



GROUP SPECIFICATION

## **Network Functions Virtualisation (NFV) Release 4; Architectural Framework; VNF generic OAM functions specification**

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# Foreword

This Group Specification (GS) has been produced by ETSI Industry Specification Group (ISG) Network Functions Virtualisation (NFV).

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# 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 the VNF generic OAM functions framework. It also specifies the functional requirements and the interface requirements for VNF generic OAM functions. Specification of the interfaces exposed by the VNF generic OAM functions and the relevant information models are also provided like also a description of requirements and modelling of descriptors of VNF generic OAM functions.

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## 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.

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The following referenced documents are necessary for the application of the present document.

- [1] [ETSI GS NFV-IFA 011](#): "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; VNF Descriptor and Packaging Specification".

### 2.2 Informative references

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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] ETSI GR NFV-EVE 019 (V4.1.1): "Network Functions Virtualisation (NFV) Release 4; Architectural Framework; Report on VNF generic OAM functions".
- [i.3] ETSI GR NFV-IFA 029 (V3.3.1): "Network Functions Virtualisation (NFV) Release 3; Architecture; Report on the Enhancements of the NFV architecture towards "Cloud-native" and "PaaS"".
- [i.4] ETSI GR NFV-EVE 022 (V5.1.1): "Network Functions Virtualisation (NFV) Release 5; Architectural Framework; Report on VNF configuration".
- [i.5] ETSI GS NFV-IFA 008 (V4.5.1): "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Ve-Vnfm reference point - Interface and Information Model Specification".
- [i.6] ETSI GR NFV-IFA 041 (V4.1.1): "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Report on enabling autonomous management in NFV-MANO".

- [i.7] ETSI GS NFV-IFA 047 (V4.4.1): "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Management data analytics Service Interface and Information Model specification".
- [i.8] IEEE 1588-2019™: "IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems".

## 3 Definition of terms, symbols and abbreviations

### 3.1 Terms

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

**VNF generic OAM function:** function that provides in a generic form OAM capabilities applicable to any kind of VNFs

NOTE 1: These functions aim at the provisioning, connectivity, configuration and monitoring of one or more VNFs.

NOTE 2: The kinds of VNF concern to diverse VNF implementation approaches and diverse network functionality and services provided by the VNFs.

### 3.2 Symbols

Void.

### 3.3 Abbreviations

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

NOTE: An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in ETSI GR NFV 003 [i.1].

CRD	Custom Resource Definition
MCCO	Managed CIS Cluster Objects
MDAF	Management Data Analytics Function
NB-F	Northbound-Function
NB-M	Northbound-Management
SB-F	Southbound-Function
SB-V	Southbound-VNF

## 4 Overview of the VNF generic OAM functions framework

### 4.1 Introduction

ETSI GR NFV-EVE 019 [i.2] describes three solutions regarding the VNF generic OAM functions architectural framework and its interactions with the rest of the entities of the NFV ecosystem (i.e. NFV-MANO, NFVI, OSS/BSS and VNFs):

- In clause 6.3 of ETSI GR NFV-EVE 019 [i.2] solution A is described, introducing the set of VNF generic OAM functions as a new functional block capable to interact with NFV-MANO, OSS/BSS and the VNF instances.



- In clause 6.4 of ETSI GR NFV-EVE 019 [i.2] solution B is described (with two variations B1 and B2) considering extending existing functional blocks functionality by considering VNF generic OAM functions. For example, VNF generic OAM functions like the *Upgrade VNF* and *VNF configuration manager* are sorted as part of EM, while the functionality of other VNF generic OAM functions like the *log aggregator* and the *log* can interact directly with NFV-MANO.
- According to solution C described in clause 6.5 of ETSI GR NFV-EVE 019 [i.2], VNF generic OAM functions can be realized as VNF Common Services, offering services to multiple consumers. The solution considers VNF Common Services are PaaS services hosted by VNFs, as described in clause 7.1.1.2 of ETSI GR NFV-IFA 029 [i.3].

According to the analysis made in ETSI GR NFV-EVE 019 [i.2] the final recommendations describe that the overall design of the VNF generic OAM functions framework qualify solution A and solution C for further investigation. In the following a description of the VNF generic OAM functions framework is provided.

## 4.2 VNF generic OAM functions framework

### 4.2.1 Framework considerations and general functional requirements

#### 4.2.1.1 General functional requirements

The present clause specifies general requirements applicable to the VNF generic OAM functions framework and all the different types of VNF generic OAM functions.

The functional requirements defined in table 4.2.1.1-1 and table 4.2.1.1-2 are equally applicable to both VM-based and Container-based environments. Table 4.2.1.1-1 provides functional requirements for the VNF generic OAM framework.

**Table 4.2.1.1-1: General functional requirements related to VNF generic OAM functions framework**

Identifier	Recommendation description
VnfGenOam.Fwk.001	The VNF generic OAM functions framework shall unambiguously define basic types of VNF generic OAM functions. See note.
VnfGenOam.Fwk.002	The VNF generic OAM functions framework shall support the capability of VNF generic OAM functions to interoperate among themselves. See note.
NOTE:	By defining basic types of VNF generic OAM functions and identifying interoperability points, implementations can unambiguously define the functionalities offered by the solutions, even when these can perform an aggregation of the basic types of VNF generic OAM functions. For example, a "VNF metrics function" could support functionalities of a "VNF metrics aggregator" and "VNF metrics analyser".

Table 4.2.1.1-2 provides generic functional requirements for the VNF generic OAM functions.

**Table 4.2.1.1-2: General functional requirements related to VNF generic OAM functions**

Identifier	Recommendation description
VnfGenOam.GenFunc.001	A VNF generic OAM function shall support the capability to expose standard interfaces and operations related to the functionality of the VNF generic OAM function.
VnfGenOam.GenFunc.002	A VNF generic OAM function shall support the capability to be managed by a managing entity. See note 1.
VnfGenOam.GenFunc.003	A VNF generic OAM function shall support the capability of being consumed by any authorized entity like VNFs, NFV-MANO entities (FBs or functions), OSS/BSS, or other authorized VNF generic OAM function.
VnfGenOam.GenFunc.004	A VNF generic OAM function shall support the capability of being consumed/shared by one or multiple services/entities at a time (e.g. OSS and NFV-MANO)..
VnfGenOam.GenFunc.005	A VNF generic OAM function shall support the capability to handle multiple entities/instances at a time (e.g. multiple VNFs).
VnfGenOam.GenFunc.006	A VNF generic OAM function shall support the capability to support requesting specific operations to NFV-MANO, VNF/VNFC instances, NFVI/hosts, and other VNF generic OAM functions.
VnfGenOam.GenFunc.007	A VNF generic OAM function shall support the capability to have a lifecycle independent of any consumer of the VNF generic OAM function.
VnfGenOam.GenFunc.008	A VNF generic OAM function shall support the capability to be terminated in a graceful manner.
VnfGenOam.GenFunc.009	A VNF generic OAM function shall support the capability to be scaled. See note 2.
VnfGenOam.GenFunc.010	A VNF generic OAM function shall support the capability to send notifications and alerts to authorized consumers (see note 3).
NOTE 1: This concerns to the "manageability" of the VNF generic OAM function. This requirement implies that the VNF generic OAM function supports the capability to expose standard interfaces and operations to configure the VNF generic OAM function, to query information and supported functionality and capabilities, to enable the subscription to notifications provided by the VNF generic OAM function, and to expose metrics, logs and other information related to the VNF generic OAM function, including its lifecycle.	
NOTE 2: Irrelevant of the realization of the VNF generic OAM function, by being scalable, the VNF generic OAM function can adapt for the increasing/decreasing demand of services from/to the VNF generic OAM function.	
NOTE 3: Notifications can be used to support monitoring actions and troubleshooting, results reporting, etc.	

#### 4.2.1.2 Relationship between VNF Generic OAM functions and PaaS

A VNF generic OAM function can be realized as a PaaS service hosted by VNFs (see also solution C considered in ETSI GR NFV-EVE 019 [i.2]). PaaS services hosted by VNFs are described in clause 7.1.1.2 of ETSI GR NFV-IFA 029 [i.3]. ETSI GR NFV-IFA 029 [i.3] describes two additional models for realizing PaaS services:

- a) PaaS services as NFVI resources; and
- b) PaaS services as a new object class.

#### 4.2.1.3 Relationship between VNF Generic OAM functions and EMs

VNF generic OAM functions can be used to perform EM related operations like VNF configuration and/or exposure of the *Indicator* and *LCM Coordination* interfaces according to ETSI GS NFV-IFA 008 [i.5] in a generic simplified way. VNF generic OAM functions can interact with any type of VNFs and relax the restriction that the configuration of different VNF types is coupled with dedicated management systems (i.e. EMs).

#### 4.2.1.4 Relationship between VNF Generic OAM functions and MDA

The Management Data Analytics Function (MDAF) enables automation in NFV-MANO. The MDAF was firstly introduced in ETSI GR NFV-IFA 041 [i.6], while the relevant interfaces' specifications are in ETSI GS NFV-IFA 047 [i.7]. In the context of the VNF generic OAM functions, data analysis mechanisms have been introduced in the VNF Metrics Analyser and the Logs Analyser functions.

The intended functionality of MDAF and VNF metrics analyser and Log analyser are conceptually similar, nevertheless according to ETS NFV specifications there is no restriction or guidelines on how these can co-exist. For example, the VNF metrics analyser function and the Log analyser function could be used to provide input to MDAF by performing analytics pre-processing.

In the present document version, the VNF Metrics analyser function (for metrics) and the Log analyser function (for logs) expose in the northbound a data analytics interface. The fundamental difference between the two functions VNF generic OAM functions with MDAF is that the former can interact directly with the VNFs. This is not the case for MDAF which can collect VNF related data through VNFM and the relevant VNF indicators.

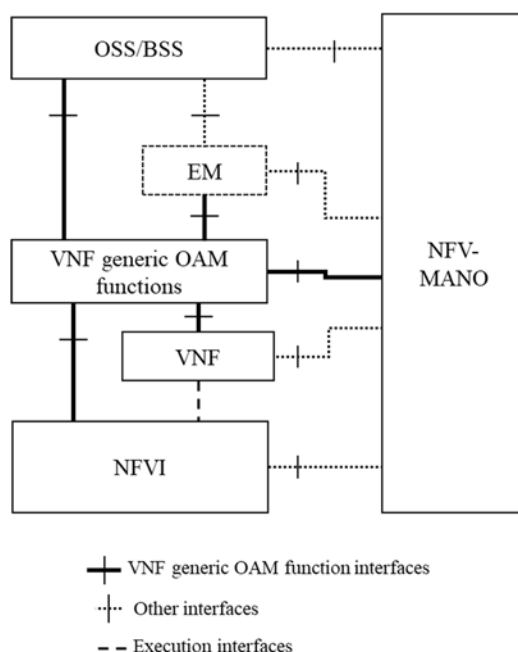
#### 4.2.1.5 Notifications management for VNF Generic OAM functions

In ETSI GR NFV-EVE 019 [i.2] the Notifications Manager function has been introduced as a VNF generic OAM function responsible for handling notifications sent by other VNF generic OAM functions and route them to authorised consumers. The present document version does not specify the relevant service interfaces and operations (e.g. to provide notifications about events generated by other VNF generic OAM functions and managing subscriptions to notifications).

NOTE: The specification is left for future versions of the present document.

### 4.2.2 Framework design

A visual representation of the VNF generic OAM functions framework is depicted in figure 4.2.2-1 reassembling properties from both Solution A in clause 6.2 and solution C in clause 6.5 of ETSI GR NFV-EVE 019 [i.2].



**Figure 4.2.2-1: VNF generic OAM functions framework**

A logical grouping of a set of different VNF generic OAM functions is considered. The set of VNF generic OAM functions can interact with other functional blocks and functions (like NFV-MANO, NFVI, etc.) over defined interfaces, either produced by the VNF generic OAM functions or produced by other functional blocks and functions. The logical set is not a managed object, rather each VNF generic OAM function can be operated and managed independently from others.

VNF generic OAM functions can be realized as PaaS services (i.e. PaaS service hosted by VNFs, PaaS services as NFVI resources or PaaS services as a new object class) by means of deployment and lifecycle management. VNF generic OAM functions can also be bundled in a modular way when being realized by respective forms of deployment.

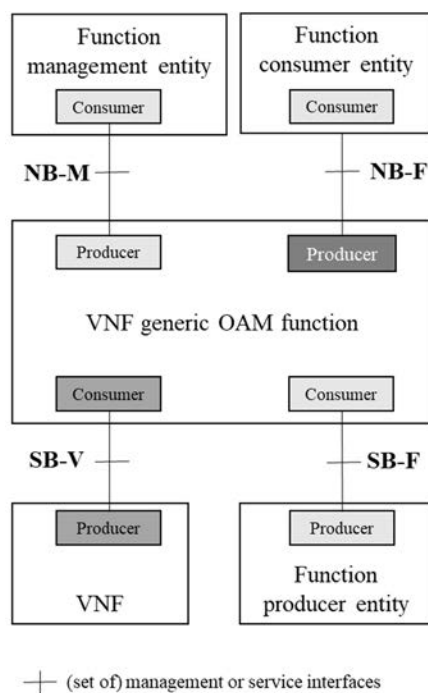
EXAMPLE: A "VNF metrics OAM function" can bundle modular individual VNF generic OAM functions such as a "VNF metrics aggregator function" and a "VNF metrics analyser function".

NOTE: Both VM-based and container-based VNF forms of deployment are possible. PaaS services management is out of the scope of the present document.

VNF generic OAM functions can interact with other entities on two major sets of interfaces categorized as "southbound" and "northbound". Northbound interfaces concern to the interfaces where the VNF generic OAM functions play the role of a "producer". Southbound interfaces comprise those where the VNF generic OAM functions play a role of "consumer" regarding the information and capabilities offered by another entity. More information about the interface and service level interactions is provided in clause 4.2.3.

### 4.2.3 Interface and service level interactions

For every VNF generic OAM function the following interfaces and service level interactions are considered, as depicted in figure 4.2.3-1.



**Figure 4.2.3-1: Interfaces and service level interactions of VNF generic OAM functions**

The set of interfaces and service level interactions of a VNF generic OAM function are categorized into two groups:

- Northbound: it comprises the set of interfaces and service level interactions on which the VNF generic OAM function primarily plays the role of a "producer" of interface and associated services.
- Southbound: it comprises the set of interfaces and service level interactions on which the VNF generic OAM function primarily plays the role of a "consumer" of interfaces and associated services produced by another entity.

The northbound set of interfaces is further split into:

- Northbound-Function (NB-F): interface(s) exposed by the VNF generic OAM function with specific functionality tailored to that VNF generic OAM function. The set of interfaces produced by each VNF generic OAM function are specified in clause 6.
- Northbound-Management (NB-M): interface(s) exposed by the VNF generic OAM function towards one or multiple corresponding management entity for the purpose of managing the VNF generic OAM function. The NB-M interface(s) are not specified in the present document since the relevant management entities are not defined in the present document either.

**NOTE:** For VNF generic OAM functions deployed as a PaaS service VNFs, VNF configuration methods described in ETSI GR NFV-EVE 022 [i.4] are also applicable for configuring VNF generic OAM functions.

The southbound set of interfaces is further split into:

- **Southbound-Function (SB-F):** to perform the intended functionality, a VNF generic OAM function can interact with different function producer entities (i.e. OSS, NFV-MANO, NFVI or other VNF generic OAM functions). In the case of inter-VNF generic OAM functions interactions, the consumer VNF generic OAM function consumes the NB-F interface of the producer VNF generic OAM function. In other cases, what interfaces are consumed by the VNF generic OAM function depend on the specific function producer entity, e.g. when interacting with NFV-MANO functional blocks and functions such as VNFM, CISM or VIM, the VNF generic OAM function consumes the authorized standard interfaces produced by the respective entity.
- **Southbound-VNF (SB-V):** it comprises the interface(s) used to interact with the VNF instances that are being managed with the VNF generic OAM function. The relevant service interaction requirements with VNF instances are specified in clause 8.

## 5 Functional requirements for VNF generic OAM functions

### 5.1 Introduction

This clause defines functional requirements for VNF generic OAM functions.

### 5.2 Functional requirements for VNF generic OAM function Traffic enforcer

Table 5.2-1 specifies functional requirements applicable to the Traffic enforcer function based on ETSI GR NFV-EVE 019 [i.2] clause 7.2.

**Table 5.2-1: Functional requirements to the Traffic enforcer function**

Numbering	Requirement
TrafficEnforcer.001	The Traffic enforcer function shall support the capability to perform traffic isolation and traffic rerouting of one or more VNFC instances (see note).
NOTE:	Traffic isolation can be partial or full (i.e. lowering the traffic sent to a VNFC instance) or full (i.e. blocking the traffic sent to a VNFC instance).

### 5.3 Functional requirements for VNF generic OAM function Network configuration manager

Table 5.3-1 specifies functional requirements applicable to the Network configuration manager function based on ETSI GR NFV-EVE 019 [i.2] clause 7.2.

**Table 5.3-1: Functional requirements to the Network configuration manager function**

Numbering	Requirement
NetConfMa.001	The Network configuration manager function shall support the capability to set network configuration information related to one or more VNF/VNFC instances.

### 5.4 Functional requirements for VNF generic OAM function Upgrade VNF

Table 5.4-1 specifies functional requirements applicable to the Upgrade VNF function based on ETSI GR NFV-EVE 019 [i.2] clause 7.2.

NOTE: Even though the function is named "Upgrade VNF", the function does not only support the upgrade, but also update procedures of a VNF, and in general on any kind of software modification involved.

**Table 5.4-1: Functional requirements to the Upgrade VNF**

Numbering	Requirement
UpgradeVNF.001	The Upgrade VNF function shall support the capability to modify the software of a VNF to another version (see note 1).
UpgradeVNF.002	The Upgrade VNF function shall support the capability to add an additional virtual resource to a VNFC instance during the process of VNF upgrading (see note 2).
UpgradeVNF.003	The Upgrade VNF function shall support the capability to coordinate among VNFs when modifying their software to run on another version (see note 3).
UpgradeVNF.004	The Upgrade VNF function shall support the capability to coordinate with other VNF generic OAM functions and/or NFV-MANO during the process of VNF software modification to address specific steps in the process (see note 4).
NOTE 1: Support to update software of VNF/VNFC, import new service name, import new certificate for other VNF in load balancer, setting configuration of CP in load balancer, etc.	
NOTE 2: Support adding CPU or memory, or adding or extending volume to use by extending the storage size, etc.	
NOTE 3: Reference to software images (VM or OS container images), database schema change, application configuration files, etc.	
NOTE 4: Examples are: to coordinate with the Network configuration manager to add network connectivity to new type of VNF instance, to coordinate with the VNF configuration manager to configure existing or new VNFC instances.	

## 5.5 Functional requirements for VNF generic OAM function Log aggregator

Table 5.5-1 specifies functional requirements applicable to the Log aggregator function based on ETSI GR NFV-EVE 019 [i.2] clause 7.2.

**Table 5.5-1: Functional requirements for the Log aggregator function**

Numbering	Requirement
LogAggregator.001	The Log aggregator function shall support the capability to collect different types of logs from different entities (e.g. VNF instances, NFV-MANO or NFVI) determined by a filter (see note 1).
LogAggregator.002	The Log aggregator function shall support the capability to pre-process the logs (see note 2).
LogAggregator.003	The Log aggregator function shall support the capability to aggregate the logs in a configurable manner (see note 3).
LogAggregator.004	The Log aggregator function shall support the capability to store historical log records (see note 4).
LogAggregator.005	The Log aggregator function shall support the capability to expose (filtered) logs to authorized consumers.
NOTE 1: The filter shall support filtering of VNF/VNFC instances by type of the VNF/VNFC, vendor, host, zone, VNF instance identifier, etc. Also it shall be able to filter by log attributes metric/log type, severity level, etc.	
NOTE 2: One form of pre-processing is to harmonize the format of the logs.	
NOTE 3: Examples of configurable forms of aggregation are to aggregate all logs based on criteria of log level, different instances belonging to the same VNF, VNF instances managed by the same VNFM, etc.	
NOTE 4: A use case to store historical log records is about using such records for further root-cause analysis.	

## 5.6 Functional requirements for VNF generic OAM function Log analyser

Table 5.6-1 specifies functional requirements applicable to the Log analyser function based on ETSI GR NFV-EVE 019 [i.2] clause 7.2.

**Table 5.6-1: Functional requirements for the Log analyser function**

Numbering	Requirement
LogAnalyser.001	The Log analyser function shall support to analyse and process different types of logs based on a set of analysis functions (see note 1).
LogAnalyser.002	The Log analyser function shall support configuration of the analytics/processing to be applied (see note 2).
LogAnalyser.003	The Log analyser function shall support the capability to send notifications based on findings from the analysis of the logs.
LogAnalyser.004	The Log analyser function shall support the capability to expose analytics results to authorized consumers.
NOTE 1: Examples of analysis functions are abnormal behaviour detection, threshold cross, statistical processing, correlation of logs, etc.	
NOTE 2: Examples of configuration forms of the analytics are set threshold, define the composition of the analytic function from a set of basic analytic functions, etc.	

## 5.7 Functional requirements for VNF generic OAM function VNF Metrics aggregator

Table 5.7-1 specifies functional requirements applicable to the VNF Metrics aggregator function based on ETSI GR NFV-EVE 019 [i.2], clause 7.2.

**Table 5.7-1: Functional requirements for the VNF Metrics aggregator function**

Numbering	Requirement
VNFMetricAggregator.001	The VNF Metrics aggregator function shall support the capability to collect different types of metrics from a set of VNF instances determined by a filter (see note 1).
VNFMetricAggregator.002	The VNF Metrics aggregator function shall support the capability to pre-process the metrics (see note 2).
VNFMetricAggregator.003	The VNF Metrics aggregator function shall support the capability to aggregate the metrics in a configurable manner (see note 3).
VNFMetricAggregator.004	The VNF Metrics aggregator function shall support the capability to store time series metrics for records (see note 4).
VNFMetricAggregator.005	The VNF Metrics aggregator function shall support the capability to expose (filtered) metrics to authorized consumers.
NOTE 1: The filter shall support filtering of VNF/VNFC instances by type of the VNF/VNFC, vendor, host, zone, VNF instance identifier, etc. Also it shall be able to filter by metric/log type, severity level, etc.	
NOTE 2: One form of pre-processing is to harmonize the format of the metrics.	
NOTE 3: Examples of configurable forms of aggregations are to aggregate all metrics related to performance, aggregate metrics from different instances belonging to the same VNF, aggregate metrics of VNF instances managed by the same VNFM, etc.	
NOTE 4: Use cases for storing time series of metrics are for instance using the stored metrics for further root-cause analysis, abnormal behaviour detection, etc.	

## 5.8 Functional requirements for VNF generic OAM function VNF Metrics analyser

Table 5.8-1 specifies functional requirements applicable to the VNF Metrics analyser function based on ETSI GR NFV-EVE 019 [i.2] clause 7.2.

**Table 5.8-1: Functional requirements for the VNF Metrics analyser function**

Numbering	Requirement
VNFMetricAnalyser.001	The VNF Metrics analyser function shall support the capability to analyse and process different types of metrics based on a set of analysis functions (see note 1).
VNFMetricAnalyser.002	The VNF Metrics analyser function shall support the capability to provide configuration of the analytics/processing of metrics to be applied (see note 2).
VNFMetricAnalyser.003	The VNF Metrics analyser function shall support the capability to send notifications based on findings from the analysis of the metrics.
VNFMetricAnalyser.004	The VNF Metrics analyser function shall support the capability to expose the metrics analytics results to authorized consumers.
NOTE 1: Examples of analysis functions are abnormal behaviour detection, threshold crossing, statistical processing, etc.	
NOTE 2: Examples of configuration forms of the analytics are set thresholds, define the composition of the analytic function from a set of basic analytic functions.	

## 5.9 Functional requirements for VNF generic OAM function Time function

Table 5.9-1 specifies functional requirements applicable to the Time function based on ETSI GR NFV-EVE 019 [i.2] clause 7.2.

**Table 5.9-1: Functional requirements for the Time function**

Numbering	Requirement
TimeFunction.001	The Time function shall support the capability to manage the synchronization between the system time of VNFs and their components.
TimeFunction.002	The Time function shall support the capability to configure the time protocol(s) used in the system (see note 2).
TimeFunction.003	The Time function shall support the capability to provide notifications and alerts to authorized consumers (see note 3).
TimeFunction.004	The Time function shall support the capability to record and provide logs to authorized consumers.
NOTE 1: Synchronization between VNFs is about preserving the time skew within a certain boundary, for the VNFs with time synchronization requirements.	
NOTE 2: The system is comprised by VNFs with time synchronization requirements and by other entities used to support synchronization (e.g. a master clock server). As an example, for the case of Precision Time Protocol (PTP), examples of configurable parameters are "slaveOnly", "priority1", etc.	
NOTE 3: Alerts triggered by the Time function can be used to support administrative actions and troubleshooting.	

## 5.10 Functional requirements for VNF generic OAM function VNF configuration manager function

Table 5.10-1 specifies functional requirements applicable to the VNF configuration manager function based on ETSI GR NFV-EVE 019 [i.2] clause 7.2.

**Table 5.10-1: Functional requirements for the VNF configuration manager function**

Numbering	Requirement
vnfConfigMgmt.001	The VNF configuration manager function shall support the capability to convey configuration information to one or more VNF/VNFC instances (see note 1).
vnfConfigMgmt.002	The VNF configuration manager function shall support the capability to query configuration information of VNF/VNFC instances (see note 2).
NOTE 1: Configuration information examples are virtualisation-dependent configurations (e.g. IP addresses set through NFV-MANO mechanisms) and certain virtualisation-independent configurations (e.g. thresholds related to the application load).	
NOTE 2: A query can be related to the fetching of the value of a specific configuration parameter.	



## 6 Interface requirements for VNF generic OAM functions

### 6.1 Introduction

This clause defines interface requirements for VNF generic OAM functions.

### 6.2 Interface requirements for VNF generic OAM function

#### 6.2.1 Interface requirements for VNF generic OAM function Traffic enforcer

Table 6.2.1-1 specifies requirements applicable to the Traffic enforcer function by means of exposed interfaces.

**Table 6.2.1-1: Requirements of the Traffic enforcer function by means of exposed interfaces**

Numbering	Requirement
TrafficEnforcerInf.001	The Traffic enforcer function shall support producing the traffic management Interface.

Table 6.2.1-2 specifies requirements applicable to the *traffic management Interface* supported by the traffic enforcer generic OAM function.

**Table 6.2.1-2: Interface requirements of the Traffic Management Interface**

Numbering	Requirement
TrafficEnf.Trafm.001	The Traffic Management Interface shall support the blocking and rerouting of traffic indicating selected VNFC Instances.

#### 6.2.2 Interface requirements for VNF generic OAM function Network configuration manager

Table 6.2.2-1 specifies requirements applicable to the Network configuration manager function by means of exposed interfaces.

**Table 6.2.2-1: Requirements of the Network configuration manager function by means of exposed interfaces**

Numbering	Requirement
NetConfMaInf.001	The Network configuration manager function shall support producing the Network configuration management Interface.

Table 6.2.2-2 specifies requirements applicable to the *Network configuration management Interface* supported by the Network configuration manager generic OAM function.

**Table 6.2.2-2: Interface requirements of the Network configuration management interface**

Numbering	Requirement
NetConfMa.NetConfm.001	The Network configuration management interface shall support configuring the network connectivity for the VNF/VNFC instances.

### 6.2.3 Interface requirements for VNF generic OAM function Upgrade VNF

Table 6.2.3-1 specifies requirements applicable to the Upgrade VNF function by means of exposed interfaces.

**Table 6.2.3-1: Requirements of the Upgrade VNF function by means of exposed interfaces**

Numbering	Requirement
UpgVNFInf.001	The Upgrade VNF function shall support producing the VNF Upgrade Management Interface.

Table 6.2.3-2 specifies requirements applicable to the *VNF Upgrade Management Interface* supported by the Upgrade VNF generic OAM function.

**Table 6.2.3-2: Interface requirements of the VNF Upgrade Management Interface**

Numbering	Requirement
UpgVNF.VNFUpgMa.001	The VNF Upgrade Management Interface shall support coordinating VNFs when modifying their software or configuration (see note 1).
UpgVNF.VNFUpgMa.002	The VNF Upgrade Management Interface shall support onboarding, deleting, and querying of VNF upgrade files (see note 2).
NOTE 1: The coordination might include installing new file(s) to the VNFC instances and/or configuration of resources related to the VNF. Coordination actions are also about adding network connectivity to the new type of VNF instance, i.e. support to update software of VNF/VNFC, import new service name, import new certificate for other VNF in load balancer, setting configuration of CP in load balancer, or trigger the addition of an additional virtual resource to a VNFC instance during the process of VNF upgrading, etc.	
NOTE 2: The VNF upgrade files might include configuration files, and modification process and coordination actions related files (e.g. new database schema, additional executables for the VNF).	

### 6.2.4 Interface requirements for VNF generic OAM function Log aggregator

Table 6.2.4-1 specifies requirements applicable to the Log aggregator VNF generic OAM function by means of exposed interfaces.

**Table 6.2.4-1: Requirements for the Log Aggregator function by means of exposed interfaces**

Numbering	Requirement
VNFLogAggregator.001	The VNF Log aggregator function shall support producing the Log Exposure Interface (see note).
NOTE: Refer to the support of capabilities of log collection by the log aggregator function specified in clause 8.2.	

Table 6.2.4-2 specifies requirements applicable to the *Log Exposure Interface* supported by the Log aggregator generic OAM function.

**Table 6.2.4-2: Interface requirements for the Log Exposure Interface**

Numbering	Requirement
LogAggr.Expose.001	The Log Exposure Interface shall support exposing the logs to authorized consumers.
LogAggr.Expose.002	The Log Exposure Interface shall support the capability to support filtering of the logs.

### 6.2.5 Interface requirements for VNF generic OAM function Log analyser

Table 6.2.5-1 specifies requirements applicable to the Log analyser VNF generic OAM function by means of exposed interfaces.

**Table 6.2.5-1: Requirements for the Log Analyser function by means of exposed interfaces**

Numbering	Requirement
VNFLogAnalyser.001	The VNF Log analyser function shall support producing the Log Analysis Exposure Interface.

Table 6.2.5-2 specifies requirements applicable to the *Log Analysis Exposure Interface* supported by the Log analyser generic OAM function.

**Table 6.2.5-2: Interface requirements for the Log Analysis Exposure Interface**

Numbering	Requirement
LogAnalyser.Expose.001	The Log Analysis Exposure Interface shall support exposing the logs analysis results to authorized consumers.
LogAnalyser.Expose.002	The Log Analysis Exposure Interface shall support configuring the processing of logs to be analysed.

## 6.2.6 Interface requirements for VNF generic OAM function VNF Metrics aggregator

Table 6.2.6-1 specifies requirements applicable to the Metrics aggregator VNF generic OAM function by means of exposed interfaces.

**Table 6.2.6-1: Requirements for the Metrics Aggregator function by means of exposed interfaces**

Numbering	Requirement
VNFMetricAggregator.001	The VNF Metrics aggregator function shall support producing the Metrics Exposure Interface (see note).
NOTE:	Refer to the support of capabilities of metrics collection by the metrics aggregator function specified in clause 8.2.

Table 6.2.6-2 specifies requirements applicable to the Metrics Exposure Interface supported by the Metrics aggregator generic OAM function.

**Table 6.2.6-2: Interface requirements for the Metrics Exposure Interface**

Numbering	Requirement
MetricAggr.Expose.001	The Metrics Exposure Interface shall support exposing the metrics to authorized consumers.
MetricAggr.Expose.002	The Metrics Exposure Interface shall support the capability to support filtering of the metrics.

## 6.2.7 Interface requirements for VNF generic OAM function VNF Metrics analyser

**Table 6.2.7-1: Requirements for the Metrics Analyser function by means of exposed interfaces**

Table 6.2.7-1 specifies requirements applicable to the Metrics analyser VNF generic OAM function by means of exposed interfaces.

Numbering	Requirement
VNFMetricAnalyser.001	The VNF Metrics analyser function shall support producing the Metrics Analysis Exposure Interface.

Table 6.2.7-2 specifies requirements applicable to the *Metrics Analysis Exposure Interface* supported by the Metrics analyser VNF generic OAM function.

**Table 6.2.7-2: Interface requirements for the Metrics Analysis Exposure Interface**

Numbering	Requirement
MetricAnalyser.Expose.001	The Metrics Analysis Exposure Interface shall support exposing the metrics analysis results to authorized consumers.
MetricAnalyser.Expose.002	The Metrics Analysis Exposure Interface shall support configuring the processing of metrics to be analysed.

## 6.2.8 Interface requirements for VNF generic OAM function Time function

Table 6.2.8-1 specifies requirements applicable to the Time function by means of exposed interfaces.

**Table 6.2.8-1: Requirements for the Time function by means of exposed interfaces**

Numbering	Requirement
TimeFuncInf.001	The Time function shall support producing the Time management interface.

Table 6.2.8-2 specifies requirements applicable to the *Time management interface* supported by the Time function.

**Table 6.2.8-2: Interface requirements for the Time management interface**

Numbering	Requirement
TimeFunc.Mgmt.001	The Time management interface shall support configuring the protocols used for time synchronization for VNF/VNFC instances with time synchronization requirements.
TimeFunc.Mgmt.002	The Time management interface shall support setting the time for VNF/VNFC instances with time synchronization requirements (see note 1).
TimeFunc.Mgmt.003	The Time management interface shall support exposing logs related to time protocol operations on VNF/VNFC instances (see note 2).
NOTE 1: Setting the time can involve different actions such as: providing specific time values to be set or forcing to synchronize the time to a source.	
NOTE 2: Time function can interact with the Log Aggregator function for logs collection related to time protocols operations.	

## 6.2.9 Interface requirements for VNF generic OAM function VNF configuration manager

Table 6.2.9-1 specifies requirements applicable to the VNF configuration manager function by means of exposed interfaces.

**Table 6.2.9-1: Requirements for the VNF configuration manager function by means of exposed interfaces**

Numbering	Requirement
VnfConfigMgmtFuncInf.001	The VNF configuration manager function shall support producing the VNF configuration management Interface.

Table 6.2.9-2 specifies requirements applicable to the *VNF configuration management Interface* supported by the VNF generic OAM function VNF configuration manager.

**Table 6.2.9-2: Interface requirements for the VNF configuration management interface**

Numbering	Requirement
VnfConfigMgmt.Conf.001	The VNF configuration management interface shall support configuring VNF/VNFC instances.
VnfConfigMgmt.Conf.002	The VNF configuration management interface shall support querying configuration information of VNF/VNFC instances.

## 6.3 Interface operations

### 6.3.1 Interface Operations on the Traffic Management Interface

#### 6.3.1.1 Description

This interface enables a consumer to manage traffic of one or more VNFC instances.

#### 6.3.1.2 Traffic Management

##### 6.3.1.2.1 Description

This operation enables the consumer to request to isolate from and reconnect traffic towards selected VNFC instances.

Table 6.3.1.2.1-1 lists the information flow exchanged between the consumer, e.g. another VNF Generic OAM function, NFV-MANO, or other management entities and the producer, that is the traffic enforcer.

**Table 6.3.1.2.1-1: Traffic Management operation**

Message	Requirement	Direction
TrafMaRequest	Mandatory	Consumer → Traffic enforcer
TrafMaResponse	Mandatory	Traffic enforcer → Consumer

##### 6.3.1.2.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.1.2.2-1.

**Table 6.3.1.2.2-1: Traffic management operation input parameters**

Parameter	Qualifier	Cardinality	Content	Description
vnfcInstanceId	M	1..N	Identifier	Identifier of the VNFC instance(s) requiring traffic management.
targetAction	M	1	Enum	Specifies the traffic control action.  VALUES: <ul style="list-style-type: none"> <li>FULL ISOLATE: Isolate specified VNFC instances from full incoming traffic</li> <li>PARTIAL ISOLATE: Isolate specified VNFC instances from partial incoming traffic (see note)</li> <li>RECONNECT: Reconnect specified VNFC instances for incoming traffic</li> </ul>
NOTE: Traffic isolation can be partial (i.e. blocking traffic destined to specific ports) or full (i.e. blocking the traffic sent to a VNFC instance).				

##### 6.3.1.2.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.1.2.3-1.

**Table 6.3.1.2.3-1: Traffic management operation output parameters**

Parameter	Qualifier	Cardinality	Content	Description
operationalResult	M	1	Not specified	Information about the traffic isolation and reconnection.

### 6.3.1.2.4 Operation results

After successful operation, the traffic of affected VNFC instances has been successfully controlled, e.g. the indicated VNFC instances have been traffic isolated or reconnected, dependent on the requested target action. The result of the operation indicates if it has been successful or not with a standard success/error result.

## 6.3.2 Interface Operations on the Network Configuration Management Interface

### 6.3.2.1 Description

This interface enables a consumer to set network configuration information to one or more VNF/VNFC instances.

### 6.3.2.2 Network configuration management

#### 6.3.2.2.1 Description

This operation enables the generic OAM function to configure the network connectivity for the VNF/VNFC instances.

Table 6.3.2.2.1-1 lists the information flow exchanged between the consumer, e.g. another VNF Generic OAM function, NFV-MANO, or other management entities and the producer, that is the network configuration manager.

**Table 6.3.2.2.1-1: Network configuration management operation**

Message	Requirement	Direction
NetConfMa Request	Mandatory	Consumer → Network configuration manager
NetConfMa Response	Mandatory	Network configuration manager → Consumer

#### 6.3.2.2.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.2.2.2-1.

**Table 6.3.2.2.2-1: Network configuration management input parameters**

Parameter	Qualifier	Cardinality	Content	Description
vnfInstancelid	M	0..1	Identifier	Identifier of the VNF instance for which the network connectivity is to be configured (see note 1 and note 2).
vnfcInstancelid	M	0..1	Identifier	Identifier of the VNFC instance for which the network connectivity is to be configured (see note 1 and note 2).
cpConfig	M	1..N	CpConfigInfo	The external CP instance(s) of the VNF/VNFC instance and the configuration information to be applied.

NOTE 1: Only one of vnfInstancelid and vnfcInstancelid shall be present.  
NOTE 2: Whether the Identifier specifies a set of VNFs/VNFCs will be investigated as part of stage 3 activities.

#### 6.3.2.2.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.2.2.3-1.

**Table 6.3.2.2.3-1: Network configuration management output parameters**

Parameter	Qualifier	Cardinality	Content	Description
operationalResult	M	1	Not specified	Information about the network configuring.

#### 6.3.2.2.4 Operation results

After successful operation, network configuration manager notifies to consumer about completion of network configuration. The result of the operation indicates if it has been successful or not with a standard success/error result.

### 6.3.3 Interface Operations on the VNF Upgrade Management Interface

#### 6.3.3.1 Description

This interface shall allow the consumer to request VNF upgrade operations to be performed by the Upgrade VNF function.

The VNF Upgrade management interface shall support the following operations:

- VNF upgrade management operation
- Onboarding VNF upgrade files
- Deleting VNF upgrade files
- Querying VNF upgrade files

#### 6.3.3.2 VNF upgrade management operation

##### 6.3.3.2.1 Description

This operation enables the consumer to request to upgrade VNF/VNFC instances with new software version, virtualised resources, configurations, etc.

Table 6.3.3.2.1-1 lists the information flow exchanged between the consumer, e.g. another VNF Generic OAM function, NFV-MANO, or other management entities and the producer, that is the Upgrade VNF function.

**Table 6.3.3.2.1-1: VNF upgrade management operation**

Message	Requirement	Direction
upgradeVNFRequest	Mandatory	Consumer → Upgrade VNF function
upgradeVNFResponse	Mandatory	Upgrade VNF function → Consumer

##### 6.3.3.2.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.3.2.2-1.

**Table 6.3.3.2.2-1: VNF upgrade management input parameters**

Parameter	Qualifier	Cardinality	Content	Description
vnfInstanceld	M	0..1	Identifier	Identifier of the VNF instance to be upgraded (see note1).
vnfcInstanceld	M	0..1	Identifier	Identifier of the VNFC instance to be upgraded (see note1).
configurableProperties	M	0..N	KeyValuePair	Updated values for configurable properties (see note 2).
fileInfold	M	1..N	Identifier	Identifier of the VNF upgrade file define by the file provider.
NOTE 1: Only one of vnfInstanceld and vnfcInstanceld shall be present.				
NOTE 2: During the upgrade process changes of connectivity can be expected and the appropriate input parameters can be considered.				

##### 6.3.3.2.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.3.2.3-1.

**Table 6.3.3.2.3-1: VNF upgrade management output parameters**

Parameter	Qualifier	Cardinality	Content	Description
UpgradeResult	M	1	Not specified	Information about the upgrade result.

### 6.3.3.2.4 Operation results

After successful operation, the Upgrade VNF function notifies to consumer about completion of the upgrade. The result of the operation indicates if it has been successful or not with a standard success/error result.

### 6.3.3.3 Onboarding VNF upgrade files

#### 6.3.3.3.1 Description

This operation enables the consumer to request to onboard VNF upgrade files for the VNF/VNFC instances.

Table 6.3.3.3.1-1 lists the information flow exchanged between the consumer, e.g. another Generic OAM function, NFV-MANO, or other management entities and the producer, that is the Upgrade VNF function.

**Table 6.3.3.3.1-1: Onboarding VNF upgrade files operation**

Message	Requirement	Direction
OnboardVNFUpgFileRequest	Mandatory	Consumer → Upgrade VNF function
OnboardVNFUpgFileResponse	Mandatory	Upgrade VNF function → Consumer

#### 6.3.3.3.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.3.3.2-1.

**Table 6.3.3.3.2-1: Onboarding VNF upgrade files input parameters**

Parameter	Qualifier	Cardinality	Content	Description
upgradeFileInfo	M	1..N	UpgFileData	Information about VNF upgrade file(s).

#### 6.3.3.3.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.3.3.3-1.

**Table 6.3.3.3.3-1: Onboarding VNF upgrade files output parameters**

Parameter	Qualifier	Cardinality	Content	Description
fileInfoId	M	0..N	Identifier	Identifier(s) of the on-boarded VNF upgrade file(s)

### 6.3.3.3.4 Operation results

After successful operation, the Upgrade VNF function notifies to consumer about completion of onboarding VNF upgrade files. The result of the operation indicates if it has been successful or not with a standard success/error result.

### 6.3.3.4 Deleting VNF upgrade files

#### 6.3.3.4.1 Description

This operation enables the consumer to delete VNF upgrade files for the VNF/VNFC instances.

Table 6.3.3.4.1-1 lists the information flow exchanged between the consumer, e.g. another Generic OAM function, NFV-MANO, or other management entities and the producer, that is the Upgrade VNF function.



**Table 6.3.3.4.1-1: Deleting VNF upgrade files operation**

Message	Requirement	Direction
DeleteVNFUpgFileRequest	Mandatory	Consumer → Upgrade VNF function
DeleteVNFUpgFileResponse	Mandatory	Upgrade VNF function → Consumer

#### 6.3.3.4.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.3.4.2-1.

**Table 6.3.3.4.2-1: Deleting VNF upgrade files input parameters**

Parameter	Qualifier	Cardinality	Content	Description
fileInfold	M	1..N	Identifier	Identifier(s) for the VNF upgrade file(s).

#### 6.3.3.4.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.3.4.3-1.

**Table 6.3.3.4.3-1: Deleting VNF upgrade files output parameters**

Parameter	Qualifier	Cardinality	Content	Description
deletedFileInfold	M	0..N	Identifier	Identifier(s) of the deleted VNF Upgrade file.

#### 6.3.3.4.4 Operation results

After successful operation, the Upgrade VNF function notifies to consumer about completion of deleting VNF upgrade files. The result of the operation indicates if it has been successful or not with a standard success/error result.

### 6.3.3.5 Querying VNF upgrade files

#### 6.3.3.5.1 Description

This operation enables consumer to query the Upgrade VNF function about VNF upgrade files for the VNF/VNFC instances.

Table 6.3.3.5.1-1 lists the information flow exchanged between the consumer, e.g. another Generic OAM function, NFV-MANO, or other management entities and the producer, that is the Upgrade VNF function.

**Table 6.3.3.5.1-1: Querying VNF upgrade files operation**

Message	Requirement	Direction
QueryVNFUpgFileRequest	Mandatory	Consumer → Upgrade VNF function
QueryVNFUpgFileResponse	Mandatory	Upgrade VNF function → Consumer

#### 6.3.3.5.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.3.5.2-1.

**Table 6.3.3.5.2-1: Querying VNF upgrade files input parameters**

Parameter	Qualifier	Cardinality	Content	Description
filter	M	1	Not specified	Filtering criteria to select one or more VNF upgrade file(s) information (see note).

NOTE: Specification of filtering mechanism is part of the protocol design.

### 6.3.3.5.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.3.5.3-1.

**Table 6.3.3.5.3-1: Querying VNF upgrade files output parameters**

Parameter	Qualifier	Cardinality	Content	Description
queryFileInfoResult	M	0..N	FileInfo	Information about the VNF upgrade file(s) matching the query.
NOTE: The lower cardinality is 0 since there may be no matches to the provided filter.				

### 6.3.3.5.4 Operation results

After successful operation, the consumer has queried the VNF upgrade file querying results. The result of the operation indicates if it has been successful or not with a standard success/error result. For a particular query, information about the VNF upgrade file querying result that are matching with the filter shall be returned.

## 6.3.4 Interface Operations on the Log Aggregator Exposure Interface

### 6.3.4.1 Description

This interface enables a consumer to access log aggregator results.

### 6.3.4.2 Exposing Log aggregator results

#### 6.3.4.2.1 Description

This operation enables the consumer to request the Log aggregator to expose the aggregated log results.

Table 6.3.4.2.1-1 lists the information flow exchanged between the consumer, e.g. another VNF generic OAM function, NFV-MANO, or other management entities and the producer, that is the VNF log aggregator.

**Table 6.3.4.2.1-1: Exposing Log aggregator result operation**

Message	Requirement	Direction
LogRequest	Mandatory	Consumer → Log aggregator
LogResponse	Mandatory	Log aggregator → Consumer

#### 6.3.4.2.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.4.2.2-1.

**Table 6.3.4.2.2-1: Exposing Log aggregator result operation input parameters**

Parameter	Qualifier	Cardinality	Content	Description
Filter	M	1	Not specified	Filtering criteria to select one or a set of logs (see note)
NOTE: Specification of filtering mechanism is part of the protocol design.				

#### 6.3.4.2.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.4.2.3-1.

**Table 6.3.4.2.3-1: Exposing Log aggregator result operation output parameters**

Parameter	Qualifier	Cardinality	Content	Description
queryResult	M	0..N	LogAggregateOutput	Information about the log(s) matching the query.

#### 6.3.4.2.4 Output parameters

After successful operation, the consumer has queried the log aggregator results. The result of the operation indicates if it has been successful or not with a standard success/error result. For a particular query, information about the log aggregator result that are matching the filter shall be returned.

### 6.3.5 Interface Operations on the Log Analysis Exposure Interface

#### 6.3.5.1 Description

This interface enables a consumer to access log analysis results.

#### 6.3.5.2 Exposing Log Analysis results

##### 6.3.5.2.1 Description

This operation enables the consumer to request the log analysis results from the Log analyser.

Table 6.3.5.2.1-1 lists the information flow exchanged between the consumer, e.g. another VNF generic OAM function, NFV-MANO, or other management entities and the producer, that is the Log analyser.

**Table 6.3.5.2.1-1: Exposing Log analysis result operation**

Message	Requirement	Direction
LogInfoRequest	Mandatory	Consumer → Log analyser
LogInfoResponse	Mandatory	Log analyser → Consumer

##### 6.3.5.2.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.5.2.2-1.

**Table 6.3.5.2.2-1: Exposing Log analysis result operation input parameters**

Parameter	Qualifier	Cardinality	Content	Description
Filter	M	1	Not specified	Filtering criteria to select one or a set of log analysis result (see note).
NOTE: Specification of filtering mechanism is part of the protocol design.				

##### 6.3.5.2.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.5.2.3-1.

**Table 6.3.5.2.3-1: Exposing Log analysis result operation output parameters**

Parameter	Qualifier	Cardinality	Content	Description
queryResult	M	0..N	LogAnalysisOutput	Information about the logs matching the query.

##### 6.3.5.2.4 Operation results

After successful operation, the consumer has queried the log analyser results. The result of the operation indicates if it has been successful or not with a standard success/error result. For a particular query, information about the log analysis result that are matching with the filter shall be returned.

## 6.3.6 Interface Operations on the Metrics Exposure Interface

### 6.3.6.1 Description

This interface enables a consumer to access metrics aggregator results.

### 6.3.6.2 Exposing Metrics aggregator results

#### 6.3.6.2.1 Description

This operation enables VNF metrics aggregator to expose the metrics aggregator results to an authorized consumer.

Table 6.3.6.2.1-1 lists the information flow exchanged between the consumer, e.g. another VNF generic OAM function, NFV-MANO, or other management entities and the producer, that is the VNF metrics aggregator.

**Table 6.3.6.2.1-1: Exposing Metrics aggregator result operation**

Message	Requirement	Direction
MetricRequest	Mandatory	Consumer → VNF metrics aggregator
MetricResponse	Mandatory	VNF metrics aggregator → Consumer

#### 6.3.6.2.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.6.2.2-1.

**Table 6.3.6.2.2-1: Exposing Metrics aggregator result operation input parameters**

Parameter	Qualifier	Cardinality	Content	Description
Filter	M	1	Not specified	Filtering criteria to select one or a set of metrics. The filter shall support to specify which vnf instances the metrics information is requested to be collected, and to be capable to aggregate all metrics related to performance, aggregate metrics from different instances belonging to the same VNF, aggregate metrics of VNF instances managed by the same VNFM, etc. (see note).
NOTE: Specification of filtering mechanism is part of the protocol design.				

#### 6.3.6.2.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.6.2.3-1.

**Table 6.3.6.2.3-1: Exposing Metrics aggregator result operation output parameters**

Parameter	Qualifier	Cardinality	Content	Description
queryResult	M	0..N	Not specified	Information about the metrics matching the query.

#### 6.3.6.2.4 Operation results

After successful operation, the consumer has queried the metrics aggregator result. The result of the operation indicates if it has been successful or not with a standard success/error result. For a particular query, information about the metrics aggregator result that are matching the filter shall be returned.

## 6.3.7 Interface Operations on the Metrics Analysis Exposure Interface

### 6.3.7.1 Description

This interface enables a consumer to access metrics analysis results.

### 6.3.7.2 Exposing Metrics Analysis results

#### 6.3.7.2.1 Description

This operation enables the consumer to request the VNF metrics analyser function to expose the metrics analysis results to an authorized consumer.

Table 6.3.7.2.1-1 lists the information flow exchanged between the consumer, e.g. another VNF generic OAM function, NFV-MANO, or other management entities and the producer, that is the VNF metrics analyser.

**Table 6.3.7.2.1-1: Exposing Metrics analysis result operation**

Message	Requirement	Direction
MetricInfoRequest	Mandatory	Consumer → VNF metrics analyser
MetricInfoResponse	Mandatory	VNF metrics analyser → Consumer

#### 6.3.7.2.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.7.2.2-1.

**Table 6.3.7.2.2-1: Exposing Metrics analysis result operation input parameters**

Parameter	Qualifier	Cardinality	Content	Description
Filter	M	1	Not specified	Filtering criteria to select one or a set of metrics analysis result. The filter to specify on which vnf instances the metrics information is requested to be collected (see note).
MetricsAnalysisConfig	M	1	Not specified	The configuration for the metrics analysis. The configuration shall support specifying the metrics to be analysed, the analysis functions, and metrics thresholds.

NOTE: Specification of filtering mechanism is part of the protocol design.

#### 6.3.7.2.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.7.2.3-1.

**Table 6.3.7.2.3-1: Exposing Metrics analysis result operation output parameters**

Parameter	Qualifier	Cardinality	Content	Description
queryResult	M	0..N	MetricsAnalysisOutput	Information about the metrics matching the query.

#### 6.3.7.2.4 Operation results

After successful operation, the consumer has queried the metric analyser results. The result of the operation indicates if it has been successful or not with a standard success/error result. For a particular query, information about the metrics analysis result that are matching with the filter shall be returned.

## 6.3.8 Interface Operations on the Time Management Interface

### 6.3.8.1 Description

The Time management interface enables the consumer to request the Time function to configure parameters relate to time synchronization to the VNF/VNFC instances.

### 6.3.8.2 Time function configuration

#### 6.3.8.2.1 Description

This operation enables the consumer to request to configure time protocols and/or setting the time function for VNF/VNFC instances with time synchronization requirements.

Table 6.3.8.2.1-1 lists the information flow exchanged between the Time function and a consumer of the interface, e.g. OSS/BSS, another Generic OAM function, NFV-MANO, or other management entities.

**Table 6.3.8.2.1-1: Time function configuration operation**

Message	Requirement	Direction
TimeConfigRequest	Mandatory	Consumer → Time function
TimeConfigResponse	Mandatory	Time function → Consumer

#### 6.3.8.2.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.8.2.2-1.

**Table 6.3.8.2.2-1: Time function configuration operation input parameters**

Parameter	Qualifier	Cardinality	Content	Description
vnfInstanceId	M	1	Identifier	Identifier of the VNF instance to be configured.
vnfcInstanceId	M	0..1	Identifier	Identifier of the VNFC instance to be configured, in case the configuration concerns to a specific VNFC.
timeConfig	M	0..1	Not specified	The timeConfig provides values for the time protocol configuration e.g. specifies clock mode, clock priority, etc. Examples of time protocols are IEEE 1588 [i.8], etc.

#### 6.3.8.2.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.8.2.3-1.

**Table 6.3.8.2.3-1: Time function configuration operation output parameters**

Parameter	Qualifier	Cardinality	Content	Description
operationalResult	M	1	Not specified	Information about the Time function configuring.

#### 6.3.8.2.4 Output results

After successful operation, time function configuration notifies to consumer about completion of time function configuration. The result of the operation indicates if it has been successful or not with a standard success/error result.

## 6.3.9 Interface Operations for the VNF generic OAM function VNF configuration manager

### 6.3.9.1 Description

The VNF configuration management interface shall support the following operations:

- Set VNF configuration
- Query VNF configuration information

### 6.3.9.2 Set VNF configuration operation

#### 6.3.9.2.1 Description

This operation enables the consumer to request to configure VNF/VNFC instances.

Table 6.3.9.2.1-1 lists the information flow exchanged between the consumer, e.g. another VNF generic OAM function, NFV-MANO, or other management entities and the producer, that is the VNF configuration manager.

**Table 6.3.9.2.1-1: VNF Configuration operation**

Message	Requirement	Direction
SetConfigRequest	Mandatory	Consumer → VNF Configuration Manager
SetConfigResponse	Mandatory	VNF Configuration Manager → Consumer

#### 6.3.9.2.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.9.2.2-1.

**Table 6.3.9.2.2-1: VNF Configuration operation input parameters**

Parameter	Qualifier	Cardinality	Content	Description
vnfInstanceId	M	1	Identifier	Identifier of the VNF instance to be configured.
vnfcInstanceId	M	0..1	Identifier	Identifier of the VNFC instance to be configured, in case the configuration concerns to a specific VNFC.
Configuration	M	1	Not specified	Information about the configuration that needs to be applied in the VNF/VNFC instances.

#### 6.3.9.2.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.9.2.3-1.

**Table 6.3.9.2.3-1: VNF Configuration operation output parameters**

Parameter	Qualifier	Cardinality	Content	Description
operationalResult	M	1	Not specified	Information about the success and failure of configuration.

#### 6.3.9.2.4 Output results

After successful operation, VNF configuration manager function notifies the consumer about completion of the VNF/VNFC configuration. The result of the operation indicates if it has been successful or not with a standard success/error result.

### 6.3.9.3 Query VNF configuration information operation

#### 6.3.9.3.1 Description

This operation enables the consumer to be able to query VNF configuration of VNF/VNFC instances.

Table 6.3.9.3.1-1 lists the information flow exchanged between the consumer, e.g. another VNF generic OAM function, NFV-MANO, or other management entities and the producer, that is the VNF configuration manager.

**Table 6.3.9.3.1-1: Query VNF Configuration operation**

Message	Requirement	Direction
QueryConfigRequestI	Mandatory	Consumer → VNF Configuration Manager
QueryConfigResponse	Mandatory	VNF Configuration Manager → Consumer

#### 6.3.9.3.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.3.9.3.2-1.

**Table 6.3.9.3.2-1: Query VNF configuration operation input parameters**

Parameter	Qualifier	Cardinality	Content	Description
filter	M	1	Not specified	Filtering criteria to select one or a set of configuration information (see note). The filter to specify on which VNF/VNFC instances the configuration information is requested to be collected (see note).

NOTE: Specification of filtering mechanism is part of the protocol design.

#### 6.3.9.3.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.3.9.3.3-1.

**Table 6.3.9.3.3-1: Querying VNF configuration operation output parameters**

Parameter	Qualifier	Cardinality	Content	Description
queryResult	M	0..N	Not specified	Information about the VNF configuration matching the query.

#### 6.3.9.3.4 Output results

After successful operation, the consumer has received from the VNF configuration manager querying results. The result of the operation indicates if it has been successful or not with a standard success/error result. For a particular query, information about the VNF configuration querying result that are matching with the filter shall be returned.

---

## 7 Information elements exchanged

### 7.1 Introduction

This clause defines, or references, definitions of information elements used in the interfaces defined in the present document.

The specification of the following information elements is part of the protocol design:

- String.



- Integer.
- Identifier.
- Filter.
- DateTime.
- Value.
- Version.
- KeyValuePair.

## 7.2 Information elements related to Network Configuration Management interface

### 7.2.1 Introduction

This clause defines information elements related to the Network Configuration Management Interface.

### 7.2.2 CpConfigInfo information element

#### 7.2.2.1 Description

This data type provides the list of attributes for the CpConfigInfo information element.

#### 7.2.2.2 Attributes

The CpConfigInfo information element shall follow the indications provided in table 7.2.2.2-1.

**Table 7.2.2.2-1: Attributes of the CpConfigInfo information element**

Parameter	Qualifier	Cardinality	Content	Description
cpInstancelId	M	1	Identifier	Identifier of the external CP instance(s) of the VNF/VNFC instance to be configured.
cpConfig	M	1	Not specified	Configuration information of the external CP instance(s) to be configured, including the information of the CP address, and the protocol that use for CP connection.

## 7.3 Information elements related to VNF Upgrade Management interface

### 7.3.1 Introduction

This clause defines information elements related to the VNF Upgrade Management interface.

### 7.3.2 UpgFileData information element

#### 7.3.2.1 Description

This data type provides the list of attributes for the UpgFileData information element.

### 7.3.2.2 Attributes

The UpgFileData information element shall follow the indications provided in table 7.3.2.2-1.

**Table 7.3.2.2-1: Attributes of the UpgFileData information element**

Parameter	Qualifier	Cardinality	Content	Description
fileInfold	M	1	Identifier	Identifier of the VNF upgrade file define by the file provider.
upgFileDescription	M	1	String	Human-readable description of the VNF Upgrade file.
fileAccessLocation	M	1	String	Information about the VNF upgrade file access address.
installationScriptLocation	M	0..1	String	Information about the access address of the installation script used for installing the VNF upgrade file.
version	M	1	Version	Version of the VNF Upgrade file.

### 7.3.3 FileInfo information element

#### 7.3.3.1 Description

This data type provides the list of attributes for the FileInfo information element.

#### 7.3.3.2 Attributes

The FileInfo information element shall follow the indications provided in table 7.3.3.2-1.

**Table 7.3.3.2-1: Attributes of the FileInfo information element**

Parameter	Qualifier	Cardinality	Content	Description
fileInfold	M	1	Identifier	Identifier of the VNF upgrade file defined by the file provider.
fileDescription	M	1	String	Human-readable description of the VNF upgrade file.
fileAccessLocation	M	1	String	Information about the VNF upgrade file access address.
installationScriptLocation	M	0..1	String	Information about the access address of the installation script used for installing the VNF upgrade file.
version	M	1	Version	Version of the VNF upgrade file.

## 7.4 Information elements related to the VNF Log Aggregator Exposure interface

### 7.4.1 Introduction

This clause defines information elements related to the VNF Log aggregator.

### 7.4.2 LogAggregateOutput information element

#### 7.4.2.1 Description

This data type provides the list of attributes for the LogAggregateOutput information element.

### 7.4.2.2 Attributes

The LogAggregateOutput information element shall follow the indications provided in table 7.4.2.2-1.

**Table 7.4.2.2-1: Attributes of the LogAggregateOutput information element**

Attribute	Qualifier	Cardinality	Content	Description
logAggregateId	M	1	Identifier	Identifier of the log aggregator output.
aggregateOutputGenerationTime	M	1	DateTime	The time when the log aggregator output is generated.
typeSpecificOutput	M	1	Not specified	The output information specific to the type of log aggregate.

## 7.5 Information elements related to the Log Analysis exposure interface

### 7.5.1 Introduction

This clause defines information elements related to the Metrics Exposure Interface.

### 7.5.2 LogAnalysisOutput information element

#### 7.5.2.1 Description

This data type provides the list of attributes for the LogAnalysisOutput information element.

#### 7.5.2.2 Attributes

The LogAnalysisOutput information element shall follow the indications provided in table 7.5.2.2-1.

**Table 7.5.2.2-1: Attributes of the LogAnalysisOutput information element**

Attribute	Qualifier	Cardinality	Content	Description
logAnalysisType	M	1	Not specified	The type of a log analysis type (e.g. root cause analysis of VNF faults)
logAnalysisId	M	1	Identifier	Identifier of the Log analysis output.
logAnalysisOutputGenerationTime	M	1	DateTime	The time when the log analysis output is generated.
typeSpecificOutput	M	1	Not specified	The output information specific to the log analysis type.

## 7.6 Information elements related to the VNF Metrics Analysis Exposure interface

### 7.6.1 Introduction

This clause defines information elements related to the VNF Metrics analysis generic OAM function exposure interface.

### 7.6.2 MetricsAnalysisOutput information element

#### 7.6.2.1 Description

This data type provides the list of attributes for the MetricsAnalysisOutput information element.

### 7.6.2.2 Attributes

The MetricsAnalysisOutput information element shall follow the indications provided in table 7.6.2.2-1.

**Table 7.6.2.2-1: Attributes of the MetricsAnalysisOutput information element**

Attribute	Qualifier	Cardinality	Content	Description
analyticsType	M	1	String	The type of a metrics analytics process (e.g. "Network service alarm incident analysis", "Network service health analysis", "Network service resource utilization analysis", etc.)
analyticsId	M	1	Identifier	Identifier of the metrics analytics output.
analyticsOutputGenerationTime	M	1	DateTime	The time when the metrics analytics output is generated.
typeSpecificOutput	M	1	Not specified	The output information specific to the type of metrics analytics.
recommendedActions	M	0..1	Not specified	Recommended actions to follow up according to the output of data analytics. In case there are no recommended actions described, then these can be decided by a consumer of the interface.

## 8 Service interaction requirements with VNFs

### 8.1 Introduction

As specified in clause 4.2.2 the Southbound-VNF (SB-V) is comprised of a set of interfaces used to interact with the VNF instances that make use of the VNF generic OAM function. Clause 8 specifies service interaction requirements for the interaction between VNF generic OAM functions and VNFs.

### 8.2 Service interaction requirements on SB-V

Table 8.2-1 provides service interaction requirements applicable to the SB-V interfaces.

**Table 8.2-1: Service interaction requirements on SB-V**

Identifier	Service interaction requirement	Additional description and relevant functional requirements
sb-v.001	The SB-V interface shall support the capability to support interactions between VNF generic OAM functions and VNFs for management purposes.	This requirement also expresses that VNF supports one or multiple means of management offered by the VNF generic OAM functions. How the connectivity is established between VNFs and VNF generic OAM functions is out of scope of the present document.  Reference requirements: <ul style="list-style-type: none"> <li>VnfGenOam.GenFunc.003</li> </ul>
sb-v.002	For configuration purposes of the VNF, the SB-V shall support the capabilities to convey configuration data via push mechanisms.	See note 1.  Push mechanism refers to the methods by which the VNF generic OAM function provides the configuration data into the VNF instance.  Reference requirements: <ul style="list-style-type: none"> <li>TrafficEnforcer.001</li> <li>NetConfMa.001</li> <li>UpgradeVNF.001</li> <li>TimeFunc.Mgmt.001</li> <li>VnfConfigMgmt.Conf.001</li> </ul>

Identifier	Service interaction requirement	Additional description and relevant functional requirements
sb-v.003	For configuration purposes of the VNF, the SB-V shall support the capabilities to convey configuration data via pull mechanisms.	<p>Pull mechanism refers to the methods by the VNF instance can retrieve the configuration data from the VNF generic OAM function.</p> <p>Reference requirements:</p> <ul style="list-style-type: none"> <li>• TrafficEnforcer.001</li> <li>• NetConfMa.001</li> <li>• UpgradeVNF.001</li> <li>• TimeFunc.Mgmt.001</li> <li>• VnfConfigMgmt.Conf.001</li> </ul>
sb-v.004	For monitoring purposes of the VNF, the SB-V shall support the capability to transfer PM/FM metrics to a VNF generic OAM function via streaming mechanisms. See note 2.	<p>See note 2.</p> <p>Reference requirements:</p> <ul style="list-style-type: none"> <li>• VNFMetricAggregator.001</li> </ul>
sb-v.005	For monitoring purposes of the VNF, the SB-V shall support the capability to transfer PM/FM metrics to a VNF generic OAM function via file-based mechanisms. See note 2.	<p>See note 2.</p> <p>Reference requirements:</p> <ul style="list-style-type: none"> <li>• VNFMetricAggregator.001</li> </ul>
sb-v.006	For logging purposes of the VNF, the SB-V shall support the capability to retrieve and pull logging data from a VNF instance. See note 3.	<p>See note 3.</p> <p>Reference requirements:</p> <ul style="list-style-type: none"> <li>• LogAggregator.001</li> </ul>
sb-v.007	For logging purposes of the VNF, the SB-V shall support the capability to transfer and collect events (or messages) with logging data from a VNF instance. See note 3.	<p>See note 3.</p> <p>Reference requirements:</p> <ul style="list-style-type: none"> <li>• LogAggregator.001</li> </ul>
<p>NOTE 1: This requirement is applicable to the case of VNF configuration manager, the Network configuration manager, the Traffic enforcer, the Time function and the Upgrade VNF function.</p> <p>NOTE 2: This is applicable to the case of the VNF metrics aggregator.</p> <p>NOTE 3: This is applicable to the case of the Log aggregator.</p>		

## 9 Descriptors for VNF generic OAM functions

### 9.1 Introduction

As VNF generic OAM functions are closely related to PaaS services, in practice different implementations can rely on different approaches on the way VNF generic OAM functions can be realized. As studied by ETSI GR NFV-IFA 029 [i.3], PaaS services can be deployed as VNFs or can be realized as NFVI resources or as a new managed object class.

Due to the different means and possibilities of deployment and the specific characteristics of VNF generic OAM functions, the description of VNF generic OAM functions is split into two main parts:

- Deployment and lifecycle management of the VNF generic OAM function (see clause 9.2). These are further referred as "deployment and lifecycle descriptors of a VNF generic OAM function".
- Description of the characteristics and capabilities of the VNF generic OAM function (see clause 9.3). These are referred as "descriptor of VNF generic OAM function characteristics".

The characteristics descriptor of a VNF generic OAM function supports the registration, inventory and discovery processes of VNF generic OAM functions by NFV-MANO. By being able to express the capability of and requirement on specific VNF generic OAM functions, NFV-MANO can use such information to determine various aspects regarding the VNF generic OAM functions such as when:

- Onboarding of VNF generic OAM functions, i.e. cataloguing VNF generic OAM functions that are ready for deployment. The information in the descriptors can be consumed directly by NFV-MANO.
- Registering information about capabilities and other properties of VNF generic OAM functions into the inventory runtime information about instantiated VNF generic OAM functions. The information in the descriptors is consumed directly by NFV-MANO when performing the registration.

- Discovering the capabilities and properties of instantiated VNF generic OAM from the registry. The information in the descriptors is consumed indirectly by NFV-MANO based on what has previously been registered.
- "Binding" VNF generic OAM functions to its managed VNF instances, i.e. establishing the association between which VNF instances make use of which VNF generic OAM functions. The information in the descriptors is consumed indirectly by NFV-MANO based on what has previously been registered.

Irrelevant of the form of deployment adopted, the specification of the descriptors for VNF generic OAM functions shall consider:

- a) The general functional requirements as described in table 4.2.1.1-1 and table 4.2.1.1-2 in clause 4.2.1.1.
- b) A unique descriptor irrelevant of the VNF generic OAM function type (e.g. Traffic enforcer, Metrics Aggregator, etc.).
- c) Reusing the corresponding standardized deployment descriptors and packaging formats.

## 9.2 Descriptors overview for VNF generic OAM function

### 9.2.1 Overview

As introduced in clause 9.1, VNF generic OAM functions can be deployed, and their lifecycle be managed using different forms. Based on the concept of VNF Common/Dedicated Service as described in ETSI GR NFV-IFA 029 [i.3] PaaS services can be deployed as VNFs or can be realized as NFVI resources or as a new object class.

Clause 9.2 specifies the requirements regarding the deployment and lifecycle descriptors for VNF generic OAM functions.

### 9.2.2 VNF generic OAM function deployed as a "VNF"

In the case a VNF generic OAM function is deployed and managed as a VNF, the requirements and information modelling specified in ETSI GS NFV-IFA 011 [1] shall apply regarding the descriptors and packaging of the VNF generic OAM function.

### 9.2.3 VNF generic OAM function deployed as an "NFVI resource"

NOTE: The specification of descriptors for deployment of PaaS Services as one or multiple virtualised resources offered as a new type of NFVI resource is not completed. Therefore, the present document version does not specify related requirements.

### 9.2.4 VNF generic OAM function deployed as a "managed CIS cluster object"

NOTE: The specification of descriptors for deployment of PaaS Services as one or multiple Managed CIS Cluster Objects (MCCO) is not completed. Therefore, the present document version does not specify related requirements.

## 9.3 Characteristics description of a VNF generic OAM function

### 9.3.1 Characteristics descriptor requirements

**Table 9.3-1: Requirements related to the description of the characteristics and capabilities of VNF generic OAM functions**

Identifier	Requirement
VnfGenOam.Desc.001	The characteristics descriptor of a VNF generic OAM function shall support uniquely identifying a VNF generic OAM function.
VnfGenOam.Desc.002	The characteristics descriptor of a VNF generic OAM function shall support specifying the following metadata of a VNF generic OAM function: version, provider, name and product description of the VNF generic OAM function.
VnfGenOam.Desc.003	The characteristics descriptor of a VNF generic OAM function shall support describing the type of a VNF generic OAM function.
VnfGenOam.Desc.004	The characteristics descriptor of a VNF generic OAM function shall support describing the characteristics of a VNF generic OAM function according to its type (see note 1)
VnfGenOam.Desc.005	The characteristics descriptor of a VNF generic OAM function shall support describing the form of deployment and lifecycle management of a VNF generic OAM function.
VnfGenOam.Desc.006	The characteristics descriptor of a VNF generic OAM function shall support describing the supported northbound-management (NB-M) interfaces exposed by the VNF generic OAM function and their version.
VnfGenOam.Desc.007	The characteristics descriptor of a VNF generic OAM function shall support describing the supported northbound-function (NB-F) interfaces exposed by the VNF generic OAM function and their version.
VnfGenOam.Desc.008	The characteristics descriptor of a VNF generic OAM function shall support describing the supported interactions in the southbound with VNFs. See note 1.
VnfGenOam.Desc.009	The characteristics descriptor of a VNF generic OAM function shall support describing the supported interactions in the southbound with other entities (i.e. OSS, NFV-MANO, NFVI or other VNF generic OAM functions). See note 2.
NOTE 1: Examples of characteristics of a VNF generic OAM function according to its type, are data models used for configuration for the case of VNF configuration manager.	
NOTE 2: See clause 4.2.3 regarding the SB-V interfaces consumed and exposed by the VNF generic OAM function.	
NOTE 3: See clause 4.2.3 regarding the SB-F interfaces consumed by the VNF generic OAM function.	

## Annex A (informative): Change History

Date	Version	Information about changes
June 2022	V0.0.1	Skeleton and ToC
July 2022	V0.0.2	<p>Update with contributions:</p> <p>NFVIFA(22)000419r1_FEAT24_IFA049_Overview of the VNF generic OAM functions framework</p> <p>NFVIFA(22)000422r3_FEAT24_IFA049_Functional requirements for VNF generic OAM function Traffic enforcer function</p> <p>NFVIFA(22)000435_FEAT24_IFA049_Functional requirements for VNF generic OAM function Network configuration manager</p> <p>NFVIFA(22)000445r2_FEAT24_IFA049_Functional_requirements_for_VNF_generic_OAM_Metric_analyser</p> <p>NFVIFA(22)000443r3_FEAT24_IFA049_Functional_requirements_for_VNF_generic_OAM_Log_analyser</p> <p>NFVIFA(22)000441r3_FEAT24_IFA049_Functional_requirements_for_VNF_generic_OAM_Log_aggregator</p> <p>NFVIFA(22)000444r3_FEAT24_IFA049_Functional_requirements_for_VNF_generic_OAM_Metric_aggregator</p> <p>NFVIFA(22)000475r2_FEAT24_IFA049_Functional requirements for VNF generic OAM function Upgrade VNF</p> <p>NFVIFA(22)000493r1_FEAT24_IFA049_requirements for the generic OAM framework</p> <p>NFVIFA(22)000518_FEAT24_IFA049_generic_OAM_framework_considerations</p> <p>NFVIFA(22)000540r2_FEAT24_IFA049_Functional requirements for VNF generic OAM function Traffic enforcer function</p>
September 2022	V0.0.3	<p>NFVIFA(22)000541r2_FEAT24_IFA049_Interface requirements for VNF generic OAM function Traffic enforcer function</p> <p>NFVIFA(22)000542r2_FEAT24_IFA049_Interface requirements for VNF generic OAM function VNF metrics aggregator function</p> <p>NFVIFA(22)000562_FEAT24_IFA049_Interface requirements for VNF generic OAM function VNF metrics analyser</p> <p>NFVIFA(22)000567r1_FEAT24_IFA049_Interface requirements for VNF generic OAM function Network configuration manager</p> <p>NFVIFA(22)000591r2_FEAT24_IFA049_Interface requirements for VNF generic OAM function Upgrade VNF</p> <p>NFVIFA(22)000593r1_FEAT24_IFA049_Interface requirements for VNF generic OAM function VNF log analyser</p> <p>NFVIFA(22)000594_FEAT24_IFA049_Interface requirements for VNF generic OAM function VNF Log aggregator function</p>
December 2022	V0.0.4	<p>NFVIFA(22)000755r1_FEAT24_IFA049_VNF generic OAM functions framework</p> <p>NFVIFA(22)000756r2_FEAT24_IFA049_Description for interface and service level interactions</p> <p>NFVIFA(22)000674r5_FEAT24_IFA049_Interface_requirement_VNF_generic_OAM_Metric_A</p> <p>NFVIFA(22)000673r5FEAT24_IFA049_Interface_requirement_VNF_generic_OAM_Metric_Analyser_Clause6.y</p> <p>NFVIFA(22)000713r2_FEAT24_IFA049_Interface_requirement_VNF_generic_OAM_Log_Analy</p> <p>NFVIFA(22)000714r3_FEAT24_IFA049_Interface_requirement_VNF_generic_OAM_Log_Aggr</p> <p>NFVIFA(22)000812_FEAT24_IFA049_Remove policy management requirements on Traffic management function and Traffic management function interface</p> <p>NFVIFA(22)000813r4_FEAT24_IFA049_Operation requirements on interface VNF generic OAM function Traffic Management Interface</p>



Date	Version	Information about changes
		NFVIFA(22)000814r3 FEAT24 IFA049 Operation requirements on interface VNF generic OAM function Network Configuration Management Interface NFVIFA(22)000815r4 FEAT24 IFA049 Operation requirements on interface VNF generic OAM function VNF Upgrade Management Interface NFVIFA(22)000859r1 FEAT24 IFA049 Functional requirements for the Time Function NFVIFA(22)000860r2 FEAT24 IFA049 Functional requirements for the VNF configuration manager function NFVIFA(22)000861r1 FEAT24 IFA049 Interface requirements for the Time Function NFVIFA(22)000862r1 FEAT24 IFA049 Interface requirements for the VNF Configuration Manager Function NFVIFA(22)000864r3 FEAT24 IFA049 Operation requirements on interface VNF generic OAM function Metrics Analysis, Metrics Aggregator, Log Analyser and Log Aggregator Exposure Interface NFVIFA(22)000872r1 FEAT24 IFA049 VNF service interactions requirements NFVIFA(22)000909r1_FEAT24_IFA049_Information_elements_related_to_Network_Config
February 2023	V0.0.5	NFVIFA(22)000910r3_FEAT24_IFA049_Information_elementsrelated_to_VNF_Upgrade_Man NFVIFA(22)000889r4_FEAT24_IFA049_Information_element_exchange_Metrics_aggre gato NFVIFA(22)000890r3 FEAT24 IFA049 Information elements exchange for VNF generic OAM function Metrics Analysis NFVIFA(22)000981r2 FEAT24 IFA049 Information elements exchange for VNF generic OAM function Metrics Analysis
March 2023	V0.0.6	NFVIFA(22)000072r1 FEAT24 IFA049 Information elements exchange for VNF generic OAM function Log Analysis NFVIFA(22)000073r1 FEAT24 IFA049 Information elements exchange for VNF generic OAM function Log Aggregator NFVIFA(22)000938r3 FEAT24 IFA049 VNF generic functions descriptors NFVIFA(23)000107 FEAT24 IFA049 Editorial cleanup clause 4.2 NFVIFA(23)000123 FEAT24 IFA049 Interface operations for the VNF generic OAM function VNF Configuration Manager NFVIFA(23)000124r2 FEAT24 IFA049 Interface operations for the VNF generic OAM Time function NFVIFA(23)000138r1 FEAT24 IFA049 Information elements related to the Editor notes in clauses 5, 6 and 7
April 2023	V0.0.7	NFVIFA(23)000139r1_FEAT24_IFA049_remove_G-OAM_analysis_related_clauses_ NFVIFA(23)000175r1_FEAT24_IFA049_VNF_generic_functions_descriptors- clasue_9_3 NFVIFA(23)000179_FEAT24_IFA049_VNF_generic_OAM_Editor_Notes_Clause6_3_2_2_2 NFVIFA(23)000180_FEAT24_IFA049__address_EN_for_clause_6_2_3_and_clause_6_3_3_3 NFVIFA(23)000182_FEAT24_IFA049_Remove_Annex_A__Example_realizations NFVIFA(23)000188_FEAT24_IFA049_VNF_generic_functions_ENs_handling-part_1_2 NFVIFA(23)000195r2_FEAT24_IFA049_VNF_generic_OAM_Editor_Notes_Clause6_2_4 NFVIFA(23)000238_FEAT24_IFA049_VNF_generic_OAM_Editor_Notes_Clause6_3_3_2_2
May 2023	V0.1.0	NFVIFA(23)000268r1 FEAT24 IFA049 1 scope and 3 Definition NFVIFA(23)000296r1 FEAT24 IFA049 VNF generic functions handling ENs (clauses 6.3.8 and 9.1) NFVIFA(23)000305r1 FEAT24 IFA049 handling ENs related to MDAF NFVIFA(23)000307 FEAT24 IFA049 Information elements related to the Editor notes in clause 6.2.6
June 2023	V0.3.0	NFVIFA(23)000331r1 FEAT24 IFA049 handling ENs related to notifications management NFVIFA(23)000475r1 FEAT24 IFA049-final review-editorial corrections NFVIFA(23)000476r1 FEAT24 IFA049-final review-technical corrections NFVIFA(23)000486r1 FEAT24 IFA049 final review comments

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# History

<b>Document history</b>		
V4.4.1	August 2023	Publication