



Network Functions Virtualisation (NFV) Release 2; Management and Orchestration; Or-Vnfm reference point - Interface and Information Model Specification

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-IFA007ed271

Keywordsinterface, management, MANO, NFV,
orchestration, virtualisation

ETSI650 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 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/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 2019.

All rights reserved.

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.

Contents

| | |
|---|----|
| Intellectual Property Rights | 14 |
| Foreword..... | 14 |
| Modal verbs terminology..... | 14 |
| 1 Scope | 15 |
| 2 References | 15 |
| 2.1 Normative references | 15 |
| 2.2 Informative references..... | 15 |
| 3 Definition of terms, symbols and abbreviations..... | 16 |
| 3.1 Terms..... | 16 |
| 3.2 Symbols..... | 16 |
| 3.3 Abbreviations | 16 |
| 4 Overview of interfaces and information elements associated to the Or-Vnfm reference point | 16 |
| 4.1 Introduction | 16 |
| 4.2 Relation to other NFV Group Specifications..... | 17 |
| 4.3 Conventions..... | 17 |
| 5 Reference point and interface requirements | 18 |
| 5.1 Introduction | 18 |
| 5.2 Or-Vnfm reference point requirements | 18 |
| 5.3 Interface requirements | 19 |
| 5.3.1 VNF Package Management interface requirements..... | 19 |
| 5.3.2 VNF Lifecycle Operation Granting interface requirements..... | 19 |
| 5.3.3 Virtualised Resources Management interfaces requirements | 20 |
| 5.3.3.1 Virtualised Resources Information Management interfaces requirements..... | 20 |
| 5.3.3.2 Virtualised Resources Management interfaces requirements..... | 20 |
| 5.3.3.3 Virtualised Resources Reservation Management interface requirements | 20 |
| 5.3.3.4 Virtualised Resources Reservation Change Notification interface requirements..... | 21 |
| 5.3.3.5 Virtualised Resources Change Notification interfaces requirements | 21 |
| 5.3.3.6 Virtualised Resources Performance Management interface requirements | 22 |
| 5.3.3.7 Virtualised Resources Fault Management interface requirements | 22 |
| 5.3.3.8 Virtualised Resources Quota Management interfaces requirements | 22 |
| 5.3.3.9 Virtualised Resources Quota Change Notification interface requirements | 23 |
| 5.3.3.10 Virtualised Resources Quota Available Notification interface requirements..... | 23 |
| 5.3.4 VNF Lifecycle Management interface requirements | 23 |
| 5.3.5 Void | 25 |
| 5.3.6 VNF Performance Management interface requirements..... | 25 |
| 5.3.7 VNF Fault Management interface requirements..... | 25 |
| 5.3.8 Void | 26 |
| 5.3.9 VNF Indicator interface requirements | 26 |
| 6 NFVO exposed interfaces | 27 |
| 6.1 Introduction | 27 |
| 6.2 VNF Package Management interface | 27 |
| 6.2.1 Description..... | 27 |
| 6.2.2 Query VNF Package Info operation | 27 |
| 6.2.2.1 Description..... | 27 |
| 6.2.2.2 Input parameters..... | 27 |
| 6.2.2.3 Output parameters | 28 |
| 6.2.2.4 Operation results | 28 |
| 6.2.3 Subscribe operation..... | 28 |
| 6.2.3.1 Description | 28 |
| 6.2.3.2 Input parameters..... | 28 |
| 6.2.3.3 Output parameters | 28 |
| 6.2.3.4 Operation results | 29 |
| 6.2.4 Notify operation..... | 29 |

| | | |
|---------|---|----|
| 6.2.4.1 | Description | 29 |
| 6.2.5 | Void | 29 |
| 6.2.6 | Fetch VNF Package operation | 29 |
| 6.2.6.1 | Description | 29 |
| 6.2.6.2 | Input parameters | 29 |
| 6.2.6.3 | Output parameters | 30 |
| 6.2.6.4 | Operation results | 30 |
| 6.2.7 | Fetch VNF Package Artifacts operation | 30 |
| 6.2.7.1 | Description | 30 |
| 6.2.7.2 | Input parameters | 30 |
| 6.2.7.3 | Output parameters | 30 |
| 6.2.7.4 | Operation results | 31 |
| 6.2.8 | Terminate Subscription operation | 31 |
| 6.2.8.1 | Description | 31 |
| 6.2.8.2 | Input parameters | 31 |
| 6.2.8.3 | Output parameters | 31 |
| 6.2.8.4 | Operation results | 31 |
| 6.2.9 | Query Subscription Info operation | 31 |
| 6.2.9.1 | Description | 31 |
| 6.2.9.2 | Input parameters | 32 |
| 6.2.9.3 | Output parameters | 32 |
| 6.2.9.4 | Operation results | 32 |
| 6.3 | VNF Lifecycle Operation Granting interface | 32 |
| 6.3.1 | Description | 32 |
| 6.3.2 | Grant VNF Lifecycle Operation operation | 32 |
| 6.3.2.1 | Description | 32 |
| 6.3.2.2 | Input parameters | 33 |
| 6.3.2.3 | Output parameters | 35 |
| 6.3.2.4 | Operation results | 37 |
| 6.4 | Virtualised Resources Management interfaces in indirect mode | 37 |
| 6.4.1 | Introduction | 37 |
| 6.4.2 | Virtualised Compute interfaces | 37 |
| 6.4.2.1 | Virtualised Compute Resources Management interface | 37 |
| 6.4.2.2 | Virtualised Compute Resources Change Notification interface | 38 |
| 6.4.2.3 | Virtualised Compute Resources Information Management interface | 38 |
| 6.4.3 | Virtualised Network interfaces | 38 |
| 6.4.3.1 | Virtualised Network Resources Management interface | 38 |
| 6.4.3.2 | Virtualised Network Resources Change Notification interface | 39 |
| 6.4.3.3 | Virtualised Network Resources Information Management interface | 39 |
| 6.4.4 | Virtualised Storage interfaces | 39 |
| 6.4.4.1 | Virtualised Storage Resources Management interface | 39 |
| 6.4.4.2 | Virtualised Storage Resources Change Notification interface | 39 |
| 6.4.4.3 | Virtualised Storage Resources Information Management interface | 40 |
| 6.4.5 | Virtualised Resource Performance Management interface | 40 |
| 6.4.6 | Virtualised Resource Fault Management interface | 40 |
| 6.4.7 | Virtualised Resources Quota Management interfaces | 41 |
| 6.4.7.1 | Virtualised Compute Resources Quota Management interface | 41 |
| 6.4.7.2 | Virtualised Network Resources Quota Management interface | 41 |
| 6.4.7.3 | Virtualised Storage Resources Quota Management interface | 41 |
| 6.4.7.4 | Virtualised Resources Quota Change Notification interface | 41 |
| 6.4.8 | Virtualised Resource Reservation interfaces | 41 |
| 6.4.8.1 | Virtualised Compute Resources Reservation Management interface | 41 |
| 6.4.8.2 | Virtualised Network Resources Reservation Management interface | 41 |
| 6.4.8.3 | Virtualised Storage Resources Reservation Management interface | 42 |
| 6.4.8.4 | Virtualised Resources Reservation Change Notification interface | 42 |
| 6.5 | Virtualised Resources Quota Available Notification interface | 42 |
| 6.5.1 | Description | 42 |
| 6.5.2 | Subscribe operation | 42 |
| 6.5.2.1 | Description | 42 |
| 6.5.2.2 | Input parameters | 42 |
| 6.5.2.3 | Output parameters | 43 |
| 6.5.2.4 | Operation results | 43 |

| | | |
|----------|---|----|
| 6.5.3 | Notify operation..... | 43 |
| 6.5.3.1 | Description..... | 43 |
| 6.5.4 | Terminate Subscription operation..... | 43 |
| 6.5.4.1 | Description..... | 43 |
| 6.5.4.2 | Input parameters..... | 44 |
| 6.5.4.3 | Output parameters..... | 44 |
| 6.5.4.4 | Operation results..... | 44 |
| 6.5.5 | Query Subscription Info operation..... | 44 |
| 6.5.5.1 | Description..... | 44 |
| 6.5.5.2 | Input parameters..... | 44 |
| 6.5.5.3 | Output parameters..... | 44 |
| 6.5.5.4 | Operation results..... | 44 |
| 7 | VNFM exposed interfaces..... | 45 |
| 7.1 | Introduction..... | 45 |
| 7.2 | VNF Lifecycle Management interface..... | 45 |
| 7.2.1 | Description..... | 45 |
| 7.2.2 | Create VNF Identifier operation..... | 46 |
| 7.2.2.1 | Description..... | 46 |
| 7.2.2.2 | Input parameters..... | 46 |
| 7.2.2.3 | Output parameters..... | 46 |
| 7.2.2.4 | Operation results..... | 46 |
| 7.2.3 | Instantiate VNF operation..... | 47 |
| 7.2.3.1 | Description..... | 47 |
| 7.2.3.2 | Input parameters..... | 47 |
| 7.2.3.3 | Output parameters..... | 48 |
| 7.2.3.4 | Operation results..... | 48 |
| 7.2.4 | Scale VNF operation..... | 48 |
| 7.2.4.1 | Description..... | 48 |
| 7.2.4.2 | Input parameters..... | 50 |
| 7.2.4.3 | Output parameters..... | 50 |
| 7.2.4.4 | Operation results..... | 50 |
| 7.2.5 | Scale VNF to Level operation..... | 51 |
| 7.2.5.1 | Description..... | 51 |
| 7.2.5.2 | Input parameters..... | 51 |
| 7.2.5.3 | Output parameters..... | 51 |
| 7.2.5.4 | Operation results..... | 52 |
| 7.2.6 | Change VNF Flavour operation..... | 52 |
| 7.2.6.1 | Description..... | 52 |
| 7.2.6.2 | Input parameters..... | 52 |
| 7.2.6.3 | Output parameters..... | 53 |
| 7.2.6.4 | Operation results..... | 53 |
| 7.2.7 | Terminate VNF operation..... | 53 |
| 7.2.7.1 | Description..... | 53 |
| 7.2.7.2 | Input parameters..... | 54 |
| 7.2.7.3 | Output parameters..... | 54 |
| 7.2.7.4 | Operation results..... | 55 |
| 7.2.8 | Delete VNF Identifier operation..... | 55 |
| 7.2.8.1 | Description..... | 55 |
| 7.2.8.2 | Input parameters..... | 55 |
| 7.2.8.3 | Output parameters..... | 55 |
| 7.2.8.4 | Operation results..... | 55 |
| 7.2.9 | Query VNF operation..... | 56 |
| 7.2.9.1 | Description..... | 56 |
| 7.2.9.2 | Input parameters..... | 56 |
| 7.2.9.3 | Output parameters..... | 56 |
| 7.2.9.4 | Operation results..... | 56 |
| 7.2.10 | Heal VNF operation..... | 57 |
| 7.2.10.1 | Description..... | 57 |
| 7.2.10.2 | Input parameters..... | 57 |
| 7.2.10.3 | Output parameters..... | 57 |
| 7.2.10.4 | Operation results..... | 57 |

| | | |
|----------|---|----|
| 7.2.11 | Operate VNF operation..... | 58 |
| 7.2.11.1 | Description..... | 58 |
| 7.2.11.2 | Input parameters..... | 59 |
| 7.2.11.3 | Output parameters..... | 59 |
| 7.2.11.4 | Operation results..... | 60 |
| 7.2.12 | Modify VNF Information operation..... | 60 |
| 7.2.12.1 | Description..... | 60 |
| 7.2.12.2 | Input parameters..... | 60 |
| 7.2.12.3 | Output parameters..... | 60 |
| 7.2.12.4 | Operation results..... | 61 |
| 7.2.13 | Get Operation Status operation..... | 61 |
| 7.2.13.1 | Description..... | 61 |
| 7.2.13.2 | Input parameters..... | 61 |
| 7.2.13.3 | Output parameters..... | 61 |
| 7.2.13.4 | Operation results..... | 62 |
| 7.2.14 | Subscribe operation..... | 62 |
| 7.2.14.1 | Description..... | 62 |
| 7.2.14.2 | Input parameters..... | 62 |
| 7.2.14.3 | Output parameters..... | 62 |
| 7.2.14.4 | Operation results..... | 62 |
| 7.2.15 | Notify operation..... | 63 |
| 7.2.15.1 | Description..... | 63 |
| 7.2.16 | Terminate Subscription operation..... | 63 |
| 7.2.16.1 | Description..... | 63 |
| 7.2.16.2 | Input parameters..... | 63 |
| 7.2.16.3 | Output parameters..... | 63 |
| 7.2.16.4 | Operation results..... | 63 |
| 7.2.17 | Query Subscription Info operation..... | 64 |
| 7.2.17.1 | Description..... | 64 |
| 7.2.17.2 | Input parameters..... | 64 |
| 7.2.17.3 | Output parameters..... | 64 |
| 7.2.17.4 | Operation results..... | 64 |
| 7.2.18 | Change External VNF Connectivity operation..... | 64 |
| 7.2.18.1 | Description..... | 64 |
| 7.2.18.2 | Input parameters..... | 65 |
| 7.2.18.3 | Output parameters..... | 65 |
| 7.2.18.4 | Operation results..... | 65 |
| 7.3 | Void..... | 66 |
| 7.4 | VNF Performance Management interface..... | 66 |
| 7.4.1 | Description..... | 66 |
| 7.4.2 | Create PM Job operation..... | 66 |
| 7.4.2.1 | Description..... | 66 |
| 7.4.2.2 | Input parameters..... | 67 |
| 7.4.2.3 | Output parameters..... | 68 |
| 7.4.2.4 | Operation results..... | 68 |
| 7.4.3 | Delete PM Jobs operation..... | 68 |
| 7.4.3.1 | Description..... | 68 |
| 7.4.3.2 | Input parameters..... | 68 |
| 7.4.3.3 | Output parameters..... | 68 |
| 7.4.3.4 | Operation results..... | 68 |
| 7.4.4 | Subscribe operation..... | 69 |
| 7.4.4.1 | Description..... | 69 |
| 7.4.4.2 | Input parameters..... | 69 |
| 7.4.4.3 | Output parameters..... | 69 |
| 7.4.4.4 | Operation results..... | 69 |
| 7.4.5 | Notify operation..... | 69 |
| 7.4.5.1 | Description..... | 69 |
| 7.4.6 | Query PM Job operation..... | 70 |
| 7.4.6.1 | Description..... | 70 |
| 7.4.6.2 | Input parameters..... | 70 |
| 7.4.6.3 | Output parameters..... | 70 |
| 7.4.6.4 | Operation results..... | 70 |

| | | |
|----------|--|----|
| 7.4.7 | Create Threshold operation..... | 70 |
| 7.4.7.1 | Description | 70 |
| 7.4.7.2 | Input parameters | 71 |
| 7.4.7.3 | Output parameters | 71 |
| 7.4.7.4 | Operation results | 71 |
| 7.4.8 | Delete Thresholds operation | 71 |
| 7.4.8.1 | Description | 71 |
| 7.4.8.2 | Input parameters | 72 |
| 7.4.8.3 | Output parameters | 72 |
| 7.4.8.4 | Operation results | 72 |
| 7.4.9 | Query Threshold operation | 72 |
| 7.4.9.1 | Description | 72 |
| 7.4.9.2 | Input parameters | 72 |
| 7.4.9.3 | Output parameters | 72 |
| 7.4.9.4 | Operation results | 73 |
| 7.4.10 | Terminate Subscription operation..... | 73 |
| 7.4.10.1 | Description | 73 |
| 7.4.10.2 | Input parameters | 73 |
| 7.4.10.3 | Output parameters | 73 |
| 7.4.10.4 | Operation results | 73 |
| 7.4.11 | Query Subscription Info operation..... | 73 |
| 7.4.11.1 | Description | 73 |
| 7.4.11.2 | Input parameters | 74 |
| 7.4.11.3 | Output parameters | 74 |
| 7.4.11.4 | Operation results | 74 |
| 7.5 | VNF Fault Management interface | 74 |
| 7.5.1 | Description..... | 74 |
| 7.5.2 | Subscribe operation..... | 74 |
| 7.5.2.1 | Description | 74 |
| 7.5.2.2 | Input parameters | 75 |
| 7.5.2.3 | Output parameters | 75 |
| 7.5.2.4 | Operation results | 75 |
| 7.5.3 | Notify operation | 75 |
| 7.5.3.1 | Description | 75 |
| 7.5.4 | Get Alarm List operation | 76 |
| 7.5.4.1 | Description | 76 |
| 7.5.4.2 | Input parameters | 76 |
| 7.5.4.3 | Output parameters | 76 |
| 7.5.4.4 | Operation results | 76 |
| 7.5.5 | Terminate Subscription operation..... | 76 |
| 7.5.5.1 | Description | 76 |
| 7.5.5.2 | Input parameters | 77 |
| 7.5.5.3 | Output parameters | 77 |
| 7.5.5.4 | Operation results | 77 |
| 7.5.6 | Query Subscription Info operation..... | 77 |
| 7.5.6.1 | Description | 77 |
| 7.5.6.2 | Input parameters | 77 |
| 7.5.6.3 | Output parameters | 77 |
| 7.5.6.4 | Operation results | 78 |
| 7.5.7 | Acknowledge alarms operation..... | 78 |
| 7.5.7.1 | Description | 78 |
| 7.5.7.2 | Input parameters | 78 |
| 7.5.7.3 | Output parameters | 78 |
| 7.5.7.4 | Operation results | 78 |
| 7.6 | Void..... | 79 |
| 7.7 | VNF Indicator interface..... | 79 |
| 7.7.1 | Description..... | 79 |
| 7.7.2 | Subscribe operation..... | 79 |
| 7.7.2.1 | Description | 79 |
| 7.7.2.2 | Input parameters | 79 |
| 7.7.2.3 | Output parameters | 79 |
| 7.7.2.4 | Operation results | 80 |

| | | |
|---------|---|----|
| 7.7.3 | Notify operation..... | 80 |
| 7.7.3.1 | Description..... | 80 |
| 7.7.4 | Get Indicator Value operation..... | 80 |
| 7.7.4.1 | Description..... | 80 |
| 7.7.4.2 | Input parameters..... | 80 |
| 7.7.4.3 | Output parameters..... | 80 |
| 7.7.4.4 | Operation results..... | 81 |
| 7.7.5 | Terminate Subscription operation..... | 81 |
| 7.7.5.1 | Description..... | 81 |
| 7.7.5.2 | Input parameters..... | 81 |
| 7.7.5.3 | Output parameters..... | 81 |
| 7.7.5.4 | Operation results..... | 81 |
| 7.7.6 | Query Subscription Info operation..... | 81 |
| 7.7.6.1 | Description..... | 81 |
| 7.7.6.2 | Input parameters..... | 82 |
| 7.7.6.3 | Output parameters..... | 82 |
| 7.7.6.4 | Operation results..... | 82 |
| 8 | Information elements exchanged..... | 82 |
| 8.1 | Introduction..... | 82 |
| 8.2 | Information elements and notifications related to VNF Package Management..... | 83 |
| 8.2.1 | Introduction..... | 83 |
| 8.2.2 | VnfPkgInfo information element..... | 83 |
| 8.2.2.1 | Description..... | 83 |
| 8.2.2.2 | Attributes..... | 83 |
| 8.2.3 | Vnfd information element..... | 84 |
| 8.2.3.1 | Description..... | 84 |
| 8.2.3.2 | Attributes..... | 84 |
| 8.2.4 | VnfPackageOnBoardingNotification..... | 84 |
| 8.2.4.1 | Description..... | 84 |
| 8.2.4.2 | Trigger Conditions..... | 84 |
| 8.2.4.3 | Attributes..... | 84 |
| 8.2.5 | VnfPackageChangeNotification..... | 84 |
| 8.2.5.1 | Description..... | 84 |
| 8.2.5.2 | Trigger Conditions..... | 85 |
| 8.2.5.3 | Attributes..... | 85 |
| 8.2.6 | VnfPackageSoftwareImageInformation information element..... | 85 |
| 8.2.6.1 | Description..... | 85 |
| 8.2.6.2 | Attributes..... | 85 |
| 8.2.7 | SoftwareImageInformation information element..... | 85 |
| 8.2.7.1 | Description..... | 85 |
| 8.2.7.2 | Attributes..... | 86 |
| 8.2.8 | VnfPackageArtifactInformation information element..... | 86 |
| 8.2.8.1 | Description..... | 86 |
| 8.2.8.2 | Attributes..... | 86 |
| 8.2.9 | Void..... | 86 |
| 8.3 | Information elements related to VNF Lifecycle Operation Granting..... | 86 |
| 8.3.1 | Introduction..... | 86 |
| 8.3.2 | ResourceDefinition information element..... | 86 |
| 8.3.2.1 | Description..... | 86 |
| 8.3.2.2 | Attributes..... | 87 |
| 8.3.3 | GrantInfo information element..... | 87 |
| 8.3.3.1 | Description..... | 87 |
| 8.3.3.2 | Attributes..... | 87 |
| 8.3.4 | ZoneInfo information element..... | 88 |
| 8.3.4.1 | Description..... | 88 |
| 8.3.4.2 | Attributes..... | 88 |
| 8.3.5 | ZoneGroupInfo information element..... | 89 |
| 8.3.5.1 | Description..... | 89 |
| 8.3.5.2 | Attributes..... | 89 |
| 8.3.6 | PlacementConstraint information element..... | 89 |
| 8.3.6.1 | Description..... | 89 |

| | | |
|-----------|--|----|
| 8.3.6.2 | Attributes..... | 89 |
| 8.3.7 | VimConstraint information element | 90 |
| 8.3.7.1 | Description | 90 |
| 8.3.7.2 | Attributes..... | 90 |
| 8.3.8 | ConstraintResourceRef information element | 90 |
| 8.3.8.1 | Description | 90 |
| 8.3.8.2 | Attributes..... | 91 |
| 8.3.9 | VimAssets information element | 91 |
| 8.3.9.1 | Description | 91 |
| 8.3.9.2 | Attributes..... | 91 |
| 8.3.10 | VimComputeResourceFlavour information element | 91 |
| 8.3.10.1 | Description | 91 |
| 8.3.10.2 | Attributes..... | 92 |
| 8.3.11 | VimSoftwareImage information element..... | 92 |
| 8.3.11.1 | Description | 92 |
| 8.3.11.2 | Attributes..... | 92 |
| 8.4 | Information elements and notifications related to Virtualised Resources Management in indirect mode..... | 93 |
| 8.4.1 | Introduction..... | 93 |
| 8.4.2 | Information elements related to Virtualised Compute | 93 |
| 8.4.2.1 | Introduction | 93 |
| 8.4.2.2 | ComputeResourceWithRpInfo information element..... | 93 |
| 8.4.2.2.1 | Description | 93 |
| 8.4.2.2.2 | Attributes | 93 |
| 8.4.2.3 | ComputeResourceWithRpId information element..... | 93 |
| 8.4.2.3.1 | Description | 93 |
| 8.4.2.3.2 | Attributes | 93 |
| 8.4.2.4 | VirtualComputeResourceWithRpInfo information element..... | 94 |
| 8.4.2.4.1 | Description | 94 |
| 8.4.2.4.2 | Attributes | 94 |
| 8.4.3 | Information elements related to Virtualised Network..... | 94 |
| 8.4.3.1 | Introduction..... | 94 |
| 8.4.3.2 | NetworkResourceWithRpInfo information element | 94 |
| 8.4.3.2.1 | Description | 94 |
| 8.4.3.2.2 | Attributes | 94 |
| 8.4.3.3 | NetworkResourceWithRpId information element..... | 94 |
| 8.4.3.3.1 | Description | 94 |
| 8.4.3.3.2 | Attributes | 95 |
| 8.4.3.4 | VirtualNetworkResourceWithRpInfo information element | 95 |
| 8.4.3.4.1 | Description | 95 |
| 8.4.3.4.2 | Attributes | 95 |
| 8.4.4 | Information elements related to Virtualised Storage | 95 |
| 8.4.4.1 | Introduction..... | 95 |
| 8.4.4.2 | StorageResourceWithRpInfo information element | 95 |
| 8.4.4.2.1 | Description | 95 |
| 8.4.4.2.2 | Attributes | 95 |
| 8.4.4.3 | StorageResourceWithRpId information element | 96 |
| 8.4.4.3.1 | Description | 96 |
| 8.4.4.3.2 | Attributes | 96 |
| 8.4.4.4 | VirtualStorageResourceWithRpInfo information element..... | 96 |
| 8.4.4.4.1 | Description | 96 |
| 8.4.4.4.2 | Attributes | 96 |
| 8.4.5 | Notifications related to changes of virtualised resources..... | 96 |
| 8.4.5.1 | Introduction..... | 96 |
| 8.4.5.2 | VirtualisedResourceWithRpChangeNotification | 97 |
| 8.4.5.2.1 | Description | 97 |
| 8.4.5.2.2 | Trigger conditions | 97 |
| 8.4.5.2.3 | Attributes | 97 |
| 8.4.5.3 | InformationWithRpChangeNotification..... | 97 |
| 8.4.5.3.1 | Description | 97 |
| 8.4.5.3.2 | Trigger conditions | 97 |
| 8.4.5.3.3 | Attributes | 97 |
| 8.4.6 | Notifications related to Virtualised Resource Performance Management | 98 |

| | | |
|-----------|---|-----|
| 8.4.6.1 | Introduction | 98 |
| 8.4.6.2 | PerformanceInformationWithRpAvailableNotification | 98 |
| 8.4.6.2.1 | Description | 98 |
| 8.4.6.2.2 | Trigger conditions | 98 |
| 8.4.6.2.3 | Attributes | 98 |
| 8.4.6.3 | ThresholdCrossedWithRpNotification | 98 |
| 8.4.6.3.1 | Description | 98 |
| 8.4.6.3.2 | Trigger conditions | 98 |
| 8.4.6.3.3 | Attributes | 98 |
| 8.4.7 | Information elements and notifications related to Virtualised Resource Fault Management | 99 |
| 8.4.7.1 | Introduction | 99 |
| 8.4.7.2 | AlarmWithRpInfo information element | 99 |
| 8.4.7.2.1 | Description | 99 |
| 8.4.7.2.2 | Attributes | 99 |
| 8.4.7.3 | AlarmWithRpNotification | 99 |
| 8.4.7.3.1 | Description | 99 |
| 8.4.7.3.2 | Trigger conditions | 99 |
| 8.4.7.3.3 | Attributes | 100 |
| 8.4.7.4 | AlarmClearedWithRpNotification | 100 |
| 8.4.7.4.1 | Description | 100 |
| 8.4.7.4.2 | Trigger conditions | 100 |
| 8.4.7.4.3 | Attributes | 100 |
| 8.4.8 | Information elements and notifications related to Virtualised Resources Quota | 100 |
| 8.4.8.1 | Introduction | 100 |
| 8.4.8.2 | VirtualComputeQuotaWithRpInfo information element | 101 |
| 8.4.8.2.1 | Description | 101 |
| 8.4.8.2.2 | Attributes | 101 |
| 8.4.8.3 | VirtualNetworkQuotaWithRpInfo information element | 101 |
| 8.4.8.3.1 | Description | 101 |
| 8.4.8.3.2 | Attributes | 101 |
| 8.4.8.4 | VirtualStorageQuotaWithRpInfo information element | 101 |
| 8.4.8.4.1 | Description | 101 |
| 8.4.8.4.2 | Attributes | 101 |
| 8.4.8.5 | VirtualisedResourceQuotaWithRpChangeNotification | 102 |
| 8.4.8.5.1 | Description | 102 |
| 8.4.8.5.2 | Trigger conditions | 102 |
| 8.4.8.5.3 | Attributes | 102 |
| 8.4.9 | Information elements and notifications related to Virtualised Resources Reservation | 102 |
| 8.4.9.1 | Introduction | 102 |
| 8.4.9.2 | ReservedVirtualComputeWithRpInfo information element | 102 |
| 8.4.9.2.1 | Description | 102 |
| 8.4.9.2.2 | Attributes | 103 |
| 8.4.9.3 | ReservedVirtualNetworkWithRpInfo information element | 103 |
| 8.4.9.3.1 | Description | 103 |
| 8.4.9.3.2 | Attributes | 103 |
| 8.4.9.4 | ReservedVirtualStorageWithRpInfo information element | 103 |
| 8.4.9.4.1 | Description | 103 |
| 8.4.9.4.2 | Attributes | 103 |
| 8.4.9.5 | VirtualisedResourceReservationWithRpChangeNotification | 104 |
| 8.4.9.5.1 | Description | 104 |
| 8.4.9.5.2 | Trigger conditions | 104 |
| 8.4.9.5.3 | Attributes | 104 |
| 8.5 | Information elements related to VNF Lifecycle Management | 104 |
| 8.5.1 | Introduction | 104 |
| 8.5.2 | VnfInfo information element | 104 |
| 8.5.2.1 | Description | 104 |
| 8.5.2.2 | Attributes | 104 |
| 8.5.3 | InstantiatedVnfInfo information element | 107 |
| 8.5.3.1 | Description | 107 |
| 8.5.3.2 | Attributes | 107 |
| 8.5.4 | VnfcResourceInfo information element | 108 |
| 8.5.4.1 | Description | 108 |

| | | |
|----------|---|-----|
| 8.5.4.2 | Attributes..... | 108 |
| 8.5.5 | VnfVirtualLinkResourceInfo information element..... | 108 |
| 8.5.5.1 | Description..... | 108 |
| 8.5.5.2 | Attributes..... | 108 |
| 8.5.6 | VirtualStorageResourceInfo information element..... | 109 |
| 8.5.6.1 | Description..... | 109 |
| 8.5.6.2 | Attributes..... | 109 |
| 8.5.7 | ResourceHandle information element..... | 109 |
| 8.5.7.1 | Description..... | 109 |
| 8.5.7.2 | Attributes..... | 110 |
| 8.5.8 | ScaleInfo information element..... | 110 |
| 8.5.8.1 | Description..... | 110 |
| 8.5.8.2 | Attributes..... | 110 |
| 8.5.9 | ExtVirtualLinkInfo information element..... | 111 |
| 8.5.9.1 | Description..... | 111 |
| 8.5.9.2 | Attributes..... | 111 |
| 8.5.10 | ExtManagedVirtualLinkInfo information element..... | 111 |
| 8.5.10.1 | Description..... | 111 |
| 8.5.10.2 | Attributes..... | 111 |
| 8.5.11 | VnfLinkPortInfo information element..... | 112 |
| 8.5.11.1 | Description..... | 112 |
| 8.5.11.2 | Attributes..... | 112 |
| 8.5.12 | VnfExtCpInfo information element..... | 112 |
| 8.5.12.1 | Description..... | 112 |
| 8.5.12.2 | Attributes..... | 112 |
| 8.5.13 | ExtLinkPortInfo information element..... | 113 |
| 8.5.13.1 | Description..... | 113 |
| 8.5.13.2 | Attributes..... | 113 |
| 8.5.14 | VnfcCpInfo information element..... | 113 |
| 8.5.14.1 | Description..... | 113 |
| 8.5.14.2 | Attributes..... | 113 |
| 8.5.15 | CpProtocolInfo information element..... | 114 |
| 8.5.15.1 | Description..... | 114 |
| 8.5.15.2 | Attributes..... | 114 |
| 8.6 | Information elements and notifications related to VNF Lifecycle Changes..... | 114 |
| 8.6.1 | Introduction..... | 114 |
| 8.6.2 | VnfLcmOperationOccurrenceNotification..... | 114 |
| 8.6.2.1 | Description..... | 114 |
| 8.6.2.2 | Trigger conditions..... | 115 |
| 8.6.2.3 | Attributes..... | 115 |
| 8.6.3 | AffectedVnfc information element..... | 116 |
| 8.6.3.1 | Description..... | 116 |
| 8.6.3.2 | Attributes..... | 116 |
| 8.6.4 | AffectedVirtualLink information element..... | 117 |
| 8.6.4.1 | Description..... | 117 |
| 8.6.4.2 | Attributes..... | 117 |
| 8.6.5 | AffectedVirtualStorage information element..... | 118 |
| 8.6.5.1 | Description..... | 118 |
| 8.6.5.2 | Attributes..... | 118 |
| 8.6.6 | Void..... | 119 |
| 8.6.7 | VnfIdentifierCreationNotification..... | 119 |
| 8.6.7.1 | Description..... | 119 |
| 8.6.7.2 | Trigger conditions..... | 119 |
| 8.6.7.3 | Attributes..... | 119 |
| 8.6.8 | VnfIdentifierDeletionNotification..... | 119 |
| 8.6.8.1 | Description..... | 119 |
| 8.6.8.2 | Trigger conditions..... | 120 |
| 8.6.8.3 | Attributes..... | 120 |
| 8.7 | Information elements and notifications related to VNF Performance Management..... | 120 |
| 8.7.1 | Introduction..... | 120 |
| 8.7.2 | ObjectSelection information element..... | 120 |
| 8.7.2.1 | Description..... | 120 |

| | | |
|----------|---|-----|
| 8.7.2.2 | Attributes..... | 120 |
| 8.7.3 | PmJob information element..... | 121 |
| 8.7.3.1 | Description..... | 121 |
| 8.7.3.2 | Attributes..... | 121 |
| 8.7.4 | Threshold information element..... | 122 |
| 8.7.4.1 | Description..... | 122 |
| 8.7.4.2 | Attributes..... | 122 |
| 8.7.5 | PerformanceReport information element..... | 123 |
| 8.7.5.1 | Description..... | 123 |
| 8.7.5.2 | Attributes..... | 123 |
| 8.7.6 | PerformanceReportEntry information element..... | 123 |
| 8.7.6.1 | Description..... | 123 |
| 8.7.6.2 | Attributes..... | 123 |
| 8.7.7 | PerformanceValueEntry information element..... | 123 |
| 8.7.7.1 | Description..... | 123 |
| 8.7.7.2 | Attributes..... | 124 |
| 8.7.8 | PerformanceInformationAvailableNotification..... | 124 |
| 8.7.8.1 | Description..... | 124 |
| 8.7.8.2 | Trigger Conditions..... | 124 |
| 8.7.8.3 | Attributes..... | 124 |
| 8.7.9 | ThresholdCrossedNotification..... | 124 |
| 8.7.9.1 | Description..... | 124 |
| 8.7.9.2 | Trigger Condition..... | 124 |
| 8.7.9.3 | Attributes..... | 124 |
| 8.8 | Information elements and notifications related to VNF Fault Management..... | 125 |
| 8.8.1 | Introduction..... | 125 |
| 8.8.2 | AlarmNotification..... | 125 |
| 8.8.2.1 | Description..... | 125 |
| 8.8.2.2 | Trigger conditions..... | 125 |
| 8.8.2.3 | Attributes..... | 125 |
| 8.8.3 | AlarmClearedNotification..... | 126 |
| 8.8.3.1 | Description..... | 126 |
| 8.8.3.2 | Trigger conditions..... | 126 |
| 8.8.3.3 | Attributes..... | 126 |
| 8.8.4 | Alarm information element..... | 126 |
| 8.8.4.1 | Description..... | 126 |
| 8.8.4.2 | Attributes..... | 126 |
| 8.8.5 | FaultyResourceInfo information element..... | 127 |
| 8.8.5.1 | Description..... | 127 |
| 8.8.5.2 | Attributes..... | 128 |
| 8.8.6 | AlarmListRebuiltNotification..... | 128 |
| 8.8.6.1 | Description..... | 128 |
| 8.8.6.2 | Trigger conditions..... | 128 |
| 8.8.6.3 | Attributes..... | 128 |
| 8.9 | Void..... | 128 |
| 8.10 | Information elements and notifications related to VNF Indicators..... | 128 |
| 8.10.1 | Introduction..... | 128 |
| 8.10.2 | IndicatorValueChangeNotification..... | 128 |
| 8.10.2.1 | Description..... | 128 |
| 8.10.2.2 | Trigger conditions..... | 128 |
| 8.10.2.3 | Attributes..... | 129 |
| 8.10.3 | IndicatorInformation information element..... | 129 |
| 8.10.3.1 | Description..... | 129 |
| 8.10.3.2 | Attributes..... | 129 |
| 8.11 | Notifications related to Virtualised Resources Quota..... | 129 |
| 8.11.1 | Introduction..... | 129 |
| 8.11.2 | VirtualisedResourceQuotaAvailableNotification..... | 129 |
| 8.11.2.1 | Description..... | 129 |
| 8.11.2.2 | Trigger Conditions..... | 129 |
| 8.11.2.3 | Attributes..... | 129 |
| 8.12 | Information elements and notifications related to multiple interfaces..... | 130 |
| 8.12.1 | Introduction..... | 130 |

| | | |
|--|--|------------|
| 8.12.2 | ExtVirtualLinkData information element | 130 |
| 8.12.2.1 | Description | 130 |
| 8.12.2.2 | Attributes | 130 |
| 8.12.2a | ExtLinkPortData information element | 131 |
| 8.12.2a.1 | Description | 131 |
| 8.12.2a.2 | Attributes | 131 |
| 8.12.3 | VnfExtCpData information element | 131 |
| 8.12.3.1 | Description | 131 |
| 8.12.3.2 | Attributes | 131 |
| 8.12.3a | VnfExtCpConfig information element | 132 |
| 8.12.3a.1 | Description | 132 |
| 8.12.3a.2 | Attributes | 132 |
| 8.12.4 | ExtManagedVirtualLinkData information element | 133 |
| 8.12.4.1 | Description | 133 |
| 8.12.4.2 | Attributes | 133 |
| 8.12.5 | VimConnectionInfo information element | 133 |
| 8.12.5.1 | Description | 133 |
| 8.12.5.2 | Attributes | 133 |
| Annex A (informative): Examples of VNF connectivity patterns | | 135 |
| A.1 | Introduction | 135 |
| A.2 | Example of a VNF with two different types of external connections points | 135 |
| A.3 | Example of changing VNF connectivity | 136 |
| Annex B (informative): Authors & contributors | | 137 |
| Annex C (informative): Change History | | 139 |
| History | | 150 |

iTeh STANDARD PREVIEW
 (standards.iteh.ai)
 Full standard:
<https://standards.iteh.ai/catalog/standard/sist/65144917-1311/4df0-93e7-0523e3d3d1b4/etsi-gs-nfv-ifa-007-v2.7.1-2019-09>