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Technical Specification

3rd Generation Partnership Project;

Technical Specification Group Services and System Aspects;

Telecommunication management;  
Configuration Management (CM);

Kernel CM Information Service (IS)

(Release 16)

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# 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:

32.661 Configuration Management (CM); Kernel CM Requirements

**32.662 Configuration Management (CM); Kernel CM Information Service (IS)**

32.666: Configuration Management (CM); Kernel CM Integration Reference Point (IRP); Solution Set (SS) definitions

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 , 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 Integration Reference Point (IRP) through which an 'IRPAgent' (typically an Element Manager or Network Element) can communicate 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 essential 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 required 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.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

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

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

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

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

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

[5] Void.

[6] 3GPP TS 32.672: "Telecommunication management; Configuration Management (CM); State Management Integration Reference Point (IRP): Information Service (IS)".

[7] ITU-T Recommendation X.710 (1997): "Information technology - Open Systems Interconnection - Common Management Information Service".

[8] ITU-T Recommendation X.721 (1992): "Information technology - Open Systems Interconnection - Structure of Management Information: Definition of management information".

[9] ITU-T Recommendation X.730 (1992): "Information technology - Open Systems Interconnection - Systems Management: Object Management Function".

[10] ITU-T Recommendation X.733 (1992): "Information technology - Open Systems  
Interconnection - Systems Management: 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".

[15] ITU-T Recommendation X.720: "Information technology - Open Systems Interconnection - Structure of management information: Management information model".

[16] Void.

[17] Void.

[18] Void.

[19] 3GPP TS 32.150: "Telecommunication management; Integration Reference Point (IRP) Concept and definitions".

[20] 3GPP TS 32.311: "Telecommunication management; Generic Integration Reference Point (IRP) management: Requirements.

[21] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[22] 3GPP TS 28.622: "Telecommunication management; Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [21], 3GPP TS 32.101 [1], 3GPP TS 32.102 [2] and 3GPP TS 32.600 [14] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [21], 3GPP TS 32.101 [1], 3GPP TS 32.102 [2] and 3GPP 32.600 [14].

**association:** In general it is used to model relationships between Managed Objects.

NOTE 1: Associations can be implemented in several ways, such as:

1) name bindings,

2) reference attributes, and

3) association objects.

NOTE 2: 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 Object (MO):** software object that encapsulates the manageable characteristics and behaviour of a particular network resource.

NOTE 3: 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.

NOTE 4: an MIB consists of:

1) a Name space (describing the MO containment hierarchy in the MIB through Distinguished Names),

2) a number of Managed Objects with their attributes, and

3) a number of Associations between these MOs. Also note that TMN (ITU-T Recommendation X.710 [7]) defines a concept of a Management Information Tree (also known as a Naming Tree) that corresponds to the name space (containment hierarchy) portion of this MIB definition. Figure 3.1 depicts the relationships between a Name space and a number of participating MOs (the shown association is of a non-containment type).



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

**Name space:** A name space is a collection of names.

NOTE 5: The IRP name convention (see 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 are 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**: See definition in TS 28.622 [22].

**Network Resource Model (NRM)**: See definition in TS 28.622 [22].

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [21] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [21].

DN Distinguished Name (see TS 32.300 [13])

MO Managed Object

MOC Managed Object Class

MOI Managed Object Instance

PM Performance Management

RDN Relative Distinguished Name (see TS 32.300 [13])

SS Solution Set

VSE Vendor Specific Extensions

# 4 System overview

## 4.1 System Context

The general definition of the System Context for the present IRP is found in 3GPP TS 32.150 [19] subclause 4.7.

In addition, the set of related IRP(s) relevant to the present IRP is shown in the two diagrams below.



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 TS 32.150 [19].

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 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

See 3GPP TS 32.150 [19].

# 6 Information Object Classes (IOCs)

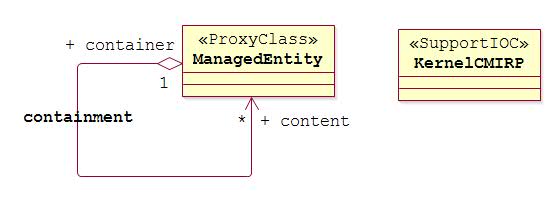
## 6.1 Imported Information entities and local labels

|  |  |
| --- | --- |
| Label reference | Local label |
| 32.312 [4], SupportIOC, ManagedGenericIRP | ManagedGenericIRP |

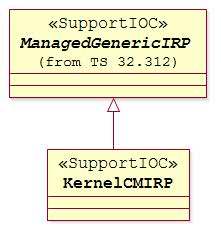
## 6.2 Class diagram

This sub-clause introduces the set of Support Information Object Classes (SupportIOCs) 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 SupportIOCs in UML. Subsequent sub-clauses provide more detailed specification of various aspects of these SupportIOCs.

### 6.2.1 Attributes and relationships



### 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 the present document. This SupportIOC inherits from ManagedGenericIRP SupportIOC specified in TS 32.312 [4].

### 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.

## 6.4 Information relationship definitions

### 6.4.1 containment (M)

#### 6.4.1.1 Definition

This represents the relationship containment as defined in ITU-T Recommendation X.720 [15].

#### 6.4.1.2 Role

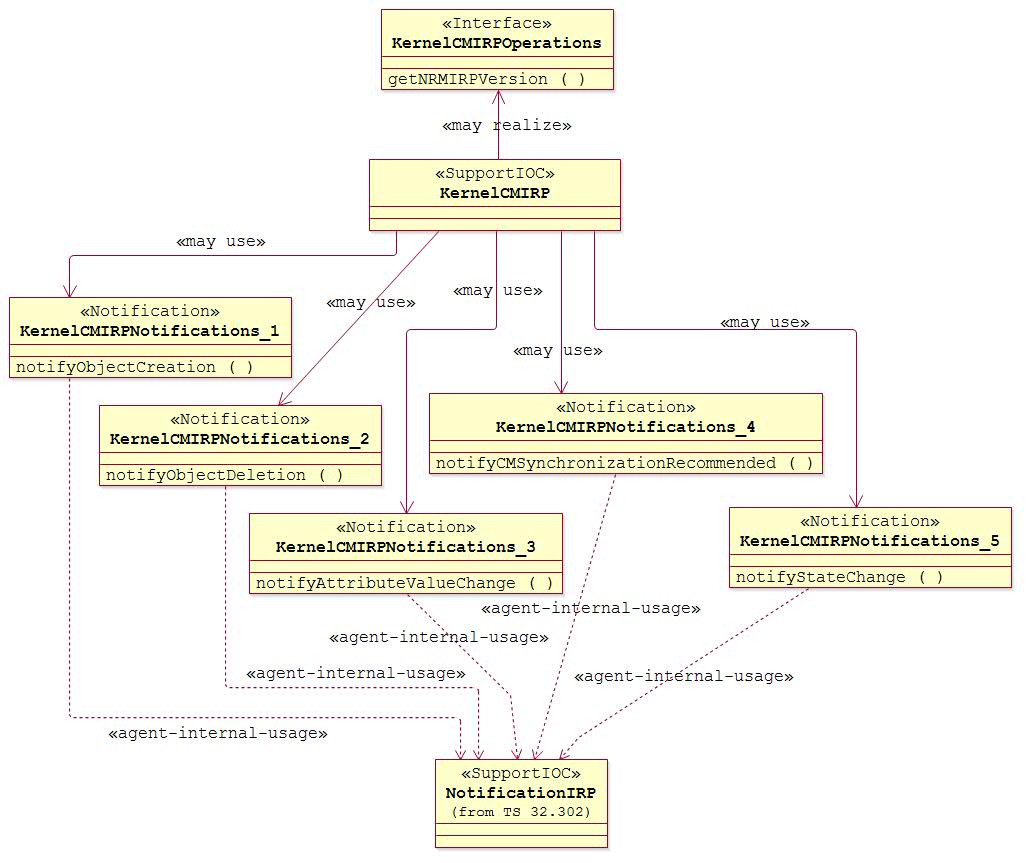
|  |  |
| --- | --- |
| Name | Definition |
| container | It represents the capability, for an instance of a ManagedEntity, to contain other objects. |
| content | It represents the capability, for an instance of a ManagedEntity, to be contained in another object. |

#### 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

When the IRPManager invokes getNRMIRPVersion to find out the Network Resource IRP SS documentversions (IRPVersions) supported by the IRPAgent, the IRPAgent shall respond, via the versionNumberList output parameter, with a list of supported Network Resource IRPversions. The rule for deriving the IRP document version number string is defined in TS 32.311 [20]. An example of this return value can contain two IRPVersions, where one indicates the 3GPP Generic Network Resource IRPVersion (e.g. "32.623 V4.2" in case of CORBA implementation) while the other indicates the 3GPP UTRAN Network Resource IRPVersion (e.g. "32.643 V4.1" in case of CORBA implementation).

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 Network Resource IRP specifications on which the VSE is based. The versionNumberList may only identify IRPVersions that are consistent with the requirements of clause 4.2 of the present document and similar requirements statements in all CM and Network Resource IRPs. The convention to identify the vendor-specific document is not a subject of the present document. It is recommended that the identification should include (a) the 3GPP IRPVersion on which the VSE is based (b) the name of the vendor and (c) the identification of the VSE document and/or its version. The inclusion of the part-(b) is to avoid possible name conflict in a multi-vendor environment. An example would be "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 TS 32.642 V4.0.x. Note in this example, the IRPVersion "32.642 V4.0" shall also be present in the versionNumberList.

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 this IRP agent. |
| 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 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).

#### 7.4.1.2 Input Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter Name | Qualifier | Matching Information | Comment |
| objectClass | M,Y | ManagedEntity.objectClass | Notification header - see [3]. It shall carry the ManagedEntity class name. |
| objectInstance | M,Y | ManagedEntity.objectInstance | Notification header - see [3]. It shall carry the DN of the ManagedEntity. |
| notificationId | M,N | -- | Notification header - see [3]. |
| eventTime | M,Y | -- | Notification header - see [3]. It shall carry the ManagedEntity creation time. |
| systemDN | C,Y | -- | Notification header - see [3]. |
| notificationType | M,Y | Mapped to notificationType in [3] – see annex A. | Notification header - see [3]. |
| correlatedNotifications | O,N | -- | A set of notifications that are correlated to the subject notification. Defined in  ITU-T Recommendation X.733 [10]. |
| additionalText | O,N | -- | It can contain further information in text on the creation of the MO. For notifications with sourceIndicator=SON\_operation information about the involved SON functionality (like self-configuration, self-optimization, self-healing etc.) may be added here, if available. |
| sourceIndicator | O,N | ENUM(  Resource\_operation,  Management\_operation,  SON\_operation,Unknown) | 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:   1. resource operation: The notification was generated in response to an internal operation of the resource; 2. management operation: The notification was generated in response to a management operation applied across the managed object boundary external to the managed object; 3. SON operation: The notification was generated as result of a SON (Self Organising Network) process like self-configuration, self-optimization, self-healing etc. . 4. unknown: It is not possible to determine the source of the operation.   Remark: An IRPAgent may not in any case be aware that SON operation lead to the generation of this generation. In this case another value than SON\_operation for sourceIndicator might be sent. |
| attributeList | O,N | LIST OF SEQUENCE <AttributeName, AttributeValue> | The attributes (name/value pairs) of the created MO. |

#### 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 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.

#### 7.5.1.2 Input Parameters

| Parameter Name | Qualifier | Matching Information | Comment |
| --- | --- | --- | --- |
| objectClass | M,Y | ManagedEntity.objectClass | See Table 7.4.1.2. |
| objectInstance | M,Y | ManagedEntity.objectInstance | See Table 7.4.1.2. |
| notificationId | M,N | -- | See Table 7.4.1.2. |
| eventTime | M,Y | -- | Notification header – see [3]. It shall carry the ManagedEntity deletion time. |
| systemDN | C,Y | -- | See Table 7.4.1.2. |
| notificationType | M,Y | Mapped to notificationType in [3] – see annex A. | See Table 7.4.1.2. |
| correlatedNotifications | O,N | -- | See Table 7.4.1.2. |
| additionalText | O,N | -- | See Table 7.4.1.2. |
| sourceIndicator | O,N | See Table 7.4.1.2. | See Table 7.4.1.2. |
| attributeList | O,N | LIST OF SEQUENCE <AttributeName, AttributeValue> | The attributes (name/value pairs) of the deleted MO. |

#### 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 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 the following table).

#### 7.6.6.2 Input Parameters

| Parameter Name | Qualifier | Matching Information | Comment |
| --- | --- | --- | --- |
| objectClass | M,Y | ManagedEntity.objectClass | See Table 7.4.1.2. |
| objectInstance | M,Y | ManagedEntity.objectInstance | See Table 7.4.1.2. |
| notificationId | M,N | -- | See Table 7.4.1.2. |
| eventTime | M,Y | -- | Notification header - see [3]. It shall carry the attribute(s) value(s) changed time. |
| systemDN | C,Y | -- | See Table 7.4.1.2. |
| notificationType | M,Y | Mapped to notificationType in [3] – see annex A. | See Table 7.4.1.2. |
| correlatedNotifications | O,N | -- | See Table 7.4.1.2. |
| additionalText | O,N | -- | See Table 7.4.1.2. |
| sourceIndicator | O,N | See Table 7.4.1.2. | See Table 7.4.1.2. |
| attributeValueChange | M,N | LIST OF SEQUENCE <AttributeName, NewAttributeValue,  CHOICE [NULL, OldAttributeValue]> | The changed attributes (name/value pairs) of the MO (with both new and, optionally, old values). |

#### 7.6.6.3 Triggering Event

##### 7.6.6.3.1 From-state

stateBeforeAttributeValueChange.

|  |  |
| --- | --- |
| Assertion Name | Definition |
| stateBeforeAttributeValueChange | The subject attribute has a value at time T1. |

##### 7.6.6.3.2 To-state

stateAfterAttributeValueChange.

|  |  |  |
| --- | --- | --- |
| Assertion Name | Definition | |
| stateAfterAttributeValueChange | | The subject attribute has been changed to a value other than the value at time T1. |

## 7.7 Interface KernelCmIRPNotifications\_4

### 7.7.1 notifyCMSynchronizationRecommended (O)

#### 7.7.1.1 Definition

IRPAgent notifies the subscribed IRPManager that part of or whole configuration information of the IRPAgent should be synchronized.

The configuration information may lose consistency between IPRAgent and IRPManager for several reasons, such as communication failure, NE or EM restarting/initialisation, new network elements being added into networks, etc. In such cases, the configuration information should be synchronized between IRPManager and IRPAgent. Normally, when there are changes in IRPAgent, these changes are sent to IRPManager through notifications like "notifyObjectCreation", "notifyObjectDeletion" or "notifyObjectAttributeValueChange". If there are large changes generated in the network, it may be inefficient to send lots of notifications to IRPManager through Itf-N. The notification "notifyCMSynchronizationRecommended" is used in this case to efficiently inform the IRPManager of large changes in CM.

In all cases, the baseMOClass, baseMOInstance and scope parameters specify the set of managed network resources whose information should be synchronized.

The recommendation is to send only this notifyCMSynchronizationRecommended notification in such event as described above, but there is no guarantee that the IRPAgent succeeds in suppressing all the other CM notifications related to MOs defined by the baseMOClass, baseMOInstance and scope parameters.

If the IRPAgent suppresses any of "notifyObjectCreation", "notifyObjectDeletion" or "notifyObjectAttributeValueChange", the IRPManager must subscribe the "notifyCMSynchronizationRecommended" in order to be aware of the changes.

Whenever notifications are suppressed, "notifyCMSynchronizationRecommended" must follow as early as possible.

#### 7.7.1.2 Input Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter Name | Qualifier | Matching Information | Comment |
| objectClass | M,Y | KernelCMIRP.objectClass | Notification header - see [3]. It shall carry the KernelCMIRP class name. |
| objectInstance | M,Y | KernelCMIRP.objectInstance | Notification header - see [3]. It shall carry the DN of the KernelCMIRP |
| notificationId | M,N | -- | See Table 7.4.1.2. |
| eventTime | M,Y | -- | Notification header - see [3]. It shall carry the time when KernelCMIRP is recommending synchronization. |
| systemDN | C,Y | -- | See Table 7.4.1.2. |
| notificationType | M,Y | Mapped to notificationType in [3] – see annex A | See Table 7.4.1.2. |
| baseMOClass | M,N | -- | It specifies the class of the root managed entity of a whole subtree, of which the configuration information should be synchronized by NM. |
| baseMOInstance | M,N | -- | It specifies the root managed entity of a whole subtree, of which the configuration information should be synchronized by NM. |
| scope | M,N | enum ScopeType  {  BASE\_ONLY,  BASE\_NTH\_LEVEL,  BASE\_SUBTREE,  BASE\_ALL  };  struct ScopePara  {  ScopeType type;  unsigned long level;  }; | The scope specifies the number of levels in the tree below the baseMOinstance which are affected by this notification. |
| additionalText | O,N | -- | It can contain further information in text on this notification. |

#### 7.7.1.3 Triggering Event

##### 7.7.1.3.1 From-state

iRPAgentInitialisation OR largeChangesDetected

|  |  |
| --- | --- |
| Assertion Name | Definition |
| iRPAgentInitialisation | The IPRAgent begins its internal initialisation and subsequently requires synchronization with the network resources. |
| largeChangesDetected | The IRPAgent has detected that large changes has taken place in the network, which requires synchronization with the network resources. |

##### 7.7.1.3.2 To-state

iRPAgentSuccessEmitNotification

|  |  |
| --- | --- |
| Assertion Name | Definition |
| iRPAgentSuccessEmitNotification | IRPAgent finished emitting notifyCMSynchronizationRecommended notification. |

## 7.8 Interface KernelCmIRPNotifications\_5

### 7.8.1 notifyStateChange (O)

#### 7.8.1.1 Definition

IRPAgent notifies the subscribed IRPManager of a change of state and or status 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 in part based on the stateChange notification type specified in ITU-T Recommendation X.721 [8] and using state management definitions from 3GPP TS 32.672 [6].

#### 7.8.1.2 Input parameters

| Parameter Name | Qualifier | Matching Information | Comment |
| --- | --- | --- | --- |
| objectClass | M,Y | ManagedEntity.objectClass | See Table 7.4.1.2. |
| objectInstance | M,Y | ManagedEntity.objectInstance | See Table 7.4.1.2. |
| notificationId | M, N | -- | See Table 7.4.1.2. |
| eventTime | M,Y | -- | Notification header - see [3]. It shall carry the ManagedEntity state changed time. |
| systemDN | C,Y | -- | See Table 7.4.1.2. |
| notificationType | M,Y | Mapped to notificationType in [3] – see annex A | See Table 7.4.1.2. |
| stateChange | M,N | LIST OF SEQUENCE  <StateName (M),  NewStateValue (M),  OldStateValue (O)> | The changed state values (name/value pairs) of the MO (with both new and, optionally, old values). |
| correlatedNotifications | O,N | -- | See Table 7.4.1.2. |
| additionalText | O,N | -- | It can contain further information in text on the attribute change of the MO. |
| sourceIndicator | O,N | See Table 7.4.1.2 | See Table 7.4.1.2. |

#### 7.8.1.3 Triggering Event

##### 7.8.1.3.1 From-state

stateBeforeStateChange.

|  |  |
| --- | --- |
| Assertion Name | Definition |
| stateBeforeStateChange | The subject attribute has a value at time T1. |

##### 7.8.1.3.2 To-state

stateAfterStateChange.

|  |  |
| --- | --- |
| Assertion Name | Definition |
| stateAfterStateChange | The subject attribute has been changed to a value other than the value at time T1. |

Annex A (normative):  
Notification/Event Types

The Notification IRP: Information Service (3GPP TS 32.302 [3]) defines an attribute called notificationType that shall be present in all notifications. The present 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 shall be mapped to the notificationType of the notification header.

This annex lists and explains Event Types used by Kernel 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 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 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]). |
| CM synchronization recommended | A notification of this type informs NM that part of or the whole configuration information of the managed system should be synchronized. |
| State change | A notification of this type indicates that the state and/or status of a managed object instance have changed (in part based on definitions from X.721 [8] and using state/status definitions from 3GPP TS 32.672 [6]). |

Table A.2: Event types applicable to each Notification

|  |  |
| --- | --- |
| Notification | Event Type |
| notifyObjectCreation | Object creation |
| notifyObjectDeletion | Object deletion |
| notifyAttributeValueChange | Attribute value change |
| notifyCMSynchronizationRecommended | CM synchronization recommended |
| notifyStateChange | State change |

Annex B (informative):  
Change history

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | | |
| **Date** | **TSG #** | **TSG Doc.** | **CR** | **Rev** | **Subject/Comment** | **Cat** | **Old** | **New** |
| Mar 2002 | SA\_15 | SP-020034 | -- | -- | Submitted to TSG SA #15 for Information | -- | 1.0.0 |  |
| Sep 2002 | SA\_17 | SP-020465 | -- | -- | Submitted to TSG SA #17 for Approval | -- | 2.0.0 | 5.0.0 |
| Mar 2003 | SA\_19 | SP-030145 | 0001 | -- | Add description of notifyCMSynchronizationRecommended notification for KernelCM IRP. | B | 5.0.0 | 6.0.0 |
| Dec 2003 | SA\_22 | SP-030630 | 0003 | -- | Correction of System Context | A | 6.0.0 | 6.1.0 |
| Mar 2004 | SA\_23 | SP-040119 | 0005 | -- | Correction of System Context | A | 6.1.0 | 6.2.0 |
| Jun 2004 | SA\_24 | SP-040260 | 0006 | -- | Add State Management Support to Kernel CM IRP IS 32.662 | B | 6.2.0 | 6.3.0 |
| Jun 2005 | SA\_28 | SP-050299 | 0007 | -- | Apply Generic System Context | F | 6.3.0 | 6.4.0 |
| Jun 2005 | SA\_28 | SP-050329 | 0008 | -- | Apply Generic System Context – Align with TS 32.150 | F | 6.3.0 | 6.4.0 |
| Sep 2005 | SA\_29 | SP-050461 | 0009 | -- | Correct return value for the operation getNRMIRPVersion | F | 6.4.0 | 6.5.0 |
| Mar 2006 | SA\_31 | SP-060089 | 0010 | -- | Use defined filter qualifier in mapping tables | F | 6.5.0 | 6.6.0 |
| Jun 2007 | SA\_36 | -- | -- | -- | Automatic upgrade to Rel-7 (no CR) at freeze of Rel-7. Deleted reference to CMIP SS, discontinued from R7 onwards. | -- | 6.6.0 | 7.0.0 |
| Dec 2008 | SA\_42 | SP-080845 | 0013 | -- | Add missing definitions re notifyAttributeValueChange and notifyStateChange triggering event | F | 7.0.0 | 7.1.0 |
| Dec 2008 | SA\_42 | -- | -- | -- | Upgrade to Release 8 | -- | 7.1.0 | 8.0.0 |
| Mar 2009 | SA\_43 | SP-090207 | 0014 | -- | Indicating Self-X in create-/delete-/change-notifications | F | 8.0.0 | 8.1.0 |
| Sep 2009 | SA\_45 | SP-090534 | 0015 | -- | Remove inconsistency of sourceIndicator definition at notifyStateChange | F | 8.1.0 | 8.2.0 |
| Dec 2009 | - | - | - | - | Update to Rel-9 version | -- | 8.2.0 | 9.0.0 |
| 2011-03 | - | - | - | - | Update to Rel-10 version (MCC) |  | 9.0.0 | 10.0.0 |
| 2012-09 | - | - | - | - | Update to Rel-11 version (MCC) |  | 10.0.0 | **11.0.0** |
| 2012-12 | SA\_58 | SP-120783 | 0017 | - | Align usage of SupportIOC with repertoire and TS 32.152 | F | 11.0.0 | **11.1.0** |
| 2014-10 | - | - | - | - | Update to Rel-12 version (MCC) |  | 11.1.0 | **12.0.0** |
| 2016-01 | - | - | - | - | Update to Rel-13 version (MCC) |  | 12.0.0 | **13.0.0** |
| 2017-04 | SA#75 | - | - | - | Promotion to Release 14 without technical change |  | 13.0.0 | **14.0.0** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2018-06 |  |  |  |  |  | Update to Rel-15 version (MCC) | 15.0.0 |
| 2019-09 | SA#85 | SP-190752 | 0018 | - | F | Correction of NR definition to avoid misalignment with RAN2 | 15.1.0 |
| 2020-07 | - | - | - | - | - | Update to Rel-16 version (MCC) | **16.0.0** |