

ETSI GS NFV-IFA 010 V5.1.1 (2024-06)



Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Functional requirements specification

Document Preview

<https://standards.iteh.ai/catalog/standards/etsi/f53765e8-cb0f-4cb1-9f28-457ffb8c5f15/etsi-gs-nfv-ifa-010-v5-1-1-2024-06>

<https://standards.iteh.ai/catalog/standards/etsi/f53765e8-cb0f-4cb1-9f28-457ffb8c5f15/etsi-gs-nfv-ifa-010-v5-1-1-2024-06>

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.

ReferenceRGS/NFV-IFA010ed511

Keywordsfunctional, management, MANO, NFV,
orchestration, requirements, 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 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

Important notice

The present document can be downloaded from:
<https://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 prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

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/ETSIDeliverableStatus.aspx>

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

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

If you find a security vulnerability in the present document, please report it through our

Coordinated Vulnerability Disclosure Program:

<https://www.etsi.org/standards/coordinated-vulnerability-disclosure>

Notice of disclaimer & limitation of liability

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

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 2024.
All rights reserved.

Contents

Intellectual Property Rights	10
Foreword.....	10
Modal verbs terminology.....	10
1 Scope	11
2 References	11
2.1 Normative references	11
2.2 Informative references.....	11
3 Definition of terms, symbols and abbreviations.....	13
3.1 Terms.....	13
3.2 Symbols.....	14
3.3 Abbreviations	14
4 General Description.....	14
4.1 Introduction	14
4.2 Overview	14
5 General functional requirements	15
5.1 General functional requirements for virtualised resource management	15
5.2 General functional requirements for multi-tenancy.....	16
5.3 General requirements for the management of NFV-MANO functional entities.....	18
5.4 General functional requirements for management of connectivity for Multi-Site services.....	19
5.5 General requirements to support network slicing.....	19
5.6 General requirements to support software modification.....	20
5.6.1 General requirements for software modification	20
5.6.2 General requirements for the software modification of NFV-MANO functional entities	21
5.6.3 General requirements for changing the current VNF Package	21
5.6.4 General requirements for the software modification of NFVI components.....	22
5.6.4.1 Description	22
5.6.4.2 NFVI operation and maintenance constraints	22
5.7 General requirements to support service availability level.....	23
5.8 General requirements for the management of PaaS Services	23
5.9 General requirements to support certificate management	24
6 Functional requirements for NFVO	24
6.1 Functional requirements for virtualised resource management.....	24
6.1.1 Functional requirements for general virtualised resource management.....	24
6.1.2 Functional requirements for VNF-related resource management in indirect mode	25
6.1.3 Functional requirements for VNF-related resource management in direct mode	25
6.1.4 Functional requirements for NS-related resource management performed by the NFVO.....	26
6.1.5 Functional requirements for resource reservation management.....	26
6.1.6 Functional requirements for virtualised resource and NFVI capacity management	27
6.1.7 Functional requirements for virtualised resource performance management	28
6.1.8 Functional requirements for virtualised resource fault management	28
6.1.9 Functional requirements for virtualised resource information management.....	29
6.1.10 Functional requirements for Network Forwarding Path (NFP) management	29
6.1.11 Functional requirements for quota management.....	29
6.1.12 Functional requirements related to permitted allowance management	30
6.2 Functional requirements for VNF lifecycle management.....	30
6.2.1 Functional requirements for VNF lifecycle management	30
6.2.2 Functional requirements for VNF instantiation	31
6.2.3 Functional requirements for VNF scaling.....	31
6.2.4 Functional requirements for VNF termination.....	31
6.2.5 Functional requirements for VNF/VNFC Snapshots	31
6.2.6 Functional requirements for changing the current VNF Package	32
6.2.7 Functional requirements for change of the external VNF connectivity	32
6.2.8 Functional requirements for changing the selected deployable modules.....	32

6.3	Functional requirements for NS lifecycle management	32
6.3.1	Functional requirements for NS lifecycle management.....	32
6.3.2	Functional requirements for NS instantiation	33
6.3.3	Functional requirements for NS scaling.....	34
6.3.4	Functional requirements for NS updating	34
6.3.5	Functional requirements for NS termination.....	35
6.4	Functional requirements for VNF configuration management.....	35
6.5	Functional requirements for VNF information management.....	35
6.5.1	Functional requirements for VNF Package management	35
6.5.2	Functional requirements for VNF instance information management.....	36
6.6	Functional requirements for NS information management	36
6.6.1	Functional requirements for NSD management.....	36
6.6.2	Functional requirements for NS instance information management.....	36
6.6.3	Functional requirements for PNF Descriptor (PNFD) archive management	36
6.7	Functional requirements for NS performance management	37
6.8	Functional requirements for VNF fault management	37
6.8.1	Functional requirements for virtualisation-related fault management	37
6.9	Functional requirements for NS fault management.....	37
6.10	Functional requirements for infrastructure resource management	38
6.11	Functional requirements for security consideration	38
6.12	Functional requirements for software image management.....	38
6.13	Functional requirements for NFV acceleration management	39
6.14	Functional requirements for multi-tenancy	39
6.15	Functional requirements for compute host reservation management	40
6.16	Functional requirements for policy management	40
6.17	Functional requirements for management of network services in a multiple administrative domain environment.....	40
6.18	Functional requirements for management of connectivity for Multi-Site services.....	41
6.19	Functional requirements related to the support for network slicing	42
6.20	Functional requirements for VNF Snapshot Packages	42
6.21	Functional requirements for OS container configuration management	43
6.22	Functional requirements for MCIOP management.....	43
6.23	Functional requirements related to data flow mirroring	44
6.24	Functional requirements for secondary container cluster network management.....	44
6.25	Functional requirements for data analytics.....	44
6.26	Functional requirements for PaaS Services management.....	44
6.26.1	Functional requirements for PaaS Services lifecycle management.....	44
6.26.2	Functional requirements for PaaS Services information management	45
7	Functional requirements for VNFM.....	45
7.1	Functional requirements for virtualised resource management.....	45
7.1.1	Functional requirements for virtualised resource management	45
7.1.2	Functional requirements for VNF-related resource management in indirect mode	46
7.1.3	Functional requirements for VNF-related resource management in direct mode	46
7.1.4	Functional requirements for resource reservation management.....	47
7.1.5	Functional requirements for virtualised resource performance management	47
7.1.6	Functional requirements for virtualised resource fault management	47
7.1.7	Functional requirements for virtualised resource information management.....	47
7.1.8	Functional requirements for quota management.....	48
7.1.9	Functional requirements related to permitted allowance management	48
7.2	Functional requirements for VNF lifecycle management.....	48
7.2.1	Functional requirements for VNF lifecycle management	48
7.2.2	Functional requirements for VNF instantiation	49
7.2.3	Functional requirements for VNF scaling	49
7.2.4	Functional requirements for VNF termination.....	50
7.2.5	Functional requirements for changing the current VNF Package	50
7.2.6	Functional requirements for change of the external VNF connectivity	50
7.2.7	Functional requirements for changing the set of instantiated VNFCs	50
7.3	Functional requirements for VNF configuration management.....	50
7.4	Functional requirements for VNF information management.....	51
7.4.1	Functional requirements for VNF Package management	51
7.4.2	Functional requirements for VNF instance information management.....	51

7.5	Functional requirements for VNF performance management	51
7.6	Functional requirements for VNF fault management	52
7.6.1	Functional requirements for virtualised resource-related VNF fault management	52
7.6.2	Functional requirements for virtualisation-related fault management	52
7.7	Functional requirements for security consideration	52
7.8	Functional requirements for software image management	53
7.9	Functional requirements for NFV acceleration management	53
7.10	Functional requirements for multi-tenancy	53
7.11	Functional requirements for VNF indicator management	53
7.12	Functional requirements for policy management	54
7.13	Functional requirements for VNF/VNFC Snapshots	54
7.14	Functional requirements for management of connectivity for Multi-Site services	54
7.15	Functional requirements for containerized workload management	55
7.15.1	Functional requirements for management of containerized workloads based on MCIOPs	55
7.15.2	Functional requirements for MCIO management	55
7.15.3	Functional requirements for OS container configuration management	56
7.15.4	Functional requirements for secondary container cluster network management	56
7.16	Functional requirements for PaaS Services management	56
8	Functional requirements for VIM	56
8.1	General considerations	56
8.2	Functional requirements for virtualised resource management	57
8.2.1	Functional requirements for virtualised resource management	57
8.2.2	Functional requirements for resource reservation management	57
8.2.3	Functional requirements for virtualised resource and NFVI capacity management	58
8.2.4	Functional requirements for virtualised resource performance management	58
8.2.5	Functional requirements for virtualised resource fault management	59
8.2.6	Functional requirements for virtualised resource information management	59
8.2.7	Functional requirements for virtualised resource configuration management	59
8.2.8	Functional requirements for NFP management	60
8.2.9	Functional requirements for quota management	60
8.3	Functional requirements for infrastructure resource management	60
8.3.1	Functional requirements for infrastructure resource performance management	60
8.3.2	Functional requirements for infrastructure resource fault management	61
8.4	Functional requirements for security consideration	61
8.5	Functional requirements for software image management	61
8.6	Functional requirements for NFV acceleration management	61
8.7	Functional requirements for multi-tenancy	62
8.8	Functional requirements for compute host reservation management	62
8.9	Functional requirements for policy management	62
8.10	Functional requirements for virtualised resource Snapshots	62
8.11	Functional requirements for management of connectivity for Multi-Site services	63
8.12	Functional requirements related to data flow mirroring	63
9	Architectural level Requirements	63
9.1	General guidelines for NFV management and orchestration interface design	63
9.2	General requirements to NFV management and orchestration interface design	63
9.3	General requirements for NFV management and orchestration services	64
9.4	General requirements for multi-tenancy	64
10	Functional requirements for NFV-MANO as managed entities	65
10.1	Functional requirements for management of NFVO as a managed entity	65
10.2	Functional requirements for management of VNFM as a managed entity	65
10.3	Functional requirements for management of VIM as a managed entity	65
10.4	Functional requirements for management of WIM as a managed entity	66
10.5	Functional requirements for management of CISM as a managed entity	66
10.6	Functional requirements for management of CIR as a managed entity	66
10.7	Functional requirements for management of CCM as a managed entity	66
10.8	Functional requirements for management of MDAF as a managed entity	67
11	Functional requirements for WIM	67
11.1	General considerations	67
11.2	Functional requirements related to virtualised resource management	67

11.2.1	Functional requirements for virtualised resource management	67
11.2.2	Functional requirements for resource reservation management.....	67
11.2.3	Functional requirements for virtualised resource fault management	68
11.2.4	Functional requirements for virtualised resource information management.....	68
11.3	Functional requirements related to infrastructure resources management.....	68
11.3.1	Functional requirements for infrastructure resources management	68
12	Functional requirements for CISM function	68
12.1	General considerations	68
12.2	Functional requirements for OS container infrastructure resource management.....	69
12.3	Functional requirements for MCIO management.....	69
12.4	Functional requirements for management of containerized workloads based on MCIOs.....	70
12.5	Functional requirements for OS container configuration management	71
12.6	Functional requirements for OS container image management.....	71
12.7	Functional requirements for secondary container cluster network management.....	71
12.8	Functional requirements for CIS cluster management	72
12.8.1	Functional requirements for CIS instance management	72
12.8.2	Functional requirements for CIS storage management.....	72
12.8.3	Functional requirements for CIS configuration management	72
12.8.4	Functional requirements for CIS MCCO management.....	72
12.9	Functional requirements for OS container workload performance management	73
12.10	Functional requirements for OS container workload fault management	73
13	Functional requirements for CIR function	73
13.1	General considerations	73
13.2	Functional requirements for OS container image management.....	74
14	Functional requirements for CCM function	74
14.1	General considerations	74
14.2	Functional requirements for CIS cluster resource management.....	74
14.3	Functional requirements for CIS cluster configuration management.....	75
14.4	Functional requirements for CIS cluster descriptor management.....	76
14.5	Functional requirements for CIS cluster fault, performance and capacity management	76
14.6	Functional requirements for CIS cluster lifecycle management.....	76
14.7	Functional requirements for MCCO management	77
14.8	Functional requirements for virtualised resource performance management.....	77
14.9	Functional requirements for virtualised resource fault management.....	77
14.10	Functional requirements for virtualised resource management.....	78
14.11	Functional requirements for virtualised resource information management	78
14.12	Functional requirements for CIS cluster resource energy management	78
15	Functional requirements for MDAF.....	79
15.1	General considerations	79
15.2	Functional requirements for data analytics.....	79
16	Functional requirements for Intent management function	79
16.1	General considerations	79
16.2	Functional requirements for Intent Management service	80
17	Functional requirements for PSR function	80
17.1	General considerations	80
17.2	Functional requirements for PaaS Service Descriptor management.....	80
17.3	Functional requirements for PaaS Services registration management.....	81
17.4	Functional requirements for PaaS Services registry and descriptor management	81
18	Functional requirements for PSM function	81
18.1	Functional requirements for PaaS Services lifecycle management	81
18.2	Functional requirements for PaaS Services information management	82
Annex A (informative): Resource management additional information		83
A.1	Quota based resource management	83
A.1.1	Overview	83
A.1.2	Summary of key aspects.....	83
A.1.3	Assignment of consumer identifiers	84

A.1.4	Setting of quotas.....	84
A.1.5	NFVO awareness of NFVI resource consumption.....	84
A.1.6	NFVI resource acquisition.....	84
A.1.7	Resource contention mitigation.....	85
A.1.8	Data centre resource utilization efficiency.....	85
A.1.9	Resource management evolution and interoperability.....	85
A.1.10	Co-existence of resource quota enforcement and resource management with reservation.....	85
A.2	Management of resource reservations.....	85
A.2.1	Introduction.....	85
A.2.2	Use cases.....	85
A.2.2.1	Use case for securing resources for several tenants.....	85
A.2.2.2	Use case for securing resources with detailed capabilities.....	86
A.2.2.3	Use case for securing resources during NS instantiation.....	86
A.2.2.4	Use case for securing resources during NS scaling.....	86
A.2.2.5	Use case for securing resources related to a scheduled event.....	86
A.2.3	Summary of key aspects.....	86
A.2.4	Resource reservation management by NFVO.....	87
A.2.5	Resource reservation handling by the VNFM.....	88
A.2.6	Resource reservation contention mitigation.....	88
A.2.7	Co-existence of reservation with quota.....	88
A.2.8	Resource reservation types.....	88
A.3	Management of permitted allowance.....	89
A.3.1	Introduction.....	89
A.3.2	Summary of key aspects.....	89
A.3.3	Setting of permitted allowance.....	89
A.3.4	Permitted allowance management by NFVO.....	90
A.3.5	Permitted allowance awareness by the VNFM.....	90
A.3.6	Permitted allowance contention mitigation.....	90
A.3.7	Co-existence of permitted allowance and resource quota enforcement.....	90
A.3.8	Co-existence of permitted allowance and resource management with reservation.....	90
Annex B (informative): Virtualised resources capacity management.....		91
B.1	Introduction.....	91
B.2	Virtualised resources capacity information management by the VIM.....	91
B.2.1	Functionality.....	91
B.3	Virtualised resources capacity management by the NFVO.....	91
B.3.1	Functionality.....	91
Annex C (informative): VNF management.....		93
C.1	Introduction.....	93
C.2	Use cases.....	93
C.2.1	Use case for stopping a VNF instance.....	93
C.2.1.1	Introduction.....	93
C.2.1.2	Steps.....	93
C.2.2	Use case for starting a VNF instance.....	94
C.2.2.1	Introduction.....	94
C.2.2.2	Steps.....	94
Annex D (informative): Network service management additional information.....		95
D.1	Introduction.....	95
D.2	General use cases.....	95
D.2.1	Use case for creating an NS instance.....	95
D.2.1.1	Introduction.....	95
D.2.1.2	Trigger.....	96
D.2.1.3	Actors and roles.....	96
D.2.1.4	Pre-conditions.....	96

D.2.1.5	Post-conditions	96
D.2.1.6	Operational Flows.....	96
D.2.2	Use case NS scaling	97
D.2.2.1	Introduction.....	97
D.2.2.2	Trigger	97
D.2.2.3	Actors and roles	97
D.2.2.4	Pre-conditions	98
D.2.2.5	Post-conditions	98
D.2.2.6	Operational Flows.....	98
D.2.3	Use case: Re-instantiation of multiple NS instances with different priorities after NFVI failure	100
D.2.3.1	Introduction.....	100
D.2.3.2	Trigger	100
D.2.3.3	Actors and roles	100
D.2.3.4	Pre-conditions	100
D.2.3.5	Post-conditions	101
D.2.3.6	Operational Flows.....	101
D.2.4	Use case: Instantiation of NS in parallel to other LCM operations	103
D.2.4.1	Introduction.....	103
D.2.4.2	Trigger	103
D.2.4.3	Actors and roles	103
D.2.4.4	Pre-conditions	103
D.2.4.5	Post-conditions	104
D.2.4.6	Operational Flows.....	104
D.2.5	Use case: Resolve resource allocation conflict by pre-empting a lower priority NS instance that is up and running	106
D.2.5.1	Introduction.....	106
D.2.5.2	Trigger	106
D.2.5.3	Actors and roles	107
D.2.5.4	Pre-conditions	107
D.2.5.5	Post-conditions	107
D.2.5.6	Operational Flows.....	108
D.2.6	Use case: Data Flow Mirroring Management Driven by NSD.....	109
D.2.6.1	Introduction.....	109
D.2.6.2	Trigger	109
D.2.6.3	Actors and roles	109
D.2.6.4	Pre-conditions	109
D.2.6.5	Post-conditions	109
D.2.6.6	Operational Flows.....	110
D.2.7	Use case: Data Flow Mirroring Management Requested Via Interfaces.....	110
D.2.7.1	Introduction.....	110
D.2.7.2	Trigger	110
D.2.7.3	Actors and roles	110
D.2.7.4	Pre-conditions	110
D.2.7.5	Post-conditions	111
D.2.7.6	Operational Flows.....	111
D.3	NS management supporting network slicing.....	111
D.3.1	Introduction	111
D.3.2	NS instance sharing between Network Slices and tenants	112
Annex E (informative): Policy management in NFV-MANO.....		113
E.1	Introduction	113
E.2	Scope of policies in NFV-MANO reference point.....	113
Annex F (informative): VNF Snapshots.....		115
F.1	Introduction	115
F.2	VNF Snapshot lifecycle.....	115
F.3	VNF/VNFC Snapshot procedures	116
F.3.1	Introduction	116

F.3.2	Create VNF Snapshot procedure	116
F.3.3	Query VNF Snapshot information procedure.....	120
F.3.4	Revert-To VNF Snapshot procedure	121
F.3.5	Delete VNF Snapshot information procedure	125

Annex G (informative): NFV-MANO and integration of management and connectivity for Multi-Site services.....127

G.1	Introduction	127
G.2	Architecture options	127
G.2.1	Architecture option #A: WIM integration into NFV-MANO framework as specialized VIM	127
G.2.2	Architecture option #B: WIM integration as external entity to the NFV-MANO framework managing WIM functionality of OSS/BSS with Os-Ma-nfvo reference points	128

Annex H (informative): NFVI operation and maintenance130

H.1	Procedures related to NFVI operation and maintenance	130
H.1.1	Introduction	130
H.1.2	VNFD-based transfer of NFVI operation and maintenance policies.....	131
H.1.3	NFVI operation and maintenance coordination for group impact	132
H.1.4	NFVI operation and maintenance coordination for virtualised resource impact	134

Annex I (informative): Aspects of PaaS Services management136

Annex J (informative): Change history139

History	142
---------------	-----

i T h S t a n d a r d s
(h t t p s : / / s t a n d a r d s . i t
D o c u m e n t i e P w r

E T S I - @ I S O V I N F O IV . 1 (2 0 2 4 - 0 6)

h t t p s : / / s t a n d a r d s . i t e h . a i f / b c 8 a c t 5 f b 6 / s t a n - d

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document specifies functional requirements for NFV management and orchestration, and general guidelines and requirements for NFV management and orchestration interface design.

The scope of the present document does not cover the functional requirements on interfaces.

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.

Not applicable.

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] Void.
- [i.2] ETSI GR NFV 003: "Network Functions Virtualisation (NFV); Terminology for main concepts in NFV".
- [i.3] ETSI GS NFV 004: "Network Functions Virtualisation (NFV); Virtualisation Requirements".
- [i.4] Void.
- [i.5] Void.
- [i.6] Void.
- [i.7] Void.
- [i.8] ETSI GS NFV-PER 001: "Network Functions Virtualisation (NFV); NFV Performance & Portability Best Practises".
- [i.9] ETSI GR NFV-IFA 023: "Network Functions Virtualisation (NFV); Management and Orchestration; Report on Policy Management in Mano; Release 3".
- [i.10] ETSI GR NFV-TST 005: "Network Functions Virtualisation (NFV); Continuous Development and Integration; Report on use cases and recommendations for VNF Snapshot".

- [i.11] ETSI GR NFV-IFA 022: "Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Report on Management and Connectivity for Multi-Site Services".
- [i.12] ETSI GR NFV-EVE 012 (V3.1.1): "Network Functions Virtualisation (NFV) Release 3; Evolution and Ecosystem; Report on Network Slicing Support with ETSI NFV Architecture Framework".
- [i.13] ETSI GS NFV-IFA 013: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Os-Ma-nfvo reference point - Interface and Information Model Specification".
- [i.14] ETSI GS NFV-IFA 005: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Or-Vi reference point - Interface and Information Model Specification".
- [i.15] ETSI GS NFV-IFA 007: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Or-Vnfm reference point - Interface and Information Model Specification".
- [i.16] ETSI GS NFV-IFA 008: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Ve-Vnfm reference point - Interface and Information Model Specification".
- [i.17] ETSI GS NFV-IFA 014: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Network Service Templates Specification".
- [i.18] ETSI GR NFV 001: "Network Functions Virtualisation (NFV); Use Cases".
- [i.19] ETSI GS NFV-IFA 011: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; VNF Descriptor and Packaging Specification".
- [i.20] ETSI GS NFV-REL 006: "Network Functions Virtualisation (NFV) Release 3; Reliability; Maintaining Service Availability and Continuity Upon Software Modification".
- [i.21] ETSI GS NFV 006: "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Architectural Framework Specification".
- [i.22] 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".
- [i.23] ETSI GS NFV-IFA 036: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Requirements for service interfaces and object model for container cluster management and orchestration specification".
- [i.24] ETSI GS NFV-IFA 047: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Management data analytics Service Interface and Information Model".
- [i.25] ETSI GS NFV-IFA 050: "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Intent Management Service Interface and Information Model Specification".
- [i.26] ETSI GR NFV-IFA 029: "Network Functions Virtualisation (NFV) Release 3; Architecture; Report on the Enhancements of the NFV architecture towards "Cloud-native" and "PaaS"".
- [i.27] ETSI GR NFV-IFA 037: "Network Functions Virtualisation (NFV) Release 4; Architectural Framework; Report on further NFV support for 5G".
- [i.28] ETSI GR NFV-EVE 019: "Network Functions Virtualisation (NFV) Release 5; Architectural Framework; Report on VNF generic OAM functions".
- [i.29] ETSI GS NFV-IFA 049: "Network Functions Virtualisation (NFV) Release 5; Architectural Framework; VNF generic OAM functions specification".
- [i.30] ETSI GS NFV-IFA 026: "Network Functions Virtualisation (NFV) Release 5; Management and Orchestration; Architecture enhancement for Security Management Specification".

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.2] and the following apply:

NOTE: A term defined in the present document takes precedence over the definition of the same term, if any, in ETSI GR NFV 003 [i.2].

compute host: whole server entity, part of an NFVI, composed of a HW platform (processor, memory, I/O devices, internal disk) and a hypervisor running on it

NOTE: This definition is from ETSI GS NFV-PER 001 [i.8].

containerized workload: VNF or VNF component designed to be deployed and managed on Container Infrastructure Service (CIS) instances

NOTE: This definition is from ETSI GS NFV-IFA 040 [i.22].

data flow mirroring job: set of processing tasks that enables the data flow mirroring from specified source network end points and the forwarding of the mirrored data flow to a specific destination network endpoint

EXAMPLE: In the OpenStack® case, data flow mirroring jobs are performed by a TaaS function.

NOTE: The OpenStack® Word Mark and OpenStack Logo are either registered trademarks/service marks or trademarks/service marks of the OpenStack Foundation, in the United States and other countries and are used with the OpenStack Foundation's permission. ETSI is not affiliated with, endorsed or sponsored by the OpenStack Foundation, or the OpenStack community.

deployable module: set of optional VDUs, specified in the VNFD for a particular VNF deployment flavour, which are used to create VNFC instances only if selected by the consumer in a VNF lifecycle management operation

Network Service (NS) healing: procedure that includes all virtualisation related corrective actions to repair a faulty Network Service (NS) instance including components/functionalities which make up the instance, and have been associated with this fault situation

NOTE 1: In a virtualised environment network service healing focuses only on the virtualised components/functionalities. In case of an NS consisting of virtualised and non-virtualised parts, a procedure able to handle both parts is needed. This will be done in connection with components/functionalities that are located outside the virtualised environment.

NOTE 2: "Virtualisation related corrective actions" refers to action(s) toward virtualised resource(s) and associated NS instance.

Operating System (OS) container: virtualisation container utilizing a shared Operating System (OS) kernel of its host

NOTE 1: The host providing the shared OS kernel can be a physical compute node or another virtualisation container.

NOTE 2: This definition is from ETSI GS NFV-IFA 040 [i.22].

PaaS Service consumer: one or more specific set of applications or services that consume a PaaS Service

EXAMPLE: Consumers can be VNFs or NS.

service availability level: information provided to assist in the selection of virtualised resources to be allocated for the NS constituents in terms of availability

VNF Common Service: modular service or a function with a lifecycle independent from its consumers and that is consumable by either one or multiple services

NOTE: Consumer of VNF Common Service can be VNFs or other services.

EXAMPLE: Messaging and storage services in IT PaaS systems, monitoring service, networked (or network-based) services like authentication and synchronization, and encryption service.

VNF Dedicated Service: modular service or a function with a lifecycle dependent on its consumers and that can only be consumed by a specific set of applications or services

NOTE: Consumer of VNF Dedicated Services can be VNFs or other services.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI GR NFV 003 [i.2] and the following apply:

CIR	Container Image Registry
CMF	Certificate Management Function
FPGA	Field Programmable Gate Array
NUMA	Non Uniform Memory Access
P	P-node (Provider node)
PCIe	Peripheral Component Interface express
PE	Provider Edge
PSD	PaaS Services Descriptor
PSM	PaaS Services Management
PSR	PaaS Services Repository
URI	Uniform Resource Identifier

4 General Description

4.1 Introduction

Network Functions Virtualisation (NFV) adds new capabilities to communications networks and requires a new set of management and orchestration functions to be added to the current model of operations, administration, maintenance and provisioning. The NFV Management and Orchestration (NFV-MANO) architectural framework has the role to manage the infrastructure and orchestrate the resources needed by the Network Services (NSs) and Virtualised Network Functions (VNFs).

In order to guide the development of the specification of the interfaces exposed between the NFV-MANO Functional Blocks (FBs), it is important to have a clear and consolidated set of functional requirements to be addressed by the NFV-MANO. The present document is providing functional requirements on NFV-MANO e.g. VNF Lifecycle Management (LCM), NS LCM, virtualised resource management, etc.

4.2 Overview

In order to provide systematic functional requirements, the present document arranges the functional requirements by categorizing the requirements according to key operational functions of NFV-MANO, which are documented in ETSI GS NFV 006 [i.21].