



# TAPI UML Model

## *TOPOLOGY*

Version 2.5.0

ONF Document Type: Technical Recommendation

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## Document History

Version	Date	Description of Change
2.3	May 27, 2021	Model Dump <i>Gendoc generates documentation from Eclipse Modeling Framework (EMF) models using document templates in formats such as OpenOffice Writer (.odt), Microsoft Word (.docx), Microsoft Excel (.xlsx) and Microsoft Powerpoint (.pptx).</i>
2.4.0	December 2022	See high level diff document in Github
2.4.1	March 2023	See high level diff document in Github
2.5.0	October 2023	See high level diff document in Github

# 1 Topology Model

TapiTopology: This module contains TAPI Topology Model definitions. Source: TapiTopology.uml  
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## 1.1 Diagrams

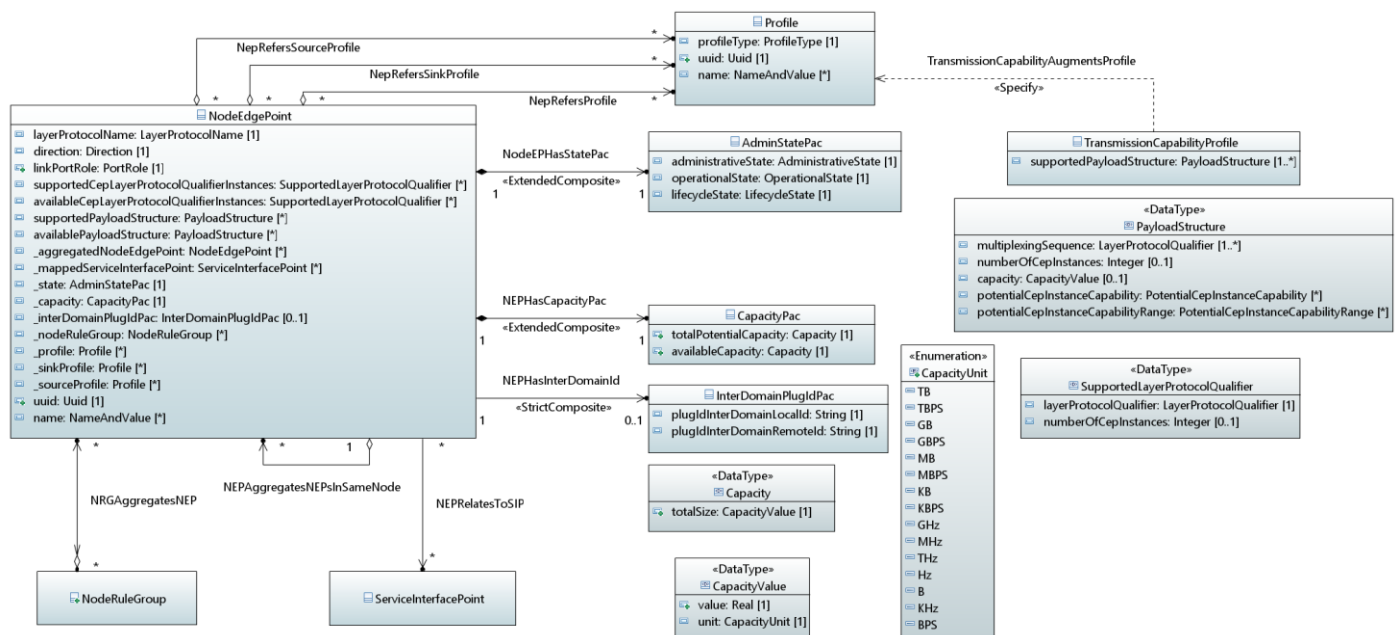
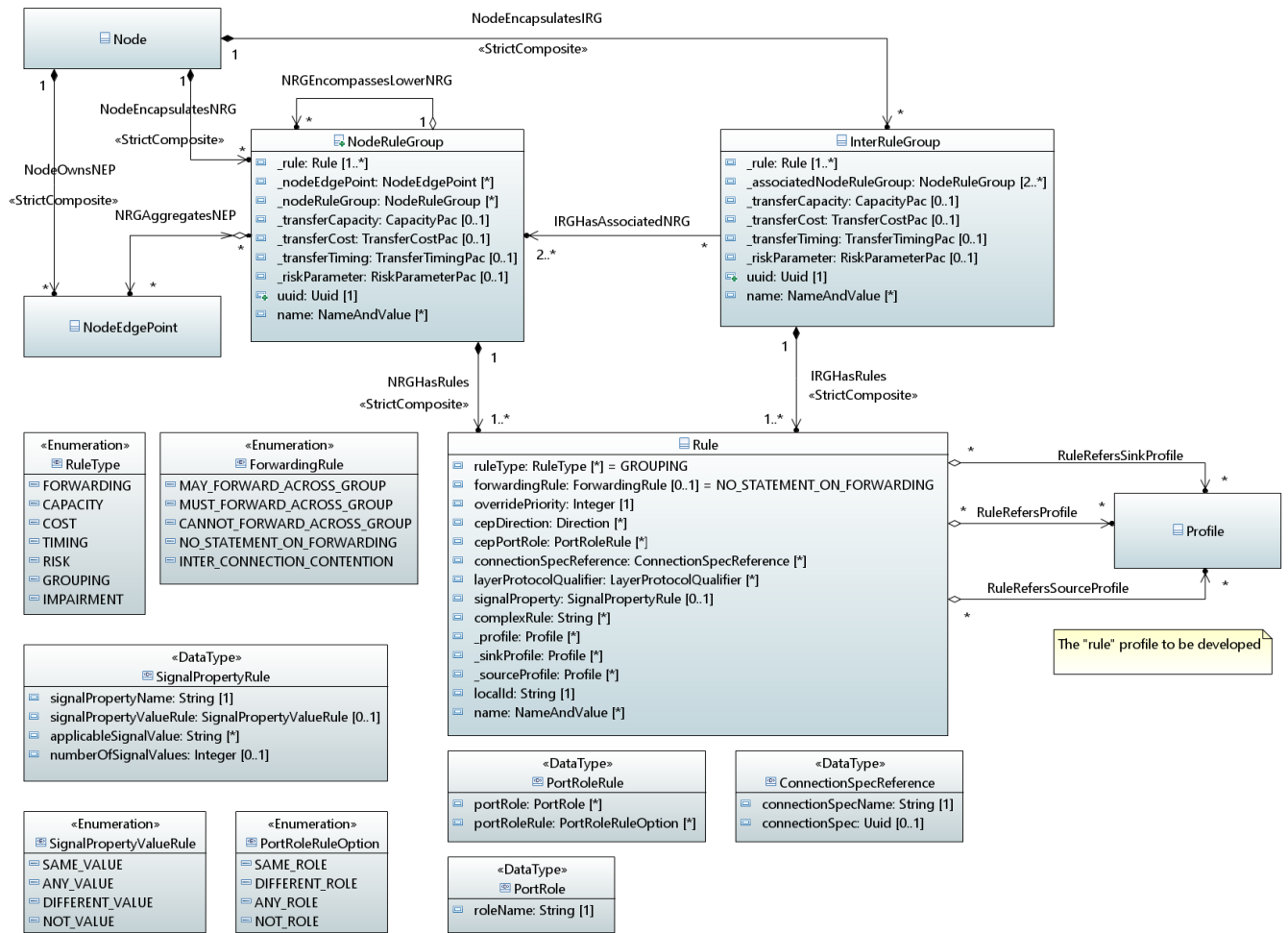
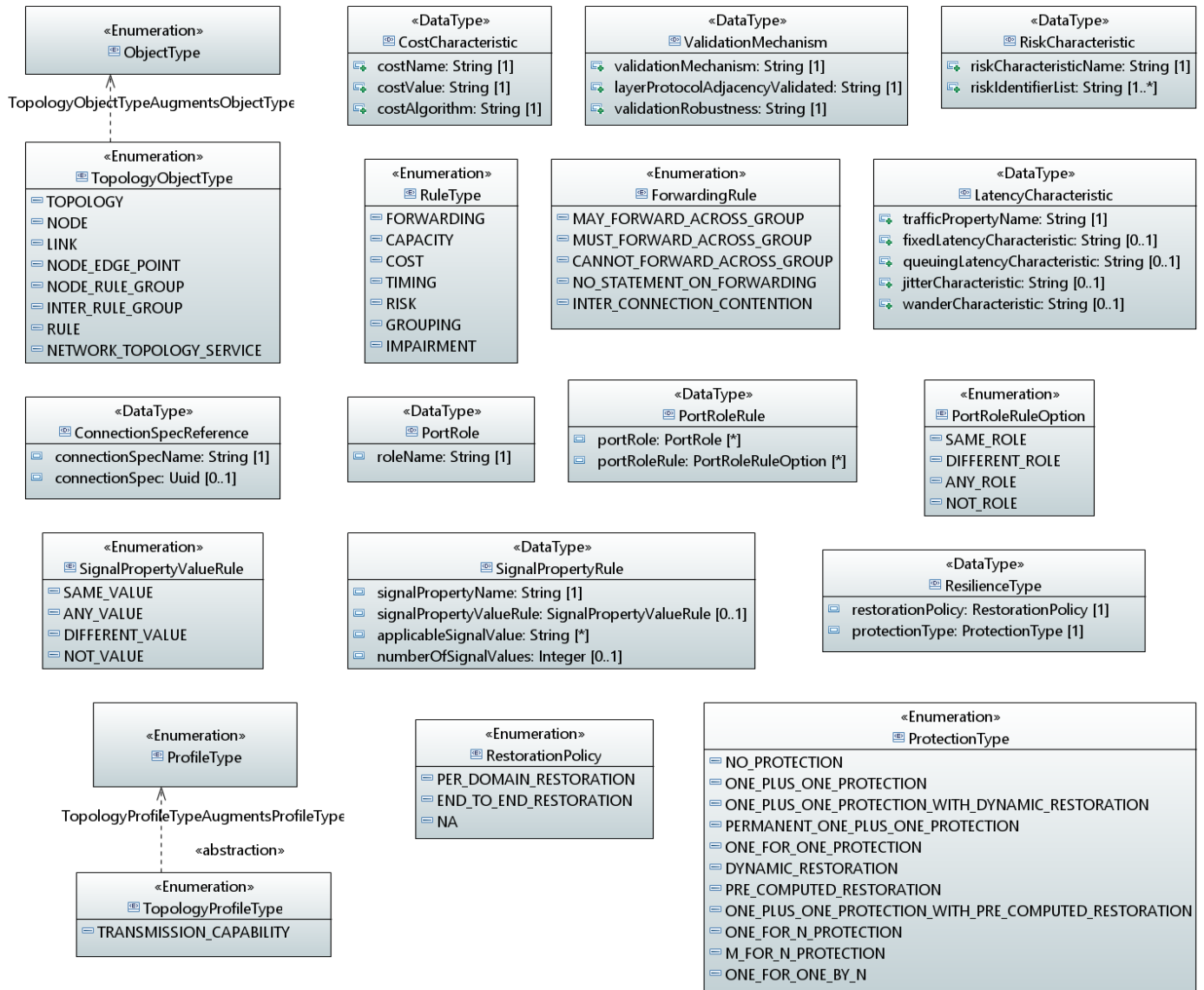
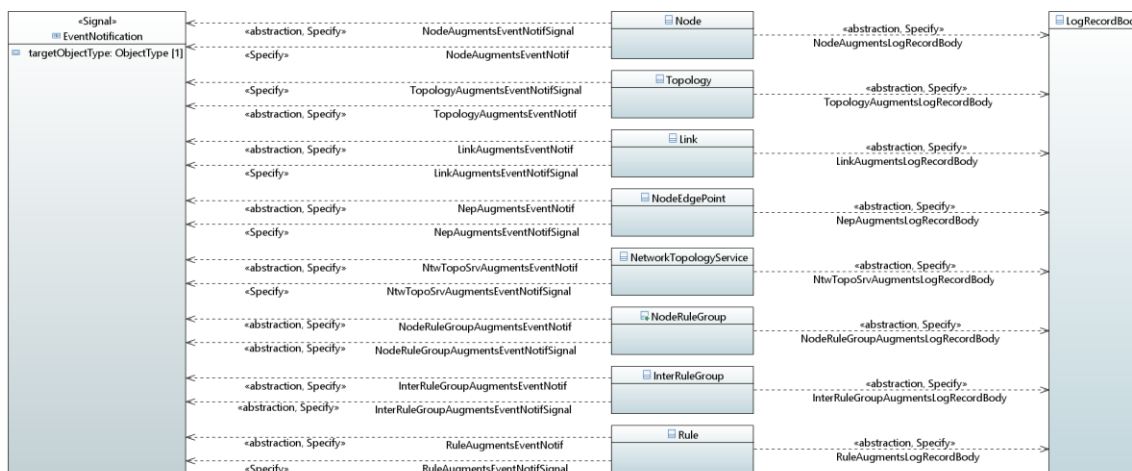
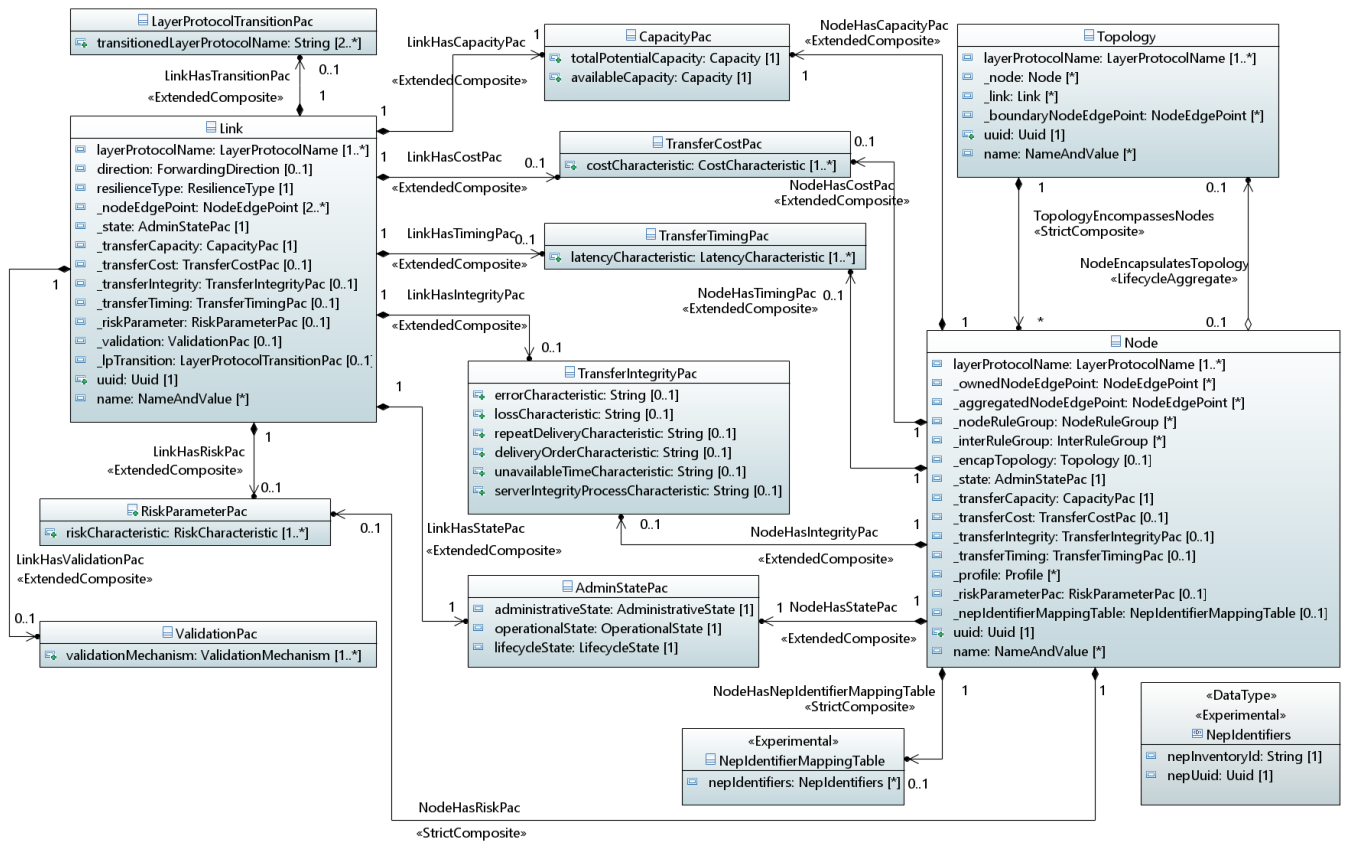
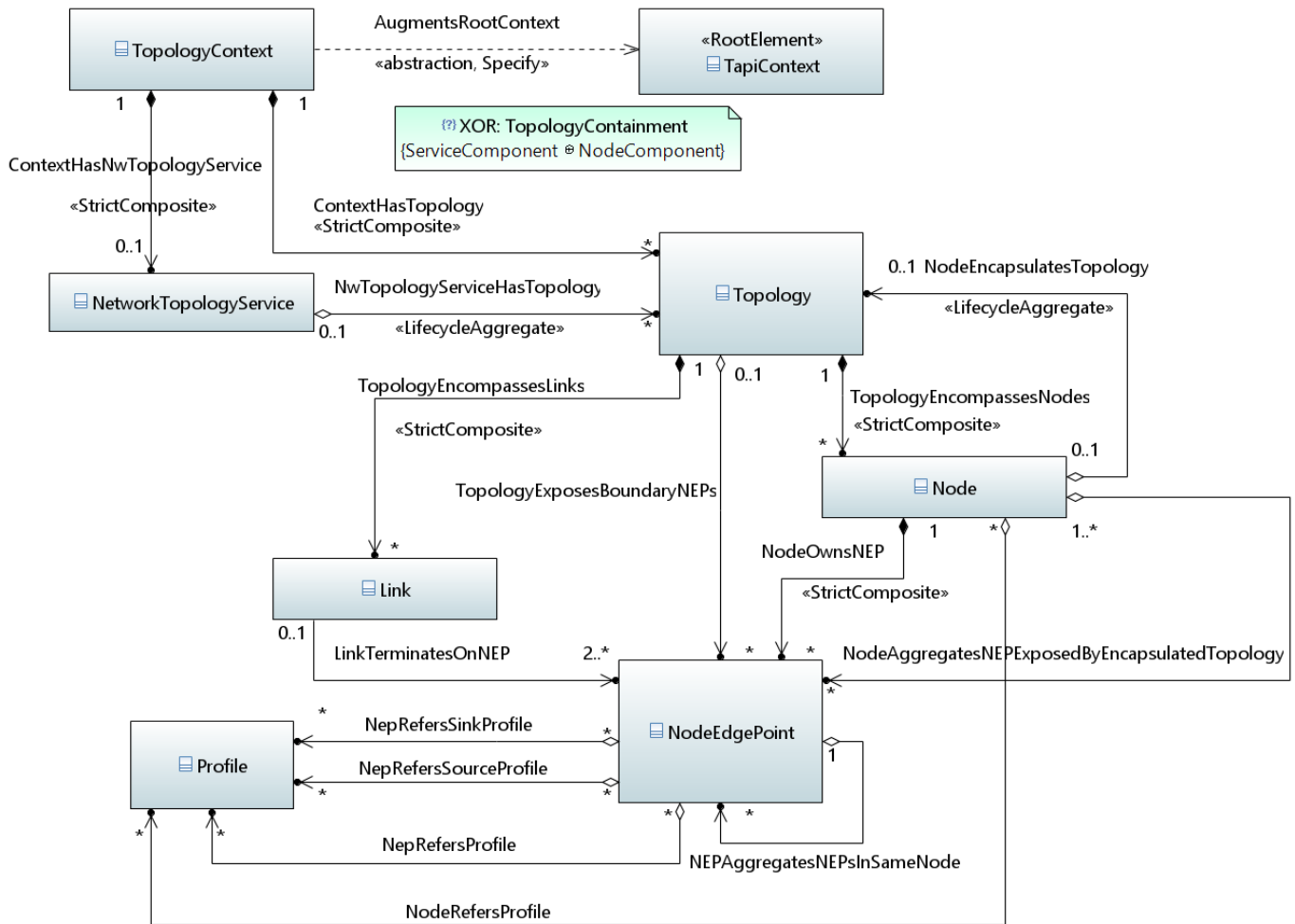


Figure 1 – Diagram *EdgePointDetails*

Figure 2 – Diagram *NodeConstraints*

Figure 3 – Diagram *TopologyDataTypes*Figure 4 – Diagram *TopologyNotifAndStream*

Figure 5 – Diagram *TopologyServiceDetails*

Figure 6 – Diagram *TopologyServiceSkeleton*

## 1.2 Classes

### 1.2.1 InterDomainPlugIdPac

#### Description:

- NEP at ENNI shall include an ENNI identifier (inter domain plug id) which must be unique in both the connected managed domains, to support the automatic discovery of interdomain links between ENNI interfaces of e.g. different network providers. The inter domain plug id can be based on OTN technology (OTU or ODU Trail Trace Identifier, SAPI). ITU-T G.709: The access point identifier shall consist of a three-character international segment and a twelve-character national segment coded according to [ITU-T T.50]. The international segment field provides a three-character ISO 3166 geographic/political country code (G/PCC). The country code shall be based on the three-character uppercase alphabetic ISO 3166 country code. The national segment field consists of two subfields: the ITU carrier code (ICC) followed by a unique access point code (UAPC). The ITU carrier code is assigned to a network operator/service provider and shall consist of 1-6 left-justified characters, alphabetic, or leading alphabetic with trailing numeric [e.g., "USATELCORuapc"].

#### Applied stereotypes:

- OpenModelClass

- support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
plugIdInterDomainLocalId	PrimitiveTypes::String	1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> Source Access Point Identifier (SAPI) in TxTI. G.709 TxTI: string[64 bytes]: The Trail Trace Identifier (TTI) information, provisioned by the managing system at the termination source, to be placed in the TTI overhead position of the source of a trail for transmission.			
plugIdInterDomainRemoteId	PrimitiveTypes::String	1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> Expected Source Access Point Identifier (ExSAPI). G.709 ExSAPI: Provisioned by the managing system, to be compared with the TTI accepted (AcTI) at the overhead position of the sink for the purpose of checking the integrity of connectivity. AcTI: string [64 bytes] The Trail Trace Identifier (TTI) information recovered (Accepted) from the TTI overhead position at the sink of a trail.			

Table 1 – Attributes for class *InterDomainPlugIdPac*

### 1.2.2 InterRuleGroup

#### Description:

- Rules that apply between groups of NodeEdgePoint (NEP) instances.

#### Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
_rule <i>Navigable association end of: <a href="#">IRGHasRules</a></i>	<a href="#">Rule</a>	1..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA



Attribute Name	Type	Mult.	Access	Stereotypes
	<b>Description:</b> The list of rules of the InterRuleGroup.			
<u>_associatedNodeRuleGroup</u> <i>Navigable association end of:</i> <a href="#">IRGHasAssociatedNRG</a>	<a href="#">NodeRuleGroup</a>	2..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The NodeRuleGroups that the InterRuleGroup constrains interconnection between. The CEPs of the NEPs of a referenced NodeRuleGroup can interconnect to the CEPs of the NEPs of another referenced NodeRuleGroup constrained by the rules of the InterRuleGroup.			
<u>_transferCapacity</u> <i>Navigable association end of:</i> <a href="#">IRGHasCapacityPac</a>	TapiCommon::ObjectClasses::CapacityPac	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The rule relates to transfer capacity constraint. The connections, matching the properties of the rule, formed between the NEPs, governed by the group, must abide by the transfer capacity statement. The capacity is assumed to be maximum allowed.			
<u>_transferCost</u> <i>Navigable association end of:</i> <a href="#">IRGHasCostPac</a>	<a href="#">TransferCostPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The rule relates to transfer cost constraint. The connections, matching the properties of the rule, formed between the NEPs, governed by the group, will acquire the cost stated. Several rules may state different costs for the same configuration. This indicated that there is underlying complexity that is not being fully expressed at the level of abstraction of the rules.			
<u>_transferTiming</u> <i>Navigable association end of:</i> <a href="#">IRGHasTimingPac</a>	<a href="#">TransferTimingPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The rule relates to transfer timing constraint. The connections, matching the properties of the rule, formed between the NEPs, governed by the group, will acquire the timing penalty stated. Several rules may state different timing penalties for the same configuration. This indicated that there is underlying complexity that is not being fully expressed at the level of abstraction of the rules.			

Attribute Name	Type	Mult.	Access	Stereotypes
_riskParameter  <i>Navigable association end of:</i> <a href="#">IRGHasRiskPac</a>	<a href="#">RiskParameterPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b>  The rule relates to risk constraints. The connections, matching the properties of the rule, formed between the NEPs, governed by the group, will acquire the risk penalty stated. Several rules may state different risk penalties for the same configuration. This indicated that there is underlying complexity that is not being fully expressed at the level of abstraction of the rules.			
uuid  Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::uuid</i>	TapiCommon::TypeDefinitions::Uuid	1	RW	OpenModelAttribute • isKey: yes – part: 1 • isInvariant: true • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b>  UUID: An identifier that is universally unique within an identifier space, where the identifier space is itself globally unique, and immutable. An UUID carries no semantics with respect to the purpose or state of the entity. UUID here uses string representation as defined in RFC 4122. The canonical representation uses lowercase characters. Pattern: [0-9a-fA-F]{8}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{12} Example of a UUID in string representation: f81d4fae-7dec-11d0-a765-00a0c91e6bf6			
name  Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::name</i>	TapiCommon::TypeDefinitions::NameAndValue	0..*	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b>  List of names. This value is unique in some namespace but may change during the life of the entity. A name carries no semantics with respect to the purpose of the entity.			

Table 2 – Attributes for class *InterRuleGroup*

### 1.2.3 LayerProtocolTransitionPac

#### Description:

- Relevant for a Link that is formed by abstracting one or more termination entities (in a stack) to focus on the flow and deemphasize the protocol transformation. This abstraction is relevant when considering multi-layer routing and the protocol transformation is not too complex, e.g. there is not multiplexing. This Pac provides the relevant abstractions of the embedded termination entities: The layer protocols of the embedded termination entities and the order of their application to the signal is still relevant and need to be accounted for. Links that included details in this Pac are often referred to as Transitional Links.

#### Applied stereotypes:

- OpenModelClass
  - support: MANDATORY

- **OpenInterfaceModelClass**
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
transitionedLayerProtocolName	PrimitiveTypes::String	2..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Provides the ordered structure of layer protocol transitions encapsulated in the Link. The list starts with the client side as the first entry and includes all layer-protocol names (hence the smallest number is 2 as otherwise the Link is not transitional). The ordering relates also to the (conceptual) port role (which emphasizes the orientation).			

Table 3 – Attributes for class *LayerProtocolTransitionPac*

#### 1.2.4 Link

##### Description:

- A Link is a topological entity which is an abstract representation of the effective adjacency between two or more Node instances (specifically NodeEdgePoint instances) in a Topology.

##### Applied stereotypes:

- **OpenModelClass**
  - support: MANDATORY
- **OpenInterfaceModelClass**
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
layerProtocolName	TapiCommon::TypeDefinitions::LayerProtocolName	1..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The layer protocol(s) of the Link.			
direction	TapiCommon::TypeDefinitions::ForwardingDirection	0..1	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The directionality of the Link.			

Attribute Name	Type	Mult.	Access	Stereotypes
resilienceType	<a href="#">ResilienceType</a>	1	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The underlying resilience type of the Link.			
_nodeEdgePoint <i>Navigable association end of:</i> <a href="#">LinkTerminatesOnNEP</a>	<a href="#">NodeEdgePoint</a>	2..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The NEPs connected by the Link.			
_state <i>Navigable association end of:</i> <a href="#">LinkHasStatePac</a>	TapiCommon::ObjectClasses::AdminStatePac	1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The Link status information.			
_transferCapacity <i>Navigable association end of:</i> <a href="#">LinkHasCapacityPac</a>	TapiCommon::ObjectClasses::CapacityPac	1	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The Link capacity.			
_transferCost <i>Navigable association end of:</i> <a href="#">LinkHasCostPac</a>	<a href="#">TransferCostPac</a>	0..1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The transfer cost of the Link.			

Attribute Name	Type	Mult.	Access	Stereotypes
_transferIntegrity <i>Navigable association end of:</i> <a href="#">LinkHasIntegrityPac</a>	<a href="#">TransferIntegrityPac</a>	0..1	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The transfer integrity of the Link.			
_transferTiming <i>Navigable association end of:</i> <a href="#">LinkHasTimingPac</a>	<a href="#">TransferTimingPac</a>	0..1	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The transfer timing of the Link.			
_riskParameter <i>Navigable association end of:</i> <a href="#">LinkHasRiskPac</a>	<a href="#">RiskParameterPac</a>	0..1	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The risk parameters of the Link.			
_validation <i>Navigable association end of:</i> <a href="#">LinkHasValidationPac</a>	<a href="#">ValidationPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The validation mechanisms of the Link.			
_lpTransition <i>Navigable association end of:</i> <a href="#">LinkHasTransitionPac</a>	<a href="#">LayerProtocolTransitionPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The information on encapsulated termination functions, applicable in case of Transitional Link.			

Attribute Name	Type	Mult.	Access	Stereotypes
uuid  Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::uuid</i>	TapiCommon::TypeDefinitions::Uuid	1	RW	OpenModelAttribute • isKey: yes – part: 1 • isInvariant: true • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
				<b>Description:</b>  UUID: An identifier that is universally unique within an identifier space, where the identifier space is itself globally unique, and immutable. An UUID carries no semantics with respect to the purpose or state of the entity. UUID here uses string representation as defined in RFC 4122. The canonical representation uses lowercase characters. Pattern: [0-9a-fA-F]{8}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{12} Example of a UUID in string representation: f81d4fac-7dec-11d0-a765-00a0c91e6bf6
name  Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::name</i>	TapiCommon::TypeDefinitions::NameAndValue	0..*	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
				<b>Description:</b>  List of names. This value is unique in some namespace but may change during the life of the entity. A name carries no semantics with respect to the purpose of the entity.

Table 4 – Attributes for class *Link*

### 1.2.5 NepIdentifierMappingTable

Description:

- Table for the mapping between UUID and Inventory Id of NEPs.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA
- Experimental

Attribute Name	Type	Mult.	Access	Stereotypes
nepIdentifiers	<a href="#">NepIdentifiers</a>	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b>  Table for the mapping between UUID and Inventory Id of NEPs.			

Table 5 – Attributes for class *NepIdentifierMappingTable*

## 1.2.6 NetworkTopologyService

### Description:

- A NetworkTopologyService represents an "intent-like" request for topology related provisioning, for future developments. The NetworkTopologyService is a container for topology request details and is distinct from the Topology that realize the request.

### Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
_topology  <i>Navigable association end of:</i> <a href="#">NwTopologyServiceHasTopology</a>	<a href="#">Topology</a>	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
<b>Description:</b>  The Topology instance(s) tracking the state of the allocated resources for the support of the NetworkTopologyService.				
uuid  Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::uuid</i>	TapiCommon::TypeDefinitions::Uuid	1	RW	OpenModelAttribute • isKey: yes – part: 1 • isInvariant: true • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
<b>Description:</b>  UUID: An identifier that is universally unique within an identifier space, where the identifier space is itself globally unique, and immutable. An UUID carries no semantics with respect to the purpose or state of the entity. UUID here uses string representation as defined in RFC 4122. The canonical representation uses lowercase characters. Pattern: [0-9a-fA-F]{8}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{12} Example of a UUID in string representation: f81d4fae-7dec-11d0-a765-00a0c91e6bf6				
name  Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::name</i>	TapiCommon::TypeDefinitions::NameAndValue	0..*	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
<b>Description:</b>  List of names. This value is unique in some namespace but may change during the life of the entity. A name carries no semantics with respect to the purpose of the entity.				

**Table 6 – Attributes for class *NetworkTopologyService***

### 1.2.7 Node

#### Description:

- The Node is a topological entity which is an abstract representation of the forwarding capabilities (of transport characteristic information) of a particular set of network resources. It is described in terms of the aggregation of set of ports (NodeEdgePoint) belonging to those network resources and the potential to enable forwarding of information between those edge ports. At the lowest level of recursion, a Node may represent a switch matrix (i.e., a fabric) in an equipment.

#### Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
layerProtocolName	TapiCommon::TypeDefinitions::LayerProtocolName	1..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The layer protocol(s) of the (multi-layer) Node.			
_ownedNodeEdgePoint  <i>Navigable association end of:</i> <a href="#">NodeOwnsNEP</a>	<a href="#">NodeEdgePoint</a>	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The NEPs belonging to / owned by this Node. By convention, only the Node instances at the lowest partitioning level "own" the NEPs. In other words, each and every NEP instance is owned by a Node at the lowest partitioning level.			
_aggregatedNodeEdgePoint  <i>Navigable association end of:</i> <a href="#">NodeAggregatesNEPExposedByEncapsulatedTopology</a>	<a href="#">NodeEdgePoint</a>	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The NEPs aggregated by this Node. By convention, only the Node instances which are not at the lowest partitioning level "aggregate" the NEPs. In other words, each and every NEP instance is owned by a Node at the lowest partitioning level. A subset of NEP instances may be aggregated by Nodes at higher partitioning levels.			



Attribute Name	Type	Mult.	Access	Stereotypes
<u>_nodeRuleGroup</u> <i>Navigable association end of:</i> <a href="#">NodeEncapsulatesNRG</a>	<a href="#">NodeRuleGroup</a>	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The Node rules applicable to this Node.			
<u>_interRuleGroup</u> <i>Navigable association end of:</i> <a href="#">NodeEncapsulatesIRG</a>	<a href="#">InterRuleGroup</a>	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b>			
<u>_encapTopology</u> <i>Navigable association end of:</i> <a href="#">NodeEncapsulatesTopology</a>	<a href="#">Topology</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> A Node may encapsulate one Topology instance, which in turn encompasses Nodes at lower partitioning level.			
<u>_state</u> <i>Navigable association end of:</i> <a href="#">NodeHasStatePac</a>	TapiCommon::ObjectClasses::AdminStatePac	1	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The Node status information.			
<u>_transferCapacity</u> <i>Navigable association end of:</i> <a href="#">NodeHasCapacityPac</a>	TapiCommon::ObjectClasses::CapacityPac	1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The transfer capacity of the Node.			

Attribute Name	Type	Mult.	Access	Stereotypes
_transferCost <i>Navigable association end of:</i> <a href="#">NodeHasCostPac</a>	<a href="#">TransferCostPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The transfer cost of the Node.			
_transferIntegrity <i>Navigable association end of:</i> <a href="#">NodeHasIntegrityPac</a>	<a href="#">TransferIntegrityPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The transfer integrity of the Node.			
_transferTiming <i>Navigable association end of:</i> <a href="#">NodeHasTimingPac</a>	<a href="#">TransferTimingPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The transfer timing of the Node.			
_profile <i>Navigable association end of:</i> <a href="#">NodeRefersProfile</a>	TapiCommon::ObjectClasses::Profile	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b>			
_riskParameterPac <i>Navigable association end of:</i> <a href="#">NodeHasRiskPac</a>	<a href="#">RiskParameterPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b>			

Attribute Name	Type	Mult.	Access	Stereotypes
<u>nepIdentifierMappingTable</u> <i>Navigable association end of:</i> <a href="#">NodeHasNepIdentifierMappingTable</a>	<a href="#">NepIdentifierMappingTable</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> Table for the mapping between UUID and Inventory Id of NEPs.			
uuid Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::uuid</i>	TapiCommon::TypeDefinitions::Uuid	1	RW	OpenModelAttribute • isKey: yes – part: 1 • isInvariant: true • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> UUID: An identifier that is universally unique within an identifier space, where the identifier space is itself globally unique, and immutable. An UUID carries no semantics with respect to the purpose or state of the entity. UUID here uses string representation as defined in RFC 4122. The canonical representation uses lowercase characters. Pattern: [0-9a-fA-F]{8}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{12} Example of a UUID in string representation: f81d4fae-7dec-11d0-a765-00a0c91e6bf6			
name Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::name</i>	TapiCommon::TypeDefinitions::NameAndValue	0..*	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> List of names. This value is unique in some namespace but may change during the life of the entity. A name carries no semantics with respect to the purpose of the entity.			

Table 7 – Attributes for class *Node*

### 1.2.8 NodeEdgePoint

#### Description:

- The NodeEdgePoint (NEP) is a topological entity which represents the ingress-egress edge-port functions that access the forwarding capabilities provided by the Node. Hence it provides an encapsulation of addressing, mapping, termination, adaptation and OAM functions of one or more transport layers (including circuit and packet forms) performed at the entry and exit points of the Node.

#### Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
layerProtocolName	TapiCommon::TypeDefinitions::LayerProtocolName	1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The layer protocol of the NodeEdgePoint (NEP).			
direction	TapiCommon::TypeDefinitions::Direction	1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The NEP direction.			
linkPortRole	TapiCommon::TypeDefinitions::PortRole	1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The role of the (conceptual) port of the associated Link.			
supportedCepLayerProtocolQualifierInstances	TapiCommon::TypeDefinitions::SupportedLayerProtocolQualifier	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The potentially supported protocols and flows. In ITU-T terms, the potentially supported adaptation and termination functions.			
availableCepLayerProtocolQualifierInstances	TapiCommon::TypeDefinitions::SupportedLayerProtocolQualifier	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b>			

Attribute Name	Type	Mult.	Access	Stereotypes
supportedPayloadStructure	TapiCommon::TypeDefinitions::PayloadStructure	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> More detailed description of available capability than "supportedCepLayerProtocol".			
availablePayloadStructure	TapiCommon::TypeDefinitions::PayloadStructure	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> More detailed description of available capability than "supportedCepLayerProtocol".			
_aggregatedNodeEdgePoint <i>Navigable association end of:</i> <a href="#">NEPAggregatesNEPsInSameNode</a>	<a href="#">NodeEdgePoint</a>	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> A NodeEdgePoint (NEP) instance may aggregate one or more other NEP instances for e.g. pooling purposes, when a set of NEP instances are equivalent for usage.			
_mappedServiceInterfacePoint <i>Navigable association end of:</i> <a href="#">NEPRelatesToSIP</a>	TapiCommon::ObjectClasses::ServiceInterfacePoint	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> A NodeEdgePoint (NEP) may be associated to a ServiceInterfacePoint (SIP), i.e. when the NEP is the resource oriented view of a SIP. NEP mapped to more than one SIP (slicing/virtualizing) or a SIP mapped to more than one NEP (load balancing/resilience) should be considered experimental.			
_state <i>Navigable association end of:</i> <a href="#">NodeEPHasStatePac</a>	TapiCommon::ObjectClasses::AdminStatePac	1	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The NodeEdgePoint (NEP) status information.			

Attribute Name	Type	Mult.	Access	Stereotypes
<u>_capacity</u> <i>Navigable association end of:</i> <a href="#">NEPHasCapacityPac</a>	TapiCommon::ObjectClasses::CapacityPac	1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The NodeEdgePoint (NEP) capacity information.			
<u>_interDomainPlugIdPac</u> <i>Navigable association end of:</i> <a href="#">NEPHasInterDomainId</a>	<a href="#">InterDomainPlugIdPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> ENNI Identifier.			
<u>_nodeRuleGroup</u> <i>Navigable association end of:</i> <a href="#">NRGAggregatesNEP</a>	<a href="#">NodeRuleGroup</a>	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b>			
<u>_profile</u> <i>Navigable association end of:</i> <a href="#">NepRefersProfile</a>	TapiCommon::ObjectClasses::Profile	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b>			
<u>_sinkProfile</u> <i>Navigable association end of:</i> <a href="#">NepRefersSinkProfile</a>	TapiCommon::ObjectClasses::Profile	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b>			

Attribute Name	Type	Mult.	Access	Stereotypes
_sourceProfile <i>Navigable association end of:</i> <a href="#">NepRefersSourceProfile</a>	TapiCommon::ObjectClasses::Profile	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> 			
uuid Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::uuid</i>	TapiCommon::TypeDefinitions::Uuid	1	RW	OpenModelAttribute • isKey: yes – part: 1 • isInvariant: true • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> UUID: An identifier that is universally unique within an identifier space, where the identifier space is itself globally unique, and immutable. An UUID carries no semantics with respect to the purpose or state of the entity. UUID here uses string representation as defined in RFC 4122. The canonical representation uses lowercase characters. Pattern: [0-9a-fA-F]{8}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{12} Example of a UUID in string representation: f81d4fae-7dec-11d0-a765-00a0c91e6bf6			
name Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::name</i>	TapiCommon::TypeDefinitions::NameAndValue	0..*	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> List of names. This value is unique in some namespace but may change during the life of the entity. A name carries no semantics with respect to the purpose of the entity.			

Table 8 – Attributes for class *NodeEdgePoint*

### 1.2.9 NodeRuleGroup

#### Description:

- Rules that apply to a group of NodeEdgePoint (NEP) instances.

#### Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
_rule <i>Navigable association end of:</i> <a href="#">NRGHasRules</a>	<a href="#">Rule</a>	1..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The list of rules of the NodeRuleGroup.			
_nodeEdgePoint <i>Navigable association end of:</i> <a href="#">NRGAggregatesNEP</a>	<a href="#">NodeEdgePoint</a>	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> NEPs and their client CEPs that the rules apply to. This reference is optional, while the reverse reference is mandatory (NEP refers to NRGs).			
_nodeRuleGroup <i>Navigable association end of:</i> <a href="#">NRGEncompassesLowerNRG</a>	<a href="#">NodeRuleGroup</a>	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> NodeRuleGroups may be nested such that finer grained rules may be applied. A nested rule group should have a subset of the NEPs of the superior rule group.			
_transferCapacity <i>Navigable association end of:</i> <a href="#">NRGHasCapacityPac</a>	TapiCommon::ObjectClasses::CapacityPac	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The rule relates to transfer capacity constraint. The connections, matching the properties of the rule, formed between the NEPs, governed by the group, must abide by the transfer capacity statement. The capacity is assumed to be maximum allowed.			
_transferCost <i>Navigable association end of:</i> <a href="#">NRGHasCostPac</a>	<a href="#">TransferCostPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA



Attribute Name	Type	Mult.	Access	Stereotypes
	<b>Description:</b> The rule relates to transfer cost constraint. The connections, matching the properties of the rule, formed between the NEPs, governed by the group, will acquire the cost stated. Several rules may state different costs for the same configuration. This indicated that there is underlying complexity that is not being fully expressed at the level of abstraction of the rules.			
_transferTiming  <i>Navigable association end of:</i> <a href="#">NRGHasTimingPac</a>	<a href="#">TransferTimingPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The rule relates to transfer timing constraint. The connections, matching the properties of the rule, formed between the NEPs, governed by the group, will acquire the timing penalty stated. Several rules may state different timing penalties for the same configuration. This indicated that there is underlying complexity that is not being fully expressed at the level of abstraction of the rules.			
_riskParameter  <i>Navigable association end of:</i> <a href="#">NRGHasRiskPac</a>	<a href="#">RiskParameterPac</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The rule relates to risk constraints. The connections, matching the properties of the rule, formed between the NEPs, governed by the group, will acquire the risk penalty stated. Several rules may state different risk penalties for the same configuration. This indicated that there is underlying complexity that is not being fully expressed at the level of abstraction of the rules.			
uuid  Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::uuid</i>	TapiCommon::TypeDefinitions::Uuid	1	RW	OpenModelAttribute • isKey: yes – part: 1 • isInvariant: true • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> UUID: An identifier that is universally unique within an identifier space, where the identifier space is itself globally unique, and immutable. An UUID carries no semantics with respect to the purpose or state of the entity. UUID here uses string representation as defined in RFC 4122. The canonical representation uses lowercase characters. Pattern: [0-9a-fA-F]{8}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{12} Example of a UUID in string representation: f81d4fae-7dec-11d0-a765-00a0c91e6bf6			
name  Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::name</i>	TapiCommon::TypeDefinitions::NameAndValue	0..*	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA

Attribute Name	Type	Mult.	Access	Stereotypes
	<b>Description:</b> List of names. This value is unique in some namespace but may change during the life of the entity. A name carries no semantics with respect to the purpose of the entity.			

Table 9 – Attributes for class *NodeRuleGroup*

### 1.2.10 RiskParameterPac

#### Description:

- The risk characteristics of a topological entity (e.g. the Link) come directly from the underlying physical realization. The risk characteristics propagate from the physical realization to the client and from the server layer to the client layer, this propagation may be modified by protection. A topological entity may suffer degradation or failure as a result of a problem in a part of the underlying realization. The realization can be partitioned into segments which have some relevant common failure modes. There is a risk of failure/degradation of each segment of the underlying realization. Each segment is a part of a larger physical/geographical unit that behaves as one with respect to failure (i.e. a failure will have a high probability of impacting the whole unit (e.g. all cables in the same duct). Disruptions to that larger physical/geographical unit will impact (cause failure/errors to) all topological entities that use any part of that larger physical/geographical entity. Any topological entity that uses any part of that larger physical/geographical unit will suffer impact and hence each topological entity shares risk. The identifier of each physical/geographical unit that is involved in the realization of each segment of a topological entity can be listed in the RiskParameter\_Pac of that topological entity. A segment has one or more risk characteristic. Shared risk between two topological entities compromises the integrity of any solution that use one of those topological entity as a backup for the other. Where two topological entities have a common risk characteristic they have an elevated probability of failing simultaneously compared to two topological entities that do not share risk characteristics.

#### Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
riskCharacteristic	<a href="#">RiskCharacteristic</a>	1..*	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>isKey: No</li> <li>isInvariant: false</li> <li>valueRange: no range constraint</li> <li>support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>AVC: NA</li> </ul>
	<b>Description:</b> A list of risk characteristics for consideration in an analysis of shared risk. Each element of the list represents a specific risk consideration.			

Table 10 – Attributes for class *RiskParameterPac*

### 1.2.11 Rule

#### Description:

- Single complex rule statement. A Node with no rule group has no restrictions and is essentially May/Any. A NodeRuleGroup constrains the CEP connectability in the Node. A Connection from a CEP/NEP must abide by all rules that relate to that CEP/NEP. Rules that are for a particular layerProtocolQualifier, connectionSpecReference, cepPortRole and cepDirection combination must be abided by in combination as dictated by overridePriority. If a particular connectionSpecReference does not have any rule statements then it is not supported and connections of that type are not possible within the rule group. If a particular cepPortRole of a particular connectionSpecReference does not have any rule statements then it is not supported and connections of that connectionSpecReference (type) cannot have that cepPortRole for CEPs from NEPs in that rule group. If a particular cepDirection for a particular connectionSpecReference does not have any rule statements then it is not supported and connections of that connectionSpecReference (type) cannot have that cepPortDirection for CEPs from NEPs in that rule group. Rules that are for different layerProtocolQualifiers or connectionSpecReferences are independent and provide options for Connection in the NodeRuleGroup. Some rules may apply to multiple connectionSpecReferences and all cepPortRoles and all cepDirections.

#### Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
ruleType	<a href="#">RuleType</a> Default value: <i>GROUPING</i>	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The focus of the rule.			
forwardingRule	<a href="#">ForwardingRule</a> Default value: <i>NO_STATEMENT_ON_FORWARDING</i>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> Rule that restricts the creation/deletion of a Connection between points in the NodeRuleGroup or related by the InterRuleGroup between NodeRuleGroups.			

Attribute Name	Type	Mult.	Access	Stereotypes
overridePriority	PrimitiveTypes::Integer	1	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The overridePriority allows for one rule in a rule group to override another. Priority n rules override priority n+1 rules. Rules of the same priority override as follows (n overrides n+1): 1 - MustNot, 2 - Must, 3 - May, 4 - Null. Within a rule the flexibility rules (signal, port role...) override as follows (n overrides n+1): 1 - Any, 2 - Same, 3 - Different. Where there are two or more "Same" rules, they will form an intersection where all must be met.			
cepDirection	TapiCommon::TypeDefinitions::Direction	0..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The list of CEP directions that the rule applies to. No entry means all CEP directions.			
cepPortRole	<a href="#">PortRoleRule</a>	0..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Indicates the port role to which the rule applies. The port role is interpreted in the context of the connection type which is identified by the connection spec, if any. The port role is not meaningful in the absence of a connection spec reference. If a NodeRuleGroup carries a port role, that role applies also to the associated InterRuleGroup where the combination of the roles in the NodeRuleGroups at the ends of the InterGroupRule define the Connection orientation. For example a root-and-leaf Connection may be used in a Node where a NodeRuleGroup collects one set of NEPs has the port role "root" and another NodeRuleGroup collects another set of NEPs has the port role "leaf" where these are joined by an InterRuleGroup. This combination specifies an allowed orientation of the root-and-leaf Connection. No port role statement means all port roles are allowed.			
connectionSpecReference	<a href="#">ConnectionSpecReference</a>	0..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Identifies the type of Connection that the rule applies to. If the attribute is not present then the rule applies to all types of Connection supported by the device.			

Attribute Name	Type	Mult.	Access	Stereotypes
layerProtocolQualifier	TapiCommon::TypeDefinitions::LayerProtocolQualifier	0..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Qualifies a rule for a particular layer protocol identifying the qualifiers that the rule applies to. If the attribute is not present then the rule applies to all relevant qualifiers of the layer protocol of the parent entity.			
signalProperty	<a href="#">SignalPropertyRule</a>	0..1	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The rule only applies to signals with the properties listed. If the attribute is not present then the rule applies to all signals.			
complexRule	PrimitiveTypes::String	0..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Allows for more complex rules where the basic rule system is not sufficient.			
_profile <i>Navigable association end of:</i> <a href="#">RuleRefersProfile</a>	TapiCommon::ObjectClasses::Profile	0..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b>			
_sinkProfile <i>Navigable association end of:</i> <a href="#">RuleRefersSinkProfile</a>	TapiCommon::ObjectClasses::Profile	0..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b>			

Attribute Name	Type	Mult.	Access	Stereotypes
_sourceProfile <i>Navigable association end of:</i> <a href="#">RuleRefersSourceProfile</a>	TapiCommon::ObjectClasses::Profile	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> 			
localId Inherited: <i>TapiCommon::ObjectClasses::LocalClass::localId</i>	PrimitiveTypes::String	1	RW	OpenModelAttribute • isKey: yes – part: 1 • isInvariant: true • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> An identifier that is unique in the context of the GlobalClass from which it is inseparable.			
name Inherited: <i>TapiCommon::ObjectClasses::LocalClass::name</i>	TapiCommon::TypeDefinitions::NameAndValue	0..*	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> List of names. This value is unique in some namespace but may change during the life of the entity. A name carries no semantics with respect to the purpose of the entity.			

Table 11 – Attributes for class *Rule*

### 1.2.12 Topology

#### Description:

- The Topology is an abstract representation of the topological aspects of a particular set of network resources. It is described in terms of the underlying topological network of Node and Link instances that enable the forwarding capabilities of that particular set of network resources.

#### Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
layerProtocolName	TapiCommon::TypeDefinitions::LayerProtocolName	1..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The layer protocol(s) of the (multi-layer) Topology.			
_node  <i>Navigable association end of:</i> <a href="#">TopologyEncompassesNodes</a>	<a href="#">Node</a>	0..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The list of Nodes which the Topology encompass.			
_link  <i>Navigable association end of:</i> <a href="#">TopologyEncompassesLinks</a>	<a href="#">Link</a>	0..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The list of Links which the Topology encompass.			
_boundaryNodeEdgePoint  <i>Navigable association end of:</i> <a href="#">TopologyExposesBoundaryNEPs</a>	<a href="#">NodeEdgePoint</a>	0..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> This list is applicable only in case of a "top" Topology (i.e. a Topology which is not encapsulated in a Node) which does not encompass a single Node. In this case, the list identifies the NEPs which are at the boundary of the Topology, which can be a subset of all the NEPs belonging to encompassed Nodes. It is expected that these boundary NEPs have an associated SIP to allow the provisioning of ConnectivityServices spanning the whole Topology.			
uuid  Inherited: TapiCommon::ObjectClasses::GlobalClass::uuid	TapiCommon::TypeDefinitions::Uuid	1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: yes – part: 1</li> <li>• isInvariant: true</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>

Attribute Name	Type	Mult.	Access	Stereotypes
	<b>Description:</b> UUID: An identifier that is universally unique within an identifier space, where the identifier space is itself globally unique, and immutable. An UUID carries no semantics with respect to the purpose or state of the entity. UUID here uses string representation as defined in RFC 4122. The canonical representation uses lowercase characters. Pattern: [0-9a-fA-F]{8}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{4}-[0-9a-fA-F]{12} Example of a UUID in string representation: f81d4fae-7dec-11d0-a765-00a0c91e6bf6			
name  Inherited: <i>TapiCommon::ObjectClasses::GlobalClass::name</i>	TapiCommon::TypeDefinitions::NameAndValue	0..*	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> List of names. This value is unique in some namespace but may change during the life of the entity. A name carries no semantics with respect to the purpose of the entity.			

Table 12 – Attributes for class *Topology*

### 1.2.13 TopologyContext

#### Description:

- This object class represents the scope of control that a particular SDN controller has with respect to a particular network, specifically regarding the topology description. An instance of this class includes its Topology object instances.

#### Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
_nwTopologyService  Navigable association end of: <a href="#">ContextHasNwTopologyService</a>	<a href="#">NetworkTopologyService</a>	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The defined operations.			
_topology  Navigable association end of: <a href="#">ContextHasTopology</a>	<a href="#">Topology</a>	0..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA



Attribute Name	Type	Mult.	Access	Stereotypes
	<b>Description:</b> The included Topology instances.			

Table 13 – Attributes for class *TopologyContext*

### 1.2.14 TransferCostPac

#### Description:

- The cost characteristics of a topological entity (e.g. a Link or a Node) not necessarily correlated to the cost of the underlying physical realization. They may be quite specific to the individual topological entity e.g. opportunity cost. Relates to layer capacity. There may be many perspectives from which cost may be considered for a particular topological entity and hence many specific costs and potentially cost algorithms. Using an entity will incur a cost.

#### Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
costCharacteristic	<a href="#">CostCharacteristic</a>	1..*	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The list of costs where each cost relates to some aspect of the topological entity.			

Table 14 – Attributes for class *TransferCostPac*

### 1.2.15 TransferIntegrityPac

#### Description:

- Transfer integrity characteristic covers expected/specified/acceptable characteristic of degradation of the transferred signal. It includes all aspects of possible degradation of signal content as well as any damage of any form to the total topological entity and to the carried signals. Note that the statement is of total impact to the topological entity so any partial usage of the topological entity (e.g. a signal that does not use full capacity) will only suffer its portion of the impact.

#### Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
errorCharacteristic	PrimitiveTypes::String	0..1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Describes the degree to which the signal propagated can be errored. Applies to TDM systems as the errored signal will be propagated and not to packet as errored packets will be discarded.			
lossCharacteristic	PrimitiveTypes::String	0..1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Describes the acceptable characteristic of lost packets where loss may result from discard due to errors or overflow. Applies to packet systems and not to TDM (as for TDM errored signals are propagated unless grossly errored and overflow/underflow turns into timing slips).			
repeatDeliveryCharacteristic	PrimitiveTypes::String	0..1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Primarily applies to packet systems where a packet may be delivered more than once (in fault recovery for example). It can also apply to TDM where several frames may be received twice due to switching in a system with a large differential propagation delay.			
deliveryOrderCharacteristic	PrimitiveTypes::String	0..1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Describes the degree to which packets will be delivered out of sequence. Does not apply to TDM as the TDM protocols maintain strict order.			
unavailableTimeCharacteristic	PrimitiveTypes::String	0..1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Describes the duration for which there may be no valid signal propagated.			

Attribute Name	Type	Mult.	Access	Stereotypes
serverIntegrityProcessCharacteristic	PrimitiveTypes::String	0..1	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> Describes the effect of any server integrity enhancement process on the characteristics of the topological entity.			

Table 15 – Attributes for class *TransferIntegrityPac*

### 1.2.16 TransferTimingPac

Description:

- A topological entity (e.g. a Link or a Node) will suffer effects from the underlying physical realization related to the timing of the information passed by the topological entity.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA
  - objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
latencyCharacteristic	<a href="#">LatencyCharacteristic</a>	1..*	RW	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The effect on the latency of a queuing process. This only has significant effect for packet based systems and has a complex characteristic.			

Table 16 – Attributes for class *TransferTimingPac*

### 1.2.17 ValidationPac

Description:

- Validation covers the various adjacency discovery and reachability verification protocols. Also may cover information source and degree of integrity.

Applied stereotypes:

- OpenModelClass
  - support: MANDATORY
- OpenInterfaceModelClass
  - objectCreationNotification: NA

- objectDeletionNotification: NA

Attribute Name	Type	Mult.	Access	Stereotypes
validationMechanism	<a href="#">ValidationMechanism</a>	1..*	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> Provides details of the specific validation mechanism(s) used to confirm the presence of an intended topological entity.			

Table 17 – Attributes for class *ValidationPac*

### 1.3 Signals

### 1.4 Associations

#### 1.4.1 ContextHasNwTopologyService

Applied stereotype:

- StrictComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
nwTopologyService	composite	Yes	<a href="#">NetworkTopologyService</a>	0..1
context	none	No	<a href="#">TopologyContext</a>	1

Table 18 – Member ends for association *ContextHasNwTopologyService*

#### 1.4.2 ContextHasTopology

Applied stereotype:

- StrictComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_topology	composite	Yes	<a href="#">Topology</a>	0..*
context	none	No	<a href="#">TopologyContext</a>	1

Table 19 – Member ends for association *ContextHasTopology*

#### 1.4.3 IRGHasAssociatedNRG

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_associatedNodeRuleGroup	none	Yes	<a href="#">NodeRuleGroup</a>	2..*
interrulegroup	none	No	<a href="#">InterRuleGroup</a>	0..*

**Table 20 – Member ends for association *IRGHasAssociatedNRG*****1.4.4 IRGHasCapacityPac**

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
transferCapacity	composite	Yes	TapiCommon::ObjectClasses::CapacityPac	0..1
interrulegroup	none	No	<a href="#">InterRuleGroup</a>	1

**Table 21 – Member ends for association *IRGHasCapacityPac*****1.4.5 IRGHasCostPac**

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferCost	composite	Yes	<a href="#">TransferCostPac</a>	0..1
interrulegroup	none	No	<a href="#">InterRuleGroup</a>	1

**Table 22 – Member ends for association *IRGHasCostPac*****1.4.6 IRGHasRiskPac**

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_riskParameter	composite	Yes	<a href="#">RiskParameterPac</a>	0..1
interrulegroup	none	No	<a href="#">InterRuleGroup</a>	1

**Table 23 – Member ends for association *IRGHasRiskPac*****1.4.7 IRGHasRules**

Applied stereotype:

- StrictComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_rule	composite	Yes	<a href="#">Rule</a>	1..*
interrulegroup	none	No	<a href="#">InterRuleGroup</a>	1

**Table 24 – Member ends for association *IRGHasRules***

### 1.4.8 IRGHasTimingPac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferTiming	composite	Yes	<a href="#">TransferTimingPac</a>	0..1
interrulegroup	none	No	<a href="#">InterRuleGroup</a>	1

Table 25 – Member ends for association *IRGHasTimingPac*

### 1.4.9 LinkHasCapacityPac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferCapacity	composite	Yes	TapiCommon::ObjectClasses::CapacityPac	1
_link	none	No	<a href="#">Link</a>	1

Table 26 – Member ends for association *LinkHasCapacityPac*

### 1.4.10 LinkHasCostPac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferCost	composite	Yes	<a href="#">TransferCostPac</a>	0..1
_link	none	No	<a href="#">Link</a>	1

Table 27 – Member ends for association *LinkHasCostPac*

### 1.4.11 LinkHasIntegrityPac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferIntegrity	composite	Yes	<a href="#">TransferIntegrityPac</a>	0..1
_link	none	No	<a href="#">Link</a>	1

Table 28 – Member ends for association *LinkHasIntegrityPac*

#### 1.4.12 LinkHasRiskPac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_riskParameter	composite	Yes	<a href="#">RiskParameterPac</a>	0..1
link	none	No	<a href="#">Link</a>	1

Table 29 – Member ends for association *LinkHasRiskPac*

#### 1.4.13 LinkHasStatePac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_state	composite	Yes	TapiCommon::ObjectClasses::AdminStatePac	1
_link	none	No	<a href="#">Link</a>	1

Table 30 – Member ends for association *LinkHasStatePac*

#### 1.4.14 LinkHasTimingPac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferTiming	composite	Yes	<a href="#">TransferTimingPac</a>	0..1
_link	none	No	<a href="#">Link</a>	1

Table 31 – Member ends for association *LinkHasTimingPac*

#### 1.4.15 LinkHasTransitionPac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_lpTransition	composite	Yes	<a href="#">LayerProtocolTransitionPac</a>	0..1
_link	none	No	<a href="#">Link</a>	1

Table 32 – Member ends for association *LinkHasTransitionPac*

**1.4.16 LinkHasValidationPac**

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_validation	composite	Yes	<a href="#">ValidationPac</a>	0..1
link	none	No	<a href="#">Link</a>	1

Table 33 – Member ends for association *LinkHasValidationPac***1.4.17 LinkTerminatesOnNEP**

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_nodeEdgePoint	none	Yes	<a href="#">NodeEdgePoint</a>	2..*
_linkPort	none	No	<a href="#">Link</a>	0..1

Table 34 – Member ends for association *LinkTerminatesOnNEP***1.4.18 NEPAggregatesNEPsInSameNode**

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_aggregatedNodeEdgePoint	shared	Yes	<a href="#">NodeEdgePoint</a>	0..*
_nodeEdgePoint	none	No	<a href="#">NodeEdgePoint</a>	1

Table 35 – Member ends for association *NEPAggregatesNEPsInSameNode***1.4.19 NEPHasCapacityPac**

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_capacity	composite	Yes	TapiCommon::ObjectClasses::CapacityPac	1
nodeedgepoint	none	No	<a href="#">NodeEdgePoint</a>	1

Table 36 – Member ends for association *NEPHasCapacityPac***1.4.20 NEPHasInterDomainId**

Description:

- ENNI NEP may have Inter Domain Plug Id.

Applied stereotype:

- StrictComposite



Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_interDomainPlugIdPac	none	Yes	<a href="#">InterDomainPlugIdPac</a>	0..1
nodeedgepoint	none	No	<a href="#">NodeEdgePoint</a>	1

Table 37 – Member ends for association *NEPHasInterDomainId*

## 1.4.21 NEPRelatesToSIP

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_mappedServiceInterfacePoint	none	Yes	TapiCommon::ObjectClasses::ServiceInterfacePoint	0..*
_mappedNodeEdgePoint	none	No	<a href="#">NodeEdgePoint</a>	0..*

Table 38 – Member ends for association *NEPRelatesToSIP*

## 1.4.22 NRGAggregatesNEP

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_nodeEdgePoint	shared	Yes	<a href="#">NodeEdgePoint</a>	0..*
_nodeRuleGroup	none	Yes	<a href="#">NodeRuleGroup</a>	0..*

Table 39 – Member ends for association *NRGAggregatesNEP*

## 1.4.23 NRGencompassesLowerNRG

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_nodeRuleGroup	shared	Yes	<a href="#">NodeRuleGroup</a>	0..*
noderulegroup	none	No	<a href="#">NodeRuleGroup</a>	1

Table 40 – Member ends for association *NRGencompassesLowerNRG*

## 1.4.24 NRGHasCapacityPac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferCapacity	composite	Yes	TapiCommon::ObjectClasses::CapacityPac	0..1
noderulegroup	none	No	<a href="#">NodeRuleGroup</a>	1

Table 41 – Member ends for association *NRGHasCapacityPac*

## 1.4.25 NRGHasCostPac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferCost	composite	Yes	<a href="#">TransferCostPac</a>	0..1
noderulegroup	none	No	<a href="#">NodeRuleGroup</a>	1

Table 42 – Member ends for association *NRGHasCostPac*

## 1.4.26 NRGHasRiskPac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
riskParameter	composite	Yes	<a href="#">RiskParameterPac</a>	0..1
noderulegroup	none	No	<a href="#">NodeRuleGroup</a>	1

Table 43 – Member ends for association *NRGHasRiskPac*

## 1.4.27 NRGHasRules

Applied stereotype:

- StrictComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_rule	composite	Yes	<a href="#">Rule</a>	1..*
noderulegroup	none	No	<a href="#">NodeRuleGroup</a>	1

Table 44 – Member ends for association *NRGHasRules*

## 1.4.28 NRGHasTimingPac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferTiming	composite	Yes	<a href="#">TransferTimingPac</a>	0..1
noderulegroup	none	No	<a href="#">NodeRuleGroup</a>	1

Table 45 – Member ends for association *NRGHasTimingPac*

## 1.4.29 NepRefersProfile

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_profile	shared	Yes	TapiCommon::ObjectClasses::Profile	0..*
nodeedgepoint	none	No	<a href="#">NodeEdgePoint</a>	0..*

Table 46 – Member ends for association *NepRefersProfile*

## 1.4.30 NepRefersSinkProfile

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_sinkProfile	shared	Yes	TapiCommon::ObjectClasses::Profile	0..*
nodeedgepoint	none	No	<a href="#">NodeEdgePoint</a>	0..*

Table 47 – Member ends for association *NepRefersSinkProfile*

## 1.4.31 NepRefersSourceProfile

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_sourceProfile	shared	Yes	TapiCommon::ObjectClasses::Profile	0..*
nodeedgepoint	none	No	<a href="#">NodeEdgePoint</a>	0..*

Table 48 – Member ends for association *NepRefersSourceProfile*

## 1.4.32 NodeAggregatesNEPExposedByEncapsulatedTopology

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_aggregatedNodeEdgePoint	shared	Yes	<a href="#">NodeEdgePoint</a>	0..*
_node	none	No	<a href="#">Node</a>	1..*

Table 49 – Member ends for association *NodeAggregatesNEPExposedByEncapsulatedTopology*

## 1.4.33 NodeEPHasStatePac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_state	composite	Yes	TapiCommon::ObjectClasses::AdminStatePac	1
_nodeEdgePoint	none	No	<a href="#">NodeEdgePoint</a>	1

Table 50 – Member ends for association *NodeEPHasStatePac*

## 1.4.34 NodeEncapsulatesIRG

Applied stereotype:

- StrictComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_interRuleGroup	composite	Yes	<a href="#">InterRuleGroup</a>	0..*
node	none	No	<a href="#">Node</a>	1

Table 51 – Member ends for association *NodeEncapsulatesIRG***1.4.35 NodeEncapsulatesNRG**

Applied stereotype:

- StrictComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
nodeRuleGroup	composite	Yes	<a href="#">NodeRuleGroup</a>	0..*
node	none	No	<a href="#">Node</a>	1

Table 52 – Member ends for association *NodeEncapsulatesNRG***1.4.36 NodeEncapsulatesTopology**

Applied stereotype:

- LifecycleAggregate

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_encapTopology	shared	Yes	<a href="#">Topology</a>	0..1
_forwardingDomain	none	No	<a href="#">Node</a>	0..1

Table 53 – Member ends for association *NodeEncapsulatesTopology***1.4.37 NodeHasCapacityPac**

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferCapacity	composite	Yes	TapiCommon::ObjectClasses::CapacityPac	1
_node	none	No	<a href="#">Node</a>	1

Table 54 – Member ends for association *NodeHasCapacityPac***1.4.38 NodeHasCostPac**

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferCost	composite	Yes	<a href="#">TransferCostPac</a>	0..1
_node	none	No	<a href="#">Node</a>	1

Table 55 – Member ends for association *NodeHasCostPac***1.4.39 NodeHasIntegrityPac**

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferIntegrity	composite	Yes	<a href="#">TransferIntegrityPac</a>	0..1
_node	none	No	<a href="#">Node</a>	1

Table 56 – Member ends for association *NodeHasIntegrityPac***1.4.40 NodeHasNepIdentifierMappingTable**

Applied stereotype:

- StrictComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_nepIdentifierMappingTable	composite	Yes	<a href="#">NepIdentifierMappingTable</a>	0..1
node	none	No	<a href="#">Node</a>	1

Table 57 – Member ends for association *NodeHasNepIdentifierMappingTable***1.4.41 NodeHasRiskPac**

Applied stereotype:

- StrictComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_riskParameterPac	composite	Yes	<a href="#">RiskParameterPac</a>	0..1
node	none	No	<a href="#">Node</a>	1

Table 58 – Member ends for association *NodeHasRiskPac***1.4.42 NodeHasStatePac**

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_state	composite	Yes	TapiCommon::ObjectClasses::AdminStatePac	1
_node	none	No	<a href="#">Node</a>	1

Table 59 – Member ends for association *NodeHasStatePac*

## 1.4.43 NodeHasTimingPac

Applied stereotype:

- ExtendedComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_transferTiming	composite	Yes	<a href="#">TransferTimingPac</a>	0..1
_node	none	No	<a href="#">Node</a>	1

Table 60 – Member ends for association *NodeHasTimingPac*

## 1.4.44 NodeOwnsNEP

Applied stereotype:

- StrictComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_ownedNodeEdgePoint	composite	Yes	<a href="#">NodeEdgePoint</a>	0..*
_node	none	No	<a href="#">Node</a>	1

Table 61 – Member ends for association *NodeOwnsNEP*

## 1.4.45 NodeRefersProfile

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_profile	shared	Yes	TapiCommon::ObjectClasses::Profile	0..*
node	none	No	<a href="#">Node</a>	0..*

Table 62 – Member ends for association *NodeRefersProfile*

## 1.4.46 NwTopologyServiceHasTopology

Applied stereotype:

- LifecycleAggregate

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_topology	shared	Yes	<a href="#">Topology</a>	0..*
_nwTopologyService	none	No	<a href="#">NetworkTopologyService</a>	0..1

**Table 63 – Member ends for association *NwTopologyServiceHasTopology*****1.4.47 RuleRefersProfile**

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_profile	shared	Yes	TapiCommon::ObjectClasses::Profile	0..*
rule	none	No	<a href="#">Rule</a>	0..*

**Table 64 – Member ends for association *RuleRefersProfile*****1.4.48 RuleRefersSinkProfile**

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_sinkProfile	shared	Yes	TapiCommon::ObjectClasses::Profile	0..*
rule	none	No	<a href="#">Rule</a>	0..*

**Table 65 – Member ends for association *RuleRefersSinkProfile*****1.4.49 RuleRefersSourceProfile**

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_sourceProfile	shared	Yes	TapiCommon::ObjectClasses::Profile	0..*
rule	none	No	<a href="#">Rule</a>	0..*

**Table 66 – Member ends for association *RuleRefersSourceProfile*****1.4.50 TopologyEncompassesLinks**

Applied stereotype:

- StrictComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_link	composite	Yes	<a href="#">Link</a>	0..*
_forwardingDomain	none	No	<a href="#">Topology</a>	1

**Table 67 – Member ends for association *TopologyEncompassesLinks*****1.4.51 TopologyEncompassesNodes**

Applied stereotype:

- StrictComposite

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
node	composite	Yes	<a href="#">Node</a>	0..*
_upperLevelFd	none	No	<a href="#">Topology</a>	1

**Table 68 – Member ends for association *TopologyEncompassesNodes*****1.4.52 TopologyExposesBoundaryNEPs**

Association end role name	Aggreg. type	Navigable	Target Class	Mult.
_boundaryNodeEdgePoint	shared	Yes	<a href="#">NodeEdgePoint</a>	0..*
topology	none	No	<a href="#">Topology</a>	0..1

**Table 69 – Member ends for association *TopologyExposesBoundaryNEPs*****1.5 Abstractions****1.5.1 AugmentsRootContext**

Augmenting Class	Augmented Class	Comment
<a href="#">TopologyContext</a>	TapiCommon::ObjectClasses::TapiContext	Augments the base TAPI Context with TopologyContext model.
target: "/TapiCommon:Context:_context"		

**Table 70 – Member ends for class abstraction *AugmentsRootContext*****1.5.2 InterRuleGroupAugmentsEventNotif**

Augmenting Class	Augmented Class	Comment
<a href="#">InterRuleGroup</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiCommon:Context:_context/TapiNotification:NotificationContext:_notificationContext/TapiNotification:NotificationContext:_eventNotification"		

**Table 71 – Member ends for class abstraction *InterRuleGroupAugmentsEventNotif*****1.5.3 InterRuleGroupAugmentsEventNotifSignal**

Augmenting Class	Augmented Class	Comment
<a href="#">InterRuleGroup</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiNotification:Notifications:EventNotification"		

**Table 72 – Member ends for class abstraction *InterRuleGroupAugmentsEventNotifSignal*****1.5.4 InterRuleGroupAugmentsLogRecordBody**

Augmenting Class	Augmented Class	Comment
<a href="#">InterRuleGroup</a>	TapiStreaming::ObjectClasses::LogRecordBody	
target: "/TapiStreaming:StreamRecord:_streamRecord/TapiStreaming:StreamRecord:_logRecord/TapiStreaming:LogRecord:_logRecordBody"		

**Table 73 – Member ends for class abstraction *InterRuleGroupAugmentsLogRecordBody***



### 1.5.5 LinkAugmentsEventNotif

Augmenting Class	Augmented Class	Comment
<a href="#">Link</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiCommon:Context:_context/TapiNotification:NotificationContext:_notificationContext/TapiNotification:NotificationContext:_eventNotification"		

**Table 74 – Member ends for class abstraction *LinkAugmentsEventNotif***

### 1.5.6 LinkAugmentsEventNotifSignal

Augmenting Class	Augmented Class	Comment
<a href="#">Link</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiNotification:Notifications:EventNotification"		

**Table 75 – Member ends for class abstraction *LinkAugmentsEventNotifSignal***

### 1.5.7 LinkAugmentsLogRecordBody

Augmenting Class	Augmented Class	Comment
<a href="#">Link</a>	TapiStreaming::ObjectClasses::LogRecordBody	
target: "/TapiStreaming:StreamRecord:_streamRecord/TapiStreaming:StreamRecord:_logRecord/TapiStreaming:LogRecord:_logRecordBody"		

**Table 76 – Member ends for class abstraction *LinkAugmentsLogRecordBody***

### 1.5.8 NepAugmentsEventNotif

Augmenting Class	Augmented Class	Comment
<a href="#">NodeEdgePoint</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiCommon:Context:_context/TapiNotification:NotificationContext:_notificationContext/TapiNotification:NotificationContext:_eventNotification"		

**Table 77 – Member ends for class abstraction *NepAugmentsEventNotif***

### 1.5.9 NepAugmentsEventNotifSignal

Augmenting Class	Augmented Class	Comment
<a href="#">NodeEdgePoint</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiNotification:Notifications:EventNotification"		

**Table 78 – Member ends for class abstraction *NepAugmentsEventNotifSignal***

### 1.5.10 NepAugmentsLogRecordBody

Augmenting Class	Augmented Class	Comment
<a href="#">NodeEdgePoint</a>	TapiStreaming::ObjectClasses::LogRecordBody	
target: "/TapiStreaming:StreamRecord:_streamRecord/TapiStreaming:StreamRecord:_logRecord/TapiStreaming:LogRecord:_logRecordBody"		

Table 79 – Member ends for class abstraction *NepAugmentsLogRecordBody*

## 1.5.11 NodeAugmentsEventNotif

Augmenting Class	Augmented Class	Comment
<a href="#">Node</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiCommon:Context:_context/TapiNotification:NotificationContext:_notificationContext/TapiNotification:NotificationContext:_eventNotification"		

Table 80 – Member ends for class abstraction *NodeAugmentsEventNotif*

## 1.5.12 NodeAugmentsEventNotifSignal

Augmenting Class	Augmented Class	Comment
<a href="#">Node</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiNotification:Notifications:EventNotification"		

Table 81 – Member ends for class abstraction *NodeAugmentsEventNotifSignal*

## 1.5.13 NodeAugmentsLogRecordBody

Augmenting Class	Augmented Class	Comment
<a href="#">Node</a>	TapiStreaming::ObjectClasses::LogRecordBody	
target: "/TapiStreaming:StreamRecord:_streamRecord/TapiStreaming:StreamRecord:_logRecord/TapiStreaming:LogRecord:_logRecordBody"		

Table 82 – Member ends for class abstraction *NodeAugmentsLogRecordBody*

## 1.5.14 NodeRuleGroupAugmentsEventNotif

Augmenting Class	Augmented Class	Comment
<a href="#">NodeRuleGroup</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiCommon:Context:_context/TapiNotification:NotificationContext:_notificationContext/TapiNotification:NotificationContext:_eventNotification"		

Table 83 – Member ends for class abstraction *NodeRuleGroupAugmentsEventNotif*

## 1.5.15 NodeRuleGroupAugmentsEventNotifSignal

Augmenting Class	Augmented Class	Comment
<a href="#">NodeRuleGroup</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiNotification:Notifications:EventNotification"		

**Table 84 – Member ends for class abstraction *NodeRuleGroupAugmentsEventNotifSignal*****1.5.16 NodeRuleGroupAugmentsLogRecordBody**

Augmenting Class	Augmented Class	Comment
<a href="#">NodeRuleGroup</a>	TapiStreaming::ObjectClasses::LogRecordBody	
target: "/TapiStreaming:StreamRecord:_streamRecord/TapiStreaming:StreamRecord:_logRecord/TapiStreaming:LogRecord:_logRecordBody"		

**Table 85 – Member ends for class abstraction *NodeRuleGroupAugmentsLogRecordBody*****1.5.17 NtwTopoSrvAugmentsEventNotif**

Augmenting Class	Augmented Class	Comment
<a href="#">NetworkTopologyService</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiCommon:Context:_context/TapiNotification:NotificationContext:_notificationContext/TapiNotification:NotificationContext:_eventNotification"		

**Table 86 – Member ends for class abstraction *NtwTopoSrvAugmentsEventNotif*****1.5.18 NtwTopoSrvAugmentsEventNotifSignal**

Augmenting Class	Augmented Class	Comment
<a href="#">NetworkTopologyService</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiNotification:Notifications:EventNotification"		

**Table 87 – Member ends for class abstraction *NtwTopoSrvAugmentsEventNotifSignal*****1.5.19 NtwTopoSrvAugmentsLogRecordBody**

Augmenting Class	Augmented Class	Comment
<a href="#">NetworkTopologyService</a>	TapiStreaming::ObjectClasses::LogRecordBody	
target: "/TapiStreaming:StreamRecord:_streamRecord/TapiStreaming:StreamRecord:_logRecord/TapiStreaming:LogRecord:_logRecordBody"		

**Table 88 – Member ends for class abstraction *NtwTopoSrvAugmentsLogRecordBody*****1.5.20 RuleAugmentsEventNotif**

Augmenting Class	Augmented Class	Comment
<a href="#">Rule</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiCommon:Context:_context/TapiNotification:NotificationContext:_notificationContext/TapiNotification:NotificationContext:_eventNotification"		

Table 89 – Member ends for class abstraction *RuleAugmentsEventNotif*

## 1.5.21 RuleAugmentsEventNotifSignal

Augmenting Class	Augmented Class	Comment
<a href="#">Rule</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiNotification:Notifications:EventNotification"		

Table 90 – Member ends for class abstraction *RuleAugmentsEventNotifSignal*

## 1.5.22 RuleAugmentsLogRecordBody

Augmenting Class	Augmented Class	Comment
<a href="#">Rule</a>	TapiStreaming::ObjectClasses::LogRecordBody	
target: "/TapiStreaming:StreamRecord: streamRecord/TapiStreaming:StreamRecord: logRecord/TapiStreaming:LogRecord: logRecordBody"		

Table 91 – Member ends for class abstraction *RuleAugmentsLogRecordBody*

## 1.5.23 TopologyAugmentsEventNotif

Augmenting Class	Augmented Class	Comment
<a href="#">Topology</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiCommon:Context:_context/TapiNotification:NotificationContext:_notificationContext/TapiNotification:NotificationContext:_eventNotification"		

Table 92 – Member ends for class abstraction *TopologyAugmentsEventNotif*

## 1.5.24 TopologyAugmentsEventNotifSignal

Augmenting Class	Augmented Class	Comment
<a href="#">Topology</a>	TapiNotification::Notifications::EventNotification	
target: "/TapiNotification:Notifications:EventNotification"		

Table 93 – Member ends for class abstraction *TopologyAugmentsEventNotifSignal*

## 1.5.25 TopologyAugmentsLogRecordBody

Augmenting Class	Augmented Class	Comment
<a href="#">Topology</a>	TapiStreaming::ObjectClasses::LogRecordBody	
target: "/TapiStreaming:StreamRecord:_streamRecord/TapiStreaming:StreamRecord:_logRecord/TapiStreaming:LogRecord:_logRecordBody"		

Table 94 – Member ends for class abstraction *TopologyAugmentsLogRecordBody*

### 1.5.26 TopologyObjectTypeAugmentsObjectType

Augmenting Enumeration	Augmented Enumeration
TopologyObjectType  <ul style="list-style-type: none"> <li>- INTER_RULE_GROUP</li> <li>- LINK</li> <li>- NETWORK_TOPOLOGY_SERVICE</li> <li>- NODE</li> <li>- NODE_EDGE_POINT</li> <li>- NODE_RULE_GROUP</li> <li>- RULE</li> <li>- TOPOLOGY</li> </ul>	ObjectType  <ul style="list-style-type: none"> <li>- PROFILE</li> <li>- SERVICE_INTERFACE_POINT</li> <li>- TAPI_CONTEXT</li> </ul>
<b>Comment</b> Enumeration Augment.	

Table 95 – Member ends for enum abstraction *TopologyObjectTypeAugmentsObjectType*

### 1.5.27 TopologyProfileTypeAugmentsProfileType

Augmenting Enumeration	Augmented Enumeration
TopologyProfileType  <ul style="list-style-type: none"> <li>- TRANSMISSION_CAPABILITY</li> </ul>	ProfileType
<b>Comment</b> Enumeration Augment.	

Table 96 – Member ends for enum abstraction *TopologyProfileTypeAugmentsProfileType*

## 1.6 Data Types

### 1.6.1 ConnectionSpecReference

Description:

- The definition of the type of Connection. This definition will explain the flows in the Connection and how they relate to the roles of (conceptual) ports.

Attribute Name	Type	Mult.	Access	Stereotypes
connectionSpecName	PrimitiveTypes::String	1	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>

Attribute Name	Type	Mult.	Access	Stereotypes
	<b>Description:</b> The name of the Connection type spec. This can be used as a reference to a paper document where full formal machine interpretable specs are not supported.			
connectionSpec	TapiCommon::TypeDefinitions::Uui d	0..1	RW	OpenModelAttribute • isKey:No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The reference to the formal Connection type spec.			

Table 97 – Attributes for data type *ConnectionSpecReference*

### 1.6.2 CostCharacteristic

#### Description:

- The cost characteristic related to some aspect of a topological entity.

Attribute Name	Type	Mult.	Access	Stereotypes
costName	PrimitiveTypes::String	1	RW	OpenModelAttribute • isKey: yes – part: 1 • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The cost characteristic will be related to some aspect of the topological entity (e.g. \$ cost, routing weight). This aspect will be conveyed by the costName.			
costValue	PrimitiveTypes::String	1	RW	OpenModelAttribute • isKey:No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The specific cost.			
costAlgorithm	PrimitiveTypes::String	1	RW	OpenModelAttribute • isKey:No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The cost may vary based upon some properties of the topological entity. The rules for the variation are conveyed by the costAlgorithm.			

**Table 98 – Attributes for data type *CostCharacteristic*****1.6.3 LatencyCharacteristic****Description:**

- Provides information on latency characteristic for a particular stated trafficProperty.

Attribute Name	Type	Mult.	Access	Stereotypes
trafficPropertyName	PrimitiveTypes::String	1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>isKey: yes – part: 1</li> <li>isInvariant: false</li> <li>valueRange: no range constraint</li> <li>support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>AVC: NA</li> </ul>
	<b>Description:</b> The identifier of the specific traffic property to which the queuing latency applies.			
fixedLatencyCharacteristic	PrimitiveTypes::String	0..1	R	OpenModelAttribute <ul style="list-style-type: none"> <li>isKey:No</li> <li>isInvariant: false</li> <li>valueRange: no range constraint</li> <li>support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>AVC: NA</li> </ul>
	<b>Description:</b> A topological entity suffers delay caused by the realization of the servers (e.g. distance related; FEC encoding etc.) along with some client specific processing. This is the total average latency effect of the topological entity.			
queuingLatencyCharacteristic	PrimitiveTypes::String	0..1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>isKey:No</li> <li>isInvariant: false</li> <li>valueRange: no range constraint</li> <li>support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>AVC: NA</li> </ul>
	<b>Description:</b> The specific queuing latency for the traffic property.			
jitterCharacteristic	PrimitiveTypes::String	0..1	R	OpenModelAttribute <ul style="list-style-type: none"> <li>isKey:No</li> <li>isInvariant: false</li> <li>valueRange: no range constraint</li> <li>support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>AVC: NA</li> </ul>
	<b>Description:</b> High frequency deviation from true periodicity of a signal and therefore a small high rate of change of transfer latency. Applies to TDM systems (and not packet).			

Attribute Name	Type	Mult.	Access	Stereotypes
wanderCharacteristic	PrimitiveTypes::String	0..1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> Low frequency deviation from true periodicity of a signal and therefore a small low rate of change of transfer latency. Applies to TDM systems (and not packet).			

Table 99 – Attributes for data type *LatencyCharacteristic*

#### 1.6.4 NepIdentifiers

Description:

- Each entry provides the mapping between the UUID and the Inventory Id of a NEP instance.

Applied stereotype:

- Experimental

Attribute Name	Type	Mult.	Access	Stereotypes
nepInventoryId	PrimitiveTypes::String	1	R	OpenModelAttribute • isKey: yes – part: 1 • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> Inventory ID of the NEP.			
nepUuid	TapiCommon::TypeDefinitions::Uuid	1	R	OpenModelAttribute • isKey: No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> UUID of the NEP.			

Table 100 – Attributes for data type *NepIdentifiers*

#### 1.6.5 PortRole

Description:

- The role of a (conceptual) port in the context of the Connection spec referenced in the rule.



Attribute Name	Type	Mult.	Access	Stereotypes
roleName	PrimitiveTypes::String	1	R	OpenModelAttribute • isKey:No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The name of the role of the CEP (associated to the conceptual port) of the Connection.			

Table 101 – Attributes for data type *PortRole*

### 1.6.6 PortRoleRule

Description:

- Constrains which (conceptual) port roles the rule applies to.

Attribute Name	Type	Mult.	Access	Stereotypes
portRole	<a href="#">PortRole</a>	0..*	R	OpenModelAttribute • isKey:No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> The role(s) of the port(s) considered in the rule.			
portRoleRule	<a href="#">PortRoleRuleOption</a>	0..*	R	OpenModelAttribute • isKey:No • isInvariant: false • valueRange: no range constraint • support: MANDATORY OpenInterfaceModelAttribute • AVC: NA
	<b>Description:</b> Where the rule references more than one (conceptual) port role or where there are rule intersections either as a result of overlay of rules or InterRuleGroup usage indicates role matching criteria for a Connection following the rules. For example if two port roles, "a" and "b", are listed and the port role rule is "different", this means that a Connection connecting CEPs in that group must have port roles that are different for each CEP in that group. In the example if a Connection can have n ports of role "a" and m ports of role "b" then a maximum of two ports can be drawn from the NEPs of the group and where there are two, one must be role "a" and one must be role "b".			

Table 102 – Attributes for data type *PortRoleRule*

### 1.6.7 ResilienceType

Description:

- The type of resiliency (protection/restoration).

Attribute Name	Type	Mult.	Access	Stereotypes
restorationPolicy	<a href="#">RestorationPolicy</a>	1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The restoration policy.			
protectionType	<a href="#">ProtectionType</a>	1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The protection type.			

Table 103 – Attributes for data type *ResilienceType*

### 1.6.8 RiskCharacteristic

#### Description:

- The information for a particular risk characteristic where there is a list of risk identifiers related to that characteristic.

Attribute Name	Type	Mult.	Access	Stereotypes
riskCharacteristicName	PrimitiveTypes::String	1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: yes – part: 1</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The name of the risk characteristic. The characteristic may be related to a specific degree of closeness. For example a particular characteristic may apply to failures that are localized (e.g. to one side of a road) where as another characteristic may relate to failures that have a broader impact (e.g. both sides of a road that crosses a bridge). Depending upon the importance of the traffic being routed different risk characteristics will be evaluated.			
riskIdentifierList	PrimitiveTypes::String	1..*	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> A list of the identifiers of each physical/geographic unit (with the specific risk characteristic) that is related to a segment of the topological entity.			

**Table 104 – Attributes for data type *RiskCharacteristic*****1.6.9 SignalPropertyRule**

Description:

- Rule related to an identified signal property.

Attribute Name	Type	Mult.	Access	Stereotypes
signalPropertyName	PrimitiveTypes::String	1	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey:No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The name of the signal property to which the rule applies.			
signalPropertyValueRule	<a href="#">SignalPropertyValueRule</a>	0..1	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey:No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Indicates how the signal properties should be accounted for.			
applicableSignalValue	PrimitiveTypes::String	0..*	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey:No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Specific values of the signal property to which the rule applies.			
numberOfSignalValues	PrimitiveTypes::Integer	0..1	R	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey:No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> The number of instances of this specific property that can be supported by the group.			

**Table 105 – Attributes for data type *SignalPropertyRule*****1.6.10 ValidationMechanism**

Description:

- Identifies the validation mechanism and describes the characteristics of that mechanism.

Attribute Name	Type	Mult.	Access	Stereotypes
validationMechanism	PrimitiveTypes::String	1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey: yes – part: 1</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Name of mechanism used to validate adjacency.			
layerProtocolAdjacencyValidated	PrimitiveTypes::String	1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey:No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> State of validation.			
validationRobustness	PrimitiveTypes::String	1	RW	OpenModelAttribute <ul style="list-style-type: none"> <li>• isKey:No</li> <li>• isInvariant: false</li> <li>• valueRange: no range constraint</li> <li>• support: MANDATORY</li> </ul> OpenInterfaceModelAttribute <ul style="list-style-type: none"> <li>• AVC: NA</li> </ul>
	<b>Description:</b> Quality of validation (i.e. how likely is the stated validation to be invalid).			

Table 106 – Attributes for data type *ValidationMechanism*

## 1.7 Enumerations

### 1.7.1 ForwardingRule

Description:

- Rule that restricts the creation/deletion of a Connection between points referenced by rule groups.

Contains Enumeration Literals:

- MAY\_FORWARD\_ACROSS\_GROUP
  - NEPs referenced by the NodeRuleGroup (or indirectly by the InterRuleGroup between NodeRuleGroups) may have Connections created between them unless some other rule overrides this. For an InterRuleGroup, points in a NodeRuleGroup at one end of the InterRuleGroup may be connected to points in a NodeRuleGroup at another end of the InterRuleGroup.
- MUST\_FORWARD\_ACROSS\_GROUP
  - NEPs referenced by the NodeRuleGroup (or indirectly by the InterRuleGroup between NodeRuleGroups) MUST have Connections created between them unless some other rule overrides this. For an InterRuleGroup, points in a NodeRuleGroup at one end of the InterRuleGroup MUST be connected to points in a NodeRuleGroup at another end of the InterRuleGroup.

- **CANNOT\_FORWARD\_ACROSS\_GROUP**
  - NEPs referenced by the NodeRuleGroup (or indirectly by the InterRuleGroup between NodeRuleGroups) MUST NOT have Connections created between them. For an InterRuleGroup points in a NodeRuleGroup at one end of the InterRuleGroup MUST NOT be connected to points in an NodeRuleGroup at another end of the InterRuleGroup.
- **NO\_STATEMENT\_ON\_FORWARDING**
  - The rule group makes no statement on forwarding.
- **INTER\_CONNECTION\_CONTENTION**
  - Connections to NEPs in the Rule Group contend for resources based upon a constraint of some signal property. For example, each Connection to a NEP in the Group must use a different value of the signal property from all other Connections to NEPs in the Rule Group. For example, each Connection to a NEP in the Group must use a same value of the signal property as all other Connections to NEPs in the Rule Group. In this case the first Connection created in the Rule Group sets the value and the Group constraint is freed when the last Connection is deleted.

### 1.7.2 PortRoleRuleOption

Description:

- Indicates how to interpret the port role list.

Contains Enumeration Literals:

- **SAME\_ROLE**
  - The (conceptual) ports of the Connection to which the rule applies must have the same role from the list in port role.
- **DIFFERENT\_ROLE**
  - The (conceptual) ports of the Connection to which the rule applies must have different roles from the list in port role.
- **ANY\_ROLE**
  - The (conceptual) ports of the Connection to which the rule applies may take any identified role.
- **NOT\_ROLE**
  - The (conceptual) ports of the Connection to which the rule applies must not have any of the listed roles.

### 1.7.3 ProtectionType

Description:

- The types of protection and restoration.

Contains Enumeration Literals:

- **NO\_PROTECTION**
- **ONE\_PLUS\_ONE\_PROTECTION**
  - Protection scheme where the switches are not required to be coordinated (typically the signal is always bridged).
- **ONE\_PLUS\_ONE\_PROTECTION\_WITH\_DYNAMIC\_RESTORATION**
  - Protection scheme where the switches are not required to be coordinated (typically the signal is always bridged). In addition is implemented a second level of resilience, through dynamic restoration of the first connection affected by a failure.

- **PERMANENT\_ONE\_PLUS\_ONE\_PROTECTION**
  - Extends the **ONE\_PLUS\_ONE\_PROTECTION\_WITH\_DYNAMIC\_RESTORATION** allowing an indeterminate number of failures to affect either of the 1+1 routes and the respective subsequent dynamic restorations.
- **ONE\_FOR\_ONE\_PROTECTION**
  - Protection scheme where the switches are coordinated (e.g. by signalling).
- **DYNAMIC\_RESTORATION**
  - Restoration scheme where the protection route is computed and implemented only when the current (and only) route is impaired (e.g. by a failure or maintenance command).
- **PRE\_COMPUTED\_RESTORATION**
  - Restoration scheme where the protection route is pre-computed. When the current (and only) route is impaired (e.g. by a failure or maintenance command) the pre-computed route is implemented.
- **ONE\_PLUS\_ONE\_PROTECTION\_WITH\_PRE\_COMPUTED\_RESTORATION**
  - Protection scheme where the switches are not required to be coordinated (typically the signal is always bridged). In addition a further protection route is pre-computed. When either the current or protection route is impaired (e.g. by a failure or maintenance command), the pre-computed route is implemented to restore resiliency level.
- **ONE\_FOR\_N\_PROTECTION**
  - N routes share one protection route. Switches need coordination (e.g. by signalling).
- **M\_FOR\_N\_PROTECTION**
  - N routes share M protection routes. Switches need coordination (e.g. by signalling).
- **ONE\_FOR\_ONE\_BY\_N**
  - N parallel one-for-one schemes.

#### 1.7.4 RestorationPolicy

Description:

- The restoration policy.

Contains Enumeration Literals:

- **PER\_DOMAIN\_RESTORATION**
  - Restoration is expected to be performed independently within each (restoration) domain scope. This implies that the server is responsible of activating the required control mechanisms to guarantee the restoration of the service autonomously.
- **END\_TO\_END\_RESTORATION**
  - Restoration is expected to be performed on end to end basis across all domain(s).
- **NA**
  - Not Applicable.

#### 1.7.5 RuleType

Description:

- The focus of the rule.

Contains Enumeration Literals:

- **FORWARDING**
  - The rule applies to the creation of Connections.
- **CAPACITY**

- The rule applies to capacity limitations.
- COST
  - The rule applies to the cost of the creation of Connections.
- TIMING
  - The rule applies to timing constraints across the group.
- RISK
  - The rule applies to risk considerations across the group so as to express shared risk.
- GROUPING
  - The rule is simply for grouping related to other rules.
- IMPAIRMENT

### 1.7.6 SignalPropertyValueRule

Description:

- Indicates how to interpret the signal property value rule.

Contains Enumeration Literals:

- SAME\_VALUE
  - The signal property of the CEP to which the rule applies must have the same value from the identified list.
- ANY\_VALUE
  - The signal property of the CEP to which the rule applies may take any identified value.
- DIFFERENT\_VALUE
  - The signal property of the CEP to which the rule applies each must have different values from the identified list.
- NOT\_VALUE
  - The signal property of the CEP to which the rule applies must not have any of the identified values.

### 1.7.7 TopologyObjectType

Description:

- The list of TAPI Topology Global Object Class types on which Notification signals can be raised.

Contains Enumeration Literals:

- TOPOLOGY
  - The Topology class.
- NODE
  - The Node class.
- LINK
  - The Link class.
- NODE\_EDGE\_POINT
  - The NodeEdgePoint (NEP) class.
- NODE\_RULE\_GROUP
  - The NodeRuleGroup class.
- INTER\_RULE\_GROUP
  - The InterRuleGroup class.
- RULE
  - The Rule class.

- NETWORK\_TOPOLOGY\_SERVICE
  - The NetworkTopologyService class.

#### **1.7.8 TopologyProfileType**

Contains Enumeration Literals:

- TRANSMISSION\_CAPABILITY

### **1.8 Primitives**