Multi-Technology Network Management support for a Naming Convention

1 Objective:

The objective of this document is to facilitate consistent naming of objects in the TMF MTNM interface. This document defines a mandatory naming convention for Equipments, CTPs and PMPs, as well as a recommendation for PTPs and FTPs.

2 General Rule

Wherever deterministic naming (or an indirect name) is used for a second class object, an attribute ‘nativeEMSName’ will be added. This is a string that describes what the object is called on the managed element and the EMS.

3 NamingAttributes_T Structure

The NamingAttributes_T structure is used as a naming scheme between the NMS and EMS interface. NamingAttributes_T is used to define identifiers for managed entities that are not instantiated as first class CORBA objects and thus do not have object identifiers. The NamingAttributes represent "the hierarchical name structure" of an object. The structure of the name is hierarchical and reflects the containment relationship between objects in a simple way. The following convention is used for the field name:

If necessary, other strings may be defined by the NMS or any EMS on an as-needed basis. The Naming Hierarchy of names is as follows:

- EMS
    1. name="EMS";value="*CompanyName*/*EMSname*"
- Subnetwork
    1. name="EMS";value="*CompanyName*/*EMSname*"
    2. name="MultiLayerSubnetwork";value="*SubnetworkName*"
- SubnetworkConnection
    1. name="EMS";value="*CompanyName*/*EMSname*"
    2. name="MultiLayerSubnetwork";value="*SubnetworkName*"
    3. name="SubnetworkConnection";value="*SubnetworkConnectionName*"
- ManagedElement
    1. name="EMS";value="*CompanyName*/*EMSname*"
    2. name="ManagedElement";value="*ManagedElementName*"
- TopologicalLink
    1. name="EMS";value="*CompanyName*/*EMSname*"
    2. name="TopologicalLink";value="*TopologicalLinkName*"
- PTP (see below for further detail)
    1. name="EMS";value="*CompanyName*/*EMSname*"

2. name="ManagedElement";value="*ManagedElementName*"
3. name="PTP";value="*PTPName*"

- FTP (see below for further detail)
  1. name="EMS";value="*CompanyName*/*EMSname*"
  2. name="ManagedElement";value="*ManagedElementName*"
  3. name="FTP";value="*FTPName*"
- CTP (see below for further detail)
  1. name="EMS";value="*CompanyName*/*EMSname*"
  2. name="ManagedElement";value="*ManagedElementName*"
  3. name="PTP";value="*PTPName*"
  4. name="CTP";value="*CTPName*"
- GTP
  1. name="EMS";value="*CompanyName*/*EMSname*"
  2. name="ManagedElement";value="*ManagedElementName*"
  1. name="GTP";value="*GTPName*"
- PMP (see below for further detail)
  1. name="EMS";value="*CompanyName*/*EMSname*"
  2. name="ManagedElement";value="*ManagedElementName*"
  3. name="PTP";value="*PTPName*"
  4. name="PMP";value="*PMPName*"

  Or

  1. name="EMS";value="*CompanyName*/*EMSname*"
  2. name="ManagedElement";value="*ManagedElementName*"
  3. name="PTP";value="*PTPName*"
  4. name="CTP";value="*CTPName*"
  5. name="PMP";value="*PMPName*"

- TPPool
  1. name="EMS";value="*CompanyName*/*EMSname*"
  2. name="MultiLayerSubnetwork";value="*SubnetworkName*"
  3. name="TPPool";value="*TPPoolName*"
- TransmissionDescriptor
  1. name="EMS";value="*CompanyName*/*EMSname*"
  2. name="TransmissionDescriptor";value="*TransmissionDescriptorName*"
- EquipmentHolder (see below for further detail)
  1. name="EMS";value="*CompanyName*/*EMSname*"
  2. name="ManagedElement";value="*ManagedElementName*"
  3. name="EquipmentHolder";value="*EquipmentHolderName*"
- Equipment (see below for further detail)
  1. name="EMS";value="*CompanyName*/*EMSname*"
  2. name="ManagedElement";value="*ManagedElementName*"
  3. name="EquipmentHolder";value="*EquipmentHolderName*"
  4. name="Equipment";value="*EquipmentName*"

- ProtectionGroup
    1. name="EMS";value="*CompanyName/EMSname*"
    2. name="ManagedElement";value="*ManagedElementName*"
    3. name="PGP";value="*ProtectionGroupName*"
- EquipmentProtectionGroup
    1. name="EMS";value="*CompanyName/EMSname*"
    2. name="ManagedElement";value="*ManagedElementName*"
    3. name="EPGP";value="*EquipmentProtectionGroupName*"
- TCAParameterProfile
    1. name="EMS";value="*CompanyName/EMSname*"
    2. name="ManagedElement";value="*ManagedElementName*"
    3. name="TCAParameterProfile";value="*TCAParameterProfileName*"
- AlarmSeverityAssignmentProfile
    1. name="EMS";value="*CompanyName/EMSname*"
    2. name="ASAP";value="*AlarmSeverityAssignmentProfileName*"
- Other Objects (for Alarm purposes)
    1. name="EMS";value="*CompanyName/EMSname*"
    2. name="ManagedElement";value="*ManagedElementName*"
    3. name="AID";value="*NameOfEntity*"

The strings used for the value field of the name-value pairs will be at most 1024 characters (from ISO8859) long with white space character allowed in the value but with no leading or trailing spaces. For instance, a value could be the string "the string splendid" but not " the string exquisite ". All name and value strings are case sensitive.

The value field is a free format string assigned by each EMS and is not standardized across this interface except for the EMS, CTP, EquipmentHolder, and Equipment names (see below for further detail).

All implementations of this interface have to comply to the naming scheme defined here. It is mandatory for conforming to this interface.

4 Equipment Naming – General Rules and Semantics

1. Components will be identified by a name=value syntax.
2. Components in a hierarchy will be separated by a ‘/’, the left most being the highest level of containment.
3. The general hierarchy identifies the equipment-holder class, and then the circuit-packs.
4. The names “rack”, “shelf”, “sub_shelf”, “slot”,”sub_slot” identify physical (not logical) equipment holders. The use of the “rack” and “sub_shelf” name strings is optional. The name “Equipment” is used to identify the circuit-pack.
5. The modeling of a “remote_unit” or “remote_subslot” is may be reported in case that an EMS manages remote equipment as an extension to the local equipment being modeled.

6. Even if a slot contains only one circuit-pack, the circuit pack is separately identified (as “Equipment”)

The naming of the equipment holders always starts from left to right and top to bottom in that order, starting from 1 at the Top Left. An example is shown in Figure 4 in the Equipment Model supporting document.

Many small MEs have a single shelf, which is mounted in a rack that can be shared by other MEs. Furthermore, MEs with a small number of shelves can be spread across multiple shared racks. When shared racks are used, the EMS does not usually know anything about the physical rack configuration because shared racks are entirely passive. As a consequence, reporting racks is optional.

Names for equipment holders have the following syntax:

- [/remote_unit=<ru>][/rack=<r>][/shelf=<sh>[/sub_shelf=<ssh>] [/slot=<sl>[/[remote_]sub_slot=<ssl>]]]] Where the rack is indicated only when a rack can be reliably reported

Examples of Equipment naming are shown in Table 1. The first two tuples, “EMS”, and “ManagedElement” are not explicitly stated in the examples, but these always prefix the equipment tuples.

Equipment Type	Name	Value	Description
Bay or a Rack	“EquipmentHolder”	“/rack=<r>”	Describes the Bay.
Shelf in a Bay	“EquipmentHolder”	“/rack=<r>/shelf=<sh>”	Describes the shelf in a bay.
Shelf without Rack information	“EquipmentHolder”	“/shelf=<sh>”	Describes the shelf.
Remote shelf without Rack information	“EquipmentHolder”	“/remote_unit=<ru>/shelf=<sh>”	Describes the remote shelf
Equipment in a shelf	“EquipmentHolder”	“[/rack=<r>]/shelf=<sh>”	If the Equipment fits the entire shelf, then that equipment is named with respect to the shelf holder.
	“Equipment”	“1”	
Sub-shelf in a shelf	“EquipmentHolder”	“[/rack=<r>]/shelf=<sh>/sub_shelf=<ssh>”	Describes the sub-shelf.
Slot in a sub-shelf	“EquipmentHolder”	“[/rack=<r>]/shelf=<sh>/sub_shelf=<ssh>/slot=<sl>”	Describes the slot.
Slot in a Shelf	“EquipmentHolder”	“[/rack=<r>]/shelf=<sh>/slot=<sl>”	Describes the slot.
Circuit Pack in	“EquipmentHolder”	“[/rack=<r>]/shelf=<sh>[/sub_shelf=<ssh>]/slot=<sl>”	Describes the

Equipment Type	Name	Value	Description
the slot	"Equipment"	"1"	circuit pack in the slot. Daughter boards have their own equipment holders that are named as sub-slots and the boards themselves are pieces of equipment in those holders.
Holder for the daughter boards or sub-slots	"EquipmentHolder"	"[/rack=<r>]/shelf=<sh>[/sub_shelf=<ssh>]/slot=<sl>/sub_slot=<ssl>"	
DaughterBoard.	"EquipmentHolder"	"[/rack=<r>]/shelf=<sh>[/sub_shelf=<ssh>]/slot=<sl>/sub_slot=<ssl>"	
	"Equipment"	"1"	
Remote daughterboard	"EquipmentHolder"	"[/rack=<r>]/shelf=<sh>[/sub_shelf=<ssh>] /slot=<sl>/remote_sub_slot=<ssl>"	
	"Equipment"	"1"	

Table 1 Examples of Equipment Naming

4.1 Naming of the PTP and FTP

The name of the PTP and/or FTP is with respect to the managed element as shown in

Name	Value
"EMS"	<EMS Name>
"ManagedElement"	<managedElementName>
"FTP"	<FTP Name>

.

Name	Value
"EMS"	<EMS Name>
"ManagedElement"	<managedElementName>
"PTP"	<PTP Name>

Name	Value
"EMS"	<EMS Name>
"ManagedElement"	<managedElementName>
"FTP"	<FTP Name>

Table 3 PTP and FTP Naming

The value part of the PTP and FTP tuple will be a free format string. This can be representative of the position of the PTP or FTP with respect to the equipment based on the implementation (e.g., "/rack=<r>[/shelf=<sh>[/sub_shelf=<ssh>][/slot=<sl>[/sub_slot=<ssl>]]]/port=<p>" or "/shelf=<sh>[/sub_shelf=<ssh>][/slot=<sl>[/sub_slot=<ssl>]]/port=<p>"), but no special constraints are imposed in this tuple.

4.2 Naming of the CTP

The CTP Naming will be relative to the PTP or FTP as shown in Table 4. This section identifies the containment of the transmission layer hierarchy of the CTP. In addition wherever a directionality is needed, the directionality is also specified of the CTP.

Name	Value
"EMS"	<EMS Name>
"ManagedElement"	<managedElementName>
"PTP" or "FTP"	<PTP Name> or <FTP Name>
"CTP"	<CTP Name>

Table 4 CTP Naming

The model components that have been considered for this modeling are:

- direction
- ATM: VP/VC Index; ATM Interfaces
- WDM: Frequency
- SONET/SDH
- PDH: DSn, En
- IP (future)

4.2.1 Rules and Semantics:

- CTP name refers to the name for a specific CTP that may encompass several layer rates to include the connectable layer rate and layer rate(s) of adaptations. As such, the pre-defined string names have been shortened to encompass the layer rates of interest in the CTP named.
- The CTP naming is intended to cover all common CTP layer rates for SONET/SDH/PDH. It is not exhaustive, and it is anticipated that new "pre-defined strings" will be added in future releases. New CTP name strings shall follow the conventions listed below. Not all layer rates have CTPs at that rate. If applications arise where a specific layer rate can provide a CTP, then these will have to be defined.
- CTP name hierarchy refers to the combination of all CTP names defining the CTP position relative to the PTP or FTP
- Order is determined by the relevant CTP containment as defined by the EMS.
- Notation order is higher to lower orders, from left to right.

- The CTP name for each layer is defined. Where-ever multiple layers are applicable to a particular CTP, the container layer is used.
- Layers (CTP Names) are combined to form the desired CTP name hierarchy
- A client layer CTP name is added to its server layer CTP name hierarchy to form the CTP name hierarchy
- Given server layer CTP /name1=value1 the addition of the a client layer would result in a CTP name hierarchy as follows /name1=value1/name2=value2
- The name and value are defined strings and there are no '/' , '=', '-' embedded.

The basic format constructors are.

- / separates layers (rates) which represent actual CTPs
- "=" separates name and values
- Within a given layer, the modifiers are separated by '-'.
- The basic format for a layer is /name=value
- The basic format of combined layers (CTP names) to form the containment (hierarchy): /name1=value1/name2=value2 etc.
- The basic format of components with in a layer is /name1=value/name2=value2 etc.
- No spaces
- No trailing /
- The "name" and "value" in the "name=value" pair are lower case

The general format is as follows:

- /name=value (/ ((modifier value *.(-name=value)(-name=value))*

In addition, whenever unidirectional CTPs are specified, the directionality is always prepended to the last tuple. In case of the Bidirectional CTP, the direction tuple must be omitted.

4.2.2 Pre-defined Name Strings:

See the Layer Rates supporting document for a complete list of naming strings for each layerRate.Qualifier strings:

- j - AUG index
- k - TUG-3 or AU-3 index
- l - TUG-2 index
- m - TU-12 or TU-11 index
- number - for tunable lasers
- remoteaddress - off-network CTP
- direction - allowed values are {src, sink}
- s – AU3 sliding concatenation offset
- t – AU4 sliding concatenation offset

4.2.2.1 Unidirectional CTP Naming

The following naming identifies the 1.3.2 TU12 CTP in the 4th AUGRP of an STMn.

- /sts3c_au4=4/vt2_tu12-k=1-l=3-m=2

The unidirectional ctp of the same type is identified as:

- /direction=src/sts3c_au4=4/vt2_tu12-k=1-l=3-m=2

- /direction=sink/sts3c_au4=4/vt2_tu12-k=1-l=3-m=2

4.2.2.2 Off-Network CTPs

TP Type	Value	Comments
Off-Network CTPs	"/remoteaddress=<remote address>"	remoteaddress.value where value is a string representation of the remote address. It is not a "true" CTP and may not be representable in the standard CTP containment hierarchy. **Note the following for this CTP:** EMS is an empty string ManagedElement is an empty string PTP is an empty string Off-network CTP name must be unique across all EMS's. Example: /remoteaddress=4539875455

4.2.2.3 ATM Components

TP Type	Value	Comments
ATM Network Interface	/atmnetworkinterface=[1..n]	The ATM Network Interface TP.
Multiple E1s supported by IMA capable ATM NI	E1	/atmnetworkinterface=1/e1=[1-n]
Multiple E1s supported by IMA capable ATM NI mapped to VC12	VC12	/atmnetworkinterface=1/vt2_tu12=[1..n]
Vpi	/atmnetworkinterface=[1..n]/vpi=[1..n]	The vpi CTP with the vp index under the ATM network interface.
Vci	/atmnetworkinterface=[1..n]/vpi=[1..n]/vci=[1..n]	The VCI CTP.
A remote destination with VPI,VCI specified.	/remoteaddress=<remote address>/vpi=[1..n]/vci=[1..n]	**Note the following for this CTP:** EMS is an empty string ManagedElement is an empty string PTP is an empty string Example: /remoteaddress=4539875455/vpi=12/vci=13

4.2.2.4 SDH/SONET CTPs

The following represent the SONET/SDH Components.

- /line192_ms64=1 (MS CTP on regenerator for OC-192/STM-64)
- Contiguous (non-sliding) concatenation
  - /sts192c_vc4_64c=[1-n]
  - /sts48c_vc4_16c=[1-n]
  - /sts12c_vc4_4c=[1-n]
  - /sts3c_au4-j=<J>
  - /sts3*Xc_vc_Xc=[1-n] where X is currently defined as 1-16. For example n in an STM-N is n = N/S. S is the smallest number in {4, 16, 64} such that S>X.
- Sliding concatenation
  - /sts3*Xc_vc4_Xc=[1-n]-s=[2-S]-t=[2-3] where sliding VC4 offset s is provided if s > 1 and sliding STS1 offset t is provided if t > 1. S is the next smallest number in the set {4, 16, 64} such that S > X.
- High order (potentially server) CTPs
  - /sts3c_au4-j=<J>
  - /sts1_au3-j=<J>-k=<K>
- Lower order CTPs, appended to the server modifiers;
  - /tu3_vc3, /vt6_tu2, /vt2_tu12, /vt15_tu11
  - -k=[1-3]
  - -l=[1-7]
  - -m=[1-4]
  - /tu_value-k=[1-3]-l=[1-7]-m=[1-4]
  - e.g. VC12 on STM-16 /sts3c_au4-j=5/vt2_tu12-k=1-l=5-m=2
  - e.g. VT1.5 on OC-12 /sts1_au3-j=2-k=2/vt15_tu11-l=1-m=2
- SDH-PDH interface layers append to the PDH PTPs
  - /sts1_au3=1 (TU-3)
  - /tu3_vc3 (AU-3)
  - /vt6_tu2=1 (TU-2)
  - /vt2_tu12=1 (TU-12 from VC-12)
  - /ds1_vt15_vc11=1 (TU-12 from VC-11)
  - /vt15_tu11=1 (TU-11)
- Inversely multiplexed encapsulated signal (e.g. Ethernet)
  - /encapsulation=1/sts3c_au4=[1-n]

Possible PTP/FTP	Layer Rate	CTP Tuple.	Comments
STM[n]_OC[3n]	Multiplex section	/line[3n]_ms[n]=1	n=[1,4,16,64]. MS CTP on regenerators
	Regenerator section	/section[3n]_rs[n]=1	n=[1,4,16,64]. RS CTP on Optical Physical STMn / OC3n
STM0_OC1	Multiplex section	/line1_ms0=1	MS CTP on regenerators
	Regenerator section	/section1_rs0=1	RS CTP on Optical Physical STM0 / OC1
STM64_OC192	sts192c_vc4_64c	/sts192c_vc4_64c=1	The number is sequential with respect to the layer rate within

			the PTP
	sts48c_vc4_16c	/sts48c_vc4_16c=[1..4]	
	sts45c_vc4_15c	VC4-15c on an VC4-16c boundary /sts45c_vc4_15c=[1-4]	When no sliding concatenation is supported. I.e. VC4-15c starts at normal VC4-16c boundary.
	sts45c_vc4_15c	/sts45c_vc4_15c=[1-4]-s=[2-16]-t[2-3]	t is provided when sliding concatenation is supported at a VC3 granularity. If only VC4 granularity is supported (i.e. t=1) then only s is provided as the VC4 slide index.
	sts21c_vc4_7c	/sts21c_vc4_7c=[1-4]-s=[2-16]-t=[2-3]	When sliding concatenation at the VC4_7c rate is supported at a VC3 granularity. When s=1 then it is not indicated. Similarly t is not provided when t=1.
	sts21c_vc4_7c	/sts21c_vc4_7c=[1-4]-s=[2-16]	Same as the above but sliding is only supported at the VC4 granularity.
	sts12c_vc4_4c	/sts12c_vc4_4c=[1..16]	
	sts3c_au4	/sts3c_au4-j=[1..64]	The layer rate represents the AUG numbering where the number of au4s is exactly 1.
	sts1_au3	/sts1_au3-j=[1..64]-k=[1..3]	The layer rate represents the AUG numbering where the number of au4s is exactly 1 and the number of au3s is 3 per AUG. For example, the 7th STS-1 on an OC-192 PTP would be called "/sts1_au3-j=3-k=1", and the 11th STS-1 would be called "/sts1_au3-j=4-k=2"
	tu3_vc3	/sts3c_au4-j=[1..64]/tu3_vc3-k=[1..3]	
	vt6_tu2	/sts3c_au4-j=[1..64]/vt6_tu2-k=[1..3]-l=[1..7]	
	vt2_tu12	/sts3c_au4-j=[1..64]/vt2_tu12-k=[1..3]-l=[1..7]-m=[1..3]	
	vt15_tu11	/sts1_au3-j=[1..64]-k=[1..3]/vt15_tu11-l=[1..7]-m=[1..4]	
STM16_OC48	sts48c_vc4_16c	/sts48c_vc4_16c=1	
	sts12c_vc4_4c	/sts12c_vc4_4c=[1..4]	
	sts9c_vc4_3c	/sts9c_vc4_3c=[1-4]	When VC4_3c is supported without sliding concatenation
	sts3c_au4	/sts3c_au4-j=[1..16]	The layer rate represents the AUG numbering where the number of au4s is exactly 1.
	sts1_au3	/sts1_au3-j=[1..16]-k=[1..3]	The layer rate represents the AUG numbering where the number of au4s is exactly 1 and the number of au3s is 3 per AUG
	tu3_vc3	/sts3c_au4-j=[1..16]/tu3_vc3-k=[1..3]	
	vt6_tu2	/sts3c_au4-j=[1..16]/vt6_tu2-k=[1..3]-l=[1..7]	
	vt2_tu12	/sts3c_au4-j=[1..16]/vt2_tu12-	

		k=[1..3]-l=[1..7]-m=[1..3]	
	vt15_tu11	/sts1_au3-j=[1..16]-k=[1..3]/vt15_tu11-l=[1..7]-m=[1..4]	
STM4_OC12	sts12c_vc4_4c	/sts12c_vc4_4c=1	
	sts3c_au4	/sts3c_au4-j=[1..4]	The layer rate represents the AUG numbering where the number of au4s is exactly 1.
	sts1_au3	/sts1_au3-j=[1..4]-k=[1..3]	The layer rate represents the AUG numbering where the number of au4s is exactly 1 and the number of au3s is 3 per AUG
	tu3_vc3	/sts3c_au4-j=[1..4]/tu3_vc3-k=[1..3]	
	vt6_tu2	/sts3c_au4-j=[1..4]/vt6_tu2-k=[1..3]-l=[1..7]	
	vt2_tu12	/sts3c_au4-j=[1..4]/vt2_tu12-k=[1..3]-l=[1..7]-m=[1..3]	
	vt15_tu11	/sts1_au3-j=[1..4]-k=[1..3]/vt15_tu11-l=[1..7]-m=[1..4]	
STM1_OC3	sts3c_au4	/sts3c_au4-j=1	
	sts1_au3	/sts1_au3-j=1-k=[1..3]	
	tu3_vc3	/sts3c_au4-j=1/tu3_vc3-k=[1..3]	
	vt15_tu11	/sts1_au3-j=1-k=[1..3]/vt15_tu11-l=[1..7]-m=[1..4]	
STM0_OC1_EC1	sts1_au3	/sts1_au3=1	There is no need for j and k as AU3 is not derived out of a AUG
	vt15_tu11	/sts1_au3=1/ vt15_tu11-l=[1..7]-m=[1..4]	
E4	VC-4	/sts3c_au4=1	This represents the SDH (G805 TTP) CTP contained in a E4 PTP. For PDH adapted to sdh/sonet. This is multilayer CTP for support of transmission parameters at more than 1 rate.
E3	Low order VC-3	/tu3_vc3=1	
DS3	High order VC-3	/sts1_au3=1	
	Low order VC-3	/tu3_vc3=1	PDH adaptation; multilayer CTP
E2	VC-2	/vt6_tu2=1	8 Mbps PDH adapted to VC2. PDH adaptation; multilayer CTP
E1	VC-12	/vt2_tu12=1	2 Mbp/s PDH adapted to VC12
DS1	TU-12 from VC-11	/ds1_vt15_vc11=1	This CTP has two layer rates.
	TU-11 from VC-11	/vt15_tu11=1	DS1 PDH interface layers append to the PDH PTPs
Ethernet	encapsulation	/encapsulation=1	
	sts3c_vc4	/encapsulation=1/sts3c_au4=[1..n]	
	sts1_vc3	/encapsulation=1/sts1_au3=[1..n]	
	VC12	/encapsulation=1/vt2_tu12=[1..n]	
	vt15_tu11	/encapsulation=1/vt15_tu11=[1..n]	
	sts3*Xc_vc4_Xc	/sts3*Xc_vc4_Xc=1	X = 1..64. For example a /sts21c_vc4_7c may be used to carry a Gig. Ethernet signal at full rate. (note that in this case the encapsulation is apart of the same CTP so it does not appear in the naming hierarchy).

4.2.2.5 PDH CTPs

The following are the components for the PDH CTPs.

- ds[0-3]=[1-n]
- e[1-5]=[1-n]
- e.g. DS1 on DS3 card /ds1=4

Examples:

Possible PTP	Layer Rate	CTP Tuple.	Comments
STM16_OC48	ds3	/sts1_au3-j=[1..16]-k=[1..3]/ds3=1	
	DS1 extracted from DS3	/sts1_au3-j=[1..16]-k=[1..3]/ds3=1/ds1=[1..28]	
	DS1 extracted from VT-1.5	/sts1_au3-j-[1..16]-k=[1..3]/vt15_tu11-l=[1..7]-m=[1..4]/ds1=1	
STM4_OC12	ds3	/sts1_au3-j=[1..4]-k=[1..3]/ds3=1	
	DS1 extracted from DS3	/sts1_au3-j=[1..4]-k=[1..3]/ds3=1/ds1=[1..28]	
	DS1 extracted from VT-1.5	/sts1_au3-j=1-k=[1..3]/vt15_tu11-l=[1..7]-m=[1..4]/ds1=1	
STM1_OC3	ds3	/sts1_au3-j=1-k=[1..3]/ds3=1	
	DS1 extracted from DS3	/sts1_au3-j=1-k=[1..3]/ds3=1/ds1=[1..28]	
	DS1 extracted from VT-1.5	/sts1_au3-j=1-k=[1..3]/vt15_tu11-l=[1..7]-m=[1..4]/ds1=1	
DS3	DS3	/ds3=1	45M, 45Mbit/s async/PDH signal,
	DS1	/ds1=[1..28]	The number represents the DS1 CTP in a DS3. Naming for 28 DS1s on a DS3
	DS0	/ds1=[1..28]/ds0=[1..24]	
DS2	DS2	/ds2=1	6Mbit/s async/PDH signal
	DS1	/ds1=[1..4]	Represents DS1 on a DS2. Naming for 4 DS1s on a DS2
DS1	DS1	/ds1=1	1.5Mbit/s async/PDH signal
	DS0	/ds0=[1..24]	
E1	E1	/e1=1	2Mbit/s PDH signal
	DS0	/ds0=[1..31]	
E2	E2	/e2=1	8Mbit/s PDH signal
E3	E3	/e3=1	34Mbit/s PDH signal
E4	E4	/e4=1	140 Mbit/s PDH signal
E5	E5	/e5=1	565 Mbit/s PDH Signal
ISDN	DS0	/ds0=[1..2]	
POTS	DS0	/ds0=1	

4.2.2.6 WDM

The following components are used to represent the WDM management.

- Och – optical channel: Frequency – derived either from the OMS or from the drop side.
  - /frequency=nnn.nn is a decimal representing the frequency in Tera Hertz (THz)
  - e.g., /frequency=nnn.nn
- digital signal rate
  - e.g. /dsr=1
- OMS CTP in an optical amplifier

  - /oms=1
- ODU CTP in a G.709 OMS port with TDM and optical multiplexing
  - /frequency=nnn.nn/odu2=1/odu1=[1-4]

Examples:

Possible PTP/FTP	Layer Rate	CTP Tuple.	Comments
OTS	oms	/oms=1	Number, meant for Optical amplifiers
OMS, OS/DSR	optical channel	/frequency=nnn.nn	Frequency Number , decimals in THz i.e., /frequency=191.90
	odu1	/frequency=nnn.nn/odu1=1	
	odu2	/frequency=nnn.nn/odu2=1	
	odu1	/frequency=nnn.nn/odu2=1 /odu1=[1-4]	odu1 in odu2
PHYSCIAL_ELECTRICAL, OS	dsr	/dsr=1	For digital signal connectivity (unspecified rate)
PHYSICAL_OPTICAL, OS	optical channel	/frequency=nnn.nn	Frequency number, decimals in THz, for optical connectivity i.e., /frequency=191.90
OCH_Data_Unit_2	odu2	/odu1=[1-4]	

4.2.2.7 Tunable Lasers:

Characteristics of the tunable lasers are such that they are a few in number and each one of them can be tuned to some variable frequency ranges, starting at some frequency and with some specified spacing. To achieve that the followinng scheme is named:

Name = “CTP”
Value = “/frequency=tunable-number=<n>
where n identifies the tunable lasers number with respect to a PTP. If a PTP has only one tunable laser,
the CTP Tuple will be

Possible PTP	Layer Rate	CTP Tuple.	Comments
OS/DSR, OS	optical channel	/ frequency=tunable-number=[1..n]	The number represents the laser number within a group of tunable lasers. This is invariant through the life of the CTP. The tuned frequency, expressed as a Transmission Parameters is represented as the variant.

To identify the ranges for which the laser may be tuned, the followiong may be added top the parameter list for the OCH CTP of the PTP.

TUNABLE_BASE_FREQUENCY // value in nnn.nn THz
TUNABLE_FREQUENCY_SPACING // nn GHz
NUMBER_OF_TUNABLE_FREQUENCIES /nn

The Tunable Base Frequency starts with the lowest frequency that is applicable (in THz) and increases by a Tunable Frequency Spacing (in GHz) and repeats in such a way to make available a Number of Total Tunable Frequencies.
Once the tunable frequency is tuned by setTPData() or via createAndActivateSNC() , the value of the Frequency is set and a new Transmission Parameter is set:

TUNED_FREQUENCY //nnn.nn frequency.

4.2.3 Pictorial Depiction of the CTP Hierarchy.

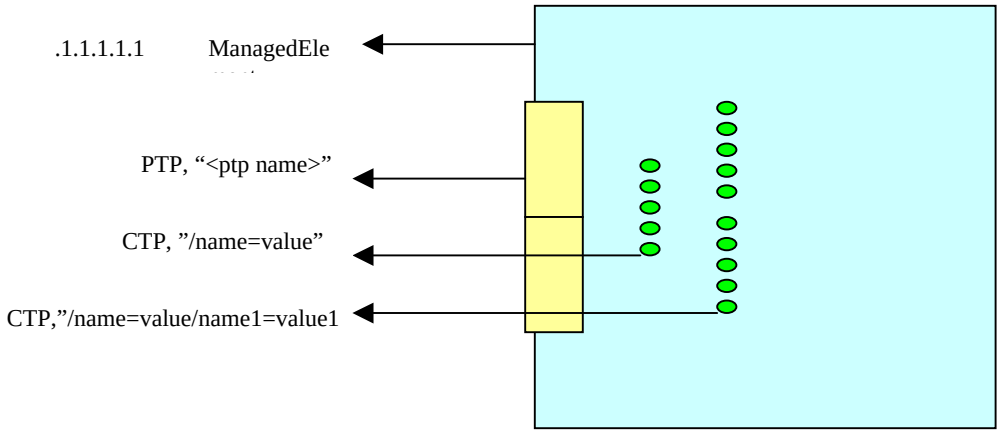

Figure 2 Bi-Directional CTP Model

Figure 2 represents the relation between the tuples of a CTP. The figure describes a completely bidirectional model.

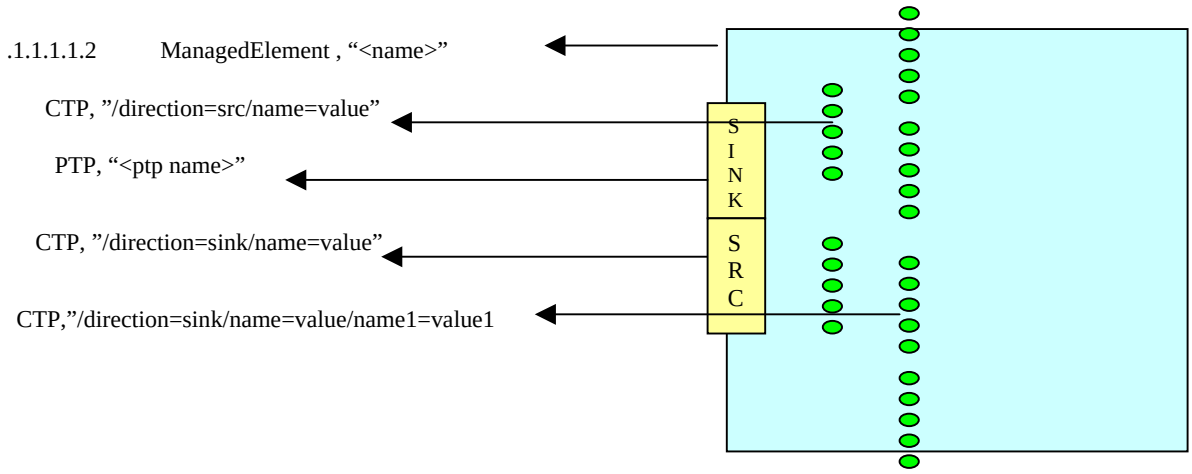

Figure 3 Uni-Directional CTP Model

Figure 3 represents a unidirectional model, where the SINK PTP contains src CTPs which in turn may contain other src CTPs.

4.3 Naming of the PMP

The value of the PMP name is "*layer rate-location-granularity*" where

- *layer rate* are the digits as defined in LayerRate_T, e.g. 15 for LR_STS3c_and_AU4_VC4
- *location* is the string defined in PMLocation_T, e.g. PML_NEAR_END_Rx
- *granularity* is the string defined in Granularity_T, e.g. 15min

The complete example thus looks like “15- PML_NEAR_END_Rx-15min”.