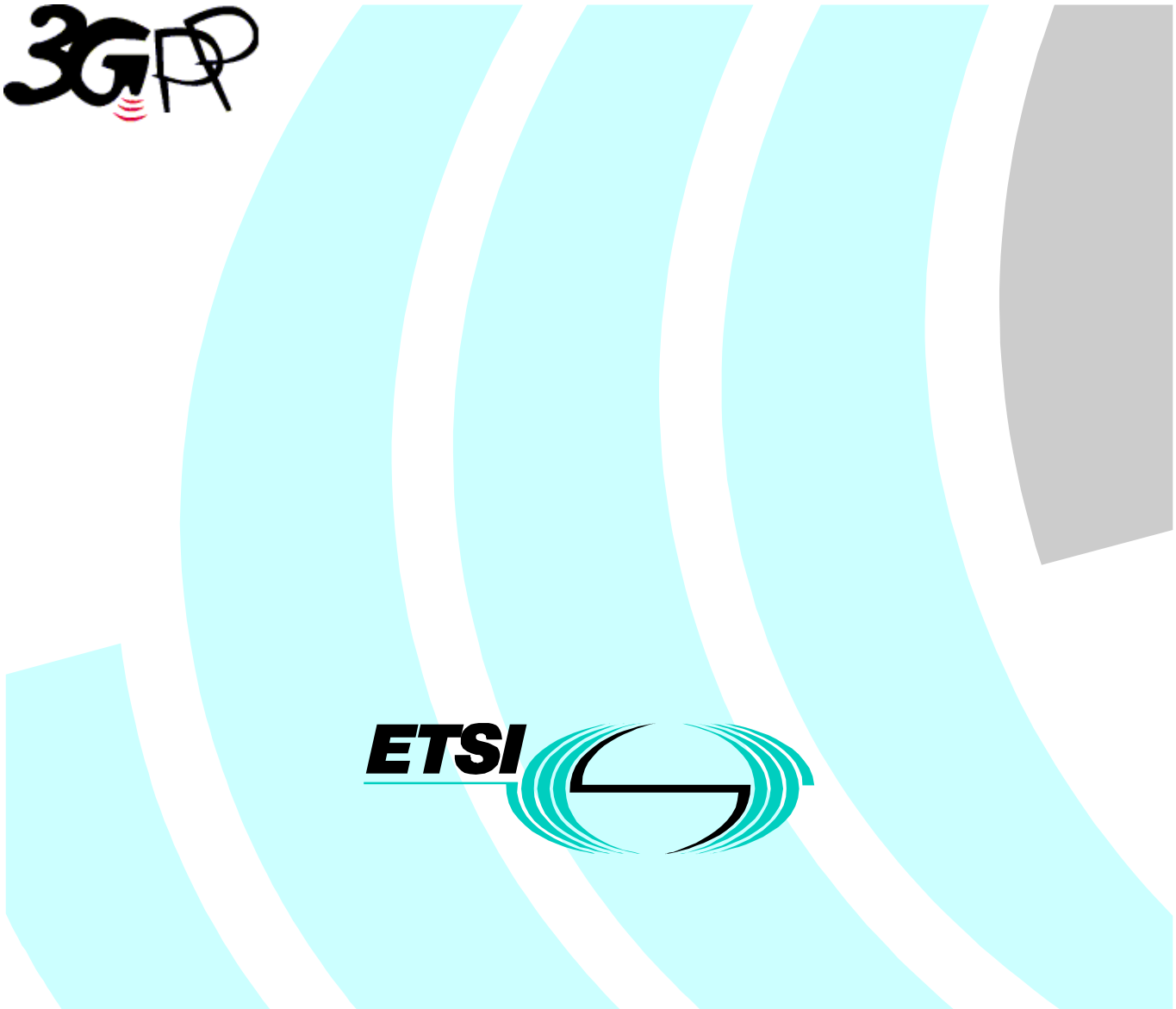
ETSI TS 132 106-5 V3.2.0 (2001-06)

Technical Specification

Universal Mobile Telecommunications System (UMTS);
Telecommunication Management;
Configuration Management;
Part 5: Basic Configuration Management IRP:
Information Model Version 1
(3GPP TS 32.106-5 version 3.2.0 Release 1999)



Reference
RTS/TSGS-0532106-5UR3

Keywords
UMTS

ETSI

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Foreword

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Contents

Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

The present document is part 5 of a multi-part TS covering the 3rd Generation Partnership Project: Technical Specification Group Services and System Aspects; Telecommunication Management; Configuration Management, as identified below:

Part 1: "3G Configuration Management: Concept and Requirements";
Part 2: "Notification Integration Reference Point: Information Service Version 1";
Part 3: "Notification Integration Reference Point: CORBA Solution Set Version 1:1";
Part 4: "Notification Integration Reference Point: CMIP Solution Set Version 1:1";
Part 5: "Basic Configuration Management IRP: Information Model Version 1";
Part 6: "Basic Configuration Management IRP CORBA Solution Set Version 1:1";
Part 7: "Basic Configuration Management IRP CMIP Solution Set Version 1:1";
Part 8: "Name Convention for Managed Objects".

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where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

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Introduction

Configuration Management (CM), in general, provides the operator with the ability to assure correct and effective operation of the 3G-network as it evolves. CM actions have the objective to control and monitor the actual configuration on the Network Elements (NEs) and Network Resources (NRs), and they may be initiated by the operator or functions in the Operations Systems (OSs) or NEs.

CM actions may be requested as part of an implementation programme (e.g. additions and deletions), as part of an optimisation programme (e.g. modifications), and to maintain the overall Quality of Service. The CM actions are initiated either as a single action on a NE of the 3G-network or as part of a complex procedure involving actions on many NEs.

The interface Itf-N, defined in 3GPP TS 32.102 [2], for CM 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 32.101 [1] and 3GPP TS 32.102 [2]. For CM, a number of IRPs (and the Name Convention) are defined herein, used by this as well as other Technical Specifications for Telecom Management produced by 3GPP. All these are included in Parts 2 and onwards in the 3GPP TS 32.106.

The present document is Part 5 of 32.106 - "Basic Configuration Management IRP: Information Model Version 1".

1 Scope

The present document (Basic Configuration Management (CM) IRP: Information Model) defines an Integration Reference Point (IRP) through which an 'IRPAgent' (typically an Element Manager or Network Element) can communicate basic Configuration Management related information to one or several 'IRPManagers' (typically Network Managers). This version of the IRP is mainly intended for “passive management” of high-level network configuration and status information as required by a Network Manager.

The present document is divided in three main parts:

1. specifies a generic IRP Information Service with operations and notifications to be used by an ‘IRPManager’ to retrieve information on managed objects maintained by an ‘IRPAgent’.

2. specifies a generic Network Resource Model, NRM (also referred to as a Management Information Model - MIM) with definitions of Managed Object Classes.

3. defines the UMTS management NRM by reusing this generic model either by direct reuse or sub-classing.

The Configuration Management (CM) area is very large. The intention is to split the specification of the related interfaces in several IRPs. In addition to the subject IRP, it is expected that IRPs will be defined for functional areas like Security management, Software management, Network & Service provisioning, etc. An important aspect of such a split is that the Network Resource Models (NRMs) defined in different IRPs are consistent. The Basic CM IRP here provides a base for all CM-related resource modelling.

To summarize, the Basic CM IRP has three main purposes:

(1) to define an interface for retrieval of Configuration Management information,

(2) to define a generic Network Resource Model that constitutes a base from which other (more specialized) resource models can inherit, and

(3) to define the applied UMTS management Network Resource Model.

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: "3G Telecom Management principles and high level requirements".

[2] 3GPP TS 32.102: "3G Telecom Management architecture".

[3] 3GPP TS 32.106-2: "Telecommunication Management; Configuration Management; Part 2: Notification Integration Reference Point; Information Service Version 1".

[4] ITU-T Recommendation M.3100 (07/95): "Generic Network Information Model".

[5] ITU-T Recommendation M.3100 Corrigendum 1 (07/98)".

[6] ITU-T Recommendation M.3100 Amendment 1 (03/99)".

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

[8] ITU-T Recommendation X.721 (02/92): "Information Technology - Open Systems Interconnection – Structure of Management Information: Definition of Management Information".

[9] ITU-T Recommendation X.730 (01/92): "Information Technology - Open Systems Interconnection – Systems Management: Object Management Function".

[10] ITU-T Recommendation X.733 (02/92): "Information Technology - Open Systems Interconnection - Alarm Reporting Function".

[11] 3GPP TS 32.111-2: "Telecommunication Management; Fault Management; Part 2: Alarm Integration Reference Point; Information Service Version 1".

[12] ETS 300 622 (GSM 12.20): “Digital cellular telecommunications system (Phase 2); Base Station System (BSS) Management Information, June 1996".

[13] 3GPP TS 32.106-8: "Name Convention for Managed Objects".

[14] 3GPP TS 32.106-1: "3G Configuration Management: Concepts and requirements".

[15] 3GPP TS 23.002: “Network Architecture”.

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] and 3GPP TS 32.106-1 [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 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 (in Release 99) however, all (non-containment) associations are modelled by means of reference attributes of the participating MOs.

Managed Element (ME): An instance of the Managed Object Class G3ManagedElement.

Managed Object (MO): In the context of the present document, a Managed Object (MO) is a software object that encapsulates the manageable characteristics and behaviour of a particular Network Resource. The MO is instance of a MO class defined in a MIM/NRM. An MO class has attributes that provide information used to characterize the objects that belong to the class (the term “attribute” is taken from TMN and corresponds to a “property” according to CIM). Furthermore, an MO class can have operations that represent the behaviour relevant for that class (the term “operation” is taken from TMN and corresponds to a “method” according to CIM). An MO class may support notifications that provide information about an event occurrence within a network resource.

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 1 depicts the relationships between a Name space and a number of participating MOs (the shown association is of a non-containment type)

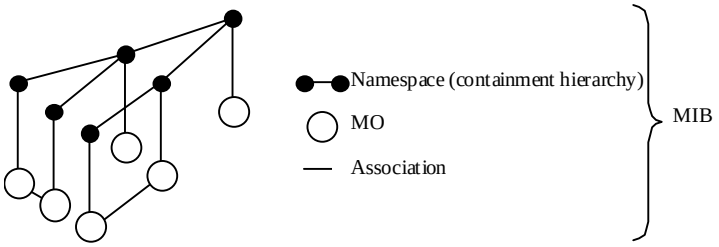


Figure 1: Relationships between a Name space and a number of participating MOs

Management Information Model (MIM): Also referred to as NRM – see the definition below.

Name space: A name space is a collection of names. The IRP name convention (see 3GPP TS 32.106-8 [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 model representing the actual managed telecommunications network resources that a System is providing through the subject IRP. An NRM describes Managed Object Classes, their associations, attributes and operations. The NRM is also referred to as "MIM" (see above), which originates from the ITU-T TMN.

Node B: A logical node responsible for radio transmission/reception in one or more cells to/from the User Equipment. It terminates the Iub interface towards the RNC.

3.2 Abbreviations

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

AUC	AUthentication Centre
BG	Border Gateway
CIM	Common Information Model
CMIP	Common Management Information Protocol
CMIS	Common Management Information Service
CN	Core Network
CORBA	Common Object Request Broker Architecture
DMTF	Distributed Management Task Force
DN	Distinguished Name (see 3GPP TS 32.106-8 [13])
EIR	Equipment Identity Register
EM	Element Manager
FM	Fault Management
GDMO	Guidelines for the Definition of Managed Objects
GGSN	Gateway GPRS Support Node
GMSC	Gateway MSC
GPRS	General Packet Radio System
HLR	Home Location Register
IDL	Interface Definition Language
IEC	International Electro-technical Commission
IETF	Internet Engineering Task Force
IRP	Integration Reference Point
ISO/IEC	International Standards Organization
ITU-T	International Telecommunication Union, Telecommunication Sector

Iub	Interface between RNC and Node B
LDAP	Lightweight Directory Access Protocol
NM	Network Manager
NE	Network Element
ME	Managed Element
MIB	Management Information Base
MIM	Management Information Model
MIT	Management Information Tree (or Naming Tree)
MO	Managed Object
MOC	Managed Object Class
MOF	Managed Object Format
MOI	Managed Object Instance
MSC	Mobile Services Switching Centre
NE	Network Element
NR	Network Resource
NRM	Network Resource Model
OSI	Open Systems Interconnection
PM	Performance Management
RDN	Relative Distinguished Name (see 3GPP TS 32.106-8 [13])
RNC	Radio Network Controller
SGSN	Serving GPRS Support Node
SMI	Structure of Management Information
SMS	Short Message Service
SMS-GMSC	SMS Gateway MSC
SMS-IWMSC	SMS Interworking MSC
SNMP	Simple Network Management Protocol
SS	Solution Set
TMN	Telecommunications Management Network
UML	Unified Modelling Language
UMTS	Universal Mobile Telecommunications System
VLR	Visitor Location Register
WBEM	Web-Based Enterprise Management
XML	eXtensible Mark-up Language

4 System overview

4.1 System context

Figure 2 and Figure 3 identify system contexts of the subject IRP in terms of its implementation called IRPAgent and the user of the IRPAgent, called IRPManager. For a definition of IRPManager and IRPAgent, see 3GPP TS 32.102 [2].

The IRPAgent implements and supports the Basic CM IRP. The IRPAgent can be an Element Manager (EM) or a mediator that interfaces one or more NEs (see Figure 2), or it can be a Network Element (NE) (see Figure 3). In the former case, the interfaces (represented by a thick dotted line) between the EM and the NEs are not subject of this IRP.

An IRPManager using this IRP shall choose one of the two System Contexts defined here, for each NE. For instance, if an EM is responsible for managing a number of NEs, the NM shall access this IRP through the EM and not directly to those NEs. For another IRP though, the System Context may be different.

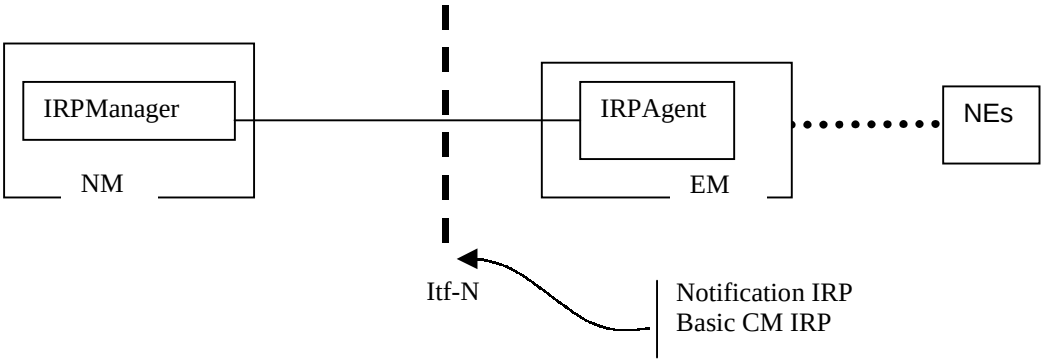


Figure 2: System Context A

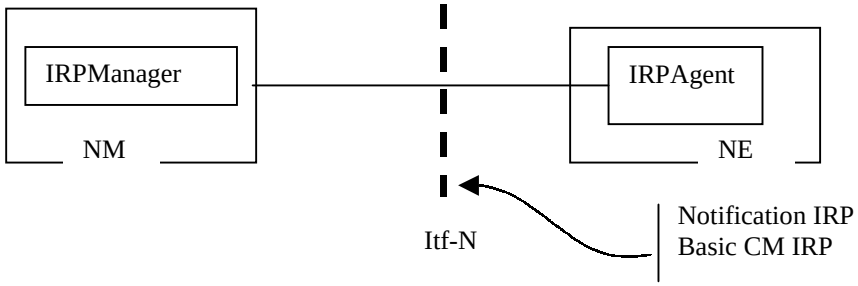


Figure 3: System Context B

4.2 Compliance rules

For general definitions of compliance rules related to qualifiers (Mandatory/Optional/Conditional) for *operations*, *notifications and parameters* (of operations and notifications) please refer to 3GPP TS 32.102 [2].

The following defines the meaning of Mandatory and Optional MOC attributes and associations between MOCs, in Solution Sets to the Basic CM IRP:

- The IRPManager shall support all mandatory attributes/associations. The IRPManager shall be prepared to receive information related to mandatory as well as optional attributes/associations without failure; however the IRPManager does not have to support handling of the optional attributes/associations.
- The IRPAgent shall support all mandatory attributes/associations. It may support optional attributes/associations.

An IRPAgent that incorporates vendor-specific extensions shall support normal communication with a 3GPP SA5-compliant IRPManager with respect to all Mandatory and Optional managed object classes, attributes, associations, operations, parameters and notifications without requiring the IRPManager to have any knowledge of the extensions.

Given that

- rules for vendor-specific extensions remain to be fully specified, and
- many scenarios under which IRPManager and IRPAgent interwork may exist,

it is recognised that in Release 4/5 the IRPManager, even though it is not required to have knowledge of vendor-specific extensions, may be required to be implemented with an awareness that extensions can exist and behave accordingly.

5 Modelling approach

This clause identifies the modelling approach adopted and used in this IRP.

As previously described, the IRP is structured in:

(1) an IRP Information Model (the subject document) that specifies the interface in a protocol neutral manner, and

(2) a number of IRP Solution Sets that provide the actual realization of the operations and notifications defined in the IRP Information Model for each protocol environment.

Figure 4 shows the structure of the Basic CM IRP (including a number of possible Solution Sets).

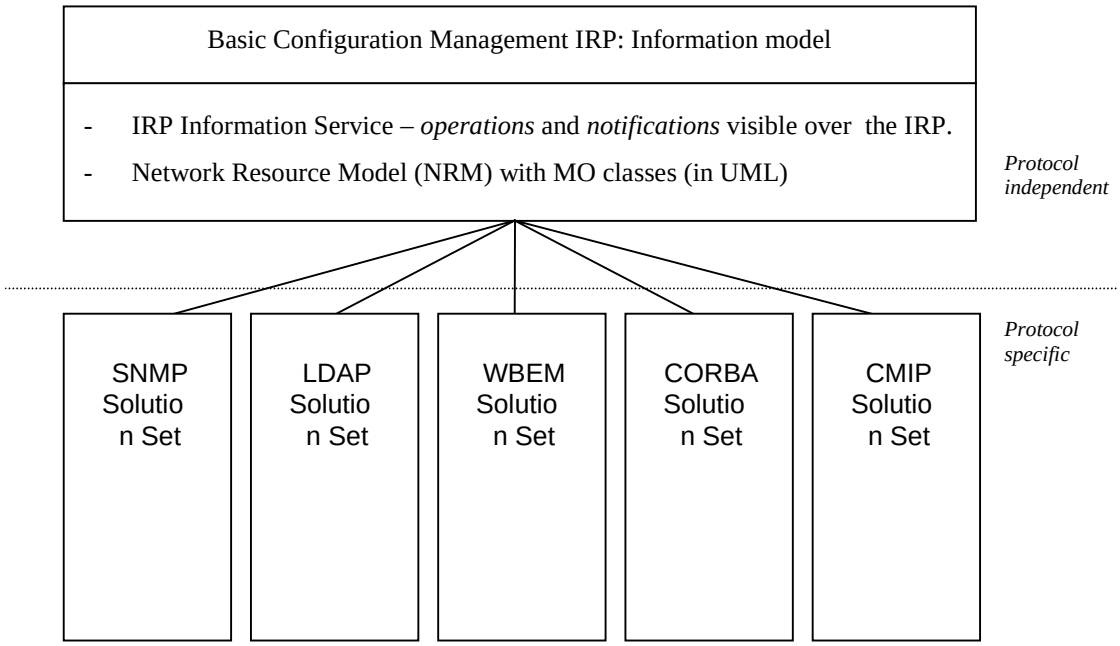


Figure 4: Basic CM IRP Structure with example Solution Sets

As shown in Figure 4, the IRP Information Model consists of two main parts:

1. **The IRP Information Service**
   This is a specification of the *operations* and *notifications* that are visible over the IRP. These operations are generic in the sense that they do not specify the Managed Objects that are retrieved/manipulated over the interface.

2. **The Network Resource Model (NRM)**
   This is a protocol-independent model that specifies a number of Managed Object classes (with attributes, operations and associations), which are relevant in the context of the subject IRP. Each Solution Set shall provide an implementation of this resource model with:

   a) references to standard models that are applicable for the corresponding protocol environment, and

   b) extensions to these standard models for the parts of the NRM that are not covered.

The modelling approaches for these two aspects of the IRP are somewhat different and are described separately in the next two subclauses.

5.1 IRP Information Service modelling approach

The IRP Information Service of the subject IRP specifies a number of protocol-independent operations and notifications that are needed by an IRPManager to retrieve CM information from an IRPAgent.

The operations and notifications of the IRP Information Service are mainly based on the principles of the Common Management Information Service (CMIS) defined in ITU-T X.710 [7] and ITU-T X.721 [8] (M-GET etc.). Note however, that the Information Service of the subject IRP is focused on the operations and notifications needed for basic CM purposes and thus only covers a subset of the operations/notifications defined in ITU-T X.710 [7]/ITU-T X.721 [8].

It is expected that most Solution Sets will implement the operations and notifications by mapping them to standard operations (and possibly standard notifications) that are applicable in the corresponding protocol environment. The CMIP Solution Set should for instance map the operations to the more generic operations defined in CMIS, an SNMP Solution Set should map the operations to applicable SNMP operations, and the CORBA Solution Set should map the operations to applicable OMG/CORBA services.

5.2 Network Resource Modelling approach

The NRM defined in the subject IRP bases its design mainly on work captured in ITU-T M.3100 [4], [5], [6]. However, as described in the Scope of the present document (clause 1): The model is highly simplified for the purpose of the NM, based on the assumption that all of the detailed CM actions, including fault correction after one or more alarms, are performed by an Element Manager which knows the vendor-specific NRM and configuration, and which is launched by the NM when necessary.

Moreover, the classes defined herein are very basic, only for the necessary support of Fault Management (FM) and Performance Management (PM), which means that they contain very few attributes – basically only for naming.

In addition, also some basic associations between some of the classes are defined.

The NRM is split into a generic and an UMTS-specific part.

Detailed mapping to the actual standard model is described in each Solution Set. It is important to note that if one selects a specific management protocol, one should also as base use existing *de-facto* conventions and standard resource models that are applicable to that protocol environment. Examples:

- SNMP Solution Sets (SMI-specifications) should be consistent with existing standard SNMP MIB-modules in order to function in an SNMP environment.
- CMIP Solution Sets (GDMO-specifications) should be based on standard models like ITU-T X.721 [8] and ITU-T M.3100 [4], [5], [6] in order to function in an OSI/TMN environment.
- WBEM Solution Sets (MOF/XML-specifications) should be based on CIM to function in a WBEM environment.

NOTE: CORBA Solution Sets are special in the sense that no such corresponding de-facto standard models exist, and CORBA/IDL is transparent to any model. Thus, one has full freedom to choose the same model for the CORBA Solution Set to this IRP, as the IRP Information Model defined herein.

Finally, all solution sets shall of course be consistent with the IRP Information Model defined herein.

6 IRP Information Model

6.1 Introduction

As already introduced in the previous clause, the present clause defines the Basic CM IRP Information Model in the form of the IRP Information Service and the Network Resource Model (split into a generic and an UMTS-specific part).

The corresponding Solution Set specifications provide protocol dependent object models. They provide the actual realization of the operations and notifications defined in this subclause in each protocol environment. One may find that the operation names and operation parameters defined in the protocol-neutral model differ from those defined in the Solution Sets (e.g. due to mappings to existing standard models that are applicable for a specific Solution Set).

6.2 IRP Information Service

This subclause specifies the *operations* and *notifications* that are visible over this IRP. These operations are generic in the sense that they do not specify the MOs that are retrieved/manipulated over the interface.

6.2.1 Interfaces

Figure 5 illustrates the operations and notifications defined as interfaces implemented and used by IRPAgent and IRPManager, described using UML notation (Interface in IRP Information Model is identical to concepts conveyed by stereotype <<interface>> of UML). Parameters and return status are not indicated.

Two interfaces are defined. One is called `BasicCmIRPOperations`. This interface defines operations implemented by IRPAgent and used (or called) by IRPManager. The other is called `BasicCmIRPNotifications`. This interface defines notifications implemented by IRPManager and used by IRPAgent.

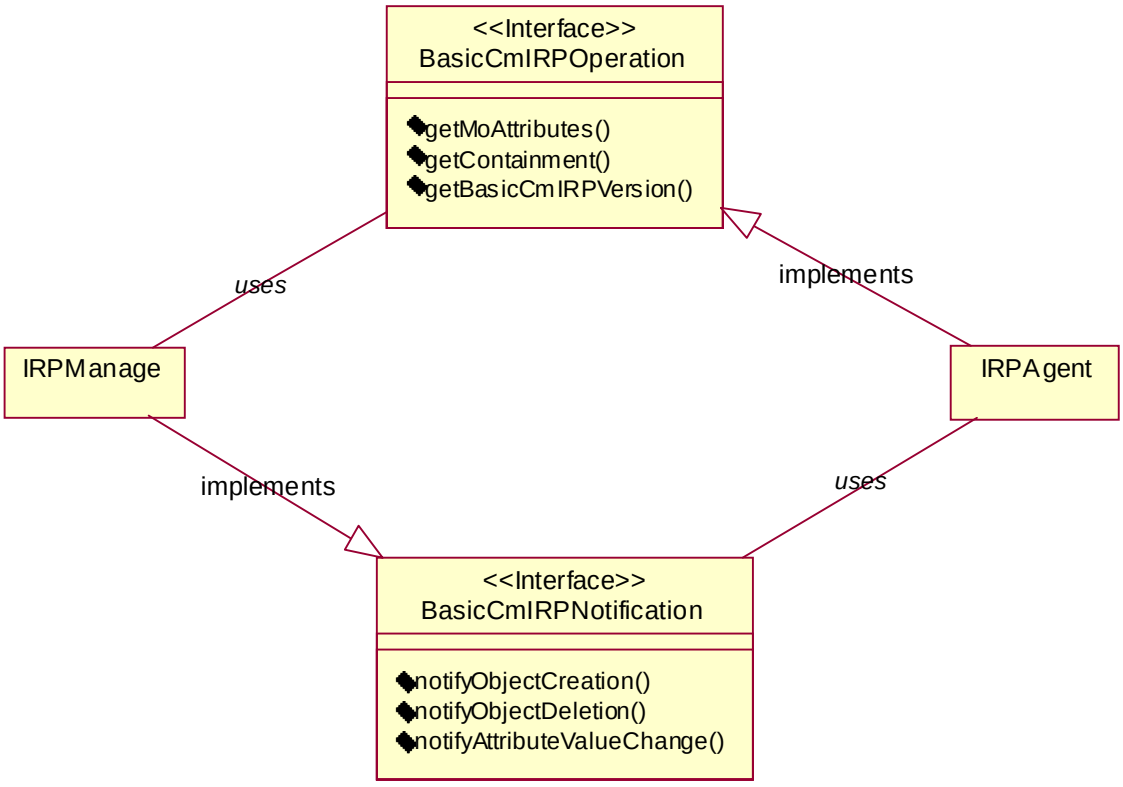


Figure 5: UML Interface Class Diagram

6.2.2 Operations

6.2.2.1 Operation getMoAttributes (M)

This operation is invoked by IRPManager to request the retrieval of management information (Managed Object attribute names and values) from the MIB maintained by IRPAgent. One or several Managed Objects may be retrieved - based on the containment hierarchy. The operation corresponds to the M-GET service defined by CMIS (ITU-T X.710 [7]).
A Solution Set may choose to split this operation in several operations (e.g. operations to get “handlers” or “iterators” to Managed Objects fulfilling the scope/filter criteria and other operations to retrieve attribute names/values from these “handlers”).

Table 1: Parameters of `getMoAttributes`

Name	Qualifier	Description
`baseObjectInstance`	Input, M	The MO where the search starts. This is a full Distinguished Name according to 3GPP TS 32.106-8 [13].
`scope`	Input, M	This parameter defines how many levels of the containment hierarchy to search (i.e. apply the filter defined below). The search starts from the MO given by the `baseObjectInstance` parameter. The levels of search that may be performed are: • the base object alone (default); • the n-th level subordinates of the base object; • the base object and all of its subordinates down to and including the n-th level; • the base object and all of its subordinates.
`filter`	Input, M	This parameter defines a filter test to be applied to the scoped Managed Object(s). If the filter is empty, all of the managed objects included by the scope are selected. The actual syntax and capabilities of the filter is Solution Set specific. However, each Solution Set should support a filter consisting of one or several assertions that may be grouped using the logical operators AND, OR and NOT. Each assertion is a logical expression of attribute existence, attribute value comparison ("equal to X, less than Y" etc.) and MO Class.
`attributeListIn`	Input, M	This parameter identifies the attributes to be returned by this operation. In R99, only the semantics "Return all attributes" shall be supported. An empty list means "Return all attributes". For future releases the possibility to specify a list of attributes is expected.
`managedObjectClass`	Output, M	For each returned MO: The class of the MO.
`managedObjectInstance`	Output, M	For each returned MO: The name of the MO. This is a full Distinguished Name according to 3GPP TS 32.106-8 [13].
`attributeListOut`	Output, M	For each returned MO: A list of name/value pairs for the MO attributes.
`status`	Output, M	(a) Operation succeeded, or (b) Operation failed because of specified or unspecified reason.

6.2.2.2 Operation `getContainment` (O)

This (optional) operation is only intended for retrieval of the containment relations from the MIB.

The output parameter 'containment' of the operation shall contain a list of all Managed Object instances in the MIB maintained by IRPAgent (or a subset starting from a given base object) including containment information (naming tree).

The structure and format of the output parameter 'containment' are Solution Set dependent.

Table 2: Parameters of `getContainment`

Name	Qualifier	Description
`baseObjectInstance`	Input, M	The MO where the search starts. This is a full Distinguished Name according to 3GPP TS 32.106-8 [13].
`scope`	Input, O	This parameter gives a value N defining how many levels of the containment hierarchy from the baseObjectInstance to include in the result. The levels of inclusion that may be performed are: • the base object alone (default); • the n-th level subordinates of the base object; • the base object and all of its subordinates down to and including the n-th level; • the base object and all of its subordinates.
`containment`	Output, M	A list of DN of all Managed Object instances that satisfy the scope.
`status`	Output, M	(a) Operation succeeded, or (b) Operation failed because of specified or unspecified reason.

6.2.2.3 Operation `getBasicCmIRPVersion` (M)

IRPManager wishes to find out the Basic CM IRP SS version(s) supported by IRPAgent. IRPAgent shall respond with a list of supported Basic CM IRP SS versions. Since the present document defines the first IRP version, implementation of IRPAgent in compliance to this version shall return with one version number in the list.

Table 3: Parameters of `getBasicCmIRPVersion`

Name	Qualifier	Description
`versionNumberList`	Output, M	It indicates one or more SS version numbers supported by the IRPAgent. This shall in Release 99 contain only one version number.
`status`	Output, M	(a) Operation succeeded in that `versionNumberList` contains valid result. (b) Operation failed. Output parameter `versionNumberList` may contain invalid result.

6.2.3 Notifications

6.2.3.1 General

Operations that IRPManager uses to manage subscription to receive notifications are specified in Notification IRP IS 3GPP TS 32.106-2 [3], which also specifies a generic notification `notify`. Notification IRP IS (3GPP TS 32.106-2 [3]) defines a number of parameter-attributes that are commonly carried in notifications as well.

The commonly carried parameter-attributes are collectively called `notificationHeader` in the present document. The parameter-attribute names and their qualifiers are listed in Table 4.

Table 4: Notification Header

Parameter-Attributes defined in 3GPP TS 32.106-2 [3]	Qualifier for use in this IS
`managedObjectClass`	M
`managedObjectInstance`	M
`notificationId`	O
`eventTime`	M
`systemDN`	C
`eventType`	M
`extendedEventType`	M

The following subclauses define specific notifications relevant for Basic CM IRP by extending `notify` in Notification IRP IS (3GPP TS 32.106-2 [3]).

6.2.3.2 Notification `notifyObjectCreation` (O)

IRPAgent notifies the subscribed IRPManager that a new Managed Object has been created and that the new object satisfies the filter constraint expressed in IRPManager's `subscribe` operation (see 3GPP TS 32.106-2 [3]). This notification is based on the `objectCreation` notification type specified in ITU-T X.721 [8] and ITU-T X.730 [9] (difference compared to these specifications are indicated in the description below).

When a `notifyObjectCreation` notification is received, that in the MOI Parameter-Attribute includes superior (parent) MO(s) that the IRPmanager is not aware of (in case the object creation notifications for that or those objects have not been received yet, or are lost), these superior MO(s) shall also be assumed to be created.

Table 5: Parameters for `notifyObjectCreation`

Name	Qualifier	Description
`notificationHeader`	Input, M	See Table 4: Notification Header.
`correlatedNotifications`	Input, O	A set of notifications that are correlated to the subject notification. Defined in ITU-T X.733 [10].
`additionalText`	Input, O	It can contain further information on the creation of the MO.
`sourceIndicator`	Input, O	This parameter, when present, indicates the source of the operation that led to the generation of this notification. It can have one of the following values: • resource operation: The notification was generated in response to an internal operation of the resource; • management operation: The notification was generated in response to a management operation applied across the managed object boundary external to the managed object; • unknown: It is not possible to determine the source of the operation.
`attributeList`	Input, O	The attributes (name/value pairs) of the created MO.

6.2.3.3 Notification `notifyObjectDeletion` (O)

IRPAgent notifies the subscribed IRPManager of a deleted Managed Object. The IRPAgent invokes this notification because the subject notification satisfies the filter constraint expressed in the IRPManager `subscribe` operation (see 3GPP TS 32.106-2 [3]). This notification is based on the `objectDeletion` notification type specified in ITU-T X.721 [8] and ITU-T X.730 [9] (difference compared to these specifications are indicated in the description below).

When a Managed Object is notified as deleted, all subordinate Managed Objects (i.e. the complete sub-tree of contained MOs under the deleted MO), if any exist, shall also be assumed to be deleted. When an IRPAgent is able to detect an atomic operation leading to the removal of a whole sub-tree of the MIB, it shall send a delete notification for only the top MO of the deleted sub-tree. Furthermore, all associations to a deleted Managed Object shall be deleted by the IRPAgent.

Table 6: Parameters for `notifyObjectDeletion`

Name	Qualifier	Description
`notificationHeader`	Input, M	See Table 4: Notification Header.
`correlatedNotifications`	Input, O	A set of notifications that are correlated to the subject notification. Defined in ITU-T X.733 [10].
`additionalText`	Input, O	It can contain further information on the deleted MO.
`sourceIndicator`	Input, O	This parameter, when present, indicates the source of the operation that led to the generation of this notification type. It can have one of the following values: • resource operation: The notification was generated in response to an internal operation of the resource; • management operation: The notification was generated in response to a management operation applied across the managed object boundary external to the managed object; • unknown: It is not possible to determine the source of the operation.
`attributeList`	Input, O	The attributes (name/value pairs) of the deleted MO.

6.2.3.4 Notification `notifyAttributeValueChange` (O)

IRPAgent notifies the subscribed IRPManager of a change of one or several attributes of a Managed Object in the NRM. The IRPAgent invokes this notification because the subject notification satisfies the filter constraint expressed in the IRPManager `subscribe` operation (see 3GPP TS 32.106-2 [3]). This notification is based on the `attributeValueChange` notification type specified in ITU-T X.721 [8] and ITU-T X.730 [9] (difference compared to these specifications are indicated in table 7).

Table 7: Parameters for `notifyAttributeValueChange`

Name	Qualifier	Description
`notificationHeader`	Input, M	See Table 4: Notification Header.
`correlatedNotifications`	Input, O	A set of notifications that are correlated to the subject notification. Defined in ITU-T X.733 [10].
`additionalText`	Input, O	It can contain further information on the attribute change of the MO.
`sourceIndicator`	Input, O	This parameter, when present, indicates the source of the operation that led to the generation of this notification type. It can have one of the following values: • resource operation: The notification was generated in response to an internal operation of the resource; • management operation: The notification was generated in response to a management operation applied across the managed object boundary external to the managed object; • unknown: It is not possible to determine the source of the operation.
`attributeValueChange Definition`	Input, M	The changed attributes (name/value pairs) of the MO (with both new and, optionally, old values).

6.3 Generic Network Resource Model (NRM)

This subclause defines the generic managed object classes supporting the Basic CM IRP. These object classes are protocol environment neutral and the model does not define the syntax or encoding of the operations and parameters.

The model described in this subclause allows for Managed Elements to be defined for management purposes according to the functionality contained within them. As an example, a single implementation of a combined MSC and VLR may be required. However, in the implementation it is required to create a single interface for the management of this element. This is expected to be achieved by instantiating a `G3ManagedElement` MOC that contains the "mscFunction" MOC, the "vlrFunction" MOC (as in the GSM 12.xx-series of specifications), and other generic or non-UMTS specific MOCs as appropriate to define the manageable capability of that managed element. See also the `managedElementType` attribute in the `G3ManagedElement` MOC definition.

It should be noted that, although this model allows for combined managed element functionality as described above, in this subclause only the high-level and generic MOCs are defined. UMTS MOCs modelling more specific managed element functionality are defined in subclause 6.4.

6.3.1 Managed Object Class (MOC) diagrams

6.3.1.1 Inheritance hierarchy

Figure 6 shows the inheritance hierarchy for the generic MO classes defined in this IRP.

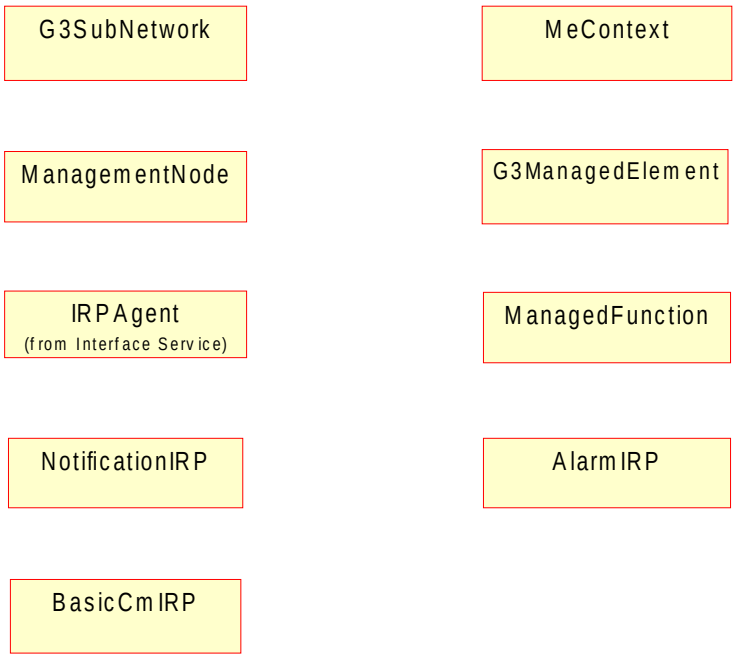
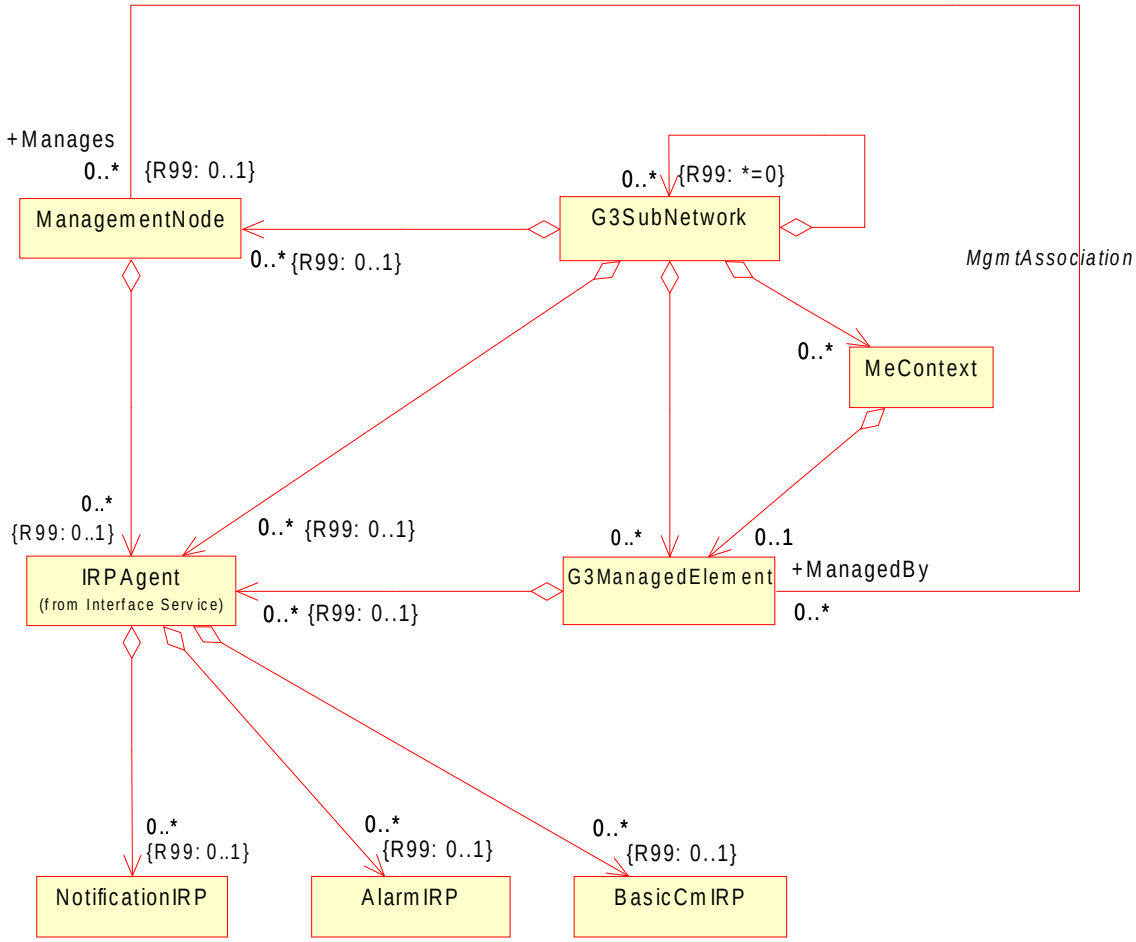


Figure 6: Generic NRM Inheritance Hierarchy

6.3.1.2 Containment/Naming and Association diagram

Figure 7 shows the containment/naming hierarchy and the associations of the generic MO classes defined by this IRP.

NOTE: The Managed Object containment/naming relationships are in the diagram(s) below indicated by UML "Aggregation by reference" ("hollow diamonds").



NOTE 1: G3ManagedElement may be contained in either a G3SubNetwork or an MeContext instance, or have no parent instance at all.

NOTE 2: The listed cardinality numbers represent transient as well as steady-state numbers, and reflect all managed object creation and deletion scenarios.

Figure 7: Generic NRM Containment/Naming and Association diagram

Each Managed Object is identified with a Distinguished Name (DN) according to 3GPP TS 32.106-8 [13] that expresses its containment hierarchy. As an example, the DN of a Managed Element instance could have a format like:

`g3SubNetwork=Sweden,meContext=MEC-Gbg-1,g3ManagedElement=RNC-Gbg-1.`

6.3.2 Managed Object Class (MOC) definitions

A general note regarding all the notification tables defined for each MOC below: Each MOC may potentially send the notifications listed in the notification table for the MOC. The notifications with qualifier (M) shall be supported by the MOC, and the notifications with qualifier (O) may be supported by the MOC.
For example, if Notification notifyObjectCreation defined in Basic CM IRP has the qualifier (M), then if a MOC is defined such that it emits such a notification, this notification shall be emitted when appropriate (i.e. when a new object is created). If Notification notifyChangedAlarm has the qualifier (O) in Alarm IRP (see 3GPP TS 32.111-2 [11]), then if a MOC is defined such that it emits such a notification, this notification may or may not be emitted when appropriate. Further, if a notification in the qualifier column (of the MOC notification tables) has a reference to another specification, it means that the qualifier for the notification is specified in the referred specification.

6.3.2.1 MOC G3SubNetwork

This Managed Object Class represents a set of managed entities as seen over the Itf-N.

A G3SubNetwork may have 0...N instances. It shall be present if either a ManagementNode or multiple G3ManagedElements are present (i.e. ManagementNode and multiple G3ManagedElement instances shall have G3SubNetwork as parent). Restriction in R99: N=1.

Table 8: Attributes of G3SubNetwork

Name	Qualifier	Description
g3SubNetworkId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of the G3SubNetwork object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
dnPrefix	READ- ONLY, C	It carries the DN Prefix information as defined in Annex C of 32.106-8 [13]. It shall only be specified if the instance of G3SubNetwork is a local root instance of the MIB. Otherwise the value shall carry the NULL semantics.
userLabel	READ- ONLY, M	A user-friendly (and user assigned) name of the associated object.

Table 9: Notifications of G3SubNetwork

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.3.2.2 MOC G3ManagedElement

This Managed Object Class represents telecommunications equipment or TMN entities within the telecommunications network that performs Managed Element (ME) functions, i.e. provides support and/or service to the subscriber.
An ME communicates with a manager (directly or indirectly) over one or more 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". This class is similar to the Managed Element class specified in ITU-T M.3100 [4], [5], [6].

A G3ManagedElement may be contained in either a G3SubNetwork or in an MeContext instance. A single G3ManagedElement seen over the Itf-N may also exist stand-alone with no parent at all.

As mentioned in the introduction to subclause 6.3 (the generic model), the G3ManagedElement MOC may be used to represent combined ME functionality (as indicated by the managedElementType attribute and the contained instances of different functional MOCs).

Single function G3ManagedElement managed object instances will have a 1..1 containment relationship to a function Managed Object (in this context a function MO is an MO derived from the ManagedFunction MOC). Multiple function G3ManagedElement managed object instances will have a 1..N containment relationship to function Managed Objects.

It should be noted that although the present document only models UMTS specific functionality with some UTRAN related MOCs, the G3ManagedElement MOC may still be used to represent other ME types than RNC or NodeB, e.g. an MSC or a combined MSC/HLR/VLR.

Table 10: Attributes of G3ManagedElement

Name	Qualifier	Description
g3ManagedElementId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of the G3ManagedElement object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
dnPrefix	READ- ONLY, C	It carries the DN Prefix information as defined in Annex C of 32.106-8 [13]. It shall only be specified if the instance of G3ManagedElement is a local root instance of the MIB. Otherwise the value shall carry the NULL semantics.
managedElementType	READ-ONLY, M	The type of managed element. It is a multi-valued attribute with one or more elements. Thus, it may represent one ME functionality, e.g. an RNC, or a combination of more than one functionality e.g. an MSC/HLR. The allowed members of this attribute are: RNC, NodeB, MSC, HLR, VLR, AUC, EIR, SMS-IWMSC, SMS-GMSC, GMSC, SGSN, GGSN and BG. The actual syntax and encoding of this attribute is Solution Set specific.
userLabel	READ-ONLY, M	A user-friendly name of this object.
vendorName	READ-ONLY, M	The name of the G3ManagedElement vendor.
userDefinedState	READ-ONLY, M	An operator defined state for operator specific usage. (See also Note below)
locationName	READ-ONLY, M	The physical location of this entity (e.g. an address).
managedBy	READ-ONLY, M	The value of this attribute shall be the DN of the related managementNode instance. This is a reference attribute modelling the role (of the association MgmtAssociation) that this ME is managed by 0-1 managementNode.
NOTE: In addition to the userDefinedState, state management attributes are expected to be included in the next release.		

Table 11: Notifications of G3ManagedElement

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.3.2.3 MOC MeContext

This Managed Object Class (MOC) 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 G3SubNetwork instance, some measure shall be taken in order to assure the global uniqueness of DNs for all MOIs under those MEs. One way could be to set different DnPrefixes 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 G3SubNetwork exists. Every instance of MeContext contains exactly one G3ManagedElement during steady-state operations.

Table 12: Attributes of `MeContext`

Name	Qualifier	Description
meContextId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
dnPrefix	READ- ONLY, C	It carries the DN Prefix information as defined in Annex C of 3GPP TS 32.106-8 [13]. It shall only be specified if the instance of MeContext is a local root instance of the MIB. Otherwise the value shall carry the NULL semantics.

Table 13: Notifications of `MeContext`

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.3.2.4 MOC `ManagementNode`

This Managed Object Class represents a telecommunications management system (EM) within the TMN that contains functionality for managing a number of Managed Elements (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 G3ManagedElement. 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.

Table 14: Attributes of `ManagementNode`

Name	Qualifier	Description
managementNodeId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
userLabel	READ-ONLY, M	A user-friendly name of this object.
vendorName	READ-ONLY, M	The name of the ManagementNode vendor.
userDefinedState	READ-ONLY, M	An operator defined state for operator specific usage.
locationName	READ-ONLY, M	The physical location of this entity (e.g. an address).
manages	READ-ONLY, M	The value of this attribute shall be a list of the DN(s) of the related ManagedElement instance(s). This is a reference attribute modelling the role (of the association MgmtAssociation) that this managementNode is responsible for managing 0-N MEs.

Table 15: Notifications of `ManagementNode`

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.3.2.5 MOC ManagedFunction

This Managed Object Class is similar to the class gsmManagedFunction defined in GSM 12.20 [12] and is provided for sub-classing only. It provides the attributes that are common to functional MO classes. Note that a Managed Element may contain several managed functions. The ManagedFunction may be extended in the future if more common characteristics to functional objects are identified.

Table 16: Attributes of ManagedFunction

Name	Qualifier	Description
userLabel	READ-ONLY, M	A user-friendly name of the associated object.

6.3.2.6 MOC IRPAgent

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

Restriction in R99: The IRPAgent will be contained under a managed object as follows (only one of the options shall be used):

1. ManagementNode, if the configuration contains a ManagementNode (see Config #1 and Config #2 in Figure A.1).
2. G3SubNetwork, if the configuration contains a G3SubNetwork and no ManagementNode (see Config #3 in Figure A.1).
3. G3ManagedElement, if the configuration contains no ManagementNode or G3SubNetwork (see Config #4 in Figure A.1).

Table 17: Attributes of IRPAgent

Name	Qualifier	Description
irpAgentId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
systemDN	READ-ONLY, C	The Distinguished Name (DN) of IRPAgent. Defined in 3GPP TS 32.106-2 [3].

Table 18: Notifications of IRPAgent

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAlarmListRebuilt	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

Note that these notifications are issued based on occurrences on the IRPAgent MOC and not on occurrences on other Basic CM IRP managed objects.

6.3.2.7 MOC NotificationIRP

This Managed Object Class represents the Notification IRP capability associated with each IRPAgent. At least one instance shall be present for every IRPAgent instance. Restriction in R99: Number of instances = 1.

Table 19: Attributes of `NotificationIRP`

Name	Qualifier	Description
`notificationIRPId`	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
`irpVersion`	READ-ONLY, M	One or more Notification IRP version entries.

6.3.2.8 MOC `AlarmIRP`

This Managed Object Class represents the Alarm IRP (see 3GPP TS 32.111-2 [11]) capability associated with each IRPAgent. Restriction in R99: Number of instances = 0..1.

Table 20: Attributes of `AlarmIRP`

Name	Qualifier	Description
`alarmIRPId`	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
`irpVersion`	READ-ONLY, M	One or more Alarm IRP (see 3GPP TS 32.111-2 [11]) version entries.

6.3.2.9 MOC `BasicCmIRP`

This Managed Object Class represents the Basic CM IRP capability associated with each IRPAgent. Restriction in R99: Number of instances = 0..1.

Table 21: Attributes of `BasicCmIRP`

Name	Qualifier	Description
`basicCmIRPId`	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
`irpVersion`	READ-ONLY, M	One or more Basic CM IRP version entries.

6.3.3 Associations

6.3.3.1 Association `MgmtAssociation` (M)

This association is used to represent relationships between one or more MEs and the ManagementNode that is responsible for managing the MEs. It has two roles, named Manages and ManagedBy. The role 'Manages' models the fact that a ManagementNode is responsible for managing zero or more MEs, and the role ManagedBy models the fact that an ME is managed by zero or one ManagementNode. Each role is in the MOC definition mapped to a reference attribute with the same name.

6.4 UMTS Network Resource Model (NRM)

This NRM includes the generic model defined in subclause 6.3, and in addition it is expected to define MOCs modelling the functionality in one or more of the Managed Elements. However, in Release 99 only a more detailed model is defined for UTRAN specific functionality.

These object classes are protocol environment neutral and the model does not define the syntax or encoding of the operations and parameters.

6.4.1 Managed Object Class (MOC) diagrams

A general note regarding all the notification tables defined for each MOC below: Each MOC may potentially send the notifications listed in the notification table for the MOC. The notifications with qualifier (M) shall be supported by the MOC, and the notifications with qualifier (O) may be supported by the MOC.
For example: If Notification notifyObjectCreation defined in Basic CM IRP has the qualifier (M), then if a MOC is defined such that it emits such a notification, this notification shall be emitted when appropriate (i.e. when a new object is created). If Notification notifyChangedAlarm has the qualifier (O) in Alarm IRP (see 3GPP TS 32.111-2 [11]), then if a MOC is defined such that it emits such a notification, this notification may or may not be emitted when appropriate. Further, if a notification in the qualifier column (of the MOC notification tables) has a reference to another specification, it means that the qualifier for the notification is specified in the referred specification.

6.4.1.1 Inheritance hierarchy

Figure 8 shows the inheritance hierarchy for the UMTS NRM. Only new MOCs compared to subclause 6.3, and MOCs inherited from the generic model, are shown here.

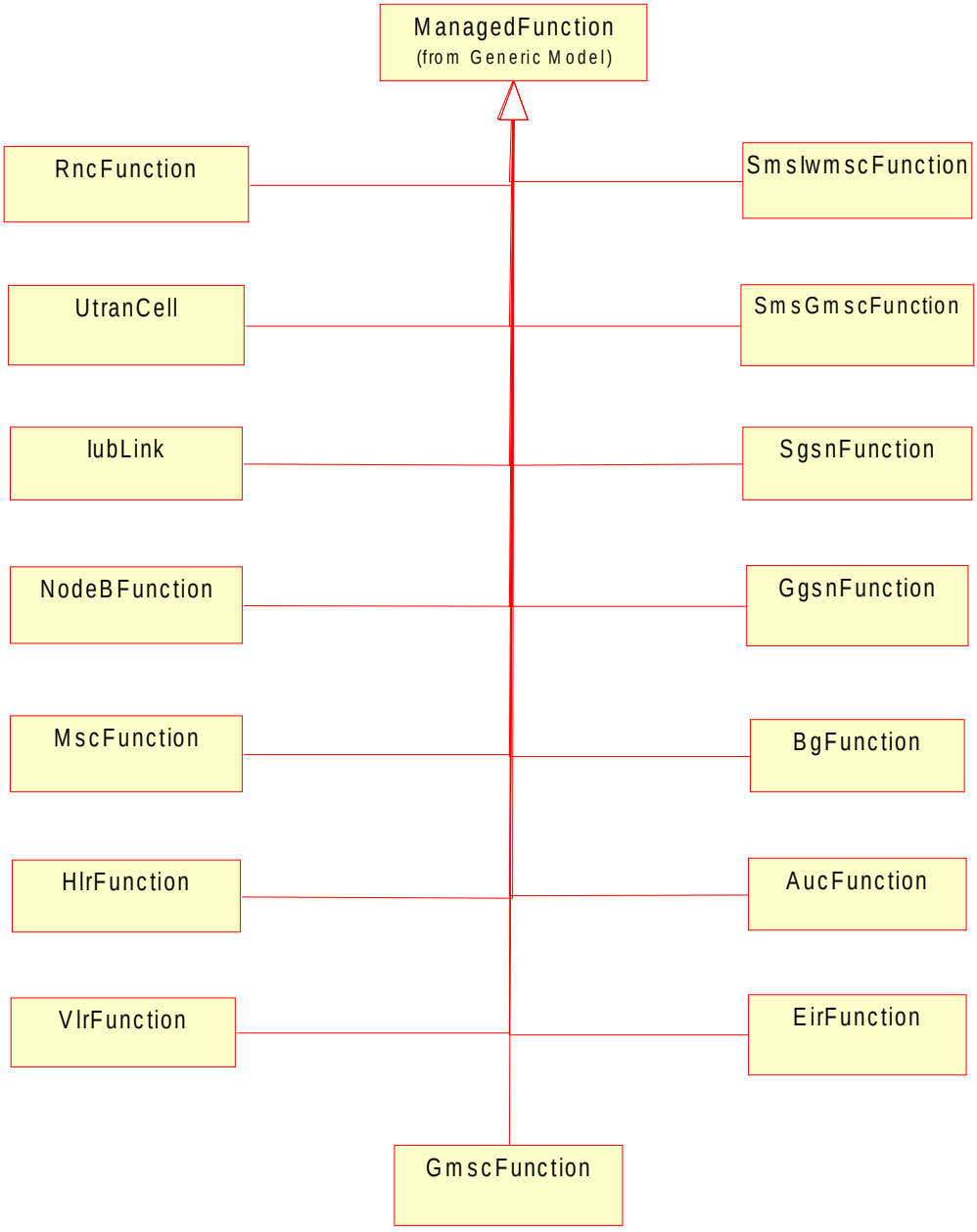
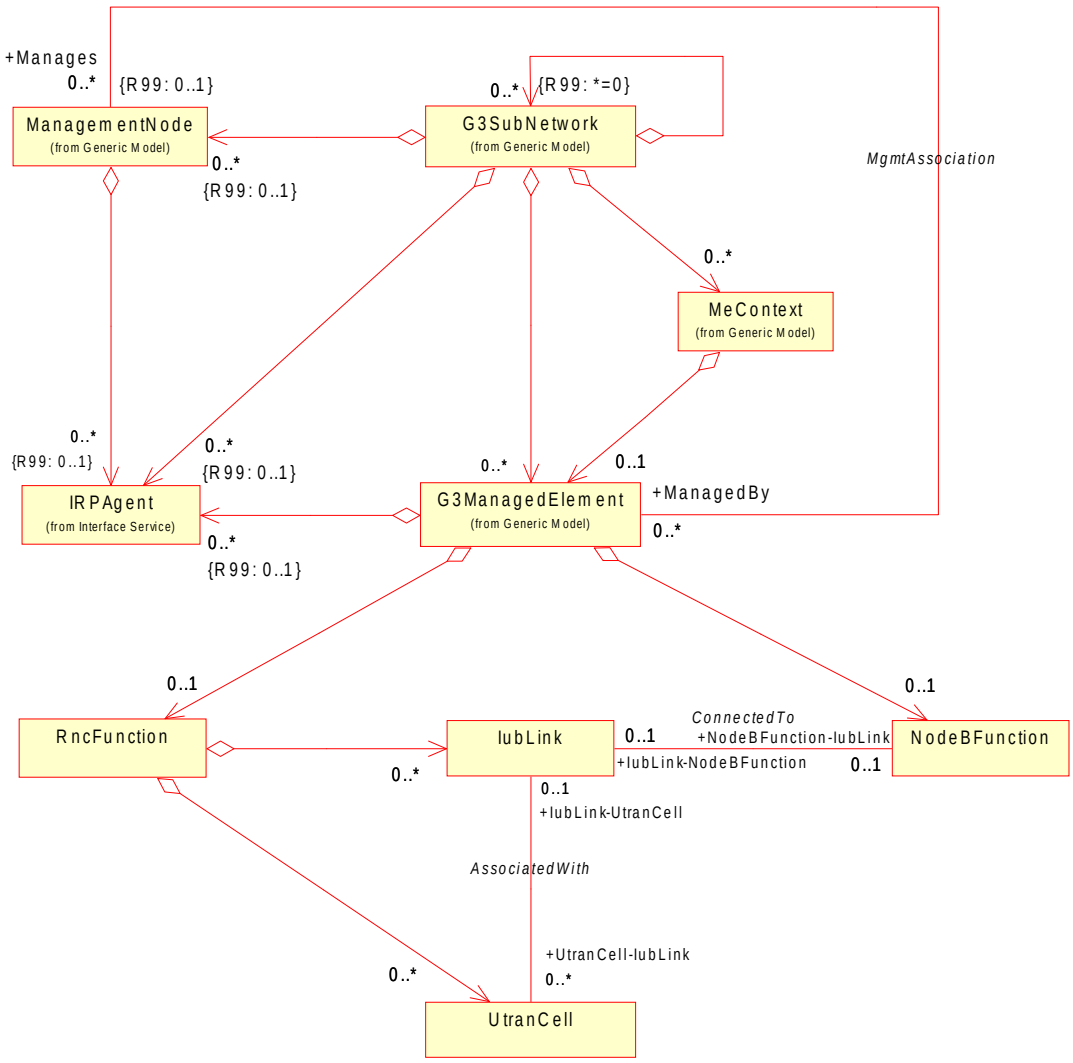


Figure 8: UMTS NRM Inheritance Hierarchy

6.4.1.2 Containment/Naming and Association diagrams

Figures 9 and 10 show the containment/naming hierarchy and the associations of the UMTS NRM defined by this IRP.

NOTE: The Managed Object containment/naming relationships are in the diagram(s) below indicated by UML "Aggregation by reference" ("hollow diamonds").



NOTE 1: G3ManagedElement may be contained in either a G3SubNetwork or an MeContext instance, or have no parent instance at all.

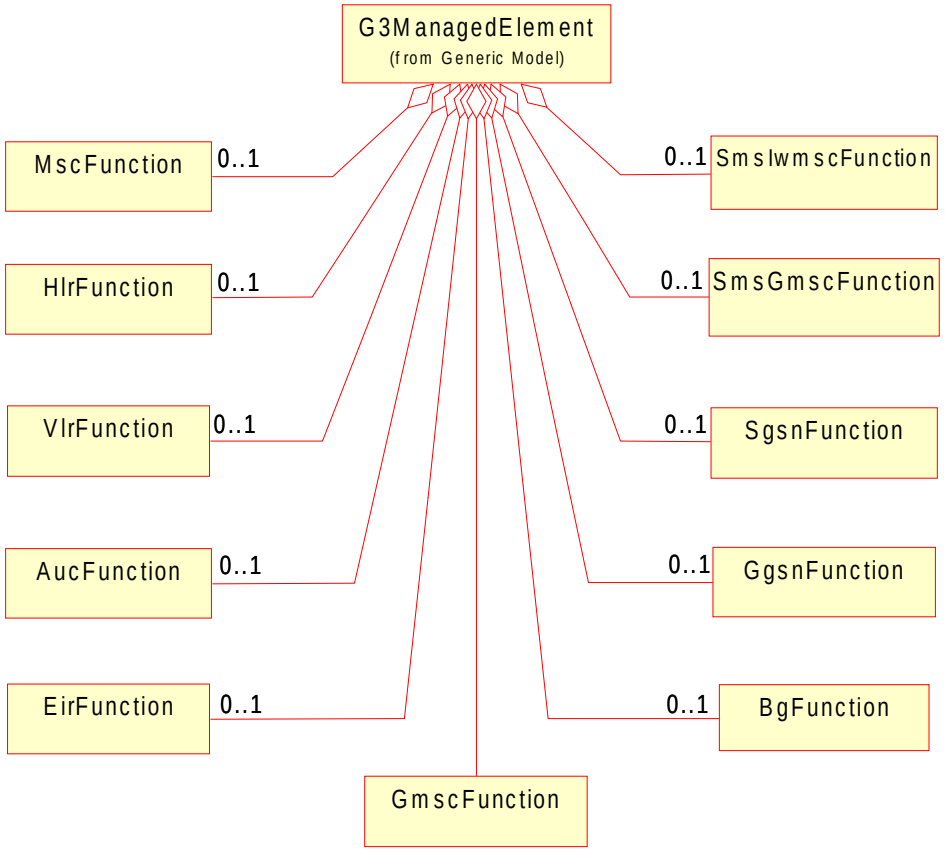
NOTE 2: The listed cardinality numbers represent transient as well as steady-state numbers, and reflect all managed object creation and deletion scenarios.

NOTE 3: The containment of MOCs NotificationIRP, AlarmIRP and BasicCmIRP under IRPAgent, which is shown in the generic model in subclause 6.3, is valid for this model as well.

Figure 9: UMTS NRM Containment/Naming and Association diagram, Network-UTRAN view

Each Managed Object is identified with a Distinguished Name (DN) according to 3GPP TS 32.106-8 [13] that expresses its containment hierarchy. As an example, the DN of a Managed Object representing a cell could have a format like:

```
g3SubNetwork=Sweden,meContext=MEC-Gbg-1,g3ManagedElement=RNC-Gbg-1, rncFunction=RF-1,utranCell=Gbg-1.
```



NOTE: The listed cardinality numbers represent transient as well as steady-state numbers, and reflect all managed object creation and deletion scenarios.

Figure 10: UMTS NRM Containment/Naming and Association diagram, CN view

6.4.2 UMTS specific Managed Object Class (MOC) definitions

6.4.2.1 MOC `RncFunction`

This Managed Object Class represents RNC functionality. For more information about the RNC, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 22: Attributes of `RncFunction`

Name	Qualifier	Description
`rncFunctionId`	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
`userLabel`	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.

Table 23: Notifications of `RncFunction`

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.4.2.2 MOC `NodeBFunction`

This Managed Object Class represents NodeB functionality. For more information about the NodeB, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 24: Attributes of `NodeBFunction`

Name	Qualifier	Description
nodeBFunctionId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
userLabel	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.
nodeBFunction-IubLink	READ-ONLY, M	The value of this attribute shall be the DN of the related IubLink instance. This is a reference attribute modelling the role (of the association ConnectedTo) that this NodeBFunction is connected to 0-1 IubLink.

Table 25: Notifications of `NodeBFunction`

Name	Qualifier	Notes
notifyAckStateChanged	M, See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.4.2.3 MOC `UtranCell`

This Managed Object Class represents a radio cell controlled by the RNC. For more information about radio cells, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 26: Attributes of UtranCell

Name	Qualifier	Description
utranCellId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
userLabel	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.
utranCell-IubLink	READ-ONLY, M	The value of this attribute shall be the DN of the related IubLink instance. This is a reference attribute modelling the role (of the association AssociatedWith) that this UtranCell is associated with 0-1 IubLink.

Table 27: Notifications of `UtranCell`

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.4.2.4 MOC `IubLink`

The 'Iub link' managed object is the logical link to a NodeB as seen from the RNC. For more information about the RNC, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 28: Attributes of IubLink

Name	Qualifier	Description
iubLinkId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
userLabel	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.
iubLink-UtranCell	READ-ONLY, M	The value of this attribute shall be a list of the DN(s) of the related UtranCell instance(s). This is a reference attribute modelling the role (of the association AssociatedWith) that this IubLink is associated with 0-N UtranCells.
iubLink-NodeBFunction	READ-ONLY, M	The value of this attribute shall be the DN of the related NodeBFunction instance. This is a reference attribute modelling the role (of the association ConnectedTo) that this IubLink is connected to 0-1 NodeBFunction.

Table 29: Notifications of `IubLink`

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.4.2.5 MOC `MscFunction`

This Managed Object Class represents MSC functionality. For more information about the MSC, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 30: Attributes of `MscFunction`

Name	Qualifier	Description
`mscFunctionId`	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
`userLabel`	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.

Table 31: Notifications of `MscFunction`

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.4.2.6 MOC `HlrFunction`

This Managed Object Class represents HLR functionality. For more information about the HLR, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 32: Attributes of `HlrFunction`

Name	Qualifier	Description
`hlrFunctionId`	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
`userLabel`	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.

Table 33: Notifications of `HlrFunction`

Name	Qualifier	Notes
`notifyAckStateChanged`	See Alarm IRP (3GPP TS 32.111-2 [11])	
`notifyAttributeValueChange`	O	
`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])	
`notifyObjectCreation`	O	
`notifyObjectDeletion`	O	

6.4.2.7 MOC `VlrFunction`

This Managed Object Class represents VLR functionality. For more information about the VLR, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 34: Attributes of `VlrFunction`

Name	Qualifier	Description
`vlrFunctionId`	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
`userLabel`	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.

Table 35: Notifications of `VlrFunction`

Name	Qualifier	Notes
`notifyAckStateChanged`	See Alarm IRP (3GPP TS 32.111-2 [11])	
`notifyAttributeValueChange`	O	
`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])	
`notifyObjectCreation`	O	
`notifyObjectDeletion`	O	

6.4.2.8 MOC `AucFunction`

This Managed Object Class represents AUC functionality. For more information about the AUC, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 36: Attributes of `AucFunction`

Name	Qualifier	Description
`aucFunctionId`	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
`userLabel`	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.

Table 37: Notifications of `AucFunction`

Name	Qualifier	Notes
`notifyAckStateChanged`	See Alarm IRP (3GPP TS 32.111-2 [11])	
`notifyAttributeValueChange`	O	
`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])	
`notifyObjectCreation`	O	
`notifyObjectDeletion`	O	

6.4.2.9 MOC `EirFunction`

This Managed Object Class represents EIR functionality. For more information about the EIR, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 38: Attributes of `EirFunction`

Name	Qualifier	Description
`eirFunctionId`	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
`userLabel`	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.

Table 39: Notifications of `EirFunction`

Name	Qualifier	Notes
`notifyAckStateChanged`	See Alarm IRP (3GPP TS 32.111-2 [11])	
`notifyAttributeValueChange`	O	
`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])	
`notifyObjectCreation`	O	
`notifyObjectDeletion`	O	

6.4.2.10 MOC `SmsIwmscFunction`

This Managed Object Class represents SMS-IWMSC functionality. For more information about the SMS-IWMSC, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 40: Attributes of `SmsIwmscFunction`

Name	Qualifier	Description
`SmsIwmscFunctionId`	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
`userLabel`	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.

Table 41: Notifications of `SmsIwmscFunction`

Name	Qualifier	Notes
`notifyAckStateChanged`	See Alarm IRP (3GPP TS 32.111-2 [11])	
`notifyAttributeValueChange`	O	
`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])	
`notifyObjectCreation`	O	
`notifyObjectDeletion`	O	

6.4.2.11 MOC `SmsGmscFunction`

This Managed Object Class represents SMS-GMSC functionality. For more information about the SMS-GMSC, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 42: Attributes of SmsGmscFunction

Name	Qualifier	Description
SmsGmscFunctionId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
userLabel	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.

Table 43: Notifications of SmsGmscFunction

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.4.2.12 MOC GmscFunction

This Managed Object Class represents GMSC functionality. For more information about the GMSC, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 44: Attributes of GmscFunction

Name	Qualifier	Description
gmscFunctionId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
userLabel	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.

Table 45: Notifications of GmscFunction

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.4.2.13 MOC SgsnFunction

This managed object class represents SGSN functionality. For more information about the SGSN, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 46: Attributes of SgsnFunction

Name	Qualifier	Description
sgsnFunctionId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
userLabel	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.

Table 47: Notifications of SgsnFunction

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.4.2.14 MOC GgsnFunction

This Managed Object Class represents GGSN functionality. For more information about the GGSN, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 48: Attributes of GgsnFunction

Name	Qualifier	Description
ggsnFunctionId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
userLabel	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.

Table 49: Notifications of GgsnFunction

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.4.2.15 MOC BgFunction

This Managed Object Class represents BG functionality. For more information about the BG, see 3GPP TS 23.002 [15].

It inherits from ManagedFunction.

Table 50: Attributes of BgFunction

Name	Qualifier	Description
bgFunctionId	READ-ONLY, M	An attribute whose 'name+value' can be used as an RDN when naming an instance of this object class. This RDN uniquely identifies the object instance within the scope of its containing (parent) object instance.
userLabel	READ-ONLY, M	A user-friendly (and user assigned) name of the associated object. Inherited from ManagedFunction.

Table 51: Notifications of BgFunction

Name	Qualifier	Notes
notifyAckStateChanged	See Alarm IRP (3GPP TS 32.111-2 [11])	
notifyAttributeValueChange	O	
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])	
notifyObjectCreation	O	
notifyObjectDeletion	O	

6.4.3 Associations

6.4.3.1 Association ConnectedTo (M)

This bi-directional association models the relationship between the IubLink and NodeB (through the NodeBFunction). It has two roles, named IubLink-NodeBFunction and NodeBFunction- IubLink. These two roles model each MOC's association with the other MOC. Each role is in the MOC definition mapped to a reference attribute with the same name.

6.4.3.2 Association AssociatedWith (M)

This bi-directional association models the relationship between the IubLink and UtranCell. It has two roles, named IubLink-UtranCell and UtranCell-IubLink. These two roles model each MOC's association with the other MOC. Each role is in the MOC definition mapped to a reference attribute with the same name.

Annex A (informative): Supported UMTS network configurations

Figure A.1 depicts four typical network configurations, which are supported by the UMTS NRM over the Itf-N. However, this does not preclude support for other configurations.

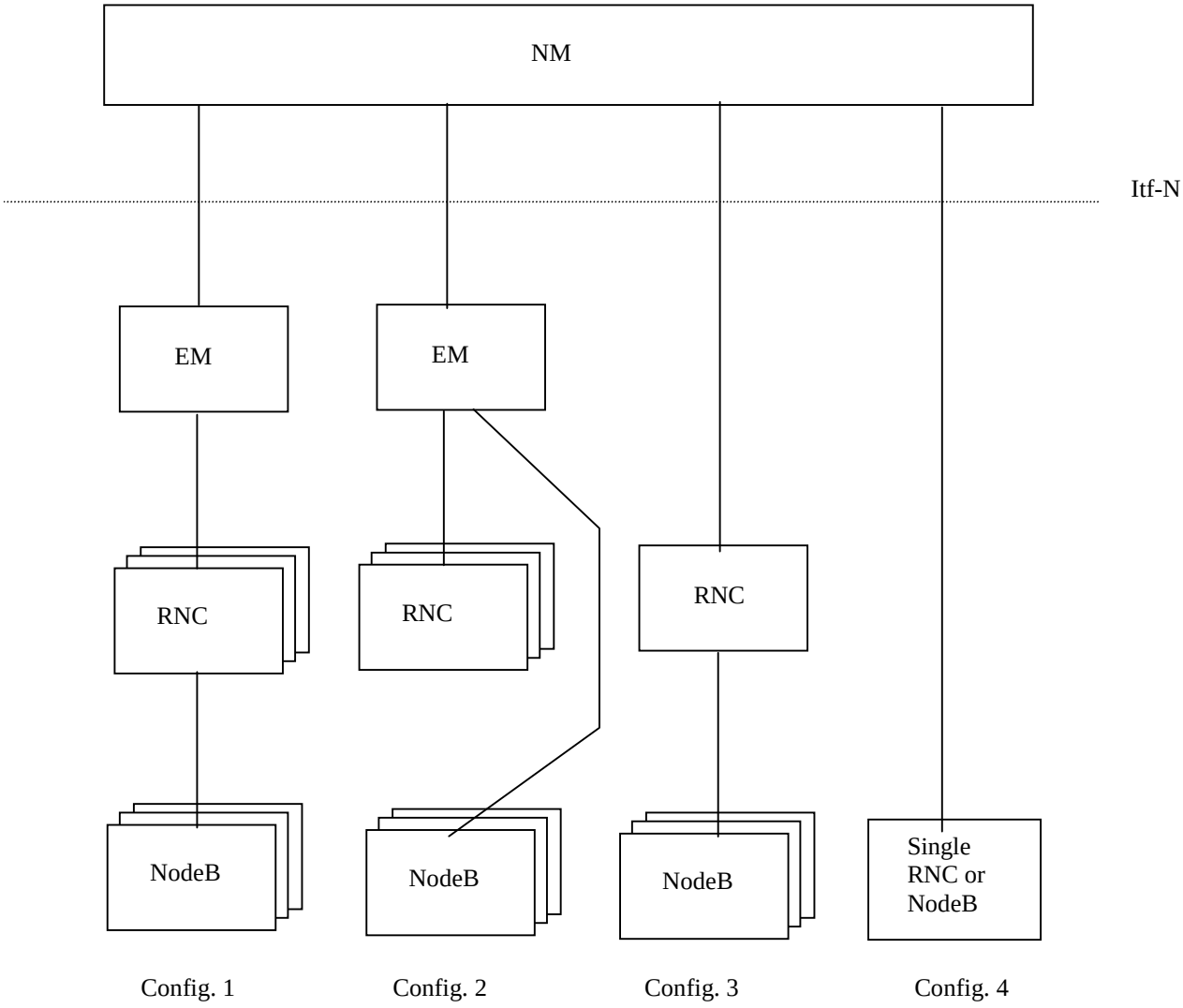


Figure A.1: Typical network configurations supported by the R99 UMTS NRM

Table A.1 shows the possible number of instances in R99 for each network configuration (counted from left to right in figure A.1.):

Table A.1: Number of instances for each R99 example configuration in figure A.1

MOC	Config. 1	Config. 2	Config. 3	Config. 4
G3SubNetwork	1	1	1	0..1
ManagementNode	1	1	0	0
G3ManagedElement	1..N	1..N	1..N	1
MeContext	0..M	0..M	0..M	0..1
RncFunction	0..P	0..P	0..1	0..1
NodeBFunction	0..Q	0..Q	0..(N-1)	0..1
IubLink	0..Q	0..Q	0..(N-1)	0
UtranCell	0..R	0..R	0..R	0..R
IRPAgent	1	1	1	1
NotificationIRP	1	1	1	1
AlarmIRP	0..1	0..1	0..1	0..1
BasicCmIRP	0..1	0..1	0..1	0..1

Annex B (normative): Event Types and Extended Event Types

This annex lists and explains Event Types and Extended Event Types used by Basic CM IRP and then lists the Event Types and Extended Event Types valid for each notification in this IRP.

Event Type is carried by a parameter called `eventType` defined in Notification IRP IS (3GPP TS 32.106-2 [3]).

Extended Event Type is carried by a parameter called extendedEventType defined in Notification IRP IS (3GPP TS 32.106-2 [3]).

Encoding of `eventType` and `extendedEventType` is Solution Set dependent. For example, the value of `eventType` may be encoded as an Object Identifier in the CMIP SS and as a numeric string in the CORBA SS.

The tables below may be extended in the future.

Table B.1: Event Types

Event Types	Explanation
Object creation	A notification of this type indicates that a new managed object instance has been created (as defined in ITU-T X.721 [8] and ITU-T X.730 [9]).
Object deletion	A notification of this type indicates that a managed object instance has been deleted (as defined in ITU-T X.721 [8] and ITU-T X.730 [9]).
Attribute value change	A notification of this type indicates that the value(s) of one or more attributes have changed (as defined in ITU-T X.721 [8] and ITU-T X.730 [9]).

Table B.2: Extended Event Types

Extended Event Types	Explanation
--	In this release of the present specification, no Extended Event Types are used. Thus, this mandatory parameter from [3] is set to NULL in all notifications defined in this specification.

Table B.3: Event types and Extended Event Types applicable to each Notification

Notification	Event Type	Extended Event type
`notifyObjectCreation`	Object creation	NULL
`notifyObjectDeletion`	Object deletion	NULL
`notifyAttributeValueChange`	Attribute value change	NULL

Annex C (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Dec 2000	S_10	SP-000513	-		Approved at TSG SA #10 and placed under Change Control.	2.0.0	3.0.0
Mar 2001	S_11	SP-010029	001		UMTS Network Resource Model alignment with TSG RAN specifications	3.0.0	3.1.0
Mar 2001	S_11	SP-010029	002		Correction of notifyObjectDeletion and notifyObjectCreation behaviour description	3.0.0	3.1.0
Jun 2001	S_12	SP-010284	003		Correction of R99 filter definition which is inconsistent with the CORBA SS	3.1.0	3.2.0
Jun 2001	S_12	SP-010284	004		Correction of UTRAN attributes	3.1.0	3.2.0

History

Document history		
V3.0.0	February 2001	Publication
V3.1.0	April 2001	Publication
V3.2.0	June 2001	Publication