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Foreword

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Introduction

The present document is part of a TS-family covering the 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Telecommunication management; as identified below:

28.621 Generic Network Resource Model (NRM) Integration Reference Point (IRP); Requirements;

28.622 Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS) ;

28.623 Generic Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions.

The interface Itf-N, defined in 3GPP TS 32.102 [2], is built up by a number of Integration Reference Points (IRPs) and a related Name Convention, which realise the functional capabilities over this interface. The basic structure of the IRPs is defined in 3GPP TS 32.150 [4].

The present document is part of a set that has been developed for converged management solutions.

The present document is part of a set that is used for management and orchestration of 5G networks and network slicing.

1 Scope

The present document specifies the Generic network resource information that can be communicated between an MnS producer and MnS consumer for telecommunication network management purposes, including management of converged networks and networks that include virtualized network functions.

This document specifies the semantics of information object class attributes and relations visible across the reference point in a protocol and technology neutral way. It does not define their syntax and encoding.

This document supports the Federated Network Information Model (FNIM) concept described in TS 32.107 [8] in that the relevant Information Object Class (IOC)s defined in this specification are directly or indirectly inherited from those specified in the Umbrella Information Model (UIM) of TS 28.620 [9].

Note that the present document is applicable to deployment scenarios using the Service Based Management Architecture (SBMA) as defined in TS 28.533 [32]. For deployment scenarios using the IRP framework as defined in TS 32.102 [2] the latest Rel-14 version of TS 28.622 is applicable.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
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[1] 3GPP TS 32.101: "Telecommunication management; Principles and high level requirements".

[2] 3GPP TS 32.102: "Telecommunication management; Architecture".

[3] 3GPP TS 32.302: "Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP): Information Service (IS)".

[4] 3GPP TS 32.150: "Telecommunication management; Integration Reference Point (IRP) Concept and Definitions".

[5] 3GPP TS 23.003: "Technical Specification Group Core Network and Terminals; Numbering, addressing and identification"

[6] Void

[7] ITU-T Recommendation X.710 (1991): "Common Management Information Service Definition for CCITT Applications".

[8] TS 32.107: "Telecommunication management; Fixed Mobile Convergence (FMC) Federated Network Information Model (FNIM)"

[9] TS 28.620: "Telecommunication management; Fixed Mobile Convergence (FMC) Federated Network Information Model (FNIM) Umbrella Information Model (UIM)"

[10] TS 32.156: "Telecommunication management; Fixed Mobile Convergence (FMC) Model Repertoire"

[11] Void

[12] Void

[13] 3GPP TS 32.300: "Telecommunication management; Configuration Management (CM); Name convention for Managed Objects".

[14] 3GPP TS 32.600: "Telecommunication management; Configuration Management (CM); Concept and high-level requirements".

[15] ETSI GS NFV 003 V1.1.1: "Network Functions Virtualisation (NFV); Terminology for Main Concepts in NFV".

[16] ETSI GS NFV-IFA 008 V3.5.1 (2021-11): "Network Functions Virtualisation (NFV) Release 3; Management and Orchestration; Ve-Vnfm reference point - Interface and Information Model Specification".

[17] Void.

[18] ETSI ES 202 336-12 V1.1.1: "Environmental Engineering (EE); Monitoring and control interface for infrastructure equipment (power, cooling and building environment systems used in telecommunication networks); Part 12: ICT equipment power, energy and environmental parameters monitoring information model".

[19] Void

[20] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[21] Void

[22] 3GPP TS 23.501: "System Architecture for the 5G System".

[23] Void

[24] Void

[25] Void

[26] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[27] 3GPP TS 28.532: "Management and orchestration; Generic management services".

[28] 3GPP TS 28.554: "Management and orchestration; 5G end to end Key Performance Indicators (KPI)".

[29] 3GPP TS 32.421: "Telecommunication management; Subscriber and equipment trace; Trace concepts and requirements".

[30] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace; Trace control and configuration management".

[31] Void

[32] 3GPP TS 28.533: "Management and orchestration; Architecture framework".

[33] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description; Stage 2".

[34] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".

[35] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".

[36] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".

[37] 3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification".

[38] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[39] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification".

[40] 3GPP TS 25.321: "Medium Access Control (MAC) protocol specification".

[41] 3GPP TS 25.331: "Radio Resource Control (RRC); Protocol specification".

[42] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in Idle mode and RRC Inactive state".

[43] 3GPP TS 37.320: "Universal Terrestrial Radio Access (UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Tests (MDT); Overall description; Stage 2".

[44] 3GPP TS 28.705: "Telecommunication management; IP Multimedia Subsystem (IMS) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[45] 3GPP TS 28.702: "Telecommunication management; Core Network (CN) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[46] 3GPP TS 28.652: "Telecommunication management; Universal Terrestrial Radio Access Network (UTRAN) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[47] 3GPP TS 28.708: "Telecommunication management; Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[48] 3GPP TS 28.541: " Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".

[49] Void

[50] 3GPP TS 28.405: "Telecommunication management; Quality of Experience (QoE) measurement collection; Control and configuration".

[51] 3GPP TS 26.247: "Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH)".

[52] 3GPP TS 26.114: "IP Multimedia Subsystem (IMS); Multimedia Telephony; Media handling and interaction".

[53] 3GPP TS 26.118: "Virtual Reality (VR) profiles for streaming applications".

[54] IETF RFC 3339: "Date and Time on the Internet: Timestamps".

[55] Void

[56] 3GPP TS 28.658: "Telecommunication management; Evolved Universal Terrestrial Radio Access Network (E-UTRAN) Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[57] 3GPP TS 28.558: "Management and orchestration; UE level measurements for 5G system".

[58] 3GPP TS 28.111: "Fault management"

[59] Void

[60] IETF RFC 1166: "Internet Numbers".

[61] IETF RFC 5952: "A recommendation for IPv6 address text representation".

[62] IETF RFC 3986: "Uniform Resource Identifier (URI): Generic Syntax".

[63] OpenAPI: "OpenAPI Specification Version 3.0.0", https://spec.openapis.org/oas/v3.0.0.

[64] IETF RFC 7950: “The YANG 1.1 Data Modeling Language”

[65] 3GPP TS 28.537: "Management and orchestration; Management capabilities"

[66] 3GPP TS 32.401: "Performance Management (PM); Concept and requirements".

[67] IETF RFC 4648: "The Base16, Base32, and Base64 Data Encodings"

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply. For terms and definitions not found here, please refer to 3GPP TS 32.101 [1], 3GPP TS 32.102 [2], 3GPP TS 32.150 [4] and 3GPP TS 32.600 [14].

Association: In general, it is used to model relationships between Managed Objects. Associations can be implemented in several ways, such as:

1) name bindings,
2) reference attributes, and
3) association objects.

This IRP stipulates that name containment associations shall be expressed through name bindings, but it does not stipulate the implementation for other types of associations as a general rule. These are specified as separate entities in the object models (UML diagrams). Currently however, all (non-containment) associations are modelled by means of reference attributes of the participating MOs.

Continuous management-based MDT: This term is defined in TS 32.422 [30].

Data node: This term is defined in TS 32.156 [10].

Information Object Class (IOC): An IOC represents the management aspect of a network resource. It describes the information that can be passed/used in management interfaces. Their representations are technology agnostic software objects. IOC has attributes that represents the various properties of the class of objects. See the term "attribute" defined in TS 32.156 [10]. Furthermore, IOC can support operations providing network management services invocable on demand for that class of objects. An IOC may support notifications that report event occurrences relevant for that class of objects. It is modelled using the stereotype "Class" in the UML meta-model. See TS 32.156 [10] for additional information on IOC.

Key Performance Indicator (KPI): This term is defined in TS 32.401 [66].

Managed Object (MO): A MO is an instance of a Managed Object Class (MOC) representing the management aspects of a network resource. Its representation is a technology specific software object. It is sometimes called MO instance (MOI). The MOC is a class of such technology specific software objects. An MOC is the same as an IOC except that the former is defined in technology specific terms and the latter is defined in technology agnostic terms. MOCs are used/defined in SS level specifications. IOCs are used/defined in IS level specifications.

Management Information Base (MIB): A MIB is an instance of an NRM and has some values on the defined attributes and associations specific for that instance. In the context of the present document, an MIB consists of:

1) a Name space (describing the MO containment hierarchy in the MIB through Distinguished Names),
2) a number of Managed Objects with their attributes and
3) a number of Associations between these MOs. Also note that TMN (ITU-T Recommendation X.710 [7]) defines a concept of a Management Information Tree (also known as a Naming Tree) that corresponds to the name space (containment hierarchy) portion of this MIB definition. Figure 3.1 depicts the relationships between a Name space and a number of participating MOs (the shown association is of a non-containment type)

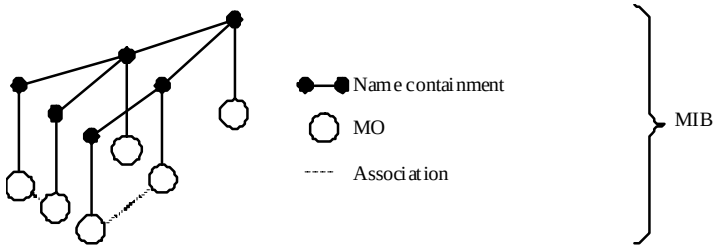


Figure 3.1: Relationships between a Name space and a number of participating MOs

Name space: A name space is a collection of names. The IRP name convention (see 3GPP TS 32.300 [13]) restricts the name space to a hierarchical containment structure, including its simplest form - the one-level, flat name space.
All Managed Objects in a MIB are included in the corresponding name space and the MIB/name space shall only support a strict hierarchical containment structure (with one root object). A Managed Object that contains another is said to be the superior (parent); the contained Managed Object is referred to as the subordinate (child). The parent of all MOs in a single name space is called a Local Root. The ultimate parent of all MOs of all managed systems is called the Global Root.

Network resource: discrete entity represented by an Information Object Class (IOC) for the purpose of network and service management.

NOTE: A network resource may represent intelligence, information, hardware and software of a telecommunication network.

Network Resource Model (NRM): A collection of IOCs, inclusive of their associations, attributes and operations, representing a set of network resources under management.

Performance metric: This term is defined in TS 32.401 [66].

Trace metrics: This term is defined in TS 32.422 [30].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [26] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [26].

CAG	Closed Access Group
C-MDT	Continuous management-based MDT
DN	Distinguished Name (see 3GPP TS 32.300 [13])
IOC	Information Object Class
KPI	Key Performance Indicator
MHI	Mobility History Information
MO	Managed Object
MOC	Managed Object Class
MOI	Managed Object Instance
MN	Master Node
MnS	Management Service (see 3GPP TS 28.533 [32])
NID	Network ID
NFVI	Network Functions Virtualisation Infrastructure (NFVI): Defined in ETSI GS NFV 003 [15].
NPN	Non-Public Network
PNI-NPN	Public Network Integrated Non-Public Network
RCEF	RRC Connection Establishment Failure
RDN	Relative Distinguished Name (see 3GPP TS 32.300 [13])
RLF	Radio Link Failure
SHR	Successful Handover Report
SN	Secondary Node
SNPN	Standalone Non-Public Network
SPR	Successful PSCell Addition/Change Report
SS	Solution Set
TRSR	Trace Recording Session Reference
VNF	Virtualised Network Function

4 Model

4.1 Imported information entities and local labels

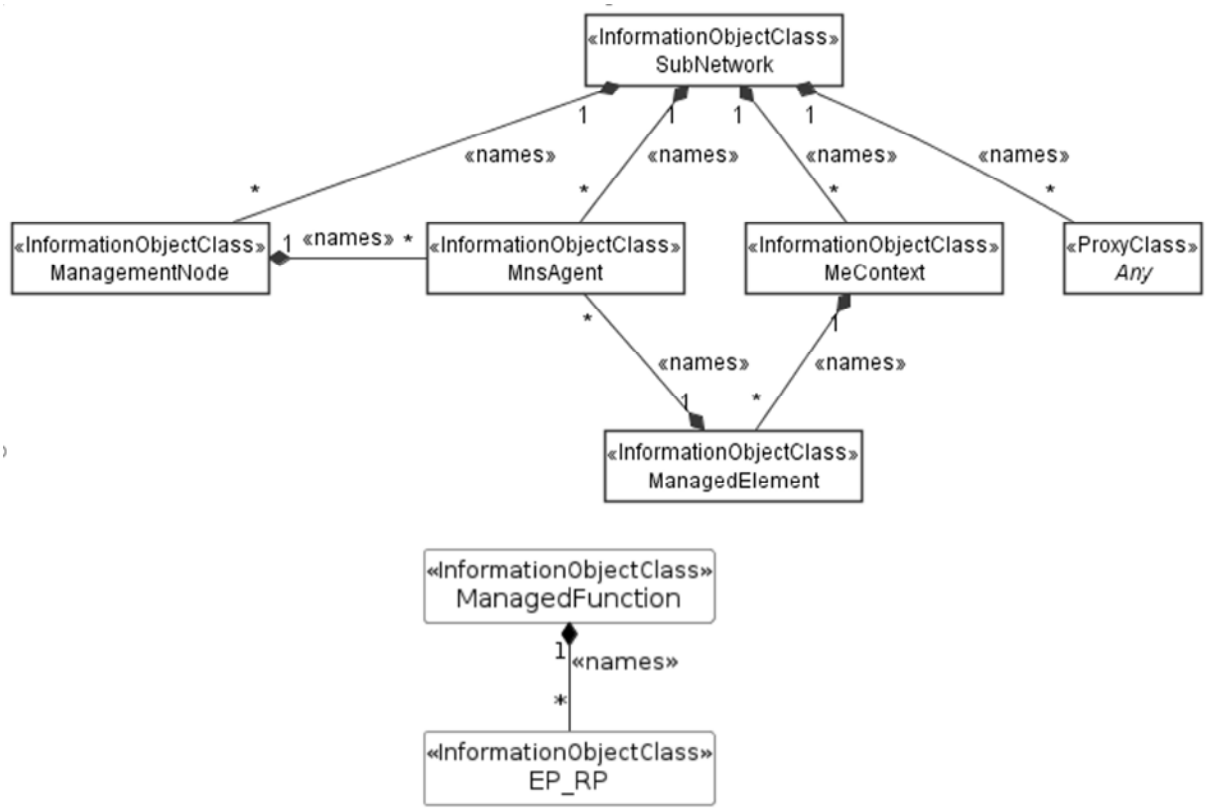
Label reference	Local label
3GPP TS 28.620 [9], IOC, *Domain_*	*Domain_*
3GPP TS 28.620 [9], IOC, *ManagedElement_*	*ManagedElement_*
3GPP TS 28.620 [9], IOC, *Function_*	*Function_*
3GPP TS 28.620 [9], IOC, *ManagementSystem_*	*ManagementSystem_*
3GPP TS 28.620 [9], IOC, *TopologicalLink_*	*TopologicalLink_*
3GPP TS 28.620 [9], IOC, *Top_*	*Top_*
3GPP TS 28.541 [48], dataType, *S-NSSAI*	*S-NSSAI*
3GPP TS 28.658 [56], dataType, PLMNId	*PLMNId*

4.2 Class diagrams

4.2.1 Relationships

This clause depicts the set of classes (e.g. IOCs) that encapsulates the information relevant for this IRP. This clause provides the overview of the relationships of relevant classes in UML. Subsequent clauses provide more detailed specification of various aspects of these classes.

The following figure shows the containment/naming hierarchy and the associations of the classes defined in the present document. See Annex A of a class diagram that combines this figure with Figure 1 of TS 32.102 [2], the class diagram of UIM.



NOTE 1: `ManagedElement` may be contained either
-in a `SubNetwork` (since *SubNetwork* inherits from *Domain_* and *ManagedElement* inherits from *ManagedElement_* and *Domain_* name-contained *ManagedElement_* as observed in the figure of Annex A) or
-in a `MeContext` instance as observed by the above figure or in the figure of Annex A.
This either-or relation cannot be shown by using an {xor} constraint in the above figure.
`ManagedElement` may also have no parent instance at all.

NOTE 2: Void

NOTE 3: If the configuration contains several instances of `SubNetwork`, exactly one `SubNetwork` instance shall directly or indirectly contain all the other `SubNetwork` instances.

NOTE 4: The `SubNetwork` instance not contained in any other instance of `SubNetwork` is referred to as "the root `SubNetwork` instance".

NOTE 5: `ManagementNode` shall be contained in the root `SubNetwork` instance.

NOTE 6: If contained in a `SubNetwork` instance, `MnsAgent` shall be contained in the root `SubNetwork` instance.

NOTE 7: Void

NOTE 8: Void

Figure 4.2.1-1: NRM fragment

Each Managed Object is identified with a Distinguished Name (DN) according to 3GPP TS 32.300 [13] that expresses its containment hierarchy. As an example, the DN of a `ManagedElement` instance could have a format like:

`SubNetwork`=Sweden,`MeContext`=MEC-Gbg-1,`ManagedElement`=RNC-Gbg-1.

NOTE 8: Void
NOTE 9: Void

Figure 4.2.1-2: Vendor specific data container NRM fragment

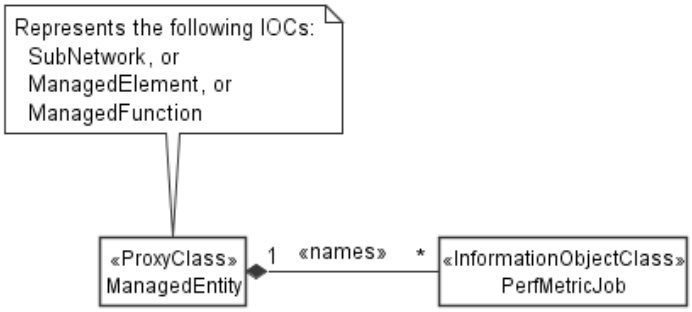


Figure 4.2.1-3: PM control NRM fragment

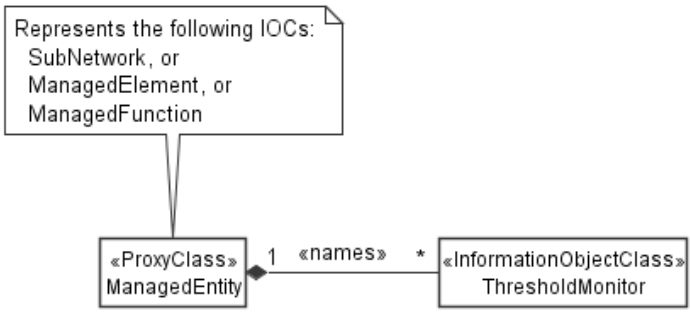


Figure 4.2.1-4: Threshold monitoring control NRM fragment

Figure 4.2.1-5: Notification subscription and heartbeat notification control NRM fragment

Figure 4.2.1-6: Void

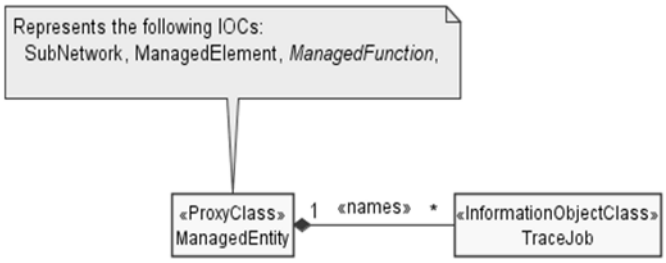


Figure 4.2.1-7: Trace control NRM fragment

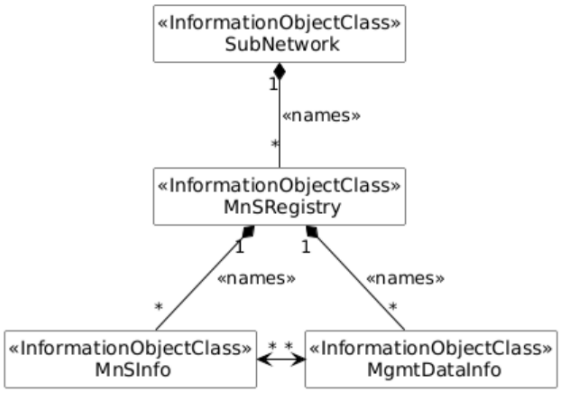


Figure 4.2.1-8: MnS Registry NRM fragment

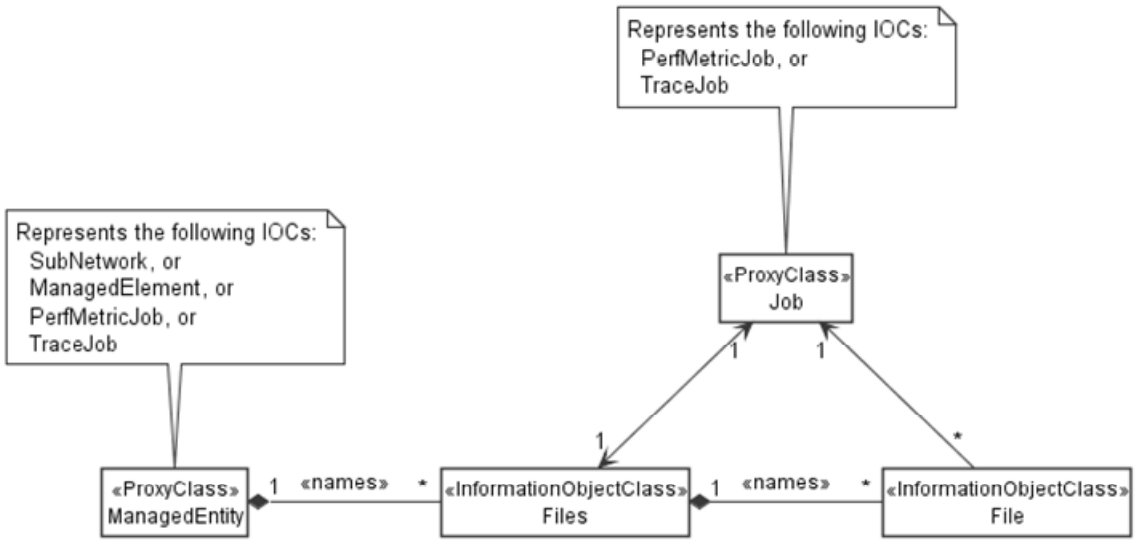


Figure 4.2.1-9: File retrieval NRM fragment

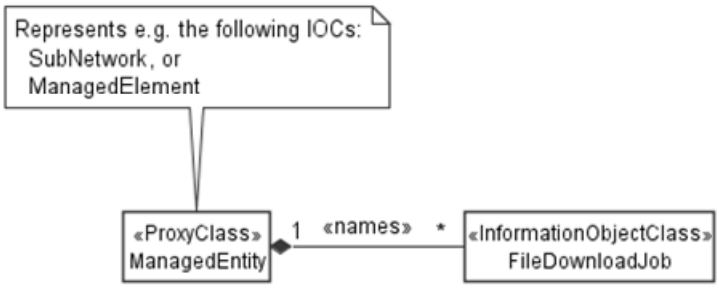


Figure 4.2.1-10: File download NRM fragment

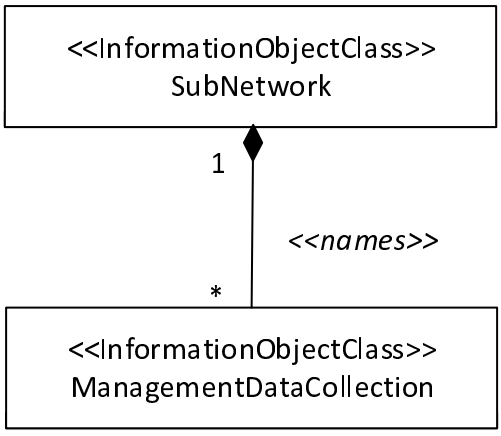


Figure 4.2.1-11: Management data collection NRM fragment

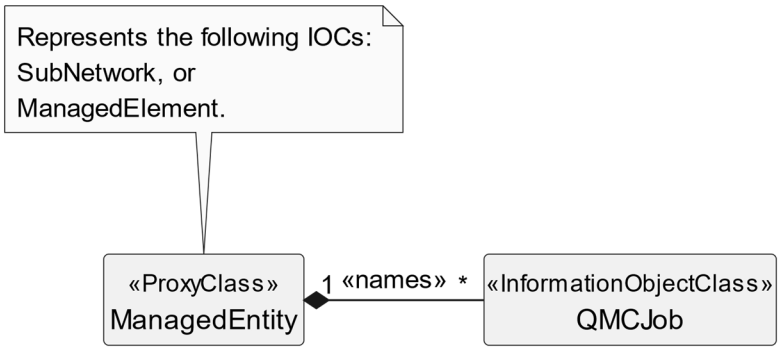


Figure 4.2.1-12: QoE Measurement Collection NRM fragment

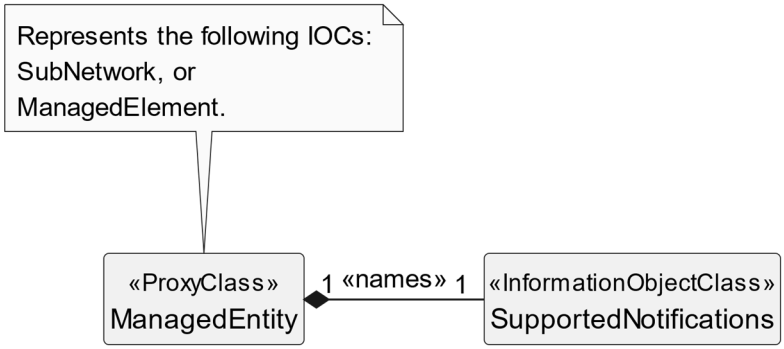


Figure 4.2.1-13: SupportedNotifications NRM fragment

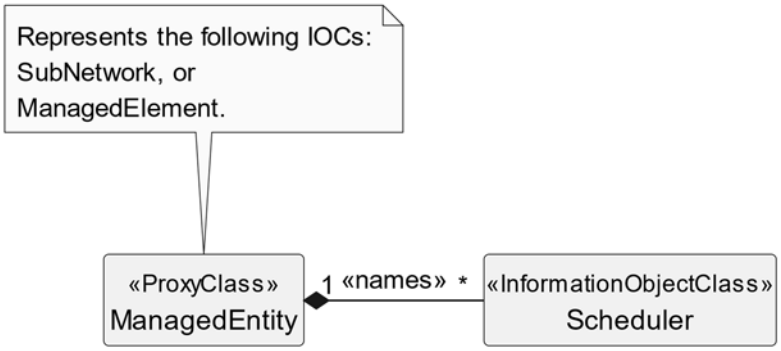


Figure 4.2.1-14: Scheduler NRM fragment

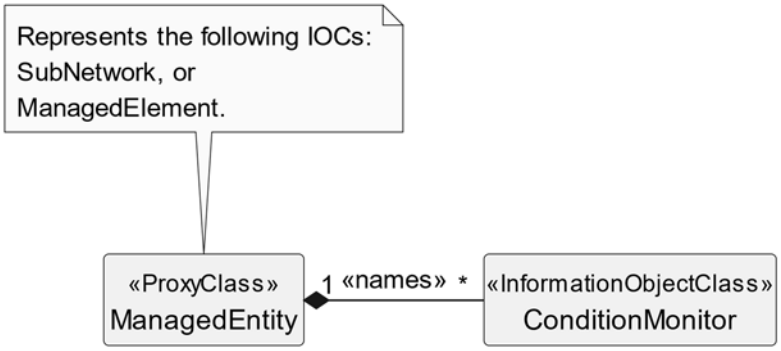


Figure 4.2.1-15: Condition monitor NRM fragment

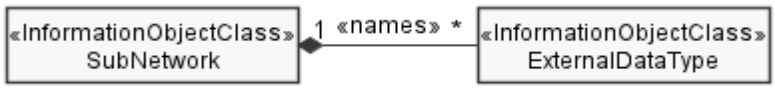


Figure 4.2.1-16: External data type NRM fragment

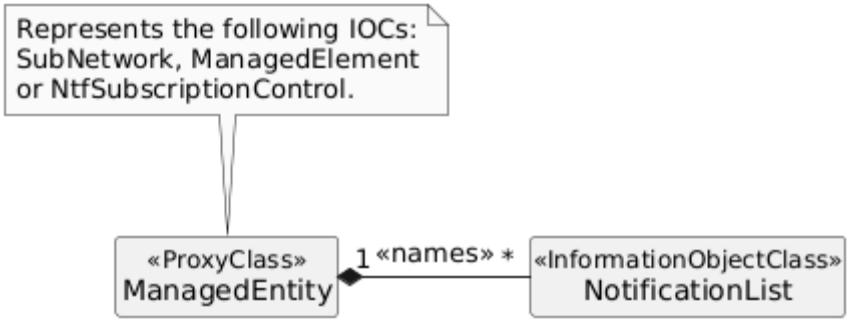


Figure 4.2.1-17: NotificationList NRM fragment

4.2.2 Inheritance

This clause depicts the inheritance relationships.

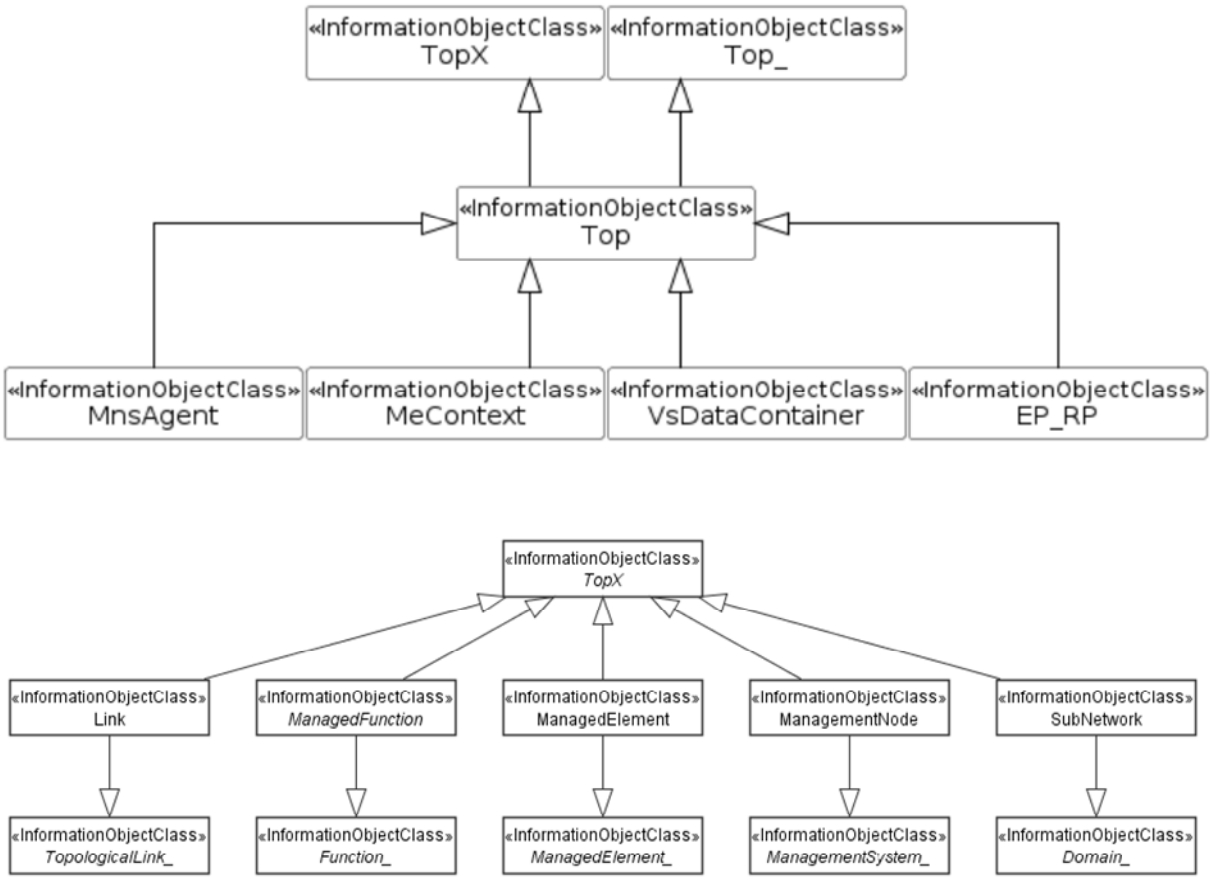


Figure 4.2.2-1: NRM fragment

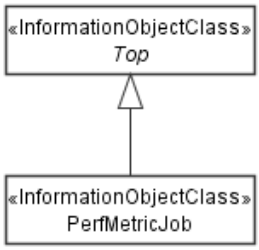


Figure 4.2.2-2: PM control NRM fragment

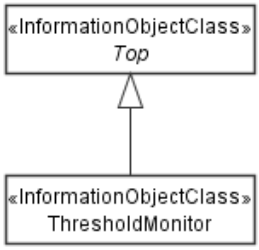


Figure 4.2.2-3: Threshold monitoring control NRM fragment

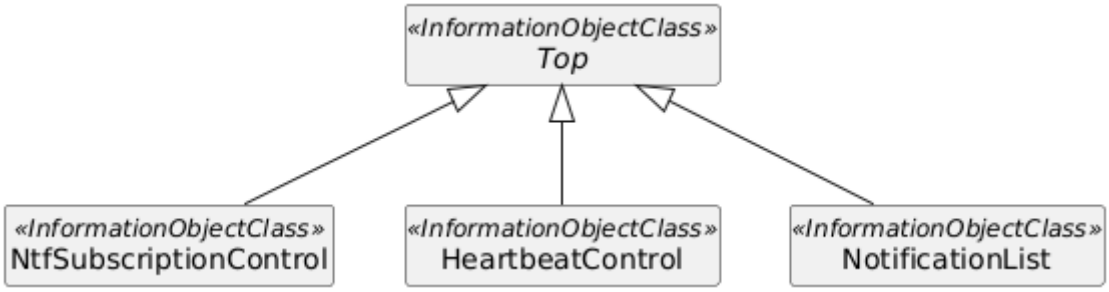


Figure 4.2.2-4: Notification subscription, notification list and heartbeat notification control NRM fragment

Figure 4.2.2-5: Void

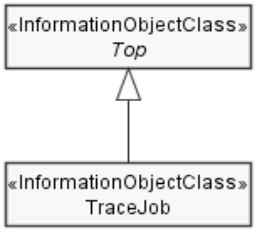


Figure 4.2.2-6: Trace control NRM fragment

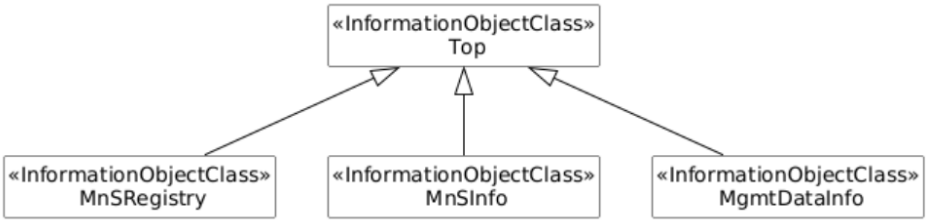


Figure 4.2.2-7: MnS Registry NRM fragment

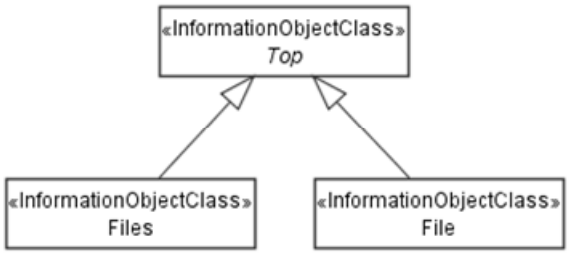


Figure 4.2.2-8: File retrieval NRM fragment

Figure 4.2.2-9: File download NRM fragment

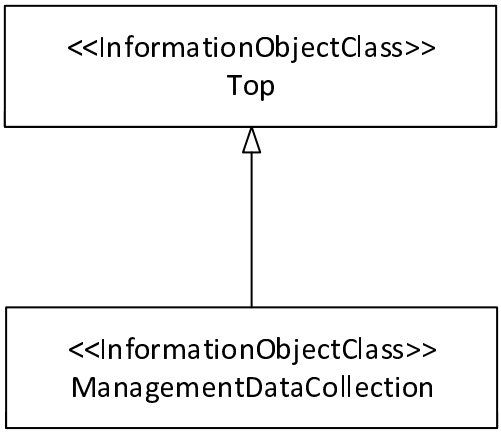


Figure 4.2.2-10: Management data collection NRM fragment

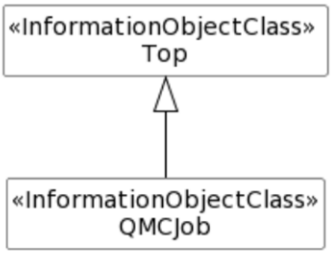


Figure 4.2.2-11: QoE Measurement Collection NRM fragment

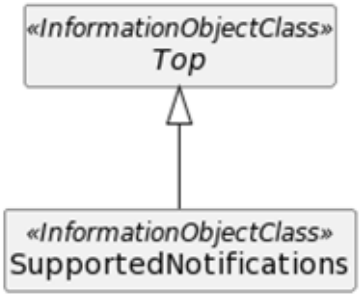


Figure 4.2.2-12: SupportedNotifications NRM fragment

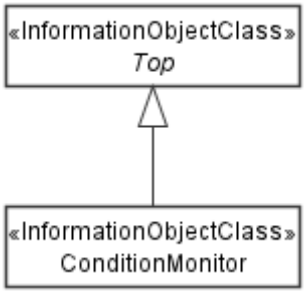


Figure 4.2.2-13: ConditionMonitor control NRM fragment

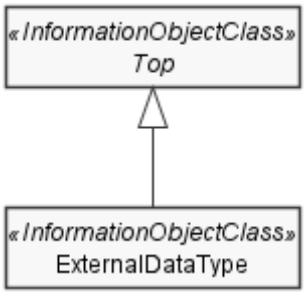


Figure 4.2.2-14: External Data Type NRM fragment

4.3 Class definitions

4.3.1 Any

4.3.1.1 Definition

This class represents the classes (e.g. IOC) that are not defined in this specification but are or will be defined in other IRP specification(s).

4.3.1.2 Attributes

None

4.3.1.3 Attribute constraints

None

4.3.1.4 Notifications

This class does not support any notification.

4.3.2 Void

4.3.2a MnsAgent

4.3.2a.1 Definition

The MnsAgent represents the MnS producers, incl. the supporting hardware and software, available for a certain management scope that is related to the object name-containing the MnS Agent.

The MnSAgent can be name-contained under an IOC as follows:

1) ManagementNode;

2) SubNetwork, if the SubNetwork does not contain a ManagementNode;

3) ManagedElement, if it is the root element.

In case the MnsAgent is name-contained under a ManagementNode, the management scope is the complete management scope of the ManagementNode or a subset thereof.

In case the MnsAgent is name-contained under a SubNetwork, the management scope is the complete SubNetwork or a subset thereof.

In case the MnsAgent is name-contained under a ManagedElement, the management scope is the complete ManagedElement or a subset thereof.

The MnsAgent shall be used only in deployments using the Service Based Management Architecture (SBMA) as defined in TS 28.533 [32].

4.3.2a.2 Attributes

The MnSAgent IOC includes the attributes inherited from Top_ IOC (defined in TS 28.620 [9]), attributes inherited from Top IOC (defined in clause 4.3.8) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
systemDN	M	T	F	F	T

4.3.2a.3 Attribute constraints

None.

4.3.2a.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions or additions.

4.3.3 ManagedElement

4.3.3.1 Definition

This IOC represents telecommunications equipment or TMN entities within the telecommunications network providing support and/or service to the subscriber.
A `ManagedElement` IOC is used to represent a Network Element defined in TS 32.101[1] including virtualization or non-virtualization scenario. `ManagementElement` instance is used for communicating with a manager (directly or indirectly) over one or more management interfaces for the purpose of being monitored and/or controlled. `ManagedElement` may or may not additionally perform element management functionality. A `ManagedElement` contains equipment that may or may not be geographically distributed.

A telecommunication equipment has software and hardware components. The `ManagedElement` IOC described above represents the following two cases:

- In the case when the software component is designed to run on dedicated hardware component, the `ManagedElement` IOC description includes both software and hardware component.
- In the case when the software is designed to run on ETSI NFV defined NFVI in ETSI GS NFV 003 [15], the `ManagedElement` IOC description would exclude the NFVI component supporting the above mentioned subject software.

A `ManagedElement` may be contained in either a `SubNetwork` or in a `MeContext` instance. A `ManagedElement` may also exist stand-alone with no parent at all.

The relation of `ManagedElement` IOC and `ManagedFunction` IOC can be described as following:

- A `ManagedElement` instance may have 1..1 containment relationship to a `ManagedFunction` instance. In this case, the `ManagedElement` IOC may be used to represent a NE with single `ManagedFunction` functionality. For example, a `ManagedElement` is used to represent the 3GPP defined RNC node.
- A `ManagedElement` instances may have 1..N containment relationship to multiple `ManagedFunction` IOC instances. In this case, the `ManagedElement` IOC may be used to represent a NE with combined `ManagedFunction` functionality (as indicated by the `managedElementType` attribute and the contained instances of different `ManagedFunction` IOCs). For example, a `ManagedElement` is used to represent the combined functionality of 3GPP defined non-split gNB.

NOTE: For some specific functional IOCs a 1..N containment relationship is permitted. The specific functional entities are identified in the NRMs that define subclasses of `ManagedFunction`.

4.3.3.2 Attributes

The `ManagedElement` IOC includes the attributes inherited from `ManagedElement_` IOC (defined in TS 28.620 [9]), attributes inherited from `TopX` IOC (defined in clause 4.3.8) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
vendorName	M	T	F	F	T
userDefinedState	M	T	T	F	T
swVersion	M	T	F	F	T
priorityLabel	O	T	T	F	T
supportedPerfMetricGroups	O	T	F	F	T
supportedTraceMetrics	O	T	F	F	T

4.3.3.3 Attribute constraints

Attribute constrains for `dnPrefix`: The attribute `dnPrefix` shall be supported if an instance of `ManagedElement` is the local root instance of the MIB. Otherwise the attribute shall be absent or carry no information.

4.3.3.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC. In addition, the following set of notifications is also valid.

Name	S	Notes
notifyFileReady	M	--
notifyFilePreparationError	M	--

4.3.4 *ManagedFunction*

4.3.4.1 Definition

This IOC is provided for sub-classing only. It provides attribute(s) that are common to functional IOCs. Note that a `ManagedElement` may contain several managed functions, a managed function may contain other managed functions as specified for the specific subclass.. The `ManagedFunction` may be extended in the future if more common characteristics to functional objects are identified.

This IOC can represent a telecommunication function either realized by software running on dedicated hardware or realized by software running on NFVI. Each `ManagedFunction` instance communicates with a manager (directly or indirectly) over one or more management interfaces exposed via its containing ME instance.

4.3.4.2 Attributes

The `ManagedFunction` IOC includes the attributes inherited from `Function_` IOC (defined in TS 28.620 [9]), attributes inherited from `TopX` IOC (defined in clause 4.3.8) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
vnfParametersList	CM	T	T	F	T
peeParametersList	CM	T	T	F	T
priorityLabel	O	T	T	F	T
supportedPerfMetricGroups	O	T	F	F	T
supportedTraceMetrics	O	T	F	F	T

4.3.4.3 Attribute constraints

Name	Definition
vnfParametersList	Condition: The `ManagedFunction` instance is realized by one or more VNF instance(s). Otherwise this attribute shall be absent.
peeParametersList	Condition: The control and monitoring of PEE parameters is supported by the ManagedFunction or sub-class instance.

4.3.4.4 Notifications

There is no notification defined.

4.3.5 ManagementNode

4.3.5.1 Definition

This IOC represents a telecommunications management system (EM) within the TMN that contains functionality for managing a number of ManagedElements (MEs). The management system communicates with the MEs directly or indirectly over one or more interfaces for the purpose of monitoring and/or controlling these MEs.

This class has similar characteristics as the ManagedElement. The main difference between these two classes is that the ManagementNode has a special association to the managed elements that it is responsible for managing.

4.3.5.2 Attributes

The ManagementNode IOC includes the attributes inherited from ManagementSystem_ IOC (defined in TS 28.620 [9]), attributes inherited from TopX IOC (defined in clause 4.3.8) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
vendorName	M	T	F	F	T
userDefinedState	M	T	T	F	T
locationName	M	T	F	F	T
swVersion	M	T	F	F	T

4.3.5.3 Attribute constraints

None

4.3.5.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC. In addition, the following set of notifications is also valid.

Name	S	Notes
notifyFileReady	M	--
notifyFilePreparationError	M	--

4.3.6 MeContext

4.3.6.1 Definition

This IOC is introduced for naming purposes. It may support creation of unique DNs in scenarios when some MEs have the same RDNs due to the fact that they have been manufacturer pre-configured.
If some MEs have the same RDNs (for the above mentioned reason) and they are contained in the same SubNetwork instance, some measure shall be taken in order to assure the global uniqueness of DNs for all IOC instances under those MEs. One way could be to set different dnPrefix for those NEs, but that would require either that:

a) all LDNs or DNs are locally modified using the new dnPrefix for the upper portion of the DNs, or

b) a mapping (translation) of the old LDNs or DNs to the new DNs every time they are used externally, e.g. in alarm notifications.

As both the two alternatives above may involve unacceptable drawbacks (as the old RDNs for the MEs then would have to be changed or mapped to new values), using MeContext offers a new alternative to resolve the DN creation. Using MeContext as part of the naming tree (and thus the DN) means that the dnPrefix, including a unique MeContext for each ME, may be directly concatenated with the LDNs, without any need to change or map the existing ME RDNs to new values.

MeContext have 0..N instances. It may exist even if no SubNetwork exists. Every instance of MeContext contains exactly one ManagedElement during steady-state operations.

4.3.6.2 Attributes

The MeContext IOC includes the attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
dnPrefix	CM	T	T	T	T

4.3.6.3 Attribute constraints

Name	Definition
dnPrefix	Condition: The instance of MeContext is the local root instance of the MIB. Otherwise the attribute shall be absent or carry no information.

4.3.6.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions or additions.

4.3.7 SubNetwork

4.3.7.1 Definition

This IOC represents a set of managed entities. There may be zero or more instances of a SubNetwork. It shall be present if either a ManagementNode or multiple ManagedElements are present (i.e. ManagementNode and multiple ManagedElement instances shall have SubNetwork as parent).

The SubNetwork instance not contained in any other instance of SubNetwork is referred to as the "root" SubNetwork instance.

4.3.7.2 Attributes

The SubNetwork IOC includes the attributes inherited from Domain_ IOC (defined in TS 28.620 [9]), attributes inherited from TopX IOC (defined in clause 4.3.8) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
setOfMcc	CM	T	F	F	T
priorityLabel	O	T	T	F	T
supportedPerfMetricGroups	O	T	F	F	T
supportedTraceMetrics	O	T	F	F	T

4.3.7.3 Attribute constraints

Name	Definition
dnPrefix (inherited from *Domain_*)	Condition: The instance of SubNetwork is the local root instance of the MIB. Otherwise the attribute shall be absent or carry no information.
setOfMcc	Condition: There is more than one value in setOfMcc of the SubNetwork ; otherwise the support is optional.

4.3.7.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions or additions

4.3.8 TopX

4.3.8.1 Definition

This IOC is provided for sub-classing only. All information object classes defined in all TS that claim to be conformant to TS 32.102 [2] shall inherit from TopX.

4.3.8.2 Attributes

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
objectClass	M	T	T	T	T
objectInstance	M	T	T	T	T

4.3.8.3 Attribute constraints

None

4.3.8.4 Notifications

There is no notification defined.

4.3.9 VsDataContainer

4.3.9.1 Definition

The VsDataContainer is a container for vendor specific data. The VsDataContainer is contained by Top and hence optionally name-contained by each IOC.

4.3.9.2 Attributes

The VsDataContainer IOC includes the attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
vsDataType	M	T	F	F	O
vsData	M	T	O	F	O
vsDataFormatVersion	M	T	F	F	O

4.3.9.3 Attribute constraints

None

4.3.9.4 Notifications

Support for notification on the change of attribute value is vendor-specific.

4.3.10 *Link*

4.3.10.1 Definition

This IOC is provided for sub-classing only. This IOC represents a communication link or reference point between two network entities. The Link IOC does not indicate whether the represented communication link or reference point is a physical or logical entity.

For the subclasses of Link, the following rules apply:

1) The subclass names shall have the form "Link_<X>_<Y>", where <X> is a string that represents the IOC at one end of the association related to the particular Link subclass, and <Y> is a string that represents the IOC at the other end of the association. For the order of the two strings, <X> shall come alphabetically before <Y>.

2) In case <X> and <Y> are YyyFunction IOCs (inheriting from ManagedFunction and on first level below ManagedElement), the <X> and <Y> strings shall have the same form as the legal values of the managedElementType attribute (see clause 4.5.1), e.g. "Auc". Otherwise <X> and <Y> shall be the full IOC names.

Thus, two valid examples of Link subclass names would be: Link_As_Cscf and Link_Mrfc_Mrfp.

4.3.10.2 Attributes

The Link IOC includes the attributes inherited from TopologicalLink_ (defined in TS 28.620 [9]), attributes inherited from TopX IOC (defined in clause 4.3.8) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
userLabel	M	T	T	F	T
linkType	O	T	F	F	T
protocolVersion	O	T	F	F	T

4.3.10.3 Attribute constraints

Name	Definition
aEnd and zEnd (inherited from *TopologicalLink_*)	Condition: The property multiplicity is 1.

4.3.10.4 Notifications

The common notifications defined in subclause 4.5 are valid for this IOC, without exceptions or additions.

4.3.11 *EP_RP*

4.3.11.1 Definition

This IOC is provided for sub-classing only. This IOC represents an end point of a communication link or a reference point between two network entities.

For naming the subclasses of EP_RP, the following rules shall apply:

- The name of the subclassed IOC shall have the form "EP_<rp>", where <rp> is a string that represents the name of the reference point.

Thus, two valid examples of EP_RP subclassed IOC names would be: EP_S1U and EP_X2C.

4.3.11.2 Attributes

The EP_RP IOC includes the attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
farEndEntity	O	T	F	F	T
userLabel	O	T	T	F	T
supportedPerfMetricGroups	O	T	F	F	T

4.3.11.3 Attribute constraints

None

4.3.11.4 Notifications

This class does not support any notification.

4.3.12 Void

4.3.13 Void

4.3.14 Void

4.3.15 Void

4.3.16 `ThresholdMonitor`

4.3.16.1 Definition

This IOC represents a threshold monitor for performance metrics. It can be name-contained by `SubNetwork`, `ManagedElement`, or `ManagedFunction`. A threshold monitor checks for threshold crossings of performance metric values related to specified managed objects and generates a notification when that happens.

The `ThresholdMonitor` is used only when NRM based threshold monitoring is supported.

To activate threshold monitoring, a MnS consumer needs to create a `ThresholdMonitor` instance on the MnS producer. For ultimate deactivation of threshold monitoring, the MnS consumer should delete the monitor to free up resources on the MnS producer.

For temporary suspension of threshold monitoring, the MnS consumer can manipulate the value of the administrative state attribute. The MnS producer may disable threshold monitoring as well, for example in overload situations. This situation is indicated by the MnS producer with setting the operational state attribute to disabled. When monitoring is resumed the operational state is set again to enabled.

All object instances below and including the instance name-containing the `ThresholdMonitor` (base object instance) are scoped for performance metricthreshold monitoring. Performance metrics are monitored only on those object instances whose object class matches the object class associated to the performance metrics to be monitored.

The optional attributes `objectInstances` and `rootObjectInstances` allow to restrict the scope. When the attribute `objectInstances` is present, only the object instances identified by this attribute are scoped. When the attribute `rootObjectInstances` is present, then the subtrees whose root objects are identified by this attribute are scoped. Both attributes may be present at the same time meaning the total scope is equal to the sum of both scopes. Object instances may be scoped by both the `objectInstances` and `rootObjectInstances` attributes. This shall not be considered as an error by the MnS producer.

Multiple thresholds can be defined for multiple performance metric sets in a single monitor using `thresholdInfoList`. The attribute `monitorGranularityPeriod` defines the granularity period to be applied. The value is a multiple of a supported granularity period for the measurements being monitored.

A threshold is defined using the attributes `thresholdValue`, `thresholdDirection` and `hysteresis`.

When `hysteresis` is absent or carries no information, a threshold is triggered when the `thresholdValue` is reached or crossed. When `hysteresis` is present, two threshold values are specified for the threshold as follows: A high threshold value equal to the threshold value plus the hysteresis value, and a low threshold value equal to the threshold value minus the hysteresis value. When the monitored performance metric increases, the threshold is triggered when the high threshold value is reached or crossed. When the monitored performance metric decreases, the threshold is triggered when the low threshold value is reached or crossed. The hysteresis ensures that the performance metric value

can oscillate around a comparison value without triggering each time the threshold when the threshold value is crossed.Using the `thresholdDirection` attribute a threshold can be configured in such a manner that it is triggered only when the monitored performance metric is going up or down upon reaching or crossing the threshold.

A `ThresholdMonitor` creation request shall be rejected, if the performance metrics requested to be monitored, the requested granularity period, or the requested combination thereof is not supported by the MnS producer. A creation request may fail, when the performance metrics requested to be monitored are not produced by a `PerfMetricJob`.

Creation and deletion of `ThresholdMonitor` instances by MnS consumers is optional; when not supported, `ThresholdMonitor` instances may be created and deleted by the system or be pre-installed.

A threshold crossing event detected by a `ThresholdMonitor` shall trigger a `notifyThresholdCrossing` notification. To subscribe to `notifyThresholdCrossing` notifications the MnS consumer shall specify one or more `ThresholdMonitor` instances in the subscription. All threshold crossings detected by the specified `ThresholdMonitor` instances are sent as `notifyThresholdCrossing` to subscribed MnS consumers (unless filtered out by the `notificationFilter` attribute of `NtfSubscriptionControl`).

4.3.16.2 Attributes

The `ThresholdMonitor` IOC includes attributes inherited from `Top` IOC (defined in clause 4.3.29) and the following attributes:

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
`administrativeState`	M	T	T	F	T
`operationalState`	M	T	F	F	T
`thresholdInfoList`	M	T	T	F	T
`monitorGranularityPeriod`	M	T	T	F	T
`objectInstances`	O	T	T	F	F
`rootObjectInstances`	O	T	T	F	F

4.3.16.3 Attribute constraints

None.

4.3.16.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC.

4.3.17 Void

4.3.18 Void

4.3.19 Void

4.3.20 `ManagedEntity <<ProxyClass>>`

4.3.20.1 Definition

This `<<ProxyClass>>` represents one or multiple IOCs. The IOCs the `<<ProxyClass>>` represents are defined where the `<<ProxyClass>>` is used.

4.3.20.2 Attributes

See respective IOCs.

4.3.20.3 Attribute constraints

See respective IOCs.

4.3.20.4 Notifications

See respective IOCs.

4.3.21 HeartbeatControl

4.3.21.1 Definition

MnS consumers (i.e. notification recipients) use heartbeat notifications to monitor the communication channels between themselves and MnS producers configured to emit notifications such as `notifyNewAlarm` and `notifyFileReady`.

A `HeartbeatControl` instance allows controlling the emission of heartbeat notifications by MnS producers. The recipients of heartbeat notifications are specified by the `notificationRecipientAddress` attribute of the `NtfSubscriptionControl` instance name containing the `HeartbeatControl` instance.

Note that the MnS consumer managing the `HeartbeatControl` instance and the MnS consumer receiving the heartbeat notifications may not be the same.

As a pre-condition for the emission of heartbeat notifications, a `HeartbeatControl` instance needs to be created. Creation of an instance with an initial non-zero value of the `heartbeatNtfPeriod` attribute triggers an immediate heartbeat notification emission. Creation of an instance with an initial zero value of the `heartbeatNtfPeriod` attribute does not trigger an emission of a heartbeat notification. Deletion of an instance does not trigger an emission of a heartbeat notification.

Once the instance is created, heartbeat notifications are emitted with a periodicity defined by the value of the `heartbeatNtfPeriod` attribute. No heartbeat notifications are emitted if the value is equal to zero. Setting a zero value to a non zero value, or a non zero value to a different non zero value, triggers an immediate heartbeat notification, that is the base for the new heartbeat period. Setting a non zero value to a zero value stops emitting heartbeats immediately; no final heartbeat notification is sent.

The attribute `triggerHeartbeatNtf` allows MnS consumers to trigger the emission of an immediate additional heartbeat notification. The emission of heartbeat notifications according to the heartbeat period is not impacted by this additional notification.

Creation and deletion of `HeartbeatControl` instances by MnS Consumers is optional; when not supported, the `HeartbeatControl` instances may be created and deleted by the system or be pre-installed.

The emission of heartbeat notifications is fully controlled by `HeartbeatControl` instances. Subscription for heartbeat notifications is not supported by `NtfSubscriptionControl`.

4.3.21.2 Attributes

The `HeartbeatControl` IOC includes attributes inherited from `Top` IOC (defined in clause 4.3.29) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
`heartbeatNtfPeriod`	M	T	T	F	T
`triggerHeartbeatNtf`	M	F	T	F	F

4.3.21.3 Attribute constraints

None.

4.3.21.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC. In addition, the following set of notifications is also valid.

Name	S	Notes
notifyHeartbeat	M	--

4.3.22 NtfSubscriptionControl

4.3.22.1 Definition

NtfSubscriptionControl represents a notification subscription of a notification recipient. It can be name-contained by SubNetwork or ManagedElement.

The scope attribute is used to select the data nodes included in the subscription. The base object instance of the scope (see clause 4.3.23) is the object instance name-containing the NtfSubscriptionControl instance. When the scope attribute is absent, all objects below and including the base object are scoped.

For most notification types the scope needs to identify a set of managed object instances, such as for alarm notifications. For some notification types one or more attributes, attribute fields or attribute elements may be specified as well, though, such as for attribute value change notifications. Details on this matter are specified together with the definition of the notification type.

Note that a scope may also include objects that are not created yet, for example, when a complete subtree is scoped, or when all objects with a specific object class are scoped. Object instances added after creating the subscription are included in the subscription as well if not explicitly excluded.

The notifications related to the selected data nodes are candidates to be sent to the address specified by the notificationRecipientAddress attribute.

The notificationTypes attribute and notificationFilter attribute allow MnS consumers to control which candidate notifications are sent to the notificationRecipientAddress.

If the notificationTypes attribute is present, its value identifies the notification types that are candidates to be sent to the notificationRecipientAddress. If the notificationTypes attribute is absent, notifications of all types are candidates to be sent to notificationRecipientAddress. Notification types supported in the NtfSubscriptionControl.notificationTypes attribute are the ones listed in the attribute SupportedNotifications.notificationTypes.

If supported, the notificationFilter attribute defines a filter that is applied to the set of candidate notifications. The filter is applicable to all parameters of a notification. Only candidate notifications that pass the filter criteria are sent to the notificationRecipientAddress. If the notificationFilter attribute is absent, all candidate notificatios are sent to the notificationRecipientAddress.

To receive notifications, a MnS consumer has to create a NtfSubscriptionControl instance on the MnS producer. A MnS consumer can create a subscription for another MnS consumer since it is not required the notificationRecipientAddress be his own address.

When a MnS consumer does not wish to receive notifications any more the MnS consumer shall delete the corresponding NtfSubscriptionControl instance.

When a subscription is created and the notification scope inludes the created subscription object and the subscribed notification types include notifications reporting object creation (notifyMOICreation or notifyMOIChanges), the first notification sent related to the new subscription shall report the creation of the NtfSubscriptionControl instance. Likewise, when a subscription is deleted and the notification scope includes the deleted subscription object and the subscribed notification types include notifications reporting object deletion (notifyMOIDeletion or notifyMOIChanges), the last notification sent related to the subscription shall report the deletion of the NtfSubscriptionControl instance.

If multiple `NtfSubscriptionControl` instances are configured to send the same notification to the same `notificationRecipientAddress`, then a separate notification message shall be sent for each such `NtfSubscriptionControl` instance.

A "NtfSubscriptionControl" class optionally supports adding a sequence number parameter to the notification header. For each notification sent from a "NtfSubscriptionControl" instance to the configured notification recipient, the sequence number is increased by one. This allows the notification recipient to detect notifications lost or reordered in transit. The sequence number sent last is reflected in the "lastSequenceNo" attribute. This allows the MnS consumer to check if he missed notifications in situations where he did not receive any notification for some time.

The "operationalState" attribute represents the operability of the subscription. The "availabilityStatus" further qualifies the opertational state. Both attributes are set by the MnS producer.

If the "operationalState" is set to "ENABLED" and "availabilityStatus" has no value the subscription process is fully operational and notifications are forwarded to the subscribed consumer.

If the "operationalState" is set to "ENABLED" and "availabilityStatus" is set to "DEGRADED" the subscription process is degraded. There is no guarantee that all notifications, that should be forwarded to the notification recipient, are forwarded.

If the "operationalState" is set to "DISABLED" and "availabilityStatus" is set to "FAILED" the subscription process is not operational, and no notifications are sent to the notification recipient.

If the "operationalState" is set to "DISABLED" and "availabilityStatus" is set to "DEPENDENCY" the subscription process itself has no problems but some other process on which it depends such as downstream processes in the event channel that feeds events into the subscription process. As a result, events are not delivered to the subscription process and no notifications are sent to the notification recipient.

When the subscription process is disabled or degraded and becomes fully operational again, the MnS producer sends the related data node tree change notifications to subscribed MnS consumers. The MnS consumer may use the reception of these notifications as a trigger to synchronize his data node tree with the data node tree on the MnS producer. However, the state change notifications contain no information about which part of the data node tree should be synchronized. For this purpose the "notifyDataNodeTreeSyncRecommended" (TS 28.532 [27]) and "alarmListRebuilt" (TS 28.111 [58]) notifications are provided.

Creation and deletion of `NtfSubscriptionControl` instances by MnS consumers is optional; when not supported, the `NtfSubscriptionControl` instances may be created and deleted by the system or be pre-installed.

4.3.22.2 Attributes

The `NtfSubscriptionControl` IOC includes attributes inherited from `Top` IOC (defined in clause 4.3.29) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
notificationRecipientAddress	M	T	T	F	T
notificationTypes	O	T	T	F	T
scope	O	T	T	F	T
notificationFilter	O	T	T	F	T
lastSequenceNo	O	T	F	F	F
operationalState	O	T	F	F	T
availabilityStatus	O	T	F	F	T

4.3.22.3 Attribute constraints

None.

4.3.22.4 Notifications

The common notifications defined in clause 4.5.2 are valid for this IOC, without exceptions or additions.

4.3.23 Scope <<dataType>>

4.3.23.1 Definition

This <<dataType>> allows to select data nodes in an object tree whose root is identified by the so called base managed object instance. The identification of the base object instance is not part of this <<dataType>> and needs to be specified by other means. The base managed object instance is typically a managed object instance in an object tree.

The scopeType and the scopeLevel attributes allow to select managed object instances. Attributes, attribute fields and attribute elements cannot be selected.

The dataNodeSelector attribute allows to select managed object instances, attributes, attribute fields, attribute elements, or attribute field elements. Its value contains a solution set specific expression for specifying the data nodes to be selected.

4.3.23.2 Attributes

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
CHOICE_1.1 scopeType	M	T	T	F	T
CHOICE_1.2 scopeLevel	O	T	T	F	T
CHOICE_2.1 dataNodeSelector	O	T	T	F	T

4.3.23.3 Attribute constraints

None.

4.3.23.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.24 Void

4.3.25 Void

4.3.27 Void

4.3.28 Void

4.3.29 *Top*

4.3.29.1 Definition

This IOC is provided for sub-classing only. All information object classes defined in all TS that claim to be conformant to TS 32.102 [2] and support the Federated Network Information Model (FNIM) concept shall inherit from Top.

4.3.29.2 Attributes

This IOC includes attributes inherited from TopX IOC (defined in clause 4.3.8) and the attributes inherited from Top _ IOC (defined in TS 28.620 [9]).

4.3.29.3 Attribute constraints

None

4.3.29.4 Notifications

There is no notification defined.

4.3.30 TraceJob

4.3.30.1 Definition

A TraceJob instance represents the Trace Control and Configuration parameters of a particular Trace Job (see TS 32.421 [29] and TS 32.422 [30] for details). It can be name-contained by SubNetwork, ManagedElement, ManagedFunction. In case of signalling based trace activation, it shall be name-contained by the UDMFunction, see TS 28.541 [48].

To activate Trace Jobs, a MnS consumer has to create TraceJob object instances on the MnS producer. A MnS consumer can activate a Trace Job for another MnS consumer since it is not required the value of traceCollectionEntityIPAddress or traceReportingConsumerUri to be his own.

For the details of Trace Job activation see clauses 4.1.1.1.2 and 4.1.2.1.2 of TS 32.422 [30].

When a MnS consumer wishes to deactivate a Trace Job, the MnS consumer shall delete the corresponding TraceJob instance. For details of management Trace Job deactivation see clauses 4.1.3.8 to 4.1.3.11 and 4.1.4.10 to 4.1.4.13 of TS 32.422 [30].

The attribute traceReference specifies a globally unique ID and identifies a Trace session. One Trace Session may be activated to multiple Network Elements. The traceReference is populated by the consumer that makes the request for a Trace Session, TS 32.422 [30].

The jobId attribute can be used to associate multiple TraceJob instances. For example, it is possible to configure the same jobId value for multiple TraceJob instances required to produce the data (e.g. RSRP values of M1 and RLF reports) for a specific network analysis.

The attribute traceReportingFormat defines the method for reporting the produced measurements. The selectable options are file-based or stream-based reporting. In case of file-based reporting the attribute traceCollectionEntityIPAddress is used to specify the IP address to which the trace records shall be transferred, while in case of stream-based reporting the attribute traceReportingConsumerUri specifies the streaming target.

The mandatory attribute traceTarget determines the target object of the TraceJob. Dependent on the network element to which the Trace Session is activated different types of the target object are possible.

The attribute pLMNTarget defines the PLMN for which sessions shall be selected in the Trace Session in case of management based activation when several PLMNs are supported in the RAN. The MDT configuration may include area scope defined by network slice, in which case the attribute pLMNTarget is not applicable.

The attribute listOfTraceMetrics allows configuration of which metrics shall be recorded.

The attribute jobType specifies the kind of data to collect. If the attribute jobType indictes Trace, the configuration parameters of attribute traceConfig shall be applied. If the attribute jobType indictes immediate MDT, logged MDT, or logged MBSFN MDT, RRC report, RLF report, RCEF report, the configuration parameters of attribute mdtConfig or a subset of these shall be applied. If the attribute jobType indictes 5GC UE level measurements, the configuration parameters of attribute ueCoreMeasConfig shall be applied.

If jobType indictes RRC report, the attribute rrcReportType shall be present. The rrcReportType allows the tracing of RRC reports.

Creation and deletion of TraceJob instances by MnS consumers is optional; when not supported, the TraceJob instances may be created and deleted by the system or be pre-installed.

4.3.30.2 Attributes

The TraceJob IOC includes attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
jobType	M	T	T	F	T
rrcReportType	CM	T	T	F	T
pLMNTarget	CM	T	T	F	T
traceReportingConsumerUri	CM	T	T	F	T
traceCollectionEntityIPAddress	M	T	T	F	T
traceReference	M	T	T	F	T
jobId	O	T	T	T	T
traceReportingFormat	M	T	T	F	T
traceTarget	M	T	T	F	T
listOfTraceMetrics	CM	T	T	F	T
traceConfig	CM	T	T	F	T
mdtConfig	CM	T	T	F	T
ueCoreMeasConfig	CM	T	T	F	T
nPNTarget	CM	T	T	F	T

4.3.30.3 Attribute constraints

Name	Definition
pLMNTarget	This attribute shall be present for management based activation when several PLMNs are supported in the RAN.
traceReportingConsumerUri	This attribute shall be present if streaming trace data reporting is supported.
traceConfig	This attribute shall be present if Trace is supported.
mdtConfig	This attribute shall be present if MDT is supported.
ueCoreMeasConfig	This attribute shall be present if 5GC UE level measurements collection is supported.
nPNTarget	This attribute shall be present for management-based activation when several NPNs are supported in the RAN (see TS 38.331 [38]). It is only applicable for NR.
listOfTraceMetrics	This attribute shall be present when configuration of which trace metrics to report is supported.
rrcReportType	This attribute shall be present if tracing of any of the RRC reports is supported.

4.3.30.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions. In addition, the following set of notifications is also valid.

Name	S	Notes
notifyFileReady	M	--
notifyFilePreparationError	M	--

4.3.31 PerfMetricJob

4.3.31.1 Definition

This IOC represents a performance metric production job. It can be name-contained by SubNetwork, ManagedElement, or ManagedFunction.

To activate the production of the specified performance metrics, a MnS consumer needs to create a PerfMetricJob instance on the MnS producer. For ultimate deactivation of metric production, the MnS consumer should delete the job to free up resources on the MnS producer.

For temporary suspension of metric production, the MnS consumer can manipulate the value of the administrative state attribute. The MnS producer may disable metric production as well, for example in overload situations. This situation is indicated by the MnS producer with setting the operational state attribute to disabled. When production is resumed the operational state is set back to enabled.

The jobId attribute can be used to associate metrics from multiple PerfMetricJob instances. The jobId can be included when reporting performance metrics to allow a MnS consumer to associate received metrics for the same purpose. For example, it is possible to configure the same jobId value for multiple PerfMetricJob instances required to produce the measurements for a specific KPI.

The attribute performanceMetrics defines the performance metrics to be produced and the attribute granularityPeriod defines the granularity period to be applied.

All object instances below and including the instance name-containing the PerfMetricJob (base object instance) are scoped for performance metric production. Performance metrics are produced only on those object instances whose object class matches the object class associated to the performance metrics to be produced.

The optional attributes objectInstances and rootObjectInstances allow to restrict the scope. When the attribute objectInstances is present, only the object instances identified by this attribute are scoped. When the attribute rootObjectInstances is present, then the subtrees whose root objects are identified by this attribute are scoped. Both attributes may be present at the same time meaning the total scope is equal to the sum of both scopes. Object instances may be scoped by both the objectInstances and rootObjectInstances attributes. This shall not be considered as an error by the MnS producer.

When the performance metric requires performance metric production on multiple managed objects, which is for example the case for KPIs, the MnS consumer needs to ensure all required objects are scoped. Otherwise a PerfMetricJob creation request shall fail.

The production of the configured performance metrics can be constrained by conditions such that metric production shall be active only if the corresponding conditions are satisfied. These conditions are not configured directly in the PerfMetricJob. Instead, the attributes schedulerRef and conditionMonitorRef are provided allowing a PerfMetricJob to refer to a Scheduler or ConditionMonitor object. Only when the conditions in the referenced object are satisfied shall metric production be enabled.

Multiple PerfMetricJob objects can be linked to the same Scheduler or ConditionMonitor object. This may be necessary, when PerfMetricJob objects need to be switched on and off synchronously.

The attribute reportingCtrl specifies the method and associated control parameters for reporting the produced measurements to MnS consumers. Three methods are available: file-based reporting with selection of the file location by the MnS producer, file-based reporting with selection of the file location by the MnS consumer, and stream-based reporting.

For file-based reporting, all performance metrics that are produced related to a PerfMetricJob instance for a reporting period shall be stored in a single reporting file.

When the administrative state is set to "UNLOCKED" after the creation of a PerfMetricJob the first granularity period shall start. When the administrative state is set to "LOCKED" or the operational state to "DISABLED", the ongoing reporting period shall be aborted, for streaming the ongoing granularity period. When the administrative state is set back to "UNLOCKED" or the operational state to "ENABLED" a new reporting period shall start, in case of streaming a new granularity period.

Changes of all other configurable attributes shall take effect only at the beginning of the next reporting period, for streaming at the beginning of the next granularity period.

When the PerfMetricJob is deleted, the ongoing reporting period shall be aborted, for streaming the ongoing granularity period.

A PerfMetricJob creation request shall be rejected, if the requested performance metrics, the requested granularity period, the requested reporting method, or the requested combination thereof is not supported by the MnS producer.

Creation and deletion of PerfMetricJob instances by MnS consumers is optional; when not supported, PerfMetricJob instances may be created and deleted by the system or be pre-installed.

When the file retrieval NRM fragment is supported by the MnS producer, the _linkToFiles attribute shall be supported, for details on the usage of this attribute see the definition of the file retrieval NRM fragment.

4.3.31.2 Attributes

The `PerfMetricJob` IOC includes attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
`administrativeState`	M	T	T	F	T
`operationalState`	M	T	F	F	T
`jobId`	M	T	T	T	T
`performanceMetrics`	M	T	T	F	T
`granularityPeriod`	M	T	T	F	T
`objectInstances`	O	T	T	F	T
`rootObjectInstances`	O	T	T	F	T
`reportingCtrl`	M	T	T	F	T
`_linkToFiles`	CO	T	F	T	F
Attributes related to role					
CHOICE_1.1 `schedulerRef`	O	T	T	F	T
CHOICE_2.1 `conditionMonitorRef`	O	T	T	F	T

4.3.31.3 Attribute constraints

Name	Definition
`_linkToFiles`	This attribute should be supported, when the MnS producer supports the file retrieval NRM fragment.

4.3.31.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC. In addition, the following set of notifications is also valid.

Name	S	Notes
`notifyFileReady`	M	--
`notifyFilePreparationError`	M	--

4.3.32 `SupportedPerfMetricGroup <<dataType>>`

4.3.32.1 Definition

This `<<dataType>>` captures a group of supported performance metrics, and associated (production and monitoring) granularity periods and reporting methods that are supported for the specified performance metric group.

4.3.32.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
`performanceMetrics`	M	T	F	F	T
`granularityPeriods`	M	T	F	F	T
`reportingMethods`	M	T	F	F	T
`reportingPeriods`	M	T	F	F	T

4.3.32.3 Attribute constraints

None

4.3.32.4 Notifications

Not applicable.

4.3.33 ReportingCtrl <<choice>>

4.3.33.1 Definition

This <<choice>> defines the method for reporting collected performance metrics to MnS consumers as well as the parameters for configuring the reporting function. It is a choice between the control parameter required for the reporting methods, whose presence selects the reporting method as follows:

When only the fileReportingPeriod attribute is present (CHOICE_1), the MnS producer shall store files on the MnS producer at a location selected by the MnS producer and, on condition that an appropriate subscription is in place, inform the MnS consumer about the availability of new files and the file location using the notifyFileReady notification. In case the preparation of a file fails, "notifyFilePreparationError" shall be sent instead.

When the fileReportingPeriod and notificationRecipientAddress attributes are present (CHOICE_2), then the MnS producer shall behave like described for the case that only the fileReportingPeriod is present. In addition, the MnS producer shall create on behalf of the MnS consumer a subscription, using NtfSubscriptionControl, for the notification types notifyMOICreation and notifyMOIDeletion related to the File instances that can be produced later. In case an existing subscription does already include the File instances to be produced, no new subscription shall be created. The notificationRecipientAddress attribute in the created NtfSubscriptionControl instance shall be set to the value of the "notificationRecipientAddress" in the related PerfMetricJob. This feature is called implicit notification subscription, as opposed to the case where the MnS consumer creates the subscription (explicit notification subscription). When the related PerfMetricJob is deleted, the NtfSubscriptionControl instance created due to the request for implicit subscription shall be deleted as well.

When only the “fileReportingPeriod” and “fileLocation” attributes are present (CHOICE_3), the MnS producer shall store the files at the location specified by “fileLocation”. The file location may identify any entity such as a file server or a MnS consumer. The identified MnS consumer may or may not be identical to the MnS consumer creating the “PerfMetricJob”. As for CHOICE_1 the MnS producer may emit “notifyFileReady” and "notifyFilePreparationError" notifications to inform subscribers that a file has been made available at the location specified by “fileLocation”.

When only the streamTarget attribute is present (CHOICE_4), the MnS producer shall stream the data to the location specified by streamTarget.

For the file-based reporting methods the fileReportingPeriod attribute specifies the time window during which collected measurements are stored into the same file before the file is closed and a new file is opened.

4.3.33.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
CHOICE_1.1 fileReportingPeriod	CM	T	T	F	T
CHOICE_2.1 fileReportingPeriod	CM	T	T	F	T
CHOICE_2.2 notificationRecipientAddress	CM	T	T	F	T
CHOICE_3.1 fileReportingPeriod	CM	T	T	F	T
CHOICE_3.2 fileLocation	CM	T	T	F	T
CHOICE_4.1 streamTarget	CM	T	T	F	T

4.3.33.3 Attribute constraints

Name	Definition
CHOICE_1.1 fileReportingPeriod	This attribute shall be supported, when the MnS producer supports file based reporting and storing files on the MnS producer.
CHOICE_2.1 fileReportingPeriod CHOICE_2.2 notificationRecipientAddress	These attributes shall be supported, when the MnS producer supports file based reporting, storing files on the MnS producer and implicit notification subscription.
CHOICE_3.1 fileReportingPeriod CHOICE_3.2 fileLocation	These attributes shall be supported, when MnS producer supports file based reporting and storing files on a MnS consumer.
CHOICE_4.1 streamTarget	This attribute shall be supported, when the MnS producer supports stream-based reporting.

4.3.33.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.34 ThresholdInfo <<dataType>>

4.3.34.1 Definition

This <<dataType>> defines a single threshold level.

4.3.34.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
performanceMetrics	M	T	T	F	T
thresholdDirection	M	T	T	F	T
thresholdValue	M	T	T	F	T
hysteresis	O	T	T	F	T

4.3.34.3 Attribute constraints

None

4.3.34.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.35 TraceReference <<dataType>>

4.3.35.1 Definition

This <<dataType>> defines a globally unique identifier, which uniquely identifies the Trace Session that is created by the TraceJob. It is composed of the MCC, MNC (resulting in PLMN identifier) and the trace identifier.

4.3.35.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
mcc	M	T	T	T	N/A
mnc	M	T	T	T	N/A
traceId	M	T	T	T	N/A

4.3.35.3 Attribute constraints

None.

4.3.35.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.36 AreaConfig <<dataType>>

4.3.36.1 Definition

This <<dataType>> defines the area for which measurement logging should be performed. It is described by a list of cells and a list of frequencies.

4.3.36.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
freqInfo	M	T	T	F	T
pciList	M	T	T	F	T

4.3.36.3 Attribute constraints

None.

4.3.36.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.37 FreqInfo <<dataType>>

4.3.37.1 Definition

This <<dataType>> defines the RF reference frequency and the frequency operating bands used in a cell for a given direction (UL or DL) in FDD or for both UL and DL directions in TDD.

4.3.37.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
arfcn	M	T	T	F	T
freqBands	M	T	T	F	T

4.3.37.3 Attribute constraints

None.

4.3.37.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.38 AreaScope <<dataType>>

4.3.38.1 Definition

This <<dataType>> defines an area scope.

The Area Scope parameter in LTE and NR contains one of the following:

- list of Cells, identified by E-UTRAN-CGI or NG-RAN CGI. Maximum 32 CGI can be defined.
- list of Tracking Area, identified by TAC. Maximum of 8 TAC can be defined.
- list of Tracking Area Identity, identified by TAC with associated plmn-Identity per TAC-List containing the PLMN identity for each TAC. Maximum of 8 TAI can be defined.

The Area Scope parameter in NR can also contain:

- list of NPN IDs in NR. It is either a list of PNI-NPNs identified by CAG ID with associated plmn-Identity (Maximum 256 PNI-NPNs can be defined) or a list of SNPN by Network ID with associated plmn-Identity (Maximum 16 SNPNs can be defined).
- list of network slices in NR. It is a list of network slices identified by PLMN-Id and S-NSSAI. Maximum of 16 PLMN-Id each with 1024 S-NSSAI can be defined.

4.3.38.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
CHOICE_1.1 eutraCellIdList	CM	T	T	F	T
CHOICE_2.1 nrCellIdList	CM	T	T	F	T
CHOICE_2.2 nPNIdentityList	O	T	T	F	T
CHOICE_3.1 tacList	M	T	T	F	T
CHOICE_3.2 cAGIdList	O	T	T	F	T
CHOICE_4.1 taiList	M	T	T	F	T
CHOICE_4.2 nPNIdentityList	O	T	T	F	T
CHOICE_5.1nPNIdentityList	O	T	T	F	T
sliceIdList	O	T	T	F	T

4.3.38.3 Attribute constraints

None.

Name	Definition
eutraCellIdList	This attribute shall be supported, when the system supports scoping by E-UTRAN.
nrCellIdList	This attribute shall be supported, when the system supports scoping by NR.

4.3.38.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.39 Tai <<dataType>>

4.3.39.1 Definition

This <<dataType>> defines a Tracking Area Identity (TAI) as specified in clause 28.6 of TS 23.003 [5], clause 8.2 of TS 38.300 [33] and clause 9.3.3.11 of TS 38.413 [34]. It is composed of the PLMN identifier (PLMN-Id, which is composed of the MCC and MNC) and the Tracking Area Code (TAC).

4.3.39.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
mcc	M	T	T	T	N/A
mnc	M	T	T	T	N/A
tac	M	T	T	T	N/A

4.3.39.3 Attribute constraints

None.

4.3.39.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.40 MbsfnArea <<dataType>>

4.3.40.1 Definition

This <<dataType>> defines a MBSFN area. It is composed of the MBSFN Area identifier and the carrier frequency (EARFCN).

4.3.40.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
mbsfnAreaId	M	T	T	F	T
earfcn	M	T	T	F	T

4.3.40.3 Attribute constraints

None.

4.3.40.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.41 MnsRegistry

4.3.41.1 Definition

This IOC is a container for MnsInfo IOC-s. It can be contained only by SubNetwork IOC. A SubNetwork IOC can contain only one instance of MnsRegistry.

The IOC is instantiated by the system.

4.3.41.2 Attributes

The MnsRegistry IOC includes the attributes inherited from Top IOC (defined in clause 4.3.29).

4.3.41.3 Attribute constraints

None.

4.3.41.4 Notifications

None.

4.3.42 MnsInfo

4.3.42.1 Definition

This IOC represents an available Management Service (MnS) and provides the data required to support its discovery. It is name-contained by MnsRegistry.

This information is used by the consumer to discover the producers of specific Management Services and to derive the addresses of the Management Service.

Attributes mnsLabel, mnsType, and mnsVersion are used to describe the Management Service.

Attribute mnsAddress is used to provide addressing information for the Management Service operations.

Attribute mnsScope is used to provide information about the management scope of the Management Service. The management scope is used to represent the set of managed object instances that can be accessed using the Management Service.

4.3.42.2 Attributes

The MnsInfo IOC includes the attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
mnsLabel	M	T	T/F	F	T
mnsType	M	T	T/F	F	T
mnsVersion	M	T	T/F	F	T
mnsAddress	M	T	T/F	F	T
mnsCapability	M	T	T/F	F	T
mnsScope	M	T	T/F	F	T
Atttibutes related to roles					
mgmtDataInfoRef	M	T	T/F	F	T
Note: For all attributes of MnSInfo, the property “isWritable=T” for the Separate MnSRegistry deployment scenario described in TS 28.537 [65], and “isWritable=F” for the Embedded MnSRegistry deployment scenario.					

4.3.42.3 Attribute constraints

None.

4.3.42.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions or additions.

4.3.43 ProcessMonitor <<dataType>>

4.3.43.1 Definition

This <<dataType>> provides attributes to monitor the progress of processes with specific purpose and limited lifetime running on MnS producers. It may be used as data type for dedicated progress monitor attributes when specifying the management representation of these processes. The attributes in this clause are defined in a generic way. For some attributes specialisations may be provided when specifying a concrete process representation.

If a management operation on some IOCs triggers an associated asynchronous process (whose progress shall be monitored), this should also result in creating an attribute named `ProcessMonitor`) in these IOC(s). The `processMonitor` attribute may be accompanied by use-case specific additional data items.

The progress of the process is described by the `status` and `progressPercentage` attributes. Additional textual qualifications for the `status` attribute may be provided by the `progessStateInfo` and `resultStateInfo` attributes.

When the process is instantiated, the `status` is set to "NOT_STARTED" and the `progressPercentage` " to "0". The MnS producer decides when to start executing the process and to transition into the "RUNNING" state. This time is captured in the `startTime` attribute. Alternatively, the process may start to execute directly upon its instantiation. One alternative must be selected when using this `<<dataType>>`.

During the "RUNNING" state the `progressPercentage` attribute may be repeatedly updated. The exact semantic of this attribute is subject to further specialisation. The `progessStateInfo` attribute may be used to provide additional textual information in the "NOT_STARTED", “CANCELLING” and "RUNNING" states. Further specialisation of `progessStateInfo` may be provided where this `<<dataType>>` is used.

Upon successful completion of the process, the `status` attribute is set to "FINISHED", the `progressPercentage` to 100%. The time is captured in the `endTime` attribute. Additional textual information may be provided in the `resultStateInfo` attribute. The type of `resultStateInfo` in this `<<dataType>>` definition is "String". Further specialisation of `resultStateInfo` may be provided where this `<<dataType>>` is used.

In case the process fails to complete successfully, the `status` attribute is set to "FAILED" or "PARTIALLY_FAILED", the current value of `progressPercentage` is frozen, and the time captured in `endTime`. The `resultStateInfo` specifies the reason for the failure. Specific failure reasons may be specified where the data type defined in this clause is used. The exact semantic of failure may be subject for further specialisation as well.

In case the process is cancelled, the `status` attribute is first set to "CANCELLING" and when the process is really cancelled then to "CANCELLED". The transition to "CANCELLED" is captured in the `endTime` attribute. The value of `rogressPercentage` is frozen. Additional textual information may be provided in the `resultStateInfo` attribute.

The `resultStateInfo` attribute is provided only for additional textual qualification of the states "FINISHED", "FAILED", "PARTIALLY_FAILED" or "CANCELLED". It shall not be used for making the outcome, that the process may produce in case of success, available.

The process may have to be completed within a certain time after its creation, for example because required data may not be available any more after a certain time, or the process outcome is needed until a certain time and when not provided by this time is not needed any more. The time until the MnS producer automatically cancels the process is indicated by the `timer` attribute.

4.3.43.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
`id`	M	T	F	F	T
`status`	M	T	F	F	T
`progressPercentage`	O	T	F	F	T
`progressStateInfo`	O	T	F	F	T
`resultStateInfo`	O	T	F	F	T
`startTime`	O	T	F	F	T
`endTime`	O	T	F	F	T
`timer`	O	T	T	F	F

4.3.43.3 Attribute constraints

None.

4.3.43.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.44 Files

4.3.44.1 Definition

This IOC represents a collection of files. It can be name-contained by SubNetwork, ManagedElement, PerfMetricJob or TraceJob. The Files object name-contains File objects, that represent the files of the collection. File collections allow to structure related files under a common root.

Instances of Files are created by MnS producers. They shall be created at latest when the first file of the collection becomes available for retrieval by MnS consumers.

The attributes of Files represent properties of the file collection and not properties of individual files.

When the file retrieval NRM fragment is used together with a data collection job (PerfMetricJob or TraceJob) the following provisions shall apply:

- The Files object shall be created at the same time as the object representing the data collection job.
- The attributes jobRef and jobId shall be supported and present in a Files instance. The attribute jobRef identifies the job that the files in the file collection relate to. The attribute jobId provides an identifier of the set of associated jobs.
- A Files instance shall contain files related to one and only one job.
- The files produced by one job shall be contained in one and only one Files instance.
- The job object shall support an attribute with a link to the created Files instance ("_linkToFiles").
- The attribute "_linkToFiles" shall be returned in the job creation response, if the stage 3 protocol supports returning attributes in an object creation response.
- The MnS producer decides where to name-contain the Files instance related to a job.

The attribute _linkToFiles allows a MnS consumer to create simple and targeted subscriptions for notifyFileReady and notifyFilePreparationError, or notifyMOICreation, notifyMOIChanges, and notifyMOIDeletion related to File instances created or deleted under the Files instance of a specific job. The subscription needs to scope simply objects one level below the Files object.

In addition, the attribute _linkToFiles allows for simple deployments not relying on notifications for reporting the availability of new files, where the MnS consumer polls regularly for new files under Files.

4.3.44.2 Attributes

The Files IOC includes the attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
numberOfFiles	M	T	F	F	F
Attributes related to roles					
jobRef	CM	T	F	T	F
jobId	CM	T	F	T	F

4.3.44.3 Attribute constraints

Name	Definition
jobRef	Condition: This attribute shall be supported when "PerfMetricJob" or "TraceJob" are supported.
jobId	Condition: This attribute shall be supported when "PerfMetricJob" or "TraceJob" are supported.

4.3.44.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions or additions.

4.3.45 File

4.3.45.1 Definition

This IOC represents a file. It is name-contained by Files.

When a file becomes available on a MnS producer for retrieval by a MnS consumer, the MnS producer shall create a File instance representing that file.

The time of creation shall be captured by the MnS producer in the fileReadyTime attribute. The MnS producer shall keep the file at least until the time specified by fileExpirationTime. After that time the MnS producer may delete the File instance. The fileExpirationTime is determined by the MnS producer based on considerations such as available storage space or file retention policies.

The attributes fileSize, fileCompression, fileDataType and fileFormat describe the file properties.

The MnS producer shall make the file available by one of the following means:

- For retrieval via a file transfer protocol. The fileLocation attribute indicates the address from where the file can be retrieved. The address includes the file transfer protocol (schema). Allowed file transfer protocols are "sftp", "ftpes" and "https".

- For retrieval of the file contents via a CM read operation. The attribute fileContent is provided for retrieving the actual file content. In this case, the name of the file is equal to the identity of the File instance.

When the file retrieval NRM fragment is used together with a data collection job (PerfMetricJob or TraceJob) the following provisions shall apply:

- The attributes jobRef and jobId shall be supported and present. The attribute jobRef identifies the job that the file is related to. The attribute jobId provides an identifier of the set of associated jobs.

The attributes jobRef and jobId allow to set notification filters in the subscription in such a way that only notifyMOICreation, notifyMOIDeletion and notifyMOIChanges notifications are sent to subscribed MnS consumers if the created or deleted File instance represents data related to jobs the subscribed MnS consumer created or is interested in.

Upon creation of a File instance, a notification of type notifyMOICreation or notifyMOIChanges shall be emitted to subscribed MnS consumers as usual. For the case that the file contains performance metric data (fileDataType is "PERFORMANCE") the MnS producer shall emit either a notification of type notifyMOICreation or notifyMOIChanges or of type notifyFileReady. The MnS consumer selects the notification type he wishes to receive with the subscription created on the MnS producer.

The objectClass and objectInstance parameters in the notification header of notifyFileReady shall identify the new File instance, instead of the related PerfMetricJob, TraceJob, ManagedElement or ManagementNode as described in TS 28.532 [27], clause 11.6.1.1.1 for the case that notifyFileReady is used as part of the file data reporting MnS.

The notification notifyFilePreparationError shall be supported as well by the File object. It shall be sent when an error occurs during the preparation of the file. No notifyFileReady or notifyMOICreation or

notifyMOIChanges shall be sent in that case. The objectClass and objectInstance parameters of the notification header shall identify the new File instance representing the corrupted file, instead of the related PerfMetricJob, TraceJob, ManagedElement or ManagementNode as described in 3GPP TS 28.532 [27], clause 11.6.1.1.1 for the case that notifyFilePreparationError is used as part of the file data reporting MnS. When the file is not created at all or deleted, the objectClass and objectInstance parameters of the notification header are populated as described in 3GPP TS 28.532 [27], clause 11.6.1.1.1. Note that to receive notifyFilePreparationError in that case the notification subscription needs to include these objects in its scope.

4.3.45.2 Attributes

The File IOC includes the attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
CHOICE_1.1 fileLocation	M	T	F	T	F
CHOICE_2.1 fileContent	M	T	F	T	F
fileCompression	M	T	F	T	F
fileSize	O	T	F	T	F
fileDataType	M	T	F	T	F
fileFormat	O	T	F	T	F
fileReadyTime	M	T	F	T	F
fileExpirationTime	O	T	F	T	F
Attributes related to roles					
jobRef	CM	T	F	T	F
jobId	CM	T	F	T	F

4.3.45.3 Attribute constraints

Name	Definition
jobRef	Condition: This attribute shall be supported when PerfMetricJob or TraceJob are supported.
jobId	Condition: This attribute shall be supported when PerfMetricJob or TraceJob are supported.

4.3.45.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC. In addition, the following set of notifications is also valid.

Name	S	Notes
notifyFileReady	M	
notifyFilePreparationError	M	

4.3.46 FileDownloadJob

4.3.46.1 Definition

The FileDownloadJob represents a job on a MnS producer that downloads a file to the MnS producer. It can be name-contained by ManagedElement or SubNetwork.

A FileDownloadJob is created by a MnS consumer to request that the MnS producer download a file from a specified location. The creation request contains the information required by the MnS producer to download the file, namely the attribute fileLocation.

The creation request may contain as well a notificationRecipientAddress. If present, this attribute instructs the MnS producer to create, on behalf of the MnS consumer, a subscription for attribute value change notifications of the new FileDownloadJob (implicit notification subscription). In case the MnS producer supports the notification type

notifyMOIChanges, the created subscription shall be for this type, otherwise for notifyMOIAttributeValueChanges. The MnS consumer needs to be prepared to receive either of them. The notificationRecipientAddress attribute of the created NtfSubscriptionControl object shall be set to the value of the notificationRecipientAddress in the FileDownloadJob creation request.

The jobMonitor attribute represents the status of a file download job and includes information the MnS consumer can use to monitor the progress and result of the file download job. The data type of this attribute is ProcessMonitor . The following specialisations are provided for this <<dataType>> for the file download job:

- The status attribute values are "NOT_STARTED", "RUNNING", "CANCELLING", "FINISHED, "FAILED" and "CANCELLED". The values "SUSPENDED" and "PARTIALLY_FAILED" are not used.
- The MnS consumer can set the value of the timer attribute to specify the time by which the file download is expected to complete, i.e. to indicate how long the file is available for download. If the timer expires before the MnS producer has finished the job the status is set to "FAILED" and resultStateInfo is set to "TIMER_EXPIRED".
- The "progessPercentage" attribute indicates how much percent of the file is already downloaded as measured by downloaded bytes from total file size in bytes.
- No specialisations are provided for the progressStateInfo attribute. Vendor specific information may be provided though.
- For the case that the status is equal to "FAILED" the resultStateInfo attribute shall indicate one of the following failure reasons: "UNKNOWN", "NO_STORAGE", "LOW_MEMROY", "NO_CONNECTION_TO_REMOTE_SERVER", "FILE_NOT_AVAILABLE", "DNS_CANNOT_BE_RESOLVED", "TIMER_EXPIRED", "OTHER".
- For the case that the status is equal to "FINISHED" or "CANCELLED" no specialisations are provided for the resultStateInfo attribute. Vendor specific information may be provided though.

Once the job is complete with jobstatus equal to "FINISHED", "CANCELLED", or "FAILED" the MnS consumer shall delete the FileDownloadJob. The MnS producer may also delete the FileDownloadJob.

4.3.46.2 Attributes

The FileDownloadJob IOC includes the attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
fileLocation	M	T	T	T	F
notificationRecipientAddress	O	T	T	T	F
cancelJob	M	T	T	F	T
jobMonitor	M	T	T	F	T

4.3.46.3 Attribute constraints

None.

4.3.46.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions or additions.

4.3.47 ManagementDataCollection

4.3.47.1 Definition

This IOC represents a management data collection request job. The requested data is of kind Trace, MDT (Minimization of Drive Test), RLF (Radio Link Failure) report, RCEF (RRC Connection Establishment Failure) report, RRC report, PM (performance measurements), KPI (end-to-end key performance indicators) or a combination of these.

The attribute `managementData` defines the management data which shall be reported. This may either include a list of data categories or a list of management data identified with their name. For further details see clause 4.3.50.

The `targetNodeFilter` attribute can be used to target object instance(s) producing the required management data. It is assumed that the consumer may not have detailed knowledge of the network and hence may not identify the exact object instance producing the required management data. In this case consumer can request management data, specified by 3GPP, produced by certain object instance (s) based on a particular location, the domain (CN or RAN) of the object instances, and the handled traffic (CP or UP) of the object instances.

To activate the production of the requested data, a MnS consumer has to create a `ManagementDataCollection` object instance on the MnS producer.

The production and reporting of the management data can be constrained by conditions such that only when the conditions are satisfied shall management data collection be enabled. For example, a MnS consumer can request to create two `ManagementDataCollection` instances. One can be configured with high data producing and reporting period on a set of conditions (e.g, to reduce transmission cost when network performance metric is in normal range). Another can be configured with low data producing and reporting period on another set of conditions (e.g. to enable network optimization when network performance metric is in abnormal range).

Editor's Note: It is currently not possible to construct conditions based on performance metrics. This needs to be enabled before the text in the paragraph above can be approved and published. Furthermore, it needs to be investigated if the `ConditionMonitor` shall be used or if the conditions should be added to this IOC directly using an attribute.

The MnS producer may derive multiple jobs (`PerfMetricJob`, `TraceJob`) from a single `ManagementDataCollection` job for collecting the required management data. The attribute `jobId` is used to correlate the derived jobs.

If the MnS producer receives the collected data from multiple sources, it shall consolidate the data into a set of management data for reporting based on the value of the attribute `consolidateOutput`.

For consolidation of file-based management data the attribute `consolidateOutput` controls:

- True: the MnS Producer shall combine the file output from jobs used to collect the required management data into a single output file as follows:
  - File is in compressed format, i.e. zip.
  - File shall contain individual output files from each configured job
  - Each file retains its original filename
  - Each file retains it original content
  - Consolidated filename uses naming convention defined in [27], clause 11.3.2.1.4 with the following:
    - <Type> is a combination of the management data types included in the consolidated output
    - <UniqueIdList> is omitted
- False: the MnS Producer shall not combine the output from jobs used to collect the required management data. The MnS Consumer shall receive separate output from the derived jobs.

Subject to the reporting method, the MnS Consumer may receive file related notifications. When consolidated output is selected the MnS Producer shall create file notifications for the consolidated files. When consolidated output is not selected, the MnS Producer shall create the notification subscriptions on behalf of the MnS Consumer and the MnS Consumer shall receive notifications directly from the derived jobs.

The attribute `collectionTimeWindow` specifies the time window for which the management data should be reported. The attributes `startTime` and the `endTime` can be in the past, present or in the future.

A `startTime` value in the past and/or a `endTime` value in the past indicate that historical management data is included.

The attribute `reportingCtrl` specifies the method and associated control parameters for reporting the produced management data to MnS consumers. Three methods are available: file-based reporting with selection of the file location by the MnS producer, file-based reporting with selection of the file location by the MnS consumer and stream-based reporting.

The attribute `dataScope` configures, whether the management data should be reported per S-NSSAI or per 5QI or per PLMN, if applicable.

The attribute `processMonitor` allows the MnS consumer to monitor the status of the management data collection represented by the object `ManagementDataCollection`.

The MnS producer indicates in the attribute `progressStateInfo` the state of the management data collection:

- NOT_STARTED
- RUNNING
- CANCELING

and indicates in the attribute `resultStateInfo`:

- FINISHED
- FAILED
- PARTIALLY_FAILED
- CANCELLED

4.3.47.2 Attributes

The `ManagementDataCollection` IOC includes the attributes inherited from `Top` IOC (defined in clause 4.3.29) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
managementData	M	T	T	T	N/A
targetNodeFilter	M	T	T	T	N/A
collectionTimeWindow	M	T	T	T	N/A
reportingCtrl	M	T	T	T	N/A
dataScope	O	T	T	T	N/A
condition	O	T	T	T	N/A
processMonitor	O	T	F	F	T
consolidateOutput	M	T	T	T	T
jobId	M	T	T	T	T

4.3.47.3 Attribute constraints

None.

4.3.47.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC. In addition, the following set of notifications is also valid.

Name	S	Notes
`notifyFileReady`	M	--
`notifyFilePreparationError`	M	--

4.3.48 Void

4.3.49 NodeFilter <<dataType>>

4.3.49.1 Definition

This <<dataType>> defines several selection criteria for the target node(s) i.e., the node(s) producing the requested management data.

The attribute areaOfInterest determines the location for which the management data is collected. The system translates the area into the target managed objects. The location is either configured by a list of TAI, a list of cells (identified either by NG-RAN CGI, E-UTRAN CGI or UTRAN CGI) or by a geographical area. The geographical area shall be mapped to the cells providing coverage for this area. The cell coverage status at the time of the request is used for the mapping. Managed objects providing service to these cells are considered as target managed objects. Furthermore, an object which name contains or is associated to a managed object providing service to the considered cell, is considered as target managed object as well.

The attribute networkDomain is used to select a particular domain (e.g. RAN, CN) for which the management data is collected. The system translates this information into the target managed objects. Managed objects from this selected particular domain (e.g RAN, CN) are considered as target managed objects. Furthermore, an object which name contains or is associated to a managed object of that domain, is considered as target managed object as well.

The attribute cpUpType is used to select the traffic type (CP, UP) for which the management data is collected. The system translates this information into the target managed objects. Managed objects catering particular traffic type (CP, UP) are considered as target managed objects. Furthermore, an object which name contains or is associated to a managed object of that traffic type, shall be considered as target managed object as well.

The attribute sst is used to select the SST (Slice/Service Type) TS 23.501 [22] for which the management data is collected. The system translates this information into the target managed objects. Managed objects related to particular SST shall be considered as target managed objects.

The attribute objectInstances is used to select one or more exact managed objects for which management data is collected.

If it is not possible to select the target node(s) (based on a particular selection criteria) deterministically, the selection criteria should not be used.

4.3.49.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
areaOfInterest	O	T	T	T	N/A
networkDomain	O	T	T	T	N/A
cpUpType	O	T	T	T	N/A
sst	O	T	T	T	N/A
objectInstances	O	T	T	T	N/A

4.3.49.3 Attribute constraints

None.

4.3.49.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.50 ManagementData <<choice>>

4.3.50.1 Definition

This <<choice>> defines the management data which is requested. It is a choice between

- a list of data categories (attribute mgtDataCategory) This may include "COVERAGE", "CAPACITY", "MOBILITY", "ENERGY_EFFICIENCY", "ACCESSIBILITY" etc. The mapping of exact measurement with the requested category shall be done at the producer and is implementation specific.
- a list of management data identified with their name (attribute "mgtDataName"). The management data name presents a specific single measurement (e.g. by selecting "RRU.PrbTotDl", see TS 28.552 [20] or "immediateMdt.nr.m1", see TS 32.422 [30]) or a set of measurements (e.g. measurement families such as RRU (radio resource utilization) or MM (mobility management) in case of PM, see TS 28.552 [20], or group of measurements such as "immediateMdt.nr" in case of MDT, see TS 32.422 [30]).

4.3.50.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
CHOICE_1.1 mgtDataCategory	M	T	T	T	N/A
CHOICE_2.1 mgtDataName	M	T	T	T	N/A

4.3.50.3 Attribute constraints

None.

4.3.50.4 Notifications

The clause 4.5 of the <<IOC>> using this <<choice>> as one of its attributes, shall be applicable.

4.3.51 AreaOfInterest <<choice>>

4.3.51.1 Definition

This <<choice>> defines the area which shall be considered for the service.

4.3.51.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
CHOICE_1.1 geoAreaToCellMapping	M	T	T	T	N/A
CHOICE_2.1 taiList	M	T	T	T	N/A
CHOICE_3.1 nrCellIdList	CM	T	T	T	N/A
CHOICE_4.1 eutraCellIdList	CM	T	T	T	N/A
CHOICE_5.1 utraCellIdList	CM	T	T	T	N/A

4.3.51.3 Attribute constraints

Name	Definition
nrCellIdList	This attribute shall be supported, when the system supports scoping by NR cells.
eutraCellIdList	This attribute shall be supported, when the system supports scoping by E-UTRAN cells
utraCellIdList	This attribute shall be supported, when the system supports scoping by UTRAN cells.

4.3.51.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.52 GeoAreaToCellMapping <<dataType>>

4.3.52.1 Definition

This <<dataType>> contains a geographical area and an association threshold. The geo-area is defined as a polygon using the attribute geoArea.

The MnS producer shall map the geographical area to cells. There are two evaluation criteria whether a cell belongs to a geographical area or not. If attribute associationThreshold is absent, the location of the base station antenna determines the belonging. If attribute associationThreshold is configured, the coverage area is considered. The attribute associationThreshold determines the lower boundary of the coverage ratio. For example, if the associationThreshold is configured to 60%, a cell shall be considered as included in the geographical area if at least 60% of the coverage area of that cell overlaps with the specified geographical area.

The mapping of the geographical area to cells is performed at instantiation of the IOC.

4.3.52.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
geoArea	M	T	T	F	N/A
associationThreshold	O	T	T	T	N/A

4.3.52.3 Attribute constraints

None.

4.3.52.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.53 GeoCoordinate <<dataType>>

4.3.53.1 Definition

This <<dataType>> defines a geographical location on earth with the altitude.

4.3.53.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
latitude	M	T	T	F	T
longitude	M	T	T	F	T
altitude	O	T	T	F	T

4.3.53.3 Attribute constraints

None.

4.3.53.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.54 QMCJob

4.3.54.1 Definition

The QoE Measurement Collection provides capability for collecting QoE information from:

- UEs which are in the specified area in case of Management Based Activation or

- an individual UE in case of Signalling Based Activation.

The QoE Measurement Collection enables collection of application layer measurements from the UE for specified end user service type. The supported service types are:

- Streaming services, see TS 26.247 [51].
- MTSI services, see TS 26.114 [52].
- VR services, see TS 26.118 [53].

A `QMCJob` instance represents the job for collecting QoE measurements according to the job parameters. For details of the QoE measurement collection configuration parameters see clause 5 of TS 28.405 [50]. A `QMCJob` instance can be name-contained by `SubNetwork` or `ManagedElement`.

A QMC Job is activated by creating a `QMCJob` object instance in the MnS producer. For details of Management Based Activation of QoE Measurement Collection see clause 4.5 and for details of Signalling Based Activation of QoE Measurement Collection see clause 4.6 of TS 28.405 [50]. The attributes `pLMNTarget` is only relevant when Management Based Activation is used and the attribute `qoETarget` is only relevant when Signalling Based Activation is used. All other attributes are common for both Management Based Activation and Signalling Based Activation.

The `areaScope` attribute defines the area scope of QoE, which is specified in clause 5.4 of TS 28.405 [50].

When a MnS consumer wishes to deactivate a `QMCJob`, the MnS consumer shall delete the corresponding `QMCJob` instance.

NOTE: If the reporting is ongoing, when a request to delete a `QMCJob` instance is received, the reporting does not end. The `QMCJob` instance is deleted, when the last reporting for the QMC Job expires.

The `jobId` attribute can be used to associate multiple `QMCJob` instances. For example, it is possible to configure the same `jobId` value for multiple `QMCJob` instances required to produce the data (e.g. Streaming services and MTSI reports) for a specific network analysis.

4.3.54.2 Attributes

The `QMCJob` IOC includes attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
serviceType	M	T	T	F	T
areaScope	CM	T	T	F	T
qoECollectionEntityAddress	M	T	T	F	T
pLMNTarget	CM	T	T	F	T
qoETarget	CM	T	T	F	T
qoEReference	M	T	T	F	T
jobId	O	T	T	T	T
sliceScope	CM	T	T	F	T
qMCConfigFile	M	T	T	F	T
mDTAlignmentInformation	O	T	T	F	T
availableRANqoEMetrics	O	T	T	F	T
mBSCommunicationServiceType	O	T	F	F	T

4.3.54.3 Attribute constraints

Name	Definition
areaScope	Condition: This attribute shall be supported when the QMC is targeting specific area(s).
pLMNTarget	Condition: This attribute shall be supported when Management Based Activation is used and if network sharing is deployed.
qoETarget	Condition: This attribute shall be supported when Signalling Based Activation is used.
sliceScope	Condition: This attribute shall be supported when the QMC is targeting specific slice(s).

4.3.54.4 Notifications

The common notifications defined in clauses 4.5.1 and 4.5.2 are valid for this IOC, without exceptions.

4.3.55 GeoArea <<choice>>

4.3.55.1 Definition

This <<choice>> defines a geographical area.

A set of geo-coordinates representing the corners of a polygon configured in the attribute geoPolygon is one choice.

4.3.55.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
CHOICE_1.1 geoPolygon	M	T	T	F	N/A

4.3.56 ExcessPacketDelayThresholds <<dataType>>

4.3.56.1 Definition

This <<dataType>> defines an excess packet delay threshold information to enable the calculation of the PDCP Excess Packet Delay in the uplink in case of M6 uplink measurements are requested. The excess packet delay threshold information is specified with the 5QI value and excess packet delay threshold value. The excess packet delay thresholds attribute is specified in clause 5.10.41 of TS 32.422 [30].

4.3.56.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
fiveQIValue	M	T	T	F	T
excessPacketDelayThresholdValue	M	T	T	F	T

4.3.56.3 Attribute constraints

None

4.3.56.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.57 TraceConfig <<dataType>>

4.3.57.1 Definition

This <<dataType>> defines the configuration parameters of IOC TraceJob which are specific for Trace or any combination of Trace.

The attribute listOfNeTypes specifies the network elements to be traced. The optional attribute listOfInterfaces allows to specify the individual interfaces of the network elements to be recorded.

The attribute traceDepth allows to configure the level of detail of the information which shall be recorded.

For trace the reporting is event based, where the triggering event is configured with attribute triggeringEvent. For each triggering event the first and last message (start/stop triggering event) to record are specified.

4.3.57.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
listOfInterfaces	O	T	T	F	T
listOfNeTypes	CM	T	T	F	T
traceDepth	M	T	T	F	T
triggeringEvents	M	T	T	F	T

4.3.57.3 Attribute constraints

Name	Definition
listOfNeTypes	This attribute shall be present only for Trace with Signalling Based Activation

4.3.57.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions.

4.3.58 MdtConfig <<dataType>>

4.3.58.1 Definition

This <<dataType>> defines the configuration parameters of IOC TraceJob which are specific for MDT or any combination of MDT.

The attribute anonymizationOfMdtData specifies the level of anonymization of MDT data.

The optional attribute areaScope defines the area scope of MDT, which is specified in clause 5.10.2 of TS 32.422 [30].

The attribute sensorInformation allows to specify the sensor information to include.

The attribute trsrPrefixCfg contains the TRSR prefix configuration parameters which shall be used by the NR-RAN nodes during TRSR assignment for a C-MDT job.

Based on the value configured for attribute jobType in IOC TraceJob, the attributes immediateMdtConfig or loggedMdtConfig or both are available: If the attribute jobType indictes immediate MDT, the attribute immediateMdtConfig is applicable. If the attribute jobType indictes logged MDT or logged MBSFN MDT, the attribute loggedMdtConfig is applicable. If the attribute jobType indictes both immediate MDT and logged MDT, both the attribute immediateMdtConfig and the attribute loggedMdtConfig are applicable.

The optional attribute plmnList allows to specify the PLMNs where measurements collection, status indication and log reporting is allowed.

4.3.58.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
anonymizationOfMdtData	M	T	T	F	T
areaScope	M	T	T	F	T
sensorInformation	CO	T	T	F	T
immediateMdtConfig	CM	T	T	F	T
loggedMdtConfig	CM	T	T	F	T
mNOnly	CO	T	T	F	T
plmnList	CO	T	T	F	T
trsrPrefixCfg	CM	T	T	F	T

4.3.58.3 Attribute constraints

Name	Definition
sensorInformation	This attribute is attribute may be present only if NR is supported.
immediateMdtConfig	This attribute shall be present only if Immediate MDT is supported.
loggedMdtConfig	This attribute shall be present only if Logged MDT is supported.
mNOnly	This attribute may be present if signalling based MDT for NR is supported and MN only for MDT is supported.
plmnList	This attribute may be present only if multiple PLMNs are supported.
trsrPrefixCfg	This attribute shall be present only if C-MDT is supported in NR-RAN.

4.3.58.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions.

4.3.59 ImmediateMdtConfig <<dataType>>

4.3.59.1 Definition

This <<dataType>> defines the configuration parameters of IOC TraceJob which are specific for Immediate MDT or any combination of Immediate MDT.

The optional attribute positioningMethod allows to specify the positioning methods to use.

The following attributes are conditional available based on the measurements configured in listOfMeasurements:

- reportInterval (conditional for M1 in LTE or NR and M1/M2 in UMTS),
- reportAmount (conditional for M1/M2 in UMTS),
- reportAmountM1LTE (conditional for M1 in LTE),
- reportAmountM4LTE (conditional for M4 in LTE),
- reportAmountM5LTE (conditional for M5 in LTE),
- reportAmountM6LTE (conditional for M6 in LTE),
- reportAmountM7LTE (conditional for M7 in LTE),
- reportAmountM1NR (conditional for M1 in NR),
- reportAmountM4NR (conditional for M4 in NR),
- reportAmountM5NR (conditional for M5 in NR),
- reportAmountM6NR (conditional for M6 in NR),
- reportAmountM7NR (conditional for M7 in NR),
- reportingTrigger (conditional for M1 in LTE or NR and M1/M2 in UMTS),
- eventThreshold (conditional for A2 event reporting or A2 event triggered periodic reporting),
- collectionPeriodRRMNR (conditional for M4 and M5 in NR),
- collectionPeriodM6NR (conditional for M6 in NR),
- collectionPeriodM7NR (conditional for M7 in NR),

- collectionPeriodRRMLTE (conditional for M3 in LTE),
- measurementPeriodLTE (conditional for M4 and M5 in LTE),
- collectionPeriodM6LTE (conditional for M6 in LTE),
- collectionPeriodM7LTE (conditional for M7 in LTE),
- collectionPeriodRRMUMTS (conditional for M4 and M5 in UMTS),
- measurementPeriodUMTS (conditional for M6 and M7 in UMTS),
- measurementQuantity (conditional for 1F event reporting).
- beamLevelMeasurement (conditional for M1 in NR),
- excessPacketDelayThresholds (conditional for M6 UL measurement in NR).

For immediate MDT, the measurement reporting is dependent on the configured measurements:

- For measurement M1 in LTE or NR, it is possible to select between periodical, event triggered, event triggered periodic reporting or reporting according to all configured RRM event triggers. For M1 and M2 measurement in UMTS, it is possible to select between periodical, event triggered reporting or reporting according to all configured RRM event triggers. Parameter reportingTrigger determines which of the reporting methods is selected and in case of event triggered or event-triggered periodic, which is the decisive event type. For periodical reporting, parameter reportInterval and one of reportAmount, reportAmountM1LTE and reportAmountM1NR, for UMTS, LTE or NR, respectively, determine the interval between two successive reports and the number of reports. This means the periodical reporting terminates after reportAmount, reportAmountM1LTE or reportAmountM1NR reports have been sent as long as the corresponding attribute is configured with a value different from infinity. For event-triggered periodic reporting, these two parameters apply in addition to parameter eventThreshold which determines the threshold of the event. In this case up to reportAmountM1LTE or reportAmountM1NR reports are sent with a periodicity of reportInterval after the entering condition is fulfilled. The reporting is stopped, if the leaving condition is fulfulled and is restarted if the configured event reoccurs. For event based reporting, there is only one report sent after the event occurs. The parameters to configure are reportingTrigger and eventThreshold. In case of UMTS and 1F event reporting, additionally parameter measurementQuantity is necessary in order to determine for which measurement(s) the event threshold is applicable. Parameter beamLevelMeasurement determines whether beam level measurements shall be included in case of NR.

- For measurement M2 in NR or LTE, reporting is according to RRM configuration, see TS 38.321 [36], TS 36.321 [37] and TS 38.331 [38], TS 36.331 [39].

- For measurement M4 in UMTS, reporting is either according to RRM configuration, see TS 25.321 [40] and TS 25.331 [41] or periodic or event triggered periodic using parameter collectionPeriodRRMUMTS and eventThresholdUphUMTS.

- For measurement M3 in UMTS, the reporting is done upon availability, see TS 37.320 [43].

- For measurements M4, M5, M6 and M7 in NR, for measurements M3, M4, M5, M6 and M7 in LTE and for measurements M5, M6 and M7 in UMTS periodical reporting is applied. The configurable parameter is the interval between two measurements (collectionPeriodRrmNR, collectionPeriodM6NR, collectionPeriodM7NR, collectionPeriodRrmLTE, measurementPeriodLTE, collectionPeriodM6LTE, collectionPeriodM7LTE, collectionPeriodRrmUMTS, measurementPeriodUMTS) and the number of reports (reportAmountM4NR, reportAmountM5NR, reportAmountM6NR, reportAmountM7NR, reportAmountM4LTE, reportAmountM5LTE, reportAmountM6LTE, reportAmountM7LTE). If no collection period is configured for M5 in UMTS, all available measurements are logged according to RRM configuration.

- Measurements M8 and M9 in NR or LTE are reported according to configured M1 and/or M6 related UE measurement reporting.

4.3.59.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
listOfMeasurements	M	T	T	F	T
reportingTrigger	CM	T	T	F	T
reportInterval	CM	T	T	F	T
reportAmount	CM	T	T	F	T
eventThreshold	CM	T	T	F	T
collectionPeriodRRMNR	CM	T	T	F	T
collectionPeriodM6NR	CM	T	T	F	T
collectionPeriodM7NR	CM	T	T	F	T
collectionPeriodRRMLTE	CM	T	T	F	T
measurementPeriodLTE	CM	T	T	F	T
collectionPeriodM6LTE	CM	T	T	F	T
collectionPeriodM7LTE	CM	T	T	F	T
eventThresholdUphUMTS	CO	T	T	F	T
collectionPeriodRRMUMTS	CM	T	T	F	T
measurementPeriodUMTS	CM	T	T	F	T
measurementQuantity	CM	T	T	F	T
beamLevelMeasurement	CM	T	T	F	T
positioningMethod	O	T	T	F	T
excessPacketDelayThresholds	CO	T	T	F	T
reportAmountM1LTE	CM	T	T	F	T
reportAmountM4LTE	CM	T	T	F	T
reportAmountM5LTE	CM	T	T	F	T
reportAmountM6LTE	CM	T	T	F	T
reportAmountM7LTE	CM	T	T	F	T
reportAmountM1NR	CM	T	T	F	T
reportAmountM4NR	CM	T	T	F	T
reportAmountM5NR	CM	T	T	F	T
reportAmountM6NR	CM	T	T	F	T
reportAmountM7NR	CM	T	T	F	T

4.3.59.3 Attribute constraints

Name	Definition
reportingTrigger	This attribute shall be present only if measurement set for M1 (in UMTS, LTE and NR) or M2 (only in UMTS) is supported.
reportInterval	This attribute shall be present when these conditions are met: measurement set for M1 (in UMTS, LTE and NR) or M2 (only in UMTS) is supported; periodic measurements or event triggered periodic measurements is supported.
reportAmount	This attribute shall be present only when these conditions are met: measurement set for M1/M2 (in UMTS) is supported; periodic measurements or event triggered periodic measurements is supported.
eventThreshold	This attribute shall be present only if A2 event reporting (in LTE and NR) or 1F/1I event reporting (in UMTS) is supported.
collectionPeriodRRMNR	This attribute shall be present only if measurement set for M4 (in NR) or M5 (in NR) is supported.
collectionPeriodM6NR	This attribute shall be present only if measurement set for M6 (in NR) is supported.
collectionPeriodM7NR	This attribute shall be present only if measurement set for M7 (in NR) is supported.
collectionPeriodRRMLTE	This attribute shall be present only if measurement set for M2 (in LTE) or M3 (in LTE) is supported.
measurementPeriodLTE	This attribute shall be present only if measurement set for M4 (in LTE) or M5 (in LTE) is supported.
measurementPeriodM6LT**E**	This attribute shall be present only if measurement set for M6 (in LTE) is supported.
measurementPeriodM7LTE	This attribute shall be present only if measurement set for M7 (in LTE) is supported.
eventThresholdUphUMTS	This attribute may be present only if measurement set for M4 (in UMTS) is supported.
collectionPeriodRRMUMTS	This attribute shall be present only if measurement set for M3 (in UMTS), M4 (in UMTS) or M5 (in UMTS) is supported.
measurementPeriodUMTS	This attribute shall be present only if measurement set for M6 (in UMTS) or M7 (in UMTS) is supported.
measurementQuantity	This attribute shall be present only if 1F event reporting is supported.
beamLevelMeasurement	This attribute shall be present only if measurement set for M1 (in NR) is supported.
excessPacketDelayThresholds	This attribute may be present only if measurement set for M6 (for UL in NR) is supported.
reportAmountM1LTE	This attribute shall be present only when these conditions are met: measurement set for M1 (in LTE) is supported; periodic measurements or event triggered periodic measurements is supported.
reportAmountM4LTE	This attribute shall be present only when these conditions are met: measurement set for M4 (in LTE) is supported; periodic measurements or event triggered periodic measurements is supported.
reportAmountM5LTE	This attribute shall be present only when these conditions are met: measurement set for M5 (in LTE) is supported; periodic measurements or event triggered periodic measurements is supported.
reportAmountM6LTE	This attribute shall be present only when these conditions are met: measurement set for M6 (in LTE) is supported; periodic measurements or event triggered periodic measurements is supported.
reportAmountM7LTE	This attribute shall be present only when these conditions are met: measurement set for M7 (in LTE) is supported; periodic measurements or event triggered periodic measurements is supported.
reportAmountM1NR	This attribute shall be present only when these conditions are met: measurement set for M1 (in NR) is supported; periodic measurements or event triggered periodic measurements is supported.

reportAmountM4NR	This attribute shall be present only when these conditions are met: measurement set for M4 (in NR) is supported; periodic measurements or event triggered periodic measurements is supported.
reportAmountM5NR	This attribute shall be present only when these conditions are met: measurement set for M5 (in NR) is supported; periodic measurements or event triggered periodic measurements is supported.
reportAmountM6NR	This attribute shall be present only when these conditions are met: measurement set for M6 (in NR) is supported; periodic measurements or event triggered periodic measurements is supported.
reportAmountM7NR	This attribute shall be present only when these conditions are met: measurement set for M7 (in NR) is supported; periodic measurements or event triggered periodic measurements is supported.

4.3.59.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions.

4.3.60 LoggedMdtConfig <<dataType>>

4.3.60.1 Definition

This <<dataType>> defines the configuration parameters of IOC TraceJob which are specific for Logged MDT or Logged MBSFN MDT.

Based on the value configured for attribute jobType in IOC TraceJob, different attributes are available. In case of LOGGED_MDT_ONLY, the attributes reportType, eventListForEventTriggeredMeasurement, eventThresholdL1, hysteresisL1, timeToTriggerL1, areaConfigurationForNeighCells and npnIdentityList are applicable. In case of LOGGED_MBSFN_MDT, the attribute mbsfnAreaList is applicable.The optional attribute areaConfigurationForNeighCells allows to specify the area for which UE is requested to perform measurements logging for neighbour cells which have list of frequencies

For logged MDT in UMTS and LTE, the reporting is periodical. Parameter loggingInterval determines the interval between the reports and parameter loggingDuration determines how long the configuration is valid meaning after this duration has passed no further reports are sent. In NR, the reporting can be periodical or event based, determined by parameter reportType. For periodical reporting the same parameters as in LTE and UMTS apply. For event based reporting, parameter eventListForEventTriggeredMeasurement configures the event type, namely ‘out of coverage’ or ‘L1 event’. In case ‘L1 event’ is selected as event type, the logging is performed according to parameter loggingInterval at regular intervals only when the conditions indicated by eventThresholdL1, hysteresisL1, timeToTriggerL1 (defining the thresholds, hysteresis and time to trigger) are met and if UE is ‘camped normally’ state (TS 38.331 [38], TS 38.304 [42]). In case ‘out of coverage’ is selected as event type, the logging is performed according to parameter loggingInterval at regular intervals only when the UE is in ‘any cell selection’ state. Furthermore, logging is performed immediately upon transition from the ‘any cell selection’ state to the ‘camped normally’ state (TS 38.331 [38], TS 38.304 [42]).

4.3.60.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
traceCollectionEntityId	M	T	T	F	T
loggingDuration	M	T	T	F	T
loggingInterval	M	T	T	F	T
reportType	CM	T	T	F	T
eventListForEventTriggeredMeasurement	CM	T	T	F	T
eventThresholdL1	CM	T	T	F	T
hysteresisL1	CM	T	T	F	T
timeToTriggerL1	CM	T	T	F	T
areaConfigurationForNeighCell	CO	T	T	F	T
mbsfnAreaList	CM	T	T	F	T
nPNIdentityList	CM	T	T	F	T

4.3.60.3 Attribute constraints

Name	Definition
reportType	This attribute shall be present only if NR is supported.
eventListForEventTriggeredMeasurement	This attribute shall be present only if NR is supported.
eventThresholdL1	This attribute shall be present only if NR is supported.
hysteresisL1	This attribute shall be present only if NR is supported.
timeToTriggerL1	This attribute shall be present only if NR is supported.
areaConfigurationForNeighCell	This attribute may be present only if NR is supported.
mbsfnAreaList	This attribute shall be present only if E-UTRAN is supported.
nPNIdentityList	This attribute shall be present only when these conditions are met: NR is supported; several NPNs are supported in the RAN (see TS 38.331 [38]).

4.3.60.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions.

4.3.61 SupportedNotifications

4.3.61.1 Definition

SupportedNotifications represents the notification related capabilities of a MnS producer. It can be name-contained by SubNetwork or ManagedElement.

The notificationTypes attribute notificationType values supported by the MnSProducer. Specific IOCs can be the source of a specific but not necessary every supported notificationType.

The notificationProtocols attribute identifies the notification transport protocols supported by a MnS producer.

4.3.61.2 Attributes

The SupportedNotifications IOC includes attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
notificationTypes	M	T	F	F	T
notificationProtocols	M	T	F	F	T

4.3.61.3 Attribute constraints

None

4.3.61.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC

4.3.62 Scheduler

4.3.62.1 Definition

This IOC defines a time scheduler. It can be name-contained by SubNetwork or ManagedElement.

The attribute schedulingTimes allows to configure one or several active time intervals. The active intervals can be configured to occur once or recurring periodically.

The boolean attribute schedulerStatus switches between TRUE and FALSE depending upon whether the configured time constraints are fulfilled or not. This attribute makes the internal Scheduler status observable.

4.3.62.2 Attributes

The Scheduler IOC includes the attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
schedulingTimes	M	T	T	F	T
schedulerStatus	M	T	F	F	T

4.3.62.3 Attribute constraints

None.

4.3.62.4 Notifications

The configuration notifications defined in clause 4.5.2 are valid for this IOC.

4.3.63 SchedulingTime <<choice>>

4.3.63.1 Definition

This <<choice>> defines the scheduling time and allows to configure one of four possible scheduling methods:

One time interval: The attribute timeWindow presents the active scheduling time. A duration more than one day may be configured.

Daily periodicity: Several active intervals per day can be configured in attribute timeIntervals. The active scheduling times recur each day.

Weekly periodicity: Several active intervals for one day can be configured in attribute timeIntervals. The active scheduling times recur on the days of the weeks configured by attribute daysOfWeek

Monthly periodicity: Several active intervals for one day can be configured in attribute timeIntervals. The active scheduling times recur on the days of the months configured by attribute daysOfMonth.

4.3.63.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
CHOICE_1.1 timeWindow	CM	T	T	F	T
CHOICE_2.1 timeIntervals	CM	T	T	F	T
CHOICE_3.1 timeIntervals	CM	T	T	F	T
CHOICE_3.2 daysOfWeek	CM	T	T	F	T
CHOICE_4.1 timeIntervals	CM	T	T	F	T
CHOICE_4.2 daysOfMonth	CM	T	T	F	T

4.3.63.3 Attribute constraints

Name	Definition
CHOICE_1.1 timeWindow	This attribute shall be supported, when the MnS producer supports a management activity for a configured one-time interval.
CHOICE_2.1 timeIntervals	This attribute shall be supported, when the MnS producer supports daily repetitive interval-based functionality.
CHOICE_3.1 timeIntervals CHOICE_3.2 daysOfWeek	This attribute shall be supported, when the MnS producer supports weekly repetitive interval-based functionality.
CHOICE_4.1 timeIntervals CHOICE_4.2 daysOfMonth	This attribute shall be supported, when the MnS producer supports monthly repetitive interval-based functionality.

4.3.63.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<choice>> as one of its attributes, shall be applicable.

4.3.64 TimeInterval <<dataType>>

4.3.64.1 Definition

This <<dataType>> defines a time interval within one day. If the whole day shall be selected, intervalStart shall be set to 00:00:00 and intervalEnd shall be set to 23:59:59.

4.3.64.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
intervalStart	M	T	T	F	T
intervalEnd	M	T	T	F	T

4.3.64.3 Attribute constraints

None.

4.3.64.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.65 ConditionMonitor

4.3.65.1 Definition

This IOC defines one or several conditions and monitors whether these conditions are satisfied. It can be name-contained by SubNetwork or ManagedElement.

The attribute `condition` allows to configure one or several conditions. Possible conditions include but are not limited to scheduling requirements or parameter settings e.g. evaluation if a configuration parameter is above a certain threshold or has a certain values.

The boolean attribute `conditionStatus` switches between TRUE and FALSE depending upon whether the configured conditions are fulfilled or not. This attribute makes the internal `ConditionMonitor` status observable.

4.3.65.2 Attributes

The `ConditionMonitor` IOC includes the attributes inherited from `Top` IOC (defined in clause 4.3.29) and the following attributes:

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
`condition`	M	T	T	F	T
`conditionStatus`	M	T	F	F	T

4.3.65.3 Attribute constraints

None.

4.3.65.4 Notifications

The configuration notifications defined in clause 4.5.2 are valid for this IOC.

4.3.66 `NpnId <<choice>>`

4.3.66.1 Definition

This `<<choice>>` represents the NPN supported by the <<IOC>> using this `<<choice>>` as one of its attributes in a Non-Public Network use case.

4.3.66.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
`plmnId`	M	T	T	F	T
CHOICE_1.1 cAGIdList	CM	T	T	F	T
CHOICE_2.1 nIDList	CM	T	T	F	T

4.3.66.3 Attribute constraints

Name	Definition
`cAGIdList`	This attribute shall be supported when the NPN use case corresponding to PNI-NPN is supported in the RAN (see TS 38.331 [38]) .
`nIDList`	This attribute shall be supported when the NPN use case corresponding to SNPN is supported in the RAN (see TS 38.331 [38]).

4.3.66.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions.

4.3.67 UECoreMeasConfig <<dataType>>

4.3.67.1 Definition

This <<dataType>> defines the configuration parameters of IOC TraceJob which are specific for 5GC UE level measurements collection.

The attribute ueCoreMeasurements defines the measurements to be produced, and the attribute ueCoreMeasGranularityPeriod defines the granularity period to be applied.

All object instances below and including the instance name-containing the TraceJob (base object instance) are scoped for measurements collection and production. The 5GC UE level measurements are produced only on those object instances whose object class matches the object class associated to the measurements to be produced.

The optional attributes objectInstances and rootObjectInstances allow to restrict the scope. When the attribute objectInstances is present, only the object instances identified by this attribute are scoped. When the attribute rootObjectInstances is present, then the subordinated objects whose root objects are identified by this attribute are scoped. Both attributes may be present at the same time meaning the total scope is equal to the sum of both scopes. Object instances may be scoped by both the objectInstances and rootObjectInstances attributes. When they are present, this shall not be considered as an error by the MnS producer.

Changes of all other configurable attributes shall take effect only at the beginning of the next granularity period.

4.3.67.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
ueCoreMeasurements	M	T	T	F	T
ueCoreMeasGranularityPeriod	O	T	T	F	T
nfTypeToMeasure	CM	T	T	F	T
objectInstances	O	T	T	F	T
rootObjectInstances	O	T	T	F	T

4.3.67.3 Attribute constraints

Name	Definition
nfTypeToMeasure (support qualifier)	This attribute shall be supported if the signalling activation of 5GC UE level measurements collected are supported.

4.3.67.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions.

4.3.68 PlmnId <<dataType>>

4.3.68.1 Definition

This <<dataType>> represents the information of a PLMN identification.

4.3.68.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
mcc	M	T	T	F	T
mnc	M	T	T	F	T

4.3.68.3 Attribute constraints

None.

4.3.68.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.69 DayInYear <<dataType>>

4.3.69.1 Definition

This <<dataType>> represents a day in a year.

4.3.69.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
month	M	T	T	F	T
monthDay	M	T	T	F	T

4.3.69.3 Attribute constraints

None.

4.3.69.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.70 IpAddr <<choice>>

4.3.70.1 Definition

This <<choice>> represents an IpAddress, it can be an Ipv4 or Ipv6 address. The Figure 4.3.70.1-1 depicts three possible <<dataType>> for this <choice>>. It indicates that only one of Ipv4Addr, Ipv6Addr and Ipv6Prefix shall be realised.

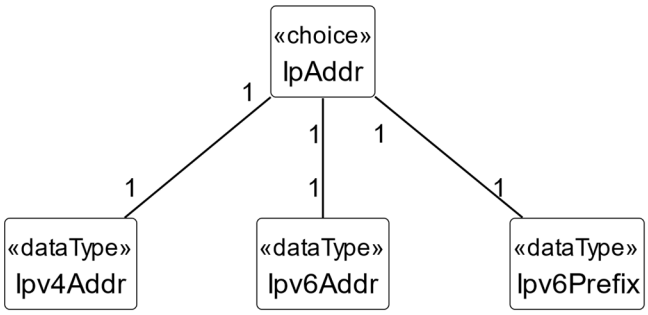


Figure 4.3.70.1-1 alternative <<dataType>> to this <<choice>>

Editor Note: To be checked if Ipv6Prefix shall be included

4.3.70.2 Attributes

This <<choice>> has no attributes.

4.3.70.3 Attribute constraints

N/A.

4.3.70.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<choice>> as one of its attributes, shall be applicable.

4.3.71 Host <<choice>>

4.3.71.1 Definition

This <<choice>> represents a host. The Figure 4.3.71.1-1 depicts two possible <<dataType>> for this <<choice>>. It indicates that only one of the two IpAddr and Fqdn shall be realised.

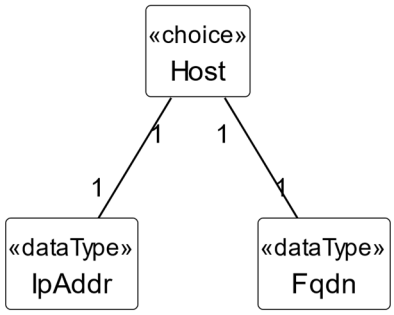


Figure 4.3.71.1-1 alternative dataType to this <<choice>>

4.3.71.2 Attributes

This <<choice>> has no attributes.

4.3.71.3 Attribute constraints

N/A.

4.3.71.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<choice>> as one of its attributes, shall be applicable.

4.3.72 PLMNInfo <<dataType>>

4.3.72.1 Definition

This <<dataType>> represents the PLMN supported by the <<IOC>> using this <<dataType>> as one of its attributes. In case of network slicing feature is supported, this <<dataType>> also represents the S-NSSAI in the PLMN supported by the <<IOC>> using this <<dataType>> as one of its attributes.

4.3.72.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
pLMNId	M	T	T	F	T
sNSSAI	CM	T	T	F	T

4.3.72.3 Attribute constraints

Name	Definition
sNSSAI	Condition: Network slicing feature is supported.

4.3.72.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.73 ExternalDataType

4.3.73.1 Definition

This IOC specifies a type of external management data and the associated meta data.

External management data is data which enrich 3GPP specified management data and management data specified based on 3GPP defined management data definition templates and frameworks. External management data can be produced by data sources of different nature (e.g. sensors) with different formats. Details see clause 6.4.1 in TS 28.537 [65].

MnS producer may use this IOC to describe external management data. For example, MnS producer publishes all external management data which are available.

MnS consumer may use this IOC to configure, discover or request external management data. For example, MnS consumer discovers and requests certain types of external management data.

The ExternalDataType IOC can be name-contained by SubNetwork.

Attribute externalDataType defines the type of external management data.

Attribute mediaLocation indicates the address from which the described external management data can be retrieved.

The value of mediaLocation, if present, can provide one or several directories or the address where the described external management data can be retrieved. The different directories can be used to group the external management data, e.g., one directory per geographical area or per time period. For example, the value of the mediaLocation attribute can be given by

"sftp://companyA.com/datastore/weatherforecasts/".

In this case a potential file with name "weatherforecastMunicht0.xml" needs to be retrieved using "sftp" from "sftp://companyA.com/datastore/weatherforecasts/weatherforecastMunicht0.xml".

Attribute externalDataTypeSchema indicates the URI where the MnS consumer can get the schema to parse the external management data.

Attribute externalDataScope is used to describe the concrete scope (e.g., geographical areas) which the external management data is applicable.

4.3.73.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
externalDataType	M	T	T	F	T
mediaLocation	M	T	T	F	T
externalDataTypeSchema	M	T	T	F	T
externalDataScope	O	T	T	F	T

4.3.73.3 Attribute constraints

None.

4.3.73.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions or additions.

4.3.74 ExternalDataScope <<dataType>>

4.3.74.1 Definition

This <<dataType>> describes the concrete scope which the external management data is applicable.

The optional attribute geoAreas defines the geographical area(s) to which the external management data is related. For example, some external management data (e.g., Electronic Map) can be used for optimizing radio network performance for a geographical area.

The optional attribute objectInstancesIncluded provides the DNs of the managed objects to which the external management data is related.

The optional attribute objectInstancesExcluded provides the DNs of the managed objects to which the external management data is not considered.

If the attributes geoAreas and objectInstancesExcluded are present, the geoAreas shall be used as scope for external data excluding the DNs specified by objectInstancesExcluded.

If the attributes geoAreas and objectInstancesIncluded are present, the geoAreas shall be used as scope for external data including the DNs specified by objectInstancesIncluded.

If the attributes geoAreas, objectInstancesIncluded and objectInstancesExcluded are present, the geoAreas shall be used as scope for external data including the DNs specified by objectInstancesIncluded and excluding the DNs specified by objectInstancesExcluded.

4.3.74.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
geoAreas	O	T	T	F	T
objectInstancesIncluded	O	T	T	F	T
objectInstancesExcluded	O	T	T	F	T

4.3.74.3 Attribute constraints

None.

4.3.74.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.75 MgmtDataInfo

4.3.75.1 Definition

This IOC describes the management capabilities for a set of management data, which can be used for management data discovery. The MgmtDataInfo <<IOC>> is name-contained by MnSRegistry <<IOC>> and associated to MnSInfo <<IOC>>.

Multiple `MgmtDataInfo` instances maybe created for different sets of management data, it is MnS producer's decision.

4.3.75.2 Attributes

The `MgmtDataInfo` IOC includes attributes inherited from Top IOC (defined in clause 4.3.29) and the following attributes:

Attribute Name	S	isReadable	isWritable	isInvariant	isNotifyable
supportedManagementData	M	T	T/F	F	T
supportedGranularityPeriods	CM	T	T/F	F	T
supportedReportingPeriods	CM	T	T/F	F	T
historicalDataPeriod	CM	T	T/F	F	T
supportedReportingMethod	M	T	T/F	F	T
supportedDataScope	O	T	T/F	F	T
Atttibutes related to roles					
supportedDataRequestMnSRef	M	T	T/F	F	T
supportedDataReportingMnSRef	M	T	T/F	F	T
Note: For all attributes of MgmtDataInfo, the property "isWritable=T" for the Separate MnSRegistry deployment scenario described in TS 28.537 [65], and "isWritable=F" for the Embedded MnSRegistry deployment scenario.					

4.3.75.3 Attribute constraints

Name	Definition
supportedGranularityPeriods	This attribute shall be supported, when the supported management data is performance metric (including performance measurement and KPI)
supportedReportingPeriods	This attribute shall be supported, when the supported management data is performance metric (including performance measurement and KPI)
historicalDataPeriod	This attribute shall be supported, when the supported management data is performance metric (including performance measurement and KPI)

4.3.75.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions or additions.

4.3.76 TraceTarget <<dataType>>

4.3.76.1 Definition

This <<dataType>> defines the target object of the `TraceJob`. See the clause 5.12 of TS 32.422 [30] for additional details.

4.3.76.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
traceTargetType	M	T	T	F	T
traceTargetValueList	M	T	T	F	T

4.3.76.3 Attribute constraints

None.

4.3.76.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.77 MnsScope <<choice>>

4.3.77.1 Definition

This <<choice>> specifies the list of managed object instances that can be accessed using the Management Service. These managed object instances can be represented with one of the following options:

- A list of DNs, i.e. representing managed object instances identified by the DN.
- A list of GeoAreas, i.e. representing managed object instances covered by the specified geographical areas. In the present document, the CHOICE_2.1 geoAreasList is only used for MnS consumer to retrieve MnS scope of the specified MnS instance.

- A list of TAIs, i.e. representing managed object instances covered by the specified TAIs.

4.3.77.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
CHOICE_1.1 objectInstanceList	M	T	T/F	T	T
CHOICE_2.1 geoAreasList	M	T	T/F	T	T
CHOICE_3.1 taiList	M	T	T/F	T	T

4.3.77.3 Attribute constraints

None

4.3.77.4 Notifications

The clause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.78 VnfParameters <<dataType>>

4.3.78.1 Definition

This <<dataType>> represents the parameter set of the VNF instance(s) corresponding to an NE.

4.3.78.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
vnfInstanceId	M	T	T	F	T
vnfdId	O	T	T	F	T
flavourId	O	T	T	F	T
autoScalable	O	T	T	F	T

4.3.78.3 Attribute constraints

None.

4.3.78.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.79 PeeParameters <<dataType>>

4.3.79.1 Definition

This <<dataType>> represents the parameter list for the control and monitoring of power, energy and environmental parameters of ManagedFunction instance(s).

4.3.79.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
siteIdentification	M	T	T	F	T
siteLatitude	O	T	T	F	T
siteLongitude	O	T	T	F	T
siteAltitude	O	T	T	F	T
siteDescription	M	T	T	F	T
equipmentType	M	T	T	F	T
environmentType	M	T	T	F	T
powerInterface	M	T	T	F	T

4.3.79.3 Attribute constraints

None.

4.3.79.4 Notifications

The subclause 4.5 of the <<IOC>> using this <<dataType>> as one of its attributes, shall be applicable.

4.3.80 TrsrPrefixCfg <<dataType>>

4.3.80.1 Definition

This <<dataType>> defines the TRSR prefix configuration parameters which are used by NR-RAN at TRSR assignment for a given C-MDT job. It defines both the base TRSR prefix and the size of the TRSR prefix. The attribute trstPrefix specifies the base TRSR prefix. The attribute trsrPrefixLength defines the size of base TRSR prefix.

4.3.80.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
trsrPrefix	M	T	F	F	T
trsrPrefixLength	M	T	F	F	T

4.3.80.3 Attribute constraints

None.

4.3.80.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC, without exceptions.

4.3.81 NotificationList

4.3.81.1 Definition

The NotificationList IOC provides an interface for the consumer that allows retrieval of notifications that have not been successfully delivered to the consumer.

A NotificationList MOI may be contained under the root ManagedElement or SubNetwork or under an NtfSubscriptionControl MOI.

If the NotificationList MOI is contained under a ManagedElement or SubNetwork the MOI make available all notifications for all objectInstances under that ManagedElement or SubNetwork. The producer may limit the notification set to notifications for which at least one subscription is present.

If the MOI is contained under an NtfSubscriptionControl MOI it makes available notifications for that subscription. The producer may limit the number of NotificationList MOIs under an NtfSubscriptionControl MOI to one.

A NotificationList may provide a subset of all applicable notifications. If the NotificationList MOI is contained under the ManagedElement or SubNetwork the attributes `notificationTypes` and `notificationFilter` may be used to select the notifications to be included. If the MOI is contained under an NtfSubscriptionControl MOI the attributes `notificationTypes` and `notificationFilter in the NotificationList` are not be available for read or write, as the similar attributes in the NtfSubscriptionControl MOI already select the notifications to be included.

The `notificationTypes` value identifies the notification types that are candidates to be provided. If the attribute is absent, notifications of all types are candidates to be provided.

The `notificationFilter` attribute defines a filter that is applied to the set of candidate notifications. The filter is applicable to all parameters of a notification. Only candidate notifications that pass the filter criteria are made available. If the attribute is absent, all candidate notifications shall be made available.

Only notifications that were prepared are included. If the producer failed to prepare a subscribed notification it will not be available in this MOI either.

The MnS producer provides notifications only back to a certain point in time in the past thusold notifications may become unavailable. This time is represented by the firstEventTime attribute. As time progresses the time captured by firstEventTime is updated by the MnS producer.

4.3.81.2 Attributes

The NotificationList IOC includes attributes inherited from `Top` IOC (defined in clause 4.3.29) and the following attributes:

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
`firstEventTime`	M	T	F	F	F
`lastEventTime`	M	T	F	F	F
`notificationEntries`	M	T	F	F	F
`notificationTypes`	O	T	T	F	T
`notificationFilter`	O	T	T	F	T

4.3.81.3 Attribute constraints

None.

4.3.81.4 Notifications

The common notifications defined in clause 4.5 are valid for this IOC.

4.3.82 NotificationEntry <<dataType>>

4.3.82.1 Definition

This `<<dataType>>` represents a single notification.

4.3.82.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
notificationEntryId	M	T	F	T	F
eventTime	M	T	F	T	F
notificationContent	M	T	F	T	F

4.3.82.3 Attribute constraints

None.

4.4 Attribute definitions

4.4.1 Attribute properties

The following table defines the properties of attributes specified in the present document.

Attribute Name	Documentation and Allowed Values	Properties
numberOfFiles	Number of files in a file collection. allowedValues: NA	Type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
fileLocation	Location of the file incl. the file transfer protocol, and the file name. The allowed file transfer protocols are: - sftp - ftpes - https Examples: "sftp://companyA.com/datastore/fileName.xml", "https://companyA.com/ManagedElement=1/Files=1/File=1"	Type: Uri multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
fileCompression	Name of the algorithm used for compressing the file. An absent `fileCompression` parameter indicates the file is not compressed. The MnS producer selects the compression algorithm. It is encouraged to use popular algorithms such as GZIP.	Type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
fileSize	Size of the file. Unit is byte. allowedValues: non-negative integers	Type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
fileDataType	Type of the management data stored in the file. AllowedValues: - "PERFORMANCE" - "TRACE" - "ANALYTICS" - "PROPRIETARY" The value "PERFORMANCE" refers to measurements and KPIs.	Type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
fileFormat	Identifier of the schema (incl. its version) used to produce the file content. If there is no schema for the file or it is not available, the `fileFormat` parameter is absent.	Type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
fileReadyTime	Date and time, when the file was closed (the last time) and made available on the MnS producer. The file content will not be changed anymore.	Type: DateTime multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
fileExpirationTime	Date and time after which the file may be deleted.	Type: DateTime multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
fileContent	File content as a Base64 encoded string according to RFC 4648 [67] section 4.	Type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
jobMonitor	Provides monitoring for the file download job. The data type of this attribute is the ProcessMonitor as defined in clause 4.3.43 with the specialisations defined in clause 4.3.46.1. allowedValues: N/A	Type: ProcessMonitor multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
cancelJob	Setting this attribute to "TRUE" cancels the file download job. As specified in the definition of ProcessMonitor, cancellation is possible in the "NOT_STARTED" and "RUNNING" state. Setting the attribute to "FALSE" has no observable result. allowedValues: TRUE, FALSE	Type: Boolean multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: FALSE isNullable: False
FileDownloadJob.jobMonitor.resultStateInfo	Provides the following specialisation for the resultStateInfo attribute of the ProcessMonitor data type for the FileDownloadJob. In the event the file download fails, and the status is equal to "FAILED", it provides the reason for the failure. allowedValues for status = "FAILED": - NULL - UNKNOWN - NO_STORAGE - LOW_MEMORY - NO_CONNECTION_TO_REMOTE_SERVER - FILE_NOT_AVAILABLE - DNS_CANNOT_BE_RESOLVED - TIMER_EXPIRED - OTHER The allowed values for "FINISHED" or "CANCELLED" are vendor specific.	Type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
heartbeatNtfPeriod	Periodicity of the heartbeat notification emission. The value of zero has the special meaning of stopping the heartbeat notification emission. Unit is in seconds. AllowedValues: non-negative integers	type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: 0 isNullable: False
triggerHeartbeatNtf	Setting this attribute to TRUE triggers an immediate additional heartbeat notification emission. Setting the value to FALSE has no observable result. The periodicity of notifyHeartbeat emission is not changed. AllowedValues: TRUE, FALSE	type: Boolean multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: FALSE isNullable: False
notificationRecipientAddress	Address of the notification recipient. allowedValues: N/A	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
notificationTypes	List of notification types. Below is a list of notificationType values that are defined in 3GPP specifications. Other notificationTypes defined by SDOs or enterprises may also be supported. allowedValues: - notifyMOICreation - notifyMOIDeletion - notifyMOIAttributeValueChanges - notifyMOIChanges - notifyEvent - notifyNewAlarm - notifyAckStateChanged - notifyComments - notifyCorrelatedNotificationChanged - notifyChangedAlarmGeneral - notifyClearedAlarm - notifyAlarmListRebuilt - notifyPotentialFaultyAlarmList - notifyFileReady - notifyFilePreparationError - notifyThresholdCrossing "notifyPotentialFaultyDataNodeTree" "notifyDataNodeTreeSyncRecommended"	type: ENUM multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
notificationFilter	Filter to be applied to candidate notifications identified by the notificationTypes attribute. Only notifications that pass the filter criteria are forwarded to the notification recipient. All other notifications are discarded. The filter can be applied to any field of a notification. allowedValues: N/A	type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
notificationProtocols	List of protocols supported for notifications. TS 28.532 [27] defines options Restful HTTP and Restful HTTP aligned with VES Other values defined by SDOs or enterprises may also be supported. allowedValues: - HTTP - HTTP_VES_ENCAPS	type: ENUM multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
scope	Scopes (selects) data nodes in an object tree. allowedValues: N/A	type: Scope multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
scopeType	If the optional scopeLevel attribute is not supported or absent, allowed values of scopeType are BASE_ONLY and BASE_ALL. The value BASE_ONLY indicates only the base object is selected. The value BASE_ALL indicates the base object and all of its subordinate objects (incl. the leaf objects) are selected. If the scopeLevel attribute is supported and present, allowed values of scopeType are BASE_NTH_LEVEL and BASE_SUBTREE. The value BASE_NTH_LEVEL indicates all objects on the level, which is specified by the scopeLevel attribute, below the base object are selected. The base object is at scopeLevel zero. The value BASE_SUBTREE indicates the base object and all subordinate objects down to and including the objects on the level, which is specified by the scopeLevel attribute, are selected. The base object is at scopeLevel zero. allowedValues: N/A	type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
scopeLevel	See definition of scopeType attribute. allowedValues: N/A	type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
dataNodeSelector	The dataNodeSelector attribute allows to select one or more managed object instances, attributes, attribute fields or attribute elements. Its value contains a solution set specific expression for selecting the nodes. allowedValues: N/A	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
availabilityStatus	The availability status provides additional information about the operational state allowedValues: - DEGRADED - DEPENDENCY	Type: AvailabilityStatus multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
lastSequenceNo	The sequence number of the last notification that was sent by a "NtfSubscriptionControl" instance. allowedValues: non-negative integers	Type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
farEndEntity	The value of this attribute shall be the Distinguished Name of the far end network entity to which the reference point is related. allowedValues: N/A	type: DN multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
linkType	This attribute defines the type of the Link. allowedValues: Signalling, Bearer, OAM&P, Other or multiple combinations of this type.	type: String multiplicity: 0..* isOrdered: False isUnique: True defaultValue: None isNullable: False
locationName	The physical location of this entity (e.g. an address). allowedValues: N/A	type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
monitorGranularityPeriod	Granularity period used to monitor performance metrics for threshold crossings. The period is defined in seconds. See Note 5 allowedValues: a multiple of a supported GP of the associated performance metrics	type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportingPeriods	Reporting periods supported for the associated performance metrics. The period is defined in seconds. allowedValues: Integer with a minimum value of 1	type: Integer multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
thresholdInfoList	List of threshold infos.	type: ThresholdInfo multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
thresholdValue	Value against which the monitored performance metric is compared at a threshold level in case the hysteresis is zero. allowedValues: float or integer	type: Float or Integer multiplicity: 1 isOrdered: NA isUnique: NA defaultValue: None isNullable: False
hysteresis	Hysteresis of a threshold. If this attribute is present the monitored performance metric is not compared against the threshold value as specified by the thresholdValue attribute but against a high and low threshold value given by highThresholdValue- = thresholdValue + hysteresis lowThresholdValue = thresholdValue - hysteresis When going up, the threshold is triggered when the performance metric reaches or crosses the high threshold value. When going down, the threshold is triggered when the performance metric reaches or crosses the low threshold value. A hysteresis may be present only when the monitored performance metric is not of type counter that can go up only. If present for a performance metric of type counter, it shall be ignored. allowedValues: non-negative float or integer	type: Float or Integer multiplicity: 0..1 isOrdered: NA isUnique: NA defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
thresholdDirection	Direction of a threshold indicating the direction for which a threshold crossing triggers a threshold. When the threshold direction is configured to "UP", the associated treshold is triggered only when the performance metric value is going up upon reaching or crossing the threshold value. The treshold is not triggered, when the performance metric is going down upon reaching or crossing the threshold value. Vice versa, when the threshold direction is configured to "DOWN", the associated treshold is triggered only when the performance metric is going down upon reaching or crossing the threshold value. The treshold is not triggered, when the performance metric is going up upon reaching or crossing the threshold value. When the threshold direction is set to "UP_AND_DOWN" the treshold is active in both direcions. In case a threshold with hysteresis is configured, the threshold direction attribute shall be set to "UP_AND_DOWN". allowedValues: - UP - DOWN - UP_AND_DOWN	type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
objectClass	Class of a managed object instance. allowedValues: N/A	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
objectInstance	Managed object instance identified by its DN. allowedValues: N/A	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
objectInstances	List of managed object instances. Each object instance is identified by its DN. allowedValues: N/A	type: DN multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
peeParametersList	This attribute contains the parameter list for the control and monitoring of power, energy and environmental parameters of ManagedFunction instance(s).	type: PeeParameters multiplicity: 0..* isOrdered: False isUnique: True defaultValue: None isNullable: False
PeeParameters.siteIdentification	The identification of the site where the ManagedFunction resides. allowedValues: N/A	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
PeeParameters.siteLatitude	The latitude of the site where the ManagedFunction instance resides, based on World Geodetic System (1984 version) global reference frame (WGS 84). Positive values correspond to the northern hemisphere. This attribute is optional for BTSFunction, RNCFunction , GNBDUFunction and NRSectorCarrier instance(s). allowedValues: -90.0000 to +90.0000	type: Float multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
PeeParameters.siteLongitude	The longitude of the site where the managedFunction instance resides, based on World Geodetic System (1984 version) global reference frame (WGS 84). Positive values correspond to degrees east of 0 degrees longitude. This attribute is optional for BTSFunction, RNCFunction, GNBDUFunction and NRSectorCarrier instance(s). allowedValues: -180.0000 to +180.0000	type: Float multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
PeeParameters.siteAltitude	The altitude of the site where the ManagedFunction instance resides, in unit of meter. This attribute is optional for BTSFunction, RNCFunction, GNBDUFunction and NRSectorCarrier instance(s).	type: Float multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
PeeParameters.siteDescription	An operator defined description of the site where the ManagedFunction instance resides. allowedValues: N/A	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
PeeParameters.equipmentType	equipmentType: The type of equipment where the ManagedFunction instance resides. allowedValues: see clause 4.4.1 of ETSI ES 202 336-12 [18].	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
PeeParameters.environmentType	environmentType: The type of environment where the ManagedFunction instance resides. allowedValues: see clause 4.4.1 of ETSI ES 202 336-12 [18].	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
PeeParameters.powerInterface	powerInterface: The type of power. allowedValues: see clause 4.4.1 of ETSI ES 202 336-12 [18].	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
priorityLabel	This is a label that consumer would assign a value on a concrete instance of the managed object. The management system takes the value of this attribute into account. The effect of this attribute value to the subject managed entity is not standardized	type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
protocolVersion	Versions(s) and additional descriptive information for the protocol(s) used for the associated communication link. Syntax and semantic is not specified. allowedValues: N/A	type: String multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
setOfMcc	Set of Mobile Country Code (MCC). The MCC uniquely identifies the country of domicile of the mobile subscriber. MCC is part of the IMSI (TS 23.003 [5]) This list contains all the MCC values in subordinate object instances to this SubNetwork instance. allowedValues: See clause 2.3 of TS 23.003 [5] for MCC allocation principles.	type: Integer multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
swVersion	The software version of the ManagementNode or ManagedElement (this is used for determining which version of the vendor specific information is valid for the ManagementNode or ManagedElement). allowedValues: N/A	type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
systemDN	Distinguished Name (DN) of a MnSAgent. allowedValues: N/A	type: DN multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
userDefinedState	An operator defined state for operator specific usage. allowedValues: N/A	type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
userLabel	A user-friendly (and user assignable) name of this object. allowedValues: N/A	type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
vendorName	The name of the vendor. allowedValues: N/A	type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
vnfParametersList	This attribute contains the parameter set of the VNF instance(s) corresponding to an NE. The presence of this attribute indicates that the ManagedFunction represented by the MOI is a virtualized function. See Note 3. allowedValues: N/A	type: VnfParameters multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
VnfParameters.vnfInstanceId	vnfInstanceId: VNF instance identifier (vnfInstanceId, see section 9.4.2 of ETSI GS NFV-IFA 008 [16]). A string length of zero for vnfInstanceId means the VNF instance(s) corresponding to the MOI does not exist (e.g. has not been instantiated yet, has already been terminated). See Note 1. allowedValues: N/A	type: string multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
VnfParameters.vnfdId	vnfdId: Identifier of the VNFD on which the VNF instance is based, see section 9.4.2 of [16]. This attribute is optional. Note: the value of this attribute is identical to that of the same attribute in clause 9.4.2 of ETSI GS NFV-IFA 008 [16].	type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
VnfParameters.flavourId	flavourId: Identifier of the VNF Deployment Flavour applied to this VNF instance, see section 9.4.3 of ETSI GS NFV-IFA 008 [16]. This attribute is optional. Note: the value of this attribute is identical to that of the same attribute in clause 9.4.3 of ETSI GS NFV-IFA 008 [16].	type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
VnfParameters. autoScalable	autoScalable: Indicator of whether the auto-scaling of this VNF instance is enabled or disabled. The type is Boolean. This attribute is optional. See Note2.	type: Boolean multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: FALSE isNullable: False
vsData	Vendor specific attributes of the type vsDataType. The attribute definitions including constraints (value ranges, data types, etc.) are specified in a vendor specific data format file. allowedValues: --	type: -- multiplicity: -- isOrdered: -- isUnique: -- defaultValue: -- isNullable: False
vsDataFormatVersion	Name of the data format file, including version. allowedValues: N/A	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
vsDataType	Type of vendor specific data contained by this instance, e.g. relation specific algorithm parameters, cell specific parameters for power control or re-selection or a timer. The type itself is also vendor specific. allowedValues: N/A	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
supportedPerfMetricGroups	A set of performance metric groups. When this attribute is contained in a managed object it may define performance metrics for this object and all descendant objects. allowedValues: N/A	type: SupportedPerfMetricGroup multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
performanceMetrics	List of performance metrics identified by name allowedValues: Performance metrics include measurements defined in TS 28.552 [20] and KPIs defined in TS 28.554 [28]. For measurements defined in TS 28.552 [20] the name is constructed as bullet e) of the measurement definition with allowed measurement type. For KPIs defined in TS 28.554 [28] the name is defined in the KPI definitions template, see chapter 5 in TS 28.554 [28], as the component designated with a). For non-3GPP specified measurements the name is defined elsewhere.	type: String multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
supportedTraceMetrics	List of trace metrics. When this attribute is contained in a managed object it defines the trace metrics supported for this object and all descendant objects. Trace metrics include trace messages, MDT measurements (Immediate MDT, Logged MDT, Logged MBSFN MDT), RLF, RCEF and RRC reports, see TS 32.422 [30]. Trace metrics are identified with their metric identifier. The metric identifier is constructed as defined in clause 10 of TS 32.422 [30]. For non-3GPP specified trace metrics the name is defined elsewhere. allowedValues: N/A	type: String multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
listOfTraceMetrics	List of trace metrics identified by name. Includes trace messages, MDT measurements (Immediate MDT, Logged MDT, Logged MBSFN MDT), RLF, RCEF and RRC reports, see TS 32.422 [30]. Trace messages are identified with their message identifier. Trace metric identifier is constructed as defined in clause 10 of TS 32.422 [30]. For non-3GPP specified trace metrics the name is defined elsewhere. allowedValues: N/A	type: String multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
rootObjectInstances	List of object instances. Each object instance is identified by its DN and designates the root of a subtree that contains the root object and all descendant objects.	type: DN multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
reportingMethods	List of reporting methods for performance metrics allowedValues: - "FILE_BASED_LOC_SET_BY_PRODUCER", - "FILE_BASED_LOC_SET_BY_CONSUMER", - "STREAM_BASED"	type: ENUM multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
jobRef	Object instance of the PerfMetricJob or TraceJob that produced the file. allowedValues: NA	Type: Dn multiplicity: 0..* isOrdered: False isUnique: True defaultValue: None isNullable: False
jobId	Identifier to associate multiple instances of a PerfMetricJob, a TraceJob or a QMCJob or to associate a ManagementDataCollection instance with the derived PerfMetricJob or TraceJob instances.	type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
granularityPeriod	Granularity period used to produce performance metrics. The period is defined in seconds. See Note 4. allowedValues: Integer with a minimum value of 1	type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
granularityPeriods	Granularity periods supported for the production of associated performance metrics. The period is defined in seconds. allowedValues: Integer with a minimum value of 1	type: Integer multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
reportingCtrl	Selecting the reporting method and defining associated control parameters.	type: ReportingCtrl multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
fileReportingPeriod	For the file-based reporting method this is the time window during which collected measurements are stored into the same file before the file is closed and a new file is opened. The period is defined in minutes. allowedValues: Multiples of granularityPeriod	type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
_linkToFiles	Link to a Files object. allowedValues: N/A	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
streamTarget	The stream target for the stream-based reporting method. allowedValues: N/A	type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
administrativeState	Administrative state of a managed object instance. The administrative state describes the permission to use or prohibition against using the object instance. The adminstrative state is set by the MnS consumer. allowedValues: LOCKED, UNLOCKED.	type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: LOCKED isNullable: False
operationalState	Operational state of manged object instance. The operational state describes if an object instance is operable ("ENABLED") or inoperable ("DISABLED"). This state is set by the object instance or the MnS producer and is hence READ-ONLY. allowedValues: ENABLED, DISABLED.	type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: DISABLED isNullable: False
jobType	It specifies whether the TraceJob represents only MDT, Trace, RLF, RCEF, RRC or 5GC UE level measurements job, or a combined job. It also defines the MDT mode. See the clause 5.9a of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: TRACE_ONLY isNullable: False
rrcReportType	Specifies the RRC reports requested, see 3GPP TS 38.331 [38]. allowed values: RLF_REPORT, RCEF_REPORT, SHR, SPR, MHI, or RA_REPORT.	type: ENUM multiplicity: 0..* isOrdered: False isUnique: True defaultValue: None isNullable: False
traceConfig	The set of parameters specific for trace configuration.	type: TraceConfig multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mdtConfig	The set of parameters specific for MDT configuration.	type: MdtConfig multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
immediateMdtConfig	The set of parameters specific for Immediate MDT configuration.	type: ImmediateMdtConfig multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
loggedMdtConfig	The set of parameters specific for Logged MDT and Logged MBSFN MDT configuration.	type: LoggedMdtConfig multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
listOfInterfaces	It specifies the interfaces that need to be traced. The attribute is applicable only for Trace. See the clause 5.5 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
listOfNeTypes	It specifies the network element types where the trace should be activated. The attribute is applicable only for Trace with Signalling Based Trace activation. See the clause 5.4 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
pLMNTarget	It specifies which PLMN that the subscriber of the session to be recorded uses as selected PLMN.	type: PlmnId multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
traceReportingConsumerUri	It specifies the Uniform Resource Identifier (URI) of the Streaming Trace data reporting MnS consumer (a.k.a. streaming target). See the clause 5.9 c of TS 32.422 [30] for additional details on the allowed values.	type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
traceCollectionEntityIPAddress	It specifies the address of the Trace Collection Entity when the attribute traceReportingFormat is configured for the file-based reporting. The attribute is applicable for both Trace and MDT. See the clause 5.9 of TS 32.422 [30] for additional details on the allowed values.	type: IpAddress multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
traceDepth	It specifies the trace depth. The attribute is applicable only for Trace. See the clause 5.3 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: MAXIMUM isNullable: False
traceReference	A globally unique identifier, which uniquely identifies the Trace Session that is created by the TraceJob. In case of shared network, it is the MCC and MNC of the Participating Operator that request the trace session that shall be provided. The attribute is applicable for both Trace and MDT. See the clause 5.6 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: TraceReference multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
traceReportingFormat	It specifies the trace reporting format - streaming trace reporting or file-based trace reporting. AllowedValues: FILE-BASED, STREAMING	type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: FILE-BASED isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
traceTarget	It specifies the target object of the Trace and MDT. The attribute is applicable for both Trace and MDT. This attribute consists the traceTargetType and traceTargetValueList In case of management based Immediate MDT, RLF reporting, RCEF reporting or RRC reporting, the traceTarget attribute shall be null value.	type: TraceTarget multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
traceTargetType	It specifies the target object type of the Trace, MDT and 5GC UE level measurements collection. The attribute is applicable for Trace, MDT, and 5GC UE level measurements collection. The traceTargetType shall be "PUBLIC_ID" in case of a Management Based Activation is done to an SCSCFFunction (Serving Call Session Control Function) or PCSCFFunction (Proxy Call Session Control Function) (TS 28.705[44]). The traceTargetType shall be "UTRAN_CELL" only in case of the UTRAN cell traffic trace function. The traceTargetType shall be "E-UTRAN_CELL" only in case of E-UTRAN cell traffic trace function. The traceTargetType shall be "NG-RAN_CELL" only in case of NR cell traffic trace function. The traceTargetType shall be either "IMSI", "IMEI" or "IMEISV" if the Trace Session is activated to any of the following ManagedEntity(ies): - HSSFunction (Home Subscriber Server) (TS 28.705 [44]) - MscServerFunction (Mobile Switching Centre Server) (TS 28.702 [45]) - SgsnFunction (Serving GPRS Support Node) (TS 28.702[45]) - GgsnFunction (Gateway GPRS Support Node) (TS 28.702[45]) - BmscFunction (Broadcast Multicast Service Centre) (TS 28.702[45]) - RncFunction (Radio Network Controller) (TS 28.652[46]) - MmeFunction (Mobility Management Entity) (TS 28.708[47]) - ServingGWFunction (Serving Gateway) (TS 28.708[47]) - PGWFunction (PDN Gateway) (TS 28.708[47]). The traceTargetType shall be either “SUPI” or “IMEISV” if the Trace Session is activated to any of the following ManagedEntity(ies) (TS 28.541[48]): - AFFunction - AMFFunction - AUSFunction - NEFFunction - NRFFunction - NSSFFunction - PCFFunction - SMFFunction - UPFFunction - UDMFunction In case of signalling based MDT, the traceTargetType attribute shall be able to carry "PUBLIC_ID", "IMSI", "IMEI", "IMEISV)" or "SUPI". In case of management based Logged MDT, the traceTarget attribute shall carry an "eNB" or a "gNB" or an "RNC". The Logged MDT should be initiated on the specified eNB/gNB/RNC in traceTarget. In case of signalling based 5GC UE level measurements collection, the traceTargetType attribute shall be able to carry "IMEISV" or "SUPI". In case of management based 5GC UE level measurements collection, the traceTargetType attribute shall be able to carry the corresponding Measured UE Identifier as defined by the bullet g) of the 5GC UE level measurements (see TS 28.558 [57]) when the TraceJob is created at the subject ManagedEntity. allowedValues: PUBLIC_ID, IMSI, IMEI, IMEISV, SUPI, ENB, GNB, RNC, UTRAN_CELL, EUTRAN_CELL, NGRAN_CELL, N4_SESSION_ID.	type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
traceTargetValueList	It specifies the ID value(s) of the target object type defined by traceTargetType	type: String multiplicity: * isOrdered: False isUnique: True defaultValue: N/A isNullable: False
triggeringEvents	It specifies the triggering event parameter of the trace session. The attribute is applicable only for Trace. See the clause 5.1 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
anonymizationOfMdtData	It specifies the level of anonymization of MDT data. This attribute is only applicable for management based activation. See the clause 5.10.12 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: NO_IDENTITY isNullable: False
areaConfigurationForNeighCell	It specifies the area for which UE is requested to perform measurement logging for neighbour cells which have list of frequencies. If it is not configured, the UE shall perform measurement logging for all the neighbour cells. Applicable only to NR Logged MDT. See the clause 5.10.26 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: AreaConfig multiplicity:* isOrdered: False isUnique: True defaultValue: None isNullable: False
areaScope	It specifies the area where data shall be collected.	type: AreaScope multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
collectionPeriodRRMLTE	It specifies the collection period for collecting RRM configured measurement samples for M3 in LTE. The attribute is applicable only for Immediate MDT. See the clause 5.10.20 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
collectionPeriodRRMUMTS	It specifies the collection period for collecting RRM configured measurement samples for M3, M4, M5 in UMTS. The attribute is applicable only for Immediate MDT. See the clause 5.10.21 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
eventListForEventTriggeredMeasurement	It specifies event types for event triggered measurement in the case of logged NR MDT. Each trace session may configure at most one event. The UE shall perform logging of measurements only upon certain condition being fulfilled: - Out of coverage. - A2 event. See the clause 5.10.28 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
eventThreshold	It specifies the threshold which should trigger the reporting in case A2 event reporting in LTE and NR or 1F/1I event in UMTS. The attribute is applicable only for Immediate MDT and when reportingTrigger is configured for A2 event in LTE and NR or 1F event or 1I event in UMTS. See the clauses 5.10.7 and 5.10.7a of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: Integer multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
listOfMeasurements	It specifies the UE measurements that shall be collected in an Immediate MDT job. The attribute is applicable only for Immediate MDT. See the clause 5.10.3 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
loggingDuration	It specifies how long the MDT configuration is valid at the UE in case of Logged MDT. The attribute is applicable only for Logged MDT and Logged MBSFN MDT. See the clause 5.10.9 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
loggingInterval	It specifies the periodicity for Logged MDT. The attribute is applicable only for Logged MDT and Logged MBSFN MDT. See the clause 5.10.8 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
eventThresholdL1	It specifies the threshold which should trigger the reporting in case of event based reporting of logged NR MDT. The attribute is applicable only for Logged MDT and when reportType is configured for event triggered reporting and when eventListEventForTriggeredMeasurement is configured for L1 event. See the clause 5.10.36 of TS 32.422 [30] for additional details on the allowed values.	type: Integer multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
hysteresisL1	It specifies the hysteresis used within the entry and leave condition of the L1 event based reporting of logged NR MDT. The attribute is applicable only for Logged MDT, when reportType is configured for event triggered reporting and when eventListForEventTriggeredMeasurement is configured for L1 event. See the clause 5.10.37 of TS 32.422 [30] for additional details on the allowed values.	type: Integer multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
timeToTriggerL1	It specifies the threshold which should trigger the reporting in case of event based reporting of logged NR MDT. The attribute is applicable only for Logged MDT, when reportType is configured for event triggered reporting and when eventListForEventTriggeredMeasurement is configured for L1 event. See the clauses 5.10.38 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mbsfnAreaList	The MBSFN Area consists of a MBSFN Area ID and Carrier Frequency (EARFCN). The target MBSFN area List can have up to 8 entries. This parameter is applicable only if the job type is Logged MBSFN MDT. See the clause 5.10.25 of TS 32.422 [30] for additional details on the allowed values.	type: MbsfnArea multiplicity: 0..8 isOrdered: False isUnique: True defaultValue: None isNullable: False
measurementPeriodLTE	It specifies the collection period for the Data Volume (M4) and Scheduled IP throughput measurements (M5) for LTE MDT taken by the eNB. The attribute is applicable only for Immediate MDT. See the clause 5.10.23 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
measurementPeriodM6LTE	It specifies the collection period for the Packet Delay measurement (M6) for MDT taken by the eNB. The attribute is applicable only for Immediate MDT. See the clause 5.10.32 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
collectionPeriodM6LTE	It specifies the collection period for the Packet Loss Rate measurement (M6) for LTE MDT taken by the eNB. The attribute is applicable only for Immediate MDT. See the clause 5.10.32 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
collectionPeriodM7LTE	It specifies the collection period for the Packet Loss Rate measurement (M7) for LTE MDT taken by the eNB. The attribute is applicable only for Immediate MDT. See the clause 5.10.33 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
measurementPeriodUMTS	It specifies the collection period for the Data Volume (M6) and Throughput measurements (M7) for UMTS MDT taken by RNC. The attribute is applicable only for Immediate MDT. See the clause 5.10.22 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
collectionPeriodRRMNR	It specifies the collection period for collecting RRM configured measurement samples for M4, M5 in NR. The attribute is applicable only for Immediate MDT. See the clause 5.10.30 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
collectionPeriodM6NR	It specifies the collection period for the Packet Delay measurement (M6) for NR MDT taken by the gNB. The attribute is applicable only for Immediate MDT. See the clause 5.10.34 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
collectionPeriodM7NR	It specifies the collection period for the Packet Loss Rate measurement (M7) for NR MDT taken by the gNB. The attribute is applicable only for Immediate MDT. See the clause 5.10.35 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: True
beamLevelMeasurement	This indicates whether the NR M1 beam level measurements shall be included or not. See the clause 5.10.40 of TS 32.422 [30] for additional details. The default value is "FALSE". allowedValues: TRUE, FALSE	type: Boolean multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: FALSE isNullable: False
eventThresholdUphUMTS	It specifies the threshold which should trigger the reporting in case of event-triggered periodic reporting for M4 (UE power headroom measurement) in UMTS. See the clause 5.10.39 of TS 32.422 [30] for additional details on the allowed values.	type: Integer multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
measurementQuantity	It specifies the measurements that are collected in an MDT job for a UMTS MDT configured for event triggered reporting. See the clause 5.10.15 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
plmnList	It indicates the PLMNs where measurement collection, status indication and log reporting are allowed. See the clause 5.10.24 of TS 32.422 [30] for additional details on the allowed values.	type: PlmnId multiplicity: 0..16 isOrdered: False isUnique: True defaultValue: None isNullable: False
positioningMethod	It specifies what positioning method should be used in the MDT job. See the clause 5.10.19 of TS 32.422 [30] for additional details on the allowed values.	type: Integer multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportAmount	It specifies the number of measurement reports that shall be taken for periodic reporting while the UE is in connected mode. The attribute is applicable only for Immediate MDT and when reportingTrigger is configured for periodical measurements. See the clause 5.10.6 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
reportAmountM1LTE	It specifies the number of measurement reports that shall be taken for periodic reporting while the UE is in connected mode. The attribute is applicable only for Immediate MDT and combined Trace and Immediate MDT and when reportingTrigger is configured for periodical measurements and applicable only for LTE. See the clause 5.10.6 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportAmountM4LTE	It specifies the number of measurement reports that shall be taken for periodic reporting while the UE is in connected mode. The attribute is applicable only for Immediate MDT and combined Trace and Immediate MDT and when reportingTrigger is configured for periodical measurements and applicable only for LTE. See the clause 5.10.6 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportAmountM5LTE	It specifies the number of measurement reports that shall be taken for periodic reporting while the UE is in connected mode. The attribute is applicable only for Immediate MDT and combined Trace and Immediate MDT and when reportingTrigger is configured for periodical measurements and applicable only for LTE. See the clause 5.10.6 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportAmountM6LTE	It specifies the number of measurement reports that shall be taken for periodic reporting while the UE is in connected mode. The attribute is applicable only for Immediate MDT and combined Trace and Immediate MDT and when reportingTrigger is configured for periodical measurements and applicable only for LTE. See the clause 5.10.6 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportAmountM7LTE	It specifies the number of measurement reports that shall be taken for periodic reporting while the UE is in connected mode. The attribute is applicable only for Immediate MDT and combined Trace and Immediate MDT and when reportingTrigger is configured for periodical measurements and applicable only for LTE. See the clause 5.10.6 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportAmountM1NR	It specifies the number of measurement reports that shall be taken for periodic reporting while the UE is in connected mode. The attribute is applicable only for Immediate MDT and combined Trace and Immediate MDT and when reportingTrigger is configured for periodical measurements and applicable only for NR. In case this attribute is not used, it carries a null semantic. See the clause 5.10.6 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportAmountM4NR	It specifies the number of measurement reports that shall be taken for periodic reporting while the UE is in connected mode. The attribute is applicable only for Immediate MDT and combined Trace and Immediate MDT and when reportingTrigger is configured for periodical measurements and applicable only for NR. See the clause 5.10.6 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportAmountM5NR	It specifies the number of measurement reports that shall be taken for periodic reporting while the UE is in connected mode. The attribute is applicable only for Immediate MDT and combined Trace and Immediate MDT and when reportingTrigger is configured for periodical measurements and applicable only for NR. See the clause 5.10.6 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
reportAmountM6NR	It specifies the number of measurement reports that shall be taken for periodic reporting while the UE is in connected mode. The attribute is applicable only for Immediate MDT and combined Trace and Immediate MDT and when reportingTrigger is configured for periodical measurements and applicable only for NR. See the clause 5.10.6 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportAmountM7NR	It specifies the number of measurement reports that shall be taken for periodic reporting while the UE is in connected mode. The attribute is applicable only for Immediate MDT and combined Trace and Immediate MDT and when reportingTrigger is configured for periodical measurements and applicable only for NR. See the clause 5.10.6 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportingTrigger	It specifies whether periodic or event based measurements should be collected. The attribute is applicable only for Immediate MDT and when the listOfMeasurements is configured for M1 (for UMTS, LTE and NR) or M2 (only for UMTS). See the clause 5.10.4 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportInterval	It specifies the interval between the periodical measurements that shall be taken when the UE is in connected mode. The attribute is applicable only for Immediate MDT and when reportingTrigger is configured for periodical measurements. See the clause 5.10.5 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
reportType	It specifies report type for logged NR MDT as: - periodical. - event triggered. See the clause 5.10.27 of TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
sensorInformation	It specifies which sensor information shall be included in logged NR MDT and immediate NR MDT measurement if they are available. The following sensor measurement can be included or excluded for the UE: - Barometric pressure. - UE speed. - UE orientation. See the clause 5.10.29 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: ENUM multiplicity:* isOrdered: False isUnique: True defaultValue: None isNullable: False
traceCollectionEntityId	It specifies the TCE Id which is sent to the UE in Logged MDT. See the clause 5.10.11 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: Integer multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mcc	Mobile Country Code allowedValues: As defined by the data type	type: Mcc multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mnc	Mobile Network allowedValues: As defined by the data type	type: Mnc multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
traceId	An identifier, which identifies the Trace (together with MCC and MNC). This is a 3 byte Octet String. See the clause 5.6 of 3GPP TS 32.422 [30] for additional details on the allowed values.	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
freqInfo	It specifies the carrier frequency and bands used in a cell.	type: FreqInfo multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
arfcn	RF Reference Frequency as defined in TS 38.104 [35], clause 5.4.2.1. The frequency provided identifies the absolute frequency position of the reference resource block (Common RB 0) of the carrier. Its lowest subcarrier is also known as Point A. allowedValues: 0, 1, …,3279165	type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
freqBands	List of NR frequency operating bands. Primary NR Operating Band as defined in TS 38.104 [35], clause 5.4.2.3. The value 1 corresponds to n1, value 2 corresponds to NR operating band n2, etc. allowedValues: 1, 2, …,1024	type: Integer multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
pciList	List of neighbour cells subject for MDT scope. allowedValues: 0, 1, …,1007	type: Integer multiplicity: 1..32 isOrdered: False isUnique: True defaultValue: None isNullable: False
tac	Tracking Area Code allowedValues: As defined by the data type	type: Tac multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
utraCellIdList	List of UTRAN cells identified by UTRAN CGI allowedValues: As defined by the data type	type: UtraCellId multiplicity: 1..32 isOrdered: False isUnique: True defaultValue: None isNullable: False
eutraCellIdList	List of E-UTRAN cells identified by E-UTRAN-CGI allowedValues: As defined by the data type	type: EutraCellId multiplicity: 1..32 isOrdered: False isUnique: True defaultValue: None isNullable: False
nrCellIdList	List of NR cells identified by NG-RAN CGI allowedValues: As defined by the data type	type: NrCellId multiplicity: 1..32 isOrdered: False isUnique: True defaultValue: None isNullable: False
tacList	Tracking Area Code list allowedValues: As defined by the data type	type: Tac multiplicity: 1..8 isOrdered: False isUnique: True defaultValue: None isNullable: False
taiList	Tracking Area Identity list allowedValues: As defined by the data type	type: Tai multiplicity: 1..8 isOrdered: False isUnique: True defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
mbsfnAreaId	MBSFN Area Identifier AllowedValues: 1, 2, …	type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
earfcn	Carrier Frequency AllowedValues: 1, 2, …	type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mnsLabel	Human-readable name of management service.	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mnsType	Type of management service. allowedValues: ProvMnS, FaultSupervisionMnS, StreamingDataReportingMnS, FileDataReportingMnS	type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mnsVersion	Version of management service.	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mnsAddress	Addressing information for Management Service operations.	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
ProcessMonitor.id	Id of the process. It is unique within a single multivalue attribute of type ProcessMonitor.	Type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
ProcessMonitor.status	This attribute represents the status of the associated process, whether it fails, succeeds etc. It does not represent the returned values of a successfully finished process. allowedValues: - NOT_STARTED - RUNNING - CANCELLING - FINISHED - FAILED - PARTIALLY_FAILED - CANCELLED	Type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
ProcessMonitor.progressPercentage	Progress of the process as percentage. Allowed values: integer between 0 and 100	Type: Integer multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
ProcessMonitor.progressStateInfo	Additional textual qualification of the states "NOT_STARTED", "CANCELLING" and "RUNNING". For specific processes, specific well-defined strings (e.g. string patterns or enums) may be defined as a specialisation. allowedValues: N/A	Type: String multiplicity: 0..* isOrdered: True isUnique: False defaultValue: None isNullable: False
ProcessMonitor.resultStateInfo	Additional textual qualification of the states "FINISHED", "FAILED", "PARTIALLY_FAILED and "CANCELLED". For example, in the "FAILED" or "PARTIALLY_FAILED" state this attribute may be used to provide error reasons. This attribute shall not be used to make the outcome of the process available for retrieval, if any. For this purpose, dedicated attributes shall be specified when specifying the representation of a specific process. For specific processes, specific well-defined strings (e.g. string patterns or enums) may be defined as a specialisation. allowedValues: N/A	Type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
ProcessMonitor.startTime	Start time of the associated process, i.e. the time when the status changed from "NOT_STARTED" to "RUNNING". allowedValues: N/A	Type: DateTime multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
ProcessMonitor.endTime	Date and time when status changed to SUCCESS, CANCELLED, FAILED or PARTIALLY_FAILED. If the time is in the future, it is the estimated time the process will end. allowedValues: N/A	Type: DateTime multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
ProcessMonitor.timer	Time until the associated process is automatically cancelled. If set, the system decreases the timer with time. When it reaches zero the cancellation of the associated process is initiated by the MnS_Producer. If not set, there is no time limit for the process. Once the timer is set, the consumer cannot change it anymore. If the consumer has not set the timer the MnS Producer may set it. Unit is minutes. allowedValues: Positive integers	Type: Integer multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mnsScope	This attribute defines the information about the management scope of the Management Service. The management scope is used to represent the set of managed object instances that can be accessed using the Management Service.	type: MnsScope multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
MnsScope.objectInstanceList	This attribute describes list of DNs for the managed object instances that can be accessed using the Management Service. If a complete SubNetwork can be accessed using the Management Service, this attribute may contain the DN of the SubNetwork instead of the DNs of the individual managed entities within the SubNetwork. If a complete ManagedElement can be accessed using the Management Service, this attribute may contain the DN of the ManagedElement instead of the DNs of the individual managed entities within the ManagedElement.	Type: DN multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
MnsScope.geoAreaList	This attribute describes geographical areas for the managed object instances that can be accessed using the Management Service.	Type: GeoArea multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
MnsScope.taiList	This attribute describes the list of Tracking Area Identities (TAI) for the managed object instances that can be accessed using the Management Service.	Type: Tai multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
mnsCapability	It describes the types of management capabilities of the MnS instance provided by the MnS producer. allowedValues: - NR_PROVISIONING - 5GC_PROVISIONING - NETWORK_SLICING_PROVISIONING - EDGE_COMPUTING_PROVISIONING - PERFORMANCE_METRIC_COLLECTION_CONTROL - PERFORMANCE_METRIC_DATA_REPORT - PERFORMANCE_METRIC_THRESHOLD_MONITOR_CONTROL - PERFORMANCE_METRIC_THRESHOLD_NOTIFICATION - FAULT_CONTROL - FAULT_NOTIFICATION - TRACE_MDT_DATA_COLLECTION_CONTROL - TRACE_MDT_DATA_REPORT - QOE_DATA_COLLECTION_CONTROL - QOE_DATA_REPORT - FILE_RETRIEVAL - FILE_DOWNLOAD - SUBSCRIPTION_CONTROL - HEARTBEAT_CONTROL - HEARTBEAT_NOTIFICATION - ML_MODEL_MANAGEMENT - MGMT_DATA_ANALYTIC - RANSC_MANAGEMENT - SON_POLICY - COMMUNICATION_SERVICE_ASSURANCE_CONTROL - INTENT_DRIVEN_MANAGEMENT - MNS_REGISTRY_AND_DISCOVERY - MGMT_DATA_ REGISTRY_AND_DISCOVERY - MNS_ACCESS_CONTROL_MANAGEMENT - DSO_RAPID_RECOVERY_AND_THRESHOLD_MONITORING - EXTERNAL_DATA_DISCOVERY_AND_REQUEST The detailed description for above enum values see Annex F in TS 28.533 [32]. Note: vendor extension values are allowed for the attribute “mnsCapability”.	Type: Enum multiplicity: 0..* isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
managementData	This attribute defines the list of management data that are requested.	Type: ManagementData multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mgtDataCategory	This attributes defines the type of management data that are requested. Allowed values for data category are COVERAGE, CAPACITY, ENERGY_EFFICIENCY, MOBILITY, ACCESSIBILITY. The data categories will map to certain measurement families defined in TS 28.552 [20], see below. In addition to the below mappings, MnS producer may map the provided categories to any additional proprietary management data, as appropriate. The COVERAGE category will map to measurement families of MR (measurements related to Measurement Report) and L1M (measurements related to Layer 1 Measurement). The CAPACITY category will map to measurement family RRU (measurements related to Radio Resource Utilization). The ENERGY_EFFICIENCY category will map to measurement family PEE (measurements related to Power, Energy and Environment). The MOBILITY category will map to measurement family MM (measurements related to Mobility Management). The ACCESSIBILITY category will map to measurement family CE (measurements related to Connection Establishment). Allowed values: COVERAGE, CAPACITY, SERVICE EXPERIENCE, TRACE, ENERGY EFFICIENCY, MOBILITY, ACCESSIBILITY See NOTE 7.	type: ENUM multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
mgtDataName	A list of management data identified by name. allowedValues: The list may include metrics or set of metrics defined in TS 28.552 [20], TS 28.554 [28] and TS 32.422 [30]. For performance measurements defined in TS 28.552 [20] the name is constructed as the bullet e) of measurement definition with allowed measurement type. For trace metrics (including trace messages, MDT measurements (Immediate MDT, Logged MDT, Logged MBSFN MDT), RRC, RLF and RCEF reports) defined in TS 32.422 [30], the name (metric identifier) is defined in clause 10 of TS 32.422 [30]. For non-3GPP specified managment data the name is defined elsewhere.	type: String multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
consolidateOutput	Indicates whether the management data collection output will be consolidated into a single file per reporting period.	type: Boolean multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
targetNodeFilter	Set of information to target the Object Instance to collect the management data from.	type: NodeFilter multiplicity: * isOrdered: False isUnique: True defaultValue: No isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
areaOfInterest	It specifies a location(s) from where the management data shall be collected.	type: AreaOfInterest multiplicity: * isOrdered: False isUnique: True defaultValue: No isNullable: False
geoAreaToCellMapping	It specifies the geographical area from where the management data shall be collected and the mapping to cells. allowedValues: N/A	type: GeoAreaToCellMapping multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
geoPolygon	It specifies the geographical area with a polygon. The polygon is specified by its corners. allowedValues: N/A	type: GeoCoordinate multiplicity: 1..* isOrdered: True isUnique: True defaultValue: None isNullable: True
geoArea	It specifies the geographical area using the coordinates of the corners of a polygon. allowedValues: N/A	type: GeoArea multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
latitude	Latitude based on World Geodetic System (1984 version) global reference frame (WGS 84). Positive values correspond to the northern hemisphere. AllowedValues: -90.0000, …+90.0000	type: float multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
longitude	Longitude based on World Geodetic System (1984 version) global reference frame (WGS 84). Positive values correspond to degrees east of 0 degrees longitude. AllowedValues: -180.0000, … +180.0000	type: float multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
altitude	It is the vertical distance between the point of interest from the mean sea level measured in metres.	type: Float multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
associationThreshold	It specifies the threshold of coverage area in percentage whether a cell belongs to the geographical area or not. If this attribute is absent, the location of the base station antenna determines whether a cell belongs to the geographical area or not. Allowed values: 1,…,100	type: Integer multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
networkDomain	It specifies the network domain of the target node. This will also result in collecting appropriate management data from the nodes belonging to the specified domain. Allowed Values: CN, RAN	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: N/A isNullable: False
cpUpType	It specifies the traffic type of the target node. This will also result in collecting appropriate management data from the nodes handling the specified traffic (e.g AMF for CP and UPF for UP). Allowed Values: CP, UP	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: N/A isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
sst	It specifies the slice service type (SST) of which the slice subnet should be targeted. Please refer to TS 23.501 [22].	type: Integer multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: N/A isNullable: False
collectionTimeWindow	Collection time window for which the management data should be reported.	type: TimeWindow multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: N/A isNullable: False
startTime	It indicates the time (in "date-time" format) when the management activity shall be started. AllowedValues: N/A.	type: DateTime multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
endTime	It indicates the time (in "date-time" format) when the management activityshall be stopped. AllowedValues: N/A.	type: DateTime multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
timeWindow	Time window for which the configured management activity shall be active.	type: TimeWindow multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
timeIntervals	List of intervals within one day for which the service shall be active.	type: TimeInterval multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
intervalStart	It indicates the time (in "full-time" format) when the service shall be started. Data type "FullTime" defines the time as specified by "full-time" in RFC3339 [54]. AllowedValues: N/A.	type: FullTime multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
intervalEnd	It indicates the time (in "full-time" format) when the service shall be stopped. "FullTime" defines the time as specified by "full-time" in RFC3339 [54]. AllowedValues: N/A.	type: FullTime multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
daysOfWeek	It indicates the days on which the service shall be scheduled in case of weekly repetition. The intervals per day are configured by attribute timeIntervals. AllowedValues: - MONDAY - TUESDAY - WEDNESDAY - THURSDAY - FRIDAY - SATURDAY - SUNDAY	type: ENUM multiplicity: 1..7 isOrdered: False isUnique: True defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
daysOfMonth	It indicates the days in a month on which the service shall be scheduled in case of monthly repetition. Value 0 presents the last day of the month. The intervals per day are configured by attribute timeIntervals. AllowedValues: 0, 1, …31	type: Integer multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
schedulingTimes	It defines the active scheduling times.	type: SchedulingTime multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
schedulerStatus	Switches between TRUE and FALSE depending upon whether the configured time constraints are fulfilled or not.	type: Boolean multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
conditionStatus	Switches between TRUE and FALSE depending upon whether the configured constraints are fulfilled or not.	type: Boolean multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
schedulerRef	Pointer to a Scheduler object.	type: Dn multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
conditionMonitorRef	Pointer to a ConditionMonitor object.	type: Dn multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
condition	Logical expression of one or several condition(s). The actual syntax and capabilities of condition is SS specific. However, each SS should support condition consisting of one or several assertions that may be grouped using the logical operators AND, OR and NOT. Only if the whole expression of condition evaluates TRUE, the attribute conditionStatus will be TRUE. Each assertion is a pointer to a Boolean parameter or a logical expression of attribute existence or attribute value comparison ("equal to X, less than Y" etc.). An empty string is not allowed. allowedValues: N/A	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
dataScope	It specifies whether the required data is reported per S-NSSAI or per 5QI or per PLMN. Allowed Value: SNSSAI, 5QI, PLMN	type: ENUM multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
serviceType	Specifies an end user service type for QoE measurements. allowedValues: DASH, MTSI, VR	type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
qoECollectionEntityAddress	Specifies the address to which the QMC records shall be transferred. Ipv4 or Ipv6 address(es) may be used.	type: IpAddress multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
qoETarget	Specifies the target object of the QMC in case of signalling based QMC. The qoETarget attribute shall be able to carry "IMSI" or "SUPI".	type: String multiplicity: 0..1 isOrdered:N/A isUnique: N/A defaultValue: None isNullable: False
qoEReference	Identifies the QoE measurement collection job in the Managed Elements and in the measurement collection entity. The QoE reference shall be globally unique therefore it is composed as follows: MCC+MNC+QMC ID, where the MCC and MNC are coming with the QMC activation request from the management system to identify one PLMN containing the management system, and QMC ID is a 3 byte Octet String. The QMC ID is generated by the management system or the operator.	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
sliceScope	Contains a list of S-NSSAIs (Single Network Slice Selection Assistance Information). A Network Slice is identified by S-NSSAI.	type: S-NSSAI multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
sliceIdList	Contains a list of network slices identified by PLMN-Id and S-NSSAI.	type: PLMNInfo multiplicity: 0..16384 isOrdered: False isUnique: True defaultValue: None isNullable: False
pLMNId	Identifies a single PLMN.	type: PLMNId multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
sNSSAI	Identifies a single network slice by S-NSSAI (Single Network Slice Selection Assistance Information).	type: S-NSSAI multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
qMCConfigFile	Provides a reference to a file including the parameters for configuration of application layer measurements, known as Container for Application Layer Measurement Configuration	Type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
excessPacketDelayThresholds	Excess packet delay thresholds info for M6 UL measurement.	type: ExcessPacketDelayThresholds multiplicity: 0..255 isOrdered: False isUnique: True defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
fiveQIValue	It indicates 5QI value. allowedValues: 0 - 255	type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
excessPacketDelayThresholdValue	Value of excess packet delay threshold for M6 UL measurement. allowedValues: 0.25ms, 0.5ms, 1ms, 2ms, 4ms, 5ms, 10ms, 20ms, 30ms, 40ms, 50ms, 60ms, 70ms, 80ms, 90ms, 100ms, 150ms, 300ms, 500ms, …	type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mDTAlignmentInformation	This parameter indicates the MDT measurements with which alignment of QoE measurement is required. This parameter is optional and is valid for NR only.	Type: TraceReference multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
availableRANqoEMetrics	This parameter indicates available RAN visible QoE metrics to the gNB. This parameter is optional and is valid for NR only. allowedValues: APP_LAYER_BUFFER_LEVEL_LIST, PLAYOUT_DELAY_FOR_MEDIA_STARTUP	Type: ENUM multiplicity: 0..2 isOrdered: False isUnique: True defaultValue: None isNullable: False
dnPrefix	It carries the DN Prefix information or no information. See Annex C of TS 32.300 [13] for one usage of this attribute. allowedValues: N/A	type: DN multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
nPNIdentityList	It defines which NPNs that can be served by the NR cell, and which CAG IDs or NIDs can be supported by the NR cell for corresponding PNI-NPN or SNPN in case of the cell is NPN-only cell. (NPN-Identity referring to TS 38.331 [38]) allowedValues: N/A	type: NpnId multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
cAGIdList	It identifies a CAG list containing up to 256 CAG-identifiers per UE or up to 12 CAG-identifiers per cell, see TS 38.331 [38]. CAG ID is used to combine with PLMN ID to identify a PNI-NPN. CAG ID is a hexadecimal range with size 32 bit. allowedValues: N/A	type: CagId multiplicity: 0..256 isOrdered: False isUnique: True defaultValue: None isNullable: False
nIDList	It identifies a list of NIDs containing up to 16 NIDs, see TS 38.331 [38]. NID is used to combine with PLMN ID to identify an SNPN. NID is a hexadecimal range with size 44 bit.	type: Nid multiplicity: 0..16 isOrdered: False isUnique: True defaultValue: None isNullable: False
nPNTarget	It defines which NPN that the subscriber of the session to be recorded uses as selected NPN. There is maximum one CAG ID present in cAGIdList in case of PNI-NPN or maximum one NID present in nIDList in case of SNPN	type: NpnId multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
ueCoreMeasConfig	The set of parameters specific for 5GC UE level measurements configuration.	type: UECoreMeasConfig multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
ueCoreMeasurements	List of 5GC UE level measurements identified by name. allowedValues: The list may include 5GC UE level measurements defined in TS 28.558 [57], or vendor specific measurements. For 5GC UE level measurements defined in TS 28.558 [57], the name is constructed as the bullet e) of measurement definition with allowed measurement type. For non-3GPP specified 5GC UE level measurements the name is defined elsewhere.	type: String multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
ueCoreMeasGranularityPeriod	Granularity period used to produce 5GC UE level measurements. The period is defined in milliseconds (ms). See Note 8. allowedValues: Integer with a minimum value of 10	type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
nfTypeToMeasure	It indicates the type of NE to produce the 5GC UE level measurements. allowedValues: The NF types represented by the measured object classes as defined by f) of the 5GC UE level measurements specified in TS 28.558 [57].	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
processMonitor	This IE indicates the process of the ManagementDataCollection MOI.	Type: ProcessMonitor multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mBSCommunicationServiceType	This IE indicates for which type of MBS communication service the QoE measurement configuration pertains to. See the clause 4.5.1 of TS 28.405 [50] for additional details. allowedValue: BROADCAST, MULTICAST	type: ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: False isNullable: False
month	It indicates the month in a year. allowedValues: 1, …, 12	type: DateMonth multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
monthDay	It indicates the day in a month. allowedValues: 1, …, 31	type: DateMonthDay multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mNOnly	This indicates whether the MDT configuration is for MN only or not. The value "FALSE" means the MDT configuration is for both MN and SN. The value “TRUE” means the MDT configuration is for MN only.	type: Boolean multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: FALSE isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
externalDataType	Type of external management data as defined by the implementation. Examples: “Electronic Map”, “Camara Data”, “UE path”, “Camera Photo”, “Event Schedule”	Type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
mediaLocation	URI of the media which includes the transfer protocol. Examples: "sftp://companyA.com/datastore/fileName.xml", "https://companyA.com/ManagedElement=1/Files=1/File=1” allowedValues: NA	Type: Uri multiplicity: 0..* isOrdered: false isUnique: true defaultValue: None isNullable: False
externalDataTypeSchema	URI of the schema to parse a type of external management data. The detailed schema definition for the different types of external management data is out of scope of this specification. allowedValues: NA	Type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
externalDataScope	It describes the concrete scope which the external management data is applicable.	type: ExternalDataScope multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
geoAreas	It describes the concrete geographical area(s)	type: GeoArea multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
objectInstancesIncluded	List of managed object instances to which the described data are related. Each object instance is identified by its DN. allowedValues: N/A	type: DN multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
objectInstancesExcluded	List of managed object instances which are not considered in relation to the described data. Each object instance is identified by its DN. allowedValues: N/A	type: DN multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
supportedManagementData	This attribute defines the list of management data that can be supported. The management data is a choice between: - a list of data categories (attribute mgtDataCategory) - a list of management data identified with their name (attribute "mgtDataName").	Type: ManagementData multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
supportedGranularityPeriods	Granularity periods supported for the production of associated management data. The period is defined in seconds.	Type: Integer multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False
supportedReportingPeriods	Reporting periods supported for the associated management data. The period is defined in seconds.	Type: Integer multiplicity: * isOrdered: False isUnique: True defaultValue: None isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
historicalDataPeriod	This attribute describes the maximum period of the requested historical data. The period is defined in seconds. When the value of this attribute is NULL, which means the capability of querying historical data is not supported.	Type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: TRUE
supportedReportingMethod	List of supported reporting methods for the associated management data. AllowedValues: - FILE - STREAM	type: ENUM multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
supportedDataScope	List of supported sub counter capabilities for the associated management data Allowed Values: - SNSSAI - 5QI - PLMN	type: ENUM multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
supportedDataRequestMnSRef	List of DN of MnSInfo for the MnS instance(s) which can be used to request the associated management data	type: DN multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
supportedDataReportingMnSRef	List of DN of MnSInfo for the MnS instance(s) which can be used to report the associated management data	type: DN multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
mgmtDataInfoRef	List of DN of MgmtDataInfo instance(s) which are associated the MnSInfo which represent a management service instance	type: DN multiplicity: 1..* isOrdered: False isUnique: True defaultValue: None isNullable: False
trsrPrefixCfg	A TRSR prefix configurations. See the subclause 5.10.x of 3GPP TS 32.422 [30] for additional details.	type: TrsrPrefixCfg multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
trsrPrefix	A 2 byte Octet String	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
trsrprefixLength	An integer to indicate how many bits are used for the TRSR prefix	type: Integer multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
firstEventTime	eventTime of first notification available. The attribute may be missing if and only if there are no notifications in the NotificationList.	Type: DateTime multiplicity: 0..1 isNullable: False
lastEventTime	eventTime of latest notification available. The attribute may be missing if and only if there are no notifications in the NotificationList.	Type: DateTime multiplicity: 0..1 isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
notificationEntries	Representation of the individual notifications. The entries shall be ordered based on eventTime of the notification, newest first.	Type: NotificationEntry multiplicity: * isOrdered: True isUnique: True isNullable: False
NotificationList.notificationFilter	Filter to be applied to candidate notifications identified by the notificationTypes attribute. Only notifications that pass the filter criteria are included. All other notifications are discarded. The filter can be applied to any field of a notification.	Type: String multiplicity: 0..1 isNullable: False
notificationEntryId	Identifier of an individual notificationEntry; unique within a NotificationList IOC. allowedValues: - If the NotificationList is contained under an NtfSubscriptionControl the value is the same as the notification's sequenceNo. - If the NotificationList is contained under SubNetwork or ManagedElement the value is the DN of the NtfSubscriptionControl that created the notification followed by a single '*' asterisk character and the sequenceNo. e.g. ManagedElement=me1,NtfSubscriptionControl=Fault1*12345	Type: String multiplicity: 1 isNullable: False
eventTime	eventTime from the header of the notification.	Type: DateTime multiplicity: 1 isNullable: False
notificationContent	The string representation of a notification as encoded in the HTTP body (excluding the HTTP headers and the optional VES header).	Type: String multiplicity: 1 isNullable: False

RNOTE 1: The value of this attribute is identical to that of the same attribute in clause 9.4.2 of ETSI GS NFV-IFA 008 [16].
NOTE 2: The value of this attribute is identical to that of the attribute isAutoscaleEnabled included in vnfConfigurableProperty in clause 9.4.2 of ETSI GS NFV-IFA 008 [16].
NOTE 3: The presence of the attribute vnfParametersList, whose vnfInstanceId with a string length of zero, in createMO operation can trigger the instantiation of the related VNF/VNFC instances.
NOTE 4: The GP defines the measurement data production rate. The supported rates are dependent on the capacity of the producer involved (e.g. the processing power of the producer, the complexity of the measurement type involved etc) and therefore, it cannot be standardized for all producers involved. The supported GPs reflects the agreement between producer and the consumer involved.
NOTE 5: The monitoring granularity period defines the measurements monitoring period. The supported monitoring periods are dependent on the capacity of the producer involved (e.g. the processing power of the producer, the complexity of the measurement type involved etc) and therefore, it cannot be standardized for all producers involved. The supported monitoring GPs reflect the agreement between producer and the consumer involved.
NOTE 6: The supported threshold levels are dependent on the capacity of the producer involved (e.g. the processing power of the producer, number of measurements being measured by the producer at the time, the complexity of the measurement type involved etc) and therefore, it cannot be standardized for all producers involved. The supported levels can only reflect the negotiated agreement between producer and the consumer involved.
NOTE 7: The above values can be further extended by the implementations, as appropriate.
NOTE 8: The ueCoreMeasGranularityPeriod defines the measurement data production rate. The supported rates are dependent on the capacity of the producer involved (e.g. the processing power of the producer, the complexity of the measurement type involved etc) and therefore, it cannot be standardized for all producers involved. The supported Granularity periods reflects the agreement between producer and the consumer involved.

4.4.2 Constraints

None

4.5 Common notifications

4.5.1 Alarm notifications

This clause presents a list of notifications, defined in TS 28.111 [58], that a MnS consumer can receive. The notification header attribute objectClass/objectInstance, defined in TS 32.302 [3], captures the DN of an instance of an IOC defined in the present document.

Name	S	Notes
notifyNewAlarm	M	
notifyClearedAlarm	M	
notifyChangedAlarmGeneral	O	
notifyCorrelatedNotificationChanged	O	
notifyAckStateChanged	O	
notifyComments	O	
notifyPotentialFaultyAlarmList	O	
notifyAlarmListRebuilt	M	

4.5.2 Configuration notifications

This clause presents a list of notifications, defined in TS 28.532 [27], that a MnS consumer can receive. The notification header attribute `objectClass/objectInstance`, defined in TS 32.302 [3], captures the DN of an instance of an IOC defined in the present document.

Name	S	Notes
notifyMOICreation	O	
notifyMOIDeletion	O	
notifyMOIAttributeValueChanges	O	
notifyMOIChanges	O	
notifyEvent	O	

4.5.3 Threshold Crossing notifications

This clause presents a list of notifications, defined in TS 28.532 [27], that a MnS consumer can receive. The notification header attribute `objectClass`/`objectInstance`, defined in TS 32.302 [3], captures the DN of an instance of an IOC defined in the present document.

Name	S	Notes
notifyThresholdCrossing	CM	Mandatory if NRM based threshold monitoring is supported.

5 Common Data Types

5.1 Introduction

This clause defines common data types for generic usage.

5.2 Simple Data Types

This clause specifies common simple data types. Simple data types represent specializations of the data types specified in TS 32.156 [10], clause 5.4.3 (i.e. predefined data types).

Table 5.2-1 lists simple data types. As noted, simple data types (“type name” column) result from applying certain constraints to predefined (“type definition” column).

Table 5.2-1: Simple Data Types

Type Name	Type Definition	Description
FullTime	String	String with format "full-time" as defined in RFC 3339 [54]
DateMonth	String	String with format "date-month" as defined in RFC 3339 [54]
DateMonthDay	String	String with format "date-mday" as defined in RFC 3339 [54]
Float	Real	Float is a number with format sufficient for precision <=7 decimal digits. Real is a number with format sufficient for precision >7 decimal digits.
Latitude	Real	The type is Real, the range is [-90, 90]
Longitude	Real	The type is Real, the range is [-180, 180]
DnList	array(DN)	List of DN
Mcc	String	Mobile Country Code, see clause 2.3 of TS 23.003 [5] for MCC,, String with pattern: '^[0-9]{3}$'
Mnc	String	Mobile Network Code, see clause 2.3 of TS 23.003 [5] for MNC, String with pattern: '^[0-9]{2,3}$'
Nid	String	This represents the Network Identifier, which together with a PLMN ID is used to identify an SNPN (see 3GPP TS 23.003 [5] and 3GPP TS 23.501 [22] clause 5.30.2.1). Pattern: '^[A-Fa-f0-9]{11}$'
CagId	String	This represents the identifier of a Closed Access Group (CAG), which together with a PLMN ID is used to identify an PNI-NPN (see 3GPP TS 23.003 [5] and 3GPP TS 23.501 [22]). Pattern: '^[A-Fa-f0-9]{8}$'
Tac	String	2 or 3-octet string identifying a tracking area code as specified in clause 9.3.3.10 of 3GPP TS 38.413 [34], in hexadecimal representation. Each character in the string shall take a value of "0" to "9", "a" to "f" or "A" to "F" and shall represent 4 bits. The most significant character representing the 4 most significant bits of the TAC shall appear first in the string, and the character representing the 4 least significant bit of the TAC shall appear last in the string. pattern: '(^[A-Fa-f0-9]{4}$)\|(^[A-Fa-f0-9]{6}$)' Examples: A legacy TAC 0x4305 shall be encoded as "4305". An extended TAC 0x63F84B shall be encoded as "63F84B"
UtraCellId	Integer	UTRAN cells identified by UTRAN CGI
EutraCellId	String	28-bit string identifying an E-UTRA Cell Id as specified in clause 9.3.1.9 of 3GPP TS 38.413 [34], in hexadecimal representation. Each character in the string shall take a value of "0" to "9", "a" to "f" or "A" to "F" and shall represent 4 bits. The most significant character representing the 4 most significant bits of the Cell Id shall appear first in the string, and the character representing the 4 least significant bit of the Cell Id shall appear last in the string. Pattern: '^[A-Fa-f0-9]{7}$' Example: An E-UTRA Cell Id 0x5BD6007 shall be encoded as "5BD6007".
NrCellId	String	36-bit string identifying an NR Cell Id as specified in clause 9.3.1.7 of 3GPP TS 38.413 [34], in hexadecimal representation. Each character in the string shall take a value of "0" to "9", "a" to "f" or "A" to "F" and shall represent 4 bits. The most significant character representing the 4 most significant bits of the Cell Id shall appear first in the string, and the character representing the 4 least significant bit of the Cell Id shall appear last in the string. Pattern: '^[A-Fa-f0-9]{9}$' Example: An NR Cell Id 0x225BD6007 shall be encoded as "225BD6007".

Fqdn	String	Fully Qualifed Domain Name, refer to clause 19.4.2 of TS 23.003 [5] Pattern: '^([0-9A-Za-z]([-0-9A-Za-z]{0,61}[0-9A-Za-z])?\.)+[A-Za-z]{2,63}\.?$' minLength: 4 maxLength: 253
Ipv4Addr	String	String identifying an IPv4 address formatted in the "dotted decimal" notation as defined in IETF RFC 1166 [60]. Pattern: '^(([0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5])\.){3}([0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5])$' example: '198.51.100.1'
Ipv6Addr	String	String identifying an IPv6 address formatted according to clause 4 of IETF RFC 5952 [61]. The mixed IPv4 IPv6 notation according to clause 5 of IETF RFC 5952 [61] shall not be used. Pattern: '^((:|(0?|([1-9a-f][0-9a-f]{0,3}))):)((0?|([1-9a-f][0-9a-f]{0,3})):){0,6}(:|(0?|([1-9a-f][0-9a-f]{0,3})))$' and Pattern: '^((([^:]+:){7}([^:]+))\|((([^:]+:)*[^:]+)?::(([^:]+:)*[^:]+)?))$' example: '2001:db8:85a3::8a2e:370:7334'
Ipv6Prefix	String	String identifying an IPv6 address prefix formatted according to clause 4 of IETF RFC 5952 [61]. IPv6Prefix data type may contain an individual /128 IPv6 address. Pattern: '^((:|(0?|([1-9a-f][0-9a-f]{0,3}))):)((0?|([1-9a-f][0-9a-f]{0,3})):){0,6}(:|(0?|([1-9a-f][0-9a-f]{0,3})))(\/(([0-9])|([0-9]{2})|(1[0-1][0-9])|(12[0-8])))$' and Pattern: '^((([^:]+:){7}([^:]+))\|((([^:]+:)*[^:]+)?::(([^:]+:)*[^:]+)?))(\/.+)$' example: '2001:db8:abcd:12::0/64'
Uri	String	String providing an URI formatted according to IETF RFC 3986 [62].
NOTE: The string Pattern in 5.2-1 may have different variants with no “^” or “$” in the pattern string.		

5.3 Enumerations

5.3.1 AdministrativeState <<enumeration>>

Table 5.3.1-1: <<enumeration>> AdministrativeState

Enumeration value	Description
"LOCKED"	Administrative State is locked.
"UNLOCKED"	Administrative State is unlocked.
“SHUTTINGDOWN”	Administrative State is shutting down.

5.3.2 BasicAdministrativeState <<enumeration>>

Table 5.3.2-1: <<enumeration>> BasicAdministrativeState

Enumeration value	Description
"LOCKED"	Administrative State is locked.
"UNLOCKED"	Administrative State is unlocked.

5.3.3 OperationalState <<enumeration>>

Table 5.3.3-1: <<enumeration>> OperationalState

Enumeration value	Description
"ENABLED"	Operational State is enabled.
"DISABLED"	Operational State is disabled.

5.3.4 UsageState<<enumeration>>

Table 5.3.4-1: <<enumeration>> UsageState

Enumeration value	Description
"IDLE"	Usage State is idle.
"ACTIVE"	Usage State is active.
"BUSY"	Usage State is busy.

5.3.5 AvailabilityStatus <<enumeration>>

Table 5.3.5-1: <<enumeration>> AvailabilityStatus

Enumeration value	Description
IN_TEST	The availability status is in test.
FAILED	The availability status is failed.
POWER_OFF	The availability status is powered off.
OFF_LINE	The availability status is offline.
OFF_DUTY	The availability status is off duty.
DEPENDENCY	The availability status is dependency
DEGRADED	The availability status is degraded.
NOT_INSTALLED	The availability status is not installed.
LOG_FULL	The availability status is log full.

5.4 Structured Data Types

5.4.1 TimeWindow <<dataType>>

5.4.1.1 Definition

This <<dataType>> defines a time window.

It is a <<dataType>> between the control parameters required to define the time window as follows:

When startTime and endTime are present, the time window starts when startTime is reached and ends when endTime is reached.

When only the startTime attribute is present, the time window starts when startTime is reached and runs until deletion of the managed object instance including this timeWindow.

When only the endTime attribute is present, the time window starts when the managed object instance including this TimeWindow is created and ends when endTime is reached.

5.4.1.2 Attributes

Attribute name	S	isReadable	isWritable	isInvariant	isNotifyable
startTime	M	T	T	T	T
endTime	M	T	T	T	T

5.4.1.3 Attribute constraints

None

5.4.1.4 Notifications

The Notifications subclause of the <<IOC>> using this `<<dataType>>` as one of its attributes, shall be applicable.

Annex A (informative): Alternate class diagram

This class diagram combines the Figure 4.2.1-1 of this document with Figure 1 of TS 28.620 [9], the class diagram of UIM.

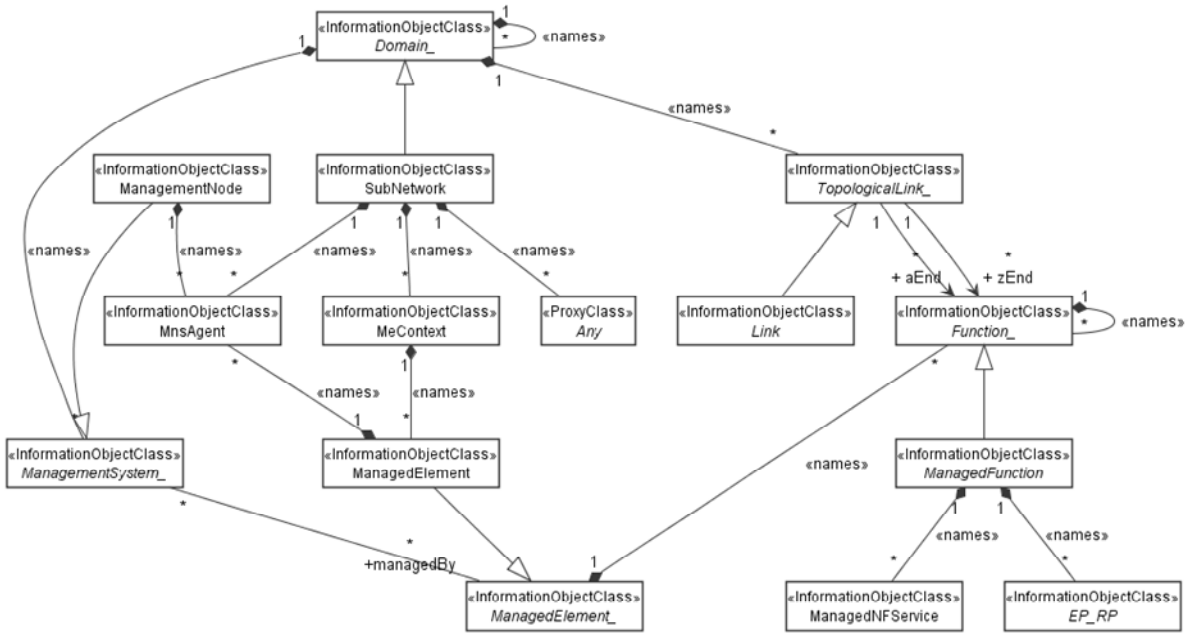


Figure A-1: Alternate class diagram

Annex B (informative): PlantUML for figures

B.1 Relationships

```
@startuml TS28.622 Figure 4.2.1-1 NRM fragment
hide empty members
hide circle
skinparam class {
BackgroundColor White
ArrowColor Black
BorderColor Black
}
skinparam ClassStereotypeFontStyle normal
top to bottom direction
skinparam nodesep 40

abstract class ManagedFunction <<InformationObjectClass>>
abstract class EP_RP <<InformationObjectClass>>
EP_RP "*" -u-* "1" ManagedFunction: <<names>>

class SubNetwork <<InformationObjectClass>>
class ManagementNode <<InformationObjectClass>>
class MnsAgent   <<InformationObjectClass>>
class MeContext  <<InformationObjectClass>>
abstract class Any        <<ProxyClass>>
class ManagedElement <<InformationObjectClass>>

ManagementNode "*" -u-* "1" SubNetwork: <<names>>
MnsAgent       "*" -u-* "1" SubNetwork: <<names>>
MeContext      "*" -u-* "1" SubNetwork: <<names>>
Any            "*" -u-* "1" SubNetwork: <<names>>
'SubNetwork     "*" --* "1" SubNetwork: <<names>>
MeContext -[hidden]l- MnsAgent
MnsAgent       "*" -l-* "1" ManagementNode: <<names>>
MnsAgent       "*" -d-* "1" ManagedElement: <<names>>

ManagedElement "*" -u-* "1" MeContext: <<names>>
ManagedFunction -[hidden]u- ManagedElement

@enduml
```

Source code for Figure 4.2.1-1 NRM fragment

```
@startuml Figure 4.2.1-8: MnS Registry NRM fragment
hide circle
hide methods
hide members

skinparam class {
    AttributeIconSize 0
    BackgroundColor white
    BorderColor black
    ArrowColor black
}
skinparam   Shadowing false
skinparam  Monochrome true
skinparam  ClassBackgroundColor White
skinparam  NoteBackgroundColor White
class  "<<InformationObjectClass>>\n SubNetwork" as SubNetwork{}
class  "<<InformationObjectClass>>\n MnSRegistry" as MnSRegistry{}
class  "<<InformationObjectClass>>\n MnSInfo" as  MnSInfo{}
class  "<<InformationObjectClass>>\n MgmtDataInfo" as  MgmtDataInfo{}
SubNetwork "1" *-- "*" MnSRegistry : <<names>>
MnSRegistry "1" *-- "*" MnSInfo : <<names>>
MnSRegistry "1" *-- "*" MgmtDataInfo : <<names>>
MnSInfo "*" <-right-> "*" MgmtDataInfo

@enduml
```

Source code for Figure 4.2.1-8 MnS Registry NRM fragment

```
@startuml Figure 4.2.1-12: QoE Measurement Collection NRM fragment
```

```
skinparam monochrome true
skinparam ClassStereotypeFontStyle normal
class ManagedEntity <<ProxyClass>>
class QMCJob <<InformationObjectClass>>
hide empty members
hide circle
ManagedEntity “1” *- “*” QMCJob : <<names>>
note top of ManagedEntity
Represents the following IOCs:
SubNetwork, or
ManagedElement.
End note
@enduml
```

Source code for Figure 4.2.1-12: QoE Measurement Collection NRM fragment

```
@startuml Figure 4.2.1-13: SupportedNotifications NRM fragment
skinparam monochrome true
skinparam ClassStereotypeFontStyle normal
class ManagedEntity <<ProxyClass>>
class SupportedNotifications <<InformationObjectClass>>
hide empty members
hide circle
ManagedEntity “1” *- “1” SupportedNotifications : <<names>>
note top of ManagedEntity
Represents the following IOCs:
SubNetwork, or
ManagedElement.
End note
@enduml
```

Source code for Figure 4.2.1-13: SupportedNotifications NRM fragment

```
@startuml Figure 4.2.1-14: Scheduler NRM fragment
skinparam monochrome true
skinparam ClassStereotypeFontStyle normal
class ManagedEntity <<ProxyClass>>
class Scheduler <<InformationObjectClass>>
hide empty members
hide circle
ManagedEntity “1” *- “*” Scheduler : <<names>>
note top of ManagedEntity
Represents the following IOCs:
SubNetwork, or
ManagedElement.
End note
@enduml
```

Source code for Figure 4.2.1-14: Scheduler NRM fragment

```
@startuml Figure 4.2.1-15: Condition monitor NRM fragment
skinparam monochrome true
skinparam ClassStereotypeFontStyle normal
class ManagedEntity <<ProxyClass>>
class ConditionMonitor <<InformationObjectClass>>
hide empty members
hide circle
ManagedEntity “1” *- “*” ConditionMonitor: <<names>>
note top of ManagedEntity
Represents the following IOCs:
SubNetwork, or
ManagedElement.
End note
@enduml
```

Source code for Figure 4.2.1-15: Condition monitor NRM fragment

```
@startuml Figure 4.2.1-16: External data type NRM fragment
skinparam monochrome true
skinparam ClassStereotypeFontStyle normal
class SubNetwork <<InformationObjectClass>>
class ExternalDataType <<InformationObjectClass>>
hide empty members
hide circle
SubNetwork "1" *- "*" ExternalDataType: <<names>>
```

```
@enduml
```

Source code for Figure 4.2.1-16: External data type NRM fragment

```
@startuml Figure 4.2.1-x: NotificationList NRM fragment
skinparam monochrome true
skinparam ClassStereotypeFontStyle normal
class ManagedEntity <<ProxyClass>>
class NotificationList  <<InformationObjectClass>>
hide empty members
hide circle
ManagedEntity “1” *- “*” NotificationList : <<names>>
note top of ManagedEntity
Represents the following IOCs:
SubNetwork, ManagedElement
or NtfSubscriptionControl.
End note
@enduml
```

Source code for Figure 4.2.1-17: NotificationList NRM fragment

B.2 Inheritance

```
@startuml Rel19 Figure 4.2.2-1: NRM fragment
hide empty members
skinparam ClassStereotypeFontStyle normal
hide circle
skinparam class {
BackgroundColor White
ArrowColor Black
BorderColor Black
}
skinparam linetype ortho
'skinparam BoxPadding 40
skinparam nodesep 2

abstract class TopX <<InformationObjectClass>>
abstract class Top_ <<InformationObjectClass>>
abstract class Top <<InformationObjectClass>>
class MnsAgent <<InformationObjectClass>>
class MeContext <<InformationObjectClass>>
class VsDataContainer <<InformationObjectClass>>
class EP_RP <<InformationObjectClass>>
TopX <|-- Top
Top_ <|-- Top
Top <|-- MnsAgent
Top <|-- MeContext
Top <|-- VsDataContainer
Top <|-- EP_RP
@enduml
```

Source code for Figure 4.2.2-1: NRM fragment (first part)

```
@startuml Figure 4.2.2-4: Notification subscription, notification list and heartbeat control NRM
fragment
skinparam monochrome true
abstract class Top <<InformationObjectClass>> {}
class NtfSubscriptionControl <<InformationObjectClass>> {}
class HeartbeatControl <<InformationObjectClass>> {}
class NotificationList <<InformationObjectClass>> {}

hide empty members
hide circle

Top  <|-- NtfSubscriptionControl
Top  <|-- HeartbeatControl
Top  <|-- NotificationList
@enduml
```

Source code for Figure 4.2.2-4: Notification subscription, notification list and heartbeat control NRM fragment

```
@startuml Figure 4.2.2-7: MnS Registry NRM fragment
hide circle
hide methods
hide members
```

```
skinparam class {
    AttributeIconSize 0
    BackgroundColor white
    BorderColor black
    ArrowColor black
}
skinparam   Shadowing false
skinparam  Monochrome true
skinparam  ClassBackgroundColor White
skinparam  NoteBackgroundColor White
class  "<<InformationObjectClass>>\n Top" as Top{}
class  "<<InformationObjectClass>>\n MnSRegistry" as MnSRegistry{}
class  "<<InformationObjectClass>>\n MnSInfo" as  MnSInfo{}
class  "<<InformationObjectClass>>\n MgmtDataInfo" as  MgmtDataInfo{}
Top  <|--  MnSRegistry
Top  <|--  MnSInfo
Top  <|--  MgmtDataInfo

@enduml
```

Source code for Figure 4.2.2-7: MnS Registry NRM fragment

```
@startuml Figure 4.2.2-12: SupportedNotifications NRM fragment
skinparam monochrome true
abstract class Top <<InformationObjectClass>> {
}
class SupportedNotifications <<InformationObjectClass>> {
}
hide empty members
hide circle

Top  <|-- SupportedNotifications
@endum
```

Source code for Figure 4.2.2-12: SupportedNotifications NRM fragment

```
@startuml Figure 4.2.2-14: External data type NRM fragment
skinparam monochrome true
abstract class Top <<InformationObjectClass>> {
}
class ExternalDataType <<InformationObjectClass>> {
}
hide empty members
hide circle

Top  <|-- ExternalDataType
@enduml
```

Source code for Figure 4.2.2-14: SupportedNotifications NRM fragment

Annex C (informative): Void

Annex D (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2012-12					New version after approval	2.0.0	11.0.0
2012-02					MCC update of TOC	11.0.0	11.0.1
2014-06	SA#64	SP-140332	001	-	Correction of reference	11.0.1	11.1.0
		SP-140358	002	-	Remove the feature support statements		
2014-09	SA#65				Upgrade to Rel-12	11.1.0	12.0.0
2015-12	SA#70	SP-150691	005	1	Add missing id attribute for 28.622	12.0.0	12.1.0
2016-01					Upgrade to Rel-13 (MCC)	12.1.0	13.0.0

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2016-12	SA#74	SP-160853	0010	-	A	Clarification on the need to show VsDataContainer self-containing itself several times	13.1.0
2017-03	SA#75	SP-170139	0012	2	A	Clarify notification triggered by VsDataContainer change	13.2.0
2017-03	SA#75	SP-170143	0015	1	B	Modify definitions of ME and MF to support virtualized network element	14.0.0
2017-03	SA#75	SP-170142	0016	3	B	Adding an attribute for ManagedFunction to support management of virtualized NE	14.0.0
2017-06	SA#76	SP-170510	0019	2	B	Add VNFInfo related attributes in IOC ManagedFunction	14.1.0
2018-01	SA#78	SP-170969	0021	-	F	Missing note in table of Attribute Properties	14.2.0
2018-03	SA#79	SP-180060	0022	-	B	Add new attribute peeParametersList to IOC ManagedFunction	15.0.0
2018-06	SA#80	SP-180421	0024	1	B	Remove references to Itf-N	15.1.0
2018-12	SA#82	SP-181156	0027	-	F	Add the missing NRM fragment supporting network performance management	15.2.0
2018-12	SA#82	SP-181042	0028	1	F	Replace MF with ManagedFunction	15.2.0
2018-12	SA#82	SP-181042	0029	1	F	Update NRM root IOCs to support slice priority	15.2.0
2019-06	SA#84	SP-190371	0031	2	B	Add IOCs for threshold monitoring control	16.0.0
2019-06	SA#84	SP-190373	0033	2	B	Update generic NRM Information Service to support Managed NF Service Object	16.0.0
2019-09	SA#85	SP-190744	0038	2	A	Update class definition with inheritance information	16.1.0
2019-09	SA#85	SP-190744	0043	1	A	Correct PMControl (Add report period attribute and disambiguate the delivery method attributes)	16.1.0
2019-09	SA#85	SP-190751	0044	-	A	Correct NR definition to avoid misalignment with RAN2 and add NRM definition	16.1.0
2019-09	SA#85	SP-190744	0046	1	A	Correct definitions of granularity period.	16.1.0
2019-09	SA#85					Correction in implementation of CR0043	16.1.1
2019-12	SA#86	SP-191158	0057	2	A	Correct definition of network resource	16.2.0
2019-12	SA#86	SP-191173	0059	-	A	Add measurementsList attribute into related IOCs	16.2.0
2019-12	SA#86	SP-191166	0062	2	B	Add heartbeat control NRM fragment	16.2.0
2019-12	SA#86	SP-191166	0063	2	B	Add notification subscription control fragment	16.2.0
2020-03	SA#87E	SP-200169	0066	-	B	Add configurable FM.	16.3.0
2020-03	SA#87E	SP-200163	0069	1	B	Add configurable KPI control NRM	16.3.0
2020-03	SA#87E	SP-200169	0071	1	F	Correct definition of HeartbeatControl and attribute NotificationType	16.3.0
2020-07	SA#88-e	SP-200489	0074	1	F	Add TOP_ as parent IOC	16.4.0
2020-07	SA#88-e	SP-200489	0075	1	F	Update concept of ME and MF	16.4.0
2020-07	SA#88-e	SP-200489	0076	-	F	Update the attribute priorityLabel for several IOCs	16.4.0
2020-07	SA#88-e	SP-200489	0077	-	F	Updated MF description with nested clarification	16.4.0
2020-07	SA#88-e	SP-200483	0078	1	B	Add trace control NRM fragment stage 2	16.4.0
2020-07	SA#88-e	SP-200484	0080	1	D	Fix inconsistent formatting	16.4.0
2020-07	SA#88-e	SP-200490	0083	1	F	Combine class diagrams of subscription and heartbeat NRM control fragments (stage 2)	16.4.0
2020-07	SA#88-e	SP-200490	0084	1	F	Update PM control fragment (stage 2)	16.4.0
2020-07	SA#88-e	SP-200490	0085	-	F	Clarify usage of the VsDataContainer (stage 2)	16.4.0
2020-07	SA#88-e	SP-200490	0086	1	F	Update FM control fragment (stage 2)	16.4.0
2020-09	SA#89e	SP-200729	0087	1	F	Correct ThresholdMonitor definition (stage 2)	16.5.0
2020-09	SA#89e	SP-200729	0088	-	F	Correct HeartbeatControl definition and some other smaller issues (stage 2)	16.5.0
2020-09	SA#90e	SP-201063	0089	1	F	Add new MDT specific parameter collection period for NR aligning with 32.422	16.6.0
2020-09	SA#90e	SP-201057	0090	1	F	Remove thresholdLevel attribute from ThresholdMonitor (stage 2)	16.6.0

2020-09	SA#90e	SP-201057	0091	1	F	Update the perfMetricJobGroupId attribute	16.6.0
2020-09	SA#90e	SP-201057	0092	-	F	Remove value handling from the granularityPeriod description.	16.6.0
2020-09	SA#90e	SP-201088	0093	-	F	Correct the attributes description of the IOCs inherited from Top and Top_	16.6.0
2020-09	SA#90e	SP-201063	0094		F	Correct 5G trace parameter for trace control	16.6.0
2020-09	SA#90e	SP-201089	0095	-	F	Update notifyThresholdCrossing to be a common notification.	16.6.0
2021-03	SA#91e	SP-210150	0097	-	F	Correct notification support table for ManagedElement and ManagementNode	16.7.0
2021-03	SA#91e	SP-210153	0099	1	F	Correction of attribute properties and IOC inheritance description	16.7.0
2021-04	SA#91e					Editorial cleanup with the help of the Rapporteur	16.7.1
2021-06	SA#92e	SP-210406	0096	3	F	Replace legacy IRPAgent with MnsAgent (stage 2)	16.8.0
2021-06	SA#92e	SP-210397	0100	1	F	Addition, adaptation and cleanup of Trace/MDT related parameters (stage2)	16.8.0
2021-06	SA#92e	SP-210416	0102	-	F	Align different (abbreviated) names for support qualifier to S	16.8.0
2021-06	SA#92e	SP-210406	0103	1	F	Clarify a subscription is required for notifyFileReady	16.8.0
2021-06	SA#92e	SP-210406	0104	1	F	Clarify definition of PerfMetricJob	16.8.0
2021-06	SA#92e	SP-210406	0105	-	F	Clarify the notification filter applies to all parameters of a notification	16.8.0
2021-06	SA#92e	SP-210406	0106	-	F	Correct common notifications table	16.8.0
2021-06	SA#92e					Editorial fix on tables and fonts	16.8.1
2021-09	SA#93e	SP-210879	0110	1	A	Correction for vnfParametersList	16.9.0
2021-09	SA#93e	SP-210885	0111	1	F	Add missing MnsAgent to class and inheritance diagrams	16.9.0
2021-09	SA#93e	SP-210871	0112	-	F	Add missing notification type “notifyClearedAlarm” to the attribute “notificationTypes”	16.9.0
2021-09	SA#93e	SP-210871	0113	1	F	Fix the issue caused by the updated NetworkSliceSubnet inheritence relationship	16.9.0
2021-09	SA#93e	SP-210865	0115	-	F	Correction and clarification of reporting in TraceJob (stage2)	16.9.0
2021-09	SA#93e	SP-210865	0116	-	F	Adaptation and cleanup of Trace/MDT related parameters (stage2)	16.9.0
2021-12	SA#94e	SP-211458	0121	-	F	Introduce missing references	16.10.0
2021-12	SA#94e	SP-211478	0124	-	A	Update Scope to be applicable for SBMA	16.10.0
2021-12	SA#94e	SP-211475	0125	1	F	Clarify behavior of NtfSubscriptionControl	16.10.0
2021-12	SA#94e	SP-211467	0122	-	B	Add support for MnS Discovery	17.0.0
2022-03	SA#95e	SP-220168	0126	1	C	Asynchronous operation NRM additions	17.1.0
2022-03	SA#95e	SP-220179	0127	1	A	Alarm Record changes	17.1.0
2022-03	SA#95e	SP-220179	0128	1	A	Notification Subscription changes	17.1.0
2022-03	SA#95e	SP-220177	0131	1	B	Enhance NRM with geographical information supporting MDA	17.1.0
2022-03	SA#95e	SP-220163	0133	1	B	Add support for discovery of managed entities	17.1.0
2022-03	SA#95e	SP-220183	0134	1	B	Add attribute to configure an identifier of a TraceJob	17.1.0
2022-03	SA#95e	SP-220171	0141	-	B	Add parameter to configure beam level measurements in NR MDT	17.1.0
2022-03	SA#95e	SP-220183	0147	-	B	Add stage2 definition for file management	17.1.0
2022-03	SA#95e					Adding a missing parenthesis in clause 4.4.1 (misimplemented CR)	17.1.1
2022-06	SA#96	SP-220510	0151	1	A	Correct isOrdered-isUnique for multivalue attributes	17.2.0
2022-06	SA#96	SP-220516	0154	-	A	Alignment of attribute names of TraceJob IOC to TS 32.422 (stage 2)	17.2.0
2022-06	SA#96	SP-220510	0156	-	A	Clean up of attribute properties	17.2.0
2022-06	SA#96	SP-220510	0158	1	A	Alarm Handling Clarifications	17.2.0
2022-06	SA#96	SP-220505	0166	-	B	Add stage 2 for management data collection and discovery	17.2.0
2022-09	SA#97e	SP-220863	0170	1	F	Include already approved changes or enhancements of attribute properties for IOC ManagementDataCollectio	17.3.0
2022-09	SA#97e	SP-220864	0172	-	A	Correction of attribute names of IOC TraceJob in the attribute property table	17.3.0
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2022-09	SA#97e	SP-220855	0174	-	B	Adding QMC job	18.0.0
2023-01	SA#98e	SP-221186	0178	-	A	Correcting attribute definitions	18.1.0
2023-01	SA#98e	SP-221186	0181	1	A	Correct description for ManagementDataCollection IOC	18.1.0
2023-01	SA#98e	SP-221187	0183	2	A	Adding a new data type to represent GeoArea via convex polygon - Stage 2	18.1.0
2023-01	SA#98e	SP-221167	0186	2	A	Add missing notifyMOIChanges in Files and File IOC	18.1.0
2023-01	SA#98e	SP-221167	0189	1	A	Correct inheritance diagram of the file download NRM fragment	18.1.0
2023-01	SA#98e	SP-221200	0192	-	A	Removing reference to non-existing clause in 32.422	18.1.0
2023-01	SA#98e	SP-221170	0195	1	A	Update MnsAgent Definition	18.1.0
2023-01	SA#98e	SP-221186	0197	3	A	Correct ManagementDataCollection definition	18.1.0
2023-01	SA#98e	SP-221176	0205	1	C	JobID for QMCJob	18.1.0
2023-01	SA#98e	SP-221176	0206	-	B	Definition of parameters MDT Alignment Information and Available RAN Visible QoE Metrics	18.1.0
2023-01	SA#98e	SP-221197	0207		A	Correct M6 Delay Threshold to align with TS 38.314 and TS 38.413	18.1.0
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2023-03	SA#99	SP-230207	0217	-	A	Adding altitude to GeoArea datatype	18.2.0
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2023-03	SA#99	SP-230211	0227	1	A	Remove unused create link subscription attribute definition.	18.2.0
2023-03	SA#99	SP-230208	0230	1	A	Clarify reporting and monitoring period usage in SupportedPerfMetricGroup datatype.	18.2.0
2023-03	SA#99	SP-230199	0233	-	A	Correction of reference list	18.2.0
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2023-06	SA#100	SP-230648	0257	-	A	Correction to missing Notification and Attribute constraints clauses	18.3.0
2023-06	SA#100	SP-230647	0261	-	A	Add clarification on TS version applicable for the IRP framework (partially implemented, MCC)	18.3.0
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2023-12	SA#102	SP-231453	0287	-	F	Rel-18 CR TS 28.622 Aligning ReportAmount LTE parameters with ImmediateMDT datatype	18.5.0
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2024-03	SA#103	SP-240186	0320	1	F	TS28.622 corrections to headings for Figure title	18.6.0
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2024-06	SA#104	SP-240806	0361	1	A	Rel-18 CR 28.622 Add missing trace message support to trace job (stage 2)	18.7.0
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2024-06	SA#104	SP-240809	0370	1	F	Rel-18 CR TS 28.622 Change NpnId from dataType to choice to align with TS 38.331	18.7.0
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2025-09	SA#109	SP-251088	0587	1	F	Rel-19 CR TS 28.622 Clarification on historical management data	19.5.0

History

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