ETSI GS NFV 003 V1.3.1 (2018-01)

GROUP SPECIFICATION

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

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Foreword

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

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**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.

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+) (GSM); 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

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.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

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] Recommendation ITU-T Y.3500: "Information technology - Cloud computing - Overview and vocabulary".

[i.2] ETSI GS NFV-MAN 001: "Network Functions Virtualisation (NFV); Management and Orchestration".

3   Terms and definitions

0-9

Void.

A to B

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

> NOTE: This definition is from ETSI GS NFV-MAN 001 [i.2].

affinity of virtualised network resources: persistent policy that forces Virtual Links (VLs) to share the same physical connectivity

> NOTE 1: "Persistent" is used here and in the following definitions to indicate that the affinity remains in effect until a change is requested by the consumer.

> NOTE 2: This may be stipulated to ensure the same transmission characteristics (such as delay) for VLs.

anti-affinity of virtualised network resources: persistent policy that forces Virtual Links (VLs) to not share any physical connectivity

> NOTE: This may be stipulated to ensure that VLs do not fail at the same time.

area affinity: policy that qualifies an affinity (or anti-affinity) policy with respect to location restrictions

> EXAMPLE: The anti-affinity policy of having virtualised compute resources on different compute nodes can be further restricted by mandating to locate the compute nodes on different shelves, racks, bays, sites, geographic areas or similar restriction.

> NOTE: Anti-affinity can be used to support availability, survivability and performance needs with respect to virtualised resources.

C

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

Composite Network Service (CNS): Network Service containing at least one Network Service

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

compute node: abstract definition of a server

consumable virtualised resource: virtualised resource that can be requested for reservation and/or allocation

> NOTE: Virtualised resources comprise compute, network and storage.

> EXAMPLE: A volume or object based virtual storage.

D to H

Void.

I

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

> NOTE: This definition is from ETSI GS NFV-MAN 001 [i.2].

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

> NOTE: It pre-exists the realization of VNFs.

infrastructure resource group: logical resource collection grouping virtual resource instances assigned to a tenant along with software images

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].

> EXAMPLE: Packet transfer performance or reliability of a network.

multi-tenancy: feature where physical,virtual or service resources are allocated in such a way that multiple tenants and their computations and data are isolated from and inaccessible by each another

> NOTE: This definition has been specialized from the term "multi-tenancy" as defined in Recommendation ITU-T Y.3500 [i.1].

N

Nested Network Service (NNS): Network Service that is part of a composite Network Service

> NOTE: A Composite Network Service is a Network Service containing at least one Network Service.

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: 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 Function(s) and/or Network Service(s), 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

NFV Security Controller: trusted security management entity that provides secure dynamic delivery of security policies and services into the virtual network

NFV Security Services Agent: entity responsible for securely receiving the Security Monitoring policy and implementing the same

NS healing: procedure that includes all virtualisation related corrective actions to repair a faulty Network Service (NS) instance including components/functionalities which make up the instance, and have been associated with this fault situation

> NOTE 1: In a virtualised environment network service healing focuses only on the virtualised components/functionalities. In case of a NS consisting of virtualised and non-virtualised parts a procedure able to handle both parts is needed. This will be done in connection with components/functionalities that are located outside the virtualised environment.

> NOTE 2: "Virtualisation related corrective actions" refers to action(s) toward virtualised resource(s) and associated NS instance.

NFV-MANO service: one or more capabilities offered via NFV-MANO functional blocks invoked using a defined interface

> NOTE: This definition has been specialized from the term "cloud service" as defined in Recommendation ITU-T Y.3500 [i.1].

> EXAMPLE: The VNFM offers a NFV-MANO service for VNF lifecycle management to the NFVO. The NFVO offers a NFV-MANO service for Network Service lifecycle management to OSS/BSS functions and uses the NFV-MANO service provided by the VNFM.

NFV-MANO service user: natural person, or entity acting on their behalf, associated with an organization that uses NFV-MANO services

> NOTE: This definition has been specialized from the term "cloud service user" as defined in Recommendation ITU-T Y.3500 [i.1].

node affinity for virtualised compute resources: persistent policy that forces virtualised compute resources to be on the same compute node

> NOTE 1: "Persistent" is used here and in the following definitions to indicate that the affinity remains in effect until a change is requested by the consumer.

> NOTE 2: This is to avoid cases where, for example, virtualised compute resource are initially on the same compute node but then later moved to separate nodes by the provider without any requested policy change from the consumer.

node anti-affinity for virtualised compute resources: persistent policy that forces each virtualised compute resource to be on different compute nodes

node affinity for virtualised storage resources: persistent policy that forces virtualised storage resources to be on the same storage node

node anti-affinity for virtualised storage resources: persistent policy that forces each virtualised storage resources to be on different storage nodes

O

Void.

P

path: data communications feature of the system describing the sequence and identity of system components visited by packets, where the components of the path may be either logical or physical

> NOTE: Examples of physical components include a physical switch or a network interface of a host, and an example of a logical component is a virtual network switch. Paths may be unidirectional or bi-directional. Paths may be further characterized as data plane or control plane when serving these classes of traffic, and as packet payload-agnostic or payload processing (as in the case of transcoding, compression, or encryption).

permitted allowance: constraint in terms of resource capacity, used by NFVO to control resource consumption by VNFMs in relation with VNF Lifecycle Operation Granting

> NOTE: Permitted allowances are maintained by the NFVO and might vary in granularity (VNFM, VNF, group of VNFs, NS, etc.).

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

Physical Network Function Descriptor(PNFD): template that describes the connectivity requirements of Connection Point(s) attached to a Physical Network Function

> NOTE: It is used by the NFVO to integrate PNF(s) into a NS.

Q

quota: upper limit on specific types of resources, usually used to prevent excessive resource consumption in the VIM by a given consumer

> NOTE: Quota is enforced by the VIM.

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

resource pool: logical grouping of NFVI hardware and software resources

> NOTE 1: A resource pool can be solely based on a certain resource type (e.g. compute, storage, networking) or include a combination of them, and can span zero, one or multiple resource zones.

> NOTE 2: An NFVI resource can be part of none, one or more than one resource pool.

resource zone: set of NFVI hardware and software resources logically grouped according to physical isolation and redundancy capabilities or to certain administrative policies for the NFVI

> NOTE: The same resource cannot be part of two different resource zones.

> EXAMPLE 1: Physical isolation may be achieved for example using a separate power supply, network equipment or physical building sites.

> EXAMPLE 2: One example of resource zones are the Availability Zones in OpenStack.

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

Security Lifecycle Management: comprises three main stages: security planning, security enforcement and security monitoring

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 Consumer: Person, device or company consuming a service provided by a Service Provider

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: 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])

service resource group: logical resource collection that groups a subset of service resource instances assigned to a tenant

> NOTE: A service resource group can include NS, VNF, PNF, VNFFG and NFP.

T

tenant: one or more NFV-MANO service users sharing access to a set of physical, virtual or service resources

> NOTE 1: This definition has been specialized from the term "tenant" as defined in Recommendation ITU-T Y.3500 [i.1].

> NOTE 2: The "tenant" concept in NFV should not be confused with the "tenant" (aka "project") concept in OpenStack. The OpenStack implementation covers a subset of the overall functionalities required by multi-tenancy in NFV.

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

trust domain: collection of entities that share a set of security policies

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 resource migration: process of relocating the virtualised resource from one physical node to another physical node

　　　NOTE:　　Examples of physical nodes are compute nodes and storage nodes.

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

Virtual Security Function (VSF): security enabling function within the NFV architecture

VNFC Snapshot: A replication of a VNFC instance at a specific point in time, capturing its full or partial state (such as state and content of the disks, memory and devices attached to the VNFC instance plus the infrastructure configuration of the VNFC instance)

VNFC Snapshot Package: collection of files representing a VNFC Snapshot which can be physically stored and transferred

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

VNF healing: procedure that includes all virtualisation-related corrective actions to repair a faulty VNF, and/or its VNFC instances and internal VNF Virtual Link(s)

　　　NOTE:　　"Virtualisation related corrective actions" refers to the corrective action(s) toward virtualised resources and associated VNF/VNFC instance(s), and/or internal VNF Virtual Link(s).

VNF Lifecycle Operation Granting: permission to perform a VNF lifecycle management operation and the resource management operations necessary to complete it, if any apply

　　　NOTE:　　There is no guarantee that the necessary resources are available after the grant is given. Information on resource requirements to execute a VNF LCM request is included in the Grant request. Granting of individual resource management operations is not in scope of VNF Lifecycle Operation Granting.

VNF Provider: person or company that provides the VNF

VNF Snapshot: replication of a VNF instance at a specific point in time, containing a consistent set of VNFC snapshots of all VNFC instances associated to the VNF instance, the VNF Descriptor and the VnfInfo (including state and settings of Virtual Links and Connection Points associated to this VNF)

VNF Snapshot Package: collection of files representing a VNF Snapshot which can be physically stored and transferred

VNF-related Resource Management in direct mode: mode of operation where the VNFM invokes on the VIM Virtualised Resources Management operations

　　　NOTE 1:　Resource reservation and quota management operations are out of the scope of this mode of operation, with the exception of query reservations and query quota.

NOTE 2: Virtualised Resources Management operations include allocation, migration, scaling, update, query, operation and termination of virtualised resources.

VNF-related Resource Management in indirect mode: mode of operation where the VNFM invokes on the NFVO Virtualised Resources Management operations and the NFVO in turn invokes them towards the VIM

NOTE 1: Resource reservation and quota management operations are out of the scope of this mode of operation, with the exception of query reservations and query quota.

NOTE 2: Virtualised Resources Management operations include allocation, migration, scaling, update, query, operation and termination of virtualised resources.

VNF Set: collection of VNFs with unspecified connectivity between them

W to Z

Void.

4 Abbreviations

0-9

Void.

A

AAA	Authentication, Authorization and Accounting
API	Application Programming Interface

B

Void.

C

CON	CONformance
CPU	Central Processing Unit

D

DUT	Device Under Test

E

Void.

F

FUT	Function Under Test

G to H

Void.

I

IFS   Interoperable Features Statement
IOP   InterOPerability
ISF   Infrastructure Security Function
ISM   Infrastructure Security Manager
IUT   Implementation Under Test

J to K

Void.

L

LCM   Life Cycle Management

M

MMI   Man-Machine Interface

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
NFV-SC   NFV Security Controller
NIC   Network Interface Controller
NS   Network Service
NSD   Network Service Descriptor
NSM   NFV Security Manager

O

OSS   Operation System Support

P

PICS   Protocol Implementation Conformance Statement
PNF   Physical Network Function
PoP   Point of Presence
PSF   Physical Security Function

Q

QE	Qualified Equipment
QF	Qualified Function

R

Void.

S

SEM	Security Element Manager
SLA	Service Level Agreements
NSD	security enhanced Network Service Descriptor
SUT	System Under Test
SSA	Security Services Agent

T

TD	Test Description
TSS	Test Suite Structure

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
VSF	Virtual Security Function
vStorage	Virtualised Storage
vSwitch	Virtualised Switch

W to Z

Void.

History

Document history		
V1.1.1	October 2013	Publication
V1.2.1	December 2014	Publication
V1.3.1	January 2018	Publication