity

**Network Interface Controller (NIC):** device in a compute node that provides a physical interface with the infrastructure network

**network operator:** defined as an operator of an electronics communications network or part thereof. An association or organization of such network operators also falls within this category (as defined in [1])

**Network Point of Presence (N-PoP):** location where a Network Function is implemented as either a Physical Network Function (PNF) or a Virtual Network Function (VNF)

**network service:** composition of Network Functions and defined by its functional and behavioural specification

NOTE: The Network Service contributes to the behaviour of the higher layer service, which is characterized by at least performance, dependability, and security specifications. The end-to-end network service behaviour is the result of the combination of the individual network function behaviours as well as the behaviours of the network infrastructure composition mechanism.

**network service descriptor:** template that describes the deployment of a Network Service including service topology (constituent VNFs and the relationships between them, Virtual Links, VNF Forwarding Graphs) as well as Network Service characteristics such as SLAs and any other artefacts necessary for the Network Service on-boarding and lifecycle management of its instances

**network service orchestration:** subset of NFV Orchestrator functions that are responsible for Network Service lifecycle management

**network service provider:** type of Service Provider implementing the Network Service

**network stability:** ability of the NFV framework to maintain steadfastness while providing its function and resume its designated behaviour as soon as possible under difficult conditions, which can be excessive load or other anomalies not exceeding the design limits

**NF forwarding graph:** graph of logical links connecting NF nodes for the purpose of describing traffic flow between these network functions

**NF set:** collection of NFs with unspecified connectivity between them

**NFVI component:** NFVI hardware resource that is not field replaceable, but is distinguishable as a COTS component at manufacturing time

**NFV framework:** totality of all entities, reference points, information models and other constructs defined by the specifications published by the ETSI ISG NFV

**NFV Infrastructure (NFVI):** totality of all hardware and software components which build up the environment in which VNFs are deployed

NOTE: The NFV-Infrastructure can span across several locations, i.e. multiple N-PoPs. The network providing connectivity between these locations is regarded to be part of the NFV-Infrastructure.

**NFV-Resource (NFV-Res):** NFV-Resources do exist inside the NFV-Infra and can be used by the VNF/VNSF to allow for their proper execution

## O

Void.

## P

**Physical Network Function (PNF):** implementation of a NF via a tightly coupled software and hardware system

## Q

Void.

## R

**resiliency:** ability of the NFV framework to limit disruption and return to normal or at a minimum acceptable service delivery level in the face of a fault, failure, or an event that disrupts the normal operation

## S

**scaling:** ability to dynamically extend/reduce resources granted to the Virtual Network Function (VNF) as needed

NOTE: This includes scaling up/down and scaling out/in.

**scaling out/in:** ability to scale by add/remove resource instances (e.g. VM)



**scaling up/down:** ability to scale by changing allocated resource, e.g. increase/decrease memory, CPU capacity or storage size

**service:** component of the portfolio of choices offered by service providers to a user, a functionality offered to a user, as defined in ETSI TR 121 905 [2]

NOTE: A user may be an end-customer, a network or some intermediate entity.

**service continuity:** continuous delivery of service in conformance with service's functional and behavioural specification and SLA requirements, both in the control and data planes, for any initiated transaction or session till its full completion even in the events of intervening exceptions or anomalies, whether scheduled or unscheduled, malicious, intentional or unintentional

NOTE 1: From an end-user perspective, service continuity implies continuation of ongoing communication sessions with multiple media traversing different network domains (access, aggregation and core network) or different user equipment.

NOTE 2: End to end service continuity requires that the service is delivered with service quality defined by an SLA. This is true regardless if the service is delivered via a non-virtual network, virtual network or a combination.

**Service Level Agreement (SLA):** negotiated agreement between two or more parties, recording a common understanding about the service and/or service behaviour (e.g. availability, performance, service continuity, responsiveness to anomalies, security, serviceability, operation) offered by one party to another, and the measurable target values characterizing the level of services

NOTE: The scope of the above definition does not include business aspects of the SLA.

**service provider:** defined as a company or organization, making use of an electronics communications network or part thereof to provide a service or services on a commercial basis to third parties (as defined in [1])

## T

**tenant domain:** domain that provides VNFs, and combinations of VNFs into Network Services, and is responsible for their management and orchestration, including their functional configuration and maintenance at application level

## U

**user service:** component of the portfolio of choices offered by service providers to the end-users/customers/subscribers

## V

**Virtual Application (VA):** more general term for a piece of software which can be loaded into a Virtual Machine

NOTE: A VNF is one type of VA.

**virtual link:** set of connection points along with the connectivity relationship between them and any associated target performance metrics (e.g. bandwidth, latency, QoS)

NOTE: The Virtual Link can interconnect two or more entities (VNF components, VNFs, or PNFs) and it is supported by a Virtual Network (VN) of the NFVI.

**Virtual Machine (VM):** virtualized computation environment that behaves very much like a physical computer/server

NOTE: A VM has all its ingredients (processor, memory/storage, interfaces/ports) of a physical computer/server and is generated by a Hypervisor, which partitions the underlying physical resources and allocates them to VMs. Virtual Machines are capable of hosting a VNF Component (VNFC).

**virtual network:** virtual network routes information among the network interfaces of VM instances and physical network interfaces, providing the necessary connectivity

NOTE: The virtual network is bounded by its set of permissible network interfaces.

**virtualisation container:** partition of a compute node that provides an isolated virtualized computation environment

NOTE: Examples of virtualization container includes virtual machine and OS container.

**Virtualisation Deployment Unit (VDU):** construct that can be used in an information model, supporting the description of the deployment and operational behaviour of a subset of a VNF, or the entire VNF if it was not componentized in subsets

NOTE: In the presence of a hypervisor, the main characteristic of a VDU is that a single VNF or VNF subset instance created based on the construct can be mapped to a single VM. A VNF may be modelled using one or multiple such constructs, as applicable.

**Virtualised CPU (vCPU):** virtualised CPU created for a VM by a hypervisor

NOTE: In practice, a vCPU may be a time sharing of a real CPU and/or in the case of multi-core CPUs, it may be an allocation of one or more cores to a VM. It is also possible that the hypervisor may emulate a CPU instruction set such that the vCPU instruction set is different to the native CPU instruction set (emulation will significantly impact performance).

**Virtualised Infrastructure Manager (VIM):** functional block that is responsible for controlling and managing the NFVI compute, storage and network resources, usually within one operator's Infrastructure Domain (e.g. NFVI-PoP)

**Virtualised NIC (vNIC):** virtualised NIC created for a VM by a hypervisor

**Virtualised Network Function (VNF):** implementation of an NF that can be deployed on a Network Function Virtualisation Infrastructure (NFVI)

**Virtualised Network Function Instance (VNF Instance):** run-time instantiation of the VNF software, resulting from completing the instantiation of its components and of the connectivity between them, using the VNF deployment and operational information captured in the VNFD, as well as additional run-time instance-specific information and constraints

**Virtualised Network Function Component (VNFC):** internal component of a VNF providing a VNF Provider a defined sub-set of that VNF's functionality, with the main characteristic that a single instance of this component maps 1:1 against a single Virtualisation Container

**Virtualised Network Function Component (VNFC) Instance:** instance of a VNFC deployed in a specific Virtualisation Container instance. It has a lifecycle dependency with its parent VNF instance

**Virtualised Network Function Descriptor (VNFD):** configuration template that describes a VNF in terms of its deployment and operational behaviour, and is used in the process of VNF on-boarding and managing the lifecycle of a VNF instance

**Virtualised Network Function Manager (VNFM):** functional block that is responsible for the lifecycle management of VNF

**Virtualised Network Function Package (VNF Package):** archive that includes a VNFD, the software image(s) associated with the VNF, as well as additional artefacts, e.g. to check the integrity and to prove the validity of the archive

**Virtualised NIC (vNIC):** virtualised NIC created for a VM by a hypervisor

**Virtualised Storage (vStorage):** virtualised non-volatile storage allocated to a VM

**Virtualised Switch (vSwitch):** Ethernet switch implemented by the hypervisor that interconnects vNICs of VMs with each other and with the NIC of the compute node

**VNF Forwarding Graph (VNF FG):** NF forwarding graph where at least one node is a VNF

**VNF Set:** collection of VNFs with unspecified connectivity between them

## W to Z

Void.

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## 4 Abbreviations

### 0-9

Void.

### A to B

Void.

### C

CPU	Central Processing Unit
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### D to M

Void.

### N

N-PoP	Network Point of Presence
NF	Network Function
NFV	Network Functions Virtualisation
NFV-Res	NFV Resource
NFVI	NFV Infrastructure
NFV-MANO	Network Functions Virtualisation Management and Orchestration
NFVI-Node	Network Functions Virtualisation Infrastructure Node
NFVI-PoP	Network Function Virtualisation Infrastructure Point of Presence
NFVO	Network Functions Virtualisation Orchestrator
NIC	Network Interface Controller
NS	Network Service

### O

Void.

### P

PNF	Physical Network Function
PoP	Point of Presence

### Q to R

Void.

### S

SLA	Service Level Agreement
-----	-------------------------

## T to U

Void.

## V

VA	Virtual Application
vCPU	Virtualised CPU
VIM	Virtualised Infrastructure Manager
VM	Virtual Machine
VNF FG	VNF Forwarding Graph
VNF	Virtualised Network Function
VNF FG	VNF Forwarding Graph
VNFC	Virtualised Network Function Component
VNFD	Virtualised Network Function Descriptor
VNFM	Virtualised Network Function Manager
vNIC	Virtualised NIC
vStorage	Virtualised Storage
vSwitch	Virtualised Switch

## W to Z

Void.

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## History

<b>Document history</b>		
V1.1.1	October 2013	Publication
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