OASIS

Requirements – Management Using Web Services

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Abstract:

This document lists the requirements for the Management Using Web Services (MUWS) specification.

Status:

This document is a working draft of the OASIS Web Services Distributed Management (WSDM) Technical Committee. Comments are most welcome.

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1 Introduction

This document lists the requirements to be satisfied by *Management Using Web Services Architecture*, part of an OASIS standard to be developed by WSDM-TC, as per the TC charter.

<u>TC Charter</u>

```
To define web services management. This includes using web services
architecture and technology to manage distributed resources. This TC
will also develop the model of a web service as a manageable resource.
This TC will collaborate with various evolving activities within other
standards groups, including, but not limited to, DMTF (working with its
technical work groups regarding relevant CIM Schema), GGF (on the OGSA
common resource  model and OGSI regarding infrastructure), and W3C (the
web services architecture committee). Also liaison with other OASIS
TCs, including the security TC and other management oriented TCs.
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Relationship to Management Of Web Services (MOWS)
This set of requirements concerns management using web services. As such, it is expected to cover management of any type of manageable resource, as long as it has a Web Services manageability interface, provided by the manageable resource or by another entity on behalf of the manageable resource. The MOWS requirements should drive the definition of a manageability model, specific to a Web Services endpoint, that will be exposed using MUWS.

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1.1 Basic Concepts Required for Management Using Web Services

NOTE: This section describes some basic concepts required for MUWS, but the definitions in use by the WSDM TC are contained in the WSDM Glossary.

An enterprise deploying a management solution would typically have the following components:

- *Manageable resources* capable of being monitored, configured, and/or controlled via one or more remote or local applications, known as *manager(s)*.
- *Manager*, an application that is capable of monitoring, configuring, and/or controlling a *mangeable resource*.
- *Manageability interface*, the place of interaction between manageable resources and the manager(s).
- Model of manageable resources describing:
  - Attributes
  - Operations
  - Event Notifications
  - Relations with other manageable resources

1.2 Existing Management Frameworks

A number of standard management frameworks are currently in wide use

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105 • SNMP (SNMPv1, SNMPv2 and SNMPv3) and related standards developed by IETF.

106 • CIM/WBEM developed by DMTF

107 • Open Management Interface (OMI) – submitted to OASIS MPTC by HP and
108 webMethods.

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110 Besides these, there are many proprietary frameworks developed by various vendors.

111 Though OMI is XML based and uses SOAP for packaging, none of these frameworks are based
112 on Web Services architecture and leverage its benefits.

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1.3 Scope

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116 The scope of the MUWS requirements, particularly in relation to the MOWS requirements, must
117 be as clear as possible. To achieve this goal, this section contains both a description of the
118 scope, and key concepts discussed during the process that have been determined to be out of
119 scope.

120 The scope of the MUWS requirements is the manageability interface and the related description
121 of the manageability interface (using WSDL). Because the MOWS requirements only address
122 manageable resources that are Web Services Endpoints, there may be a need to model a more
123 abstract manageable resource.

124 **Out of Scope**

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What is out of scope for the MUWS requirements is the management information model for a Web Service, requirements on the manager, and the following specific items identified during the requirements development process:

- Ensure that the specification makes it easy to develop an adapter to existing systems for managing manageable resources.
- Definition of management applications.
- Management system conflict resolution is out of scope.

The specification developed from the MUWS requirements should outline:

- the architecture for Management Using Web Services
- the management patterns
- how a manager uses the manageability interface
- how a manageable resource uses the manageability interface
- how to self manage

1.4 Notation

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this specification are to be interpreted as described in IETF RFC 2119.

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2 MUWS Requirements

2.1 Functional Requirements

2.1.1 Web Services Based (A) [WS-BASE]

Guiding principle: Do not reinvent the "wheel" or the infrastructure.

[WS-BASE.001] The Manageability Interface MUST leverage existing Internet infrastructure and standards as defined by the Web Services Architecture developed by W3C WSA Working Group, as well as related standards from WS-I and OASIS. {#1, #11, #45, #96, 128, 125, 39, 22}.

For the purpose of this section, the standards include, but are not limited to:

- XML
- HTTP, HTTPS
- SOAP
- WSDL (1.1 or 1.2)
- WS-I Basic Profile (as a goal for interoperability)

Note: Some of these standards are more mature than others, which will require close attention.

<EDITOR'S NOTE: Need to make sure this aligns with the WS-SOS work.>

[WS-BASE.001.1] The Manageability Interface messages MUST be expressable in XML infoset messages.

[WS-BASE.001.2] The Manageability Interface and Description MUST allow discovery of manageable resources through Web services discovery mechanisms. These mechanisms could be based on a central registry like UDDI and/or decentralized, out-of-band gathering of WSDL documents (such as retrieving WSDL documents through a crawler). {#6, #76}

[WS-BASE.001.3] The Manageability Interface MUST require description of management capabilities of a manageable resource using WSDL and the documents the WSDL refers to. WSDL should be used for:

    capabilities {#122}

    manageability interface - properties and operations that represent the management capabilities {#2, #15}

    access – description of the binding of the interface to the wire format (including message packaging) {#3, #15}

    addressability description – information necessary to send a message to invoke the interface described using the access described. {#2, #3, #4, #15}

    NOTE: some of the capabilities may not be fully described in the WSDL interface at design time; the details of some capabilities may only be accessible during runtime.

[WS-BASE.001.4] Goal: Leverage, do not invent, non-management specific Web services infrastructure. If non-management specific services/infrastructure is required then it is placed as a requirement on the Web services community. This TC may need to assist in the development of the infrastructure services. Required services/infrastructure include, but are not limited to:

    o   notifications

    o   relationships

    o   registry

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- o policy
- o reliable messaging
- o security {#1, #11, #22, #39, #57, #90, #125, #128}

[WS-BASE.001.5] The Manageability Interface MUST enable interoperability between vendors (for example, WS-I basic profile conformance). Note that interoperability MAY require agreement on aspects of the management information model. {#71}

2.1.2 Message Exchange Patterns (B) [MEP]

The Manageability Interface:

[MEP.001] MUST support synchronous delivery of messages and notifications. {#38}

    [MEP.001.1] MUST support the request/response style using synchronous delivery. (Sender "waits" for the response to come back). {#142}

    [MEP.001.2] SHOULD support the delayed response style using synchronous delivery. (Sender gets a "message received" response, the "substantive" response is delivered during a later transaction. It may be initiated by the original sender or the original receiver.)

    [MEP.001.3] SHOULD support the one-way style using synchronous delivery. (Sender gets a "message received" response only.)

[MEP.002] SHOULD support asynchronous delivery of messages and notifications. (See also MEP.003.3)

    [MEP.002.1] SHOULD support the request/response style using asynchronous delivery. (Sender sends the request and "hangs up". "Substantive" response is delivered by the original receiver in a subsequent asynchronous delivery.)

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[MEP.002.2] SHOULD support the one-way style using asynchronous delivery. (Sender gets no response at all.)

[MEP.003] MUST support delivery of notifications. {#98, #33}

[MEP.003.1] The notification receiver SHOULD be able to control what notifications are sent to it (for example, using filtering and/or subscription at manageable resource side).

[MEP.003.2] The notification receiver SHOULD be able to indicate whether it wants to receive notifications asynchronously as and when they happen or poll them periodically. {#90}

[MEP.003.3] The Manageability Interface SHOULD support asynchronous delivery of notifications

[MEP.003.4] The Manageability Interface MUST support synchronous polling for notifications

[MEP 003.5] The Manageability Interface MUST be able to indicate if it supports asynchronous and/or polling notification mechanisms.

[MEP.003.6] The Manageability Interface MUST support guaranteed notifications and be able to indicate that support. {#90}

[MEP.003.7] The Manageability Interface MUST support ordering of notifications from a manageable resource's perspective. (If event A happens before event B then the notification receiver should be able to use the ordering mechanism to determine that A was before B) {#90}

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2.1.3 Consistency with Other Management Standards (C) [STD-CON]

[STD-CON.001] The Manageability Interface SHOULD be consistent with existing management specifications such that it can be used/applied in those communities. Including, but not limited to: GGF, DMTF. {#12, #20, #130}

[STD-CON.002] The Manageability Interface SHOULD consider consistency with upcoming (draft) management specifications such that it can be used/applied in those communities. Including, but not limited to: GGF, DMTF. {#12, #20, #130}

[STD-CON.003] The Manageability Interface SHOULD not inhibit the simultaneous usage with existing management environments and protocols in a common environment.

> **[STD-CON.003.1]** The Manageability Interface MUST NOT inhibit the simultaneous usage of existing standard management environments and protocols (at a minimum, WBEM/CIM and SNMP).

[STD-CON.004] The Manageability Interface SHOULD be specified to allow other standards to use this standard. {#12, #130, #57}

> **[STD-CON.004.1]** The Manageability Interface SHOULD, wherever reasonable, be specified so that it is possible to use modules of this standard and not only the standard as a whole.

2.1.4 Distributed Management (D) [DIST-M]

[DIST-M.001] The Manageability Interface MUST not preclude use in highly distributed environments. {#18, #81, #85, #101}

> **[DIST-M.001.1]** The Manageability Interface SHOULD be able to be used over the public Internet.

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[DIST-M.001.2] The Manageability Interface MUST not force a central point of control or failure for implementations of this specification

[DIST-M.001.3] The Manageability Interface MUST allow a manager to manage multiple manageable resources

[DIST-M.001.4] The Manageability Interface MUST allow a manageable resource to be managed by multiple managers {#42, #98}

[DIST-M.001.5] The Manageability Interface MUST enable support of scalable volumes of manageable resources {#101}

[DIST-M.001.6] The Manageability Interface MUST enable support of scalable volumes of manager interactions {#101}

[DIST-M.001.7] The Manageability Interface MUST enable access to aggregates of manageable resources. Allowing: {#33, #132, #24}

　　Support for global actions (#111)

　　It SHOULD be possible to retrieve management information or carry out management operations on more than one manageable resource with a single request. {69, 72}

[DIST-M.001.8] The Manageability Interface MUST support management of occasionally connected resources, including the recovery of state. {#85, #101}

[DIST-M.001.9] The Manageability Interface MUST define proper exceptions so that implementations can tolerate failures, such as a connection failure, in a distributed environment. {#117}

[DIST-M.001.10] The Manageability Interface SHOULD not prohibit local autonomy (respect local overrides) {#111}

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[DIST-M.001.11] The Manageability Interface SHOULD ensure that time sensitive specifications define how to calibrate time or be time difference tolerant**.**

[DIST-M.001.12] The Manageability Interface MUST work with loose data consistency. Not all interactions need to be atomic or transactional. {#114}

[DIST-M.001.13] The Manageability Interface MUST support role collapsing as noted in the subrequirements.

> **[DIST-M.001.13.1]** The Manageability Interface MUST not preclude an entity acting as a manager from also being a manageable resource. {#85} NOTE: This is very similar to [MAN-MGMT.001], and may be deleted.

> **[DIST-M.001.13.2]** The Manageability Interface MUST not preclude manageability interface aware proxies and chains. {#24}

[DIST-M.001.14] The Manageability Interface MUST not preclude Manager of Managers (Hierarchical Manager) {#32, #43, #126, #133}.

> **[DIST-M.001.14.1]** Across enterprise boundaries. {#133}

[DIST-M.001.15] The Manageability Interface MUST not preclude Collaboration/Federation among managers, including but not limited to: {#52} (See also [FED.001]).

> **[DIST-M.001.15.1]** Cooperative, peer to peer, managers {#98}

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2.1.5 Security (E) [SEC]

[SEC.001] The Manageability Interface MUST enable secure management, as dictated by the threats of the environment. This includes (but is not limited to) support for the functionality described in the sub-requirements, SEC.001.1-6. {#25, #19, #30}

> **[SEC.001.1]** The Manageability Interface SHOULD support having the manager authenticate the manageable resource.

> **[SEC.001.2]** The Manageability Interface SHOULD support having the manageable resource authenticate the manager.

> **[SEC.001.3]** The Manageability Interface SHOULD support an underlying mechanism that guarantees the integrity of the messages exchanged. {#82}

> **[SEC 001.4]** The Manageability Interface SHOULD support an underlying mechanism that guarantees the confidentiality of the messages exchanged. {#82}

> **[SEC.001.5]** The Manageability Interface SHOULD not preclude establishing, using, and managing trust relationships. {#82}

> **[SEC.001.6]** The Manageability Interface SHOULD support access control (such as distinguishing between the ability to view and the ability to change) for management information, operations and event notifications at appropriate granularity. Access SHOULD be controllable by role (the security mechanism being used will determine what "role" means). For example, an internal manager should have greater control than a manager being run by a partner. {#74, #99, #116, #83, #82}

[SEC.002] The Manageability Interface MUST be NAT and firewall "friendly", meaning that the interface MUST NOT require additional support in NAT and firewall products, and that sufficient information MUST be provided for a firewall proxy to inspect the management messages. {#99}

[SEC.003] The Manageability Interface MUST not increase security risks or enlarge security exposures. {#112}

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Deleted: The Manageability Interface MUST be firewall friendly, i.e. work across enterprises

331 **[SEC.004]** The Manageability Interface MUST allow a self-contained, fallback security model, for
332 use when the security infrastructure is not available. {#41}

333 **[SEC.005]** The Manageability Interface MUST be able to be used to manage a Security
334 Infrastructure {#34}

335   **[SEC.005.1]** The Manageability Interface MUST allow operational capabilities on security
336   features (e.g., enable, disable). Security configuration SHOULD only be allowed via the
337   Manageability Interface if appropriate access controls are in place. {#70}

2.1.6 Model Neutrality (F) [MDL-NEUT]

339 **[MDL-NEUT.001]** The Manageability Interface MUST be model neutral and be able to work with
340 multiple existing, domain specific models (at a minimum, the information exposed by CIM and by
341 the standard MIBs of the IETF). {#68, #36, #122}

342

2.1.7 Model Exposure (G) [MDL-EXP]

344 **[MDL-EXP.001]** The Manageability Interface MUST expose the manageability capabilities
345 (management information, operations, and capabilities) of the manageable resource using a
346 WSDL description or operations defined in the WSDL. {#76, #7}

347   **[MDL-EXP.001.1]** The Manageability Interface MUST expose the Identity of the
348   manageable resource. (See [MNGBL-RES.003])
349   **[MDL-EXP.001.2]** The Manageability Interface MUST expose the management lifecycle
350   state of the manageable resource.
351   **[MDL-EXP.001.3]** The Manageability Interface MUST expose the management
352   performance metrics of the manageable resource.

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[MDL-EXP.001.4] The Manageability Interface MUST expose the management configuration of the manageable resource.

[MDL-EXP.001.5] The Manageability Interface MUST expose the management operations of the manageable resource.

[MDL-EXP.001.6] The Manageability Interface MUST expose the events of the manageable resource through notifications.

> **[MDL-EXP.001.6.1]** Events MUST be specified according to a standard XML management event format or extensions to such. {#38}

[MDL-EXP.001.7] The Manageability Interface SHOULD expose all the relationships of the manageable resource with other manageable resources.

> **[MDL-EXP.001.7.1]** The Manageability Interface SHOULD expose relationships with other management interfaces
>
> **[MDL-EXP.001.7.2]** The Manageability Interface SHOULD expose relationships between portTypes
>
> **[MDL-EXP.001.7.3]** The Manageability Interface SHOULD expose relationships between service instances {#89}
>
> **[MDL-EXP.001.7.4]** The Manageability Interface SHOULD enable relationships between manageable resources to be discoverable from the manageable resources {#8}
>
> **[MDL-EXP.001.7.5]** The Manageability Interface SHOULD enable relationships between manageable resources to be discoverable from Web Services discovery mechanisms {#8}
>
> **NOTE: This requirement is very similar to [DISC.003] and may be deleted.**
>
> **[MDL-EXP.001.7.6]** The Manageability Interface MUST be able to expose the relationship concepts of multiple existing models.

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[MDL-EXP.001.8] **The Manageability Interface SHOULD enable exposure of other interfaces and information that are associated with the manageable resource (for example, work flows and policies). {#9,#10}**

[MDL-EXP.001.9] The Manageability Interface SHOULD enable exposure of existing standard management models and runtimes (at a minimum, the information exposed by CIM and by the standard MIBs of the IETF). {#65, #50}

- **[MDL-EXP.001.9.1]** The Manageability Interface SHOULD consider and leverage current models of service (such as the existing CIM_Service class, defined by the DMTF). {#23}

[MDL-EXP.001.10] The Manageability Interface MUST be able to associate metadata with the operations, attributes and notifications of the manageable resource.

[MDL-EXP.001.10.1] The Manageability Interface MUST support categorization/typing of its information, operations, notifications, and relations {#5}

[MDL-EXP.001.10.2] The Manageability Interface MUST be able to associate read/write characteristics with attributes {#91}

[MDL-EXP.001.10.3] The Manageability Interface MUST be able to associate information for internationalization of values in the model {#91}

[MDL-EXP.001.10.4] The Manageability Interface MUST be able to associate semantics with the model {#16}

[MDL-EXP.002] The Manageability Interface MUST support exposing changes to the model during runtime.

2.1.8 Manageable Resource (H) [MNGBL-RES]

[MNGBL-RES.001] The Manageability Interface MUST support management of varieties of resources:

> **[MNGBL-RES.001.1]** Including hardware related resources (such as machines, networking elements, devices, application software) as well as software related resources (such as a Web Service, a business process, SLA). {#60, #29}

> **[MNGBL-RES.001.2]** Including physical resources {#31} and logical resources {#31}

> **[MNGBL-RES.001.3]** Including transient and long-lived/persistent resources {#64}

> **[MNGBL-RES.001.4]** Including Web Services and elements of the Web Services Architecture

[MNGBL-RES.002] The Manageability Interface MUST support a modular approach to providing management capabilities. For example, a manageability interface may support Monitor but not Control.

> **[MNGBL-RES.002.1]** The Manageability Interface SHOULD support Monitor management capabilities {#79}

> **[MNGBL-RES.002.2]** The Manageability Interface SHOULD support Configure (i.e., the non-volatile state, which involves both viewing and setting) management capabilities {#81}

> **[MNGBL-RES.002.3]** The Manageability Interface SHOULD support Control (expressed in actions, not state) management capabilities {#80}

[MNGBL-RES.003] The Manageability Interface MUST support identification of the manageable resource and be uniquely identifiable (where identifiers can be recreatable) {#95, #46} (See [MDL-EXP.001.1])

[MNGBL-RES.004] There MUST be a supported method for obtaining a description (and therefore an invocable reference to the manageable resource) for a given identity {#95}

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423 **[MNGBL-RES.005]** The Manageability Interface MUST support expressing aggregations of
424 resources {#73, #93}

425 **[MNGBL-RES.006]** The Manageability Interface MUST support incremental implementation of
426 manageability. (Ranges from minimally Identifiable to Fully Manageable) The specification must
427 identify the increments supported. {#103}

2.1.9 Life-cycle Management (I) [LC-MGMT]

429 There is some overlap between this section and [DIST-M.001.13], and also to some extent with
430 [DIST-M.001.14, 15].

431 **[LC-MGMT.001]** The Manageability Interface MUST allow monitoring of life-cycle states of
432 manageable resources.

433 **[LC-MGMT.002]** The Manageability Interface MUST allow control of life-cycle states of
434 manageable resources.

435 **[LC-MGMT.003]** The Manageability Interface SHOULD allow creation and deletion of new
436 manageability interfaces for manageable resources {#92}

437 **[LC-MGMT.004]** The Manageability Interface MUST not define a canonical lifecycle for all
438 manageable resources. (Note: this is a modeling exercise) {#131}

2.1.10 Management Manageability (S) [MAN-MGMT]

440 **[MAN-MGMT.001]** The Manageability Interface MUST not preclude a manager from being a
441 manageable resource.

442 **[MAN-MGMT.002]** The Manageability Interface MUST enable resources that are part of a
443 management infrastructure to be manageable resources. {#58, #102}

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444 [MAN-MGMT.003] The Manageability Interface MUST not preclude manageable resources from
445 using their own manageability interfaces.

446 [MAN-MGMT.004] The Manageability Interface MUST not preclude the ability of a system to
447 explain its own workings via the manageability interface. {#106}

2.1.11 Federation (T) [FED]

449 [FED.001] The Manageability Interface MUST not preclude the development of federated
450 managers {#100, #141} This is related to [DIST-M.001.15].

2.1.12 Co-existance (U,V) [CO-EXIST]

452 [CO-EXIST.001] The Manageability Interface SHOULD make use of existing specifications where
453 appropriate to avoid duplication and conflict, e.g. GGF OGSI, DMTF CIM/WBEM – {#12, #130,
454 #20}

455 [CO-EXIST.002] The Manageability Interface SHOULD be usable by other specifications where
456 there are similar requirements. {#12, #130, #20}.

457 [CO-EXIST.003] The Manageability Interface MUST allow implementations to co-exist without
458 interfering with existing standardized management infrastructures {138, 35}
459

2.1.13 Discovery [DISC]

461 [DISC.001] The Manageability Interface MUST be described in WSDL documents and XML
462 Schema. {#6, #76}

[DISC.002] The Manageability Interface and Description MUST enable the discovery of appropriate relationships between manageable resources via Web services discovery mechanisms. {#8}

[DISC.003] The Manageability Interface and Description MUST enable discovery of manageability capabilities of resources.

2.1.14 Miscellaneous (J) [MISC]

[MISC.001] The Manageability Interface MUST use XML schema types available for attributes, such as Time and Date when representing a time.

[MISC.002] The Manageability Interface MUST advance the definition of XML array types so that they become independent of the web services binding (currently, the definition is too tightly tied to a SOAP binding)."

2.1.15 Collections of Management Actions and Transactions [TRANS]

NOTE: This section may affect and be affected by requirements for long-running business transactions/business processes and workflows.

[TRANS.001] The Manageability Interface MUST support the description/definition of a "unit of work" that consists of multiple actions against a single resource.

[TRANS.002] The Manageability Interface MUST support the description/definition of a "unit of work" that consists of the same action applied to multiple resources.

[TRANS.003] The Manageability Interface MUST support the description/definition of a "unit of work" that consists of multiple actions against multiple resources.

[TRANS.004] The Manageability Interface MAY support execution of a unit of work against multiple resources.

[TRANS.004.1] The Manageability Interface MUST support execution of a unit of work against a single resource.

[TRANS.005] The Manageability Interface MUST support idempotence for units of work against one or more resources.

NOTE: If units of work are not supported, this requirement is met trivially.

[TRANS.006] The Manageability Interface MUST enable reporting of status, errors or lack of support for execution of a unit of work against one or more resources.

[TRANS.007] The Manageability Interface SHOULD support requests for asynchronous execution of actions against one or more resources, within a unit of work, with (idempotent) callbacks.

[TRANS.008] The Manageability Interface MAY support requests for atomic (all-or-nothing) execution of a unit of work against one or more resources.

[TRANS.008.1] If asynchronous actions are supported [TRANS.007] and asynchronous actions occur in at atomic unit of work, then eventual execution of the asynchronous actions MUST be guaranteed if the atomic unit of work is completed, with ensuing consequent callbacks also guaranteed.

[TRANS.009] The Manageability Interface MUST enable reporting of status, errors or lack of support for atomic execution of a unit of work against one or more resources.

[TRANS.010] The Manageability Interface MAY allow changes for partially completed units of work to be externally visible.

[TRANS.010.1] If atomic units of work are supported [TRANS.008], then changes due to the actions in the unit of work SHOULD NOT be externally visible until the unit of work has completed.

509 **[TRANS.011]** The Manageability Interface MUST support requests for rollback of atomic units of
510 works that have not completed.

511 **[TRANS.012]** The Manageability Interface MUST support status for rollback requests for atomic
512 units of work.

513 **[TRANS.013]** The Manageability Interface SHOULD support time-out for a unit of work consisting
514 of multiple actions against one or more resources, with callback that may result in a rollback
515 request for that unit of work.

516

2.2 Non-Functional Requirements

517

2.2.1 Interoperability (K) [INTEROP]

518

519 **[INTEROP.001]** The Manageability Interface specification MUST define one standard WS-I
520 compliant binding required. {#67, #47, #40}

521 **[INTEROP.002]** The Manageability Interface specification MUST define the set of minimal
522 compliance requirements and SHOULD define additional, recommended compliance
523 requirements. {#123, #75}

2.2.2 Evolvability (L) [EVOLV]

524

525 **[EVOLV.001]** The Manageability Interface SHOULD be designed so that it can be evolved
526 without breaking backward compatibility.

527 **[EVOLV.002]** The Manageability Interface SHOULD not preclude multiple versions of the MUWS
528 specification executing simultaneously in the same system. {#127, #109}

529 **[EVOLV.002.1]** The Manageability Interface MUST enable upgrades {#108}

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compliance requirements

530 **[EVOLV.002.2]** The Manageability Interface MUST enable maintenance

2.2.3 Extensibility (M) [EXTN]

532 **[EXTN.001]** The Manageability Interface MUST enable extension of the management models
533 exposed by adding additional model elements, management information, operations, event
534 notifications and relations. {#13, #49, #17}

2.2.4 Scalability (N) [SCAL]

536 **[SCAL.001]** The Manageability Interface MUST not preclude scalable deployment. {#110}

537 **[SCAL.002]** The Manageability Interface SHOULD make it possible to specify filtering/processing
538 through the manageability interface to reduce network traffic and distribute computation.

539 **[SCAL.003]** The Manageability Interface MUST not preclude scalability of events (event storm
540 handling in large scale systems, event aggregation) {#137}

2.2.5 Useability (O) [USE]

542 **[USE.001]** The Manageability Interface Specification MUST address usability of WSDM
543 specification to implementers. This is important for rapid adoption.

544 **[USE.001.1]** The Manageability Interface specification SHOULD make it possible to
545 create a minimally compliant implementation with relatively small amount of effort
546 including gradual adoption. {#62, #55}

547 **[USE.001.2]** The specification SHOULD provide sufficient clarity to implementers.

548 **[USE.002]** The Manageability Interface SHOULD provide diagnostic capabilities.{#107}

2.2.6 Internationalization (P) [I18N]

[I18N.001] The Manageability Interface MUST allow compliant implementations to be localized. {#66, #134}

[I18N.002] The Manageability Interface MUST leverage internationalization support that is part of the Web Services standards. {#87}

2.2.7 Performance Impact (R) [PERF]

[PERF.001] The Manageability Interface SHOULD be supportable with minimal impact on resource performance {#113, #27}

[PERF.002] The Manageability Interface SHOULD be supportable in resource constrained systems {#118}

[PERF.003] The Manageability Interface MUST not preclude manageable resources from controlling the impact of management on their environments.

3 Use Cases

Peer managers

Multiple, diverse managers

International Supply chain scenario

Dynamically assembled Composite applications

- ManyMillion managed objects

Capable and constrained managed resources

Billing (Utility computing)

WSMF: Distributed auction

WSMF: End to End management

Service Access Points deployment

Adapter to existing technologies (CIM, JMX, SNMP)

OGSA Use cases

Managing field service org with mobile devices

Use mgmt protocol to communicate logical filters to managed resources

Coexisting versions

Do it all Securely

Implementing manageability

Controlling a resource (upgrade/change)

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580   Feedback loop
581   Human override

4 References

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Appendix A. Acknowledgments

599

600 The editors would like to acknowledge the contributions of the OASIS WSDM Technical
601 Committee, whose voting members at the time of publication were:

602

Appendix B. Brainstorming

603

604   Requirements identified in WSDM-TC F2F brainstorming session.

Requirement	Number
(A) Access to manageability capabilities of manageable resources is described using WSDL (Binding)	3.
(A) Addressability or access point for manageability capabilities of manageable resources is described using WSDL (Port)	4.
(A) based on ws standards	128.
(A) be a GOOD web service (wsdl, use messaging efforts avail for ws allowing multiple transports, interoperability efforts underway)	45.
(A) composability, independently written put together so can understnd the result, like continuity principles, understanding semantics of change	105.
(A) Leverages, does not invent, non-management specific Web services infrastructure. If non-management specific services/infrastructure is required then it is	11.

placed as a requirement on the Web services community. Required infrastructure includes: notifications, relationships, registry, etc.	
(A) loose coupling	48.
(A) Manageability capabilities of manageable resources described using WSDL (PortType)	2.
(A) Manageable resources are discoverable in a manner consistent with the Web services architecture.	6.
(A) Use existing internet infrastructures	1.
(A) work in ws platform medium	96.
(A) ws management architecture – identify facilities that allow management using ws for management applications	28.
(A) wsdl based, portTypes, bindings	15.
(A, G) discovery	76.
(A,C) consistent w/ existing and future ws, don't break ws	125.
(A,C) ws-I compliant	71.
(A,C,E) support current ws security models	25.

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(A,G,H) discovery oriented, use whatever tools in other models too to figure out whats around	104.
(B) support event mechanism	38.
(B) support pull and push notification models, also guaranteed delivery in order	90.
(B) Synch and asynch usage	142.
(C) Is defined consistently with existing Web services management specifications such that it can be used/applied in those communities, i.e. GGF, DMTF	12.
(C) leverage existing ws standards	39.
(C) management using vs/ cim/soap overlaps	130.
(C,K) offer a framework for comprehensive management solution – allow other standards to plug in and complete this picture (i.e. other ws standards, etc.)	57.
(C1) defined consistently w/ existing management specs including ggf, dmtf	20.
(C1) develop/support latest ws standards	22.
(C1) extend current models of a service	23.

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(D) ability to normalize time for data sources and data sinks	135.
(D) aggregate up to higher level user so can see end to end management, depth and breadth	132.
(D) availablitily of time synchronization service	136.
(D) cooperative expectections – manager must expect are not alone	98.
(D) distributed, disconnected, scaleability	101.
(D) exception handling for large scale systems, any part of nw unavail, but can't talk to who you need to to do job, cope with reconnection, unexpected	117.
(D) global and local – respect for local autonomy, global actions	111.
(D) highly distributed	18.
(D) loose consistency – data gathering, not all in transactions or atomic	114.
(D) operates in distrib environment, occasional connectivity, hierarchy of management collection, (list in DisMan on distrib env?)	85.
(D) support for hierarchical and heterogeneous	43.

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managers	
(D) support heirarchial infrastructure for management, not single layered	126.
(D) support more than one manager for a managed resource	42.
(D, T) hierarchy of manager (federated) – across and within enterprises	133.
(D,H) support aggregation and representation of resources	33.
(D,N) can be multilayered (can have aggregations and proxy and chains)	24.
(D,T) support distribution and federated management	52.
(D,T) support federated and hierarchical manager approaches (mgr to mgr)	32.
(E) access control, acl mechanism for accessing mgmt info of managed resources, tie into roles from management of ws.	74.
(E) build in security consciousness, awareness, adaptability, esp. cross enterprise.. We both monitor, but for different reasons.	99.

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(E) deal with privacy issues – who's allowed to see what	116.
(E) design infrastructure to uh, to be congnizant of denial of service attacks	139.
(E) do no harm – guard against attacks	112.
(E) provide diff levels of access, what controls and data can access	83.
(E) secure	19.
(E) secure mechanism, protecting data AND management interface	82.
(E) security – possible for operator to enable/disable security features	70.
(E) security management	34.
(E) stand alone security model that doesn't require separate saml authorities, ldap directories, etc.	41.
(E) ws mgmt arch is securable	30.
(F) ability to map between models, platform a way to describe model in higher level terms and then others can see how to map in	97.

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(F) act as model normalizing/neutralizing layer so it can support various tiers, domains	56.
(F) apply management to diff domain specific models	68.
(F) should be model agnostic, able to expose snmp mib,	36.
(F,H) managed object agnostic	122.
(G) Additional descriptions, work flows and/or policies can be associated with a manageable resource	9.
(G) Additional interfaces for the manageable resource can be associated with the manageable resource (i.e. security, administration, etc.)	10.
(G) Manageability capabilities can be categorized according to their purpose, i.e. properties can be categorized as identification information, description, metrics, capabilities, configuration information, etc.	5.
(G) Manageability capabilities of a manageable resource are discoverable from the WSDL.	7.
(G) metadata for attributes and operations, like i18n	91.

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name, read writeable, etc.	
(G) model based, if support a model, completely support it, can support part of this one and that one, if support multiple models support all parts of those models	124.
(G) relationships – on the fly, Managed resources need relationships from runtime, static not enough	89.
(G) Relationships between manageable resources are discoverable from the manageable resources or Web services discovery mechanisms	8.
(G, H) ability to do auditing and accounting	115.
(G, Q) support for monitoring, config, eventing, etc, (read/write, ops, events) consistent so that you have an event get semantic content and when invoke an operation have semantic	21.
(G, V) possible to expose mgmt of existing ws mgmt models and runtime systems	65.
(G,A) support new methodology for management based on web services use. Thru this framework enable exposure of management info in standard external way without wanting to interfere with internal implementations of the managed objects.	50.

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(G,Q) need to address semantic content as well as operations (no blobs)	16.
(H) ability of sys to explain own workings	106.
(H) able to monitor ws, including status info/metrics	79.
(H) configure ws	81.
(H) control ws,	80.
(H) extensions for unique ids, recreatable ids – I am a managed object in one area and create a relationship between myself and someone in another area, need to be able to find that other object/ handle	95.
(H) grouping of resources based on type, locality, and other factors (usability)	73.
(H) groupings/collections	93.
(H) need a unique ID for resources, whether is a business process, disk, etc. so can see relationships between these resources	46.
(H) search criteria - search mgd domain for types of objects	94.
(H) support management of web services as resources	60.

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(H) support mgmt of longlived and shortlived resources	64.
(H) ws mgmt arch applies equally to physical and logical resources	31.
(H,L) awareness and capabilities piecewise, resources monitoriable to fully capable	103.
(H,S) ws mgmt arch is manageable as a resource	29.
(I) do we want features to allow object creation and deletion (new managed objects)	92.
(I) lifecycle management of diverse components in various domains	131.
(I) support deployment/lifecycle management	26.
(J) ability to have some manager capabilities collocated w/ managed element	44.
(J) Be able to support various deployment models – agent based, agentless	51.
(J) management application agnostic	121.
(J) management infrastructure, not management application	120.
(J) meet a timing window of ??, urgency of meaningful	63.

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contribution window	
(J) transactional – consistency on a unit of work	143.
(J) work closely w/ of and using. Do using first, where mgmt of is an instance of this	129.
(J) ws u ws is implementable w/o dependency on work yet to happen that we don't have control of	35.
(K) ability for a compliant manager to work with a compliant agent in a predictable way	67.
(K) define one and only one standard binding required for compliance	40.
(K) interoperability	47.
(K) interoperability – compliant mgr interop w/ compliant manageable resource for all the resources capabilities	75.
(K) provides for standard set of operations for compliance	123.
(L) must allow world of management upgradeable and maintainable thru multiple versions in same system in parallel and together	127.
(L) tolerate multiple versions of same thing in same	109.

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systems	
(L) versioning and piece-wise upgrade	108.
(M) adapt to various management needs that different domains have… allow for different capabilities that they need, i.e. security, other protocols, etc.	54.
(M) Extensibility	13.
(M) extensibility	49.
(M) extensible	17.
(N) discovery – scalaeability issue here too, advertising many objects, or hierarchies in a registry	88.
(N) fw should allow scaleable (on operation to 15000 res shouldn't force 15000 requests)	69.
(N) potentially highly scalable and available	110.
(N) scaleability – across objects, and w/in an object. Don't want to have to do a sep ws request to get every value of every attr, rather get all attr values together	86.
(N) scaleability of events (event storm handling in large scale systems, event aggregation	137.
(N) small to large number of objects	119.

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(N) support grouping of managed resources for bulk config and operations	72.
(O) simple and easy to plug into by various supplier and developers	62.
(O) testability and debuggability	107.
(O) usable in a way that makes adoption of it easy and people can gradually comply with it	55.
(O,K) At least one standard binding is defined (but not required to be supported by all compliant implementations): SOAP/HTTP.	14.
(O,V) enable, easy to develop ws agents for other resources (like snmp,etc.)	84.
(P) fw should support internationalization	66.
(P) i18n, consider cross locale; management is around the world, managed resources may be in diff locale domains than managers	87.
(P) internationalization	134.
(Q) semantic intelligence built into it (chewable bite sizes)	53.
(R) developed so cognizant of system	27.

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overhead/requirements	
(R) minimally intrusive, mgmt system not have unnecessary effects on ability to do work	113.
(R) scaleable footprint – small devices and large devices	118.
(S) needs to be self-managed management infrastructure	58.
(S) self aware, self management, recursive	102.
(T) federated management fundamental	100.
(T) intervention by humans that can be dealt with – override-ability	140.
(T) understanding effect of your actions on other systems, management system conflict resolution	141.
(U) support legacy systems, able to build a proxy for existing systems	37.
(V) Accommodate existing middleware architectures (J2EE, .net)	61.
(V) allow existing deployed resource in enterprise to be part of the ws management fw, wrap existing, legacy applications	59.

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(V) coexist w/ other existing mgmt infrastructures	138.
(V) inclusion of other protocol bridge, interact w/ non ws endpoints	77.
(V) keep a biased eye on existing implementations	78.

605

606

607   •2.1 Functional Requirements

608   •(A) 2.1.1 WSA Compliance

609   •1, 2, 3, 4, 6, 11, 12, 15, 16, 22, 25, 28, 45, 48, 50, 71, 76, 104, 105,125, 128

610   •(B) 2.1.2 Message Exchange Patterns

611   •38, 90, 142

612   •(C) 2.1.3 Conformance/Consistency with Other Standards

613   •11, 12, 20, 23, 25, 39, 57, 71, 125, 130,

614   •(D) 2.1.4 Distributed Management – multiple managers, hierachical

615   •18, 24, 32, 33, 42, 43, 53, 85, 98, 101, 103, 111, 114, 117, 126, 132, 133, 135, 136

616   •(E) 2.1.5 Security

617   •19, 25, 30, 34, 41, 70, 74, 82, 83, 99, 112, 115, 116, 139

618   •(F) 2.1.6 Model Neutrality

619   •36, 56, 68, 97, 122

620   •(G) 2.1.7 Model Exposure

621	•5, 7, 8, 9, 10, 21, 23, 33, 50, 65, 76, 89, 91, 104, 115, 122, 124
622	•(H) 2.1.8 Manageable Resources
623	•29, 31, 46, 60, 64, 73, 79, 80, 81, 93, 94, 95, 103, 106
624	•(I) 2.1.9 Life-cycle Management
625	•26, 92, 131
626	•(J) 2.1.10 Miscellaneous
627	•35, 44, 51, 63, 94, 112, 120, 121, 122, 129, 143
628	•2.2 Non-Functional Requirements
629	•2.2.1 (K) Interoperability
630	•14, 40, 47, 57, 67, 75, 123
631	•2.2.2 (L) Evolvability
632	•103, 108, 109, 125, 127
633	•2.2.3 (M) Extensibility
634	•9, 10, 13, 17, 49, 54
635	•2.2.4 (N) Scalability
636	•24, 32, 33, 69, 72, 86, 88, 110, 119, 137
637	•2.2.5 (O) Useability
638	•14, 55, 62, 84, 107
639	•2.2.6 (P) Internationalization
640	•66, 87, 134
641	•New

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642 •(Q) Semantics
643 •16, 21, 53
644 •(R) Performance Impact
645 •27, 113, 118
646 •(S) Self Management.
647 •29, 58,102
648 •(T) Federation.
649 •32, 53, 100, 103, 133, 140, 141
650 •(U,V) Coexistence
651 •37, 50, 51, 59, 61, 77, 78, 84, 13
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653 **Appendix C.**

Appendix D. Notices

654

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684 # Appendix E. Revision History

Date	Lead Author	Description
May 13, 2003	Pankaj Kumar	Initial Draft.
May 27, 2003	Pankaj Kumar	Draft#2 -- Incorporated requirements identified in the F2F brainstorming into the main text. Used the classification agreed upon in the phone conf. With Heather, John and Veena.
Aug. 1, 2003	Pankaj Kumar	Draft#4 – Accepted the changes proposed by the TC (as marked by Heather). Added Out of Scope Section. Removed table fragments from within the main part of the document. Made minor formatting related changes.
Aug. 11, 2003	John DeCarlo	Draft #5 – Made the changes proposed by TC. Reworked Section 1. Made formatting changes for consistency and some grammar changes for consistency.
Sep. 18, 2003	John DeCarlo	Draft #6 – Made a large number of changes based on TC Input, primarily from Andrea and Andreas.

Sep 26, 2003	John DeCarlo	Still Draft #6 – added a section on Transactions and removed listing Transactions as out of scope. Also updated based on Andrea's input on Andreas's comments. Cleaned up some editorial bullet consistency, too.

685

686   Note:

687   When we get to creating a glossary, define 'monitoring'