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TECHNICAL SPECIFICATION

Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Self-Organizing Networks (SON)
Policy Network Resource Model (NRM)
Integration Reference Point (IRP);
Solution Set (SS) definitions
(3GPP TS 28.629 version 19.0.0 Release 19)

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Contents

Foreword

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

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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:

28.627: Self-Organizing Networks (SON) Policy Network Resource Model (NRM) Integration Reference Point (IRP); Requirements.

28.628: Self-Organizing Networks (SON) Policy Network Resource Model (NRM) Integration Reference Point (IRP); Information Service (IS).

28.629: Self-Organizing Networks (SON) Policy Network Resource Model (NRM) Integration Reference Point (IRP); Solution Set (SS) definitions.

1 Scope

The present document specifies the Solution Set definitions for the IRP whose semantics is specified in 3GPP TS 28.628 [4] SON Policy Network Resource Model IRP: Information Service (IS).

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 TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 32.101: "Telecommunication management; Principles and high level requirements".

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

[4] 3GPP TS 28.628: "Telecommunication management; Self-Organizing Networks (SON) Policy Network Resource Model (NRM) Integration Reference Point (IRP): Information Service (IS)".

[5] 3GPP TS 32.616: "Telecommunication management; Configuration Management (CM); Bulk CM Integration Reference Point (IRP); Solution Set (SS) definitions".

[6] 3GPP TS 32.606: "Telecommunication management; Configuration Management (CM); Basic CM Integration Reference Point (IRP); Solution Set (SS) definitions".

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

[8] 3GPP TS 28.623: "Generic network resources Integration Reference Point (IRP); Solution Set (SS) definition".

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

[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)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TS 32.101 [2], 3GPP TS 32.102 [3] and TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TS 28.628 [4], 3GPP TS 32.101 [2], 3GPP TS 32.102 [3] and TR 21.905 [1], in that order.

XML file: See definition in TS 32.616 [5].

XML document: See definition in TS 32.616 [5].

XML declaration: See definition in TS 32.616 [5].

XML element: See definition in TS 32.616 [5].

empty XML element: See definition in TS 32.616 [5].

XML content (of an XML element): See definition in TS 32.616 [5].

XML start-tag: See definition in TS 32.616 [5].

XML end-tag: See definition in TS 32.616 [5].

XML empty-element tag: See definition in TS 32.616 [5].

XML attribute specification: See definition in TS 32.616 [5].

DTD: See definition in TS 32.616 [5].

XML schema: See definition in TS 32.616 [5].

XML namespace: See definition in TS 32.616 [5].

XML complex type: See definition in TS 32.616 [5].

XML element type: See definition in TS 32.616 [5].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1], 3GPP TS 28.628 [4] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TS 28.628 [4], 3GPP TS 32.101 [2], 3GPP TS 32.102 [3] and TR 21.905 [1], in that order.

CM	Configuration Management
CORBA	Common Object Request Broker Architecture
DTD	Document Type Definition
eNodeB	evolved NodeB
IDL	Interface Definition Language (OMG)
IOC	Information Object Class
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
XML	eXtensible Markup Language

4 Solution Set definitions

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

- 3GPP SON Policy NRM IRP CORBA SS (see Annex A)
- 3GPP SON Policy NRM IRP XML definitions (see Annex B)

Annex A (normative): CORBA Solution Set

A.0 General

This annex contains the CORBA Solution Set for the IRP whose semantics is specified in SON Policy NRM IRP: Information Service (3GPP TS 28.628 [4]).

A.1 Architectural Features

A.1.0 Introduction

The overall architectural feature of CS IRP is specified in 3GPP TS 28.628 [4].

This clause specifies features that are specific to the CORBA SS.

A.1.1 Syntax for Distinguished Names and Versions

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

A.2 Mapping

A.2.1 General mapping

See clause A.1.1 of [8]

A.2.2 Information Object Class (IOC) mapping

A.2.2.1 IOC SONTargets

IS Attributes	SS Attributes	SS Type
hoFailureRate	hoFailureRate	GenericSONPolicyNRMAttributeTypes::HooTarget
rrcConnection EstablishmentFailure RateCharacteristic	rrcConnection EstablishmentFailure RateCharacteristic	GenericSONPolicyNRMAttributeTypes: CacTargetLink
rrcConnection AbnormalReleaseRate Characteristic	rrcConnection AbnormalReleaseRate Characteristic	GenericSONPolicyNRMAttributeTypes: CacTargetLink
eRabSetupFailure RateCharacteristic	eRabSetupFailure RateCharacteristic	GenericSONPolicyNRMAttributeTypes: CacTargetLink
eRabAbnormalRelease RateCharacteristic	eRabAbnormalRelease RateCharacteristic	GenericSONPolicyNRMAttributeTypes: CacTargetLink
rachOptAccessProbability	rachOptAccessProbability	GenericSONPolicyNRMAttributeTypes: AccessProbabilityROTargetSet
rachOptAccessDelayProbability	rachOptAccessDelayProbability	GenericSONPolicyNRMAttributeTypes: AccessDelayProbabilityROTargetSet
pDCPDataVolumeLoadRate	pDCPDataVolumeLoadRate	GenericSONPolicyNRMAttributeTypes: AasTarget
iPThroughputLoadRate	iPThroughputLoadRate	GenericSONPolicyNRMAttributeTypes: AasTarget
activeUEAmountLoadRate	activeUEAmountLoadRate	GenericSONPolicyNRMAttributeTypes: AasTarget
*) NOTE 1: At least one of the attributes shall be supported. **) NOTE 2: Only one of these attributes shall be present.		

A.2.2.2 IOC SONControl

IS Attributes	SS Attributes	SS Type
hooSwitch	hooSwitch	boolean
lboSwitch	lboSwitch	boolean
cocSwitch	cocSwitch	boolean
esSwitch	esSwitch	boolean
roSwitch	roSwitch	boolean
aasSplitSwitch	aasSplitSwitch	boolean
aasMergeSwitch	aasMergeSwitch	boolean
aasShapeSwitch	aasShapeSwitch	boolean
NOTE: For all conditional qualifiers, see attribute constraints in TS 28.628 [4].		

A.2.2.3 IOC ESPolicies

IS Attributes	SS Attributes	SS Type
esActivationOriginalCellLoadParameters	esActivationOriginalCellLoadParameters	CellLoadParameters
esActivationCandidateCellsLoadParameters	esActivationCandidateCellsLoadParameters	CellLoadParameters
esDeactivationCandidateCellsLoadParameters	esDeactivationCandidateCellsLoadParameters	CellLoadParameters
esNotAllowedTimePeriod	esNotAllowedTimePeriod	ESNotAllowedTimePeriod

A.2.2.4 IOC EUtranCellSON

IS Attributes	SS Attributes	SS Type
maximumDeviationHoTrigger	maximumDeviationHoTrigger	GenericSONPolicyNRMAttributeTypes:: MaximumDeviationHoTriggerType
minimumTimeBetweenHoTriggerChange	minimumTimeBetweenHoTriggerChange	GenericSONPolicyNRMAttributeTypes:: MinimumTimeBetweenHoTriggerChangeType
alterCovConfig	alterCovConfig	GenericSONPolicyNRMAttributeTypes:: AntennaCovConfigListType
replacedCells	replacedCells	GenericSONPolicyNRMAttributeTypes:: CellLocalIDListType

A.2.2.5 IOC EnergySavingProperties

IS Attributes	SS Attributes	SS Type
energySavingState	energySavingState	GenericSONPolicyNRMAttributeTypes::EnergySavingStateEnumType
energySavingControl	energySavingControl	GenericSONPolicyNRMAttributeTypes::EnergySavingControlEnumType
isProbingCapable	isProbingCapable	Boolean

A.2.2.6 IOC SONFuncInfo

IS Attributes	SS Attributes	SS Type
sonFuncCapabilityBelowItfN	sonFuncCapabilityBelowItfN	GenericSONPolicyNRMAttributeTypes: SonFuncNameListType

A.2.2.7 IOC SONCoordinationPolicies

Attributes	SS Attributes	SS Type
selectedSonCoordPolicy	selectedSonCoordPolicy	GenericSONPolicyNRMAttributeTypes:: SonCoordPoliciesType
sonFuncPriorityOrder	sonFuncPriorityOrder	GenericSONPolicyNRMAttributeTypes:: SonFuncNameListType

A.2.2.8 IOC InterRatEsPolicies

IS Attributes	SS Attributes	SS Type
interRatEsActivationOriginalCellParameters	interRatEsActivationOriginalCellParameters	RelativeCellLoadParameters
interRatEsActivationCandidateCellParameters	interRatEsActivationCandidateCellParameters	RelativeCellLoadParameters
interRatEsDeactivationCandidateCellParameters	interRatEsDeactivationCandidateCellParameters	RelativeCellLoadParameters

A.3 Solution Set definitions

A.3.1 IDL definition structure

Clause A.3.2 defines the constants and types used by the SON Policy NRM IRP.

A.3.2 IDL specification "SONPolicyNetworkResourcesNRMDefs.idl"

```
//File:SONPolicyNetworkResourcesNRMDefs.idl
#ifndef _SONPOLICYNETWORKRESOURCESNRMDEFS_IDL_
#define _SONPOLICYNETWORKRESOURCESNRMDEFS_IDL_
#include "GenericNetworkResourcesNRMDefs.idl"
#include "TimeBase.idl"
#pragma prefix "3gppsa5.org"
/**
 * This module defines constants for each MO class name and
 * the attribute names for each defined MO class.
 */
module SONPolicyNetworkResourcesNRMDefs
{
    /*
     * Definitions for MO class SONTargets
     */
    interface SONTargets: GenericNetworkResourcesNRMDefs::Top
    {
        const string CLASS = "SONTargets";
        // Attribute Names
        //
        const string id = "id";
        const string hoFailureRate = "hoFailureRate";
        const string rrcConnectionEstablishmentFailureRateCharacteristic =
"rrcConnectionEstablishmentFailureRateCharacteristic";
        const string rrcConnectionAbnormalReleaseRateCharacteristic =
"rrcConnectionAbnormalReleaseRateCharacteristic";
        const string eRabSetupFailureRateCharacteristic = "eRabSetupFailureRateCharacteristic";
        const string eRabAbnormalReleaseRateCharacteristic =
"eRabAbnormalReleaseRateCharacteristic";
        const string rachOptAccessProbability = "rachOptAccessProbability";
        const string rachOptAccessDelayProbability = "rachOptAccessDelayProbability";
        const string pDCPDataVolumeLoadRate = "pDCPDataVolumeLoadRate";
        const string iPThroughputLoadRate = "iPThroughputLoadRate";
        const string activeUEAmountLoadRate = "activeUEAmountLoadRate";
    };

    /*
     * Definitions for MO class SONControl
     */
    interface SONControl: GenericNetworkResourcesNRMDefs::Top
    {
        const string CLASS = "SONControl";
        // Attribute Names
        //
        const string id = "id";
        const string hooSwitch = "hooSwitch";
        const string lboSwitch = "lboSwitch";
        const string cocSwitch = "cocSwitch";
        const string esSwitch = "esSwitch";
        const string roSwitch = "roSwitch";
        const string aasSwitch = "aasSplitSwitch";
        const string aasSwitch = "aasMergeSwitch";
        const string aasSwitch = "aasShapeSwitch";
    };


    /*
     * Definitions for MO class ESPolicies
     */
    interface ESPolicies: GenericNetworkResourcesNRMDefs::Top
    {
        const string CLASS = "ESPolicies";
```

```
        // Attribute Names
        //
        const string id = "id";
        const string esActivationOriginalCellLoadParameters =
"esActivationOriginalCellLoadParameters";
        const string esActivationCandidateCellsLoadParameters =
"esActivationCandidateCellsLoadParameters";
        const string esDeactivationCandidateCellsLoadParameters =
"esDeactivationCandidateCellsLoadParameters";

        const string esNotAllowedTimePeriod = "esNotAllowedTimePeriod";
    };

    /*
     * Definitions for MO class InterRatEsPolicies
     */
    interface ESPolicies: GenericNetworkResourcesNRMDefs::Top
    {
        const string CLASS = "InterRatEsPolicies";
        // Attribute Names
        //
        const string id = "id";
        const string interRatEsActivationOriginalCellParameters =
"interRatEsCellActivationOriginalCellParameters";
        const string interRatEsActivationCandidateCellParameters =
"interRatEsActivationCandidateCellParameters";
        const string interRatEsDeactivationCandidateCellParameters =
"interRatEsDeactivationCandidateCellParameters";


/*
     * Definitions for MO class EUtranCellSON
     */
    interface EUtranCellSON: GenericNetworkResourcesNRMDefs::Top
    {
        const string CLASS = "EUtranCellSON";
        // Attribute Names
        //
        const string id = "id";
        const string maximumDeviationHoTrigger = "maximumDeviationHoTrigger";
        const string minimumTimeBetweenHoTriggerChange = "minimumTimeBetweenHoTriggerChange";
        const string alterCovConfig = "AlterCovConfig";
        const string replacedCells = "ReplacedCells";
    };

    /*
     * Definitions for MO class EnergySavingProperties
     */

    interface EnergySavingProperties: GenericNetworkResourcesNRMDefs::Top
    {
        const string CLASS = "EnergySavingProperties";
        // Attribute Names
        //
        const string id = "id";
        const string energySavingState= "energySavingState";
        const string energySavingControl= "energySavingControl";
        const string isProbingCapable = "isProbingCapable";

    };

    /*
     * Definitions for MO class SONFuncInfo
     */
    interface SONFuncInfo: GenericNetworkResourcesNRMDefs::Top
    {
        const string CLASS = "SONFuncInfo";
        // Attribute Names
        //
        const string id = "id";
        const string sonFuncCapabilityBelowItfN = "sonFuncCapabilityBelowItfN";
    };

    /*
     * Definitions for MO class SONCoordinationPolicies
     */
    interface SONCoordinationPolicies: GenericNetworkResourcesNRMDefs::Top
    {
```

```
        const string CLASS = "SONCoordinationPolicies";
        // Attribute Names
        //
        const string id = "id";
        const string selectedSonCoordPolicy = "selectedSonCoordPolicy";
        const string sonFuncPriorityOrder = "sonFuncPriorityOrder";
    };


};

module GenericSONPolicyNRMAttributeTypes
{
    /*
     * Composite Availble Capacity (CAC)target type related to RRC/eRAB setup
     */
    struct CacTarget
    {
        unsigned short lower_end_of_cac_range;
        unsigned short upper_end_of_cac_range;
        unsigned short target_value;
        unsigned short target_weight;
};
    typedef sequence<CacTarget> CacTargetList;

    struct CacTargetLink
    {
        CacTargetList uplink_cac_target;
        CacTargetList downlink_cac_target;
    };

    /*
     * HOO target type
     */
    struct HooTarget
    {
        unsigned short target_value;
        unsigned short target_priority;
    };
    typedef sequence<HooTarget> HooTargetList;

    /*
     * Cell load parameters type related to energy saving
     */
    struct CellLoadParameters
    {
        unsigned short load_threshold;
        unsigned short time_duration;
    };
/*

    /*
     * Cell load parameters type related to energy saving
     */
    struct RelativeCellLoadParameters
    {
        unsigned short relative_load_threshold;
        unsigned short time_duration;
    };
    /*

typedef TimeBase::UtcT UTCTime;
struct PeriodOfDay
   {
      UTCTime start_time;
      UTCTime end_time;
};
  enum WeekDayType
    {
        MONDAY,
        TUESDAY,
        WEDNESDAY,
        THURSDAY,
        FRIDAY,
        SATURDAY,
        SUNDAY
    };
    typedef sequence <WeekDayType> DaysOfWeek;
```

```
struct TimePeriodElement
   {
      DaysOfWeek days;
        PeriodOfDay period_of_day;
 };

typedef sequence<TimePeriodElement> ESNotAllowedTimePeriod;

    /*
     * Rach Optimization target type
     */
    enum ROTargetType
    {
        RO_ACCESS_PROBABILITY,
        RO_ACCESS_DELAY_PROBABILITY
    };

    enum ROProbability
   {
       25percent,
       50percent,
       75percent,
       90percent
   };

    typedef unsigned short (10..560) AccessDelayRange;
    typedef unsigned short (1..200) AccessNumberAttemptRange;

    struct accessProbabilityROTarget
    {
       ROProbability rOProbability;
       AccessNumberAttemptRange attemptNumber;
    };

    struct accessDelayProbabilityROTarget
    {
       ROProbability rOProbability;
       AccessDelayRange accessDelay;
    };

    typedef sequence <accessProbabilityROTarget,4> AccessProbabilityROTargetSet;
    typedef sequence <accessDelayProbabilityROTarget,4> AccessDelayProbabilityROTargetSet;

    union RachOptTarget switch (ROTargetType)
   {
      case RO_ACCESS_PROBABILITY: AccessProbabilityROTargetSet aPTargets;
      case RO_ACCESS_DELAY_PROBABILITY: AccessDelayProbabilityROTargetSet aDPTargets;
   };

    /*
     * Active Antenna System (AAS) Target Type
     */
    struct AasTarget
    {
        unsigned short target_lower_threshold;
        unsigned short target_upper_threshold;
        unsigned short target_weight;
    };
    /*

   typedef unsigned short (1..96) MaximumDeviationHoTriggerType;

   typedef unsigned short (0..1440) MinimumTimeBetweenHoTriggerChangeType;

    struct AntennaPowerRange
    {
        unsigned short AnternnaPowerLowerThreshold;
        unsigned short AnternnaPowerUpperThreshold;
    };

    struct AntennaCovConfigType
    {
        unsigned short stateId;
        unsigned short (0...360) horizontalHBW;
        unsigned short (0...360) verticalHBW;
        AntennaPowerRange maximumTransmissionPowerRange;
        AntennaPowerRange referenceSignalPowerRange;
    };
```

```
   typedef sequence <AntennaCovConfigType> AntennaCovConfigListType;

   typedef unsigned short (0..255) CellLocalIDType;

   typedef sequence <CellLocalIDType> CellLocalIDListType;

   enum energySavingStateEnumType
   {
     IS_ENERGYSAVING,
     IS_NOT_ENERGYSAVING
   };

   enum energySavingControlEnumType
   {
     TO_BE_ENERGYSAVING,
     TO_BE_NOT_ENERGYSAVING
   };

   enum SonFuncNameType
   {
     ANR,
     HOO,
     LBO,
     ES,
     COC,
     CCO,
     AAS
   };

typedef sequence <SonFuncNameType> SonFuncNameListType;

enum SonCoordPoliciesType
    {
     BASE_ON_PRIORITY,
     BASE_ON_STATE
};

};
#endif // _SONPOLICYNETWORKRESOURCESNRMDEFS_IDL_
```

Annex B (normative): XML definitions

B.0 General

The annex specifies the XML definitions for the SON Policy NRM IRP as it applies to Itf-N, in accordance with SON Policy NRM IRP [4].

The XML file formats are based on XML [9], XML Schema [10] [11] and XML Namespace [12] standards.

B.1 Architectural features

B.1.0 Introduction

The overall architectural feature of SON Policy Network Resource Model IRP is specified in 3GPP TS 28.628 [4]. This clause specifies features that are specific to the XML definitions.

The XML definitions of this document specify the schema for a configuration content.

When using the XML definitions for a configuration file transfer with the Bulk CM IRP, using either CORBA Solution Set or SOAP Solution Set of 3GPP TS 32.616 [5], the basic part of the XML file format definition is provided by 3GPP TS 32.616 [5]. The XML definitions of this document provide the schema for the configuration content to be included in such a configuration file.

When using the XML definitions with a SOAP solution set of any interface IRP that perform operations on managed objects, for example the Basic CM IRP SOAP SS of 3GPP TS 32.606 [6], the XML definitions of this document provides the schema for the configuration content operated on by the interface IRP. Such configuration content can be name of managed object and, if applicable, IOC attributes.

B.1.1 Syntax for Distinguished Names

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

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 overall description of the file format of configuration data XML files is provided by 3GPP TS 32.616 [5].

Annex A of the present document defines the NRM-specific XML schema `sonPolicyNrm.xsd` for the SON Policy NRM IRP IS defined in 3GPP TS 28.628 [4].

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

The definition of those NRM-specific XML element types complies with the generic mapping rules defined in 3GPP TS 32.616 [5].

B.3 Solution Set definitions

B.3.1 XML definition structure

Clause B.3.2 provides XML definitions of SON Policy NRM IRP IOCs as defined in 3GPP TS 28.628 [4].

B.3.2 XML Schema “sonPolicyNrm.xsd”

The following XML schema sonPolicyNrm.xsd is the NRM-specific schema for the SON Policy Network Resource Model IRP NRM defined in 3GPP TS 28.628 [4]:

```
<?xml version="1.1" encoding="UTF-8"?>
<!--
  3GPP TS 28.629 SON Policy Network Resource Model IRP
  XML schema definition
  sonPolicyNrm.xsd
-->

<schema
  targetNamespace="http://www.3gpp.org/ftp/specs/archive/28_series/28.629#sonPolicyNrm"
  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/28.623#genericNrm"/>

  <!--SON Policy NRM IRP IS class associated XML elements -->

  <!-- CAC Range: 0~10000 -->
  <simpleType name="cacRange">
    <restriction base="unsignedShort">
        <maxInclusive value="10000"/>
    </restriction>
  </simpleType>

  <!-- Relative Cell Load Range: 0~10000 -->
  <simpleType name="relativeCellLoadRange">
    <restriction base="unsignedShort">
        <maxInclusive value="10000"/>
    </restriction>
  </simpleType>

  <!--time duration Range: 0-900 -->
  <simpleType name="timeDurationRange">
    <restriction base="unsignedShort">
        <maxInclusive value="900"/>
    </restriction>
  </simpleType>

  <!-- Rate: representing a percentage -->
  <simpleType name="rateRange">
    <restriction base="unsignedShort">
      <maxInclusive value="100"/>
    </restriction>
  </simpleType>

  <!-- RACH Optimization Probability -->
  <simpleType name="ROProbability">
    <restriction base="unsignedShort">
      <enumeration value="25"/>
      <enumeration value="50"/>
      <enumeration value="75"/>
      <enumeration value="90"/>
    </restriction>
  </simpleType>
  <simpleType name="WeekDay">
     <restriction base="string">
      <enumeration value="Monday"/>
      <enumeration value="Tuesday"/>
      <enumeration value="Wednesday"/>
```

```
      <enumeration value="Thursday"/>
      <enumeration value="Friday"/>
      <enumeration value="Saturday"/>
      <enumeration value="Sunday"/>
   </restriction>
   </simpleType>

   <complexType name="WeekDays">
      <sequence>
      <element name="day" type="sp:WeekDay" maxOccurs="7"/>
      </sequence>
   </complexType>


  <!-- Weight: 1~N. Higher the number, higher the weight -->
  <complexType name="LBOTarget">
    <sequence>
      <element name="lowerEndOfCacRange" type="sp:cacRange" minOccurs="0"/>
      <element name="upperEndOfCacRange" type="sp:cacRange" minOccurs="0"/>
      <element name="Rate" type="sp:rateRange" minOccurs="0"/>
      <element name="Weight" type="unsignedShort" minOccurs="0"/>
    </sequence>
  </complexType>

   <complexType name="LBOLinkTarget">
   <sequence>
    <element name="UplinkTarget" type="sp:LBOTarget" minOccurs="0"/>
    <element name="DownlinkTarget" type="sp:LBOTarget" minOccurs="0"/>
   </sequence>
   </complexType>


  <complexType name="HooTarget">
    <sequence>
      <element name="Rate" type="sp:rateRange" minOccurs="0"/>
      <element name="Weight" type="unsignedShort" minOccurs="0"/>
    </sequence>
  </complexType>

  <complexType name="CellLoadParameters">
    <sequence>
      <element name="LoadThreshold" type="sp:rateRange" minOccurs="0"/>
      <element name="TimeDuration" type="unsignedShort" minOccurs="0"/>
    </sequence>
  </complexType>

  <complexType name="RelativeCellLoadParameters">
    <sequence>
      <element name="LoadThreshold" type="sp:relativeCellLoadRange"/>
      <element name="TimeDuration" type="sp:timeDurationRange"/>
    </sequence>
  </complexType>

<!-- Time shall be specified in UTC format -->

  <complexType name="DailyPeriod">
      <sequence>
       <element name="StartTime" type="time"/>
       <element name="EndTime" type="time"/>
      </sequence>
   </complexType>

  <complexType name="TimePeriod">
   <sequence>
      <element name="Day" type="sp:WeekDays"/>
      <element name="PeriodOfDay" type="sp:DailyPeriod"/>
   </sequence>
   </complexType>

<!--Time period type in which energy saving is not allowed-->
  <complexType name="ESNotAllowedTimePeriod">
    <sequence>
       <element name="TimePeriodList" type="sp:TimePeriod"/>
    </sequence>
  </complexType>


  <simpleType name="AccessDelayRange">
```

```
    <restriction base="unsignedShort">
      <minInclusive value="10"/>
      <maxInclusive value="560"/>
    </restriction>
  </simpleType>

  <complexType name="AccessDelayProbabilityROTarget">
    <sequence>
      <element name="Probability" type="sp:ROProbability"/>
      <element name="AccessDelay" type="sp:AccessDelayRange"/>
    </sequence>
  </complexType>

  <complexType name="AccessDelayProbabilityTargetSet">
    <sequence>
      <element name="AccessDelayProbabilityTarget" type="sp:AccessDelayProbabilityROTarget"
maxOccurs="4"/>
    </sequence>
  </complexType>


  <simpleType name="AccessNumberAttemptRange">
    <restriction base="unsignedShort">
      <minInclusive value="1"/>
      <maxInclusive value="200"/>
    </restriction>
  </simpleType>

  <complexType name="AccessProbabilityROTarget">
    <sequence>
      <element name="Probability" type="sp:ROProbability"/>
      <element name="AccessNumber" type="sp:AccessNumberAttemptRange"/>
    </sequence>
  </complexType>

  <complexType name="AccessProbabilityTargetSet">
    <sequence>
      <element name="AccessProbabilityTarget" type="sp:AccessProbabilityROTarget" maxOccurs="4"/>
    </sequence>
  </complexType>


  <complexType name="rachOptTarget">
    <choice maxOccurs="4">
      <element name="rachOptAccessProbability" type="sp:AccessProbabilityTargetSet"/>
      <element name="rachOptAccessDelayProbability" type="sp:AccessDelayProbabilityTargetSet"/>
    </choice>
  </complexType>

  <!-- Weight: 1~N. Higher the number, higher the weight -->
  <complexType name="AasTarget">
    <sequence>
      <element name="TargetLowerThreshold" type="sp:rateRange" minOccurs="0"/>
      <element name="TargetUpperThreshold" type="sp:rateRange" minOccurs="0"/>
      <element name="Weight" type="unsignedShort" minOccurs="0"/>
    </sequence>
  </complexType>

    <simpleType name="MaximumDeviationHoTriggerType">
       <restriction base="unsignedShort">
         <minInclusive value="1"/>
         <maxInclusive value="96"/>
       </restriction>
    </simpleType>

    <simpleType name="MinimumTimeBetweenHoTriggerChangeType">
       <restriction base="unsignedShort">
         <maxInclusive value="1440"/>
       </restriction>
    </simpleType>

  <!-- Cell Local ID Range: 0-255 -->
    <simpleType name="CellLocalIDType">
       <restriction base="unsignedShort">
         <maxInclusive value="255"/>
       </restriction>
    </simpleType>
```

```
<!-- Cell Local ID List -->
<complexType name="CellLocalIDListType">
  <sequence>
    <element name="CellLocalID" type="sp:CellLocalIDType"/>
  </sequence>
</complexType>

<!-- Cell Coverage State Range: 0-15 -->
  <simpleType name="CellCovStateType">
     <restriction base="unsignedShort">
       <maxInclusive value="15"/>
     </restriction>
  </simpleType>

<!-- Beamwidth Range: 0-360 -->
  <simpleType name="Beamwidth">
     <restriction base="unsignedShort">
       <maxInclusive value="360"/>
     </restriction>
  </simpleType>

<!-- Antenna transmission Power Range: -60..50 -->
  <simpleType name="AntennaPowerType">
     <restriction base="unsignedShort">
       <minInclusive value="-60"/>
       <maxInclusive value="50"/>
     </restriction>
  </simpleType>

<complexType name="AntennaPowerRangeType">
  <sequence>
    <element name="AntennaPowerLowerThreshold" type="sp:AntennaPowerType"/>
    <element name="AntennaPowerUpperThreshold" type="sp:AntennaPowerType"/>
  </sequence>
</complexType>

<!-- Antenna coverae configuration -->
<complexType name="AntennaCovConfigType">
  <sequence>
    <element name="SateID" type="sp:CellCovStateType "/>
    <element name="HorizontalHBW" type="sp:Beanwidth"/>
    <element name="VerticalHBW" type="sp:Beanwidth"/>
    <element name="MaxTransmissionPowerRange" type="sp:AntennaPowerRangeType"/>
    <element name="ReferenceSignalPowerRange" type="sp:AntennaPowerRangeType"/>
  </sequence>
</complexType>

<!-- Antenna coverae configuration List -->
<complexType name="AntennaCovConfigListType">
  <sequence>
    <element name="AntennaCovConfig" type="sp:AntennaCovConfigType"/ maxOccurs="16"/>
  </sequence>
</complexType>

<simpleType name="energySavingStateEnumType">
  <restriction base="string">
    <enumeration value="isEnergySaving"/>
    <enumeration value="isNotEnergySaving"/>
  </restriction>
</simpleType>

<simpleType name="energySavingControlEnumType">
  <restriction base="string">
    <enumeration value="toBeEnergySaving"/>
    <enumeration value="toBeNotEnergySaving"/>
  </restriction>
</simpleType>


<simpleType name="SonFuncNameType">
  <restriction base="string">
    <enumeration value="anr"/>
    <enumeration value="hoo"/>
    <enumeration value="lbo"/>
    <enumeration value="es"/>
    <enumeration value="coc"/>
    <enumeration value="cco"/>
    <enumeration value="aas"/>
```

```
    </restriction>
  </simpleType>

  <simpleType name="SonCoordPoliciesType">
    <restriction base="string">
      <enumeration value="baseOnPriority"/>
      <enumeration value="baseOnState"/>
    </restriction>
  </simpleType>

  <complexType name="SonFuncNameListType">
    <sequence>
      <element name="SonFuncName" type="sp:SonFuncNameType" maxOccurs="unbounded"/>
    </sequence>
  </complexType>


  <element name="SONTarget">
    <complexType>
      <complexContent>
        <extension base="xn:NrmClass">
          <sequence>
            <element name="attributes" minOccurs="0">
              <complexType>
                <all>
                  <element name="hoFailureRate" type="sp:HooTarget" minOccurs="0"/>
                  <element name="rrcConnectionEstablishmentFailureRate" type="sp:LBOLinkTarget"
minOccurs="0"/>
                  <element name="rrcConnectionAbnormalReleaseRate" type="sp:LBOLinkTarget"
minOccurs="0"/>
                  <element name="eRabSetupFailureRate" type="sp:LBOLinkTarget" minOccurs="0"/>
                  <element name="eRabAbnormalReleaseRate" type="sp:LBOLinkTarget" minOccurs="0"/>
                  <element name="rachOpt" type="sp:rachOptTarget" minOccurs="0"/>
                  <element name="pDCPDataVolumeLoadRate" type="sp:Aas Target" minOccurs="0"/>
                  <element name="iPThroughputLoadRate" type="sp:AasTarget" minOccurs="0"/>
                  <element name="activeUEAmountLoadRate" type="sp:Aas Target" minOccurs="0"/>
                </all>
              </complexType>
            </element>
          </sequence>
        </extension>
      </complexContent>
    </complexType>
  </element>

  <element name="SONControl">
    <complexType>
      <complexContent>
        <extension base="xn:NrmClass">
          <sequence>
            <element name="attributes" minOccurs="0">
              <complexType>
                <all>
                  <!--Switch:ON/OFF-->
                  <element name="hooSwitch" type="boolean" minOccurs="0"/>
                  <element name="lboSwitch" type="boolean" minOccurs="0"/>
                  <element name="cocSwitch" type="boolean" minOccurs="0"/>
                  <element name="esSwitch" type="boolean" minOccurs="0"/>
                  <element name="roSwitch" type="boolean" minOccurs="0"/>
                  <element name="aasSplit Switch" type="boolean" minOccurs="0"/>
                  <element name="aasMergeSwitch" type="boolean" minOccurs="0"/>
                  <element name="aasShapeSwitch" type="boolean" minOccurs="0"/>
                </all>
              </complexType>
            </element>
          </sequence>
        </extension>
      </complexContent>
    </complexType>
  </element>

  <element name="ESPolicies">
    <complexType>
      <complexContent>
        <extension base="xn:NrmClass">
          <sequence>
            <element name="attributes" minOccurs="0">
              <complexType>
```

```
                <all>
                  <element name="esActivationOriginalCellLoadParameters"
type="sp:CellLoadParameters" minOccurs="0"/>
                  <element name="esActivationCandidateCellsLoadParameters"
type="sp:CellLoadParameters" minOccurs="0"/>
                  <element name="esDeactivationCandidateCellsLoadParameters"
type="sp:CellLoadParameters" minOccurs="0"/>
              <element name="esNotAllowedTimePeriod" type="sp:ESNotAllowedTimePeriod"/>
                </all>
              </complexType>
            </element>
          </sequence>
        </extension>
      </complexContent>
    </complexType>
  </element>

  <element name="InterRatEsPolicies">
    <complexType>
      <complexContent>
        <extension base="xn:NrmClass">
          <sequence>
            <element name="attributes">
              <complexType>
                <all>
                  <element name="interRatEsActivationOriginalCellParameters"
type="sp:RelativeCellLoadParameters" minOccurs="0"/>
                  <element name="interRatEsActivationCandidateCellParameters"
type="sp:RelativeCellLoadParameters" minOccurs="0"/>
                  <element name="interRatEsDeactivationCandidateCellParameters"
type="sp:RelativeCellLoadParameters" minOccurs="0"/>
                </all>
              </complexType>
            </element>
          </sequence>
        </extension>
      </complexContent>
    </complexType>
  </element>

  <element name="EUtranCellSON">
    <complexType>
      <complexContent>
        <extension base="xn:NrmClass">
          <sequence>
            <element name="attributes">
              <complexType>
                <all>
                  <element name="maximumDeviationHoTrigger"
                           type="sp:MaximumDeviationHoTriggerType" minOccurs="0"/>
                  <element name="minimumTimeBetweenHoTriggerChange"
                           type="sp:MinimumTimeBetweenHoTriggerChangeType" minOccurs="0"/>
                  <element name="alterCovConfig"
                           type="sp:AntennaCovConfigListType" minOccurs="0"/>
                  <element name="replacedCells"
                           type="sp:CellLocalIDListType" minOccurs="0"/>
                </all>
              </complexType>
            </element>
          </sequence>
        </extension>
      </complexContent>
    </complexType>
  </element>

  <element name="EnergySavingProperties">
    <complexType>
      <complexContent>
        <extension base="xn:NrmClass">
          <sequence>
            <element name="attributes" minOccurs="0">
              <complexType>
                <all>
                  <element name="energySavingState" type="sp:energySavingStateEnumType"/>
                  <element name="energySavingControl" type="sp:energySavingControlEnumType"
                           minOccurs="0"/>
                  <element name="isProbingCapable" type="boolean" minOccurs="0"/>
                </all>
```

```
            </complexType>
          </element>
        </sequence>
      </extension>
    </complexContent>
  </complexType>
</element>

<element name="SONFuncInfo">
  <complexType>
    <complexContent>
      <extension base="xn:NrmClass">
        <sequence>
          <element name="attributes" minOccurs="0">
            <complexType>
              <all>
                <element name="sonFuncCapabilityBelowItfN" type="sp:SonFuncNameListType"/>
              </all>
            </complexType>
          </element>
        </sequence>
      </extension>
    </complexContent>
  </complexType>
</element>

<element name="SONCoordinationPolicies">
  <complexType>
    <complexContent>
      <extension base="xn:NrmClass">
        <sequence>
          <element name="attributes" minOccurs="0">
            <complexType>
              <all>
                <element name="selectedSonCoordPolicy" type="sp:SonCoordPoliciesType"
minOccurs="0"/>
                <element name="sonFuncPriorityOrder" type="sp:SonFuncNameListType" minOccurs="0"/>
              </all>
            </complexType>
          </element>
        </sequence>
      </extension>
    </complexContent>
  </complexType>
</element>


</schema>
```

Annex C (informative): Change history

Change history								
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Cat**	**Old**	**New**
2013-06	SA#60	SP-130304	001	1	SON coordination synchronization with 32.526	F	11.0.0	11.1.0
			002	1	Energy saving synchronization with 32.526			
2013-09	SA#61	SP-130441	003	1	Add missing Object class id for SONPolicy IOCs	F	11.1.0	11.2.0
2014-06	SA#64	SP-140332	004	1	upgrade XSD	F	11.2.0	11.3.0
		SP-140358	005	-	remove the feature support statements	F		
2014-09	SA#65	SP-140560	006	-	Update the link from Solution Set to Information Service due to the end of Release 12	C	11.3.0	12.0.0
2015-12	SA#70	SP-150691	008	1	Align id attribute definitions	A	12.0.0	12.1.0
2016-01					Upgrade to Rel-13(MCC)		12.1.0	13.0.0

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2016-06	SA#72	SP-160407	0012	-	F	Update the link from IRP Solution Set to IRP Information Service	13.1.0
2017-03	SA#75	-	-	-		Promotion to Release 14 without technical change	14.0.0
2017-06	SA#76	SP-170514	0013	-	F	Update link from IRP SS to IS	14.1.0
2018-01	SA#78	SP-170968	0014	2	B	Add SON for AAS management attributes	15.0.0
2020-07	-	-	-	-	-	Update to Rel-16 version (MCC)	16.0.0
2022-03	-	-	-	-	-	Update to Rel-17 version (MCC)	17.0.0
2024-04	-	-	-	-	-	Update to Rel-18 version (MCC)	18.0.0
2024-09	SA#105	SP-241163	0017	1	A	Rel-18 CR TS 28.629 Correction of ref to DN and XML	18.1.0
2025-09	SA#109	-	-	-	-	Update to Rel-19 version (MCC)	19.0.0

History

Document history		
V19.0.0	October 2025	Publication