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*Technical Specification*

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**Universal Mobile Telecommunications System (UMTS);**
**Telecommunication management;**
**Configuration Management (CM);**
**Basic CM Integration Reference Point (IRP):**
**Information service**
**(3GPP TS 32.602 version 4.3.0 Release 4)**

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# Foreword

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# Contents

# Foreword

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

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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 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.

Due to the growing number of specifications to model new services and Resource Models for Configuration Management (CM), as well as the expected growth in size of each of them from 3GPP Release 4 onwards, a new structure of the specifications is already needed in Release 4. This structure is needed for several reasons, but mainly to enable more independent development and release for each part, as well as a simpler document identification and version handling. Another benefit would be that it becomes easier for bodies outside 3GPP, such as the ITU-T, to refer to telecom management specifications from 3GPP. The new structure of the specifications does not lose any information or functionality supported by the Release 1999. The restructuring also includes defining new IRPs for the Network Resource Models (Generic, Core Network and UTRAN NRM).

Finally, the Name convention for Managed Objects (in Release 1999: 32.106-8) has been moved to a separate number series used for specifications common between several management areas (e.g. CM, FM, PM).

The following table shows an overview of the mapping between the old Release 1999 and new Release 4 CM specification structure.

**Table: Mapping between Release '99 and the new Rel-4 specifications**

| R99 Old no. | Old (R99) specification title | Rel-4 New no. | New (Rel-4) specification title |
|---|---|---|---|
| 32.106-1 | 3G Configuration Management: Concept and Requirements | 32.600 | **3G Configuration Management**: **Concept and High-level Requirements** |
| 32.106-1 | <Notification IRP requirements from 32.106-1 and 32.106-2> | 32.301 | **Notification IRP**: Requirements |
| 32.106-2 | Notification IRP: IS | 32.302 | Notification IRP: Information Service |
| 32.106-3 | Notification IRP: CORBA SS | 32.303 | Notification IRP: CORBA SS |
| 32.106-4 | Notification IRP: CMIP SS | 32.304 | Notification IRP: CMIP SS |
| 32.106-8 | Name convention for Managed Objects | 32.300 | **Name Convention for Managed Objects** |
| 32.106-1 | <Basic CM IRP IS requirements from 32.106-1 and 32.106-5> | 32.601 | **Basic CM IRP**: Requirements |
| 32.106-5 | Basic CM IRP IM (Intro & IS part) | 32.602 | Basic CM IRP: Information Service |
| 32.106-6 | Basic CM IRP CORBA SS (IS related part) | 32.603 | Basic CM IRP: CORBA SS |
| 32.106-7 | Basic CM IRP CMIP SS (IS related part) | 32.604 | Basic CM IRP: CMIP SS |
| 32.106-1 | <Basic CM IRP Generic NRM requirements from 32.106-1 and 32.106-5> | 32.621 | **Generic Network Resources IRP**: Requirements |
| 32.106-5 | Basic CM IRP IM (Generic NRM part) | 32.622 | Generic Network Resources IRP: NRM |
| 32.106-6 | Basic CM IRP CORBA SS (Generic NRM related part) | 32.623 | Generic Network Resources IRP: CORBA SS |
| 32.106-7 | Basic CM IRP CMIP SS (Generic NRM related part) | 32.624 | Generic Network Resources IRP: CMIP SS |
| 32.106-1 | <Basic CM IRP CN NRM requirements from 32.106-1 and 32.106-5> | 32.631 | **Core Network Resources IRP**: Requirements |
| 32.106-5 | Basic CM IRP IM (CN NRM part) | 32.632 | Core Network Resources IRP: NRM |
| 32.106-6 | Basic CM IRP CORBA SS (CN NRM related part) | 32.633 | Core Network Resources IRP: CORBA SS |
| 32.106-7 | Basic CM IRP CMIP SS (CN NRM related part) | 32.634 | Core Network Resources IRP: CMIP SS |
| 32.106-1 | <Basic CM IRP UTRAN NRM requirements from 32.106-1 and 32.106-5> | 32.641 | **UTRAN Network Resources IRP**: Requirements |
| 32.106-5 | Basic CM IRP IM (UTRAN NRM part) | 32.642 | UTRAN Network Resources IRP: NRM |
| 32.106-6 | Basic CM IRP CORBA SS (UTRAN NRM related part) | 32.643 | UTRAN Network Resources IRP: CORBA SS |
| 32.106-7 | Basic CM IRP CMIP SS (UTRAN NRM related part) | 32.644 | UTRAN Network Resources IRP: CMIP SS |

# 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).

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 Configuration Management (CM) area is very large. The intention is to split the specification of the related interfaces in several IRPs – as described in the Introduction clause above. An important aspect of such a split is that the Network Resource Models (NRMs) defined in different IRPs containing NRMs are consistent, and that NRMs supported by an IRPAgent implementation can be accessed as one coherent model through one IRP Information Service. The Basic CM IRP: IS defined herein provides one such Information Service.

Thus, to summarize, the Basic CM IRP: IS defined in the present document has the following main purpose: to define an interface for retrieval of Configuration Management information.

# 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.

[1] 3GPP TS 32.101: "Telecommunication management; Principles and high level requirements".

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

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

[4] 3GPP TS 32.312: "Telecommunication management; Generic Integration Reference Point (IRP) management; Information Service (IS)".

[5] - [6] Void.

[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] - [12] Void.

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

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

# 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)

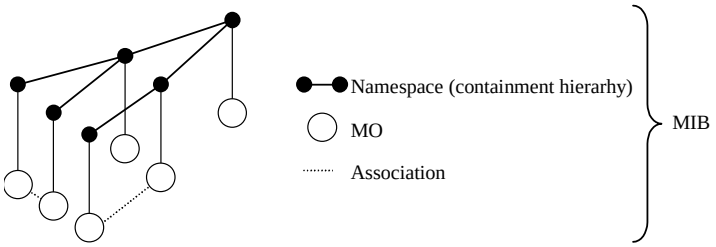


**Figure 3.1: Relationships between a Name space and a number of participating MOs**

**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 NE can be managed via System Context A or B. The criterion for choosing System Context A or B to manage a particular NE is implementation dependent. An IRPAgent shall support one of the two System Contexts. By observing the interaction across the Itf-N, an IRPManager cannot deduce if the EM and NE are integrated in a single system or if they run in separate systems.

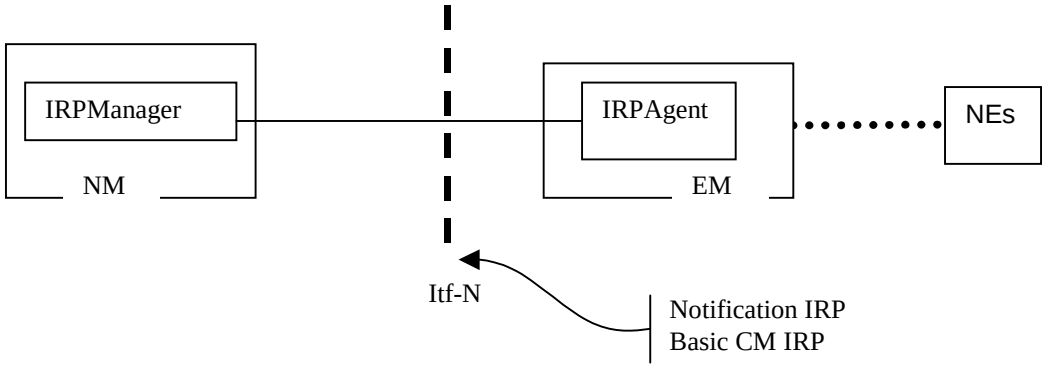


**Figure 4.1: System Context A**

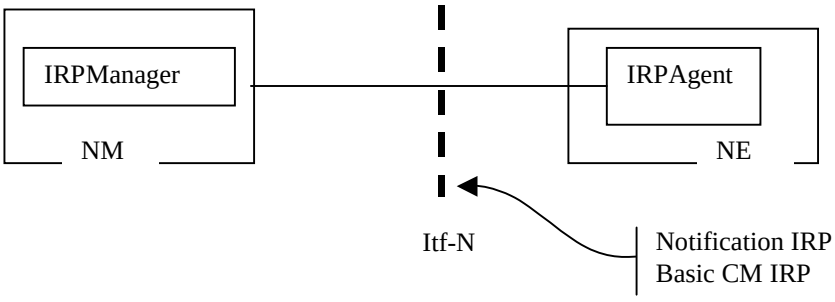


**Figure 4.2: System Context B**

## 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 Recommendation X.710 [7] and ITU-T Recommendation 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 Recommendation X.710 [7]/ITU-T Recommendation 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 IRP Information Service

This clause 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.

## 6.1 Interfaces

Figure 6.1 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.

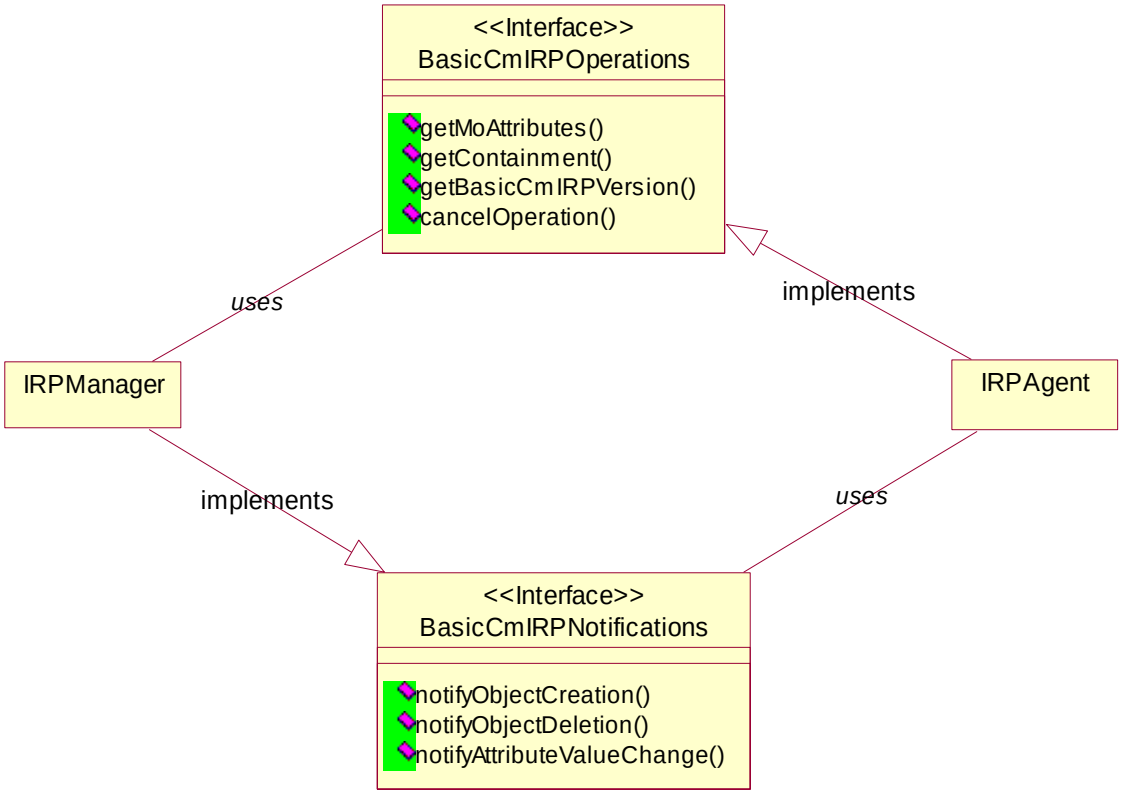


**Figure 6.1: UML Interface Class Diagram**

# 6.2 Operations

## 6.2.1 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 Recommendation 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 |
|---|---|---|
| invokeIdentifierIn | Input, C | This parameter identifies the current invocation in both IRPManager and IRPAgent. This parameter can be used together with the "cancelOperation" operation to cancel an on-going "getMOAttributes" operation. |
| baseObjectInstance | Input, M | The MO where the search starts. This is a full Distinguished Name according to 3GPP TS 32.300 [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:<br>the base object alone (default);<br>the n-th level subordinates of the base object;<br>the base object and all of its subordinates down to and including the n-th level;<br>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.<br>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 the current version, 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. |
| invokeIdentifierOut | Output, M | This parameter identifies the current invocation in both IRPManager and IRPAgent. This parameter can be used together with the "cancelOperation" operation to cancel an on-going "getMOAttributes" operation. |
| 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 32.300 [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<br>(b) Operation failed because of specified or unspecified reason. |

### 6.2.2 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 |
|---|---|---|
| invokeIdentifierIn | Input, C | This parameter identifies the current invocation in both IRPManager and IRPAgent. This parameter can be used together with the "cancelOperation" operation to cancel an on-going "getContainment" operation. |
| baseObject Instance | Input, M | The MO where the search starts. This is a full Distinguished Name according to 3GPP TS 32.300 [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.<br>The levels of inclusion that may be performed are:<br>the base object alone (default);<br>the n-th level subordinates of the base object;<br>the base object and all of its subordinates down to and including the n-th level;<br>the base object and all of its subordinates. |
| invokeIdentifierOut | Output, M | This parameter identifies the current invocation in both IRPManager and IRPAgent. This parameter can be used together with the "cancelOperation" operation to cancel an on-going "getContainment" operation. |
| containment | Output, M | A list of DN of all Managed Object instances that satisfy the scope. |
| status | Output, M | (a) Operation succeeded, or<br>(b) Operation failed because of specified or unspecified reason. |

### 6.2.3 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.<br>The IRP document version number (sometimes called 'IRPVersion' or 'version number') string is used to identify which specification version(s) an implementation is conformant to. Each string in this set is derived using a rule described in the 'Generic IRP' 3GPP TS 32.312 [4]. |
| status | Output, M | (a) Operation succeeded in that versionNumberList contains valid result.<br>(b) Operation failed. Output parameter versionNumberList may contain invalid result. |

### 6.2.4 Operation `cancelOperation` (O)

IRPManager invokes this operation to cancel an on-going Basic CM IRP operation it issued before. Presently the Basic CM IRP operations that can be cancelled by invoking "cancelOperation" are "getMOAttributes" and "getContainment".

**Table 4: Parameters of `cancelOperation`**

| Name | Qualifier | Description |
|---|---|---|
| invokeIdentifier | Input, M | This parameter identifies an on-going Basic CM IRP operation to be cancelled. |
| status | Output, M | (a) Operation succeeded.<br>(b) Operation failed because of specified or unspecified reason. |

# 6.3 Notifications

## 6.3.1 General

Operations that IRPManager uses to manage subscription to receive notifications are specified in Notification IRP IS 3GPP TS 32.302 [3]. Notification IRP IS [3] does not define any specific notification but instead defines information that is commonly found in notifications defined by other IRPs. This information is called notificationHeader.

Thus, the commonly carried attributes in each notification are collectively called `notificationHeader` in the present document. The attribute names and their qualifiers are listed in Table 4.

**Table 4: Notification Header**

| Attributes defined in 3GPP TS 32.302 [3] | Comment | Qualifier for use in this IS |
|---|---|---|
| managedObjectClass | (mapped to objectClass in [3]) | M |
| managedObjectInstance | (mapped to objectInstance in [3]) | M |
| notificationId | | O |
| eventTime | | M |
| systemDN | | C |
| eventType | (mapped to notificationType in [3] – see Annex A) | M |

The following clauses define specific notifications relevant for Basic CM IRP.

## 6.3.2 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 32.302 [3]). This notification is based on the `objectCreation` notification type specified in ITU-T Recommendation X.721 [8] and ITU-T Recommendation X.730 [9] (difference compared to these specifications are indicated in the description below).

**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 Recommendation 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:<br>resource operation: The notification was generated in response to an internal operation of the resource;<br>management operation: The notification was generated in response to a management operation applied across the managed object boundary external to the managed object;<br>unknown: It is not possible to determine the source of the operation. |
| attributeList | Input, O | The attributes (name/value pairs) of the created MO. |

## 6.3.3 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 32.302 [3]). This notification is based on the `objectDeletion` notification type specified in ITU-T Recommendation X.721 [8] and ITU-T Recommendation 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.

**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 Recommendation 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:<br>resource operation: The notification was generated in response to an internal operation of the resource;<br>management operation: The notification was generated in response to a management operation applied across the managed object boundary external to the managed object;<br>unknown: It is not possible to determine the source of the operation. |
| attributeList | Input, O | The attributes (name/value pairs) of the deleted MO. |

## 6.3.4 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 32.302 [3]). This notification is based on the `attributeValueChange` notification type specified in ITU-T Recommendation X.721 [8] and ITU-T Recommendation 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 Recommendation 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:<br>resource operation: The notification was generated in response to an internal operation of the resource;<br>management operation: The notification was generated in response to a management operation applied across the managed object boundary external to the managed object;<br>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). |

# 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 following tables 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 Recommendation X.721 [8] and ITU-T Recommendation X.730 [9]). |
| Object deletion | A notification of this type indicates that a managed object instance has been deleted (as defined in ITU-T Recommendation X.721 [8] and ITU-T Recommendation 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 Recommendation X.721 [8] and ITU-T Recommendation 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** |
| Jun 2001 | S_12 | SP-010283 | -- | -- | New document 32.602 based on 32.106-5 V3.1.0<br>Approved at TSG SA #12 and placed under Change Control | 2.0.0 | 4.0.0 |
| Sep 2001 | S_13 | SP-010476 | 001 | -- | Replace the current parameter invokeIdentifier with the two parameters invokeIdentifierIn and invokeIdentifierOut in the operations getMoAttributes() and getContainment() | 4.0.0 | 4.1.0 |
| Dec 2003 | S_22 | SP-030630 | 004 | -- | Correction of System Context | 4.1.0 | 4.2.0 |
| Mar 2004 | S_23 | SP-040119 | 006 | -- | Correction of System Context | 4.2.0 | 4.3.0 |
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# History

| Document history | | |
|---|---|---|
| V4.0.0 | June 2001 | Publication |
| V4.1.0 | September 2001 | Publication |
| V4.2.0 | December 2003 | Publication |
| V4.3.0 | March 2004 | Publication |
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