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SERIES M: TELECOMMUNICATION MANAGEMENT, INCLUDING TMN AND NETWORK MAINTENANCE

Telecommunications management network

Multi-technology network management: Information agreement (TMF608)

ITU-T Recommendation M.3170.2

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ITU-T Recommendation M.3170.2

Multi-technology network management: Information agreement (TMF608)

Summary

The multi-technology network management (MTNM) solution suite realizes a TMN interface between the NML and EML according to ITU-T Recommendation M.3010 for the FCAPS management of multi-technology fixed transport, access and aggregation networks.

This Recommendation explains the structure of the MTNM information agreement (TMF608) and relates its components to the M.3020 methodology for TMN interface specification. It wraps TMF608 and associated supporting documents by referencing them normatively and relating them to identified Recommendations on TMN functionality (FCAPS-based) and TMN interface specification methodology but not to Recommendations on TMN interface analysis models. This Recommendation can also be used as a first lead-in to the MTNM information agreement.

Source

ITU-T Recommendation M.3170.2 was approved on 16 March 2007 by ITU-T Study Group 4 (2005-2008) under the ITU-T Recommendation A.8 procedure.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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ITU-T Recommendation M.3170.2

Multi-technology network management: Information agreement (TMF608)

1 Scope

The multi-technology network management (MTNM) solution suite is an implementation standard of a TMN interface between the NML and EML according to [ITU-T M.3010] for the FCAPS management of multi-technology fixed transport, access and aggregation networks. The MTNM implementation view specifies a CORBA-based TMN Q interface between an NMS (CORBA client or TMN manager) and an EMS (CORBA server or TMN agent which is in contact to the NEL).

The MTNM solution suite consists of the following deliverables:

- The MTNM business view is specified in the business agreement (BA) TMF513.
- The MTNM system view is specified in UML in the information agreement (IA) TMF608.
- The MTNM CORBA-based implementation and deployment views are specified in the CORBA IDL solution set (SS) TMF814 (with HTML documentation) and associated implementation statement (IS) templates and guidelines TMF814A.
- The MTNM supporting documentation (SD) guides and lightens the work with the MTNM views and also includes normative parts of the interface such as name/value pairs.

This Recommendation outlines the structure of TMF608 and describes its relationship to the other M.3170-series Recommendations and to other TMN Recommendations.

This Recommendation emphasizes that the M.3170-series Recommendations go for *Level B* TMN interface information conformance (as defined by [ITU-T M.3010]): the managed object classes supported by the MTNM NML-EML Interface are specified in approved standards of the *de facto* standards body TM Forum ([TMF608 v3.0], [b-TMF608 v2.1], [TMF814 v3.0], [TMF814 v2.1] and [ITU-T M.3170.3] – see clauses 6.4 and 6.5). This Recommendation provides a coarse overview of the UML diagram fragments and state diagrams of TMF608 and presents some principles for mapping the MTNM fine-grained UML [TMF608 v3.0] and [b-TMF608 v2.1] to a service-oriented UML [TMF814 v3.0 SD] that forms a starting point for any service-oriented solution set construction such as the service-oriented CORBA IDL of [TMF814 v3.0], [TMF814 v2.1] and [ITU-T M.3170.3].

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T G.805] ITU-T Recommendation G.805 (2000), *Generic functional architecture of transport networks*.

[ITU-T G.852.2] ITU-T Recommendation G.852.2 (1999), *Enterprise viewpoint description of transport network resource model*.

[ITU-T M.3010] ITU-T Recommendation M.3010 (2000), *Principles for a telecommunications management network*.

[ITU-T M.3013] ITU-T Recommendation M.3013 (2000), *Considerations for a telecommunications management network.*

[ITU-T M.3020] ITU-T Recommendation M.3020 (2007), *Management interface specification methodology*.

[ITU-T M.3050.x] ITU-T Recommendations M.3050.x (2004), *Enhanced Telecom Operations Map (eTOM).*

NOTE – This series of Recommendations has the following structure:

M.3050.0 – *eTOM – Introduction.*

M.3050.1 – *eTOM – The business process framework.*

M.3050.2 – *eTOM – Process decompositions and descriptions.*

M.3050.3 – *eTOM – Representative process flows.*

M.3050.4 – *eTOM – B2B integration: Using B2B inter-enterprise integration with the eTOM.*

M.3050/Supplement 1 – *eTOM – ITIL application note.*

M.3050/Supplement 2 – *eTOM – Public B2B Business Operations Map (BOM).*

M.3050/Supplement 3 – *eTOM to M.3400 mapping*.

[ITU-T M.3170.0] ITU-T Recommendation M.3170.0 (2007), *Muti-technology network management – Introduction and supporting documentation*.

[ITU-T M.3170.1] ITU-T Recommendation M.3170.1 (2007), *Multi-technology network management – Business agreement (TMF513).*

[ITU-T M.3170.3] ITU-T Recommendation M.3170.3 (2007), *Multi-technology network management – CORBA IDL solution set (TMF814) with implementation statement templates and guidelines (TMF814A).*

[ITU-T M.3200] ITU-T Recommendation M.3200 (1997), *TMN management services and telecommunications managed areas: overview*.

[ITU-T M.3400] ITU-T Recommendation M.3400 (2000), *TMN management functions*.

[ITU-T X.735] ITU-T Recommendation X.735 (1992) | ISO/IEC 10164-6:1993, *Information technology – Open Systems Interconnection – Systems Management: Log control function*.

[TMF513 v3.0] TM Forum TMF513 Version 3.0 (2004), *Multi-technology network management (MTNM) NML-EML Interface: Business agreement*, except for the table of references contained in Appendix B.

NOTE – This Recommendation does not reference this table for the same reasons explained in the note of [TMF608 v3.0]. Instead the truly normative references of [TMF513 v3.0], namely [TMF608 v3.0], [ITU-T G.805] and [ITU-T X.735], are added to the references clause of this Recommendation while the useful and available non-normative references are added to the bibliography of this Recommendation (see [TMF044 v2.0] and [b-TMF402 v5.10]).

[TMF608 v3.0] TM Forum TMF608 Version 3.0 (2004), *Multi-Technology Network Management (MTNM) NML-EML Interface: Information Agreement*, Rational Rose™ (UML) version and generated HTML version, except for the table of references contained in Appendix B.

NOTE – This table of references consists of the columns "reference", "description" and "brief use summary". Whilst the last column is meant to clearly indicate for each reference (i.e., row) whether the reference is needed for the implementation of the specification (a normative reference) or was used for the development of the

specification (a non-normative reference), it turned out that this goal was not reached unambigously in all cases. Therefore, this Recommendation does not reference this table.

Instead the truly normative references of [TMF608 v3.0], namely [TMF513 v3.0], [ITU-T G.805] and [ITU-T X.735], are added to the references clause of this Recommendation while the useful and available non-normative references are added to the bibliography of this Recommendation (see [b-TMF044 v2.0] and [b-TMF404 v2.8]).

[TMF814 v2.1] TM Forum TMF814 Version 2.1 (2002), *Multi-Technology Network Management (MTNM) NML-EML Interface: CORBA IDL Solution Set*.

[TMF814 v3.0] TM Forum TMF814 Version 3.0 (2004), *Multi-Technology Network Management (MTNM) NML-EML Interface: CORBA IDL Solution Set*.

[TMF814 v3.0 SD] TM Forum TMF814 Version 3.0 (2004), *Multi-Technology Network Management (MTNM) NML-EML Interface: CORBA IDL Solution Set*, Supporting Document "Traceability between IA and SS", file "MappingIASS.pdf".

3 Definitions

Refer to clause 3 of [ITU-T M.3170.0].

4 Abbreviations

Refer to clause 4 of [ITU-T M.3170.0].

5 Conventions

This Recommendation does not use any particular notational or other conventions.

6 TMF608 overview – A lead-in to the MTNM information agreement

This information agreement specifies the MTNM NML-EML interface information model for the management of multi-technology networks including transport networks based SONET/SDH, OTN, ATM, DSL and point-to-point Ethernet technologies. The interface information model is essentially defined in terms of M.3170.1/TMF513 business agreement specifications followed by the interface information model specifications themselves.

The referenced business agreement specifications include:

- **Project scope and objectives** which provide an executive summary by identifying the Interface being addressed and describing the benefits gained by the problem's solution.
- **Interface information requirements** which reference M.3170.1/TMF513 to list the functional and non-functional interface information requirements to be fulfilled by the interface information model described in this information agreement.
- **Interface information use cases** which reference M.3170.1/TMF513 to identify the interface information use case diagrams and descriptions needed to describe the way actors use the interface and the interactions across the interface covered in this information agreement.
- **Requirement traceability matrices** which refer to M.3170.1/TMF513 to show the traceability of use cases to requirement statements, of object classes to use cases, etc. See clause 6 of [ITU-T M.3170.1] and [TMF513 v3.0] for the various types of traceability matrices.

NOTE 1 – Traceability between the information agreement (IA) and the CORBA IDL solution set (SS) is provided by the supporting document "Traceability between IA and SS" [TMF814 v3.0 SD] (contained in the solution set [TMF814 v3.0]). This document lists all classes, attributes, relationships, operations, enums, strings and structs defined in the IA and associates them with the respective IDL definitions in the SS.

The interface information model specifications provide a protocol-neutral description of the interface that cover the business agreement specifications. The TM Forum MTNM team has been using UML and the Rational Rose™ modelling tool to develop the MTNM interface information model. The complete protocol-neutral master specification is contained in the Rational Rose™ version of [TMF608 v3.0] (file "TMF608v3.0_2004_04.mdl"). A generated HTML version of [TMF608 v3.0] is also available (see Figure 6-1 below). The interface information model specifications include:

- **Interface information model UML diagrams** which provide complete UML fragments for all managed object classes of the interface and state diagrams for the states (see clause 6.4).
- **Interface information model UML class dictionary** which describes the object classes with attributes, relationships and operations, the enums, the strings and the structs of the interface.

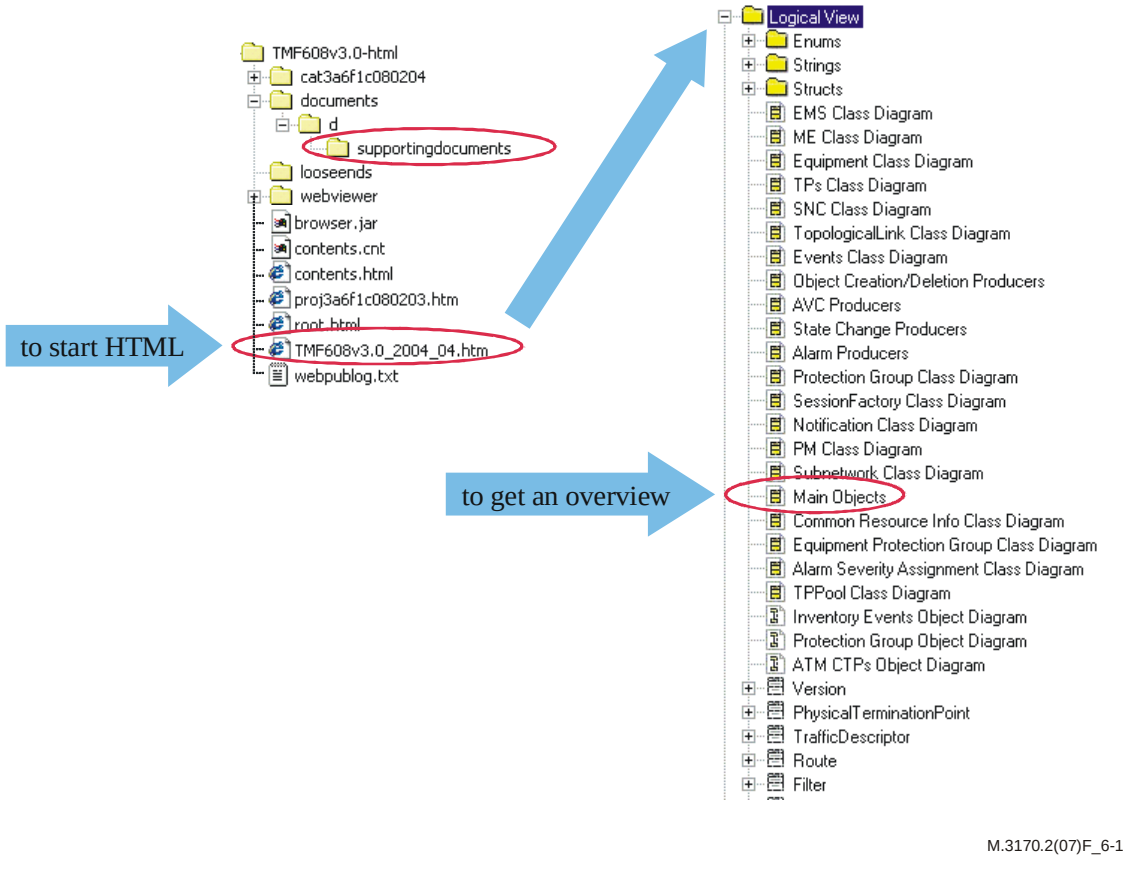


Figure 6-1 – Structure of the HTML version of TMF608

The detailed business agreement specifications for the MTNM NML-EML interface shall be in accordance with [ITU-T M.3170.1], which references [TMF513 v3.0].

The detailed static interface information UML model with class diagrams and class dictionary and the detailed dynamic interface information UML model with state diagrams for the MTNM NML-EML interface shall be in accordance with [TMF608 v3.0], which extends [b-TMF608 v2.1].

NOTE 2 – [TMF608 v3.0] incorporates [b-TMF608 v2.1] (though with certain well-documented changes) and so [b-TMF608 v2.1] is not a formal prerequisite for [TMF608 v3.0]. However, knowledge of the more readily accessible (although superseded) v2.1 may greatly simplify the approach to and understanding of v3.0.

6.1 Relationship to other M.3170-series Recommendations

M.3170.1/TMF513 defines the requirements for the interface both in terms of the objects and operations that the interface is required to support and the overall behaviour of the interface. It contains a mapping to M.3170.2/TMF608 which links the requirements to the classes, attributes and operations specified in the UML information model. This Recommendation specifies the details of the classes, their relationships and their operations behaviour that are required to support the requirements of the MTNM NML-EML interface. It also provides UML diagram fragments and state diagrams. Hence [ITU-T M.3170.1] and this Recommendation are mutually traceable and fully define the interface.

M.3170.3/TMF814 presents the CORBA IDL specification of the MTNM NML-EML interface. In defining a protocol-specific implementation that meets the specification defined in [ITU-T M.3170.1] and this Recommendation, it is necessary to consider protocol-specific issues such as efficiency and interoperability. This results in a service-oriented UML model (as opposed to a fine-grained model) and a corresponding service-oriented CORBA IDL model as outlined in clause 6.5 and detailed in [ITU-T M.3170.3].

6.2 Relationship to other TMN Recommendations

The following relationships to other TMN Recommendations exist:

- The MTNM NML-EML interface is based on M.3010 functional architecture, including logical layered architecture and physical architecture defined in [ITU-T M.3010] and [ITU-T M.3013], and meets the Level B TMN interface information conformance defined in Amendment 1 to [ITU-T M.3010].
- The M.3170-series Recommendations address the problems arising in the resource management and operations (RM&O) business processes defined in [ITU-T M.3050.x] which in turn are mapped to the TMN management functions in [ITU-T M.3400] that categorizes the management function sets and their members (according to FCAPS application) and specifies them together with generic end-to-end flow scenarios that relate them to TMN management services and TMN managed areas according to [ITU-T M.3200].
- The M.3170.1 business agreement, the M.3170.2 information agreement and the M.3170.3 CORBA IDL Solution Set are defined using the TM Forum's methodological analogues (in particular the BA and IA templates [b-TMF402 v5.10], [b-TMF404 v2.8] and the MTNM use case template) to the requirements, analysis and design (RAD) phases and templates defined in [ITU-T M.3020].

Refer to clause 7 for a few more details.

6.3 Relationship to other TM Forum specifications

Refer to clause 6.3 of [ITU-T M.3170.1].

6.4 Overview of UML diagram fragments and state diagrams

The interface information model UML diagrams of TMF608 encompass the following diagram fragments for MTNM managed object classes (class diagrams and collaboration diagrams)

EMS, managed element, equipment, termination points (see Figure 6-2), SNC, topological link, events, object creation/deletion producers, attribute value change producers, state change producers, alarm producers, protection group, session factory, notifications, performance management classes, subnetwork, main classes, common resource info, equipment protection group, alarm severity assignment classes, TP pool, inventory events, protection groups, ATM CTPs.

And the following state diagrams for MTNM states:

Equipment holder state, SNC state (pending supported), SNC state (pending not supported), SNC modification (without SNC name preservation), SNC modification (with SNC name preservation), SNC modification (with multiple routes and SNC name preservation), TMD state (see Figure 6-3).

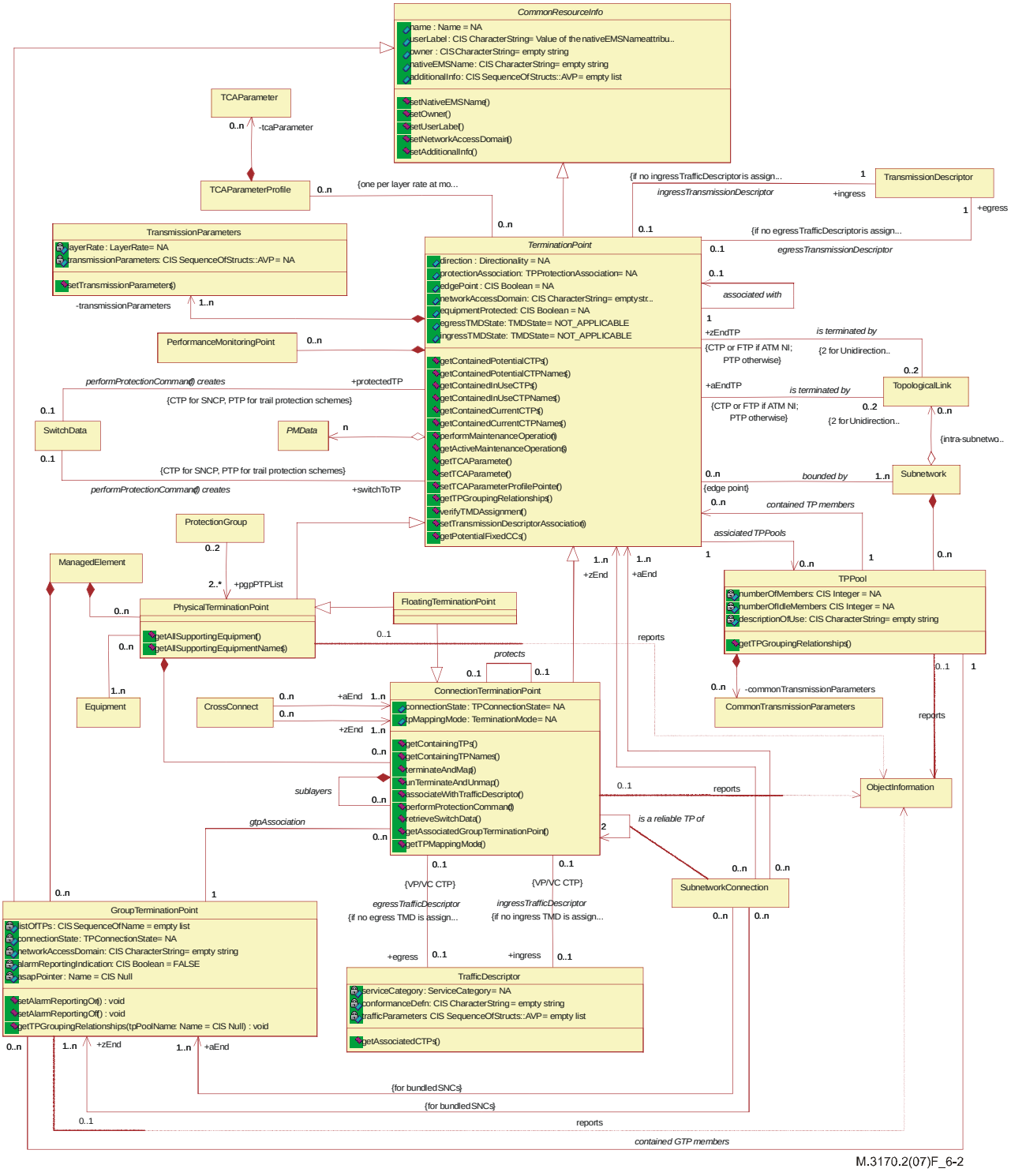


Figure 6-2 – TMF608 v3.0 UML diagram fragment: Termination points

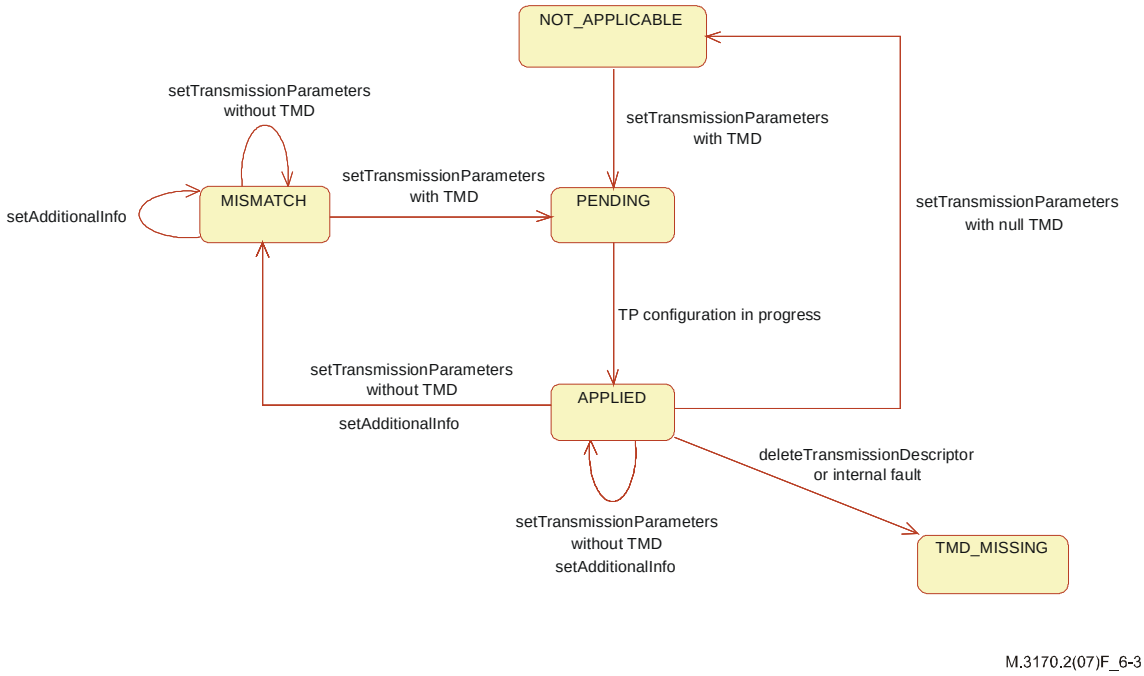


Figure 6-3 – TMF608 v3.0 state diagram: Transmission descriptor (TMD) state

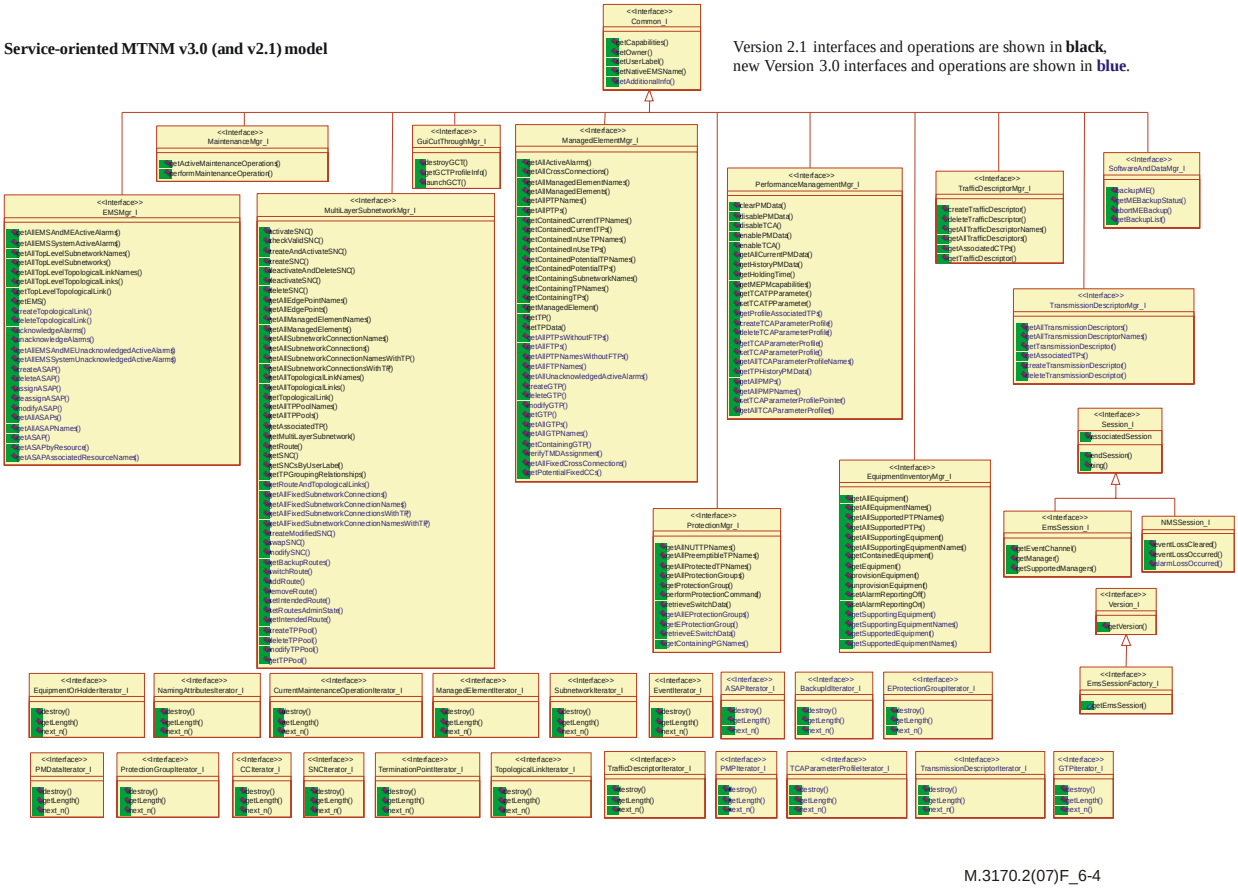
Refer to the "logical view" tree of the HTML version of [TMF608 v3.0] (see Figure 6-1) for more details.

6.5 Mapping the fine-grained UML to a service-oriented UML

The service-oriented approach to information modelling requires the separation of the state and behaviour of managed objects. A service-oriented managed object is a managed object whose state and behaviour are distributed in the interface definition; its state is left with the object while its behaviour (operations and notifications) is delegated to a steward object.

In case of MTNM, these steward objects are CORBA interfaces called service-oriented façades, managing objects or object managers, while the managed objects themselves are CORBA structs. Service orientation therefore results in a two-part information model whose parts can be progressed independently. Figure 6-4 provides an overview of the MTNM CORBA interfaces in UML notation. These interfaces include the façades for managed object behaviour, iterator interfaces per object class and the session service interfaces. Refer to [ITU-T M.3170.3] for details. Figure 6-2 of [ITU-T M.3170.3] provides an equivalent overview but without showing the operations.

The mapping is accompanied by the supporting document "Traceability between IA and SS" [TMF814 v3.0 SD] which lists all UML artefacts defined in TMF608 and associates them with the respective IDL definitions in TMF814. This SD also specifies generic rules which have to be taken into account when creating any protocol-specific specification (such as the CORBA IDL SS) based on the IA.



M.3170.2(07)F_6-4

Figure 6-4 – Service-oriented UML diagram of MTNM v3.0 (and v2.1)

Mapping the fine-grained UML to a service-oriented UML includes assignment of steward interfaces to managed object classes. Figure 6-5 summarizes this mapping for MTNM v2.1.

TMF814 Manager (CORBA façade object with IOR)	**MTNM v2.1 Managed Object** managed by, or *used by*, CORBA façade object
ME Manager	managed element (**ME**), termination point (TP) (**PTP**, **CTP**, *TPPool*), alarm, AID, cross-connect (XC), *TD*, *MLSN*
MLSN Manager	multi-layer sub-network (**MLSN**) (includes singleton), sub-network connection (**SNC**) (includes cross-connection), topological link (**TL**), **TPPool**, *CTP*, *PTP*, *route*, *TD*
EQP Manager	equipment (**EQP**), equipment holder (**EQPH**) (various types), *PTP*
EMS Manager	element management system (**EMS**) object, TL, alarm, AID, *MLSN*
TD Manager	traffic descriptor (**TD**), *TP*
PM Manager	performance management (PM) object (PM location, granularity, PM parameter, TCA parameter, PM data), *TP*, *ME*
Protection Manager	protection group (**PGP**), *TP*
Maintenance Mgr	maintenance operation, *TP*
GCT Manager	GUI cut-through (GCT) widget data, GCT launch command data
root interfaces (are not façades)	EMS session factory (entry point to EMS), *user name*, *password*, EMS session, NMS session, *event channel*

M.3170.2(07)F_6-5

Figure 6-5 – TMF814 v2.1 managers and managed objects

The extension of Figure 6-5 to [TMF814 v3.0] is for further study but see Figures 6-1 and 6-2 of [ITU-T M.3170.3] for an overview of the managers and managed object classes of MTNM v3.0.

7 Referencing TMF608

This Recommendation normatively references the TM Forum approved MTNM information agreement (IA) v3.0 [TMF608 v3.0] which extends the MTNM IA v2.1 [b-TMF608 v2.1], as well as the associated MTNM supporting documents, and points to a number of MTNM-related in-force ITU-T Recommendations specifying TMN functionality (FCAPS-based) and TMN interface specification methodology, including UML repertoire and UML templates, but not TMN interface analysis models since the M.3170-series Recommendations go for Level B and not for Level A TMN interface information conformance (as defined by Amendment 1 to [ITU-T M.3010]) (see clause 9 of [ITU-T M.3170.3] for details).

Figure 7-1 shows how this Recommendation points to TM Forum-approved documents and to related ITU-T Recommendations on TMN functionality (according to TMF513) and TMN methodology.

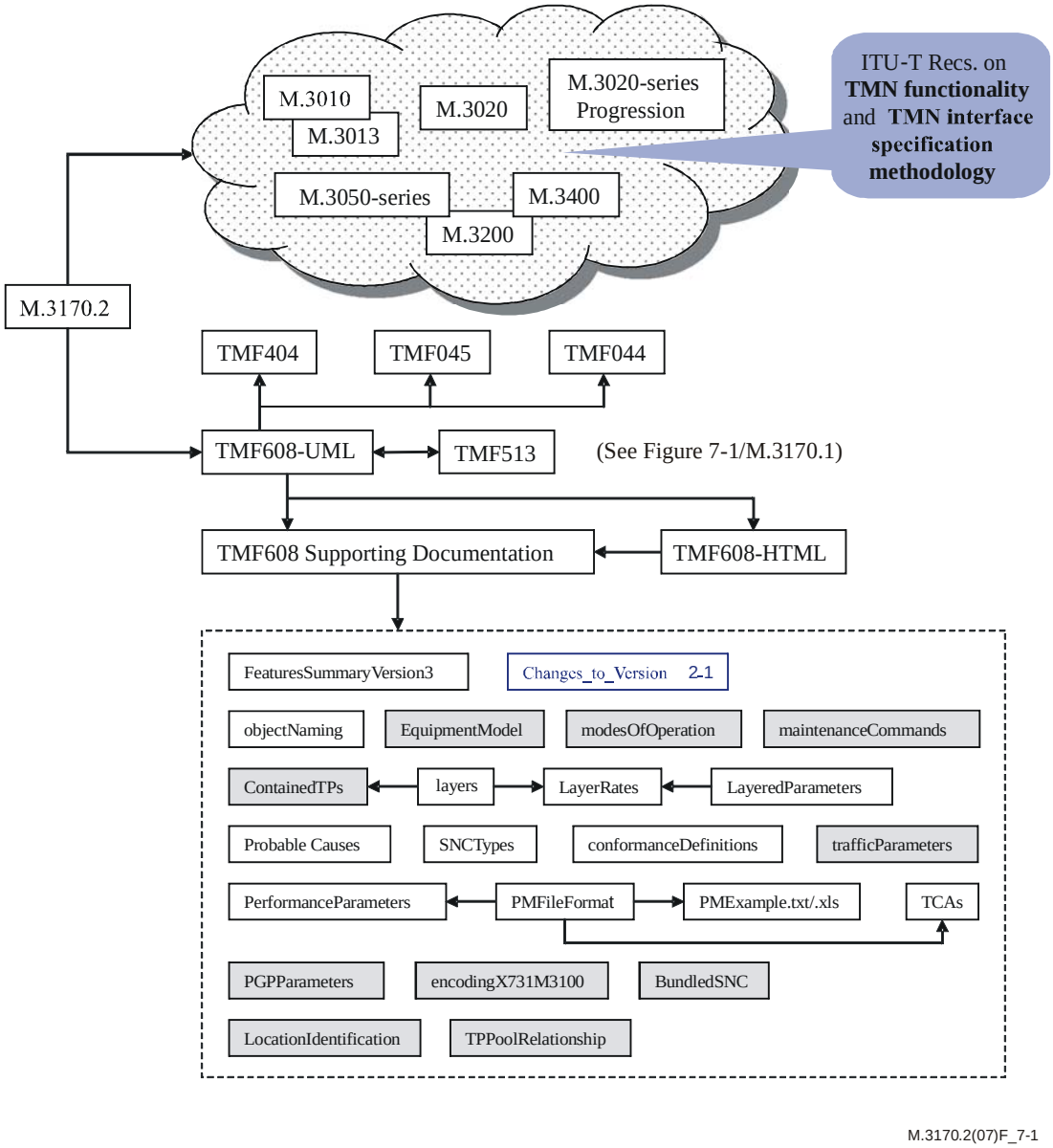


Figure 7-1 – ITU-T and TM Forum documents linked by M.3170.2

At the TM Forum side, Figure 7-1 shows the information agreement reference structure with regard to other key TM Forum-approved documents, mainly by referring to TMF513 (see clause 6.3 of [ITU-T M.3170.1]), and looks inside the SD box (IA-relevant supporting documents according to Table 6-1 of [ITU-T M.3170.0]). Refer to clause 6.3 of the companion Recommendation [ITU-T M.3170.0] for a detailed overview of the supporting documentation. Supporting documents that are only packaged with TMF608 are coloured in blue. Supporting documents that are not packaged with TMF513 are shaded in gray.

At the ITU-T side, Figure 7-2 depicts an "ITU-T Recommendation cloud" with the IA-relevant ITU-T Recommendations. The cloud encompasses the TMN-related Recommendations from TMF513 and the M.3020-series progression. This progression will, in particular, adopt at a high level 3GPP's UML modelling framework [b-TS 132 151 v6.3.0], [b-TS 132 152 v6.3.0] which is based on their fundamental IRP concept [b-TS 132 150 v6.5.0]. Harmonization of the MTNM UML modelling principles (see also [TMF814 v3.0 SD]), repertoire and templates with 3GPP's UML modelling approach and the M.3020-series progression is for further study.

Bibliography

The following references contain information that was used in the development of the M.3170-series Recommendations.

[b-TMF044 v2.0] TM Forum TMF044 Version 2.0 (2003), *TM Forum Glossary*. www.tmforum.org/browse.aspx?catid=860&linkID=28087

[b-TMF402 v5.10] TM Forum TMF402 Version 5.10 (2005), *TMF Business Agreement Template*. www.tmforum.org/browse.aspx?catID=866&linkID=24300

[b-TMF404 v2.8] TM Forum TMF404 Version 2.8 (2005), *TMF Information Agreement Template*. www.tmforum.org/browse.aspx?catID=866&linkID=24299

[b-TMF513 v2.1] TM Forum TMF513 Version 2.1 (2002), *Multi-Technology Network Management (MTNM) NML-EML Interface: Business Agreement*. www.tmforum.org/browse.aspx?catid=860&linkID=24195.

[b-TMF608 v2.1] TM Forum TMF608 Version 2.1 (2002), *Multi-Technology Network Management (MTNM) NML-EML Interface: Information Agreement*, PDF version and generated HTML version. www.tmforum.org/browse.aspx?catid=860&linkID=20309.

[b-TS 132 150] ETSI TS 132 150 Version 6.5.0 (2006), *Digital cellular telecommunications system (Phase 2+); UMTS; Telecommunication management; Integration Reference Point (IRP) Concept and definitions.*

[b-TS 132 151] ETSI TS 132 151 Version 6.3.0 (2006), *Digital cellular telecommunications system (Phase 2+); UMTS; Telecommunication management; Integration Reference Point (IRP) Information Service (IS) template*.

[b-TS 132 152] ETSI TS 132 152 Version 6.3.0 (2005), *Digital cellular telecommunications system (Phase 2+); UMTS; Telecommunication management; Integration Reference Point (IRP) Information Service (IS) Unified Modelling Language (UML) repertoire*.

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