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Technical Specification

**Digital cellular telecommunications system (Phase 2+);
Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Integration Reference Point (IRP)
Information Service (IS) template
(3GPP TS 32.151 version 9.4.0 Release 9)**



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Foreword

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Foreword

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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:

TS 32.150:	Integration Reference Point (IRP) Concept and definitions
TS 32.151:	Integration Reference Point (IRP) Information Service (IS) template
TS 32.152:	Integration Reference Point (IRP) Information Service (IS) Unified Modelling Language (UML) repertoire
TS 32.153	Integration Reference Point (IRP) technology specific templates
TS 32.154	Backward and Forward Compatibility (BFC); Concept and definitions
TS 32.155	Requirements template

1 Scope

The present document contains the template to be used for the production of all Integration Reference Point (IRP) Information Service (IS) specifications within the 3GPP 32-series.

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 32.150: "Telecommunication management; Integration Reference Point (IRP) Concept and definitions".
- [4] 3GPP TS 32.152: "Telecommunication management; Integration Reference Point (IRP) Information Service (IS) Unified Modelling Language (UML) repertoire".
- [5] 3GPP TS 32.622: "Telecommunication management; Configuration Management (CM); Generic network resources Integration Reference Point (IRP): Network Resource Model (NRM)".
- [6] 3GPP TS 32.111-2: "Telecommunication management; Fault Management; Part 2: Alarm Integration Reference Point (IRP): Information Service".
- [7] 3GPP TS 32.302: "Telecommunication Management; Configuration Management (CM); Notification Integration Reference Point (IRP): Information Service (IS)".
- [8] ITU-T Recommendation M.3020 (2009): Management interface specification methodology – Annex E Information type definitions – type repertoire.
- [9] 3GPP TS 32.602: "Telecommunication Management; Configuration Management (CM): Basic CM IRP: Information Service (IS)".
- [10] 3GPP TS 32.612: "Telecommunication Management; Configuration Management (CM): Bulk CM 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 TS 32.101 [1], 3GPP TS 32.102 [2], 3GPP TS 32.150 [3] and the following apply:

IRPAgent: See 3GPP TS 32.150 [3].

IRPManager: See 3GPP TS 32.150 [3].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TS 32.101 [1], 3GPP TS 32.102 [2], 3GPP TS 32.150 [3] and the following apply:

IOC	Information Object Class
IRP	Integration Reference Point
IS	Information Service
OMG	Object Management Group
UML	Unified Modelling Language (OMG)

4 Information Service (IS) template

The present document contains the templates to be used for the production of all Integration Reference Point (IRP) Information Service (IS) specifications within the 3GPP 32-series.

For the introductory clause 1 (Scope) of all NRM IRP ISs, clause W1 shall be used.

For the introductory clause 1 (Scope) of all Interface IRP ISs, clause W2 shall be used.

For the introductory clauses 2 and 3 of all IRP ISs, the text shall be written conforming to the standard 3GPP TS template (i.e. not this IRP IS template).

The other clauses in this template that shall be used in the IS specifications following their introductory clauses are numbered starting with "X", which in general should correspond to clause 4 that is the beginning of the main part of the TS. However, if there is a need in a specific IS to introduce additional clauses in the body, X may correspond to a number higher than 4.

For a NRM IRP IS, only clause X shall be used.

For an Interface IRP IS, both clauses X and Y shall be used.

The IS template uses qualifiers M, O, CM, CO and C. The semantics of these qualifiers are defined in TS 32.150 [3].

The IS template uses Information Type as one characteristic to describe IOC attributes and operation/notification parameters. The valid Information Type(s) that can be used and their semantics are defined in ITU-T M.3020 Annex E [8].

Usage of fonts shall be according to the following table.

Item	Font
Class names	Courier New
Attribute names	Courier New
Operation names	Courier New
Parameter names	Courier New
Assertion names	Courier New
Notification names	Courier New
Exception names	Courier New
State names	Arial
Matching Information	Courier New
Information Type	Courier New
Legal Values	Courier New
NOTE: These font requirements do not apply to UML diagrams.	

W1 Scope

The following quoted text is relevant for all NRM IRP ISs. It shall be copied as the first two paragraphs of the NRM IRP IS specification. IRP IS author may add additional paragraph(s) if necessary.

The present document specifies the <<n>> (where <<n>> shall be substituted by the name of the NRM IRP IS concerned such as "HNS", "E_UTRAN", "GERAN") network resource information that can be communicated between an IRP Agent and one or several IRP Managers for network management purposes.

This document specifies the semantics and behaviour of information object class attributes and relations visible across the reference point in a protocol and technology neutral way. It does not define their syntax and encoding.

W2 Scope

The following quoted text is relevant for all Interface IRP ISs. It shall be copied as the first two paragraphs of the Interface IRP IS specification. IRP IS author may add additional paragraph(s) if necessary.

The present document specifies the <<n>> (where <<n>> shall be substituted by the name of the Interface IRP IS concerned such as 'Alarm', 'Test', 'Entry Point') management operations and notifications that can be communicated between an IRP Agent and one or several IRP Managers.

This document specifies the semantics and behaviour of operations, notifications and their parameters visible across the reference point in a protocol and technology neutral way. It does not define their syntax and encoding.

X Information Object Classes

This 'X' clause shall be used for NRM IRP ISs. This 'X' clause shall also be used for Interface IRP ISs.

"X" represents a clause number in the actual Information Service TS.

X.1 Imported information entities and local labels

This clause identifies a list of information entities (e.g. information object class, interface, information relationship, information attribute) that have been defined in other specifications and that are imported in the present specification. All imported entities shall be treated as if it is defined locally in present specification. One usage of import is for inheritance purpose. Each element of this list is a pair (label reference, local label). The label reference contains the name of the specification where it is defined, the type of the information entity and its name. The local label of imported information entities can then be used throughout the specification instead of the label reference.

This information is provided in a table. An example of such a table is given here below:

Label reference	Local label
3GPP TS 32.622 [5], information object class, Top	Top

X.2 Class diagram

X.2.1 Attributes and relationships

This first set of diagrams represents all information object classes defined in this IS with all their relationships and all their attributes, including relationships with imported IOCs (if any). These diagrams shall contain information object class cardinalities (for associations as well as containment relationships) and may also contain association names and role names. These shall be UML compliant class diagrams (see also 3GPP TS 32.152 [4]).

Characteristics (attributes, relationships) of imported information object classes need not to be repeated in the diagrams. Information object classes should be defined using the stereotype <<InformationObjectClass>>.

X.2.2 Inheritance

This second set of diagrams represents the inheritance hierarchy of all information object classes defined in this IS. These diagrams do not need to contain the complete inheritance hierarchy but shall at least contain the parent information object classes of all information object classes defined in the present document. By default, an information object class inherits from the information object class "top". These shall be UML compliant class diagrams.

Characteristics (attributes, relationships) of imported information object classes need not to be repeated in the diagrams. Information object classes should be defined using the stereotype <<InformationObjectClass>>.

NOTE: some inheritance relationships presented in clause X.2.2 can be repeated in clause X.2.1 to enhance readability.

X.3 Information object class definitions

Each information object class is defined using the following structure.

Inherited items (attributes etc.) shall not be shown, as they are defined in the parent IOC(s) and thus valid for all subclasses.

X.3.a InformationObjectClassName

InformationObjectClassName is the name of the information object class.

"a" represents a number, starting at 1 and increasing by 1 with each new definition of an IOC.

X.3.a.1 Definition

The <definition> subclause is written in natural language. The <definition> subclause refers to the information object class itself. The characteristics related to the relationships that the object class can have with other object classes can't be found in the definition. The reader has to refer to relationships definition to find such kind of information. Information related to inheritance shall be precised here.

For NRM IRP ISs, information on traceability back to one or more requirements supported by this IOC should also be defined here, in the following form:

Referenced TS	Requirement label	Comment
3GPP TS 32.xyz [xy]	REQ-SM-CON-23	Optional clarification
3GPP TS 32.xyz [xy]	REQ-SM-FUN-11	Optional clarification

X.3.a.2 Attributes

The <attributes> subclause presents the list of attributes, which are the manageable properties of the object class. Each element is a tuple (attributeName, supportQualifier, readQualifier, writeQualifier):

- The supportQualifier indicates whether the attribute is Mandatory (M), Optional (O), Conditional-Mandatory (CM), Conditional-Optional (CO), SS-Conditional (C) or Not supported (—).
- The readQualifier indicates whether the attribute shall be readable by the IRPManager. Allowed values are: Mandatory (M), Optional (O) and Not supported (—).
- The writeQualifier indicates whether the attribute shall be writeable by the IRPManager. Allowed values are: Mandatory (M), Optional (O) and Not supported (—).

The semantics of the above used qualifiers are defined in TS 32.150 [3].

There is a dependency relationship between the supportQualifier, readQualifier, and writeQualifier. The supportQualifier indicates the requirements for the support of the attribute. For any given attribute, regardless of the value of the supportQualifier, at least one of the readQualifier or writeQualifier must be "M". The implication of the "O" supportQualifier is that the attribute is optional, however the read and write qualifiers indicate how the optional attribute shall be supported, should the optional attribute be supported.

Private or IRPAgent Internal attributes are per definition not readable by the IRPManager. Their readQualifier is hence always "—".

Private or IRPAgent Internal attributes are per definition not writable by the IRPManager. Their writeQualifier is hence always "—".

The readQualifier and writeQualifier of a supported attribute, that is public, may not be both "—".

The use of "—" in supportQualifier is reserved for documenting support of attributes defined by an «Archetype» IOC. Attributes with a supportQualifier of "—" are not implemented by the IOC that is realizing a subset of the attributes defined by the «Archetype». The readQualifier and writeQualifier are of no relevance in this case. However, a not supported attribute is neither readable nor writable. For this reason the readQualifier and writeQualifier shall be "—" for unsupported attributes.

For any IOC that uses one or more attributes from an «Archetype», a separate table shall be used to indicate the supported attributes. This table is absent if no «Archetype» attributes are supported. For example, if a particular IOC has defined attributes (i.e. attributes not defined by an «Archetype») and encapsulates attributes from two «Archetype»s, then the totality of the attributes of said IOC will be contained in three separate tables.

This information is provided in a table. An example of such a table is given below:

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
ntfSubscriptionId	M	M	O

Another example, where the support qualifier is "O" is given here below:

Attribute name	Support Qualifier	Read Qualifier	Write Qualifier
ntfSubscriptionId	O	M	O

In this example, the ntfSubscriptionId is an optional attribute. If the implementation chose to support ntfSubscriptionId, then the said implementation is required to support read and may support write.

NOTE: This subclause does not need to be present when there is no attribute to define.

X.3.a.b Attribute constraints

The <attribute constraints> subclause presents constraints between attributes that are always held to be true. Those properties are always held to be true during the lifetime of the attributes and in particular don't need to be repeated in pre or post conditions of operations or notifications.

"b" represents a number, consecutively following the previous existing subclause under X.3.a.

NOTE: This subclause does not need to be present when there are no attribute constraints to define.

X.3.a.b Relationships

The <relationship> subclause presents the list of relationships in which this class is involved. Each element is a relationshipName.

"b" represents a number, consecutively following the previous existing subclause under X.3.a.**NOTE:** This subclause is optional and may be avoided since all relationships are represented in the class diagram in clause X.2.1.

X.3.a.b State diagram

The <state diagram> subclause contains state diagrams. A state diagram of an information object class defines permitted states of this information object class and the transitions between those states. A state is expressed in terms of individual attribute values or a combination of attribute values or involvement in relationships of the information object class being defined. This shall be a UML compliant state diagram.

"b" represents a number, consecutively following the previous existing subclause under X.3.a.**NOTE:** This subclause does not need to be present when there is no state diagram to define.

X.3.a.b Notifications

"b" represents a number, consecutively following the previous existing subclause under X.3.a.

The < Notifications> subclause, for this IOC, presents:

- a) optionally, a reference to the common notifications defined in subclause X.6 as valid for this IOC, and
- b) optionally, a list of notifications that shall be excluded from the list of common notifications (defined in subclause X.6) for this IOC (note: inherited notifications from the parent IOC(s) can not be excluded), and
- c) optionally, a list of notifications applicable to this IOC, and which may or may not be defined in the common notifications in subclause X.6.

The notifications identified in this subclause are notifications that can be emitted across the Itf-N, where the "object class" and "object instance" parameters of the notification header (see note 2) of these notifications identifies an instance of the IOC defined by the encapsulating subclause (i.e. clause X.3.a).

The notifications identified in this subclause, may originate from implementation object(s) whose identifier is mapped in the implementation, to the object instance identifier used over the Itf-N. Hence the presence of notifications in this clause (i.e. clause X.3.a.6) does not imply nor identify those notifications as being originated from an instance of the IOC defined by the encapsulating subclause (i.e. clause X.3.a).

The information related to option c) above is provided in a table. An example of such a table is given below:

Name	Qualifier	Notes
notifyCMSynchronizationRecommended	O	Example notification.

NOTE 1: This subclause and table can be absent.

NOTE 2: The notification header is defined in the notification IRP Information service TS 32.302 [7].

NOTE 3: The qualifier of a notification, specified in Notification Table, indicates if such notification can carry the instance DN in the notification. The qualifier of a notification, specified in an Interface IRP, indicates the Interface IRP support level regarding the emission of the subject notification.

An IRPManager can receive notification-XYZ that carries DN of class-ABC instance if and only if:

- a) The class-ABC Notification Table defines the notification-XYZ and
- b) The class-ABC instance implementation supports this notification-XYZ and
- c) An Interface IRP defines the notification-XYZ and
- d) The Interface IRP implementation supports this notification-XYZ.

X.4 Information relationship definitions

Each information relationship is defined using the following structure.

Inherited relationships shall not be shown, as they are defined by the parent IOC(s) and thus valid for all subclasses.

X.4.a InformationRelationshipName (supportQualifier)

InformationRelationshipName is the name of the information relationship followed by a qualifier indicating whether the relationship is Mandatory (M), Optional (O), Conditional-Mandatory (CM), Conditional-Optional (CO), or SS-Conditional (C).

"a" represents a number, starting at 1 and increasing by 1 with each new definition of an information relationship.

X.4.a.1 Definition

The <definition> subclause is written in natural language.

X.4.a.2 Roles

The <roles> subclause identifies the roles played in the relationship by object classes. Each element is a pair (roleName, roleDefinition).

This information is provided in a table. An example of such a table is given here below:

Name	Definition
isSubscribedBy	This role represents the one who has subscribed.

X.4.a.3 Constraints

The <constraints> subclause contains the list of properties specifying the semantic invariants that must be preserved on the relationship. Each element is a pair (propertyName, propertyDefinition). Those properties are always held to be true during the lifetime of the relationship and don't need to be repeated in pre or post conditions of operations or notifications.

This information is provided in a table. An example of such a table is given here below:

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

X.5 Information attribute definitions

Each information attribute is defined using the following structure.

Inherited attributes shall not be shown, as they are defined in the parent IOC(s) and thus valid for all subclasses.

X.5.1 Definition and Legal Values

This subclause contains for each attribute being defined its Attribute Name, its Definition written in natural language, its Information Type (see [8]) and an optional list of Legal Values supported by the attribute.

In the case where the Legal Values can be enumerated, each element is a pair (Legal Value Name, Legal Value Semantics), unless a Legal Value Semantics applies to several values in which case the Semantics is provided only once. When the Legal Values cannot be enumerated, the list of Legal Values is defined by a single definition.

This information is provided in a table. An example of such a table is given here below:

Attribute Name	Definition	Information Type / Legal Values
ntfSubscriptionId	It identifies uniquely a subscription	INTEGER / --
ntfSubscriptionState	It indicates the activation state of a subscription	ENUMERATED / "suspended": the subscription is suspended. "notSuspended": the subscription is active.

X.5.2 Constraints

The <constraints> subclause indicates whether there are any constraints affecting attributes. Each constraint is defined by a pair (propertyName, propertyDefinition). PropertyDefinitions are expressed in natural language.

An example is given here below:

Name	Definition
inv_TimerConstraints	The ntfTimeTickTimer is lower than or equal to ntfTimeTick.

X.6 Common Notifications

This <Common Notifications> subclause presents a list of notifications that can be referred to by any IOC defined by this IRP specification. These notifications are only applicable to IOCs referring to this subclause in subclause 'X.3.a.6'. This information is provided in a table. An example of such a table is given below:

Name	Qualifier	Notes
notifyAttributeValueChange	O	Example common notification
notifyObjectCreation	O	Example
notifyObjectDeletion	O	Example

NOTE: This clause does not need to be present when there are no common notifications.

X.7 System State Model

Some configurations of information are special or complex enough to justify the usage of a state diagram to clarify them. A state diagram in this clause defines permitted states of the system and the transitions between those states. A state is expressed in terms of a combination of attribute values constraints or involvement in relationships of one or more information object classes.

Y Interface Definition

This 'Y' clause shall be used for Interface IRP ISs.

"Y" represents a number, immediately following "X".

Y.1 Class diagram representing interfaces

Each interface is defined in the diagram. This shall be a UML compliant class diagram (see also 3GPP TS 32.152 [4]).

Interfaces are defined using a stereotype <<Interface>>. Each interface contains a set of either operations or notifications which are mandatory or either a single operation or a single notification which is optional. The support of an interface by an information object class is represented by a relationship between the 2 entities with a cardinality (1..1) if all the operations or notifications contained in the interface are mandatory, and (0..1) if the operation or notification contained in the interface is optional. On the class diagram, each operation and notification in an interface shall be qualified as "public" by the addition of a symbol "+" before each operation and notification.

Y.2 Generic rules

The following rules are relevant for all ISs. They shall simply be copied as part of the specification.

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_yyy` where "yyy" 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_yyy` which is raised when (a) the pre-condition `supported_optional_input_parameter_yyy` 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.

Y.b InterfaceName Interface (supportQualifier)

InterfaceName is the name of the interface followed by a qualifier indicating whether the interface is Mandatory (M), Optional (O), Conditional-Mandatory (CM), Conditional-Optional (CO), or SS-Conditional (C).

"b" represents a number, starting at 3 and increasing by 1 with each new definition of an interface.

Each interface is defined by its name and by a sequence of operations or notifications.

Interfaces related to operations shall be listed before the interfaces related to notifications.

If the interface is related to operation(s), the following Y.b.a "Operation OperationName (supportQualifier)" shall be applied.

If the interface is related to notification(s), the next Y.b.a "Notification NotificationName (supportQualifier)" below shall be applied.

Y.b.a Operation OperationName (supportQualifier)

OperationName is the name of the operation followed by a qualifier indicating whether the operation is Mandatory (M), Optional (O), Conditional-Mandatory (CM), Conditional-Optional (CO), or SS-Conditional (C).

"a" represents a number, starting at 1 and increasing by 1 with each new definition of an operation.

Y.b.a.1 Definition

The <definition> subclause is written in natural language.

Information on traceability back to one or more requirements supported by this operation should also be defined here, in the following form:

Referenced TS	Requirement label	Comment
3GPP TS 32.xyz [xy]	REQ-SM-CON-23	Optional clarification
3GPP TS 32.xyz [xy]	REQ-SM-FUN-11	Optional clarification

Y.b.a.2 Input parameters

List of input parameters of the operation. Each element is a tuple (Parameter Name, Support Qualifier, Information Type (see [8] and Note 1) and an optional list of Legal Values supported by the parameter, Comment). Legal Values for the Support Qualifier are: Mandatory (M), Optional (O), Conditional-Mandatory (CM), Conditional-Optional (CO), or SS-Conditional (C).

This information is provided in a table. An example of such a table is given here below:

Parameter Name	Support Qualifier	Information Type / Legal Values	Comment
eventIdList	M	SET OF INTEGER / --	One or more event identifiers

Note 1: Information Type qualifies the parameter of Parameter Name. In the case where the Legal Values can be enumerated, each element is a pair (Legal Value Name, Legal Value Semantics), unless a Legal Value Semantics applies to several values in which case the definition is provided only once. When the Legal Values cannot be enumerated, the list of Legal Values is defined by a single definition.

Y.b.a.3 Output parameters

List of output parameters of the operation. Each element is a tuple (Parameter Name, Support Qualifier, Matching Information / Information Type (see [8]) (Note 1) and an optional list of Legal Values supported by the parameter, Comment). Legal Values for the Support Qualifier are: Mandatory (M), Optional (O), Conditional-Mandatory (CM), Conditional-Optional (CO), or SS-Conditional (C).

This information is provided in a table. An example of such a table is given here below:

Parameter Name	Support Qualifier	Matching Information / Information Type / Legal Values	Comment
eventTime	M	AlarmInformation.alarmRaisedTime / GeneralizedTime / --	The parameter carries the <ul style="list-style-type: none"> alarmRaisedTime in case notificationType carries notifyNewAlarm, alarmChangedTime in case notificationType carries notifyChangedAlarm, alarmClearedTime in case notificationType carries notifyClearedAlarm.

Note 1: Information Type qualifies the parameter of Parameter Name. In the case where the Legal Values can be enumerated, each element is a pair (Legal Value Name, Legal Value Semantics), unless a Legal Value Semantics applies to several values in which case the definition is provided only once. When the Legal Values cannot be enumerated, the list of Legal Values is defined by a single definition.

This table shall also include a special parameter "status" to indicate the completion status of the operation (success, partial success, failure reason etc.).

Y.b.a.4 Pre-condition

A pre-condition is a collection of assertions joined by AND, OR, and NOT logical operators. The pre-condition must be held to be true before the operation is invoked. An example is given here below:

*notificationCategoriesNotAllSubscribed OR
notificationCategoriesParameterAbsentAndNotAllSubscribed*

Each assertion is defined by a pair (propertyName, propertyDefinition). All assertions constituting the pre-condition are provided in a table. An example of such a table is given here below:

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 ntfnSubscription which is involved in a subscription relationship with the NtfSubscriber identified by the managerReference input parameter.

Y.b.a.5 Post-condition

A post-condition is a collection of assertions joined by AND, OR, and NOT logical operators. The post-condition must be held to be true after the completion of the operation. When nothing is said in a post-condition regarding an information entity, the assumption is that this information entity has not changed compared to what is stated in the pre-condition. An example is given here below:

subscriptionDeleted OR allSubscriptionDeleted

Each assertion is defined by a pair (propertyName, propertyDefinition). All assertions constituting the post-condition are provided in a table. An example of such a table is given here below:

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

Y.b.a.6 Exceptions

List of exceptions that can be raised by the operation. Each element is a tuple (exceptionName, condition, ReturnedInformation, exitState).

Y.b.a.6.c exceptionName

ExceptionName is the name of an exception.

"c" represents a number, starting at 1 and increasing by 1 with each new definition of an exception.

This information is provided in a table. An example of such a table is given here below:

Exception Name	Definition
ope_failed_existing_subscription	<p>Condition: (notificationCategoriesNotAllSubscribed OR notificationCategoriesParameterAbsentAndNotAllSubscribed) not verified.</p> <p>Returned information: output parameter status is set to OperationFailedExistingSubscription.</p> <p>Exit state: Entry State.</p>

Each notification is defined using the following structure.

Y.b.a.7 Constraints

The < constraints> subclause presents constraints for the operation or its parameters.

NOTE: This subclause does not need to be present when there are no constraints to define.

Y.b.a Notification NotificationName (supportQualifier)

NotificationName is the name of the notification followed by a qualifier indicating whether the notification is Mandatory (M), Optional (O), Conditional-Mandatory (CM), Conditional-Optional (CO) or SS-Conditional (C).

"a" represents a number, starting at 1 and increasing by 1 with each new definition of a notification.

Y.b.a.1 Definition

The <definition> subclause is written in natural language.

Information on traceability back to one or more requirements supported by this notification should also be defined here, in the following form:

Referenced TS	Requirement label	Comment
3GPP TS 32.xyz [xy]	REQ-SM-CON-23	Optional clarification
3GPP TS 32.xyz [xy]	REQ-SM-FUN-11	Optional clarification

Y.b.a.2 Input parameters

List of input parameters of the notification. Each element is a tuple (Parameter Name, Qualifiers, Matching Information / Information Type (see [8]) (Note 1) and an optional list of Legal Values supported by the parameter, Comment).

The column "Qualifiers" contains the two qualifiers, Support Qualifier and Filtering Qualifier, separated by a comma. The Support Qualifier indicates whether the attribute is Mandatory (M), Optional (O), Conditional-Mandatory (CM), Conditional-Optional (CO), or SS-Conditional (C). The Filtering Qualifier indicates whether the parameter of the notification can be filtered or not. Values are Yes (Y) or No (N).

This information is provided in a table. An example of such a table is given here below:

Parameter Name	Qualifiers	Matching Information / Information Type / Legal Values	Comment
managerReference	M,Y	ntfSubscriber.ntfManagerReference / STRING / --	It specifies the reference of IRPManager to which notifications shall be sent.
alarmType	M,Y	AlarmInformation.eventType / ENUMERATED / "Communications Alarm": a communication error alarm. "Processing Error Alarm": a processing error alarm. "Environmental Alarm": an environmental violation alarm. "Quality Of Service Alarm": a quality of service violation alarm. "Equipment Alarm": an alarm related to equipment malfunction.	

Note 1: Information Type qualifies the parameter of Parameter Name. In the case where the Legal Values can be enumerated, each element is a pair (Legal Value Name, Legal Value Semantics), unless a Legal Value Semantics applies to several values in which case the definition is provided only once. When the Legal Values cannot be enumerated, the list of Legal Values is defined by a single definition.

Y.b.a.3 Triggering event

The triggering event for the notification to be sent is the transition from the information state defined by the "from state" subclause to the information state defined by the "to state" subclause.

Y.b.a.3.1 From state

This subclause is a collection of assertions joined by AND, OR, and NOT logical operators. An example is given here below:

alarmMatched AND alarmInformationNotCleared

Each assertion is defined by a pair (propertyName, propertyDefinition). All assertions constituting the state "from state" are provided in a table. An example of such a table is given here below:

Assertion Name	Definition
alarmMatched	The matching-criteria-attributes of the newly generated network alarm has values that are identical (matches) with ones in one AlarmInformation in AlarmList..
alarmInformationNotCleared	The perceivedSeverity of the newly generated network alarm is not Cleared.

Y.b.a.3.2 To state

This subclause is a collection of assertions joined by AND, OR and NOT logical operators. When nothing is said in a to-state regarding an information entity, the assumption is that this information entity has not changed compared to what is stated in the from state. An example is given here below:

resetAcknowledgementInformation AND perceivedSeverityUpdated

Each assertion is defined by a pair (propertyName, propertyDefinition). All assertions constituting the state "to state" are provided in a table. An example of such a table is given here below:

Assertion Name	Definition
resetAcknowledgementInformation	The matched AlarmInformation identified in inv_alarmMatched in pre-condition has been updated according to the following rule: ackTime, ackUserId and ackSystemId are updated to contain no information; ackState is updated to "unacknowledged".
perceivedSeverityUpdated	The perceivedSeverity attribute of matched AlarmInformation identified in inv_alarmMatched in pre-condition has been updated.

Y.b.a.4 Constraints

The < constraints> subclause presents constraints for the notification or its parameters.

NOTE: This subclause does not need to be present when there are no constraints to define.

Y.c Scenario

This subclause contains one or more sequence diagrams, each describing a possible scenario. These shall be UML compliant sequence diagrams. This is an optional subclause.

Annex A (informative): Change history

Change history								
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Cat	Old	New
Sep 2006	SA_33	SP-060548	0004	--	Update of 32.151 to use a MCC supported font	F	6.3.0	7.0.0
Dec 2006	SA_34	SP-060724	0005	--	Correct the clause numbering instructions for Operations and Notifications	F	7.0.0	7.1.0
Mar 2007	SA_35	SP-070045	0006	--	Suppress inherited items	F	7.1.0	7.2.0
Mar 2007	SA_35	SP-070045	0007	--	Improve specification of Common notifications	F	7.1.0	7.2.0
Mar 2007	SA_35	SP-070045	0008	--	Correct the references of IRPAgent and IRPManager	F	7.1.0	7.2.0
Sep 2007	SA_37	SP-070610	0009	--	Correct open issues in the IS template	F	7.2.0	8.0.0
Sep 2007	SA_37	SP-070610	0010	--	Add missing instructions for Interface IRP ISs	F	7.2.0	8.0.0
Sep 2007	SA_37	SP-070614	0011	--	Remove visibility qualifier usage	C	7.2.0	8.0.0
Jun 2008	SA_40	SP-080329	0012	--	Introduction of traceability in the IS template	C	8.0.0	8.1.0
Mar 2009	SA_43	SP-090207	0013	--	Correct subclause numbering	F	8.1.0	8.2.0
Mar 2009	--	--	--	--	Editorial modifications	--	8.2.0	8.2.1
Jun 2009	SA_44	SP-090290	0014	--	Introduce Information Type in IS template	C	8.2.1	9.0.0
Sep 2009	SA_45	SP-090627	0015	--	Introduce Information Type in IS template	D	9.0.0	9.1.0
Dec 2009	SA-46	SP-090719	0016	--	Add template text for Scope section for all IRP IS	F	9.1.0	9.2.0
Mar 2010	SA-47	SP-100035	0017	--	Clarify support qualifier usage in Notification Table in 32.151	F	9.2.0	9.3.0
Sep 2010	SA-49	SP-100488	0083	--	Clarification on the meaning of the imported entities	F	9.3.0	9.4.0

History

Document history		
V9.2.0	January 2010	Publication
V9.3.0	April 2010	Publication
V9.4.0	October 2010	Publication