



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

*Full standard available at:
https://standards.iteh.ai/catalog/standards/sist/44-111-1-17/etsi-gs-nfv-sol-004-v2-3-1-2017-07*

Disclaimer

The present document has been produced and approved by the Network Functions Virtualisation (NFV) ETSI Industry Specification Group (ISG) and represents the views of those members who participated in this ISG. It does not necessarily represent the views of the entire ETSI membership.

Reference

DGS/NFV-SOL004

Keywords

NFV, virtualisation

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSI/DeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2017.
All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.
3GPP™ and **LTE™** are Trade Marks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

oneM2M logo is protected for the benefit of its Members
GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Contents

| | |
|---|-----------|
| Intellectual Property Rights | 4 |
| Foreword..... | 4 |
| Modal verbs terminology..... | 4 |
| 1 Scope | 5 |
| 2 References | 5 |
| 2.1 Normative references | 5 |
| 2.2 Informative references..... | 5 |
| 3 Definitions and abbreviations..... | 6 |
| 3.1 Definitions..... | 6 |
| 3.2 Abbreviations | 6 |
| 4 VNF package..... | 6 |
| 4.1 TOSCA YAML Cloud Service Archive (CSAR) overview..... | 6 |
| 4.1.1 CSAR structure | 6 |
| 4.1.2 CSAR with TOSCA-Metadata directory | 6 |
| 4.1.3 CSAR zip without TOSCA-Metadata directory | 7 |
| 4.2 VNF package structure and format..... | 7 |
| 4.3 VNF package file contents | 7 |
| 4.3.1 General..... | 7 |
| 4.3.2 VNF package manifest file | 7 |
| 4.3.3 VNF package change history file..... | 8 |
| 4.3.4 VNF package testing files..... | 8 |
| 4.3.5 VNF package licensing information..... | 9 |
| 4.3.6 Certificate file | 9 |
| 5 Adding security to TOSCA CSAR..... | 9 |
| 5.1 VNF package authenticity and integrity | 9 |
| 5.2 VNF package manifest and certificate files..... | 10 |
| 5.3 Conventions in the manifest file..... | 11 |
| 5.4 Signature of individual artifacts | 12 |
| 5.5 Support for security sensitive artifacts..... | 12 |
| Annex A (informative): TOSCA CSAR examples..... | 13 |
| A.1 CSAR with the TOSCA-Metadata directory..... | 13 |
| A.2 CSAR without the TOSCA-Metadata directory..... | 13 |
| Annex B (informative): Authors & contributors..... | 15 |
| Annex C (informative): Change History | 16 |
| History | 17 |

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.

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.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference>.

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 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] TOSCA-Simple-Profile-YAML-v1.1-csprd01: "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: See <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] IANA register for Media Types.

NOTE: See <https://www.iana.org/assignments/media-types/media-types.txt>.

- [8] Recommendation ITU-T X.509: "Information technology - Open Systems Interconnection - The Directory: Public-key and attribute certificate frameworks".

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] TOSCA-v1.0-os: "TOSCA Version 1.0".
- [i.2] TOSCA-Simple-Profile-YAML-v1.0-csprd02: "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".

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] apply.

3.2 Abbreviations

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

| | |
|-------|---|
| CA | Certificate Authority |
| CMS | Cryptographic Message Syntax |
| CSAR | Cloud Service Archive |
| NFVI | NFV Infrastructure |
| NFVO | NFV Orchestrator |
| TOSCA | Topology and Orchestration Specification for Cloud Applications |
| URI | Universal Resource Identifier |
| UTF | Unicode Transformation Format |
| VNF | Virtualised Network Function |
| VNFC | VNF Component |
| VNFD | VNF Descriptor |
| YAML | YAML Ain't Markup Language |

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]. The CSAR file may 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 containing a single yaml (.yml or .yaml) file at the root of the archive. The yaml file is a TOSCA definition template that contains a metadata section with *template_name* and *template_version* metadata. This file is the CSAR Entry-Definitions file.

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

4.1.2 CSAR with TOSCA-Metadata directory

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.

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 are 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

4.1.3 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:

EXAMPLE:

```
tosca_definitions_version: tosca_simple_yaml_1_1
metadata:
  template_name: MainServiceTemplate
  template_author: Onboarding portal
  template_version: 1.0
```

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.

4.3 VNF package file contents

4.3.1 General

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

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

If the option with a TOSCA-Metadata directory is used and the *CSAR-Version* parameter indicates version 1.0, all files that are contained in the archive shall be referenced from the TOSCA.meta file. If the *CSAR-Version* parameter indicates version 1.1, the files that are referenced and pointed to by relative path names through artifact definitions in one of the TOSCA definitions files (e.g. the VNFD) contained in the CSAR need not be declared in the TOSCA.meta file.

Examples of VNF package options are described in annex A.

4.3.2 VNF package manifest file

A CSAR VNF package shall have a manifest file. The manifest file shall have an extension *.mf* and the same name as the main TOSCA definitions YAML file and be located at the root of the archive (archive without TOSCA-Metadata directory) or in the location specified by the TOSCA.meta file (archive with a TOSCA-Metadata directory). In the latter case, the corresponding entry shall be named "Entry-Manifest".

The manifest file shall start with the VNF package metadata in the form of a name-value pairs. Each pair shall appear on a different line. The "name" and the "value" shall be separated by a colon. The name shall be one of those specified in table 1 and the values shall comply with the provisions specified in table 1.

Table 1: List of valid names and values for VNF package metadata

| Name | Value |
|--|--|
| vnf_provider_id | A sequence of UTF-8 characters See note. |
| vnf_product_name | A sequence of UTF-8 characters0 See note. |
| vnf_release_data_time | String formatted according to IETF RFC 3339 [3]. |
| vnf_package_version | A sequence of groups of one or more digits separated by dots. See note. |
| NOTE: The value shall be identical to those specified in the VNFD. | |

An example of valid manifest file metadata entries follows.

EXAMPLE:

```
metadata:
vnf_product_name: vMRF-1-0-0
vnf_provider_id: Acme
vnf_package_version: 1.0
vnf_release_data_time: 2017.01.01T10:00+03:00
```

END OF EXAMPLE

If the VNF package refers to external files, the manifest file shall contain digests of individual files in the package, both local files contained in the package and external files referenced in the package.

If the VNF package does not refer to external files, the manifest files may contain digests of individual files contained in the package. If the manifest file does not include digests, the complete CSAR file shall be digitally signed by the VNF provider. A consumer of the VNF package verifies the digests in the manifest file by computing the actual digests and comparing them with the digests listed in the manifest file.

The manifest file, or alternatively, the signature of the CSAR file, is the key for decision regarding a VNF package integrity and validity in terms of its contained artifacts. The specification of the manifest file and specific algorithms used in digest creation and validation is described in the security related sub-clause.

4.3.3 VNF package change history file

A CSAR VNF package shall have a humanly readable text file describing any change in the constituency of the VNF package. All the changes in the VNF package shall be versioned, tracked and inventoried in the change history file.

The VNF package change history file shall be named "ChangeLog.txt" and be located at the root of the archive (archive without TOSCA-Metadata directory) or in the location specified by the TOSCA.meta file (archive with a TOSCA-Metadata directory). In the latter case, the corresponding entry shall be named "Entry-Change-Log".

4.3.4 VNF package testing files

To enable VNF package validation, a VNF Provider should include in a VNF package files containing necessary information (e.g. test description) in order to perform VNF testing. The contents of VNF testing information is outside the scope of the present document.

The VNF testing information shall be located in a directory named "Tests" located at the root of the archive (archive without TOSCA-Metadata directory) or in the location specified by the TOSCA.meta file (archive with a TOSCA-Metadata directory). In the latter case, the corresponding entry shall be named "Entry-Tests".

4.3.5 VNF package licensing information

As required in ETSI GS NFV-IFA 011 [1] the VNF package shall contain license information for the released VNF. The license information shall include a single license term for the whole VNF. In addition the license information may also include license terms for each of the VNF package artifacts if different from the one of the released VNF.

The VNF licensing information shall be located in a directory named "Licenses" located at the root of the archive (archive without TOSCA-Metadata directory) or in the location specified by the TOSCA.meta file (archive with a TOSCA-Metadata directory). In the latter case, the corresponding entry shall be named "Entry-Licenses".

4.3.6 Certificate file

If the manifest file is signed by the VNF provider (see option 1 in clause 5.1), the CSAR VNF package shall contain a certificate file if the certificate is not included in the signature container (see note) within the manifest file. In this case, the certificate file shall have an extension .cert and the same name as the main TOSCA definitions YAML file and be located at the root of the archive (archive without TOSCA-Metadata directory) or in the location specified by the TOSCA.meta file (archive with a TOSCA-Metadata directory). In the latter case, the corresponding entry shall be named "Entry-Certificate".

NOTE: Signature container refers to a structure in a standard format (e.g. CMS) which contains signature and additional data needed to process the signature (e.g. certificates, algorithms, etc.).

If the complete CSAR file is signed by the VNF provider (see option 2 in clause 5.1), the certificate file shall be contained in a zip file together with the CSAR file and the signature file if the certificate is not included in the signature file. The certificate file shall have an extension .cert and the same name as the CSAR file.

5 Adding security to TOSCA CSAR

5.1 VNF package authenticity and integrity

As specified in ETSI GS NFV-IFA 011 [1] a VNF package shall support a method for authenticity and integrity assurance.

In order to provide the public key based authenticity and integrity for the whole VNF package one of the two following options shall be followed:

Option 1: The VNF package shall contain a Digest (a.k.a. hash) for each of the components of the VNF package. The table of hashes is included in the manifest file, which is signed with the VNF provider private key. In addition, the VNF provider shall include a signing certificate that includes the VNF provider public key, following a pre-defined naming convention and located either at the root of the archive or in a predefined location (e.g. directory).

The certificate may also be included in the signature container, if the signature format allows that. For example, the CMS format allows to include the certificate in the same container as the signature.

Option 2: The complete CSAR file shall be digitally signed with the VNF provider private key. The VNF provider delivers one zip file consisting of the CSAR file, a signature file and a certificate file that includes the VNF provider public key. The certificate may also be included in the signature container, if the signature format allows that.

In option 2, the VNF package delivered would therefore be according to figure 5.1-1.