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TECHNICAL SPECIFICATION

**Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Generic Network Resource Model (NRM)
Integration Reference Point (IRP);
Solution Set (SS) definitions
(3GPP TS 28.623 version 15.2.0 Release 15)**

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Contents

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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:

28.621 Generic Network Resource Model (NRM) Integration Reference Point (IRP); Requirements.

28.622 Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS).

28.623 Generic Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions.

1 Scope

The TS 28.62x-series (Generic Network Resources IRP) define an Integration Reference Point (IRP) through which an "IRPAgent" (typically an Element Manager or Network Element) can communicate Network Management related information to one or several "IRPManagers" (typically Network Managers).

This TS-family specifies a generic Network Resource Model, NRM (also referred to as a Management Information Model - MIM) with definitions of Information Object Classes (IOCs) and Managed Object Classes (MOCs).

The present document specifies the Solution Set definition for the Generic NRM IRP.

The Solution Set definition is related to 3GPP TS 28.622 V14.1.X [4].

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.

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

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

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

[4]   3GPP TS 28.622: "Generic Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS)".

[5]   3GPP TS 32.300: "Telecommunication management; Configuration Management (CM); Name convention for Managed Objects".

[6]   3GPP TS 32.306: "Telecommunication management; Configuration Management (CM); Notification Integration Reference Point (IRP); Solution Set (SS) definitions".

[7]   3GPP TS 32.616: "Telecommunication management; Configuration Management (CM); Bulk CM Integration Reference Point (IRP); Solution Set (SS) definitions".

[8]   W3C REC-xml11-20060816: "Extensible Markup Language (XML) 1.1 (Second Edition)".

[9]   Void.

[10]   W3C XML Schema Definition Language (XSD) 1.1 Part 1: Structures.

[11]   W3C XML Schema Definition Language (XSD) 1.1 Part 2: Datatypes.

[12]   W3C REC-xml-names-20060816: "Namespaces in XML 1.1 (Second Edition)".

[13]   3GPP TS 32.158: "Management and orchestration; Design rules for REpresentational State Transfer (REST) Solution Sets (SS) ".

3 Definitions and abbreviations

3.1 Definitions

For terms and definitions please refer to 3GPP TS 32.101 [1], 3GPP TS 32.102 [2], 3GPP TS 32.600 [3] and 3GPP TS 28.622 [4].

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 [8]; in the scope of the present document.

XML declaration: it specifies the version of XML being used

> NOTE: See [8].

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 [8].

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 [8].

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 [8].

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 [8].

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 [8].

XML attribute specification: has a name and a value

> NOTE: See [8].

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

> NOTE: See [8].

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 [9], [10] and [11].

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

NOTE: See [12], 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 [9], [10] and [11].

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 [9], [10] and [11].

For additional terms and definitions please refer to 3GPP TS 32.101 [1], 3GPP TS 32.102 [2], 3GPP TS 32.600 [3] and 3GPP TS 28.622 [4].

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
JSON	JavaScript Object Notation
IS	Information Service
IDL	Interface Definition Language (OMG)
IRP	Integration Reference Point
IS	Information Service
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 Generic NRM IRP Solution Set Definitions:

- 3GPP Generic NRM IRP CORBA SS (Annex A).

- 3GPP Generic NRM IRP XML Definitions (Annex B).

- 3GPP Generic NRM IRP JSON Definitions (Annex C).

Annex A (normative):
CORBA Solution Set

A.0 General

This annex contains the CORBA Solution Set for the IRP whose semantics is specified in Generic NRM IRP: Information Service (TS 28.622 [4]).

A.1 Architectural features

The overall architectural feature of Generic Network Resources IRP is specified in 3GPP TS 28.622 [4]. 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 [5].

A.1.2 Rules for NRM extensions

A.1.2.0 Introduction

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

A.1.2.1 Allowed extensions

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

NRM MOCs may be subclassed. Subclassed MOCs 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 MOC shall support all attributes of its superior class. Vendor-specific attributes cannot be added to 3GPP SA5 NRM MOCs 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 MOCs be represented in IDL. 3GPP SA5's NRM MOCs 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.1.2.2 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 MOCs) specified in the present document may not be subclassed or extended. New interfaces may be defined with vendor-specific methods.

A.2 Mapping

A.2.1 General mapping

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 an 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 Information Object Class (IOC) mapping

This Solution Set supports reference attributes for relations other than containment relations between objects. Reference attributes are therefore introduced in each MOC where needed.

A.2.2.1 IOC SubNetwork

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

IS Attributes	SS Attributes	SS Type
id	id	string
dnPrefix	dnPrefix	string
userLabel	userLabel	string
userDefinedNetworkType	userDefinedNetworkType	string
setOfMcc	setOfMcc	GenericNetworkResourcesIRPSystem::AttributeTypes::StringSet

A.2.2.2 IOC ManagedElement

Mapping from NRM IOC ManagedElement attributes and association roles to SS equivalent MOC ManagedElement attributes

IS Attributes	SS Attributes	SS Type
id	id	string
dnPrefix	dnPrefix	string
userLabel	userLabel	string
locationName	locationName	string
vendorName	vendorName	string
userDefinedState	userDefinedState	string
managedElementType	managedElementType	GenericNetworkResourcesIRPSystem::AttributeTypes::StringSet
managedBy	managedBy	GenericNetworkResourcesIRPSystem::AttributeTypes::MOReferenceSet
swVersion	swVersion	string

A.2.2.3 IOC MeContext

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

IS Attributes	SS Attributes	SS Type
id	id	string
dnPrefix	dnPrefix	string

A.2.2.4   IOC ManagementNode

Mapping from NRM IOC ManagementNode attributes and association roles to SS equivalent MOC ManagementNode attributes

IS Attributes	SS Attributes	SS Type
id	id	string
userLabel	userLabel	string
locationName	locationName	string
vendorName	vendorName	string
userDefinedState	userDefinedState	string
managedElements	managedElements	GenericNetworkResourcesIRPSystem::AttributeTypes::MOReferenceSet
swVersion	swVersion	string

A.2.2.5   IOC VsDataContainer

Mapping from NRM IOC VsDataContainer attributes and association roles to SS equivalent MOC VsDataContainer attributes

IS Attributes	SS Attributes	SS Type
id	id	string
vsDataType	vsDataType	string
vsData	vsData	any
vsDataFormatVersion	vsDataFormatVersion	string

A.2.2.6   IOC ManagedFunction

Mapping from NRM IOC ManagedFunction attributes and association roles to SS equivalent MOC ManagedFunction attributes

IS Attributes	SS Attributes	SS Type
id	id	string
peeParametersList	peeParametersList	GenericNetworkResourcesIRPSystem::AttributeTypes::PEEParametersListType
userLabel	userLabel	string
vnfParametersList	vnfParametersList	GenericNetworkResourcesIRPSystem::AttributeTypes::VNFParametersListType

A.2.2.7   IOC IRPAgent

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

IS Attributes	SS Attributes	SS Type
id	id	string
systemDN	systemDN	string

A.2.2.8   IOC Top

Mapping from NRM IOC Top attributes to SS equivalent attributes in all MOCs

IS Attributes	SS Attributes	SS Type
objectClass	CLASS	string
objectInstance	No direct mapping	

A.2.2.9   IOC Link

Mapping from NRM IOC Link attributes to SS equivalent MOC IRPAgent attributes

IS Attributes	SS Attributes	SS Type
id	id	string
userLabel (see note 2)	userLabel	string
aEnd	aEnd	GenericNetworkResourcesIRPSystem::AttributeTypes::MOReference
zEnd	zEnd	GenericNetworkResourcesIRPSystem::AttributeTypes::MOReference
linkType	linkType	LinkTypeType
protocolName	protocolName	string
protocolVersion	protocolVersion	string

NOTE 1: Void.

NOTE 2: Void.

A.2.2.10 IOC EP_RP

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

IS Attributes	SS Attributes	SS Type
id	id	string
userLabel	userLabel	string
farEndEntity	farEndEntity	GenericNetworkResourcesIRPSystem::AttributeTypes::MOReference

A.3　　Solution Set definitions

A.3.1　　IDL definition structure

Clause A.3.2 defines the types which are used by the Generic NRM IRP.

Clause A.3.3 defines the MO classes for the Generic NRM IRP.

A.3.2　　IDL specification "GenericNetworkResourcesIRPSystem.idl"

```
//File: GenericNetworkResourcesIRPSystem.idl
#ifndef _GENERIC_NETWORK_RESOURCES_IRP_SYSTEM_IDL_
#define _GENERIC_NETWORK_RESOURCES_IRP_SYSTEM_IDL_

// This statement must appear after all include statements
#pragma prefix "3gppsa5.org"

module GenericNetworkResourcesIRPSystem
{
    /**
     * The format of Distinguished Name (DN) is specified in "Name Convention
     * for Managed Objects (3GPP TS 32.300 [5])".
     */
    typedef string DN;

    /**
     *  This module adds datatype definitions for types
     *  used in the NRM which are not basic datatypes defined
     *  already in CORBA.
     */
    module AttributeTypes
    {
        /**
         * An MO reference refers to an MO instance.
         * "otherMO" contains the distinguished name of the referred MO.
         * A conceptual "null" reference (meaning no MO is referenced)
         * is represented as an empty string ("").
         *
         */
        struct MOReference
        {
            DN otherMO;
        };

        /**
         * MOReferenceSet represents a set of MO references.
         * This type is used to hold 0..n MO references.
         * A referred MO is not allowed to be repeated (therefore
         * it is denoted as a "Set")
         */
        typedef sequence<MOReference> MOReferenceSet;

        /**
         *  A set of strings.
         */
        typedef sequence<string> StringSet;

        /**
         *  A set of long.
         */
        typedef sequence<long> LongSet;
        /*
         * The LinkListSet represents the Link_X_Y objects (or subclasses of
         * Link_X_Y objects) that have a relationship with this object instance.
         * Each Link_X_Y object models interface(s) between objects of class X and
         * Y. The object containing this attribute must either be a class of type X,
         * Y, XFunction, YFunction or a subclass of one of those classes. The
         * LinkListSet may be empty, or there may be no instances for a particular
         * Link_X_Y class name.
         */
        typedef MOReferenceSet LinkListSet;

        /**
         * VNFParameters includes several attributes of a VNF instance.
```

```
        * The detailed definition of the attributes, see clause 4.4.1 of [4].
        */
       struct VNFParameters
       {
          string vnfInstanceId;
          string vnfdId;
          string flavourId;
          boolean autoScalable;
       };

       /**
        * VNFParametersListType represents a list of VNFParameters.
        * The detailed definition of vnfParametersListType, see clause 4.4.1 of [4].
        */
       typedef sequence<VNFParameters> VNFParametersListType;
       struct PEEParameters
       {
          string siteIdentification;
          float siteLatitude;
          float siteLongitude;
          string siteDescription;
          string equipmentType;
          string environmentType;
          string powerInterface;
       };

       /**
        * PEEParametersListType represents a list of PEEParameters.
        * The detailed definition of PEEParametersListType, see clause 4.4.1 of [4].
        */
       typedef sequence<PEEParameters> PEEParametersListType;



    };

};

#endif // _GENERIC_NETWORK_RESOURCES_IRP_SYSTEM_IDL_
```

A.3.3   IDL specification "GenericNetworkResourcesNRMDefs.idl"

```
//File: GenericNetworkResourcesNRMDefs.idl
#ifndef _GENERIC_NETWORK_RESOURCES_NRM_DEFS_IDL_
#define _GENERIC_NETWORK_RESOURCES_NRM_DEFS_IDL_
// This statement must appear after all include statements
#pragma prefix "3gppsa5.org"
/**
 * This module defines constants for each MO class name and
 * the attribute names for each defined MO class.
 */
module GenericNetworkResourcesNRMDefs
{
      /**
       *  Definitions for MO class Top
       */
      interface Top
      {
         // Attribute Names
         //
         const string CLASS = "Top";
      };
      /**
       *  Definitions for MO class SubNetwork
       */
      interface SubNetwork : Top
      {
         const string CLASS = "SubNetwork";
         // Attribute Names
         //
         const string id = "id";
         const string dnPrefix = "dnPrefix";
         const string userLabel = "userLabel";
         const string userDefinedNetworkType = "userDefinedNetworkType";
         const string setOfMcc = "setOfMcc";
      };

      /**
       *  Definitions for MO class ManagedElement
       */
      interface ManagedElement : Top
      {
         const string CLASS = "ManagedElement";
         // Attribute Names
         //
         const string id = "id";
         const string dnPrefix = "dnPrefix";
         const string managedElementType = "managedElementType";
         const string userLabel = "userLabel";
         const string vendorName = "vendorName";
         const string userDefinedState ="userDefinedState";
         const string locationName ="locationName";
         const string managedBy = "managedBy";
         const string swVersion = "swVersion";
      };

      /**
       *  Definitions for MO class MeContext
       */
      interface MeContext : Top
      {
         const string CLASS = "MeContext";
         // Attribute Names
         //
         const string id = "id";
         const string dnPrefix = "dnPrefix";
      };
      /**
       *  Definitions for MO class ManagementNode
       */
      interface ManagementNode : Top
      {
         const string CLASS = "ManagementNode";

         // Attribute Names
         //
         const string id = "id";
```

```
        const string userLabel = "userLabel";
        const string vendorName = "vendorName";
        const string userDefinedState = "userDefinedState";
        const string locationName = "locationName";
        const string managedElements = "managedElements";
        const string swVersion = "swVersion";
    };


    /**
     *  Definitions for abstract MO class ManagedFunction
     *
     */
    interface ManagedFunction : Top
    {
        const string CLASS = "ManagedFunction";
        // Attribute Names
        //
        const string id = "id";
        const string peeParametersList = "peeParametersList";
        const string userLabel = "userLabel";
        const string vnfParametersList = "vnfParametersList";
    };


    /**
     *  Definitions for MO class IRPAgent
     */
    interface IRPAgent : Top
    {
        const string CLASS = "IRPAgent";
        // Attribute Names
        //
        const string id = "id";
        const string systemDN = "systemDN";
    };
    /**
     *  Definitions for abstract MO class Link
     *  This inherits from ManagedFunction
     *  The attributes aEnd and zEnd are populated with the DNs
     *  of the entities associated via the link class.
     *  The aEnd takes the DN of the 1st entity in alphabetical order,
     *  the zEnd takes the 2nd entity in alphabetical order of the class
     *  names.
     */
    interface Link : ManagedFunction
    {
        const string CLASS = "Link";
        // Attribute Names
        //
        const string aEnd = "aEnd";
        const string zEnd = "zEnd";
        const string linkType = "linkType";
        const string protocolName = "protocolName";
        const string protocolVersion = "protocolVersion";
    };
    /**
     *  Definitions for MO class VsDataContainer
     */
    interface VsDataContainer : Top
    {
        const string CLASS = "VsDataContainer";
        // Attribute Names
        //
        const string id = "id";
        const string vsDataType = "vsDataType";
        const string vsData = "vsData";
        const string vsDataFormatVersion = "vsDataFormatVersion";
    };
    /**
     *  Definitions for abstract MO class EP_RP
     */
    interface EP_RP : Top
    {
        const string CLASS = "EP_RP";
        // Attribute Names
        //
        const string farEndEntity = "farEndEntity";
        const string id = "id";
        const string userLabel = "userLabel";
```

```
        };       /**
         *  This module adds datatypes definitions for the Link Class
         *  These attributes are not the basic datatypes already defined
         */
        module LinkAttributeTypes
        {
            enum LinkType
            {
                SIGNALLING,
                BEARER,
                OAM_AND_P,
                OTHER
            };
            typedef sequence <LinkType> LinkTypeType;
        };
};
#endif // _GENERIC_NETWORK_RESOURCES_NRM_DEFS_IDL_
```

```
        };       /**
         *  This module adds datatypes definitions for the Link Class
         *  These attributes are not the basic datatypes already defined
         */
        module LinkAttributeTypes
```

Annex B (normative):
XML Definitions

B.0 General

This annex contains the XML Definitions for the Generic NRM IRP as it applies to Itf-N, in accordance with Generic NRM IRP IS definitions [4].

The XML file formats are based on XML [8], XML Schema [10] [11] and XML Namespace [12] standards.

B.1 Architectural features

B.1.0 Introduction

The overall architectural feature of Generic Network Resources IRP is specified in 3GPP TS 28.622 [4].

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

B.1.1 Syntax for Distinguished Names

The syntax of a Distinguished Name is defined in 3GPP TS 32.300 [5].

B.2 Mapping

B.2.1 General mapping

An IOC maps to an XML element of the same name as the IOC's name in the IS. An IOC attribute maps to a sub-element of the corresponding IOC's XML element, and the name of this sub-element is the same as the attribute's name in the IS.

B.2.2 Information Object Class (IOC) mapping

The mapping is 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 28.616 [7].

Annex B.3.3 of the present document defines the NRM-specific XML schema `genericNrm.xsd` for the Generic Network Resources IRP NRM defined in 3GPP TS 28.622 [4].

XML schema `genericNrm.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 28.616 [7], with the following exception: as defined in 3GPP TS 28.616 [7], the `vsData` XML element type has an empty XML content.

Additionally, XML schema `genericNrm.xsd` also provides the following global XML declarations and definitions:

- XML complex type `NrmClass`: derivation base type (see [8], [10] and [11]) for all NRM class associated XML element types (see 3GPP TS 28.616 [7]);

- XML element type `vsData`: derivation base type (see [8], [10] and [11]) for all vendor-specific XML element types (see 3GPP TS 28.616 [7]);

- XML element type `SubNetworkOptionallyContainedNrmClass`: substitution group head (see [8], [10] and [11]) for all XML element types associated to further NRM classes optionally contained under `SubNetwork` NRM class;

- XML element type `ManagedElementOptionallyContainedNrmClass`: substitution group head (see [8], [10] and [11]) for all XML element types associated to further NRM classes optionally contained under `ManagedElement` NRM class.

B.3.2 Graphical Representation

The graphical representation is not present in the current version of this specification.

B.3.3   XML schema "genericNrm.xsd"

```
<?xml version="1.1" encoding="UTF-8"?>

<!--
  3GPP TS 28.623 Generic Network Resources IRP
  Bulk CM Configuration data file NRM-specific XML schema
  genericNrm.xsd
-->

<schema
  targetNamespace="http://www.3gpp.org/ftp/specs/archive/28_series/28.623#genericNrm"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified"
  xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:xn="http://www.3gpp.org/ftp/specs/archive/28_series/28.623#genericNrm"
  xmlns:sp="http://www.3gpp.org/ftp/specs/archive/28_series/28.629#sonPolicyNrm"
>
<import namespace="http://www.3gpp.org/ftp/specs/archive/28_series/28.629#sonPolicyNrm"/>
  <!-- Base XML type for all NRM class associated XML elements -->

  <complexType name="NrmClass">
    <attribute name="id" type="string" use="required"/>
    <attribute name="modifier" use="optional">
      <simpleType>
        <restriction base="string">
          <enumeration value="create"/>
          <enumeration value="delete"/>
          <enumeration value="update"/>
        </restriction>
      </simpleType>
    </attribute>
  </complexType>

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

  <simpleType name="dn">
    <restriction base="string">
      <maxLength value="400"/>
    </restriction>
  </simpleType>

  <complexType name="dnList">
    <sequence minOccurs="0" maxOccurs="unbounded">
      <element name="dn" type="xn:dn"/>
    </sequence>
  </complexType>

  <simpleType name="linkType">
    <list>
      <simpleType>
        <restriction base="string">
          <enumeration value="Signalling"/>
          <enumeration value="Bearer"/>
          <enumeration value="OAM_AND_P"/>
          <enumeration value="Other"/>
        </restriction>
      </simpleType>
    </list>
  </simpleType>

  <complexType name="linkListType">
    <sequence minOccurs="0" maxOccurs="unbounded">
      <element name="dn" type="xn:dn"/>
    </sequence>
  </complexType>

  <complexType name="managedElementTypeListType">
    <sequence minOccurs="0" maxOccurs="unbounded">
      <element name="managedElementType" type="string"/>
    </sequence>
  </complexType>

  <complexType name="vnfParametersListType">
    <sequence minOccurs="1" maxOccurs="unbounded">
      <element name="vnfInstanceId" type="string"/>
      <element name="vnfdId" type="string" minOccurs="0"/>
```

```
          <element name="flavourId" type="string" minOccurs="0"/>
          <element name="autoScalable" type="boolean"/>
        </sequence>
      </complexType>

      <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="-180.0000"/>
          <maxInclusive value="180.0000"/>
        </restriction>
      </simpleType>


      <complexType name="peeParametersListType">
        <sequence minOccurs="1" maxOccurs="unbounded">
          <element name="siteIdentification" type="string"/>
          <element name="siteLatitude" type="latitude" minOccurs="0"/>
          <element name="siteLongitude" type="longitude" minOccurs="0"/>
          <element name="siteDescription" type="string"/>
          <element name="equipmentType" type="string"/>
          <element name="environmentType" type="string"/>
          <element name="powerInterface" type="string"/>
        </sequence>
      </complexType>




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

      <element name="SubNetwork">
        <complexType>
          <complexContent>
            <extension base="xn:NrmClass">
              <sequence>
                <element name="attributes" minOccurs="0">
                  <complexType>
                    <all>
                      <element name="dnPrefix" minOccurs="0"/>
                      <element name="userLabel"/>
                      <element name="userDefinedNetworkType"/>
                      <element name="setOfMcc" minOccurs="0"/>
                      <element name="priority" type="integer" 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"/>
                  <element ref="xn:VsDataContainer"/>
                </choice>
                <choice minOccurs="0" maxOccurs="1">
                  <element ref="sp:ESPolicies"/>
                </choice>
              </sequence>
            </extension>
          </complexContent>
        </complexType>
      </element>

      <element name="ManagedElement">
        <complexType>
          <complexContent>
            <extension base="xn:NrmClass">
              <sequence>
```

```xml
              <element name="attributes" minOccurs="0">
                <complexType>
                  <all>
                    <element name="dnPrefix"/>
                    <element name="managedElementTypeList" type="xn: managedElementTypeListType"
minOccurs="0"/>
                    <element name="userLabel"/>
                    <element name="vendorName"/>
                    <element name="userDefinedState"/>
                    <element name="locationName"/>
                    <element name="swVersion"/>
                    <element name="managedBy" type="xn:dnList" minOccurs="0"/>
                    <element name="priority" type="integer" minOccurs="0"/>
                  </all>
                </complexType>
              </element>
              <choice minOccurs="0" maxOccurs="unbounded">
                <element ref="xn:IRPAgent"/>
                <element ref="xn:ManagedElementOptionallyContainedNrmClass"/>
                <element ref="xn:VsDataContainer"/>
              </choice>
            </sequence>
          </extension>
        </complexContent>
      </complexType>
    </element>

    <element name="ManagedFunction">
      <complexType>
        <complexContent>
          <extension base="xn:NrmClass">
            <sequence>
              <element name="attributes" minOccurs="0">
                <complexType>
                  <all>
                    <element name="userLabel" type="string"/>
                    <element name="vnfParametersList" type="xn:vnfParametersListType"/>
                    <element name="peeParametersList" type="xn:peeParametersListType"/>
                    <element name="priority" type="integer" minOccurs="0"/>
                  </all>
                </complexType>
              </element>
              <choice minOccurs="0" maxOccurs="unbounded">
                <element ref="xn:VsDataContainer"/>
                <element ref="xn:EP_RP"/>
              </choice>
            </sequence>
          </extension>
        </complexContent>
      </complexType>
    </element>

    <element name="MeContext">
      <complexType>
        <complexContent>
          <extension base="xn:NrmClass">
            <sequence>
              <element name="attributes" minOccurs="0">
                <complexType>
                  <all>
                   <element name="dnPrefix" minOccurs="0"/>
                  </all>
                </complexType>
              </element>
              <choice minOccurs="0" maxOccurs="unbounded">
                <element ref="xn:ManagedElement"/>
              </choice>
            </sequence>
          </extension>
        </complexContent>
      </complexType>
    </element>

    <element name="ManagementNode">
      <complexType>
        <complexContent>
          <extension base="xn:NrmClass">
            <sequence>
```

```
              <element name="attributes" minOccurs="0">
                <complexType>
                  <all>
                    <element name="userLabel"/>
                    <element name="vendorName"/>
                    <element name="locationName"/>
                    <element name="managedElements" type="xn:dnList" minOccurs="0"/>
                    <element name="swVersion"/>
                    <element name="userDefinedState"/>
                  </all>
                </complexType>
              </element>
              <choice minOccurs="0" maxOccurs="unbounded">
                <element ref="xn:IRPAgent"/>
                <element ref="xn:VsDataContainer"/>
              </choice>
            </sequence>
          </extension>
        </complexContent>
      </complexType>
    </element>

    <element name="IRPAgent">
      <complexType>
        <complexContent>
          <extension base="xn:NrmClass">
            <sequence>
              <element name="attributes" minOccurs="0">
                <complexType>
                  <all>
                    <element ref="xn:systemDN" minOccurs="0"/>
                  </all>
                </complexType>
              </element>
            </sequence>
          </extension>
        </complexContent>
      </complexType>
    </element>

    <element name="VsDataContainer">
      <complexType>
        <complexContent>
          <extension base="xn:NrmClass">
            <sequence>
              <element name="attributes" minOccurs="0">
                <complexType>
                  <all>
                    <element name="vsDataType"/>
                    <element name="vsDataFormatVersion"/>
                    <element ref="xn:vsData"/>
                  </all>
                </complexType>
              </element>
              <choice minOccurs="0" maxOccurs="unbounded">
                <element ref="xn:VsDataContainer"/>
              </choice>
            </sequence>
          </extension>
        </complexContent>
      </complexType>
    </element>

    <!--
      IRPAgent IOC attributes
    -->

    <element name="systemDN" type="xn:dn"/>

    <!--
      VsDataContainer NRM class vsData attribute associated empty XML element
    -->

    <complexType name="vsData"/>
    <element name="vsData" type="xn:vsData"/>

    <!--
      Abstract head XML element for all XML elements associated to further
```

```
    NRM classes optionally contained under SubNetwork NRM class
  -->

  <element
    name="SubNetworkOptionallyContainedNrmClass"
    type="xn:NrmClass"
    abstract="true"
  />

  <!--
    Abstract head XML element for all XML elements associated to further
    NRM classes optionally contained under ManagedElement NRM class
  -->

  <element
    name="ManagedElementOptionallyContainedNrmClass"
    type="xn:NrmClass"
    abstract="true"
  />

</schema>
```

```
    NRM classes optionally contained under SubNetwork NRM class
  -->

  <element
    name="SubNetworkOptionallyContainedNrmClass"
    type="xn:NrmClass"
    abstract="true"
  />

  <!--
```

Annex C (normative): JSON definitions

C.1 General

This annex contains the JSON Definitions for the Generic NRM, in accordance with Generic NRM IRP IS definitions [4].

C.2 Architectural features

C.2.1 Introduction

The overall architectural feature of Generic NRM is specified in 3GPP TS 28.622 [4].

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

C.2.2 Syntax for Distinguished Names

The syntax of a Distinguished Name is defined in 3GPP TS 32.300 [5].

C.3 Mapping

C.3.1 `IOC` mapping

Mapping from the IOCs defined in the information model to SS equivalent definitions are listed in the following table.

IOC Name	JSON definitions' Name	JSON Type
SubNetwork	subNetwork	object
ManagedElement	managedElement	object
ManagedFunction	managedFunction	object
MeContext	meContext	object
ManagementNode	managementNode	object
IRPAgent	iRPAgent	object
VsDataContainer	vsDataContainer	object

C.3.2 Attributes mapping

Mapping from the attributes of IOCs defined in the information model to SS equivalent definitions are listed in the following table.

Object Attributes	JSON definitions' Name	JSON Type
managedElementTypeList	managedElementTypeList	ManagedElementTypeList
managedBy	managedBy	DnList
managedElements	managedElements	DnList
vnfParametersList	vnfParametersList	VnfParametersList
peeParametersList	peeParametersList	PeeParametersList
siteLatitude	siteLatitude	SiteLatitude
siteLongitude	siteLongitude	SiteLongitude

C.4   Solution Set (SS) definitions

C.4.1   JSON definition structure

JSON is used as resource representations format carried in the HTTP request and HTTP response message bodies. The properties (key-value pairs) on an object are defined using the properties keyword.

The definition of the JSON resource object complies with the generic rules defined in 3GPP TS 32.158 [13].

C.4.2   Graphical representation

Not present.

C.4.3   JSON schema "genericNrm.json"

```
{
  "$schema": "http://json-schema.org/draft-05/schema#",
    "id": "http://3gpp.org/28623/genericNrm.json",
    "description": "JSON based solution set definitions for Generic NRM",
    "definitions": {
        "subNetwork": {
            "type": "object",
            "properties": {
                "id": { "type": "string" },
                "attributes": {
                    "type": "object",
                    "properties": {
                        "dnPrefix": {
                            "type": "string"
                        },
                        "userLabel": {
                            "type": "string"
                        },
                        "userDefinedNetworkType": {
                            "type": "string"
                        },
                        "setOfMcc": {
                            "type": "string",
                                "pattern": "[02-79][0-9][0-9]"
                        },
                        "priority": {
                            "type": "integer"
                        }
                    },
                    "required": [
                        "userLabel",
                        "userDefinedNetworkType",
                    ]
                }
            }
        },
        "managedElement": {
            "type": "object",
            "properties": {
                "id": { "type": "string" },
                "attributes": {
                    "type": "object",
                        "properties": {
                            "dnPrefix": {
                                "type": "string"
                            },
                            "userLabel": {
```

ETSI

```
                                "type": "string"
                        },
                        "managedElementTypeList": {
                                "$ref": "#/definitions/ManagedElementTypeListType"
                        },
                        "vendorName": {
                                "type": "string"
                        },
                        "userDefinedState": {
                                "type": "string"
                        },
                        "locationName": {
                                "type": "string"
                        },
                        "swVersion": {
                                "type": "string"
                        },
                        "managedBy": {
                                "$ref": "#/definitions/DnList"
                        },
                        "priority": {
                                "type": "integer"
                        }
                    },
                    "required": [
                        "dnPrefix",
                        "userLabel",
                        "vendorName",
                        "userDefinedState",
                        "locationName",
                        "swVersion",
                    ]
                }
            }
        },
        "managedFunction": {
            "type": "object",
            "properties": {
                    "id": { "type": "string" },
                    "attributes": {
                        "type": "object",
                        "properties": {
                            "userLabel": {
                                    "type": "string"
                            },
                            "vnfParametersList": {
                                    "$ref": "#/definitions/VnfParametersList"
                            },
                            "peeParametersList": {
                                    "$ref": "#/definitions/PeeParametersList"
                            },
                            "priority": {
                                    "type": "integer"
                            }
                        },
                        "required": [
                            "userLabel",
                        ]
                    }
                }
            }
        },
        "meContext": {
            "type": "object",
            "properties": {
                    "id": { "type": "string" },
                    "attributes": {
                        "type": "object",
                        "properties": {
                            "dnPrefix": {
                                    "type": "string"
                            }
                        }
                    }
                }
            }
        },
        "managementNode": {
            "type": "object",
            "properties": {
```

```
                        "id": { "type": "string" },
                        "attributes": {
                            "type": "object",
                            "properties": {
                                "userLabel": {
                                        "type": "string"
                                },
                                "vendorName": {
                                        "type": "string"
                                },
                                "locationName": {
                                        "type": "string"
                                },
                                "managedElements": {
                                        "$ref": "#/definitions/DnList"
                                },
                                "swVersion": {
                                        "type": "string"
                                },
                                "userDefinedState": {
                                        "type": "string"
                                }
                          },
                          "required": [
                             "userLabel",
                             "vendorName",
                             "locationName",
                             "swVersion",
                             "userDefinedState",
                          ]
                    }
              }
        },
        "iRPAgent": {
            "type": "object",
            "properties": {
                        "id": { "type": "string" },
                        "attributes": {
                            "type": "object",
                            "properties": {
                                "systemDN": {
                                        "$ref": "#/definitions/Dn"
                                }
                            }
                        }
                }
        },
        "vsDataContainer": {
            "type": "object",
            "properties": {
                        "id": { "type": "string" },
                        "attributes": {
                            "type": "object",
                            "properties": {
                                "vsDataType": {
                                        "type": "string"
                                },
                                "vsDataFormatVersion": {
                                        "type": "string"
                                },
                                "vsData": {
                                        "type": "object",
                                        "properties": {
                                            "id": { "type": "string" },
                                            "attributes": {
                                                "type": "object",
                                                "properties": {}
                                        }
                                    }
                                }
                        },
                        "required": [
                            "vsDataType",
                            "vsDataFormatVersion",
                            "vsData",
                        ]
                }
        }
```

```
        },
        "ManagedElementTypeList": {
            "type": "array",
            "items": {
                "$ref": "#/definitions/ManagedElementType"
            }
        },
        "ManagedElementType": {
            "type": "string"
        },
        "DnList": {
            "type": "array",
            "items": {
                "$ref": "#/definitions/Dn"
            }
        },
        "Dn": {
            "type": "string",
            "maxLength": 400
        },
        "VnfParametersList": {
            "type": "array",
            "items": {
              "$ref": "#/definitions/VnfParameter"
            }
        },
        "VnfParameter": {
            "type": "object",
            "properties": {
                "vnfInstanceId": {
                        "type": "string"
                },
                "vnfdId": {
                        "type": "string"
                },
                "flavourId": {
                        "type": "string"
                },
                "autoScalable": {
                        "type": "boolean"
                }
            },
            "required": [
                "vnfInstanceId",
                "autoScalable",
            ]
        },
        "PeeParametersList": {
            "type": "array",
            "items": {
              "$ref": "#/definitions/PeeParameter"
            }
        },
        "PeeParameter": {
            "type": "object",
            "properties": {
                "siteIdentification": {
                        "type": "string"
                },
                "siteLatitude": {
                        "$ref": "#/definitions/SiteLatitude"
                },
                "siteLongitude": {
                        "$ref": "#/definitions/SiteLongitude"
                },
                "siteDescription": {
                        "type": "string"
                },
                "equipmentType": {
                        "type": "string"
                },
                "environmentType": {
                        "type": "string"
                },
                "powerInterface": {
                        "type": "string"
                }
            },
```

```
                    "required": [
                            "siteIdentification",
                            "siteDescription",
                            "equipmentType",
                            "environmentType",
                            "powerInterface",
                    ]
            },
            "SiteLatitude": {
                "type": "number",
                "minimum": -90.0000,
                "maximum": 90.0000,
                "multipleOf": 1.0000
            },
            "SiteLongitude": {
                "type": "number",
                "minimum": -180.0000,
                "maximum": 180.0000,
                "multipleOf": 1.0000
            }
        }
    }
```

Annex D (informative):
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2012-12					New version after approval	2.0.0	11.0.0
2013-06	SA#60	SP-130304	002	2	Correction of XML schema	11.0.0	11.1.0
2014-06	SA#64	SP-140332	003	1	upgrade XSD	11.1.0	11.2.0
		SP-140358	004	-	remove the feature support statements		
2014-09	SA#65	SP-140560	005	-	Update the link from Solution Set to Information Service due to the end of Release 12	11.2.0	12.0.0
2015-12	SA#70	SP-150691	006	1	Add missing id attribute	12.0.0	12.1.0
2016-01					Upgrade to Rel-13 (MCC)	12.1.0	13.0.0
2016-03	SA#71	SP-160031	010	1	Make the XML schema well formed	13.0.0	13.1.0

Change history						
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2016-06	SA#72	SP-160407	0011	-	F	Update the link from IRP Solution Set to IRP Information Service	13.2.0
2017-03	SA#75	-	-	-		Promotion to Release 14 without technical change	14.0.0
2017-06	SA#76	SP-170510	0015	2	B	Modifications to align with IS to support Configuration Management for mobile networks that include virtualized network functions	14.1.0
2018-03	SA#79	SP-180060	0016	1	B	Add attribute peeParametersList to Solution Set definitions	15.0.0
2018-12	SA#82	SP-181042	0018	1	F	Update NRM root IOCs Solution Set to support priority	15.1.0
2019-03	SA#83	SP-190121	0020	1	F	Update Generic NRM Solution Set to support JSON	15.2.0

History

Document history		
V15.0.0	July 2018	Publication
V15.1.0	April 2019	Publication
V15.2.0	May 2019	Publication