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Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Configuration Management (CM);
Notification Integration Reference Point (IRP);
Information Service (IS)
(3GPP TS 32.302 version 16.0.0 Release 16)**



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Foreword

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

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

32.301: Configuration Management (CM); Notification Integration Reference Point (IRP): Requirements

32.302: Configuration Management (CM); Notification Integration Reference Point (IRP): Information Service (IS)

32.303: Configuration Management (CM); Notification Integration Reference Point (IRP): Common Object Request Broker Architecture (CORBA) Solution Set (SS)

32.305: Configuration Management (CM); Notification Integration Reference Point (IRP): eXtensible Markup Language (XML) definition

32.307: Configuration Management (CM); Notification Integration Reference Point (IRP): Simple Object Access Protocol (SOAP) Solution Set (SS)

The Itf-N interface is built up by a number of Integration Reference Points (IRPs) and a related Name Convention, which realise the functional capabilities over this interface. The basic structure of the IRPs is defined in 3GPP TS 32.101 [5] and 3GPP TS 32.102 [6].

Network Elements (NEs) under management and element managers generate notifications of events about occurrences within the network. Different kinds of events carry different kinds of information. For instance a new alarm as specified in Alarm IRP: Information Service [1], is one possible kind of event, an object creation as specified in Basic CM IRP: Information Service [8] is another possible kind of event.

Information of an event is carried in notification. An IRPAgent (typically an EM or a NE) emits notifications. IRPManager (typically a network management system) receives notifications. The purpose of Notification IRP is to define an interface through which an IRPManager can subscribe to IRPAgent for receiving notifications.

This IRP bases its design on work captured in ITU-T Recommendation X.734 [2], OMG Notification Service [4]. The central design ideas are:

- Separation of notification Consumers (IRPManagers) from Producers (IRPAgents);

- Notifications are sent to IRPManagers without the need for IRPManagers to periodically check for new notifications.

Common characteristics related to notifications in all other IRPs are gathered in one IRP.

1 Scope

The purpose of Notification IRP is to define an interface through which an IRPManager can subscribe to an IRPAgent for receiving notifications. The present document is the "Information Service" of Notification IRP. It defines, for the purpose of subscribing to an IRPAgent for receiving notifications, the information observable and controlled by management system's client and it also specifies the semantics of the interactions used to carry this information. It also defines the information common to all notifications which is called the notificationHeader.

An IRPAgent supporting this IRP IS may emit one or multiple categories of notifications, such as alarms (as specified in Alarm IRP: Information Service [1]) and others. This IRP IS defines a mechanism that IRPManager can use to determine the categories of notifications supported by an IRPAgent. It also defines a mechanism (subscribe and unsubscribe operations) that IRPManager can use to specify the categories of notifications IRPAgent should emit to IRPManager during subscription. It also defines a mechanism (getSubscriptionIds operation) that IRPManager can use to check which categories of notifications it has subscribed to. IRPManager can set and change filter criteria applicable during the life-cycle of a subscription. IRPManager can also exercise flow-control on IRPAgent's emission of notifications (suspendSubscription and resumeSubscription operations).

Using different managerReference, an IRPManager can subscribe several times. It will result in multiple subscriptions. As far as IRPAgent is concerned, notifications are sent to multiple "places".

Using the same managerReference, an IRPManager can subscribe several times specifying different categories of notifications.

This IRP IS does not specify information that is carried in some but not all notifications. That kind of information is specified in other IRP ISs involved. For example, perceivedSeverity is a piece of information specific for notifications carrying alarm information. This information is not defined in the present document but in Alarm IRP: Information Service [1].

How IRPManager discovers the IRPAgent's address or reference (so that IRPManager can invoke an operation) is outside the scope of the present document.

This IRP IS is aligned with ITU-T M.3702 [13] in terms of the definitions of operations for Notification management.

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 32.111-2: "Telecommunication management; Fault Management; Part 2: Alarm Integration Reference Point (IRP): Information Service (IS)".
- [2] ITU-T Recommendation X.734 (1992): "Information technology - Open Systems Interconnection - Systems management: Event report management function".
- [3] 3GPP TS 32.300: "Telecommunication management; Configuration Management (CM); Name convention for Managed Objects".
- [4] Void
- [5] 3GPP TS 32.101: "Telecommunication management; Principles and high level requirements".

- [6] 3GPP TS 32.102: "Telecommunication management; Architecture".
- [7] 3GPP TS 32.301: "Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP): Requirements".
- [8] 3GPP TS 32.602: "Telecommunication management; Configuration Management (CM); Basic CM Integration Reference Point (IRP): Information Service (IS)".
- [9] Void.
- [10] 3GPP TS 32.312: "Telecommunication management; Generic Integration Reference Point (IRP) management: Information Service (IS)".
- [11] 3GPP TS 32.311: "Telecommunication management; Generic Integration Reference Point (IRP) management: Requirements".
- [12] 3GPP TS 32.150: "Telecommunication management; Integration Reference Point (IRP) Concept and definitions".
- [13] ITU-T M.3702 (01/2012): "Telecommunication Management, Including TMN and Network Maintenance; Integrated services digital networks; Common management services – Notification management – Protocol neutral requirements and analysis".
- [14] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [14], 3GPP TS 32.101 [5], 3GPP TS 32.102 [6] and 3GPP TS 32.301 [7] 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 [14], 3GPP TS 32.101 [5], 3GPP TS 32.102 [6] and 3GPP TS 32.301 [7].

IRPAgent: See 3GPP TS 32.102 [6].

IRPManager: See 3GPP TS 32.102 [6].

event: it is an occurrence that is of significance to network operators, the NEs under surveillance and network management applications

Events can indicate many types of network management information, such as network alarms, network configuration change information and network performance data.

notification: it refers to the transport of information regarding events from event producer to consumer (receiver) In this IRP, notification is used to carry information about network events from IRPAgent to IRPManager. Producer sends notifications to consumers as soon as new events occur. Consumer does not need to check ("pull") for events.

IRP: See 3GPP TS 32.102 [6].

notification category: The semantics and syntax of the notification category string are identical to that defined for "IRP document version number string", see 3GPP TS 32.311 [11] subclause 3.1.

qualifiers: the meaning of qualifiers for operations, parameters and information attributes (whether they are Mandatory(M)/ Conditional(C)/ Optional(O)) defined in the present (Information Service) document is provided in 3GPP TS 32.102 [6].

Moreover, qualifiers of information attributes, when those information attributes are re-used in other IRP ISs, obey to the following rule: Mandatory and Conditional qualifiers of information attributes shall always be the same in other IRPs ISs, Optional qualifiers of information attributes may be set to either Optional or Mandatory in the other IRP ISs.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [14] 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 [14].

CM	Configuration Management
DN	Distinguished Name
IOC	Information Object Class
NM	Network Manager
SS	Solution Set

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 [12] subclause 4.7.

In addition, the set of related IRP(s) relevant to the present IRP is shown in figure 1 and figure 2.

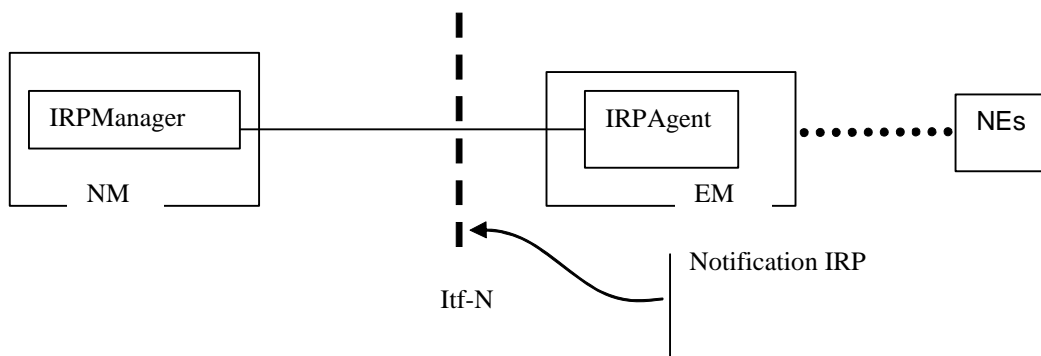


Figure 1: System Context A

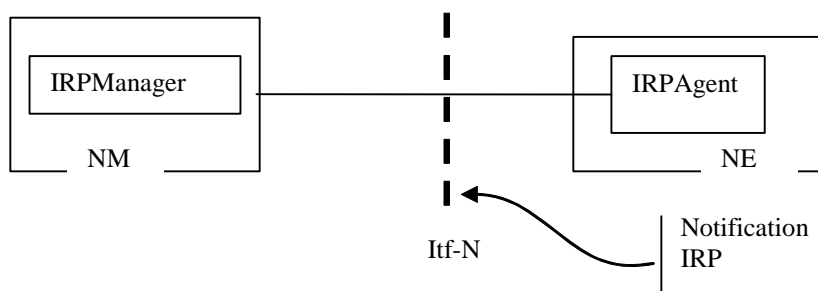


Figure 2: System Context B

5 Information Object Classes

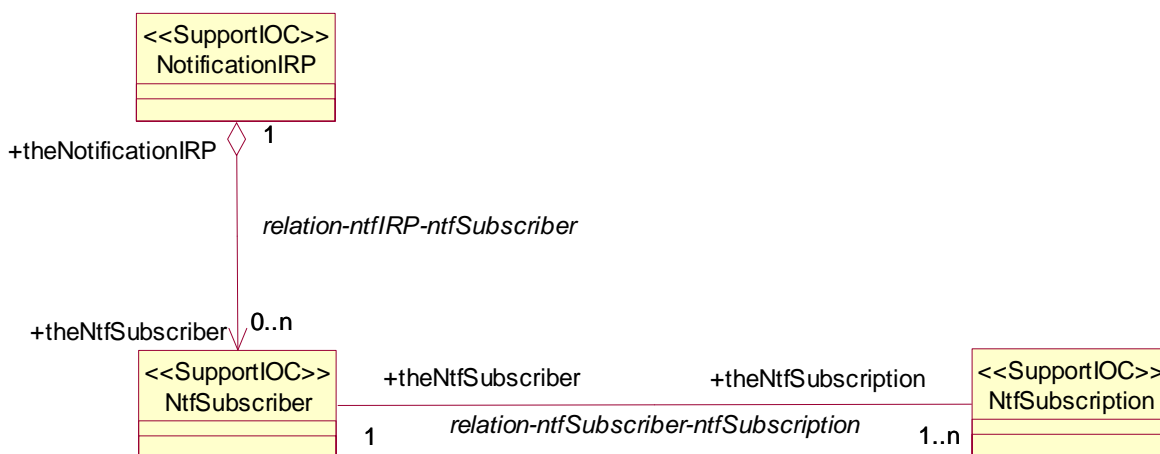
5.1 Imported information entities and local labels

Label reference	Local label
3GPP TS 32.312 [10], Support IOC, ManagedGenericIRP	ManagedGenericIRP

5.2 Class Diagram

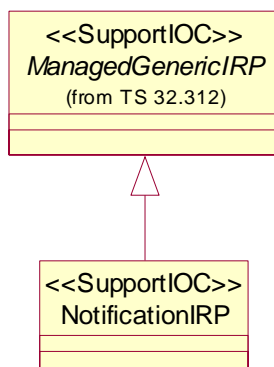
5.2.1 Attributes and relationships

This subclause depicts the set of Support IOCs that encapsulate information within the notification IRP. The intent is to identify the information required for the notification IRP implementation of its operations and notification emission. This subclause provides the overview of all Support IOCs in UML. Subsequent subclauses provide more detailed specification of various aspects of these Support IOCs.



5.2.2 Inheritance

This subclause depicts the inheritance relationships that exist between Support IOCs.



5.3 Information object classes definition

5.3.1 NtfSubscriber

5.3.1.1 Definition

This Support IOC represents a Subscriber from a notification IRP perspective : a subscriber is fully identified by a manager reference. An IRPManager using multiple managerReference attributes to subscribe will result in multiple NtfSubscriber instances.

5.3.1.2 Attributes

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
ntfManagerReference	M	M	M

5.3.2 NtfSubscription

5.3.2.1 Definition

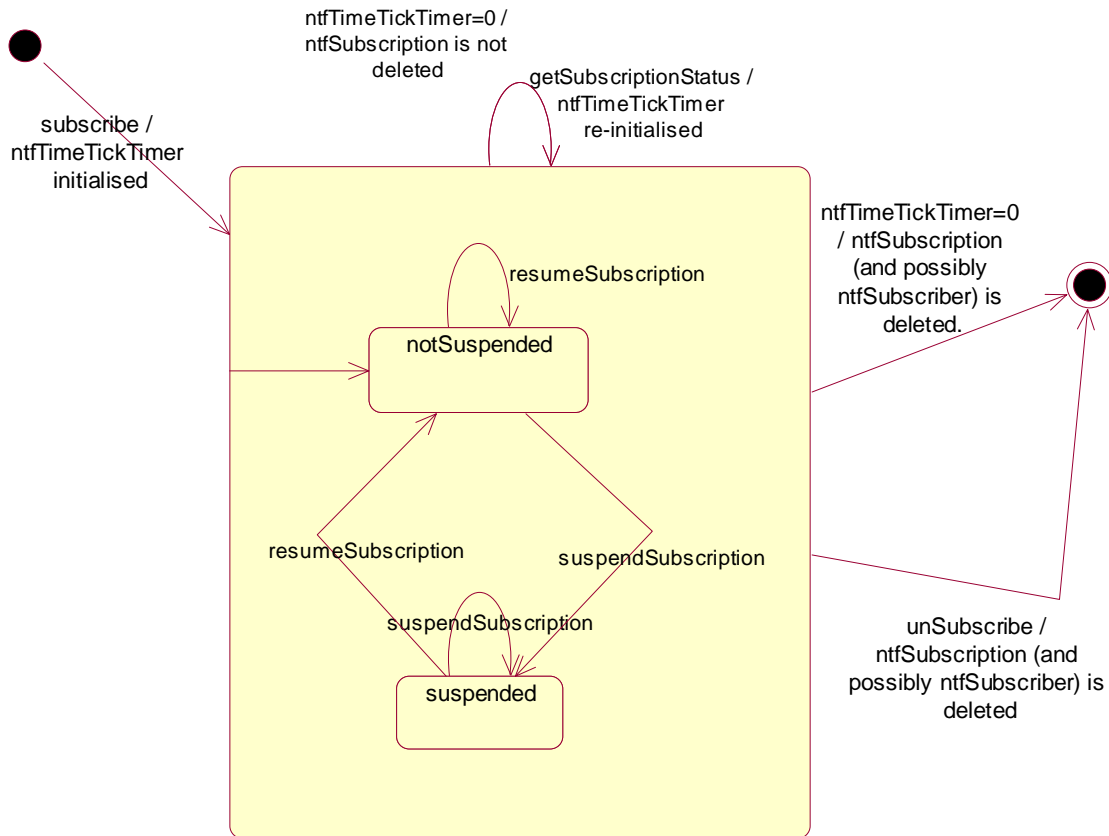
This Support IOC represents a subscription that has been requested by an IRPManager and created.

5.3.2.2 Attributes

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
ntfSubscriptionId	M	M	-
ntfSubscriptionState	M	M	M
ntfTimeTick	M	M	M
ntfTimeTickTimer	M	-	-
ntfNotificationCategorySet	M	M	M
ntfFilter	M	M	M

5.3.2.3 State diagram

The diagram below depicts states that can be supported by a NtfSubscription.



NotificationIRP can lose the list of managerReference that identifies current IRPManagers under subscription. Under this condition, IRPAgent is incapable of sending events to the affected subscriber(s).

This Notification IRP recommends that IRPManager should invoke the getSubscriptionStatus operation periodically to confirm that IRPAgent still has the IRPManager's reference in its list. In case getSubscriptionStatus returns the exception operation_failed, IRPManager should assume that IRPAgent has lost the IRPManager's reference.

This IRP does not recommend the frequency IRPManager should use to invoke getSubscriptionStatus operation.

5.3.3 NotificationIRP

5.3.3.1 Definition

This Support IOC represents a notification IRP. It inherits from Support IOC ManagedGenericIRP.

5.4 Information relationship definitions

5.4.1 relation-ntfSubscriber-ntfSubscription (M)

5.4.1.1 Definition

This relationship defines the relationship between a NtfSubscriber and its current subscriptions.

5.4.1.2 Roles

Name	Definition
theNtfSubscriber	This role represents the one who has subscribed. It can be played by instances of Support IOC NtfSubscriber
theNtfSubscription	This role represents the subscriptions which were made and not unsubscribed. It can be played by instances of Support IOC NtfSubscription

5.4.1.3 Constraints

Name	Definition
inv_notificationCategoriesAllDistinct	The notification categories contained in the ntfNotificationCategorySet attribute of NtfSubscription playing the role theNtfSubscription are all distinct from each other.

5.4.2 relation-ntfIRP-ntfSubscriber (M)

5.4.2.1 Definition

This relationship defines the relationship between the NotificationIRP and the current subscribers of notifications.

5.4.2.2 Roles

Name	Definition
theNtfSubscriber	This role represents the entities to which IRPAgent will notify events. It is played by instances of Support IOC NtfSubscriber
theNotificationIRP	This role represents the NotificationIRP to which an IRPManager has subscribed. It is played by instances of Support IOC NotificationIRP

5.4.2.3 Constraints

Name	Definition
inv_uniqueManagerReference	All NtfSubscriber involved in the subscriptionRegistration relationship with NotificationIRP are distinguished from each other by their ntfManagerReference Attribute.

5.5 Information attribute definitions

This subclause defines the semantics of the Attributes used in Support IOCs.

5.5.1 Definitions and legal values

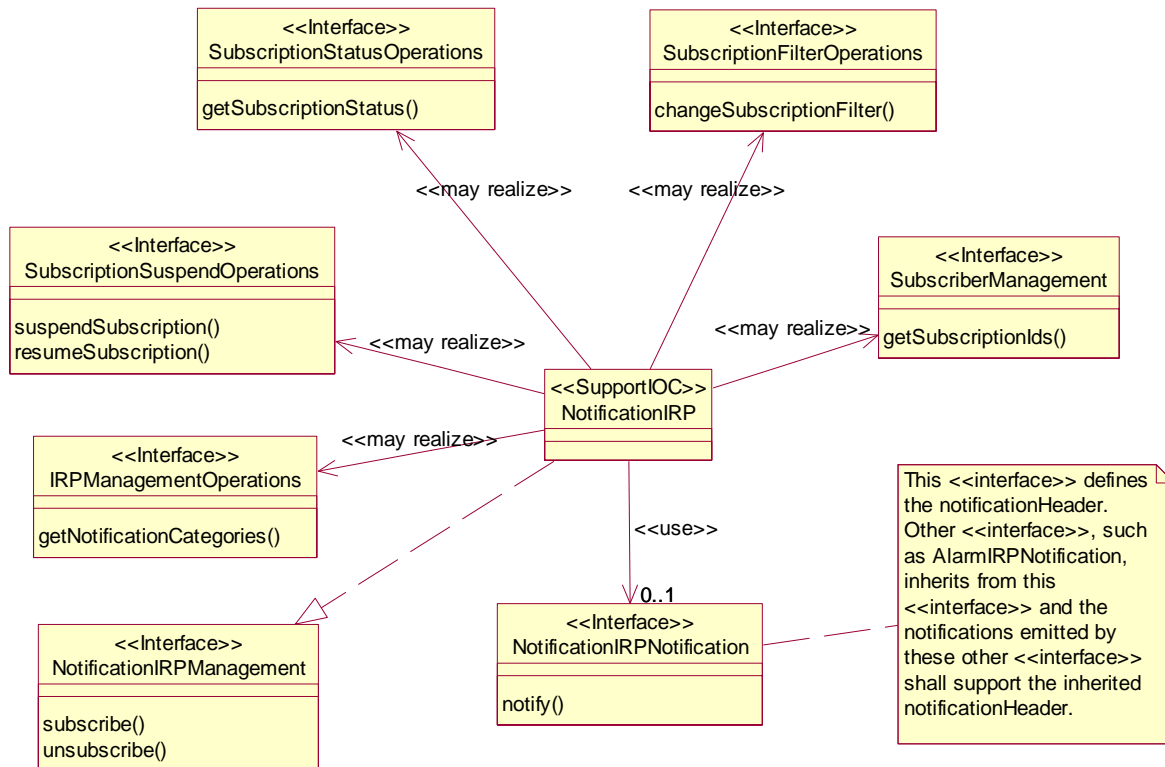
Attribute Name	Definition	Legal Values
ntfSubscriptionId	It identifies uniquely a subscription	N/A
ntfSubscriptionState	It indicates the activation state of a subscription	"suspended": the subscription is suspended "notSuspended": the subscription is active
ntfTimeTick	this Attribute represents the initial value of ntfTimeTickTimer. It is in unit of whole minute. This value defines a time window within which IRPManager intends to invoke <code>getSubscriptionStatus</code> (or <code>subscribe</code>) operation to confirm its subscription. A special value indicates infinity which is such that timer will never expire and IRPAgent needs other means to decide when to delete resources allocated to the IRPManager	Integer greater or equal to 15, OR special infinite value
ntfTimeTickTimer	this Attribute represents the current value of a timer	integer greater or equal to zero
ntfNotificationCategorySet	this Attribute represents a set of notification categories (see also Definition of notification category in subclause 3.1)	
ntfFilter	this Attribute represents the filter of a subscription. The filter can be applied to parameters of notification header (see NotificationIRPNotification interface) and to parameters of notifications defined as filterable in other IRP ISs. IRPAgent shall notify IRPManagers if the event satisfies the filter constraint.	
ntfManagerReference	this Attribute contains the reference of a manager. It uniquely identifies a subscriber	

5.5.2 Constraints

- "ntfTimeTickTimer is lower or equal to ntfTimeTick".

6 Interface Definition

6.1 Class diagram representing interfaces



6.2 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` which is raised when an internal problem occurs and that the operation cannot be completed. The exception has the same entry and exit state.

6.3 notificationIRPManagement Interface (M)

6.3.1 Operation subscribe (M)

6.3.1.1 Definition

IRPManager invokes this operation to establish subscription to receive network events via notifications, under the filter constraint specified in this operation.

6.3.1.2 Input parameters

Parameter Name	Qualifier	Information Type	Comment
managerReference	M	NtfSubscriber.ntfManagerReference	It specifies the reference of IRPManager to which notifications shall be sent.
timeTick	O	NtfSubscription.ntfTimeTick	It specifies the value of a timer hold by NotificationIRP for the subject IRPManager. The value is in unit of whole minute. A special infinite value is assumed when parameter is absent or present but equal to zero.
notificationCategories	O	SET OF (name of IRP, version of IRP)	It identifies one or more Notification Category (see also Definition in subclause 3.1)
filter	O	NtfSubscription.ntfFilter Filter constraint grammar is SS dependent	It specifies a filter constraint that IRPAgent shall use to filter notification of the category specified in notificationCategories parameter. If this parameter is absent, then no filter constraint shall be applied.

6.3.1.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
subscriptionId	M	NtfSubscription.ntfSubscriptionId	It holds an unambiguous identity of this subscription.
status	M	ENUM (OperationSucceeded, OperationFailedExistingSubscription, OperationFailed)	If subscriptionCreated is true, status = OperationSucceeded. If operation_failed_existing_subscription is true, status = OperationFailedExistingSubscription If operation_failed is true, status = OperationFailed.

6.3.1.4 Pre-condition

notificationCategoriesNotAllSubscribed OR notificationCategoriesParameterAbsentAndNotAllSubscribed.

Assertion Name	Definition
notificationCategoriesNotAllSubscribed	At least one notificationCategory identified in the notificationCategories input parameter is supported by IRPAgent and is not a member of the ntfNotificationCategorySet attribute of an NtfSubscription which is involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter.
notificationCategoriesParameterAbsentAndNotAllSubscribed	The notificationCategories input parameter is absent and at least one notificationCategory supported by IRPAgent is not a member of the ntfNotificationCategorySet attribute of an ntfSsubscription which is involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter.

6.3.1.5 Post-condition

subscriberPossiblyCreated AND subscriptionCreated.

Assertion Name	Definition
subscriberPossiblyCreated	An NtfSubscriber with a ntfManagerReference attribute equal to the value of the managerReference input parameter is involved in a subscriptionRegistration relationship with NotificationIRP.
subscriptionCreated	An NtfSubscription has been created according to the following rules: <ul style="list-style-type: none"> - ntfSubscriptionState attribute value has been set to "notSuspended"; - ntfTimeTick attribute value has been set to the value of the timeTick input parameter if this value was higher or equal to 15, or set to 15 if this parameter value was between 1 and 15, or set to a special infinite value if the parameter value was lower or equal to 0 or if parameter was absent; - ntfTimeTickTimer has been reset with the value of timeTick attribute; - ntfFilter attribute value has been set to the value of the filter input parameter if present; - NtfSubscription is involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter; - attribute ntfNotificationCategorySet of NtfSubscription contains EITHER the notification categories identified by the notificationCategories input parameter that were not already contained in the ntfNotificationCategorySet attribute of other NtfSubscription of the same NtfSubscriber identified by the managerReference input parameter OR if notificationCategories input parameter is absent, all notification categories supported by IRPAgent that were not already contained in the ntfNotificationCategorySet attribute of other subscriptions of the same NtfSubscriber identified by the managerReference input parameter.

6.3.1.6 Exceptions

Name	Definition
operation_failed_existing_subscription	Condition: (notificationCategoriesNotAllSubscribed OR notificationCategoriesParameterAbsentAndNotAllSubscribed) not true Returned Information: The output parameter status Exit state: Entry State
Operation_failed	Condition: Post-condition is false Returned Information: The output parameter status Exit state: Entry State

6.3.2 Operation unsubscribe (M)

6.3.2.1 Definition

The IRPManager invokes this operation to cancel subscriptions. The IRPManager can cancel one subscription made with a managerReference by providing the corresponding subscriptionId or all subscriptions made with the same managerReference by leaving the subscriptionId parameter absent.

6.3.2.2 Input parameters

Parameter Name	Qualifier	Information Type	Comment
managerReference	M	NtfSubscriber.ntfManagerReference	It specifies the reference of an IRPManager.
subscriptionId	O	NtfSubscription.ntfSubscriptionId	It holds a subscriptionId carried as the output parameter in the subscribe operation.

6.3.2.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
status	M	ENUM (OperationSucceeded, OperationFailed)	If (subscriptionDeleted OR allSubscriptionDeleted) is true, status = OperationSucceeded. If operation_failed is true, status = OperationFailed.

6.3.2.4 Pre-condition

validSubscriptionId&ManagerReference OR SubscriptionIdAbsent&ValidManagerReference

Assertion Name	Definition
validSubscriptionId&ManagerReference	The NtfSubscription identified by subscriptionId input parameter is involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter.
SubscriptionIdAbsent&ValidManagerReference	The subscriptionId input parameter is absent and the NtfSubscriber identified by the managerReference input parameter exists.

6.3.2.5 Post-condition

subscriptionDeleted OR allSubscriptionDeleted.

Assertion Name	Definition
subscriptionDeleted	The NtfSubscription identified by subscriptionId input parameter is no more involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter and has been deleted. If this NtfSubscriber has no more NtfSubscription, it is deleted as well.
allSubscriptionDeleted	"n the case subscriptionId input parameter was absent, the NtfSubscriber identified by the managerReference input parameter is no more involved in any subscription relationship and is deleted, the corresponding NtfSubscription have been deleted as well.

6.3.2.6 Exceptions

Name	Definition
Operation_failed	Condition: Pre-condition is false or post-condition is false Returned Information: The output parameter status Exit state: Entry State

6.4 subscriberManagement Interface (O)

6.4.1 Operation getSubscriptionIds (M)

6.4.1.1 Definition

IRPManager invokes this operation to get the values of all still valid (not unsubscribed or removed by IRPAgent) subscriptionIds assigned by NotificationIRP as result of previously subscribe operations performed by this IRPManager.

6.4.1.2 Input parameters

Parameter Name	Qualifier	Information Type	Comment
managerReference	M	NtfSubscriber.ntfManagerReference	It specifies the reference of IRPManager that requests the set of identifiers of active subscriptions related to this IRPManager.

6.4.1.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
subscriptionIdSet	M	SET OF NtfSubscription.ntfSubscriptionId where NtfSubscription is involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter	It holds a set of the subscriptionId, each assigned as output parameter in previous subscribe operations invoked by the current IRPManager. This value should contain no information if the IRPManager did not yet subscribe to that System or System lost all subscription related information.
status	M	ENUM (Operation succeeded, Operation failed)	If validSubscriptionIdSet is true, status = OperationSucceeded. If operation_failed is true, status = OperationFailed.

6.4.1.4 Pre-condition

validManagerReference.

Assertion Name	Definition
validManagerReference	The NtfSubscriber identified by the managerReference input parameter exists.

6.4.1.5 Post-condition

None specific

6.4.1.6 Exceptions

Name	Definition
Operation_failed	Condition: Pre-condition is false Returned Information: The output parameter status Exit state: Entry State

6.5 subscriptionStatusOperations Interface (O)

6.5.1 Operation getSubscriptionStatus (M)

6.5.1.1 Definition

IRPManager invokes this operation to query the subscription status of a particular subscription. IRPManager can use getSubscriptionStatus operation to know about the filter constraint in effect, the state of subscription (i.e. if subscription is suspended/inactive or resumed/active), the timeTick value that may be set at subscribe invocation time and the notificationCategory currently in used in the subscription.

6.5.1.2 Input parameters

Parameter Name	Qualifier	Information Type	Comment
subscriptionId	M	NtfSubscription.ntfSubscriptionId	It holds the subscriptionId carried as the output parameter in the subscribe operation

6.5.1.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
notificationCategorySet	C	NtfSubscription.ntfNotificationCategorySet	It identifies the notification Category(ies) supported in this subscription.
filterInEffect	O	NtfSubscription.ntfFilter	It contains the filter constraint currently set.
SubscriptionState	O	NtfSubscription.ntfSubscriptionState	
timeTick	O	NtfSubscription.ntfTimeTick	It carries the same value as the one in subscribe operation
status	M	ENUM (Operation succeeded, Operation failed)	If (timeTickReset) is true, status = OperationSucceeded. If operation_failed is true, status = OperationFailed.

6.5.1.4 Pre-condition

validSubscriptionId.

Assertion Name	Definition
validSubscriptionId	"the NtfSubscription identified by subscriptionId input parameter is involved in a subscription relationship"

6.5.1.5 Post-condition

timeTickReset

Assertion Name	Definition
timeTickReset	The ntfTimeTickTimer attribute of NtfSubscription identified as input parameter has been reset with the value of ntfTimeTick attribute of the same NtfSubscription.

6.5.1.6 Exceptions

Name	Definition
Operation_failed	Condition: Pre-condition is false or post-condition is false Returned Information: The output parameter status Exit state: Entry State

6.6 subscriptionFilterOperations Interface (O)

6.6.1 Operation changeSubscriptionFilter (M)

6.6.1.1 Definition

IRPManager invokes this operation to replace the present filter constraint with a new one.

6.6.1.2 Input parameters

Parameter Name	Qualifier	Information Type	Comment
subscriptionId	M	NtfSubscription.ntfSubscriptionId	It carries the subscriptionId carried as the output parameter in the subscribe operation.
filter	M	NtfSubscription.ntfFilter	It specifies a filter constraint

6.6.1.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
status	M	ENUM (Operation succeeded, Operation failed)	If filterUpdated is true, status = OperationSucceeded. If operation_failed is true, status = OperationFailed.

6.6.1.4 Pre-condition

validNtfSubscriptionId.

Assertion Name	Definition
validNtfSubscriptionId	The NtfSubscription identified by subscriptionId input parameter is involved in a subscription relationship.

6.6.1.5 Post-condition

filterUpdated.

Assertion Name	Definition
filterUpdated	The ntfFilter attribute value of the NtfSubscription identified by subscriptionId input parameter has been set to the value of the filter input parameter.

6.6.1.6 Exceptions

Name	Definition
Operation_failed	Condition: Pre-condition is false or post-condition is false Returned Information: The output parameter status Exit state: Entry State

6.7 subscriptionSuspendOperations Interface (O)

6.7.1 Operation suspendSubscription (M)

6.7.1.1 Definition

IRPManager invokes this operation to request IRPAgent to stop emission of notifications. IRPAgent may lose notification(s) if subscription is suspended.

6.7.1.2 Input parameters

Parameter Name	Qualifier	Information Type	Comment
subscriptionId	M	NtfSubscription.ntfSubscriptionId	It carries the subscriptionId carried as the output parameter in the subscribe operation.

6.7.1.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
status	M	ENUM (Operation succeeded, Operation failed)	If subscriptionStateSuspended is true, status = OperationSucceeded. If operation_failed is true, status = OperationFailed.

6.7.1.4 Pre-condition

validSubscriptionId.

Assertion Name	Definition
validSubscriptionId	The NtfSubscription identified by subscriptionId input parameter is involved in a subscription relationship.

6.7.1.5 Post-condition

subscriptionStateSuspended.

Assertion Name	Definition
subscriptionStateSuspended	The ntfSubscriptionState attribute value of the NtfSubscription identified by subscriptionId input parameter has been set to or kept as "suspended".

6.7.1.6 Exceptions

Name	Definition
Operation_failed	Condition: Pre-condition is false or post-condition is false Returned Information: The output parameter status Exit state: Entry State

6.7.2 Operation resumeSubscription (M)

6.7.2.1 Definition

IRPManager invokes this operation to request IRPAgent to resume emission of notifications.

6.7.2.2 Input parameters

Parameter Name	Qualifier	Information Type	Comment
subscriptionId	M	NtfSubscription.ntfSubscriptionId	It carries the subscriptionId carried as the output parameter in the subscribe operation.

6.7.2.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
status	M	ENUM (Operation succeeded, Operation failed)	If subscriptionStateNotSuspended is true, status = OperationSucceeded. If operation_failed is true, status = OperationFailed.

6.7.2.4 Pre-condition

validSubscriptionId.

Assertion Name	Definition
validSubscriptionId	The NtfSubscription identified by subscriptionId input parameter is involved in a subscription relationship.

6.7.2.5 Post-condition

subscriptionStateNotSuspended.

Assertion Name	Definition
subscriptionStateNotSuspended	The ntfSubscriptionState attribute value of the NtfSubscription identified by subscriptionId input parameter has been set to or kept as "notSuspended".

6.7.2.6 Exceptions

Name	Definition
Operation_failed	Condition: Pre-condition is false or post-condition is false Returned Information: The output parameter status Exit state: Entry State

6.8 IRPManagementOperations Interface (O)

6.8.1 Operation getNotificationCategories (M)

6.8.1.1 Definition

IRPManager invokes this operation to query the categories of notification supported by IRPAgent. IRPAgent returns the list of categories of notification supported. Each category of notification defines the name and the version of the IRP specification. The list of category of notification returned shall only contain the name and version of the IRP specifications that actually have notifications defined.

IRPManager does not need to be in subscription to invoke this operation.

6.8.1.2 Input parameters

None.

6.8.1.3 Output parameters

Parameter Name	Qualifier	Matching Information	Comment
NotificationCategoryList	M	SET OF (name and version of IRP specification) where each IRP is contained by IRPAgent and the attribute notificationNameProfile of the ManagedGenericIRP is not empty.	
status	M	ENUM (Operation succeeded, Operation failed)	OperationFailed only if operation_failed_internal_problem

6.8.1.4 Pre-condition

None specific.

6.8.1.5 Post-condition

None specific.

6.8.1.6 Exceptions

None specific.

6.9 NotificationIRPNotification Interface

IRPAgent notifies the subscribed IRPManager that an event has occurred and that the event has satisfied the filter constraints used for this subscription. One event example is the notification defined in Alarm IRP: IS (3GPP TS 32.111-2 [1]).

It should be possible to pack multiple notifications together for sending to NM. This provides more efficient use of data communication resources. In order to pack multiple notifications, an EM/NE configurable parameter defines the maximum number of notifications to be packed together. Additionally an EM/NE configurable parameter defines the maximum time delay before the notifications have to be sent.

Under normal operations, an IRPAgent shall send, to each IRPManager, notifications in the same order they were generated, i.e. in the First-In, First-Out order. There shall not be any priority given to types of notifications.

This interface doesn't define any specific notification but instead defines information that is commonly found in notifications defined by other IRPs. This information is called notificationHeader. Notification interfaces defined in other IRPs, such as Alarm IRP: IS (3GPP TS 32.111-2 [1]), shall inherit from this interface and define their notifications by:

- Identifying and qualifying the Notification Header attributes for their use;
- Specify additional attributes specific to their use.

Despite the fact that the semantic of notifications is defined by other IRP ISs, it is notification IRP and not those IRP that is responsible for the emission of those notifications.

The Notification Header is defined here below.

Attribute Name	Qualifier	Comment
objectClass	M, Y	It specifies the class name of the IOC. A network event has occurred in an instance of this class.
objectInstance	M, Y	It specifies the instance of the above IOC in which the network event occurred by carrying the Distinguished Name (DN) of this object instance. This object may or may not be identical to the object instance actually emitting the notification.
notificationId	O,N	<p>This is an identifier for the notification, which may be used to correlate notifications. The identifier of the notification shall be chosen to be unique across all notifications of a particular managed object throughout the time that correlation is significant, it uniquely identifies the notification from other notifications generated by the subject Information Object.</p> <p>If IRPManager receives notifications from one IRPAgent, IRPManager shall use the identifier of the notification and the <code>objectInstance</code> to uniquely identify all received notifications.</p> <p>If IRPManager receives notifications from multiple IRPAgents and notifications of each Information Object are reported at most through one IRPAgent, IRPManager shall use the identifier of the notification and <code>objectInstance</code> to uniquely identify all received notifications.</p> <p>If IRPManager receives notifications from multiple IRPAgents and notifications of one or more Information Objects are reported through two or more IRPAgents, IRPManager shall use the identifier of the notification together with <code>objectInstance</code> and the identity of IRPAgent (<code>systemDN</code>), to uniquely identify all received notifications. If the information <code>systemDN</code> is absent, IRPManager needs other means, which are outside the scope of this IRP, to determine the identity of IRPAgent.</p> <p>How identifiers of notifications are re-used to correlate notifications is outside of the scope of this recommendation.</p>
eventTime	M, Y	It indicates the event occurrence time. The semantics of Generalised Time specified by ITU-T shall be used here.
systemDN	C, Y	<p>The <code>systemDN</code> of that notification shall carry either (1) the IRPAgent instance containing that Interface IRP instance, or (2) the DN of that particular Interface IRP instance responsible for the emission of the notification.</p> <p>(1) If the IRPAgent contains single (not multiple) Interface IRP instance of a particular class, then the <code>systemDN</code> of a notification may carry the DN of the IRPAgent or DN of the subject Interface IRP instance.</p> <p>(2) If the IRPAgent contains multiple Interface IRP instances of the same class, then the <code>systemDN</code> of a notification shall carry the DN of a particular Interface IRP instance responsible for the emission of that notification.</p> <p>Example of item (2) above:</p> <ul style="list-style-type: none"> - Alarm IRP:IS specifies <code>notifyNewAlarm</code>. If there are multiple AlarmIRP instances under one IRPAgent, then the <code>systemDN</code> of <code>notifyNewAlarm</code> shall be present and carry the DN of the AlarmIRP.
notificationType	M, Y	The type of notification which is reported by the notification

Annex A (informative): Change history

Change history								
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Cat	Old	New
Jun 2001	S_12	SP-010283	--	--	Approved at TSG SA #12 and placed under Change Control	--	2.0.0	4.0.0
Dec 2001	S_14	SP-010642	0001	--	Remove ambiguity of the return information for getNotificationCategories() operation	F	4.0.0	4.1.0
Dec 2001	S_14	SP-010653	0002	--	Change from Mandatory to Conditional the qualifier of the output parameter 'NotificationCategorySet' of the operation 'getSubscriptionStatus'	C	4.1.0	5.0.0
Mar 2002	--	--	--	--	Cosmetics (changed styles on cover)	--	5.0.0	5.0.1
Dec 2002	--	--	--	--	Cosmetics	--	5.0.1	5.0.2
Jun 2003	S_20	SP-030278	0004	--	Correction of the description of the objectClass and objectInstance parameter of the notification header	A	5.0.2	5.1.0
Mar 2004	S_23	SP-040118	0005	--	Update Ntf IRP IS using new Template and UML Repertoire	F	5.1.0	6.0.0
Dec 2004	S_26	SP-040793	0007	--	Add missing rules on how to construct the string NotificationCategory	A	6.0.0	6.1.0
Mar 2005	S_27	SP-050035	0008	--	Apply Generic System Context	F	6.1.0	6.2.0
Jun 2005	--	--	--	--	Introduction update : added 32.305 new TS-family member	--	6.2.0	6.2.1
Mar 2006	SA_31	SP-060089	0009	--	Correct the use/meaning of systemDN in notification header	F	6.2.1	6.3.0
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.	--	6.3.0	7.0.0
Dec 2008	SA_42	--	--	--	Upgrade to Release 8	-	7.0.0	8.0.0
Dec 2009	SA_46	SP-090719	0010	--	Align usage of SupportIOC according to repertoire and template	C	8.0.0	9.0.0
Sep 2010	SA_49	SP-100489	0011	--	Correction of incorrect attribute name for NtfSubscription	F	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	0012	-	add reference to ITU-T Rec	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
2017-03	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	0013	-	F	Correct definition of NR to align with RAN2	15.1.0
2020-07	-	-	-	-	-	Update to Rel-16 version (MCC)	16.0.0

History

Document history		
V16.0.0	August 2020	Publication