



# Management Using Web Services: Architecture

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# 1 Introduction

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## 1.1 Terminology

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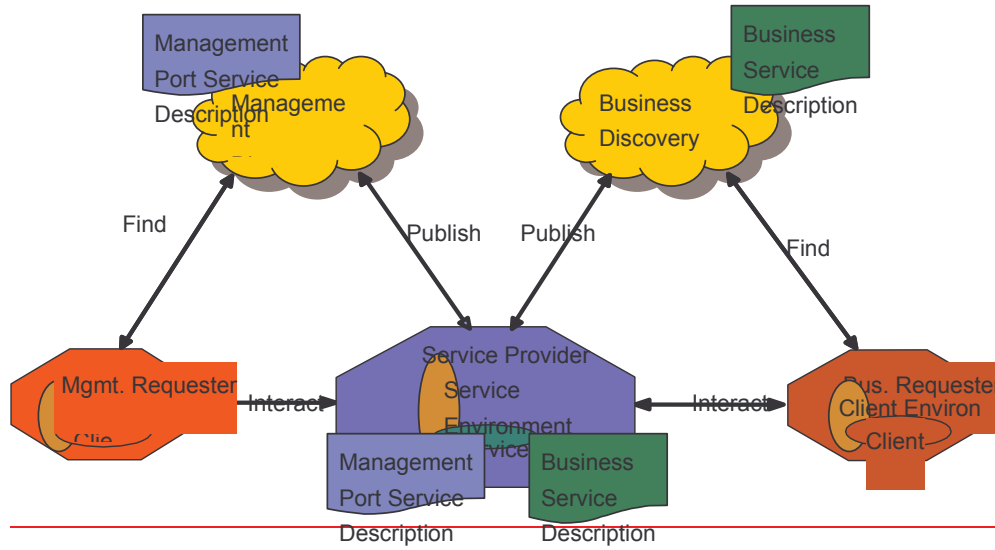
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## 2 Context



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## 49 **3 Concepts**

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### 50 **3.1 MUWS Architecture Introduction**

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

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### 58 **3.2 MUWS Architecture Scope**

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

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

67 The Consumer of Manageability (each manager which needs to manage some aspect of a  
68 manageable resource using MUWS is a consumer of Manageability). The Consumer must be  
69 able to make use of the manageability interface(s) provided by or on behalf of manageable  
70 resources. Conventional management applications that do not support MUWS will not be  
71 addressed at all in the MUWS Architecture. The Consumer of Manageability, like any Web  
72 Service consumer, must be able to send messages to, receive responses from, and possibly  
73 receive notifications from the manageability interface. There are no requirements imposed on the  
74 use of information received.

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

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

Comment: Need a definition that resource is manageable.

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87 Required infrastructure components. Examples include, but are not limited to, a Registry, a  
88 Policy Repository, or a Security service. They will be mentioned in the document where

89 appropriate, and MUWS has requirements on these services, but they will not be defined here.  
90 Also, much of this work will be addressed via the MUWS Platform requirements.

### 92 3.3 MUWS Architecture Concept Diagram

93  
94  
95

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

102

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

110

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

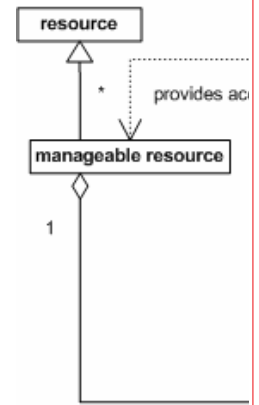
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120 For example, ability to offer metrics could be captured in a 'Metrics' UML model which is,  
121 therefore, an instance of the manageability capability concept. The semantics of offering metrics  
122 could be rendered from the UML model into a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

125

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

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UML model

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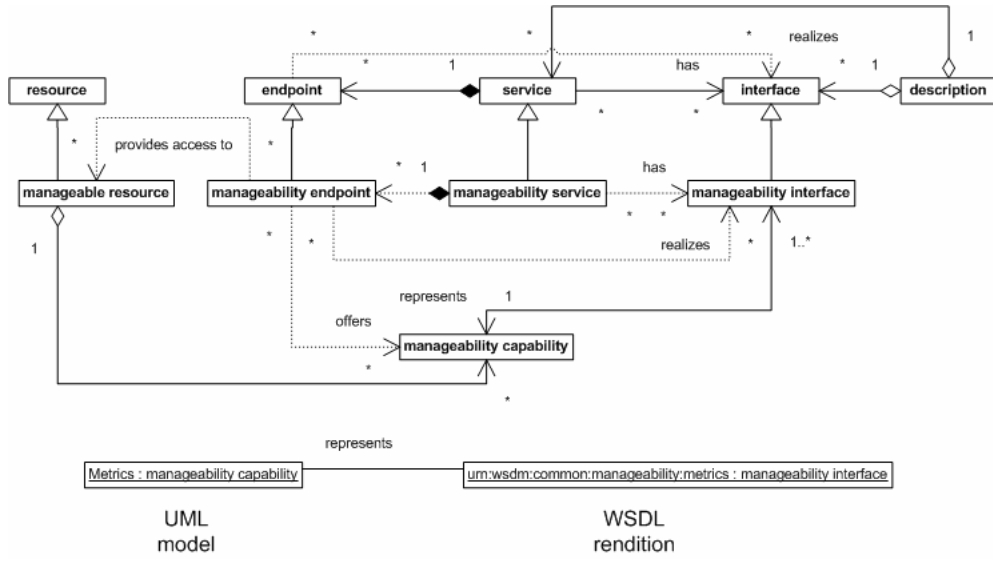
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Figure X. MUWS Concepts |

**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.

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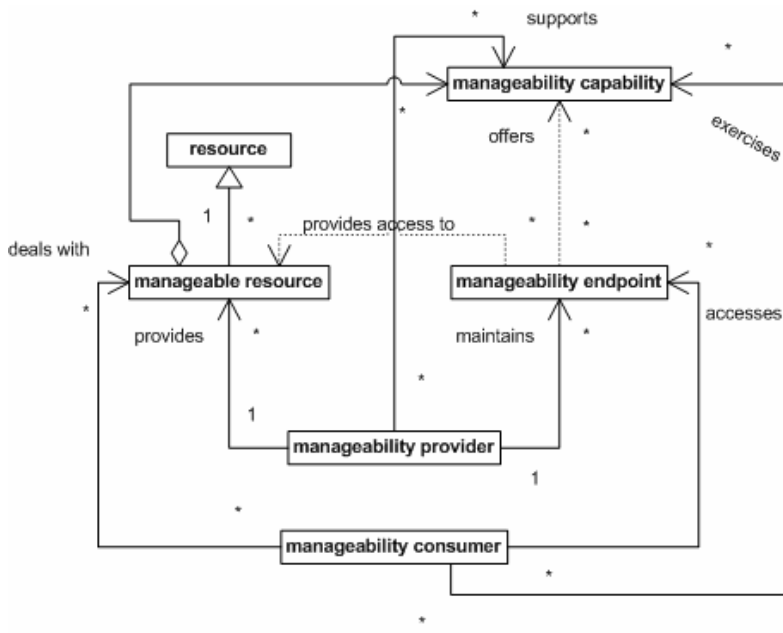
## 4 Logical Architecture

### 4.1 Logical Model

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

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

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## 4.2 Information Model

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The manageability provider may provide many manageable resources, instances of which belong to one instance of the provider. To do this, manageability provider maintains manageability endpoints which provide access to manageable resources. Manageable resource is a resource with a number of manageability capabilities composed into it. Manageability capabilities are explicitly supported by the manageability provider and are offered via manageability endpoints.

The manageability consumers deal with manageable resources. To 'deal with' in this context means to exert control and to obtain and interpret the information. In order to deal with 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. 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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## 4.3 Roles

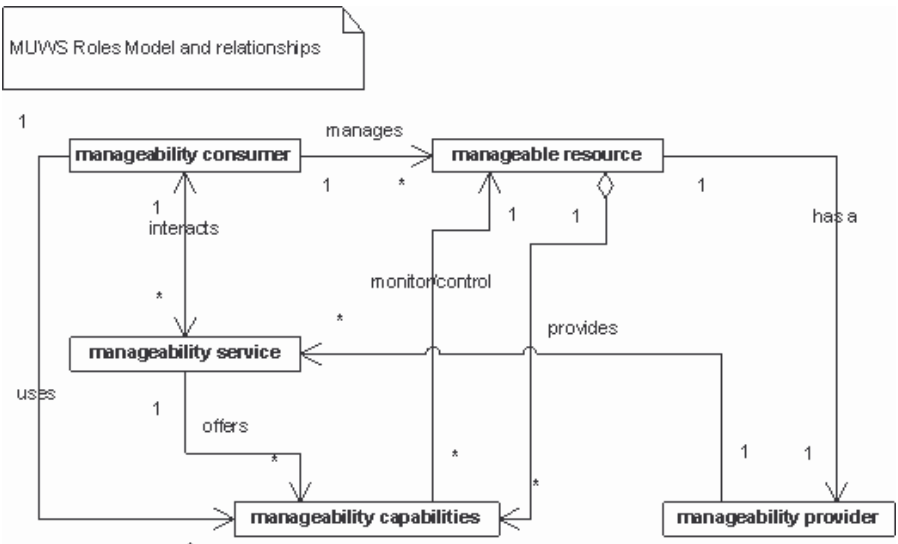
179 This section documents the roles various components of the MUWS Architecture, as well as  
 180 related components, will have during management using Web Services. It is not intended to  
 181 constrain the locus of implementation, but instead is intended to document the required  
 182 components and which actions each is required to take.

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

185  
 186 The major roles are Consumer of the Manageability Service and Provider of the Manageability  
 187 Service. Related roles are Manageable Resource and related infrastructure components, such  
 188 as a Directory.

189  
 190 There are also actions only referred to here, because there is no direct relationship to the  
 191 manageability service, and standardization is not required. Such as getting a new manageability  
 192 service or component up and running for the first time.

193



194

195 **Figure X, MUWS Roles**

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**4.3.1 Consumer of Manageability**

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

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

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

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

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

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

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

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### 217 | **4.3.2 Provider of Manageability**

218 |

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

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223 | ~~Provider of Manageability provides the manageability quality for a resource and therefore enables~~  
224 | ~~a resource to become a manageable resource. For example, Provider of Manageability may be~~  
225 | ~~code helping the resource expose its metrics via MUWS.~~

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

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

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

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

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

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

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234 | The Provider must follow the security requirements of the environment.

235 |

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### 236 | **4.3.3 Manageable Resource**

237 |

238 | The Manageable Resource must perform the business tasks it is normally required to do.  
239 | Because there are no restrictions on the locus of implementation, the manageable resource may  
240 | or may not implement the role of Provider of the Manageability Service.

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### 4.3.4 Infrastructure Components

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

249

## 4.4 Processing Model and Interaction Patterns

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

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

256  
257  
258

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

259  
260  
261

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

262  
263  
264

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

265  
266  
267

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

268  
269  
270

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

271

*Zulah's comments: Discovery:*

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272

*1. The MC must determine the manageable resource to be managed*

273

*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.*

274

*3. MC obtains the description of the appropriate MS and the associated information model*

275

*4. MC determines that it can interact - makes this possible*

276

*5. MC has endpoint reference for the appropriate endpoint with the capabilities that the MC wishes to use*

277

*-*

278

*Interaction:*

279

*1. MC understands and meets the endpoint requirements for interaction*

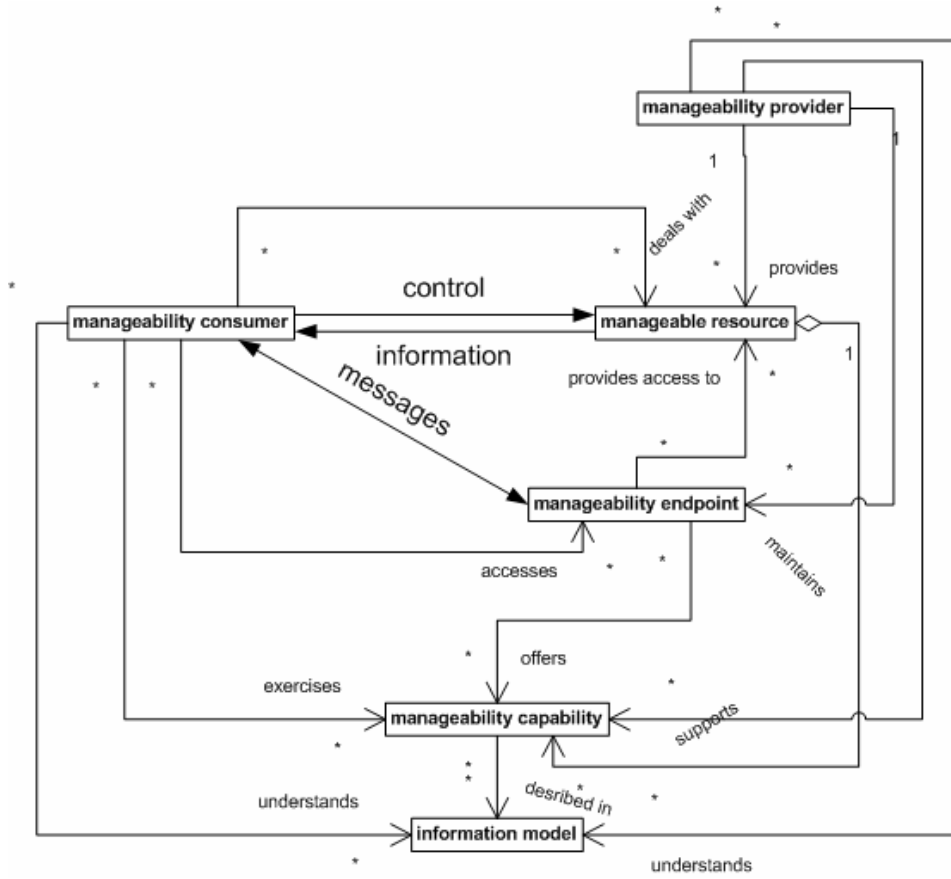
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*2. MC monitors and controls resource by exchanging messages with the MS]*

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*2. MC monitors and controls resource by exchanging messages with the MS]*



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Figure X, MUWS Basic Processing Model

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### 4.5 Delegation Architecture



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289 **6 References**

290 **6.1 Normative**

291 | .

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## Appendix A. Acknowledgments

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

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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

297

298

## **Appendix C. Notices**

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**Page 6: [18] Deleted** **John DeCarlo** **11/6/2003 12:13 PM**

A resource is a manageable resource if it has manageability, management policy, and management related semantics [cite WSA]. In this document, we are

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**Page 6: [20] Comment** **zulah** **11/5/2003 2:08 PM**

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.

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**Page 6: [21] Comment** **John DeCarlo** **11/6/2003 12:25 PM**

Although it may define some common aggregations.