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Technical Specification

**3rd Generation Partnership Project;
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Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

   x   the first digit:

       1   presented to TSG for information;

       2   presented to TSG for approval;

       3   or greater indicates TSG approved document under change control.

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

   z   the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

The present document is part of a TS-family covering the 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Telecommunication management; as identified below:

   32.391:   **"Delta Synchronization Integration Reference Point (IRP): Requirements".**

   32.392:   "Delta Synchronization Integration Reference Point (IRP); Information Service (IS)".

   32.396:   "Delta Synchronization Integration Reference Point (IRP); Solution Set (SS) definitions".

The Itf-N interface is built up by a number of 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 [1] and 3GPP TS 32.102 [2].

IRPManagers (typically Network Management Systems) and IRPAgents (typically EMs or NEs) synchronize their data concerning alarms or configuration data. In certain scenarios this synchronization is lost or not done. This IRP provides functionality to significantly reduce the amount of data which needs to be transferred in order to re-establish synchronization.

1 Scope

The purpose of Delta Synchronization IRP is to define an interface through which an IRPManager can request only those data which changed (i.e. changed, were created or deleted) from a synchronization point onwards.

The present document contains the Requirements of Delta Synchronization IRP. It defines, for the purpose of Delta Synchronization, the basic requirements to be fulfilled on Itf-N.

2 References

The following documents contain provisions that, through reference in this text, constitute provisions of the present document.

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

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

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

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

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

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

[4]   3GPP TS 32.342: "Telecommunication management; File Transfer (FT); Integration Reference Point (IRP); Information Service (IS)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

changed instance / alarm: it refers to a managed object instance or an alarm that has changed during a period defined two time based references

A managed object instance / alarm is considered changed if:

a) It is present at the beginning of the period and absent at the end of the period; or

b) It is absent at the beginning of the period and present at the end of the period; or

c) At least one of its attribute / parameter values is different at the beginning and at the end of the period.

CM data: data which can be managed by CM (no matter if basic or bulk CM)

delta synchronization: state of MIB is the totality of states of all managed object instances in that MIB
State of MIB can be changed. AlarmList content can be changed. Delta synchronization refers to a process where the IRPManager's view of the MIB state or the AlarmList content at T1 (sometimes referred to as the beginning of the Delta Synchronization period) can be updated to that at T2 (sometimes referred to as the end of the Delta Synchronization period) by receiving and processing only those data involving changed instances.

delta synchronization point: it refers to a point in time based on the clock used by the IRPAgent
It relates to the T1 and T2 of the Delta Synchronization process.

FM data: alarm data as it would be retrieved with operation getAlarmList

full synchronization: it is a specialized Delta Synchronization process in that at T1 (beginning of the Delta Synchronization period), there is no managed object instance or the AlarmList content is empty

IRP: See 3GPP TS 32.101 [1].

IRPAgent: See 3GPP TS 32.102 [2].

IRPManager: See 3GPP TS 32.102 [2].

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CM	Configuration Management
EM	Element Manager
IRP	Integration Reference Point
IS	Information Service (see 3GPP TS 32.101 [1])
Itf-N	Interface N
MIB	Management Information Base
NE	Network Element

4 Requirements for Delta Synchronization between IRP Manager and IRP Agent

4.1 Concept

Delta Synchronization allows an IRPManager to request information about changes which took place since a specific point in time (synchronization point) and applies both to the alarm list and configuration data. This gives the IRPManager an efficient way to align his picture with the picture the IRPAgent has.

4.1.1 Difference to full synchronization:

"Full synchronization", provided in TS 32.60n and 32.111-n series by operations such as getMOAttributes and getAlarmList, on the other hand delivers - in the requested scope (and filter, if applied) - the complete data at that point in time when the IRPAgent prepares the response to such an operation request.

For all cases when only a few data have changed, a "full synchronization" would deliver too many data and the potentially huge amount of data would have to be checked where changes took place. Delta synchronization can be beneficial in these cases.

This benefit would be destroyed, if in responses to delta synchronization request the IRPAgent would deliver the same data as in full synchronization responses. Therefore this is not allowed (except in the trivial cases where the changed data is identical to the existing data).

4.1.2 Difference to logging:

A suitably administered log contains a history of the changes which took place, potentially also since the synchronization point. But many of these changes could refer to the same instances which e.g. changed several times or where changes were undone again.

Delta synchronization tries to compress this information as far as possible to only one set of delta synchronization data per changed instance and not to report undone changes. Therefore it is not allowed to deliver the full change history since the synchronization point (except for those trivial cases when there were no "compressible" changes).

NOTE: Delta synchronization not necessarily has to be based on a log. For cases where changes take place which are not recorded in a log - e.g. because the changes do not result in a notification to be logged - using the log would fail to produce the correct delta synchronization data.

4.2 General requirements

4.2.1 Data which require delta synchronization:

    4.2.1.2 CM data

    4.2.1.2 FM data

4.2.2 Scenarios when delta synchronization can be required:

    4.2.2.1 IRPManager recognizes that its data may not be up-to-date

    4.2.2.2 Interruption and re-establishment of the Manager-Agent communication (especially useful for interruptions when not a very big amount of data changed)

    4.2.2.3 IRPAgent does not generate CM-related notifications (notifyObjectCreation / notifyObjectDeletion / notifiyAttributeValueChange)

    4.2.2.4 IRPManager does not evaluate CM-related notifications (notifyObjectCreation / notifyObjectDeletion / notifiyAttributeValueChange)

    4.2.2.5 IRPManager regularly synchronizes its data

4.2.3 Time aspects

    4.2.3.1 Time parameters in the context of the delta synchronization refer to the IRPAgent's time.

4.3 Requirements for operations related to delta synchronization

4.3.1 The Itf-N shall allow an IRPManager to request delta synchronization data for the managed resources of the whole or optionally only a part of the network.

4.3.2 The Itf-N shall allow an IRPManager to specify in its request if it wants delta synchronization data starting from a synchronization point in time or from the last synchronization (i.e. the last time the IRPAgent stored a section of the delta data).
The IRPAgent may choose to only accept a request for delta data related to the IRPAgent's own synchronizationPoints

4.3.3 The Itf-N should allow an IRPManager to request if it wants in delta synchronization responses - only the identification of the changed instances (concerning configuration or alarm status) or - the complete data (attributes/parameters) of the changed instances (including identification). This choice is not possible, if the delta data is delivered in files, not in the operation response.

4.3.4 The IRPAgent shall indicate in its response to the delta synchronization request whether the delivered data is new, was modified or deleted since the last delta synchronization / last getAlarmList / last getMOattributes / synchronization point.

    4.3.4.1 If an instance is created and deleted again / an alarm is raised and cleared again and acknowledged, then both should not be reported, if the IRPAgent can fulfil the delta synchronization request exactly. If the IRPAgent delivers more data, then the deletion / alarm acknowledgement should be reported.

    4.3.4.2 If an attribute value / an alarm parameter changes several times and the end value is not equal to the start value, then only the last change shall be reported

    4.3.4.3 If an attribute value / an alarm parameter changes and returns to its start value, then either nothing shall be reported or the last value. It is only allowed to report a last value, which is equal to the start

value, if a change took place in between. Start- and end synchronization point shall be indicated by the IRPAgent. (This requirement is valid within one operation response/file.)

4.3.5 The Itf-N shall allow an IRPManager to request activation or deactivation of the delta synchronization functionality.

4.3.6 The Itf-N shall allow an IRPManager to request a synchronizationPoint in the IRPAgent. The time for this synchronizationPoint is determined by the IRPAgent.

4.3.7 The Itf-N shall allow an IRPManager to request to read the available synchronizationPoints.

4.3.8 A change shall be reported in a delta synchronization response regardless whether the change was already been or will be reported by other means (e.g. by a notification).

4.3.9 The agent may deliver more, but not less than the changed data since the delta synchronization point. The agent should try to keep the excess delta data as small as possible. In case of such excess data the IRPAgent has to specify the used synchronization point in its reply to the IRPManager.

4.3.10 The IRPAgent may reject the delta synchronization request if too many data changed since the specified delta synchronization point. In case of such a rejection the IRPAgent has to specify the reason in its reply to the IRPManager.

4.3.11 The IRPAgent may reject the delta synchronization request with "last synchronization" as synchronization point, if the IRPAgent can not determine this last synchronization point. In case of such a rejection the IRPAgent shall specify the reason in its reply to the IRPManager.

4.3.12 If the delta synchronization functionality is deactivated, then a notification indicating this shall be sent out by the IRPAgent.

4.3.13 Optional requirement: The IRP Agent sends a notification when it establishes a new synchronizationPoint.

4.3.14 The IRPAgent may deliver the delta data not directly, but via references to files. In this case the availability of the files shall be announced by a notifyFileReady (see [4]).

Annex A (informative):
Change history

Change history								
Date	**TSG #**	**TSG Doc.**	**CR**	**R**	**Subject/Comment**	**Cat**	**Old**	**New**
Dec 2006	SA_34	SP-060734	--	--	Submitted to SA#34 for Information	--	1.0.0	
Mar 2007	SA_35	SP-070052	--	--	Submitted to SA#35 for Approval	--	2.0.0	7.0.0
Dec 2008	SA_42	--	--	--	Upgrade to Release 8	--	7.0.0	8.0.0
Dec 2009	-	-	-	-	Update to Rel-9 version (MCC)	--	8.0.0	9.0.0
2011-03	-	-	-	-	Update to Rel-10 version (MCC)	--	9.0.0	10.0.0
2012-09	-	-	-	-	-	Update to Rel-11 version (MCC)	10.0.0	**11.0.0**