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Technical Specification

3rd Generation Partnership Project;

Technical Specification Group Services and System Aspects;

Telecommunication management;

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

(Release 18)

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Contents

Foreword 5

Introduction 5

1 Scope 6

2 References 6

3 Definitions and abbreviations 7

3.1 Definitions 7

3.2 Abbreviations 7

4 Solution Set (SS) definitions 7

Annex A (normative): CORBA Solution Set 8

A.0 General 8

A.1 Architectural features 8

A.1.1 Syntax for Distinguished Names 8

A.1.2 Rules for NRM extensions 8

A.1.2.0 Introduction 8

A.1.2.1 Allowed extensions 8

A.1.2.2 Extensions not allowed 8

A.2 Mapping 10

A.2.1 General mapping 10

A.2.2 Information Object Class (IOC) mapping 10

A.2.2.1 IOC SubNetwork 10

A.2.2.2 IOC ManagedElement 10

A.2.2.3 IOC MeContext 10

A.2.2.4 IOC ManagementNode 11

A.2.2.5 IOC VsDataContainer 11

A.2.2.6 IOC ManagedFunction 11

A.2.2.7 IOC IRPAgent 11

A.2.2.8 IOC Top 11

A.2.2.9 IOC Link 12

A.2.2.10 IOC EP\_RP 12

A.2.2.11 IOC ThresholdMonitoringCapability 12

A.2.2.12 IOC ThresholdMonitor 12

A.2.2.13 IOC TraceJob 13

A.3 Solution Set (SS) definitions 14

A.3.1 IDL definition structure 14

A.3.2 IDL specification "GenericNetworkResourcesIRPSystem.idl" 14

A.3.3 IDL specification "GenericNetworkResourcesNRMDefs.idl" 17

Annex B (normative): XML Definitions 20

B.0 General 20

B.1 Architectural features 20

B.1.0 Introduction 20

B.1.1 Syntax for Distinguished Names 20

B.2 Mapping 20

B.2.1 General mapping 20

B.2.2 Information Object Class (IOC) mapping 20

B.3 Solution Set (SS) definitions 21

B.3.1 XML definition structure 21

B.3.2 Graphical Representation 21

B.3.3 XML schema "genericNrm.xsd" 22

Annex C (normative): OpenAPI definitions 32

C.1 General 32

C.2 Void 32

C.3 Void 32

C.4 Solution Set (SS) definitions 32

C.4.1 Void 32

C.4.2 Void 32

C.4.2a OpenAPI document "TS28623\_ComDefs.yaml" 32

C.4.3 OpenAPI document "TS28623\_GenericNrm.yaml" 35

Annex D (normative): YANG definitions 64

D.1 General 64

D.2 Modules 64

D.2.1 module \_3gpp-common-ep-rp.yang 64

D.2.2 module \_3gpp-common-managed-element.yang 65

D.2.3 module \_3gpp-common-managed-function.yang 69

D.2.4 module \_3gpp-common-measurements.yang 73

D.2.5 module \_3gpp-common-subnetwork.yang 80

D.2.6 module \_3gpp-common-top.yang 84

D.2.6a module \_3gpp-common-subscription-control.yang 84

D.2.7 module \_3gpp-common-yang-extensions.yang 87

D.2.8 module \_3gpp-common-yang-types.yang 89

D.2.9 module \_3gpp-common-fm.yang 100

D.2.10 module \_3gpp-common-trace.yang 107

D.2.11 module \_3gpp-common-mnsregistry.yang 125

D.2.12 Void 126

D.2.13 module \_3gpp-common-filemanagement.yang 126

D.2.14 module \_3gpp-common-qmcjob.yang 128

D.2.15 module \_3gpp-common-files.yang 131

D.2.16 module \_3gpp-common-managementdatacollection.yang 135

D.2.17 module \_3gpp-common-mnsagent.yang 140

D.2.18 module \_3gpp-common-management-node.yang 141

D.3 Void 142

D.4 Mount information 142

Annex E (informative): Change history 143

# Foreword

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

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

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

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

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

# Introduction

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

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 V16.4.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.

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

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

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

[3] 3GPP TS 32.600: "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] Void

[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] Void

[14] 3GPP TS 32.160: "Management and orchestration; Management Service Template".

[15] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[16] IETF RFC 8528: "YANG Schema Mount".

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [15], 3GPP TS 32.101 [1], 3GPP TS 32.102 [2], 3GPP TS 32.600 [3], 3GPP TS 28.622 [4] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [15] and 3GPP TS 32.101 [1], 3GPP TS 32.102 [2] and 3GPP TS 32.600 [3] and 3GPP TS 28.622 [4].

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [15], 3GPP TS 32.600 [3] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [15] and 3GPP TS 32.600 [3].

JSON JavaScript Object Notation

SS Solution Set

# 4 Solution Set (SS) 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).

- 3GPP Generic NRM IRP YANG Definitions (Annex D).

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 (3GPP 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.2.2.11 IOC ThresholdMonitoringCapability

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

| IS Attributes | SS Attributes | SS Type |
| --- | --- | --- |
| supportedMonitoringGPs | supportedMonitoringGPs | GenericNetworkResourcesIRPSystem::AttributeTypes::LongSet |

### A.2.2.12 IOC ThresholdMonitor

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

| IS Attributes | SS Attributes | SS Type |
| --- | --- | --- |
| thresholdInfoList | thresholdInfoList | GenericNetworkResourcesIRPSystem::AttributeTypes::ThresholdInfoListType |
| monitoringGP | monitoringGP | long |
| monitoringNotifTarget | monitoringNotifTarget | string |
| monitoredIOCName | monitoredIOCName | string |
| monitoredObjectDNs | monitoredObjectDNs | GenericNetworkResourcesIRPSystem::AttributeTypes::DNListType |

### A.2.2.13 IOC TraceJob

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

| IS Attributes | SS Attributes | SS Type |
| --- | --- | --- |
| tjJobType | tjJobType | tjJobType-Type |
| tjListOfInterfaces | tjListOfInterfaces | tjListOfInterfaces-Type |
| tjListOfNeTypes | tjListOfNeTypes | tjListOfNeTypes-Type |
| tjPLMNTarget | tjPLMNTarget | tjPLMNTarget-Type |
| tjStreamingTraceConsumerURI | tjTraceConsumer | StreamingTraceConsumerURI-Type |
| tjTraceCollectionEntityAddress | tjTraceConsumer | TraceCollectionEntityAddress-Type |
| tjTraceDepth | tjTraceDepth | tjTraceDepth-Type |
| tjTraceReference | tjTraceReference | tjTraceReference-Type |
| tjTraceReportingFormat | tjTraceReportingFormat | tjTraceReportingFormat-Type |
| tjTraceTarget | tjTraceTarget | tjTraceTarget-Type |
| tjTriggeringEvent | tjTriggeringEvent | tjTriggeringEvent-Type |
| tjMDTAnonymizationOfData | tjMDTAnonymizationOfData | tjMDTAnonymizationOfData-Type |
| tjMDTAreaConfigurationForNeighCell | tjMDTAreaConfigurationForNeighCell | tjMDTAreaConfigurationForNeighCell-Type |
| tjMDTAreaScope | tjMDTAreaScope | tjMDTAreaScope-Type |
| tjMDTCollectionPeriodRrmLte | tjMDTCollectionPeriodRrmLte | tjMDTCollectionPeriodRrmLte-Type |
| tjMDTCollectionPeriodRrmUmts | tjMDTCollectionPeriodRrmUmts | tjMDTCollectionPeriodRrmUmts-Type |
| tjMDTCollectionPeriodRrmNR | tjMDTCollectionPeriodRrmNR | tjMDTCollectionPeriodRrmNR-Type |
| tjMDTEventListForTriggeredMeasurement | tjMDTEventListForTriggeredMeasurement | tjMDTEventListForTriggeredMeasurement-Type |
| tjMDTEventThreshold | tjMDTEventThreshold | tjMDTEventThreshold-Type |
| tjMDTListOfMeasurements | tjMDTListOfMeasurements | tjMDTListOfMeasurements-Type |
| tjMDTLoggingDuration | tjMDTLoggingDuration | tjMDTLoggingDuration-Type |
| tjMDTLoggingInterval | tjMDTLoggingInterval | tjMDTLoggingInterval-Type |
| tjMDTMBSFNAreaList | tjMDTMBSFNAreaList | tjMDTMBSFNAreaList-Type |
| tjMDTMeasurementPeriodLTE | tjMDTMeasurementPeriodLTE | tjMDTMeasurementPeriodLTE-Type |
| tjMDTMeasurementPeriodUMTS | tjMDTMeasurementPeriodUMTS | tjMDTMeasurementPeriodUMTS-Type |
| tjMDTMeasurementQuantity | tjMDTMeasurementQuantity | tjMDTMeasurementQuantity-Type |
| tjMDTPLMList | tjMDTPLMList | tjMDTPLMList-Type |
| tjMDTPositioningMethod | tjMDTPositioningMethod | tjMDTPositioningMethod-Type |
| tjMDTReportAmount | tjMDTReportAmount | tjMDTReportAmount-Type |
| tjMDTReportingTrigger | tjMDTReportingTrigger | tjMDTReportingTrigger-Type |
| tjMDTReportInterval | tjMDTReportInterval | tjMDTReportInterval-Type |
| tjMDTReportType | tjMDTReportType | tjMDTReportType-Type |
| tjMDTSensorInformation | tjMDTSensorInformation | tjMDTSensorInformation-Type |
| tjMDTTraceCollectionEntityID | tjMDTTraceCollectionEntityID | tjMDTTraceCollectionEntityID-Type |
| excessPacketDelayThresholds | excessPacketDelayThresholds | excessPacketDelayThresholds-Type |

# A.3 Solution Set (SS) 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;

typedef any ThresholdValueType;

enum Direction {INCREASING, DECREASING};

union HysteresisType switch(boolean)

{

case TRUE: long long\_value;

case FALSE: float float\_value;

};

struct ThresholdPackElement

{

ThresholdValueType thresholdValue;

short thresholdLevel;

HysteresisType hysteresis;

};

typedef sequence<ThresholdPackElement> ThresholdPackType;

struct ThresholdInfo

{

string measurementType;

Direction direction\_;

ThresholdPackType thresholdPack;

};

typedef sequence<ThresholdInfo> ThresholdInfoListType;

};

/\*\*

\* This module adds datatype definitions for PM Control

\*/

module PMControlTypes

{

Struct Measurements

{

measurementTypes StringSet,

gPs LongSet

};

typedef sequence <Measurements> Measurements;

enum PMAdministrativeStateType

{

LOCKED,

SHUTTINGDOWN,

UNLOCKED

};

enum PMOperationalStateType

{

ENABLED,

DISABLED

};

typedef MOReferenceSet ManagedObjectDNsType;

typedef MOReferenceSet ManagedObjectDNsBasicType;

typedef integer DefaultFileBasedGPType;

typedef integer DefaultFileReportPeriodType;

typedef string DefaultFileLocationType;

typedef integer DefaultStreamBasedGPType;

typedef string DefaultStreamTargetType;

typedef integer FileBasedGPType;

typedef integer FileReportingPeriodType;

typedef string FileLocationType;

typedef integer StreamBasedGPType;

typedef string StreamTargetType;

};

};

#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";

};

/\*\*

\* Definitions for MO class ThresholdMonitoringCapability

\*/

interface ThresholdMonitoringCapability : Top

{

const string CLASS = "ThresholdMonitoringCapability";

// Attribute Names

//

const string supportedMonitoringGPs = "supportedMonitoringGPs";

};

/\*\*

\* Definitions for MO class ThresholdMonitor

\*/

interface ThresholdMonitor : Top

{

const string CLASS = "ThresholdMonitor";

// Attribute Names

//

const string thresholdInfoList = "thresholdInfoList";

const string monitoringGP = "monitoringGP";

const string monitoringNotifTarget = "monitoringNotifTarget";

const string monitoredIOCName = "monitoredIOCName";

const string monitoredObjectDNs = "monitoredObjectDNs";

};

/\*\*

\* 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\_

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 TS 28.622 [4].

The XML file formats are based on XML W3C REC-xml11-20060816 [8], W3C XML Schema Definition Language (XSD) 1.1 Part 1: Structures [10] W3C XML Schema Definition Language (XSD) 1.1 Part 2: Datatypes [11] and W3C REC-xml-names-20060816 [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 (SS) 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="xn:latitude" minOccurs="0"/>

<element name="siteLongitude" type="xn: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>

<simpleType name="pMAdministrativeStateType">

<restriction base="string">

<enumeration value="LOCKED"/>

<enumeration value="SHUTTINGDOWN"/>

<enumeration value="UNLOCKED"/>

</restriction>

</simpleType>

<simpleType name="pMOperationalStateType">

<restriction base="string">

<enumeration value="ENABLED"/>

<enumeration value="DISABLED"/>

</restriction>

</simpleType>

<simpleType name="nFServiceType">

<restriction base="string">

<enumeration value="Namf\_Communication"/>

<enumeration value="Namf\_EventExposure"/>

<enumeration value="Namf\_MT"/>

<enumeration value="Namf\_Location"/>

<enumeration value="Nsmf\_PDUSession"/>

<enumeration value="Nsmf\_EventExposure"/>

<enumeration value="others"/>

</restriction>

</simpleType>

<simpleType name="usageStateType">

<restriction base="string">

<enumeration value="IDEL"/>

<enumeration value="ACTIVE"/>

<enumeration value="BUSY"/>

</restriction>

</simpleType>

<simpleType name="registrationStateType">

<restriction base="string">

<enumeration value="LOCKED"/>

<enumeration value="SHUTTING\_DOWN"/>

<enumeration value="UNLOCKED"/>

</restriction>

</simpleType>

<simpleType name="NFType">

<restriction base="string">

<enumeration value="NRF"/>

<enumeration value="UDM"/>

<enumeration value="AMF"/>

<enumeration value="SMF"/>

<enumeration value="AUSF"/>

<enumeration value="NEF"/>

<enumeration value="PCF"/>

<enumeration value="SMSF"/>

<enumeration value="NSSF"/>

<enumeration value="UDR"/>

<enumeration value="GMLC"/>

<enumeration value="5G EIR"/>

<enumeration value="SEPP"/>

<enumeration value="UPF"/>

<enumeration value="N3IWF"/>

<enumeration value="AF"/>

<enumeration value="UDSF"/>

<enumeration value="DN"/>

</restriction>

</simpleType>

<simpleType name="operationSemanticsType">

<restriction base="string">

<enumeration value="REQUEST\_RESPONSE"/>

<enumeration value="SUBSCRIBE\_NOTIFY"/>

</restriction>

</simpleType>

<complexType name="SAP">

<sequence>

<element name="host" type="xn:hostType"/>

<element name="port" type="integer"/>

</sequence>

</complexType>

<complexType name="hostType">

<sequence>

<element name="ipv4Address" type="string"/>

<element name="ipv6Address" type="string"/>

<element name="fqdn" type="string"/>

</sequence>

</complexType>

<complexType name="operationsList">

<sequence>

<element name="operation" type="xn:operationType" minOccurs="1" maxOccurs="unbounded"/>

</sequence>

</complexType>

<complexType name="operationType">

<sequence>

<element name="name" type="string"/>

<element name="allowedNFTypes" type="xn:NFType"/>

<element name="operationSemantics" type="xn:operationSemanticsType"/>

</sequence>

</complexType>

<complexType name="MeasurementTypeList">

<sequence minOccurs="1" maxOccurs="unbounded">

<element name="measurementType" type="string"/>

</sequence>

</complexType>

<complexType name="GPList">

<sequence minOccurs="1" maxOccurs="unbounded">

<element name="gP" type="integer"/>

</sequence>

</complexType>

<complexType name="Measurements">

<sequence>

<element name="measurementTypes" type="xn:MeasurementTypeList"/>

<element name="GPs" type="xn:GPList"/>

</sequence>

</complexType>

<complexType name="MeasurementsList">

<sequence>

<element name="measurements" type="xn:Measurements" minOccurs="1" maxOccurs="unbounded"/>

</sequence>

</complexType>

<complexType name="GPListType">

<sequence minOccurs="1" maxOccurs="unbounded">

<element name="GP" type="integer"/>

</sequence>

</complexType>

<complexType name="KPINameList">

<sequence minOccurs="1" maxOccurs="unbounded">

<element name="kPIName" type="string"/>

</sequence>

</complexType>

<complexType name="KPIs">

<sequence>

<element name="kPITypes" type="xn:KPINameList"/>

<element name="GPs" type="xn:GPList"/>

</sequence>

</complexType>

<complexType name="KPIsList">

<sequence>

<element name="kPIs" type="xn:KPIs" minOccurs="1" maxOccurs="unbounded"/>

</sequence>

</complexType>

<simpleType name="directionType">

<list>

<simpleType>

<restriction base="string">

<enumeration value="increasing"/>

<enumeration value="decreasing"/>

</restriction>

</simpleType>

</list>

</simpleType>

<complexType name="thrsholdPackType">

<sequence minOccurs="1" maxOccurs="unbounded">

<element name="thresholdPackElement" type="xn:thresholdPackElementType"/>

</sequence>

</complexType>

<complexType name="thresholdPackElementType">

<all>

<element name="thresholdValue" type="string"/>

<element name="thresholdLevel" type="integer"/>

<element name="hysteresis" type="decimal" minOccurs="0"/>

</all>

</complexType>

<complexType name="thresholdInfoType">

<all>

<element name="measurementType" type="string"/>

<element name="direction" type=" xn:directionType"/>

<element name="thresholdPack" type=" xn:thrsholdPackType"/>

</all>

</complexType>

<complexType name="thresholdInfoListType">

<sequence minOccurs="1" maxOccurs="unbounded">

<element name="ThresholdInfoElement" type="xn:thresholdInfoType"/>

</sequence>

</complexType>

<simpleType name="ScopeType">

<restriction base="string">

<enumeration value="BASE\_ONLY"/>

<enumeration value="BASE\_ALL"/>

<enumeration value="BASE\_NTH\_LEVEL"/>

<enumeration value="BASE\_SUBTREE"/>

</restriction>

</simpleType>

<complexType name="Scope">

<sequence>

<element name="scopeType" type="xn:ScopeType"/>

<element name="scopeLevel" type="integer" minOccurs="0"/>

</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"/>

<element name="measurementsList" type="xn:MeasurementsList" minOccurs="0"/>

<element name="kPIsList" type="xn:KPIsList" 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"/>

<element ref="xn:ThresholdMonitoringCapability"/>

<element ref="xn:ThresholdMonitor"/>

<element ref="xn:MeasurementControl"/>

<element ref="xn:NtfSubscriptionControl"/>

</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>

<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"/>

<element name="measurementsList" type="xn:MeasurementsList" minOccurs="0"/>

</all>

</complexType>

</element>

<choice minOccurs="0" maxOccurs="unbounded">

<element ref="xn:IRPAgent"/>

<element ref="xn:ManagedElementOptionallyContainedNrmClass"/>

<element ref="xn:VsDataContainer"/>

<element ref="xn:ThresholdMonitoringCapability"/>

<element ref="xn:ThresholdMonitor"/>

<element ref="xn:MeasurementControl"/>

<element ref="xn:NtfSubscriptionControl"/>

</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"/>

<element name="measurementsList" type="xn:MeasurementsList" minOccurs="0"/>

</all>

</complexType>

</element>

<choice minOccurs="0" maxOccurs="unbounded">

<element ref="xn:VsDataContainer"/>

<element ref="xn:EP\_RP"/>

<element ref="xn:ThresholdMonitoringCapability"/>

<element ref="xn:ThresholdMonitor"/>

<element ref="xn:MeasurementControl"/>

</choice>

</sequence>

</extension>

</complexContent>

</complexType>

</element>

<element name="ManagedNFService">

<complexType>

<complexContent>

<extension base="xn:NrmClass">

<sequence>

<element name="attributes" minOccurs="0">

<complexType>

<all>

<element name="userLabel" type="string"/>

<element name="nFServiceType" type="xn:nFServiceType"/>

<element name="AdministrativeState" type="xn:pMAdministrativeStateType"/>

<element name="OperationalState" type="xn:pMOperationalStateType"/>

<element name="usageState" type="xn:usageStateType"/>

<element name="registrationState" type="xn:registrationStateType"/>

<element name="sAP" type="xn:SAP" minOccurs="0"/>

<element name="operations" type="xn:operationsList" minOccurs="0"/>

</all>

</complexType>

</element>

<choice minOccurs="0" maxOccurs="unbounded">

<element ref="xn:VsDataContainer"/>

<element ref="xn:ThresholdMonitoringCapability"/>

<element ref="xn:ThresholdMonitor"/>

</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="MeasurementControl">

<complexType>

<complexContent>

<extension base="xn:NrmClass">

<sequence>

<element name="attributes" minOccurs="0">

<complexType>

<all>

<element name="pMAdministrativeState" type="xn:pMAdministrativeStateType"/>

<element name="pMOperationalState" type="xn:pMOperationalStateType"/>

<element name="defaultFileBasedGP" type="integer"/>

<element name="defaultFileReportingPeriod" type="integer"/>

<element name="defaultFileLocation" type="string"/>

<element name="defaultStreamBasedGP" type="integer"/>

<element name="defaultStreamTarget" type="string"/>

</all>

</complexType>

</element>

<choice minOccurs="0" maxOccurs="unbounded">

<element ref="xn:MeasurementReader"/>

</choice>

</sequence>

</extension>

</complexContent>

</complexType>

</element>

<element name="MeasurementReader">

<complexType>

<complexContent>

<extension base="xn:NrmClass">

<sequence>

<element name="attributes" minOccurs="0">

<complexType>

<all>

<element name="measurementTypes"/>

<element name="fileBasedGP" type="integer" minOccurs="0"/>

<element name="fileReportingPeriod" type="integer" minOccurs="0"/>

<element name="fileLocation" type="string" minOccurs="0"/>

<element name="streamBasedGP" type="integer" minOccurs="0"/>

<element name="streamTarget" type="string" minOccurs="0"/>

<element name="managedObjectDNsBasic" type="xn:dnList" minOccurs="0"/>

<element name="managedObjectDNs" type="xn:dnList" minOccurs="0"/>

</all>

</complexType>

</element>

</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="EP\_RP">

<complexType>

<complexContent>

<extension base="xn:NrmClass">

<sequence>

<element name="attributes" minOccurs="0">

<complexType>

<all>

<element name="farEndEntity" type="xn:dn" minOccurs="0"/>

<element name="userLabel" type="string" minOccurs="0"/>

<element name="measurementsList" type="xn:MeasurementsList" 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>

<element name="ThresholdMonitoringCapability">

<complexType>

<complexContent>

<extension base="xn:NrmClass">

<sequence>

<element name="attributes" minOccurs="0">

<complexType>

<all>

<element name="supportedMonitoringGPs" type="xn:GPListType"/>

</all>

</complexType>

</element>

<choice minOccurs="0" maxOccurs="unbounded">

<element ref="xn:ThresholdMonitoringCapabilityOptionallyContainedNrmClass"/>

</choice>

</sequence>

</extension>

</complexContent>

</complexType>

</element>

<element name="HeartbeatControl">

<complexType>

<complexContent>

<extension base="xn:NrmClass">

<sequence>

<element name="attributes" minOccurs="0">

<complexType>

<all>

<element name="heartbeatNtfPeriod" type="integer"/>

<element name="triggerHeartbeatNtf" type="boolean"/>

</all>

</complexType>

</element>

</sequence>

</extension>

</complexContent>

</complexType>

</element>

<element name="ThresholdMonitor">

<complexType>

<complexContent>

<extension base="xn:NrmClass">

<sequence>

<element name="attributes" minOccurs="0">

<complexType>

<all>

<element name="thresholdInfoList" type="xn:thresholdInfoListType"/>

<element name="monitoringGP" type="integer"/>

<element name="monitoringNotifTarget" type="string"/>

<element name="monitoredIOCName" type="string"/>

<element name="monitoredObjectDNs" type="xn:dnList"/>

</all>

</complexType>

</element>

<choice minOccurs="0" maxOccurs="unbounded">

<element ref="xn:ThresholdMonitorOptionallyContainedNrmClass"/>

</choice>

</sequence>

</extension>

</complexContent>

</complexType>

</element>

<element name="NtfSubscriptionControl">

<complexType>

<complexContent>

<extension base="xn:NrmClass">

<sequence>

<element name="attributes" minOccurs="0">

<complexType>

<all>

<element name="notificationRecipientAddress" type="string"/>

<element name="notificationTypes" type="string" minOccurs="0" />

<element name="scope" type="xn:Scope"/>

<element name="notificationFilter" type="string" minOccurs="0" />

</all>

</complexType>

</element>

<choice minOccurs="0" maxOccurs="1">

<element ref="xn:HeartbeatControl"/>

</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"

/>

<!--

Abstract head XML element for all XML elements associated to further

NRM classes optionally contained under ThresholdMonitoringCapability NRM class

-->

<element

name="ThresholdMonitoringCapabilityOptionallyContainedNrmClass"

type="xn:NrmClass"

abstract="true"

/>

<!--

Abstract head XML element for all XML elements associated to further

NRM classes optionally contained under ThresholdMonitor NRM class

-->

<element

name="ThresholdMonitorOptionallyContainedNrmClass"

type="xn:NrmClass"

abstract="true"

/>

</schema>

Annex C (normative):  
OpenAPI definitions

# C.1 General

This annex contains the OpenAPI definition of the Generic NRM in YAML format.

The Information Service (IS) of the Generic NRM is defined in 3GPP TS 28.622 [4].

Mapping rules to produce the OpenAPI definition based on the IS are defined in 3GPP TS 32.160 [14].

# C.2 Void

# C.3 Void

# C.4 Solution Set (SS) definitions

## C.4.1 Void

## C.4.2 Void

## C.4.2a OpenAPI document "TS28623\_ComDefs.yaml"

openapi: 3.0.1

info:

title: Common Type Definitions

version: 18.3.0

description: >-

OAS 3.0.1 specification of common type definitions in the Generic NRM

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externalDocs:

description: 3GPP TS 28.623; Generic NRM; Common type definitions

url: http://www.3gpp.org/ftp/Specs/archive/28\_series/28.623/

paths: {}

components:

schemas:

Float:

type: number

format: float

DateTime:

type: string

format: date-time

Latitude:

type: number

format: float

minimum: -90

maximum: 90

Longitude:

type: number

format: float

minimum: -180

maximum: 180

Dn:

type: string

DnList:

type: array

items:

$ref: '#/components/schemas/Dn'

Mcc:

type: string

pattern: '^[0-9]{3}$'

Mnc:

type: string

pattern: '^[0-9]{2,3}$'

Nid:

type: string

pattern: '^[A-Fa-f0-9]{11}$'

PlmnId:

type: object

properties:

mcc:

$ref: '#/components/schemas/Mcc'

mnc:

$ref: '#/components/schemas/Mnc'

Tac:

type: string

pattern: '(^[A-Fa-f0-9]{4}$)|(^[A-Fa-f0-9]{6}$)'

UtraCellId:

type: integer

EutraCellId:

type: string

pattern: '^[A-Fa-f0-9]{7}$'

NrCellId:

type: string

pattern: '^[A-Fa-f0-9]{9}$'

TimeWindow:

type: object

properties:

startTime:

$ref: '#/components/schemas/DateTime'

endTime:

$ref: '#/components/schemas/DateTime'

GeoCoordinate:

type: object

properties:

latitude:

$ref: '#/components/schemas/Latitude'

longitude:

$ref: '#/components/schemas/Longitude'

altitude:

$ref: '#/components/schemas/Float'

ConvexGeoPolygon:

type: array

items:

$ref: '#/components/schemas/GeoCoordinate'

minItems: 3

GeoArea:

type: object

properties:

convexGeoPolygon:

$ref: '#/components/schemas/ConvexGeoPolygon'

GeoAreaToCellMapping:

type: object

properties:

geoArea:

$ref: '#/components/schemas/GeoArea'

associationThreshold:

type: integer

AreaOfInterest:

oneOf:

- $ref: '#/components/schemas/GeoAreaToCellMapping'

- type: array

items:

$ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Tai'

- type: array

items:

$ref: '#/components/schemas/NrCellId'

- type: array

items:

$ref: '#/components/schemas/EutraCellId'

- type: array

items:

$ref: '#/components/schemas/UtraCellId'

Fqdn:

type: string

Ipv4Addr:

type: string

pattern: '^(([0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5])\.){3}([0-9]|[1-9][0-9]|1[0-9][0-9]|2[0-4][0-9]|25[0-5])$'

example: '198.51.100.1'

Ipv6Addr:

type: string

allOf:

- pattern: '^((:|(0?|([1-9a-f][0-9a-f]{0,3}))):)((0?|([1-9a-f][0-9a-f]{0,3})):){0,6}(:|(0?|([1-9a-f][0-9a-f]{0,3})))$'

- pattern: '^((([^:]+:){7}([^:]+))|((([^:]+:)\*[^:]+)?::(([^:]+:)\*[^:]+)?))$'

example: '2001:db8:85a3::8a2e:370:7334'

Ipv6Prefix:

type: string

allOf:

- pattern: '^((:|(0?|([1-9a-f][0-9a-f]{0,3}))):)((0?|([1-9a-f][0-9a-f]{0,3})):){0,6}(:|(0?|([1-9a-f][0-9a-f]{0,3})))(\/(([0-9])|([0-9]{2})|(1[0-1][0-9])|(12[0-8])))$'

- pattern: '^((([^:]+:){7}([^:]+))|((([^:]+:)\*[^:]+)?::(([^:]+:)\*[^:]+)?))(\/.+)$'

example: '2001:db8:abcd:12::0/64'

IpAddr:

oneOf:

- $ref: '#/components/schemas/Ipv4Addr'

- $ref: '#/components/schemas/Ipv6Addr'

- $ref: '#/components/schemas/Ipv6Prefix'

HostAddr:

# This definition will be deprecated, when all occurances of HostAddr

# are replaced by Host.

oneOf:

- $ref: '#/components/schemas/Ipv4Addr'

- $ref: '#/components/schemas/Ipv6Addr'

- $ref: '#/components/schemas/Fqdn'

Host:

oneOf:

- $ref: '#/components/schemas/IpAddr'

- $ref: '#/components/schemas/Fqdn'

Uri:

type: string

AdministrativeState:

type: string

enum:

- LOCKED

- UNLOCKED

OperationalState:

type: string

enum:

- ENABLED

- DISABLED

UsageState:

type: string

enum:

- IDEL

- ACTIVE

- BUSY

AvailabilityStatus:

type: string

enum:

- IN\_TEST

- FAILED

- POWER\_OFF

- OFF\_LINE

- OFF\_DUTY

- DEPENDENCY

- DEGRADED

- NOT\_INSTALLED

- LOG\_FULL

AttributeNameValuePairSet:

description: >-

The key of this map is the attribute name, and the value the attribute value.

type: object

minProperties: 1

additionalProperties:

nullable: true

AttributeValueChangeSet:

description: >-

The first array item contains the attribute name value pairs with the new values,

and the second array item the attribute name value pairs with the optional old values.

type: array

items:

$ref: '#/components/schemas/AttributeNameValuePairSet'

minItems: 1

maxItems: 2

Filter:

description: >-

The filter format shall be compliant to XPath 1.0.

type: string

SystemDN:

type: string

NotificationId:

type: integer

NotificationType:

oneOf:

- $ref: 'TS28532\_FaultMnS.yaml#/components/schemas/AlarmNotificationTypes'

- $ref: 'TS28532\_ProvMnS.yaml#/components/schemas/CmNotificationTypes'

- $ref: 'TS28532\_PerfMnS.yaml#/components/schemas/PerfNotificationTypes'

- $ref: 'TS28532\_HeartbeatNtf.yaml#/components/schemas/HeartbeatNotificationTypes'

- $ref: 'TS28532\_FileDataReportingMnS.yaml#/components/schemas/FileNotificationTypes'

NotificationHeader:

type: object

properties:

href:

$ref: '#/components/schemas/Uri'

notificationId:

$ref: '#/components/schemas/NotificationId'

notificationType:

$ref: '#/components/schemas/NotificationType'

eventTime:

$ref: '#/components/schemas/DateTime'

systemDN:

$ref: '#/components/schemas/SystemDN'

required:

- href

- notificationId

- notificationType

- eventTime

- systemDN

ErrorResponse:

description: >-

Default schema for the response message body in case the request

is not successful.

type: object

properties:

error:

type: object

properties:

errorInfo:

type: string

## C.4.3 OpenAPI document "TS28623\_GenericNrm.yaml"

openapi: 3.0.1

info:

title: Generic NRM

version: 18.3.0

description: >-

OAS 3.0.1 definition of the Generic NRM

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externalDocs:

description: 3GPP TS 28.623; Generic NRM

url: http://www.3gpp.org/ftp/Specs/archive/28\_series/28.623/

paths: {}

components:

schemas:

#-------- Definition of types-----------------------------------------------------

RegistrationState:

type: string

enum:

- REGISTERED

- DEREGISTERED

VnfParameter:

type: object

properties:

vnfInstanceId:

type: string

vnfdId:

type: string

flavourId:

type: string

autoScalable:

type: boolean

PeeParameter:

type: object

properties:

siteIdentification:

type: string

siteDescription:

type: string

siteLatitude:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Latitude'

siteLongitude:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Longitude'

siteAltitude:

type: number

format: float

equipmentType:

type: string

environmentType:

type: string

powerInterface:

type: string

ThresholdInfo:

type: object

properties:

thresholdDirection:

type: string

enum:

- UP

- DOWN

- UP\_AND\_DOWN

thresholdValue:

oneOf:

- type: integer

- $ref: 'TS28623\_ComDefs.yaml#/components/schemas/Float'

hysteresis:

oneOf:

- type: integer

minimum: 0

- type: number

format: float

minimum: 0

Operation:

type: object

properties:

name:

type: string

allowedNFTypes:

$ref: '#/components/schemas/NFType'

operationSemantics:

$ref: '#/components/schemas/OperationSemantics'

NFType:

type: string

description: ' NF name defined in TS 23.501 or TS 29.510'

enum:

- NRF

- UDM

- AMF

- SMF

- AUSF

- NEF

- PCF

- SMSF

- NSSF

- UDR

- LMF

- GMLC

- 5G\_EIR

- SEPP

- UPF

- N3IWF

- AF

- UDSF

- DN

- BSF

- CHF

- NWDAF

- PCSCF

- CBCF

- HSS

- UCMF

- SOR\_AF

- SPAF

- MME

- SCSAS

- SCEF

- SCP

- NSSAAF

- ICSCF

- SCSCF

- DRA

- IMS\_AS

- AANF

- 5G\_DDNMF

- NSACF

- MFAF

- EASDF

- DCCF

- MB\_SMF

- TSCTSF

- ADRF

- GBA\_BSF

- CEF

- MB\_UPF

- NSWOF

- PKMF

- MNPF

- SMS\_GMSC

- SMS\_IWMSC

- MBSF

- MBSTF

- PANF

- TNGF

- W\_AGF

- TWIF

- TSN\_AF

OperationSemantics:

type: string

enum:

- REQUEST\_RESPONSE

- SUBSCRIBE\_NOTIFY

SAP:

type: object

properties:

host:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/HostAddr'

port:

type: integer

NFServiceType:

type: string

enum:

- Namf\_Communication

- Namf\_EventExposure

- Namf\_MT

- Namf\_Location

- Nsmf\_PDUSession

- Nsmf\_EventExposure

- Others

TransportProtocol:

anyOf:

- type: string

enum:

- TCP

- type: string

SupportedPerfMetricGroup:

type: object

properties:

performanceMetrics:

type: array

items:

type: string

granularityPeriods:

type: array

items:

type: integer

minimum: 1

reportingMethods:

type: array

items:

type: string

enum:

- FILE\_BASED\_LOC\_SET\_BY\_PRODUCER

- FILE\_BASED\_LOC\_SET\_BY\_CONSUMER

- STREAM\_BASED

reportingPeriods:

type: array

items:

type: integer

minimum: 1

ReportingCtrl:

oneOf:

- type: object

properties:

fileReportingPeriod:

type: integer

- type: object

properties:

fileReportingPeriod:

type: integer

fileLocation:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Uri'

- type: object

properties:

streamTarget:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Uri'

Scope:

type: object

properties:

scopeType:

type: string

enum:

- BASE\_ONLY

- BASE\_ALL

- BASE\_NTH\_LEVEL

- BASE\_SUBTREE

scopeLevel:

type: integer

ProcessMonitor:

description: >-

This data type is the "ProcessMonitor" data type without specialisations.

type: object

properties:

jobId:

type: string

status:

type: string

enum:

- NOT\_STARTED

- RUNNING

- FINSHED

- FAILED

- PARTIALLY\_FAILED

- CANCELLING

- CANCELLED

progressPercentage:

type: integer

minimum: 0

maximum: 100

progressStateInfo:

type: string

resultStateInfo:

type: string

startTime:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DateTime'

endTime:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DateTime'

timer:

type: integer

FileDownloadJobProcessMonitor:

description: >-

This data type is the "ProcessMonitor" data type with specialisations

for usage in the "FileDownloadJob".

type: object

properties:

jobId:

type: string

status:

type: string

enum:

- NOT\_STARTED

- RUNNING

- FINSHED

- FAILED

- CANCELLING

- CANCELLED

progressPercentage:

type: integer

minimum: 0

maximum: 100

progressStateInfo:

type: string

resultStateInfo:

oneOf:

- type: string

enum:

- NULL

- UNKNOWN

- NO\_STORAGE

- LOW\_MEMROY

- NO\_CONNECTION\_TO\_REMOTE\_SERVER

- FILE\_NOT\_AVAILABLE

- DNS\_CANNOT\_BE\_RESOLVED

- TIMER\_EXPIRED

- OTHER

- type: string

startTime:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DateTime'

endTime:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DateTime'

timer:

type: integer

AreaScope:

oneOf:

- type: array

items:

$ref: '#/components/schemas/EutraCellId'

- type: array

items:

$ref: '#/components/schemas/NrCellId'

- type: array

items:

$ref: '#/components/schemas/Tac'

- type: array

items:

$ref: '#/components/schemas/Tai'

Tai:

type: object

properties:

mcc:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Mcc'

mnc:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Mnc'

tac:

$ref: '#/components/schemas/Tac'

AreaConfig:

type: object

properties:

freqInfo:

$ref: '#/components/schemas/FreqInfo'

pciList:

type: array

items:

type: integer

FreqInfo:

description: specifies the carrier frequency and bands used in a cell.

type: object

properties:

arfcn:

type: integer

freqBands:

type: array

items:

type: integer

MbsfnArea:

type: object

properties:

mbsfnAreaId:

type: integer

minimum: 1

earfcn:

type: integer

minimum: 1

Tac:

type: string

pattern: '(^[A-Fa-f0-9]{4}$)|(^[A-Fa-f0-9]{6}$)'

EutraCellId:

type: string

pattern: '^[A-Fa-f0-9]{7}$'

NrCellId:

type: string

pattern: '^[A-Fa-f0-9]{9}$'

IpAddr:

oneOf:

- $ref: 'TS28623\_ComDefs.yaml#/components/schemas/Ipv4Addr'

- $ref: 'TS28623\_ComDefs.yaml#/components/schemas/Ipv6Addr'

ManagementData:

oneOf:

- type: array

items:

type: string

enum:

- COVERAGE

- CAPACITY

- ENERGY\_EFFICIENCY

- MOBILITY

- ACCESSIBILITY

- type: array

items:

type: string

NodeFilter:

type: object

properties:

areaOfInterest:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/AreaOfInterest'

networkDomain:

type: string

enum:

- CN

- RAN

cpUpType:

type: string

enum:

- CP

- UP

sst:

type: integer

#-------- Definition of types used in Trace control NRM fragment------------------

jobType-Type:

type: string

description: Specifies whether the TraceJob represents only MDT, Logged MBSFN MDT, Trace or a combined Trace and MDT job. Applicable for Trace, MDT, RCEF and RLF reporting. See 3GPP TS 32.422 clause 5.9a for additional details.

enum:

- IMMEDIATE\_MDT\_ONLY

- LOGGED\_MDT\_ONLY

- TRACE\_ONLY

- IMMEDIATE\_MDT AND TRACE

- RLF\_REPORT\_ONLY

- RCEF\_REPORT\_ONLY

- LOGGED\_MBSFN\_MDT

listOfInterfaces-Type:

description: The interfaces to be recorded in the Network Element. See 3GPP TS 32.422 clause 5.5 for additional details.

type: object

properties:

MSCServerInterfaces:

type: array

items:

type: string

enum:

- A

- Iu-CS

- Mc

- MAP-G

- MAP-B

- MAP-E

- MAP-F

- MAP-D

- MAP-C

- CAP

MGWInterfaces:

type: array

items:

type: string

enum:

- Mc

- Nb-UP

- Iu-UP

RNCInterfaces:

type: array

items:

type: string

enum:

- Iu-CS

- Iu-PS

- Iur

- Iub

- Uu

SGSNInterfaces:

type: array

items:

type: string

enum:

- Gb

- Iu-PS

- Gn

- MAP-Gr

- MAP-Gd

- MAP-Gf

- Ge

- Gs

- S6d

- S4

- S3

- S13

GGSNInterfaces:

type: array

items:

type: string

enum:

- Gn

- Gi

- Gmb

S-CSCFInterfaces:

type: array

items:

type: string

enum:

- Mw

- Mg

- Mr

- Mi

P-CSCFInterfaces:

type: array

items:

type: string

enum:

- Gm

- Mw

I-CSCFInterfaces:

type: array

items:

type: string

enum:

- Cx

- Dx

- Mg

- Mw

MRFCInterfaces:

type: array

items:

type: string

enum:

- Mp

- Mr

MGCFInterfaces:

type: array

items:

type: string

enum:

- Mg

- Mj

- Mn

IBCFInterfaces:

type: array

items:

type: string

enum:

- Ix

- Mx

E-CSCFInterfaces:

type: array

items:

type: string

enum:

- Mw

- Ml

- Mm

- Mi/Mg

BGCFInterfaces:

type: array

items:

type: string

enum:

- Mi

- Mj

- Mk

ASInterfaces:

type: array

items:

type: string

enum:

- Dh

- Sh

- ISC

- Ut

HSSInterfaces:

type: array

items:

type: string

enum:

- MAP-C

- MAP-D

- Gc

- Gr

- Cx

- S6d

- S6a

- Sh

- N70

- N71

- NU1

EIRInterfaces:

type: array

items:

type: string

enum:

- MAP-F

- S13

- MAP-Gf

BM-SCInterfaces:

type: array

items:

type: string

enum:

- Gmb

MMEInterfaces:

type: array

items:

type: string

enum:

- S1-MME

- S3

- S6a

- S10

- S11

- S13

SGWInterfaces:

type: array

items:

type: string

enum:

- S4

- S5

- S8

- S11

- Gxc

PDN\_GWInterfaces:

type: array

items:

type: string

enum:

- S2a

- S2b

- S2c

- S5

- S6b

- Gx

- S8

- SGi

eNBInterfaces:

type: array

items:

type: string

enum:

- S1-MME

- X2

en-gNBInterfaces:

type: array

items:

type: string

enum:

- S1-MME

- X2

- Uu

- F1-C

- E1

AMFInterfaces:

type: array

items:

type: string

enum:

- N1

- N2

- N8

- N11

- N12

- N14

- N15

- N20

- N22

- N26

AUSFInterfaces:

type: array

items:

type: string

enum:

- N12

- N13

NEFInterfaces:

type: array

items:

type: string

enum:

- N29

- N30

- N33

NRFInterfaces:

type: array

items:

type: string

enum:

- N27

NSSFInterfaces:

type: array

items:

type: string

enum:

- N22

- N31

PCFInterfaces:

type: array

items:

type: string

enum:

- N5

- N7

- N15

SMFInterfaces:

type: array

items:

type: string

enum:

- N4

- N7

- N10

- N11

- S5-C

SMSFInterfaces:

type: array

items:

type: string

enum:

- N20

- N21

UDMInterfaces:

type: array

items:

type: string

enum:

- N8

- N10

- N13

- N21

- NU1

UPFInterfaces:

type: array

items:

type: string

enum:

- N4

ng-eNBInterfaces:

type: array

items:

type: string

enum:

- NG-C

- Xn-C

- Uu

gNB-CU-CPInterfaces:

type: array

items:

type: string

enum:

- NG-C

- Xn-C

- Uu

- F1-C

- E1

- X2-C

gNB-CU-UPInterfaces:

type: array

items:

type: string

enum:

- E1

gNB-DUInterfaces:

type: array

items:

type: string

enum:

- F1-C

listOfNeTypes-Type:

description: The Network Element types where Trace Session activation is needed. See 3GPP TS 32.422 clause 5.4 for additional details.

type: array

items:

type: string

enum:

- MSC\_SERVER

- SGSN

- MGW

- GGSN

- RNC

- BM\_SC

- MME

- SGW

- PGW

- ENB

- EN\_GNB

- GNB\_CU\_CP

- GNB\_CU\_UP

- GNB\_DU

- AMF

- PCF

- SMF

- UPF

- AUSF

- SMSF

- HSS

- UDM

plmnTarget-Type:

type: object

description: The PLMN for which sessions shall be selected in the Trace Session in case of management based activation when several PLMNs are supported in the RAN (this means that shared cells and not shared cells are allowed for the specified PLMN. Note that the PLMN Target might differ from the PLMN specified in the Trace Reference, as that specifies the PLMN that is containing the management system requesting the Trace Session from the NE. See 3GPP TS 32.422 clause 5.9b for additional details.

properties:

mcc:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Mcc'

mnc:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Mnc'

required:

- mcc

- mnc

traceDepth-Type:

description: Specifies how detailed information should be recorded in the Network Element. The Trace Depth is a paremeter for Trace Session level, i.e., the Trace Depth is the same for all of the NEs to be traced in the same Trace Session. See 3GPP TS 32.422 clause 5.3 for additional details.

type: string

enum:

- MINIMUM

- MEDIUM

- MAXIMUM

- VENDORMINIMUM

- VENDORMEDIUM

- VENDORMAXIMUM

traceReference-Type:

type: object

description: The Trace Reference parameter shall be globally unique, therefore the Trace Reference shall compose as follows - MCC+MNC+Trace ID, where the MCC and MNC are coming with the Trace activation request from the management system to identify one PLMN containing the management system, and Trace ID is a 3 byte Octet String. See 3GPP TS 32.422 clause 5.6 for additional details.

properties:

mcc:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Mcc'

mnc:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Mnc'

traceId:

type: string

required:

- mcc

- mnc

- traceId

traceReportingFormat-Type:

type: string

description: Specifies whether file-based or streaming reporting shall be used for this Trace Session. See 3GPP TS 32.422 clause 5.11 for additional details.

enum:

- FILE-BASED

- STREAMING

traceTarget-Type:

type: object

description: Trace target conveying both the type and value of the target ID. For additional details see 3GPP TS 32.422

properties:

TargetIdType:

type: string

enum:

- IMSI

- IMEI

- IMEISV

- PUBLIC\_ID

- UTRAN\_CELL

- E-UTRAN\_CELL

- NG-RAN\_CELL

- eNB

- RNC

- gNB

- SUPI

TargetIdValue:

type: string

required:

- TargetIdType

- TargetIdValue

triggeringEvents-Type:

type: object

description: Specifies when to start a Trace Recording Session and which message shall be recorded first, when to stop a Trace Recording Session and which message shall be recorded last respectively. See 3GPP TS 32.422 clause 5.1 for additional detials.

properties:

MSC\_SERVER:

type: array

items:

type: string

enum:

- MO\_MT\_CALLS

- MO\_MT\_SMS

- LU\_IMSIattach\_IMSIdetach

- HANDOVER

- SS

SGSN:

type: array

items:

type: string

enum:

- PDPcontext

- MO\_MT\_SMS

- RAU\_GPRSattach\_GPRSdetach

- MBMScontext

MGW:

type: array

items:

type: string

enum:

- CONTEXT

GGSN:

type: array

items:

type: string

enum:

- PDPcontext

- MBMScontext

IMS:

type: array

items:

type: string

enum:

- SIPsession\_StandaloneTransaction

BM\_SC:

type: array

items:

type: string

enum:

- MBMSactivation

MME:

type: array

items:

type: string

enum:

- UEinitiatedPDNconnectivityRequest

- ServiceRequest

- InitialAttach\_TAU\_Detach

- UEinitiatedPDNdisconnection

- BearerActivationModificationDeletion

- Handover

SGW:

type: array

items:

type: string

enum:

- PDNconnectionCreation

- PDNconnectionTermination

- BearerActivationModificationDeletion

PGW:

type: array

items:

type: string

enum:

- PDNconnectionCreation

- PDNconnectionTermination

- BearerActivationModificationDeletion

AMF:

type: array

items:

type: string

enum:

- Registration

- ServiceRequest

- Handover

- UEderegistration

- NetworkDeregistration

- UEMobilityFromEPC

- UEMobilityToEPC

SMF:

type: array

items:

type: string

enum:

- PDUsessionEstablishment

- PDUsessionModification

- PDUsessionRelease

- PDUsessionUPactivationDeactivation

- MobilityBtw3gppAndN3gppTo5GC

- MobilityFromEpc

PCF:

type: array

items:

type: string

enum:

- AMpolicy

- SMpolicy

- Authorization

- BDTpolicy

UPF:

type: array

items:

type: string

enum:

- N4Session

AUSF:

type: array

items:

type: string

enum:

- UEauthentication

NEF:

type: array

items:

type: string

enum:

- EventExposure

- PFDmanagement

- ParameterProvision

- Trigger

NRF:

type: array

items:

type: string

enum:

- NFmanagement

- NFdiscovery

NSSF:

type: array

items:

type: string

enum:

- NSSelection

- NSSAI

SMSF:

type: array

items:

type: string

enum:

- SMservice

UDM:

type: array

items:

type: string

enum:

- UEcontext

- SubscriberData

- UEauthentication

- EventExposure

anonymizationOfMdtData-Type:

description: Specifies level of MDT anonymization. For additional details see 3GPP TS 32.422 clause 5.10.12.

type: string

enum:

- NO\_IDENTITY

- TAC\_OF\_IMEI

beamLevelMeasurement-Type:

description: Determines whether beam level measurements shall be included in case of immediate MDT M1 measurement in NR. For additional details see 3GPP TS 32.422 clause 5.10.40.

type: boolean

collectionPeriodRrmLte-Type:

description: See details in 3GPP TS 32.422 clause 5.10.20.

type: string

enum:

- 100ms

- 1000ms

- 1024ms

- 1280ms

- 2048ms

- 2560ms

- 5120ms

- 10000ms

- 10240ms

- 60000ms

collectionPeriodM6Lte-Type:

description: See details in 3GPP TS 32.422 clause 5.10.32.

type: string

enum:

- 1024ms

- 2048ms

- 5120ms

- 10240ms

collectionPeriodM7Lte-Type:

description: See details in 3GPP TS 32.422 clause 5.10.33.

type: integer

minimum: 1

maximum: 60

collectionPeriodRrmUmts-Type:

description: See details in 3GPP TS 32.422 clause 5.10.21.

type: string

enum:

- 100ms

- 250ms

- 500ms

- 1000ms

- 2000ms

- 3000ms

- 4000ms

- 6000ms

collectionPeriodRrmNr-Type:

description: See details in 3GPP TS 32.422 clause 5.10.30.

type: string

enum:

- 1024ms

- 2048ms

- 5120ms

- 10240ms

- 60000ms

collectionPeriodM6Nr-Type:

description: See details in 3GPP TS 32.422 clause 5.10.34.

type: string

enum:

- 120ms

- 240ms

- 480ms

- 640ms

- 1024ms

- 2048ms

- 5120ms

- 10240ms

- 20480ms

- 40960ms

- 1min

- 6min

- 12min

- 30min

collectionPeriodM7Nr-Type:

description: See details in 3GPP TS 32.422 clause 5.10.35.

type: integer

minimum: 1

maximum: 60

eventListForEventTriggeredMeasurement-Type:

description: See details in 3GPP TS 32.422 clause 5.10.28.

type: string

enum:

- OUT\_OF\_COVERAGE

- A2\_EVENT

eventThreshold-Type:

description: See details in 3GPP TS 32.422 clause 5.10.7, 5.10.7a, 5.10.13 and 5.10.14.

type: object

properties:

EventThresholdRSRP:

oneOf:

- type: integer

minimum: 0

maximum: 97

- type: integer

minimum: 0

maximum: 127

EventThresholdRSRQ:

oneOf:

- type: integer

minimum: 0

maximum: 34

- type: integer

minimum: 0

maximum: 127

EventThreshold1F:

type: object

properties:

CPICH\_RSCP:

type: integer

minimum: -120

maximum: 25

CPICH\_EcNo:

type: integer

minimum: -24

maximum: 0

PathLoss:

type: integer

minimum: 30

maximum: 165

EventThreshold1I:

type: integer

minimum: -120

maximum: 25

listOfMeasurements-Type:

description: See details in 3GPP TS 32.422 clause 5.10.3 for details.

type: object

properties:

UMTS:

type: array

items:

type: string

enum:

- M1

- M2

- M3

- M4

- M5

- M6\_DL

- M6\_UL

- M7\_DL

- M7\_UL

LTE:

type: array

items:

type: string

enum:

- M1

- M2

- M3

- M4

- M5

- M1\_EVENT\_TRIGGERED

- M6

- M7

- M8

- M9

NR:

type: array

items:

type: string

enum:

- M1

- M2

- M3

- M4

- M5

- M6

- M7

- M1\_EVENT\_TRIGGERED

- M8

- M9

loggingDuration-Type:

description: See details in 3GPP TS 32.422 clause 5.10.9.

type: string

enum:

- 600s

- 1200s

- 2400s

- 3600s

- 5400s

- 7200s

loggingInterval-Type:

description: See details in 3GPP TS 32.422 clause 5.10.8.

type: object

properties:

UMTS:

type: array

items:

type: string

enum:

- 1.28s

- 2.56s

- 5.12s

- 10.24s

- 20.48s

- 30.72s

- 40.96s

- 61.44s

LTE:

type: array

items:

type: string

enum:

- 1.28s

- 2.56s

- 5.12s

- 10.24s

- 20.48s

- 30.72s

- 40.96s

- 61.44s

NR:

type: array

items:

type: string

enum:

- 0.32s

- 0.64s

- 1.28s

- 2.56s

- 5.12s

- 10.24s

- 20.48s

- 30.72s

- 40.96s

- 61.44s

- INFINITY

eventThresholdL1-Type:

description: See details in 3GPP TS 32.422 clause 5.10.X.

type: object

properties:

RSRP:

type: integer

minimum: 0

maximum: 127

RSRQ:

type: integer

minimum: 0

maximum: 127

hysteresisL1-Type:

description: See details in 3GPP TS 32.422 clause 5.10.Y.

type: integer

minimum: 0

maximum: 30

timeToTriggerL1-Type:

description: See details in 3GPP TS 32.422 clause 5.10.Z.

type: string

enum:

- 0ms

- 40ms

- 64ms

- 80ms

- 100ms

- 128ms

- 160ms

- 256ms

- 320ms

- 480ms

- 512ms

- 640ms

- 1024ms

- 1280ms

- 2560ms

- 5120ms

measurementPeriodLte-Type:

description: See details in 3GPP TS 32.422 clause 5.10.23.

type: string

enum:

- 1024ms

- 2048ms

- 5120ms

- 10240ms

- 1min

measurementPeriodUmts-Type:

description: See details in 3GPP TS 32.422 clause 5.10.22.

type: string

enum:

- 1000ms

- 2000ms

- 3000ms

- 4000ms

- 6000ms

- 8000ms

- 12000ms

- 16000ms

- 20000ms

- 24000ms

- 28000ms

- 32000ms

- 64000ms

measurementQuantity-Type:

description: See details in 3GPP TS 32.422 clause 5.10.15.

type: string

enum:

- CPICH\_EcNo

- CPICH\_RSCP

- PathLoss

eventThresholdUphUmts-Type:

description: See details in 3GPP TS 32.422 clause 5.10.A.

type: integer

minimum: 0

maximum: 31

plmnList-Type:

description: See details in 3GPP TS 32.422 clause 5.10.24.

type: array

items:

type: object

properties:

mcc:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Mcc'

mnc:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Mnc'

required:

- mcc

- mnc

maxItems: 16

positioningMethod-Type:

description: See details in 3GPP TS 32.422 clause 5.10.19.

type: string

enum:

- GNSS

- E-CELL\_ID

reportAmount-Type:

description: See details in 3GPP TS 32.422 clause 5.10.6.

type: string

enum:

- 1

- 2

- 4

- 8

- 16

- 32

- 64

- INFINITY

reportingTrigger-Type:

description: See details in 3GPP TS 32.422 clause 5.10.4.

type: array

items:

type: string

enum:

- PERIODICAL

- A2\_FOR\_LTE\_NR

- 1F\_FOR\_UMTS

- 1I\_FOR\_UMTS\_MCPS\_TDD

- A2\_TRIGGERED\_PERIODIC\_FOR\_LTE\_NR

- ALL\_CONFIGURED\_RRM\_FOR\_LTE\_NR

- ALL\_CONFIGURED\_RRM\_FOR\_UMTS

reportInterval-Type:

description: See details in 3GPP TS 32.422 clause 5.10.5.

type: object

properties:

UMTS:

type: array

items:

type: string

enum:

- 250ms

- 500ms

- 1000ms

- 2000ms

- 3000ms

- 4000ms

- 6000ms

- 8000ms

- 12000ms

- 16000ms

- 20000ms

- 24000ms

- 28000ms

- 32000ms

- 64000ms

LTE:

type: array

items:

type: string

enum:

- 120ms

- 240ms

- 480ms

- 640ms

- 1024ms

- 2048ms

- 5120ms

- 10240ms

- 60000ms

- 360000ms

- 720000ms

- 1800000ms

- 3600000ms

NR:

type: array

items:

type: string

enum:

- 120ms

- 240ms

- 480ms

- 640ms

- 1024ms

- 2048ms

- 5120ms

- 10240ms

- 20480ms

- 40960ms

- 60000ms

- 360000ms

- 720000ms

- 1800000ms

reportType-Type:

description: Report type for logged NR MDT. See details in 3GPP TS 32.422 clause 5.10.27.

type: string

enum:

- PERIODICAL

- EVENT\_TRIGGERED

sensorInformation-Type:

description: See details in 3GPP TS 32.422 clause 5.10.29.

type: array

items:

type: string

enum:

- BAROMETRIC\_PRESSURE

- UE\_SPEED

- UE\_ORIENTATION

traceCollectionEntityId-Type:

description: See details in 3GPP TS 32.422 clause 5.10.11. Only TCE Id value may be sent over the air to the UE being configured for Logged MDT.

type: integer

excessPacketDelayThresholds-Type:

description: Excess Packet Delay Threshold for NR MDT. See details in 3GPP TS 32.422 clause 4.1.1 and 4.1.2.

type: array

properties:

fiveQIValue:

type: integer

excessPacketDelayThresholdValue:

type: string

enum:

- 0.25ms

- 0.5ms

- 1ms

- 2ms

- 4ms

- 5ms

- 10ms

- 20ms

- 30ms

- 40ms

- 50ms

- 60ms

- 70ms

- 80ms

- 90ms

- 100ms

- 150ms

- 300ms

- 500ms

minItems: 0

maxItems: 255

#-------- end of Definition of types used in Trace control NRM fragment ----------

#-------- Definition of abstract IOC Top -----------------------------------------

Top-Attr:

# This definition will be deprecated, when all occurances of Top-Attr

# are replaced by Top.

type: object

properties:

id:

type: string

nullable: true

objectClass:

type: string

objectInstance:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

VsDataContainer:

$ref: '#/components/schemas/VsDataContainer-Multiple'

required:

- id

Top:

type: object

properties:

id:

type: string

nullable: true

objectClass:

type: string

objectInstance:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

VsDataContainer:

$ref: '#/components/schemas/VsDataContainer-Multiple'

required:

- id

#-------- Definition of IOCs with new name-containments defined in other TS ------

SubNetwork-Attr:

type: object

properties:

dnPrefix:

type: string

userLabel:

type: string

userDefinedNetworkType:

type: string

setOfMcc:

type: array

items:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Mcc'

priorityLabel:

type: integer

supportedPerfMetricGroups:

type: array

items:

$ref: '#/components/schemas/SupportedPerfMetricGroup'

supportedTraceMetrics:

type: array

items:

type: string

ManagedElement-Attr:

type: object

properties:

dnPrefix:

type: string

managedElementTypeList:

type: array

items:

type: string

userLabel:

type: string

locationName:

type: string

managedBy:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

vendorName:

type: string

userDefinedState:

type: string

swVersion:

type: string

priorityLabel:

type: integer

supportedPerfMetricGroups:

type: array

items:

$ref: '#/components/schemas/SupportedPerfMetricGroup'

supportedTraceMetrics:

type: array

items:

type: string

SubNetwork-ncO:

type: object

properties:

ManagementNode:

$ref: '#/components/schemas/ManagementNode-Multiple'

MnsAgent:

$ref: '#/components/schemas/MnsAgent-Multiple'

MeContext:

$ref: '#/components/schemas/MeContext-Multiple'

PerfMetricJob:

$ref: '#/components/schemas/PerfMetricJob-Multiple'

ThresholdMonitor:

$ref: '#/components/schemas/ThresholdMonitor-Multiple'

TraceJob:

$ref: '#/components/schemas/TraceJob-Multiple'

ManagementDataCollection:

$ref: '#/components/schemas/ManagementDataCollection-Multiple'

NtfSubscriptionControl:

$ref: '#/components/schemas/NtfSubscriptionControl-Multiple'

AlarmList:

$ref: '#/components/schemas/AlarmList-Single'

FileDownloadJob:

$ref: '#/components/schemas/FileDownloadJob-Multiple'

Files:

$ref: '#/components/schemas/Files-Multiple'

MnsRegistry:

$ref: '#/components/schemas/MnsRegistry-Single'

ManagedElement-ncO:

type: object

properties:

MnsAgent:

$ref: '#/components/schemas/MnsAgent-Multiple'

PerfMetricJob:

$ref: '#/components/schemas/PerfMetricJob-Multiple'

ThresholdMonitor:

$ref: '#/components/schemas/ThresholdMonitor-Multiple'

TraceJob:

$ref: '#/components/schemas/TraceJob-Multiple'

NtfSubscriptionControl:

$ref: '#/components/schemas/NtfSubscriptionControl-Multiple'

AlarmList:

$ref: '#/components/schemas/AlarmList-Single'

FileDownloadJob:

$ref: '#/components/schemas/FileDownloadJob-Multiple'

Files:

$ref: '#/components/schemas/Files-Multiple'

#-------- Definition of abstract IOCs --------------------------------------------

ManagedFunction-Attr:

type: object

properties:

userLabel:

type: string

vnfParametersList:

type: array

items:

$ref: '#/components/schemas/VnfParameter'

peeParametersList:

type: array

items:

$ref: '#/components/schemas/PeeParameter'

priorityLabel:

type: integer

supportedPerfMetricGroups:

type: array

items:

$ref: '#/components/schemas/SupportedPerfMetricGroup'

supportedTraceMetrics:

type: array

items:

type: string

EP\_RP-Attr:

type: object

properties:

userLabel:

type: string

farEndEntity:

type: string

supportedPerfMetricGroups:

type: array

items:

$ref: '#/components/schemas/SupportedPerfMetricGroup'

TraceJob-Attr:

type: object

description: abstract class used as a container of all TraceJob attributes

properties:

jobType:

$ref: '#/components/schemas/jobType-Type'

listOfInterfaces:

$ref: '#/components/schemas/listOfInterfaces-Type'

listOfNeTypes:

$ref: '#/components/schemas/listOfNeTypes-Type'

plmnTarget:

$ref: '#/components/schemas/plmnTarget-Type'

traceReportingConsumerUri:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Uri'

traceCollectionEntityIpAddress:

$ref: '#/components/schemas/IpAddr'

traceDepth:

$ref: '#/components/schemas/traceDepth-Type'

traceReference:

$ref: '#/components/schemas/traceReference-Type'

jobId:

type: string

traceReportingFormat:

$ref: '#/components/schemas/traceReportingFormat-Type'

traceTarget:

$ref: '#/components/schemas/traceTarget-Type'

triggeringEvents:

$ref: '#/components/schemas/triggeringEvents-Type'

anonymizationOfMdtData:

$ref: '#/components/schemas/anonymizationOfMdtData-Type'

areaConfigurationForNeighCell:

$ref: '#/components/schemas/AreaConfig'

areaScope:

type: array

items:

$ref: '#/components/schemas/AreaScope'

beamLevelMeasurement:

$ref: '#/components/schemas/beamLevelMeasurement-Type'

collectionPeriodRrmLte:

$ref: '#/components/schemas/collectionPeriodRrmLte-Type'

collectionPeriodM6Lte:

$ref: '#/components/schemas/collectionPeriodM6Lte-Type'

collectionPeriodM7Lte:

$ref: '#/components/schemas/collectionPeriodM7Lte-Type'

collectionPeriodRrmUmts:

$ref: '#/components/schemas/collectionPeriodRrmUmts-Type'

collectionPeriodRrmNr:

$ref: '#/components/schemas/collectionPeriodRrmNr-Type'

collectionPeriodM6Nr:

$ref: '#/components/schemas/collectionPeriodM6Nr-Type'

collectionPeriodM7Nr:

$ref: '#/components/schemas/collectionPeriodM7Nr-Type'

eventListForEventTriggeredMeasurement:

$ref: '#/components/schemas/eventListForEventTriggeredMeasurement-Type'

eventThreshold:

$ref: '#/components/schemas/eventThreshold-Type'

listOfMeasurements:

$ref: '#/components/schemas/listOfMeasurements-Type'

loggingDuration:

$ref: '#/components/schemas/loggingDuration-Type'

loggingInterval:

$ref: '#/components/schemas/loggingInterval-Type'

eventThresholdL1:

$ref: '#/components/schemas/eventThresholdL1-Type'

hysteresisL1:

$ref: '#/components/schemas/hysteresisL1-Type'

timeToTriggerL1:

$ref: '#/components/schemas/timeToTriggerL1-Type'

mbsfnAreaList:

type: array

items:

$ref: '#/components/schemas/MbsfnArea'

measurementPeriodLte:

$ref: '#/components/schemas/measurementPeriodLte-Type'

measurementPeriodUmts:

$ref: '#/components/schemas/measurementPeriodUmts-Type'

measurementQuantity:

$ref: '#/components/schemas/measurementQuantity-Type'

eventThresholdUphUmts:

$ref: '#/components/schemas/eventThresholdUphUmts-Type'

plmnList:

$ref: '#/components/schemas/plmnList-Type'

positioningMethod:

$ref: '#/components/schemas/positioningMethod-Type'

reportAmount:

$ref: '#/components/schemas/reportAmount-Type'

reportingTrigger:

$ref: '#/components/schemas/reportingTrigger-Type'

reportInterval:

$ref: '#/components/schemas/reportInterval-Type'

reportType:

$ref: '#/components/schemas/reportType-Type'

sensorInformation:

$ref: '#/components/schemas/sensorInformation-Type'

traceCollectionEntityId:

$ref: '#/components/schemas/traceCollectionEntityId-Type'

excessPacketDelayThresholds:

$ref: '#/components/schemas/excessPacketDelayThresholds-Type'

ManagedFunction-ncO:

type: object

properties:

PerfMetricJob:

$ref: '#/components/schemas/PerfMetricJob-Multiple'

ThresholdMonitor:

$ref: '#/components/schemas/ThresholdMonitor-Multiple'

ManagedNFService:

$ref: '#/components/schemas/ManagedNFService-Multiple'

TraceJob:

$ref: '#/components/schemas/TraceJob-Multiple'

#-------- Definition of concrete IOCs --------------------------------------------

VsDataContainer-Single:

type: object

properties:

id:

type: string

attributes:

type: object

properties:

vsDataType:

type: string

vsDataFormatVersion:

type: string

vsData:

nullable: true

VsDataContainer:

$ref: '#/components/schemas/VsDataContainer-Multiple'

ManagedNFService-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

userLabel:

type: string

nFServiceType:

$ref: '#/components/schemas/NFServiceType'

sAP:

$ref: '#/components/schemas/SAP'

operations:

type: array

items:

$ref: '#/components/schemas/Operation'

administrativeState:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/AdministrativeState'

operationalState:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/OperationalState'

usageState:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/UsageState'

registrationState:

$ref: '#/components/schemas/RegistrationState'

ManagementNode-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

userLabel:

type: string

managedElements:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

vendorName:

type: string

userDefinedState:

type: string

locationName:

type: string

swVersion:

type: string

MnsAgent:

$ref: '#/components/schemas/MnsAgent-Multiple'

MnsAgent-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

systemDN:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

MeContext-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

dnPrefix:

type: string

PerfMetricJob-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

administrativeState:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/AdministrativeState'

operationalState:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/OperationalState'

jobId:

type: string

performanceMetrics:

type: array

items:

type: string

granularityPeriod:

type: integer

minimum: 1

objectInstances:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

rootObjectInstances:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

reportingCtrl:

$ref: '#/components/schemas/ReportingCtrl'

Files:

$ref: '#/components/schemas/Files-Multiple'

ThresholdMonitor-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

administrativeState:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/AdministrativeState'

operationalState:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/OperationalState'

performanceMetrics:

type: array

items:

type: string

thresholdInfoList:

type: array

items:

$ref: '#/components/schemas/ThresholdInfo'

monitorGranularityPeriod:

type: integer

minimum: 1

objectInstances:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

rootObjectInstances:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

NtfSubscriptionControl-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

notificationRecipientAddress:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Uri'

notificationTypes:

type: array

items:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/NotificationType'

scope:

$ref: '#/components/schemas/Scope'

notificationFilter:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Filter'

HeartbeatControl:

$ref: '#/components/schemas/HeartbeatControl-Single'

HeartbeatControl-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

heartbeatNtfPeriod:

type: integer

minimum: 0

triggerHeartbeatNtf:

type: boolean

TraceJob-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

$ref: '#/components/schemas/TraceJob-Attr'

Files:

$ref: '#/components/schemas/Files-Multiple'

ManagementDataCollection-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

managementData:

$ref: '#/components/schemas/ManagementData'

targetNodeFilter:

$ref: '#/components/schemas/NodeFilter'

collectionTimeWindow:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/TimeWindow'

reportingCtrl:

$ref: '#/components/schemas/ReportingCtrl'

dataScope:

type: string

enum:

- SNSSAI

- 5QI

AlarmList-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

administrativeState:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/AdministrativeState'

operationalState:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/OperationalState'

numOfAlarmRecords:

type: integer

lastModification:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DateTime'

alarmRecords:

description: >-

This resource represents a map of alarm records.

The alarmIds are used as keys in the map.

type: object

additionalProperties:

$ref: 'TS28532\_FaultMnS.yaml#/components/schemas/AlarmRecord'

FileDownloadJob-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

fileLocation:

type: string

notificationRecipientAddress:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Uri'

cancelJob:

type: string

enum:

- TRUE

- FALSE

jobMonitor:

$ref: '#/components/schemas/FileDownloadJobProcessMonitor'

Files-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

numberOfFiles:

type: integer

jobRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

jobId:

type: string

File:

$ref: '#/components/schemas/File-Multiple'

File-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

fileLocation:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Uri'

fileCompression:

type: string

fileSize:

type: integer

fileDataType:

type: string

enum:

- PERFORMANCE

- TRACE

- ANALYTICS

- PROPRIETARY

fileFormat:

type: string

fileReadyTime:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DateTime'

fileExpirationTime:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DateTime'

fileContent:

type: string

jobRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

jobId:

type: string

MnsRegistry-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

MnsInfo:

$ref: '#/components/schemas/MnsInfo-Multiple'

MnsInfo-Single:

allOf:

- $ref: '#/components/schemas/Top'

- type: object

properties:

mnsLabel:

type: string

mnsType:

type: string

enum:

- ProvMnS

- FaultSupervisionMnS

- StreamingDataReportingMnS

- FileDataReportingMnS

mnsVersion:

type: string

mnsAddress:

description: Resource URI as defined in the relevant Technical Specification

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Uri'

mnsScope:

description: >-

List of the managed object instances that can be accessed using the MnS.

If a complete SubNetwork can be accessed using the MnS, this attribute may

contain the DN of the SubNetwork instead of the DNs of the individual managed

entities within the SubNetwork.

type: array

items:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

#-------- Definition of YAML arrays for name-contained IOCs ----------------------

VsDataContainer-Multiple:

type: array

items:

$ref: '#/components/schemas/VsDataContainer-Single'

ManagedNFService-Multiple:

type: array

items:

$ref: '#/components/schemas/ManagedNFService-Single'

ManagementNode-Multiple:

type: array

items:

$ref: '#/components/schemas/ManagementNode-Single'

MnsAgent-Multiple:

type: array

items:

$ref: '#/components/schemas/MnsAgent-Single'

MeContext-Multiple:

type: array

items:

$ref: '#/components/schemas/MeContext-Single'

PerfMetricJob-Multiple:

type: array

items:

$ref: '#/components/schemas/PerfMetricJob-Single'

ThresholdMonitor-Multiple:

type: array

items:

$ref: '#/components/schemas/ThresholdMonitor-Single'

TraceJob-Multiple:

type: array

items:

$ref: '#/components/schemas/TraceJob-Single'

ManagementDataCollection-Multiple:

type: array

items:

$ref: '#/components/schemas/ManagementDataCollection-Single'

NtfSubscriptionControl-Multiple:

type: array

items:

$ref: '#/components/schemas/NtfSubscriptionControl-Single'

FileDownloadJob-Multiple:

type: array

items:

$ref: '#/components/schemas/FileDownloadJob-Single'

Files-Multiple:

type: array

items:

$ref: '#/components/schemas/Files-Single'

File-Multiple:

type: array

items:

$ref: '#/components/schemas/File-Single'

MnsInfo-Multiple:

type: array

items:

$ref: '#/components/schemas/MnsInfo-Single'

#-------- Definitions in TS 28.623 for TS 28.532 ---------------------------------

resources-genericNrm:

oneOf:

- $ref: '#/components/schemas/VsDataContainer-Single'

- $ref: '#/components/schemas/ManagementNode-Single'

- $ref: '#/components/schemas/MnsAgent-Single'

- $ref: '#/components/schemas/MeContext-Single'

- $ref: '#/components/schemas/ManagedNFService-Single'

- $ref: '#/components/schemas/PerfMetricJob-Single'

- $ref: '#/components/schemas/ThresholdMonitor-Single'

- $ref: '#/components/schemas/TraceJob-Single'

- $ref: '#/components/schemas/ManagementDataCollection-Single'

- $ref: '#/components/schemas/NtfSubscriptionControl-Single'

- $ref: '#/components/schemas/HeartbeatControl-Single'

- $ref: '#/components/schemas/AlarmList-Single'

- $ref: '#/components/schemas/FileDownloadJob-Single'

- $ref: '#/components/schemas/Files-Single'

- $ref: '#/components/schemas/File-Single'

- $ref: '#/components/schemas/MnsRegistry-Single'

- $ref: '#/components/schemas/MnsInfo-Single'

Annex D (normative):  
YANG definitions

# D.1 General

This annex contains the YANG definitions for the Generic NRM.

# D.2 Modules

## D.2.1 module \_3gpp-common-ep-rp.yang

<CODE BEGINS>

module \_3gpp-common-ep-rp {

yang-version 1.1;

namespace "urn:3gpp:sa5:\_3gpp-common-ep-rp";

prefix "eprp3gpp";

import \_3gpp-common-yang-types { prefix types3gpp ; }

import ietf-inet-types { prefix inet; }

import \_3gpp-common-measurements { prefix meas3gpp; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Common/basic class/grouping to be inherited/reused.

This IOC represents an end point of a link used across a reference

point between two network entities.";

reference

"3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)

3GPP TS 28.620

Umbrella Information Model (UIM)";

revision 2020-06-08 { reference "CR-0092"; }

revision 2019-06-17 {

description "Initial revision";

}

grouping EP\_RPGrp {

description "Abstract class, represents an end point of a link used

across a reference point between two network entities.

For naming the subclasses of EP\_RP, the following rules shall apply:

- The name of the subclassed IOC shall have the form ’EP\_<rp>’,

where <rp> is a string that represents the name of the reference point.

Thus, two valid examples of EP\_RP subclassed IOC names would be:

EP\_S1 and EP\_X2.";

leaf userLabel {

type string;

description "A user-friendly (and user assignable) name of this object.";

}

leaf farEndEntity {

config false;

type types3gpp:DistinguishedName;

}

}

grouping EP\_Common {

uses EP\_RPGrp;

uses meas3gpp:SupportedPerfMetricGroupGrp;

list localAddress {

description "Local IP address and VLAN ID.";

key "ipAddress vlanId";

min-elements 1;

max-elements 1;

uses types3gpp:AddressWithVlan;

}

leaf remoteAddress {

description "Remote IP address.";

mandatory true;

type inet:ip-address;

}

}

}

<CODE ENDS>

## D.2.2 module \_3gpp-common-managed-element.yang

<CODE BEGINS>

module \_3gpp-common-managed-element {

yang-version 1.1;

namespace urn:3gpp:sa5:\_3gpp-common-managed-element;

prefix "me3gpp";

import \_3gpp-common-yang-types { prefix types3gpp ; }

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-measurements { prefix meas3gpp; }

import \_3gpp-common-subscription-control { prefix subscr3gpp; }

import \_3gpp-common-fm { prefix fm3gpp; }

import \_3gpp-common-trace { prefix trace3gpp; }

import \_3gpp-common-files { prefix files3gpp; }

import \_3gpp-5gc-nrm-configurable5qiset { prefix fiveqi3gpp; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Defines ManagedElement which will be augmented

by other IOCs";

reference "3GPP TS 28.623

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)

3GPP TS 28.620

Umbrella Information Model (UIM)";

revision 2023-04-26 { reference CR-0250; }

revision 2023-02-14 { reference "CR-0234"; }

revision 2022-09-30 { reference "CR-0191"; }

revision 2021-01-16 { reference "CR-0120"; }

revision 2020-08-06 { reference "CR-0102"; }

revision 2020-08-03 { reference "CR-0095"; }

revision 2020-06-08 { reference "CR-0092"; }

revision 2020-05-12 { reference "CR0084"; }

revision 2020-02-24 { reference "S5-201365"; }

revision 2019-06-17 { reference " S5-203316"; }

revision 2019-05-08 { reference "Initial revision"; }

feature Configurable5QISetUnderManagedElement {

description "The Configurable5QISet shall be contained under

ManagedElement";

}

feature FilesUnderManagedElement {

description "Files shall be contained under ManagedElement";

}

feature MeasurementsUnderManagedElement {

description "The MeasurementSubtree shall be contained under

ManagedElement";

}

feature SubscriptionControlUnderManagedElement {

description "The SubscriptionControlSubtree shall be contained under

ManagedElement";

}

feature FmUnderManagedElement {

description "The FmSubtree shall be contained under ManagedElement";

}

feature TraceUnderManagedElement {

description "The TraceSubtree shall be contained under ManageElement";

}

feature DESManagementFunction {

description "Class representing Distributed SON or Domain-Centralized SON

Energy Saving feature. The DESManagementFunction shall be contained under

ManagedElement.";

}

feature DMROFunction {

description "Class representing D-SON function of MRO feature. The

DMROFunction shall be contained under ManagedElement.";

}

feature DRACHOptimizationFunction {

description "Class representing D-SON function of RACH optimization

feature. The DRACHOptimizationFunction shall be contained under

ManagedElement.";

}

feature DPCIConfigurationFunction {

description "Class representing Distributed SON or Domain-Centralized SON

function of PCI configuration feature. The DPCIConfigurationFunction shall

be contained under ManagedElement.";

}

feature CPCIConfigurationFunction {

description "Class representing Cross Domain-Centralized SON function of PCI

configuration feature. The CPCIConfigurationFunction shall be contained

under ManagedElement.";

}

feature CESManagementFunction {

description "Class representing Cross Domain-Centralized SON Energy Saving

feature. The CESManagementFunction shall be contained under

ManagedElement.";

}

grouping ManagedElement\_Grp {

description "Abstract class representing telecommunications resources.

An ME communicates with a manager (directly or indirectly) for the

purpose of being monitored and/or controlled. MEs may perform element

management functionality.

An ME (and its contained Function\_(s)) may or may not be geographically

distributed. An ME (and its contained Function\_(s)) is often referred

to as a Network Element";

leaf dnPrefix {

description "Provides naming context that allows the Managed

Elements to be partitioned into logical domains.

A Distingushed Name(DN) is defined by 3GPP TS 32.300,

which splits the DN into a DN Prefix and Local DN";

type types3gpp:DistinguishedName;

}

leaf userLabel {

description "A user-friendly (and user assignable) name of this object.";

type string;

}

leaf locationName {

description "The physical location (e.g. an address) of an entity

represented by a (derivative of) ManagedElement\_. It may contain no

information to support the case where the derivative of

ManagedElement\_ needs to represent a distributed multi-location NE.";

config false;

type string;

}

leaf-list managedBy {

description "Relates to the role played by ManagementSystem\_ in the

between ManagedSystem\_ and ManagedElement\_. This attribute contains

a list of the DN(s) of the related subclasses of

ManagementSystem\_ instance(s).";

config false;

type types3gpp:DistinguishedName;

}

leaf-list managedElementTypeList {

description "The type of functionality provided by the ManagedElement.

It may represent one ME functionality or a combination of

more than one functionality.

1) The allowed values of this attribute are the names of the IOC(s)

that are (a) derived/subclassed from ManagedFunction and (b) directly

name-contained by ManagedElement IOC (on the first level below

ManagedElement), but with the string 'Function' excluded.

2) If a ManagedElement contains multiple instances of a ManagedFunction

this attribute will not contain repeated values.

3) The capitalisation (usage of upper/lower case) of characters in this

attribute is insignificant. Thus, the NodeB should be case insensitive

when reading these values.

4) Two examples of allowed values are:

- NodeB;

- HLR, VLR.";

config false;

min-elements 1;

type string;

}

}

grouping ManagedElementGrp {

description "Represents telecommunications equipment or

TMN entities within the telecommunications network providing support

and/or service to the subscriber.";

uses ManagedElement\_Grp;

leaf vendorName {

config false;

type string;

}

leaf userDefinedState {

type string;

description "An operator defined state for operator specific usage";

}

leaf swVersion {

config false;

type string;

}

leaf priorityLabel {

type uint32;

mandatory true;

}

uses meas3gpp:SupportedPerfMetricGroupGrp;

leaf-list supportedTraceMetrics {

type string;

config false;

description "List of trace metrics. When this attribute is contained in

a managed object it defines the trace metrics supported for this

object and all descendant objects.

Trace metrics include trace messages, MDT measurements

(Immediate MDT, Logged MDT, Logged MBSFN MDT), RLF and RCEF reports,

see TS 32.422. Trace metrics are identified with their metric

identifier. The metric identifier is constructed as defined

in clause 10 of TS 32.422.";

}

}

list ManagedElement {

description "Represents telecommunications equipment or TMN entities within

the telecommunications network providing support and/or service to the

subscriber. An ManagedElement IOC is used to represent a Network Element

defined in TS 32.101 including virtualizeation or non-virtualization

scenario. An ManagedElement instance is used for communicating with a

manager (directly or indirectly) over one or more management interfaces

for the purpose of being monitored and/or controlled. ManagedElement may

or may not additionally perform element management functionality.

An ManagedElement contains equipment that may or may not be geographically

distributed.

A telecommunication equipment has software and hardware components. The

ManagedElement IOC described above represents following two case:

- In the case when the software component is designed to run on dedicated

hardware component, the ManagedElement IOC description includes both

software and hardware components.

- In the case when the software is designed to run on ETSI NFV defined

NFVI [15], the ManagedElement IOC description would exclude the NFVI

component supporting the above mentioned subject software.

A ManagedElement may be contained in either a SubNetwork or in a MeContext

instance. A single ManagedElement may also exist stand-alone with no

parent at all.

The relation of ManagedElement IOC and ManagedFunction IOC can be

described as following:

- A ManaagedElement instance may have 1..1 containment relationship to a

ManagedFunction instance. In this case, the ManagedElement IOC may be

used to represent a NE with single functionality. For example, a

ManagedElement is used to represent the 3GPP defined RNC node;

- A ManagedElement instance may have 1..N containment relationship to

multiple ManagedFunction IOC instances. In this case, the ManagedElement

IOC may be used to represent a NE with combined ManagedFunction

funcationality (as indicated by the managedElementType attribute and the

contained instances of different ManagedFunction IOCs).For example, a

ManagedElement is used to represent the combined functionality of 3GPP

defined gNBCUCPFuntion, gNBCUUPFunction and gNBDUFunction";

key id;

uses top3gpp:Top\_Grp;

container attributes {

uses ManagedElementGrp;

}

uses meas3gpp:MeasurementSubtree {

if-feature MeasurementsUnderManagedElement;

}

uses subscr3gpp:SubscriptionControlSubtree {

if-feature SubscriptionControlUnderManagedElement;

}

uses fm3gpp:FmSubtree {

if-feature FmUnderManagedElement;

}

uses trace3gpp:TraceSubtree {

if-feature TraceUnderManagedElement;

}

uses files3gpp:FilesSubtree {

if-feature FilesUnderManagedElement;

}

uses fiveqi3gpp:Configurable5QISetSubtree {

if-feature Configurable5QISetUnderManagedElement;

} }

}

<CODE ENDS>

## D.2.3 module \_3gpp-common-managed-function.yang

<CODE BEGINS>

module \_3gpp-common-managed-function {

yang-version 1.1;

namespace urn:3gpp:sa5:\_3gpp-common-managed-function;

prefix mf3gpp;

import \_3gpp-common-yang-types { prefix types3gpp; }

import \_3gpp-common-yang-extensions { prefix yext3gpp; }

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-measurements { prefix meas3gpp; }

import \_3gpp-common-trace { prefix trace3gpp; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "The module defines a base class/grouping for major 3GPP

functions.";

reference

"3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)

3GPP TS 28.620

Umbrella Information Model (UIM)";

revision 2023-04-26 { reference CR-0250; }

revision 2023-02-14 { reference "CR-0234"; }

revision 2022-11-02 { reference "CR-0753"; }

revision 2022-10-24 { reference CR-0196; }

revision 2022-01-07 { reference "CR-0146"; }

revision 2021-01-25 { reference "CR-0122"; }

revision 2020-09-30 { reference "CR-bbbb"; }

revision 2020-08-06 { reference "CR-0102"; }

revision 2020-08-03 { reference "CR-0095"; }

revision 2020-06-23 { reference "CR-085"; }

revision 2020-06-08 { reference "CR-0092"; }

revision 2019-11-21 { reference "S5-197275, S5-197735"; }

revision 2019-10-28 { reference S5-193518 ; }

revision 2019-06-18 { reference "Initial revision"; }

feature MeasurementsUnderManagedFunction {

description "The MeasurementSubtree shall be contained under ManageElement";

}

feature TraceUnderManagedFunction {

description "The TraceSubtree shall be contained under ManagedFunction";

}

grouping OperationGrp {

description "This data type represents an operation.";

reference "3gpp TS 28.622";

leaf name {

type string;

mandatory true;

yext3gpp:notNotifyable;

}

leaf-list allowedNFTypes {

type string;

min-elements 1;

description "The type of the managed NF service instance

The specifc values allowed are described in TS 23.501";

}

leaf operationSemantics {

type enumeration {

enum REQUEST\_RESPONSE;

enum SUBSCRIBE\_NOTIFY;

}

config false;

mandatory true;

description "Semantics type of the operation.";

reference "3GPP TS 23.502";

}

}

grouping ManagedNFServiceGrp {

description "A ManagedNFService represents a Network Function (NF) service.";

reference "Clause 7 of 3GPP TS 23.501.";

leaf userLabel {

type string;

description "A user-friendly (and user assignable) name of this object.";

}

leaf nFServiceType {

config false;

mandatory true;

type string;

description "The type of the managed NF service instance

The specifc values allowed are described in clause 7.2 of TS 23.501";

yext3gpp:notNotifyable;

}

list sAP {

key "host port";

min-elements 1;

max-elements 1;

description "The service access point of the managed NF service instance";

uses types3gpp:SAPGrp;

}

list operations {

key name;

min-elements 1;

uses OperationGrp ;

description "Set of operations supported by the managed NF

service instance";

}

leaf administrativeState {

type types3gpp:AdministrativeState;

mandatory true;

description "Permission to use or prohibition against using the instance";

}

leaf operationalState {

type types3gpp:OperationalState;

config false;

mandatory true;

description "Describes whether the resource is installed and working";

}

leaf usageState {

type types3gpp:usageState ;

config false;

mandatory true;

description "Describes whether the resource is actively in use at a

specific instant, and if so, whether or not it has spare

capacity for additional users.";

}

leaf registrationState {

type enumeration {

enum REGISTERED;

enum DEREGISTERED;

}

config false;

}

}

grouping Function\_Grp {

description "A base grouping for 3GPP functions.";

leaf userLabel {

type string;

description "A user-friendly (and user assignable) name of this object.";

}

}

grouping ManagedFunctionGrp {

description "Abstract root class to be inherited/reused by classes

representing 3GPP functions.

Anywhere this grouping is used by classes inheriting from ManagedFunction

the list representing the inheriting class needs to include all

contained classes of ManagedFunction too. Contained classes are

either

- augmented into the Function class or

- shall be included in the list representing the inheriting class

using the grouping ManagedFunctionContainedClasses:

1) EP\_RP solved using augment

2) uses mf3gpp:ManagedFunctionContainedClasses;

";

uses Function\_Grp;

list vnfParametersList {

key vnfInstanceId;

description "Contains the parameter set of the VNF

instance(s) corresponding to an NE.

The presence of this list indicates that the ManagedFunction

represented is realized by one or more VNF instance(s). Otherwise it

shall be absent.

The presence of a vnfParametersList entry, whose vnfInstanceId with a

string length of zero, in createMO operation can trigger the

instantiation of the related VNF/VNFC instances.";

leaf vnfInstanceId {

type string ;

description "VNF instance identifier";

reference "ETSI GS NFV-IFA 008 v2.1.1:

Network Functions Virtualisation (NFV); Management and Orchestration;

Ve-Vnfm reference point - Interface and Information Model Specification

section 9.4.2

ETSI GS NFV-IFA 015 v2.1.2: Network Functions Virtualisation (NFV);

Management and Orchestration; Report on NFV Information Model

section B2.4.2.1.2.3";

}

leaf vnfdId {

type string ;

description "Identifier of the VNFD on which the VNF instance is based.

The absence of the leaf or a string length of zero for vnfInstanceId

means the VNF instance(s) does not exist (e.g. has not been

instantiated yet, has already been terminated).";

reference "ETSI GS NFV-IFA 008 v2.1.1:

Network Functions Virtualisation (NFV); Management and Orchestration;

Ve-Vnfm reference point - Interface and Information Model Specification

section 9.4.2";

}

leaf flavourId {

type string ;

description "Identifier of the VNF Deployment Flavour applied to this

VNF instance.";

reference "ETSI GS NFV-IFA 008 v2.1.1:

Network Functions Virtualisation (NFV) Management and Orchestration";

}

leaf autoScalable {

type boolean ;

mandatory true;

description "Indicator of whether the auto-scaling of this

VNF instance is enabled or disabled.";

}

}

list peeParametersList {

key idx;

description "Contains the parameter set for the control

and monitoring of power, energy and environmental parameters of

ManagedFunction instance(s).";

leaf idx { type uint32; }

leaf siteIdentification {

type string;

mandatory true;

description "The identification of the site where the

ManagedFunction resides.";

}

leaf siteLatitude {

type decimal64 {

fraction-digits 4;

range "-90.0000..+90.0000";

}

description "The latitude of the site where the ManagedFunction

instance resides, based on World Geodetic System (1984 version)

global reference frame (WGS 84). Positive values correspond to

the northern hemisphere. This attribute is optional

for BTSFunction, RNCFunction, GNBDUFunction and

NRSectorCarrier instance(s).";

}

leaf siteLongitude {

type decimal64 {

fraction-digits 4;

range "-180.0000..+180.0000";

}

description "The longitude of the site where the ManagedFunction

instance resides, based on World Geodetic System (1984 version)

global reference frame (WGS 84). Positive values correspond to

degrees east of 0 degrees longitude. This attribute is optional

for BTSFunction, RNCFunction, GNBDUFunction and

NRSectorCarrier

instance(s).";

}

leaf siteAltitude {

type decimal64 {

fraction-digits 4;

}

description "The altitude of the site where the ManagedFunction

instance resides, in the unit of meter. This attribute is

optional for BTSFunction, RNCFunction, GNBDUFunction and

NRSectorCarrier instance(s).";

}

leaf siteDescription {

type string;

mandatory true;

description "An operator defined description of the site where

the ManagedFunction instance resides.";

}

leaf equipmentType {

type string;

mandatory true;

description "The type of equipment where the managedFunction

instance resides.";

reference "clause 4.4.1 of ETSI ES 202 336-12";

}

leaf environmentType {

type string;

mandatory true;

description "The type of environment where the managedFunction

instance resides.";

reference "clause 4.4.1 of ETSI ES 202 336-12";

}

leaf powerInterface {

type string;

mandatory true;

description "The type of power.";

reference "clause 4.4.1 of ETSI ES 202 336-12";

}

}

leaf priorityLabel {

mandatory true;

type uint32;

}

uses meas3gpp:SupportedPerfMetricGroupGrp;

leaf-list supportedTraceMetrics {

type string;

config false;

description "List of trace metrics. When this attribute is contained in

a managed object it defines the trace metrics supported for this

object and all descendant objects.

Trace metrics include trace messages, MDT measurements

(Immediate MDT, Logged MDT, Logged MBSFN MDT), RLF and RCEF reports,

see TS 32.422. Trace metrics are identified with their metric

identifier. The metric identifier is constructed as defined

in clause 10 of TS 32.422.";

}

}

grouping ManagedFunctionContainedClasses {

description "A grouping used to containe classes (lists) contained by

the abstract IOC ManagedFunction";

list ManagedNFService {

description "Represents a Network Function (NF)";

reference "3GPP TS 23.501";

key id;

uses top3gpp:Top\_Grp;

container attributes {

uses ManagedNFServiceGrp;

}

}

uses meas3gpp:MeasurementSubtree {

if-feature MeasurementsUnderManagedFunction ;

}

uses trace3gpp:TraceSubtree {

if-feature TraceUnderManagedFunction ;

}

}

}

<CODE ENDS>

## D.2.4 module \_3gpp-common-measurements.yang

<CODE BEGINS>

module \_3gpp-common-measurements {

yang-version 1.1;

namespace "urn:3gpp:sa5:\_3gpp-common-measurements";

prefix "meas3gpp";

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-yang-types { prefix types3gpp; }

import \_3gpp-common-yang-extensions { prefix yext3gpp; }

import \_3gpp-common-files { prefix files3gpp; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Defines Measurement and KPI related groupings

Any list/class intending to use this should include 2 or 3 uses statements

controlled by a feature:

A)

+++ feature MeasurementsUnderMyClass {

+++ description 'Indicates whether measurements and/or KPIs are supported

+++ for this class.';

+++ }

B) include the attribute measurementsList and/or kPIsList indicating the

supported measurment and KPI types and GPs. Note that for classes

inheriting from ManagedFunction, EP\_RP or SubNetwork these attributes are

already inherited, so there is no need to include them once more. E.g.

+++ grouping MyClassGrp {

+++ uses meas3gpp:SupportedPerfMetricGroup;

+++ }

C) include the class PerfmetricJob to control the measurements/KPIs. E.g.

list MyClass {

container attributes {

uses MyClassGrp;

}

+++ uses meas3gpp:MeasurementSubtree {

+++ if-feature MeasurementsUnderMyClass ;

+++ }

}

Measurements can be contained under ManagedElement, SubNetwork, or

any list representing a class inheriting from Subnetwork or

ManagedFunction. Note: KPIs will only be supported under SubNetwork";

reference "3GPP TS 28.623

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)";

revision 2023-04-26 { reference CR-0250; }

revision 2023-02-18 { reference "CR-0240"; }

revision 2023-02-14 { reference "CR-0234"; }

revision 2022-11-04 { reference "CR-0212 CR-0194"; }

revision 2022-10-24 { reference CR-0196; }

revision 2022-09-30 { reference CR-0191; }

revision 2021-07-22 { reference "CR-0137"; }

revision 2020-11-06 { reference "CR-0118"; }

revision 2020-09-04 { reference "CR-000107"; }

revision 2020-06-08 { reference "CR-0092"; }

revision 2020-05-31 { reference "CR-0084"; }

revision 2020-03-11 { reference "S5-201581, SP-200229"; }

revision 2019-11-21 { reference "S5-197275, S5-197735"; }

revision 2019-10-28 { reference "S5-193516"; }

revision 2019-06-17 { reference " "; }

feature FilesUnderPerfMetricJob {

description "Files shall be contained under PerfMetricJob";

}

grouping ThresholdInfoGrp {

description "Defines a single threshold level.";

leaf-list measurementTypes {

type string;

description "The Measurement type can be those specified in TS 28.552,

TS 32.404 and can be those specified by other SDOs or can be

vendor-specific.";

}

leaf thresholdLevel {

type uint64;

mandatory true;

description "Number (key) for a single threshold in the threshold list

applicable to the monitored performance metric.";

}

leaf thresholdDirection {

type enumeration {

enum UP;

enum DOWN;

enum UP\_AND\_DOWN;

}

must '. = "UP\_AND\_DOWN" or not(../hysteresis)' {

error-message "In case a threshold with hysteresis is configured, the "

+"threshold direction attribute shall be set to 'UP\_AND\_DOWN'.";

}

mandatory true;

description "Direction of a threshold indicating the direction for which

a threshold crossing triggers a threshold.

When the threshold direction is configured to 'UP', the associated

treshold is triggered only when the performance metric value is going

up upon reaching or crossing the threshold value. The treshold is not

triggered, when the performance metric is going down upon reaching or

crossing the threshold value.

Vice versa, when the threshold direction is configured to 'DOWN', the

associated treshold is triggered only when the performance metric is

going down upon reaching or crossing the threshold value. The treshold

is not triggered, when the performance metric is going up upon reaching

or crossing the threshold value.

When the threshold direction is set to 'UP\_AND\_DOWN' the treshold is

active in both direcions.

In case a threshold with hysteresis is configured, the threshold

direction attribute shall be set to 'UP\_AND\_DOWN'.";

}

leaf thresholdValue {

type union {

type int64;

type decimal64 {

fraction-digits 2;

}

}

mandatory true;

description "Value against which the monitored performance metric is

compared at a threshold level in case the hysteresis is zero";

}

leaf hysteresis {

type union {

type uint64;

type decimal64 {

fraction-digits 2;

range "0..max";

}

}

description "Hysteresis of a threshold. If this attribute is present

the monitored performance metric is not compared against the

threshold value as specified by the thresholdValue attribute but

against a high and low threshold value given by

threshold-high = thresholdValue + hysteresis

threshold-low = thresholdValue - hysteresis

When going up, the threshold is triggered when the performance metric

reaches or crosses the high threshold value. When going down, the

hreshold is triggered when the performance metric reaches or crosses

the low threshold value.

A hysteresis may be present only when the monitored performance

metric is not of type counter that can go up only. If present

for a performance metric of type counter, it shall be ignored.";

}

}

grouping SupportedPerfMetricGroupGrp {

list SupportedPerfMetricGroups {

config false;

description "Captures a group of supported performance metrics and

associated parameters related to their production and reporting.

A SupportedPerfMetricGroup attribute which is part of an MOI may

define performanceMetrics for any MOI under the subtree contained

under that MOI, e.g. SupportedPerfMetricGroup on a ManagedElement

can specify supported metrics for contained ManagedFunctions

like a GNBDUFunction.";

leaf-list performanceMetrics {

type string;

min-elements 1;

description "Performance metrics include measurements defined in

TS 28.552 and KPIs defined in TS 28.554. Performance metrics can

also be specified by other SDOs or be vendor specific.

Performance metrics are identfied with their names.

For measurements defined in TS 28.552 the name is constructed as

follows:

- 'family.measurementName.subcounter' for measurement types with

subcounters

- 'family.measurementName' for measurement types without subcounters

- 'family' for measurement families

For KPIs defined in TS 28.554 the name is defined in the KPI

definitions template as the component designated with e).

A name can also identify a vendor specific performance metric or a

group of vendor specific performance metrics.";

}

leaf-list granularityPeriods {

type uint32 {

range 1..max ;

}

units seconds;

description "Granularity periods supported for the associated

measurement types. The period is defined in seconds.";

}

leaf-list reportingMethods {

type enumeration {

enum FILE\_BASED\_LOC\_SET\_BY\_PRODUCER;

enum FILE\_BASED\_LOC\_SET\_BY\_CONSUMER;

enum STREAM\_BASED;

}

min-elements 1;

}

leaf-list reportingPeriods {

type uint32 {

range 1..max ;

}

units seconds;

description "Reporting periods supported for the associated

measurement types. The period is defined in seconds.";

}

}

}

grouping PerfMetricJobGrp {

description "Represents the attributtes of the IOC PerfMetricJob";

leaf administrativeState {

default UNLOCKED;

type types3gpp:AdministrativeState ;

description "Enable or disables production of the metrics";

}

leaf operationalState {

config false;

mandatory true;

type types3gpp:OperationalState ;

description "Indicates whether the PerfMetricJob is working.";

}

leaf jobId {

type string;

description "Id for a PerfMetricJob job.";

}

leaf-list performanceMetrics {

type string;

min-elements 1;

description "Performance metrics include measurements defined in

TS 28.552 and KPIs defined in TS 28.554. Performance metrics can

also be those specified by other SDOs or vendor specific metrics.

Performance metrics are identfied with their names. A name can also

identify a vendor specific group of performance metrics.

For measurements defined in TS 28.552 the name is constructed as

follows:

- 'family.measurementName.subcounter' for measurement types with

subcounters

- 'family.measurementName' for measurement types without subcounters

- 'family' for measurement families

For KPIs defined in TS 28.554 the name is defined in the KPI

definitions template as the component designated with e).";

}

leaf granularityPeriod {

type uint32 {

range 1..max ;

}

units seconds;

mandatory true;

description "Granularity period used to produce measurements. The value

must be one of the supported granularity periods for the metric.";

}

leaf-list objectInstances {

type types3gpp:DistinguishedName;

}

leaf-list rootObjectInstances {

type types3gpp:DistinguishedName;

description "Each object instance designates the root of a subtree that

contains the root object and all descendant objects.";

}

uses types3gpp:ReportingCtrl {

refine "reportingCtrl/file-based-reporting/fileReportingPeriod" {

must '(number(.)\*"60") mod number(../granularityPeriod) = "0"' {

error-message

"The time-period must be a multiple of the granularityPeriod.";

}

}

}

leaf \_linkToFiles {

type string ;

config false;

mandatory true;

yext3gpp:notNotifyable ;

description "Link to a 'Files' object.";

}

}

grouping ThresholdMonitorGrp {

description "A threshold monitor that is created by the consumer for

the monitored entities whose measurements are required by consumer

to monitor.";

leaf administrativeState {

default UNLOCKED;

type types3gpp:AdministrativeState ;

description "Enables or disables the ThresholdMonitor.";

}

leaf operationalState {

config false;

mandatory true;

type types3gpp:OperationalState ;

description "Indicates whether the ThresholdMonitor is working.";

}

list thresholdInfoList {

key idx;

min-elements 1;

leaf idx { type uint32 ; }

uses ThresholdInfoGrp;

description "List of threshold info.";

}

leaf monitorGranularityPeriod {

type uint32 {

range "1..max";

}

units second;

mandatory true;

description " Granularity period used to monitor measurements for

threshold crossings. ";

}

leaf-list objectInstances {

type types3gpp:DistinguishedName;

yext3gpp:notNotifyable;

}

leaf-list rootObjectInstances {

type types3gpp:DistinguishedName;

description "Each object instance designates the root of a subtree that

contains the root object and all descendant objects.";

yext3gpp:notNotifyable;

}

}

grouping MeasurementSubtree {

description "Contains classes that define measurements.

Should be used in all classes (or classes inheriting from)

- SubNnetwork

- ManagedElement

- ManagedFunction

If a YANG module wants to augment these classes/list/groupings they must

augment all user classes!

If a class uses this grouping in its list it shall also use the

grouping SupportedPerfMetricGroupGrp to add SupportedPerfMetricGroup as

an attribute to its grouping";

list PerfMetricJob {

description "This IOC represents a performance metric production job. It

can be name-contained by SubNetwork, ManagedElement, or ManagedFunction.

To activate the production of the specified performance metrics, a MnS

consumer needs to create a PerfMetricJob instance on the MnS producer.

For ultimate deactivation of metric production, the MnS consumer should

delete the job to free up resources on the MnS producer.

For temporary suspension of metric production, the MnS consumer can

manipulate the value of the administrative state attribute. The MnS

producer may disable metric production as well, for example in overload

situations. This situation is indicated by the MnS producer with setting

the operational state attribute to disabled. When production is resumed

the operational state is set back to enabled.

The jobId attribute can be used to associate metrics from multiple

PerfMetricJob instances. The jobId can be included when reporting

performance metrics to allow a MnS consumer to associate received

metrics for the same purpose. For example, it is possible to configure

the same jobId value for multiple PerfMetricJob instances required to

produce the measurements for a specific KPI.

The attribute performanceMetrics defines the performance metrics to be

produced and the attribute granularityPeriod defines the granularity

period to be applied.

All object instances below and including the instance name-containing

the PerfMetricJob (base object instance) are scoped for performance

metric production. Performance metrics are produced only on those object

instances whose object class matches the object class associated to the

performance metrics to be produced.

The attributes objectInstances and rootObjectInstances allow to restrict

the scope. When the attribute objectInstances is present, only the object

instances identified by this attribute are scoped. When the attribute

rootObjectInstances is present, then the subtrees whose root objects are

identified by this attribute are scoped. Both attributes may be present

at the same time meaning the total scope is equal to the sum of both

scopes. Object instances may be scoped by both the objectInstances and

rootObjectInstances attributes. This shall not be considered as an error

by the MnS producer.

When the performance metric requires performance metric production on

multiple managed objects, which is for example the case for KPIs, the

MnS consumer needs to ensure all required objects are scoped. Otherwise

a PerfMetricJob creation request shall fail.

The attribute reportingCtrl specifies the method and associated control

parameters for reporting the produced measurements to MnS consumers.

Three methods are available: file-based reporting with selection of the

file location by the MnS producer, file-based reporting with selection

of the file location by the MnS consumer and stream-based reporting.

For file-based reporting, all performance metrics that are produced

related to a 'PerfMetricJob' instance for a reporting period shall be

stored in a single reporting file.

When the administrative state is set to 'UNLOCKED' after the creation

of a 'PerfMetricJob' the first granularity period shall start. When

the administrative state is set to 'LOCKED' or the operational state

to 'DISABLED', the ongoing reporting period shall be aborted, for

streaming the ongoing granularity period. When the administrative

state is set back to 'UNLOCKED' or the operational state to 'ENABLED'

a new reporting period period shall start, in case of streaming a new

granularity period.

Changes of all other configurable attributes shall take effect only at

the beginning of the next reporting period, for streaming at the

beginning of the next granularity period.

When the 'PerfMetricJob' is deleted, the ongoing reporting period shall

be aborted, for streaming the ongoing granularity period.

A PerfMetricJob creation request shall fail, when the requested

performance metrics, the requested granularity period, the requested

repoting method, or the requested combination thereof is not supported

by the MnS producer.

Creation and deletion of PerfMetricJob instances by MnS consumers is

optional; when not supported, PerfMetricJob instances may be created and

deleted by the system or be pre-installed.";

key id;

uses top3gpp:Top\_Grp ;

container attributes {

uses PerfMetricJobGrp ;

}

uses files3gpp:FilesSubtree {

if-feature FilesUnderPerfMetricJob;

}

}

list ThresholdMonitor {

key id;

description "Represents a threshold monitor for performance metrics.

It can be contained by SubNetwork, ManagedElement, or ManagedFunction.

A threshold monitor checks for threshold crossings of performance metric

values and generates a notification when that happens.

The ThresholdMonitor shall be used only when NRM based threshold

monitoring is supported.

To activate threshold monitoring, a MnS consumer needs to create a

ThresholdMonitor instance on the MnS producer. For ultimate deactivation

of threshold monitoring, the MnS consumer should delete the monitor to

free up resources on the MnS producer.

For temporary suspension of threshold monitoring, the MnS consumer can

manipulate the value of the administrative state attribute. The MnS

producer may disable threshold monitoring as well, for example in

overload situations. This situation is indicated by the MnS producer with

setting the operational state attribute to disabled. When monitoring is

resumed the operational state is set again to enabled.

All object instances below and including the instance containing the

ThresholdMonitor (base object instance) are scoped for performance

metric production. Performance metrics are monitored only on those

object instances whose object class matches the object class associated

to the performance metrics to be monitored.

The optional attributes objectInstances and rootObjectInstances allow to

restrict the scope. When the attribute objectInstances is present, only

the object instances identified by this attribute are scoped. When the

attribute rootObjectInstances is present, then the subtrees whose root

objects are identified by this attribute are scoped. Both attributes may

be present at the same time meaning the total scope is equal to the sum

of both scopes. Object instances may be scoped by both the objectInstances

and rootObjectInstances attributes. This shall not be considered as an

error by the MnS producer.

Multiple thresholds can be defined for multiple performance metric sets

in a single monitor using thresholdInfoList. The attribute

monitorGranularityPeriod defines the granularity period to be applied.

The value is a supported GP for the measurements being monitored.

Threshold crossing behaviour is as defined in [54], Annex F.

Each threshold is identified with a number (key) called thresholdLevel.

A threshold is defined using the attributes thresholdValue ,

thresholdDirection and hysteresis.

When hysteresis is absent or carries no information, a threshold is

triggered when the thresholdValue is reached or crossed. When hysteresis

is present, two threshold values are specified for the threshold as

follows: A high treshold value equal to the threshold value plus the

hysteresis value, and a low threshold value equal to the threshold value

minus the hysteresis value. When the monitored performance metric

increases, the threshold is triggered when the high threshold value is

reached or crossed. When the monitored performance metric decreases, the

threshold is triggered when the low threshold value is reached or crossed.

The hsyteresis ensures that the performance metric value can oscillate

around a comparison value without triggering each time the threshold when

the threshold value is crossed.

Using the thresholdDirection attribute a threshold can be configured in

such a manner that it is triggered only when the monitored performance

metric is going up or down upon reaching or crossing the threshold.

A ThresholdMonitor creation request shall be rejected, if the performance

metrics requested to be monitored, the requested granularity period, or

the requested combination thereof is not supported by the MnS producer.

A creation request may fail, when the performance metrics requested to be

monitored are not produced by a PerfMetricJob.

Creation and deletion of ThresholdMonitor instances by MnS consumers is

optional; when not supported, ThresholdMonitor instances may be created

and deleted by the system or be pre-installed.";

uses top3gpp:Top\_Grp ;

container attributes {

uses ThresholdMonitorGrp ;

}

}

}

}

<CODE ENDS>

## D.2.5 module \_3gpp-common-subnetwork.yang

<CODE BEGINS>

module \_3gpp-common-subnetwork {

yang-version 1.1;

namespace "urn:3gpp:sa5:\_3gpp-common-subnetwork";

prefix "subnet3gpp";

import \_3gpp-common-yang-types { prefix types3gpp; }

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-measurements { prefix meas3gpp; }

import \_3gpp-common-subscription-control { prefix subscr3gpp; }

import \_3gpp-common-fm { prefix fm3gpp; }

import \_3gpp-common-trace { prefix trace3gpp; }

import ietf-yang-schema-mount { prefix yangmnt; }

import \_3gpp-common-files { prefix files3gpp; }

import \_3gpp-5gc-nrm-configurable5qiset { prefix fiveqi3gpp; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Defines basic SubNetwork which will be augmented by other IOCs";

reference "3GPP TS 28.623

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)

3GPP TS 28.620

Umbrella Information Model (UIM)";

revision 2023-04-26 { reference CR-0250; }

revision 2023-02-14 { reference CR-0234; }

revision 2022-09-30 { reference CR-0191 ; }

revision 2021-01-16 { reference "CR-0120"; }

revision 2020-08-06 { reference "CR-0102"; }

revision 2020-06-08 { reference "CR-0092"; }

revision 2020-05-08 {

reference "S5-203316";

}

revision 2020-03-11 {

description "Added KPIs and corrections";

reference "S5-201365, S5-201581, SP-200229";

}

revision 2020-02-24 {

reference "S5-201365";

}

revision 2019-06-17 {

reference "Initial revision";

}

feature Configurable5QISetUnderSubNetwork {

description "The Configurable5QISet shall be contained under

Subnetwork";

}

feature FilesUnderSubNetwork {

description "Files shall be contained under Subnetwork";

}

feature ExternalsUnderSubNetwork {

description "Classes representing external entities like EUtranFrequency,

ExternalGNBCUCPFunction, ExternalENBFunction

are contained under a Subnetwork list/class.";

}

feature MeasurementsUnderSubNetwork {

description "The MeasurementSubtree shall be contained under SubNetwork";

}

feature SubscriptionControlUnderSubNetwork {

description "The SubscriptionControlSubtree shall be contained under

SubNetwork";

}

feature FmUnderSubNetwork {

description "The FmSubtree shall be contained under SubNetwork";

}

feature TraceUnderSubNetwork {

description "The TraceSubtree shall be contained under SubNetwork";

}

feature DESManagementFunction {

description "Class representing Distributed SON or Domain-Centralized SON

Energy Saving feature. The DESManagementFunction shall be contained under

SubNetwork.";

}

feature DMROFunction {

description "Class representing D-SON function of MRO feature. The

DMROFunction shall be contained under SubNetwork.";

}

feature DRACHOptimizationFunction {

description "Class representing D-SON function of RACH optimization feature.

The DRACHOptimizationFunction shall be contained under SubNetwork.";

}

feature DPCIConfigurationFunction {

description "Class representing Distributed SON or Domain-Centralized SON

function of PCI configuration feature. The DPCIConfigurationFunction shall

be contained under SubNetwork.";

}

feature CPCIConfigurationFunction {

description "Class representing Cross Domain-Centralized SON function of PCI

configuration feature. The CPCIConfigurationFunction shall be contained

under SubNetwork.";

}

feature CESManagementFunction {

description "Class representing Cross Domain-Centralized SON Energy Saving

feature. The CESManagementFunction shall be contained under SubNetwork.";

}

grouping Domain\_Grp {

description "A domain is a partition of instances of managed entities

such that :

- the group represents a topological structure which describes the

potential for connectivity

- Subject to common administration

- With common characteristics";

leaf dnPrefix {

type types3gpp:DistinguishedName;

reference "Annex C of 32.300 ";

}

leaf userLabel {

type string;

description "A user-friendly (and user assignable) name of this object.";

}

leaf userDefinedNetworkType {

type string;

description "Textual information indicating network type, e.g. 'UTRAN'.";

}

}

grouping SubNetworkGrp {

uses Domain\_Grp;

leaf-list setOfMcc {

description "Set of Mobile Country Code (MCC).

The MCC uniquely identifies the country of domicile

of the mobile subscriber. MCC is part of the IMSI (3GPP TS 23.003)

This list contains all the MCC values in subordinate object

instances to this SubNetwork instance.

See clause 2.3 of 3GPP TS 23.003 for MCC allocation principles.

It shall be supported if there is more than one value in setOfMcc

of the SubNetwork. Otherwise the support is optional.";

type types3gpp:Mcc;

}

leaf priorityLabel {

mandatory true;

type uint32;

}

uses meas3gpp:SupportedPerfMetricGroupGrp;

leaf-list supportedTraceMetrics {

type string;

config false;

description "List of trace metrics. When this attribute is contained in

a managed object it defines the trace metrics supported for this

object and all descendant objects.

Trace metrics include trace messages, MDT measurements

(Immediate MDT, Logged MDT, Logged MBSFN MDT), RLF and RCEF reports,

see TS 32.422. Trace metrics are identified with their metric

identifier. The metric identifier is constructed as defined

in clause 10 of TS 32.422.";

}

}

list SubNetwork {

key id;

description "Represents a set of managed entities";

uses top3gpp:Top\_Grp;

container attributes {

uses SubNetworkGrp;

leaf-list parents {

description "Reference to all containg SubNetwork instances

in strict order from the root subnetwork down to the immediate

parent subnetwork.

If subnetworks form a containment hierarchy this is

modeled using references between the child SubNetwork and the parent

SubNetworks.

This reference MUST NOT be present for the top level SubNetwork and

MUST be present for other SubNetworks.";

type leafref {

path "../../../SubNetwork/id";

}

}

leaf-list containedChildren{

description "Reference to all directly contained SubNetwork instances.

If subnetworks form a containment hierarchy this is

modeled using references between the child SubNetwork and the parent

SubNetwork.";

type leafref {

path "../../../SubNetwork/id";

}

}

}

uses meas3gpp:MeasurementSubtree {

if-feature MeasurementsUnderSubNetwork;

}

uses subscr3gpp:SubscriptionControlSubtree {

if-feature SubscriptionControlUnderSubNetwork;

}

uses fm3gpp:FmSubtree {

if-feature FmUnderSubNetwork;

}

uses trace3gpp:TraceSubtree {

if-feature TraceUnderSubNetwork;

}

uses files3gpp:FilesSubtree {

if-feature FilesUnderSubNetwork;

}

uses fiveqi3gpp:Configurable5QISetSubtree {

if-feature Configurable5QISetUnderSubNetwork;

}

yangmnt:mount-point children-of-SubNetwork {

description "Mountpoint for ManagedElement";

reference "RFC8528 YANG Schema Mount";

}

// augment external parts here

}

}

<CODE ENDS>

## D.2.6 module \_3gpp-common-top.yang

<CODE BEGINS>

module \_3gpp-common-top {

yang-version 1.1;

namespace urn:3gpp:sa5:\_3gpp-common-top;

prefix top3gpp;

organization "3gpp SA5";

description "The model defines a YANG mapping of the top level

information classes used for management of 5G networks and

network slicing.";

reference

"3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)

3GPP TS 28.620

Umbrella Information Model (UIM)";

revision 2019-06-17 {

description "Initial revision";

}

grouping Top\_Grp {

description "Abstract class supplying a naming attribute";

reference "3GPP TS 28.620";

leaf id {

type string;

description "Key leaf (namingAttribute) for a class/list.

Should be used as a key leaf for lists representing

stage 2 classes.";

reference "3GPP TS 32.300 Name convention for managed objects";

}

}

}

<CODE ENDS>

## D.2.6a module \_3gpp-common-subscription-control.yang

<CODE BEGINS>

module \_3gpp-common-subscription-control {

yang-version 1.1;

namespace "urn:3gpp:sa5:\_3gpp-common-subscription-control";

prefix "subscr3gpp";

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-yang-extensions { prefix yext3gpp; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Defines IOCs for subscription and heartbeat control.";

reference "3GPP TS 28.623

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

3GPP TS 28.623";

revision 2022-10-20 { reference CR-0196; }

revision 2021-01-16 { reference "CR-0120"; }

revision 2020-08-26 { reference "CR-0106"; }

revision 2019-11-29 { reference "S5-197648 S5-197647 S5-197829 S5-197828"; }

grouping NtfSubscriptionControlGrp {

description "Attributes of a specific notification subscription";

leaf notificationRecipientAddress {

type string;

mandatory true;

}

leaf-list notificationTypes {

type string;

description "Defines the types of notifications that are candidates

for being forwarded to the notification recipient.

If the notificationFilter attribute is not supported or not present

all candidate notifications types are forwarded to the notification;

discriminated by notificationFilter attribute.";

}

list scope {

key "scopeType";

min-elements 1;

max-elements 1;

description "Describes which object instances are selected with

respect to a base object instance.";

leaf scopeType {

type enumeration {

enum BASE\_ONLY;

enum BASE\_ALL;

enum BASE\_NTH\_LEVEL;

enum BASE\_SUBTREE;

}

description "If the optional scopeLevel parameter is not supported

or absent, allowed values of scopeType are BASE\_ONLY and BASE\_ALL.

The value BASE\_ONLY indicates only the base object is selected.

The value BASE\_ALL indicates the base object and all of its

subordinate objects (incl. the leaf objects) are selected.

If the scopeLevel parameter is supported and present, allowed

values of scopeType are BASE\_ALL, BASE\_ONLY, BASE\_NTH\_LEVEL

and BASE\_SUBTREE.

The value BASE\_NTH\_LEVEL indicates all objects on the level,

which is specified by the scopeLevel parameter, below the base

object are selected. The base object is at scopeLevel zero.

The value BASE\_SUBTREE indicates the base object and all of its

subordinate objects down to and including the objects on the level,

which is specified by the scopeLevel parameter, are selected.

The base object is at scopeLevel zero.";

}

leaf scopeLevel {

when '../scopeType = "BASE\_NTH\_LEVEL" or ../scopeType = "BASE\_SUBTREE"';

type uint16;

mandatory true;

description "See description of scopeType.";

}

}

leaf notificationFilter {

type string;

description "Defines a filter to be applied to candidate notifications

identified by the notificationTypes attribute.

If notificationFilter is present, only notifications that pass the

filter criteria are forwarded to the notification recipient; all other

notifications are discarded.

The filter can be applied to any field of a notification.";

}

}

grouping HeartbeatControlGrp {

description "Attributes of HeartbeatControl.";

leaf heartbeatNtfPeriod {

type uint32;

mandatory true;

units seconds;

description "Specifies the periodicity of heartbeat notification emission.

The value of zero has the special meaning of stopping the heartbeat

notification emission.";

}

leaf triggerHeartbeatNtf {

type boolean;

default false;

description "Setting this attribute to 'true' triggers an immediate

additional heartbeat notification emission. Setting the value to

'false' has no observable result.

The periodicity of notifyHeartbeat emission is not changed.

After triggering the heartbeat the system SHALL set the value

back to false.";

yext3gpp:notNotifyable;

}

}

grouping SubscriptionControlSubtree {

description "Contains notification subscription related classes.

Should be used in all classes (or classes inheriting from)

- SubNetwork

- ManagedElement

If some YAM wants to augment these classes/list/groupings they must

augment all user classes!";

list NtfSubscriptionControl {

description "A NtfSubscriptionControl instance represents the

notification subscription of a particular notification recipient.

The scope attribute is used to select managed object instances.

The base object instance of the scope is the object instance

name-containing the NtfSubscriptionControl instance.

The notifications related to the selected managed object instances

are candidates to be sent to the address specified by the

notificationRecipientAddress attribute.

The notificationType attribute and notificationFilter attribute

allow MnS consumers to exercise control over which candidate

notifications are sent to the notificationRecipientAddress.

If the notificationType attribute is supported and present, its

value identifies the

types of notifications that are candidate to be sent to the

notificationRecipientAddress. If the notificationType attribute is

not supported or not present, all types of notifications are

candidate to be sent to notificationRecipientAddress.

If supported, the notificationFilter attribute defines a filter that

is applied to the set of candidate notifications. Only candidate

notifications that pass the filter criteria are sent to the

notificationRecipientAddress. If the notificationFilter attribute is

not supported all candidate notificatios are sent to the

notificationRecipientAddress.

To receive notifications, a MnS consumer has to create

NtfSubscriptionControl object instancess on the MnS producer.

A MnS consumer can create a subscription for another MnS consumer

since it is not required the notificationRecipientAddress be his own

address.

When a MnS consumer does not wish to receive notifications any more

the MnS consumer shall delete the corresponding NtfSubscriptionControl

instance.

Creation and deletion of NtfSubscriptionControl instances by MnS

consumers is optional; when not supported, the NtfSubscriptionControl

instances may be created and deleted by the system or be

pre-installed.";

key id;

uses top3gpp:Top\_Grp;

container attributes {

uses NtfSubscriptionControlGrp;

}

list HeartbeatControl {

description "MnS consumers (i.e. notification recipients) use heartbeat

notifications to monitor the communication channels between them and

data reporting MnS producers emitting notifications such as

notifyNewAlarm and notifyFileReady.

A HeartbeatControl instance allows controlling the emission of

heartbeat notifications by MnS producers. The recipients of heartbeat

notifications are specified by the notificationRecipientAddress

attribute of the NtfSubscriptionControl instance containing the

HeartbeatControl instance.

Note that the MnS consumer managing the HeartbeatControl instance

and the MnS consumer receiving the heartbeat notifications may not be

the same.

As a pre-condition for the emission of heartbeat notifications, a

HeartbeatControl instance needs to be created. Creation of an instance

with an initial non-zero value of the heartbeatNtfPeriod attribute

triggers an immediate heartbeat notification emission. Creation of an

instance with an initial zero value of the heartbeatPeriod attribute

does not trigger an emission of a heartbeat notification. Deletion of

an instance does not trigger an emission of a heartbeat notification.

Once the instance is created, heartbeat notifications are emitted with

a periodicity defined by the value of the heartbeatNtfPeriod

attribute. No heartbeat notifications are emitted if the value is

equal to zero. Setting a zero value to a non zero value, or a non zero

value to a different non zero value, triggers an immediate heartbeat

notification, that is the base for the new heartbeat period. Setting a

non zero value to a zero value stops emitting heartbeats immediately;

no final heartbeat notification is sent.

Creation and deletion of HeartbeatControl instances by MnS Consumers

is optional; when not supported, the HeartbeatControl instances may be

created and deleted by the system or be pre-installed.

Whether and when to emit heartbeat notifications is controlled by

HeartbeatControl. Subscription for heartbeat is not supported via the

NtfSubscriptionControl.";

max-elements 1;

key id;

uses top3gpp:Top\_Grp;

container attributes {

uses HeartbeatControlGrp;

}

}

}

}

}

<CODE ENDS>

## D.2.7 module \_3gpp-common-yang-extensions.yang

<CODE BEGINS>

module \_3gpp-common-yang-extensions {

yang-version 1.1;

namespace urn:3gpp:sa5:\_3gpp-common-yang-extensions ;

prefix yext3gpp ;

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "The module defines YANG extensions needed

3GPP YANG modeling.

Copyright (c) 2019 3GPP. All rights reserved.

Extensions MUST be defined with the following structure in the

description statement:

- What is this statement.

- Newline,

- This statement can be a substatement of the xxx statements with

cardinality x..y.

- This statement can have the following substatements with

cardinality x..y.

- Newline

- Is changing this statement an editorial, BC(backwards compatible)

or NBC(non-BC) change?

- Newline.

- The argument its meaning and type. Preferably use YANG types and

constraints to define the argument's type.

Any extension statement can be added with a

deviation/deviate add statement. In this case the restriction about

the parent statement of the extension SHALL be evaluated based on the

target of the deviation statement.

Support for this module does not mean that a YANG server implements

support for each of these extensions.

Implementers of each specific module using an extensions MUST check

if the server implements support for the used extension.

Note: modules use many extensions which individual

implementations MAY or MAY NOT support.

If support for an extension is missing the extension statement needs

individual handling or it SHOULD be removed from the module using

the extension e.g. with a deviation.";

reference "3GPP TS 28.623

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

3GPP TS 28.623";

revision 2022-10-20 { reference CR-0196; }

revision 2019-06-23 { reference "Initial version"; }

extension notNotifyable {

description

"Indicates that data change notifications shall not be sent

for this attribute. If the extension is not present and other

conditions are fulfilled data change notification should be sent.

If a list or container already has the notNotifyable

extension, that is also valid for all contained data nodes.

The statement MUST only be a substatement of a leaf, leaf-list, list,

container statement that is contained within the 'attributes'

container of an IOC and that represents an attribute or sub-parts of

an attribute .

Zero or one notNotifyable statement is allowed per parent statement.

NO substatements are allowed.

Adding this statement is an NBC change, removing it is BC.";

}

extension inVariant {

description

"Indicates that the value for the data node can only be set when its

parent data node is being created. To change the value after that, the

parent data node must be deleted and recreated with the data node

having the new value.

It is unnecessary to use and MUST NOT be used for key leafs.

The statement MUST only be a substatement of a leaf, leaf-list, list

statements that is config=true.

Zero or one inVariant statement is allowed per parent statement.

NO substatements are allowed.

Adding this statement is an NBC change, removing it is BC.";

}

extension initial-value {

description "Specifies a value that the system will set for a leaf

leaf-list if a value is not specified for it when its parent list

or container is created. The value has no effect in any other

modification e.g. changing or removing the value.

The description statement of the parent statement SHOULD contain

the label 'Initial-value: ' followed by the text from the argument.

The statement MUST only be a substatement of a leaf or leaf-list.

The statement MUST NOT be present if the leaf or the leaf-list

has a default statement or the type used for the data node

has a default value.

The statement MUST NOT be used for config=false data or in an

action, rpc or notification.

Zero or one initial-value statements are allowed for a leaf parent

statement. Zero or more initial-value statements are allowed for a

leaf-list parent statement. If the leaf-list is ordered-by user, the

initial values are stored in the order they appear in the YANG definition.

NO substatements are allowed.

Always consider using a YANG-default statement instead.

Modification of the initial-value is a non-backwards-compatible change.

The argument specifies a single initial value for a leaf or leaf-list.

The value MUST be part of the valuespace of the leaf/leaf-list.

It follows the same rules as the argument of the default statement.";

argument "initial-value";

}

}

<CODE ENDS>

## D.2.8 module \_3gpp-common-yang-types.yang

<CODE BEGINS>

module \_3gpp-common-yang-types {

yang-version 1.1;

namespace "urn:3gpp:sa5:\_3gpp-common-yang-types";

prefix "types3gpp";

import ietf-inet-types { prefix inet; }

import ietf-yang-types { prefix yang; }

import \_3gpp-common-yang-extensions { prefix yext3gpp; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "The model defines a YANG mapping of the top level

information classes used for management of 5G networks and

network slicing.";

reference "3GPP TS 28.623";

revision 2023-05-10 { reference CR-0250; }

revision 2023-02-14 { reference CR-0234; }

revision 2022-11-04 { reference "CR-0194"; }

revision 2022-10-24 { reference CR-0196; }

revision 2022-07-26 { reference "CR-0180" ; }

revision 2022-02-09 { reference "CR-0144"; }

revision 2021-11-01 { reference "CR-0141"; }

revision 2021-09-30 {

description "Added Longitude, Latitude, TenthOfDegrees, OnOff.";

reference "CR-0138";

}

revision 2020-11-06 {

description "Removed incorrect S-NSSAI definitions.";

reference "CR-0118";

}

revision 2020-03-10 {

description "Removed faulty when statements.";

reference "SP-200229";

}

revision 2019-10-25 {

description "Added ManagedNFProfile.";

reference "S5-194457";

}

revision 2019-10-16 {

description "Added SAP and usageState.";

reference "S5-193518";

}

revision 2019-06-23 {

reference "Initial version.";

}

typedef EnabledDisabled {

type enumeration {

enum DISABLED ;

enum ENABLED ;

}

}

grouping nameValuePair {

leaf name { type string; }

leaf value { type string; }

}

grouping ProcessMonitorGrp {

description "Provides attributes to monitor the progress of processes

with specific purpose and limited lifetime running on MnS producers.

It may be used as data type for dedicated progress monitor attributes

when specifying the management representation of these processes.

The attributes in this clause are defined in a generic way.

For some attributes specialisations may be provided when specifying a

concrete process representation.

If a management operation on some IOCs triggers an associated

asynchronous process (whose progress shall be monitored), this should

also result in creating an attribute named 'processMonitor' (of type

'ProcessMonitor') in these IOC(s). The processMonitor attribute may be

accompanied by use-case specific additional data items.

The progress of the process is described by the 'status' and

'progressPercentage' attributes. Additional textual qualifications for

the 'status' attribute may be provided by the 'progressStateInfo' and

'resultStateInfo' attributes.

When the process is instantiated, the 'status' is set to 'NOT\_RUNNING'

and the 'progressPercentage' to '0'. The MnS producer decides when to

start executing the process and to transition into the 'RUNNING' state.

This time is captured in the 'startTime' attribute. Alternatively, the

process may start to execute directly upon its instantiation. One

alternative must be selected when using this data type.

During the 'RUNNING' state the 'progressPercentage' attribute may be

repeatedly updated. The exact semantic of this attribute is subject to

further specialisation. The 'progressInfo' attribute may be used to

provide additional textual information in the 'NOT\_RUNNING', 'CANCELLING'

and 'RUNNING' states. Further specialisation of

'progressStateInfo' may be provided where this data type is

used.

Upon successful completion of the process, the 'status' attribute is set

to 'FINISHED', the 'progressPercentage' to 100%. The time is captured in

the 'endTime' attribute. Additional textual information may be provided

in the 'resultStateInfo' attribute. The type of

'resultStateInfo' in this data type definition is 'String'.

Further specialisation of 'resultStateInfo' may be provided

where this data type is used.

In case the process fails to complete successfully, the 'status'

attribute is set to 'FAILED' or 'PARTIALLY\_FAILED', the current value of

'progressPercentage' is frozen, and the time captured in 'endTime'. The

'resultStateInfo' specifies the reason for the failure.

Specific failure reasons may be specified where the data type defined in

this clause is used. The exact semantic of failure may be subject for

further specialisation as well.

In case the process is cancelled, the 'status' attribute is first set to

'CANCELLING' and when the process is really cancelled then to 'CANCELLED'.

The transition to 'CANCELLED' is captured in the 'endTime' attribute.

The value of 'progressPercentage' is frozen. Additional textual

information may be provided in the 'resultStateInfo' attribute.

The 'resultStateInfo' attribute is provided only for additional textual

qualification of the states 'FINISHED', 'FAILED', 'PARTIALLY\_FAILED' or

'CANCELLED'. It shall not be used for making the outcome, that the

process may produce in case of success, available.

The process may have to be completed within a certain time after its

creation, for example because required data may not be available any

more after a certain time, or the process outcome is needed until a

certain time and when not provided by this time is not needed any more.

The time until the MnS producer automatically cancels the process is

indicated by the 'timer' attribute.";

leaf id {

type string;

mandatory true;

description "Id of the process. It is unique within a single

multivalue attribute of type ProcessMonitor.";

}

leaf status {

type enumeration {

enum NOT\_STARTED ;

enum RUNNING ;

enum CANCELLING ;

enum FINISHED ;

enum FAILED ;

enum PARTIALLY\_FAILED ;

enum CANCELLED ;

}

config false;

default RUNNING;

description "Represents the status of the associated process,

whether it fails, succeeds etc.

It does not represent the returned values of a successfully finished

process. ";

}

leaf progressPercentage {

type uint8 {

range 0..100;

}

config false;

description "Progress of the associated process as percentage";

}

leaf-list progressStateInfo {

type string;

config false;

description "Additional textual qualification of the states

'NOT\_STARTED', 'CANCELLING' and 'RUNNING'.

For specific processes, specific well-defined strings (e.g. string

patterns or enums) may be defined as a specialisation.";

}

leaf resultStateInfo {

type string;

config false;

description "Additional textual qualification of the states

'FINISHED', 'FAILED', 'PARTIALLY\_FAILED and 'CANCELLED'.

For example, in the 'FAILED' or 'PARTIALLY\_FAILED' state this

attribute may be used to provide error reasons.

This attribute shall not be used to make the outcome of the process

available for retrieval, if any. For this purpose, dedicated

attributes shall be specified when specifying the representation of

a specific process.

For specific processes, specific well-defined strings (e.g. string

patterns or enums) may be defined as a specialisation.";

}

leaf startTime {

type yang:date-and-time;

config false;

description "Start time of the associated process, i.e. the time when the

status changed from 'NOT\_STARTED' to 'RUNNING'.";

}

leaf endTime {

type yang:date-and-time;

config false;

description "Date and time when status changed to 'SUCCESS', 'CANCELLED',

'FAILED' or 'PARTIALLY\_FAILED'.

If the time is in the future, it is the estimated time

the process will end.";

}

leaf timer {

type uint32;

units minutes;

description "Time until the associated process is automatically cancelled.

If set, the system decreases the timer with time. When it reaches zero

the cancellation of the associated process is initiated by the

MnS\_Producer.

If not set, there is no time limit for the process.

Once the timer is set, the consumer can not change it anymore.

If the consumer has not set the timer the MnS Producer may set it.";

yext3gpp:notNotifyable;

}

}

typedef TenthOfDegrees {

type uint16 {

range 0..3600;

}

units "0.1 degrees";

description "A single integral value corresponding to an angle in degrees

between 0 and 360 with a resolution of 0.1 degrees.";

}

typedef Latitude {

type decimal64 {

fraction-digits 4;

range "-90.0000..+90.0000";

}

description "Latitude values";

}

typedef Longitude {

type decimal64 {

fraction-digits 4;

range "-180.0000..+180.0000";

}

description "Longitude values";

}

typedef OnOff {

type enumeration {

enum ON;

enum OFF;

}

}

// grouping ManagedNFProfile will be removed as it is

// being moved to \_3gpp-5gc-nrm-nfprofile

grouping ManagedNFProfile {

description "Defines profile for managed NF";

reference "3GPP TS 23.501";

leaf idx { type uint32 ; }

leaf nfInstanceID {

config false;

mandatory true;

type yang:uuid ;

description "This parameter defines profile for managed NF.

The format of the NF Instance ID shall be a

Universally Unique Identifier (UUID) version 4,

as described in IETF RFC 4122 " ;

}

leaf-list nfType {

config false;

min-elements 1;

type NfType;

description "Type of the Network Function" ;

}

leaf hostAddr {

mandatory true;

type inet:host ;

description "Host address of a NF";

}

leaf authzInfo {

type string ;

description "This parameter defines NF Specific Service authorization

information. It shall include the NF type (s) and NF realms/origins

allowed to consume NF Service(s) of NF Service Producer.";

reference "See TS 23.501" ;

}

leaf location {

type string ;

description "Information about the location of the NF instance

(e.g. geographic location, data center) defined by operator";

reference "TS 29.510" ;

}

leaf capacity {

mandatory true;

type uint16 ;

description "This parameter defines static capacity information

in the range of 0-65535, expressed as a weight relative to other

NF instances of the same type; if capacity is also present in the

nfServiceList parameters, those will have precedence over this value.";

reference "TS 29.510" ;

}

leaf nFSrvGroupId {

type string ;

description "This parameter defines identity of the group that is

served by the NF instance.

May be config false or true depending on the ManagedFunction.

Config=true for Udrinfo. Config=false for UdmInfo and AusfInfo.

Shall be present if ../nfType = UDM or AUSF or UDR. ";

reference "TS 29.510" ;

}

leaf-list supportedDataSetIds {

type enumeration {

enum SUBSCRIPTION;

enum POLICY;

enum EXPOSURE;

enum APPLICATION;

}

description "List of supported data sets in the UDR instance.

May be present if ../nfType = UDR";

reference "TS 29.510" ;

}

leaf-list smfServingAreas {

type string ;

description "Defines the SMF service area(s) the UPF can serve.

Shall be present if ../nfType = UPF";

reference "TS 29.510" ;

}

leaf priority {

type uint16;

description "This parameter defines Priority (relative to other NFs

of the same type) in the range of 0-65535, to be used for NF selection;

lower values indicate a higher priority. If priority is also present

in the nfServiceList parameters, those will have precedence over

this value. Shall be present if ../nfType = AMF ";

reference "TS 29.510" ;

}

}

typedef usageState {

type enumeration {

enum IDLE;

enum ACTIVE;

enum BUSY;

}

description "It describes whether or not the resource is actively in

use at a specific instant, and if so, whether or not it has spare

capacity for additional users at that instant. The value is READ-ONLY.";

reference "ITU T Recommendation X.731";

}

grouping SAPGrp {

leaf host {

type inet:host;

mandatory true;

}

leaf port {

type inet:port-number;

mandatory true;

}

description "Service access point.";

reference "TS 28.622";

}

typedef Mcc {

description "The mobile country code consists of three decimal digits,

The first digit of the mobile country code identifies the geographic

region (the digits 1 and 8 are not used):";

type string {

pattern '[02-79][0-9][0-9]';

}

reference "3GPP TS 23.003 subclause 2.2 and 12.1";

}

typedef Mnc {

description "The mobile network code consists of two or three

decimal digits (for example: MNC of 001 is not the same as MNC of 01)";

type string {

pattern '[0-9][0-9][0-9]|[0-9][0-9]';

}

reference "3GPP TS 23.003 subclause 2.2 and 12.1";

}

grouping PLMNId {

leaf mcc {

mandatory true;

type Mcc;

}

leaf mnc {

mandatory true;

type Mnc;

}

reference "TS 23.658";

}

typedef Nci {

description "NR Cell Identity. The NCI shall be of fixed length of 36 bits

and shall be coded using full hexadecimal representation.

The exact coding of the NCI is the responsibility of each PLMN operator";

reference "TS 23.003";

type union {

type string {

length 36;

pattern '[01]+';

}

type string {

length 9;

pattern '[a-fA-F0-9]\*';

}

}

}

typedef OperationalState {

reference "3GPP TS 28.625 and ITU-T X.731";

type enumeration {

enum DISABLED {

value 0;

description "The resource is totally inoperable.";

}

enum ENABLED {

value 1;

description "The resource is partially or fully operable.";

}

}

}

typedef BasicAdministrativeState {

reference "3GPP TS 28.625 and ITU-T X.731";

type enumeration {

enum LOCKED {

value 0;

description "The resource is administratively prohibited from performing

services for its users.";

}

enum UNLOCKED {

value 1;

description "The resource is administratively permitted to perform

services for its users. This is independent of its inherent

operability.";

}

}

}

typedef AdministrativeState {

reference "3GPP TS 28.625 and ITU-T X.731";

type enumeration {

enum LOCKED {

value 0;

description "The resource is administratively prohibited from performing

services for its users.";

}

enum UNLOCKED {

value 1;

description "The resource is administratively permitted to perform

services for its users. This is independent of its inherent

operability.";

}

enum SHUTTINGDOWN {

value 2;

description "Use of the resource is administratively permitted to

existing instances of use only. While the system remains in

the shutting down state the manager or the managed element

may at any time cause the resource to transition to the

locked state.";

}

}

}

typedef AvailabilityStatus {

type enumeration {

enum IN\_TEST;

enum FAILED;

enum POWER\_OFF;

enum OFF\_LINE;

enum OFF\_DUTY;

enum DEPENDENCY;

enum DEGRADED;

enum NOT\_INSTALLED;

enum LOG\_FULL;

}

}

typedef CellState {

type enumeration {

enum IDLE;

enum INACTIVE;

enum ACTIVE;

}

}

typedef Nrpci {

type uint32;

description "Physical Cell Identity (PCI) of the NR cell.";

reference "TS 36.211 subclause 6.11";

}

typedef Tac {

type int32 {

range 0..16777215 ;

}

description "Tracking Area Code";

reference "TS 23.003 clause 19.4.2.3";

}

grouping TaiGrp {

description "This <<dataType>> defines a Tracking Area Identity (TAI)

as specified in clause 28.6 of TS 23.003, clause 8.2 of TS 38.300

and clause 9.3.3.11 of TS 38.413. It is composed of the PLMN

identifier (PLMN-Id, which is composed of the MCC and MNC) and

the Tracking Area Code (TAC). ";

list plmnId {

description "PLMN Identity.";

min-elements 1;

max-elements 1;

key "mcc mnc";

uses types3gpp:PLMNId;

}

leaf tac { type Tac; }

}

typedef AmfRegionId {

type union {

type uint8 ;

type string {

length 8;

pattern '[01]\*';

}

}

reference "clause 2.10.1 of 3GPP TS 23.003";

}

typedef AmfSetId {

type union {

type uint16 {

range '0..1023';

}

type string {

length 8;

pattern '[01]\*';

}

}

reference "clause 2.10.1 of 3GPP TS 23.003";

}

typedef AmfPointer {

type union {

type uint8 {

range '0..63';

}

type string {

length 6;

pattern '[01]\*';

}

}

reference "clause 2.10.1 of 3GPP TS 23.003";

}

grouping AmfIdentifier {

leaf amfRegionId {

type AmfRegionId;

}

leaf amfSetId {

type AmfSetId;

}

leaf amfPointer {

type AmfPointer;

}

description "The AMFI is constructed from an AMF Region ID,

an AMF Set ID and an AMF Pointer.

The AMF Region ID identifies the region,

the AMF Set ID uniquely identifies the AMF Set within the AMF Region, and

the AMF Pointer uniquely identifies the AMF within the AMF Set. ";

}

// type definitions especially for core NFs

typedef NfType {

type enumeration {

enum NRF;

enum UDM;

enum AMF;

enum SMF;

enum AUSF;

enum NEF;

enum PCF;

enum SMSF;

enum NSSF;

enum UDR;

enum LMF;

enum GMLC;

enum 5G\_EIR;

enum SEPP;

enum UPF;

enum N3IWF;

enum AF;

enum UDSF;

enum BSF;

enum CHF;

}

}

typedef NotificationType {

type enumeration {

enum N1\_MESSAGES;

enum N2\_INFORMATION;

enum LOCATION\_NOTIFICATION;

}

}

typedef Load {

description "Latest known load information of the NF, percentage ";

type uint8 {

range 0..100;

}

}

typedef N1MessageClass {

type enumeration {

enum 5GMM;

enum SM;

enum LPP;

enum SMS;

}

}

typedef N2InformationClass {

type enumeration {

enum SM;

enum NRPPA;

enum PWS;

enum PWS\_BCAL;

enum PWS\_RF;

}

}

grouping DefaultNotificationSubscription {

leaf notificationType {

type NotificationType;

}

leaf callbackUri {

type inet:uri;

}

leaf n1MessageClass {

type N1MessageClass;

}

leaf n2InformationClass {

type N2InformationClass;

}

}

grouping Ipv4AddressRange {

leaf start {

type inet:ipv4-address;

}

leaf end {

type inet:ipv4-address;

}

}

grouping Ipv6PrefixRange {

leaf start {

type inet:ipv6-prefix;

}

leaf end {

type inet:ipv6-prefix;

}

}

typedef NsiId {

type string;

}

typedef UeMobilityLevel {

type enumeration {

enum STATIONARY;

enum NOMADIC;

enum RESTRICTED\_MOBILITY;

enum FULLY\_MOBILITY;

}

}

typedef ResourceSharingLevel {

type enumeration {

enum SHARED;

enum NOT\_SHARED;

}

}

typedef TxDirection {

type enumeration {

enum DL;

enum UL;

enum DL\_AND\_UL;

}

}

grouping AddressWithVlan {

leaf ipAddress {

type inet:ip-address;

}

leaf vlanId {

type uint16;

}

}

typedef DistinguishedName { // TODO is this equivalent to TS 32.300 ?

type string {

pattern '([a-zA-Z][a-zA-Z0-9-]\*=(\\( |#|\\|>|<|;|"|\+|,|[a-fA-F0-9]{2})|[^\\><;"+,# ])'

+ '((\\( |#|\\|>|<|;|"|\+|,|[a-fA-F0-9]{2})|[^\\><;"+,])\*'

+ '(\\( |#|\\|>|<|;|"|\+|,|[a-fA-F0-9]{2})|[^\\><;"+, ]))?'

+ '[,\+])\*[a-zA-Z][a-zA-Z0-9-]\*=(\\( |#|\\|>|<|;|"|\+|,|[a-fA-F0-9]{2})|[^\\><;"+,# ])'

+ '((\\( |#|\\|>|<|;|"|\+|,|[a-fA-F0-9]{2})'

+ '|[^\\><;"+,])\*(\\( |#|\\|>|<|;|"|\+|,|[a-fA-F0-9]{2})|[^\\><;"+, ]))?';

}

description "Represents the international standard for the representation

of Distinguished Name (RFC 4512).

The format of the DistinguishedName REGEX is:

{AttributeType = AttributeValue}

AttributeType consists of alphanumeric and hyphen (OIDs not allowed).

All other characters are restricted.

The Attribute value cannot contain control characters or the

following characters : \\ > < ; \" + , (Comma) and White space

The Attribute value can contain the following characters if they

are excaped : \\ > < ; \" + , (Comma) and White space

The Attribute value can contain control characters if its an escaped

double digit hex number.

Examples could be

UID=nobody@example.com,DC=example,DC=com

CN=John Smith,OU=Sales,O=ACME Limited,L=Moab,ST=Utah,C=US";

reference "RFC 4512 Lightweight Directory Access Protocol (LDAP):

Directory Information Models";

} // recheck regexp it doesn't handle posix [:cntrl:]

typedef QOffsetRange {

type int8 {

range "-24 | -22 | -20 | -18 | -16 | -14 | -12 | -10 | -8 | -6 | " +

" -5 | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 8 | 10 | " +

" 12 | 14 | 16 | 18 | 20 | 22 | 24";

}

units dB;

}

grouping ReportingCtrl {

choice reportingCtrl {

mandatory true;

description "

This choice defines the method for reporting collected performance

metrics to MnS consumers as well as the parameters for configuring the

reporting function. It is a choice between the control parameter

required for the reporting methods, whose presence selects the

reporting method as follows:

- When only the fileReportingPeriod attribute is present, the MnS

producer shall store files on the MnS producer at a location selected

by the MnS producer and, on condition that an appropriate subscription

is in place, inform the MnS consumer about the availability of new

files and the file location using the notifyFileReady notification.

In case the preparation of a file fails, 'notifyFilePreparationError'

shall be sent instead.

- When the 'fileReportingPeriod' and 'notificationRecipientAddress'

attributes are present, then the MnS producer shall behave like

described for the case that only the 'fileReportingPeriod' is present.

In addition, the MnS producer shall create on behalf of the MnS

consumer a subscription, using 'NtfSubscriptionControl', for the

notification types 'notifyMOICreation' and 'notifyMOIDeletion' related

to the 'File' instances that will be produced later. In case an existing

subscription does already include the 'File' instances to be produced,

no new subscription shall be created. The

'notificationRecipientAddress' attribute in the created

'NtfSubscriptionControl' instance shall be set to the value of the

'notificationRecipientAddress' in the related 'PerfMetricJob'. This

feature is called implicit notification subscription, as opposed to the

case where the MnS consumer creates the subscription (explicit

notification subscription). When the related 'PerfMetricJob' is

deleted, the 'NtfSubscriptionControl' instance created due to the

request for implicit subscription shall be deleted as well.

- When only the fileReportingPeriod and fileLocation attributes are

present, the MnS producer shall store the files on a MnS consumer, that

can be any entity such as a file server, at the location specified by

fileLocation. No notification is emitted by the MnS producer.

- When only the streamTarget attribute is present, the MnS producer

shall stream the data to the location specified by streamTarget.

For the file-based reporting methods the fileReportingPeriod attribute

specifies the time window during which collected measurements are

stored into the same file before the file is closed and a new file is

opened.";

case file-based-reporting {

leaf fileReportingPeriod {

type uint32 {

range 1..max;

}

units minutes;

mandatory true;

description "For the file-based reporting method this is the time

window during which collected measurements are stored into the same

file before the file is closed and a new file is opened.

The time-period must be a multiple of the granularityPeriod.

Applicable when the file-based reporting method is supported.";

}

choice reporting-target {

case file-target {

leaf fileLocation {

type string ;

description "Applicable and must be present when the file-based

reporting method is supported, and the files are stored on the MnS

consumer.";

}

}

case notification-target {

leaf notificationRecipientAddress {

type string;

description "Must be present when the notification-based reporting

method is supported, and the the files are available as

notifications for the MnS consumer to subscribe to.";

}

}

description "When netiher fileLocation or notificationRecipientAddress

are present, the files are stored and available to the MnS consumer

if the MnS subscribes to the notifyFileReady notification.";

}

}

case stream-based-reporting {

leaf streamTarget {

type string;

mandatory true;

description "Applicable when stream-based reporting method is

supported.";

}

}

}

}

}

<CODE ENDS>

## D.2.9 module \_3gpp-common-fm.yang

<CODE BEGINS>

module \_3gpp-common-fm {

yang-version 1.1;

namespace "urn:3gpp:sa5:\_3gpp-common-fm";

prefix "fm3gpp";

import ietf-yang-types { prefix yang; }

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-yang-types { prefix types3gpp; }

import \_3gpp-common-yang-extensions { prefix yext3gpp; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Defines a Fault Management model";

reference "3GPP TS 28.623

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)";

revision 2023-05-10 { reference CR-0250; }

revision 2022-10-24 { reference CR-0196; }

revision 2021-08-08 { reference "CR-0132"; }

revision 2021-06-02 { reference "CR-0130"; }

revision 2020-06-03 { reference "CR-0091"; }

revision 2020-02-24 { reference "S5-201365"; }

feature AcknowledgeByConsumer {

description "Indicates whether alarm acknowledgement by the consumer is

supported.";

}

typedef eventType {

type enumeration {

enum COMMUNICATIONS\_ALARM {

value 2;

}

enum QUALITY\_OF\_SERVICE\_ALARM {

value 3;

}

enum PROCESSING\_ERROR\_ALARM {

value 4;

}

enum EQUIPMENT\_ALARM {

value 5;

}

enum ENVIRONMENTAL\_ALARM {

value 6;

}

enum INTEGRITY\_VIOLATION {

value 7;

}

enum OPERATIONAL\_VIOLATION {

value 8;

}

enum PHYSICAL\_VIOLATION {

value 9;

}

enum SECURITY\_SERVICE\_OR\_MECHANISM\_VIOLATION {

value 10;

}

enum TIME\_DOMAIN\_VIOLATION {

value 11;

}

}

description "General category for the alarm.";

}

typedef severity-level {

type enumeration {

enum CRITICAL { value 3; }

enum MAJOR { value 4; }

enum MINOR { value 5; }

enum WARNING { value 6; }

enum INDETERMINATE { value 7; }

enum CLEARED { value 8; }

}

description "The possible alarm severities";

}

grouping AlarmRecordGrp {

description "Contains alarm information of an alarmed object instance.

A new record is created in the alarm list when an alarmed object

instance generates an alarm and no alarm record exists with the same

values for objectInstance, alarmType, probableCause and specificProblem.

When a new record is created the MnS producer creates an alarmId, that

unambiguously identifies an alarm record in the AlarmList.

Alarm records are maintained only for active alarms. Inactive alarms are

automatically deleted by the MnS producer from the AlarmList.

Active alarms are alarms whose

a) perceivedSeverity is not CLEARED, or whose

b) perceivedSeverity is CLEARED and its ackState is not ACKNOWLEDED.";

leaf alarmId {

type string;

mandatory true;

description "Identifies the alarmRecord";

yext3gpp:notNotifyable;

}

leaf objectInstance {

type types3gpp:DistinguishedName;

config false ;

mandatory true;

yext3gpp:notNotifyable;

}

leaf notificationId {

type int32;

config false ;

mandatory true;

description "The Id of the last notification updating the AlarmRecord.";

yext3gpp:notNotifyable;

}

leaf alarmRaisedTime {

type yang:date-and-time ;

mandatory true;

config false ;

yext3gpp:notNotifyable;

}

leaf alarmChangedTime {

type yang:date-and-time ;

config false ;

description "not applicable if related alarm has not changed";

yext3gpp:notNotifyable;

}

leaf alarmClearedTime {

type yang:date-and-time ;

config false ;

description "not applicable if related alarm was not cleared";

yext3gpp:notNotifyable;

}

leaf alarmType {

type eventType;

config false ;

mandatory true;

description "General category for the alarm.";

yext3gpp:notNotifyable;

}

leaf probableCause {

type union {

type int32;

type string;

}

config false ;

mandatory true;

yext3gpp:notNotifyable;

}

leaf specificProblem {

type union {

type int32;

type string;

}

config false ;

reference "ITU-T Recommendation X.733 clause 8.1.2.2.";

yext3gpp:notNotifyable;

}

leaf perceivedSeverity {

type severity-level;

mandatory true;

description "This is Writable only if producer supports consumer

to set perceivedSeverity to CLEARED";

yext3gpp:notNotifyable;

}

leaf backedUpStatus {

type boolean;

config false ;

description "Indicates if an object (the MonitoredEntity) has a back

up. See definition in ITU-T Recommendation X.733 clause 8.1.2.4.";

yext3gpp:notNotifyable;

}

leaf backUpObject {

type types3gpp:DistinguishedName;

config false ;

description "Backup object of the alarmed object as defined in

ITU-T Rec. X. 733";

yext3gpp:notNotifyable;

}

leaf trendIndication {

type enumeration {

enum MORE\_SEVERE;

enum NO\_CHANGE;

enum LESS\_SEVERE;

}

config false ;

description "Indicates if some observed condition is getting better,

worse, or not changing. ";

reference "ITU-T Recommendation X.733 clause 8.1.2.6.";

yext3gpp:notNotifyable;

}

grouping ThresholdInfoGrp {

leaf measurementType {

type string;

mandatory true;

}

leaf direction {

type enumeration {

enum INCREASING;

enum DECREASING;

}

mandatory true;

description "

If it is 'Increasing', the threshold crossing notification is

triggered when the measurement value equals or exceeds a

thresholdValue.

If it is 'Decreasing', the threshold crossing notification is

triggered when the measurement value equals or below a

thresholdValue.";

}

leaf thresholdLevel {

type string;

}

leaf thresholdValue {

type string;

}

leaf hysteresis {

type string;

description "The hysteresis has a threshold high and a threshold

low value that are different from the threshold value.

A hysteresis, therefore, defines the threshold-high and

threshold-low levels within which the measurementType value is

allowed to oscillate without triggering the threshold crossing

notification.";

}

}

list thresholdInfo {

config false ;

yext3gpp:notNotifyable;

description "Indicates the crossed threshold";

uses ThresholdInfoGrp;

}

list stateChangeDefinition {

key attributeName;

config false ;

description "Indicates MO attribute value changes associated with the

alarm for state attributes of the monitored entity (state transitions).

The change is reported with the name of the state attribute, the new

value and an optional old value.

See definition in ITU-T Recommendation X.733 [4] clause 8.1.2.10.";

yext3gpp:notNotifyable;

leaf attributeName {

type string;

}

anydata newValue {

mandatory true;

description "The new value of the attribute. The content of this data

node shall be in accordance with the data model for the attribute.";

}

anydata oldValue{

description "The old value of the attribute. The content of this data

node shall be in accordance with the data model for the attribute.";

}

}

list monitoredAttributes {

key attributeName;

config false ;

yext3gpp:notNotifyable;

description "Attributes of the monitored entity and their

values at the time the alarm occurred that are of interest for the

alarm report.";

reference "ITU-T Recommendation X.733 clause 8.1.2.11.";

leaf attributeName {

type string;

}

anydata value {

mandatory true;

description "The value of the attribute. The content of this data

node shall be in accordance with the data model for the attribute.";

}

}

leaf proposedRepairActions {

type string;

config false ;

description "Indicates proposed repair actions. See definition in

ITU-T Recommendation X.733 clause 8.1.2.12.";

yext3gpp:notNotifyable;

}

leaf additionalText {

type string;

config false ;

yext3gpp:notNotifyable;

}

list additionalInformation {

key name;

config false ;

yext3gpp:notNotifyable;

description "Vendor specific alarm information in the alarm.";

uses types3gpp:nameValuePair;

}

leaf rootCauseIndicator {

type boolean;

default false;

config false ;

description "It indicates that this AlarmInformation is the root cause

of the events captured by the notifications whose identifiers are in

the related CorrelatedNotification instances.";

yext3gpp:notNotifyable;

}

leaf ackTime {

if-feature AcknowledgeByConsumer;

type yang:date-and-time ;

config false ;

description "It identifies the time when the alarm has been

acknowledged or unacknowledged the last time, i.e. it registers the

time when ackState changes.";

yext3gpp:notNotifyable;

}

leaf ackUserId {

if-feature AcknowledgeByConsumer;

type string;

description "It identifies the last user who has changed the

Acknowledgement State.";

yext3gpp:notNotifyable;

}

leaf ackSystemId {

if-feature AcknowledgeByConsumer;

type string;

description "It identifies the system (Management System) that last

changed the ackState of an alarm, i.e. acknowledged or unacknowledged

the alarm.";

yext3gpp:notNotifyable;

}

leaf ackState {

if-feature AcknowledgeByConsumer;

type enumeration {

enum ACKNOWLEDGED {

description "The alarm has been acknowledged.";

}

enum UNACKNOWLEDGED {

description "The alarm has unacknowledged or the alarm has never

been acknowledged.";

}

}

yext3gpp:notNotifyable;

}

leaf clearUserId {

type string;

description "Carries the identity of the user who invokes the

clearAlarms operation.";

yext3gpp:notNotifyable;

}

leaf clearSystemId {

type string;

yext3gpp:notNotifyable;

}

leaf serviceUser {

type string;

config false ;

description "It identifies the service-user whose request for service

provided by the serviceProvider led to the generation of the

security alarm.";

yext3gpp:notNotifyable;

}

leaf serviceProvider {

type string;

config false ;

description "It identifies the service-provider whose service is

requested by the serviceUser and the service request provokes the

generation of the security alarm.";

yext3gpp:notNotifyable;

}

leaf securityAlarmDetector {

type string;

config false ;

yext3gpp:notNotifyable;

}

list correlatedNotifications {

key sourceObjectInstance;

description "List of correlated notifications";

leaf sourceObjectInstance {

type types3gpp:DistinguishedName;

}

leaf-list notificationId {

type int32;

min-elements 1;

}

}

}

grouping AlarmListGrp {

description "Represents the AlarmList IOC.";

leaf administrativeState {

type types3gpp:AdministrativeState ;

default LOCKED;

description "When set to UNLOCKED, the alarm list is updated.

When the set to LOCKED, the existing alarm records are not

updated, and new alarm records are not added to the alarm list.";

}

leaf operationalState {

type types3gpp:OperationalState ;

default DISABLED;

config false;

description "The producer sets this attribute to ENABLED, indicating

that it has the resource and ability to record alarm in AlarmList

else, it sets the attribute to DISABLED.";

}

leaf numOfAlarmRecords {

type uint32 ;

config false;

mandatory true;

description "The number of alarm records in the AlarmList";

yext3gpp:notNotifyable;

}

leaf lastModification {

type yang:date-and-time ;

config false;

description "The last time when an alarm record was modified";

yext3gpp:notNotifyable;

}

list alarmRecords {

key alarmId;

description "List of alarmRecords";

yext3gpp:notNotifyable;

uses AlarmRecordGrp;

}

}

grouping FmSubtree {

description "Contains FM related classes.

Should be used in all classes (or classes inheriting from)

- SubNetwork

- ManagedElement

If some YAM wants to augment these classes/list/groupings they must

augment all user classes!";

list AlarmList {

key id;

max-elements 1;

description "The AlarmList represents the capability to store and manage

alarm records. The management scope of an AlarmList is defined by all

descendant objects of the base managed object, which is the object

name-containing the AlarmList, and the base object itself.

AlarmList instances are created by the system or are pre-installed.

They cannot be created nor deleted by MnS consumers.

When the alarm list is locked or disabled, the existing alarm records

are not updated, and new alarm records are not added to the alarm list";

uses top3gpp:Top\_Grp ;

container attributes {

uses AlarmListGrp ;

}

}

}

}

<CODE ENDS>

## D.2.10 module \_3gpp-common-trace.yang

<CODE BEGINS>

module \_3gpp-common-trace {

yang-version 1.1;

namespace "urn:3gpp:sa5:\_3gpp-common-trace";

prefix "trace3gpp";

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-yang-types {prefix types3gpp; }

import \_3gpp-common-yang-extensions {prefix yext3gpp; }

import ietf-inet-types { prefix inet; }

import \_3gpp-common-files { prefix files3gpp; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Trace handling";

reference "3GPP TS 28.623

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)" ;

revision 2023-04-26 { reference CR-0250; }

revision 2023-02-18 { reference "CR-0234"; }

revision 2023-02-16 { reference "CR-0233"; }

revision 2022-09-30 { reference CR-0191 ; }

revision 2022-04-27 { reference "CR-0159"; }

revision 2021-10-18 { reference "CR-0139"; }

revision 2021-07-22 { reference "CR-0137"; }

revision 2021-01-25 { reference "CR-0122"; }

revision 2020-11-16 { reference "CR-0117"; }

revision 2020-08-06 { reference "CR-0102"; }

feature FilesUnderTraceJob {

description "Files shall be contained under TraceJob";

}

grouping FreqInfoGrp {

description "Represents the FreqInfo dataType.

This <<dataType>> defines the RF reference frequency and the frequency

operating bands used in a cell for a given direction (UL or DL) in FDD

or for both UL and DL directions in TDD";

leaf arfcn {

type uint32 {

range 0..3279165;

}

mandatory true;

description "RF Reference Frequency as defined in TS 38.104,

clause 5.4.2.1. The frequency provided identifies the absolute

frequency position of the reference resource block (Common RB 0)

of the carrier. Its lowest subcarrier is also known as Point A.";

}

leaf-list freqBands {

type uint32 {

range 1..1024;

}

min-elements 1;

description "List of NR frequency operating bands. Primary NR

Operating Band as defined in TS 38.104, clause 5.4.2.3.

The value 1 corresponds to n1, value 2 corresponds to NR operating

band n2, etc.";

}

}

grouping AreaConfigGrp {

description "Represents the AreaConfig dataType.

This <<dataType>> defines the area for which measurement logging should

be performed. It is described by a list of cells and a list of

frequencies.";

list freqInfo {

key arfcn;

min-elements 1;

max-elements 32;

description "It specifies the carrier frequency and bands used in

a cell.";

uses FreqInfoGrp ;

}

leaf-list pciList {

type uint32 {

range 0..1007;

}

min-elements 1;

max-elements 32;

description "List of neighbour cells subject for MDT scope.";

}

}

grouping AreaScopeGrp {

description "Represents the AreaScope dataType.

This <<dataType>> defines the area scope of MDT.

The Area Scope parameter in LTE and NR is either:

- list of Cells, identified by E-UTRAN-CGI or NG-RAN CGI.

Maximum 32 CGI can be defined.

- list of Tracking Area, identified by TAC.

Maximum of 8 TAC can be defined.

- list of Tracking Area Identity, identified by TAC with

associated plmn-Identity perTAC-List containing the

PLMN identity for each TAC. Maximum of 8 TAI can be defined.";

choice AreaScopeChoice {

leaf-list eutraCellIdList {

type string;

min-elements 1;

max-elements 32;

description "List of E-UTRAN cells identified by E-UTRAN-CGI";

}

leaf-list utraCellIdList {

type string;

min-elements 1;

max-elements 32;

description "List of UTRAN cells identified by UTRAN CGI";

}

leaf-list tacList {

type types3gpp:Tac;

min-elements 1;

max-elements 8;

description "Tracking Area Code list";

}

list taiList {

description "Tracking Area Identity list";

key idx;

min-elements 1;

max-elements 8;

leaf idx { type string; }

uses types3gpp:TaiGrp;

}

}

}

grouping ExcessPacketDelayThresholdsGrp {

description "Represents the ExcessPacketDelayThresholds dataType.

This <<dataType>> defines a excess packet delay threshold information

to enable the calculation of the PDCP Excess Packet Delay in the

uplink in case of M6 uplink measurements are requested. The excess

packet delay threshold information is specified with the 5QI value

and excess packet delay threshold value.";

leaf fiveQIValue {

type uint8;

mandatory true;

description "It indicates 5QI value.";

}

leaf excessPacketDelayThresholdValue {

type decimal64 {

fraction-digits 2;

range 0.25|0.5|1|2|4|5|10|20|30|40|50|60|70|80|90|100|150|300|500 ;

}

mandatory true;

units milliseconds;

description "Value of excess packet delay threshold

for M6 UL measurement in milliseconds.";

}

}

grouping TraceReferenceGrp {

description "Represents the TraceReference dataType.

This <<dataType>> defines a globally unique identifier, which uniquely

identifies the Trace Session that is created by the TraceJob. It is

composed of the MCC, MNC (resulting in PLMN identifier) and the

trace identifier.";

uses types3gpp:PLMNId; // mcc+mnc

leaf traceId {

type string;

mandatory true;

description "An identifier, which identifies the Trace

(together with MCC and MNC). This is a 3 byte Octet String.";

}

}

grouping MbsfnAreaGrp {

description "Represents the MbsfnArea dataType.

This <<dataType>> defines a MBSFN area. It is composed of the MBSFN Area

identifier and the carrier frequency (EARFCN).";

leaf mbsfnAreaId {

type uint32 {

range 1..max;

}

mandatory true;

description "MBSFN Area Identifier";

}

leaf earfcn{

type uint32 {

range 1..max;

}

mandatory true;

description "Carrier Frequency";

}

}

grouping TraceJobGrp {

leaf jobType {

type enumeration {

enum IMMEDIATE\_MDT\_ONLY;

enum LOGGED\_MDT\_ONLY;

enum TRACE\_ONLY;

enum IMMEDIATE\_MDT\_AND\_TRACE;

enum RLF\_REPORT\_ONLY;

enum RCEF\_REPORT\_ONLY;

enum LOGGED\_MBSFN\_MDT;

}

default TRACE\_ONLY;

description "Specifies the MDT mode and it specifies also whether the

TraceJob represents only MDT, Logged MBSFN MDT, Trace or a combined

Trace and MDT job. The attribute is applicable for Trace, MDT, RCEF and

RLF reporting.";

reference "Clause 5.9a of 3GPP TS 32.422 for additional details on the

allowed values.";

}

list listOfInterfaces {

key idx;

description "Specifies the interfaces that need to be traced in the given

ManagedEntityFunction.The attribute is applicable only for Trace. In

case this attribute is not used, it carries a null semantic.";

reference "Clause 5.5 of 3GPP TS 32.422 for additional details on the

allowed values.";

leaf idx { type uint32 ; }

leaf-list MSCServerInterfaces {

type enumeration {

enum A ;

enum Iu-CS ;

enum Mc ;

enum MAP-G ;

enum MAP-B ;

enum MAP-E ;

enum MAP-F ;

enum MAP-D ;

enum MAP-C ;

enum CAP ;

}

}

leaf-list MGWInterfaces {

type enumeration {

enum Mc ;

enum Nb-UP ;

enum Iu-UP ;

}

}

leaf-list RNCInterfaces {

type enumeration {

enum Iu-CS ;

enum Iu-PS ;

enum Iur ;

enum Iub ;

enum Uu ;

}

}

leaf-list SGSNInterfaces {

type enumeration {

enum Gb ;

enum Iu-PS ;

enum Gn ;

enum MAP-Gr ;

enum MAP-Gd ;

enum MAP-Gf ;

enum Ge ;

enum Gs ;

enum S6d ;

enum S4 ;

enum S3 ;

enum S13 ;

}

}

leaf-list GGSNInterfaces {

type enumeration {

enum Gn ;

enum Gi ;

enum Gmb ;

}

}

leaf-list S-CSCFInterfaces {

type enumeration {

enum Mw ;

enum Mg ;

enum Mr ;

enum Mi ;

}

}

leaf-list P-CSCFInterfaces {

type enumeration {

enum Gm ;

enum Mw ;

}

}

leaf-list I-CSCFInterfaces {

type enumeration {

enum Cx ;

enum Dx ;

enum Mg ;

enum Mw ;

}

}

leaf-list MRFCInterfaces {

type enumeration {

enum Mp ;

enum Mr ;

}

}

leaf-list MGCFInterfaces {

type enumeration {

enum Mg ;

enum Mj ;

enum Mn ;

}

}

leaf-list IBCFInterfaces {

type enumeration {

enum Ix ;

enum Mx ;

}

}

leaf-list E-CSCFInterfaces {

type enumeration {

enum Mw ;

enum Ml ;

enum Mm ;

enum Mi-Mg ;

}

}

leaf-list BGCFInterfaces {

type enumeration {

enum Mi ;

enum Mj ;

enum Mk ;

}

}

leaf-list ASInterfaces {

type enumeration {

enum Dh ;

enum Sh ;

enum ISC ;

enum Ut ;

}

}

leaf-list HSSInterfaces {

type enumeration {

enum MAP-C ;

enum MAP-D ;

enum Gc ;

enum Gr ;

enum Cx ;

enum S6d ;

enum S6a ;

enum Sh ;

}

}

leaf-list EIRInterfaces {

type enumeration {

enum MAP-F ;

enum S13 ;

enum MAP-Gf ;

}

}

leaf-list BM-SCInterfaces {

type enumeration {

enum Gmb ;

}

}

leaf-list MMEInterfaces {

type enumeration {

enum S1-MME ;

enum S3 ;

enum S6a ;

enum S10 ;

enum S11 ;

enum S13 ;

}

}

leaf-list SGWInterfaces {

type enumeration {

enum S4 ;

enum S5 ;

enum S8 ;

enum S11 ;

enum Gxc ;

}

}

leaf-list PDN\_GWInterfaces {

type enumeration {

enum S2a ;

enum S2b ;

enum S2c ;

enum S5 ;

enum S6b ;

enum Gx ;

enum S8 ;

enum SGi ;

}

}

leaf-list eNBInterfaces {

type enumeration {

enum S1-MME ;

enum X2 ;

}

}

leaf-list en-gNBInterfaces {

type enumeration {

enum S1-MME ;

enum X2 ;

enum Uu ;

enum F1-C ;

enum E1 ;

}

}

leaf-list AMFInterfaces {

type enumeration {

enum N1 ;

enum N2 ;

enum N8 ;

enum N11 ;

enum N12 ;

enum N14 ;

enum N15 ;

enum N20 ;

enum N22 ;

enum N26 ;

}

}

leaf-list AUSFInterfaces {

type enumeration {

enum N12 ;

enum N13 ;

}

}

leaf-list NEFInterfaces {

type enumeration {

enum N29 ;

enum N30 ;

enum N33 ;

}

}

leaf-list NRFInterfaces {

type enumeration {

enum N27 ;

}

}

leaf-list NSSFInterfaces {

type enumeration {

enum N22 ;

enum N31 ;

}

}

leaf-list PCFInterfaces {

type enumeration {

enum N5 ;

enum N7 ;

enum N15 ;

}

}

leaf-list SMFInterfaces {

type enumeration {

enum N4 ;

enum N7 ;

enum N10 ;

enum N11 ;

enum S5-C ;

}

}

leaf-list SMSFInterfaces {

type enumeration {

enum N20 ;

enum N21 ;

}

}

leaf-list UDMInterfaces {

type enumeration {

enum N8 ;

enum N10 ;

enum N13 ;

enum N21 ;

}

}

leaf-list UPFInterfaces {

type enumeration {

enum N4 ;

}

}

leaf-list ng-eNBInterfaces {

type enumeration {

enum NG-C ;

enum Xn-C ;

enum Uu ;

}

}

leaf-list gNB-CU-CPInterfaces {

type enumeration {

enum NG-C ;

enum Xn-C ;

enum Uu ;

enum F1-C ;

enum E1 ;

enum X2-C ;

}

}

leaf-list gNB-CU-UPInterfaces {

type enumeration {

enum E1 ;

}

}

leaf-list gNB-DUInterfaces {

type enumeration {

enum F1-C ;

}

}

}

leaf-list listOfNETypes {

type enumeration {

enum MSC\_SERVER;

enum SGSN;

enum MGW;

enum GGSN;

enum RNC;

enum BM\_SC;

enum MME;

enum SGW;

enum PGW;

enum ENB;

enum EN\_GNB;

enum GNB\_CU\_CP;

enum GNB\_CU\_UP;

enum GNB\_DU;

}

description "Specifies in which type of ManagedFunction the trace should

be activated. The attribute is applicable only for Trace with

Signalling Based Trace activation. In case this attribute is not used,

it carries a null semantic";

reference "Clause 5.4 of 3GPP TS 32.422 for additional details on the

allowed values";

}

list pLMNTarget {

key "mcc mnc";

description "Specifies which PLMN that the subscriber of the session to

be recorded uses as selected PLMN. PLMN Target might differ from the

PLMN specified in the Trace Reference";

reference "Clause 5.9b of 3GPP TS 32.422";

uses types3gpp:PLMNId;

}

leaf traceReportingConsumerUri {

when '../traceReportingFormat = "STREAMING"';

type inet:uri;

description "URI of the Streaming Trace data reporting MnS consumer

(a.k.a. streaming target).

This attribute shall be present if file based trace data reporting is

supported and traceReportingFormat set to 'file based' or when

jobType is set to Logged MDT or Logged MBSFN MDT.";

reference "Clause 5.9 of 3GPP TS 32.422";

}

leaf traceCollectionEntityIPAddress {

when '../traceReportingFormat = "FILE\_BASED" or '

+'../jobType = "LOGGED\_MDT\_ONLY" or ../jobType = "LOGGED\_MBSFN\_MDT"';

type union {

type inet:uri;

type inet:ip-address;

}

description "Specifies the address of the Trace Collection Entity when

the attribute traceReportingFormat is configured for the file-based

reporting. The attribute is applicable for both Trace and MDT.";

reference "Clause 5.9 of 3GPP TS 32.422";

}

leaf traceDepth {

when '../jobType = "TRACE\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type enumeration {

enum MINIMUM;

enum MEDIUM;

enum MAXIMUM;

enum VENDORMINIMUM;

enum VENDORMEDIUM;

enum VENDORMAXIMUM;

}

default MAXIMUM;

description "Specifies how detailed information should be recorded in the

Network Element. The Trace Depth is a paremeter for Trace Session level,

i.e., the Trace Depth is the same for all of the NEs to be traced in

the same Trace Session.

The attribute is applicable only for Trace, otherwise it carries a null

semantic.";

reference "Clause 5.3 of 3GPP TS 32.422";

}

list traceReference {

key "idx";

min-elements 1;

max-elements 1;

description "A globally unique identifier, which uniquely identifies the

Trace Session that is created by the TraceJob.

In case of shared network, it is the MCC and MNC of the Participating

Operator that request the trace session that shall be provided.

The attribute is applicable for both Trace and MDT.";

reference "Clause 5.6 of 3GPP TS 32.422";

leaf idx { type uint32 ; }

uses trace3gpp:TraceReferenceGrp ;

}

leaf jobId {

type string;

yext3gpp:inVariant;

description "Identifier of a TraceJob";

}

leaf traceReportingFormat {

type enumeration {

enum FILE\_BASED;

enum STREAMING;

}

default FILE\_BASED;

description "Specifies the trace reporting format - streaming trace

reporting or file-based trace reporting";

reference "3GPP TS 32.422 clause 5.11";

}

list traceTarget {

key "targetIdType targetIdValue";

max-elements 1;

leaf targetIdType {

type enumeration {

enum IMSI;

enum IMEI;

enum IMEISV;

enum PUBLIC\_ID;

enum UTRAN\_CELL;

enum E\_UTRAN\_CELL;

enum NG\_RAN\_CELL;

enum ENB;

enum RNC;

enum GNB;

enum SUPI;

}

}

leaf targetIdValue {

type string;

}

description "Specifies the target object of the Trace and MDT. The

attribute is applicable for both Trace and MDT. This attribute

includes the ID type of the target as an enumeration and the ID value.

The traceTarget shall be public ID in case of a Management Based

Activation is done to an ScscfFunction. The traceTarget shall be

cell only in case of the UTRAN cell traffic trace function.

The traceTarget shall be E-UtranCell only in case of E-UTRAN cell

traffic trace function.The traceTarget shall be either IMSI or

IMEI(SV) if the Trace Session is activated to any of the following

ManagedEntity(ies):

- HssFunction

- MscServerFunction

- SgsnFunction

- GgsnFunction

- BmscFunction

- RncFunction

- MmeFunction

The traceTarget shall be IMSI if the Trace Session is activated to a

ManagedEntity playing a role of ServinGWFunction.

In case of signaling based Trace/MDT, the traceTarget attribute shall

be able to carry (IMSI or IMEI(SV)or SUPI), the mDTAreaScope attribute

shall be able to carry a list of (cell or E-UtranCell or NRCellDU or

TA/LA/RA).

In case of management based Immediate MDT, the traceTarget attribute

shall be null value, the mDTAreaScope attribute shall carry a list of

(Utrancell or E-UtranCell or NRCellDU).

In case of management based Logged MDT, the traceTarget attribute

shall carry an eBs or a RNC or gNBs. The Logged MDT should be initiated

on the specified eNB or RNC or gNB in traceTarget. The mDTAreaScope

attribute shall carry a list of (Utrancell or E-UtranCell or NRCellDU or

TA/LA/RA).

In case of RLF reporting, or RCEF reporting, the traceTarget

attribute shall be null value, the mDTAreaScope attribute shall carry

one or list of eNBs/gNBs";

reference "3GPP TS 32.422";

}

leaf triggeringEvents {

when '../jobType = "TRACE\_ONLY" or ' +

'../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type string ;

description "Specifies the triggering event parameter of the trace session.

The attribute is applicable only for Trace. In case this attribute is

not used, it carries a null semantic.";

reference "Clause 5.1 of 3GPP TS 32.422";

}

leaf anonymizationOfMDTData {

when ../areaScope ;

type enumeration {

enum NO\_IDENTITY;

enum TAC\_OF\_IMEI;

}

default NO\_IDENTITY;

description "Specifies level of MDT anonymization.";

reference "3GPP TS 32.422 clause 5.10.12.";

}

list areaConfigurationForNeighCell {

when '../jobType = "LOGGED\_MDT\_ONLY"';

key "idx";

leaf idx { type uint32 ; }

description "It specifies the area for which UE is requested to perform

measurement logging for neighbour cells which have list of frequencies.

If it is not configured, the UE shall perform measurement logging for

all the neighbour cells.

Applicable only to NR Logged MDT.";

reference "3GPP TS 32.422 clause 5.10.26.";

uses AreaConfigGrp;

}

list areaScope {

key "idx";

leaf idx { type uint32 ; }

description "It specifies the area where data shall be collected.

List of eNB/list of gNB/eNB/gNB for RLF or RCEF.

List of cells/TA/LA/RA for signaling based MDT or management

based Logged MDT.

List of cells for management based Immediate MDT.

Cell, TA, LA, RA are mutually exclusive.

This attribute shall be present if MDT is supported.";

reference "Clause 5.10.2 of 3GPP TS 32.422";

uses AreaScopeGrp;

}

leaf collectionPeriodRRMLTE {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type uint32 {

range "250|500|1000|2000|3000|4000|6000|8000|12000|16000|20000|"

+"24000|28000|32000|64000";

}

units milliseconds;

description "Specifies the collection period for collecting RRM configured

measurement samples for M2, M3 in LTE. The attribute is applicable only

for Immediate MDT. In case this attribute is not used, it carries a

null semantic.";

reference "Clause 5.10.20 of 3GPP TS 32.422";

}

leaf collectionPeriodM6LTE {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type uint32 {

range "1024|2048|5120|10240";

}

units milliseconds;

description "Specifies the collection period for the Packet Delay

measurement (M6) for MDT taken by the eNB. The attribute is applicable

only for Immediate MDT. In case this attribute is not used,

it carries a null semantic.";

reference "Clause 5.10.32 of TS 32.422 ";

}

leaf collectionPeriodM7LTE {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type uint16 {

range 1..60 ;

}

description "It specifies the collection period for the Packet Loss Rate

measurement (M7) for LTE MDT taken by the eNB. The attribute is

applicable only for Immediate MDT. In case this attribute

is not used, it carries a null semantic.";

reference "Clause 5.10.33 of TS 32.422 .";

}

leaf collectionPeriodRRMUMTS {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type uint32 {

range "1024|1280|2048|2560|5120|"

+"10240|60000";

}

units milliseconds;

description "Specifies the collection period for collecting RRM configured

measurement samples for M3, M4, M5 in UMTS. The attribute is applicable

only for Immediate MDT. In case this attribute is not used, it carries

a null semantic";

reference "Clause 5.10.21 of 3GPP TS 32.422";

}

leaf collectionPeriodRRMNR {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type uint32 {

range "1024|2048|5120|10240|60000";

}

units milliseconds;

description "Specifies the collection period for collecting RRM

configured measurement samples for M4, M5 in NR. The attribute is

applicable only for Immediate MDT. In case this attribute is not

used, it carries a null semantic.";

reference "Clause 5.10.30 of 3GPP TS 32.422";

}

leaf collectionPeriodM6NR {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type enumeration {

enum 120ms;

enum 240ms;

enum 480ms;

enum 640ms;

enum 1024ms;

enum 2048ms;

enum 5120ms;

enum 10240ms;

enum 20480ms;

enum 40960ms;

enum 1min;

enum 6min;

enum 12min;

enum 30min;

}

description "It specifies the collection period for the Packet Delay

measurement (M6) for NR MDT taken by the gNB. The attribute is

applicable only for Immediate MDT. In case this attribute is not used,

it carries a null semantic.";

reference "clause 5.10.34 of TS 32.422";

}

leaf collectionPeriodM7NR {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type uint32 {

range "1..60";

}

description "It specifies the collection period for the Packet Loss Rate

measurement (M7) for NR MDT taken by the gNB. The attribute is

applicable only for Immediate MDT. In case this attribute is not used,

it carries a null semantic.";

reference "clause 5.10.35 of TS 32.422";

}

leaf beamLevelMeasurement {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type boolean;

default false;

description "Indicates whether the NR M1 beam level measurements shall

be included or not.";

reference "Clause 5.10.40 of TS 32.422";

}

leaf eventListForEventTriggeredMeasurement {

when '../jobType = "LOGGED\_MDT\_ONLY"';

type enumeration {

enum OUT\_OF\_COVERAGE ;

enum A2\_EVENT ;

}

description "Specifies event types for event triggered measurement in the

case of logged NR MDT. Each trace session may configure at most one

event. The UE shall perform logging of measurements only upon certain

condition being fulfilled:

- Out of coverage.

- A2 event.";

reference "Clause 5.10.28 of 3GPP TS 32.422";

}

leaf eventThreshold {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"';

type int64;

description "Specifies the threshold which should trigger the reporting

in case A2 event reporting in LTE or 1F/1l event in UMTS. The attribute

is applicable only for Immediate MDT and when reportingTrigger is

configured for A2 event in LTE or 1F event or 1l event in UMTS. In

case this attribute is not used, it carries a null semantic.";

reference "Clauses 5.10.7 and 5.10.7a of 3GPP TS 32.422";

}

leaf listOfMeasurements {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"';

type enumeration {

enum M1;

enum M2;

enum M3;

enum M4;

enum M5;

enum M6\_DL;

enum M6\_UL;

enum M7\_DL;

enum M7\_UL;

enum M1\_EVENT\_TRIGGERED;

enum M6;

enum M7;

enum M8;

enum M9;

}

description "It specifies the UE measurements that shall be collected in

an Immediate MDT job. The attribute is applicable only for Immediate MDT.

In case this attribute is not used, it carries a null semantic.";

reference "3GPP TS 32.422 clause 5.10.3";

}

leaf loggingDuration {

when '../jobType = "LOGGED\_MDT\_ONLY" or'

+ ' ../jobType = "LOGGED\_MBSFN\_MDT"';

type uint32 {

range "600|1200|2400|3600|5400|7200";

}

units seconds;

description "Specifies how long the MDT configuration is valid at the

UE in case of Logged MDT. The attribute is applicable only for

Logged MDT and Logged MBSFN MDT. In case this attribute is not used, it

carries a null semantic.";

reference "5.10.9 of 3GPP TS 32.422";

}

leaf loggingInterval {

when '../jobType = "LOGGED\_MDT\_ONLY" or'

+ ' ../jobType = "LOGGED\_MBSFN\_MDT"';

type uint32 {

range "0|320|640|1280|2560|5120|10240|20480|"

+"30720|40960|61440";

}

units milliseconds;

description "Specifies the periodicty for Logged MDT. The attribute is

applicable only for Logged MDT and Logged MBSFN MDT. In case this

attribute is not used, it carries a null semantic.

The value 0 indicates Infinity for NR.";

reference "5.10.8 of 3GPP TS 32.422";

}

leaf eventThresholdL1 {

when '../jobType = "LOGGED\_MDT\_ONLY" or'

+ ' ../jobType = "LOGGED\_MBSFN\_MDT"';

type uint32 {

range "0..127";

}

description "It specifies the threshold which should trigger

the reporting in case of event based reporting of logged NR MDT.

The attribute is applicable only for Logged MDT and when reportType

is configured for event triggered reporting and when

eventListForEventTriggeredMeasurement is configured for L1 event.

In case this attribute is not used, it carries a null semantic.";

reference "clause 5.10.36 of TS 32.422";

}

leaf hysteresisL1 {

when '../jobType = "LOGGED\_MDT\_ONLY" or '

+ '../jobType = "LOGGED\_MBSFN\_MDT"';

type uint32 {

range "0..30";

}

description "It specifies the hysteresis used within the entry and leave

condition of the L1 event based reporting of logged NR MDT.

The attribute is applicable only for Logged MDT, when reportType

is configured for event triggered reporting and when

eventListForEventTriggeredMeasurement is configured for L1 event.

In case this attribute is not used, it carries a null semantic.";

reference "clause 5.10.37 of TS 32.422";

}

leaf timeToTriggerL1 {

when '../jobType = "LOGGED\_MDT\_ONLY" or '

+ '../jobType = "LOGGED\_MBSFN\_MDT"';

type int32 {

range 0|40|64|80|100|128|160|256|320|480|512|640|1024|1280|2560|5120;

}

units milliseconds;

description "It specifies the threshold which should trigger

the reporting in case of event based reporting of logged NR MDT.

The attribute is applicable only for Logged MDT, when reportType

is configured for event triggered reporting and when

eventListForEventTriggeredMeasurement is configured for L1 event.

In case this attribute is not used, it carries a null semantic.";

reference "clauses 5.10.38 of TS 32.422";

}

list mBSFNAreaList {

when '../jobType = "LOGGED\_MBSFN\_MDT"';

key "mbsfnAreaId earfcn";

max-elements 8;

description "The MBSFN Area consists of a MBSFN Area ID and Carrier

Frequency (EARFCN). The target MBSFN area List can have up to 8 entries.

This parameter is applicable only if the job type is Logged MBSFN MDT.";

reference "5.10.25 of 3GPP TS 32.422";

uses MbsfnAreaGrp;

}

leaf measurementPeriodLTE {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type uint32 {

range "1024|1280|2048|2560|5120|"

+"10240|60000";

}

units milliseconds;

description "It specifies the measurement period for the Data Volume and

Scheduled IP throughput measurements for MDT taken by the eNB.

The attribute is applicable only for Immediate MDT. In case this

attribute is not used, it carries a null semantic.";

reference "Clause 5.10.23 of 3GPP TS 32.422";

}

leaf measurementPeriodUMTS {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ 'or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type uint32 {

range "250|500|1000|2000|3000|4000|6000|8000|12000|16000|20000|"

+"24000|28000|32000|64000";

}

units milliseconds;

description "It specifies the measurement period for the Data Volume and

Throughput measurements for MDT taken by RNC.

The attribute is applicable only for Immediate MDT. In case this

attribute is not used, it carries a null semantic.";

reference "Clause 5.10.22 of 3GPP TS 32.422";

}

leaf measurementQuantity {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type enumeration {

enum CPICH\_ECNO;

enum CPICH\_RSCP;

enum PATHLOSS;

}

description "It specifies the measurements that are collected in an MDT

job for a UMTS MDT configured for event triggered reporting.";

reference "Clause 5.10.15 of 3GPP TS 32.422";

}

leaf eventThresholdUphUMTS {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type uint16 {

range 0..31 ;

}

description "It specifies the threshold which should trigger

the reporting in case of event-triggered periodic reporting for M4

(UE power headroom measurement) in UMTS. In case this attribute is

not used, it carries a null semantic.";

reference "5.10.39 of TS 32.422";

}

list pLMNList {

when '../jobType = "LOGGED\_MDT\_ONLY"';

key "mcc mnc";

uses types3gpp:PLMNId;

max-elements 16;

description "It indicates the PLMNs where measurement collection, status

indication and log reporting is allowed.";

reference "Clause 5.10.24 of 3GPP TS 32.422";

}

leaf positioningMethod {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' or ../jobType = "IMMEDIATE\_MDT\_AND\_TRACE"';

type enumeration {

enum GNSS;

enum E\_CELL\_ID;

}

description "It specifies what positioning method should be used in the

MDT job.";

reference "Clause 5.10.19 of 3GPP TS 32.422";

}

leaf reportAmount {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' and ../reportingTrigger = "PERIODICAL"';

type union {

type uint32 {

range "1|4|8|16|32|64" ;

}

type enumeration {

enum INFINITY;

}

}

description "It specifies the number of measurement reports that shall be

taken for periodic reporting while the UE is in connected.

The attribute is applicable only for Immediate MDT and when

reportingTrigger is configured for periodical measurements. In

case this attribute is not used, it carries a null semantic.";

reference "Clause 5.10.6 of 3GPP TS 32.422";

}

leaf reportingTrigger {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"';

type enumeration {

enum PERIODICAL;

enum A2\_FOR\_LTE;

enum 1F\_FOR\_UMTS;

enum 1I\_FOR\_UMTS\_MCPS\_TDD;

enum A2\_TRIGGERED\_PERIODIC\_FOR\_LTE;

enum ALL\_CONFIGURED\_RRM\_FOR\_LTE;

enum ALL\_CONFIGURED\_RRM\_FOR\_UMTS;

}

description "It specifies whether periodic or event based measurements

should be collected.

The attribute is applicable only for Immediate MDT and when the

listOfMeasurements is configured for M1 (for both UMTS and LTE)

or M2 (only for UMTS). In case this attribute is not used, it carries

a null semantic.";

reference "Clause 5.10.4 of 3GPP TS 32.422";

}

leaf reportInterval {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"'

+ ' and ../reportingTrigger = "PERIODICAL"';

type uint32 {

range "120|240|250|480|500|640|1000|1024|2000|2048|3000|4000|"

+"5120|6000|8000|10240|12000|16000|20000|"

+"20480|24000|28000|32000|40960|60000|64000|"

+"360000|720000|1800000|3600000";

}

units milliseconds;

description "It specifies the interval between the periodical measurements

that shall be taken when the UE is in connected mode.

The attribute is applicable only for Immediate MDT and when

reportingTrigger is configured for periodical measurements. In case

this attribute is not used, it carries a null semantic.";

reference "5.10.5 of 3GPP TS 32.422";

}

leaf reportType {

when '../jobType = "IMMEDIATE\_MDT\_ONLY"';

type enumeration {

enum PERIODICAL;

enum EVENT\_TRIGGERED;

}

description "It specifies report type for logged NR MDT";

reference "Clause 5.10.27 of 3GPP TS 32.422";

}

leaf-list sensorInformation {

type enumeration {

enum BAROMETRIC\_PRESSURE;

enum UE\_SPEED;

enum UE\_ORIENTATION;

}

description "It specifies which sensor information shall be included in

logged NR MDT and immediate NR MDT measurement if they are available.

The following sensor measurement can be included or excluded for

the UE.";

reference "Clause 5.10.29 of 3GPP TS 32.422";

}

leaf traceCollectionEntityId {

when '../jobType = "LOGGED\_MDT\_ONLY" or '

+ '../jobType = "LOGGED\_MBSFN\_MDT"';

type uint32;

description "It specifies the TCE Id which is sent to the UE in

Logged MDT.";

reference "Clause 5.10.11 of 3GPP TS 32.422";

}

list excessPacketDelayThresholds {

description "Excess packet delay thresholds info for M6 UL measurement.";

min-elements 1;

key idx;

leaf idx { type string; }

uses ExcessPacketDelayThresholdsGrp;

}

}

grouping TraceSubtree {

description "Contains classes that manage Tracing.

Should be used in all classes (or classes inheriting from)

- SubNnetwork

- ManagedElement

- ManagedFunction

If a YANG module wants to augment these classes/list/groupings they must

augment all user classes!";

list TraceJob {

description "A TraceJob instance represents the Trace Control and

Configuration parameters of a particular Trace Job (see TS 32.421 and

TS 32.422 for details). It can be name-contained by SubNetwork,

ManagedElement, ManagedFunction.

To activate Trace Jobs, a MnS consumer has to create TraceJob object

instances on the MnS producer. A MnS consumer can activate a Trace Job

for another MnS consumer since it is not required the value of

traceCollectionEntityIPAddress or traceReportingConsumerUri to be

his own.

For the details of Trace Job activation see clauses 4.1.1.1.2 and

4.1.2.1.2 of TS 32.422.

When a MnS consumer wishes to deactivate a Trace Job, the MnS consumer

shall delete the corresponding TraceJob instance.

For details of management Trace Job activation/deactivation see clause

4.1.1.1.2 of TS 32.422.

The attribute traceReference specifies a globally unique ID and

identifies a Trace session. One Trace Session may be activated to

multiple Network Elements. The traceReference is populated by the

consumer that makes the request for a Trace Session.

The jobId attribute presents the job identifier of a TraceJob instance.

The jobId can be used to associate multiple TraceJob instances.

For example, it is possible to configure the same jobId value for

multiple TraceJob instances required to produce the data (e.g. RSRP

values of M1 and RLF reports) for a specific network analysis.

The attribute traceReportingFormat defines the method for reporting

the produced measurements. The selectable options are file-based or

stream-based reporting. In case of file-based reporting the attribute

traceCollectionEntityIPAddress is used to specify the IP address to

which the trace records shall be transferred, while in case of

stream-based reporting the attribute traceReportingConsumerUri

specifies the streaming target.

The mandatory attribute traceTarget determines the target object of

the TraceJob. Dependent on the network element to which the Trace

Session is activated different types of the target object are possible.

The attribute pLMNTarget defines the PLMN for which sessions shall be

selected in the Trace Session in case of management based activation

when several PLMNs are supported in the RAN.

The attribute jobType specifies the kind of data to collect. Dependent

on the selected type various parameters shall be available. The

attributes jobType, traceReference,

traceCollectionEntityIPAddress, traceTarget and traceReportingFormat

are mandatory for all job types. If streaming reporting is selected

for traceReportingFormat, traceReportingConsumerUri shall be present

additionally. The attribute pLMNTarget shall be present if trace

activation method is management based.

For the different job types the attributes are differentiated as follows:

- In case of TRACE\_ONLY additionally the following attributes shall be

available: listOfNETypes, traceDepth, and triggeringEvents.

For this case the optional attribute listOfInterfaces allows to specify

the interfaces to be recorded.

- In case of IMMEDIATE\_MDT\_ONLY additionally the following attributes

shall be available:

- anonymizationOfMDTData,

- listOfMeasurements,

- collectionPeriodRRMUMTS (conditional for M4 and M5 in UMTS),

- measurementPeriodUMTS (conditional for M6 and M7 in UMTS),

- collectionPeriodRRMLTE (conditional for M3 in LTE),

- measurementPeriodLTE (conditional for M4 and M5 in LTE),

- collectionPeriodM6LTE (conditional for M6 in LTE),

- collectionPeriodM7LTE (conditional for M7 in LTE),

- collectionPeriodRRMNR (conditional for M4 and M5 in NR),

- collectionPeriodM6NR (conditional for M6 in NR),

- collectionPeriodM7NR (conditional for M7 in NR),

- beamLevelMeasurement (conditional for M1 in NR),

- reportInterval (conditional for M1 in LTE or NR and M1/M2 in UMTS),

- reportAmount (conditional for M1 in LTE or NR and M1/M2 in UMTS),

- reportingTrigger (conditional for M1 in LTE or NR and M1/M2 in UMTS),

- eventThreshold (conditional for A2 event reporting or A2 event

triggered periodic reporting),

- measurementQuantity (conditional for 1F event reporting).

- excessPacketDelayThresholds (conditional for M6 UL measurement in NR).

For this case the optional attribute areaScope allows to specify the

area in terms of cells or Tracking Area/Routing Area/Location area where

the MDT data collection shall take place and the optional attributes

positioningMethod, sensorInformation allow to specify the positioning

methods to use or the sensor information to include.

- In case of IMMEDIATE\_MDT\_AND\_TRACE both additional attributes of

TRACE\_ONLY and IMMEDIATE\_MDT\_ONLY shall apply.

- In case of LOGGED\_MDT\_ONLY additionally the following attributes shall

be available: anonymizationOfMDTData, traceCollectionEntityId,

loggingInterval, loggingDuration, reportType,

eventListForEventTriggeredMeasurements.

For this case the optional attribute areaScope allows to specify the

area in terms of cells or Tracking Area/Routing Area/Location area

where the MDT data collection shall take place, the optional attribute

pLMNList allows to specify the PLMNs where measurement collection,

status indication and log reporting is allowed, the optional attribute

areaConfigurationForNeighCell allows to specify the area for which UE

is requested to perform measurements logging for neighbour cells which

have list of frequencies and the optional attribute sensorInformation

allows to specify the sensor information to include.

- In case of RLF\_REPORT\_ONLY and RCEF\_REPORT\_ONLY the optional attribute

areaScope allows to specify the eNB or list of eNBs or gNB or list of

gNBs where the reports should be collected.

- In case of LOGGED\_MBSFN\_MDT additionally the following attributes

shall be available: anonymizationOfMDTData, loggingInterval,

loggingDuration, mBSFNAreaList.

Reporting of measurements and messages can be periodical, event

triggered or event triggered periodic depending on the selected

job type.

- For trace the reporting is event based, where the triggering event

is configured with attribute triggeringEvents. For each triggering

event the first and last message (start/stop triggering event) to

record are specified.

- For immediate MDT, the reporting is dependent on the configured

measurements:

- For measurement M1 in LTE or NR, it is possible to select between

periodical, event triggered, event triggered periodic reporting or

reporting according to all configured RRM event triggers. For M1 and

M2 measurement in UMTS, it is possible to select between periodical,

event triggered reporting or reporting according to all configured RRM

event triggers. Parameter reportingTrigger determines which of the

reporting methods is selected and in case of event triggered or

event-triggered periodic, which is the decisive event type. For

periodical reporting, parameters reportInterval and reportAmount

determine the interval between two successive reports and the number

of reports. This means the periodical reporting terminates after

reportAmount reports have been sent as long as reportAmount is

configured with a value different from infinity. For event-triggered

periodic reporting, these two parameters apply in addition to parameter

eventThreshold which determines the threshold of the event. In this

case up to reportAmount reports are sent with a periodicity of

reportInterval after the entering condition is fulfilled. The

reporting is stopped, if the leaving condition is fulfulled and is

restarted if the configured event reoccurs. For event based reporting,

there is only one report sent after the event occurs. The parameters

to configure are reportingTrigger and eventThreshold. In case of UMTS

and 1f event reporting, additionally parameter measurementQuantity is

necessary in order to determine for which measurement(s) the event

threshold is applicable.

Parameter beamLevelMeasurement determines whether beam level

measurements shall be included in case of NR.

- For measurement M2 in LTE or NR, reporting is according to

RRM configuration, see TS 38.321, TS 36.321 and TS 38.331, TS 36.331.

For measurement M4 in UMTS, reporting is either according to RRM

configuration, see TS 25.321 and TS 25.331 or periodic or event

triggered periodic using parameter collectionPeriodRRMUMTS and

eventThresholdUphUMTS.

- For measurement M3 in UMTS, the reporting is done upon availability,

see TS 37.320.

- For measurements M4, M5, M6 and M7 in NR, for measurements

M3, M4, M5, M6 and M7 in LTE and for measurements M5, M6 and M7 in

UMTS periodical reporting is applied. The configurable parameter is

the interval between two measurements (collectionPeriodRRMNR,

collectionPeriodM6NR, collectionPeriodM7NR, collectionPeriodRRMLTE,

measurementPeriodLTE, collectionPeriodM6LTE, collectionPeriodM7LTE,

collectionPeriodRRMUMTS, measurementPeriodUMTS). If no collection

period is configured for M5 in UMTS, all available measurements are

logged according to RRM configuration.

- For logged MDT in UMTS and LTE, the reporting is periodical.

Parameter loggingInterval determines the interval between the reports

and parameter loggingDuration determines how long the configuration is

valid meaning after this duration has passed no further reports are

sent. In NR, the reporting can be periodical or event based,

determined by parameter reportType. For periodical reporting the same

parameters as in LTE and UMTS apply. For event based reporting,

parameter eventListForEventTriggeredMeasurement configures the event

type, namely 'out of coverage' or 'L1 event'. In case 'L1 event' is

selected as event type, the logging is performed according to

parameter loggingInterval at regular intervals only when the

conditions indicated by eventThresholdL1, hysteresisL1, timeToTriggerL1

(defining the thresholds, hysteresis and time to trigger) are met and

if UE is 'camped normally' state (TS 38.331, TS 38.304). In case

'out of coverage' is selected as event type, the logging is performed

according to parameter loggingInterval at regular intervals only when

the UE is in 'any cell selection' state. Furthermore, logging is

performed immediately upon transition from the 'any cell selection'

state to the 'camped normally' state ( TS 38.331, TS 38.304 ).

Creation and deletion of TraceJob instances by MnS consumers is

optional; when not supported, the TraceJob instances may be created

and deleted by the system or be pre-installed.";

key id;

uses top3gpp:Top\_Grp ;

container attributes {

uses TraceJobGrp ;

}

uses files3gpp:FilesSubtree {

if-feature FilesUnderTraceJob;

} }

}

}

<CODE ENDS>

## D.2.11 module \_3gpp-common-mnsregistry.yang

<CODE BEGINS>

module \_3gpp-common-mnsregistry {

yang-version 1.1;

namespace "urn:3gpp:sa5:\_3gpp-common-mnsregistry";

prefix "mnsregist3gpp";

import \_3gpp-common-subnetwork { prefix subnet3gpp; }

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-yang-types { prefix types3gpp; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Defines the YANG mapping of the MNSRegistry Information Object

Class (IOC) that is part of the Generic Network Resource Model (NRM).";

reference "3GPP TS 28.623 Generic Network Resource Model (NRM)";

revision 2023-02-14 { reference CR-0234; }

revision 2021-11-23 { reference "S5-216090"; }

revision 2021-10-18 { reference "S5-215263"; }

revision 2021-08-29 { reference "Initial revision, S5-214388"; }

grouping MnsInfoGrp {

description "Represents the MnsInfo IOC.";

leaf mnsLabel {

description "Human-readable name of management service.";

mandatory true;

type string;

}

leaf mnsType {

description "Type of management service.";

type enumeration {

enum ProvMnS;

enum FaultSupervisionMnS;

enum StreamingDataReportingMnS;

enum FileDataReportingMnS;

}

}

leaf mnsVersion {

description "Version of management service.";

type string;

}

leaf mnsAddress {

description "Addressing information for Management Service operations.";

mandatory true;

type string;

}

leaf-list mnsScope {

description "List of the managed object instances that can be accessed

using the MnS. If a complete SubNetwork can be accessed using the MnS,

this attribute may contain the DN of the SubNetwork instead of the

DNs of the individual managed entities within the SubNetwork.";

min-elements 1;

type types3gpp:DistinguishedName;

}

}

grouping MnsRegistryGrp {

description "Currently no own attributes defined.";

}

augment "/subnet3gpp:SubNetwork" {

list MnsRegistry {

description "This IOC is a container for MnsInfo IOC-s. It can be

contained only by SubNetwork IOC. A SubNetwork IOC can contain

only one instance of MnsRegistry.

The IOC is instantiated by the system.";

key id;

max-elements 1;

uses top3gpp:Top\_Grp;

container attributes {

uses MnsRegistryGrp;

}

list MnsInfo {

description "This IOC represents an available Management Service (MnS)

and provides the data required to support its discovery.

It is name-contained by MnsRegistry.

This information is used by the consumer to discover the producers

of specific Management Services and to derive the addresses of the

Management Service.

Attributes mnsLabel, mnsType, and mnsVersion are used to describe

the Management Service.

Attribute mnsAddress is used to provide addressing information for

the Management Service operations.

Attribute mnsScope is used to provide information about the

management scope of the Management Service. The management scope is

defined as the set of managed object instances that can be accessed

using the Management Service.";

key id;

uses top3gpp:Top\_Grp;

container attributes {

uses MnsInfoGrp;

}

}

}

}

}

<CODE ENDS>

## D.2.12 Void

## D.2.13 module \_3gpp-common-filemanagement.yang

<CODE BEGINS>

module \_3gpp-common-filemanagement {

yang-version 1.1;

namespace "urn:3gpp:sa5:\_3gpp-common-filemanagement";

prefix "filemgmt3gpp";

import \_3gpp-common-subnetwork { prefix subnet3gpp; }

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-yang-types { prefix types3gpp; }

import \_3gpp-common-yang-extensions { prefix yext3gpp; }

import \_3gpp-common-managed-element { prefix me3gpp; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Defines the YANG mapping of the FileDownloadJob Information Object

Class (IOC) that is part of the Generic Network Resource Model (NRM).";

reference "3GPP TS 28.623 Generic Network Resource Model (NRM)";

revision 2023-02-14 { reference CR-0234; }

revision 2022-10-24 { reference CR-0196; }

revision 2022-02-10 { reference "Initial revision, S5-221757"; }

grouping FileDownloadProcessMonitor {

description "Provides specialisations of the ProcessMonitor datatype.";

uses types3gpp:ProcessMonitorGrp {

refine resultStateInfo {

description "If status is FAILED resultStateInfo will be one of

the following or empty.";

must '../status != "FAILED"

or . = "UNKNOWN"

or . = "NO\_STORAGE"

or . = "LOW\_MEMORY"

or . = "NO\_CONNECTION\_TO\_REMOTE\_SERVER"

or . = "FILE\_NOT\_AVAILABLE"

or . = "DNS\_CANNOT\_BE\_RESOLVED"

or . = "TIMER\_EXPIRED"

or . = "OTHER"

or . = "NULL" ';

}

refine status {

description "Status must not be 'PARTIALLY\_FAILED'.";

must '. != "PARTIALLY\_FAILED" ';

}

}

}

grouping FileDownloadJobGrp {

description "Represents the FileDownloadJob IOC.";

reference "3GPP TS 28.622";

uses top3gpp:Top\_Grp;

leaf fileLocation {

description "Provides the location of a file.

allowedValues: File URI (See RFC 8089)";

mandatory true;

type string;

yext3gpp:notNotifyable;

}

leaf notificationRecipientAddress {

description "Address of the notification recipient.";

type string;

yext3gpp:notNotifyable;

}

leaf cancelJob {

description "Setting this attribute to TRUE cancels the file download job.

As specified in the definition of ProcessMonitor, cancellation is

possible in the NOT\_STARTED and RUNNING state. Setting the attribute

to FALSE has no observable result.";

type boolean;

mandatory true;

}

list jobMonitor {

key "id";

description "Provides monitoring for the file download job.";

uses FileDownloadProcessMonitor;

}

}

grouping FileDownloadJobSubtree {

description "Helps augmenting FileDownloadJob into multiple places.";

list FileDownloadJob {

description "Specifies the FileDownloadJob IOC, see 3GPP TS 28.622.";

key "id";

uses top3gpp:Top\_Grp;

container attributes {

uses FileDownloadJobGrp;

}

}

}

augment "/subnet3gpp:SubNetwork" {

uses FileDownloadJobSubtree;

}

augment "/me3gpp:ManagedElement" {

uses FileDownloadJobSubtree;

}

}

<CODE ENDS>

## D.2.14 module \_3gpp-common-qmcjob.yang

<CODE BEGINS>

module \_3gpp-common-qmcjob {

yang-version 1.1;

namespace "urn:3gpp:sa5:\_3gpp-common-qmcjob";

prefix "qmc3gpp";

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-subnetwork { prefix subnet3gpp; }

import \_3gpp-common-yang-types { prefix types3gpp; }

import \_3gpp-5g-common-yang-types { prefix types5g3gpp; }

import \_3gpp-common-managed-element { prefix me3gpp; }

import \_3gpp-common-trace { prefix trace3gpp; }

import ietf-inet-types { prefix inet; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Quality of Experience Measurement Collection Job handling";

reference "3GPP TS 28.623

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)";

revision 2023-02-14 { reference "CR-0234"; }

revision 2022-11-04 { reference "CR-0215"; }

revision 2022-08-17 { reference "CR-0185"; }

revision 2022-04-29 { reference "CR-0171"; }

revision 2022-03-22 { reference "draftCR"; }

revision 2022-01-06 { reference "CR-0142"; }

grouping QMCJobGrp {

leaf serviceType {

description "Specifies an end user service type for QoE measurements.";

mandatory true;

type enumeration {

enum DASH;

enum MTSI;

enum VR;

}

}

list areaScope {

key "idx";

leaf idx { type uint32 ; }

description "It specifies the area where data shall be collected.

List of eNB/list of gNB/eNB/gNB for RLF or RCEF.

List of cells or Tracking Area for QMC.

Cell, TA, LA, RA are mutually exclusive.";

reference "Clause 5.10.2 of 3GPP TS 32.422";

uses trace3gpp:AreaScopeGrp;

}

leaf qoECollectionEntityAddress {

type inet:ip-address;

mandatory true;

description "Specifies the address to which the QMC records shall be

transferred. Ipv4 or Ipv6 address(es) may be used.";

}

list pLMNTarget {

max-elements 1;

description "Defines the PLMN for which sessions shall be selected in

the network request session in case of area based QMC when several

PLMNs are supported in the RAN (this means that shared cells and not

shared cells are allowed for the specified PLMN. Furthermore, several

PLMNs can be used for not shared RAN cases as well as for shared RAN

cases.). Only the sessions may be selected where the PLMN that the

UE reports as selected PLMN is the same as the PLMN Target.";

uses types3gpp:PLMNId;

key "mcc mnc";

}

leaf qoETarget {

type string;

description "Specifies the target object of the QMC in case of

signalling based QMC. The qoETarget attribute shall be able

to carry IMSI or SUPI.";

mandatory true;

}

leaf qoEReference {

type string;

mandatory true;

description "Identifies the QoE measurement collection job in the

Managed Elements and in the measurement collection entity. The QoE

reference shall be globally unique therefore it is composed as follows:

MCC+MNC+QMC ID, where the MCC and MNC are coming with the QMC

activation request from the management system to identify one PLMN

containing the management system, and QMC ID is a 3 byte Octet String.

The QMC ID is generated by the management system or the operator.";

}

leaf jobId {

type string;

description "The jobId attribute presents the job identifier of a

QMCJob instance. The jobId can be used to associate multiple QMCJob

instances. For example, it is possible to configure the same jobId

for multiple QMCJob instances required to produce the data

(e.g. Streaming services and MTSI reports) for a specific network

analysis.";

}

list sliceScope {

description "Contains a list of S-NSSAIs (Single Network Slice Selection

Assistance Information). A Network Slice end to end is identified by

S-NSSAI.";

key "sd sst";

uses types5g3gpp:SNssai;

}

leaf qMCConfigFile {

type string;

description "Provides a reference to a file including the parameters for

configuration of application layer measurements, known as Container

for Application Layer Measurement Configuration.";

mandatory true;

}

list mDTAlignmentInformation {

key "idx";

min-elements 1;

max-elements 1;

description "This parameter indicates the MDT measurements with which

alignment of QoE measurement is required. This parameter is optional

and is valid for NR only.";

leaf idx { type uint32 ; }

uses trace3gpp:TraceReferenceGrp ;

}

leaf-list availableRANqoEMetrics {

type enumeration {

enum appLayerBufferLevelList;

enum playoutDelayForMedia;

enum Startup;

}

max-elements 2;

description "This parameter indicates available RAN visible QoE metrics

to the gNB. This parameter is optional and is valid for NR only.";

}

}

grouping QMCJobSubTree {

description "Helps with augmenting QMCJob into multple places.";

list QMCJob {

description "The QoE Measurement Collection provides capability for

collecting QoE information from:

- UEs which are in the specified area in case of Management Based

Activation or

- an individual UE in case of Signalling Based Activation.

The QoE Measurement Collection enables collection of application layer

measurements from the UE for specified end user service type.

The supported service types are:

- Streaming services, see TS 26.247

- MTSI services, see TS 26.114

- VR services, see TS 26.118

A QMCJob instance represents the job for collecting QoE measurements

according to the job parameters. For details of the QoE measurement

collection configuration parameters see clause 5 of TS 28.405.

QMCJob instance can be name-contained by SubNetwork or ManagedElement.

A QMC Job is activated by creating a QMCJob object instance in the

producer. For details of Management Based Activation of QoE Measurement

Collection see clause 4.5 and for details of Signalling Based

Activation of QoE Measurement Collection see clause 4.6 of TS 28.405.

The attributes areaScope and pLMNTarget are only relevant when

Management Based Activation is used and the attribute qoETarget is

only relevant when Signalling Based Activation is used. All other

attributes are common for both Management Based Activation and

Signalling Based Activation.

When a MnS consumer wishes to deactivate a QMC Job, the MnS consumer

shall delete the corresponding QMCJob instance.

NOTE: If the reporting is ongoing, when a request to delete a QMCJob

is received, the reporting does not end. The QMCJob instance is deleted,

when the last reporting for the QMC Job expires.

The jobId attribute presents the job identifier of a QMCJob instance.

jobId can be used to associate multiple QMCJob instances. For example,

it is possible to configure the same jobId value for multiple QMCJob

instances required to produce the data (e.g. Streaming services and

MTSI reports) for a specific network analysis.

The QoE Measurement Collection provides capability for collecting QoE

information from:

- UEs which are in the specified area in case of Management Based

Activation or

- an individual UE in case of Signalling Based Activation.

The QoE Measurement Collection enables collection of application layer

from the UE for specified end user service type. The supported service

types are:

- Streaming services, see TS 26.247.

- MTSI services, see TS 26.114.

- VR services, see TS 26.118.

A QMCJob instance represents the job for collecting QoE measurements

according to the job parameters. For details of the QoE measurement

collection configuration parameters see clause 5 of TS 28.405. A QMCJob

instance can be name-contained by SubNetwork or ManagedElement.

A QMC Job is activated by creating a QMCJob object instance in the

MnS producer. For details of Management Based Activation of QoE

Measurement Collection see clause 4.5 and for details of Signalling

Based Activation of QoE Measurement Collection see

clause 4.6 of TS 28.405. The attributes areaScope and pLMNTarget are

only relevant when Management Based Activation is used and the

attribute qoETarget is only relevant when Signalling Based Activation

is used. All other attributes are common for both Management Based

Activation and Signalling Based Activation.

When a MnS consumer wishes to deactivate a QMC Job, the MnS consumer

shall delete the corresponding QMCJob instance.

NOTE: If the reporting is ongoing, when a request to delete a QMCJob

instance is received, the reporting does not end. The QMCJob instance

is deleted, when the last reporting for the QMC Job expires.

The jobId attribute presents the job identifier of a QMCJob instance.

The jobId can be used to associate multiple QMCJob instances.

example, it is possible to configure the same jobId value for multiple

QMCJob instances required to produce the data (e.g. Streaming services

and MTSI reports) for a specific network analysis.";

key id;

uses top3gpp:Top\_Grp;

container attributes {

uses QMCJobGrp;

}

}

}

augment "/subnet3gpp:SubNetwork" {

uses QMCJobSubTree;

}

augment "/me3gpp:ManagedElement" {

uses QMCJobSubTree;

}

}

<CODE ENDS>

## D.2.15 module \_3gpp-common-files.yang

<CODE BEGINS>

module \_3gpp-common-files {

yang-version 1.1;

namespace "urn:3gpp:sa5:\_3gpp-common-files";

prefix "files3gpp";

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-yang-types { prefix types3gpp; }

import \_3gpp-common-yang-extensions { prefix yext3gpp; }

import ietf-yang-types { prefix yang; }

import ietf-inet-types { prefix inet; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Defines the YANG mapping of File retrieval NRM fragment

including the IOCs File and Files.";

reference "3GPP TS 28.623

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)";

revision 2022-09-28 { reference CR-0191; }

grouping FileGrp {

description "Represents the File IOC.";

leaf fileLocation {

type inet:uri ;

mandatory true;

yext3gpp:notNotifyable ;

description "Location of the file incl. the file transfer protocol,

and the file name for the case the file content cannot be retrieved

by reading the 'fileContent' attribute.

The allowed file transfer protocols are:

- sftp

- ftpes

- https

Examples:

'sftp://companyA.com/datastore/fileName.xml',

'https://companyA.com/ManagedElement=1/Files=1/File=1'

";

}

leaf fileCompression {

type string ;

mandatory true;

yext3gpp:notNotifyable ;

description "Name of the algorithm used for compressing the file.

An empty or absent 'fileCompression' parameter indicates the file is

not compressed. The MnS producer selects the compression algorithm.

It is encouraged to use popular algorithms such as GZIP.";

}

leaf fileSize {

type uint64 ;

mandatory true;

units bytes;

yext3gpp:notNotifyable ;

description "Size of the file";

}

leaf fileDataType {

type enumeration {

enum PERFORMANCE {

description "The value 'PERFORMANCE' refers to measurements and KPIs";

}

enum TRACE;

enum ANALYTICS;

enum PROPRIETARY;

}

mandatory true;

yext3gpp:notNotifyable ;

description "Type of the management data stored in the file.";

}

leaf fileFormat {

type string ;

mandatory true;

yext3gpp:notNotifyable ;

description "Identifier of the XML or ASN.1 schema (incl. its version)

used to produce the file content.";

}

leaf fileReadyTime {

type yang:date-and-time ;

mandatory true;

yext3gpp:notNotifyable ;

description "Date and time, when the file was closed (the last time)

and made available on the MnS producer.

The file content will not be changed anymore.";

}

leaf fileExpirationTime {

type yang:date-and-time ;

mandatory true;

yext3gpp:notNotifyable ;

description "Date and time after which the file may be deleted.";

}

leaf fileContent {

type string ; // String is very restrictive

mandatory true;

yext3gpp:notNotifyable ;

description "File content";

}

leaf-list jobRef {

type types3gpp:DistinguishedName ;

yext3gpp:notNotifyable ;

description "Object instance of the 'PerfMetricJob' or 'TraceJob'

that produced the file.";

}

leaf jobId {

type string ;

yext3gpp:notNotifyable ;

description "Identifier of a PerfMetricJob job or a TraceJob.";

}

}

grouping FilesGrp {

description "Represents the Files IOC.";

leaf numberOfFiles {

type uint64 ;

yext3gpp:notNotifyable ;

description "Number of files in a file collection.";

}

leaf-list jobRef {

type types3gpp:DistinguishedName ;

yext3gpp:notNotifyable ;

description "Object instance of the 'PerfMetricJob' or 'TraceJob'

that produced the file.";

}

leaf jobId {

type string ;

yext3gpp:notNotifyable ;

description "Identifier of a PerfMetricJob job or a TraceJob.";

}

}

grouping FilesSubtree {

description "Contains classes of the File retrieval NRM fragment.

Should be used in classes (or classes inheriting from)

- SubNnetwork

- ManagedElement

- PerfMetricJob

- TraceJob

If a YANG module wants to augment these classes/list/groupings they must

augment all user classes!";

list Files {

description "This IOC represents a collection of files. It can be

name-contained by 'SubNetwork', 'ManagedElement', 'PerfMetricJob' or

'TraceJob'. The 'Files' object name-contains 'File' objects, that

represent the files of the collection. File collections allow to

structure related files under a common root.

Instances of 'Files' are created by MnS producers. They shall be

created at latest when the first file of the collection becomes

available for retrieval by MnS consumers.

The attributes of 'Files' represent properties of the file collection

and not properties of individual files.

When the file retrieval NRM fragment is used together with a data

collection job ('PerfMetricJob' or 'TraceJob') the following

provisions shall apply:

- The 'Files' object shall be created at the same time as the object

representing the data collection job.

- The attributes 'jobRef' and 'jobId' shall be supported and present

in a 'Files' instance. They shall identify the job that the files in

the file collection relate to.

- A 'Files' instance shall contain files related to one and only one

job.

- The files produced by one job shall be contained in one and only

one 'Files' instance.

- The job object shall support an attribute with a link to the

created 'Files' instance ('\_linkToFiles').

- The attribute '\_linkToFiles' shall be returned in the job creation

response, if the stage 3 protocol supports returning attributes in an

object creation response.

- The MnS producer decides where to name-contain the 'Files' instance

related to a job.

The attribute '\_linkToFiles' allows a MnS consumer to create simple

and targeted subscriptions for 'notifyFileReady',

'notifyFilePreparationError' and 'notifyFileDeletion', or

'notifyMOICreation', 'notifyMOIChanges', 'notifyFilePreparationError'

and 'notifyFileDeletion' related to 'File' instances created or deleted

under the 'Files' instance of a specific job. The subscription needs

to scope simply objects one level below the 'Files' object.

In addition, the attribute '\_linkToFiles' allows for simple

deployments not relying on notifications for reporting the

availability of new files, where the MnS consumer polls regularly

for new files under 'Files'.";

key id;

config false;

uses top3gpp:Top\_Grp ;

container attributes {

uses FilesGrp ;

}

list File {

description "Represents a file. It is name-contained by 'Files'.

When a file becomes available on a MnS producer for retrieval by a

MnS consumer, the MnS producer shall create a 'File' instance

representing that file.

The time of creation shall be captured by the MnS producer in the

'fileReadyTime' attribute. The MnS producer shall keep the file at

least until the time specified by 'fileExpirationTime'. After that

time the MnS producer may delete the 'File' instance.

The 'fileExpirationTime' is determined by the MnS producer based on

considerations such as available storage space or file retention

policies.

The attributes 'fileSize', 'fileCompression', 'fileDataType' and

'fileFormat' describe the file properties.

The 'fileLocation' attribute indicates the address where the file can

be retrieved. The address includes the file transfer protocol (schema).

Allowed file transfer protocols are 'sftp', 'ftpes' and 'https'.

The value of 'fileLocation' can be identical to or different from the

address of the 'File' instance. The attribute 'fileContent' is

provided for retrieving the actual file content. When identifying in

the Read request a 'File' instance and specifying only the

'fileContent' attribute be returned, then only the file content shall

be returned in the response. Note, as usual, multiple attributes can

be specified to be returned, so that the file content together with

some or all file meta data attributes can be returned in response to

a single request.

In case the 'fileLocation' specifies a location different than the

'File' object location, then the attribute 'fileContent' cannot be

used for retrieving the file content. For example, the 'File' object

location may be given by

'https://companyA.com/ManagedElement=1/Files=1/File=1'

and the value of the 'fileLocation' attribute by

'sftp://companyA.com/datastore/fileName.xml'

In this case the file needs to be retrieved using 'sftp' from

'sftp://companyA.com/datastore/fileName.xml'. Attempts to read the

'fileContent' attribute shall return an error.

When the file retrieval NRM fragment is used together with a data

collection job ('PerfMetricJob' or 'TraceJob') the following

provisions shall apply:

- The attributes 'jobRef' and 'jobId' shall be supported and

present. They shall identify the job that the file is related to.

The attributes 'jobRef' and 'jobId' allow to set notification filters

in the subscription in such a way that only 'notifyMOICreation',

notifyMOIChanges and

'notifyMOIDeletion' notifications are sent to subscribed MnS consumers

if the created or deleted 'File' instance represents data related to

jobs the subscribed MnS consumer created or is interested in.

Upon creation of a 'File' instance, a notification of type

'notifyMOICreation' or 'notifyMOIChanges' shall be emitted to

subscribed MnS consumers as

usual. For the case that the file contains performance metric data

('fileDataType' is 'PERFORMANCE') the MnS producer shall emit either

a notification of type 'notifyMOICreation', 'notifyMOICreation' or

of type

'notifyFileReady'. The MnS consumer selects the notification type he

wishes to receive with the subscription created on the MnS producer.

The 'objectClass' and 'objectInstance' parameters in the notification

header of 'notifyFileReady' shall identify the new 'File' instance,

instead of the related 'PerfMetricJob', 'TraceJob', 'ManagedElement'

or 'ManagementNode'as described in 3GPP TS 28.532,

clause 11.6.1.1.1 for the case that 'notifyFileReady' is used as

part of the file data reporting MnS.

The notification 'notifyFilePreparationError' shall be supported as

well by the 'File' object. It shall be sent when an error occurs

during the preparation of the file. No 'notifyFileReady' or

'notifMOICreation shall be sent in that case. The 'objectClass'

and 'objectInstance' parameters of the notification header shall

identify the new 'File' instance representing the corrupted file,

instead of the related 'PerfMetricJob', 'TraceJob', 'ManagedElement'

or 'ManagementNode'as described in 3GPP TS 28.532, clause 11.6.1.1.1

for the case that 'notifyFilePreparationError' is used as part of

the file data reporting MnS. When the file is not created at all or

deleted, the 'objectClass' and 'objectInstance' parameters of the

notification header are populated as described in 3GPP TS 28.532,

clause 11.6.1.1.1. Note that to receive 'notifyFilePreparationError'

in that case the notification subscription needs to include these

objects in its scope.";

key id;

uses top3gpp:Top\_Grp ;

container attributes {

uses FileGrp ;

}

}

}

}

}

<CODE ENDS>

## D.2.16 module \_3gpp-common-managementdatacollection.yang

<CODE BEGINS>

module \_3gpp-common-managementdatacollection {

yang-version 1.1;

namespace "urn:3gpp:sa5:\_3gpp-common-managementdatacollection";

prefix "mgtdatcol3gpp";

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-yang-types {prefix types3gpp; }

import \_3gpp-common-yang-extensions {prefix yext3gpp; }

//import ietf-inet-types { prefix inet; }

import ietf-yang-types { prefix yang; }

import \_3gpp-common-subnetwork { prefix subnet3gpp; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Handling management data collection";

reference "3GPP TS 28.623

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)";

revision 2023-02-14 { reference "CR-0234"; }

revision 2022-11-04 { reference "CR-0194"; }

grouping GeoCoordinateGrp {

description "Geographical location on earth";

leaf latitude {

type decimal64 {

fraction-digits 4;

range -90..90 ;

}

mandatory true;

description "Latitude based on World Geodetic System (1984 version)

global reference frame (WGS 84). Positive values correspond to the

northern hemisphere.";

}

leaf longitude {

type decimal64 {

fraction-digits 4;

range -180..180 ;

}

mandatory true;

description "Longitude based on World Geodetic System (1984 version)

global reference frame (WGS 84). Positive values correspond to

degrees east of 0 degrees longitude.";

}

}

grouping GeoAreaGrp {

description "This data type defines a geographical area.

The geo-area is defined using a convex polygon in the attribute

'convexGeoPolygon'.";

list convexGeoPolygon {

description "Specifies the geographical area with a convex polygon.

The convex polygon is specified by its corners.";

key "latitude longitude";

min-elements 3;

ordered-by user;

uses GeoCoordinateGrp;

}

}

grouping GeoAreaToCellMappingGrp {

description "Represents the GeoAreaToCellMapping data type.

The mapping of the geographical area to cells is performed at

instantiation of the IOC.";

list geoArea {

description "It specifies the geographical area using the cordinates of

the corners of a convex polygon.";

key idx;

max-elements 1;

leaf idx {

type string;

}

uses GeoAreaGrp;

}

leaf associationThreshold {

type uint8 {

range 1..100;

}

yext3gpp:inVariant;

description "It specifies the threshold of coverage area in

percentage whether a cell belongs to the geographical area or not.

If this attribute is absent, the location of the base station

antenna determines whether a cell belongs to the geographical

area or not.";

}

}

grouping AreaOfInterestGrp {

description "It specifies a location(s) from where the management data

shall be collected.";

list geoAreaToCellMapping {

description "Contains a geographical area and an association threshold.

The geo-area is defined as a convex polygon using the attribute

'geoArea'.

The MnS producer shall map the geographical area to cells. There are

two evaluation criteria whether a cell belongs to a geographical area

or not. If attribute 'associationThreshold' is absent, the location

of the base station antenna determines the belonging. If attribute

'associationThreshold' is configured, the coverage area is considered.

The attribute 'associationThreshold' determines the lower boundary of

the coverage ratio. For example, if the 'associationThreshold' is

configured to 60%, a cell shall be considered as included in the

geographical area if at least 60% of the coverage area of that

cell overlaps with the specified geographical area.

The mapping of the geographical area to cells is performed at

instantiation of the IOC.";

key idx;

leaf idx { type string; }

uses GeoAreaToCellMappingGrp;

}

list taiList {

description "Tracking Area Identity list";

key idx;

min-elements 1;

max-elements 8;

leaf idx { type string; }

uses types3gpp:TaiGrp;

}

leaf-list nrCellIdList {

type string;

description "List of NR cells identified by NG-RAN CGI";

}

leaf-list eutraCellIdList {

type string;

description "List of E-UTRAN cells identified by E-UTRAN-CGI";

}

leaf-list utraCellIdList {

type string;

description "List of UTRAN cells identified by UTRAN CGI";

}

}

grouping NodeFilterGrp {

list areaOfInterest {

key idx;

leaf idx {

type string;

}

uses AreaOfInterestGrp;

description "It specifies a location(s) from where the management data

shall be collected. It is defined in terms of TAI(s).";

}

leaf networkDomain {

type enumeration {

enum CN;

enum RAN;

}

// mandatory false

description "It specifies the network domain of the target node. This

will also result in collecting appropriate management data from the

nodes belonging to the specified domain.";

}

leaf cpUpType {

type enumeration {

enum CP;

enum UP;

}

// mandatory false

description "It specifies the traffic type of the target node. This will

also result in collecting appropriate management data from the nodes

handling the specified traffic (e.g AMF for CP and UPF for UP).";

}

leaf sst {

type uint8; // TS 28.003 clause 28.4.

description "It specifies the slice service type (SST) of which the slice

subnet should be targeted. Please refer to 3GPP TS 23.501: 'System

Architecture for the 5G System'";

}

}

typedef mgtDataCategoryType {

type enumeration {

enum COVERAGE;

enum CAPACITY;

enum ENERGY\_EFFICIENCY;

enum MOBILITY;

enum ACCESSIBILITY;

}

description "";

}

grouping TimeWindowGrp {

leaf startTime {

type yang:date-and-time;

}

leaf endTime {

type yang:date-and-time;

}

}

grouping ManagementDataCollectionGrp {

choice managementData {

case mgtDataCategory {

leaf-list category {

type mgtDataCategoryType;

min-elements 1;

max-elements 5; // The ENUM contains 5 possible values

description "This attributes defines the type of management data that

are requested.

Allowed values for data category are COVERAGE, CAPACITY,

ENERGY\_EFFICIENCY, MOBILITY, ACCESSIBILITY. The data categories

will map to certain measurement families defined in TS 28.552, see

below. In addition to the below mappings, MnS producer may map the

provided categories to any additional proprietary management data,

as appropriate.

- The COVERAGE category will map to measurement families of MR

(measurements related to Measurement Report) and L1M (measurements

related to Layer 1 Measurement).

- The CAPACITY category will map to measurement family RRU

(measurements related to Radio Resource Utilization).

- The ENERGY\_EFFICIENCY category will map to measurement family PEE

(measurements related to Power, Energy and Environment).

- The MOBILITY category will map to measurement family MM

(measurements related to Mobility Management).

- The ACCESSIBILITY category will map to measurement family CE

(measurements related to Connection Establishment).";

}

}

case mgtDataName {

leaf-list name {

type string;

min-elements 1;

description "The list may include metrics or set of metrics defined

in TS 28.552, TS 28.554 and TS 32.422.

The metrics are identified with their names/identifiers.

For performance measurements defined in TS 28.552 the name is

constructed as follows:

- 'family.measurementName.subcounter' for measurement types with

subcounters

- 'family.measurementName' for measurement types without

subcounters

- 'family' for measurement families

For KPIs defined in TS 28.554 the name is defined according to the

KPI definitions template as the component designated with a).

For trace metrics (including trace messages, MDT measurements

(Immediate MDT, Logged MDT, Logged MBSFN MDT), RLF and RCEF

reports) defined in TS 32.422, the name (metric identifier) is

defined in clause 10 of TS 32.422.";

}

}

mandatory true;

}

list targetNodeFilter {

key idx;

leaf idx {

type string;

}

min-elements 1;

description "Set of information to target the Object Instance to collect

the measurements from.";

uses NodeFilterGrp;

}

list collectionTimeWindow {

key "startTime endTime";

max-elements 1;

description "Collection time window for which the management data

should be reported.";

uses TimeWindowGrp;

}

list reportingCtrl {

key idx;

leaf idx {

type string;

}

min-elements 1;

max-elements 1;

uses types3gpp:ReportingCtrl;

description "Selecting the reporting method and defining associated

control parameters.";

}

leaf dataScope {

type enumeration {

enum SNSSAI;

enum 5QI;

}

// mandatory false; [Implicit]

description "It specifies whether the required data is reported per

S-NSSAI or per 5QI.";

}

}

augment /subnet3gpp:SubNetwork {

list ManagementDataCollection {

key id;

uses top3gpp:Top\_Grp ;

container attributes {

uses ManagementDataCollectionGrp;

}

description "This IOC represents a management data collection request

job. The requested data could be of kind Trace, MDT (Minimization

of Drive Test), RLF (Radio Link Failure) report, RCEF (RRC Connection

Establishment Failure) report, PM (performance measurements), KPI

(end-to-end key performance indicators) or a combination of these.

The attribute 'managementData' defines the management data which shall

be reported. This may either include a list of data categories or a

list of management data identified with their name. For further details

see TS 28.622 clause 4.3.50. The 'targetNodeFilter' attribute can be

used to target object instance(s) producing the required management

data. It is assumed that the consumer may not have detailed knowledge

of the network and hence may not identify the exact object instance

producing the required management data. In this case consumer can

request management data, specified by 3GPP, produced by certain network

function(s) based on a particular location, the domain (CN or RAN) of

the network function, and the handled traffic (CP or UP) of the network

function.

To activate the production of the requested data, a MnS consumer has to

create a 'ManagementDataCollection' object instance on the MnS producer.

The MnS producer will derive multiple jobs ('PerfMetricJob',

'TraceJob') from a single 'ManagementDataCollection' job for collecting

the required management data. Once it receives the measurement from

multiple sources, it consolidates the data into a set of management data

for reporting.

The attribute 'collectionTimeWindow' specifies the time window for which

the management data should be reported.

The attribute 'reportingCtrl' specifies the method and associated

control parameters for reporting the produced management data to MnS

consumers. Three methods are available: file-based reporting with

selection of the file location by the MnS producer, file-based

reporting with selection of the file location by the MnS consumer and

stream-based reporting.

The attribute 'dataScope' configures, whether the management data

should be reported per S-NSSAI or per 5QI, if applicable.";

}

}

}

<CODE ENDS>

## D.2.17 module \_3gpp-common-mnsagent.yang

<CODE BEGINS>

module \_3gpp-common-mnsagent {

yang-version 1.1;

namespace urn:3gpp:sa5:\_3gpp-common-mnsagent;

prefix "magent3gpp";

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-yang-types { prefix types3gpp ; }

import \_3gpp-common-managed-element { prefix me3gpp ; }

import \_3gpp-common-subnetwork { prefix subnet3gpp ; }

import \_3gpp-common-management-node { prefix mmgmtnode3gpp ; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Defines MnsAgent IOCs";

reference "3GPP TS 28.623

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)

3GPP TS 28.620

Umbrella Information Model (UIM)";

revision 2023-02-14 { reference "CR-0234"; }

feature MnsAgentUnderManagedElement {

description "MnsAgent shall be contained under ManagedElement.";

}

feature MnsAgentUnderSubNetwork {

description "MnsAgent shall be contained under SubNetwork.";

}

feature MnsAgentUnderManagementNode {

description "MnsAgent shall be contained under ManagementNode.";

}

grouping MnsAgentGrp {

description "Represents the MnsAgentGrp IOC.";

leaf systemDN {

type types3gpp:DistinguishedName;

config false;

description "Distinguished Name (DN) of a IRPAgent or a MnSAgent.";

}

}

grouping MnsAgentSubtree {

list MnsAgent {

description "The MnsAgent represents the MnS producers, incl. the

supporting hardware and software, available for a certain management

scope that is related to the object name-containing the MnS Agent.

The MnSAgent can be name-contained under an IOC as follows:

1) ManagementNode;

2) SubNetwork, if the SubNetwork does not contain a ManagementNode;

3) ManagedElement, if it is the root element.

In case the MnsAgent is name-contained under a ManagementNode, the

management scope is the complete management scope of the

ManagementNode or a subset thereof.

In case the MnsAgent is name-contained under a SubNetwork, the

management scope is the complete SubNetwork or a subset thereof.

In case the MnsAgent is name-contained under a ManagedElement, the

management scope is the complete ManagedElement or a subset thereof.";

key id;

uses top3gpp:Top\_Grp;

container attributes {

uses MnsAgentGrp;

}

}

}

augment /me3gpp:ManagedElement {

if-feature MnsAgentUnderManagedElement;

uses MnsAgentSubtree;

}

augment /subnet3gpp:SubNetwork {

if-feature MnsAgentUnderSubNetwork;

uses MnsAgentSubtree;

}

augment /subnet3gpp:SubNetwork/mmgmtnode3gpp:ManagementNode {

if-feature MnsAgentUnderManagementNode;

uses MnsAgentSubtree;

}

}

<CODE ENDS>

## D.2.18 module \_3gpp-common-management-node.yang

<CODE BEGINS>

module \_3gpp-common-management-node {

yang-version 1.1;

namespace urn:3gpp:sa5:\_3gpp-common-management-node;

prefix "mmgmtnode3gpp";

import \_3gpp-common-top { prefix top3gpp; }

import \_3gpp-common-yang-types { prefix types3gpp ; }

import \_3gpp-common-subnetwork { prefix subnet3gpp ; }

organization "3GPP SA5";

contact "https://www.3gpp.org/DynaReport/TSG-WG--S5--officials.htm?Itemid=464";

description "Defines ManagementNode IOCs";

reference "3GPP TS 28.623

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Solution Set (SS) definitions

3GPP TS 28.622

Generic Network Resource Model (NRM)

Integration Reference Point (IRP);

Information Service (IS)

3GPP TS 28.620

Umbrella Information Model (UIM)";

revision 2023-02-14 { reference "CR-0234"; }

grouping ManagementSystem\_Grp {

description "Represents the ManagementSystem\_ IOC.";

leaf userLabel {

type string;

description "A user-friendly (and user assignable) name of this object.";

}

leaf-list managedElements {

type types3gpp:DistinguishedName;

config false;

description "Contains a list of the DN(s) of the related subclasses of

ManagedElement\_ instance(s).";

}

}

grouping ManagementNodeGrp {

uses ManagementSystem\_Grp;

leaf vendorName {

type string;

config false;

}

leaf userDefinedState {

type string;

description "An operator defined state for operator specific usage";

}

leaf locationName {

type string;

config false;

description "The physical location of this entity (e.g. an address).";

}

leaf swVersion {

type string;

config false;

}

}

augment /subnet3gpp:SubNetwork {

list ManagementNode {

description "Represents a telecommunications management system (EM) within

the TMN that contains functionality for managing a number of

ManagedElements (MEs). The management system communicates with the MEs

directly or indirectly over one or more interfaces for the purpose

of monitoring and/or controlling these MEs.

This class has similar characteristics as the ManagedElement. The

main difference between these two classes is that the ManagementNode

has a special association to the managed elements that it is

responsible for managing.";

key id;

uses top3gpp:Top\_Grp;

container attributes {

uses ManagementNodeGrp;

}

}

}

}

<CODE ENDS>

# D.3 Void

# D.4 Mount information

If the class ManagedElement and the underlying hierarchy is contained under a SubNetwork all YANG modules containing IOCs that can be contained under the ManagedElement directly or under other IOCs contained by the ManagedElement and the YANG module for ManagedElement itself shall be mounted at the mountpoint "children-of-SubNetwork" in the YANG module \_3gpp-common-subnetwork.

See IETF RFC 8528 [16] that describes the mechanism that adds the schema trees defined by a set of YANG modules onto a mount point defined in the schema tree in another YANG module.

Annex E (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 |
| 2019-06 | SA#84 | SP-190371 | 0021 | - | B | Add IOCs for threshold monitoring control | 16.0.0 |
| 2019-09 | SA#85 | SP-190745 | 0026 | 1 | F | generate JSON definition for generic NRM based on new style guideline | 16.1.0 |
| 2019-09 | SA#85 | SP-190744 | 0027 | - | A | Add IDL XML YANG solutions | 16.1.0 |
| 2019-09 | SA#85 | SP-190751 | 0029 | - | A | Correct references and remove not need abbreviations | 16.1.0 |
| 2019-12 | SA#86 | SP-191166 | 0031 | 1 | F | Correct XML solution set for generic NRM | 16.2.0 |
| 2019-12 | SA#86 | SP-191166 | 0035 | - | B | Updates to YANG SS | 16.2.0 |
| 2019-12 | SA#86 | SP-191173 | 0037 | 1 | A | Add the definition of attribute measurementsList | 16.2.0 |
| 2019-12 | SA#86 | SP-191166 | 0039 | - | B | Add heartbeat control NRM fragment - Stage 3 | 16.2.0 |
| 2019-12 | SA#86 | SP-191166 | 0040 | - | B | Add notification subscription control NRM fragment - Stage 3 | 16.2.0 |
| 2020-03 | SA#87E | SP-200163 | 0041 | 2 | B | Add configurable KPI control NRM | 16.3.0 |
| 2020-03 | SA#87E | SP-200163 | 0042 | - | B | Add configurable FM - YANG Solution | 16.3.0 |
| 2020-03 | SA#87E | SP-200230 | 0043 | 1 | F | Add OpenAPI definitions required by the ProvMnS | 16.3.0 |
| 2020-03 | SA#87E | SP-200169 | 0045 |  | F | Correct errors in yang solution set | 16.3.0 |
| 2020-03 | SA#87E |  |  |  |  | Correction in the implementation of CR0041 | 16.3.1 |
| 2020-03 | SA#87E |  |  |  |  | Correction of implementation | 16.3.2 |
| 2020-07 | SA#88E | SP-200490 | 0046 | 2 | B | Add OpenAPI definitions for the FM control fragment | 16.4.0 |
| 2020-07 | SA#88E | SP-200489 | 0047 | - | F | Correct OpenAPI definition for notificationTypes | 16.4.0 |
| 2020-07 | SA#88E | SP-200483 | 0079 | 2 | B | Add trace control NRM fragment stage 3 | 16.4.0 |
| 2020-07 | SA#88E | SP-200484 | 0080 | - | D | Fix inconsistent formatting | 16.4.0 |
| 2020-07 | SA#88E | SP-200493 | 0081 | - | B | Stage3 add the NRM fragment for SON management | 16.4.0 |
| 2020-07 | SA#88E | SP-200485 | 0082 | - | F | Update the definition of SNssai | 16.4.0 |
| 2020-07 | SA#88E | SP-200490 | 0084 | - | F | Update ManagedElement YANG moduel | 16.4.0 |
| 2020-07 | SA#88E | SP-200596 | 0085 | 1 | F | Update Nrm YANG | 16.4.0 |
| 2020-07 | SA#88E | SP-200490 | 0087 | 2 | F | Update PM control fragment (OpenAPI definitions) | 16.4.0 |
| 2020-07 | SA#88E | SP-200490 | 0088 | - | F | Clarify usage of the VsDataContainer (OpenAPI definitions) | 16.4.0 |
| 2020-07 | SA#88E | SP-200490 | 0089 | - | F | Add common data definitions (OpenAPI definitions) | 16.4.0 |
| 2020-07 | SA#88E | SP-200490 | 0091 | - | F | Update FM control fragment (YANG definitions) | 16.4.0 |
| 2020-07 | SA#88E | SP-200490 | 0092 | - | F | Update PM Control fragment (YANG definitions) | 16.4.0 |
| 2020-07 | SA#88E | SP-200490 | 0093 | 1 | F | Correct genericNRM definition in XML solution | 16.4.0 |
| 2020-09 | SA#89e | SP-200729 | 0095 | - | F | Correction of YANG errors | 16.5.0 |
| 2020-09 | SA#89e | SP-200727 | 0101 | 1 | A | Clean-up definitions and references | 16.5.0 |
| 2020-09 | SA#89e | SP-200729 | 0102 | - | B | YANG SS for Trace Control | 16.5.0 |
| 2020-09 | SA#89e | SP-200724 | 0103 | - | F | Add missing definitions to comDefs.yaml (OpenAPI definitions) | 16.5.0 |
| 2020-09 | SA#89e | SP-200724 | 0104 | - | F | Correct various smaller errors (e.g. validation errors) in genericNRM.yaml (OpenAPI definitions) | 16.5.0 |
| 2020-09 | SA#89e | SP-200729 | 0105 | 1 | F | Correct ThresholdMonitor definition (OpenAPI definitions) | 16.5.0 |
| 2020-09 | SA#89e | SP-200729 | 0106 | - | F | Update HeartbeatControl YANG definition | 16.5.0 |
| 2020-09 | SA#89e | SP-200729 | 0107 | - | F | Update ThresholdMonitor YANG definition | 16.5.0 |
| 2020-12 | SA#90e | SP-201057 | 0108 | - | F | Correction of NRM YANG errors | 16.6.0 |
| 2020-12 | SA#90e | SP-201063 | 0109 | 1 | F | Add new MDT specific parameter collection period for NR aligning with 28.622 for stage 3 | 16.6.0 |
| 2020-12 | SA#90e | SP-201057 | 0110 | - | F | Remove thresholdLevel attribute from ThresholdMonitor (OpenAPI definition) | 16.6.0 |
| 2020-12 | SA#90e | SP-201050 | 0111 | 1 | F | Correct and add types in comDefs.yaml (OpenAPI definition) | 16.6.0 |
| 2020-12 | SA#90e | SP-201050 | 0112 | 1 | F | Use comDefs.yaml instead of local definitions in genericNrm.yaml (OpenAPI definition) | 16.6.0 |
| 2020-12 | SA#90e | SP-201057 | 0113 | 1 | F | Update attribute perfMetricJobGroupId. | 16.6.0 |
| 2020-12 | SA#90e | SP-201057 | 0114 | - | F | Remove value handling from the granularityPeriod description | 16.6.0 |
| 2020-12 | SA#90e | SP-201088 | 0115 | - | F | Correct and add types in comDefs.yaml (OpenAPI definition) | 16.6.0 |
| 2020-12 | SA#90e | SP-201063 | 0117 |  | F | Correct trace target parameter for trace control in stage 3 | 16.6.0 |
| 2020-12 | SA#90e | SP-201089 | 0118 | 1 | F | Remove incorrect S-NSSAI definition from YANG SS | 16.6.0 |
| 2021-03 | SA#91e | SP-210146 | 0121 | - | F | Fix compilation errors | 16.7.0 |
| 2021-03 | SA#91e | SP-210153 | 0125 | - | F | YANG compilation error and missing stage 2 corrections | 16.7.0 |
| 2021-06 | SA#92e | SP-210406 | 0119 | 2 | F | Replace legacy IRPAgent with MnsAgent (OpenAPI definition) | 16.8.0 |
| 2021-06 | SA#92e | SP-210397 | 0127 | 1 | F | Correction of Trace/MDT related parameters (OpenAPI definition) | 16.8.0 |
| 2021-06 | SA#92e | SP-210397 | 0128 | 1 | F | Align Trace/MDT related parameters to TS 32.422 (OpenAPI definition) | 16.8.0 |
| 2021-06 | SA#92e | SP-210406 | 0129 | 1 | F | Clean up regarding common data types (OpenAPI definition) | 16.8.0 |
| 2021-06 | SA#92e | SP-210411 | 0130 | - | F | Correct definition of additionalInformation (YANG) | 16.8.0 |
| 2021-09 | SA#93e | SP-210886 | 0131 | 1 | F | Replace local data type definition for notificationFilter by common filter definition | 16.9.0 |
| 2021-09 | SA#93e | SP-210886 | 0132 | 1 | F | Correct data type of notificationId (YANG definitions) | 16.9.0 |
| 2021-09 | SA#93e | SP-210886 | 0133 | 1 | F | Clarify resource id is required and nullable (OpenAPI definitions) | 16.9.0 |
| 2021-09 | SA#93e | SP-210865 | 0134 | - | F | Correction and clarification of reporting in TraceJob (stage3) | 16.9.0 |
| 2021-09 | SA#93e | SP-210865 | 0135 | - | F | Adaptation and cleanup of Trace/MDT related parameters (stage3) | 16.9.0 |
| 2021-09 | SA#93e | SP-210871 | 0136 | - | F | YANG updates to correct YANG merging problems | 16.9.0 |
| 2021-09 | SA#93e | SP-210867 | 0137 | 1 | F | Correction of YANG Solution set | 16.9.0 |
| 2021-12 | SA#94e | SP-211475 | 0139 | 1 | F | Correction of YANG Solution set | 16.10.0 |
| 2021-12 | SA#94e | SP-211458 | 0142 | - | F | Introduce missing IEs for HSS and UDM Trace Record | 16.10.0 |
| 2021-12 | SA#94e | SP-211465 | 0138 | 1 | B | Add new common types for YANG | 17.0.0 |
| 2021-12 | SA#94e | SP-211467 | 0140 | - | B | Add support for MnS Discovery | 17.0.0 |
| 2021-12 | SA#94e | SP-211473 | 0141 | - | B | Add new common types for YANG | 17.0.0 |
| 2022-03 | SA#95e | SP-220168 | 0144 | 1 | C | Asynchronous operation NRM additions - YANG Stage-3 | 17.1.0 |
| 2022-03 | SA#95e | SP-220177 | 0146 | 1 | B | Enhance NRM with geographical information supporting MDA | 17.1.0 |
| 2022-03 | SA#95e | SP-220163 | 0147 | 1 | B | Add support for discovery of managed entities | 17.1.0 |
| 2022-03 | SA#95e | SP-220183 | 0148 | - | B | Add file retrieval NRM fragment (OpenAPI definitions) | 17.1.0 |
| 2022-03 | SA#95e | SP-220183 | 0149 | 1 | B | Add file download NRM fragment (OpenAPI definitions) | 17.1.0 |
| 2022-03 | SA#95e | SP-220171 | 0153 | - | B | Add parameter to configure beam level measurements in NR MDT | 17.1.0 |
| 2022-03 | SA#95e | SP-220183 | 0154 | - | B | Add attribute to configure an identifier of a TraceJob | 17.1.0 |
| 2022-03 | SA#95e | SP-220187 | 0156 |  | B | Add file download NRM fragment (YANG) | 17.1.0 |
| 2022-06 | SA#96 | SP-220498 | 0159 | - | A | Stage 3 Yang fix for 3GPP Common Trace | 17.2.0 |
| 2022-06 | SA#96 | SP-220498 | 0162 | 1 | A | OpenAPI file name and dependence change for comDefs.yaml | 17.2.0 |
| 2022-06 | SA#96 | SP-220498 | 0163 | 1 | A | OpenAPI file name and dependence change for genericNrm.yaml | 17.2.0 |
| 2022-06 | SA#96 | SP-220498 | 0166 | - | A | yaml indentation correction for comDefs.yaml | 17.2.0 |
| 2022-06 | SA#96 | SP-220516 | 0168 | - | A | Alignment of attribute names of TraceJob IOC to TS 32.422 (stage 3) | 17.2.0 |
| 2022-06 | SA#96 | SP-220496 | 0169 | - | F | Fix description of attribute mnsScope | 17.2.0 |
| 2022-06 | SA#96 | SP-220516 | 0174 | - | A | Alignment of attribute values of attribute tjMDTReportInterval to TS 32.422, TS 38.413 and TS 38.423 | 17.2.0 |
| 2022-06 | SA#96 | SP-220505 | 0175 | - | B | Add stage 3 for management data collection and discovery (OpenAPI definitions) | 17.2.0 |
| 2022-06 | SA#96 |  |  |  |  | Correction of implementation in D.2.10 | 17.2.1 |
| 2022-06 | SA#96 |  |  |  |  | Further corrections on the changes in the code from the annexes | 17.2.2 |
| 2022-09 | SA#97e | SP-220853 | 0180 | - | A | YANG Corrections | 17.3.0 |
| 2022-09 | SA#97e | SP-220859 | 0182 | 1 | A | Adding missing interface for SMF | 17.3.0 |
| 2022-09 | SA#97e | SP-220863 | 0186 | - | F | Correction of file names in OpenAPI Solution Set | 17.3.0 |
| 2022-09 | SA#97e | SP-220864 | 0188 | - | A | Correction of attribute names according to Upper Camel Case Convention and WKA | 17.3.0 |
| 2022-09 | SA#97e | SP-220855 | 0185 | 1 | B | Add QMC job (stage 3 YANG) | 18.0.0 |
| 2022-09 | SA#97e |  |  |  |  | Alignment with content in FORGE | 18.0.1 |
| 2022-09 | SA#97e |  |  |  |  | Alignment with content in FORGE (Yang) | 18.0.2 |
| 2023-01 | SA#98e | SP-221172 | 0189 | - | F | YANG Corrections in Word TS | 18.1.0 |
| 2023-01 | SA#98e | SP-221188 | 0191 | 1 | B | FIles and File IOCs YANG | 18.1.0 |
| 2023-01 | SA#98e | SP-221186 | 0194 | - | A | Add YANG for ManagementDataCollection | 18.1.0 |
| 2023-01 | SA#98e | SP-221188 | 0197 | - | B | NRM enhancements for NF List | 18.1.0 |
| 2023-01 | SA#98e | SP-221173 | 0202 | 1 | A | Adding YANG begin and End markers | 18.1.0 |
| 2023-01 | SA#98e | SP-221186 | 0204 | 1 | A | Correct yaml definition for ManagementDataCollection IOC | 18.1.0 |
| 2023-01 | SA#98e | SP-221187 | 0206 | - | A | Adding a new data type only to represent GeoArea via convex polygon - Stage 3 | 18.1.0 |
| 2023-01 | SA#98e | SP-221172 | 0212 | - | F | YANG Corrections | 18.1.0 |
| 2023-01 | SA#98e | SP-221176 | 0215 |  | B | Definition of parameters MDT Alignment Information and Available RAN Visible QoE Metrics (stage3, YANG) | 18.1.0 |
| 2023-01 | SA#98e | SP-221170 | 0218 | - | A | Add missing attribute properties to YANG | 18.1.0 |
| 2023-01 | SA#98e | SP-221197 | 0219 | 1 | A | Correct M6 Delay Threshold to align with TS 38.314 and TS 38.413 | 18.1.0 |
| 2023-01 | SA#98e |  |  |  |  | Fixing minor implementation mistakes | 18.1.1 |
| 2023-03 | SA#99 | SP-230199 | 0223 | 1 | A | Fix IpAddr stage 3 definition | 18.2.0 |
| 2023-03 | SA#99 | SP-230207 | 0226 | - | A | Adding altitude to GeoArea datatype - Stage 3 | 18.2.0 |
| 2023-03 | SA#99 | SP-230200 | 0230 | - | A | Missing Mount information | 18.2.0 |
| 2023-03 | SA#99 | SP-230210 | 0233 | 1 | A | Correcting traceRecordingSessionReference property (stage3) | 18.2.0 |
| 2023-03 | SA#99 | SP-230204 | 0234 | 1 | F | YANG Corrections | 18.2.0 |
| 2023-03 | SA#99 | SP-230208 | 0240 | 1 | A | Clarify reporting and monitoring period usage in SupportedPerfMetricGroup datatype. (stage3) | 18.2.0 |
| 2023-03 | SA#99 | SP-230211 | 0241 | - | F | Correct YANG for ReportingCtrl | 18.2.0 |
| 2023-03 | SA#99 |  |  |  |  | Correction of annexes for alignment with FORGE | 18.2.1 |
| 2023-06 | SA#100 | SP-230653 | 0214 | 3 | B | Add stage 3 for data type AvailabilityStatus | 18.3.0 |
| 2023-06 | SA#100 | SP-230651 | 0244 | 1 | F | Correcting the min and max Items possible for fiveQIValue attribute in Stage 3 | 18.3.0 |
| 2023-06 | SA#100 | SP-230649 | 0246 | - | A | correction to stage 3 implementation for MnSInfo and MnsRegistry | 18.3.0 |
| 2023-06 | SA#100 | SP-230651 | 0250 | - | F | YANG Corrections | 18.3.0 |