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Cloud Infrastructure Management Interface (CIMI) Primer

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Foreword

This document contains scenarios that describe common uses of the CIMI protocol.

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Overview

For the sake of simplicity, in each of the following scenarios the Cloud Provider only supports the minimum features needed to demonstrate the features highlighted by each scenario. Therefore, the results of the query to the Cloud Entry Point (CEP) to retrieve the list of supported features will be customized for each scenario. Additionally the URI of the Cloud Entry Point is assumed to be <http://example.com/CEP>.

Scenario 1 : Creating a New Machine

This scenario will create a new Machine. The new Machine's configuration will be based on existing configurations and images offered by the provider. However, a new Credential resource (userid & password) will be created.

Step 1 : Retrieve the CEP

The CEP will provide the links to the set of resources that are available in this Cloud. You retrieve the CEP to discover the URL to each collection:

```
GET / HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/CloudEntryPoint",
  "id": "http://example.com/CEP",
  "baseURI": "http://example.com/",
  "resourceMetadata": { "href": "http://example.com/resourceMetadata" },
  "machines": { "href": "http://example.com/machines" },
  "machineConfigs": { "href": "http://example.com/machineConfigs" },
  "machineImages": { "href": "http://example.com/machineImages" },
  "credentials": { "href": "http://example.com/credentials" }
}
```

Step 2 : Retrieve the list of Machine Images

Before you can create a new Machine, first decide what kind of operating system and/or software you want to have pre-installed. The Machine Images collection is the set of predefined Machine Images that this Cloud offers:

```
GET /machineImages HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineImageCollection",
  "id": "http://example.com/machineImages",
  "machineImages": [
    { "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineImage",
      "id": "http://example.com/images/WinXP-SP2",
      "name": "WinXP SP2",
      "description": "Windows XP with Service Pack 2",
      "created": "2012-01-01T12:00:00Z",
      "updated": "2012-01-01T12:00:00Z",
      "imageLocation": { "href": "http://example.com/data/8934322" }
    },
    { "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineImage",
      "id": "http://example.com/images/Win7",
      "name": "Windows 7",
      "description": "Windows 7",
      "created": "2012-01-01T12:00:00Z",
      "updated": "2012-01-01T12:00:00Z",
      "imageLocation": { "href": "http://example.com/data/8934344" }
    }
  ],
}
```

```
{ "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineImage",
  "id": "http://example.com/images/Linux-SUSE",
  "name": "Linux SUSE",
  "description": "Linux SUSE",
  "created": "2012-01-01T12:00:00Z",
  "updated": "2012-01-01T12:00:00Z",
  "imageLocation": { "href": "http://example.com/data/8934311" }
}

]
```

Step 2.1 : Choose a Machine Image

Next examine each Machine Image to find one that meets your needs. The first one is acceptable, so you will use it later.

Step 3 : Retrieve the list of Machine Configurations

Next you decide what kind of virtual hardware you want to install your Machine Image onto. As with determining the kind of Machine Image you want, first ask for the list of available Machine Configurations:

```
GET /machineConfigs HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI":
  "http://schemas.dmtf.org/cimi/1/MachineConfigurationCollection",
  "id": "http://example.com/machineConfigs",
  "machineConfigurations": [
    { "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineConfiguration",
      "id": "http://example.com/configs/tiny",
      "name": "tiny",
      "description": "a teenie tiny one",
      "created": "2012-01-01T12:00:00Z",
      "updated": "2012-01-01T12:00:00Z",
      "cpu": 1,
      "memory": 4000000,
      "disks" : [
        { "capacity": 50000000 }
      ]
    },

    { "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineConfiguration",
      "id": "http://example.com/configs/small",
      "name": "small",
      "description": "a small sized one",
      "created": "2012-01-01T12:00:00Z",
      "updated": "2012-01-01T12:00:00Z",
      "cpu": 1,
      "memory": 8000000,
      "disks" : [
        { "capacity": 500000000 }
      ]
    },

    { "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineConfiguration",
```

```

    "id": "http://example.com/configs/medium",
    "name": "medium",
    "description": "a medium one",
    "created": "2012-01-01T12:00:00Z",
    "updated": "2012-01-01T12:00:00Z",
    "cpu": 1,
    "memory": 16000000,
    "disks" : [
      { "capacity": 1000000000 },
      { "capacity": 1000000000 },
    ]
  }
]
}

```

Step 3.1 : Choose a Machine Configuration

Next examine the returned list and pick a Machine Configuration that suits your needs. The first one is acceptable, so you will use it later.

Step 4 : Create a new Credential Resource

You want to use your own userid and password for this new Machine, so you need to create a new Credential resource. This process is done by using the POST operation, but first you need to retrieve the Credential collection so that you know where to POST a new Credential resource to:

```
GET /credentials HTTP/1.1
```

```

HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/CredentialCollection",
  "id": "http://example.com/credentials",
  "operations": [ { "rel": "add", "href": "http://example.com/credentials" } ]
}

```

Notice at this point there are no Credential resources in the environment. Before you can create a new Credential resource, you must first discover this Cloud provider's extension attributes for the Credential resource. By default the CIMI specification does not define how the initial user of a new Machine is specified; rather it is left open for each Cloud provider to determine how this information should be provided. Clients can discover this information by querying the Credential resource metadata resource. To examine this resource, first look through the ResourceMetadata collection for this Provider's description of the Credential's resource. Start by retrieving the ResourceMetadata collection from the URI referenced in the Cloud Entry Point:

```
GET /resourceMetadata HTTP/1.1
```

```

HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/ResourceMetadataCollection",
  "id": "http://example.com/resourceMetadata",
  "resourceMetadataas": [
    { "resourceURI": "http://schemas.dmtf.org/cimi/1/ResourceMetadata",
      "id": "http://example.com/resources/Credential",
      "typeURI": "http://schemas.dmtf.org/cimi/1/Credential",
      "name": "Credential",
      "attributes": [

```

```

    { "name": "userID", "namespace": "http://example.com",
      "type": "string", "required": "true" },
    { "name": "password", "namespace": "http://example.com",
      "type": "string", "required": "true" }
  ]
}
]
}

```

Now iterate over the list of resourceMetadata entries in the collection for the one whose "typeURI" is "http://schemas.dmtf.org/cimi/1/Credential". After you find it, you can now examine the extensions this Provider has added to the Credential resource and the above indicates that the Credential resource has been extended and must include two attributes called "userID" and "password". Both are of type "string".

Now create a new Credential resource by using the POST operation:

```

POST /credentials HTTP/1.1
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/CredentialCreate",
  "name": "Default",
  "description": "My Default User",
  "credentialTemplate": {
    "userID": "JoeSmith",
    "password": "letmein"
  }
}

```

```

HTTP/1.1 201 Created
Location: http://example.com/creds/12345
CIMI-Specification-Version: 1.0

```

Note: While the "userID" and "password" attributes were discovered via the Credential ResourceMetadata, the "name" and "description" attributes are part of the common set of attributes available on all resources. In a future scenario you will see how the client knew that "userID" and "password" were the proper attribute names for this image type and Cloud provider.

Step 5 : Create a new Machine

Retrieve the Machines collection so that you know where to POST a new Machine to:

```
GET /machines HTTP/1.1
```

```

HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineCollection",
  "id": "http://example.com/machines",
  "operations": [ { "rel": "add", "href": "http://example.com/machines" } ]
}

```

Now create a new one:

```

POST /machines HTTP/1.1
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineCreate",

```

```

"name": "myMachine1",
"description": "My very first machine",
"machineTemplate": {
  "machineConfig": { "href": " http://example.com/configs/tiny" },
  "machineImage": { "href": " http://example.com/images/WinXP-SP2" },
  "credential": { "href": "http://example.com/creds/12345" }
}
}

```

```

HTTP/1.1 201 Created
Location: http://example.com/machines/843752
CIMI-Specification-Version: 1.0

```

Step 6 : Query new Machine

Retrieve the Machine to get the full representation of the new Machine:

```
GET /machines/843752 HTTP/1.1
```

```

HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/Machine",
  "id": "http://example.com/machines/843752",
  "name": "myMachine1",
  "description": "My very first machine",
  "created": "2012-08-15T12:15:00Z",
  "updated": "2012-08-15T12:15:00Z",
  "state": "STOPPED",
  "cpu": 1,
  "memory": 4000000,
  "disks" : { "href": "http://example.com/machines/843752/disks",
  "networkInterfaces": { "href": "http://example.com/machines/843752/NIs",
  "operations": [
    { "rel": "edit", "href": "http://example.com/machines/843752" },
    { "rel": "delete", "href": "http://example.com/machines/843752" },
    { "rel": "http://schemas.dmtf.org/cimi/1/action/start",
      "href": "http://example.com/machines/843752" }
  ]
}

```

Notice the "state" attribute on the Machine is "STOPPED", which is the initial state of a new machine.

Step 7 : Start a Machine

The presence of the "start" operation in the "operations" array of the Machine representation indicates not only which URI to POST the "start" operation to, but that you are able to do it at this time.

```

POST /machines/843752 HTTP/1.1
Content-Type: application/json

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/Action",
  "action": "http://schemas.dmtf.org/cimi/1/action/start"
}

```

```

HTTP/1.1 204 No Content
CIMI-Specification-Version: 1.0

```

Step 7.1 : Query a Machine to verify it is started

Query the Machine again to verify that it is started:

```
GET /machines/843752 HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/Machine",
  "id": "http://example.com/machines/843752",
  "name": "myMachine1",
  "description": "My very first machine",
  "created": "2012-08-15T12:15:00Z",
  "updated": "2012-08-15T12:15:00Z",
  "state": "STARTED",
  "cpu": 1,
  "memory": 4000000,
  "disks" : { "href": "http://example.com/machines/843752/disks",
  "networkInterfaces": { "href": "http://example.com/machines/843752/NIs",
  "operations": [
    { "rel": "edit", "href": "http://example.com/machines/843752" },
    { "rel": "delete", "href": "http://example.com/machines/843752" },
    { "rel": "http://schemas.dmtf.org/cimi/1/action/stop",
      "href": "http://example.com/machines/843752" }
  ]
}
```

Notice the "state" attribute on the Machine is "STARTED" and that the "operations" array no longer indicates that the "start" operation is available; rather the "stop" operation is available now instead.

Step 8 : Stop a Machine

Using the "stop" operation's URL, you can now ask for the Machine to be stopped:

```
POST /machines/843752 HTTP/1.1
Content-Type: application/json

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/Action",
  "action": "http://schemas.dmtf.org/cimi/1/action/stop"
}
```

```
HTTP/1.1 204 No Content
CIMI-Specification-Version: 1.0
```

Step 9 : Update a Machine's attributes

Using PUT operation on the "edit" operation's URL, you can update some of the attribute of the Machine, for example the "name" and "description":

```
PUT /machines/843752?$select=name,description HTTP/1.1
Content-Type: application/json

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/Machine",
  "name" : "Cool Demo #1"
}
```

```
HTTP/1.1 200 OK
CIMI-Specification-Version: 1.0
```

```
{ "name" : "Cool Demo #1" }
```

Notice that URL of the "edit" operation has been modified to indicate which attributes are being updated; only those attributes will be touched. Because the URL includes the "description" attribute but the HTTP request body does not, that attribute is erased.

Scenario 2 : Adding a New Volume to a Machine

This scenario will create a new Volume and connect it to an existing Machine.

Step 1 : Obtain the Machine URL

Machine:

```
http://example.com/machines/843752
```

Step 2 : Retrieve the CEP

The CEP will provide the links to the set of resources that are available in this Cloud. Retrieve the CEP to discover the URL to each collection:

```
GET / HTTP/1.1 HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/CloudEntryPoint",
  "id": "http://example.com/CEP",
  "baseURI": "http://example.com/",
  "machines": { "href": "http://example.com/machines" },
  "machineConfigs": { "href": "http://example.com/machineConfigs" },
  "machineImages": { "href": "http://example.com/machineImages" },
  "credentials": { "href": "http://example.com/credentials" },
  "volumes": { "href": "http://example.com/volumes" },
  "volumeConfigs": { "href": "http://example.com/vConfigs" }
}
```

Step 3 : Get the list of VolumeConfigurations to determine which to use

When you create a new Volume, you need to decide what kind of Volume to create, e.g., its size, format, etc. The Volume Configurations collection is the set of predefined Volume Configurations that this Cloud offers:

```
GET /vConfigs HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI":
  "http://schemas.dmtf.org/cimi/1/VolumeConfigurationCollection",
  "id": "http://example.com/volumeConfigs",
  "volumeConfigurations": [
    { "resourceURI": "http://schemas.dmtf.org/cimi/1/VolumeConfiguration",
      "id": "http://example.com/vConfigs/small",
      "name": "Small",
      "description": "A pretty small one",
      "created": "2012-08-15T12:15:00Z",
      "updated": "2012-08-15T12:15:00Z",
      "type": "http://schemas.dmtf.org/cimi/1/mapped",
      "format": "NTFS",
      "capacity": 60000000
    },
    { "resourceURI": "http://schemas.dmtf.org/cimi/1/VolumeConfiguration",
      "id": "http://example.com/vConfigs/medium",
      "name": "Small",
```

```

    "description": "A medium sized one",
    "created": "2012-08-15T12:15:00Z",
    "updated": "2012-08-15T12:15:00Z",
    "type": "http://schemas.dmtf.org/cimi/1/mapped",
    "format": "NTFS",
    "capacity": 500000000
  },

  { "resourceURI": "http://schemas.dmtf.org/cimi/1/VolumeConfiguration",
    "id": "http://example.com/vConfigs/large",
    "name": "Large",
    "description": "A large one",
    "created": "2012-08-15T12:15:00Z",
    "updated": "2012-08-15T12:15:00Z",
    "type": "http://schemas.dmtf.org/cimi/1/mapped",
    "format": "NTFS",
    "capacity": 1000000000
  }
]
}

```

Step 3.1 : Choose a Volume Configuration

Next examine each Volume Configuration to find the one that meets your needs. The first one is acceptable, so you will use it later.

Step 4 : Create a new Volume

Retrieve the Volumes collection so that you know where to POST a new Volume to:

```
GET /volumes HTTP/1.1
```

```

HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/VolumeCollection",
  "id": "http://example.com/volumes",
  "operations": [ { "rel": "add", "href": "http://example.com/volumes" } ]
}

```

Now create a new one:

```

POST /volumes HTTP/1.1
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/VolumeCreate",
  "name": "myVolume1",
  "description": "My first new volume",
  "volumeTemplate": {
    "volumeConfig": { "href": "http://example.com/vConfigs/small" }
  }
}

```

```

HTTP/1.1 201 Created
Location: http://example.com/volumes/35782
CIMI-Specification-Version: 1.0

```

Step 5 : Retrieve the Volume Information

To verify that the Volume you created and connected to the Machine is what you wanted, follow the reference that was returned from the previous step:

```
GET /volumes/35782 HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/Volume",
  "id": "http://example.com/volumes/35782",
  "name": "myVolume1",
  "created": "2012-09-15T12:15:00Z",
  "updated": "2012-09-15T12:15:00Z",
  "description": "My first new volume",
  "type": "http://schemas.dmtf.org/cimi/1/mapped",
  "capacity": 60000000,
  "operations": [
    { "rel": "edit", "href": "http://example.com/volumes/35782" },
    { "rel": "delete", "href": "http://example.com/volumes/35782" }
  ]
}
```

Step 6 : Retrieve the Machine's volume collection

Before you can connect this new Volume to your Machine, you first need to retrieve the Machine's Volume collection to know where to send your request to. First retrieve the Machine to get the reference to the collection:

```
GET /machines/843752 HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/Machine",
  "id": "http://example.com/machines/843752",
  "name": "myMachine1",
  "description": "My very first machine",
  "created": "2012-08-15T12:15:00Z",
  "updated": "2012-08-15T12:15:00Z",
  "state": "STARTED",
  "cpu": 1,
  "memory": 4000000,
  "disks": { "href": "http://example.com/machines/843752/disks",
  "volumes": { "href": "http://example.com/machines/843752/volumes" },
  "networkInterfaces": { "href": "http://example.com/machines/843752/NIs",
  "operations": [
    { "rel": "edit", "href": "http://example.com/machines/843752" },
    { "rel": "delete", "href": "http://example.com/machines/843752" },
    { "rel": "http://schemas.dmtf.org/cimi/1/action/stop",
      "href": "http://example.com/machines/843752" }
  ]
}
```

Note that in the previous scenario, the "volumes" attribute was not present due to the limited scope of that scenario; however, now the "volumes" attribute appears because the scenario (and features of our sample Provider) are expanded to include support for Volumes.

Now retrieve the Volume collection:

```
GET /machines/843752/volumes HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineVolumeCollection",
  "id": "http://example.com/machines/843752/volumes",
  "operations": [
    { "rel": "add", "href": "http://example.com/machines/843752/volumes" }
  ]
}
```

Note that there are no Volumes currently connected to this Machine.

Step 7 : Connect the new Volume to a Machine

You connect the Volume to the Machine by using the "add" operation on the Volume collection and pass in a new MachineVolume resource:

```
POST /machines/843752/volumes HTTP/1.1
Content-Type: application/json
```

```
{ "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineVolume",
  "initialLocation": "V",
  "volume": { "href": "http://example.com/volumes/35782" }
}
```

```
HTTP/1.1 201 Created
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineVolume",
  "id": "http://example.com/machines/843752/volumes/1",
  "initialLocation": "V",
  "volume": { "href": "http://example.com/volumes/35782" },
  "operations": [
    { "rel": "edit", "href": "http://example.com/machines/843752/volumes/1" },
    { "rel": "delete", "href": "http://example.com/machines/843752/volumes/1" }
  ]
}
```

Step 8 : Query the Machine's volume collection to verify the update

Retrieve the Machine's volume collection to get the complete list of Volumes and use the list to verify the update was successful:

```
GET /machines/843752/volumes HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineVolumeCollection",
  "id": "http://example.com/machines/843752/volumes",
  "machineVolumes": [
    { "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineVolumes",
      "id": "http://example.com/machines/843752/volumes/1",
      "initialLocation": "V",
      "volume": { "href": "http://example.com/volumes/35782" },

```

```
    "operations": [
      { "rel": "edit", "href": "http://example.com/machines/843752/volumes/1"},
      { "rel": "delete", "href": "http://example.com/machines/843752/volumes/1"}
    ],
    "operations": [
      { "rel": "add", "href": "http://example.com/machines/843752/volumes" }
    ]
  }
```

Scenario 3 : Defining and Using Machine Templates

This scenario will create a new Machine Template that will then be used to create a new Machine. Machine Templates are convenience resources that allow for well-defined descriptions (configuration, image, etc.) of a Machine to be persisted such that it can be reused later. This feature is particularly useful when the user of the new Machine may not be technically savvy enough to know all of the details necessary to create the Machine. Commonly, Machine Templates are created for demos, or complex configurations, where a particular Machine Image must be used on a particular Machine Configuration. Machine Templates allow this information to be persisted and easily reused.

For convenience, reuse the configuration information already obtained in the previous scenarios.

Step 1 : Retrieve the CEP

The CEP will provide the links to the set of resources that are available in this Cloud. Retrieve the CEP to discover the URL to each collection:

```
GET / HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/CloudEntryPoint",
  "id": "http://example.com/CEP",
  "baseURI": "http://example.com/",
  "machines": { "href": "http://example.com/machines" },
  "machineTemplates": { "href": "http://example.com/machineTemplates" },
  "machineConfigs": { "href": "http://example.com/machineConfigs" },
  "machineImages": { "href": "http://example.com/machineImages" },
  "credentials": { "href": "http://example.com/credentials" }
}
```

Step 2 : Create a new Machine Template

From the previous scenarios, you already have the MachineConfiguration, MachineImage, and Credential resources that you will reuse for this MachineTemplate:

MachineImage:

```
http://example.com/images/WinXP-SP2
```

MachineConfiguration:

```
http://example.com/configs/tiny
```

Credential:

```
http://example.com/creds/12345
```

Before you can create the new MachineTemplate, you first need to determine the URL to which the POST is sent. This location is obtained from the MachineTemplate collection URL that was returned as part of the CEP:

```
GET /machineTemplates HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineTemplateCollection",
  "id": "http://example.com/machineTemplates",
  "operations": [
```

```
    { "rel": "add", "href": "http://example.com/machineTemplates" }  
  ]  
}
```

Note that there are no MachineTemplates in the environment right now.

Now create the new MachineTemplate resource:

```
POST /machineTemplates HTTP/1.1  
Content-Type: application/json  
CIMI-Specification-Version: 1.0  
  
{ "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineTemplate",  
  "name": "Demo1",  
  "description": "My first demo",  
  "machineConfig": { "href": "http://example.com/configs/tiny" },  
  "machineImage": { "href": "http://example.com/images/WinXP-SP2" },  
  "credential": { "href": "http://example.com/creds/12345" }  
}
```

```
HTTP/1.1 201 Created  
Location: http://example.com/machineTemplates/82754  
CIMI-Specification-Version: 1.0
```

Step 3 : Create a new Machine by using a Machine Template

Now create a new Machine by using this Machine Template:

```
POST /machines HTTP/1.1  
Content-Type: application/json  
CIMI-Specification-Version: 1.0  
  
{ "resourceURI": "http://schemas.dmtf.org/cimi/1/MachineCreate",  
  "name": "myMachine2",  
  "description": "My second machine",  
  "machineTemplate": { "href": "http://example.com/machineTemplates/82754" }  
}
```

```
HTTP/1.1 201 Created  
Location: http://example.com/machines/843799  
CIMI-Specification-Version: 1.0
```

Scenario 4 : Creating a New Machine from an existing Volume

This scenario will create a new Machine that boots from an existing Volume. This simple example assumes that the user knows that there is an existing Volume with the bootable property equal to true.

Step 1 : Retrieve the CEP

The CEP will provide the links to the set of resources that are available in this Cloud. Retrieve the CEP to discover the URL to each collection:

```
GET / HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
X-CIMI-Specification-Version: 1.0

{ "resourceType": "http://schemas.dmtf.org/cimi/1/CloudEntryPoint",
  "id": "http://example.com/CEP",
  "baseURI": "http://example.com/",
  "resourceMetadata": { "href": "http://example.com/resourceMetadata" },
  "machines": { "href": "http://example.com/machines" },
  "machineConfigs": { "href": "http://example.com/machineConfigs" },
  "machineImages": { "href": "http://example.com/machineImages" },
  "credentials": { "href": "http://example.com/credentials" },
  "volumes": { "href": "http://example.com/volumes" },
  "volumeConfigs": { "href": "http://example.com/vConfigs" }
}
```

Step 2 : Get the list of Volumes to determine which to use

When you create a new Machine from a Volume, you need to decide which Volume to use. The Volume collection is the set of existing Volumes that this Cloud offers:

```
GET /volumes HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
X-CIMI-Specification-Version: 1.0

{ "resourceType": "http://schemas.dmtf.org/cimi/1/VolumeCollection",
  "id": "http://example.com/volumes",
  "volumes": [
    { "resourceType": "http://schemas.dmtf.org/cimi/1/Volume",
      "id": "http://example.com/volumes/vol1",
      "name": "Win7-Bootable",
      "created": "2012-08-15T12:15:00Z",
      "updated": "2012-08-15T12:15:00Z",
      "description": "A bootable volume running Windows 7",
      "state": "AVAILABLE",
      "capacity": 60000000,
      "bootable": true
    },
    { "resourceType": "http://schemas.dmtf.org/cimi/1/Volume",
      "id": "http://example.com/volumes/vol2",
      "name": "Generic Volume",
      "created": "2012-08-15T12:15:00Z",
      "updated": "2012-08-15T12:15:00Z",
      "description": "A generic volume for Windows",
      "state": "AVAILABLE",
      "capacity": 60000000,
      "bootable": false
    }
  ]
}
```

```

    "capacity": 60000000,
    "bootable": true
  }
]
}

```

Step 2.1 : Choose a Volume

Next examine each Volume to find the one that meets your needs. The first one is acceptable, so you will use it later.

Step 3 : Create a new Machine

Retrieve the Machines collection so you know where to POST a new Machine to:

```
GET /machines HTTP/1.1
```

```

HTTP/1.1 200 OK
Content-Type: application/json
X-CIMI-Specification-Version: 1.0

{ "resourceType": "http://schemas.dmtf.org/cimi/1/MachineCollection",
  "id": "http://example.com/machines",
  "operations": [
    { "rel": "add", "href": "http://example.com/machines" }
  ]
}

```

Now create a new one, connecting it to the bootable Volume:

```

POST /machines HTTP/1.1
Content-Type: application/json
X-CIMI-Specification-Version: 1.0

{ "resourceType": "http://schemas.dmtf.org/cimi/1/MachineCreate",
  "name": "myMachine2",
  "description": "My second machine",
  "machineTemplate": {
    "volumes": [
      { "initialLocation": "V",
        "volume": "http://example.com/volumes/vol1" }
    ]
  }
}

```

Note that the MachineTemplate in this case does not specify a MachineImage or MachineConfiguration to use. In this example, for simplicity, you can assume that the Provider has default values for those.

```

HTTP/1.1 201 Created
Location: http://example.com/machines/852108
X-CIMI-Specification-Version: 1.0

```

Step 4 : Query new Machine

Retrieve the Machine to get the full representation of the new Machine:

```
GET /machines/852108 HTTP/1.1
```

```

HTTP/1.1 200 OK
Content-Type: application/json
X-CIMI-Specification-Version: 1.0

```

```
{ "resourceType": "http://schemas.dmtf.org/cimi/1/Machine",
  "id": "http://example.com/machines/852108",
  "name": "myMachine2",
  "description": "My second machine",
  "created": "2012-03-26T10:04:00Z",
  "updated": "2012-03-26T10:04:00Z",
  "state": "STOPPED",
  "cpu": "1",
  "memory": 4000000,
  "disks" : { "href": "http://example.com/machines/852108/disks",
  "volumes": { "href": "http://example.com/machines/852108/volumes" },
  "networkInterfaces": { "href": "http://example.com/machines/852108/NIs",
  "operations": [
    { "rel": "edit", "href": "http://example.com/machines/852108" },
    { "rel": "delete", "href": "http://example.com/machines/852108" },
    { "rel": "http://schemas.dmtf.org/cimi/1/action/start",
      "href": "http://example.com/machines/852108" }
  ]
}
```

Notice the "state" attribute on the Machine is "STOPPED", which is the initial state of a new machine.

Scenario 5 : Defining and Using System Templates

This scenario will create a new System Template that will then be used to create a new System. System Templates are convenience resources that allow for well-defined descriptions (configuration, image, etc.) of a System to be persisted such that it can be reused later.

Step 1 : Retrieve the CEP

The CEP will provide the links to the set of resources that are available in this Cloud. Retrieve the CEP to discover the URL to each collection:

```
GET / HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/CloudEntryPoint",
  "id": "http://example.com/CEP",
  "baseURI": "http://example.com/",
  "systemTemplates": { "href": "http://example.com/systemTemplates" },
  "machineTemplates": { "href": "http://example.com/machineTemplates" },
  "credentialTemplates": { "href": "http://example.com/credentialTemplates" },
  "volumeTemplates": { "href": "http://example.com/volumeTemplates" }
}
```

Step 2 : Create a new System Template

You will define a SystemTemplate that when instantiated creates a Machine, a Volume connected to the Machine, and a Credential resource. To achieve this configuration, you will include in the SystemTemplate definition a MachineTemplate by value, a VolumeTemplate by reference, and a CredentialTemplate by reference. The VolumeTemplate and CredentialTemplate resources are already available:

VolumeTemplate:

```
http://example.com/volumeTemplates/95839
```

CredentialTemplate:

```
http://example.com/credentialTemplates/72000
```

Note: Alternatively, you could have included the VolumeTemplate and CredentialTemplate by value in the MachineTemplate definition below. However, it is beneficial to immediately see in the SystemTemplate which resources are involved and generally, automatic creation of the credential is more secure.

Before you can create the new SystemTemplate, you first need to determine the URL to which the POST is sent. This location is obtained from the SystemTemplate collection URL that was returned as part of the CEP:

```
GET /systemTemplates HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/SystemTemplateCollection",
  "id": "http://example.com/systemTemplates",
  "operations": [
    { "rel": "add", "href": "http://example.com/systemTemplates" }
  ]
}
```

```
}
```

Now create the new System Template resource:

```
POST /systemTemplates HTTP/1.1
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/SystemTemplate",
  "name": "System Demo1",
  "description": "My first system template demo",
  "componentDescriptors": [
    { "name": "MyMachine",
      "type": "http://schemas.dmtf.org/cimi/1/Machine",
      "machineTemplate":
        { "name" : "Machine in system demo",
          "description" : "Machine in system",
          "machineConfig": { "href": "http://example.com/configs/tiny" },
          "machineImage": { "href": "http://example.com/images/WinXP-SP2" },
          "credential": { "href": "#MyCredential" },
          "volumes": [
            { "href": "#MyVolume",
              "initialLocation": "/vol"
            }
          ]
        }
    },
    { "name": "MyCredential",
      "type": "http://schemas.dmtf.org/cimi/1/Credential",
      "credentialTemplate":
        { "href": "http://example.com/credentialTemplates/72000" }
    },
    { "name": "MyVolume",
      "type": "http://schemas.dmtf.org/cimi/1/Volume",
      "volumeTemplate": { "href": "http://example.com/volumeTemplates/95839" }
    }
  ]
}
```

```
HTTP/1.1 201 Created
Location: http://example.com/systemTemplates/48920
CIMI-Specification-Version: 1.0
```

Step 3 : Create a new System by using a System Template

Now create a new System by using this System Template:

```
POST /systems HTTP/1.1
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/SystemCreate",
  "name": "MySystem1",
  "description": "My first system",
  "systemTemplate": { "href": "http://example.com/systemTemplates/48920" }
}
```

```
HTTP/1.1 201 Created
Location: http://example.com/systems/78342
```

```
CIMI-Specification-Version: 1.0
```

Note that, alternatively, the Provider could have decided to return a reference to a Job resource instead of waiting until the System is completely created. Instead of the above 201 response, this could have resulted in the following response:

```
HTTP/1.1 202 Accepted
CIMI-Job-URI: http://example.com/Jobs/90001
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/Job",
  "id": "http://example.com/Jobs/90001",
  "name": "SystemCreationJob",
  "created": "2012-03-15T12:15:00Z",
  "updated": "2012-03-15T12:15:00Z",
  "targetResource": { "href": "http://example.com/systems" },
  "affectedResources": {
    "href": "http://example.com/systems/110001",
  },
  "action": "add",
  "status": "RUNNING",
  "progress": 30,
  "timeOfStatusChange": "2012-03-15T12:15:00Z",
  "isCancellable": "true",
  "nestedJobs": [
    { "href": "http://example.com/Jobs/90002" },
    { "href": "http://example.com/Jobs/90003" }
  ]
}
```

According to this response, the Provider chose to create two nested Jobs and the "affectedResources" attribute includes a reference to the newly created System. Periodic retrieval of the Job's representation will allow the Consumer to determine when the Job is completed, i.e., it is completed when the "progress" attribute has a value of 100.

Step 4 : Query the new System

Retrieve the System to get the full representation of the new System:

```
GET /systems/87342
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/System",
  "id": "http://example.com/systems/78342",
  "name": "MySystem1",
  "description": "My first system",
  "created": "2012-08-15T12:15:00Z",
  "updated": "2012-08-15T12:15:00Z",
  "state": "STOPPED",
  "machines": { "href": "http://example.com/systems/87432/machines" },
  "credentials": { "href": "http://example.com/systems/87342/creds" },
  "volumes": { "href": "http://example.com/systems/87342/vols" },
  "operations": [
    { "rel": "edit", "href": "http://example.com/systems/78342" }
  ]
}
```

Scenario 6 : Editing System Templates

In this scenario you will add a second Machine to an existing System Template.

Step 1 : Edit an existing System Template

You will edit the System Template created in a previous scenario and add another machine that shares its credential and volume resources:

SystemTemplate:

```
http://example.com/systemTemplates/48920
```

Retrieve the existing SystemTemplate definition:

```
GET /systemTemplates/48920 HTTP/1.1
```

```
HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/SystemTemplate",
  "name": "System Demo1",
  "description": "My first system template demo",
  "created": "2012-08-15T12:15:00Z",
  "updated": "2012-08-15T12:15:00Z",
  "componentDescriptors": [
    { "name": "MyMachine",
      "type": "http://schemas.dmtf.org/cimi/1/Machine",
      "machineTemplate":
        { "name" : "Machine in system demo",
          "description" : "Machine in system",
          "machineConfig": { "href": "http://example.com/configs/tiny" },
          "machineImage": { "href": "http://example.com/images/WinXP-SP2" },
          "credential": { "href": "#MyCredential" },
          "volumes": [
            { "href": "#MyVolume",
              "initialLocation": "/vol"
            }
          ]
        }
    ],
    { "name": "MyCredential",
      "type": "http://schemas.dmtf.org/cimi/1/Credential",
      "credentialTemplate":
        { "href": "http://example.com/credentialTemplates/72000" }
    },
    { "name": "MyVolume",
      "type": "http://schemas.dmtf.org/cimi/1/Volume",
      "volumeTemplate": { "href": "http://example.com/volumeTemplates/95839" }
    }
  ],
  "operations" : [
    { "rel": "edit", "href": "http://example.com/systemTemplates/48920" }
  ]
}
```

Now update the SystemTemplate resource:

```
PUT /systemTemplates/48920 HTTP/1.1
```

```

Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/SystemTemplate",
  "name": "System Demo1",
  "description": "My first system template demo",
  "componentDescriptors": [
    { "name": "MyMachine",
      "type": "http://schemas.dmtf.org/cimi/1/Machine",
      "machineTemplate":
        { "name" : "Machine in system demo",
          "description" : "Machine in system",
          "machineConfig": { "href": "http://example.com/configs/tiny" },
          "machineImage": { "href": "http://example.com/images/WinXP-SP2" },
          "credential": { "href": "#MyCredential" },
          "volumes": [
            { "href": "#MyVolume",
              "initialLocation": "/vol"
            }
          ]
        },
      "quantity": 2
    },
    { "name": "MyCredential",
      "type": "http://schemas.dmtf.org/cimi/1/Credential",
      "credentialTemplate":
        { "href": "http://example.com/credentialTemplates/72000" }
    },
    { "name": "MyVolume",
      "type": "http://schemas.dmtf.org/cimi/1/Volume",
      "volumeTemplate": { "href": "http://example.com/volumeTemplates/95839" }
    }
  ]
}

```

```

HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/SystemTemplate",
  "name": "System Demo1",
  "description": "My first system template demo",
  "created": "2012-09-15T12:15:00Z",
  "updated": "2012-09-15T12:15:00Z",
  "componentDescriptors": [
    { "name": "MyMachine",
      "type": "http://schemas.dmtf.org/cimi/1/Machine",
      "machineTemplate":
        { "name" : "Machine in system demo",
          "description" : "Machine in system",
          "machineConfig": { "href": "http://example.com/configs/tiny" },
          "machineImage": { "href": "http://example.com/images/WinXP-SP2" },
          "credential": { "href": "#MyCredential" },
          "volumes": [
            { "href": "#MyVolume",
              "initialLocation": "/vol"
            }
          ]
        }
    }
  ]
}

```

```

    ],
    "quantity": 2
  },
  { "name": "MyCredential",
    "type": "http://schemas.dmtf.org/cimi/1/Credential",
    "credentialTemplate":
      { "href": "http://example.com/credentialTemplates/72000" }
  },
  { "name": "MyVolume",
    "type": "http://schemas.dmtf.org/cimi/1/Volume",
    "volumeTemplate": { "href": "http://example.com/volumeTemplates/95839" }
  }
],
"operations": [
  { "rel": "edit", "href": "http://example.com/systemTemplates/48920" }
]
}

```

Step 2 : Create a new System using a System Template

Now create a new System using this System Template by sending a POST to the same URL that you used in the previous scenario to create a new System:

```

POST /systems HTTP/1.1
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/SystemCreate",
  "name": "MySystem2",
  "description": "My second system",
  "systemTemplate": { "href": "http://example.com/systemTemplates/48920" }
}

```

```

HTTP/1.1 201 Created
Location: http://example.com/systems/78343
CIMI-Specification-Version: 1.0

```

Step 3 : Query the new System

Retrieve the System to get the full representation of the new System:

```
GET /systems/87343
```

```

HTTP/1.1 200 OK
Content-Type: application/json
CIMI-Specification-Version: 1.0

{ "resourceURI": "http://schemas.dmtf.org/cimi/1/System",
  "id": "http://example.com/systems/78342",
  "name": "MySystem2",
  "description": "My second system",
  "created": "2012-10-15T12:15:00Z",
  "updated": "2012-10-15T12:15:00Z",
  "state": "STOPPED",
  "machines": { "href": "http://example.com/systems/87432/machines" },
  "credentials": { "href": "http://example.com/systems/87342/creds" },
  "volumes": { "href": "http://example.com/systems/87342/vols" },
  "operations" : [
    { "rel": "edit", "href": "http://example.com/systems/78342" }
  ]
}

```

```
]
}
```

Change History:

Version	Date	Who	What
0.01	08/26/11	Doug	Initial Draft
0.02	08/28/11	Doug	Added creating/attaching a Volume scenario. Added the notion of checking the EntityMetadata for MachineAdmin in scenario #1 since the client needs to know that userid/pwd are required. Added change history.
0.03	08/29/11	Doug	Added creating/using MachineTemplates. Renamed the doc to be a Primer.
0.04	08/30/11	Doug	Added more descriptive text to indicate that in a real world scenario people would normally loop over the entire list of resources returned looking for the one they want.
0.05	08/31/11	Doug	Added boilerplate DMTF info.
0.06	09/09/11	Doug	Added a step to scenario to update some properties.
0.08	09/21/11	Doug	Make 'stop' action URIs consistent to resolve issue 1364 .
0.09	10/04/11	Doug	s/gigabyte/gibibyte/ in memory to resolve issue 1362 .
0.10	10/04/11	Doug	Alignment with issues 1241 , 1242 , 1351 , 1220 resolved in v42 of the main spec.
0.11	10/05/11	Doug	Alignment with issue 1369 .
0.12	10/06/11	Doug	s/status/state/ to align with issue 1095 . Make sure PUT responses have response bodies to align with issue 1118 .
0.13	10/26/11	Doug	Added some abstract text to resolve issue 1422 .
0.14	12/06/11	Doug	Added clarifying text around adding volumes to resolve issue 1441 .
0.15	12/07/11	Doug	Removed "protocol" from Machine and Volume entities to resolve issue 1247 .
0.16	12/08/11	Doug	Added the use of MachineAdminTemplate to resolve issue 1368 .
0.17	01/11/12	Doug	s/self/id/ to resolve issue 1496 . Fix the ordering and state of new Machines to resolve issue 1491 .
0.18	01/18/12	Doug	Update boilerplate stuff.
0.19	01/19/12	Doug	Added updated time to resolve issue 1485 .
0.20	02/01/12	Doug	Change MachineAdmin to Credentials to resolve issue 1532 . Add a forward and ack section to resolve issue 1530 .
0.21	02/15/12	Doug	Fixed minor typos to resolve issue 1553 .
0.22	02/23/12	Doug	Make the doc more stand-alone to resolve issue 1554 .
0.23	03/14/12	Doug	Add some SystemTemplate scenarios to resolve issue 1489 .
0.24	03/20/12	Doug	Use application/json and application/xml as the media-types to resolve issue 1456 . Add "/CEP" to CloudEntryPoint URIs and add "rootURI" to CEP data to resolve issue 1472 .
0.25	03/21/12	Doug	Turn CEP.EntityMetadata into a ref to resolve issue 1596 . Switch from using VSPs to just direct pointers to Networks to resolve issue 1578 . Add Address entity to resolve issue 1445 . Add an overview to resolve issue 1603 .
0.26	03/28/12	Doug	Convert things over to using Collections to resolve issues 1359 and 1644 .
0.27	04/11/12	Doug	Update doc version number. Add an async variant to scenario 4 to resolve issue 1604 .
0.28	04/19/12	Doug	Remove X- from HTTP headers to resolve issue 1649 . Reduce Volume support to just "mapped" to resolve issue 1531 .
0.29	04/26/12	Doug	Use http://schemas.dmtf.org/cimi/1 as our namespace to resolve issue 1641 . Add new scenario using a bootable volume to resolve issue 1642 .
0.30	04/30/12	Cathi	Brightleaf review/update.
0.31	05/02/12	Doug	Change "Entity" to "Resource" to resolve issue 1711 .
0.32	05/09/12	Doug	s/rootURI/baseURI/g to resolve issue 1735 . For attributes like

			memory and capacity covert it from a structure to a single integer to resolve issue 1734 .
0.33	05/20/12	Doug	Per cmwg msg 201205/msg00053.html reordered some stuff in System and CEP to align with the TOC.
0.34	05/23/12	Doug	s/Credentials/Credential/g to resolve issue 1748 .
0.35	06/08/12	Doug	Inline some collections to resolve issue 1749 .
0.36	06/13/12	Doug	Remove CIMI from the query parameter names to resolve issue 1767 .