# ETSI TS 132 752 V8.1.0 (2009-07)

Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Evolved Packet Core (EPC) Network Resource Model (NRM)
Integration Reference Point (IRP): Information Service (IS)
(3GPP TS 32.752 version 8.1.0 Release 8)**

Reference
RTS/TSGS-0532752v810

Keywords
GSM, LTE, UMTS

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Sous-Préfecture de Grasse (06) N° 7803/88

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Foreword

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The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp.

Contents

Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x   the first digit:

1   presented to TSG for information;

2   presented to TSG for approval;

3   or greater indicates TSG approved document under change control.

y   the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z   the third digit is incremented when editorial only changes have been incorporated in the document.

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:

32.751:   "Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP): Requirements";

32.752:   "Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP): Information Service (IS)";

32.753:   "Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP): Common Object Request Broker Architecture (CORBA) Solution Set (SS)";

32.755:   "Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP): Bulk CM eXtensible Markup Language (XML) file format definition".

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 by 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 optimization programme (e.g. modifications), and to maintain the overall Quality of Service (QoS). The CM actions are initiated either as single actions on single NEs of the 3G network, or as part of a complex procedure involving actions on many resources/objects in one or several NEs.

1 Scope

The present document specifies the protocol neutral EPC Network Resource Model IRP Information Service, through which an 'IRPAgent' (typically an Element Manager or Network Element) can communicate information to one or several 'IRPManagers' (typically Network Managers) concerning EPC resources. It reuses relevant parts of the Generic NRM in 3GPP TS 32.622 [6], either by direct reuse or sub-classing, and in addition to that defines EPC specific Information Object Classes.

In order to access the information defined by this NRM, an Interface IRP such as the "Basic CM IRP" is needed (3GPP TS 32.602 [7]). However, which Interface IRP is applicable is outside the scope of the present document.

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

[4]   3GPP TS 32.300: "Telecommunication management; Configuration Management (CM); Name convention for Managed Objects".

[5]   3GPP TS 32.600: "Telecommunication management; Configuration Management (CM); Concept and high-level requirements".

[6]   3GPP TS 32.622: "Telecommunication management; Configuration Management (CM); Generic network resources Integration Reference Point (IRP): Network Resource Model (NRM)".

[7]   3GPP TS 32.602: "Telecommunication management; Configuration Management (CM); Basic Configuration Management Integration Reference Point (IRP): Information Service (IS)".

[8]   3GPP TS 32.632: "Telecommunication management; Configuration Management (CM); Core network resources Integration Reference Point (IRP): Network Resource Model (NRM)".

[9]   3GPP TS 23.401: "GPRS enhancements for E-UTRAN access".

[10]   3GPP TS 32.732: "Telecommunication management; IP Multimedia Subsystem (IMS) Network Resource Model (NRM) Integration Reference Point (IRP): Information Service (IS)".

[11]   3GPP TS 32.762: "Telecommunication management; Evolved Universal Terrestrial Radio Access Network (E-UTRAN) network resources Integration Reference Point (IRP): Network Resource Model (NRM)".

[12]   3GPP TS 23.402: "Architecture Enhancements for non-3GPP accesses".

[13]   3GPP TS 32.662: "Telecommunication management; Configuration Management (CM); Kernel CM; Information service (IS)".

[14]   3GPP TS 23.003: " Technical Specification Group Core Network and Terminals; Numbering, addressing and identification".

[15]   3GPP TR 32.816-160: "Telecommunication management; Study on management of Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and Evolved Packet Core (EPC) ".

[16]   3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[17]   3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TS 32.101 [1], 3GPP TS 32.102 [2], 3GPP TS 32.600 [5] and the following apply:

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).

Managed Element (ME): an instance of the Information Object Class `ManagedElement` defined in 3GPP TS 32.622 [6].

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. This class, called **Information Object Class (IOC)** 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, the IOC 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). The IOC may support the emission of *notifications* that provide information about an event occurrence within a network resource.

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

Network Resource Model (NRM): a model representing the actual managed telecommunications network resources that a System is providing through the subject IRP.
An NRM identifies and describes IOCs, their associations, attributes and operations.
The NRM is also referred to as "MIM" (see above), which originates from the ITU-T TMN.

3.2   Abbreviations

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

CIM	Common Information Model
EM	Element Manager
eNodeB	evolved NodeB
EPC	Evolved Packet Core
ePDG	evolved Packet Data Gateway
E-UTRAN	Evolved Universal Terrestrial Radio Access Network

GPRS	General Packet Radio System
IOC	Information Object Class
IRP	Integration Reference Point
IS	Information Service
ME	Managed Element
MIM	Management Information Model
MME	Mobility Management Entity
MO	Managed Object
NE	Network Element
NR	Network Resource
NRM	Network Resource Model
PCRF	Policy and Charging Rules Function
P-GW	PDN Gateway
RDN	Relative Distinguished Name (see 3GPP TS 32.300 [4])
S-GW	Serving Gateway
TMN	Telecom Management Network
UML	Unified Modelling Language

4 System overview

4.1 Compliance rules

The following defines the meaning of Mandatory and Optional IOC attributes and associations between IOCs, in Solution Sets to the IRP defined by the present document:

- 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 IOCs, attributes and associations 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 recognized that 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

The modelling approach is described in the "Generic network resources IRP NRM" (3GPP TS 32.622 [6]).

It should be noted that this model allows for combined Managed Element functionality, where more than one 'function IOCs' (inherited from `ManagedFunction`) modelling more specific managed element functionality may be contained in the `ManagedElement` IOC.

6 Information Object Classes

6.1 Imported information entities and local labels

Label reference	Local label
TS 32.762 [11], information object class, ENBFunction	ENBFunction
TS 32.732 [10], information object class, HssFunction	HssFunction
TS 32.622 [6], information object class, Link	Link
TS 32.622 [6], information object class, ManagedElement	ManagedElement
TS 32.622 [6], information object class, ManagedFunction	ManagedFunction
TS 32.632 [8], information object class, SgsnFunction	SgsnFunction
TS 32.622 [6], information object class, SubNetwork	SubNetwork
TS 32.622 [6], information object class, EP_RP	EP_RP

6.2 Class diagram

6.2.1 Attributes and relationships

This clause depicts the set of IOCs that encapsulate information relevant for this service. This clause provides the overview of all information object classes in UML. Subsequent clauses provide more detailed specification of various aspects of these information object classes.

The figures below show the containment/naming hierarchy and the associations of the information object classes defined in the present document.

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

Each IOC is identified with a Distinguished Name (DN) according to 3GPP TS 32.300 [4] that expresses its containment hierarchy. As an example, the DN of an IOC representing a MME (3GPP TS 23.401 [9]) could have a format like:

 1) SubNetwork=China, MeContext =MEC-Gbg-1, ManagedElement =MME-Gbg-1, MMEFunction=MME-1.
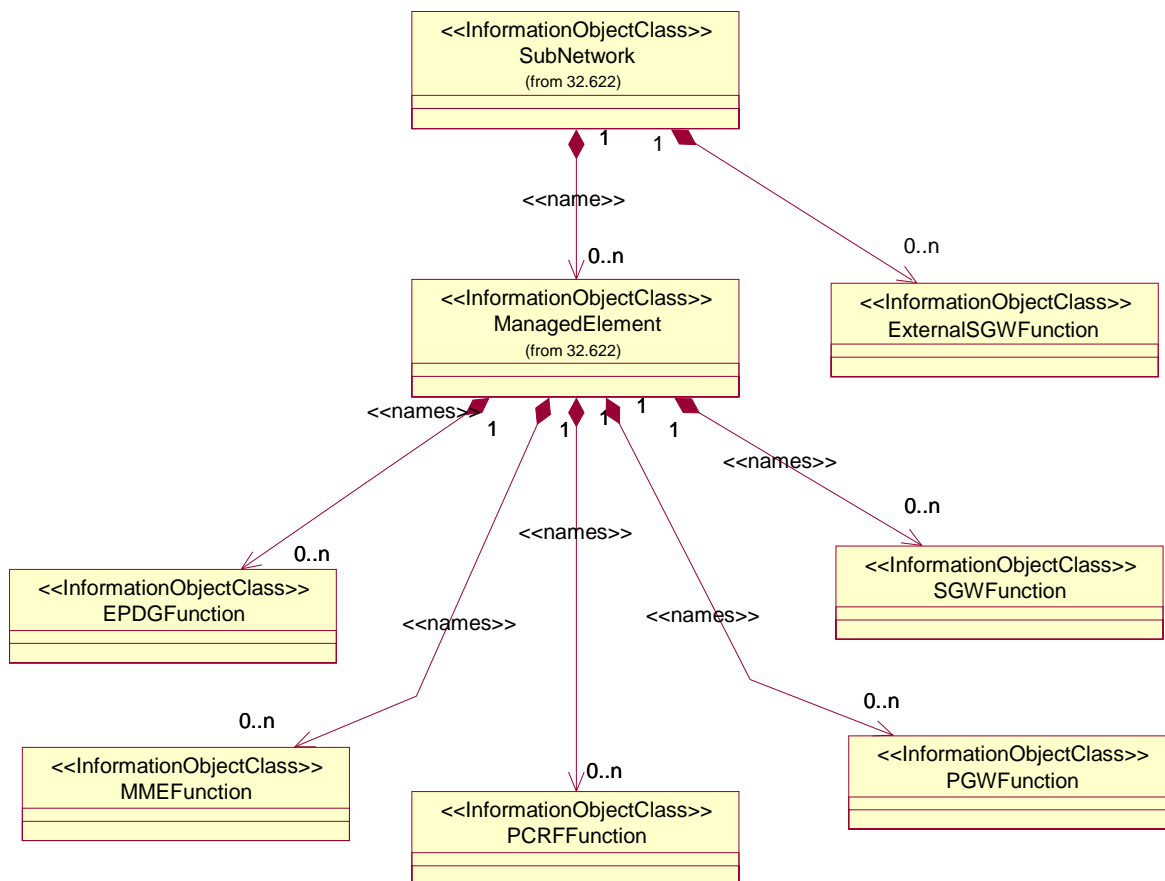
**Figure 6.2.1.1: EPC NRM Containment/Naming Relationships**
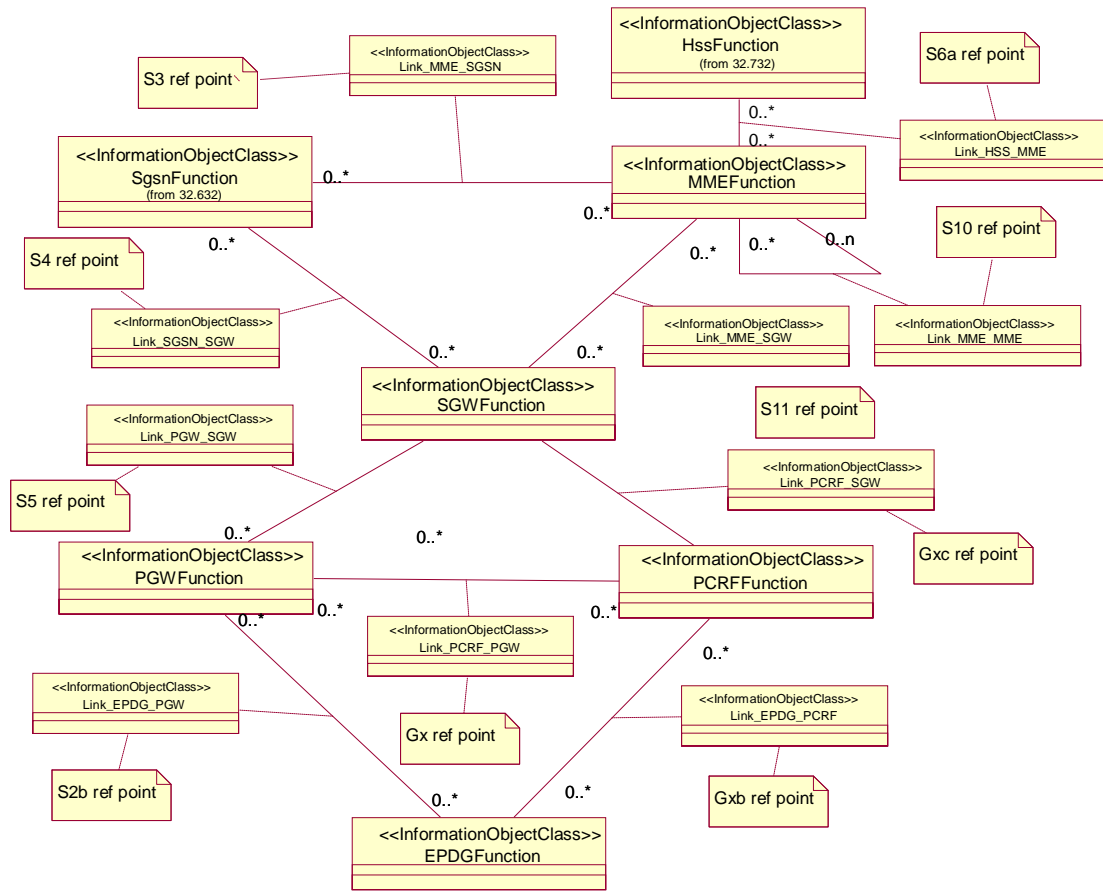
Figure 6.2.1.2: EPC NRM Containment/Naming and Association_1
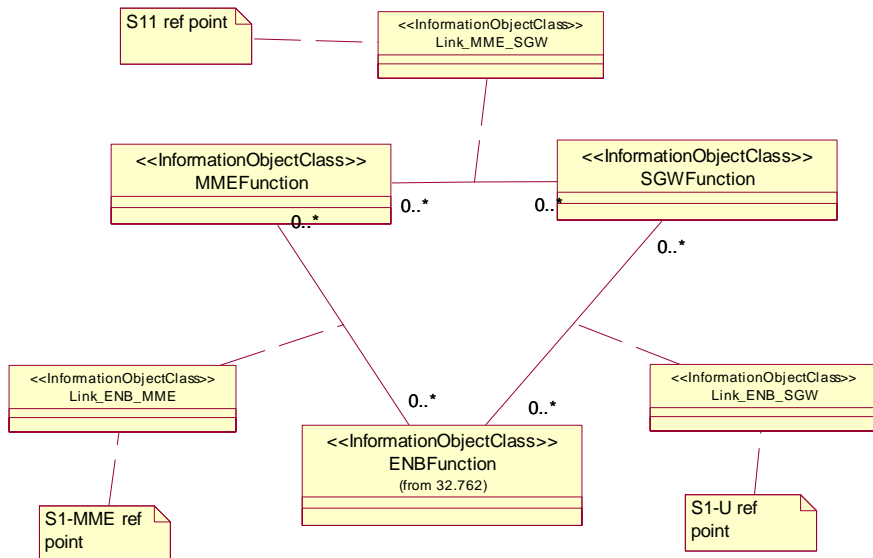
Figure 6.2.1.3: EPC NRM Containment/Naming and Association_2
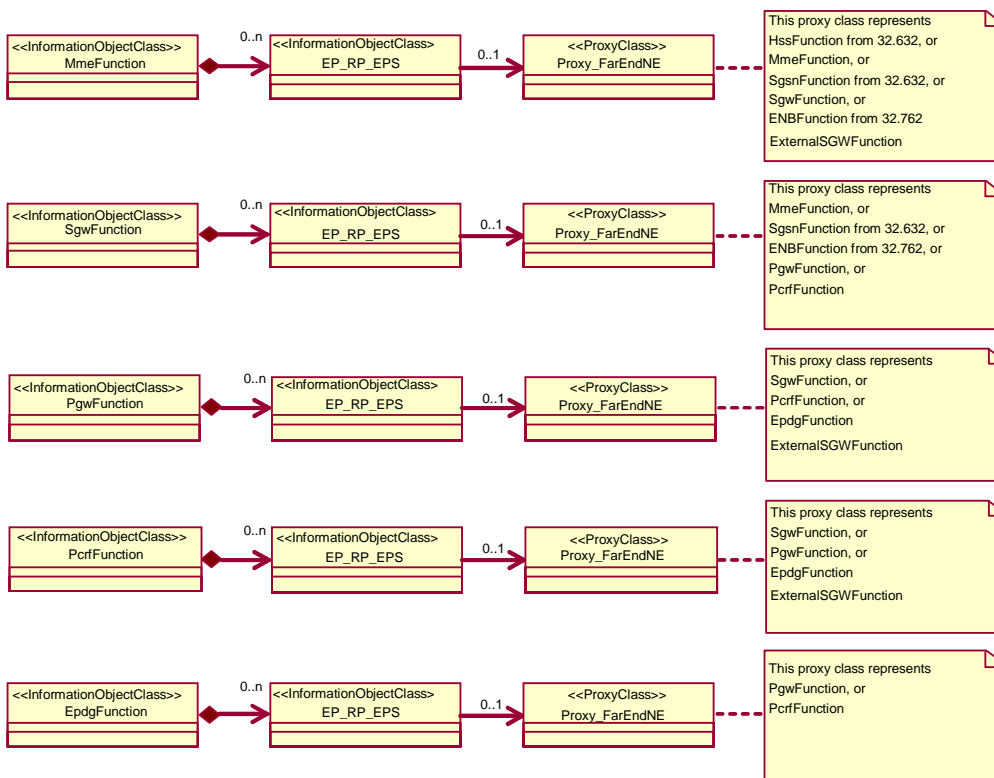
Figure 6.2.1.4: EPC NRM Containment/Naming and Association3
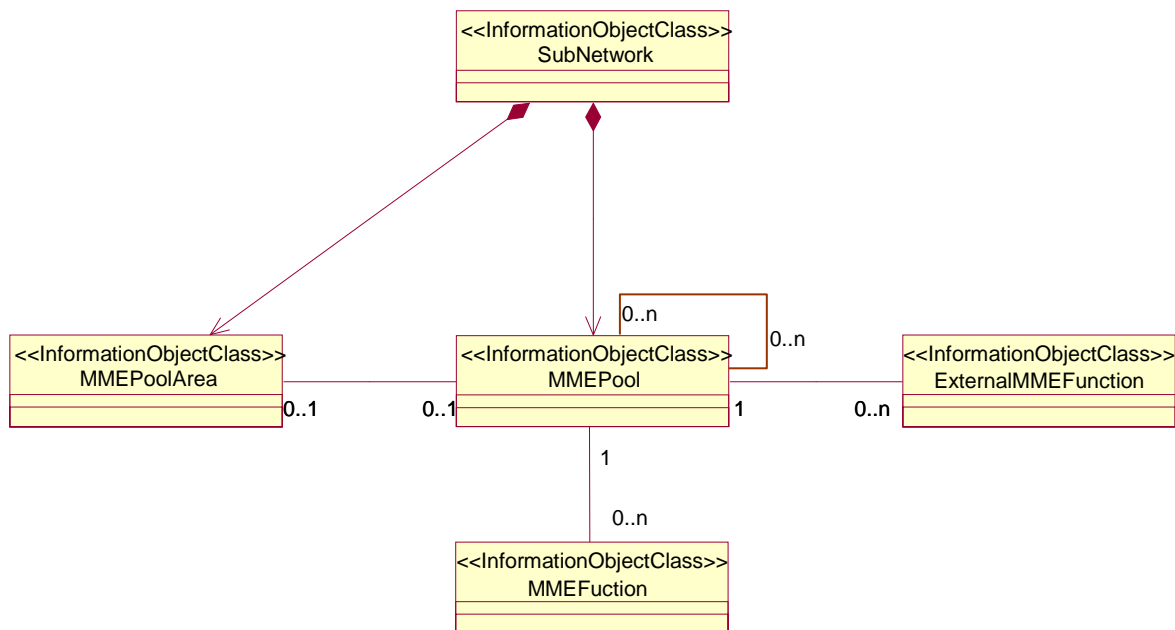
Figure 6.2.1.5 MME Pool Object Model of EPC NRM

Editor's Note:

The above diagram model/support "1 MMEFunction/ExternalMMEFunction can at most belong to one MMEPool." Technically, there is no identified problem of supporting "1 MMEFunction/ExternalMMEFunction participates in more than one MMEPool". However, support of such configuration is complex and costly. Use Case justification would be required.

6.2.2   Inheritance

This clause depicts the inheritance relationships that exist between IOCs.

The figures below show the inheritance hierarchy for the EPC NRM.
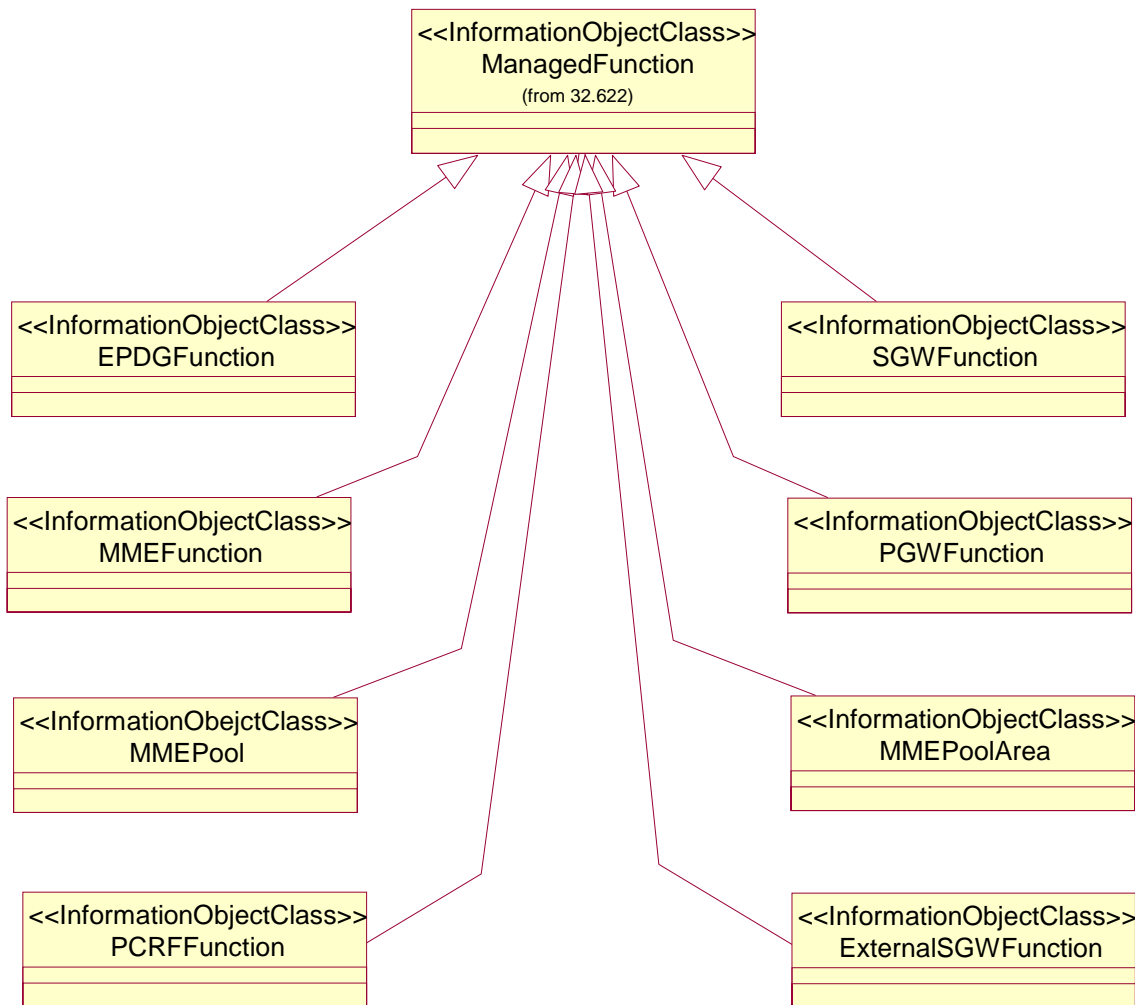
Figure 6.2.2.1: EPC NRM Inheritance Hierarchy_1
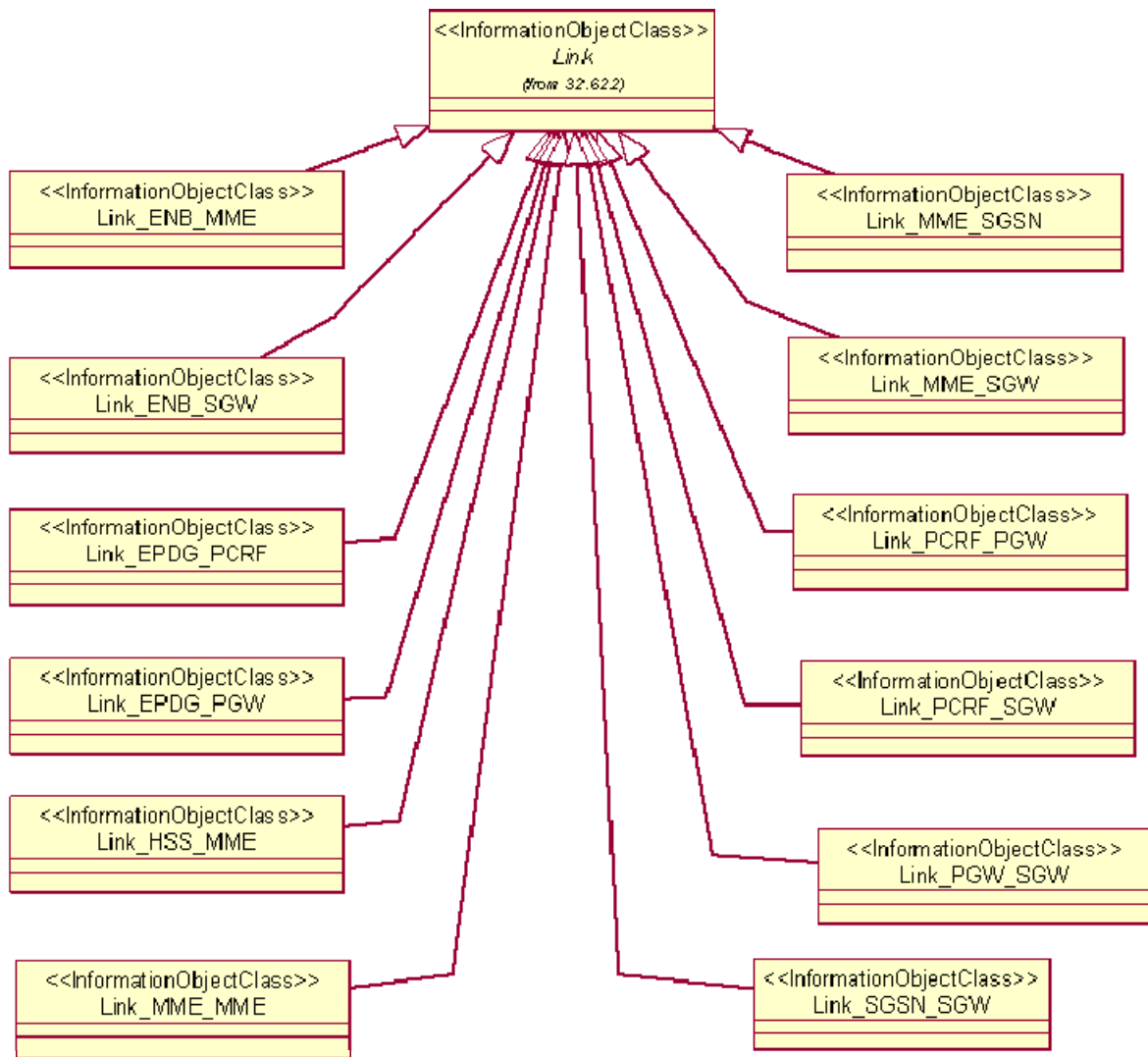
Figure 6.2.2.2: EPC NRM Inheritance Hierarchy_2
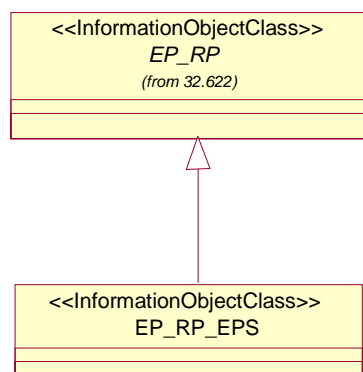
Figure 6.2.2.3: EPC NRM Inheritance Hierarchy_3

6.3 Information Object Class (IOC) definitions

6.3.1 EPDGFunction

6.3.1.1 Definition

This IOC represents ePDG functionality. For more information about the ePDG, see 3GPP TS 23.402 [12].

6.3.2 MMEFunction

6.3.2.1 Definition

This IOC represents MME functionality. For more information about the MME, see 3GPP TS 23.401 [9].

6.3.2.2 Attributes

| Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
id	M	M	-
pLMNIdList	M	M	-
mMEC	M	M	-
sGWAddress	CM	M	M
sGSNAddress	CM	M	M
mMEPool	M	M	-

6.3.2.3 Attribute constraints

The attribute sGWAddress is conditional mandatory (CM). When the MME using DNS for SGW IP address query, it is not needed, otherwise, it is mandatory.

The attribute sGSNAddress is conditional mandatory (CM). When the MME using DNS for SGSN IP address query, it is not needed, otherwise, it is mandatory.

6.3.3 PCRFFunction

6.3.3.1 Definition

This IOC represents PCRF functionality. For more information about the PCRF, see 3GPP TS 23.401 [9].

6.3.4 PGWFunction

6.3.4.1 Definition

This IOC represents PDN Gateway functionality. For more information about the PDN Gateway, see 3GPP TS 23.401 [9].

6.3.5 SGWFunction

6.3.5.1 Definition

This IOC represents Serving Gateway functionality. For more information about the Serving Gateway, see 3GPP TS 23.401 [9].

6.3.5.2 Attributes

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
id	M	M	-
pLMNIdList	M	M	-
tACList	M	M	-

6.3.6 MMEPool

6.3.6.1 Definition

This IOC represents MME Pool. For more information about the MME Pool, see 3GPP TS 23.401 [9].Key concepts related to MME Pool are:

- An MME Pool consists of one or more MME nodes. A particular node can be a member of one and only one MME Pool.

- One MME Pool serves at most one MME Pool Area. One MME Pool Area can be served by at most one MME Pool.

6.3.6.2 Attributes

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
id	M	M	-
mMEGI	M	M	-
mMEPoolMemberList	M	M	M
mMEPoolArea	M	M	M
adjacentMMEPools	M	M	M

6.3.6.3 Attribute constraints

None.

6.3.7 MMEPoolArea

6.3.7.1 Definition

This IOC represents MME Pool Area. For more information about the MME Pool Area, see 3GPP TS 23.401 [9]. Key concepts related to MME Pool Area are:

- An MME Pool Area is defined as an area within which an UE may be served without the need to change the serving MME. It is a collection of complete Tracking Areas (TAs).

- A particular TA can be a member of one or more MME Pool Areas. In the latter case, the MME Pool Areas involved are called "overlapping MME Pool Areas".

6.3.7.2 Attributes

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
id	M	M	-
mMEPool	M	M	M
tACList	M	M	M
pLMNIdList	O	M	-

6.3.7.3　Attribute constraints

None.

6.3.8　Link_ENB_MME

6.3.8.1　Definition

This IOC models the S1-MME reference point as defined in TS 23.401 [9].

6.3.9　Link_ENB_SGW

6.3.9.1　Definition

This IOC models the S1-U reference point as defined in TS 23.401 [9].

6.3.10　Link_EPDG_PCRF

6.3.10.1　Definition

This IOC models the Gxb reference point as defined in TS 23.402 [12].

6.3.11　Link_EPDG_PGW

6.3.11.1　Definition

This IOC models the S2b reference point as defined in TS 23.402 [12].

6.3.12　Link_HSS_MME

6.3.12.1　Definition

This IOC models the S6a reference point as defined in TS 23.401 [9].

6.3.13　Link_MME_MME

6.3.13.1　Definition

This IOC models the S10 reference point as defined in TS 23.401 [9].

6.3.14　Link_MME_SGSN

6.3.14.1　Definition

This IOC models the S3 reference point as defined in TS 23.401 [9].

6.3.15　Link_MME_SGW

6.3.15.1　Definition

This IOC models the S11 reference point as defined in TS 23.401 [9].

6.3.16 Link_PCRF_SGW

6.3.16.1 Definition

This IOC models the Gxc reference point as defined in TS 23.402 [12].

6.3.17 Link_PCRF_PGW

6.3.17.1 Definition

This IOC models the Gx reference point as defined in TS 23.401 [9].

6.3.18 Link_PGW_SGW

6.3.18.1 Definition

This IOC models the S5 reference point as defined in TS 23.401 [9].

6.3.19 Link_SGSN_SGW

6.3.19.1 Definition

This IOC models the S4 reference point as defined in TS 23.401 [9].

6.3.20 EP_RP_EPS

6.3.20.1 Definition

This IOC represents an end point of reference point in EPC as defined in TS 23.401 [9].

6.3.20.2 Attributes

Attribute Name	Support Qualifier	Read Qualifier	Write Qualifier
farEndNeIpAddr	O	M	CM

6.3.20.3 Attribute constraints

Name	Definition
farEndNeIpAddr's write qualifier	When the EP_RP_EPS object belongs to the different Domain Manager as the NE pointed by the farEndNeIpAddr attribute, the Write Qualifier of farEndNeIpAddr attribute is needed.

6.3.20.4 Notifications

The common notifications defined in subclause 6.1.6 of 3GPP TS 32.622[6] are valid for this IOC, without exceptions or additions.

6.3.21 ExternalSGWFunction

6.3.21.1 Definition

This IOC represents SGW functionality controlled by another IRPAgent. For more information about the SGW, see 3GPP TS 23.401 [9].

6.3.21.2 Attributes

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
id	M	M	-
pLMNIdList	M	M	M
tACList	M	M	M

6.3.22 `ExternalMMEFunction`

6.3.22.1 Definition

This IOC represents MME functionality controlled by another IRPAgent. For more information about the MME, see 3GPP TS 23.401 [9].

6.3.22.2 Attributes

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
id	M	M	-
pLMNIdList	M	M	M
mMEC	M	M	M
mMEPool	M	M	M

6.4 Information Relationship definitions

In this version of the present document there are no information relationship definitions.

6.5 Information Attribute definitions

6.5.1 Definition and legal values

Attribute Name	Definition	Legal Values
adjacentMMEPools	The DNs of the adjacent MMEPool instances.	
farEndNeIpAddr	The IP address(es) of the far end network entity to which the reference point is related. The IP address can be either IPv4 or IPv6.	
mMEC	MME Identifier (MMEI) is constructed from an MME Group ID (MMEGI) and an MME Code (MMEC). The MMEC is unique within the MME pool area and, if overlapping pool areas are in use, unique within the area of overlapping MME pools. (Ref. 3GPP TS 23.003[14])	
mMEGI	MME Identifier (MMEI) is constructed from an MME Group ID (MMEGI) and an MME Code (MMEC). The MMEGI is the unique identity of MME Pool within the context of PLMN. (Ref.3GPP TS 23.003[14]). Note: An UE, supported by a cell, can connect to one out of a group of MMEs. The group consists of the MMEs supporting the tracking area for the cell limited to those that are connected to the serving eNB. The MME is identified by the combination PLMNID-MMEGI-MMEC. The combination is called GUMMEI.	
mMEPool	It is the DN of a MMEPool instance.	
mMEPoolArea	It is the DN of a MMEPoolArea instance.	
mMEPoolMemberList	It is the list of DNs of MMEFunction instances of the MMEPool.	
pLMNIdList	It is a list of PLMN-Id, PLMN-Id= Mobile Country Codes (MCC)|| Mobile Network Codes(MNC) (Ref. 3GPP TS 23.003[14]) The MMEPoolArea.pLMNIdList purpose is to identify the PLMNs (related to MMEFunction) the MME Pool is serving. The MMEeunction.pLMNIdList purpose is as following. One operator may have several PLMN Ids and accordingly RAN broadcasts these Ids to enable UEs of different PLMN (i.e, UEs with different MNC in their IMSIs) to access its network. If CN node does not know this PLMN list, UEs of different PLMN than the one combined in MME might be treated as UEs from other operators. This will affect Location Update and Inter-MME handover procedures, and also the changing rate.	
sGWAddress	It is the Serving GW address, used to select the Serving GW. (Ref.3GPP TS 23.401[9]). This is an IPv4 or an IPv6 address.	
sGSNAddress	It is the SGSN address, used to select SGSN for handovers to 2G or 3G 3GPP access networks. (Ref.3GPP TS 23.401[9]). This is an IPv4 or an IPv6 address.	

`tACList`	It is the list of TAC of the `MMEPoolArea`. Note: A cell can only broadcast one TAC. See TS 36.300 v8.4.0 [16], section 10.1.7 (PLMNID and TAC relation). The Tracking Area Identity is constructed from the MCC (Mobile Country Code), MNC (Mobile Network Code) and TAC (Tracking Area Code). (Ref.3GPP TS 23.401[9])	

6.6   Common notifications

Name	Qualifier	Notes
`notifyAckStateChanged`	See Alarm IRP (3GPP TS 32.111-2 [3])	
`notifyAlarmListRebuilt`	See Alarm IRP (3GPP TS 32.111-2 [3])	
`notifyChangedAlarm`	See Alarm IRP (3GPP TS 32.111-2 [3])	
`notifyClearedAlarm`	See Alarm IRP (3GPP TS 32.111-2 [3])	
`notifyComments`	See Alarm IRP (3GPP TS 32.111-2 [3])	
`notifyNewAlarm`	See Alarm IRP (3GPP TS 32.111-2 [3])	
`notifyPotentialFaultyAlarmList`	See Alarm IRP (3GPP TS 32.111-2 [3])	
`notifyAttributeValueChange`	See Kernel CM IRP (3GPP TS 32.662 [13])	
`notifyObjectCreation`	See Kernel CM IRP (3GPP TS 32.662 [13])	
`notifyObjectDeletion`	See Kernel CM IRP (3GPP TS 32.662 [13])	

Annex A (informative):
Change history

Change history								
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Cat**	**Old**	**New**
Dec 2008	SP-42	SP-080752			Presentation to SA for information		---	1.0.0
Mar 2009	SP-43	SP-090071	--	--	Presentation to SA for approval	--	2.0.0	8.0.0
Jun 2009	SP-44	SP-090289	002	--	Add ExternalSGWFunction and attributes for SGWFunction (6.5.1 not deleted, due to editorial error in the CR).	F	8.0.0	8.1.0
Jun 2009	SP-44	SP-090289	001	--	Add ExternalMMEFunction and relations for MMEPools	F	8.0.0	8.1.0

History

Document history		
V8.0.0	April 2009	Publication
V8.1.0	July 2009	Publication