

# **Multi-Technology Network Management Business Agreement**

*NML-EML Interface Version 3.0*



**TMF 513**



*Member Approved Version 3.0*

*April 2004*

## **Executive Summary**

This document defines the business agreement for the exchange of management information within a model of telecommunication management business functions documented in TM FORUM's enhanced Telecom Operations Map (eTOM). Specifically, the Business Agreement captured in this document defines the information exchange, or interface, between Network Management Systems (NMS) and Element Management Systems (EMS) enabling management of SONET/SDH, DWDM and ATM transport networks.

This document covers the NML-EML interface.

As the problem of managing next-generation networks composed of hybrid network elements become more and more prevalent, previously technology-specific interface solutions become insufficient. The goal of the team is to provide a single common solution to enable management of these hybrid network elements.

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## Acknowledgements

The Multi-Technology Network Management, NML-EML Interface, Version 3.0 is a genuinely collaborative effort. The TeleManagement Forum would like to thank the following people for contributing their time and expertise to the production of this document. It is just not possible to recognize all the organizations and individuals that have contributed or influenced the Multi-Technology Network Management (MTNM) Business Agreement. We apologize to any person or organization we inadvertently missed in these acknowledgments.

Key individuals that reviewed, provided input, managed, edited and determined how to utilize inputs coming from all over the world, and really made this document happen were:

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- Ralf Kimmlingen, Deutsche Telekom
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The MTNM team would specifically like to recognize the significant contribution made by Edgar Riemann. Edgar who as the Team Leader for the majority of the Version 3.0 work was a key individual in ensuring the successful completion of Version 3.0 of the MTNM interface.

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Although not directly used within this document, access to documentation and work from standards bodies and other forums have contributed to the evolution of the Multi-Technology Network Management (MTNM) Business Agreement. This access was via public information or TM Forum member knowledge. This list of standards bodies and forums is not inclusive and does not imply review and concurrence by these organizations or their representatives. It is important however to acknowledge the work and their influence on the TeleManagement Forum work:

- American National Standards Institute (ANSI)
- ATM Forum
- DSL Forum
- European Telecommunications Standards Institute (ETSI)
- Institute of Electrical and Electronics Engineers (IEEE)
- International Telecommunications Union - Telecommunication Standardization Sector (ITU-T)
- Internet Engineering Task Force (IETF)
- Metro Ethernet Forum (MEF)
- MPLS and Frame Relay Alliance
- Object Management Group (OMG)
- Optical Interworking Forum (OIF)
- Telcordia Technologies

## About this Document

### TM Forum Documents

The Multi-Technology Network Management (MTNM) NML-EML Interface Business Agreement is being issued as Member Approved Version 3.0. It can be considered valid until further noticed by the Telemanagement Forum ("TM Forum"), at which time the TM Forum expects to update it to reflect comments from implementation experience, as well as to reflect additional member comment.

The Multi-Technology Network Management (MTNM) NML-EML Interface Business Agreement Version 3.0 supersedes the TM Forum Multi-Technology Network Management (MTNM) NML-EML Interface Business Agreement Version 2.1 in its entirety.

The list of features that have been added/enhanced are listed in the attached supporting document [FeatureSummaryVersion3](#).

This document will continue under formal change control. Supporting work will be issued as revisions to this document. A document of this type is a "living document," intended to capture and communicate current knowledge and practices. Further inputs will be made because of detailed work ongoing in the TM Forum and the industry.

The specification of the NML-EML interface is contained in a set of four documents:

- TMF513 - MTNM Business Agreement (this document)
- TMF608 - MTNM Information Agreement
- TMF814 - MTNM Solution Set
- TMF814A - MTNM Implementation Statement Template and Guidelines

In addition to these specification documents there are a number of supporting documents that are provided as part of the NML-EML Interface specification. These supporting documents contain details on various specific aspects of the NML-EML Interface and are intended to help clarify some of the specific aspects of the interface.

The details of the NML-EML Interface are specified in the above mentioned documents and it is expected that anyone wishing to understand the details of this interface be familiar with these documents. Specifically it is expected that TMF 513 which specifies the requirements and the use cases should be considered as the entry point into the document set.

TMF 513 defines the requirements for the interface both in terms of the objects and operations that the interface is required to support and the behavior of the interface. TMF 513 contains a mapping to TMF 608 this mapping links the requirements to the classes and operations specified in UML information model.

TMF 608 specifies the details of the classes their relationships and their operations behavior that are required to support the requirements of the NML-EML Interface. Hence TMF 513 and TMF 608 fully define the NML-EML Interface.

TMF 814 specifies a CORBA IDL implementation of the NML-EML Interface. In defining a specific implementation that meets the specification defined in TMF 513 and TMF 608 it is necessary to consider implementation specific issues such as efficiency, compatibility etc.

## Revision History

Version	Date	Description of change
3.0	08/01/03	<p>Changed format to the latest Business Agreement Template - TMF 402 Version 5.5, January 2002.</p> <p>Changed from Version 2.1 to Version 3.0 and changed to a Member Approved Version.</p> <p>Updated <a href="#">Section 3</a> to refer to eTOM.</p> <p>Updated ALL existing requirements to indicate that their source was Version 2.0.</p> <p>Added Common Attributes requirement <a href="#">{Requirement I. 060}</a> and updated all appropriate requirements to refer to it.</p> <p>Restructured the requirements to be consistent in their object oriented approach (object, attributes etc.).</p> <p>Re-structured the Category I requirements to have all objects with a requirement for the description and a requirement for the attributes. Added the following requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement I. 061}</a></li> <li>• <a href="#">{Requirement I. 062}</a></li> <li>• <a href="#">{Requirement I. 063}</a></li> <li>• <a href="#">{Requirement I. 064}</a></li> <li>• <a href="#">{Requirement I. 065}</a></li> <li>• <a href="#">{Requirement I. 066}</a></li> <li>• <a href="#">{Requirement I. 088}</a></li> <li>• <a href="#">{Requirement I. 094}</a></li> </ul> <p>Added PG Parameter list attribute to Protection Group object (<a href="#">{Requirement I. 066}</a>).</p> <p>Added Common Event Information requirements <a href="#">{Requirement I. 068}</a> and <a href="#">{Requirement I. 093}</a> and restructured events/notification section appropriately.</p> <p>Re-arranged some of the requirements to align with the Use Case partitioning.</p> <p>Deleted requirement <a href="#">{Requirement I. 055}</a> as it was replaced with an update to <a href="#">{Requirement I. 048}</a>.</p> <p>Deleted requirement <a href="#">{Requirement II. 070}</a> as it was covered by requirement <a href="#">{Requirement II. 066}</a>.</p> <p>Deleted requirement <a href="#">{Requirement II. 081}</a> as it was covered by requirement <a href="#">{Requirement II. 067}</a>.</p> <p>Deleted requirement <a href="#">{Requirement II. 113}</a> as it was covered by <a href="#">{Requirement II. 059}</a>.</p> <p>Deleted requirement <a href="#">{Requirement II. 123}</a> as it was covered by <a href="#">{Requirement II. 221}</a> and <a href="#">{Requirement II. 222}</a>.</p> <p>Deleted section heading 4.2.8.1 Prevention.</p> <p>Added the following new definitions to <a href="#">Appendix A</a>:</p> <ul style="list-style-type: none"> <li>• Internal topological link</li> <li>• Network Access Domain</li> <li>• Off-network topological link</li> <li>• Trail</li> </ul>

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Version	Date	Description of change
3.0	08/01/03	<p>Moved the create and delete Traffic Descriptor related requirements to the Provisioning section.          Updated the descriptions of the Traffic Descriptor attributes.</p> <p>Made editorial changes (for consistency) to the names of a number of the Use Cases in <a href="#">Section 5</a>.</p> <p>Added the following missing requirements from Version 2.0:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement II. 274}</a></li> <li>• <a href="#">{Requirement II. 275}</a></li> <li>• <a href="#">{Requirement II. 276}</a></li> <li>• <a href="#">{Requirement II. 195}</a></li> <li>• <a href="#">{Requirement II. 279}</a></li> <li>• <a href="#">{Requirement II. 280}</a></li> <li>• <a href="#">{Requirement II. 281}</a></li> <li>• <a href="#">{Requirement II. 282}</a></li> <li>• <a href="#">{Requirement II. 283}</a></li> <li>• <a href="#">{Requirement II. 284}</a></li> </ul> <p>Re-structured the Category II requirements and added the following requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement II. 262}</a></li> </ul>
3.0	08/01/03	<p><b>020705am_adminDomains.doc</b> and <b>AdminDomains_20020906.rtf</b> - added the attribute Network Access Domain to the following objects:</p> <ul style="list-style-type: none"> <li>• <a href="#">Managed Element (ME)</a></li> <li>• <a href="#">Subnetwork</a></li> <li>• <a href="#">Subnetwork Connection (SNC)</a></li> <li>• <a href="#">Termination Point (TP)</a></li> <li>• <a href="#">Topological Link (TL)</a></li> </ul> <p>updated the following requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement II. 084}</a></li> <li>• <a href="#">{Requirement II. 169}</a></li> </ul> <p>added the following new requirement:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement II. 193}</a></li> </ul>
3.0	08/01/03	<p><b>030314am_trails.doc</b> - added the following new requirement:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement II. 153}</a></li> </ul> <p>updated the following requirement:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement II. 084}</a></li> </ul> <p>updated the following use case:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)</a></li> </ul>

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3.0	08/01/03	<p><b>030523am_asapmng.doc</b> - added the attribute Alarm severity assignment profile to the following objects:</p> <ul style="list-style-type: none"> <li>• <a href="#">Element Management System (EMS)</a></li> <li>• <a href="#">Equipment</a></li> <li>• <a href="#">Equipment Holder</a></li> <li>• <a href="#">Equipment Protection Group (EPG)</a></li> <li>• <a href="#">Group Termination Point (GTP)</a></li> <li>• <a href="#">Managed Element (ME)</a></li> <li>• <a href="#">Protection Group (PG)</a></li> <li>• <a href="#">Subnetwork Connection (SNC)</a></li> <li>• <a href="#">Termination Point (TP)</a></li> <li>• <a href="#">Topological Link (TL)</a></li> </ul> <p>updated the following requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement II. 084}</a></li> </ul> <p>added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement I. 080}</a></li> <li>• <a href="#">{Requirement I. 081}</a></li> <li>• <a href="#">{Requirement I. 082}</a></li> <li>• <a href="#">{Requirement II. 196}</a></li> <li>• <a href="#">{Requirement II. 197}</a></li> <li>• <a href="#">{Requirement II. 198}</a></li> <li>• <a href="#">{Requirement II. 199}</a></li> <li>• <a href="#">{Requirement II. 200}</a></li> <li>• <a href="#">{Requirement II. 201}</a></li> <li>• <a href="#">{Requirement II. 202}</a></li> <li>• <a href="#">{Requirement II. 203}</a></li> <li>• <a href="#">{Requirement II. 204}</a></li> <li>• <a href="#">{Requirement II. 205}</a></li> <li>• <a href="#">{Requirement II. 206}</a></li> <li>• <a href="#">{Requirement II. 207}</a></li> <li>• <a href="#">{Requirement II. 208}</a></li> <li>• <a href="#">{Requirement II. 209}</a></li> </ul>

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3.0	08/01/03	<p>updated the following use case in</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.5.8: NMS provisions alarm reporting on for a TP</a></li> <li>• <a href="#">Use Case 5.5.9: NMS provisions alarm reporting off for a TP</a></li> <li>• <a href="#">Use Case 5.5.21: NMS assigns an Alarm Severity Assignment Profile (ASAP) to a CTP</a></li> <li>• <a href="#">Use Case 5.8.1: NMS reconciles active alarms from an EMS</a></li> <li>• <a href="#">Use Case 5.8.2: NMS reconciles active alarms for a specified Managed Element</a></li> <li>• <a href="#">Use Case 5.8.6: EMS Notifies NMS of Alarms or Threshold Crossing Alert (TCA)s</a></li> <li>• <a href="#">Use Case 5.9.3: NMS provisions alarm reporting on/off for equipment</a></li> <li>• <a href="#">Use Case 5.9.4: NMS provisions alarm reporting on/off for an equipment holder</a></li> </ul>
3.0	08/01/03	<p><b>AlarmAcknowledgementFinalized20030403.doc</b> - added the following new requirements in <a href="#">Section 4.2.4.1</a> and:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement II. 154}</a></li> <li>• <a href="#">{Requirement II. 155}</a></li> <li>• <a href="#">{Requirement II. 156}</a></li> <li>• <a href="#">{Requirement II. 157}</a></li> <li>• <a href="#">{Requirement II. 158}</a></li> <li>• <a href="#">{Requirement II. 287}</a></li> <li>• <a href="#">{Requirement II. 288}</a></li> </ul> <p>added the following new use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.8.7: Alarm Acknowledgement in the NMS</a></li> <li>• <a href="#">Use Case 5.8.8: Alarm Unacknowledgement in the NMS</a></li> <li>• <a href="#">Use Case 5.8.9: Alarm Acknowledgement in the EMS</a></li> <li>• <a href="#">Use Case 5.8.10: NMS reconciles Unacknowledged Active Alarms from an EMS</a></li> <li>• <a href="#">Use Case 5.8.11: NMS reconciles Unacknowledged Active Alarms for a specified Managed Element</a></li> </ul> <p>Updated requirements <a href="#">{Requirement I. 047}</a> and <a href="#">{Requirement I. 047}</a> to include new attribute "Acknowledgement indicator".</p>
3.0	08/01/03	<p><b>AlarmLoss_20030507.doc</b>- added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement I. 077}</a></li> <li>• <a href="#">{Requirement II. 177}</a></li> <li>• <a href="#">{Requirement II. 178}</a></li> </ul> <p>added the following new use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.8.12: EMS discards an event to be sent to the NMS</a></li> <li>• <a href="#">Use Case 5.8.13: EMS succeeds in forwarding an event to the NMS again</a></li> <li>• <a href="#">Use Case 5.8.14: EMS sends a heartbeat notification to the NMS</a></li> </ul>

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3.0	08/01/03	<p><b>Arc-FM_021001.doc</b> - added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">Requirement II. 159</a></li> <li>• <a href="#">Requirement II. 160</a></li> <li>• <a href="#">Requirement II. 161</a></li> <li>• <a href="#">Requirement II. 162</a></li> </ul> <p>updated requirements <a href="#">Requirement I. 015</a> and <a href="#">Requirement I. 011</a> to include the following new attribute:</p> <ul style="list-style-type: none"> <li>• Alarm reporting indicator</li> </ul> <p>updated the following requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">Requirement II. 084</a></li> </ul>
3.0	08/01/03	<p><b>BAUpdatesForTPHistoryPMData.doc</b> - added the following new requirement:</p> <ul style="list-style-type: none"> <li>• <a href="#">Requirement II. 163</a></li> </ul> <p>added the following new Use Case:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.11.11: On demand retrieval of historical Performance Monitoring Data (PMD) for a specified set of TPs</a></li> </ul>
3.0	08/01/03	<p><b>Bundled SNCs-15Apr03.doc</b> - added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">Requirement I. 069</a></li> <li>• <a href="#">Requirement I. 070</a></li> <li>• <a href="#">Requirement I. 076</a></li> <li>• <a href="#">Requirement II. 164</a></li> <li>• <a href="#">Requirement II. 165</a></li> <li>• <a href="#">Requirement II. 166</a></li> <li>• <a href="#">Requirement II. 167</a></li> <li>• <a href="#">Requirement II. 171</a></li> <li>• <a href="#">Requirement II. 172</a></li> <li>• <a href="#">Requirement II. 173</a></li> <li>• <a href="#">Requirement II. 184</a></li> </ul> <p>updated the following requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">Requirement I. 015</a> to include the following new attributes: <ul style="list-style-type: none"> <li>• Bundled SNC indicator</li> <li>• GTP deletion indicator</li> </ul> </li> <li>• <a href="#">Requirement I. 020</a> to indicate that GTPs can be cross-connected.</li> <li>• <a href="#">Requirement I. 023</a> to indicate that <a href="#">Connection State</a> is also applicable to GTPs.</li> <li>• <a href="#">Requirement II. 064</a> - OC, <a href="#">Requirement II. 065</a> - OD and <a href="#">Requirement II. 066</a> AVC</li> <li>• <a href="#">Requirement II. 084</a> to indicate that the end points can be CTPs, FTPs or GTPs and to include the following new attributes: <ul style="list-style-type: none"> <li>• Bundled SNC indicator</li> <li>• GTP deletion indicator</li> </ul> </li> </ul>

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3.0	08/01/03	<p><b>SetAlarmReportingForGTPs-11June03.doc</b> - added new attribute Alarm reporting indicator to <a href="#">{Requirement I. 070}</a>.</p> <p>added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement II. 219}</a></li> <li>• <a href="#">{Requirement II. 220}</a></li> </ul>
3.0	08/01/03	<p><b>DSL_20030623.doc</b> - added the following new use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.5.26: NMS provisions or re-provisions a single DSL line</a></li> <li>• <a href="#">Use Case 5.5.27: NMS provisions multiple DSL lines by using TMDs</a></li> </ul>
3.0	08/01/03	<p><b>Dynamic Connection Management</b> - added the “Correlation identifier” attribute to the <a href="#">Subnetwork Connection (SNC)</a> object.</p>
3.0	08/01/03	<p><b>Equipment Manufacturer - 17 April 02.doc</b> - added the “Manufacturer” attribute to the following objects:</p> <ul style="list-style-type: none"> <li>• Managed Element (ME)</li> <li>• Equipment</li> </ul>
3.0	08/01/03	<p><b>Equipment Protection - 22 July 02.doc</b> - added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement I. 072}</a></li> <li>• <a href="#">{Requirement I. 073}</a></li> <li>• <a href="#">{Requirement I. 074}</a></li> <li>• <a href="#">{Requirement II. 174}</a></li> <li>• <a href="#">{Requirement II. 175}</a></li> <li>• <a href="#">{Requirement II. 176}</a></li> <li>• <a href="#">{Requirement II. 269}</a></li> </ul> <p>updated the following use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.7.1: NMS retrieves all the Protection Groups of a Managed Element</a></li> <li>• <a href="#">Use Case 5.7.2: Protection Switch Notification for Equipment, Trail and SNC Protection</a></li> <li>• <a href="#">Use Case 5.7.3: NMS retrieves the protection switch information for Equipment, Trail and SNC Protection</a></li> </ul> <p>updated <a href="#">{Requirement I. 032}</a> to include the following new attributes:</p> <ul style="list-style-type: none"> <li>• protection role</li> <li>• protection scheme state</li> </ul> <p>updated <a href="#">{Requirement I. 005}</a> to include the new attribute equipment protected.</p>
3.0	08/01/03	<p><b>EthernetModelling_20030204.doc</b> - added the following new use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.6.12: NMS creates and activates a point-to-point Ethernet Service using fragmentation</a></li> <li>• <a href="#">Use Case 5.6.13: NMS modifies a point-to-point Ethernet Service with fragmentation</a></li> <li>• <a href="#">Use Case 5.6.14: NMS deletes a point-to-point Ethernet Service with fragmentation</a></li> </ul>

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3.0	08/01/03	<p><b>FixedcrossConnect030520.doc</b> - updated <a href="#">(Requirement I. 020)</a> and <a href="#">(Requirement I. 015)</a> to add the Fixed attribute.</p> <p>updated <a href="#">(Requirement I. 005)</a> to add the following attributes:</p> <ul style="list-style-type: none"> <li>• Client connectivity</li> <li>• Server connectivity</li> </ul> <p>added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">(Requirement II. 179)</a></li> <li>• <a href="#">(Requirement II. 180)</a></li> <li>• <a href="#">(Requirement II. 181)</a></li> <li>• <a href="#">(Requirement II. 182)</a></li> <li>• <a href="#">(Requirement II. 183)</a></li> <li>• <a href="#">(Requirement II. 185)</a></li> </ul>
3.0	08/01/03	<p><b>Floating TPs_20020531.doc</b> - added the following new requirement:</p> <ul style="list-style-type: none"> <li>• <a href="#">(Requirement I. 075)</a></li> </ul> <p>added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">(Requirement II. 214)</a></li> <li>• <a href="#">(Requirement II. 215)</a></li> <li>• <a href="#">(Requirement II. 216)</a></li> <li>• <a href="#">(Requirement II. 217)</a></li> <li>• <a href="#">(Requirement II. 210)</a></li> <li>• <a href="#">(Requirement II. 211)</a></li> <li>• <a href="#">(Requirement II. 212)</a></li> <li>• <a href="#">(Requirement II. 213)</a></li> </ul>
3.0	08/01/03	<p><b>GetSNCRouteWithCTPsAndTopoLinks_02192003.doc</b> - added the following new requirement:</p> <ul style="list-style-type: none"> <li>• <a href="#">(Requirement II. 218)</a></li> </ul>
3.0	08/01/03	<p><b>GTPUseCases9June03.doc</b> - added the following new use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.5.15: NMS creates a Group Termination Point (GTP)</a></li> <li>• <a href="#">Use Case 5.5.16: NMS modifies a Group Termination Point (GTP)</a></li> <li>• <a href="#">Use Case 5.5.17: NMS deletes a Group Termination Point (GTP)</a></li> </ul>

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Version	Date	Description of change
3.0	08/01/03	<p><b>IMA_20030215.doc</b> - added the following new use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.5.22: NMS locks (in a forced response deferred/graceful fashion) or unlocks a number of IMA links to modify the transport capacity of the corresponding fixed IMA group</a></li> <li>• <a href="#">Use Case 5.5.23: NMS requests dynamic provisioning of an IMA group by the EMS subject to a prescribed bandwidth that is communicated as number and connectable layer rate of the IMA links</a></li> <li>• <a href="#">Use Case 5.5.24: NMS provisions the IMA virtual link between two peer IMA groups as a topological link</a></li> <li>• <a href="#">Use Case 5.5.25: NMS unprovisions an IMA virtual link between IMA groups</a></li> <li>• <a href="#">Use Case 5.6.15: NMS creates a flexible IMA group</a></li> <li>• <a href="#">Use Case 5.6.16: NMS deletes a flexible IMA group</a></li> <li>• <a href="#">Use Case 5.6.17: NMS modifies the transport capacity or the routing targets of a flexible IMA group</a></li> </ul>
3.0	08/01/03	<p><b>NetworkRouting030527.doc</b> - updated the following attributes in <a href="#">{Requirement I. 015}</a>:</p> <ul style="list-style-type: none"> <li>• Network routed</li> <li>• Reroute allowed</li> </ul> <p>added the following new attributes in <a href="#">{Requirement I. 015}</a>:</p> <ul style="list-style-type: none"> <li>• Network reroute</li> <li>• Revertive</li> </ul> <p>updated the following attributes in <a href="#">{Requirement II. 084}</a>:</p> <ul style="list-style-type: none"> <li>• Network routed</li> <li>• Reroute allowed</li> </ul> <p>added the following new attributes in <a href="#">{Requirement II. 084}</a>:</p> <ul style="list-style-type: none"> <li>• Network reroute</li> <li>• Revertive</li> </ul>
3.0	08/01/03	<p><b>OpaqueView_20030520.doc</b> - added the following new attributes to <a href="#">{Requirement I. 015}</a>:</p> <ul style="list-style-type: none"> <li>• aEnd TP role</li> <li>• zEnd TP role</li> </ul> <p>updated the following requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement I. 014}</a></li> <li>• <a href="#">{Requirement II. 083}</a></li> <li>• <a href="#">{Requirement II. 084}</a></li> <li>• <a href="#">{Requirement II. 153}</a></li> </ul> <p>added the following new requirement:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement I. 092}</a></li> </ul> <p>updated the following use cases:</p>
3.0	08/01/03	<p><b>Phase III Support for Radio Protection_19062002.doc</b> - Added new attribute <a href="#">APS protocol type</a> to the <a href="#">Protection Group (PG)</a> object.</p>

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Version	Date	Description of change
3.0	08/01/03	<p><b>PM SC Notifications - 14 Jan 03.doc</b> - added the following new requirement:</p> <ul style="list-style-type: none"> <li>• <a href="#">(Requirement I. 083)</a></li> </ul>
3.0	08/01/03	<p><b>PMPDefs_20030109.doc</b> - added the following new attribute in <a href="#">(Requirement I. 005)</a>:</p> <ul style="list-style-type: none"> <li>• Performance monitoring point</li> </ul> <p>updated the following requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">(Requirement II. 064)</a></li> <li>• <a href="#">(Requirement II. 065)</a></li> </ul> <p>added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">(Requirement I. 084)</a></li> <li>• <a href="#">(Requirement I. 085)</a></li> <li>• <a href="#">(Requirement II. 221)</a></li> <li>• <a href="#">(Requirement II. 222)</a></li> </ul> <p>updated the following use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a></li> <li>• <a href="#">Use Case 5.11.1: NMS activates collection of Performance Monitoring Data (PMD) for a specified set of TPs</a></li> <li>• <a href="#">Use Case 5.11.2: NMS deactivates collection of Performance Monitoring Data (PMD) for a specified set of TPs</a></li> <li>• <a href="#">Use Case 5.11.7: NMS sets PM thresholds on a TP</a></li> <li>• <a href="#">Use Case 5.11.9: NMS enables Threshold Crossing Alerts (TCA) for a specified set of TPs</a></li> <li>• <a href="#">Use Case 5.11.10: NMS disables Threshold Crossing Alerts (TCA) for a specified set of TPs</a></li> <li>• <a href="#">Use Case 5.11.12: NMS retrieves Performance Monitoring Points (PMP) contained in an ME or a TP</a></li> </ul>
3.0	08/01/03	<p><b>Root Cause Alarm Indication - 24 Jan 02.doc</b> - updated the following requirement:</p> <ul style="list-style-type: none"> <li>• <a href="#">(Requirement I. 048)</a></li> </ul> <p>added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">(Requirement II. 223)</a></li> <li>• <a href="#">(Requirement II. 224)</a></li> </ul> <p>added the following new use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.8.4: NMS registers to receive RCAs only, raw alarms only, or both RCAs and raw alarms from an EMS</a></li> <li>• <a href="#">Use Case 5.8.5: EMS determines a more appropriate root cause than one previously reported</a></li> </ul>
3.0	08/01/03	<p><b>Setting_Additional_Info_20030205.doc</b> - added the following new requirement:</p> <ul style="list-style-type: none"> <li>• <a href="#">(Requirement II. 223)</a></li> </ul> <p>added the following new use case:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.5.5: NMS provisions the Additional Information</a></li> </ul>

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Version	Date	Description of change
3.0	08/01/03	<p><b>SNC-alarms_020313_CB.doc</b> - not yet completed</p>
3.0	08/01/03	<p><b>SNCModify_030509.doc</b> and <b>SNCModify_030527am.doc</b> -added the following attributes in <a href="#"><u>{Requirement I. 015}</u></a>:</p> <ul style="list-style-type: none"> <li>• Retain SNC</li> <li>• Priority</li> </ul> <p>updated the following requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#"><u>{Requirement I. 021}</u></a></li> </ul> <p>added the following attributes in <a href="#"><u>{Requirement II. 084}</u></a>:</p> <ul style="list-style-type: none"> <li>• Retain SNC</li> <li>• Priority</li> <li>• Exclusive intended route</li> </ul> <p>added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#"><u>{Requirement I. 089}</u></a></li> <li>• <a href="#"><u>{Requirement II. 241}</u></a></li> <li>• <a href="#"><u>{Requirement II. 242}</u></a></li> <li>• <a href="#"><u>{Requirement II. 243}</u></a></li> <li>• <a href="#"><u>{Requirement II. 244}</u></a></li> <li>• <a href="#"><u>{Requirement II. 245}</u></a></li> <li>• <a href="#"><u>{Requirement II. 246}</u></a></li> <li>• <a href="#"><u>{Requirement II. 247}</u></a></li> <li>• <a href="#"><u>{Requirement II. 248}</u></a></li> <li>• <a href="#"><u>{Requirement II. 249}</u></a></li> <li>• <a href="#"><u>{Requirement II. 250}</u></a></li> <li>• <a href="#"><u>{Requirement II. 251}</u></a></li> <li>• <a href="#"><u>{Requirement II. 252}</u></a></li> <li>• <a href="#"><u>{Requirement II. 256}</u></a></li> <li>• <a href="#"><u>{Requirement II. 257}</u></a></li> <li>• <a href="#"><u>{Requirement II. 258}</u></a></li> <li>• <a href="#"><u>{Requirement II. 259}</u></a></li> <li>• <a href="#"><u>{Requirement II. 260}</u></a></li> <li>• <a href="#"><u>{Requirement II. 261}</u></a></li> </ul> <p>updated the following use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#"><u>Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)</u></a></li> <li>• <a href="#"><u>Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)</u></a></li> <li>• <a href="#"><u>Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</u></a></li> <li>• <a href="#"><u>Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)</u></a></li> <li>• <a href="#"><u>Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)</u></a></li> </ul>

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Version	Date	Description of change
3.0	08/01/03	<ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)</a></li> <li>• <a href="#">Use Case 5.6.4: NMS adds a route to a Subnetwork Connection (SNC)</a></li> <li>• <a href="#">Use Case 5.6.5: NMS removes a route from a Subnetwork Connection (SNC)</a></li> <li>• <a href="#">Use Case 5.6.6: NMS creates-modifies the route of a Subnetwork Connection (SNC)</a></li> </ul>
3.0	08/01/03	<p><b>Support for Log Service - 4 June 2002.doc</b> - added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement I. 090}</a></li> <li>• <a href="#">{Requirement I. 091}</a></li> <li>• <a href="#">{Requirement I. 095}</a></li> <li>• <a href="#">{Requirement I. 096}</a></li> <li>• <a href="#">{Requirement I. 097}</a></li> <li>• <a href="#">{Requirement I. 098}</a></li> <li>• <a href="#">{Requirement II. 253}</a></li> <li>• <a href="#">{Requirement II. 254}</a></li> <li>• <a href="#">{Requirement II. 255}</a></li> </ul> <p>updated the following requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement II. 064}</a></li> <li>• <a href="#">{Requirement II. 065}</a></li> <li>• <a href="#">{Requirement II. 066}</a></li> <li>• <a href="#">{Requirement II. 067}</a></li> </ul>
3.0	08/01/03	<p><b>Supported and Supporting Equipment - 14 Jan 02.doc</b> - added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement II. 225}</a></li> <li>• <a href="#">{Requirement II. 226}</a></li> <li>• <a href="#">{Requirement II. 227}</a></li> <li>• <a href="#">{Requirement II. 228}</a></li> </ul>
3.0	08/01/03	<p><b>SwdIBackup_20021230.doc</b> - added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement I. 086}</a></li> <li>• <a href="#">{Requirement II. 229}</a></li> <li>• <a href="#">{Requirement II. 230}</a></li> <li>• <a href="#">{Requirement II. 231}</a></li> <li>• <a href="#">{Requirement II. 232}</a></li> </ul>

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Version	Date	Description of change
3.0	08/01/03	<p><b>TCA-Profile_081102.doc</b> - added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">Requirement I. 067</a></li> <li>• <a href="#">Requirement I. 087</a></li> <li>• <a href="#">Requirement II. 233</a></li> <li>• <a href="#">Requirement II. 234</a></li> <li>• <a href="#">Requirement II. 235</a></li> <li>• <a href="#">Requirement II. 236</a></li> <li>• <a href="#">Requirement II. 237</a></li> <li>• <a href="#">Requirement II. 238</a></li> <li>• <a href="#">Requirement II. 239</a></li> <li>• <a href="#">Requirement II. 240</a></li> </ul> <p>added the following new use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.11.13: NMS configures TCA Parameter Profile</a></li> <li>• <a href="#">Use Case 5.11.14: NMS modifies TCA Parameter Profile Pointer</a></li> </ul>
3.0	08/01/03	<p><b>TLCreation_20020901.doc</b> - added the following requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">Requirement II. 168</a></li> <li>• <a href="#">Requirement II. 169</a></li> <li>• <a href="#">Requirement II. 170</a></li> </ul>
3.0	08/01/03	<p><b>TL Definition.doc</b> - updated the following requirement:</p> <ul style="list-style-type: none"> <li>• <a href="#">Requirement I. 010</a></li> </ul>
3.0	08/01/03	<p><b>TPPool_070703.doc</b> - changed requirement for <a href="#">Termination Point Pool (TP Pool)</a> object to no longer be a type of TP</p> <p>updated the following requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">Requirement I. 005</a></li> <li>• <a href="#">Requirement II. 028</a></li> <li>• <a href="#">Requirement I. 094</a></li> </ul> <p>added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">Requirement II. 265</a></li> <li>• <a href="#">Requirement II. 266</a></li> <li>• <a href="#">Requirement II. 267</a></li> <li>• <a href="#">Requirement II. 268</a></li> <li>• <a href="#">Requirement II. 272</a></li> </ul> <p>updated the following use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a></li> </ul>

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<b>Version</b>	<b>Date</b>	<b>Description of change</b>
3.0	08/01/03	<p>added the following new use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.5.18: NMS creates a Termination Point Pool (TP Pool)</a></li> <li>• <a href="#">Use Case 5.5.19: NMS modifies a Termination Point Pool (TP Pool)</a></li> <li>• <a href="#">Use Case 5.5.20: NMS deletes a Termination Point Pool (TP Pool)</a></li> </ul>
3.0	08/01/03	<p><b>Transmission_Descriptors_20030613.doc</b> - added the following new requirements:</p> <ul style="list-style-type: none"> <li>• <a href="#">{Requirement I. 078}</a></li> <li>• <a href="#">{Requirement I. 079}</a></li> <li>• <a href="#">{Requirement II. 186}</a></li> <li>• <a href="#">{Requirement II. 187}</a></li> <li>• <a href="#">{Requirement II. 188}</a></li> <li>• <a href="#">{Requirement II. 188}</a></li> <li>• <a href="#">{Requirement II. 190}</a></li> <li>• <a href="#">{Requirement II. 191}</a></li> <li>• <a href="#">{Requirement II. 192}</a></li> <li>• <a href="#">{Requirement II. 194}</a></li> <li>• <a href="#">{Requirement II. 277}</a></li> <li>• <a href="#">{Requirement II. 278}</a></li> </ul> <p>updated requirement <a href="#">{Requirement I. 005}</a> and to include the following new attributes:</p> <ul style="list-style-type: none"> <li>• Ingress TMD</li> <li>• Egress TMD</li> <li>• Ingress TMD state</li> <li>• Egress TMD state</li> </ul> <p>added the following new use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.5.12: NMS creates a Transmission Descriptor (TMD)</a></li> <li>• <a href="#">Use Case 5.5.13: NMS modifies a Transmission Descriptor (TMD) on a TP</a></li> <li>• <a href="#">Use Case 5.5.14: NMS deletes a Transmission Descriptor (TMD)</a></li> </ul>

## Time Stamp

This version of the MTNM NML-EML Interface Business Agreement, can be considered valid until further notice from TM Forum.

## How to obtain a copy

An electronic copy of the MTNM MNL-EML Interface Solution Set can be downloaded at the TM Forum Web Site ([www.tmforum.org](http://www.tmforum.org)). Contact the TM Forum office (see previously for contact details, or via the web site) for any further information.

## How to comment on the document

Comments must be in written form and addressed to the contacts identified in [Appendix C](#).

Please be specific, since your comments will be dealt with by the team evaluating numerous inputs and trying to produce a single text. Thus we appreciate significant specific input. We are looking for more input than "word-smith" items, however editing and structural help are greatly appreciated where better clarity is the result.

## About TeleManagement Forum

TeleManagement Forum is an international consortium of communications service providers and their suppliers. Its mission is to help service providers and network operators automate their business processes in a cost- and time-effective way. Specifically, the work of the TM Forum includes:

- Establishing operational guidance on the shape of business processes.
- Agreeing on information that needs to flow from one process activity to another.
- Identifying a realistic systems environment to support the interconnection of operational support systems.
- Enabling the development of a market and real products for integrating and automating telecommunications operations processes.

The members of TM Forum include service providers, network operators and suppliers of equipment and software to the communications industry. With that combination of buyers and suppliers of operational support systems, TM Forum is able to achieve results in a pragmatic way that leads to product offerings (from member companies) as well as paper specifications.

## TM Forum Business Agreements

A Business Agreement has two parts, i.e., the Business Problem Statement and the Business Requirement Model. The Problem Statement is customer oriented and written in business terms. It defines the problem, the scope and the objectives, recognizes the customer point of view, and identifies both process and information needs or issues. The Business Requirement Model consists of implementation independent description that includes categorized Requirement Statements, a set of Use Cases, and static and dynamic UML diagrams.

It is expected to be in draft form before the start of implementation of applications, systems and system interfaces. Several of the components of the BA are produced using Paradigm Plus UML diagrams. TM Forum uses the Paradigm Plus tool to produce its Business Requirement Models.

For a description of the relationship between the different documents produced by TMF projects, please see TMF Process documentation, templates and guides. For a description of TMF methodology for protocol neutral modeling, please see TMF methodology documentation.

## Use and Extension of a TM Forum Business Agreement

This document defines the business problem and requirement model for NML-EML Interface. The Business Agreement is used to gain consensus on the business requirements for exchanging information among processes and systems in order to solve a specific business problem. The Business Agreement should feed the development of Information Agreement(s), which is a technology-neutral model of one or more interfaces. While the Business Agreement contains sufficient information to be a “stand alone” document, it is better read together with the Information Agreement document (TMF 608). Reviewing the two documents together helps in gaining a full understanding of how the technology neutral information model is defined for this requirement model. An initial Business Agreement may only deal with a subset of the requirements. It is acceptable for subsequent issues of the document to add additional requirements not addressed by earlier releases of the Business Agreement. Business Agreements are the basis for requirement traceability for information models.

It is expected that this document will be used:

- As the foundation for a TM Forum Information Agreement(s)

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- To facilitate requirement agreement between Service Providers and vendors
- As input to a service Provider's Request for Information / Request for Proposal (RFI/RFP-RFX)
- As input for vendors developing Commercial Off The Shelf (COTS) products

As a source of requirements for other bodies working in this area.

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## 1 INTRODUCTION

### 1.1 Document Overview

This document defines the business agreement for the exchange of management information within a model of telecommunication management business functions documented in TM FORUM's Telecom Operations Map. Specifically, the Business Agreement captured in this document defines the information exchange, or interface, between Network Management Systems (NMS) and Element Management Systems (EMS) enabling management of SONET/SDH, DWDM and ATM transport networks.

This document covers the NML-EML interface.

As the problem of managing next-generation networks composed of hybrid network elements become more and more prevalent, previously technology-specific interface solutions become insufficient. The goal of the team is to provide a single common solution to enable management of these hybrid network elements.

The following releases are planned for this document:

Release 3.0: Member Evaluation

Release 3.0: Public Evaluation

### 1.2 Document Structure

The Business Agreement contains the business problem statement including the scope, objectives and business scenarios. The bulk of the Business Agreement is the categorized requirement statements, the use cases, as well as the associated diagrams that model the static and dynamic relationships defined by the requirement statements and use cases.

This document has two major parts, the Business Problem Statement and the Business Requirement Model. The following is the structure of the BA:

- Section 1      **Introduction:** Provides overview of this the document and outlines its structure and defines essential terms used in the document.

*Business Problem Statement:*

- Section 2      **Business Problem Description, Project Scope and Objectives:** Identifies the business problem, including the scope, objectives, business scenarios and the benefits to be gained through the solution.

- Section 3      **Business Processes:** Describes the existing business processes and proposed improvements in terms of the Telecom Operations Map

*Business Requirement Model:*

- Section 4      **Requirements:** Lists the functional and non-functional requirements to be fulfilled by each interface for each business scenario as described in the problem statement.

- Section 5      **Use Cases:** Presents Use Case descriptions and diagrams to define the interactions across each of the process interfaces covered in the Business Agreement.
- Section 6      **Business Requirement Model UML Diagrams:** Contains the Business requirement Model, along with the traceability to the requirements and use cases. This serves as the starting point for developing an Information Agreement and Solution Set(s).
- Section 7      **Traceability Matrices:** Provides matrices that show traceability for Requirements vs. Use Cases, Use Cases vs. Object Class and others as necessary.

Issues and Appendices:

- Section 8      **Summary and Open Issues:** Reviews the work of the project and identifies open issues.
- Appendix A      **Terms and Abbreviations Used Within This Document**
- Appendix B      **References**
- Appendix C      **Contacts**
- Appendix D      **UML Model**

### 1.3 Terminology Used In This Document

This section identifies the important terms, abbreviations and acronyms introduced by the project and those applied from external sources specifically for this Business Agreement. More detailed definitions and definitions for other terms are shown in [Appendix A](#).

This document makes use of the following terms:

ASAP	Alarm Severity Assignment Profile. Refer to <a href="#">{Requirement I. 080}</a>
CTP	Connection Termination Point. Refer to <a href="#">{Requirement I. 006}</a> .
Edge TP	Edge Termination Point. Refer to <a href="#">{Requirement I. 008}</a> .
EMS	Element Management System. Refer to <a href="#">{Requirement I. 001}</a> .
Equipment	<a href="#">{Requirement I. 032}</a> .
Equipment Holder	<a href="#">{Requirement I. 033}</a> .
EPG	Equipment Protection Group. Refer to <a href="#">{Requirement I. 072}</a>
FTP	Floating Termination Point. Refer to <a href="#">{Requirement I. 075}</a>
Layer Rate	Refer to <a href="#">{Requirement I. 022}</a> .
ME	Managed Element. Refer to <a href="#">{Requirement I. 002}</a> .
NAD	Network Access Domain
NE	Network Element
NMS	Network Management System

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Protection Group	<a href="#">Requirement I. 066</a>
PTP	Physical Termination Point. Refer to <a href="#">Requirement I. 007</a> .
Route	Refer to <a href="#">Requirement I. 021</a> .
Subnetwork	Refer to <a href="#">Requirement I. 012</a> .
SNC	Subnetwork Connection. Refer to <a href="#">Requirement I. 014</a> .
TCA Parameter	Threshold Crossed Alert Parameter. Refer to <a href="#">Requirement I. 035</a> .
TCA Parameter Profile	Threshold Crossed Alert Parameter Profile. Refer to <a href="#">Requirement I. 067</a>
TD	Traffic Descriptor. Refer to <a href="#">Requirement I. 025</a> .
TMD	Transmission Descriptor. Refer to <a href="#">Requirement I. 078</a> .
TL	Topological Link. Refer to <a href="#">Requirement I. 010</a> .
TP	Termination Point. Refer to <a href="#">Requirement I. 004</a> .
TP Parameters	Termination Point Parameters. Refer to <a href="#">Requirement I. 024</a> .
TP Pool	Termination Point Pool. Refer to <a href="#">Requirement I. 009</a> .
XC	Cross-Connect. Refer to <a href="#">Requirement I. 019</a> .

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## 2 BUSINESS PROBLEM DESCRIPTION, PROJECT SCOPE AND OBJECTIVES

### 2.1 Business Problem

As the communications industry continues to evolve with deregulation and liberalization, service providers are under increased pressure to deliver a broadened set of services at competitive price points. As a result, service providers must deliver these services in an efficient, cost-effective and timely manner. The ability to effectively manage these networks become key in retaining existing, as well as acquiring new market share. However, the complexities surrounding today's networks present challenges in achieving the effective network management goal.

The composition of today's networks has contributed to the complexity of managing these networks. These networks are commonly composed of network elements provided by various vendors. The task of interoperability extends beyond the network element layer up to the management layers, to include interoperability between multi-vendor Element and Network Management Systems.

Service Providers have also taken advantage of technological advancements in transport network equipment. It is not uncommon for service providers to deploy next generation, multi-technology network elements, (or "hybrid NEs"), as these network elements provide new services and optimal network resource utilization. However, network management solutions that have been specified to date applies only to a specific technology.

There is an industry demand for a full-featured, commercially available, scalable and non-proprietary network management solution, where multi-vendor, multi-technology management systems interoperate in an open architecture environment.

### 2.2 Supported Business Scenarios

The NML-EML interface has been specified to support a wide variety of network management business scenarios from the provisioning of connections to the retrieval of equipment inventory information. The fact that this document describes the requirements for a network management interface means that there are a large number of business scenarios that may be supported by the a network management interface that meets the requirements specified in this document. Examples of the business scenarios that may be supported include, but are not limited to:

- Inventory Discovery
- Connection Provisioning
- Equipment Provisioning
- Performance Management

For specific cases of these and other business scenarios please refer to MTNM Catalyst IIS.

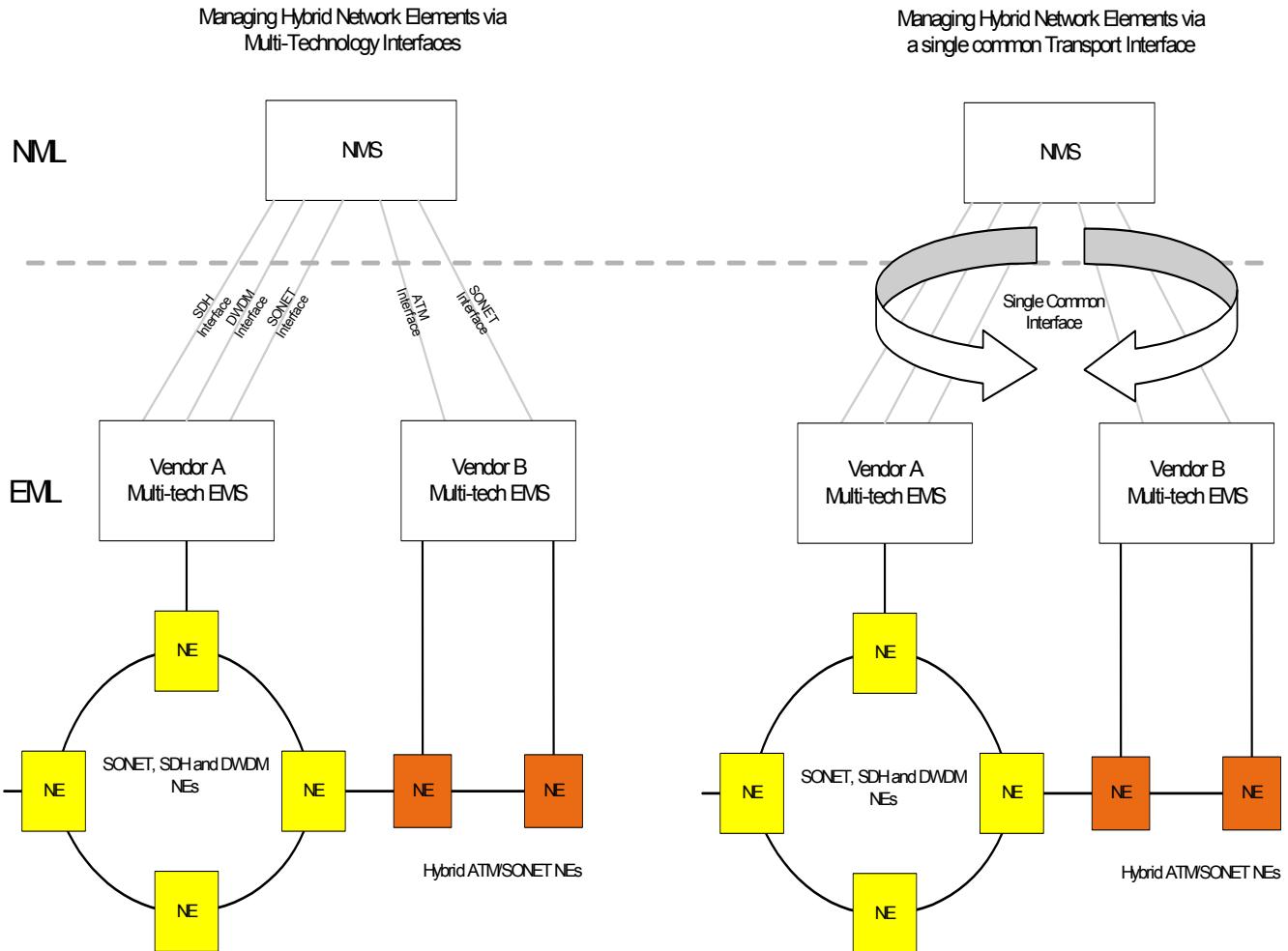
### 2.3 Project Scope

There is an immediate industry need, (as expressed by Service Providers) to provide a single, common solution in managing multi-technology networks, (including SONET, SDH, DWDM, and ATM). Today, technology-specific forums, (i.e. NSIF, ATMF, OIF, etc.) produce separate solutions or interfaces specific to their technology areas. The objective of the team is to provide a single common solution to address:

- Multiple transport network technologies – including SONET, SDH DWDM and ATM

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- Hybrid network elements that support multiple technologies, (as illustrated in the following diagram)



**Figure 2.1: Project Scope**

## 2.4 Project Objectives

The specific objective for the Multi-technology Network Management modeling team includes:

- Utilize the work of the Phase I SSIM and ATMIM groups by reviewing, identifying and resolving the difference in the business requirements and UML models to create a common network management model to manage multi-technology networks.
- Build support of DWDM management and enhance management features to the NML-EML Interface.
- The development of Protocol-Independent Information Models, supporting Use Cases for a multi-technology NML-EML Interface.
- Develop CORBA IDL specifications needed to implement the model and demonstrate its viability

- Assurance that the top-down approach is taken and that the Network Management processes from the higher layers, BML, SML and NML, by collaboration with CaSMIM, are consistently fulfilled at the lower layers of the TMN, (NML to EML) to achieve complete flow-through.

## **2.5 Benefits Gained by Solving this Business Problem - Business Case**

### **2.5.1 Overall benefit of solving business problem**

The expected beneficiaries are service providers, customers and vendors. The major benefits are due to a flexible and extensible common solution to the management of multi-technology network elements in a network using multi-vendor, multi-technology management systems.

### **2.5.2 Benefits to the end user or customer**

As a consequence of the Service Providers' benefits, the customers will benefit by:

An improved service: the provisioning of new service will be fast and the unavailability of the service will be limited due to the correlation of network fault to services.

Reduction of prices: The reduction of Service Provider cost will lead to the reduction of service prices.

### **2.5.3 Benefits to a Service Provider**

The multi-technology NML-EML solution will provide Service Providers with an efficient way to manage their next-generation networks composed of hybrid network elements. The solution will ensure multi-vendor interoperability as it will be an open and accessible to the industry.

Service Providers will benefit from a common multi-technology network management interface able to translate the service definitions that are made in Service Management Systems into technology specific implementations. It will result in:

- Rapid Service Delivery by decreasing service activation time
- Fast introduction of new technologies: New Technologies can be introduced in the Network without causing major changes to the interfaces at the Network Management Level.
- Increased Operating Efficiency through automation and integration of network management and element management systems.
- Enable multi-vendor interoperability affording service providers the option of choosing various vendor products.

#### **2.5.4 Benefits to a Vendor and/or Systems Integrator**

Agreements at TMF, the ATM Forum, the ADSL Forum, the Network and Services Integration Forum and other Industry fora address how to interconnect technology specific equipment from different vendors and manage the resultant network. This leaves a major area of uncertainty: how to manage mixed technology environments. The providers of management systems can respond to service provider requests with custom designs based on the technologies employed, the interfaces supported by the peer and north/southbound systems, and the specific Service Provider requirements - but this is prohibitively expensive and consumes a large amount of scarce development resources. The result is proposals for network management solutions that take too long and cost too much. Neither Service Provider nor vendor benefits. The goal: solutions that meet the most important needs of the Service Provider and are available quickly, at reasonable cost, and provide flexibility for changes in the future as new technologies are added. The work here provides requirements for common interfaces to support this goal. Hence, management system vendors and software providers will be able to develop network management systems and applications that can be used by multiple Service Providers, and which support multiple technologies in a multi-vendor environment with increased efficiency and reduced cost.

#### **2.5.5 Benefits to the TM Forum**

The work of the team aligns with the TM Forum TOM in the network and element layers in the areas of Network Planning, Provisioning, Inventory Management, and Monitoring. Additionally, the team is solving an immediate industry need for a solution that is applicable across multiple technologies, including SONET/SDH, DWDM and ATM.

## 3 BUSINESS PROCESSES

### 3.1 Process Definition and Issues

This section defines the business process issues to be addressed in this document. It provides a business process view of the requirements to be satisfied through a standardized NML-EML interface. This document defines the business need, formal requirements, and scenarios in the form of UML Use Cases that are needed to support business process that interact with the Network Elements.

The nature of this project does not directly address any specific business process but is dedicated to provide support for most known business process that rely on an NML-EML interface. The end product shall be an interface that is designed to support a large variety of business processes that depend on and support multiple technologies, including SONET/SDH, DWDM and ATM.

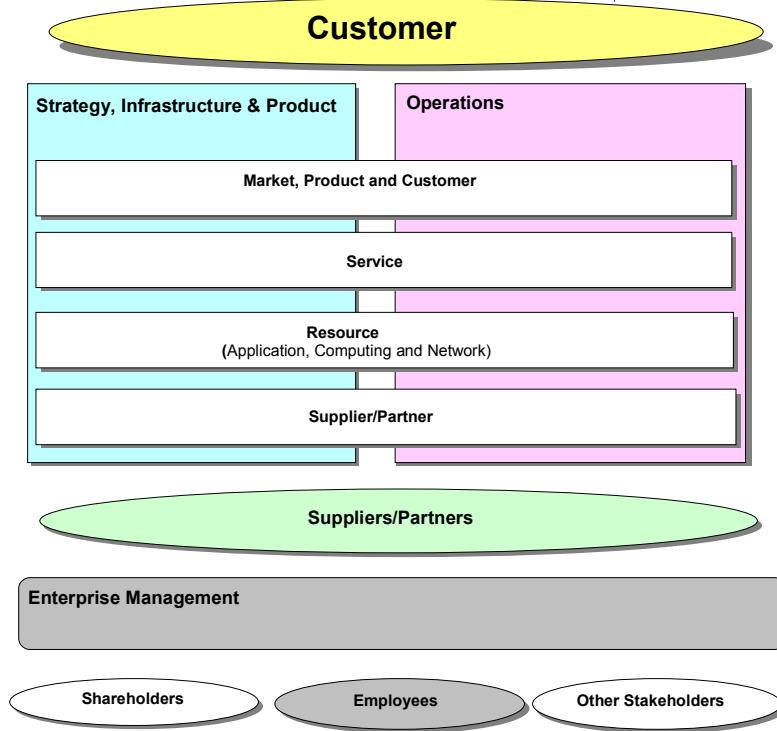
### 3.2 Mapping of Processes to eTOM Business Process Framework

#### 3.2.1 eTOM Business Process Framework

The eTOM is a business process framework or model that provides the enterprise processes required for a service provider. It is not a service provider business model. In other words, it does not address the strategic issues or questions of who a service provider's target customers should be, what market segments should the service provider serve, what are a service provider's vision, mission, etc. A business process framework is one part of the strategic business model and plan for a service provider.

The eTOM is based on the Telecom Operations Map (TOM). The eTOM broadens the TOM to a total enterprise framework and addresses the impact of ebusiness. Although the eTOM is more complex than the TOM, in some ways it is more intuitive than the TOM in that it closes gaps in enterprise management (i.e., corporate-type) processes, marketing processes, customer retention processes, supplier and partner management processes, etc.

**Figure 3.1: eTOM Business Process Framework Conceptual Structure**



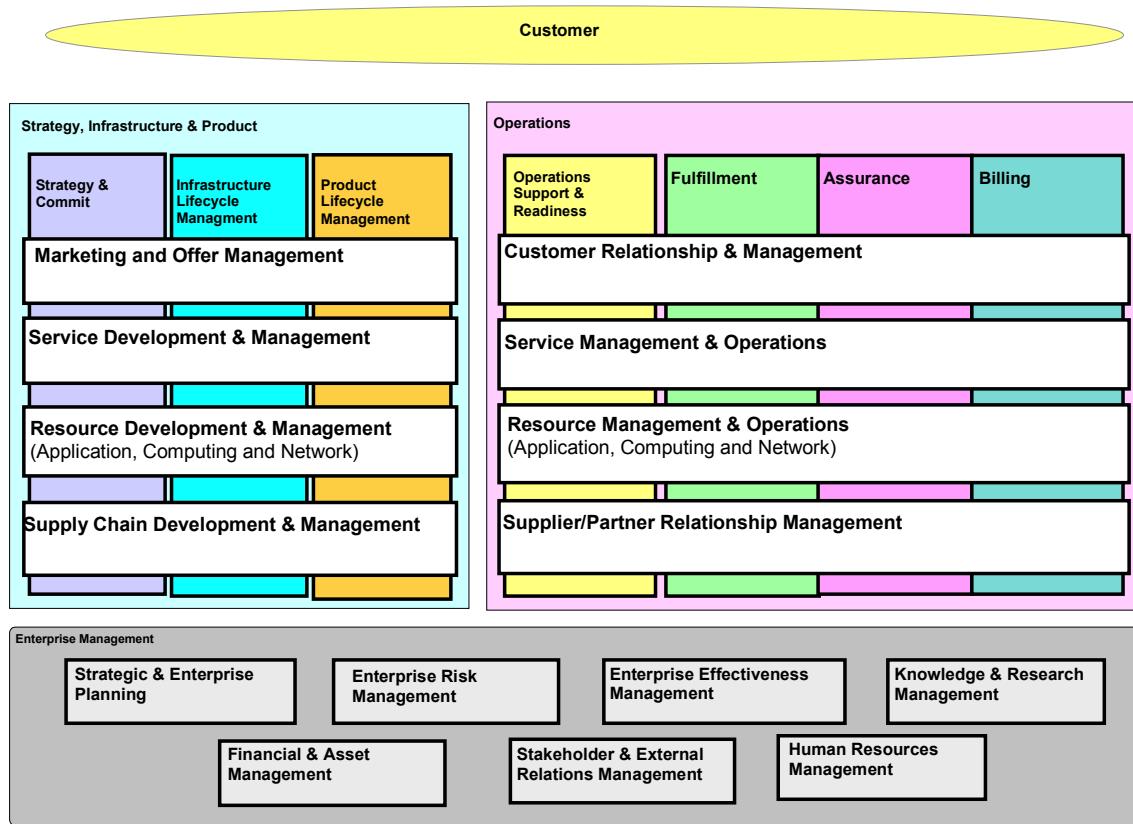
[Figure 3.1](#) shows the highest conceptual view of the eTOM Business Process Framework. This view provides an overall context that differentiates strategy and lifecycle processes from the operations processes in two large process areas, seen as the two major boxes in the upper part of the diagram. It also differentiates the key functional areas as horizontal layers across these process areas. The third major process area, concerned with the management of the enterprise itself, is shown as a separate box in the lower part of the diagram. In addition, [Figure 3.1](#) shows the internal and external entities that interact with the enterprise (as ovals).

[Figure 3.2](#) shows how the three major process areas - designated as Level 0 processes of the eTOM business process framework - are decomposed into their constituent Level 1 process groupings. This view thus provides the Level 1 decomposition of the Level 0 processes and gives an overall view of the eTOM framework. However, in practice it is the next level - the Level 2 decomposition of the Level 1 processes - at which users tend to work, as this degree of detail is needed in analyzing their businesses.

[Figure 3.2](#) shows seven end-end vertical process groupings, that are the end-to-end processes that are required to support customers and to manage the business. Amongst these end-end Vertical Process Groupings, the focal point of the eTOM framework is on the core customer operations processes of Fulfillment, Assurance and Billing (FAB). Operations Support & Readiness (OSR) is differentiated from FAB real-time processes to highlight the focus on enabling support and automation in FAB, i.e.. on line and immediate support of customers, with OSR ensuring that the operational environment is in place to let the FAB processes do their job. Outside of the Operations process area - in the Strategy, Infrastructure & Product (SIP) process area - the Strategy & Commit vertical, as well as the two Lifecycle Management verticals, are differentiated. These are distinct because, unlike Operations, they do not directly support the customer, are intrinsically different from the Operations processes and work on different business time cycles.

The horizontal process groupings in [Figure 3.2](#) distinguish functional operations processes and other types of business functional processes, e.g., Marketing versus Selling, Service Development versus Service Configuration, etc. Amongst these Horizontal Functional Process Groupings, those on the left (that cross the Strategy & Commit, Infrastructure Lifecycle Management and Product Lifecycle Management vertical process groupings) enable, support and direct the work in the Operations process area.

**Figure 3.2: eTOM Level 0 View of Level 1 Process Groupings**



The MTNM NML-EML Interface addresses the problems arising in the Resource Management & Operations.

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Resource Management & Operations (RM&O): this process grouping maintains knowledge of resources (application, computing and network infrastructures) and is responsible for managing all these resources.(e.g. networks, IT systems, servers, routers, etc.) utilized to deliver and support services required by or proposed to customers. It also includes all functionalities responsible for the direct management of all such resources (network elements, computers, servers, etc.) utilized within the enterprise. These processes are responsible for ensuring that the network and information technologies infrastructure supports the end-to-end delivery of the required services. The job of these processes is to ensure that infrastructure runs smoothly, is accessible to services and employees, is maintained and is responsive to the needs, whether directly or indirectly, of services, customers and employees. RM&O also has the basic function to assemble information about the resources (e.g.. from network elements and/or element management systems), and then integrate, correlate, and in many cases, summarize that data to pass on the relevant information to Service Management systems, or to take action in the appropriate resource.

In the original TOM Business Process Framework, the "Network and Systems Management" processes were included at the highest, most general level. This is no longer adequate in an ebusiness world. Application and computing management are as important as network management. Moreover, network, computing and applications resources must increasingly be managed in a joint and integrated fashion. To cope with these needs, eTOM has introduced the Resource Management & Operations process grouping (together with the corresponding Resource Development & Management grouping within SIP), to provide integrated management across these three sets of resources: applications, computing and network. These areas also combine the Network Element Management processes of the TOM, since these processes are actually critical components of any resource management process, as opposed to a separate process layer.

The RM&O processes thus manage the complete service provider network and sub-network and information technology architectures.

eTOM differentiates day-to-day operations and support from planning and development, and other strategy and lifecycle processes. In the TOM, these resource layer processes were not differentiated or were not addressed. The eTOM structure better depicts the structure of an enterprise, especially in an ebusiness era.

## 4 REQUIREMENTS

This section lists the single concept, requirement statements to be fulfilled by the Business Requirement Model.

### 4.1 Category I: Static and Structural Requirements

The requirements for the NML-EML Interface have been specified in terms of the entities (objects) that are visible across the interface and the operations that may be performed on these objects. A number of the objects visible across the interface are required to have a common set of attributes. [Table 4.1](#) identifies the objects that shall have a common set of attributes.

**Table 4.1: Objects containing a common set of attributes**

	Object Name
1	<a href="#">Alarm Severity Assignment Profile (ASAP)</a>
2	<a href="#">Element Management System (EMS)</a>
3	<a href="#">Equipment</a>
4	<a href="#">Equipment Holder</a>
5	<a href="#">Equipment Protection Group (EPG)</a>
6	<a href="#">Group Termination Point (GTP)</a>
7	<a href="#">Managed Element (ME)</a>
8	<a href="#">Performance Monitoring Point (PMP)</a>
9	<a href="#">Protection Group (PG)</a>
10	<a href="#">Subnetwork</a>
11	<a href="#">Subnetwork Connection (SNC)</a>
12	<a href="#">Termination Point (TP)<sup>a</sup></a>
13	<a href="#">Topological Link (TL)</a>
14	<a href="#">Termination Point Pool (TP Pool)</a>
15	<a href="#">Traffic Descriptor (TD)</a>
16	<a href="#">Transmission Descriptor (TMD)</a>
17	<a href="#">Threshold Crossing Alert (TCA) Parameter Profile</a>

a. This includes all types of TP (i.e. PTPs, CTPs and FTPs)

#### 4.1.1 Common Attributes

{Requirement I. 060} All objects identified in [Table 4.1](#) shall have the following attributes:

1) Name

This attribute represents a unique, invariant (for the life of the object) identifier for the object within the Element Management System (EMS) management domain.

2) User label

This attribute represents a provisionable, user friendly name for the object. It shall be initially set to the same value as the native EMS name attribute by the EMS. This attribute is owned and shall be provisionable by the NMS.

3) Native EMS name

This attribute represents the name of the object as presented on the EMS GUI. The native EMS name attribute is owned by the EMS which may or may not support changing this value.

4) Owner

This attribute represents an identifier for the owner of the object. This attribute shall be provisionable by the NMS.

5) Additional information

This attribute represents data (i.e., attributes) that has not been explicitly modeled as part of the object and allows for this data to be exchanged across the NML-EML Interface.

Source: Version 3.0.

Mandatory/Optional: Mandatory

#### 4.1.2 Element Management System (EMS)

{Requirement I. 001} The Element Management System (EMS) object shall represent the abstraction of the [Subnetwork](#)(s) managed by the EMS (i.e. Subnetworks in the EMS management domain) and the EMS itself.

Source: Version 2.0.

Mandatory/Optional: Mandatory.

{Requirement I. 061} The EMS object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

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- 1) Software version

This attribute shall represent the version of the EMS vendor software.

- 2) Type

This attribute shall represent the vendor and type of the EMS.

- 3) Alarm severity assignment profile

This attribute shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that has been assigned to the EMS.

|  
| Source: Version 2.0.  
|

| Mandatory/Optional: Mandatory.  
|

#### 4.1.3 Managed Element (ME)

{Requirement I. 002} A Managed Element (ME) object shall represent the EMS view of a Network Element (NE).

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

{Requirement I. 003} An ME object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

1) Location

This attribute shall represent the geographical location of the ME

2) Software version

This attribute shall represent the software version of the ME.

3) Product name

This attribute shall represent the ME vendor's name/designation for the product (i.e. the name the vendor uses to identify the Network Element (NE)).

4) Communication state

This attribute shall represent the state of the current connectivity between the EMS and the Network Element.

5) Supported connection layer rate(s)

This attribute shall represent a list of the rates for which cross-connects can be established in the ME.

6) Synchronization state

This attributes shall indicate whether the EMS is able to keep its data synchronized with the Network Element (NE) data and generate all appropriate notifications relating to changes in the data.

7) Network Access Domain

This attribute shall represent the Network Access Domain to which this ME has been assigned.

8) Manufacturer

This attribute shall represent the ME vendor name.

9) Alarm severity assignment profile

This attribute shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that has been assigned to the ME.

| Source: Version 2.0.

Mandatory/Optional: Mandatory.

#### 4.1.4 Termination Point (TP)

{Requirement I. 004} A Termination Point (TP) object shall represent a logical abstraction of an endpoint (actual or potential) of either:

- 1) A [Topological Link \(TL\)](#) or
- 2) A [Subnetwork Connection \(SNC\)](#)

Source: Version 2.0.

Mandatory/Optional: Mandatory.

{Requirement I. 005} A TP object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

- 1) Directionality

This attribute shall represent the directionality of the TP (bidirectional, source, or sink).

An ATM TP will always have directionality set to bi-directional.

- 2) Protection association

This attribute shall represent whether the TP is participating in a Path Switched Ring (PSR) protection scheme with another TP. (For example in a multi-layer subnetwork, if 'a', 'b', 'c' are edge points and a three-ended connection is required from 'a' to 'b', where 'b' is one of the endpoints. If 'c' is the constrained choice for 'b' as the other end of the three-ended connection, then 'b' and 'c' are said to be associated by a protection association.)

- 3) Edge Point

This attribute represents whether the TP is at the edge of a subnetwork. (Refer to [{Requirement I. 008}](#)).

- 4) Network Access Domain

This attribute shall represent the Network Access Domain (NAD) to which this TP has been assigned.

- 5) Equipment protected

This attribute shall indicate whether or not the TP is supported by [Equipment](#) that is protected.

- 6) Ingress TMD state

This attribute shall indicate the state of consistency between a TP and its associated ingress [Transmission Descriptor \(TMD\)](#).

7) Egress TMD state

This attribute shall indicate the state of consistency between a TP and its associated egress [Transmission Descriptor \(TMD\)](#).

8) GTP or TPPool

This attribute shall represent the name of the [Group Termination Point \(GTP\)](#) or [Termination Point Pool \(TP Pool\)](#) of which this TP is a member, if applicable

9) Layered transmission parameters

This attribute shall represent the transmission parameters associated with the different layers that are encapsulated within the TP. Refer to the supporting document [LayeredParameters.pdf](#) for details of the currently defined transmission parameters.

10) Ingress TMD

This attribute shall represent the name of the ingress [Transmission Descriptor \(TMD\)](#) associated with this TP.

11) Egress TMD

This attribute shall represent the name of the egress [Transmission Descriptor \(TMD\)](#) associated with this TP.

12) TCA parameter profile

This attribute shall represent the name of the [Threshold Crossing Alert \(TCA\) Parameter Profile](#) associated with this TP.

13) Alarm severity assignment profile

This attribute shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that has been assigned to the TP.

14) Performance monitoring point

This attribute shall represent the names of the [Performance Monitoring Point \(PMP\)](#)s associated with this TP.

|  
| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.5 Physical Termination Point (PTP)

{Requirement I. 007} A Physical Termination Point (PTP) object shall represent the actual or potential endpoint of a [Topological Link \(TL\)](#).

Essentially, this is a representation of a physical port. Examples of PTPs are T1 ports, T3 ports, OC-N optical ports, etc.

PTPs have a containment relationship with [Connection Termination Point \(CTP\)](#)s. PTPs forming a UPSR pair are related and contain related CTPs. If the PTP is potentially able to support a CTP on a particular layer rate, then that CTP shall be represented at the EML-NML Interface.

CTPs are always clients of the PTP but that the layer relationship may reverse.

Each bidirectional PTP (or ATMNI CTP) may be either endpoint of one bidirectional topological link or of up to two unidirectional topological links being the aEnd (source) of one of these topological links and the zEnd (sink) of the other.

Each unidirectional PTP (or ATMNI CTP) must not be the endpoint of more than one unidirectional topological link.

A PTP object is a type of [Termination Point \(TP\)](#) object that shall have the attributes identified in [{Requirement I. 005}](#).

|  
Source: Version 2.0.

|  
Mandatory/Optional: Mandatory.

##### 4.1.5.1 Edge Termination Point (Edge TP)

{Requirement I. 008} An Edge Termination Point (Edge TP) is a [Termination Point \(TP\)](#) that is at an entrance or exit point of a [Subnetwork](#), (i.e. add-drop or TPs that terminate topological links between two Subnetworks).

|  
Source: Version 2.0.

|  
Mandatory/Optional: Mandatory.

#### 4.1.6 Connection Termination Point (CTP)

{Requirement I. 006} A Connection Termination Point (CTP) object shall represent the actual or potential end point of either:

- 1) A [Subnetwork Connection \(SNC\)](#) or
- 2) An ATM Network Interface (ATMNI) at the Network Interface layer rate.

A CTP may be contained by and be the client of a [Physical Termination Point \(PTP\)](#), an [Floating Termination Point \(FTP\)](#) or a CTP. A CTP may be contained by and be the server of an FTP or a CTP (via inverse multiplexing).

Source: Version 2.0.

Mandatory/Optional: Mandatory.

{Requirement I. 062} A CTP object is a type of [Termination Point \(TP\)](#) and therefore shall have, in addition to the attributes identified in [{Requirement I. 005}](#), the following attributes:

- 1) Connection state

This attribute shall indicate whether the CTP is involved in an active cross-connection at the CTP's rate. (Refer to [{Requirement I. 023}](#)).

- 2) Mapping mode

This attribute shall indicate if the CTP is configured such that it is capable of supporting lower rate connections, or if the CTP is configured such that it is capable of supporting cross-connections at the TP's rate. Refer to [Section 4.2.2.1.1](#).

- 3) Ingress TD

This attribute shall represent the name of the ingress [Traffic Descriptor \(TD\)](#) associated with this CTP.

- 4) Egress TD

This attribute shall represent the name of the egress [Traffic Descriptor \(TD\)](#) associated with this CTP.

Note: The ingress and egress traffic descriptor attributes may be empty in the following cases

- i) For technologies that don't use the TD concept. (Currently only used on ATM CTPs).
- ii) If the CTP is involved in a uni-directional connection.
- iii) If there is no assigned bandwidth when an implicit VPCTP is created.

Source: Version 2.0.

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| Mandatory/Optional: Mandatory.

#### 4.1.7 Floating Termination Point (FTP)

{Requirement I. 075} A Floating Termination Point (FTP) object shall represent a [Termination Point \(TP\)](#) that is not directly supported by a physical port.

An FTP is a TP without a physical layer that behaves both like a [Physical Termination Point \(PTP\)](#) and a [Connection Termination Point \(CTP\)](#):

- FTPs (client side) behave like PTPs wherever PTPs are used in NML-EML Interface.
- FTPs (server side) behave like CTPs wherever CTPs are used in NML-EML Interface.

FTPs have a containment relationship with CTPs. The FTP will contain CTPs in client layers and may contain CTPs in Server layer (via inverse multiplexing).

A FTP object is a type of CTP object and also a type of PTP object and shall have the attributes identified in [{Requirement I. 062}](#) and [{Requirement I. 007}](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.1.8 Group Termination Point (GTP)

{Requirement I. 069} A Group Termination Point (GTP) object shall represent a sequence of [Connection Termination Point \(CTP\)](#)s (with a specific order) in the same [Managed Element \(ME\)](#).

GTPs shall have the following behavior:

- 1) The CTPs comprising a GTP need not be contiguous.
- 2) A CTP can not belong to more than one GTP at a time.
- 3) Once a CTP is included in a GTP, it can not be cross-connected independent of the GTP.
- 4) All CTPs in a GTP must have the same [Connection State](#) and be in the same network access domain.
- 5) A GTP shall be named with respect to the containing ME.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement I. 070} A GTP object shall have, in addition to the attributes identified in [{Requirement I. 005}](#), the following attributes:

1) Contained TPs

This attribute represents a list of the names of the [Termination Point \(TP\)](#)s that are contained by the GTP.

2) Connection State

This attribute represents whether the GTP is involved in an active cross-connection. (Refer to [{Requirement I. 023}](#)).

3) Network Access Domain

This attribute represents the Network Access Domain (NAD) to which this GTP has been assigned.

4) Alarm reporting

This attribute shall indicate whether alarm reporting for the GTP is enabled or disabled.

5) Alarm severity assignment profile

This attribute shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that has been assigned to the GTP.

6) TP Pool

This attribute shall represent the name of the [Termination Point Pool \(TP Pool\)](#) of which this GTP is a member, if applicable

|  
| Source: Version 3.0.  
|  
| Mandatory/Optional: Mandatory.

#### 4.1.9 Termination Point Pool (TP Pool)

{Requirement I. 009}

A Termination Point Pool (TP Pool) object shall represent a grouping (without a specific order) of [Termination Point \(TP\)](#)s or [Group Termination Point \(GTP\)](#)s from the same Subnetwork, for some administrative management purposes (e.g. bandwidth reservation, common routing etc.).

The members of a TP Pool are administered and used independently of each other but for a common purpose. A [Connection Termination Point \(CTP\)](#) that is contained in a GTP cannot be a member of a TP Pool but the whole GTP can. A CTP that is contained in a TPPool cannot be added to a GTP. A TP or GTP can be a member of at most one TPPool.

For ATM, this object shall be used to support the administrative partitioning of the ATM Network Interface (ATM NI) consisting of a reserved range of Virtual Path Identifier (VPI) values and bandwidth. In this example the set of potential client CTPs of the ATM NI CTP is partitioned into a set of TP Pool objects. While the ATM NI CTP represents a real network interface the TP Pool objects represent virtual network interfaces consisting of a set or range of ATM VP CTPs

If an [Element Management System \(EMS\)](#) does not support the concept of administrative partitioning, then **no** TP Pool objects shall be present at the NML-EML Interface.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

{Requirement I. 094}

A TP Pool object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

- 1) Contained members

This attribute shall represent a list of the names of the [Termination Point \(TP\)](#)s or [Group Termination Point \(GTP\)](#)s that are contained by the TPPool.

- 2) Number of members

This attribute shall represent the total number of currently contained TPs or GTPs.

- 3) Number of idle members

This attribute shall represent the number of currently contained idle TPs or GTPs that are free to be used for the intended management purpose (e.g., potential ATM VP CTPs that are currently not “in use”).

- 4) Layered transmission parameters

This attribute shall represent the common layers and transmission parameters (if any) associated with the contained TPs (or the TPs contained in contained GTPs). (Refer to [{Requirement I. 005}](#).)

- 5) Description of use

This attribute shall optionally describe the specific use of the TP pool, in particular how its members are collected and administered. For example, the description of use of an ATM VP TP pool could be “Virtual UNI”.

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.1.10 Topological Link (TL)

{Requirement I. 010}

A Topological Link (TL) is a physical link between two [Physical Termination Point \(PTP\)](#)s or a trail between two [Termination Point \(TP\)](#)s (e.g., an ATM link between two ATM NI CTPs), which are called aEnd TP and zEnd TP of the TL.

The layer rate of a TL is determined by the lowest common layer rate of the two end point TPs, about which the EMS has knowledge (with the physical layer being the very lowest).

A TL reported by an EMS to the NMS will usually be between two Network Elements (NEs) that are managed by the same EMS but need not be adjacent. Depending on the capabilities of the EMS and the NEs, a TL may or may not be auto-discovered by the EMS.

The end points of a TL may belong to different [Subnetworks](#), in which case it is called a "*top-level TL*", or to the same Subnetwork, and then the TL is called an "inner TL".

For a TP that is connected outside of the EMS' span of control, if the EMS knows about the remote end, the EMS may provide this information via a single-ended TL, called an "*off-network TL*". Such a TL is referred to as single-ended since only one end point, namely the aEnd TP, belongs to the EMS managing the TL the other (i.e., the zEnd TP) being off-network and being reported as a remote address (and possibly being managed by another EMS). An off-network TL is considered as a top-level TL.

The end points of a TL may also belong to the same ME, in which case it is called an "*internal TL*".

The TL may be created/deleted by the NMS and is implemented by the EMS.

The TL is contained in the EMS. A TL may traverse through DWDM equipment and optical transport networks managed by another EMS. The TL reported by the first EMS in that case could correspond to a (regenerator) section under its management domain. It is up to the NMS user to put together the exact topology of the network in such cases, based on the reported MEs and TLs.

For unidirectional TLs the aEnd TP marks the traffic source whereas the zEnd TP marks the traffic sink.

|  
Source: Version 2.0.

|  
Mandatory/Optional: Mandatory.

{Requirement I. 011} A TL object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

1) Directionality

This attribute shall represent the directionality of the TL. A TL may be unidirectional or bidirectional. A unidirectional TL may connect to bidirectional TPs.

2) aEnd [Termination Point \(TP\)](#)

This attribute shall represent the name of the A end TP.

3) zEnd [Termination Point \(TP\)](#)

This attribute shall represent the name of the Z end TP.

4) Layer rate

This attribute shall represent the layer rate of the TL. Refer to [{Requirement I. 022}](#).

5) Network Access Domain

This attribute represents the Network Access Domain (NAD) to which this TL has been assigned.

6) Alarm reporting

This attribute shall indicate whether alarm reporting for the TL is enabled or disabled.

7) Alarm severity assignment profile

This attribute shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that has been assigned to the TL.

|  
| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.11 Subnetwork

{Requirement I. 012} A Subnetwork object shall represent the topology provided by the EMS system.

The main services provided within a Subnetwork are the set-up and tear-down of [Subnetwork Connection \(SNC\)](#).

A [Managed Element \(ME\)](#) may belong to more than one Subnetwork, at different layer rates (e.g. SDH & ATM). However, Subnetworks cannot overlap at the same layer rate.

Subnetworks are created/deleted/modified by the EMS only. (Note that the NMS may internally define its own representation of Subnetworks).

The NMS initially discovers the existing Subnetworks and is later notified by the EMS of Subnetwork creations, deletions or changes

Refer to supporting document [layers.pdf](#) for more information on the concept of Subnetworks.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

{Requirement I. 013} A Subnetwork object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

1) Type

Refer to [{Requirement I. 038}](#)

2) Supported SNC layer rate(s)

Refer to [{Requirement I. 022}](#)

3) Network Access Domain

This attribute represents the Network Access Domain (NAD) to which this Subnetwork has been assigned.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.11.1 Subnetwork Type

{Requirement I. 038} The NML-EML Interface shall support the management of the following network topologies or Subnetwork types:

1) Singleton

Used for a single NE that is managed independently of its Topological Link connectivity to other NEs. It may for example be a member of a ring that is managed by a number of EMS'. It is acceptable for an EMS to represent all NEs as being in Singleton Subnetworks regardless of the actual network configuration. A singleton Subnetwork does not contain internal topological links.

2) Chain

Used to cover the case where two or more NEs are managed by the same EMS and are connected by Topological Links in a chain.

3) Path Switched Ring (PSR)

Used to cover the case where two or more NEs are managed by the same EMS and are connected by Topological Links in a ring that is capable of supporting Subnetwork Connection protection. (e.g. UPSR, SNCP Ring)

4) Shared Protection Ring (SPRing)

Used to cover the case where two or more NEs are managed by the same EMS and are connected by Topological Links in a complete ring that supports Shared Line Protection (e.g. BLSR)

5) Open PSR

Used to cover the case where two or more NEs of a PSR (but not the entire ring) are managed by the same EMS. (e.g. Open UPSR)

6) Open SPRing

Used to cover cases where two or more NEs of an SPRing (but not the entire ring) are managed by one EMS. (e.g. Open BLSR)

7) Mesh

Used to cover an arbitrary set of two or more NEs not covered by any other type.

|  
Source: Version 2.0.

|  
Mandatory/Optional: Mandatory.

#### 4.1.12 Subnetwork Connection (SNC)

{Requirement I. 014} A Subnetwork Connection (SNC) object shall represent the relationship between two of the following types on end points:

- [Physical Termination Point \(PTP\)](#)
- [Connection Termination Point \(CTP\)](#) or
- [Group Termination Point \(GTP\)](#) (refer to [{Requirement I. 076}](#)) or
- [Floating Termination Point \(FTP\)](#)

An SNC represents a transparent end-to-end connection or a trail (closed or half-open) through or within a [Subnetwork](#) according to the roles associated to its end points.

If it represents a connection, its end points are CTPs or FTPs with the SNC's layer rate as connectable layer rate. In the case of GTPs (i.e. a Bundled connection) the SNC does not have an explicit layer rate

If it represents a trail, its end points are CTPs or FTPs or PTPs.

An SNC shall be contained in a Subnetwork.

Source: Version 2.0.

Mandatory/Optional: Mandatory.

{Requirement I. 015} An SNC object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

- 1) State  
Refer to [{Requirement I. 017}](#).
- 2) Directionality  
This attribute shall represent the directionality of the SNC (bidirectional or unidirectional).
- 3) Layer rate  
Refer to [{Requirement I. 022}](#).
- 4) Static protection level  
This attribute shall represent the degree of internal resilience/protection of the SNC e.g., to indicate whether the Subnetwork Connection should be Protected, Preemptible, or Unprotected. The EMS will be required to create a SNC with the specified Protection Level.
- 5) Type  
This attribute shall indicate the specific traffic flow through the SNC. (Refer to [{Requirement I. 040}](#))
- 6) aEnd TPs  
This attribute shall represent a list of the following aEnd [Termination Point \(TP\)](#)s:
  - [Physical Termination Point \(PTP\)](#)
  - [Connection Termination Point \(CTP\)](#)
  - [Group Termination Point \(GTP\)](#)
  - [Floating Termination Point \(FTP\)](#)
- 7) zEnd TPs  
This attribute shall represent a list of the following zEnd [Termination Point \(TP\)](#)s:
  - [Physical Termination Point \(PTP\)](#)
  - [Connection Termination Point \(CTP\)](#)
  - [Group Termination Point \(GTP\)](#)
  - [Floating Termination Point \(FTP\)](#)
- 8) Network routed  
This attribute shall indicate if the route of the SNC was computed by either the network or the EMS during activation.
- 9) Reroute allowed  
This attribute shall indicate if an SNC may be rerouted.

- 10) Network reroute  
This attribute shall indicate if the reroute (if allowed) shall be computed by the network, by the EMS, or by either.
- 11) Revertive  
This attribute shall indicate whether the SNC shall always attempt to return to its intended Route.
- 12) Network Access Domain  
This attribute represents the Network Access Domain to which this TP has been assigned.
- 13) Alarm reporting  
This attribute shall indicate whether alarm reporting for the SNC is enabled or disabled.
- 14) Correlation identifier  
This attribute shall contain information about relationships that this subnetwork connection may have to other objects.
- 15) Bundled SNC  
This parameter shall indicate if the SNC to be created is a bundled SNC
- 16) GTP deletion  
The attribute shall only be used when creating bundled SNCs. It shall indicate that the EMS has to delete all the interior GTPs supporting the bundled SNC when the SNC is deleted.
- 17) Fixed  
This attribute shall indicate whether the SNC is fixed (i.e. cannot be deleted by the NMS) or flexible. A fixed SNC is defined a SNC whose all cross-connects are fixed.
- 18) Alarm severity assignment profile  
This attribute shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that has been assigned to the SNC.
- 19) Retain SNC  
This attribute shall indicate if when modifying an SNC whether the original SNC shall be deleted or put into the pending state.
- 20) Priority  
This attribute shall represent the priority of the SNC (i.e highest (0) to lowest).
- 21) aEnd point role  
This attribute shall represent the role of the aEnd [Termination Point \(TP\)](#)s of the SNC. Refer to [{Requirement I. 092}](#).

22) zEnd point role

This attribute shall represent the role of the zEnd [Termination Point \(TP\)](#)s of the SNC. Refer to [{Requirement I. 092}](#).

Source: Version 2.0.

Mandatory/Optional: Mandatory.

#### 4.1.12.1 Subnetwork Connection (SNC) End Point Role

{Requirement I. 092} The EMS shall ensure that the [Termination Point \(TP\)](#) role assigned to the end point TPs of a [Subnetwork Connection \(SNC\)](#) shall indicate whether the TP is either:

- an SNC-like end point - referred to as a *connection matrix* end point
- a trail-like end point - referred to as a *link connection* end point

At a connection matrix end point the span of the SNC starts at a G.805 Connection Point (CP) with a fixed or flexible connection through the Network Element (NE) at the SNC layer, i.e. the connectable layer of the end point.

At a link connection (LC) end point connectivity is adapted from a server layer and the span of the SNC starts with a G.805 Termination Connection Point (TCP).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.1.12.2 Subnetwork Connection (SNC) Naming

{Requirement I. 016} The EMS shall ensure that each name that is assigned to an [Subnetwork Connection \(SNC\)](#) shall be unique and must not be re-used.

Source: Version 2.0.

Mandatory/Optional: Mandatory.

#### 4.1.12.3 Subnetwork Connection (SNC) States

{Requirement I. 017} The SNC State attribute of the Subnetwork Connection indicates one of the following values:

- 1) Active  
The SNC is not in pending state, a route has been assigned to the SNC and all XC<sub>s</sub> for the SNC are active in the network.
- 2) Pending  
The SNC has been created by an NMS and has not been activated by any NMS; or the SNC has been successfully deactivated by an NMS. That state has no relationship with the network state of the XC<sub>s</sub> of the SNC.
- 3) Partial  
The SNC is not in pending state, and either a route has not been assigned to the SNC, or not all of the cross-connects of the SNC are active in the network. This may or may not include activated SNCs for which there are currently no active cross-connects in the network, depending on the SNC management mode of operation.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.12.4 Subnetwork Connection (SNC) Types

{Requirement I. 040} The NML-EML Interface shall support the following complex types of [Subnetwork Connection \(SNC\)](#):

- 1) Simple
- 2) Add Drop A
- 3) Add Drop Z
- 4) Double Add Drop
- 5) Interconnect
- 6) Double Interconnect
- 7) Open Add Drop
- 8) Explicit

| Refer to supporting document [SNCTypes.pdf](#) for further information regarding Subnetwork Connection types.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.12.5 Subnetwork Connection (SNC) Routing Constraints

{Requirement I. 018}

The NMS may provide routing constraint information to the EMS as part of the creation and activation of an SNC. The routing constraint information in a specific SNC create shall include:

EITHER:

- 1) Resources that must not be part of the route chosen as a result of the request (i.e. excluded resources). The resources may be:
  - [Managed Element \(ME\)](#)s
  - [Termination Point \(TP\)](#)s
  - [Subnetwork Connection \(SNC\)](#)s
  - [Topological Link \(TL\)](#)s
  - [Group Termination Point \(GTP\)](#)s

OR:

- 2) Resources that must form part of the route chosen as a result of the request (i.e. included resources). The resources may be:
  - [Cross-Connect \(XC\)](#)s
  - [Termination Point \(TP\)](#)s
  - [Managed Element \(ME\)](#)s
  - [Topological Link \(TL\)](#)s
  - [Group Termination Point \(GTP\)](#)s

Additional information related to the capabilities of the specific EMS may be provided.

Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.1.12.6 Subnetwork Connection (SNC) Configurations

{Requirement I. 039}

The NML-EML Interface shall support the following [Subnetwork Connection \(SNC\)](#) configurations:

- 1) Unidirectional, Point-to-Point
- 2) Unidirectional, Point-to-Multipoint
- 3) Bidirectional, Point-to-Point

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| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.13 Bundled Subnetwork Connection (B-SNC)

{Requirement I. 076}

A bundled Subnetwork Connection (B-SNC) is a type of [Subnetwork Connection \(SNC\)](#) where the end points are [Group Termination Point \(GTP\)](#)s. The [Route](#) of a B-SNC is also comprised of a collection of cross-connected GTPs.

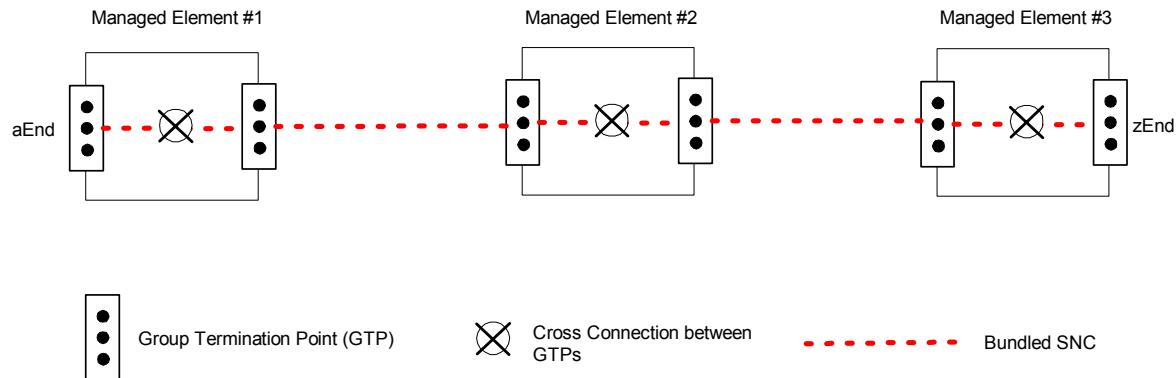
[Figure 4.1](#) depicts a B-SNC (see the dotted line).

The following conditions apply to a B-SNC:

- 1) The [Connection Termination Point \(CTP\)](#) ordering is preserved between the aEnd and zEnd of the B-SNC, i.e., the  $i^h$  CTP in the aEnd GTP in Managed Element #1 is mapped to the  $i^h$  CTP in the zEnd GTP in Managed Element #3, refer to [Figure 4.1](#).
- 2) The CTPs within the GTPs along the route of the B-SNC must match. So, each GTP along the route should contain a sequence CTPs of a given set of layer rates and in a particular order. For example, if one endpoint of a B-SNC is a GTP whose first 3 CTPs are of layer rate STS-1, the next three CTPs are of layer rate VT1.5 and the last two CTPs are of layer rate STS3c, then all other GTPs supporting the B-SNC must have the same number of CTPs of each layer rate and in the same order as the given GTP.
- 3) The CTPs comprising a GTP that supports a bundled SNC service need not be contiguous,
- 4) For a B-SNC each supporting GTP shall be contained in a [Physical Termination Point \(PTP\)](#) or a [Floating Termination Point \(FTP\)](#).
- 5) For a B-SNC service spanning a non-singleton subnetwork, the aEnd and zEnd attributes are GTPs such that the CTPs comprising each GTP are contained in the same PTP or FTP

| Source: Version 3.0.

| Mandatory/Optional: Optional.



**Figure 4.1: Bundle Subnetwork Connection**

#### **4.1.14 Cross-Connect (XC)**

{Requirement I. 019} A Cross-Connect (XC) object shall represent a physical connection within a Network Element (NE).

An XC is atomic and is identified, similarly to an [Subnetwork Connection \(SNC\)](#) in a singleton [Subnetwork](#), based on its external shape.

An XC is primarily used in the specification of an SNC [Route](#).

|  
Source: Version 2.0.

|  
Mandatory/Optional: Mandatory.

{Requirement I. 020} A XC object shall have the following attributes:

1) Type

This attribute shall indicate the specific traffic flow through the XC. (Refer to [Section 4.1.12.4](#)).

2) Directionality

This attribute shall represent the directionality of the XC (bidirectional or unidirectional).

3) Active

This attribute shall indicate if the XC is active in the Network Element (NE).

4) Fixed

This attribute shall indicate if the XC is fixed (i.e. cannot be deleted by the NMS) or is flexible.

5) Additional information

Refer to [{Requirement I. 060}](#).

6) aEnd TP(s)

This attribute shall represent a list of the following aEnd [Termination Point \(TP\)](#)s:

- [Connection Termination Point \(CTP\)](#)
- [Group Termination Point \(GTP\)](#)
- [Floating Termination Point \(FTP\)](#)

7) zEnd TP(s)

This attribute shall represent a list of the following zEnd [Termination Point \(TP\)](#)s:

- [Connection Termination Point \(CTP\)](#)
- [Group Termination Point \(GTP\)](#)
- [Floating Termination Point \(FTP\)](#)

Source: Version 2.0.

Mandatory/Optional: Mandatory.

#### 4.1.15 Route

{Requirement I. 021}

The Route object shall represent the route of a [Subnetwork Connection \(SNC\)](#). An SNC route shall be represented as a partially ordered series of [Cross-Connect \(XC\)](#)s through which the SNC traverses. Only XC's on the SNC's layer rate are part of the route.

The XC's that are part of the Route shall be listed from the NE on which the SNC starts (first entry) to the NE on which the SNC ends (last entry).

A SNC may be associated with more than one Route

- always 1 intended Route, i.e. the preferred, or default Route
- 0..n backup/alternative Route(s)

A route belongs to only one SNC. However XC's/[Connection Termination Point \(CTP\)](#)s can be shared by Routes of different SNCs.

| Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement I. 089}

A Route object shall have the following attributes:

1) Identifier

This attribute shall represent a unique identifier for the route within the context of the [Subnetwork Connection \(SNC\)](#) name.

2) Contained XC

This attribute shall represent the partially ordered list of [Cross-Connect \(XC\)](#)s that constitute the SNC route.

3) Intended

This attribute shall indicate whether the Route is the intended Route (also referred to as the preferred, or default route) or the backup Route. The intended route could be simply the first time provisioned route, or the preferred route for a number of factors, from network engineering to intrinsic media reliability. The backup route shall be partly or totally different from intended route (but with same end points), and its main use is for restoration and maintenance purposes.

4) Actual state

This attribute shall represent a summary state of the actual states of the XC in the network, regardless of the SNC that the XC are currently serving. It can assume only the following values:

- Inactive - none of the contained XC are active in the network
- Active - all of the contained XC are active in the network. So it is the route where SNC traffic is currently carried. There can be at most one active route per SNC. The in use by attribute shall indicate that the Route is not being used by another SNC.
- Partial - one or more, but not all the XC are active in the network.

5) Administrative state

This attribute shall represent whether the Route is allowed to be active or not.

6) In use by

This attribute shall indicate whether the Route is being used by another SNC. A Route is considered to be in use by another SNC if at least one of its XC or CTPs is carrying traffic of another SNC.

7) Exclusive

This attribute shall indicate that the Route can only be associated with a single SNC. This means that the XC and CTPs that are contained by this Route can only be used by the SNC to which the Route is associated.

8) Additional information

Refer to [{Requirement I. 060}](#).

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| Source: Version 3.0.

| Mandatory/Optional: Mandatory.

#### 4.1.16 Layer Rate

{Requirement I. 022} The Layer rate is used to identify:

- 1) The supported rate(s) of a [Managed Element \(ME\)](#),
- 2) The layer rate of a [Connection Termination Point \(CTP\)](#),
- 3) The layer rate of a [Physical Termination Point \(PTP\)](#),
- 4) The layer rate of a [Subnetwork Connection \(SNC\)](#),
- 5) The supported rate(s) of a [Subnetwork](#),
- 6) The layer rate of a [Topological Link \(TL\)](#).
- 7) The layer rate of a [Protection Group \(PG\)](#).
- 8) The layer rate of a [Threshold Crossing Alert \(TCA\) Parameter Profile](#).
- 9) The layer rate of a [Performance Monitoring Point \(PMP\)](#).

Refer to supporting document [LayerRates.pdf](#) for the currently defined layer rates.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.1.17 Connection State

{Requirement I. 023} The Connection state attribute of a [Connection Termination Point \(CTP\)](#) or [Group Termination Point \(GTP\)](#) object shall have the following values:

- 1) Sink connected
- 2) Source connected
- 3) Bi-directionally connected
- 4) Not connected

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.18 Transmission Parameter

{Requirement I. 024} A Transmission Parameter is a characteristic of a [Termination Point \(TP\)](#) that shall be identified by a name value pair.

Refer to supporting document [LayeredParameters.pdf](#) for the currently identified TP parameters.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.1.19 Traffic Descriptor (TD)

{Requirement I. 025} A Traffic Descriptor (TD) object represents a collection of attributes, which are used to define bandwidth and Quality of Service (QoS) characteristics on a [Connection Termination Point \(CTP\)](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| {Requirement I. 063} A TD object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

1) Service category

This attribute shall represent the ATM Service Category which relates quality requirements and traffic characteristics to network behavior (procedures and parameters). It is intended to specify a combination of Quality of Service (QoS) commitment and traffic parameters that is suitable for a given set of applications (user interpretation) and that allows for specific multiplexing schemes at the ATM layer (network interpretation). Refer to [{Requirement I. 027}](#) for a list of supported service categories.

2) Conformance profile

This attribute shall represent the conformance profile which characterizes an ATM connection. The conformance definitions are taken from the ATM Forum UNI 4.1, UNI 4.0, and UNI 3.1 standards. Refer to [{Requirement I. 028}](#) for a list of the supported profiles.

3) Traffic parameters

This attribute shall represent a set of traffic and QoS parameters. Refer to [{Requirement I. 029}](#) for a list of the supported parameters.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

{Requirement I. 026} The NML-EML Interface shall support the Traffic Descriptor (TD) combinations as specified in supporting document [conformanceDefinitions.pdf](#).

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.1.19.1 Traffic Descriptor (TD) Service Category

{Requirement I. 027} The NML-EML Interface shall support the following [Traffic Descriptor \(TD\)](#) Service Categories:

- 1) CBR (Constant Bit Rate)
- 2) rt-VBR (Real-Time Variable Bit Rate)
- 3) nrt-VBR (Non-Real-Time Variable Bit Rate)
- 4) UBR (Unspecified Bit Rate)
- 5) ABR (Available Bit Rate)
- 6) GFR (Guaranteed Frame Rate)

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.1.19.2 Traffic Descriptor (TD) Conformance Profile

{Requirement I. 028} The NML-EML Interface shall support the following [Traffic Descriptor \(TD\)](#) Conformance Profiles listed below.

The TD Conformance Profile combined with the [Traffic Descriptor \(TD\) Service Category](#) uniquely identifies the columns in the tables in the supporting document [TrafficDescriptorCombinations.pdf](#).

- 1) CBR Legacy 1 (CBR.L1)
- 2) CBR Legacy 2 (CBR.L2)
- 3) VBR Legacy 1 (VBR.L1)
- 4) VBR Legacy 2 (VBR.L2)
- 5) VBR Legacy 3 (VBR.L3)
- 6) VBR Legacy 4 (VBR.L4)
- 7) CBR.1
- 8) VBR.1
- 9) VBR.2
- 10) VBR.3
- 11) UBR.1
- 12) UBR.2
- 13) GFR.1
- 14) GFR.2
- 15) USER

Other combination of standard and vendor-specific TD parameters may also be supported.

Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.1.19.3 Traffic Descriptor (TD) Parameters

{Requirement I. 029} The NML-EML Interface shall support the [Traffic Descriptor \(TD\)](#) parameters as identified in supporting document [LayeredParameters.pdf](#).

Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.1.20 Transmission Descriptor (TMD)

{Requirement I. 078} A Transmission Descriptor (TMD) object represents a collection of attributes, which are used to define multi-layered transmission parameters, and additional information parameters on a [Termination Point \(TP\)](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement I. 079} A TMD object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

1) Layered transmission parameters

This attribute shall represent a list of transmission parameters which can be set and/or retrieved at a specified layer on a [Termination Point \(TP\)](#) having this TMD assigned as an egress or ingress TMD. For each layer, a layer-specific [Alarm Severity Assignment Profile \(ASAP\)](#) can be embedded into the respective single-layer list of transmission parameters.

2) Additional TP information

This attribute shall represent additional parameters which can be set and/or retrieved on a [Termination Point \(TP\)](#) having this TMD assigned as egress or ingress TMD.

3) External representation

This attribute shall represent a reference to the external representation of the TMD (e.g., an XML file name). The contents of this information is opaque at the NML-EML Interface and not utilized.

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### **4.1.21 NML-EML Interface Version**

{Requirement I. 030} A unique identifier, referred to as the Interface Version Number, shall be assigned to a specific version of the NML-EML Interface.

The EMS shall maintain the Interface Version Number associated with the specific version of the NML-EML Interface that the EMS is using.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

##### **4.1.21.1 Interface Versioning**

{Requirement I. 031} The NML-EML Interface shall fulfill the following requirements.

- 1) Support of multiple versions of an interface.
- 2) Support of Naming Context conventions.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### **4.1.22 Equipment**

{Requirement I. 064} An Equipment object shall represent the manageable physical components of a NE such as the circuit packs, the fans and any other type of replaceable unit within the NE.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

{Requirement I. 032} An Equipment object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

1) Service state

This attribute shall indicate the current administrative state of the equipment. The administrative states that shall be supported are In Service, Out of Service and Out of Service for Maintenance.

2) Alarm reporting

This attribute shall indicate whether alarm reporting for this equipment is enabled or disabled.

3) Expected equipment type

This attribute shall represent the type of the expected equipment. This attribute may have no value if there is no expected equipment.

4) Installed equipment type

This attribute shall represent the type of installed equipment. This attribute may have no value if there is no installed equipment.

5) Installed part number

This attribute shall represent the vendor's part number of the installed equipment.

6) Installed serial number

This attribute shall represent the vendor's serial number of the installed equipment. The combination of the installed part number and the installed serial number for a specific piece of vendor equipment shall uniquely identify that equipment.

7) Installed version

This attribute shall represent the vendor's version of the installed equipment.

8) Manufacturer

This attribute shall represent the name of the equipment vendor.

9) Protection role

This attribute shall represent the protection role (e.g. primary or secondary) that the equipment plays in case it takes part in an equipment protection scheme

10) Protection scheme state

This attribute shall indicate the current state of the protection scheme (i.e. whether it is active or locked).

11) Alarm severity assignment profile

This attribute shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that has been assigned to the Equipment.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.23 Equipment Holder

{Requirement I. 033} An Equipment Holder object shall represent resources of the Network Element (NE) that are capable of holding other physical components.

Specific resources that are represented by an Equipment Holder object shall be for instance racks (bays), shelves, and slots or sub-slots.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory

{Requirement I. 065} An Equipment Holder shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

1) Alarm reporting

This attribute shall indicate whether alarm reporting for this equipment holder is enabled or disabled.

2) Type

This attribute shall indicate the type of the physical container represented by the Equipment Holder e.g. a rack, a shelf, a sub-shelf, a slot or sub-slot.

3) Expected or installed equipment

This attribute shall represent the equipment that is installed or is expected to be installed in the physical container represented by the Equipment Holder.

4) Acceptable equipment types

This attribute shall represent a list of the types of [Equipment](#) that can be contained by the Equipment Holder. Note: this shall apply when the Equipment Holder represents a slot.

5) State

This attribute shall represent the current condition of the Equipment Holder with respect to the contained equipment.

6) Alarm severity assignment profile

This attribute shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that has been assigned to the Equipment Holder.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory

#### | 4.1.24 Equipment Protection Group (EPG)

| {Requirement I. 072} The Equipment Protection Group (EPG) object shall represent [Equipment](#) protection.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement I. 073} An EPG object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

1) Type

This attribute shall represent the type of the EPG (e.g. M:N).

2) Protection scheme state

This attribute shall indicate the current state of the protection scheme (i.e. whether it is active or locked).

3) Reversion mode

This attribute shall indicate whether the protection scheme is revertive or not.

4) Protected [Equipment](#)

These attribute shall represent a list of the protected Equipment instances.

5) Protecting Equipment

This attribute shall represent a list of the protecting Equipment instances.

6) PG parameter list

This attribute shall represent the EPG specific parameters. For example SwitchMode, SwitchPosition, wait to restore time.

7) Alarm severity assignment profile

This attribute shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that has been assigned to the EPG.

| Source: Version 3.0.

| Mandatory/Optional: Mandatory.

#### 4.1.25 Protection Group (PG)

This section is not applicable to ATM technology.

| {Requirement I. 034} The Protection Group (PG) object shall represent trail protection schemes.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement I. 066} A PG object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

| 1) Type

| This attribute shall represent the type of the PG.

| 2) Protection scheme state

| This attribute shall indicate the current state of the protection scheme (i.e. whether it is active or locked).

| 3) Reversion mode

| This attribute shall indicate whether the protection scheme is revertive or not.

| 4) Layer Rate

| Refer to [{Requirement I. 022}](#).

| 5) Protection related PTPs

| This attribute shall represent a list of the [Physical Termination Point \(PTP\)](#)(s) related by the PG.

| 6) PG parameters

| This attribute shall represent the Protection Group specific parameters (e.g. switch mode, switch position, wait to restore time etc.).

| 7) APS protocol type

| This attribute shall indicate the type of APS protocol supported by the PG.

| 8) Alarm severity assignment profile

| This attribute shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that has been assigned to the PG

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.26 Threshold Crossing Alert (TCA) Parameter

| {Requirement I. 088} A Threshold Crossing Alert (TCA) Parameter object shall represent the the TCA parameters contained with a [Threshold Crossing Alert \(TCA\) Parameter Profile](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement I. 035} A Threshold Crossing Alert (TCA) Parameter object shall have the following attributes:

| 1) Name

| This attribute shall represent the name of the TCA parameter. Refer to supporting document [PerformanceParameters.pdf](#) for the currently defined TCA parameter names.

| 2) Granularity

| This attribute shall represent the time granularity of the TCA parameter, either 15 minutes or 24 hours. This attribute is not applicable for instantaneous measurements (i.e. gauge type measurements).

| 3) Location

| This attribute shall represent the location of the TCA parameter relative to the signal flow.

| 4) Threshold type

| This attribute shall represent the type of the TCA parameter, (shall indicate the level at which the threshold is triggered or cleared).Refer to supporting document [TCAs.pdf](#) for more details of the threshold type

| 5) Trigger

| This attribute shall indicate whether the threshold type shall trigger a raise or a clear TCA.

| 6) Value

| This attribute shall represent the value for the TCA parameter.

| 7) Measurement units

| This attribute shall represent the unit of measurement for the TCA parameter.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### | **4.1.27 Threshold Crossing Alert (TCA) Parameter Profile**

| {Requirement I. 067} A Threshold Crossing Alert (TCA) Parameter Profile object shall represent for a  
| specific layer rate a set of [Threshold Crossing Alert \(TCA\) Parameters](#)s associated  
| with a set of [Termination Point \(TP\)](#)s.

| Source: Version 3.0.

| Mandatory/Optional: Mandatory.

| {Requirement I. 087} A TCA Parameter Profile object shall have, in addition to the attributes identified  
| in [{Requirement I. 060}](#), the following attributes:

| 1) Layer rate

| This attribute shall represent the layer to which the PM threshold values  
| apply. (Refer to [{Requirement I. 022}](#)).

| 2) Associated TPs

| This attribute shall represent a list of the [Termination Point \(TP\)](#) that are  
| associated with the TCA Parameter Profile.

| 3) TCA Parameters

| This attribute shall represent a list of [Threshold Crossing Alert \(TCA\)](#)  
| [Parameters](#).

| Source: Version 3.0.

| Mandatory/Optional: Mandatory.

#### **4.1.28 Alarm Severity Assignment Profile (ASAP)**

{Requirement I. 080} The Alarm Severity Assignment Profile (ASAP) object shall represent a set of severities that can be assigned to specific alarm probable causes.

An ASAP is contained within a EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement I. 081} An ASAP object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

1) Fixed

This attribute shall indicate whether the ASAP is modifiable by NMS or not. If not, the ASAP can be neither modified nor deleted by the NMS, but only assigned/de-assigned.

2) Alarm severity assignments

This attribute shall represent the set of alarm severity assignments. Refer to [{Requirement I. 082}](#).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.1.28.1 Alarm Severity Assignment (ASA)

{Requirement I. 082}

The Alarm Severity Assignment (ASA) object shall represent the specific severities for the various service affecting conditions that are to be assigned to a specific alarm probable cause.

1) Probable cause

This attribute shall represent the name of specific probable cause to which the severities are to be assigned. Refer to supporting document for

2) Probable cause qualifier

This attribute shall represent the probable cause qualifier and shall be present if the probable cause attribute is not sufficient to uniquely identify an alarm. OPTIONAL

3) Native probable cause

This attribute shall represent the native probable cause. OPTIONAL

4) Service affecting severity

This attribute shall represent the value to be assigned in case the reportable alarm is service affecting.

5) Non-service affecting severity

This attribute shall represent the severity value to be assigned in case the reportable alarm is non-service affecting.

6) Service independent severity

This attribute shall represent the severity value to be assigned in case the reportable alarm is service independent. This severity value may also be assigned in the case where the EMS is unable to determine whether the alarm is service affecting or not.

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.1.29 Performance Monitoring Point (PMP)

{Requirement I. 084}

The Performance Monitoring Point (PMP) object shall represent an access point at which performance monitoring and threshold supervision are provided for a set of PM parameters.

It is contained in a [Termination Point \(TP\)](#).

All PMPs contained in a TP constitute the PM capabilities of the TP.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement I. 085} A PMP object shall have, in addition to the attributes identified in [{Requirement I. 060}](#), the following attributes:

1) Layer rate

This attribute shall represent the layer rate of the PMP. The layer specified must be supported by the containing TP. Refer to [{Requirement I. 022}](#).

2) Location

This attribute shall represent the location of the performance monitoring measurement.

3) Granularity

This attribute shall represent the time granularity of the PMP, either 15 minutes or 24 hours. This attribute is not applicable for instantaneous measurements (i.e. gauge type measurements)

4) Supervision state

This attribute shall represent whether threshold supervision is enabled or disabled.

5) Monitoring state

This attribute shall represent whether performance monitoring is enabled or disabled.

6) PM parameters

This attribute shall represent a list of the names of the PM parameter associated with the PMP. Refer to supporting document [PerformanceParameters.pdf](#) for the list of currently defined performance parameters.

7) PM thresholds

This attribute shall represent a list of the names of the thresholds associated with each PM parameter. Refer to [{Requirement I. 099}](#).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.1.29.1 PM Threshold

- {Requirement I. 099}      The PM Threshold object shall represent the specific severities for the various service affecting conditions that are to be assigned to a specific alarm probable cause
- 1)    Threshold type  
This attribute shall represent the type of the PM threshold, (shall indicate the level at which the threshold is triggered or cleared).
  - 2)    Trigger  
This attribute shall indicate whether the PM threshold shall trigger a raise or a clear TCA.
  - 3)    Value  
This attribute shall represent the value for the PM threshold parameter.
  - 4)    Measurement units  
This attribute shall represent the unit of measurement for the PM threshold parameter.

|      Source: Version 2.0.

|      Mandatory/Optional: Mandatory.

#### 4.1.30 Log

- {Requirement I. 090}      A Log object shall represent a repository on the EMS used to store notifications.  
The Log object shall be based on the managed object defined in the ITU-T Recommendation X.735, Information Technology - Open systems Interconnection Systems Management: Log Control Function.

|      Source: Version 3.0.

|      Mandatory/Optional: Optional.

{Requirement I. 091} A Log object shall have the following attributes defined in ITU-T Recommendation X.735.

- 1) Operational state
- 2) Administrative state
- 3) Size
- 4) Full action
- 5) Duration
- 6) Scheduling
- 7) Availability status
- 8) Record compaction
- 9) Capacity alarm thresholds
- 10) Discriminator construct

| Source: Version 3.0.

| Mandatory/Optional: Mandatory.

## 4.1.31 Naming Requirements

### 4.1.31.1 Termination Point Naming

#### 4.1.31.1.1 Physical Termination Point (PTP) Naming

{Requirement I. 036} A [Physical Termination Point \(PTP\)](#) shall be named relative to the [Managed Element \(ME\)](#) in which it is contained.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.31.1.2 Connection Termination Point (CTP) Naming

{Requirement I. 037} A [Connection Termination Point \(CTP\)](#) shall be named relative to a containing [Physical Termination Point \(PTP\)](#) or a containing [Connection Termination Point \(CTP\)](#).

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

## 4.1.32 Event Notifications

{Requirement I. 041} The NML-EML Interface shall support a reliable mechanism for the EMS to send event notifications to the NMS.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

[Table 4.2](#) identifies the different event types that have been defined for the NML-EML Interface.

| **Table 4.2: Event Notification Types**

	Event Type
1	<a href="#">Object Creation Notification</a>
2	<a href="#">Object Deletion Notification</a>
3	<a href="#">Attribute Value Change Notification</a>
4	<a href="#">State Change Notification</a>

**Table 4.2: Event Notification Types**

	Event Type
5	<a href="#">Protection Switch Notification</a>
6	<a href="#">Equipment Protection Switch Notification</a>
7	<a href="#">Threshold Crossing Alert (TCA) Notification</a>
8	<a href="#">Alarm Notification</a>
9	<a href="#">File Transfer Status Notification</a>
10	<a href="#">Route Change Notification</a>
11	<a href="#">Heartbeat Notification</a>
12	<a href="#">Performance Monitoring Point (PMP) State Change Notification</a>
13	<a href="#">Software Backup Status Notification</a>
14	<a href="#">Log Attribute Value Change Notification</a>
15	<a href="#">Log Capacity Threshold Alarm Notification</a>
16	<a href="#">Log Processing Error Alarm Notification</a>
17	<a href="#">Log State Change Notification</a>

#### 4.1.32.1 Common Event Notification Information

{Requirement I. 068} All event notifications identified in [Table 4.2](#) shall have the following attributes:

1) Identifier

This attribute shall represent an identifier for the event. The value of this identifier is not guaranteed to be unique.

2) Type

This attribute shall represent the type of the event as identified in [Table 4.2](#).

Source: Version 2.0.

Mandatory/Optional: Mandatory.

[Table 4.3](#) identifies those event notifications that contain a common set of attributes.

**Table 4.3: Event Types with common attributes**

	Event Type
1	<a href="#">Object Creation Notification</a>
2	<a href="#">Object Deletion Notification</a>

**Table 4.3: Event Types with common attributes**

	Event Type
3	<a href="#">Attribute Value Change Notification</a>
4	<a href="#">State Change Notification</a>
5	<a href="#">Threshold Crossing Alert (TCA) Notification</a>
6	<a href="#">Alarm Notification</a>
7	<a href="#">Route Change Notification</a>

{Requirement I. 093} All event notifications identified in [Table 4.3](#) shall have the following attributes:

1) Object Name

This attribute shall represent the name of the object against which the event notification is generated.

2) Object Type

This attribute shall represent the type of the object against which the event notification is generated.

3) EMS timestamp

This attribute shall represent the time at which the event occurred at the EMS.

4) NE timestamp

This attribute shall represent the time at which the event occurred at the NE.

5) Edge Point

This attribute shall indicate whether the event is related to a [Termination Point \(TP\)](#) at the edge of a subnetwork. (Refer to [{Requirement I. 008}](#)).

Source: Version 2.0.

Mandatory/Optional: Mandatory.

#### 4.1.32.1.1 AID

There are certain alarm conditions that the EMS may wish to report to an NMS for which there is no explicit object modeled across the NML-EML Interface (i.e. there is no specific object type defined). Under these conditions the EMS shall use the "AID" object type.

| {Requirement I. 057} The NML-EML Interface shall allow the EMS to generate alarms against objects that are not explicitly modeled by the Interface by using the "AID" objectType.

The EMS shall ensure that all such entities have a unique value for the AID within the Network Element (NE).

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### **4.1.32.2 Event Notification Types**

##### **4.1.32.2.1 Object Creation Notification**

{Requirement I. 042} An Object Creation Notification, is an event used across the NML-EML Interface to indicate that an object has been created.

An Object Creation Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) and [{Requirement I. 093}](#) the following attributes:

- 1) Object Information

This attribute shall represent all of the attribute names and their values for the created object.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

##### **4.1.32.2.2 Object Deletion Notification**

{Requirement I. 043} An Object Deletion Notification, is an event used across the NML-EML Interface to indicate that an object has been deleted.

An Object Deletion Notification shall have the attributes identified in [{Requirement I. 068}](#) and [{Requirement I. 093}](#).

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

##### **4.1.32.2.3 Attribute Value Change Notification**

{Requirement I. 044} An Attribute Value Change Notification, is an event used across the NML-EML Interface to indicate that one or more of the attribute values of an object have changed.

An Attribute Value Change Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) and [{Requirement I. 093}](#) the following attributes:

- 1) Attribute name

This attribute shall represent a list of the attribute name(s) that have changed their value.

- 2) Attribute value

This attribute shall represent a list of the new values of the attribute(s).

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### **4.1.32.2.4 State Change Notification**

{Requirement I. 045} A State Change Notification, is an event used across the NML-EML Interface to indicate that a state transition has occurred.

An State Change Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) and [{Requirement I. 093}](#) the following attributes:

- 1) State attribute name

This attribute shall represent the state attribute name(s) (identifier(s)) of the object that have changed their value.

- 2) State attribute value

This attribute shall represent the new value of the state attribute(s) of the object.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.32.2.5 Protection Switch Notification

{Requirement I. 046} A Protection Switch Notification, is an event used across the NML-EML Interface to indicate that a protection switch has occurred.

A Protection Switch Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) the following attributes:

1) Type

This attribute shall represent the type of the protection for which the switch has occurred.

2) Switch reason

This attribute shall represent the reason for the switch.

3) Layer rate

This attribute shall represent the layer at which the switch has occurred.  
(Refer to [{Requirement I. 022}](#)).

4) PG

This attribute shall represent the name of the [Protection Group \(PG\)](#) in the case of a trail switch. Not used if the protection type is Subnetwork Connection Protection (SNCP).

5) Protected TP

This attribute shall represent the name of the [Termination Point \(TP\)](#) being protected.

6) Switch away from TP

This attribute shall represent the name of the TP being switched away from.

7) Switch to TP

This attribute shall represent the name of the TP that is switched to.

Source: Version 2.0.

Mandatory/Optional: Mandatory.

#### 4.1.32.2.6 Equipment Protection Switch Notification

{Requirement I. 074} An Equipment Protection Switch Notification, is an event used across the NML-EML Interface to indicate that a equipment protection switch has occurred.

An Equipment Protection Switch Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) the following attributes:

1) Type

This attribute shall represent the type of the protection for which the switch has occurred.

2) Switch reason

This attribute shall represent the reason for the switch.

3) EPG

This attribute shall represent the name of the [Equipment Protection Group \(EPG\)](#).

4) Protected Equipment

This attribute shall represent the name of the [Equipment](#) being protected.

5) Switch away from Equipment

This attribute shall represent the name of the Equipment being switched away from.

6) Switch to Equipment

This attribute shall represent the name of the Equipment that is switched to.

7) EMS timestamp

This attribute shall represent the time at which the event occurred at the EMS.

8) NE timestamp

This attribute shall represent the time at which the event occurred at the NE.

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.1.32.2.7 Threshold Crossing Alert (TCA) Notification

{Requirement I. 047} A Threshold Crossed Alert (TCA) Notification, is an event used across the NML-EML Interface to indicate that a performance monitoring parameter threshold has been crossed.

An Threshold Crossed Alert (TCA) Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) and [{Requirement I. 093}](#) the following attributes:

1) Native EMS name

This attribute represents the name of the object whose threshold has been crossed as presented on the EMS GUI. The native EMS name attribute is owned by the EMS which may or may not support changing this value.

2) Clearable

This attribute shall indicate whether the TCA shall have an associated clear or is a clear.

3) Perceived severity

This attribute shall indicate (when the TCA is reported as an alarm) whether it is a raise (value shall be INDETERMINATE) or a clear (value shall be CLEARED) alarm.

4) Layer rate

This attribute shall indicate the layer at which the threshold was crossed (Refer to [{Requirement I. 022}](#)).

5) Granularity

This attribute shall represent the time granularity of the TCA, either 15 minutes or 24 hours. This attribute is not applicable for instantaneous measurements (i.e. gauge type measurements).

6) Parameter name

Refer to [{Requirement I. 035}](#).

7) Parameter location

Refer to [{Requirement I. 035}](#).

8) Threshold type

Refer to [{Requirement I. 035}](#).

9) Value

Refer to [{Requirement I. 035}](#). OPTIONAL

10) Measurement units

Refer to [{Requirement I. 035}](#). OPTIONAL

11) Acknowledgement

Refer to [{Requirement I. 071}](#).

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| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.32.2.8 Alarm Notification

{Requirement I. 048} An Alarm Notification, is an event used across the NML-EML Interface to indicate that a fault condition has occurred.

An Alarm Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) and [{Requirement I. 093}](#) the following attributes:

- 1) Clearable  
Refer to [{Requirement I. 050}](#).
- 2) Layer rate  
Refer to [{Requirement I. 022}](#).
- 3) Probable Cause  
Refer to [{Requirement I. 051}](#).
- 4) Perceived severity  
Refer to [{Requirement I. 052}](#).
- 5) Service affecting  
Refer to [{Requirement I. 053}](#).
- 6) Probable Cause Qualifier  
Refer to [{Requirement I. 049}](#). OPTIONAL.
- 7) Affected PTPs  
This attribute shall in the case of equipment related alarms represent the names of the affected [Physical Termination Point \(PTP\)](#) implemented by the alarmed equipment. OPTIONAL.
- 8) Additional text  
Refer to [{Requirement I. 056}](#). OPTIONAL.
- 9) Native EMS Name  
Refer to [{Requirement I. 060}](#). OPTIONAL.
- 10) Native Probable Cause  
This attribute shall represent the value of the probable cause shown on the EMS user interface. OPTIONAL.
- 11) Acknowledgement  
Refer to [{Requirement I. 071}](#).
- 12) Root Cause Alarm indication  
This attribute shall indicate whether the alarm is a raw (un-correlated) alarm or a root cause alarm indication.

## 13) X.733 Event Type

This attribute shall represent the classification of the alarm in terms of the categories specified in ITU-T X.733. This is consistent with the ITU-T X.733 definition. *OPTIONAL*.

## 14) X.733 Specific problems

This attribute shall represents a clarification of the Probable Cause of the alarm. This is similar to Probable Cause Qualifier, but this attribute is designed to be human readable and compatible with ITU usage. This is consistent with the ITU-T X.733 definition. *OPTIONAL*

## 15) X.733 Backed-up status

This attribute shall represent whether or not the object emitting the alarm has been backed-up, and services provided to the user have, therefore, not been disrupted. This is consistent with the ITU-T X.733 definition *OPTIONAL*

## 16) X.733 Back-up object

This attribute shall represent the object that is providing back-up services for the object to which the alarm notification pertains. This parameter shall be present when the X.733 Backed-up status attribute is present and indicates that the object has been backed up. This is consistent with the ITU-T X.733 definition. *OPTIONAL*.

## 17) X.733 Trend indication

This attribute shall represent the current severity trend of the object it indicates that there are one or more alarms ("outstanding alarms") which have not been cleared, and pertain to the same object as that to which this alarm ("current alarm") pertains. This is consistent with the ITU-T X.733 definition. *OPTIONAL*

## 18) X.733 Correlated notifications

This attribute shall represent the a set of Notification identifiers and, if necessary, their associated object names. This set is defined to be the set of all notifications to which this notification is considered to be correlated. The source object name shall be present if the correlated event report is from an object other than the one in which the Correlated Notifications parameter appears. Otherwise it shall be empty. This is consistent with the ITU-T X.733 definition. *OPTIONAL*.

## 19) X.733 Monitored attributes

This attribute shall represent the one or more attributes of the managed object and their corresponding values at the time of the alarm. This is consistent with the ITU-T X.733 definition. *OPTIONAL*.

## 20) X.733 Proposed repair actions

This attribute shall represent one or more possible solutions (such as switch in standby equipment, retry, replace media). This is consistent with the ITU-T X.733 definition. *OPTIONAL*.

21) X.733 Additional Information

This attribute shall represent a set of additional information in an alarm notification. The same information can be directly encoded as separate parameters of the notification. However, this parameter is retained for consistency with ITU-T X.733. *OPTIONAL*.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.32.2.8.1 Probable Cause Qualifier

{Requirement I. 049} The optional Probable Cause Qualifier parameter, when present, identifies further refinements to the Probable cause of the alarm, so as to correlate the “raise” and “clear” notifications of the same fault condition in case of ambiguity (i.e., when several different fault conditions give rise to the same values). The parameter gives more detail about the alarm, e.g., it may further qualify the source. Refer to [{Requirement I. 054}](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.1.32.2.8.2 Clearable

{Requirement I. 050} An indication is required as to whether an alarm raise event will have an associated alarm clear event. If an alarm clear event is generated then the alarm is defined to be clearable.

The same distinction is used in [Threshold Crossing Alert \(TCA\) Notification](#).

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.1.32.2.8.3 Probable Cause

{Requirement I. 051} The Probable Cause will allow the EMS to indicate the likely cause of the alarm. Refer to supporting document [ProbableCauses.pdf](#) for the currently specified probable cause names.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### **4.1.32.2.8.4 Perceived Severity**

{Requirement I. 052} Perceived Severity is defined as:

- Critical
- Major
- Minor
- Warning
- Cleared or
- Indeterminate

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### **4.1.32.2.8.5 Service Affecting**

{Requirement I. 053} The service affecting indication is defined as the EMS' determination of whether or not the condition affects service. The EMS shall indicate if the condition is service affecting, is not service affecting, or is unknown as to whether it is service affecting.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### **4.1.32.2.8.6 Alarm Identification**

{Requirement I. 054} An instance of an alarm shall be uniquely identifiable if:

- 1) The Source Name, Layer and Probable Cause can uniquely correlate clears with alarms, then the Probable Cause Qualifier is empty (default value).
- 2) The Source Name, Layer and Probable Cause are not sufficient to uniquely correlate clears with raises, then the Probable Cause Qualifier field is not empty. It contains information such that any clear of that alarm would correlate to the alarm.

This means that if the alarm is raised, cleared, raised again, and cleared again, if the original clear and second alarm were missed, the second clear would clear the first alarm.

| Source: Version 2.0.

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| Mandatory/Optional: Mandatory.

#### **4.1.32.2.8.7 Additional Text**

{Requirement I. 056} The optional Additional Text attribute allows a free form text description to be reported.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### **4.1.32.2.8.8 Acknowledgement**

{Requirement I. 071} The optional Acknowledgement attribute shall have the following possible values:.

- 1) Not applicable

This indicates that the EMS does not support acknowledgement for this event or does not support acknowledgement at all

- 2) Acknowledged

This indicates that the alarm has been acknowledged in the EMS. All alarm fields other than emsTime and acknowledge indication shall remain similar to the original alarm notification.(The emsTime is always provided as the time that the alarm acknowledgement notification has been reported by the EMS.)

- 3) Unacknowledged

This indicates that the alarm has not been acknowledged but the EMS, or in the event that the alarm has been previously acknowledged and then unacknowledged. All alarm fields other than emsTime shall remain in that case similar to the original alarm notification.(The emsTime is always provided as the time that the alarm acknowledgement notification has been reported by the EMS.).

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.1.32.2.9 File Transfer Status Notification

{Requirement I. 058} A File Transfer Status Notification, is an event used across the NML-EML Interface to indicate that status of the transfer of the performance monitoring data file.

A File Transfer Status Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) the following attributes:

- 1) File name

This attribute shall represent the name of the file being transferred (this shall include the path name).

- 2) Transfer status

This attribute shall represent the current state of the transfer (in progress, failed or completed)

- 3) Percentage complete

This attribute shall indicate the percent complete of the file transfer it shall be in the range 0..100.

- 4) Reason for failure

This attribute shall represent, in the event of a failure, reason for the failure.

Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.1.32.2.10 Route Change Notification

{Requirement I. 059} A Route Change Notification is an event used across the NML-EML Interface to indicate a change in a [Subnetwork Connection \(SNC\)](#) route.

A Route Change Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) and [{Requirement I. 093}](#) the following attributes:

- 1) Route change state

This attribute shall represent the current state of the route change (started, completed, or failed)

- 2) Route

This attribute shall represent the new route following a successful route change.

Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.1.32.2.11 Heartbeat Notification

{Requirement I. 077} A Heartbeat Notification is an event used across the NML-EML Interface to indicate the state of the notification delivery mechanism between the EMS and the NMS.

The Heartbeat Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) the following attributes:

1) Object Name

This attribute shall represent the name of the object against which the event notification is generated. In this case it shall be the name of the EMS

2) Object Type

This attribute shall represent the type of the object against which the event notification is generated. In this case it shall identify the EMS as the type of the object

3) EMS timestamp

This attribute shall represent the time at which the event occurred at the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.1.32.2.12 Performance Monitoring Point (PMP) State Change Notification

{Requirement I. 083}

A Performance Monitoring Point (PMP) State Change Notification is a special type of [State Change Notification](#) event used across the NML-EML Interface to indicate the following:

- PM data has been cleared
- PM data collection has been disabled or enabled
- TCA generation has been enabled or disabled.

This notification is used to report only one type of change at a time. The EMS shall not use both this notification and individual PMP state change notifications to report the same event.

This notification and an attribute value change notification on a PMP may be used interchangeably by the EMS s on individual PMPs and other times on a list of PMPs.

A PMP State Change Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) the following attributes:

- 1) PMP name(s)

This attribute shall represent a list of the PMP name(s) for which a state attribute has changed its value.

- 2) Attribute value(s)

This attribute shall represent a list of the state attribute name(s) that have changed their value along with their new values.

- 3) EMS timestamp

This attribute shall represent the time at which the event occurred at the EMS.

- 4) NE timestamp

This attribute shall represent the time at which the event occurred at the NE.

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.1.32.2.13 Software Backup Status Notification

{Requirement I. 086} A Software Backup Status Notification, is an event used across the NML-EML Interface to indicate that status of the backup of the [Managed Element \(ME\)](#) data.

A Software Backup Status Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) the following attributes:

1) NE Name

This attribute shall represent the name of the Network Element that is being backed up.

2) Backup status

This attribute shall represent the current state of the transfer (idle, in progress, completed, aborted or failed)

3) EMS timestamp

This attribute shall represent the time at which the event occurred at the EMS.

4) NE timestamp

This attribute shall represent the time at which the event occurred at the NE.

|  
| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.1.32.2.14 Log Attribute Value Change Notification

{Requirement I. 095} A Log Attribute Value Change Notification is a special type of [Attribute Value Change Notification](#) event used across the NML-EML Interface to indicate the following Log attributes have changed:

- capacity alarm threshold
- log full action
- maximum log size
- start time
- stop time
- week mask
- changing the discriminator constraint
- max record life

A Log Attribute Value Change Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) the following attributes:

- 1) Attribute identifier  
This attribute shall represent the attribute that has changed its value.
- 2) Old attribute value  
This attribute shall represent the old value of the attribute.
- 3) New attribute value  
This attribute shall represent the new value of the attribute.

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.1.32.2.15 Log Capacity Threshold Alarm Notification

{Requirement I. 096} A Log Capacity Threshold Alarm Notification is a special type of [Threshold Crossing Alert \(TCA\) Notification](#) event used across the NML-EML Interface to indicate the Log capacity alarm threshold attribute has been crossed.

A Log Capacity Threshold Alarm Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) the following attributes:

- 1) Observed value

This attribute shall represent the current Log size, as a percentage of the maximum Log size.

- 2) Crossed value

This attribute shall represent the threshold level that has been crossed.

- 3) Perceived severity

This attribute shall represent the severity of the alarm. The perceived severity is minor if the Log is not full, and critical otherwise.

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.1.32.2.16 Log Processing Error Alarm Notification

{Requirement I. 097} A Log Processing Error Alarm Notification is a special type of [Alarm Notification](#) event used across the NML-EML Interface to indicate a processing error has occurred associated with the Log functionality.

A Log Processing Error Alarm Notification shall have in addition to the attributes identified in [{Requirement I. 068}](#) the following attributes:

- 1) Error number

This attribute shall represent the error number associated with the problem.

- 2) Error reason

This attribute shall represent a textual description of the problem.

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.1.32.2.17 Log State Change Notification

{Requirement I. 098} A Log State Change Notification is a special type of [State Change Notification](#) event used across the NML-EML Interface to indicate a change in the state of the Log.

A Log State Change Notification shall have in addition to the attributes identified in [Requirement I. 068](#) the following attributes:

- 1) State identifier

This attribute shall represent the attribute that has changed its value.

- 2) New state value

This attribute shall represent the new value of the state.

Source: Version 3.0.

Mandatory/Optional: Mandatory.

### 4.2 Category II: Normal Sequences, Dynamic Requirements

#### 4.2.1 Inventory Management

##### 4.2.1.1 Inventory Retrieval

###### 4.2.1.1.1 Element Management System (EMS) Inventory

{Requirement II. 001} The NML-EML Interface shall allow the NMS to retrieve all the attributes of the [Element Management System \(EMS\)](#).

Source: Version 2.0.

Mandatory/Optional: Optional.

###### 4.2.1.1.2 Managed Element (ME) Inventory

{Requirement II. 002} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Managed Element \(ME\)](#)s that are being managed by the EMS.

Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 003} The NML-EML Interface shall allow the NMS to retrieve the names of all the Managed Element (ME)s that are being managed by the EMS.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 004} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the Managed Element (ME)s contained within an NMS specified Subnetwork.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 005} The NML-EML Interface shall allow the NMS to retrieve the names of all the Managed Element (ME)s contained within an NMS specified Subnetwork.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 006} The NML-EML Interface shall allow the NMS to retrieve the attributes of a Managed Element (ME) given an NMS specified ME name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### **4.2.1.1.3 Subnetwork Inventory**

The NMS and EMS shall have a common view of the topology that is under the control of the EMS. The EMS will determine the Subnetwork(s) and shall provide the Subnetwork(s) information to the NMS.

| {Requirement II. 008} The NML-EML Interface shall allow the NMS to retrieve the attributes of a Subnetwork, given an NMS specified Subnetwork name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| {Requirement II. 009} The NML-EML Interface shall allow the NMS to retrieve the names of the containing Subnetwork(s) for a given NMS specified Managed Element (ME) name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| {Requirement II. 010} The NML-EML Interface shall allow the NMS to retrieve a the names of all the top level Subnetwork(s).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| {Requirement II. 011} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the top level Subnetworks that are being managed by the EMS.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.1.1.4 Topological Link (TL) Inventory

{Requirement II. 012} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the top level [Topological Link \(TL\)s](#) between the [Subnetworks](#) that are managed by the EMS.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 013} The NML-EML Interface shall allow the NMS to retrieve the names of all the top level [Topological Link \(TL\)s](#) between the [Subnetworks](#) that are managed by the EMS.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 014} The NML-EML Interface shall allow the NMS to retrieve the attributes of a top level [Topological Link \(TL\)](#), given an NMS specified top level TL name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 015} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Topological Link \(TL\)s](#) between NEs given an NMS specified [Subnetwork](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 016} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Topological Link \(TL\)s](#) between NEs given an NMS specified [Subnetwork](#).

| Source: Version 2.0.

Mandatory/Optional: Optional.

- | {Requirement II. 017} The NML-EML Interface shall allow the NMS to retrieve the attributes of a [Topological Link \(TL\)](#), given an NMS specified TL name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### **4.2.1.1.5 Subnetwork Connection (SNC) Inventory**

##### **4.2.1.1.5.1 Flexible Subnetwork Connections (SNC)**

A [Subnetwork Connection \(SNC\)](#) shall be considered a flexible SNC unless explicitly stated otherwise.

- | {Requirement II. 018} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Subnetwork Connection \(SNC\)](#)s contained within an NMS specified [Subnetwork](#) name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

- | {Requirement II. 019} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Subnetwork Connection \(SNC\)](#) contained within an NMS specified [Subnetwork](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

- | {Requirement II. 020} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Subnetwork Connection \(SNC\)](#)s contained within an NMS specified [Subnetwork](#) and for a specific SNC layer rate(s).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 021} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Subnetwork Connection \(SNC\)](#)s contained within an NMS specified [Subnetwork](#) and connection rate(s).

| Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 022} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Subnetwork Connection \(SNC\)](#)s that contain the NMS specified [Termination Point \(TP\)](#) and connection rate(s).

- 1) If a [Physical Termination Point \(PTP\)](#) is specified, then all SNC(s) that pass through the contained [Connection Termination Point \(CTP\)](#)s are returned. The SNCs returned include the CTPs at either end or as part of their route.
- 2) If a CTP is specified, then all the SNC(s) that pass through the specified CTP are returned. The SNCs returned include the CTPs at either end or as part of the route.

If the CTP provides the source of a point-to-multipoint SNC then all the SNCs of that multipoint configuration that connect to that CTP will be returned.

| Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 023} The NML-EML Interface shall allow the NMS to retrieve the names of all the Subnetwork Connection (SNC)s that contain the NMS specified Termination Point (TP) and connection rate(s).

If the connection rate list is empty:

- 1) If a Physical Termination Point (PTP) is specified then all SNC(s) containing all of the PTP(s)' contained Connection Termination Point (CTP)s are returned.
- 2) If a CTP is specified, then all the SNC(s) that contain the specified CTP are returned.

For either a PTP or a CTP identified by the NMS, if the NMS specifies one or more connection rates, the list of returned SNC names are constrained based on the specified connection rates.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| {Requirement II. 024} The NML-EML Interface shall allow the NMS to retrieve the attributes of a Subnetwork Connection (SNC) given an NMS specified SNC name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| {Requirement II. 025} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the Subnetwork Connection (SNC)s given an NMS specified SNC user label.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.1.1.5.2 Fixed Subnetwork Connections (SNC)

A fixed Subnetwork Connection (SNC) shall be an SNC in which all of the Cross-Connect (XC)s are fixed.

{Requirement II. 179} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the fixed Subnetwork Connection (SNC)s contained within an NMS specified Subnetwork.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 180} The NML-EML Interface shall allow the NMS to retrieve the names of all the fixed Subnetwork Connection (SNC) contained within an NMS specified Subnetwork.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 181} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the fixed Subnetwork Connection (SNC)s that contain the NMS specified Termination Point (TP) and connection rate(s).

- 1) If a Physical Termination Point (PTP) is specified, then all SNC(s) that pass through the contained Connection Termination Point (CTP)s are returned. The SNCs returned include the CTPs at either end or as part of their route.
- 2) If a CTP is specified, then all the SNC(s) that pass through the specified CTP are returned. The SNCs returned include the CTPs at either end or as part of the route.

If the CTP provides the source of a point-to-multipoint SNC then all the SNCs of that multipoint configuration that connect to that CTP will be returned.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 182} The NML-EML Interface shall allow the NMS to retrieve the names of all the fixed Subnetwork Connection (SNC)s that contain the NMS specified Termination Point (TP) and connection rate(s).

If the connection rate list is empty:

- 1) If a Physical Termination Point (PTP) is specified then all SNC(s) containing all of the PTP(s)' contained Connection Termination Point (CTP)s are returned.
- 2) If a CTP is specified, then all the SNC(s) that contain the specified CTP are returned.

For either a PTP or a CTP identified by the NMS, if the NMS specifies one or more connection rates, the list of returned SNC names are constrained based on the specified connection rates.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.1.1.6 Route Inventory

{Requirement II. 026} The NML-EML Interface shall allow the NMS to retrieve the attributes of a Route given an NMS specified Subnetwork Connection (SNC) name.

If the SNC has alternative routes, then the NML-EML Interface shall allow the NMS to retrieve the intended route (if the SNC is the Pending or Partial state), the active route otherwise.

Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 218} The NML-EML Interface shall allow the NMS to retrieve the attributes of a Route and the attributes of all the Topological Link (TL)s given an NMS specified Subnetwork Connection (SNC) name.

If the SNC has alternative routes, then the NML-EML Interface shall allow the NMS to retrieve the intended route (if the SNC is the Pending or Partial state), the active route otherwise.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 256} The NML-EML Interface shall allow the NMS to retrieve the attributes of the backup [Route](#) given an NMS specified [Subnetwork Connection \(SNC\)](#) name and Route identifier.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 260} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Route](#)s (intended and backup) given an NMS specified [Subnetwork Connection \(SNC\)](#) name.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 261} The NML-EML Interface shall allow the NMS to retrieve the attributes of the intended [Route](#) given an NMS specified [Subnetwork Connection \(SNC\)](#) name.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.1.1.7 Termination Point (TP) Inventory

{Requirement II. 027} The NML-EML Interface shall allow the NMS to retrieve the attributes of a [Termination Point \(TP\)](#) given an NMS specified TP name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 029} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Connection Termination Point \(CTP\)](#)s that are associated with an NMS specified [Traffic Descriptor \(TD\)](#) name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 030} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Termination Point Pool \(TP Pool\)](#)s that are associated with an NMS specified [Termination Point \(TP\)](#).

| Descriptions of the associations can be obtained from the respective TPPool attributes for the description of use.

| In case of ATM VP TP Pool administration the specified TP is an ATM NI CTP representing a real user network interface that gets partitioned into virtual user network interfaces represented by TP pools. Each TP pool contains ATM VP CTPs that are clients of the specified ATM NI CTP.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 186} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Termination Point \(TP\)](#)s that are associated with an NMS specified [Transmission Descriptor \(TMD\)](#) name.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 285} The NML-EML Interface shall allow the NMS to retrieve the names of all the Termination Point (TP)s that are associated with an NMS specified Threshold Crossing Alert (TCA) Parameter Profile name.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.1.1.8 Termination Point Pool (TP Pool) Inventory

{Requirement II. 268} The NML-EML Interface shall allow the NMS to retrieve the attributes of a Termination Point Pool (TP Pool) given an NMS specified TP Pool name.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 031} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the Termination Point Pool (TP Pool)s given an NMS specified Subnetwork name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 032} The NML-EML Interface shall allow the NMS to retrieve the names of all the Termination Point Pool (TP Pool)s given an NMS specified Subnetwork name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 028} The NML-EML Interface shall allow the NMS to retrieve the names of all the Termination Point (TP)s and Group Termination Point (GTP)s that have been grouped by the NMS specified Termination Point Pool (TP Pool).

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.2.1.1.9 Physical Termination Point (PTP) Inventory

{Requirement II. 033} The NML-EML Interface shall allow the NMS to retrieve the attributes all the [Physical Termination Point \(PTP\)s](#) (ports) given an NMS specified [Managed Element \(ME\)](#) name and one or more layer rate(s).

The NML-EML Interface shall allow the NMS to specify one or more layer rates to set the scope of the retrieval of PTPs from the EMS.

| Source: Version 2.0.

Mandatory/Optional: Optional.

Example physical TP layer rates covering SONET and SDH are: Electrical STS1 / STM0; Electrical STS3 / STM1; Optical OC1 / STM0; Optical OC3 / STM1

{Requirement II. 034} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Physical Termination Point \(PTP\)s](#) (ports) given an NMS specified [Managed Element \(ME\)](#) name and one or more layer rate(s).

The NML-EML Interface shall allow the NMS to specify one or more layer rates to set the scope of the retrieval of PTPs from the EMS.

| Source: Version 2.0.

Mandatory/Optional: Optional.

Example physical TP layer rates covering SONET and SDH are: Electrical STS1 / STM0; Electrical STS3 / STM1; Optical OC1 / STM0; Optical OC3 / STM1.

{Requirement II. 035} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Physical Termination Point \(PTP\)s](#) (ports) given an NMS specified [Managed Element \(ME\)](#) name and connection layer rate(s).

| Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 036} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Physical Termination Point \(PTP\)](#)s (ports) given an NMS specified [Managed Element \(ME\)](#) name connection layer rate(s).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 214} The NML-EML Interface shall allow the NMS to retrieve a the attributes of all the [Physical Termination Point \(PTP\)](#)s (ports) and [Floating Termination Point \(FTP\)](#)s given an NMS specified [Managed Element \(ME\)](#) name and one or more layer rate(s).

| The NML-EML Interface shall allow the NMS to specify one or more layer rates to set the scope of the retrieval of PTPs and FTPs from the EMS.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 215} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Physical Termination Point \(PTP\)](#)s (ports) and [Floating Termination Point \(FTP\)](#)s given an NMS specified [Managed Element \(ME\)](#) name and one or more layer rate(s).

| The NML-EML Interface shall allow the NMS to specify one or more layer rates to set the scope of the retrieval of PTPs and FTPs from the EMS.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 216} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Physical Termination Point \(PTP\)](#)s (ports) and [Floating Termination Point \(FTP\)](#)s given an NMS specified [Managed Element \(ME\)](#) name that are capable of supporting the NMS specified connection layer rate(s).

| Source: Version 3.0.

| Mandatory/Optional: Optional.

| {Requirement II. 217} The NML-EML Interface shall allow the NMS to retrieve the names of the [Physical Termination Point \(PTP\)](#)s (ports) and [Floating Termination Point \(FTP\)](#)s given an NMS specified [Managed Element \(ME\)](#) name that are capable of supporting the NMS specified connection layer rate(s).

| Source: Version 3.0.

| Mandatory/Optional: Optional.

| {Requirement II. 289} The NML-EML Interface shall allow the NMS to retrieve the names of the [Protection Group \(PG\)](#)s containing the given an NMS specified [Physical Termination Point \(PTP\)](#) name.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.1.1.10 Edge Termination Point (Edge TP) Inventory

{Requirement II. 037} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Edge Termination Point \(Edge TP\)s](#) (ports) given an NMS specified [Subnetwork](#) name and one or more layer rate(s).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| Example physical TP layer rates covering SONET and SDH are: Electrical STS1 / STM0; Electrical STS3 / STM1; Optical OC1 / STM0; Optical OC3 / STM1.

{Requirement II. 038} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Edge Termination Point \(Edge TP\)s](#) (ports) given an NMS specified [Subnetwork](#) name and one or more layer rate(s).

| The NML-EML Interface shall allow the NMS to specify one or more layer rates to set the scope of the retrieval of Edge TPs from the EMS.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| Example physical TP layer rates covering SONET and SDH are: Electrical STS1 / STM0; Electrical STS3 / STM1; Optical OC1 / STM0; Optical OC3 / STM1.

{Requirement II. 039} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Edge Termination Point \(Edge TP\)s](#) (ports) given an NMS specified [Subnetwork](#) name and that are capable of supporting the NMS specified connection layer rate(s).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 040} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Edge Termination Point \(Edge TP\)s](#) (ports) given an NMS specified [Subnetwork](#) name and that are capable of supporting the NMS specified connection layer rate(s).

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### **4.2.1.1.11 Contained Termination Point (TP) Inventory**

##### **4.2.1.1.11.1 Potential Termination Point (TP)s**

- {Requirement II. 041}      The NML-EML Interface shall allow the NMS to retrieve the attributes of all the potentially present [Termination Point \(TP\)](#)(s) contained by (served by) a given TP identified by a NMS specified TP name and layer rate.

| Source: Version 2.0.

Mandatory/Optional: Optional.

Some examples:

If the NMS specifies an OC3 physical TP (port) name that can be mapped to STS1s or VT1.5s, then the EMS response would include 3 STS1 TPs (CTPs) and 84 VT1.5 TPs (CTPs), respectively.

If the NMS specifies an STS1 TP name (physical or logical TP, i.e., a physical port or a logical channel (CTP) that can be mapped to VT1.5s), then the EMS response would include 28 VT1.5 TPs (CTPs)

- {Requirement II. 042}      The NML-EML Interface shall allow the NMS to retrieve the names of all the potentially present [Termination Point \(TP\)](#)(s) contained by (served by) a given TP identified by a NMS specified TP name and layer rate.

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.2.1.11.2 Cross-connectible or cross-connected Termination Point (TP)s

{Requirement II. 043} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the currently cross-connectible or cross-connected [Termination Point \(TP\)](#)(s) that are contained by (served by) a given TP identified by a NMS specified TP name and layer rate.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| Some examples:

| If the NMS specifies an OC3 physical TP (port) name that can be mapped to STS1s or VT1.5s, then

| If none of the STS1 CTPs are terminated and mapped the EMS response would include only the 3 STS1 TPs (CTPs).

| If all 3 STS1 CTPs are terminated and mapped, then 84 VT1.5 TPs (CTPs), are returned.

| If the NMS specifies an STS1 TP name (physical or logical TP, i.e., a physical port or a logical channel (CTP) that can be mapped to VT1.5s), then the EMS response would include:

| 28 VT1.5 TPs (CTPs) if the STS1 TP is terminated and mapped.

| No TPs if the STS1 TP is neither terminated nor mapped.

{Requirement II. 044} The NML-EML Interface shall allow the NMS to retrieve the name(s) of all the currently cross-connectible or cross-connected [Termination Point \(TP\)](#)(s) that are contained by (served by) a given TP identified by a NMS specified TP name and layer rate.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

Some examples:

If the NMS specifies an OC3 physical TP (port) name that can be mapped to STS1s or VT1.5s, then

- If none of the STS1 CTPs are terminated and mapped the EMS response would include only the names of 3 STS1 TPs (CTPs).
- If all 3 STS1 CTPs are terminated and mapped, then the names of 84 VT1.5 TPs (CTPs), are returned.

If the NMS specifies an STS1 TP name (physical or logical TP, i.e., a physical port or a logical channel (CTP) that can be mapped to VT1.5s), then the EMS response would include the names of:

- 28 VT1.5 TPs (CTPs) if the STS1 TP is terminated and mapped.

No TPs if the STS1 TP is neither terminated nor mapped.

#### 4.2.1.1.11.3 In Use Termination Point (TP)s

An “in use” [Termination Point \(TP\)](#) is defined as a TP that is used by an [Subnetwork Connection \(SNC\)](#) in any state (including pending) or a TP that is terminated and mapped (either with or without assigned bandwidth).

{Requirement II. 045}

The NML-EML Interface shall allow the NMS to retrieve the attributes of all the “in use” (actual) [Termination Point \(TP\)s](#) that are contained by (served by) a given TP identified by a NMS specified TP name and layer rate.

| Source: Version 2.0.

Mandatory/Optional: Optional.

This operation will be used when there are a large number of potential TPs (e.g., in ATM). All of the potential TPs are not returned. The TPs can be scoped on layer rate. If no layer rate is specified, then actual TP at all the contained layers are returned. If layer rate(s) are specified, then only actual TPs at the specified layer rates are returned.

{Requirement II. 046}

The NML-EML Interface shall allow the NMS to retrieve the names of all the “in use” (actual) [Termination Point \(TP\)](#) that are contained by (served by) a given TP identified by a NMS specified TP name and layer rate.

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### **4.2.1.1.12 Containing Termination Point (TP) Inventory**

{Requirement II. 047}      The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Termination Point \(TP\)](#)(s) that contain (serves) the TP identified by the NMS specified TP name

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

|      Some examples:

- a)      If the NMS specifies an STS1 TP (CTP) name that is a channel of an OC3, then the EMS would respond with the OC3 physical TP.
- b)      If the NMS specifies an OC3 physical TP (port) name, then the EMS would respond with no containing TPs.

{Requirement II. 048}      The NML-EML Interface shall allow the NMS to retrieve the name(s) of all the [Termination Point \(TP\)](#)(s) that contain the TP identified by the NMS specified TP name.

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

#### 4.2.1.1.13 Floating Termination Point (FTP) Inventory

{Requirement II. 210} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Floating Termination Point \(FTP\)](#)s given an NMS specified [Managed Element \(ME\)](#) name and one or more layer rate(s).

The NML-EML Interface shall allow the NMS to specify one or more layer rates to set the scope of the retrieval of FTPs from the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 211} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Floating Termination Point \(FTP\)](#)s (ports) given an NMS specified [Managed Element \(ME\)](#) name and one or more layer rate(s).

The NML-EML Interface shall allow the NMS to specify one or more layer rates to set the scope of the retrieval of TPs from the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 212} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Floating Termination Point \(FTP\)](#)s given an NMS specified [Managed Element \(ME\)](#) name that are capable of supporting the NMS specified connection layer rate(s).

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 213} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Floating Termination Point \(FTP\)](#)s given an NMS specified [Managed Element \(ME\)](#) name that are capable of supporting the NMS specified connection layer rate(s).

Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.1.14 Associated Termination Point (TP) Inventory

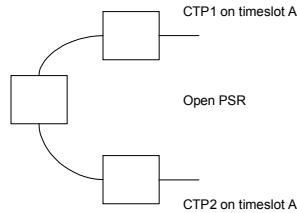
{Requirement II. 049} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Termination Point \(TP\)](#)s associated with a given TP identified by an NMS specified TP name.

Some examples of associated TPs to be returned by the EMS

In the case of an open Path Switched Ring (PSR) topology, if the NMS specifies a CTP (timeslot) on one end of the open PSR, the EMS shall return the CTP on the other end of the open PSR corresponding to the specified timeslot, associated with relationship, (as illustrated in [Figure 4.2](#)).

| Source: Version 2.0.

Mandatory/Optional: Optional.



**Figure 4.2: Associated CTP Relationship in an Open Ring**

#### **4.2.1.1.15 Supported Termination Point (TP) Inventory**

{Requirement II. 050}      The NML-EML Interface shall allow the NMS to retrieve the attributes of all of the [Physical Termination Point \(PTP\)](#)(s) that are supported by the [Equipment](#) identified by the NMS specified Equipment name.

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

{Requirement II. 051}      The NML-EML Interface shall allow the NMS to retrieve all the name(s) of the [Physical Termination Point \(PTP\)](#)(s) that are supported by the [Equipment](#) identified by the NMS specified Equipment name.

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

#### **4.2.1.1.16 Supporting Termination Point (TP) Inventory**

{Requirement II. 052}      The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Equipment](#)(s) that support the [Physical Termination Point \(PTP\)](#) identified by the NMS specified PTP name.

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

{Requirement II. 053}      The NML-EML Interface shall allow the NMS to retrieve all the name(s) of the [Equipment](#)(s) that support the [Physical Termination Point \(PTP\)](#) identified by the NMS specified TP name.

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

#### **4.2.1.1.17 Performance Management (PM) Inventory**

##### **4.2.1.1.17.1 Performance Management (PM) Parameters**

{Requirement II. 054} The NML-EML Interface shall allow the NMS to retrieve the set of supported PM parameters for an NMS specified [Managed Element \(ME\)](#). Refer to [{Requirement II. 118}](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

##### **4.2.1.1.17.2 TCA Thresholds**

{Requirement II. 055} The NML-EML Interface shall allow the NMS to retrieve the value of a specific [Threshold Crossing Alert \(TCA\) Parameter](#) for a [Termination Point \(TP\)](#) identified by an NMS specified TP name, layer rate, granularity and location.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

##### **4.2.1.1.17.3 TCA Parameter Profiles**

{Requirement II. 233} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Threshold Crossing Alert \(TCA\) Parameter Profiles](#) that are being managed by the EMS.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 273} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Threshold Crossing Alert \(TCA\) Parameter Profiles](#) that are being managed by the EMS.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 234} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Threshold Crossing Alert \(TCA\) Parameter Profile](#) given an NMS specified TCA Parameter Profile name.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### **4.2.1.1.17.4 Performance Monitoring Point (PMP) Inventory**

{Requirement II. 221} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Performance Monitoring Point \(PMP\)](#)s supported by a [Managed Element \(ME\)](#) or a [Termination Point \(TP\)](#) for an NMS specified ME or TP name.

In the case of the NMS supplied ME name the names of the PMPs associated with all the TPs contained within the ME shall be returned. In the case of the NMS supplied TP name then only the names of those PMPs associated with the named TP shall be returned.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 222} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Performance Monitoring Point \(PMP\)](#) supported by a [Managed Element \(ME\)](#) or a [Termination Point \(TP\)](#) for an NMS specified ME or TP name.

In the case of the NMS supplied ME name the PMPs associated with all the TPs contained within the ME shall be returned. In the case of the NMS supplied TP name then only those PMPs associated with the named TP shall be returned.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.1.1.18 Equipment Inventory

{Requirement II. 056} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the Equipments given an NMS specified Managed Element (ME) name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 057} The NML-EML Interface shall allow the NMS to retrieve the names of all the Equipments given an NMS specified Managed Element (ME) name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 058} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the Equipment contained directly in the Equipment Holder identified by an NMS specified Equipment Holder name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 279} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the Equipments and Equipment Holders given an NMS specified Equipment Holder name.

| The EMS shall return all Equipments and Equipment Holders at all levels of containment beneath the specified Equipment Holder.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 280} The NML-EML Interface shall allow the NMS to retrieve the names of all the Equipments given an NMS specified Equipment Holder name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.1.1.19 Supporting Equipment Inventory

{Requirement II. 225} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the Equipments that support an Equipment identified by an NMS specified Equipment name.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 226} The NML-EML Interface shall allow the NMS to retrieve names of all the Equipments that support an Equipment identified by an NMS specified Equipment name.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.1.1.20 Supported Equipment Inventory

{Requirement II. 227} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Equipments](#) that are supported by an [Equipment](#) identified by an NMS specified [Equipment](#) name.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 228} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Equipments](#) that are supported by an [Equipment](#) identified by an NMS specified [Equipment](#) name.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.1.1.21 Protection Inventory

{Requirement II. 059} The NML-EML Interface shall allow the NMS to retrieve all the [Protection Group \(PG\)](#)s available in the [Managed Element \(ME\)](#)s.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| This shall be used by the NMS to manage protected trails between subnetworks. In the case of MSSPRing (BLSR), these protection groups also contain information about the, SPRING\_NODE\_ID which is needed at the time of subnetwork connection creation (i.e. the ingress/egress nodes of a ring).

{Requirement II. 274} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Connection Termination Point \(CTP\)](#)s that support Non-Preemptible Unprotected Traffic (NUT) services associated with a given [Protection Group \(PG\)](#) identified by an NMS specified PG name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 275} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Connection Termination Point \(CTP\)](#)s that support protected services associated with a given [Protection Group \(PG\)](#) identified by an NMS specified PG name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 276} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Connection Termination Point \(CTP\)](#)s that support preemptively and unprotected services associated with a given [Protection Group \(PG\)](#) identified by an NMS specified PG name.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### **4.2.1.1.22 Equipment Protection Inventory**

{Requirement II. 174}      The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Equipment Protection Group \(EPG\)s](#) available in the [Managed Element \(ME\)s](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

#### **4.2.1.1.23 Traffic Descriptor (TD) Inventory**

{Requirement II. 060}      The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Traffic Descriptor \(TD\)s](#) that are being managed by the EMS.

Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 061}      The NML-EML Interface shall allow the NMS to retrieve the names of all the [Traffic Descriptor \(TD\)s](#) that are being managed by the EMS.

Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 062}      The NML-EML Interface shall allow the NMS to retrieve the attributes of a [Traffic Descriptor \(TD\)](#) given an NMS specified TD name.

Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.2.1.1.24 Transmission Descriptor (TMD) Inventory

{Requirement II. 187} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Transmission Descriptor \(TMD\)](#)s that are being managed by the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 188} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Transmission Descriptor \(TMD\)](#)s that are being managed by the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 189} The NML-EML Interface shall allow the NMS to retrieve the attributes of a [Transmission Descriptor \(TMD\)](#) for an NMS specified TMD name.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.1.1.25 Cross-Connect (XC) Inventory

##### 4.2.1.1.25.1 Flexible Cross-Connect (XC)s

A [Cross-Connect \(XC\)](#) shall be considered a flexible XC unless explicitly stated otherwise.

{Requirement II. 063} The NML-EML Interface shall allow the NMS to retrieve the attributes of all of the [Cross-Connect \(XC\)](#)s given an NMS specified [Managed Element \(ME\)](#) name.

Source: Version 2.0.

Mandatory/Optional: Optional.

#### **4.2.1.1.25.2 Fixed Cross-Connect (XC)s**

A fixed [Cross-Connect \(XC\)](#) is an XC that cannot be deleted by the NMS.

- {Requirement II. 183} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the fixed [Cross-Connect \(XC\)](#)s given an NMS specified [Managed Element \(ME\)](#) name.

Source: Version 3.0.

Mandatory/Optional: Optional.

- {Requirement II. 185} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the potentially fixed [Cross-Connect \(XC\)](#)s that are associated with the NMS specified [Termination Point \(TP\)](#) name.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### **4.2.1.1.26 Group Termination Point (GTP) Inventory**

- {Requirement II. 171} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Group Termination Point \(GTP\)](#)s that are being managed by the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

- {Requirement II. 172} The NML-EML Interface shall allow the NMS to retrieve all the names of all the [Group Termination Point \(GTP\)](#)s that are being managed by the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

- {Requirement II. 173} The NML-EML Interface shall allow the NMS to retrieve the attributes of a [Group Termination Point \(GTP\)](#) for an NMS specified GTP name.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

| {Requirement II. 184} The NML-EML Interface shall allow the NMS to retrieve the attributes of a [Group Termination Point \(GTP\)](#) that contains a given NMS specified [Connection Termination Point \(CTP\)](#) name.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

| {Requirement II. 272} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Termination Point Pool \(TP Pool\)](#)s that are associated with the NMS specified [Group Termination Point \(GTP\)](#) name.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.1.1.27 Alarm Severity Assignment Profile (ASAP) Inventory

| {Requirement II. 205} The NML-EML Interface shall allow the NMS to retrieve the attributes of all the [Alarm Severity Assignment Profile \(ASAP\)](#)s that are being managed by the EMS.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

| {Requirement II. 206} The NML-EML Interface shall allow the NMS to retrieve the names of all the [Alarm Severity Assignment Profile \(ASAP\)](#)s that are being managed by the EMS.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 207} The NML-EML Interface shall allow the NMS to retrieve the attributes of a [Alarm Severity Assignment Profile \(ASAP\)](#) for an NMS specified ASAP name.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 208} The NML-EML Interface shall allow the NMS to retrieve all the [Alarm Severity Assignment Profile \(ASAP\)](#)s that are assigned to an NMS specified object.

Only [Termination Point \(TP\)](#)s can refer to more than one ASAP, at most one ASAP per encapsulated layer rate.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 209} The NML-EML Interface shall allow the NMS to retrieve the name of all the objects assigned to an NMS specified [Alarm Severity Assignment Profile \(ASAP\)](#) name.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.1.2 Inventory Notifications

As subnetwork resources are updated, the EMS shall be required to notify its clients (e.g. NMS) about changes in inventory, e.g., link additions/deletions, Network Element (NE)s being added or deleted from a Subnetwork (for physical and logical resources).

**Table 4.4: Objects for which create and delete notification shall be generated**

	Object
1	<a href="#">Alarm Severity Assignment Profile (ASAP)</a>
2	<a href="#">Equipment</a>
3	<a href="#">Equipment Holder</a>
4	<a href="#">Equipment Protection Group (EPG)</a>

**Table 4.4: Objects for which create and delete notification shall be generated**

	<b>Object</b>
5	<a href="#">Floating Termination Point (FTP)</a>
6	<a href="#">Group Termination Point (GTP)</a>
7	<a href="#">Log</a>
8	<a href="#">Managed Element (ME)</a>
9	<a href="#">Performance Monitoring Point (PMP)</a>
10	<a href="#">Physical Termination Point (PTP)</a>
11	<a href="#">Protection Group (PG)</a>
12	<a href="#">Subnetwork</a>
13	<a href="#">Subnetwork Connection (SNC)</a>
14	<a href="#">Threshold Crossing Alert (TCA) Parameter Profile</a>
15	<a href="#">Topological Link (TL)</a>
16	<a href="#">Termination Point Pool (TP Pool)</a>
17	<a href="#">Traffic Descriptor (TD)</a>
18	<a href="#">Transmission Descriptor (TMD)</a>

#### 4.2.1.2.1 Object Creation Notifications

{Requirement II. 064} The NML-EML Interface shall allow the NMS to subscribe to notifications from the EMS related to the creation of the objects specified in [Table 4.4](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.1.2.2 Object Deletion Notifications

{Requirement II. 065} The NML-EML Interface shall allow the NMS to subscribe to notifications from the EMS related to the deletion of the objects specified in [Table 4.4](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.1.2.3 Attribute Value Change Notification

{Requirement II. 066} The NML-EML Interface shall allow the NMS to subscribe to notifications from the EMS related to changes in the values of the attributes of the objects specified in [Table 4.4](#) and the following objects:

- 1) [Connection Termination Point \(CTP\)](#)
- 2) [Element Management System \(EMS\)](#)

An Attribute Value Change Notification shall be emitted for an object where one or more of its' attribute values have changed.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

Attribute Value Change notifications are emitted on a single object, multiple attribute basis.

#### 4.2.1.2.4 State Change Notification

{Requirement II. 067} The NML-EML Interface shall allow the NMS to subscribe to notifications from the EMS related to changes in the values of the state attribute of the following objects:

- 1) [Connection Termination Point \(CTP\)](#)
- 2) [Equipment](#)
- 3) [Equipment Holderr](#)
- 4) [Equipment Protection Group \(EPG\)](#)
- 5) [Floating Termination Point \(FTP\)](#)
- 6) [Log](#)
- 7) [Managed Element \(ME\)](#)
- 8) [Physical Termination Point \(PTP\)](#)
- 9) [Performance Monitoring Point \(PMP\)](#)
- 10) [Protection Group \(PG\)](#)
- 11) [Subnetwork Connection \(SNC\)](#)

All objects with state attributes shall emit a State Change Notification when the value of the state attribute changes.

| Source: Version 2.0.

Mandatory/Optional: Optional.

## 4.2.2 Provisioning

### 4.2.2.1 Managed Element/Subnetwork Administration and Configuration

#### 4.2.2.1.1 Connection Termination Point (CTP) Termination and Mapping

{Requirement II. 068} The NML-EML Interface shall allow the NMS to request that an NMS specified [Connection Termination Point \(CTP\)](#) be terminated and mapped.

This request, if successful, will configure the NMS specified CTP such that it will then be capable of supporting lower rate connections. If the CTP is successfully configured such that it is capable of supporting lower rate connections, then the CTP's mapping mode should indicate as such.

Note that before carrying out the NMS' request, the EMS should confirm that the NMS specified CTP is capable of being terminated and mapped and that it is not involved in an active cross-connection at the CTP's rate. Some examples:

- Termination and mapping of an STS1 CTP such that it will support VT1.5 CTPs.
- Termination and mapping of a T3 CTP such that it will support T1 CTPs.

| Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 069} The NML-EML Interface shall allow the NMS to request that an NMS specified [Connection Termination Point \(CTP\)](#) no longer be terminated and mapped.

This request, if successful, will configure the NMS specified CTP such that it will then be capable of supporting cross-connections at the CTP's rate. If the CTP is successfully configured such that it is capable of supporting cross-connections at the CTP's rate, then the CTP's mapping mode should indicate as such.

Note that before carrying out the NMS' request, the EMS shall confirm that the NMS specified CTP is not supporting an active [Cross-Connect \(XC\)](#) at a client layer rate (e.g., for an NMS specified STS1 CTP, EMS should confirm that no contained VT1.5 CTPs are involved in an active cross-connection).

| Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 071}      The NML-EML Interface shall allow the NMS to retrieve the mapping mode of an NMS specified [Connection Termination Point \(CTP\)](#) name.

|      Source: Version 2.0.

       Mandatory/Optional: Optional.

#### 4.2.2.1.2 Provisioning of Termination Point (TP) Parameters

{Requirement II. 072} The NML-EML Interface shall allow the NMS to provision [Termination Point \(TP\)](#) transmission parameters.

| Refer to supporting document [LayeredParameters.pdf](#) for the currently defined set of supported TP parameters.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

##### 4.2.2.1.2.1 Assignment of Transmission Descriptor (TMD)s

{Requirement II. 194} The NML-EML Interface shall allow the NMS to associate an ingress and/or egress [Transmission Descriptor \(TMD\)](#) with a given [Termination Point \(TP\)](#) identified by an NMS specified TP name.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

###### 4.2.2.1.2.1.1 Transmission Descriptor (TMD) Assignment behavior

{Requirement II. 277} The assignment of a [Transmission Descriptor \(TMD\)](#) to a [Termination Point \(TP\)](#) as egress or ingress TMD by using the TMD's name amounts to an overwriting of the layered transmission parameters of the TP by the layered transmission parameters of the TMD regarding the egress/outgoing or ingress/incoming transmission on the TMD's layers, and to an overwriting of the additional info parameters of the TP by the additional TP info parameters of the TMD.

| Note that these parameters may also be set according to [{Requirement II. 072}](#) and [{Requirement II. 223}](#) without using a TMD. Current parameters of the TP that are not present as parameters of the TMD are left unchanged by the TMD assignment.

| The unassignment of a TMD from a TP (by using the empty TMD name) has no effect on the parameters of the TP, i.e. the layered transmission parameters and additional info parameters of the TP remain unchanged.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.2.1.2.2 Verification of Transmission Descriptor (TMD) Assignment

{Requirement II. 278} The NML-EML Interface shall allow the NMS to validate the ingress and/or egress [Transmission Descriptor \(TMD\)](#) assigned to a [Termination Point \(TP\)](#) given an NMS specified TP name.

The following is provided for clarification:

- The assignment of a [Transmission Descriptor \(TMD\)](#) to a [Termination Point \(TP\)](#) is called consistent, if whenever a TMD transmission parameter is also present as a TP transmission parameter or a TMD additional TP info parameter is also present as a TP additional info parameter, the common parameters of the TMD and TP have the same values.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.2.1.2.3 Assignment of Threshold Crossing Alert (TCA) Parameter Profiles

{Requirement II. 235} The NML-EML Interface shall allow the NMS to associate a [Threshold Crossing Alert \(TCA\) Parameter Profile](#) with a [Termination Point \(TP\)](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.2.1.3 Termination Point (TP) Alarm Reporting

{Requirement II. 108} The NML-EML Interface shall allow the NMS to activate (allow, or turn on) alarm reporting for a particular [Termination Point \(TP\)](#).

The alarm reporting must be turned on at the layer represented by the [Termination Point \(TP\)](#). Refer to [{Requirement II. 072}](#).

Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 109} The NML-EML Interface shall allow the NMS to deactivate (inhibit, or turn off) alarm reporting for a particular [Termination Point \(TP\)](#).

The alarm reporting must be turned off at the layer represented by the [Termination Point \(TP\)](#). Refer to [{Requirement II. 072}](#)

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### **4.2.2.1.4 ATM Virtual Path (VP) and Virtual Connection (VC) Connection Termination Point (CTP) Provisioning**

Section 4.2.2.1.4 is only applicable to ATM technology.

{Requirement II. 073} The NML-EML Interface shall allow the NMS to configure terminated and mapped VP (or VC) [Connection Termination Point \(CTP\)](#)s at the end of a VP (or VC) trail.

A terminated (and available for mapping) VP or VC CTP can be turned to non terminated (nor available for mapping), (and can therefore be deleted on the NE if required), only if not used as a server by other lower level CTPs (e.g., a terminated VP CTP can be deleted only if does not carry any VC CTPs).

| Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 074} The NML-EML Interface shall allow the NMS to configure (assign) the ingress and egress [Traffic Descriptor \(TD\)](#) on a VP or VC CTP that is terminated.

| Source: Version 2.0.

Mandatory/Optional: Optional.

This is used for the management of an explicit VP overlay.

#### **4.2.2.1.5 Subnetwork Connection (SNC) Alarm Reporting**

In order to provide this, the EMS has to correlate TP related information into “arc” related information. Note: How to provide this correlation is behavior of the EMS and is therefore outside the scope of the MTNM interface. The activation / de-activation do not imply anything on the alarm reporting flag of any of the related TPs of the SNC / topological link. The NMS shall be able to retrieve the status of the activation / de-activation.

{Requirement II. 159} The NML-EML Interface shall allow the NMS to activate (allow, or turn on) alarm reporting for a particular [Subnetwork Connection \(SNC\)](#).

| Source: Version 3.0.

Mandatory/Optional: Optional.

- {Requirement II. 160} The NML-EML Interface shall allow the NMS to de-activate (inhibit, or turn off) alarm reporting for a particular [Subnetwork Connection \(SNC\)](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

#### **4.2.2.1.6 Topological Link (TL) Alarm Reporting**

- {Requirement II. 161} The NML-EML Interface shall allow the NMS to activate (allow, or turn on) alarm reporting for a particular [Topological Link \(TL\)](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

- {Requirement II. 162} The NML-EML Interface shall allow the NMS to de-activate (inhibit, or turn off) alarm reporting for a particular [Topological Link \(TL\)](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

#### **4.2.2.1.7 Group Termination Point (GTP) Alarm Reporting**

- {Requirement II. 219} The NML-EML Interface shall allow the NMS to activate (allow, or turn on) alarm reporting for a particular [Group Termination Point \(GTP\)](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

- {Requirement II. 220} The NML-EML Interface shall allow the NMS to de-activate (inhibit, or turn off) alarm reporting for a particular [Group Termination Point \(GTP\)](#).

|  
|      Source: Version 3.0.  
|  
|      Mandatory/Optional: Optional.

#### 4.2.2.2 Common Attribute Management

The NML-EML Interface defines a number of objects which have common attributes (an attribute does not have to be defined from every object in order for it to be considered common). The NML-EML Interface shall allow the NMS to set the value of certain of the common attributes. The follow list identifies the common attributes for which the NMS shall be allowed to set the value.

- [User label](#)<sup>1</sup>
- [Owner](#)
- [Additional information](#)
- [Native EMS name](#)
- Network Access Domain

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|      <sup>1</sup> The [User label](#) is required to be validated for uniqueness by the EMS.

#### 4.2.2.2.1 User Label

{Requirement II. 075} The NML-EML Interface shall allow the NMS to provision the [User label](#) attribute for all objects identified in [Table 4.1](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.2.2.2 Owner

{Requirement II. 076} The NML-EML Interface shall allow the NMS to provision the [Owner](#) attribute for all objects identified in [Table 4.1](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.2.2.3 Additional information

{Requirement II. 223} The NML-EML Interface shall allow the NMS to provision the [Additional information](#) attribute for all objects identified in [Table 4.1](#).

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.2.2.4 Native EMS Name

{Requirement II. 077} The NML-EML Interface shall allow the NMS to provision the [Native EMS name](#) attribute for all objects identified in [Table 4.1](#).

| Refer to supporting document [nativeEMSName.pdf](#) for the rules for native EMS names.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.2.2.5 Network Access Domain (NAD)

**Table 4.5: Objects containing the Network Access Domain attribute**

	Object Name
1	<a href="#">Group Termination Point (GTP)</a>
2	<a href="#">Managed Element (ME)</a>
3	<a href="#">Subnetwork</a>
4	<a href="#">Subnetwork Connection (SNC)</a>
5	<a href="#">Termination Point (TP)<sup>a</sup></a>
6	<a href="#">Topological Link (TL)</a>

a. This includes all types of TP (i.e. PTPs, CTPs and FTPs)

{Requirement II. 193} The NML-EML Interface shall allow the NMS to provision the Network Access Domain (NAD) attribute for the objects identified in [Table 4.5](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

### 4.2.2.3 Group Termination Point (GTP) Management

#### 4.2.2.3.1 Creation of Group Termination Point (GTP)s

{Requirement II. 164} The NML-EML Interface shall allow the NMS to create a [Group Termination Point \(GTP\)](#) in the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

##### 4.2.2.3.1.1 Group Termination Point (GTP) Create Data

{Requirement II. 165} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS create a [Group Termination Point \(GTP\)](#)

1) User label

Refer to [{Requirement I. 060}](#).

2) User label uniqueness

This parameter shall indicate to the EMS to check whether the user label is unique amongst the GTPs within the EMS.

3) Owner

Refer to [{Requirement I. 060}](#).

4) Contained CTPs

This parameter shall represent a list of the names of the Connection Termination Point (CTP) that are to be contained by the GTP.

5) Starting CTP name

In cases where the CTPs are contiguous and of the same layer rate, this parameter shall indicate the first CTP in the group. This parameter is used in lieu of the Contained CTPs parameter.

6) Number of CTPs

This parameter is used in conjunction with the starting CTP name parameter. It shall indicate the number of contiguous CTPs that follow the first CTP in the group. It equals 1 minus the total number of CTPs in the GTP.

7) Additional information.

Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### **4.2.2.3.2 Deletion of Group Termination Point (GTP)s**

{Requirement II. 166}      The NML-EML Interface shall allow the NMS to delete a [Group Termination Point \(GTP\)](#) given the NMS specified GTP name from the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### **4.2.2.3.3 Modification of Group Termination Point (GTP)s**

{Requirement II. 167}      The NML-EML Interface shall allow the NMS to add or remove [Connection Termination Point \(CTP\)s](#) from a [Group Termination Point \(GTP\)](#) given the NMS specified CTP names and the GTP name from the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### **4.2.2.3.4 Termination Point Pool (TP Pool) Management**

##### **4.2.2.3.4.1 Creation of Termination Point Pool (TP Pool)s**

{Requirement II. 264}      The NML-EML Interface shall allow the NMS to create a [Termination Point Pool \(TP Pool\)](#) in the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.2.3.4.2 Termination Point Pool (TP Pool) Create Data

{Requirement II. 265} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS create a [Termination Point Pool \(TP Pool\)](#)

- 1) User label  
Refer to [{Requirement I. 060}](#).
- 2) User label uniqueness  
This parameter shall indicate to the EMS to check whether the user label is unique amongst the TP Pools within the EMS.
- 3) Owner  
Refer to [{Requirement I. 060}](#).
- 4) Containing Subnetwork  
This parameter shall represent the name of [Subnetwork](#) containing the TP Pool.
- 5) Contained members  
This parameter shall represent a list of the names of the [Termination Point \(TP\)](#)s or [Group Termination Point \(GTP\)](#)s, all taken from MEs that belong to the above-specified Subnetwork, that are to be contained by the TP Pool.
- 6) Layered transmission parameters  
This parameter shall represent the common layers and transmission parameters the above-specified Contained TPs, or TPs contained in Contained GTPs, are required to have (e.g., ATM VP layer with prescribed traffic characteristics).
- 7) Description of use  
This attribute shall describe the specific use of the TP pool, in particular how its members are collected and administered.
- 8) Additional information.  
Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.2.2.3.5 Deletion of Termination Point Pool (TP Pool)s

{Requirement II. 266} The NML-EML Interface shall allow the NMS to delete a [Termination Point Pool \(TP Pool\)](#) given the NMS specified TP Pool name from the EMS.

Source: Version 3.0.

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| Mandatory/Optional: Optional.

#### **4.2.2.3.6 Modification of Termination Point Pool (TP Pool)s**

{Requirement II. 267}      The NML-EML interface shall allow the NMS to add or remove [Termination Point \(TP\)](#)s or [Group Termination Point \(GTP\)](#)s to or from a TP Pool given the NMS specified TP or GTP names and the TP Pool name.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### **4.2.2.4 Topological Link Management**

##### **4.2.2.4.1 Creation of Topological Link (TL)s**

{Requirement II. 168}      The NML-EML Interface shall allow the NMS to create a [Topological Link \(TL\)](#) in the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.2.4.1.1 Topological Link (TL) Creation Data

{Requirement II. 169} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS create a [Topological Link \(TL\)](#)

- 1) User label  
Refer to [{Requirement I. 060}](#).
- 2) User label uniqueness  
This parameter shall indicate to the EMS to check whether the user label is unique amongst the TLs within the EMS.
- 3) Owner  
Refer to [{Requirement I. 060}](#).
- 4) Directionality  
This attribute shall represent the directionality of the TL (bidirectional or unidirectional).
- 5) aEnd [Termination Point \(TP\)](#)  
This parameter shall represent the name of the aEnd TP of the TL.
- 6) zEnd [Termination Point \(TP\)](#)  
This parameter shall represent the name of the zEnd TP of the TL.
- 7) Layer Rate  
This parameter shall represent the layer rate of the TL. Refer to [{Requirement I. 022}](#).
- 8) Network Access Domain  
This attribute represents the Network Access Domain (NAD) to which this Subnetwork has been assigned.
- 9) Alarm reporting  
This attribute shall indicate whether alarm reporting for the TL is enabled or disabled.
- 10) Alarm severity assignment profile  
This attribute shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that has been assigned to the TL.
- 11) Additional information.  
Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### **4.2.2.4.2 Deletion of Topological Link (TL)s**

{Requirement II. 170}      The NML-EML Interface shall allow the NMS to delete a [Topological Link \(TL\)](#) given the NMS specified TL name from the EMS.

|                  Source: Version 3.0.

|                  Mandatory/Optional: Optional.

#### **4.2.2.5 Traffic Descriptor (TD) Management**

##### **4.2.2.5.1 Creation of Traffic Descriptor (TD)s**

{Requirement II. 097}      The NML-EML Interface shall allow the NMS to create a [Traffic Descriptor \(TD\)](#) in the EMS.

|                  Source: Version 2.0.

|                  Mandatory/Optional: Optional.

#### 4.2.2.5.1.1 Traffic Descriptor (TD) Creation Data

{Requirement II. 098} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS create a [Traffic Descriptor \(TD\)](#):

- 1) User label  
Refer to [{Requirement I. 060}](#).
- 2) User label uniqueness  
This attribute shall indicate to the EMS that the value of the user label attribute must be unique amongst the TDs within the EMS.
- 3) Owner  
Refer to [{Requirement I. 060}](#).
- 4) Service Category  
Refer to [{Requirement I. 027}](#).
- 5) Conformance Profile.  
Refer to [{Requirement I. 028}](#).
  - Standard traffic descriptor parameters for this Conformance profile.  
Refer to [{Requirement I. 029}](#).
- 6) Traffic Parameters  
This attribute shall represent the parameters (sets of name/value pairs) used in the traffic descriptor. Refer to supporting document [LayeredParameters.pdf](#) for a list of possible traffic parameters.
- 7) Additional information  
Refer to [{Requirement I. 060}](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.2.5.2 Deletion of Traffic Descriptor (TD)s

{Requirement II. 099} The NML-EML Interface shall allow the NMS to delete a [Traffic Descriptor \(TD\)](#) given the NMS specified TD name from the EMS.

The EMS shall refuse/fail this request if any CTPs are associated with this Traffic Descriptor.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.2.6 Transmission Descriptor (TMD) Management

##### 4.2.2.6.1 Creation of Transmission Descriptor TMD)s

{Requirement II. 190} The NML-EML Interface shall allow the NMS to create a [Transmission Descriptor \(TMD\)](#) in the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

###### 4.2.2.6.1.1 Transmission Descriptor (TMD) Creation Data

{Requirement II. 191} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS create a [Transmission Descriptor \(TMD\)](#):

1) User label

Refer to [{Requirement I. 060}](#).

2) User label uniqueness

This attribute shall indicate to the EMS that the value of the user label attribute must be unique amongst the TMDs within the EMS.

3) Owner

Refer to [{Requirement I. 060}](#).

4) Layered transmission parameters

This attribute shall represent a list of transmission parameters which can be set and/or retrieved at a specified layer on a TP having this TMD assigned as egress or ingress TMD. Specific parameters include, for example, frame format, line code, alarm reporting control (enable/disable), TP service state (In Service, Out Of Service etc.).

5) Additional TP information

This attribute shall represent any additional information parameters which can be set on the [Termination Point \(TP\)](#) having this TMD assigned as an egress or ingress TMD.

6) External representation

This attribute shall represent a reference to the external representation of the TMD (e.g., an XML file name). The contents of this information is opaque at the NML-EML Interface and not utilized.

7) .Additional information

Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

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| Mandatory/Optional: Mandatory.

#### 4.2.2.6.2 Deletion of Transmission Descriptor (TMD)s

{Requirement II. 192} The NML-EML Interface shall allow the NMS to delete a [Transmission Descriptor \(TMD\)](#) given the NMS specified TMD name from the EMS.

The EMS shall refuse/fail this request if any [Termination Point \(TP\)](#)s are associated with this TMD.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.2.7 Alarm Severity Assignment Profile (ASAP) Management

##### 4.2.2.7.1 Creation of Alarm Severity Assignment Profile (ASAP)s

{Requirement II. 196} The NML-EML Interface shall allow the NMS to create an [Alarm Severity Assignment Profile \(ASAP\)](#) in the EMS.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

###### 4.2.2.7.1.1 Alarm Severity Assignment Profile (ASAP) Creation Data

{Requirement II. 197} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS create an [Alarm Severity Assignment Profile \(ASAP\)](#):

1) User label

Refer to [{Requirement I. 060}](#).

2) User label uniqueness

This attribute shall indicate to the EMS that the value of the user label attribute must be unique amongst the ASAPs within the EMS.

3) Owner

Refer to [{Requirement I. 060}](#).

4) Alarm severity assignments

This attribute shall represent the set of alarm severity assignments. Refer to [{Requirement I. 082}](#).

5) Additional information

Refer to [{Requirement I. 060}](#).

|  
|      Source: Version 3.0.  
|  
|

Mandatory/Optional: Optional.

#### 4.2.2.7.2 Modification of Alarm Severity Assignment Profile (ASAP)s

{Requirement II. 198} The NML-EML Interface shall allow the NMS to modify an [Alarm Severity Assignment Profile \(ASAP\)](#) in the EMS.

The EMS shall refuse/fail this request if the ASAP is fixed, i.e. it can neither be modified or deleted by the NMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

##### 4.2.2.7.2.1 Alarm Severity Assignment Profile (ASAP) Modification Data

{Requirement II. 199} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS modify an [Alarm Severity Assignment Profile \(ASAP\)](#):

1) ASAP name

This parameter shall represent the name of the ASAP that is to be modified.

2) User label

Refer to [{Requirement I. 060}](#).

3) User label uniqueness

This attribute shall indicate to the EMS that the value of the user label attribute must be unique amongst the ASAPS within the EMS.

4) Owner

Refer to [{Requirement I. 060}](#).

5) Alarm severity assignments

This attribute shall represent the new set of alarm severity assignments that are to be applied to the ASAP. Refer to [{Requirement I. 082}](#).

6) Additional information

Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.2.7.3 Deletion of Alarm Severity Assignment Profile (ASAP)s

{Requirement II. 200} The NML-EML Interface shall allow the NMS to delete an [Alarm Severity Assignment Profile \(ASAP\)](#) given the NMS specified ASAP name from the EMS.

The EMS shall refuse/fail this request if at least one object is pointing to this ASAP instance, or the ASAP cannot be deleted, i.e. neither can be modified nor deleted by NMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.2.7.4 Assignment of Alarm Severity Assignment Profile (ASAP)s

{Requirement II. 201} The NML-EML Interface shall allow the NMS to assign an [Alarm Severity Assignment Profile \(ASAP\)](#) to any of the objects identified in [Table 4.6](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

##### 4.2.2.7.4.1 Alarm Severity Assignment Profile (ASAP) Assignment Data

{Requirement II. 202} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS assign an [Alarm Severity Assignment Profile \(ASAP\)](#) to an object:

1) ASAP name

This parameter shall represent the name of the ASAP that is to be assigned.

2) Object name

This parameter shall represent the name of the object to which the ASAP is to be assigned. Refer to [Table 4.6](#) for a list of the objects.

3) Layer rate

This parameter shall represent the layer rate to which the ASAP is applicable. This shall be need when the addressed object is a [Termination Point \(TP\)](#).

4) .Additional information

Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

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| Mandatory/Optional: Mandatory.

#### 4.2.2.7.5 De-assignment of Alarm Severity Assignment Profile (ASAP)s

{Requirement II. 203} The NML-EML Interface shall allow the NMS to de-assign an [Alarm Severity Assignment Profile \(ASAP\)](#) to any of the objects identified in [Table 4.6](#).

The EMS shall refuse/fail this request if the ASAP is assigned in a fixed way to the object.

Source: Version 3.0.

Mandatory/Optional: Optional.

##### 4.2.2.7.5.1 Alarm Severity Assignment Profile (ASAP) De-assignment Data

{Requirement II. 204} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS de-assign an [Alarm Severity Assignment Profile \(ASAP\)](#) to an object:

1) Object name

This parameter shall represent the name of the object to which the ASAP is to be de-assigned. Refer to [Table 4.6](#) for a list of the objects.

2) Layer rate

This parameter shall represent the layer rate to which the ASAP is applicable. This shall be need when the addressed object is a [Termination Point \(TP\)](#).

3) Additional information

Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.2.2.8 Threshold Crossing Alert (TCA) Parameter Profile Management

##### 4.2.2.8.1 Creation of Threshold Crossing Alert (TCA) Parameter Profiles

{Requirement II. 236} The NML-EML Interface shall allow the NMS to create an [Threshold Crossing Alert \(TCA\) Parameter Profile](#) in the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.2.8.1.1 Threshold Crossing Alert (TCA) Parameter Profile Creation Data

{Requirement II. 237} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS create an [Threshold Crossing Alert \(TCA\) Parameter Profile](#):

1) ME name

This parameter shall represent the name of the [Managed Element \(ME\)](#) in which the profile is to be created.

2) User label

Refer to [{Requirement I. 060}](#).

3) User label uniqueness.

This parameter shall indicate to the EMS that the value of the user label attribute must be unique amongst the TCA Parameter Profiles within the EMS.

4) Owner

Refer to [{Requirement I. 060}](#).

5) Layer rate

This parameter shall represent the layer to which the TCA parameter threshold values apply. (Refer to [{Requirement I. 022}](#)).

6) TCA Parameter assignments

This parameter shall represent the set of TCA parameter assignments. Refer to [{Requirement I. 035}](#).

7) Additional information

Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.2.8.2 Modification of Threshold Crossing Alert (TCA) Parameter Profiles

{Requirement II. 238} The NML-EML Interface shall allow the NMS to modify an [Threshold Crossing Alert \(TCA\) Parameter Profile](#) in the EMS.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.2.8.2.1 Threshold Crossing Alert TCA) Parameter Profile Modification Data

{Requirement II. 239} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS modify an [Threshold Crossing Alert \(TCA\) Parameter Profile](#):

- 1) TCA Parameter Profile name

This parameter shall represent the name of the TCA Parameter Profile that is to be modified.

- 2) TCA Parameter assignments

This parameter shall represent the set of TCA parameter assignments. Refer to [{Requirement I. 035}](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.2.8.3 Deletion of Threshold Crossing Alert (TCA) Parameter Profiles

{Requirement II. 240} The NML-EML Interface shall allow the NMS to delete an [Threshold Crossing Alert \(TCA\) Parameter Profile](#) given the NMS specified TCA Parameter Profile name from the EMS.

The EMS shall refuse/fail this request if at least one object is pointing to this TCA Parameter Profile instance.

Source: Version 3.0.

Mandatory/Optional: Optional.

### 4.2.3 Connection Management (Simple and Point-to-Multi-Point Connections)

#### 4.2.3.1 Subnetwork Connection (SNC) Management

##### 4.2.3.1.1 Static Route Selection

{Requirement II. 080} The NML-EML Interface shall allow the NMS to create a [Subnetwork Connection \(SNC\)](#) with a particular route. Refer to [{Requirement I. 018}](#)

Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.2.3.1.2 Subnetwork Connection (SNC) Establishment, Modification and Release

##### 4.2.3.1.2.1 Creation of Subnetwork Connection (SNC)s

{Requirement II. 082}

The NML-EML Interface shall allow the NMS to create a planned [Subnetwork Connection \(SNC\)](#) in an EMS given the NMS specified data listed in [{Requirement II. 084}](#).

NMS specified SNC data IAs a result of the (successful) completion of this request, the EMS shall create an object representing the SNC, but shall not attempt to establish (on NES) any of the cross-connections associated with the SNC. The successfully created SNC will be in pending state.

| Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 083}

The NML-EML Interface shall allow the NMS to create point to multi-point configurations.

Each leg of a point to multi-point configuration shall be represented by its own [Subnetwork Connection \(SNC\)](#) which allows for individual management of each leg. (e.g. add or remove). All SNCs of a point to multi-point configuration share the same aEnd [Termination Point \(TP\)](#).

| Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 153}

The NML-EML Interface shall allow the NMS to create a [Subnetwork Connection \(SNC\)](#) without specifying the ending [Termination Point \(TP\)](#) instances, but only the ending [Managed Element \(ME\)](#) instances or containing TP instances.

The end TP instances will be chosen by the EMS, at SNC creation time. These ME or TP instances are therefore identified by the name value “EMS\_assigned”.

| Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.3.1.2.1.1 Subnetwork Connection (SNC) Creation Data

{Requirement II. 084} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS create a [Subnetwork Connection \(SNC\)](#):

- 1) User label

Refer to [{Requirement I. 060}](#).

- 2) User label uniqueness

This parameter shall indicate to the EMS that the value of the user label attribute must be unique amongst the SNCs within the EMS.

- 3) Owner

Refer to [{Requirement I. 060}](#).

- 4) Directionality

This parameter shall represent the directionality of the SNC (bidirectional or unidirectional). The EMS shall set the directionality to unidirectional if either an ingress or egress Traffic Descriptor is zero for an ATM Subnetwork Connection.

- 5) Static protection level

This parameter shall indicate the degree of internal resilience/protection of the SNC e.g., to indicate whether the Subnetwork Connection should be Protected, Preemptible, or Unprotected. The EMS will be required to create a SNC with the specified protection level. Refer to the supporting document [SNCTypes.pdf](#) for details on the static protection level parameter.

- 6) Protection effort

This parameter shall indicate whether the resilience requested must be achieved or not. Refer to the supporting document [SNCTypes.pdf](#) for details on the protection effort parameter.

- 7) SNC Type

Refer to [{Requirement I. 040}](#).

- 8) Layer Rate

Refer to [{Requirement I. 022}](#).

- 9) Routing constraint data

Refer to [{Requirement I. 018}](#).

- 10) Complete route

This parameter shall indicate whether the routing constraint data attribute specifies a complete route.

- 11) Network routed

This parameter shall indicates whether the route shall be computed by the network, by the EMS or either.

## 12) Reroute allowed

This parameter shall indicate if the SNC may be rerouted.

## 13) Network reroute

This parameter shall indicate if the reroute (if allowed) shall be computed by the network, by the EMS, or by either.

## 14) Revertive

This parameter shall indicate whether the SNC shall always attempt to return to its intended Route.

## 15) Priority

This parameter shall represent the priority of the SNC (i.e. highest (0) to lowest).

## 16) Exclusive intended route

This parameter shall indicate if the intended route that is provided as part of this creation data is an exclusive route.

## 17) aEnd TP(s)

This parameter represents a list of the names of the aEnd [Termination Point \(TP\)](#) (s) that shall be the aEnd points of the SNC. The names may be either specific or generic. The TPs may of the following type:

- [Connection Termination Point \(CTP\)](#)
- [Group Termination Point \(GTP\)](#)
- [Floating Termination Point \(FTP\)](#)

## 18) zEnd TP(s)

This parameter represents a list of the names of the zEnd [Termination Point \(TP\)](#) (s) that shall be the zEnd points of the SNC. The names may be either specific or generic. The TPs may of the following type:

- [Connection Termination Point \(CTP\)](#)
- [Group Termination Point \(GTP\)](#)
- [Floating Termination Point \(FTP\)](#)

## 19) Additional information

Refer to [{Requirement I. 060}](#).

## 20) Bundled SNC

This parameter shall indicate if the SNC to be created is a bundled SNC

## 21) GTP deletion

The parameter shall only be used when creating bundled SNCs. It shall indicate that the EMS has to delete all the interior GTPs supporting the bundled SNC when the SNC is deleted.

22) Alarm reporting

This parameter shall indicate whether alarm reporting for the SNC is to be enabled or disabled.

23) Alarm severity assignment profile

This attribute shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that is to be assigned to the SNC.

24) aEnd point role

This attribute shall represent the role of the aEnd [Termination Point \(TP\)](#)s of the SNC. Refer to [{Requirement I. 092}](#).

25) zEnd point role

This attribute shall represent the role of the zEnd [Termination Point \(TP\)](#)s of the SNC. Refer to [{Requirement I. 092}](#).

26) Network Access Domain

This attribute represents the Network Access Domain (NAD) to which this Subnetwork has been assigned.

27) Grade of impact

This parameter shall indicate the degree to which the creation of the SNC may impact the Subnetwork. Refer to the supporting document [SNCTypes.pdf](#) for details on the grade of impact parameter.

28) EMS freedom level

This parameter shall indicate the level of freedom given to the EMS in determining the effect on the Subnetwork when performing SNC operations.

Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.2.3.1.2.2 Validation of Subnetwork Connection (SNC)s

- {Requirement II. 085} The NML-EML Interface shall allow an NMS to check if a valid [Subnetwork Connection \(SNC\)](#) can be created given the NMS specified SNC creation data specified in [{Requirement II. 084}](#).

The NMS may also request the EMS to consider the SNC resources to determine whether activation of the SNC, if applied, will succeed. The validity check will take into consideration the subnetwork's equipment capabilities and the current resource states.

This is a best effort guarantee as the resources may not be available when the NMS tries to actually activate the SNC.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.3.1.2.3 Activation of Subnetwork Connection (SNC)s

- {Requirement II. 086} The NML-EML Interface shall allow the NMS to request that an EMS activate an NMS specified [Subnetwork Connection \(SNC\)](#) given the NMS specified SNC data listed in [{Requirement II. 087}](#).

As a result of the (successful) completion of this request, the EMS will have issued the required commands such that all [Cross-Connect \(XC\)](#)s associated with (comprising) the SNC are in place (i.e., are provisioned on NE(s)). The state of the successfully activated SNC will transition to active.

If the NMS specified SNC has more than one route, this operation unlocks all the routes, delegating the EMS and/or the network (e.g. restoration process) the actual activation of the appropriate route.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.3.1.2.3.1 Subnetwork Connection (SNC) Activation Data

{Requirement II. 087} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS activate a [Subnetwork Connection \(SNC\)](#).

1) SNC name

This parameter shall indicate the name of the previously created SNC that is to be activated.

2) Grade of impact

This parameter shall indicate the degree to which the activation of the SNC may impact the Subnetwork. Refer to the supporting document [SNCTypes.pdf](#) for details on the grade of impact parameter.

3) EMS freedom level

This parameter shall indicate the level of freedom given to the EMS in determining the effect on the Subnetwork when performing SNC operations.

4) [Termination Point \(TP\)s to modify](#)

This parameter shall identify a list of TPs that are to be modified as part of the activation request. Each item in the list shall contain the following:

- TP name (generic TP names are not allowed)
- Transmission parameters
- Ingress traffic descriptor name
- Egress traffic descriptor name
- Mapping mode

Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.2.3.1.2.4 Creation and Activation of Subnetwork Connection (SNC)s

{Requirement II. 088} The NML-EML Interface shall allow the NMS to request that a [Subnetwork Connection \(SNC\)](#) be both created and activated (as a result of a single request from the NMS) given the NMS specified SNC data listed in [{Requirement II. 084}](#).

As a result of (successful) completion of this request, the EMS shall create an object representing the SNC and shall have issued required commands such that all cross-connections associated with (comprising) the SNC are in place (i.e., are provisioned on NE(s)). The state of the successfully created and activated SNC will transition to active.

If the NMS specified SNC has more than one route, this operation unlocks all the routes, delegating the EMS and/or the network (e.g. restoration process) the actual activation of the appropriate route.

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.2.3.1.2.4.1 Subnetwork Connection (SNC) Creation and Activation Data

{Requirement II. 089} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS create and activate a [Subnetwork Connection \(SNC\)](#):

- 1) The parameters required to create an SNC (Refer to [{Requirement II. 084}](#)).
- 2) [Termination Point \(TP\)s](#) to modify

This parameter shall identify a list of TPs that are to be modified as part of the activation request. Each item in the list shall contain the following:

- TP name (generic TP names are not allowed)
- Transmission parameters
- Ingress transmission descriptor name
- Egress transmission descriptor name
- Mapping mode

Source: Version 2.0.

Mandatory/Optional: Mandatory.

#### 4.2.3.1.2.5 Addition of a Route to a Subnetwork Connection (SNC)

{Requirement II. 241} The NML-EML interface shall allow the NMS to add a protection route to an NMS specified [Subnetwork Connection \(SNC\)](#) in an EMS given the NMS specified SNC data listed in [{Requirement II. 242}](#).

As a result of (successful) completion of this request, the EMS shall add the new route to the SNC, but shall not attempt to establish (on NEs) any cross connections as side effect of this operation, because the route is created in locked state.

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.3.1.2.5.1 Subnetwork Connection (SNC) Route Addition Data

{Requirement II. 242} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS add a route to a [Subnetwork Connection \(SNC\)](#).

1) SNC name

This parameter shall represent the name of the SNC to which the [Route](#) is to be assigned that is to be activated.

2) Grade of impact

This parameter shall indicate the degree to which the activation of the added route may impact the Subnetwork. (Refer to the supporting document [SNCTypes.pdf](#) for details on the grade of impact parameter.

3) EMS freedom level

This parameter shall indicate the level of freedom given to the EMS in determining the effect on the Subnetwork when performing SNC operations.

4) Intended

This parameter shall indicate if this route is the new intended route for the SNC, as opposed to a back-up route.

5) Exclusive

This parameter shall indicate if this route is an exclusive route for this SNC. An exclusive route is a route that no other SNCs can share any of its XCs or CTPs.

6) Routing constraint data

Refer to [{Requirement I. 018}](#).

7) Complete route

This parameter shall indicate whether the routing constraint data attribute specifies a complete route.

8) Additional information

Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.2.3.1.2.6 Removal of a Route from a Subnetwork Connection (SNC)

{Requirement II. 243} The NML-EML Interface shall allow the NMS to remove a protection route from an NMS specified [Subnetwork Connection \(SNC\)](#) given the NMS specified SNC data listed in [{Requirement II. 244}](#).

As a result of (successful) completion of this request, the EMS shall delete the protection route of specified SNC. The specified route must not be in the unlocked state, and must not be the intended route. Of course it is possible to delete a locked backup route which is “in use” by other SNC route, because this operation has no side effect on routes of any other SNCs, even if sharing [Cross-Connect \(XC\)s/Connection Termination Point \(CTP\)s](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

##### 4.2.3.1.2.6.1 Subnetwork Connection (SNC) Route Removal Data

{Requirement II. 244} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS remove a route from a [Subnetwork Connection \(SNC\)](#).

1) SNC name

This parameter shall represent the name of the SNC from which the [Route](#) is to be removed.

2) Route identifier

This parameter shall represent the identifier of the route that is to be removed.

3) EMS freedom level

This parameter shall indicate the level of freedom given to the EMS in determining the effect on the Subnetwork when performing SNC operations.

4) Additional information

Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### **4.2.3.1.2.7 Creation-Modification of a Subnetwork Connection (SNC)**

{Requirement II. 245} The NML-EML Interface shall allow the NMS to modify (a route of) an NMS specified [Subnetwork Connection \(SNC\)](#) in the EMS given the NMS specified SNC data listed in [{Requirement II. 246}](#).

As a result of (successful) completion of this request, the EMS shall update the route description, but shall not attempt to establish (in the network) any of the [Cross-Connect \(XC\)](#)s associated with the modified route. The state of the successfully modified route will be locked.

If the EMS can preserve the name of the NMS specified SNC then the route is modified. If the EMS cannot preserve the name of the NMS specified SNC then the EMS shall create a new pending SNC from an existing pending or active SNC.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.3.1.2.7.1 Subnetwork Connection (SNC) Modification Data

{Requirement II. 246} The NML-EML Interface shall allow the NMS to specify in addition to the creation parameters specified in [{Requirement II. 084}](#), the following parameters when it requests that an EMS modify a [Subnetwork Connection \(SNC\)](#):

- 1) SNC name  
This parameter shall represent the name of the SNC to be modified.
- 2) Route identifier  
This parameter shall represent the identifier of the route that is to be modified. If not specified, the intended [Route](#) shall be used
- 3) Modification type  
This parameter shall indicate the type of the modification to be performed (i.e. rerouting or add/remove protection)
- 4) Retain SNC  
This parameter shall indicate if when modifying an SNC whether the original SNC shall be deleted or put into the pending state.
- 5) Modify server layers  
This parameter shall indicate whether the EMS is allowed to modify the server layers to fulfil the protection constraints identified by this request.
- 6) Added or new route  
This parameter shall represent (depending on the modification type), the route of a new protection leg or the whole SNC. When it describes a segment to be added, either the SNCP cross-connects or the switch TPs that will be changed in the segment may be specified by the NMS. The EMS then chooses the missing segments. Alternatively, the NMS may specify the full route.
- 7) Removed route  
This parameter shall represent the protection leg that is to be removed from the SNC. Either the last cross-connects (that contain the SNCP) are specified by the NMS or the full route may be specified. This parameter can be used in conjunction with Added Or New Route only to reroute a segment
- 8) [Termination Point \(TP\)](#)s to modify  
This parameter shall identify a list of TPs that are to be modified as part of the modification request. Each item in the list shall contain the following:
  - TP name (generic TP names are not allowed)
  - Transmission parameters
  - Ingress transmission descriptor name
  - Egress transmission descriptor name
  - Mapping mode

|  
| Source: Version 3.0.  
|  
| Mandatory/Optional: Mandatory.

#### **4.2.3.1.2.8 Modification of a Subnetwork Connection (SNC)**

{Requirement II. 257} The NML-EML Interface shall allow the NMS to modify an NMS specified [Subnetwork Connection \(SNC\)](#) in the EMS given the NMS specified SNC data listed in [{Requirement II. 246}](#).

As a result of (successful) completion of this request, the EMS shall modify and activate the SNC.

The end result of this operation is equivalent to an NMS using the create-modify operation followed by the swap operation.

|  
| Source: Version 3.0.  
|  
| Mandatory/Optional: Optional.

#### 4.2.3.1.2.9 Swap a Subnetwork Connection (SNC)

{Requirement II. 258} The NML-EML Interface shall allow the NMS to activate a pending [Subnetwork Connection \(SNC\)](#) and deactivate an active SNC in a single atomic operation given the NMS specified SNC data listed in [{Requirement II. 259}](#).

Source: Version 3.0.

Mandatory/Optional: Optional.

##### 4.2.3.1.2.9.1 Subnetwork Connection (SNC) Swap Data

{Requirement II. 259} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS swap two [Subnetwork Connection \(SNC\)](#)s.

1) SNC name to be deactivated

This parameter shall indicate the name of the active SNC that is to be deactivated.

2) SNC name to be activated

This parameter shall indicate the name of the previously created SNC that is to be activated.

3) Grade of impact

This parameter shall indicate the degree to which the activation of the SNC may impact the Subnetwork. Refer to the supporting document [SNCTypes.pdf](#) for details on the grade of impact parameter.

4) EMS freedom level

This parameter shall indicate the level of freedom given to the EMS in determining the effect on the Subnetwork when performing this operation.

5) TPs to modify

This parameter shall identify a list of [Termination Point \(TP\)](#)s that are to be modified as part of the swap request. Each item in the list shall contain the following:

- TP name (generic TP names are not allowed)
- Transmission parameters
- Ingress traffic descriptor name
- Egress traffic descriptor name
- Mapping mode

Source: Version 3.0.

Mandatory/Optional: Optional.

#### **4.2.3.1.2.10 Switch the Route of a Subnetwork Connection (SNC)**

{Requirement II. 247}      The NML-EML Interface shall allow the NMS to switch a route of a NMS specified [Subnetwork Connection \(SNC\)](#) given the NMS specified SNC data listed in [{Requirement II. 248}](#).

As a result of (successful) completion of this request, the EMS shall activate in the network the input route, and deactivate the currently active route, plus all the partial routes, if any. The operation is refused if performed on a pending SNC, or on a locked route. The operation does not affect the administrative state of any route. The restoration process is still allowed to re-route again, e.g. in case of failures.

|      Source: Version 3.0.

|      Mandatory/Optional: Optional.

#### 4.2.3.1.2.10.1 Subnetwork Connection (SNC) Route Switch Data

{Requirement II. 248} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS switched the route of a [Subnetwork Connection \(SNC\)](#).

1) SNC name

This parameter shall represent the name of the SNC for which the [Route](#) is to be switched.

2) Route identifier

This parameter shall represent the identifier of the route that is to be switched.

3) Grade of impact

This parameter shall indicate the degree to which the route switch of the SNC may impact the Subnetwork. Refer to the supporting document [SNCTypes.pdf](#) for details on the grade of impact parameter.

4) EMS freedom level

This parameter shall indicate the level of freedom given to the EMS in determining the effect on the Subnetwork when performing SNC operations.

5) [Termination Point \(TP\)](#)s to modify

This parameter shall identify a list of TPs that are to be modified as part of the switch route request. Each item in the list shall contain the following:

- TP name (generic TP names are not allowed)
- Transmission parameters
- Ingress transmission descriptor name
- Egress transmission descriptor name
- Mapping mode

6) Additional information

Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.2.3.1.2.11 Set the Administrative state of a Subnetwork Connection (SNC) Route

{Requirement II. 249} The NML-EML Interface shall allow the NMS to set the administrative state of one or more of the routes of an NMS specified [Subnetwork Connection \(SNC\)](#) given the NMS specified SNC data listed in [{Requirement II. 250}](#).

As a result of (successful) completion of this request, the EMS shall update the administrative state of addressed routes. The unlocked routes of an SNC are the set of resources the restoration process is allowed to work with.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 250} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS set the administrative state of one or more of the routes of a [Subnetwork Connection \(SNC\)](#).

1) SNC name

This parameter shall represent the name of the SNC for which the [Route](#) is to be switched.

2) Route identifiers

This parameter shall represent a list of the identifiers of the routes that are to have their administrative state set.

3) Administrative state values

This attribute shall represent a list of the values for the administrative states of the routes specified.

4) Additional information

Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### **4.2.3.1.2.12 Set the intended Route of a Subnetwork Connection (SNC)**

{Requirement II. 251} The NML-EML Interface shall allow the NMS to set a route as the intended one of an NMS specified [Subnetwork Connection \(SNC\)](#) given the NMS specified SNC data listed in [{Requirement II. 248}](#).

As a result of (successful) completion of this request, the addressed route is the intended one, and the formerly intended route is a backup one

Source: Version 3.0.

Mandatory/Optional: Optional.

##### **4.2.3.1.2.12.1 Subnetwork Connection (SNC) set intended Route Data**

{Requirement II. 252} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS set the administrative state of one or more of the routes of a [Subnetwork Connection \(SNC\)](#).

1) SNC name

This parameter shall represent the name of the SNC for which the [Route](#) is to be switched.

2) Route identifier

This parameter shall represent the identifier of the route that is to be set to the intended route of the SNC.

3) Additional information

Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### **4.2.3.1.2.13 Deactivation of Subnetworks Connections**

{Requirement II. 090} The NML-EML Interface shall allow the NMS to request that an EMS deactivate an NMS specified [Subnetwork Connection \(SNC\)](#). Refer to [{Requirement II. 091}](#) for the data provide as part of the deactivation request.

As a result of (successful) completion of this request, the EMS will have issued required commands such that all cross-connections associated with (comprising) the Subnetwork Connection have been removed (i.e., are no longer provisioned on NE(s)), but the EMS shall preserve the object representing the Subnetwork Connection. The successfully deactivation of the specified SNC will transition to pending.

If the NMS specified SNC has more then one route, this operation locks all the routes, which means that EMS and/or the network (e.g. restoration process) have no more control over these routes. All the currently active [Cross-Connect \(XC\)](#)s for this SNC shall be removed, of any (active or partial) route.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.3.1.2.13.1 Subnetwork Connection (SNC) Deactivation Data

{Requirement II. 091} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS de-activate a [Subnetwork Connection \(SNC\)](#):

1) SNC name

This attribute shall indicate the name of the previously created SNC that is to be activated.

2) Grade of impact

This attribute shall indicate the degree to which the activation of the SNC may impact the Subnetwork. Refer to the supporting document [SNCTypes.pdf](#) for details on the grade of impact parameter.

3) EMS freedom level

This attribute shall indicate the level of freedom given to the EMS in determining the effect on the Subnetwork when performing SNC operations.

4) [Termination Point \(TP\)](#)s to modify

This attribute shall identify a list of TPs that are to be modified as part of the activation request. Each item in the list shall contain the following:

- TP name (generic TP names are not allowed)
- Transmission parameters
- Ingress transmission descriptor name
- Egress transmission descriptor name
- Mapping mode

Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.2.3.1.2.14 Deletion of Subnetwork Connection (SNC)s

{Requirement II. 092} The NML-EML Interface shall allow the NMS to request that an EMS delete an NMS specified [Subnetwork Connection \(SNC\)](#). Refer to [{Requirement II. 093}](#) for the data provide as part of the delete request.

As a result of the (successful) completion of this request, the EMS shall delete the object representing the SNC. The EMS shall refuse/fail this request if any of the cross-connections associated with (comprising) the SNC were in place (i.e., are provisioned on NE(s)) at the time of the request (i.e., the SNC must be successfully deactivated before the EMS will allow the SNC to be deleted).

If the SNC has more than one route, then the operation deletes the SNC, its intended and all back-up route(s).

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### **4.2.3.1.2.14.1 Subnetwork Connection (SNC) Deletion Data**

{Requirement II. 093} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS delete a [Subnetwork Connection \(SNC\)](#):

- 1) SNC name

This attribute shall indicate the name of the previously created SNC that is to be activated.

- 2) EMS freedom level

This attribute shall indicate the level of freedom given to the EMS in determining the effect on the Subnetwork when performing SNC operations.

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### **4.2.3.1.2.15 Deactivate and Delete Subnetwork Connection (SNC)s and Point to MultiPoint Connections**

{Requirement II. 094} The NML-EML Interface shall allow the NMS to request that an EMS both deactivate and delete (as a result of a single request) an NMS specified Subnetwork Connection (SNC). Refer to [{Requirement II. 095}](#) for the data provided as part of the deactivate and delete request.

As a result of (successful) completion of this request, the EMS will have issued required commands such that all cross-connections associated with (comprising) the Subnetwork Connection have been removed (i.e., are no longer provisioned on NE(s)), and the EMS shall delete the object representing the Subnetwork Connection.

If the NMS specified SNC has more than one route, this operation locks all the routes, which means that EMS and/or the network (e.g. restoration process) have no more control over these routes. All the currently active Cross-Connect (XC)s for this SNC shall be removed, of any (active or partial) route. Then the operation deletes the SNC, its intended and all back-up route(s).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.3.1.2.15.1 Subnetwork Connection (SNC) Deactivation and Deletion Data

{Requirement II. 095} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS de-activate and delete a [Subnetwork Connection \(SNC\)](#):

1) SNC name

This attribute shall indicate the name of the previously created SNC that is to be activated.

2) Grade of impact

This attribute shall indicate the degree to which the activation of the SNC may impact the Subnetwork. Refer to the supporting document [SNCTypes.pdf](#) for details on the grade of impact parameter.

3) EMS freedom level

This attribute shall indicate the level of freedom given to the EMS in determining the effect on the Subnetwork when performing SNC operations.

4) [Termination Point \(TP\)](#)s to modify

This attribute shall identify a list of TPs that are to be modified as part of the activation request. Each item in the list shall contain the following:

- TP name (generic TP names are not allowed)
- Transmission parameters
- Ingress transmission descriptor name
- Egress transmission descriptor name
- Mapping mode

Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 096} The NML-EML Interface shall allow an NMS to de-activate and delete the leg of a point to multipoint configuration.

Each leg of a point to multipoint configuration shall be a separate [Subnetwork Connection \(SNC\)](#).

Source: Version 2.0.

Mandatory/Optional: Optional.

#### **4.2.3.1.3 Subnetwork Connection (SNC) Management Mode**

{Requirement II. 100}      The NML-EML Interface shall allow the NMS to retrieve the subnetwork connection management mode of operation.

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

### **4.2.4 Fault Management**

#### **4.2.4.1 Alarm Surveillance**

##### **4.2.4.1.1 Alarm Administration**

###### **4.2.4.1.1.1 Alarm Subscription**

The NML-EML Interface shall support the reporting of alarm conditions and clear conditions.

|      {Requirement II. 101}      The NML-EML Interface shall allow the NMS to subscribe to non-EMS system related alarms from the EMS, (e.g. [Managed Element \(ME\)](#), [Subnetwork](#), [Subnetwork Connection \(SNC\)](#), [Equipment](#) and Environmental alarms, etc.).

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

|      {Requirement II. 102}      The NML-EML Interface shall allow the NMS to subscribe to EMS system related alarms from the EMS.

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

|      {Requirement II. 105}      The NML-EML Interface shall allow of one or more NMSs to subscribe to EMS alarms.

|      Source: Version 2.0.

Mandatory/Optional: Optional.

- | {Requirement II. 106} The NML-EML Interface shall allow the NMS to un-subscribe from a successful previous subscription for alarms.

| Source: Version 2.0.

Mandatory/Optional: Optional.

- | {Requirement II. 107} The NML-EML Interface shall allow the NMS to un-subscribe based on one or more filtering criteria from a successful previous subscription for alarms.

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### **4.2.4.1.1.2 Alarm Filtering**

- | {Requirement II. 103} The NML-EML Interface shall allow the NMS to specify zero or more alarm filters to be applied by the EMS as part of the NMS' alarm subscription request/update.

| Source: Version 2.0.

Mandatory/Optional: Optional.

- | {Requirement II. 104} The NML-EML Interface shall allow the NMS to specify whether an alarm that matches a filter criterion be forwarded to the NMS by the EMS (subscription mechanism) or whether an alarm/event that matches filter criterion be excluded from being forwarded up to the NMS by the EMS (filtering mechanism).

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### **4.2.4.1.1.3 Alarm Loss**

{Requirement II. 177} The NML-EML Interface shall allow the EMS to inform the NMS about the status of event forwarding and whether lifecycle events and/or alarms have been discarded.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 178} The NML-EML Interface shall allow the EMS to inform the NMS about the availability of the event channel.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### **4.2.4.1.2 Alarm Summary**

{Requirement II. 110} The NML-EML Interface shall allow the NMS to retrieve active Network Element (NE) alarms from the EMS for a given NMS specified NE name and filter criteria (filtering may be performed using the probable cause and/or severity).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 111} The NML-EML Interface shall allow the NMS to retrieve all active EMS related alarms from the EMS for a given NMS specified filter criteria (filtering may be performed using the probable cause and/or severity).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 270} The NML-EML Interface shall allow the NMS to retrieve all active EMS related alarms and NE related alarms from the EMS for a given NMS specified filter criteria (filtering may be performed using the probable cause and/or severity).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| {Requirement II. 287} The NML-EML Interface shall allow the NMS to retrieve unacknowledged active Network Element (NE) alarms from the EMS for a given NMS specified NE name and filter criteria (filtering may be performed using the probable cause and/or severity).

| Source: Version 3.0.

| Mandatory/Optional: Optional.

| {Requirement II. 154} The NML-EML Interface shall allow the NMS to retrieve all unacknowledged active EMS related alarms and NE related alarms from the EMS for a given NMS specified filter criteria (filtering may be performed using the probable cause and/or severity).

| Source: Version 3.0.

| Mandatory/Optional: Optional.

| {Requirement II. 288} The NML-EML Interface shall allow the NMS to retrieve all unacknowledged active EMS related alarms from the EMS for a given NMS specified filter criteria (filtering may be performed using the probable cause and/or severity).

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### **4.2.4.1.3 Alarm Acknowledgement**

{Requirement II. 155} The NML-EML Interface shall allow the NMS to acknowledge an alarm.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 156} The NML-EML Interface shall allow the NMS to un-acknowledge an alarm.

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 157} The NML-EML Interface shall allow the NMS to subscribe to notifications from the EMS to indicate that an alarm has been acknowledged. (i.e. the EMS, the same NMS, or another NMS).

Source: Version 3.0.

Mandatory/Optional: Optional.

{Requirement II. 158} The NML-EML Interface shall allow the NMS to subscribe to notifications from the EMS to indicate that an alarm has been un-acknowledged. (i.e. the EMS, the same NMS, or another NMS).

Source: Version 3.0.

Mandatory/Optional: Optional.

#### 4.2.4.1.4 Alarm Severity Assignment

To control the severities of alarms that may be reported by the EMS the NML-EML Interface shall allow an NMS to assign an [Alarm Severity Assignment Profile \(ASAP\)](#) to certain of the objects visible across the interface. [Table 4.6](#) identifies the objects to which an ASAP may be assigned.

**Table 4.6: Objects to which an ASAP may be assigned**

	Object Name
1	<a href="#">Element Management System (EMS)</a>
2	<a href="#">Equipment</a>
3	<a href="#">Equipment Holder</a>
4	<a href="#">Equipment Protection Group (EPG)</a>
5	<a href="#">Group Termination Point (GTP)</a>
6	<a href="#">Managed Element (ME)</a>
7	<a href="#">Protection Group (PG)</a>
8	<a href="#">Subnetwork Connection (SNC)</a>
9	<a href="#">Termination Point (TP)</a>
10	<a href="#">Topological Link (TL)</a>

#### 4.2.4.1.5 Alarm Root Cause Indication

- {Requirement II. 223} The NML-EML Interface shall allow the EMS to indicate whether an alarm is a raw (un-correlated) alarm or a root cause alarm indication.

Source: Version 3.0.

Mandatory/Optional: Mandatory.

- {Requirement II. 224} The NML-EML Interface shall allow the EMS to change its diagnosis of a root cause and send an appropriate update to the NMS

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### **4.2.5 Protection**

##### **4.2.5.1 Trail and Subnetwork Connection (SNC) Protection**

This section addresses the NML-EML Interface requirements that enable an NMS to discover and manage trail and subnetwork connection protection and the switching of both trails and the subnetwork connection protection.

The basic principle is one of discovery of trail protection than to manage protection switching via the interface.

This section only applies to SONET/SDH.

#### 4.2.5.1.1 Determine all ring and linear trail protection schemes

{Requirement II. 112} The NML-EML Interface shall allow the NMS to discover all trail protection schemes (both linear and ring configurations), to the extent that the EMS knows of the configuration that exist in the network managed by the EMS.

Refer to [{Requirement II. 059}](#)

Source: Version 2.0.

Mandatory/Optional: Optional.

It is possible that the resources of a ring (or a linear system) are split among more than one EMS.

The NML-EML Interface shall not indicate if the ring is a complete ring, a portion of a complete ring or a open ring that is still in the process of being provisioned (or any linear system).

The ordering of Network Element (NE)s within a ring is not explicitly indicated across the NML-EML Interface. This information may be inferred from the [Topological Link \(TL\)](#)s passed across the NML-EML Interface.

#### 4.2.5.1.2 Determine traffic source for trail and subnetwork connection protection schemes

{Requirement II. 114} The NML-EML Interface shall allow the NMS to determine the traffic source of a [Protection Group \(PG\)](#) or a [Subnetwork Connection \(SNC\)](#). In addition the NMS needs to determine:

- 1) The current protection switch state (whether protection switching is locked, automatic or forced). switch reason
- 2) The protection attributes (e.g. whether the scheme is unidirectional or bi directional (also known as single or dual ended) or the protocol used for MSSPRING). PGP parameter
- 3) If the switching is revertive or not.
- 4) Support for 1+1 (with no extra traffic capability) and 1:N which does support extra traffic on the protection resources.

Source: Version 2.0.

Mandatory/Optional: Optional.

This shall provide operator the information on a end-to-end trail basis.

#### **4.2.5.1.3 Protection Switching Notifications**

{Requirement II. 115} The NML-EML Interface shall allow the EMS to send notifications in case of switching events related to trail and subnetwork connection protection (SNCP).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### **4.2.5.1.4 Protection Switching Commands**

##### **4.2.5.1.4.1 Perform Protection Switch**

{Requirement II. 116} The NML-EML Interface shall allow the NMS to perform protection switch commands that are supported by a [Connection Termination Point \(CTP\)](#) or a [Protection Group \(PG\)](#) that is currently connected as being able to perform a protection switch.

CTPs are used only for protection switch commands that cannot be performed via the PG object. For example for SNCP no PG object exists and the protection switch operation is applied directly to a CTP.

The following are the known values for SDH APS and VC Trail Protection schemes:

- 1) Lockout
- 2) Clear
- 3) Forced Switch
- 4) Manual Switch
- 5) Exerciser

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### **4.2.5.1.4.2 Query Protection Switch Status**

{Requirement II. 117} The NML-EML Interface shall allow the NMS to query the EMS to determine if any persistent protection switch commands have been invoked.

This query shall be supported on a [Connection Termination Point \(CTP\)](#) and on a [Protection Group \(PG\)](#).

| Refer to [{Requirement II. 195}](#) for the details if the data that shall be returned by the EMS.

The query on CTP is only applicable for protection schemes that do not employ a PG. For example for SNCP protection no protection group object exists and the protection switch operation and query is applied directly on a CTP.

| Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 195} The NML-EML Interface shall allow the NMS to retrieve the following switch status information for a [Protection Group \(PG\)](#) or a [Connection Termination Point \(CTP\)](#) identified by an NMS specified PG or CTP name:

1) Type

This attribute shall represent the type of the protection for which the switch has occurred.

2) Switch reason

This attribute shall represent the reason for the switch.

3) Layer rate

This attribute shall represent the layer at which the switch has occurred.  
(Refer to [{Requirement I. 022}](#)).

4) PG

This attribute shall represent the name of the [Protection Group \(PG\)](#) in the case of a trail switch. Not used if the protection type is Subnetwork Connection Protection (SNCP).

5) Protected TP

This attribute shall represent the name of the [Termination Point \(TP\)](#) being protected.

6) Switch away from TP

This attribute shall represent the name of the TP being switched away from.

7) Switch to TP

This attribute shall represent the name of the TP that is switched to.

8) Additional information

Refer to [{Requirement I. 060}](#).

Source: Version 2.0.

Mandatory/Optional: Optional.

## 4.2.5.2 Equipment Protection

### 4.2.5.2.1 Determine active Equipment

{Requirement II. 175} The NML-EML Interface shall allow the NMS to determine the active [Equipment](#) instances within an [Equipment Protection Group \(EPG\)](#). In addition the NMS needs to determine:

- 1) The current protection switch state (whether protection switching is locked, automatic or forced).
- 2) The protection attributes.
- 3) If the switching is revertive or not.

Refer to [{Requirement II. 269}](#) for the details of the data that shall be returned by the EMS.

|  
| Source: Version 3.0.  
|  
|

Mandatory/Optional: Optional.

{Requirement II. 269} The NML-EML Interface shall allow the NMS to retrieve the following switch status information for a [Equipment Protection Group \(EPG\)](#) identified by an NMS specified EPG name:

- 1) Type  
This attribute shall represent the type of the protection for which the switch has occurred.
- 2) Switch reason  
This attribute shall represent the reason for the switch.
- 3) EPG  
This attribute shall represent the name of the [Equipment Protection Group \(EPG\)](#).
- 4) Protected Equipment  
This attribute shall represent the name of the [Equipment](#) being protected.
- 5) Switch to Equipment  
This attribute shall represent the name of the Equipment that is switched to.
- 6) Additional information  
Refer to [{Requirement I. 060}](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### | **4.2.5.2.2 Protection Switching Notifications**

| {Requirement II. 176} The NML-EML Interface shall allow the EMS to send notifications in case of an Equipment protection switch.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

### **4.2.6 Performance Management**

| The NML-EML Interface shall support Performance Monitoring functions for [Termination Point \(TP\)](#)s.

#### **4.2.6.1 Supported PM Parameters**

| {Requirement II. 118} The NML-EML Interface shall allow the NMS to monitor and collect PM parameters (counters and analogue gauge measurements, nearEnd and/or farEnd) for 24 hours (uni- or bidirectional) and 15 minutes (unidirectional) measurement intervals.

| Refer to the supporting document [PerformanceParameters.pdf](#) for the currently defined PM parameters.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

##### **4.2.6.1.1 Parameter Measurement Points**

| {Requirement II. 119} The NML-EML Interface shall allow the NMS to monitor and collect the PM parameters defined in [{Requirement II. 118}](#) on per TP basis.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| {Requirement II. 120} The NML-EML Interface shall allow the NMS to enable and disable PM on endpoints of a SNC.

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### **4.2.6.2 Enabling/Disabling of PM data collection**

{Requirement II. 121}      The NML-EML Interface shall allow the NMS to enable and disable the collection of PM data on a list of TP names basis or for a list of [Managed Element \(ME\)](#)s.

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

#### **4.2.6.3 Enabling / Disabling of TCA notification**

{Requirement II. 122}      The NML-EML Interface shall allow the NMS to enable and disable the notification of Threshold Crossed Alerts on a list of TPs or for a list of [Managed Element \(ME\)](#)s.

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

#### **4.2.6.4 PM Capabilities**

{Requirement II. 124}      The NML-EML Interface shall allow the NMS to query the EMS for the number of supported previous or history day-registers and 15minute-registers.

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

#### **4.2.6.5 TCA Threshold Retrieval**

#### **4.2.6.6 TCA Threshold Setting**

{Requirement II. 125}      The NML-EML Interface shall allow the NMS to set the value of specific [Threshold Crossing Alert \(TCA\) Parameters](#) for a [Termination Point \(TP\)](#) identified by an NMS specified TP name, layer rate, granularity and location.

|      Source: Version 2.0.

|      Mandatory/Optional: Optional.

#### 4.2.6.7 Threshold Crossed Notifications

{Requirement II. 126}      The NML-EML Interface shall allow the EMS to send Threshold Crossed Alerts (TCAs) upon a threshold violation spontaneously (immediately after getting the event from the ME).

|      Source: Version 2.0.

       Mandatory/Optional: Optional.

#### 4.2.6.8 Historical PM Data

##### 4.2.6.8.1 File Transfer

{Requirement II. 128}      The NML-EML Interface shall allow the NMS to request the delivery of a historical PM data file for a specified set of [Termination Point \(TP\)](#)s and PM parameters to an external data server for further evaluation.

|      Refer to [{Requirement II. 284}](#) for the contents of the data file.

       The file shall have a defined format that is defined in the supporting document [PMFileFormat.pdf](#).

       It shall be readable by spreadsheet programs. When reading the register values, the EMS shall inform the NMS if the determination of PM data has not been activated for a specified TP.

|      Source: Version 2.0.

       Mandatory/Optional: Optional.

#### 4.2.6.8.1.1 PM Data File Format

{Requirement II. 284} The historical PM data file returned by the EMS shall contain the following information

1) Start time

This attribute shall represent the start of time frame for contained PM records.

2) End time

This attribute shall represent the end of time frame for contained PM records.

3) Layer rate

This attribute shall represent the layer rate of the PM data. The layer specified must be supported by the containing TP. Refer to [{Requirement I. 022}](#).

4) Granularity

This parameter shall represent the time granularity of the PM measurement data, either 15 minutes or 24 hours. This attribute is not applicable for instantaneous measurements (i.e. gauge type measurements)

5) User label

Refer to [{Requirement I. 060}](#).

6) Period end time

This attribute shall represent the period end time of the interval for which the data is being reported.

7) Monitored time

This attribute shall represent the number of seconds monitored within the measurement period. OPTIONAL

8) Number of periods

This attribute shall represent the number of measurement periods with the same value and status starting at the monitored time. This can be used for zero suppression and unavailable periods. OPTIONAL

9) PM parameter measurements

This attribute shall represent a list of the PM parameter measurements. Refer to [{Requirement II. 283}](#).

Source: Version 2.0.

Mandatory/Optional: Mandatory.

{Requirement II. 129} The NML-EML Interface shall allow the NMS to request (using a data file as defined in [{Requirement II. 128}](#)) the values of all (or a specific number of) historical 24hour registers of all the PM measurement points within the EMS controlled domain that have been activated.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 130} The NML-EML Interface shall allow the NMS to request (using a data file as defined in [{Requirement II. 128}](#)) the values of all (or a specific number of) historical 15minute registers of all the PM measurement points within the EMS controlled domain that have been activated.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### **4.2.6.8.2 On Demand**

{Requirement II. 163} The NML-EML Interface shall allow the NMS to request for a specific period of time the historical PM measurements for a specified set of [Termination Point \(TP\)](#)s and PM parameters.

| When reading the history bucket values, the EMS shall inform the NMS if the determination of PM data has not been activated for a specified TP.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.6.9 Current PM Data Retrieval

{Requirement II. 131} The NML-EML Interface shall allow the NMS to request the current PM measurement for a list of [Termination Point \(TP\)s](#).

When reading the register values, the EMS shall inform the NMS if the determination of PM data has not been activated for a specified TP.

| Refer to [{Requirement II. 282}](#) for the details if the data that shall be returned by the EMS.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 281} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests the current PM measurement data for a list of [Termination Point \(TP\)s](#).

1) TP name

This parameter shall represent the name of the TP from which to retrieve the PM measurement data.

2) Layer rates

This parameter shall represent a list of the layer rates of the PM measurement data to be retrieved. The layer specified must be supported by the containing TP. Refer to [{Requirement I. 022}](#).

3) Granularities

This parameter shall represent a list of the time granularities of the PM measurement data, either 15 minutes or 24 hours.

4) Locations

This parameter shall represent a list of the locations of the PM measurement data.

5) PM Parameters

This parameter shall represent a list of the names of the PM parameters for which measurement data shall be retrieved.

| Source: Version 2.0.

| Mandatory/Optional: Mandatory.

#### 4.2.6.9.1 PM Measurement Data

{Requirement II. 282}      The NML-EML Interface shall allow the NMS to retrieve the following PM Data for a [Termination Point \(TP\)](#) identified by an NMS specified TP name:

1) Layer rate

This parameter shall represent the layer rate of the PM data. The layer specified must be supported by the containing TP. Refer to [{Requirement I. 022}](#).

2) Granularity

This parameter shall represent the time granularity of the PM measurement data, either 15 minutes or 24 hours. This attribute is not applicable for instantaneous measurements (i.e. gauge type measurements)

3) Retrieval time

This parameter shall represent the NE time at which the PM measurement data was obtained from the NE.

4) PM parameter measurements

This attribute shall represent a list of the PM parameter measurements. Refer to [{Requirement II. 283}](#).

Source: Version 2.0.

Mandatory/Optional: Optional.

#### 4.2.6.9.1.1 PM Parameter Measurement

{Requirement II. 283} A PM Parameter Measurement represents a specific PM parameter data measurement associated with a [Termination Point \(TP\)](#):

- 1) PM parameter  
This parameter shall represent the name of the PM parameter.
- 2) Location  
This attribute shall represent the location of the performance monitoring measurement.
- 3) Value  
This attribute shall represent the layer rate of the PM data. The layer specified must be supported by the containing TP. Refer to [{Requirement I. 022}](#).
- 4) Measurement unit  
This attribute shall represent the unit of the measurement (e.g. seconds, milli-amps, hertz etc.)
- 5) Status  
This attribute shall represent the status of a measurement interval.(i.e. valid, incomplete, invalid, unavailable or zero-suppressed).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.6.10 Clearing PM Data

{Requirement II. 132} The NML-EML Interface shall allow the NMS ability to clear (reset) the PM Data for a list of TPs or for a list of Network Element (NE)s.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.7 Equipment Management

An equipment model shall be supported at the NML-EML Interface to provide the following capabilities to the network operator and management systems.

#### 4.2.7.1 Acquire Actual Equipment

{Requirement II. 133} The NML-EML Interface shall allow the NMS to retrieve the actual equipment configuration in the network to allow an operator to perform the following:

- 1) To be able to locate in the instances of equipment of a particular type/version/serial-number.
- 2) The information shall be to the level of field replaceable entity and shall be structured such that the replaceable unit is identifiable.
- 3) The information shall be structured such that searches may be performed on the data from the specific vendors equipment with a familiar degree of detail to that available at the vendors own system (i.e. at the same level of granularity).
- 4) To allow the network management system to convey an accurate view of the actual equipping in the network.
- 5) A slot shall be able to identify the equipage (equipped or unequipped) of a circuit pack.
- 6) The interface shall be able to retrieve specific equipment data and shall be able to report notification of addition/removal of a equipment.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### 4.2.7.2 Actual versus Expected Equipment

{Requirement II. 134} The NML-EML Interface shall allow the NMS the ability to identify a mismatch between the “actual” and “expected” equipment.

This shall allow the NMS to aid in fault correction and service impact interpretation (e.g. Mean Time to Repair). A slot shall identify the actual deployed circuit pack and a list of supported circuit packs or equipment's.

- 1) The card that has been physically installed in a holder
- 2) The card that was created (i.e. set as expected) to be in the specific equipment holder.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### **4.2.7.3 Installed Equipment**

{Requirement II. 135}      The NML-EML Interface shall allow the NMS to retrieve information related to installed [Equipment](#).

|                  Source: Version 2.0.

|                  Mandatory/Optional: Optional.

#### **4.2.7.4 Provisioning of Equipment**

{Requirement II. 136}      The interface shall allow the NMS to provision the expected [Equipment](#) for each [Equipment Holder](#).

|                  Source: Version 2.0.

|                  Mandatory/Optional: Optional.

#### 4.2.7.4.1 Equipment Creation Data

{Requirement II. 263} The NML-EML Interface shall allow the NMS to specify the following parameters when it requests that an EMS provision an [Equipment](#)

- 1) User label  
Refer to [{Requirement I. 060}](#).
- 2) User label uniqueness  
This parameter shall indicate to the EMS to check whether the user label is unique amongst the equipments within the EMS.
- 3) Owner  
Refer to [{Requirement I. 060}](#).
- 4) Expected equipment type  
This parameter shall represent the type of the expected equipment.
- 5) Alarm reporting  
This parameter shall indicate whether alarm reporting for this equipment is to be enabled or disabled.
- 6) Alarm severity assignment profile  
This parameter shall represent the name of the [Alarm Severity Assignment Profile \(ASAP\)](#) that is to be assigned to the Equipment.
- 7) Manufacturer  
This parameter shall represent the name of the equipment vendor.
- 8) Protection role  
This parameter shall represent the protection role (e.g. primary or secondary) that the equipment plays in case it takes part in an equipment protection scheme
- 9) Protection scheme state  
This parameter shall indicate the state of the protection scheme (i.e. whether it is to be active or locked).
- 10) Additional information.  
Refer to [{Requirement I. 060}](#).

Source: Version 3.0.

Mandatory/Optional: Mandatory.

#### 4.2.7.5 Unprovisioning of Equipment

{Requirement II. 262} The interface shall allow the NMS to unprovision the expected [Equipment](#) for each [Equipment Holder](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### **4.2.7.6 Provisioning Equipment Alarm Reporting**

{Requirement II. 078} The NML-EML Interface shall allow the NMS to enable and disable alarm reporting on an [Equipment](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### **4.2.7.7 Provisioning Equipment Holder Alarm Reporting**

{Requirement II. 079} The NML-EML Interface shall allow the NMS to enable and disable alarm reporting on an [Equipment Holder](#).

| Source: Version 2.0.

| Mandatory/Optional: Optional.

### **4.2.8 Software Management**

#### **4.2.8.1 Database Backup**

{Requirement II. 229} The NML-EML Interface shall allow the NMS to request the EMS to backup the data of NMS specified [Managed Element \(ME\)](#).

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 230} The NML-EML Interface shall allow the NMS to retrieve the current status of a NMS specified [Managed Element \(ME\)](#) database backup.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 231} The NML-EML Interface shall allow the NMS to request the EMS abort the database backup for an NMS specified [Managed Element \(ME\)](#).

| Source: Version 3.0.

| Mandatory/Optional: Optional.

{Requirement II. 232} The NML-EML Interface shall allow the NMS to retrieve the names of all the database backups for a list of NMS specified [Managed Element \(ME\)](#) names that are available on the EMS.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.9 Log Management

{Requirement II. 253}      The NML-EML Interface shall allow the NMS to retrieve all of the MTNM notifiable events and alarms available on the EMS.

|                  Source: Version 3.0.

|                  Mandatory/Optional: Optional.

{Requirement II. 254}      The NML-EML Interface shall support the following log capabilities defined in ITU Recommendation X.735.

- 1) delete Log Records
- 2) get Log Records
- 3) retrieve Log Records
- 4) set Administrative State
- 5) set Capacity Alarm Threshold
- 6) set Discriminator Construct
- 7) set Log Full Action
- 8) set Max Log Size
- 9) set Max Record Life
- 10) set Week Mask

|                  Source: Version 3.0.

|                  Mandatory/Optional: Optional.

{Requirement II. 255}      There shall be one instance of the Log Service per EMS.

|                  Source: Version 3.0.

|                  Mandatory/Optional: Mandatory.

{Requirement II. 271}      The NML-EML Interface shall allow the NMS to retrieve the attributes of the Log from the EMS.

| Source: Version 3.0.

| Mandatory/Optional: Optional.

#### 4.2.10 Maintenance Commands

{Requirement II. 137} The NML-EML Interface shall allow the NMS to set and release the maintenance commands that are supported by a [Termination Point \(TP\)](#).

| The following is a list of maintenance of operations that shall be supported:

- 1) Facility Loopback
- 2) Terminal Loopback
- 3) Force AIS Upstream
- 4) Force AIS DownStream
- 5) Force RDI
- 6) Set as segment end point (Note: unset is provided by the already-included release action)
- 7) Launch end-to-end loopback OAM cell
- 8) Launch segment loopback OAM cell

| A distinct error message will be returned to distinguish between a command rejected because of the current state of the object and between the command not being supported

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirement II. 138} The NML-EML Interface shall allow the NMS to query the EMS to determine if any persistent maintenance commands have been invoked.

| This query is support by the [Managed Element \(ME\)](#) and [Termination Point \(TP\)](#) objects.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

| It will be possible to add additional commands, as required for other technologies or to support more robust maintenance needs.

#### **4.2.11 Interface Version**

{Requirement II. 286}      The NML-EML Interface shall support the ability to allow an NMS to retrieve the interface version from the EMS.

|                          Source: Version 2.0.

|                          Mandatory/Optional: Mandatory.

#### **4.2.12 Security Management**

##### **4.2.12.1 Identification**

{Requirement II. 139}      The NML-EML Interface shall support the identification of an NMS.

|                          Source: Version 2.0.

|                          Mandatory/Optional: Optional.

##### **4.2.12.2 Authentication**

{Requirement II. 140}      The NML-EML Interface shall allow the NMS to be authenticated before access to the EMS is allowed.

|                          Source: Version 2.0.

|                          Mandatory/Optional: Optional.

##### **4.2.12.3 Session**

{Requirement II. 141}      The NML-EML Interface shall allow the NMS to establish a communication session following the successful authentication of the NMS by the EMS.

|                          Source: Version 2.0.

|                          Mandatory/Optional: Optional.

{Requirement II. 142}      The NML-EML Interface shall allow the NMS to establish multiple communication sessions.

| Source: Version 2.0.

Mandatory/Optional: Optional.

{Requirement II. 143} The NML-EML Interface shall allow the NMS or EMS to terminate a communication session.

| Source: Version 2.0.

Mandatory/Optional: Optional.

#### **4.2.12.3.1 Detection**

{Requirement II. 144}      The NML-EML Interface shall allow the EMS, in the event that it can detect a security violation or realize a failed access attempt, to generate an appropriate alarm.

|                  Source: Version 2.0.

|                  Mandatory/Optional: Optional.

### **4.2.13 System Requirements**

#### **4.2.13.1 NML-EML Communication Status Monitoring**

{Requirement II. 145}      The NML-EML Interface shall allow for both the NMS and the EMS to detect an NMS/EMS communication failure.

|                  Source: Version 2.0.

|                  Mandatory/Optional: Optional.

#### **4.2.13.2 NML-EML Interface Capabilities**

{Requirement II. 146}      The NML-EML Interface shall allow the NMS to retrieve a list of interface operations with information whether they are supported or not supported by the EMS.

|                  Source: Version 2.0.

|                  Mandatory/Optional: Optional.

#### **4.2.14 GUI Cut-Through (GCT)**

{Requirement II. 147}      The NML-EML Interface shall allow the NMS to access the EMS user interface.

|                  Source: Version 2.0.

|                  Mandatory/Optional: Optional.

{Requirement II. 148} The GCT feature must be supported by a generic cross-platform interface.

The NML-EML Interface shall be supplemented by a client-server window system that would facilitate the actual launch of the GCT.

| Source: Version 2.0.

Mandatory/Optional: Optional.

The window system protocol (e.g. X-protocol) providing the solution for the actual launch of the GCT is outside the MTNM interface solution set. In order for the MTNM GCT interface to be truly platform independent it should not be based on the implementation details relevant to any specific window system.

{Requirement II. 149} EMS GCT functionality on NMS is the same as the one available to an EMS client user when invoked within the EMS.

| Source: Version 2.0.

Mandatory/Optional: Optional.

The security issues, however, are not currently addressed in this interface (at this release bilateral agreement is required, in the future security issues may be defined as a part of the interface).

When there is a bilateral agreement regarding the definition of users the following applies:

The EMS allows control of the various EMS features depending on capability level of the user. Within a given window context, user access should be limited only to those operations, which are allowed given the (EMS) user info.

User identification may have the following behavior (based on bilateral agreement):

As long as at least one GUI cut-through session is active, then the user remains logged in.

For a less secure, seamless cut-through the EMS user login and password is maintained at the NMS (outside the scope of the Interface). When the cut-through session is invoked, then the login and password is passed across the Interface

When there is a bilateral agreement regarding the definition of user capabilities the following applies:

The EMS shall allow the restriction of user access by allowing an NMS to explicitly specify the user capability. (When there is no specified user id the capability value alone determines the functionality of the GCT.) Typical user capabilities that are envisioned are read-only and read-write.

When both user identification and user capability are both agreed upon and both are specified then the user capability is to be applied as a further restriction to the capability implicit in the user information.

- {Requirement II. 150}
- The GUI Cut-through shall allow the context to be specified. The user can make a request for a specific object in different window contexts and the user's entry point into the EMS should be in the same context or window type as requested by the NMS. The only window context that must be supported is the Top-Level context. If the EMS does not provide data for a window type, the NMS will use the data for the top level window. The suggested optional window contexts are Fault, Configuration (software management/connection management), Accounting, Performance, Security and Systems Management. When the desired window context is unavailable for the given object scope, then a window context that contains and/or allows navigation into the requested context is provided. The interface will allow the NMS to retrieve all the GCT contexts that are supported by the EMS.

| Source: Version 2.0.

Mandatory/Optional: Optional.

- {Requirement II. 151}
- The GCT feature may apply to different objects managed within each EMS, i.e. the GCT request must have a scope (either EMS or ME). The scope field in the GCT data record reflects the supported scope of the GCT operation.

| Source: Version 2.0.

Mandatory/Optional: Optional.

When the GCT is not implemented for the requested object scope, the EMS will launch the GCT of the closest superior object available (this information is available through the hierarchy of the object name). For example, if a certain GCT is unavailable for the requested ME then a GCT (of the same context) should be launched for the EMS instead. The NMS should request the narrowest scope desired. Alternatively the NMS shall only request a scope that is known to be supported according to the profile/GCT capability information received.

- {Requirement II. 152} If possible, the EMS should be able to actively manage the GCT application windows.
- 1) Integrate the EMS window within NMS window hierarchy (e.g. associate it to the NMS main window on creation of the GCT window) if made possible by the window system protocol.
  - 2) The EMS should be able to close all of the GCT windows upon request by the NMS, or notify the NMS that closing of the GCT is disabled. Optional based on EMS.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### **4.3 Category III: Abnormal or Exception Conditions, Dynamic Requirements**

- {Requirement III. 001} The NML-EML Interface shall allow the NMS to detect when the EMS is no longer available.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

- {Requirement III. 002} The NML-EML Interface shall allow the EMS to detect when the NMS is no longer available.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

#### **4.4 Category IV: Expectations and Non-Functional Requirements**

{Requirements IV. 001} The NML-EML Interface must take into account scalability and performance issues. Real-world scenarios shall be applied to check for object instance scale (MIB instances) and operations intensity

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirements IV. 002} Physical entities shall be supported in a concise manner. It is the intention of this model to be a practical scalable solution.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirements IV. 003} The NML-EML Interface shall allow an EMS to support multiple NMSs simultaneously.

| Source: Version 2.0.

| Mandatory/Optional: Optional.

{Requirements IV. 004} The NML-EML Interface shall allow an NMS to support multiple EMSs simultaneously.

| Source: Version 2.0.

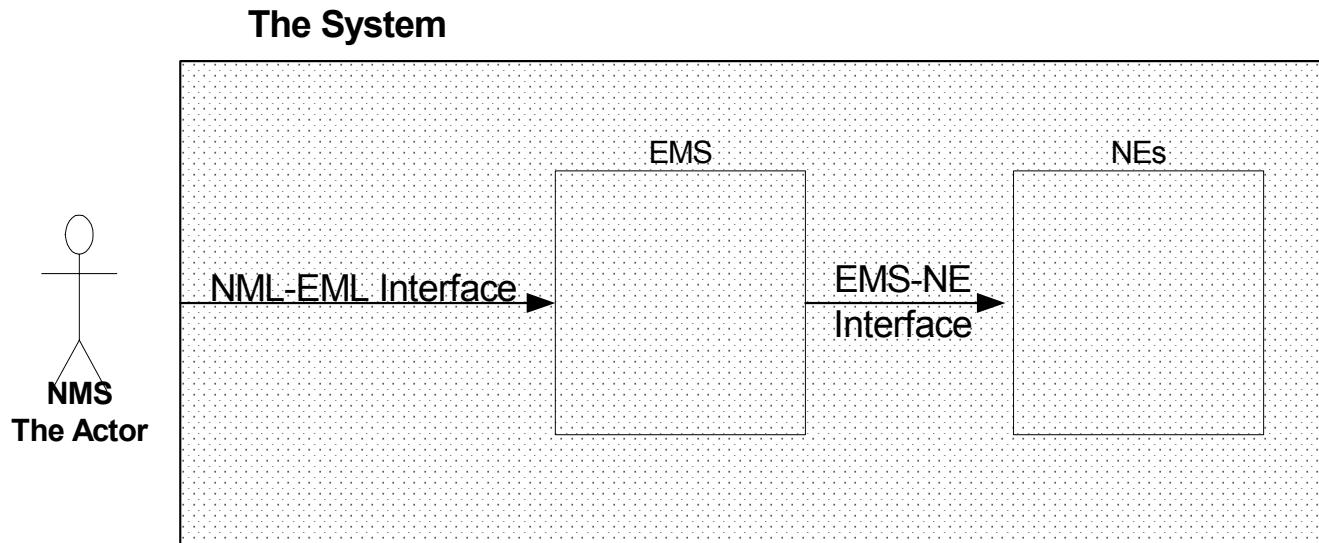
| Mandatory/Optional: Optional.

#### **4.5 Category V: System Administration Requirements**

No System Administration requirements have been identified at this time.

## 5 USE CASES

### 5.1 Actor-System Context Diagram

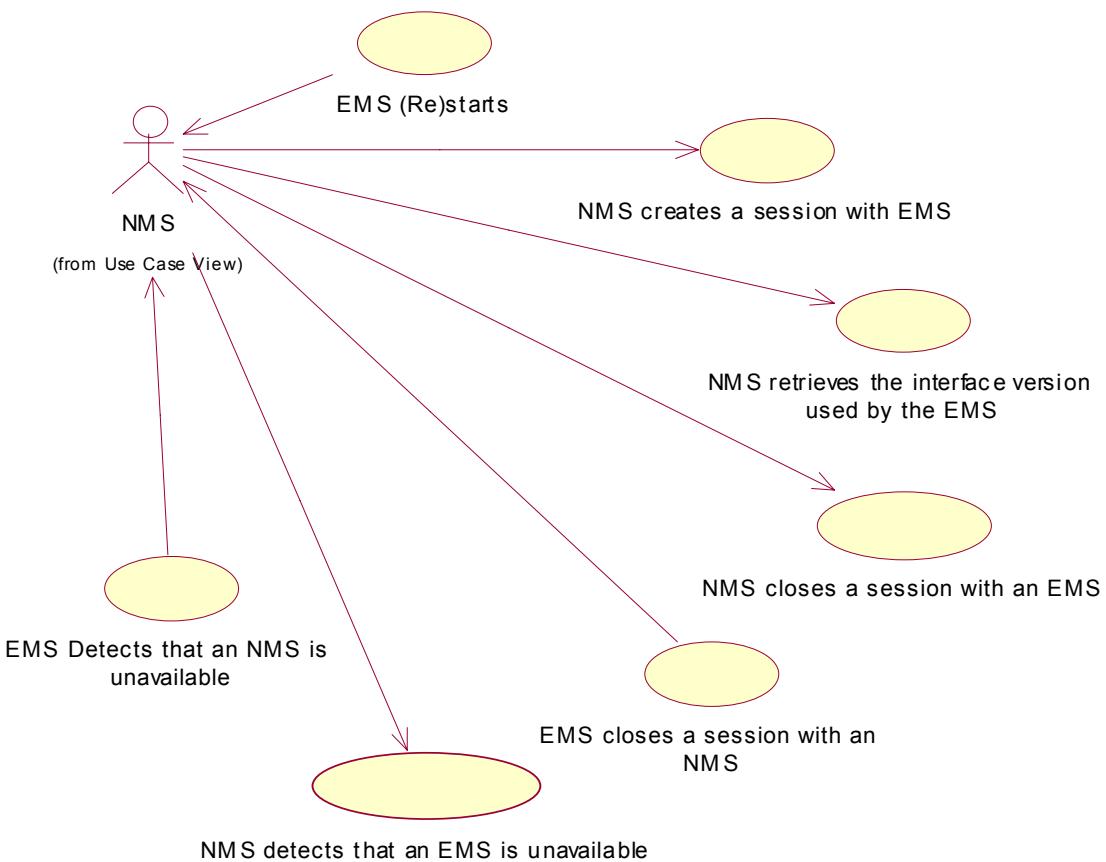


The System includes both the NML-EML Interface and the EMS and its Network (i.e. its managed NEs).

Figure 5.1: Actor-System Context Diagram

## 5.2 NMS-EMS Session Management Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.2.1:</a>	<a href="#">EMS (Re)starts</a>	<a href="#">{Requirement I. 041}</a> , <a href="#">{Requirements IV. 003}</a>
<a href="#">Use Case 5.2.2:</a>	<a href="#">NMS creates a session with EMS</a>	<a href="#">{Requirement I. 041}</a> , <a href="#">{Requirement II. 139}</a> , <a href="#">{Requirement II. 140}</a> , <a href="#">{Requirement II. 144}</a> , <a href="#">{Requirement II. 145}</a>
<a href="#">Use Case 5.2.3:</a>	<a href="#">NMS retrieves the interface version used by the EMS</a>	<a href="#">{Requirement I. 030}</a> , <a href="#">{Requirement I. 031}</a>
<a href="#">Use Case 5.2.4:</a>	<a href="#">NMS closes a session with an EMS</a>	<a href="#">{Requirement II. 139}</a> , <a href="#">{Requirement II. 140}</a>
<a href="#">Use Case 5.2.5:</a>	<a href="#">EMS closes a session with an NMS</a>	<a href="#">{Requirement II. 139}</a> , <a href="#">{Requirement II. 140}</a>
<a href="#">Use Case 5.2.6:</a>	<a href="#">NMS detects that an EMS is unavailable</a>	<a href="#">{Requirement II. 145}</a> , <a href="#">{Requirement III. 001}</a> , <a href="#">{Requirement III. 002}</a>
<a href="#">Use Case 5.2.7:</a>	<a href="#">EMS detects that an NMS is unavailable</a>	<a href="#">{Requirement I. 041}</a> , <a href="#">{Requirement II. 145}</a> , <a href="#">{Requirement III. 001}</a> , <a href="#">{Requirement III. 002}</a>



**Figure 5.2: Session Management Use Cases**

### 5.2.1 EMS (Re)starts

#### Use Case 5.2.1: EMS (Re)starts

<b>Name</b>	EMS (Re)starts
<b>Summary</b>	<p>The EMS starts up and creates an entry point (root) EMS object. It also prepares everything to send out notifications.</p> <p>This use case contains some implementation details about the usage of the CORBA Naming and Notification Services.</p>
<b>Actor(s)</b>	None
<b>Pre-Conditions</b>	<p>Any required communication services are running on the EMS and Notification Service hosts.</p> <p>Naming Services can be federated to link an NMS and EMS Naming Service at a given “context”.</p>
<b>Begins When</b>	The EMS starts.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) When the EMS starts it puts an entry point object in a location that is available to an NMS.             <ul style="list-style-type: none"> <li>• The entry point object is a CORBA object reference.</li> <li>• The CORBA Naming Service can be used to store the CORBA object references. Exchanging CORBA object references via another mechanism is acceptable if agreed to by both EMS and NMS implementation groups.</li> </ul> </li> <li>2) If not already done at a previous startup, the EMS contacts the Notification Service for creation of an event channel. A reference to this event channel can therefore be provided to an NMS upon request (refer to <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>).</li> <li>3) If not already done at a previous startup, the EMS registers as a supplier to this event channel.</li> <li>4) The EMS (re)connects to the event channel and is thus able to send out notifications.</li> </ol> <p><b>Note:</b>            The EMS may not be completely initialized when the entry point object is made available. This is because the EMS will have to do internal initialization as well as initializing the interface. It is an EMS implementation decision on how to handle requests arriving during initialization.</p>
<b>Ends When</b>	The EMS has made the entry point EMS Object available and is able to send out notifications.
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Internal EMS errors – may not initialize some internal components.</li> <li>2) May not be able to register Object.</li> <li>3) May not be able to register or to connect to the notification service.</li> <li>4) Communication services may not be running – installation or administration problem.</li> </ol>

**Use Case 5.2.1: EMS (Re)starts**

<b>Post-Conditions</b>	The EMS is ready to receive requests on its interface and to send out notifications.
<b>Traceability</b>	<a href="#">{Requirement I. 041}</a> , <a href="#">{Requirements IV. 003}</a>

## 5.2.2 NMS creates a session with EMS

### Use Case 5.2.2: NMS creates a session with EMS

<b>Name</b>	NMS creates a session with EMS
<b>Summary</b>	<p>The NMS client finds the EMS entry point object of the required interface version. It also registers and connects to the event channel as a consumer of notifications. The NMS may then synchronize its network database.</p> <p>This use case contains some implementation details about the usage of CORBA Naming and Notification Services. It also assumes that there exists one Notification Service per EMS (as recommended, but not mandated).</p>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	Post-conditions of <a href="#">Use Case 5.2.1: EMS (Re)starts</a> .
<b>Begins When</b>	NMS (re)starts - in which case this use case is performed for every EMS to be enrolled or detects that there is a new EMS that it wishes to enroll.

**Use Case 5.2.2: NMS creates a session with EMS**

<b>Description</b>	<p>1) The NMS locates the EMS entry point object.</p> <p>2) The NMS retrieves the version of the EMS for validation as described in <a href="#">Use Case 5.2.3: NMS retrieves the interface version used by the EMS</a>.</p> <p>3) The NMS sets up a session with the EMS. The EMS may perform identification and authentication by verifying the user id and the password provided by the NMS. It is then able to detect security violations and to send out appropriate alarms.</p> <p>4) The NMS sends a request to retrieve the capabilities from the EMS.</p> <p>5) The EMS replies with its supported capabilities.</p> <p>6) The NMS retrieves the reference of the event channel to be used to receive notifications from the EMS.</p> <p>7) If not already done in a previous session setup, the NMS registers as a consumer to this event channel and creates any filters that it requires. For examples of the type of information that the NMS may register for refer to <a href="#">Use Case 5.4.1: NMS registers to receive network updates information from the EMS</a> and <a href="#">Use Case 5.8.3: NMS registers to receive alarms or threshold crossing alerts from an EMS</a>.</p> <p>8) If the NMS restarts, i.e. if it was registered earlier, the notification service sends out all notifications that occurred during the NMS' downtime (this is only the case if persistence has been enabled for the notification service). In this case the NMS can synchronize its database by evaluating these notifications.</p> <p><b>Note:</b> There are time-out values recommended for alarms and other events. After these time-outs expire the notification service discards notifications. If an NMS downtime had exceeded these times the NMS should synchronize the active alarms or the whole configuration, respectively. If event loss (synchronization) notifications are supported by the EMS then the NMS will synchronize the alarms and/or the entire configuration once retrieving such a notification.</p> <p>If the EMS supports the Log Service then the NMS may use the capabilities of the Log Service to resynchronize.</p> <p>9) If the NMS starts for the first time or if it decides to discard all notifications sent out in step 6, it (re)discovers the EMS' network inventory as described in the <a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>.</p> <p>10) The NMS periodically checks the availability of the EMS.</p> <p>11) The EMS periodically checks the availability of the NMS</p>
<b>Ends When</b>	<p>Either NMS or EMS calls one of the following use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.2.4: NMS closes a session with an EMS</a>.</li> <li>• <a href="#">Use Case 5.2.5: EMS closes a session with an NMS</a>.</li> <li>• <a href="#">Use Case 5.2.6: NMS detects that an EMS is unavailable</a>.</li> <li>• <a href="#">Use Case 5.2.7: EMS detects that an NMS is unavailable</a>.</li> </ul>

**Use Case 5.2.2: NMS creates a session with EMS**

<b>Exceptions</b>	1) No compatible version of the entry point object. 2) Access denied: The EMS detects a security violation. 3) Invalid input: The NMS session specified is invalid. 4) Processing failure: The requested operation could not be performed.
<b>Post-Conditions</b>	1) There exists a valid session between the NMS and the EMS which is supervised by both. 2) The NMS is initialized and ready to communicate with the EMS as well as to receive notifications.
<b>Traceability</b>	<a href="#">Requirement I. 041</a> , <a href="#">Requirement II. 139</a> , <a href="#">Requirement II. 140</a> , <a href="#">Requirement II. 144</a> , <a href="#">Requirement II. 145</a>

### 5.2.3 NMS retrieves the interface version used by the EMS

#### Use Case 5.2.3: NMS retrieves the interface version used by the EMS

<b>Name</b>	NMS retrieves the interface version used by the EMS
<b>Summary</b>	The NMS checks the version of the EMS interface with which it is interacting.
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS successfully locates the EMS entry point object.
<b>Begins When</b>	The NMS sends a request to retrieve the interface version.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) NMS sends a request for the interface version to the EMS.</li> <li>2) EMS responds with the interface version.</li> </ul>
<b>Ends When</b>	EMS sends the interface version to the NMS.
<b>Exceptions</b>	None
<b>Post-Conditions</b>	<ul style="list-style-type: none"> <li>1) Same as pre-conditions.</li> <li>2) NMS has retrieved the interface version supported by the EMS.</li> </ul>
<b>Traceability</b>	<a href="#">(Requirement I. 030}</a> , <a href="#">(Requirement I. 031}</a>

### 5.2.4 NMS closes a session with an EMS

#### Use Case 5.2.4: NMS closes a session with an EMS

<b>Name</b>	NMS closes a session with an EMS
<b>Summary</b>	The NMS closes communication to the EMS as well as to the notification service, e.g. the NMS performs a controlled shutdown.
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) Session between EMS and NMS has been established.</li> </ul>
<b>Begins When</b>	NMS starts to close the session.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The NMS signs out for notifications for which it was previously registered and disconnects from the notification service. There is no confirmation from the EMS on this request.</li> <li>2) The NMS informs the EMS that it wishes to end communications.</li> </ul>
<b>Ends When</b>	The NMS stops communicating with the EMS.
<b>Exceptions</b>	None

**Use Case 5.2.4: NMS closes a session with an EMS**

<b>Post-Conditions</b>	1) The NMS has released all resources associated with the EMS. 2) The EMS has released all resources associated with the NMS. 3) The NMS process is no longer communicating with the EMS. 4) Notifications are no longer sent to the NMS.
<b>Traceability</b>	<a href="#">(Requirement II. 139)</a> , <a href="#">(Requirement II. 140)</a>

### 5.2.5 EMS closes a session with an NMS

#### Use Case 5.2.5: EMS closes a session with an NMS

<b>Name</b>	EMS closes a session with an NMS.
<b>Summary</b>	The EMS closes communication to the NMS, e.g. because of a controlled EMS shutdown. The NMS therefore closes the communication to the notification service.
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins When</b>	EMS starts to delete the session.
<b>Description</b>	<p>1) The EMS informs the NMS that it wishes to end communications. There is no confirmation from the NMS on this request.</p> <p>2) The NMS may sign out for notifications for which it was previously registered and may disconnect from the notification service.</p> <p>Note that there is no guarantee to find the same notification service when a new session between NMS and EMS is created later on.</p>
<b>Ends When</b>	The NMS stops communicating with the EMS.
<b>Exceptions</b>	None
<b>Post-Conditions</b>	<p>1) The NMS has taken the appropriate internal action and released all resources associated with the EMS.</p> <p>2) The EMS has released all resources associated with the NMS.</p> <p>3) The NMS process is no longer communicating with the EMS.</p> <p>4) The notification service is not trying to send notifications from this EMS to the NMS any longer if the NMS decided to sign out.</p>
<b>Traceability</b>	<a href="#">(Requirement II. 139)</a> , <a href="#">(Requirement II. 140)</a>

### 5.2.6 NMS detects that an EMS is unavailable

#### Use Case 5.2.6: NMS detects that an EMS is unavailable

<b>Name</b>	NMS detects that an EMS unavailable
<b>Summary</b>	<p>The NMS detects that an EMS it had a session with before, or the notification service became unavailable. This might be detected due to a failure on a request or on a heartbeat. The NMS therefore releases the session with the EMS.</p> <p>This may be because of an EMS process crash, because the EMS hardware being powered off before the NMS process has done a controlled shut down, because of a connection breakdown or a notification service failure.</p>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .

**Use Case 5.2.6: NMS detects that an EMS is unavailable**

<b>Begins When</b>	The NMS receives a failure on a heartbeat or on a request to the EMS or the notification service.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS receives a failure on a heartbeat or on a request to the EMS or the notification service which means that the EMS or the notification service isn't available any longer.</li> <li>2) The NMS signs out for notifications for which it was previously registered and disconnects from the notification service if the notification service is still available.</li> <li>3) The NMS releases all resources associated with the EMS.</li> <li>4) The NMS takes appropriate internal action and frees up any resources associated with the EMS connection..</li> </ol>
<b>Ends When</b>	The NMS has cancelled the session with the EMS.
<b>Exceptions</b>	None
<b>Post-Conditions</b>	The NMS process is no longer communicating with the EMS. The NMS needs to create a new session to restore the communication.
<b>Traceability</b>	<a href="#">(Requirement II. 145)</a> , <a href="#">(Requirement III. 001)</a> , <a href="#">(Requirement III. 002)</a>

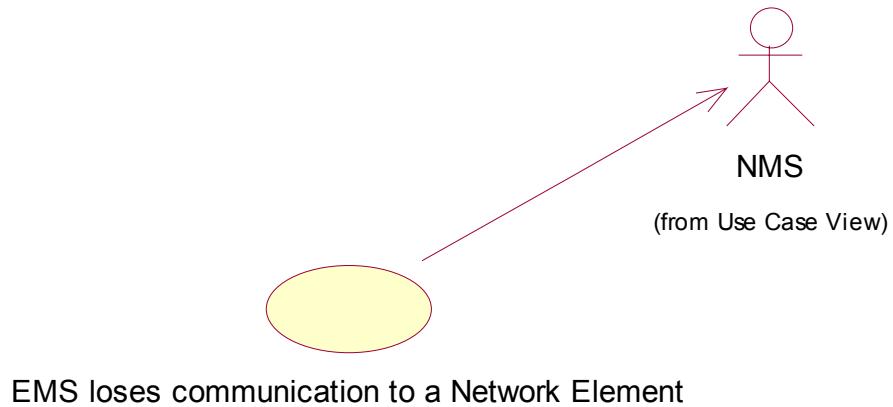
### 5.2.7 EMS Detects that an NMS is unavailable

#### Use Case 5.2.7: EMS detects that an NMS is unavailable

<b>Name</b>	EMS detects that an NMS is unavailable
<b>Summary</b>	<p>The EMS detects that an NMS it had a session with before became unavailable. This might be detected due to a failure on a heartbeat. The EMS therefore releases the session with the NMS.</p> <p>This may be because of an NMS process crash, because the NMS hardware being powered off before the EMS process has done a controlled shut down or because of a connection breakdown.</p>
<b>Actor(s)</b>	EMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS.</a>
<b>Begins When</b>	The EMS receives a failure on a heartbeat.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The EMS receives a failure on a heartbeat.</li> <li>2) The EMS releases all resources associated with the NMS.</li> </ol>
<b>Ends When</b>	The EMS has cancelled the session with the NMS.
<b>Exceptions</b>	None
<b>Post-Conditions</b>	<ol style="list-style-type: none"> <li>1) The EMS process is no longer communicating with the NMS. The NMS needs to create a new session to restore the communication.</li> <li>2) If there wasn't a failure with the notification service, the notification service may (if persistence is enabled) continue to store all notifications which cannot be delivered to the NMS. Thus, it is possible to deliver them after an NMS restart.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement I. 041}</a> , <a href="#">{Requirement II. 145}</a> , <a href="#">{Requirement III. 001}</a> , <a href="#">{Requirement III. 002}</a>

### 5.3 EMS-NE Session Management Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.3.1:</a>	<a href="#">EMS loses communication to a Network Element</a>	{Requirement I. 003}, {Requirement II. 067}



**Figure 5.3: EMS-NE Session Management Use Cases**

### 5.3.1 EMS loses communication to a Network Element

#### Use Case 5.3.1: EMS loses communication to a Network Element

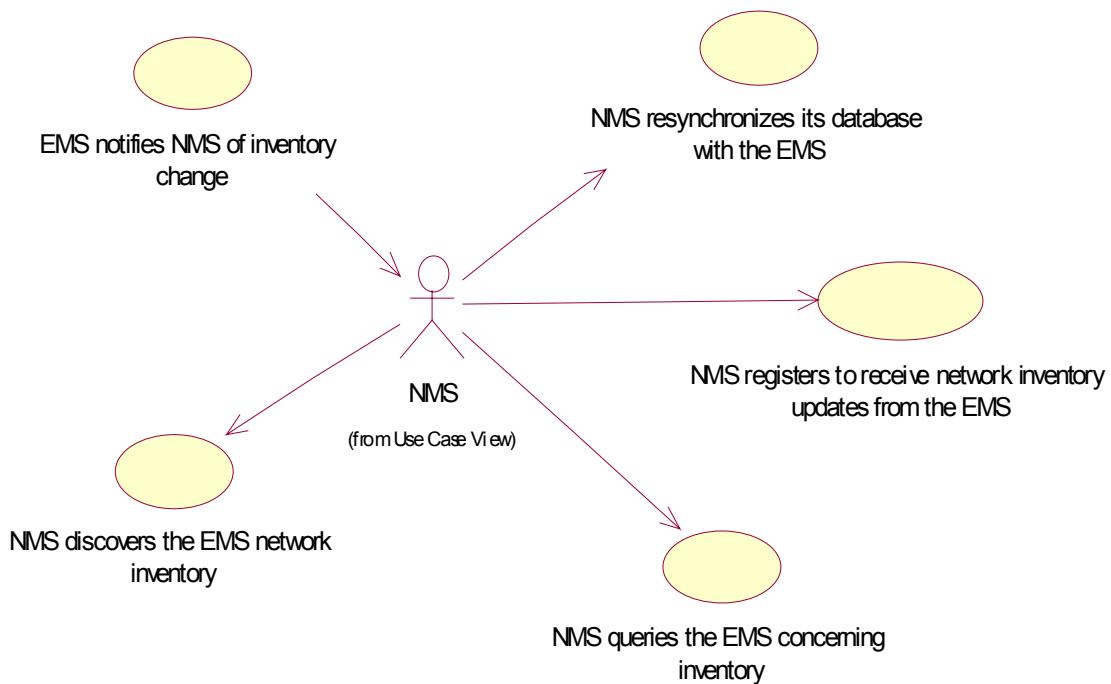
<b>Use Case Name</b>	EMS loses communication to a Network Element
<b>Summary</b>	The EMS detects that communication to an NE has been lost (e.g. a craft has reset the NE)
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	EMS detects loss of communication with the Network Element (NE)
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The EMS detects that communication to an NE has been lost.</li> <li>2) EMS sends a state change notifications to the Notification Service indicating a change in the communication state to the NE.</li> <li>3) Once the NE returns to a fully operational state and communication between it and the EMS is reinstated, EMS sends state change notifications to the Notification Service.</li> <li>4) If the EMS automatically resynchronizes with the NE then the EMS shall send the appropriate notifications to the Notification Service.</li> <li>5) If the EMS does not automatically resynchronize with the NE then an state change notification shall be sent to the Notification Service indicating that the EMS is out of synchronization with the NE (NE synchronization state attribute is set to false). Another state change notification shall be sent to the notification service when the EMS has resynchronized with the NE (NE synchronization state attribute is set to true). While the EMS is out of synchronization with the NE the EMS might not send notifications to the Notification Service.</li> </ol>
<b>Ends when</b>	The EMS sends applicable notifications to the Notification Service
<b>Post-conditions</b>	The EMS is aware of the communication state changes
<b>Exceptions</b>	No Interface exceptions as no NMS-initiated operations
<b>Traceability</b>	<a href="#">(Requirement I. 003)</a> , <a href="#">(Requirement II. 067)</a>

### 5.4 Discovery and Inventory Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.4.1:</a>	<a href="#">NMS registers to receive network updates information from the EMS</a>	<a href="#">(Requirement II. 064)</a> , <a href="#">(Requirement II. 065)</a> , <a href="#">(Requirement II. 066)</a> , <a href="#">(Requirement II. 067)</a>
<a href="#">Use Case 5.4.2:</a>	<a href="#">NMS resynchronizes its database with the EMS</a>	Refer to <a href="#">Use Case 5.4.3</a> : and <a href="#">Use Case 5.4.4</a> :

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Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.4.3:</a>	<a href="#">NMS discovers the EMS network inventory</a>	<a href="#">{Requirement II. 001}</a> , <a href="#">{Requirement II. 002}</a> , <a href="#">{Requirement II. 011}</a> , <a href="#">{Requirement II. 012}</a> , <a href="#">{Requirement II. 015}</a> , <a href="#">{Requirement II. 018}</a> , <a href="#">{Requirement II. 031}</a> , <a href="#">{Requirement II. 033}</a> , <a href="#">{Requirement II. 041}</a> or <a href="#">{Requirement II. 043}</a> , <a href="#">{Requirement II. 056}</a> , <a href="#">{Requirement II. 059}</a> , <a href="#">{Requirement II. 060}</a>
<a href="#">Use Case 5.4.4:</a>	<a href="#">NMS queries EMS concerning inventory</a>	<a href="#">{Requirement II. 002}</a> , <a href="#">{Requirement II. 004}</a> , <a href="#">{Requirement II. 006}</a> , <a href="#">{Requirement II. 011}</a> , <a href="#">{Requirement II. 008}</a> , <a href="#">{Requirement II. 012}</a> , <a href="#">{Requirement II. 015}</a> , <a href="#">{Requirement II. 018}</a> , <a href="#">{Requirement II. 020}</a> , <a href="#">{Requirement II. 022}</a> , <a href="#">{Requirement II. 024}</a> , <a href="#">{Requirement II. 026}</a> , <a href="#">{Requirement II. 033}</a> , <a href="#">{Requirement II. 040}</a> , <a href="#">{Requirement II. 047}</a> , <a href="#">{Requirement II. 050}</a> , <a href="#">{Requirement II. 056}</a> , <a href="#">{Requirement II. 058}</a>
<a href="#">Use Case 5.4.5:</a>	<a href="#">EMS notifies NMS of inventory change</a>	<a href="#">{Requirement II. 064}</a> , <a href="#">{Requirement II. 065}</a> , <a href="#">{Requirement II. 066}</a> , <a href="#">{Requirement II. 067}</a>



**Figure 5.4: Discovery and Inventory Use Cases**

### 5.4.1 NMS registers to receive network inventory updates from the EMS

#### Use Case 5.4.1: NMS registers to receive network inventory updates information from the EMS

<b>Use Case Name</b>	NMS registers to receive network inventory information from the EMS.
<b>Summary</b>	The NMS registers with the notification service related to the EMS, sets the appropriate filter to receive network inventory update notifications, and connects to the notification service.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS has a reference for the notification service used by the EMS.</li> </ul>
<b>Begins when</b>	The NMS sends a request to register itself at the notification service related to the EMS.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The NMS registers at the notification service related to the EMS as a consumer of notifications (if this has not been done earlier).</li> <li>2) The NMS sets the filter criteria needed to receive inventory updates from the EMS via the notification service.</li> <li>3) The NMS connects to the notification service and thus is able to receive notifications matching the filter conditions specified (if this has not been done earlier).</li> </ul> <p><b>Note:</b> The NMS can request that the inventory notifications be filtered based on resource type (e.g., PTPs) and/or notification type (i.e., creations, attribute value changes, deletions). All the inventory notifications are time stamped. Refer to <a href="#">{Requirement II. 064}</a> for object creation notifications, <a href="#">{Requirement II. 065}</a> for object deletion notifications, <a href="#">{Requirement II. 066}</a> for attribute change notifications and <a href="#">{Requirement II. 067}</a> for state change notifications.</p>
<b>Ends when</b>	<p>In case of success: The NMS receives a positive acknowledgement to its connection request to the notification service.</p> <p>In case of failure: The NMS receives a negative acknowledgement to its registration request, an invalid filter specified or the request times out.</p>
<b>Post-conditions</b>	<p>In case of success: The NMS is connected to the Notification Service with filtering criteria to receive network inventory update notifications.</p> <p>In case of failure: The NMS is not connected to the Notification Service with filtering criteria to receive network inventory update notifications.</p>

**Use Case 5.4.1: NMS registers to receive network updates information from the EMS**

<b>Exceptions</b>	Filter creation: <ul style="list-style-type: none"><li>• Invalid grammar</li></ul> Filter building <ul style="list-style-type: none"><li>• Invalid constraint</li></ul> Connection phase: <ul style="list-style-type: none"><li>• Illegal consumer type</li><li>• Consumer already connected.</li></ul>
<b>Traceability</b>	<a href="#">(Requirement II. 064)</a> , <a href="#">(Requirement II. 065)</a> , <a href="#">(Requirement II. 066)</a> , <a href="#">(Requirement II. 067)</a>

### 5.4.2 NMS resynchronizes its database with the EMS

#### Use Case 5.4.2: NMS resynchronizes its database with the EMS

<b>Use Case Name</b>	NMS resynchronizes its database with the EMS
<b>Summary</b>	The NMS sends a series of queries to the EMS, with the intent of re synchronizing its understanding of the EMS's network inventory with the actual EMS inventory.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS has determined that it wants to resynchronize its database with that of the EMS.</li> </ul>
<b>Begins when</b>	The NMS sends the first inventory query to the EMS.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) This Use Case is basically <a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a> in a different context.</li> <li>2) It is also possible to do a partial re-synchronization In this case <a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a> is re-used (multiple times).</li> </ul>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS has received the last response to the requests that it sent the EMS.</p> <p>In case of failure:</p> <p>The NMS has determined all requests have been acknowledged or have timed out, and at least one of the requests has timed out or was acknowledged in the negative (the EMS could not or would not return the requested information).</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>The NMS has collected all the requested inventory information from the EMS.</p> <p>In case of failure:</p> <p>The NMS has not collected all the inventory information that it requested.</p>
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Communication failure between the NMS and the EMS.</li> <li>2) The NMS may include incorrect or unknown information in its queries to the EMS.</li> <li>3) Entity not found: when an input parameter references an object that does not exist</li> <li>4) Query unknown or not supported.</li> <li>5) Unable to comply</li> </ul>
<b>Traceability</b>	Refer to <a href="#">Use Case 5.4.3</a> and <a href="#">Use Case 5.4.4</a> :

### 5.4.3 NMS discovers the EMS network inventory

#### Use Case 5.4.3: NMS discovers the EMS network inventory

<b>Use Case Name</b>	NMS discovers the EMS network inventory
<b>Summary</b>	The NMS sends a series of queries to the EMS, with the intent of discovering the network inventory managed by the EMS.

**Use Case 5.4.3: NMS discovers the EMS network inventory**

<b>Actors</b>	NMS
<b>Pre-conditions</b>	<p>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</p> <p>2) The NMS has not yet discovered the inventory managed by the EMS.</p>
<b>Begins when</b>	The NMS sends the first inventory query to the EMS.
<b>Description</b>	<p>There are many possible ways for the NMS to obtain the EMS's inventory. Two possibilities are given below, however the queries can be sent in many different combinations.</p> <p>Although the requests themselves are synchronous, the NMS may send subsequent inventory requests to the EMS before receiving a response to a pending request.</p> <p>Although not mandated by this use case, the NMS may want to start receiving EMS inventory updates at the time the discovery process begins. Once the NMS has received responses to all the inventory queries, the NMS can analyze the inventory update notifications that it received during the discovery process (if any) and updates its inventory accordingly.</p> <p><b>(Approach A: Discovery of all subnetworks' details)</b></p> <ol style="list-style-type: none"> <li>1) The NMS sends a request to retrieve EMS information from the EMS.</li> <li>2) The EMS returns the name, user label, native EMS name, owner, type and software version of the EMS.</li> <li>3) The NMS sends a request to retrieve all subnetworks from the EMS.</li> <li>4) The EMS returns the names and associated information for all the subnetworks that it manages.</li> <li>5) The NMS sends a request to retrieve all Managed Elements from the EMS.</li> <li>6) For each request, the EMS returns the names and associated information concerning the Managed Elements.</li> <li>7) For each Managed Element, the NMS sends a request to retrieve the Physical Termination Points from the EMS. Alternatively, for each termination point (PTP or CTP), the EMS sends a request to retrieve all the contained Performance Monitoring Points (PMPs) within a specified PTP or CTP from the EMS.</li> <li>8) For each request, the EMS returns the names of the Physical Termination Points (PTPs) and all information associated with the PTP, including a indication of whether the PTP is on the edge of the containing subnetwork. For each request, the EMS returns the names of the contained PMPs and all associated information.</li> <li>9) For each subnetwork, the NMS sends a request to retrieve all the topological links within a specified subnetwork from the EMS.</li> <li>10) The EMS returns all the names and associated information for all the topological links associated with a subnetwork.</li> <li>11) The NMS sends a request to retrieve all the top level topological links from the EMS.</li> <li>12) The EMS returns the names and associated information for each of the top-level links.</li> <li>13) For each PTP, the EMS sends a request to retrieve all the contained CTPs within a specified PTP or CTP from the EMS.</li> </ol>

**Use Case 5.4.3: NMS discovers the EMS network inventory**

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|--|--|
|  | <ul style="list-style-type: none"> <li>14) For each request, the EMS returns the names of the contained CTPs and all associated information. If the CTP contains other CTPs, this information will also be returned.</li> <li>15) For each identified subnetwork, the NMS sends a request to retrieve all the subnetwork connections from the EMS.</li> <li>16) For each request, the EMS returns the names of the subnetwork connections and all associated information.</li> <li>17) For each subnetwork connection, the NMS sends a request to retrieve all the routes.</li> <li>18) For every ME the NMS sends a request to retrieve all protection groups from the EMS.</li> <li>19) For each request, the EMS returns the associated information for all the protection groups it manages within the ME specified.</li> <li>20) For every ME the NMS sends a request to retrieve all cross-connects from the EMS.</li> <li>21) For each request, the EMS returns the associated information for all the cross-connects it manages within the ME specified.</li> <li>22) For every subnetwork the NMS sends a request to retrieve all TP Pools from the EMS.</li> <li>23) For each request, the EMS returns the names and associated information for all the TP Pools it manages within the subnetwork specified.</li> <li>24) If supported by the EMS, the NMS sends a request to retrieve all traffic descriptors from the EMS.</li> <li>25) The EMS returns the names and associated information for all the traffic descriptors it manages.</li> <li>26) If supported by the EMS, for every ME the NMS sends a request to retrieve all equipment holders and equipment from the EMS.</li> <li>27) For each request, the EMS returns the names and associated information for all the equipment holders and equipment it manages in the ME specified.</li> <li>28) Refer to <a href="#">Use Case 5.11.5: NMS retrieves PM capabilities of a Managed Element (ME)</a>.</li> </ul> |
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**(Approach B: Discovery of subnetworks with their edge points only)**

- 1) The NMS sends a request to retrieve all the EMS information from the EMS.
- 2) The EMS returns the name, user label, native EMS name, owner, type and software version of the EMS.
- 3) The NMS sends a request to retrieve all subnetworks from the EMS.
- 4) The EMS returns the names and associated information for all the subnetworks that it manages.
- 5) For each subnetwork, the NMS sends a request to retrieve from the EMS the Physical Termination Points (PTPs) which are the edges of a specified subnetwork.
- 6) For each request, the EMS returns the names of the edge points and all information associated with it.

**Use Case 5.4.3: NMS discovers the EMS network inventory**

	<p>7) The NMS sends a request to retrieve all the top level topological links from the EMS.</p> <p>8) The EMS returns the names and associated information for each of the top-level links.</p> <p>9) For each PTP, the EMS sends a request to retrieve all the contained CTPs within a specified PTP or CTP from the EMS.</p> <p>10) For each request, the EMS returns the names of the contained CTPs and all associated information. If the CTP contains other CTPs, this information will also be returned.</p> <p>11) For each identified subnetwork, the NMS sends a request to retrieve all the subnetwork connections from the EMS.</p> <p>12) For each request, the EMS returns the names of the subnetwork connections and all associated information.</p> <p>13) If supported by the EMS, the NMS sends a request to retrieve all traffic descriptors from the EMS.</p> <p>14) The EMS returns the names and associated information for all the traffic descriptors it manages.</p>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS has received the last response to the requests that it sent the EMS.</p> <p>In case of failure:</p> <p>The NMS has determined all requests have been acknowledged or have timed out, and at least one of the requests has timed out or was acknowledged in the negative (the EMS could not or would not return the requested information).</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>The NMS has collected all the requested inventory information from the EMS.</p> <p>In case of failure:</p> <p>The NMS has not collected all the inventory information that it requested.</p>
<b>Exceptions</b>	<p>1) Communication failure between the NMS and the EMS.</p> <p>2) The NMS may include incorrect or unknown information in its queries to the EMS.</p> <p>3) Entity not found: when an input parameter references an object that does not exist. See <a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>.</p> <p>4) Query unknown or not supported.</p> <p>5) Unable to comply.</p>
<b>Traceability</b>	<p><a href="#">{Requirement II. 001}</a>, <a href="#">{Requirement II. 002}</a>, <a href="#">{Requirement II. 011}</a>, <a href="#">{Requirement II. 012}</a>, <a href="#">{Requirement II. 015}</a>, <a href="#">{Requirement II. 018}</a>, <a href="#">{Requirement II. 031}</a>, <a href="#">{Requirement II. 033}</a>, <a href="#">{Requirement II. 041}</a> or <a href="#">{Requirement II. 043}</a>, <a href="#">{Requirement II. 056}</a>, <a href="#">{Requirement II. 059}</a>, <a href="#">{Requirement II. 060}</a></p>

#### 5.4.4 NMS queries the EMS concerning inventory

##### Use Case 5.4.4: NMS queries EMS concerning inventory

<b>Use Case Name</b>	NMS queries EMS concerning inventory
<b>Summary</b>	<p>The NMS sends a request to the EMS concerning a particular network inventory item. The following network inventory queries are possible:</p> <ol style="list-style-type: none"> <li>1) List of all Subnetworks managed by the EMS (the names or all associated attributes).</li> <li>2) List of all Managed Elements within a subnetwork (the names or all associated attributes).</li> <li>3) List of all the Managed Elements that are managed by the EMS (the names or all associated attributes).</li> <li>4) List of all PTPs associated with a Managed Element (just the names, or with all associated attributes).</li> <li>5) List of all CTPs supported by a PTP (just the names, or with all associated attributes).</li> <li>6) List of all CTPs supported by a CTP (just the names, or with all associated attributes).</li> <li>7) List of all Topological Links within a subnetwork (the names or all associated attributes).</li> <li>8) List of all top-level Topological Links (the names or all associated attributes), i.e., the links between subnetworks</li> <li>9) List of all Subnetwork Connection associated with a subnetwork (just the names, or with all associated attributes).</li> <li>10) The present value of the attributes associated with a particular Subnetwork, Managed Element, Topological Link, PTP, CTP, or Subnetwork Connection</li> <li>11) The name of the containing subnetwork for a specified Managed Element</li> <li>12) List of all Subnetwork Connections at a specified rate (just the names, or with all associated attributes). Example rates are VT1.5/TU11 and VT2/TU12.</li> <li>13) List of Subnetwork Connections that use a specified TP (just the names, or with all associated attributes). The TP can be a CTP or a PTP.</li> <li>14) The route(s) of a specified subnetwork connection</li> <li>15) List of all the PTPs at a specified layer or set of layers (e.g., Electrical STS1/STM0, Optical OC3/STM1) and associated with a particular Managed Element. The request can be for just the names of the PTP, or all the associated attributes.</li> <li>16) List of the all the PTPs at the edge of a subnetwork (just the names, or with all associated attributes). The request can be scoped to get only the PTPs at a specified layer or set of layers.</li> <li>17) List of all TPs that contain a specified CTP (just the names, or with all associated attributes).</li> <li>18) List of TPs associated with a specified TP (just the names, or with all associated attributes).</li> </ol>

**Use Case 5.4.4: NMS queries EMS concerning inventory**

	<p>19) List of all cross-connections for a specified Managed Element. The request can be filtered to get only the cross-connections at a specified layer rate or set of layer rates.</p> <p>20) List of Equipment and Equipment Holder objects contained in a specified Managed Element, or Equipment Holder, for all levels of the containment hierarchy (just the names, or with all associated attributes).</p> <p>21) List of all Equipment and Equipment Holder objects directly contained in a specified Equipment Holder.</p> <ul style="list-style-type: none"> <li>• This method differs from the previous one in that it only looks at the next level of the containment hierarchy.</li> </ul> <p>22) List of all PTPs supported by an Equipment (just the names, or with all associated attributes).</p> <ul style="list-style-type: none"> <li>• The PTPs that are returned are those that share their physical layer with the primary equipment (i.e. that represent a port on the equipment or are connected by a fibre, wire, etc.).</li> <li>• When there is equipment protection, this operation reports PTPs for the primary equipment only. That is, when called on a protecting equipment (as opposed to the primary equipment), this operation returns an empty list, irrespective of the current switch status.</li> </ul> <p>23) List of all Equipment objects which implement a PTP. (just the names, or with all associated attributes).</p> <ul style="list-style-type: none"> <li>• The equipments that are returned are those which support the physical layer of the PTP (i.e. have the port on them or are connected by a fibre, wire, etc.).</li> <li>• For a particular PTP the Tx port and Rx port may be on different cards and in this case both should be returned. Equipment that are used by the PTPs, but that do not support them directly (such as a shared DEMUX card) are not reported.</li> </ul> <p>24) List of all protection groups. Refer to <a href="#">Use Case 5.7.1: NMS retrieves all the Protection Groups of a Managed Element</a>.</p> <p>25) List of names of CTPs that can carry protected traffic (protected TPs).</p> <p>26) List of names of CTPs that can carry preemptible extra traffic (preemptible TPs).</p> <p>27) List of names of CTPs that are configured to carry Non-preemptible Unprotected extra Traffic (NUT TPs).</p> <p>28) List of all ASAPs of the EMS.</p>
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<p>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</p> <p>2) The NMS determines that it needs to query the EMS concerning a particular network inventory item.</p>
<b>Begins when</b>	The NMS sends an inventory query to the EMS.

**Use Case 5.4.4: NMS queries EMS concerning inventory**

<b>Description</b>	<p>1) The NMS sends a network inventory query to the EMS.</p> <p>2) The EMS provides the requested network inventory information to the NMS.</p>
<b>Ends when</b>	<p>In case of success: The NMS receives the requested network inventory information.</p> <p>In case of failure: The NMS receives a negative response from the NMS or the request times out.</p>
<b>Post-conditions</b>	<p>In case of success: The NMS has received the requested network inventory information from the EMS.</p> <p>In case of failure: The EMS has not received the requested network inventory information.</p>
<b>Exceptions</b>	<p>1) Communication failure between the NMS and the EMS.</p> <p>2) The NMS may include incorrect or unknown information in its queries to the EMS. See Use Case 5.4.2: NMS resynchronizes its database with the EMS.</p> <p>3) Query unknown or not supported.</p> <p>4) Unable to comply.</p>
<b>Traceability</b>	<p><a href="#">Requirement II. 002</a>, <a href="#">Requirement II. 004</a>, <a href="#">Requirement II. 006</a>, <a href="#">Requirement II. 011</a>,  <a href="#">Requirement II. 008</a>, <a href="#">Requirement II. 012</a>, <a href="#">Requirement II. 015</a>, <a href="#">Requirement II. 018</a>,  <a href="#">Requirement II. 020</a>, <a href="#">Requirement II. 022</a>, <a href="#">Requirement II. 024</a>, <a href="#">Requirement II. 026</a>,  <a href="#">Requirement II. 033</a>, <a href="#">Requirement II. 040</a>, <a href="#">Requirement II. 047</a>, <a href="#">Requirement II. 050</a>,  <a href="#">Requirement II. 056</a>, <a href="#">Requirement II. 058</a>.</p>

### 5.4.5 EMS notifies NMS of inventory change

#### Use Case 5.4.5: EMS notifies NMS of inventory change

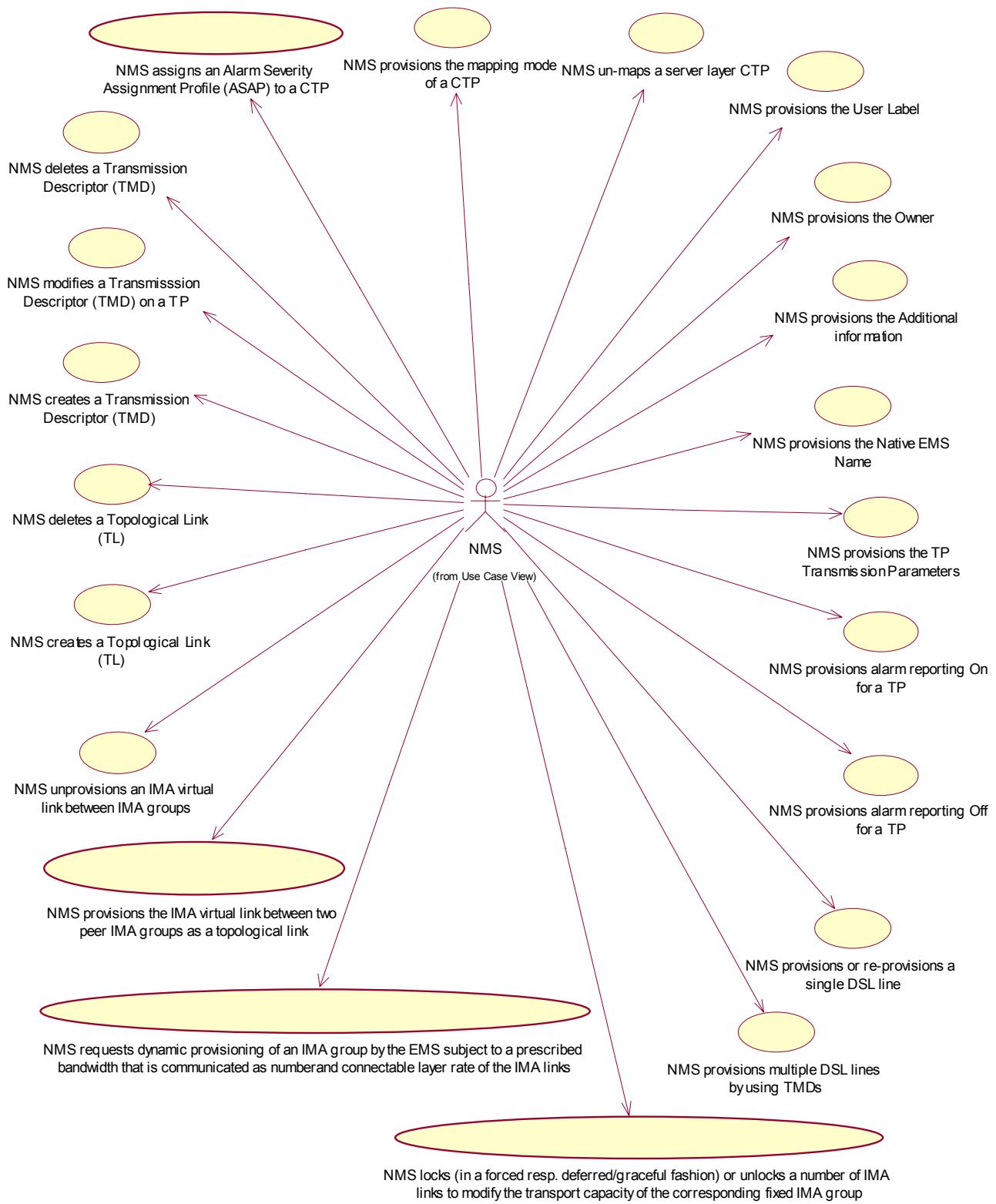
<b>Use Case Name</b>	EMS notifies NMS of inventory change
<b>Summary</b>	The EMS detects a change in the monitored network and notifies the NMS.
<b>Actors</b>	EMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.4.1: NMS registers to receive network updates information from the EMS</a> .
<b>Begins when</b>	The EMS detects a change in the monitored network.
<b>Description</b>	<p>1) The EMS detects a change in the monitored network and generates a notification to inform the NMS. Refer to <a href="#">{Requirement II. 064}</a> for object creation notifications, <a href="#">{Requirement II. 065}</a> for object deletion notifications, <a href="#">{Requirement II. 066}</a> for attribute change notifications and <a href="#">{Requirement II. 067}</a> for state change notifications.</p> <p>2) The NMS receives the notification from the Notification Service.</p>
<b>Ends when</b>	<p>In case of success: The NMS receives the notification.</p> <p>In case of failure: The NMS does not receive the notification.</p>
<b>Post-conditions</b>	<p>In case of success: The NMS database remains aligned with the EMS's database.</p> <p>In case of failure: The NMS database is misaligned with the EMS's database.</p>
<b>Exceptions</b>	
<b>Traceability</b>	<a href="#">{Requirement II. 064}</a> , <a href="#">{Requirement II. 065}</a> , <a href="#">{Requirement II. 066}</a> , <a href="#">{Requirement II. 067}</a>

### 5.5 Provisioning Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.5.1:</a>	<a href="#">NMS provisions the mapping mode of a CTP</a>	<a href="#">{Requirement II. 068}</a>
<a href="#">Use Case 5.5.2:</a>	<a href="#">NMS un-maps a server layer CTP</a>	<a href="#">{Requirement II. 069}</a>
<a href="#">Use Case 5.5.3:</a>	<a href="#">NMS provisions the User Label</a>	<a href="#">{Requirement II. 075}</a>
<a href="#">Use Case 5.5.4:</a>	<a href="#">NMS provisions the Owner</a>	<a href="#">{Requirement II. 076}</a>
<a href="#">Use Case 5.5.5:</a>	<a href="#">NMS provisions the Additional Information</a>	<a href="#">{Requirement II. 223}</a>
<a href="#">Use Case 5.5.6:</a>	<a href="#">NMS provisions the Native EMS Name</a>	<a href="#">{Requirement II. 077}</a>
<a href="#">Use Case 5.5.7:</a>	<a href="#">NMS Provisions the TP Transmission Parameters</a>	<a href="#">{Requirement II. 072}</a>

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Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.5.8:</a>	<a href="#">NMS provisions alarm reporting on for a TP</a>	{Requirement II. 108}
<a href="#">Use Case 5.5.9:</a>	<a href="#">NMS provisions alarm reporting off for a TP</a>	{Requirement II. 109}
<a href="#">Use Case 5.5.10:</a>	<a href="#">NMS creates a Topological Link (TL)</a>	{Requirement II. 168}
<a href="#">Use Case 5.5.11:</a>	<a href="#">NMS deletes a Topological Link (TL)</a>	{Requirement II. 170}
<a href="#">Use Case 5.5.12:</a>	<a href="#">NMS creates a Transmission Descriptor (TMD)</a>	{Requirement II. 190}
<a href="#">Use Case 5.5.13:</a>	<a href="#">NMS modifies a Transmission Descriptor (TMD) on a TP</a>	{Requirement II. 194}
<a href="#">Use Case 5.5.14:</a>	<a href="#">NMS deletes a Transmission Descriptor (TMD)</a>	{Requirement II. 192}
<a href="#">Use Case 5.5.15:</a>	<a href="#">NMS creates a Group Termination Point (GTP)</a>	{Requirement II. 164}, {Requirement II. 165}
<a href="#">Use Case 5.5.16:</a>	<a href="#">NMS modifies a Group Termination Point (GTP)</a>	{Requirement II. 167}
<a href="#">Use Case 5.5.17:</a>	<a href="#">NMS deletes a Group Termination Point (GTP)</a>	{Requirement II. 166}
<a href="#">Use Case 5.5.18:</a>	<a href="#">NMS creates a Termination Point Pool (TP Pool)</a>	{Requirement II. 264}, {Requirement II. 265}
<a href="#">Use Case 5.5.19:</a>	<a href="#">NMS modifies a Termination Point Pool (TP Pool)</a>	{Requirement II. 267}
<a href="#">Use Case 5.5.20:</a>	<a href="#">NMS deletes a Termination Point Pool (TP Pool)</a>	{Requirement II. 266}
<a href="#">Use Case 5.5.21:</a>	<a href="#">NMS assigns an Alarm Severity Assignment Profile (ASAP) to a CTP</a>	{Requirement II. 201}
<a href="#">Use Case 5.5.22:</a>	<a href="#">NMS locks (in a forced response deferred/graceful fashion) or unlocks a number of IMA links to modify the transport capacity of the corresponding fixed IMA group</a>	
<a href="#">Use Case 5.5.23:</a>	<a href="#">NMS requests dynamic provisioning of an IMA group by the EMS subject to a prescribed bandwidth that is communicated as number and connectable layer rate of the IMA links</a>	
<a href="#">Use Case 5.5.24:</a>	<a href="#">NMS provisions the IMA virtual link between two peer IMA groups as a topological link</a>	
<a href="#">Use Case 5.5.25:</a>	<a href="#">NMS unprovisions an IMA virtual link between IMA groups</a>	
<a href="#">Use Case 5.5.26:</a>	<a href="#">NMS provisions or re-provisions a single DSL line</a>	
<a href="#">Use Case 5.5.27:</a>	<a href="#">NMS provisions multiple DSL lines by using TMDs</a>	



**Figure 5.5: Provisioning Use Cases**

### 5.5.1 NMS provisions the mapping mode of a CTP

#### Use Case 5.5.1: NMS provisions the mapping mode of a CTP

<b>Use Case Name</b>	NMS provisions the mapping mode of a CTP
<b>Summary</b>	The NMS sets the mapping mode of a CTP (e.g., DS3, STS1, or VC4) to support client layer rate connections.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS knows the CTP it wishes to terminate and map, e.g. has a handle for the CTP.</li> <li>3) CTP has to be able to be terminated and mapped.</li> </ul>
<b>Begins when</b>	The NMS sends a request to the EMS to terminate and map the CTP (server layer CTP).
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The EMS validates the request against the server layer CTP specified as described in steps 2 through 8.</li> <li>2) The EMS validates if specified CTP exists. If not exception 1) is thrown.</li> <li>3) The EMS validates if the specified CTP is capable of being mapped.</li> <li>4) The EMS validates if the specified CTP is involved in an existing server layer cross-connection. If yes, the CTP cannot be terminated and mapped.</li> <li>5) The EMS validates ME containing the specified CTP is not accessible, if not then exception 4) is thrown.</li> <li>6) The EMS ignores any pending SNCs involving this CTP at either the server layer rate or a client layer rate.</li> <li>7) Note that it may be possible to set a CTP that is involved in a partial subnetwork connection to terminated and mapped (even if the partial SNC is at the server layer rate) if this CTP is not involved in an existing active cross-connection.</li> <li>8) The EMS validates if the CTP was already terminated and mapped, then the operation shall be considered a success.</li> <li>9) The EMS terminates and maps the CTP specified. An AVC will be sent to the Notification Service.</li> <li>10) If in the specific implementation of NE/EMS the client layer CTPs are actually created as a result of this operation, then it is assumed that the alarm reporting state of the newly created client layer CTPs will be disabled by default. Object creation notifications will not be generated for the newly created client layer CTPs. The EMS sends a response to the NMS</li> </ul>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives a response.</p> <p>In case of failure:</p> <p>The NMS receives a negative response or exception.</p>

**Use Case 5.5.1: NMS provisions the mapping mode of a CTP**

<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) The server layer trail termination functions are available.</li> <li>2) The CTP (including server layer trail termination functions) alarm reporting state remains unchanged from its setting prior to use of this operation. If the CTP had not previously existed on the NE, then it is assumed that the alarm reporting state of the newly created CTP will be disabled by default.</li> <li>3) If in the specific implementation of NE/EMS the client layer CTPs are actually created then it is assumed that the alarm reporting state of the client layer CTPs will be disabled by default on application of the terminate and map operation.</li> <li>4) AVC notifications are sent to the notification service.</li> </ol> <p>In case of failure:</p> <p>None.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Entity not found: The specified CTP does not exist.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Unable to comply: The CTP is involved in an existing, active cross connection at the CTP's native rate (CTP's layer rate); or the CTP is not in a valid state.</li> <li>4) NE communication loss</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II_068}</a>

### 5.5.2 NMS un-maps a server layer CTP

#### Use Case 5.5.2: NMS un-maps a server layer CTP

<b>Use Case Name</b>	NMS un-maps a server layer CTP
<b>Summary</b>	The NMS sets the mapping mode of a server layer CTP (e.g., DS3, STS1, or VC4) to no longer be mapped to client layer capacity (e.g., VT Group/TUG/VT1.5/VC12 etc.) and to no longer terminate the corresponding server layer G.805 trail.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS has a handle for a CTP that it wishes to modify.</li> <li>3) CTP has to be able to be un-terminated and un-mapped.</li> </ul>
<b>Begins when</b>	The NMS sends a request to the EMS to un-terminate and un-map a specified server layer CTP
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The EMS validates the request against the server layer CTP specified</li> <li>2) The EMS validates if the specified server layer CTP exists</li> <li>3) The EMS validates if the specified server layer CTP is capable of being un-mapped</li> <li>4) The EMS validates if specified server layer CTP is involved in (is not supporting) an existing Active client layer cross-connection (i.e., the client CTPs (if any exist) are in a not connected connection state). If yes, the server layer CTP cannot be un-mapped.</li> <li>5) Note that it is possible to adjust a Server layer CTP that is involved in a pending subnetwork connection, whether there are pending SNCs at a client layer rate or at the server layer rate. In other words, this operation ignores pending subnetwork connections involving the Server layer CTP or any client CTPs.</li> <li>6) Note that it is possible to adjust a CTP that is involved in a partial subnetwork connection (even if the partial SNC is at a client layer rate) if none of the client CTPs are involved in an existing active client layer cross-connection.</li> <li>7) If the Server layer CTP was already un-terminated and unadapted, then the operation shall be considered a success.</li> <li>8) The EMS sets the mapping mode on the Server layer CTP to un-channelized/un-terminated. AVC will be sent to the Notification Service.</li> <li>9) The EMS applies any necessary operations on the NE to deactivate traffic and management functions on the G.805 TTP, e.g., disables path trace processing, disables multiplexing/channelizing/mapping functions (makes the server layer CTP available for cross-connection at the server layer), removes VT visibility, etc. The alarm reporting state of the server layer CTP (and aggregated G.805 TTP) remains unchanged from its setting prior to use of this operation.</li> <li>10) The EMS sends a response to the NMS.</li> </ul>

**Use Case 5.5.2: NMS un-maps a server layer CTP**

<b>Ends when</b>	<p>In case of success: The NMS receives a response.</p> <p>In case of failure: The NMS receives a negative response.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) The appropriate structure is set on the NE so that the Server layer CTP (e.g., an STS1 CTP) is then available to be part of an SNC at the CTP rate (e.g., STS1).</li> <li>2) The Server layer CTP (and aggregated G.805 TTP) alarm reporting state remains unchanged from its setting prior to use of this operation.</li> <li>3) AVC notifications are sent to the Notification Service.</li> </ol> <p>In case of failure:</p> <p>None. NMS has received a negative response.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Entity not found: The specified CTP does not exist</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Unable to comply: The CTP is supporting (containing) one or more lower order (client) CTPs that are involved in existing, active cross connections at the lower order CTP rates.</li> <li>4) NE communication los</li> </ol>
<b>Traceability</b>	<a href="#">(Requirement II. 069)</a>

### 5.5.3 NMS provisions the User Label

#### Use Case 5.5.3: NMS provisions the User Label

<b>Use Case Name</b>	NMS provisions the User Label.
<b>Summary</b>	The NMS provisions the User Label of an object.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS knows the object for which it wishes to set the user label.</li> </ul>
<b>Begins when</b>	The NMS sends a request to the EMS to set the user label of an object and specifies whether the user label has to be unique among all objects of the same class as this object.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) If the NMS has specified that the user label has to be unique, the EMS checks if any other object of the same class has the given user label. If yes, exception 3) is thrown.</li> <li>2) EMS sets the user label to the specified value.</li> <li>3) If there has been a change in the value of the user label attribute, then the EMS forwards an AVC to the Notification Service.</li> <li>4) EMS replies with a success indication.</li> </ul>
<b>Ends when</b>	The NMS receives a response or a failure exception.
<b>Post-conditions</b>	<p>In case of success:</p> <p>User label of the specified object is set/modified and the corresponding AVCs are sent to the notification service.</p> <p>In case of failure:</p> <p>None</p>
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Entity not found: The specified object does not exist.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Unable to comply: The User Label can not be set.</li> <li>4) User label in use: The given user label is already being used.</li> <li>5) Invalid input: The specified name is invalid.</li> <li>6) NE communication loss.</li> </ul>
<b>Traceability</b>	<a href="#">{Requirement II. 075}</a>

### 5.5.4 NMS provisions the Owner

#### Use Case 5.5.4: NMS provisions the Owner

<b>Use Case Name</b>	NMS provisions the Owner.
<b>Summary</b>	The NMS provisions the Owner of an object.
<b>Actors</b>	NMS

**Use Case 5.5.4: NMS provisions the Owner**

<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS.</a></li> <li>2) The NMS knows the object for which it wishes to set the owner.</li> </ol>
<b>Begins when</b>	The NMS sends a request to the EMS to set the owner of an object.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) EMS sets the owner attribute of the specified object to the specified value.</li> <li>2) If there has been a change in the value of the owner attribute, then the EMS forwards an AVC to the notification service.</li> <li>3) EMS replies with a success indication</li> </ol>
<b>Ends when</b>	The NMS receives a response or a failure exception.
<b>Post-conditions</b>	<p>In case of success:</p> <p>Owner of specified object is set/modified and the corresponding AVC is sent to the notification service.</p> <p>In case of failure:</p> <p>None</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Entity not found: The specified object does not exist.</li> <li>2) Processing failure: The requested operation could not be performed.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 076}</a>

### 5.5.5 NMS provisions the Additional Information

#### Use Case 5.5.5: NMS provisions the Additional Information

<b>Use Case Name</b>	NMS provisions the Additional Information.
<b>Summary</b>	The NMS provisions the Additional Information of an object.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS knows the object for which it wishes to set the additional information.</li> </ul>
<b>Begins when</b>	The NMS sends a request to the EMS to set the additional information of an object.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) EMS sets the additional information attribute of the specified object to the specified value. As an input only the list of parameters to be changed, removed, or added is provided. If an entry is to be removed a special value is applied. If a parameter is specified that is currently not part of the additional information attribute of the specified object that parameter is added by the EMS with the specified value. The EMS may reject removal and addition requests.</li> <li>2) If there has been a change in the value of the additional information attribute, then the EMS forwards an AVC to the notification service.</li> <li>3) EMS replies with a success indication</li> </ul>
<b>Ends when</b>	The NMS receives a response or a failure exception.
<b>Post-conditions</b>	<p>In case of success:</p> <p>Additional information of the specified object is set/modified and the corresponding AVC is sent to the notification service.</p> <p>In case of failure:</p> <p>None</p>
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Entity not found: The specified object does not exist.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Unable to comply: The EMS is unable or unwilling to execute the request.</li> <li>4) Invalid input: The input parameters are syntactically incorrect.</li> <li>5) NE communication loss.</li> </ul>
<b>Traceability</b>	<a href="#">{Requirement II. 223}</a>

### 5.5.6 NMS provisions the Native EMS Name

#### Use Case 5.5.6: NMS provisions the Native EMS Name

<b>Use Case Name</b>	NMS provisions the Native EMS Name
<b>Summary</b>	The NMS provisions the native EMS name of an object.
<b>Actors</b>	NMS

**Use Case 5.5.6: NMS provisions the Native EMS Name**

<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS.</a></li> <li>2) The NMS knows the object for which it wishes to set the native EMS name.</li> <li>3) The EMS supports setting of native EMS name by NMS.</li> </ol>
<b>Begins when</b>	The NMS sends a request to the EMS to set the native EMS name of an object.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) EMS sets the native EMS name of the specified object to the specified value.</li> <li>2) If there has been a change in the native EMS name, then the EMS forwards an AVC to the notification service.</li> <li>3) EMS replies with a success indication.</li> </ol>
<b>Ends when</b>	The NMS receives a response or a failure exception.
<b>Post-conditions</b>	<p>In case of success:</p> <p>Native EMS Name of specified object is set/modified and the corresponding AVC is sent to the notification service.</p> <p>In case of failure:</p> <p>None</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Entity not found: The specified object does not exist.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: The specified name is invalid.</li> <li>4) Unable to comply: The native EMS name can not be set.</li> <li>5) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 077}</a>

### 5.5.7 NMS provisions the TP Transmission Parameters

#### Use Case 5.5.7: NMS Provisions the TP Transmission Parameters

<b>Use Case Name</b>	NMS Provisions the TP Transmission Parameters
<b>Summary</b>	<p>1) The NMS requests that a termination point's (TP) transmission parameters be provisioned. For example, the types of TP transmission parameters that can be provisioned include for SONET/SDH/DWDM:</p> <ul style="list-style-type: none"> <li>• For DS1: frame format (e.g. SF, ESF, and Unframed) and line coding (e.g. B8ZS and AMI)</li> <li>• For DS3: frame format (e.g. M23, C-bit parity, and Unframed)</li> <li>• For STS-1: expected incoming and outgoing path trace</li> <li>• For DWDM TP: TunedFrequency, etc.</li> </ul> <p>2) The NMS must be aware that the provisioning of a TP transmission parameter when the TP is actively involved in a SNC may cause service disruption. The provisioning of a connected TP does not involve in the tearing down of the associated cross-connect.</p> <p><b>Note:</b> The specific TP transmission parameters and values varies across different vendors and technologies.</p>
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS sends the request to set a transmission parameter(s) on the TP.
<b>Description</b>	<p>1) The NMS sends the request to set transmission parameter(s) on the specified TP.</p> <p>2) The EMS validates the TP reference (e.g. name).</p> <p>3) The EMS validates the request (e.g. transmission parameter name(s) exists and value(s) are valid) and supported.</p> <p>4) The EMS sets the specified TP's transmission parameter(s) to the specified value(s).</p> <p>5) If there has been a transmission parameter value change(s), then the EMS forwards attribute value change notification(s) to all subscribing NMSs.</p> <p>6) The EMS replies with a success indication.</p>
<b>Ends when</b>	<p>In case of success: The NMS receives an indication of success of the action.</p> <p>In case of failure: The NMS receives an indication of failure of the action.</p>

**Use Case 5.5.7: NMS Provisions the TP Transmission Parameters**

<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) The TP's transmission parameter(s) have been set to the specified value.</li> <li>2) The EMS has forwarded attribute value change notification(s) if the TP's transmission parameter(s) have changed in value.</li> </ol> <p>In case of partial success:</p> <p>If the request to set the transmission parameter(s) succeeded and the TP's transmission parameter(s) have changed in value, then the EMS has forwarded attribute value change notification(s) to all subscribing NMSs.</p> <p>In case of failure:</p> <p>Appropriate exception is reported to the NMS.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed.</li> <li>2) Invalid input: The TP reference is invalid.</li> <li>3) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">(Requirement II. 072)</a>

### 5.5.8 NMS provisions alarm reporting on for a TP

#### Use Case 5.5.8: NMS provisions alarm reporting on for a TP

<b>Use Case Name</b>	NMS provisions alarm reporting on for a TP
<b>Summary</b>	The NMS requests to activate all alarm reporting on a termination point (TP).
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS sends the request to activate alarm reporting to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends the request to activate alarm reporting on for a specified TP.</li> <li>2) The EMS validates the TP reference (e.g. name).</li> <li>3) The EMS enables alarm reporting on the specified TP. The alarm reporting state of the contained TP(s) may also be enabled.</li> <li>4) The EMS replies with a success indication.</li> <li>5) Attribute Value Change notification(s) for the specified TP and the contained TP(s), if any, are forwarded to the notification service indicating that alarm reporting has been activated for these TP(s).</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives an indication of success of the action.</p> <p>In case of failure:</p> <p>The NMS receives an indication of failure of the action.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) Alarm monitoring is enabled on the specified TP. This does not mean that alarm is reported anyway, because Alarm Severity Assignment Profile may perform further filtering.</li> <li>2) The EMS has forwarded an attribute value change notification if there was an attribute value change with the enabling of alarm monitoring on the TP.</li> </ol> <p>In case of failure:</p> <p>None.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed.</li> <li>2) Invalid input: The TP reference is invalid.</li> <li>3) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">(Requirement II. 108}</a>

### 5.5.9 NMS provisions alarm reporting off for a TP

#### Use Case 5.5.9: NMS provisions alarm reporting off for a TP

<b>Use Case Name</b>	NMS provisions alarm reporting off for a TP
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**Use Case 5.5.9: NMS provisions alarm reporting off for a TP**

<b>Summary</b>	The NMS requests to deactivate alarm reporting on a specified termination point (TP). Notes: There are no side effects upon transmission behavior (propagated alarm signals e.g. AIS) associated with the TP.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS sends the request to deactivate alarm reporting to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends the request to deactivate alarm reporting on the specified TP.</li> <li>2) The EMS validates the TP reference (e.g. name).</li> <li>3) The EMS disables alarm reporting on the specified TP. The alarm reporting state of the contained TP(s) may also be disabled. This disables alarm reporting even if Alarm Severity Assignment Profile would allow it.</li> <li>4) The EMS replies with a success indication.</li> <li>5) Attribute Value Change notification(s) for the specified TP and the contained TP(s), if any, are forwarded to the notification service indicating that alarm reporting has been deactivated for these TP(s).</li> </ol>
<b>Ends when</b>	<p>In case of success: The NMS receives an indication of success of the action.</p> <p>In case of failure: The NMS receives an indication of failure of the action.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) Alarm reporting is disabled on the specified TP and all the contained TP(s)..</li> <li>2) The EMS has forwarded an attribute value change notification.</li> </ol> <p>In case of failure: None.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed.</li> <li>2) Invalid input: The TP reference is invalid.</li> <li>3) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 109}</a>

### 5.5.10 NMS creates a Topological Link (TL)

#### Use Case 5.5.10: NMS creates a Topological Link (TL)

<b>Use Case Name</b>	NMS creates a Topological Link (TL)
<b>Summary</b>	The NMS creates a Topological Link (TL).
<b>Actors</b>	NMS.
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The Topological Link end TPs have to exist</li> </ul>
<b>Begins when</b>	The NMS sends the request to the EMS to create a Topological Link.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The EMS validates the request syntax. If not exception 1) is thrown.</li> <li>2) The EMS validates the TL name is not already in use. As owner of TPs and TLs, the EMS may perform this validation against data that was manually entered at the EMS or auto-discovered. This EMS authority to use auto-discovered information also applies to the following data validations. If not exception 2) is thrown.</li> <li>3) The EMS validates that the A and Z end TPs referenced in the request exist in its domain of control. If not exception 3) is thrown.</li> <li>4) The EMS validates that neither TP is already assigned to a TL. If not exception 2) is thrown.</li> <li>5) The EMS validates that the rate specified in the request, as well as any other additional creation information, is consistent with its own data. If not exception 2) is thrown.</li> <li>6) As owner of TPs and TLs, the EMS validates the request against its own criteria. If not exception 4) is thrown.</li> <li>7) The EMS creates the TL.</li> <li>8) The EMS sends a response to the NMS.</li> </ul>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives an indication of success of the action.</p> <p>In case of failure:</p> <p>The NMS receives an indication of failure of the action.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>The TL is available.</p> <p>In case of failure:</p> <p>None. NMS has received an indication of failure of the action or exception</p>

**Use Case 5.5.10: NMS creates a Topological Link (TL)**

<b>Exceptions</b>	1) Invalid input: request syntax is not valid. 2) Object in use: the request attempts to create a TL that already exists, or the request references TPs that are already associated with TLs. 3) Entity not found: the request references an entity that does not exist. 4) Unable to comply: the EMS rejects the request based on its own criteria. 5) Processing failure: The requested operation could not be performed. 6) User label in use: The user label supplied by the NMS is already in use.
<b>Traceability</b>	<a href="#">(Requirement II. 168)</a>

### 5.5.11 NMS deletes a Topological Link (TL)

#### Use Case 5.5.11: NMS deletes a Topological Link (TL)

<b>Use Case Name</b>	NMS deletes a Topological Link (TL)
<b>Summary</b>	The NMS deletes a Topological Link (TL).
<b>Actors</b>	NMS.
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS has identified an existing Topological Link for deletion.</li> </ol>
<b>Begins when</b>	The NMS sends the request to the EMS to delete a Topological Link.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The EMS validates the request syntax. If not exception 1) is thrown.</li> <li>2) The EMS validates that the TL exists in its span of control. If not, exception 2 is thrown.</li> <li>3) As owner of TLs, the EMS validates the request against its own criteria. If not exception 3) is thrown.</li> <li>4) The EMS deletes the TL.</li> <li>5) The EMS sends a response to the NMS.</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives an indication of success of the action.</p> <p>In case of failure:</p> <p>The NMS receives an indication of failure of the action.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>The TL is deleted.</p> <p>In case of failure:</p> <p>None.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Invalid input: request syntax is not valid.</li> <li>2) Entity not Found: the request references a TL that does not exist.</li> <li>3) Unable to Comply: the EMS rejects the request based on its own criteria.</li> <li>4) Processing failure: The requested operation could not be performed.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 170}</a>

### 5.5.12 NMS creates a Transmission Descriptor (TMD)

#### Use Case 5.5.12: NMS creates a Transmission Descriptor (TMD)

<b>Use Case Name</b>	NMS creates a Transmission Descriptor (TMD)
<b>Summary</b>	The use case describes how the NMS requests that an EMS create a Transmission Descriptor (TMD). The NMS passes the TMD information to the EMS. The resulting TMD is returned as a result to the NMS.

**Use Case 5.5.12: NMS creates a Transmission Descriptor (TMD)**

<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS.</a>
<b>Begins When</b>	The NMS sends the create TMD request to EMS.
<b>Description</b>	<p>1) The NMS sends a create TMD request to EMS with the TMD creation information. The NMS may request that the EMS enforce a unique user label (the user label is selected by the NMS and the EMS makes sure the user label is not already in use).</p> <p>2) The EMS validates the request. The EMS creates the TMD, assigns a unique name to the TMD and stores it persistently.</p> <p>3) The EMS replies with a success indication.</p> <p>4) A TMD object creation event is sent by EMS to the notification service.</p> <p><b>Note:</b> It is up to the internal implementation of EMS which data are stored in EMS persistently and which ones will be queried from ME as required.</p>
<b>Ends When</b>	The EMS sends a reply to the NMS.
<b>Post-Conditions</b>	The TMD has been created in the EMS
<b>Exceptions</b>	<p>1) Not implemented: The EMS does not support this service.</p> <p>2) Invalid input: The NMS has supplied invalid input data.</p> <p>3) User label in use: The user label supplied by the NMS is already in use.</p> <p>4) Capacity exceeded: The Input data is valid but the EMS cannot create the TMD because the EMS has already exceeded its maximum number of TMDs.</p> <p>5) Processing failure: The requested operation could not be performed.</p>
<b>Traceability</b>	<a href="#">{Requirement II. 190}</a>

### 5.5.13 NMS modifies a Transmission Descriptor (TMD) on a TP

#### Use Case 5.5.13: NMS modifies a Transmission Descriptor (TMD) on a TP

<b>Use Case Name</b>	NMS modifies a Transmission Descriptor (TMD) on a TP
<b>Summary</b>	The NMS changes the Transmission Descriptor (TMD) (ingress and/or egress) for a TP.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) TransmissionDescriptor to be associated has to exist.</li> </ol>
<b>Begins when</b>	The NMS sends the modify TP request to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends the modify TP request to the EMS.</li> <li>2) The EMS validates the TP identifier.</li> <li>3) The EMS validates the TMD Name(s).</li> <li>4) The EMS communicates with the Network Elements (NE).</li> <li>5) The EMS changes the TMD(s) if possible. This will fail under the following conditions: <ul style="list-style-type: none"> <li>• The TP is terminating, but was not explicitly created.</li> <li>• The input data is valid but the EMS cannot change the TMD because resources are not available on the NE.</li> <li>• The input data is valid but the EMS cannot change the TMD because the new TMD does not provide enough resources for the existing SNCs running over the TP.</li> </ul> </li> <li>6) The EMS replies with a success indication.</li> <li>7) The EMS will generate an AVC for the TP with the new TMD name.</li> </ol>
<b>Ends when</b>	The EMS sends a reply to the NMS.
<b>Post-conditions</b>	The TMD(s) on the TP has been updated.
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: The NMS has supplied invalid input data (e.g. the TP or TMD identifier is invalid).</li> <li>4) Entity not found: The TP or TMD does not exist.</li> <li>5) Unable to comply: The transmission parameter values could not be configured in the TP.</li> <li>6) NE communication loss</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 194}</a>

### 5.5.14 NMS deletes a Transmission Descriptor (TMD)

#### Use Case 5.5.14: NMS deletes a Transmission Descriptor (TMD)

<b>Use Case Name</b>	NMS deletes a Transmission Descriptor (TMD)
<b>Summary</b>	<p>The NMS deletes a Transmission Descriptor (TMD).</p> <p>Remark:</p> <ul style="list-style-type: none"> <li>• The NMS is responsible to maintain the consistency of TMD across multiple administrative subnetworks. Routine integrity checking may be required. NMS must also check that the TMD is not being used in any EMS under its network domain, before the TMD can be deleted from the persistent storage.</li> <li>• This operation is idempotent. If the service is called with the name of a non-existent TMD, it will succeed.</li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The Transmission Descriptor to be deleted has to exist.</li> <li>3) The Transmission Descriptor has no association to a TP.</li> </ol>
<b>Begins When</b>	The NMS sends the delete TMD request to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a delete TMD request to the EMS.</li> <li>2) The EMS validates the TMD identifier and checks that this TMD is not being used on the EMS.</li> <li>3) If no TPs are using this TMD, the EMS deletes the TMD.</li> <li>4) The EMS replies with a success indication.</li> <li>5) A TMD object deletion event is sent by EMS to the notification service.</li> </ol>
<b>Ends When</b>	The EMS sends a reply to the NMS.
<b>Post-Conditions</b>	The TMD has been deleted in the EMS.
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Communication Failure with NE.</li> <li>3) Object in use: The TMD is being used.</li> <li>4) Entity not found: The TMD does not exist in the EMS.</li> <li>5) Invalid input: The NMS has supplied invalid input data (The TMD Name is invalid).</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 192}</a>

### 5.5.15 NMS creates a Group Termination Point (GTP)

#### Use Case 5.5.15: NMS creates a Group Termination Point (GTP)

<b>Use Case Name</b>	NMS creates a Group Termination Point (GTP)
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**Use Case 5.5.15: NMS creates a Group Termination Point (GTP)**

<b>Summary</b>	The use case describes how the NMS requests that an EMS create a new GTP. The NMS requests the creation of the GTP by either <ol style="list-style-type: none"> <li>1) listing the CTPs that comprise the GTP, or</li> <li>2) in the case of contiguous CTPs of the same layer rate, the NMS may list the first CTP and the number of following (contiguous) CTPs.</li> </ol> The resulting GTP is returned as a result to the NMS.
<b>Actors</b>	NMS.
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS.</a></li> <li>2) The NMS has defined a Topological Link</li> </ol>
<b>Begins when</b>	The NMS sends the request to the EMS to create a Group Termination Point (GTP).
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a create GTP request to EMS with the GTP distinguishing information. The NMS can provide either a listing of the specific CTPs that comprise the GTP, or the NMS may list the first CTP and the number of following CTPs (this second approach is only valid for contiguous CTPs of the same layer rate). The NMS also needs to determine the gtpEffort level. If gtpEffort is set to EFFORT_SAME, then the EMS must create the GTP with the exact same list of CTPs as provided with the GTP creation request. If EFFORT_WHATEVER is specified, then the EMS may comply with the total bandwidth requirement by using a different set of CTPs. It should be noted that this mode (i.e., EFFORT_WHATEVER) allows for the GTP components to be instantiated at a later time by the ME (e.g., upon detection of user's signal). Therefore the operation may successfully return a new GTP with an empty listOfCTPs attribute (to be updated at a later time once the component CTPs are created in the ME).</li> <li>2) The EMS validates the request. The EMS creates the GTP, assigns a unique name to the GTP and stores it persistently. If the NMS has specified EFFORT_WHATEVER, the EMS may create the GTP with a different list of CTPs than specified by the NMS, or create the GTP with an empty list of CTPs. In the latter case, the EMS supplies the CTPs at some later point in time (typically upon detection of a user signal connecting to the GTP).</li> <li>3) The EMS replies with a success indication.</li> <li>4) A Create GTP Notification is sent by EMS to the notification service.</li> </ol> <p><b>Note:</b></p> <p>It is up to the internal implementation of EMS which data are stored in EMS persistently and which ones will be queried from ME as required.</p>
<b>Ends when</b>	In case of success: The NMS receives an indication of success of the action. In case of failure: The NMS receives an indication of failure of the action.

**Use Case 5.5.15: NMS creates a Group Termination Point (GTP)**

<b>Post-conditions</b>	<p>In case of success:</p> <p>The GTP is available.</p> <p>In case of failure:</p> <p>None. NMS has received an indication of failure of the action or exception</p>
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Service not implemented by the EMS</li> <li>2) The NMS has supplied invalid input data.</li> <li>3) The user label supplied by the NMS is already in use.</li> <li>4) The Input data is valid but the EMS cannot create the GTP because there are insufficient resources in the network to create the GTP.</li> </ul>
<b>Traceability</b>	<a href="#">(Requirement II. 164)</a> , <a href="#">(Requirement II. 165)</a>

## 5.5.16 NMS modifies a Group Termination Point (GTP)

### Use Case 5.5.16: NMS modifies a Group Termination Point (GTP)

<b>Use Case Name</b>	NMS modifies a Group Termination Point (GTP)
<b>Summary</b>	The use case describes how the NMS requests that an EMS modify an existing GTP that has a non-empty list of CTPs. The modify GTP operation is used to add or delete CTPs from a GTP. For a given request, the NMS can only add or delete CTPs, not both. It is not possible to add a CTP that is already involved in a cross connection or SNC, or that is part of another GTP. Attempts to modify a GTP that is involved in a cross connection (or SNC) should be rejected by the EMS. The operation is best-effort, i.e., the EMS will add or delete as many of the identified CTPs as possible. If the service is called with the name of a non-existent GTP or CTP, it will fail. If the GTP was initially created with gtpEffort equal to EFFORT_SAME, the EMS should reject the modification request.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The GTP to be modified already exists, and the EMS has assigned a set of CTPs to the GTP.</li> </ol>
<b>Begins when</b>	The NMS sends the modify GTP request to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a modify GTP request to EMS with the GTP distinguishing information.</li> <li>2) If the request involves CTP additions, the EMS will attempt to add as many of the CTPs as possible. If the request involves CTP deletions, the EMS will attempt to delete as many of the requested CTPs as possible.</li> <li>3) The EMS replies with a success indication and an updated listing of the CTPs that comprise the modified GTP.</li> <li>4) The EMS sends an AVC notification to the notification service, indicating that the list of CTPs for the GTP has changed.</li> </ol>
<b>Ends when</b>	The EMS sends a reply to the NMS.
<b>Post-conditions</b>	The GTP has been modified in the EMS.
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Service not implemented by the EMS.</li> <li>2) The NMS has supplied invalid input data.</li> <li>3) The user label supplied by the NMS is already in use.</li> <li>4) The EMS has not yet assigned a set of CTPs to the GTP.</li> <li>5) The GTP was initially created with gtpEffort equal to EFFORT_SAME.</li> <li>6) The Input data is valid but the EMS cannot modify the GTP because there are insufficient resources in the network to make the requested modification.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II, 167}</a>

**5.5.17 NMS deletes a Group Termination Point (GTP)****Use Case 5.5.17: NMS deletes a Group Termination Point (GTP)**

<b>Use Case Name</b>	NMS deletes a Group Termination Point (GTP)
<b>Summary</b>	The NMS deletes a GTP. This operation is idempotent. If the service is called with the name of a non-existent GTP, it will succeed.
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins When</b>	The NMS sends the delete GTP request to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a delete GTP request to the EMS.</li> <li>2) The EMS validates the GTP identifier and checks that this GTP is not being used in a XC or SNC.</li> <li>3) If no XCs or SNCs are using this GTP, the EMS deletes the GTP.</li> <li>4) The EMS replies with a success indication.</li> <li>5) A GTP object deletion event is sent by EMS to the notification service.</li> </ol>
<b>Ends When</b>	The EMS sends a reply to the NMS.
<b>Post-Conditions</b>	The GTP has been deleted in the EMS.
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Service not implemented</li> <li>2) Communication Failure with NE.</li> <li>3) The GTP is being used by an XC or an SNC.</li> <li>4) The NMS has supplied invalid input data (The TMD Name is invalid).</li> </ol>
<b>Traceability</b>	<a href="#">(Requirement II. 166)</a>

**5.5.18 NMS creates a Termination Point Pool (TP Pool)****Use Case 5.5.18: NMS creates a Termination Point Pool (TP Pool)**

<b>Use Case Name</b>	NMS creates a Termination Point Pool (TP Pool)
<b>Summary</b>	The use case describes how the NMS requests that an EMS create a TP Pool. The NMS passes the TP Pool create information to the EMS. The resulting TP Pool is returned as a result to the NMS.  Remark: <ul style="list-style-type: none"> <li>• It is up to the NMS whether it maintains TP Pools across multiple administrative subnetworks and hence EMSs.</li> </ul>
<b>Actors</b>	NMS.
<b>Pre-conditions</b>	1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS sends the request to the EMS to create a TP Pool.

**Use Case 5.5.18: NMS creates a Termination Point Pool (TP Pool)**

<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a create TPPool request to EMS with the TPPool creation information. The NMS may request that the EMS enforce a unique user label (the user label is selected by the NMS and the EMS makes sure the user label is not already in use).</li> <li>2) The EMS validates the request. The EMS creates the TP Pool, assigns a unique name to the TPPool and stores it persistently.</li> <li>3) The EMS replies with a success indication.</li> <li>4) A TPPool object creation event is sent by EMS to the notification service.</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives an indication of success of the action.</p> <p>In case of failure:</p> <p>The NMS receives an indication of failure of the action.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>The TPPool is available.</p> <p>In case of failure:</p> <p>None. NMS has received an indication of failure of the action or exception</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Service not implemented by the EMS</li> <li>2) The NMS has supplied invalid input data.</li> <li>3) The user label supplied by the NMS is already in use.</li> <li>4) The Input data is valid but the EMS cannot create the TPPool because the EMS has already exceeded its maximum number of TP Pools or the requested TPPool is too large.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 264}</a> , <a href="#">{Requirement II. 265}</a>

## 5.5.19 NMS modifies a Termination Point Pool (TP Pool)

### Use Case 5.5.19: NMS modifies a Termination Point Pool (TP Pool)

<b>Use Case Name</b>	NMS modifies a Termination Point Pool (TP Pool)
<b>Summary</b>	The NMS changes the contents of a TPPool.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The TP pool to be modified has to exist.</li> <li>3) TPs or GTPs to be removed have to be idle.</li> <li>4) TPs or GTPs to be added have to exist and have to belong to the TPPool's Subnetwork and must not be contained in a GTP or another TP pool.</li> </ol>
<b>Begins when</b>	The NMS sends the modify TPPool request to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends the modify TPPool request to the EMS, i.e. requests to add or delete TPs or GTPs to or from the TPPool.</li> <li>2) The EMS validates the passed TP identifiers.</li> <li>3) The EMS validates the TPPool identifier.</li> <li>4) The EMS changes the TPPool attributes if possible. This will fail under the following conditions: <ul style="list-style-type: none"> <li>• One or more passed TPs are “in use”.</li> <li>• One or more passed TPs are contained in a GTP.</li> </ul> </li> <li>5) The EMS replies with a success indication.</li> <li>6) The EMS will generate an AVC for the TPPool with the changed attributes..</li> </ol>
<b>Ends when</b>	The EMS sends a reply to the NMS.
<b>Post-conditions</b>	The TPPool has been modified in the EMS.
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Service not implemented by the EMS.</li> <li>2) Non-specific EMS internal failure.</li> <li>3) The NMS has supplied invalid input data (i.e., the TPPool identifier of one or more TP identifiers are invalid).</li> <li>4) One or more TPs or GTPs do not exist or do not belong to the TPPool's Subnetwork, and so the addressed TPPool can not be modified.</li> <li>5) An input parameter references an object that does not exist.</li> <li>6) One or more TPs or GTPs to be removed are not idle, or one or more TPs or GTPs to be added are contained in a GTP or another TPPool.<sup>7)</sup>The operation would result in resources being created or activated beyond the capacity supported by the NE/EMS.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 267}</a>

### 5.5.20 NMS deletes a Termination Point Pool (TP Pool)

#### Use Case 5.5.20: NMS deletes a Termination Point Pool (TP Pool)

<b>Use Case Name</b>	NMS deletes a Termination Point Pool (TP Pool)
<b>Summary</b>	<p>The NMS deletes a TPPool.</p> <p>Remark:</p> <ul style="list-style-type: none"> <li>• The NMS is responsible to maintain the consistency of TPPool across multiple administrative subnetworks and hence EMSs. Routine integrity checking may be required. NMS must also check that the TPPool is not being used in any EMS under its network domain, before the TPPool can be deleted from the persistent storage.</li> <li>• This operation is idempotent. If the service is called with the name of a non-existent TPPool, it will succeed.</li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The TP pool to be deleted must not be in use, i.e. all of its members must be idle.</li> </ol>
<b>Begins When</b>	The NMS sends the delete TPPool request to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a delete TPPool request to the EMS.</li> <li>2) The EMS validates the TPPool identifier and checks that this TPPool is not being used on the EMS, i.e. has all its member TPs or GTPs idle.</li> <li>3) If no TPs or GTPs are using this TPPool, the EMS deletes the TPPool.</li> <li>4) The EMS replies with a success indication.</li> <li>4) A TPPool object deletion event is sent by EMS to the notification service.</li> </ol>
<b>Ends When</b>	The EMS sends a reply to the NMS.
<b>Post-Conditions</b>	The TPPool has been deleted in the EMS. (Note. The TPPool can be deleted in the NMS if and only if no EMS uses this TD.)
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Service not implemented</li> <li>2) Non-specific EMS internal failure.</li> <li>3) The TPPool is being used (i.e., not all contained TPs or GTPs are idle).</li> <li>4) The NMS has supplied invalid input data (i.e., the TPPool name is invalid).</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 266}</a>

### 5.5.21 NMS assigns an Alarm Severity Assignment Profile (ASAP) to a CTP

#### Use Case 5.5.21: NMS assigns an Alarm Severity Assignment Profile (ASAP) to a CTP

<b>Use Case Name</b>	NMS assigns an Alarm Severity Assignment Profile (ASAP) to a CTP
<b>Summary</b>	The NMS assigns an ASAP, either previously created by the NMS, or created by EMS, to a CTP, at an NMS specified layer rate.

**Use Case 5.5.21: NMS assigns an Alarm Severity Assignment Profile (ASAP) to a CTP**

<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The identified ASAP already exists in the EMS.</li> <li>3) In case the resource is a TP: the provided layer rate is an encapsulated layer rate of the TP.</li> <li>4) The identified object has to exist.</li> <li>5) The identified object has to support the ASAP pointer feature.</li> </ol>
<b>Begins When</b>	The NMS sends the assign ASAP request to the EMS with the specified CTP.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends the request to assign the ASAP to the addressed CTP.</li> <li>2) The EMS validates the assignment request.</li> <li>3) if EMS does not support assignment of ASAPs via this interface, an exception is thrown.</li> <li>4) If the ASAP name does not refer to an ASAP object, or the specified layer rate is invalid for the addressed resource, i.e. it is not an encapsulated layer rate, then an exception is thrown.</li> <li>5) If the ASAP name or the resource name reference to non-existent object, then an exception is thrown.</li> <li>6) If there is a currently assigned ASAP, and this assignment is fixed on EMS side, then an exception is thrown.</li> <li>7) If the resource name refers to an object not supporting ASAP pointer feature then an exception is thrown.</li> <li>8) The NMS connects to the notification service and thus is able to receive notifications matching the filter conditions specified (if this has not been done earlier).</li> </ol> <p><b>Note:</b></p> <p>The main filtering criteria is on the notification type (i.e., alarm and/or threshold crossing alert). In addition, the NMS can request other filtering criteria. Any of the parameters of the filterable body of the alarm or threshold crossing alert notification can be used. The commonest filtering criteria for alarms are the Probable Cause and Perceived Severity parameters. See <a href="#">Use Case 5.8.1: NMS reconciles active alarms from an EMS</a> and <a href="#">Use Case 5.8.2: NMS reconciles active alarms for a specified Managed Element</a></p>
<b>Ends When</b>	The EMS sends a reply to the NMS.

**Use Case 5.5.21: NMS assigns an Alarm Severity Assignment Profile (ASAP) to a CTP**

<b>Post-Conditions</b>	<p>In case of success:</p> <p>This operation causes an alarm re-evaluation of the already detected defects according to the following rules. If alarms are reportable (*):</p> <ul style="list-style-type: none"> <li>• if the severity changes from any of critical, major, minor, warning, to not alarmed, then an alarm notification with cleared is sent and the alarm is no longer available for any alarm retrieval operation.</li> <li>• if the severity changes from not alarmed to any of critical, major, minor, warning, then an alarm notification with the new perceivedSeverity is sent (with the current EMS/NE time) and the alarm is available for any alarm retrieval operation.</li> <li>• if the severity changes from any of critical, major, minor, warning, to any of critical, major, minor, warning, then the alarm re-evaluation process is not performed.</li> </ul> <p>(*) an alarm is reportable by ME/EMS when</p> <ul style="list-style-type: none"> <li>• AlarmReporting = "on" (for PTP, CTP, FTP),</li> <li>• alarmReportingIndicator = true (for SNC, TopologicalLink, Equipment, EquipmentHolder, GTP),</li> <li>• always reportable for all other objects which do not have any alarm reporting attribute.</li> </ul> <p>Moreover, once an alarm becomes reportable by ME/EMS then the following procedure is performed:</p> <ul style="list-style-type: none"> <li>• If the managed object has a valid aSAPpointer, then it is searched the entry with &lt;same probableCause&gt; AND &lt;same probableCauseQualifier&gt; AND &lt;same nativeProbableCause&gt; <ul style="list-style-type: none"> <li>i) probableCauseQualifier value may be empty, which means &lt;TRUE&gt; condition</li> <li>ii) nativeProbableCause value may be empty, which means &lt;TRUE&gt; condition</li> </ul> <p>E.g. if the reportable alarm has LOS probableCause and an ASAP entry is found with LOS probableCause and both probableCauseQualifier and nativeProbableCause are empty strings, then the search is successful, and the associated severities are assigned:</p> <ul style="list-style-type: none"> <li>• the alarm is service affecting: it is assigned the severity specified in the serviceAffecting attribute; if not explicitly assigned, i.e. ANY, see below (*)</li> <li>• the alarm is service non affecting: it is assigned the severity specified in the serviceNonAffecting attribute; if not explicitly assigned, i.e. ANY, see below (*)</li> </ul> </li> </ul>
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**Use Case 5.5.21: NMS assigns an Alarm Severity Assignment Profile (ASAP) to a CTP**

	<ul style="list-style-type: none"> <li>• the alarm is service independent or EMS does not know whether the alarm actually affects the service or not: it is assigned the severity specified in the serviceIndependentOrUnknown attribute; if not explicitly assigned, i.e. ANY, see below (*)</li> <li>• If the corresponding probableCause is not found in the ASAP, or the managed object has not a (valid) aSAPpointer then:           <ul style="list-style-type: none"> <li>(*) it is assigned the default / native severity at EMS/NE side, if any, otherwise the INDETERMINATE severity is assigned.</li> </ul> <p>Once a severity (including the INDETERMINATE) has been assigned, the alarm notification is emitted, but in the case of “NOTALARMED” - cleared severity, which causes the non emission of the alarm notification. Any operation of alarm retrieval will not include such “NOTALARMED” alarms.</p> <p>In case of failure:</p> <p>Either the currently assigned ASAP is maintained, e.g. because the assignment is fixed on EMS side, or no ASAP is assigned.</p> </li> </ul>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: The aSAPName does not refer to an ASAP object, or layerRate is invalid for the addressed resource, i.e. it is not an encapsulated layerRate.</li> <li>4) Entity not found: The aSAPName or resourceName reference an object that does not exist.</li> <li>5) Unable to comply: The currently assigned ASAP object cannot be de-assigned, or resourceName refers to object not supporting ASAP pointer feature.</li> </ol>
<b>Traceability</b>	<a href="#">(Requirement II. 201)</a>

### **5.5.22 NMS locks (in a forced response deferred/graceful fashion) or unlocks a number of IMA links to modify the transport capacity of the corresponding fixed IMA group**

**Use Case 5.5.22: NMS locks (in a forced response deferred/graceful fashion) or unlocks a number of IMA links to modify the transport capacity of the corresponding fixed IMA group**

<b>Use Case Name</b>	NMS locks (in a forced response. deferred/graceful fashion) or unlocks a number of IMA links to modify the transport capacity of the corresponding fixed IMA group
<b>Summary</b>	<p>Depending on the respective equipment support the bandwidth capacity of a ready-to-use or in-use configured IMA group can be adjusted by locking previously unlocked IMA links or unlocking previously locked IMA links or both. The NMS must first discover the server CTPs of the fixed IMA group FTP (because these are the associated potential or actual IMA links) and determine which of them are currently locked (or shutting down) and which are unlocked. Depending on the capacity requirement to be met it then locks or unlocks the appropriate IMA links.</p> <p>This Use Case is an application of the following use cases depending on how the EMS supports the locking and unlocking of a TP:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a></li> <li>• <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a></li> <li>• <a href="#">Use Case 5.5.5: NMS provisions the Additional Information</a></li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins When</b>	The NMS sends a request to the EMS for the server CTPs of the IMA group FTP
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS queries the EMS regarding the CTPs supported by the IMA group FTP and figures out the server CTPs, i.e. the fragments.</li> <li>2) The NMS verifies if it can meet the requirements of the bandwidth demand using the available fragments (number and transmission rate of fragments).</li> <li>3) If the bandwidth demand can be fulfilled then the NMS selects the series of CTPs that needs to be locked (in a forced or graceful manner) or unlocked for adjusting the bandwidth.</li> <li>4) The NMS sends requests to provision each CTP needed to support the bandwidth adjustment order (refer to <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a> in case of using "ServiceState" response <a href="#">Use Case 5.5.5: NMS provisions the Additional Information</a> in case of using "AdminState").</li> <li>5) The bandwidth demand is met successfully if the NMS receives a success indication from the EMS for each CTP provisioning and the new bandwidth is stored in the IMA group as transmission parameter "Bandwidth" of LR_ATM_NI.6. If one or several CTPs could not be provisioned properly then the NMS may choose to meet the bandwidth demand only partially or to re-provision the CTPs that were successfully provisioned (i.e., rollback the successful work).</li> </ol>

**Use Case 5.5.22: NMS locks (in a forced response deferred/graceful fashion) or unlocks a number of IMA links to modify the transport capacity of the corresponding fixed IMA group**

<b>Ends When</b>	<p>In case of success: The NMS receives the indication that all CTPs are provisioned properly.</p> <p>In case of failure: The NMS receives an indication of provisioning failure for at least one CTP.</p>
<b>Post-Conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) All CTPs required to fulfill the bandwidth demand have been provisioned.</li> <li>2) The EMS has forwarded TP modification notifications to all subscribing NMSs</li> </ol> <p>In case of failure:</p> <p>Some or all CTPs have not been newly provisioned.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> </ol>
<b>Traceability</b>	

**5.5.23 NMS requests dynamic provisioning of an IMA group by the EMS subject to a prescribed bandwidth that is communicated as number and connectable layer rate of the IMA links**

**Use Case 5.5.23: NMS requests dynamic provisioning of an IMA group by the EMS subject to a prescribed bandwidth that is communicated as number and connectable layer rate of the IMA links**

<b>Use Case Name</b>	NMS requests dynamic provisioning of an IMA group by the EMS subject to a prescribed bandwidth that is communicated as number and connectable layer rate of the IMA links.
<b>Summary</b>	<p>Using appropriate transmission parameters for the IMA group the NMS requests by the EMS to load the IMA group with a load of its choice but with prescribed bandwidth.</p> <p>This Use Case is an application of the following use case:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a></li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins When</b>	The NMS splits the required bandwidth into a layer rate supported by the ME and a multiplicity factor.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS recalculates the required bandwidth according to the formula “FragmentServerLayer” * “AllocatedNumber” thereby taking care that “FragmentServerLayer” represents a transmission layer rate supported by the ME (refer to the transmission parameters for layer rate LR_Fragment).</li> <li>2) The NMS executes the <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a> for the IMA group TP with these two transmission parameters.</li> <li>3) The bandwidth demand is met successfully if the NMS receives a success indication from the EMS for each CTP provisioning and the new bandwidth is stored in the IMA group as transmission parameter “Bandwidth” of LR_ATM_NI.</li> </ol>
<b>Ends When</b>	<p>In case of success:</p> <p>The NMS receives the indication that the IMA group has been re configured, namely AVCs for the two passed transmission parameters.</p> <p>In case of failure:</p> <p>The NMS receives an indication of configuration failure.</p>
<b>Post-Conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) All SNCs required to reload the IMA group have been created implicitly.</li> <li>2) The EMS has forwarded AVC notifications to all subscribing NMSs</li> </ol> <p>In case of failure:</p> <p>The NMS receives an indication of provisioning failure for the IMA group TP.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> </ol>
<b>Traceability</b>	

## 5.5.24 NMS provisions the IMA virtual link between two peer IMA groups as a topological link

**Use Case 5.5.24: NMS provisions the IMA virtual link between two peer IMA groups as a topological link**

<b>Use Case Name</b>	NMS provisions the IMA virtual link between two peer IMA groups as a topological link
<b>Summary</b>	<p>The NMS determines the number and layer rate of the IMA links required to support the bandwidth demand on either side of the IMA virtual link. It then creates a bidirectional TL between the two peer IMA groups at the ATM NI layer that provides the bandwidth.</p> <p>This Use Case is an application of the following use case:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.5.10: NMS creates a Topological Link (TL)</a></li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins When</b>	The NMS splits the required bandwidth into a layer rate supported by the ME and a multiplicity factor.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS recalculates the required bandwidth according to the formula “FragmentServerLayer” * “AllocatedNumber” thereby taking care that “FragmentServerLayer” represents a transmission layer rate supported by the ME (refer to the transmission parameters for layer rate LR_Fragment).</li> <li>2) The NMS executes the <a href="#">Use Case 5.5.10: NMS creates a Topological Link (TL)</a> with the following TL create data: bidirectional, LR_ATM_NI as layer rate, the two IMA groups as end points, and the two transmission parameters of step 1 as additional creation info.</li> <li>3) The bandwidth demand is met successfully if the NMS receives a success indication from the EMS for the TL creation, the new bandwidth is stored in both IMA groups as transmission parameter “Bandwidth” of LR_ATM_NI, and the two transmission parameters are stored as additional info parameters of the TL.</li> </ol>
<b>Ends When</b>	<p>In case of success:</p> <p>The NMS receives the indication that the TL has been created.</p> <p>In case of failure:</p> <p>The NMS receives an indication of creation failure (of some SNC or the TL).</p>
<b>Post-Conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) All SNCs required to load both IMA groups, and the TL, have been created.</li> <li>2) The EMS has forwarded SNC and TL creation notifications to all subscribing NMSSs.</li> </ol> <p>In case of failure:</p> <p>Some or all SNCs or the TL itself could not be created.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> </ol>
<b>Traceability</b>	

## 5.5.25 NMS unprovisions an IMA virtual link between IMA groups

### Use Case 5.5.25: NMS unprovisions an IMA virtual link between IMA groups

<b>Use Case Name</b>	NMS unprovisions an IMA virtual link between IMA groups
<b>Summary</b>	<p>The NMS deletes the TL between the IMA groups it has previously created.</p> <p>This Use Case is an application of the following use case:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.5.11: NMS deletes a Topological Link (TL)</a></li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	<p>The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> and either <a href="#">Use Case 5.5.24: NMS provisions the IMA virtual link between two peer IMA groups as a topological link</a> or <a href="#">Use Case 5.6.15: NMS creates a flexible IMA group</a> for both considered IMA groups (i.e., the NMS can only delete TLs that it owns).</p>
<b>Begins When</b>	The NMS determines the name of the TL between the two IMA groups in question
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS determines the name of the TL between the two considered IMA groups, optionally locks the two IMA groups (depending on EMS requirements), and executes the <a href="#">Use Case 5.5.11: NMS deletes a Topological Link (TL)</a>.</li> <li>2) The IMA virtual link is deleted successfully if the NMS receives a success indication from the EMS for the TL deletion.</li> <li>3) If the TL or one or several SNCs could not be deactivated and deleted (e.g., because they carry traffic and cannot be put out-of-service) then either the NMS needs to try again at a later time (IMA groups are only partially unloaded) or the NMS may set the Administrative state of the involved CTPs to “shutting down”, when supported by the EMS, to indicate its intention of SNC and TL deletion.</li> </ol>
<b>Ends When</b>	<p>In case of success:</p> <p>The NMS receives the indication that the TL has been deleted.</p> <p>In case of failure:</p> <p>The NMS receives an indication of deletion failure (of some SNC or the TL).</p>
<b>Post-Conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) All SNCs constituting both IMA groups and the TL have been deleted.</li> <li>2) The EMS has forwarded SNC and TL deletion notifications to all subscribing NMSs.</li> </ol> <p>In case of failure:</p> <p>Some or all SNCs or the TL itself could not be deleted.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> </ol>
<b>Traceability</b>	

## 5.5.26 NMS provisions or re-provisions a single DSL line

### Use Case 5.5.26: NMS provisions or re-provisions a single DSL line

<b>Use Case Name</b>	NMS provisions or re-provisions a single DSL line
<b>Summary</b>	<p>The NMS identifies the DSL line to be provisioned as either a TL between the TU-C/O PTP and the TU-R PTP or a single PTP representing both TU PTPs (e.g., since the TU-R is unmanaged). The NMS (re-)provisions the DSL line by provisioning its one or two end points. It locks the end point(s) administratively when required by the responsible EMS, sets the desired DSL parameters (which are transmission parameters of the respective DSL PTPs), and unlocks the end point(s) of the DSL line if they were locked. If administrative locking and unlocking are required by an EMS this means that DSL re-provisioning cannot be done in-service.</p> <p>This Use Case is an application of the following use cases depending on how the EMS(es) support(s) the locking and unlocking of a TP:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a></li> <li>• <a href="#">Use Case 5.5.5: NMS provisions the Additional Information</a></li> <li>• <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a></li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins When</b>	The NMS has identified the DSL line to be (re-)provisioned as either a TL or a single PTP.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS identifies the DSL line to be (re-)provisioned as either a TL or a single PTP (refer to <a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>).</li> <li>2) The NMS may assume that the downstream configuration parameters are stored at the TU-C/O PTP. The NMS knows whether the upstream configuration parameters are stored at the TU-C/O PTP as well (usual case) or at the TU-R PTP.</li> <li>3) The NMS locks the PTP(s) where the DSL parameters are stored when required.</li> <li>4) The NMS writes the desired downstream DSL parameters to the TU-C/O PTP and the desired upstream DSL parameters to the PTP where they are stored (refer to <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a>).</li> <li>5) The NMS unlocks the (re-)provisioned PTP(s) if it was (they were) locked.</li> </ol>
<b>Ends When</b>	<p>In case of success: The NMS receives the indication that all PTPs are provisioned properly.</p> <p>In case of failure: The NMS receives an indication of provisioning failure for at least one PTP.</p>
<b>Post-Conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) All PTPs constituting the DSL line have been provisioned.</li> <li>2) The EMS has forwarded PTP modification notifications to all subscribing NMSEs.</li> </ol> <p>In case of failure: Some or all PTPs have not been newly provisioned.</p>

**Use Case 5.5.26: NMS provisions or re-provisions a single DSL line**

<b>Exceptions</b>	1) Not implemented: The EMS does not support this service. 2) Processing failure: The requested operation could not be performed.
<b>Traceability</b>	

## 5.5.27 NMS provisions multiple DSL lines by using TMDs

### Use Case 5.5.27: NMS provisions multiple DSL lines by using TMDs

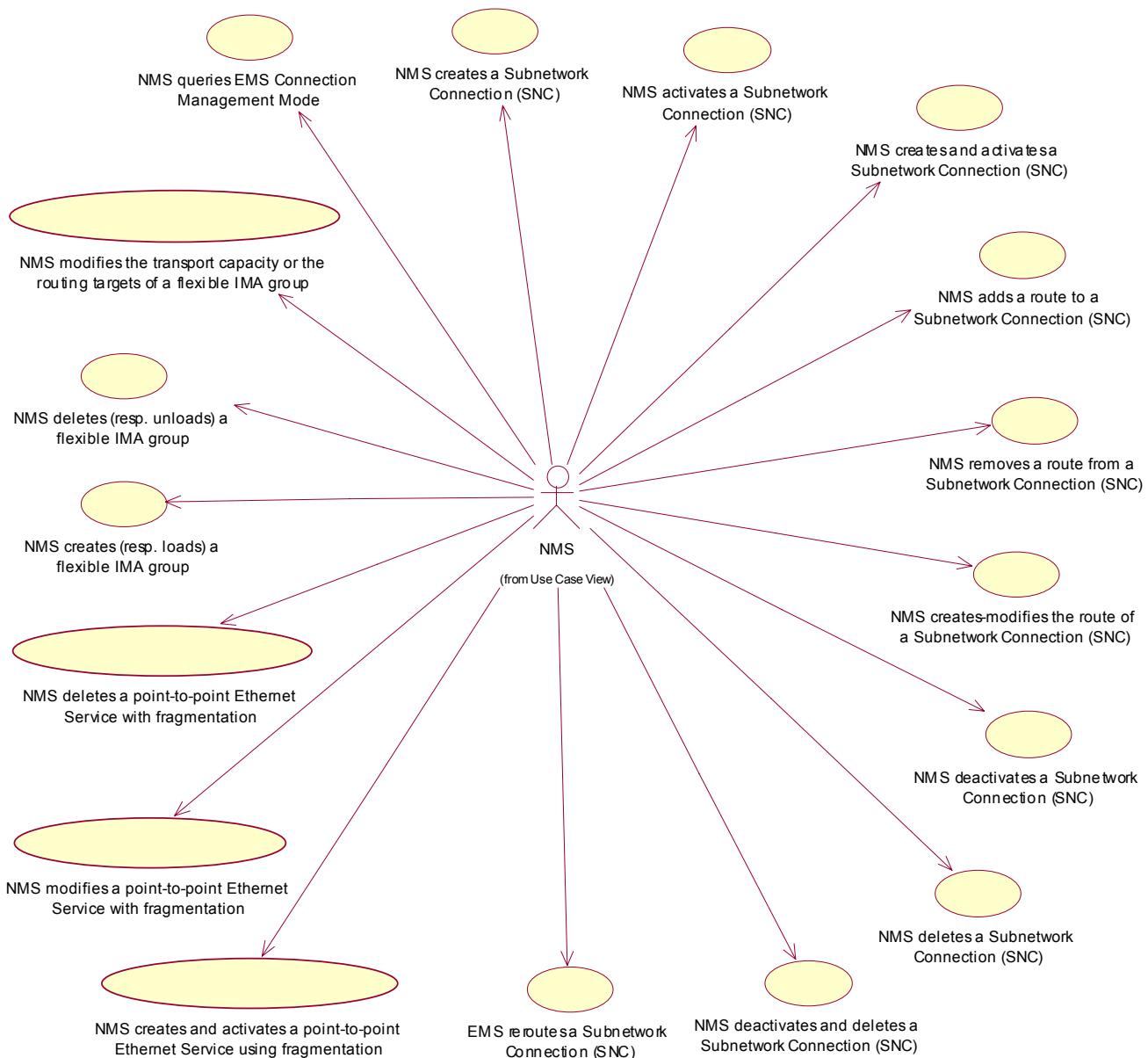
<b>Use Case Name</b>	NMS provisions multiple DSL lines by using TMDs
<b>Summary</b>	<p>The NMS identifies each DSL line to be provisioned as either a TL between the TU-C/O PTP and TU-R PTP or a single PTP representing both TU PTPs (e.g., since the TU-R is unmanaged).</p> <p>The NMS provisions each DSL line by provisioning its one or two end points by means of the same DSL TMDs. It locks all end points administratively when required by the EMS, assigns the desired TMDs to all end points, and unlocks the end points if they were locked. If administrative locking and unlocking are required by an EMS this means that DSL mass provisioning cannot be done in-service.</p> <p>This Use Case is an application of the following use cases depending on how the EMS(es) support(s) the locking and unlocking of a TP:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a></li> <li>• <a href="#">Use Case 5.5.5: NMS provisions the Additional Information</a></li> <li>• <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a></li> <li>• <a href="#">Use Case 5.5.13: NMS modifies a Transmission Descriptor (TMD) on a TP</a></li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins When</b>	The NMS has identified the DSL line to be mass provisioned as either a TL or a single PTP.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS identifies the DSL line to be mass provisioned as either TLs or a single PTPs (refer to <a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>).</li> <li>2) The NMS identifies the TMDs to be used. There may be a TMD for downstream/egress direction and a TMD for upstream/ingress direction (as seen from the TU-C/O PTP resp. aEndTP of the DSL line), or a TMD for both directions.</li> <li>3) The NMS locks all PTPs where the DSL downstream and upstream configuration parameters are stored when required.</li> <li>4) The NMS assigns the desired downstream TMD to all TU-C/O PTPs that store downstream parameters and the desired upstream TMD (which could be the same as the downstream TMD) to all PTPs that store upstream parameters (refer to <a href="#">Use Case 5.5.13: NMS modifies a Transmission Descriptor (TMD) on a TP</a>).</li> <li>5) The NMS unlocks the mass provisioned PTPs if they were locked.</li> </ol>
<b>Ends When</b>	<p>In case of success:</p> <p>The NMS receives the indication that all PTPs are provisioned properly.</p> <p>In case of failure:</p> <p>The NMS receives an indication of provisioning failure for at least one PTP.</p>

**Use Case 5.5.27: NMS provisions multiple DSL lines by using TMDs**

<b>Post-Conditions</b>	<p>In case of success:</p> <ul style="list-style-type: none"><li>1) All PTPs constituting an end point of the DSL lines have been provisioned.</li><li>2) The EMS has forwarded PTP modification notifications to all subscribing NMSSes.</li></ul> <p>In case of failure:</p> <p>Some or all PTPs have not been newly provisioned.</p>
<b>Exceptions</b>	<ul style="list-style-type: none"><li>1) Not implemented: The EMS does not support this service.</li><li>2) Processing failure: The requested operation could not be performed.</li></ul>
<b>Traceability</b>	

## 5.6 Connection Management Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.6.1:</a>	<a href="#">NMS creates a Subnetwork Connection (SNC)</a>	{Requirement II. 082}, {Requirement II. 083}, {Requirement II. 084}
<a href="#">Use Case 5.6.2:</a>	<a href="#">NMS activates a Subnetwork Connection (SNC)</a>	{Requirement II. 086}, {Requirement II. 087}
<a href="#">Use Case 5.6.3:</a>	<a href="#">NMS creates and activates a Subnetwork Connection (SNC)</a>	{Requirement II. 088}, {Requirement II. 089}
<a href="#">Use Case 5.6.4:</a>	<a href="#">NMS adds a route to a Subnetwork Connection (SNC)</a>	{Requirement II. 241}, {Requirement II. 242}
<a href="#">Use Case 5.6.5:</a>	<a href="#">NMS removes a route from a Subnetwork Connection (SNC)</a>	{Requirement II. 243}, {Requirement II. 244}
<a href="#">Use Case 5.6.6:</a>	<a href="#">NMS creates-modifies the route of a Subnetwork Connection (SNC)</a>	{Requirement II. 245}, {Requirement II. 246}
<a href="#">Use Case 5.6.7:</a>	<a href="#">NMS deactivates a Subnetwork Connection (SNC)</a>	{Requirement II. 090}, {Requirement II. 091}
<a href="#">Use Case 5.6.8:</a>	<a href="#">NMS deletes a Subnetwork Connection (SNC)</a>	{Requirement II. 092}, {Requirement II. 093}
<a href="#">Use Case 5.6.9:</a>	<a href="#">NMS deactivates and deletes a Subnetwork Connection (SNC)</a>	{Requirement II. 094}, {Requirement II. 095}
<a href="#">Use Case 5.6.10:</a>	<a href="#">EMS reroutes a Subnetwork Connection (SNC)</a>	{Requirement II. 084}
<a href="#">Use Case 5.6.11:</a>	<a href="#">NMS queries EMS Connection Management Mode</a>	{Requirement II. 100}
<a href="#">Use Case 5.6.12:</a>	<a href="#">NMS creates and activates a point-to-point Ethernet Service using fragmentation</a>	
<a href="#">Use Case 5.6.13:</a>	<a href="#">NMS modifies a point-to-point Ethernet Service with fragmentation</a>	
<a href="#">Use Case 5.6.14:</a>	<a href="#">NMS deletes a point-to-point Ethernet Service with fragmentation</a>	
<a href="#">Use Case 5.6.15:</a>	<a href="#">NMS creates a flexible IMA group</a>	
<a href="#">Use Case 5.6.16:</a>	<a href="#">NMS deletes a flexible IMA group</a>	
<a href="#">Use Case 5.6.17:</a>	<a href="#">NMS modifies the transport capacity or the routing targets of a flexible IMA group</a>	



**Figure 5.6: Connection Management Use Cases**

**5.6.1 NMS creates a Subnetwork Connection (SNC)**

**Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)**

<b>Use Case Name</b>	NMS creates a Subnetwork Connection (SNC)
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### Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)

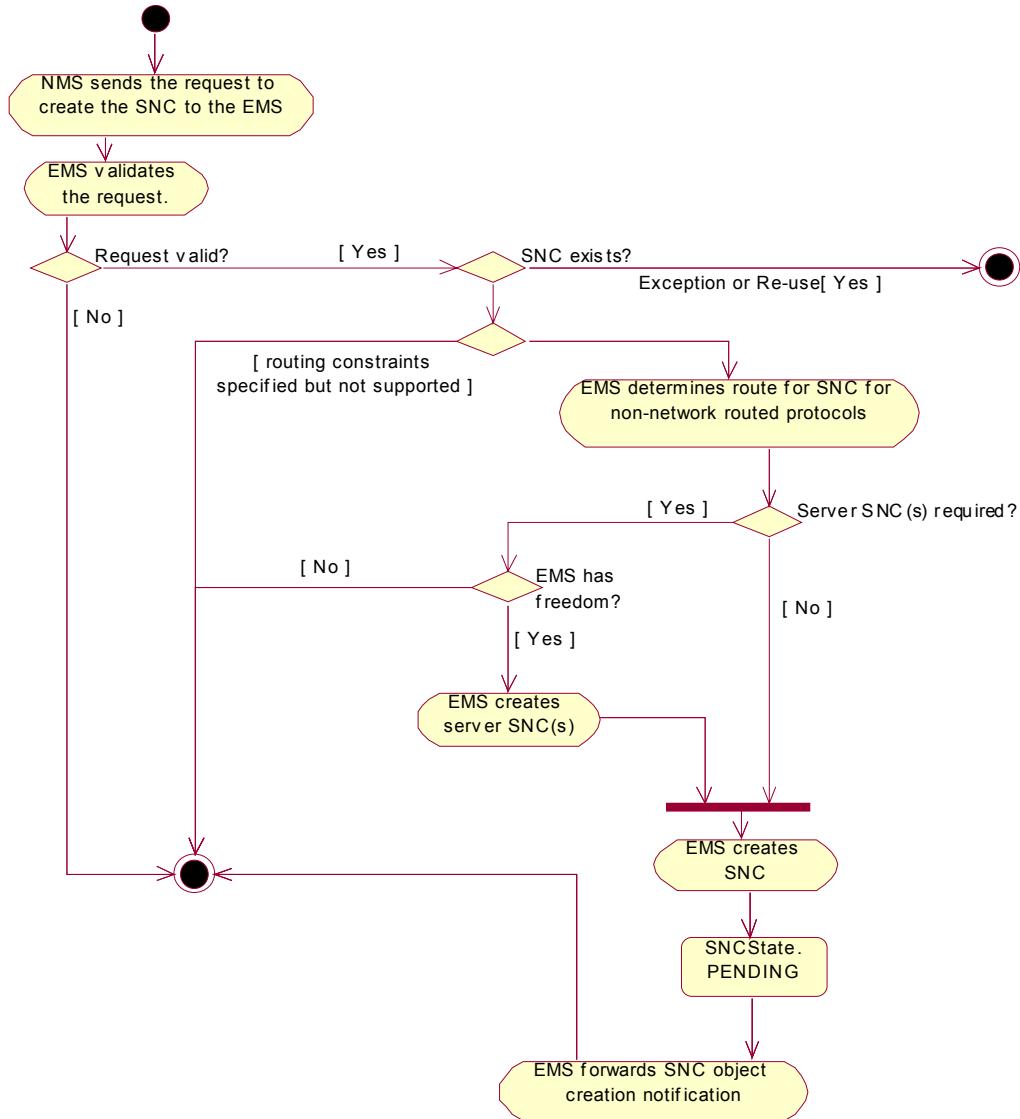
<p><b>Summary</b></p> <p>This use case describes how an NMS can create either a point-to-point SNC or the leg of a broadcast connection.</p> <p>This use case requires that the EMS supports the Pending state for SNCs.</p> <p>The EMS is required to create an SNC of the specified SNC type, layer rate, directionality and grade of impact between the specified A end and Z end termination points. If the EMS cannot meet any of these parameters, an appropriate exception is raised.</p> <p>If non-network routed protocols are used for route determination and the NMS did not request network routing:</p> <p style="margin-left: 20px;">The EMS creates an SNC of the specified static protection level that best matches the specified protection effort. If the protection effort is <i>same</i>, the EMS creates an SNC with the specified static protection level. If the protection effort is <i>sameOrBetter</i> or <i>sameOrWorse</i>, the EMS first attempts to provide the protection level requested. If it is not possible, the EMS attempts to provide better or worse static protection according to the protection effort parameter. However, if the NMS requests static protection level <i>partiallyProtected</i> with protection Effort <i>sameOrBetter</i>, the EMS may attempt to provide <i>fullyProtected</i> first.</p> <p>If the NMS specifies routing constraints in the request and the EMS supports this feature, the EMS is required to either include or exclude specified resources during route selection based on the provided criteria even if there are pending, partial, or active SNCs using the required parts of the route. The NMS may specify the full route in the request. If the NMS does not specify routing constraints or does not provide a full route, then the EMS itself will select the full or partial route respectively. If the EMS does not support the routing constraints feature and routing constraints are specified in the request, or supports the feature but cannot satisfy the NMS routing criteria, an exception is raised.</p> <p>If the EMS cannot use the routing constraints for a BLSR case, <i>BLSRDirection</i> and <i>Timeslot</i> parameters in <i>additionalInformation</i> may be used for route selection if specified by the NMS.</p> <p>If network routed protocols are used for route determination and the NMS requests network routing:</p> <p style="margin-left: 20px;">The EMS requests the network determine the route of the SNC of the specified static protection level.</p> <p>If the NMS specifies routing constraints in the request and the network supports this feature, the EMS passes these constraints to the network. If the network does not support the routing constraints feature or supports the feature but cannot satisfy the NMS routing criteria, an exception is raised.</p> <p>If the EMS supports the capability to manage more than one route for the same SNC, then the route of the newly created SNC shall be the <i>intended</i> route.</p> <p>If an <i>exclusive</i> SNC has been specified, then the EMS must find a route that does not conflict or share XCs or CTPs with any other existing SNC route, in any administrative state.</p> <p>Once an <i>exclusive</i> (intended) route has been created by the EMS, any further creation operations in which conflicts are detected with the <i>exclusive</i> route shall raise an exception.</p>
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**Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)**

	<p>For DWDM: A routing constraint for DWDM (frequency) can be specified similar to the use of timeslot for SONET/SDH.</p> <p>If an existing SNC respects all the conditions specified in the NMS request, the EMS is allowed to return the existing SNC. It is also allowed to attempt to create a different SNC. For rerouting behavior, please see <a href="#">Use Case 5.6.4: NMS adds a route to a Subnetwork Connection (SNC)</a> and <a href="#">Use Case 5.6.5: NMS removes a route from a Subnetwork Connection (SNC)</a>.</p> <p>Where applicable, the exception contains a list of the failed cross-connections and the reason(s) for failure.</p> <p>Notes: From an NMS perspective, there is no limit on the number of SNCs in the pending state that use the same route. However, the EMS may limit the number of pending SNCs (depending on specific EMS implementation).</p>
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS sends the SNC creation request to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends the request to create an SNC to the EMS.</li> <li>2) The EMS validates the request. If the request is not valid (invalid parameters, or the EMS does not support Pending SNC state), an exception is raised.</li> <li>3) If an SNC with the same properties as specified in the NMS request already exists, the EMS may return that SNC.</li> <li>4) If the EMS does not support routing constraints and they are specified in the request, or any of the mandatory parameters cannot be satisfied, or the NMS requested user label uniqueness and the specified user label already exists in the EMS, an exception is raised.</li> <li>5) If non-network routed protocols are used for route determination and the NMS did not request network routing the EMS determines the route of the requested SNC using the specified static protection level and protection effort and optional routing constraints. If the routing constraints are not specified or a complete route is not defined by the NMS, then the EMS itself selects a full or partial route respectively.</li> <li>6) If a server SNC is required and the EMS has freedom to create the server SNC for this request, the server SNC is created. If the EMS does not have this level of freedom, an exception is raised. Note that a server SNC is defined to be a SNC on a server layer needed to establish the traffic for the (client) SNC to be created.</li> <li>7) If network routed protocols are used for route determination and the NMS requested network routing the EMS creates the SNC (this does not involve the entering of the cross-connection(s) at the ME(s)). The EMS initializes the SNC with the specified parameters of the request and the route. The SNC state is Pending.</li> <li>8) The EMS replies with a success indication.</li> <li>9) The EMS forwards a SNC object creation notification to the notification service.</li> </ol>

**Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)**

<b>Ends when</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) The NMS receives an indication of success of the action.</li> <li>2) The EMS returns the created SNC name and its distinguishing information.</li> </ol> <p>In case of failure:</p> <p>The NMS receives an indication of failure of the action or exception.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) The SNC has been created and not activated.</li> <li>2) The EMS has forwarded a SNC object creation notification to all NMSSs.</li> <li>3) If generic end point(s) were specified, then the defined end point(s) are replied.</li> </ol> <p>In case of failure:</p> <p>The SNC has not been created.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed.</li> <li>2) Not implemented: The EMS does not support this service.</li> <li>3) Invalid input: At least 1 of the CTP references is invalid.</li> <li>4) Invalid input: At least 1 of the CTP parameters is invalid.</li> <li>5) Invalid input: In case a bundled SNC is requested, the GTP endpoints of the SNC do not match, i.e., the GTPs do not have the same number of CTPs and in a particular order with respect to their layer rates or are not of the same layer rate</li> <li>6) Unable to comply: The EMS cannot create a SNC with the NMS-specified static protection level and protection effort.</li> <li>7) Unsupported routing constraints: The SNC can not be created because of cross-connection or CTP conflicts with other SNCs.</li> <li>8) Unsupported routing constraints: Timeslot conflicts with other SNCs.</li> <li>9) The number of total pending SNCs has exceeded the maximum limit. The limit is dependent on EMS implementation.</li> <li>10) Unsupported routing constraints: The EMS does not support routing constraints specified.</li> <li>11) User label in use: The user label uniqueness constraint is not met.</li> <li>12) Unsupported routing constraints: SNC cannot be created because of conflict with another active or partial SNC.</li> <li>13) Object in use: The intended route is in conflict with an “exclusive” route of another SNC.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 082}</a> , <a href="#">{Requirement II. 083}</a> , <a href="#">{Requirement II. 084}</a>



**Figure 5.7: Activity Diagram for [NMS creates a Subnetwork Connection \(SNC\)](#)**

## 5.6.2 NMS activates a Subnetwork Connection (SNC)

### Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)

<b>Use Case Name</b>	NMS activates a Subnetwork Connection (SNC)
<b>Summary</b>	<p>The NMS requests to activate a subnetwork connection (SNC). An SNC can be activated while in any state.</p> <p>If transmission parameters are specified for A end or Z end CTPs, the EMS will apply them either before or after the creation of the cross-connections, as appropriate. The alarm reporting on the CTPs and the containing TPs may be turned on by the EMS, unless otherwise specified via the alarm reporting transmission parameter.</p> <p>An already activated SNC can be activated again.</p> <p>Where applicable, the exception or error reason contains a list of the failed CTPs and the reason(s) for failure.</p> <p>If the addressed SNC has more routes, this operation unlocks all the routes, delegating the EMS and/or the network (e.g. restoration process) the actual activation of more appropriate route</p>
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The SNC has been created.</li> </ol>
<b>Begins when</b>	The NMS sends the SNC activation request to the EMS.

**Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)**

Description	<p>1) The NMS sends the request to activate the specified SNC to the EMS.</p> <p>2) The EMS validates the SNC reference (e.g. name). If the request is not valid, an exception is raised.</p> <p>3) If the SNC is already activated, then the EMS replies with a success indication. The EMS may not send the commands to the NE a second time for the cross-connection establishment. However the commands may be sent for the transmission parameters.</p> <p>4) If the SNC of the referenced name is pending and some contained cross-connections are on another (active) SNC, the EMS behavior depends on whether the SNC is a part of point-to-multipoint configuration or not. If the SNC is a part of point-to-multipoint configuration, the use case is carried out, otherwise an exception (resources occupied) is raised if cross-connection sharing is not supported. If no cross-connections to be established are on another active SNC, the use case is carried out.</p> <p>5) If the specified aEnd and/or zEnd CTPs are not terminated and mapped at the appropriate connection rate, then the EMS behavior depends on the NMS specified EMS freedom. If the EMS does not have this level of freedom to terminate and map/un-terminate and un-map TPs, an exception is raised. If the NMS specified this level of freedom in the request, the EMS either terminates and maps containing or un-terminates and un-map the contained termination points of the aEnd and/or zEnd CTPs. Refer to <a href="#">Use Case 5.5.1: NMS provisions the mapping mode of a CTP</a> and <a href="#">Use Case 5.5.2: NMS un-maps a server layer CTP</a>.</p> <p>6) If the TP parameters were specified for at least 1 of the A-end and/or Z-end CTPs then the EMS may provision the parameters on these CTPs before activation of the cross-connections. Refer to <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a>, <a href="#">Use Case 5.5.8: NMS provisions alarm reporting on for a TP</a> and <a href="#">Use Case 5.5.9: NMS provisions alarm reporting off for a TP</a>. The EMS may put all the containing TPs in service.</p> <p>7) If the NMS specified this level of freedom in the request and a server SNC is involved and is not active, the server SNC is activated.</p> <p>8) The EMS initiates the activation of the SNC (which involves entering the cross-connection(s) at the ME(s)).</p> <p>9) If TP parameters have not been applied before activation of cross-connections, they are applied now. See step #6.</p> <p>10) If network routed protocols are used for route determination the EMS requests that the network determine the route of the requested SNC using the specified static protection level and protection effort and optional routing constraints.</p> <p>11) If all of the cross-connections comprising the SNC have been established, then the EMS sets the SNC state of the SNC to active. The EMS updates the connection state of the affected CTPs to either sink, source, or bidirectionally connected. If there are more routes, then it is up to EMS the choice of better route to activate. Once a route has been successfully activated (its actual state is "active") then the SNC is enabled to transit to active state.</p> <p>12) If network routed protocols are used for route determination and a complete route cannot be determined:</p>
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**Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)**

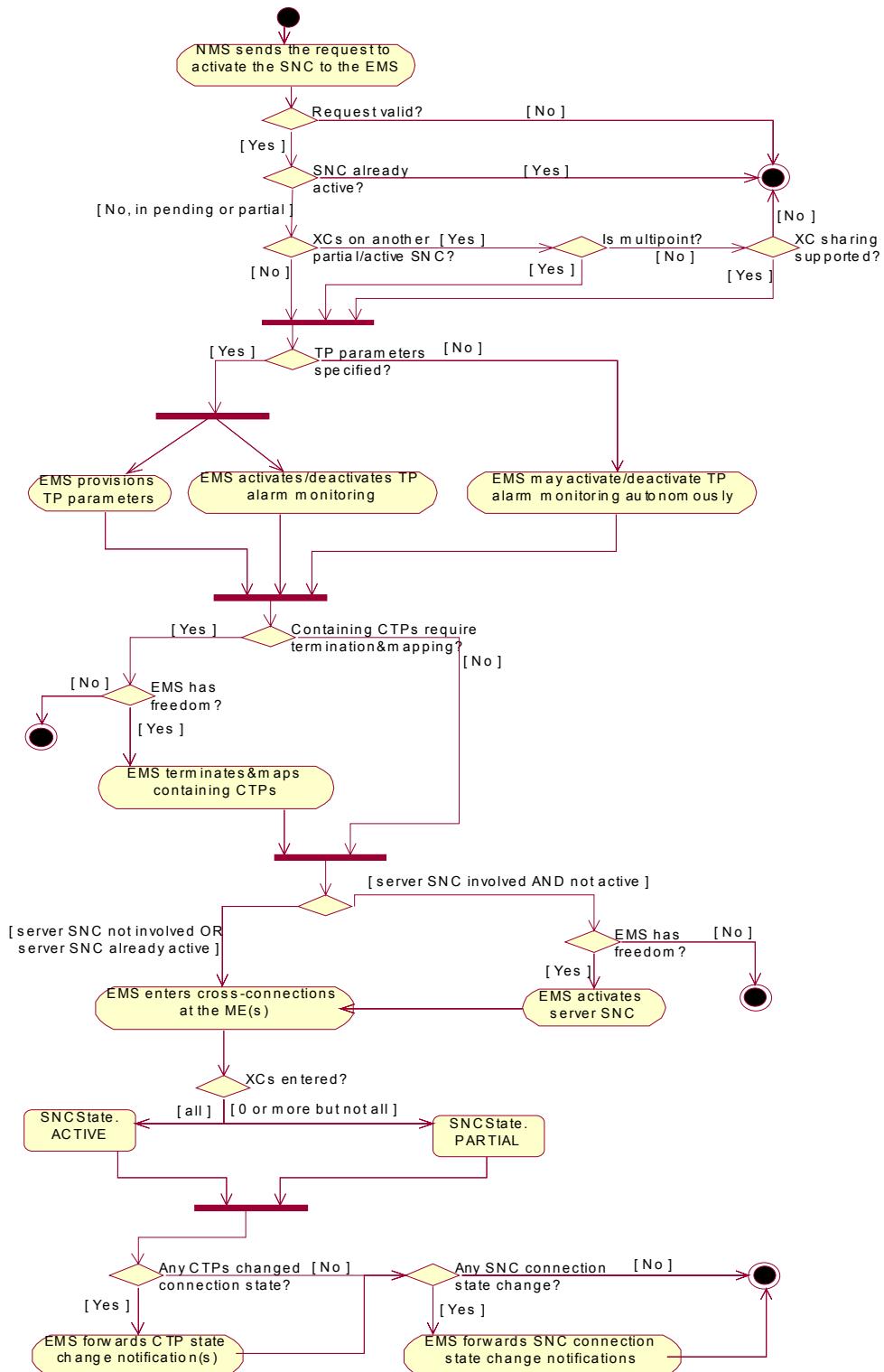
	<ul style="list-style-type: none"> <li>• If the NMS requests that rerouting can be performed. The SNC state shall be set to partial and the network attempts to determine a new route for the SNC. Refer to <a href="#">Use Case 5.6.4: NMS adds a route to a Subnetwork Connection (SNC)</a> and <a href="#">Use Case 5.6.5: NMS removes a route from a Subnetwork Connection (SNC)</a></li> <li>• If the NMS requests that rerouting cannot be performed. The SNC state shall be set to partial.</li> </ul> <p>13) If <u>not all</u> cross-connections comprising the SNC have been established(*), then the EMS sets the SNC state of the SNC to partial. The EMS updates the connection state of those CTPs that were successfully established to either sink, source, or bidirectionally connected. The EMS replies with a failure indication and error reason.</p> <p>(*) in case of multi-route SNC, this means that the EMS (or the network) was not able to activate any (just unlocked) route of the SNC</p> <p>14) If there has been a SNC state change, then the EMS forwards a SNC state change notification to the notification service.</p> <p>15) If there has been a CTP connection state change, then the EMS forwards a CTP state change notification to the notification service.</p> <p>16) If there are error conditions, (e.g. failure to provision TP transmission parameters) existing after establishing all the XCs, then the EMS will reply with a failure indication and error reason. In this case the SNC state will be active. Otherwise if there are no error conditions the EMS replies with a success indication.</p>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives an indication of success of the action.</p> <p>In case of failure:</p> <p>The NMS receives an indication of failure of the action.</p>

**Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)**

<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) The SNC has been activated.</li> <li>2) If the EMS has provisioned TP parameters, refer to the post-conditions as specified in <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a>, <a href="#">Use Case 5.5.8: NMS provisions alarm reporting on for a TP</a> and <a href="#">Use Case 5.5.9: NMS provisions alarm reporting off for a TP</a>.</li> <li>3) If the EMS has performed terminate and map or un-terminate and un-map, refer to the post-conditions (in case of success) as specified in to <a href="#">Use Case 5.5.1: NMS provisions the mapping mode of a CTP</a> and <a href="#">Use Case 5.5.2: NMS un-maps a server layer CTP</a>.</li> <li>4) If there has been a change in the SNC state of the SNC, then the EMS will forward a state change notification for a SNC state to the NMS.</li> <li>5) If there has been a CTP connection state change, then state change notification(s) are emitted to the NMS.</li> </ol> <p>In case of failure:</p> <ol style="list-style-type: none"> <li>1) The SNC has not been completely activated, (i.e. zero or more cross-connections comprising of the SNC have been activated).</li> <li>2) If the EMS has successfully provisioned TP parameters and failed to activate the SNC, refer to the post-conditions as specified in <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a>, <a href="#">Use Case 5.5.8: NMS provisions alarm reporting on for a TP</a> and <a href="#">Use Case 5.5.9: NMS provisions alarm reporting off for a TP</a>.</li> <li>3) If the EMS has successfully performed terminate and map or un-terminate and un-map and failed to activate the SNC, refer to the post-conditions as specified in to <a href="#">Use Case 5.5.1: NMS provisions the mapping mode of a CTP</a> and <a href="#">Use Case 5.5.2: NMS un-maps a server layer CTP</a>.</li> <li>4) If there has been a change in the SNC state of the SNC as a result of a failure, then the EMS will forward a state change notification for a SNC state to the NMS.</li> <li>5) If there has been a CTP connection state change as a result of the failure, then state change notification(s) are sent to the NMS.</li> </ol>
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**Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)**

<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Invalid input: Any input parameter is syntactical incorrect.</li> <li>2) At least 1 of the CTP references failed to be provisioned. See exception list from <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a>, <a href="#">Use Case 5.5.8: NMS provisions alarm reporting on for a TP</a> and <a href="#">Use Case 5.5.9: NMS provisions alarm reporting off for a TP</a>.</li> <li>3) Not in valid state: At least 1 of the containing termination points of the CTP references failed to be terminated and mapped or contained CTP(s) failed to be un-terminated and unmapped. See exception list from <a href="#">Use Case 5.5.1: NMS provisions the mapping mode of a CTP</a> and <a href="#">Use Case 5.5.2: NMS un-maps a server layer CTP</a>.</li> <li>4) NE communications loss.</li> <li>5) Object in use: XC or CTP conflicts between the active route (with equal or higher priority) of this and other SNCs or when XC creation would involve a TP that has an existing fixed XC that does not match that required for the SNC.</li> <li>6) Object in use: Timeslot conflicts with other SNCs.</li> <li>7) Unable to comply: The SNC is in pending state and is in conflict with another active or partial SNC.</li> <li>8) Entity not found: The SNC reference (e.g. name) or one or more TP references reference objects that do not exist.</li> <li>9) Not implemented: The EMS does not support this service.</li> <li>10) Processing failure: The requested operation could not be performed.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 086}</a> , <a href="#">{Requirement II. 087}</a>



**Figure 5.8: Activity Diagram for NMS activates a Subnetwork Connection (SNC)**

### 5.6.3 NMS creates and activates a Subnetwork Connection (SNC)

#### Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)

<b>Use Case Name</b>	NMS creates and activates a Subnetwork Connection (SNC)
<b>Summary</b>	<p>This operation provides a way to create and activate a point-to-point subnetwork connection or a leg of a broadcast configuration in one request.</p> <p>The EMS is required to create an SNC of the specified SNC type, layer rate, directionality and grade of impact between the specified A end and Z end termination points. If the EMS cannot meet any of these parameters, an appropriate exception is raised.</p> <p>If non-network routed protocols are used for route determination and the NMS did not request network routing:</p> <p style="margin-left: 20px;">The EMS creates an SNC of the specified static protection level that best matches the specified protection effort. If the protection effort is <i>same</i>, the EMS creates an SNC with the specified static protection level. If the protection effort is <i>sameOrBetter</i> or <i>sameOrWorse</i>, the EMS first attempts to provide the protection level requested. If it is not possible, the EMS attempts to provide better or worse static protection according to the protection effort parameter. However, if the NMS requests static protection level <i>partiallyProtected</i> with protection Effort <i>sameOrBetter</i>, the EMS may attempt to provide <i>fullyProtected</i> first.</p> <p style="margin-left: 20px;">If the NMS specifies routing constraints in the request and the EMS supports this feature, the EMS is required to either include or exclude specified resources during route selection based on the provided criteria even if there are pending, partial, or active SNCs using the required parts of the route. The NMS may specify the full route in the request. If the NMS does not specify routing constraints or does not provide full route, then the EMS itself will select the full or partial route respectively. If the EMS does not support the routing constraints feature and routing constraints are specified in the request, or supports the feature but cannot satisfy the NMS routing criteria, an exception is raised.</p> <p style="margin-left: 20px;">If the EMS cannot use the routing constraints for a BLSR case, BLSRDirection and Timeslot parameters in additionalInformation may be used for route selection if specified by the NMS.</p> <p>If network routed protocols are used for route determination and the NMS requests network routing:</p> <p style="margin-left: 20px;">The EMS requests the network determine the route of the SNC of the specified static protection level.</p> <p style="margin-left: 20px;">If the NMS specifies routing constraints in the request and the network supports this feature, the EMS passes these constraints to the network. If the network does not support the routing constraints feature or supports the feature but cannot satisfy the NMS routing criteria, an exception is raised.</p> <p>If the EMS supports the capability to manage more routes for the same SNC, then the route of the newly activated SNC is the INTENDED route. The activation implies that the route is unlocked.</p> <p>If EXCLUSIVE SNC has been specified, then the EMS must find a route that does not conflict or share XCs or CTPs with any other existing SNC route, in any administrative state.</p>

**Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)**

	<p>Once an EXCLUSIVE (intended) route has been created by EMS, any further creation operation which conflicts with the exclusive route shall be refused.</p> <p>For DWDM: A routing constraint for DWDM (frequency) can be specified similar to the use of timeslot for SONET/SDH.</p> <p>If transmission parameters are specified for A end or Z end CTPs, the EMS will apply them either before or after the creation of the cross-connections, as appropriate. The alarm reporting on the CTPs and the containing TPs may be turned on by the EMS, unless otherwise specified via the alarm reporting transmission parameter.</p> <p>If the pending state is supported, it is possible for the SNC to be created but activation to be rejected if conflicting active or partial SNCs, the resulting SNC will be in pending state. If the pending state is not supported, then this is not possible and the SNC will not be created if activation is rejected.</p> <p>If an existing SNC respects all the conditions specified in the NMS request, the EMS is allowed to return the existing SNC. It is also allowed to attempt to create and activate a different SNC.</p> <p>For rerouting behavior, refer to <a href="#">Use Case 5.6.4: NMS adds a route to a Subnetwork Connection (SNC)</a> and <a href="#">Use Case 5.6.5: NMS removes a route from a Subnetwork Connection (SNC)</a>.</p> <p>Where applicable, the exception contains a list of the failed cross-connections and the reason(s) for failure.</p> <p><b>Note:</b></p> <ul style="list-style-type: none"> <li>1) From an NMS perspective, there is no limit on the number of SNCs in the pending state that use the same route. However, the EMS may limit the number of pending SNCs (depending on specific EMS implementation).</li> <li>2) The EMS may not support pending SNCs at all.</li> <li>3) For ATM specific behavior, refer to <a href="#">Use Case 5.14.1: NMS creates and activates an ATM Subnetwork Connection (SNC)</a>.</li> </ul>
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS sends the SNC create and activate request to the EMS.

**Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)**

Description	<p>Case A: Pending SNC(s) not supported:</p> <ol style="list-style-type: none"> <li>1) The NMS sends the request to create and activate a SNC to the EMS.</li> <li>2) The EMS validates the request. If the request is not valid, an exception is raised.</li> <li>3) If an SNC with the same properties as specified in the NMS request already exists, the EMS may reuse that SNC.</li> <li>4) If the EMS (or the network for network routed) does not support routing constraints and they are specified in the request, or any of the mandatory parameters cannot be satisfied, or the NMS requested user label uniqueness and the specified user label already exists in the EMS, an exception is raised.</li> <li>5) If some of cross-connections to be established for a referenced SNC are on another, active or partial SNC, the EMS behavior depends on whether the requested SNC is to be a part of broadcast configuration or not. If the requested SNC is to be a part of the broadcast configuration, the use case is carried out, otherwise an exception (resources occupied) is thrown if cross-connection sharing is not supported. If none of the cross-connections to be established are on another, active or partial SNC, the use case is carried out.</li> <li>6) If non-network routed protocols are used for route determination and the NMS did not request network routing, the EMS determines the route of the requested SNC using the specified static protection level, protection effort and optional routing constraints. If routing constraints are not specified or a complete route is not defined by the NMS, then the EMS itself selects a full or partial route respectively.</li> <li>7) If network routed protocols are used for route determination and the NMS requests network routing, the network determines the route of the requested SNC using the specified static protection level and optional routing constraints. If routing constraints are not specified or a complete route is not defined by the NMS, then the network itself selects a the route.</li> <li>8) If a server SNC is required and the EMS has freedom to create the server SNC for this request, the server SNC is created if it does not already exist and then activated. If the NMS did not specify this level of freedom in the request, an exception is raised.</li> <li>9) If the TP parameters were specified for at least 1 of the A-end and/or Z-end CTPs in the original create request, then the EMS may provision the parameters on these CTPs before activation of cross-connections. Refer to <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a>, <a href="#">Use Case 5.5.8: NMS provisions alarm reporting on for a TP</a> and <a href="#">Use Case 5.5.9: NMS provisions alarm reporting off for a TP</a>.</li> <li>10) If the specified aEnd and/or zEnd CTPs are not terminated and mapped at the appropriate connection rate, then the EMS behavior depends on the NMS specified EMS freedom. If the EMS does not have this level of freedom to terminate and map/un-terminate and un-map TPs, an exception is raised. If the NMS specified this level of freedom in the request, the EMS either terminates and maps containing or un-terminates and un-maps the contained termination points of the aEnd and/or zEnd CTPs. Refer to <a href="#">Use Case 5.5.1: NMS provisions the mapping mode of a CTP</a> and <a href="#">Use Case 5.5.2: NMS un-maps a server layer CTP</a>.</li> </ol>
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**Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)**

	<p>11) The EMS initiates the activation of the SNC (which involves entering the cross-connection(s) at the ME(s)).</p> <p>12) If TP parameters have not been applied before activation of cross-connections, they are applied now. See step #9.</p> <p>13) If all of the cross-connections comprising the SNC have been established, then the EMS sets the SNC state of the SNC to active. The EMS updates the SNC state of the affected CTPs to either sink, source, or bidirectionally connected. The EMS replies with a success indication. The EMS forwards a SNC object creation notification to the notification service.. The EMS forwards a CTP connection state change notification for all affected CTPs to the notification service.</p> <p>14) If there are error conditions, (e.g. failure to provision TP transmission) existing after establishing all the cross-connections, then the EMS will reply with a failure indication and error reason. In this case the SNC state of the SNC will be active.</p> <p>15) If one or more (possibly all) of the cross-connections comprising the SNC have been established (*) then the EMS sets the SNC state of the SNC to partial. The EMS updates the connection state of those CTPs that were successfully established to either sink, source, or bidirectionally connected. The EMS replies with a failure indication and error reason.</p> <p>(*) in case of multi-route SNC, this means that the EMS (or the network) was not able to activate any (just unlocked) route of the SNC.</p> <p>16) The EMS forwards a SNC object creation notification to the notification service.</p> <p>17) The EMS forwards a CTP connection state change notification for all CTPs that were successfully established to the notification service.</p> <p>18) If none of the cross-connections comprising the SNC have been established, then the EMS replies with a failure indication and error reason. The SNC is not created.</p> <p>Case B: Pending SNC(s) supported:</p> <ol style="list-style-type: none"> <li>1) The NMS sends the request to create and activate an SNC to the EMS.</li> <li>2) The EMS creates the SNC. Refer to <a href="#">Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)</a>.</li> <li>3) The EMS activates the SNC. Refer to <a href="#">Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)</a>.</li> </ol>
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**Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)**

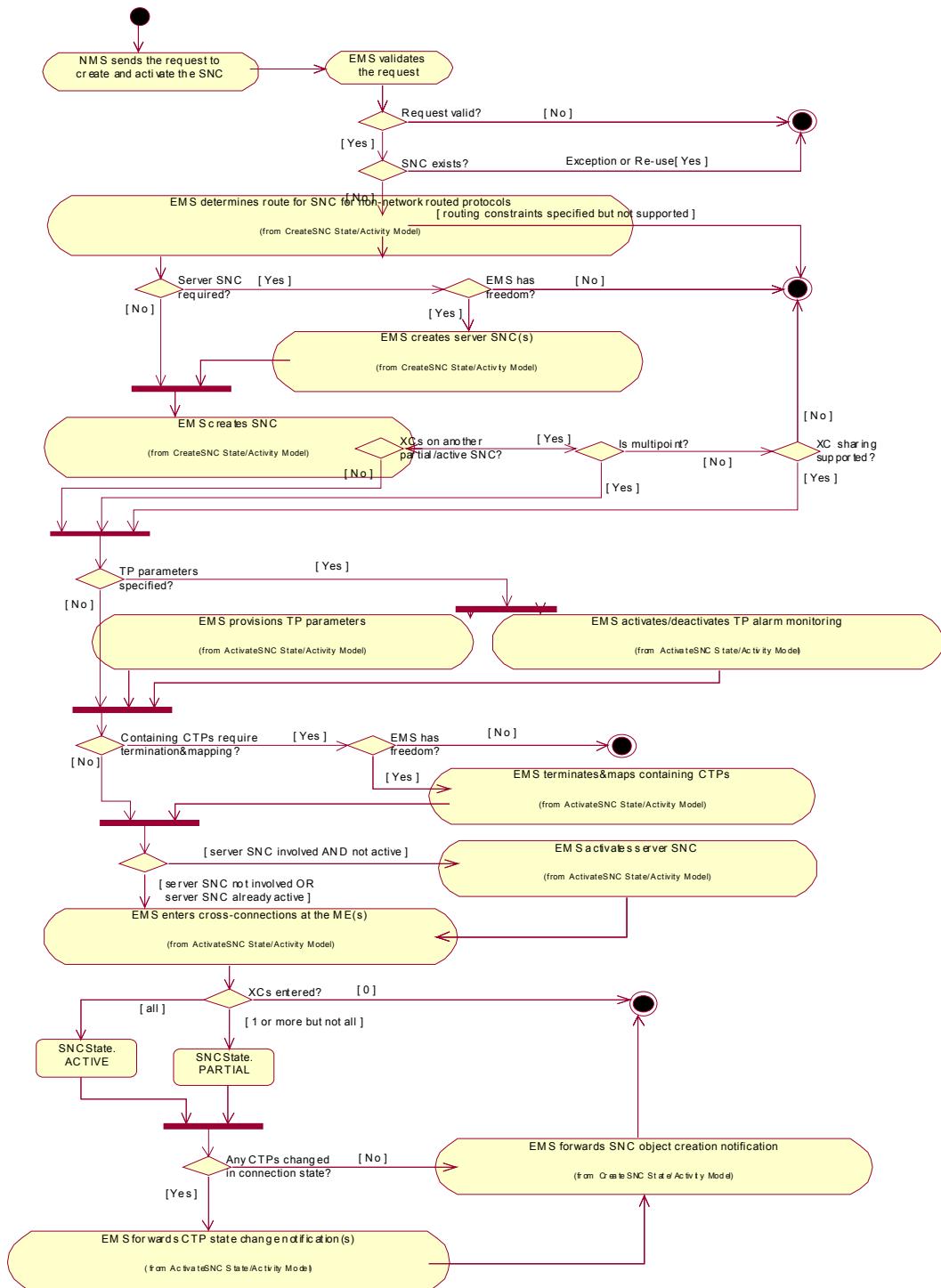
<b>Ends when</b>	<p>Case A: Pending SNC(s) not supported:</p> <p>In case of success:</p> <ol style="list-style-type: none"> <li>1) The SNC has been created and activated.</li> <li>2) If the EMS has provisioned TP parameters, refer to the post-conditions as specified in <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a>, <a href="#">Use Case 5.5.8: NMS provisions alarm reporting on for a TP</a> and <a href="#">Use Case 5.5.9: NMS provisions alarm reporting off for a TP</a>.</li> <li>3) If the EMS has performed terminate and map or un-terminate and un-map, refer to the post-conditions (in case of success) as specified in <a href="#">Use Case 5.5.1: NMS provisions the mapping mode of a CTP</a> and <a href="#">Use Case 5.5.2: NMS un-maps a server layer CTP</a>.</li> <li>4) The EMS has forwarded a SNC object creation notification to the notification service.</li> <li>5) The EMS has forwarded CTP connection state change notification(s) to the notification service.</li> </ol> <p>In case of failure:</p> <ol style="list-style-type: none"> <li>1) The SNC has not been created (i.e. invalid request or no cross-connections comprising the SNC were activated).</li> <li>2) The SNC has been created but has not been completely activated, (i.e. one or more cross-connections comprising of the SNC have been activated).</li> <li>3) If the EMS has successfully provisioned TP parameters and failed to activate the SNC, refer to the post-conditions as specified in <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a>, <a href="#">Use Case 5.5.8: NMS provisions alarm reporting on for a TP</a> and <a href="#">Use Case 5.5.9: NMS provisions alarm reporting off for a TP</a>.</li> <li>4) If the EMS has successfully performed terminate and map or un-terminate and un-map and failed to activate the SNC, refer to the post-conditions as specified in <a href="#">Use Case 5.5.1: NMS provisions the mapping mode of a CTP</a> and <a href="#">Use Case 5.5.2: NMS un-maps a server layer CTP</a>.</li> <li>5) If there has been a CTP connection state change as a result of the failure, then state change notification(s) are emitted to the notification service.</li> </ol> <p>Case B: Pending SNC(s) supported:</p> <p>Refer to the Refer to <a href="#">Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)</a> and <a href="#">Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)</a>.</p>
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**Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)**

<b>Post-conditions</b>	<p>Case A: Pending SNC(s) not supported:</p> <ol style="list-style-type: none"> <li>1) At least 1 of the CTP references is invalid.</li> <li>2) At least 1 of the CTP parameters is invalid.</li> <li>3) The EMS cannot meet specified static protection level and protection effort for the referenced SNC.</li> <li>4) the EMS does not support the routing constraints specified</li> <li>5) Timeslot conflicts with other SNCs.</li> <li>6) The number of total pending SNCs has exceeded the maximum limit. The limit is dependent on EMS implementation.</li> <li>7) At least 1 of the CTP references failed to be provisioned. See exception list from <a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a>, <a href="#">Use Case 5.5.8: NMS provisions alarm reporting on for a TP</a> and <a href="#">Use Case 5.5.9: NMS provisions alarm reporting off for a TP</a>.</li> <li>8) At least 1 of the containing termination points of the CTP references failed to be channelized or contained CTP(s) failed to be de-channelized. See exception list from <a href="#">Use Case 5.5.1: NMS provisions the mapping mode of a CTP</a> and <a href="#">Use Case 5.5.2: NMS un-maps a server layer CTP</a>.</li> <li>9) Communications failure between the EMS and the ME(s) and this prevents creation and activation of the SNC.</li> <li>10) the SNC is in conflict with another active or partial SNC and can not be created</li> <li>11) Cross-connection or CTP conflicts with other SNCs.</li> <li>12) userLabel uniqueness constraint is not met</li> <li>13) Non-specific EMS internal failure.</li> </ol> <p>Case B: Pending SNC(s) supported:</p> <ol style="list-style-type: none"> <li>1) See exception list from <a href="#">Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)</a>.</li> <li>2) See exception list from <a href="#">Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)</a>.</li> </ol>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) See exception list from <a href="#">Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)</a>.</li> <li>2) See exception list from <a href="#">Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)</a>.</li> </ol>
<b>Traceability</b>	<a href="#">(Requirement II. 088}</a> , <a href="#">(Requirement II. 089}</a>

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**Figure 5.9: Activity Diagram for [NMS creates and activates a Subnetwork Connection \(SNC\)](#) (Pending not supported)**

### 5.6.4 NMS adds a route to a Subnetwork Connection (SNC)

#### Use Case 5.6.4: NMS adds a route to a Subnetwork Connection (SNC)

<b>Use Case Name</b>	NMS adds a route to a Subnetwork Connection (SNC)
<b>Summary</b>	The NMS requests to add a protection route to a given Subnetwork Connection in an EMS. As a result of (successful) completion of this request, the EMS shall add the new route to the Subnetwork Connection, but shall not attempt to establish (on NEs) any cross connections as side effect of this operation, because the route is created in locked state.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS has a reference to the notification service.</li> <li>3) An SNC exists</li> </ul>
<b>Begins when</b>	he NMS sends an add route request to the EMS.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) It is possible to specify if the new added route becomes the intended one, and / or if it is exclusive.</li> <li>2) It is possible to describe zero, more or all routing constraints, i.e. the whole route description.</li> </ul>
<b>Ends when</b>	The EMS has completed the route creation.
<b>Post-conditions</b>	The newly added route is available at the interface, in locked state.
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: Any input parameter is syntactical incorrect.</li> <li>4) Entity not found: Fields of input parameters reference objects that do not exist.</li> <li>5) Protection effort not met: The NMS requests a route with a static protection level (inherited from SNC) that cannot be met by the EMS.</li> <li>6) Unable to comply: The EMS is unable to find an appropriate route.</li> <li>7) Object in use: The route is in conflict with an “exclusive” (even locked) route of another SNC.</li> <li>8) NE communication loss.</li> <li>9) Unsupported routing constraints: The EMS does not support the routing constraints specified.</li> </ul>
<b>Traceability</b>	<a href="#">{Requirement II. 241}</a> , <a href="#">{Requirement II. 242}</a>

### 5.6.5 NMS removes a route from a Subnetwork Connection (SNC)

#### Use Case 5.6.5: NMS removes a route from a Subnetwork Connection (SNC)

<b>Use Case Name</b>	NMS removes a route from a Subnetwork Connection (SNC)
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**Use Case 5.6.5: NMS removes a route from a Subnetwork Connection (SNC)**

<b>Summary</b>	The NMS requests to remove a protection route from a subnetwork connection. As a result of (successful) completion of this request, the EMS shall delete the protection route of addressed Subnetwork Connection. Of course it is possible to delete a locked backup route which is “in use” by other SNC route, because this operation has no side effect on routes of any other SNCs, even if sharing XCs/TPs.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS has a reference to the notification service.</li> <li>3) An SNC exists</li> <li>4) The addressed route must not be in the unlocked state</li> <li>5) The addressed route must not be the intended route</li> </ul>
<b>Begins when</b>	The NMS sends a remove route request to the EMS.
<b>Description</b>	The route is removed, so at least the SNC remains with only the intended route.
<b>Ends when</b>	The EMS has completed the route removal.
<b>Post-conditions</b>	The route is no longer exists.
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed. The EMS does not support the requested feature.</li> <li>3) Invalid input: Any input parameter is syntactical incorrect.</li> <li>4) Entity not found: Fields of input parameters reference objects that do not exist.</li> <li>5) Not in valid state: The route is in the UNLOCKED state, or the route is the intended one.</li> <li>6) NE communication loss.</li> </ul>
<b>Traceability</b>	<a href="#">{Requirement II. 243}</a> , <a href="#">{Requirement II. 244}</a>

**5.6.6 NMS creates-modifies the route of a Subnetwork Connection (SNC)****Use Case 5.6.6: NMS creates-modifies the route of a Subnetwork Connection (SNC)**

<b>Use Case Name</b>	NMS creates-modifies the route of a Subnetwork Connection (SNC)
<b>Summary</b>	The NMS requests to modify a route of a Subnetwork Connection. As a result of (successful) completion of this request, the addressed SNC route is modified. If the SNC was in PENDING or PARTIAL state, then the state is unchanged. If the SNC was in ACTIVE state, then the output state is PARTIAL. In case the SNC has several routes, then the administrative state of the addressed route will always transit to LOCKED state.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<p>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</p> <p>2) The NMS has a reference to the notification service.</p>
<b>Begins when</b>	The NMS sends a modify route request to the EMS.
<b>Description</b>	<p>Two classes of modification are available:</p> <ul style="list-style-type: none"> <li>• add protection leg, remove protection leg</li> <li>• reroute</li> </ul> <p>It is possible to describe zero, more or all routing constraints, i.e. the whole route or leg description. At least, it must be possible to</p> <ul style="list-style-type: none"> <li>• add/remove a protection leg to/from a simple SNC</li> <li>• change from simple to add drop type and vice versa</li> </ul>
<b>Ends when</b>	The EMS has completed the route modification.
<b>Post-conditions</b>	The modified route is available at the interface, in locked state. It is not retrievable the current route in the network.
<b>Exceptions</b>	<p>1) Not implemented: The EMS does not support this service.</p> <p>2) Processing failure: The requested operation could not be performed.</p> <p>3) Invalid input: Any input parameter is syntactical incorrect.</p> <p>4) Object in use: The SNC can not be created because of XC or CTP conflicts with other SNCs.</p> <p>5) Entity not found: Fields of input parameters reference objects that do not exist.</p> <p>6) Protection effort not met: The NMS requests a new SNC with a static protection level and protection effort that cannot be met by the EMS.</p> <p>7) Unable to comply: The SNC cannot be created because it cannot comply with any of the input parameter constraints for a reason different than the ones above.</p> <p>8) Unsupported routing constraints: The EMS does not support the routing constraints specified.</p> <p>9) User label in use: The user label supplied by the NMS is already in use.</p>
<b>Traceability</b>	<a href="#">{Requirement II. 245}</a> , <a href="#">{Requirement II. 246}</a>

## 5.6.7 NMS deactivates a Subnetwork Connection (SNC)

### Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)

<b>Use Case Name</b>	NMS deactivates a Subnetwork Connection (SNC)
<b>Summary</b>	<p>The NMS requests that an SNC be deactivated from the EMS' managed subnetwork (i.e., de-provisioned from the EMS' managed subnetwork). However, as a result of this action, the EMS continues to maintain the SNC object within the EMS. The deactivate operation requires that the EMS support the Pending state for SNCs.</p> <p>Deactivating an SNC implies deletion in the ME of all the non-shared cross-connects that belong to this SNC. The PTPs are left in the same service state and are not put out-of-service.</p> <p>Some examples of why an NMS would use this use case include:</p> <ul style="list-style-type: none"> <li>• To free-up resources in the underlying managed subnetwork yet maintain a record of the SNC such that it could be quickly reactivated. For example, this is useful if 2 or more SNC share resources at different times of the day.</li> <li>• To maintain a record of the SNC in the EMS such that the EMS maintains knowledge of the network resources (e.g., aEnd CTP(s), zEnd CTP(s), route, etc.) which would be allocated for the SNC.</li> </ul> <p>If the addressed SNC has more routes, this operation locks all the routes, delegating the EMS and/or the network (e.g. restoration process) the actual deactivation of all XCs which are not shared with (routes of) other SNCs.</p>
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS must have knowledge of the identification of the SNC (e.g., the identifying name of the SNC).</li> </ol>
<b>Begins when</b>	The NMS sends a request to the EMS to deactivate an SNC.

**Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)**

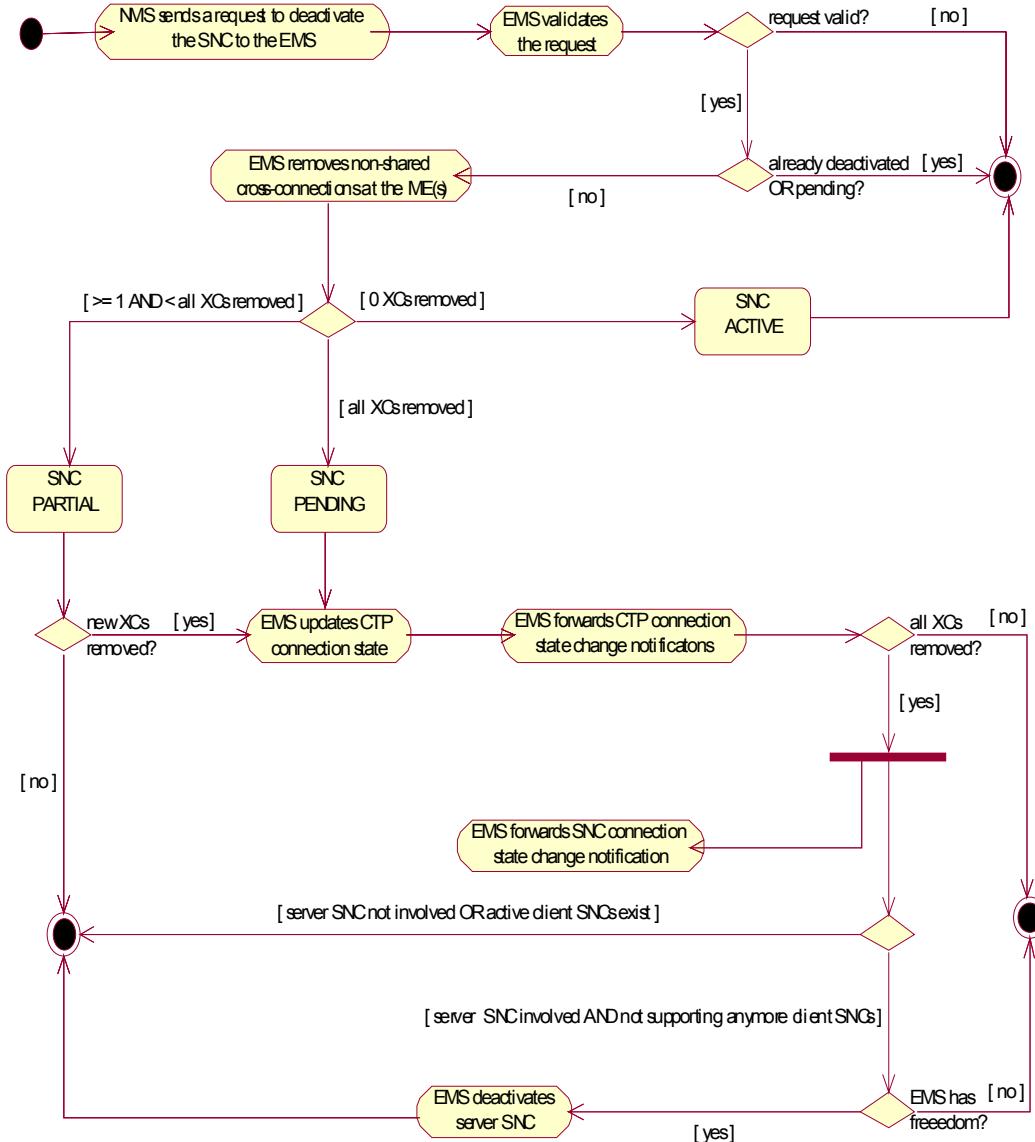
Description	<p>1) The EMS validates the specified SNC.</p> <p>2) The EMS initiates the deactivation of the SNC. SNC deactivation involves EMS communication with Managed Elements. The EMS attempts to remove, from the applicable Managed Elements, all the non-shared cross-connections which comprise this SNC.</p> <ul style="list-style-type: none"> <li>• An already deactivated SNC can be deactivated again with success (the EMS is not required to send the commands to the ME a second time, however).</li> <li>• While in SNCS_PARTIAL state, it is possible to deactivate an SNC again, this corresponds to a retry.</li> </ul> <p>3) If the EMS succeeds in deactivating the SNC (i.e., if all the non-shared cross-connections comprising the SNC on applicable Managed Elements have been removed), the state of the SNC changes to PENDING (or remains in PENDING if already in the PENDING state). The supporting CTPs are left in the same state and are not put out of service. The deactivation is successful even if some XC representing fixed connectivity cannot be deleted. An SNC cannot be deactivated if it is composed solely of fixed cross-connects.</p> <ul style="list-style-type: none"> <li>• The EMS provides a success indication to the NMS.</li> </ul> <p>4) If the EMS fails to deactivate the SNC, a failure indication is sent to the NMS, and:</p> <ul style="list-style-type: none"> <li>• If at least one, but not all of the non-shared cross-connections comprising the SNC on applicable Managed Elements have been removed, the SNC's state changes to PARTIAL (or remains in PARTIAL if already in the PARTIAL state);</li> <li>• If none of the non-shared cross-connections comprising the SNC on applicable Managed Elements have been removed, the SNC's state remains ACTIVE.</li> </ul> <p>5) If there has been an SNC state change, the EMS generates a state change notification when the SNC's state has been changed and sends it to the notification service.</p> <p>6) For any cross-connection that has been successfully removed as a result of the deactivate SNC action, the EMS generates a state change notification for the associated connection termination points (CTPs), that have transitioned to Not Connected. Note that the CTP may still be Connected in the opposite direction as part of another SNC.</p> <p>7) The NMS can request that the EMS set TP transmission parameters as a side-effect of the deactivate SNC action.</p> <ul style="list-style-type: none"> <li>• The EMS should send AVC notifications for the successfully modified TPs.</li> <li>• If a given entry in the list of transmission parameters specified by the NMS can not be successfully applied to the TP, for any reason, then an error reason is returned to the NMS.</li> <li>• Existing TP transmission parameters for which no changes were requested will be left unchanged.</li> </ul>
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**Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)**

	<ul style="list-style-type: none"> <li>The alarm reporting on the CTPs and the containing TPs may be turned off by the EMS as part of this request, unless otherwise specified by the NMS</li> </ul> <p>8) If a Server SNC was involved in this SNC, the Server SNC does not support any other Client SNCs, and all cross-connections comprising the referenced SNC have been removed, then the EMS behavior depends on whether the EMS has freedom to deactivate the Server SNC. If the EMS does not have this level of freedom, only the Client SNC is deactivated.</p>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives an indication of success of the request.</p> <p>In case of failure:</p> <ol style="list-style-type: none"> <li>1) The NMS receives an indication of failure of the request, or</li> <li>2) The request times out.</li> </ol>
<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) The network resources (CTPs) which had been used in the SNC are freed in the managed subnetwork (really, are no longer in active use by the SNC).</li> <li>2) The EMS maintains the SNC object.</li> <li>3) The SNC state is the PENDING state.</li> <li>4) If a change of SNC state has occurred, the EMS has sent a state change notification to the Notification Service.</li> <li>5) For any change of TP connection state, the EMS has sent a state change notification to the notification service.</li> <li>6) For the successfully modified TPs, the EMS should send AVC notifications to the notification service</li> </ol> <p>In case of failure:</p> <ol style="list-style-type: none"> <li>1) Some or all of the network resources (CTPs) associated with the SNC are still in active use by the SNC, as indicated in the TP Connection State.</li> <li>2) The EMS maintains the SNC object.</li> <li>3) The SNC state is either the ACTIVE (all network resources associated with the SNC are still in use by the SNC) or PARTIAL state (some network resources associated with the SNC are still in use by the SNC).</li> <li>4) If a change of SNC state has occurred, the EMS sends a state change notification to the notification service.</li> <li>5) For any change of TP connection state, the EMS has sent a state change notification to the notification service.</li> </ol>

**Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)**

<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Service not implemented by the EMS</li> <li>2) Non-specific internal EMS failure</li> <li>3) The sncName provided by the NMS does not refer to an SNC object, or when any field in tpsToModify is invalid</li> <li>4) The sncName or tpsToModify (provided by the NMS) references an object that does not exist</li> <li>5) The SNC is fixed and can not be deactivated</li> <li>6) Communications failure (or communications nonexistent) between the EMS and one or more of the underlying (applicable) Managed Elements. This exception is only used in the case where no change has been made to the SNC object or to any CTP.</li> </ol> <p>Whenever an exception is raised, it can be assumed that no network changes have been made to the SNC.</p>
<b>Traceability</b>	<a href="#">{Requirement II. 090}</a> , <a href="#">{Requirement II. 091}</a>



**Figure 5.10: Activity Diagram for NMS deactivates a Subnetwork Connection (SNC)**

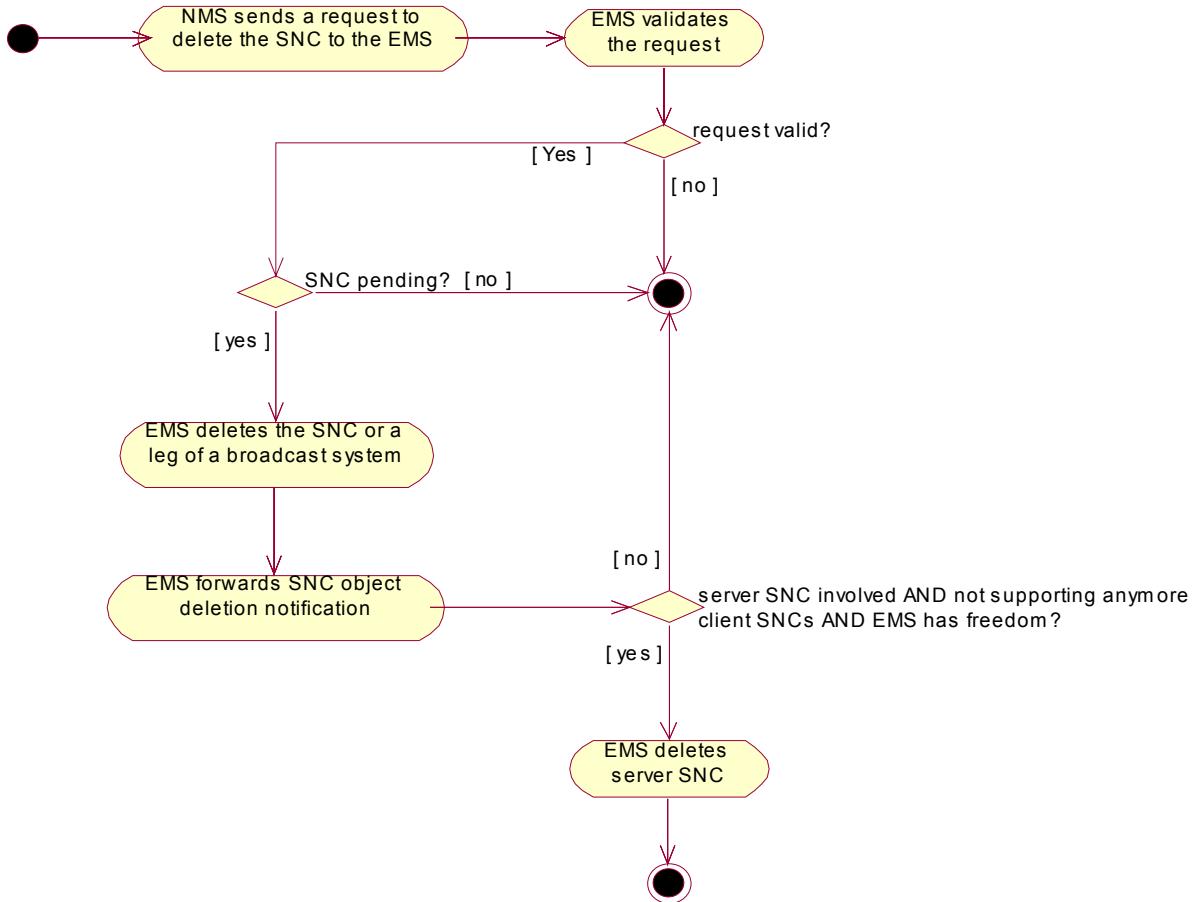
## 5.6.8 NMS deletes a Subnetwork Connection (SNC)

### Use Case 5.6.8: NMS deletes a Subnetwork Connection (SNC)

<b>Use Case Name</b>	NMS deletes a Subnetwork Connection (SNC)
<b>Summary</b>	<p>The NMS requests that an SNC be deleted in the EMS (i.e., SNC object maintained by the EMS be deleted as a result of this action). This use case also includes the deletion a leg from a broadcast system.</p> <p>The delete operation requires that the EMS supports the Pending state for SNCs.</p> <p>Some examples of why an NMS would use this use case include:</p> <ul style="list-style-type: none"> <li>• To delete a record of the SNC from the EMS to free-up EMS resources.</li> <li>• To delete a record of the SNC from the EMS such that the EMS no longer has any network resources (e.g., aEnd CTP(s), zEnd CTP(s), route, etc.) allocated for the SNC.</li> </ul> <p>If the SNC has more routes, then the operation deletes the SNC, its intended and all backup route(s).</p>
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS must have knowledge of the identification of the SNC (e.g., the identifying name of the SNC).</li> <li>3) The SNC must be in Pending state.</li> </ol>
<b>Begins when</b>	The NMS sends a request to the EMS to delete an SNC.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The EMS validates the SNC provided by the NMS as part of the request.</li> <li>2) The EMS will only delete an SNC in the PENDING state.</li> <li>3) The EMS initiates the deletion of the SNC in the EMS. SNC deletion is not expected to involve EMS communication with Managed Elements. <ul style="list-style-type: none"> <li>• SNC deletion involves the EMS deleting the SNC object that the EMS maintains. If successful, the EMS provides a success indication to the NMS.</li> <li>• If the SNC is part of a broadcast system, the EMS only deletes the specified leg of the broadcast system and the other legs are left unchanged.</li> </ul> </li> <li>4) If the EMS fails to delete the SNC, a failure indication is sent to the NMS. The SNC state remains in PENDING.</li> <li>5) The EMS generates an object deletion notification when the SNC object is deleted and sends it to the notification service.</li> <li>6) If an Server SNC was involved in this SNC, and the Server SNC does not support any other Client SNCs, then the EMS behavior depends on whether the EMS has freedom to delete the Server SNC. If the EMS does not have this level of freedom, only the Client SNC is deleted.</li> </ol>

**Use Case 5.6.8: NMS deletes a Subnetwork Connection (SNC)**

<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives an indication of success of the request.</p> <p>In case of failure:</p> <ol style="list-style-type: none"> <li>1) The NMS receives an indication of failure of the request, or</li> <li>2) The request times out, or</li> <li>3) The NMS receives an indication that the request was rejected (e.g., if the SNC that was requested to be deleted was in other than the PENDING state).</li> </ol>
<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) The SNC object within the EMS has been deleted.</li> <li>2) The EMS has sent an object deletion notification to the notification service.</li> </ol> <p>In case of failure:</p> <p>The SNC object still exists within the EMS.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed. Non-specific internal EMS failure.</li> <li>3) Invalid input: Any input parameter is syntactically incorrect.</li> <li>4) Entity not found: The sncName or tpsToModify (provided by the NMS) references an object that does not exist.</li> <li>5) Unable to comply: The SNC is fixed and can not be deactivated</li> <li>6) NE communication loss.</li> </ol> <p><b>Note:</b> Whenever an exception is raised, it can be assumed that no network or EMS database changes have been made to the SNC.</p>
<b>Traceability</b>	<a href="#">(Requirement II. 092}</a> , <a href="#">(Requirement II. 093}</a>



**Figure 5.11: Activity Diagram for NMS deletes a Subnetwork Connection (SNC)**

## 5.6.9 NMS deactivates and deletes a Subnetwork Connection (SNC)

### Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)

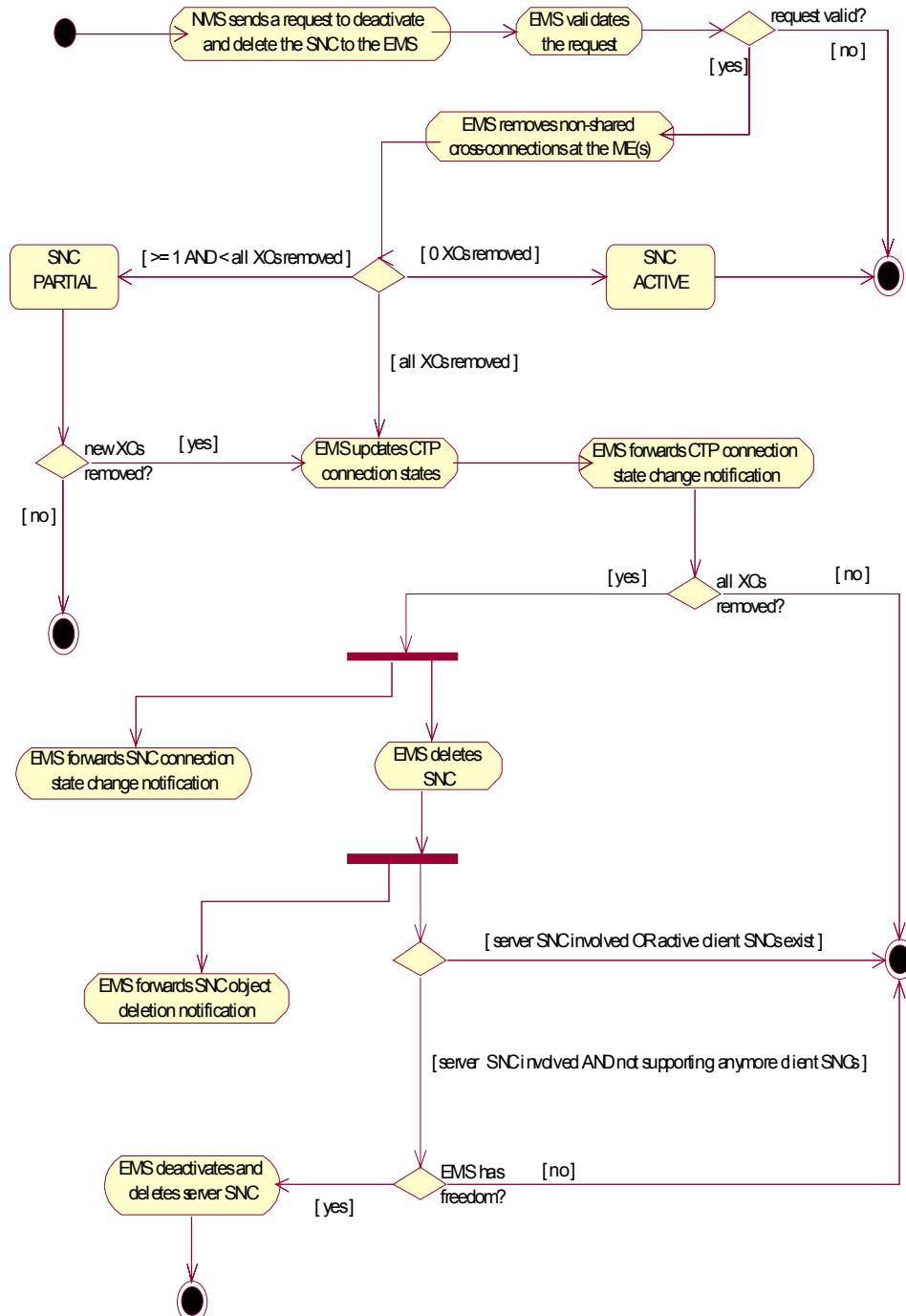
<b>Use Case Name</b>	NMS deactivates and deletes a Subnetwork Connection (SNC)
<b>Summary</b>	<p>The NMS requests that an SNC be deactivated and deleted. As a result of successfully completing this use case:</p> <ul style="list-style-type: none"> <li>• The SNC will be de-provisioned from the EMS' managed subnetwork, and</li> <li>• The SNC object will be removed from the EMS.</li> </ul> <p>If PENDING SNC(s) are supported by the EMS, this use case first uses the NMS Deactivates a Subnetwork Connection use case. If that use case is successfully completed, then the NMS Deletes a Subnetwork Connection use case is employed. This use case assumes that the deletion of the SNC <b>will never fail if pending SNC(s) are not supported by the EMS</b>. It is up to the EMS to enforce this assumption.</p> <p>Some examples of why an NMS would use this use case include:</p> <ul style="list-style-type: none"> <li>• To accomplish via a single request: the freeing-up of resources in the underlying managed subnetwork</li> <li>• The deletion of the record of the SNC from the EMS to free-up EMS resources</li> <li>• The removal of any EMS knowledge of the network resources allocated for the SNC.</li> </ul> <p>If the addressed SNC has more routes, this operation locks all the routes, which means that EMS and/or the network (e.g. restoration process) have no more control over these routes. All the currently active XCs for this SNC shall be removed, of any (active or partial) route. Then the operation deletes the SNC, its intended and all back-up route(s).</p>
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The pre-conditions of <a href="#">Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)</a> .
<b>Begins when</b>	The NMS sends a request to the EMS to deactivate and delete an SNC.

**Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)**

<b>Description</b>	<p>Case A: Pending SNC(s) not supported</p> <ol style="list-style-type: none"> <li>1) The EMS validates the specified SNC. If the request is invalid, an exception is raised.</li> <li>2) The EMS initiates the deactivation of the SNC. SNC deactivation involves EMS communication with managed elements. The EMS attempts to remove, from the applicable managed elements, all the non-shared cross-connections which comprise this SNC.</li> <li>3) If the EMS succeeds in deactivating the SNC (i.e., if all the cross-connections comprising the SNC on applicable managed elements have been removed), the EMS initiates the deletion of the SNC in the EMS. SNC deletion is not expected to involve EMS communication with managed elements. SNC deletion involves the EMS deleting the SNC object that the EMS maintains. The EMS provides a success indication to the NMS. The EMS generates an object deletion notification when the SNC object is deleted and sends it to the notification service. The deactivation is successful even if some XCs representing fixed connectivity cannot be deleted. An SNC cannot be deactivated if it is composed solely of fixed cross-connects.</li> <li>4) If the EMS fails to deactivate the SNC, a failure indication is sent to the NMS, and:</li> <li>5) If at least one, but not all cross-connections comprising the SNC on applicable managed elements have been removed, the SNC's state changes to PARTIAL (or remains in PARTIAL if already in the PARTIAL state);</li> <li>6) If none of the cross-connections comprising the SNC on applicable managed elements have been removed, the SNC's state remains ACTIVE.</li> <li>7) If there has been an SNC state change, the EMS generates a state change notification when the SNC's state has been changed and sends it to the notification service.</li> <li>8) For any cross-connection that has been successfully removed as a result of the deactivate SNC action, the EMS generates a state change notification for the associated connection termination points (CTPs), indicating that the TP connection state has transitioned to Not Connected.</li> <li>9) If an Server SNC was involved in this SNC, the Server SNC does not support any other Client SNCs and all cross-connections comprising the SNC have been removed, the EMS behavior depends on whether the EMS has freedom to deactivate and delete the Server SNC. If the EMS does not have this level of freedom, only the Client SNC is deactivated and deleted.</li> </ol> <p>Case B: Pending SNC(s) supported</p> <p>This use case first uses the “NMS Deactivates a Subnetwork Connection” use case.</p>
	<p>If the “NMS Deactivates a Subnetwork Connection” use case is successfully completed, this use case then uses the “NMS Deletes a Subnetwork Connection” use case.</p>

**Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)**

<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives an indication of success of the request. (Note that only a single success indication should be provided, not an indication for the successful deactivation of the SNC followed by another indication for the successful deletion of the SNC).</p> <p>In case of failure:</p> <ol style="list-style-type: none"> <li>1) The NMS receives an indication of failure of the SNC deactivation action, or</li> <li>2) The NMS receives an indication of failure of the SNC deletion action, or</li> <li>3) The request times out.</li> </ol>
<b>Post-conditions</b>	<p>In case of success:</p> <p>This use case uses the Post Conditions of the Delete SNC use cases.</p> <p>In case of failure:</p> <ol style="list-style-type: none"> <li>1) The SNC state is either ACTIVE (all network resources associated with the SNC are still in use by the SNC) or PARTIAL (some network resources associated with the SNC are still in use by the SNC). <ul style="list-style-type: none"> <li>• Some or all of the network resources (CTPs) associated with the SNC are still in active use by the SNC, as indicated in the TP Connection State.</li> <li>• The EMS maintains the SNC object.</li> </ul> </li> <li>2) The network resources (CTPs) which had been used in the SNC are freed in the managed subnetwork and the SNC is in the PENDING state. However, (for whatever reason) the EMS maintains the SNC object.</li> <li>3) The request times out.</li> <li>4) If a change of SNC state has occurred, the EMS sends a state change notification to the notification service.</li> </ol> <p>For any change of TP connection state, the EMS has sent a state change notification to the notification service.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed. Non-specific EMS internal failure.</li> <li>2) Invalid input: Any input parameter is syntactical incorrect (e.g the sncName provided by the NMS does not refer to an SNC object, or when any field in tpsToModify is invalid).</li> <li>3) Entity not found: The sncName or tpsToModify (provided by the NMS) reference an object that does not exist.</li> <li>4) Unable to comply: The SNC is fixed and can not be deactivated.</li> <li>5) NE communications loss.</li> </ol> <p><b>Note:</b> Whenever an exception is raised, it can be assumed that no network changes have been made to the SNC</p>
<b>Traceability</b>	<a href="#">(Requirement II. 094)</a> , <a href="#">(Requirement II. 095)</a> .


 Figure 5.12: Activity Diagram for [NMS deactivates and deletes a Subnetwork Connection \(SNC\)](#)

**5.6.10 EMS reroutes a Subnetwork Connection (SNC)****Use Case 5.6.10: EMS reroutes a Subnetwork Connection (SNC)**

<b>Use Case Name</b>	EMS reroutes a Subnetwork Connection (SNC)
<b>Summary</b>	<p>The EMS has the ability to reroute an SNC. There are a variety of reasons why this may happen. The NMS should know if it is possible for the EMS to reroute the SNC. The NMS will be notified when reroutes occur.</p> <p>The following are examples of when a reroute would occur in an EMS domain:</p> <ul style="list-style-type: none"> <li>a) Failure in the SNC or reversion (this is the main use)</li> <li>b) A lower cost route is available.</li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS has registered with the notification service.</li> <li>3) The SNC is in an ACTIVE state before the route change is initiated. The SNC can also be in a PARTIAL state if the route change failed or in PENDING state if a route is available at that time and the route change is re-initiated.</li> </ol>
<b>Begins When</b>	The NMS creates an SNC

**Use Case 5.6.10: EMS reroutes a Subnetwork Connection (SNC)**

<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS can specify at SNC create time if it wishes the EMS to perform automatic rerouting of SNCs.</li> <li>2) The NMS can specify one of the following reroute behaviors (don't care", "yes" or "no") <ul style="list-style-type: none"> <li>• If the NMS specifies don't care", the EMS can choose the behavior.</li> <li>• If the NMS specifies "yes" and the EMS does not support this feature, the EMS will raise an unable to comply exception with the error reason indicating re-route not supported.</li> <li>• If the NMS specifies "no" and the EMS only supports the specified connection using reroute, the EMS will raise an unable to comply exception with the error reason indicating only re-route supported.</li> <li>• The actual value for the SNC ("yes" or "no") instance is contained in the reply.</li> </ul> </li> <li>3) A condition occurs that results in the reroute of the SNC: <ul style="list-style-type: none"> <li>• A route change notification is sent indicating that a re-route has started; the notification contains the original route that is no longer available.</li> <li>• The SNC is re-routed successfully a route change notification is sent indicating that the SNC has been re-routed successfully; the notification contains the new route.</li> <li>• The SNC cannot be re-routed a route change notification is sent indicating that the SNC re-routing has failed; the notification contains the original route.</li> </ul> </li> <li>4) If the EMS attempts to reroute an SNC it will send appropriate 'notifications' to the notification service. The EMS may send SNC state changes. The SNC state may not be impacted if the EMS can create a new connection in the network before deleting old.</li> </ol>
<b>Ends When</b>	The EMS has completed its re-routing and the SNC has either been successfully re-routed or has failed.
<b>Post-Conditions</b>	The SNC will have particular reroute behavior as defined in the EMS reply.
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Communication Failure with NE.</li> <li>2) The EMS does not support the requested feature.</li> </ol>
<b>Traceability</b>	<a href="#">(Requirement II. 084)</a>

**Note:**

This is an optional feature which the EMS may not implement. The support of this feature by an EMS can be discovered by the NMS as a capability of the EMS.

This feature is of particular relevance to a network routed SNC but may also be applicable to NMS/EMS routed SNCs.

### 5.6.11 NMS queries EMS Connection Management Mode

#### Use Case 5.6.11: NMS queries EMS Connection Management Mode

<b>Use Case Name</b>	NMS queries EMS Connection Management Mode
<b>Summary</b>	The NMS requests the connection management mode (capabilities) from the EMS.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS sends the request to retrieve the connection management mode (capabilities) from the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends the request to retrieve the capabilities (which includes connection management mode) from the EMS.</li> <li>2) The EMS replies with its supported capabilities (including the connection management mode indicating whether CC sharing and Pending SNCs are supported).</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p style="margin-left: 20px;">The NMS receives the EMS capabilities.</p> <p>In case of failure:</p> <p style="margin-left: 20px;">None</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p style="margin-left: 20px;">The EMS has sent its capabilities to the NMS.</p> <p>In case of failure:</p> <p style="margin-left: 20px;">None.</p>
<b>Exceptions</b>	Processing failure: The requested operation could not be performed
<b>Traceability</b>	<a href="#">{Requirement II. 100}</a>

### 5.6.12 NMS creates and activates a point-to-point Ethernet Service using fragmentation

The following use case is an example of provisioning an Ethernet Service using fragmentation, it should be noted that this is just one example of service provisioning using fragmentation and this use case can apply to other services using fragmentation such as digital video broadcast.

#### Use Case 5.6.12: NMS creates and activates a point-to-point Ethernet Service using fragmentation

<b>Use Case Name</b>	NMS creates and activates a point-to-point Ethernet Service using fragmentation
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**Use Case 5.6.12: NMS creates and activates a point-to-point Ethernet Service using fragmentation**

<b>Summary</b>	The creation and activation of a point-to-point Ethernet service with fragmentation, such as SONET/SDH Virtual Concatenation or Inverse Multiplexing for ATM, involves the creation of multiple SNCs between two fragmentation capable A-end and Z-end termination points. The NMS must first discover the Ethernet ports and the capabilities of the termination points where fragmentation and reassembly occurs at the A-end and Z-end MEs. Then the NMS creates and activates as many SNCs as necessary to meet the requirements of the service order that is being implemented. This Use Case is an application of the following use case: <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a></li> </ul>
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS asks the EMS(s) for the capabilities of the two Ethernet ports to be connected.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends requests to discover the capabilities of the two Ethernet ports to be connected (i.e., existing and potential CTPs with LR_Fragment layer rate). This provides the fragmentation options available for these Ethernet ports, especially the number of available fragments and their rate (VT1.5, STS1, STS3c, etc.).</li> <li>2) The NMS verifies if it can meet the requirements of the service order using the available fragments (maximum bandwidth, etc.).</li> <li>3) If the service order can be fulfilled and several fragmentation options are available (e.g., using STS1 or STS3c fragment from an OC12) then the NMS selects the scenario that best meet the requirement. The outcome is a series of SNCs that needs to be implemented for transporting the Ethernet service.</li> <li>4) The NMS sends requests to create and activate each SNC needed to support the Ethernet service (to refer <a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a>).</li> <li>5) The Ethernet service is provisioned successfully if the NMS receives a success indication from the EMS for each SNC creation and activation.</li> <li>6) If one or several SNC could not be created and activated then the NMS may choose to leave the Ethernet service in a partial state or to delete the SNCs that were successfully created (i.e., rollback).</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives the indication that all SNCs are created and activated.</p> <p>In case of failure:</p> <p>The NMS receives an indication of creation or activation failure for at least one SNC</p>

**Use Case 5.6.12: NMS creates and activates a point-to-point Ethernet Service using fragmentation**

<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) All SNCs required to fulfil the Ethernet service order have been activated.</li> <li>2) The EMS has forwarded SNC creation notifications to all subscribing NMSs.</li> </ol> <p>In case of failure:</p> <p>Some or all SNCs have not been created.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Non-specific EMS internal failure.</li> <li>2) Service not implemented by the EMS.</li> </ol>
<b>Traceability</b>	

**5.6.13 NMS modifies a point-to-point Ethernet Service with fragmentation**

The following use case is an example of modifying an Ethernet Service using fragmentation, it should be noted that this is just one example of modifying a service using fragmentation and this use case can apply to other services using fragmentation such as digital video broadcast.

**Use Case 5.6.13: NMS modifies a point-to-point Ethernet Service with fragmentation**

<b>Use Case Name</b>	NMS modifies a point-to-point Ethernet Service with fragmentation
<b>Summary</b>	<p>The modification described in this use case consists in changing the transport capacity by adding or deleting Subnetwork Connections to either increase or decrease the total bandwidth available to the point-to-point Ethernet service. This use case requires dynamic allocation (i.e.g., LCAS or LASR) to be supported on the A-end and Z-end MEs or the NMS would have to delete and re-create the bearer SNCs (service impacting operation). This Use Case is an application of the following existing use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a></li> <li>• <a href="#">Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)</a></li> <li>• <a href="#">Use Case 5.6.8: NMS deletes a Subnetwork Connection (SNC)</a></li> </ul> <p>Note that many other modification scenarios are possible including those involving changes to individual Subnetwork Connections (re-routing, protection level, etc.).</p>
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<p>The NMS has executed:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a></li> <li>• <a href="#">Use Case 5.6.12: NMS creates and activates a point-to-point Ethernet Service using fragmentation.</a></li> </ul>
<b>Begins when</b>	The NMS has determined which SNCs need to be created or deleted

**Use Case 5.6.13: NMS modifies a point-to-point Ethernet Service with fragmentation**

<b>Description</b>	<p>If the modification consists in increasing the transport capacity:</p> <ol style="list-style-type: none"> <li>1) The NMS sends requests to discover the remaining capabilities of the two Ethernet ports. This provides for the number of fragments that are still available.</li> <li>2) The NMS verifies if it can meet the capacity requirement of the new service order using the available fragments.</li> <li>3) If the new service order can be fulfilled with the remaining fragments then the NMS sends requests to create and activate additional SNCs (to refer <a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a>).</li> <li>4) The Ethernet service is re-provisioned successfully if the NMS receives a success indication from the EMS for each SNC creation and activation.</li> <li>5) If one or several SNC could not be created and activated then the NMS may choose to leave the Ethernet service in a partial state or to delete the SNCs that were successfully created (i.e., rollback).</li> </ol> <p>If the modification consists in decreasing the transport capacity:</p> <ol style="list-style-type: none"> <li>1) Depending on the existing fragmentation and rate the NMS determines which SNCs need to be deleted to fulfil the new service order.</li> <li>2) The NMS sends requests to deactivate the SNCs that are no longer needed (to refer Use Case 5.6.4 NMS Deactivates a Subnetwork Connection).</li> <li>3) The NMS sends requests to delete the SNCs that are no longer needed (to refer Use Case 5.6.8: NMS deletes a Subnetwork Connection (SNC)).</li> <li>4) The Ethernet service is re-provisioned successfully if the NMS receives a success indication from the EMS for each SNC deletion.</li> <li>5) If one or several SNC could not be deleted (e.g., because they carry traffic and can't be put out of service) then the NMS needs to try again at a later time (Ethernet service is only partially modified).</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives the indication that all new SNCs are created and activated (capacity increase case) or it receives indication that all unneeded SNCs are deleted (capacity decrease case).</p> <p>In case of failure:</p> <p>The NMS receives an indication of creation or activation failure for at least one new SNC (capacity increase case) or it receives indication of deletion failure for at least one unneeded SNCs (capacity decrease case).</p>

**Use Case 5.6.13: NMS modifies a point-to-point Ethernet Service with fragmentation**

<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) All new SNCs required to fulfil the Ethernet service order have been activated (capacity increase case) or all SNCs no longer required have been deleted (capacity decrease case).</li> <li>2) The EMS has forwarded SNC creation notifications (capacity increase case) or deletion notifications (capacity decrease case) to all subscribing NMSs..</li> </ol> <p>In case of failure:</p> <p>Some or all SNCs have not been created (capacity increase case) or deleted (capacity decrease case).</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Non-specific EMS internal failure.</li> <li>2) Service not implemented by the EMS.</li> </ol>
<b>Traceability</b>	

**5.6.14 NMS deletes a point-to-point Ethernet Service with fragmentation**

The following use case is an example of deleting an Ethernet Service with fragmentation, it should be noted that this is just one example of deleting a service using fragmentation and this use case can apply to other services using fragmentation such as digital video broadcast.

**Use Case 5.6.14: NMS deletes a point-to-point Ethernet Service with fragmentation**

<b>Use Case Name</b>	NMS deletes a point-to-point Ethernet Service with fragmentation
<b>Summary</b>	<p>The removal of a point-to-point Ethernet service with fragmentation, such as SONET/SDH Virtual Concatenation or Inverse Multiplexing for ATM, involves the deletion of all SNCs provisioned between the two fragmentation capable A-end and Z-end termination points. This Use Case is essentially an application of the following existing Use Cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)</a></li> <li>• <a href="#">Use Case 5.6.8: NMS deletes a Subnetwork Connection (SNC)</a></li> </ul>
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<p>The NMS has executed:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a></li> <li>• <a href="#">Use Case 5.6.12: NMS creates and activates a point-to-point Ethernet Service using fragmentation</a></li> </ul>
<b>Begins when</b>	The NMS has determined which SNCs need to be deleted

**Use Case 5.6.14: NMS deletes a point-to-point Ethernet Service with fragmentation**

<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends requests to deactivate all SNCs involved in the Ethernet service (refer to <a href="#">Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)</a>).</li> <li>2) The NMS sends requests to delete all SNCs involved in the Ethernet service (refer to <a href="#">Use Case 5.6.8: NMS deletes a Subnetwork Connection (SNC)</a>).</li> <li>3) The Ethernet service is deleted successfully if the NMS receives a success indication from the EMS for all SNC deletions.</li> <li>4) If one or several SNC could not be deleted (e.g., because they carry traffic and can't be put out of service) then the NMS needs to try again at a later time (Ethernet service is only partially deleted).</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives the indication that all SNCs are deleted.</p> <p>In case of failure:</p> <p>The NMS receives an indication of deletion failure for at least one SNC</p>
<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) All SNCs required to delete the Ethernet service have been deleted.</li> <li>2) The EMS has forwarded SNC deletion notifications to all subscribing NMSs</li> </ol> <p>In case of failure:</p> <p>Some or all SNCs have not been deleted</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Non-specific EMS internal failure.</li> <li>2) Service not implemented by the EMS.</li> </ol>
<b>Traceability</b>	

**5.6.15 NMS creates a flexible IMA group****Use Case 5.6.15: NMS creates a flexible IMA group**

<b>Use Case Name</b>	NMS creates a flexible IMA group
<b>Summary</b>	<p>This use case assumes that an IMA group FTP is offered by the EMS (i.e., it exists due to equipment capabilities) none of whose fragments is connected to a supporting CTP, i.e. the whole server capacity is “unloaded”. The NMS then “loads” the IMA group according to its transport capacity requirements by setting up appropriate SNCs. The NMS first discovers all server CTPs of the IMA group FTP, recognizes that all of them are unconnected, and then discovers the available unconnected supporting CTPs. Then the NMS creates and activates as many SNCs as necessary to meet the requirements of the bandwidth order that is being implemented.</p> <p>This Use Case is an application of the following use case:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a></li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins When</b>	The NMS sends a request to the EMS for the capabilities of the IMA group TP and the available transport capabilities of the ME.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends requests to discover the server-side capabilities of the IMA group TP, i.e. the number of available fragments and their rate (e.g., E1 or DS1 or VC-12 or SHDSL), and the available transport capabilities of the ME, i.e. the number of unconnected supporting CTPs of the appropriate rate(s).</li> <li>2) The NMS verifies if it can meet the requirements of the bandwidth demand using the available fragments (maximum bandwidth, etc.) and supporting TPs.</li> <li>3) If the bandwidth demand can be fulfilled and several fragmentation options are available then the NMS selects the scenario that best meets the requirement. The outcome is a series of SNCs that needs to be implemented for transporting all of the ATM services of the IMA group.</li> <li>4) The NMS sends requests to create and activate each SNC needed to support the capacity requirements (refer to <a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a>).</li> <li>5) The capacity requirements are met successfully if the NMS receives a success indication from the EMS for each SNC creation and activation.</li> <li>6) If one or several SNCs could not be created and activated then the NMS may choose to meet the bandwidth demand only partially or to deactivate and delete the SNCs that were successfully created (i.e., rollback the successful work).</li> </ol>
<b>Ends When</b>	<p>In case of success:</p> <p>The NMS receives the indication that all SNCs are created and activated.</p> <p>In case of failure:</p> <p>The NMS receives an indication of creation or activation failure for at least one SNC.</p>

**Use Case 5.6.15: NMS creates a flexible IMA group**

<b>Post-Conditions</b>	<p>In case of success:</p> <ul style="list-style-type: none"><li>1) All SNCs required to fulfill the bandwidth demand have been activated.</li><li>2) The EMS has forwarded SNC creation notifications to all subscribing NMSs.</li></ul> <p>In case of failure:</p> <p>Some or all SNCs have not been created..</p>
<b>Exceptions</b>	<ul style="list-style-type: none"><li>1) Not implemented: The EMS does not support this service.</li><li>2) Processing failure: The requested operation could not be performed.</li></ul>
<b>Traceability</b>	

## 5.6.16 NMS deletes a flexible IMA group

### Use Case 5.6.16: NMS deletes a flexible IMA group

<b>Use Case Name</b>	NMS deletes a flexible IMA group
<b>Summary</b>	The unloading of a flexible IMA group involves the deletion of all SNCs that have been provisioned between the fragments of the IMA group and the supporting CTPs. This Use Case is an application of the following use case: <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)</a></li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> and has executed <a href="#">Use Case 5.6.15: NMS creates a flexible IMA group</a> (i.e., the NMS can only unload an IMA group that it has previously loaded itself).
<b>Begins When</b>	The NMS has determined which SNCs need to be deactivated and deleted
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS determines which SNCs need to be deactivated and deleted and, optionally, locks the IMA group to initiate immediate or deferred shutdown.</li> <li>2) The NMS sends requests to deactivate and delete all SNCs that are involved with server CTPs of the considered IMA group (refer to <a href="#">Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)</a>) thereby disconnecting the involved supporting CTPs at the other sides of the SNCs.</li> <li>3) The IMA group is unloaded successfully if the NMS receives a success indication from the EMS for all SNC deletions.</li> <li>4) If one or several SNCs could not be deactivated and deleted (e.g., because they carry traffic and cannot be put out-of-service) then either the NMS needs to try again at a later time (IMA group is only partially unloaded) or the NMS may set the Administrative state of the involved CTPs to “shutting down”, when supported by the EMS, to indicate its intention of SNC deletion.</li> </ol>
<b>Ends When</b>	In case of success: The NMS receives the indication that all SNCs are deleted. In case of failure: The NMS receives an indication of deletion failure for at least one SNC.
<b>Post-Conditions</b>	In case of success: <ol style="list-style-type: none"> <li>1) All SNCs required to unload the IMA group have been deleted.</li> <li>2) The EMS has forwarded SNC deletion notifications to all subscribing NMSs.</li> </ol> In case of failure: <p>Some or all SNCs have not been deleted, and the involved CTPs could be in Administrative state “shutting down”.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> </ol>
<b>Traceability</b>	

**5.6.17 NMS modifies the transport capacity or the routing targets of a flexible IMA group****Use Case 5.6.17: NMS modifies the transport capacity or the routing targets of a flexible IMA group**

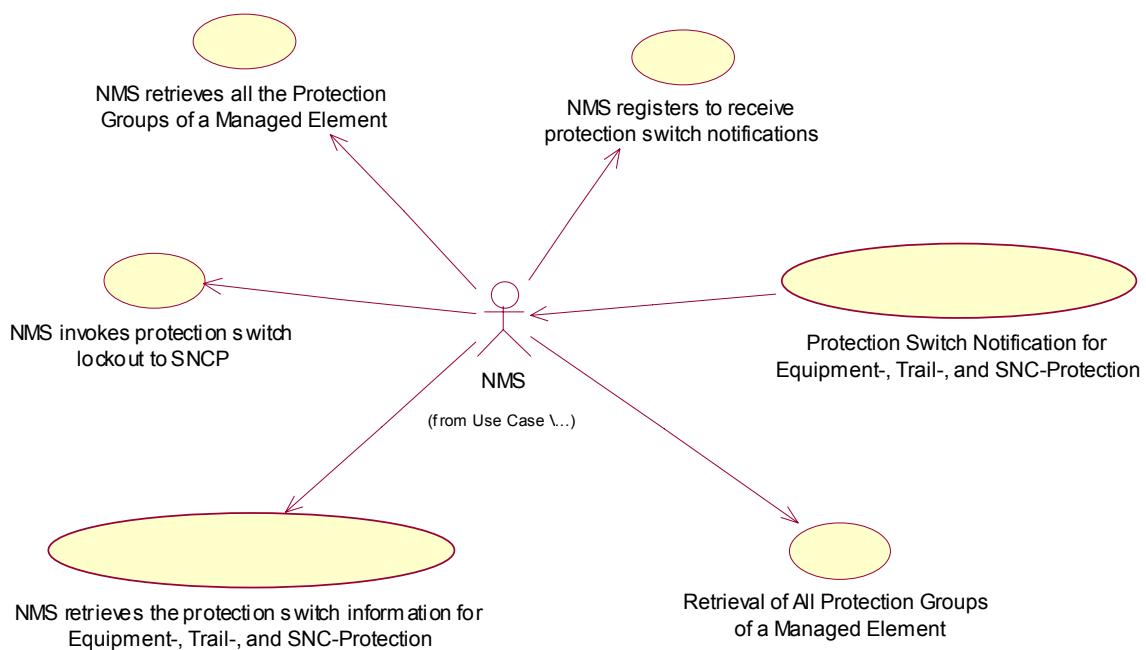
<b>Use Case Name</b>	NMS modifies the transport capacity or the routing targets of a flexible IMA group.
<b>Summary</b>	<p>The modification described in this use case consists in changing the transport capacity or the routing targets of an IMA group by adding or deleting Subnetwork Connections to either increase or decrease the total bandwidth available to the IMA group from available supporting CTPs or to redirect the transport to and from other supporting CTPs. This use case requires dynamic allocation by the LASR procedure to be supported on the considered IMA group since otherwise the NMS would have to delete and recreate SNCs which would unavoidably be a service impacting operation.</p> <p>This Use Case is an application of the following use cases:</p> <ul style="list-style-type: none"> <li>• <a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a></li> <li>• <a href="#">Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)</a></li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> and has executed <a href="#">Use Case 5.6.15: NMS creates a flexible IMA group</a> (i.e., the NMS can only unload an IMA group that it has previously loaded itself).
<b>Begins When</b>	The NMS has determined which SNCs need to be created or deleted or recreated.
<b>Description</b>	<p>If the modification consists in increasing the transport capacity:</p> <ol style="list-style-type: none"> <li>1) The NMS sends requests to discover the remaining server-side capabilities of the IMA group TP. This provides for the number of still available fragments.</li> <li>2) The NMS verifies if it can meet the requirements of the bandwidth increase demand using the still available fragments (maximum bandwidth, etc.).</li> <li>3) If the bandwidth increase demand can be fulfilled with the remaining fragments then the NMS sends requests to create and activate additional SNCs (refer to <a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a>).</li> <li>4) The bandwidth increase demand is met successfully if the NMS receives a success indication from the EMS for each SNC creation and activation.</li> <li>5) If one or several SNCs could not be created and activated then the NMS may choose to meet the bandwidth increase demand only partially or to delete the SNCs that were successfully created (i.e., rollback the successful work).</li> </ol> <p>If the modification consists in decreasing the transport capacity:</p> <ol style="list-style-type: none"> <li>1) Depending on the existing fragmentation and layer rate the NMS determines which SNCs need to be deleted to fulfill the bandwidth decrease order.</li> <li>2) The NMS sends requests to deactivate and delete the SNCs that are no longer needed (refer to <a href="#">Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)</a>).</li> <li>3) The IMA group is re-provisioned successfully if the NMS receives a success indication from the EMS for each SNC deletion.</li> </ol>

**Use Case 5.6.17: NMS modifies the transport capacity or the routing targets of a flexible IMA group**

	<p>4) If one or several SNCs could not be deactivated and deleted (e.g., because they carry traffic and cannot be put out-of-service) then either the NMS needs to try again at a later time (IMA group is only partially unloaded) or the NMS may set the Administrative state of the involved CTPs to “shutting down”, when supported by the EMS, to indicate its intention of SNC deletion.</p> <p>If the modification consists in rerouting the physical transport:</p> <ol style="list-style-type: none"> <li>1) The NMS executes the <a href="#">Use Case 5.6.16: NMS deletes a flexible IMA group</a> for the old, no longer needed or usable, load of the IMA group.</li> <li>2) The NMS executes the <a href="#">Use Case 5.6.15: NMS creates a flexible IMA group</a> for the new load of the IMA group. This use case includes the determination of the supporting CTPs that constitute the new load.</li> </ol>
<b>Ends When</b>	<p>In case of success:</p> <p>The NMS receives the indication that all new SNCs are created and activated and/or all unneeded SNCs are deleted.</p> <p>In case of failure:</p> <p>The NMS receives an indication of creation or activation or deletion failure for at least one SNC.</p>
<b>Post-Conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) All SNCs required to fulfill the capacity adjustment requirement have been activated or deleted.</li> <li>2) The EMS has forwarded SNC creation and deletion notifications to all subscribing NMSs.</li> </ol> <p>In case of failure:</p> <p>Some or all SNCs have not been created or deleted, and the involved CTPs could be in Administrative state “shutting down”.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> </ol>
<b>Traceability</b>	

## 5.7 Protection Management Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.7.1:</a>	<a href="#">NMS retrieves all the Protection Groups of a Managed Element</a>	{Requirement II. 059}, {Requirement II. 174}
<a href="#">Use Case 5.7.2:</a>	<a href="#">Protection Switch Notification for Equipment, Trail and SNC Protection</a>	{Requirement I. 046}, {Requirement II. 115}, {Requirement I. 074}, {Requirement II. 175}
<a href="#">Use Case 5.7.3:</a>	<a href="#">NMS retrieves the protection switch information for Equipment, Trail and SNC Protection</a>	{Requirement II. 114}, {Requirement II. 175}
<a href="#">Use Case 5.7.4:</a>	<a href="#">NMS registers to receive protection switch notifications</a>	{Requirement II. 115}
<a href="#">Use Case 5.7.5:</a>	<a href="#">NMS invokes protection switch lockout to SNCP</a>	{Requirement II. 116}



**Figure 5.13: Protection Management Use Cases**

### 5.7.1 NMS retrieves all the Protection Groups of a Managed Element

#### Use Case 5.7.1: NMS retrieves all the Protection Groups of a Managed Element

<b>Use Case Name</b>	NMS retrieves all the Protection Groups of a Managed Element.
<b>Summary</b>	The NMS attempts to learn about the existence of all protection groups that exist in a network element.  This use case applies to both TP and equipment protection groups.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> . 2) The Managed Element exists within the control of the EMS.
<b>Begins when</b>	NMS requires the information about the existence of the protection groups in a Managed Element.
<b>Description</b>	1) The NMS requests the list of protection groups in a Managed Element. The NMS will send the name of the Managed Element as input.  Note that the NMS can request all TP protection groups or all Equipment protection groups, but not both in the same request.
	2) The EMS returns the list of all the protection groups contained in the Managed Element.
	3) In the case of non-Equipment Protection Groups the EMS orders the protection group TPs in the list as follows:
	<ul style="list-style-type: none"> <li>• The ProtectedTPs are always presented ahead of the protecting TP.</li> <li>• The TPs in the East direction are always presented contiguously ahead of the West directions.</li> <li>• In case of 4-fiber rings, there are three groups presented, two span groups and one 4-fiber ring group.</li> <li>• This ordering and scheme is applicable to all technologies.</li> </ul>
	4) If the EMS does not know the reversion Mode or the protection Scheme state, a value of UNKNOWN is returned.
	5) For BLSR and 1:N MSP, non Pre-emptible traffic shall be ALLOWED, or NOT_ALLOWED.
	6) The applicable parameters of each protection group type is returned. If not known, a value of UNKNOWN is returned.
	7) The ProtectionScheme State is identified to be AUTOMATIC or FORCED_OR_LOCKED_OUT to switch. This indicates whether the protection scheme is free to switch or is constrained from switching. The protection scheme is constrained from switching when it is forced or locked.
	8) The wtrTime is provided in seconds. If the EMS cannot obtain that value, a value of -1 is returned.
<b>Ends when</b>	The EMS completes the service.

**Use Case 5.7.1: NMS retrieves all the Protection Groups of a Managed Element**

<b>Post-conditions</b>	The NMS is aware of the protection groups in a Network Element.
<b>Exceptions</b>	<ul style="list-style-type: none"><li>1) Processing failure: The requested operation could not be performed.</li><li>2) Invalid input: The name of the Network Element in the request does not reference a managedElement object.</li><li>3) Entity not found: The name of the Network Element references object which does not exist.</li><li>4) NE communication loss.</li></ul>
<b>Traceability</b>	<a href="#">{Requirement II. 059}</a> , <a href="#">{Requirement II. 174}</a>

## 5.7.2 Protection Switch Notification for Equipment, Trail and SNC Protection

### Use Case 5.7.2: Protection Switch Notification for Equipment, Trail and SNC Protection

<b>Use Case Name</b>	Protection Switch Notification for Equipment, Trail and SNC Protection.
<b>Summary</b>	This use case describes events that occur at the network level and how the NMS learns of them.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a></li> <li>2) The NMS has executed <a href="#">Use Case 5.7.4: NMS registers to receive protection switch notifications</a>. In the case of equipment protection, the NMS has registered to receive equipment protection switch notifications.</li> <li>3) In the case of Trail and SNC Protection the Termination Points in question are in a protection configuration.</li> <li>4) In the case of Equipment, the Equipment instances in question are in a protection configuration (only M:N equipment protection has been identified, so far)</li> </ul>
<b>Begins when</b>	Either a network fault has occurred or a user triggers a switch from the EMS or the Craft creating a switch in the traffic source or the NMS triggers a switch.

**Use Case 5.7.2: Protection Switch Notification for Equipment, Trail and SNC Protection**

<b>Description</b>	<ol style="list-style-type: none"> <li>1) In case of Trail protection switch (including the span switch in a 4-fiber ring configurations), the traffic source has switched from the protected to protecting or vice versa.</li> <li>2) In case of a ring switch, the traffic has switched from the protected channels of a span to the protecting channels of the other span.</li> <li>3) In case of a SNC protection switch, the traffic being received at the reliable TP (the output of the service selector), is switched from the worker TP to the protection TP or switched back.</li> <li>4) The 1+1 and 1:N Trail protection (including the span switch in a 4-fiber ring) notification is raised against the Trail protection groups.</li> <li>5) In the case of M:N equipment protection, the notification is raised against the equipment protection group.</li> <li>6) In case of a ring switch the notification is raised against the Ring groups.</li> <li>7) In case of a SNC protection switch, the notification is raised against the reliable TP.</li> </ol>
	<p>The EMS provides the following information to the NMS in the notification:</p> <ol style="list-style-type: none"> <li>1) The protection type shall be provided to identify whether a protection switch is an Equipment protection, Trail protection or an SNC protection.</li> <li>2) The switch reason shall be provided, which shall be Restored, Signal Fail, Signal Mismatch, Signal Degrade, Automatic Switch, Manual Switch, or Not Applicable.</li> <li>3) In the case of Trail or SNC protection the layer rate shall be provided to which this switch is related.</li> <li>4) The group name shall be provided, which identifies the protection group for which protection switch status is being reported. The group name shall be NULL if the protection type is SNC protection.</li> <li>5) The protected TP shall be provided. For a SNC, this is always the reliable TP. For a 2F MSSP ring notification, this is the TP that is/was inactive during the switch. For a 4F MSSP ring switch notification, this is the worker TP that is/was inactive during the switch. For a 1:N MSP switch notification, this is the worker TP for which the protection switch occurred. For a revertive 1+1 MSP, this is always the worker TP. For a non-revertive 1+1 MSP switch notification, this is the TP that is inactive after the switch. In the case of equipment protection, the protected equipment instance shall be provided. For a M:N group, the protected equipment instance always identifies the worker equipment instance for which the switch occurred.</li> <li>6) The switchAwayFromTP shall be provided. For a 2F MSSP ring switch, this is the TP that switched. For a 4F MSSP ring span switch, this is one of the TPs in the Trail1:N groups (worker or protection). In the case of equipment protection, the switchAwayFromEquipment is provided (this identifies the equipment instance being switched away from).</li> <li>7) The switchToTP shall be provided, which identifies the TP that is the active source after the switch, or currently active if no protection switch is currently active. In the case of equipment protection, the switchToEquipment is provided (this identifies the equipment instance which is being switched to).</li> </ol>

**Use Case 5.7.2: Protection Switch Notification for Equipment, Trail and SNC Protection**

<b>Ends when</b>	The NMS is notified of the switch.
<b>Post-conditions</b>	Subject to filter conditions, NMS knows of the present traffic source.
<b>Exceptions</b>	Not applicable.
<b>Traceability</b>	<a href="#">{Requirement I. 046}</a> , <a href="#">{Requirement II. 115}</a> , <a href="#">{Requirement I. 074}</a> , <a href="#">{Requirement II. 175}</a>

### 5.7.3 NMS retrieves the protection switch information for Equipment, Trail and SNC Protection

#### Use Case 5.7.3: NMS retrieves the protection switch information for Equipment, Trail and SNC Protection

<b>Use Case Name</b>	NMS retrieves the protection switch information for Equipment, Trail and SNC Protection.
<b>Summary</b>	This use case describes how the NMS learns of the traffic source of the protection groups and protected SNCs.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The Termination Points in question are in a protection configuration (Trail or SNC Protection).</li> <li>3) In the case of Equipment, the equipment instances in question are in a protection configuration.</li> </ul>
<b>Begins when</b>	NMS wishes to discover the present traffic source of a Trail or a SNC Protection configuration, or the active equipment instance in a Equipment protection group.

**Use Case 5.7.3: NMS retrieves the protection switch information for Equipment, Trail and SNC Protection**

<b>Description</b>	<p>The EMS provides the following information to the NMS in the response to a query regarding the current protection switch status of a protection group or a SNC:</p> <ol style="list-style-type: none"> <li>1) The protection type shall be provided to identify whether a protection switch is a Trail protection switch or a SNC protection.</li> <li>2) The switch reason shall be provided, which shall be Restored, Signal Fail, Signal Mismatch, Signal Degrade, Automatic Switch, Manual Switch, or Not Applicable.</li> <li>3) The layer rate shall be provided, which this switch is relevant to. not applicable for equipment protection).</li> <li>4) The group name shall be provided, which identifies the protection group for which protection switch status is being reported. The group name shall be NULL if the protection type indicates SNC protection.</li> <li>5) TP Protection:  The protected TP shall be provided. For a SNC protection, this is always the reliable TP. For a retrieval of a 2Fiber MS SP ring, each TP is protected, and two SwitchData structures are returned. For a retrieval of a 4Fiber MS SP ring, each worker TP is protected, and two SwitchData structures are returned. For a retrieval of a 1:N Trail protection, each worker TP is protected, and N SwitchData structures are returned. For a revertive 1+1 Trail protection, this is always the worker TP. For a retrieval of a non-revertive 1+1 Trail protection switch, this is the active TP.</li> <li>6) Equipment Protection:  For a retrieval of an M:N group, the protected equipment always identifies a worker equipment instance. In this case, N ESwitchData structures are returned as a result of retrieve ESwitchData request (one for each worker equipment instance).</li> <li>7) The switchToTP shall be provided, which identifies the TP that is the active source after the switch, or currently active if no protection switch is currently active.</li> <li>8) In the case of equipment protection, the protected equipment instance shall be provided. For a M:N group, the protected equipment instance always identifies the worker equipment instance for which the switch occurred.</li> </ol>
<b>Ends when</b>	The NMS is presented with all the information.
<b>Post-conditions</b>	NMS knows of the traffic source.
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS is unable to support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: The input object does not reference a protection group or a reliable CTP of a SNC object.</li> <li>4) Entity not found: The input object does not exist.</li> <li>5) NE communication loss..</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 114}</a> , <a href="#">{Requirement II. 175}</a>

### 5.7.4 NMS registers to receive protection switch notifications

#### Use Case 5.7.4: NMS registers to receive protection switch notifications

<b>Use Case Name</b>	NMS registers to receive protection switch notifications
<b>Summary</b>	The NMS registers at the notification service related to the EMS, sets the appropriate filter to receive protection switch notifications, and connects to the notification service.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS has a reference to the notification service used by the EMS.</li> </ol>
<b>Begins when</b>	The NMS sends a request to register itself at the notification service related to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS registers at the notification service related to the EMS as a consumer of notifications (if this has not been done earlier).</li> <li>2) The NMS sets the filter criteria needed to receive protection switch notifications from the EMS via the notification service.</li> <li>3) The NMS connects to the notification service and thus is able to receive notifications matching the filter conditions specified (if this has not been done earlier).</li> </ol> <p><b>Note:</b> The main filtering criteria is on the notification type (i.e., protection switch). In addition, the NMS can request other filtering criteria. Any of the parameters of the filterable body of the protection switch notification (Refer to <a href="#">(Requirement I. 046)</a>) can be used.</p>
<b>Ends when</b>	<p>In case of success: The NMS receives a positive acknowledgement to its connection request to the notification service.</p> <p>In case of failure: The EMS returns an error indication.</p>
<b>Post-conditions</b>	<p>In case of success: The specified filter(s) are set up or modified.</p> <p>In case of failure: The NMS receives a negative acknowledgement to a request for registration, filter building or connection or a request times out.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Filter creation:             <ol style="list-style-type: none"> <li>a) Invalid grammar</li> </ol> </li> <li>2) Filter building:             <ol style="list-style-type: none"> <li>a) Invalid constraint</li> </ol> </li> <li>3) Connection phase:             <ol style="list-style-type: none"> <li>a) Illegal consumer type</li> <li>b) Consumer already connected</li> </ol> </li> </ol>

**Use Case 5.7.4: NMS registers to receive protection switch notifications**

Traceability	<a href="#">{Requirement II. 115}</a>
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### 5.7.5 NMS invokes protection switch lockout to SNCP

#### Use Case 5.7.5: NMS invokes protection switch lockout to SNCP

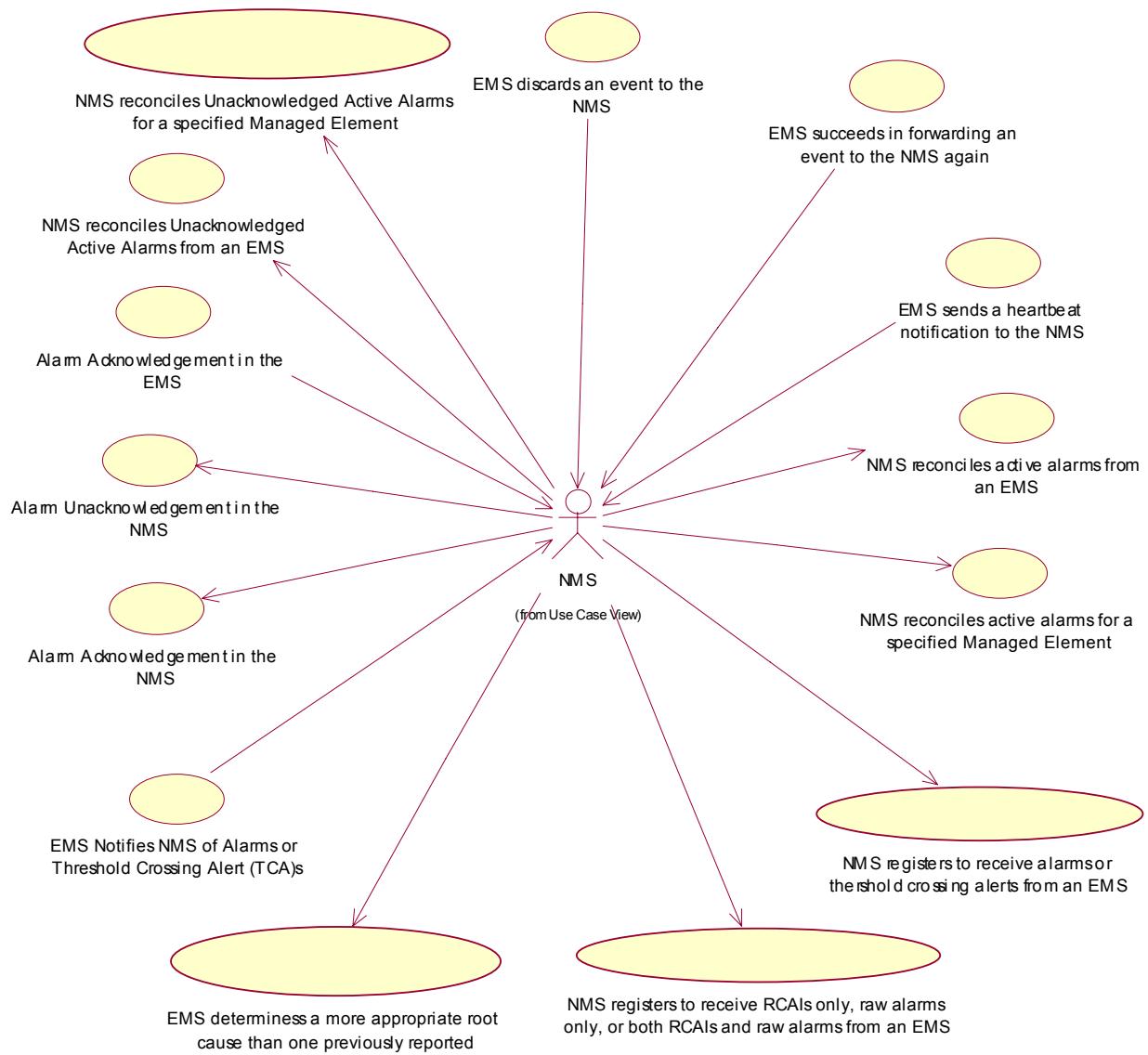
<b>Use Case Name</b>	NMS invokes protection switch lockout to SNCP
<b>Summary</b>	NMS applies protection switch lockout to a reliable CTP of a SNC that is protected by SNCP.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) A SNC currently exists that employs SNCP.</li> <li>3) The NMS has determined which CTPs participate in the SNCP switch.</li> </ul>
<b>Begins when</b>	A request to apply a protection command is applied.
<b>Description</b>	The command is applied to the reliable CTP that is defined as being able to perform a protection switch.
<b>Ends when</b>	The EMS responds that the command was applied or an exception is thrown.
<b>Post conditions</b>	The SNCP scheme is now locked and will not switch automatically such as when a transmission error would normally cause a protection switch.
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed.</li> <li>2) Unable to comply: The CTP is not performing a protection switch in a SNCP.</li> <li>3) Not implemented: The EMS does not support this service.</li> <li>4) NE communication loss.</li> </ul>
<b>Traceability</b>	{Requirement II. 116}

## 5.8 Fault Management Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.8.1:</a>	<a href="#">NMS reconciles active alarms from an EMS</a>	{Requirement II. 111}
<a href="#">Use Case 5.8.2:</a>	<a href="#">NMS reconciles active alarms for a specified Managed Element</a>	{Requirement II. 110}
<a href="#">Use Case 5.8.3:</a>	<a href="#">NMS registers to receive alarms or threshold crossing alerts from an EMS</a>	{Requirement II. 103}
<a href="#">Use Case 5.8.4:</a>	<a href="#">NMS registers to receive RCAs only, raw alarms only, or both RCAs and raw alarms from an EMS</a>	{Requirement II. 223}
<a href="#">Use Case 5.8.5:</a>	<a href="#">EMS determines a more appropriate root cause than one previously reported</a>	{Requirement II. 224}
<a href="#">Use Case 5.8.6:</a>	<a href="#">EMS Notifies NMS of Alarms or Threshold Crossing Alert (TCA)s</a>	{Requirement II. 126}
<a href="#">Use Case 5.8.7:</a>	<a href="#">Alarm Acknowledgement in the NMS</a>	{Requirement II. 155} {Requirement II. 157}

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Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.8.8:</a>	<a href="#">Alarm Unacknowledgement in the NMS</a>	<a href="#">{Requirement II. 156}</a> <a href="#">{Requirement II. 158}</a>
<a href="#">Use Case 5.8.9:</a>	<a href="#">Alarm Acknowledgement in the EMS</a>	<a href="#">{Requirement II. 157}</a>
<a href="#">Use Case 5.8.10:</a>	<a href="#">NMS reconciles Unacknowledged Active Alarms from an EMS</a>	<a href="#">{Requirement II. 154}</a>
<a href="#">Use Case 5.8.11:</a>	<a href="#">NMS reconciles Unacknowledged Active Alarms for a specified Managed Element</a>	<a href="#">{Requirement II. 154}</a>
<a href="#">Use Case 5.8.12:</a>	<a href="#">EMS discards an event to be sent to the NMS</a>	<a href="#">{Requirement II. 177}</a>
<a href="#">Use Case 5.8.13:</a>	<a href="#">EMS succeeds in forwarding an event to the NMS again</a>	<a href="#">{Requirement II. 177}</a>
<a href="#">Use Case 5.8.14:</a>	<a href="#">EMS sends a heartbeat notification to the NMS</a>	<a href="#">{Requirement II. 178}</a>



**Figure 5.14: Fault Management Use Cases**

### 5.8.1 NMS reconciles active alarms from an EMS

#### Use Case 5.8.1: NMS reconciles active alarms from an EMS

<b>Use Case Name</b>	NMS reconciles active alarms from an EMS
<b>Summary</b>	The NMS requests the current list of active EMS-specific and non-EMS-specific alarms and TCAs that are under the control of an EMS (both those raised by the NEs and those raised by the EMS itself)..  Some alarms may be filtered out (excluded) by specifying their probable causes or severities.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS sends a request to the EMS for the current list of active EMS-specific and non-EMS-specific alarms and TCAs.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a request to the EMS for its summary of active EMS-specific and non-EMS-specific alarms and TCAs, with parameters to filter out (exclude) certain values of probable cause or severity if the NMS does not wish to receive the whole list. These filtering criteria are independent of the filtering set up by the NMS for the notification service.</li> <li>2) The EMS responds to the NMS request by returning a list of active alarms and TCAs that meet the specified filtering criteria or the request times out.</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives the current list of active EMS-specific and non-EMS-specific alarms and TCAs. Active alarms are those not inhibited neither by alarm reporting attribute, nor by assigned ASAP.</p> <p>In case of failure:</p> <p>The NMS receives a failure indication.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>The NMS receives the current list of active EMS-specific and non-EMS-specific alarms and TCAs.</p> <p>In case of failure:</p> <p>The NMS does not receive a current list of active EMS-specific and non-EMS-specific alarms and TCAs from the EMS.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) NMS request times out.</li> <li>2) Processing failure: The requested operation could not be performed.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 111}</a>

### 5.8.2 NMS reconciles active alarms for a specified Managed Element

#### Use Case 5.8.2: NMS reconciles active alarms for a specified Managed Element

<b>Use Case Name</b>	NMS reconciles active alarms for a specified Managed Element
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**Use Case 5.8.2: NMS reconciles active alarms for a specified Managed Element**

<b>Summary</b>	NMS reconciles active alarms for a specified Managed Element.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS sends a request to the EMS for the current list of active alarms and TCAs for a specified managed element
<b>Description</b>	<p>1) The NMS sends a request to the EMS for its list of active alarms and TCAs for a specified managed element, with parameters to filter out (exclude) certain values of probable cause or severity if the NMS does not wish to receive the whole list. These filtering criteria are independent of the filtering set up by the NMS for the notification service.</p> <p>2) The EMS responds to the NMS request by returning a list of active alarms and TCAs that meet the specified filtering criteria or the request times out.</p>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives the current list of active alarms and TCAs for the specified managed element from the EMS. Active alarms are those not inhibited neither by alarm reporting attribute, nor by assigned ASAP.</p> <p>In case of failure:</p> <p>The NMS receives a failure indication.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>The NMS has the current list of active alarms and TCAs for the specified managed element from the EMS.</p> <p>In case of failure:</p> <p>The NMS does not receive the current list of active alarms and TCAs for the specified managed element from the EMS.</p>
<b>Exceptions</b>	<p>1) Processing failure: The requested operation could not be performed.</p> <p>2) Invalid input: One of the input parameter contains undefined values.</p> <p>3) NE communication loss.</p>
<b>Traceability</b>	<a href="#">{Requirement II. 110}</a>

### 5.8.3 NMS registers to receive alarms or threshold crossing alerts from an EMS

#### Use Case 5.8.3: NMS registers to receive alarms or threshold crossing alerts from an EMS

<b>Use Case Name</b>	NMS registers to receive alarms or threshold crossing alerts from an EMS
<b>Summary</b>	The NMS registers at the notification service related to the EMS, sets the appropriate filter to receive alarm notifications and/or threshold crossing alert notifications, and connects to the notification service.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS has a reference for the notification service used by the EMS.</li> </ul>
<b>Begins when</b>	The NMS sends a request to register itself at the notification service related to the EMS.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The NMS registers at the notification service related to the EMS as a consumer of notifications (if this has not been done earlier).</li> <li>2) The NMS sets the filter criteria needed to receive alarm notifications and threshold crossing alert notifications from the EMS via the notification service.</li> <li>3) The NMS connects to the notification service and thus is able to receive notifications matching the filter conditions specified (if this has not been done earlier).</li> </ul> <p><b>Note:</b>  The main filtering criteria is on the notification type (i.e., alarm and/or threshold crossing alert).  In addition, the NMS can request other filtering criteria. Any of the parameters of the filterable body of the alarm or threshold crossing alert notification can be used.  The commonest filtering criteria for alarms are the Probable Cause and Perceived Severity parameters. See <a href="#">Use Case 5.8.1: NMS reconciles active alarms from an EMS</a> and <a href="#">Use Case 5.8.2: NMS reconciles active alarms for a specified Managed Element</a>.</p>
<b>Ends when</b>	<p>In case of success:  The NMS receives a positive acknowledgement to its connection request to the notification service.</p> <p>In case of failure:  The EMS returns an error indication.</p>
<b>Post-conditions</b>	<p>In case of success:  The specified filter(s) are set up or modified.</p> <p>In case of failure:  The NMS receives a negative acknowledgement to a request for registration, filter building or connection or a request times out.</p>

**Use Case 5.8.3: NMS registers to receive alarms or threshold crossing alerts from an EMS**

<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Filter creation:           <ul style="list-style-type: none"> <li>• Invalid grammar</li> </ul> </li> <li>2) Filter building           <ul style="list-style-type: none"> <li>• Invalid constraint</li> </ul> </li> <li>3) Connection phase:           <ul style="list-style-type: none"> <li>• Illegal consumer type</li> <li>• Consumer already connected</li> </ul> </li> </ol>
<b>Traceability</b>	<a href="#">(Requirement II. 103)</a>

**5.8.4 NMS registers to receive RCAs only, raw alarms only, or both RCAs and raw alarms from an EMS**

When the NMS intends to receive RCAs and raw alarms, it does not have to set any filter criterium (since according to OMGServicesUsage.pdf the filter criterium is either "rcailIndicator" = FALSE for raw alarms or "rcailIndicator" = TRUE for RCAs).

**Use Case 5.8.4: NMS registers to receive RCAs only, raw alarms only, or both RCAs and raw alarms from an EMS**

<b>Use Case Name</b>	NMS registers to receive RCAs only, raw alarms only, or both RCAs and raw alarms from an EMS
<b>Summary</b>	The NMS registers at the notification service related to the EMS, sets the appropriate filter to receive RCAs, raw alarms or both, and connects to the notification service.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS has a reference for the notification service used by the EMS.</li> </ol>
<b>Begins when</b>	The NMS sends a request to register itself at the notification service related to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS registers at the notification service related to the EMS as a consumer of notifications (if this has not been done earlier).</li> <li>2) The NMS sets the filter criteria needed to receive RCAs, raw alarms or both from the EMS via the notification service.</li> <li>3) The NMS connects to the notification service and thus is able to receive notifications matching the filter conditions specified (if this has not been done earlier).</li> </ol> <p><b>Note:</b> In addition to the notification type, the NMS can request filtering on any of the parameters of the filterable body of the notification. For this use case, it would be necessary to filter on the RCAI field.</p>

**Use Case 5.8.4: NMS registers to receive RCAs only, raw alarms only, or both RCAs and raw alarms from an EMS**

<b>Ends when</b>	<p>In case of success: The NMS receives a positive acknowledgement to its connection request to the notification service.</p> <p>In case of failure: The EMS returns an error indication.</p>
<b>Post-conditions</b>	<p>In case of success: The specified filter(s) are set up or modified.</p> <p>In case of failure: The NMS receives a negative acknowledgement to a request for registration, filter building or connection or a request times out.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Filter creation:             <ul style="list-style-type: none"> <li>• Invalid grammar</li> </ul> </li> <li>2) Filter building             <ul style="list-style-type: none"> <li>• Invalid constraint</li> </ul> </li> <li>3) Connection phase:             <ul style="list-style-type: none"> <li>• Illegal consumer type</li> <li>• Consumer already connected</li> </ul> </li> </ol>
<b>Traceability</b>	<a href="#">[Requirement II. 223]</a>

**5.8.5 EMS determines a more appropriate root cause than one previously reported****Use Case 5.8.5: EMS determines a more appropriate root cause than one previously reported**

<b>Use Case Name</b>	EMS determines a more appropriate root cause than one previously reported
<b>Summary</b>	The EMS has reported a root cause to the NMS, and would like to revise the reported root cause.
<b>Actors</b>	EMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS has a reference for the notification service used by the EMS.</li> <li>3) The EMS has sent a root cause alarm to the NMS and the alarm is still active</li> </ul>
<b>Begins when</b>	The EMS determines a root cause that supersedes one or more previously reported (and still uncleared) root cause alarm indications.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The EMS clears a root cause alarm that has been previously sent to the NMS. The EMS does not clear the raw alarms associated with the root cause.</li> <li>2) The EMS sends a new root cause alarm to the NMS. (The idea is that this new root cause is more accurate than the initial root cause alarm.)</li> </ul>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS has received the new root cause alarm indication, and has received the clear(s) for the previous root cause alarm indication(s) that are superseded by the new root cause alarm indication.</p> <p>In case of failure:</p> <p>The NMS has not received the new root cause alarm and clear(s) for the previous root cause alarm indication(s) that are superseded by the new root cause alarm indication.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>The NMS understands that the initial root cause alarm(s) is cleared and the new root cause alarm is active.</p> <p>In case of failure:</p> <p>The NMS is not aware that the initial root cause alarm has been upgraded/corrected.</p>
<b>Exceptions</b>	
<b>Traceability</b>	<a href="#">(Requirement II_224)</a>

**5.8.6 EMS notifies NMS of Alarms or Threshold Crossing Alert (TCA)s****Use Case 5.8.6: EMS Notifies NMS of Alarms or Threshold Crossing Alert (TCA)s**

<b>Use Case Name</b>	EMS notifies NMS of Alarm or Threshold Crossing Alert (TCA)s
<b>Summary</b>	The EMS detects an alarm or threshold crossing alert and notifies the NMS.

**Use Case 5.8.6: EMS Notifies NMS of Alarms or Threshold Crossing Alert (TCA)s**

<b>Actors</b>	NMS
<b>Pre-conditions</b>	<p>1) The NMS has executed <a href="#">Use Case 5.8.3: NMS registers to receive alarms or threshold crossing alerts from an EMS.</a></p> <p>2) The notification service for these notifications is available.</p>
<b>Begins when</b>	The EMS detects an alarm or threshold crossing alert.
<b>Description</b>	<p>1) The EMS detects an alarm or threshold crossing alert and generates a notification to inform the NMS. The EMS does not generate the alarm notification if the object emitting the alarm has the alarm reporting attribute switched off, or the Alarm Severity Assignment Profile severity is assigned to NOTALARMED for that detected alarm probable cause.</p> <p>2) The NMS receives the notification from the notification service.</p>
<b>Ends when</b>	<p>In case of success: The NMS receives the notification.</p> <p>In case of failure: The NMS does not receive the notification.</p>
<b>Post-conditions</b>	<p>In case of success: The NMS' database remains aligned with the EMS's database.</p> <p>In case of failure: The NMS' database is misaligned with the EMS's database.</p>
<b>Exceptions</b>	
<b>Traceability</b>	<a href="#">{Requirement II. 126}</a>

### 5.8.7 Alarm Acknowledgement in the NMS

#### Use Case 5.8.7: Alarm Acknowledgement in the NMS

<b>Use Case Name</b>	Alarm Acknowledgement in the NMS
<b>Summary</b>	The operator acknowledges one or more active alarms in the NMS. The NMS forwards the alarm acknowledgment through an interface operation to the EMS. The NMS will be notified in case that the alarm acknowledgment operation is successful.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The alarms to be acknowledged are active, unacknowledged, and the alarm bearing objects are managed by the EMS.</li> </ul>
<b>Begins when</b>	The operator acknowledges one or more alarms in the NMS
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The NMS issues an interface request to acknowledge the alarm in the EMS.</li> <li>2) The EMS acknowledges the alarm in the NE (if applicable).</li> <li>3) The alarm is updated as “acknowledged” in the EMS.</li> <li>4) The NMS is then notified that the alarm has been acknowledged in the EMS.</li> </ul>
<b>Ends when</b>	<p>In case of success:</p> <p>All NMS' receive an alarm acknowledged notification after the operation completes successfully.</p> <p>In case of failure:</p> <p>No alarms are acknowledged in the EMS and the NMS does not receive any “alarm acknowledged” notifications.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>All successfully acknowledged alarms are in an acknowledged state in the EMS.</p> <p>In case of failure:</p> <ul style="list-style-type: none"> <li>1) Alarms that cannot be acknowledged are indicated to the NMS.</li> <li>2) The NMS receives alarm notifications with an “alarm acknowledged” indication for all alarms successfully acknowledged in the EMS.</li> </ul>
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed.</li> <li>2) Invalid input: The input parameter are syntactical incorrect.</li> <li>3) Not implemented: The EMS does not support this service.</li> </ul>
<b>Traceability</b>	<a href="#">{Requirement II. 155}</a> , <a href="#">{Requirement II. 157}</a>

### 5.8.8 Alarm Unacknowledgement in the NMS

#### Use Case 5.8.8: Alarm Unacknowledgement in the NMS

<b>Use Case Name</b>	Alarm Unacknowledgement in the NMS
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**Use Case 5.8.8: Alarm Unacknowledgement in the NMS**

<b>Summary</b>	The operator unacknowledges, in the NMS, one or more active and previously acknowledged alarms. The NMS forwards the alarm unacknowledgement through an interface operation to the EMS. The NMS will be notified in case that the alarm unacknowledgement operation is successful.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The alarms to be acknowledged are active, unacknowledged, and the alarm bearing objects are managed by the EMS.</li> </ul>
<b>Begins when</b>	The operator unacknowledges, in the NMS, one or more active and previously acknowledged alarms. The NMS forwards the alarm unacknowledgement through an interface operation to the EMS. The NMS will be notified in case that the alarm unacknowledgement operation is successful.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The NMS issues an interface request to unacknowledge the alarm in the EMS.</li> <li>2) The EMS unacknowledges the alarm in the NE (if applicable).</li> <li>3) The alarm is updated as “unacknowledged” in the EMS.</li> <li>4) The NMS is then notified that the alarm has been unacknowledged in the EMS.</li> </ul>
<b>Ends when</b>	<p>In case of success:</p> <p>All NMS' receive an alarm unacknowledged notification after the operation completes successfully.</p> <p>In case of failure:</p> <p>No alarms are unacknowledged in the EMS and the NMS does not receive any “alarm unacknowledged” notifications.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>All successfully acknowledged alarms are in an unacknowledged state in the EMS.</p> <p>In case of failure:</p> <ul style="list-style-type: none"> <li>1) Alarms that cannot be unacknowledged are indicated to the NMS.</li> <li>2) The NMS receives alarm notifications with an “alarm unacknowledged” indication for all alarms successfully unacknowledged in the EMS.</li> </ul>
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed</li> <li>2) Invalid input: The input parameters are syntactical incorrect.</li> <li>3) Not implemented: The EMS does not support this service.</li> </ul>
<b>Traceability</b>	<a href="#">{Requirement II. 156}</a> , <a href="#">{Requirement II. 158}</a>

### 5.8.9 Alarm Acknowledgement in the EMS

#### Use Case 5.8.9: Alarm Acknowledgement in the EMS

<b>Use Case Name</b>	Alarm Acknowledgement in the EMS
<b>Summary</b>	The operator acknowledges alarms in the EMS through GUI Cut-Through or directly on the EMS GUI according to EMS alarm lifecycle acknowledgement steps.
<b>Actors</b>	None
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.8.3: NMS registers to receive alarms or threshold crossing alerts from an EMS</a> .
<b>Begins when</b>	The operator acknowledges one or more alarms in the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The EMS attempts to acknowledge the alarm in the NE (if applicable).</li> <li>2) The alarm is updated as “acknowledged” in the EMS and NE if applicable.</li> <li>3) The NMS is then notified that the alarm has been acknowledged in the EMS</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives an alarm acknowledged notification after the EMS operation completes successfully.</p> <p>In case of failure:</p> <p>The alarm is not acknowledged in the EMS and the NMS does not receive an “alarm acknowledged” notification.</p>
<b>Post-conditions</b>	<p>The alarms are acknowledged in the EMS.</p> <p>The NMS receives an alarm notification with an “alarm acknowledged” indication for those alarms that are acknowledged.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Internal Error</li> <li>2) Loss of NE communication</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 157}</a>

### 5.8.10 NMS reconciles Unacknowledged Active Alarms from an EMS

#### Use Case 5.8.10: NMS reconciles Unacknowledged Active Alarms from an EMS

<b>Use Case Name</b>	NMS reconciles unacknowledged active alarms from an EMS
<b>Summary</b>	<p>The NMS requests the current list of active unacknowledged EMS-specific and non-EMS-specific alarms and TCAs that are under the control of an EMS (both those raised by the NEs and those raised by the EMS itself).</p> <p>Some alarms may be filtered out (excluded) by specifying their probable causes or severities.</p>
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .

**Use Case 5.8.10: NMS reconciles Unacknowledged Active Alarms from an EMS**

<b>Begins when</b>	The NMS sends a request to the EMS for the current list of active unacknowledged EMS-specific and non-EMS-specific alarms and TCAs.
<b>Description</b>	<p>1) The NMS sends a request to the EMS for its summary of unacknowledged active EMS-specific and non-EMS-specific alarms and TCAs, with parameters to filter out (exclude) certain values of probable cause or severity if the NMS does not wish to receive the whole list. These filtering criteria are independent of the filtering set up by the NMS for the notification service.</p> <p>2) The EMS responds to the NMS request by returning a list of active unacknowledged alarms and TCAs that meet the specified filtering criteria or the request times out.</p>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives the list of active unacknowledged EMS-specific and non-EMS-specific alarms and TCAs.</p> <p>In case of failure:</p> <p>The NMS receives a failure indication.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>The NMS receives the list of active unacknowledged EMS-specific and non-EMS-specific alarms and TCAs.</p> <p>In case of failure:</p> <p>The NMS receives a failure indication.</p>
<b>Exceptions</b>	1) Processing failure: The requested operation could not be performed.
<b>Traceability</b>	<a href="#">(Requirement II. 154)</a>

**5.8.11 NMS reconciles Unacknowledged Active Alarms for a specified Managed Element****Use Case 5.8.11: NMS reconciles Unacknowledged Active Alarms for a specified Managed Element**

<b>Use Case Name</b>	NMS reconciles unacknowledged active alarms for a specified Managed Element
<b>Summary</b>	NMS reconciles unacknowledged active alarms and TCAs for a specified Managed Element. Some alarms may be filtered out (excluded) by specifying their probable causes or severities.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS sends a request to the EMS for the current list of unacknowledged active alarms and TCAs for a specified managed element.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a request to the EMS for its list of active alarms and TCAs for a specified managed element, with parameters to filter out (exclude) certain values of probable cause or severity if the NMS does not wish to receive the whole list. These filtering criteria are independent of the filtering set up by the NMS for the notification service.</li> <li>2) The EMS responds to the NMS request by returning a list of unacknowledged active alarms and TCAs that meet the specified filtering criteria or the request times out.</li> </ol>
<b>Ends when</b>	<p>In case of success: The NMS receives the list of unacknowledged active alarms and TCAs for the specified managed element from the EMS.</p> <p>In case of failure: The NMS receives a failure indication.</p>
<b>Post-conditions</b>	<p>In case of success: The NMS has the current list of unacknowledged active alarms and TCAs for the specified managed element from the EMS.</p> <p>In case of failure: The NMS does not receive the current list of unacknowledged active alarms and TCAs for the specified managed element from the EMS.</p>
<b>Exceptions</b>	1) Processing failure: The requested operation could not be performed.
<b>Traceability</b>	<a href="#">(Requirement II. 154)</a>

**5.8.12 EMS discards an event to be sent to the NMS****Use Case 5.8.12: EMS discards an event to be sent to the NMS**

<b>Use Case Name</b>	EMS discards an event to be sent to the NMS
<b>Summary</b>	The EMS discards an event, e.g. because the notification service became unavailable. The NMS is informed about this and must not assume to be synchronized any longer.

**Use Case 5.8.12: EMS discards an event to be sent to the NMS**

<b>Actors</b>	EMS
<b>Pre-conditions</b>	<p>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</p> <p>2) EMS discards an event.</p>
<b>Begins when</b>	The EMS discards an event to be sent to the NMS.
<b>Description</b>	<p>1) The EMS determines the type of notification that has been discarded.</p> <p>2) If the notification is about object creation (OC), object deletion (OD), attribute value change (AVC), state change (SC) or route change (RC), the EMS informs the NMS that a lifecycle event was discarded. For all other notification types the NMS is informed that an alarm was discarded. The NMS may use operations provided by the NMS to do this or when the notification service is available may send alarms with an appropriate probable cause.</p> <p>3) If a 2nd event has to be discarded, the EMS informs the NMS only if it didn't inform the NMS about this type of notification already. Thus at a time, the NMS will get informed about the loss of events at most twice, once about lifecycle events and once about alarms.</p>
<b>Ends when</b>	<p>In case of success:</p> <p style="padding-left: 20px;">The NMS is aware that an event has been discarded.</p> <p>In case of failure:</p> <p style="padding-left: 20px;">The NMS is unaware that an event has been discarded.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p style="padding-left: 20px;">The NMS is aware that an event has been discarded.</p> <p>In case of failure:</p> <p style="padding-left: 20px;">The NMS is unaware that an event has been discarded.</p>
<b>Exceptions</b>	None
<b>Traceability</b>	<a href="#">{Requirement II. 177}</a>

### 5.8.13 EMS succeeds in forwarding an event to the NMS again

Use Case 5.8.13: EMS succeeds in forwarding an event to the NMS again

<b>Use Case Name</b>	EMS succeeds in forwarding an event to the NMS again
<b>Summary</b>	The EMS is able to resume event forwarding and informs the NMS about this. The NMS may synchronize and can rely on upcoming events again
<b>Actors</b>	EMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has successfully executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS.</a></li> <li>2) The EMS has informed the NMS that an event has been discarded before.</li> </ul>
<b>Begins when</b>	The EMS succeeds to forward an event to the NMS.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The EMS informs the NMS that event forwarding is resumed. There is one operation provided by the NMS for this. If the EMS has sent alarms about the event loss before it shall clear those alarms.</li> <li>2) The NMS may start synchronization after that either for alarms, TCA and protection switch states alone or for the complete configuration dependent on what it was informed about before.</li> </ul>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS is informed that EMS has resumed event forwarding.</p> <p>In case of failure:</p> <p>The NMS is not informed that EMS has resumed event forwarding</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>The NMS is informed that the EMS has resumed event forwarding and may have started synchronization.</p> <p>In case of failure:</p> <p>The NMS is not informed that the EMS has resumed event forwarding and may have started synchronization.</p>
<b>Exceptions</b>	
<b>Traceability</b>	<a href="#">(Requirement II_177)</a>

### 5.8.14 EMS sends a heartbeat notification to the NMS

Use Case 5.8.14: EMS sends a heartbeat notification to the NMS

<b>Use Case Name</b>	EMS sends a heartbeat notification to the NMS
<b>Summary</b>	The EMS sends a heartbeat notification to the NMS if there are no other notifications to be forwarded for some time. The NMS thus knows that the notification service is still available even if there are no other notification for a longer time.
<b>Actors</b>	EMS

**Use Case 5.8.14: EMS sends a heartbeat notification to the NMS**

<b>Pre-conditions</b>	The NMS has successfully executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS.</a>
<b>Begins when</b>	The NMS has successfully executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS.</a>
<b>Description</b>	<p>1) The EMS sends out heartbeat notifications to the NMS on a regular basis.</p> <p>2) The NMS can conclude that the notification service is unavailable if it doesn't receive any heartbeat notifications for some time.</p>
<b>Ends when</b>	<p>1) The NMS has successfully executed <a href="#">Use Case 5.2.4: NMS closes a session with an EMS.</a> or</p> <p>2) The EMS has successfully executed <a href="#">Use Case 5.2.5: EMS closes a session with an NMS</a></p>
<b>Post-conditions</b>	The NMS has successfully executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS.</a>
<b>Exceptions</b>	None.
<b>Traceability</b>	<a href="#">{Requirement II. 178}</a>

## 5.9 Equipment Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.9.1:</a>	<a href="#">NMS unprovisions equipment</a>	<a href="#">{Requirement II. 262}</a>
<a href="#">Use Case 5.9.2:</a>	<a href="#">NMS provisions equipment</a>	<a href="#">{Requirement II. 136}</a>
<a href="#">Use Case 5.9.3:</a>	<a href="#">NMS provisions alarm reporting on/off for equipment</a>	<a href="#">{Requirement II. 078}</a>
<a href="#">Use Case 5.9.4:</a>	<a href="#">NMS provisions alarm reporting on/off for an equipment holder</a>	<a href="#">{Requirement II. 078}</a>

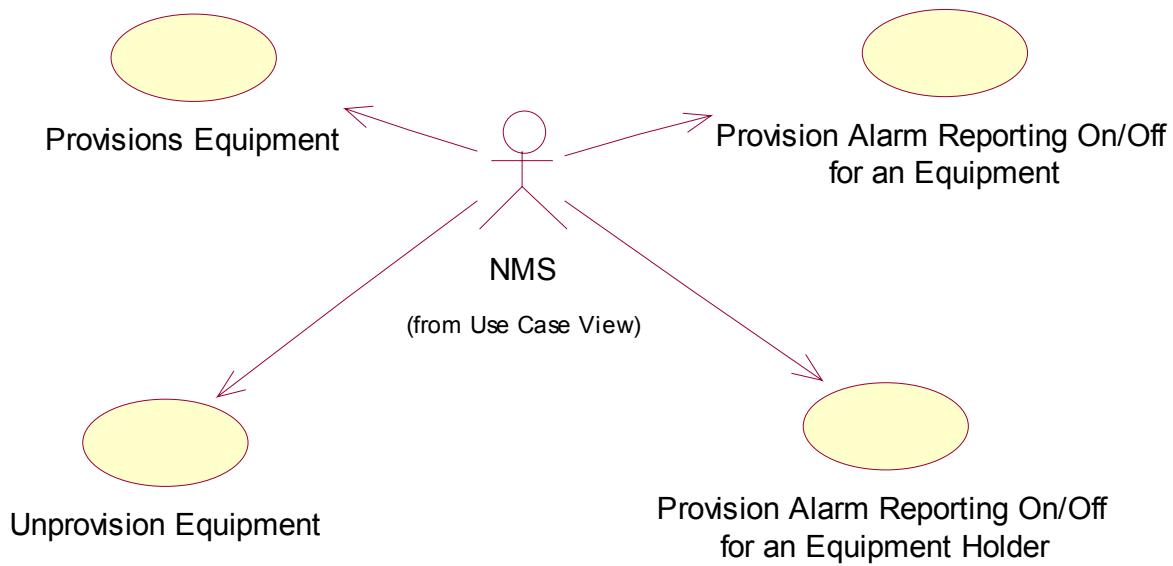


Figure 5.15: Equipment Use Cases

## 5.9.1 NMS unprovisions equipment

### Use Case 5.9.1: NMS unprovisions equipment

<b>Use Case Name</b>	NMS unprovisions equipment
<b>Summary</b>	An operator permanently unprovisions an equipment from the managed element. The successful result of this operation is the potential deletion of the equipment object and all of its related objects, such as Termination Points.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) Equipment to be unprovisioned is not in use.</li> </ol>
<b>Begins when</b>	The NMS sends a request to un provision an equipment or the NMS detects equipment has been unprovisioned.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends the request to the EMS</li> <li>2) The EMS validates the equipment name. If the name cannot be found an exception is thrown.</li> <li>3) The EMS may check if a service is assigned to a port of the equipment (e.g. a supported PTP is in service) in which case an exception will be thrown.</li> <li>4) The EMS deletes all of the equipment related objects, such as Termination Points.</li> <li>5) The EMS should attempt to set the equipment state to out of service by maintenance prior to un provisioning the equipment.</li> <li>6) The EMS un provisions the equipment.</li> <li>7) Appropriate notifications shall be sent.</li> </ol>
<b>Ends when</b>	The EMS sends a response.
<b>Post-conditions</b>	The Equipment is unprovisioned and all its related objects deleted
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: The equipment name does not reference an equipment object.</li> <li>4) Object in use: The equipment resources are in use.</li> <li>5) Entity not found: The equipment name references an object which does not exist.</li> <li>6) Unable to comply: The equipment can not be un provisioned at the managedElement.</li> <li>7) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 262}</a>

## 5.9.2 NMS provisions equipment

### Use Case 5.9.2: NMS provisions equipment

<b>Use Case Name</b>	NMS provisions equipment
<b>Summary</b>	An operator permanently provisions an equipment in an equipment holder in a ME. The result of this operation may be the creation of the equipment object and all of its related objects such as Termination Points.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) Equipment holder do not has an expected equipment.</li> </ol>
<b>Begins when</b>	The NMS sends a request to provision an equipment or the NMS detects equipment has been provisioned.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends request to EMS to provision an equipment.</li> <li>2) The EMS validates the equipment CreateData.</li> <li>3) If the equipmentHolder does not exist, an exception is thrown.</li> <li>4) If the equipmentHolder already has an expected equipment, an exception is thrown.</li> <li>5) The EMS provisions the equipment object and all of its related objects.</li> <li>6) Appropriate notifications shall be sent.</li> </ol>
<b>Ends when</b>	The EMS sends a response.
<b>Post-conditions</b>	Equipment and all of its related objects exist.
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Object in use: The equipment holder already has an expected equipment.</li> <li>4) Invalid input: The equipment holder does not reference an equipmentHolder object.</li> <li>5) Entity not found: The equipmentHolder references object that does not exist.</li> <li>6) Unable to comply: The equipment can not be created at the managedElement.</li> <li>7) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II_136}</a>

## 5.9.3 NMS provisions alarm reporting on/off for equipment

### Use Case 5.9.3: NMS provisions alarm reporting on/off for equipment

<b>Use Case Name</b>	NMS provisions alarm reporting on/off for equipment
<b>Summary</b>	The NMS requests to activate/deactivate all alarm reporting on an equipment.
<b>Actors</b>	NMS

**Use Case 5.9.3: NMS provisions alarm reporting on/off for equipment**

<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS sends the request to activate/deactivate alarm reporting to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends the request to activate/deactivate alarm reporting for a specified equipment.</li> <li>2) The EMS validates the equipment reference (e.g. name).</li> <li>3) The EMS enables/disables alarm reporting on the specified equipment.</li> <li>4) The EMS replies with a success indication.</li> <li>5) Attribute Value Change notification(s) for the specified equipment are forwarded to the notification service indicating that alarm reporting has been activated/deactivated for the specified equipment.</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives an indication of success of the action.</p> <p>In case of failure:</p> <p>The NMS receives an indication of failure of the action.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) Alarm monitoring is enabled/disabled on the specified equipment.</li> </ol> <p><b>Note:</b></p> <p>If alarm monitoring is enabled, this does not mean that alarm is reported anyway, because Alarm Severity Assignment Profile may perform further filtering.</p> <p>If alarm monitoring is disabled, then alarm reporting is disabled even if Alarm Severity Assignment Profile would allow it.</p> <ol style="list-style-type: none"> <li>2) The EMS has forwarded an attribute value change notification if there was an attribute value change with the enabling/disabling of alarm monitoring on the equipment.</li> </ol> <p>In case of failure:</p> <p>None.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Invalid input: The equipment reference is invalid.</li> <li>2) NE communications loss.</li> <li>3) Entity not found: The specified equipment object does not exist.</li> <li>4) Processing failure: The requested operation could not be performed.</li> <li>5) Unable to comply: The alarm reporting can not be enabled/disabled</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II_078}</a>

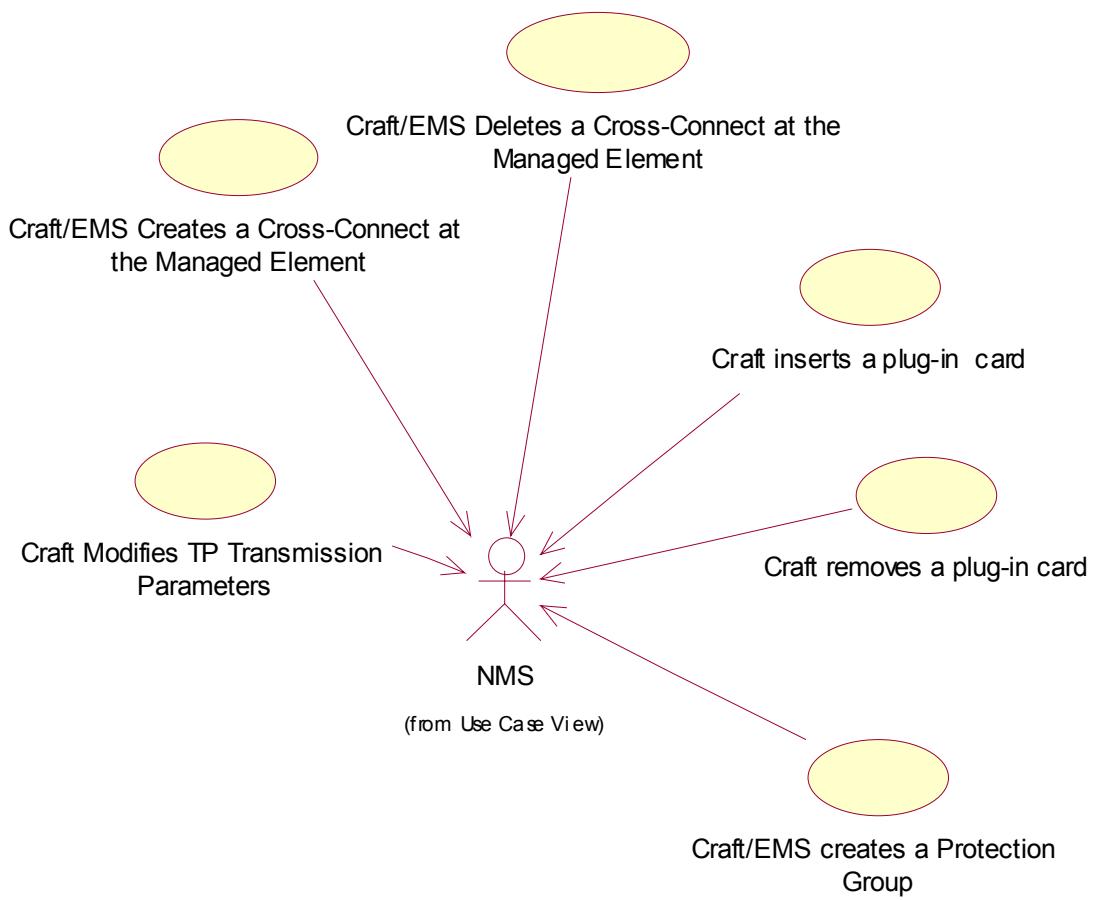
### 5.9.4 NMS provisions alarm reporting on/off for an equipment holder

#### Use Case 5.9.4: NMS provisions alarm reporting on/off for an equipment holder

<b>Use Case Name</b>	NMS provisions alarm reporting on/off for an equipment holder
<b>Summary</b>	The NMS requests to activate/deactivate all alarm reporting on an equipment holder.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	The NMS sends the request to activate/deactivate alarm reporting to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends the request to activate/deactivate alarm reporting on for a specified equipment holder.</li> <li>2) The EMS validates the equipment holder reference (e.g. name).</li> <li>3) The EMS enables/disables alarm reporting on the specified equipment holder.</li> <li>4) The EMS replies with a success indication.</li> <li>5) Attribute Value Change notification(s) for the specified equipment holder are forwarded to the notification service indicating that alarm reporting has been activated/deactivated for the specified equipment holder.</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives an indication of success of the action.</p> <p>In case of failure:</p> <p>The NMS receives an indication of failure of the action.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <ol style="list-style-type: none"> <li>1) Alarm monitoring is enabled/disabled on the specified equipment holder.</li> </ol> <p><b>Note:</b></p> <p>If alarm monitoring is enabled, this does not mean that alarm is reported anyway, because Alarm Severity Assignment Profile may perform further filtering.</p> <p>If alarm monitoring is disabled, then alarm reporting is disabled even if Alarm Severity Assignment Profile would allow it.</p> <ol style="list-style-type: none"> <li>2) The EMS has forwarded an attribute value change notification if there was an attribute value change with the enabling/disabling of alarm monitoring on the equipment holder.</li> </ol> <p>In case of failure:</p> <p>None.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Invalid input: The equipment reference is invalid.</li> <li>2) NE communications loss.</li> <li>3) Processing failure: The requested operation could not be performed.</li> <li>4) Unable to comply: The alarm reporting can not be enabled/disabled.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 078}</a>

## 5.10 Craft Related Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.10.1:</a>	<a href="#">Craft modifies TP Transmission Parameter(s) of a TP</a>	<a href="#">{Requirement I. 044}</a> , <a href="#">{Requirement II. 066}</a>
<a href="#">Use Case 5.10.2:</a>	<a href="#">Craft/EMS creates a cross-connect (XC) in a Network Element (NE)</a>	<a href="#">{Requirement I. 042}</a> , <a href="#">{Requirement I. 045}</a> , <a href="#">{Requirement II. 064}</a> , <a href="#">{Requirement II. 067}</a>
<a href="#">Use Case 5.10.3:</a>	<a href="#">Craft/EMS Deletes a cross-connect (XC) in a Network Element (NE)</a>	<a href="#">{Requirement I. 042}</a> , <a href="#">{Requirement I. 045}</a> , <a href="#">{Requirement II. 065}</a> , <a href="#">{Requirement II. 067}</a>
<a href="#">Use Case 5.10.4:</a>	<a href="#">Craft inserts a plug-in card</a>	<a href="#">{Requirement I. 042}</a> , <a href="#">{Requirement I. 045}</a> , <a href="#">{Requirement II. 064}</a> , <a href="#">{Requirement II. 067}</a> , <a href="#">{Requirement II. 133}</a> , <a href="#">{Requirement II. 134}</a>
<a href="#">Use Case 5.10.5:</a>	<a href="#">Craft removes a plug-in card</a>	<a href="#">{Requirement I. 043}</a> , <a href="#">{Requirement I. 045}</a> , <a href="#">{Requirement II. 065}</a> , <a href="#">{Requirement II. 067}</a>
<a href="#">Use Case 5.10.6:</a>	<a href="#">Craft/EMS creates a Protection Group</a>	<a href="#">{Requirement I. 042}</a> , <a href="#">{Requirement II. 064}</a> , <a href="#">{Requirement II. 112}</a> , <a href="#">{Requirement II. 059}</a>



**Figure 5.16: Craft related Use Cases**

### 5.10.1 Craft modifies TP Transmission Parameter(s) of a TP

#### Use Case 5.10.1: Craft modifies TP Transmission Parameter(s) of a TP

<b>Use Case Name</b>	Craft modifies Transmission Parameter(s) of a TP
<b>Summary</b>	The craft operator modifies transmission parameters on a TP of an NE using a craft interface or an EMS interface.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) Termination Point exists on NE.</li> <li>3) NMS is attached to a notification service.</li> </ul>
<b>Begins when</b>	EMS detects that the TP Transmission Parameters have been modified on the NE.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The EMS will send an attribute value change notification for all attributes that have changed.</li> <li>2) The EMS will not update the SNCs which use this termination point, regardless of the SNC state.</li> </ul>
<b>Ends when</b>	EMS has sent notifications.
<b>Post-conditions</b>	<ul style="list-style-type: none"> <li>1) Transmission parameters are changed on a TP in NE.</li> <li>2) EMS has sent notifications.</li> </ul>
<b>Exceptions</b>	No Interface exceptions as no NMS-initiated operations
<b>Traceability</b>	<a href="#">(Requirement I. 044)</a> , <a href="#">(Requirement II. 066)</a>

### 5.10.2 Craft/EMS creates a cross-connect (XC) in a Network Element (NE)

#### Use Case 5.10.2: Craft/EMS creates a cross-connect (XC) in a Network Element (NE)

<b>Use Case Name</b>	Craft/EMS creates a cross-connect (XC) on a Network Element (NE)
<b>Summary</b>	Craft person enters a new XC in an NE.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<p>The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</p> <p>NMS is attached to a notification service.</p>
<b>Begins when</b>	EMS detects that XC has been established on NE managed by the EMS.

**Use Case 5.10.2: Craft/EMS creates a cross-connect (XC) in a Network Element (NE)**

<b>Description</b>	<ol style="list-style-type: none"> <li>1) The EMS sends tpConnectionState state change notifications (state= ‘bi-connected’ or ‘sink-connected’ or ‘source-connected’). The notification is sent even when the EMS exposes only a mesh and the TP is not an edge TP.</li> <li>2) If the XC participates in an existing partial SNC and the XC is the last XC needed to complete the SNC, the SNC state changes to ‘active’ state. The EMS forwards SNC state change notifications.</li> <li>3) If the XC participates in an existing partial SNC and the XC is not the last XC, the SNC state will remain in partial.</li> <li>4) If the XC does not match in any existing partial or active SNC, then a new SNC object is created to represent it. The EMS forwards a SNC object creation notification. The SNC state of the newly created SNC is active.</li> <li>5) No SNCs in pending state are affected.</li> </ol>
<b>Ends when</b>	EMS sends appropriate notifications.
<b>Post-conditions</b>	The SNC object may be created as described above, and appropriate notifications (as described above) are sent.
<b>Exceptions</b>	No Interface exceptions as no NMS-initiated operations
<b>Traceability</b>	<a href="#">{Requirement I. 042}</a> , <a href="#">{Requirement I. 045}</a> , <a href="#">{Requirement II. 064}</a> , <a href="#">{Requirement II. 067}</a>

### 5.10.3 Craft/EMS deletes a cross-connect (XC) in a Network Element (NE)

#### Use Case 5.10.3: Craft/EMS Deletes a cross-connect (XC) in a Network Element (NE)

<b>Use Case Name</b>	Craft/EMS deletes a cross-connect (XC) in a Network Element (NE)
<b>Summary</b>	When a craft deletes a XC which is a part of an existing SNC, the EMS determines the applicable state of the SNC and provides applicable notifications (if any) to NMSs.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> . NMS is attached to a notification service. The state of SNC is either active or partial.
<b>Begins when</b>	EMS detects deletion of XC on NE managed by EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) EMS detects the deletion of the XC, and finds the affected SNC;</li> <li>2) If the state of the SNC is active and the deleted XC is not the only XC associated with the SNC (and at least one of the other XCs associated with the SNC is still in place on an NE), EMS changes the state of SNC to partial.</li> <li>3) If the state of the SNC is active and EMS detects that the deleted XC is the only XC associated with the SNC, the EMS: <ul style="list-style-type: none"> <li>• deletes the SNC if Pending state is not supported.</li> <li>• changes the SNC state to partial if pending state is supported.</li> </ul> </li> <li>4) If the state of the SNC is partial and EMS detects that the deleted XC is not the only XC associated with the SNC (nor the last remaining XC associated with the SNC), there will be no change on the SNC state.</li> <li>5) If the state of the SNC is partial and EMS detects that the deleted XC is the last remaining XC associated with the SNC, the EMS: <ul style="list-style-type: none"> <li>• leaves the state of the SNC in the partial state if pending is supported.</li> <li>• deletes the SNC if pending is not supported.</li> </ul> </li> <li>6) If the XC deletion caused a state change to the SNC, a State Change Notification is sent to the notification service.</li> <li>7) If the XC deletion caused the deletion of the SNC, an Object Deletion Notification is sent to the notification service.</li> <li>8) The EMS sends state change notifications for the TPs that have changed state.</li> </ol>
<b>Ends when</b>	EMS sends applicable notifications (if any) to the notification service.
<b>Post-conditions</b>	EMS determines the new SNC state, sends state change notifications for the TPs, and sends applicable SNC Object Deletion and/or State Change Notifications (if any) to the notification service.
<b>Exceptions</b>	No Interface exceptions as no NMS-initiated operations
<b>Traceability</b>	<a href="#">{Requirement I. 042}</a> , <a href="#">{Requirement I. 045}</a> , <a href="#">{Requirement II. 065}</a> , <a href="#">{Requirement II. 067}</a>

### 5.10.4 Craft inserts a plug-in card

#### Use Case 5.10.4: Craft inserts a plug-in card

<b>Use Case Name</b>	Craft inserts a plug-in card
<b>Summary</b>	The Craft inserts a plug-in card.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> . NMS is attached to a notification service.
<b>Begins when</b>	EMS detects insertion of plug-in card.
<b>Description</b>	<p>1) If new equipment and auto-provisioning is supported, the following notifications are sent to the notification service:</p> <ul style="list-style-type: none"> <li>• Equipment object creation notification</li> <li>• Equipment Holder State Change</li> <li>• If it is a equipment supporting TPs, PTP Object Creation Notifications may be sent to the notification service (Refer to the provision Equipment use case)</li> </ul> <p>2) If auto-provisioning is not supported, the following notifications may be sent to the notification service:</p> <ul style="list-style-type: none"> <li>• Equipment object creation notification if the equipment has not been provisioned.</li> <li>• Equipment Holder State Change</li> </ul> <p>3) If it is insertion of a provisioned plug-in, the following notifications may be sent to the notification service.</p> <ul style="list-style-type: none"> <li>• Equipment Holder State Change</li> <li>• Equipment State changes and AVCs.</li> </ul>
<b>Ends when</b>	The EMS sends applicable notifications to the notification service.
<b>Post-conditions</b>	The NMS is aware of the potential or modification of the PTPs, the state changes of the contained CTPs and the creation of any topological links.
<b>Exceptions</b>	No Interface exceptions as no NMS-initiated operations
<b>Traceability</b>	<a href="#">{Requirement I. 042}</a> , <a href="#">{Requirement I. 045}</a> , <a href="#">{Requirement II. 064}</a> , <a href="#">{Requirement II. 067}</a> , <a href="#">{Requirement II. 133}</a> , <a href="#">{Requirement II. 134}</a>

### 5.10.5 Craft removes a plug-in card

#### Use Case 5.10.5: Craft removes a plug-in card

<b>Use Case Name</b>	Craft removes a Plug-In card
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**Use Case 5.10.5: Craft removes a plug-in card**

<b>Summary</b>	The Craft removes a plug-in that has no relevance to connection management. Removal of the plug-in implies a deletion of the equipment on the network element or via the EMS (TPs not associated to SNCs)
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> . NMS is attached to a notification service.
<b>Begins when</b>	EMS detects removal of the plug-in card.
<b>Description</b>	<p>1) If an equipment is removed, and the equipment has not already been de-provisioned, the following notifications may be sent to the notification service:</p> <ul style="list-style-type: none"> <li>• Equipment State change and AVCs</li> <li>• Equipment Holder State Change</li> </ul> <p>2) If the equipment was in a de-provisioned state the following notifications may be sent to the notification service:</p> <ul style="list-style-type: none"> <li>• Equipment object deletion</li> <li>• Equipment Holder State Change</li> </ul>
<b>Ends when</b>	The EMS sends applicable notifications to the notification service.
<b>Post-conditions</b>	The NMS is aware of the potential deletion or modification of the equipment/equipment holder.
<b>Exceptions</b>	No Interface exceptions as no NMS-initiated operations
<b>Traceability</b>	<a href="#">{Requirement I. 043}</a> , <a href="#">{Requirement I. 045}</a> , <a href="#">{Requirement II. 065}</a> , <a href="#">{Requirement II. 067}</a>

### 5.10.6 Craft/EMS creates a Protection Group

#### Use Case 5.10.6: Craft/EMS creates a Protection Group

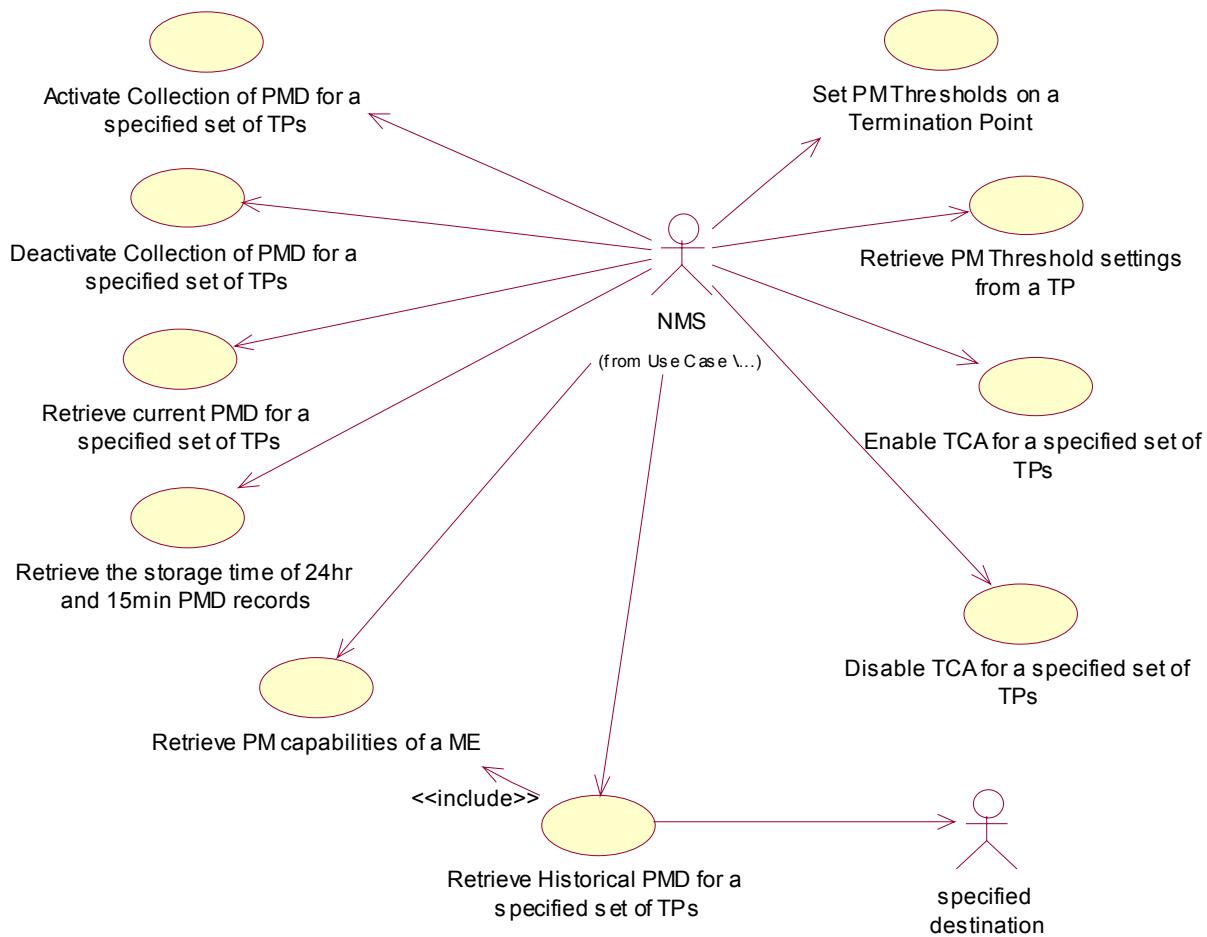
<b>Use Case Name</b>	Craft/EMS creates a Protection Group
<b>Summary</b>	The Craft creates a Protection Group on a network element via the EMS or on the network element or the EMS detects a new protection group on communication association
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> . NMS is attached to the notification service
<b>Begins when</b>	EMS detects that a Protection Group was created on a Managed Element
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The EMS identifies the protection group type. If the protection group identified pertains to a 4 fiber MS SP ring (BLSR) protection, the EMS sends three separate Object creation notifications (one each for the span groups and one for the combined groups). In all other cases, a single group is identified to be sent to the NMS.</li> <li>2) The Object creation notification identifies the steady state switch status of the protection group.</li> <li>3) Edge point boolean is set for this notification if any of the TPs forming the protection group is an edge point.</li> </ul>
<b>Ends when</b>	The EMS sends applicable notifications to the notification service
<b>Post-conditions</b>	The NMS is aware of the existence of the line level protection.
<b>Exceptions</b>	No Interface exceptions as no NMS-initiated operations
<b>Traceability</b>	<a href="#">{Requirement I. 042}</a> , <a href="#">{Requirement II. 064}</a> , <a href="#">{Requirement II. 112}</a> , <a href="#">{Requirement II. 059}</a>

### 5.11 Performance Management Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.11.1:</a>	<a href="#">NMS activates collection of Performance Monitoring Data (PMD) for a specified set of TPs</a>	<a href="#">{Requirement II. 121}</a> , <a href="#">{Requirement II. 132}</a>
<a href="#">Use Case 5.11.2:</a>	<a href="#">NMS deactivates collection of Performance Monitoring Data (PMD) for a specified set of TPs</a>	<a href="#">{Requirement II. 121}</a>
<a href="#">Use Case 5.11.3:</a>	<a href="#">NMS retrieves current Performance Monitoring Data (PMD) for a specified set of TPs</a>	<a href="#">{Requirement II. 131}</a>
<a href="#">Use Case 5.11.4:</a>	<a href="#">NMS retrieves the storage time of 24hr and 15min Performance Monitoring Data (PMD) records</a>	<a href="#">{Requirement II. 124}</a>
<a href="#">Use Case 5.11.5:</a>	<a href="#">NMS retrieves PM capabilities of a Managed Element (ME)</a>	<a href="#">{Requirement II. 054}</a> , <a href="#">{Requirement II. 221}</a> , <a href="#">{Requirement II. 222}</a>
<a href="#">Use Case 5.11.6:</a>	<a href="#">NMS retrieves historical Performance Monitoring Data (PMD) for a specified set of TPs</a>	<a href="#">{Requirement II. 128}</a> , <a href="#">{Requirement II. 129}</a> , <a href="#">{Requirement II. 130}</a>

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Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.11.7:</a>	<a href="#">NMS sets PM thresholds on a TP</a>	<a href="#">{Requirement I. 054}</a> , <a href="#">{Requirement II. 125}</a>
<a href="#">Use Case 5.11.8:</a>	<a href="#">NMS retrieves PM threshold settings from a TP</a>	<a href="#">{Requirement I. 054}</a> , <a href="#">{Requirement II. 055}</a>
<a href="#">Use Case 5.11.9:</a>	<a href="#">NMS enables Threshold Crossing Alerts (TCA) for a specified set of TPs</a>	<a href="#">{Requirement II. 122}</a> , <a href="#">{Requirement II. 126}</a>
<a href="#">Use Case 5.11.10:</a>	<a href="#">NMS disables Threshold Crossing Alerts (TCA) for a specified set of TPs</a>	<a href="#">{Requirement II. 122}</a>
<a href="#">Use Case 5.11.11:</a>	<a href="#">On demand retrieval of historical Performance Monitoring Data (PMD) for a specified set of TPs</a>	<a href="#">{Requirement II. 163}</a>
<a href="#">Use Case 5.11.12:</a>	<a href="#">NMS retrieves Performance Monitoring Points (PMP) contained in an ME or a TP</a>	<a href="#">{Requirement II. 221}</a>
<a href="#">Use Case 5.11.13:</a>	<a href="#">NMS configures TCA Parameter Profile</a>	<a href="#">{Requirement II. 238}</a> , <a href="#">{Requirement II. 239}</a>
<a href="#">Use Case 5.11.14:</a>	<a href="#">NMS modifies TCA Parameter Profile Pointer</a>	<a href="#">{Requirement II. 238}</a> , <a href="#">{Requirement II. 239}</a>



**Figure 5.17: Performance Management Use Cases**

**Note:**

{Requirement I. 047}, {Requirement II. 050} and {Requirement II. 056} specify the information that has to be provided by an EMS in the PM related notifications. These requirements are **not covered** by the following use cases.

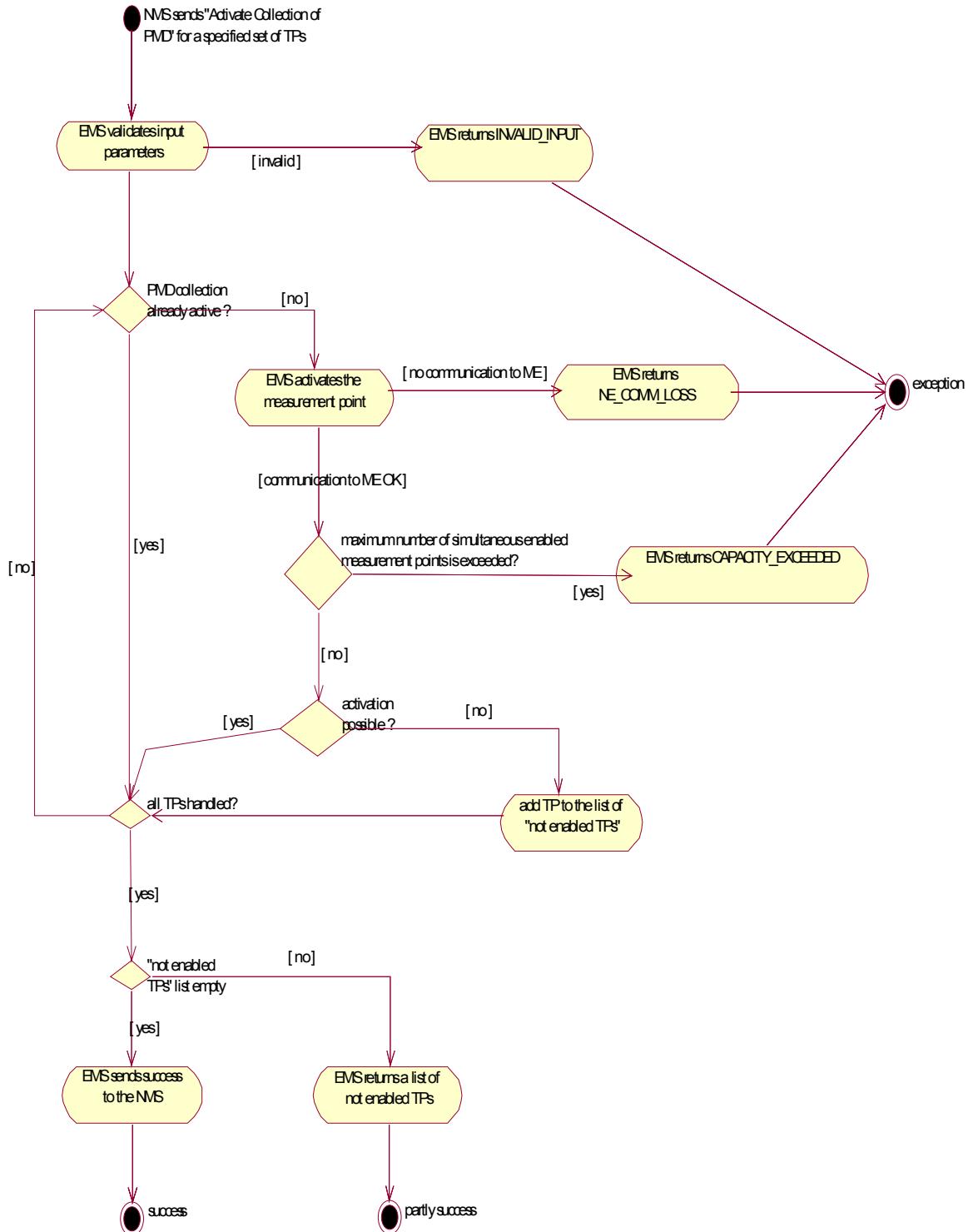
### 5.11.1 NMS activates collection of Performance Monitoring Data (PMD) for a specified set of TPs

#### Use Case 5.11.1: NMS activates collection of Performance Monitoring Data (PMD) for a specified set of TPs

<b>Use Case Name</b>	NMS activates collection of Performance Monitoring Data (PMD) for a specified set of TPs
<b>Summary</b>	The NMS requests the EMS to activate measurement of PMD for a list of TP and layer rate measurement points. For each measurement point, location category (nearEnd (unidirectional) and/or farEnd (unidirectional) and/or bidirectional) and granularity (15min register and/or, 24hr register and/or NA) can be specified.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS must have knowledge of the ME or the TPs specified.</li> <li>3) The EMS must have active communications established with the MEs, to which the TPs belong, which are specified.</li> </ol>
<b>Begins when</b>	The NMS sends a request to the EMS to activate measurement of PMD.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends an activation request command to the EMS: The NMS specifies the measurement points to which the request shall be applied. It is possible to identify all TPs of a ME or a set of individual TPs (PTPs and/or CTPs). For each measurement point the NMS has to define: <ul style="list-style-type: none"> <li>• the layer rate</li> <li>• the granularity (15min-register and/or 24hr-register and/or NA) and</li> <li>• the location (nearEnd (unidirectional) and/or farEnd (unidirectional) and/or bidirectional)</li> </ul> An empty list for layer rate, granularity or location means that the ME has to use every supported item.</li> <li>2) The EMS validates the provided parameters.</li> <li>3) If necessary the EMS sends the appropriate command(s) to the ME to activate the reporting of PMD from the MEs to the EMS.</li> <li>4) The NMS may request the PM registers be cleared.</li> <li>5) If PMD collection is already active for one or more of the specified TPs, the operation shall be considered a success.</li> <li>6) The operation is best-effort. If Performance Monitoring could not be enabled for a subset of the TPs specified, a list identifying the non-enabled subset is returned.</li> <li>7) If nearEnd/farEnd/bidirectional PMD collection cannot be separately activated for an ME, the EMS should hide this from the NMS.</li> <li>8) For every item activated the EMS sends a state change notification on the monitoring state of the affected Performance Monitoring Point to the notification service</li> </ol>

**Use Case 5.11.1: NMS activates collection of Performance Monitoring Data (PMD) for a specified set of TPs**

<b>Ends when</b>	<p>In case of success: The NMS receives a confirmation</p> <p>In case of failure: The NMS receives an exception or gets an indication of the subset of TPs that could not be enabled..</p>
<b>Post-conditions</b>	<p>In case of success: The requested functionality of the TPs specified are enabled for collection of PMD.</p> <p>In case of failure: When an exception is received, nothing has changed in the EMS domain otherwise, the requested functionality of the TPs specified are enabled for collection of PMD <b>except</b> the ones identified as not enabled.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed.</li> <li>2) Invalid input: No TP/ME is specified in the input data or it contains at least one invalid data item</li> <li>3) NE communication loss</li> <li>4) Capacity exceeded: The maximum number of simultaneous enabled measurement points is exceeded</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 121}</a> , <a href="#">{Requirement II. 132}</a>



**Figure 5.18: Activity Diagram for NMS activates collection of Performance Monitoring Data (PMD) for a specified set of TPs**

## 5.11.2 NMS deactivates collection of Performance Monitoring Data (PMD) for a specified set of TPs

### Use Case 5.11.2: NMS deactivates collection of Performance Monitoring Data (PMD) for a specified set of TPs

<b>Use Case Name</b>	NMS deactivates collection of Performance Monitoring Data (PMD) for a specified set of TPs
<b>Summary</b>	The NMS requests the EMS to de-activate measurement of PMD for a list of TP and layer rate measurement points. For each measurement point, location category (nearEnd (unidirectional) and/or farEnd (unidirectional) and/or bidirectional) and granularity (15min-register and/or 24hr-register and/or NA) has to be specified.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS must have knowledge of the ME or the TPs specified.</li> <li>3) The EMS must have active communications established with the MEs, to which the specified TP belongs.</li> </ol>
<b>Begins when</b>	The NMS sends a request to the EMS to stop measurement of PMD.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a de-activation request command to the EMS. The NMS specifies the measurement points to which the request shall be applied. It is possible to identify all TPs of a ME or a set of individual TPs (PTPs and/or CTPs). For each measurement point the NMS has to define: <ul style="list-style-type: none"> <li>• the layer rate</li> <li>• the granularity (15min-register and/or 24hr-register and/or NA) and</li> <li>• the location (nearEnd (unidirectional) and/or farEnd (unidirectional) and/or bidirectional)</li> </ul> An empty list for layer rate, granularity or location means that the ME has to stop the collection of every supported item. Stop of data collection does not imply deleting data for the particular measurement point. </li> <li>2) The EMS validates the provided parameters.</li> <li>3) The EMS on its turn sends the appropriate command(s) to the ME to stop collecting of PMD for the specified set of TPs.</li> <li>4) The operation is best-effort. If Performance Monitoring could not be disabled for a subset of the TPs specified, a list identifying the non-disabled subset is returned.</li> <li>5) Following successful processing of the appropriate command(s), data collection stops immediately. This leads to incomplete collection period(s). These incomplete periods have to be marked by an appropriate status when reported.</li> <li>6) If PMD collection is not active for one or more of the specified TPs, the operation shall be considered a success.</li> <li>7) If nearEnd/farEnd/bidirectional PMD collection cannot be separately de-activated for an ME, the EMS should hide this from the NMS.</li> </ol>

**Use Case 5.11.2: NMS deactivates collection of Performance Monitoring Data (PMD) for a specified set of TPs**

	8) For every item deactivated the EMS sends a state change notification on the monitoring state of the affected Performance Monitoring Point to the notification service.
<b>Ends when</b>	<p>In case of success: The NMS receives a confirmation</p> <p>In case of failure: The NMS receives an exception or gets an indication of the subset of TPs that could not be disabled..</p>
<b>Post-conditions</b>	<p>In case of success The requested functionality of the TPs specified are disabled for collection of PMD.</p> <p>In case of failure: When an exception is received, nothing has changed in the EMS domain otherwise, the requested functionality of the TPs specified are disabled for collection of PMD <b>except</b> the ones identified as not disabled.</p>
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed.</li> <li>2) Invalid input: No TP/ME is specified in the input data or it contains at least one invalid data item.</li> <li>3) NE communication loss.</li> </ul>
<b>Traceability</b>	<a href="#">{Requirement II. 121}</a>

### 5.11.3 NMS retrieves current Performance Monitoring Data (PMD) for a specified set of TPs

#### Use Case 5.11.3: NMS retrieves current Performance Monitoring Data (PMD) for a specified set of TPs

<b>Use Case Name</b>	NMS retrieves current Performance Monitoring Data (PMD) for a specified set of TPs
<b>Summary</b>	The NMS requests the EMS to send current PMD data to the NMS. A list of TP and layer rate measurement points have to be specified. It is possible to filter the amount of requested PMD based on a list of PM parameters. For each measurement point, location category (nearEnd (unidirectional) and/or farEnd (unidirectional) and/or bidirectional) and granularity (15min register and/or, 24hr register and/or NA) has to be specified.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS must have knowledge of the MEs and TPs specified.</li> <li>3) PMD collection must have been enabled for the TPs specified.</li> <li>4) The EMS must have active communications established with the ME, to which the TPs belong.</li> </ol>
<b>Begins when</b>	The NMS requests the EMS to send current PMD.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a request command to retrieve the current PMD to the EMS: The NMS specifies the measurement points and a list of PM parameters (e.g. BBE, ES) from which the current PMD are requested. It is possible to identify all TPs of a ME or a set of individual TPs (PTPs and/or CTPs). For each measurement point the NMS has to define: <ul style="list-style-type: none"> <li>• the layer rate</li> <li>• the granularity (15min-register and/or 24hr-register and/or NA) and</li> <li>• the location (nearEnd (unidirectional) and/or farEnd (unidirectional) and/or bidirectional)</li> </ul> An empty list for PM parameter, layer rate, granularity or location means that the ME has to use every supported item.</li> <li>2) The EMS validates the provided parameters.</li> <li>3) If the determination of a PM Parameter is Zero for a specified TP, the EMS returns also these records</li> <li>4) If no current performance data are available for (some of) the PM parameters for (some of) the TPs specified in the request, the EMS returns UNAVAILABLE for those records.</li> <li>5) In general PMD will not be complete for current 15min or 24hr registers. Incomplete records will be marked as INCOMPLETE.</li> <li>6) The operation mode will be best-effort. Only the supported PM parameters have to be send by the EMS.</li> <li>7) The EMS sends current PMD as specified in the request to the NMS.</li> </ol>

**Use Case 5.11.3: NMS retrieves current Performance Monitoring Data (PMD) for a specified set of TPs**

<b>Ends when</b>	<p>In case of success: The NMS receives a response with the requested current PMD.</p> <p>In case of failure: The NMS receives an exception.</p>
<b>Post-conditions</b>	<p>In case of success: Nothing has changed in the EMS domain.</p> <p>In case of failure: Nothing has changed in the EMS domain.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: No TP/ME is specified in the input data or it contains at least one invalid data item.</li> <li>4) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 131}</a>

## 5.11.4 NMS retrieves the storage time of 24hr and 15min Performance Monitoring Data (PMD) records

### Use Case 5.11.4: NMS retrieves the storage time of 24hr and 15min Performance Monitoring Data (PMD) records

<b>Use Case Name</b>	NMS retrieves the storage time of 24hr and 15min Performance Monitoring Data (PMD) records
<b>Summary</b>	The NMS requests the EMS to return the storage capacity or holding time in hours it keeps 24hr and 15min PMD records after the corresponding 24hr or 15min collecting registers has been closed. This is supposed to be the worst case time. There is no requirement on the EMS to support any predefined holding times.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<p>The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</p> <p>If the EMS has to contact the MEs to get the capacity, the EMS must also have an active communications established with every ME.</p>
<b>Begins when</b>	The NMS sends a request to the EMS to be informed about PMD storage times.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a request command to the EMS.</li> <li>2) The EMS validates the request.</li> <li>3) If the EMS does not support the storage of PMD, the minimum time across all MEs managed by the EMS has to be calculated by the EMS (if necessary by consulting each ME in its domain).</li> <li>4) The EMS returns one PMD storage time for all 24hr collection registers and one PMD storage time for all 15min collection registers.</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives a response with the required information.</p> <p>In case of failure:</p> <p>The NMS receives an exception.</p>
<b>Post-conditions</b>	<p>In case of success:</p> <p>Nothing has changed in the EMS domain.</p> <p>In case of failure:</p> <p>Nothing has changed in the EMS domain.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 124}</a>

### 5.11.5 NMS retrieves PM capabilities of a Managed Element (ME)

#### Use Case 5.11.5: NMS retrieves PM capabilities of a Managed Element (ME)

<b>Use Case Name</b>	NMS retrieves PM capabilities of a Managed Element (ME)
<b>Summary</b>	The NMS requests the EMS to return the PM capabilities (list of supported PM Parameters and location) of a ME for a specified layer rate
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) A communication session must be active between the EMS and the relevant ME.</li> </ol>
<b>Begins when</b>	The NMS sends a request to the EMS to be informed about PM capabilities.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a request command to the EMS: Within the request the NMS specifies the ME and the layer rate for which PM capabilities are to be returned.</li> <li>2) The EMS validates the provided parameters.</li> <li>3) The EMS returns a list of PM parameters that are supported for the ME and layer rate specified.</li> </ol>
<b>Ends when</b>	<p>In case of success: The NMS receives a response with the required information.</p> <p>In case of failure: The NMS receives an exception.</p>
<b>Post-conditions</b>	<p>In case of success: Nothing has changed in the EMS domain.</p> <p>In case of failure: Nothing has changed in the EMS domain.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed.</li> <li>2) Invalid input: The provided name does not reference a ME or layer rate contains undefined rates</li> <li>3) Entity not found: The provided name references an object which does not exist</li> <li>4) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">(Requirement II. 054}</a> , <a href="#">(Requirement II. 221}</a> , <a href="#">(Requirement II. 222}</a>

### 5.11.6 NMS retrieves historical Performance Monitoring Data (PMD) for a specified set of TPs

#### Use Case 5.11.6: NMS retrieves historical Performance Monitoring Data (PMD) for a specified set of TPs

<b>Use Case Name</b>	NMS retrieve historical Performance Monitoring Data (PMD) for a specified set of TPs
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**Use Case 5.11.6: NMS retrieves historical Performance Monitoring Data (PMD) for a specified set of TPs**

<b>Summary</b>	The NMS requests the EMS to store history PMD within a specified time interval into a data file, and to send that data file to a specified destination using FTP mechanisms. A list of TP and layer rate, location categories (nearEnd (unidirectional) and/or farEnd (unidirectional) and/or bidirectional) and a granularity (15min, 24hr) for each measurement point has to be specified. It is possible to filter the amount of requested PMD based on a list of PM parameters. Username and password for file transfer to the given destination are also needed as input for this operation.
<b>Actors</b>	NMS, remote target
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS must have knowledge of the MEs and the TPs specified.</li> <li>3) If the EMS has to retrieve the requested PMD from the ME, the EMS must also have an active communications established with the relevant MEs.</li> </ul>
<b>Begins when</b>	The NMS sends a request to the EMS to send PMD to a specific destination for a set of specified TPs.

**Use Case 5.11.6: NMS retrieves historical Performance Monitoring Data (PMD) for a specified set of TPs**

<p><b>Description</b></p>	<p>1) The NMS sends the request command to the EMS:</p> <p>The NMS specifies the measurement points and a list of PM parameters (e.g. BBE, ES) from which the historical PMD are requested. It is possible to identify all TPs of a ME or a set of individual TPs (PTPs and/or CTPs). For each measurement point the NMS has to define:</p> <ul style="list-style-type: none"> <li>• the layer rate</li> <li>• the granularity (15min-register and/or 24hr-register and/or NA) and</li> <li>• the location (nearEnd (unidirectional) and/or farEnd (unidirectional) and/or bidirectional)</li> </ul> <p>An empty list for PM parameters, layer rate, granularity or location means that every supported item is requested.</p> <p>2) Regarding the FTP mechanism the NMS has to specify:</p> <ul style="list-style-type: none"> <li>• the destination (hostname of the destination machine and full pathName of the target directory within the destination machine) to which the output file has to be sent</li> <li>• a user name for the file</li> <li>• a password for the file</li> </ul> <p>3) In order to limit the amount of requested historical PMD the NMS may also provide a time frame (start time, end time).</p> <p>4) The 'start' and 'end' time are aligned to UTC. 24hr time periods are considered to start at and include 0:00 am. 15min time periods are considered to start at and include 00/15/30/45 minute.</p> <p>5) The NMS may force the EMS to contact also the MEs in order to get also the history data that has not been uploaded to the EMS yet.</p> <p>6) The EMS validates the provided parameters.</p> <p>7) The returned PM parameters are best-effort. Only the supported PM parameters have to be send in the file.</p> <p>8) The EMS stores PMD as specified in the request into a data file, and sends that data file by FTP to the destination, using username and password as specified.hostname of the destination machine and the full pathName of the target directory within the destination machine</p> <p>9) The EMS shall notify the NMS when the file transfer is completed or when the file transfer is failed.</p> <p>Notes concerning output file format:</p> <p>Considering a TP and a PM parameter the following holds true:</p> <p>If the NMS specified PM parameter is not supported for a TP there shall be no entry in the output file for this parameter and TP.</p> <p><b>Note:</b>  <a href="#">Use Case 5.11.5: NMS retrieves PM capabilities of a Managed Element (ME)</a> can be used to check if PM parameter are supported for a TP in advance.</p>
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**Use Case 5.11.6: NMS retrieves historical Performance Monitoring Data (PMD) for a specified set of TPs**

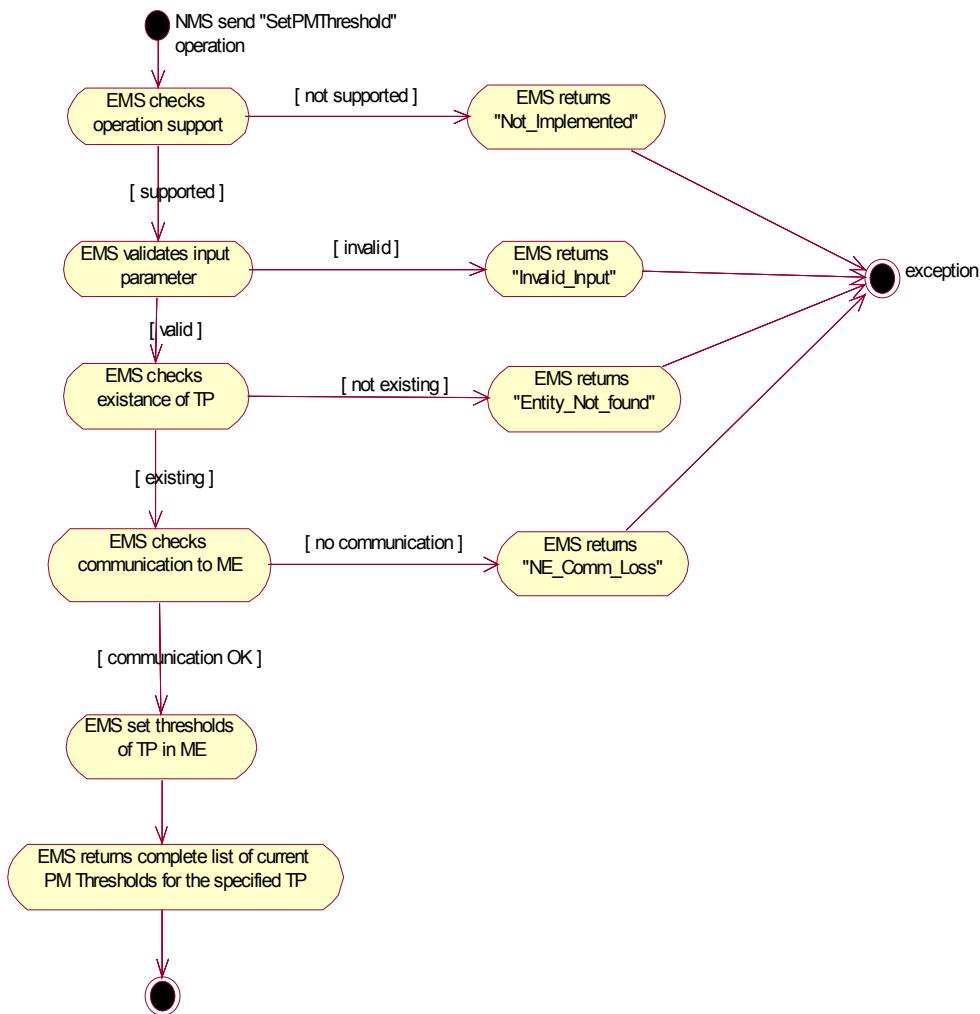
	<p>Otherwise, i.e. if the PM parameter is supported for a TP,      if there are no measurement intervals at all, within the specified time interval, there is no entry in the output file for this parameter and TP.</p> <p>if there are some UNAVAILABLE measurement intervals, within the specified time interval, the description field has the value UNAVAILABLE. If there are a number of successive UNAVAILABLE periods the EMS has to combine these periods in the output file.</p> <p>if a measurement interval is only partly covered by the given time interval, a status field shall identify this and the related PM data record shall contain the number of monitored seconds.</p> <p>to indicate zero suppression, (i.e. if PM parameter has value zero over some successive measurement intervals), the related PMD record shall contain the number of full measurement periods with zero values.</p>
<b>Ends when</b>	<p>In case of success:      The NMS receives an indication that the file transfer is completed.</p> <p>In case of failure:      The NMS receives an exception or gets an indication that the file transfer has been failed</p>
<b>Post-conditions</b>	<p>In case of success:      PMD for the set of TPs specified are sent to the requested destination. Nothing has changed in the EMS domain.</p> <p>In case of failure:      Nothing has changed in the EMS domain.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: Any input parameter is invalid</li> <li>4) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 128}</a> , <a href="#">{Requirement II. 129}</a> , <a href="#">{Requirement II. 130}</a>

**5.11.7 NMS sets PM thresholds on a TP****Use Case 5.11.7: NMS sets PM thresholds on a TP**

<b>Use Case Name</b>	NMS sets PM thresholds on a TP
<b>Summary</b>	The purpose of this use case is to modify the values of 15min- and/or 24hr- and/or instantaneous measurement PM Thresholds on a TP.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS must have knowledge of the TP specified.</li> <li>3) A communication between the EMS and the relevant ME has to be active.</li> </ul>
<b>Begins when</b>	The NMS sends the request to the EMS.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The NMS send the request to the EMS: The NMS specifies the TP to which the request shall be applied to. It can be applied to a PTP or a CTP and a set of Performance Monitoring Points (PMPs).</li> <li>2) The EMS checks if the operation is supported.</li> <li>3) The EMS validates the input parameters.</li> <li>4) The EMS checks the existence of the TP.</li> <li>5) Thresholds within the TP that are not defined in the request remain as they are (i.e. thresholds currently applied at the specified TP and layer rate measurement points are not modified if the NMS does not explicitly specify them in the request).</li> <li>6) The EMS set the thresholds of the TP in the NE as requested. This part is best effort.</li> <li>7) The EMS returns a complete list of the current PM Thresholds for the specified TP.</li> <li>8) For every set of PM thresholds set on a TP the EMS sends AVCs notifications for the affected PMPs to the notification service</li> </ul>
<b>Ends when</b>	<p>In case of success: The NMS receives a complete list of the current PM Thresholds for the specified TP response.</p> <p>In case of failure: The NMS receives an exception.</p>
<b>Post-conditions</b>	<p>In case of success: The requested PM Thresholds are modified on the TP.</p> <p>In case of failure: Nothing has changed in the EMS domain.</p>

**Use Case 5.11.7: NMS sets PM thresholds on a TP**

<b>Exceptions</b>	1) Not implemented: The EMS does not support this service. 2) Processing failure: The requested operation could not be performed. 3) Invalid input: The name of the TP does not reference a Termination Point, or at least one of the provided parameters are not valid 4) Entity not found: The TP name references a TP which does not exist 5) NE communication loss.
<b>Traceability</b>	{Requirement I. 054}, {Requirement II. 125}

**Figure 5.19: Activity Diagram for NMS sets PM thresholds on a TP**

### 5.11.8 NMS retrieves PM threshold settings from a TP

#### Use Case 5.11.8: NMS retrieves PM threshold settings from a TP

<b>Use Case Name</b>	NMS retrieves PM threshold settings from a TP
<b>Summary</b>	The purpose of this use case is to retrieve the current values of 15min- and/or 24hr and/or instantaneous measurement PM Thresholds from a Termination Point.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ul style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS must have knowledge of the TP specified.</li> <li>3) If the EMS has to contact the ME to get this information, a communication between the EMS and the relevant ME has to be active.</li> </ul>
<b>Begins when</b>	The NMS sends the request to the EMS.
<b>Description</b>	<ul style="list-style-type: none"> <li>1) The NMS send the request to the EMS. The NMS specifies the TP to which the request shall be applied to. It can be applied to a PTP or a CTP. A specific PM parameter and a Performance Monitoring Point (PMP).</li> <li>2) The NMS specifies the specific TP measurement point to which the request shall be applied to. It can be applied to either a PTP or a CTP.</li> <li>3) The EMS checks if the operation is supported.</li> <li>4) The EMS validates the input parameters.</li> <li>5) The EMS checks the existence of the TP.</li> <li>6) The NMS has to define the PM parameter name.</li> <li>7) The requested PM Threshold values are returned by the EMS.</li> </ul>
<b>Ends when</b>	<p>In case of success: The NMS receives a response with the current threshold settings for the TP.</p> <p>In case of failure: The NMS receives an exception.</p>
<b>Post-conditions</b>	<p>In case of success: Nothing has changed in the EMS domain.</p> <p>In case of failure: Nothing has changed in the EMS domain.</p>
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed.</li> <li>2) Invalid input: The name of the TP does not reference a Termination Point, the layer rate is undefined or the granularity is undefined.</li> <li>3) Entity not found: The referenced TP does not exist.</li> <li>4) NE communication loss.</li> </ul>
<b>Traceability</b>	<a href="#">{Requirement I. 054}</a> , <a href="#">{Requirement II. 055}</a>

### 5.11.9 NMS enables Threshold Crossing Alerts (TCA) for a specified set of TPs

Use Case 5.11.9: NMS enables Threshold Crossing Alerts (TCA) for a specified set of TPs

<b>Use Case Name</b>	NMS enables Threshold Crossing Alerts (TCA) for a specified set of TPs
<b>Summary</b>	The NMS requests the EMS to enable the spontaneous (immediately after getting the event from the ME) generation of a TCA for a list of TP measurement points, in case when a PM Threshold value is reached or crossed.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS must have knowledge of the MEs and the TPs specified.</li> <li>3) If the EMS needs to enable the alert generation in the ME, the EMS must also have an active communications established with the ME, to which the TP belongs.</li> </ol>
<b>Begins when</b>	The NMS sends a request to the EMS to enable the generation of TCAs for a specified set of TPs.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends an enabling request command to the EMS: The NMS specifies the measurement points to which the request shall be applied. It is possible to identify all TPs of a ME or a set of individual TPs (PTPs and/or CTPs). For each measurement point the NMS has to define: <ul style="list-style-type: none"> <li>• the layer rate</li> <li>• the granularity (15min-register and/or 24hr-register and/or NA)</li> <li>• the location (nearEnd (unidirectional) and/or farEnd (unidirectional) and/or bidirectional)</li> </ul> An empty list for layer rate, granularity or location means that the ME has to use every supported item.</li> <li>2) The EMS validates the provided parameters.</li> <li>3) If necessary the EMS sends the appropriate command(s) to the ME to enable the reporting of TCAs from the MEs to the EMS.</li> <li>4) Following successful processing of the appropriate command(s), the generation of TCAs is enabled for the specified TPs.</li> <li>5) If generation of TCAs is already enabled for one or more of the specified TPs, the operation shall be considered a success.</li> <li>6) The operation is best-effort. If alert generation could not be enabled for a subset of the TPs specified, a list identifying the non-enabled subset is returned.</li> <li>7) For every item enabled the EMS sends a state change notification on the supervision state of the affected Performance Monitoring Point to the notification service.</li> </ol>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives a confirmation</p> <p>In case of failure:</p> <p>The NMS receives an exception or gets an indication of the subset of TPs that could not be enabled.</p>

**Use Case 5.11.9: NMS enables Threshold Crossing Alerts (TCA) for a specified set of TPs**

<b>Post-conditions</b>	<p>In case of success:</p> <p>The requested threshold supervision functionality of the TPs specified are enabled for generating TCAs.</p> <p>In case of failure:</p> <p>When the NMS receives an exception, nothing has changed in the EMS domain otherwise, the requested threshold supervision functionality of the TPs specified are enabled for generating TCA <b>except</b> the ones identified as not enabled.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: Some input data contains invalid data.</li> <li>4) Unable to comply: The EMS is unable to enable TCA for the specified TPs, i.e. no TPs were enabled.</li> <li>5) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 122}</a> , <a href="#">{Requirement II. 126}</a>

### 5.11.10 NMS disables Threshold Crossing Alerts (TCA) for a specified set of TPs

#### Use Case 5.11.10: NMS disables Threshold Crossing Alerts (TCA) for a specified set of TPs

<b>Use Case Name</b>	NMS disables Threshold Crossing Alerts (TCA) for a specified set of TPs
<b>Summary</b>	The NMS requests the EMS to disable the generation of a TCA for a list of TP measurement points.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<p>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</p> <p>2) The NMS must have knowledge of the MEs and the TPs specified.</p>
<b>Begins when</b>	The NMS sends a request to the EMS to disable the generation of TCAs for a specified set of TPs.
<b>Description</b>	<p>1) The NMS sends a disabling request command to the EMS:</p> <p>The NMS specifies the measurement points to which the request shall be applied. It is possible to identify all TPs of a ME or a set of individual TPs (PTPs and/or CTPs). For each measurement point the NMS has to define:</p> <ul style="list-style-type: none"> <li>• the layer rate</li> <li>• the granularity (15min-register and/or 24hr-register and/or NA)</li> <li>• the location (nearEnd (unidirectional) and/or farEnd (unidirectional) and/or bidirectional)</li> </ul> <p>An empty list for layer rate, granularity or location means that the ME has to use every supported item.</p> <p>2) The EMS validates the provided parameters.</p> <p>3) Following successful processing of the command, the generation of TCAs is disabled for the specified TPs.</p> <p>4) If generation of TCAs is already disabled for one or more of the specified TPs, the operation shall be considered a success.</p> <p>5) The operation is best-effort. If alert generation could not be disabled for a subset of the TPs specified, a list identifying the non-disabled subset is returned.</p> <p>6) For every item disabled the EMS sends a state change notification on the supervision state of the affected Performance Monitoring Point to the notification service.</p>
<b>Ends when</b>	<p>In case of success:</p> <p>The NMS receives a confirmation</p> <p>In case of failure:</p> <p>The NMS receives an exception or gets an indication of the subset of TPs that could not be disabled.</p>

**Use Case 5.11.10: NMS disables Threshold Crossing Alerts (TCA) for a specified set of TPs**

<b>Post-conditions</b>	<p>In case of success:</p> <p>The requested threshold supervision functionality of the TPs specified do no longer generate TCAs.</p> <p>In case of failure:</p> <p>When the NMS receives an exception, nothing has changed in the EMS domain otherwise, the requested threshold supervision functionality of the TPs specified do no longer generate TCAs <b>except</b> the ones identified as not disabled.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: Some input data contains invalid data.</li> <li>4) Unable to comply: The EMS is unable to disable TCA for the specified TPs, i.e. no TPs were disabled.</li> <li>5) NE communication loss</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 122}</a>

### 5.11.11 On demand retrieval of historical Performance Monitoring Data (PMD) for a specified set of TPs

**Use Case 5.11.11: On demand retrieval of historical Performance Monitoring Data (PMD) for a specified set of TPs**

<b>Use Case Name</b>	On demand retrieval of historical Performance Monitoring Data (PMD) for a specified set of TPs
<b>Summary</b>	The NMS requests the EMS to send history PMD data to the NMS. A list of TP and layer rate measurement points have to be specified. It is possible to filter the amount of requested PMD based on a list of PM parameters. For each measurement point, location category (nearEnd (unidirectional) and/or farEnd (unidirectional) and/or bidirectional) and granularity (15min register and/or, 24hr register and/or NA) has to be specified.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The NMS must have knowledge of the MEs and TPs specified.</li> <li>3) PMD collection must have been enabled for the TPs specified.</li> <li>4) The EMS must have active communications established with the ME, to which the TPs belong.</li> </ol>
<b>Begins when</b>	The NMS sends a request to the EMS to get the historical PMD for the specified TP.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a request command to retrieve the history PMD to the EMS: The NMS specifies the measurement points and a list of PM parameters (e.g. BBE, ES) from which the historical PMD are requested. It is possible to identify all TPs of a ME or a set of individual TPs (PTPs and/or CTPs). For each measurement point the NMS has to define: <ul style="list-style-type: none"> <li>• the layer rate</li> <li>• the granularity (15min-register and/or 24hr-register and/or NA) and</li> <li>• the location (nearEnd (unidirectional) and/or farEnd (unidirectional) and/or bidirectional)</li> </ul> An empty list for PM parameter, layer rate, granularity or location means that the ME has to use every supported item.</li> <li>2) The EMS validates the provided parameters.</li> <li>3) If the determination of a PM Parameter is Zero for a specified TP, the EMS returns also these records.</li> <li>4) If no current performance data are available for (some of) the PM parameters for (some of) the TPs specified in the request, the EMS returns UNAVAILABLE for those records.</li> <li>5) The operation mode will be best-effort. Only the supported PM parameters have to be send by the EMS.</li> <li>6) The EMS sends history PMD as specified in the request to the NMS</li> </ol>

**Use Case 5.11.11: On demand retrieval of historical Performance Monitoring Data (PMD) for a specified set of TPs**

<b>Ends when</b>	In case of success: The NMS receives a response with the requested historical PMD.  In case of failure: The NMS receives an exception.
<b>Post-conditions</b>	In case of success: Nothing has changed in the EMS domain.  In case of failure: Nothing has changed in the EMS domain.
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: No TP/ME is specified in the input data or it contains at least one invalid data item</li> <li>4) NE communication loss.</li> <li>5) Unable to comply: The EMS supports retrieval of PM data only for a few buckets in past and NMS request is exceeding that time period.</li> <li>6) Entity not found: One of the TPs does not exist.</li> </ul>
<b>Traceability</b>	<a href="#">{Requirement II. 163}</a>

**5.11.12 NMS retrieves Performance Monitoring Points (PMP) contained in an ME or a TP**

Use Case 5.11.12: NMS retrieves Performance Monitoring Points (PMP) contained in an ME or a TP

<b>Use Case Name</b>	NMS retrieves Performance Monitoring Points (PMP) contained in an ME or a TP
<b>Summary</b>	The NMS requests the EMS to return all Performance Monitoring Points (PMPs) contained in an ME or a TP. Note that the result provides not only the monitoring and supervision states but also the PM capabilities on a per TP basis and the PM thresholds.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The EMS must have active communications established with the ME, to which the TPs belong.</li> </ol>
<b>Begins when</b>	The NMS sends a request to the EMS to get all PMPs contained in an ME or a TP.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a request command to the EMS. Within the request the NMS specifies the ME or the TP for which the contained PMPs are to be returned.</li> <li>2) The EMS validates the provided parameters.</li> <li>3) The EMS returns a list of PMPs that are contained in the ME or TP specified.</li> </ol>
<b>Ends when</b>	<p>In case of success: The NMS receives a response with the requested PMP.</p> <p>In case of failure: The NMS receives an exception.</p>
<b>Post-conditions</b>	<p>In case of success: Nothing has changed in the EMS domain.</p> <p>In case of failure: Nothing has changed in the EMS domain.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: The provided name does not reference a ME or TP.</li> <li>4) Entity not found: The provided name references an object which does not exist.</li> <li>5) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">(Requirement II. 221)</a>

**5.11.13 NMS configures TCA Parameter Profile**

Use Case 5.11.13: NMS configures TCA Parameter Profile

<b>Use Case Name</b>	NMS configures TCA Parameter Profile Pointer
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**Use Case 5.11.13: NMS configures TCA Parameter Profile**

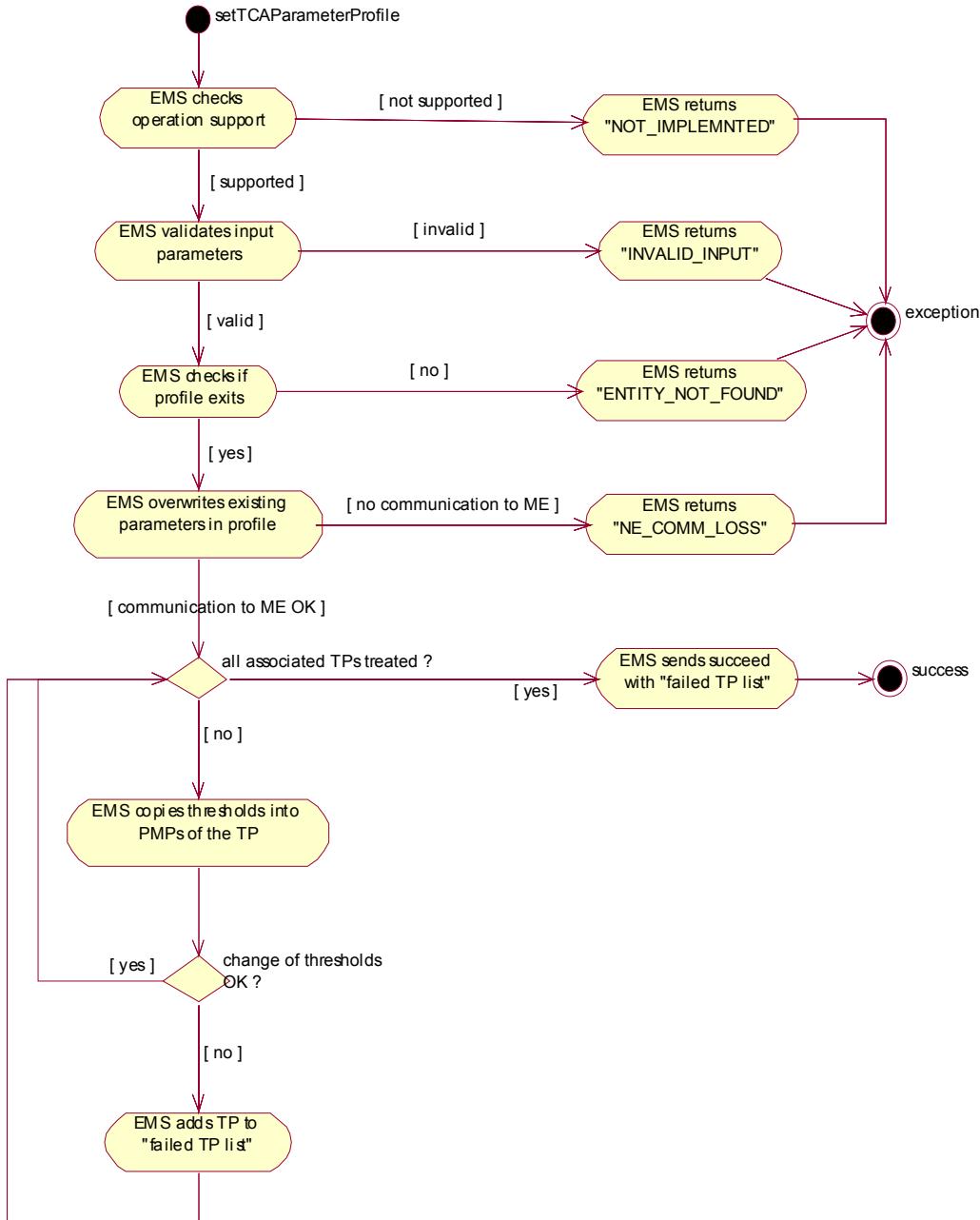
<b>Summary</b>	The purpose of this use case is to configure the TCA thresholds contained in the Performance Monitoring Points of a TP by modifying the assignment of the TCA Parameter Profiles to this TP.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"><li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li><li>2) TP specified must exist.</li><li>3) TCA Parameter Profile specified must exist.</li><li>4) A communication between the EMS and the relevant ME has to be active.</li></ol>
<b>Begins when</b>	The NMS sends the request to the EMS.

**Use Case 5.11.13: NMS configures TCA Parameter Profile**

<b>Description</b>	<p>1) The NMS send the request to the EMS: The NMS specifies the TP to which the request shall be applied to. It can be applied to a PTP, a FTP or a CTP.</p> <p>2) The NMS has to define:</p> <ul style="list-style-type: none"> <li>• the TCA Parameter Profile to be removed; could be empty</li> <li>• the TCA Parameter Profile to be added; could be empty the granularity (15min-register or 24hr-register or NA) and for every threshold to be set</li> </ul> <p>3) The EMS checks if the operation is supported.</p> <p>4) The EMS validates the input parameters.</p> <p>5) The EMS checks the existence of the TP.</p> <p>6) If a TCA Parameter Profile has to be removed. Only the attribute TCA Parameter Profile Pointer of the TP has to be updated and an AVC notification has to be send.</p> <p>7) If a TCA Parameter Profile has to be added. The EMS checks the existence of the TCA Parameter Profile to be added.</p> <p>8) If the TCA Parameter Profile to be added is already assigned to the TP the EMS shall overwrite the threshold values in the TP if necessary to make the values in the PMPs consistent with the values in the profile. (Note: Individual values may have been changed in the PMPs before via the <a href="#">Use Case 5.11.7: NMS sets PM thresholds on a TP</a>).</p> <p>9) When this is not successful, the EMS shall send an exception to the NMS explaining the reason.</p> <p>10) If the TCA Parameter Profile is not already assigned to the TP but defines thresholds of the same layer as an already assigned TCA Parameter Profile the EMS shall send an exception to the NMS explaining the reason.</p> <p>11) If the TCA Parameter Profile is not already assigned to the TP and defines thresholds of a different layer than the already assigned TCA Parameter Profiles, then the EMS shall set the threshold values as defined in the TCA Parameter Profile. When the thresholds could not be set the EMS shall send an exception to the NMS explaining the reason.</p> <p><b>Note:</b> The attribute TCA Parameter Profile of the TP shall only be updated once within this operation and only one AVC notification shall be send.</p>
<b>Ends when</b>	<p>In case of success: The threshold values of the TP are consistent with the added/removed TCA Parameter Profiles..</p> <p>In case of failure: The NMS receives an exception.</p>

**Use Case 5.11.13: NMS configures TCA Parameter Profile**

<b>Post-conditions</b>	<p>In case of success:</p> <p>The threshold values of the TP are consistent with the added/removed TCA Parameter Profiles.</p> <p>In case of failure:</p> <p>Nothing has changed in the EMS domain.</p>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: Any input parameter are syntactical incorrect.</li> <li>4) Entity not found: TP or TCA Parameter Profile to be assigned does not exist.</li> <li>5) Object in use: TCA Parameter Profile of the same layer is already assigned to the TP.</li> <li>6) Unable to comply: The threshold values in the TP could not be configured.</li> <li>7) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">(Requirement II. 238)</a> , <a href="#">(Requirement II. 239)</a>



**Figure 5.20: Activity Diagram for [NMS configures TCA Parameter Profile](#)**

**5.11.14 NMS modifies TCA Parameter Profile Pointer****Use Case 5.11.14: NMS modifies TCA Parameter Profile Pointer**

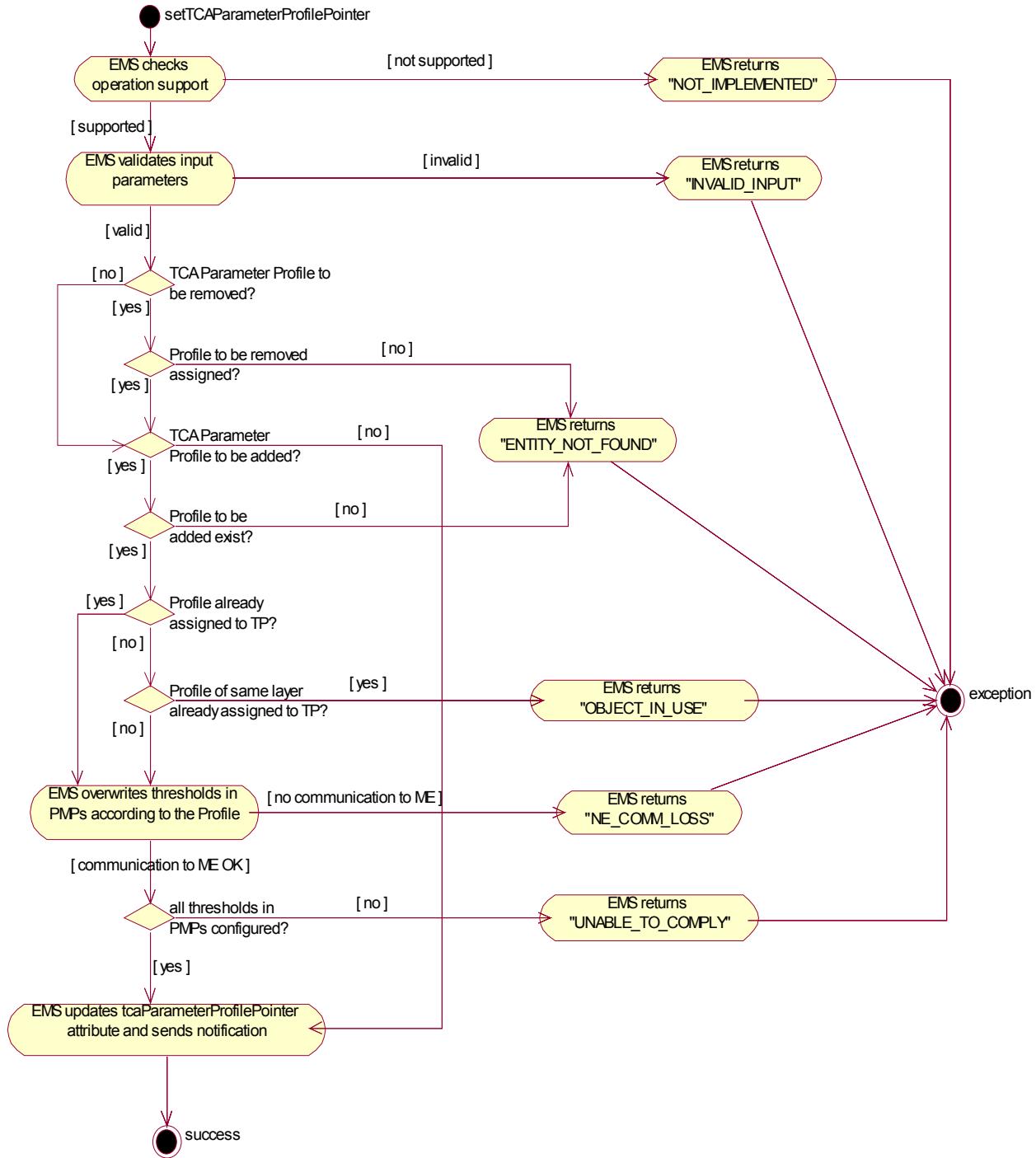
<b>Use Case Name</b>	NMS modifies TCA Parameter Profile Pointer
<b>Summary</b>	The purpose of this use case is to modify all the TCA thresholds contained in an already created TCA Parameter Profile. This operation overwrites all the existing threshold values of the profile with the new provided threshold values; i.e. it changes the profile completely.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"><li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li><li>2) TCA Parameter Profile specified must exist.</li><li>3) A communication between the EMS and the relevant ME has to be active.</li></ol>
<b>Begins when</b>	The NMS sends the request to the EMS.

**Use Case 5.11.14: NMS modifies TCA Parameter Profile Pointer**

<b>Description</b>	<p>1) The NMS send the request to the EMS: The NMS specifies the TCA Parameter Profile to which the request shall be applied to.</p> <p>2) The NMS has to define the list of TCA parameters which contains the following information for each threshold value:</p> <ul style="list-style-type: none"> <li>• layer rate - already defined via the instance of the TCA Parameter Profile</li> <li>• parameter name - e.g. BBE, ES</li> <li>• granularity - i.e. 15 minute, 24 hours, N/A</li> <li>• location of the measurement</li> <li>• type of threshold - e.g. high, low</li> <li>• trigger flag - indicates if the threshold is for the trigger or the clear</li> <li>• value of the threshold</li> <li>• unit of the threshold</li> </ul> <p>3) The EMS checks if the operation is supported.</p> <p>4) The EMS validates the input parameters.</p> <p>5) The EMS checks the existence of the TCA Parameter Profile.</p> <p>6) The EMS overwrites all parameters with the provided ones.</p> <p><b>Note:</b> This includes also deletion of thresholds if the threshold is no longer contained in the provided list of TCA Parameters.</p> <p>7) Then EMS changes all threshold values of all the TPs associated to this profile according to the new values.</p> <p><b>Note:</b> Thresholds which have been deleted in the Profile will not be changed in the PMPs of the associated TPs.</p> <p>8) The EMS has to return all TPs that could not be changed to the new threshold values due to some error reasons.</p>
<b>Ends when</b>	<p>In case of success: The TCA Parameter Profile contains the new provided threshold values and every TP (except the TPs returned as failed TPs) assigned to this profile has been set to the new threshold values.</p> <p>In case of failure: The NMS receives an exception.</p>

**Use Case 5.11.14: NMS modifies TCA Parameter Profile Pointer**

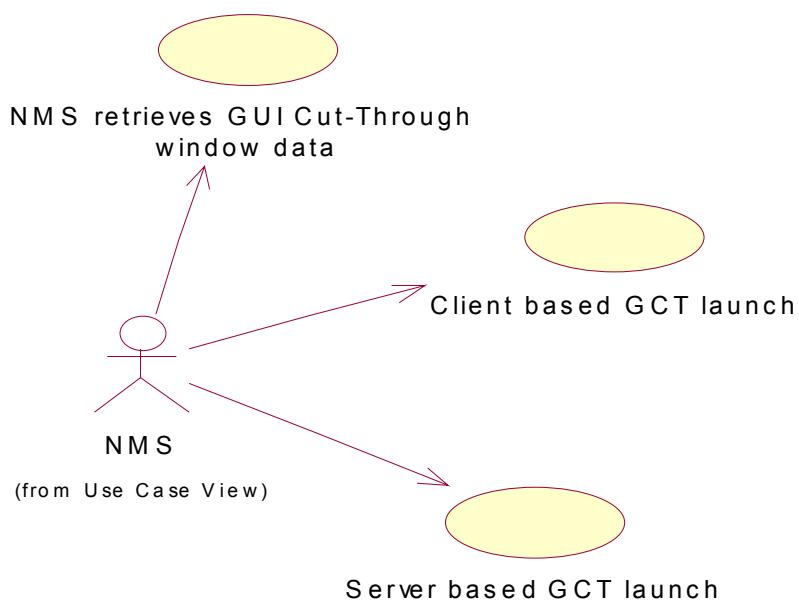
<b>Post-conditions</b>	<p>In case of success:</p> <p>The TCA Parameter Profile contains the new provided threshold values. Every TP (except the TPs returned as failed TPs) assigned to this profile has been set to the new threshold values and if supervision is switched on, starts to use the new values for supervision.</p> <p>In case of failure:</p> <p>Nothing has changed in the EMS domain.</p>
<b>Exceptions</b>	<ul style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: One or more input parameters are syntactically incorrect.</li> <li>4) Entity not found: The TCA Parameter Profile to be changed does not exist.</li> <li>5) NE communication loss.</li> </ul>
<b>Traceability</b>	<a href="#">{Requirement II. 238}</a> , <a href="#">{Requirement II. 239}</a>



**Figure 5.21: Activity Diagram for [NMS modifies TCA Parameter Profile Pointer](#)**

## 5.12 GUI Cut-Through Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.12.1:</a>	<a href="#">NMS retrieves GUI Cut-Through window data</a>	<a href="#">{Requirement II. 150}</a>
<a href="#">Use Case 5.12.2:</a>	<a href="#">Client based GCT launch</a>	<a href="#">{Requirement II. 151}</a>
<a href="#">Use Case 5.12.3:</a>	<a href="#">Server based GCT launch</a>	<a href="#">{Requirement II. 151}</a> , <a href="#">{Requirement II. 152}</a>



**Figure 5.22: GUI Cut-Through Use Cases**

### 5.12.1 NMS retrieves GUI Cut-Through window data

#### Use Case 5.12.1: NMS retrieves GUI Cut-Through window data

<b>Use Case Name</b>	NMS retrieves GUI Cut-Through window data
<b>Summary</b>	The NMS is required to launch GCT. It retrieves the relevant GCT commands required to launch the GCT for each supported window type, or scope and context. Additionally, it receives indication if the EMS supports server-launch. The retrieval of the data is done through the NMS-EMS interface. <a href="#">Use Case 5.12.2: Client based GCT launch</a> describes the client-based launch and <a href="#">Use Case 5.12.3: Server based GCT launch</a> describes the server-based launch.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins when</b>	NMS requires the relevant GCT window data
<b>Description</b>	NMS gets the list of GCT parameters for all windows supported by EMS through the NMS-EMS interface. EMS indicates if it also supports server-based launch.
<b>Ends when</b>	In case of success: The NMS has all required GCT information. In case of failure: The NMS does not have the required GCT window data; NMS cannot attempt to launch a GCT outside the interface.
<b>Post conditions</b>	The NMS has retrieved the GCT information from the EMS.
<b>Exceptions</b>	Processing failure: The requested operation could not be performed.
<b>Traceability</b>	{Requirement II. 150}

**Note:**

For [Use Case 5.12.2: Client based GCT launch](#) and [Use Case 5.12.3: Server based GCT launch](#), NMS has to ensure that it is possible for GCT to be displayed on the GCT Display location. For example, the GCT server has permission to access a given display address; access control is turned off at the GCT client (e.g. the X-server of the NMS station) for the EMS GCT-server address (e.g. by executing xhost + [GCT host]).

### 5.12.2 Client based GCT launch

#### Use Case 5.12.2: Client based GCT launch

<b>Use Case Name</b>	Client based GCT launch
<b>Summary</b>	<p>The EMS GUI is launched via a client-server protocol. The NMS initiates the GCT launch once it has retrieved the relevant application name and application arguments through the NMS-EMS interface.</p> <p>This USE CASE addresses the client-based GCT launch.</p>
<b>Actors</b>	NMS and GCT server
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.12.1: NMS retrieves GUI Cut-Through window data</a>.</li> <li>2) NMS has ensured that it is possible for GCT to be displayed on the GCT Display location.</li> <li>3) NMS has access to any other required server (e.g. ICA server for Citrix).</li> </ol> <p>For Citrix configuration</p> <p>The EMS applications can be accessed by a Citrix server running on the same OS platform (maybe different workstations).</p> <p>The EMS GCT application is registered with Citrix server under a certain application name. The relevant application name is known to the EMS.</p>
<b>Begins when</b>	User request to display a GUI component that is managed by the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) If required, the NMS requests the GCT parameters (USE CASE 1)</li> <li>2) The NMS determines which EMS context and scope has to be launched.</li> <li>3) The NMS runs the GCT command using the parameters retrieved</li> </ol>
<b>Ends when</b>	The EMS GCT application is displayed on GCT Display.
<b>Post-conditions</b>	The GCT application opens the display successfully at the NMS.
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Processing Failure: The requested operation could not be performed.</li> <li>2) Invalid input: One of the input parameter is invalid.</li> <li>3) Entity not found: The object referenced does not exist.</li> <li>4) Capacity exceeded: The maximum number of active GCTs has been reached.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 151}</a>

### 5.12.3 Server based GCT launch

#### Use Case 5.12.3: Server based GCT launch

<b>Use Case Name</b>	Server based GCT launch (e.g. using an X-protocol)
<b>Summary</b>	<p>The GUI can be launched via a pure X-protocol, initiated by the EMS / server side once it is requested to do so through the MTNM interface.</p> <p>This USE CASE addresses the optional server-based GCT launch.</p>

**Use Case 5.12.3: Server based GCT launch**

<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.12.1: NMS retrieves GUI Cut-Through window data</a>.</li> <li>2) EMS has indicated that it supports server launch.</li> <li>3) NMS has ensured that it is possible for GCT to be displayed on the GCT Display location.</li> </ol>
<b>Begins when</b>	User request to display a GUI component that is managed by the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS request a launch of the GCT via the MTNM interface.</li> <li>2) The EMS runs the GCT application on the X-server and attempts to redirect the display to the NMS display address. This step is outside of the MTNM interface and is shown as a dashed line in the figure below.</li> <li>3) Once the GCT is displayed on NMS and the system call returns, the server launch operation returns and indicates if it supports closing of GCT window.</li> </ol>
<b>Ends when</b>	The display of a given GUI application becomes available at the NMS X-terminal.
<b>Post-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS is aware to whether the GCT has launched successfully (otherwise an exception would have been thrown).</li> <li>2) If the EMS supports closing of GCT windows then it must maintain the aliases of the open GCT windows.</li> <li>3) The EMS must notify the NMS system whenever the closing of the GCT being opened is not available.</li> </ol>
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Internal error.</li> <li>3) Invalid Input.</li> <li>4) Unable to comply. For example the EMS cannot support the (valid) context and scope combination requested.</li> <li>5) Maximum GCT displays has been reached.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 151}</a> , <a href="#">{Requirement II. 152}</a>

## 5.13 ATM Provisioning Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.13.1:</a>	NMS creates a Traffic Descriptor (TD)	{Requirement II. 097}, {Requirement II. 098}
<a href="#">Use Case 5.13.2:</a>	NMS modifies a Traffic Descriptor (TD) on a VPCTP or VCCTP	{Requirement II. 074}
<a href="#">Use Case 5.13.3:</a>	NMS deletes a Traffic Descriptor (TD)	{Requirement II. 099}

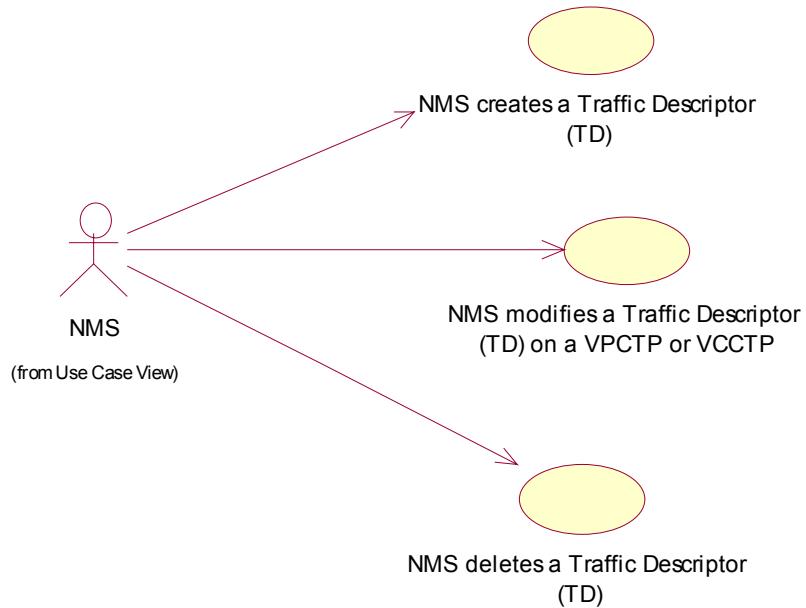


Figure 5.23: ATM Provisioning Use Cases

### 5.13.1 NMS creates a Traffic Descriptor (TD)

#### Use Case 5.13.1: NMS creates a Traffic Descriptor (TD)

<b>Use Case Name</b>	NMS creates a Traffic Descriptor (TD)
<b>Summary</b>	The use case describes how the NMS requests that an EMS create a new Traffic Descriptor. The NMS passes the traffic descriptor information to the EMS. The resulting Traffic Descriptor is returned as a result to the NMS.
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS.</a>
<b>Begins When</b>	The NMS sends the Add TD request to EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends a create TD request to EMS with the TD distinguishing information. The NMS may request that the EMS enforce a unique user label (the user label is selected by the NMS and the EMS makes sure the user label is not already in use).</li> <li>2) The EMS validates the request. The EMS creates the TD, assigns a unique name to the TD and stores it persistently.</li> <li>3) The EMS replies with a success indication.</li> <li>4) A Create TD Notification is sent by EMS to the notification service.</li> </ol> <p><b>Note:</b> It is up to the internal implementation of EMS which data are stored in EMS persistently and which ones will be queried from ME as required.</p>
<b>Ends When</b>	The EMS sends a reply to the NMS.
<b>Post-Conditions</b>	The TD has been established in the EMS
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Invalid input: The NMS has supplied invalid input data.</li> <li>4) User label in use: The user label supplied by the NMS is already in use.</li> <li>5) Capacity exceeded: The Input data is valid but the EMS cannot create the TD because the EMS has already exceeded its maximum number of TDs.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 097}</a> , <a href="#">{Requirement II. 098}</a>

**5.13.2 NMS modifies a Traffic Descriptor (TD) on a VPCTP or VCCTP****Use Case 5.13.2: NMS modifies a Traffic Descriptor (TD) on a VPCTP or VCCTP**

<b>Use Case Name</b>	NMS modifies a Traffic Descriptor (TD) on a VPCTP or VCCTP
<b>Summary</b>	The NMS changes the Traffic Descriptors (ingress and/or egress) for a VPCTP or VCCTP.
<b>Actors</b>	NMS
<b>Pre-conditions</b>	<ol style="list-style-type: none"> <li>1) The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>.</li> <li>2) The TD to be associated with the VPCTP or VCCTP has to exist.</li> </ol>
<b>Begins when</b>	The NMS sends the modify VPCTP or VCCTP request to the EMS
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends the modify VPCTP or VCCTP request to the EMS.</li> <li>2) The EMS validates the VPCTP or VCCTP identifier.</li> <li>3) The EMS validates the TD Name(s).</li> <li>4) The EMS communicates with the Network Elements.</li> <li>5) The EMS changes the TD(s) if possible. This will fail under the following conditions: <ul style="list-style-type: none"> <li>• The VPCTP is terminating, but was not explicitly created.</li> <li>• The input data is valid but the EMS cannot change the TD because resources are not available on the ME.</li> <li>• The input data is valid but the EMS cannot change the TD because the new TD does not provide enough resources for the existing VCs running over the VPCTP.</li> </ul> </li> <li>6) The EMS replies with a success indication.</li> <li>7) The EMS will generate an AVC for the TP with the new TD name.</li> </ol>
<b>Ends when</b>	The EMS sends a reply to the NMS.
<b>Post-conditions</b>	The TD(s) on the VPCTP or VCCTP has been updated and uses the traffic values contained in the associated TD.
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Processing failure: The requested operation could not be performed.</li> <li>2) Invalid input: VPCTP, VCCTP or TD identifier is invalid.</li> <li>3) Entity not found: The VPCTP, VCCTP or TD does not exist.</li> <li>4) Unable to comply: The traffic values could not be configured in the VPCTP or VCCTP.</li> <li>5) NE communication loss.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II_074}</a>

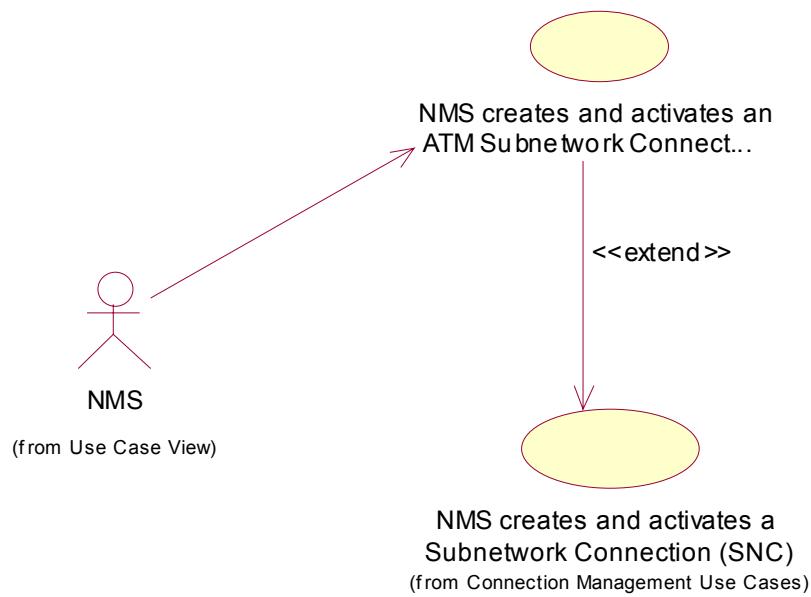
### 5.13.3 NMS deletes a Traffic Descriptor (TD)

#### Use Case 5.13.3: NMS deletes a Traffic Descriptor (TD)

<b>Use Case Name</b>	NMS deletes a Traffic Descriptor (TD)
<b>Summary</b>	<p>The NMS deletes a TD.</p> <p>Remark:</p> <ul style="list-style-type: none"> <li>• The NMS is responsible to maintain the consistency of TD across multiple administrative sub-networks. Routine integrity checking may be required. NMS must also check that the TD is not being used in any EMS under its network domain, before the TD can be deleted from the persistent storage.</li> <li>• This operation is idempotent. If the service is called with the name of a non-existent Traffic Descriptor, it will succeed.</li> </ul>
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins When</b>	The NMS sends the Delete TD request to the EMS.
<b>Description</b>	<ol style="list-style-type: none"> <li>1) The NMS sends Delete TD request to the EMS.</li> <li>2) The EMS validates the TD identifier and checks that this TD is not being used on by the EMS.</li> <li>3) If no SNCs or TPs are using this TD, the EMS deletes the TD entry.</li> <li>4) The EMS replies with a success indication.</li> <li>5) A Delete TD Notification is sent by EMS to the notification service.</li> </ol>
<b>Ends When</b>	The EMS sends a reply to the NMS.
<b>Post-Conditions</b>	The TD has been deleted in the EMS (Note. The TD can only be deleted in the NMS if and only if no EMS uses this TD).
<b>Exceptions</b>	<ol style="list-style-type: none"> <li>1) Not implemented: The EMS does not support this service.</li> <li>2) Processing failure: The requested operation could not be performed.</li> <li>3) Object in use: The TD is being used.</li> <li>4) Entity not found: The TD does not exist in the EMS.</li> <li>5) Invalid input: The TD Name is invalid.</li> </ol>
<b>Traceability</b>	<a href="#">{Requirement II. 099}</a>

### 5.14 ATM Connection Management Use Cases

Use Case	Use Case Name	Requirement(s) Fulfilled
<a href="#">Use Case 5.14.1:</a>	<a href="#">NMS creates and activates an ATM Subnetwork Connection (SNC)</a>	<a href="#">{Requirement II. 088}</a> , <a href="#">{Requirement II. 089}</a>



**Figure 5.24: ATM Connection Management Use Cases**

**5.14.1 NMS creates and activates an ATM Subnetwork Connection (SNC)****Use Case 5.14.1: NMS creates and activates an ATM Subnetwork Connection (SNC)**

<b>Use Case Name</b>	NMS creates and activates an ATM Subnetwork Connection (SNC)
<b>Summary</b>	The NMS sets up a Subnetwork Connection on an EMS Subnetwork. The NMS supplies the CTP names or NSAP addresses. This use case extends the <a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a> . The only differences are with respect to that use case are specified here.
<b>Actor(s)</b>	NMS
<b>Pre-Conditions</b>	The NMS has executed <a href="#">Use Case 5.2.2: NMS creates a session with EMS</a> .
<b>Begins When</b>	The NMS sends the Create and Activate SNC request to the EMS.

**Use Case 5.14.1: NMS creates and activates an ATM Subnetwork Connection (SNC)**

<b>Description</b>	<p>1) The EMS configures the end point CTPs. The EMS should try to determine if the operation will succeed before making any configuration changes. This would be done as part of validation. It is preferable not to change the configuration of one CTP if the EMS can determine that the next CTP cannot be changed. For each CTP in the SNC the EMS will do the following:</p> <ul style="list-style-type: none"> <li>• If the CTP is already used by a PARTIAL or ACTIVE SNC, the request is rejected.</li> <li>• For a connection at the VP layer, <ul style="list-style-type: none"> <li>i) If the VP CTP was previously explicitly configured to contain VC CTPs the request will be rejected. (i.e. if it is TERMINATED_AND_AVAILABLE_FOR_MAPPING with an assigned Traffic Descriptor (assigned bandwidth))</li> <li>ii) If there are VC CTPs using the VP CTP, then the request will be rejected.</li> <li>iii) If the VP CTP is already NEITHER_TERMINATED_NOR_AVAILABLE_FOR_MAPPING it will be left in this mode.</li> </ul> </li> <li>• For a connection at the VC layer, <ul style="list-style-type: none"> <li>i) If the VP CTP was previously either explicitly or implicitly configured to contain VC CTPs the mapping mode of the VP CTP will be left unchanged (TERMINATED_AND_AVAILABLE_FOR_MAPPING).</li> <li>ii) If the VP CTP is configured as NEITHER_TERMINATED_NOR_AVAILABLE_FOR_MAPPING, the VP CTP will be implicitly configured to contain VC CTPs. Note that there will be no bandwidth assigned to the terminating VP CTP (The Traffic Descriptors will be empty).</li> </ul> </li> </ul> <p>In the above cases, if the mapping mode is changed, an AVC will be generated.</p> <p>The TP Traffic Descriptors specified on the end points are used.</p> <ol style="list-style-type: none"> <li>2) For the intermediate points along the route of the SNC <ul style="list-style-type: none"> <li>• If the SNC is created using network routing protocols, there will be no notifications regarding the connection state or mapping mode of the intermediate points along the route</li> <li>• For all other cases, the EMS may have to configure the mapping mode. Also appropriate notifications will be sent for the connection state and the mapping mode changes.</li> </ul> </li> <li>3) The EMS activates the required SNC in the network. <ul style="list-style-type: none"> <li>• A network routed SNC will be an atomic operation from the cross-connect perspective. However the SNC can still use the PARTIAL state. If an SPVX source switch cannot reach the destination, it is considered to be PARTIAL because one or more resources have been allocated. The behavior is that the network routing protocol will try to establish the connection when the required links are in place.</li> </ul> </li> </ol>
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**Use Case 5.14.1: NMS creates and activates an ATM Subnetwork Connection (SNC)**

<b>Description</b>	<ul style="list-style-type: none"><li>• An EMS routed SNC may use the PARTIAL SNC state</li><li>• In a network routed SNC, the configuration of the endpoints (if they are in the EMS domain) will be included as part of the activate operation. If the EMS fails to create and activate the SNC it will be in the PARTIAL state as some resources are allocated.</li></ul>
<b>Post-Conditions</b>	Refer to <a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a> .
<b>Exceptions</b>	Refer to <a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a> .
<b>Traceability</b>	<a href="#">{Requirement II. 088}</a> , <a href="#">{Requirement II. 089}</a>

MULTI-TECHNOLOGY NETWORK MANAGEMENT BUSINESS AGREEMENT

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## 6 BUSINESS REQUIREMENT MODEL UML DIAGRAMS

A requirement model is an implementation neutral (i.e. logical) description covering a problem statement ([Section 2](#) and [Section 3](#)), a set of requirement statements ([Section 4](#)) and a set of use cases ([Section 5](#)).

A requirement model is written from a business perspective and is produced prior to the start of implementation of systems, applications and interfaces.

### 6.1 Static Model

The complete static model can be found in the MTNM Information Agreement, NML-EML Interface, (TMF 608). [Section 6.1.1](#) contains the UML classes (including the names of the attributes and operations) and is provided to facilitate traceability between the requirements statements in [Section 4](#) and the UML Information Model specified in TMF 608.

#### 6.1.1 Classes

[Table 6.1](#) contains a list of the UML Classes defined in TMF 608. The color coding that is used is the same as that used within TMF 608.

objects unchanged with respect to Version 2.1
objects changed with respect to Version 2.1
new objects in Version 3.0

**Table 6.1: UML Model Classes**

#	UML Classes
1	<a href="#">AID</a>
2	<a href="#">AlarmInformation</a>
3	<a href="#">AlarmSeverityAssignmentProfile</a>
4	<a href="#">ASAPCreateModifyData</a>
5	<a href="#">Attribute</a>
6	<a href="#">CommonResourceInfo</a>
7	<a href="#">CommonTransmissionParameters</a>
8	<a href="#">ConnectionTerminationPoint</a>
9	<a href="#">Consumer</a>
10	<a href="#">CrossConnect</a>
11	<a href="#">EMS</a>
12	<a href="#">EMSSession</a>
13	<a href="#">EProtectionSwitch</a>

**Table 6.1: UML Model Classes**

#	UML Classes
14	<a href="#">Equipment</a>
15	<a href="#">EquipmentCreateData</a>
16	<a href="#">EquipmentHolder</a>
17	<a href="#">EquipmentProtectionGroup</a>
18	<a href="#">ESwitchData</a>
19	<a href="#">Event</a>
20	<a href="#">EventInformation</a>
21	<a href="#">FileTransferStatus</a>
22	<a href="#">Filter</a>
23	<a href="#">FloatingTerminationPoint</a>
24	<a href="#">GCTProfileInfo</a>
25	<a href="#">GroupTerminationPoint</a>
26	<a href="#">HeartbeatInformation</a>
27	<a href="#">HistoricalPMDDataFile</a>
28	<a href="#">Log</a>
29	<a href="#">LogAVC</a>
30	<a href="#">LogCapacityThresholdAlarm</a>
31	<a href="#">LogObjectCreation</a>
32	<a href="#">LogObjectDeletion</a>
33	<a href="#">LogProcessingErrorAlarm</a>
34	<a href="#">LogRecord</a>
35	<a href="#">LogStateChange</a>
36	<a href="#">ManagedElement</a>
37	<a href="#">NMSSession</a>
38	<a href="#">ObjectInformation</a>
39	<a href="#">PerformanceManager</a>
40	<a href="#">PerformanceMonitoringPoint</a>
41	<a href="#">PhysicalTerminationPoint</a>
42	<a href="#">PMCurrentData</a>
43	<a href="#">PMData</a>
44	<a href="#">PMHistoricData</a>

**Table 6.1: UML Model Classes**

#	UML Classes
45	<a href="#">PMHistoricMeasurement</a>
46	<a href="#">PMMeasurement</a>
47	<a href="#">PMPParameter</a>
48	<a href="#">PMPStateChangeInformation</a>
49	<a href="#">PMThreshold</a>
50	<a href="#">ProtectionGroup</a>
51	<a href="#">ProtectionSwitch</a>
52	<a href="#">Route</a>
53	<a href="#">RouteCreateData</a>
54	<a href="#">Session</a>
55	<a href="#">SessionFactory</a>
56	<a href="#">SNCCreateData</a>
57	<a href="#">SNCModifyData</a>
58	<a href="#">SNCRouteChangeData</a>
59	<a href="#">SoftwareBackupStatus</a>
60	<a href="#">SoftwareManager</a>
61	<a href="#">Subnetwork</a>
62	<a href="#">SubnetworkConnection</a>
63	<a href="#">Supplier</a>
64	<a href="#">SwitchData</a>
65	<a href="#">TCAPParameter</a>
66	<a href="#">TCAPParameterProfile</a>
67	<a href="#">TDCreateData</a>
68	<a href="#">TerminationPoint</a>
69	<a href="#">ThresholdCrossingAlertInformation</a>
70	<a href="#">TLCREATEData</a>
71	<a href="#">TopologicalLink</a>
72	<a href="#">TPData</a>
73	<a href="#">TPPool</a>
74	<a href="#">TPPoolCreateData</a>
75	<a href="#">TrafficDescriptor</a>

**Table 6.1: UML Model Classes**

#	UML Classes
76	<a href="#">TransmissionDescriptor</a>
77	<a href="#">TransmissionDescriptorCreateData</a>
78	<a href="#">TransmissionParameters</a>
79	<a href="#">Version</a>

### 6.1.1.1 AID

Refer to [{Requirement I. 057}](#).

### 6.1.1.2 AlarmInformation

Table 6.2: UML Class AlarmInformation (derived from [EventInformation](#)) Attributes - [{Requirement I. 048}](#)

Attribute Name	<a href="#">{Requirement I. 048}</a>
isClearable	<a href="#">1) Clearable</a>
layer	<a href="#">2) Layer rate</a>
probableCause	<a href="#">3) Probable Cause</a>
perceivedSeverity	<a href="#">4) Perceived severity</a>
serviceAffecting	<a href="#">5) Service affecting</a>
probableCauseQualifier	<a href="#">6) Probable Cause Qualifier</a>
affectedPTPs	<a href="#">7) Affected PTPs</a>
additionalText	<a href="#">8) Additional text</a>
nativeEMSName	<a href="#">9) Native EMS Name</a>
nativeProbableCause	<a href="#">10) Native Probable Cause</a>
acknowledgeIndication	<a href="#">11) Acknowledgement</a>
rootCauseAlarmIndication	<a href="#">12) Root Cause Alarm indication</a>
X.733::EventType	<a href="#">13) X.733 Event Type</a>
X.733::SpecificProblems	<a href="#">14) X.733 Specific problems</a>
X.733::BackedUpStatus	<a href="#">15) X.733 Backed-up status</a>
X.733::BackUpObject	<a href="#">16) X.733 Back-up object</a>
X.733::TrendIndication	<a href="#">17) X.733 Trend indication</a>
X.733::CorrelatedNotifications	<a href="#">18) X.733 Correlated notifications</a>
X.733::MonitoredAttributes	<a href="#">19) X.733 Monitored attributes</a>
X.733::ProposedRepairActions	<a href="#">20) X.733 Proposed repair actions</a>
X.733::AdditionalInformation	<a href="#">21) X.733 Additional Information</a>

### 6.1.1.3 ASAPCreateModifyData

Table 6.3: UML Class ASAPCreateModifyData Attributes - [{Requirement II. 197}](#)

Attribute Name	<a href="#">{Requirement II. 197}</a>
userLabel	<a href="#">1) User label</a>
forceUniqueness	<a href="#">2) User label uniqueness</a>
owner	<a href="#">3) Owner</a>
alarmSeverityAssignmentList	<a href="#">4) Alarm severity assignments</a>

**Table 6.3: UML Class ASAPCreateModifyData Attributes - [\(Requirement II. 197\)](#)**

<b>Attribute Name</b>	<a href="#">{Requirement II. 197}</a>
additionalInfo	<a href="#">5) Additional information</a>

#### 6.1.1.4 AlarmSeverityAssignmentProfile

**Table 6.4: UML Class AlarmSeverityAssignmentProfile (derived from [CommonResourceInfo](#)) Attributes - [\(Requirement I. 080\)](#)**

<b>Attribute Name</b>	<a href="#">{Requirement I. 081}</a>
fixed	<a href="#">1) Fixed</a>
alarmSeverityAssignmentList	<a href="#">2) Alarm severity assignments</a>

**Table 6.5: UML Class AlarmSeverityAssignmentProfile Operations**

<b>Operation Name</b>	
getASAPAssociatedResourceNames	<a href="#">{Requirement II. 209}</a>

### 6.1.1.5 Attribute

Table 6.6: UML Class Attribute Attributes - [\(Requirement I. 044\)](#) and [\(Requirement I. 045\)](#)

Attribute Name	<a href="#">(Requirement I. 044)</a>	<a href="#">(Requirement I. 045)</a>
id	<a href="#">1) Attribute name</a>	<a href="#">1) State attribute name</a>
value	<a href="#">2) Attribute value</a>	<a href="#">2) State attribute value</a>

### 6.1.1.6 CommonResouceInfo

Table 6.7: UML Class CommonResouceInfo Attributes - [\(Requirement I. 060\)](#)

Attribute Name	<a href="#">(Requirement I. 060)</a>
name	<a href="#">1) Name</a>
userLabel	<a href="#">2) User label</a>
nativeEmsName	<a href="#">3) Native EMS name</a>
owner	<a href="#">4) Owner</a>
additionalInfo	<a href="#">5) Additional information</a>

Table 6.8: UML Class CommonResouceInfo Operations

Operation Name	
setAdditionalInfo	<a href="#">(Requirement II. 223)</a>
setNativeEmsName	<a href="#">(Requirement II. 077)</a>
setOwner	<a href="#">(Requirement II. 076)</a>
setUserLabel	<a href="#">(Requirement II. 075)</a>
setNetworkAccessDomain	<a href="#">(Requirement II. 193)</a>

### 6.1.1.7 CommonTransmissionParameters

**Table 6.9: UML Class CommonTransmissionParameters Attributes**

Attribute Name	
layerRate	<a href="#">{Requirement I. 022}</a>
transmissionParameters	<a href="#">{Requirement I. 024}</a>

### 6.1.1.8 ConnectionTerminationPoint

**Table 6.10: UML Class ConnectionTerminationPoint (derived from [TerminationPoint](#)) Attributes - [{Requirement I. 006}](#)**

Attribute Name	<a href="#">{Requirement I. 062}</a>
connectionState	<a href="#">1) Connection state</a>
tpMappingMode	<a href="#">2) Mapping mode</a>
association to <a href="#">TrafficDescriptor</a>	<a href="#">3) Ingress TD</a>
association to <a href="#">TrafficDescriptor</a>	<a href="#">4) Egress TD</a>

**Table 6.11: UML Class ConnectionTerminationPoint (derived from [TerminationPoint](#)) Operations - [{Requirement I. 006}](#)**

Operation Name	
associateWithTrafficDescriptor	<a href="#">{Requirement II. 074}</a>
getAssociatedGroupTerminationPoint	<a href="#">{Requirement II. 184}</a>
getContainingTPs	<a href="#">{Requirement II. 047}</a>
getContainingTPsNames	<a href="#">{Requirement II. 048}</a>
getTPMappingMode	<a href="#">{Requirement II. 071}</a>
performProtectionCommand	<a href="#">{Requirement II. 116}</a>
retrieveSwitchData	<a href="#">{Requirement II. 117}</a>
terminateAndMap	<a href="#">{Requirement II. 068}</a> (SONET/SDH)
terminateAndMap	<a href="#">{Requirement II. 073}</a> (ATM)
unTerminateAndUnmap	<a href="#">{Requirement II. 069}</a>

### 6.1.1.9 Consumer

**Table 6.12: UML Class Consumer Operations**

Operation Name	
pushEvent	

### 6.1.1.10 CrossConnect

**Table 6.13: UML Class CrossConnect Attributes - {Requirement I. 019}**

Attribute Name	{Requirement I. 020}
ccType	1) Type
direction	2) Directionality
active	3) Active
fixed	4) Fixed
additionalInfo	5) Additional information
associations to: <a href="#">ConnectionTerminationPoint</a> <a href="#">GroupTerminationPoint</a>	6) aEnd TP(s)
associations to: <a href="#">ConnectionTerminationPoint</a> <a href="#">GroupTerminationPoint</a>	7) zEnd TP(s)

### 6.1.1.11 EMS

**Table 6.14: UML Class EMS (derived from [CommonResourceInfo](#)) Attributes - {Requirement I. 001}**

Attribute Name	{Requirement I. 061}
emsVersion	1) Software version
type	2) Type
asapPointer	3) Alarm severity assignment profile

**Table 6.15: UML Class EMS (derived from [CommonResourceInfo](#)) Operations**

Operation Name	
acknowledgeAlarms	{Requirement II. 155}
assignASAP	{Requirement II. 201}
createASAP	{Requirement II. 196}

**Table 6.15: UML Class EMS (derived from [CommonResourceInfo](#)) Operations**

<b>Operation Name</b>	
createTopologicalLink	<a href="#">{Requirement II. 168}</a>
createTrafficDescriptor	<a href="#">{Requirement II. 097}</a>
createTransmissionDescriptor	<a href="#">{Requirement II. 190}</a>
deassignASAP	<a href="#">{Requirement II. 203}</a>
deleteASAP	<a href="#">{Requirement II. 200}</a>
deleteTopologicalLink	<a href="#">{Requirement II. 170}</a>
deleteTrafficDescriptor	<a href="#">{Requirement II. 099}</a>
deleteTransmissionDescriptor	<a href="#">{Requirement II. 192}</a>
destroyGCT	<a href="#">{Requirement II. 152}</a>
getAllASAPNames	<a href="#">{Requirement II. 206}</a>
getAllASAPs	<a href="#">{Requirement II. 205}</a>
getAllEMSSAndMEActiveAlarms	<a href="#">{Requirement II. 270}</a>
getAllEMSSystemActiveAlarms	<a href="#">{Requirement II. 111}</a>
getAllManagedElementNames	<a href="#">{Requirement II. 003}</a>
getAllManagedElements	<a href="#">{Requirement II. 002}</a>
getAllTopLevelSubnetworkNames	<a href="#">{Requirement II. 010}</a>
getAllTopLevelSubnetworks	<a href="#">{Requirement II. 011}</a>
getAllTopLevelTopologicalLinkNames	<a href="#">{Requirement II. 013}</a>
getAllTopLevelTopologicalLinks	<a href="#">{Requirement II. 012}</a>
getAllTrafficDescriptorNames	<a href="#">{Requirement II. 061}</a>
getAllTrafficDescriptors	<a href="#">{Requirement II. 060}</a>
getAllTransmissionDescriptorNames	<a href="#">{Requirement II. 188}</a>
getAllTransmissionDescriptors	<a href="#">{Requirement II. 187}</a>
getASAP	<a href="#">{Requirement II. 207}</a>
getASAPByResource	<a href="#">{Requirement II. 208}</a>
getCapabilities	<a href="#">{Requirement II. 146}</a>
getEMS	<a href="#">{Requirement II. 001}</a>
getGCTProfileInfo	<a href="#">{Requirement II. 151}</a>
getLog	<a href="#">{Requirement II. 271}</a>
getManagedElementByName	<a href="#">{Requirement II. 006}</a>
getMultiLayerSubnetwork	<a href="#">{Requirement II. 008}</a>

**Table 6.15: UML Class EMS (derived from [CommonResourceInfo](#)) Operations**

<b>Operation Name</b>	
getTopLevelTopologicalLink	<a href="#">{Requirement II. 014}</a>
getTrafficDescriptorByName	<a href="#">{Requirement II. 062}</a>
getTransmissionDescriptorByName	<a href="#">{Requirement II. 189}</a>
launchGCT	<a href="#">{Requirement II. 147}</a>
modifyASAP	<a href="#">{Requirement II. 198}</a>
unacknowledgeAlarms	<a href="#">{Requirement II. 156}</a>
getAllEMSAndMEUnacknowledgedActiveAlarms	<a href="#">{Requirement II. 154}</a>
getAllEMSSystemUnacknowledgedActiveAlarms	<a href="#">{Requirement II. 288}</a>

### 6.1.1.12 EMSSession

**Table 6.16: UML Class EMSSession (derived from [Session](#)) Operations**

Operation Name	
getSupplier	

### 6.1.1.13 EProtectionSwitch

**Table 6.17: UML Class EProtectionSwitch (derived from [Event](#)) Attributes - {[Requirement I. 074](#)}**

Attribute Name	{ <a href="#">Requirement I. 074</a> }
eProtectionGroupType	<a href="#">1) Type</a>
eSwitchReason	<a href="#">2) Switch reason</a>
groupName	<a href="#">3) EPG</a>
protectedE	<a href="#">4) Protected Equipment</a>
switchAwayFromE	<a href="#">5) Switch away from Equipment</a>
switchToE	<a href="#">6) Switch to Equipment</a>
emsTime	<a href="#">7) EMS timestamp</a>
neTime	<a href="#">8) NE timestamp</a>

### 6.1.1.14 Equipment

**Table 6.18: UML Class Equipment (derived from [CommonResourceInfo](#)) Attributes - {[Requirement I. 064](#)}**

Attribute Name	{ <a href="#">Requirement I. 032</a> }
serviceState	<a href="#">1) Service state</a>
alarmReportingIndicator	<a href="#">2) Alarm reporting</a>
expectedEquipmentType	<a href="#">3) Expected equipment type</a>
installedEquipmentType	<a href="#">4) Installed equipment type</a>
installedPartNumber	<a href="#">5) Installed part number</a>
installedSerialNumber	<a href="#">6) Installed serial number</a>
installedVersion	<a href="#">7) Installed version</a>
manufacturer	<a href="#">8) Manufacturer</a>
protectionRole	<a href="#">9) Protection role</a>
protectionSchemeState	<a href="#">10) Protection scheme state</a>
asapPointer	<a href="#">11) Alarm severity assignment profile</a>

**Table 6.19: UML Class Equipment (derived from [CommonResourceInfo](#)) Operations**

Operation Name	
getSupportedPTPNames	<a href="#">{Requirement II. 051}</a>
getSupportedPTPs	<a href="#">{Requirement II. 050}</a>
setAlarmReportingOff	<a href="#">{Requirement II. 078}</a>
setAlarmReportingOn	<a href="#">{Requirement II. 078}</a>
getSupportingEquipment	<a href="#">{Requirement II. 225}</a>
getSupportingEquipmentNames	<a href="#">{Requirement II. 226}</a>
getSupportedEquipment	<a href="#">{Requirement II. 227}</a>
getSupportedEquipmentNames	<a href="#">{Requirement II. 228}</a>

### 6.1.1.15 EquipmentCreateData

Table 6.20: UML Class EquipmentCreateData Attributes - [\(Requirement II. 263}](#)

Attribute Name	<a href="#">(Requirement II. 263}</a>
userLabel	<a href="#">1) User label</a>
forceUniqueness	<a href="#">2) User label uniqueness</a>
owner	<a href="#">3) Owner</a>
expectedEquipmentType	<a href="#">4) Expected equipment type</a>
alarmReportingIndication	<a href="#">5) Alarm reporting</a>
asapPointer	<a href="#">6) Alarm severity assignment profile</a>
manufacturer	<a href="#">7) Manufacturer</a>
protectionRole	<a href="#">8) Protection role</a>
protectionSchemeState	<a href="#">9) Protection scheme state</a>
additionalCreationInfo	<a href="#">10) Additional information.</a>

### 6.1.1.16 EquipmentHolder

Table 6.21: UML Class EquipmentHolder (derived from [CommonResourceInfo](#)) Attributes - [\(Requirement I. 033}](#)

Attribute Name	<a href="#">(Requirement I. 065}</a>
alarmReportingIndicator	<a href="#">1) Alarm reporting</a>
equipmentHolderType	<a href="#">2) Type</a>
acceptableEquipmentList	<a href="#">4) Acceptable equipment types</a>
expectedOrInstalledEquipment	<a href="#">3) Expected or installed equipment</a>
holderState	<a href="#">5) State</a>
asapPointer	<a href="#">6) Alarm severity assignment profile</a>

Table 6.22: UML Class EquipmentHolder (derived from [CommonResourceInfo](#)) Operations

Operation Name	
getAllEquipment	<a href="#">(Requirement II. 279}</a>
getAllEquipmentNames	<a href="#">(Requirement II. 280}</a>
getContainedEquipment	<a href="#">(Requirement II. 058}</a>
provisionEquipment	<a href="#">(Requirement II. 136}</a>

**Table 6.22: UML Class EquipmentHolder (derived from [CommonResourceInfo](#)) Operations**

Operation Name	
setAlarmReportingOff	<a href="#">{Requirement II. 079}</a>
setAlarmReportingOn	<a href="#">{Requirement II. 079}</a>
unprovisionEquipment	<a href="#">{Requirement II. 262}</a>

### 6.1.1.17 EquipmentProtectionGroup

**Table 6.23: UML Class EquipmentProtectionGroup (derived from CommonResourceInfo) Attributes - [{Requirement I. 072}](#)**

Attribute Name	<a href="#">{Requirement I. 073}</a>
eProtectionGroupType	<a href="#">1) Type</a>
protectionSchemeState	<a href="#">2) Protection scheme state</a>
reversionMode	<a href="#">3) Reversion mode</a>
association to <a href="#">Equipment</a>	<a href="#">4) Protected Equipment</a>
association to <a href="#">Equipment</a>	<a href="#">5) Protecting Equipment</a>
ePgpParameters	<a href="#">6) PG parameter list</a>
asapPointer	<a href="#">7) Alarm severity assignment profile</a>

**Table 6.24: UML Class EquipmentProtectionGroup (derived from CommonResourceInfo) Operations**

Operation Name	
retrieveESwitchData	<a href="#">{Requirement II. 175}</a>

### 6.1.1.18 ESwitchData

**Table 6.25: UML Class ESwitchData Attributes - [\(Requirement II. 269\)](#)**

Attribute Name	<a href="#">(Requirement II. 269)</a>
eProtectionGroupType	<a href="#">1) Type</a>
eSwitchReason	<a href="#">2) Switch reason</a>
<i>association to </i> <a href="#">EquipmentProtectionGroup</a>	<a href="#">3) EPG</a>
<i>association to </i> <a href="#">Equipment</a>	<a href="#">4) Protected Equipment</a>
<i>association to </i> <a href="#">Equipment</a>	<a href="#">5) Switch to Equipment</a>
additionallInfo	<a href="#">6) Additional information</a>

### 6.1.1.19 Event

**Table 6.26: UML Class Event Attributes - [\(Requirement I. 068\)](#)**

Attribute Name	<a href="#">(Requirement I. 068)</a>
notificationId	<a href="#">1) Identifier</a>
eventType	<a href="#">2) Type</a>

### 6.1.1.20 EventInformation

**Table 6.27: UML Class EventInformation (derived from [Event](#)) Attributes - [\(Requirement I. 093\)](#)**

Attribute Name	<a href="#">(Requirement I. 093)</a>
objectName	<a href="#">1) Object Name</a>
objectType	<a href="#">2) Object Type</a>
neTime	<a href="#">4) NE timestamp</a>
emsTime	<a href="#">3) EMS timestamp</a>
edgePointRelated	<a href="#">5) Edge Point</a>

### 6.1.1.21 FileTransferStatus

**Table 6.28: UML Class FileTransferStatus (derived from [Event](#)) Attributes - [\(Requirement I. 058\)](#)**

Attribute Name	<a href="#">(Requirement I. 058)</a>
fileName	<a href="#">1) File name</a>
transferStatus	<a href="#">2) Transfer status</a>
percentComplete	<a href="#">3) Percentage complete</a>

**Table 6.28: UML Class FileTransferStatus (derived from [Event](#)) Attributes - {[Requirement I. 058](#)}**

Attribute Name	<a href="#">{Requirement I. 058}</a>
failureReason	<a href="#">4) Reason for failure</a>

### 6.1.1.22 Filter

**Table 6.29: UML Class Filter Attributes**

Operation Name	
addConstraints	
match	

### 6.1.1.23 FloatingTerminationPoint

derived from [PhysicalTerminationPoint](#) and [ConnectionTerminationPoint](#), no new attributes, no new operations - {[Requirement I. 075](#)}.

### 6.1.1.24 GCTProfileInfo

**Table 6.30: UML Class -GCTProfileInfo Attributes**

Attribute Name	
serverLaunchCapability	
gctHostName	
emsGctPlatform	
guiCutThroughDataList	

### 6.1.1.25 GroupTerminationPoint

**Table 6.31: UML Class - GroupTerminationPoint (derived from [CommonResourceInfo](#)) Attributes - {Requirement I. 069}**

Attribute Name	<a href="#">{Requirement I. 070}</a>
listOfTPs	<a href="#">1) Contained TPs</a>
connectionState	<a href="#">2) Connection State</a>
networkAccessDomain	<a href="#">3) Network Access Domain</a>
alarmReportingIndication	<a href="#">4) Alarm reporting</a>
asapPointer	<a href="#">5) Alarm severity assignment profile</a>

**Table 6.32: UML Class GroupTerminationPoint (derived from [CommonResourceInfo](#)) Operations**

Operation Name	
setAlarmReportingOn	<a href="#">{Requirement II. 219}</a>
setAlarmReportingOff	<a href="#">{Requirement II. 220}</a>
getTPGroupingRelationships	<a href="#">{Requirement II. 272}</a>

### 6.1.1.26 HeartbeatInformation

Table 6.33: UML Class HeartbeatInformation (derived from [Event](#)) Attributes - [{Requirement I. 077}](#)

Attribute Name	<a href="#">{Requirement I. 077}</a>
objectName	<a href="#">1) Object Name</a>
objectType	<a href="#">2) Object Type</a>
emsTime	<a href="#">3) EMS timestamp</a>

### 6.1.1.27 HistoricalPMDataFile

Table 6.34: UML Class HistoricalPMDataFile Attributes - [{Requirement II. 284}](#)

Attribute Name	<a href="#">{Requirement II. 284}</a>
startTime	<a href="#">1) Start time</a>
endTime	<a href="#">2) End time</a>

### 6.1.1.28 Log

Table 6.35: UML Class Log Attributes - [{Requirement I. 090}](#)

Attribute Name	<a href="#">{Requirement I. 091}</a>
operationalState	<a href="#">1) Operational state</a>
administrativeState	<a href="#">2) Administrative state</a>
logSize	<a href="#">3) Size</a>
logFullAction	<a href="#">4) Full action</a>
logDuration	<a href="#">5) Duration</a>
logScheduling	<a href="#">6) Scheduling</a>
availabilityStatus	<a href="#">7) Availability status</a>
logRecordCompaction	<a href="#">8) Record compaction</a>
logCapacityAlarmThresholds	<a href="#">9) Capacity alarm thresholds</a>
discriminatorConstruct	<a href="#">10) Discriminator construct</a>

Table 6.36: UML Class Log Operations

Operation Name	<a href="#">{Requirement II. 254}</a>
deleteLogRecords	<a href="#">1) delete Log Records</a>

**Table 6.36: UML Class Log Operations**

Operation Name	<a href="#">(Requirement II. 254)</a>
getLogRecords	<a href="#">2) get Log Records</a>
retrieveLogRecords	<a href="#">3) retrieve Log Records</a>
setAdministrativeState	<a href="#">4) set Administrative State</a>
setCapacityAlarmThreshold	<a href="#">5) set Capacity Alarm Threshold</a>
setDiscriminatorConstruct	<a href="#">6) set Discriminator Construct</a>
setLogFullAction	<a href="#">7) set Log Full Action</a>
setMaxLogSize	<a href="#">8) set Max Log Size</a>
setMaxRecordLife	<a href="#">9) set Max Record Life</a>
setWeekMask	<a href="#">10) set Week Mask</a>

### 6.1.1.29 LogAVC

**Table 6.37: UML Class LogAVC (derived from [Event](#)) Attributes - [\(Requirement I. 095\)](#)**

Attribute Name	<a href="#">(Requirement I. 095)</a>
attributeType	<a href="#">1) Attribute identifier</a>
oldvalue	<a href="#">2) Old attribute value</a>
newValue	<a href="#">3) New attribute value</a>

### 6.1.1.30 LogCapacityThresholdAlarm

**Table 6.38: UML Class LogCapacityThresholdAlarm (derived from [Event](#)) Attributes - [\(Requirement I. 096\)](#)**

Attribute Name	<a href="#">(Requirement I. 096)</a>
observedValue	<a href="#">1) Observed value</a>
crossedValue	<a href="#">2) Crossed value</a>
perceivedSeverity	<a href="#">3) Perceived severity</a>

### 6.1.1.31 LogObjectCreation

derived from [Event](#).

### 6.1.1.32 LogObjectDeletion

derived from [Event](#).

### 6.1.1.33 LogProcessingErrorAlarm

Table 6.39: UML Class LogProcessingErrorAlarm (derived from [Event](#)) Attributes - [{Requirement I. 097}](#)

<b>Attribute Name</b>	<a href="#">{Requirement I. 097}</a>
errorNumber	<a href="#">1) Error number</a>
errorReason	<a href="#">2) Error reason</a>

### 6.1.1.34 LogRecord

Table 6.40: UML Class LogRecord Attributes -

<b>Attribute Name</b>	
recordId	
time	
eventInfo	

### 6.1.1.35 LogStateChange

Table 6.41: UML Class LogStateChange (derived from [Event](#)) Attributes - [{Requirement I. 098}](#)

<b>Attribute Name</b>	<a href="#">{Requirement I. 098}</a>
stateType	<a href="#">1) State identifier</a>
newValue	<a href="#">2) New state value</a>

### 6.1.1.36 ManagedElement

Table 6.42: UML Class ManagedElement (derived from CommonResourceInfo) Attributes - [{Requirement I. 002}](#)

<b>Attribute Name</b>	<a href="#">{Requirement I. 003}</a>
locationName	<a href="#">1) Location</a>
systemLevelVersion	<a href="#">2) Software version</a>
productName	<a href="#">3) Product name</a>
communicationState	<a href="#">4) Communication state</a>
connectionRates	<a href="#">5) Supported connection layer rate(s)</a>
emsInSyncState	<a href="#">6) Synchronization state</a>
networkAccessDomain	<a href="#">7) Network Access Domain</a>
manufacturer	<a href="#">8) Manufacturer</a>

**Table 6.42: UML Class ManagedElement (derived from CommonResourceInfo) Attributes - {Requirement I. 002}**

<b>Attribute Name</b>	<a href="#">{Requirement I. 003}</a>
asapPointer	<a href="#">9) Alarm severity assignment profile</a>

**Table 6.43: UML Class ManagedElement (derived from CommonResourceInfo) Operations**

<b>Operation Name</b>	
createGroupTerminationPoint	<a href="#">{Requirement II. 164}</a>
deleteGroupTerminationPoint	<a href="#">{Requirement II. 166}</a>
getActiveMaintenanceOperations	<a href="#">{Requirement II. 138}</a>
getAllActiveAlarms	<a href="#">{Requirement II. 110}</a>
getAllCrossConnections	<a href="#">{Requirement II. 063}</a>
getAllIEProtectionGroups	<a href="#">{Requirement II. 174}</a>
getAllEquipment	<a href="#">{Requirement II. 056}</a>
getAllEquipmentNames	<a href="#">{Requirement II. 057}</a>
getAllFixedCrossConnections	<a href="#">{Requirement II. 183}</a>
getAllFTPNames	<a href="#">{Requirement II. 211}</a>
getAllIFTPNames	<a href="#">{Requirement II. 213}</a>
getAllIFTPs	<a href="#">{Requirement II. 210}</a>
getAllIFTPs	<a href="#">{Requirement II. 212}</a>
getAllGroupTerminationPointNames	<a href="#">{Requirement II. 172}</a>
getAllGroupTerminationPoints	<a href="#">{Requirement II. 171}</a>
getAllINUTTPNames	<a href="#">{Requirement II. 274}</a>
getAllPreemptibleTPNames	<a href="#">{Requirement II. 275}</a>
getAllProtectedTPNames	<a href="#">{Requirement II. 276}</a>
getAllProtectionGroups	<a href="#">{Requirement II. 059}</a>
getAllPTPNames	<a href="#">{Requirement II. 215}</a>
getAllPTPNames	<a href="#">{Requirement II. 217}</a>
getAllPTPNamesWithoutFTPs	<a href="#">{Requirement II. 034}</a>
getAllPTPNamesWithoutFTPs	<a href="#">{Requirement II. 036}</a>
getAllPTPs	<a href="#">{Requirement II. 214}</a>
getAllPTPs	<a href="#">{Requirement II. 216}</a>

**Table 6.43: UML Class ManagedElement (derived from CommonResourceInfo) Operations**

Operation Name	
getAllPTPsWithoutFTPs	<a href="#">(Requirement II. 033)</a>
getAllPTPsWithoutFTPs	<a href="#">(Requirement II. 035)</a>
getContainingSubnetworkNames	<a href="#">(Requirement II. 009)</a>
getEProtectionGroup	<a href="#">(Requirement II. 175)</a>
getEquipment	<a href="#">(Requirement II. 056)</a>
getGroupTerminationPoint	<a href="#">(Requirement II. 173)</a>
getProtectionGroup	<a href="#">(Requirement II. 112)</a>
getTP	<a href="#">(Requirement II. 027)</a>
modifyGroupTerminationPoint	<a href="#">(Requirement II. 167)</a>
getAllUnacknowledgedActiveAlarms	<a href="#">(Requirement II. 287)</a>

### 6.1.1.37 NMSSession

**Table 6.44: UML Class NMSSession (derived from Session) Operations [\(Requirement II. 177\)](#)**

Operation Name	
eventLossOccurred	<a href="#">(Requirement II. 177)</a>
eventLossCleared	<a href="#">(Requirement II. 177)</a>
alarmLossOccurred	<a href="#">(Requirement II. 177)</a>

### 6.1.1.38 ObjectInformation

derived from [EventInformation](#), contains the [Attribute](#)(s) of the object (Refer to [\(Requirement I. 042\)](#), [\(Requirement I. 044\)](#) and [\(Requirement I. 045\)](#)).

### 6.1.1.39 PerformanceMonitoringPoint

**Table 6.45: UML Class PerformanceMonitoringPoint (derived from [CommonResourceInfo](#)) Attributes {Requirement I. 084}**

Attribute Name	<a href="#">{Requirement I. 085}</a>
layerRate	<a href="#">1) Layer rate</a>
pmLocation	<a href="#">2) Location</a>
granularity	<a href="#">3) Granularity</a>
supervisionState	<a href="#">4) Supervision state</a>
monitoringState	<a href="#">5) Monitoring state</a>
association to <a href="#">PMPParameter</a>	<a href="#">6) PM parameters</a>

### 6.1.1.40 PerformanceManager

**Table 6.46: UML Class PerformanceManager Operations**

Operation Name	Requirements
clearPMData	<a href="#">{Requirement II. 132}</a>
createTCAPParameterProfile	<a href="#">{Requirement II. 236}</a>
deleteTCAPParameterProfile	<a href="#">{Requirement II. 240}</a>
disablePMData	<a href="#">{Requirement II. 121}</a>
disableTCA	<a href="#">{Requirement II. 122}</a>
enablePMData	<a href="#">{Requirement II. 121}</a>
enableTCA	<a href="#">{Requirement II. 122}</a>
getAllCurrentPMData	<a href="#">{Requirement II. 131}</a>
getAllPMPNames	<a href="#">{Requirement II. 222}</a>
getAllPMPs	<a href="#">{Requirement II. 221}</a>
getAllTCAPParameterProfileNames	<a href="#">{Requirement II. 233}</a>
getAllTCAPramerterProfiles	<a href="#">{Requirement II. 273}</a>
getHistoryPMData	<a href="#">{Requirement II. 128}</a>
getHistoryPMDa	<a href="#">{Requirement II. 129}</a>
getHistoryPMData	<a href="#">{Requirement II. 130}</a>
getHoldingTime	<a href="#">{Requirement II. 124}</a>
getMEPMCapabilities	<a href="#">{Requirement II. 054}</a>
getTCAPParameterProfile	<a href="#">{Requirement II. 234}</a>

**Table 6.46: UML Class PerformanceManager Operations**

Operation Name	Requirements
getTPHistoryPMDData	<a href="#">(Requirement II. 163}</a>
setTCAParameterProfile	<a href="#">(Requirement II. 238}</a>

### 6.1.1.41 PhysicalTerminationPoint

Table 6.47: UML Class PhysicalTerminationPoint (derived from [TerminationPoint](#)) Operations

Operation Name	
getAllSupportingEquipment	<a href="#">{Requirement II. 052}</a>
getAllSupportingEquipmentNames	<a href="#">{Requirement II. 053}</a>
getContainingPGNames	<a href="#">{Requirement II. 289}</a>

### 6.1.1.42 PMCurrentData

Table 6.48: UML Class PMCurrentData (derived from [PMData](#)) Attributes

Attribute Name	<a href="#">{Requirement II. 282}</a>
retrievalTime	<a href="#">3) Retrieval time</a>

### 6.1.1.43 PMData

Table 6.49: UML Class PMData Attributes - [{Requirement II. 282}](#)

Attribute Name	<a href="#">{Requirement II. 282}</a>
layerRate	<a href="#">1) Layer rate</a>
granularity	<a href="#">2) Granularity</a>
association to <a href="#">PMCurrentData</a>	<a href="#">3) Retrieval time</a>
association to <a href="#">PMMeasurement</a>	<a href="#">4) PM parameter measurements</a>

### 6.1.1.44 PMHistoricData

Table 6.50: UML Class PMHistoricData (derived from [PMData](#)) Attributes - [{Requirement II. 284}](#)

Attribute Name	<a href="#">{Requirement II. 284}</a>
userLabel	<a href="#">5) User label</a>

### 6.1.1.45 PMHistoricMeasurement

Table 6.51: UML Class PMHistoricMeasurement(derives from [PMMeasurement](#)) Attributes - [{Requirement II. 284}](#)

Attribute Name	<a href="#">{Requirement II. 284}</a>
periodEndTime	<a href="#">6) Period end time</a>
monitoredTime	<a href="#">7) Monitored time</a>

**Table 6.51: UML Class PMHistoricMeasurement(derives from [PMMeasurement](#)) Attributes - [{Requirement II. 284}](#)**

Attribute Name	<a href="#">{Requirement II. 284}</a>
numberOfPeriods	<a href="#">8) Number of periods</a>

### 6.1.1.46 PMMeasurement

Table 6.52: UML Class PMMeasurement Attributes - [\(Requirement II. 282\)](#)

Attribute Name	<a href="#">(Requirement II. 282)</a>
pmParName	<a href="#">1) PM parameter</a>
pmLocation	<a href="#">2) Location</a>
value	<a href="#">3) Value</a>
unit	<a href="#">4) Measurement unit</a>
status	<a href="#">5) Status</a>

### 6.1.1.47 PMParameter

Table 6.53: UML Class PMParameter Attributes - [\(Requirement I. 085\)](#)

Attribute Name	<a href="#">(Requirement I. 085)</a>
pmParameterName	<a href="#">6) PM parameters</a>

### 6.1.1.48 PMPStateChangeInformation

Table 6.54: UML Class PMPStateChangeInformation derived from [Event](#)) Attributes [\(Requirement I. 083\)](#)

Attribute Name	<a href="#">(Requirement I. 083)</a>
pmpNameList	<a href="#">1) PMP name(s)</a>
attributeList	<a href="#">2) Attribute value(s)</a>
emsTime	<a href="#">3) EMS timestamp</a>
neTime	<a href="#">4) NE timestamp</a>

### 6.1.1.49 PMThreshold

Table 6.55: UML Class PMThreshold Attributes - [\(Requirement I. 099\)](#)

Attribute Name	
thresholdType	<a href="#">1) Threshold type</a>
triggerFlag	<a href="#">2) Trigger</a>
value	<a href="#">3) Value</a>
unit	<a href="#">4) Measurement units</a>

### 6.1.1.50 ProtectionGroup

**Table 6.56: UML Class ProtectionGroup (derived from [CommonResourceInfo](#)) Attributes - {Requirement I. 034}**

Attribute Name	<a href="#">{Requirement I. 066}</a>
protectionGroupType	<a href="#">1) Type</a>
protectionSchemeState	<a href="#">2) Protection scheme state</a>
reversionMode	<a href="#">3) Reversion mode</a>
rate	<a href="#">4) Layer Rate</a>
<i>association to a list of <a href="#">PhysicalTerminationPoint</a></i>	<a href="#">5) Protection related PTPs</a>
pgpParameters	<a href="#">6) PG parameters</a>
apsProtocolType	<a href="#">7) APS protocol type</a>
asapPointer	<a href="#">8) Alarm severity assignment profile</a>

**Table 6.57: UML Class ProtectionGroup (derived from [CommonResourceInfo](#)) Operations**

Operation Name	
performProtectionCommand	<a href="#">{Requirement II. 116}</a>
retrieveSwitchData	<a href="#">{Requirement II. 117}</a>

### 6.1.1.51 ProtectionSwitch

Table 6.58: UML Class ProtectionSwitch (derived from [Event](#)) Attributes [\(Requirement I. 046}](#)

Attribute Name	<a href="#">(Requirement I. 046}</a>
protectionType	<a href="#">1) Type</a>
switchReason	<a href="#">2) Switch reason</a>
layer	<a href="#">3) Layer rate</a>
groupName	<a href="#">4) PG</a>
protectedTP	<a href="#">5) Protected TP</a>
switchAwayFromTP	<a href="#">6) Switch away from TP</a>
switchToTP	<a href="#">7) Switch to TP</a>

### 6.1.1.52 Route

Table 6.59: UML Class Route Attributes - [\(Requirement I. 021}](#)

Attribute Name	<a href="#">(Requirement I. 089}</a>
routeld	<a href="#">1) Identifier</a>
association to <a href="#">CrossConnect</a>	<a href="#">2) Contained XCs</a>
intended	<a href="#">3) Intended</a>
actualState	<a href="#">4) Actual state</a>
administrativeState	<a href="#">5) Administrative state</a>
inUseBy	<a href="#">6) In use by</a>
exclusive	<a href="#">7) Exclusive</a>
additionalInfo	<a href="#">8) Additional information</a>

### 6.1.1.53 RouteCreateData

Table 6.60: UML Class RouteCreateData Attributes - [\(Requirement II. 242}](#)

Attribute Name	<a href="#">(Requirement II. 242}</a>
operation parameter	<a href="#">1) SNC name</a>
operation parameter	<a href="#">2) Grade of impact</a>
operation parameter	<a href="#">3) EMS freedom level</a>
intended	<a href="#">4) Intended</a>
exclusive	<a href="#">5) Exclusive</a>

**Table 6.60: UML Class RouteCreateData Attributes - {Requirement II. 242}**

Attribute Name	{Requirement II. 242}
association to <a href="#">CrossConnect</a>	<a href="#">6) Routing constraint data</a>
fullRoute	<a href="#">7) Complete route</a>
additionalCreationInfo	<a href="#">8) Additional information</a>

### 6.1.1.54 Session

**Table 6.61: UML Class - Session Operations**

Operation Name	
ping	
endSession	

### 6.1.1.55 SessionFactory

**Table 6.62: UML Class - SessionFactory Operations - {Requirement II. 141}**

Operation Name	
getSession	{Requirement II. 141}

### 6.1.1.56 SNCCreateData

**Table 6.63: UML Class - SNCCreateData Attributes {Requirement II. 084}**

Attribute Name	<a href="#">{Requirement II. 084}</a>
userLabel	<a href="#">1) User label</a>
forceUniqueness	<a href="#">2) User label uniqueness</a>
owner	<a href="#">3) Owner</a>
direction	<a href="#">4) Directionality</a>
staticProtectionLevel	<a href="#">5) Static protection level</a>
protectionEffort	<a href="#">6) Protection effort</a>
sncType	<a href="#">7) SNC Type</a>
layerRate	<a href="#">8) Layer Rate</a>
associations to: <a href="#">CrossConnect</a> , <a href="#">TerminationPoint</a> , <a href="#">ManagedElement</a> , <a href="#">SubnetworkConnection</a> , <a href="#">TopologicalLink</a> , <a href="#">GroupTerminationPoint</a>	<a href="#">9) Routing constraint data</a>
fullRoute	<a href="#">10) Complete route</a>
networkRouted	<a href="#">11) Network routed</a>
rerouteAllowed	<a href="#">12) Reroute allowed</a>
networkReroute	<a href="#">13) Network reroute</a>
revertive	<a href="#">14) Revertive</a>

**Table 6.63: UML Class - SNCCreateData Attributes {Requirement II. 084}**

Attribute Name	<a href="#">{Requirement II. 084}</a>
priority	<a href="#">15) Priority</a>
intendedRouteExclusive	<a href="#">16) Exclusive intended route</a>
<i>associations to:</i> <a href="#">ConnectionTerminationPoint</a> , <a href="#">FloatingTerminationPoint</a>	<a href="#">17) aEnd TP(s)</a>
<i>associations to:</i> <a href="#">ConnectionTerminationPoint</a> , <a href="#">FloatingTerminationPoint</a>	<a href="#">18) zEnd TP(s)</a>
additionalCreationInfo	<a href="#">19) Additional information</a>
bundledSNCIndicator	<a href="#">20) Bundled SNC</a>
mustRemoveGTPs	<a href="#">21) GTP deletion</a>
alarmReportingIndication	<a href="#">22) Alarm reporting</a>
asapPointer	<a href="#">23) Alarm severity assignment profile</a>
aEndPointsRole	<a href="#">24) aEnd point role</a>
zEndPointsRole	<a href="#">25) zEnd point role</a>
networkAccessDomain	<a href="#">26) Network Access Domain</a>
<i>operation parameter</i>	<a href="#">27) Grade of impact</a>
<i>operation parameter</i>	<a href="#">28) EMS freedom level</a>

### 6.1.1.57 SNCModifyData

Table 6.64: UML Class - SNCModifyData (derived from [SNCCreateData](#)) Attributes - [{Requirement II. 246}](#)

Attribute Name	<a href="#">{Requirement II. 246}</a>
<i>operation parameter</i>	<a href="#">1) SNC name</a>
<i>operation parameter</i>	<a href="#">2) Route identifier</a>
modifyType	<a href="#">3) Modification type</a>
retainOldSNC	<a href="#">4) Retain SNC</a>
modifyServerLayersAllowed	<a href="#">5) Modify server layers</a>
addedOrNewRoute	<a href="#">6) Added or new route</a>
removedRoute	<a href="#">7) Removed route</a>
<i>operation parameter</i>	<a href="#">8) Termination Point (TP)s to modify</a>

### 6.1.1.58 SNCRouteChangeData

Table 6.65: UML Class - SNCRouteChangeData (derived from [EventInformation](#)) Attributes - [{Requirement I. 059}](#)

Attribute Name	<a href="#">{Requirement I. 059}</a>
routeChangeState	<a href="#">1) Route change state</a>
association to <a href="#">Route</a>	<a href="#">2) Route</a>

### 6.1.1.59 SoftwareBackupStatus

Table 6.66: UML Class SoftwareBackupStatus (derived from [Event](#)) Attributes - [{Requirement I. 086}](#)

Attribute Name	<a href="#">{Requirement I. 086}</a>
meName	<a href="#">1) NE Name</a>
backupStatus	<a href="#">2) Backup status</a>
emsTime	<a href="#">3) EMS timestamp</a>
neTime	<a href="#">4) NE timestamp</a>

### 6.1.1.60 SoftwareManager

Table 6.67: UML Class SoftwareManager Operations

Operation Name	Requirement
backupME	<a href="#">{Requirement II. 229}</a>

**Table 6.67: UML Class SoftwareManager Operations**

Operation Name	Requirement
getMEBackupStatus	<a href="#">(Requirement II. 230)</a>
abortMEBackup	<a href="#">(Requirement II. 231)</a>
getBackupList	<a href="#">(Requirement II. 232)</a>

### 6.1.1.61 Subnetwork

**Table 6.68: UML Class Subnetwork (derived from [CommonResourceInfo](#)) Attributes - [\(Requirement I. 012\)](#)**

Attribute Name	<a href="#">(Requirement I. 013)</a>
subnetworkType	<a href="#">1) Type</a>
connectionRates	<a href="#">2) Supported SNC layer rate(s)</a>
networkAccessDomain	<a href="#">3) Network Access Domain</a>

**Table 6.69: UML Class Subnetwork (derived from [CommonResourceInfo](#)) Operations**

Operation Name	Requirement
activateSNC	<a href="#">(Requirement II. 086)</a>
checkValidSNC	<a href="#">(Requirement II. 085)</a>
createAndActivateSNC	<a href="#">(Requirement II. 088)</a>
createModifiedSNC	<a href="#">(Requirement II. 245)</a>
createSNC	<a href="#">(Requirement II. 082)</a>
createSNC	<a href="#">(Requirement II. 083)</a>
createSNC	<a href="#">(Requirement II. 153)</a>
createTPPool	<a href="#">(Requirement II. 264)</a>
deactivateAndDeleteSNC	<a href="#">(Requirement II. 094)</a>
deactivateAndDeleteSNC	<a href="#">(Requirement II. 096)</a>
deactivateSNC	<a href="#">(Requirement II. 090)</a>
deleteSNC	<a href="#">(Requirement II. 092)</a>
deleteTPPool	<a href="#">(Requirement II. 266)</a>
getAllEdgePointNames	<a href="#">(Requirement II. 038)</a>
getAllEdgePointNames	<a href="#">(Requirement II. 040)</a>
getAllEdgePoints	<a href="#">(Requirement II. 037)</a>

**Table 6.69: UML Class Subnetwork (derived from [CommonResouceInfo](#)) Operations**

<b>Operation Name</b>	<b>Requirement</b>
getAllEdgePoints	<a href="#">{Requirement II. 039}</a>
getAllFixedSubnetworkConnectionNames	<a href="#">{Requirement II. 180}</a>
getAllFixedSubnetworkConnectionNamesWithTP	<a href="#">{Requirement II. 182}</a>
getAllFixedSubnetworkConnections	<a href="#">{Requirement II. 179}</a>
getAllFixedSubnetworkConnectionsWithTP	<a href="#">{Requirement II. 181}</a>
getAllManagedElementNames	<a href="#">{Requirement II. 005}</a>
getAllManagedElements	<a href="#">{Requirement II. 004}</a>
getAllSubnetworkConnectionNames	<a href="#">{Requirement II. 019}</a>
getAllSubnetworkConnectionNamesWithTP	<a href="#">{Requirement II. 023}</a>
getAllSubnetworkConnections	<a href="#">{Requirement II. 018}</a>
getAllSubnetworkConnections	<a href="#">{Requirement II. 020}</a>
getAllSubnetworkConnectionsWithTP	<a href="#">{Requirement II. 022}</a>
getAllTopologicalLinkNames	<a href="#">{Requirement II. 016}</a>
getAllTopologicalLinks	<a href="#">{Requirement II. 015}</a>
getAllTPPoolNames	<a href="#">{Requirement II. 032}</a>
getAllTPPools	<a href="#">{Requirement II. 031}</a>
getAssociatedTP	<a href="#">{Requirement II. 049}</a>
getSNC	<a href="#">{Requirement II. 024}</a>
getSNCsByUserLabel	<a href="#">{Requirement II. 025}</a>
getTopologicalLink	<a href="#">{Requirement II. 017}</a>
getTPPool	<a href="#">{Requirement II. 268}</a>
modifySNC	<a href="#">{Requirement II. 257}</a>
modifyTPPool	<a href="#">{Requirement II. 267}</a>
swapSNC	<a href="#">{Requirement II. 258}</a>

### 6.1.1.62 SubnetworkConnection

Table 6.70: UML Class SubnetworkConnection (derived from [CommonResourceInfo](#)) Attributes - [{Requirement I. 014}](#)

Attribute Name	<a href="#">{Requirement I. 015}</a>
sncState	<a href="#">1) State</a>
direction	<a href="#">2) Directionality</a>
connectionRate	<a href="#">3) Layer rate</a>
staticProtectionLevel	<a href="#">4) Static protection level</a>
sncType	<a href="#">5) Type</a>
<i>associations to <a href="#">TerminationPoint</a>, <a href="#">GroupTerminationPoint</a></i>	<a href="#">6) aEnd TPs</a>
<i>associations to <a href="#">TerminationPoint</a>, <a href="#">GroupTerminationPoint</a></i>	<a href="#">7) zEnd TPs</a>
networkRouted	<a href="#">8) Network routed</a>
rerouteAllowed	<a href="#">9) Reroute allowed</a>
networkReroute	<a href="#">10) Network reroute</a>
revertive	<a href="#">11) Revertive</a>
networkAccessDomain	<a href="#">12) Network Access Domain</a>
alarmReportingIndication	<a href="#">13) Alarm reporting</a>
correlationId	<a href="#">14) Correlation identifier</a>
bundledSNCIndicator	<a href="#">15) Bundled SNC</a>
mustRemoveGTPs	<a href="#">16) GTP deletion</a>
fixed	<a href="#">17) Fixed</a>
asapPointer	<a href="#">18) Alarm severity assignment profile</a>
retainOldSNC	<a href="#">19) Retain SNC</a>
priority	<a href="#">20) Priority</a>
aEndPointsRole	<a href="#">21) aEnd point role</a>
zEndPointsRole	<a href="#">22) zEnd point role</a>

**Table 6.71: UML Class SubnetworkConnection (derived from [CommonResourceInfo](#)) Operations**

Operation Name	Requirement
addRoute	<a href="#">{Requirement II. 241}</a>
getBackupRoutes	<a href="#">{Requirement II. 256}</a>
getBackupRoutes	<a href="#">{Requirement II. 260}</a>
getIntendedRoute	<a href="#">{Requirement II. 261}</a>
getRoute	<a href="#">{Requirement II. 026}</a>
getRouteAndTopologicalLinks	<a href="#">{Requirement II. 218}</a>
removeRoute	<a href="#">{Requirement II. 243}</a>
setAlarmReportingOff	<a href="#">{Requirement II. 160}</a>
setAlarmReportingOn	<a href="#">{Requirement II. 159}</a>
setIntendedRoute	<a href="#">{Requirement II. 251}</a>
setRoutesAdminState	<a href="#">{Requirement II. 249}</a>
switchRoute	<a href="#">{Requirement II. 247}</a>

### 6.1.1.63 Supplier

No attributes, no operations.

### 6.1.1.64 SwitchData

Table 6.72: UML Class SwitchData Attributes [\(Requirement II. 195\)](#)

Attribute Name	<a href="#">(Requirement II. 195)</a>
protectionType	<a href="#">1) Type</a>
switchReason	<a href="#">2) Switch reason</a>
layerRate	<a href="#">3) Layer rate</a>
additionalInfo	<a href="#">4) PG</a>
association to <a href="#">ProtectionGroup</a>	<a href="#">5) Protected TP</a>
association to <a href="#">TerminationPoint</a>	<a href="#">6) Switch away from TP</a>
association to <a href="#">TerminationPoint</a>	<a href="#">7) Switch to TP</a>
additionalInfo	<a href="#">8) Additional information</a>

### 6.1.1.65 TCAParameter

Table 6.73: UML Class TCAParameter Attributes - [\(Requirement I. 088\)](#)

Attribute Name	<a href="#">(Requirement I. 035)</a>
pmParameterName	<a href="#">1) Name</a>
granularity	<a href="#">2) Granularity</a>
pmLocation	<a href="#">3) Location</a>
thresholdType	<a href="#">4) Threshold type</a>
triggerFlag	<a href="#">5) Trigger</a>
value	<a href="#">6) Value</a>
unit	<a href="#">7) Measurement units</a>

### 6.1.1.66 TCAParameterProfile

Table 6.74: UML Class TCAParameterProfile (derived from [CommonResourceInfo](#)) Attributes - [\(Requirement I. 067\)](#)

Attribute Name	<a href="#">(Requirement I. 087)</a>
layerRate	<a href="#">1) Layer rate</a>
associatedTPs	<a href="#">2) Associated TPs</a>
association to <a href="#">TCAParameter</a>	<a href="#">3) TCA Parameters</a>

**Table 6.75: UML Class TCAPerParameterProfile (derived from [CommonResourceInfo](#)) Operations**

Operation Name	Requirement
getAssociatedTPs	<a href="#">{Requirement II. 285}</a>

### 6.1.1.67 TDCreateData

Table 6.76: UML Class TDCreateData Attributes - [\(Requirement II. 098\)](#)

Attribute Name	<a href="#">(Requirement II. 098)</a>
userLabel	<a href="#">1) User label</a>
forceUniqueness	<a href="#">2) User label uniqueness</a>
owner	<a href="#">3) Owner</a>
serviceCategory	<a href="#">4) Service Category</a>
conformanceDefinition	<a href="#">5) Conformance Profile.</a>
trafficParameters	<a href="#">6) Traffic Parameters</a>
additionalCreationInfo	<a href="#">7) Additional information</a>

### 6.1.1.68 TerminationPoint

Table 6.77: UML Class TerminationPoint (derived from [CommonResourceInfo](#)) Attributes - [\(Requirement I. 004\)](#)

Attribute Name	<a href="#">(Requirement I. 005)</a>
direction	<a href="#">1) Directionality</a>
protectionAssociation	<a href="#">2) Protection association</a>
edgePoint	<a href="#">3) Edge Point</a>
networkAccessDomain	<a href="#">4) Network Access Domain</a>
equipmentProtected	<a href="#">5) Equipment protected</a>
egressTMDState	<a href="#">6) Ingress TMD state</a>
ingressTMDState	<a href="#">7) Egress TMD state</a>
association to: <a href="#">GroupTerminationPoint</a> or <a href="#">TPPool</a>	<a href="#">8) GTP or TPPool</a>
association to <a href="#">TransmissionParameters</a>	<a href="#">9) Layered transmission parameters</a>
association to ingress <a href="#">TransmissionDescriptor</a>	<a href="#">10) Ingress TMD</a>
association to egress <a href="#">TransmissionDescriptor</a>	<a href="#">11) Egress TMD</a>
association to <a href="#">TCAPerParameterProfile</a>	<a href="#">12) TCA parameter profile</a>
association to <a href="#">AlarmSeverityAssignmentProfile</a>	<a href="#">13) Alarm severity assignment profile</a>
association to <a href="#">PerformanceMonitoringPoint</a>	<a href="#">14) Performance monitoring point</a>

**Table 6.78: UML Class TerminationPoint (derived from [CommonResourceInfo](#)) Operations**

<b>Operation Name</b>	<b>Requirement</b>
getActiveMaintenanceOperations	<a href="#">{Requirement II. 138}</a>
getContainedCurrentCTPNames	<a href="#">{Requirement II. 044}</a>
getContainedCurrentCTPs	<a href="#">{Requirement II. 043}</a>
getContainedInUseCTPNames	<a href="#">{Requirement II. 046}</a>
getContainedInUseCTPs	<a href="#">{Requirement II. 045}</a>
getContainedPotentialCTPNames	<a href="#">{Requirement II. 042}</a>
getContainedPotentialCTPs	<a href="#">{Requirement II. 041}</a>
getPotentialFixedCCs	<a href="#">{Requirement II. 185}</a>
getTCAParameter	<a href="#">{Requirement II. 055}</a>
getTPGroupingRelationships	<a href="#">{Requirement II. 030}</a>
performMaintenanceOperation	<a href="#">{Requirement II. 137}</a>
setTCAParameter	<a href="#">{Requirement II. 125}</a>
setTCAParameterProfilePointer	<a href="#">{Requirement II. 235}</a>
setTransmissionDescriptorAssociation	<a href="#">{Requirement II. 194}</a>
verifyTMDAssignment	<a href="#">{Requirement II. 278}</a>

### 6.1.1.69 ThresholdCrossingAlertInformation

**Table 6.79: UML Class ThresholdCrossingAlertInformation (derived from [EventInformation](#)) Attributes - [{Requirement I. 047}](#)**

Attribute Name	<a href="#">{Requirement I. 047}</a>
nativeEMSName	<a href="#">1) Native EMS name</a>
isClearable	<a href="#">2) Clearable</a>
perceivedSeverity	<a href="#">3) Perceived severity</a>
layerRate	<a href="#">4) Layer rate</a>
granularity	<a href="#">5) Granularity</a>
pmParameterName	<a href="#">6) Parameter name</a>
pmLocation	<a href="#">7) Parameter location</a>
thresholdType	<a href="#">8) Threshold type</a>
value	<a href="#">9) Value</a>
unit	<a href="#">10) Measurement units</a>
acknowledgeIndication	<a href="#">11) Acknowledgement</a>

### 6.1.1.70 TLCREATEData

**Table 6.80: UML Class TLCREATEData Attributes - [{Requirement II. 169}](#)**

Attribute Name	<a href="#">{Requirement II. 169}</a>
userLabel	<a href="#">1) User label</a>
forceUniqueness	<a href="#">2) User label uniqueness</a>
owner	<a href="#">3) Owner</a>
direction	<a href="#">4) Directionality</a>
association to <a href="#">TerminationPoint</a>	<a href="#">5) aEnd Termination Point (TP)</a>
association to <a href="#">TerminationPoint</a>	<a href="#">6) zEnd Termination Point (TP)</a>
layerRate	<a href="#">7) Layer Rate</a>
networkAccessDomain	<a href="#">8) Network Access Domain</a>
alarmReportingIndication	<a href="#">9) Alarm reporting</a>
asapPointer	<a href="#">10) Alarm severity assignment profile</a>
additionalCreateInfo	<a href="#">11) Additional information.</a>

### 6.1.1.71 TopologicalLink

**Table 6.81: UML Class TopologicalLink (derived from [CommonResourceInfo](#)) Attributes - {Requirement I. 010}**

Attribute Name	<a href="#">{Requirement I. 011}</a>
direction	<a href="#">1) Directionality</a>
association to <a href="#">TerminationPoint</a>	<a href="#">2) aEnd Termination Point (TP)</a>
association to <a href="#">TerminationPoint</a>	<a href="#">3) zEnd Termination Point (TP)</a>
layerRate	<a href="#">4) Layer rate</a>
networkAccessDomain	<a href="#">5) Network Access Domain</a>
alarmReportingIndication	<a href="#">6) Alarm reporting</a>

**Table 6.82: UML Class TopologicalLink (derived from [CommonResourceInfo](#)) Operations**

Operation Name	
setAlarmReportingOn	<a href="#">{Requirement II. 161}</a>
setAlarmReportingOff	<a href="#">{Requirement II. 162}</a>

### 6.1.1.72 TPData

**Table 6.83:** UML Class TPData Attributes

Attribute Name	
tpMappingMode	

### 6.1.1.73 TPPool

**Table 6.84:** UML Class TPPool Attributes - [\(Requirement I. 009\)](#)

Attribute Name	<a href="#">(Requirement I. 094)</a>
numberOfMembers	<a href="#">1) Contained members</a>
association to <a href="#">GroupTerminationPoint</a> , <a href="#">TerminationPoint</a>	<a href="#">2) Number of members</a>
numberOfIdleMembers	<a href="#">3) Number of idle members</a>
association to <a href="#">CommonTransmissionParameters</a>	<a href="#">4) Layered transmission parameters</a>
descriptionOfUse	<a href="#">5) Description of use</a>

**Table 6.85:** UML Class TPPool (derived from [CommonResourceInfo](#)) Operations - [\(Requirement I. 009\)](#)

Operation Name	Requirement
getTPGroupingRelationships	<a href="#">(Requirement II. 028)</a>

### 6.1.1.74 TPPoolCreateData

Table 6.86: UML Class TPPoolCreateData Attributes - [\(Requirement II. 265}](#)

Attribute Name	<a href="#">(Requirement II. 265}</a>
userLabel	<a href="#">1) User label</a>
forceUniqueness	<a href="#">2) User label uniqueness</a>
owner	<a href="#">3) Owner</a>
operation parameter	<a href="#">4) Containing Subnetwork</a>
containedMembers	<a href="#">5) Contained members</a>
association to <a href="#">TransmissionParameters</a>	<a href="#">6) Layered transmission parameters</a>
descriptionOfUse	<a href="#">7) Description of use</a>
additionalCreateInfo	<a href="#">8) Additional information.</a>

### 6.1.1.75 TrafficDescriptor

Table 6.87: UML Class TrafficDescriptor Attributes - [\(Requirement I. 025}](#)

Attribute Name	<a href="#">(Requirement I. 063}</a>
serviceCategory	<a href="#">1) Service category</a>
conformanceDefn	<a href="#">2) Conformance profile</a>
trafficParameters	<a href="#">3) Traffic parameters</a>

Table 6.88: UML Class TrafficDescriptor Operations

Operation Name	Requirement
getAssociatedCTPs	<a href="#">(Requirement II. 029}</a>

### 6.1.1.76 TransmissionDescriptor

Table 6.89: UML Class - TransmissionDescriptor (derived from [CommonResourceInfo](#)) - {[Requirement I. 078](#)}

Attribute Name	{ <a href="#">Requirement I. 079</a> }
association to <a href="#">TransmissionParameters</a>	<a href="#">1) Layered transmission parameters</a>
additionalTPIinfo	<a href="#">2) Additional TP information</a>
externalRepresentationReference	<a href="#">3) External representation</a>

Table 6.90: UML Class - TransmissionDescriptor (derived from [CommonResourceInfo](#))

Operation Name	Requirement
getAssociatedTPs	{ <a href="#">Requirement II. 186</a> }

### 6.1.1.77 TransmissionDescriptorCreateData

Table 6.91: UML Class TransmissionDescriptorCreateData Attributes - [\(Requirement II. 191\)](#)

Attribute Name	<a href="#">(Requirement II. 191)</a>
userLabel	<a href="#">1) User label</a>
forceUniqueness	<a href="#">2) User label uniqueness</a>
owner	<a href="#">3) Owner</a>
association to <a href="#">TransmissionParameters</a>	<a href="#">4) Layered transmission parameters</a>
additionalTPInfo	<a href="#">5) Additional TP information</a>
externalRepresentationReference	<a href="#">6) External representation</a>
additionalCreationInfo	<a href="#">7) Additional information</a>

### 6.1.1.78 TransmissionParameters

Table 6.92: UML Class - TransmissionParameters Attributes

Attribute Name	
layerRate	<a href="#">(Requirement I. 022)</a>
transmissionParameters	<a href="#">(Requirement I. 024)</a>

Table 6.93: UML Class - TransmissionParameters Operations

Operation Name	
setTransmissionParameters	<a href="#">(Requirement II. 072)</a>

### 6.1.1.79 Version

Table 6.94: UML Class - Version Operations - [\(Requirement I. 030\)](#)

Operation Name	
getVersion	<a href="#">(Requirement II. 286)</a>

## 6.2 Dynamic Model

The dynamic model can be found in the MTNM Information Agreement, NML-EML Interface, (TMF 608).

## 7 TRACEABILITY MATRICES

These matrices show the traceability of requirement statements from Section 4 to Use Cases from Section 5. They also show the relationship of Use Cases from Section 5 to object classes from Section 6.

### 7.1 Use Case versus Requirements

[Table 7.1](#) provides a mapping between the Use Cases in [Section 5](#) and the requirements in [Section 4](#). Column 1 of [Table 7.1](#) lists all the Use Cases and column 2 identifies the corresponding requirements. When a specific Use Case is covered by more than one requirement then there are multiple entries for that Use Case.

**Table 7.1: Use Case to Requirement Map**

Use Case	Requirement
<b><a href="#">NMS-EMS Session Management Use Cases</a></b>	
<a href="#">Use Case 5.2.1: EMS (Re)starts</a>	{Requirement I. 041}
<a href="#">Use Case 5.2.1: EMS (Re)starts</a>	{Requirements IV. 003}
<a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>	{Requirement I. 041}
<a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>	{Requirement II. 139}
<a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>	{Requirement II. 140}
<a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>	{Requirement II. 144}
<a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>	{Requirement II. 145}
<a href="#">Use Case 5.2.3: NMS retrieves the interface version used by the EMS</a>	{Requirement I. 030}
<a href="#">Use Case 5.2.3: NMS retrieves the interface version used by the EMS</a>	{Requirement I. 031}
<a href="#">Use Case 5.2.4: NMS closes a session with an EMS</a>	{Requirement II. 139}
<a href="#">Use Case 5.2.4: NMS closes a session with an EMS</a>	{Requirement II. 140}
<a href="#">Use Case 5.2.5: EMS closes a session with an NMS</a>	{Requirement II. 139}
<a href="#">Use Case 5.2.5: EMS closes a session with an NMS</a>	{Requirement II. 140}
<a href="#">Use Case 5.2.6: NMS detects that an EMS is unavailable</a>	{Requirement II. 145}
<a href="#">Use Case 5.2.6: NMS detects that an EMS is unavailable</a>	{Requirement III. 001}
<a href="#">Use Case 5.2.6: NMS detects that an EMS is unavailable</a>	{Requirement III. 002}
<a href="#">Use Case 5.2.7: EMS detects that an NMS is unavailable</a>	{Requirement I. 041}
<a href="#">Use Case 5.2.7: EMS detects that an NMS is unavailable</a>	{Requirement II. 145}
<a href="#">Use Case 5.2.7: EMS detects that an NMS is unavailable</a>	{Requirement III. 001}
<a href="#">Use Case 5.2.7: EMS detects that an NMS is unavailable</a>	{Requirement III. 002}
<b><a href="#">EMS-NE Session Management Use Cases</a></b>	
<a href="#">Use Case 5.3.1: EMS loses communication to a Network Element</a>	{Requirement I. 003}

**Table 7.1: Use Case to Requirement Map**

Use Case	Requirement
<a href="#">Use Case 5.3.1: EMS loses communication to a Network Element</a>	<a href="#">{Requirement II. 067}</a>
<b><u>Discovery and Inventory Use Cases</u></b>	
<a href="#">Use Case 5.4.1: NMS registers to receive network updates information from the EMS</a>	<a href="#">{Requirement II. 064}</a>
<a href="#">Use Case 5.4.1: NMS registers to receive network updates information from the EMS</a>	<a href="#">{Requirement II. 065}</a>
<a href="#">Use Case 5.4.1: NMS registers to receive network updates information from the EMS</a>	<a href="#">{Requirement II. 066}</a>
<a href="#">Use Case 5.4.1: NMS registers to receive network updates information from the EMS</a>	<a href="#">{Requirement II. 067}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 001}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 002}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 004}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 006}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 011}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 008}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 012}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 015}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 018}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 020}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 022}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 024}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 026}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 031}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 033}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 040}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 041}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 043}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 047}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 050}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 056}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 058}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 059}</a>
<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>	<a href="#">{Requirement II. 060}</a>

**Table 7.1: Use Case to Requirement Map**

Use Case	Requirement
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 001}
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 002}
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 011}
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 012}
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 015}
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 018}
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 031}
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 033}
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 041}
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 043}
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 056}
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 059}
<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>	{Requirement II. 060}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 002}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 004}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 006}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 011}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 008}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 012}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 015}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 018}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 020}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 022}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 024}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 026}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 033}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 040}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 047}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 050}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 056}
<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>	{Requirement II. 058}

**Table 7.1: Use Case to Requirement Map**

Use Case	Requirement
<a href="#">Use Case 5.4.5: EMS notifies NMS of inventory change</a>	{Requirement II. 064}
<a href="#">Use Case 5.4.5: EMS notifies NMS of inventory change</a>	{Requirement II. 065}
<a href="#">Use Case 5.4.5: EMS notifies NMS of inventory change</a>	{Requirement II. 066}
<a href="#">Use Case 5.4.5: EMS notifies NMS of inventory change</a>	{Requirement II. 067}
<b>Provisioning Use Cases</b>	
<a href="#">Use Case 5.5.1: NMS provisions the mapping mode of a CTP</a>	{Requirement II. 068}
<a href="#">Use Case 5.5.2: NMS un-maps a server layer CTP</a>	{Requirement II. 069}
<a href="#">Use Case 5.5.3: NMS provisions the User Label</a>	{Requirement II. 075}
<a href="#">Use Case 5.5.4: NMS provisions the Owner</a>	{Requirement II. 076}
<a href="#">Use Case 5.5.5: NMS provisions the Additional Information</a>	{Requirement II. 223}
<a href="#">Use Case 5.5.6: NMS provisions the Native EMS Name</a>	{Requirement II. 077}
<a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a>	{Requirement II. 072}
<a href="#">Use Case 5.5.8: NMS provisions alarm reporting on for a TP</a>	{Requirement II. 108}
<a href="#">Use Case 5.5.9: NMS provisions alarm reporting off for a TP</a>	{Requirement II. 109}
<a href="#">Use Case 5.5.10: NMS creates a Topological Link (TL)</a>	{Requirement II. 168}
<a href="#">Use Case 5.5.11: NMS deletes a Topological Link (TL)</a>	{Requirement II. 170}
<a href="#">Use Case 5.5.12: NMS creates a Transmission Descriptor (TMD)</a>	{Requirement II. 190}
<a href="#">Use Case 5.5.13: NMS modifies a Transmission Descriptor (TMD) on a TP</a>	{Requirement II. 194}
<a href="#">Use Case 5.5.14: NMS deletes a Transmission Descriptor (TMD)</a>	{Requirement II. 192}
<a href="#">Use Case 5.5.15: NMS creates a Group Termination Point (GTP)</a>	{Requirement II. 164}
<a href="#">Use Case 5.5.15: NMS creates a Group Termination Point (GTP)</a>	{Requirement II. 165}
<a href="#">Use Case 5.5.16: NMS modifies a Group Termination Point (GTP)</a>	{Requirement II. 167}
<a href="#">Use Case 5.5.17: NMS deletes a Group Termination Point (GTP)</a>	{Requirement II. 166}
<a href="#">Use Case 5.5.18: NMS creates a Termination Point Pool (TP Pool)</a>	{Requirement II. 264}
<a href="#">Use Case 5.5.18: NMS creates a Termination Point Pool (TP Pool)</a>	{Requirement II. 265}
<a href="#">Use Case 5.5.19: NMS modifies a Termination Point Pool (TP Pool)</a>	{Requirement II. 267}
<a href="#">Use Case 5.5.20: NMS deletes a Termination Point Pool (TP Pool)</a>	{Requirement II. 266}
<a href="#">Use Case 5.5.21: NMS assigns an Alarm Severity Assignment Profile (ASAP) to a CTP</a>	{Requirement II. 201}
<a href="#">Use Case 5.5.22: NMS locks (in a forced response deferred/graceful fashion) or unlocks a number of IMA links to modify the transport capacity of the corresponding fixed IMA group</a>	

**Table 7.1: Use Case to Requirement Map**

Use Case	Requirement
<a href="#">Use Case 5.5.23: NMS requests dynamic provisioning of an IMA group by the EMS subject to a prescribed bandwidth that is communicated as number and connectable layer rate of the IMA links</a>	
<a href="#">Use Case 5.5.24: NMS provisions the IMA virtual link between two peer IMA groups as a topological link</a>	
<a href="#">Use Case 5.5.25: NMS unprovisions an IMA virtual link between IMA groups</a>	
<a href="#">Use Case 5.5.26: NMS provisions or re-provisions a single DSL line</a>	
<a href="#">Use Case 5.5.27: NMS provisions multiple DSL lines by using TMDs</a>	
<b><u>Connection Management Use Cases</u></b>	
<a href="#">Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)</a>	{Requirement II. 082}
<a href="#">Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)</a>	{Requirement II. 083}
<a href="#">Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)</a>	{Requirement II. 084}
<a href="#">Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)</a>	{Requirement II. 086}
<a href="#">Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)</a>	{Requirement II. 087}
<a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a>	{Requirement II. 088}
<a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a>	{Requirement II. 089}
<a href="#">Use Case 5.6.4: NMS adds a route to a Subnetwork Connection (SNC)</a>	{Requirement II. 241}
<a href="#">Use Case 5.6.4: NMS adds a route to a Subnetwork Connection (SNC)</a>	{Requirement II. 242}
<a href="#">Use Case 5.6.5: NMS removes a route from a Subnetwork Connection (SNC)</a>	{Requirement II. 243}
<a href="#">Use Case 5.6.5: NMS removes a route from a Subnetwork Connection (SNC)</a>	{Requirement II. 244}
<a href="#">Use Case 5.6.6: NMS creates-modifies the route of a Subnetwork Connection (SNC)</a>	{Requirement II. 245}
<a href="#">Use Case 5.6.6: NMS creates-modifies the route of a Subnetwork Connection (SNC)</a>	{Requirement II. 246}
<a href="#">Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)</a>	{Requirement II. 090}
<a href="#">Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)</a>	{Requirement II. 091}
<a href="#">Use Case 5.6.8: NMS deletes a Subnetwork Connection (SNC)</a>	{Requirement II. 092}
<a href="#">Use Case 5.6.8: NMS deletes a Subnetwork Connection (SNC)</a>	{Requirement II. 093}
<a href="#">Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)</a>	{Requirement II. 094}
<a href="#">Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)</a>	{Requirement II. 095}
<a href="#">Use Case 5.6.10: EMS reroutes a Subnetwork Connection (SNC)EMS reroutes a Subnetwork Connection (SNC)</a>	{Requirement II. 084}
<a href="#">Use Case 5.6.11: NMS queries EMS Connection Management Mode</a>	{Requirement II. 100}
<a href="#">Use Case 5.6.12: NMS creates and activates a point-to-point Ethernet Service using fragmentation</a>	

**Table 7.1: Use Case to Requirement Map**

Use Case	Requirement
<a href="#">Use Case 5.6.13: NMS modifies a point-to-point Ethernet Service with fragmentation</a>	
<a href="#">Use Case 5.6.14: NMS deletes a point-to-point Ethernet Service with fragmentation</a>	
<a href="#">Use Case 5.6.15: NMS creates a flexible IMA group</a>	
<a href="#">Use Case 5.6.16: NMS deletes a flexible IMA group</a>	
<a href="#">Use Case 5.6.17: NMS modifies the transport capacity or the routing targets of a flexible IMA group</a>	
<b><u>Protection Management Use Cases</u></b>	
<a href="#">Use Case 5.7.1: NMS retrieves all the Protection Groups of a Managed Element</a>	{Requirement II. 059}
<a href="#">Use Case 5.7.1: NMS retrieves all the Protection Groups of a Managed Element</a>	{Requirement II. 174}
<a href="#">Use Case 5.7.2: Protection Switch Notification for Equipment, Trail and SNC Protection</a>	{Requirement I. 046}
<a href="#">Use Case 5.7.2: Protection Switch Notification for Equipment, Trail and SNC Protection</a>	{Requirement I. 074}
<a href="#">Use Case 5.7.2: Protection Switch Notification for Equipment, Trail and SNC Protection</a>	{Requirement II. 115}
<a href="#">Use Case 5.7.2: Protection Switch Notification for Equipment, Trail and SNC Protection</a>	{Requirement II. 175}
<a href="#">Use Case 5.7.3: NMS retrieves the protection switch information for Equipment, Trail and SNC Protection</a>	{Requirement II. 114}
<a href="#">Use Case 5.7.3: NMS retrieves the protection switch information for Equipment, Trail and SNC Protection</a>	{Requirement II. 175}
<a href="#">Use Case 5.7.4: NMS registers to receive protection switch notifications</a>	{Requirement II. 115}
<a href="#">Use Case 5.7.5: NMS invokes protection switch lockout to SNCP</a>	{Requirement II. 116}
<b><u>Fault Management Use Cases</u></b>	
<a href="#">Use Case 5.8.1: NMS reconciles active alarms from an EMS</a>	{Requirement II. 111}
<a href="#">Use Case 5.8.2: NMS reconciles active alarms for a specified Managed Element</a>	{Requirement II. 110}
<a href="#">Use Case 5.8.3: NMS registers to receive alarms or threshold crossing alerts from an EMS</a>	{Requirement II. 103}
<a href="#">Use Case 5.8.4: NMS registers to receive RCAs only, raw alarms only, or both RCAs and raw alarms from an EMS</a>	{Requirement II. 223}
<a href="#">Use Case 5.8.5: EMS determines a more appropriate root cause than one previously reported</a>	{Requirement II. 224}
<a href="#">Use Case 5.8.6: EMS Notifies NMS of Alarms or Threshold Crossing Alert (TCA)s</a>	{Requirement II. 126}
<a href="#">Use Case 5.8.7: Alarm Acknowledgement in the NMS</a>	{Requirement II. 155}
<a href="#">Use Case 5.8.7: Alarm Acknowledgement in the NMS</a>	{Requirement II. 157}
<a href="#">Use Case 5.8.8: Alarm Unacknowledgement in the NMS</a>	{Requirement II. 156}
<a href="#">Use Case 5.8.8: Alarm Unacknowledgement in the NMS</a>	{Requirement II. 158}

**Table 7.1: Use Case to Requirement Map**

Use Case	Requirement
<a href="#">Use Case 5.8.9: Alarm Acknowledgement in the EMS</a>	{Requirement II. 157}
<a href="#">Use Case 5.8.10: NMS reconciles Unacknowledged Active Alarms from an EMS</a>	{Requirement II. 154}
<a href="#">Use Case 5.8.11: NMS reconciles Unacknowledged Active Alarms for a specified Managed Element</a>	{Requirement II. 154}
<a href="#">Use Case 5.8.12: EMS discards an event to be sent to the NMS</a>	{Requirement II. 177}
<a href="#">Use Case 5.8.13: EMS succeeds in forwarding an event to the NMS again</a>	{Requirement II. 177}
<a href="#">Use Case 5.8.14: EMS sends a heartbeat notification to the NMS</a>	{Requirement II. 178}
<b><u>Equipment Use Cases</u></b>	
<a href="#">Use Case 5.9.1: NMS unprovisions equipment</a>	{Requirement II. 262}
<a href="#">Use Case 5.9.2: NMS provisions equipment</a>	{Requirement II. 136}
<a href="#">Use Case 5.9.3: NMS provisions alarm reporting on/off for equipment</a>	{Requirement II. 078}
<a href="#">Use Case 5.9.4: NMS provisions alarm reporting on/off for an equipment holder</a>	{Requirement II. 078}
<b><u>Craft Related Use Cases</u></b>	
<a href="#">Use Case 5.10.1: Craft modifies TP Transmission Parameter(s) of a TP</a>	{Requirement I. 044}
<a href="#">Use Case 5.10.1: Craft modifies TP Transmission Parameter(s) of a TP</a>	{Requirement II. 066}
<a href="#">Use Case 5.10.2: Craft/EMS creates a cross-connect (XC) in a Network Element (NE)</a>	{Requirement I. 042}
<a href="#">Use Case 5.10.2: Craft/EMS creates a cross-connect (XC) in a Network Element (NE)</a>	{Requirement I. 045}
<a href="#">Use Case 5.10.2: Craft/EMS creates a cross-connect (XC) in a Network Element (NE)</a>	{Requirement II. 064}
<a href="#">Use Case 5.10.2: Craft/EMS creates a cross-connect (XC) in a Network Element (NE)</a>	{Requirement II. 067}
<a href="#">Use Case 5.10.3: Craft/EMS Deletes a cross-connect (XC) in a Network Element (NE)</a>	{Requirement I. 042}
<a href="#">Use Case 5.10.3: Craft/EMS Deletes a cross-connect (XC) in a Network Element (NE)</a>	{Requirement I. 045}
<a href="#">Use Case 5.10.3: Craft/EMS Deletes a cross-connect (XC) in a Network Element (NE)</a>	{Requirement II. 065}
<a href="#">Use Case 5.10.3: Craft/EMS Deletes a cross-connect (XC) in a Network Element (NE)</a>	{Requirement II. 067}
<a href="#">Use Case 5.10.4: Craft inserts a plug-in card</a>	{Requirement I. 042}
<a href="#">Use Case 5.10.4: Craft inserts a plug-in card</a>	{Requirement I. 045}
<a href="#">Use Case 5.10.4: Craft inserts a plug-in card</a>	{Requirement II. 064}
<a href="#">Use Case 5.10.4: Craft inserts a plug-in card</a>	{Requirement II. 067}
<a href="#">Use Case 5.10.4: Craft inserts a plug-in card</a>	{Requirement II. 133}
<a href="#">Use Case 5.10.4: Craft inserts a plug-in card</a>	{Requirement II. 134}
<a href="#">Use Case 5.10.5: Craft removes a plug-in card</a>	{Requirement I. 043}
<a href="#">Use Case 5.10.5: Craft removes a plug-in card</a>	{Requirement I. 045}

**Table 7.1: Use Case to Requirement Map**

Use Case	Requirement
<a href="#">Use Case 5.10.5: Craft removes a plug-in card</a>	<a href="#">{Requirement II. 065}</a>
<a href="#">Use Case 5.10.5: Craft removes a plug-in card</a>	<a href="#">{Requirement II. 067}</a>
<a href="#">Use Case 5.10.6: Craft/EMS creates a Protection Group</a>	<a href="#">{Requirement I. 042}</a>
<a href="#">Use Case 5.10.6: Craft/EMS creates a Protection Group</a>	<a href="#">{Requirement II. 059}</a>
<a href="#">Use Case 5.10.6: Craft/EMS creates a Protection Group</a>	<a href="#">{Requirement II. 064}</a>
<a href="#">Use Case 5.10.6: Craft/EMS creates a Protection Group</a>	<a href="#">{Requirement II. 112}</a>
<b><a href="#">Performance Management Use Cases</a></b>	
<a href="#">Use Case 5.11.1: NMS activates collection of Performance Monitoring Data (PMD) for a specified set of TPs</a>	<a href="#">{Requirement II. 121}</a>
<a href="#">Use Case 5.11.1: NMS activates collection of Performance Monitoring Data (PMD) for a specified set of TPs</a>	<a href="#">{Requirement II. 132}</a>
<a href="#">Use Case 5.11.2: NMS deactivates collection of Performance Monitoring Data (PMD) for a specified set of TPs</a>	<a href="#">{Requirement II. 121}</a>
<a href="#">Use Case 5.11.3: NMS retrieves current Performance Monitoring Data (PMD) for a specified set of TPs</a>	<a href="#">{Requirement II. 131}</a>
<a href="#">Use Case 5.11.4: NMS retrieves the storage time of 24hr and 15min Performance Monitoring Data (PMD) records</a>	<a href="#">{Requirement II. 124}</a>
<a href="#">Use Case 5.11.5: NMS retrieves PM capabilities of a Managed Element (ME)</a>	<a href="#">{Requirement II. 054}</a>
<a href="#">Use Case 5.11.5: NMS retrieves PM capabilities of a Managed Element (ME)</a>	<a href="#">{Requirement II. 221}</a>
<a href="#">Use Case 5.11.5: NMS retrieves PM capabilities of a Managed Element (ME)</a>	<a href="#">{Requirement II. 222}</a>
<a href="#">Use Case 5.11.6: NMS retrieves historical Performance Monitoring Data (PMD) for a specified set of TPs</a>	<a href="#">{Requirement II. 128}</a>
<a href="#">Use Case 5.11.6: NMS retrieves historical Performance Monitoring Data (PMD) for a specified set of TPs</a>	<a href="#">{Requirement II. 129}</a>
<a href="#">Use Case 5.11.6: NMS retrieves historical Performance Monitoring Data (PMD) for a specified set of TPs</a>	<a href="#">{Requirement II. 130}</a>
<a href="#">Use Case 5.11.7: NMS sets PM thresholds on a TP</a>	<a href="#">{Requirement I. 054}</a>
<a href="#">Use Case 5.11.7: NMS sets PM thresholds on a TP</a>	<a href="#">{Requirement II. 125}</a>
<a href="#">Use Case 5.11.8: NMS retrieves PM threshold settings from a TP</a>	<a href="#">{Requirement I. 054}</a>
<a href="#">Use Case 5.11.8: NMS retrieves PM threshold settings from a TP</a>	<a href="#">{Requirement II. 055}</a>
<a href="#">Use Case 5.11.9: NMS enables Threshold Crossing Alerts (TCA) for a specified set of TPs</a>	<a href="#">{Requirement II. 122}</a>
<a href="#">Use Case 5.11.9: NMS enables Threshold Crossing Alerts (TCA) for a specified set of TPs</a>	<a href="#">{Requirement II. 126}</a>
<a href="#">Use Case 5.11.10: NMS disables Threshold Crossing Alerts (TCA) for a specified set of TPs</a>	<a href="#">{Requirement II. 122}</a>
<a href="#">Use Case 5.11.10: NMS disables Threshold Crossing Alerts (TCA) for a specified set of TPs</a>	<a href="#">{Requirement II. 122}</a>

**Table 7.1: Use Case to Requirement Map**

Use Case	Requirement
<a href="#">Use Case 5.11.11: On demand retrieval of historical Performance Monitoring Data (PMD) for a specified set of TPs</a>	{Requirement II. 163}
<a href="#">Use Case 5.11.12: NMS retrieves Performance Monitoring Points (PMP) contained in an ME or a TP</a>	{Requirement II. 221}
<a href="#">Use Case 5.11.13: NMS configures TCA Parameter Profile</a>	{Requirement II. 238}
<a href="#">Use Case 5.11.13: NMS configures TCA Parameter Profile</a>	{Requirement II. 239}
<a href="#">Use Case 5.11.14: NMS modifies TCA Parameter Profile Pointer</a>	{Requirement II. 238}
<a href="#">Use Case 5.11.14: NMS modifies TCA Parameter Profile Pointer</a>	{Requirement II. 239}
<b><u>GUI Cut-Through Use Cases</u></b>	
<a href="#">Use Case 5.12.1: NMS retrieves GUI Cut-Through window data</a>	{Requirement II. 150}
<a href="#">Use Case 5.12.2: Client based GCT launch</a>	{Requirement II. 151}
<a href="#">Use Case 5.12.3: Server based GCT launch</a>	{Requirement II. 151}
<a href="#">Use Case 5.12.3: Server based GCT launch</a>	{Requirement II. 152}
<b><u>ATM Provisioning Use Cases</u></b>	
<a href="#">Use Case 5.13.1: NMS creates a Traffic Descriptor (TD)</a>	{Requirement II. 097}
<a href="#">Use Case 5.13.1: NMS creates a Traffic Descriptor (TD)</a>	{Requirement II. 098}
<a href="#">Use Case 5.13.2: NMS modifies a Traffic Descriptor (TD) on a VPCTP or VCCTP</a>	{Requirement II. 074}
<a href="#">Use Case 5.13.3: NMS deletes a Traffic Descriptor (TD)</a>	{Requirement II. 099}
<b><u>ATM Connection Management Use Cases</u></b>	
<a href="#">Use Case 5.14.1: NMS creates and activates an ATM Subnetwork Connection (SNC)</a>	{Requirement II. 088}
<a href="#">Use Case 5.14.1: NMS creates and activates an ATM Subnetwork Connection (SNC)</a>	{Requirement II. 089}

## 7.2 UML Object Class versus Requirements

[Table 7.2](#) provides a mapping between the UML Classes in [Section 6.1.1](#) and the requirements in [Section 4](#). Column 1 of [Table 7.2](#) lists all UML Classes and column 2 identifies the corresponding requirement. Where there is no entry in column 2 this means that there is no corresponding requirement for that particular UML Class. When a specific UML Class has more than one requirement then there are multiple entries for that UML Class.

**Table 7.2: UML Class to Requirement Map**

	UML Class	Requirement
1	<a href="#">AID</a>	{Requirement I. 057}
2	<a href="#">AlarmInformation</a>	{Requirement I. 048}

**Table 7.2: UML Class to Requirement Map**

	UML Class	Requirement
3	<a href="#">AlarmSeverityAssignmentProfile</a>	{Requirement I. 080}
	<a href="#">AlarmSeverityAssignmentProfile</a>	{Requirement I. 081}
4	<a href="#">ASAPCreateModifyData</a>	{Requirement II. 197}
5	<a href="#">Attribute</a>	{Requirement I. 044}
	<a href="#">Attribute</a>	{Requirement I. 045}
6	<a href="#">CommonResourceInfo</a>	{Requirement I. 060}
7	<a href="#">CommonTransmissionParameters</a>	
8	<a href="#">ConnectionTerminationPoint</a>	{Requirement I. 006}
	<a href="#">ConnectionTerminationPoint</a>	{Requirement I. 062}
9	<a href="#">Consumer</a>	
10	<a href="#">CrossConnect</a>	{Requirement I. 019}
	<a href="#">CrossConnect</a>	{Requirement I. 020}
11	<a href="#">EMS</a>	{Requirement I. 001}
	<a href="#">EMS</a>	{Requirement I. 061}
12	<a href="#">EMSSession</a>	
13	<a href="#">EProtectionSwitch</a>	{Requirement I. 074}
14	<a href="#">Equipment</a>	{Requirement I. 032}
	<a href="#">Equipment</a>	{Requirement I. 064}
15	<a href="#">EquipmentCreateData</a>	{Requirement II. 263}
16	<a href="#">EquipmentHolder</a>	{Requirement I. 033}
	<a href="#">EquipmentHolder</a>	{Requirement I. 065}
17	<a href="#">EquipmentProtectionGroup</a>	{Requirement I. 072}
	<a href="#">EquipmentProtectionGroup</a>	{Requirement I. 073}
18	<a href="#">ESwitchData</a>	{Requirement II. 175}
19	<a href="#">Event</a>	{Requirement I. 068}
20	<a href="#">EventInformation</a>	{Requirement I. 093}
21	<a href="#">FileTransferStatus</a>	{Requirement I. 058}
22	<a href="#">Filter</a>	
23	<a href="#">FloatingTerminationPoint</a>	{Requirement I. 075}
24	<a href="#">GCTProfileInfo</a>	

**Table 7.2: UML Class to Requirement Map**

	UML Class	Requirement
25	<a href="#">GroupTerminationPoint</a>	<a href="#">{Requirement I. 069}</a>
	<a href="#">GroupTerminationPoint</a>	<a href="#">{Requirement I. 070}</a>
26	<a href="#">HeartbeatInformation</a>	<a href="#">{Requirement I. 077}</a>
27	<a href="#">HistoricalPMDDataFile</a>	
28	<a href="#">Log</a>	<a href="#">{Requirement I. 090}</a>
	<a href="#">Log</a>	<a href="#">{Requirement I. 091}</a>
29	<a href="#">LogAVC</a>	<a href="#">{Requirement I. 095}</a>
30	<a href="#">LogCapacityThresholdAlarm</a>	<a href="#">{Requirement I. 096}</a>
31	<a href="#">LogObjectCreation</a>	
32	<a href="#">LogObjectDeletion</a>	
33	<a href="#">LogProcessingErrorAlarm</a>	<a href="#">{Requirement I. 097}</a>
34	<a href="#">LogRecord</a>	
35	<a href="#">LogStateChange</a>	<a href="#">{Requirement I. 098}</a>
36	<a href="#">ManagedElement</a>	<a href="#">{Requirement I. 002}</a>
	<a href="#">ManagedElement</a>	<a href="#">{Requirement I. 003}</a>
37	<a href="#">NMSSession</a>	
38	<a href="#">ObjectInformation</a>	
39	<a href="#">PerformanceManager</a>	
40	<a href="#">PerformanceMonitoringPoint</a>	<a href="#">{Requirement I. 084}</a>
	<a href="#">PerformanceMonitoringPoint</a>	<a href="#">{Requirement I. 085}</a>
41	<a href="#">PhysicalTerminationPoint</a>	<a href="#">{Requirement I. 007}</a>
42	<a href="#">PMCurrentData</a>	
43	<a href="#">PMData</a>	
44	<a href="#">PMHistoricData</a>	
45	<a href="#">PMHistoricMeasurement</a>	
46	<a href="#">PMMeasurement</a>	
47	<a href="#">PMPParameter</a>	
48	<a href="#">PMPStateChangeInformation</a>	<a href="#">{Requirement I. 083}</a>
49	<a href="#">PMThreshold</a>	
50	<a href="#">ProtectionSwitch</a>	<a href="#">{Requirement I. 046}</a>

**Table 7.2: UML Class to Requirement Map**

	UML Class	Requirement
51	<a href="#">ProtectionGroup</a>	{Requirement I. 034}
	<a href="#">ProtectionGroup</a>	{Requirement I. 066}
52	<a href="#">Route</a>	{Requirement I. 021}
	<a href="#">Route</a>	{Requirement I. 089}
53	<a href="#">RouteCreateData</a>	{Requirement II. 242}
54	<a href="#">Session</a>	
55	<a href="#">SessionFactory</a>	
56	<a href="#">SNCCreateDate</a>	{Requirement II. 084}
57	<a href="#">SNCModifyData</a>	{Requirement II. 246}
58	<a href="#">SNCRouteChangeData</a>	{Requirement I. 059}
59	<a href="#">SoftwareBackupStatus</a>	{Requirement I. 086}
60	<a href="#">SoftwareManager</a>	
61	<a href="#">Subnetwork</a>	{Requirement I. 012}
	<a href="#">Subnetwork</a>	{Requirement I. 013}
62	<a href="#">SubnetworkConnection</a>	{Requirement I. 014}
	<a href="#">SubnetworkConnection</a>	{Requirement I. 015}
63	<a href="#">Supplier</a>	
64	<a href="#">SwitchData</a>	
65	<a href="#">TCAParameter</a>	{Requirement I. 035}
	<a href="#">TCAParameter</a>	{Requirement I. 088}
66	<a href="#">TCAParameterProfile</a>	{Requirement I. 067}
	<a href="#">TCAParameterProfile</a>	{Requirement I. 087}
67	<a href="#">TDCreateData</a>	{Requirement II. 098}
68	<a href="#">TerminationPoint</a>	{Requirement I. 004}
	<a href="#">TerminationPoint</a>	{Requirement I. 005}
69	<a href="#">ThresholdCrossingAlertInformation</a>	{Requirement I. 047}
70	<a href="#">TLCREATEData</a>	{Requirement II. 169}
71	<a href="#">TopologicalLink</a>	{Requirement I. 010}
	<a href="#">TopologicalLink</a>	{Requirement I. 011}
72	<a href="#">TPData</a>	

**Table 7.2: UML Class to Requirement Map**

	UML Class	Requirement
73	<a href="#">TPPool</a>	{Requirement I. 009}
	<a href="#">TPPool</a>	{Requirement I. 094}
74	<a href="#">TPPoolCreateData</a>	{Requirement II. 265}
75	<a href="#">TrafficDescriptor</a>	{Requirement I. 025}
	<a href="#">TrafficDescriptor</a>	{Requirement I. 063}
76	<a href="#">TransmissionDescriptor</a>	{Requirement I. 078}
	<a href="#">TransmissionDescriptor</a>	{Requirement I. 079}
77	<a href="#">TransmissionDescriptorCreateData</a>	{Requirement II. 191}
78	<a href="#">TransmissionParameters</a>	
79	<a href="#">Version</a>	{Requirement I. 030}

### 7.3 UML Class versus Use Case

[Table 7.3](#) provides a mapping between the UML Classes in [Section 6.1.1](#) and the Use Cases in [Section 5](#).

**Table 7.3: Use Case to UML Class Map**

	UML Class	Use Case
1	<a href="#">AID</a>	
2	<a href="#">AlarmInformation</a>	<a href="#">Use Case 5.8.6: EMS Notifies NMS of Alarms or Threshold Crossing Alert (TCA)s</a>
3	<a href="#">ASAPCreateModifyData</a>	
4	<a href="#">AlarmSeverityAssignmentProfile</a>	
5	<a href="#">Attribute</a>	
6	<a href="#">CommonResourceInfo</a>	
7	<a href="#">CommonTransmissionParameters</a>	

**Table 7.3: Use Case to UML Class Map**

	<b>UML Class</b>	<b>Use Case</b>
8	<a href="#">ConnectionTerminationPoint</a>	<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>
	<a href="#">ConnectionTerminationPoint</a>	<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>
	<a href="#">ConnectionTerminationPoint</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
	<a href="#">ConnectionTerminationPoint</a>	<a href="#">Use Case 5.5.1: NMS provisions the mapping mode of a CTP</a>
	<a href="#">ConnectionTerminationPoint</a>	<a href="#">Use Case 5.5.2: NMS un-maps a server layer CTP</a>
	<a href="#">ConnectionTerminationPoint</a>	<a href="#">Use Case 5.5.3: NMS provisions the User Label</a>
	<a href="#">ConnectionTerminationPoint</a>	<a href="#">Use Case 5.5.4: NMS provisions the Owner</a>
	<a href="#">ConnectionTerminationPoint</a>	<a href="#">Use Case 5.7.3: NMS retrieves the protection switch information for Equipment, Trail and SNC Protection</a>
	<a href="#">ConnectionTerminationPoint</a>	<a href="#">Use Case 5.7.5: NMS invokes protection switch lockout to SNCP</a>
	<a href="#">ConnectionTerminationPoint</a>	<a href="#">Use Case 5.5.6: NMS provisions the Native EMS Name</a>
9	<a href="#">Consumer</a>	<a href="#">Use Case 5.4.1: NMS registers to receive network updates information from the EMS</a>
	<a href="#">Consumer</a>	<a href="#">Use Case 5.4.5: EMS notifies NMS of inventory change</a>
	<a href="#">Consumer</a>	<a href="#">Use Case 5.7.4: NMS registers to receive protection switch notifications</a>
	<a href="#">Consumer</a>	<a href="#">Use Case 5.8.3: NMS registers to receive alarms or threshold crossing alerts from an EMS</a>
10	<a href="#">CrossConnect</a>	<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>
	<a href="#">CrossConnect</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
11	<a href="#">EMS</a>	<a href="#">Use Case 5.12.1: NMS retrieves GUI Cut-Through window data</a>
	<a href="#">EMS</a>	<a href="#">Use Case 5.12.2: Client based GCT launch</a>
	<a href="#">EMS</a>	<a href="#">Use Case 5.12.3: Server based GCT launch</a>
	<a href="#">EMS</a>	<a href="#">Use Case 5.13.1: NMS creates a Traffic Descriptor (TD)</a>
	<a href="#">EMS</a>	<a href="#">Use Case 5.13.3: NMS deletes a Traffic Descriptor (TD)</a>
	<a href="#">EMS</a>	<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>
	<a href="#">EMS</a>	<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>
	<a href="#">EMS</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
	<a href="#">EMS</a>	<a href="#">Use Case 5.6.11: NMS queries EMS Connection Management Mode</a>
	<a href="#">EMS</a>	<a href="#">Use Case 5.8.1: NMS reconciles active alarms from an EMS</a>

**Table 7.3: Use Case to UML Class Map**

	<b>UML Class</b>	<b>Use Case</b>
12	<a href="#">EMSSession</a>	<a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>
	<a href="#">EMSSession</a>	<a href="#">Use Case 5.2.4: NMS closes a session with an EMS</a>
	<a href="#">EMSSession</a>	<a href="#">Use Case 5.2.6: NMS detects that an EMS is unavailable</a>
13	<a href="#">EProtectionSwitch</a>	
14	<a href="#">Equipment</a>	<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>
	<a href="#">Equipment</a>	<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>
	<a href="#">Equipment</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
	<a href="#">Equipment</a>	<a href="#">Use Case 5.5.3: NMS provisions the User Label</a>
	<a href="#">Equipment</a>	<a href="#">Use Case 5.5.4: NMS provisions the Owner</a>
	<a href="#">Equipment</a>	<a href="#">Use Case 5.5.6: NMS provisions the Native EMS Name</a>
	<a href="#">Equipment</a>	<a href="#">Use Case 5.9.3: NMS provisions alarm reporting on/off for equipment</a>
15	<a href="#">EquipmentCreateData</a>	
16	<a href="#">EquipmentHolder</a>	<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>
	<a href="#">EquipmentHolder</a>	<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>
	<a href="#">EquipmentHolder</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
	<a href="#">EquipmentHolder</a>	<a href="#">Use Case 5.5.3: NMS provisions the User Label</a>
	<a href="#">EquipmentHolder</a>	<a href="#">Use Case 5.5.4: NMS provisions the Owner</a>
	<a href="#">EquipmentHolder</a>	<a href="#">Use Case 5.5.6: NMS provisions the Native EMS Name</a>
	<a href="#">EquipmentHolder</a>	<a href="#">Use Case 5.9.1: NMS unprovisions equipment</a>
	<a href="#">EquipmentHolder</a>	<a href="#">Use Case 5.9.2: NMS provisions equipment</a>
	<a href="#">EquipmentHolder</a>	<a href="#">Use Case 5.9.4: NMS provisions alarm reporting on/off for an equipment holder</a>
17	<a href="#">EquipmentProtectionGroup</a>	
18	<a href="#">ESwitchData</a>	
19	<a href="#">Event</a>	
20	<a href="#">EventInformation</a>	
21	<a href="#">FileTransferStatus</a>	

**Table 7.3: Use Case to UML Class Map**

	<b>UML Class</b>	<b>Use Case</b>
22	<a href="#">Filter</a>	<a href="#">Use Case 5.4.1: NMS registers to receive network updates information from the EMS</a>
	<a href="#">Filter</a>	<a href="#">Use Case 5.4.5: EMS notifies NMS of inventory change</a>
	<a href="#">Filter</a>	<a href="#">Use Case 5.7.4: NMS registers to receive protection switch notifications</a>
	<a href="#">Filter</a>	<a href="#">Use Case 5.8.3: NMS registers to receive alarms or threshold crossing alerts from an EMS</a>
23	<a href="#">FloatingTerminationPoint</a>	
24	<a href="#">GCTProfileInfo</a>	<a href="#">Use Case 5.12.1: NMS retrieves GUI Cut-Through window data</a>
25	<a href="#">GroupTerminationPoint</a>	
26	<a href="#">HeartbeatInformation</a>	
27	<a href="#">HistoricalPMDDataFile</a>	
28	<a href="#">Log</a>	
29	<a href="#">LogAVC</a>	
30	<a href="#">LogCapacityThresholdAlarm</a>	
31	<a href="#">LogObjectCreation</a>	
32	<a href="#">LogObjectDeletion</a>	
33	<a href="#">LogProcessingErrorAlarm</a>	
34	<a href="#">LogRecord</a>	
35	<a href="#">LogStateChange</a>	
36	<a href="#">ManagedElement</a>	<a href="#">Use Case 5.3.1: EMS loses communication to a Network Element</a>
	<a href="#">ManagedElement</a>	<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>
	<a href="#">ManagedElement</a>	<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>
	<a href="#">ManagedElement</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
	<a href="#">ManagedElement</a>	<a href="#">Use Case 5.5.3: NMS provisions the User Label</a>
	<a href="#">ManagedElement</a>	<a href="#">Use Case 5.5.4: NMS provisions the Owner</a>
	<a href="#">ManagedElement</a>	<a href="#">Use Case 5.5.6: NMS provisions the Native EMS Name</a>
	<a href="#">ManagedElement</a>	<a href="#">Use Case 5.7.1: NMS retrieves all the Protection Groups of a Managed Element</a>
	<a href="#">ManagedElement</a>	<a href="#">Use Case 5.8.2: NMS reconciles active alarms for a specified Managed Element</a>

**Table 7.3: Use Case to UML Class Map**

	<b>UML Class</b>	<b>Use Case</b>
37	<a href="#">NMSSession</a>	<a href="#">Use Case 5.2.2: NMS creates a session with EMS</a>
	<a href="#">NMSSession</a>	<a href="#">Use Case 5.2.5: EMS closes a session with an NMS</a>
	<a href="#">NMSSession</a>	<a href="#">Use Case 5.2.7: EMS detects that an NMS is unavailable</a>
38	<a href="#">ObjectInformation</a>	<a href="#">Use Case 5.10.1: Craft modifies TP Transmission Parameter(s) of a TP</a>
	<a href="#">ObjectInformation</a>	<a href="#">Use Case 5.10.2: Craft/EMS creates a cross-connect (XC) in a Network Element (NE)</a>
	<a href="#">ObjectInformation</a>	<a href="#">Use Case 5.10.3: Craft/EMS Deletes a cross-connect (XC) in a Network Element (NE)</a>
	<a href="#">ObjectInformation</a>	<a href="#">Use Case 5.10.4: Craft inserts a plug-in card</a>
	<a href="#">ObjectInformation</a>	<a href="#">Use Case 5.10.5: Craft removes a plug-in card</a>
	<a href="#">ObjectInformation</a>	<a href="#">Use Case 5.10.6: Craft/EMS creates a Protection Group</a>
	<a href="#">ObjectInformation</a>	<a href="#">Use Case 5.3.1: EMS loses communication to a Network Element</a>
	<a href="#">ObjectInformation</a>	<a href="#">Use Case 5.4.5: EMS notifies NMS of inventory change</a>
39	<a href="#">PerformanceManager</a>	<a href="#">Use Case 5.11.1: NMS activates collection of Performance Monitoring Data (PMD) for a specified set of TPs</a>
	<a href="#">PerformanceManager</a>	<a href="#">Use Case 5.11.10: NMS disables Threshold Crossing Alerts (TCA) for a specified set of TPs</a>
	<a href="#">PerformanceManager</a>	<a href="#">Use Case 5.11.2: NMS deactivates collection of Performance Monitoring Data (PMD) for a specified set of TPs</a>
	<a href="#">PerformanceManager</a>	<a href="#">Use Case 5.11.3: NMS retrieves current Performance Monitoring Data (PMD) for a specified set of TPs</a>
	<a href="#">PerformanceManager</a>	<a href="#">Use Case 5.11.4: NMS retrieves the storage time of 24hr and 15min Performance Monitoring Data (PMD) records</a>
	<a href="#">PerformanceManager</a>	<a href="#">Use Case 5.11.5: NMS retrieves PM capabilities of a Managed Element (ME)</a>
	<a href="#">PerformanceManager</a>	<a href="#">Use Case 5.11.6: NMS retrieves historical Performance Monitoring Data (PMD) for a specified set of TPs</a>
	<a href="#">PerformanceManager</a>	<a href="#">Use Case 5.11.7: NMS sets PM thresholds on a TP</a>
	<a href="#">PerformanceManager</a>	<a href="#">Use Case 5.11.8: NMS retrieves PM threshold settings from a TP</a>
	<a href="#">PerformanceManager</a>	<a href="#">Use Case 5.11.9: NMS enables Threshold Crossing Alerts (TCA) for a specified set of TPs</a>
40	<a href="#">PerformanceMonitoringPoint</a>	

**Table 7.3: Use Case to UML Class Map**

	<b>UML Class</b>	<b>Use Case</b>
41	<a href="#">PhysicalTerminationPoint</a>	<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>
	<a href="#">PhysicalTerminationPoint</a>	<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>
	<a href="#">PhysicalTerminationPoint</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
	<a href="#">PhysicalTerminationPoint</a>	<a href="#">Use Case 5.5.3: NMS provisions the User Label</a>
	<a href="#">PhysicalTerminationPoint</a>	<a href="#">Use Case 5.5.4: NMS provisions the Owner</a>
	<a href="#">PhysicalTerminationPoint</a>	<a href="#">Use Case 5.5.6: NMS provisions the Native EMS Name</a>
42	<a href="#">PMCurrentData</a>	
43	<a href="#">PMData</a>	
44	<a href="#">PMHistoricData</a>	
45	<a href="#">PMHistoricMeasurement</a>	
46	<a href="#">PMMeasurement</a>	
47	<a href="#">PMPParameter</a>	
48	<a href="#">PMPStateChangeInformation</a>	
49	<a href="#">PMThreshold</a>	
50	<a href="#">ProtectionGroup</a>	<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>
	<a href="#">ProtectionGroup</a>	<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>
	<a href="#">ProtectionGroup</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
	<a href="#">ProtectionGroup</a>	<a href="#">Use Case 5.5.3: NMS provisions the User Label</a>
	<a href="#">ProtectionGroup</a>	<a href="#">Use Case 5.5.4: NMS provisions the Owner</a>
	<a href="#">ProtectionGroup</a>	<a href="#">Use Case 5.5.6: NMS provisions the Native EMS Name</a>
	<a href="#">ProtectionGroup</a>	<a href="#">Use Case 5.7.1: NMS retrieves all the Protection Groups of a Managed Element</a>
	<a href="#">ProtectionGroup</a>	<a href="#">Use Case 5.7.3: NMS retrieves the protection switch information for Equipment, Trail and SNC Protection</a>
51	<a href="#">ProtectionSwitch</a>	<a href="#">Use Case 5.7.2: Protection Switch Notification for Equipment, Trail and SNC Protection</a>
52	<a href="#">Route</a>	<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>
	<a href="#">Route</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
53	<a href="#">RouteCreateData</a>	
54	<a href="#">Session</a>	
55	<a href="#">SessionFactory</a>	<a href="#">Use Case 5.2.1: EMS (Re)starts</a>

**Table 7.3: Use Case to UML Class Map**

	<b>UML Class</b>	<b>Use Case</b>
56	<a href="#">SNCCreateData</a>	<a href="#">Use Case 5.14.1: NMS creates and activates an ATM Subnetwork Connection (SNC)</a>
	<a href="#">SNCCreateData</a>	<a href="#">Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)</a>
	<a href="#">SNCCreateData</a>	<a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a>
57	<a href="#">SNCModifyData</a>	
58	<a href="#">SNCRouteChangeData</a>	<a href="#">Use Case 5.6.10: EMS reroutes a Subnetwork Connection (SNC)</a>
59	<a href="#">SoftwareBackupStatus</a>	
60	<a href="#">SoftwareManager</a>	
61	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.14.1: NMS creates and activates an ATM Subnetwork Connection (SNC)</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.5.3: NMS provisions the User Label</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.5.4: NMS provisions the Owner</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.5.6: NMS provisions the Native EMS Name</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.6.1: NMS creates a Subnetwork Connection (SNC)</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.6.8: NMS deletes a Subnetwork Connection (SNC)</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)</a>
	<a href="#">Subnetwork</a>	<a href="#">Use Case 5.6.10: EMS reroutes a Subnetwork Connection (SNC)</a>

**Table 7.3: Use Case to UML Class Map**

	<b>UML Class</b>	<b>Use Case</b>
62	<a href="#">SubnetworkConnection</a>	<a href="#">Use Case 5.14.1: NMS creates and activates an ATM Subnetwork Connection (SNC)</a>
	<a href="#">SubnetworkConnection</a>	<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>
	<a href="#">SubnetworkConnection</a>	<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>
	<a href="#">SubnetworkConnection</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
	<a href="#">SubnetworkConnection</a>	<a href="#">Use Case 5.5.3: NMS provisions the User Label</a>
	<a href="#">SubnetworkConnection</a>	<a href="#">Use Case 5.5.4: NMS provisions the Owner</a>
	<a href="#">SubnetworkConnection</a>	<a href="#">Use Case 5.5.6: NMS provisions the Native EMS Name</a>
	<a href="#">SubnetworkConnection</a>	<a href="#">Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)</a>
	<a href="#">SubnetworkConnection</a>	<a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a>
	<a href="#">SubnetworkConnection</a>	<a href="#">Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)</a>
	<a href="#">SubnetworkConnection</a>	<a href="#">Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)</a>
63	<a href="#">Supplier</a>	<a href="#">Use Case 5.2.1: EMS (Re)starts</a>
	<a href="#">Supplier</a>	<a href="#">Use Case 5.4.5: EMS notifies NMS of inventory change</a>
64	<a href="#">SwitchData</a>	<a href="#">Use Case 5.7.3: NMS retrieves the protection switch information for Equipment, Trail and SNC Protection</a>
65	<a href="#">TCAParameter</a>	
66	<a href="#">TCAParameterProfile</a>	
67	<a href="#">TDCreateData</a>	
68	<a href="#">TerminationPoint</a>	
69	<a href="#">ThresholdCrossingAlertInformation</a>	<a href="#">Use Case 5.8.6: EMS Notifies NMS of Alarms or Threshold Crossing Alert (TCAs)</a>
70	<a href="#">TLCreateData</a>	
71	<a href="#">TopologicalLink</a>	<a href="#">Use Case 5.4.2: NMS resynchronizes its database with the EMS</a>
	<a href="#">TopologicalLink</a>	<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>
	<a href="#">TopologicalLink</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
	<a href="#">TopologicalLink</a>	<a href="#">Use Case 5.5.3: NMS provisions the User Label</a>
	<a href="#">TopologicalLink</a>	<a href="#">Use Case 5.5.4: NMS provisions the Owner</a>
	<a href="#">TopologicalLink</a>	<a href="#">Use Case 5.5.6: NMS provisions the Native EMS Name</a>

**Table 7.3: Use Case to UML Class Map**

	UML Class	Use Case
72	<a href="#">TPData</a>	<a href="#">Use Case 5.14.1: NMS creates and activates an ATM Subnetwork Connection (SNC)</a>
	<a href="#">TPData</a>	<a href="#">Use Case 5.6.2: NMS activates a Subnetwork Connection (SNC)</a>
	<a href="#">TPData</a>	<a href="#">Use Case 5.6.3: NMS creates and activates a Subnetwork Connection (SNC)</a>
	<a href="#">TPData</a>	<a href="#">Use Case 5.6.7: NMS deactivates a Subnetwork Connection (SNC)</a>
	<a href="#">TPData</a>	<a href="#">Use Case 5.6.9: NMS deactivates and deletes a Subnetwork Connection (SNC)</a>
73	<a href="#">TPPool</a>	<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>
	<a href="#">TPPool</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
	<a href="#">TPPool</a>	<a href="#">Use Case 5.5.3: NMS provisions the User Label</a>
	<a href="#">TPPool</a>	<a href="#">Use Case 5.5.4: NMS provisions the Owner</a>
	<a href="#">TPPool</a>	<a href="#">Use Case 5.5.6: NMS provisions the Native EMS Name</a>
74	<a href="#">TPPoolCreateData</a>	
75	<a href="#">TrafficDescriptor</a>	<a href="#">Use Case 5.13.2: NMS modifies a Traffic Descriptor (TD) on a VPCTP or VCCTP</a>
	<a href="#">TrafficDescriptor</a>	<a href="#">Use Case 5.13.1: NMS creates a Traffic Descriptor (TD)</a>
	<a href="#">TrafficDescriptor</a>	<a href="#">Use Case 5.13.3: NMS deletes a Traffic Descriptor (TD)</a>
	<a href="#">TrafficDescriptor</a>	<a href="#">Use Case 5.4.3: NMS discovers the EMS network inventory</a>
	<a href="#">TrafficDescriptor</a>	<a href="#">Use Case 5.4.4: NMS queries EMS concerning inventory</a>
	<a href="#">TrafficDescriptor</a>	<a href="#">Use Case 5.5.3: NMS provisions the User Label</a>
	<a href="#">TrafficDescriptor</a>	<a href="#">Use Case 5.5.4: NMS provisions the Owner</a>
	<a href="#">TrafficDescriptor</a>	<a href="#">Use Case 5.5.6: NMS provisions the Native EMS Name</a>
76	<a href="#">TransmissionDescriptor</a>	
77	<a href="#">TransmissionDescriptorCreateData</a>	
78	<a href="#">TransmissionParameters</a>	<a href="#">Use Case 5.5.7: NMS Provisions the TP Transmission Parameters</a>
	<a href="#">TransmissionParameters</a>	<a href="#">Use Case 5.5.8: NMS provisions alarm reporting on for a TP</a>
	<a href="#">TransmissionParameters</a>	<a href="#">Use Case 5.5.9: NMS provisions alarm reporting off for a TP</a>
79	<a href="#">Version</a>	<a href="#">Use Case 5.2.3: NMS retrieves the interface version used by the EMS</a>

## 7.4 Requirements by Category

### 7.4.1 Category I

Table 7.4 provides a mapping between the Category I requirements in [Section 4.1](#) and the UML Classes in [Section 6.1.1](#). There are some Category I requirements that do not have a corresponding UML Class, in these cases a comment has been added to summarize the requirement (these comments are in a **bold font**)

**Table 7.4: Category I requirements**

Requirement	UML Class or Comment
<a href="#">{Requirement I. 001}</a>	<a href="#">EMS</a>
<a href="#">{Requirement I. 002}</a>	<a href="#">ManagedElement</a>
<a href="#">{Requirement I. 003}</a>	<a href="#">ManagedElement</a>
<a href="#">{Requirement I. 004}</a>	<a href="#">TerminationPoint</a>
<a href="#">{Requirement I. 005}</a>	<a href="#">TerminationPoint</a>
<a href="#">{Requirement I. 006}</a>	<a href="#">ConnectionTerminationPoint</a>
<a href="#">{Requirement I. 007}</a>	<a href="#">PhysicalTerminationPoint</a>
<a href="#">{Requirement I. 008}</a>	<b>Edge Termination Point</b>
<a href="#">{Requirement I. 009}</a>	<a href="#">TPPool</a>
<a href="#">{Requirement I. 010}</a>	<a href="#">TopologicalLink</a>
<a href="#">{Requirement I. 011}</a>	<a href="#">TopologicalLink</a>
<a href="#">{Requirement I. 012}</a>	<a href="#">Subnetwork</a>
<a href="#">{Requirement I. 013}</a>	<a href="#">Subnetwork</a>
<a href="#">{Requirement I. 014}</a>	<a href="#">SubnetworkConnection</a>
<a href="#">{Requirement I. 015}</a>	<a href="#">SubnetworkConnection</a>
<a href="#">{Requirement I. 016}</a>	<b>SNC names must not be re-used.</b>
<a href="#">{Requirement I. 017}</a>	<b>SNC States</b>
<a href="#">{Requirement I. 018}</a>	<b>SNC Configurations</b>
<a href="#">{Requirement I. 019}</a>	<a href="#">CrossConnect</a>
<a href="#">{Requirement I. 020}</a>	<a href="#">CrossConnect</a>
<a href="#">{Requirement I. 021}</a>	<a href="#">Route</a>
<a href="#">{Requirement I. 022}</a>	<b>Layer rate</b>
<a href="#">{Requirement I. 023}</a>	<b>Connection states</b>
<a href="#">{Requirement I. 024}</a>	<b>TP Parameters</b>

**Table 7.4: Category I requirements**

<b>Requirement</b>	<b>UML Class or Comment</b>
<a href="#">{Requirement I. 025}</a>	<a href="#">TrafficDescriptor</a>
<a href="#">{Requirement I. 026}</a>	<b>TD Combinations</b>
<a href="#">{Requirement I. 027}</a>	<b>TD Service Category</b>
<a href="#">{Requirement I. 028}</a>	<b>TD Conformance Profile</b>
<a href="#">{Requirement I. 029}</a>	<b>TD Parameters</b>
<a href="#">{Requirement I. 030}</a>	<a href="#">Version</a>
<a href="#">{Requirement I. 031}</a>	<b>Interface versioning</b>
<a href="#">{Requirement I. 032}</a>	<a href="#">Equipment</a>
<a href="#">{Requirement I. 033}</a>	<a href="#">EquipmentHolder</a>
<a href="#">{Requirement I. 034}</a>	<a href="#">ProtectionGroup</a>
<a href="#">{Requirement I. 035}</a>	<a href="#">TCAParameter</a>
<a href="#">{Requirement I. 036}</a>	<b>PTP naming</b>
<a href="#">{Requirement I. 037}</a>	<b>CTP naming</b>
<a href="#">{Requirement I. 038}</a>	<b>Subnetwork type</b>
<a href="#">{Requirement I. 039}</a>	<b>SNC configurations</b>
<a href="#">{Requirement I. 040}</a>	<b>SNC types</b>
<a href="#">{Requirement I. 041}</a>	<b>Event Notifications</b>
<a href="#">{Requirement I. 042}</a>	<b>Object Creation Notification</b>
<a href="#">{Requirement I. 043}</a>	<b>Object Deletion Notification</b>
<a href="#">{Requirement I. 044}</a>	<b>Attribute Value Change Notification</b> <a href="#">Attribute</a>
<a href="#">{Requirement I. 045}</a>	<b>State Change Notification</b> <a href="#">Attribute</a>
<a href="#">{Requirement I. 046}</a>	<b>Protection Switch Notification</b> <a href="#">ProtectionSwitch</a>
<a href="#">{Requirement I. 047}</a>	<b>Threshold Crossing Alert Notification</b> <a href="#">ThresholdCrossingAlertInformation</a>
<a href="#">{Requirement I. 048}</a>	<b>Alarm Notification</b> <a href="#">AlarmInformation</a>
<a href="#">{Requirement I. 049}</a>	<b>Alarm - Probable Cause Qualifier</b>
<a href="#">{Requirement I. 050}</a>	<b>Alarm - Clearable</b>
<a href="#">{Requirement I. 051}</a>	<b>Alarm - Probable Cause</b>

**Table 7.4: Category I requirements**

Requirement	UML Class or Comment
<a href="#">(Requirement I. 052)</a>	<b>Alarm - Perceived severity</b>
<a href="#">(Requirement I. 053)</a>	<b>Alarm - Service affecting</b>
<a href="#">(Requirement I. 054)</a>	<b>Alarm - Alarm indication</b>
<a href="#">(Requirement I. 055)</a>	Deleted - replaced with an update to <a href="#">(Requirement I. 048)</a> .
<a href="#">(Requirement I. 056)</a>	<b>Alarm - Additional text</b>
<a href="#">(Requirement I. 057)</a>	<b>AID</b>
<a href="#">(Requirement I. 058)</a>	<b>File Transfer Status Notification</b> <a href="#">FileTransferStatus</a>
<a href="#">(Requirement I. 059)</a>	<b>Route Change Notification</b> <a href="#">SNCRouteChangeData</a>
<a href="#">(Requirement I. 060)</a>	<a href="#">CommonResourceInfo</a>
<a href="#">(Requirement I. 061)</a>	<a href="#">EMS</a>
<a href="#">(Requirement I. 062)</a>	<a href="#">ConnectionTerminationPoint</a>
<a href="#">(Requirement I. 063)</a>	<a href="#">TrafficDescriptor</a>
<a href="#">(Requirement I. 064)</a>	<a href="#">Equipment</a>
<a href="#">(Requirement I. 065)</a>	<a href="#">EquipmentHolder</a>
<a href="#">(Requirement I. 066)</a>	<a href="#">ProtectionGroup</a>
<a href="#">(Requirement I. 067)</a>	<a href="#">TCAPerParameterProfile</a>
<a href="#">(Requirement I. 068)</a>	<a href="#">Event</a>
<a href="#">(Requirement I. 069)</a>	<a href="#">GroupTerminationPoint</a>
<a href="#">(Requirement I. 070)</a>	<a href="#">GroupTerminationPoint</a>
<a href="#">(Requirement I. 071)</a>	<b>Alarm - Acknowledgement</b>
<a href="#">(Requirement I. 072)</a>	<a href="#">EquipmentProtectionGroup</a>
<a href="#">(Requirement I. 073)</a>	<a href="#">EquipmentProtectionGroup</a>
<a href="#">(Requirement I. 074)</a>	<a href="#">EProtectionSwitch</a>
<a href="#">(Requirement I. 075)</a>	<a href="#">FloatingTerminationPoint</a>
<a href="#">(Requirement I. 076)</a>	<b>Bundled SNC</b>
<a href="#">(Requirement I. 077)</a>	<a href="#">HeartbeatInformation</a>
<a href="#">(Requirement I. 078)</a>	<a href="#">TransmissionDescriptor</a>
<a href="#">(Requirement I. 079)</a>	<a href="#">TransmissionDescriptor</a>
<a href="#">(Requirement I. 080)</a>	<a href="#">AlarmSeverityAssignmentProfile</a>

**Table 7.4: Category I requirements**

Requirement	UML Class or Comment
<a href="#">{Requirement I. 081}</a>	<a href="#">AlarmSeverityAssignmentProfile</a>
<a href="#">{Requirement I. 082}</a>	<b>Alarm Severity Assignment</b>
<a href="#">{Requirement I. 083}</a>	<a href="#">PMPStateChangeInformation</a>
<a href="#">{Requirement I. 084}</a>	<a href="#">PerformanceMonitoringPoint</a>
<a href="#">{Requirement I. 085}</a>	<a href="#">PerformanceMonitoringPoint</a>
<a href="#">{Requirement I. 086}</a>	<a href="#">SoftwareBackupStatus</a>
<a href="#">{Requirement I. 087}</a>	<a href="#">TCAParameterProfile</a>
<a href="#">{Requirement I. 088}</a>	<a href="#">TCAParameter</a>
<a href="#">{Requirement I. 089}</a>	<a href="#">Route</a>
<a href="#">{Requirement I. 090}</a>	<a href="#">Log</a>
<a href="#">{Requirement I. 091}</a>	<a href="#">Log</a>
<a href="#">{Requirement I. 092}</a>	<b>SNC end point role</b>
<a href="#">{Requirement I. 093}</a>	<a href="#">EventInformation</a>
<a href="#">{Requirement I. 094}</a>	<a href="#">TPPool</a>
<a href="#">{Requirement I. 095}</a>	<a href="#">LogAVC</a>
<a href="#">{Requirement I. 096}</a>	<a href="#">LogCapacityThresholdAlarm</a>
<a href="#">{Requirement I. 097}</a>	<a href="#">LogProcessingErrorAlarm</a>
<a href="#">{Requirement I. 098}</a>	<a href="#">LogStateChange</a>
<a href="#">{Requirement I. 099}</a>	<a href="#">PMThreshold</a>

#### 7.4.2 Category II

[Table 7.5](#) provides a mapping between the Category I requirements in [Section 4.2](#), the Use Cases in [Section 5](#) and the UML Class operations in [Section 6.1.1](#). There are some Category II requirements that do not have a corresponding UML Class operation, in these cases a comment has been added to summarize the requirement (these comments are in a **bold font**). In some cases the comments take the form of a suggested UML Class operation name that would be required to meet the requirement (these comments are in a **bold red font**).

**Table 7.5: Category II requirements**

Requirement	Use Case	UML Class Operation or Comment
<a href="#">{Requirement II. 001}</a>	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a>	<a href="#">EMS::getEMS</a>
<a href="#">{Requirement II. 002}</a>	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">EMS::getAllManagedElements</a>

**Table 7.5: Category II requirements**

Requirement	Use Case	UML Class Operation or Comment
{Requirement II. 003}		<a href="#">EMS</a> ::getAllManagedElementNames
{Requirement II. 004}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">Subnetwork</a> ::getAllManagedElements
{Requirement II. 005}		<a href="#">Subnetwork</a> ::getAllManagedElementNames
{Requirement II. 006}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">EMS</a> ::getManagedElementByName
{Requirement II. 007}		Deleted - requirement was already covered by <a href="#">{Requirement II. 011}</a>
{Requirement II. 008}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">EMS</a> ::getMultiLayerSubnetwork
{Requirement II. 009}		<a href="#">ManagedElement</a> ::getContainingSubnetworkNames
{Requirement II. 010}		<a href="#">EMS</a> ::getAllTopLevelSubnetworkNames
{Requirement II. 011}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">EMS</a> ::getAllTopLevelSubnetworks
{Requirement II. 012}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">EMS</a> ::getAllTopLevelTopologicalLinks
{Requirement II. 013}		<a href="#">EMS</a> ::getAllTopLevelTopologicalLinkNames
{Requirement II. 014}		<a href="#">EMS</a> ::getTopLevelTopologicalLink
{Requirement II. 015}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">Subnetwork</a> ::getAllTopologicalLinks
{Requirement II. 016}		<a href="#">Subnetwork</a> ::getAllTopologicalLinkNames
{Requirement II. 017}		<a href="#">Subnetwork</a> ::getTopologicalLink
{Requirement II. 018}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">Subnetwork</a> ::getAllSubnetworkConnections
{Requirement II. 019}		<a href="#">Subnetwork</a> ::getAllSubnetworkConnectionNames
{Requirement II. 020}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">Subnetwork</a> ::getAllSubnetworkConnections
{Requirement II. 021}		<a href="#">Subnetwork</a> ::getAllSubnetworkConnectionNames
{Requirement II. 022}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">Subnetwork</a> ::getAllSubnetworkConnectionsWithTP
{Requirement II. 023}		<a href="#">Subnetwork</a> ::getAllSubnetworkConnectionNamesWithTP
{Requirement II. 024}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">Subnetwork</a> ::getSNC

**Table 7.5: Category II requirements**

<b>Requirement</b>	<b>Use Case</b>	<b>UML Class Operation or Comment</b>
<a href="#">{Requirement II. 025}</a>		<a href="#">Subnetwork</a> ::getSNCsByUserLabel
<a href="#">{Requirement II. 026}</a>	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">SubnetworkConnection</a> ::getRoute
<a href="#">{Requirement II. 027}</a>		<a href="#">ManagedElement</a> ::getTP
<a href="#">{Requirement II. 028}</a>		<a href="#">TPPool</a> ::getTPGroupingRelationships
<a href="#">{Requirement II. 029}</a>		<a href="#">TrafficDescriptor</a> ::getAssociatedCTPs
<a href="#">{Requirement II. 030}</a>		<a href="#">TerminationPoint</a> ::getTPGroupingRelationships
<a href="#">{Requirement II. 031}</a>	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a>	<a href="#">Subnetwork</a> ::getAllTPPools
<a href="#">{Requirement II. 032}</a>		<a href="#">Subnetwork</a> ::getAllTPPoolNames
<a href="#">{Requirement II. 033}</a>	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">ManagedElement</a> ::getAllPTPsWithoutFTPs
<a href="#">{Requirement II. 034}</a>		<a href="#">ManagedElement</a> ::getAllPTPNamesWithoutFTPs
<a href="#">{Requirement II. 035}</a>		<a href="#">ManagedElement</a> ::getAllPTPsWithoutFTPs
<a href="#">{Requirement II. 036}</a>		<a href="#">ManagedElement</a> ::getAllPTPNamesWithoutFTPs
<a href="#">{Requirement II. 037}</a>		<a href="#">Subnetwork</a> ::getAllEdgePoints
<a href="#">{Requirement II. 038}</a>		<a href="#">Subnetwork</a> ::getAllEdgePointNames
<a href="#">{Requirement II. 039}</a>		<a href="#">Subnetwork</a> ::getAllEdgePoints
<a href="#">{Requirement II. 040}</a>	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">Subnetwork</a> ::getAllEdgePointNames
<a href="#">{Requirement II. 041}</a>	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a>	<a href="#">TerminationPoint</a> ::getContainedPotentialCTPs
<a href="#">{Requirement II. 042}</a>		<a href="#">TerminationPoint</a> ::getContainedPotentialCTPNames
<a href="#">{Requirement II. 043}</a>	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a>	<a href="#">TerminationPoint</a> ::getContainedCurrentCTPs
<a href="#">{Requirement II. 044}</a>		<a href="#">TerminationPoint</a> ::getContainedCurrentCTPNames
<a href="#">{Requirement II. 045}</a>		<a href="#">TerminationPoint</a> ::getContainedInUseCTPs
<a href="#">{Requirement II. 046}</a>		<a href="#">TerminationPoint</a> ::getContainedInUseCTPNames
<a href="#">{Requirement II. 047}</a>	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">ConnectionTerminationPoint</a> ::getContainingTPs
<a href="#">{Requirement II. 048}</a>		<a href="#">ConnectionTerminationPoint</a> ::getContainingTPsNames
<a href="#">{Requirement II. 049}</a>		<a href="#">Subnetwork</a> ::getAssociatedTP

**Table 7.5: Category II requirements**

Requirement	Use Case	UML Class Operation or Comment
{Requirement II. 050}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">Equipment</a> ::getSupportedPTPs
{Requirement II. 051}		<a href="#">Equipment</a> ::getSupportedPTPNames
{Requirement II. 052}		<a href="#">PhysicalTerminationPoint</a> ::getAllSupportingEquipment
{Requirement II. 053}		<a href="#">PhysicalTerminationPoint</a> ::getAllSupportingEquipmentNames
{Requirement II. 054}	<a href="#">Use Case 5.11.5:</a>	<a href="#">PerformanceManager</a> ::getMEPMCapabilities
{Requirement II. 055}	<a href="#">Use Case 5.11.8:</a>	<a href="#">TerminationPoint</a> ::getTCAParameter
{Requirement II. 056}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">ManagedElement</a> ::getAllEquipment <a href="#">ManagedElement</a> ::getEquipment
{Requirement II. 057}		<a href="#">ManagedElement</a> ::getAllEquipmentNames
{Requirement II. 058}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.4:</a>	<a href="#">EquipmentHolder</a> ::getContainedEquipment
{Requirement II. 059}	<a href="#">Use Case 5.10.6:</a> <a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a> <a href="#">Use Case 5.7.1:</a>	<a href="#">ManagedElement</a> ::getAllProtectionGroups
{Requirement II. 060}	<a href="#">Use Case 5.4.2:</a> <a href="#">Use Case 5.4.3:</a>	<a href="#">EMS</a> ::getAllTrafficDescriptors
{Requirement II. 061}		<a href="#">EMS</a> ::getAllTrafficDescriptorNames
{Requirement II. 062}		<a href="#">EMS</a> ::getTrafficDescriptorByName
{Requirement II. 063}		<a href="#">ManagedElement</a> ::getAllCrossConnections
{Requirement II. 064}	<a href="#">Use Case 5.10.2:</a> <a href="#">Use Case 5.10.4:</a> <a href="#">Use Case 5.10.6:</a> <a href="#">Use Case 5.4.1:</a> <a href="#">Use Case 5.4.5:</a>	<b>Object Creation Notifications.</b>
{Requirement II. 065}	<a href="#">Use Case 5.10.3:</a> <a href="#">Use Case 5.10.5:</a> <a href="#">Use Case 5.4.1:</a> <a href="#">Use Case 5.4.5:</a>	<b>Object Deletion Notifications.</b>
{Requirement II. 066}	<a href="#">Use Case 5.10.1:</a> <a href="#">Use Case 5.4.1:</a> <a href="#">Use Case 5.4.5:</a>	<b>Attribute Value Change Notifications.</b>

**Table 7.5: Category II requirements**

Requirement	Use Case	UML Class Operation or Comment
{Requirement II. 067}	<a href="#">Use Case 5.10.2:</a> <a href="#">Use Case 5.10.3:</a> <a href="#">Use Case 5.10.4:</a> <a href="#">Use Case 5.10.5:</a> <a href="#">Use Case 5.3.1:</a> <a href="#">Use Case 5.4.1:</a> <a href="#">Use Case 5.4.5:</a>	<b>State Change Notifications.</b>
{Requirement II. 068}	<a href="#">Use Case 5.5.1:</a>	<a href="#">ConnectionTerminationPoint::terminateAndMap</a>
{Requirement II. 069}	<a href="#">Use Case 5.5.2:</a>	<a href="#">ConnectionTerminationPoint::unTerminateAndUnmap</a>
{Requirement II. 070}		Deleted - requirement was already covered by <a href="#">{Requirement II. 066}</a> .
{Requirement II. 071}		<a href="#">ConnectionTerminationPoint::getTPMappingMode</a>
{Requirement II. 072}	<a href="#">Use Case 5.5.7:</a>	<a href="#">TransmissionParameters::setTransmissionParameters</a>
{Requirement II. 073}		<a href="#">ConnectionTerminationPoint::terminateAndMap</a>
{Requirement II. 074}	<a href="#">Use Case 5.13.2:</a>	<a href="#">ConnectionTerminationPoint::associateWithTrafficDescriptor</a>
{Requirement II. 075}	<a href="#">Use Case 5.5.3:</a>	<a href="#">CommonResourceInfo::setUserLabel</a>
{Requirement II. 076}	<a href="#">Use Case 5.5.4:</a>	<a href="#">CommonResourceInfo::setOwner</a>
{Requirement II. 077}	<a href="#">Use Case 5.5.6:</a>	<a href="#">CommonResourceInfo::setNativeEmsName</a>
{Requirement II. 078}	<a href="#">Use Case 5.9.3:</a> <a href="#">Use Case 5.9.4:</a>	<a href="#">Equipment::setAlarmReportingOff</a> <a href="#">Equipment::setAlarmReportingOn</a>
{Requirement II. 079}		<a href="#">EquipmentHolder::setAlarmReportingOff</a> <a href="#">EquipmentHolder::setAlarmReportingOn</a>
{Requirement II. 080}		<b>Create an SNC with a specific Route.</b>
{Requirement II. 081}		Deleted - requirement was already covered by <a href="#">{Requirement II. 067}</a> .
{Requirement II. 082}	<a href="#">Use Case 5.6.1:</a>	<a href="#">Subnetwork::createSNC</a>
{Requirement II. 083}	<a href="#">Use Case 5.6.1:</a>	<a href="#">Subnetwork::createSNC</a>
{Requirement II. 084}	<a href="#">Use Case 5.6.1:</a> <a href="#">Use Case 5.6.10:</a>	<a href="#">SNCCreateData</a>
{Requirement II. 085}		<a href="#">Subnetwork::checkValidSNC</a>
{Requirement II. 086}	<a href="#">Use Case 5.6.2:</a>	<a href="#">Subnetwork::activateSNC</a>
{Requirement II. 087}	<a href="#">Use Case 5.6.2:</a>	<b>SNC Activation Data.</b>
{Requirement II. 088}	<a href="#">Use Case 5.6.3:</a> <a href="#">Use Case 5.14.1:</a>	<a href="#">Subnetwork::createAndActivateSNC</a>
{Requirement II. 089}	<a href="#">Use Case 5.14.1:</a> <a href="#">Use Case 5.6.3:</a>	<b>SNC Creation and Activation Data.</b>
{Requirement II. 090}	<a href="#">Use Case 5.6.7:</a>	<a href="#">Subnetwork::deactivateSNC</a>

**Table 7.5: Category II requirements**

Requirement	Use Case	UML Class Operation or Comment
<a href="#">{Requirement II. 091}</a>	<a href="#">Use Case 5.6.7:</a>	<b>SNC Deactivation Data.</b>
<a href="#">{Requirement II. 092}</a>	<a href="#">Use Case 5.6.8:</a>	<a href="#">Subnetwork</a> ::deleteSNC
<a href="#">{Requirement II. 093}</a>	<a href="#">Use Case 5.6.8:</a>	<b>SNC Deletion Data.</b>
<a href="#">{Requirement II. 094}</a>	<a href="#">Use Case 5.6.9:</a>	<a href="#">Subnetwork</a> ::deactivateAndDeleteSNC
<a href="#">{Requirement II. 095}</a>	<a href="#">Use Case 5.6.9:</a>	<b>SNC Deactivation and Deletion Data.</b>
<a href="#">{Requirement II. 096}</a>		<a href="#">Subnetwork</a> ::deactivateAndDeleteSNC
<a href="#">{Requirement II. 097}</a>	<a href="#">Use Case 5.13.1:</a>	<a href="#">EMS</a> ::createTrafficDescriptor
<a href="#">{Requirement II. 098}</a>	<a href="#">Use Case 5.13.1:</a>	<a href="#">TDCreateData</a>
<a href="#">{Requirement II. 099}</a>	<a href="#">Use Case 5.13.3:</a>	<a href="#">EMS</a> ::deleteTrafficDescriptor
<a href="#">{Requirement II. 100}</a>	<a href="#">Use Case 5.6.11:</a>	<a href="#">EMS</a> ::getCapabilities
<a href="#">{Requirement II. 101}</a>		<b>NMS shall be able to subscribe to non-EMS alarms.</b>
<a href="#">{Requirement II. 102}</a>		<b>NMS shall be able to subscribe to EMS alarms.</b>
<a href="#">{Requirement II. 103}</a>	<a href="#">Use Case 5.8.3:</a>	<b>Alarm filtering - ability to create filters.</b>
<a href="#">{Requirement II. 104}</a>		<b>Alarm filtering - ability to specify filter behavior.</b>
<a href="#">{Requirement II. 105}</a>		<b>Multiple NMS shall be able to subscribe to alarms.</b>
<a href="#">{Requirement II. 106}</a>		<b>NMS shall be able to un-subscribe to alarms.</b>
<a href="#">{Requirement II. 107}</a>		<b>NMS shall be able to un-subscribe to alarms based on filter criteria.</b>
<a href="#">{Requirement II. 108}</a>	<a href="#">Use Case 5.5.8:</a>	<a href="#">TransmissionParameters</a> ::setTransmissionParameters
<a href="#">{Requirement II. 109}</a>	<a href="#">Use Case 5.5.9:</a>	<a href="#">TransmissionParameters</a> ::setTransmissionParameters
<a href="#">{Requirement II. 110}</a>	<a href="#">Use Case 5.8.2:</a>	<a href="#">ManagedElement</a> ::getAllActiveAlarms
<a href="#">{Requirement II. 111}</a>	<a href="#">Use Case 5.8.1:</a>	<a href="#">EMS</a> ::getAllEMSSystemActiveAlarms
<a href="#">{Requirement II. 112}</a>	<a href="#">Use Case 5.10.6:</a>	<a href="#">ManagedElement</a> ::getProtectionGroup
<a href="#">{Requirement II. 113}</a>		Deleted - requirement was already covered by <a href="#">{Requirement II. 059}</a>
<a href="#">{Requirement II. 114}</a>	<a href="#">Use Case 5.7.3:</a>	<a href="#">ProtectionGroup</a> ::retrieveSwitchData
<a href="#">{Requirement II. 115}</a>	<a href="#">Use Case 5.7.2:</a> <a href="#">Use Case 5.7.4:</a>	<b>EMS shall send Protection Switch Notifications.</b>
<a href="#">{Requirement II. 116}</a>	<a href="#">Use Case 5.7.5:</a>	<a href="#">ConnectionTerminationPoint</a> ::performProtectionCommand <a href="#">ProtectionGroup</a> ::performProtectionCommand
<a href="#">{Requirement II. 117}</a>		<a href="#">ConnectionTerminationPoint</a> ::retrieveSwitchData <a href="#">ProtectionGroup</a> ::retrieveSwitchData
<a href="#">{Requirement II. 118}</a>		<b>Monitor and collect PM parameters</b>
<a href="#">{Requirement II. 119}</a>		<b>Monitor and collect PM parameters on a TP basis.</b>

**Table 7.5: Category II requirements**

Requirement	Use Case	UML Class Operation or Comment
{Requirement II. 120}		<b>Enable and disable PM on SNC endpoints.</b>
{Requirement II. 121}	<a href="#">Use Case 5.11.1:</a> <a href="#">Use Case 5.11.2:</a>	<a href="#">PerformanceManager</a> ::disablePMData <a href="#">PerformanceManager</a> ::enablePMData
{Requirement II. 122}	<a href="#">Use Case 5.11.10:</a> <a href="#">Use Case 5.11.10:</a> <a href="#">Use Case 5.11.9:</a>	<a href="#">PerformanceManager</a> ::disableTCA <a href="#">PerformanceManager</a> ::enableTCA
{Requirement II. 123}		Deleted - replaced with <a href="#">{Requirement II. 221}</a> and <a href="#">{Requirement II. 222}</a> .
{Requirement II. 124}	<a href="#">Use Case 5.11.4:</a>	<a href="#">PerformanceManager</a> ::getHoldingTime
{Requirement II. 125}	<a href="#">Use Case 5.11.7:</a>	<a href="#">TerminationPoint</a> ::setTCAParameter
{Requirement II. 126}	<a href="#">Use Case 5.11.9:</a> <a href="#">Use Case 5.8.6:</a>	<b>EMS shall send TCA Notifications.</b>
{Requirement II. 127}		Deleted - duplicate of <a href="#">{Requirement II. 055}</a>
{Requirement II. 128}	<a href="#">Use Case 5.11.6:</a>	<a href="#">PerformanceManager</a> ::getHistoryPMData
{Requirement II. 129}	<a href="#">Use Case 5.11.6:</a>	<a href="#">PerformanceManager</a> ::getHistoryPMData
{Requirement II. 130}	<a href="#">Use Case 5.11.6:</a>	<a href="#">PerformanceManager</a> ::getHistoryPMData
{Requirement II. 131}	<a href="#">Use Case 5.11.3:</a>	<a href="#">PerformanceManager</a> ::getAllCurrentPMData
{Requirement II. 132}	<a href="#">Use Case 5.11.1:</a>	<a href="#">PerformanceManager</a> ::clearPMData
{Requirement II. 133}	<a href="#">Use Case 5.10.4:</a>	<b>Get actual equipment configuration</b>
{Requirement II. 134}	<a href="#">Use Case 5.10.4:</a>	<b>Identify equipment mismatch configurations.</b>
{Requirement II. 135}		<b>Get installed equipment information.</b>
{Requirement II. 136}	<a href="#">Use Case 5.9.2:</a>	<a href="#">EquipmentHolder</a> ::provisionEquipment
{Requirement II. 137}		<a href="#">TerminationPoint</a> ::performMaintenanceOperation
{Requirement II. 138}		<a href="#">ManagedElement</a> ::getActiveMaintenanceOperations <a href="#">TerminationPoint</a> ::getActiveMaintenanceOperations
{Requirement II. 139}	<a href="#">Use Case 5.2.2:</a> <a href="#">Use Case 5.2.4:</a> <a href="#">Use Case 5.2.5:</a>	<b>Identification of NMS.</b>
{Requirement II. 140}	<a href="#">Use Case 5.2.2:</a> <a href="#">Use Case 5.2.4:</a> <a href="#">Use Case 5.2.5:</a>	<b>Authentication of NMS.</b>
{Requirement II. 141}		<a href="#">SessionFactory</a> ::getSession
{Requirement II. 142}		<b>Establish multiple sessions.</b>
{Requirement II. 143}		<b>Terminate a session.</b>
{Requirement II. 144}	<a href="#">Use Case 5.2.2:</a>	<b>Detect security violations.</b>

**Table 7.5: Category II requirements**

Requirement	Use Case	UML Class Operation or Comment
{Requirement II. 145}	<a href="#">Use Case 5.2.2:</a> <a href="#">Use Case 5.2.6:</a> <a href="#">Use Case 5.2.7:</a>	<b>Detect communication failures.</b>
{Requirement II. 146}		<a href="#">EMS</a> ::getCapabilities
{Requirement II. 147}		<a href="#">EMS</a> ::launchGCT
{Requirement II. 148}		<b>GCT</b>
{Requirement II. 149}		<b>GCT</b>
{Requirement II. 150}	<a href="#">Use Case 5.12.1:</a>	<b>GCT</b>
{Requirement II. 151}	<a href="#">Use Case 5.12.2:</a> <a href="#">Use Case 5.12.3:</a>	<a href="#">EMS</a> ::getGCTProfileInfo
{Requirement II. 152}	<a href="#">Use Case 5.12.3:</a>	<a href="#">EMS</a> ::destroyGCT
{Requirement II. 153}		<a href="#">Subnetwork</a> ::createSNC
{Requirement II. 154}	<a href="#">Use Case 5.8.10:</a> <a href="#">Use Case 5.8.11:</a>	<a href="#">EMS</a> ::getAllEMSSystemActiveAlarms
{Requirement II. 155}	<a href="#">Use Case 5.8.7:</a>	<a href="#">EMS</a> ::acknowledgeAlarms
{Requirement II. 156}	<a href="#">Use Case 5.8.8:</a>	<a href="#">EMS</a> ::unacknowledgeAlarms
{Requirement II. 157}	<a href="#">Use Case 5.8.7:</a> <a href="#">Use Case 5.8.9:</a>	<b>Subscribe to an acknowledged alarm.</b>
{Requirement II. 158}	<a href="#">Use Case 5.8.8:</a>	<b>Subscribe to an unacknowledged alarm.</b>
{Requirement II. 159}		<a href="#">SubnetworkConnection</a> ::setAlarmReportingOn
{Requirement II. 160}		<a href="#">SubnetworkConnection</a> ::setAlarmReportingOff
{Requirement II. 161}		<a href="#">TopologicalLink</a> ::setAlarmReportingOn
{Requirement II. 162}		<a href="#">TopologicalLink</a> ::setAlarmReportingOff
{Requirement II. 163}	<a href="#">Use Case 5.11.11:</a>	<a href="#">PerformanceManager</a> ::getTPHistoryPMData
{Requirement II. 164}		<a href="#">ManagedElement</a> ::createGroupTerminationPoint
{Requirement II. 165}		<b>GTP Creation Data.</b>
{Requirement II. 166}		<a href="#">ManagedElement</a> ::deleteGroupTerminationPoint
{Requirement II. 167}		<a href="#">ManagedElement</a> ::modifyGroupTerminationPoint
{Requirement II. 168}	<a href="#">Use Case 5.5.10:</a>	<a href="#">EMS</a> ::createTopologicalLink
{Requirement II. 169}		<a href="#">TLCREATEData</a>
{Requirement II. 170}	<a href="#">Use Case 5.5.11:</a>	<a href="#">EMS</a> ::deleteTopologicalLink
{Requirement II. 171}		<a href="#">ManagedElement</a> ::getAllGroupTerminationPoints

**Table 7.5: Category II requirements**

Requirement	Use Case	UML Class Operation or Comment
{Requirement II. 172}		<a href="#">ManagedElement::getAllGroupTerminationPointNames</a>
{Requirement II. 173}		<a href="#">ManagedElement::getGroupTerminationPoint</a>
{Requirement II. 174}	<a href="#">Use Case 5.7.1:</a>	<a href="#">ManagedElement::getAllEProtectionGroups</a>
{Requirement II. 175}	<a href="#">Use Case 5.7.2: Use Case 5.7.3:</a>	<a href="#">ESwitchData</a> <a href="#">EquipmentProtectionGroup::retrieveESwitchData</a> <a href="#">ManagedElement::getEProtectionGroup</a>
{Requirement II. 176}		<b>Determine active Equipment in Protection Group.</b>
{Requirement II. 177}	<a href="#">Use Case 5.8.12: Use Case 5.8.13:</a>	<a href="#">NMSSession::eventLossOccurred</a> <a href="#">NMSSession::eventLossCleared</a> <a href="#">NMSSession::alarmLossOccurred</a>
{Requirement II. 178}	<a href="#">Use Case 5.8.14:</a>	<b>Event Channel availability.</b>
{Requirement II. 179}		<a href="#">Subnetwork::getAllFixedSubnetworkConnections</a>
{Requirement II. 180}		<a href="#">Subnetwork::getAllFixedSubnetworkConnectionNames</a>
{Requirement II. 181}		<a href="#">Subnetwork::getAllFixedSubnetworkConnectionsWithTP</a>
{Requirement II. 182}		<a href="#">Subnetwork::getAllFixedSubnetworkConnectionNamesWithTP</a>
{Requirement II. 183}		<a href="#">ManagedElement::getAllFixedCrossConnections</a>
{Requirement II. 184}		<a href="#">ConnectionTerminationPoint::getAssociatedGroupTerminationPoint</a>
{Requirement II. 185}		<a href="#">TerminationPoint::getPotentialFixedCCs</a>
{Requirement II. 186}		<a href="#">TransmissionDescriptor::getAssociatedTPs</a>
{Requirement II. 187}		<a href="#">EMS::getAllTransmissionDescriptors</a>
{Requirement II. 188}		<a href="#">EMS::getAllTransmissionDescriptorNames</a>
{Requirement II. 189}		<a href="#">EMS::getTransmissionDescriptorByName</a>
{Requirement II. 190}	<a href="#">Use Case 5.5.12:</a>	<a href="#">EMS::createTransmissionDescriptor</a>
{Requirement II. 191}		<a href="#">TransmissionDescriptorCreateData</a>
{Requirement II. 192}	<a href="#">Use Case 5.5.14:</a>	<a href="#">EMS::deleteTransmissionDescriptor</a>
{Requirement II. 193}		<a href="#">CommonResourceInfo::setNetworkAccessDomain</a>
{Requirement II. 194}	<a href="#">Use Case 5.5.13:</a>	<a href="#">TerminationPoint::setTransmissionDescriptorAssociation</a>
{Requirement II. 195}		<a href="#">SwitchData</a>
{Requirement II. 196}		<a href="#">EMS::createASAP</a>
{Requirement II. 197}		<a href="#">ASAPCreateModifyData</a>
{Requirement II. 198}		<a href="#">EMS::modifyASAP</a>
{Requirement II. 199}		<b>ASAP Modification Data.</b>

**Table 7.5: Category II requirements**

Requirement	Use Case	UML Class Operation or Comment
<a href="#">Requirement II. 200}</a>		<a href="#">EMS</a> ::deleteASAP
<a href="#">Requirement II. 201}</a>	<a href="#">Use Case 5.5.21:</a>	<a href="#">EMS</a> ::assignASAP
<a href="#">Requirement II. 202}</a>		<b>ASAP Assignment Data.</b>
<a href="#">Requirement II. 203}</a>		<a href="#">EMS</a> ::deassignASAP
<a href="#">Requirement II. 204}</a>		<b>ASAP Deassignment Data.</b>
<a href="#">Requirement II. 205}</a>		<a href="#">EMS</a> ::getAllASAPs
<a href="#">Requirement II. 206}</a>		<a href="#">EMS</a> ::getAllASAPNames
<a href="#">Requirement II. 207}</a>		<a href="#">EMS</a> ::getASAP
<a href="#">Requirement II. 208}</a>		<a href="#">EMS</a> ::getASAPByResource
<a href="#">Requirement II. 209}</a>		<a href="#">AlarmSeverityAssignmentProfile</a> ::getASAPAssociatedResourceNames
<a href="#">Requirement II. 210}</a>		<a href="#">ManagedElement</a> ::getAllFTPs
<a href="#">Requirement II. 211}</a>		<a href="#">ManagedElement</a> ::getAllFTPNames
<a href="#">Requirement II. 212}</a>		<a href="#">ManagedElement</a> ::getAllFTPs
<a href="#">Requirement II. 213}</a>		<a href="#">ManagedElement</a> ::getAllFTPNames
<a href="#">Requirement II. 214}</a>		<a href="#">ManagedElement</a> ::getAllPTPs
<a href="#">Requirement II. 215}</a>		<a href="#">ManagedElement</a> ::getAllPTPNames
<a href="#">Requirement II. 216}</a>		<a href="#">ManagedElement</a> ::getAllPTPs
<a href="#">Requirement II. 217}</a>		<a href="#">ManagedElement</a> ::getAllPTPNames
<a href="#">Requirement II. 218}</a>		<a href="#">SubnetworkConnection</a> ::getRouteAndTopologicalLinks
<a href="#">Requirement II. 219}</a>		<a href="#">GroupTerminationPoint</a> ::setAlarmReportingOn
<a href="#">Requirement II. 220}</a>		<a href="#">GroupTerminationPoint</a> ::setAlarmReportingOff
<a href="#">Requirement II. 221}</a>	<a href="#">Use Case 5.11.12:</a>	<a href="#">PerformanceManager</a> ::getAllPMPs
<a href="#">Requirement II. 222}</a>		<a href="#">PerformanceManager</a> ::getAllPMPNames
<a href="#">Requirement II. 223}</a>	<a href="#">Use Case 5.5.5: Use Case 5.8.4:</a>	<a href="#">CommonResourceInfo</a> ::setAdditionalInfo
<a href="#">Requirement II. 224}</a>	<a href="#">Use Case 5.8.5:</a>	<b>EMS shall be able to change the root cause for an alarm.</b>
<a href="#">Requirement II. 225}</a>		<a href="#">Equipment</a> ::getSupportingEquipment
<a href="#">Requirement II. 226}</a>		<a href="#">Equipment</a> ::getSupportingEquipmentNames
<a href="#">Requirement II. 227}</a>		<a href="#">Equipment</a> ::getSupportedEquipment
<a href="#">Requirement II. 228}</a>		<a href="#">Equipment</a> ::getSupportedEquipmentNames
<a href="#">Requirement II. 229}</a>		<a href="#">SoftwareManager</a> ::backupME

**Table 7.5: Category II requirements**

Requirement	Use Case	UML Class Operation or Comment
<a href="#">Requirement II. 230}</a>		<a href="#">SoftwareManager::getMEBackupStatus</a>
<a href="#">Requirement II. 231}</a>		<a href="#">SoftwareManager::abortMEBackup</a>
<a href="#">Requirement II. 232}</a>		<a href="#">SoftwareManager::getBackupList</a>
<a href="#">Requirement II. 233}</a>		<a href="#">PerformanceManager::getAllTCAParameterProfileNames</a>
<a href="#">Requirement II. 234}</a>		<a href="#">PerformanceManager::getTCAParameterProfile</a>
<a href="#">Requirement II. 235}</a>		<a href="#">TerminationPoint::setTCAParameterProfile</a>
<a href="#">Requirement II. 236}</a>		<a href="#">PerformanceManager::createTCAParameterProfile</a>
<a href="#">Requirement II. 237}</a>		<b>TCAParameterProfile Creation Data.</b>
<a href="#">Requirement II. 238}</a>	<a href="#">Use Case 5.11.13:</a> <a href="#">Use Case 5.11.14:</a>	<a href="#">PerformanceManager::setTCAParameterProfile</a>
<a href="#">Requirement II. 239}</a>	<a href="#">Use Case 5.11.13:</a> <a href="#">Use Case 5.11.14:</a>	<b>TCAParameterProfile Modification Data.</b>
<a href="#">Requirement II. 240}</a>		<a href="#">PerformanceManager::deleteTCAParameterProfile</a>
<a href="#">Requirement II. 241}</a>	<a href="#">Use Case 5.6.4:</a>	<a href="#">SubnetworkConnection::addRoute</a>
<a href="#">Requirement II. 242}</a>	<a href="#">Use Case 5.6.4:</a>	<a href="#">RouteCreateData</a>
<a href="#">Requirement II. 243}</a>	<a href="#">Use Case 5.6.5:</a>	<a href="#">SubnetworkConnection::removeRoute</a>
<a href="#">Requirement II. 244}</a>	<a href="#">Use Case 5.6.5:</a>	<b>Route Removal Data.</b>
<a href="#">Requirement II. 245}</a>	<a href="#">Use Case 5.6.6:</a>	<a href="#">Subnetwork::createModifiedSNC</a>
<a href="#">Requirement II. 246}</a>	<a href="#">Use Case 5.6.6:</a>	<a href="#">SNCModifyData</a>
<a href="#">Requirement II. 247}</a>		<a href="#">SubnetworkConnection::switchRoute</a>
<a href="#">Requirement II. 248}</a>		<b>Switch Route Data.</b>
<a href="#">Requirement II. 249}</a>		<a href="#">SubnetworkConnection::setRoutesAdminState</a>
<a href="#">Requirement II. 250}</a>		Set route administrative state data
<a href="#">Requirement II. 251}</a>		<a href="#">SubnetworkConnection::setIntendedRoute</a>
<a href="#">Requirement II. 252}</a>		<b>Set Intended Route Data.</b>
<a href="#">Requirement II. 253}</a>		<b>Retrieval of all Alarms and Events.</b>

**Table 7.5: Category II requirements**

Requirement	Use Case	UML Class Operation or Comment
{Requirement II. 254}		<a href="#">Log</a> ::deleteLogRecords <a href="#">Log</a> ::getLogRecords <a href="#">Log</a> ::retrieveLogRecords <a href="#">Log</a> ::setAdministrativeState <a href="#">Log</a> ::setCapacityAlarmThreshold <a href="#">Log</a> ::setDiscriminatorConstruct <a href="#">Log</a> ::setLogFullAction <a href="#">Log</a> ::setMaxLogSize <a href="#">Log</a> ::setMaxRecordLife <a href="#">Log</a> ::setWeekMask
{Requirement II. 255}		<b>One instance of the Log Service.</b>
{Requirement II. 256}		<a href="#">SubnetworkConnection</a> ::getBackupRoutes
{Requirement II. 257}		<a href="#">Subnetwork</a> ::modifySNC
{Requirement II. 258}		<a href="#">Subnetwork</a> ::swapSNC
{Requirement II. 259}		<b>Swap SNC Data.</b>
{Requirement II. 260}		<a href="#">SubnetworkConnection</a> ::getBackupRoutes
{Requirement II. 261}		<a href="#">SubnetworkConnection</a> ::getIntendedRoute
{Requirement II. 262}	<a href="#">Use Case 5.9.1:</a>	<a href="#">EquipmentHolder</a> ::unprovisionEquipment
{Requirement II. 263}		<a href="#">EquipmentCreateData</a>
{Requirement II. 264}		<a href="#">Subnetwork</a> ::createTPPool
{Requirement II. 265}		<a href="#">TPPoolCreateData</a>
{Requirement II. 266}		<a href="#">Subnetwork</a> ::deleteTPPool
{Requirement II. 267}		<a href="#">Subnetwork</a> ::modifyTPPool
{Requirement II. 268}		<a href="#">Subnetwork</a> ::getTPPool
{Requirement II. 269}		<a href="#">ESwitchData</a>
{Requirement II. 270}		<a href="#">EMS</a> ::getAllEMSAndMEActiveAlarms
{Requirement II. 271}		<a href="#">EMS</a> ::getLog
{Requirement II. 272}		<a href="#">GroupTerminationPoint</a> ::getTPGroupingRelationships
{Requirement II. 273}		<a href="#">PerformanceManager</a> ::getAllTCAPerparameterProfiles
{Requirement II. 274}		<a href="#">ManagedElement</a> ::getAllNUTTPNames
{Requirement II. 275}		<a href="#">ManagedElement</a> ::getAllPreemptibleTPNames
{Requirement II. 276}		<a href="#">ManagedElement</a> ::getAllProtectedTPNames
{Requirement II. 277}		<b>TMD Assignment behavior.</b>
{Requirement II. 278}		<a href="#">TerminationPoint</a> ::verifyTMDAssignment

**Table 7.5: Category II requirements**

Requirement	Use Case	UML Class Operation or Comment
<a href="#">{Requirement II. 279}</a>		<a href="#">EquipmentHolder</a> ::getAllEquipment
<a href="#">{Requirement II. 280}</a>		<a href="#">EquipmentHolder</a> ::getAllEquipmentNames
<a href="#">{Requirement II. 281}</a>		<b>Get current PM Data.</b>
<a href="#">{Requirement II. 282}</a>		<a href="#">PMData</a>
<a href="#">{Requirement II. 283}</a>		<a href="#">PMMeasurement</a>
<a href="#">{Requirement II. 284}</a>		<b>Historical PM Data File Format.</b>
<a href="#">{Requirement II. 285}</a>		<a href="#">TCAPerparameterProfile</a> ::getAssociatedTPs
<a href="#">{Requirement II. 286}</a>		<a href="#">Version</a> ::getVersion
<a href="#">{Requirement II. 287}</a>		<a href="#">EMS</a> ::getAllEMSAndMEUnacknowledgedActiveAlarms
<a href="#">{Requirement II. 288}</a>		<a href="#">EMS</a> ::getAllEMSSystemUnacknowledgedActiveAlarms
<a href="#">{Requirement II. 289}</a>		<a href="#">PhysicalTerminationPoint</a> ::getContainingPGNames

#### 7.4.3 Category III

[Table 7.6](#) provides a mapping between the Category III requirements in [Section 4.3](#), the Use Cases in [Section 5](#) and the UML Class operations in [Section 6.1.1](#). The nature of Category III requirements means that they do not have a corresponding UML Class operation and so a comment has been added to summarize the requirement (these comments are in a **bold font**).

**Table 7.6: Category III requirements**

Requirement	Use Case	UML Class Operation or Comment
<a href="#">{Requirement III. 001}</a>	<a href="#">Use Case 5.2.6:</a> <a href="#">Use Case 5.2.7:</a>	<b>NMS detects when an EMS is no longer available.</b>
<a href="#">{Requirement III. 002}</a>	<a href="#">Use Case 5.2.6:</a> <a href="#">Use Case 5.2.7:</a>	<b>EMS detects when an NMS is no longer available.</b>

#### 7.4.4 Category IV

[Table 7.7](#) provides a mapping between the Category IV requirements in [Section 4.4](#), the Use Cases in [Section 5](#) and the UML Class operations in [Section 6.1.1](#). The nature of Category IV requirements means that they do not have a corresponding UML Class operation and so a comment has been added to summarize the requirement (these comments are in a **bold font**).

**Table 7.7: Category IV requirements**

Requirement	Use Case	UML Class Operation or Comment
<a href="#">{Requirements IV. 001}</a>		<b>Interface must be scalable.</b>

**Table 7.7: Category IV requirements**

Requirement	Use Case	UML Class Operation or Comment
<a href="#">{Requirements IV. 002}</a>		Interface model shall be concise.
<a href="#">{Requirements IV. 003}</a>	<a href="#">Use Case 5.2.1:</a>	EMS to support multiple NMSs.
<a href="#">{Requirements IV. 004}</a>		NMS to support multiple EMSs.

#### 7.4.5 Category V

There are currently no Category V requirements.

## 8 SUMMARY AND OPEN ISSUES

### 8.1 Summary

The open issues and items for future work have been captured in the appendices of this document.

### 8.2 Open Issues

- 1) Some inconsistenciesexist between this document in particular the use cases and the CORBA IDL solution set with respect to exceptions.

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## **APPENDIX A TERMS AND ABBREVIATIONS USED WITHIN THIS DOCUMENT**

## A.1 Terminology

Table A.1:

Term	Definition	TMF or Outside Source
Active Alarm	A clearable raised alarm is considered to be active for as long as no associated clear notification has been received.	
Actor	<p>The term actor is a keyword which refers to a coherent set of roles that an entity (human or non-human) outside of the system being modelled plays when interacting with one or more use cases.</p> <p>Systems can also be related to actors in that for two systems interacting with each other, each is an actor to the other.</p> <p>Actors represent system users. They help delimit the system and give a clearer picture of what the system should do. It is important to note that an actor interacts with, but has no control over the use cases.</p> <p>An actor is someone or something that:</p> <ul style="list-style-type: none"> <li>Interacts with or uses the system</li> <li>Provides input to and receives information from the system</li> <li>Is external to the system and has no control over the use cases</li> </ul>	
Inner topological link	A topological link that exists within a subnetwork.	
Internal topological link	A topological link that exists within the same managed element.	
Network Access Domain	A Network Access Domain (NAD) represents a domain to which certain transmission network resources may be assigned.	
Network Management System	The Network Management System represents the hardware and software components used by the SP or Network Provider to manage their networks as a whole. The NMS provides an end-to-end network view of the entire network enabling management of the NEs contained in the network. These NEs managed across the network are typically provided by multiple vendors. The NMS performs management functions across the Network Management Layer (NML) of the TMN. Some examples of these management functions include connection management and circuit fault correlation.	

**Table A.1:**

Term	Definition	TMF or Outside Source
NML-EML Interface	The NML-EML Interface represents the communication data and exchange mechanism between the management system(s) that deploy the NML and EML functions of the TMN. A Network Management System (NMS) that performs NML functionalities may communicate with one or more Element Management Systems (EMSs) that performs EML functionalities via the NML-EML Interface.	
Off-network topological link	A topological link whose zEnd TP is outside of the EMS' span of control and is reported as a remote address if the EMS knows about the remote end.	
System	The term system refers to a stereotyped package that represents the entire system being modelled.	W1 - UML Modeling for the W1 - UML Modeling for the Telecom Environment Telecom Environment, Part 1: Introduction to UML for Communications, 7/18/2000, Al Vincent (TeleManagement Forum)
Top level topological link	A topological link that exists between subnetworks.	
Trail	A topological link or an SNC between two TPs that encapsulate a trail termination function at the layer of the TL or SNC.	

## A.2 Abbreviations and Acronyms

**Table A.2:**

Abbreviation/ Acronym	Abbreviation/ Acronym Spelled Out	Definition	TMF or External Source
15min	15 minute	Used to identify a 15 minute window size.	MTNM
24hr	24 hour	Used to identify a 1 day window size.	MTNM
CTP	Connection Termination Point	A CTP represents the actual or potential end point of a subnetwork connection, or represents an ATM network interface. (It is a combination of the ITU-T Connection Termination Point function and Trail Termination Point function.)	MTNM
EMS	Element Management System	It represents the management system located at the "south" side of the interface. See also chapter "Terminology Used In This Document".	MTNM

**Table A.2:**

<b>Abbreviation/ Acronym</b>	<b>Abbreviation/ Acronym Spelled Out</b>	<b>Definition</b>	<b>TMF or External Source</b>
ME	Managed Element	A ME is an abstract class used to represent Network Elements visible across the interface.	MTNM
NA	Not Applicable	In the PM context the non applicable granularity is used for current instantaneous measurements.	MTNM
NMS	Network Management System	It represents the management system located at the "north" side of the interface. See also chapter Terminology Used In This Document".	MTNM
PM	Performance Management	Is the comprehensive term for all functionalities that are used to provide the Network Management System with information about the performance of the services in the Subnetwork.	MTNM
PMD	Performance Monitoring Data	Data that is retrieved via the interface using Performance Management	MTNM
TCA	Threshold Crossing Alert	Functionality that provides automatic notifications when performance of a service is outside a predefined range.	MTNM
TP	Termination Point	A TP is a logical abstraction of an endpoint (actual or potential) of a topological link, or a subnetwork connection.	MTNM
PTP	Physical Termination Point	A PTP is an actual or potential endpoint of a topological link. Essentially, this is a representation of a physical port.	MTNM
UTC	Universal Time Coordinated	Standardised time format used for time stamping.	ITU-T Recommendation X.680

## APPENDIX B REFERENCES

### B.1 References

**Table 1:**

<b>Reference</b>	<b>Description</b>	<b>Brief Use Summary</b>
Project Charter	MTNM Project Charter	Used for objectives and scope and for the project benefits.
TMF Glossary	TMF Glossary made available to public and members Version <>#>	Not used
TOM	TMF Telecom Operations Map: A high-level view of end-to-end service fulfillment, service assurance and billing, TMF-GB910, TMF, Morristown, 1998	Used for process definitions.
TMF Project Management, Process and Methodology Documents	TMF Team Leader Handbook, TMF Process Guides, TMF Templates, TMF Template Guides, TMF Modeling Methodology Manual	Used to provide method and consistency to work and documents
ITU-T G.805	ITU recommendations, Generic functional architecture of transport networks, G.805, 11/95	Used in defining the information model.
TMF 608	MTNM Information Agreement: A protocol neutral Interface Information model for the NML-EML interface for management of multi technology networks, i.e. ATM, SONET/SDH, DWDM, and hybrid networks.	Used for the UML models for the interface.
X.735	ITU-T Recommendation X.735, Information Technology - Open systems Interconnection Systems Management : Log Control Function.	Used for the definition of the Log object and the supported operations

### B.2 Source or Use

None.

### B.3 IPR Releases and Patent Disclosures

None.

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## **APPENDIX D UML MODEL**

The UML model can be found in Multi-Technology Network Management Information Agreement, NML-EML Interface, TMF 608.