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Contents

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].

This specification is part of a set that has been developed for converged management solutions.

1 Scope

The present document specifies the Generic network resource information that can be communicated between an IRPAgent and an IRPManager 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 [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 [9].

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.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[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] 3GPP TS 32.532: " Telecommunication management; Software Management Integration Reference Point (IRP); Information Service (IS) "

[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] 3GPP TS 32.111-2: "Telecommunication management; Fault Management; Part 2: Alarm Integration Reference Point (IRP): Information Service (IS)".

[12] 3GPP TS 32.662: "Telecommunication management; Configuration Management (CM); Kernel CM Information Service (IS)".

[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 v2.1.1: "Network Functions Virtualisation (NFV); Management and Orchestration; Ve-Vnfm reference point - Interface and Information Model Specification".

[17] ETSI GS NFV-IFA 015 v2.1.2: "Network Functions Virtualisation (NFV); Management and Orchestration; Report on NFV Information Model"

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.

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 [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.

Managed Element (ME): An instance of the IOC `ManagedElement`.

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)

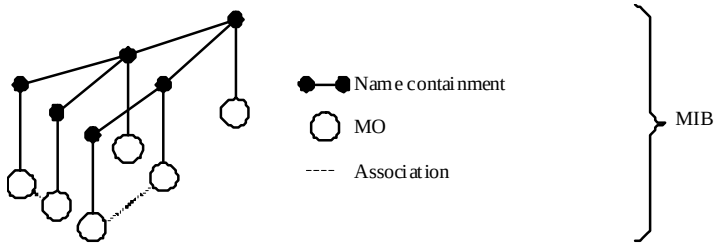


Figure 3.1: Relationships between a Name space and a number of participating MOs

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 shall be 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 Model (NRM): A collection of IOCs representing a set of Network Resources under management.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AUC	Authentication Centre
DN	Distinguished Name (see 3GPP TS 32.300 [13])
EM	Element Manager
HLR	Home Location Register
IOC	Information Object Class
IRP	Integration Reference Point
ME	Managed Element
MIB	Management Information Base
MO	Managed Object
MOC	Managed Object Class
MOI	Managed Object Instance
MSC	Mobile Services Switching Centre
NFVI	Network Functions Virtualisation Infrastructure (NFVI): Defined in ETSI GS NFV 003 [15].
NR	Network Resource
NRM	Network Resource Model
RDN	Relative Distinguished Name (see 3GPP TS 32.300 [13])
RNC	Radio Network Controller
SS	Solution Set
TMN	Telecommunications Management Network
UML	Unified Modelling Language
VLR	Visitor Location Register
VNF	Virtualised Network Function

4 Model

4.1 Imported information entities and local labels

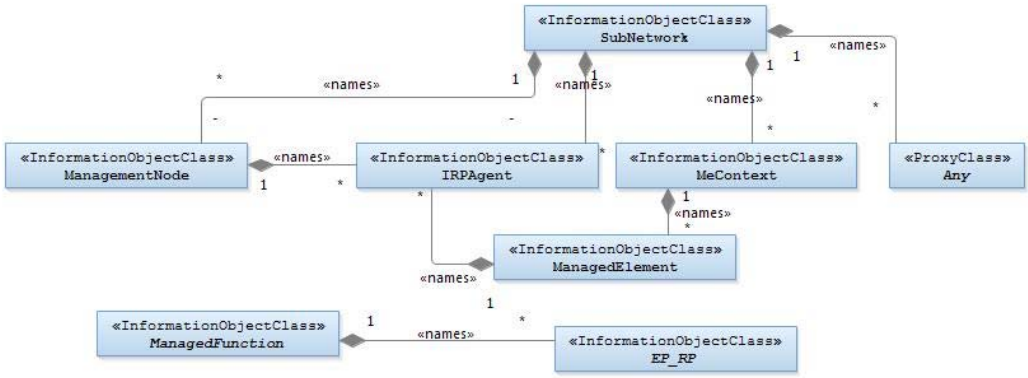
Label reference	Local label
3GPP TS 32.111-2 [11], notification, notifyAckStateChanged	notifyAckStateChanged
3GPP TS 32.662 [12], notification, notifyAttributeValueChanged	notifyAttributeValueChanged
3GPP TS 32.111-2 [11], notification, notifyChangedAlarm	notifyChangedAlarm
3GPP TS 32.111-2 [11], notification, notifyClearedAlarm	notifyClearedAlarm
3GPP TS 32.111-2 [11], notification, notifyComments	notifyComments
3GPP TS 32.111-2 [11], notification, notifyNewAlarm	notifyNewAlarm
3GPP TS 32.662 [12], notification, notifyObjectCreation	notifyObjectCreation
3GPP TS 32.662 [12], notification, notifyObjectDeletion	notifyObjectDeletion
3GPP TS 32.111-2 [11], notification, notifyAlarmListRebuilt	notifyAlarmListRebuilt
3GPP TS 32.111-2 [11], notification, notifyPotentialFaultyAlarmList	notifyPotentialFaultyAlarmList
3GPP TS 32.532 [6], notification, notifyDownloadNESwStatusChanged	notifyDownloadNESwStatusChanged
3GPP TS 32.532 [6], notification, notifyInstallNESwStatusChanged	notifyInstallNESwStatusChanged
3GPP TS 32.532 [6], notification, notifyActivateNESwStatusChanged	notifyActivateNESwStatusChanged
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_*

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 [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: Each instance of the `VsDataContainer` shall only be contained under one IOC. The `VsDataContainer` can be contained under IOCs defined in other NRMs.

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.

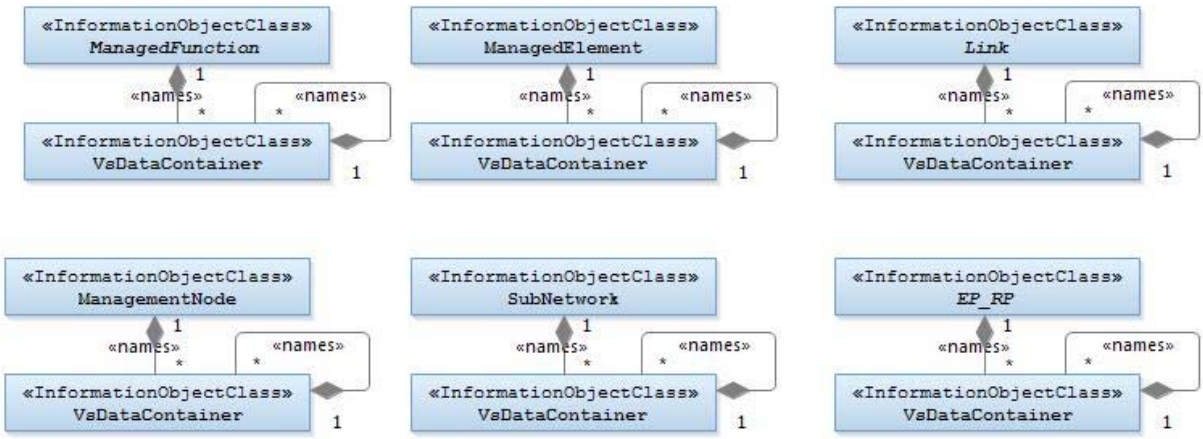
NOTE 6: If contained in a `SubNetwork` instance, `IRPAgent` shall be contained in the root `SubNetwork` instance.

NOTE 7: For a clarification on the choice of containment of the `IRPAgent` (since it has three possible parents), see the def. of `IRPAgent`.

Figure 4.2.1-1: Generic NRM Containment/Naming and Association diagram

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: Each instance of the `VsDataContainer` shall only be contained under one IOC. The `VsDataContainer` can be contained under IOCs defined in other NRMs by virtue of inheritance from the GENERIC NRM.

Figure 4.2.1-2: `VsDataContainer` Containment/Naming and Association in GENERIC NRM diagram

The `VsDataContainer` is only used for the Bulk CM IRP.

4.2.2 Inheritance

This clause depicts the inheritance relationships.

The following figure shows the inheritance diagram.

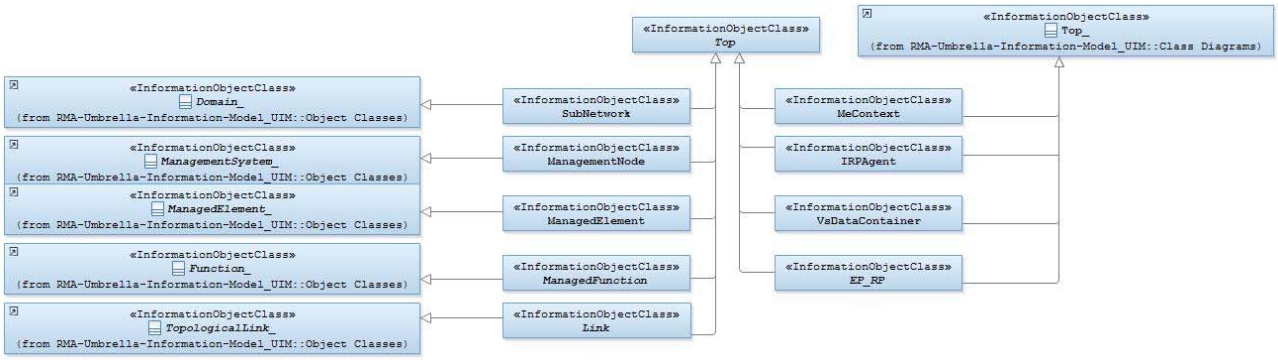


Figure 4.2.2-1: Generic Network Resource Model IRP Inheritance Hierarchy

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 `IRPAgent`

4.3.2.1 Definition

This IOC represents the functionality of an `IRPAgent`. It shall be present. For a definition of `IRPAgent`, see 3GPP TS 32.102 [2].

The `IRPAgent` will be contained under an IOC as follows (only one of the options shall be used):

1) ManagementNode, if the configuration contains a ManagementNode;

2) SubNetwork, if the configuration contains a SubNetwork and no ManagementNode;

3) ManagedElement, if the configuration contains no ManagementNode or SubNetwork.

4.3.2.2 Attributes

Attribute Name	Support Qualifier	isReadable	isWritable	isInvariant	isNotifyable
systemDN	C	M	-	-	M

4.3.2.3 Attribute constraints

None

4.3.2.4 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.
An ME communicates with a manager (directly or indirectly) over one or more management interfaces for the purpose of being monitored and/or controlled. MEs may or may not additionally perform element management functionality. An ME contains equipment that may or may not be geographically distributed. An ME is often referred to as a "Network Element".

A telecommunication equipment has software and hardware components. The IOC described above represents the case when the software component is designed to run on dedicated hardware component. In the case when the software is designed to run on ETSI NFV defined NFVI [15], the 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 single ManagedElement seen over the Itf-N may also exist stand-alone with no parent at all.

The ManagedElement IOC may be used to represent combined ME functionality (as indicated by the managedElementType attribute and the contained instances of different functional IOCs).

Single function ManagedElement IOC instances will have a 1..1 containment relationship to a function IOC instance (in this context a function IOC instance is an instance of an IOC derived from the ManagedFunction IOC). Multiple function ManagedElement instances will have a 1..N containment relationship to function IOC instances.

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

Attribute Name	Support Qualifier	isReadable	isWritable	isInvariant	isNotifyable
id	M	M	-	M	-
vendorName	M	M	-	-	M
userDefinedState	M	M	M	-	M
swVersion	M	M	-	-	M

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	Qualifier	Notes
`notifyDownloadNESwStatusChanged`	See Software Management IRP (3GPP TS 32.532 [6])	
`notifyInstallNESwStatusChanged`	See Software Management IRP (3GPP TS 32.532 [6])	
`notifyActivateNESwStatusChanged`	See Software Management IRP (3GPP TS 32.532 [6])	

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. 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 MF 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

Attribute Name	Support Qualifier	isReadable	isWritable	isInvariant	isNotifyable
`id`	M	M	-	M	-
`vnfParametersList`	CM	M	M	-	M

4.3.4.3 Attribute constraints

Name	Definition
`vnfParametersList`	It shall be supported if the MF instance is realized by one or more VNF instance(s). Otherwise this attribute shall be absent.

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

Attribute Name	Support Qualifier	isReadable	isWritable	isInvariant	isNotifyable
id	M	M	-	M	-
vendorName	M	M	-	-	M
userDefinedState	M	M	M	-	M
locationName	M	M	-	-	M
swVersion	M	M	-	-	M

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, without exceptions or additions.

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

Attribute Name	Support Qualifier	isReadable	isWritable	isInvariant	isNotifyable
dnPrefix	CM	M	-	-	M

4.3.6.3 Attribute constraints

Name	Definition
dnPrefix	It shall be supported if an 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 as seen over the Itf-N.

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

Attribute Name	Support Qualifier	isReadable	isWritable	isInvariant	isNotifyable
id	M	M	-	M	-
setOfMcc	CM	M	-	-	M

4.3.7.3 Attribute constraints

Name	Definition
dnPrefix (inherited from *Domain_*)	It shall be supported if an instance of SubNetwork is the local root instance of the MIB. Otherwise the attribute shall be absent or carry no information.
setOfMcc	If there is more than one value in setOfMcc of the SubNetwork instance, the support of this attribute setOfMcc is mandatory. Otherwise it 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 *Top*

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 32.102 [2] shall inherit from Top.

4.3.8.2 Attributes

Attribute Name	Support Qualifier	isReadable	isWritable	isInvariant	isNotifyable
objectClass	M	M	-	M	M
objectInstance	M	M	-	M	M

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 managed object is a container for vendor specific data. The number of instances of the VsDataContainer can differ from vendor to vendor. This IOC shall only be used by the Bulk CM IRP for all the NRMs.

4.3.9.2 Attributes

Attribute Name	Support Qualifier	isReadable	isWritable	isInvariant	isNotifyable
vsDataType	M	M	-	-	O
vsData	M	M	O	-	O
vsDataFormatVersion	M	M	-	-	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

Attribute Name	Support Qualifier	isReadable	isWritable	isInvariant	isNotifyable
id	M	M	-	M	-
userLabel	M	M	M	-	M
linkType	O	M	-	-	M
protocolVersion	O	M	-	-	M

4.3.10.3 Attribute constraints

Name	Definition
aEnd and zEnd (inherited from *TopologicalLink_*)	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 link used across a reference point between two network entities.

The detailed subclassed IOC, e.g. EP_X2, will be defined in E-UTRAN NRM IRP, by inheriting from this EP_RP.

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_S1 and EP_X2.

4.3.11.2 Attributes

Attribute Name	Support Qualifier	isReadable	isWritable	isInvariant	isNotifyable
farEndEntity	O	M	-	-	M
userLabel	O	M	M	-	M

4.3.11.3 Attribute constraints

None

4.3.11.4 Notifications

This class does not support any notification.

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
farEndEntity	The value of this attribute shall be the Distinguished Name of the far end network entity to which the reference point is related. As an example, with EP_Iucs, if the instance of EP_Iucs is contained by one RncFunction instance, the farEndEntity is the Distinguished Name of the MscServerFunction instance to which this Iucs reference point is related. allowedValues: N/A	type: DN multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: No default value isNullable: False
id	An attribute whose "name+value" can be used as an RDN when naming an instance of the object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.	type: DN multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None allowedValues: N/A 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: F isUnique: T defaultValue: No default value 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: No default value isNullable: False
objectClass	An attribute which captures the name of the class from which the object instance is an occurrence of. allowedValues: N/A	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: No default value isNullable: False
objectInstance	An information which captures the Distinguished Name of any object. allowedValues: N/A	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: No default value 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: 0..* isOrdered: F isUnique: T defaultValue: no default value isNullable: False
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: F isUnique: T defaultValue: No default value isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
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: No default value isNullable: False
systemDN	The Distinguished Name (DN) of IRPAgent. Defined in 3GPP TS 32.300. allowedValues: N/A	type: DN multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: No default value 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: No default value 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: No default value isNullable: False
vendorName	The name of the vendor. allowedValues: N/A	type: String multiplicity: 0..1 isOrdered: N/A isUnique: N/A defaultValue: No default value isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
vnfParametersList	This attribute contains the parameter set of the VNF instance(s) corresponding to an NE. Each entry in the list contains: - vnfInstanceId - vnfdId (optional) - flavourId (optional) - autoScalable vnfInstanceId: VNF instance identifier (vnfInstanceId, see section 9.4.2 of [16] and section B2.4.2.1.2.3 of [17]). See Note 1. 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]. flavourId: Identifier of the VNF Deployment Flavour applied to this VNF instance, see section 9.4.3 of [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]. autoScalable: Indicator of whether the auto-scaling of this VNF instance is enabled or disabled. The type is Boolean. See Note2. The presence of this attribute indicates that the ManagedFunction represented by the MOI is a virtualized function. allowedValues: N/A 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).	type: String multiplicity: 0..* isOrdered: N/A isUnique: True defaultValue: No default value isNullable: True
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: No default value 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: No default value isNullable: False

Attribute Name	Documentation and Allowed Values	Properties
Note1 : 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]. Note2: the value of this attribute is identical to that of the same attribute included in vnfConfigurableProperty in clause 9.4.2 of ETSI GS NFV-IFA 008 [16].		

4.4.2 Constraints

None

4.5 Common notifications

4.5.1 Alarm notifications

This clause presents a list of notifications, defined in [11], that IRPManager can receive. The notification header attribute `objectClass/objectInstance`, defined in [3], would capture the DN of an instance of an IOC defined in this IRP specification.

Name	Qualifier	Notes
`notifyAckStateChanged`	See Alarm IRP (3GPP TS 32.111-2 [11])	
`notifyChangedAlarm`	See Alarm IRP (3GPP TS 32.111-2 [11])	
`notifyClearedAlarm`	See Alarm IRP (3GPP TS 32.111-2 [11])	
`notifyNewAlarm`	See Alarm IRP (3GPP TS 32.111-2 [11])	
`notifyComments`	See Alarm IRP (3GPP TS 32.111-2 [11])	
`notifyAlarmListRebuilt`	See Alarm IRP (3GPP TS 32.111-2 [11])	
`notifyPotentialFaultyAlarmList`	See Alarm IRP (3GPP TS 32.111-2 [11])	

4.5.2 Configuration notifications

This clause presents a list of notifications, defined in [12], that IRPManager can receive. The notification header attribute `objectClass/objectInstance`, defined in [3], would capture the DN of an instance of an IOC defined in this IRP specification.

Name	Qualifier	Notes
`notifyAttributeValueChange`	O	
`notifyObjectCreation`	O	
`notifyObjectDeletion`	O	

Annex A (informative): Alternate class diagram

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

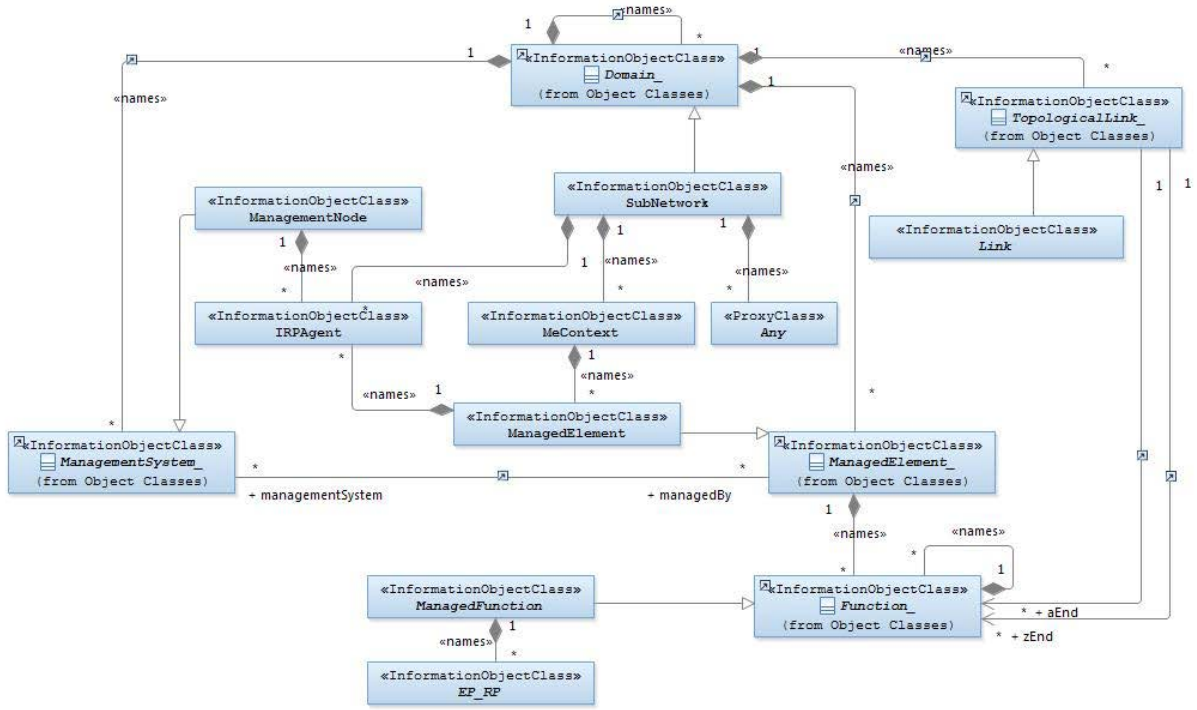


Figure A-1: Alternate class diagram

Annex B (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

History

Document history		
V14.0.0	April 2017	Publication
V14.1.0	July 2017	Publication