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6 **Cloud Infrastructure Management Interface**

7 **(CIMI) Model and REST Interface over HTTP**

8 **An Interface for Managing Cloud Infrastructure**

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35 Abstract

36 This document is a deliverable from the DMTF Cloud Management Working Group. It defines a logical
37 model for the management of resources within the Infrastructure as a Service domain. This model was
38 developed to address the use cases outlined in the “Scoping Framework for Cloud Management Models
39 and Protocol Requirements” document.

40 Acknowledgments

41 TBD

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161 **1 Scope**

162 This specification describes the model and protocol for management interactions between a cloud
163 Infrastructure as a Service (IaaS) provider and the consumers of an IaaS service. The basic entities of
164 IaaS (machines, storage, and networks) are modeled with the goal of providing consumer management
165 access to an implementation of IaaS and facilitating portability between cloud implementations that
166 support the specification. This document specifies a Representational State Transfer (REST) style
167 protocol, although the model is designed to be protocol independent and other protocols are possible.
168 CIMI addresses the management of the lifecycle of infrastructure provided by a cloud provider. CIMI does
169 not extend beyond infrastructure management to the control of the applications and services that the
170 consumer chooses to run on the infrastructure provided as a service by the provider. Although CIMI may
171 be to some extent applicable to other cloud service models, such as Platform as a Service (PaaS) or
172 Storage as a Service, these uses are outside the design goals of CIMI.

173 **1.1 Document Structure**

174 This document defines a model and an HTTP/REST-based protocol.

175 The core REST pattern is defined first and, after each entity is defined, any REST-specific information for
176 that entity will be specified.

177 **1.2 Document Versioning Scheme**

178 This document will adhere to the versioning scheme defined in DSP4004 section 6.3.

179 **1.3 Typographical Conventions**

180 This specification uses the following syntax to define the serialization of resources:

- 181 • Values in *italics* indicate data types instead of literal values.
- 182 • Characters are appended to items to indicate cardinality:
 - 183 ○ "?" (0 or 1)
 - 184 ○ "*" (0 or more)
 - 185 ○ "+" (1 or more)
- 186 • Ellipses (i.e., "...") indicate points of extensibility. Note that the lack of an ellipsis does not mean
187 no extensibility point exists, rather it is just not explicitly called out - usually for the sake of
188 brevity.

189 **2 References**

190 The following referenced documents are indispensable for the application of this document. For dated
191 references, only the edition cited applies. For undated references, the latest edition of the referenced
192 document (including any amendments) applies:

193 **IEC 80000-13:2008**, International Organization for Standardization, Geneva, Switzerland, *Quantities and*
194 *units – Part 13: Information science and technology*, April 2008,
195 http://www.iso.org/iso/catalogue_detail?csnumber=31898

196 **IETF RFC 2045**, N. Freed et al, *Multipurpose Internet Mail Extensions (MIME) Part One: Format of*
197 *Internet Message Bodies*, November 1996, <http://www.ietf.org/rfc/rfc2045.txt>

- 198 **IETF RFC 2616**, R. Fielding et al, *Hypertext Transfer Protocol -- HTTP/1.1*, June 1999,
199 <http://www.ietf.org/rfc/rfc2616.txt>
- 200 **IETF RFC 2246**, T. Dierks and C. Allen, *The TLS Protocol Version 1.0*, January 1999,
201 <http://www.ietf.org/rfc/rfc2246.txt>
- 202 **IETF RFC 3986**, T. Berners-Lee et al, *Uniform Resource Identifiers (URI): Generic Syntax*, August 1998,
203 <http://www.ietf.org/rfc/rfc3986.txt>
- 204 **IETF RFC 4288**, N. Freed and J. Klensin, *Media Type Specifications and Registration Procedures*,
205 December 2005, <http://www.ietf.org/rfc/rfc4288.txt>
- 206 **IETF RFC 4346**, T. Dierks and E. Rescorla, *The Transport Layer Security (TLS) Protocol Version 1.1*,
207 April 2006, <http://www.ietf.org/rfc/rfc4346.txt>
- 208 **IETF RFC 4627**, D. Crockford, *The application/json Media Type for JavaScript Object Notation (JSON)*,
209 July 2006, <http://www.ietf.org/rfc/rfc4627.txt>
- 210 **IETF RFC 5246**, T. Dierks and E. Rescorla, *The Transport Layer Security (TLS) Protocol Version 1.1*,
211 <http://www.ietf.org/rfc/rfc5246.txt>
- 212 **ISO 8601:2004**, International Organization for Standardization, Geneva, Switzerland, *Data elements and*
213 *interchange formats -- Information interchange -- Representation of dates and times*, March 2008,
214 http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40874
- 215 **ISO/IEC Directives, Part 2**, *Rules for the structure and drafting of International Standards*,
216 <http://isotc.iso.org/livelink/livelink.exe?func=ll&objId=4230456&objAction=browse&sort=subtype>
- 217 **ITU-T X.509**, Telecommunication Standardization Sector of ITU, *Information technology - Open Systems*
218 *Interconnection - The Directory: Public-key and attribute certificate frameworks*, November 2008,
219 <http://www.itu.int/rec/T-REC-X.509-200811-I>
- 220 **NIST Special Publication 800-57**, Elaine Barker et al, *Recommendation for Key Management – Part 1:*
221 *General (Revised)*, March 2007, [http://csrc.nist.gov/publications/nistpubs/800-57/sp800-57-Part1-](http://csrc.nist.gov/publications/nistpubs/800-57/sp800-57-Part1-revised2_Mar08-2007.pdf)
222 [revised2_Mar08-2007.pdf](http://csrc.nist.gov/publications/nistpubs/800-57/sp800-57-Part1-revised2_Mar08-2007.pdf)
- 223 **NIST Special Publication 800-131A**, Elaine Barker and Allen Roginsky, *Transitions: Recommendation*
224 *for Transitioning the Use of Cryptographic Algorithms and Key Lengths*, January 2011,
225 <http://csrc.nist.gov/publications/nistpubs/800-131A/sp800-131A.pdf>
- 226 **Representational State Transfer**, Roy Fielding, Doctoral dissertation, University of California,
227 *Architectural Styles and the Design of Network-based Software Architectures (Chapter 5)*, 2000,
228 http://www.ics.uci.edu/~fielding/pubs/dissertation/rest_arch_style.htm
- 229 **XMLSchema - Part 1**, World Wide Web Consortium (W3C) Recommendation, H. Thompson, et al.,
230 Editors, *XML Schema Part 1: Structures Second Edition*, 28 October 2004,
231 <http://www.w3.org/TR/xmlschema-1/>
- 232 **XMLSchema - Part 2**, World Wide Web Consortium (W3C) Recommendation, P. Biron, A. Malhotra,
233 Editors, *XML Schema Part 2: Datatypes (Second Edition)*, 28 October 2004,
234 <http://www.w3.org/TR/xmlschema-2/>
- 235 **DMTF DSP-0243**, Distributed Management Task Force, Inc., *Open Virtualization Format Specification*
236 *1.1.0*, http://www.dmtf.org/sites/default/files/standards/documents/DSP0243_1.1.0.pdf
- 237 **DMTF DSP-0259**, Distributed Management Task Force, Inc., *Cloud Infrastructure Management Interface -*
238 *CIM Model (CIMI-CIM) 0.0.1*, <http://members.dmtf.org/apps/org/workgroup/cmwg/download.php/yyyy>
- 239 **DMTF DSP-4004**, Distributed Management Task Force, Inc., *DMTF Release Process 2.4.0*,
240 http://www.dmtf.org/sites/default/files/standards/documents/DSP4004_2.4.0.pdf

241 **DMTF DSP-XXXX**, Distributed Management Task Force, Inc., *Cloud Infrastructure Management Interface*
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243 <http://members.dmtf.org/apps/org/workgroup/cmwg/download.php/zzz>

244 **DMTF DSP-ISXXXX**, Distributed Management Task Force, Inc., *Scoping Framework for Cloud*
245 *Management Models and Protocol Requirements 0.1.5*,
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247 [mework_v015.doc](http://members.dmtf.org/apps/org/workgroup/cmwg/download.php/56339/Cloud%20Management%20Framework_v015.doc)

248 *Note: the CIMI-RNG document is not yet available*

249 **3 Terms and Definitions**

250 In this document, some terms have a specific meaning beyond the normal English meaning. Those terms
251 are defined in this clause.

252 The terms "shall" ("required"), "shall not," "should" ("recommended"), "should not" ("not recommended"),
253 "may," "need not" ("not required"), "can" and "cannot" in this document are to be interpreted as described
254 in [ISO/IEC Directives, Part 2](#), Annex H. The terms in parenthesis are alternatives for the preceding term,
255 for use in exceptional cases when the preceding term cannot be used for linguistic reasons. Note that
256 [ISO/IEC Directives, Part 2](#), Annex H specifies additional alternatives. Occurrences of such additional
257 alternatives shall be interpreted in their normal English meaning.

258 The terms "clause," "subclause," "paragraph," and "annex" in this document are to be interpreted as
259 described in [ISO/IEC Directives, Part 2](#), Clause 5.

260 The terms "normative" and "informative" in this document are to be interpreted as described in [ISO/IEC](#)
261 [Directives, Part 2](#), Clause 3. In this document, clauses, subclauses, or annexes labeled "(informative)" do
262 not contain normative content. Notes and examples are always informative elements.

263 **3.1 Authentication**

264 The process of verifying a claim, made by a subject, that it should be allowed to act on behalf of a given
265 principal (person, service, etc.). Typical authentication mechanisms involved the use of
266 username/password combination or public/private key pairs.

267 **3.2 Authorization**

268 (also known as **Access Control**) The process of verifying that an authenticated principal (person, service,
269 etc.) has permission to perform certain operations (e.g. read, update) on specific resources.

270 **3.3 Cloud Service Consumer**

271 A category of actors that includes the Consumer Business Manager (who approves business and
272 financial expenditures for consumed services, accounts for used service instances, establishes business
273 relationships; sets up accounts, budget, and terms; etc.), the Consumer Service Administrator (who
274 requests service instances and changes to service instances, purchase services within the business
275 relationship; create Service Users (including policies), allocate resources, such as compute and storage,
276 generate reports (usage), etc.), and Service Users (who uses service instances provided by a Cloud
277 Service Provider). The term "**Consumer**" is used when the indicated action or activity could involve one or
278 more of the above actors. In cases where the distinction between the actors in this category is relevant,
279 the more detailed term will be used.

280 **3.4 Cloud Service Provider**

281 A category of actors that includes the Service Operations Manager (who manages the technical
282 infrastructure required for providing cloud services, monitors and measures performance and utilization
283 against SLAs, provides reports from monitoring and measurement, etc.), Service Business Manager (who
284 offers all types of services developed by cloud service developers, accounts for services potentially
285 offered by service providers themselves and services offered on behalf of cloud service developers,
286 establishes a portfolio of business relationships, and sets up accounts and terms for Consumers, etc.),
287 and Service Transition Manager (who enables a customer to use the cloud service, including
288 "onboarding", integration, and process adoption, defines and creates service offerings based on
289 Templates and Configurations that can be used by Consumers and are populated into the catalog, etc.).
290 The term "Provider" is used when the indicated action or activity could involve one or more of the above
291 actors. In cases where the distinction between the actors in the category is relevant, the more detailed
292 term will be used.

293 **3.5 Configuration**

294 A Configuration is a set of metadata, the values of which serve as the parameters of a discrete
295 conformation of a specific type of virtual resource. For example, a Machine Configuration may define a
296 Machine with the equivalent of a 2.66 GHz processor, 4 GB of memory, and 320 GB of local disk storage.

297 **3.6 Message Confidentiality**

298 A quality of a message which prevents anyone but the intended receiver(s) from viewing its contents.

299 **3.7 Message Integrity**

300 A quality of a message which allows a receiver of that message to determine if the contents of the
301 message have been altered since its creation.

302 **3.8 Template**

303 A Template is the entity that represents the set of metadata and instructions used to instantiate resources
304 (e.g. a Machine Template is used to create Machines). Templates may aggregate other metadata entities
305 such as other Templates, Configurations and Images. For example, a Machine Template refers to a
306 Machine Configuration and a Machine Image.

307 How a specific protocol mapping, or implementation, chooses to supply Templates as inputs to the
308 instantiation process may vary. However, some common patterns should be considered:

- 309 1. By reference - allow Consumers to reference a Template (that exists as an entity in the Provider) as
310 part of the instantiation operation.
- 311 2. By value - allow Consumers to dynamically provide the Template information as part of the
312 instantiation operation.
- 313 3. Reference with overrides - allow Consumers to reference a Template (that exists as an entity in the
314 Provider) and provide additional values that override the attributes of that Template as part of the
315 instantiation operation.

316 **4 REST/HTTP Protocol**

317 **4.1 Protocol Definition**

318 All operations are based on the HyperText Transfer Protocol, version 1.1 [\[RFC2616\]](#). Each request is
319 sent using an HTTP verb such as PUT, GET, DELETE, HEAD or POST and includes a message body in

320 either JSON or XML format. Each response uses a standard HTTP status code, overloaded with
 321 semantics by the context of the particular request that was made. Each entity in the model has a MIME
 322 standard ContentType that further contextualizes the operation requests and responses.

323 The entities in the model are identified by URIs and each entity's representation MUST contain a "uri"
 324 property that acts as a "self pointer". This URI SHALL be unique within the context of the Provider's
 325 implementation. Dereferencing (via an HTTP GET) the URI of an entity will yield a representation of the
 326 entity containing attributes and links to associated entities. To begin operations, a client must know the
 327 URI to the main entry point of a Cloud Provider - also known as the "Cloud Entry Point" entity. All other
 328 entities within the environment shall then be discoverable via the iterative following of links to associated
 329 resource within each resource retrieved.

330 4.1.1 Protocol Security

331 Cloud Providers SHALL support secure HTTP connections using TLS. Cloud Providers MAY support non-
 332 secure HTTP connections. TLS 1.0, which shall be implemented, is specified in [\[RFC2246\]](#), and the TLS
 333 1.1 and TLS 1.2 should be implemented as specified in [\[RFC4346\]](#) and [\[RFC5246\]](#), respectively.

334 To ensure a minimum level of security and interoperability between implementations, all CIMI clients and
 335 servers shall support the TLS_DHE_DSS_WITH_3DES_EDE_CBC_SHA cipher suite (hexadecimal value
 336 {0x0013}), which is also the mandatory cipher suite for TLS 1.0 (see [\[RFC2246\]](#) Section 9, Mandatory
 337 Cipher Suites), as well as the TLS_RSA_WITH_AES_128_CBC_SHA cipher suite (hexadecimal value
 338 {0x002F}) shall be implemented, which is the mandatory cipher suite for both TLS 1.1 and TLS 1.2.
 339 Finally, the TLS_RSA_WITH_AES_128_CBC_SHA256 cipher suite (hexadecimal value {0x003C}) should
 340 be included with all recommended TLS 1.2 implementations to meet the transition to a security strength of
 341 112 bits (guidance is provided in NIST Special Publication 800-57 [\[NIST 800-57\]](#) and NIST Special
 342 Publication 800-131A [\[NIST 800-131A\]](#)). Implementers are free to include additional cipher suites, but
 343 must prefer the mandatory ones in negotiation.

344 4.1.2 XML Namespaces

345 The following table lists the XML namespaces that are used in this specification. The choice of any
 346 namespace prefix is arbitrary and not semantically significant.

Prefix	XML Namespaces	Specification
cimi	http://www.dmtf.org/cimi	This specification
xs	http://www.w3.org/2001/XMLSchema	XML Schema XMLSchema - Part 2

347 4.1.3 URI Space

348 While URIs returned by providers are to be treated as opaque by consumers, and consumers MUST NOT
 349 make assumptions about the layout of the URIs or the structures of the URIs of the resources, consumer
 350 may augment URIs with any well-defined query parameters which are supported by the provider as
 351 defined in section 4.1.6. Providers shall not use the CIMI-defined query parameter reserved namespace
 352 (i.e. names starting with "CIMI").

353 4.1.4 Media Types

354 In this specification, resource representations and request bodies are encoded in either JSON, as
 355 specified in [\[RFC4627\]](#) or in XML.

356 Each type of resource has its own media-type, which matches the pattern application/.Xxxx+json, where
 357 "Xxxx" represents the portion of the identifier unique to a particular representation format for each
 358 resource (entity in the model). The identifier MUST either be a DMTF standard identifier as defined in this

359 specification and as registered in accordance to [RFC4288], or it must be a vendor specific identifier that
360 is globally unique (vendor extension).

361 The server implementation shall provide representations of all resources available in both JSON and XML
362 as specified herein. The client implementation may thus use either JSON or XML to communicate with
363 any server implementation.

364 4.1.5 Request Headers

365 This specification uses general-header, request-header, and entity-header headers as defined in HTTP
366 1.1 [RFC2616] in request messages to provide metadata about the message. Applications using
367 messages defined in this specification shall use headers consistent with HTTP 1.1.

368 In addition to headers defined in HTTP 1.1, request messages may include a header defined by this
369 specification to indicate the set of allowable versions of the CIMI API that server shall use to process the
370 message.

```
371 X-CIMI-Specification-Version = "X-CIMI-Specification-Version" ":" api-version(s)
```

372 For example:

```
373 X-CIMI-Specification-Version=1.0
```

374 The header allows for a list of *api-version* values to be specified (separated by commas). When more
375 than one value is present the server shall choose one of those versions of the specification to process the
376 message. Clients including more than one value are indicating that any of the specified values are
377 acceptable.

378 Per DSP4004 [DSP4004], the "api-version" string is made up of 3 parts: m.n.u - major.minor.update.
379 When present in this header, it shall include at least the major and minor (m.n) version numbers. It may
380 also include the "update" portion of the version if necessary. Absence of the "update" portion of the "api-
381 version" string implies that any "update" version of that major.minor version of the specification is
382 acceptable to the client.

383 If the server is unable to support any of the specified versions then it shall generate a fault and not
384 process the message. Absence of this header indicates that the server may choose any version of this
385 specification to process the message.

386 4.1.6 Request Query Parameters

387 To modify the behavior of the Provider when processing request messages, Consumers may augment
388 request URIs with the following query parameters:

389 4.1.6.1 CIMISelect

390 The CIMISelect query parameter may be used to specify a subset of a resource to be acted upon. This
391 has the semantic equivalence of referencing a different resource whose attributes are a subset of the
392 original resource. The format of a CIMISelect query parameter is:

```
393 ?CIMISelect=attrName,*
```

394 The value of the CIMISelect query parameter is a comma separated list of attribute names. Any attribute
395 name erroneously appearing in the list that is not part of the resource shall be ignored by the Provider. An
396 attribute name of "*" is equivalent to specifying all of the attributes of the resource. Any attribute name
397 explicitly appearing more than once in a URI shall have its second (and subsequent) appearances
398 ignored.

399 The CIMISelect query parameter may appear more than once in a URI which is semantically equivalent to
400 all of the attribute names appearing as values of a single CIMISelect query parameter. For example:

```
401 ?CIMISelect=name&CIMISelect=state
```

402 is equivalent to:

403 `?CIMISelect=name, state`

404 Order of attribute names in the CIMISelect query parameter is not relevant for serialization purposes - the
405 attributes will be serialized per the serialization rules/order as specified by the resource definition.

406 Attribute names listed in a CIMISelect value may also include further qualified depending on the type of
407 attribute as follows:

408 **Arrays**

409 This specification allows for the Consumer to subset the list of entries in an array by including a bracketed
410 expression after the attribute name:

411 `?CIMISelect=attrName[expression]`

412 Where "expression" can be one of the following:

- 413 • index (a single number)
414 If the "expression" is a single number then it is to be treated as an index into the array and only
415 that one entry in the array is referenced. Arrays are one-based - i.e. an index of "1" references
416 the first entry in the array. An index value that is beyond the number of entries in the array results
417 in an empty reference.
- 418 • range (low-high)
419 If the "expression" is expressed as a range then only the entries in that range are referenced. As
420 with the "index" expression, arrays are one-based and any range value(s) outside of the number
421 of entries in the array results in an empty reference.
- 422 • value expression
423 The "expression" may be a syntactical expression used to select the set of array entries based on
424 the value of the attributes in those entries.
425
426 The "expression" may use the following mathematical constructs: "=", "<", ">", "<=", ">=", "<>",
427 "and", "or", "(" and ")". Each of these shall be percent encoded in the URL as appropriate.
428
429 For example, an expression of:
430 `name=mine`
431 indicates that the array entry is included in the referenced set if that entry's "name" attribute has a
432 value of "mine".
433
434 Normally the "attribute name" portion of an expression is just a single word, the attribute name
435 itself, however, if the attribute is a nested resource, or a reference, then a dot (.) may be included
436 in the attribute name as a way to represent a traversal into that secondary resource.

437 If this qualifier appears on an attribute name, and that attribute is not an array, then the Provider shall
438 ignore the qualifier.

439 Examples (the URI of "/machines" references a Machines Collection resource):

440 `GET /machines?CIMISelect=operations`

441 This returns just the 'operations' attribute of the Machines Collection resource.

442 `GET /machines?CIMISelect=machines[1]`

443 This returns just the 'machines' attribute of the Machines Collection resource, but just the first machine in
444 the array.

445 `GET /machines?CIMISelect=machines[1-100]`

446 This returns just the 'machines' attribute of the Machines Collection resource, but just the first 100
447 machines in the array.

448 `GET /machines?CIMISelect=machines[href.name=mine]`

449 This returns just the 'machines' attribute of the Machines Collection resource, but only machines whose
450 'name' attribute has a value of 'mine' will be included in the array.

451 `GET /machines?CIMISelect=*,machines[href.name=mine]`

452 This returns all of the attributes of the Machines Collection resource, but the machines array is subset to
453 just the machines whose 'name' attribute has a value of 'mine'.

454 `GET /machines?CIMISelect=machines[memory.quantity>64 and memory.units=byte]`

455 This returns just the 'machines' attribute of the Machines Collection resource, but only machines that have
456 more than 64 bytes of memory will be included in the array.

457 4.1.6.2 CIMIExpand

458 The CIMIExpand query parameter may be used to specify which of the references should be "expanded".
459 To "expand" a reference means that the attributes of the resource being referenced are to be included in
460 the serialization of that attribute. This allows for a more optimized retrieval of resources.

461 The format of a CIMIExpand query parameter is:

462 `?CIMIExpand=attrName,*`

463 The value of the CIMIExpand query parameter is a comma separated list of attribute names. Any attribute
464 name erroneously appearing in the list that is not part of the resource, or is not a reference, shall be
465 ignored by the Provider. An attribute name of "*" is equivalent of specifying all of the attributes. Any
466 attribute name explicitly appearing more than once in a URI shall have its second (and subsequent)
467 appearances ignored.

468 The CIMIExpand query parameter may appear more than once in a URI which is semantically equivalent
469 to all of the attribute names appearing as values of a single CIMIExpand query parameter. For example:

470 `?CIMIExpand=foo1&CIMIExpand=foo2`

471 is equivalent to:

472 `?CIMIExpand=foo1,foo2`

473 Example:

474 `GET /machines?CIMIExpand=machines`

475 Would result in something similar to this:

```
476 <MachineCollection xmlns="http://www.dmtf.org/cimi">
477   <machine href="http://example.com/machines/1234">
478     <self> http://example.com/machines/1234 </self>
479     <name> mine </name>
480     <state> STARTED </state>
481     ...
482   </machine>
483 </MachineCollection>
```

484 And in JSON it would be:

```
485 { "machines": [
486   { "href": "http://example.com/machines/1234",
487     "self": "http://example.com/machines/1234",
488     "name": "mine",
489     "state": "STARTED",
490     ...
491   }
492 }
```


493 4.1.7 Response Headers

494 This specification uses general-header, response-header, and entity-header headers as defined in HTTP
495 1.1 [RFC2616] in response messages to provide metadata about the message. Applications using
496 messages defined in this specification shall use headers consistent with HTTP 1.1.

497 In addition to headers defined in HTTP 1.1, response messages shall include a header defined by this
498 specification to indicate the version of the CIMI API that the server used to process the message.

499 `X-CIMI-Specification-Version = "X-CIMI-Specification-Version" ":" api-version`

500 See section 4.1.5 for more details on this header.

501 Additionally, if the server supports the Job entity then response messages shall include a header defined
502 by this specification to indicate the URI for the job created to process the associated request message.

503 `X-CIMI-Job-URI = "X-CIMI-Job-URI" ":" string`

504 In cases where an error occurs during the processing of a request, the Provider shall include a
505 representation of a Job entity describing the status of the failed operation. This shall be included even in
506 cases where the Provider does not normally support Job entities. This is done to ensure that Consumers
507 are provided with sufficient information, in a consistent manner, as to the reason for the failure regardless
508 of whether the Provider supports Jobs or not. When Jobs are not supported in general, any of the
509 references in the Job representation (e.g. "self" or the "href" for nestedJobs) shall be empty paths (i.e. "")
510 and the "nestedJobs" array shall be expanded (see 4.1.6.2) to inline the representation of the pseudo
511 subordinate Jobs

512 4.1.8 HTTP Status Codes

513 Server implementations will return standard HTTP response codes as described in the following table,
514 under the conditions listed in the description.

515 **Editors Note:** These are changes from the basic HTTP semantics that are overloaded for the whole
516 specification. We will remove any status codes that are standard HTTP without overloading.

517 **Table: HTTP Status Codes**

HTTP Status	Description
100 Continue	The client SHOULD continue with its request. This interim response is used to inform the client that the initial part of the request has been received and has not yet been rejected by the platform. The client SHOULD continue by sending the remainder of the request or, if the request has already been completed, ignore this response.
200 OK	The request was successfully completed. If this request created a new resource that is addressable with a URI, and a response body is returned containing a representation of the new resource, a 200 status will be returned with a Location header containing the canonical URI for the newly created resource
201 Created	A request that created a new resource was completed, and no response body containing a representation of the new resource is being returned. A Location header containing the canonical URI for the newly created resource will be returned. Per the HTTP/1.1 specification: <i>The origin server MUST create the resource before returning the 201 status</i>

	<i>code. If the action cannot be carried out immediately, the server SHOULD respond with 202 (Accepted) response instead.</i>
202 Accepted	<p>The request has been accepted for processing, but the processing has not been completed. Per the HTTP/1.1 specification, the returned entity (if any) SHOULD include an indication of the request's current status. A Location header containing the canonical URI for the not-yet completed resource would be returned along with the Status attribute indicating its progress.</p> <p>If a service implementing this specification supports the Job entity then it SHOULD return the representation of a Job entity in the HTTP body of the response and shall include a 'X-CIMI-Job-URI' HTTP header indicating the URI of the Job entity itself.</p> <p>Per the HTTP/1.1 specification:</p> <p><i>The entity returned with this response SHOULD include an indication of the request's current status and either a pointer to a status monitor or some estimate of when the user can expect the request to be fulfilled</i></p>
400 Bad Request	The request could not be processed because it contains missing or invalid information (such as validation error on an input field, a missing required value, and so on)
401 Unauthorized	The authentication credentials (TBD) included with this request are missing or invalid
403 Forbidden	The server recognized your credentials, but you do not possess authorization to perform this request
404 Not Found	The request specified a URI of a resource that does not exist
405 Method Not Allowed	The HTTP verb specified in the request (DELETE, GET, HEAD, POST, PUT) is not supported for this request URI. This is used in the create/update/delete of MachineConfiguration and MachineImages to indicate that the provider only supports a fixed set of immutable entities.
406 Not Acceptable	The resource identified by this request is not capable of generating a representation corresponding to one of the media types in the Accept header of the request
409 Conflict	A creation or update request could not be completed, because it would cause a conflict in the current state of the resources supported by the platform. This is used in MachineTemplate create/update to indicate that the MachineConfiguration cannot support the given MachineImage, for example.
410 Gone	The requested resource is no longer available at the server and no forwarding address is known. This condition is expected to be considered permanent. Clients with link editing capabilities SHOULD delete references to the Request-URI after user approval. If the server does not know, or has no facility to determine, whether or not the condition is permanent, the status code 404 (Not Found) SHOULD be used instead. This response is cacheable unless indicated otherwise
412 Precondition Failed	The precondition given in one or more of the request-header fields evaluated to false when it was tested on the server. This response code allows the client to place preconditions on the current resource meta-information (header field data) and thus prevent the requested method from being applied to a resource

	other than the one intended
500 Internal Server Error	The server encountered an unexpected condition which prevented it from fulfilling the request
501 Not Implemented	The server does not support the functionality required to fulfill the request
503 Service Unavailable	The server is currently unable to handle the request due to temporary overloading or maintenance of the server

518 4.1.9 Serialization of References

519 References, as indicated by the type 'ref' in the model, are defined to be URIs in the REST/HTTP protocol
520 mapping. In the JSON serialization they will appear as type "string" and in the XML serialization they will
521 appear as type "xs:anyURI".

522 References in both JSON and XML have an extensibility point that allows for additional information (such
523 as the target resource to be included "by value") if supported. For example, a reference to a Volume in
524 this specification will appear like this in JSON:

```
525     "volume": { "href": string }
```

526 and this in XML:

```
527     <volume href="xs:anyURI"/>
```

528 For convenience the JSON and XML, as shown above, excludes the implicit extensibility points that would
529 allow for the attributes of the target Volume to be included if desired. So, technically the above should be
530 written as:

```
531     "volume": { "href": string, ... }
```

532 and this in XML:

```
533     <volume href="xs:anyURI" > xs:any* </volume>
```

534 however, for brevity they are excluded.

535 4.1.10 Serialization of Arrays

536 Within this specification, arrays in JSON are serialized with a wrapper property. When serializing arrays,
537 conformant implementations SHALL NOT include empty arrays (i.e. arrays that contain no child
538 properties) in the JSON serialization. For example, an array of references to a list of Volumes attached to
539 a Machine is serialized as:

```
540     "volumes": [  
541         { "href": string, "attachmentPoint": string }, +  
542     ], ?
```

543 Notice that the child of the "volumes" property is defined with a "+", meaning at least one child is required.
544 This is done to ensure that the JSON serialization is minimized and only includes the wrapping "volumes"
545 element if, and only if, there are volumes.

546 4.2 Protocol Resource Operations

547 This section defines the set of common REST/HTTP operations that a Cloud Provider might expose. At its
548 core there are four basic CRUD (Create, Read, Update and Delete) operations. The manner in which
549 these are used is consistent across all resources within the model; therefore, their use is defined once
550 and is to be applied consistently. Some resources support specialized operations that do not fit well into a

551 CRUD style of operation and those will all follow a similar high-level pattern but each operation is allowed
552 to have slight variations to accommodate its specific needs. The specifics of these special operations are
553 detailed within the section that defines the resource.

554 When appropriate some of the resource representations will include "operation" properties. These either
555 provide URI references that can be used to perform operations on the resource, or they are URI
556 references to other resources that are related to the current resource. Providers shall only include
557 "operation" properties when the specified operation or related resource is accessible to the current client
558 for that particular resource. This means that based on many factors (e.g. authorization rights of the
559 clients, current state of the resource, etc.) a different set of "operation" properties might be returned on
560 each serialization of the resource.

561 4.2.1 Operational Principles

562 4.2.1.1 Resource Navigation

563 The retrieval of the representation of a Resource using (GET <ResourceURI>) shall return the attributes
564 of the resource; these attributes might include a set of references to related resources. In that case, it is
565 possible to obtain every related resource by repeatedly applying the GET method on the retrieved
566 references.

567 Example:

568 If a resourceX contains an attribute "attrA" of string type and an attribute "attrB", where the latter
569 references resourceY, the operation:

```
570 GET <ResourceURI_X> HTTP/1.1  
571 Host: ...  
572 Accept: application/CIMI-...  
573 X-CIMI-Specification-Version: 1.0
```

574 returns a message containing the following:

575 **JSON serialization:**

```
576 { "attrA": : "hello",  
577   "attrB": { "href": "http://example.com/uriB" }  
578 }
```

579 **XML serialization:**

```
580 <Resource_X xmlns="http://www.dmtf.org/cimi">  
581   <attrA> hello </attrA>  
582   <attrB href="http://example.com/uriB" />  
583 </Resource_X>
```

584 Following the attrB uri ("uriB"), the operation:

```
585 GET <uriB> HTTP/1.1  
586 Host: ...  
587 Accept: application/CIMI-...  
588 X-CIMI-Specification-Version: 1.0
```

589 returns a message containing the following:

590 **JSON serialization:**

```
591 { "attrY": : "bye" }
```

592 **XML serialization:**

```
593 <Resource_Y xmlns="http://www.dmtf.org/cimi">
594   <attrY> bye </attrY>
595 </Resource_Y>
```

596 **Notes:**

- 597 1) It is possible that the retrived reference obtained with the GET <ResourceURI> operation
 598 does not directly refer to a related resorce, but to a list of homogeneous related
 599 resources. In such case, the result of the GET operation will be a list of URIs, and thus
 600 the result of a further GET on one of such URIs will return the related resource.
- 601 2) this makes it possible to navigate the CIMI resource hierachy with just the knowledge of
 602 the root URI of the Cloud Provider.

603 **4.2.1.2 Operations on a Resource**

604 When it is possible to execute specific operations on the resource, then the response to the GET method
 605 on the resource uri shall contain information to perform such operations, in particular:

- 606 1. The operation name (typology) such as add, delete, edit, start, stop are described using the rel
 607 attribute in the "operation" element.
- 608 2. The URI to perform the above mentioned operation.

609 It is possible to understand that such a field isn't a link to a related resource but instead is an operation by
 610 the presence of the attribute "operations" in JSON or the element "operation" in XML.

611 The operation shall be performed by invoking the REST specific function on the specified URI.

612 **Example:**

613 If for the resource X an operation is provided to edit that resource, the Get <ResourceURI> response
 614 message will contain the following:

615 **JSON serialization:**

```
616 { "operations": [
617   { "rel": "edit", "href": "editURI" }
618 ]
619 }
```

620 **XML serialization:**

```
621 <Resource_X xmlns="http://www.dmtf.org/cimi">
622   <operation rel="edit" href="editURI"/>
623 </Resource_X>
```

624 In this example the operation will be performed with the HTTP PUT on editURI, as follows:

```
625 PUT <editURI> HTTP/1.1
626 Host: ...
627 Accept: application/CIMI-...
628 Content-Type: application/CIMI-...
629 X-CIMI-Specification-Version: 1.0
630
631 <serialization of request to update the resource>
```

632 4.2.2 Common CRUD (Create Read Update and Delete) Operations

633 Each of the resources supported by this protocol will adhere to the interaction patterns defined in the
634 following sections. Section 5 then defines resource specific information such as the serialization of each
635 resource's properties and which specific actions are supported.

636 4.2.2.1 Creating a new Resource

637 To create a new instance of a resource type, an HTTP POST request is sent to a designated "addURI" for
638 that resource type. In many cases, the Collection resource that maintains, or groups, all instances of that
639 resource type will contain an "addLink" property which contains the "addURI" that is to be used.

640 The request will be of the following form:

```
641 POST <addURI> HTTP/1.1
642 Host: ...
643 Accept: application/CIMI-...
644 Content-Type: application/CIMI-...
645 X-CIMI-Specification-Version: 1.0
646
647 <serialization of request to create a new resource>
```

648 The following provides additional constraints on the request message:

649 **X-CIMI-Specification-Version**

650 This optional HTTP header specifies the list of versions of this specification that the server shall
651 choose from to process this message.

652 During the process of creating the resource, depending on the resource type, the Provider may set the
653 state of the new resource to a value of "CREATING".

654 The response will be of the following form:

```
655 HTTP/1.1 201 Created
656 Location: ...
657 Content-Type: application/CIMI-...
658 X-CIMI-Specification-Version: 1.0
659
660 <serialization of new resource>
```

661 The following provides additional constraints on the response message:

662 **X-CIMI-Specification-Version**

663 This REQUIRED HTTP header specifies the version of this specification that was used to process this
664 message.

665 The HTTP response will also include a status code, as described in the following table:

HTTP Status	Description
201 Created	The new resource was created
202 Accepted	The resource is in the process of being created. Investigate Job to determine the current status of the operation.
400 Bad Request	Invalid parameter or field names in the request.
401 Unauthenticated	Incorrect or missing authentication credentials.
403 Unauthorized	Client lacks the proper authorization to perform this request.

666 4.2.2.2 Reading a Resource

667 To retrieve the representation of resource, an HTTP GET request is sent to the URI of that resource.

668 The request will be of the following form:

```
669 GET <ResourceURI> HTTP/1.1
670 Host: ...
671 Accept: application/CIMI-...
672 X-CIMI-Specification-Version: 1.0
```

673 The following provides additional constraints on the request message:

674 **X-CIMI-Specification-Version**

675 This optional HTTP header specifies the list of versions of this specification that the server shall
676 choose from to process this message.

677 The response will be of the following form:

```
678 HTTP/1.1 200 OK
679 Content-Type: application/CIMI-...
680 X-CIMI-Specification-Version: 1.0
681
682 <serialization of resource>
```

683 The following provides additional constraints on the response message:

684 **X-CIMI-Specification-Version**

685 This REQUIRED HTTP header specifies the version of this specification that was used to process this
686 message.

687 The HTTP response will also include a status code, as described in the following table:

HTTP Status	Description
401 Unauthenticated	Incorrect or missing authentication credentials.
403 Unauthorized	Client lacks the proper authorization to perform this request.

688 4.2.2.3 Updating a Resource

689 To update the representation of a resource, an HTTP PUT request is sent to a designated "editURI" for
690 that resource type. In many cases, this "editURI" will be the same as the URI of resource itself - retrieving
691 the resource representation MUST include an "editLink" property, which contains the "editURI" that is to
692 be used, if the requester is allowed to modify the resource.

693 While processing a PUT request if the server detects that an attempt is being made to update a read-
694 only, or immutable, attribute then it SHALL silently ignore that attribute update request and SHALL NOT
695 generate an error. This applies to resource partial updates as well.

696 Due to potential conflicts that might occur due to multiple concurrent updates, Consumers should use the
697 partial update mechanism, defined in 4.2.2.3.1, to reduce the chances of mistakenly updating attributes
698 with out-of-date data.

699 The request will be of the following form:

```
700 PUT <editURI> HTTP/1.1
701 Host: ...
702 Accept: application/CIMI-...
703 Content-Type: application/CIMI-...
704 X-CIMI-Specification-Version: 1.0
705
```

706 `<serialization of request to update a resource>`

707 The following provides additional constraints on the request message:

708 **X-CIMI-Specification-Version**

709 This optional HTTP header specifies the list of versions of this specification that the server shall
710 choose from to process this message.

711 The response will be of the following form:

```
712 HTTP/1.1 200 OK
713 Content-Type: application/CIMI-...
714 X-CIMI-Specification-Version: 1.0
715
716 <serialization of updated resource>
```

717 The following provides additional constraints on the response message:

718 **X-CIMI-Specification-Version**

719 This REQUIRED HTTP header specifies the version of this specification that was used to process this
720 message.

721 The HTTP response message body shall include the updated version of the resource representation.

722 The HTTP response will also include a status code, as described in the following table:

HTTP Status	Description
202 Accepted	The resource is in the process of being created. Investigate Job to determine the current status of the operation.
400 Bad Request	Invalid parameter or field names in the request.
401 Unauthenticated	Incorrect or missing authentication credentials.
403 Unauthorized	Client lacks the proper authorization to perform this request.

723 **4.2.2.3.1 Partial Updates to a Resource**

724 To update only certain top-level attributes of a resource a consumer MAY do so by including only the
725 changes attributes in the representation of the resource within the HTTP request body. When this is done
726 the URI to the resource SHALL include the attributes to be modified as a comma separated list of query
727 parameters - in other words the URI will be of the form:

728 `http://example.com/resource?CIMISelect=attribute1,attribute2,...`

729 Only the attributes listed in the URI's query parameters will be modified; attributes not listed in the URI are
730 not directly modified by the request. Note that this does not preclude the modification of one attribute
731 causing side-effects that result in the modification of an attribute not listed in the query parameters.

732 Any attribute listed in the URI but not included within the HTTP request body are reset to a resource
733 specific value (e.g. removed).

734 From an HTTP perspective, the updated subsetting resource is a distinct one; the semantics of a normal
735 HTTP PUT are adhered to - it is a complete replacement update of the specified resource. From the
736 Consumer's perspective, the partial update is interpreted and executed by the Cloud Service Provider,
737 and some part of the resource is/are changed.

738 For example, the following request will update just the name and description attributes of a Machine:

```

739 PUT /machines/myMachine?CIMISelect=name,description HTTP/1.1
740 Host: ...
741 Accept: application/CIMI-Machine
742 Content-Type: application/CIMI-Machine
743 X-CIMI-Specification-Version: 1.0
744
745 <Machine>
746   <name>My New Machine</name>
747 </Machine>

```

748 In this example, the "name" attribute is set to "My New Machine" and the "description" attribute is erased.

749 4.2.2.4 Deleting a Resource

750 To delete a resource, an HTTP DELETE request is sent to a designated "deleteURI" for that resource
751 type. In many cases, this "deleteURI" will be the same as the URI of resource itself - retrieving the
752 resource representation MUST include a "deleteLink" property, which contains the "deleteURI" that is to
753 be used, if the requester is allowed to delete the resource.

754 The request will be of the following form:

```

755 DELETE <deleteURI> HTTP/1.1
756 Host: ...
757 X-CIMI-Specification-Version: 1.0

```

758 The following provides additional constraints on the request message:

759 X-CIMI-Specification-Version

760 This optional HTTP header specifies the list of versions of this specification that the server shall
761 choose from to process this message.

762 During the process of deleting the resource, depending on the resource type, the Provider may set the
763 state of the new resource to a value of "DELETING".

764 The response will be of the following form:

```

765 HTTP/1.1 200 OK
766 X-CIMI-Specification-Version: 1.0

```

767 The following provides additional constraints on the response message:

768 X-CIMI-Specification-Version

769 This REQUIRED HTTP header specifies the version of this specification that was used to process this
770 message.

771 The HTTP response will also include a status code, as described in the following table:

HTTP Status	Description
202 Accepted	The resource is in the process of being created. Investigate Job to determine the current status of the operation.
400 Bad Request	Invalid parameter or field names in the request.
401 Unauthenticated	Incorrect or missing authentication credentials.
403 Unauthorized	Client lacks the proper authorization to perform this request.

772 4.2.2.5 Other Operations

773 While some modifications to the resources in the model can be done via a simple update (PUT) operation
774 to the resource's "editURI", sometimes a more complex set of actions need to be taken. In these cases,
775 the operations will be modeled as HTTP POSTs to the operation specific "Link" property/URI of the
776 resource.

777 For each of the resources that define additional operations, a description of the HTTP request and
778 response bodies will be provided. However, the general HTTP interaction will be as described below.

779 The request will be of the following form:

```
780 POST <operationLinkURI> HTTP/1.1  
781 Host: ...  
782 Accept: application/CIMI-...  
783 Content-Type: application/CIMI-...  
784 X-CIMI-Specification-Version: 1.0  
785  
786 <serialization of request to perform some action>
```

787 The following provides additional constraints on the request message:

788 X-CIMI-Specification-Version

789 This optional HTTP header specifies the list of versions of this specification that the server shall
790 choose from to process this message.

791 The form of the response will vary depending on the operation and will be defined by the operation itself.

792 Note that the definition of the "Create" operation (see section 4.2.2.1) follows this same pattern - it is just
793 called out for ease of reference.

794 4.2.2.6 Synchronous Operations

795 If a Provider supports the Job entity then each incoming PUT, DELETE, POST request SHALL result in a
796 Job entity being created and a reference to that Job entity SHALL be returned back to the client via the X-
797 CIMI-Job-URI HTTP Header in the HTTP response message:

```
798 X-CIMI-Job-URI: <uri-to-Job>
```

799 In this case, the requested operation shall be complete and the Job URI SHALL point to a completed Job.
800 If the Job is not complete, then the server SHALL return a 202 and follow the instructions for
801 Asynchronous Operations.

802 4.2.2.7 Asynchronous Operations

803 In some cases, an operation requested by the client may take an undetermined amount of time to
804 complete. For example, creating a new Machine or starting an existing Machine, may take a relatively
805 long time to complete. In these cases, it is not practical to complete these operations within a reasonable
806 HTTP request timeout interval. For these cases, the Provider SHALL return an HTTP "202 Accepted"
807 response code.

808 As with synchronous operations, if a Provider supports the Job entity then it SHALL create a Job entity for
809 the incoming request and return a reference to that Job entity back to the client via the X-CIMI-Job-URI
810 HTTP Header in the HTTP response message. Additionally, in the case of a "202 Accepted" response
811 code and a Job URI being returned, the Provider MAY also return a representation of the Job entity in the
812 body of the HTTP response message. If the request did not include the Job MIME type in the HTTP
813 Accept header, then the encoding style (json vs xml) of the response SHOULD match the encoding style
814 of the request message.

815 Note that the decision as to whether any particular operation will be synchronous or asynchronous is at
816 the server's discretion.

817 **5 Model**

818 This model assumes that a business relationship has already been established between the Cloud
819 Consumer and the Cloud Provider. This relationship may include financial terms, creating separately
820 administered clouds that the consuming organization is paying for, and the establishment of
821 authentication credentials to access the administrative entry point for each cloud. This scope of this
822 model is one separately administered cloud.

823 **5.1 Extensibility**

824 There are three types of extensibility mechanisms defined by the CIMI model. The first allows for a CIMI
825 consumer to add additional data to a resource. Each resource in the CIMI model has an attribute called
826 "properties". Consumers, when creating or updating a resource, may store any name/value pair in the
827 "properties" attribute. CIMI providers shall store and return these values to the consumer. There is no
828 obligation for the provider to understand or take any action based on these values - they are there for the
829 consumer's convenience. Providers shall not add elements to this "properties" attribute.

830 The second type of extensibility mechanism allows for provider defined extensions. Providers may extend
831 the CIMI model by defining new attributes for any of the CIMI resources. It is recommended that providers
832 use the EntityMetadata resource to advertise these new attributes along with any constraints that might
833 need to be understood by consumers.

834 Finally, providers may also choose to extend the CIMI model by defining new resource types. As with new
835 attributes, it is recommended that providers use EntityMetadata to advertise the presence of these new
836 resources along with any constraints.

837 **5.2 Identifiers**

838 All identifiers (e.g. entity names, attributes, operations, parameter names) defined by this specification, or
839 defined via an extension, shall adhere to the following:

- 840 • Identifier names shall be treated as case sensitive
- 841 • Identifier names shall only use the following set of characters:
 - 842 ○ Upper case ASCII (U+0041 through U+005A)
 - 843 ○ Lower case ASCII (U+0061 through U+007A)
 - 844 ○ Digits (U+0030 through U+0039)
 - 845 ○ Underscore (U+005F)

846 **5.3 Attribute "Properties"**

847 Each attribute of the entities in the CIMI model is augmented by a set of "Properties" that further qualify
848 the attribute being defined. The following describes the possible "Properties".

849 **Optionality:**

850 The entity definition tables contain an indicator as to whether the specified attribute (and its
851 corresponding feature) is required to be supported by Cloud providers. Possible values are:

- 852 • Optional - indicates that the specified attribute/feature may be supported

- 853 • Mandatory - indicates that the specified attribute/feature shall be supported
- 854 • Conditional - indicates the specified attribute/feature is mandatory if the condition is satisfied. The
- 855 condition will be described in the description cell. If the condition is not met, the attribute is
- 856 optional.

857 **Mutability:**

858 Attributes are either “Immutable” (their values are fixed for the lifetime of the entity), or “Mutable” (their

859 values may change over the lifetime of the entity). Unless otherwise noted, all attributes are mutable.

860 **Writability:**

861 Mutable attributes are either “Writeable” (their value may be changed by the Consumer) or “Read-Only”

862 (their value may only be changed by the Provider). Unless otherwise noted, all mutable attributes are

863 writeable.

864 **5.4 Data Types and Values**

865 Unless specifically asked to not include certain attributes in the resource representation, the absence of

866 an attribute in the representation means that the attribute has no value (i.e. is undefined); meaning there

867 is no notion of an attribute having an implied value. Note that a client can not distinguish (from just looking

868 at the returned representation) whether a particular attribute is not supported from one that does not exist.

869 Likewise, an absent attribute from a resource representation as the input to an update operation means

870 that the Consumer is requesting that the Provider remove that attribute.

871 The following describes the data types and values that are used within the model definition tables.

872 **URIs:**

873 Note that the format and syntax of the attributes of type “URI” is defined by RFC 3986 [[RFC3986](#)] with the

874 following, additional constraints: Relative URIs MUST start with a “/”, otherwise the URI is assumed to be

875 absolute and no URI processing (to determine the full path) will be performed. Relative URIs are

876 interpreted as being relative to the root URI of the CloudEntryPoint.

877 **Units:**

878 Some of the entities defined by this specification have attributes that describe an amount of something

879 that belongs to, or is associated with that entity. For example, the `Machine` entity has a `memory` attribute

880 which describes “the size of the memory allocated to this machine”. This specification adopts the

881 convention of representing such attributes via a duple consisting of a `quantity` (represented as an

882 integer) and `units` (represented as a string). The allowable values for `units` are listed in the following

883 table. Their meaning is defined in IEC 80000-13:2008 [[IEC 80000-13:2008](#)]. Their numerical equivalents

884 are provided here for convenience:

String	Numerical Value	String	Numerical Value
kilobyte	10 ³	kibibyte	2 ¹⁰
megabyte	10 ⁶	mebibyte	2 ²⁰
gigabyte	10 ⁹	gibibyte	2 ³⁰
terabyte	10 ¹²	tebibyte	2 ⁴⁰
petabyte	10 ¹⁵	pebibyte	2 ⁵⁰
exabyte	10 ¹⁸	exbibyte	2 ⁶⁰

zettabyte	10 ²¹	zebibyte	2 ⁷⁰
yottabyte	10 ²⁴	yobibyte	2 ⁸⁰

885 5.5 Relationship Semantics

886 A reference between two entity instances has the semantics of a simple “association”. In particular,
 887 unless specified otherwise, (a) the same referred instance can be referred by other entity instances, i.e.
 888 be “shared”, and (b) the referred entity instance is not affected when deleting the referring entity instance
 889 (i.e. the Delete operation is a “shallow delete” by default).

890 The embedding of a sub-entity inside another entity, has the semantics of a “composition” (or whole-part
 891 relationship in UML). In particular, unless specified otherwise: (a) an embedded sub-entity cannot be
 892 shared by several entity instances, (b) when deleting an embedding entity instance, the embedded sub-
 893 entity instances are also deleted.

894 5.6 Alternative Model Formats

895 Since it is expected that this specification will be implemented using a variety of technologies, as a
 896 convenience, the definition of the model elements are provided in alternative formats that are easily
 897 consumable by technology-specific tooling.

898 This model is available in a CIM/MOF format [CIMI-CIM] as well as a RelaxNG format [CIMI-RNG].

899 *Note: the CIMI-RNG document is not yet available.*

900 In the event of inconsistencies between the various formats, the normative text within this specification
 901 takes precedence over the XML Schemas and alternative formats, which in turn take precedence over
 902 examples.

903 5.7 Entities

904 The following sections detail the attributes of the entities defined by the CIMI model.

905 5.7.1 Common Attributes

906 The entities described by this document share the following, common attributes.

Attribute	Type	Description
self	ref	The unique self-reference to this entity; assigned upon entity creation. This attribute value shall be unique in the provider’s cloud. Properties: Mandatory / Immutable
name	string	The human readable name of this entity; assigned by the creator as a part of the entity creation input. Properties: Optional / Mutable
description	string	The human readable description of this entity; assigned by the creator as a part of the entity creation input. Properties: Optional / Mutable

created	DateTimeUTC	The timestamp when this entity was created. The format should be unambiguous, and the value is immutable . Properties: Optional / Immutable
properties	map	A list of key/value pairs, some of which may control one or more aspects this entity. Properties may also serve as an extension point, allowing consumers to record additional information about the resource. The same "key" SHALL NOT be used more than once within a "properties" attribute. Properties: Optional / Mutable

907 5.8 Entity Metadata

908 Implementations of this specification SHOULD allow for Consumers to discover the metadata associated
 909 with each supported entity. Doing so allows for the discovery of Provider defined constraints on the CIMI
 910 defined attributes as well as discovery of any new extension attributes that the Provider may have
 911 defined. The mechanism by which this metadata is made available will be protocol specific.

912 Each entity's metadata will contain the following pieces of information:

Name	EntityMetadata										
Type URI	http://www.dmtf.org/cimi/EntityMetadata										
Attribute	Type	Description									
self	ref	The unique self-reference to this entity; assigned upon entity creation. This attribute value is immutable , and shall be unique in the provider's cloud. Properties: Mandatory / Mutable									
typeURI	URI	A unique URI associated with, and denoting, this entity type. Properties: Mandatory / Mutable									
name	string	The name of the entity type. Properties: Mandatory / Mutable									
attributes	attribute[]	A set of Provider defined metadata that can be used by clients to discover any metadata associated with each attribute, as well we the set of extension attributes. Each attribute will contain the following nested data: <table border="1"> <tr> <td>Name</td> <td colspan="2">attribute</td> </tr> <tr> <td>Data</td> <td>Type</td> <td>Description</td> </tr> <tr> <td>name</td> <td>string</td> <td>The name of the attribute. Properties: Mandatory / Mutable</td> </tr> </table>	Name	attribute		Data	Type	Description	name	string	The name of the attribute. Properties: Mandatory / Mutable
Name	attribute										
Data	Type	Description									
name	string	The name of the attribute. Properties: Mandatory / Mutable									

		<table border="1"> <tr> <td>namespace</td> <td>URI</td> <td> <p>The namespace in which this attribute is defined. It is recommended that a dereference of this URI returns information about the attribute. This SHALL not be present when describing a CIMI defined attribute, but SHALL be present when describing a non-CIMI defined attribute.</p> <p>Properties: Mandatory / Mutable</p> </td> </tr> <tr> <td>type</td> <td>string</td> <td> <p>The data type of the attribute. This SHALL not be present when describing a CIMI defined attribute, but SHALL be present when describing a non-CIMI defined attribute.</p> <p>Properties: Mandatory / Mutable</p> </td> </tr> <tr> <td>required</td> <td>boolean</td> <td> <p>Indicates whether this entity requires this attribute to be present. When absent the implied value is "false".</p> <p>Properties: Mandatory / Mutable</p> </td> </tr> <tr> <td>constraints</td> <td>abstract</td> <td> <p>Type specific data that describes the constraints of this attribute. When absent there are no constraints.</p> <p>Properties: Mandatory / Mutable</p> </td> </tr> </table> <p>Properties: Optional / Mutable</p>	namespace	URI	<p>The namespace in which this attribute is defined. It is recommended that a dereference of this URI returns information about the attribute. This SHALL not be present when describing a CIMI defined attribute, but SHALL be present when describing a non-CIMI defined attribute.</p> <p>Properties: Mandatory / Mutable</p>	type	string	<p>The data type of the attribute. This SHALL not be present when describing a CIMI defined attribute, but SHALL be present when describing a non-CIMI defined attribute.</p> <p>Properties: Mandatory / Mutable</p>	required	boolean	<p>Indicates whether this entity requires this attribute to be present. When absent the implied value is "false".</p> <p>Properties: Mandatory / Mutable</p>	constraints	abstract	<p>Type specific data that describes the constraints of this attribute. When absent there are no constraints.</p> <p>Properties: Mandatory / Mutable</p>						
namespace	URI	<p>The namespace in which this attribute is defined. It is recommended that a dereference of this URI returns information about the attribute. This SHALL not be present when describing a CIMI defined attribute, but SHALL be present when describing a non-CIMI defined attribute.</p> <p>Properties: Mandatory / Mutable</p>																		
type	string	<p>The data type of the attribute. This SHALL not be present when describing a CIMI defined attribute, but SHALL be present when describing a non-CIMI defined attribute.</p> <p>Properties: Mandatory / Mutable</p>																		
required	boolean	<p>Indicates whether this entity requires this attribute to be present. When absent the implied value is "false".</p> <p>Properties: Mandatory / Mutable</p>																		
constraints	abstract	<p>Type specific data that describes the constraints of this attribute. When absent there are no constraints.</p> <p>Properties: Mandatory / Mutable</p>																		
operations	operation[]	<p>A set of Provider defined operations that can be used by clients to act on the entity.</p> <p>Each operation will contain the following nested data:</p> <table border="1"> <thead> <tr> <th>Name</th> <td colspan="2">operation</td> </tr> <tr> <th>Data</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>name</td> <td>string</td> <td> <p>The name of the operation.</p> <p>Properties: Mandatory / Mutable</p> </td> </tr> <tr> <td>uri</td> <td>URI</td> <td> <p>A URI that uniquely identifies the operation at a global level.</p> <p>Properties: Mandatory / Mutable</p> </td> </tr> <tr> <td>description</td> <td>string</td> <td> <p>The human readable description of the semantic of the operation.</p> <p>Properties: Mandatory / Mutable</p> </td> </tr> <tr> <td>method</td> <td>string</td> <td> <p>The method to use to perform the operation.</p> </td> </tr> </tbody> </table>	Name	operation		Data	Type	Description	name	string	<p>The name of the operation.</p> <p>Properties: Mandatory / Mutable</p>	uri	URI	<p>A URI that uniquely identifies the operation at a global level.</p> <p>Properties: Mandatory / Mutable</p>	description	string	<p>The human readable description of the semantic of the operation.</p> <p>Properties: Mandatory / Mutable</p>	method	string	<p>The method to use to perform the operation.</p>
Name	operation																			
Data	Type	Description																		
name	string	<p>The name of the operation.</p> <p>Properties: Mandatory / Mutable</p>																		
uri	URI	<p>A URI that uniquely identifies the operation at a global level.</p> <p>Properties: Mandatory / Mutable</p>																		
description	string	<p>The human readable description of the semantic of the operation.</p> <p>Properties: Mandatory / Mutable</p>																		
method	string	<p>The method to use to perform the operation.</p>																		

				Properties: Mandatory / Mutable
		inputMessage	string	The body mimeType of the request message, it may depend on the model format chosen by the provider. Properties: Mandatory / Mutable
		outputMessage	string	The body mimeType of the response message, it may depend on the model format chosen by the provider. Properties: Mandatory / Mutable
		Properties: Optional / Mutable		

913 The following describes the serialization of the entity in both JSON and XML:

914 **JSON media type:** application/CIMI-EntityMetadata+json

915 **JSON serialization:**

```

916 { "self": string,
917   "typeURI": URI,
918   "name": string,
919   "attributes" : [
920     { "name": string,
921       "namespace": string, ?
922       "type": string, ?
923       "required": boolean, ?
924       ...constraints...? } *
925   ], ?
926   "operations" : [
927     { "name": string
928       "description": string, ?
929       "method": string,
930       "inputMessage": string, ?
931       "outputMessage": string ? }, *
932   ] ?
933   ...
934 }
```

935 **XML media type:** application/CIMI-EntityMetadata+xml

936 **XML serialization:**

```

937 <EntityMetadata xmlns="http://www.dmtf.org/cimi">
938   <self> xs:anyURI </self>
939   <name> xs:string </name>
940   <typeURI> xs:anyURI </typeURI>
941   <attribute name="xs:string" namespace="xs:anyURI"? type="xs:string"
942     required="xs:boolean"? >
943     ...constraints...?
944   </attribute> *
945   <operation name="xs:string" description="xs:string"? method="xs:string"
946     inputMessage="xs:string"? outputMessage="xs:string"? /> *
947   <xs:any>*
948 </EntityMetadata>
```

949 Additional metadata about the entity or attributes MAY be included by the Provider.

950 5.8.1 Attribute Types

951 The following describes the constraint metadata corresponding to the attribute's "type" value.

952 **type="string"**

953 The JSON SHALL be of the form:

```
954 "values": [ string, + ] ?
```

955 The XML SHALL be of the form:

```
956 <value> xs:string </value> *
```

957 **type="integer"**

958 The JSON SHALL be of the form:

```
959 "values": [ integer, + ], ?
960 "ranges": [ { "low": integer, "high": integer }, + ] ?
```

961 The XML SHALL be of the form:

```
962 <value> xs:integer </value> *
963 <range low="xs:integer" high="xs:integer"/> *
```

964 The total value space of an 'integer' attribute is the accumulation of all values and ranges.

965 **type="boolean"**

966 The JSON SHALL be of the form:

```
967 "value": boolean ?
```

968 The XML SHALL be of the form:

```
969 <value> xs:boolean </value> ?
```

970 Only one 'value' is permitted which indicates whether the attribute is required to be either 'true' or 'false'.

971 5.8.2 Examples

972 The following shows a sample metadata document for a VolumeConfiguration entity in XML that as been
973 extended with a "Location" string attribute:

```
974 <EntityMetadata xmlns="http://www.dmtf.org/cimi">
975   <self> http://example.org/types/VC </self>
976   <typeURI> http://www.dmtf.org/cimi/VolumeConfiguration </typeURI>
977   <name> VolumeConfiguration </name>
978   <attribute name="Location" namespace="http://example.org/" type="string"/>
979 </EntityMetadata>
```

980 The following shows the same VolumeConfiguration but the "Location" attribute is restricted to a set of
981 values and is required:

```
982 <EntityMetadata xmlns="http://www.dmtf.org/cimi">
983   <self> http://example.org/types/VC </self>
984   <typeURI> http://www.dmtf.org/cimi/VolumeConfiguration </typeURI>
985   <name> VolumeConfiguration </name>
986   <attribute name="Location" namespace="http://example.org/" type="string"
987     required="true">
988     <value> NYC </value>
989     <value> LAX </value>
```



```

990     </attribute>
991 </EntityMetadata>

```

992 The following shows the same VolumeConfiguration serialized in JSON:

```

993 { "self": "http://example.org/types/VC",
994   "typeURI": "http://www.dmtf.org/cimi/VolumeConfiguration",
995   "name": "VolumeConfiguration",
996   "attributes": [
997     { "name": "Location",
998       "namespace": "http://example.org",
999       "type": "string",
1000       "required": true,
1001       "values": [ "NYC", "LAX" ]
1002     }
1003   ]
1004 }

```

1005 The following shows a Volume serialized in JSON which provides an operation of data compression. In this
1006 specific example the method returned (POST) is for the CIMI REST protocol; should another protocol be
1007 implemented (e.g SOAP) the "method" will be different :

```

1008 { "uri": "http://example.org/types/V",
1009   "typeURI": "http://www.dmtf.org/cimi/Volume",
1010   "name": "Volume",
1011   "operations": [
1012     {
1013       "name": "compress",
1014       "uri": "http://example.org/cimi/action/compress"
1015       "description": "Compress the data stored in the volume",
1016       "method": "POST"
1017     }
1018   ]
1019 }

```

1020 5.9 Cloud Entry Point

1021 The Cloud Entry Point represents the entry point into the cloud defined by the CIMI Model. The Cloud
1022 Entry Point implements a catalog of entities such as Systems, System Templates, Machines, Machine
1023 Templates, etc. that can be queried and browsed by the Consumer.

Name	CloudEntryPoint	
Type URI	http://www.dmf.org/cimi/CloudEntryPoint	
Attribute	Type	Description
systemTemplates	ref	A reference to the System Template Collection of this CloudEntry Point. Properties: Optional / Mutable
systems	ref	A reference to the System Collection of this Cloud Entry Point. Properties: Optional / Mutable
machineTemplates	ref	A reference to the Machine Template Collection of this Cloud Entry Point. Properties: Optional / Mutable

machineConfigs	ref	A reference to the Machine Configuration Collection of this Cloud Entry Point. Properties: Optional / Mutable
machineImages	ref	A reference to the Machine Image Collection of this Cloud Entry Point. Properties: Optional / Mutable
machineAdminTemplates	ref	A reference to the Machine Admin Template Collection of this Cloud Entry Point. Properties: Optional / Mutable
machineAdmins	ref	A reference to the Machine Admin Collection of this Cloud Entry Point. Properties: Optional / Mutable
machines	ref	A reference to the Machine Collection of this Cloud Entry Point. Properties: Optional / Mutable
volumeTemplates	ref	A reference to the Volume Template Collection of this Cloud Entry Point. Properties: Optional / Mutable
volumeConfigs	ref	A reference to the Volume Configuration Collection of this Cloud Entry Point. Properties: Optional / Mutable
volumeImages	ref	A reference to the Volume Image Collection of this Cloud Entry Point. Properties: Optional / Mutable
volumes	ref	A reference to the Volume Collection of this Cloud Entry Point. Properties: Optional / Mutable
networkTemplates	ref	A reference to the Network Template Collection of this Cloud Entry Point. Properties: Optional / Mutable
networkConfigs	ref	A reference to the Network Configuration Collection of this Cloud Entry Point. Properties: Optional / Mutable
networks	ref	A reference to the Network Collection of this Cloud Entry Point. Properties: Optional / Mutable
vspTemplates	ref	A reference to the VSP Template Collection of this Cloud Entry Point. Properties: Optional / Mutable
vspConfigs	ref	A reference to the VSP Configuration Collection of this Cloud Entry

		Point. Properties: Optional / Mutable
vsp	ref	A reference to the VSP Collection of this Cloud Entry Point. Properties: Optional / Mutable
routingGroupTemplates	ref	A reference to the Routing Group Template Collection of this Cloud Entry Point. Properties: Optional / Mutable
routingGroups	ref	A reference to the Routing Group Collection of this Cloud Entry Point. Properties: Optional / Mutable
meterTemplates	ref	A reference to the Meter Template Collection of this Cloud Entry Point. Properties: Optional / Mutable
meters	ref	A reference to the Meter Collection of this Cloud Entry Point. Properties: Optional / Mutable
eventLogs	ref	A reference to the Event Log Collection of this Cloud Entry Point. Properties: Optional / Mutable
events	ref	A reference to the Event Collection of this Cloud Entry Point Properties: Optional / Mutable
jobTime	long	This value is Provider specific and is the minimum amount of time a Job will be retained by the system after the completion of the Job. Properties: Optional / Mutable
entityMetadata	ref[]	List of references to EntityMetadata entities supported by the Provider. If an entity does not have any metadata then it will not appear in this list - e.g. it has no constraints beyond what the CIMI specification defines nor does it have any extension attributes. Properties: Optional / Mutable

1024 The following describes the serialization of the entity in both JSON and XML:

1025 **JSON media type:** application/CIMI-CloudEntryPoint+json

1026 **JSON serialization:**

```

1027 { "self": string,
1028   "name": string, ?
1029   "description": string, ?
1030   "created": string, ?
1031   "properties": { "key": string, + }, ?
1032   "systemTemplates": { "href": string }, ?
1033   "systems": { "href": string }, ?
1034   "machineTemplates": { "href": string }, ?
1035   "machineConfigs": { "href": string }, ?

```

```

1036 "machineImages": { "href": string }, ?
1037 "machineAdminTemplates": { "href" string }, ?
1038 "machineAdmins": { "href" string }, ?
1039 "machines": { "href": string }, ?
1040 "volumeTemplates": { "href": string }, ?
1041 "volumeConfigs": { "href": string }, ?
1042 "volumeImages": { "href": string }, ?
1043 "volumes": { "href": string }, ?
1044 "networkTemplates": { "href": string }, ?
1045 "networkConfigs": { "href": string }, ?
1046 "networks": { "href": string }, ?
1047 "vspTemplates": { "href": string }, ?
1048 "vspConfigs": { "href": string }, ?
1049 "vsps": { "href": string }, ?
1050 "routingGroups" { "href": string }, ?
1051 "routingGroupTemplates" { "href": string }, ?
1052 "meterTemplates": { "href": string }, ?
1053 "meters": { "href": string }, ?
1054 "eventLogs": { "href": string }, ?
1055 "events": { "href": string }, ?
1056 "job_time": number, ?
1057 "entityMetadata": [
1058     { "href": string }, +
1059 ], ?
1060 "operations": [
1061     { "rel": "edit", "href": string }, ?
1062 ] ?
1063 ...
1064 }

```

1065 **XML media type:** application/CIMI-CloudEntryPoint+xml

1066 **XML serialization:**

```

1067 <CloudEntryPoint xmlns="http://www.dmtf.org/cimi">
1068   <self> xs:anyURI </self>
1069   <name> xs:string </name> ?
1070   <description> xs:string </description> ?
1071   <created> xs:dateTime </created>
1072   <property key="xs:string"> xs:string </property> *
1073   <systemTemplates href="xs:anyURI"/> ?
1074   <systems href="xs:anyURI"/> ?
1075   <machineTemplates href="xs:anyURI"/> ?
1076   <machineConfigs href="xs:anyURI"/> ?
1077   <machineImages href="xs:anyURI"/> ?
1078   <machineAdminTemplates href="xs:anyURI"/> ?
1079   <machineAdmins href="xs:anyURI"/> ?
1080   <machines href="xs:anyURI"/> ?
1081   <volumeTemplates href="xs:anyURI"/> ?
1082   <volumeConfigs href="xs:anyURI"/> ?
1083   <volumeImages href="xs:anyURI"/> ?
1084   <volumes href="xs:anyURI"/> ?
1085   <networkTemplates href="xs:anyURI"/> ?
1086   <networkConfigs href="xs:anyURI"/> ?
1087   <networks href="xs:anyURI"/> ?
1088   <vspTemplates href="xs:anyURI"/> ?
1089   <vspConfigs href="xs:anyURI"/> ?
1090   <vsps href="xs:anyURI"/> ?
1091   <routingGroupTemplates href="xs:anyURI"/> ?
1092   <routingGroups href="xs:anyURI"/> ?
1093   <meterTemplates href="xs:anyURI"/> ?
1094   <meters href="xs:anyURI"/> ?
1095   <eventLogs href="xs:anyURI"/> ?

```

```

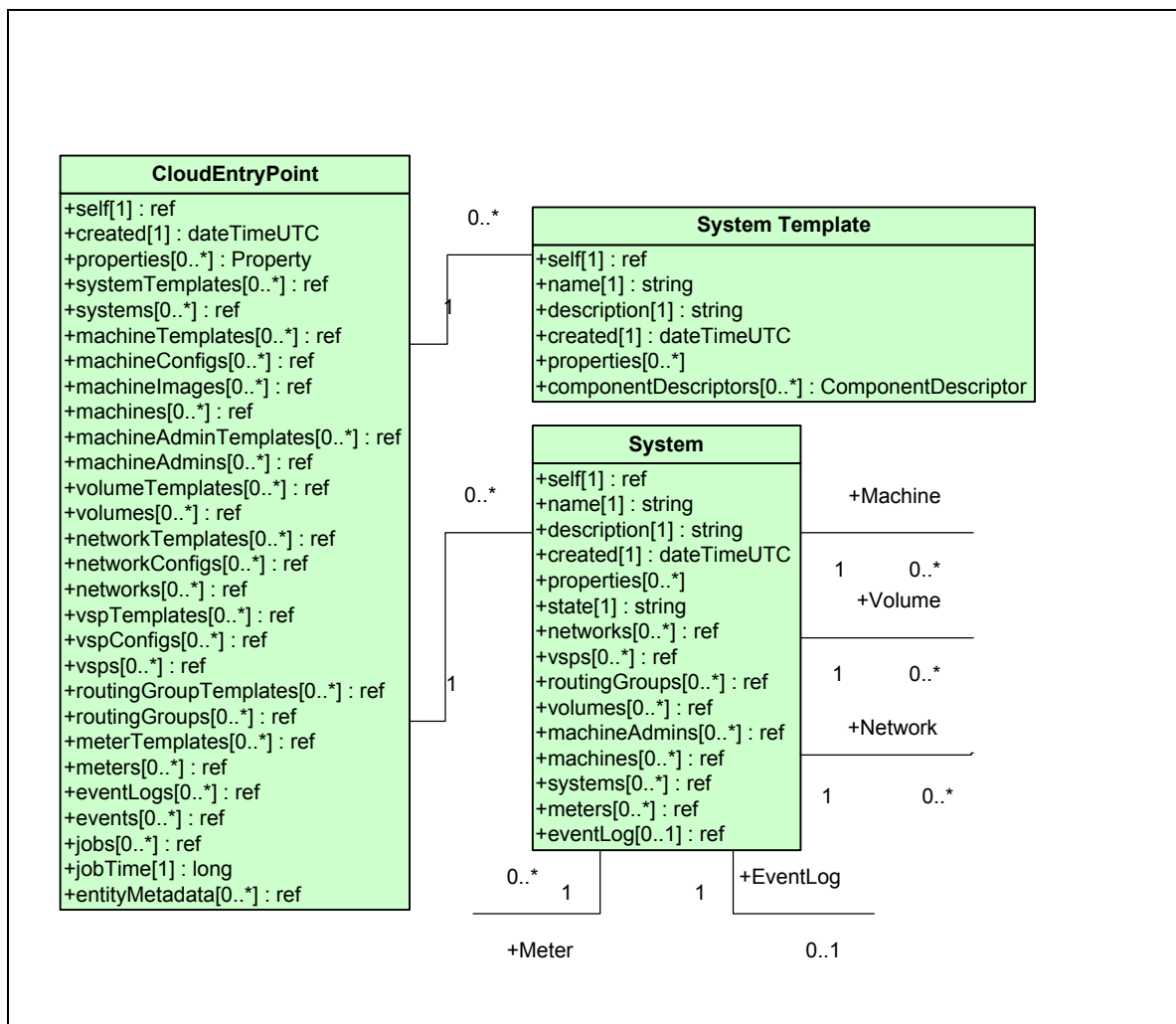
1096 <events href="xs:anyURI"/> ?
1097 <job_time> xs:integer </job_time>
1098 <entityMetadata href="xs:anyURI"/> *
1099 <operation rel="edit" href="xs:anyURI"/> ?
1100 <xs:any>*
1101 </CloudEntryPoint>
    
```

1102 **5.9.1 Operations**

1103 This entity supports the Read and Update operations.

1104 **5.10 System Entities and Relationships**

1105 The following diagram illustrates the entities involved in constructing a System and their relationships.
 1106 Although this drawing is in the style of an Entity Relationship diagram, the use of UML is neither rigorous
 1107 nor normative.



1108
 1109 **Figure 1 - System Entities**

1110 **5.10.1 System Template**

1111 The System Template contains the set of individual descriptors necessary to create the components of a
 1112 System. Each component descriptor can be considered to be the persisted view of the create operation

1113 that instantiates the component. In practice, the Provider will interpret the set of component descriptors as
 1114 a set of creation operations to be executed in an order compatible with the dependencies (e.g.
 1115 attachments or references between components) that are manifest between these components.

1116 A System Template may include component references in the descriptors, used to express links between
 1117 components of the resulting System. A component reference uses the "name" of the target (referred)
 1118 component. For example, <volume href="#newVolume"/> would reference a Volume named
 1119 "newVolume".

Name	SystemTemplate																		
Type URI	http://www.dmtf.org/cimi/SystemTemplate																		
Attribute	Type	Description																	
component Descriptors	component Descriptor[]	<p>The list of component descriptors describing the components of a System instance realized from this SystemTemplate. For each component descriptor, the corresponding component is created when a System instance is created. Each component descriptor refers to a template (either by reference or value), and may also provide additional metadata (name, description, properties). The creation order of components is not specified in SystemTemplate, in particular the order of the component descriptors in this array is not meaningful in terms of creation order.</p> <table border="1"> <thead> <tr> <th>Name</th> <td>componentDescriptor</td> </tr> <tr> <th>Data</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>name</td> <td>string</td> <td>The value of the "name" attribute that will be associated with a System component created from this component descriptor. Note: this name is not to be confused with the name that may be present in the component template – e.g. a MachineTemplate - from which this component will be instantiated. Properties: Optional / Mutable</td> </tr> <tr> <td>description</td> <td>string</td> <td>The value of the "description" attribute that will be associated with a System component created from this component descriptor.Properties: Optional / Mutable</td> </tr> <tr> <td>properties</td> <td>map</td> <td>The key/value pairs that will be associated with a System component created from this component descriptor. Properties: Optional / Mutable</td> </tr> <tr> <td>type</td> <td>URI</td> <td>The TypeURI of the component to be created from this component descriptor, e.g. for a machine: http://www.dmtf.org/cimi/Machine</td> </tr> </tbody> </table>	Name	componentDescriptor	Data	Type	Description	name	string	The value of the "name" attribute that will be associated with a System component created from this component descriptor. Note: this name is not to be confused with the name that may be present in the component template – e.g. a MachineTemplate - from which this component will be instantiated. Properties: Optional / Mutable	description	string	The value of the "description" attribute that will be associated with a System component created from this component descriptor. Properties: Optional / Mutable	properties	map	The key/value pairs that will be associated with a System component created from this component descriptor. Properties: Optional / Mutable	type	URI	The TypeURI of the component to be created from this component descriptor, e.g. for a machine: http://www.dmtf.org/cimi/Machine
Name	componentDescriptor																		
Data	Type	Description																	
name	string	The value of the "name" attribute that will be associated with a System component created from this component descriptor. Note: this name is not to be confused with the name that may be present in the component template – e.g. a MachineTemplate - from which this component will be instantiated. Properties: Optional / Mutable																	
description	string	The value of the "description" attribute that will be associated with a System component created from this component descriptor. Properties: Optional / Mutable																	
properties	map	The key/value pairs that will be associated with a System component created from this component descriptor. Properties: Optional / Mutable																	
type	URI	The TypeURI of the component to be created from this component descriptor, e.g. for a machine: http://www.dmtf.org/cimi/Machine																	

				Properties: Optional / Mutable
	<i>component Template</i>	structure		<p>Either a reference to a component Template or the Template data itself inlined (i.e. the Template "value").</p> <p>Note that the exact name of this attribute will vary depending on the type of entity being created. E.g. MachineTemplate for a Machine.</p> <p>Note: Component references (expressing links between components of a resulting System) are to be found – if any - in Templates that are provided inline, as such references contain names that are only relevant to the SystemTemplate where these template values are embedded.</p> <p>Properties: Mandatory / Mutable</p>
	quantity	integer		<p>Number of component instances to be created from this component descriptor. By default, equal to 1. When the value is 2 or more, the actual name assigned to each instance will be the "name" value concatenated with a sequential number (e.g. if name="mymachine", and quantity=3 the names will be: mymachine1, mymachine2, mymachine3.)</p> <p>Properties: Optional / Mutable</p>
				Properties: Optional / Mutable

1120 **JSON media type:** application/CIMI-SystemTemplate+json

1121 **JSON serialization:**

```

1122 { "self": string,
1123   "name": string, ?
1124   "description": string, ?
1125   "created": string, ?
1126   "properties": { "key": string, + }, ?
1127   "componentDescriptors": [
1128     { "name": string, ?
1129       "description": string, ?
1130       "properties": { "name": string, + }, ?
1131       "type": string,
1132       "componentTemplate": {
1133         "href": string, ...
1134       }
1135     }, +
1136   ], ?
1137   "operations": [
1138     { "rel": "edit", "href": string }, ?
1139     { "rel": "delete", "href": string } ?
1140   ] ?
1141   ...

```

1142 }

1143 **XML media type:** application/CIMI-SystemTemplate+xml

1144 **XML serialization:**

```

1145 <SystemTemplate xmlns="http://www.dmtf.org/cimi">
1146   <self> xs:anyURI </self>
1147   <name> xs:string </name> ?
1148   <description> xs:string </description> ?
1149   <created> xs:string </created>
1150   <property key="xs:string"> xs:string </property> *
1151   <componentDescriptor>
1152     <name> xs:string </name> ?
1153     <description> xs:string </description> ?
1154     <property name="xs:string"> xs:string </property> *
1155     <type> xs:anyURI </type>
1156     <componentTemplate href="xs:anyURI"? > ... </componentTemplate>
1157   </componentDescriptor> *
1158   <operation rel="edit" href="xs:anyURI"/> ?
1159   <operation rel="delete" href="xs:anyURI"/> ?
1160   <xs:any*
1161 </SystemTemplate>
    
```

1162 **5.10.1.1 Operations**

1163 This entity supports the Read, Update and Delete operations. Create is supported via the System
 1164 Template Collection entity.

1165 **5.10.2 System Template Collection**

1166 A System Template Collection entity represents the collection of System Template entities within a
 1167 Provider. This resource can be used to locate and create System Templates.

Name	SystemTemplateCollection	
Type URI	http://www.dmtf.org/cimi/SystemTemplateCollection	
Attribute	Type	Description
systemTemplates	ref[]	An array of references to the set of System Templates in the Provider. Properties: Mandatory / Mutable

1168 The following describes the serialization of the entity in both JSON and XML:

1169 **JSON media type:** application/CIMI-SystemTemplateCollection+json

1170 **JSON serialization:**

```

1171 { "self": string,
1172   "name": string, ?
1173   "description": string, ?
1174   "created": string, ?
1175   "properties": { "key": string, + }, ?
1176   "systemTemplates": [
1177     { "href": string }, +
1178   ], ?
1179   "operations": [
1180     { "rel": "add", "href": string }, ?
1181     { "rel": "edit", "href": string } ?
1182   ] ?
    
```


1183 }
 1184 }

1185 **XML media type:** application/CIMI-SystemTemplateCollection+xml

1186 **XML serialization:**

```

1187 <SystemTemplateCollection xmlns="http://www.dmtf.org/cimi">
1188   <self> xs:anyURI </self>
1189   <name> xs:string </name> ?
1190   <description> xs:string </description> ?
1191   <created> xs:string </created>
1192   <property key="xs:string"> xs:string </property> *
1193   <systemTemplate href="xs:anyURI"/> *
1194   <operation rel="add" href="xs:anyURI"/> ?
1195   <operation rel="edit" href="xs:anyURI"/> ?
1196   <xs:any>*
1197 </SystemTemplateCollection>
    
```

1198 **5.10.2.1 Operations**

1199 This entity supports the Read and Update operations. Creation of new System Template entities is
 1200 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

1201 **5.10.3 System**

1202 A System is a realized entity that consists of for example: one or more Networks, Volumes, Machines
 1203 (and others) that could be connected and associated with each other. A System can be created from the
 1204 interpretation of a SystemTemplate. A System can be operated and managed as a single entity and
 1205 usually forms a stack of service. For example, a shopping cart system consists of machines for web
 1206 servers and databases, network addresses for public access, and volumes for database files. A System
 1207 may directly provide a user facing component, or may provide an infrastructure component.

Name	System	
Type URI	http://www.dmtf.org/cimi/System	
Attribute	Type	Description
state	string	<p>Indicates the operational state of the System.</p> <p>Allowable values include:</p> <p>CREATING: The System is in the process of being created. Allowable action when in this state is: delete.</p> <p>AVAILABLE: The System is available and ready for use. Allowable action when in this state is: delete.</p> <p>DELETING: The System is in the process of being deleted. Allowable action when in this state is: delete.</p> <p>ERROR: The Provider has detected an error in the System. Allowable action when in this state is: delete.</p> <p>Providers may define additional values.</p> <p>This value is read-only and will change based on the state of the System.</p> <p>Properties: Mandatory / Mutable</p>

networks	ref[]	<p>The list of Networks contained in this System. Adding an item (of type Network) to this list is logically equivalent to associating the Network to this System with a “containment relationship”. Removing an item from this list is logically equivalent to de-associating the Network from this System.</p> <p>Properties: Optional / Mutable</p>
vsp	ref[]	<p>The list of VSPs contained in this System. Adding an item (of type VSP) to this list is logically equivalent to associating the VSP to this System with a "containment relationship". Removing an item from this list is logically equivalent to de-associating the VSP from this System.</p> <p>Properties: Optional / Mutable</p>
routingGroups	ref[]	<p>The list of Routing Groups contained in this System. Adding an item (of type RoutingGroup) to this list is logically equivalent to associating the Routing Group to this System with a "containment relationship". Removing an item from this list is logically equivalent to de-associating the Routing Group from this System.</p> <p>Properties: Optional / Mutable</p>
volumes	ref[]	<p>The list of Volumes contained in this System. Adding an item (of type Volume) to this list is logically equivalent to associating the Volume to this System with a “containment relationship”. Removing an item from this list is logically equivalent to de-associating the Volume from this System.</p> <p>Properties: Optional / Mutable</p>
machineAdmins	ref[]	<p>The list of MachineAdmins contained in this System. Adding an item (of type MachineAdmin) to this list is logically equivalent to associating the MachineAdmin to this System with a “containment relationship”. Removing an item from this list is logically equivalent to de-associating the MachineAdmin from this System.</p> <p>Properties: Optional / Mutable</p>
machines	ref[]	<p>The list of Machines contained in this System. Adding an item (of type Machine) to this list is logically equivalent to associating the Machine to this System with a “containment relationship”. Removing an item from this list is logically equivalent to de-associating the Machine from this System.</p> <p>Properties: Optional / Mutable</p>
systems	ref[]	<p>The list of nested Systems contained in this System. Adding an item (of type System) to this list is logically equivalent to associating the referenced System to this System with a “containment relationship”. Removing an item from this list is logically equivalent to de-associating the referenced System from this System.</p> <p>Properties: Optional / Mutable</p>
meters	ref[]	<p>A list of references to Meters monitored for this System.</p> <p>Properties: Optional / Mutable</p>
eventLog	ref	<p>A reference to the EventLog of this System.</p>

		Properties: Optional / Mutable
--	--	---------------------------------------

1208 **JSON media type:** application/CIMI-System+json

1209 **JSON serialization:**

```

1210 { "self": string,
1211     "name": string, ?
1212     "description": string, ?
1213     "created": string, ?
1214     "properties": { "key": string, + }, ?
1215     "state": string,
1216     "networks": [
1217         { "href": string }, +
1218     ], ?
1219     "vsps": [
1220         { "href": string }, +
1221     ], ?
1222     "volumes": [
1223         { "href": string }, +
1224     ], ?
1225     "machineAdmins": [
1226         { "href": string }, +
1227     ], ?
1228     "machines": [
1229         { "href": string }, +
1230     ], ?
1231     "systems": [
1232         { "href": string }, +
1233     ], ?
1234     "meters": [
1235         { "href": string }, +
1236     ], ?
1237     "eventLog": { "href": string }, ?
1238     "operations": [
1239         { "rel": "edit", "href": string }, ?
1240         { "rel": "delete", "href": string } ?
1241     ] ?
1242     ...
1243 }
```

1244 **XML media type:** application/CIMI-System+xml

1245 **XML serialization:**

```

1246 <System xmlns="http://www.dmtf.org/cimi">
1247   <self> xs:anyURI </self>
1248   <name> xs:string </name> ?
1249   <description> xs:string </description> ?
1250   <created> xs:string </created>
1251   <property key="xs:string"> xs:string </property> *
1252   <state> xs:string </state>
1253   <network href="xs:anyURI"/> *
1254   <vsp href="xs:anyURI"/> *
1255   <volume href="xs:anyURI"/> *
1256   <machineAdmin href="xs:anyURI"/> *
1257   <machine href="xs:anyURI"/> *
1258   <system href="xs:anyURI"/> *
1259   <meter href="xs:anyURI"/> *
1260   <eventLog href="xs:anyURI"/> ?
1261   <operation rel="edit" href="xs:anyURI"/> ?
1262   <operation rel="delete" href="xs:anyURI"/> ?
```

```
1263     <xs:any>*
```

```
1264 </System>
```

1265 5.10.3.1 Operations

1266 This entity supports the Read, Update and Delete operations. Create is supported via the System
1267 Collection entity.

1268 5.10.4 System Collection

1269 A System Collection entity represents the collection of System entities within a Provider. This entity can
1270 be used to locate and create Systems.

Name	SystemCollection	
Type URI	http://www.dmtf.org/cimi/SystemCollection	
Attribute	Type	Description
systems	ref[]	An array of references to the set of Systems in the Provider. Properties: Mandatory / Mutable

1271 The following describes the serialization of the entity in both JSON and XML:

1272 **JSON media type:** application/CIMI-SystemCollection+json

1273 **JSON serialization:**

```
1274 { "self": string,
```

```
1275   "name": string, ?
```

```
1276   "description": string, ?
```

```
1277   "created": string, ?
```

```
1278   "properties": { "key": string, + }, ?
```

```
1279   "systems": [
```

```
1280     { "href": string }, +
```

```
1281   ], ?
```

```
1282   "operations": [
```

```
1283     { "rel": "add", "href": string }, ?
```

```
1284     { "rel": "edit", "href": string } ?
```

```
1285   ] ?
```

```
1286   ...
```

```
1287 }
```

1288 **XML media type:** application/CIMI-SystemCollection+xml

1289 **XML serialization:**

```
1290 <SystemCollection xmlns="http://www.dmtf.org/cimi">
```

```
1291   <self> xs:anyURI </self>
```

```
1292   <name> xs:string </name> ?
```

```
1293   <description> xs:string </description> ?
```

```
1294   <created> xs:string </created>
```

```
1295   <property key="xs:string"> xs:string </property> *
```

```
1296   <system href="xs:anyURI"/> *
```

```
1297   <operation rel="add" href="xs:anyURI"/> ?
```

```
1298   <operation rel="edit" href="xs:anyURI"/> ?
```

```
1299   <xs:any>*
```

```
1300 </SystemCollection>
```

1301 **5.10.4.1 Operations**

1302 This entity supports the Read and Update operations.

1303 The following custom operations are also defined:

1304 **Creating a New System**1305 **/link@rel:** add

1306 This operation will create a new System.

1307 Input parameters: Either a reference to a System Template or a System Template itself.

1308 Output parameters: A reference to a new System and optionally the representation of the System.

1309 • **HTTP/REST Protocol**

1310 To create a new System a POST is sent to the "add" URI of the SystemCollection where the HTTP
 1311 request body SHALL be as described below. Note this structure allows for certain properties to be passed
 1312 in "by value" or by "reference". The definition of each property can be found in section 5.10.1.

1313 **JSON media type:** application/CIMI-SystemCreate+json1314 **JSON serialization:**

```

1315 { "name": string, ?
1316   "description": string, ?
1317   "properties": { "key": string, + }, ?
1318   "systemTemplate" : { "href": string, ?
1319     "properties": { "key": string, + }, ?
1320     "componentDescriptors": [
1321       { "name": string, ?
1322         "description": string, ?
1323         "properties": { "name": string, + }, ?
1324         "type": string,
1325         "componentTemplate": {
1326           "href": string, ...
1327       }
1328     }, +
1329   ], ?
1330 }
1331 ...
1332 }
```

1333 **XML media type:** application/CIMI-SystemCreate+xml1334 **XML serialization**

```

1335 <SystemCreate>
1336   <name> xs:string </name> ?
1337   <description> xs:string </description> ?
1338   <property key="xs:string"> xs:string </property> *
1339   <systemTemplate href="xs:anyURI"?>
1340     <property key="xs:string"> xs:string </property> *
1341     <componentDescriptor>
1342       <name> xs:string </name> ?
1343       <description> xs:string </description> ?
1344       <property name="xs:string"> xs:string </property> *
1345       <type> xs:anyURI </type>
1346       <componentTemplate href="xs:anyURI"? > ... </componentTemplate>
1347     </componentDescriptor> *
1348   </systemTemplate>
```

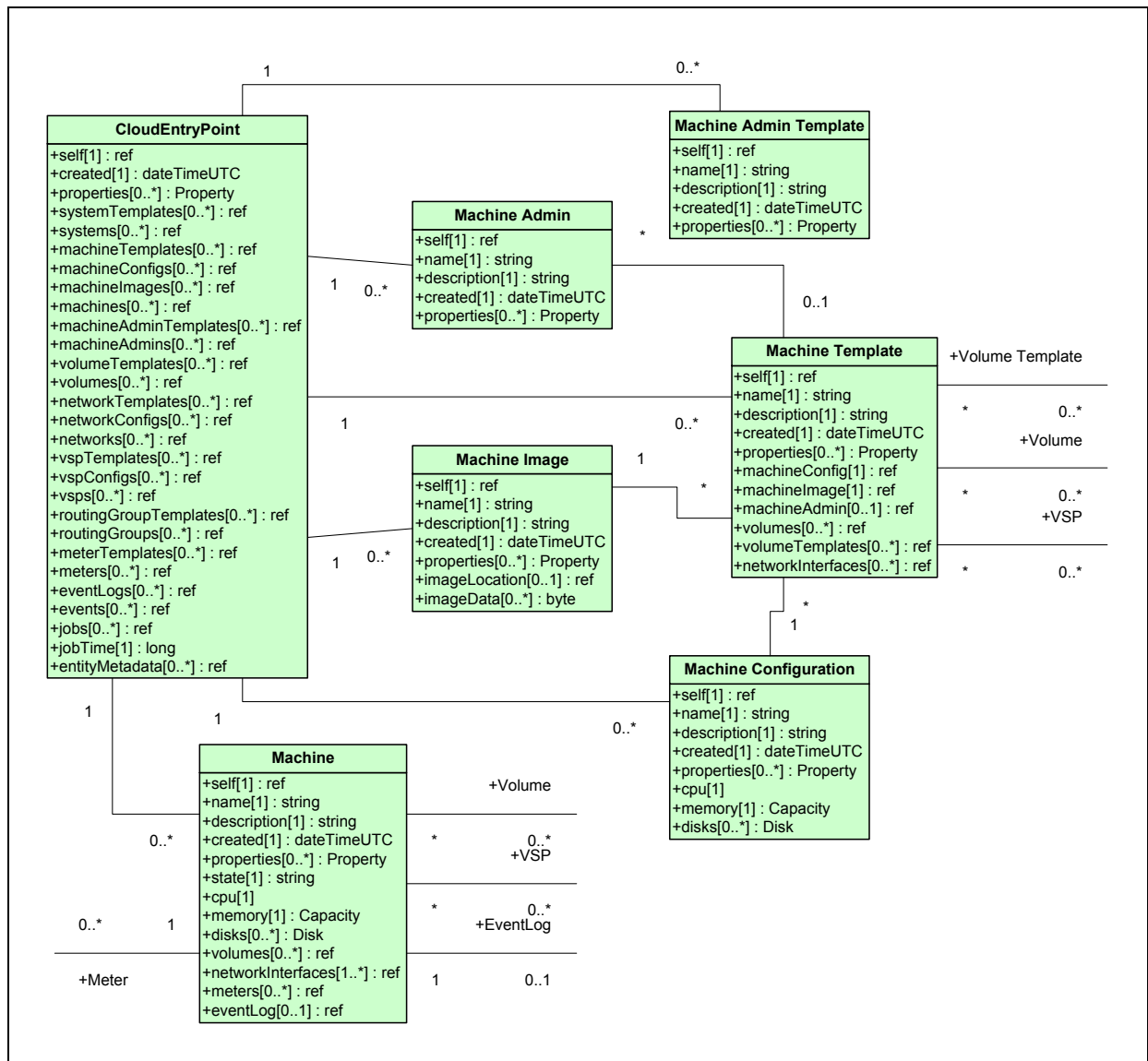
```
1349 <xs:any*>
1350 </SystemCreate>
```

1351 The serialization of some reference properties are specified such that a request MAY either include a
 1352 reference ("href") to an existing entity or to include the entity "inline" as a set of additional properties.
 1353 Requests SHALL NOT include both a reference and the inlined set of properties.

1354 Upon successful processing of the request, the HTTP response body MAY either be empty or contain a
 1355 serialization of the System entity.

1356 5.11 Machine Entities and Relationships

1357 The following diagram illustrates the entities involved in constructing a Machine and their relationships.
 1358 Although this drawing is in the style of an Entity Relationship diagram, the use of UML is neither rigorous
 1359 nor normative.



1360
 1361 **Figure 2 - Machine Entities**

1362 **5.11.1 Machine Template**

1363 A Machine Template represents the set of metadata and instructions used in the creation of a Machine.

Name	MachineTemplate													
Type URI	http://www.dmtf.org/cimi/MachineTemplate													
Attribute	Type	Description												
machineConfig	ref	A reference to the Machine Configuration that will be used to create a Machine from this Machine Template. Properties: Mandatory / Mutable												
machineImage	ref	A reference to the Machine Image that will be used to create a Machine from this Machine Template. Properties: Mandatory / Mutable												
machineAdmin	ref	A reference to the Machine Admin that will be used to create the initial login credential for the new Machine. Properties: Optional / Mutable												
volumes	volume[]	<p>A list of references to existing Volumes that will be attached to the Machine during its creation.</p> <p>Each volume attribute has the following sub-attributes which describe aspects of the way in which the Machine will be attached to the Volume:</p> <table border="1"> <thead> <tr> <th>Name</th> <td colspan="2">volume</td> </tr> <tr> <th>Attribute</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>attachmentPoint</td> <td>String</td> <td>File system path where the Volume will be attached. Properties: Mandatory / Mutable</td> </tr> <tr> <td>volume</td> <td>ref</td> <td>Reference to the Volume that will be attached. Properties: Mandatory / Mutable</td> </tr> </tbody> </table> <p>Properties: Optional / Mutable</p>	Name	volume		Attribute	Type	Description	attachmentPoint	String	File system path where the Volume will be attached. Properties: Mandatory / Mutable	volume	ref	Reference to the Volume that will be attached. Properties: Mandatory / Mutable
Name	volume													
Attribute	Type	Description												
attachmentPoint	String	File system path where the Volume will be attached. Properties: Mandatory / Mutable												
volume	ref	Reference to the Volume that will be attached. Properties: Mandatory / Mutable												
volumeTemplates	volumeTemplate[]	<p>A list of references to Volume Templates that will be used to create a set of new Volumes that will to be attached to the Machine during its creation.</p> <p>If the Machine is created as part of a System creation, the Volumes created from these templates will be considered as part of that System without the need for these Volume Templates to also be listed in the <code>volumeTemplates</code> attribute of the relevant System Template. If the same Volume Template reference is listed in both the <code>volumeTemplates</code> attribute of a System Template and in the <code>volumeTemplates</code> attribute of a Machine Template contained by</p>												

		<p>that System Template, this means that multiple, distinct Volume instances will be created as part of the overall System creation.</p> <p>Each volumeTemplate attribute has the following sub-attributes which describe aspects of the way in which the Machine will be attached to the Volume instance that will be created from the template:</p> <table border="1"> <thead> <tr> <th>Name</th> <td colspan="2">volumeTemplate</td> </tr> <tr> <th>Attribute</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>attachmentPoint</td> <td>String</td> <td>File system path where the Volume will be attached. Properties: Mandatory / Mutable</td> </tr> <tr> <td>volumeTemplate</td> <td>ref</td> <td>Reference to the Volume Template that will be used to create a new Volume. Properties: Mandatory / Mutable</td> </tr> </tbody> </table> <p>Properties: Optional / Mutable</p>	Name	volumeTemplate		Attribute	Type	Description	attachmentPoint	String	File system path where the Volume will be attached. Properties: Mandatory / Mutable	volumeTemplate	ref	Reference to the Volume Template that will be used to create a new Volume. Properties: Mandatory / Mutable
Name	volumeTemplate													
Attribute	Type	Description												
attachmentPoint	String	File system path where the Volume will be attached. Properties: Mandatory / Mutable												
volumeTemplate	ref	Reference to the Volume Template that will be used to create a new Volume. Properties: Mandatory / Mutable												
networkInterfaces	networkInterface[]	<p>A list of sub-entities that define the network interfaces that will be created on Machines instantiated from this template.</p> <table border="1"> <thead> <tr> <th>Name</th> <td colspan="2">networkInterface</td> </tr> <tr> <th>Attribute</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>vsp</td> <td>ref</td> <td>A reference to the VSP (Virtual Switch Port) for this network interface. Note this is a reference to a VSP and not a VSPTemplate. It is expected that VSPs and Networks will be defined separately and prior to the Machines that connect to them. Properties: Optional / Mutable</td> </tr> <tr> <td>hostname</td> <td>string</td> <td>DNS resolvable name associated with this network interface. While this attribute can be specified in most cases it is expected to be supplied by the Provider. Specifying this value is typically only done when the Template is only used for one particular Machine. Properties: Optional / Mutable</td> </tr> </tbody> </table>	Name	networkInterface		Attribute	Type	Description	vsp	ref	A reference to the VSP (Virtual Switch Port) for this network interface. Note this is a reference to a VSP and not a VSPTemplate. It is expected that VSPs and Networks will be defined separately and prior to the Machines that connect to them. Properties: Optional / Mutable	hostname	string	DNS resolvable name associated with this network interface. While this attribute can be specified in most cases it is expected to be supplied by the Provider. Specifying this value is typically only done when the Template is only used for one particular Machine. Properties: Optional / Mutable
Name	networkInterface													
Attribute	Type	Description												
vsp	ref	A reference to the VSP (Virtual Switch Port) for this network interface. Note this is a reference to a VSP and not a VSPTemplate. It is expected that VSPs and Networks will be defined separately and prior to the Machines that connect to them. Properties: Optional / Mutable												
hostname	string	DNS resolvable name associated with this network interface. While this attribute can be specified in most cases it is expected to be supplied by the Provider. Specifying this value is typically only done when the Template is only used for one particular Machine. Properties: Optional / Mutable												

		macAddress	string	<p>Address assigned by the hypervisor when a machine is created or a unique address can be manually assigned.</p> <p>While this attribute can be specified in most cases it is expected to be supplied by the Provider. Specifying this value is typically only done when the Template is only used for one particular Machine.</p> <p>Properties: Optional / Mutable</p>
		state	string	<p>The state of an interface configurable to be “Active” or “Standby”.</p> <p>Properties: Mandatory / Mutable</p>
		protocol	string	<p>Selected network protocol such as - IPv4 or IPv6.</p> <p>Properties: Mandatory / Mutable</p>
		allocation	string	<p>The option for “Dynamic Host Allocation Protocol” or static.</p> <p>Properties: Mandatory / Mutable</p>
		address	string	<p>The IP address assigned to a virtual interface.</p> <p>While this attribute can be specified in most cases it is expected to be supplied by the Provider. Specifying this value is typically only done when the Template is only used for one particular Machine.</p> <p>Properties: Optional / Mutable</p>
		defaultGateway	string	<p>An IP address to a firewall or router that serves other networks.</p> <p>Properties: Optional / Mutable</p>
		dns	string	<p>The IP address of the Domain Name Service from host name to IP resolution.</p> <p>Properties: Optional / Mutable</p>

		maxTransmissionUnit	integer	To set the largest supported packet size. Properties: Optional / Mutable
Properties: Optional / Mutable				

1364 The following describes the serialization of the entity in both JSON and XML:

1365 **JSON media type:** application/CIMI-MachineTemplate+json

1366 **JSON serialization:**

```

1367 { "self": string,
1368   "name": string, ?
1369   "description": string, ?
1370   "created": string, ?
1371   "properties": { "key": string, + }, ?
1372   "machineConfig": { "href": string },
1373   "machineImage": { "href": string },
1374   "machineAdmin": { "href": string }, ?
1375   "volumes": [
1376     { "href": string, "attachmentPoint": string }, +
1377   ], ?
1378   "volumeTemplates": [
1379     { "href": string, "attachmentPoint": string }, +
1380   ], ?
1381   "networkInterfaces": [
1382     { "vsp": { "href": string }, "hostname": string, "macAddress": string,
1383       "state": string, "protocol": string, "allocation": string,
1384       "address": string, "defaultGateway": string, "dns": string,
1385       "maxTransmissionUnit": integer }, +
1386   ], ?
1387   "operations": [
1388     { "rel": "edit", "href": string }, ?
1389     { "rel": "delete", "href": string } ?
1390   ] ?
1391   ...
1392 }
```

1393 **XML media type:** application/CIMI-MachineTemplate+xml

1394 **XML serialization:**

```

1395 <MachineTemplate xmlns="http://www.dmtf.org/cimi">
1396   <self> xs:anyURI </self>
1397   <name> xs:string </name> ?
1398   <description> xs:string </description> ?
1399   <created> xs:string </created>
1400   <property key="xs:string"> xs:string </property> *
1401   <machineConfig href="xs:anyURI"/>
1402   <machineImage href="xs:anyURI"/>
1403   <machineAdmin href="xs:anyURI"/> ?
1404   <volume href="xs:anyURI" attachmentPoint="xs:string" /> *
1405   <volumeTemplate href="xs:anyURI" attachmentPoint="xs:string" /> *
1406   <networkInterface>
1407     <vsp href="xs:anyURI"/>
1408     <hostname> xs:string </hostname>
1409     <macAddress> xs:string </macAddress>
1410     <state> xs:string </state>
1411     <protocol> xs:string </protocol>
1412     <allocation> xs:string </alloction>
```

```

1413     <address> xs:string </address>
1414     <defaultGateway> xs:string </defaultGateway>
1415     <dns> xs:string </dns>
1416     <maxTransmissionUnit> xs:integer </maxTransmissionUnit>
1417 </networkInterface> *
1418 <operation rel="edit" href="xs:anyURI"/> ?
1419 <operation rel="delete" href="xs:anyURI"/> ?
1420 <xs:any>*
1421 </MachineTemplate>

```

1422 5.11.1.1 Operations

1423 This entity supports the Read, Update and Delete operations. Create is supported via the Machine
1424 Template Collection entity.

1425 5.11.2 Machine Template Collection

1426 A Machine Template Collection entity represents the collection of Machine Template entities within a
1427 Provider. This entity can be used to locate and create Machine Templates.

Name	MachineTemplateCollection	
Type URI	http://www.dmtf.org/cimi/MachineTemplateCollection	
Attribute	Type	Description
machineTemplates	ref[]	An array of references to the set of Machine Templates in the Provider. Properties: Mandatory / Mutable

1428 The following describes the serialization of the entity in both JSON and XML:

1429 **JSON media type:** application/CIMI-MachineTemplateCollection+json

1430 **JSON serialization:**

```

1431 { "self": string,
1432   "name": string, ?
1433   "description": string, ?
1434   "created": string, ?
1435   "properties": { "key": string, + }, ?
1436   "machineTemplates": [
1437     { "href": string }, +
1438   ], ?
1439   "operations": [
1440     { "rel": "add", "href": string }, ?
1441     { "rel": "edit", "href": string } ?
1442   ] ?
1443   ...
1444 }

```

1445 **XML media type:** application/CIMI-MachineTemplateCollection+xml

1446 **XML serialization:**

```

1447 <MachineTemplateCollection xmlns="http://www.dmtf.org/cimi">
1448   <self> xs:anyURI </self>
1449   <name> xs:string </name> ?
1450   <description> xs:string </description> ?
1451   <created> xs:string </created>
1452   <property key="xs:string"> xs:string </property> *
1453   <machineTemplate href="xs:anyURI"/> *

```

```

1454 <operation rel="add" href="xs:anyURI"/> ?
1455 <operation rel="edit" href="xs:anyURI"/> ?
1456 <xs:any>*
1457 </MachineTemplateCollection>
    
```

1458 **5.11.2.1 Operations**

1459 This entity supports the Read and Update operations. Creation of new Machine Template entities is
 1460 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

1461 **5.11.3 Machine Configuration**

1462 The Machine Configuration entity represents the set of configuration values that define the (virtual)
 1463 hardware resources of a to-be-realized Machine Instance. Machine Configurations are created by
 1464 Providers and MAY, at the Providers discretion, be created by Consumers.

Name	MachineConfiguration										
Type URI	http://www.dmtf.org/cimi/MachineConfiguration										
Attribute	Type	Description									
cpu	TBD	Indicate the amount of CPU (based on standard CPU measurement) that a Machine realized from this configuration would have, by default. Properties: Mandatory / Mutable									
memory	structure	Indicates the amount of RAM that a Machine realized from this configuration will have. This attribute has the following sub-attributes which serve to describe it: <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th>Attribute</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>quantity</td> <td>integer</td> <td>A numerical quantity expressed as an integer. Properties: Mandatory / Mutable</td> </tr> <tr> <td>units</td> <td>string</td> <td>An enumerated value that expresses the unit of measurement used. Allowable values are byte, kibibyte, mebibyte, gibibyte, tebibyte, pebibyte, exbibyte, zebibyte, and yobibyte. Properties: Mandatory / Mutable</td> </tr> </tbody> </table> Properties: Mandatory / Mutable	Attribute	Type	Description	quantity	integer	A numerical quantity expressed as an integer. Properties: Mandatory / Mutable	units	string	An enumerated value that expresses the unit of measurement used. Allowable values are byte , kibibyte , mebibyte , gibibyte , tebibyte , pebibyte , exbibyte , zebibyte , and yobibyte . Properties: Mandatory / Mutable
Attribute	Type	Description									
quantity	integer	A numerical quantity expressed as an integer. Properties: Mandatory / Mutable									
units	string	An enumerated value that expresses the unit of measurement used. Allowable values are byte , kibibyte , mebibyte , gibibyte , tebibyte , pebibyte , exbibyte , zebibyte , and yobibyte . Properties: Mandatory / Mutable									
disks	disk[]	Contains the list of metadata of the disks that will be created upon the instantiation of a Machine from this configuration. The disks are local storages to the Machine. Each disks attribute has the following sub-attributes: <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th>Name</th> <td colspan="2">disk</td> </tr> <tr> <th>Attribute</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>capacity</td> <td></td> <td>Indicates the initial capacity of the disk described by this attribute. This property has the following, sub-attributes.</td> </tr> </tbody> </table>	Name	disk		Attribute	Type	Description	capacity		Indicates the initial capacity of the disk described by this attribute. This property has the following, sub-attributes.
Name	disk										
Attribute	Type	Description									
capacity		Indicates the initial capacity of the disk described by this attribute. This property has the following, sub-attributes.									

Attribute	Type	Description
quantity	integer	A numerical quantity expressed as an integer. Properties: Mandatory / Mutable
units	string	An enumerated value that expresses the unit of measurement used. Allowable values are byte, kilobyte, megabyte, gigabyte, terabyte, petabyte, exabyte, zettabyte, and yottabyte . Properties: Mandatory / Mutable
Properties: Mandatory / Mutable		
format	string	The format/type of this disk (e.g. ext4, NTFS). Properties: Mandatory / Mutable
attachmentPoint	string	File system path where this disk is attached. Properties: Mandatory / Mutable
Properties: Optional / Mutable		

1465 Note: The disk attributes "format" and "attachmentPoint" will not appear on Machine entities because
 1466 once the Machine is created the user of the Machine will be able to modify those attributes of a disk,
 1467 possibly without the Provider's knowledge. Therefore it might not be an aspect of the Machine that the
 1468 Provider can reliably manage.

1469 **JSON media type:** application/CIMI-MachineConfiguration+json

1470 **JSON serialization:**

```

1471 { "self": string,
1472   "name": string, ?
1473   "description": string, ?
1474   "created": string, ?
1475   "properties": { "key": string, + }, ?
1476   "cpu": string,
1477   "memory": { "quantity": integer, "units": string },
1478   "disks": [
1479     { "capacity": { "quantity": integer, "units": string },
1480     "format": string, "attachmentPoint": string }, +
1481   ], ?
1482   "operations": [
1483     { "rel": "edit", "href": string }, ?
1484     { "rel": "delete", "href": string } ?
1485   ] ?
1486   ...
1487 }
```

1488 **XML media type:** application/CIMI-MachineConfiguration+xml

1489 **XML serialization:**

```

1490 <MachineConfiguration xmlns="http://www.dmtf.org/cimi">
```

```

1491 <self> xs:anyURI </self>
1492 <name> xs:string </name> ?
1493 <description> xs:string </description> ?
1494 <created> xs:string </created>
1495 <property key="xs:string"> xs:string </property> *
1496 <cpu> xs:string </cpu>
1497 <memory quantity="xs:integer" units="xs:string"/>
1498 <disk>
1499   <capacity quantity="xs:integer" units="xs:string">
1500   <format> xs:string </format>
1501   <attachmentPoint> xs:string </attachmentPoint>
1502 </disk> *
1503 <operation rel="edit" href="xs:anyURI"/> ?
1504 <operation rel="delete" href="xs:anyURI"/> ?
1505 <xs:any>*
1506 </MachineConfiguration>

```

1507 5.11.3.1 Operations

1508 This entity supports the Read, Update and Delete operations. Create is supported via the Machine
1509 Configuration Collection entity.

1510 5.11.4 Machine Configuration Collection

1511 A Machine Configuration Collection entity represents the collection of Machine Configuration entities
1512 within a Provider. This entity can be used to locate and create Machine Configurations.

Name	MachineConfigurationCollection	
Type URI	http://www.dmtf.org/cimi/MachineConfigurationCollection	
Attribute	Type	Description
machineConfigurations	ref[]	An array of references to the set of Machine Configurations in the Provider. Properties: Mandatory / Mutable

1513 The following describes the serialization of the entity in both JSON and XML:

1514 **JSON media type:** application/CIMI-MachineConfigurationCollection+json

1515 **JSON serialization:**

```

1516 { "self": string,
1517   "name": string, ?
1518   "description": string, ?
1519   "created": string, ?
1520   "properties": { "key": string, + }, ?
1521   "machineConfigurations": [
1522     { "href": string }, +
1523   ], ?
1524   "operations": [
1525     { "rel": "add", "href": string }, ?
1526     { "rel": "edit", "href": string } ?
1527   ] ?
1528   ...
1529 }

```

1530 **XML media type:** application/CIMI-MachineConfigurationCollection+xml

1531 **XML serialization:**

```

1532 <MachineConfigurationCollection xmlns="http://www.dmtf.org/cimi">
1533   <self> xs:anyURI </self>
1534   <name> xs:string </name> ?
1535   <description> xs:string </description> ?
1536   <created> xs:string </created>
1537   <property key="xs:string"> xs:string </property> *
1538   <machineConfiguration href="xs:anyURI"/> *
1539   <operation rel="add" href="xs:anyURI"/> ?
1540   <operation rel="edit" href="xs:anyURI"/> ?
1541   <xs:any>*
1542 </MachineConfigurationCollection>

```

1543 5.11.4.1 Operations

1544 This entity supports the Read and Update operations. Creation of new Machine Configuration entities is
 1545 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

1546 5.11.5 Machine Image

1547 This entity represents the information (e.g. an Open Virtualization Format (OVF) package) necessary for
 1548 hardware virtualized resources to create a Machine Instance; it contains configuration data such as
 1549 startup instructions, including possible combinations of the following:

- 1550 • the software image (i.e. a copy of an installed Machine) which is to be instantiated on the disk
 1551 and other virtual resources
- 1552 • installation software, which, when executed on the hardware (virtual) resources, builds the
 1553 machine instance
- 1554 • both a disk image and a set of software and parameters in order to install new components not
 1555 included in original disk image

Name	MachinelImage	
Type URI	http://www.dmtf.org/cimi/MachinelImage	
Attribute	Type	Description
state	string	<p>Indicates the operational state of the MachinelImage.</p> <p>Allowable values include:</p> <p>CREATING: The MachinelImage is in the process of being created. Allowable action when in this state is: delete.</p> <p>AVAILABLE: The MachinelImage is available and ready for use. Allowable action when in this state is: delete.</p> <p>DELETING: The MachinelImage is in the process of being deleted. Allowable action when in this state is: delete.</p> <p>ERROR: The Provider has detected an error in the MachinelImage. Allowable action when in this state is: delete.</p> <p>Providers may define additional values.</p> <p>This value is read-only and will change based on the state of the</p>

		<p>MachinelImage.</p> <p>Properties: Mandatory / Mutable</p>
imageLocation	ref	<p>A reference to the location of the binary data that makes up this image. Either this attribute or imageData SHALL be present; however both values SHALL NOT be present simultaneously.</p> <p>Properties: Optional / Immutable</p>
imageData	byte[]	<p>The binary data that makes up this image. Either this attribute or imageLocation SHALL be present; however both values SHALL NOT be present simultaneously.</p> <p>Properties: Optional / Immutable</p>

1556 The following describes the serialization of the entity in both JSON and XML:

1557 JSON media type: **application/CIMI-MachinelImage+json**

1558 **JSON serialization:**

```

1559 { "self": string,
1560   "name": string, ?
1561   "description": string, ?
1562   "created": string, ?
1563   "properties": { "key": string, + }, ?
1564   "state": string,
1565   "imageLocation": { "href": string }, ?
1566   "imageData": string, ?
1567   "operations": [
1568     { "rel": "edit", "href": string }, ?
1569     { "rel": "delete", "href": string } ?
1570   ] ?
1571   ...
1572 }
```

1573 **XML media type:** application/CIMI-MachinelImage+xml

1574 **XML serialization:**

```

1575 <MachineImage xmlns="http://www.dmtf.org/cimi">
1576   <self> xs:anyURI </self>
1577   <name> xs:string </name> ?
1578   <description> xs:string </description> ?
1579   <created> xs:string </created>
1580   <property key="xs:string"> xs:string </property> *
1581   <state> xs:string </state>
1582   <imageLocation href="xs:anyURI"/> ?
1583   <imageData> xs:string </imageData> ?
1584   <operation rel="edit" href="xs:anyURI"/> ?
1585   <operation rel="delete" href="xs:anyURI"/> ?
1586   <xs:any>*
1587 </MachineImage>
```

1588 5.11.5.1 Operations

1589 This entity supports the Read, Update and Delete operations. Create is supported via the Machine Image
1590 Collection entity.

1591 When creating a new Machine Image the representation of the new Machine Image may include a
1592 reference in the "imageLocation" attribute. Providers shall inspect this reference (most likely via an HTTP

1593 HEAD) to determine if any special processing is required. This specification defines the following
 1594 additional steps that Providers shall take depending on the type of entity being referenced:

1595 <http://www.dmtf.org/cimi/Machine>

1596 If the "imageLocation" is a reference to a Machine then the Provider shall create a new Machine Image
 1597 based on the Machine being referenced. Upon completion of the create operation the Machine Image's
 1598 "machineImage" attribute shall not reference the Machine (as the Machine might change over time), but
 1599 instead it shall reference the (or contain the data of a) static representation of the Machine.

1600 5.11.6 Machine Image Collection

1601 A Machine Image Collection entity represents the collection of Machine Image entities within a Provider.
 1602 This entity can be used to locate and create Machine Images.

Name	MachineImageCollection	
Type URI	http://www.dmtf.org/cimi/MachineImageCollection	
Attribute	Type	Description
machineImages	ref[]	An array of references to the set of Machine Images in the Provider. Properties: Mandatory / Mutable

1603 The following describes the serialization of the entity in both JSON and XML:

1604 **JSON media type:** application/CIMI-MachineImageCollection+json

1605 **JSON serialization:**

```

1606 { "self": string,
1607   "name": string, ?
1608   "description": string, ?
1609   "created": string, ?
1610   "properties": { "key": string, + }, ?
1611   "machineImages": [
1612     { "href": string }, +
1613   ], ?
1614   "operations": [
1615     { "rel": "add", "href": string }, ?
1616     { "rel": "edit", "href": string } ?
1617   ] ?
1618   ...
1619 }
```

1620 **XML media type:** application/CIMI-MachineImageCollection+xml

1621 **XML serialization:**

```

1622 <MachineImageCollection xmlns="http://www.dmtf.org/cimi">
1623   <self> xs:anyURI </self>
1624   <name> xs:string </name> ?
1625   <description> xs:string </description> ?
1626   <created> xs:string </created>
1627   <property key="xs:string"> xs:string </property> *
1628   <machineImage href="xs:anyURI"/> *
1629   <operation rel="add" href="xs:anyURI"/> ?
1630   <operation rel="edit" href="xs:anyURI"/> ?
1631   <xs:any>*
1632 </MachineImageCollection>
```

1633 **5.11.6.1 Operations**

1634 This entity supports the Read and Update operations. Creation of new Machine Image entities is
 1635 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

1636 **5.11.7 Machine**

1637 An instantiated compute resource that encapsulates both CPU and Memory.

Name	Machine	
Type URI	http://www.dmtf.org/cimi/Machine	
Attribute	Type	Description
state	string	<p>Indicates the operational state of the Machine.</p> <p>Allowable values include:</p> <p>CREATING: The Machine is in the process of being created. Allowable action when in this state is: delete.</p> <p>STARTING: The Machine is in the process of being started. Allowable actions when in this state are: start restart, stop and delete.</p> <p>STARTED: The Machine is available and ready for use. Allowable actions when in this state are: stop, restart, pause, suspend and capture.</p> <p>STOPPING: The Machine is in the process of being stopped. Allowable actions when in this state are: start, restart, stop and delete.</p> <p>STOPPED: This is the virtual equivalent of powering off a physical Machine. There is no saved CPU or memory state. Allowable actions when in this state are: start, restart and capture.</p> <p>PAUSING: The Machine in the process of being PAUSED. Allowable actions when in this state are: start, restart and delete.</p> <p>PAUSED: In this state the Machine and its virtual resources remain instantiated and resources remain allocated - similar to the "STARTED" state, but the Machine and its virtual resources are not enabled to perform tasks. Allowable actions when in this state are: start, restart and capture.</p> <p>SUSPENDING: The Machine is in the process of being suspended. Allowable actions when in this state are: start, restart and delete.</p> <p>SUSPENDED: In this state the Machine and its virtual resources are stored on non-volatile storage. The Machine and its resources are not enabled to perform tasks. Allowable actions when in this state are: start, restart and capture.</p> <p>DELETING: The Machine is in the process of being deleted. Allowable action when in this state is: delete.</p> <p>ERROR: The Provider has detected an error in the Machine. Allowable actions when in this state are: start, restart, stop and delete.</p>

		<p>PAUSED and SUSPENDED stated are optional and Providers may choose to support them or not.</p> <p>Providers may define additional values.</p> <p>This value is read-only and will change based on the state of the Machine.</p> <p>Properties: Mandatory / Mutable</p>												
cpu	TBD	<p>The size of the CPU allocated to this Machine to be used. This should adhere to the standard unit of measurement. For example, a Machine with 4 unit worth of CPU would allow the processes in the Machine to use up to 4 units worth of CPU (and be charged thereof).</p> <p>When this value is increased, it implies that the Machine is allocated more CPU to use, and vice versa when the value is decreased.</p> <p>Properties: Mandatory / Mutable</p>												
memory	structure	<p>The size of the memory (RAM) allocated to this Machine.</p> <p>When this value is increased, it implies that the Machine is allocated more RAM, and vice versa when the value is decreased.</p> <p>This attribute has the following sub-attributes which serve to describe it:</p> <table border="1"> <thead> <tr> <th>Attribute</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>quantity</td> <td>integer</td> <td>A numerical quantity expressed as an integer. Properties: Mandatory / Mutable</td> </tr> <tr> <td>units</td> <td>string</td> <td>An enumerated value that expresses the unit of measurement used. Allowable values are byte, kibibyte, mebibyte, gibibyte, tebibyte, pebibyte, exbibyte, zebibyte, and yobibyte. Properties: Mandatory / Mutable</td> </tr> </tbody> </table> <p>Properties: Mandatory / Mutable</p>	Attribute	Type	Description	quantity	integer	A numerical quantity expressed as an integer. Properties: Mandatory / Mutable	units	string	An enumerated value that expresses the unit of measurement used. Allowable values are byte , kibibyte , mebibyte , gibibyte , tebibyte , pebibyte , exbibyte , zebibyte , and yobibyte . Properties: Mandatory / Mutable			
Attribute	Type	Description												
quantity	integer	A numerical quantity expressed as an integer. Properties: Mandatory / Mutable												
units	string	An enumerated value that expresses the unit of measurement used. Allowable values are byte , kibibyte , mebibyte , gibibyte , tebibyte , pebibyte , exbibyte , zebibyte , and yobibyte . Properties: Mandatory / Mutable												
disks	disk[]	<p>The list of disks (local storages) that are part of the Machine. Adding an element to this list creates a disk.</p> <p>Each disk attribute has the following sub-attributes which describe aspects of the disk:</p> <table border="1"> <thead> <tr> <th>Name</th> <td>disk</td> </tr> <tr> <th>Attribute</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>capacity</td> <td colspan="2">Indicates the initial capacity of the disk described by this attribute. This property has the following, sub-attributes.</td> </tr> <tr> <td></td> <td>Attrib</td> <td>Type</td> <td>Description</td> </tr> </tbody> </table>	Name	disk	Attribute	Type	Description	capacity	Indicates the initial capacity of the disk described by this attribute. This property has the following, sub-attributes.			Attrib	Type	Description
Name	disk													
Attribute	Type	Description												
capacity	Indicates the initial capacity of the disk described by this attribute. This property has the following, sub-attributes.													
	Attrib	Type	Description											

		<table border="1"> <tr> <td colspan="3">ute</td> </tr> <tr> <td>quantity</td> <td>integer</td> <td> A numerical quantity expressed as an integer. Properties: Mandatory / Mutable </td> </tr> <tr> <td>units</td> <td>string</td> <td> An enumerated value that expresses the unit of measurement used. Allowable values are byte, kilobyte, megabyte, gigabyte, terabyte, petabyte, exabyte, zettabyte, and yottabyte. Properties: Mandatory / Mutable </td> </tr> </table> <p>Properties: Mandatory / Mutable</p>	ute			quantity	integer	A numerical quantity expressed as an integer. Properties: Mandatory / Mutable	units	string	An enumerated value that expresses the unit of measurement used. Allowable values are byte , kilobyte , megabyte , gigabyte , terabyte , petabyte , exabyte , zettabyte , and yottabyte . Properties: Mandatory / Mutable						
ute																	
quantity	integer	A numerical quantity expressed as an integer. Properties: Mandatory / Mutable															
units	string	An enumerated value that expresses the unit of measurement used. Allowable values are byte , kilobyte , megabyte , gigabyte , terabyte , petabyte , exabyte , zettabyte , and yottabyte . Properties: Mandatory / Mutable															
		Properties: Optional / Mutable															
volumes	volume[]	<p>The list of networked volumes that are attached to this Machine.</p> <p>Adding a Volume to this list means that the Machine has some access to the data on the Volume. Removing a Volume from this list means that the Machine no longer has access to the data on the Volume.</p> <p>Each volume attribute has the following sub-attributes which describe aspects of the way in which the Machine is attached to the Volume:</p> <table border="1"> <tr> <td>Name</td> <td>volume</td> </tr> </table> <p>See "volume" in "5.11.1 Machine Template" for the definition of this sub-entity.</p> <p>Properties: Optional / Mutable</p>	Name	volume													
Name	volume																
networkInterfaces	networkInterface[]	<p>A list of sub-entities that define the network interfaces on this Machine.</p> <table border="1"> <tr> <td>Name</td> <td colspan="2">networkInterface</td> </tr> <tr> <td>Attribute</td> <td>Type</td> <td>Description</td> </tr> <tr> <td>vsp</td> <td>URI</td> <td> A reference to the VSP (Virtual Switch Port) for this network interface. Properties: Mandatory / Mutable </td> </tr> <tr> <td>hostname</td> <td>string</td> <td> DNS resolvable name associated with this network interface. Properties: Mandatory / Mutable </td> </tr> <tr> <td>macAddress</td> <td>string</td> <td>Address assigned by the hypervisor when a machine is created or a</td> </tr> </table>	Name	networkInterface		Attribute	Type	Description	vsp	URI	A reference to the VSP (Virtual Switch Port) for this network interface. Properties: Mandatory / Mutable	hostname	string	DNS resolvable name associated with this network interface. Properties: Mandatory / Mutable	macAddress	string	Address assigned by the hypervisor when a machine is created or a
Name	networkInterface																
Attribute	Type	Description															
vsp	URI	A reference to the VSP (Virtual Switch Port) for this network interface. Properties: Mandatory / Mutable															
hostname	string	DNS resolvable name associated with this network interface. Properties: Mandatory / Mutable															
macAddress	string	Address assigned by the hypervisor when a machine is created or a															

			unique address can be manually assigned. Properties: Optional / Mutable
		state	string The state of an interface configurable to be "Active" or "Standby". Properties: Mandatory / Mutable
		protocol	string Selected network protocol such as - IPv4 or IPv6. Properties: Mandatory / Mutable
		allocation	string The option for "Dynamic Host Allocation Protocol" or static. Properties: Machine / Mutable
		address	string The IP address assigned to a virtual interface. Properties: Mandatory / Mutable
		defaultGateway	string An IP address to a firewall or router that serves other networks. Properties: Optional / Mutable
		dns	string The IP address of the Domain Name Service from host name to IP resolution. Properties: Optional / Mutable
		maxTransmissionUnit	integer To set the largest supported packet size. Properties: Optional / Mutable
		Properties: Mandatory / Mutable	
meters	ref[]	A list of references to Meters monitored for this Machine. Properties: Optional / Mutable	
eventLog	ref	A reference to the EventLog of this Machine. Properties: Optional / Mutable	

1638 The following describes the serialization of the entity in both JSON and XML:

1639 **JSON media type:** application/CIMI-Machine+json

1640 **JSON serialization:**

```
1641 { "self": string,
1642   "name": string, ?
1643   "description": string, ?
```

```

1644 "created": string, ?
1645 "properties": { "key": string, + }, ?
1646 "state": string,
1647 "cpu": string,
1648 "memory": { "quantity": integer, "units": string },
1649 "disks" : [
1650   { "capacity": { "quantity": integer, "units": string } }, +
1651 ], ?
1652 "volumes" : [
1653   { "volume": { "href": string },
1654     "attachmentPoint": string } +
1655 ], ?
1656 "networkInterfaces": [
1657   { "vsp": { "href": string }, "hostname": string, "macAddress": string,
1658     "state": string, "protocol": string, "allocation": string,
1659     "address": string, "defaultGateway": string, "dns": string,
1660     "maxTransmissionUnit": integer }, +
1661 ], ?
1662 "meters": [
1663   { "href": string }, +
1664 ], ?
1665 "eventLog": { "href": string }, ?
1666 "operations": [
1667   { "rel": "edit", "href": string }, ?
1668   { "rel": "delete", "href": string }, ?
1669   { "rel": "http://www.dmtf.org/cimi/action/start", "href": string }, ?
1670   { "rel": "http://www.dmtf.org/cimi/action/stop", "href": string }, ?
1671   { "rel": "http://www.dmtf.org/cimi/action/restart", "href": string }, ?
1672   { "rel": "http://www.dmtf.org/cimi/action/pause", "href": string }, ?
1673   { "rel": "http://www.dmtf.org/cimi/action/suspend", "href": string } ?
1674 ]
1675 ...
1676 }

```

1677 **XML media type:** application/CIMI-Machine+xml

1678 **XML serialization:**

```

1679 <Machine xmlns="http://www.dmtf.org/cimi">
1680   <self> xs:anyURI </self>
1681   <name> xs:string </name> ?
1682   <description> xs:string </description> ?
1683   <created> xs:string </created>
1684   <property key="xs:string"> xs:string </property> *
1685   <state> xs:string </state>
1686   <cpu> xs:string </cpu>
1687   <memory quantity="xs:integer" units="xs:string"/>
1688   <disk>
1689     <capacity quantity="xs:integer" units="xs:string"/>
1690   </disk> *
1691   <volume href="xs:anyURI" attachmentPoint="xs:string"/> *
1692   <networkInterface>
1693     <vsp href="xs:anyURI"/>
1694     <hostname> xs:string </hostname>
1695     <macAddress> xs:string </macAddress>
1696     <state> xs:string </state>
1697     <protocol> xs:string </protocol>
1698     <allocation> xs:string </allocation>
1699     <address> xs:string </address>
1700     <defaultGateway> xs:string </defaultGateway>
1701     <dns> xs:string </dns>
1702     <maxTransmissionUnit> xs:integer </maxTransmissionUnit>
1703   </networkInterface> *

```

```

1704 <meter href="xs:anyURI"/> *
1705 <eventLog href="xs:anyURI"/> ?
1706 <operation rel="edit" href="xs:anyURI"/> ?
1707 <operation rel="delete" href="xs:anyURI"/> ?
1708 <operation rel="http://www.dmtf.org/cimi/action/start" href="xs:anyURI"/> ?
1709 <operation rel="http://www.dmtf.org/cimi/action/stop" href="xs:anyURI"/> ?
1710 <operation rel="http://www.dmtf.org/cimi/action/restart" href="xs:anyURI"/> ?
1711 <operation rel="http://www.dmtf.org/cimi/action/pause" href="xs:anyURI"/> ?
1712 <operation rel="http://www.dmtf.org/cimi/action/suspend" href="xs:anyURI"/> ?
1713 <operation rel="http://www.dmtf.org/cimi/action/capture" href="xs:anyURI"/> ?
1714 <xs:any>*
1715 </Machine>

```

1716 5.11.7.1 Operations

1717 This entity supports the Read, Update and Delete operations. Create is supported via the Machine
1718 Collection entity.

1719 The following custom operations are also defined:

1720 Starting a Machine

1721 **/link@rel:** http://www.dmtf.org/cimi/action/start

1722 This operation will start a Machine.

1723 Input parameters: None.

1724 Output parameters: None.

1725 During the processing of this operation the Machine shall be in the "STARTING" state.

1726 Upon successful completion of this operation the Machine shall be in the "STARTED" state.

1727 When a Machine is in the "STOPPED" state, starting it is the virtual equivalent of powering on a physical
1728 machine. There is no restored CPU or Memory state, so the guest OS will typically perform it's boot or
1729 installation tasks.

1730 If the Machine was in the "SUSPENDED" or "PAUSED" state, starting it has the effect of resuming it.

1731 • HTTP/REST Protocol

1732 To start a Machine a POST is sent to the "http://www.dmtf.org/cimi/start" URI of the Machine where the
1733 HTTP request body SHALL be as described below.

1734 **JSON media type:** application/CIMI-Action+json

1735 JSON serialization:

```

1736 { "action": "http://www.dmtf.org/cimi/action/start" ,
1737   "properties": { "key": string, + } ?
1738   ...
1739 }

```

1740 **XML media type:** application/CIMI-Action+xml

1741 XML serialization

```

1742 <Action xmlns="http://www.dmtf.org/cimi">
1743   <action> http://www.dmtf.org/cimi/action/start </action>
1744   <property key="xs:string"> xs:string </property> *
1745   <xs:any>*
1746 </Action>

```

1747 Upon successful processing of the request, the HTTP response body will be empty.

1748 **Stopping a Machine**

1749 **/link@rel:** http://www.dmtf.org/cimi/action/stop

1750 This operation will stop, or shutdown, a Machine.

1751 Input parameters: None.

1752 Output parameters: None.

1753 During the processing of this operation the Machine shall be in the "STOPPING" state.

1754 Upon successful completion of this operation the Machine will be in the "STOPPED" state. Stopping a
 1755 machine is the virtual equivalent of powering off a physical machine. There is no saved CPU or Memory
 1756 state.

1757 • **HTTP/REST Protocol**

1758 To stop a Machine a POST is sent to the "http://www.dmtf.org/cimi/stop" URI of the Machine where the
 1759 HTTP request body SHALL be as described below.

1760 **JSON media type:** application/CIMI-Action+json

1761 **JSON serialization:**

```
1762 { "action": "http://www.dmtf.org/cimi/action/stop" ,
1763   "properties": { "key": string, + } ?
1764   ...
1765 }
```

1766 **XML media type:** application/CIMI-Action+xml

1767 **XML serialization**

```
1768 <Action xmlns="http://www.dmtf.org/cimi">
1769   <action> http://www.dmtf.org/cimi/action/stop </action>
1770   <property key="xs:string"> xs:string </property> *
1771   <xs:any>*
1772 </Action>
```

1773 Upon successful processing of the request, the HTTP response body will be empty.

1774 **Restarting a Machine**

1775 **/link@rel:** http://www.dmtf.org/cimi/action/restart

1776 This operation will restart a Machine. If the Machine is in the "STARTED" state then this operation will
 1777 have the semantic effect of executing the "stop" and then "start" operations. If the Machine is in the
 1778 "STOPPED" state then this operation will have the semantic effect of executing the "start" operation.

1779 Input parameters: None.

1780 Output parameters: None.

1781 During the processing of this operation the Machine shall be in the "STOPPING" and/or "STARTING"
 1782 states as appropriate depending on its initial state.

1783 Upon successful completion of this operation the Machine will be in the "STARTED" state. Restarting a
 1784 machine is the virtual equivalent of powering off, then on a physical machine. There is no restored CPU
 1785 or Memory state, so the guest OS will typically perform it's boot or installation tasks.

1786 • **HTTP/REST Protocol**

1787 To restart a Machine a POST is sent to the "http://www.dmtf.org/cimi/restart" URI of the Machine where
1788 the HTTP request body SHALL be as described below.

1789 **JSON media type:** application/CIMI-Action+json

1790 **JSON serialization:**

```
1791 { "action": "http://www.dmtf.org/cimi/action/restart" ,
1792   "properties": { "key": string, + } ?
1793   ...
1794 }
```

1795 **XML media type:** application/CIMI-Action+xml

1796 **XML serialization**

```
1797 <Action xmlns="http://www.dmtf.org/cimi">
1798   <action> http://www.dmtf.org/cimi/action/restart </action>
1799   <property key="xs:string"> xs:string </property> *
1800   <xs:any>*
1801 </Action>
```

1802 Upon successful processing of the request, the HTTP response body will be empty.

1803 **Pausing a Machine**

1804 **/link@rel:** http://www.dmtf.org/cimi/action/pause

1805 This operation will pause a Machine.

1806 Input parameters: None.

1807 Output parameters: None.

1808 During the processing of this operation the Machine shall be in the "PAUSING" state.

1809 Upon successful completion of this operation the Machine will be in the "PAUSED" state. Pausing a
1810 machine will keep the Machine and its resources instantiated but the Machine will not be available to
1811 perform any tasks. The current state of the CPU and Memory will be retained in volatile memory.

1812 • **HTTP/REST Protocol**

1813 To pause a Machine a POST is sent to the "http://www.dmtf.org/cimi/pause" URI of the Machine where
1814 the HTTP request body SHALL be as described below.

1815 **JSON media type:** application/CIMI-Action+json

1816 **JSON serialization:**

```
1817 { "action": "http://www.dmtf.org/cimi/action/pause" ,
1818   "properties": { "name": string, + } ?
1819   ...
1820 }
```

1821 **XML media type:** application/CIMI-Action+xml

1822 **XML serialization**

```
1823 <Action xmlns="http://www.dmtf.org/cimi">
1824   <action> http://www.dmtf.org/cimi/action/pause </action>
1825   <property name="xs:string"> xs:string </property> *
```

```
1826     <xs:any>*
1827     </Action>
```

1828 Upon successful processing of the request, the HTTP response body will be empty.

1829 **Suspending a Machine**

1830 **/link@rel:** http://www.dmtf.org/cimi/action/suspend

1831 This operation will suspend a Machine.

1832 Input parameters: None.

1833 Output parameters: None.

1834 During the processing of this operation the Machine shall be in the "SUSPENDING" state.

1835 Upon successful completion of this operation the Machine will be in the "SUSPENDED" state.

1836 Suspending a machine will keep the Machine and its resources instantiated but the Machine will not be
1837 available to perform any tasks. The current state of the CPU and Memory will be retained in non-volatile
1838 memory.

- 1839 **HTTP/REST Protocol**

1840 To pause a Machine a POST is sent to the "http://www.dmtf.org/cimi/suspend" URI of the Machine where
1841 the HTTP request body SHALL be as described below.

1842 **JSON media type:** application/CIMI-Action+json

1843 **JSON serialization:**

```
1844     { "action": "http://www.dmtf.org/cimi/action/suspend" ,
1845       "properties": { "name": string, + } ?
1846       ...
1847     }
```

1848 **XML media type:** application/CIMI-Action+xml

1849 **XML serialization**

```
1850     <Action xmlns="http://www.dmtf.org/cimi">
1851       <action> http://www.dmtf.org/cimi/action/suspend </action>
1852       <property name="xs:string"> xs:string </property> *
1853       <xs:any>*
1854     </Action>
```

1855 Upon successful processing of the request, the HTTP response body will be empty.

1856 **Capturing a Machine**

1857 **/link@rel:** http://www.dmtf.org/cimi/action/capture

1858 This operation will create a new Machine Image from an existing Machine. This operation follows the
1859 definition as defined by the creating a new Machine Image operation - see 5.11.5.1 for more details.

1860 **5.11.8 Machine Collection**

1861 A Machine Collection resource represents the collection of Machine entities within a Provider. This
1862 resource can be used to locate and create Machines.

Name	MachineCollection
------	-------------------

Type URI	http://www.dmtf.org/cimi/MachineCollection	
Attribute	Type	Description
machines	ref[]	An array of references to the set of Machines in the Provider. Properties: Mandatory / Mutable

1863 The following describes the serialization of the entity in both JSON and XML:

1864 **JSON media type:** application/CIMI-MachineCollection+json

1865 **JSON serialization:**

```
1866 { "self": string,
1867   "name": string, ?
1868   "description": string, ?
1869   "created": string, ?
1870   "properties": { "key": string, + }, ?
1871   "machines": [
1872     { "href": string }, +
1873   ], ?
1874   "operations": [
1875     { "rel": "add", "href": string }, ?
1876     { "rel": "edit", "href": string } ?
1877   ] ?
1878   ...
1879 }
```

1880 **XML media type:** application/CIMI-MachineCollection+xml

1881 **XML serialization:**

```
1882 <MachineCollection xmlns="http://www.dmtf.org/cimi">
1883   <self> xs:anyURI </self>
1884   <name> xs:string </name> ?
1885   <description> xs:string </description> ?
1886   <created> xs:string </created>
1887   <property key="xs:string"> xs:string </property> *
1888   <machine href="xs:anyURI"/> *
1889   <operation rel="add" href="xs:anyURI"/> ?
1890   <operation rel="edit" href="xs:anyURI"/> ?
1891   <xs:any>*
1892 </MachineCollection>
```

1893 5.11.8.1 Operations

1894 This entity supports the Read and Update operations.

1895 The following custom operations are also defined:

- 1896 **Creating a New Machine**

1897 **/link@rel:** add

1898 This operation will create a new Machine.

1899 Input parameters: Either a reference to a Machine Template or a Machine Template itself.

1900 Output parameters: A reference to a new Machine and optionally the representation of the Machine.

- 1901 **HTTP/REST Protocol**

1902 To create a new Machine a POST is sent to the "add" URI of the MachineCollection where the HTTP
 1903 request body SHALL be as described below. Note this structure allows for certain properties to be passed
 1904 in "by value" or by "reference". The definition of each property can be found in section 5.11.1.

1905 **JSON media type:** application/CIMI-MachineCreate+json

1906 **JSON serialization:**

```

1907 { "name": string, ?
1908   "description": string, ?
1909   "properties": { "key": string, + }, ?
1910   "machineTemplate": { "href": string, ?
1911     "properties": { "key": string, + }, ?
1912     "machineConfig": { "href": string, ?
1913       "properties": { "key": string, + }, ?
1914       "cpu": string, ?
1915       "memory": { "quantity": integer, "units": string }, ?
1916       "disks": [
1917         { "capacity": { "quantity": integer, "units": string },
1918           "guestInterface": string }, +
1919       ] ?
1920     },
1921     "machineImage": { "href": string,
1922       "properties": { "key": string, + }, ?
1923       "imageLocation": { "href": string }, ?
1924       "imageData": string, ?
1925     }, ?
1926     "machineAdmin": { "href": string, ?
1927       <provider specific data> ?
1928     }, ?
1929     "volumes": [
1930       { "href": string, "attachmentPoint": string }, +
1931     ], ?
1932     "volumeTemplates": [
1933       { "href": string, ?
1934         "properties": { "key": string, + }, ?
1935         "attachmentPoint": string,
1936         "volumeConfig": { "href": string, ?
1937           "properties": { "key": string, + }, ?
1938           "format": string, ?
1939           "capacity": { "quantity": number, "units": string }, ?
1940           "supportsSnapshots": boolean, ?
1941           "guestInterface": string ?
1942         }, ?
1943         "volumeImage": { "href": string,
1944           "properties": { "key": string, + }, ?
1945           "imageLocation": { "href": string }, ?
1946           "imageData": string, ?
1947           "bootable": boolean ?
1948         } ?
1949       }, +
1950     ],
1951     "networkInterfaces": [
1952       { "vsp": { "href": string }, "hostname": string, "macAddress": string,
1953         "state": string, "protocol": string, "allocation": string,
1954         "address": string, "defaultGateway": string, "dns": string,
1955         "maxTransmissionUnit": integer }, +
1956     ] ?
1957   }
1958   ...
1959 }

```

1960 **XML media type:** application/CIMI-MachineCreate+xml

1961 **XML serialization**

```

1962 <MachineCreate>
1963   <name> xs:string </name> ?
1964   <description> xs:string </description> ?
1965   <property key="xs:string"> xs:string </property> *
1966
1967   <machineTemplate href="xs:anyURI"? >
1968     <property key="xs:string"> xs:string </property> *
1969     <machineConfig href="xs:anyURI"? >
1970       <property key="xs:string"> xs:string </property> *
1971       <cpu> xs:string </cpu> ?
1972       <memory quantity="xs:integer" units="xs:string"/>
1973       <disk>
1974         <capacity quantity="xs:integer" units="xs:string">
1975           <guestInterface> xs:string </guestInterface>
1976         </disk> *
1977     </machineConfig>
1978     <machineImage href="xs:anyURI">
1979       <property key="xs:string"> xs:string </property> *
1980       <imageLocation href="xs:anyURI"/> ?
1981       <imageData> xs:string </imageData> ?
1982     </machineImage>
1983     <machineAdmin href="xs:anyURI"? >
1984       xs:any* <!-- provider specific data -->
1985     </machineAdmin> ?
1986     <volume href="xs:anyURI" attachmentPoint="xs:string"/> *
1987     <volumeTemplate href="xs:anyURI"? attachmentPoint="xs:string" >
1988       <property key="xs:string"> xs:string </property> *
1989       <volumeConfig href="xs:anyURI">
1990         <property key="xs:string"> xs:string </property> *
1991         <format> xs:string </format> ?
1992         <capacity quantity="xs:integer" units="xs:string"/> ?
1993         <supportsSnapshots> xs:boolean </supportsSnapshots> ?
1994         <guestInterface> xs:string </guestInterface> ?
1995       </volumeConfig>
1996       <volumeImage href="xs:anyURI">
1997         <property key="xs:string"> xs:string </property> *
1998         <imageLocation href="xs:anyURI"/> ?
1999         <imageData> xs:any* </imageData> ?
2000         <bootable> xs:boolean </bootable> ?
2001       </volumeImage> ?
2002     </volumeTemplate> *
2003     <networkInterface>
2004       <vsp href="xs:anyURI"/>
2005       <hostname> xs:string </hostname>
2006       <macAddress> xs:string </macAddress>
2007       <state> xs:string </state>
2008       <protocol> xs:string </protocol>
2009       <allocation> xs:string </allocation>
2010       <address> xs:string </address>
2011       <defaultGateway> xs:string </defaultGateway>
2012       <dns> xs:string </dns>
2013       <maxTransmissionUnit> xs:integer </maxTransmissionUnit>
2014     </networkInterface> *
2015   </machineTemplate>
2016
2017   <xs:any>*
2018
2019 </MachineCreate>

```

2020 The serialization of some reference properties are specified such that a request MAY either include a
 2021 reference ("href") to an existing entity or to include the entity "inline" as a set of additional properties.
 2022 Requests SHALL NOT include both a reference and the inlined set of properties.

2023 Upon successful processing of the request, the HTTP response body MAY either be empty or contain a
 2024 serialization of the Machine entity.

2025 **5.11.9 Machine Admin Template**

2026 This entity captures the configuration values for realizing a MachineAdmin. A Machine Admin Template
 2027 may be used to create multiple MachineAdmins.

Name	MachineAdminTemplate	
Type URI	http://www.dmtf.org/cimi/MachineAdminTemplate	
Attribute	Type	Description

2028 The following describes the serialization of the entity in both JSON and XML:

2029 **JSON media type:** application/CIMI-MachineAdminTemplate+json

2030 **JSON serialization:**

```

2031 { "self": string,
2032   "name": string, ?
2033   "description": string, ?
2034   "created": string, ?
2035   "properties": { "key": string, + }, ?
2036   ...
2037   "operations": [
2038     { "rel": "edit", "href": string }, ?
2039     { "rel": "delete", "href": string } ?
2040   ] ?
2041   ...
2042 }
```

2043 **XML media type:** application/CIMI-MachineAdminTemplate+xml

2044 **XML serialization:**

```

2045 <MachineAdminTemplate xmlns="http://www.dmtf.org/cimi">
2046   <self> xs:anyURI </self>
2047   <name> xs:string </name> ?
2048   <description> xs:string </description> ?
2049   <created> xs:string </created>
2050   <property key="xs:string"> xs:string </property> *
2051   ...
2052   <operation rel="edit" href="xs:anyURI"/> ?
2053   <operation rel="delete" href="xs:anyURI"/> ?
2054   <xs:any>*
2055 </MachineAdminTemplate>
```

2056 **5.11.9.1 Operations**

2057 This entity supports the Read, Update and Delete operations. Create is supported via the Machine Admin
 2058 Template Collection entity.

2059 5.11.10 Machine Admin Template Collection

2060 A Machine Admin Template Collection entity represents the collection of Machine AdminTemplate entities
2061 within a Provider. This entity can be used to locate and create Machine Admin Templates.

Name	MachineAdminTemplateCollection	
Type URI	http://www.dmtf.org/cimi/MachineAdminTemplateCollection	
Attribute	Type	Description
machineAdminTemplates	ref[]	An array of references to the set of Machine Admin Templates in the Provider. Properties: Mandatory / Mutable

2062 The following describes the serialization of the entity in both JSON and XML:

2063 **JSON media type:** application/CIMI-MachineAdminTemplateCollection+json

2064 **JSON serialization:**

```
2065 { "self": string,
2066   "name": string, ?
2067   "description": string, ?
2068   "created": string, ?
2069   "properties": { "key": string, + }, ?
2070   "machineAdminTemplates": [
2071     { "href": string }, +
2072   ], ?
2073   "operations": [
2074     { "rel": "add", "href": string }, ?
2075     { "rel": "edit", "href": string } ?
2076   ] ?
2077   ...
2078 }
```

2079 **XML media type:** application/CIMI-VolumeTemplateCollection+xml

2080 **XML serialization:**

```
2081 <MachineAdminTemplateCollection xmlns="http://www.dmtf.org/cimi">
2082   <self> xs:anyURI </self>
2083   <name> xs:string </name> ?
2084   <description> xs:string </description> ?
2085   <created> xs:string </created>
2086   <property key="xs:string"> xs:string </property> *
2087   <machineAdminTemplate href="xs:anyURI"/> *
2088   <operation rel="add" href="xs:anyURI"/> ?
2089   <operation rel="edit" href="xs:anyURI"/> ?
2090   <xs:any>*
2091 </MachineAdminTemplateCollection>
```

2092 5.11.10.1 Operations

2093 This entity supports the Read and Update operations. Creation of new Machine Template entities is
2094 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

2095 5.11.11 Machine Admin

2096 A Machine Admin entity contains the information required to create the initial administrative super- user of
2097 a newly created Machine. Due to the variation between operating systems and Providers, this

2098 specification does not mandate one particular set of attributes that all implementations need to support.
 2099 However, Providers are expected to extend this entity with additional attributes to meet their
 2100 requirements.

2101 For example, a Provider might extend this entity with username and password attributes, which would
 2102 then be the login information for new Machines. These extension attributes would appear as siblings to
 2103 the common attributes like 'name' and 'description'.

Name	MachineAdmin	
Type URI	http://www.dmtf.org/cimi/MachineAdmin	
Attribute	Type	Description

2104 Some common extension attributes that Providers might use include:

2105 **UserName/Password:**

Attribute	Type	Description
userName	string	The initial superuser's user name. Properties: Mandatory / Mutable
password	string	Initial superuser's password. Properties: Mandatory / Mutable

2106 **Public Key:**

Attribute	Type	Description
key	byte[]	The digit of the public key for the initial superuser. Properties: Mandatory / Mutable

2107 **JSON media type:** application/CIMI-MachineAdmin+json

2108 **JSON serialization:**

```
2109 { "self": string,
2110   "name": string, ?
2111   "description": string, ?
2112   "created": string, ?
2113   "properties": { "key": string, + }, ?
2114   "operations": [
2115     { "rel": "edit", "href": string } ?
2116     { "rel": "delete", "href": string } ?
2117   ] ?
2118   ...
2119 }
```

2120 **XML media type:** application/CIMI-MachineAdmin+xml

2121 **XML serialization:**

```
2122 <MachineAdmin xmlns="http://www.dmtf.org/cimi">
2123   <self> xs:anyURI </self>
```



```

2124     <name> xs:string </name> ?
2125     <description> xs:string </description> ?
2126     <created> xs:string </created>
2127     <property key="xs:string"> xs:string </property> *
2128     <operation rel="edit" href="xs:anyURI"/> ?
2129     <operation rel="delete" href="xs:anyURI"/> ?
2130     <xs:any>*
2131 </MachineAdmin>

```

2132 5.11.11.1 Operations

2133 This entity supports the Read, Update and Delete operations. Create is supported via the Machine Admin
2134 Collection entity.

2135 5.11.12 Machine Admin Collection

2136 A Machine Admin Collection entity represents the collection of Machine Admin entities within a Provider.
2137 This entity can be used to locate and create MachineAdmins.

Name	MachineAdminCollection	
Type URI	http://www.dmtf.org/cimi/MachineAdminCollection	
Attribute	Type	Description
machineAdmins	ref[]	An array of references to the set of Machine Admins in the provider. Properties: Mandatory / Mutable

2138 The following describes the serialization of the entity in both JSON and XML:

2139 **JSON media type:** application/CIMI-MachineAdminCollection+json

2140 **JSON serialization:**

```

2141 { "self": string,
2142   "name": string, ?
2143   "description": string, ?
2144   "created": string, ?
2145   "properties": { "key": string, + }, ?
2146   "machineAdmins": [
2147     { "href": string }, +
2148   ], ?
2149   "operations": [
2150     { "rel": "add", "href": string }, ?
2151     { "rel": "edit", "href": string } ?
2152   ] ?
2153   ...
2154 }

```

2155 **XML media type:** application/CIMI-MachineAdminCollection+xml

2156 **XML serialization:**

```

2157 <MachineAdminCollection xmlns="http://www.dmtf.org/cimi">
2158   <self> xs:anyURI </self>
2159   <name> xs:string </name> ?
2160   <description> xs:string </description> ?
2161   <created> xs:string </created>
2162   <property key="xs:string"> xs:string </property> *
2163   <machineAdmin href="xs:anyURI"/> *
2164   <operation rel="add" href="xs:anyURI"/> ?

```

```

2165     <operation rel="edit" href="xs:anyURI"/> ?
2166     <xs:any>*
2167 </MachineAdminCollection>

```

2168 5.11.12.1 Operations

2169 This entity supports the Read and Update operations.

2170 The following custom operations are also defined:

- 2171 • **Creating a New Machine Admin**

2172 **/link@rel:** add

2173 This operation will create a new Machine Admin.

2174 Input parameters: Either a reference to a Machine Admin Template or a Machine Admin Template itself.

2175 Output parameters: A reference to a new Machine Admin and optionally the representation of the
2176 Machine Admin.

- 2177 • **HTTP/REST Protocol**

2178 To create a new Machine Admin a POST is sent to the "add" URI of the MachineAdminCollection where
2179 the HTTP request body SHALL be as described below. Note this structure allows for certain properties to
2180 be passed in "by value" or by "reference". The definition of each property can be found in section 5.11.9.

2181 **JSON media type:** application/CIMI-MachineAdminCreate+json

2182 **JSON serialization:**

```

2183 { "name": string, ?
2184   "description": string, ?
2185   "properties": { "key": string, + }, ?
2186   "machineAdminTemplate": { "href": string, ?
2187     "properties": { "key": string, + }, ?
2188     ...
2189   }
2190   ...
2191 }

```

2192 **XML media type:** application/CIMI-MachineAdminCreate+xml

2193 **XML serialization**

```

2194 <MachineAdminCreate>
2195   <name> xs:string </name> ?
2196   <description> xs:string </description> ?
2197   <property key="xs:string"> xs:string </property> *
2198
2199   <machineAdminTemplate href="xs:anyURI"? >
2200     <property key="xs:string"> xs:string </property> *
2201     ...
2202   </machineAdminTemplate>
2203
2204   <xs:any>*
2205
2206 </MachineAdminCreate>

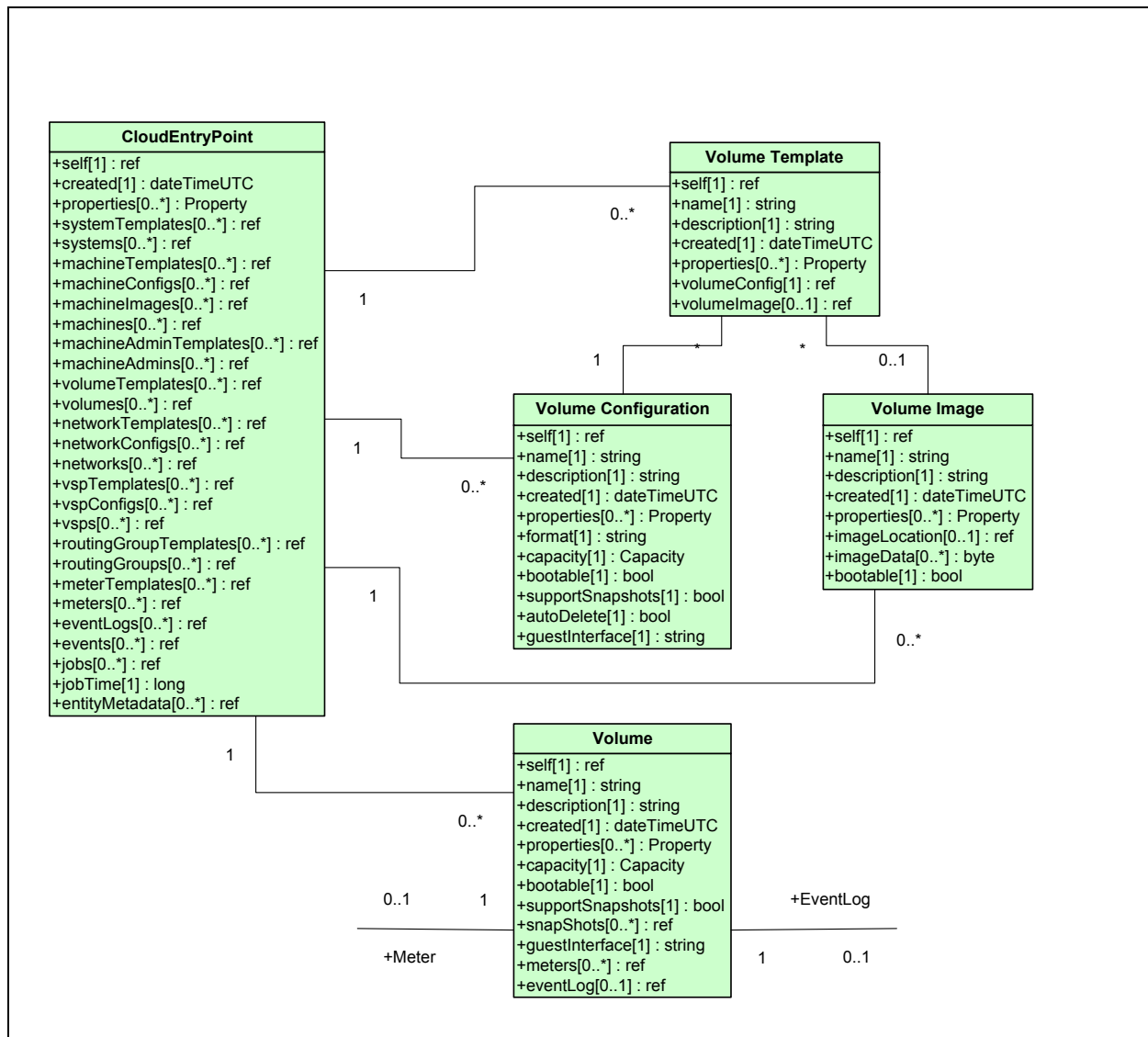
```

2207 The serialization of some reference properties are specified such that a request MAY either include a
2208 reference ("href") to an existing entity or to include the entity "inline" as a set of additional properties.
2209 Requests SHALL NOT include both a reference and the inlined set of properties.

2210 Upon successful processing of the request, the HTTP response body MAY either be empty or contain a
 2211 serialization of the MachineAdmin entity.

2212 **5.12 Volume Entities and Relationships**

2213 The following diagram illustrates the entities involved in constructing a Volume and their relationships.
 2214 Although this drawing is in the style of an Entity Relationship diagram, the use of UML is neither rigorous
 2215 nor normative.



2216
 2217 **Figure 3 - Volume Entities**

2218 **5.12.1 Volume Template**

2219 This entity captures the configuration values for realizing a Volume. A Volume Template may be used to
 2220 create multiple Volumes.

Name	VolumeTemplate
Type URI	http://www.dmtf.org/cimi/VolumeTemplate

Attribute	Type	Description
volumeConfig	ref	A reference to the Volume Configuration that will be used to create a Volume from this Volume Template. Properties: Mandatory / Mutable
volumeImage	ref	A reference to the Volume Image that will be used to create a Volume from this Volume Template. Properties: Optional / Mutable

2221 The following describes the serialization of the entity in both JSON and XML:

2222 **JSON media type:** application/CIMI-VolumeTemplate+json

2223 **JSON serialization:**

```

2224 { "self": string,
2225   "name": string, ?
2226   "description": string, ?
2227   "created": string, ?
2228   "properties": { "key": string, + }, ?
2229   "volumeConfig": { "href": string },
2230   "volumeImage": { "href": string },
2231   "operations": [
2232     { "rel": "edit", "href": string }, ?
2233     { "rel": "delete", "href": string } ?
2234   ] ?
2235   ...
2236 }
```

2237 **XML media type:** application/CIMI-VolumeTemplate+xml

2238 **XML serialization:**

```

2239 <VolumeTemplate xmlns="http://www.dmtf.org/cimi">
2240   <self> xs:anyURI </self>
2241   <name> xs:string </name> ?
2242   <description> xs:string </description> ?
2243   <created> xs:string </created>
2244   <property key="xs:string"> xs:string </property> *
2245   <volumeConfig href="xs:anyURI"/>
2246   <volumeImage href="xs:anyURI"/>
2247   <operation rel="edit" href="xs:anyURI"/> ?
2248   <operation rel="delete" href="xs:anyURI"/> ?
2249   <xs:any*>
2250 </VolumeTemplate>
```

2251 **5.12.1.1 Operations**

2252 This entity supports the Read, Update and Delete operations. Create is supported via the Volume
 2253 Template Collection entity.

2254 **5.12.2 Volume Template Collection**

2255 A Volume Template Collection entity represents the collection of VolumeTemplate entities within a
 2256 Provider. This entity can be used to locate and create Volume Templates.

Name	VolumeTemplateCollection
-------------	--------------------------

Type URI	http://www.dmtf.org/cimi/VolumeTemplateCollection	
Attribute	Type	Description
volumeTemplates	ref[]	An array of references to the set of Volume Templates in the Provider. Properties: Mandatory / Mutable

2257 The following describes the serialization of the entity in both JSON and XML:

2258 **JSON media type:** application/CIMI-VolumeTemplateCollection+json

2259 **JSON serialization:**

```

2260 { "self": string,
2261   "name": string, ?
2262   "description": string, ?
2263   "created": string, ?
2264   "properties": { "key": string, + }, ?
2265   "volumeTemplates": [
2266     { "href": string }, +
2267   ], ?
2268   "operations": [
2269     { "rel": "add", "href": string }, ?
2270     { "rel": "edit", "href": string } ?
2271   ] ?
2272   ...
2273 }
```

2274 **XML media type:** application/CIMI-VolumeTemplateCollection+xml

2275 **XML serialization:**

```

2276 <VolumeTemplateCollection xmlns="http://www.dmtf.org/cimi">
2277   <self> xs:anyURI </self>
2278   <name> xs:string </name> ?
2279   <description> xs:string </description> ?
2280   <created> xs:string </created>
2281   <property key="xs:string"> xs:string </property> *
2282   <volumeTemplate href="xs:anyURI"/> *
2283   <operation rel="add" href="xs:anyURI"/> ?
2284   <operation rel="edit" href="xs:anyURI"/> ?
2285   <xs:any>*
2286 </VolumeTemplateCollection>
```

2287 5.12.2.1 Operations

2288 This entity supports the Read and Update operations. Creation of new Volume Template entities is
2289 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

2290 5.12.3 Volume Configuration

2291 The Volume Configuration entity represents the set of configuration values needed to create a Volume
2292 with certain characteristics. Volume Configurations are created by Providers and MAY, at the Providers
2293 discretion, be created by Consumers.

Name	VolumeConfiguration
Type URI	http://www.dmtf.org/cimi/VolumeConfiguration

Attribute	Type	Description									
format	String	The format of the file system that will be placed on Volumes created from this configuration. This attribute is only meaningful for Volume Configurations that describe block devices. This attribute is optional; the absence of this attribute indicates that Volumes created from this configuration will not be formatted with a file system. Example values: "ext4", "ntfs". Properties: Mandatory / Mutable									
capacity	structure	The default size, when limited, of the Volume created from this Volume Configuration. This attribute has the following, sub-attributes. <table border="1"> <thead> <tr> <th>Attribute</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>quantity</td> <td>integer</td> <td>A numerical quantity expressed as an integer. Properties: Mandatory / Mutable</td> </tr> <tr> <td>units</td> <td>String</td> <td>An enumerated value that expresses the unit of measurement used. Allowable values are byte, kilobyte, megabyte, gigabyte, terabyte, petabyte, exabyte, zettabyte, and yottabyte. Properties: Mandatory / Mutable</td> </tr> </tbody> </table> Properties: Mandatory / Mutable	Attribute	Type	Description	quantity	integer	A numerical quantity expressed as an integer. Properties: Mandatory / Mutable	units	String	An enumerated value that expresses the unit of measurement used. Allowable values are byte, kilobyte, megabyte, gigabyte, terabyte, petabyte, exabyte, zettabyte, and yottabyte. Properties: Mandatory / Mutable
Attribute	Type	Description									
quantity	integer	A numerical quantity expressed as an integer. Properties: Mandatory / Mutable									
units	String	An enumerated value that expresses the unit of measurement used. Allowable values are byte, kilobyte, megabyte, gigabyte, terabyte, petabyte, exabyte, zettabyte, and yottabyte. Properties: Mandatory / Mutable									
supportsSnapshots	boolean	This property indicates whether Volumes created from this Volume Configuration will support the ability to take snapshots. Properties: Mandatory / Mutable									
guestInterface	String	This property indicates the interface that will be offered to a Machine instances by Volumes created from this Volume Configuration. Properties: Mandatory / Mutable									

2294 The following describes the serialization of the entity in both JSON and XML:

2295 **JSON media type:** application/CIMI-VolumeConfiguration+json

2296 **JSON serialization:**

```

2297 { "self": string,
2298   "name": string, ?
2299   "description": string, ?
2300   "created": string, ?
2301   "properties": { "key": string, + }, ?
2302   "format": string,
2303   "capacity": { "quantity": number, "units": string },
2304   "supportsSnapshots": boolean,
2305   "guestInterface": string,
2306   "operations": [
2307     { "rel": "edit", "href": string }, ?

```

```

2308     { "rel": "delete", "href": string } ?
2309   ] ?
2310   ...
2311 }

```

2312 **XML media type:** application/CIMI-VolumeConfiguration+xml

2313 **XML serialization:**

```

2314 <VolumeConfiguration xmlns="http://www.dmtf.org/cimi">
2315   <self> xs:anyURI </self>
2316   <name> xs:string </name> ?
2317   <description> xs:string </description> ?
2318   <created> xs:string </created>
2319   <property key="xs:string"> xs:string </property> *
2320   <format> xs:string </format>
2321   <capacity quantity="xs:integer" units="xs:string"/>
2322   <supportsSnapshots> xs:boolean </supportsSnapshots>
2323   <guestInterface> xs:string </guestInterface>
2324   <operation rel="edit" href="xs:anyURI"/> ?
2325   <operation rel="delete" href="xs:anyURI"/> ?
2326   <xs:any*>
2327 </VolumeConfiguration>

```

2328 5.12.3.1 Operations

2329 This entity supports the Read, Update and Delete operations. Create is supported via the Volume
2330 Configuration Collection entity.

2331 5.12.4 Volume Configuration Collection

2332 A Volume Configuration Collection entity represents the collection of Volume Configuration entities within
2333 a Provider. This entity can be used to locate and create Volume Configurations.

Name	VolumeConfigurationCollection	
Type URI	http://www.dmtf.org/cimi/VolumeConfigurationCollection	
Attribute	Type	Description
volumeConfigurations	ref[]	An array of references to the set of Volume Configurations in the Provider. Properties: Mandatory / Mutable

2334 The following describes the serialization of the entity in both JSON and XML:

2335 **JSON media type:** application/CIMI-VolumeConfigurationCollection+json

2336 **JSON serialization:**

```

2337 { "self": string,
2338   "name": string, ?
2339   "description": string, ?
2340   "created": string, ?
2341   "properties": { "key": string, + }, ?
2342   "volumeConfigurations": [
2343     { "href": string }, +
2344   ], ?
2345   "operations": [
2346     { "rel": "add", "href": string }, ?
2347     { "rel": "edit", "href": string } ?

```

```

2348     ] ?
2349     ...
2350 }
    
```

2351 **XML media type:** application/CIMI-VolumeConfigurationCollection+xml

2352 **XML serialization:**

```

2353 <VolumeConfigurationCollection xmlns="http://www.dmtf.org/cimi">
2354   <self> xs:anyURI </self>
2355   <name> xs:string </name> ?
2356   <description> xs:string </description> ?
2357   <created> xs:string </created>
2358   <property key="xs:string"> xs:string </property> *
2359   <volumeConfiguration href="xs:anyURI"/> *
2360   <operation rel="add" href="xs:anyURI"/> ?
2361   <operation rel="edit" href="xs:anyURI"/> ?
2362   <xs:any>*
2363 </VolumeConfigurationCollection>
    
```

2364 **5.12.4.1 Operations**

2365 This entity supports the Read and Update operations. Creation of new Volume Image entities is
 2366 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

2367 **5.12.5 Volume Image**

2368 This entity represents an image that could be place on a pre-loaded volume.

Name	VolumelImage	
Type URI	http://www.dmtf.org/cimi/VolumelImage	
Attribute	Type	Description
state	string	<p>Indicates the operational state of the VolumelImage.</p> <p>Allowable values include:</p> <p>CREATING: The VolumelImage is in the process of being created. Allowable action when in this state is: delete.</p> <p>AVAILABLE: The VolumelImage is available and ready for use. Allowable action when in this state is: delete.</p> <p>DELETING: The VolumelImage is in the process of being deleted. Allowable action when in this state is: delete.</p> <p>ERROR: The Provider has detected an error in the VolumelImage. Allowable action when in this state is: delete.</p> <p>Providers may define additional values.</p> <p>This value is read-only and will change based on the state of the VolumelImage.</p> <p>Properties: Mandatory / Mutable</p>
imageLocation	ref	A reference to the location of the binary data that makes up this image. Either this attribute or imageData SHALL be present; however, both values

		SHALL NOT be present simultaneously. Properties: Optional / Immutable
imageData	byte[]	The binary data that makes up this image. Either this attribute or imageLocation SHALL be present; however, both values SHALL NOT be present simultaneously. Properties: Optional / Immutable
bootable	boolean	This property indicates whether Volumes created from this Volume Configuration will be bootable. Properties: Mandatory / Mutable

2369 The following describes the serialization of the entity in both JSON and XML:

2370 **JSON media type:** application/CIMI-VolumeImage+json

2371 **JSON serialization:**

```

2372 { "self": string,
2373   "name": string, ?
2374   "description": string, ?
2375   "created": string, ?
2376   "properties": { "key": string, + }, ?
2377   "state": string,
2378   "imageLocation": { "href": string }, ?
2379   "imageData": string, ?
2380   "bootable": boolean,
2381   "operations": [
2382     { "rel": "edit", "href": string }, ?
2383     { "rel": "delete", "href": string } ?
2384   ] ?
2385   ...
2386 }
```

2387 **XML media type:** application/CIMI-VolumeImage+xml

2388 **XML serialization:**

```

2389 <VolumeImage xmlns="http://www.dmtf.org/cimi">
2390   <self> xs:anyURI </self>
2391   <name> xs:string </name> ?
2392   <description> xs:string </description> ?
2393   <created> xs:string </created>
2394   <property key="xs:string"> xs:string </property> *
2395   <state> xs:string </state>
2396   <imageLocation href="xs:anyURI"/> ?
2397   <imageData> xs:any* </imageData> ?
2398   <bootable> xs:boolean </bootable>
2399   <operation rel="edit" href="xs:anyURI"/> ?
2400   <operation rel="delete" href="xs:anyURI"/> ?
2401   <xs:any*>
2402 </VolumeImage>
```

2403 5.12.5.1 Operations

2404 This entity supports the Read, Update and Delete operations. Create is supported via the Volume Image
2405 Collection entity.

2406 5.12.6 Volume Image Collection

2407 A Volume Image Collection entity represents the collection of VolumeImage entities within a Provider.
2408 This entity can be used to locate and create Volume Images.

Name	VolumeImageCollection	
Type URI	http://www.dmtf.org/cimi/VolumeImageCollection	
Attribute	Type	Description
volumeImages	ref[]	An array of references to the set of Volume Images in the Provider. Properties: Mandatory / Mutable

2409 The following describes the serialization of the entity in both JSON and XML:

2410 **JSON media type:** application/CIMI-VolumeImageCollection+json

2411 **JSON serialization:**

```
2412 { "self": string,
2413   "name": string, ?
2414   "description": string, ?
2415   "created": string, ?
2416   "properties": { "key": string, + }, ?
2417   "volumeImages": [
2418     { "href": string }, +
2419   ], ?
2420   "operations": [
2421     { "rel": "add", "href": string }, ?
2422     { "rel": "edit", "href": string } ?
2423   ] ?
2424   ...
2425 }
```

2426 **XML media type:** application/CIMI-VolumeImageCollection+xml

2427 **XML serialization:**

```
2428 <VolumeImageCollection xmlns="http://www.dmtf.org/cimi">
2429   <self> xs:anyURI </self>
2430   <name> xs:string </name> ?
2431   <description> xs:string </description> ?
2432   <created> xs:string </created>
2433   <property key="xs:string"> xs:string </property> *
2434   <volumeImage href="xs:anyURI"/> *
2435   <operation rel="add" href="xs:anyURI"/> ?
2436   <operation rel="edit" href="xs:anyURI"/> ?
2437   <xs:any>*
2438 </VolumeImageCollection>
```

2439 5.12.6.1 Operations

2440 This entity supports the Read and Update operations. Creation of new Volume Image entities is
2441 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

2442 5.12.7 Volume

2443 A Volume represents storage at either the block or file-system level. Volumes can be attached to
2444 Machines. Once attached, Volumes can be accessed by processes on that Machine.

Name	Volume										
Type URI	http://www.dmtf.org/cimi/Volume										
Attribute	Type	Description									
state	string	<p>Indicates the operational state of the Volume.</p> <p>Allowable values include:</p> <p>CREATING: The Volume is in the process of being created. Allowable action when in this state is: delete.</p> <p>AVAILABLE: The Volume is available and ready for use. Allowable action when in this state is: delete.</p> <p>DELETING: The Volume is in the process of being deleted. Allowable action when in this state is: delete.</p> <p>ERROR: The Provider has detected an error in the Volume. Allowable action when in this state is: delete.</p> <p>Providers may define additional values.</p> <p>This value is read-only and will change based on the state of the Volume.</p> <p>Properties: Mandatory / Mutable</p>									
capacity	structure	<p>The maximum size, when limited, of the Volume.</p> <p>When this value is increased, the Volume can contain more data. Decreasing this value may require evaluations.</p> <p>This attribute has the following, sub-attributes.</p> <table border="1"> <thead> <tr> <th>Attribute</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>quantity</td> <td>integer</td> <td> <p>A numerical quantity expressed as an integer.</p> <p>Properties: Mandatory / Mutable</p> </td> </tr> <tr> <td>units</td> <td>string</td> <td> <p>An enumerated value that expresses the unit of measurement used. Allowable values are byte, kilobyte, megabyte, gigabyte, terabyte, petabyte, exabyte, zettabyte, and yottabyte.</p> <p>Properties: Mandatory / Mutable</p> </td> </tr> </tbody> </table> <p>Properties: Mandatory / Mutable</p>	Attribute	Type	Description	quantity	integer	<p>A numerical quantity expressed as an integer.</p> <p>Properties: Mandatory / Mutable</p>	units	string	<p>An enumerated value that expresses the unit of measurement used. Allowable values are byte, kilobyte, megabyte, gigabyte, terabyte, petabyte, exabyte, zettabyte, and yottabyte.</p> <p>Properties: Mandatory / Mutable</p>
Attribute	Type	Description									
quantity	integer	<p>A numerical quantity expressed as an integer.</p> <p>Properties: Mandatory / Mutable</p>									
units	string	<p>An enumerated value that expresses the unit of measurement used. Allowable values are byte, kilobyte, megabyte, gigabyte, terabyte, petabyte, exabyte, zettabyte, and yottabyte.</p> <p>Properties: Mandatory / Mutable</p>									
bootable	boolean	<p>This property indicates whether this Volume is bootable.</p> <p>Properties: Mandatory / Mutable</p>									
supportsSnapshots	boolean	<p>This property indicates whether the Volume supports the ability to take snapshots.</p>									

		Properties: Mandatory / Mutable
snapShots	ref[]	A list of references to Volume Images that represent snapshots taken from the Volume. Properties: Optional / Mutable
guestInterface	String	This property indicates the interface offered to a Machine instance to gain access to the storage contents. Properties: Mandatory / Mutable
meters	ref[]	A list of references to Meters monitored for this Volume. Properties: Optional / Mutable
eventLog	ref	A reference to the EventLog of this Volume. Properties: Optional / Mutable

2445 The following describes the serialization of the entity in both JSON and XML:

2446 **JSON media type:** application/CIMI-Volume+json

2447 **JSON serialization:**

```

2448 { "self": string,
2449   "name": string, ?
2450   "description": string, ?
2451   "created": string, ?
2452   "properties": { "key": string, + }, ?
2453   "state": string,
2454   "capacity": { "quantity": number, "units": string },
2455   "bootable": boolean,
2456   "supportsSnapshots": boolean,
2457   "snapshots": [
2458     { "href": string }, +
2459   ], ?
2460   "guestInterface": string,
2461   "meters": [
2462     { "href": string }, +
2463   ], ?
2464   "eventLog": { "href": string }, ?
2465   "operations": [
2466     { "rel": "edit", "href": string }, ?
2467     { "rel": "delete", "href": string } ?
2468   ] ?
2469   ...
2470 }

```

2471 **XML media type:** application/CIMI-Volume+xml

2472 **XML serialization:**

```

2473 <Volume xmlns="http://www.dmtf.org/cimi">
2474   <self> xs:anyURI </self>
2475   <name> xs:string </name> ?
2476   <description> xs:string </description> ?
2477   <created> xs:string </created>
2478   <property key="xs:string"> xs:string </property> *
2479   <state> xs:string </state>
2480   <capacity quantity="xs:integer" units="xs:string"/>

```

```

2481     <bootable> xs:boolean </bootable>
2482     <supportsSnapshots> xs:boolean </supportsSnapshots>
2483     <shapshot href="xs:anyURI"/> *
2484     <guestInterface> xs:string </guestInterface>
2485     <meter href="xs:anyURI"/> *
2486     <eventLog href="xs:anyURI"/> ?
2487     <operation rel="edit" href="xs:anyURI"/> ?
2488     <operation rel="delete" href="xs:anyURI"/> ?
2489     <xs:any>*
2490 </Volume>

```

2491 5.12.7.1 Operations

2492 This entity supports the Read, Update and Delete operations. Create is supported via the Volume
2493 Collection entity.

2494 5.12.8 Volume Collection

2495 A Volume Collection entity represents the collection of Volumes within a Provider. This entity can be used
2496 to locate and create Volumes.

Name	VolumeCollection	
Type URI	http://www.dmtf.org/cimi/VolumeCollection	
Attribute	Type	Description
volumes	ref[]	An array of references to the set of Volumes in the provider. Properties: Mandatory / Mutable

2497 The following describes the serialization of the entity in both JSON and XML:

2498 **JSON media type:** application/CIMI-VolumeCollection+json

2499 **JSON serialization:**

```

2500 { "self": string,
2501   "name": string, ?
2502   "description": string, ?
2503   "created": string, ?
2504   "properties": { "key": string, + }, ?
2505   "volumes": [
2506     { "href": string }, +
2507   ], ?
2508   "operations": [
2509     { "rel": "add", "href": string }, ?
2510     { "rel": "edit", "href": string } ?
2511   ] ?
2512   ...
2513 }

```

2514 **XML media type:** application/CIMI-VolumeCollection+xml

2515 **XML serialization:**

```

2516 <VolumeCollection xmlns="http://www.dmtf.org/cimi">
2517   <self> xs:anyURI </self>
2518   <name> xs:string </name> ?
2519   <description> xs:string </description> ?
2520   <created> xs:string </created>
2521   <property key="xs:string"> xs:string </property> *

```

```

2522     <volume href="xs:anyURI"/> *
2523     <operation rel="add" href="xs:anyURI"/> ?
2524     <operation rel="edit" href="xs:anyURI"/> ?
2525     <xs:any>*
2526 </VolumeCollection>

```

2527 5.12.8.1 Operations

2528 This entity supports the Read and Update operations.

2529 The following custom operations are also defined:

2530 Creating a New Volume

2531 **/link@rel:** add

2532 This operation will create a new Volume.

2533 Input parameters: Either a reference to a Volume Template or a Volume Template itself.

2534 Output parameters: A reference to a new Volume and optionally the representation of the Volume.

2535 • HTTP/REST Protocol

2536 To create a new Volume a POST is sent to the "add" URI of the VolumeCollection where the HTTP
 2537 request body SHALL be as described below. Note this structure allows for certain properties to be passed
 2538 in "by value" or by "reference". The definition of each property can be found in section 5.12.1.

2539 **JSON media type:** application/CIMI-VolumeCreate+json

2540 **JSON serialization:**

```

2541 { "name": string, ?
2542   "description": string, ?
2543   "properties": { "key": string, + }, ?
2544   "volumeTemplate": { "href": string, ?
2545     "properties": { "key": string, + }, ?
2546     "volumeConfig": { "href": string, ?
2547       "properties": { "key": string, + }, ?
2548       "format": string, ?
2549       "capacity": { "quantity": number, "units": string }, ?
2550       "supportsSnapshots": boolean, ?
2551       "guestInterface": string, ?
2552     },
2553     "volumeImage": { "href": string,
2554       "properties": { "key": string, + }, ?
2555       "imageLocation": { "href": string }, ?
2556       "imageData": string, ?
2557       "bootable": boolean ?
2558     } ?
2559   }
2560   ...
2561 }

```

2562 **XML media type:** application/CIMI-VolumeCreate+xml

2563 **XML serialization**

```

2564 <VolumeCreate>
2565   <name> xs:string </name> ?
2566   <description> xs:string </description> ?
2567   <property key="xs:string"> xs:string </property> *
2568   <volumeTemplate href="xs:anyURI"? >

```

```

2569     <property key="xs:string"> xs:string </property> *
2570     <volumeConfig href="xs:anyURI"? >
2571         <property key="xs:string"> xs:string </property> *
2572         <format> xs:string </format> ?
2573         <capacity quantity="xs:integer" units="xs:string"/> ?
2574         <supportsSnapshots> xs:boolean </supportsSnapshots> ?
2575         <guestInterface> xs:string </guestInterface> ?
2576     </volumeConfig>
2577     <volumeImage href="xs:anyURI">
2578         <property key="xs:string"> xs:string </property> *
2579         <imageLocation href="xs:anyURI"/> ?
2580         <imageData> xs:any* </imageData> ?
2581         <bootable> xs:boolean </bootable> ?
2582     </volumeImage> ?
2583 </volumeTemplate>
2584 <xs:any>*
2585 </VolumeCreate>

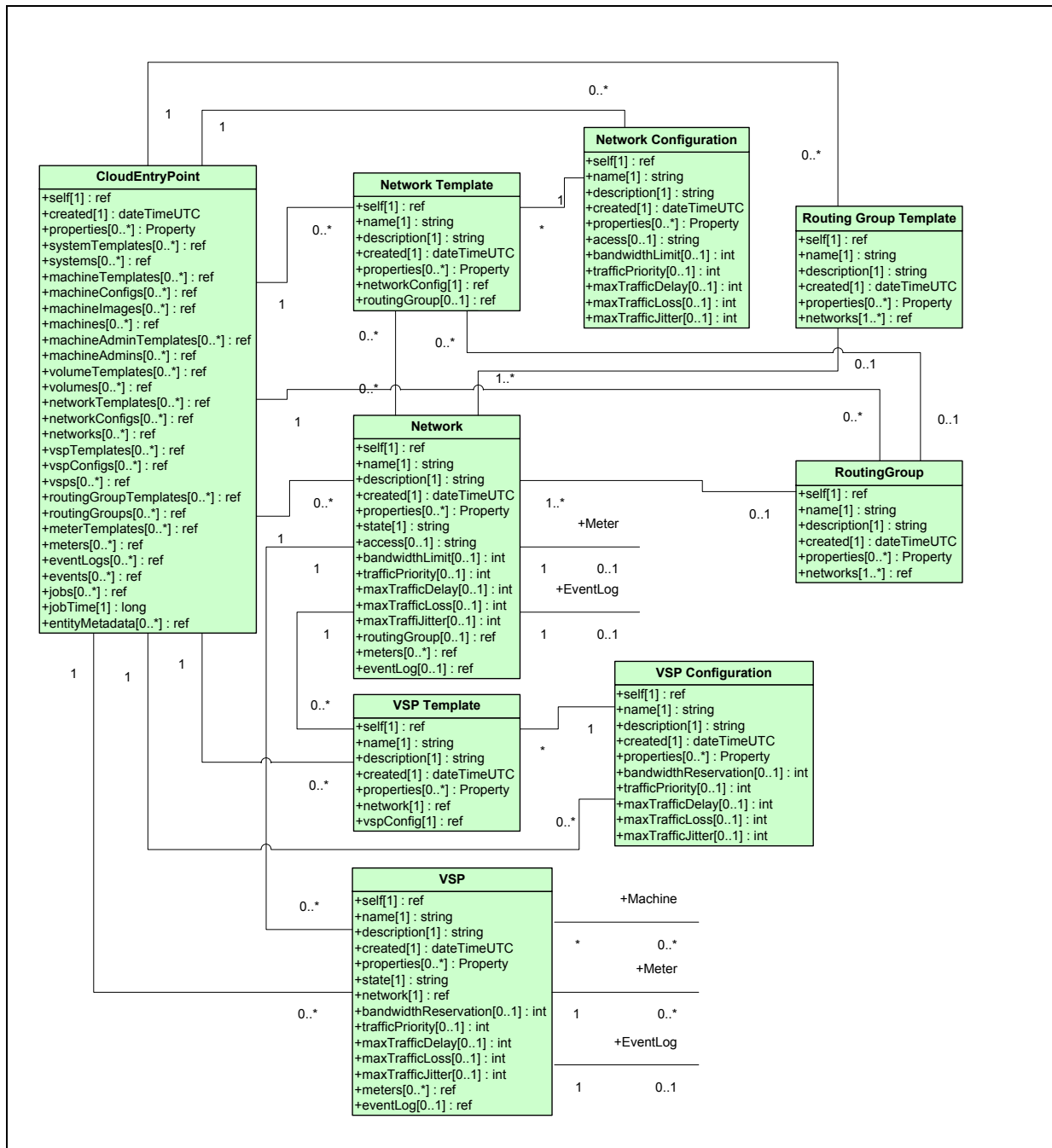
```

2586 The serialization of some reference properties are specified such that a request MAY either include a
 2587 reference ("href") to an existing entity or to include the entity "inline" as a set of additional properties.
 2588 Requests SHALL NOT include both a reference and the inlined set of properties.

2589 Upon successful processing of the request, the HTTP response body MAY either be empty or contain a
 2590 serialization of the Volume entity.

2591 **5.13 Network Entities and Relationships**

2592 The following diagram illustrates the entities involved in constructing Networks and their Virtual Switch
 2593 Ports (VSPs) and their relationships. Although this drawing is in the style of an Entity Relationship
 2594 diagram, the use of UML is neither rigorous nor normative.



2595

2596 **Figure 4 - Network Entities**

2597 **5.13.1 Network Template**

2598 The Network Template is a set of configuration values for realizing a Network. An instance of Network
 2599 Template may be used to create multiple Networks.

Name	NetworkTemplate
Type URI	http://www.dmtf.org/cimi/NetworkTemplate

Attribute	Type	Description
networkConfig	ref	A reference to the Network Configuration that will be used to create a Network from this Network Template. Properties: Mandatory / Mutable
routingGroup	ref	A reference to a RoutingGroup that the net Network will be part of. Note that Networks route to themselves, therefore this attribute will only appear in cases where the Network that will be created from this template routes to one or more additional Networks. Properties: Optional / Mutable

2600 The following describes the serialization of the entity in both JSON and XML:

2601 **JSON media type:** application/CIMI-NetworkTemplate+json

2602 **JSON serialization:**

```

2603 { "self": string,
2604     "name": string, ?
2605     "description": string, ?
2606     "created": string, ?
2607     "properties": { "key": string, + }, ?
2608     "networkConfig": { "href": string },
2609     "routingGroup": { "href": string }, ?
2610     "operations": [
2611         { "rel": "edit", "href": string }, ?
2612         { "rel": "delete", "href": string } ?
2613     ] ?
2614     ...
2615 }
```

2616 **XML media type:** application/CIMI-NetworkTemplate+xml

2617 **XML serialization:**

```

2618 <NetworkTemplate xmlns="http://www.dmtf.org/cimi">
2619   <self> xs:anyURI </self>
2620   <name> xs:string </name> ?
2621   <description> xs:string </description> ?
2622   <created> xs:string </created>
2623   <property key="xs:string"> xs:string </property> *
2624   <networkConfig href="xs:anyURI"/>
2625   <routingGroup href="xs:anyURI"/> ?
2626   <operation rel="edit" href="xs:anyURI"/> ?
2627   <operation rel="delete" href="xs:anyURI"/> ?
2628   <xs:any>*
2629 </NetworkTemplate>
```

2630 5.13.1.1 Operations

2631 This entity supports the Read, Update and Delete operations. Create is supported via the Network
2632 Template Collection entity.

2633 5.13.2 Network Template Collection

2634 A Network Template Collection entity represents the collection of NetworkTemplateas within a Provider.
2635 This resource can be used to locate and create NetworkTemplates.

Name	NetworkTemplateCollection	
Type URI	http://www.dmtf.org/cimi/NetworkTemplateCollection	
Attribute	Type	Description
networkTemplates	ref[]	An array of references to the set of Network Templates in the Provider. Properties: Mandatory / Mutable

2636 The following describes the serialization of the entity in both JSON and XML:

2637 **JSON media type:** application/CIMI-NetworkTemplateCollection+json

2638 **JSON serialization:**

```

2639 { "self": string,
2640   "name": string, ?
2641   "description": string, ?
2642   "created": string, ?
2643   "properties": { "key": string, + }, ?
2644   "networkTemplates": [
2645     { "href": string }, +
2646   ], ?
2647   "operations": [
2648     { "rel": "add", "href": string }, ?
2649     { "rel": "edit", "href": string } ?
2650   ] ?
2651   ...
2652 }
```

2653 **XML media type:** application/CIMI-NetworkTemplateCollection+xml

2654 **XML serialization:**

```

2655 <NetworkTemplateCollection xmlns="http://www.dmtf.org/cimi">
2656   <self> xs:anyURI </self>
2657   <name> xs:string </name> ?
2658   <description> xs:string </description> ?
2659   <created> xs:string </created>
2660   <property key="xs:string"> xs:string </property> *
2661   <networkTemplate href="xs:anyURI"/> *
2662   <operation rel="add" href="xs:anyURI"/> ?
2663   <operation rel="edit" href="xs:anyURI"/> ?
2664   <xs:any>*
2665 </NetworkTemplateCollection>
```

2666 **5.13.2.1 Operations**

2667 This entity supports the Read and Update operations. Creation of new Network Template entities is
 2668 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

2669 **5.13.3 Network Configuration**

2670 The set of configuration values representing the information needed to create a Network with certain
 2671 characteristics.

Name	NetworkConfiguration
Type URI	http://www.dmtf.org/cimi/NetworkConfiguration

Attribute	Type	Description
access	string	An indicator of whether or not the Machine entity has access to a Public or Private network. An indication of Public represents an open and Internet routable network. An indication of Private identifies a local non-routed network. Properties: Optional / Mutable
bandwidthLimit	integer	Maximum allowable bandwidth. Properties: Optional / Mutable
trafficPriority	integer	Indicates priority of traffic on this network. Properties: Optional / Mutable
maxTrafficDelay	integer	The requested maximum delay for end to end transmission specified in nanoseconds with uint64 (i.e. latency). Properties: Optional / Mutable
maxTrafficLoss	integer	The requested maximum percentage traffic loss for end to end transmission with uint8, min 0 max 100. The percentage of traffic lost in the transmission traffic. A value of zero indicates that a lossless transmission is requested. A value of 100 indicates a best effort transmission. The default value is 100. Properties: Optional / Mutable
maxTrafficJitter	integer	The requested maximum jitter for end to end transmission with uint32 when traffic is packetized. The variation between packets arriving specified in nanoseconds with uint64. Properties: Optional / Mutable

2672 The following describes the serialization of the entity in both JSON and XML:

2673 **JSON media type:** application/CIMI-NetworkConfiguration+json

2674 **JSON serialization:**

```

2675 { "self": string,
2676   "name": string, ?
2677   "description": string, ?
2678   "created": string, ?
2679   "properties": { "key": string, + }, ?
2680   "access": string, ?
2681   "bandwidthLimit": number, ?
2682   "trafficPriority": number, ?
2683   "maxTrafficDelay": number, ?
2684   "maxTrafficLoss": number, ?
2685   "maxTrafficJitter": number, ?
2686   "operations": [
2687     { "rel": "edit", "href": string }, ?
2688     { "rel": "delete", "href": string } ?
2689   ] ?
2690   ...
2691 }
```

2692 **XML media type:** application/CIMI-NetworkConfiguration+xml

2693 **XML serialization:**

```

2694 <NetworkConfiguration xmlns="http://www.dmtf.org/cimi">
2695   <self> xs:anyURI </self>
2696   <name> xs:string </name> ?
2697   <description> xs:string </description> ?
2698   <created> xs:string </created>
2699   <property key="xs:string"> xs:string </property> *
2700   <access> xs:string </access> ?
2701   <bandwidthLimit> xs:string <bandwidthLimit> ?
2702   <trafficPriority> xs:integer </trafficPriority> ?
2703   <maxTrafficDelay> xs:integer </maxTrafficDelay> ?
2704   <maxTrafficLoss> xs:integer </maxTrafficLoss> ?
2705   <maxTrafficJitter> xs:integer </maxTrafficJitter> ?
2706   <operation rel="edit" href="xs:anyURI"/> ?
2707   <operation rel="delete" href="xs:anyURI"/> ?
2708   <xs:any>*
2709 </NetworkConfiguration>
    
```

2710 **5.13.3.1 Operations**

2711 This entity supports the Read, Update and Delete operations. Create is supported via the Network
 2712 Configuration Collection entity.

2713 **5.13.4 Network Configuration Collection**

2714 A Network Configuration Collection entity represents the collection of Network Configurations within a
 2715 Provider. This entity can be used to locate and create Network Configurations.

Name	NetworkConfigurationCollection	
Type URI	http://www.dmtf.org/cimi/NetworkConfigurationCollection	
Attribute	Type	Description
networkConfigurations	ref[]	An array of references to the set of Network Configurations in the provider. Properties: Mandatory / Mutable

2716 The following describes the serialization of the entity in both JSON and XML:

2717 **JSON media type:** application/CIMI-NetworkConfigurationCollection+json

2718 **JSON serialization:**

```

2719 { "self": string,
2720   "name": string, ?
2721   "description": string, ?
2722   "created": string, ?
2723   "properties": { "key": string, + }, ?
2724   "networkConfigurations": [
2725     { "href": string }, +
2726   ], ?
2727   "operations": [
2728     { "rel": "add", "href": string }, ?
2729     { "rel": "edit", "href": string } ?
2730   ] ?
2731   ...
2732 }
    
```

2733 **XML media type:** application/CIMI-NetworkConfigurationCollection+xml

2734 **XML serialization:**

```

2735 <NetworkConfigurationCollection xmlns="http://www.dmtf.org/cimi">
2736   <self> xs:anyURI </self>
2737   <name> xs:string </name> ?
2738   <description> xs:string </description> ?
2739   <created> xs:string </created>
2740   <property key="xs:string"> xs:string </property> *
2741   <networkConfiguration href="xs:anyURI"/> *
2742   <operation rel="add" href="xs:anyURI"/> ?
2743   <operation rel="edit" href="xs:anyURI"/> ?
2744   <xs:any>*
2745 </NetworkConfigurationCollection>

```

2746 5.13.4.1 Operations

2747 This entity supports the Read and Update operations. Creation of new Network Collection entities is
 2748 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

2749 5.13.5 Network

2750 A Network is a realized entity that represents an abstraction of a layer 2 broadcast domain.

Name	Network	
Type URI	http://www.dmtf.org/cimi/Network	
Attribute	Type	Description
state	string	<p>Indicates the operational state of the System.</p> <p>Allowable values include:</p> <p>CREATING: The Network is in the process of being created. Allowable action when in this state is: delete.</p> <p>STARTING: The Network is in the process of being started. Allowable actions when in this state are: stop and delete.</p> <p>STARTED: The Network is available and ready for use. Allowable actions when in this state are: stop and delete.</p> <p>SUSPENDING: The Network is in the process of being suspended. Allowable actions when in this state are: suspend, stop and delete.</p> <p>SUSPENDED: The Network is suspended. Allowable actions when in this state are: start, stop and delete.</p> <p>STOPPING: The Network is in the process of being stopped. Allowable actions when in this state are: stop and delete.</p> <p>STOPPED: The Network is stopped and not available for use. Allowable actions when in this state are: start and delete.</p> <p>DELETING: The Network is in the process of being deleted. Allowable action when in this state is: delete.</p> <p>ERROR: The Provider has detected an error in the Network. Allowable</p>

		<p>action when in this state is: delete.</p> <p>Providers may define additional values.</p> <p>This value is read-only and will change based on the state of the Network.</p> <p>Properties: Mandatory / Mutable</p>
access	string	<p>An indicator of whether or not the Machine entity has access to a Public or Private network. An indication of Public represents an open and Internet routable network. An indication of Private identifies a local non-routed network.</p> <p>Properties: Optional / Mutable</p>
bandwidthLimit	integer	<p>Maximum allowable bandwidth.</p> <p>Properties: Optional / Mutable</p>
trafficPriority	integer	<p>Indicates priority of traffic on this network.</p> <p>Properties: Optional / Mutable</p>
maxTrafficDelay	integer	<p>The requested maximum delay for end to end transmission specified in nanoseconds with uint64 (i.e. latency).</p> <p>Properties: Optional / Mutable</p>
maxTrafficLoss	integer	<p>The requested maximum percentage traffic loss for end to end transmission with uint8, min 0 max 100. The percentage of traffic lost in the transmission traffic. A value of zero indicates that a lossless transmission is requested. A value of 100 indicates a best effort transmission. The default value is 100.</p> <p>Properties: Optional / Mutable</p>
maxTrafficJitter	integer	<p>The requested maximum jitter for end to end transmission with uint32 when traffic is packetized. The variation between packets arriving specified in nanoseconds with uint64.</p> <p>Properties: Optional / Mutable</p>
routingGroup	ref	<p>A reference to a RoutingGroup that this Network is part of.</p> <p>Note that Networks route to themselves, therefore this attribute will only appear in cases where the Network routes to one or more additional Networks.</p> <p>Properties: Optional / Mutable</p>
meters	ref[]	<p>A list of references to Meters monitored for this Network.</p> <p>Properties: Optional / Mutable</p>
eventLog	ref	<p>A reference to the EventLog of this Network.</p> <p>Properties: Optional / Mutable</p>

2751 The following describes the serialization of the entity in both JSON and XML:

2752 **JSON media type:** application/CIMI-Network+json

2753 **JSON serialization:**

```

2754 { "self": string,
2755     "name": string, ?
2756     "description": string, ?
2757     "created": string, ?
2758     "properties": { "key": string, + }, ?
2759     "state": string,
2760     "access": string, ?
2761     "bandwidthLimit": number, ?
2762     "trafficPriority": number, ?
2763     "maxTrafficDelay": number, ?
2764     "maxTrafficLoss": number, ?
2765     "maxTrafficJitter": number, ?
2766     "routingGroup": { "href": string }, ?
2767     "meters": [
2768         { "href": string }, +
2769     ], ?
2770     "eventLog": { "href": string }, ?
2771     "operations": [
2772         { "rel": "edit", "href": string }, ?
2773         { "rel": "delete", "href": string } ?
2774     ] ?
2775     ...
2776 }
```

2777 **XML media type:** application/CIMI-Network+xml

2778 **XML serialization:**

```

2779 <Network xmlns="http://www.dmtf.org/cimi">
2780   <self> xs:anyURI </self>
2781   <name> xs:string </name> ?
2782   <description> xs:string </description> ?
2783   <created> xs:string </created>
2784   <property key="xs:string"> xs:string </property> *
2785   <state> xs:string </state>
2786   <access> xs:string </access> ?
2787   <bandwidthLimit> xs:integer </bandwidthLimit> ?
2788   <trafficPriority> xs:integer </trafficPriority> ?
2789   <maxTrafficDelay> xs:integer </maxTrafficDelay> ?
2790   <maxTrafficLoss> xs:integer </maxTrafficLoss> ?
2791   <maxTrafficJitter> xs:integer </maxTrafficJiffer> ?
2792   <routingGroup href="xs:anyURI"/> ?
2793   <meter href="xs:anyURI"/> *
2794   <eventLog href="xs:anyURI"/> ?
2795   <operation rel="edit" href="xs:anyURI"/> ?
2796   <operation rel="delete" href="xs:anyURI"/> ?
2797   <xs:any>*
2798 </Network>
```

2799 5.13.5.1 Operations

2800 This entity supports the Read, Update and Delete operations. Create is supported via the Network
2801 Collection entity.

2802 The following custom operations are also defined:

2803 Starting a Network

2804 **//link@rel:** <http://www.dmtf.org/cimi/action/start>

2805 This operation will start a Network.

2806 Input parameters: None.

2807 Output parameters: None.

2808 During the processing of this operation the Network shall be in the "STARTING" state.

2809 Upon successful completion of this operation the Network shall be in the "STARTED" state.

2810 **NOTE: need a better description - Steve?**

2811 • **HTTP/REST Protocol**

2812 To start a Network a POST is sent to the "http://www.dmtf.org/cimi/start" URI of the Network where the
 2813 HTTP request body SHALL be as described below.

2814 **JSON media type:** application/CIMI-Action+json

2815 **JSON serialization:**

```
2816 { "action": "http://www.dmtf.org/cimi/action/start" ,
2817   "properties": { "key": string, + } ?
2818   ...
2819 }
```

2820 **XML media type:** application/CIMI-Action+xml

2821 **XML serialization**

```
2822 <Action xmlns="http://www.dmtf.org/cimi">
2823   <action> http://www.dmtf.org/cimi/action/start </action>
2824   <property key="xs:string"> xs:string </property> *
2825   <xs:any>*
2826 </Action>
```

2827 Upon successful processing of the request, the HTTP response body will be empty.

2828 **Suspending a Network**

2829 **/link@rel:** http://www.dmtf.org/cimi/action/suspend

2830 This operation will suspend a Network.

2831 Input parameters: None.

2832 Output parameters: None.

2833 During the processing of this operation the Network shall be in the "SUSPENDING" state.

2834 Upon successful completion of this operation the Network shall be in the "SUSPENDED" state.

2835 **NOTE: need a better description - Steve?**

2836 • **HTTP/REST Protocol**

2837 To start a Network a POST is sent to the "http://www.dmtf.org/cimi/suspend" URI of the Network where
 2838 the HTTP request body SHALL be as described below.

2839 **JSON media type:** application/CIMI-Action+json

2840 **JSON serialization:**

```
2841 { "action": "http://www.dmtf.org/cimi/action/suspend" ,
2842   "properties": { "key": string, + } ?
2843   ...
2844 }
```

2845 **XML media type:** application/CIMI-Action+xml

2846 **XML serialization**

```
2847 <Action xmlns="http://www.dmtf.org/cimi">
2848   <action> http://www.dmtf.org/cimi/action/suspend </action>
2849   <property key="xs:string"> xs:string </property> *
2850   <xs:any>*
2851 </Action>
```

2852 Upon successful processing of the request, the HTTP response body will be empty.

2853 **Stopping a Network**

2854 **//link@rel:** http://www.dmtf.org/cimi/action/stop

2855 This operation will stop a Network.

2856 Input parameters: None.

2857 Output parameters: None.

2858 During the processing of this operation the Network shall be in the "STOPPING" state.

2859 Upon successful completion of this operation the Network shall be in the "STOPPED" state.

2860 **NOTE: need a better description - Steve?**

2861 • **HTTP/REST Protocol**

2862 To start a Network a POST is sent to the "http://www.dmtf.org/cimi/stop" URI of the Network where the
2863 HTTP request body SHALL be as described below.

2864 **JSON media type:** application/CIMI-Action+json

2865 **JSON serialization:**

```
2866 { "action": "http://www.dmtf.org/cimi/action/stop" ,
2867   "properties": { "key": string, + } ?
2868   ...
2869 }
```

2870 **XML media type:** application/CIMI-Action+xml

2871 **XML serialization**

```
2872 <Action xmlns="http://www.dmtf.org/cimi">
2873   <action> http://www.dmtf.org/cimi/action/stop </action>
2874   <property key="xs:string"> xs:string </property> *
2875   <xs:any>*
2876 </Action>
```

2877 Upon successful processing of the request, the HTTP response body will be empty.

2878 **5.13.6 Network Collection**

2879 A Network Collection entity represents the collection of Networks within a Provider. This entity can be
 2880 used to locate and create Networks.

Name	NetworkCollection	
Type URI	http://www.dmtf.org/cimi/NetworkCollection	
Attribute	Type	Description
networks	ref[]	An array of references to the set of Networks in the Provider. Properties: Mandatory / Mutable

2881 The following describes the serialization of the entity in both JSON and XML:

2882 **JSON media type:** application/CIMI-NetworkCollection+json

2883 **JSON serialization:**

```
2884 { "self": string,
2885   "name": string, ?
2886   "description": string, ?
2887   "created": string, ?
2888   "properties": { "key": string, + }, ?
2889   "networks": [
2890     { "href": string }, +
2891   ], ?
2892   "operations": [
2893     { "rel": "add", "href": string }, ?
2894     { "rel": "edit", "href": string } ?
2895   ] ?
2896   ...
2897 }
```

2898 **XML media type:** application/CIMI-NetworkCollection+xml

2899 **XML serialization:**

```
2900 <NetworkCollection xmlns="http://www.dmtf.org/cimi">
2901   <self> xs:anyURI </self>
2902   <name> xs:string </name> ?
2903   <description> xs:string </description> ?
2904   <created> xs:string </created>
2905   <property key="xs:string"> xs:string </property> *
2906   <network href="xs:anyURI"/> *
2907   <operation rel="add" href="xs:anyURI"/> ?
2908   <operation rel="edit" href="xs:anyURI"/> ?
2909   <xs:any>*
2910 </NetworkCollection>
```

2911 **5.13.6.1 Operations**

2912 This entity supports the Read and Update operations.

2913 The following custom operations are also defined:

2914 **Creating a New Network**

2915 **/link@rel:** add

2916 This operation will create a new Network.

2917 Input parameters: Either a reference to a Network Template or a Network Template itself.

2918 Output parameters: A reference to a new Network and optionally the representation of the Network.

2919 • **HTTP/REST Protocol**

2920 To create a new Network a POST is sent to the "add" URI of the NetworkCollection where the HTTP
2921 request body SHALL be as described below. Note this structure allows for certain properties to be passed
2922 in "by value" or by "reference". The definition of each property can be found in section 5.13.1.

2923 **JSON media type:** application/CIMI-NetworkCreate+json

2924 **JSON serialization:**

```
2925 { "name": string, ?
2926   "description": string, ?
2927   "properties": { "key": string, + }, ?
2928   "networkTemplate": { "href": string, ?
2929     "properties": { "key": string, + } ?
2930     "networkConfig": { "href": string, ?
2931       "properties": { "key": string, + }, ?
2932       "access": string, ?
2933       "bandwidthLimit": number, ?
2934       "trafficPriority": number, ?
2935       "maxTrafficDelay": number, ?
2936       "maxTrafficLoss": number, ?
2937       "maxTrafficJitter": number, ?
2938     },
2939     "routingGroup": { "href": string } ?
2940   ] ?
2941 }
2942 ...
2943 }
```

2944 **XML media type:** application/CIMI-NetworkCreate+xml

2945 **XML serialization**

```
2946 <NetworkCreate>
2947   <name> xs:string </name> ?
2948   <description> xs:string </description> ?
2949   <property key="xs:string"> xs:string </property> *
2950   <networkTemplate href="xs:anyURI"? >
2951     <property key="xs:string"> xs:string </property> *
2952     <networkConfig href="xs:anyURI"? >
2953       <property key="xs:string"> xs:string </property> *
2954       <access> xs:string </access> ?
2955       <bandwidthLimit> xs:string <bandwidthLimit> ?
2956       <trafficPriority> xs:integer </trafficPriority> ?
2957       <maxTrafficDelay> xs:integer </maxTrafficDelay> ?
2958       <maxTrafficLoss> xs:integer </maxTrafficLoss> ?
2959       <maxTrafficJitter> xs:integer </maxTrafficJitter> ?
2960     </networkConfig>
2961     <routingGroup href="xs:anyURI"/> ?
2962   </networkTemplate>
2963   <xs:any>*
2964 </NetworkCreate>
```

2965 The serialization of some reference properties are specified such that a request MAY either include a
2966 reference ("href") to an existing entity or to include the entity "inline" as a set of additional properties.
2967 Requests SHALL NOT include both a reference and the inlined set of properties.

2968 Upon successful processing of the request, the HTTP response body MAY either be empty or contain a
 2969 serialization of the Network entity.

2970 **5.13.7 VSP (Virtual Switch Port) Template**

2971 The VSP Template is a set of Configuration values for realizing a VSP. A VSP Template may be used to
 2972 create multiple VSPs.

Name	VSPTemplate	
Type URI	http://www.dmtf.org/cimi/VSPTemplate	
Attribute	Type	Description
network	ref	A reference to the network to be associated with this VSP. Properties: Mandatory / Mutable
vspConfig	ref	A reference to the VSP Configuration that will be used to create a VSP from this VSP Template. Properties: Mandatory / Mutable

2973 The following describes the serialization of the entity in both JSON and XML:

2974 **JSON media type:** application/CIMI-VSPTemplate+json

2975 **JSON serialization:**

```

2976 { "self": string,
2977   "name": string, ?
2978   "description": string, ?
2979   "created": string, ?
2980   "properties": { "key": string, + }, ?
2981   "network": { "href": string },
2982   "vspConfig": { "href": string },
2983   "operations": [
2984     { "rel": "edit", "href": string }, ?
2985     { "rel": "delete", "href": string } ?
2986   ] ?
2987   ...
2988 }
```

2989 **XML media type:** application/CIMI-VSPTemplate+xml

2990 **XML serialization:**

```

2991 <VSPTemplate xmlns="http://www.dmtf.org/cimi">
2992   <self> xs:anyURI </self>
2993   <name> xs:string </name> ?
2994   <description> xs:string </description> ?
2995   <created> xs:string </created>
2996   <property key="xs:string"> xs:string </property> *
2997   <network href="xs:anyURI"/>
2998   <vspConfig href="xs:anyURI"/>
2999   <operation rel="edit" href="xs:anyURI"/> ?
3000   <operation rel="delete" href="xs:anyURI"/> ?
3001   <xs:any>*
3002 </VSPTemplate>
```

3003 **5.13.7.1 Operations**

3004 This entity supports the Read, Update and Delete operations. Create is supported via the VSP Template
3005 Collection entity.

3006 **5.13.8 VSP (Virtual Switch Port) Template Collection**

3007 A VSP Template Collection entity represents the collection of VSP Templates within a Provider. This
3008 entity can be used to locate and create VSP Templates.

Name	VSPTemplateCollection	
Type URI	http://www.dmtf.org/cimi/VSPTemplateCollection	
Attribute	Type	Description
vspTemplates	ref[]	An array of references to the set of VSP Templates in the Provider. Properties: Mandatory / Mutable

3009 The following describes the serialization of the entity in both JSON and XML:

3010 **JSON media type:** application/CIMI-VSPTemplateCollection+json

3011 **JSON serialization:**

```
3012 { "self": string,
3013   "name": string, ?
3014   "description": string, ?
3015   "created": string, ?
3016   "properties": { "key": string, + }, ?
3017   "vspTemplates": [
3018     { "href": string }, +
3019   ], ?
3020   "operations": [
3021     { "rel": "add", "href": string }, ?
3022     { "rel": "edit", "href": string } ?
3023   ] ?
3024   ...
3025 }
```

3026 **XML media type:** application/CIMI-VSPTemplateCollection+xml

3027 **XML serialization:**

```
3028 <VSPTemplateCollection xmlns="http://www.dmtf.org/cimi">
3029   <self> xs:anyURI </self>
3030   <name> xs:string </name> ?
3031   <description> xs:string </description> ?
3032   <created> xs:string </created>
3033   <property key="xs:string"> xs:string </property> *
3034   <vspTemplate href="xs:anyURI"/> *
3035   <operation rel="add" href="xs:anyURI"/> ?
3036   <operation rel="edit" href="xs:anyURI"/> ?
3037   <xs:any>*
3038 </VSPTemplateCollection>
```

3039 **5.13.8.1 Operations**

3040 This entity supports the Read and Update operations. Creation of new VSP Template entities is
3041 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

3042 **5.13.9 VSP (Virtual Switch Port) Configuration**

3043 The set of configuration values representing the information needed to create a VSP with certain
 3044 characteristics.

Name	VSPConfiguration	
Type URI	http://www.dmtf.org/cimi/VSPConfiguration	
Attribute	Type	Description
bandwidthReservation	integer	Minimum Bandwidth requirements. Properties: Optional / Mutable
trafficPriority	integer	Indicates priority of traffic on this network. Properties: Optional / Mutable
maxTrafficDelay	integer	The requested maximum delay for end to end transmission specified in nanoseconds with uint64 (i.e. latency). Properties: Optional / Mutable
maxTrafficLoss	integer	The requested maximum percentage traffic loss for end to end transmission with uint8, min 0 max 100. The percentage of traffic lost in the transmission traffic. A value of zero indicates that a lossless transmission is requested. A value of 100 indicates a best effort transmission. The default value is 100. Properties: Optional / Mutable
maxTrafficJitter	integer	The requested maximum jitter for end to end transmission with uint32 when traffic is packetized. The variation between packets arriving specified in nanoseconds with uint64. Properties: Optional / Mutable

3045 The following describes the serialization of the entity in both JSON and XML:

3046 **JSON media type:** application/CIMI-VSPConfiguration+json

3047 **JSON serialization:**

```

3048 { "self": string,
3049   "name": string, ?
3050   "description": string, ?
3051   "created": string, ?
3052   "properties": { "key": string, + }, ?
3053   "bandwidthReservation": number, ?
3054   "trafficPriority": number, ?
3055   "maxTrafficDelay": number, ?
3056   "maxTrafficLoss": number, ?
3057   "maxTrafficJitter": number, ?
3058   "operations": [
3059     { "rel": "edit", "href": string }, ?
3060     { "rel": "delete", "href": string } ?
3061   ] ?
3062   ...
3063 }
```

3064 **XML media type:** application/CIMI-VSPConfiguration+xml

3065 **XML serialization:**

```

3066 <VSPConfiguration xmlns="http://www.dmtf.org/cimi">
3067   <self> xs:anyURI </self>
3068   <name> xs:string </name> ?
3069   <description> xs:string </description> ?
3070   <created> xs:string </created>
3071   <property key="xs:string"> xs:string </property> *
3072   <bandwidthReservation> xs:integer </bandwidthReservation> ?
3073   <trafficPriority> xs:integer </trafficPriority> ?
3074   <maxTrafficDelay> xs:integer </maxTrafficDelay> ?
3075   <maxTrafficLoss> xs:integer </maxTrafficLoss> ?
3076   <maxTrafficJitter> xs:integer </maxTrafficJitter> ?
3077   <operation rel="edit" href="xs:anyURI"/> ?
3078   <operation rel="delete" href="xs:anyURI"/> ?
3079   <xs:any>*
3080 </VSPConfiguration>

```

3081 5.13.9.1 Operations

3082 This entity supports the Read, Update and Delete operations. Create is supported via the VSP
3083 Configuration Collection entity.

3084 5.13.10 VSP (Virtual Switch Port) Configuration Collection

3085 A VSP Configuration Collection entity represents the collection of VSP Configurations within a Provider.
3086 This entity can be used to locate and create VSP Configurations.

Name	VSPConfigurationCollection	
Type URI	http://www.dmtf.org/cimi/VSPConfigurationCollection	
Attribute	Type	Description
vspConfigurations	ref[]	An array of references to the set of VSP Configurations in the Provider. Properties: Mandatory / Mutable

3087 The following describes the serialization of the entity in both JSON and XML:

3088 **JSON media type:** application/CIMI-VSPConfigurationCollection+json

3089 **JSON serialization:**

```

3090 { "self": string,
3091   "name": string, ?
3092   "description": string, ?
3093   "created": string, ?
3094   "properties": { "key": string, + }, ?
3095   "vspConfigurations": [
3096     { "href": string }, +
3097   ], ?
3098   "operations": [
3099     { "rel": "add", "href": string }, ?
3100     { "rel": "edit", "href": string } ?
3101   ] ?
3102   ...
3103 }

```

3104 **XML media type:** application/CIMI-VSPConfigurationCollection+xml

3105 **XML serialization:**

```

3106 <VSPConfigurationCollection xmlns="http://www.dmtf.org/cimi">
3107   <self> xs:anyURI </self>
3108   <name> xs:string </name> ?
3109   <description> xs:string </description> ?
3110   <created> xs:string </created>
3111   <property key="xs:string"> xs:string </property> *
3112   <vspConfiguration href="xs:anyURI"/> *
3113   <operation rel="add" href="xs:anyURI"/> ?
3114   <operation rel="edit" href="xs:anyURI"/> ?
3115   <xs:any>*
3116 </VSPConfigurationCollection>
    
```

3117 **5.13.10.1 Operations**

3118 This entity supports the Read and Update operations. Creation of new VSP Configuration entities is
 3119 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

3120 **5.13.11 VSP (Virtual Switch Port)**

3121 A VSP represents the connection parameters of a network port.

Name	VSP	
Type URI	http://www.dmtf.org/cimi/VSP	
Attribute	Type	Description
state	string	<p>An indicator of whether or not a specified port is on or off [Default = Enabled].</p> <p>This value is read-only and will change based on the state of the VSP.</p> <p>Properties: Mandatory / Mutable</p> <p>Indicates the operational state of the VSP.</p> <p>Allowable values include:</p> <p>CREATING: The VSP is in the process of being created. Allowable action when in this state is: delete.</p> <p>STARTED: The VSP is available (enabled) and ready for use. Allowable actions when in this state are: stop and delete.</p> <p>STOPPED:The VSP is stopped(disabled) and not available for use. Allowable actions when in this state are: start and delete.</p> <p>DELETING: The VSP is in the process of being deleted. Allowable action when in this state is: delete.</p> <p>ERROR: The Provider has detected an error in the VSP. Allowable action when in this state is: delete.</p> <p>Providers may define additional values.</p> <p>This value is read-only and will change based on the state of the</p>

		Network. Properties: Mandatory / Mutable
network	ref	A reference to the network associated with this VSP. Properties: Mandatory / Mutable
bandwidthReservation	integer	Minimum Bandwidth requirements. Properties: Optional / Mutable
trafficPriority	integer	Indicates priority of traffic on this VSP. Properties: Optional / Mutable
maxTrafficDelay	integer	The requested maximum delay for end to end transmission specified in nanoseconds with uint64 (i.e. latency). Properties: Optional / Mutable
maxTrafficLoss	integer	The requested maximum percentage traffic loss for end to end transmission with uint8, min 0 max 100. The percentage of traffic lost in the transmission traffic. A value of zero indicates that a lossless transmission is requested. A value of 100 indicates a best effort transmission. The default value is 100. Properties: Optional / Mutable
maxTrafficJitter	integer	The requested maximum jitter for end to end transmission with uint32 when traffic is packetized. The variation between packets arriving specified in nanoseconds with uint64. Properties: Mandatory / Mutable
meters	ref[]	A list of references to Meters monitored for this VSP. Properties: Optional / Mutable
eventLog	ref	A reference to the EventLog of this VSP. Properties: Optional / Mutable

3122 The following describes the serialization of the entity in both JSON and XML:

3123 **JSON media type:** application/CIMI-VSP+json

3124 **JSON serialization:**

```

3125 { "self": string,
3126   "name": string, ?
3127   "description": string, ?
3128   "created": string, ?
3129   "properties": { "key": string, + }, ?
3130   "network": { "href": string },
3131   "state": string, ?
3132   "bandwidthLimit": number, ?
3133   "trafficPriority": number, ?
3134   "maxTrafficDelay": number, ?
3135   "maxTfafficLoss": number, ?
3136   "maxTrafficJitter": number, ?

```

```

3137     "meters": [
3138         { "href": string }, +
3139     ], ?
3140     "eventLog": { "href": string }, ?
3141     "operations": [
3142         { "rel": "edit", "href": string }, ?
3143         { "rel": "delete", "href": string } ?
3144     ] ?
3145     ...
3146 }

```

3147 **XML media type:** application/CIMI-VSP+xml

3148 **XML serialization:**

```

3149 <VSP xmlns="http://www.dmtf.org/cimi">
3150   <self> xs:anyURI </self>
3151   <name> xs:string </name> ?
3152   <description> xs:string </description> ?
3153   <created> xs:string </created>
3154   <property key="xs:string"> xs:string </property> *
3155   <network href="xs:anyURI">
3156     <state> xs:string </state> ?
3157     <bandwidthLimit> xs:integer </bandwidthLimit> ?
3158     <trafficPriority> xs:integer </trafficPriority> ?
3159     <maxTrafficDelay> xs:integer </maxTrafficDelay> ?
3160     <maxTrafficLoss> xs:integer </maxTrafficLoss> ?
3161     <maxTrafficJitter> xs:integer </maxTrafficJiffer> ?
3162     <meter href="xs:anyURI"/> *
3163     <eventLog href="xs:anyURI"/> ?
3164     <operation rel="edit" href="xs:anyURI"/> ?
3165     <operation rel="delete" href="xs:anyURI"/> ?
3166     <xs:any>*
3167 </VSP>

```

3168 5.13.11.1 Operations

3169 This entity supports the Read, Update and Delete operations. Create is supported via the VSP Collection
3170 entity.

3171 The following custom operations are also defined:

3172 Starting a VSP

3173 **/link@rel:** http://www.dmtf.org/cimi/action/start

3174 This operation will start a VSP.

3175 Input parameters: None.

3176 Output parameters: None.

3177 Upon successful completion of this operation the VSP shall be in the "STARTED" state.

3178 **NOTE: need a better description - Steve?**

3179 • **HTTP/REST Protocol**

3180 To start a VSP a POST is sent to the "http://www.dmtf.org/cimi/start" URI of the VSP where the HTTP
3181 request body SHALL be as described below.

3182 **JSON media type:** application/CIMI-Action+json

3183 **JSON serialization:**

```
3184 { "action": "http://www.dmtf.org/cimi/action/start" ,  
3185   "properties": { "key": string, + } ?  
3186   ...  
3187 }
```

3188 **XML media type:** application/CIMI-Action+xml

3189 **XML serialization**

```
3190 <Action xmlns="http://www.dmtf.org/cimi">  
3191   <action> http://www.dmtf.org/cimi/action/start </action>  
3192   <property key="xs:string"> xs:string </property> *  
3193   <xs:any>*  
3194 </Action>
```

3195 Upon successful processing of the request, the HTTP response body will be empty.

3196 **Stopping a VSP**

3197 **//link@rel:** http://www.dmtf.org/cimi/action/stop

3198 This operation will stop a VSP.

3199 Input parameters: None.

3200 Output parameters: None.

3201 Upon successful completion of this operation the VSP shall be in the "STOPPED" state.

3202 **NOTE: need a better description - Steve?**

3203 • **HTTP/REST Protocol**

3204 To start a VSP a POST is sent to the "http://www.dmtf.org/cimi/stop" URI of the VSP where the HTTP
3205 request body SHALL be as described below.

3206 **JSON media type:** application/CIMI-Action+json

3207 **JSON serialization:**

```
3208 { "action": "http://www.dmtf.org/cimi/action/stop" ,  
3209   "properties": { "key": string, + } ?  
3210   ...  
3211 }
```

3212 **XML media type:** application/CIMI-Action+xml

3213 **XML serialization**

```
3214 <Action xmlns="http://www.dmtf.org/cimi">  
3215   <action> http://www.dmtf.org/cimi/action/stop </action>  
3216   <property key="xs:string"> xs:string </property> *  
3217   <xs:any>*  
3218 </Action>
```

3219 Upon successful processing of the request, the HTTP response body will be empty.

3220 5.13.12 VSP (Virtual Switch Port) Collection

3221 A VSP Collection entity represents the collection of VSPs within a Provider. This entity can be used to
3222 locate and create VSPs.

Name	VSPCollection	
Type URI	http://www.dmtf.org/cimi/VSPCollection	
Attribute	Type	Description
vsp	ref[]	An array of references to the set of VSPs in the Provider. Properties: Mandatory / Mutable

3223 The following describes the serialization of the entity in both JSON and XML:

3224 **JSON media type:** application/CIMI-VSPCollection+json

3225 **JSON serialization:**

```
3226 { "self": string,
3227   "name": string, ?
3228   "description": string, ?
3229   "created": string, ?
3230   "properties": { "key": string, + }, ?
3231   "vsp": [
3232     { "href": string }, +
3233   ], ?
3234   "operations": [
3235     { "rel": "add", "href": string }, ?
3236     { "rel": "edit", "href": string } ?
3237   ] ?
3238   ...
3239 }
```

3240 **XML media type:** application/CIMI-VSPCollection+xml

3241 **XML serialization:**

```
3242 <VSPCollection xmlns="http://www.dmtf.org/cimi">
3243   <self> xs:anyURI </self>
3244   <name> xs:string </name> ?
3245   <description> xs:string </description> ?
3246   <created> xs:string </created>
3247   <property key="xs:string"> xs:string </property> *
3248   <vsp href="xs:anyURI"/> *
3249   <operation rel="add" href="xs:anyURI"/> ?
3250   <operation rel="edit" href="xs:anyURI"/> ?
3251   <xs:any>*
3252 </VSPCollection>
```

3253 5.13.12.1 Operations

3254 This entity supports the Read and Update operations.

3255 The following custom operations are also defined:

3256 **Creating a New VSP**

3257 **/link@rel:** add

3258 This operation will create a new VSP.

3259 Input parameters: Either a reference to a VSP Template or a VSP Template itself.

3260 Output parameters: A reference to a new VSP and, optionally, the representation of the VSP.

3261 • **HTTP/REST Protocol**

3262 To create a new VSP a POST is sent to the "add" URI of the VSPCollection where the HTTP request
3263 body SHALL be as described below. Note this structure allows for certain properties to be passed in "by
3264 value" or by "reference". The definition of each property can be found in section 5.13.7.

3265 **JSON media type:** application/CIMI-VSPCreate+json

3266 **JSON serialization:**

```
3267 { "name": string, ?
3268   "description": string, ?
3269   "properties": { "key": string, + }, ?
3270   "vspTemplate": { "href": string, ?
3271     "properties": { "key": string, + } ?
3272     "network": { "href": string }, ?
3273     "vspConfig": { "href": string, ?
3274       "properties": { "key": string, + }, ?
3275       "bandwidthReservation": number, ?
3276       "trafficPriority": number, ?
3277       "maxTrafficDelay": number, ?
3278       "maxTrafficLoss": number, ?
3279       "maxTrafficJitter": number ?
3280     } ?
3281   }
3282   ...
3283 }
```

3284 **XML media type:** application/CIMI-VSPCreate+xml

3285 **XML serialization**

```
3286 <NVSPCreate>
3287   <name> xs:string </name> ?
3288   <description> xs:string </description> ?
3289   <property key="xs:string"> xs:string </property> *
3290   <vspTemplate href="xs:anyURI"? >
3291     <property key="xs:string"> xs:string </property> *
3292     <network href="xs:anyURI"/> ?
3293     <vspConfig href="xs:anyURI">
3294       <property key="xs:string"> xs:string </property> *
3295       <bandwidthReservation> xs:integer </bandwidthReservation> ?
3296       <trafficPriority> xs:integer </trafficPriority> ?
3297       <maxTrafficDelay> xs:integer </maxTrafficDelay> ?
3298       <maxTrafficLoss> xs:integer </maxTrafficLoss> ?
3299       <maxTrafficJitter> xs:integer </maxTrafficJitter> ?
3300     </vspConfig> ?
3301   </vspTemplate>
3302   <xs:any>*
3303 </VSPCreate>
```

3304 The serialization of some reference properties are specified such that a request MAY either include a
3305 reference ("href") to an existing entity or to include the entity "inline" as a set of additional properties.
3306 Requests SHALL NOT include both a reference and the inlined set of properties.

3307 Upon successful processing of the request, the HTTP response body MAY either be empty or contain a
3308 serialization of the VSP entity.

3309 5.13.13 Routing Group Template

3310 This entity captures the configuration values for realizing a RoutingGroup. A Routing Group Template
3311 may be used to create multiple RoutingGroup.

Name	RoutingGroupTemplate	
Type URI	http://www.dmtf.org/cimi/RoutingGroupTemplate	
Attribute	Type	Description
networks	ref[]	An array of references to the networks in this Routing Group. Properties: Mandatory / Mutable

3312 The following describes the serialization of the entity in both JSON and XML:

3313 **JSON media type:** application/CIMI-RoutingGroupTemplate+json

3314 **JSON serialization:**

```
3315 { "self": string,
3316   "name": string, ?
3317   "description": string, ?
3318   "created": string, ?
3319   "properties": { "key": string, + }, ?
3320   "networks": [
3321     { "href": string }, +
3322   ], ?
3323   "operations": [
3324     { "rel": "edit", "href": string }, ?
3325     { "rel": "delete", "href": string } ?
3326   ] ?
3327   ...
3328 }
```

3329 **XML media type:** application/CIMI-RoutingGroupTemplate+xml

3330 **XML serialization:**

```
3331 <RoutingGroupTemplate xmlns="http://www.dmtf.org/cimi">
3332   <self> xs:anyURI </self>
3333   <name> xs:string </name> ?
3334   <description> xs:string </description> ?
3335   <created> xs:string </created>
3336   <property key="xs:string"> xs:string </property> *
3337   <network href="xs:anyURI"> *
3338   <operation rel="edit" href="xs:anyURI"/> ?
3339   <operation rel="delete" href="xs:anyURI"/> ?
3340   <xs:any>*
3341 </RoutingGroupTemplate>
```

3342 5.13.13.1 Operations

3343 This entity supports the Read, Update and Delete operations. Create is supported via the Routing Group
3344 Template Collection entity.

3345 5.13.14 Routing Group Template Collection

3346 A Routing Group Template Collection entity represents the collection of Routing Group Template entities
3347 within a Provider. This entity can be used to locate and create Routing Group Templates.

Name	RoutingGroupTemplateCollection	
Type URI	http://www.dmtf.org/cimi/RoutingGroupTemplateCollection	
Attribute	Type	Description
routingGroupTemplates	ref[]	An array of references to the set of Routing Group Templates in the Provider. Properties: Mandatory / Mutable

3348 The following describes the serialization of the entity in both JSON and XML:

3349 **JSON media type:** application/CIMI-RoutingGroupTemplateCollection+json

3350 **JSON serialization:**

```

3351 { "self": string,
3352   "name": string, ?
3353   "description": string, ?
3354   "created": string, ?
3355   "properties": { "key": string, + }, ?
3356   "routingGroupTemplates": [
3357     { "href": string }, +
3358   ], ?
3359   "operations": [
3360     { "rel": "add", "href": string }, ?
3361     { "rel": "edit", "href": string } ?
3362   ] ?
3363   ...
3364 }
```

3365 **XML media type:** application/CIMI-RoutingGroupTemplateCollection+xml

3366 **XML serialization:**

```

3367 <RoutingGroupTemplateCollection xmlns="http://www.dmtf.org/cimi">
3368   <self> xs:anyURI </self>
3369   <name> xs:string </name> ?
3370   <description> xs:string </description> ?
3371   <created> xs:string </created>
3372   <property key="xs:string"> xs:string </property> *
3373   <routingGroupTemplate href="xs:anyURI"/> *
3374   <operation rel="add" href="xs:anyURI"/> ?
3375   <operation rel="edit" href="xs:anyURI"/> ?
3376   <xs:any>*
3377 </RoutingGroupTemplateCollection>
```

3378 5.13.14.1 Operations

3379 This entity supports the Read and Update operations. Creation of new Routing Group Template entities is
3380 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

3381 5.13.15 Routing Group

3382 A Routing Group represents a collection of Networks that route to each other..

Name	RoutingGroup
Type URI	http://www.dmtf.org/cimi/RoutingGroup

Attribute	Type	Description
networks	ref[]	An array of references to the networks in this Routing Group. Properties: Mandatory / Mutable

3383 The following describes the serialization of the entity in both JSON and XML:

3384 **JSON media type:** application/CIMI-RoutingGroup+json

3385 **JSON serialization:**

```

3386 { "self": string,
3387   "name": string, ?
3388   "description": string, ?
3389   "created": string, ?
3390   "properties": { "key": string, + }, ?
3391   "networks": [
3392     { "href": string }, +
3393   ], ?
3394   "operations": [
3395     { "rel": "edit", "href": string }, ?
3396     { "rel": "delete", "href": string } ?
3397   ] ?
3398   ...
3399 }
```

3400 **XML media type:** application/CIMI-RoutingGroup+xml

3401 **XML serialization:**

```

3402 <VSP xmlns="http://www.dmtf.org/cimi">
3403   <self> xs:anyURI </self>
3404   <name> xs:string </name> ?
3405   <description> xs:string </description> ?
3406   <created> xs:string </created>
3407   <property key="xs:string"> xs:string </property> *
3408   <network href="xs:anyURI"> *
3409   <operation rel="edit" href="xs:anyURI"/> ?
3410   <operation rel="delete" href="xs:anyURI"/> ?
3411   <xs:any*>
3412 </VSP>
```

3413 **5.13.15.1 Operations**

3414 This entity supports the Read, Update and Delete operations. Create is supported via the RoutingGroup
3415 Collection entity.

3416 **5.13.16 Routing Group Collection**

3417 A Routing Group Collection entity represents the collection of Routing Groups within a Provider. This
3418 entity can be used to locate and create Routing Groups.

Name	RoutingGroupCollection	
Type URI	http://www.dmtf.org/cimi/RoutingGroupCollection	
Attribute	Type	Description
routingGroups	ref[]	An array of references to the set of RoutingGroups in the Provider.

	Properties: Mandatory / Mutable
--	----------------------------------------

3419 The following describes the serialization of the entity in both JSON and XML:

3420 **JSON media type:** application/CIMI-RoutingGroupCollection+json

3421 **JSON serialization:**

```

3422 { "self": string,
3423   "name": string, ?
3424   "description": string, ?
3425   "created": string, ?
3426   "properties": { "key": string, + }, ?
3427   "routingGroups": [
3428     { "href": string }, +
3429   ], ?
3430   "operations": [
3431     { "rel": "add", "href": string }, ?
3432     { "rel": "edit", "href": string } ?
3433   ] ?
3434   ...
3435 }
```

3436 **XML media type:** application/CIMI-RoutingGroupCollection+xml

3437 **XML serialization:**

```

3438 <RoutingGroupCollection xmlns="http://www.dmtf.org/cimi">
3439   <self> xs:anyURI </self>
3440   <name> xs:string </name> ?
3441   <description> xs:string </description> ?
3442   <created> xs:string </created>
3443   <property key="xs:string"> xs:string </property> *
3444   <routingGroup href="xs:anyURI"/> *
3445   <operation rel="add" href="xs:anyURI"/> ?
3446   <operation rel="edit" href="xs:anyURI"/> ?
3447   <xs:any*>
3448 </RoutingGroupCollection>
```

3449 5.13.16.1 Operations

3450 This entity supports the Read and Update operations.

3451 The following custom operations are also defined:

3452 **Creating a New RoutingGroup**

3453 **/link@rel:** add

3454 This operation will create a new RoutingGroup.

3455 Input parameters: Either a reference to a Routing Group Template or a Routing Group Template itself.

3456 Output parameters: A reference to a new RoutingGroup and, optionally, the representation of the
3457 RoutingGroup.

3458 • **HTTP/REST Protocol**

3459 To create a new RoutingGroup a POST is sent to the "add" URI of the RoutingGroupCollection where the
3460 HTTP request body SHALL be as described below. Note this structure allows for certain properties to be
3461 passed in "by value" or by "reference". The definition of each property can be found in section 5.13.13.

3462 **JSON media type:** application/CIMI-RoutingGroupCreate+json

3463 **JSON serialization:**

```

3464 { "name": string, ?
3465   "description": string, ?
3466   "properties": { "key": string, + }, ?
3467   "routingGroupTemplate": { "href": string, ?
3468     "properties": { "key": string, + }, ?
3469     "networks": [
3470       { "href": string }, +
3471     ] ?
3472 }
3473 ...
3474 }
```

3475 **XML media type:** application/CIMI-RoutingGroupCreate+xml

3476 **XML serialization**

```

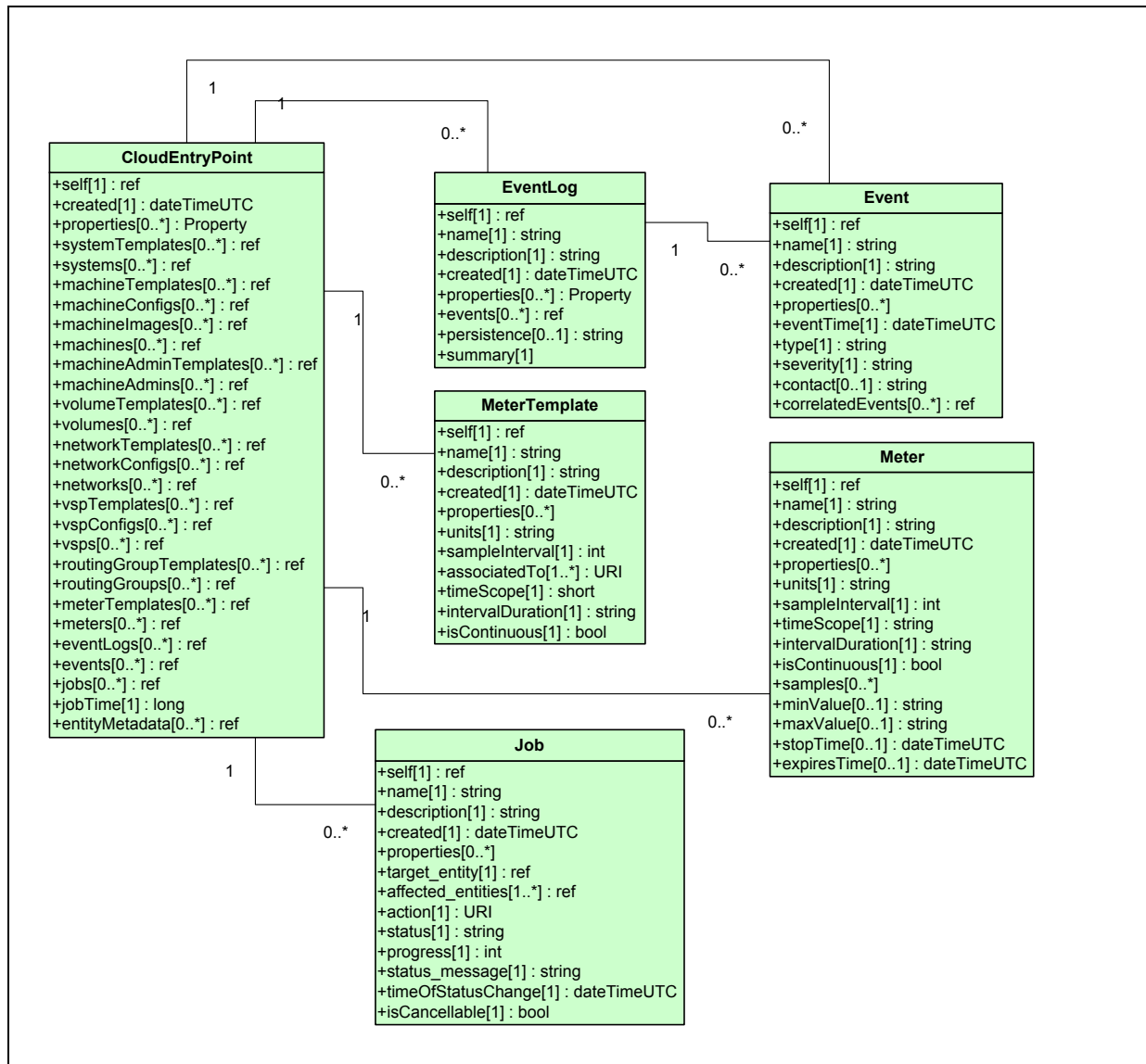
3477 <RoutingGroupCreate>
3478   <name> xs:string </name> ?
3479   <description> xs:string </description> ?
3480   <property key="xs:string"> xs:string </property> *
3481   <routingGroupTemplate href="xs:anyURII"? >
3482     <property key="xs:string"> xs:string </property> *
3483     <network href="xs:anyURI"/> *
3484   </routingGroupTemplate/>
3485   <xs:any>*
3486 </RoutingGroupCreate>
```

3487 The serialization of some reference properties are specified such that a request MAY either include a
 3488 reference ("href") to an existing entity or to include the entity "inline" as a set of additional properties.
 3489 Requests SHALL NOT include both a reference and the inlined set of properties.

3490 Upon successful processing of the request, the HTTP response body MAY either be empty or contain a
 3491 serialization of the RoutingGroup entity.

3492 5.14 Monitoring Entities and Relationships

3493 The following diagram illustrates the entities involved in tracking the progress of operations as well as
 3494 metering and monitoring the status of other entities. Although this drawing is in the style of an Entity
 3495 Relationship diagram, the use of UML is neither rigorous nor normative.



3496

3497 **Figure 5 - Monitoring Entities**

3498 **5.14.1 Job**

3499 This entity represents a process (i.e. a sequence of one or more operations directed to accomplish a
 3500 specific goal) performed by the Provider.

3501 If a Provider supports exposing Job entities to Consumers then each request from a Consumer that would
 3502 result in a change to the environment MUST result in a Job entity being created and a reference to that
 3503 Job entity MUST be made available to the requesting Consumer. Providers MAY create additional Job
 3504 entities for Provider initiated operations.

Name	Job	
Type URI	http://www.dmtf.org/cimi/Job	
Attribute	Type	Description

targetEntity	ref	A reference to the top-level entity upon which the operation is being performed. Typically, this would be the instance which was specified when the operation was initiated. This attribute value is read-only . Properties: Mandatory / Mutable
action	URI	A URI that indicates the type of action being performed. Properties: Mandatory / Immutable
status	string	The current status of the process associated with this operation. Sample values for this include "running", "failed", "success", and "cancelled". This attribute value is read-only . Properties: Mandatory / Mutable
returnCode	Integer	The operation return code, the specific value will be implementation specific. Values in the range of 0 to 9999 are reserved for use by this specification. This attribute is read-only . Properties: Mandatory / Immutable
progress	integer	An integer value in the range 0 ... 100 that indicates the progress of this Job. This attribute value is read-only . Properties: Mandatory / Mutable
statusMessage	string	This attribute is a human-readable string that provides information about the operation. It is used to further qualify or provide additional information about the current status of the operation. For example, this may indicate the reason why the operation failed, or whether the operation was cancelled by the Consumer or the Provider. This attribute value is read-only . Properties: Mandatory / Mutable
timeOfStatusChange	DateTimeUTC	A timestamp indicating the last time that the status of the operation changed. This attribute value is read-only . Properties: Mandatory / Mutable
isCancellable	boolean	Specifies whether the task being performed by this Job object supports the Cancel operation. Properties: Mandatory / Immutable
parentJob	ref	A reference to the Job that this entity is a subordinate of. This attribute is read-only . Properties: Mandatory / Immutable
nestedJobs	ref[]	An array of references to a set of subordinate Job entities. This attribute is read-only . Properties: Mandatory / Immutable

3505 The following describes the serialization of the entity in both JSON and XML:

3506 **JSON media type:** application/CIMI-Job+json

3507 **JSON serialization:**

```

3508 { "self": string,
3509     "name": string, ?
3510     "description": string, ?
3511     "created": string, ?
3512     "properties": { "key": string, + }, ?
3513     "targetEntity": { "href": string },
3514     "action": string,
3515     "status": string,
3516     "returnCode": integer,
3517     "progress": integer,
3518     "statusMessage": string,
3519     "timeOfStatusChange": date,
3520     "isCancellable": boolean,
3521     "parentJob": { "href": string }, ?
3522     "nestedJobs": [
3523         { "href": string? }, +
3524     ], ?
3525     "operations": [
3526         { "rel": "edit", "href": string }, ?
3527         { "rel": "delete", "href": string } ?
3528     ] ?
3529     ...
3530 }
```

3531 **XML media type:** application/CIMI-Job+xml

3532 **XML serialization:**

```

3533 <Job xmlns="http://www.dmtf.org/cimi">
3534   <self> xs:anyURI </self>
3535   <name> xs:string </name> ?
3536   <description> xs:string </description> ?
3537   <created> xs:string </created>
3538   <property key="xs:string"> xs:string </property> *
3539   <targetEntity href="xs:anyURI"/>
3540   <action> xs:anyURI </action>
3541   <status> xs:string </status>
3542   <returnCode> xs:integer </returnCode>
3543   <progress> xs:integer <progress>
3544   <statusMessage> xs:string </statusMessage>
3545   <timeOfStatusChange> xs:dateTime </timeOfStatusChange>
3546   <isCancellable> xs:boolean </isCancellable>
3547   <parentJob href="xs:anyURI"/> ?
3548   <nestedJob href="xs:anyURI"/> *
3549   <operation rel="edit" href="xs:anyURI"/> ?
3550   <operation rel="delete" href="xs:anyURI"/> ?
3551   <xs:any>*
3552 </Job>
```

3553 5.14.1.1 Operations

3554 This entity supports the Read, Update and Delete operations.

3555 5.14.2 Job Collection

3556 A Job Collection entity represents the collection of Jobs within a Provider. This resource can be used to
3557 locate Jobs.

Name	JobCollection	
Type URI	http://www.dmtf.org/cimi/JobCollection	
Attribute	Type	Description
jobs	ref[]	An array of references to the set of Jobs in the Provider. Properties: Mandatory / Mutable

3558 The following describes the serialization of the entity in both JSON and XML:

3559 **JSON media type:** application/CIMI-JobCollection+json

3560 **JSON serialization:**

```

3561 { "self": string,
3562   "name": string, ?
3563   "description": string, ?
3564   "created": string, ?
3565   "properties": { "key": string, + }, ?
3566   "jobs": [
3567     { "href": string }, +
3568   ], ?
3569   "operations": [
3570     { "rel": "edit", "href": string } ?
3571   ] ?
3572   ...
3573 }
```

3574 **XML media type:** application/CIMI-JobCollection+xml

3575 **XML serialization:**

```

3576 <JobCollection xmlns="http://www.dmtf.org/cimi">
3577   <self> xs:anyURI </self>
3578   <name> xs:string </name> ?
3579   <description> xs:string </description> ?
3580   <created> xs:string </created>
3581   <property key="xs:string"> xs:string </property> *
3582   <job href="xs:anyURI"/> *
3583   <operation rel="edit" href="xs:anyURI"/> ?
3584   <xs:any>*
3585 </JobCollection>
```

3586 5.14.2.1 Operations

3587 This entity supports the Read and Update operations.

3588 5.14.3 Meter Template

3589 A Meter Template represents the definition of a Meter.

Name	MeterTemplate	
Type URI	http://www.dmtf.org/cimi/MeterTemplate	
Attribute	Type	Description
aspect	URI	A unique identifier representing the aspect of the resource being metered. See the table below for the set of CIMI defined URIs.

units	string	Human readable name of the used units, e.g. kilobits per second, CPU usage percentage, etc. Properties: Mandatory / Mutable
sampleInterval	integer	It indicates the time between consecutive samples in seconds. Properties: Mandatory / Mutable
associatedTo	URI[]	An array of URIs that indicate the entities to which a Meter created from this template can be applied. The value space of these URIs is identical to that of EntityMetadata.typeURI - a URI that uniquely identifies an entity type. Properties: Mandatory / Mutable
timeScope	string	It indicates the time scope to which the Meter value applies. Two possible values: "Point" indicates that the Meter applies to a point in time. "Interval" indicates that the Meter applies to a time interval. For instance, it would be possible to define a MeterTemplate which purpose is to provide the daily average CPU usage. Properties: Mandatory / Mutable
intervalDuration	string	It indicates the interval duration when the timeScope is set to "Interval". Possible values: hourly, daily, weekly, monthly or yearly. Properties: Mandatory / Mutable
isContinuous	boolean	It indicates whether or not the Meter value is continuous or scalar. Performance Meters are an example of a linear metric. Properties: Mandatory / Mutable

3590 The following describes the serialization of the entity in both JSON and XML:

3591 **JSON media type:** application/CIMI-MeterTemplate+json

3592 **JSON serialization:**

```

3593 { "self": string,
3594   "name": string, ?
3595   "description": string, ?
3596   "created": string, ?
3597   "properties": { "key": string, + }, ?
3598   "aspect": string,
3599   "units": string,
3600   "sampleInterval": integer,
3601   "associatedTo": [
3602     { "href": string }, +
3603   ], ?
3604   "timeScope": string,
3605   "intervalDuration": string,
3606   "isContinuous": boolean,
3607   "operations": [
3608     { "rel": "edit", "href": string }, ?
3609     { "rel": "delete", "href": string } ?
3610   ] ?
3611   ...
3612 }
```

3613 **XML media type:** application/CIMI-MeterTemplate+xml

3614 **XML serialization:**

```

3615 <MeterTemplate xmlns="http://www.dmtf.org/cimi">
3616   <self> xs:anyURI </self>
3617   <name> xs:string </name> ?
3618   <description> xs:string </description> ?
3619   <created> xs:string </created>
3620   <property key="xs:string"> xs:string </property> *
3621   <aspect> xs:anyURI </aspect>
3622   <units> xs:string </units>
3623   <sampleInterval> xs:integer </sampleInterval>
3624   <associatedTo href="xs:anyURI"/> *
3625   <timeScope> xs:string </timeScope>
3626   <intervalDuration> xs:string </intervalDuration>
3627   <isContinuous> xs:boolean </isContinuous>
3628   <operation rel="edit" href="xs:anyURI"/> ?
3629   <operation rel="delete" href="xs:anyURI"/> ?
3630   <xs:any*>
3631 </MeterTemplate>
    
```

3632 The following table describes the "aspect" URIs defined by this specification. Providers may define new
 3633 aspect URIs and it is recommended that these URIs be dereferencable such that Consumers can
 3634 discover the details of the new aspect. For brevity the "URI" column in the table only shows that last part
 3635 of the URI - it should be appended to: "http://www.dmtf.org/cimi/aspect/".

Aspect	Description
cpu	The percentage CPU usage of the resource. Typically associated with CEP, System and Machine resources. For resources which group other resources (e.g. CEP or System resources), this aspect provides the aggregated percentage usage of the CPU.
memory	The amount of memory being used by the resource. Typically associated with CEP, System and Machine resources. For resources which group other resources (e.g. CEP or System resources), this aspect provides the aggregated usage of the memory.
disk	The amount of disk being used by the resource. Typically associated with CEP, System, Machine and Volume resources. For resources which group other resources (e.g. CEP or System resources), this aspect provides the aggregated disk usage.
bandwidth	The amount of network traffic. Typically associated with CEP, System and Network resources. For CEP and System resources, this aspect provides the aggregated bandwidth of all the networks under them.
inputBandwidth	The amount of input bandwidth used by the resource. Typically associated with Machine, VSP and Volume resources. For Machine resources, this aspect provides the aggregated input bandwidth usage of all its network interfaces .
outputBandwidth	The amount of output bandwidth used by the resource. Typically associated with Machine, VSP and Volume resources. For Machine resources, this aspect provides the aggregated input bandwidth usage of all its network interfaces.

3636 **5.14.3.1 Operations**

3637 This entity supports the Read, Update and Delete operations. Create is supported via the Meter Template
 3638 entity.

3639 **5.14.4 Meter Template Collection**

3640 A Meter Template Collection entity represents the collection of Meter Templates within a Provider. This
3641 entity can be used to locate Meter Templates.

Name	MeterTemplateCollection	
Type URI	http://www.dmtf.org/cimi/MeterTemplateCollection	
Attribute	Type	Description
meterTemplates	ref[]	An array of references to the set of Meter Templates in the Provider. Properties: Mandatory / Mutable

3642 The following describes the serialization of the entity in both JSON and XML:

3643 **JSON media type:** application/CIMI-MeterTemplateCollection+json

3644 **JSON serialization:**

```
3645 { "self": string,
3646   "name": string, ?
3647   "description": string, ?
3648   "created": string, ?
3649   "properties": { "key": string, + }, ?
3650   "meterTemplates": [
3651     { "href": string }, +
3652   ], ?
3653   "operations": [
3654     { "rel": "add", "href": string } ?
3655     { "rel": "edit", "href": string } ?
3656   ] ?
3657   ...
3658 }
```

3659 **XML media type:** application/CIMI-MeterTemplateCollection+xml

3660 **XML serialization:**

```
3661 <MeterTemplateCollection xmlns="http://www.dmtf.org/cimi">
3662   <self> xs:anyURI </self>
3663   <name> xs:string </name> ?
3664   <description> xs:string </description> ?
3665   <created> xs:string </created>
3666   <property key="xs:string"> xs:string </property> *
3667   <meterTemplate href="xs:anyURI"/> *
3668   <operation rel="add" href="xs:anyURI"/> ?
3669   <operation rel="edit" href="xs:anyURI"/> ?
3670   <xs:any>*
3671 </MeterTemplateCollection>
```

3672 **5.14.4.1 Operations**

3673 This entity supports the Read and Update operations. Creation of new Meter Template entities is
3674 supported via a POST to the "addLink" URI as described in section 4.2.2.1.

3675 **5.14.5 Meter**

3676 This entity represents an available Meter of some property associated to a given entity.

Name	Meter										
Type URI	http://www.dmtf.org/cimi/Meter										
Attribute	Type	Description									
targetEntity	ref	A reference to the entity to which the Meter is related. This attribute is read-only . Properties: Mandatory / Mutable									
aspect	URI	A unique identifier representing the aspect of the resource being metered.									
units	string	Name of the used units, e.g. kilobits per second, CPU usage percentage, etc. This attribute is read-only . Properties: Mandatory / Mutable									
sampleInterval	integer	It indicates the time between consecutive samples in seconds. This attribute is read-only . Properties: Mandatory / Mutable									
timeScope	string	It indicates the time scope to which this meter's value applies. Two possible values: "Point" indicates that the Meter applies to a point in time. "Interval" indicates that the Meter applies to a time interval. For instance, it would be possible to define a MeterTemplate which purpose is to provide the daily average CPU usage. This attribute is read-only . Properties: Mandatory / Mutable									
intervalDuration	string	It indicates the interval duration when the timeScope is set to "Interval". Possible values: hourly, daily, weekly, monthly or yearly. This attribute is read-only . Properties: Mandatory / Mutable									
isContinuous	boolean	It indicates whether or not the Meter value is continuous or scalar. Performance Meters are an example of a linear metric. This attribute is read-only . Properties: Mandatory / Mutable									
samples	sample[]	A list of taken samples Each sample attribute has the following sub-attributes: <table border="1"> <tr> <td>Name</td> <td colspan="2">sample</td> </tr> <tr> <td>Attribute</td> <td>Type</td> <td>Description</td> </tr> <tr> <td>timeStamp</td> <td>DateTimeUTC</td> <td>It indicates when the measure was taken (timeScope="Point"). When the timeScope is "Interval", it indicates the end of the time interval.</td> </tr> </table>	Name	sample		Attribute	Type	Description	timeStamp	DateTimeUTC	It indicates when the measure was taken (timeScope="Point"). When the timeScope is "Interval", it indicates the end of the time interval.
Name	sample										
Attribute	Type	Description									
timeStamp	DateTimeUTC	It indicates when the measure was taken (timeScope="Point"). When the timeScope is "Interval", it indicates the end of the time interval.									

				Properties: Mandatory / Mutable
		value	string	It indicates the sampled value of the measure. Properties: Mandatory / Mutable
		Properties: Mandatory / Mutable		
minValue	string	It indicates the expected minimal measure value. This attribute is read-only . Properties: Mandatory / Mutable		
maxValue	string	It indicates the expected maximum measure value. This attribute is read-only . Properties: Mandatory / Mutable		
stopTime	dateTimeUTC	It indicates a time from which the meter stops tracking samples. This attribute is writable . Properties: Mandatory / Mutable		
expiresTime	dateTimeUTC	It indicates the time from which the Meter is not monitored anymore. It implies the deletion of the Meter after this time. This attribute is writable . Properties: Mandatory / Mutable		

3677 The following describes the serialization of the entity in both JSON and XML:

3678 **JSON media type:** application/CIMI-Meter+json

3679 **JSON serialization:**

```

3680 { "self": string,
3681   "name": string, ?
3682   "description": string, ?
3683   "created": string, ?
3684   "properties": { "key": string, + }, ?
3685   "targetEntity": { "href": string },
3686   "aspect": string,
3687   "units": string,
3688   "sampleInterval": integer,
3689   "timeScope": string,
3690   "intervalDuration": string,
3691   "isContinuous": boolean,
3692   "samples": [
3693     { "timestamp": string, "value": string }, +
3694   ], ?
3695   "minValue": string, ?
3696   "maxValue": string, ?
3697   "stopTime": string, ?
3698   "expiresTime": string, ?
3699   "operations": [
3700     { "rel": "edit", "href": string }, ?
3701     { "rel": "delete", "href": string } ?
3702   ] ?
3703   ...
3704 }
```

3705 **XML media type:** application/CIMI-Meter+xml

3706 **XML serialization:**

```

3707 <Meter xmlns="http://www.dmtf.org/cimi">
3708   <self> xs:anyURI </self>
3709   <name> xs:string </name> ?
3710   <description> xs:string </description> ?
3711   <created> xs:string </created>
3712   <property key="xs:string"> xs:string </property> *
3713   <targetEntity href="xs:anyURI"/>
3714   <aspect> xs:anyURI </aspect>
3715   <units> xs:string </units>
3716   <sampleInterval> xs:integer </sampleInterval>
3717   <timeScope> xs:string <timeScope>
3718   <intervalDuration xs:string </intervalDuration>
3719   <isContinuous> xs:boolean </isContinuous>
3720   <sample timestamp="xs:dateTime" value="xs:string"/> *
3721   <minValue> xs:string </minValue> ?
3722   <maxValue> xs:string </maxValue> ?
3723   <stopTime> xs:dateTime </stopTime> ?
3724   <expiresTime> xs:dateTime </expiresTime> ?
3725   <operation rel="edit" href="xs:anyURI"/> ?
3726   <operation rel="delete" href="xs:anyURI"/> ?
3727   <xs:any>*
3728 </Meter>

```

3729 **5.14.5.1 Operations**

3730 This entity supports the Read, Update and Delete operations. Create is supported via the Meter
3731 Collection entity.

3732 The following custom operations are also defined:

3733 **Starting a Meter**

3734 **/link@rel:** http://www.dmtf.org/cimi/action/start

3735 This operation will start a Meter.

3736 Input parameters: None.

3737 Output parameters: None.

3738 Upon successful completion of this operation the Meter will begin to record samples related to its
3739 associated resource.

3740 • **HTTP/REST Protocol**

3741 To start a Meter a POST is sent to the "http://www.dmtf.org/cimi/start" URI of the Meter where the HTTP
3742 request body SHALL be as described below.

3743 **JSON media type:** application/CIMI-Action+json

3744 **JSON serialization:**

```

3745 { "action": "http://www.dmtf.org/cimi/action/start" ,
3746   "properties": { "key": string, + } ?
3747   ...
3748 }

```

3749 **XML media type:** application/CIMI-Action+xml

3750 **XML serialization**

```
3751 <Action xmlns="http://www.dmtf.org/cimi">
3752   <action> http://www.dmtf.org/cimi/action/start </action>
3753   <property key="xs:string"> xs:string </property> *
3754   <xs:any>*
3755 </Action>
```

3756 Upon successful processing of the request, the HTTP response body will be empty.

3757 **Stopping a Meter**

3758 **//link@rel:** http://www.dmtf.org/cimi/action/stop

3759 This operation will stop a Meter.

3760 Input parameters: None.

3761 Output parameters: None.

3762 Upon successful completion of this operation the Meter will no longer be recording samples related to its
3763 associated resource.

3764 • **HTTP/REST Protocol**

3765 To stop a Meter a POST is sent to the "http://www.dmtf.org/cimi/start" URI of the Meter where the HTTP
3766 request body SHALL be as described below.

3767 **JSON media type:** application/CIMI-Action+json

3768 **JSON serialization:**

```
3769 { "action": "http://www.dmtf.org/cimi/action/stop" ,
3770   "properties": { "key": string, + } ?
3771   ...
3772 }
```

3773 **XML media type:** application/CIMI-Action+xml

3774 **XML serialization**

```
3775 <Action xmlns="http://www.dmtf.org/cimi">
3776   <action> http://www.dmtf.org/cimi/action/stop </action>
3777   <property key="xs:string"> xs:string </property> *
3778   <xs:any>*
3779 </Action>
```

3780 Upon successful processing of the request, the HTTP response body will be empty.

3781 5.14.6 Meter Collection

3782 A Meter Collection entity represents the collection of Meters within a Provider. This entity can be used to
3783 locate and create Meters.

Name	MeterCollection	
Type URI	http://www.dmtf.org/cimi/MeterCollection	
Attribute	Type	Description

meters	ref[]	An array of references to the set of Meters in the Provider. Properties: Mandatory / Mutable
--------	-------	--------------------------------------------------------------------------------------------------------

3784 The following describes the serialization of the entity in both JSON and XML:

3785 **JSON media type:** application/CIMI-MeterCollection+json

3786 **JSON serialization:**

```

3787 { "self": string,
3788   "name": string, ?
3789   "description": string, ?
3790   "created": string, ?
3791   "properties": { "key": string, + }, ?
3792   "meters": [
3793     { "href": string }, +
3794   ], ?
3795   "operations": [
3796     { "rel": "add", "href": string }, ?
3797     { "rel": "edit", "href": string } ?
3798   ] ?
3799   ...
3800 }
```

3801 **XML media type:** application/CIMI-MeterCollection+xml

3802 **XML serialization:**

```

3803 <MeterCollection xmlns="http://www.dmtf.org/cimi">
3804   <self> xs:anyURI </self>
3805   <name> xs:string </name> ?
3806   <description> xs:string </description> ?
3807   <created> xs:string </created>
3808   <property key="xs:string"> xs:string </property> *
3809   <meter href="xs:anyURI"/> *
3810   <operation rel="add" href="xs:anyURI"/> ?
3811   <operation rel="edit" href="xs:anyURI"/> ?
3812   <xs:any>*
3813 </MeterCollection>
```

3814 5.14.6.1 Operations

3815 This entity supports the Read and Update operations.

3816 The following custom operations are also defined:

3817 **Creating a New Meter**

3818 **/link@rel:** add

3819 This operation will create a new Meter.

3820 Input parameters: Either a reference to a Meter Template or a Meter Template itself.

3821 Output parameters: A reference to a new Meter and optionally the representation of the Meter.

3822 • **HTTP/REST Protocol**

3823 To create a new Meter a POST is sent to the "add" URI of the MeterCollection where the HTTP request
3824 body SHALL be as described below. Note this structure allows for certain properties to be passed in "by
3825 value" or by "reference". The definition of each property can be found in section 5.14.3.

3826 **JSON media type:** application/CIMI-MeterCreate+json

3827 **JSON serialization:**

```

3828 { "name": string, ?
3829   "description": string, ?
3830   "properties": { "key": string, + }, ?
3831   "meterTemplate": { "href": string, ?
3832     "properties": { "key": string, + }, ?
3833     "units": string, ?
3834     "sampleInterval": integer, ?
3835     "associatedTo": [
3836       { "href": string }, +
3837     ], ?
3838     "timeScope": string, ?
3839     "intervalDuration": string, ?
3840     "isContinuous": boolean, ?
3841   }
3842   ...
3843 }
```

3844 **XML media type:** application/CIMI-MeterCreate+xml

3845 **XML serialization**

```

3846 <MeterCreate>
3847   <name> xs:string </name> ?
3848   <description> xs:string </description> ?
3849   <property key="xs:string"> xs:string </property> *
3850   <meterTemplate href="xs:anyURI"? >
3851     <property key="xs:string"> xs:string </property> *
3852     <units> xs:string </units> ?
3853     <sampleInterval> xs:integer </sampleInterval> ?
3854     <associatedTo href="xs:anyURI"/> *
3855     <timeScope> xs:string </timeScope> ?
3856     <intervalDuration> xs:string </intervalDuration> ?
3857     <isContinuous> xs:boolean </isContinuous> ?
3858   </meterTemplate>
3859   <xs:any>*
3860 </MeterCreate>
```

3861 The serialization of some reference properties are specified such that a request MAY either include a
 3862 reference ("href") to an existing entity or to include the entity "inline" as a set of additional properties.
 3863 Requests SHALL NOT include both a reference and the inlined set of properties.

3864 Upon successful processing of the request, the HTTP response body MAY either be empty or contain a
 3865 serialization of the Meter entity.

3866 5.14.7 Event Log

3867 An entity that represents a registry of Events.

Name	EventLog	
Type URI	http://www.dmtf.org/cimi/EventLog	
Attribute	Type	Description
targetEntity	ref	A reference to the entity to which the Events are related.
events	ref[]	A list of references to occurred Events.

		Properties: Mandatory / Mutable															
persistence	string	A value that indicates the persistence of the Events within the EventLog. For instance, daily, weekly, monthly or yearly. Properties: Mandatory / Mutable															
summary	structure	A summary of all the events present in the EventLog when the read operation is performed, grouped per severity. Each summary attribute has the following sub-attributes:															
		<table border="1"> <thead> <tr> <th>Attribute</th> <th>Type</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>low</td> <td>integer</td> <td>Number of occurred Events with a low severity. Properties: Mandatory / Mutable</td> </tr> <tr> <td>medium</td> <td>integer</td> <td>Number of occurred Events with a medium severity. Properties: Mandatory / Mutable</td> </tr> <tr> <td>high</td> <td>integer</td> <td>Number of occurred Events with a high severity. Properties: Mandatory / Mutable</td> </tr> <tr> <td>critical</td> <td>integer</td> <td>Number of occurred Events with a critical severity. Properties: Mandatory / Mutable</td> </tr> </tbody> </table>	Attribute	Type	Description	low	integer	Number of occurred Events with a low severity. Properties: Mandatory / Mutable	medium	integer	Number of occurred Events with a medium severity. Properties: Mandatory / Mutable	high	integer	Number of occurred Events with a high severity. Properties: Mandatory / Mutable	critical	integer	Number of occurred Events with a critical severity. Properties: Mandatory / Mutable
		Attribute	Type	Description													
		low	integer	Number of occurred Events with a low severity. Properties: Mandatory / Mutable													
		medium	integer	Number of occurred Events with a medium severity. Properties: Mandatory / Mutable													
		high	integer	Number of occurred Events with a high severity. Properties: Mandatory / Mutable													
critical	integer	Number of occurred Events with a critical severity. Properties: Mandatory / Mutable															
Properties: Mandatory / Mutable																	

3868 The following describes the serialization of the entity in both JSON and XML:

3869 **JSON media type:** application/CIMI-EventLog+json

3870 **JSON serialization:**

```

3871 { "self": string,
3872   "name": string, ?
3873   "description": string, ?
3874   "created": string, ?
3875   "properties": { "key": string, + }, ?
3876   "targetEntity": { "href": string },
3877   "events": [
3878     { "href": string }, +
3879   ], ?
3880   "persistence", string,
3881   "summary", {
3882     "low": number,
3883     "medium": number,
3884     "high": number,
3885     "critical": number
3886   }, ?
3887   "operations": [
3888     { "rel": "edit", "href": string }, ?
3889     { "rel": "delete", "href": string } ?
3890   ] ?
3891   ...

```


3892 }
}3893 **XML media type:** application/CIMI-EventLog+xml3894 **XML serialization:**

```

3895 <EventLog xmlns="http://www.dmtf.org/cimi">
3896   <self> xs:anyURI </self>
3897   <name> xs:string </name> ?
3898   <description> xs:string </description> ?
3899   <created> xs:string </created>
3900   <property key="xs:string"> xs:string </property> *
3901   <targetEntity href="xs:anyURI"/>
3902   <event href="xs:anyURI"/> *
3903   <persistence> xs:string </persistence>
3904   <summary>
3905     <low> xs:integer </low>
3906     <medium> xs:integer </medium>
3907     <high> xs:integer </high>
3908     <critical> xs:integer </critical>
3909   </summary>
3910   <operation rel="edit" href="xs:anyURI"/> ?
3911   <operation rel="delete" href="xs:anyURI"/> ?
3912   <xs:any>*
3913 </EventLog>

```

3914 **5.14.7.1 Operations**

3915 This entity supports the Read, Update and Delete operations.

3916 **5.14.8 Event Log Collection**3917 A Event Log Collection entity represents the collection of Event Logs within a Provider. This resource can
3918 be used to locate EventLogs.

Name	EventLogCollection	
Type URI	http://www.dmtf.org/cimi/EventLogCollection	
Attribute	Type	Description
eventLogs	ref[]	An array of references to the set of Event Logs in the Provider. Properties: Mandatory / Mutable

3919 The following describes the serialization of the entity in both JSON and XML:

3920 **JSON media type:** application/CIMI-EventLogCollection+json3921 **JSON serialization:**

```

3922 { "self": string,
3923   "name": string, ?
3924   "description": string, ?
3925   "created": string, ?
3926   "properties": { "key": string, + }, ?
3927   "eventLogs": [
3928     { "href": string }, +
3929   ], ?
3930   "operations": [
3931     { "rel": "edit", "href": string } ?
3932   ] ?

```

3933 ...
 3934 }

3935 **XML media type:** application/CIMI-EventLogCollection+xml

3936 **XML serialization:**

```

3937 <EventLogCollection xmlns="http://www.dmtf.org/cimi">
3938   <self> xs:anyURI </self>
3939   <name> xs:string </name> ?
3940   <description> xs:string </description> ?
3941   <created> xs:string </created>
3942   <property key="xs:string"> xs:string </property> *
3943   <eventLog href="xs:anyURI"/> *
3944   <operation rel="edit" href="xs:anyURI"/> ?
3945   <xs:any>*
3946 </EventLogCollection>
    
```

3947 **5.14.8.1 Operations**

3948 This entity supports the Read and Update operations.

3949 **5.14.9 Event**

3950 An entity that represents the notification of an event within the managed infrastructure. Some examples of
 3951 Events may be:

- 3952 • Machine X has been rebooted by guest OS
- 3953 • Machine X is not responding to platform services
- 3954 • A new vCPU has been added to machine X following defined elasticity rules

3955 The scope of the Event concept is any kind of information that the Provider is able to track within its
 3956 infrastructure and that can constitute useful information for the consumer. Possible examples, but not
 3957 limited to, are errors and inconveniences that occur in the (virtual) resources assigned to consumers,
 3958 some provider initiated actions such as maintenance tasks, etc.

Name	Event	
Type URI	http://www.dmtf.org/cimi/Event	
Attribute	Type	Description
eventTime	dateTimeUTC	The time and date of creation of the Event. Properties: Mandatory / Immutable
type	string	A value that indicates the kind of Event (informational, error, alarm, etc.). This attribute is read-only . Properties: Mandatory / Mutable
severity	string	A value indicating the Event severity. Possible values are: critical, high, medium or low. This attribute is read-only . Properties: Mandatory / Mutable
contact	string	An optional identifier that references a contact point to solve the problem (helpdesk, technical staff, etc.). This attribute is read-only .

		Properties: Mandatory / Mutable
correlatedEvents	ref[]	A list of Event references whose notifications are correlated with (related to) this one. Properties: Mandatory / Mutable

3959 The following describes the serialization of the entity in both JSON and XML:

3960 **JSON media type:** application/CIMI-Event+json

3961 **JSON serialization:**

```

3962 { "self": string,
3963   "name": string, ?
3964   "description": string, ?
3965   "created": string, ?
3966   "properties": { "key": string, + }, ?
3967   "eventTime": string,
3968   "type": string,
3969   "severity": string,
3970   "contact": string, ?
3971   "correlatedEvents": [
3972     { "href": string }, +
3973   ], ?
3974   "operations": [
3975     { "rel": "edit", "href": string }, ?
3976     { "rel": "delete", "href": string } ?
3977   ] ?
3978   ...
3979 }
```

3980 **XML media type:** application/CIMI-Event+xml

3981 **XML serialization:**

```

3982 <Event xmlns="http://www.dmtf.org/cimi">
3983   <self> xs:anyURI </self>
3984   <name> xs:string </name> ?
3985   <description> xs:string </description> ?
3986   <created> xs:string </created>
3987   <property key="xs:string"> xs:string </property> *
3988   <eventTime> xs:dateTime </eventTime>
3989   <type> xs:string </type>
3990   <severity> xs:string </severity>
3991   <contact> xs:string </contact> ?
3992   <correlatedEvent href="xs:anyURI"/> *
3993   <operation rel="edit" href="xs:anyURI"/> ?
3994   <operation rel="delete" href="xs:anyURI"/> ?
3995   <xs:any>*
3996 </Event>
```

3997 **5.14.9.1 Operations**

3998 This entity supports the Read, Update and Delete operations.

3999 **5.14.10 Event Collection**

4000 An Event Collection entity represents the collection of Events within a Provider. This entity can be used to
4001 locate Events.

Name	EventCollection	
Type URI	http://www.dmtf.org/cimi/EventCollection	
Attribute	Type	Description
events	ref[]	An array of references to the set of Events in the Provider. Properties: Mandatory / Mutable

4002 The following describes the serialization of the entity in both JSON and XML:

4003 **JSON media type:** application/CIMI-EventCollection+json

4004 **JSON serialization:**

```

4005 { "self": string,
4006   "name": string, ?
4007   "description": string, ?
4008   "created": string, ?
4009   "properties": { "key": string, + }, ?
4010   "events": [
4011     { "href": string }, +
4012   ], ?
4013   "operations": [
4014     { "rel": "edit", "href": string } ?
4015   ] ?
4016   ...
4017 }
```

4018 **XML media type:** application/CIMI-EventCollection+xml

4019 **XML serialization:**

```

4020 <EventCollection xmlns="http://www.dmtf.org/cimi">
4021   <self> xs:anyURI </self>
4022   <name> xs:string </name> ?
4023   <description> xs:string </description> ?
4024   <created> xs:string </created>
4025   <property key="xs:string"> xs:string </property> *
4026   <event href="xs:anyURI"/> *
4027   <operation rel="edit" href="xs:anyURI"/> ?
4028   <xs:any>*
4029 </EventCollection>
```

4030 **5.14.10.1 Operations**

4031 This entity supports the Read and Update operations.

4032 **6 Security**

4033 This specification considers two separate but related security domains. The first domain, API-level
4034 security, concerns the protection of the entities modeled by this specification. For example, insuring that
4035 unauthorized users are not allowed to alter a Machine instance. The second domain, resource-level
4036 security, deals with the protection of the underlying resources represented by these entities. For example,
4037 insuring that unauthorized users cannot login to the Linux instance corresponding to that Machine.

4038 **6.1 API Level Security**

4039 **6.1.1 Authentication**

4040 Except in cases where the access control policy allows for anonymous requests, the Provider SHALL
4041 authenticate all request messages and determine the identity of theConsumer. The techniques used to
4042 authenticate messages are outside the scope of this specification.

4043 Protocol bindings of the CIMI Model specification are encouraged to include requirements for the most
4044 common authentication mechanisms applicable to that protocol (e.g. the use of BasicAuth for protocols
4045 using HTTP).

4046 **6.1.2 Message Integrity**

4047 Messages exchanged between the Consumer and the Provider SHOULD have message integrity
4048 protections applied. The mechanisms used to provide message integrity are outside the scope of this
4049 specification.

4050 Protocol bindings of the CIMI Model specification are encouraged to include requirements for the most
4051 common integrity mechanisms applicable to that protocol (e.g. the use of TLS for protocols using HTTP).

4052 **6.1.3 Message Confidentiality**

4053 Messages exchanged between the Consumer and the Provider MAY have message confidentiality
4054 protections applied. The mechanisms used to provide message confidentiality are outside the scope of
4055 this specification.

4056 **6.1.4 Authorization**

4057 The Provider SHOULD process messages only if authorized by access control policy, which may
4058 reference the Consumer's identity, the message type and content, and other contextual information when
4059 making this decision. The language in which this access control policy is expressed as well as the
4060 process by which these authorization decisions are made are outside the scope of this specification.

4061 **6.1.5 Multi-Tenancy**

4062 In cases where a Provider uses multi-tenancy to support a set of Consumers, the operations in this
4063 specification are modeled under the assumption that each Consumer's view of the system (i.e. which
4064 entities are visible, discoverable, and accessible) is scoped to those entities provisioned for or created by
4065 that Consumer. To the Consumer it appears that the Provider is implementing a sole-use instance of the
4066 CIMI API (albeit one who's non-functional characteristics may be influenced the actions of invisible co-
4067 Consumers).

4068 **6.2 Resource Level Credentials**

4069 This specification intentionally avoids constraining the type, nature, or operation of the resources
4070 represented by the entities that it defines. It is therefore outside the scope of this specification to define
4071 the mechanism(s) used to access the resource represented by the Machine entity. There is, however, an
4072 integration point between this specification and such mechanisms, namely the management of the
4073 credentials (user names, passwords, keys, etc.) used to provision such access. This information is
4074 encapsulated by the Machine Admin entity (described in Section 0).

4075

Annex A (informative) – Change Log

4076

Version	Date	Who	What
0.0.1	10/15/10	Gil, Jack	Initial Draft
0.0.2	10/19/10	Jack	Adding the attribute descriptions and high level operational descriptions on the entities
0.0.3	10/29/10	Gil	Add section on the “Initial Scenario” and the mapping of its required use cases to our model.
0.0.4	11/15/10	Gil	Removed ‘definition’ attribute from System Template, Machine Template, Volume Template, and Network Template (per 912). Added “networkInterfaces” attribute to Machine with sub-properties that define IP address – added “protocol”, “subnet_mask”, “default_gateway” and “dns_servers to Network entity (per 910). Removed inline issues and created issues 928 , 929 , and 930 .
0.0.5	11/17/10	Gil	Change “Cloud Site” to “Site per 882 . Added Job entity and removed ‘progress’ attributes per 911 . Added structure to Machine/disks and Machine/volumes per 915 .
0.0.6	12/01/10	Gil	Removed “jobs” attributes from System and System Template to complete 911 . Added “capacity” and “format”, removed “type” from Machine/volumes to complete 915 .
0.0.7	12/10/10	Gil	Added Image entity to resolve 935 . Added new initial scenario to resolve 994 .
0.0.8	12/15/10	Gil	Removed “os” attribute from Machine Template to resolve 1032 . Added quantity/units sub-properties to describe memory and disk sizes and capacities for Machines and Machine Templates to resolve 1009 . Removed “based_on” attribute from System, Machine, Volume, and Network to resolve 1001 . Removed all template property descriptions to the effect that “changes to [this attribute] should correspondingly evaluate the [objects] that have been instantiated based on this [object template]” to resolve 1005 .
0.0.9	01/05/11	Gil	Add Update operation to all entities as resolution to 1003 . Change “Image” entity to “Machine Image” and updated description to resolve 1026 . Fixed some capitalization and terminology inconsistencies.
0.0.10	01/18/11	Gil	Add Provider entity as resolution to 1043 . Change “params” attribute to “properties” in all entities with that attribute – resolves 1002 .
0.0.11	01/19/11	Gil	Move “format” attribute from the Machine-Volume connection to Volume itself and remove “capacity” attribute from the Machine-Volume connection to resolve 956 . Add “properties” attribute to all entities that lacked it as completion of 1002 . Add “Read” operation to all entities that lacked it; homogenize the description of the “Read” operation across all entities - 1049
0.0.12	01/26/11	Gil	Further edits to tweak the resolution for 1043 .

0.0.13	02/02/11	Gil	Added “Create new Machine Image from existing Machine” scenario as per the decision of the WG on 02/02/2011.
0.0.14	02/09/11	Gil	Added “job_time” property to Provider entity as resolution of 1038 . Renamed Machine Template to Machine Configuration and created a new Machine Template entity that reflects the resolution of 1045 .
0.0.15	02/21/11	Gil	Added definition of “Template” as resolution of 1063 . Changed definitions of Machine Configuration and Machine image as resolution of 1069 . Updated UML diagram to remove all relationships that weren’t explicitly defined as attributes of the relevant entities.
0.0.16	03/07/11	Gil	Add additional text to description of Template in section 3.2 to resolve 1044 . Add column to all entity tables to describe attribute data types to resolve 1073 . Changed the 'templates' attribute of Site to 'systemtemplates' to resolve 1075 . Changed the description of Machine Configuration to resolve 1079 .
0.0.17	03/22/11	Gil	Change attributes on Job entity to resolve 1080 . Added “guestInterface” attribute to Machine Configuration, Machine, Volume Template, and Volume to resolve 1083 . Changed description of the operations on Machine Configuration to resolve 1084 . Moved “hostname” attribute of Machine to a sub-property of the “networkinterface” to resolve 1087 . Added “volumes” and “volumetemplates” attributes to Provider entity to resolve 1089 . Removed “state” attributes from System Template and Machine Template to resolve 1093 .
0.0.18	03/23/11	Gil	Add constraint on relative URIs to heading of Section 4.2, “Attributes”, to resolve 1100 . Add “volume” sub-attribute to “volumes” attribute of Machine to resolve 1110 . Applied consistent camelCased naming to resolve 1111 . Added definitions for “immutable/mutable” and “writeable/read-only” to heading of Section 4.2, “Attributes”; revised all mentions of immutable and mutable to agree with these definitions to resolve 1126 .
0.0.19	03/30/11	Gil	Add table that defines attributes common to all entities and remove those same attributes from the entity tables to resolve 1094 . Add Volume Configuration and Volume Image entities to resolve 1096 .
0.0.20	04/06/11	Gil	Add sub-section that describes unit attributes in both base-10 and base-2 (e.g. kilobyte, kibibyte), change memory units to base-2 names (e.g. kibibyte, mebibyte), change unit designators to singular, add reference to IEC 80000-13:2008 – all to resolve 1101 .
0.0.21	04/13/11	Doug	Renamed title of section 4.2 per 1153 . Expanded the text for the create operation of a System per 999 . Added the delete operation to the list of ops for Network per 1011 . Converted all pointers to URIs instead of the name of the type its points to per 1129 .
0.0.22	04/20/11	Doug	Added section 4.2.1 per 1113 and 1115 . Modified the definition of Site.Create per 1132 . Modified Site description per 1133 . Moved 'bootable' from volume Config to Volume Image per 1137 . Removed 'local' from Volume and Volume Config per 1138 . Modified definition of Volume per 1139 . Removed 'autoDelete' from Volume per 1140 .
0.0.23	04/27/11	Gil	Changed description of unit values in Section 4.2.2.1 to resolve

			1157 . Change places where “mutable” is meant as “writeable” to use “writeable”; add Update operation to Provider entity to resolve 1158 .
0.0.24	05/11/11	Gil	Added Machine Admin entity to resolve 1164 . Added text describing the requirements on when a Job entity is created to resolve 1166 .
0.0.25	05/25/11	Gil	Added new Section 4.2 describing the facilities for retrieving metadata about the entities, added “Entity Metadata” to UML diagram, added “Type URI” to each entity type - to resolve 1135 . Changed description of VolumeConfiguration:format and removed Volume:format to resolve 1136 .
0.0.26	06/01/11	Gil	Added volumes and volumeTemplates attributes to the Machine Templates entity to resolved 1155 . Changed description of Provider entity to resolve 1174 . Chaged the description of the SystemTemplate.Update operation to resolve 1175 . Added Section 6 “Security” (plus relevant definitions) to resolve 1178 .
0.0.27	06/07/11	Gil	Merged Site and Provider entities into new Cloud Entry Point entity to resolve 1192 and 1196 . Added operations and options to Machine and Machine template to resolve 1204 . Replaced “Create and deploy a Machine using a Provider created Machine Template” scenario and added “Create a Machine by passing a Machine Template by value”, and “Create a Machine using a User created Machine Template” to resolve 1205 . Added “Create a Machine Template by specifying individual components” and “Create a Machine Template from a template file” scenarios to resolve 1206 . Added “Create new Machine Image from an image file” and “Create new Machine Image from Machine instance” scenarios to resolve 1207 .
0.0.28	06/09/2011	Gil	Added ‘MeterTemplate’ and ‘Meter’ entities and references to resolve 908 . Added Event and EventLog entities and references to resolve 909 . Added ‘Cancel’ operation and ‘isCancellable’ attribute to the Job entity to resolve 1012 . Added terminology definition for “Configuration” to resolve 1191 .
0.0.29	06/20/2011	Gil	Removed “Role in Use Cases” rows from entity tables to resolve 1223 . Fixed miscellaneous typos and miscapitalizations to resolve 1226 .
0.0.30	07/28/2011	Gil, Doug	Merged CM model and HTTP protocol documents. Added definitions of “Consumer” and “Provider” to Section 3, “Terms and Definitions”; made various changes to use these terms consistently throughout the document to resolve 1180 . Fix serializations to resolve 1219 . Added support for partial updates to resolve 1154 . Fixed the CloudEntryPoint to point to the Collection entities to resolve 1238 . Tweaked the uri field of EntityMetadata to resolve 1254 . Added resolution of 1171 from HTTP protocol doc. Changed Network Template and Network entities, added VSP Template, VSP Configuration, and VSP to resolve 1010 , 1085 , 1086 , and 1088 .
0.0.31	08/01/2011	Doug	Removed text that duplicates the HTTP spec to resolve 1193 .
0.0.32	08/22/2011	Doug	Added ../xs:any* to show explicit extensibility points to resolve 1271 . Added section 4.1.10 (Serialization of Array) and s/*/+/g on array children to resolve 1270 .

0.0.33	08/24/2011	Doug	Used CIMI and Cloud Infrastructure Management Interface where appropriate. Added section 5.1 which points to the CIMI-CIM and CIMI-RNG docs. Add WIP front-matter.
0.0.34	08/28/2011	Doug	s/The follow describes/The following describes/. Fixed the heading style on the "Entities" section - it lost its style at some point. Added the serialization headers for the EntityMetadata JSON/XML - to match the other entities in the model. s/Entity/EntityMetadata/ in the XML to match the entity type and be more descriptive.
0.0.35	08/31/2011	Gil, Doug	Re-factor ER diagram into separate sub-diagrams and re-organize sections around these diagrams. Changed title of doc and added resolution of issue 1310 .
0.0.36	09/07/2011	Brightleaf	Various edits as part of the WIP release.
0.0.37	09/09/2011	Gil	Changed description of Job:isCancellable to resolve 1240 . Add Volumes and Networks to System entity to resolve 1245 . Changed title of Section 6.1.6 to "Control Machine State" to resolve 1246 . Added 'status' attribute to Network and changed VSP:state to VSP:status to resolve 1255 . Changed descriptions of 'imageLocation' and 'imageData' for both MachineImage and VolumeImage to resolve 1264 . Changed wording in 4 th paragraph of 4.2.1.3.1 to resolve issue 1266 .
0.0.38	09/09/2011	Doug	Removed empty row in Machine table, filled in empty "Optionality" cells for CEP.
0.0.39	09/12/2011	Doug	Added section "4.2.1 Operational Principles" to resolve HTTP issue 1172 .
0.0.40	09/21/2011	Doug	Lots of minor editorial changes to resolve 1269 .
0.0.41	09/21/2011	Doug	Added text about URIs to resolve issue 1267 . Modified the "properties" attribute to resolve issue 1352 . Fixed SystemTemplate, it was missing some name, description and networkInterface definition attributes in the pseudo-schema. Added "Model Semantics and Conventions" section to resolve issue 1274 . Made CEP.EntityMetadata a URI[] instead of a map to resolve issue 1243 . Make 'stop' action URIs consistent to resolve issue 1364 .
0.0.42	10/04/2011	Doug	Added typographical convention and preamble text to terms & def'n section to resolve issue 1272 . Removed "format" and "attachmentPoint" from Machine.disk to resolve issue 1241 . Removed disk.guestInterface from Machine and MachineConfig to resolve issue 1242 . Changed most uses of URI to "ref" in the model tables to resolve issue 1351 . Changed 'uri' to "self" on entities to resolve 1220 .
0.0.43	10/04/2011	Doug	Added support for CIMISelect query parameter to resolve issue 1384 . Clarified the optionality of the HTTP version header to resolve issue 1363 .
0.0.44	10/05/2011	Doug	Added start/restart to Machine's operations resolve issue 1369 . Cleaned up some text around Jobs to resolve issue 1194 . Tweak the optionality of some attributes to resolve issue 1412 . Add support for operations in EntityMetadata per issue 1168 . Added the definition of

			optional, mandatory and condition to resolve issue 1339 . Also moved some of the high-level topics about the model (units, identifier, ...) to a common spot at the start of section 5.
0.0.45	10/06/2011	Doug	Moved EntityMetadata into the Entities section to resolve issue 1415 . Add some clarifying text about routingGroups to resolve issue 1413 . Replace status with state on select resources to resolve issue 1095 . Define what 'ref' maps to for REST to resolve issue 1409 . Add pious advice about some network properties to resolve issue 1259 . Clean up some of the pointers in EventLog, Meter and Event to resolve issue 1383 . Add start/stop operations to Meter to resolve issue 1237 . Clarify the behavior when updating read-only properties to resolve issue 1118 . Adding RoutingGroup as a new entity to resolve issue 1260 .
0.0.45a	10/12/2011	Gil	Removed requirement to support TLS NULL cipher to resolve 1244 . Updated diagrams to match changes in the text.
0.0.46	10/18/2011	Doug	Added recommendation to use partial updates to avoid overwriting changes to resolve 1360 . Removed attr_regex feature to resolve 1418 . Clarify just how opaque our URIs really are to resolve 1417 .
0.0.47	10/26/2011	Doug	Added an 'extensibility" section to resolve issue 1356 . Explain what a missing attributes in the serializations mean, and fix some Optional vs Mandatory flags to resolve issue 1114 .
0.0.48	11/03/2011	Doug	Added text around our versioning scheme to resolve issue 1119 .
0.0.49	11/09/2011	Doug	Add new scope text to resolve issue 1435 . Fix the JSON serialization of "properties" to resolve issue 1436 .
0.0.50	11/14/2011	Doug	Added support for enum/query support for collections to resolve issue 1405 .
0.0.51	11/28/2011	Doug	Updated description of HTTP error code 501 to resolve issue 1442 .
0.0.52	11/30/2011	Doug	Remove Bibliography to resolve issue 1443 . Add networkInterfaces to MachineTemplate in machine.create() to resolve issue 1460 . Added pause and resume operations to Machine to resolve issue 1434 .
0.0.53	12/06/2011	Doug	s/using/used/ to resolve issue 1466 . Removed the word "use" to resolve issue 1465 . Removed section 6 to resolve issue 1464 . Changed the use of the word "avoid" to resolve issue 1469 . Add 'aspect' to Meter(Template) to resolve issue 1444 . Tweaked the note at the end of MachineConfig to resolve issue 1454 .
0.0.54	12/07/2011	Doug	Removed 'protocol' from Machine and Volume entities to resolve issue 1247 . Complete the definition of SystemTemplate, add MachineAdminTemplate and RoutingGroupTemplate to resolve issue 1368 . Updated the state values on many entities to resolve issue 1446 . Use Job as the error response message and allow hierarchical jobs to resolve issue 1452 . s/Network/VSP/ in some VSP attributes to resolve issue 1471 .
0.0.55	12/08/2011	Doug	Add support for capturing a Machine to a MachineImage to resolve issue 1448 .

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