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Technical Specification

**Universal Mobile Telecommunications System (UMTS);
Telecommunication management;
Configuration Management (CM);
Bulk CM Integration Reference Point (IRP):
eXtensible Markup Language (XML) file format definition
(3GPP TS 32.615 version 5.4.0 Release 5)**



Reference

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Contents

Intellectual Property Rights	2
Foreword.....	2
Foreword.....	4
Introduction	4
1 Scope	5
2 References	5
3 Definitions and abbreviations.....	6
3.1 Definitions	6
3.2 Abbreviations	7
4 Structure and content of configuration data XML files.....	7
4.1 Global structure	7
4.2 XML elements fileHeader and fileFooter	9
4.2.1 XML element fileHeader	9
4.2.2 XML element fileFooter	9
4.3 XML element configData.....	10
4.3A NRM-specific XML elements	10
4.3A.1 NRM-specific XML schemas	10
4.3A.2 Generic mapping rules	11
4.4 XML attribute specification modifier	13
4.5 XML elements VsDataContainer, vsData and vsDataFormatVersion	17
5 Structure and content of session log XML files	18
5.1 Global structure	19
5.2 XML elements fileHeader and fileFooter	20
5.3 XML element activity	20
Annex A (normative): Configuration data file base XML schema (file name "configData.xsd")	22
Annex B (normative): Configuration data file NRM specific XML schemas.....	24
Annex C (informative): Configuration data file vendor-specific XML schema example	25
Annex D (normative): Session log file XML schema (file name "sessionLog.xsd")	26
Annex E (normative): XML schema electronic files.....	28
Annex F (informative): Change history	29
History	30

Foreword

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where:

- x the first digit:
 - 1 presented to TSG for information;
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Introduction

The present document is part of the 32.61x-series covering the 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Telecommunication management; Configuration Management (CM), as identified below:

- 32.611: "Bulk CM Integration Reference Point (IRP): Requirements".
- 32.612: "Bulk CM Integration Reference Point (IRP): Information Service (IS)".
- 32.613: "Bulk CM Integration Reference Point (IRP): Common Object Request Broker Architecture (CORBA) Solution Set (SS)".
- 32.614: "Bulk CM Integration Reference Point (IRP): Common Management Information Protocol (CMIP) Solution Set (SS)".
- 32.615: "Bulk CM Integration Reference Point (IRP): eXtensible Markup Language (XML) file format definition".**

Due to the number of specifications defining Network Resource Models (NRMs) for Configuration Management as well as their expected growth in size from Release 5 onwards, a new structure of specifications is already needed in Release 5 for the definition of the XML file formats for the Bulk CM IRP (in Release 4 solely defined in 3GPP TS 32.615). This structure is needed to enable independent development and release for CM NRMs and corresponding NRM-specific parts of the Bulk CM XML file format definition, from each other and from the non NRM-specific part of the Bulk CM XML file format definition.

Table: New specification structure for Bulk CM IRP XML file format definition

3GPP Rel-4	3GPP Rel-5	TS no.	TS title
New	Yes	32.615	Bulk Configuration Management IRP: XML File Format Definition
	New	32.625	Generic Network Resources IRP: Bulk CM XML File Format Definition
	New	32.635	Core Network Resources IRP: Bulk CM XML File Format Definition
	New	32.645	UTRAN Network Resources IRP: Bulk CM XML File Format Definition
	New	32.655	GERAN Network Resources IRP: Bulk CM XML File Format Definition

1 Scope

The present document provides the main part of the XML file format definition for the Bulk Configuration Management IRP IS [1].

The other parts of this XML file format definition are NRM-specific parts.

Those NRM-specific parts are provided by 3GPP TS 32.625 [11], 3GPP TS 32.635 [12], 3GPP TS 32.645 [13] and 3GPP TS 32.655 [14].

Bulk CM XML file formats are based on XML [2], XML Schema [3] [4] [5] and XML Namespace [6] standards.

This File Format Definition specification is related to 3GPP TS 32.612 V5.3.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 32.612: "Telecommunication management; Configuration Management (CM); Bulk CM Integration Reference Point (IRP): Information Service (IS)".
- [2] W3C REC-xml-20001006: "Extensible Markup Language (XML) 1.0 (Second Edition)".
- [3] W3C REC-xmlschema-0-20010502: "XML Schema Part 0: Primer".
- [4] W3C REC-xmlschema-1-20010502: "XML Schema Part 1: Structures".
- [5] W3C REC-xmlschema-2-20010502: "XML Schema Part 2: Datatypes".
- [6] W3C REC-xml-names-19990114: "Namespaces in XML".
- [7] 3GPP TS 32.300: "Telecommunication management; Configuration Management (CM); Name convention for Managed Objects".
- [8] 3GPP TS 32.622: "Telecommunication management; Configuration Management (CM); Generic network resources Integration Reference Point (IRP): Network Resource Model (NRM)".
- [9] 3GPP TS 32.642: "Telecommunication management; Configuration Management (CM); UTRAN network resources Integration Reference Point (IRP): Network Resource Model (NRM)".
- [10] 3GPP TS 32.652: "Telecommunication management; Configuration Management (CM); GERAN network resources Integration Reference Point (IRP): Network Resource Model (NRM)".
- [11] 3GPP TS 32.625: "Telecommunication management; Configuration Management (CM); Generic network resources Integration Reference Point (IRP): Bulk CM eXtensible Markup Language (XML) file format definition".
- [12] 3GPP TS 32.635: "Telecommunication management; Configuration Management (CM); Core network resources Integration Reference Point (IRP): Bulk CM eXtensible Markup Language (XML) file format definition".

- [13] 3GPP TS 32.645: "Telecommunication management; Configuration Management (CM); UTRAN network resources Integration Reference Point (IRP): Bulk CM eXtensible Markup Language (XML) file format definition".
- [14] 3GPP TS 32.655: "Telecommunication management; Configuration Management (CM); GERAN network resources Integration Reference Point (IRP): Bulk CM eXtensible Markup Language (XML) file format definition".

3 Definitions and abbreviations

3.1 Definitions

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

XML file: a file containing an XML document.

XML document: see [2]; in the scope of this specification, an XML document is composed of the succession of an optional XML declaration followed by a root XML element.

XML declaration: see [2]; it specifies the version of XML and the character encoding being used.

XML element: see [2]; an 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.

empty XML element: see [2]; an 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.

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: see [2]; 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.

XML end-tag: see [2]; the end of a non-empty XML element is marked by an XML end-tag containing the name of the XML element.

XML empty-element tag: see [2]; an empty XML element is composed simply of an empty-element tag containing the name and the set of XML attribute specifications of the XML element.

XML attribute specification: see [2]; an XML attribute specification has a name and a value.

DTD: see [2]; a DTD defines structure and content constraints to be respected by an XML document to be valid with regard to this DTD.

XML schema: see [3], [4] and [5]; 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.

XML namespace: see [6]; in the scope of this specification, enables qualifying element and attribute names used in XML documents by associating them with namespaces identified by different XML schemas.

XML complex type: see [3], [4] and [5]; 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.

XML element type: see [3], [4] and [5]; 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.

3.2 Abbreviations

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

CM	Configuration Management
DTD	Document Type Definition
DN	Distinguished Name
EDGE	Enhanced Data for GSM Evolution
GERAN	GSM/EDGE Radio Access Network
GSM	Global System for Mobile communication
IRP	Integration Reference Point
IS	Information Service
NRM	Network Resource Model
RDN	Relative Distinguished Name
UMTS	Universal Mobile Telecommunications System
UTRAN	Universal Terrestrial Radio Access Network
XML	eXtensible Markup Language

4 Structure and content of configuration data XML files

The present clause defines the file format of configuration data XML files exchanged between an IRPManager and an IRPAgent as part of `upload` and `download` operations of the Bulk CM IRP IS (see [1]).

Upload and download configuration data XML files share a common file format defined by the XML schema in Annex A and by the following subclauses.

Additionally, vendor-specific XML schemas shall be provided to enable configuration data XML files to carry vendor-specific data (see subclause 4.5).

The use of XML schemas enables to ensure configuration data XML files have the proper structure and to some extent the proper content, and in particular to ensure:

- for a given NRM instance, it is properly named/positioned with regard to the global NRM naming tree;
- for a given NRM instance, only attributes of the corresponding NRM class are present;
- for a given NRM attribute, its value is of the proper type.

Location of the XML schemas used for configuration data XML files is outside the scope of this document.

4.1 Global structure

The content of a configuration data XML file is the succession of:

- the standard XML declaration with specification of the version of XML and of the character encoding being used (see [2]);
- a `bulkCmConfigDataFile` XML element; this is the root XML element of configuration data XML files.

The definition of the allowed character encoding(s) is outside the scope of this document.

As defined by the following extract of XML schema `configData.xsd` (see Annex A):

```

<element name="bulkCmConfigDataFile">
  <complexType>
    <sequence>
      <element name="fileHeader">
[...]
      </element>
      <element name="configData" maxOccurs="unbounded">
[...]
    </element>

```



```

        <element name="fileFooter">
[...]
        </element>
    </sequence>
</complexType>
</element>

```

the XML content of a `bulkCmConfigDataFile` XML element is the succession of:

- a `fileHeader` XML element (see subclause 4.2);
- one or several `configData` XML elements (see subclause 4.3);
- a `fileFooter` XML element (see subclause 4.2).

XML elements `fileHeader` and `fileFooter` are empty XML elements (see subclause 4.2).

The `bulkCmConfigDataFile` XML element shall also have all the XML attribute specifications that declare the XML namespaces (see [6]) used in the XML file.

The following XML namespaces are potentially used in configuration data XML files:

- the default XML namespace is associated with the configuration data files base XML schema `configData.xsd` (see Annex A);
- for each NRM-specific XML schema, a specific XML namespace prefix is defined for the associated XML namespace (see subclause 4.3A.1);
- XML namespaces prefixes starting with `vs`, e.g. `vsRHO11`, are reserved for the XML namespaces associated with the vendor-specific XML schemas (see clause 4.5).

Each `configData` XML element (see subclause 4.3) carries:

- NRM instances with or without their NRM attribute values in a NRM naming tree organized structure together with `modifier` XML attribute specification (see subclause 4.4);
- possibly vendor-specific data (see subclause 4.5).

A `configData` XML element can carry an entire tree of NRM instances with their NRM attribute values and the related vendor-specific data or any subset of it.

The following is an example of a configuration data XML file, without presentation of the XML attribute specifications and XML content of `fileHeader`, `configData` and `fileFooter` XML elements (replaced by [...]; see subclauses 4.2, 4.3, 4.4 and 4.5):

```

<?xml version="1.0" encoding="UTF-8"?>
<bulkCmConfigDataFile
  xmlns=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32615-540.zip#configData"
[...]
>
  <fileHeader [...]/>
  <configData [...>
[...]
  </configData>
  <configData [...>
[...]
  </configData>
  <fileFooter [...]/>
</bulkCmConfigDataFile>

```

4.2 XML elements fileHeader and fileFooter

4.2.1 XML element fileHeader

As defined by the following extract of XML schema configData.xsd (see Annex A):

```
<element name="fileHeader">
  <complexType>
    <attribute name="fileFormatVersion" type="string" use="required"/>
    <attribute name="senderName" type="string" use="optional"/>
    <attribute name="vendorName" type="string" use="optional"/>
  </complexType>
</element>
```

a fileHeader XML element:

- has the following XML attribute specifications:
 - a fileFormatVersion XML attribute specification; this attribute specification carries the abridged number and version of this 3GPP document (see below); this identifies the version of the file format used for assembling the XML file;
 - a conditional senderName XML attribute specification; this attribute specification shall be present only in XML files generated by the IRPAgent; it carries the DN of the IRPAgent that assembled the XML file, i.e. the value of the systemDN NRM attribute of the IRPagent NRM instance (see [8]);
 - a conditional vendorName XML attribute specification; this attribute specification shall be present only in XML files generated by the IRPAgent; it carries the name of the vendor of the IRPAgent that assembled the XML file;
- and has an empty XML content.

The abridged number and version of a 3GPP document is constructed from its version specific full reference "3GPP [...] (yyyy-mm)" by:

- removing the leading "3GPP TS";
- removing everything including and after the version third digit, representing editorial only changes, together with its preceding dot character;
- from the resulting string, removing leading and trailing white space, replacing every multi character white space by a single space character and changing the case of all characters to uppercase.

The following is an example of a fileHeader XML element:

```
<fileHeader
  fileFormatVersion="32.615 V4.0"
  senderName="DC=a1.companyNN.com,SubNetwork=1,IRPagent=1"
  vendorName="Company NN"
/>
```

4.2.2 XML element fileFooter

As defined by the following extract of XML schema configData.xsd (see Annex A):

```
<element name="fileFooter">
  <complexType>
    <attribute name="dateTime" type="dateTime" use="required"/>
  </complexType>
</element>
```

a fileFooter XML element:

- has a `dateTime` XML attribute specification; this attribute specification carries the date and time the XML file was assembled;
- and has an empty XML content.

The following is an example of a `fileFooter` XML element:

```
<fileFooter dateTime="2001-05-07T12:00:00+02:00"/>
```

4.3 XML element `configData`

As defined by the following extract of XML schema `configData.xsd` (see Annex A):

```
<element name="configData" maxOccurs="unbounded">
  <complexType>
    <choice>
      <element ref="xn:SubNetwork"/>
      <element ref="xn:MeContext"/>
      <element ref="xn:ManagedElement"/>
    </choice>
    <attribute name="dnPrefix" type="string" use="optional"/>
  </complexType>
</element>
```

a `configData` XML element:

- has an optional `dnPrefix` XML attribute specification; this attribute specification carries the DN Prefix information as defined in Annex C of 3GPP TS 32.300 [7];
- and its XML content is an instance of the specific type of XML element (see below) corresponding to one of the NRM classes `SubNetwork`, `MeContext` or `ManagedElement` (see [8]); depending on the System Context of the IRP (see [1]) the used NRM class shall be:
 - in case of System Context A, only `SubNetwork` NRM class, or;
 - in case of System Context B, only `MeContext` or `ManagedElement` NRM class.

This instance of `SubNetwork/MeContext/ManagedElement` NRM class corresponding specific XML element type is the starting point for a `configData` XML element to possibly contain several NRM instances in a NRM naming tree organized structure (see subclause 4.3A.2).

The following is an example of a `configData` XML element:

```
<configData dnPrefix="DC=a1.companyNN.com">
  <xn:SubNetwork [...]>
[...]
```

```
</xn:SubNetwork>
```

```
</configData>
```

4.3A NRM-specific XML elements

NRM-specific XML element types are generically defined under the mapping rules defined in subclause 4.3A.2.

NRM-specific XML element types are explicitly declared by NRM-specific XML schemas as defined in subclause 4.3A.1.

4.3A.1 NRM-specific XML schemas

NRM-specific XML schemas are defined in the NRM-specific parts (see clause 1) of the XML file format definition for the Bulk Configuration Management IRP IS [1].

NRM-specific XML schemas with definition of corresponding XML namespace prefixes (see subclause 4.1) are listed by the following table:

Table 2: NRM-specific XML schemas, corresponding 3GPP TSs and XML namespace prefixes

NRM	XML schema	3GPP TS no.	XML namespace prefix
Generic Network Resources	genericNrm.xsd	32.625 [11]	xn
Core Network Resources	coreNrm.xsd	32.635 [12]	cn
UTRAN Network Resources	utranNrm.xsd	32.645 [13]	un
GERAN Network Resources	geranNrm.xsd	32.655 [14]	gn

Each NRM-specific XML schema explicitly declares NRM-specific XML element types for the related NRM.

Additionally, XML schema `genericNrm.xsd` (see [11]) also provides global XML declarations and definitions for the support of:

- NRM-specific XML element type declaration;
- vendor-specific XML element type declaration (see subclause 4.5).

4.3A.2 Generic mapping rules

NRM-specific XML element types are generically defined under the following mapping rules:

- to each NRM class corresponds a specific type of XML element having the following characteristics:
 - its name is the name of the NRM class;
 - it derives by extension (see [3], [4] and [5]) the `NrmClass` XML complex type defined in the XML schema `genericNrm.xsd` (see [11]);
 - it has the following XML attribute specifications, inherited from `NrmClass` XML complex type:
 - an `id` XML attribute specification; this attribute specification carries the attribute value part of the RDN of the NRM instance carried by the XML element, i.e. the value of the naming attribute of this NRM instance;
 - an optional `modifier` XML attribute specification (see subclause 4.4);
 - and its XML content is the succession of:
 - an optional `attributes` XML element whose XML content is the succession of:
 - zero or more specific XML elements (see below) corresponding to attributes of the NRM class, each occurring not more than once;
 - zero or more similar specific XML elements corresponding to direct subordinate NRM classes of the NRM class to which the current XML element corresponds;
- to each NRM attribute of each NRM class, except for the following NRM attributes:
 - the naming NRM attribute of each NRM class, whose value is already carried by the `id` XML attribute specification of the specific XML element corresponding to the NRM class;
 - the conditional `dnPrefix` NRM attribute of `SubNetwork`, `MeContext` and `ManagedElement` NRM classes (see [8]), whose value is already carried by the `dnPrefix` XML attribute specification of the `configData` XML element;

corresponds a specific type of XML element having the following characteristics:

- its name is constructed from the name of the NRM attribute by removing any contained dash character;
- and it has an XML content; this XML content carries the value of the NRM attribute.

For example for the SubNetwork NRM class (see [8]), the corresponding extract of XML schema genericNrm.xsd (see [11]) is the following:

```
<element name="SubNetwork">
  <complexType>
    <complexContent>
      <extension base="xn:NrmClass">
        <sequence>
          <element name="attributes" minOccurs="0">
            <complexType>
              <all>
                <element name="userLabel" minOccurs="0"/>
                <element name="userDefinedNetworkType" minOccurs="0"/>
              </all>
            </complexType>
          </element>
          <choice minOccurs="0" maxOccurs="unbounded">
            <element ref="xn:SubNetwork"/>
            <element ref="xn:ManagedElement"/>
            <element ref="xn:MeContext"/>
            <element ref="xn:ManagementNode"/>
            <element ref="xn:IRPAgent"/>
            <element ref="xn:SubNetworkOptionallyContainedNrmClass"/>
          </choice>
        </sequence>
      </extension>
    </complexContent>
  </complexType>
</element>
```

supported by the following extract of XML schema genericNrm.xsd (see [11]):

```
<complexType name="NrmClass">
  <attribute name="id" type="string" use="required"/>
  <attribute name="modifier" use="optional">
[...]
```

Exceptions to the generic mapping rules for the definition of NRM-specific XML element types are listed by the following table:

Table 3: Generic mapping rule exceptions

NRM classes / attributes	NRM 3GPP TS no.	Exception description references
vsData attribute of VsDataContainer class	32.622 [8]	subclause 4.5 of the present document and annex A of 3GPP TS 32.625 [11]

The following is an example of a configData XML element with regard to NRM-specific XML elements (in **bold**) in a configuration data XML file:

```
<?xml version="1.0" encoding="UTF-8"?>
<bulkCmConfigDataFile
  xmlns=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32615-540.zip#configData"
  xmlns:xn=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32625-520.zip#genericNrm"
[...]
```

```
>
```

```
[...]
```

```
<configData dnPrefix="DC=a1.companyNN.com">
  <xn:SubNetwork id="1">
```

```

<xn:attributes>
  <xn:userLabel>Paris SN1</xn:userLabel>
  <xn:userDefinedNetworkType>UMTS</xn:userDefinedNetworkType>
</xn:attributes>
<xn:ManagementNode id="1">
  <xn:attributes>
    <xn:userLabel>Paris MN1</xn:userLabel>
    <xn:vendorName>Company NN</xn:vendorName>
    <xn:userDefinedState>commercial</xn:userDefinedState>
    <xn:locationName>Montparnasse</xn:locationName>
  </xn:attributes>
</xn:ManagementNode>
<xn:ManagedElement id="1">
  <xn:attributes>
    <xn:managedElementType>RNC</xn:managedElementType>
    <xn:userLabel>Paris RN1</xn:userLabel>
    <xn:vendorName>Company NN</xn:vendorName>
    <xn:userDefinedState>commercial</xn:userDefinedState>
    <xn:locationName>Champ de Mars</xn:locationName>
  </xn:attributes>
</xn:ManagedElement>
<xn:ManagedElement id="2">
  <xn:attributes>
    <xn:managedElementType>RNC</xn:managedElementType>
    <xn:userLabel>Paris RN2</xn:userLabel>
    <xn:vendorName>Company NN</xn:vendorName>
    <xn:userDefinedState>commercial</xn:userDefinedState>
    <xn:locationName>Concorde</xn:locationName>
  </xn:attributes>
</xn:ManagedElement>
</xn:SubNetwork>
</configData>
[...]
```

4.4 XML attribute specification modifier

As defined by the following extract of XML schema genericNrm.xsd (see [11]):

```

<attribute name="modifier" use="optional">
  <simpleType>
    <restriction base="string">
      <enumeration value="create"/>
      <enumeration value="delete"/>
      <enumeration value="update"/>
    </restriction>
  </simpleType>
</attribute>
```

the value of the optional modifier XML attribute specification of the specific XML elements corresponding to the classes of the NRM is one of the following: create, delete, or update.

The semantic carried by a modifier XML attribute specification applies only to the NRM instance corresponding to the containing XML element and not to any explicit or implicit subordinate NRM instances of this NRM instance.

The following rules apply for the modifier XML attribute specification:

- in upload XML configuration files, no modifier XML attribute specification should be present; on the contrary those are to be considered as meaningless and shall be ignored;
- in download XML configuration files:

- if an XML element carrying an NRM instance has a `modifier` XML attribute specification of value `create`, then all directly or indirectly contained XML element carrying NRM instances, if any, shall also have a `modifier` XML attribute specification of value `create`;
- if an XML element carrying an NRM instance has a `modifier` XML attribute specification of value `delete`, then all directly or indirectly contained XML element carrying NRM instances, if any, shall also have a `modifier` XML attribute specification of value `delete`;
- if an XML element carrying an NRM instance has a `modifier` XML attribute specification of value `update`, then all directly contained XML element carrying NRM instances, if any, may also have a `modifier` XML attribute specification, this one being of either value `create`, `delete`, or `update`;
- if an XML element carrying an NRM instance has no `modifier` XML attribute specification or a `modifier` XML attribute specification of value `delete`, then it shall not directly contain an `attributes` XML element.

A tree of XML elements corresponding to a tree of NRM instances with all XML elements having a `modifier` XML attribute specification of value `create` is considered to be in accordance with the following rule from Bulk CM IRP IS 3GPP TS 32.612 [1]:

"When part or a whole NRM subtree is to be created, in the configuration data file the IRPManager shall first action the create action of parents MO instances before actioning the create of any child MO instances contained in the NRM subtree i.e. create actions on MO instances shall be specified in recursive manner following the NRM hierarchy subtree from the highest MO instances to the lowest MO instances the IRPManager requires to be created."

In such a tree of NRM instances, the XML element carrying a given NRM instance does not accurately appear before XML elements carrying subordinate NRM instances. The latter XML elements rather appear as the last part of the XML content of the former XML element.

Nevertheless, XML parsing of such a tree of NRM instances can still enable the above Bulk CM IRP IS rule to be fully respected. Example of an XML parsing enabling such compliance is one effectively actioning the creation of each NRM instance when having parsed the XML start-tag of the XML element carrying the NRM instance and, if any, the contained `attributes` XML element.

A tree of XML elements corresponding to a tree of NRM instances with all XML elements having a `modifier` XML attribute specification of value `delete` is considered to be in accordance with the following rule from Bulk CM IRP IS 3GPP TS 32.612 [1]:

"When part or whole NRM subtree is to be deleted, in the configuration data file the IRPManager shall first action delete of all associated child instances contained in the NRM subtree before actioning delete of MO parents instances i.e. delete actions on MO instances shall be specified in a recursive manner following the NRM hierarchy subtree from the lowest MO instances to the highest MO instances the IRPManager requires to be deleted."

In such a tree of NRM instances, the XML elements carrying subordinate NRM instances do not appear before the XML element carrying the parent NRM instance. The former XML elements rather appear as the XML content of the latter XML element.

Nevertheless, XML parsing of such a tree of NRM instances can still enable the above Bulk CM IRP IS rule to be fully respected. Example of an XML parsing enabling such compliance is one effectively actioning the delete of each NRM instance when parsing the XML end-tag of the XML element carrying the NRM instance.

The following are examples of legal `configData` XML element with regard to `modifier` XML attribute specification (in **bold**) in configuration data XML files:

- example 1:

```
<?xml version="1.0" encoding="UTF-8"?>
<bulkCmConfigDataFile
  xmlns=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32615-540.zip#configData"
  xmlns:xn=
```

```

"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32625-520.zip#genericNrm"
[...]
>
[...]
<configData dnPrefix="DC=a1.companyNN.com">
  <xn:SubNetwork id="1" modifier="create">
    <xn:attributes>
      <xn:userLabel>Paris SN1</xn:userLabel>
      <xn:userDefinedNetworkType>UMTS</xn:userDefinedNetworkType>
    </xn:attributes>
    <xn:ManagementNode id="1" modifier="create">
      <xn:attributes>
        <xn:userLabel>Paris MN1</xn:userLabel>
        <xn:locationName>Montparnasse</xn:locationName>
      </xn:attributes>
    </xn:ManagementNode>
    <xn:ManagedElement id="1" modifier="create">
      <xn:attributes>
        <xn:managedElementType>RNC</xn:managedElementType>
      </xn:attributes>
    </xn:ManagedElement>
    <xn:ManagedElement id="2" modifier="create">
      <xn:attributes>
        <xn:managedElementType>RNC</xn:managedElementType>
      </xn:attributes>
    </xn:ManagedElement>
    <xn:ManagedElement id="3" modifier="create">
      <xn:attributes>
        <xn:managedElementType>RNC</xn:managedElementType>
      </xn:attributes>
    </xn:ManagedElement>
  </xn:SubNetwork>
</configData>
</bulkCmConfigDataFile>

```

- example 2:

```

<?xml version="1.0" encoding="UTF-8"?>
<bulkCmConfigDataFile
  xmlns=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32615-540.zip#configData"
  xmlns:xn=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32625-520.zip#genericNrm"
[...]
>
[...]
<configData dnPrefix="DC=a1.companyNN.com">
  <xn:SubNetwork id="1">
    <xn:ManagedElement id="1" modifier="create">
      <xn:attributes>
        <xn:managedElementType>RNC</xn:managedElementType>
      </xn:attributes>
    </xn:ManagedElement>
    <xn:ManagedElement id="2" modifier="create">
      <xn:attributes>
        <xn:managedElementType>RNC</xn:managedElementType>
      </xn:attributes>
    </xn:ManagedElement>
    <xn:ManagedElement id="3" modifier="create">
      <xn:attributes>
        <xn:managedElementType>RNC</xn:managedElementType>
      </xn:attributes>
    </xn:ManagedElement>
  </xn:SubNetwork>
</configData>

```



```

    </xn:SubNetwork>
  </configData>
[...]
```

- example 3:

```

<?xml version="1.0" encoding="UTF-8"?>
<bulkCmConfigDataFile
  xmlns=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32615-540.zip#configData"
  xmlns:xn=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32625-520.zip#genericNrm"
[...]
```

```

>
[...]
```

```

  <configData dnPrefix="DC=a1.companyNN.com">
    <xn:SubNetwork id="1" modifier="delete">
      <xn:ManagementNode id="1" modifier="delete">
        </xn:ManagementNode>
      <xn:ManagedElement id="1" modifier="delete">
        </xn:ManagedElement>
      <xn:ManagedElement id="2" modifier="delete">
        </xn:ManagedElement>
    </xn:SubNetwork>
  </configData>
[...]
```

- example 4:

```

<?xml version="1.0" encoding="UTF-8"?>
<bulkCmConfigDataFile
  xmlns=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32615-540.zip#configData"
  xmlns:xn=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32625-520.zip#genericNrm"
[...]
```

```

>
[...]
```

```

  <configData dnPrefix="DC=a1.companyNN.com">
    <xn:SubNetwork id="1">
      <xn:ManagedElement id="1" modifier="delete">
        </xn:ManagedElement>
      <xn:ManagedElement id="2" modifier="delete">
        </xn:ManagedElement>
    </xn:SubNetwork>
  </configData>
[...]
```

- example 5:

```

<?xml version="1.0" encoding="UTF-8"?>
<bulkCmConfigDataFile
  xmlns=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32615-540.zip#configData"
  xmlns:xn=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32625-520.zip#genericNrm"
  xmlns:un=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32645-540.zip#utranNrm"
[...]
```

```

>
[...]
```

```

<configData dnPrefix="DC=a1.companyNN.com">
  <xn:SubNetwork id="1" modifier="update">
    <xn:attributes>
      <xn:userLabel>Paris SN1</xn:userLabel>
    </xn:attributes>
    <xn:ManagementNode id="1" modifier="update">
      <xn:attributes>
        <xn:userLabel>Paris MN1</xn:userLabel>
      </xn:attributes>
    </xn:ManagementNode>
    <xn:ManagedElement id="1" modifier="delete">
      <un:RncFunction id="1" modifier="delete">
        </un:RncFunction>
      </xn:ManagedElement>
    <xn:ManagedElement id="2" modifier="create">
      <xn:attributes>
        <xn:managedElementType>RNC</xn:managedElementType>
      </xn:attributes>
      <un:RncFunction id="2" modifier="create">
        <un:attributes>
          <un:userLabel>Paris RF2</un:userLabel>
        </un:attributes>
      </un:RncFunction>
    </xn:ManagedElement>
  </xn:SubNetwork>
</configData>
</bulkCmConfigDataFile>

```

4.5 XML elements VsDataContainer, vsData and vsDataFormatVersion

As all XML element types corresponding to NRM classes (see subclause 4.3A.2), the VsDataContainer XML element type, explicitly declared in 3GPP TS 32.625 [11], corresponds to the VsDataContainer NRM class defined in 3GPP TS 32.622 [8].

Contained in an attributes XML element type, itself contained in a VsDataContainer XML element, as all XML element types corresponding to NRM attributes (see subclause 4.3A.2), the vsData and vsDataFormatVersion XML element types, explicitly declared in 3GPP TS 32.625 [11], correspond to the vsData and vsDataFormatVersion NRM attributes defined in 3GPP TS 32.622 [8].

As an exception to the generic mapping rules for the definition of NRM-specific XML element types (see subclause 4.3A.2), the vsData XML element type has an empty XML content.

Each vendor-specific XML schema shall declare one or more vendor-specific XML element types that:

- have a name starting with vsData, e.g. vsDataRHO;
- derive by extension (see [3], [4] and [5]) the vsData XML element type declared by the XML schema genericNrm.xsd (see [11]);

- are designated as members of the substitution group (see [3], [4] and [5]) headed by the `vsData` XML element type.

Beyond the above statement, the definition of vendor-specific XML schemas is outside the scope of this document.

The XML content of those vendor-specific XML elements carry vendor-specific data.

The XML content of the `vsDataFormatVersion` XML element shall be the filename, without the ".xsd" file extension and without any path specification, of the vendor-specific XML schema used for the related `VsDataContainer` XML element.

See Annex C for an example of a vendor-specific XML schema.

The following is an example of a vendor-specific XML element (in **bold**) deriving and extending the `vsData` XML element in a configuration data XML file:

```
<?xml version="1.0" encoding="UTF-8"?>
<bulkCmConfigDataFile
  xmlns=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32615-540.zip#configData"
  xmlns:xn=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32625-520.zip#genericNrm"
  xmlns:un=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32645-540.zip#utranNrm"
  xmlns:vsRHO11="http://www.companyNN.com/xmlschemas/NNRncHandOver.1.1"
[... ]
>
[... ]
  <configData dnPrefix="DC=a1.companyNN.com">
    <xn:SubNetwork id="1">
      <xn:ManagedElement id="1">
        <un:RncFunction id="1">
          <xn:VsDataContainer id="1">
            <xn:attributes>
              <xn:vsDataType>RncHandOver</xn:vsDataType>
              <xn:vsDataFormatVersion>NNRncHandOver.1.1</xn:vsDataFormatVersion>
              <vsRHO11:vsDataRHO>
                <vsRHO11:abcMin>12</vsRHO11:abcMin>
                <vsRHO11:abcMax>34</vsRHO11:abcMax>
              </vsRHO11:vsDataRHO>
            </xn:attributes>
          </xn:VsDataContainer>
        </un:RncFunction>
      </xn:ManagedElement>
    </xn:SubNetwork>
  </configData>
[... ]
</bulkCmConfigDataFile>
```

5 Structure and content of session log XML files

The present clause defines the file format of session log XML files exchanged between an IRPManager and an IRPAgent as part of `getSessionLog` operation of the Bulk CM IRP IS (see [1]).

This file format is defined by the XML schema in Annex D and by the following subclauses.

The use of an XML schema enables to ensure session log XML files have the proper structure and to some extent the proper content.

Location of the XML schemas used for session log XML files is outside the scope of this document.

5.1 Global structure

The content of a session log XML file is the succession of:

- the standard XML declaration with specification of the version of XML and of the character encoding being used (see [2]);
- a `bulkCmSessionLogFile` XML element; this is the root XML element of session log XML files.

The definition of the allowed character encoding(s) is outside the scope of this document.

As defined by the following extract of XML schema `sessionLog.xsd` (see Annex D):

```
<element name="bulkCmSessionLogFile">
  <complexType>
    <sequence>
      <element name="fileHeader">
[...]
```

```
      </element>
      <element name="activity" maxOccurs="unbounded">
[...]
```

```
      </element>
      <element name="fileFooter">
[...]
```

```
      </element>
    </sequence>
  </complexType>
</element>
```

the XML content of a `bulkCmSessionLogFile` XML element is the succession of:

- a `fileHeader` XML element (see subclause 5.2);
- one or several `activity` XML elements (see subclause 5.3);
- a `fileFooter` XML element (see subclause 5.2).

XML elements `fileHeader` and `fileFooter` are empty XML elements (see subclause 5.2).

The `bulkCmSessionLogFile` XML element shall also have all the XML attribute specifications that declare the XML namespaces (see [6]) used in the XML file.

Only the default XML namespace is used in session log XML files. It is associated with the session log file XML schema `sessionLog.xsd` (see Annex D).

The following is an example of a session log XML file, without presentation of the XML attribute specifications and XML content of `fileHeader`, `activity` and `fileFooter` XML elements (replaced by [...]; see subclauses 5.2 and 5.3):

```
<?xml version="1.0" encoding="UTF-8"?>
<bulkCmSessionLogFile
  xmlns=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32615-540.zip#sessionLog"
[...]
```

```
>
  <fileHeader [...]/>
  <activity [...]>
[...]
```

```
</activity>
  <activity [...]>
[...]
```

```
</activity>
  <fileFooter [...]/>
</bulkCmSessionLogFile>
```

5.2 XML elements fileHeader and fileFooter

The XML elements fileHeader and fileFooter for session log XML files have the same definition, structure and content as the XML elements fileHeader and fileFooter for configuration data XML files (see subclause 4.2).

5.3 XML element activity

As defined by the following extract of XML schema sessionLog.xsd (see Annex D):

```

<element name="activity" maxOccurs="unbounded">
  <complexType>
    <sequence>
      <element name="log" maxOccurs="unbounded">
[...
      </element>
    </sequence>
    <attribute name="dateTime" type="dateTime" use="required"/>
    <attribute name="type" use="required">
      <simpleType>
        <restriction base="string">
          <enumeration value="upload"/>
          <enumeration value="download"/>
          <enumeration value="validate"/>
          <enumeration value="preactivate"/>
          <enumeration value="activate"/>
          <enumeration value="fallback"/>
        </restriction>
      </simpleType>
    </attribute>
  </complexType>
</element>

```

an activity XML element:

- has the following XML attribute specifications:
 - a dateTime XML attribute specification; this attribute specification carries the date and time the Bulk CM activity was started;
 - a type XML attribute specification; this attribute specification carries the type of the Bulk CM activity triggered by the IRPManager, upload, download, validate, preactivate, activate or fallback;
- and its XML content is the succession of one or several log XML elements.

As defined by the following extract of XML schema sessionLog.xsd (see Annex D):

```

<element name="log" maxOccurs="unbounded">
  <complexType>
    <simpleContent>
      <extension base="string">
        <attribute name="time" type="time" use="required"/>
        <attribute name="type" use="required">
          <simpleType>
            <restriction base="string">
              <enumeration value="informative"/>
              <enumeration value="error"/>
            </restriction>
          </simpleType>
        </attribute>
        <attribute name="dn" type="string" use="optional"/>

```

```

        <attribute name="modifier" use="optional">
          <simpleType>
            <restriction base="string">
              <enumeration value="create"/>
              <enumeration value="delete"/>
              <enumeration value="update"/>
            </restriction>
          </simpleType>
        </attribute>
      </extension>
    </simpleContent>
  </complexType>
</element>

```

a log XML element:

- has the following XML attribute specifications:
 - a *time* XML attribute specification; this attribute specification carries the time the logged Bulk CM internal event occurred;
 - a *type* XML attribute specification; this attribute specification carries the type of the logged Bulk CM internal event, being either *informative* or *error*;
 - an optional *dn* XML attribute specification; this attribute specification carries the DN of the NRM instance associated with the logged Bulk CM internal event, if any;
 - an optional *modifier* XML attribute specification; this attribute specification carries the value of the *modifier* (see subclause 4.4) associated with the NRM instance, if any;
- and it has an XML content; this XML content carries the description of the logged Bulk CM internal event.

The following is an example of an *activity* XML element (in **bold**) in a session log XML file:

```

<?xml version="1.0" encoding="UTF-8"?>
<bulkCmSessionLogFile
  xmlns=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32615-540.zip#sessionLog"
[...]
>
[...]
  <activity dateTime="2001-05-07T12:00:00+02:00" type="download">
    <log time="12:00:01+02:00" type="informative">
      Download requested with:
      downloadDataFileReference="ftp://a1.companyNN.com/data/upld123.xml"
    </log>
    <log time="12:00:02+02:00" type="error"
      dn="DC=a1.companyNN.com,SubNetwork=1"
      modifier="update"
    >
      No such instance
    </log>
  </activity>
[...]
</bulkCmSessionLogFile>

```

Annex A (normative): Configuration data file base XML schema (file name "configData.xsd")

The following XML schema configData.xsd is the base schema for configuration data XML files:

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

<!--
  3GPP TS 32.615 Bulk CM IRP
  Configuration data file base XML schema
  configData.xsd
-->

<schema
  targetNamespace=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32615-540.zip#configData"

  elementFormDefault="qualified"

  xmlns="http://www.w3.org/2001/XMLSchema"

  xmlns:xn=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32625-520.zip#genericNrm"

  xmlns:cn=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32635-520.zip#coreNrm"

  xmlns:un=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32645-540.zip#utranNrm"

  xmlns:gn=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32655-540.zip#geranNrm"
>

  <import
    namespace=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32625-520.zip#genericNrm"
  />
  <import
    namespace=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32635-520.zip#coreNrm"
  />
  <import
    namespace=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32645-540.zip#utranNrm"
  />
  <import
    namespace=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32655-540.zip#geranNrm"
  />

  <!-- Configuration data file root XML element -->

  <element name="bulkCmConfigDataFile">
    <complexType>
      <sequence>
        <element name="fileHeader">
          <complexType>
```

```
        <attribute name="fileFormatVersion" type="string" use="required"/>
        <attribute name="senderName" type="string" use="optional"/>
        <attribute name="vendorName" type="string" use="optional"/>
    </complexType>
</element>
<element name="configData" maxOccurs="unbounded">
    <complexType>
        <choice>
            <element ref="xn:SubNetwork"/>
            <element ref="xn:MeContext"/>
            <element ref="xn:ManagedElement"/>
        </choice>
        <attribute name="dnPrefix" type="string" use="optional"/>
    </complexType>
</element>
<element name="fileFooter">
    <complexType>
        <attribute name="dateTime" type="dateTime" use="required"/>
    </complexType>
</element>
</sequence>
</complexType>
</element>

</schema>
```


Annex B (normative): Configuration data file NRM specific XML schemas

Void.

Annex C (informative): Configuration data file vendor-specific XML schema example

The following XML schema is an example of vendor-specific schema for configuration data XML files:

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

<!--
  Configuration data file vendor-specific XML schema example
  NNRncHandOver.1.1.xsd
-->

<schema
  targetNamespace="http://www.companyNN.com/xmlschemas/NNRncHandOver.1.1"
  elementFormDefault="qualified"
  xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:xn=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32625-520.zip#genericNrm"
>

  <import
    namespace=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32625-520.zip#genericNrm"
    />

  <!-- RncHandOver version 1.1 company NN vendor-specific data -->

  <element name="vsDataRHO" substitutionGroup="xn:vsData">
    <complexType>
      <complexContent>
        <extension base="xn:vsData">
          <all>
            <element name="abcMin" minOccurs="0"/>
            <element name="abcMax" minOccurs="0"/>
          </all>
        </extension>
      </complexContent>
    </complexType>
  </element>

</schema>
```

Annex D (normative): Session log file XML schema (file name "sessionLog.xsd")

The following XML schema sessionLog.xsd is the schema for session log XML files:

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

<!--
  3GPP TS 32.615 Bulk CM IRP
  Session log file XML schema
  sessionLog.xsd
-->

<schema
  targetNamespace=
"http://www.3gpp.org/ftp/specs/latest/rel-5/32_series/32615-540.zip#sessionLog"
  elementFormDefault="qualified"
  xmlns="http://www.w3.org/2001/XMLSchema"
>

  <!-- Session log file root XML element -->

  <element name="bulkCmSessionLogFile">
    <complexType>
      <sequence>
        <element name="fileHeader">
          <complexType>
            <attribute name="fileFormatVersion" type="string" use="required"/>
            <attribute name="senderName" type="string" use="optional"/>
            <attribute name="vendorName" type="string" use="optional"/>
          </complexType>
        </element>
        <element name="activity" maxOccurs="unbounded">
          <complexType>
            <sequence>
              <element name="log" maxOccurs="unbounded">
                <complexType>
                  <simpleContent>
                    <extension base="string">
                      <attribute name="time" type="time" use="required"/>
                      <attribute name="type" use="required">
                        <simpleType>
                          <restriction base="string">
                            <enumeration value="informative"/>
                            <enumeration value="error"/>
                          </restriction>
                        </simpleType>
                      </attribute>
                      <attribute name="dn" type="string" use="optional"/>
                      <attribute name="modifier" use="optional">
                        <simpleType>
                          <restriction base="string">
                            <enumeration value="create"/>
                            <enumeration value="delete"/>
                            <enumeration value="update"/>
                          </restriction>
                        </simpleType>
                      </attribute>
                    </extension>
                  </simpleContent>
                </complexType>
              </element>
            </sequence>
          </complexType>
        </element>
      </sequence>
    </complexType>
  </element>

```

```
        </extension>
      </simpleContent>
    </complexType>
  </element>
</sequence>
<attribute name="dateTime" type="dateTime" use="required"/>
<attribute name="type" use="required">
  <simpleType>
    <restriction base="string">
      <enumeration value="upload"/>
      <enumeration value="download"/>
      <enumeration value="validate"/>
      <enumeration value="preactivate"/>
      <enumeration value="activate"/>
      <enumeration value="fallback"/>
    </restriction>
  </simpleType>
</attribute>
</complexType>
</element>
<element name="fileFooter">
  <complexType>
    <attribute name="dateTime" type="dateTime" use="required"/>
  </complexType>
</element>
</sequence>
</complexType>
</element>
</schema>
```

Annex E (normative): XML schema electronic files

The normative XML schema electronic files corresponding to the present document, if available, are contained in archive 32615-540-XMLSchema.zip which accompanies the present document.

Annex F (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
Jun 2001	S_12	SP-010283	--	--	Approved at TSG SA #12 and placed under Change Control	2.0.0	4.0.0
Dec 2001	S_14	SP-010645	001	--	Addition of MCC and MNC attributes to GSM cell related MOCs in Bulk CM XML file format	4.0.0	4.1.0
Mar 2002	S_15	SP-020032	002	--	Alignment of XML file definitions with W3C, and modifications to allow use of commercially available XML processing tools	4.1.0	4.2.0
Jun 2002	S_16	SP-020298	003	--	New structure of specifications for the definition of Bulk CM IRP XML file formats	4.2.0	5.0.0
Sep 2002	--	--	--	--	Cosmetics by Rapporteur/MCC	5.0.0	5.0.1
Jun 2003	S_20	SP-030284	006	--	Correction of Bulk CM session log file XML element "log" declaration	5.0.1	5.1.0
Jun 2003	S_20	SP-030287	007	--	Correction of Bulk CM configuration data file XML schema namespace URIs	5.0.1	5.1.0
Jun 2003	S_20	SP-030288	008	--	Generic NRM XML schema dependencies removal	5.0.1	5.1.0
Sep 2003	S_21	SP-030414	009	--	Add missing Activities to Session Log XML	5.1.0	5.2.0
Sep 2003	S_21	SP-030418	010	--	Inclusion of External BSS Function in GERAN XML Schema - Alignment with 32.652/655	5.1.0	5.2.0
Oct 2003	--	--	--	--	Attached to this TS the normative XML schema electronic files corresponding to Sept 2003 TS 32.615	5.2.0	5.2.1
Dec 2003	S_22	SP-030646	012	--	Correction of the number of possible URAs from 1 to 8	5.2.1	5.3.0
Mar 2004	S_23	SP-040131	013	--	Add the capability to contain instances of VsDataContainer to some MOs - Align with the IS 32.612	5.3.0	5.4.0

History

Document history		
V5.0.0	June 2002	Publication (Withdrawn)
V5.0.1	September 2002	Publication
V5.1.0	June 2003	Publication
V5.2.0	September 2003	Publication (Withdrawn)
V5.2.1	October 2003	Publication
V5.3.0	December 2003	Publication
V5.4.0	March 2004	Publication