Diagnostics and Monitoring Trap Management Object

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Open Mobile Alliance

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1. Scope

This document describes the Trap framework and the management object(s) as a part of the framework to be employed in a Diagnostics and Monitoring activity that leverages the OMA DM v1.2 protocols. It provides standard DM management objects and associated client-side and server-side behaviour necessary to utilize the event monitoring capabilities on the mobile devices.

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2. References

2.1 Normative References

[DMPRO] "OMA Device Management Protocol, Version 1.2". Open Mobile Alliance™. OMA-TS-DM-Protocol-V1_2, URL:http://www.openmobilealliance.org

[IOPPROC] "OMA Interoperability Policy and Process", Version 1.1, Open Mobile Alliance™, OMA-IOP-Process-V1_1, URL:http://www.openmobilealliance.org/

[OMADM] *OMA Device Management, Version 1.2*. Open Mobile Alliance™. URL:http://www.openmobilealliance.org

[RFC2119] "Key words for use in RFCs to Indicate Requirement Levels", S. Bradner, March 1997, URL:http://www.ietf.org/rfc/rfc2119.txt

[RFC2234] "Augmented BNF for Syntax Specifications: ABNF". D. Crocker, Ed., P. Overell. November 1997, URL:http://www.ietf.org/rfc/rfc2234.txt

2.2 Informative References

[DMSTDOBJ] "OMA Device Management Standardized Objects, Version 1.2". Open Mobile Alliance™. OMA-TS-DM-StdObj-V1_2. URL:http://www.openmobilealliance.org

[RFC2616] "Hypertext Transfer Protocol – HTTP/1.1". Network Working group. June 1999. URL: http://www.ietf.org/rfc/rfc2616.txt

[RFC3986] "Uniform Resource Identifier (URI): Generic Syntax." Network Working group. January 2005. URL: http://www.ietf.org/rfc/rfc3986.txt

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3. Terminology and Conventions

3.1 Conventions

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [RFC2119].

All sections and appendixes, except “Scope” and “Introduction”, are normative, unless they are explicitly indicated to be informative.

3.2 Definitions

Diagnostics and Monitoring Function	Functions in a device that can be remotely invoked by a Diagnostics and Monitoring System, that, when invoked, executes a diagnostics related logic to return results
Trap	A mechanism employed by a management authority to enable the Device to capture and report events and other relevant information generated from various components of the Device, such as a protocol stack, device drivers, or applications.

3.3 Abbreviations

DM	Device Management
MO	Management Object
OMA	Open Mobile Alliance
OMNA	Open Mobile Naming Authority
URI	Uniform Resource Identifier
URN	Uniform Resource Name

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4. Introduction

The OMA Trap Framework v1.0 specified in this document builds on top of the existing OMA DM based management system to enable in an interoperable way specifying and using any kind of events worthwhile for managing and monitoring the networked services or applications that are deployed on the Device, or faults on the general software and hardware, etc.

The OMA Trap Framework provides the common structure of the Trap Management Objects on which further definitions for the specific events by vendors and standard bodies will be based, and the Trap mechanisms for sending and receiving Notifications about the events.

The OMA Trap Framework v1.0 is compatible with [OMA-DM].

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5. The Trap Framework

5.1 Trap Identifier

Any event that is specified as a Trap MUST be assigned an identifier, the Trap identifier. The Trap identifier MUST be an URN and it MAY be registered with OMNA. The assignment of the identifier can be done by the entity who specifies the Trap, following the guidance or the administration from Open Mobile Naming Authority [OMNA] in order for the identifier to be unique and persistent.

Trap identifiers defined by OMA SHALL be an URN consistent with the Management Object identifier as follows: "urn:oma:mo:oma-diagmontrap:1.0", for example, urn:oma:mo:oma-diagmontrap:trapid-abc:1.0.

5.2 Registrations

If the Device supports a Trap, it means the Device is capable of monitoring the event and send Notifications whenever it detects the event. If the Management Authority wants to use the capability, it has to register for it.

There are two types of Registration depending on the direction in which the Notification is bound, outward and inward. The first type, outward Registration is used when the Management Authority wants to receive the Notification as soon as the Traps are generated; whereas, the second type, inward Registration allows that Traps can be transferred to some other functional components on the same Device so as to trigger a certain operation in the destination.

For outward Registration, the server MUST register with a server identifier or it MUST be failed with status 403 Forbidden. The OMA Trap Framework supports multiple Trap recipients. Therefore, it MUST be possible that more than one server can register on one Trap at the same time with the maximum allowed number being limited by the vendors based on the `Occurrence` framework property of the Trap node [OMA-DM]. In this case, the order in which the Device sends the Notifications for each server should be decided at the discretion of the vendors.

Inward Registration involves relatively more complex procedure compared to outward one. This is mainly due to the fact that security mechanisms in [OMA-DM] are not applicable in addressing the security issues pointed out in section 5.4.

5.3 Notifications

When the Trap occurs, the Device MUST send Notifications as practical to all the registered recipients. Corresponding to the Registration type, there are two types of Notification - outward and inward.

5.3.1 Outward Notifications

The outward Notifications MUST be transmitted to the servers as a part of DM session using the Generic Alert mechanism [OMA-DM]. On top of that, additional restrictions on the contents and the usage of the elements in the Generic Alert message are specified for the Notification as follows.

- **Usage of Meta, Type:** This element MUST be specified and the content of this element MUST specify the Trap alert type string, "urn:oma:mo:diagmon:1.0:TrapNotification", which implies that this Generic Alert message contains the Trap Notification.
- **Usage of Meta, Format:** This element MUST be specified and the content of this element MUST specify the format of the `Data` element, i.e. "chr".
- **Usage of Source, LocURI:** This element MUST be specified and the content of this element MUST specify the URI of the placeholder node for the Trap Source.

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- **Usage of Data (inside Item):** This element MUST be specified and the content of this element MUST specify the Trap identifier.
- **Usage of Other Fields:** `Correlator` MUST NOT be used, and the use of the `Mark` elements is vendor specific.

5.3.2 Inward Notifications

Although the details of the delivery mechanism are implementation specific, the Notification MUST provide the same information to the recipients as for the outward Notification.

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6. Trap MO

A trap is a well known concept employed in network management. It is a mechanism employed by a management authority to enable the Device to capture and report events and other relevant information generated from various components of the Device, such as a protocol stack, device drivers, or applications.

The Trap MO framework defined in this specification will be used for specific Trap MOs to be defined and uniquely identified by a Trap ID.

6.1 The TrapMO

In particular, a TrapMO is used to report the occurrence of an event of interest. A Trap is associated with a trap identifier and a server identifier. It also defines a collection method and a reference node to refer to other management objects or URI, which may be associated with additional activities, e.g. DiagMonMO.

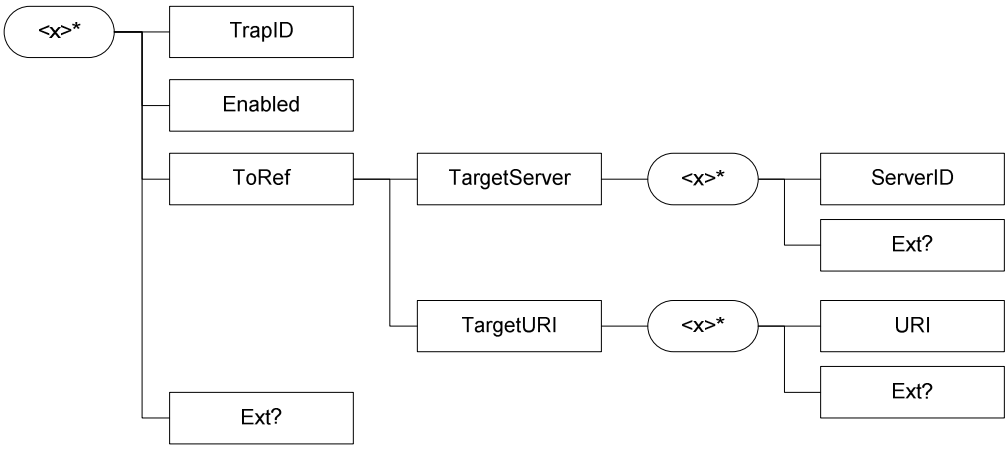

Figure 1: Diagnostics and Monitoring Trap Management Object

6.2 Management Object Properties

This Section describes the properties for Trap Management Object.

<x>

Status	Tree Occurrence	Format	Min. Access Types
Required	OneOrMore	node	Get

This interior node groups together the parameters of the DiagMon Trap MO. The ancestor elements of this node define the position in the DM tree of this MO.

The type of this node MUST be the Trap Management Object ID “urn:oma:mo:oma-diagmontrap:1.0”

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<x>/TrapID

Status	Tree Occurrence	Format	Min. Access Types
Required	One	chr	Get

The TrapId leaf is used to define a unique identifier that identifies a Trap MO. The value of the leaf object MUST be a unique registered identifier.

Values
Leaf values are in URN format [RFC3986] (OMNA May be used to register the URN).

<x>/Enabled

Status	Tree Occurrence	Format	Min. Access Types
Required	One	bool	Get, Replace

The Enabled node is used to indicate if the Trap is enabled ('true') or disabled ('false'). If the Trap is disabled, no action related to the Trap is performed.

Values
true
false

<x>/ToRef

Status	Tree Occurrence	Format	Min. Access Types
Required	One	node	Get

This interior node is a placeholder for all recipient reference.

<x>/ToRef/TargetServer

Status	Tree Occurrence	Format	Min. Access Types
Required	ZeroOrOne	node	Get

This interior node is a placeholder for specifying targeted server as a trap recipient.

<x>/ToRef/TargetServer/<x>

Status	Tree Occurrence	Format	Min. Access Types
Required	ZeroOrMore	node	Get,

This interior node is a placeholder for each registration for outward notification.

<x>/ToRef/TargetServer/<x>/ServerID

Status	Tree Occurrence	Format	Min. Access Types
Required	One	chr	Get

This leaf node specifies the server identifier of the registered DM Server.

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<x>/ToRef/TargetServer/<x>/Ext

Status	Tree Occurrence	Format	Min. Access Types
Optional	ZeroOrOne	node	Get

This interior node is a placeholder for extension by vendors or standards organizations.

<x>/ToRef/TargetURI

Status	Tree Occurrence	Format	Min. Access Types
Required	ZeroOrOne	node	Get

This interior node indicates the targeted internal executable node as a trap recipient.

<x>/ToRef/TargetURI/<x>

Status	Tree Occurrence	Format	Min. Access Types
Required	ZeroOrMore	node	Get

This interior node is a placeholder for each registration for inward notification.

<x>/ToRef/TargetURI/<x>/URI

Status	Tree Occurrence	Format	Min. Access Types
Required	One	chr	Get, Replace

This leaf node specifies the device internal target URI reference which will be invoked by trap.

<x>/ToRef/TargetURI/<x>/Ext

Status	Tree Occurrence	Format	Min. Access Types
Optional	ZeroOrOne	node	Get

This interior node is a placeholder for extension by vendors or standards organizations.

<x>/Ext

Status	Tree Occurrence	Format	Min. Access Types
Optional	ZeroOrOne	node	Get

This interior node is a placeholder for platform or vendor specific extensions.

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Appendix A. Change History (Informative)

A.1 Approved Version History

Reference	Date	Description
n/a	n/a	No prior version

A.2 Draft/Candidate Version 1.0 History

Document Identifier	Date	Sections	Description
Draft Versions OMA-TS-DiagMonTrapMO-V1_0	26 Mar 2006	All	For discussion of Baseline document
	12 Jun 2006	All	Draft to be proposed as baseline
	17 Jan 2007	6.1 & 6.2	Accommodated CR OMA-DM-Diag-2006-0058R01-CR_TrapMo_bug_
	04 Apr 2007	6.3	Accommodated CR OMA-DM-Diag-2007-0010R01-CR_Trap_generic_alert
	02 May 2007	6.2	Accommodated CR OMA-DM-Diag-2007-0018R02-CR_ToRef_recipient
	30 Jun 2007	All	Accommodated CR OMA-DM-Diag-2007-0015R06-CR_Trap_New_Baseline
	04 Jul 2007	SCR	Accommodated CR Diag-0025_Fix_SCR
	30 Aug 2008	All	Editorial cleanup
	11 Oct 2008	Appendix B	CR OMA-DM-Diag-2008-0046
	15 Oct 2008	All	Editorial changes (to support automatic generation of DDF and diagram)
	22 Oct 2008	5.1, 6.2	OMA-DM-Diag-2008- 0058 OMA-DM-Diag-2008-0063R01
	01 Dec 2008	2.2, 3.3	OMA-DM-Diag-2008-0069R01
	03 Mar 2009	- 7.1, 7.2 5.3.1 All	Implemented agreed CRs: OMA-DM-Diag-2009-0010-CR_CONR_Resolution_TrapMO OMA-DM-Diag-2009-0020-CR_TrapMO_TS_Alert_Type_Update Editorial changes: 1. Document language set to English 2. Spelling errors were fixed 3. Table of Contents and List of Figures were updated 4. Headers and footers were updated - document name and dates 5. Added description for <x>/Ext node as an editorial change 6. Fixed this table (A.2) since document identifiers were wrong for all documents 7. Removed Appendix C
	18 Mar 2009	All	Editorial Cleanup
Candidate Versions OMA-TS-DiagMonTrapMO-V1_0	14 Apr 2009	n/a	Status changed by TP OMA-TP-2009-0138-INP_DiagMon_V1_0_ERP_for_Candidate_Approval

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Appendix B. Static Conformance Requirements (Normative)

The notation used in this appendix is specified in [IOPPROC].

B.1 SCR for Trap MO Tree Structure

Item	Function	Reference	Requirement
TRAP-T-001-M	Use of appropriate Management Object identifier for the TRAP MO node	Section 6.2	
TRAP-T-002-M	Support for REQUIRED nodes under root node	Section 6.2	

B.2 SCR for DiagMon Client

Item	Function	Reference	Requirement
Trap-C-001-M	DM Client allows Diagnostics and Monitoring System to invoke monitoring of trap events and notifications via Trap MOs	Section 5	
Trap-C-002-O	Results are provided asynchronously to the Trap notification recipient(s) defined by /<x>/ToRef/TargetServer and /<x>/ToRef/TargetURI	Section 5.2.6.2	
Trap-C-003-O	Subsequent Get by server returns Trap results available	Section 5	
Trap-C-004-M	Alert Type provides information on Trap MO	Section 5	

B.3 SCR for DiagMon System

Item	Function	Reference	Requirement
TRAP-S-001-M	Support for the Trap Management Object	Section 6.2	
Trap-S-002-M	Diagnostics and Monitoring System can invoke device monitoring of trap events and receive notifications via Trap MOs	Section 5.2.6.2	
Trap-S-003-O	Results are receives asynchronously by the Diagnostics and Monitoring System	Section 5	

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Trap-S-004-O	Server can Get results from the Trap MO	Section 5	
Trap-S-005-M	Alert Type is received that provides information on the Trap MO	Section 5	

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