



# Management Using Web Services: Architecture

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# 46 1 Introduction

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

## 48 1.1 Terminology

49 The key words *must*, *must not*, *required*, *shall*, *shall not*, *should*, *should not*, *recommended*, *may*,  
50 and *optional* in this document are to be interpreted as described in **Error! Reference source not**  
51 **found..**

## 52 1.2 MUWS Architecture Introduction

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

59

## 60 1.3 MUWS Architecture Scope

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

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

68 The Consumer of Manageability (each manager which needs to manage some aspect of a  
69 manageable resource using MUWS is a consumer of Manageability). The Consumer must be  
70 able to make use of the manageability interface(s) provided by or on behalf of manageable  
71 resources. Conventional management applications that do not support MUWS will not be  
72 addressed at all in the MUWS Architecture. The Consumer of Manageability, like any Web  
73 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.

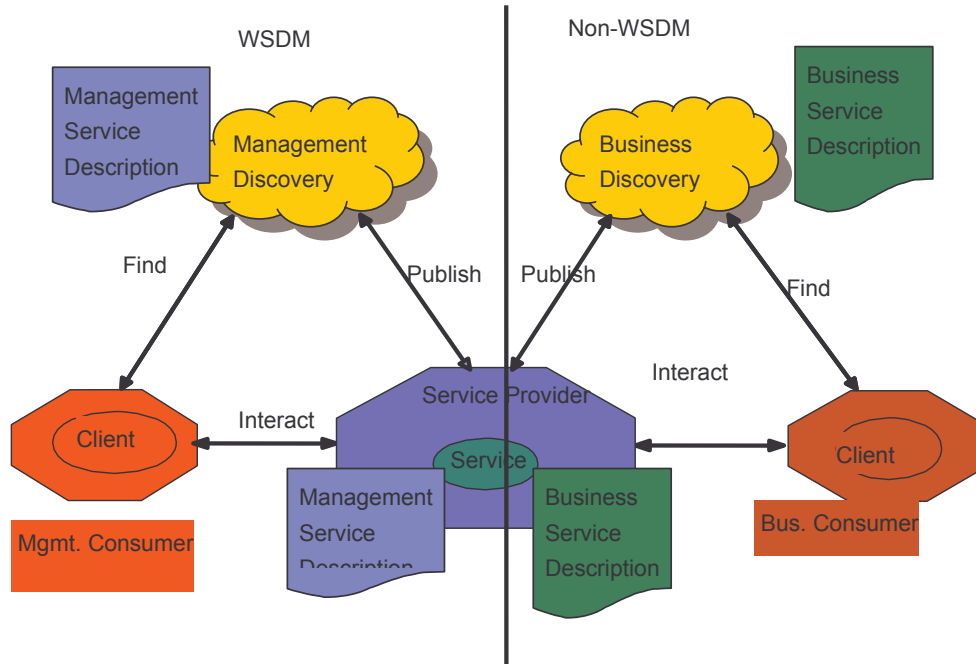
88 Required infrastructure components. Examples include, but are not limited to, a Registry, a  
89 Policy Repository, or a Security service. They will be mentioned in the document where  
90 appropriate, and MUWS has requirements on these services, but they will not be defined here.  
91 Also, much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

92

## 2 Context

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



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Figure X, WS Architecture, both WSDM and non-WSDM

103  
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**Comment:** Could also insert here various "toaster" diagrams to show the types of possibilities.

---

## 3 Concepts

105  
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107

### 3.1 MUWS Architecture Concept Diagram

109

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

116

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

124

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

133

134 |For example, ability to offer metrics could be captured in a 'Metrics' UML model which is,  
135 therefore, an instance of the manageability capability concept. The semantics of offering metrics





**Comment:** We have a difference of opinion here on the purpose of MUWS. In my mind the specification defines the mapping from any model to an interface. It does not itself define a model. What we need to discuss is the issue of some canonical manageability items. Ones that need to be canonical in order to provide a uniform platform for manageability (e.g., identity), and the ones that either are canonical because we believe any model has them - which IMO are not where we should be focusing. So I think that this is a point of discussion.

---

149 **4 Logical Architecture**

150 **4.1 Role Definitions**

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

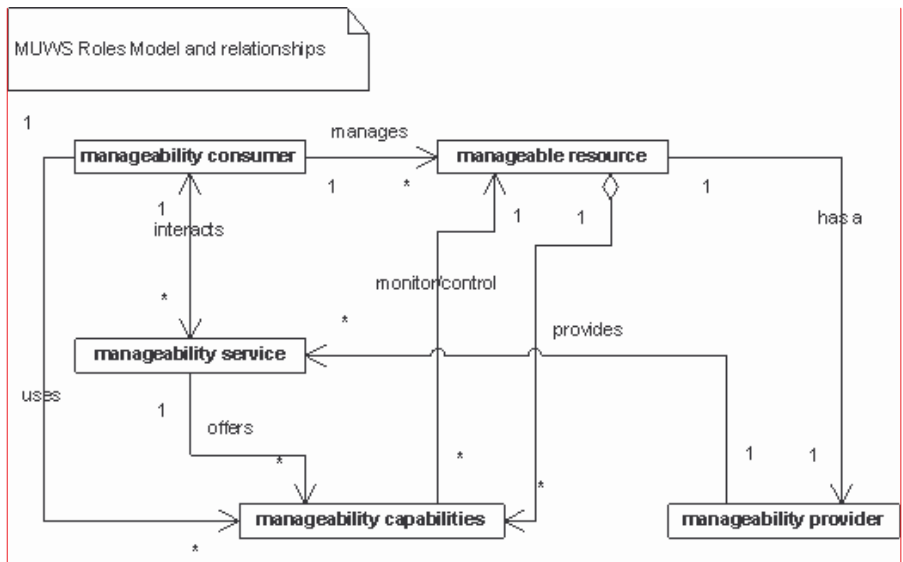
155 NOTE: One application implementation may have many roles or a full role may be implemented  
156 by a combination of many different applications.

157

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

161

162



**Comment:** The diagram needs to be merged with Logical Model after we have crisp definitions up front. Check words, etc.

Figure X, MUWS Roles

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165

### 4.1.1 Consumer of Manageability

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167

The Consumer of Manageability does the following:

- Consumes manageability information
- Manages the resource (monitor, configure, etc)
- Understands the manageability capabilities of the resource

172

### 4.1.2 Provider of Manageability

173  
174

The Provider of Manageability does the following:

- 176
- 177
- Provides the Manageability quality for a manageable resource, enabling a resource to become a manageable resource
  - Provides information for Consumer (according to the manageability capabilities of the resource)
- 178
- 179
- 180

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

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.

### 184 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

### 190 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

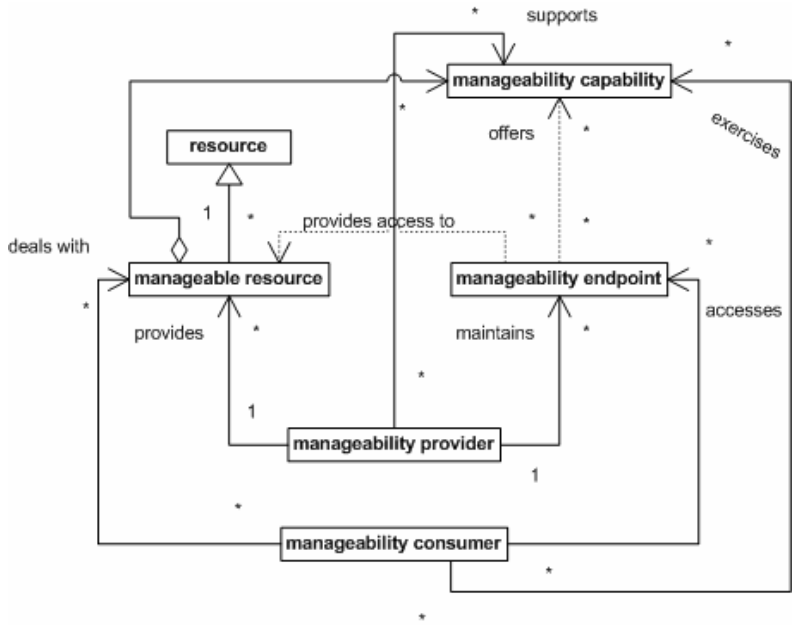
## 196 4.2 Logical Model

197 | A Manageability Provider may provide the manageability quality for many resources. In other  
198 words a Manageability Provider may help many resources become manageable  
199 resources, instances of which belong to one instance of the Provider. To accomplish this, a  
200 Manageability Provider maintains manageability endpoints which provide access to the  
201 manageable resources. According to the concepts definition, a manageable resource is a  
202 resource with a number of manageability capabilities composed into it. In order to compose  
203 capabilities into the manageable resource, a Manageability Provider supports the manageability  
204 capabilities that are offered by the manageability endpoints. For example, a Manageability  
205 Provider could embed a piece of code to support the manageability capabilities into a resource

206 thus making a resource manageable. A Provider may also support the capabilities by deploying  
 207 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.

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



217  
 218 Figure X, MUWS Logical Model

219

## 220 4.3 Information Model

221

222 [Editor: Need something here. Behind the capability there is an information model. Provider and  
223 Consumer need to understand that model. We may need to specify a minimum set, such as  
224 Identity. Or just say that a well-formed information model addresses the requirements in the  
225 Requirements Document.]

226

## 227 4.4 Processing Model and Interaction Patterns

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

- 230 1. Manageability consumer and manageability provider have to understand the information  
231 model in which the semantics of a manageability capability are described. For example, it  
232 could be a UML model that expresses a group of properties, operations, events and  
233 metadata. The meaning of what the model defines has to be equally understood by both  
234 parties.
- 235 2. Manageability consumer exerts control over and obtains information about the  
236 manageable resource by exchanging messages with one or more manageability  
237 endpoints that provide access to the manageable resource.
- 238 3. Manageability consumer has to be able to obtain the description of the manageability  
239 service, its endpoints and necessary manageability interfaces. Manageability provider  
240 has to be able to obtain the description of the manageability interfaces for the capabilities  
241 it wants to support.
- 242 4. Manageability consumer and manageability provider both have to equally understand  
243 how to establish which manageability interface corresponds to which manageability  
244 capability and vice versa.
- 245 5. Manageability consumer establishes which capabilities are supported by the manageable  
246 resource either from the description of the manageability service or by exchanging  
247 messages with the manageability endpoint.
- 248 6. Manageability consumer discovers necessary manageable resources by discovering  
249 manageable endpoints, reading their descriptions and exchanging messages as required.  
250 Manageability provider advertises/registers available manageability endpoints.

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

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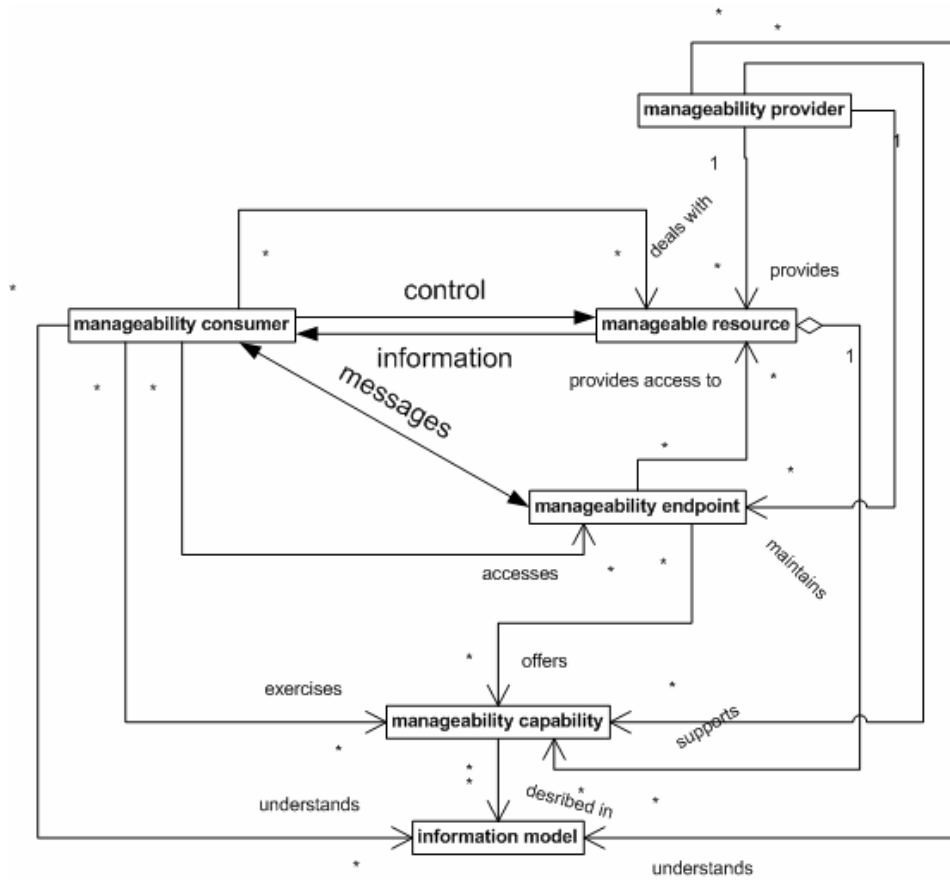
[Zulah's comments: [Discovery](#):

1. The MC must determine the manageable resource to be managed
2. MP has a description of the information model for the manageability capabilities - access to which is provided via the MS. For each manageable resource that the MP is providing an MS for.
3. MC obtains the description of the appropriate MS and the associated information model
4. MC determines that it can interact - makes this possible
5. MC has endpoint reference for the appropriate endpoint with the capabilities that the MC wishes to use

Interaction:

1. MC understands and meets the endpoint requirements for interaction
2. MC monitors and controls resource by exchanging messages with the MS]

**Comment:** The UArch group believes that these points are covered already, but in Zulah's absence decided to keep these comments in here for now.



266  
267

Figure X, MUWS Basic Processing Model

268 **4.5 Delegation Architecture**

269

---

## 270 5 Implementation Architecture

### 271 5.1 Implementation of Roles

#### 272 5.1.1 Consumer of Manageability

273

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

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

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

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

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

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

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

291

#### 292 5.1.2 Provider of Manageability

293

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

**Comment:** This section was added to Implementation because it was too much detail for the conceptual discussion of Roles up above. It is subject to change as the document progresses.



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

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

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

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

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

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

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

310

### 311 **5.1.3 Manageable Resource**

312

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

316

### 317 **5.1.4 Infrastructure Components**

318

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

322

323

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324 **6 References**

325 **6.1 Normative**

326 .

327

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## Appendix A. Acknowledgments

328

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

329

330

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## 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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