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Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; VNF Package and PNFD Archive specification

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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 specifies the structure and format of a VNF package file and its constituents, fulfilling the requirements specified in ETSI GS NFV-IFA 011 [1] for a VNF package.

The present document also specifies the structure and format of a PNFD archive file and its constituents, fulfilling the requirements specified in ETSI GS NFV-IFA 014 [9] for a PNFD archive.

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-IFA 011: "Network Functions Virtualisation (NFV); Management and Orchestration; VNF Packaging Specification".
- [2] OASIS Standard: "TOSCA Simple Profile in YAML Version 1.1".
- [3] IETF RFC 3339: "Date and Time on the Internet: Timestamps".
- [4] IANA register for Hash Function Textual Names.

NOTE: Available at <https://www.iana.org/assignments/hash-function-text-names/hash-function-text-names.xhtml>.

- [5] IETF RFC 5652 (September 2009): "Cryptographic Message Syntax (CMS)".
- [6] IETF RFC 7468: "Textual Encodings of PKIX, PKCS, and CMS Structures".
- [7] Void.
- [8] Recommendation ITU-T X.509: "Information technology - Open Systems Interconnection - The Directory: Public-key and attribute certificate frameworks".
- [9] ETSI GS NFV-IFA 014: "Network Functions Virtualisation (NFV); Management and Orchestration; Network Service Templates Specification".
- [10] IETF RFC 2315: "PKCS #7: Cryptographic Message Syntax Version 1.5".

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] OASIS Standard-v1.0-os: "Topology and Orchestration Specification for Cloud Applications Version 1.0".
- [i.2] OASIS Standard: "TOSCA Simple Profile in YAML Version 1.0".
- [i.3] ETSI GS NFV 003: "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".
- [i.4] ETSI GS NFV-SOL 001: "Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; NFV descriptors based on TOSCA specification".
- [i.5] ETSI NFV registry of non-MANO artifact sets.
NOTE: Available at <http://register.etsi.org/NFV>.
- [i.6] ETSI GS NFV-SOL 006: "Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; NFV descriptors based on YANG specification".
- [i.7] ETSI GS NFV-SOL 004 (V2.4.1): "Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; VNF Package specification".
- [i.8] ETSI GS NFV-SOL 004 (V2.5.1): "Network Functions Virtualisation (NFV) Release 2; Protocols and Data Models; VNF Package 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 [i.3] and the following apply:

non-MANO artifact: artifact for use by functional blocks beyond NFV-MANO

non-MANO artifact set: set of related non-MANO artifacts which are intended to be used together

3.2 Symbols

Void.

3.3 Abbreviations

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

ASCII	American Standard Code for Information Interchange
CA	Certificate Authority
CMS	Cryptographic Message Syntax
CSAR	Cloud Service ARchive
IANA	Internet Assigned Number Association

NFVI	NFV Infrastructure
NFVO	NFV Orchestrator
PKCS	Public Key Cryptographic Standard
PNF	Physical Network Function
PNFD	PNF Descriptor
TOSCA	Topology and Orchestration Specification for Cloud Applications
URI	Universal Resource Identifier
UTF	Unicode Transformation Format
VNF	Virtualised Network Function
VNFD	VNF Descriptor
YAML	YAML Ain't Markup Language
YANG	Yet Another Next Generation

4 VNF package

4.1 TOSCA YAML Cloud Service Archive (CSAR) overview

4.1.1 CSAR structure

TOSCA YAML CSAR file is an archive file using the ZIP file format whose structure complies with the TOSCA Simple Profile YAML v1.1 Specification [2]. According to the TOSCA Simple Profile YAML v1.1 Specification [2], the CSAR file shall have one of the two following structures:

- CSAR containing a *TOSCA-Metadata* directory, which includes the *TOSCA.meta* metadata file providing an entry information for processing a CSAR file as defined in TOSCA v1.0 specification [i.1].
- CSAR without a *TOSCA-Metadata* directory and containing a single yml file with a *.yml* or *.yaml* extension at the root of the archive. The yml file is a TOSCA definition template that shall contain a metadata section with *template_name* and *template_version* metadata.

In addition, the CSAR file may optionally contain other directories with bespoke names and contents.

4.1.2 CSAR with TOSCA-Metadata directory

4.1.2.1 General

The *TOSCA.meta* metadata file includes *block_0* with the *Entry-Definitions* keyword pointing to a TOSCA definitions YAML file used as entry for parsing the contents of the overall CSAR archive.

Any TOSCA definitions files besides the one denoted by the *Entry-Definitions* keyword can be found by processing respective *imports* statements in the entry definitions file (or in recursively imported files).

Any additional artifacts files (e.g. scripts, binaries, configuration files) can be either declared explicitly through blocks in the *TOSCA.meta* file as described in TOSCA v1.0 specification [i.1] or pointed to by relative path names through artifact definitions in one of the TOSCA definitions files contained in the CSAR file.

Extension of the *TOSCA.meta* file is described in clause 4.1.2.2.

In order to indicate that the simplified structure (i.e. not all files need to be declared explicitly) of *TOSCA.meta* file allowed by TOSCA Simple profile YAML 1.0 [i.2] is used, the *CSAR-Version* keyword listed in *block_0* of the meta-file denotes the version 1.1 as described in the below example. Otherwise the *CSAR-Version* keyword denotes the version 1.0 and all files shall be declared explicitly.

EXAMPLE:

```
TOSCA-Meta-File-Version: 1.0
CSAR-Version: 1.1
Created-by: Onboarding portal
Entry-Definitions: Definitions/MainServiceTemplate.yaml
```

END OF EXAMPLE.

4.1.2.2 TOSCA.meta file extension

The TOSCA.meta file structure extension is used when files defined in clauses 4.3.2 to 4.3.6 of the present document are included in the VNF package and when using CSAR with TOSCA-Metadata directory, as described in clause 4.1.2.1.

NOTE: TOSCA v1.0 specification [i.1] does not preclude the TOSCA.meta file block _0 to be extended with key value pairs.

4.1.2.3 TOSCA.meta file keynames extension

Table 4.1.2.3-1 specifies an extension of the list of recognized TOSCA.meta file keynames as specified in TOSCA-v1.0 specification [i.1] for the TOSCA.meta file. The keynames represents the entries for artifacts defined in clauses 4.3.2 to 4.3.6 of the present document and shall be located in the block_0.

Table 4.1.2.3-1: List of TOSCA-meta file keynames extensions

Keyname	Required	Type	Description
ETSI-Entry-Manifest	yes	string	Location of the Manifest file as defined in clause 4.3.2
ETSI-Entry-Change-Log	yes	string	Location of the Change history file as defined in clause 4.3.3
ETSI-Entry-Tests	no	string	Location of the Testing files as defined in clause 4.3.4
ETSI-Entry-Licenses	yes	string	Location of the Licensing information as defined in clause 4.3.5
ETSI-Entry-Certificate	no	string	Location of the Certificate file as defined in clause 4.3.6

Use of the Entry-Manifest, Entry-Change-Log, Entry-Tests, Entry-Licenses and Entry-Certificate keynames defined in versions 2.4.1 [i.7] to 2.5.1 [i.8] of the present document is deprecated. These keynames are only provided for backward compatibility with legacy VNF Package consumers- VNF package providers are warned that support of these keynames can be removed in subsequent versions of the present document. The key with and without the ETSI- prefix should not be both present in the TOSCA.meta. If both are present they shall point to the same value.

EXAMPLE:

```
TOSCA-Meta-File-Version: 1.0
CSAR-Version: 1.1
Created-By: MyCompany
Entry-Definitions: MRF.yaml
ETSI-Entry-Manifest: MRF.mf
ETSI-Entry-Licenses: Files/Licenses
ETSI-Entry-Change-Log: Files/ChangeLog.txt
```

END OF EXAMPLE.

4.1.3 CSAR zip without TOSCA-Metadata directory

The yaml file at the root of the archive is the *CSAR Entry-Definition* file. The CSAR-Version is defined by the *template_version* metadata as can be seen in the below example. The value of *template_version* shall be set to 1.1.

EXAMPLE:

```
tosca_definitions_version: tosca_simple_yaml_1_2
metadata:
  template_name: MainServiceTemplate
  template_author: Onboarding portal
  template_version: 1.1
```

END OF EXAMPLE.

4.1.4 TOSCA Entry definition file metadata extension

4.1.4.1 Metadata keynames

Table 4.1.4.1-1 specifies an extension of the list of recognized metadata keynames as specified in TOSCA-Simple-Profile-YAML-v1.1 [2] for the main TOSCA Service Template.

Table 4.1.4.1-1: List of metadata keynames extensions

Keyname	Required	Type	Description
yang_definitions	no	string	Reference to a YANG definition file representing the VNFD within a VNF Package

4.1.4.2 Additional requirement

If a YANG-based VNFD is included in the VNF Package, the main TOSCA definitions YAML file shall include a metadata section with an additional metadata entry, where the keyname is "yang_definitions" and the value is the path to the YANG file representing the VNFD within the VNF Package. No additional contents shall be included in the main TOSCA definitions YAML file.

NOTE: The above requirement ensures that there cannot be both a YANG-based and a TOSCA-based representation of a VNFD in the same package.

EXAMPLE:

```
tosca_definitions_version: toasca_simple_yaml_1_1
metadata:
  template_name: MainServiceTemplate
  template_author: Onboarding portal
  template_version: 1.1
  yang_definitions: Definitions/myvnfd.xml
```

END OF EXAMPLE.

4.2 VNF package structure and format

The structure and format of a VNF package shall conform to the TOSCA Simple Profile YAML v1.1 Specification of the CSAR format [2].

NOTE: This implies that the VNF package can be structured according to any of the two options described in clause 4.1.

The consumer of a VNF package complying with the present document shall be able to process a CSAR file structured according to any of the two options described in clause 4.1. If the CSAR file contains a TOSCA-Metadata directory and a single yaml file with a .yml or .yaml extension at the root of the archive, the TOSCA.meta file contained in the TOSCA-Metadata directory shall be used as an entry information for processing the CSAR file.

4.3 VNF package file contents

4.3.1 General

A VNF Package shall contain a main TOSCA definitions YAML file representing all or part of the VNFD, and additional files. It shall be structured according to one of the CSAR structure options described in clause 4.1.

NOTE 1: ETSI GS NFV-SOL 001 [i.4] specifies the structure and format of the VNFD based on TOSCA specifications.

NOTE 2: ETSI GS NFV-SOL 006 [i.6] specifies the structure and format of the VNFD based on YANG specifications.