Microwave Information Model

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Document History

Version	Date	Description of Change
0.1	2016-07-08	Initial version of the Microwave Information Model as technology specific extension to the TR-512 ONF Core Information Model 1.1 [ONF CM]
0.2	2016-18-11	Consolidating review comments and findings of the 3rd MW PoC. Version for ONF-wide review.
1.0	2016-15-12	Consolidating comments of the ONF-wide review and finalizing for approval by ONF Tech Council. Version for official publishing.
1.1.0-1	2019-02-15	Consolidating all improvements discussed in the wireless transport project since publishing version 1.0, incorporating the information and data models of the 5th ONF PoC, provided for review on project level.
1.1.0-2	2019-03-04	Consolidating all feedback from review on project level, provided for review on working group level.
1.1.0	2019-04-10	Finalized and published

1   Introduction

This ONF Technical Recommendation (TR) is a technology specific extension to the TR-512 ONF Core Information Model 1.2 [ONF CM]. In accordance with the SDN architecture for wireless transport networks [ONF SDN Arch WL], this management-control is expected to be achieved by wireless devices and SDN applications within or on top of an SDN Controller.

The provided version 1.1 consolidates a couple of improvements that have been implemented in a backward compatible manner.

2   Definitions

2.1   Terms

The primary purpose of this document is to define terms and hence terms are defined throughout the document. Key terms are highlighted in section 2.2 Abbreviations and Acronyms of this document and of the TR-512 ONF Core Information Model 1.2 [ONF CM] by referring to the section in this document where the term is defined.

2.2   Abbreviations and Acronyms

Term	Explanation
ALIC	Adjacent Link Interference Cancelation

Term	Explanation
ATPC	Automatic Transmit Power Control
CEPT	European Conference of Postal and Telecommunications Administrations
CPRI	Common Public Radio Interface
CTP	Connection Termination Point
Cur	Current
DCN	Data Communication Network
E1	TDM frame containing 30 digital voice channels
ERC	European Research Council
FDD	Frequency Division Duplexer
Hsb	Hot stand-by
ID	Identifier
Int	Integer
LTP	Logical Termination Point
MIMO	Multiple Input Multiple Output Transmission
MW	Point-to-point microwave, including millimeter wave
MWPS	Microwave Physical Section
MWS	Microwave Section
NGFI	Next Generation Fronthaul Interface
*_Pac	Technology Specific Conditional Package
PDH	Plesiochronous Digital Hierarchy
PmP	Point-to-multipoint
REC	Recommendation
Ref	Reference
Rx	Receive
SDH	Synchronous Digital Hierarchy
SDN	Software Defined Network
SNCP	Sub-Network Connection Protection
TDD	Time-Division Duplexer
TDM	Time-Division Multiplexing
TTP	Trail Termination Point
TR	ONF Technical Recommendation
tx	Transmit
UUID	Universally Unique Identifier

Term	Explanation
XPIC	Cross Polarization Interference Cancelation

3 Compliance Statement

Completeness

A device's interface must not be denoted as compliant to this Microwave Information Model, if it doesn't implement all components.

Support

The hardware does not necessarily need to make available all functionalities covered by this modeling. In case some functionality is not available at the hardware, the device's interface shall answer the default values defined in this model. All functionalities, which are available at the hardware and covered by the Microwave Information Model, must be manageable with this model (to the extent of the comprised attributes).

Options

This Microwave Information Model offers two alternative modeling of the logical structuring of the physical resource provided by the radio link. The device's interface must at least implement the alternative, which is specific to its device type (e.g. pure Ethernet, Ethernet+TDM Hybrid).

Proprietary Extensions

Interfaces implementing elements of this Microwave Information Model plus additional components must not be denoted as compliant. Such interfaces might be called "based on" or "expanding" it.

4 Overview of the Microwave Information Model

4.1 Coverage

The Microwave Information Model covers the following aspects:

- The radio link with its analogue characteristics like center frequency, channel bandwidth, modulation etc.

- Grouping of radio links into diversity or protection configurations

- Segmentation of the transport resources provided by a radio link

- Allocation of higher layer traffic flows (e.g. Ethernet, E1, CPRI) on these segments

- Bundling of several radio links' resources for Ethernet transport

- Header compression on the transmission path

It does not cover e.g. synchronization, user management, DCN, TDM multiplexing or Ethernet.

The Microwave Information Model provides the necessary attributes for

- the device informing the SDN Controller about its capabilities

- the Controller configuring the device

- the device providing status, problem and performance information

4.2   Overview

The Microwave Information Model comprises the following three most important elements:

- AirInterface_Pac – Contains the analogue characteristics of the physical layer of a single radio link; represents the combination of modem and radio

- Structure_Pac – Segments the physical resource provided by the AirInterface into logical pieces that can be booked by Containers

- Container_Pac – Offers transport services to higher protocol layers, e.g. fixed size containers for TDM or containers of dynamic size for Ethernet

The following three additional elements are required for modeling microwave features based on bundling of radio links into specific types of groups:

- AirInterfaceHsb – Provides hot-stand-by protection

- AirInterfaceDiversity_Pac – Required for space and frequency diversity

- CoChannelGroup – Groups AirInterface_Pacs for modeling XPIC, MIMO and ALIC

The following picture shall help understanding the logical concept, but it has to be noted that the associations between the *_Pacs are implemented in a more complex way, which is described in chapter 7 Attachment to the Core Information Model.
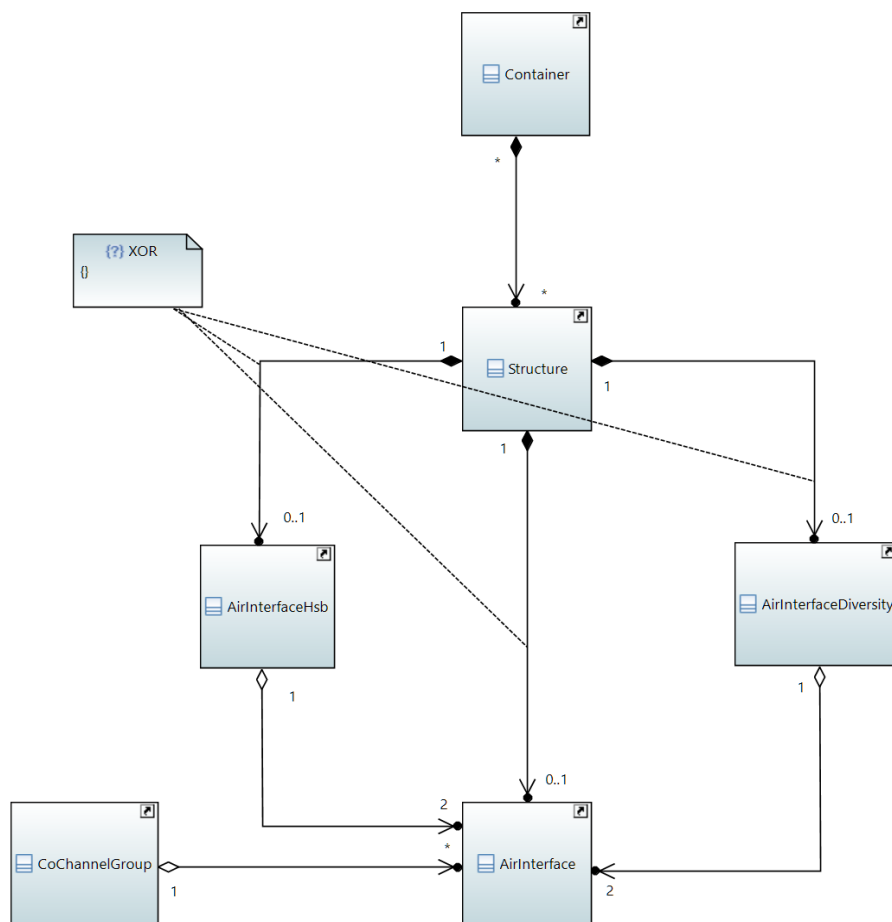
Figure 1: Model Overview

All *_Pacs are sub-structured into the following classes:

- Capabilities – The device informs about its features, characteristics and parameter value ranges

- Configuration – The Controller configures the device and the device informs about its current configuration

- Status – The device informs about measurement values and its current operational status

- Problems – The device informs about the problems currently active at the device

- Current Performance – The device informs about the current values of its performance counters

- Historical Performance – The device informs about the values of its performance counters at the end of a well-defined time period
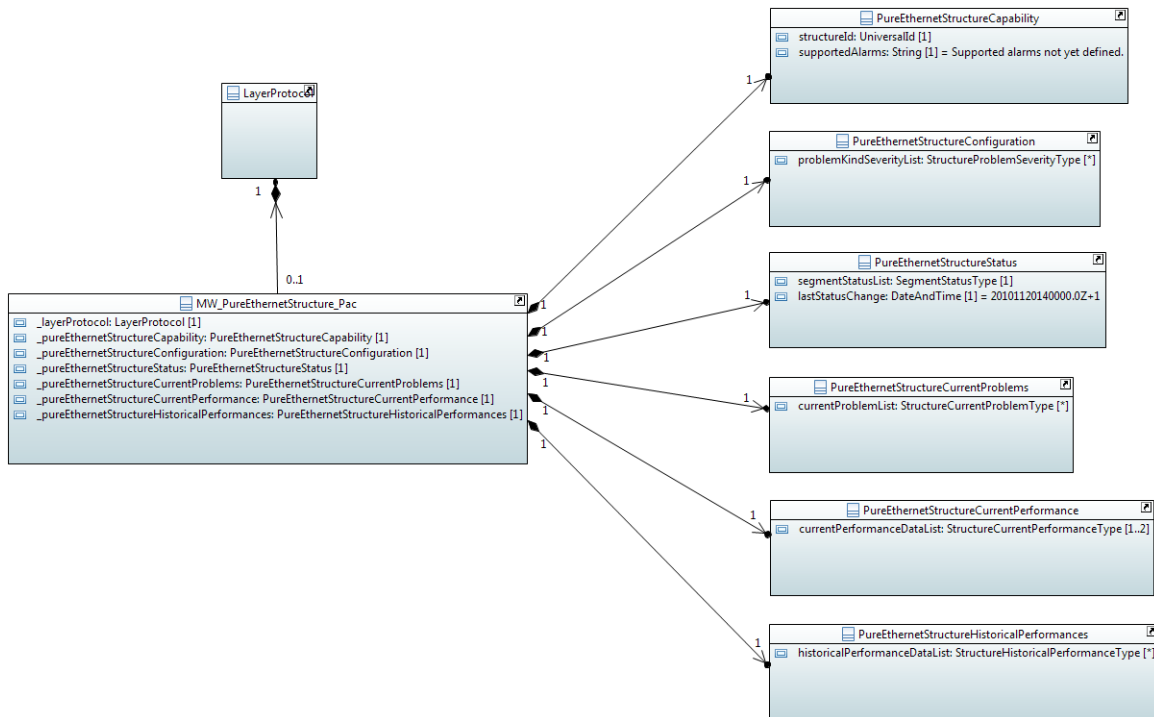
Figure 2: Exemplary Structure of *_Pacs

Each *_Pac is sufficiently described by one set of capability, configuration, status and current performance attributes, but several current problem and historical performance value sets might be required. Nevertheless, *CurrentProblems and *HistoricalPerformances classes are in a one to one association to the *_Pac. The necessary multiplicity is generated by lists inside these classes. This additional hierarchy is required by the interface implementation after conversion to YANG.

5 Conventions

5.1 UML Modeling Conventions

This TR follows the conventions as described in the TR-512 ONF Core Information Model 1.2 [ONF CM] and the TR-514 ONF UML Modeling Guidelines [ONF UMLG].

5.2   Default Values

The default values in the Microwave Information Model have been defined in accordance to the following basic principles:

- Every attribute (except keys, which have to be unique) shall have a default value.

- The default value shall be inside the value range of the data type of the attribute.

- Capability attributes:

  - The default value shall either indicate unavailability of the functionality (if applicable)

  - or be outside the range of reasonable values of the attribute.

- Configuration, status and performance attributes:

  - The default value shall either represent the configuration, status or performance measurement value right after starting the device (in case such a "neutral" value is applicable to the attribute)

  - or be outside the range of reasonable values of the attribute.

Lists of data types shall contain the minimum multiplicity number of elements. This also means that lists of data types with a minimum multiplicity of zero shall just be empty as a default.

5.3   Comments

The comprised comments are meant to explain the attributes in such a way that further documentation is not required for understanding the attributes' meaning.

In rare cases (e.g. Problems) the modeling is open for amending device specific elements. This is done by Capability attributes of data type String, which are foreseen to contain an unspecified number of elements separated by comma. In such cases, the comment field is also used for defining a minimum set of elements, which must be supported. Of course, adding additional elements to these lists is not seen as a Proprietary Extensions according to chapter 3.

Double quotes have been avoided within the comments for supporting the conversion to YANG.

5.4   ONF Stereotypes

5.4.1   attributeValueChangeNotification

This stereotype defines whether a notification has to be raised, when the attribute changes its value.

It has been set on "true" for all attributes, which are comprised in Configuration classes or in data types used by attributes of the Configuration classes.

It has also been set on "true" for status attributes, which might be subject to automated changes, but do not represent gradually changing measurement values.

The attributeValueChangeNotification stereotype has been set on "false" for status attributes, which are exclusively following configuration activities. This is for avoiding double messaging.

5.4.2   objectCreationNotification and objectDeletionNotification

These stereotypes define whether a notification has to be raised when an instance of a class has been created, respectively deleted.

It has been set on "true" for all *_Pac classes, which are potentially attached to the LayerProtocol class of the Core Information Model (see chapter 7 Attachment to the Core Information Model for details).

5.4.3 isInvariant

This stereotype defines whether the value of the attribute can be changed, or not, after it has been created.

It has been set on "true" (means: cannot be changed) for the following attributes:

- *Ids, which are representing target addressed for referencing data types or classes, (except ContainerIDs, which are required for connecting logical traffic from outside the reach of the modeling with a Container)

- All attributes, which are comprised in Capability classes or in data types used by attributes of the Capability classes

- All attributes, which are comprised in data types that are attached to the CurrentProblems classes.

- All attributes, which are comprised in data types that are attached to the *Performance classes.

- All attributes, which are comprised in Notifications

It has been set on "false" (means: can be changed) for the following attributes:

- All attributes, which are comprised in Configuration classes

- All attributes, which are comprised in Status classes or in data types used by attributes of the Status classes

5.4.4 valueRange

This stereotype identifies the allowed values for the attribute.

It has not been used within the Microwave Information Model, because of a conflict with the policy defined for default values in chapter 5.2

5.4.5 partOfObjectKey

This stereotype indicates whether the attribute is part of the object key or not. Value "0" (default) means the attribute is not part of the object key. Values > "0" indicate that the attribute is part of the object key and the value defines the order of the attribute in case the key is composed of more than one attribute.

The partOfObjectKey stereotype has been set on "1" for all *Id attributes, which are of data type UniversalId, but not the *IdRef attributes, which are referring on them.

It does also not apply on containerID attributes that represent a configurable string and are required for associating traffic flows to the transport resources (Container) provided by the Microwave Information Model.

5.4.6 unit

This optional stereotype contains a textual definition of the unit associated with the attribute's value.

The following units have been used in the Microwave Information Model

Unit	Meaning
%	Percentage
Bytes	Total number of Bytes
Bytes/min	Bytes per minute
Bytes/s	Bytes per second
Celsius	Degree Celsius

Unit	Meaning
dB	Decibel
dBm	Decibel milliwatt
kbit/s	1000 bit per second
kHz	1000 Hertz
s	Second
symbols	Number of symbols

5.4.7 Support Qualifier

This stereotype qualifies the support of the object class at the management interface.

Aside the following exceptions, the SupportQualifier has always been left on its default value "mandatory":

- The MW_PureEthernetStructure_Pac class is "conditional_mandatory" for device types transporting pure Ethernet.

- The MW_HybridMwStructure_Pac class is "conditional_mandatory" for device types transporting Ethernet + TDM.

5.4.8 bitLength

The bitLength stereotype has been used to define Integer primitives smaller than 64bit.

5.4.9 Unsigned, Encoding and Counter

The unsigned, encoding and counter stereotypes have not been applied.

6 Special elements

6.1 Capabilities of the Radio Interface

The value ranges of the devices' parameters, which are for configuring the analogue characteristics of the physical layer, are depending from each other.

Example 1: The availability of XPIC depends (in some cases) on the channel bandwidth, which depends on the center frequency.

Example 2: The maximum and minimum configurable transmit power are depending on the adjusted modulation scheme.

The number of permutations of value ranges can reach the area of several thousand depending on the number of center frequencies, channel bandwidths and modulation schemes adjustable at the device.

To limit the volume of capability information, it has been decided not to describe the radio characteristics for each and every explicit center frequency, but to reference on an external description of the allowed center frequencies and to describe the transmission modes, which are adjustable based on this channel plan.

Example: ECC/REC/(01) 04 Annex 5 is describing 7MHz, 14MHz, 28MHz, 56MHz, 112MHz and 224MHz channels. In case a device would not support 224MHz channels, the list of supported transmission modes shall just not contain any element with a channel bandwidth of 224MHz.

The supportedChannelPlan attribute is used for unambiguously referencing a single channel plan description. The following list shows a couple of non-binding examples for official documents, which are relevant for Europe.

Table 1: Examples for supportedChannelPlan values

supportedChannelPlan	Frequency Band	Comment
ECC/REC/(04)05	3.4-3.6GHz	
ECC/REC/(04)05	3.6-3.8GHz	
ERC/REC14-01	5.925-6.425GHz	
CEPT/ERC/REC 12-05E_Annex_A	10.0-10.68GHz	1,75-28MHz
CEPT/ERC/REC 12-05E_Annex_B	10.0-10.68GHz	56MHz
CEPT/ERC/REC12-02E_Annex_A	12.75-13.25GHz	1,75-28MHz
CEPT/ERC/REC12-02E_Annex_B	12.75-13.25GHz	56MHz
CEPT/ERC/REC12-07E_Annex_A	14.5-15.35GHz	
CEPT/ERC/REC12-03E	17.7-19.7GHz	
T/R13-02	22.0-29.5GHz	
T/R13-02_Annex_A1	22.0-22.6GHz	
T/R13-02_Annex_A1	23.0-23.6GHz	
T/R13-02_Annex_A2	22.59075-22.75875GHz	
T/R13-02_Annex_A2	22.84275-23.01075GHz	
T/R13-02_Annex_A3	22.75875-22.84275GHz	
T/R13-02_Annex_B	24.5-26.5GHz	
T/R13-02_Annex_C	27.5-29.5GHz	
ECC/REC/(02)02	31.0-31.3GHz	
ERC/REC/(01)02_Annex_B	31.8-33.4GHz	FDD
T/R12-01E	37.0-39.5GHz	
ECC/REC/(01)04_Annex_2	40.5-43.5GHz	Block
ECC/REC/(01)04_Annex_5	40.5-43.5GHz	Channels
ERC/REC12-11_Annex_2	48.5-50.2GHz	
ERC/REC12-11_Annex_1	51.4-52.6GHz	
ERC/REC12-12_Annex_2	55.78-57.0GHz	FDD
ECC/REC/(09)01	57-64GHz	
ECC/REC/(05)02	64-66GHz	
ECC/REC/(05)07_Annex_1	71-76GHz	
ECC/REC/(05)07_Annex_2	81-86GHz	
ECC/REC/(14)01_Annex_2	92-95GHz	FDD

For handling the dependencies, the description of the capabilities of the radio interface has been organized in three layers:

- The Capability class, which is common to all *_Pacs, contains several characteristics that are specific to the combination of modem and radio, but applicable to all modes the radio link could operate. Further on, it contains a list of supported channel plans.

- The ChannelPlanType data type mainly contains the supportedChannelPlan attribute, which is a String containing the name of a channel plan description, and a list of transmission modes, which can be operated on the referenced channel plan.

- The TransmissionModeType data type contains the attributes required to describe the analogue characteristics of the radio link.
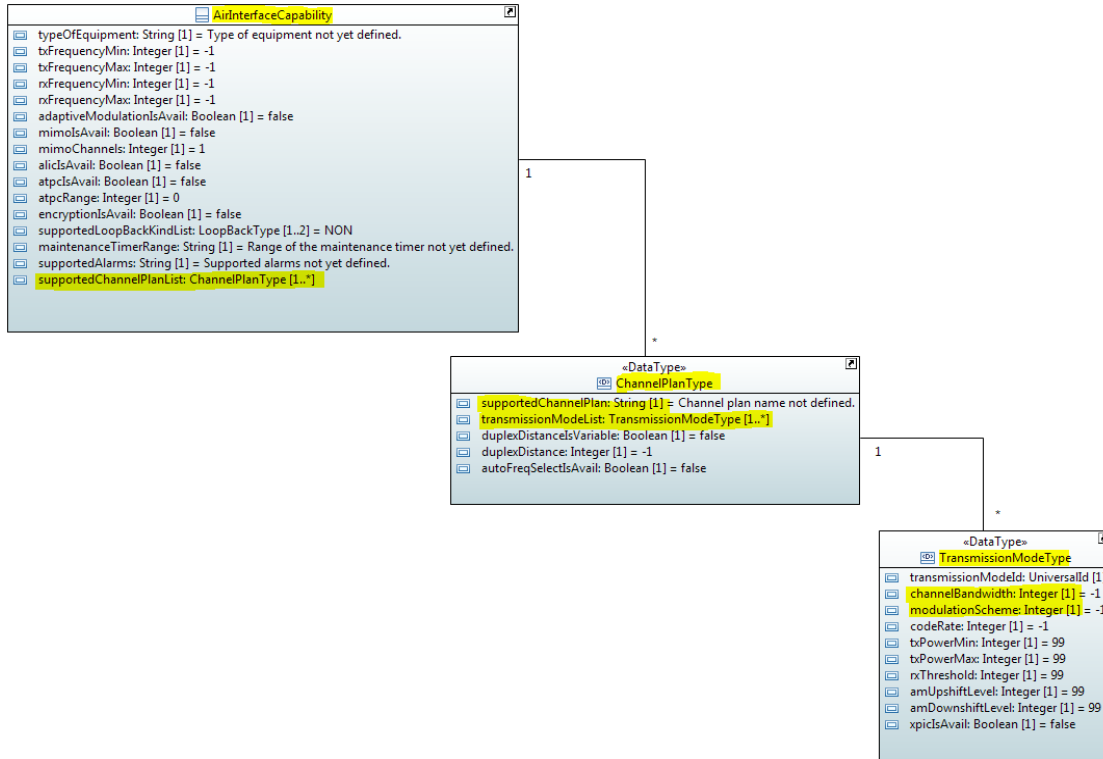
Figure 3: Tree Structure of AirInterface Capabilities

The attributes of the Capability class and its associated data types are expressing the capabilities of the hardware type. This applies also to the xpicIsAvail attribute, which is contained in the TransmissionModeType data type and does not give any information about the operational capability of the individual installation on site.

6.2   Multiple Structure Classes

The Microwave Information Model supports allocating traffic flows on the physical resources of the radio interface. The allocation is modeled by associating *Container classes with sub-segments provided by the *Structure classes.

The methods of sub-segmenting and allocating depend on the implementation of the wireless transport device (e.g. time division duplex vs. frequency division duplex, point-to-point vs. shared medium).

Due to the very basic differences of these methods and the ways of modeling them, the Microwave Information Model offers several Structure_Pacs that must be alternatively applied depending on the devices type (see also chapter 3).

The current version of the modeling offers Structure_Pacs for point-to-point links, which are implementing frequency division duplex and are distinguishing Pure Ethernet and Hybrid microwave links.

- The PureEthernetStructure_Pac offers a single segment, which might vary in size, if adaptive modulation is activated. One or several (only in case the value of the EthernetContainerCapability: bundlingIsAvail attribute is set on "1") of those segments can be linked to an EthernetContainer_Pac.

- The HybridMwStructure_Pac provides multiple TDM segments, which are of fixed size, and an additional segment for Ethernet that is of variable size. There is a one to one relation between TdmContainer_Pac and TDM segment. The Ethernet segment behaves equally to the one provided by the PureEthernetStructure_Pac.

Besides allowing definition of much simpler *Structure classes, this way of modeling is also seen to be more flexible in regards to future expansions.

6.3 Problem Definitions, Associations and Inheritances

As already stated in chapter 4.2, the multiplicity of the associations between *_Pac and *CurrentProblems classes are always one and *CurrentProblems classes contain a list of *CurrentProblemType data type.

Problem statements, respectively alarms contain generic attributes. Usually, generic attributes are consolidated in classes belonging to the Core Information Model and are inherited from these classes.

Since no such super class is available in the applied version of the Core Information Model, an individual super class has been defined as a preliminary substitute.

So the *CurrentProblemType data types contain a problemName attribute. problemSeverity, sequenceNumber and timestamp attributes are inherited from the generic MwCurrentProblem super class.
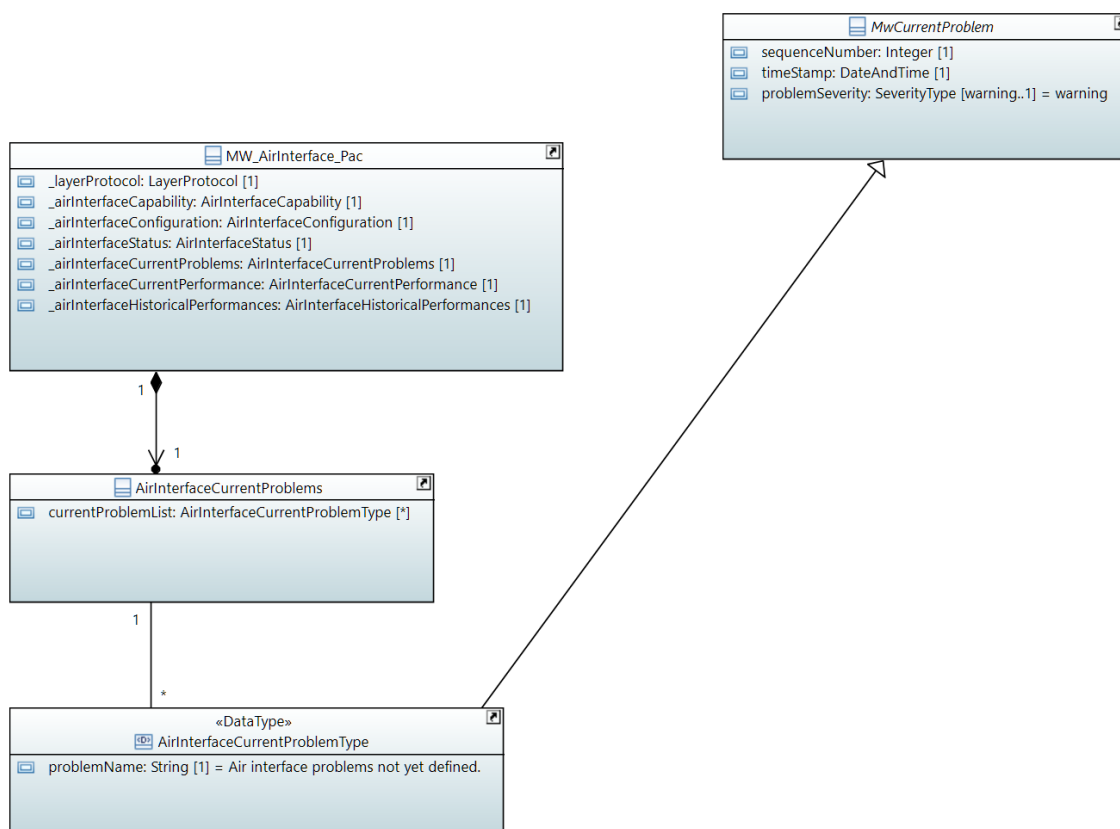
Figure 4: Example for Current Problems Associations and Inheritances

The problemName attributes are just seemingly identical in all *CurrentProblemType data types. The problemName attributes cannot be inherited from the MwCurrentProblem super class, because corresponding supportedAlarms attributes in *Capability classes are referenced in their respective comment fields.

The severity of a kind of problem shall be configurable. A problemKindSeverityList attribute is added to each of the *Configuration classes for that purpose. The severity defined in *ProblemSeverityType data types shall then be applied to all instances of the *CurrentProblemType data type comprising the same problem name.
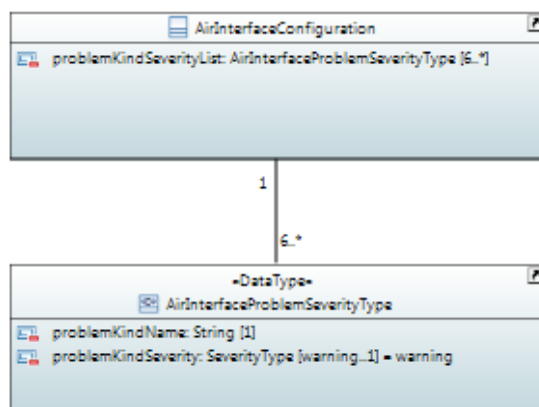
Figure 5: Example for Current Problems Definition

The multiplicity of the association towards the *ProblemSeverityType data type is determined by the number of problem types specified in the corresponding supportedAlarms attribute in the *Capability class. The number of problem types, which are prescribed in the comment field of the corresponding supportedAlarms attribute is always given as the minimum multiplicity.

6.4   Performance Values

As already stated in chapter 4.2, the multiplicities of the associations between *_Pac and *CurrentPerformance respectively *HistoricalPerformances classes are always one and *CurrentPerformance respectively *HistoricalPerformances classes contain a *CurrentPerformanceType respectively *HistoricalPerformanceType data type list.

Technology specific performance value attributes have been put into *PerformanceType data types for being able of referencing them as current performance values as well as historical performance values. Generic performance value attributes are inherited from super classes provided by the Core Information Model and a modeling of ITU-T G874.1.
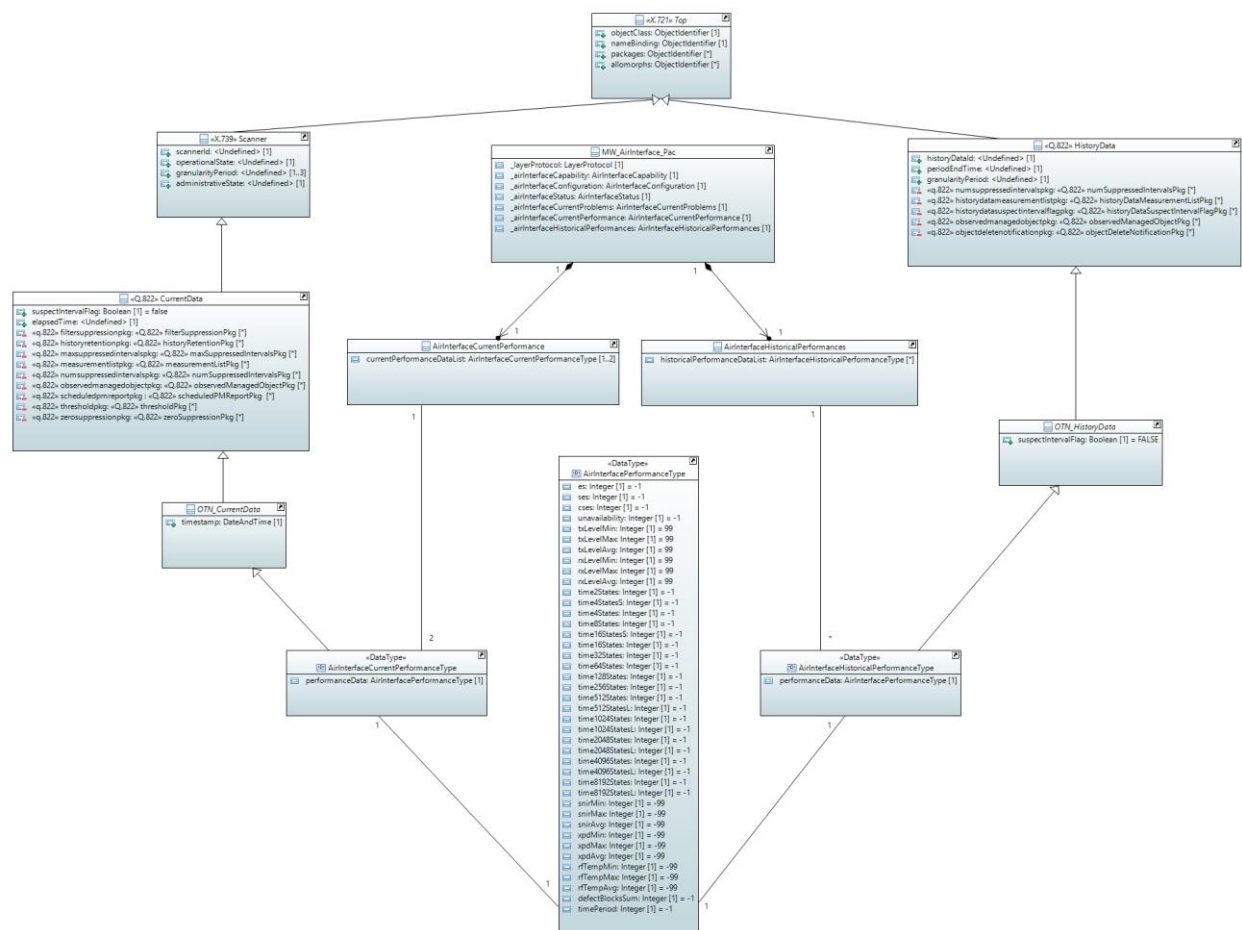
Figure 6: Example for Performance Associations and Inheritances

The isInvariant stereotype of the attributes, which are contained in the *PerformanceType data types, are set on 'true'. This applies also on the current performance values. As a consequence, current performance values have to be readout as a complete, new instance of the *PerformanceType data type. This matches also with the inherited timestamp attribute.

The *PerformanceType data types also inherit a granularityPeriod attribute. Since there is no filtering of 15min or 24h performance values at the device or mediator, data for both granularity periods is uploaded and has to be sorted based on this attribute on application level.

6.5   TDM Containers

The Microwave Information Model basically allows transporting any kinds of TDM signals. This is possible, because neither TDM containers nor TDM segments are fixedly predefined in the modeling.

Instead the Capability class of the TdmContainer_Pac is associated with a list of TdmContainerType data types. Name and bandwidth consumption of container types can be defined within the TdmContainerType data type. Prescriptions for names and sizes are made within the comments at the corresponding attributes.
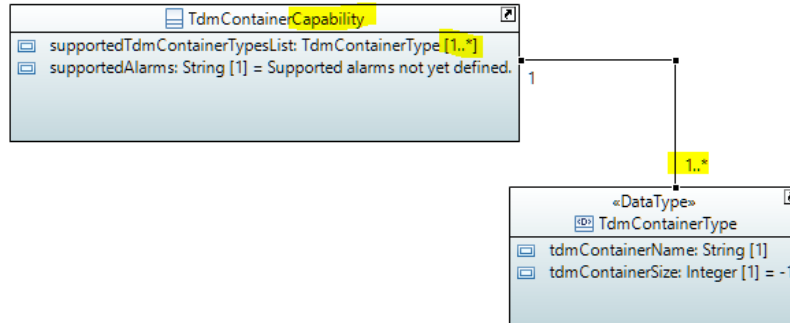
Figure 7: TDM Container Capabilities

The actual type of an instance of a TDM container can then be chosen from the defined types.
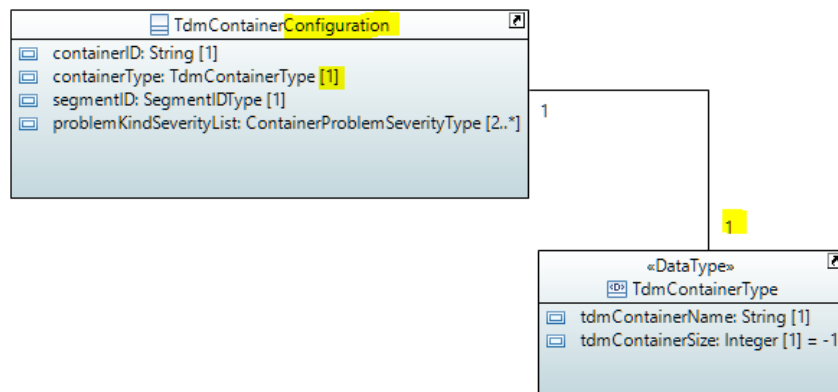
Figure 8: TDM Container Configuration

The modeling of the HybridMwStructure class is very similar. Obviously, bandwidth consumption of the container (tdmContainerSize attribute in TdmContainerType data type) and size of the transport resource (tdmSegmentSize attribute in TdmStructureType data type) have to have the same value for successful allocation.

6.6   TxPower Interpretation

AirInterface::AirInterfaceConfiguration::txPower shall be interpreted as a maximum value. Independently from any adaptive modulation or automated transmit power control (ATPC) configuration, the actually operated transmit power shall never exceed this value.

While adaptive Modulation is increasing the operated modulation scheme, the transmit power, which is available as a maximum at the device, is declining. In case the transmit power, which is available as a maximum at the device, is falling below the configured txPower, the device shall operate at the maximum possible transmit power.

The validation process of the Netconf server inside the device shall accept an adaptive modulation configuration, if the txPower value is lower or equal to the maximum possible transmit power in at least one of the modulation schemes, which are included in the chosen modulation range.

6.7   Adaptive Modulation Performance Data Interpretation

Modeling of the performance values in regards with adaptive modulation has changed with TR-532v1.1. The former explicit listing of combinations of modulation and coding schemes has been found to be too inflexible and has been marked deprecated.

A new data type (TimeXStatesType) is combining the definition of a transmission mode from the capabilities segment of the model with an Integer describing the length of the time period, in which this transmission mode had been operated. And the performance data holds a list of this data type.

This modeling is much more flexible, because it does not outdate when vendors offer new combinations of modulation and coding scheme at their devices, but it has also some ambiguity to be ruled.

The number of the transmission modes, which is determined by all available combinations of channelBandwidth, modulationScheme, codeRate and symbolRateReductionFactor is assumed to usually exceed the number of TimeXStates, which is determined by the number of combinations of available performance values.

Example: In case a device does not collect performance data about the operated channelBandwidth it cannot differentiate corresponding TimeXStates. It is not clear, to which transmission mode some operation time period has to be associated, because the operated channelBandwidth has not been documented.

The following prescription is made to overcome this ambiguity:

The transmission mode, which is to be referenced in an instance of the TimeXStatesType data type, shall be chosen at first from the available performance data and after that still undefined channelBandwidth, modulationScheme, codeRate or symbolRateReductionFactor shall be chosen according to their status value at the end of the measurement period.

(txPowerMin, txPowerMax, rxThreshold, amUpshiftLevel, amDownshiftLevel and xpicIsAvail are determined by the combination of channelBandwidth, modulationScheme, codeRate and symbolRateReductionFactor, but do not contribute to the total number of different transmission modes.)

6.8 Capacity Calculation

The Microwave Information Model intentionally does not contain any attribute expressing a capacity. This is because interpretation of such value is differing a lot and misinterpretation is easily leading to errors of up to 20%.

Instead it is recommended that the operator defines its own way of calculating capacities and applies this method on all kinds of media, including microwave. The Microwave Information Model comprises all necessary data for such calculation, even about packet compression, if wished to be regarded.

In case some operator or application provider would require some starting point for own considerations, the following proposal might be helpful.

Air interface capacity =

> (channel bandwidth of the currently operated transmission mode)

> / (symbol rate reduction factor of the currently operated transmission mode)

> * log2(number of states in the modulation scheme of the currently operated transmission mode)

> * (code rate of the currently operated transmission mode)

> / 1.15

The symbol rate reduction factor is expressing a reduced symbol rate like 4 for ¼ BPSK or 2 for ½ BPSK. The code rate is to be calculated as the ratio of number of symbols carrying payload information to number of transmitted symbols, while the number of symbols carrying payload information equals the number of transmitted symbols - (number of symbols carrying overhead information + number of redundant symbols for forward error correction).

7 Attachment to the Core Information Model

The Core Information Model is the basis of the Microwave Information Model. However not all object classes of the Core Information Model are necessary for a control interface between microwave devices and SDN

Controller. For example the root element of the Microwave Information Model is the NetworkElement object class. The SdnController object class must not be implemented in network elements, because a network element cannot offer any control for SDN Controllers.

The following classes of the Core Information Model are not used by the Microwave Information Model:

- SdnController

- NetworkControlDomain

- Link

- LinkPort

- FcRoute

Figure 9 highlights the classes of the Core Information Model, which are part of the Microwave Information Model.
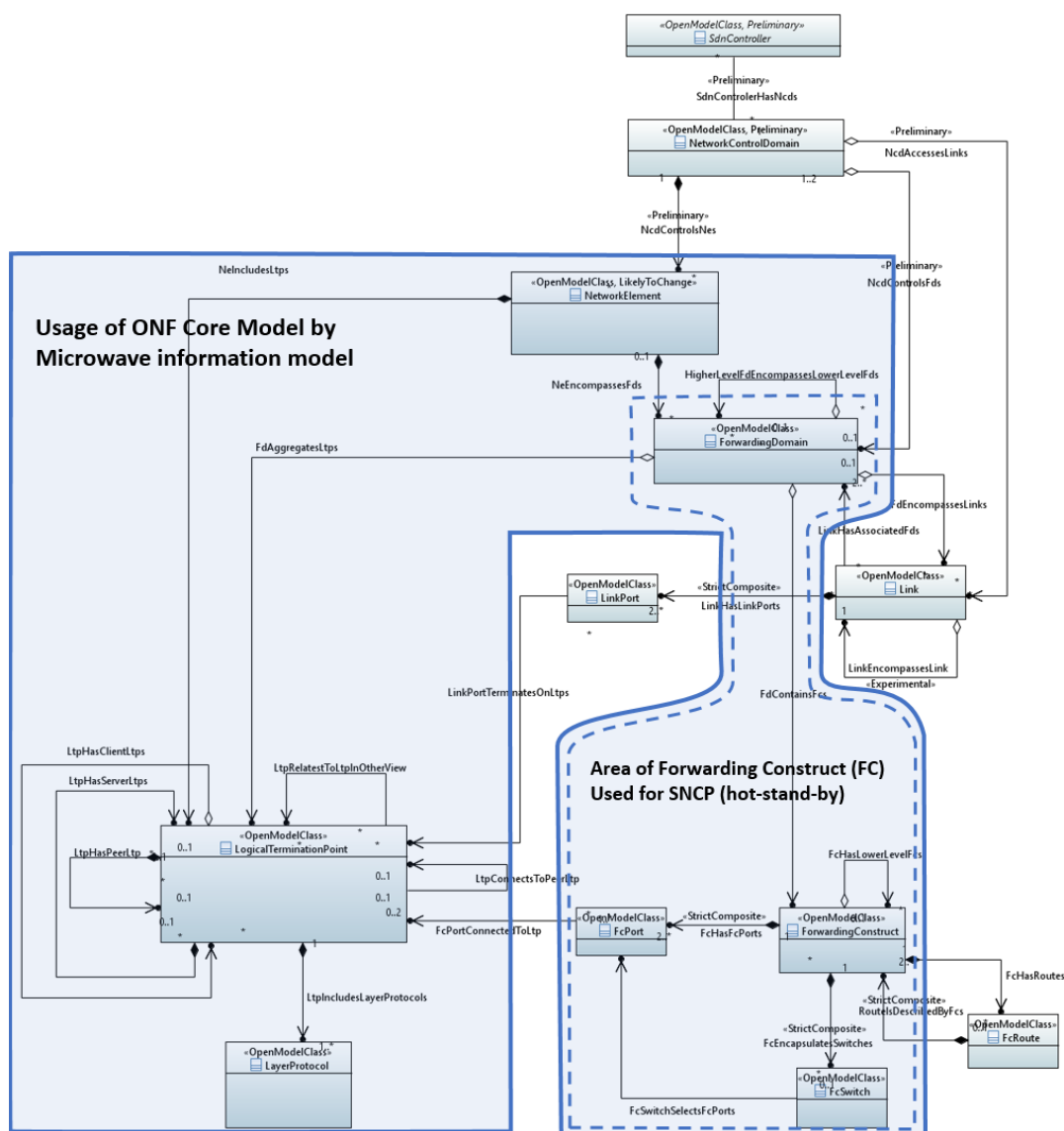
Figure 9: Usage of ONF Core Information Model 1.2

The LogicalTerminationPoints (LTP) is the most important class. Its associations allow complex hierarchies of LTPs. A LayerProtocol class provides content to the generic LTP class and describes its function.

The following layerProtocolName values have to be applied:

layerProtocolName	Type of *_Pac
ETC	Ethernet Container
MWPS	Air Interface
MWS	Pure Ethernet Structure, Hybrid Microwave Structure and Diversity
TDM	TDM Container

Technology specific extensions of the Core Information Model are implemented by associating the LayerProtocol class with conditional packages. These conditional packages are called *_Pacs.

An attribute for referencing these *_Pacs was missing in the LayerProtocol class of the version of the Core Information Model, which had been used for the TR-532v1.0.

Instead, the extension attribute has been used to define the following additional attributes for referencing the *_Pac classes:

value-name	Example value
revision	2017-03-24
conditional-package	mw-ethernet-container-pac
capability	urn:onf:params:xml:ns:yang:microwave-model?module=microwave-model

The Microwave Information Model defines six technology specific conditional packages, which are pointing to the LayerProtocol:

- The MW_AirInterface_Pac defines an LTP as microwave physical section trail termination point (MWPS-TTP).

- The MW_AirInterfaceDiversity_Pac defines an LTP as microwave section connection termination point (MWS-CTP). This conditional package is only required, while SpaceDiversity or FrequencyDiversity is used.

- The MW_PureEthernetStructure_Pac defines an LTP as microwave section trail termination point (MWS-TTP) for pure Ethernet microwave systems.

- The MW_HybridMWStructure_Pac defines an LTP as microwave section trail termination point (MWS-TTP) for microwave systems transporting Ethernet and TDM containers.

- The MW_EthernetContainter_Pac defines an LTP as a microwave client connection termination point (MW-Client-CTP) for an Ethernet client signal.

- The MW_TdmContainter_Pac defines an LTP as a microwave client connection termination point (MW-Client-CTP) for any type of TDM client signal.

Figure 10 shows the associations between the six microwave specific conditional packages and the LayerProtocol class of the Core Information Model. Please note that for simplicity reasons the ForwardingConstruct class is not displayed.
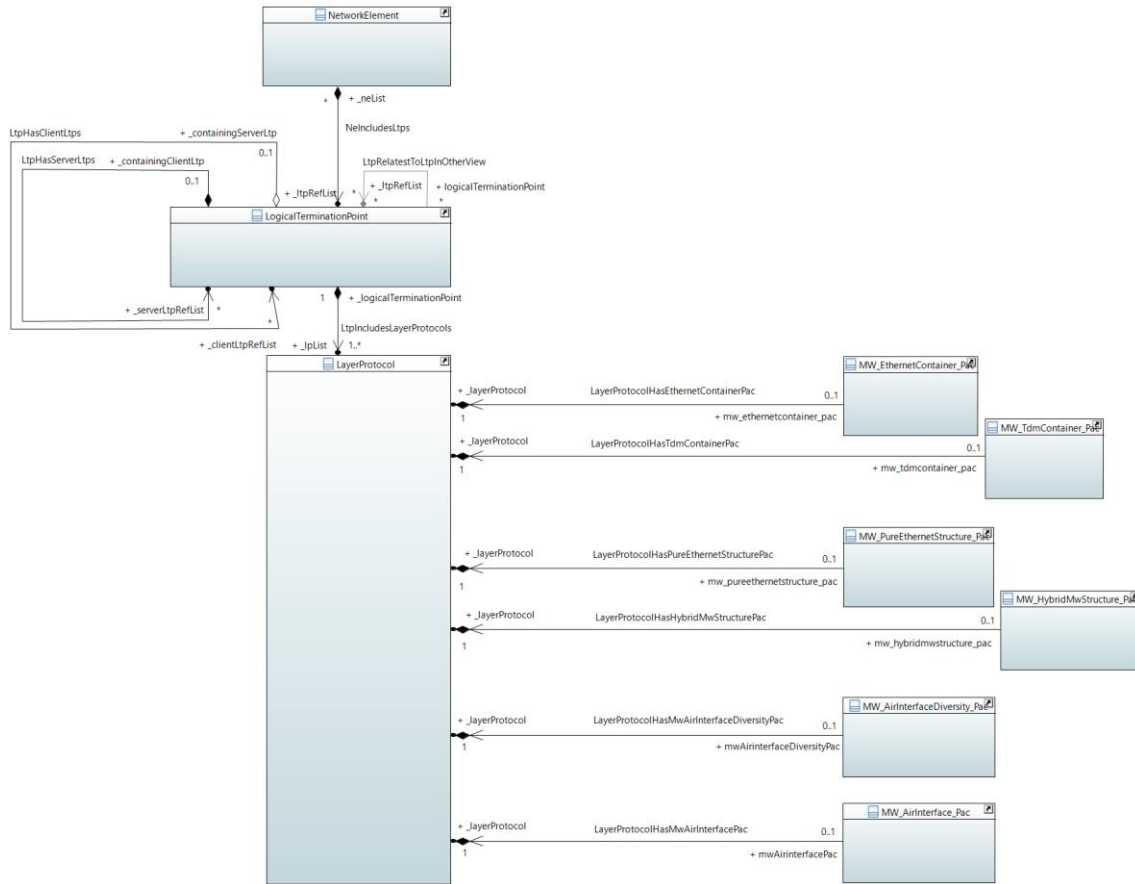
Figure 10: Associations between LayerProtocol and *_Pac

7.1   Attachment of the Co-Channel Group Class

The CoChannelGroup class is for modeling XPIC, MIMO and ALIC, which are required for operating groups of air interfaces that are sharing the same frequency channel. The grouping is done by a list of LogicalTerminationPoint (LTPs) with associated AirInterface_Pacs.
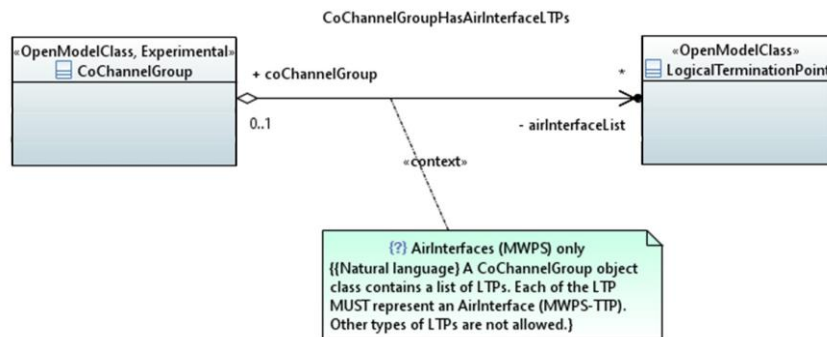
Figure 11: Associations between CoChannelGroup and LTP

7.2 Attachment of the HSB Pac

The hot-stand-by (HSB) functionality of microwave devices is a 1+1 SNCP of the microwave section (MWS). The Core Information Model covers such protection function by the ForwardingConstruct class. Therefore the Microwave Information Model has no technology specific conditional package for that purpose.

It needs to be mentioned that not all required protection control functions are yet defined. Future versions of the Core Information Model or the Microwave Information Model will define those functions. Please see also a corresponding entry in chapter 11 Future Work.
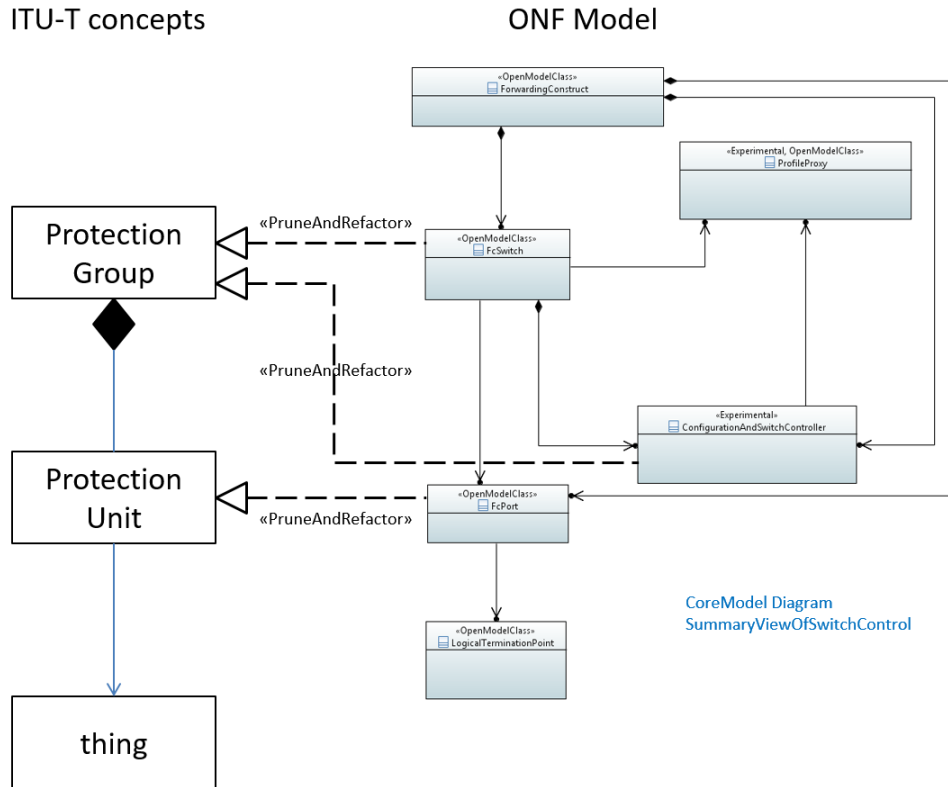
Figure 12: HSB is covered by the ForwardingConstruct of the Core Information Model

8 Backward Compatibility of this Version

The changes, which have been made while preparing version 1.1., do not cause interoperability problems between a client using an original version and a server using an updated version. No existing artifact (e.g. class, data type or attribute) has been altered or deleted. For some artifacts better alternatives have been added. Outdated artifacts have been marked with the lifecycle statement "deprecated".

The changes, which have been made while preparing version 1.1., do not cause interoperability problems between a server using an original version and a client using an updated version. The SupportQualifier [section 5.9 of ONF UMLG], which results in feature [section 7.18.1 of RFC 6020] and if-feature [section 7.18.2 of RFC 6020] statements in YANG, has been used to mark new artifacts to be feature "revision1_1".

A new revision statement [section 7.1.9 of RFC 6020] has been included in the YANG Microwave Data Model in front of the existing revision statements and all modifications comply with the constraints for updating YANG modules [section 10 of RFC 6020].

9   Changes in this Version

All changes from TR-532v1.0 to TR-532v1.1 plus background information about the underlying issues have been documented in the Wireless Transport Project's decision register for this purpose on https://wiki.opennetworking.org/display/OTCC/WT+Decision+register.

10 Non-Backward Compatibility of the next Version

TR-532 comprises not just the technology specific *_Pacs for managing the microwave radio interface, but also the Core Information Model itself. Because the next version of TR-532 will require to comprise an updated version of the Core Information Model, which is not backward compatible, also the next version of TR-532 will not be backward compatible.

Please, see further information about future work, which will also impact backward compatibility, in chapter 11.

11 Future Work

The pureEthernetStructure_Pac and the EthernetContainer_Pac would also be comprised in TR-541, which is describing the Ethernet PHY information model. Neither redundancy, which would arise from putting these two *_Pacs into both TR documents, nor asymmetry, with would come from referencing TR-532 in TR-541, seem to be adequate to deal with this favorable re-use. Instead, it is considered to decompose the current Microwave Information Model into the comprised *_Pacs, make these *_Pacs available on a separate repository, and to just reference these *_Pacs inside the respective TR documents. Apart from avoiding redundancy, this decomposition would also allow updating the *_Pacs independently from each other. As a consequence, each *_Pac would be delivered as a separate YANG file.

Current version of TR-532 is limited on technology specific conditional packages to the LayerProtocol class of the Core Information Model. This results in a comprehensive model for managing the microwave devices. From the controller's and the applications' points of view, these microwave devices have to be connected to describe a network topology. The necessary classes for describing such topologies are also comprised in the Core Information Model, but they require technology specific conditional packages in the same way the LayerProtocol class does. It is considered to define microwave specific conditional packages also for the ForwardingConstruct and to reference them in the next version of TR-532.

Additional aspects and functionality will incrementally be added to the Microwave Information Model in future versions. The following areas for potential amendments have been identified:

- Aligning the modeling of *CurrentProblemType data types to the Core Information Model after provisioning of corresponding super classes

- Aligning the modeling of protection after planed changes at the Core Information Model.

- Adding additional attributes (e.g. "coChannelConfigurationIsComplete") for expressing the operational readiness for operating e.g. XPIC.

- Enriching modeling of MIMO according to hardware implementations

- Adding Structure classes for covering point-to-multipoint (PmP) systems

- Adding automatic neighbor discovery and its relation to trail trace identifier according to ITU-T REG 7714.1

- Adding relations to the Equipment Model

- Adding Structure classes for covering Time-Division Duplexer (TDD) systems

- Adding Structure classes for covering Next Generation Fronthaul Interface (NGFI)

12 UML Model Files

The Papyrus export, which is holding the UML modeling files of the TR-532v1.1 can be found on

https://www.opennetworking.org/software-defined-standards/models-apis/

The available .zip file comprises the

- AirInterface_Pac (incl. CoChannelGroup)

- AirInterfaceDiversity_Pac

- HybridMwStructure_Pac

- PureEthernetStructure_Pac

- TdmContainer_Pac

- EthernetContainer_Pac

and all related datatypes, notifications and imported artefacts.

> Please note that YANG Model files, Data Dictionary (GenDoc export) and Interface Simulator are just implementations of the UML modeling files.
>
> In case of any divergence, the UML modeling files are always the relevant data base.

13 YANG Model Files

The YANG files generated from the UML model referenced in chapter 12 can be found on

https://www.opennetworking.org/software-defined-standards/models-apis/

14 Interface Simulator

An Interface Simulator is for supporting application development without own hardware. The Interface Simulator, which has been used within framework of the 5th ONF PoC for developing applications based on the UML model referenced in chapter 12, can be found on

https://github.com/Melacon/WTE_PoC5

15 Data Dictionary

Please be aware that the following lists are showing not all the attribute's characteristics and stereotypes, e.g. default value and unit are missing.

15.1 AirInterface_Pac and CoChannelGroup

15.1.1 MW_AirInterface_Pac

Qualified Name: MicrowaveModel::ObjectClasses::AirInterface::MW_AirInterface_Pac

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: YES
  - objectDeletionNotification: YES
  - support: MANDATORY

Table 2: Attributes for MW_AirInterface_Pac

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_layerProtocol	LayerProtocol ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	CoreModel-CoreNetworkModule-ObjectClasses:NetworkElement/_ltpRefList/_lpList/uuid
_airInterfaceCapability	AirInterfaceCapability ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_airInterfaceConfiguration	AirInterfaceConfiguration ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_airInterfaceStatus	AirInterfaceStatus ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_airInterfaceCurrentProblems	AirInterfaceCurrentProblems ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_airInterfaceCurrentPerformance	AirInterfaceCurrentPerformance ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_airInterfaceHistoricalPerformances	AirInterfaceHistoricalPerformances ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

15.1.2 AirInterfaceCapability

Qualified Name: MicrowaveModel::ObjectClasses::AirInterface::AirInterfaceCapability

Describes the 'analog' capabilities of modem and transmitter of the microwave device. Value ranges of attributes are not independently (e.g. min. and max. transmit power depends on modulation). Legal combinations of values are expressed in transmissionModeTypes.

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 3: Attributes for AirInterfaceCapability

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
typeOfEquipment	String Type of equipment not yet defined.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	This parameter indicates the equipment type. Instead of uploading the complete set of capabilities, capabilities of the same equipment type could be reused. Should be unique for a combination of modem, radio and their respective firmware.
txFrequencyMin	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: MANDATORY	Value of the minimum transmit frequency tunable at the air interface.
txFrequencyMax	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: MANDATORY	Value of the maximum transmit frequency tunable at the air interface.
rxFrequencyMin	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: MANDATORY	Value of the minimum receive frequency tunable at the air interface.
rxFrequencyMax	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: MANDATORY	Value of the maximum receive frequency tunable at the air interface.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
supportedChannelPlanList	ChannelPlanType Supported alarms not yet defined.	1..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	List of channel spacing that are supported by the device.
adaptiveModulationIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	In case the device is capable of adaptive modulation, this field shall contain a 'true'.
mimoIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	In case the device is capable of MIMO, this field shall contain a 'true'.
mimoChannels	Integer 1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: channels • support: MANDATORY	Maximum number (n) of spatial multiplexing streams that can be conveyed by an n x n MIMO configuration.
alicIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	In case the microwave radio is capable of Adjacent Link Interference Cancelation (canceling of interference cause by transmitters located at the same site), this field shall contain a 'true'.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
atpcIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	In case the microwave radio is capable of ATPC, this field shall contain a 'true'.
atpcRange	Integer 0	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Extent of the ATPC range. This value represents a device specific maximum value. The actual range of the ATPC at a specific link might be limited by the difference between configured transmit power (AirInterface::AirInterfaceConfiguration::txPower) and minimum transmit power of the device (TypeDefinitions::TransmissionModeType::txPowerMin).
encryptionIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Shall be marked 'true', if payload encryption is available.
supportedLoopBackKindList	LoopBackType NON	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	List of supported kinds of looping back of header information to the remote site.
maintenanceTimerRange	String Range of the maintenance timer not yet defined.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: s • support: MANDATORY	Available time periods for maintenance configurations (e.g. the loop back of microwave header information) to be described. Concrete values shall be separated by commas (e.g. '10, 60, 360'). Ranges shall be expressed as two values separated by a minus (e.g. '10-360').

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
supportedAlarmList	String Supported alarms not yet defined.	7..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Available alarms to be listed. Mandatory:'signalIsLost','rslIsExceeded', 'signalIDMismatching','temperatureIsExceeded','modemIsFaulty','radioIsFaulty' and 'modulationIsDownShifted'. Further alarms might be added by the vendor.
supportedAlarms	String Supported alarms not yet defined.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY Deprecated	Available alarms to be listed. Mandatory:'signalIsLost','rslIsExceeded', 'temperatureIsExceeded','modemIsFaulty','radioIsFaulty' and 'modulationIsDownShifted'. Further alarms might be added by the device. Names are to be separated by commas.

15.1.3 AirInterfaceConfiguration

Qualified Name: MicrowaveModel::ObjectClasses::AirInterface::AirInterfaceConfiguration

Configuration of the radio link.

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 4: Attributes for AirInterfaceConfiguration

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
airInterfaceName	String Air interface ID not yet defined.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Operator specific microwave link ID (often used for coding area, type of element and sequential number).
remoteAirInterfaceName	String Air interface ID at the remote site not yet defined.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Name of the air interface, which belongs to the same link, at the remote site.
expectedSignalID	Integer 0	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	If set on '0', the receiver ignores the signal ID of the received signal. If set on any other value, the receiver exclusively synchronizes on signals with the same signal ID.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
transmittedSignalID	Integer 0	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Transmitted radio signal ID for synchronizing the receiver.
radioSignalID	String Radio signal ID not yet defined.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY Deprecated	The radioSignalId is transmitted on the air interface so the remote site of the link synchronizes on the correct transmitter. The local radio MUST NOT synchronize on a radio signal with a different radioSignalId. The link ID is neither an ID necessary to span the model nor an ID referencing external data. It is just some sort of name of the link transmitted so the correct remote site can be identified in an interference situation. The value zero might be used to make the microwave to disable the link ID check.
txFrequency	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: MANDATORY	Center frequency of the transmit channel. The values to be configured have to exactly match the values listed in the international agreement referenced in channelPlanID. In case of automated selection of the transmit frequency this field shall describe the lowest center frequency selectable.
rxFrequency	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: MANDATORY	Center frequency of the receive channel.

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Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_transmissionModeMin	TransmissionModeType ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Minimum transmission mode to be configured (in case adaptive modulation is not used, this value represents also the fixed transmission mode).
_transmissionModeMax	TransmissionModeType ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Maximum transmission mode to be configured.
txChannelBandwidth	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: MANDATORY Deprecated	Bandwidth of the transmit channel. The value shall be expressed explicitly (means in kHz) not as a reference to an international agreement. The values shall be chosen from the following _list: 3.500, 7.000, 14.000, 27.500, 28.000, 29.000, 29.650, 30.000, 40.000, 50.000, 55.000, 56.000, 59.300, 60.000, 80.000, 100.000, 112.000, 120.000, 150.000, 200.000, 250.000, 500.000, 750.000, 1.000.000, 1.250.000, 1.500.000, 1.750.000, 2.000.000;

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
rxChannelBandwidth	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: MANDATORY	Bandwidth of the receive channel. The value shall be expressed explicitly (means in kHz) not as a reference to an international agreement. The values shall be chosen from the following _list: 3.500, 7.000, 14.000, 27.500, 28.000, 29.000, 29.650, 30.000, 40.000, 50.000, 55.000, 56.000, 59.300, 60.000, 80.000, 100.000, 112.000, 120.000, 150.000, 200.000, 250.000, 500.000, 750.000, 1.000.000, 1.250.000, 1.500.000, 1.750.000, 2.000.000;
polarization	PolarizationType NOT_SPECIFIED	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Allows documenting the polarization of the air interface.
powerIsOn	Boolean true	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Power ON. Activation of the entire radio in a split mount configuration shall be expressed as a 'true'.
transmitterIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Activation of the transmitter inside the radio shall be expressed as a 'true'.
receiverIsOn	Boolean true	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Maintenance Feature. Activation of the receiver inside the radio shall be expressed as a 'true'. Attribute shall also be used for RX main and RX diversity squelches in case of diversity configurations.

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Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
txPower	Integer 99	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Transmit power to be configured on the microwave link. Signed Byte is required. The actually operated transmit power might be lower depending on adaptive modulation and ATPC.
adaptiveModulationIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Adaptive Modulation. Activation of adaptive modulation shall be expressed as a 'true'.
modulationMin	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: symbols • support: MANDATORY Deprecated	Minimum modulation to be configured (in case adaptive modulation is not used, this value represents also the fixed modulation). The modulation scheme shall be described by the number of states in the phase diagram (e.g. BPSK->'2' or 256QAM->'256'). Allowed values are defined in TypeDefinitions::transmissionModeType ::modulationScheme.
modulationMax	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: symbols • support: MANDATORY Deprecated	Maximum modulation to be configured. The value of this field is only relevant, if Adaptive Modulation has been activated. The modulation scheme shall be described by the number of states in the phase diagram (e.g. BPSK->'2' or 256QAM->'256'). Allowed values are defined in TypeDefinitions::transmissionModeType ::modulationScheme.
xpicIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Activation of Cross Polarization Interference Cancelation shall be expressed as a 'true'. In case XPIC is not available for the current combination of channel bandwidth and modulation or the hardware in general, this parameter shall always be set to 'false'.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
mimoIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Activation of Multiple Input Multiple Output (MIMO) shall be expressed as a 'true'.
alicIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Activation of Adjacent Link Interference Cancelation (ALIC) shall be expressed as a 'true'.
atpcIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	ATPC. Activation of Automated Transmit Power Control shall be expressed as a 'true'.
atpcThreshUpper	Integer 99	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: dBm • support: MANDATORY	If the receive level is higher than the upper threshold value, the transmitter is notified to decrease transmit power.
atpcThreshLower	Integer 99	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: dBm • support: MANDATORY	If the receive level is lower than the lower threshold value, the transmitter is notified to increase transmit power.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
atpcTxPowerMin	Integer -99	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Transmit power, which is not to be undercut, while operating ATPC.
autoFreqSelectIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Activation of automatically selecting the transmit frequency in unlicensed bands shall be expressed as a 'true'.
autoFreqSelectRange	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: channels • support: MANDATORY	Number of transmit channels (starting at the center frequency defined in txFrequency and with channel bandwidth according to txChannelBandwidth) that define the range within the transmit frequency can automatically been chosen.
modulationIsOn	Boolean true	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Maintenance Feature. De-activation of the modulation of the carrier signal for fault management shall be expressed as a 'false'.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
encryptionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Activates encryption of the payload.
cryptographicKey	String Cryptographic key not yet defined.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Key for transforming plaintext into ciphertext data.
performanceMonitoringCollectionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Enables measurement, collection, storage and access to performance data.
thresholdCrossAlarmList	ThresholdCrossAlarmType ./.	0..6	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	List of threshold cross alarms to be configured.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
loopBackKindOn	LoopBackType NON	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Maintenance Feature. The currently configured type of looping back of the air interface header shall be expressed here. The received header is returned to the remote site.
maintenanceTimer	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY	Time of existence of any maintenance configuration (e.g. the loop back of microwave header information). Valid values are defined in AirInterface::AirInterfaceCapability::maintenanceTimerRange.
problemKindSeverityList	AirInterfaceProblemSeverityType ./.	6..*	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Severity of the problem to be configured.

15.1.4 AirInterfaceStatus

Qualified Name: MicrowaveModel::ObjectClasses::AirInterface::AirInterfaceStatus

Measurements of current values on the air interface and operational status of the device.

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 5: Attributes for AirInterfaceStatus

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
txFrequencyCur	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: MANDATORY	Center frequency of the currently operated transmit channel.
rxFrequencyCur	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: MANDATORY	Center frequency of the currently operated receive channel.
txLevelCur	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Current transmit level.
rxLevelCur	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Current receive level.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_transmissionModeCur	TransmissionModeType None	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Currently operated transmission mode according to definitions in Capabilities.
modulationCur	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: symbols • support: MANDATORY Deprecated	Currently operated modulation on transmit path. The modulation scheme shall be described by the number of states in the phase diagram (e.g. BPSK->'2' or 256QAM->'256'). Allowed values are defined in TypeDefinitions::transmissionModeType ::modulationScheme.
codeRateCur	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: % • support: MANDATORY Deprecated	Code rate of the currently operated coding scheme (Net bit rate ≤ Gross bit rate · code rate).
receivedSignalID	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	ID of the signal, which the receiver is currently synchronized on.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
snirCur	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Currently measured signal to (noise+interference) ratio.
xpdCur	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Currently measured cross polarization discrimination.
rfTempCur	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: Celsius • support: MANDATORY	Current temperature (in degree Celsius) of the radio module inside the outdoor unit.
lastStatusChange	DateTime 2010-11-20T14:00:00+01:00	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Time the Air Interface entered its current operational status. _format:yyyyMMddhhmmss.s[Z|{+|-}HHMm]; yyyy='0000'..'9999' year; MM='01'..'12' month; dd='01'..'31' day; hh='00'..'23' hour; mm='00'..'59' minute; ss='00'..'59' second; s='.0'..'.9'tenth of second (set to '.0' if EMS or NE cannot support this granularity); Z='Z' indicates UTC (rather than local time); {+|-}='+' or '-' delta from UTC; HH='00'..'23' time zone difference in hours; Mm='00'..'59' time zone difference in minutes.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
radioPowerIsUp	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	If the radio unit has power and is switched on, this shall be expressed as a 'true'.
linkIsUp	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	If connection is established to the remote site with the same linkID, this shall be expressed as a 'true'.
xpicIsUp	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	If XPIC is currently actually working (not just configured), this shall be expressed as a 'true'.
mimoIsUp	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	If MIMO is currently actually working (not just configured), this shall be expressed as a 'true'.
alicIsUp	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	If Adjacent Link Interference Cancelation (ALIC) is currently actually working (not just configured), this shall be expressed as a 'true'.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
atpcIsUp	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	If ATPC is currently actually working (not just configured), this shall be expressed as a 'true'.
autoFreqSelectIsUp	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	If automated frequency selection is currently actually working (not just configured), this shall be expressed as a 'true'.
loopBackKindUp	LoopBackType NON	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	The currently active (not just configured) type of looping back of the air interface header shall be expressed here. The received header is returned to the remote site.
localEndPointId	String not-supported	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	The value of the localEndPointId is a vendor specific identifier of the air interface, used by the node to discover a microwave radio link.
remoteEndPointId	String not-supported	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	The value of the remoteEndPointId is a vendor specific identifier or the airinterface at the remote side, used to by the node to discover a microwave radio link.

15.1.5 AirInterfaceCurrentProblems

Qualified Name: MicrowaveModel::ObjectClasses::AirInterface::AirInterfaceCurrentProblems

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 6: Attributes for AirInterfaceCurrentProblems

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
currentProblemList	AirInterfaceCurrentProblemType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.1.6 AirInterfaceCurrentPerformance

Qualified Name: MicrowaveModel::ObjectClasses::AirInterface::AirInterfaceCurrentPerformance

Aggregated performance information of the air interface at a particular moment.

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 7: Attributes for AirInterfaceCurrentPerformance

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
currentPerformanceDataList	AirInterfaceCurrentPerformanceType ./.	1..2	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	At least values of the counters, which are reset every 15 minutes, are to be provided. If available, the current values of the counters, which are reset every 24 hour, can be provided, too.

15.1.7 AirInterfaceHistoricalPerformances

Qualified Name: MicrowaveModel::ObjectClasses::AirInterface::AirInterfaceHistoricalPerformances

Aggregated performance information of the air interface for a pre-defined measurement interval.

Applied stereotypes:
- OpenModelClass
    - objectCreationNotification: NO
    - objectDeletionNotification: NO
    - support: MANDATORY

Table 8: Attributes for AirInterfaceHistoricalPerformances

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
historicalPerformanceDataList	AirInterfaceHistoricalPerformanceType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.1.8 CoChannelGroup

Qualified Name: MicrowaveModel::ObjectClasses::AirInterface::CoChannelGroup

Required for configuring XPIC, MIMO and ALIC.

Applied stereotypes:

- OpenModelClass
  - objectCreationNotification: YES
  - objectDeletionNotification: YES
  - support: MANDATORY

Table 9: Attributes for CoChannelGroup

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
coChannelGroupId	UniversalId ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	
_airInterfaceList	LogicalTerminationPoint ./.	0..*	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	List of air interfaces, which are part of the co-channel (XPIC, MIMO, ALIC) group.
sortOfCoChannelGroup	String Kind of co-channel group not specified.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Type of group of air interfaces with the same transmit and receive frequency. The values shall be chosen from the following _list:'XPIC', 'MIMO', 'ALIC';
_logicalterminationpoint	LogicalTerminationPoint ./.	0..*	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NA • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY Deprecated	See referenced class

15.2 Structure_Pacs

15.2.1 PureEthernetStructure_Pac

15.2.1.1   MW_PureEthernetStructure_Pac

Qualified Name: MicrowaveModel::ObjectClasses::PureEthernetStructure::MW_PureEthernetStructure_Pac

The pureEthernetStructure_Pac and its attached classes MUST be provided on management interfaces of microwave devices, which are transporting Ethernet traffic only.

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Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: YES
  - objectDeletionNotification: YES
  - support: CONDITIONAL_MANDATORY
  - condition: pure-ethernet In case the microwave device allows using the entire air interface capacity for Ethernet transport only, it has to support this feature on its management interface.

Table 10: Attributes for MW_PureEthernetStructure_Pac

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_layerProtocol	LayerProtocol ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	CoreModel-CoreNetworkModule-ObjectClasses:NetworkElement/_ltpRefList/_lpList/uuid
_pureEthernetStructureCapability	PureEthernetStructureCapability ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_pureEthernetStructureConfiguration	PureEthernetStructureConfiguration ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_pureEthernetStructureStatus	PureEthernetStructureStatus ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_pureEthernetStructureCurrentProblems	PureEthernetStructureCurrentProblems ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_pureEthernetStructureCurrentPerformance	PureEthernetStructureCurrentPerformance ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_pureEthernetStructureHistoricalPerformances	PureEthernetStructureHistoricalPerformances ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

15.2.1.2 PureEthernetStructureCapability

Qualified Name: MicrowaveModel::ObjectClasses::PureEthernetStructure::PureEthernetStructureCapability

Describes the logical structuring of the physical capacity provided by a pure Ethernet microwave device. Segmentation is not available. No fixed segment size. No TDM transport.

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 11: Attributes for PureEthernetStructureCapability

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
structureId	UniversalId ./.	1	R	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Identifies the Structure for bundling and container.
supportedAlarmList	String Supported alarms not yet defined.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Available alarms to be listed. Mandatory:non. Names are to be separated by commas. Further alarms might be added by the vendor.
supportedAlarms	String Supported alarms not yet defined.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY Deprecated	Available alarms to be listed. Mandatory:non. Names are to be separated by commas. Further alarms might be added by the device.

15.2.1.3 PureEthernetStructureConfiguration

Qualified Name: MicrowaveModel::ObjectClasses::PureEthernetStructure::PureEthernetStructureConfiguration

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 12: Attributes for PureEthernetStructureConfiguration

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
performanceMonitoringCollectionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Enables measurement, collection, storage and access to performance data.
problemKindSeverityList	StructureProblemSeverityType ./.	0..*	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Severity of the type of problem to be configured.

15.2.1.4   PureEthernetStructureStatus

Qualified Name: MicrowaveModel::ObjectClasses::PureEthernetStructure::PureEthernetStructureStatus
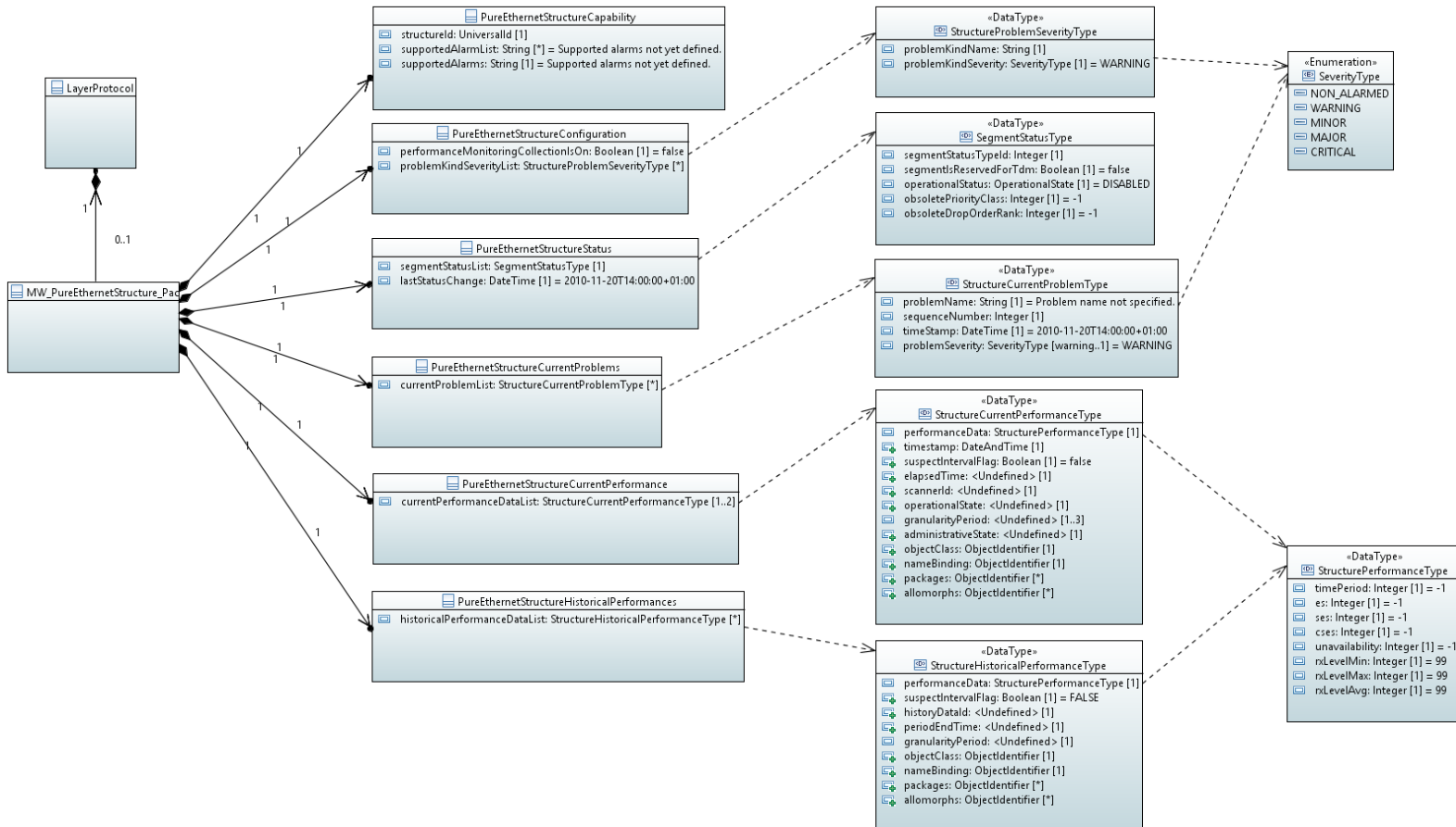

Applied stereotypes:
- OpenModelClass
    - objectCreationNotification: NO
    - objectDeletionNotification: NO
    - support: MANDATORY

Table 13: Attributes for PureEthernetStructureStatus

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
segmentStatusList	SegmentStatusType ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Status of the Ethernet transport segment. Always just one segment.
lastStatusChange	DateTime 2010-11-20T14:00:00+01:00	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Time and date of the last update of the status information. _format:yyyyMMddhhmmss.s[Z|{+|-}HHMm]; yyyy='0000'..'9999' year; MM='01'..'12' month; dd='01'..'31' day; hh='00'..'23' hour; mm='00'..'59' minute; ss='00'..'59' second; s='.0'..'.9'tenth of second (set to '.0' if EMS or NE cannot support this granularity); Z='Z' indicates UTC (rather than local time); {+|-}='+' or '-' delta from UTC; HH='00'..'23' time zone difference in hours; Mm='00'..'59' time zone difference in minutes.

15.2.1.5   PureEthernetStructureCurrentProblems

Qualified Name: MicrowaveModel::ObjectClasses::PureEthernetStructure::PureEthernetStructureCurrentProblems

Applied stereotypes:
- OpenModelClass
    - objectCreationNotification: NO
    - objectDeletionNotification: NO
  - support: MANDATORY

Table 14: Attributes for PureEthernetStructureCurrentProblems

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
currentProblemList	StructureCurrentProblemType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.2.1.6   PureEthernetStructureCurrentPerformance

Qualified Name: MicrowaveModel::ObjectClasses::PureEthernetStructure::PureEthernetStructureCurrentPerformance

Aggregated performance information of the structure of an pure Ethernet microwave at a particular moment.

Applied stereotypes:
- OpenModelClass
    - objectCreationNotification: NO
    - objectDeletionNotification: NO
    - support: MANDATORY

Table 15: Attributes for PureEthernetStructureCurrentPerformance

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
currentPerformanceDataList	StructureCurrentPerformanceType ./.	1..2	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	At least values of the counters, which are reset every 15 minutes, are to be provided. If available, the current values of the counters, which are reset every 24 hour, can be provided, too.

15.2.1.7   PureEthernetStructureHistoricalPerformances

Qualified Name: MicrowaveModel::ObjectClasses::PureEthernetStructure::PureEthernetStructureHistoricalPerformances

Aggregated performance information of the structure of an pure Ethernet microwave for a pre-defined measurement interval.

Applied stereotypes:

- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 16: Attributes for PureEthernetStructureHistoricalPerformances

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
historicalPerformanceDataList	StructureHistoricalPerformanceType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.2.2 HybridMwStructure_Pac

15.2.2.1   MW_HybridMwStructure_Pac

Qualified Name: MicrowaveModel::ObjectClasses::HybridMwStructure::MW_HybridMwStructure_Pac

The HybridMwStructure_Pac and its attached classes MUST be provided on management interfaces of microwave devices, which are transporting TDM and Ethernet traffic.

Applied stereotypes:
- OpenModelClass
    - objectCreationNotification: YES
    - objectDeletionNotification: YES
    - support: CONDITIONAL_MANDATORY
    - condition: hybrid-microwave In case the microwave device allows Ethernet and native TDM transport in parallel, it has to support this feature on its management interface.

Table 17: Attributes for MW_HybridMwStructure_Pac

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_layerProtocol	LayerProtocol ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	CoreModel-CoreNetworkModule-ObjectClasses:NetworkElement/_ltpRefList/_lpList/uuid
_hybridMwStructureCapability	HybridMwStructureCapability ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_hybridMwStructureConfiguration	HybridMwStructureConfiguration ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_hybridMwStructureStatus	HybridMwStructureStatus ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_hybridMwStructureCurrentProblems	HybridMwStructureCurrent Problems ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_hybridMwStructureCurrentPerformance	HybridMwStructureCurrent Performance ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_hybridMwStructureHistoricalPerformances	HybridMwStructureHistoric alPerformances ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

15.2.2.2 HybridMwStructureCapability

Qualified Name: MicrowaveModel::ObjectClasses::HybridMwStructure::HybridMwStructureCapability

Describes the logical structuring of the physical capacity provided by a hybrid microwave device (TDM + Ethernet). Segmentation is available.
TDM transport is available.

Applied stereotypes:
• OpenModelClass

- objectCreationNotification: NO
- objectDeletionNotification: NO
- support: MANDATORY

Table 18: Attributes for HybridMwStructureCapability

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
structureId	UniversalId ./.	1	R	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Identifies the Structure for bundling and container.
supportedTdmStructureTypesList	TdmStructureType ./.	1..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Lists the TDM frame types that are supported.
supportedAlarmList	String Supported alarms not yet defined.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Available alarms to be listed. Mandatory:non. Names are to be separated by commas. Further alarms might be added by the vendor.
supportedAlarms	String Supported alarms not yet defined.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY Deprecated	Available alarms to be listed. Mandatory:non. Names are to be separated by commas. Further alarms might be added by the device.

15.2.2.3   HybridMwStructureConfiguration

Qualified Name: MicrowaveModel::ObjectClasses::HybridMwStructure::HybridMwStructureConfiguration
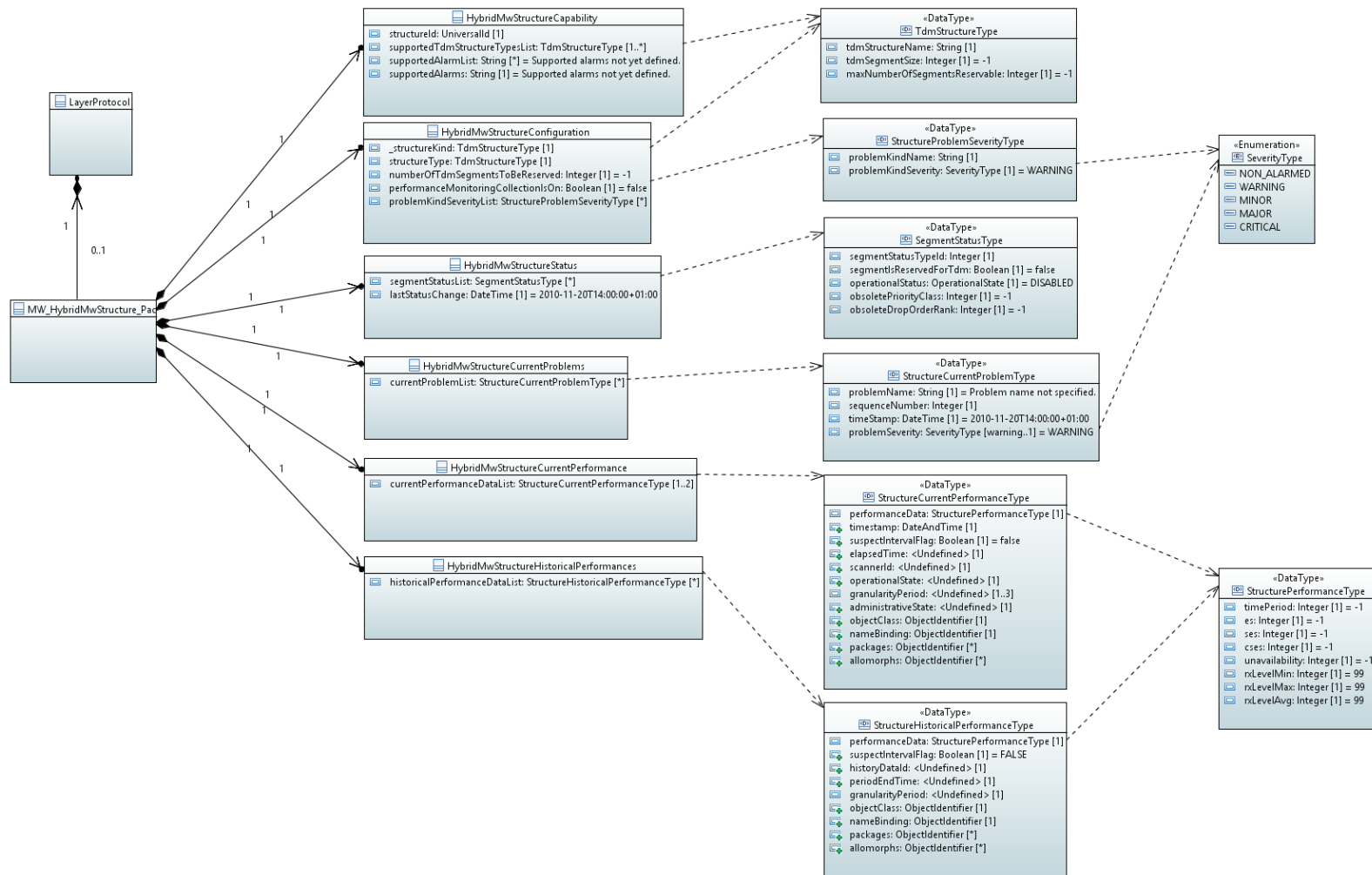
Applied stereotypes:

- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 19: Attributes for HybridMwStructureConfiguration

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_structureKind	TdmStructureType ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	TDM frame to be applied.
structureType	TdmStructureType ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY Deprecated	TDM frame to be applied.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
numberOfTdmSegmentsToBeReserved	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: no unit defined • support: MANDATORY	Allows to configure the number of segments reserved for TDM frames of the type specified in HybridMwStructure::HybridMwStructureConfiguration::structureType
performanceMonitoringCollectionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0	Enables measurement, collection, storage and access to performance data.
problemKindSeverityList	StructureProblemSeverityType ./.	0..*	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Severity of the type of problem to be configured.

15.2.2.4   HybridMwStructureStatus

Qualified Name: MicrowaveModel::ObjectClasses::HybridMwStructure::HybridMwStructureStatus

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 20: Attributes for HybridMwStructureStatus

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
segmentStatusList	SegmentStatusType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Status of each segment (all TDM and one Ethernet). Multiplicity = HybridMwStructure::StructureConfiguration::tdmReservedNumberOfSegments + 1
lastStatusChange	DateTime 2010-11-20T14:00:00+01:00	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Time and date of the last update of the status information. _format:yyyyMMddhhmmss.s[Z|{+|-}HHMm]; yyyy='0000'..'9999' year; MM='01'..'12' month; dd='01'..'31' day; hh='00'..'23' hour; mm='00'..'59' minute; ss='00'..'59' second; s='.0'..'.9'tenth of second (set to '.0' if EMS or NE cannot support this granularity); Z='Z' indicates UTC (rather than local time); {+|-}='+' or '-' delta from UTC; HH='00'..'23' time zone difference in hours; Mm='00'..'59' time zone difference in minutes.

15.2.2.5   HybridMwStructureCurrentProblems

Qualified Name: MicrowaveModel::ObjectClasses::HybridMwStructure::HybridMwStructureCurrentProblems

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 21: Attributes for HybridMwStructureCurrentProblems

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
currentProblemList	StructureCurrentProblemType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.2.2.6 HybridMwStructureCurrentPerformance

Qualified Name: MicrowaveModel::ObjectClasses::HybridMwStructure::HybridMwStructureCurrentPerformance

Aggregated performance information of the structure of a hybrid microwave at a particular moment.

Applied stereotypes:
- OpenModelClass
    - objectCreationNotification: NO
    - objectDeletionNotification: NO
    - support: MANDATORY

Table 22: Attributes for HybridMwStructureCurrentPerformance

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
currentPerformanceDataList	StructureCurrentPerformanceType ./.	1..2	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	At least values of the counters, which are reset every 15 minutes, are to be provided. If available, the current values of the counters, which are reset every 24 hour, can be provided, too.

15.2.2.7 HybridMwStructureHistoricalPerformances

Qualified Name: MicrowaveModel::ObjectClasses::HybridMwStructure::HybridMwStructureHistoricalPerformances

Aggregated performance information of the structure of a hybrid microwave for a pre-defined measurement interval.

Applied stereotypes:

- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 23: Attributes for HybridMwStructureHistoricalPerformances

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
historicalPerformanceDataList	StructureHistoricalPerformanceType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.3   Container_Pacs

15.3.1 EthernetContainer_Pac
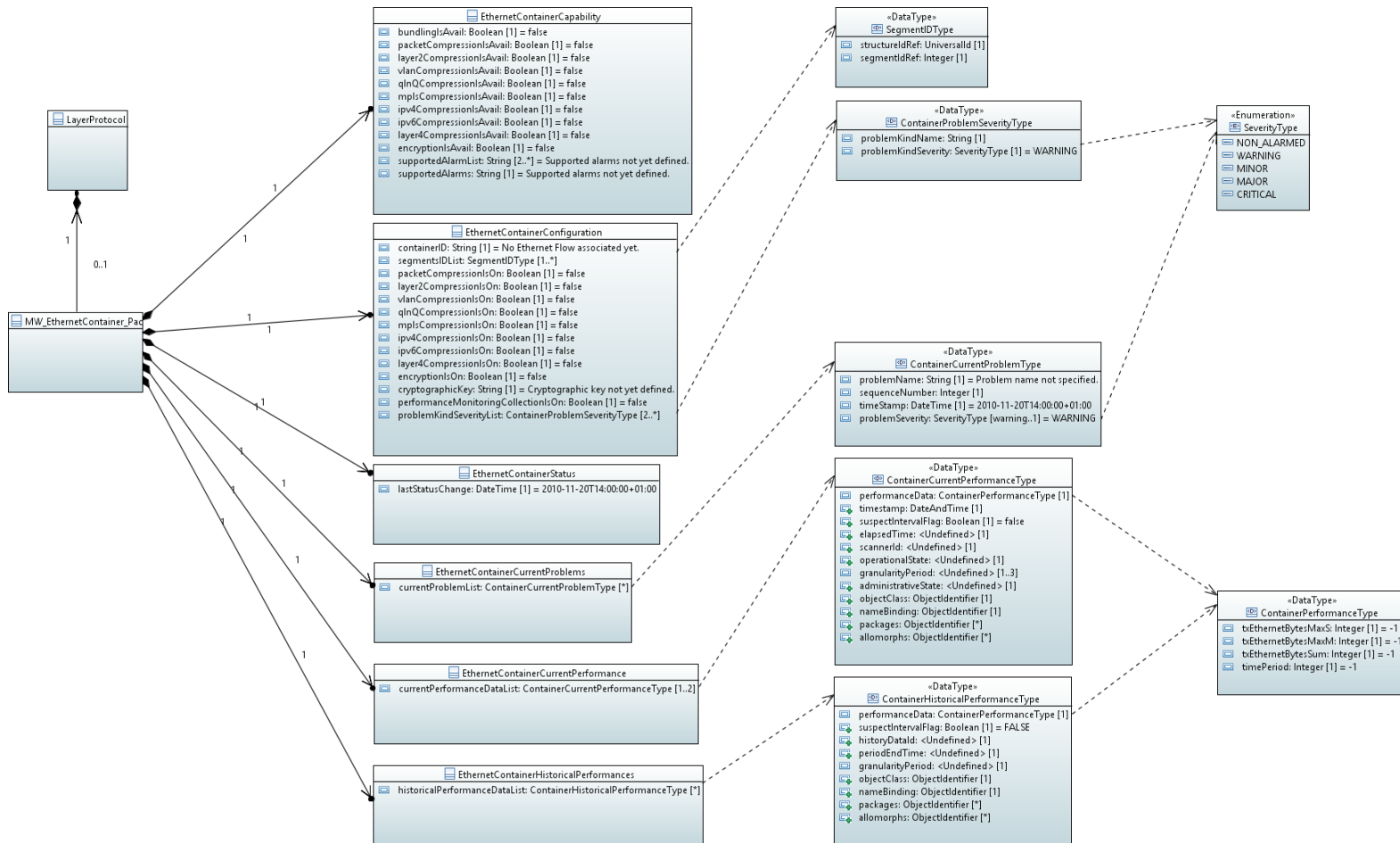
15.3.1.1   MW_EthernetContainer_Pac

Qualified Name: MicrowaveModel::ObjectClasses::EthernetContainer::MW_EthernetContainer_Pac

Applied stereotypes:

- OpenModelClass
  - objectCreationNotification: YES
  - objectDeletionNotification: YES
  - support: MANDATORY

Table 24: Attributes for MW_EthernetContainer_Pac

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_layerProtocol	LayerProtocol ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	CoreModel-CoreNetworkModule-ObjectClasses:NetworkElement/_ltpRefList/_lpList/uuid
_ethernetContainerCapability	EthernetContainerCapability ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_ethernetContainerConfiguration	EthernetContainerConfiguration ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_ethernetContainerStatus	EthernetContainerStatus ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_ethernetContainerCurrentProblems	EthernetContainerCurrentProblems ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_ethernetContainerCurrentPerformance	EthernetContainerCurrentPerformance ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_ethernetContainerHistoricalPerformances	EthernetContainerHistoricalPerformances ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

15.3.1.2   EthernetContainerCapability

Qualified Name: MicrowaveModel::ObjectClasses::EthernetContainer::EthernetContainerCapability

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 25: Attributes for EthernetContainerCapability

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
bundlingIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	This attribute has to be set on 'true', if the device allows combining resources from several air interfaces for transporting this Ethernet container.
packetCompressionIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	In case packet compression can be activated, but not configured to a certain type, packetCompressionAvail shall be set on 'true', but none of the compression level specific booleans.
layer2CompressionIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on layer 2 available at the device.
vlanCompressionIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on VLAN layer available at the device.
qInQCompressionIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on layer of a second VLAN available at the device.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
mplsCompressionIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on mpls layer available at the device.
ipv4CompressionIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on layer 3 for IPv4 available at the device.
ipv6CompressionIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on layer 3 for IPv6 available at the device.
layer4CompressionIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on layer 4 (TCP and UDP header) available at the device.
encryptionIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Shall be marked 'true', if Ethernet payload encryption is available.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
supportedAlarmList	String Supported alarms not yet defined.	2..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0	Available alarms to be listed. Mandatory:'framingIsFaulty' and 'containerIsDown'. Further alarms might be added by the vendor.
supportedAlarms	String Supported alarms not yet defined.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY Deprecated	Available alarms to be listed. Mandatory:'framingIsFaulty' and 'containerIsDown'. Further alarms might be added by the device.

15.3.1.3   EthernetContainerConfiguration

Qualified Name: MicrowaveModel::ObjectClasses::EthernetContainer::EthernetContainerConfiguration

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 26: Attributes for EthernetContainerConfiguration

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
containerID	String No Ethernet Flow associated yet.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	ContainterID in Netconf must be the same as EthernetPortID in OpenFlow so a connection can be made between the two items, which separately exist in the controller.
segmentsIDList	SegmentIDType ./.	1..*	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Lists the segments used for transporting this Ethernet container. In case EthernetContainer::ContainerCapability::bundlingIsAvail==0, all TypeDefinitions::segmentIdType::structureId must be identical in the list.
packetCompressionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	In case packet compression is activated, but no type is activated, it is assumed that the device chooses the optimum.
layer2CompressionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on layer 2 configured at the device.
vlanCompressionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on VLAN layer configured at the device.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
qInQCompressionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on layer of a second VLAN configured at the device.
mplsCompressionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on MPLS layer configured at the device.
ipv4CompressionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on layer 3 for IPv4 configured at the device.
ipv6CompressionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on layer 3 for IPv6 configured at the device.
layer4CompressionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Packet compression on layer 4 (TCP and UDP header) configured at the device.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
encryptionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Activates encryption of the Ethernet payload.
cryptographicKey	String Cryptographic key not yet defined.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Key for transforming plaintext into cipher text data.
performanceMonitoringCollectionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Enables measurement, collection, storage and access to performance data.
problemKindSeverityList	ContainerProblemSeverityType ./.	2..*	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Severity of the problem to be configured.

15.3.1.4   EthernetContainerStatus

Qualified Name: MicrowaveModel::ObjectClasses::EthernetContainer::EthernetContainerStatus

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 27: Attributes for EthernetContainerStatus

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
lastStatusChange	DateTime 2010-11-20T14:00:00+01:00	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Time the Container entered its current operational status. _format:yyyyMMddhhmmss.s[Z|{+|-}HHMm]; yyyy='0000'..'9999' year; MM='01'..'12' month; dd='01'..'31' day; hh='00'..'23' hour; mm='00'..'59' minute; ss='00'..'59' second; s='.0'..'.9'tenth of second (set to '.0' if EMS or NE cannot support this granularity); Z='Z' indicates UTC (rather than local time); {+|-}='+' or '-' delta from UTC; HH='00'..'23' time zone difference in hours; Mm='00'..'59' time zone difference in minutes.

15.3.1.5   EthernetContainerCurrentProblems

Qualified Name: MicrowaveModel::ObjectClasses::EthernetContainer::EthernetContainerCurrentProblems

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 28: Attributes for EthernetContainerCurrentProblems

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
currentProblemList	ContainerCurrentProblemType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.3.1.6 EthernetContainerCurrentPerformance

Qualified Name: MicrowaveModel::ObjectClasses::EthernetContainer::EthernetContainerCurrentPerformance

Aggregated performance information of the Ethernet container at a particular moment.

Applied stereotypes:
- OpenModelClass
    - objectCreationNotification: NO
    - objectDeletionNotification: NO
    - support: MANDATORY

Table 29: Attributes for EthernetContainerCurrentPerformance

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
currentPerformanceDataList	ContainerCurrentPerformanceType ./.	1..2	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.3.1.7 EthernetContainerHistoricalPerformances

Qualified Name: MicrowaveModel::ObjectClasses::EthernetContainer::EthernetContainerHistoricalPerformances

Aggregated performance information of the Ethernet container for a pre-defined measurement interval.

Applied stereotypes:

- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 30: Attributes for EthernetContainerHistoricalPerformances

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
historicalPerformanceDataList	ContainerHistoricalPerformanceType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.3.2 TdmContainer_Pac

15.3.2.1   MW_TdmContainer_Pac

Qualified Name: MicrowaveModel::ObjectClasses::TdmContainer::MW_TdmContainer_Pac

The TdmContainer_Pac and its attached classes MUST be provided on management interfaces of microwave devices, which are transporting TDM traffic.

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: YES
  - objectDeletionNotification: YES
  - support: CONDITIONAL_MANDATORY
  - condition: hybrid-microwave In case the microwave device allows Ethernet and native TDM transport in parallel, it has to support this feature on its management interface.

Table 31: Attributes for MW_TdmContainer_Pac

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_layerProtocol	LayerProtocol ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	CoreModel-CoreNetworkModule-ObjectClasses:NetworkElement/_ltpRefList/_lpList/uuid
_tdmContainerCapability	TdmContainerCapability ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_tdmContainerConfiguration	TdmContainerConfiguration ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_tdmContainerStatus	TdmContainerStatus ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_tdmContainerCurrentProblems	TdmContainerCurrentProblems ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_tdmContainerCurrentPerformance	TdmContainerCurrentPerformance ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_tdmContainerHistoricalPerformances	TdmContainerHistoricalPerformances ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

15.3.2.2   TdmContainerCapability

Qualified Name: MicrowaveModel::ObjectClasses::TdmContainer::TdmContainerCapability

Bundling is not available.

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO

- objectDeletionNotification: NO
- support: MANDATORY

Table 32: Attributes for TdmContainerCapability

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
supportedTdmContainerTypesList	TdmContainerType ./.	1..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Lists the TDM containers that are supported.
supportedAlarmList	String Supported alarms not yet defined.	2..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this feature for allowing clients with v1.1 managing servers with v1.0.	Available alarms to be listed. Mandatory:'framingIsFaulty' and 'containerIsDown'. Further alarms might be added by the vendor.
supportedAlarms	String Supported alarms not yet defined.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY Deprecated	Available alarms to be listed. Mandatory:'framingIsFaulty' and 'containerIsDown'. Further alarms might be added by the device.

15.3.2.3   TdmContainerConfiguration

Qualified Name: MicrowaveModel::ObjectClasses::TdmContainer::TdmContainerConfiguration
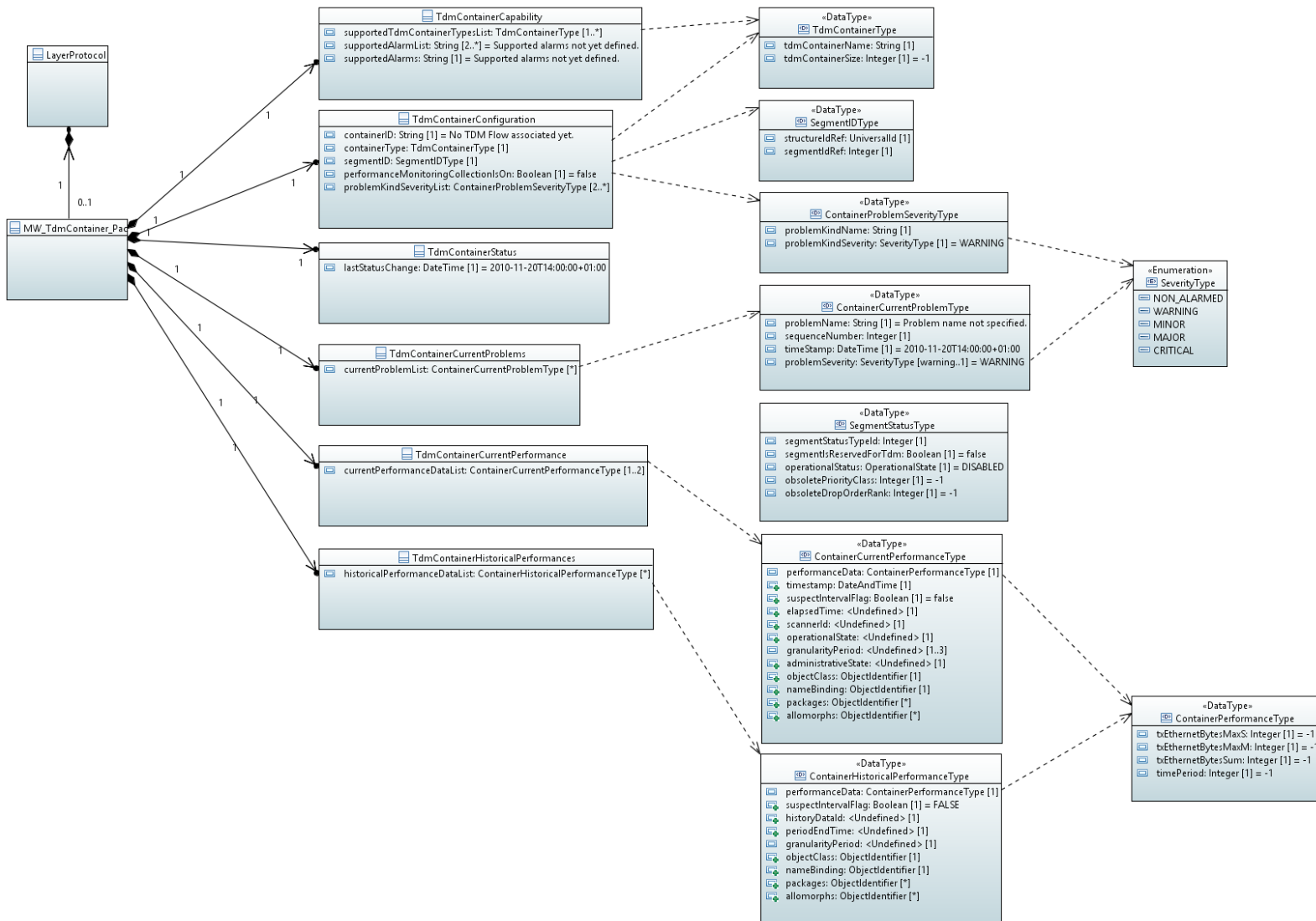
Applied stereotypes:
- OpenModelClass

- objectCreationNotification: NO
- objectDeletionNotification: NO
- support: MANDATORY

Table 33: Attributes for TdmContainerConfiguration

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
containerID	String No TDM Flow associated yet.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	ContainterID in Netconf must be the same as TDM Flow ID so a connection can be made between the two items, which separately exist in the controller.
containerType	TdmContainerType ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Type of TDM container.
segmentID	SegmentIDType ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Multiplicity = 1; One segment per TDM container; Type of segment must match type of container;
performanceMonitoringCollectionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Enables measurement, collection, storage and access to performance data.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
problemKindSeverityList	ContainerProblemSeverityType ./.	2..*	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Severity of the problem to be configured.

15.3.2.4   TdmContainerStatus

Qualified Name: MicrowaveModel::ObjectClasses::TdmContainer::TdmContainerStatus

Applied stereotypes:
- OpenModelClass
    - objectCreationNotification: NO
    - objectDeletionNotification: NO
    - support: MANDATORY

Table 34: Attributes for TdmContainerStatus

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
lastStatusChange	DateTime 2010-11-20T14:00:00+01:00	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Time the Container entered its current operational status. _format:yyyyMMddhhmmss.s[Z|{+|-}HHMm]; yyyy='0000'..'9999' year; MM='01'..'12' month; dd='01'..'31' day; hh='00'..'23' hour; mm='00'..'59' minute; ss='00'..'59' second; s='.0'..'.9'tenth of second (set to '.0' if EMS or NE cannot support this granularity); Z='Z' indicates UTC (rather than local time); {+|-}='+' or '-' delta from UTC; HH='00'..'23' time zone difference in hours; Mm='00'..'59' time zone difference in minutes.

15.3.2.5   TdmContainerCurrentProblems

Qualified Name: MicrowaveModel::ObjectClasses::TdmContainer::TdmContainerCurrentProblems

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 35: Attributes for TdmContainerCurrentProblems

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
currentProblemList	ContainerCurrentProblemType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.3.2.6   TdmContainerCurrentPerformance

Qualified Name: MicrowaveModel::ObjectClasses::TdmContainer::TdmContainerCurrentPerformance

Aggregated performance information of the TDM container at a particular moment.

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 36: Attributes for TdmContainerCurrentPerformance

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
currentPerformanceDataList	ContainerCurrentPerformanceType ./.	1..2	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	At least values of the counters, which are reset every 15 minutes, are to be provided. If available, the current values of the counters, which are reset every 24 hour, can be provided, too.

15.3.2.7 TdmContainerHistoricalPerformances

Qualified Name: MicrowaveModel::ObjectClasses::TdmContainer::TdmContainerHistoricalPerformances

Aggregated performance information of the TDM container for a pre-defined measurement interval.

Applied stereotypes:
- OpenModelClass
    - objectCreationNotification: NO
    - objectDeletionNotification: NO
    - support: MANDATORY

Table 37: Attributes for TdmContainerHistoricalPerformances

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
historicalPerformanceDataList	ContainerHistoricalPerformanceType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.4   AirInterfaceHsb
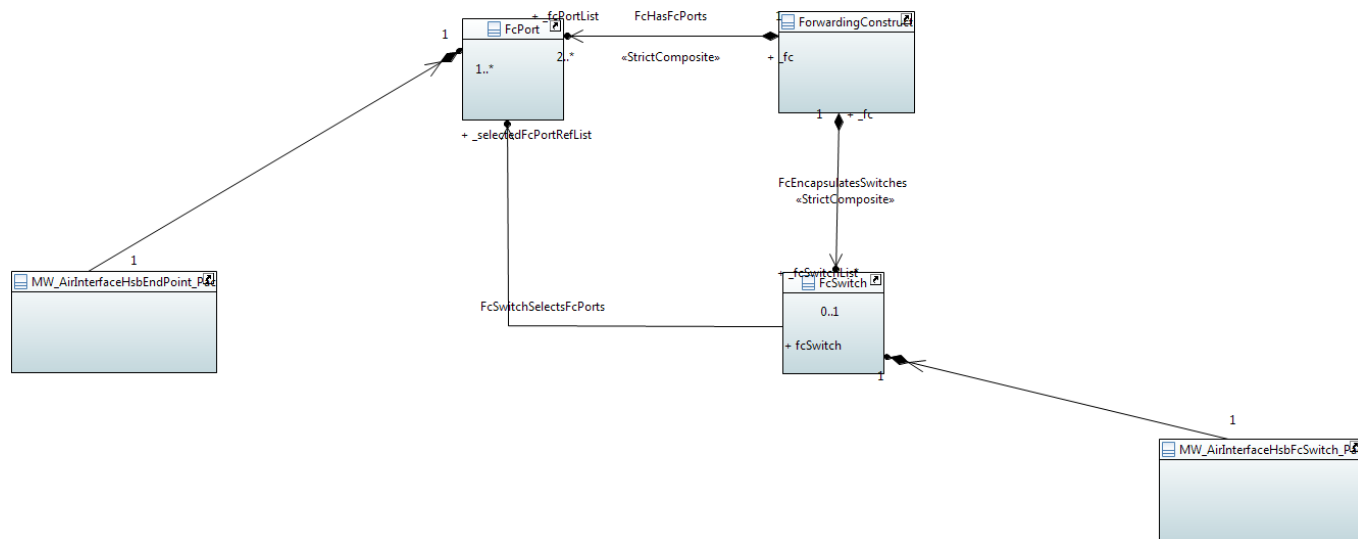
15.4.1 MW_AirInterfaceHsbFcSwitch_Pac

Qualified Name: MicrowaveModel::ObjectClasses::AirInterfaceHsb::MW_AirInterfaceHsbFcSwitch_Pac

Represents and defines a protection switch structure encapsulated in the forwarding construct. Essentially performs the function of Protection Group. Associates to 2 or more Endpoints each playing the role of a Protection Unit. One or more protection EndPoints (standby/backup) provide protection for one or more working (i.e. regular/main/preferred) Endpoints where either protection or working can feed one or more protected Endpoint. May be used in revertive or non-revertive (symmetric) mode. When in revertive mode may define waitToRestore time. May be used in one of several modes including source switch, destination switched, source and destination switched etc (covering cases such as 1+1 ane 1:1). May be lockout (prevented from switching), force switched or manual switched. Will indicate switch state and change of state.

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: YES
  - objectDeletionNotification: YES
  - support: MANDATORY

Table 38: Attributes for MW_AirInterfaceHsbFcSwitch_Pac

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
protType	ProtectionType HSB	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Indicates the protection scheme that is used for the ProtectionGroup.
airInterfaceHsbConfigurationIsFaultySeverity	SeverityType WARNING	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	The level of severity of an airInterfaceHsbConfigurationIsFaulty alarm shall be chosen from an enumeration.
airInterfaceHsbIsPartlyDownSeverity	SeverityType WARNING	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	The level of severity for one link out of the HSB configuration being down shall be chosen from an enumeration.
airInterfaceHsbIsDownSeverity	SeverityType WARNING	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	The level of severity of the total HSB configuration being down shall be chosen from an enumeration.
_fcswitch	FcSwitch ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

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15.4.2 MW_AirInterfaceHsbEndPoint_Pac

Qualified Name: MicrowaveModel::ObjectClasses::AirInterfaceHsb::MW_AirInterfaceHsbEndPoint_Pac

The EndPoint (EP) object class models the access to the FC function. Each EndPoint instance has a role (e.g., working, protection, protected, hub, spoke, leaf, root, etc.) with respect to the FC function. The association of the FC to LTPs is made via EndPoints (essentially the ports of the FC) where each EndPoint (EP) of the FC has a role in the context of the FC. The traffic forwarding between the associated End PointsEPs of the FC depends upon the type of FC and may be associated with FCSwitch object instances. In cases where there is protection conveys the protecting role of the access to the FC. The EP replaces the Protection Unit of a traditional protection model. It represents a protected (resilient/reliable) point or a protecting (unreliable working or protection) point.

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: YES
  - objectDeletionNotification: YES
  - support: MANDATORY

Table 39: Attributes for MW_AirInterfaceHsbEndPoint_Pac

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
role	RoleType WORKING	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	
_endpoint	FcPort ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

15.5   AirInterfaceDiversity_Pac

15.5.1 MW_AirInterfaceDiversity_Pac

Qualified Name: MicrowaveModel::ObjectClasses::AirInterfaceDiversity::MW_AirInterfaceDiversity_Pac

Applied stereotypes:

- OpenModelClass
  - objectCreationNotification: YES

- objectDeletionNotification: YES
- support: MANDATORY

Table 40: Attributes for MW_AirInterfaceDiversity_Pac

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_layerProtocol	LayerProtocol ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	CoreModel-CoreNetworkModule-ObjectClasses:NetworkElement/_ltpRefList/_lpList/uuid
_airInterfaceDiversityCapability	AirInterfaceDiversityCapability ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_airInterfaceDiversityConfiguration	AirInterfaceDiversityConfiguration ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_airInterfaceDiversityStatus	AirInterfaceDiversityStatus ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_airInterfaceDiversityCurrentProblems	AirInterfaceDiversityCurrentProblems ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_airInterfaceDiversityCurrentPerformance	AirInterfaceDiversityCurrentPerformance ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class
_airInterfaceDiversityHistoricalPerformances	AirInterfaceDiversityHistoricalPerformances ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	See referenced class

15.5.2 AirInterfaceDiversityCapability

Qualified Name: MicrowaveModel::ObjectClasses::AirInterfaceDiversity::AirInterfaceDiversityCapability

Describes the capabilities in implementing different types of air interface diversity.
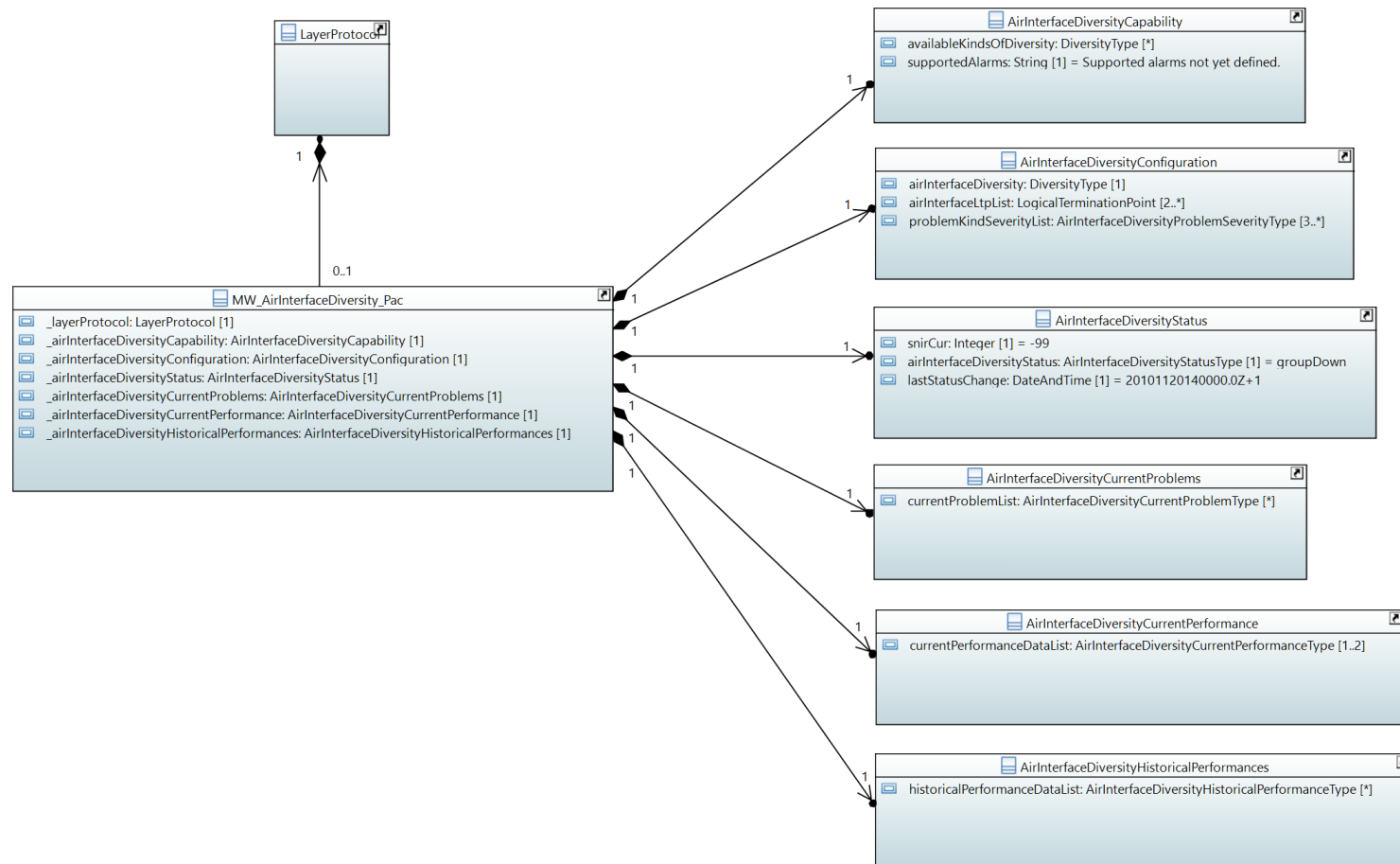
Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 41: Attributes for AirInterfaceDiversityCapability

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
availableKindsOfDiversity	DiversityType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Available types of diversity to be listed.
supportedAlarmList	String Supported alarms not yet defined.	2..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Available alarms to be listed. Mandatory:'airInterfaceDiversityConfigurationIsPartlyDown' (at least one air interface is down, but not all of them) and 'airInterfaceDiversityConfigurationIsDown' (all air interfaces are down). Further alarms might be added by the vendor.
supportedAlarms	String Supported alarms not yet defined.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY Deprecated	Available alarms to be listed. Mandatory:'airInterfaceDiversityConfigurationIsPartlyDown' (at least one air interface is down, but not all of them) and 'airInterfaceDiversityConfigurationIsDown' (all air interfaces are down). Further alarms might be added by the device. Names are to be separated by commas.

15.5.3 AirInterfaceDiversityConfiguration

Qualified Name: MicrowaveModel::ObjectClasses::AirInterfaceDiversity::AirInterfaceDiversityConfiguration

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 42: Attributes for AirInterfaceDiversityConfiguration

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
airInterfaceDiversity	DiversityType ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Type of air interface diversity configured at the link.
_airInterfaceLtpList	LogicalTerminationPoint ./.	2..*	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	_multiplicity:2-ThisAirInterfaceDiversity::AirInterfaceDiversityConfiguration::airInterfaceDiversity::diversityType::numberOfAirInterfacesMax
performanceMonitoringCollectionIsOn	Boolean false	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Enables measurement, collection, storage and access to performance data.
thresholdCrossAlarmList	ThresholdCrossAlarmType ./.	0..6	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	List of threshold cross alarms to be configured.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
problemKindSeverityList	AirInterfaceDiversityProblemSeverityType ./.	3..*	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Severity of the problem to be configured.

15.5.4 AirInterfaceDiversityStatus

Qualified Name: MicrowaveModel::ObjectClasses::AirInterfaceDiversity::AirInterfaceDiversityStatus

Applied stereotypes:
- OpenModelClass
    - objectCreationNotification: NO
    - objectDeletionNotification: NO
    - support: MANDATORY

Table 43: Attributes for AirInterfaceDiversityStatus

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
snirCur	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Currently measured signal to (noise+interference) ratio of the combined signals.
airInterfaceDiversityStatus	AirInterfaceDiversityStatusType GROUP_DOWN	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Status of the air interface bundle.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
lastStatusChange	DateTime 2010-11-20T14:00:00+01:00	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Time the Diversity Group entered its current operational status. _format:yyyyMMddhhmmss.s[Z|{+|-}HHMm]; yyyy='0000'..'9999' year; MM='01'..'12' month; dd='01'..'31' day; hh='00'..'23' hour; mm='00'..'59' minute; ss='00'..'59' second; s='.0'..'.9'tenth of second (set to '.0' if EMS or NE cannot support this granularity); Z='Z' indicates UTC (rather than local time); {+|-}='+' or '-' delta from UTC; HH='00'..'23' time zone difference in hours; Mm='00'..'59' time zone difference in minutes.

15.5.5 AirInterfaceDiversityCurrentProblems

Qualified Name: MicrowaveModel::ObjectClasses::AirInterfaceDiversity::AirInterfaceDiversityCurrentProblems

Applied stereotypes:
- OpenModelClass
    - objectCreationNotification: NO
    - objectDeletionNotification: NO
    - support: MANDATORY

Table 44: Attributes for AirInterfaceDiversityCurrentProblems

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
currentProblemList	AirInterfaceDiversityCurrentProblemType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.5.6 AirInterfaceDiversityCurrentPerformance

Qualified Name: MicrowaveModel::ObjectClasses::AirInterfaceDiversity::AirInterfaceDiversityCurrentPerformance

Aggregated performance information of the air interface diversity configuration at a particular moment.

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 45: Attributes for AirInterfaceDiversityCurrentPerformance

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
currentPerformanceDataList	AirInterfaceDiversityCurrentPerformanceType ./.	1..2	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	At least values of the counters, which are reset every 15 minutes, are to be provided. If available, the current values of the counters, which are reset every 24 hour, can be provided, too.

15.5.7 AirInterfaceDiversityHistoricalPerformances

Qualified Name: MicrowaveModel::ObjectClasses::AirInterfaceDiversity::AirInterfaceDiversityHistoricalPerformances

Aggregated performance information of the air interface diversity configuration for a pre-defined measurement interval.

Applied stereotypes:
- OpenModelClass
  - objectCreationNotification: NO
  - objectDeletionNotification: NO
  - support: MANDATORY

Table 46: Attributes for AirInterfaceDiversityHistoricalPerformances

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
historicalPerformanceDataList	AirInterfaceDiversityHistoricalPerformanceType ./.	0..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.6 Data Types

15.6.1 ChannelPlanType

Qualified Name: MicrowaveModel::TypeDefinitions::ChannelPlanType

Table 47: Attributes for ChannelPlanType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
supportedChannelPlan	String ./.	1	R	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Unique name (e.g. ECC/REC/(01)04_Annex 5) of a document, which describes a frequency grid that can be adjusted at the air interface. Corresponding channel plans to be delivered by the hardware vendor and to be stored by the operator in an controller/application attached database.
transmissionModeList	TransmissionModeType ./.	1..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
duplexDistanceIsVariable	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	To be set on 'true', if the distance between transmitted and received frequency is variable.
duplexDistanceList	Integer -1	1..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Distance between transmitted and received frequency. To be filled with single value, in case duplex distance is not variable. To be filled with all configurable values, in case duplex distance is variable.
duplexDistance	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: MANDATORY Deprecated	Distance between transmitted and received frequency.
autoFreqSelectIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	In case the microwave radio is capable of automatically selecting the transmit frequency in unlicensed bands, this field shall contain a 'true'.

15.6.2 TransmissionModeType

Qualified Name: MicrowaveModel::TypeDefinitions::TransmissionModeType

Table 48: Attributes for TransmissionModeType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
transmissionModeId	UniversalId ./.	1	R	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Indentifies the transmissionMode for internal reference.
transmissionModeName	String Name of the transmission mode not yet defined.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Name of the transmission mode. BBBB-m*-i*/t*-r*. B=four digits of channel bandwidth in MHz. m*=required number of digits for modulation name. (i*/t*=code rate.) i*=required number of digits for number of information bits. t*=required number of digits for total bits. r*=required number of digits for rate reduction factor. Example: 028-4QAM-188/204-1
channelBandwidth	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kHz • support: MANDATORY	Bandwidth of the transmit channel. The value shall be expressed explicitly (means in kHz) not as a reference to an international agreement. The values shall be chosen from the following _list: 3.500, 7.000, 14.000, 27.500, 28.000, 29.000, 29.650, 30.000, 40.000, 50.000, 55.000, 56.000, 59.300, 60.000, 80.000, 100.000, 112.000, 120.000, 150.000, 200.000, 250.000, 500.000, 750.000, 1.000.000, 1.250.000, 1.500.000, 1.750.000, 2.000.000;
modulationScheme	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: symbols • support: MANDATORY	Modulation scheme, which is base to the other characteristics described in the same transmissionModeType data type. The modulation scheme shall be described by the number of states in the phase diagram (e.g. BPSK->'2' or 256QAM->'256').

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
codeRate	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: % • support: MANDATORY	Code rate of the coding scheme in % (Net bit rate ≤ Gross bit rate · code rate).
symbolRateReductionFactor	Integer 1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Reduction factor for the symbol rate. Example: value would be 4 for 1/4BPSK.
txPowerMin	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Value of the minimum transmit power the modem can operate in dBm.
txPowerMax	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Value of the maximum transmit power the modem can operate in dBm.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
rxThreshold	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: dBm • support: MANDATORY	Value of the receive level required to decode the received signal with a Bit Error Rate of 1e-6 or less.
amUpshiftLevel	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Value of the receive level that has to be exceeded to shift into a higher modulation scheme.
amDownshiftLevel	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Value of the receive level that has to be exceeded for not shifting into a lower modulation scheme.
xpicIsAvail	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	In case this air interface type is capable of XPIC, this field shall contain a 'true'. This information shall purely relate to capabilities of the equipment type, but not to the operational capability of a specific hardware composition on site. Means for example that this attribute might contain a 'true' statement, even if an additional cable would have been required to actually operate XPIC in a specific case.

15.6.3 AirInterfaceProblemSeverityType

Qualified Name: MicrowaveModel::TypeDefinitions::AirInterfaceProblemSeverityType

Table 49: Attributes for AirInterfaceProblemSeverityType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
problemKindName	String ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: NA • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Name of the alarm according to AirInterface::AirInterfaceCapability::supportedAlarms
problemKindSeverity	SeverityType WARNING	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Severity of this type of alarm.

15.6.4 AirInterfaceCurrentProblemType

Qualified Name: MicrowaveModel::TypeDefinitions::AirInterfaceCurrentProblemType

Table 50: Attributes for AirInterfaceCurrentProblemType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
problemName	String Problem name not specified.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Name of the alarm according to AirInterface::AirInterfaceCapability::supportedAlarms

15.6.5 AirInterfacePerformanceType

Qualified Name: MicrowaveModel::TypeDefinitions::AirInterfacePerformanceType

Consolidated performance information of the air interface.

Table 51: Attributes for AirInterfacePerformanceType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
es	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY	Number of errored seconds.
ses	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY	Number of severely errored seconds.
cses	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY	Number of consecutive severely errored seconds.
unavailability	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY	Total time of unavailability in seconds.
txLevelMin	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Minimum transmit power. Signed integers are required.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
txLevelMax	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Maximum transmit power. Signed integers are required.
txLevelAvg	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Averaged transmit power. Signed integers are required.
rxLevelMin	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Minimum receive level. Signed integers are required.
rxLevelMax	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Maximum receive level. Signed integers are required.
rxLevelAvg	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: MANDATORY	Averaged receive level. Signed integers are required.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
timeXStatesList	TimeXStatesType ./.	1..*	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Time period the transmitter operated in the respective transmission mode.
time2States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	Sum of all seconds the transmitter operated in e.g. BPSK.
time4StatesS	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time4States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
time8States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time16StatesS	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time16States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time32States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
time64States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time128States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time256States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time512States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
time512StatesL	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time1024States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time1024StatesL	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time2048States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
time2048StatesL	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time4096States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time4096StatesL	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
time8192States	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
time8192StatesL	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY Deprecated	
snirMin	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Minimum signal to (noise+interference) ratio.
snirMax	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Maximum signal to (noise+interference) ratio.
snirAvg	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Averaged signal to (noise+interference) ratio.
xpdMin	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Minimum cross polarization discrimination.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
xpdMax	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Maximum cross polarization discrimination.
xpdAvg	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Averaged cross polarization discrimination.
rfTempMin	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: C • support: MANDATORY	Lowest temperature (in degree Celsius) of the radio module inside the outdoor unit.
rfTempMax	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: C • support: MANDATORY	Highest temperature (in degree Celsius) of the radio module inside the outdoor unit.
rfTempAvg	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: C • support: MANDATORY	Averaged temperature (in degree Celsius) of the radio module inside the outdoor unit.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
defectBlocksSum	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: blocks • support: MANDATORY	Total number of blocks that were defect after receiving and could not be corrected by the FEC.
timePeriod	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY	Total length of the measurement period.

15.6.6 AirInterfaceCurrentPerformanceType

Qualified Name: MicrowaveModel::TypeDefinitions::AirInterfaceCurrentPerformanceType

Turns performance information into current performance information by inheriting from OTN_CurrentData.

Table 52: Attributes for AirInterfaceCurrentPerformanceType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
performanceData	AirInterfacePerformanceType ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.6.7 AirInterfaceHistoricalPerformanceType

Qualified Name: MicrowaveModel::TypeDefinitions::AirInterfaceHistoricalPerformanceType

Turns performance information into historical performance information by inheriting from OTN_HistoryData.

Table 53: Attributes for AirInterfaceHistoricalPerformanceType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
performanceData	AirInterfacePerformanceType ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.6.8 DiversityType

Qualified Name: MicrowaveModel::TypeDefinitions::DiversityType

Table 54: Attributes for DiversityType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
diversityName	String ./.	1	R	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Names to be chosen from the following list: 'spaceDiversity', 'frequencyDiversity'
numberOfAirInterfacesMax	Integer 1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: air interfaces • support: MANDATORY	Maximum number of air interfaces that could be part of this kind of diversity.

15.6.9 AirInterfaceDiversityProblemSeverityType

Qualified Name: MicrowaveModel::TypeDefinitions::AirInterfaceDiversityProblemSeverityType

Table 55: Attributes for AirInterfaceDiversityProblemSeverityType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
problemKindName	String ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: NA • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Name of the alarm according to AirInterfaceDiversity::AirInterfaceDiversityCapability::supportedAlarms
problemKindSeverity	SeverityType WARNING	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Severity of this type of alarm.

15.6.10   AirInterfaceDiversityCurrentProblemType

Qualified Name: MicrowaveModel::TypeDefinitions::AirInterfaceDiversityCurrentProblemType

Table 56: Attributes for AirInterfaceDiversityCurrentProblemType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
problemName	String Problem name not specified.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Name of the alarm according to AirInterfaceDiversity::AirInterfaceDiversityCapability::supportedAlarms

15.6.11   AirInterfaceDiversityPerformanceType

Qualified Name: MicrowaveModel::TypeDefinitions::AirInterfaceDiversityPerformanceType

Consolidated performance information of the air interface diversity group.

Table 57: Attributes for AirInterfaceDiversityPerformanceType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
snirMin	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Minimum signal to (noise+interference) ratio of the combined signals.
snirMax	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Maximum signal to (noise+interference) ratio of the combined signals.
snirAvg	Integer -99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dB • support: MANDATORY	Average signal to (noise+interference) ratio of the combined signals.

15.6.12 AirInterfaceDiversityCurrentPerformanceType

Qualified Name: MicrowaveModel::TypeDefinitions::AirInterfaceDiversityCurrentPerformanceType

Turns performance information into current performance information by inheriting from OTN_CurrentData.

Table 58: Attributes for AirInterfaceDiversityCurrentPerformanceType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
performanceData	AirInterfaceDiversityPerformanceType ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.6.13 AirInterfaceDiversityHistoricalPerformanceType

Qualified Name: MicrowaveModel::TypeDefinitions::AirInterfaceDiversityHistoricalPerformanceType

Turns performance information into historical performance information by inheriting from OTN_HistoryData.

Table 59: Attributes for AirInterfaceDiversityHistoricalPerformanceType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
performanceData	AirInterfaceDiversityPerformanceType ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.6.14 TdmStructureType

Qualified Name: MicrowaveModel::TypeDefinitions::TdmStructureType

Table 60: Attributes for TdmStructureType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
tdmStructureName	String ./.	1	R	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Names to be chosen from the following list: 'e1','t1','j1','e3','ds3','stm1','cpri1','cpri2','cpri3','cpri4','cpri5','cpri6' or 'cpri7'
tdmSegmentSize	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kbit/s • support: MANDATORY	Size of the TDM segment in kbit/s. Values to be chosen from the following list: '2048','1544','34000','44736','155520','614400','1228800','2457600','3072000','4915200','6144000' or '9830400;
maxNumberOfSegmentsReservable	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: segments • support: MANDATORY	Device specific maximum number of segments (not depending on current air interface configuration) that can be reserved for this type of segment on a single air interface.

15.6.15 StructureProblemSeverityType

Qualified Name: MicrowaveModel::TypeDefinitions::StructureProblemSeverityType

Table 61: Attributes for StructureProblemSeverityType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
problemKindName	String ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: NA • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Name of the alarm according to Structure::StructureCapability::supportedAlarms

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
problemKindSeverity	SeverityType WARNING	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Severity of this type of alarm.

15.6.16   StructureCurrentProblemType

Qualified Name: MicrowaveModel::TypeDefinitions::StructureCurrentProblemType

Table 62: Attributes for StructureCurrentProblemType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
problemName	String Problem name not specified.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Name of the alarm according to Structure::StructureCapability::supported Alarms

15.6.17   StructurePerformanceType

Qualified Name: MicrowaveModel::TypeDefinitions::StructurePerformanceType

Consolidated performance information of the Structure.

Table 63: Attributes for StructurePerformanceType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
timePeriod	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY • condition:	Total length of the measurement period in seconds.
es	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Number of errored seconds. 1+0: Same value as for single air interface. 1+1 and Diversity: Value representing the combined signals.
ses	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Number of severely errored seconds. 1+0: Same value as for single air interface. 1+1 and Diversity: Value representing the combined signals.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
cses	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Number of consecutive severely errored seconds. 1+0: Same value as for single air interface. 1+1 and Diversity: Value representing the combined signals.
unavailability	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Total time of unavailability in seconds. 1+0: Same value as for single air interface. 1+1 and Diversity: Value representing the combined signals.
rxLevelMin	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Minimum receive level. 1+0: Same value as for single air interface. 1+1: Value representing the combined signals. Diversity: To be left on default value.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
rxLevelMax	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Maximum receive level. 1+0: Same value as for single air interface. 1+1: Value representing the combined signals. Diversity: To be left on default value.
rxLevelAvg	Integer 99	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_8_BIT • unit: dBm • support: CONDITIONAL_MANDATORY • condition:revision1_1 All artifacts, which have been added in release TR-532 v1.1, have to be marked with this if-feature statement for allowing clients with v1.1 managing servers with v1.0.	Averaged receive level. 1+0: Same value as for single air interface. 1+1: Value representing the combined signals. Diversity: To be left on default value.

15.6.18 StructureCurrentPerformanceType

Qualified Name: MicrowaveModel::TypeDefinitions::StructureCurrentPerformanceType

Turns performance information into current performance information by inheriting from OTN_CurrentData.

Table 64: Attributes for StructureCurrentPerformanceType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
performanceData	StructurePerformanceType ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.6.19 StructureHistoricalPerformanceType

Qualified Name: MicrowaveModel::TypeDefinitions::StructureHistoricalPerformanceType

Turns performance information into historical performance information by inheriting from OTN_HistoryData.

Table 65: Attributes for StructureHistoricalPerformanceType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
performanceData	StructurePerformanceType ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.6.20 TdmContainerType

Qualified Name: MicrowaveModel::TypeDefinitions::TdmContainerType

Table 66: Attributes for TdmContainerType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
tdmContainerName	String ./.	1	R	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Names to be chosen from the following list: 'e1','t1','j1','e3','t3','stm1','cpri1','cpri2','cpri3','cpri4','cpri5','cpri6' or 'cpri7'
tdmContainerSize	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: kbit/s • support: MANDATORY	Capacity required for transporting this type of container (in kbit/s). Values to be chosen from the following list: '2048','1544','34000','44736','155520','614400','1228800','2457600','3072000','4915200','6144000' or '9830400;

15.6.21   SegmentIDType

Qualified Name: MicrowaveModel::TypeDefinitions::SegmentIDType

Identifies the segments, which are used to transport the container.

Table 67: Attributes for SegmentIDType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
structureIdRef	UniversalId ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
segmentIdRef	Integer ./.	1	RW	OpenModelAttribute • partOfObjectKey: 2 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: no unit defined • support: MANDATORY	Combinations of structureId and segmentId must be unique inside the device to assure that every resource is used just once.

15.6.22 SegmentStatusType

Qualified Name: MicrowaveModel::TypeDefinitions::SegmentStatusType

Table 68: Attributes for SegmentStatusType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
segmentStatusTypeId	Integer ./.	1	R	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_16_BIT • unit: no unit defined • support: MANDATORY	
segmentIsReservedForTdm	Boolean false	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	The number of segments, which is configured by Structure::StructureConfiguration::tdmReservedNumberOfSegements, has to be reserved for TDM. Starting from the lowest index value, these segments have to be marked with a 'true' in segmentIsReservedForTdm.
operationalStatus	OperationalState DISABLED	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Current operational status of each segment.

15.6.23   ContainerProblemSeverityType

Qualified Name: MicrowaveModel::TypeDefinitions::ContainerProblemSeverityType

Table 69: Attributes for ContainerProblemSeverityType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
problemKindName	String ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: NA • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Name of the alarm according to Container::ContainerCapability::supportedAlarms
problemKindSeverity	SeverityType WARNING	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Severity of this type of alarm.

15.6.24   ContainerCurrentProblemType

Qualified Name: MicrowaveModel::TypeDefinitions::ContainerCurrentProblemType

Table 70: Attributes for ContainerCurrentProblemType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
problemName	String Problem name not specified.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Name of the alarm according to Container::ContainerCapability::supportedAlarms

15.6.25 ContainerPerformanceType

Qualified Name: MicrowaveModel::TypeDefinitions::ContainerPerformanceType

Consolidated performance information of the Container.

Table 71: Attributes for ContainerPerformanceType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
txEthernetBytesMaxS	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: Bytes/s • support: MANDATORY	Counts the number of Bytes of Ethernet traffic (before header compression) transmitted within a second and keeps the highest value within the measurement period. Field to be left blank for all types of TDM containers.
txEthernetBytesMaxM	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_64_BIT • unit: Bytes/min • support: MANDATORY	Counts the number of Bytes of Ethernet traffic (before header compression) transmitted within a minute and keeps the highest value with in the measurement period. Field to be left blank for all types of TDM containers.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
txEthernetBytesSum	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_64_BIT • unit: Bytes • support: MANDATORY	Total number of Bytes of Ethernet traffic (before header compression) transmitted (in direction out of the device) during the measurement period. Field to be left blank for all types of TDM containers.
timePeriod	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY	Total length of the measurement period in seconds.

15.6.26 ContainerCurrentPerformanceType

Qualified Name: MicrowaveModel::TypeDefinitions::ContainerCurrentPerformanceType

Turns performance information into current performance information by inheriting from OTN_CurrentData.

Table 72: Attributes for ContainerCurrentPerformanceType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
performanceData	ContainerPerformanceType ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.6.27 ContainerHistoricalPerformanceType

Qualified Name: MicrowaveModel::TypeDefinitions::ContainerHistoricalPerformanceType

Turns performance information into historical performance information by inheriting from OTN_HistoryData.

Table 73: Attributes for ContainerHistoricalPerformanceType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
performanceData	ContainerPerformanceType ./.	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	

15.6.28 ThresholdCrossAlarmType

Qualified Name: MicrowaveModel::TypeDefinitions::ThresholdCrossAlarmType

Allows defining a threshold cross alarm.

Table 74: Attributes for ThresholdCrossAlarmType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
g826ValueKind	G826Type ./.	1	RW	OpenModelAttribute • partOfObjectKey: 1 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Kind of performance value that shall be equipped with a threshold alarm.
granularityPeriod	GranularityPeriodType ./.	1	RW	OpenModelAttribute • partOfObjectKey: 2 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Period of the performance data collection.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
alarmRaisingThreshold	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY	Number of events required for raising the threshold cross alarm.
alarmClearingThreshold	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: YES • isInvariant: false • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY	Number of events required for clearing the threshold cross alarm.

15.6.29 TimeXStatesType

Qualified Name: MicrowaveModel::TypeDefinitions::TimeXStatesType

Table 75: Attributes for TimeXStatesType

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
_transmissionMode	TransmissionModeType ./.	1	R	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Operated transmission mode.
time	Integer -1	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: s • support: MANDATORY	Sum of all seconds the transmitter operated the transmission mode.

15.7 Enumeration Types

15.7.1 LoopBackType

Qualified Name: MicrowaveModel::TypeDefinitions::LoopBackType

Contains Enumeration Literals:
- RF_TO_REMOTE:
  - Returning the header information of the remote site back to the remote site on the radio interface between both outdoor units.
- RF_TO_LOCAL:
  - Returning the header information of the local site back to the local site on the radio interface between both outdoor units.
- IF_TO_REMOTE:
  - Returning the header information of the remote site back to the remote site on the intermediate frequency interface between local indoor unit and outdoor unit.
- IF_TO_LOCAL:
  - Returning the header information of the local site back to the local site on the intermediate frequency interface between local indoor unit and outdoor unit.
- NONE:
- IF:
  - Intermediate Frequency on the interface between indoor and outdoor unit.
    - Deprecated
- RF:
  - Radio Frequency on the interface between outdoor unit and outdoor unit at the remote site.
    - Deprecated

15.7.2 SeverityType

Qualified Name: MicrowaveModel::TypeDefinitions::SeverityType

According to ITU-T M.3160

Contains Enumeration Literals:
- NON_ALARMED:
- WARNING:
- MINOR:

- MAJOR:
- CRITICAL:

15.7.3 PolarizationType

Qualified Name: MicrowaveModel::TypeDefinitions::PolarizationType

Contains Enumeration Literals:
- NOT_SPECIFIED:
- HORIZONTAL:
- VERTICAL:

15.7.4 ProtectionType

Qualified Name: MicrowaveModel::TypeDefinitions::ProtectionType

Contains Enumeration Literals:
- HSB:

15.7.5 RoleType

Qualified Name: MicrowaveModel::TypeDefinitions::RoleType

Contains Enumeration Literals:
- WORKING:
- PROTECTION:
- PROTECTED:

15.7.6 AirInterfaceDiversityStatusType

Qualified Name: MicrowaveModel::TypeDefinitions::AirInterfaceDiversityStatusType

Contains Enumeration Literals:
- GROUP_DOWN:

- o   All air interfaces that are members of the diversity configuration are down.
- NOT_ALL_AI_ACTIVE:
  - o   At least one, but not all of the air interfaces that are part of the diversity configuration is not working.
- ALL_AI_ACTIVE:
  - o   All air interfaces that are part of the diversity configuration are working.

15.7.7 GranularityPeriodType

Qualified Name: MicrowaveModel::TypeDefinitions::GranularityPeriodType

The enumeration with the options for granularity period of the performance data.

Contains Enumeration Literals:
- UNKNOWN:
- PERIOD-15-MIN:
- PERIOD-24-HOURS:

15.7.8 G826Type

Qualified Name: MicrowaveModel::TypeDefinitions::G826Type

Contains Enumeration Literals:
- ES:
  - o   Errored Seconds. Threshold cross alarm will relate to TypeDefinitions::AirInterfacePerformanceType::es .
- SES:
  - o   Severely Errored Seconds. Threshold cross alarm will relate to TypeDefinitions::AirInterfacePerformanceType::ses .
- CSES:
  - o   Consecutive Severely Errored Seconds. Threshold cross alarm will relate to TypeDefinitions::AirInterfacePerformanceType::cses .
- NOT_SPECIFIED:

15.8   Super Classes

15.8.1 MwCurrentProblem

Qualified Name: MicrowaveModel::ObjectClasses::SuperClasses::MwCurrentProblem
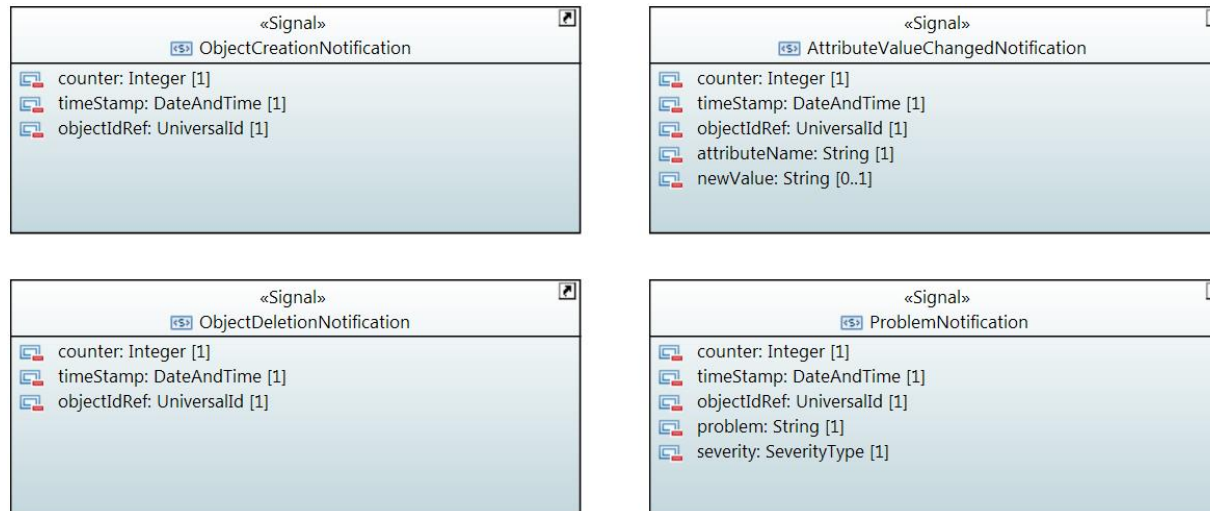
Applied stereotypes:
- OpenModelClass
    - objectCreationNotification: NO
    - objectDeletionNotification: NO
    - support: MANDATORY

Table 76: Attributes for MwCurrentProblem

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
sequenceNumber	Integer ./.	1	R	OpenModelAttribute • partOfObjectKey: 1 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: no unit defined • support: MANDATORY	Unique sequence number of the current problem object.
timeStamp	DateTime 2010-11-20T14:00:00+01:00	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Time and date of the problem. _format:yyyyMMddhhmmss.s[Z|{+|-}HHMm]; yyyy='0000'..'9999' year; MM='01'..'12' month; dd='01'..'31' day; hh='00'..'23' hour; mm='00'..'59' minute; ss='00'..'59' second; s='.0'..'.9'tenth of second (set to '.0' if EMS or NE cannot support this granularity); Z='Z' indicates UTC (rather than local time); {+|-}='+' or '-' delta from UTC; HH='00'..'23' time zone difference in hours; Mm='00'..'59' time zone difference in minutes.
problemSeverity	SeverityType WARNING	1	R	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Severity of the alarm.

15.9 Notifications

15.9.1 AttributeValueChangedNotification

Qualified Name: MicrowaveModel::Notifications::AttributeValueChangedNotification

To be sent when an attribute has changed and one or more controllers have to update their data.

Applied stereotypes:

- OpenModelNotification
  - triggerConditionList: invalid
  - support: MANDATORY

Table 77: Attributes for AttributeValueChangedNotification

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
counter	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: no unit defined • support: MANDATORY	Counts attribute value changed notifications.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
timeStamp	DateTime 2010-11-20T14:00:00+01:00	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	
objectIdRef	UniversalId ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	ID of the affected MW_AirInterface_Pac, MW_AirInterfaceDiversity_Pac, MW_Structure_Pac, MW_PureEthernetStructure_Pac, MW_HybridMwStructure_Pac, MW_Container_Pac, MW_EthernetContainer_Pac or MW_TdmContainer_Pac.
attributeName	String Attribute name not specified.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Name of the attribute that has been changed.
newValue	String New value not specified.	0..1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Attribute value converted to a string (xml, json, ...)

15.9.2 ObjectCreationNotification

Qualified Name: MicrowaveModel::Notifications::ObjectCreationNotification

To be sent when a new MW_AirInterface_Pac, MW_AirInterfaceDiversity_Pac, MW_Structure_Pac, MW_PureEthernetStructure_Pac, MW_HybridMwStructure_Pac, MW_Container_Pac, MW_EthernetContainer_Pac or MW_TdmContainer_Pac has to be instancieted in the controller.

Applied stereotypes:

- OpenModelNotification
  - triggerConditionList: invalid
  - support: MANDATORY

Table 78: Attributes for ObjectCreationNotification

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
counter	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: no unit defined • support: MANDATORY	Counts object creation notifications.
timeStamp	DateTime 2010-11-20T14:00:00+01:00	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	
objectIdRef	UniversalId ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	ID of the affected MW_AirInterface_Pac, MW_AirInterfaceDiversity_Pac, MW_Structure_Pac, MW_PureEthernetStructure_Pac, MW_HybridMwStructure_Pac, MW_Container_Pac, MW_EthernetContainer_Pac or MW_TdmContainer_Pac.
objectType	String Type of created object not specified.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Type of Object to be chosen from the following list of values: 'MW_AirInterface_Pac', 'MW_AirInterfaceDiversity_Pac', 'MW_Structure_Pac', 'MW_PureEthernetStructure_Pac', 'MW_HybridMwStructure_Pac', 'MW_Container_Pac', 'MW_EthernetContainer_Pac' or 'MW_TdmContainer_Pac'.

15.9.3 ObjectDeletionNotification

Qualified Name: MicrowaveModel::Notifications::ObjectDeletionNotification

To be sent when a new MW_AirInterface_Pac, MW_AirInterfaceDiversity_Pac, MW_Structure_Pac, MW_PureEthernetStructure_Pac, MW_HybridMwStructure_Pac, MW_Container_Pac, MW_EthernetContainer_Pac or MW_TdmContainer_Pac instance has to be deleted in the controller.

Applied stereotypes:
- OpenModelNotification
    - triggerConditionList: invalid
    - support: MANDATORY

Table 79: Attributes for ObjectDeletionNotification

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
counter	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: no unit defined • support: MANDATORY	Counts object deletion notifications.
timeStamp	DateTime 2010-11-20T14:00:00+01:00	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	
objectIdRef	UniversalId ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	ID of the affected MW_AirInterface_Pac, MW_AirInterfaceDiversity_Pac, MW_Structure_Pac, MW_PureEthernetStructure_Pac, MW_HybridMwStructure_Pac, MW_Container_Pac, MW_EthernetContainer_Pac or MW_TdmContainer_Pac.

15.9.4 ProblemNotification

Qualified Name: MicrowaveModel::Notifications::ProblemNotification

To be sent when a problem occurs at a MW_AirInterface_Pac, MW_AirInterfaceDiversity_Pac, MW_Structure_Pac, MW_PureEthernetStructure_Pac, MW_HybridMwStructure_Pac, MW_Container_Pac, MW_EthernetContainer_Pac or MW_TdmContainer_Pac.

Applied stereotypes:
- OpenModelNotification
  - triggerConditionList: invalid
  - support: MANDATORY

Table 80: Attributes for ProblemNotification

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
counter	Integer -1	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: LENGTH_32_BIT • unit: no unit defined • support: MANDATORY	Counts problem notifications
timeStamp	DateTime 2010-11-20T14:00:00+01:00	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	
objectIdRef	UniversalId ./.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	ID of the affected MW_AirInterface_Pac, MW_AirInterfaceDiversity_Pac, MW_Structure_Pac, MW_PureEthernetStructure_Pac, MW_HybridMwStructure_Pac, MW_Container_Pac, MW_EthernetContainer_Pac or MW_TdmContainer_Pac.

Attribute Name	Type DefaultValue	Multiplicity	Access	Stereotypes	Description
problem	String Problem name not specified.	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Name of the problem according to AirInterface::AirInterfaceCapability::supportedAlarms or AirInterfaceDiversity::AirInterfaceDiversityCapability::supportedAlarms or Structure::StructureCapability::supportedAlarms or PureEthernetStructure::PureEthernetStructureCapability::supportedAlarms or HybridMwStructure::HybridMwStructureCapability::supportedAlarms or Container::ContainerCapability::supportedAlarms or EthernetContainer::EthernetContainerCapability::supportedAlarms or TdmContainer:TdmContainerCapability::supportedAlarms.
severity	SeverityType WARNING	1	RW	OpenModelAttribute • partOfObjectKey: 0 • AVC: NO • isInvariant: true • valueRange: no range constraint • bitLength: NA • unit: no unit defined • support: MANDATORY	Severity of the problem according to AirInterface::AirInterfaceConfiguration::problemSeverityList, AirInterfaceDiversity::AirInterfaceDiversityConfiguration::problemSeverityList, Structure::StructureConfiguration::problemSeverityList, PureEthernetStructure::PureEthernetStructureConfiguration::problemSeverityList, HybridMwStructure::HybridMwStructureConfiguration::problemSeverityList, Container::ContainerConfiguration::problemSeverityList, EthernetContainer::EthernetContainerConfiguration::problemSeverityList or TdmContainer::TdmContainerConfiguration::problemSeverityList

16 Translation Table Functional Model

Functional Model	Information Model
MW-Client	Container
MWS	Structures
MWS-X	Group of Structures
MWPS	AirInterface

17 References

Reference	Comment
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[RFC 6020]	YANG - A Data Modeling Language for the Network Configuration, October 2010 (https://tools.ietf.org/html/rfc6020)

18 Back matter

18.1 Editors

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18.2 Contributors

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