Virtualization Management the oVirt way

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Red Hat
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Agenda

- What is oVirt?
- Where did it come from?
- What does it do?
- Architecture
- Roadmap
- What's next?
What is oVirt?

Large scale, centralized management for server and desktop virtualization

Based on leading performance, scalability and security infrastructure technologies

Provide an open source alternative to vCenter/vSphere

Focus on KVM for best integration/performance

Focus on ease of use/deployment
## How Does It Look?

The image shows a screenshot of the oVirt Enterprise Virtualization Engine Web Administration interface with Mozilla Firefox. The interface is used to manage virtual machines and includes a tree view on the left and a list view on the right. The list view displays various virtual machines with columns for Name, Cluster, Host, IP Address, Memory, CPU, Network, Display, Status, and Uptime.

### Virtual Machines

<table>
<thead>
<tr>
<th>Name</th>
<th>Cluster</th>
<th>Host</th>
<th>IP Address</th>
<th>Memory</th>
<th>CPU</th>
<th>Network</th>
<th>Display</th>
<th>Status</th>
<th>Uptime</th>
<th>Logged-in User</th>
</tr>
</thead>
<tbody>
<tr>
<td>kaka</td>
<td>intel-cluster</td>
<td>novt-wds2.qa.lab.twrvred</td>
<td></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>myVm1</td>
<td>intel-cluster</td>
<td>novt-wds2.qa.lab.twrvred</td>
<td></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Up</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
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<td>intel-cluster</td>
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<td>Spice</td>
<td>Up</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>myVm11</td>
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<td>novt-wds2.qa.lab.twrvred</td>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Up</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>myVm12</td>
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<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Up</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
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<td>intel-cluster</td>
<td>novt-wds2.qa.lab.twrvred</td>
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<td>Spice</td>
<td>Up</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
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<td>novt-wds2.qa.lab.twrvred</td>
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<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Up</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
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<td>Spice</td>
<td>Up</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
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<td>0%</td>
<td>Spice</td>
<td>Up</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>myVm17</td>
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<td>Spice</td>
<td>Up</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>myVm18</td>
<td>intel-cluster</td>
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<td>0%</td>
<td>Spice</td>
<td>Up</td>
<td>1 day</td>
<td></td>
</tr>
<tr>
<td>myVm19</td>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>myVm2</td>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Down</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>myVm21</td>
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<td>novt-wds2.qa.lab.twrvred</td>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>myVm22</td>
<td>intel-cluster</td>
<td>novt-wds2.qa.lab.twrvred</td>
<td></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>myVm23</td>
<td>intel-cluster</td>
<td>novt-wds2.qa.lab.twrvred</td>
<td></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>myVm24</td>
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<td>0%</td>
<td>Spice</td>
<td>Passed</td>
<td>5 days</td>
<td></td>
</tr>
<tr>
<td>myVm25</td>
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<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Passed</td>
<td>5 days</td>
<td></td>
</tr>
<tr>
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<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Passed</td>
<td>5 days</td>
<td></td>
</tr>
<tr>
<td>myVm27</td>
<td>intel-cluster</td>
<td>novt-wds2.qa.lab.twrvred</td>
<td></td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>Spice</td>
<td>Passed</td>
<td>5 days</td>
<td></td>
</tr>
</tbody>
</table>

Last Message: 2012-Jan-31, 23:18:41  User admin@internal logged in.
Goals of the oVirt project

- Build a community around all levels of the virtualization stack – hypervisor, manager, GUI, API, etc.
- To deliver both a cohesive complete stack and discretely reusable components for open virtualization management
- Provide a release of the project on a well defined schedule
- Focus on management of the KVM hypervisor, with exceptional guest support beyond Linux
- Provide a venue for user and developer communication and coordination
Governance

- Merit based, open governance model
- Built using the best concepts taken from Apache and Eclipse Foundations
- Governance split between board and projects
  - oVirt Board
  - Multiple projects under the oVirt brand
Governance (oVirt Board)

- Initial board
  - Red Hat, IBM, NetApp, Cisco, SUSE, Intel
  - A few domain leaders from sub-projects
  - Mentors
  - There is no limit to the number of board seats
  - Additional seats are voted based on merit
How to Start?

- Build from source
- Or, just install pre-packaged
  - yum install ovirt-engine
  - engine-setup
- Add managed hosts
  - from engine
  - use ovirt-node registration/approve flow
Add Host As Simple As
Configure Networks

ovirt Enterprise Virtualization Engine Web Administration - Mozilla Firefox

Logged in user: admin@internal | Configure | Guide | About | Sign Out

File Edit View History Bookmarks Tools Help

File Edit View History Bookmarks Tools Help

ovirt Enterprise Virtualization Engine E.

Search: Host:

Data Centers Clusters Hosts Storage Virtual Machines Pools Templates Users

New Edit Remove Advances Maintenance Configure Local Storage Assign Tags

Name HostIP Cluster Status
notvds2.qa.lab.redhat.com notvds2.qa.lab.redhat.com intel-cluster Up
notvds3.qa.lab.redhat.com notvds3.qa.lab.redhat.com intel-cluster Non Responsive
notvds4.qa.lab.redhat.com notvds4.qa.lab.redhat.com NFS-intel Maintenance

Load Memory CPU Network Span/Status
80% 80% 0% 0% 80% classic
90% 6% 0% 0% None
90% 6% 0% 0% None

Network Interfaces Host Hooks Permissions

Name Address MMC Speed (Mbps) Rx (Mbps) Tx (Mbps) Drops (p/s) Bond VLAN Network Name
em2 78.87.11.89.FB 1000 < 1 < 1 0
em1 10.35.64.69 78.87.11.89.FA 1000 < 1 < 1 0

Last Message: 2012-Jan-31 19:41 User admin@internal logged in

Browser Firefox version 9 is currently not supported.
Without Scripts or Config Files
Configure Storage Once for Entire Cluster
Extend with More LUNs as Needed
Add Servers or Desktops

Virtualization Management the oVirt way

Add Servers or Desktops
Even Windows via Sysprep
Virtualization Management the oVirt way

SPICE or VNC
Migratable or Not
Highly Available?

Virtualization Management the oVirt way

High Availability:
- Priority for Run/Migration queue:
  - Low
  - Medium
  - High
- Highly Available
Control Allocated Resources (Disk, Memory)
Advanced Options via Custom Properties
Assign Permissions to Objects by Roles
Define Your Own Roles
User Portal

Virtualization Management the oVirt way
## Management Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Availability</td>
<td>Restart guest VMs from failed hosts automatically on other hosts</td>
</tr>
<tr>
<td>Live Migration</td>
<td>Move running VM between hosts with zero downtime</td>
</tr>
<tr>
<td>System Scheduler</td>
<td>Continuously load balance VMs based on resource usage/policies</td>
</tr>
<tr>
<td>Power Saver</td>
<td>Concentrate virtual machines on fewer servers during off-peak hours</td>
</tr>
<tr>
<td>Maintenance Manager</td>
<td>No downtime for virtual machines during planned maintenance windows. Hypervisor patching</td>
</tr>
<tr>
<td>Image Management</td>
<td>Template based provisioning, thin provisioning and snapshots</td>
</tr>
<tr>
<td>Monitoring &amp; Reporting</td>
<td>For all objects in system – VM guests, hosts, networking, storage etc.</td>
</tr>
<tr>
<td>OVF Import/Export</td>
<td>Import and export VMs and templates using OVF files</td>
</tr>
<tr>
<td>V2V</td>
<td>Convert VMs from VMware and RHEL/Xen to oVirt</td>
</tr>
</tbody>
</table>
Virtual Desktop Infrastructure (VDI)

Centralized management, security and policy enforcement

Virtual desktops with user experience of a physical PC

- Multiple monitors
- HD quality video
- Bi-directional audio/video for VoIP or video-conferencing
- Smartcard support
- USB support

Industry leading density of virtual desktops/server
oVirt High Level Architecture

Virtualization Management the oVirt way

- Postgres
- AD
- IPA

- Shared Storage: FC/iSCSI/NFS

- oVirt Engine
  - Java

- REST

- Admin Portal: gwt
- SDK/CLI: python
- User Portal: gwt

- Linux/Windows client

- Guest agent
- Guest agent

- Linux VM
- Win VM

- libvirt
- VDSM
- Host | Node

- Local Storage

Virtualization Management the oVirt way
<api>
  <link rel="capabilities" href="/rhevm-api/capabilities"/>
  <link rel="clusters" href="/rhevm-api/clusters"/>
  <link rel="clusters/search" href="/rhevm-api/clusters?search={query}"/>
  <link rel="datacenters" href="/rhevm-api/datacenters"/>
  <link rel="datacenters/search" href="/rhevm-api/datacenters?search={query}"/>
  <link rel="events" href="/rhevm-api/events"/>
  <link rel="events/search" href="/rhevm-api/events?search={query}"/>
  <link rel="hosts" href="/rhevm-api/hosts"/>
  <link rel="hosts/search" href="/rhevm-api/hosts?search={query}"/>
  <link rel="networks" href="/rhevm-api/networks"/>
  <link rel="roles" href="/rhevm-api/roles"/>
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  <link rel="tags" href="/rhevm-api/tags"/>
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  <link rel="groups" href="/rhevm-api/groups"/>
  <link rel="domains" href="/rhevm-api/domains"/>
  <link rel="vmpools" href="/rhevm-api/vmpools"/>
  <link rel="vmpools/search" href="/rhevm-api/vmpools?search={query}"/>
  <link rel="vms" href="/rhevm-api/vms"/>
  <link rel="vms/search" href="/rhevm-api/vms?search={query}"/>
</api>

<system_version revision="428" build="0" minor="6" major="4"/>

<vms>
  <total>22</total>
  <active>5</active>
</vms>

<hosts>
  <total>6</total>
  <active>5</active>
</hosts>

<users>
  <total>2</total>
</users>
Virtualization Management the oVirt way
This XML file does not appear to have any style information associated with it. The document tree is shown below.

```xml
<host_nics>
  <host_nic id="dbb39d06-3aef-468c-83e6-88eae0a3f346" href="/rhevm-api/hosts/15896dce-edd0-415c-a524-c9b02f278895/nics/dbb39d06-3aef-468c-83e6-88eae0a3f346">
    <name>eth0</name>
  </host_nic>
  <actions>
    <link rel="attach" href="/rhevm-api/hosts/15896dce-edd0-415c-a524-c9b02f278895/nics/dbb39d06-3aef-468c-83e6-88eae0a3f346/attach"/>
    <link rel="detach" href="/rhevm-api/hosts/15896dce-edd0-415c-a524-c9b02f278895/nics/dbb39d06-3aef-468c-83e6-88eae0a3f346/detach"/>
  </actions>
</host_nics>

<network>
  <name>rhevm</name>
</network>
<ip address="10.35.16.151"/>
</host_nics>

<host_nic id="0d98b08c-9b42-45a4-a226-b7dd3f0854cf" href="/rhevm-api/hosts/15896dce-edd0-415c-a524-c9b02f278895/nics/0d98b08c-9b42-45a4-a226-b7dd3f0854cf">
  <name>eth1</name>
  <actions>
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    <link rel="detach" href="/rhevm-api/hosts/15896dce-edd0-415c-a524-c9b02f278895/nics/0d98b08c-9b42-45a4-a226-b7dd3f0854cf/detach"/>
  </actions>
</host_nic>
</host_nics>

<host id="15896dce-edd0-415c-a524-c9b02f278895" href="/rhevm-api/hosts/15896dce-edd0-415c-a524-c9b02f278895">
  <network address=""/>
</host>
```

Virtualization Management the oVirt way
- Creating the proxy

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

- Listing all collections

```python
api.vms
```

- Listing collection's methods.

- Querying collection with oVirt search engine.

- Querying collection by custom constraint.

- Querying collection for specific resource.

- Accessing resource methods and properties.
- 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.
oVirt 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 first form, no arguments are provided, and the connection details are re: 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 be in the user@domain format.
* password - The password to use.
Virtualization Management the oVirt way

Data Warehouse based on Talend ETL
<table>
<thead>
<tr>
<th>Repository</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active Virtual Machines by OS (BR19)</strong></td>
<td>The report contains comparative measurements of running virtual machines and OS usage in for a selected cluster and a selected virtual machine's type within the requested period.</td>
</tr>
<tr>
<td><strong>Cluster Capacity Vs Usage (BR19)</strong></td>
<td>This report contains charts displaying host's resources usage measurements (CPU core, physical Memory) and charts displaying virtual machine's resources usage measurements (virtual machine's total vCPU, Virtual Memory size) for a selected cluster.</td>
</tr>
<tr>
<td><strong>Host OS Break Down (BR22)</strong></td>
<td>This report contains a table and a chart displaying the number of hosts for each OS version for a selected cluster within a requested period.</td>
</tr>
<tr>
<td><strong>Summary of Host Usage Resources (BR17)</strong></td>
<td>The report contains a scattered chart of CPU and memory usage date within a requested period and for a selected cluster.</td>
</tr>
</tbody>
</table>
Active Virtual Machines by OS in Clusters of Data Center Default

Criteria: Datacenter: Default, Cluster: All

Date Range: 2011-08-01 - 2011-10-31, VM Type: All, Period: Quarterly, Show Deleted Virtual Machines: Yes

- RHEL vs Other Linux OS
- Distribution of Windows Versions
- RHEL vs Windows OS
- Virtual Machines With Known OS vs Unknown OS
Notification Service

- oVirt allows registration to certain audit events
- The notification service sends emails per audit message to relevant users
- Also monitors engine itself

![Add Event Notification](image)
## oVirt Guest Agent

- The guest agent provides additional information to oVirt Engine, such as guest memory usage, guest IP address, installed applications and SSO.
- Python code, available for both Linux and Windows guests.
- Communication is done over virtio-serial.
- SSO for Windows is based on a gina module for XP and a credential provider for Windows 7.
- SSO for RHEL 6 is based on a PAM module with support for both KDE and Gnome.
Virtualization Management the oVirt way
Virtualization Management the oVirt way
Hooks

• “Hook” mechanism for customization
  • Allows administrator to define scripts to modify VM operation
    • eg. Add extra options such as CPU pinning, watchdog device, direct LUN access, etc
  • Allows oVirt to be extended for new KVM features before full integration is done
  • An easy way to test a new kvm/libvirt/linux feature
Hooks
Hooks

- Hook scripts are called at specific VM lifecycle events
  - VDSM (management agent) Start
  - Before VM start
  - After VM start
  - Before VM migration in/out
  - After VM migration in/out
  - Before and After VM Pause
  - Before and After VM Continue
  - Before and After VM Hibernate
  - Before and After VM resume from hibernate
  - On VM stop
  - On VDSM Stop
- Hooks can modify a virtual machines XML definition before VM start
- Hooks can run system commands – eg. Apply firewall rule to VM
Sample Hooks

- CPU pinning
- SR/IOV
- Smart card
- Direct LUN
- Hugepages
- Promiscuous mode network interface
- Cisco VN-Link

- Fileinject
- Floppy
- Hostusb
- Isolatedprivatevlan
- Numa
- Qos
- Scratchpad
- sbios
In the works (engine-devel@ovirt.org)

- Live snapshots
- Live storage migration
- Quotas
- Hot plug
- Multiple storage domains
- Shared disks
- iScsi disk
- Shared file system support
- Storage array integration
- Gluster support
- Qbg/Qbh
- virt-resize, pv-resize
- libguestfs integration
- Stable device addresses
- Network types
- Backup API
- SLA
- SDM
- Many many more...
How To Contribute or Download

- **Website and Repository:**
  - http://www.ovirt.org
  - http://www.ovirt.org/wiki
  - http://www.ovirt.org/project/subprojects/

- **Mailing lists:**
  - http://lists.ovirt.org/mailman/listinfo

- **IRC:**
  - #ovirt on OFTC
What's Next

• Version 3.0
  • Released last week

• Next Workshop
  • Beijing – March 21st
  • Hosted by IBM in their Campus
  • http://www.ovirt.org/news-and-events/workshop/
THANK YOU!

http://www.ovirt.org
**Thin Provisioning**

**Over-Commitment** is a storage function which allows RHEV-M to logically allocate more storage than is physically available

- Generally, Virtual Machines use less storage than what has been allocated to them
- Virtual Machine to operate completely unaware of the resources that are actually available

- QEMU identifies the highest offset written onto the logical volume
- VDSM monitors the highest offset marked by QEMU
- VDSM requests to the SPM to extend the logical volume when needed