NSD Information Model Specification for Open-O

1. Scope

The scope of the present document is to describe the NSD Information Model Specification.

2. Terms, Definitions and Abbreviations

For the purposes of the present document, the following abbreviations apply:

Abbreviation	Definition
CM	Conditional Mandatory
CO	Conditional Optional
CP	Connection Point
CPD	Connection Point Descriptor
DSL	Domain Specific Language
MANO	Management and Orchestration
MPLS	Multi-Protocol Label Switching
NFP	Network Forwarding Path
NFPD	Network Forwarding Path Descriptor
NSD	Network Service Descriptor
PNFD	Physical Network Function Descriptor
UML	Unified Modeling Language
VL	Virtual Link
VLD	Virtual Link Descriptor
VNFFG	VNF Forwarding Graph
VNFFGD	VNF Forwarding Graph Descriptor

Table 2-1 Abbreviations

3. NSD Information Mode

The Network Service Descriptor (NSD) is a deployment template which consists of information used by the NFV Orchestrator (NFVO) for life cycle management of an NS.

An NS is a composition of Network Functions (NF) arranged as a set of functions with unspecified connectivity between them or according to one or more forwarding graphs. As illustrated in figure 4.1-1, the description of a NS as used by the NFV Management and Orchestration (MANO) functions to deploy an NS instance includes or references the descriptors of its constituent objects:

● Zero, one or more Virtualized Network Function Descriptors (VNFD);

● Zero, one or more Physical Network connect PNFs to VLs;

● Zero, one or more nested NSD;

NOTE 1: The information contained with to integrate PNFs in an NS.

NOTE 2: An NSD references at least either one VNFD or one nested NSD.

- Zero, one or more Virtual Link Descriptor (VLD) used by the NFVO to deploy Virtual Links (VL) ; and
- Zero, one or more VNF Forwarding Graph Descriptors (VNFFGD).

A VNF Forwarding Graph Descriptor (VNFFGD) describes a topology of the NS or a portion of the NS, by referencing a pool of connection points and service access points, the descriptors of its constituent VNFs, PNFs of the VLs that connect them. It may also contain one or more Network Forwarding Path (NFP) descriptors.

NOTE 3: Different VNFFGDs can be contained in a given NSD. Each VNFFGD uses subsets of the lists of VLDs, VNFDs and PNFDs included in the NSD.

NOTE 4: For a given NS different VNFFGs can result in packets/frames traversing identical sequences of (V)NFs depending on the NFP descriptors included in the VNFFGDs.

NOTE 5: In a given VNFFG the connectivity topology represents how the (V)NFs among which packets/frames can be exchanged are connected to each other. A Network Connectivity Topology (NCT), as defined in ETSI GS NFV-SWA 001 [i.3] represents a higher logical level connectivity, possibly a global view of combined connectivity from different VNFFGs of a given NS.
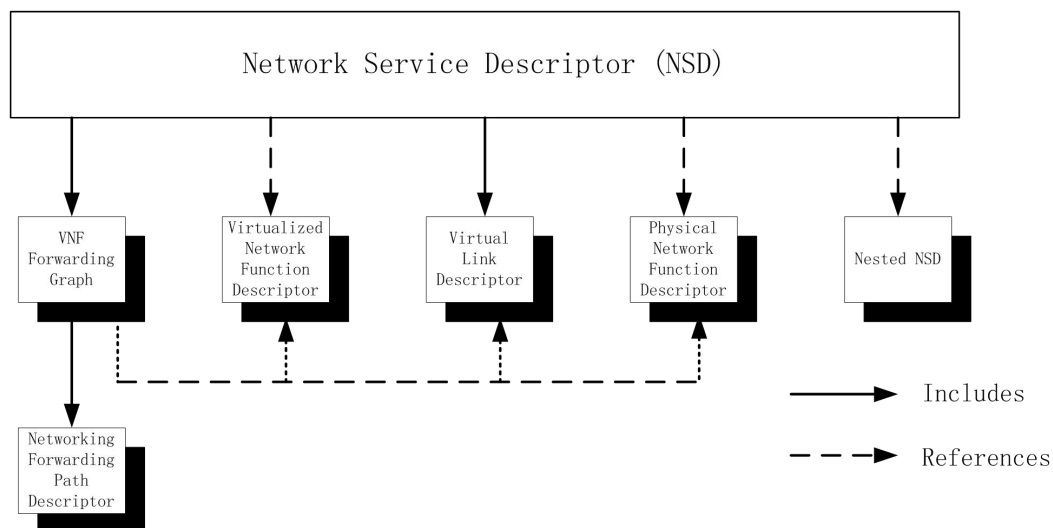
4. Functional Requirements

4.1 NSD

Table 4-1 specifies requirements to the templates for NSD instances.

Numbering	Requirements Description
NST_NSD001	The NSD shall reference the VNFDs applicable to its constituent VNFs.

Numbering	Requirements Description
NST_NSD002	The NSD shall include the VLDs applicable to the VLs used by the NS to interconnect its constituent NFs.
NST_NSD003	The NSD shall reference the PNFDs applicable to its constituent PNFs.
NST_NSD004	The NSD shall include the descriptors of the VNFFGs applicable to the NS.
NST_NSD005	The NSD shall support the capability to include or reference NS life cycle management scripts describing how to react upon specific life cycle events, fault detection, performance threshold crossing detection and other events that can occur at the NFVO reference points.
NST_NSD006	The NSD shall support the capability to provide monitoring parameters to be tracked during the lifetime of a NS instance.
NST_NSD007	The NSD shall support the capability to describe auto scale rules, associating criteria to scaling actions.
NST_NSD008	The NSD shall include security information enabling validating its authenticity and integrity.
NST_NSD009	The NSD shall include a globally unique identifier for identifying each descriptor instance.
NST_NSD010	The NSD shall include an identifier to select the controller compatible with the NSD.

4.2 VNFFGD

Table 4-2 specifies requirements to the templates for VNFFGD instances.

Numbering	Requirements Description
NST_FGD001	A VNFFGD shall enable associating multiple network forwarding paths to a forwarding graph.
NST_FGD002	Within a VNFFGD, an NFP description shall enable associating a set of conditions captured in a rule to a sequence of connection points to be traversed by packets or frames matching these conditions.
NST_FGD003	A VNFFGD shall reference the VNFDs and PNFDs of its constituent VNFs and PNFs.
NST_FGD004	A VNFFGD shall reference the VLDs applicable to instantiate VLs

Numbering	Requirements Description
	between the VNFs and PNFs that are part of the VNFFG.
NST_FGD005	A VNFFGD shall enable referencing a pool of descriptors of connection points attached to constituent VNFs and PNFs of the parent NS or of a nested NS.

4.3 NSVLD

Table 4-3 specifies requirements to the templates for VLD instances.

Numbering	Requirements Description
NST_VLD001	A VLD shall enable specifying the type of connectivity provided by the link between VNFs.

5. Information Model Definition

5.1 NSD

The NSD information element is a template whose instances are used by the NFVO for the lifecycle management of NSs.

Attribute	Qualifier	Cardinality	Content	Description
id	M	1	Identifier	Identifier of this NSD information element. It Globally uniquely identifies an instance of the NSD. [Refer to IFA014]
designer	M	1	string	Designer of this NSD. [Refer to IFA014]
version	M	1	String	Identifies the version of the NSD. [Refer to IFA014]
controllerinfo	M	1	String	Identifies controller(s) compatible with the

Attribute	Qualifier	Cardinality	Content	Description
				NS described in this version of the NSD. [add for ONAP]
name	M	1	String	Identifies the name of the NSD. [Refer to IFA014]
vnfdId	M	0…N	Identifier (Reference to Vnfd)	VNFD information element(s) of this NSD. It Globally uniquely identifies an instance of the NSD. [Refer to IFA014]
pnfdId	M	0…N	Identifier	Identifier of the PNFD information element. It Globally uniquely identifies an instance of the NSD. [Refer to IFA014]
virtualLinkDesc	M	0…N	NSVLD	Specifies the constituent VLDs. See NOTE 2. [Refer to IFA014]
cpdId	M	0…N	Identifier	References the descriptor of VNF or PNF external connection points [Refer to IFA014]
vnffgd	M	0…N	VNFFGD	Specifies the descriptors of the applicable forwarding graphs. [Refer to IFA014]
planId	M	0…1	Plan	Specifies a list of life cycle management

Attribute	Qualifier	Cardinality	Content	Description
				workflow..
NOTE 1: Cardinality of 0 means that the NS is a NF set with unspecified connectivity.				

5.2 VNFD

Reference to VNFD Information Model Specification document.

5.3 PNFD

Attribute	Qualifier	Cardinality	Content	Description
pnfid	M	1	Identifier	Identifier of this Pnfd information element. It uniquely identifies the PNFD. [Refer to IFA014]
provider	M	1	string	provider of this PNFD[Refer to IFA014]
version	M	1	String	Identifies the version of the PNFD. [Refer to IFA014]
description	M	0…1	String	Specifies human-readable information on the purpose of the connection point (e.g. connection point for control plane traffic).
pnf_type	M	1	String	type of PNF
request_reclassification	O	1	boolean	Determines whether VNF can request reclassification by the VNF forwarder
nsh_aware	O	1	boolean	Describes whether this VNF can process NSH headers.
management_address	M	1	String	Describes management port address of this PNF.

5.4 PNFCPD

Attribute	Qualifier	Cardinality	Content	Description
id	M	1	Identifier	Identifies this CPD information element within a NSD. [Refer to IFA014]
vldId	M	0…N	Identifier (Reference to a NSVLD)	References the VLD information element inside the NSD or the parent NSD.
description	M	0…1	String	Specifies human-readable information on the purpose of the connection point (e.g. connection point for control plane traffic). [Refer to IFA014]
layerProtocol	M	1..N	Enum	Identifies a protocol that the connection points corresponding to the CPD support for connectivity purposes (e.g. Ethernet, MPLS, ODU2, IPV4, IPV6, Pseudo-Wire, etc.). [Refer to IFA014]
cpRole	M	0…1	String	Identifies the role of the connection points corresponding to the CPD in the context of the traffic flow patterns in the VNF, PNF or NS. For example an NS with a tree flow pattern within the NS will have legal cpRoles of ROOT and LEAF. [Refer to IFA014]
sfcEncapsulation	M	0…1	String	Defines the encapsulation of SFC.
direction	M	0…1	String	Identity the direction of this CP including input, output, bidirectional.
interfaceName	M	0…1	String	Specifies physical interface name of CP for PNF.

5.5 NSVLD

The NSVLD information element provides general information enabling the instantiation of virtual links.

Attribute	Qualifier	Cardinality	Content	Description

Attribute	Qualifier	Cardinality	Content	Description
id	M	1	Identifier	Identifier of the NsVirtualLinkDesc information element. It uniquely identifies a VLD. [Refer to IFA014]
connectivityType	M	1	ConnectivityType	Specifies the protocol exposed by the VL and the flow pattern supported by the VL. [Refer to IFA014]
description	M	0…1	String	Specifies human-readable information on the purpose of the VL (e.g. control plane traffic). [Refer to IFA014]
networkType	M	1	String	Specifies the network type including but not restricted to FLAT, VLAN, GRE, VXLAN, exposed by the VL and the flow pattern supported by the VL.
networkName	M	1	String	Specifies name of the network.

5.6 VNFFGD

The VNFFGD information element describes a topology of connectivity of a NS and optionally forwarding rules applicable to the traffic over this topology.

Attribute	Qualifier	Cardinality	Content	Description
id	M	1	Identifier	Identifier of this VNFFGD. [Refer to IFA014]
description	M	0…1	string	Description of this VNFFG.
numberOf_Endpoints	M	1	integer	Count of the external endpoints included in this VNFFG
dependentVirtualLink	M	1…N	String[]	Identifies the reference to a NSVLD used in this Forwarding Graph [Refer to IFA014]
connectionPoint	M	0…N	String[]	Reference to a set of connection points forming

Attribute	Qualifier	Cardinality	Content	Description
				the VNFFG. [Refer to IFA014]
constituentVnfs	M	0…N	String[]	Reference to a set of VNFDs used in this VNFFG.
constituentPnfs	M	0…N	String[]	Reference to a set of PNFD used in this VNFFG.
nfpdId	M	0…N	Identifier	Reference to the forwarding paths associated to the VNFFG. [Refer to IFA014]

5.7 NFPD

Attribute	Qualifier	Cardinality	Content	Description
nfpId	M	1	Identifier	Identifies this nfpd information element within a VNFFGD. [Refer to IFA014]
description	M	0…1	String	Specifies the description of this NFPD.
policy	M	0…1	FPPolicy	Specifies an NFP classification and selection rule. The rule is expressed as a criteria. [Refer to IFA014 nfpRule]
cpdId	M	0…N	Identifier (Reference to a CPD)	References to a set of CPDs to be traversed by the traffic flows matching the criteria. This shall be a connection point attached to one of the constituent VNFs and PNFs of the parent VNFFG. [Refer to IFA014]
symmetric	M	0…1	Boolean	If the chain is symmetric, SDN Controller will create two service paths, one ingress and another egress.
direction	M	0…1	string	Identifies the direction of the NFPD including forward and reverse.

Attribute	Qualifier	Cardinality	Content	Description
NOTE 1: When multiple values are provided, the order is significant and specifies the sequence of connection points to be traversed.				

5.8 ConnectivityType

Attribute	Qualifier	Cardinality	Content	Description
layerProtocol	M	1	String	Identifies the protocol that the VL supports (Ethernet, MPLS, ODU2, IPV4, IPV6, Pseudo-Wire, etc.). [Refer to IFA014]
flowPattern	M	0..1	String	Identifies the flow pattern of the connectivity (Line, Tree, Mesh, etc.). [Refer to IFA014]

5.9 FPPolicy

Attribute	Qualifier	Cardinality	Content	Description
type	M	1	String	Identifies the type of the rule. Only supports ACL now.
criteria	M	1	Criteria	Identifies the criteria of the rule.

5.10   Criteria

Attribute	Qualifier	Cardinality	Content	Description
ipProtocol	M	0…1	String	Specifies the ip protocol type of the criteria.
sourcePortRange	M	0…1	String	Specifies the source port range of the criteria.
destPortRange	M	0…1	String	Specifies the destination port range of the criteria.
sourceIpRange	M	0…1	String	Specifies the source ip range of the criteria.

Attribute	Qualifier	Cardinality	Content	Description
destIpRange	M	0…1	String	Specifies the destination ip range of the criteria.

5.11　Plan

Attribute	Qualifier	Cardinality	Content	Description
id	M	1	String	Identifies the id of this plan for life cycle management.
workflow	M	1	String	Specifies the workflow for NS creation.