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SERIES M: TELECOMMUNICATION MANAGEMENT,
INCLUDING TMN AND NETWORK MAINTENANCE

Integrated services digital networks

Common management services – Notification management – Protocol neutral requirement and analysis

Recommendation ITU-T M.3702

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Recommendation ITU-T M.3702

Common management services – Notification management – Protocol neutral requirement and analysis

Summary

Recommendation ITU-T M.3702 provides the requirements and analysis for one of the common management services – notification management. The functional requirements for notification management interface include the management functions for notification subscription, notification type, notification storage and recovery. In the analysis part, the detail information model supporting the above function across the management interface is provided.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T M.3702	2010-01-13	2

Keywords

Common management service, notification management, notification IRP.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

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Recommendation ITU-T M.3702

Common management services – Notification management – Protocol neutral requirement and analysis

1 Scope

The purpose of this Recommendation is to define an interface through which a manager can subscribe to an agent for receiving notifications. This Recommendation provides the requirements and analysis phase of one of the common management services: Notification management in a protocol neutral way. It defines, for the purpose of subscribing to an agent for receiving notifications, the basic requirements that shall be fulfilled by a notification interface.

Agents generate notifications of events about occurrences within the network. Different kinds of events carry different kinds of information. An agent emits notifications. A manager receives notifications. This Recommendation defines an interface through which a manager can subscribe to an agent for receiving notifications and the information model used to define specific notification types in other Recommendations.

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

This Recommendation provides the protocol neutral model definition for notification. It defines, for the purpose of subscribing to an agent for receiving notifications, the information observable and controlled by the 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.

An agent may emit one or multiple types of notifications, defined as extensions of the notification information object class (IOC) defined herein. This Recommendation defines a mechanism that a manager can use to determine the types of notifications supported by an agent. It also defines a mechanism (subscribe and unsubscribe operations) that a manager can use to specify the type of notifications an agent should emit to a manager during subscription. It also defines a mechanism (getSubscriptionIds operation) that a manager can use to check which types of notifications it has subscribed to. A manager can set and change filtering criteria applicable during the life-cycle of a subscription and subscribe to filters already configured by another manager. A manager can also exercise flow control on an agent's emission of notifications (suspendSubscription, resumeSubscription operations).

A manager can create several subscriptions. This will result in multiple subscriptions. As far as the agent is concerned, notifications are sent to multiple destinations with different filtering criteria.

This Recommendation specifies the information that is carried in all notifications. Further information is defined by specializations of the Notification IOC.

How a manager discovers the agent's address or reference (so that the manager can invoke an operation) is outside the scope of this Recommendation.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T M.3020] Recommendation ITU-T M.3020 (2009), *Management interface specification methodology*.
- [ITU-T M.3160] Recommendation ITU-T M.3160 (2008), *Generic, protocol-neutral management information model*.
- [ITU-T X.680] Recommendation ITU-T X.680 (2008) | ISO/IEC 8824-1:2008, *Information technology – Abstract syntax Notation One (ASN.1): Specification of basic notation*.
- [ITU-T X.701] Recommendation ITU-T X.701 (1997) | ISO/IEC 10040:1998, *Information technology – Open Systems Interconnection – Systems management overview*.
- [ITU-T X.734] Recommendation ITU-T X.734 (1992) | ISO/IEC 10164-5:1993, *Information technology – Open Systems Interconnection – Systems Management: Event report management function*.
- [ITU-T X.790] Recommendation ITU-T X.790 (1995), *Trouble management function for ITU-T applications*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 agent [ITU-T M.3020]: Encapsulates a well-defined subset of management functionality. It interacts with managers using a management interface. From the manager's perspective, the agent behaviour is only visible via the management interface.

3.1.2 event [ITU-T X.790]: An instantaneous occurrence that changes the global status of an object. This status change may be persistent or temporary, thus allowing for surveillance, monitoring, and performance measurement functionality, etc. Events may or may not generate reports; they may be spontaneous or planned; they may trigger other events or may be triggered by one or more other events.

3.1.3 information object class [ITU-T M.3020]: Describes the information that can be passed/used in management interfaces and is modelled using the stereotype "Class" in the UML meta-model. For a formal definition of information object class and its structure of specification, see Annex B of [ITU-T M.3020].

3.1.4 manager [ITU-T M.3020]: Models a user of agent(s) and it interacts directly with the agent(s) using management interfaces.

Since the manager represents an agent user, it gives a clear picture of what the agent is supposed to do. From the agent perspective, the manager behaviour is only visible via the management interface.

NOTE – Considered equivalent to IRPManager 3GPP TS 32.150.

3.1.5 notification [ITU-T X.701]: Information emitted by a managed object relating to an event that has occurred within the managed object.

3.2 Terms defined in this Recommendation

This Recommendation has no new definitions.

4 Abbreviations

This Recommendation uses the following abbreviations:

DN	Distinguished Name
EM	Element Manager
IOC	Information Object Class
IRP	Integration Reference Point
NE	Network Element
NM	Network Manager
UML	Unified Modelling Language

5 Conventions

This Recommendation follows the conventions defined in [ITU-T M.3020].

In this Recommendation, the term "subscription" indicates a subscription of a notification service, and the term "subscriber" is the representation in an agent of a receiver of notifications, Notification IRP is an interface in an agent providing notification management functions.

6 Requirements

6.1 Concepts and background

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

This notification IRP bases its design on work captured in [ITU-T X.734].

6.2 Business-level requirements

6.2.1 Requirements

An event may occur in the network at any time. The agent should send notifications to the manager indicating these events. The notification management requirements can be grouped into one of the following categories:

- General, i.e., the notification management requirements with general purpose, e.g., notification report, notification mechanism, notification header, etc.
- Subscription management, e.g., subscribe notification, unsubscribe notifications, suspend subscription, resume subscription, modify subscription, query subscription.
- Notification type, e.g., query notification type.
- Notification storage and recovery, e.g., temporary notification storage and recover.

6.2.1.1 General

REQ-NO-FUN-01	The agent shall provide a mechanism to send notifications to managers.
REQ-NO-FUN-02	The notification mechanism will allow the definition of notification types in other Recommendations.

REQ-NO-FUN-03 It is required that all notifications emitted by the notification interface support the same header that contains enough information to identify the type of notification, the source of the notification and the time at which the notification originated.

6.2.1.2 Subscription management

The following requirements apply to the notification management interface.

REQ-NO-FUN-04 The agent shall provide the managers with the capability to subscribe and unsubscribe to the notification mechanism.

REQ-NO-FUN-05 A manager shall be able to specify filtering criteria (including the types of notifications) of a subscription that shall be applied by the notification mechanism.

REQ-NO-FUN-06 A manager shall be able to specify the destination of a subscription to which notifications should be forwarded by the notification mechanism in the agent.

REQ-NO-FUN-07 A manager shall be able to suspend and resume the notifications pertaining to a subscription. Events may be lost when notifications are suspended.

REQ-NO-FUN-08 A manager shall be able to suspend and resume notifications from all subscriptions for a given agent. Events may be lost when notifications are suspended.

REQ-NO-FUN-09 Any manager shall be able to set and change filtering criteria applicable during the life-cycle of one of its subscriptions in order to change the pre-defined criteria which determine what notifications are sent.

REQ-NO-FUN-10 A manager shall be able to query the information of a specified subscription in an agent.

REQ-NO-FUN-11 A manager shall be able to query the information of all the subscriptions of the manager for the given agent.

6.2.1.3 Notification type

REQ-NO-FUN-12 The agent shall provide managers with the capability to discover the notification types supported by the agent.

The above requirements are documented in the subsequent use cases.

6.2.1.4 Notification storage and recovery

REQ-NO-FUN-13 If forwarding is not possible at the time a notification is requested, e.g., due to communication breakdown, then the notifications shall be sent as soon as the communication capability has been restored. The storage space is limited. The storage capacity is operator and implementation dependent. If the number of delayed notifications exceeds the storage space, then notifications may be lost and a synchronization procedure may be required. Such a synchronization procedure is outside the scope of this Recommendation.

6.2.2 Actor roles

The capabilities described in this Recommendation are available and relevant to all agents and managers.

6.2.3 Telecommunication resources

The notification management functionality is applicable to all types of telecommunication resources.

6.2.4 High-level use case diagrams

The first overview use case diagram in Figure 1 shows the overall interaction of the notification management interface.

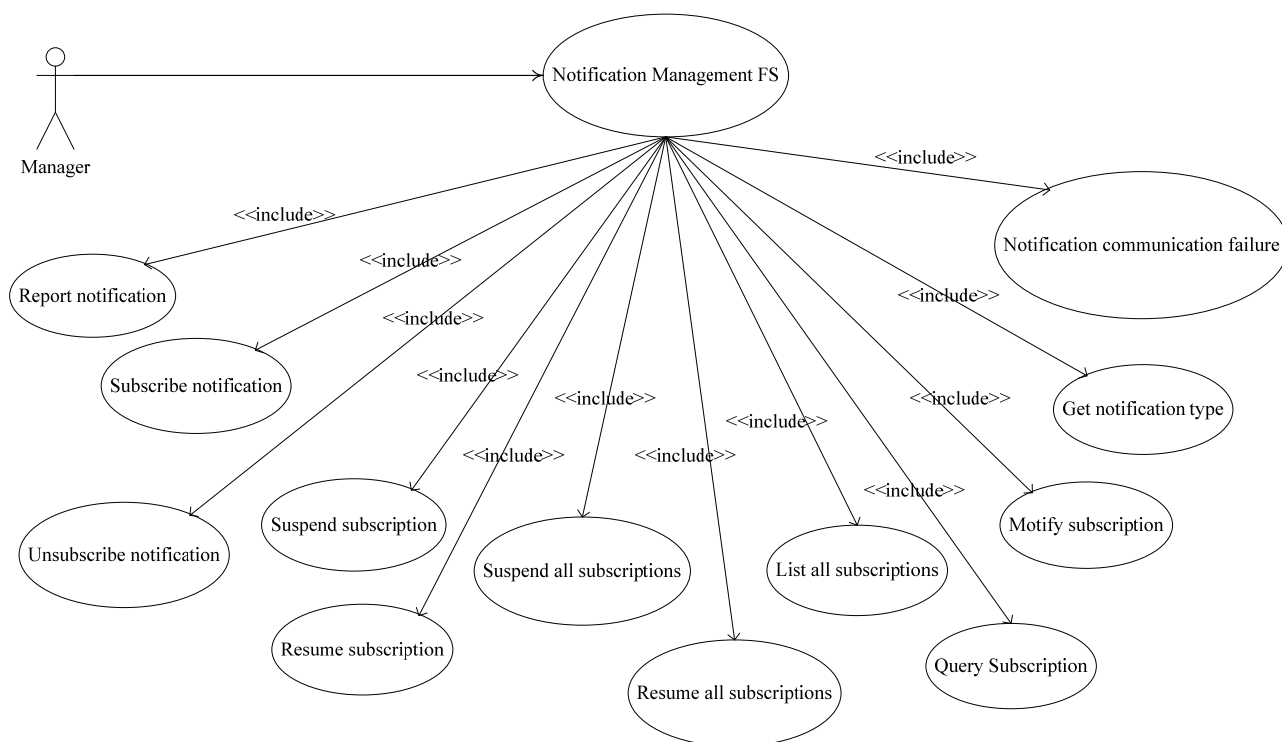


Figure 1 – High-level use case diagram of the notification management interface

6.3 Specification-level requirements

6.3.1 Requirements

There are no specification-level requirements.

6.3.2 Actor roles

See clause 6.2.2.

6.3.3 Telecommunications resources

See clause 6.2.3.

6.3.4 Use cases

The general exceptions (e.g., communication error, processing error) related to all uses cases will not be described in the following uses cases, and they will only be handled in design phases.

6.3.4.1 Report notification

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	Agents can report notifications on any reportable event to managers, through the management interface.	
Actor and roles	All agents and managers.	
Telecom resources	All types of telecommunication resources.	
Assumptions	The communication between the agent and the manager is available.	
Pre-conditions	The manager has subscribed to this type of notifications and the subscription is not suspended.	Subscribe notification
Begins when	A reportable event occurs in the agent.	
Step 1	When any reportable event occurs in an agent, a corresponding notification is generated.	
Step 2	The notification is then processed in the notification report mechanism of the agent. For each manager that has subscribed to this type of notification, the filtering criteria will be checked.	
Step 3	If the notification meets the filtering criteria of the managers' subscription, it will be delivered to those managers. Otherwise, the notification is discarded.	
Ends when	A notification of the event is delivered to all subscribed managers, for subscriptions whose filters match the notification. Otherwise, the notification is discarded, if no filters match this notification.	
Exceptions	Communication error.	
Post-conditions	The manager receives the notification if it matches the filtering criteria of the managers' subscription. Otherwise, the notification is discarded.	
Traceability	REQ-NO-FUN-01	

6.3.4.2 Subscribe notification

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	The manager can send a request to an agent to subscribe to notifications from the agent, through the management interface.	
Actor and roles	All agents and managers	
Telecom resources	All types of telecommunication resources.	
Assumptions	Communication between the manager and the agent is available.	
Pre-conditions	The notification forwarding mechanism in the agent is created and ready to work.	

Use case stage	Evolution/Specification	<<Uses>> Related use
Begins when	The manager sends a request to an agent in order to subscribe to notifications from the agent.	
Step 1	The manager sends a request to the agent to subscribe to notifications; the request should include the following information: – manager identifier; – notification destination; – notification types; – filtering criteria.	
Step 2.1	If the subscription is created successfully, the agent will return the identifier of the subscription. The subsequent notifications will be forwarded according to the destination and filtering criteria of the subscription.	
Step 2.2	If the subscription creation fails, the agent will return error information. The possible errors are listed under "Exceptions".	
Ends when	The agent gives the manager a response indicating that the subscription creation is completed, or the subscription is failed because of errors.	
Exceptions	Already Subscribed; Invalid parameter.	
Post-conditions	The subscription is created by the agent at the request of the manager. Through this new subscription, notifications will be sent to the manager accordingly.	
Traceability	REQ-NO-FUN-04, REQ-NO-FUN-05, REQ-NO-FUN-06	

6.3.4.3 Unsubscribe notification

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	A manager can send a request to an agent to unsubscribe an existing notification subscription from the agent, through the management interface.	
Actor and roles	All agents and managers.	
Telecom resources	All types of telecommunication resources.	
Assumptions	The communication between the manager and the agent is available.	
Pre-conditions	The manager has already subscribed to the agent.	
Begins when	A manager sends a request to an agent in order to unsubscribe notifications from the agent.	
Step 1	The manager sends a request to the agent to unsubscribe an existing notification subscription; the request should include the following information: – subscription identifier.	

Use case stage	Evolution/Specification	<<Uses>> Related use
Step 2.1	If the operation succeeds, the subscription will be removed. The agent will return operation success information, and subsequent notifications will no longer be forwarded to the manager through this subscription.	
Step 2.2	If the subscription removal fails, the agent will return error information. The possible errors are listed under "Exceptions".	
Ends when	The agent gives the manager a response indicating that the specified notification subscription is removed, or the unsubscribe operation fails because of errors.	
Exceptions	Unknown subscription.	
Post-conditions	The specified notification subscription is removed by the agent at the request of the manager. No more notifications will be forwarded to the manager, because of this deleted notification subscription.	
Traceability	REQ-NO-FUN-04	

6.3.4.4 Suspend subscription

Use case stage	Evolution/Specification	<<Uses>> Related use
Goal	A manager can send a request to an agent to suspend a notification subscription in the agent, through the management interface. Thereafter, notifications will not be forwarded to the manager through this subscription.	
Actor and roles	All agents and managers.	
Telecom resources	All types of telecommunication resources.	
Assumptions	The communication between the manager and the agent is available. The agent supports the function of suspending a notification subscription. The manager has already subscribed to the agent.	
Pre-conditions	The specified notification subscription exists in the agent and it is not suspended.	
Begins when	A manager sends a request to an agent to suspend a notification subscription.	
Step 1	The manager sends a request to the agent to suspend an existing notification subscription. The request should include the following information: – subscription identifier.	
Step 2.1	If the operation succeeds, the subscription will temporarily be suspended, and no notifications will be forwarded to the manager through this subscription until it is resumed.	