



## Network Functions Virtualisation (NFV); Management and Orchestration

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## Reference

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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 describes the management and orchestration framework required for the provisioning of virtualised network functions (VNF), and the related operations, such as the configuration of the virtualised network functions and the infrastructure these functions run on. The objectives are to define this framework, provide requirements for management and orchestration, identify topics that may serve in later gap analysis against current standards, identify best practices and provide guidance on how to address identified new topics. The focus of the present document is on aspects of management and orchestration that are specific to NFV.

The present document addresses the following topics of management and orchestration: architecture framework for management and orchestration of NFV, information elements, interfaces, provisioning, configuration, and operational management, including interworking with existing operations and management systems.

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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 not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI GS NFV 001: "Network Functions Virtualisation (NFV); Use Cases".
- [i.2] ETSI GS NFV 002: "Network Functions Virtualisation (NFV); Architectural Framework".
- [i.3] ETSI GS NFV 003: "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".
- [i.4] ETSI GS NFV-INF 001: "Network Functions Virtualisation; Infrastructure Overview".
- [i.5] ETSI GS NFV-INF 003: "Network Functions Virtualisation (NFV); Infrastructure; Compute Domain".
- [i.6] ETSI GS NFV-INF 004: "Network Functions Virtualisation (NFV); Infrastructure; Hypervisor Domain".

- [i.7] ETSI GS NFV-INF 005: "Network Functions Virtualisation (NFV); Infrastructure; Network Domain".
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## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI GS NFV 003 [i.3] and the following apply:

**administrative domain:** collection of systems and networks operated by a single organization or administrative authority

NOTE: The components which make up the domain are assumed to interoperate with a significant degree of mutual trust among them based on a stable trust relationship, while a transient, specific trust relationship shall be established for interoperating with components in other domains.

**connection point:** information element representing the virtual and/or physical interface that offers the network connections between instances of NS, VNF, VNFC (based on the VDU information element), PNF and a VL

NOTE: Some examples of virtual and/or physical interfaces are a virtual port, a virtual NIC address, a physical port, a physical NIC address or the endpoint of an IP VPN.

**consumer:** role played by a functional block that consumes certain functions exposed by another functional block

**deployment flavour:** template that describes a specific deployment (of a Network Service or VNF) supporting specific KPIs (such as capacity and performance)

**infrastructure domain:** administrative domain that provides virtualised infrastructure resources such as compute, network, and storage or a composition of those resources via a service abstraction to another Administrative Domain, and is responsible for the management and orchestration of those resources

**producer:** role played by a functional block that produces certain functions, and exposes them externally through public interfaces to other functional blocks

**resource orchestration:** subset of NFV Orchestrator functions that are responsible for global resource management governance

### 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI GS NFV 002 [i.2] and the following apply:

ADC	Application Delivery Controller
API	Application Programming Interface
BRAS	Broadband Remote Access Server
BSS	Business Support System
CIM	Common Information Model
CMS	Cloud Management System
CPE	Customer Premise Equipment
CPU	Central Processing Unit

CSAR	Cloud Service Archive
DMTF	Distributed Management Task Force
DPDK	Data Plane Development Kit
DSL	Digital Subscriber Line
DSLAM	DSL Access Multiplexer
E2E	End to end
ECC	Error Correcting Code
EM	Element Management
EMS	Element Management System
FCAPS	Fault Management, Configuration Management, Accounting Management, Performance Management, and Security Management
GB	Gigabyte
GRE	Generic Routing Encapsulation
HA	High Availability
HW	Hardware
ID	Identifier
IGMP	Internet Group Management Protocol
IMS	IP Multimedia System
IOMMU	Input/Output Memory Management Unit
IOTLB	Input/Output Translation Lookaside Buffer
IP	Internet Protocol
IPMI	Intelligent Platform Management Interface
ISG	Industry Specification Group
KPI	Key Performance Indicator
KQI	Key Quality Indicator
KVM	Kernel Virtual Machine
LAN	Local Area Network
LRO	Large Receive Offload
LSO	Large Segmentation Offload
MAC	Media Access Control
MEF	Metro Ethernet Forum
MPLS	Multi-Protocol Label Switching
MRB	Media Resource Broker
MRF	Media Resource Function
MTU	Maximum Transmission Unit
NCT	Network Connection Topology
NF	Network Function
NFP	Network Forwarding Path
NFV	Network Functions Virtualisation
NFVI	Network Functions Virtualisation Infrastructure
NFVI-PoP	NFVI Point of Presence
NFV-MANO	NFV Management and Orchestration
NFVO	Network Functions Virtualisation Orchestrator
NIC	Network Interface Card
NMS	Network Management System
N-PoP	Network Point of Presence
NS	Network Service
NSD	Network Service Descriptor
NSR	Network Service Record
NVGRE	Network Virtualization using Generic Routing Encapsulation
OSS	Operations Support System
OVF	Open Virtualisation Format
PCI	Peripheral Component Interconnect
PNF	Physical Network Function
PNFD	Physical Network Function Descriptor
PNFR	Physical Network Function Record
PRS	Problem Resolution Standard
PXE	Preboot Execution Environment
QoS	Quality of Service
RCA	Root Cause Analysis
RDMA	Remote Direct Memory Access
RSS	Receive Side Scaling

RTT	Round Trip Time
SDN	Software-Defined Networking
SHA	Secure Hash Algorithm
SID	Information Framework
SLA	Service Level Agreement
SMT	Simultaneous Multithreading
SR-IOV	Single Root Input/Output Virtualization
S-CSCF	Service Call Session Control Function
SWA	Software Architecture Work group
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol / Internet Protocol
TLB	Translation Lookaside Buffer
TOSCA	Topology and Orchestration Specification for Cloud Applications
URI	Uniform Resource Identifier
VDU	Virtualisation Deployment Unit
VEPA	Virtual Ethernet Port Aggregator
vEPC	Virtual Evolved Packet Core
VIM	Virtualised Infrastructure Manager
VL	Virtual Link
VLAN	Virtual LAN
VLD	Virtual Link Descriptor
VLR	Virtual Link Record
VM	Virtual Machine
VNF	Virtualised Network Function
VNFC	Virtual Network Function Component
VNFD	Virtualised Network Function Descriptor
VNFFG	VNF Forwarding Graph
VNFFGD	VNFFG Descriptor
VNFFGR	VNFFG Record
VNFM	VNF Manager
VNFR	VNF Record
vPGW	Virtual Packet Gateway
VPN	Virtual Private Network
VXLAN	Virtual eXtensible LAN
WAN	Wide Area Network
WIM	WAN Infrastructure Manager
XML	Extensible Markup Language
XSD	XML Schema Definition

Full STANDARD REVIEW  
 (standards.ietf.ai)  
 Full standard:  
<http://standards.ietf.ai/catalog/standards/sist/5265fb2d-98d1-49e-839b-cc9de5b21288/etsi-gs-nfv-man-001-v1.1.1-2014-12>

## 4 NFV Management and Orchestration: objectives and concepts

This clause provides an overview of the NFV management and orchestration objectives.

### 4.1 Overview

Network Functions Virtualisation (NFV) adds new capabilities to communications networks and requires a new set of management and orchestration functions to be added to the current model of operations, administration, maintenance and provisioning. In legacy networks, Network Function (NF) implementations are often tightly coupled with the infrastructure they run on. NFV decouples software implementations of Network Functions from the computation, storage, and networking resources they use. The virtualisation insulates the Network Functions from those resources through a virtualisation layer.

The decoupling exposes a new set of entities, the Virtualised Network Functions (VNFs), and a new set of relationships between them and the NFV Infrastructure (NFVI). VNFs can be chained with other VNFs and/or Physical Network Functions (PNFs) to realize a Network Service (NS).