oVirt

Introduction to oVirt RESTful API SDK and CLI

01 Nov 2011

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HTTP Background

The Hypertext Transfer Protocol (HTTP) is a networking protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web.

- HTTP is an Application Layer protocol

  (The protocol definitions presume a reliable Transport Layer)

- client-server computing model
- HTTP Resources are identified and located on the network by Uniform Resource Identifiers
- HTTP functions as a request-response

HTTP methods

- GET

  Requests a representation of the specified resource. Requests using GET (and a few other HTTP methods) "SHOULD NOT have the significance of taking an action other than retrieval".

- HEAD

  Asks for the response identical to the one that would correspond to a GET request, but without the response body. This is useful for retrieving meta-information written in response headers, without having to transport the entire content.

HTTP methods con.

- POST

  Submits data to be processed to the identified resource. The data is included in the body of the request.

- PUT

  Uploads a representation of the specified resource.

- DELETE

  Deletes the specified resource.

- TRACE

  Echoes back the received request, so that a client can see what (if any) changes or additions have been made by intermediate servers.

HTTP methods con.

- OPTIONS

  Returns the HTTP methods that the server supports for specified URL. This can be used to check the functionality of a web server by requesting '*' instead of a specific resource.

- CONNECT

  Converts the request connection to a transparent TCP/IP tunnel, usually to facilitate SSL-encrypted communication (HTTPS) through an unencrypted HTTP proxy.

- PATCH

  Is used to apply partial modifications to a resource.

HTTP response codes

- 1xx Informational

  - 102 Processing

  ...

- 2xx Success

  - 200 OK

  - 201 Created

  - 202 Accepted

  ...

- 3xx Redirection

  ...

- 4xx Client Error

  - 400 Bad Request

  - 401 Unauthorized

  - 404 Not Found

  ...

- 5xx Server Error

  - 500 Internal Server Error

  - 503 Service Unavailable

  ...

REST Background

- REST is Representational State Transfer
- The term Representational State Transfer was introduced and defined in 2000 by Roy Fielding in his doctoral dissertation

  (Fielding is one of the principal authors of the Hypertext Transfer Protocol (HTTP) specification versions 1.0 and 1.1)

REST Concepts

- Client–server
- Stateless
- Cacheable
- Uniform interface

REST Concepts

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- Identification of resources
- Manipulation of resources through representations
- Self-descriptive
- Hypermedia as the engine of application state

  Clients make state transitions only through actions, a client does not assume that any particular actions will be available for any particular resources beyond those described in representations previously received from the server.

Media types

- XML

```
<vms>
  <vm id=”xxx”>
    <name>yyy<name>
  </vm>
</vms>
```

- JavaScript Object Notation (JSON)

```
{
  “vms” : [
    “vm” : {
      “id” : ”xxx”,
      “name” : ”yyy” } ]
}
```

- YAML

```
- vms:
  -  id: “xxx”
     name: yyyy
```

SOAP vs. REST

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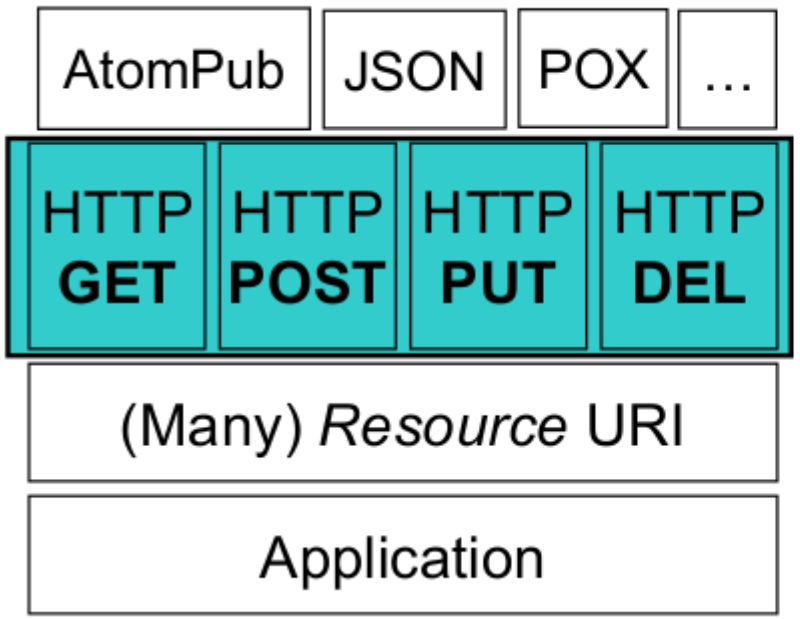
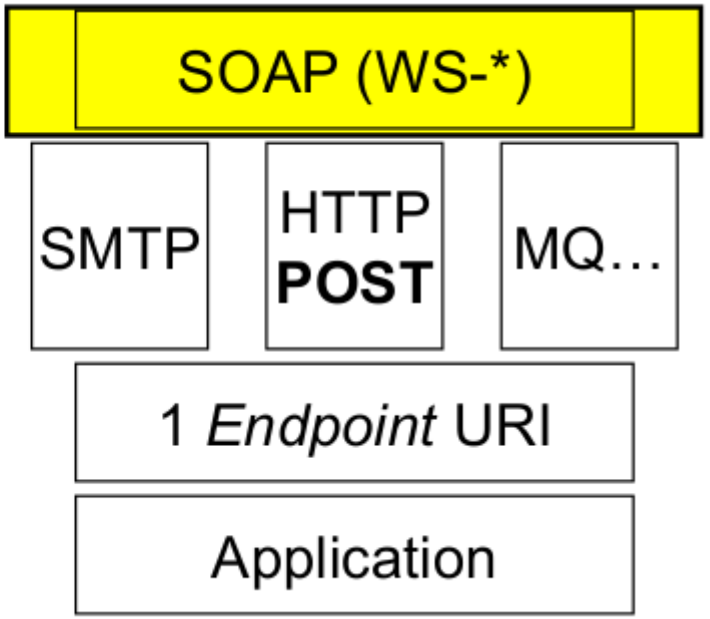
- REST advantages:
  - Lightweight - not a lot of extra xml markup
  - Human Readable Results
  - Easy to build - no toolkits required

- SOAP advantages:
  - Easy to consume (sometimes)
  - Rigid - type checking, adheres to a contract
  - Development tools

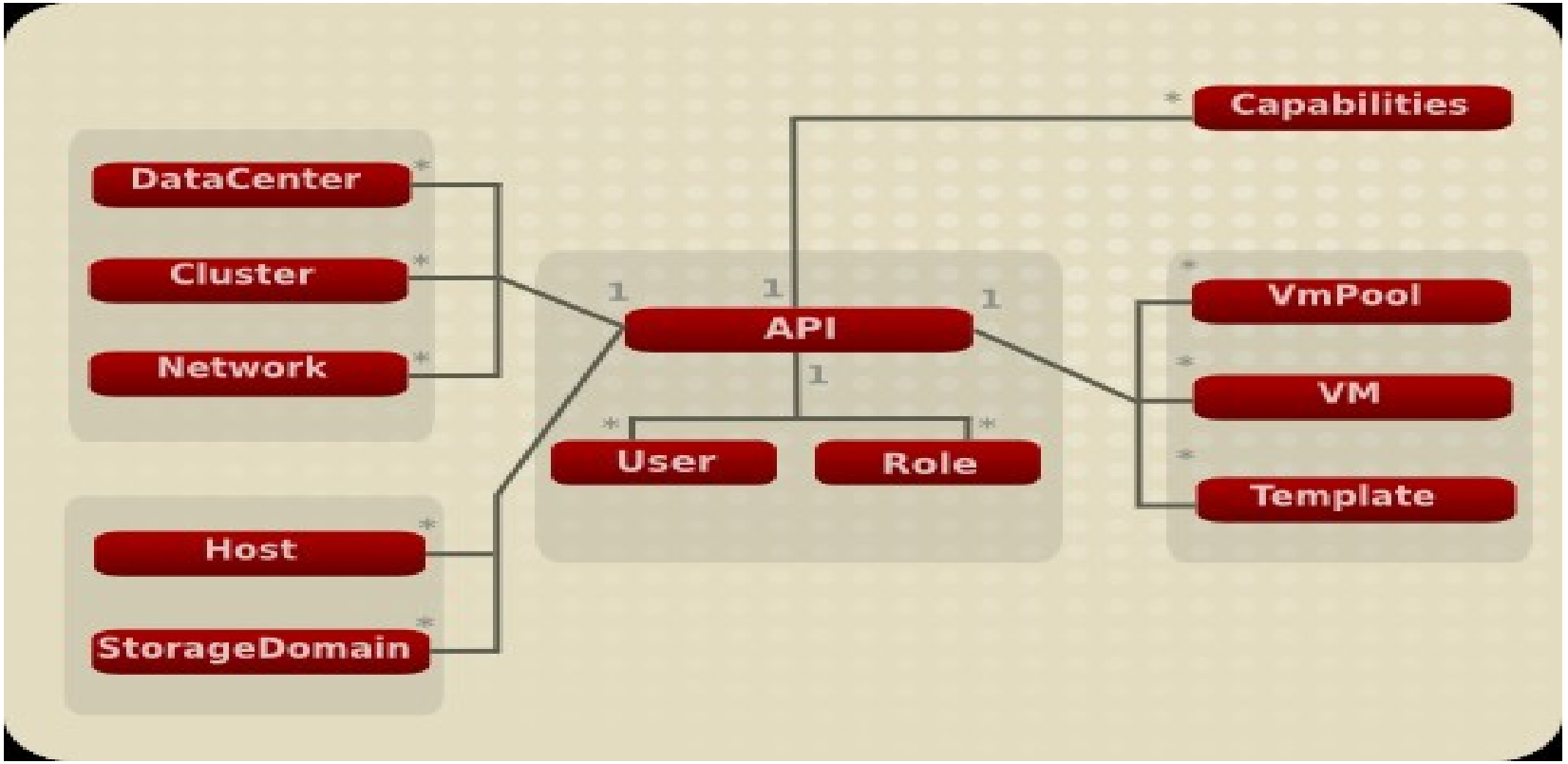
SOAP vs. REST


AtomPub
JSON
POX
…
HTTP GET
HTTP POST
HTTP PUT
HTTP DEL
(Many) Resource URI
Application

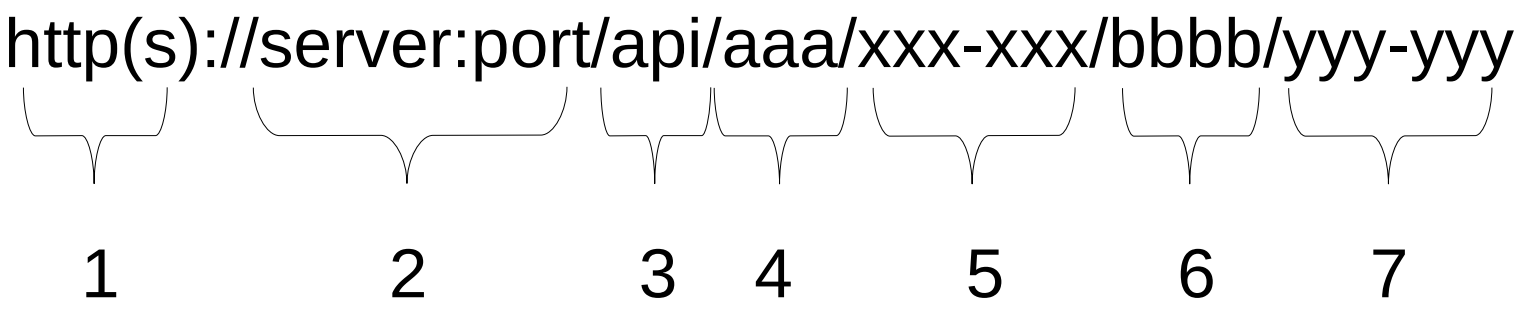

SOAP (WS-*)
SMTP
HTTP POST
MQ…
1 Endpoint URI
Application

oVirt-API as a RESTful API

- Container: JBOSS 5.1
- Framework: RESTeasy 2.2.2GA
- http(s)://server:port/api/



oVirt-API URI structure



1. protocol
2. server details
3. entry point (base resource)
4. collection
5. resource
6. sub-collection
7. sub-resource

oVirt-API How-to (the methods)

- To list all collection resources, use GET.

  GET http(s)://server:port/api/vms
- To retrieve specific resource, use GET.

  GET http(s)://server:port/api/vms/xxx
- To create a resource, use POST.

  POST http(s)://server:port/api/vms

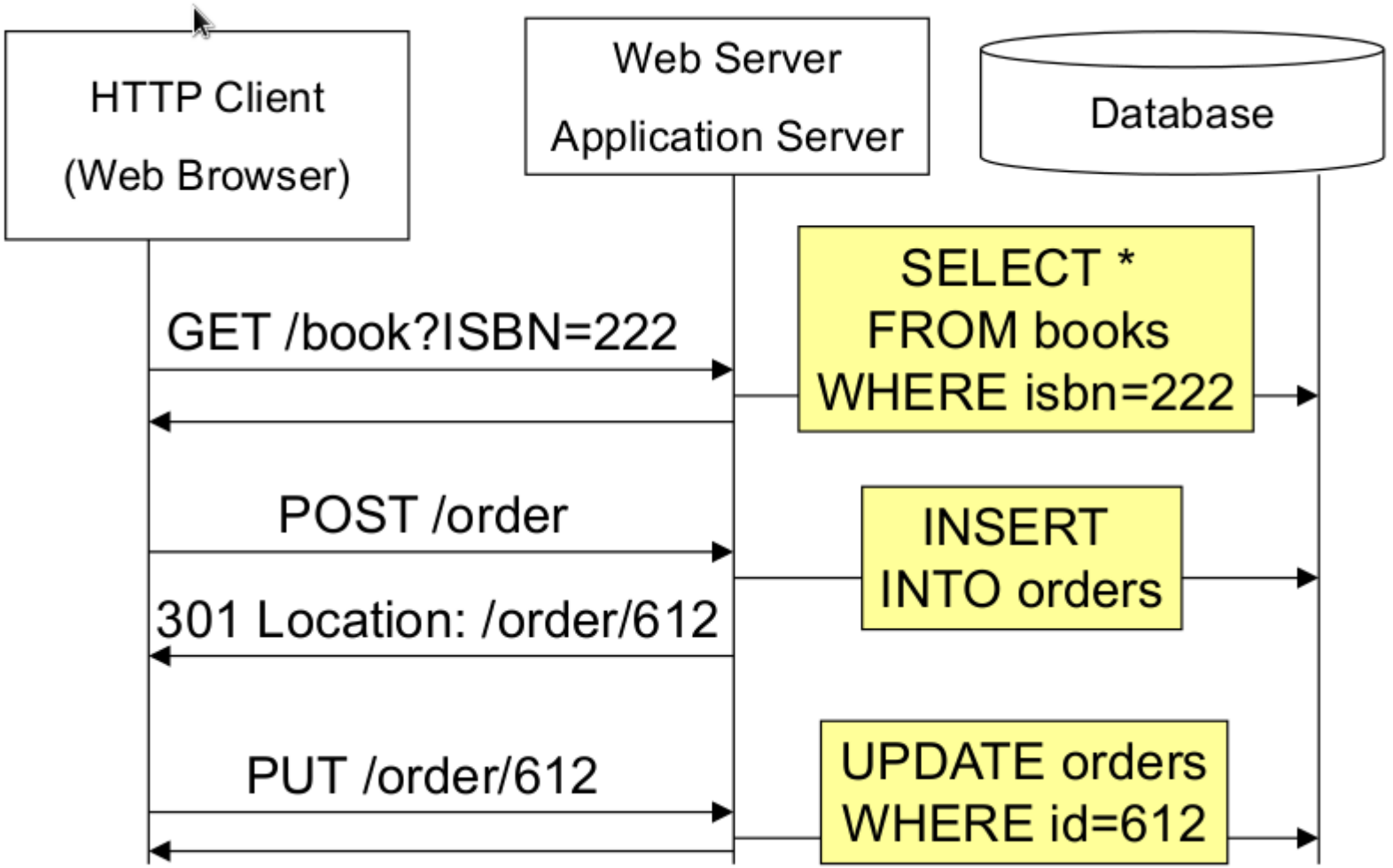
  <vm>...</vm>
- To update the resource, use PUT.

  PUT http(s)://server:port/api/vms/xxx

  <vm><name>aaa</name></vm>
- To remove the resource, use DELETE.

  DELETE http(s)://server:port/api/vms/xxx

oVirt-API methods (behind the scene)



oVirt-API How-to (headers)

- Method::Any
  - Accept: application/xml, yaml, json (mandatory) *
  - Authorization: Basic ... (mandatory)
  - Accept-Language: de | nl | it
- Method::GET
  - details = statistics | disks | nics | tags ...
- Method::POST
  - Expect: 201-created

oVirt-API resource structure

GET http(s)://server:port/api/vms/xxx

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<vm id="xxx" href="/api/vms/xxx">  identification details
    <name>vm1_iscsi</name>
    <status>DOWN</status>
    <memory>10737418240</memory>
    <cpu>
        <topology cores="1" sockets="1"/>
    </cpu>
    <start_time>2011-07-13T12:05:34.931Z</start_time>
    <creation_time>2011-05-31T16:47:51+03:00</creation_time>
    <actions>
        <link rel="start" href="/api/vms/xxx/start"/>
        <link rel="stop" href="/api/vms/xxx/stop"/>
    </actions>
    <link rel="disks" href="/api/vms/xxx/disks"/>
    <link rel="nics" href="/api/vms/xxx/nics"/>
    <cluster id="zzz" href="/api/clusters/zzz"/>
    <template id="yyy" href="/api/templates/yyy"/>
</vm>
```

Metadata

Resource details

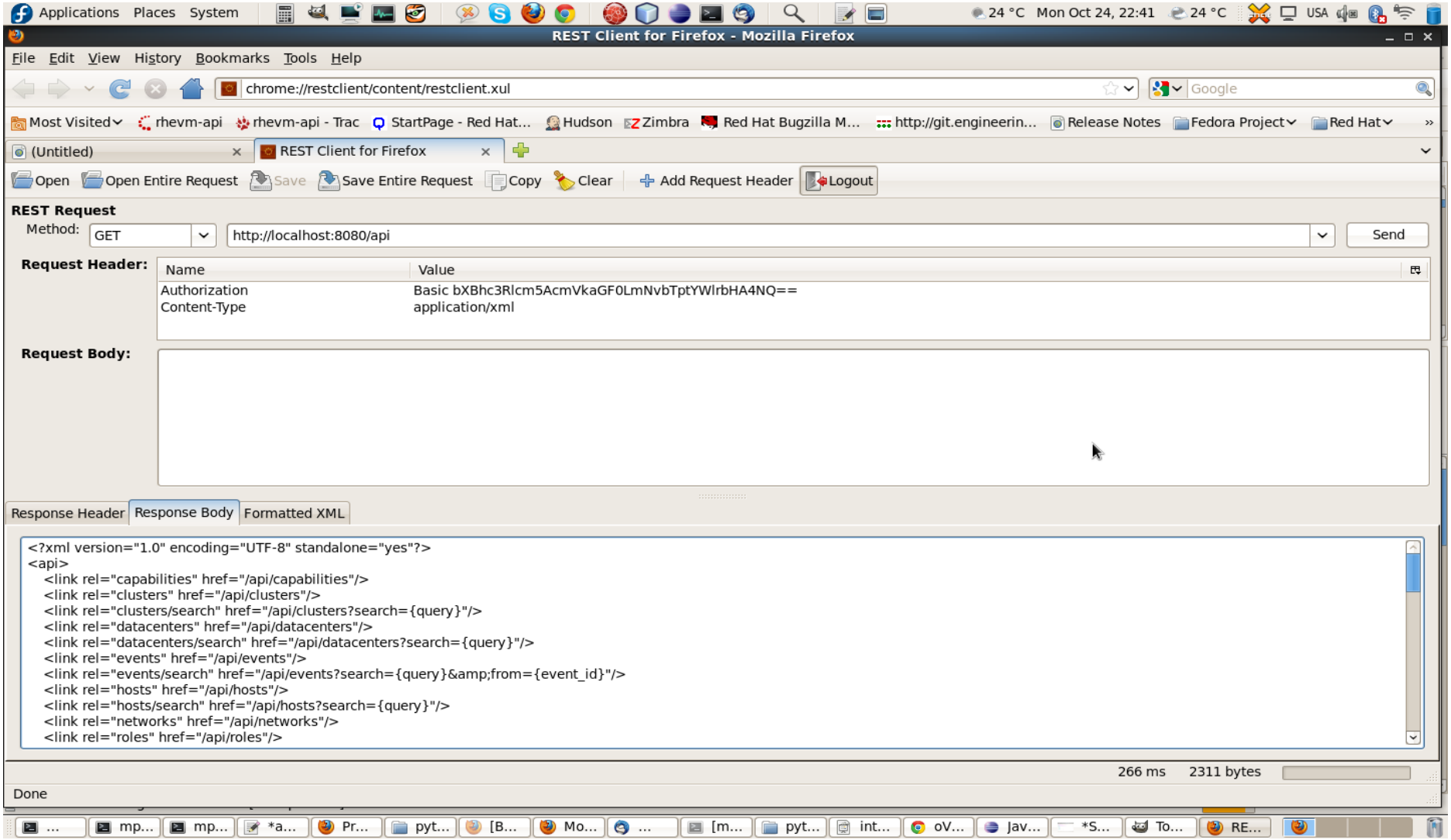
Actions

Links to related resources

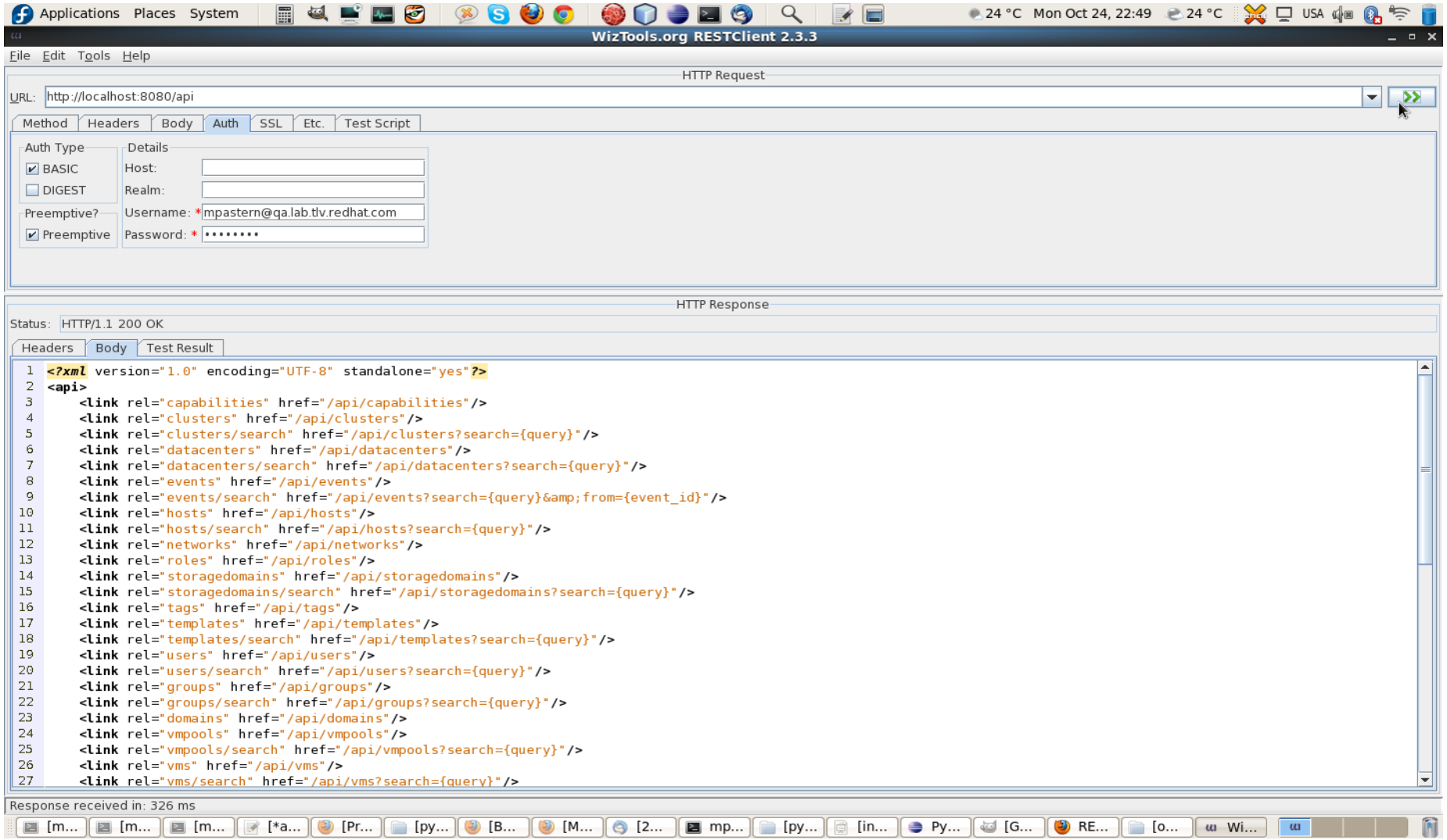
Clients / Tools

- Any HTTP library/client can be used as a a client for RHEVM-API
- Common used clients are:
  - FF REST Client
  - REST-Client (Google)
  - Linux: curl / wget
  ...

FF REST Client



REST-Client (Google)



Examples

- GET http(s)://server:port/api

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<api>
    <link rel="capabilities" href="/api/capabilities"/>
    ...
    <link rel="vms" href="/api/vms"/>
    <link rel="vms/search" href="/api/vms?search={query}"/>
    <special_objects>
        <link rel="templates/blank" href="/api/templates/00000000-0000-0000-0000-000000000000"/>
        <link rel="tags/root" href="/api/tags/00000000-0000-0000-0000-000000000000"/>
    </special_objects>
    <product_info>
        <version revision="0" build="0" minor="0" major="3"/>
    </product_info>
    <summary>
        <vms>
            <total>5</total>
            <active>1</active>
        </vms>
        <hosts>
            <total>3</total>
            <active>2</active>
        </hosts>
        <users>
            <total>6</total>
            <active>2</active>
        </users>
        <storage_domains>
            <total>7</total>
            <active>8</active>
        </storage_domains>
    </summary>
</api>
```

Example GET

Get:

GET http(s)://server:port/api/vms/xxx

Get with 'curl':

curl -v -u "user@domain:password" -H "Content-type: application/xml" -X GET http(s)://server:port/api/vms/xxx

Example CREATE

- Create VM:

  POST http(s)://server:port/api/vms
  ```
  <vm>
    <name>my_new_vm</name>
    <cluster id="xxx" />
    <template id="yyy" />
  </vm>
  ```

- Create with 'curl'

  ```
  curl -v -u "user@domain:password"
     -H "Content-type: application/xml"
     -d '<vm>
     <name>my_new_vm</name>
     <cluster><name>cluster_name</name></cluster>
     <template><name>template_name</name></template>
      </vm>'
     'http(s)://server:port/api/vms'
  ```

Example UPDATE

- Update:

  PUT http(s)://server:port/api/vms/xxx
  <vm>
    <name>new_name</name>
  </vm>

- Update with 'curl':

  echo "<vm><name>new_name</name></vm>" > /tmp/upload.xml
  curl -v -u "user@domain:password"
    -H "Content-type: application/xml"
    -T /tmp/upload.xml
    'http(s)://server:port/api/vms/xxx'

Example DELETE

- Delete:

  DELETE http(s)://server:port/api/vms/xxx

- Delete with 'curl':

  curl -v -u "user@domain:password" -X DELETE http(s)://server:port/api/vms/xxx

Python SDK: (The concepts):

- Complete protocol abstraction.
- Full compliance with the oVirt api architecture.
- Auto-completion.
- Self descriptive.
- Intuitive and easy to use.
- Auto-Generated.

RSDL:
(The RESTful Services Description Language)

- Why?
  - No way to know how to create the resource [1].
  - No way to know which actions available on collection [1].
  - No way to know which parameters to pass [1]:
    - mandatory/optional/read-only.
    - type.
    - overloads.
  - If resource is yet not created:
    - No way to know which actions available on it [1].
    - No way to know which sub-collections available [1].
    - No way to know how the resource representation looks like [1].

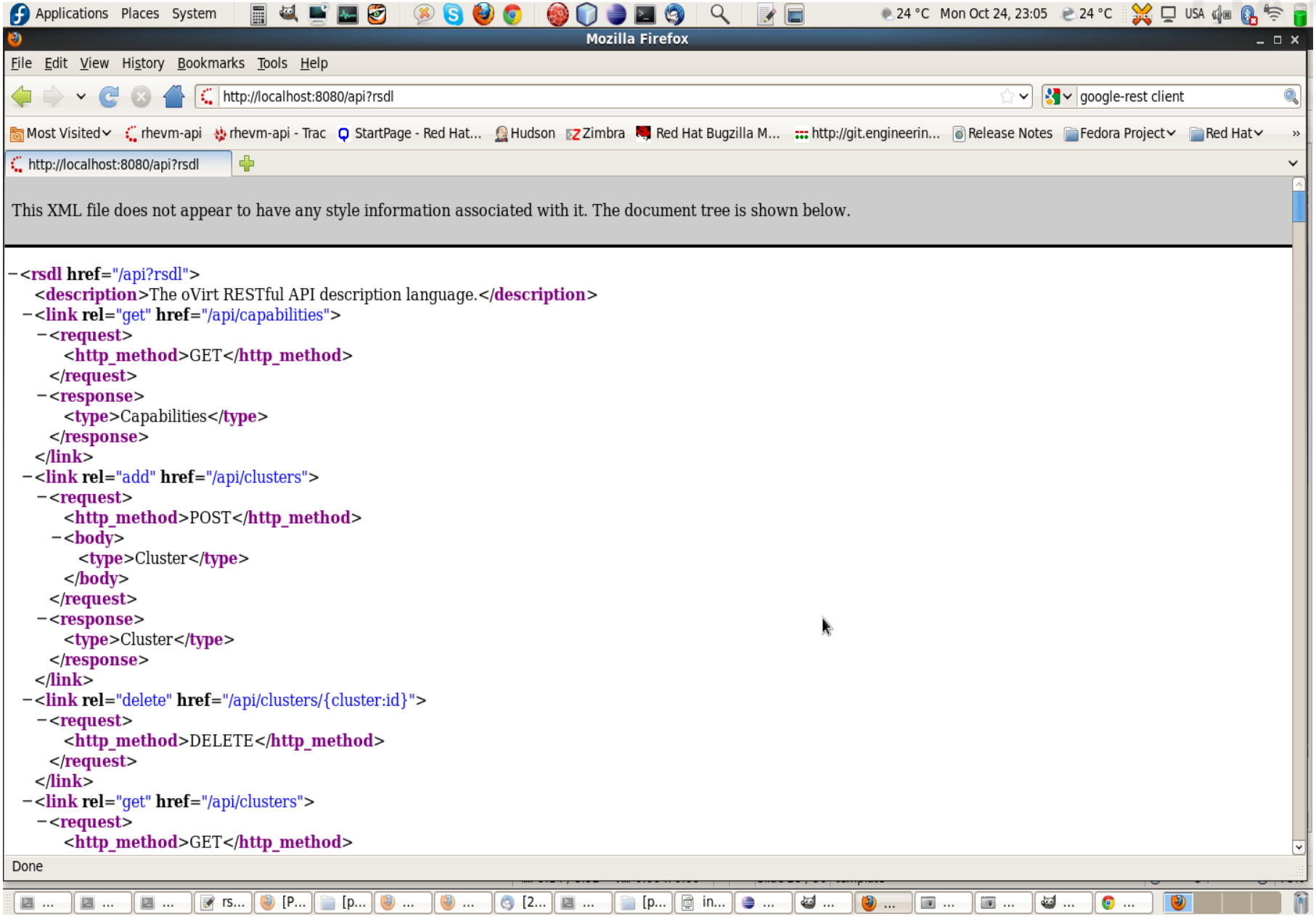
[1] other than reading documentation.

RSDL: (RESTful Services Description Language)

- How?

  GET: http(s)://server:port/api?rsdl

```
<link rel="get" href="/api/clusters">
    <request>
        <http_method>GET</http_method>
    </request>
    <response>
        <type>Clusters</type>
    </response>
</link>
<link rel="add" href="/api/clusters/{cluster:id}/permissions">
    <request>
        <http_method>POST</http_method>
        <body>
            <type>Permission</type>
        </body>
    </request>
    <response>
        <type>Permission</type>
    </response>
</link>
<link rel="delete" href="/api/clusters/{cluster:id}/permissions/{permission:id}">
    <request>
        <http_method>DELETE</http_method>
    </request>
</link>
```


Applications Places System
24 °C Mon Oct 24, 23:05 24 °C USA
Mozilla Firefox
File Edit View History Bookmarks Tools Help
http://localhost:8080/api?rsdl
google-rest client
Most Visited rhevm-api rhevm-api - Trac StartPage - Red Hat... Hudson Zimbra Red Hat Bugzilla M... http://git.engineerin... Release Notes Fedora Project Red Hat
http://localhost:8080/api?rsdl
This XML file does not appear to have any style information associated with it. The document tree is shown below.
−<rsdl href="/api?rsdl">
<description>The oVirt RESTful API description language.</description>
−<link rel="get" href="/api/capabilities">
−<request>
<http_method>GET</http_method>
</request>
−<response>
<type>Capabilities</type>
</response>
</link>
−<link rel="add" href="/api/clusters">
−<request>
<http_method>POST</http_method>
−<body>
<type>Cluster</type>
</body>
</request>
−<response>
<type>Cluster</type>
</response>
</link>
−<link rel="delete" href="/api/clusters/{cluster:id}">
−<request>
<http_method>DELETE</http_method>
</request>
</link>
−<link rel="get" href="/api/clusters">
−<request>
<http_method>GET</http_method>
Done

Python SDK: (Usage)

- Creating the proxy
- Listing all collections

```
#create proxy
api = API(url='http://localhost:8080', username='user@domain', password='password')

api.
```

```
vms
__init__(url, username, password, key_file, cert_file, port, s
```

- Listing collection's methods.

```
api.vms.
```

```
add(vm)
get(name)
list(query)
```

- Querying collection with oVirt search engine.
- Querying collection by custom constraint.

```
#list by query
vms = api.vms.list(query = 'name=python_vm')

#search vms by property constraint
vms = api.vms.list(memory=1073741824)
```

- Querying collection for specific resource.

```
#get by constraints
vm = api.vms.get(id = '02f0f4a4-9738-4731-83c4-293f3f734782')
```

- Accessing resource methods and properties.

```
vm.st
```

```
start()
start_time
stateless
```

Python SDK: (Usage)

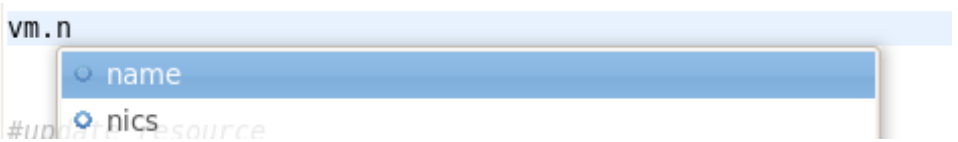
- Accessing resource properties and sub-collections.

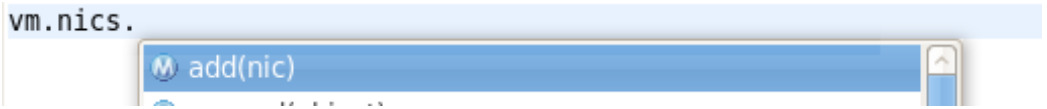
- Accessing sub-collection methods.

- Querying sub-collection by custom constraint.

- Retrieving sub-collection resource.

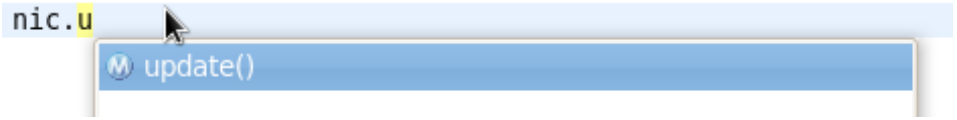
- Accessing sub-collection resource properties and methods.






```
nics = vm.nics.list(interface='e1000')
```

```
nic = vm.nics.get(name='eth0')
```



CLI:

```
AVAILABLE COMMANDS

    * action          execute an action on an object
    * cd              change directory
    * clear           clear the screen
    * connect         connect to a RHEV manager
    * console         open a console to a VM
    * create          create a new object
    * delete          delete an object
    * disconnect      disconnect from RHEV manager
    * exit            quit this interactive terminal
    * getkey          dump private ssh key
    * help            show help
    * list            list or search objects
    * ping            test the connection
    * pwd             print working directory
    * save            save configuration variables
    * set             set a configuration variable
    * show            show one object
    * status          show status
    * update          update an object
```

```
(oVirt cli) > help connect

USAGE

  connect
  connect <url> <username> <password>

DESCRIPTION

  Connect to a RHEV manager. This command has two forms. In the firs
  form, no arguments are provided, and the connection details are rea
  from their respective configuration variables (see 'show'). In
  the second form, the connection details are provided as arguments.

  The arguments are:

   * url          - The URL to connect to.
   * username     - The user to connect as. Important: this needs to
                    in the user@domain format.
   * password     - The password to use.
```

CLI – querying for resources

```
USAGE

  list <type> [search]... [object identifiers]

DESCRIPTION

  List or search for objects of a cetain type. There are two forms. If
  only <type> is provided, all objects of the specified type are
  returned. If a search query is given, it must be a valid RHEV-M search
  query. In that case objects matching the query are returned.

AVAILABLE TYPES

  The <type> parameter must be one of the following. Note: not all types
  implement search!

    * capabilities
    * clusters
    * datacenters
    * events
    * hosts
    * networks
    * roles
    * storagedomains
    * tags
    * templates
    * users
    * vmpools
    * vms
```

```
(oVirt cli) > list vms
name       status
---------  -------
new_vm     down
python_vm  unknown
vm1_nfs    down
vmpool-1   down
vm_test    down
vm_test2   down

(oVirt cli) > show vm new_vm

id         : 62004129-a806-4e48-9b39-f6a54c97cba6
name       : new_vm
status     : down
memory     : 1024
os         : unassigned
display    : spice
monitors   : 1
stateless  : False
template   : 94f5ad88-a12a-4f48-af9f-f2ba28b7285b
cluster    : 99408929-82cf-4dc7-a532-9d998063fa95
```

CLI – create


```
  $ create vm --name myvm --memory 512 --type SERVER \
              --cluster Default --template Blank

This example does the same but now using pre-formatted input:

  $ create vm << EOM
  > <vm>
  >   <name>myvm</name>
  >   <memory>512000000</memory>
  >   <type>SERVER</type>
  >   <cluster><name>Default</name></cluster>
  >   <template><name>Blank</name></template>
  > </vm>
  > EOM
```

Create using resource arguments

Create using resource XML representation

```
(oVirt cli) > create cluster --name test
error: rhev: Incomplete parameters
detail: Cluster [dataCenter.name|id] required for add
(oVirt cli) >
(oVirt cli) >
(oVirt cli) > create vm --name test --cluster Default_nfs --template Blank
error: rhev: Operation Failed
detail: Storage Domain cannot be accessed.
```

Parameters incompleteness failure

BE failure

CLI – update

```
(oVirt cli) > list clusters
id                                   name           description
-----------------------------------  -------------  --------------------------
7073b1ac-ef46-11e0-aa7c-d3e6f6b5731d  aa
80eed02c-ac7d-11e0-b702-0bf21e6d33af  b
82b1c018-ac7d-11e0-ac42-5b8d8dcd7c92  c
63bc09b0-8b8b-11e0-bdc2-4356942887b3  Default_iscsi
99408929-82cf-4dc7-a532-9d998063fa95  Default_nfs    The default server cluster
ffb2d112-8cf0-11e0-b34b-7f61455e6a71  Test_iscsi
ada1672a-8cf1-11e0-9d3e-b75c5a33ec19  Test_nfs
ad9bd996-a893-11e0-b174-e3232e67a091  Test_vlans

(oVirt cli) > update cluster aa --name bb
(oVirt cli) > list clusters
id                                   name           description
-----------------------------------  -------------  --------------------------
80eed02c-ac7d-11e0-b702-0bf21e6d33af  b
7073b1ac-ef46-11e0-aa7c-d3e6f6b5731d  bb
82b1c018-ac7d-11e0-ac42-5b8d8dcd7c92  c
63bc09b0-8b8b-11e0-bdc2-4356942887b3  Default_iscsi
99408929-82cf-4dc7-a532-9d998063fa95  Default_nfs    The default server cluster
ffb2d112-8cf0-11e0-b34b-7f61455e6a71  Test_iscsi
ada1672a-8cf1-11e0-9d3e-b75c5a33ec19  Test_nfs
ad9bd996-a893-11e0-b174-e3232e67a091  Test_vlans
```

CLI – delete

```
(oVirt cli) > list clusters
id                                   name           description
-----------------------------------  -------------  -------------------------
80eed02c-ac7d-11e0-b702-0bf21e6d33af  b
7073b1ac-ef46-11e0-aa7c-d3e6f6b5731d  bb
82b1c018-ac7d-11e0-ac42-5b8d8dcd7c92  c
63bc09b0-8b8b-11e0-bdc2-4356942887b3  Default_iscsi
99408929-82cf-4dc7-a532-9d998063fa95  Default_nfs    The default server cluster
ffb2d112-8cf0-11e0-b34b-7f61455e6a71  Test_iscsi
ada1672a-8cf1-11e0-9d3e-b75c5a33ec19  Test_nfs
ad9bd996-a893-11e0-b174-e3232e67a091  Test_vlans

(oVirt cli) > delete cluster bb
(oVirt cli) > list clusters
id                                   name           description
-----------------------------------  -------------  -------------------------
80eed02c-ac7d-11e0-b702-0bf21e6d33af  b
82b1c018-ac7d-11e0-ac42-5b8d8dcd7c92  c
63bc09b0-8b8b-11e0-bdc2-4356942887b3  Default_iscsi
99408929-82cf-4dc7-a532-9d998063fa95  Default_nfs    The default server cluster
ffb2d112-8cf0-11e0-b34b-7f61455e6a71  Test_iscsi
ada1672a-8cf1-11e0-9d3e-b75c5a33ec19  Test_nfs
ad9bd996-a893-11e0-b174-e3232e67a091  Test_vlans
```

CLI - action

```
USAGE

  action <type> <id> <action> [base identifiers] [attribute options]

DESCRIPTION

  Executes the an action on an object. This command requires the
  following arguments:

    * type        - The type to operate on
    * id          - The name or id identifying the object
    * action      - The action to take

  For more specific help on the available actions and options, use
  'help action <type> <id>'

AVAILABLE TYPES

  The <type> parameter must be one of the following:

    * cluster
    * datacenter
    * event
    * host
    * network
    * role
    * storagedomain
    * tag
    * template
    * user
    * vm
    * vmpool

RETURN VALUES

  This command will return one of the following statuses. To see the
  exit status of the last command, type 'status'.

    * 000 (OK)
    * 001 (SYNTAX_ERROR)
    * 002 (COMMAND_ERROR)
    * 003 (INTERRUPTED)
    * 004 (UNKNOWN_ERROR)
    * 010 (REMOTE_ERROR)
    * 011 (NOT_FOUND)
```

```
(oVirt cli) > show vm new_vm

id          : 62004129-a806-4e48-9b39-f6a54c97cba6
name        : new_vm
status      : down
memory      : 1024
os          : unassigned
display     : spice
monitors    : 1
stateless   : False
template    : 94f5ad88-a12a-4f48-af9f-f2ba28b7285b
cluster     : 99408929-82cf-4dc7-a532-9d998063fa95

(oVirt cli) > action vm new_vm start

status: complete

(oVirt cli) > show vm new_vm

id          : 62004129-a806-4e48-9b39-f6a54c97cba6
name        : new_vm
status      : powering_up
memory      : 1024
os          : unassigned
display     : spice
monitors    : 1
stateless   : False
template    : 94f5ad88-a12a-4f48-af9f-f2ba28b7285b
cluster     : 99408929-82cf-4dc7-a532-9d998063fa95
```

What next?

- Non-Admin users support
- Actions on Collection (atomic network operations)
- Pagination on collections
- Async update/delete
- Exposing additional oVirt search capabilities
- SDKs (C# / Ruby / Delphi / Java / ...)
- Clients (PowerShell / ...)

New oVirt engine features

- Quota
- New networking capabilities (bridgeless)
- Multiple storage domains
- Backup API
- Full support for Async tasks

...

THANK YOU !

Wiki: http://ovirt.org/wiki/Category:Api
ML : engine-devel
GIT : git://gerrit.ovirt.org/ovirt-engine-sdk