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Network Functions Virtualisation (NFV) Release 5; Protocols and Data Models; NFV-MANO procedures 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 NFV-MANO procedures involving multiple interfaces that reference the operations specified in ETSI GS NFV-SOL 003 [3], ETSI GS NFV-SOL 002 [2] and ETSI GS NFV-SOL 005 [4], and the information from NFV descriptors as specified in ETSI GS NFV-SOL 001 [1] and ETSI GS NFV-SOL 006 [5]. In addition, the procedures consider the functional requirements specified in ETSI GS NFV-IFA 010 [i.3] and related interface specifications.

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-SOL 001: "Network Functions Virtualisation (NFV) Release 5; Protocols and Data Models; NFV descriptors based on TOSCA specification".

[2] ETSI GS NFV-SOL 002: "Network Functions Virtualisation (NFV) Release 5; Protocols and Data Models; RESTful protocols specification for the Ve-Vnfm Reference Point".

[3] ETSI GS NFV-SOL 003: "Network Functions Virtualisation (NFV) Release 5; Protocols and Data Models; RESTful protocols specification for the Or-Vnfm Reference Point".

[4] ETSI GS NFV-SOL 005: "Network Functions Virtualisation (NFV) Release 5; Protocols and Data Models; RESTful protocols specification for the Os-Ma-nfvo Reference Point".

[5] ETSI GS NFV-SOL 006: "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; NFV descriptors based on YANG Specification".

[6] ETSI GS NFV-IFA 014: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Network Service Templates Specification".

[7] ETSI GS NFV-SOL 013: "Network Functions Virtualisation (NFV) Release 5; Protocols and Data Models; Specification of common aspects for RESTful NFV MANO APIs".

[8] ETSI GS NFV-IFA 011: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; VNF Descriptor and Packaging Specification".

[9] ETSI GS NFV-SOL 014: "Network Functions Virtualisation (NFV) Release 5; Protocols and Data Models; YAML data model specification for descriptor-based virtualised resource management.

[10] ETSI GS NFV-SOL 009: "Network Functions Virtualisation (NFV) Release 5; Protocols and Data Models; RESTful protocols specification for the management of NFV-MANO".

[11] ETSI GS NFV-SOL 018: "Network Functions Virtualisation (NFV) Release 5; Protocols and Data Models; Profiling specification of protocol and data model solutions for OS Container management and orchestration".

[12] ETSI GS NFV-IFA 040: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Requirements for service interfaces and object model for OS container management and orchestration specification".

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

[i.2] Void.

[i.3] ETSI GS NFV-IFA 010: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Functional requirements specification".

[i.4] ETSI GR NFV-IFA 038: "Network Functions Virtualisation (NFV) Release 4; Architectural Framework; Report on network connectivity for container-based VNF".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI GR NFV 003 [i.1] apply.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI GR NFV 003 [i.1] apply.

4 Overview of NFV-MANO procedures

4.1 Introduction

The present document specifies NFV-MANO procedures that consist of information flows and the key information to be sent across the NFV-MANO interfaces to realize the interaction with and within the NFV-MANO framework. For each one of the procedures, it specifies:

- the order in which the information is exchanged;
- the input data to operations based on the information state held by the interface consumers (e.g. from NFV descriptors); and
- key information to be exchanged between the different NFV-MANO entities in various scenarios.

Each NFV-MANO procedure specifies the baseline interaction steps corresponding to the functionality and capabilities specified in NFV-MANO API specifications in the ETSI GS NFV-SOL series ([2], [3] and [4]), clarifying the key information exchanged among the different NFV-MANO functional entities and with other external entities such as OSS/BSS, EM and VNF. The specified NFV-MANO procedures focus on the interactions and management capabilities offered by the NFV-MANO framework. In this respect, additional interactions performed by other management systems such as the OSS/BSS and EM with the VNF might be necessary to ensure that the NS and VNF instances are fully configured and operational, or to decommission services that the NS and VNF instances perform.

4.2 List of NFV-MANO procedures

The present document specifies NFV-MANO procedures involving the baseline interactions with and within the NFV-MANO framework based on ETSI NFV Release-2 specifications. The present document details the procedures below:

1) On-boarding of a VNF Package: The procedure for the on-boarding of a VNF package.

2) Instantiation of a NS instance: The procedure for the creation and instantiation of a NS instance needed for a network service.

3) Termination of a NS instance: The procedure for the termination of a NS instance triggered through Update NS or Terminate NS.

4) Scaling of VNF instance(s) in a NS instance: The procedure for the scaling of VNF instance(s) associated with a NS instance triggered through Scale NS with option of scaling VNF instance(s).

5) Change VNF external connectivity of VNF instance(s) in a NS instance: The procedure for the change of external connectivity of VNF instance(s) associated with a NS instance triggered through NS update.

6) Creation of a VNF snapshot: The procedure for the creation of a VNF snapshot triggered through NS update.

7) Creation of a VNF snapshot package: The procedure for the creation of a VNF snapshot package based on a snapshotted VNF instance.

In the subsequent clauses, the applicable flows, procedural steps and mapping of key attributes across different interfaces corresponding to the individual MANO procedures are specified in detail.

NOTE: The present document version does not specify detailed error handling applicable to NFV-MANO procedures.

4.3 Security considerations

4.3.1 Overview

The NFV-MANO procedures documented in the present document do not specify the steps to handle the authorization to consume the NFV-MANO APIs referred in the procedures.

Before the start of the NFV-MANO procedure (as a general security framework setup policy), or as part of the steps in which the NFV-MANO API interactions take place, the producer and consumer functional blocks of an API shall have established the proper authorization setup as specified in clause 8 of ETSI GS NFV-SOL 013 [7].

4.3.2 Security information on NFV-MANO functional entity

4.3.2.1 Overview

As a pre-condition for all the NFV-MANO procedure flows specified in the present document:

- The NFV-MANO functional entity acting as a producer functional block of an API shall have been configured with the server interface security information for each of its produced interfaces.

- The NFV-MANO functional entity acting as a consumer functional block of an API shall have been configured with the client interface security information for each of the consumed interfaces.

The approach to configure the interface security information via NFV-MANO management procedures specified in ETSI GS NFV-SOL 009 [10] is specified in clause 4.3.2.2.

4.3.2.2 NFV-MANO configuration settings approach

This clause applies if the security information as a pre-condition for all the NFV-MANO procedure flows specified in the present document are set using configuration approach following the procedure defined in ETSI GS NFV-SOL 009 [10].

- The NFV-MANO functional entity acting as a producer functional block of an API shall have been configured with the server interface security information defined in Table 5.6.3.11-1 of ETSI GS NFV-SOL 009 [10] for each of its produced interfaces.
- The NFV-MANO functional entity acting as a consumer functional block of an API shall have been configured with the client interface security information defined in Table 5.6.3.12-1 of ETSI GS NFV-SOL 009 [10] for each of the consumed interfaces.

5 NFV-MANO procedures

5.1 VNF Package on-boarding procedure

5.1.1 Introduction

Clause 5.1 specifies the NFV-MANO procedure for VNF package on-boarding.

NOTE: Additional interactions previous to the VNF Package on-boarding might be possible as required for operations that are handled outside MANO such as collecting VNFD creation requirement, developing VNFD, build VNF package, checking the VNF package consistency and its contents, and verifying the instantiation in test environment.

5.1.2 Pre-conditions

Table 5.1.2-1 specifies the pre-conditions applicable to the VNF package on-boarding procedure.

Table 5.1.2-1: VNF package on-boarding procedure pre-conditions

#	Pre-condition	Additional description
1	VNF Provider delivers the VNF descriptor, artefacts and other CSAR content in a VNF package.	VNF Provider delivers a new VNF package to the Service Provider.
2	If the NSD contains one or multiple "container-based VNFs", the VNF Packages include the MCIOP(s).	N/A
3	The local MCIOP repository is connected with the CISM in the same NFVI-PoP and the CISM is configured and has access rights to the local MCIOP repository.	The CISM needs to be connected to the local MCIOP repository to obtain the MCIOPs that will be interpreted by CISM to create the MCIOs by allocating their requested infrastructure resources on Container Infrastructure Service (CIS) instances.
4	The local CIRs repository is connected with the CISM in the same NFVI-PoP and the CISM is configured and has access rights to the local CIR repository.	CISM needs to be connected to the local CIRs to obtain the OS container images, as an MCIO may be deployed as an OS container from its corresponding OS container image.

5.1.3 Procedure flow

Depending on the service provider's requirement and the size of artifacts (such as software images), the VNF package may include or exclude certain artifacts in a flexible manner. For example, the VNF package may exclude software images or other artifacts and provide artefact path or link to the external artifacts as specified in clause 9.2 of ETSI GS NFV-SOL 005 [4]. The means to provide these artifacts is not specified in the present document.

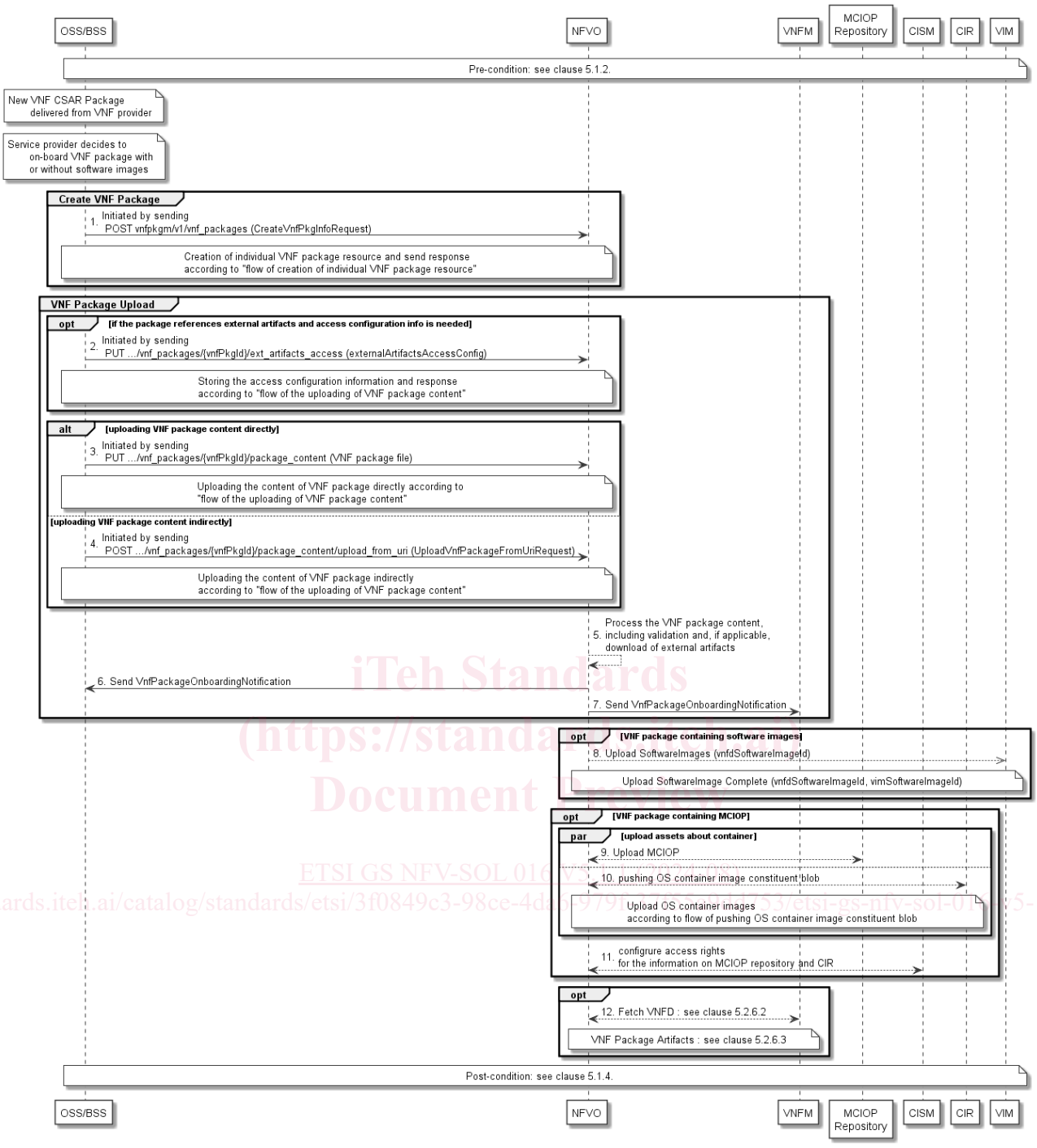

Figure 5.1.3-1: Procedure flow of VNF package on-boarding

The NFV-MANO procedure of VNF package on-boarding comprises the following steps:

1. To perform the VNF package on-boarding process, the OSS/BSS shall first send to the NFVO a "CreateVnfPkgInfoRequest" in the payload of the POST request to the "VNF packages" resource as specified in clause 9.4.2.3.1 of ETSI GS NFV-SOL 005 [4].

   As described in "Flow of the creation of an individual VNF package resource" (see clause 9.3.1 of ETSI GS NFV-SOL 005 [4]), the NFVO creates the "Individual VNF package" resource.

   The NFVO generates a unique VnfPkgId for the VNF package.

   Table 5.1.5.1-1 lists the key information exchanged between OSS/BSS and NFVO for the create VNF package operation.

2. In case the VNF package references external artifacts and access configuration information is needed, the OSS/BSS shall provide access configuration information for the subsequent download of the external VNF package artifacts to the NFVO by sending a PUT request to the "Access configuration for external artifacts" resource as specified in clause 9.4.4a.3.3 of ETSI GS NFV-SOL 005 [4], according to the "Flow of the uploading of VNF package content" (see clause 9.3.2 of ETSI GS NFV-SOL 005 [4]). The NFVO stores the access configuration information for later use.

3. In case the OSS/BSS uploads the VNF package content to the NFVO directly, the OSS/BSS shall send to the NFVO a "ZIP file that represents the VNF package" in the payload of the PUT request to the "VNF package content" resource as specified in clause 9.4.5.3.3 of ETSI GS NFV-SOL 005 [4], and as described in the "Flow of the uploading of VNF package content" (see clause 9.3.2 of ETSI GS NFV-SOL 005 [4]).

   Table 5.1.5.2-1 lists the key information exchanged between NFVO and VNFM during VNF package upload operation.

   The OSS/BSS can poll the "Individual VNF package" resource to track the completion of uploading operation by sending a GET request to the "Individual VNF package" resource as specified in clause 9.4.3.3.2 of ETSI GS NFV-SOL 005 [4].

4. In case the OSS/BSS uploads the VNF package content to the NFVO indirectly from URI, the OSS/BSS shall send to the NFVO a data structure of type "UploadVnfPackageFromUriRequest" in the payload of the POST request to the "Upload VNF package from URI task" resource as specified in clause 9.4.6.3.1 of ETSI GS NFV-SOL 005 [4], and as described in the "Flow of the uploading of VNF package content" (see clause 9.3.2 of ETSI GS NFV-SOL 005 [4]). The NFVO utilizes the address information to retrieve the VNF package content.

   Table 5.1.5.2-2 lists the key information exchanged between NFVO and VNFM during VNF package upload operation.

   The OSS/BSS can poll the "Individual VNF package" resource to track the completion of uploading operation by sending a GET request to the "Individual VNF package" resource as specified in clause 9.4.3.3.2 of ETSI GS NFV-SOL 005 [4].

   In case the VNF package references external artifacts, the NFVO downloads the external artifacts (see clause 9.4.6.3.1 of ETSI GS NFV-SOL 005 [4], as applicable) by utilizing the access configuration information and the information in the VNF package.

NOTE 1: Some parts of the validation of the package on NFVO side can happen before downloading external artifacts (for instance, in case of a double zipped, externally signed package, the validation of the signature would typically be performed after uploading the package.

5. Further, the NFVO processes the VNF package validating the contents of the package such as checksum, certificates, etc. Upon completion of validating the VNF package (including external artifacts, if applicable), the NFVO stores the VNF package contents in its repository and updates the VNF package information. Table 5.1.5.3-1 lists the key information updated in the VNF package information.

Sending the VnfPackageOnBoardingNotification (step 6 and step 7) may be executed in any order, and in parallel to the step 8.

6. On completion of successful on-boarding of the VNF content, if there are any applicable subscriptions for VNF Package Management notifications, NFVO sends a POST request, each containing a "VnfPackageOnboardingNotification" in the payload body, to the OSS/BSS as "notification endpoint" resources defined in the matching subscriptions, as per clauses 9.5.2.8 and 9.4.10.3.1 of ETSI GS NFV-SOL 005 [4].

7. On completion of successful on-boarding of the VNF content, if there are any applicable subscriptions for VNF Package Management notifications, NFVO sends a POST request, each containing a "VnfPackageOnboardingNotification" in the payload body, to the VNFM as "notification endpoint" resources defined in the matching subscriptions, as per clauses 9.5.2.5 and 10.4.9.3.1 of ETSI GS NFV-SOL 003 [3].

Uploading software images (step 8) can be executed after successful completion of step 4. Uploading software images (step 8) and fetching of VNFD (step 9) may be executed in any order.