



Going Further with Red Hat Enterprise Virtualization

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Agenda

- RHEV Architecture / 3.1 Features / Roadmap
- Storage Backend
- rhevm-reports
- Insight: RHEV Logs



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- Storage Backend
- rhelm-reports
- Insight: RHEV Logs



WHAT IS RED HAT ENTERPRISE VIRTUALIZATION?

RHEV Manager

**RHEV APIs and
management engine
and ALL features**

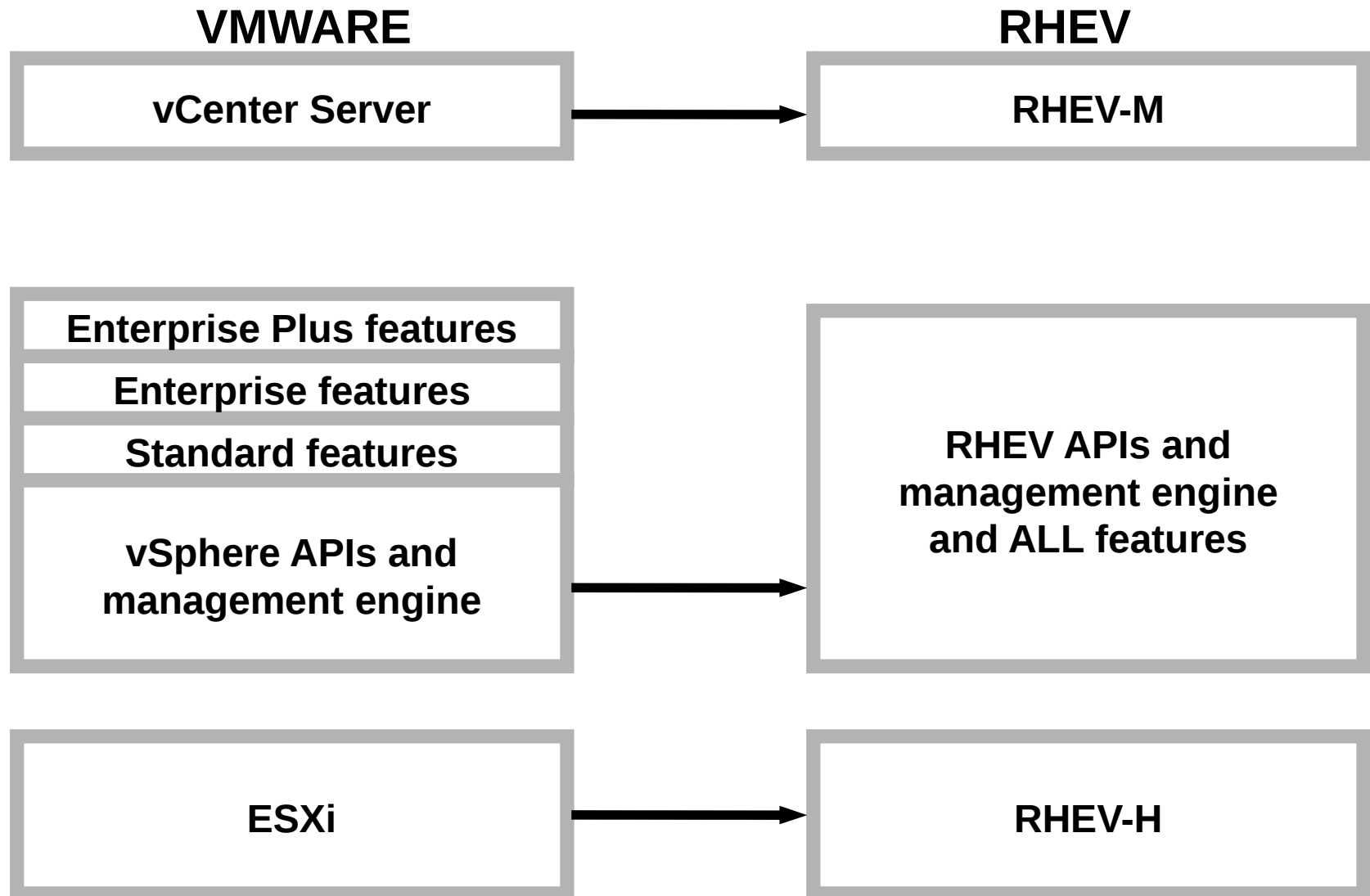
**RHEV
Hypervisor**

RHEL Host

**RHEV
Hypervisor**



OR IF YOU WILL...



RED HAT ENTERPRISE VIRTUALIZATION RHEV MANAGER FEATURES

The screenshot shows the RHEV Manager web interface. The top navigation bar includes links for 'Enterprise Virtualization', 'Logged in user: rhevadmin', 'Sign out', 'Configure', 'About', and 'Guide'. The main content area displays the 'Hosts' tab with a table of hosts:

Name	Host/IP	Cluster	Status	Load	Memory	CPU	Network	Spm Status
alpha	alpha.rhev.lab.e	Default	Up	1 VMs	13%	0%	0%	SPM
beta	beta.rhev.lab.er	Default	Up	1 VMs	12%	0%	0%	None
gamma	gamma.rhev.lab	Default	Up	0 VMs	3%	0%	0%	None

Below the table, there are five application icons labeled 'APP' with different operating system logos (Red Hat, Windows, Linux, etc.). At the bottom, a diagram shows three server icons connected to a cloud and a database icon, with the text 'RED HAT ENTERPRISE VIRTUALIZATION' in a red box above them.

- High Availability
- Live Migration
- Load Balancing (DRS)
- Power Saver (DPM)
- Templates, thin provisioning, snapshots
- Centralized storage and networking management
- V2V / P2V utility
- Power User Portal
- Reporting Engine



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RHEV 3.1 - HIGHLIGHTS

RHEV 3.1 – December 2012

Web Admin

- Full HTML based Web Admin (replaces Windows Admin UI)

Improved Scalability

- 160 Virtual CPUs per VM
- 2 TB Virtual RAM per VM

P2V

- Quickly migrate physical machines to virtual machines

Quotas

- Quotas for storage, CPU and memory

Live Snapshots

- Live snapshots of Virtual Machine

Storage Migration

- Live migration of virtual machine disk between storage domains

Tech Preview

Hotplug Disk

- Hot plug/unplug virtual machine disk image

Disk Management

- New UI for managing internal and external (direct lun) disks

Hot plug NIC

- Hot plug/unplug virtual machine's network interface

Gluster Integration

- Manage Gluster from within RHEV Manager



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RHEV 3.1

Platform Infrastructure

OpenJDK

- Run on 100% open source infrastructure
- No requirement for proprietary Oracle JRE

JBoss EAP 6

- Reduced in-memory footprint
- Reduced startup time
- Improved performance and scalability

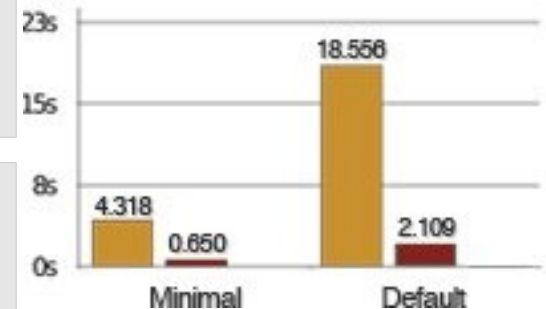
Directory Servers

- Support for two new directory servers
- Red Hat Directory Server
- IBM Tivoli Directory Server

Jasper 4.7

- Move to the latest JasperSoft reporting engine

Boot Time Results



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RHEV 3.1

Platform Infrastructure

Guest Scalability

- 160 Virtual CPUs per VM
- 2 TB Virtual RAM per VM

New CPU Support

- New Intel Core i3, i5, i7 (code named “Sandy Bridge”)
- New AMD family 15h processors (code named “Bulldozer”)

P2V

- Quickly migrate Physical machine to Virtual

Quotas

- Quotas for storage, CPU and memory



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RHEV 3.1

User Interface

Reports Integration

- Integrate Reports / Dashboard into web admin portal
- Single Signon between Admin portal and Jasper Reports

The screenshot shows the RHEV web interface with the 'Data Centers' tab selected. A context menu is open for the 'Default' data center, listing various actions and reports. The reports are categorized into Executive, Inventory, Service Level, and Trend.

Name	Storage Type	Status	Compatibility Version
DC30_140_si6	iSCSI	Up	3.0
DC31-140-si6	iSCSI	Up	3.1
Default		Uninitialized	3.1

Storage | Logical Networks | Clusters

Attach Data | Attach ISO | Attach Export | Detach

Domain Name	Domain Type	Used Space
SD-31-140-si6	Data (Master)	20 GB

Executive

- Active Virtual Machines by OS (BR18)
- Cluster Capacity Vs Usage (BR19)
- Host OS Break Down (BR22)
- Summary of Host Usage Resources (BR17)

Inventory

- Hosts Inventory (BR1)
- Virtual Machines Inventory (BR9)

Service Level

- Cluster Host Uptime (BR7)
- High Availability Virtual Servers Uptime (BR14)
- Cluster Quality of Service - Hosts (BR6)
- Cluster Quality of Service - Virtual Machines (BR13)
- Top 10 Downtime Hosts (BR7B)

Trend

- Five Most Utilized Hosts (Over Time) (BR4)
- Five Most Utilized Virtual Machines (Over Time) (BR11)
- Five Least Utilized Hosts (Over Time) (BR5)
- Five Least Utilized Virtual Machines (Over Time) (BR12)



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RHEV 3.1

User Interface

Task Manager

- Interface to view and manage on-going tasks



Last Task:		2012-Jun-22, 22:26:43	Adding Disk DiskName		3 Alerts		Events	Tasks (1)
Adding Disk DiskName		2012-Jun-22, 22:26:43	N/A	6b84cf28				
Validating		2012-Jun-22, 22:26:43	till	2012-Jun-22, 22:26:43				
Executing		2012-Jun-22, 22:26:43	N/A					
Creating Volume		2012-Jun-22, 22:26:44	N/A					
Adding Disk DiskName		2012-Jun-22, 22:15:22	till	2012-Jun-22, 22:15:24	1471979			
Creating VM VM in Cluster Default		2012-Jun-22, 22:15:13	till	2012-Jun-22, 22:15:13	32591c15			
Adding Disk DiskName		2012-Jun-22, 22:12:58	till	2012-Jun-22, 22:13:04	246188c3			



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RHEV 3.1

Integration & API

Linux CLI

- New CLI based on upstream command line tool
- Allows all RHEV operations to be run from command line

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



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RHEV 3.1

Storage

Direct LUN

- UI support for configuring direct LUN access for virtual machine

Add Virtual Disk

☐ Internal ☒ External (Direct Lun)

Alias:

Description:

Interface:

Data Center:

Use Host:

Storage Type:

☐ Wipe after delete

☐ Is bootable

☐ Is shareable

Discover Targets

Address: ☐ User Authentication:

Port: CHAP username: CHAP password:

Target Name	Address	Port	
<input checked="" type="checkbox"/> iqn.2000-01.org.cathrow.diskstation.name	172.16.31.6	3260	<input type="button" value="Login"/>

LUN ID	Dev. Size	#path	Vendor ID	Product ID	Serial
<input type="radio"/> 36001405fa1db99	1024GB	1	SYNOLOGY	iSCSI Storage	
<input checked="" type="radio"/> 360014056787e5f	1858GB	1	SYNOLOGY	iSCSI Storage	



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RHEV 3.1

Storage

Shared Disk

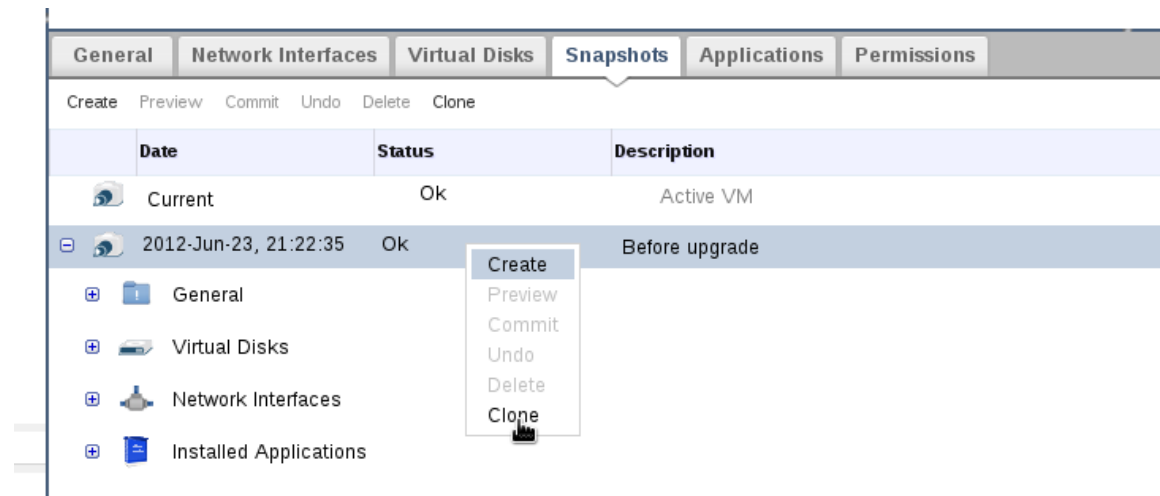
- Allow VM disk to be shared e.g., Shared disk for database

Multiple Storage Domains

- Allow VM to use disks from multiple storage domains (Tiered storage)

Live Snapshots

- Live snapshots of Virtual Machine
- Clone VM from snapshot without requiring templates




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RHEV 3.1

Storage

POSIX Filesystem

- Infrastructure to support other shared file systems
e.g., Gluster, IBM GPFS, etc

 **New Domain**

Name

Data Center

Domain Function / Storage Type

Format

Use Host

Path

Path to device to mount/ remote export

VFS Type

Mount Options

OK

Cancel



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RHEV 3.1

Virtual Desktop Infrastructure

Autostart VM

- Extend VM pools to autostart virtual machines

SPICE

Native USB

- Native USB 2.0 support in Spice (remove 3rd party USB solution)
- Support for USB remoting for Linux guests

WAN Optimizations

- Optimizations for low bandwidth / high latency networks



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RHEV 3.2 – 3.x

RHEV 3.2 – Target H1-2013

RHEL 6.4

- Based on RHEL 6.4 Hypervisor

Host Level SLA

- SLA / QoS for CPU, memory and network

UI Plugins

- Extension framework for RHEV plugins

Array Offload

- Offload basic storage operations to array – clone, delete, etc

RHEV 3.3 and RHEV 3.4 in planning phase



Going Further with RHEV-M

- Schedule regular rhevm database backups using pg_dump (or with rhevm-log-collector):
<https://access.redhat.com/knowledge/solutions/61993>
- Bond the RHEV-M logical network for additional robustness. Mode 4 is a good choice if available.
- Configure RHEV-M to be highly available (clustered):
<https://access.redhat.com/knowledge/articles/216973>

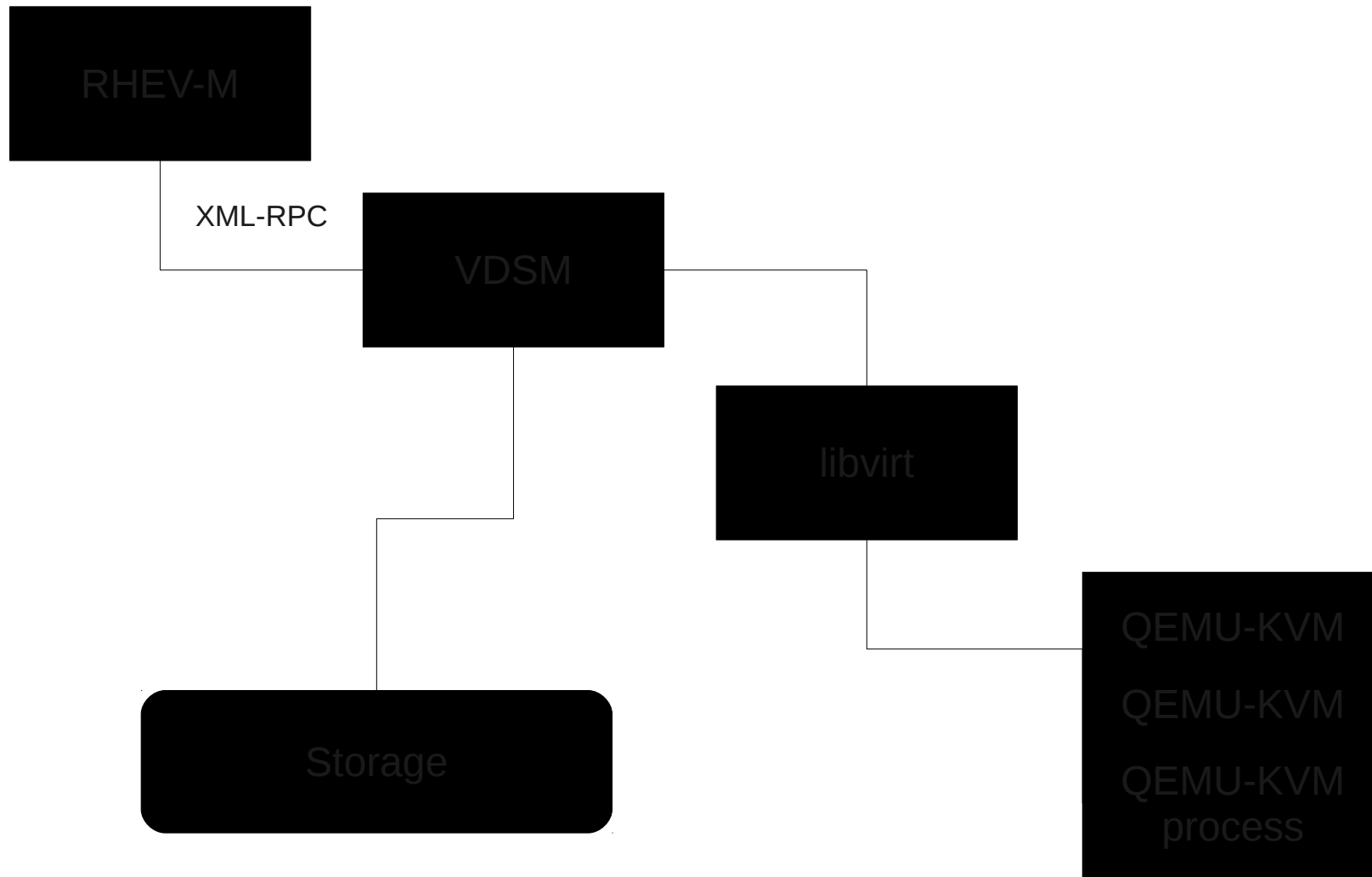


Agenda

- RHEV Architecture / 3.1 Features / Roadmap
- Storage Backend
- rhevm-reports
- Insight: RHEV Logs



Hypervisor – VDSM / libvirt



Hypervisor – VDSM / libvirt

- vdsmd listens for incoming commands from RHEV-M
 - Operates libvirt for VM lifecycle management
 - Manages Storage Domains, Pools, SPM role, metadata, VM volumes and snapshots
 - Monitors storage domain availability
 - Written in Python
 - Communicates with RHEV-M using XML-RPC on port 54321
 - Configuration in /etc/vdsm/vdsm.conf
- libvirt starts, stops, pauses and migrates VMs
 - Used to operate and control virtual machines: Start/Stop/Restart, Migrations, Monitoring



Hypervisor – VDSM / libvirt

vdsClient

- Can be used to interact with vdsmd for troubleshooting only
- Does not update RHEV-M database

Examples

- Print a list of running vm's:

```
vdsClient -s 0 list table
```

- Get VM info from host

```
vdsClient -s 0 getAllVmStats
```

- Start a virtual machine (for exceptional situations only)

```
vdsClient -s 0 create /dev/null vmId=b53eff20-7fb2-4b73-8172-76ec279f917b  
memSize=1024 macAddr=00:1a:4a:40:18:0b display=vnc vmName=rhel6_2  
drive=pool:82e6bb7a-8c10-41c9-80c2-f947d6adac13,domain:d964e86d-ac5f-48a6-b7e4-  
7742b6fcf271,image:9c997323-36b1-4ce9-906f-c9a7e8ba8e08,volume:c1acf9b6-ac55-44f1-  
bfe6-b38c20c27bec,boot:true,format:cow bridge=rhev
```

- Direct access to libvirt functionality via virsh is restricted



Storage – Definitions

Storage pool – logical equivalent to Data Center, groups storage domains together

Storage domain – chunk of storage that holds virtual machine disks

Storage Pool Manager – single host in data center that is chosen to manage all storage in a storage pool

Host Storage Manager – VDSM component on each host that reads/writes messages to the SPM



Storage – Architecture

Physical types:

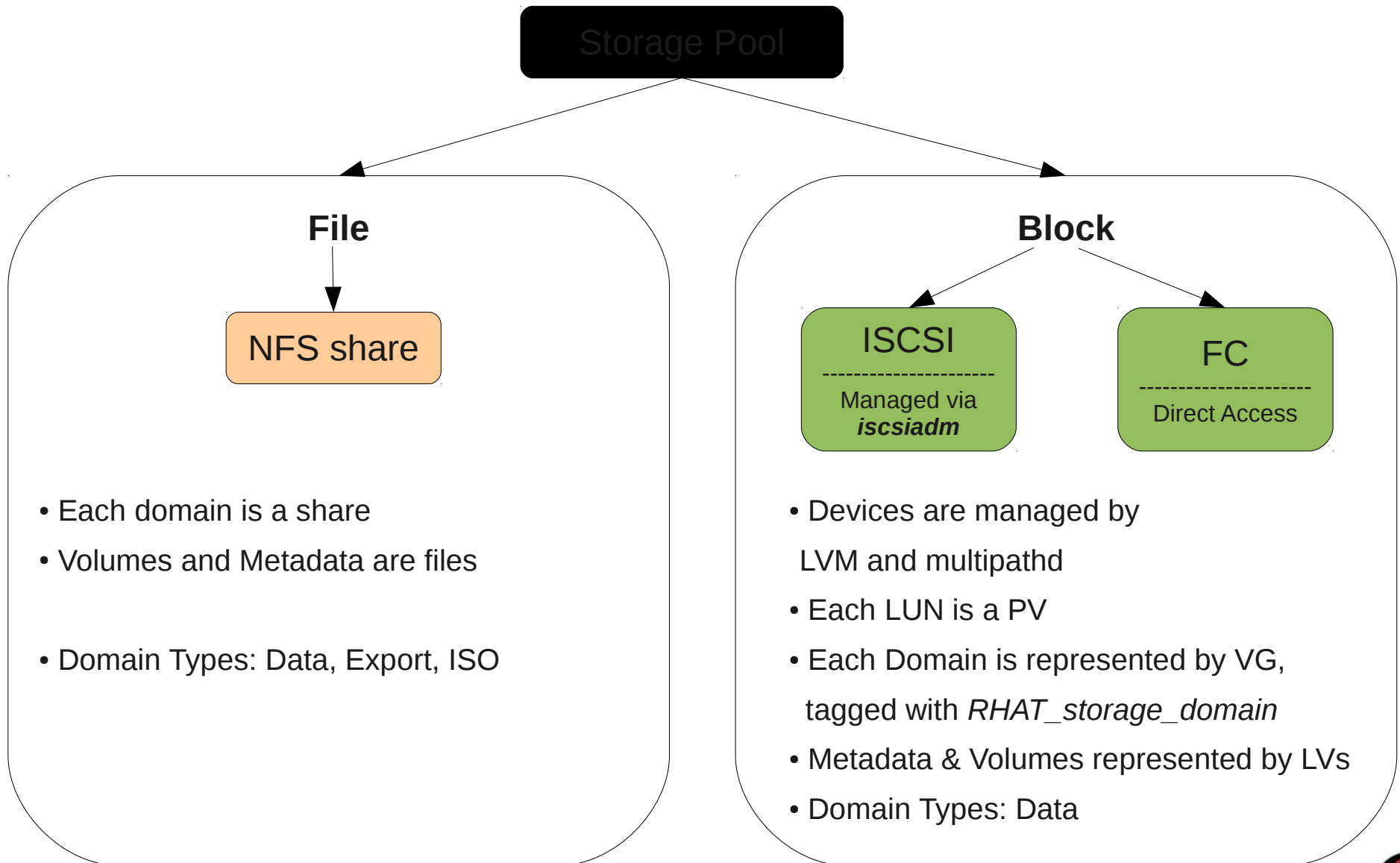
- File – NFS
- Block – iSCSI, FC

Logical domain types:

- **Data** Domain – holds the volumes (NFS & Block)
- **ISO** Domain – holds the ISO images (NFS only)
- **Export** Domain – for VM export/import between storage pools and environments (NFS only)



Storage – Architecture



Storage – Architecture

How are virtual machines stored?

- OVF file
 - Holds VM description – name, NICs, CPU, memory, disks and more
 - Only used when importing/exporting VM's to/from RHEV
- VM disk
 - Managed as “image” which is a logical group of volumes
 - Volumes in an image are different versions of a disk
 - Stored as files on NFS
 - Stored on LVM logical volumes on iSCSI/FC



Storage – Architecture

Image Format Types:

- RAW – plain binary image
- QCOW2 – QEMU copy-on-write format, supports snapshots

Allocation Types:

- Sparse (Thin Provision)
- Preallocated

Supported combinations:

- QCOW / Sparse
 - On Block Storage type: vdsm monitors the free space of the volume and it is extended as needed
 - On File Storage type: sparse image file simply increases in size
- RAW / Preallocated



Storage – Architecture

Snapshots

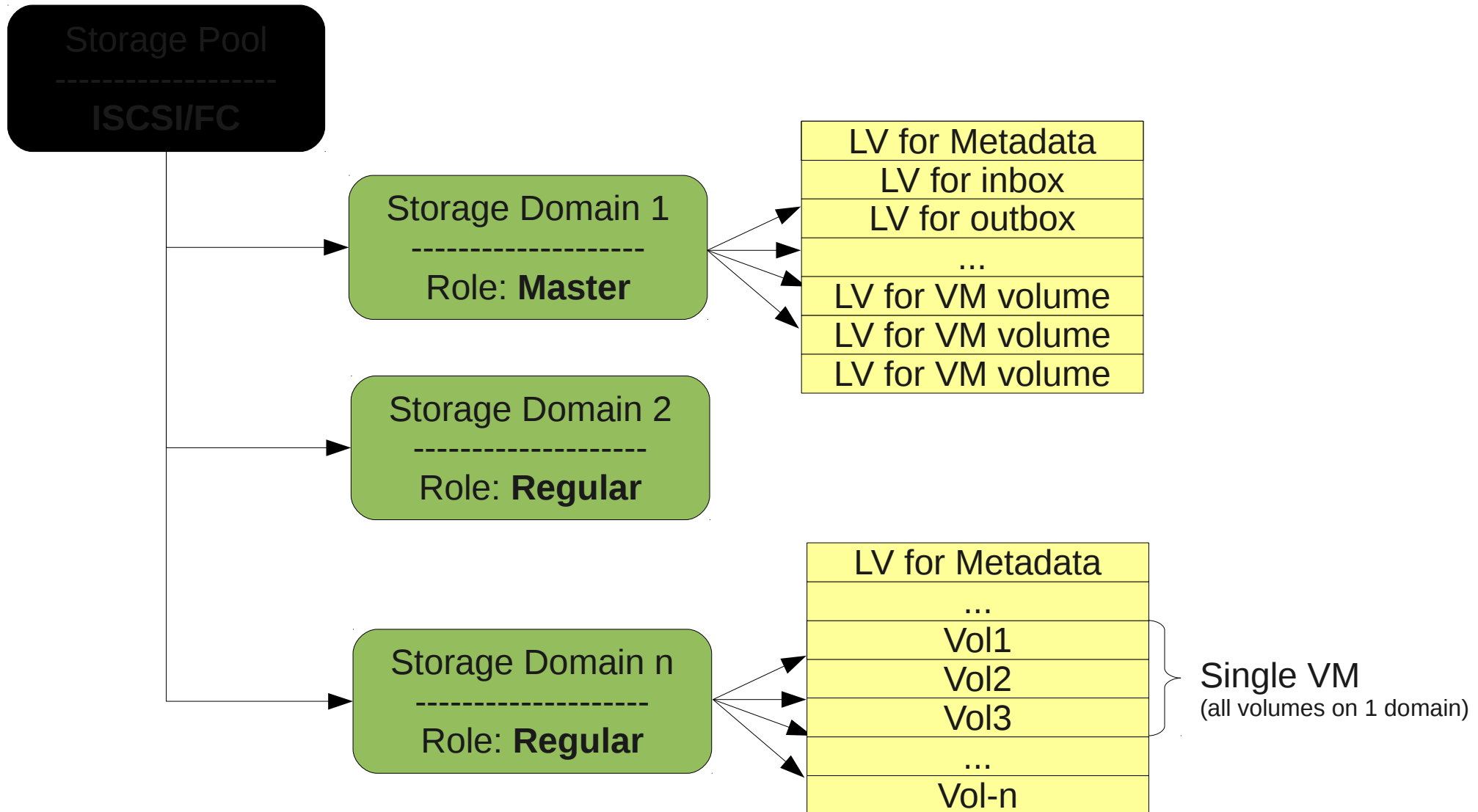
- A new Sparse volume is created, regardless of type of original volume
- QCOW2 chains the volumes together, grouped as image
- The last volume on the chain is read-writable (rw); all the others are read-only (r)
- On Block storage, all its volumes/LVs must be active

Templates

- Template volume can be used as head of chain
 - Template volume is always read-only in this case



Storage – Architecture



Storage – Metadata

- Metadata - information describing the storage pool and each of its storage domains that is stored on the physical storage
- Consists of a combination of text and LVM tags
- Three storage domain metadata versions exist: V1, V2, and V3
 - Version 1 used by ISO and Export storage domains, and all RHEV 2.x domains
 - Version 2 used by new data storage domains in RHEV 3.0
 - Version 3 used by RHEV 3.1 storage domains to allow for live snapshots
- Block storage metadata
 - V1 storage domain metadata located on `/dev/<SD_UUID>/metadata`
 - V2, V3 storage domain metadata is part of VG tags
 - Volume metadata located on `/dev/<SD_UUID>/metadata`
- NFS storage metadata
 - storage domain metadata located in `/rhev/data-center/mnt/<mountpoint>/<SD_UUID>/dom_md/metadata`
 - Volume metadata located in `/rhev/data-center/mnt/<mountpoint>/<SD_UUID>/images/<image_GUID>/<volume_UUID>.meta`



Storage – Architecture

Volumes are visible to all hosts in storage pool

SPM:

- single host to control all storage operations

Master Data Storage Domain:

- Single storage domain that keeps all the up-to-date information about the storage pool as metadata

Metadata:

- Storage pool and domain has metadata that describes it
- Each volume also has metadata describing it
- On Block storage - volume metadata is stored on LV
- On NFS storage - volume metadata is a file per volume with .meta suffix



Storage – Structure

```
# tree /rhev/data-center
```

- Show the tree structure of the Storage Pool as seen by host
- tree package is not installed by default in RHEL 6
- tree package not available on RHEV-H

```
# python /usr/share/vdsm/dumpStorageTable.py
```

- Provides a table view of the storage

```
# pvs | vgs | lvs -o +tags
```

- Shows LVM information with RHEV-related tags



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- RHEV Architecture / 3.1 Features / Roadmap
- Storage Backend
- **rhevm-reports**
- Insight: RHEV Logs
- Roadmap



Importance of Business Intelligence

- Right decisions on solid data
- Know everything about your product
- Preparing for the future
- Summarizing and simplifying large data
- Integral part of managing virtualization



RHEV-M Data Warehouse

- API for historical configuration and statistical data
- Used to create SQL reports using any tool
- Currently provides information on host, vm, disks, storage domain and more
- Uses ETL (**E**xtract **T**ransform **L**oad) service to receive data from the ovirt engine database
- This service is called ovirt-engine-dwhd and runs as a self-contained Java daemon



RHEV-M Backend DWH Views

- The engine API for the ETL
- Creates a more user friendly interface of the engine tables
- Gaps the differences between the engine to the history database tables
- First stage in data transformation



Talend Open Studio

- Our development tool for the ETL process
- Powerful and versatile open source solution for data integration
- Easy-to-use graphical development environment
- Support for all types of data integration, data migration and data synchronization operations
- Strong open source community
- Based on the eclipse UI



Service Features

- The 3.1 service reports on start\stop to the RHEV-M audit log
- The service also collects only when the engine is up and available
- Does a version comparability check with engine and history databases
- Has a watchdog fail-safe
- The service is configurable via a properties file located under /etc/ovirt-engine/ovirt-engine-dwh



Database Tables and API Views

- Sample data is collected at the end of every minute and is kept for up to 48 hours
- Hourly level is aggregated every hour for the hour before last and is kept for 2 months
- Daily level is aggregated every day for the day before last and is kept for 5 years
- Configuration history is saved forever
- Tag history is also saved forever



Reports Roadmap

- Support hibernate create database to enable cross database compatibility
- Add more columns of statistics
 - File RFEs for additional data
- Add more sources other than rhevm database



Going further with rhevm-reports

- Customer Portal Group for RHEV Reports:
<https://access.redhat.com/groups/reports-rhev>
- Jaspersoft Report Gallery:
<https://www.jaspersoft.com/report-gallery>
- Jaspersoft Webinars:
<https://www.jaspersoft.com/resources/webinars>



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Diagnosing a problem can be difficult...

- Complex project
 - Multiple technologies
 - Distributed components
- Deep integration with the operating system
 - Storage (LVM, multipath, iSCSI)
 - Network (VLAN, bond, bridge)



How to debug a RHEV Issue

- **Understand** the flow
- **Follow** the logs
- **Trace** the issue
- **Report** the issue
- **Propose** a solution (Red Hat)



Get familiar with RHEV Logs

- RHEV (ovirt-engine) – backend
 - **Engine log** **`/var/log/ovirt-engine/engine.log`**
 - **Console log** **`/var/log/ovirt-engine/console.log`**
 - **Server log** **`/var/log/ovirt-engine/server.log`**
- VDSM – hypervisor
 - **VDSM log** **`/var/log/vdsm/vdsm.log`**
 - **Libvirt log** **`/var/log/libvirtd.log`**
 - **QEMU log** **`/var/log/libvirt/qemu/<vm>.log`**



What is a logcollector?

- A logcollector is a “super sosreport” that you run from the RHEV-Manager
- It collects:
 - sosreport from the Manager
 - sosreport(s) from selected hosts
 - rhev-m database (postgres) dump



rhevm-log-collector syntax

- --no-hypervisors

Why? If diagnosing a manager-only issue. Skips hosts.

- -c CLUSTER, --cluster=CLUSTER1,CLUSTER2

What? Grabs sosreports from hosts in cluster

Why? To diagnose an issue w/ this cluster only

- -d DATACENTER, --data-center=DC1,DC2

Why? To diagnose a wider range issue

- -H HOSTS_LIST, --hosts=HOST1,HOST2,HOST3

Why? Targeted log collection. Saves space. Maybe only need the current SPM system's log. SPM manages storage interactions like creating VM disks or adding storage domain.



Running logcollector

```
[root@virtville ~]# rhelm-log-collector collect
```

Please provide the REST API password for the admin@internal RHEV-M user (CTRL+D to skip):

About to collect information from 1 hypervisors. Continue? (Y/n): y

INFO: Gathering information from selected hypervisors...

INFO: collecting information from byount-rhev1.usersys.redhat.com

INFO: finished collecting information from byount-rhev1.usersys.redhat.com

Please provide the password for the PostgreSQL user, postgres, to dump the engine PostgreSQL database instance (CTRL+D to skip):

INFO: Gathering PostgreSQL the RHEV-M database and log files from localhost...

INFO: Gathering RHEV-M information...

INFO: Log files have been collected and placed in /tmp/logcollector/sosreport-LogCollector-20130119194417-7bcc.tar.xz.

The MD5 for this file is 338b1ba4a4fbb859873df56840dc7bcc and its size is 32.6



What do the logs look like?

```
[root@virtville ~]# rhenvx sosreport-LogCollector-byount.tar.xz
INFO: The Log Collector version is 3.0
INFO: Extracting sosreport-LogCollector-byount.tar.xz into sosreport-
LogCollector-byount/
INFO: The logs are successfully extracted to sosreport-LogCollector-
byount/
```

```
[root@virtville ~]# ll
drwx-----. 11 byount byount 4096 Dec 19 22:43 byount-rhev1
                                     ^ host 1
drwxrwxr-x.  3 byount byount 4096 Dec 20 09:28 database
drwx-----. 13 byount byount 4096 Dec 19 22:44 virtville
                                     ^ manager
```



See what the customer sees!

- The customer's rhevm database is one of the most important things that a logcollector provides and we use “**db viewer**” to import their RHEV-M database onto one of our lab systems.
- We can “see” what their environment was like when they ran logcollector
- Occasionally, fixing a RHEV issue requires running a SQL command. Importing the customer's database allows us to pre-test SQL queries.



Follow an Event with the “Correlation ID”

Data Centers

Clusters

Hosts

Storage

Disks

Virtual Machines

Pools

Templates

Users

Basic View

Advanced View

	Time	Message	Event ID	User	Host	Virtual Machine	Template	Data Center	Storage	Cluster	Gluster	Correlation Id
✓	2012-Dec-19, 22:28	Snapshot oh-snap creation for VM rhel6	68	admin		rhel6	Blank	Default		Default		18940702
✓	2012-Dec-19, 22:28	Snapshot oh-snap creation for VM rhel6	45	admin		rhel6	Blank	Default		Default		18940702

Have the customer note the Correlation ID for the event that had a problem (if applicable)!

Pools

Templates

Users

Host	Virtual Machine	Template	Data Center	Storage	Cluster	Gluster	Correlation Id
	rhel6	Blank	Default		Default		18940702
	rhel6	Blank	Default		Default		18940702



Gathering info on an Event

- Events tab
 - Capture error message
 - Get correlation id
- ovirt-engine
 - Search correlation id in logs
 - Search for error
 - Understand command (internal or external)
- Hypervisor
 - Match the time with engine
 - Look for 'Run and protect' command
 - Look for error



Correlation ID in the logs

- Start with RHEV-M (/var/log/ovirt-engine/engine.log for RHEV 3.1 or /var/log/rhev/rhev.log for RHEV 3.0)

```
2013-01-04 13:52:00,567 INFO [org.ovirt.engine.core.bll.RunVmCommand] (pool-3-thread-7)
[55d7793e] Running command: RunVmCommand internal: false. Entities affected : ID:
514e0257-3f28-4f39-9a44-d2b786146675 Type: VM
```

- Then look at a host's log – this will be either the system that was SPM at the time of the problem **OR** the system where the VM was running (../vds/vdsm.log)

```
Thread-808241::DEBUG::2013-01-04 13:50:17,308::BindingXMLRPC::894::vds::(wrapper) client
[10.35.64.13]::call vmCreate with ({'bridge': 'rhev', 'acpiEnable': 'true', 'emulatedMachine': 'rhel6.2.0',
'tabletEnable': 'true', 'vmId': '514e0257-3f28-4f39-9a44-d2b786146675', 'transparentHugePages':
'true', 'spiceSslCipherSuite': 'DEFAULT', 'cpuType': 'Westmere', 'smp': '1', 'macAddr':
'00:1a:4a:16:9a:0b', 'boot': 'c', 'custom': {}, 'vmType': 'kvm', 'memSize': 1024, 'smpCoresPerSocket': '1',
'vmName': 'qa-cobbler', 'spiceMonitors': '1', 'nice': '0', 'drives': [{'index': '0', 'domainID': 'd5d0dfe6-c2b9-
429e-96c2-c1cd247ac828', 'format': 'cow', 'boot': 'true', 'volumeID': '6ebfe919-34b8-43d6-b7d9-
957d36dc9a4a', 'imageID': '56254aa4-02cc-48fa-9204-09bba43b31cf', 'poolID': '132859ec-ef83-4c01-
b411-0cea6d3e1ed6', 'propagateErrors': 'off', 'if': 'virtio'}], 'nicModel': 'pv', 'keyboardLayout': 'en-us',
'kvmEnable': 'true', 'pitReinjection': 'false', 'timeOffset': '280', 'spiceSecureChannels': 'smain,sinputs',
'display': 'vnc'},) {} flowID [55d7793e]
```



Going further with RHEV Logs

- Try performing an action on the RHEV-M and follow the flow to one of the hosts
 - The SPM system will always handle storage domain VM sparse volume extensions. If it's storage-related, think SPM. Otherwise, look on the host where the VM is running.
- Spice logs are found on the host as well as the client:
<https://access.redhat.com/knowledge/solutions/46865>



Wrap-up

- Discussed new 3.1 features and roadmap
- Quick dive into the storage backend of RHEV
- Looked at rhevm-reports for a visual understanding of a rhev environment
- An insight into how a Red Hat Support Engineer works a RHEV case



For more info...

- Visit the RHEV Product Page on the Red Hat Customer Portal:
https://access.redhat.com/products/Red_Hat_Enterprise_Virtualization/
 - Tech briefs, Whitepapers, Reference Architectures



**RED HAT®
ENTERPRISE VIRTUALIZATION 3**

THE PATH TO FREEDOM IS RIGHT IN FRONT OF YOU.

Overview Knowledge Evaluations Track A: Standard Setup Track B: Minimal Setup Troubleshooting

Red Hat Enterprise Virtualization is a complete virtualization solution with leading performance, security, manageability, and much more. Red Hat Enterprise Virtualization is fully open source software, based on the

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Thanks!

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