oVirt and OpenStack Storage (present and future)

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Agenda

- Introduction

    - oVirt and OpenStack Overview

- Present

    - oVirt and Glance Integration

    - Importing and Exporting Glance Images

    - Current Constraints and Limitations

- Future

    - Glance Future Integration

    - Keystone Authentication in oVirt

    - oVirt and Cinder Integration

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oVirt Overview

- oVirt is a virtualization management application

- manages hardware nodes, storage and network resources, in order to deploy and monitor virtual machines running in your data center

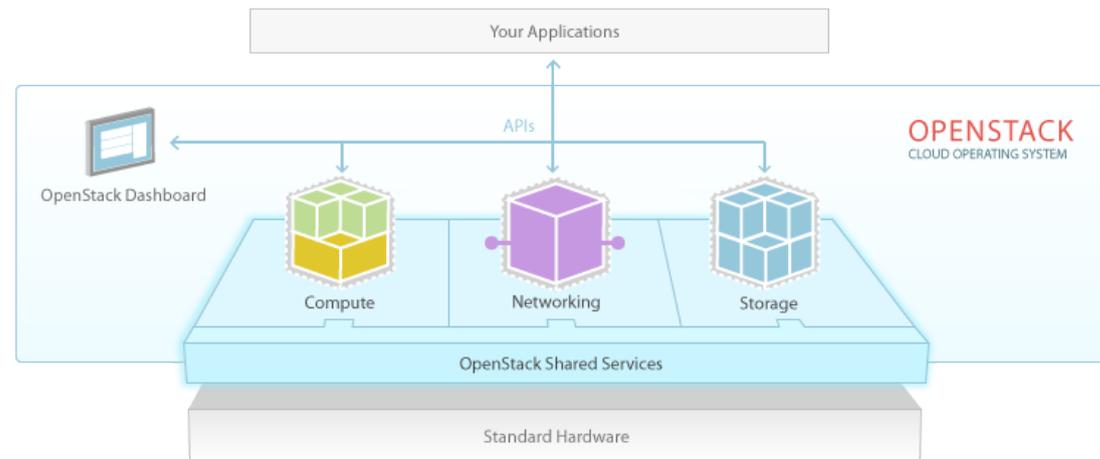- Free open source software released under the terms of the Apache License

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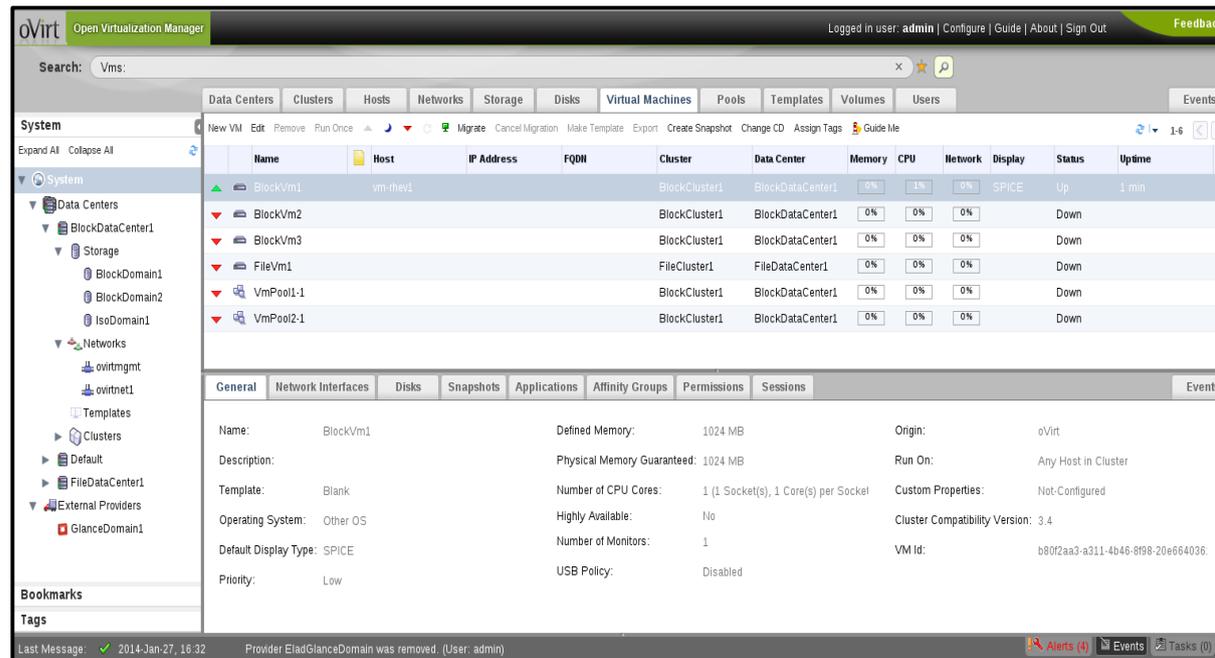
The oVirt Virtualization Architecture

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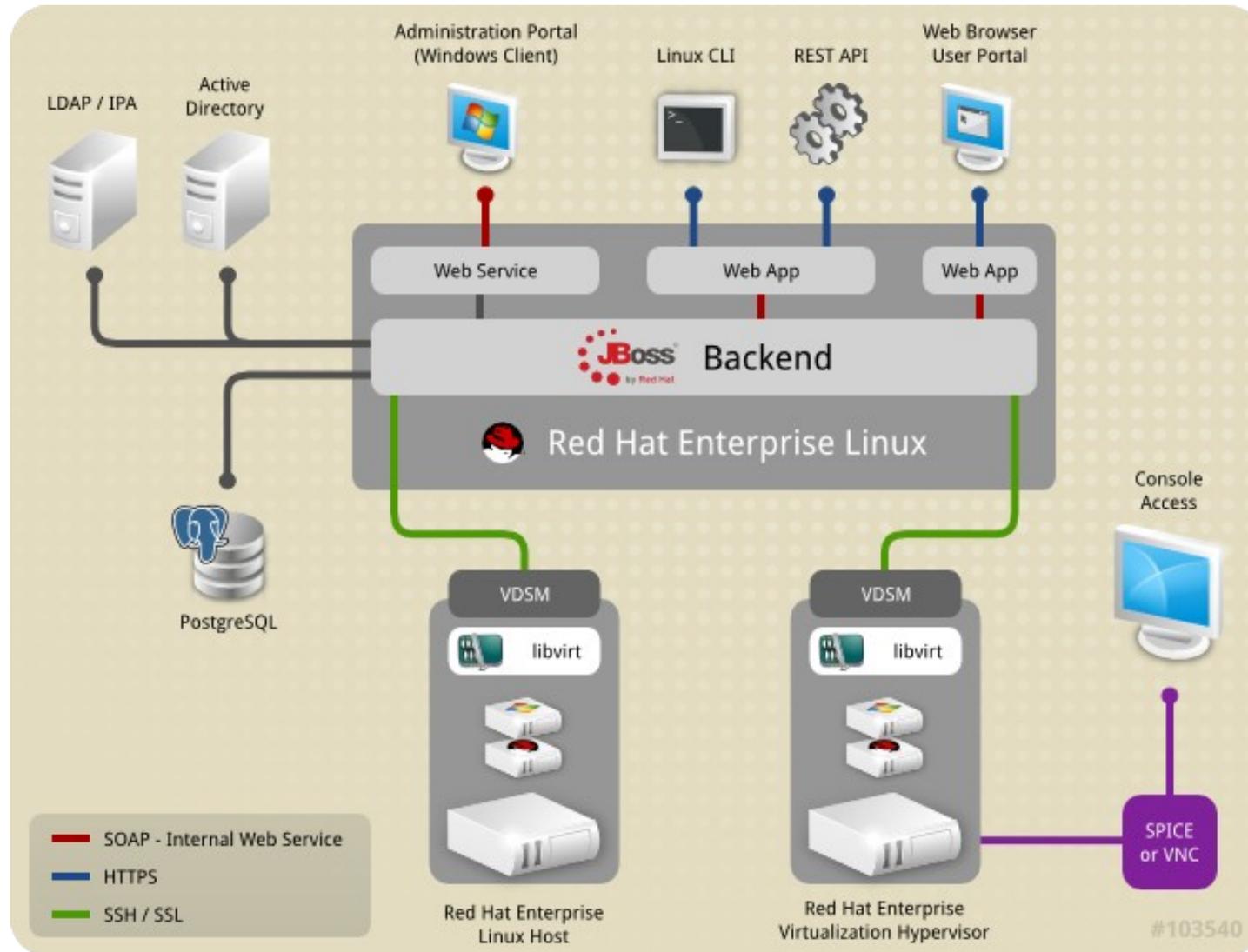
OpenStack Overview

- Cloud computing project to provide an Infrastructure as a Service (IaaS)

- Controls large pools of compute, storage, and networking resources

- Free open source software released under the terms of the Apache License
- Project is managed by the OpenStack Foundation, a non-profit corporate entity established in September 2012

OpenStack Glance Service

- Provides services for discovering, registering, and retrieving virtual machine images

- RESTful API that allows querying of VM image metadata and retrieval of the actual image

- Stored images can be used as a template

- It can also be used to store and catalog an unlimited number of backups

- Images available through Glance can be stored in a variety of locations (simple filesystems, OpenStack Swift, etc.)

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Glance Supported Formats

Disk Formats

- **raw** (an unstructured disk image format)
- **qcow2** (disk format supported by the QEMU)
- **iso** (format for the data contents of an optical disc)
- **vhd, vmdk, vdi** (VMWare, Xen, Microsoft, VirtualBox, and others)
- **aki, ari, ami** (Amazon images)

Container Formats

- **bare** (no container or metadata envelope for the image)
- **ovf** (ovf container format)
- **aki, ari, ami** (Amazon containers)

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Glance Image Base Metadata

- **checksum:** md5 checksum of the image

- **container_format:** bare, ovf, ...

- **created_at, updated_at, deleted_at:** creation, last update and deletion date and time

- **deleted:** whether the image has been deleted or not (True/False)

- **disk_format:** raw, qcow2, ...

- **id, name:** uuid of the image and name

- **is_public:** whether the image is public or not (True/False)

- **min_disk, min_ram**: generic recommendation for using the image

- **owner:** uuid of the owner of the image

- **protected:** whether the image can be deleted or not (True/False)

- **size:** real size of the image (not the virtual image size seen by the guest)

- **status:** active, saving, queued, killed, pending_delete, deleted

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Glance Image Common Properties

- In Glance API Version 1 it is possible to add custom properties to the images (not officially standardized)

- In Glance API Version 2 some additional custom properties have been standardized:

  - **architecture:** the CPU architecture that must be supported by the hypervisor (e.g. x86_64, arm, ppc64, ...)

  - **hypervisor_type:** xen, qemu, kvm, lxc, uml, ...

 - **os_type, os_distro, os_version:** OS information

- More information at:

  http://docs.openstack.org/trunk/openstack-compute/admin/content/image-metadata.html
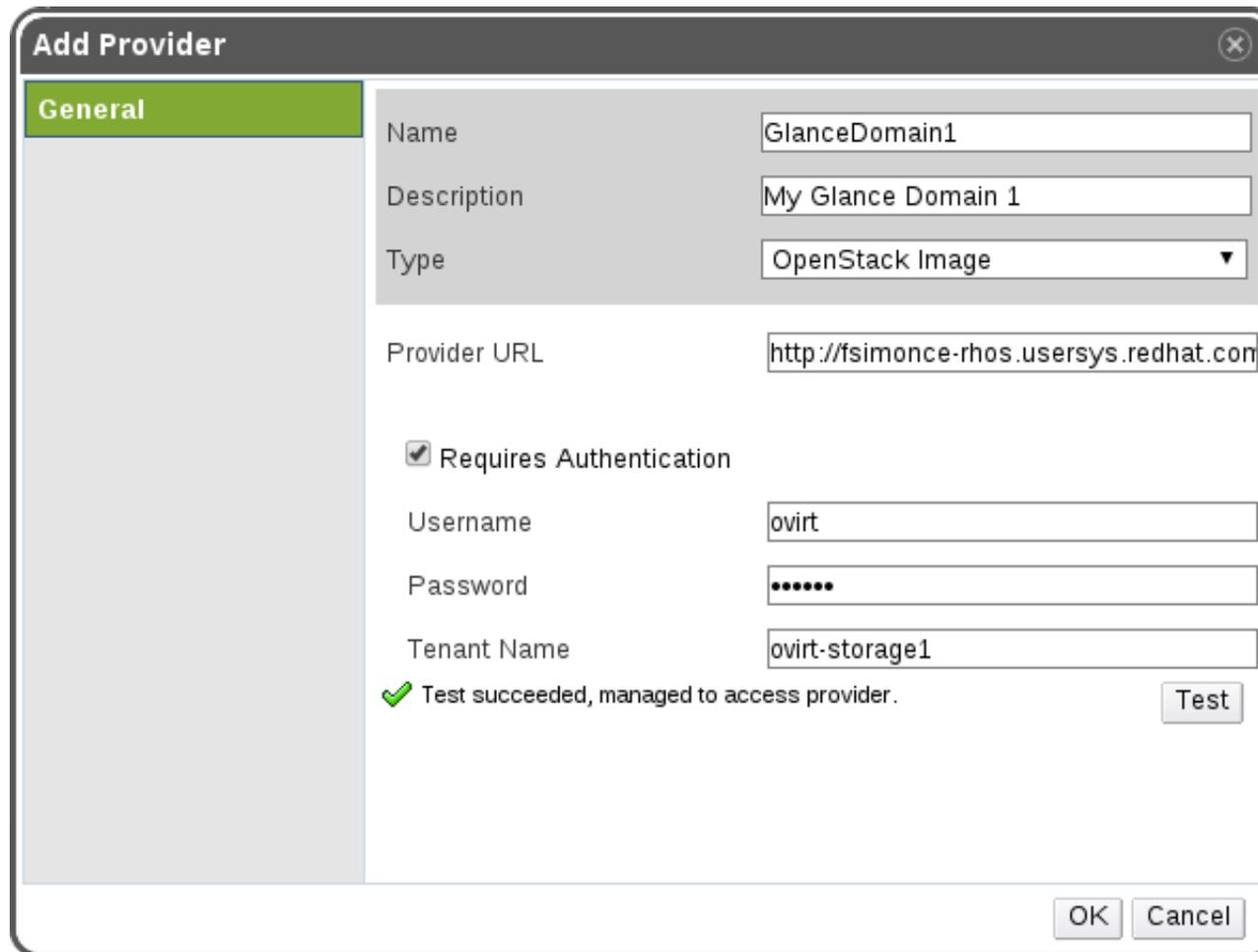
Glance - Interesting Use Cases for oVirt

- Import and Export single images (templates) from and to Glance for interoperability with OpenStack

- Unlimited number of backups for images and VMs

- Store ISO images in Glance and use them natively in the oVirt VMs

- Import and Export full VMs and templates supporting:

  - Complete VM definition

  - Multiple disks

  - Snapshots

Phase 1 Use Cases Implementation

- Import and Export single images (templates) from and to Glance for interoperability with OpenStack

- Unlimited number of backups for images and VMs

- Store ISO images in Glance and use them transparently for oVirt VMs

- Import and Export full VMs and templates supporting:

    - Complete VM definition

    - Multiple disks

    - Snapshots

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External Providers and Glance 1/2

- External Providers support in oVirt 3.3; oVirt is now capable to interface with some additional supported services (e.g. OpenStack Image/Network, Foreman)

- New "Providers" Tab in WebAdmin to add, edit and remove the External Providers

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External Providers and Glance 2/2
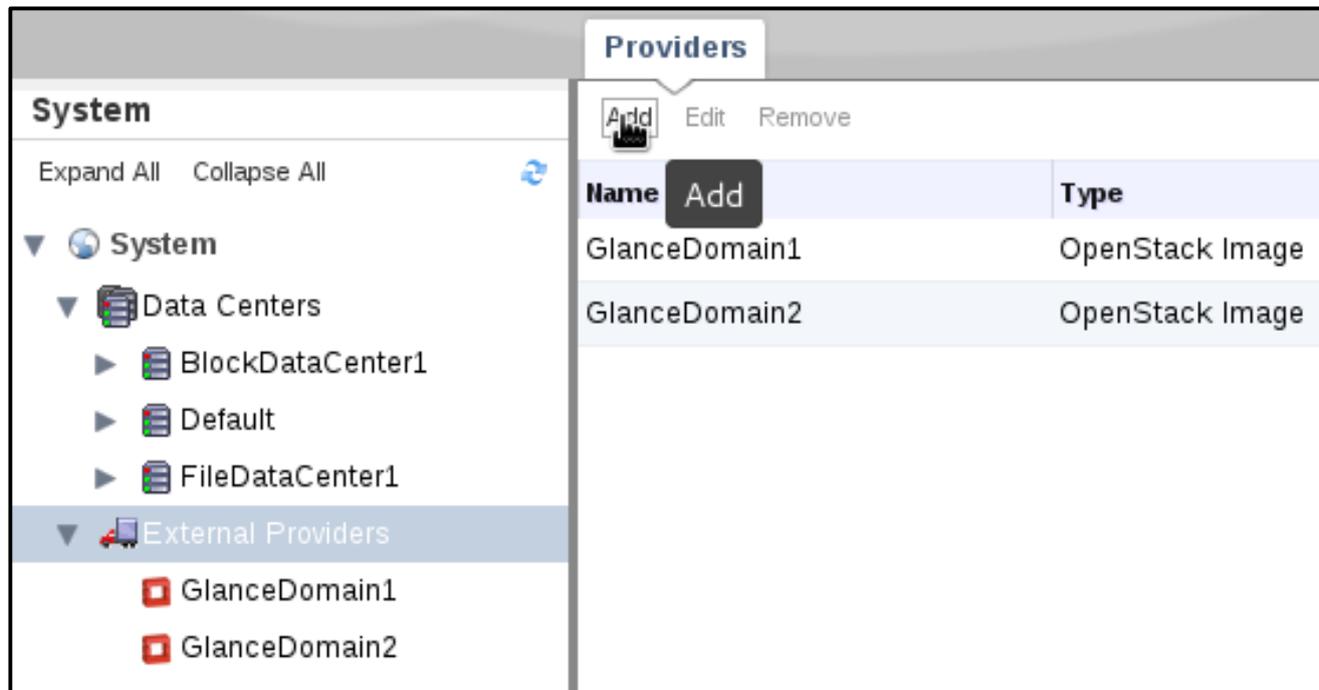
- Glance is the "OpenStack Image" External Provider

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Glance as oVirt External Provider

- Glance Storage Domains are also listed in the Storage Tab
- They don't belong to a specific Data Center (Unattached)

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OpenStack Java SDK

- To accomplish some operations (e.g. Glance images listing) oVirt Engine requires a direct connection to OpenStack services

- OpenStack clients are the native Python bindings for the OpenStack APIs (used to implement the command-line interfaces)

- openstack-java-sdk is a third-party OpenStack client API library for Java (licensed under the Apache 2 license)

- Since February 2013 (os-java-sdk 3.0.0) oVirt engineers have started contributing code, highlights:

  - Introduce "connectors" to reduce the number of dependencies (JBoss vs Glassfish)

  - Stabilize Keystone, Glance and Neutron (was Quantum) APIs

  - Improve Keystone authentication with Token Providers
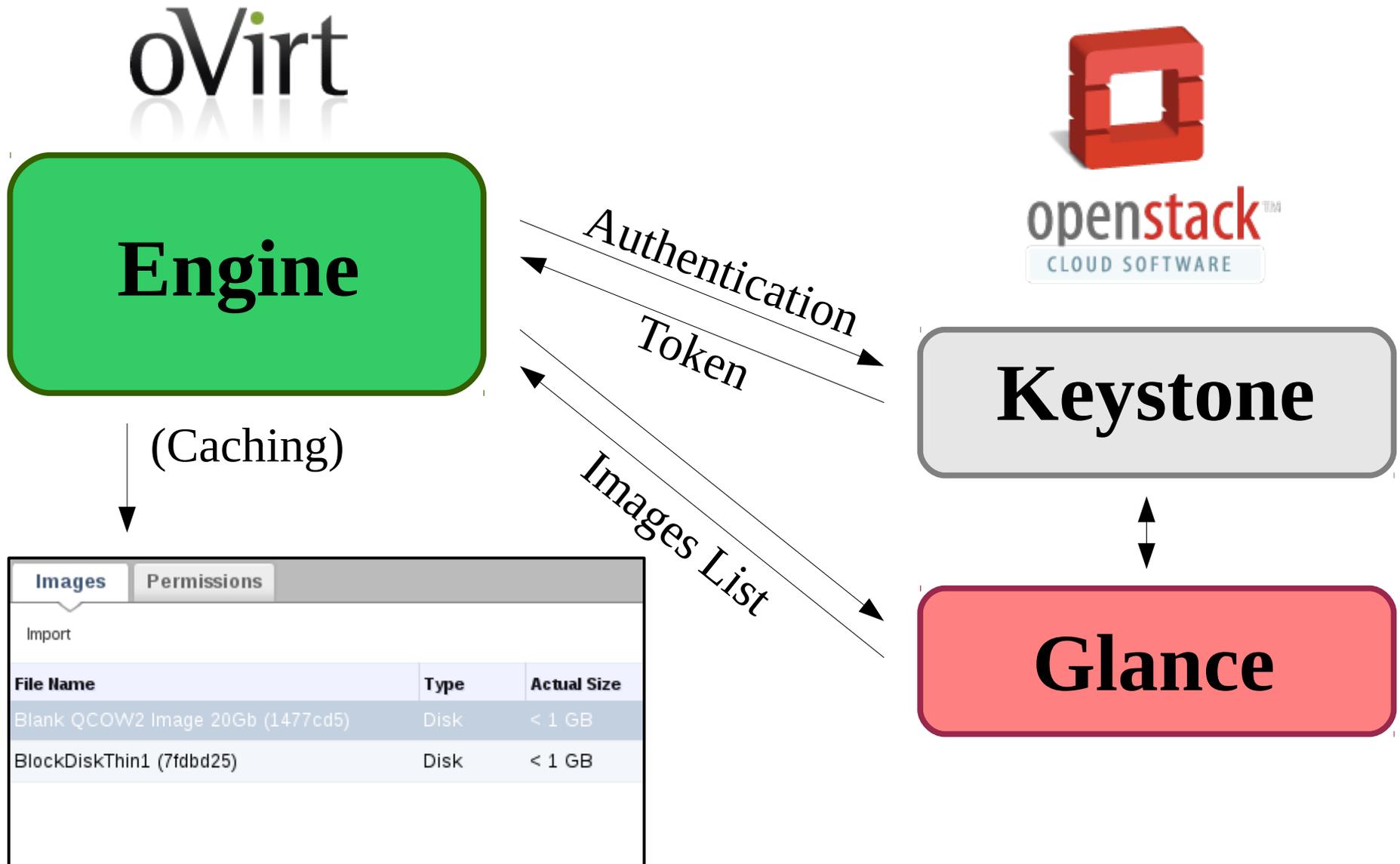
Glance Images Discovery

- Active Glance Images (in the known and supported formats) are listed in the Images sub-tab when a Glance domain is selected

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Glance Images Discovery Diagram

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Importing Glance Images

- To import from Glance select the relevant Images and click on the "Import" button in the "Images" sub-tab

- Select the destination parameters in the pop-up dialog as the destination Data Center, Domain and Quota

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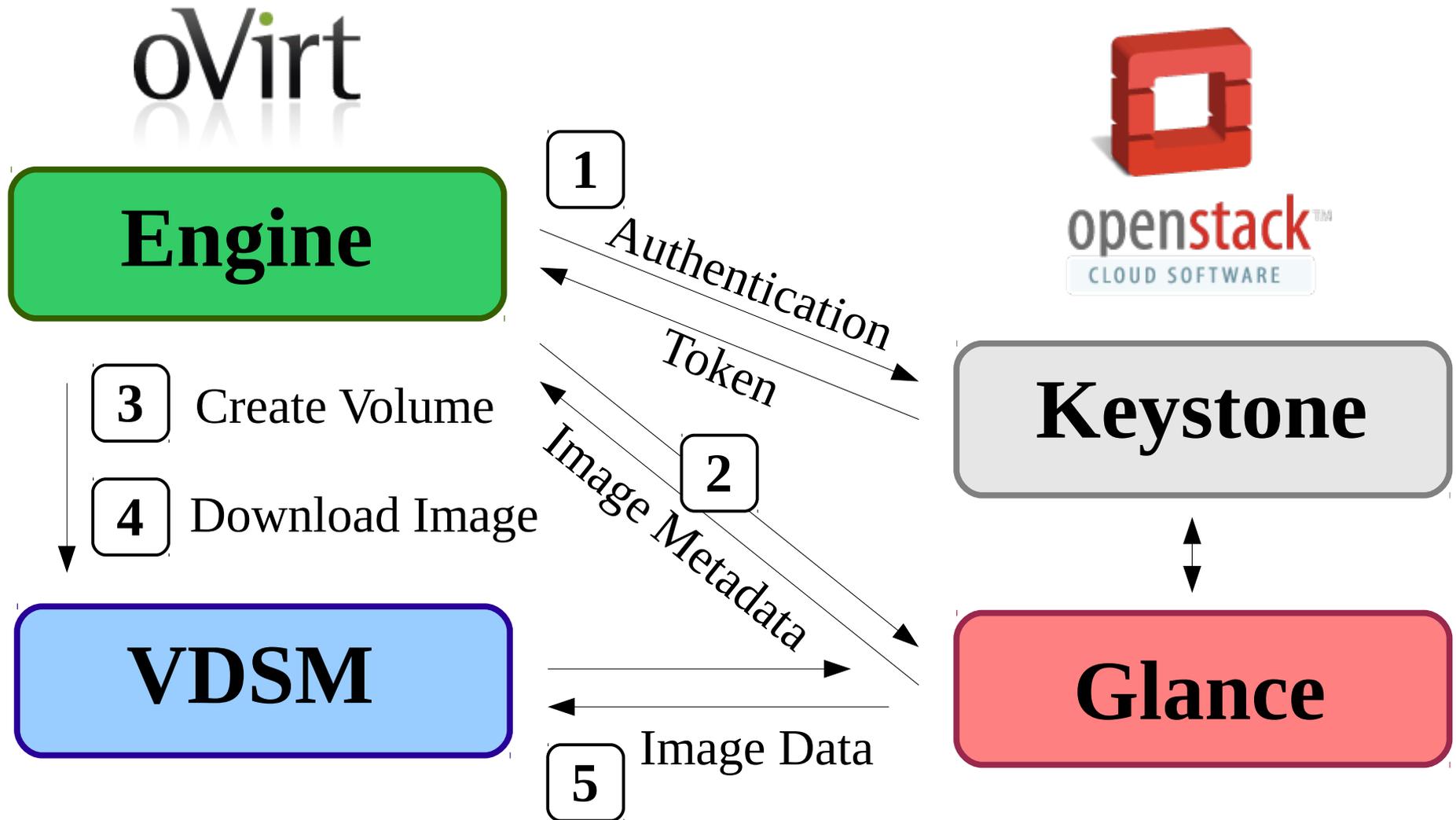**Federico Simoncelli – oVirt and OpenStack Storage (present and future)**

- Glance Metadata doesn't provide the Image Virtual Size

- When the Image is in the qcow2 format, the virtual size is discovered by downloading the image qcow2 header (72 bytes)

Engine

Image Metadata

Glance

Download Image
QCOW2 Header
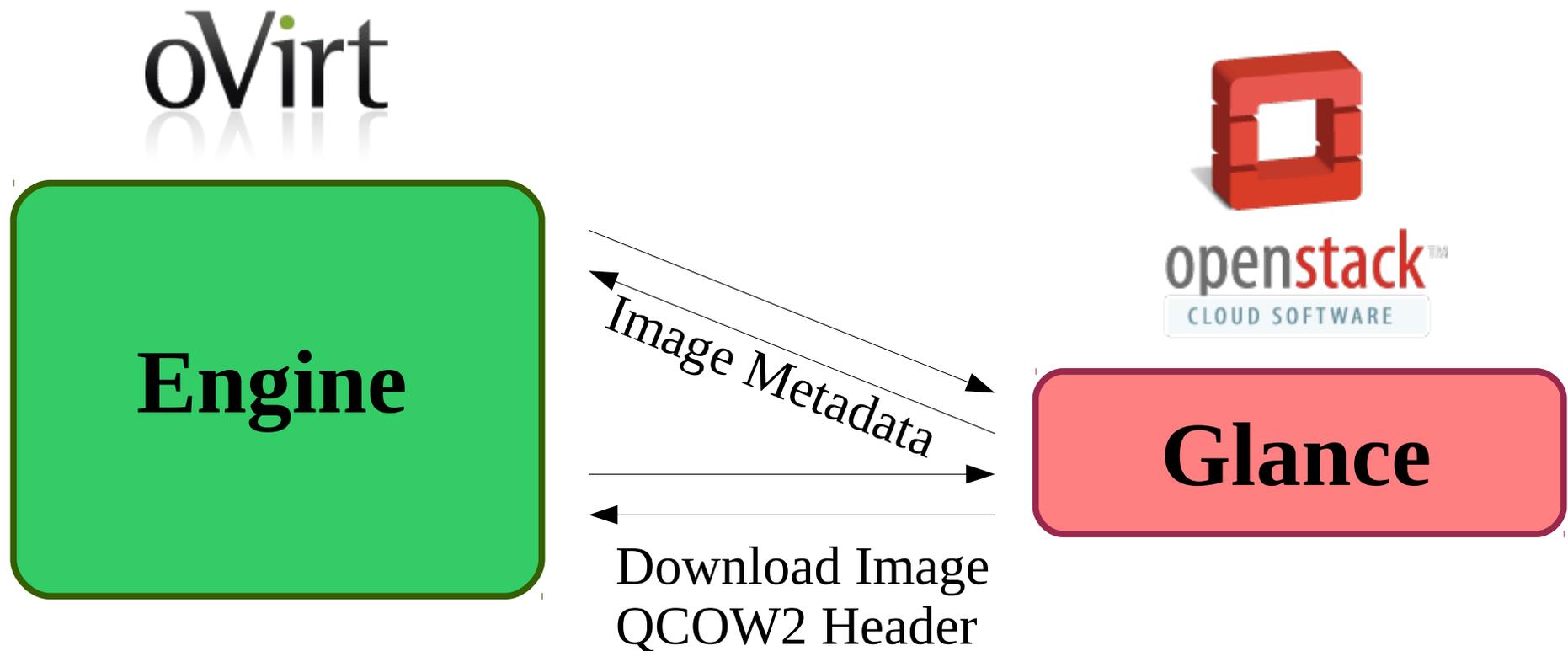
Imported Glance Image in oVirt

- The imported Image can be found in the "Disks" tab

- The relevant Metadata is maintained, some other parameters are set to the default (e.g. interface VirtIO) and they can be modified later

- An oVirt VM can now be instantiated with the Disk and eventually it can be transformed into a Template (automated in oVirt 3.4)

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Exporting Disks to Glance

- To export to Glance select the relevant Disks and click on the "Export" button in the "Disks" tab

- Select the destination Glance Domain in the pop-up dialog

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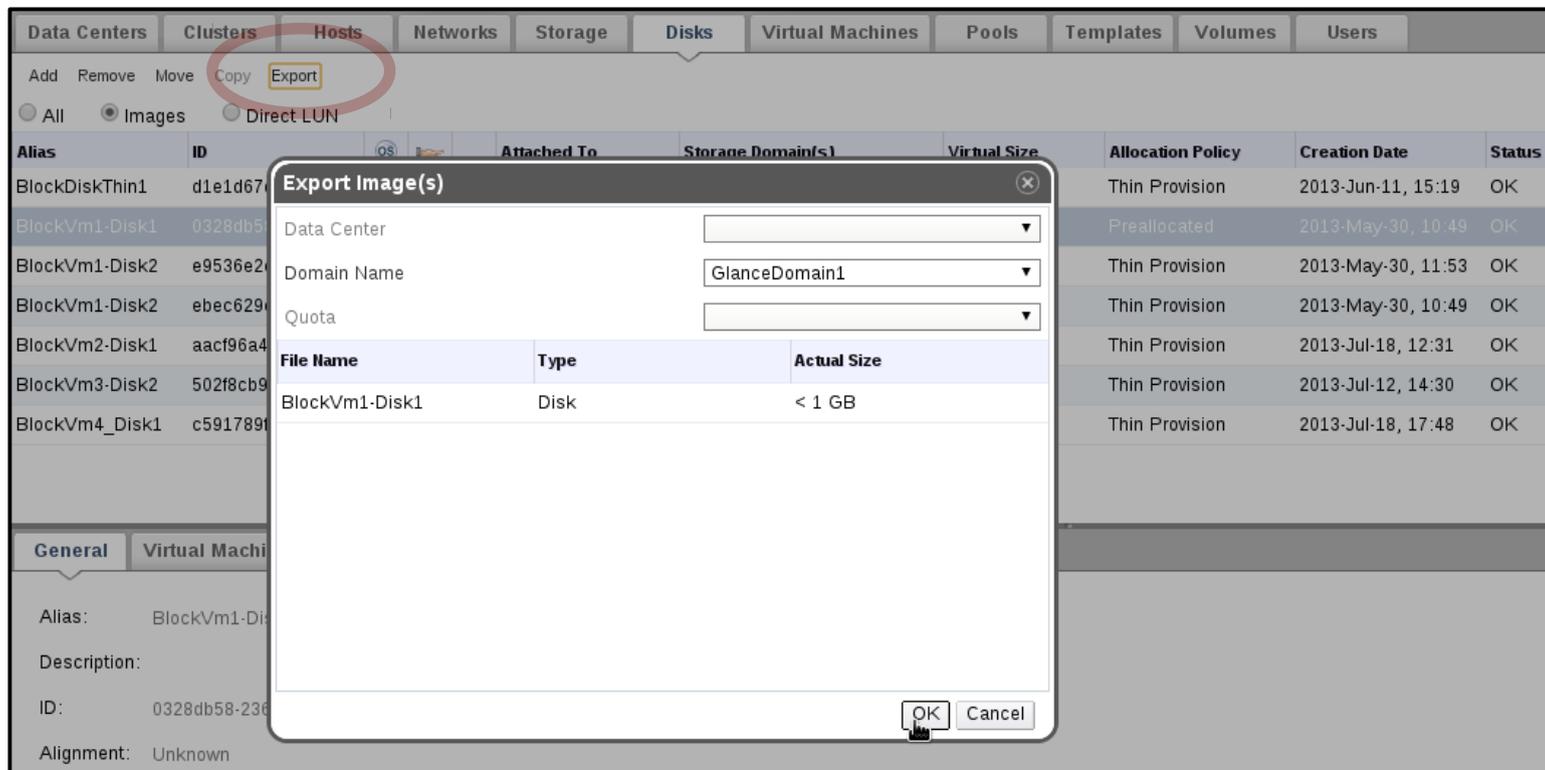
Exporting Glance Images Diagram

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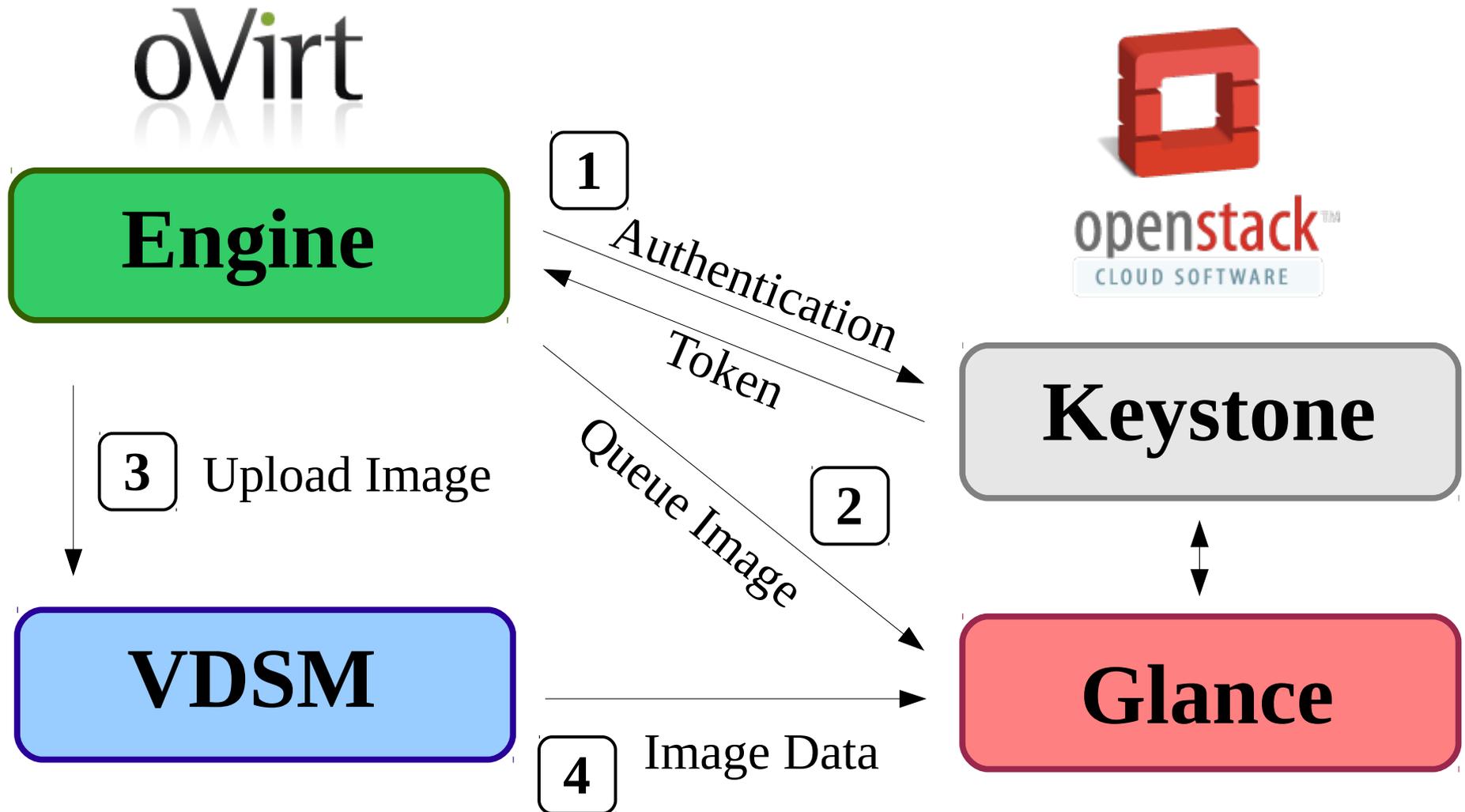
Exported oVirt Disk in Glance

```
# glance image-list
+--------------+----------------------+--------+-----------+-----------+--------+
| ID           | Name                 | Disk   | Container | Size      | Status |
+--------------+----------------------+--------+-----------+-----------+--------+
| 1477cd5a...  | Blank QCOW2 Image 20Gb | qcow2 | bare      | 262144    | active |
| 7fdbd255...  | BlockDiskThin1       | qcow2  | bare      | 134217728 | active |
+--------------+----------------------+--------+-----------+-----------+--------+

# glance image-show 7fdbd255-4851-495e-8af2-300f9967c6b5
+------------------+--------------------------------------+
| Property         | Value                                |
+------------------+--------------------------------------+
| checksum         | 089092ee15690fe33ec12d426ac50e70     |
| container_format | bare                                 |
| created_at       | 2013-07-24T16:41:11                  |
| deleted          | False                                |
| disk_format      | qcow2                                |
| id               | 7fdbd255-4851-495e-8af2-300f9967c6b5 |
| is_public        | False                                |
| name             | BlockDiskThin1                       |
| owner            | 5b7d836142f9444a9e2bd3494669c831     |
| protected        | False                                |
| size             | 134217728                            |
| status           | active                               |
| updated_at       | 2013-07-24T17:07:15                  |
+------------------+--------------------------------------+
```

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VDSM Sharing Image Support

- New API to download and upload images using predefined methods

```
downloadImage(methodArgs, spUUID, sdUUID, imgUUID, volUUID=None)

uploadImage(methodArgs, spUUID, sdUUID, imgUUID, volUUID=None)
```

- HTTP method implemented and fully compatible with Glance

```
methodArgs = {
    'method': 'http',
    'url': 'http://source-or-destination/path/to/image',
    'headers': {'X-My-Header', 'MyHeaderValue'},
}
```

- X-Auth-Token provided by Keystone is passed as one of the headers

VDSM Client Download Examples

- VDSM gained support for Glance:

```
$ vdsClient 0 downloadImage http '{
  "method": "http",
  "url": "http://glance:9292/v1/images/320897a4-6924-4b31-a256-f51c97d15d95",
  "headers": {
    "X-Auth-Token": "1ad97ccf22aa47a89e082b6491fb4b70",
}}' \
0b11dedd-6134-4775-8ccb-6a935d16320c d26915e8-9049-43a3-ba74-e403730875dc \
11400413-b99f-4eae-a0dd-24bd347bac18 16e71d6c-bf73-4e0f-a49d-8df45967d28c
```

- And for all other HTTP servers as well:

```
$ vdsClient 0 downloadImage http '{
  "method": "http",
  "url": "http://download.fedoraproject.org/.../Fedora-x86_64-19-sda.qcow2",
}' \
0b11dedd-6134-4775-8ccb-6a935d16320c d26915e8-9049-43a3-ba74-e403730875dc \
11400413-b99f-4eae-a0dd-24bd347bac18 16e71d6c-bf73-4e0f-a49d-8df45967d28c
```

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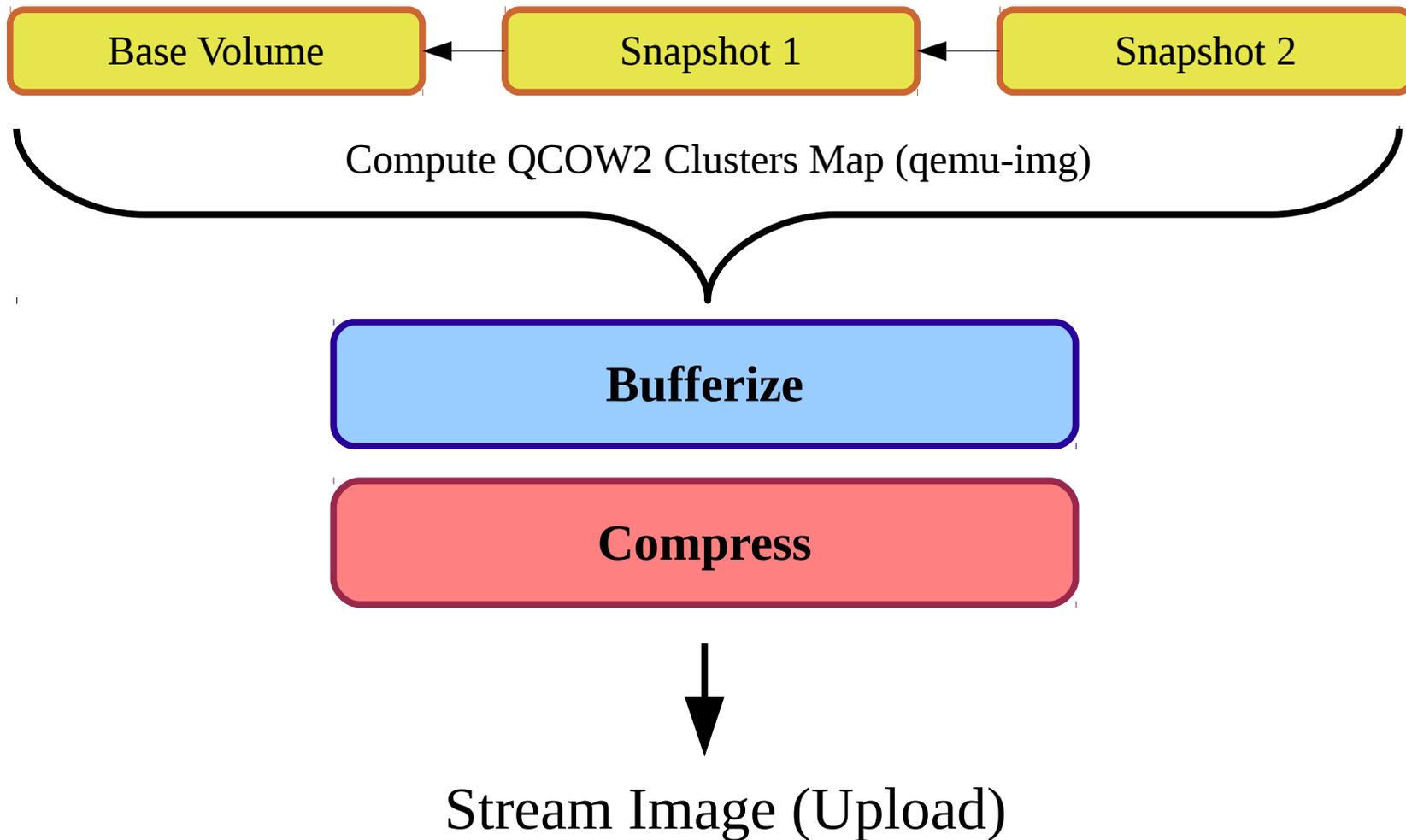# downloadImage QCOW2 on Block Domains

Engine

1 Download Image

2 HEAD (Get Size)

GET (Download)

4

VDSM

HTTP Server (Glance)

3 Extend Volume

Volume

Glance – Current Limitations
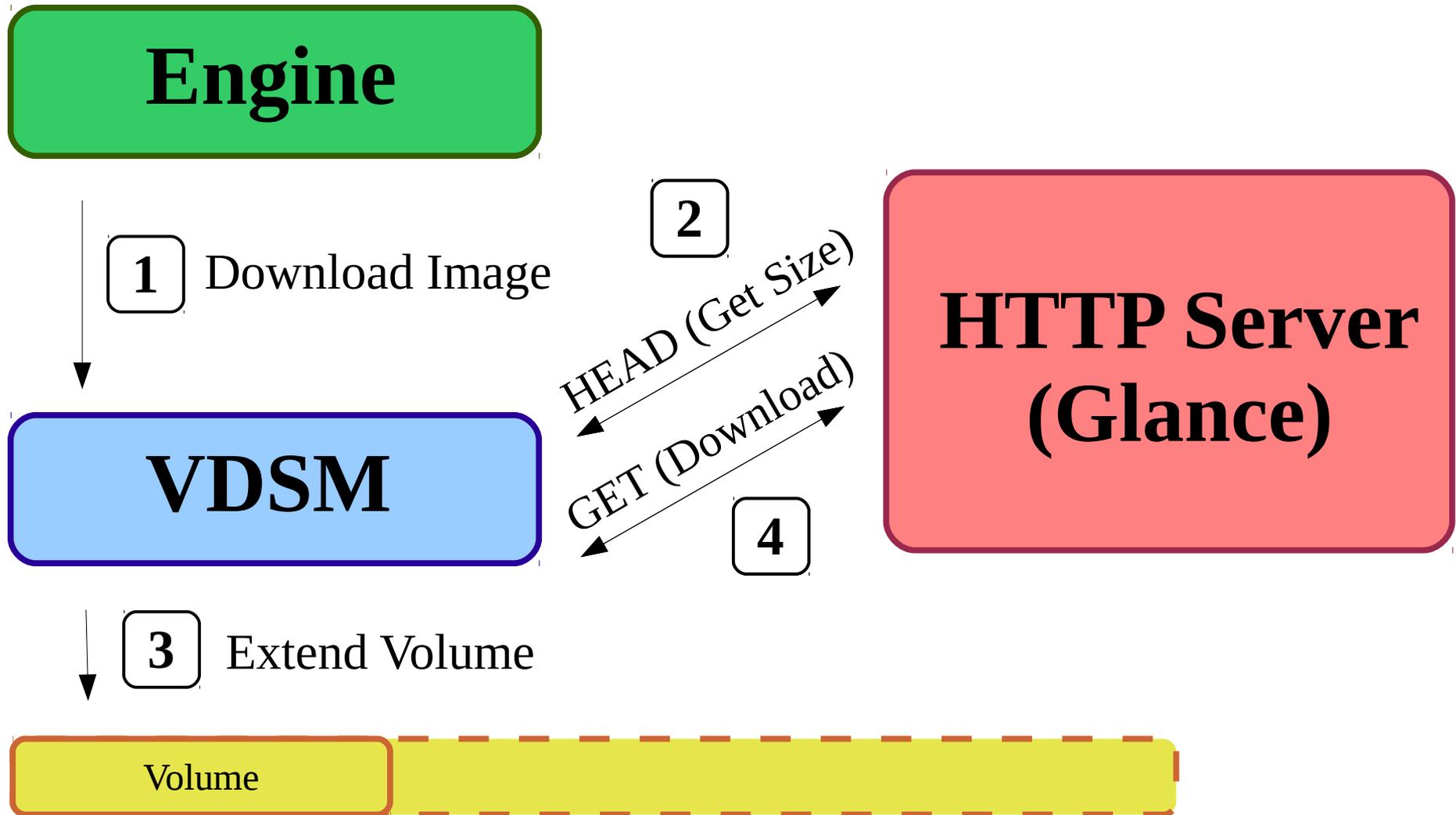
- It's not currently possible to export images with multiple volumes:

  - Disks cannot have snapshots

  - Disks cannot be Thin-Provisioned on a Template

- There is no live VM disk export, VM should be down (but uploading Templates is always possible)

- No sparseness support (on file domains) for the raw format, imported images are always preallocated

- No resume option for partially downloaded images

Glance – Future Improvements

- **oVirt-Engine**: additional simple operations (e.g. Delete Image)

- **VDSM**: volume chain online squash (to support disks with snapshots)

- **VDSM/Glance**: upload Image compression (and sparseness)

- **oVirt-Engine**: integrated upload and download via WebAdmin and UserPortal

- **oVirt-Engine/VDSM**: Store ISO images in Glance and use them natively in the oVirt VMs

- **oVirt-Engine/VDSM/OpenStack**: Import and Export full VMs and Templates

Glance Future: Squashing and Compression

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Keystone – Future Integration

- oVirt 3.4 introduced a large refactoring for Authentication and Directory services

  - Authentication confirms the identity of a User

  - Directory Services provide a set of information about Users

- Authentication and Directory services are mix-and-match
(e.g. Kerberos Authentication with LDAP Directory Service)

- A Keystone Authentication backend has been sketched to verify the new Authentication/Directory implementation
(anyone from the community is welcome to pick up this work and complete it)

Keystone – Interesting Use Cases for oVirt

- Consolidate Authentication in Keystone (oVirt and OpenStack data centers)

- Associate Keystone Users (and Tenants) to oVirt entities and assign specific Permissions and Roles

- Reuse the oVirt Keystone Identities when interfacing with other OpenStack services (glance, neutron, cinder, etc.)
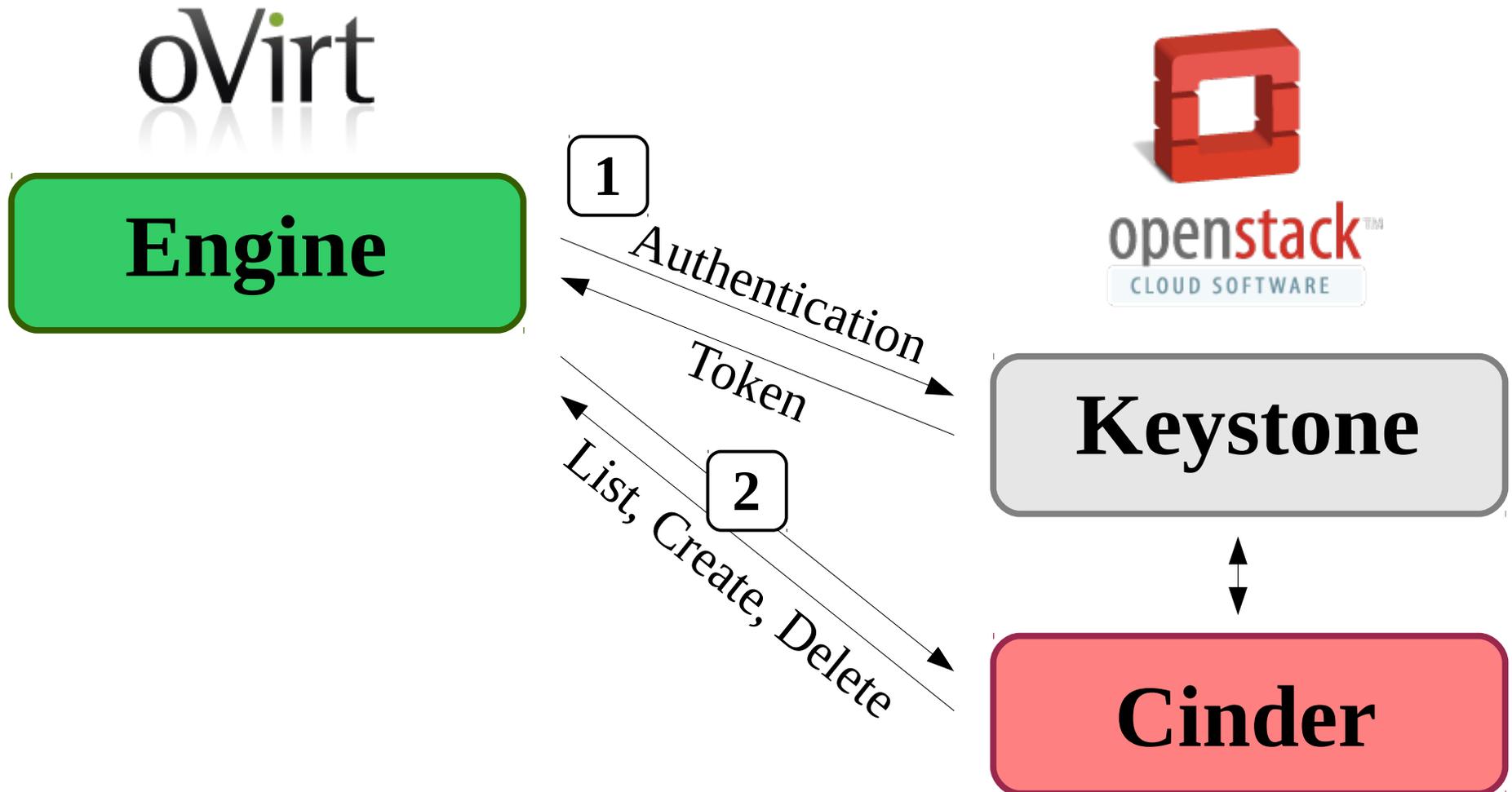
oVirt Authentication using Keystone

1 Authentication

Token

2

3

Engine

Keystone

Service

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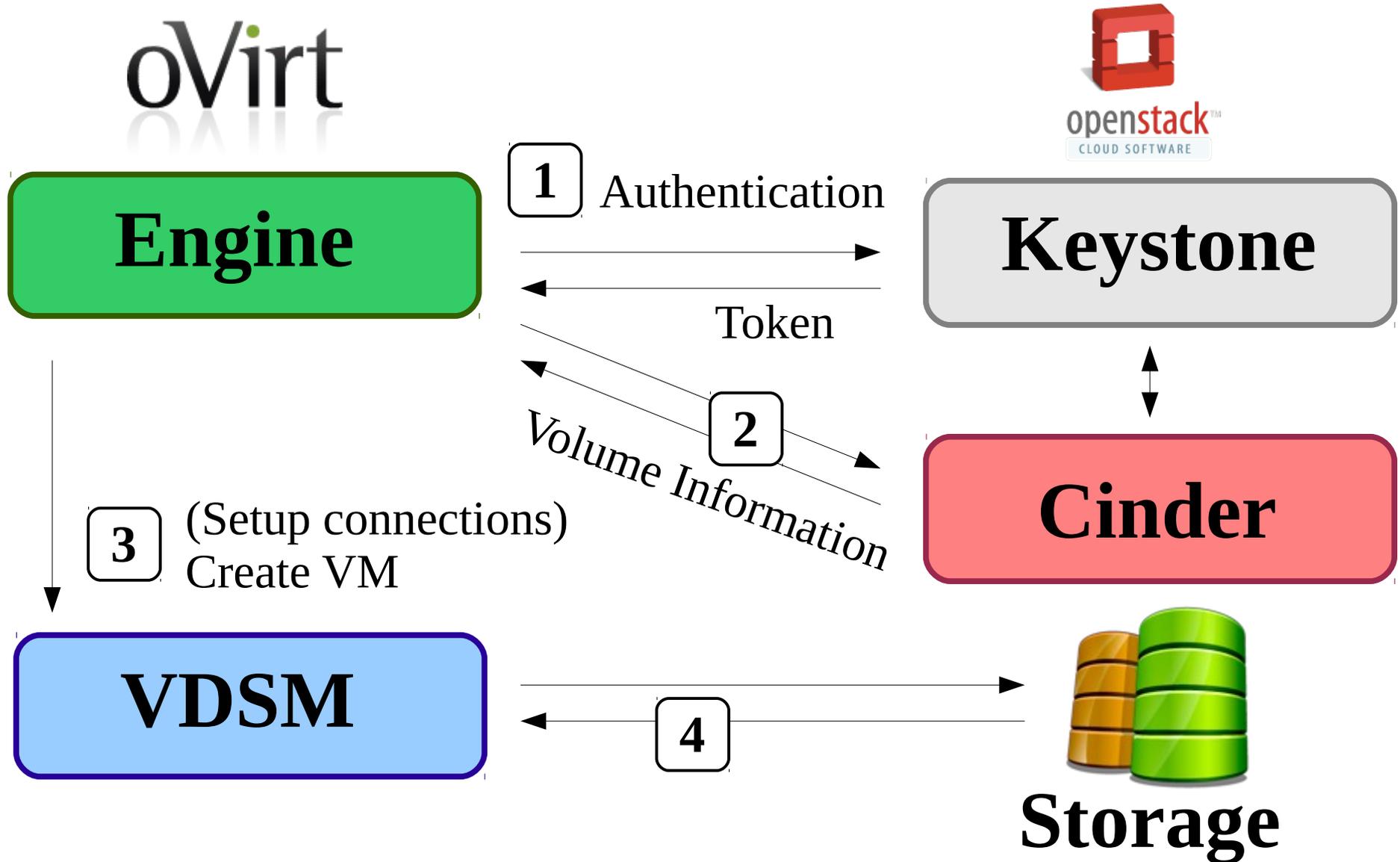
OpenStack Cinder Service
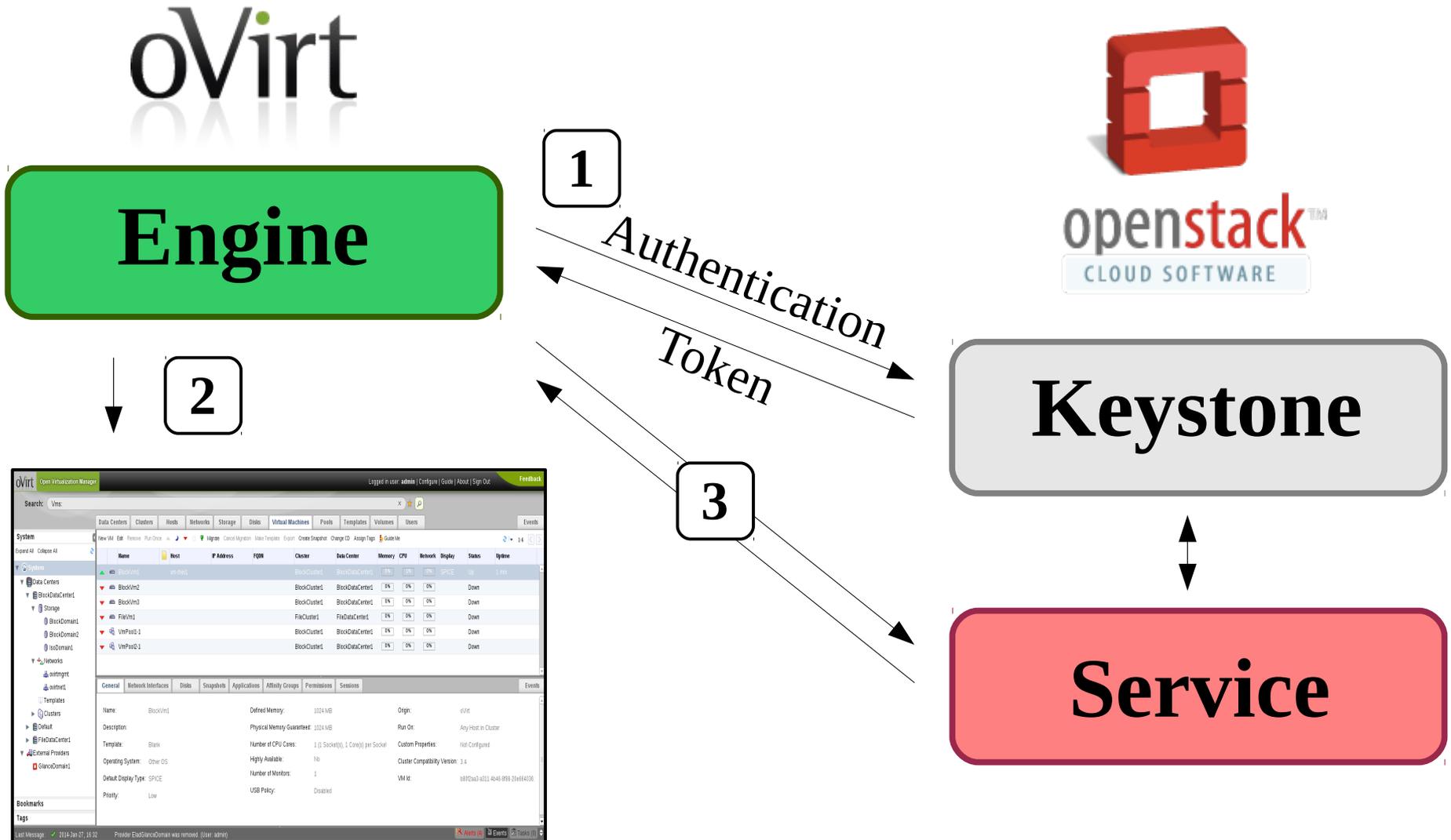
- Provides an infrastructure for managing volumes in OpenStack (since the Folsom)

- Volumes are persistent R/W block storage devices most commonly attached to the Compute Node through iSCSI

- Volumes have a lifecycle independent of VM instances

- Supports Snapshots (a read-only point in time copy of a volume)

- Snapshots can be used to create new volumes (and Glance images)

- Backups are archived in OpenStack Object Storage (Swift)

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Cinder – Interesting Use Cases for oVirt

- Import and Export oVirt Images from and to Cinder

- Share Cinder Volumes for interoperability with OpenStack

- Leverage the Cinder Volume drivers for the supported storage appliances (IBM, NetApp, Dell, EMC)

- Gain storage offloading capabilities (Cinder Volumes)

- Unify snapshots and backup strategies in your data centers (oVirt/OpenStack)

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Using Cinder Volumes

oVirt

Engine

1 Authentication

Token

2 Volume Information

Keystone

Cinder

3 (Setup connections)
Create VM

VDSM

4

Storage

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Useful Links and Mailing Lists

- **Work in Progress**

  - **glance.ovirt.org (public glance images library)**

- **Useful Links**

  - http://www.ovirt.org/Features/Glance_Integration

  - http://www.openstack.org

- **Mailing lists**

  - arch@ovirt.org users@ovirt.org

  - vdsm-devel@lists.fedorahosted.org

  - engine-devel@ovirt.org

- **IRC**

  - #ovirt on OFTC

  - #vdsm on Freenode

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