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[TOC](#)

"The OAM Acronym Soup"

draft-ietf-opsawg-mpls-tp-oam-def-06.txt

Abstract

At first glance the acronym "OAM" seems to be well known and well understood. Looking at the acronym a bit more closely reveals a set of recurring problems that are revisited time and again.

This document provides a definition of the acronym OAM (Operations, Administration, and Maintenance) for use in all future IETF documents that refer to OAM. In particular, it will be applied in all MPLS Transport Profile (MPLS-TP) documents.

This document is a product of a joint Internet Engineering Task Force (IETF) / International Telecommunication Union Telecommunication Standardization Sector (ITU-T) effort to include an MPLS Transport Profile within the IETF MPLS and PWE3 architectures to support the capabilities and functionalities of a packet transport network.

This Informational Internet-Draft is aimed at achieving IETF Consensus before publication as an RFC and will be subject to an IETF Last Call. [RFC Editor, please remove this note before publication as an RFC and insert the correct Streams Boilerplate to indicate that the published RFC has IETF Consensus.]

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Table of Contents

- [1.](#) Introduction
- [2.](#) OAM and O, A and M
 - [2.1.](#) OAM as a Functional Unit
 - [2.2.](#) The Acronym Broken Up
 - [2.2.1.](#) O in OAM
 - [2.2.2.](#) A in OAM
 - [2.2.3.](#) M in OAM
- [3.](#) Use of the OAM Acronym in the MPLS-TP effort
- [4.](#) Acronyms for the MPLS-TP effort
- [5.](#) IANA Considerations
- [6.](#) Security Considerations
- [7.](#) Acknowledgments
- [8.](#) Informative references
- [§](#) Authors' Addresses

1. Introduction

[TOC](#)

The main purpose of this document is to provide a definition of the OAM acronym such that it is useful for MPLS. However, the information in this document is not specific to MPLS, so broader applicability of the OAM definitions provided is appropriate.

The acronym OAM is frequently used in the data and telecommunication industry. One would assume that something that is so widely used is very clearly defined. However a closer look reveals some points that need to be clarified.

The examples below show a number of different ways that the OAM acronym has been expanded in previous documents. The examples come from many sources including some of the early MPLS-TP I-Ds.

- *OAM = Operation, Administration, Maintenance
- *OAM = Operations, Administration, Maintenance
- *OAM = Operations, Administration, and Maintenance
- *OAM = Operations, Administration, Management
- *OAM = Operations and Maintenance
- *OAM = Operations and Management
- *O&M = Operations and Maintenance
- *O&M = Operations and Management
- *O&M = OAM and Management

Sometimes there is a fourth letter added to the acronym:

- *OAM and P = Operations, Administration, Maintenance and Provisioning

If such an important piece of our technology is so poorly defined, or if there are dialects of the technology with different understandings of such a key concept, this will eventually cause problems. Trying to understand the use of an acronym that is as "content-rich" as OAM reveals two levels of complexity. First, each letter in the acronym represents an integrated piece of functionality; secondly the acronym as such represents something that is more than just the sum of its parts.

There is also the issue of how each piece of the acronym is defined. This document provides an analysis of how each piece of the acronym is defined and provides possible interpretations of the acronym. Finally the interpretation of the OAM acronym to use for the MPLS-TP effort based on the agreement reached in the JWT (Joint Working Team) report [\[1\] \(Bryant, S. and L. Andersson, "Joint Working Team \(JWT\) Report on MPLS Architectural Considerations for a Transport Profile," February 2009.\)](#) is provided.

Another useful document to make the OAM term understandable in a wider scope is found in [An Overview of Operations, Administration, and](#)

[Maintenance \(OAM\) Mechanisms \(Mizrahi, T., "An Overview of Operations, Administration, and Maintenance \(OAM\) Mechanisms," January 2010.\)](#) [2].

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2. OAM and O, A and M

[TOC](#)

2.1. OAM as a Functional Unit

[TOC](#)

Operations And Maintenance (OAM): A group of network management functions that provide network fault indication, performance information, and data and diagnosis functions. ATM OAM [ITU-T I.610 \(International Telecommunication Union, "B-ISDN operation and maintenance principles and functions," February 1999.\)](#) [4] is an example specification that uses this expansion of the OAM acronym.

Operations, Administration, and Maintenance (OAM): A group of network management functions that provide network fault indication, fault localization, performance information, and data and diagnosis functions. Examples where this acronym is used are Clause 57 of [IEEE 802.3-2008 \(IEEE, "Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier sense multiple access with collision detection \(CSMA/CD\) access method and physical layer specifications," December 2008.\)](#) [3] and [ITU-T Y.1731 \(International Telecommunication Union, "OAM functions and mechanisms for Ethernet based networks," February 2008.\)](#) [8].

The [ITU-T M.3010 \(International Telecommunication Union, "Principles for a telecommunications management network," February 2000.\)](#) [7]

Recommendation defines operations systems function as a function block that processes information related to the telecommunications management for the purpose of monitoring/coordinating and/or controlling telecommunication functions including management functions (i.e. the TMN (Telecommunications Management Network) itself).

The Metro Ethernet Forum refers to OAM as the tools and utilities to install, monitor and troubleshoot a network, helping carriers run their networks more effectively [MEF 17 \(Metro Ethernet Forum, "Service OAM Requirements & Framework - Phase 1," April 2007.\)](#) [9].

2.2. The Acronym Broken Up

[TOC](#)

2.2.1. O in OAM

[TOC](#)

The O in the OAM acronym invariably stands for "Operations".

However there is some ambivalence in the definition and scope of the term "Operation".

Examples of tools related to "operations" are performance monitoring tools used for service level agreement (SLA) measurement, fault management tools used to monitor the health of nodes and links in the network, and network provisioning tools.

2.2.2. A in OAM

[TOC](#)

The A in the OAM acronym stands for "Administration".

Examples of "administration" tools are network discovery and planning tools.

2.2.3. M in OAM

[TOC](#)

In the list above the M in the OAM acronym stands for "Maintenance" or "Management".

Maintenance and Management may have different interpretations.

Maintenance is defined further in Section 3, while Management is a broader term applicable to many functions applied to the network as described in Section 3.

Since these terms have different interpretations, it is not a good idea to use them interchangeably. This document defines the "M" in the OAM acronym to mean Maintenance.

Examples of "maintenance" tools are implementations of connectivity check, loopback, link trace, and other tools that can be used to monitor and diagnose failures in a network or network element.

The Recommendation [ITU-T M.20 \(International Telecommunication Union, "Maintenance philosophy for telecommunication networks," October 1992.\)](#) [5] defines maintenance as the whole of operations required for setting up and maintaining, within prescribed limits, any element involved in the setting up of a connection (see the [ITU-T M.60 \(International Telecommunication Union, "Maintenance terminology and definitions," March 1993.\)](#) [6] Recommendation). The purpose is to properly plan and

program the maintenance operations required to establish and maintain a network.

A major aim of the concept of maintenance is to minimize both the occurrence and the impact of failures and to ensure that in case of a failure the correct actions are taken. The ITU-T documents also clearly define a maintenance philosophy.

3. Use of the OAM Acronym in the MPLS-TP effort

[TOC](#)

In [Section 4 \(Acronyms for the MPLS-TP effort\)](#) the acronyms as they will be used in the MPLS-TP effort are listed. This section gives some background on the definitions provided.

"Mgt" will be used if an abbreviation for "Management" is needed. This draft does not define Management. It is noted, however, that an important part of management functionality relates to tools to report the state of the network.

In MPLS-TP documents, the OAM acronym is to be used for "Operations, Administration, and Maintenance", i.e. excluding provisioning. OAM tools and protocols, and the "Management space" are complementary in nature. Management focuses on FCAPS (Fault, Configuration, Accounting, Provisioning, and Security) functionality and on manager (or NOC (Network Operations Center)) to device (or network) interaction.

From an architecture point of view OAM protocols and tools deployed in the data plane tend to be "horizontal", i.e., network element to network element. The management protocols tend to be "vertical", i.e., between management stations and network elements.

From an architecture point of view OAM protocols and tools deployed in the data plane tend to be "horizontal" i.e. network element to network element while the management protocols tend to be "vertical".

The components of the OAM acronym (and provisioning) are defined as follows:

- *Operations - Operation activities are undertaken to keep the network (and the services that the network provides) up and running. It includes monitoring the network and finding problems. Ideally these problems should be found before users are affected.

- *Administration - Administration activities involve keeping track of resources in the network and how they are used. It includes all the bookkeeping that is necessary to track networking resources and the network under control.

- *Maintenance - Maintenance activities are focused on facilitating repairs and upgrades - for example, when equipment must be replaced, when a router needs a patch for an operating system image, or when a new switch is added to a network. Maintenance

also involves corrective and preventive measures to make the managed network run more effectively, e.g. adjusting device configuration and parameters.

"Provisioning" is outside the scope of this document, but the following definition is provided for completeness.

*Provisioning - Provisioning activities involve configuring resources in the network to support the offered services. This might include setting up the network so that a new customer can receive an Internet access service.

In general, Provisioning is used to configure the network to provide new services, whereas OAM is used to keep the network in a state that it can support already existing services. Sometimes it is necessary to talk about the combination of functions and tools supplied by OAM and Management, it is preferred that this is spelled out as "OAM and Management". In cases where an acronym is needed O&M should be used.

4. Acronyms for the MPLS-TP effort

[TOC](#)

OAM - Operations, Administration, and Maintenance

O&M - OAM and Management

"Mgt" - Management

5. IANA Considerations

[TOC](#)

This memo includes no request to IANA.

6. Security Considerations

[TOC](#)

This document provides guidance for the use of the OAM acronym in other documents. This document does not have direct security implications. Misunderstanding of an acronym may lead to incorrect specification or implementation which may, in turn, open up security concerns with protocols or deployed networks. Clarifying the meaning of OAM is, therefore, a benefit for future stability of specifications.

[TOC](#)

7. Acknowledgments

The following individuals significantly contributed to this document.

*Malcolm Betts from M. C. Betts Consulting Ltd.

*Kam Lam from Alcatel Lucent

*Dieter Beller from Alcatel Lucent

Thanks to the experts of ITU-T SG 15 for their review and comments.

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[TOC](#)

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[TOC](#)

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