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LTE;
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Solution Set (SS) definitions
(3GPP TS 32.726 version 11.0.0 Release 11)

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Foreword

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Contents

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:

32.721: Configuration Management (CM); Repeater network resources Integration Reference Point (IRP); Requirements

32.722: Configuration Management (CM); Repeater network resources Integration Reference Point (IRP); Information Service (IS)

32.726: Configuration Management (CM); Repeater network resources Integration Reference Point (IRP): Solution Set (SS) definitions

Configuration Management (CM), in general, provides the operator with the ability to assure correct and effective operation of the 3G network as it evolves. CM actions have the objective to control and monitor the actual configuration on the Network Elements (NEs) and Network Resources (NRs), and they may be initiated by the operator or by functions in the Operations Systems (OSs) or NEs.

CM actions may be requested as part of an implementation programme (e.g. additions and deletions), as part of an optimisation programme (e.g. modifications), and to maintain the overall Quality of Service (QoS). The CM actions are initiated either as single actions on single NEs of the 3G network, or as part of a complex procedure involving actions on many resources/objects in one or several NEs.

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1 Scope

The present specifies the Solution Set definitions for the IRP whose semantics are specified in the Repeater Network Resources IRP NRM Information Service (3GPP TS 32.722 [1]).

This Solution Set specification is related to TS 32.722 v11.0.X.

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 32.722: "Telecommunication management; Configuration Management (CM); Repeater Network Resources Model (NRM):Integration Reference Point (IRP): Information Service (IS)".

[2] 3GPP TS 32.612: "Telecommunication management; Configuration Management (CM); Bulk CM Integration Reference Point (IRP); Information Service (IS)".

[3] 3GPP TS 32.616: "Telecommunication management; Configuration Management (CM); Bulk CM Integration Reference Point (IRP); Solution Set (SS) definitions

[4] 3GPP TS 32.101: "Telecommunication management; Principles and high level requirements".

[5] 3GPP TS 32.102: "Telecommunication management; Architecture".

[6] 3GPP TS 32.600: "Telecommunication management; Configuration Management (CM); Concept and high-level requirements"..

[7] 3GPP TS 32.300: "Telecommunication management; Configuration Management (CM); Name convention for Managed Objects".

[8] OMG Notification Service, Version 1.0.

[9] OMG CORBA services: Common Object Services Specification, Update: November 22, 1996.

[10] The Common Object Request Broker: Architecture and Specification (for specification of valid version, see [1]).

[11] 3GPP TS 32.306: "Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP): Solution Set (SS) definitions ".

[12] 3GPP TS 32.111-6: "Telecommunication management; Fault Management; Part 3: Alarm Integration Reference Point (IRP): Solution Set (SS) definitions ".

[13] W3C REC-xml-20001006: "Extensible Markup Language (XML) 1.0 (Second Edition)".

[14] W3C REC-xmlschema-0-20010502: "XML Schema Part 0: Primer".

[15] W3C REC-xmlschema-1-20010502: "XML Schema Part 1: Structures".

[16] W3C REC-xmlschema-2-20010502: "XML Schema Part 2: Datatypes".

[17] W3C REC-xml-names-19990114: "Namespaces in XML".

3 Definitions and abbreviations

3.1 Definitions

For terms and definitions please refer to 3GPP TS 32.101 [4], 3GPP TS 32.102 [5], 3GPP TS 32.600 [6] and 3GPP TS 32.722 [1] the following terms and definitions apply:

XML file: file containing an XML document

XML document: composed of the succession of an optional XML declaration followed by a root XML element

NOTE: See [13]; in the scope of the present document.

XML declaration: it specifies the version of XML being used

NOTE: See [13].

XML element: has a type, is identified by a name, may have a set of XML attribute specifications and is either composed of the succession of an XML start-tag followed by the XML content of the XML element followed by an XML end-tag, or composed simply of an XML empty-element tag; each XML element may contain other XML elements

NOTE: See [13].

empty XML element: having an empty XML content; an empty XML element still possibly has a set of XML attribute specifications; an empty XML element is either composed of the succession of an XML start-tag directly followed by an XML end-tag, or composed simply of an XML empty-element tag

NOTE: See [13].

XML content (of an XML element): empty if the XML element is simply composed of an XML empty-element tag; otherwise the part, possibly empty, of the XML element between its XML start-tag and its XML end-tag

XML start-tag: the beginning of a non-empty XML element is marked by an XML start-tag containing the name and the set of XML attribute specifications of the XML element

NOTE: See [13].

XML end-tag: the end of a non-empty XML element is marked by an XML end-tag containing the name of the XML element

NOTE: See [13].

XML empty-element tag: composed simply of an empty-element tag containing the name and the set of XML attribute specifications of the XML element

NOTE: See [13].

XML attribute specification: has a name and a value

NOTE: See [13].

DTD: defines structure and content constraints to be respected by an XML document to be valid with regard to this DTD

NOTE: See [13].

XML schema: more powerful than a DTD, an XML schema defines structure and content constraints to be respected by an XML document to conform with this XML schema; through the use of XML namespaces several XML schemas can be used together by a single XML document; an XML schema is itself also an XML document that shall conform with the XML schema for XML schemas

NOTE: See [14], [15] and [16].

XML namespace: enables qualifying element and attribute names used in XML documents by associating them with namespaces identified by different XML schemas

NOTE: See [17], in the scope of the present document.

XML complex type: defined in an XML schema; cannot be directly used in an XML document; can be the concrete type or the derivation base type for an XML element type or for another XML complex type; ultimately defines constraints for an XML element on its XML attribute specifications and/or its XML content

NOTE: See [14], [15] and [16].

XML element type: declared by an XML schema; can be directly used in an XML document; as the concrete type of an XML element, directly or indirectly defines constraints on its XML attribute specifications and/or its XML content; can also be the concrete type or the derivation base type for another XML element type

NOTE: See [14], [15] and [16].

3.2 Abbreviations

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

CM	Configuration Management
CORBA	Common Object Request Broker Architecture
DN	Distinguished Name
DTD	Document Type Definition
EDGE	Enhanced Data for GSM Evolution
GERAN	GSM/EDGE Radio Access Network
GSM	Global System for Mobile communication
IS	Information Service
IDL	Interface Definition Language (OMG)
IOC	Information Object Class
IRP	Integration Reference Point
MO	Managed Object
MOC	Managed Object Class
NRM	Network Resource Model
OMG	Object Management Group
SS	Solution Set
UMTS	Universal Mobile Telecommunications System
UTRAN	Universal Terrestrial Radio Access Network
XML	eXtensible Markup Language

4 Solution Set definitions

This specification defines the following 3GPP Repeater NRM IRP Solution Set definitions:

- 3GPP Repeater NRM IRP CORBA SS (Annex A)
- 3GPP Repeater NRM IRP XML definitions (Annex B)

Annex A (normative): CORBA Solution Set

This annex contains the CORBA Solution Set for the IRP whose semantics is specified in Repeater NRM IRP: Information Service (TS 32.722 [1]).

A.1 Architectural Features

The overall architectural feature of Repeater Network Resources IRP is specified in 3GPP TS 32.722 [1].
This clause specifies features that are specific to the CORBA SS.

A.1.1 Syntax for Distinguished Names

The syntax of a Distinguished Name is defined in 3GPP TS 32.300 [7].

A.1.2 Notifications

Notifications are sent according to the Notification IRP: CORBA SS (see 3GPP TS 32.306 [11]).

A.2 Mapping

A.2.1 General mappings

Attributes modelling associations as defined in the NRM (here also called 'reference attributes') are in this SS mapped to attributes. The names of the reference attributes in the NRM are mapped to the corresponding attribute names in the MOC. When the cardinality for an association is 0..1 or 1..1 the datatype for the reference attribute is defined as a MOReference. The value of an MO reference contains the distinguished name of the associated MO. When the cardinality for an association allows more than one referred MO, the reference attribute will be of type MOReferenceSet, which contains a sequence of MO references.

A.2.2 Repeater NRM Information Object Class (IOC) mapping

A.2.2.1 IOC RepeaterFunction

Mapping from NRM IOC RepeaterFunction attributes to SS equivalent MOC RepeaterFunction attributes

NRM Attributes of IOC RepeaterFunction in 3GPP TS 32.722 [1]	SS Attributes	SS Type	Support Qualifier	Read	Write
repeaterFunctionId	repeaterFunctionId	string	M	M	-
userLabel	userLabel	string	M	M	M
priority	priority	long	M	M	M
latitude	latitude	float	M	M	O
Longitude	longitude	float	M	M	O
ctrlConnMode	ctrlConnMode	ctrlConnMode	M	M	M
environmentInfo	environmentInfo	string	M	M	-
powerSwitch	powerSwitch	powerSwitch	M	M	M
ulAttenuation	ulAttenuation	long	M	M	M
dlAttenuation	dlAttenuation	long	M	M	M
firmwareVer	firmwareVer	string	M	M	-
repeaterType	repeaterType	repeaterType	M	M	-
repeaterFunction-ExternalUtranCell	repeaterFunctionExternalUtranCell	GenericNetworkResourcesIRPSystem::AttributeTypes::MOReference	M	M	-

A.3 Rules for management information model extensions

This clause discusses how the models and IDL definitions provided the present document can be extended for a particular implementation and still remains compliant with 3GPP SA5's specifications.

A.3.1 Allowed extensions

Vendor-specific IOCs may be supported. The vendor-specific IOCs may support new types of attributes. The 3GPP SA5-specified notifications may be issued referring to the vendor-specific IOCs and vendor-specific attributes. New IOCs shall be distinguishable from 3GPP SA5 IOCs by name. 3GPP SA5-specified and vendor-specific attributes may be used in vendor-specific IOCs. Vendor-specific attribute names shall be distinguishable from existing attribute names.

NRM IOCs may be subclassed. Subclassed IOCs shall maintain the specified behaviour of the 3GPP SA5's superior classes. They may add vendor-specific behaviour with vendor-specific attributes. When subclassing, naming attributes cannot be changed. The subclassed IOC shall support all attributes of its superior class. Vendor-specific attributes cannot be added to 3GPP SA5 NRM IOCs without subclassing.

When subclassing, the 3GPP SA5-specified containment rules and their specified cardinality shall still be followed. As an example, `ManagementNode` (or its subclasses) shall be contained under `SubNetwork` (or its subclasses).

Managed Object Instances may be instantiated as CORBA objects. This requires that the IOCs be represented in IDL. 3GPP SA5's NRM IOCs are not currently specified in IDL, but may be specified in IDL for instantiation or subclassing purposes. However, management information models should not require that IRPManagers access the instantiated managed objects other than through supported methods in the present document.

Extension rules related to notifications (Notification categories, Event Types, Extended Event Types etc.) are for further study.

A.3.2 Extensions not allowed

The IDL specifications in the present document cannot be edited or altered. Any additional IDL specifications shall be specified in separate IDL files.

IDL interfaces (note: not IOCs) specified in the present document may not be subclassed or extended. New interfaces may be defined with vendor-specific methods.

A.4 Solution Set definitions

A.4.1 IDL definition structure

Clause A.4.2 defines the MO classes for the Repeater NRM IRP

A.4.2 IDL specification (file name "RepeaterNetworkResourcesNRMDefs.idl")

```
//File:RepeaterNetworkResourcesNRMDefs.idl
#ifndef _REPEATERNETWORKRESOURCESNRMDEFS_IDL_
#define _REPEATERNETWORKRESOURCESNRMDEFS_IDL_
#include "GenericNetworkResourcesNRMDefs.idl"
#pragma prefix "3gppsa5.org"
/**
 * This module defines constants for each MO class name and
 * the attribute names for each defined MO class.
 */
module RepeaterNetworkResourcesNRMDefs
{
      /**
       *  Definitions for MO class RepeaterFunction
       */
      interface RepeaterFunction : GenericNetworkResourcesNRMDefs::ManagedFunction
      {
          const string CLASS = "RepeaterFunction";
         // Attribute Names
         //
         const string repeaterFunctionId   = "repeaterFunctionId";
         const string priority          = "priority";
         const string latitude          = "latitude";
         const string longitude             = "longitude";
         const string ctrlConnMode      = "ctrlConnMode";
         const string environmentInfo = "environmentInfo";
         const string powerSwitch       = "powerSwitch";
         const string dLAttenuation   = "dLAttenuation";
         const string uLAttenuation   = "uLAttenuation";
         const string firmwareVer           = "firmwareVer";
         const string repeaterType      = "repeaterType";
         const string repeaterFunctionExternalUtranCell = "repeaterFunctionExternalUtranCell";
    };

      enum ctrlConnMode
      {
         GSM_SMS,
         WCDMA_SMS,
         CIRCLE_SWITCH_DATA_CSD,
            PACKAGE_SWITCH_DATA_IP,
            SERIAL_PORT
      };

       enum powerSwitch {ON,OFF};

     enum repeaterType
     {
       WIDE_BAND_REPT_FUNCTION,
       FREQ_SEL_REPT_FUNCTION,
       FIBER_REPT_FUNCTION,
       INDOOR_REPT_FUNCTION,
       FREQ_SHIFT_REPT_FUNCTION

     };
 };
#endif //_REPEATERNETWORKRESOURCESNRMDEFS_IDL_
```

Annex B (normative): XML definitions

This annex provides the NRM-specific part related to the Repeater NRM IRP [1] of the XML file format definition for the Bulk Configuration Management IRP IS [2].

The main part of this XML file format definition is provided by 3GPP TS 32.616 [3].

Bulk CM XML file formats are based on XML [13], XML Schema [14] [15] [16] and XML Namespace [17] standards.

B.1 Architectural features

The overall architectural feature of IMS NRM IRP is specified in 3GPP TS 32.722 [1].

This clause specifies features that are specific to the XML Schema definitions.

B.1.1 Syntax for Distinguished Names

The syntax of a Distinguished Name is defined in 3GPP TS 32.300 [7].

B.2 Mapping

Not present in the current version of this specification.

B.3 Solution Set definitions

B.3.1 XML definition structure

The overall description of the file format of configuration data XML files is provided by 3GPP TS 32.616 [3].

Annex B.3.2 of the present document defines the NRM-specific XML schema `RepeaterNrm.xsd` for the Repeater Network Resources IRP NRM defined in 3GPP TS 32.722 [1].

XML schema `RepeaterNrm.xsd` explicitly declares NRM-specific XML element types for the related NRM.

The definition of those NRM-specific XML element types complies with the generic mapping rules defined in 3GPP TS 32.616 [3].

B.3.2 XML schema (file name "RepeaterNrm.xsd")

```
<?xml version="1.0" encoding="UTF-8"?>

<!--
  3GPP TS 32.726 Repeater Network Resources IRP
  Bulk CM Configuration data file NRM-specific XML schema
  repeaterNrm.xsd
-->

<schema
  targetNamespace=
"http://www.3gpp.org/ftp/specs/archive/32_series/32.726#repeaterNrm"
  elementFormDefault="qualified"
  xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:xn=
"http://www.3gpp.org/ftp/specs/archive/32_series/32.626#genericNrm"
  xmlns:rn=
"http://www.3gpp.org/ftp/specs/archive/32_series/32.726#repeaterNrm"
>

  <import
    namespace=
"http://www.3gpp.org/ftp/specs/archive/32_series/32.626#genericNrm"
  />

  <!-- Repeater Network Resources IRP NRM attribute related XML types -->

  <simpleType name="priority">
    <restriction base="integer">
      <minInclusive value="0"/>
      <maxInclusive value="268435455"/>
    </restriction>
  </simpleType>

  <simpleType name="dLAttenuation">
    <restriction base="integer">
      <minInclusive value="0"/>
      <maxInclusive value="268435455"/>
    </restriction>
  </simpleType>

  <simpleType name="uLAttenuation">
    <restriction base="integer">
      <minInclusive value="0"/>
      <maxInclusive value="268435455"/>
    </restriction>
  </simpleType>


  <simpleType name="latitude">
    <restriction base="decimal">
      <fractionDigits value="4"/>
      <minInclusive value="-90.0000"/>
      <maxInclusive value="90.0000"/>
    </restriction>
  </simpleType>

  <simpleType name="longitude">
    <restriction base="decimal">
      <fractionDigits value="4"/>
      <minInclusive value="-90.0000"/>
      <maxInclusive value="90.0000"/>
    </restriction>
  </simpleType>

  <simpleType name="ctrlConnMode">
    <restriction base="string">
      <enumeration value="GSM_SMS"/>
      <enumeration value="WCDMA_SMS"/>
      <enumeration value="CIRCLE_SWITCH_DATA_CSD"/>
      <enumeration value="PACKAGE_SWITCH_DAT_IP"/>
      <enumeration value="SERIAL_PORT"/>
    </restriction>
  </simpleType>
```

```
  <simpleType name="powerSwitch">
    <restriction base="string">
      <enumeration value="ON"/>
      <enumeration value="OFF"/>
    </restriction>
  </simpleType>
  <simpleType name="repeaterType">
    <restriction base="string">
      <enumeration value="WideBandReptFunction"/>
      <enumeration value="FreqSelReptFunction"/>
      <enumeration value="FiberReptFunction"/>
      <enumeration value="IndoorReptFunction"/>
      <enumeration value="FreqShiftReptFunction"/>
    </restriction>
  </simpleType>

  <!-- Repeater Network Resources IRP NRM class associated XML elements -->

  <element
    name="RepeaterFunction "
    substitutionGroup="xn:ManagedElementOptionallyContainedNrmClass"
  >
    <complexType>
      <complexContent>
        <extension base="xn:NrmClass">
          <sequence>
            <element name="attributes" minOccurs="0">
              <complexType>
                <all>
                  <element name="userLabel" type="string"/>
                  <element name="priority" type="rn:priority"/>
                  <element name="latitude" type="rn:latitude"/>
                  <element name="longitude" type="rn:longitude"/>
                  <element name="ctrlConnMode" type="rn:ctrlConnMode"/>
                  <element name="environmentInfo" type="string"/>
                  <element name="powerSwitch" type="rn:powerSwitch"/>
                  <element name="dLAttenuation" type="rn:dLAttenuation"/>
                  <element name="uLattenuation" type="rn:uLAttenuation"/>
                  <element name="firmwareVer" type="string"/>
                  <element name="repeaterType" type="rn:repeaterType"/>
                  <element name="repeaterFunctionExternalUtranCell" type="xn:dn"/>
                </all>
              </complexType>
            </element>
            <choice minOccurs="0" maxOccurs="unbounded">
              <element ref="xn:VsDataContainer"/>
            </choice>
          </sequence>
        </extension>
      </complexContent>
    </complexType>
  </element>
</schema>
```

Annex C (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2010-09	SA#49	SP-100504	--	--	Presentation to SA for Information and Approval	---	1.0.0
2010-10	--	--	--	--	Publication	1.0.0	10.0.0
2010-12	SA#50	SP-100759	001	1	Correcting XML schema of Repeater network resources IRP - Align with 32.722 IS	10.0.0	10.1.0
2012-09	SA#57	-	-	-	Automatic upgrade from previous Release version 10.1.0	10.1.0	11.0.0

History

Document history		
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