Technical Specification Group Services and System Aspects **TSGS#15(02)0034**
Meeting #15, Cheju Island, Korea, 11-14 March 2002

Source:	**SA5 (Telecom Management)**
Title:	**2 Rel-5 draft TSs v100 on Kernel Configuration Management IRP: 32.661 (Requirements) & 32.662 (Information Service) - for Information**
Document for:	**Information**
Agenda Item:	**7.5.3**

3GPP TSG-SA5 (Telecom Management) S5-020163
Meeting #26, Miami / FL, USA, 25 February - 1 March 2002

Presentation of Technical Specification to TSG SA

Presentation to:	**TSG SA Meeting #15**
Document for presentation:	**TS 32.661, Version 1.0.0, Kernel Configuration Management IRP: Requirements, and TS 32.662, Version 1.0.0, Kernel Configuration Management IRP: Information Service**
Presented for:	**Information**

Abstract of document: These are draft Stage One and Stage Two Specifications for the new Kernel Configuration Management IRP.

Work done against the WID contained in SP-010461 (Work Item ID: OAM-NIM).

Purpose of These Specifications:
This new IRP is intended for Release 5 and consist of the two specifications contained in this package and one or two Stage 3 Solution Set Specifications (CORBA or CMIP). The purpose of this specification is to provide the essential Configuration Management (CM) Capability that would be used together with either or both of the Basic CM IRP or Bulk CM IRP. As such the IRP takes some of its functionality from the current Release 4 Basic CM IRP and adds some new functionality.

Status of These Specifications:
The Requirements specification (32.661) is complete and ready **for Approval** as Release 5.
The Information Service (32.662) specification will require some minor updates when certain minor formatting issues that are common to several documents are resolved.

Outstanding Issues:
- There are no drafts of a Solution Set (either 32.663 CORBA or 32.664 CMIP) at this point in time.

Contentious Issues:
None.

3GPP TS 32.661 V1.0.0 (2002-03)

Technical Specification

3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; 3G Configuration Management: Kernel Configuration Management IRP: Requirements (Release 5)

Keywords
Configuration management

3GPP

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Contents

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Version x.y.z

where:

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  - 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

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 optimisation 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 defines, in addition to the requirements defined in [1], [2] and [3], the requirements for the present IRP: Kernel Configuration Management IRP. It is the intent of Kernel Configuration Management to provide an IRP that contains the configuration management functionality that is basic and minimal. It is the functionality that is common to and required by both Basic CM and Bulk CM. While neither the Basic CM IRP nor Bulk CM IRP requires the other, they each require the Kernel CM IRP.

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 32.600: "3G Configuration Management: Concept and High-level Requirements".

[4] 3GPP TS 32.622: "Generic Network Resources IRP: NRM".

[5] 3GPP TS 32.632: "Core Network Resources IRP: NRM".

[6] 3GPP TS 32.642: "UTRAN Network Resources IRP: NRM".

[7] 3GPP TS 32.652: "GERAN Network Resources IRP: NRM".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

Data: is any information or set of information required to give software or equipment or combinations thereof a specific state of functionality.

Element Manager (EM): provides a package of end-user functions for management of a set of closely related types of Network Elements (NEs). These functions can be divided into two main categories:

- *Element Management Functions* for management of NEs on an individual basis. These are basically the same functions as supported by the corresponding local terminals.
- *Sub-Network Management Functions* that are related to a network model for a set of NEs constituting a clearly defined sub-network, which may include relations between the NEs. This model enables additional functions on the sub-network level (typically in the areas of network topology presentation, alarm correlation, service impact analysis and circuit provisioning).

IRP: See 3GPP TS 32.101 [1].

IRP Information Model: See 3GPP TS 32.101 [1].

IRP Information Service: See 3GPP TS 32.101 [1].

IRP Solution Set: See 3GPP TS 32.101 [1].

Managed Object (MO): an abstract entity, which may be accessed through an open interface between two or more systems, and representing a Network Resource (NR) for the purpose of management. The Managed Object (MO) is an instance of a Managed Object Class (MOC) as defined in a Management Information Model (MIM). The MIM does not define how the MO or NR is implemented; only what can be seen in the interface.

Managed Object Class (MOC): a description of all the common characteristics for a number of MOs, such as their attributes, operations, notifications and behaviour.

Managed Object Instance (MOI): an instance of a MOC, which is the same as a MO as described above.

Management Information Base (MIB): the set of existing managed objects in a management domain, together with their attributes, constitutes that management domain's MIB. The MIB may be distributed over several OS/NEs.

Management Information Model (MIM): also referred to as NRM – see the definition below. There is a slight difference between the meaning of MIM and NRM – the term MIM is generic and can be used to denote any type of management model, while NRM denotes the model of the actual managed telecommunications Network Resources (NRs).

Network Element (NE): is a discrete telecommunications entity, which can be, managed over a specific interface e.g. the RNC.

Network Manager (NM): provides a package of end-user functions with the responsibility for the management of a network, mainly as supported by the EM(s) but it may also involve direct access to the NEs. All communication with the network is based on open and well-standardised interfaces supporting management of multi-vendor and multi-technology NEs.

Network Resource (NR): is a component of a NE, which can be identified as a discrete separate entity and is in an object oriented environment for the purpose of management represented by an abstract entity called Managed Object (MO).

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

Object Management Group (OMG): see http://www.omg.org.

Operations System (OS): indicates a generic management system, independent of its location level within the management hierarchy.

3.3 Abbreviations

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

CM	Configuration Management
CMIP	Common Management Information Protocol
CORBA	Common Object Request Broker Architecture
EM	Element Manager
FM	Fault Management
IRP	Integration Reference Point
IS	Information Service (see [1])
ITU-T	International Telecommunication Union, Telecommunication Standardisation Sector
MIB	Management Information Base
MIM	Management Information Model
MOC	Managed Object Class
MOI	Managed Object Instance
NE	Network Element
NM	Network Manager

NR	Network Resource
NRM	Network Resource Model
OMG	Object Management Group
OS	Operations System
PM	Performance Management
TM	Telecom Management
UML	Unified Modelling Language (OMG)
UMTS	Universal Mobile Telecommunications System

4 Requirements

4.1 General Requirements

This requirements specification defines requirements for the IS for this IRP. As such, capabilities specified here as being required in the IS are not necessarily required in the product implementation. That which is required in the product implementation will be specified in the IS itself.

The following general and high-level requirements apply for the present IRP:

A. IRP-related requirements in 3GPP TS 32.101: "3G Telecom Management principles and high level requirements" [1].

B. IRP-related requirements in 3GPP TS 32.102: "3G Telecom Management architecture" [2].

C. IRP-related requirements in 3GPP TS 32.600: "3G Configuration Management: Concept and High-level Requirements" [3].

In addition to the above, the following more specific requirements apply:

1. The IS defined by this IRP shall enable an NM to operate on (access) any of the NRMs defined in [4], [5], [6] and [7].

2. The IS defined by this IRP shall as far as possible be independent of any specific definitions of MOCs, attributes etc. in the NRMs referred to in item 1.

4.2 Kernel CM Requirements

The IS defined by this IRP shall include the following operations that may be invoked by the IRP Manager to retrieve management information from the IRPAgent:

- An operation to retrieve the IRP version(s) of the NRM Solution Sets that are supported by each Network Resource IRP present in the subject implementation.

The IS defined by this IRP shall include a notification capability by which the IRPAgent sends management information to the IRPManager whenever an event of a specific type occurs. Specifically, the following types of notifications shall be supported:

- A notification that identifies the instance of a managed object that was created
- A notification that identifies one or more instances of a managed object that were deleted.
- A notification that identifies the values of one or more attributes of a managed object instance that were changed.

Annex A (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Mar 2002	S_15	SP-020034	--	--	Submitted to TSG SA #15 for Information	1.0.0	

3GPP TS 32.662 V1.0.0 (2002-03)

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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 (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 defines a component of 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).

The function of this Kernel CM IRP Information Service is to define an interface that provides the basic CM services. While it is not expected that the Kernel CM IRP alone will provide adequate CM capability, The Kernel CM IRP is expected to provide the common supporting capability for other IRPs such as the Basic CM IRP or the Bulk CM IRP, each of which require the Kernel CM IRP.

2 References

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

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[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 32.302: "Telecommunication Management; Configuration Management; Part 2: Notification Integration Reference Point; Information Service".

[4] 3GPP TS 32.312: "Generic IRP Management: Information Service".

[5] Void

[6] Void

[7] ITU-T Recommendation X.710 (1997): "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] Void

[12] Void

[13] 3GPP TS 32.300: "Name Convention for Managed Objects".

[14] 3GPP TS 32.600: "3G Configuration Management: Concepts and requirements".

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 32.600 [14].

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

(1) name bindings,

(2) reference attributes, and

(3) association objects.

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

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. Furthermore, an MO class can have operations that represent the behaviour relevant for that

class. 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 3.1 depicts the relationships between a Name space and a number of participating MOs (the shown association is of a non-containment type)

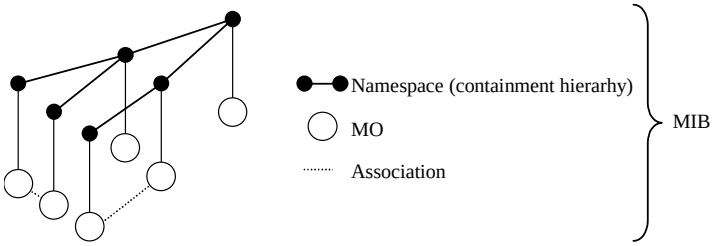


Figure 3.1: Relationships between a Name space and a number of participating MOs

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

Network Resource Model (NRM): A 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:

CMIP	Common Management Information Protocol
CMIS	Common Management Information Service
CN	Core Network
CORBA	Common Object Request Broker Architecture
DN	Distinguished Name (see 3GPP TS 32.300 [13])
EM	Element Manager
FM	Fault Management
IDL	Interface Definition Language
IRP	Integration Reference Point
ITU-T	International Telecommunication Union, Telecommunication Sector
ME	Managed Element
MIB	Management Information Base
MIM	Management Information Model

MO	Managed Object
MOC	Managed Object Class
MOI	Managed Object Instance
NE	Network Element
NM	Network Manager
NR	Network Resource
NRM	Network Resource Model
PM	Performance Management
RDN	Relative Distinguished Name (see 3GPP TS 32.300 [13])
SNMP	Simple Network Management Protocol
SS	Solution Set
TMN	Telecommunications Management Network
UML	Unified Modelling Language
UMTS	Universal Mobile Telecommunications System

4 System overview

4.1 System context

Figure 4.1 and Figure 4.2 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: IS. The IRPAgent can be an Element Manager (EM) or a mediator that interfaces one or more NEs (see Figure 4.1), or it can be a Network Element (NE) (see Figure 4.2). 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.

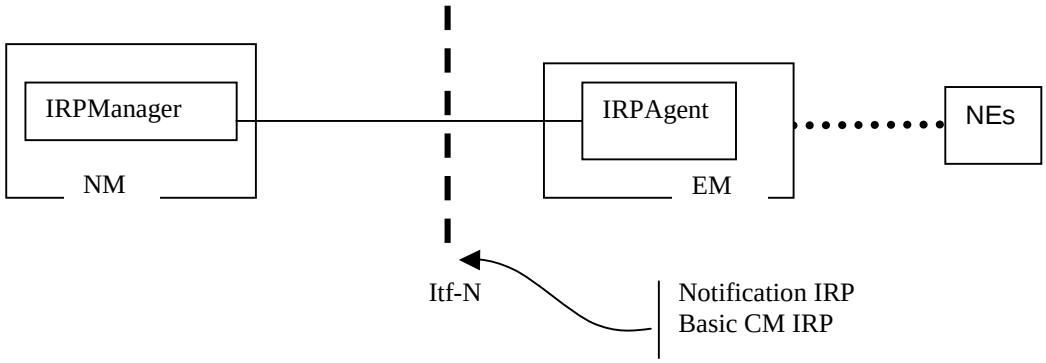


Figure 4.1: System Context A

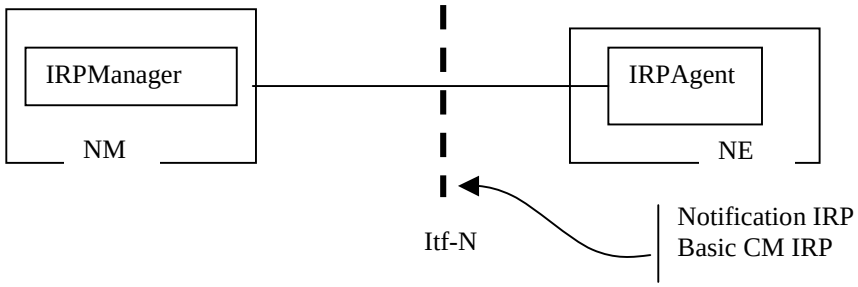


Figure 4.2: System Context B

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].

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 described in 3GPP TS 32.101 [1], an IRP comprises the following components:

(1) an IRP Information Model that specifies the interface in a protocol neutral manner, defined as an Information Service and/or one or more Network Resource Models,

(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.

The present document defines one such Information Service – the Basic CM IRP: IS.

The IRP Information Service is a specification of the *operations* and *notifications* that are visible over the IRP. These operations/notifications are generic in the sense that they do not specify the Managed Objects that are retrieved/manipulated/informed about over the interface, and thus this IS is independent of the NRM being managed.

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.
A 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 a CORBA Solution Set should map the operations to applicable OMG/CORBA services.

6 Information Object Classes

6.1 Imported Information entities and local labels

Label reference	Local label
32.622, information object class, `Top`	`Top`
32.622, information object class, `IRPAgent`	`IRPAgent`
32.622, information object class, `GenericIRP`	`GenericIRP`
32.312, information object class, `ManagedGenericIRP`	`ManagedGenericIRP`

6.2 Class diagram

This sub-clause introduces the set of information object classes (IOCs) that encapsulate information within the `IRPAgent`. The intent is to identify the information required for the KernelCmIRP Agent implementation of its operations and notification emission. This sub-clause provides the overview of all support object classes in UML. Subsequent sub-clauses provide more detailed specification of various aspects of these support object classes.

6.2.1 Attributes and relationships

Editor's Note: The UML in this specification will be updated with regard to UML conventions after the related methodology has been agreed to. The agreement to reflect IRPAgent as containing KernelCmIRP will also be included at that time.

6.2.2 Inheritance

6.3 Information Object Class Definitions

6.3.1 KernelCmIRP

6.3.1.1 Definition

`KernelCmIRP` is the representation of the Kernel configuration management capabilities specified by this specification. This IOC inherits from `ManagedGenericIRP` IOC specified in TS 32.312.

6.3.2 ManagedEntity

6.3.2.1 Definition

The IOC `ManagedEntity` represents the role that can be played by an instance of an IOC defined in Network Resources Models, e.g. Generic Network Resource Model, Core Network Resource Model, UTRAN Network Resource Model or GERAN Network Resource Model.

Editors Note: Attributes of ManagedEntity will be referenced in Matching Information specifications later in this document. These attributes are not actually defined in the managed objects represented by the information object ManagedEntity. Therefore, following the example of the Alarm IRP (which is supposed to be the definitive new methodology reference) which references similar attributes of MonitoredObject, these attributes are not defined in this section (Section 6).

6.4 Information relationships definitions

6.4.1 containment (M)

6.4.1.1 Definition

This represents the relationship containment as defined in ITU-T Rec X.720 [].

6.4.1.2 Role

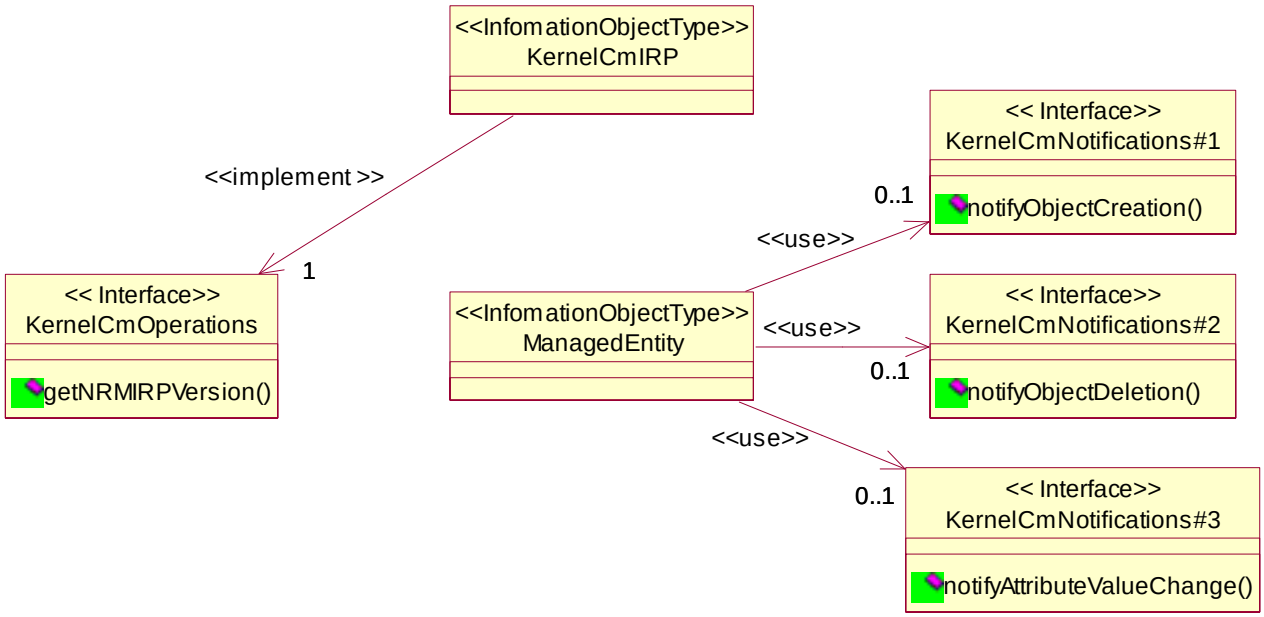
Name	Definition
`container`	It represents the capability, for an instance of a ManagedEntity, to contain other objects.
`content`	It represents the capability, for an instance of a ManagedEntity, to be contained in another object.

6.4.1.3 Constraint

Name	Definition
`inv_noSelfContainment`	No instance of the IOC `ManagedEntity` can play both roles `container` and `content` in the same instance of the relationship `containment`.

7 Interface Definition

7.1 Class diagram



7.2 Generic rules

Rule 1: Each operation with at least one input parameter supports a pre-condition valid_input_parameter which indicates that all input parameters shall be valid with regards to their information type. Additionally, each such operation supports an exception operation_failed_invalid_input_parameter which is raised when pre-condition valid_input_parameter is false. The exception has the same entry and exit state.

Rule 2: Each operation with at least one optional input parameter supports a set of pre-conditions supported_optional_input_parameter_xxx where "xxx" is the name of the optional input parameter and the pre-condition indicates that the operation supports the named optional input parameter. Additionally, each such operation supports an exception operation_failed_unsupported_optional_input_parameter_xxx which is raised when (a) the pre-condition supported_optional_input_parameter_xxx is false and (b) the named optional input parameter is carrying information. The exception has the same entry and exit state.

Rule 3: Each operation shall support a generic exception operation_failed_internal_problem that is raised when an internal problem occurs and that the operation cannot be completed. The exception has the same entry and exit state.

7.3 Interface KernelCmIRPOperations

7.3.1 Operation `getNRMIRPVersion` (M)

7.3.1.1 Definition

The IRPManager wishes to find out the NRM SS versions supported by the IRPAgent. The IRPAgent shall respond with a list of supported NRM SS IRPversion(s). The list of returned NRM SS IRP versions (**IRP document version number string** of, i.e., TS 32.311) carried in the output parameter `versionNumberList`, indicates the 3GPP specified NRM SS IRPVersions. An example of this return value can contain two IRPVersions, where one indicates the 3GPP Generic NRM IRP Version while the other indicates the 3GPP UTRAN NRM IRP Version.

It is expected that vendors may provide vendor-specific extended capabilities and features (VSE) that are based on a 3GPP published specification. It is further expected that the vendor will publish these VSE in a document with an unambiguous identification.

If an IRPAgent does not support VSE, the `vSEVersionNumberList` parameter shall contain no information.

If an IRPAgent supports VSE, the `vSEVersionNumberList` parameter shall contain identification of one or more documents published by the vendor. The `versionNumberList` shall contain the IRPVersions indicating the 3GPP SS specifications on which the VSE is based.

The convention to identify the vendor-specific document is not a subject of this specification. It is recommended that (a) the name of the vendor and (b) the identification of the document and (c) its version number are part of this identification. The inclusion of the part-(a) is to avoid possible name conflict in a multi-vendor environment. An example would be “TS 32.642 V4.0 Ericsson v.1”. This sample indicates the identification of a document published by Ericsson that specifies a list of VSE that is based on the 3GPP 32.642 V4.0.x”.

The lists returned by `versionNumberList` and `vSEVersionNumberList` shall not contain duplicates.

7.3.1.2 Input parameters

None

7.3.1.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
`versionNumberList`	M	ManagedGenericIRP.iRPVersion	It carries one or more SS version numbers supported by the IRP.

Parameter Name	Qualifier	Matching Information	Comment
vSEVersionNumberList	M	ManagedGenericIRP.iRPVersion	It carries one or more identifications of vendor published documents containing VSE NRMs specifications.
status	M	ENUM (Operation succeeded, Operation failed)	If operation_failed_internal_problem status = OperationFailed.

7.3.1.4 Pre-condition

None specific

7.3.1.5 Post-condition

None specific

7.3.1.6 Exceptions

None specific

7.4 Interface KernelCmIRPNotifications#1

7.4.1 notifyObjectCreation (O)

7.4.1.1 Definition

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 32.302 [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).

7.4.1.2 Input Parameters

Parameter Name	Qualifier	Matching Information	Comment
objectClass	M,F	ManagedEntity.objectClass	Notificaton header - see [3].
objectInstance	M,F	ManagedEntity.objectInstance.	Notificaton header - see [3].
notificationId	M	This carries the semantics of notification identifier.	Notificaton header - see [3]. **Editor's Note:** This is mandatory in Alarm IRP but previously optional for CM?
eventTime	M,F	ManagedEntity.creationTime	Notificaton header - see [3].
systemDN	C,F	IRPAgent.systemDN where the IRPAgent is related to the KernelCmIRP.	Notificaton header - see [3].
notificationType	M,F	Mapped to notificationType in [3] – see Annex A	Notificaton header - see [3].
correlatedNotifications	O	See comment.	A set of notifications that are correlated to the subject notification. Defined in ITU-T X.733 [10]..
additionalText	O	Text.	It can contain further information on the creation of the MO.
sourceIndicator	O	ENUM(Resource_operation, Management_operation,	This parameter, when present, indicates the source of the operation that led to the generation of this notification. It can

Parameter Name	Qualifier	Matching Information	Comment
		Unknown)	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	O	LIST OF SEQUENCE <AttributeName, AttributeValue>	The attributes (name/value pairs) of the created MO.

Note: F in the Qualifier column denotes a Filterable Parameter.

Editor's Note: The F qualifier is used for the same parameters in the Alarm IRP (the methodology reference) but a definition of F could not be found. The editor is assuming that F denotes filterable. Should other attributes be designated as filterable?

7.4.1.3 Triggering Event

7.4.1.3.1 From-state

stateBeforeObjectCreation.

Assertion Name	Definition
stateBeforeObjectCreation	The number of instances of the IOC ManagedEntity is equal to N.

7.4.1.3.2 To-state

stateAfterObjectCreation.

Assertion Name	Definition
stateAfterObjectCreation	The number of instances of the IOC ManagedEntity is equal to N + 1.

7.5 Interface KernelCmIRPNotifications#2

7.5.1 notifyObjectDeletion (O)

7.5.1.1 Definition

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 32.302 [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).

Note that when a Managed Object is deleted, all subordinate Managed Objects (i.e. the complete sub-tree of the MIB) are also deleted. Furthermore, all associations where the Managed Object participates are deleted.

7.5.1.2 Input Parameters

Parameter Name	Qualifier	Matching Information	Comment
objectClass	M,F	ManagedEntity.objectClass	Notificaton header - see [3].
objectInstance	M,F	ManagedEntity.distinguishedName.	Notificaton header - see [3].
notificationId	M	This carries the semantics of notification identifier.	Notificaton header - see [3]. **Editor's Note:** This is mandatory in Alarm IRP but previously optional for CM?
eventTime	M,F	ManagedEntity.deletionTime	Notificaton header - see [3].
systemDN	C,F	IRPAgent.systemDN where the IRPAgent is related to the KernelCmIRP.	Notificaton header - see [3].
notificationType	M,F	Mapped to notificationType in [3] – see Annex A	Notificaton header - see [3].
correlatedNotifications	O	See comment	A set of notifications that are correlated to the subject notification. Defined in ITU-T X.733 [10]..
additionalText	O	Text	It can contain further information on the deleted MO.
sourceIndicator	O	ENUM(Resource_operation, Management_operation, Unknown)	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	O	LIST OF SEQUENCE <AttributeName, AttributeValue>	The attributes (name/value pairs) of the deleted MO.

Note: F in the Qualifier column denotes a Filterable Parameter.

7.5.1.3 Triggering Event

7.5.1.3.1 From-state

stateBeforeObjectDeletion.

Assertion Name	Definition
StateBeforeObjectDeletion	The number of instances of the IOC ManagedEntity is equal to N.

7.5.1.3.2 To-state

stateAfterObjectDeletion.

Assertion Name	Definition
stateAfterObjectDeletion	The number of instances of the IOC ManagedEntity is equal to N - 1.

7.6 Interface KernelCmIRPNotifications#3

7.6.1 notifyAttributeValueChange (O)

7.6.6.1 Definition

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 32.302 [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).

7.6.6.2 Input Parameters

Parameter Name	Qualifier	Matching Information	Comment
objectClass	M,F	ManagedEntity.objectClass	Notificaton header - see [3].
objectInstance	M,F	ManagedEntity.distinguishedName.	Notificaton header - see [3].
notificationId	M	This carries the semantics of notification identifier.	Notificaton header - see [3]. **Editor's Note:** This is mandatory in Alarm IRP but previously optional for CM?
eventTime	M,F	ManagedEntity. AttributeValueChangedTime	Notificaton header - see [3].
systemDN	C,F	IRPAgent.systemDN where the IRPAgent is related to the KernelCmIRP.	Notificaton header - see [3].
notificationType	M,F	Mapped to notificationType in [3] – see Annex A	Notificaton header - see [3].
correlatedNotifications	O	See comment	A set of notifications that are correlated to the subject notification. Defined in ITU-T X.733 [10].
additionalText	O	Text.	It can contain further information on the attribute change of the MO.
sourceIndicator	O	ENUM(Resource_operation, Management_operation, Unknown)	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;

Parameter Name	Qualifier	Matching Information	Comment
			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	M	LIST OF SEQUENCE <AttributeName, NewAttributeValue, CHOICE [NULL, OldAttributeValue]>	The changed attributes (name/value pairs) of the MO (with both new and, optionally, old values).

Note: F in the Qualifier column denotes a Filterable Parameter.

7.6.6.3 Triggering Event

7.6.6.3.1 From-state

stateBeforeAttributeValueChange.

Assertion Name	Definition
stateBeforeAttributeValueChange	

7.6.6.6.2 To-state

stateAfterAttributeValueChange.

Assertion Name	Definition
stateAfterAttributeValueChange	

Annex A (normative): Notification/Event Types

Notification IRP: Information Service [3] defines an attribute called `notificationType` that shall be present in all notifications. This document defines an attribute called `eventType` that shall be present in all CM notifications defined herein. The mapping of this `eventType` to the `notificationType` is that they are semantically equal for the CM notifications. Thus, the event types described below (also the same as in Release 99) shall be mapped to the `notificationType` of the notification header.

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

Encoding of `eventType` 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 A.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 A.2: Event types applicable to each Notification

Notification	Event Type
notifyObjectCreation	Object creation
notifyObjectDeletion	Object deletion
notifyAttributeValueChange	Attribute value change

Annex B (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
Mar 2002	S_15	SP-020034	--	--	Submitted to TSG SA #15 for Information	1.0.0	