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GROUP SPECIFICATION

Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Network Service Templates Specification

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1 Scope

The present document specifies requirements and templates for describing Network Functions Virtualisation (NFV) Network Services (NSs) in the form of meta-data.

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 GS NFV 003: "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".

[2] ETSI GS NFV-IFA 011: "Network Functions Virtualisation (NFV); Management and Orchestration; VNF Descriptor and Packaging Specification".

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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 002: "Network Functions Virtualisation (NFV); Architectural Framework".

[i.2] ETSI GS NFV-IFA 013: "Network Functions Virtualisation (NFV); Management and Orchestration; Os-Ma-Nfvo reference point - Interface and Information Model Specification".

[i.3] ETSI GS NFV-SWA 001: "Network Functions Virtualisation (NFV); Virtual Network Functions Architecture".

[i.4] ISO/IEC 9646-7: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 7: Implementation Conformance Statements".

[i.5] ETSI GS NFV-REL 001: "Network Functions Virtualisation (NFV); Resiliency Requirements".

[i.6] IETF RFC 7665: "Service Function Chaining (SFC) Architecture".

[i.7] ETSI GS NFV-IFA 005: "Network Functions Virtualisation (NFV); Management and Orchestration; Or-Vi reference point - Interface and Information Model Specification".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI GS NFV 003 [1] and the following apply:

Service Access Point (SAP): connection point where a NS can be accessed

NOTE: A SAP can either provide access to an NS, e.g. to an end-user, or interconnect different NS.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI GS NFV 003 [1] and the following apply:

CDN	Content Delivery Network
CM	Conditional Mandatory
CO	Conditional Optional
CP	Connection Point
CPD	Connection Point Descriptor
DF	Deployment Flavour
DSL	Domain Specific Language
E-LAN	Ethernet Local Area Network
GS	Group Specification
IPV4	Internet Protocol Version 4
IPV6	Internet Protocol Version 6
LAN	Local Area Network
MANO	Management and Orchestration
MPLS	MultiProtocol Label Switching
NCT	Network Connectivity Topology
NFP	Network Forwarding Path
NFPD	Network Forwarding Path Descriptor
NS	Network Service
NSD	Network Service Descriptor
ODU2	Optical channel Data Unit - type 2
PM	Performance Management
PNFD	Physical Network Function Descriptor
SAP	Service Access Point
SAPD	Service Access Point Descriptor
SFC	Service Function Chaining
UML	Unified Modelling Language
VL	Virtual Link
VLD	Virtual Link Descriptor
VNFFG	VNF Forwarding Graph
VNFFGD	VNF Forwarding Graph Descriptor
XOR	eXclusive OR

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4 Overview

4.1 Network Service Descriptions

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 Virtualised Network Function Descriptors (VNFD);
- zero, one or more Physical Network Function Descriptors (PNFD) used by the NFVO to determine how to connect PNFs to VLs;
- zero, one or more nested NSD;

NOTE 1: The information contained within the PNFD is limited to the description of the connectivity requirements 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 Descriptors (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 and 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.

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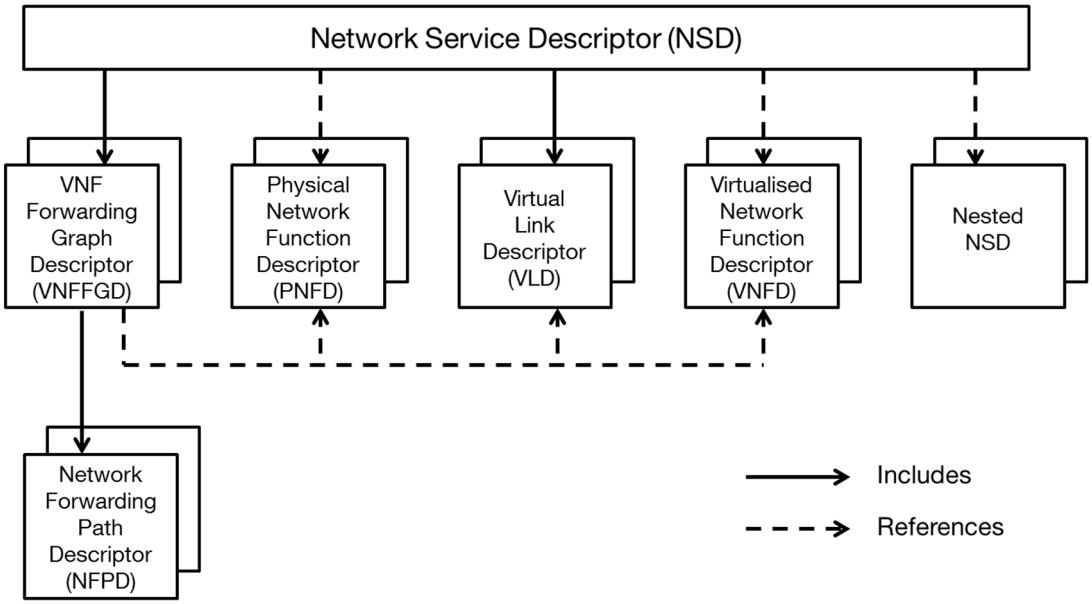

Figure 4.1-1: NSD overview

4.2 Relation to other ETSI NFV Group Specifications

The concepts of network services and forwarding graphs are described in ETSI GS NFV 002 [i.1].

Instances of objects created according to the templates specified in the present document are exchanged at the Os-Ma-Nfvo reference point as specified in ETSI GS NFV-IFA 013 [i.2].

The format of the VNF descriptors referenced in a network service template shall comply with the specifications in ETSI GS NFV-IFA 011 [2].

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4.3 Conventions

The attributes of the NSD and associated information elements are described in the tables provided in clause 6. Each table has 5 columns, with the following significance:

- The "Attribute" column provides the attribute name.
- The "Qualifier" column indicates whether the support of the attribute is mandatory, optional or conditional.
- The "Cardinality" column contains the minimum and maximum cardinality of this information element (e.g. 1, 2, 0..N, 1..N). A cardinality range starting with 0 indicates that the attribute needs not always to be included.
- The "Content" column provides information on the type of the attribute values. It can be the name of an Information Element, a primitive type (Identifier, DateTime, etc.) or a generic UML type (String, Integer, etc.). If a cell in the "Content" column is marked as "Not specified", this means that the specification of the type is left to the data model design stage.
- The "Description column" provides a brief explanatory description and additional constraints.

The following notations, defined in ISO/IEC 9646-7 [i.4], are used for the qualifier column of information elements:

- M mandatory - the attribute shall be supported.
- O optional - the attribute may, but need not, be supported.
- CM conditional mandatory - the attribute shall be supported under certain conditions. If the specified conditions are met then the attribute shall be supported. These conditions are specified in the Description column.

- CO conditional optional - the attribute may, but need not, be supported under certain conditions. If the specified conditions are met then the attribute may, but need not, be supported. These conditions are specified in the Description column.

The following notation is used for parameters that represent identifiers, and for attributes that represent identifiers in information elements and notifications:

- If parameters are referring to an identifier of an actual object, their type is "Identifier".
- If an object (information element or notification) contains an attribute that identifies the object, the type of that attribute is "Identifier" and the description states that the attribute is the identifier of that particular notification or information element.

EXAMPLE 1: Identifier "resourceId" of the "NetworkSubnet information element" has type "Identifier" and description "Identifier of this NetworkSubnet information element".

- If an object (information element or notification) contains an attribute that references another object or objects defined in an ETSI NFV Group Specification (GS), the type of the attribute is "Identifier", followed by the list of objects it references.

EXAMPLE 2: "Identifier (Reference to Vnfc)" or "Identifier (Reference to Vnfc, VirtualLink or VirtualStorage)".

4.4 Various levels of NFV entities

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For NFV management and orchestration, there are four basic levels of entities:

- Descriptors - general type definitions for things such as NSs, VNFs and VLs.
- Descriptor objects - an instance of a descriptor, e.g. an instance of an NSD (not an instance of a NS instantiated according to this NSD):
  - A descriptor object may provide (among other things) value ranges and default values for the attributes in the associated NFV entity class.
  - In the present document, the creation of subclasses of generic descriptors (e.g. NSD_x as a subclass of NSD) has been avoided, since this approach would create a proliferation of descriptor classes.
- NFV entity classes - these are classes that represent various NFV entities such as NS, VNF and VL. There is one-to-one mapping between the set of descriptor objects and the set of NFV entity classes. An example of NFV entity class is CDN NS.
- NFV entity instances - these are instances of a given NFV entity class. An NFV entity instance is used to represent the current state and attribute values for a given NFV entity. Each NFV entity instance is bound by the associated descriptor object, e.g. value ranges and default values for attributes. More than one NFV entity instance can be created from the same associated descriptor object. An example of NFV entity instance is CDN NS instance.

Each level puts constraints on the subsequent levels.

Information in a lower level does not appear in a higher level, e.g. NFV entity instance information does not appear in the associated NFV entity class, descriptor object or descriptor.

5 Functional requirements

5.1 Void

5.2 Functional requirements for Network Service Descriptor

Table 5.2-1 specifies functional requirements applicable to the templates for NSD instances.

Table 5.2-1: Functional requirements for NSD

Numbering	Requirement description
NST_NSD001	The NSD shall reference the VNFDs applicable to its constituent VNFs.
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 specify the Service Access Points (SAPs) of the NS.
NST_NSD005	The NSD shall include the descriptors of the VNFFGs applicable to the NS. See note 1.
NST_NSD006	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_NSD007	The NSD shall support the capability to provide monitoring parameters to be tracked during the lifetime of a NS instance. See note 2.
NST_NSD008	The NSD shall support the capability to describe one or more NS DF(s).
NST_NSD009	The NSD shall support the capability to describe auto scale rules, associating criteria to scaling actions (e.g. removing existing VNF instances from an NS instance).
NST_NSD010	The NSD shall include security information enabling validating its authenticity and integrity.
NST_NSD011	The NSD shall support the capability to reference NSDs used to instantiate nested or appended NSs. See note 3.
NST_NSD012	The NSD shall include a globally unique identifier for identifying each descriptor instance.
NOTE 1: A NS might have multiple graphs, for example, for: 1) Control plane traffic. 2) Management plane traffic. 3) User plane traffic. NOTE 2: These can be used for specifying different Deployment Flavours (DF) for the NS in the NSD or in determining the need to scale-out. NOTE 3: NSs are composable, i.e. they can include other NSs (a.k.a. nested NS) or other NSs can be appended to them.	

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5.3 Functional requirements for Network Service Deployment Flavour

Table 5.3-1 specifies functional requirements applicable to the templates for describing NS DF.

Table 5.3-1: Functional requirements for NS DF description

Numbering	Requirement description
NST_NSF001	An NS DF description shall describe how many instances of each constituent VNF are required.
NST_NSF002	An NS DF description shall reference a VNF flavour to be used for each constituent VNF.
NST_NSF003	An NS DF description shall enable describing affinity and anti-affinity rules between the different instances of a constituent VNF.
NST_NSF004	An NS DF description shall enable describing affinity and anti-affinity rules between the constituent VNFs.
NST_NSF005	An NS DF description shall enable referencing a VL flavour to be used for each VL connected to its constituent VNFs.
NST_NSF006	An NS DF description shall enable describing affinity and anti-affinity rules between the different instances of a constituent VL.
NST_NSF007	An NS DF description shall enable describing affinity and anti-affinity rules between the constituent VLs.
NST_NSF008	An NS DF description shall support the capability to describe dependencies between VNF and/or nested NS instances in terms of primary and secondary entities. See note.
NOTE: This information is used, for example, to define the sequence in which various numbered VNF and/or nested NS should be instantiated by the NFVO.	