



Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Management data analytics Service Interface and Information Model Specification

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Reference

DGS/NFV-IFA047

Keywords

MANO, MDAF, NFV

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Foreword

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

Modal verbs terminology

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1 Scope

The present document specifies the service requirements for the Management Data Analytics (MDA) Function (MDAF). It also specifies corresponding service interfaces produced by the MDAF, as well as the information elements exposed by the service interface operations.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference>.

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

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

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI GR NFV 003: "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".
- [i.2] ETSI GR NFV-IFA 041: "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Report on Enabling Autonomous Management in NFV-MANO".
- [i.3] ETSI GS NFV-IFA 013: "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Os-Ma-nfvo reference point - Interface and Information Model Specification".
- [i.4] ETSI GS NFV-IFA 027: "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Performance Measurements Specification".
- [i.5] ETSI GS NFV-IFA 007: "Network Functions Virtualisation (NFV) Release 4; Management and Orchestration; Or-vnfm reference point - Interface and Information Model Specification".

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

Management Data Analytics Function (MDAF): function that processes and analyses management data to provide analytics outputs

NOTE 1: The MDAF can exploit Artificial Intelligence (AI) and/or Machine Learning (ML) models in its analytics process.

NOTE 2: The analytics outputs can enable next step actions for network operations and maintenance.

3.2 Symbols

Void.

3.3 Abbreviations

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

AI	Artificial Intelligence
MDA	Management Data Analytics
MDAF	Management Data Analytics Function
ML	Machine Learning

4 Overview

4.1 Introduction

ETSI GR NFV-IFA 041 [i.2] studies various aspects of management data analytics in the context of NFV and describes the functionality related to the management data analytics. Such functionality is composed into the following NFV-MANO function:

- Management Data Analytics Function (MDAF)

The MDAF is responsible for processing and analysing management data to provide analytics outputs upon requests from a consumer. The functional requirements for the MDAF specified in ETSI GS NFV-IFA 010 [1] shall apply.

The present document specifies the requirements on the services to be provided by the MDAF, and on the associated management service interfaces exposed to NFV-MANO functional blocks (i.e. the NFVO) and/or other OSS entities external to NFV-MANO.

4.2 MDA services

The MDAF offers one or multiple MDA services, which are exposed by corresponding data analytics service interface named MDA-1. ML model training services may be offered by the MDAF but these are not specified in the present document version.

Figure 4.2-1 illustrates the MDA-1 interface exposed by the MDA Producer to offer its MDA services to the MDA Consumer. The MDAF acts as the MDA Producer, and the MDA Consumer can be either the NFVO or other OSS entities external to NFV-MANO.

In the context of the present document, MDA services are exposed through northbound management interfaces produced by the MDAF, which is capable to handle the management data analytics request for the NFV-MANO management domain.

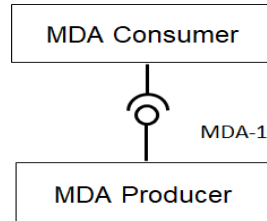


Figure 4.2-1: Interface model of MDA services

5 MDAF service requirements

5.1 Introduction

Clause 5 of the present document specifies the set of requirements applicable to interfaces exposing MDA services offered by the MDAF.

5.2 General MDA service requirements

Table 5.2-1 specifies requirements applicable to the services provided by the MDAF.

Table 5.2-1: MDA service requirements

Identifier	Requirement
MdaSvc.001	The MDAF shall provide a data analytics service.

5.3 Data analytics service interface requirements

Table 5.3-1 specifies the requirements applicable to the interface of the data analytics service produced by the MDAF.

Table 5.3-1: Data analytics service interface requirements

Identifier	Requirement
DaMgt.001	The data analytics service interface produced by the MDAF shall support data analytics operations on a certain type.
DaMgt.002	The data analytics service interface produced by the MDAF shall support providing notifications about events related to data analytics processing to the MDA Consumer.
DaMgt.003	The data analytics service interface produced by the MDAF shall support managing subscriptions to notifications about events related to data analytics processing.
DaMgt.004	The data analytics service interface produced by the MDAF shall support querying and retrieving data analytics outputs.

6 MDAF service interfaces

6.1 Introduction

Clause 6 of the present document defines the service interfaces exposed by the MDAF towards the MDA Consumer.

NOTE: The fact that information elements and attributes are presented in tabular form does not preclude protocol designs in which these information elements and attributes are encoded in different parts of request and response messages. For example, in a RESTful interface, parts of them can be encoded in the URL, in the message header, in the message body or any combination thereof.

6.2 Data analytics service interface (MDA-1)

6.2.1 Description

This interface allows the MDA Consumer to invoke data analytics operations towards the MDAF. This interface is named MDA-1, as described in clause 4.2.

6.2.2 Data analytics operation

6.2.2.1 Description

This operation initiates a data analytics process on a certain type of analytics. Table 6.2.2.1-1 lists the information flow exchanged between the MDA Consumer and the MDAF.

Table 6.2.2.1-1: Data analytics operation

Message	Requirement	Direction
DataAnalyticsRequest	Mandatory	MDA Consumer → MDAF
DataAnalyticsResponse	Mandatory	MDAF → MDA Consumer

6.2.2.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.2.2.2-1.

Table 6.2.2.2-1: Data analytics operation input parameters

Parameter	Qualifier	Cardinality	Content	Description
mDAType	M	1	String	The type of a data analytics process. Examples of types of data analytics include "Network service alarm incident analysis", "Network service health analysis", "Network service resource utilization analysis", etc.
controlAttributes	M	1	ControlAttributes	Control attributes associated to a data analytics process, to guide the output of the data analytics process.
NOTE: The type of a data analytics process indicates the subject (e.g. NS alarm incident) to be analysed. Machine-processable values of strings are left up to protocol design stage to be determined.				

6.2.2.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.2.2.3-1.

Table 6.2.2.3-1: Data analytics operation output parameters

Parameter	Qualifier	Cardinality	Content	Description
analyticsId	M	1	Identifier	The identifier generated by the MDAF used to identify the data analytics process and the associated data analytics output. This identifier is later used in the associated notification informing about the data analytics process.

6.2.2.4 Operation results

In case of success, a data analytics process has been initiated in the MDAF. If the control attributes cannot fit in with the type of the data analytics, the operation shall be rejected.

In case of failure, appropriate error information is returned.

6.2.3 Notify operation

6.2.3.1 Description

This operation notifies a subscriber about events related to data analytics changes, e.g. the start or result of a data analytics process (asynchronous operation).

This operation distributes notifications to subscribers. It is a one-way operation issued by the producer (MDAF) that cannot be invoked as an operation by the consumer (MDA Consumer). In order to receive notifications, the consumer (MDA Consumer) shall perform an explicit Subscribe operation beforehand.

Table 6.2.3.1-1 lists the information flow exchanged between the MDAF and the MDA Consumer.

Table 6.2.3.1-1: Notify operation

Message	Requirement	Direction
Notify	Mandatory	MDAF → MDA Consumer

The following notifications can be notified/sent by this operation:

- DataAnalyticsChangeNotification (see clause 7.2.2).

6.2.4 Subscribe operation

6.2.4.1 Description

This operation enables the MDA Consumer to subscribe with a filter for the notifications sent by the MDAF which are related to data analytics changes.

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

Table 6.2.4.1-1 lists the information flow exchanged between the MDAF and the MDA Consumer.

Table 6.2.4.1-1: Subscribe operation

Message	Requirement	Direction
SubscribeRequest	Mandatory	MDA Consumer → MDAF
SubscribeResponse	Mandatory	MDAF → MDA Consumer

6.2.4.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.2.4.2-1.

Table 6.2.4.2-1: Subscribe operation input parameters

Parameter	Qualifier	Cardinality	Content	Description
filter	M	1	Filter	Input filter for selecting e.g. the NFV-MANO object instances or MDA types of interest.

6.2.4.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.2.4.3-1.

Table 6.2.4.3-1: Subscribe operation output parameters

Parameter	Qualifier	Cardinality	Content	Description
subscriptionId	M	1	Identifier	Identifier of the subscription realized.

6.2.4.4 Operation results

After successful subscription, the consumer (MDA Consumer) is registered to receive notifications related to data analytics changes.

The result of the operation shall indicate if the subscription has been successful or not with a standard success/error result. For a particular subscription, only notifications matching the filter will be delivered to the consumer.

6.2.5 Terminate Subscription operation

6.2.5.1 Description

This operation enables the MDA Consumer to terminate a particular subscription.

Table 6.2.5.1-1 lists the information flow exchanged between the MDA Consumer and the MDAF.

Table 6.2.5.1-1: Terminate Subscription operation

Message	Requirement	Direction
TerminateSubscriptionRequest	Mandatory	MDA Consumer → MDAF
TerminateSubscriptionResponse	Mandatory	MDAF → MDA Consumer

6.2.5.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.2.5.2-1.

Table 6.2.5.2-1: Terminate Subscription operation input parameters

Parameter	Qualifier	Cardinality	Content	Description
subscriptionId	M	1	Identifier	Identifier of the subscription to be terminated.

6.2.5.3 Output parameters

None.

6.2.5.4 Operation results

After successful termination of a subscription, the identified subscription does not exist anymore, and the MDA Consumer will not receive notifications related that subscription any longer. The result of the operation shall indicate if the subscription termination has been successful or not with a standard success/error result.

6.2.6 Query Subscription Info operation

6.2.6.1 Description

This operation enables the MDA Consumer to query information about subscriptions.

Table 6.2.6.1-1 lists the information flow exchanged between the MDA Consumer and the MDAF.

Table 6.2.6.1-1: Query Subscription operation

Message	Requirement	Direction
QuerySubscriptionInfoRequest	Mandatory	MDA Consumer → MDAF
QuerySubscriptionInfoResponse	Mandatory	MDAF → MDA Consumer

6.2.6.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.2.6.2-1.

Table 6.2.6.2-1: Query Subscription Info operation input parameters

Parameter	Qualifier	Cardinality	Content	Description
filter	M	1	Filter	Filtering criteria to select one or a set of subscriptions. Details are part of the protocol design.

6.2.6.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.2.6.3-1.

Table 6.2.6.3-1: Query Subscription Info operation output parameters

Parameter	Qualifier	Cardinality	Content	Description
queryResult	M	0..N	Not specified	Information about the subscription(s) matching the query.

6.2.6.4 Operation results

After successful operation, the MDAF has queried the internal subscription objects. 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 subscriptions to notifications related to data analytics change that the MDA Consumer has access to and that are matching the filter shall be returned.

6.2.7 Query data analytics output operation

6.2.7.1 Description

This operation enables the MDA Consumer to query the MDAF information about data analytics outputs. The applicable data analytics outputs can be chosen based on filtering criteria, and the information can be restricted to selected attributes.

Table 6.2.7.1-1 lists the information flow exchanged between the MDA Consumer and the MDAF.

Table 6.2.7.1-1: Query data analytics output operation

Message	Requirement	Direction
QueryDataAnalyticsOutputRequest	Mandatory	MDA Consumer → MDAF
QueryDataAnalyticsOutputResponse	Mandatory	MDAF → MDA Consumer

6.2.7.2 Input parameters

The input parameters sent when invoking the operation shall follow the indications provided in table 6.2.7.2-1.

Table 6.2.7.2-1: Query data analytics output operation input parameters

Parameter	Qualifier	Cardinality	Content	Description
filter	M	1	Filter	Filter to select the data analytics outputs about which information is queried.
attributeSelector	M	0..N	String	Provides a list of attribute names. If present, only these attributes are returned for the data analytics output(s) matching the filter. If absent, the complete information is returned for the data analytics output(s) matching the filter.

6.2.7.3 Output parameters

The output parameters returned by the operation shall follow the indications provided in table 6.2.7.3-1.

Table 6.2.7.3-1: Query data analytics output operation output parameters

Parameter	Qualifier	Cardinality	Content	Description
analyticsOutput	M	0..N	AnalyticsOutput	The information items about the selected data analytics outputs that are returned. If attributeSelector is present, only the attributes listed in the attributeSelector are returned for the selected data analytics output(s). See note.
NOTE: The lower cardinality is "0" since there can be no matches to the provided filter.				

6.2.7.4 Operation results

In case of success, information related to the data analytics outputs that match the filter is returned. In case of failure, appropriate error information is returned.

7 Information elements

7.1 Information elements related to data analytics

7.1.1 Introduction

This clause defines information elements related to data analytics.

7.1.2 ControlAttributes information element

7.1.2.1 Description

The ControlAttributes information element provides control information for the data analytics output.

NOTE: The present document version does not specify the support to control when or the periodicity at which the MDAF will provide the data analytics output.

7.1.2.2 Attributes

The ControlAttributes information element shall follow the indications provided in table 7.1.2.2-1.

Table 7.1.2.2-1: Attributes of the ControlAttributes information element

Attribute	Qualifier	Cardinality	Content	Description
analyticsCollectionInterval	M	1	Not specified	Specifies the time interval of management data to be used in the data analytics process. For instance, it enables the consumer to indicate that the processing of the data analytics output is requested to consider analytics data generated in a given interval of time, e.g. the last 24 hours. See note 3.
locationAreald	M	0..N	Identifier	Indicates location areas from which available management data is to be involved in the data analytics process. See note 1 and note 2.
objectInstanceld	M	0..N	Identifier	Identifies the NFV-MANO managed object instances (e.g. NS instances, VNF instances) to be involved in the data analytics process. See note 1.
NOTE 1: At least one of the following attributes shall be present: locationAreald or objectInstanceld.				
NOTE 2: Examples of location areas are NFVI-PoPs, resource zones, CIS clusters, container namespaces, etc.				
NOTE 3: The present document does not specify how to control to/from the MDAF the availability of "historical" analytics data to be considered for the data analytics process.				

7.1.3 AnalyticsOutput information element

7.1.3.1 Description

This information element provides information about output of a data analytics process.

7.1.3.2 Attributes

The AnalyticsOutput information element shall follow the indications provided in table 7.1.3.2-1.

Table 7.1.3.2-1: Attributes of the AnalyticsOutput information element

Attribute	Qualifier	Cardinality	Content	Description
mDAType	M	1	String	The type of a data analytics process. Examples of types of data analytics include "Network service alarm incident analysis", "Network service health analysis", "Network service resource utilization analysis", etc.
analyticsId	M	1	Identifier	Identifier of the data analytics output.
analyticsOutputGenerationTime	M	0..1	DateTime	The time when the data analytics output is generated. See note.
typeSpecificOutput	M	0..1	Not specified	The output information specific to the type of data analytics. See note.
recommendedActions	M	0..1	Not specified	Recommended actions to follow up according to the output of data analytics.
NOTE: This attribute shall be present if the data analytics output represents the results of a successful data analytics process.				

7.2 Information elements and notifications related to data analytics changes

7.2.1 Introduction

This clause defines notifications related to data analytics changes.

7.2.2 DataAnalyticsChangeNotification

7.2.2.1 Description

This notification informs the receiver of events related to data analytics processing. The support of the notification is mandatory.

7.2.2.2 Trigger conditions

This notification is produced by the MDAF when there is an event caused by the data analytics process, e.g. the result of the data analytics (i.e. availability of a corresponding data analytics output).

If this is a notification about the start of a data analytics process, the notification shall be sent before any action (including sending the input information collection requests for data analytics purpose) is taken, however, after acknowledging the data analytics request to the MDA Consumer (see clause 6.2.2).

If this is a notification about the result of a data analytics process, the notification shall be sent after all other actions of data analytics have been executed. This notification can also be raised in case of an unsuccessful data analytics process to provide appropriate error information.

7.2.2.3 Attributes

The DataAnalyticsChangeNotification information element shall follow the indications provided in table 7.2.2.3-1.

Table 7.2.2.3-1: Attributes of the DataAnalyticsChangeNotification

Attribute	Qualifier	Cardinality	Content	Description
notificationStatus	M	1	Enum	Indicates whether this notification reports about the start or the result of a data analytics process. VALUES: START: Informs about the start of the data analytics RESULT: Informs about the result of the data analytics
analyticsId	M	1	Identifier (Reference to AnalyticsOutput)	Reference to the data analytics process and output to which this notification is associated.
analysisStatus	M	1	Not specified	Indicates the analysis status. In case the notification represents the result of a data analytics process that was not successful, the notification shall contain appropriate error information.
analyticsOutput	M	0..1	AnalyticsOutput	The output of the data analytics process. Shall be present in case the "notificationStatus" is set to "RESULT".

Annex A (informative): Examples of MDA use cases

A.1 Introduction

The clauses under Annex A describe examples of NFV-MANO related MDA use cases. Enabling data as input data for the MDAF data analytics process and analytics outputs provided by the MDAF as part of data analytics process results are elaborated in respective use case examples.

A.2 Network service alarm incident analysis

A.2.1 Overview

This use case describes the analysis of Network Service (NS) alarm incidents with assistance of the MDAF. Alarms can be propagated over multiple layers in NFV-MANO if a source fault occurs. In addition, the same source fault can give rise to the performance deterioration of the NS. The MDAF analyses a series of alarms and deteriorated performance measurements to provide the analytics output indicating the root cause of network service alarm incidents. For a more detailed use case description, refer to clause 5.3.2 of ETSI GR NFV-IFA 041 [i.2].

A.2.2 Enabling data

The enabling data applied in this use case are provided in table A.2.2-1.

Table A.2.2-1: Enabling data for network service alarm incident analysis

Data category	Description	Data Source
Alarm notifications	Alarm information, e.g. the alarm notifications sent by NFV-MANO entities.	NFVO/VNFM/VIM (see clause 8.5.4 alarm information element of ETSI GS NFV-IFA 013 [i.3] as an example of alarm notification)
Performance measurements	The deteriorated or abnormal performance measurements based on certain performance monitoring threshold.	NFVO/VNFM/VIM (see performance measurements as specified in ETSI GS NFV-IFA 027 [i.4])

A.2.3 Analytics output

The information elements of analytics output specific to this use case are provided in table A.2.3-1.

Table A.2.3-1: Analytics output for network service alarm incident analysis

Information elements	Description
nSIncidentSourceObject	Indicates the objects managed by NFV-MANO which are the root cause of the NS alarm incident.
sourceFaultType	Indicates the type of source fault that has caused the NS alarm incident (see note).
eventTime	Indicates the timestamp when the failure is reported.
issueID	Holds the identifier of the reported failure. When provided in a data analytics output, this identifier provides information to the MDA Consumer for traceability of the NS alarm incident.
perceivedSeverity	Indicates the relative level of severity of the incident.
NOTE:	sourceFaultType can be mapped to the eventType and optional faultType of an alarm (see clause 8.5.4 alarm information element of ETSI GS NFV-IFA 013 [i.3]).

A.3 Network service health analysis

A.3.1 Overview

This use case describes the analysis of NS instance health with assistance of the MDAF. NS health is a high-level metric of the NS runtime status, which reflects whether or not the NS runs normally during its lifetime. The MDAF can collect NS health related information (e.g. alarms, performance measurements, etc.) in advance, or collect information based on the request of NS health analysis from the MDAF Consumer. Based on the NS health analytics output provided by the MDAF, the MDA Consumer can further initiate lifecycle operations (e.g. NS scaling or healing) of an unhealthy NS to bring it back to its normal state. For a more detailed use case description, refer to clause 5.3.3 of ETSI GR NFV-IFA 041 [i.2].

A.3.2 Enabling data

The enabling data applied in this use case are provided in table A.3.2-1.

Table A.3.2-1: Enabling data for network service health analysis

Data category	Description	Data Source
State	State of the NS instance to be analysed, e.g. INSTANTIATED, NOT_INSTANTIATED.	NFVO (see clause D.3 NS state model of ETSI GS NFV-IFA 013 [i.3])
Performance measurements	Performance measurements associated to the NS instance.	NFVO (see performance measurements as specified in ETSI GS NFV-IFA 027 [i.4])
Alarm notifications	Alarm notifications associated to the NS instance.	NFVO (see clause 8.5.4 alarm information element of ETSI GS NFV-IFA 013 [i.3] as an example of alarm notification)
Configurations	Configuration parameters of the constituent objects (e.g. VNF instances) of the NS instance.	NFVO/VNFM/CISM/VIM/WIM (see clause 7.3.5 update NS operation of ETSI GS NFV-IFA 013 [i.3] as an example of modifying information data and/or configurable properties of a VNF instance belonging to the NS instance)

Data category	Description	Data Source
VNF indicators	VNF indicators associated to the constituent VNF instances of the NS instance.	VNFM (see clause 7.7 VNF indicator interfaces of ETSI GS NFV-IFA 007 [i.5])

A.3.3 Analytics output

The information elements of analytics output specific to this use case are provided in table A.3.3-1.

Table A.3.3-1: Analytics output for network service health analysis

Information elements	Description
healthStatus	Indicates the health status of the NS instance, e.g. HEALTHY, SUB_HEALTHY, NOT_HEALTHY.
unhealthyObjects	Indicates the constituent objects of the NS instance which are in SUB_HEALTHY or NOT_HEALTHY status.
unhealthCause	Indicates the analysed cause(s) for respective unhealthy objects.
recommendedActions	Indicates the recommended actions to recover unhealthy objects, e.g. to scale or heal constituent VNF instances of the NS instance.

A.4 Network service resource utilization analysis

A.4.1 Overview

This use case describes the analysis of NS instance resource utilization with assistance of the MDAF. The MDAF collects NS instance's resource utilization related information (e.g. performance measurements, VNF indicators, etc.) periodically based on the analytics request from the NFVO. Based on the NS resource utilization analytics output provided by the MDAF, the NFVO can further initiate operations for resolving NS resource utilization issues identified in the analysis. As a pre-condition, thresholds for identifying the under-utilized or over-utilized status of NS instance's resources can be configured by the MDAF against the NFVO managing the corresponding NS instance. For a more detailed use case description, refer to clause 5.3.4 of ETSI GR NFV-IFA 041 [i.2].

A.4.2 Enabling data

The enabling data applied in this use case are provided in table A.4.2-1.

Table A.4.2-1: Enabling data for network service resource utilization analysis

Data category	Description	Data Source
Performance measurements	Performance measurements associated to the NS instance to be analysed, such as virtual compute related measurements for each constituent VNF instance of the NS instance, network data volume related measurements of an SAP belonging to the NS instance, network data volume related measurements of an external CP belonging to the constituent VNF instances of the NS instance.	NFVO/VNFM (see performance measurements as specified in ETSI GS NFV-IFA 027 [i.4])
VNF indicators	VNF indicators associated to the constituent VNF instances of the NS.	VNFM (see clause 7.7 VNF indicator interfaces of ETSI GS NFV-IFA 007 [i.5])

A.4.3 Analytics output

The information elements of analytics output specific to this use case are provided in table A.4.3-1.

Table A.4.3-1: Analytics output for network service resource utilization analysis

Information elements	Description
resourceUtilizationStatus	Indicates the resource utilization status of the NS instance, e.g. NORMAL, UNDER_UTILIZED, OVER_UTILIZED.
resourceType	Indicates the resource type associated to resourceUtilizationStatus, e.g. COMPUTE, STORAGE or NETWORK.
abnormalUtilizationCause	Indicates the analysed cause(s) for respective abnormal resource utilization (when the resourceUtilizationStatus value is either UNDER_UTILIZED or OVER_UTILIZED).
recommendedActions	Indicates the recommended actions to resolve the NS instance's resource utilization issues, e.g. to scale the NS instance or update corresponding NFV-MANO policies impacted by NS instance resource utilization issues.

Annex B (informative): Change History

Date	Version	Information about changes
March 2022	0.0.1	First draft, introducing the skeleton, scope and definition of the GS. NFVIFA(22)000098, NFVIFA(22)000099r1, NFVIFA(22)000121r1
May 2022	0.0.2	Early draft including the following contributions until IFA#282 meeting: NFVIFA(22)000256r1, NFVIFA(22)000262r1, NFVIFA(22)000282r2
November 2022	0.0.3	Early draft including the following contributions until IFA#311 meeting: NFVIFA(22)000627, NFVIFA(22)000786r2, NFVIFA(22)000790r2, NFVIFA(22)000810r1
December 2022	0.0.4	Stable draft including the following contributions until IFA#313 meeting: NFVIFA(22)000840r2, NFVIFA(22)000856r2, NFVIFA(22)000874r1, NFVIFA(22)000875r2, NFVIFA(22)000878
January 2023	0.0.5	Final draft including the following contributions until IFA#320 meeting: NFVIFA(22)000961, NFVIFA(22)000962, NFVIFA(22)000964, NFVIFA(23)000006, NFVIFA(23)000014r1, NFVIFA(23)000030, NFVIFA(23)000031r2, NFVIFA(23)000032, NFVIFA(23)000036r1

History

Document history		
V4.4.1	March 2023	Publication