ETSI GS NFV-TST 010 V4.4.1 (2024-08)

Network Functions Virtualisation (NFV) Release 4; Testing; API Conformance Testing Specification

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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 - APE 7112B
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Contents

Intellectual Property Rights 5
Foreword 5
Modal verbs terminology 5
Introduction 5
1 Scope 6
2 References 6
2.1 Normative references 6
2.2 Informative references 7
3 Definition of terms, symbols and abbreviations 7
3.1 Terms 7
3.2 Symbols 7
3.3 Abbreviations 7
4 Methodology 8
4.1 General 8
4.2 System Under Test (SUT) 8
4.3 Test configurations 8
4.3.1 General 8
4.3.2 Config_prod_VE 9
4.3.3 Config_prod_VNFM 10
4.3.4 Config_prod_NFVO 10
4.3.5 Config_prod_VNFM_GRANT 11
4.3.6 Config_prod_Notif_Endpoint 11
4.3.7 Config_prod_NFV-MANO 12
4.4 Void 12
4.5 Generic Test Description 12
4.5.1 General 12
4.5.2 Test Description format 13
4.5.3 Scope of the tests 14
4.5.3.1 General 14
4.5.3.2 General characteristics of the reference points 15
4.5.3.3 Basic behaviours of the API producer/consumer and verification steps 16
4.5.3.3.0 Introduction 16
4.5.3.3.1 Producer sends event triggered notifications based on consumer subscriptions 16
4.5.3.3.2 Producer sends periodic notifications based on the consumer subscriptions 18
4.5.3.3.3 Producer executes the requested API operation 19
4.5.3.3.4 Consumer fetches the files/package info 20
4.5.3.4 Workflow test considerations 22
4.5.4 Verification 22
4.5.4.0 Introduction 22
4.5.4.1 Common verification aspects 22
4.5.4.2 Verification aspects for individual APIs 23
4.5.4.3 Verification aspects not considered 24
5 Void 24
6 Void 24
7 Void 25
Annex A (informative): Known Issues 26
Annex B (informative): Workflow Test Descriptions 27
Annex C: Void 28

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ETSI GS NFV-TST 010 V4.4.1 (2024-08)
https://standards.iteh.ai/catalog/standards/etsi/300d16f3-949e-43ff-87be-4b907d6aaa0b/etsi-gs-nfv-tst-010-v4-4-1-2024-08

Annex D (normative): Word format presentation of the test suite for the Os-Ma-nfvo Reference Point 29

Annex E (normative): Word format presentation of the test suite for the Ve-Vnfm Reference Point 30

Annex F (normative): Word format presentation of the test suite for the Or-Vnfm Reference Point 31

Annex G (normative): Word format presentation of the test suite for NFV-MANO Management 32

Annex H (normative): Word format presentation of the test suite for the Or-Or reference point 33

H.1 General 33

H.2 SOL011 NSD Management 33

H.3 SOL011 NS Lifecycle Management 33

H.4 SOL011 NS Performance Management 33

H.5 SOL011 NS Fault Management 34

Annex I (normative): Word format presentation of the test suite for NFV-MANO Policy Management 35

Annex J (informative): Change History 36

History 37

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ETSI GS NFV-TST 010 V4.4.1 (2024-08)
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Foreword

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Modal verbs terminology

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Introduction

The interoperability among the functional entities which supports the requirements and functionalities specified in ETSI NFV deliverables is one of the key and most important aspect to develop and deploy the NFV environment. In order to achieve such interoperability, ETSI GR NFV-TST 007 [i.1] specifies the methodologies and test scenario for the testing of interoperability mainly based on the ETSI NFV IFA specification series which specifies the reference point/interface and functional requirements. At the same time, the validation of the NFV specification compliance of each functional entities is also key aspects to be ensured for the interoperability, in particular protocol solution/API level. Therefore, the present document specifies the API conformance testing.

1 Scope

The present document specifies methodologies of conformance test including Test Descriptions for NFV implementations with interfaces specified in NFV specifications: ETSI GS NFV-SOL 002 [2] for the *Ve-Vnfm* reference point, ETSI GS NFV-SOL 003 [1] for the *Or-Vnfm* reference point and ETSI GS NFV-SOL 005 [3] for the *Os-Ma-Nfvo* reference point. Furthermore, the following specifications are also supported for conformance: ETSI GS NFV-SOL 009 [7] for the management of NFV-MANO, ETSI GS NFV-SOL 011 [8] for the *Or-Or* reference point, and ETSI GS NFV-SOL 012 [i.4] for the policy management interface.

Each ETSI NFV-SOL deliverable specifies a set of interfaces built on the RESTful approach and meant to be used over the HTTP protocol. The aim of the present document is to define the methodologies and the procedures with Test Descriptions to test conformance of the exchanged HTTP payloads and the implementation of required actions for one or more of the available interfaces within a reference point.

Since the targets of the testing are functionality (semantic checks) and the HTTP payloads (syntax checks), methodologies, including test suite(s) and/or any technologies from any organizations (in particular Open Source Initiatives) that can improve or help the (automated) test execution are also considered as being in the scope of the present document.

NOTE: The full set of functionalities supported by ETSI NFV Release 4 (V4.4.1) can be found in ETSI GS NFV-IFA 010 [i.5].

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 003 (V4.4.1): "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; RESTful protocols specification for the Or-Vnfm Reference Point".

[2] ETSI GS NFV-SOL 002 (V4.4.1): "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; RESTful protocols specification for the Ve-Vnfm Reference Point".

[3] ETSI GS NFV-SOL 005 (V4.4.1): "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; RESTful protocols specification for the Os-Ma-nfvo Reference Point".

[4] ETSI GS NFV-TST 002 (V1.1.1): "Network Functions Virtualisation (NFV); Testing Methodology; Report on NFV Interoperability Testing Methodology".

[5] ETSI GS NFV-SOL 013 (V4.4.1): "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; Specification of common aspects for RESTful NFV MANO APIs".

[6] ETSI GS NFV-SOL 001 (V4.4.1): "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; NFV descriptors based on TOSCA specification".

[7] ETSI GS NFV-SOL 009 (V4.4.1): "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; RESTful protocols specification for the management of NFV-MANO".

[8] ETSI GS NFV-SOL 011 (V4.4.1): "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; RESTful protocols specification for the Or-Or Reference Point".

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[9] Void.

[10] Void.

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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 GR NFV-TST 007 (V3.1.1): "Network Functions Virtualisation (NFV) Release 3; Testing; Guidelines on Interoperability Testing for MANO".

[i.2] Robot Framework.

[i.3] Robot2doc tool.

[i.4] ETSI GS NFV-SOL 012 (V4.4.1): "Network Functions Virtualisation (NFV) Release 4; Protocols and Data Models; RESTful protocols specification for the Policy Management Interface".

[i.5] ETSI GS NFV-IFA 010 (V4.4.1): "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Functional requirements specification".

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3 Definition of terms, symbols and abbreviations

3.1 Terms

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

Test Description (TD): set of information required to define/run the API conformance test and to realize the verdict for the API conformance test

3.2 Symbols

Void.

3.3 Abbreviations

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

API	Application Programming Interface
AUT	API Under Test
EM	Element Manager
FUT	Function Under Test
IUT	Implementation Under Test
LCM	Life Cycle Management
NFVI	NFV Infrastructure
NFVO	NFV Orchestrator
NS	Network Service
NSD	Network Service Descriptor
PNFD	PNF Descriptor
SUT	System Under Test

TD	Test Description
TLS	Transport Layer Security
VE	Virtual Element
VIM	Virtualised Infrastructure Manager
VNF	Virtual Network Function
VNFD	VNF Descriptor
VNFM	VNF Manager

4 Methodology

4.1 General

The purpose of general conformance testing is to determine to what extent an implementation of a standard conforms to the requirements of that standard. Concepts from ETSI GS NFV-TST 002 [4] are used in the present document.

The important factors which characterize conformance testing are as follows:

- the System or Implementation Under Test (SUT or IUT) defines the boundaries (open interfaces) for testing;
- the conformance test system is a specialized tool (system) built for the purpose of testing and on which specific test scripts can be run;
- the SUT comes from a single supplier (or, at least, a single product line);
- the tests are executed by a dedicated test system that has full control of the SUT and the ability to observe all communications from the SUT;
- the tests are performed at open standardized interfaces that are not (usually) accessible to a normal user (i.e. they are specified at the protocol level);
- the tests are specified at the detailed protocol level and are not usually based on functionality as experienced by a user;
- the tests verify responses or related request operations from SUT and also verify notifications when appropriate.

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4.2 System Under Test (SUT)

The System Under Test (SUT) is identified by an implementation of the Function Under Test (FUT) producing or consuming the API under test e.g. in the case of the Or-vnfm reference point the Function Under Test (FUT) may be either a NFVO implementation or a VNFM implementation.

The function shall be tested in isolation with respect to other functional blocks in a NFV platform, to guarantee that the outcomes of the conformance tests are not the result of interoperability issues with other components.

4.3 Test configurations

4.3.1 General

In accordance with clause 1, the scope of the present document is to define a testing methodology and test suite for both the conformant protocol exchange (i.e. valid serialization and order of messages) and the initialization or execution of the functionalities mandated for each protocol operation, including the conformant management of internal state.

In order to enable the FUT to correctly execute the operations mandated, the FUT shall be tested while being executed in a test environment which provides all the functional elements needed for the correct outcome of the operation.

EXAMPLE: To correctly execute an instantiation a VNFM requires evaluation in a test environment which provides a VIM and NFVI plus the NFVO to grant the operation.

The test system shall provide the implementation of an API Consumer and a Notification Endpoint for the API Under Test (AUT). Moreover, the test configuration may contain observation interfaces between the Test System and the FUT or any other functional block which is part of the test environment. The specification of the mentioned observation interfaces is out of the scope of the present document.

Stimuli to the FUT shall be injected by the Test System via the AUT only.

Conformance checks on the status and outcome of the operations triggered by the protocol shall be verified by the Test System by means of:

- read operations issued via the AUT; or
- reception of notifications on the Notification Endpoint exposed by the test system; or
- other test interfaces to support triggers or verifications.

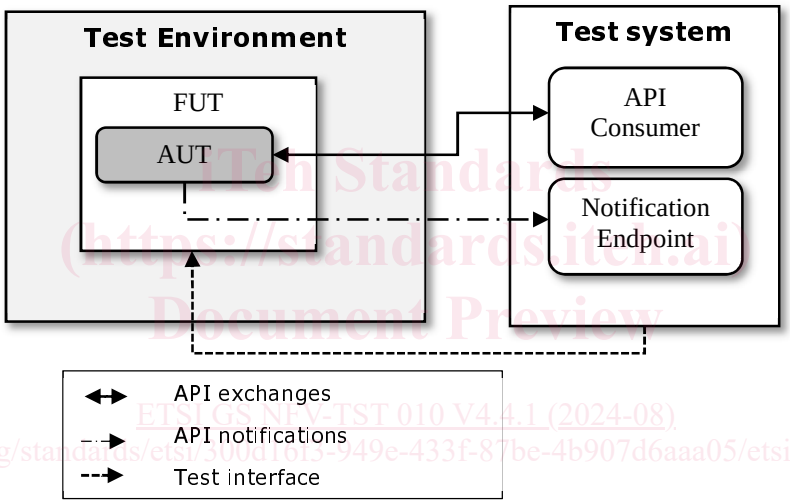

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Figure 4.3.1-1: Generic SUT configuration

The test configurations specified in clause 4.3 fulfil the needs of Test Descriptions specified in annexes D, E, F, G, H and I contained in archive gs_nfv-tst010v040401p0.zip which accompanies the present document for the different FUTs and AUTs in scope of the present document.

4.3.2 Config_prod_VE

The configuration config_prod_VE shall be implemented to test APIs which are produced by FUTs in a VNF or EM. The test environment of the VNF/EM is the NFVI where the test is executed.

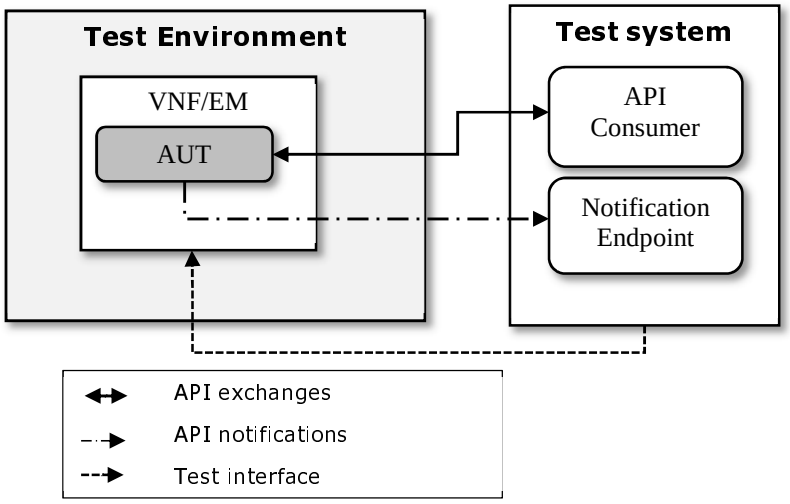

Figure 4.3.2-1: Configuration for tests of APIs with the FUTs as Producer run in a VNF/EM

4.3.3 Config_prod_VNFM

The configuration config_prod_VNFM shall be implemented to test APIs produced by FUTs which implement a VNFM. The test environment of the virtual element is the NFVI where the VE is executed.

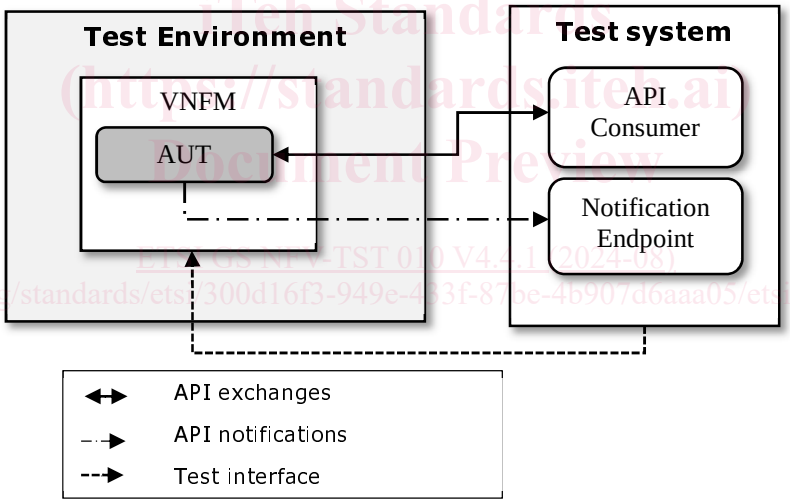

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Figure 4.3.3-1: Configuration for tests of APIs with VNFM as Producer

4.3.4 Config_prod_NFVO

The configuration config_prod_NFVO shall be implemented to test APIs produced by FUTs which implement a NFVO. The test environment of the virtual element is a NFV platform providing VNFM, VIM and NFVI.

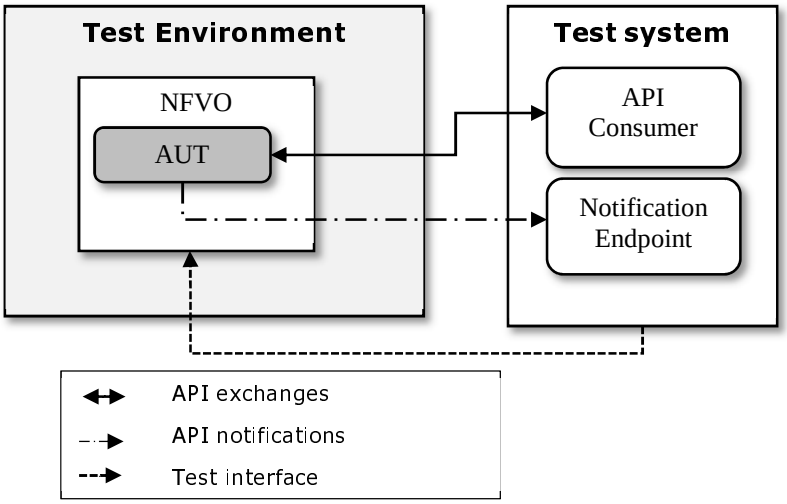

Figure 4.3.4-1: Configuration for tests of APIs with NFVO as Producer

4.3.5 Config_prod_VNFM_GRANT

The configuration config_prod_VNFM_GRANT shall be implemented to test APIs produced by FUTs which implement a VNFM for VNF LCM test cases where an Operation Grant is needed. The test environment of the virtual element is composed by the NFVI where the VE is executed and a NFVO component exposing the VNF Lifecyle Operation Granting API.

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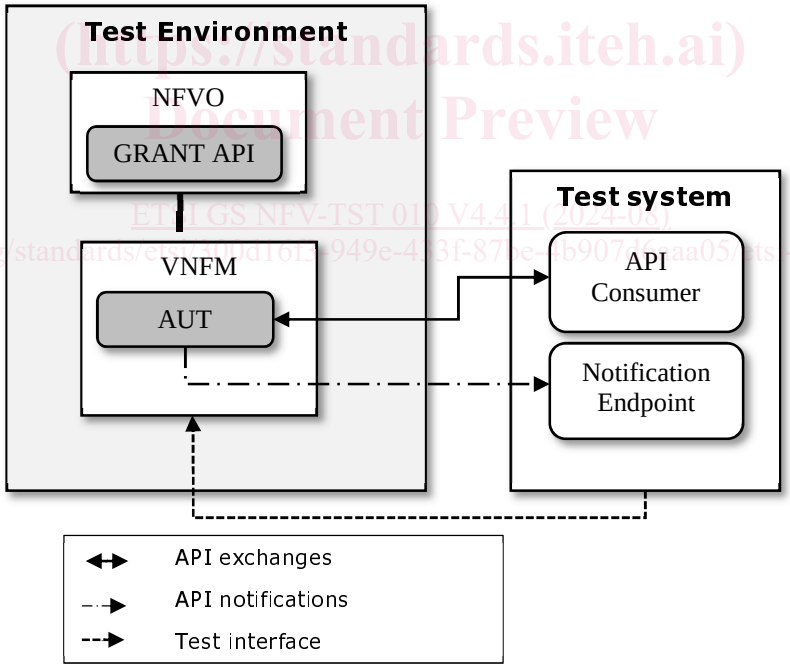

Figure 4.3.5-1: Configuration for tests of APIs with VNFM as Producer, where the VNFLifecycleOperationGranting API is required

4.3.6 Config_prod_Notif_Endpoint

The configuration config_prod_Notif_Endpoint shall be implemented to test any notification endpoint. The test environment of the virtual element is a NFV platform providing an API Provider.