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Management Using Web Services: Architecture

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Abstract:

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1 Introduction

[Provide an introductory chapter, indicating if any parts of it are non-normative.]

1.1 Terminology

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 **Error! Reference source not found.**.

1.2 MUWS Architecture Introduction

The MUWS Architecture being addressed in this document consists of the pieces needed for management using Web Services of generic Information Technology resources. This requires that manageability of the manageable resource be presented via Web Services, whether or not the resource is a Web Service itself. The Introduction/Context section (Section 1) placed this work in the larger context of Web Services Architecture and following sections will provide more detail about the components of the MUWS Architecture.

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1.3 MUWS Architecture Scope

The MUWS Architecture being defined consists of the Provider of Manageability via Web Services (which consists of the Web Services endpoint(s), service(s), and interface(s) that expose the manageability capabilities for the manageable resource), the Consumer of Manageability, and other required infrastructure.

In addition to providing detailed information on the components that make up the Provider of Manageability, this document will address other items. The following items require specific notes on which parts are in and out of scope for the MUWS Architecture:

The Consumer of Manageability (each manager which needs to manage some aspect of a manageable resource using MUWS is a consumer of Manageability). The Consumer must be able to make use of the manageability interface(s) provided by or on behalf of manageable resources. Conventional management applications that do not support MUWS will not be addressed at all in the MUWS Architecture. The Consumer of Manageability, like any Web Service consumer, must be able to send messages to, receive responses from, and possibly

74 receive notifications from the manageability interface. There are no requirements imposed on the
75 use of information received.

76 NOTE: It is important to note that not every Consumer will have the same capabilities. For
77 example, some may be able to process WSDL dynamically, others may not. Some may only be
78 able to do monitoring, others may be able to do monitoring and configuring. This MUWS
79 Architecture will refer to the Consumer in a generic sense, not requiring any particular
80 implementation to provide any particular capability.

81 The Manageable Resource. Trying not to change the resource, just specify manageability. No
82 constraints or requirements will be placed on the actual resource itself. In particular, the
83 constraints and requirements will be put on the manageability endpoint and manageability
84 interface to properly provide what manageability capabilities are available for that manageable
85 resource via Web Services. It is entirely possible for there to be manageability capabilities that
86 are not directly supplied by the manageable resource, but are inferred or calculated by another
87 entity and offered by the manageability endpoint.

88 Required infrastructure components. Examples include, but are not limited to, a Registry, a
89 Policy Repository, or a Security service. They will be mentioned in the document where
90 appropriate, and MUWS has requirements on these services, but they will not be defined here.
91 Also, much of this work will be addressed via the MUWS Platform requirements.

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2 Context

This section provides a context for the WSDM MUWS Architecture. The MUWS Architecture makes use of the Web Services Architecture.

`

WSDM | Non-WSDM

Management Service Description

Management Discovery

Business Discovery

Business Service Description

Find

Publish

Publish

Find

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Interact

Service Provider

Interact

Client

Service

Client

Management Service Description

Business Service Description

Mgmt. Consumer

Bus. Consumer
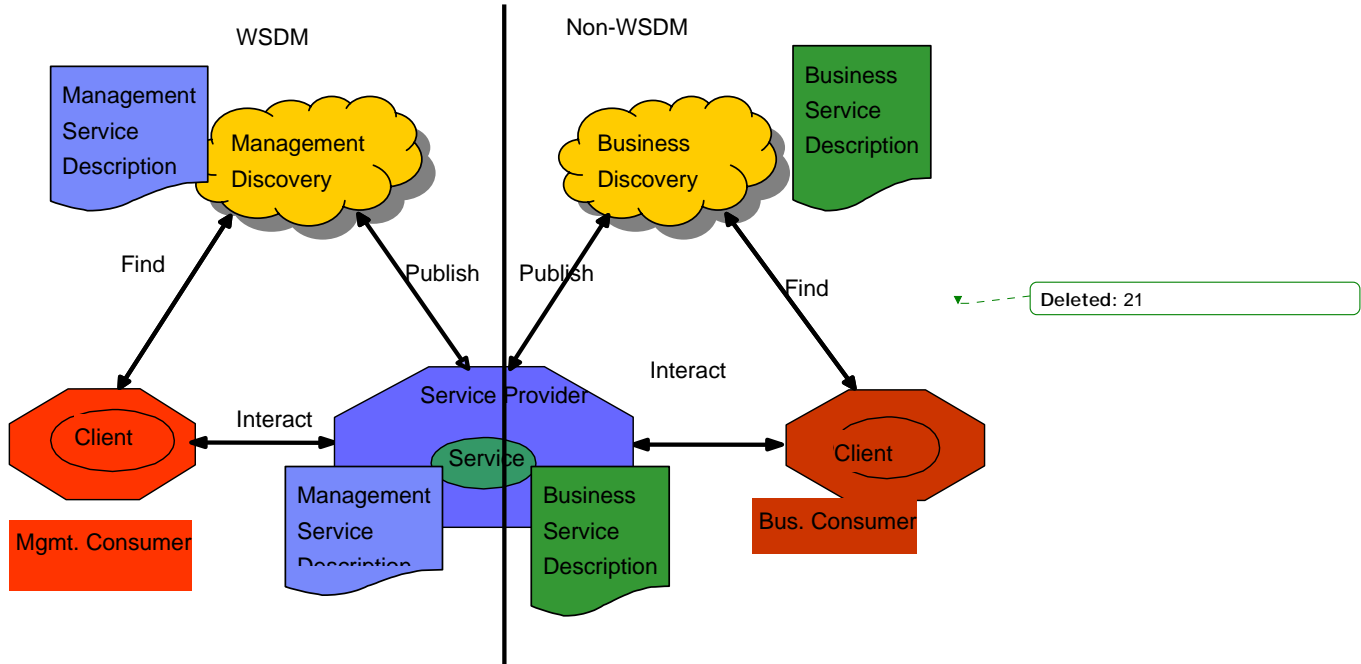
Figure X, WS Architecture, both WSDM and non-WSDM

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3 Concepts

3.1 MUWS Architecture Concept Diagram

This Management Using Web Services specification defines how manageability of an arbitrary IT resource can be accessed via Web services. Thus, manageability is one possible quality of a resource. '' Manageability 'is composed of a number of capabilities. Each capability has its own distinct semantics (e.g., could be expressed in a UML model). Therefore, a manageable resource composes a set of manageability capabilities. Figure ?, relates the concepts necessary for management using Web services.

According to the concepts in the WSDL specification, a Web service is an aggregate of endpoints each offering the service at an address and accessible according to a binding. A service has a number of interfaces that are realized by all of its endpoints. Each interface describes a set of named messages that could be exchanged and their format. Properly formatted messages could be sent to an endpoint's address in a way prescribed by the binding. A description (document, artifact) is composed of definitions of interfaces and services. A description may contain both or either of the definitions.

In accordance with the Web Services concepts expressed above, access to the manageability for a resource must be provided by an endpoint. We call such an endpoint a manageability endpoint. Implicitly, a manageability endpoint belongs to a manageability service, which has a number of manageability interfaces that are realized by manageability endpoints. Thus, a single manageability interface represents all or part of a manageability capability. Similarly, a single manageability capability may be represented in one or more interfaces. The semantics of a particular capability is represented in a set of possible message exchanges and rendered in message formats grouped into one or more interfaces.

For example, ability to offer metrics could be captured in a 'Metrics' UML model which is, therefore, an instance of the manageability capability concept. The semantics of offering metrics
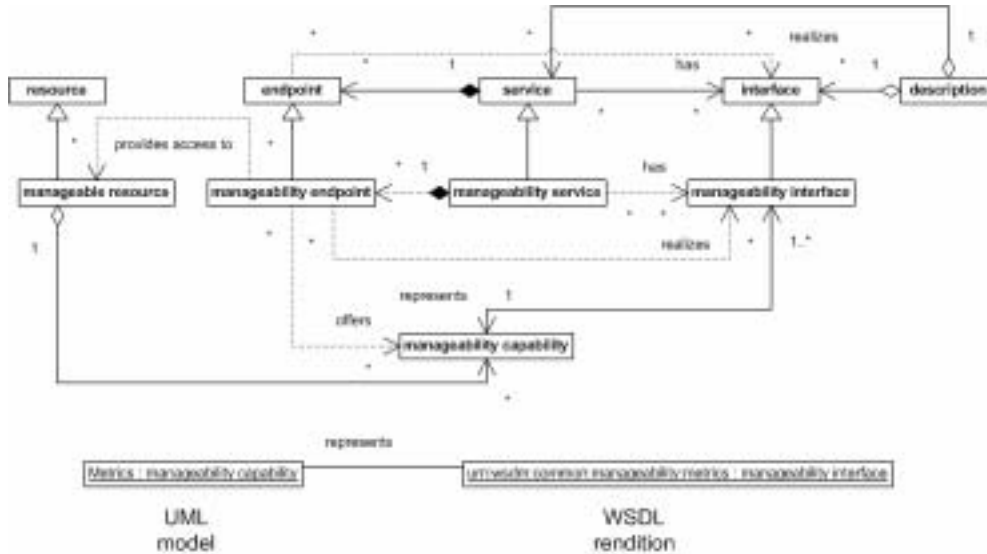
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136 could be rendered from the UML model into a WSDL interface description defined in a
137 "urn:wsdm:common:manageability:metrics" namespace. That would be an instance of the
138 manageability interface concept.

139

140 This specification defines the base set of manageability capabilities that could be composed into
141 a manageable resource or combined into aggregate capabilities. For example, a
142 TotallyManagableResource uber-capability could be defined that includes all of the base
143 manageability capabilities. Such aggregate capability could also be composed into a manageable
144 resource, and in that sense, an aggregate capability is conceptually the same as any other
145 capability. However, this specification does not currently attempt to define (identify) the aggregate
146 capabilities and focuses on the definition of the base set.

> **Comment:** This example needs to match our agreement on the "meta-model" for manageability capabilities. I would suggest that we put a place holder for an example and insert one once we have agreement on the meta model.

> **Comment:** Although it may define some common aggregations.

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147
148 Figure X, MUWS Concepts

4 Logical Architecture

4.1 Role Definitions

This section documents the roles that the major components of the MUWS Architecture, as well as related components, will have during Management Using Web Services. It is not intended to constrain the locus of implementation, but instead is intended to document the required components and how they interact.

NOTE: One application implementation may have many roles or a full role may be implemented by a combination of many different applications.
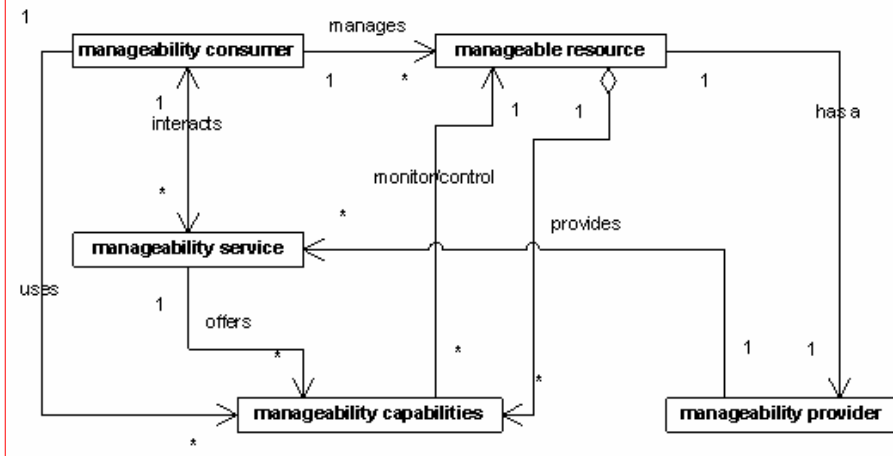

The major roles are Consumer of the Manageability Service and Provider of the Manageability Service. Related roles are Manageable Resource and related infrastructure components, such as a Directory.

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MUWS Roles Model and relationships

163

164   Figure X, MUWS Roles

165

4.1.1 Consumer of Manageability

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168   The Consumer of Manageability does the following:

169   • Consumes manageability information

170   • Manages the resource (monitor, configure, etc)

171   • Understands the manageability capabilities of the resource

172

4.1.2 Provider of Manageability

174

175   The Provider of Manageability does the following:

176   •   Provides the Manageability quality for a manageable resource, enabling a resource to
177   become a manageable resource

178   •   Provides information for Consumer (according to the manageability capabilities of the
179   resource)

180

181 NOTE: The Provider may be implemented in the manageable resource or it may not. The
182 Provider may supply Manageability for more than one manageable resource. In other words, this
183 is not intended to constrain the locus of implementation.

4.1.3 Manageable Resource

185

186 The Manageable Resource is an IT resource that can be managed by a WSDM based
187 infrastructure. Because there are no restrictions on the locus of implementation, the manageable
188 resource may or may not implement the role of Provider of the Manageability Service.

189

4.1.4 Infrastructure Components

191

192 The Web Services Infrastructure Components are identified in this document as providing specific
193 services that the Consumer or Provider requires in order to consume or provide the Manageability
194 Service.

195

4.2 Information Model

197

198 [Editor: Need something here. Behind the capability there is an information model. Provider and
199 Consumer need to understand that model. We may need to specify a minimum set, such as
200 Identity. Or just say that a well-formed information model addresses the requirements in the
201 Requirements Document.] [Editor: make it before the Logical model. Simply say that the
202 manageability capabilities need to be expressed in an Information Model.]

203

> **Comment**: Needs to be more definitive. Provider of Manageability makes a resource MUWS manageable. Provides the quality of manageability for the resource.

> **Deleted:** 21

4.3 Logical Model

A Manageability Provider may provide the manageability quality for many resources. In other words a Manageability Provider may help many resources become manageable resources, instances of which belong to one instance of the Provider. To accomplish this, a Manageability Provider maintains manageability endpoints which provide access to the manageable resources. According to the concepts definition, a manageable resource is a resource with a number of manageability capabilities composed into it. In order to compose capabilities into the manageable resource, a Manageability Provider supports the manageability capabilities that are are offered by the manageability endpoints. For example, a Manageability Provider could embed a piece of code to support the manageability capabilities into a resource thus making a resource manageable. A Provider may also support the capabilities by deploying resources in a container that could add manageability quality to all its resources.

Comment: Need to capture the concept that a provider may be a manageable in and of itself.

The manageability consumers deal with (act upon) manageable resources. To 'deal with' in this context means to exert control and to obtain and interpret the information. In order to deal with (act upon) the manageable resource, consumers access manageability endpoints and exercise offered manageability capabilities. To 'exercise' in this context means to make use of the distinct semantics defined for a given manageability capability on the necessary manageable resource. Essentially, consumers exercise understanding of the semantics defined by a capability, but exercise it on the actual manageable resource. Technically, it translates into being able to use a distinct group of properties, operations, events and metadata by exchanging messages with the manageability endpoint.

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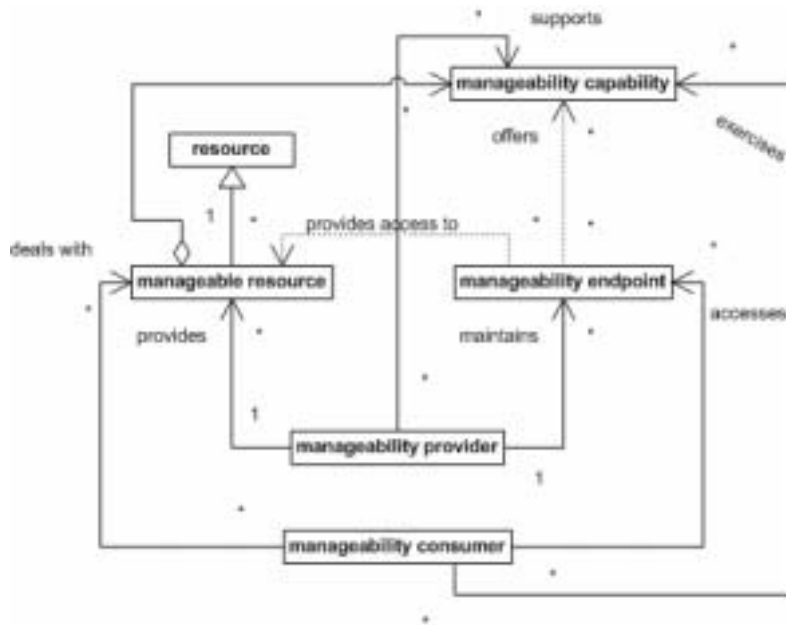
Figure X, MUWS Logical Model

4.4 Processing Model and Interaction Patterns

The compliant implementations of the roles defined in the logical model act according to the following basic processing rules:

1. Manageability consumer and manageability provider have to understand the information model in which the semantics of a manageability capability are described. For example, it could be a UML model that expresses a group of properties, operations, events and metadata. The meaning of what the model defines has to be equally understood by both parties.

237   2. Manageability consumer exerts control over and obtains information about the
238   manageable resource by exchanging messages with one or more manageability
239   endpoints that provide access to the manageable resource.

240   3. Manageability consumer has to be able to obtain the description of the manageability
241   service, its endpoints and necessary manageability interfaces. Manageability provider
242   has to be able to obtain the description of the manageability interfaces for the capabilities
243   it wants to support.

> **Comment:** For 1. We have decided to define the description of the manageability capabilities (UML and English text), so the Provider can use this description.

244   4. Manageability consumer and manageability provider both have to equally understand
245   how to establish which manageability interface corresponds to which manageability
246   capability and vice versa.

247   5. Manageability consumer establishes which capabilities are supported by the manageable
248   resource either from the description of the manageability service or by exchanging
249   messages with the manageability endpoint.

250   6. Manageability consumer discovers necessary manageable resources by discovering
251   manageable endpoints, reading their descriptions and exchanging messages as required.
252   Manageability provider advertises/registers available manageability endpoints.

253

> **Deleted:** 21

control

manageability consumer

information

messages

manageable resource

manageability provider

details with

provides

1

1

provides access to

manageability endpoint

accesses

maintains

offers

exercises

manageability capability

supports

understands

described in

information model

understands

254

255   Figure X, MUWS Basic Processing Model

256 4.5 Delegation Architecture

257

5 Implementation Architecture

5.1 Implementation of Roles

5.1.1 Consumer of Manageability

The Consumer of Manageability plays a role in the management of manageable resources. Because the Manageability Service is a Web Service, the Consumer must follow the Web Services rules. Needs to do the following. Consume information, manage the resource (monitor, configure, etc). Needs to understand the resource. Using information provided by manageability. And to control and configure the resource using the manageability capabilities.

The Consumer must send properly formatted messages (based on the WSDL describing the service) to the appropriate Provider of the manageability service. .

The Consumer must be able to locate the appropriate Provider for the manageable resource being managed.

The Consumer must be able to receive responses from the Provider.

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In order to receive Notifications, the Consumer must also provide a Web Service (making it a specialized Provider of a Notification Receipt Web Service) that supports receiving notifications from the Provider and responds appropriately.

The Consumer may be capable of discovering manageable resources from a Provider which has a relationship with another Provider or manageable resource or through a Directory.

The Consumer must follow the security requirements of the Provider and properly authenticate with the Provider as well as using interoperable confidentiality and integrity mechanisms.

5.1.2 Provider of Manageability

The Provider of Manageability plays the largest role in the management of manageable resources via MUWS. The Provider supplies Manageability for a manageable resource. It provides sufficient information for Consumer according to the manageability capabilities of the resource. And may assist with configuration.

286 Provider of Manageability provides the manageability quality for a resource and therefore enables
287 a resource to become a manageable resource. For example, Provider of Manageability may be
288 code helping the resource expose its metrics via MUWS.

289 NOTE: The Provider may be implemented in the manageable resource or it may not. The
290 Provider may supply Manageability for more than one manageable resource. In other words, this
291 is not intended to constrain the locus of implementation.

292 The Provider must describe the Manageability provided for a manageable resource in WSDL.

293 The Provider must be able to receive properly formatted messages as described in the WSDL.

294 The Provider must be able to respond to properly formatted messages appropriately.

295 The Provider may be able to generate Notifications and send them to a Consumer as indicated by
296 the Consumer or via the Consumer's WSDL.

297 The Provider must follow the security requirements of the environment.

298

299 5.1.3 Manageable Resource

300

301 The Manageable Resource is an IT resource that can be managed by a WSDM based
302 infrastructure. Because there are no restrictions on the locus of implementation, the manageable
303 resource may or may not implement the role of Provider of the Manageability Service.

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305 5.1.4 Infrastructure Components

306

307 The Web Services Infrastructure Components are identified in this document as providing specific
308 services that the Consumer or Provider requires in order to consume or provide the Manageability
309 Service.

310

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6 References

6.1 Normative

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Appendix A. Acknowledgments

The following individuals were members of the committee during the development of this specification:

319 # Appendix B. Revision History

Rev	Date	By Whom	What
1	30 October 2003	Zulah Eckert	Set up the original template
1	5 November 2003	Zulah Eckert and John DeCarlo	Add material on scope, roles, concept diagram, and other text
3	26 November 2003	John DeCarlo	Update document based on UArch discussions.

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Appendix C. Notices

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