# Multi-Technology Operations Systems Interface (MTOSI) – XML Solution Set

**TMF 854**

*Version 1.1* *December, 2005*

**©TeleManagement Forum 2005**

**NOTICE**

The TeleManagement Forum ("TM Forum") has made every effort to ensure that the contents of this document are accurate. However, no liability is accepted for any errors or omissions or for consequences of any use made of this document.

This document is a draft working document of TM Forum and is provided to its members solely for formal comments and evaluation. It is not a Forum Approved Document and is solely circulated for the purposes of assisting TM Forum in the preparation of a final document in furtherance of the aims and mission of TM Forum. Any use of this document by the recipient is at its own risk. Under no circumstances will TM Forum be liable for direct or indirect damages or any costs or losses resulting from the use of this document by the recipient.

Members of TM Forum are granted limited copyright waiver to distribute this document within their companies. They may not make paper or electronic copies for distribution outside their companies. The only purpose of the provision of this draft document to members is for making formal comments thereon to TM Forum.

This document may involve a claim of patent rights by one or more TM Forum members, pursuant to the agreement on Intellectual Property Rights between TM Forum and its members, and by non-members of TM Forum.

Direct inquiries to the TM Forum office:

240 Headquarters Plaza,
East Tower – 10th Floor,
Morristown, NJ 07960, USA
Tel. +1 973 944 5100
Fax +1 973 944 5110
TM Forum Web Page: www.tmforum.org

# ACKNOWLEDGMENTS

The Multi-Technology Operations Systems Interface (MTOSI) – Implementation Statement 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 MTOSI XML Solution Set. 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:

- Michel Besson, Cramer Systems
- Francesco Caruso, Telcordia Technologies
- Shlomo Cwang, TTI Telecom
- Nigel Davis, Nortel Networks
- Stephen Fratini, Telcordia Technologies
- Elisabetta Gardelli, Siemens Com
- Jérôme Magnet, Nortel Networks
- Scott Toborg, Cramer Systems

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 MTOSI. This access was via public information or TM Forum member knowledge. This list of standards bodies and forums is not exhaustive 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:

- European Telecommunications Standards Institute (ETSI)
- International Telecommunications Union - Telecommunication Standardization Sector (ITU-T)
- World Wide Web Consortium (W3C)
- Open Applications Group (OAGi)
- Web Services Interoperability Organization (WS-I)
- OSS through Java Initiative (OSS/J)

# ABOUT THIS DOCUMENT

## TM Forum Documents

The MTOSI XML Solution Set is being issued as Member Evaluation (Draft) Version 1.0. When released, it will be considered valid until further notice by the TeleManagement Forum. At which time the TeleManagement Forum expects to update it to reflect comments from implementation experience, as well as to reflect additional member comment.

The purpose of an Evaluation Version is to encourage input based on experience of members and the public as they begin to use the document. Following the Evaluation Period, documents that are seen to deliver value are candidates for formal approval by the TM Forum. All documents approved by the TM Forum (as well as those previously approved by the NMF) undergo a formal review and approval process.

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," capture and communicating current knowledge and practices. Further inputs will be made because of detailed work ongoing in the TM Forum and the industry.

This document should be read in conjunction with following other MTOSI Phase 1 major deliverable documents:

- RN306 – MTOSI Release Notes
- TMF517 – MTOSI Business Agreement
- TMF608 – MTNM Information Agreement (which includes both the MTNM and MTOSI information models)

## Revision History

### Release Information:

| ISSUE | DATE | COMMENTS |
|---|---|---|
| Release 1.0 | | This is the first release of the document. |

### Version Information:

| ISSUE | DATE | COMMENTS |
|---|---|---|
| Version 0.8 | | This has been submitted to the Approvals Committee |
| Version 0.9 | 23-July-05 | Updated for Member Evaluation. |
| Version 1.0 | 05-Aug-05 | Removed Release from title page. |
| Version 1.1 | 12-Dec-05 | Final update for Release 1.0 |

## How can we comment on the documents?

Comments must be in written form and addressed to the team editor for review with the project team. Please send your comments to the editor using the editor's e-mail shown in the section below.


| **MTOSI Team Leader** |
| --- |
| Stephen Fratini, Telcordia Technologies, Inc. |
| Phone: +1-732-699-2226 |
| Email: sfratini@telcordia.com |

| **MTOSI Business Agreement Editor** |
| --- |
| Elisabetta Gardelli, Siemens Mobile Communications SpA |
| Phone: +39 02 95266301 |
| email: Elisabetta.Gardelli@siemens.com |

| **MTOSI XML Solution Set Editors** |
| --- |
| Francesco Caruso, Telcordia Technologies, Inc. |
| Phone : +1 732 699 3072 |
| email : caruso@research.telcordia.com |

| |
| --- |
| Jérôme Magnet, Nortel Networks |
| Phone: +1 613 763 1480 |
| email: jeromem@nortel.com |

| **TMF Senior Technical Manager** |
| --- |
| Ian Best, TM Forum |
| Phone : +44-1666-86-0754 |
| email : ibest@tmforum.org |

| |
| --- |
| **MTOSI email address**: mtosi@lists.tmforum.org |

# TABLE OF CONTENTS

**NOTICE** ..... **I**

**ACKNOWLEDGMENTS** ..... **III**

**ABOUT THIS DOCUMENT** ..... **IV**

TM Forum Documents ..... iv

Revision History ..... iv

How can we comment on the documents? ..... v

**TABLE OF CONTENTS** ..... **VI**

**PREFACE** ..... **8**

About TeleManagement Forum ..... 8

**1 INTRODUCTION** ..... **9**

**1.1 Document Structure** ..... **9**

**1.2 Key terms used in this document** ..... **10**

**2 GETTING STARTED GUIDE** ..... **12**

**2.1 MTOSI XML Solution Set Package Description** ..... **12**

**2.2 Release Notes** ..... **12**

**2.3 Support and Information** ..... **12**

**3 XML INTERFACE SOLUTION DESCRIPTION** ..... **14**

**3.1 TMF 854 XML Foundations** ..... **14**

3.1.1 XML Information Architecture ..... 14

3.1.2 XML Schema Definitions ..... 15

3.1.3 Web Services Definitions ..... 16

**3.2 XML Interface User Documentation** ..... **17**

**3.3 XML Samples** ..... **17**

**3.4 MTOSI Supporting Documents ..... 18**
3.4.1 Overview ..... 18
3.4.2 Understanding the MTOSI XML interface ..... 18
3.4.3 Conforming to the MTOSI XML interface ..... 18
3.4.4 Implementing the MTOSI XML interface ..... 19

**GLOSSARY ..... 20**

**REFERENCES ..... 21**

**STANDARDS ..... 22**

# PREFACE

## 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 telecom 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.

 ©TeleManagement Forum 2005 

# 1 INTRODUCTION

This MTOSI XML Solution Set (TMF 854 v1.0) is one of the three major deliverables of MTOSI Release 1.0. The other two major deliverables are the MTOSI Business Agreement (See **Ref 1**) and the MTNM Information Agreement (See **Ref 2**). The reader should consult RN306, MTOSI Release Notes, for a more complete description of what is included in MTOSI Release 1.0.

This MTOSI XML Solution Set document is the summary guide of all implementation specifications and guidelines for the XML OS-OS Interface solution as described in the MTOSI Business Agreement (See **Ref 1**).

As a summary guide, this document contains references to other MTOSI Release 1.0 deliverables such as the supporting documents and the XML interface definitions.

## 1.1 Document Structure

The following is a summary of the sections found in this document:

Section 1 This section is the introduction of the document

Section 2 This section is the getting started guide for the MTOSI XML Solution Set (SS).

Section 3 This section is the description of all deliverables that are accompanying the MTOSI XML SS.

 ©TeleManagement Forum 2005 

## 1.2 Key terms used in this document

**Service Provider**

In this document, the term *Service Provider* (SP) refers to companies who provide telecommunications services as a business. SPs may operate networks, or if they do not operate networks they may simply integrate the services of other providers (who operate networks) in order to deliver a total service to their customers. In this document a *Value-added Service Provider* is also called a SP.

Providing telecommunications service to any one End-Customer may involve multiple SPs, where one SP may "sub-contract" with other SPs to fulfill the customer's needs. When necessary to account for this relationship, the term SP is used in this document to describe the enterprise responsible to provide service to an End-Customer: the SP provides access through a contract or subscription. The term *Other Provider* is used to denote enterprises which have a sub-contractual responsibility.

**Network and Network Provider**

In this document, the term *Network* refers to the networks, networking components, network systems and/or network management systems which may or may not be owned and operated by the SPs which are used to deliver services.

The network is managed by the *Network Provider* whose primary task is to organize the basic infrastructure, such as switches, interlinks, local loop etc. The services can be supplied internally within the same organization, to its own SP organization, or to external SPs.

Note: The European Commission, in its Green Paper, has regulated that a formal split be made within telecoms in network operating departments and SP departments with a formal supplier relationship that is equal to an external vendor/buyer relationship. This relationship must be non-discriminatory. Similarly, requirements of the FCC Ruling on Interconnection in the US are encouraging companies to formally separate their network provider and SP business.

**Managed Element (ME)**

A *Managed Element* (ME) is used to represent the management view of what is typically called a Network Element in the industry. The ME includes equipment holders, equipment, Physical Termination Points (PTPs) and the Connection Termination Points (CTPs) supported by the PTPs.

**Network Management System (NMS)**

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 MEs contained in the network. These MEs managed across the network are typically provided by multiple vendors. The NMS performs management functions across the Network Management Layer (NML) of the TMN. A NMS may perform several management functions (e.g., fault and performance management) and may manage multiple technologies (e.g., SDH and Ethernet).

**Element Management System (EMS)**

The *Element Management System (EMS)* represents the hardware and software

components used by the SP or Network Provider to manage one or more Network Elements (NEs). The EMS provides management across a subnetwork or a single NE, typically across a single vendor equipment or collection of single vendor equipment. The EMS performs management functions across the Element Management Layer (EML) of the TMN. Some examples of these management functions include provisioning of NE resources and collection of NE faults.

**Operations System (OS)**

The term Operations System (OS) is used to refer to any system that has EML, NML and/or SML functionality.

**OS-OS Interface**

The *OS-OS Interface* represents the communication data and exchange mechanism between a set of two or more management system(s). The communication is facilitated by a Common Communication Vehicle (CCV).

# 2 GETTING STARTED GUIDE

## 2.1 MTOSI XML Solution Set Package Description

Because it is the summary user guide of the *MTOSI XML Solution Set*, this document is found in the root folder of the ***TMF854_v1.0.zip*** package, which can be downloaded from the TM Forum Web site.

The *MTOSI XML Solution Set* package contains this document, the TMF 854 specification itself and a set of associated supporting documents. On extraction of the package contents, the root folder name ***tmf854_v1.0*** is created with the following sub-folders:

| | |
|---|---|
| ***docs*** | The folder with all the HTML documentation. See section 3.2. |
| ***SD*** | The folder with all the supporting documents associated with TMF 854. See section 3.4. |
| ***wsdl*** | The folder with all the WSDL files. See section 3.1.3. |
| ***xml*** | The folder with all the XML sample files. See section 3.3. |
| ***xsd*** | The folder with all the XSD files. See section 3.1.2. |

Additionally, the following files are found in the package root folder:

| | |
|---|---|
| ***ReadMe.txt*** | The TMF 854 package content overview in a simple text file |
| ***RN306_v1.0_MTOSI_ReleaseNotes.pdf*** | The MTOSI Release 1.0 notes |
| ***TMF854_v1.0_MTOSI_XMLSS.pdf*** | This is this document. |

The *MTOSI XML Solution Set* package does not include the other two main MTOSI Release 1.0 deliverables; TMF 517 v1.0 and TMF 608 v3.1.

## 2.2 Release Notes

The MTOSI Release 1.0 notes are captured in a PDF file, which is found in the root folder of the ***TMF854_v1.0.zip*** package (See above). This document provides a short summary of all the documents that comprise MTOSI Release 1.0. It is recommended that you read this document before any of the other MTOSI Release 1.0 documents.

## 2.3 Support and Information

In order to resolve discrepancies and ambiguities found in the TMF 854 definitions, the following specification precedence order should be used by all MTOSI implementers:

1. **TMF 854 XML definition**:

   The TMF 854 XML definition shall be used as the master to resolve any discrepancy or ambiguity between the TMF 854 XML and a supporting document.

2. **TMF 608 IA definition**:

   The TMF 608 shall be assessed for clarification when:

   - ✓ There is a situation that is not covered or which is ambiguous in the TMF 854 XML, and
   - ✓ It is not covered or clarified in any supporting document.

   The MTOSI implementer shall use TMF 608 for an explanation of the ambiguous statement provided that the explanation does not contradict the statement in the TMF 854 XML or the supporting documents.

3. **The TMF 517 BA definition**:

   The TMF 517 shall be assessed for clarification when:

   - ✓ There is a case that is not covered or ambiguous in the TMF 854 XML, and
   - ✓ It is not covered or clarified in any supporting documents, and
   - ✓ It is not covered or clarified in the TMF 608.

   The MTOSI implementer shall use TMF 517 for an explanation of the ambiguous statement provided that the explanation does not contradict the statement in the TMF 854 XML or the supporting documents.

For any discrepancies the implementer should raise the issue with the MTOSI team via the normal procedure, i.e., send email to mtosi@tmforum.org or contact the MTOSI team leader (listed at the beginning of this document).

# 3 XML INTERFACE SOLUTION DESCRIPTION

## 3.1 TMF 854 XML Foundations

### 3.1.1 XML Information Architecture

MTOSI is an OS-OS interface standard with an information architecture that is entirely based on XML definitions as seen in Figure 1. The two main components of the MTOSI XML are:

- The TMF 854 Version 1 XML Schema (XSD) definitions (Details in section 3.1.2), and
- The TMF 854 Version 1 Web services (WSDL) definitions (Details in section 3.1.3).

These two components are defined by the TM Forum MTOSI team and depend on basic WSDL and XML standards defined in the W3C standards body (shown in beige in the following figure).

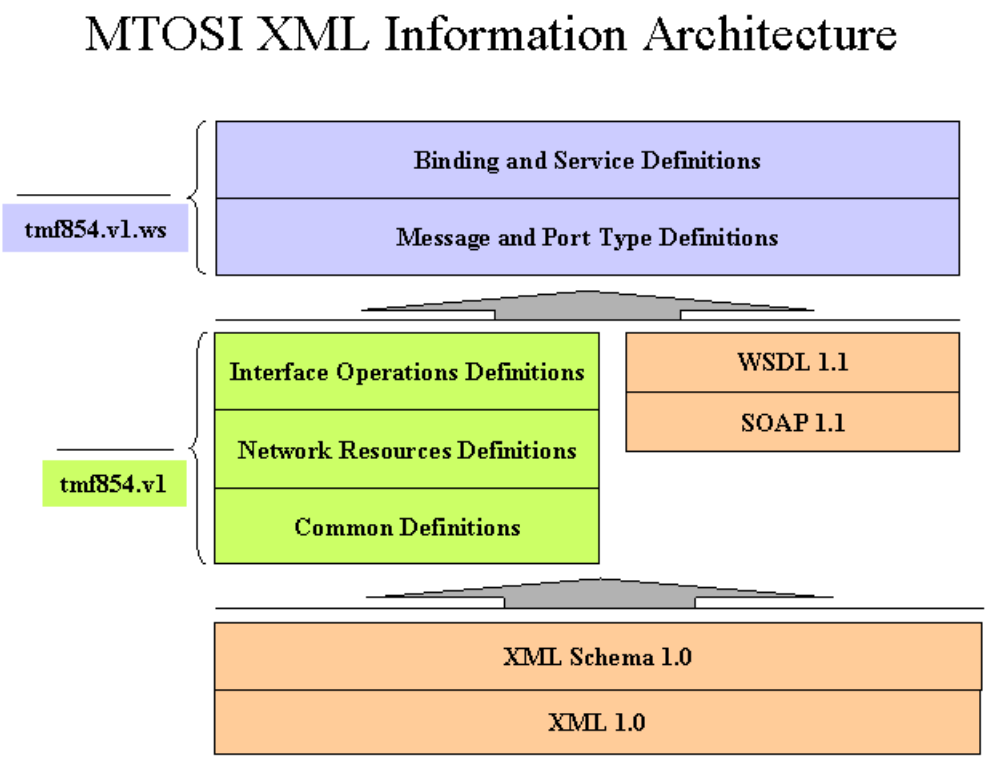


**Figure 1 MTOSI v1 XML Information Architecture**

The MTOSI XML definitions are based on the following XML specifications:

**XML version 1.0** (Ref 4)

This is the core XML specification used by all the XML definitions.

**XML Schema version 1.0** (Ref 5)

This is the XML specification used for the definition of the MTOSI schema in terms of XML Schema Documents (XSD).

**SOAP version 1.1** (Ref 7)

This is the XML specification used in the description of the MTOSI Web services for the definition of the messages and bindings with a specific transport or MOM technology.

**WSDL version 1.1** (Ref 6)

This is the XML specification used for the definition of the MTOSI Web services.

### 3.1.2 XML Schema Definitions

#### *3.1.2.1 Introduction*

The definitions of all the MTOSI XML messages are entirely described using XML Schema Documents (XSD files). The partitioning of the MTOSI XSD files is based on the following three definition layers (See Figure 1):

- Common definitions,
- Network resource definitions, and
- Interface operations definitions.

All the MTOSI XSD files are found in the ***xsd*** sub-folder of the *MTOSI XML Solution Set* package.

#### *3.1.2.2 Common Definitions*

This is the first layer of the MTOSI schema specifications where all the generic (metadata) definitions used in the description of the MTOSI message structure are introduced. It includes the schema definition of the MTOSI header.

All the common definitions XSD files are found in the sub-folder: ***xsd/common***

#### *3.1.2.3 Network Resources Definitions*

This is the second layer of the MTOSI schema specifications. It contains the description of all the MTOSI network resource structural definitions, i.e., the objects that represent network resources such as subnetworks and managed elements.

All the network resource definitions XSD files are found in the sub-folder: ***xsd/networkResources***

#### *3.1.2.4 Interface Operations Definitions:*

This is the third layer of the MTOSI schema specifications. It is also the top layer as it is visible to the implementer as it contains the description of all the MTOSI operations (i.e., the operation signatures). The definitions of the operations are grouped in one XSD file per interface of the MTOSI services.

All these interfaces XSD files are found in the sub-folder: ***xsd/interfaces***

### 3.1.3 Web Services Definitions

#### *3.1.3.1 Introduction*

The MTOSI Release 1.0 defines an OS-OS interface standard with the following services:

- **Configuration Service**: Includes the InventoryRetrieval interface with the support of the getInventory coarse-grained operation, as well as, all the MTNM managers' interfaces and their operations.
- **Discovery Service**: Defines a basic management service to support the operation for the discovery of OS capabilities.
- **Fault Service**: Includes the AlarmMonitoring interface with the support of the alarm coarse-grained retrieval operation.
- **Notification Service**: Includes the support for topic based brokering (Pub-Sub) notifications.

Refer to the MTOSI SD2-1 for all the details about the MTOSI implementation profiles.

#### *3.1.3.2 WSDL Definitions*

The description of these MTOSI services are defined in terms of Web Service Definition Language (WSDL) files, which are another set of XML definitions, based on the Web Services specifications (Ref 6) and the SOAP specifications (Ref 7).

The WSDL definitions used for the description of the MTOSI Release 1.0 Web Services are partitioned in the following two layers:

- Common definitions, and
- Soap binding definitions.

Note that in MTOSI Release 1.0, the supported transport used as the MTOSI Common Communication Vehicle (CCV) is JMS. And, other transports such as HTTP or CORBA may be included in later MTOSI releases.

All the MTOSI WSDL files are found in the ***wsdl*** sub-folder of the *MTOSI XML Solution Set* package.

#### *3.1.3.3 Common Definitions*

The purpose of the common definitions layer is to identify all the generic WSDL definitions that support an abstract description of the MTOSI Web services. The common WSDL definitions include:

- The WSDL definitions of all the messages per MTOSI interfaces, and
- The WSDL definitions of all the port types (interfaces) and their operations per MTOSI service.

All the WSDL files for the common definitions are found in the sub-folder: ***wsdl/common***

#### *3.1.3.4 SOAP Binding Definitions*

The purpose of the SOAP binding definitions layer is to partition all the specific WSDL definitions that are relevant to a transport technology used as the MTOSI CCV.

This is the XML definitions top layer in the MTOSI XML information architecture (See Figure 1).

Note that in MTOSI Release 1.0 the only supported CCV is a JMS bus. And, due to WSDL limitations (See next section), the WSDL definitions for the JMS SOAP binding as offered in the MTOSI Release 1.0 cannot be used as is.

All the WSDL files for the SOAP/JMS binding definitions are found in the sub-folder: ***wsdl/jms***

#### *3.1.3.5 Limitations*

At the time of the MTOSI Release 1.0 specifications development, W3C had not yet provided WSDL definitions and extensions to support the SOAP bindings with a JMS transport.

Therefore, the current set of MTOSI WSDL definitions are not readily deployable as Web Service components in an application server. However, all the missing WSDL JMS binding details are covered in one specific supporting document (See section 3.4.4).

Also, the MTOSI team has decided to keep all the WSDL definitions in the *MTOSI XML Solution Set* as the master code for the generation of the following:

- The MTOSI user interface (HTML) documentation, and
- The native code (Java, C++, or else) for rapid development of OS solutions with support of the MTOSI Release 1.0 services (Servers and/or clients).

## 3.2 XML Interface User Documentation

The *MTOSI XML Solution Set* comes with an HTML-based user documentation. It is viewable using any Web browser by opening the index.html file found in the ***docs*** sub-folder.

The user documentation of the MTOSI XML interface provides the following views:

- WSDL view for navigation of the MTOSI XML interface from the Web service definitions down to the XML Schema definitions,
- XSD view for navigation of the MTOSI XML interface per XSD definition categories,
- Types view for navigation per data types of the MTOSI XML interface, and
- Index view for an alphabetical list of all MTOSI XML definitions.

The user documentation is integrated with the *MTOSI XML Solution Set* package file structure as it has hyper links to all the WSDL and XSD files.

## 3.3 XML Samples

Included in the *MTOSI XML Solution Set* package are some MTOSI XML sample files, which are found in the ***xml*** sub-folder. These XML samples are to be used as:

- Additional help for MTOSI implementers to understand the various structural aspects of the MTOSI XML interface.
- Supporting examples from some supporting documents.

## 3.4 MTOSI Supporting Documents

### 3.4.1 Overview

Included in the *MTOSI XML Solution Set* package are a set of supporting documents to be found in the ***SD*** sub-folder. The supporting documents fall in the following two categories:

- SD1-x: Reference to the supporting documents that are shared with the MTNM. These documents provide additional specifications and recommendations on specific topics, which are all related to the model shared by MTNM and MTOSI.
- SD2-x: Reference to the supporting documents that are specific to the MTOSI. These documents provide the specifications, guidelines, and templates that contribute to the implementation of the MTOSI XML interface.

This section will provide the references to the essential MTOSI supporting documents based on the specific interest or role one may have with respect to using MTOSI as the XML interface in a SP's OS.

For a complete reference to all the supporting documents, use the MTOSI release 1.0 notes document [Ref 3].

### 3.4.2 Understanding the MTOSI XML interface

Someone interested in understanding the technical details that define the MTOSI Release 1.0 as an XML OS-OS interface should read the following supporting documents:

- SD2-4 A document that contains a sample network accompanied with some XML examples to illustrate the MTOSI as a transport independent XML interface.
- SD2-5 An analysis of the MTOSI XML interface regarding the support of Message Handling Patterns (MEP).
- SD2-6 An analysis of the MTOSI XML interface regarding versioning and extensibility of its schema.
- SD2-7 The MTOSI network resources naming specification.
- SD2-8 The MTOSI Notification Service specification.

### 3.4.3 Conforming to the MTOSI XML interface

Someone interested in writing a conformance implementation agreement document of the MTOSI Release 1.0 as the XML OS-OS interface for an SP's solution shall use the SD2-1 supporting document.

The SD2-1 supporting document provides a collection of templates concerning the various interfaces, operations, objects and notifications in the TMF 854. The templates are to be completed by those organizations that have implemented or are planning to implement TMF 854. The templates can be used to share information about an OS supplier's implementation of TMF 854 (in a standard manner) to their clients and business partners, or it can be used by a service provider to indicate what they require from their OS suppliers.

### 3.4.4 Implementing the MTOSI XML interface

A software developer whose task is to implement MTOSI Release 1.0 should read the following supporting documents:

- SD2-2 This is the implementation user guide that describes all the specifications and recommendations related to XML usage. It shall be consulted along with the HTML based user interface documentation (See 3.2).
- SD2-9 This document describes all the adaptation details of the MTOSI XML interface to JMS transport.

# GLOSSARY

| | |
|---|---|
| **CCV** | Common Communication Vehicle |
| **EMS** | Element Management System |
| **HTTP** | HyperText Transfer Protocol |
| **JMS** | Java Message Service |
| **MEP** | Message Handling Pattern |
| **MOM** | Message Oriented Middleware |
| **MTNM** | Multi Technology Network Management |
| **MTOSI** | Multi Technology Operations System Interface |
| **NE** | Network Element |
| **NMS** | Network Management System |
| **OS** | Operations System |
| **SOAP** | Simple Object Access Protocol |
| **SP** | Service Provider |
| **TMF** | TeleManagement Forum |
| **XML** | eXtended Markup Language |
| **XSD** | XML Schema Documents |
| **WSDL** | Web Service Description Language |

 ©TeleManagement Forum 2005 

# REFERENCES


Ref 1 TMF 517 Version 1.0, MTOSI Business Agreement, TM Forum // Technical Programs // MTOSI

Ref 2 TMF 608 Version 3.2, MTNM/MTOSI Information Agreement, TM Forum // Technical Programs // MTOSI

Ref 3 RN 306 v0.3 MTOSI Release Notes,

Ref 4 Extensible Markup Language (XML) 1.0 (Third Edition), W3C Recommendation 04 February 2004

Ref 5 XML Schema Specifications, W3C Recommendation 28 October 2004

Ref 6 Web Service Definition Language (WSDL) 1.1, W3C Note 15 March 2001

Ref 7 Simple Object Access Protocol (SOAP) 1.1, W3C Note 08 May 2000

# STANDARDS

[S1] ITU-T Recommendation X.731, *State Management Function*, 1992.

[S2] ITU-T Recommendation X.733, *Alarm Reporting Function*, 1992.

[S3] GR-1093-CORE (Telcordia), *Generic State Requirements for Network Elements (NEs)*, Issue 2, June 2000.