# Red Hat Virtualization 4.4

## Technical Reference

The technical architecture of Red Hat Virtualization environments

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The technical architecture of Red Hat Virtualization environments

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## Legal Notice



## Abstract

This document describes the concepts, components, and technologies used in a Red Hat Virtualization environment.

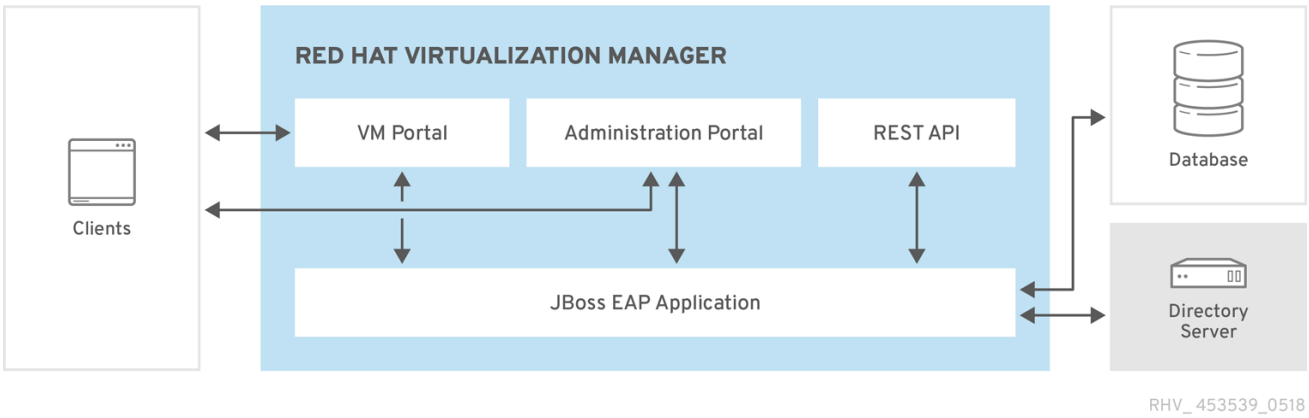
# Table of Contents

# CHAPTER 1. INTRODUCTION

## 1.1. RED HAT VIRTUALIZATION MANAGER

The Red Hat Virtualization Manager provides centralized management for a virtualized environment. A number of different interfaces can be used to access the Red Hat Virtualization Manager. Each interface facilitates access to the virtualized environment in a different manner.

**Figure 1.1. Red Hat Virtualization Manager Architecture**




The Red Hat Virtualization Manager provides graphical interfaces and an Application Programming Interface (API). Each interface connects to the Manager, an application delivered by an embedded instance of the Red Hat JBoss Enterprise Application Platform. There are a number of other components which support the Red Hat Virtualization Manager in addition to Red Hat JBoss Enterprise Application Platform.

## 1.2. RED HAT VIRTUALIZATION HOST

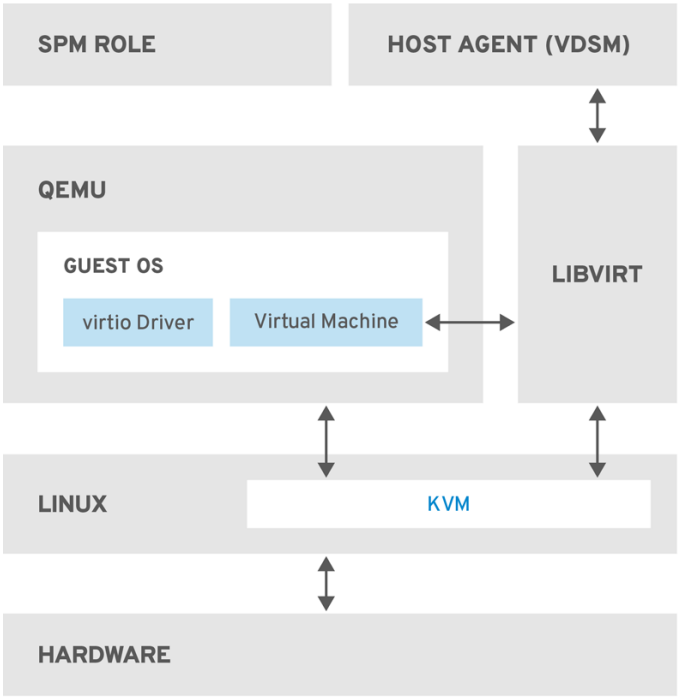
A Red Hat Virtualization environment has one or more hosts attached to it. A host is a server that provides the physical hardware that virtual machines make use of.

Red Hat Virtualization Host (RHVH) runs an optimized operating system installed using a special, customized installation media specifically for creating virtualization hosts.

Red Hat Enterprise Linux hosts are servers running a standard Red Hat Enterprise Linux operating system that has been configured after installation to permit use as a host.

Both methods of host installation result in hosts that interact with the rest of the virtualized environment in the same way, and so, will both referred to as **hosts**.

Figure 1.2. Host Architecture




### Kernel-based Virtual Machine (KVM)

The Kernel-based Virtual Machine (KVM) is a loadable kernel module that provides full virtualization through the use of the Intel VT or AMD-V hardware extensions. Though KVM itself runs in kernel space, the guests running upon it run as individual QEMU processes in user space. KVM allows a host to make its physical hardware available to virtual machines.

### QEMU

QEMU is a multi-platform emulator used to provide full system emulation. QEMU emulates a full system, for example a PC, including one or more processors, and peripherals. QEMU can be used to launch different operating systems or to debug system code. QEMU, working in conjunction with KVM and a processor with appropriate virtualization extensions, provides full hardware assisted virtualization.

### Red Hat Virtualization Manager Host Agent, VDSM

In Red Hat Virtualization, **VDSM** initiates actions on virtual machines and storage. It also facilitates inter-host communication. VDSM monitors host resources such as memory, storage, and networking. Additionally, VDSM manages tasks such as virtual machine creation, statistics accumulation, and log collection. A VDSM instance runs on each host and receives management commands from the Red Hat Virtualization Manager using the re-configurable port **54321**.

### VDSM-REG

**VDSM** uses **VDSM-REG** to register each host with the Red Hat Virtualization Manager. **VDSM-REG** supplies information about itself and its host using port **80** or port **443**.

### libvirt

Libvirt facilitates the management of virtual machines and their associated virtual devices. When Red Hat Virtualization Manager initiates virtual machine life-cycle commands (start, stop, reboot), VDSM invokes libvirt on the relevant host machines to execute them.

### Storage Pool Manager, SPM

The Storage Pool Manager (SPM) is a role assigned to one host in a data center. The SPM host has sole authority to make all storage domain structure metadata changes for the data center. This includes creation, deletion, and manipulation of virtual disks, snapshots, and templates. It also

includes allocation of storage for sparse block devices on a Storage Area Network(SAN). The role of SPM can be migrated to any host in a data center. As a result, all hosts in a data center must have access to all the storage domains defined in the data center.
Red Hat Virtualization Manager ensures that the SPM is always available. In case of storage connectivity errors, the Manager re-assigns the SPM role to another host.

### Guest Operating System

Guest operating systems do not need to be modified to be installed on virtual machines in a Red Hat Virtualization environment. The guest operating system, and any applications on the guest, are unaware of the virtualized environment and run normally.
Red Hat provides enhanced device drivers that allow faster and more efficient access to virtualized devices. You can also install the Red Hat Virtualization Guest Agent on guests, which provides enhanced guest information to the management console.

## 1.3. COMPONENTS THAT SUPPORT THE MANAGER

### Red Hat JBoss Enterprise Application Platform

Red Hat JBoss Enterprise Application Platform is a Java application server. It provides a framework to support efficient development and delivery of cross-platform Java applications. The Red Hat Virtualization Manager is delivered using Red Hat JBoss Enterprise Application Platform.

**IMPORTANT**

The version of the Red Hat JBoss Enterprise Application Platform bundled with Red Hat Virtualization Manager is **not** to be used to serve other applications. It has been customized for the specific purpose of serving the Red Hat Virtualization Manager. Using the Red Hat JBoss Enterprise Application Platform that is included with the Manager for additional purposes adversely affects its ability to service the Red Hat Virtualization environment.

### Gathering Reports and Historical Data

The Red Hat Virtualization Manager includes a data warehouse that collects monitoring data about hosts, virtual machines, and storage. A number of pre-defined reports are available. Customers can analyze their environments and create reports using any query tools that support SQL.
The Red Hat Virtualization Manager installation process creates two databases. These databases are created on a Postgres instance which is selected during installation.

- The **engine** database is the primary data store used by the Red Hat Virtualization Manager. Information about the virtualization environment like its state, configuration, and performance are stored in this database.

- The **ovirt_engine_history** database contains configuration information and statistical metrics which are collated over time from the **engine** operational database. The configuration data in the **engine** database is examined every minute, and changes are replicated to the **ovirt_engine_history** database. Tracking the changes to the database provides information on the objects in the database. This enables you to analyze and enhance the performance of your Red Hat Virtualization environment and resolve difficulties.
  For more information on generating reports based on the **ovirt_engine_history** database see the History Database in the *Red Hat Virtualization Data Warehouse Guide* .

IMPORTANT

The replication of data to the **ovirt_engine_history** database is performed by the **RHEVM History Service**, ovirt-engine-dwhd.

**Directory services**

Directory services provide centralized network-based storage of user and organizational information. Types of information stored include application settings, user profiles, group data, policies, and access control. The Red Hat Virtualization Manager supports Active Directory, Identity Management (IdM), OpenLDAP, and Red Hat Directory Server 9. There is also a local, internal domain for administration purposes only. This internal domain has only one user: the admin user.

## 1.4. STORAGE

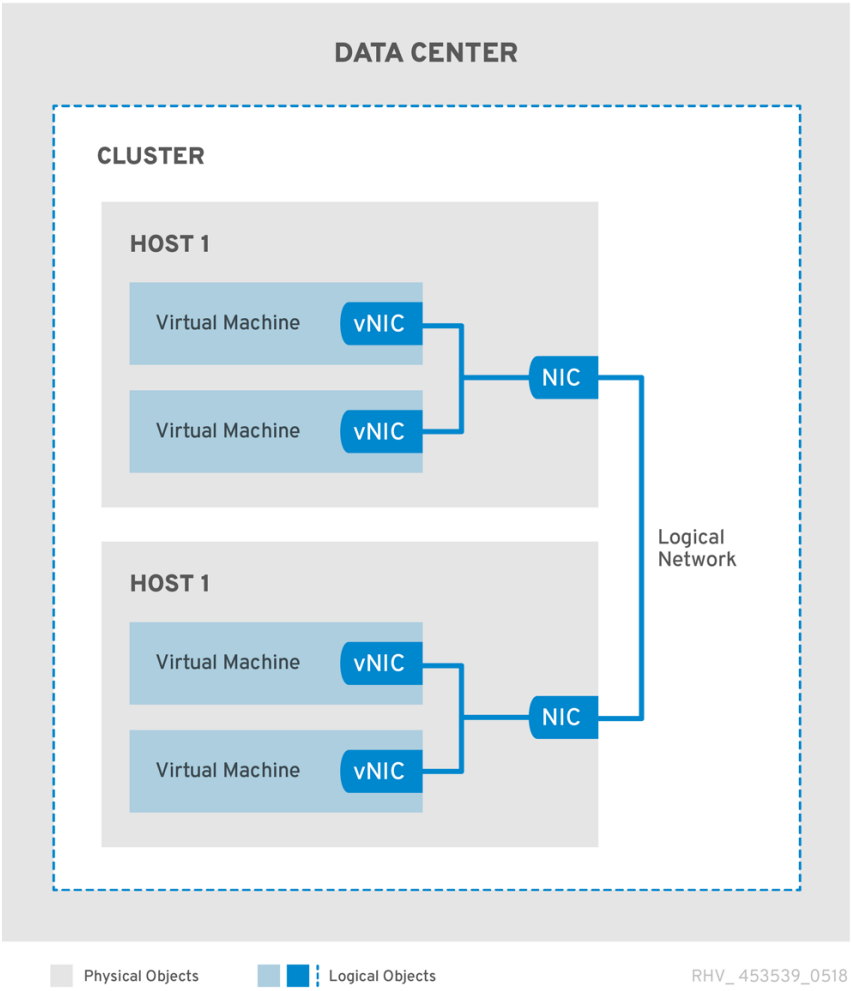
Red Hat Virtualization uses a centralized storage system for virtual disks, templates, snapshots, and ISO files. Storage is logically grouped into storage pools, which are comprised of storage domains. A storage domain is a combination of storage capacity and metadata that describes the internal structure of the storage. See Storage Domain Types

The data domain is the only one required by each data center. A data storage domain is exclusive to a single data center. Export and ISO domains are optional. Storage domains are shared resources, and must be accessible to all hosts in a data center.

## 1.5. NETWORK

The Red Hat Virtualization network architecture facilitates connectivity between the different elements of the Red Hat Virtualization environment. The network architecture not only supports network connectivity, it also allows for network segregation.

Figure 1.3. Network Architecture




Networking is defined in Red Hat Virtualization in several layers. The underlying physical networking infrastructure must be in place and configured to allow connectivity between the hardware and the logical components of the Red Hat Virtualization environment.

### Networking Infrastructure Layer

The Red Hat Virtualization network architecture relies on some common hardware and software devices:

- Network Interface Controllers (NICs) are physical network interface devices that connect a host to the network.
- Virtual NICs (vNICs) are logical NICs that operate using the host's physical NICs. They provide network connectivity to virtual machines.
- Bonds bind multiple NICs into a single interface.
- Bridges are a packet-forwarding technique for packet-switching networks. They form the basis of virtual machine logical networks.

### Logical Networks

Logical networks allow segregation of network traffic based on environment requirements. The types of logical network are:

- logical networks that carry virtual machine network traffic,

- logical networks that do not carry virtual machine network traffic,
- optional logical networks,
- and required networks.

All logical networks can either be required or optional.

A logical network that carries virtual machine network traffic is implemented at the host level as a software bridge device. By default, one logical network is defined during the installation of the Red Hat Virtualization Manager: the **ovirtmgmt** management network.

Other logical networks that can be added by an administrator are: a dedicated storage logical network, and a dedicated display logical network. Logical networks that do not carry virtual machine traffic do not have an associated bridge device on hosts. They are associated with host network interfaces directly.

Red Hat Virtualization segregates management-related network traffic from migration-related network traffic. This makes it possible to use a dedicated network (without routing) for live migration, and ensures that the management network (ovirtmgmt) does not lose its connection to hypervisors during migrations.

**Explanation of logical networks on different layers**

Logical networks have different implications for each layer of the virtualization environment.

**Data Center Layer**

Logical networks are defined at the data center level. Each data center has the **ovirtmgmt** management network by default. Further logical networks are optional but recommended. Designation as a **VM Network** and a custom MTU can be set at the data center level. A logical network that is defined for a data center must also be added to the clusters that use the logical network.

**Cluster Layer**

Logical networks are made available from a data center, and must be added to the clusters that will use them. Each cluster is connected to the management network by default. You can optionally add to a cluster logical networks that have been defined for the cluster's parent data center. When a required logical network has been added to a cluster, it must be implemented for each host in the cluster. Optional logical networks can be added to hosts as needed.

**Host Layer**

Virtual machine logical networks are implemented for each host in a cluster as a software bridge device associated with a given network interface. Non-virtual machine logical networks do not have associated bridges, and are associated with host network interfaces directly. Each host has the management network implemented as a bridge using one of its network devices as a result of being included in a Red Hat Virtualization environment. Further required logical networks that have been added to a cluster must be associated with network interfaces on each host to become operational for the cluster.

**Virtual Machine Layer**

Logical networks can be made available to virtual machines in the same way that a network can be made available to a physical machine. A virtual machine can have its virtual NIC connected to any virtual machine logical network that has been implemented on the host that runs it. The virtual machine then gains connectivity to any other devices or destinations that are available on the logical network it is connected to.

**Example 1.1. Management Network**

The management logical network, named **ovirtmgmt**, is created automatically when the Red Hat Virtualization Manager is installed. The **ovirtmgmt** network is dedicated to management traffic between the Red Hat Virtualization Manager and hosts. If no other specifically purposed bridges are set up, **ovirtmgmt** is the default bridge for all traffic.

## 1.6. DATA CENTERS

A data center is the highest level of abstraction in Red Hat Virtualization. A data center contains three types of information:

**Storage**

This includes storage types, storage domains, and connectivity information for storage domains. Storage is defined for a data center, and available to all clusters in the data center. All host clusters within a data center have access to the same storage domains.

**Logical networks**

This includes details such as network addresses, VLAN tags and STP support. You can define logical networks for a data center and apply them to clusters.

**Clusters**

Clusters are groups of hosts with compatible processor cores, either AMD or Intel processors. Clusters are migration domains; virtual machines can be live-migrated to any host within a cluster, and not to other clusters. One data center can hold multiple clusters, and each cluster can contain multiple hosts.

## 1.7. DATA CENTER AND CLUSTER COMPATIBILITY LEVELS

Red Hat Virtualization data centers and clusters have a compatibility version.

The data center compatibility version indicates the version of Red Hat Virtualization that the data center is intended to be compatible with. All clusters in the data center must support the desired compatibility level.

The cluster compatibility version indicates the features of Red Hat Virtualization supported by all of the hosts in the cluster. The cluster compatibility is set according to the version of the least capable host operating system in the cluster.

The table below provides a compatibility matrix of RHV versions and the required data center and cluster compatibility levels.

**Table 1.1. Data center and cluster levels supported with Red Hat Virtualization**

| Compatibility Level | RHV Version | Description |
|---|---|---|
| 4.7 | 4.4 | Compatibility Level 4.7 was introduced in RHV 4.4 to support new features introduced by RHEL 8.6 hypervisors. |

| Compatibility Level | RHV Version | Description |
|---|---|---|
| 4.6 | 4.4.6 | Compatibility Level 4.6 was introduced in RHV 4.4.6 to support new features introduced by RHEL 8.4 hypervisors with Advanced Virtualization 8.4 packages. |
| 4.5 | 4.4.3 | Compatibility Level 4.5 was introduced in RHV 4.4.3 to support new features introduced by RHEL 8.3 hypervisors with Advanced Virtualization 8.3 packages. |

### Limitations

- Virtio NICs are enumerated as a different device after upgrading the cluster compatibility level to 4.6. Therefore, the NICs might need to be reconfigured. Red Hat recommends that you test the virtual machines before you upgrade the cluster by setting the cluster compatibility level to 4.6 on the virtual machine and verifying the network connection.
  If the network connection for the virtual machine fails, configure the virtual machine with a custom emulated machine that matches the current emulated machine, for example pc-q35-rhel8.3.0 for 4.5 compatibility version, before upgrading the cluster.

# CHAPTER 2. STORAGE

## 2.1. STORAGE DOMAINS OVERVIEW

A storage domain is a collection of images that have a common storage interface. A storage domain contains complete images of templates and virtual machines (including snapshots), ISO files, and metadata about themselves. A storage domain can be made of either block devices (SAN - iSCSI or FCP) or a file system (NAS - NFS, GlusterFS, or other POSIX compliant file systems).

**NOTE**

GlusterFS Storage is deprecated, and will no longer be supported in future releases.

On NAS, all virtual disks, templates, and snapshots are files.

On SAN (iSCSI/FCP), each virtual disk, template or snapshot is a logical volume. Block devices are aggregated into a logical entity called a volume group, and then divided by LVM (Logical Volume Manager) into logical volumes for use as virtual hard disks. See Red Hat Enterprise Linux Configuring and managing logical volumes for more information on LVM.

Virtual disks can have one of two formats, either QCOW2 or raw. The type of storage can be either sparse or preallocated. Snapshots are always sparse but can be taken for disks of either format.

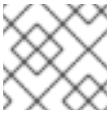
Virtual machines that share the same storage domain can be migrated between hosts that belong to the same cluster.

## 2.2. TYPES OF STORAGE BACKING STORAGE DOMAINS

Storage domains can be implemented using block based and file based storage.

**File Based Storage**

The file based storage types supported by Red Hat Virtualization are NFS, GlusterFS, other POSIX compliant file systems, and storage local to hosts.



**NOTE**

GlusterFS Storage is deprecated, and will no longer be supported in future releases.

File based storage is managed externally to the Red Hat Virtualization environment.

NFS storage is managed by a Red Hat Enterprise Linux NFS server, or other third party network attached storage server.

Hosts can manage their own local storage file systems.

**Block Based Storage**

Block storage uses unformatted block devices. Block devices are aggregated into volume groups by the Logical Volume Manager (LVM). An instance of LVM runs on all hosts, unaware of the instances running on other hosts. VDSM adds clustering logic on top of LVM by scanning volume groups for changes. When changes are detected, VDSM updates individual hosts by telling them to refresh their

volume group information. The hosts divide the volume group into logical volumes, writing logical volume metadata to disk. If more storage capacity is added to an existing storage domain, the Red Hat Virtualization Manager causes VDSM on each host to refresh volume group information.

A Logical Unit Number (LUN) is an individual block device. One of the supported block storage protocols, iSCSI or Fibre Channel, is used to connect to a LUN. The Red Hat Virtualization Manager manages software iSCSI connections to the LUNs. All other block storage connections are managed externally to the Red Hat Virtualization environment. Any changes in a block based storage environment, such as the creation of logical volumes, extension or deletion of logical volumes and the addition of a new LUN are handled by LVM on a specially selected host called the Storage Pool Manager. Changes are then synced by VDSM which storage metadata refreshes across all hosts in the cluster.

## 2.3. STORAGE DOMAIN TYPES

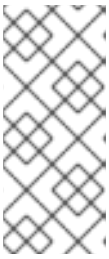
Red Hat Virtualization supports the following types of storage domains, as well as the storage types that each storage domain supports.

- The **Data Domain** stores the hard disk images of all virtual machines in the Red Hat Virtualization environment. Disk images may contain an installed operating system or data stored or generated by a virtual machine. Data storage domains support NFS, iSCSI, FCP, GlusterFS and POSIX compliant storage. A data domain cannot be shared between multiple data centers.

NOTE

GlusterFS Storage is deprecated, and will no longer be supported in future releases.

- The **Export Domain** provides transitory storage for hard disk images and virtual machine templates being transferred between data centers. Additionally, export storage domains store backed up copies of virtual machines. Export storage domains support NFS storage. Multiple data centers can access a single export storage domain but only one data center can use it at a time.



NOTE

The Export domain is deprecated. Storage data domains can be unattached from a data center and imported to another data center in the same environment, or in a different environment. Virtual machines, floating virtual disks, and templates can then be uploaded from the imported storage domain to the attached data center.

- The **ISO Domain** stores ISO files, also called images. ISO files are representations of physical CDs or DVDs. In the Red Hat Virtualization environment the common types of ISO files are operating system installation disks, application installation disks, and guest agent installation disks. These images can be attached to virtual machines and booted in the same way that physical disks are inserted into a disk drive and booted. ISO storage domains allow all hosts within the data center to share ISOs, eliminating the need for physical optical media.

NOTE

The ISO domain is a deprecated storage domain type. The ISO Uploader tool has been deprecated. Red Hat recommends uploading ISO images to the data domain with the Administration Portal or with the REST API.

## 2.4. STORAGE FORMATS FOR VIRTUAL DISKS

### QCOW2 Formatted Virtual Machine Storage

QCOW2 is a storage format for virtual disks. QCOW stands for QEMU copy-on-write. The QCOW2 format decouples the physical storage layer from the virtual layer by adding a mapping between logical and physical blocks. Each logical block is mapped to its physical offset, which enables storage over-commitment and virtual machine snapshots, where each QCOW volume only represents changes made to an underlying virtual disk.

The initial mapping points all logical blocks to the offsets in the backing file or volume. When a virtual machine writes data to a QCOW2 volume after a snapshot, the relevant block is read from the backing volume, modified with the new information and written into a new snapshot QCOW2 volume. Then the map is updated to point to the new place.

### Raw

The raw storage format has a performance advantage over QCOW2 in that no formatting is applied to virtual disks stored in the raw format. Virtual machine data operations on virtual disks stored in raw format require no additional work from hosts. When a virtual machine writes data to a given offset in its virtual disk, the I/O is written to the same offset on the backing file or logical volume.

Raw format requires that the entire space of the defined image be preallocated unless using externally managed thin provisioned LUNs from a storage array.

## 2.5. VIRTUAL DISK STORAGE ALLOCATION POLICIES

### Preallocated Storage

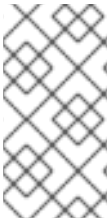
All of the storage required for a virtual disk is allocated prior to virtual machine creation. If a 20 GB disk image is created for a virtual machine, the disk image uses 20 GB of storage domain capacity. Preallocated disk images cannot be enlarged. Preallocating storage can mean faster write times because no storage allocation takes place during runtime, at the cost of flexibility. Allocating storage this way reduces the capacity of the Red Hat Virtualization Manager to overcommit storage. Preallocated storage is recommended for virtual machines used for high intensity I/O tasks with less tolerance for latency in storage. Generally, server virtual machines fit this description.

NOTE

If thin provisioning functionality provided by your storage back-end is being used, preallocated storage should still be selected from the Administration Portal when provisioning storage for virtual machines.

### Sparsely Allocated Storage

The upper size limit for a virtual disk is set at virtual machine creation time. Initially, the disk image does not use any storage domain capacity. Usage grows as the virtual machine writes data to disk, until the upper limit is reached. Capacity is not returned to the storage domain when data in the disk image is removed. Sparsely allocated storage is appropriate for virtual machines with low or medium intensity I/O tasks with some tolerance for latency in storage. Generally, desktop virtual machines fit this description.



NOTE

If thin provisioning functionality is provided by your storage back-end, it should be used as the preferred implementation of thin provisioning. Storage should be provisioned from the graphical user interface as preallocated, leaving thin provisioning to the back-end solution.

## 2.6. STORAGE METADATA VERSIONS IN RED HAT VIRTUALIZATION

Red Hat Virtualization stores information about storage domains as metadata on the storage domains themselves. Each major release of Red Hat Virtualization has seen improved implementations of storage metadata.

**V1 metadata (Red Hat Virtualization 2.x series)**

- Each storage domain contains metadata describing its own structure, and all of the names of physical volumes that are used to back virtual disks.
- Master domains additionally contain metadata for all the domains and physical volume names in the storage pool. The total size of this metadata is limited to 2 KB, limiting the number of storage domains that can be in a pool.
- Template and virtual machine base images are read only.
- V1 metadata is applicable to NFS, iSCSI, and FC storage domains.

**V2 metadata (Red Hat Enterprise Virtualization 3.0)**

- All storage domain and pool metadata is stored as logical volume tags rather than written to a logical volume. Metadata about virtual disk volumes is still stored in a logical volume on the domains.
- Physical volume names are no longer included in the metadata.
- Template and virtual machine base images are read only.
- V2 metadata is applicable to iSCSI, and FC storage domains.

**V3 metadata (Red Hat Enterprise Virtualization 3.1 and later)**

- All storage domain and pool metadata is stored as logical volume tags rather than written to a logical volume. Metadata about virtual disk volumes is still stored in a logical volume on the domains.
- Virtual machine and template base images are no longer read only. This change enables live snapshots, live storage migration, and clone from snapshot.
- Support for unicode metadata is added, for non-English volume names.
- V3 metadata is applicable to NFS, GlusterFS, POSIX, iSCSI, and FC storage domains.

NOTE

GlusterFS Storage is deprecated, and will no longer be supported in future releases.

**V4 metadata (Red Hat Virtualization 4.1 and later)**

- Support for QCOW2 compat levels - the QCOW image format includes a version number to allow introducing new features that change the image format so that it is incompatible with earlier versions. Newer QEMU versions (1.7 and above) support QCOW2 version 3, which is not backwards compatible, but introduces improvements such as zero clusters and improved performance.

- A new xleases volume to support VM leases - this feature adds the ability to acquire a lease per virtual machine on shared storage without attaching the lease to a virtual machine disk.
  A VM lease offers two important capabilities:

  - Avoiding split-brain.

  - Starting a VM on another host if the original host becomes non-responsive, which improves the availability of HA VMs.

**V5 metadata (Red Hat Virtualization 4.3 and later)**

- Support for 4K (4096 byte) block storage.

- Support for variable SANLOCK allignments.

- Support for new properties:

  - **BLOCK_SIZE** - stores the block size of the storage domain in bytes.

  - **ALIGNMENT** - determines the formatting and size of the xlease volume. (1MB to 8MB). Determined by the maximum number of host to be supported (value provided by the user) and disk block size.
    For example: a 512b block size and support for 2000 hosts results in a 1MB xlease volume.

    A 4K block size with 2000 hosts results in a 8MB xlease volume.

    The default value of maximum hosts is 250, resulting in an xlease volume of 1MB for 4K disks.

- Deprecated properties:

  - The **LOGBLKSIZE**, **PHYBLKSIZE**, **MTIME**, and **POOL_UUID** fields were removed from the storage domain metadata.

  - The **SIZE** (size in blocks) field was replaced by **CAP** (size in bytes).

NOTE

- You cannot boot from a 4K format disk, as the boot disk always uses a 512 byte emulation.

- The nfs format always uses 512 bytes.

## 2.7. STORAGE DOMAIN AUTORECOVERY IN RED HAT VIRTUALIZATION

Hosts in a Red Hat Virtualization environment monitor storage domains in their data centers by reading metadata from each domain. A storage domain becomes inactive when all hosts in a data center report that they cannot access the storage domain.

Rather than disconnecting an inactive storage domain, the Manager assumes that the storage domain has become inactive temporarily, because of a temporary network outage for example. Once every 5 minutes, the Manager attempts to re-activate any inactive storage domains.

Administrator intervention may be required to remedy the cause of the storage connectivity interruption, but the Manager handles re-activating storage domains as connectivity is restored.

## 2.8. THE STORAGE POOL MANAGER

Red Hat Virtualization uses metadata to describe the internal structure of storage domains. Structural metadata is written to a segment of each storage domain. Hosts work with the storage domain metadata based on a single writer, and multiple readers configuration. Storage domain structural metadata tracks image and snapshot creation and deletion, and volume and domain extension.

The host that can make changes to the structure of the data domain is known as the Storage Pool Manager (SPM). The SPM coordinates all metadata changes in the data center, such as creating and deleting disk images, creating and merging snapshots, copying images between storage domains, creating templates and storage allocation for block devices. There is one SPM for every data center. All other hosts can only read storage domain structural metadata.

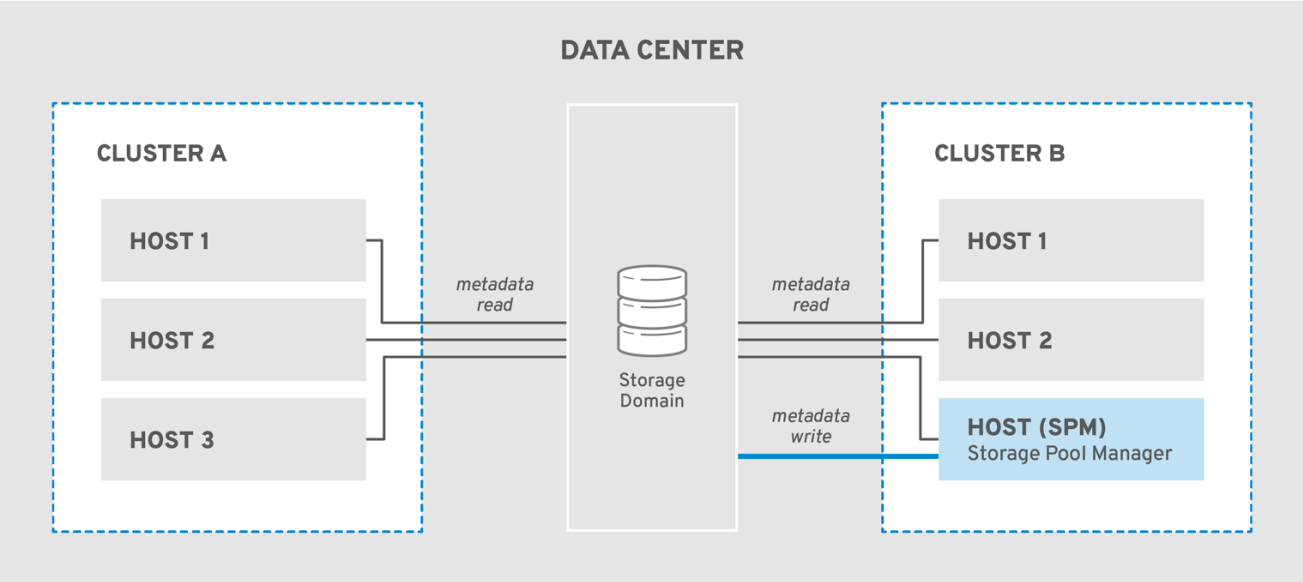
A host can be manually selected as the SPM, or it can be assigned by the Red Hat Virtualization Manager. The Manager assigns the SPM role by causing a potential SPM host to attempt to assume a storage-centric lease. The lease allows the SPM host to write storage metadata. It is storage-centric because it is written to the storage domain rather than being tracked by the Manager or hosts. Storage-centric leases are written to a special logical volume in the **master** storage domain called **leases**. Metadata about the structure of the data domain is written to a special logical volume called **metadata**. The **leases** logical volume protects the **metadata** logical volume from changes.

The Manager uses VDSM to issue the **spmStart** command to a host, causing VDSM on that host to attempt to assume the storage-centric lease. If the host is successful it becomes the SPM and retains the storage-centric lease until the Red Hat Virtualization Manager requests that a new host assume the role of SPM.

The Manager moves the SPM role to another host if:

- The SPM host can not access all storage domains, but can access the **master** storage domain
- The SPM host is unable to renew the lease because of a loss of storage connectivity or the lease volume is full and no write operation can be performed
- The SPM host crashes

**Figure 2.1. The Storage Pool Manager Exclusively Writes Structural Metadata.**




## 2.9. STORAGE POOL MANAGER SELECTION PROCESS

If a host has not been manually assigned the Storage Pool Manager (SPM) role, the SPM selection process is initiated and managed by the Red Hat Virtualization Manager.

First, the Red Hat Virtualization Manager requests that VDSM confirm which host has the storage-centric lease.

The Red Hat Virtualization Manager tracks the history of SPM assignment from the initial creation of a storage domain onward. The availability of the SPM role is confirmed in three ways:

- The "getSPMstatus" command: the Manager uses VDSM to check with the host that had SPM status last and receives one of "SPM", "Contending", or "Free".
- The metadata volume for a storage domain contains the last host with SPM status.
- The metadata volume for a storage domain contains the version of the last host with SPM status.

If an operational, responsive host retains the storage-centric lease, the Red Hat Virtualization Manager marks that host SPM in the administrator portal. No further action is taken.

If the SPM host does not respond, it is considered unreachable. If power management has been configured for the host, it is automatically fenced. If not, it requires manual fencing. The Storage Pool Manager role cannot be assigned to a new host until the previous Storage Pool Manager is fenced.

When the SPM role and storage-centric lease are free, the Red Hat Virtualization Manager assigns them to a randomly selected operational host in the data center.

If the SPM role assignment fails on a new host, the Red Hat Virtualization Manager adds the host to a list containing hosts the operation has failed on, marking these hosts as ineligible for the SPM role. This list is cleared at the beginning of the next SPM selection process so that all hosts are again eligible.

The Red Hat Virtualization Manager continues request that the Storage Pool Manager role and storage-centric lease be assumed by a randomly selected host that is not on the list of failed hosts until the SPM selection succeeds.

Each time the current SPM is unresponsive or unable to fulfill its responsibilities, the Red Hat Virtualization Manager initiates the Storage Pool Manager selection process.

## 2.10. EXCLUSIVE RESOURCES AND SANLOCK IN RED HAT VIRTUALIZATION

Certain resources in the Red Hat Virtualization environment must be accessed exclusively.

The SPM role is one such resource. If more than one host were to become the SPM, there would be a risk of data corruption as the same data could be changed from two places at once.

Prior to Red Hat Enterprise Virtualization 3.1, SPM exclusivity was maintained and tracked using a VDSM feature called **safelease**. The lease was written to a special area on all of the storage domains in a data center. All of the hosts in an environment could track SPM status in a network-independent way. The VDSM's safe lease only maintained exclusivity of one resource: the SPM role.

Sanlock provides the same functionality, but treats the SPM role as one of the resources that can be locked. Sanlock is more flexible because it allows additional resources to be locked.

Applications that require resource locking can register with Sanlock. Registered applications can then request that Sanlock lock a resource on their behalf, so that no other application can access it. For example, instead of VDSM locking the SPM status, VDSM now requests that Sanlock do so.

Locks are tracked on disk in a **lockspace**. There is one lockspace for every storage domain. In the case of the lock on the SPM resource, each host's liveness is tracked in the lockspace by the host's ability to renew the hostid it received from the Manager when it connected to storage, and to write a timestamp to the lockspace at a regular interval. The **ids** logical volume tracks the unique identifiers of each host, and is updated every time a host renews its hostid. The SPM resource can only be held by a live host.

Resources are tracked on disk in the **leases** logical volume. A resource is said to be **taken** when its representation on disk has been updated with the unique identifier of the process that has taken it. In the case of the SPM role, the SPM resource is updated with the hostid that has taken it.

The Sanlock process on each host only needs to check the resources once to see that they are taken. After an initial check, Sanlock can monitor the lockspaces until timestamp of the host with a locked resource becomes stale.

Sanlock monitors the applications that use resources. For example, VDSM is monitored for SPM status and hostid. If the host is unable to renew it's hostid from the Manager, it loses exclusivity on all resources in the lockspace. Sanlock updates the resource to show that it is no longer taken.

If the SPM host is unable to write a timestamp to the lockspace on the storage domain for a given amount of time, the host's instance of Sanlock requests that the VDSM process release its resources. If the VDSM process responds, its resources are released, and the SPM resource in the lockspace can be taken by another host.

If VDSM on the SPM host does not respond to requests to release resources, Sanlock on the host kills the VDSM process. If the kill command is unsuccessful, Sanlock escalates by attempting to kill VDSM using sigkill. If the sigkill is unsuccessful, Sanlock depends on the **watchdog daemon** to reboot the host.

Every time VDSM on the host renews its hostid and writes a timestamp to the lockspace, the watchdog daemon receives a **pet**. When VDSM is unable to do so, the watchdog daemon is no longer being petted.

After the watchdog daemon has not received a pet for a given amount of time, it reboots the host. This final level of escalation, if reached, guarantees that the SPM resource is released, and can be taken by another host.

## 2.11. THIN PROVISIONING AND STORAGE OVER-COMMITMENT

The Red Hat Virtualization Manager provides provisioning policies to optimize storage usage within the virtualization environment. A thin provisioning policy allows you to over-commit storage resources, provisioning storage based on the actual storage usage of your virtualization environment.

Storage over-commitment is the allocation of more storage to virtual machines than is physically available in the storage pool. Generally, virtual machines use less storage than what has been allocated to them. Thin provisioning allows a virtual machine to operate as if the storage defined for it has been completely allocated, when in fact only a fraction of the storage has been allocated.

**NOTE**

While the Red Hat Virtualization Manager provides its own thin provisioning function, you should use the thin provisioning functionality of your storage back-end if it provides one.

To support storage over-commitment, VDSM defines a threshold which compares logical storage allocation with actual storage usage. This threshold is used to make sure that the data written to a disk image is smaller than the logical volume that backs the disk image. QEMU identifies the highest offset written to in a logical volume, which indicates the point of greatest storage use. VDSM monitors the highest offset marked by QEMU to ensure that the usage does not cross the defined threshold. So long as VDSM continues to indicate that the highest offset remains below the threshold, the Red Hat Virtualization Manager knows that the logical volume in question has sufficient storage to continue operations.

When QEMU indicates that usage has risen to exceed the threshold limit, VDSM communicates to the Manager that the disk image will soon reach the size of it's logical volume. The Red Hat Virtualization Manager requests that the SPM host extend the logical volume. This process can be repeated as long as the data storage domain for the data center has available space. When the data storage domain runs out of available free space, you must manually add storage capacity to expand it.

## 2.12. LOGICAL VOLUME EXTENSION

The Red Hat Virtualization Manager uses thin provisioning to overcommit the storage available in a storage pool, and allocates more storage than is physically available. Virtual machines write data as they operate. A virtual machine with a thinly-provisioned disk image will eventually write more data than the logical volume backing its disk image can hold. When this happens, logical volume extension is used to provide additional storage and facilitate the continued operations for the virtual machine.

Red Hat Virtualization provides a thin provisioning mechanism over LVM. When using QCOW2 formatted storage, Red Hat Virtualization relies on the host system process qemu-kvm to map storage blocks on disk to logical blocks in a sequential manner. This allows, for example, the definition of a logical 100 GB disk backed by a 1 GB logical volume. When qemu-kvm crosses a usage threshold set by VDSM, the local VDSM instance makes a request to the SPM for the logical volume to be extended by another one gigabyte. VDSM on the host running a virtual machine in need of volume extension notifies the SPM VDSM that more space is required. The SPM extends the logical volume and the SPM VDSM instance causes the host VDSM to refresh volume group information and recognize that the extend operation is complete. The host can continue operations.

Logical Volume extension does not require that a host know which other host is the SPM; it could even

be the SPM itself. The storage extension communication is done via a storage mailbox. The storage mailbox is a dedicated logical volume on the data storage domain. A host that needs the SPM to extend a logical volume writes a message in an area designated to that particular host in the storage mailbox. The SPM periodically reads the incoming mail, performs requested logical volume extensions, and writes a reply in the outgoing mail. After sending the request, a host monitors its incoming mail for responses every two seconds. When the host receives a successful reply to its logical volume extension request, it refreshes the logical volume map in device mapper to recognize the newly allocated storage.

When the physical storage available to a storage pool is nearly exhausted, multiple images can run out of usable storage with no means to replenish their resources. A storage pool that exhausts its storage causes QEMU to return an **enospc error**, which indicates that the device no longer has any storage available. At this point, running virtual machines are automatically paused and manual intervention is required to add a new LUN to the volume group.

When a new LUN is added to the volume group, the Storage Pool Manager automatically distributes the additional storage to logical volumes that need it. The automatic allocation of additional resources allows the relevant virtual machines to automatically continue operations uninterrupted or resume operations if stopped.

## 2.13. THE EFFECT OF STORAGE DOMAIN ACTIONS ON STORAGE CAPACITY

**Power on, power off, and reboot a stateless virtual machine**

These three processes affect the copy-on-write (COW) layer in a stateless virtual machine. For more information, see the **Stateless** row of the Virtual Machine General Settings table in the *Virtual Machine Management Guide*.

**Create a storage domain**

Creating a block storage domain results in files with the same names as the seven LVs shown below, and initially should take less capacity.

```
ids          64f87b0f-88d6-49e9-b797-60d36c9df497 -wi-ao---- 128.00m
inbox        64f87b0f-88d6-49e9-b797-60d36c9df497 -wi-a----- 128.00m
leases       64f87b0f-88d6-49e9-b797-60d36c9df497 -wi-a-----   2.00g
master       64f87b0f-88d6-49e9-b797-60d36c9df497 -wi-ao----   1.00g
metadata     64f87b0f-88d6-49e9-b797-60d36c9df497 -wi-a----- 512.00m
outbox       64f87b0f-88d6-49e9-b797-60d36c9df497 -wi-a----- 128.00m
xleases      64f87b0f-88d6-49e9-b797-60d36c9df497 -wi-a-----   1.00g
```

**Delete a storage domain**

Deleting a storage domain frees up capacity on the disk by the same of amount of capacity the process deleted.

**Migrate a storage domain**

Migrating a storage domain does not use additional storage capacity. For more information about migrating storage domains, see Migrating Storage Domains Between Data Centers in the Same Environment in the *Administration Guide*.

**Move a virtual disk to other storage domain**

Migrating a virtual disk requires enough free space to be available on the target storage domain. You can see the target domain's approximate free space in the Administration Portal.

The storage types in the move process affect the visible capacity. For example, if you move a preallocated disk from block storage to file storage, the resulting free space may be considerably smaller than the initial free space.

Live migrating a virtual disk to another storage domain also creates a snapshot, which is automatically merged after the migration is complete. To learn more about moving virtual disks, see Moving a Virtual Disk in the *Administration Guide*.

**Pause a storage domain**

Pausing a storage domain does not use any additional storage capacity.

**Create a snapshot of a virtual machine**

Creating a snapshot of a virtual machine can affect the storage domain capacity.

- Creating a live snapshot uses memory snapshots by default and generates two additional volumes per virtual machine. The first volume is the sum of the memory, video memory, and 200 MB of buffer. The second volume contains the virtual machine configuration, which is several MB in size. When using block storage, rounding up occurs to the nearest unit Red Hat Virtualization can provide.
- Creating an offline snapshot initially consumes 1 GB of block storage and is dynamic up to the size of the disk.
- Cloning a snapshot creates a new disk the same size as the original disk.
- Committing a snapshot removes all child volumes, depending on where in the chain the commit occurs.
- Deleting a snapshot eventually removes the child volume for each disk and is only supported with a running virtual machine.
- Previewing a snapshot creates a temporary volume per disk, so sufficient capacity must be available to allow the creation of the preview.
- Undoing a snapshot preview removes the temporary volume created by the preview.

**Attach and remove direct LUNs**

Attaching and removing direct LUNs does not affect the storage domain since they are not a storage domain component. For more information, see Overview of Live Storage Migration in the *Administration Guide*.

# CHAPTER 3. NETWORKING

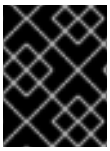
## 3.1. HOST NETWORKING

On the data link layer (layer 2), RHV enables the configuration of Linux bonds to connect to VLANs and define the MTU for network interfaces. These networks can be shared via Linux bridges to virtual machines.

For SR-IOV, you can configure the number of virtual functions and their mapping to logical networks.

FCoE manages its own VLANs. These FCoE managed VLANs are used exclusively for storage access. They are invisible to the Manager and any virtual machines.

iSCSI manages iSCSI bonds. They are not part of RHV's visible host network configuration. You can use iSCSI without iSCSI bonds, which are useful only to improve the reliability of iSCSI storage.



**IMPORTANT**

All hosts in a cluster must use either IPv4 or IPv6 as the IP stack for their management network. Dual stack is not supported.

You can configure the DNS resolver that the host uses.

It is also possible to manage network roles and QoS.

## 3.2. VIRTUAL MACHINE NETWORKING TYPES

In RHV, virtual NICs of virtual machines can connect to the following types of networks:

- Linux bridges
- SR-IOV NICs
- RHV's internal OVN

The following diagram shows the structure of these three approaches, where:

- **Host 1** represents Linux bridges
- **Host 2** represents SR-IOV NICs
- **Host 3** represents OVN

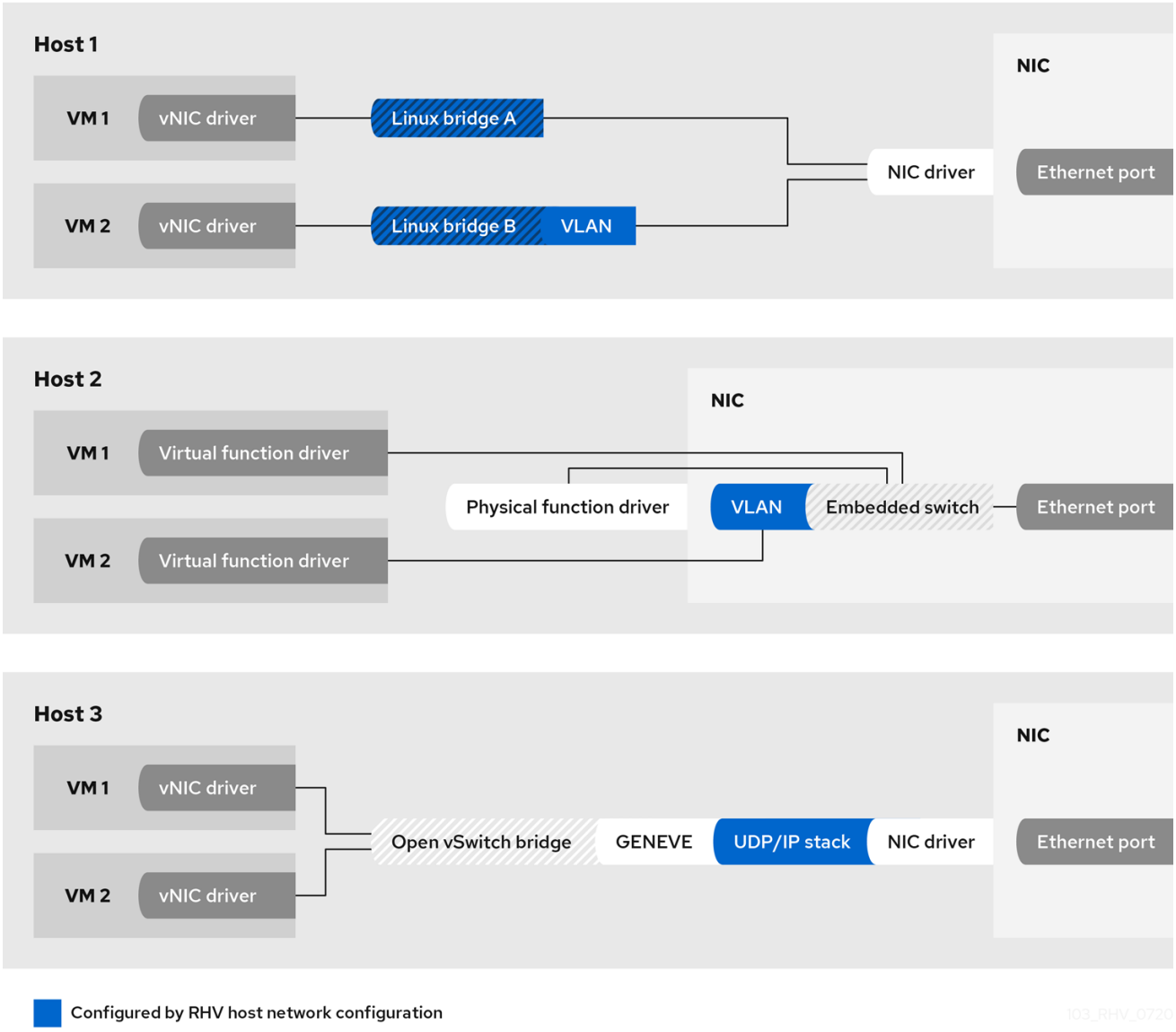



Table 3.1. Comparison of network types

| | Linux bridge | SR-IOV | RHV internal OVN |
|---|---|---|---|
| Isolation from physical host networks | Layer 3, Separate IP network possible | Layer 2, Separate VLANs possible | Isolated |
| Live Migration | x | x | x |
| QoS | x | | |
| Port Mirroring | x | | |
| configuration of plugged vNIC | x | x | |
| MAC address management | x | x | x |

| | Linux bridge | SR-IOV | RHV internal OVN |
|---|---|---|---|
| MTU propagation | x | | x |
| VLAN filtering, might require configuration on the physical switch | x | x | Technology Preview |
| MAC Spoofing Protection | x | | x |
| IP Spoofing Protection | x | | x |
| Predefined Network Filters | x | | |
| Custom Layer 3/4 Filtering | | | x |
| NAT | | | |
| DHCP/Router Advertisements | | | x |
| Layer 3 Router | | | x |
| Performance | ** | *** | * |
| virtual machine network data encapsulation | flat, VLAN | flat, VLAN | Stable: GENEVE; Technology Preview: flat, VLAN |

### Networking choices for various scenarios

Linux bridge is the default, and the most proven option. It fits most use cases.

For scenarios that require very low network latency or a large number of Ethernet frames, consider investing in SR-IOV. Keep in mind, however, that SR-IOV requires hardware support and additional configuration steps.

RHV's internal OVN networks enable virtual machines to communicate with each other without any manual network configuration.

The Manager provides only a subset of software-defined networking (SDN) features and user interfaces. To use all SDN features, similar to RHV's internal OVN or a third-party SDN, you need to use an additional client, such as CloudForms.

You can combine all network types on a single host and connect them to the same virtual machine.

## 3.2.1. Interaction with guest operating system

RHV supports the initial configuration of a virtual machine by providing configuration data via cloud-init. If the qemu-guest-agent runs inside the virtual machine, RHV can report the IP addresses of the virtual machine.

If the virtual machine uses a VirtIO NIC, the MTU of the RHV logical networks are provided to the guest operating system. The guest operating system can pick up the MTU from DHCPv4 or IPv6 router advertisements if the logical network supports these advertisements.

### 3.2.2. Host and virtual machine networking

Linux bridge networking separates virtual machine and host networking on OSI layer 3. Therefore the networking configuration, including VLAN, bonding, and MTU, is shared between the host and its virtual machines.

To reduce their surface, hosts should not assign IP addresses to VLANs that are connected to virtual machines. By not assigning IP addresses, the hosts can avoid potential confusion caused by virtual machine traffic.

The IP address associated with the Linux bridge is not required to be within the same subnet as the virtual machines that use the bridge for connectivity. If the bridge is assigned an IP address on the same subnet as the virtual machines that use it, the host is addressable within the logical network by virtual machines. As a rule, it is not recommended to run network exposed services on a virtualization host.

## 3.3. NETWORK ARCHITECTURE

Networking in Red Hat Virtualization includes basic networking, networking within a cluster, and host networking configurations.

**Basic networking**

The basic hardware and software elements that facilitate networking.

**Networking within a cluster**

Network interactions among cluster objects such as hosts, logical networks and virtual machines.

**Host networking configurations**

Supported configurations for networking within a host.

A well designed and built network ensures that high bandwidth tasks receive adequate bandwidth, that latency does not impact user interactions, and that virtual machines can be successfully migrated within a migration domain. A poorly built network can cause unacceptable latency, and migration and cloning failures that result from network flooding.

An alternative method of managing your network is by integrating with Cisco Application Centric Infrastructure (ACI), by configuring Red Hat Virtualization on Cisco's Application Policy Infrastructure Controller (APIC) version 3.1(1) and later according to Cisco's documentation. On the Red Hat Virtualization side, all that is required is connecting the hosts' NICs to the network and the virtual machines' vNICs to the required network. The remaining configuration tasks are managed by Cisco ACI.

## 3.4. BASIC NETWORKING TERMS

Red Hat Virtualization provides networking functionality between virtual machines, virtualization hosts, and wider networks using:

- Logical networks

- A network interface controller (NIC)
- A Linux bridge
- A Bond
- A virtual network interface controller (vNIC)
- A virtual LAN (VLAN)

NICs, Linux bridges, and vNICs enable network communication between hosts, virtual machines, local area networks, and the Internet. Bonds and VLANs are optionally implemented to enhance security, fault tolerance, and network capacity.

## 3.5. NETWORK INTERFACE CONTROLLER

The network interface controller (NIC) is a network adapter or LAN adapter that connects a computer to a computer network. The NIC operates on both the physical and data link layers of the machine and enables network connectivity. All virtualization hosts in a Red Hat Virtualization environment have at least one NIC, though it is more common for a host to have two or more NICs.

One physical NIC can have multiple virtual NICs (vNICs) logically connected to it. A virtual NIC acts as a network interface for a virtual machine. To distinguish between a vNIC and the NIC that supports it, the Red Hat Virtualization Manager assigns each vNIC a unique MAC address.

## 3.6. LINUX BRIDGE

A Linux bridge is a software device that uses packet forwarding in a packet-switched network. Bridging allows multiple network interface devices to share the connectivity of one NIC and appear on a network as separate physical devices. The bridge examines a packet's source addresses to determine relevant target addresses. Once the target address is determined, the bridge adds the location to a table for future reference. This allows a host to redirect network traffic to virtual machine associated vNICs that are members of a bridge.

Custom properties can be defined for both the bridge and the Ethernet connection. VDSM passes the network definition and custom properties to the setup network hook script.

## 3.7. BONDS

A bond is a collection of multiple network interface cards into a single software-defined device. Because bonded network interfaces combine the transmission capability of the network interface cards included in the bond to act as a single network interface, they can provide greater transmission speed than that of a single network interface card. Also, because all network interface cards in the bond must fail for the bond itself to fail, bonding provides increased fault tolerance. However, one limitation is that the network interface cards that form a bonded network interface must be of the same make and model to ensure that all network interface cards in the bond support the same options and modes.

The packet dispersal algorithm for a bond is determined by the bonding mode used.

**IMPORTANT**

Modes 1, 2, 3 and 4 support both virtual machine (bridged) and non-virtual machine (bridgeless) network types. Modes 0, 5 and 6 support non-virtual machine (bridgeless) networks only.

## 3.8. BONDING MODES

Red Hat Virtualization uses Mode 4 by default, but supports the following common bonding modes:

**Mode 0 (round-robin policy)**

Transmits packets through network interface cards in sequential order. Packets are transmitted in a loop that begins with the first available network interface card in the bond and ends with the last available network interface card in the bond. All subsequent loops then start with the first available network interface card. Mode 0 offers fault tolerance and balances the load across all network interface cards in the bond. However, Mode 0 cannot be used in conjunction with bridges, and is therefore not compatible with virtual machine logical networks.

**Mode 1 (active-backup policy)**

Sets all network interface cards to a backup state while one network interface card remains active. In the event of failure in the active network interface card, one of the backup network interface cards replaces that network interface card as the only active network interface card in the bond. The MAC address of the bond in Mode 1 is visible on only one port to prevent any confusion that might otherwise be caused if the MAC address of the bond changed to reflect that of the active network interface card. Mode 1 provides fault tolerance and is supported in Red Hat Virtualization.

**Mode 2 (XOR policy)**

Selects the network interface card through which to transmit packets based on the result of an XOR operation on the source and destination MAC addresses modulo network interface card **slave** count. This calculation ensures that the same network interface card is selected for each destination MAC address used. Mode 2 provides fault tolerance and load balancing and is supported in Red Hat Virtualization.

**Mode 3 (broadcast policy)**

Transmits all packets to all network interface cards. Mode 3 provides fault tolerance and is supported in Red Hat Virtualization.

**Mode 4 (IEEE 802.3ad policy)**

Creates aggregation groups in which the interfaces share the same speed and duplex settings. Mode 4 uses all network interface cards in the active aggregation group in accordance with the IEEE 802.3ad specification and is supported in Red Hat Virtualization.

**Mode 5 (adaptive transmit load balancing policy)**

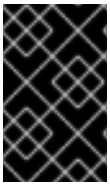
Ensures the distribution of outgoing traffic accounts for the load on each network interface card in the bond and that the current network interface card receives all incoming traffic. If the network interface card assigned to receive traffic fails, another network interface card is assigned to the role of receiving incoming traffic. Mode 5 cannot be used in conjunction with bridges, therefore it is not compatible with virtual machine logical networks.

**Mode 6 (adaptive load balancing policy)**

Combines Mode 5 (adaptive transmit load balancing policy) with receive load balancing for IPv4 traffic without any special switch requirements. ARP negotiation is used for balancing the receive load. Mode 6 cannot be used in conjunction with bridges, therefore it is not compatible with virtual machine logical networks.

## 3.9. SWITCH CONFIGURATION FOR BONDING

Switch configurations vary per the requirements of your hardware. Refer to the deployment and networking configuration guides for your operating system.



IMPORTANT

For every type of switch it is important to set up the switch bonding with the Link Aggregation Control Protocol (LACP) protocol and **not** the Cisco Port Aggregation Protocol (PAgP) protocol.

## 3.10. VIRTUAL NETWORK INTERFACE CARDS

Virtual network interface cards (vNICs) are virtual network interfaces that are based on the physical NICs of a host. Each host can have multiple NICs, and each NIC can be a base for multiple vNICs.

When you attach a vNIC to a virtual machine, the Red Hat Virtualization Manager creates several associations between the virtual machine to which the vNIC is being attached, the vNIC itself, and the physical host NIC on which the vNIC is based. Specifically, when a vNIC is attached to a virtual machine, a new vNIC and MAC address are created on the physical host NIC on which the vNIC is based. Then, the first time the virtual machine starts after that vNIC is attached, **libvirt** assigns the vNIC a PCI address. The MAC address and PCI address are then used to obtain the name of the vNIC (for example, **eth0**) in the virtual machine.

The process for assigning MAC addresses and associating those MAC addresses with PCI addresses is slightly different when creating virtual machines based on templates or snapshots:

- If PCI addresses have already been created for a template or snapshot, the vNICs on virtual machines created based on that template or snapshot are ordered in accordance with those PCI addresses. MAC addresses are then allocated to the vNICs in that order.
- If PCI addresses have not already been created for a template, the vNICs on virtual machines created based on that template are ordered alphabetically. MAC addresses are then allocated to the vNICs in that order.
- If PCI addresses have not already been created for a snapshot, the Red Hat Virtualization Manager allocates new MAC addresses to the vNICs on virtual machines based on that snapshot.

Once created, vNICs are added to a network bridge device. The network bridge devices connect virtual machines to virtual logical networks.

Running the **ip addr show** command on a virtualization host shows all of the vNICs that are associated with virtual machines on that host. Also visible are any network bridges that have been created to back logical networks, and any NICs used by the host.

```
[root@rhev-host-01 ~]# ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 16436 qdisc noqueue state UNKNOWN
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP qlen 1000
    link/ether 00:21:86:a2:85:cd brd ff:ff:ff:ff:ff:ff
    inet6 fe80::221:86ff:fea2:85cd/64 scope link
       valid_lft forever preferred_lft forever
3: wlan0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc mq state DOWN qlen
1000
    link/ether 00:21:6b:cc:14:6c brd ff:ff:ff:ff:ff:ff
5: ;vdsmdummy;: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN
    link/ether 4a:d5:52:c2:7f:4b brd ff:ff:ff:ff:ff:ff
```

```
6: bond0: <BROADCAST,MULTICAST,MASTER> mtu 1500 qdisc noop state DOWN
    link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff
7: bond4: <BROADCAST,MULTICAST,MASTER> mtu 1500 qdisc noop state DOWN
    link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff
8: bond1: <BROADCAST,MULTICAST,MASTER> mtu 1500 qdisc noop state DOWN
    link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff
9: bond2: <BROADCAST,MULTICAST,MASTER> mtu 1500 qdisc noop state DOWN
    link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff
10: bond3: <BROADCAST,MULTICAST,MASTER> mtu 1500 qdisc noop state DOWN
    link/ether 00:00:00:00:00:00 brd ff:ff:ff:ff:ff:ff
11: ovirtmgmt: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state
UNKNOWN
    link/ether 00:21:86:a2:85:cd brd ff:ff:ff:ff:ff:ff
    inet 10.64.32.134/23 brd 10.64.33.255 scope global ovirtmgmt
    inet6 fe80::221:86ff:fea2:85cd/64 scope link
       valid_lft forever preferred_lft forever
```

The console output from the command shows several devices: one loop back device (**lo**), one Ethernet device (**eth0**), one wireless device ( **wlan0**), one VDSM dummy device ( **;vdsmdummy;**), five bond devices (**bond0**, **bond4**, **bond1**, **bond2**, **bond3**), and one network bridge ( **ovirtmgmt**).

vNICs are all members of a network bridge device and logical network. Bridge membership can be displayed using the **brctl show** command:

```
[root@rhev-host-01 ~]# brctl show
bridge name bridge id  STP enabled interfaces
ovirtmgmt  8000.e41f13b7fdd4 no  vnet002
       vnet001
       vnet000
       eth0
```

The console output from the **brctl show** command shows that the virtio vNICs are members of the **ovirtmgmt** bridge. All of the virtual machines that the vNICs are associated with are connected to the **ovirtmgmt** logical network. The **eth0** NIC is also a member of the **ovirtmgmt** bridge. The **eth0** device is cabled to a switch that provides connectivity beyond the host.

## 3.11. VIRTUAL LAN (VLAN)

A VLAN (Virtual LAN) is an attribute that can be applied to network packets. Network packets can be "tagged" into a numbered VLAN. A VLAN is a security feature used to isolate network traffic at the switch level. VLANs are separate and mutually exclusive. The Red Hat Virtualization Manager is VLAN-aware and able to tag and redirect VLAN traffic, however VLAN implementation requires a switch that supports VLANs.

At the switch level, ports are assigned a VLAN designation. A switch applies a VLAN tag to traffic originating from a particular port, marking the traffic as part of a VLAN, and ensures that responses carry the same VLAN tag. A VLAN can extend across multiple switches. VLAN tagged network traffic on a switch is undetectable except by machines connected to a port designated with the correct VLAN. A given port can be tagged into multiple VLANs, which allows traffic from multiple VLANs to be sent to a single port, to be deciphered using software on the machine that receives the traffic.

## 3.12. NETWORK LABELS

You can use network labels to simplify several administrative tasks associated with creating and administering logical networks and associating those logical networks with physical host network interfaces and bonds.

A network label is a plain text, human readable label that you can attach to a logical network or a physical host network interface. Follow these rules when creating a label:

- There is no limit on the length of a label.
- You must use a combination of lowercase and uppercase letters, underscores and hyphens.
- You cannot use use spaces or special characters.

Attaching a label to a logical network or physical host network interface creates an association with other logical networks or physical host network interfaces to which the same label has been attached:

**Network Label Associations**

- When you attach a label to a logical network, that logical network will be automatically associated with any physical host network interfaces with the given label.
- When you attach a label to a physical host network interface, any logical networks with the given label will be automatically associated with that physical host network interface.
- Changing the label attached to a logical network or physical host network interface is the same as removing a label and adding a new label. The association between related logical networks or physical host network interfaces is updated.

**Network Labels and Clusters**

- When a labeled logical network is added to a cluster and there is a physical host network interface in that cluster with the same label, the logical network is automatically added to that physical host network interface.
- When a labeled logical network is detached from a cluster and there is a physical host network interface in that cluster with the same label, the logical network is automatically detached from that physical host network interface.

**Network Labels and Logical Networks With Roles**

- When a labeled logical network is assigned to act as a display network or migration network, that logical network is then configured on the physical host network interface using DHCP so that the logical network can be assigned an IP address.
  Setting a label on a role network (for instance, "a migration network" or "a display network") causes a mass deployment of that network on all hosts. Such mass additions of networks are achieved through the use of DHCP. This method of mass deployment was chosen over a method of typing in static addresses, because of the unscalable nature of the task of typing in many static IP addresses.

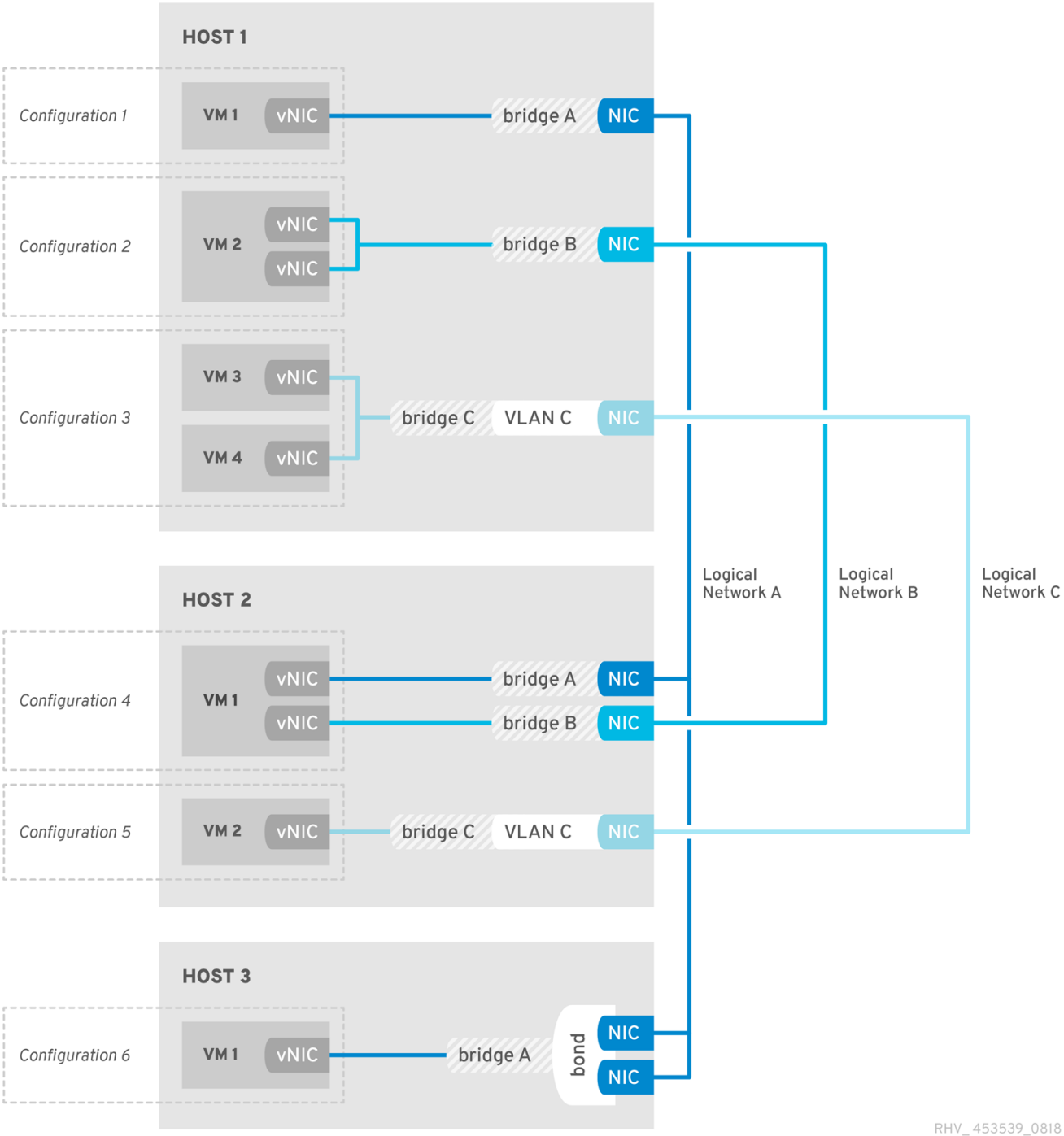
## 3.13. CLUSTER NETWORKING

Cluster level networking objects include:

- Clusters
- Logical Networks

A data center is a logical grouping of multiple clusters and each cluster is a logical group of multiple hosts. The following diagram depicts the contents of a single cluster.

**Figure 3.1. Networking within a cluster**




Hosts in a cluster all have access to the same storage domains. Hosts in a cluster also have logical networks applied to the cluster. For a virtual machine logical network to become operational for use with virtual machines, the network must be defined and implemented for each host in the cluster using the Red Hat Virtualization Manager. Other logical network types can be implemented on only the hosts that use them.

Multi-host network configuration automatically applies any updated network settings to all of the hosts within the data center to which the network is assigned.

## 3.14. LOGICAL NETWORKS

Logical networking enables the Red Hat Virtualization environment to separate network traffic by type. For example, the **ovirtmgmt** network is created by default during the installation of Red Hat Virtualization to be used for management communication between the Manager and hosts. A typical use for logical networks is to group network traffic with similar requirements and usage together. In many cases, a storage network and a display network are created by an administrator to isolate traffic of each respective type for optimization and troubleshooting.

Red Hat Virtualization supports the following logical network types:

- Logical networks that carry only host network traffic, such as storage or migration traffic
- Logical networks that carry host and virtual machine network traffic
- Logical networks that carry only virtual machine network traffic, such as OVN networks

Logical networks are defined at the data center level.

If necessary, the Red Hat Virtualization Manager automatically instantiates logical networks on the host, depending on the type of virtual machine network. For more information, see virtual machine networking types.

**Example 3.1. Example usage of a logical network.**

A system administrator wants to use a logical network to test a web server.

There are two hosts called Red Host and White Host in a cluster called Pink Cluster in a data center called Purple Data Center. Both Red Host and White Host have been using the default logical network, **ovirtmgmt**, for all networking functions. The system administrator responsible for Pink Cluster decides to isolate network testing for a web server by placing the web server and some client virtual machines on a separate logical network. She decides to call the new logical network **test_logical_network**.

1. She creates a new logical network, named **test_logical_network**, for the Purple Data Center with VLAN tagging enabled. VLAN tagging is necessary when you have two logical networks connected to the same physical NIC. She applies **test_logical_network** to the Pink Cluster.
2. In Red Host, she attaches **test_logical_network** to a physical NIC that will be included in the bridge that RHV creates. The network is non-operational until she sets up the corresponding bridge in all hosts in the cluster by adding a physical network interface on each host in the Pink cluster to **test_logical_network**. She repeats this step for White Host. When both White Host and Red Host have the **test_logical_network** logical network bridged to a physical network interface, the **test_logical_network** becomes operational and is ready to be used by virtual machines.
3. She associates the virtual machines on the Red Host and White Host with the new network.

## 3.15. REQUIRED NETWORKS, OPTIONAL NETWORKS, AND VIRTUAL MACHINE NETWORKS

A required network is a logical network that must be available to all hosts in a cluster. When a host's required network becomes non-operational, virtual machines running on that host are migrated to another host; the extent of this migration is dependent upon the chosen scheduling policy. This is

beneficial if you have virtual machines running mission critical workloads.

An optional network is a logical network that has not been explicitly declared as **Required**. Optional networks can be implemented on only the hosts that use them. The presence or absence of optional networks does not affect the **Operational** status of a host. When a non-required network becomes non-operational, the virtual machines running on the network are not migrated to another host. This prevents unnecessary I/O overload caused by mass migrations. Note that when a logical network is created and added to clusters, the **Required** box is selected by default.

To change a network's **Required** designation, from the Administration Portal, select a network, click the **Cluster** tab, and click the **Manage Networks** button.

A virtual machine network, called a **VM network** in the user interface, is a logical network designated to carry only virtual machine network traffic. A virtual machine network can be required or optional. Virtual machines that use an optional virtual machine network only start on hosts with that network.

## 3.16. PORT MIRRORING

Port mirroring copies layer 3 network traffic on a given logical network and host to a virtual interface on a virtual machine. This virtual machine can be used for network debugging and tuning, intrusion detection, and monitoring the behavior of other virtual machines on the same host and logical network.

The only traffic copied is internal to one logical network on one host. There is no increase in traffic on the network external to the host. However, a virtual machine with port mirroring enabled uses more host CPU and RAM than other virtual machines.

Port mirroring is enabled or disabled in the vNIC profiles of logical networks, and has the following limitations:

- Hot linking vNICs with a profile that has port mirroring enabled is not supported.
- Port mirroring cannot be altered when the vNIC profile is attached to a virtual machine.

Given the above limitations, it is recommended that you enable port mirroring on an additional, dedicated vNIC profile.

**IMPORTANT**

Enabling port mirroring reduces the privacy of other network users.

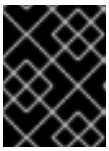
## 3.17. HOST NETWORKING CONFIGURATIONS

Cluster Networking can be helpful to understand these networking configurations.

Common types of networking configurations for virtualization hosts include:

- **Bridge and NIC configuration.**
  This configuration uses a Linux bridge to connect one or more virtual machines to the host's NIC.

  An example of this configuration is the automatic creation of the **ovirtmgmt** network when installing the Red Hat Virtualization Manager. Then, during host installation, the Red Hat Virtualization Manager installs **VDSM** on the host. The **VDSM** installation process creates the **ovirtmgmt** bridge which obtains the host's IP address to enable communication with the Manager.



IMPORTANT

All hosts in a cluster must use either IPv4 or IPv6 as the IP stack for their management network. Dual stack is not supported.

- **Bridge, VLAN, and NIC configuration.**
  A VLAN can be included in the bridge and NIC configuration to provide a secure channel for data transfer over the network and supports connecting multiple bridges to a single NIC using multiple VLANs.

- **Bridge, Bond, and VLAN configuration.**
  A bond creates a logical link that combines the two (or more) physical Ethernet links. The resultant benefits include NIC fault tolerance and potential bandwidth extension, depending on the bonding mode.

- **Multiple Bridge, Multiple VLAN, and NIC configuration.**
  This configuration connects a NIC to multiple VLANs.

  For example, to connect a single NIC to two VLANs, the network switch can be configured to pass network traffic that has been tagged into one of the two VLANs to one NIC on the host. The host uses two vNICs to separate VLAN traffic, one for each VLAN. Traffic tagged into either VLAN then connects to a separate bridge by having the appropriate vNIC as a bridge member. Each bridge, in turn, connects to multiple virtual machines.

NOTE

You can also bond multiple NICs to facilitate a connection with multiple VLANs. Each VLAN in this configuration is defined over the bond comprising the multiple NICs. Each VLAN connects to an individual bridge and each bridge connects to one or more guests.

# CHAPTER 4. POWER MANAGEMENT

## 4.1. INTRODUCTION TO POWER MANAGEMENT AND FENCING

The Red Hat Virtualization environment is most flexible and resilient when power management and fencing have been configured. Power management allows the Red Hat Virtualization Manager to control host power cycle operations, most importantly to reboot hosts on which problems have been detected. Fencing is used to isolate problem hosts from a functional Red Hat Virtualization environment by rebooting them, in order to prevent performance degradation. Fenced hosts can then be returned to responsive status through administrator action and be reintegrated into the environment.

Power management and fencing make use of special dedicated hardware in order to restart hosts independently of host operating systems. The Red Hat Virtualization Manager connects to a power management devices using a network IP address or hostname. In the context of Red Hat Virtualization, a power management device and a fencing device are the same thing.

## 4.2. POWER MANAGEMENT BY PROXY IN RED HAT VIRTUALIZATION

The Red Hat Virtualization Manager does not communicate directly with fence agents. Instead, the Manager uses a proxy to send power management commands to a host power management device. The Manager uses VDSM to execute power management device actions, so another host in the environment is used as a fencing proxy.

You can select between:

- Any host in the same cluster as the host requiring fencing.
- Any host in the same data center as the host requiring fencing.

A viable fencing proxy host has a status of either **UP** or **Maintenance**.

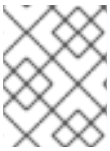
## 4.3. POWER MANAGEMENT

The Red Hat Virtualization Manager is capable of rebooting hosts that have entered a non-operational or non-responsive state, as well as preparing to power off under-utilized hosts to save power. This functionality depends on a properly configured power management device. The Red Hat Virtualization environment supports the following power management devices:

- American Power Conversion (**apc**)
- IBM Bladecenter (**Bladecenter**)
- Cisco Unified Computing System (**cisco_ucs**)
- Dell Remote Access Card 5 (**drac5**)
- Dell Remote Access Card 7 (**drac7**)
- Electronic Power Switch (**eps**)
- HP BladeSystem (**hpblade**)
- Integrated Lights Out (**ilo**, **ilo2**, **ilo3**, **ilo4**)
- Intelligent Platform Management Interface (**ipmilan**)

- Remote Supervisor Adapter (**rsa**)
- Fujitsu-Siemens RSB (**rsb**)
- Western Telematic, Inc (**wti**)

HP servers should use **ilo3** or **ilo4**, Dell servers use **drac5** or Integrated Dell Remote Access Controllers (**idrac**), and IBM servers use **ipmilan**. Integrated Management Module (IMM) uses the IPMI protocol, and therefore IMM users can use **ipmilan**.



NOTE

APC 5.x power management devices are not supported by the **apc** fence agent. Use the **apc_snmp** fence agent instead.

In order to communicate with the listed power management devices, the Red Hat Virtualization Manager makes use of fence agents. The Red Hat Virtualization Manager allows administrators to configure a fence agent for the power management device in their environment with parameters the device will accept and respond to. Basic configuration options can be configured using the graphical user interface. Special configuration options can also be entered, and are passed un-parsed to the fence device. Special configuration options are specific to a given fence device, while basic configuration options are for functionalities provided by all supported power management devices. The basic functionalities provided by all power management devices are:

- **Status**: check the status of the host.
- **Start**: power on the host.
- **Stop**: power down the host.
- **Restart**: restart the host. Actually implemented as stop, wait, status, start, wait, status.

Best practice is to test the power management configuration once when initially configuring it, and occasionally after that to ensure continued functionality.

Resilience is provided by properly configured power management devices in all of the hosts in an environment. Fencing agents allow the Red Hat Virtualization Manager to communicate with host power management devices to bypass the operating system on a problem host, and isolate the host from the rest of its environment by rebooting it. The Manager can then reassign the SPM role, if it was held by the problem host, and safely restart any highly available virtual machines on other hosts.

## 4.4. FENCING

In the context of the Red Hat Virtualization environment, fencing is a host reboot initiated by the Manager using a fence agent and performed by a power management device. Fencing allows a cluster to react to unexpected host failures as well as enforce power saving, load balancing, and virtual machine availability policies.

Fencing ensures that the role of Storage Pool Manager (SPM) is always assigned to a functional host. If the fenced host was the SPM, the SPM role is relinquished and reassigned to a responsive host. Because the host with the SPM role is the only host that is able to write data domain structure metadata, a non-responsive, un-fenced SPM host causes its environment to lose the ability to create and destroy virtual disks, take snapshots, extend logical volumes, and all other actions that require changes to data domain structure metadata.

When a host becomes non-responsive, all of the virtual machines that are currently running on that host can also become non-responsive. However, the non-responsive host retains the lock on the virtual machine hard disk images for virtual machines it is running. Attempting to start a virtual machine on a second host and assign the second host write privileges for the virtual machine hard disk image can cause data corruption.

Fencing allows the Red Hat Virtualization Manager to assume that the lock on a virtual machine hard disk image has been released; the Manager can use a fence agent to confirm that the problem host has been rebooted. When this confirmation is received, the Red Hat Virtualization Manager can start a virtual machine from the problem host on another host without risking data corruption. Fencing is the basis for highly-available virtual machines. A virtual machine that has been marked highly-available can not be safely started on an alternate host without the certainty that doing so will not cause data corruption.

When a host becomes non-responsive, the Red Hat Virtualization Manager allows a grace period of thirty (30) seconds to pass before any action is taken, to allow the host to recover from any temporary errors. If the host has not become responsive by the time the grace period has passed, the Manager automatically begins to mitigate any negative impact from the non-responsive host. The Manager uses the fencing agent for the power management card on the host to stop the host, confirm it has stopped, start the host, and confirm that the host has been started. When the host finishes booting, it attempts to rejoin the cluster that it was a part of before it was fenced. If the issue that caused the host to become non-responsive has been resolved by the reboot, then the host is automatically set to **Up** status and is once again capable of starting and hosting virtual machines.

## 4.5. SOFT-FENCING HOSTS

Hosts can sometimes become non-responsive due to an unexpected problem, and though VDSM is unable to respond to requests, the virtual machines that depend upon VDSM remain alive and accessible. In these situations, restarting VDSM returns VDSM to a responsive state and resolves this issue.

"SSH Soft Fencing" is a process where the Manager attempts to restart VDSM via SSH on non-responsive hosts. If the Manager fails to restart VDSM via SSH, the responsibility for fencing falls to the external fencing agent if an external fencing agent has been configured.

Soft-fencing over SSH works as follows. Fencing must be configured and enabled on the host, and a valid proxy host (a second host, in an UP state, in the data center) must exist. When the connection between the Manager and the host times out, the following happens:

1. On the first network failure, the status of the host changes to "connecting".

2. The Manager then makes three attempts to ask VDSM for its status, or it waits for an interval determined by the load on the host. The formula for determining the length of the interval is configured by the configuration values TimeoutToResetVdsInSeconds (the default is 60 seconds) + [DelayResetPerVmInSeconds (the default is 0.5 seconds)]*(the count of running virtual machines on host) + [DelayResetForSpmInSeconds (the default is 20 seconds)] * 1 (if host runs as SPM) or 0 (if the host does not run as SPM). To give VDSM the maximum amount of time to respond, the Manager chooses the longer of the two options mentioned above (three attempts to retrieve the status of VDSM or the interval determined by the above formula).

3. If the host does not respond when that interval has elapsed, **vdsm restart** is executed via SSH.

4. If **vdsm restart** does not succeed in re-establishing the connection between the host and the Manager, the status of the host changes to **Non Responsive** and, if power management is configured, fencing is handed off to the external fencing agent.

NOTE

Soft-fencing over SSH can be executed on hosts that have no power management configured. This is distinct from "fencing": fencing can be executed only on hosts that have power management configured.

## 4.6. USING MULTIPLE POWER MANAGEMENT FENCING AGENTS

Single agents are treated as primary agents. The secondary agent is valid when there are two fencing agents, for example for dual-power hosts in which each power switch has two agents connected to the same power switch. Agents can be of the same or different types.

Having multiple fencing agents on a host increases the reliability of the fencing procedure. For example, when the sole fencing agent on a host fails, the host will remain in a non-operational state until it is manually rebooted. The virtual machines previously running on the host will be suspended, and only fail over to another host in the cluster after the original host is manually fenced. With multiple agents, if the first agent fails, the next agent can be called.

When two fencing agents are defined on a host, they can be configured to use a concurrent or sequential flow:

- **Concurrent**: Both primary and secondary agents have to respond to the Stop command for the host to be stopped. If one agent responds to the Start command, the host will go up.
- **Sequential**: To stop or start a host, the primary agent is used first, and if it fails, the secondary agent is used.

# CHAPTER 5. LOAD BALANCING, SCHEDULING, AND MIGRATION

## 5.1. LOAD BALANCING, SCHEDULING, AND MIGRATION

Individual hosts have finite hardware resources, and are susceptible to failure. To mitigate against failure and resource exhaustion, hosts are grouped into clusters, which are essentially a grouping of shared resources. A Red Hat Virtualization environment responds to changes in demand for host resources using load balancing policy, scheduling, and migration. The Manager is able to ensure that no single host in a cluster is responsible for all of the virtual machines in that cluster. Conversely, the Manager is able to recognize an underutilized host, and migrate all virtual machines off of it, allowing an administrator to shut down that host to save power.

Available resources are checked as a result of three events:

- Virtual machine start - Resources are checked to determine on which host a virtual machine will start.
- Virtual machine migration - Resources are checked in order to determine an appropriate target host.
- Time elapses - Resources are checked at a regular interval to determine whether individual host load is in compliance with cluster load balancing policy.

The Manager responds to changes in available resources by using the load balancing policy for a cluster to schedule the migration of virtual machines from one host in a cluster to another. The relationship between load balancing policy, scheduling, and virtual machine migration are discussed in the following sections.

## 5.2. LOAD BALANCING POLICY

Load balancing policy is set for a cluster, which includes one or more hosts that may each have different hardware parameters and available memory. The Red Hat Virtualization Manager uses a load balancing policy to determine which host in a cluster to start a virtual machine on. Load balancing policy also allows the Manager determine when to move virtual machines from over-utilized hosts to under-utilized hosts.

The load balancing process runs once every minute for each cluster in a data center. It determines which hosts are over-utilized, which are hosts under-utilized, and which are valid targets for virtual machine migration. The determination is made based on the load balancing policy set by an administrator for a given cluster. The options for load balancing policies are **VM_Evenly_Distributed**, **Evenly_Distributed**, **Power_Saving**, **Cluster_Maintenance**, and **None**.

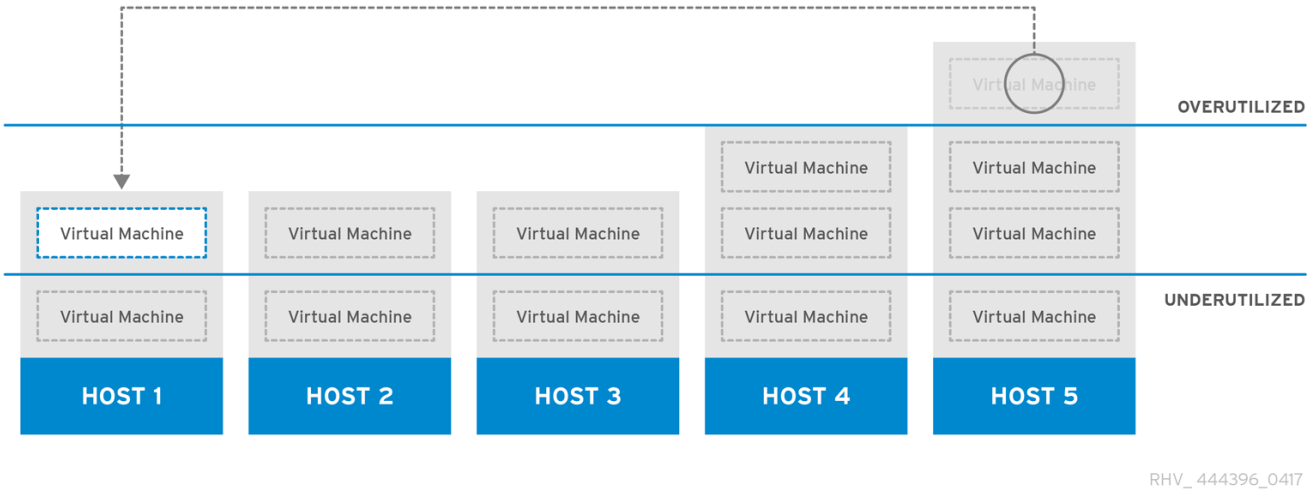
## 5.3. LOAD BALANCING POLICY: VM_EVENLY_DISTRIBUTED

A virtual machine evenly distributed load balancing policy distributes virtual machines evenly between hosts based on a count of the virtual machines. The high virtual machine count is the maximum number of virtual machines that can run on each host, beyond which qualifies as overloading the host. The VM_Evenly_Distributed policy allows an administrator to set a high virtual machine count for hosts. The maximum inclusive difference in virtual machine count between the most highly-utilized host and the least-utilized host is also set by an administrator. The cluster is balanced when every host in the cluster has a virtual machine count that falls inside this migration threshold. The administrator also sets the number of slots for virtual machines to be reserved on SPM hosts. The SPM host will have a lower load than other hosts, so this variable defines how many fewer virtual machines than other hosts it can run. If any host is running more virtual machines than the high virtual machine count and at least one host has a

virtual machine count that falls outside of the migration threshold, virtual machines are migrated one by one to the host in the cluster that has the lowest CPU utilization. One virtual machine is migrated at a time until every host in the cluster has a virtual machine count that falls within the migration threshold.

## 5.4. LOAD BALANCING POLICY: EVENLY_DISTRIBUTED

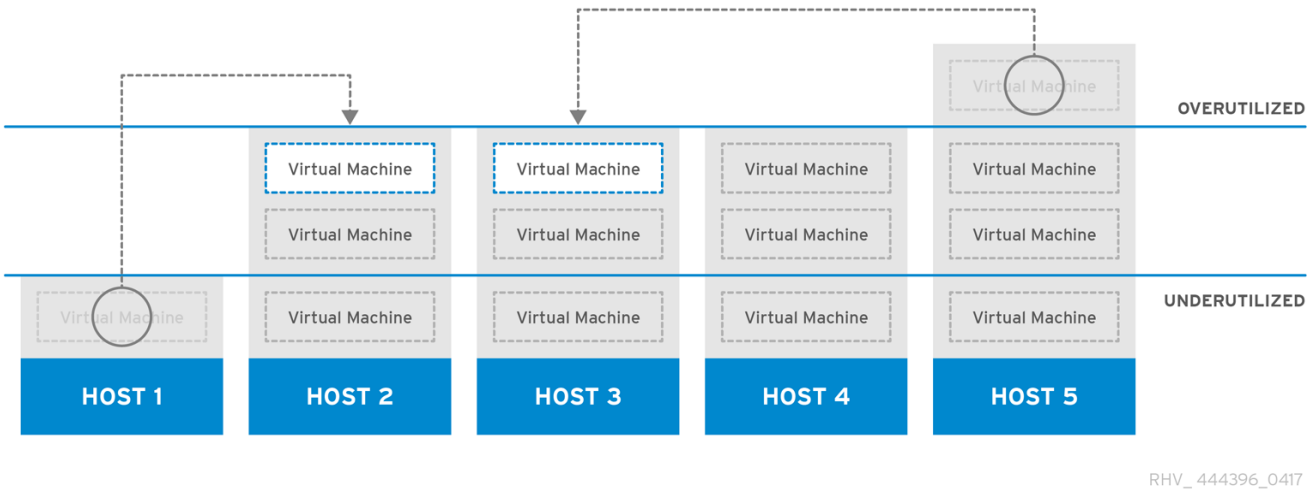
**Figure 5.1. Evenly Distributed Scheduling Policy**




An evenly distributed load balancing policy selects the host for a new virtual machine according to lowest CPU load or highest available memory. The maximum CPU load and minimum available memory that is allowed for hosts in a cluster for a set amount of time are defined by the evenly distributed scheduling policy's parameters. Beyond these limits the environment's performance will degrade. The evenly distributed policy allows an administrator to set these levels for running virtual machines. If a host has reached the defined maximum CPU load or minimum available memory and the host stays there for more than the set time, virtual machines on that host are migrated one by one to the host in the cluster that has the lowest CPU or highest available memory depending on which parameter is being utilized. Host resources are checked once per minute, and one virtual machine is migrated at a time until the host CPU load is below the defined limit or the host available memory is above the defined limit.

## 5.5. LOAD BALANCING POLICY: POWER_SAVING

**Figure 5.2. Power Saving Scheduling Policy**




A power saving load balancing policy selects the host for a new virtual machine according to lowest CPU or highest available memory. The maximum CPU load and minimum available memory that is allowed for hosts in a cluster for a set amount of time is defined by the power saving scheduling policy's parameters.

Beyond these limits the environment's performance will degrade. The power saving parameters also define the minimum CPU load and maximum available memory allowed for hosts in a cluster for a set amount of time before the continued operation of a host is considered an inefficient use of electricity. If a host has reached the maximum CPU load or minimum available memory and stays there for more than the set time, the virtual machines on that host are migrated one by one to the host that has the lowest CPU or highest available memory depending on which parameter is being utilized. Host resources are checked once per minute, and one virtual machine is migrated at a time until the host CPU load is below the defined limit or the host available memory is above the defined limit. If the host's CPU load falls below the defined minimum level or the host's available memory rises above the defined maximum level the virtual machines on that host are migrated to other hosts in the cluster as long as the other hosts in the cluster remain below maximum CPU load and above minimum available memory. When an under-utilized host is cleared of its remaining virtual machines, the Manager will automatically power down the host machine, and restart it again when load balancing requires or there are not enough free hosts in the cluster.

## 5.6. LOAD BALANCING POLICY: NONE

If no load balancing policy is selected, virtual machines are started on the host within a cluster with the lowest CPU utilization and available memory. To determine CPU utilization a combined metric is used that takes into account the virtual CPU count and the CPU usage percent. This approach is the least dynamic, as the only host selection point is when a new virtual machine is started. Virtual machines are not automatically migrated to reflect increased demand on a host.

An administrator must decide which host is an appropriate migration target for a given virtual machine. Virtual machines can also be associated with a particular host using pinning. Pinning prevents a virtual machine from being automatically migrated to other hosts. For environments where resources are highly consumed, manual migration is the best approach.

## 5.7. LOAD BALANCING POLICY: CLUSTER_MAINTENANCE

A cluster maintenance scheduling policy limits activity in a cluster during maintenance tasks. When a cluster maintenance policy is set:

- No new virtual machines may be started, except highly available virtual machines. (Users can create highly available virtual machines and start them manually.)
- In the event of host failure, highly available virtual machines will restart properly and any virtual machine can migrate.

## 5.8. HIGHLY AVAILABLE VIRTUAL MACHINE RESERVATION

A highly available (HA) virtual machine reservation policy enables the Red Hat Virtualization Manager to monitor cluster capacity for highly available virtual machines. The Manager has the capability to flag individual virtual machines for High Availability, meaning that in the event of a host failure, these virtual machines will be rebooted on an alternative host. This policy balances highly available virtual machines across the hosts in a cluster. If any host in the cluster fails, the remaining hosts can support the migrating load of highly available virtual machines without affecting cluster performance. When highly available virtual machine reservation is enabled, the Manager ensures that appropriate capacity exists within a cluster for HA virtual machines to migrate in the event that their existing host fails unexpectedly.

## 5.9. SCHEDULING

In Red Hat Virtualization, scheduling refers to the way the Red Hat Virtualization Manager selects a host in a cluster as the target for a new or migrated virtual machine.

For a host to be eligible to start a virtual machine or accept a migrated virtual machine from another host, it must have enough free memory and CPUs to support the requirements of the virtual machine being started on or migrated to it. A virtual machine will not start on a host with an overloaded CPU. By default, a host's CPU is considered overloaded if it has a load of more than 80% for 5 minutes, but these values can be changed using scheduling policies. If multiple hosts are eligible targets, one will be selected based on the load balancing policy for the cluster. For example, if the Evenly_Distributed policy is in effect, the Manager chooses the host with the lowest CPU utilization. If the Power_Saving policy is in effect, the host with the lowest CPU utilization between the maximum and minimum service levels will be selected. The Storage Pool Manager (SPM) status of a given host also affects eligibility as a target for starting virtual machines or virtual machine migration. A non-SPM host is a preferred target host, for instance, the first virtual machine started in a cluster will not run on the SPM host if the SPM role is held by a host in that cluster.

See Scheduling Policies in the *Administration Guide* for more information.

## 5.10. MIGRATION

The Red Hat Virtualization Manager uses migration to enforce load balancing policies for a cluster. Virtual machine migration takes place according to the load balancing policy for a cluster and current demands on hosts within a cluster. Migration can also be configured to automatically occur when a host is fenced or moved to maintenance mode. The Red Hat Virtualization Manager first migrates virtual machines with the lowest CPU utilization. This is calculated as a percentage, and does not take into account RAM usage or I/O operations, except as I/O operations affect CPU utilization. If there are more than one virtual machines with the same CPU usage, the one that will be migrated first is the first virtual machine returned by the database query run by the Red Hat Virtualization Manager to determine virtual machine CPU usage.

Virtual machine migration has the following limitations by default:

- A bandwidth limit of 52 MiBps is imposed on each virtual machine migration.
- A migration will time out after 64 seconds per GB of virtual machine memory.
- A migration will abort if progress is stalled for 240 seconds.
- Concurrent outgoing migrations are limited to one per CPU core per host, or 2, whichever is smaller.

See Understanding live migration "migration_max_bandwidth" and "max_outgoing_migrations" parameters in vdsm.conf for details about tuning migration settings.

# CHAPTER 6. DIRECTORY SERVICES

## 6.1. DIRECTORY SERVICES

The Red Hat Virtualization platform relies on directory services for user authentication and authorization. Interactions with all Manager interfaces, including the VM Portal, Administration Portal, and REST API are limited to authenticated, authorized users. Virtual machines within the Red Hat Virtualization environment can use the same directory services to provide authentication and authorization, however they must be configured to do so. The currently supported providers of directory services for use with the Red Hat Virtualization Manager are Identity Management (IdM), Red Hat Directory Server 9 (RHDS), Active Directory (AD), and OpenLDAP. The Red Hat Virtualization Manager interfaces with the directory server for:

- Portal logins (User, Power User, Administrator, REST API).
- Queries to display user information.
- Adding the Manager to a domain.

Authentication is the verification and identification of a party who generated some data, and of the integrity of the generated data. A principal is the party whose identity is verified. The verifier is the party who demands assurance of the principal's identity. In the case of Red Hat Virtualization, the Manager is the verifier and a user is a principal. Data integrity is the assurance that the data received is the same as the data generated by the principal.

Confidentiality and authorization are closely related to authentication. Confidentiality protects data from disclosure to those not intended to receive it. Strong authentication methods can optionally provide confidentiality. Authorization determines whether a principal is allowed to perform an operation. Red Hat Virtualization uses directory services to associate users with roles and provide authorization accordingly. Authorization is usually performed after the principal has been authenticated, and may be based on information local or remote to the verifier.

During installation, a local, internal domain is automatically configured for administration of the Red Hat Virtualization environment. After the installation is complete, more domains can be added.

## 6.2. LOCAL AUTHENTICATION: INTERNAL DOMAIN

The Red Hat Virtualization Manager creates a limited, internal administration domain during installation. This domain is not the same as an AD or IdM domain, because it exists based on a key in the Red Hat Virtualization PostgreSQL database rather than as a directory service user on a directory server. The internal domain is also different from an external domain because the internal domain will only have one user: the **admin@internal** user. Taking this approach to initial authentication allows Red Hat Virtualization to be evaluated without requiring a complete, functional directory server, and ensures an administrative account is available to troubleshoot any issues with external directory services.

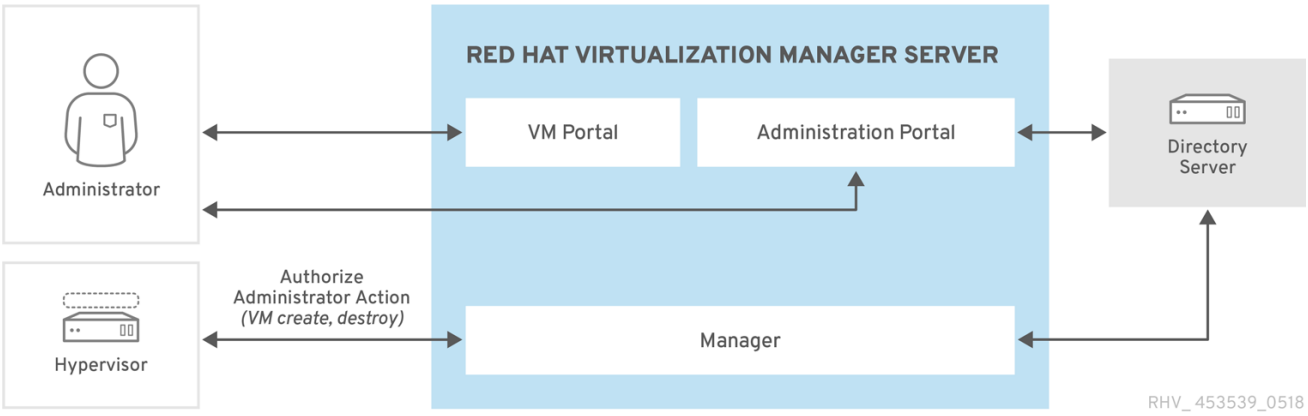
The admin@internal user is for the initial configuration of an environment. This includes installing and accepting hosts, adding external AD or IdM authentication domains, and delegating permissions to users from external domains.

## 6.3. REMOTE AUTHENTICATION USING GSSAPI

In the context of Red Hat Virtualization, remote authentication refers to authentication that is handled by a remote service, not the Red Hat Virtualization Manager. Remote authentication is used for user or API connections coming to the Manager from within an AD, IdM, or RHDS domain. The Red Hat

Virtualization Manager must be configured by an administrator using the **engine-manage-domains** tool to be a part of an RHDS, AD, or IdM domain. This requires that the Manager be provided with credentials for an account from the RHDS, AD, or IdM directory server for the domain with sufficient privileges to join a system to the domain. After domains have been added, domain users can be authenticated by the Red Hat Virtualization Manager against the directory server using a password. The Manager uses a framework called the Simple Authentication and Security Layer (SASL) which in turn uses the Generic Security Services Application Program Interface (GSSAPI) to securely verify the identity of a user, and ascertain the authorization level available to the user.

**Figure 6.1. GSSAPI Authentication**



# CHAPTER 7. TEMPLATES AND POOLS

## 7.1. TEMPLATES AND POOLS

The Red Hat Virtualization environment provides administrators with tools to simplify the provisioning of virtual machines to users. These are templates and pools. A template is a shortcut that allows an administrator to quickly create a new virtual machine based on an existing, pre-configured virtual machine, bypassing operating system installation and configuration. This is especially helpful for virtual machines that will be used like appliances, for example web server virtual machines. If an organization uses many instances of a particular web server, an administrator can create a virtual machine that will be used as a template, installing an operating system, the web server, any supporting packages, and applying unique configuration changes. The administrator can then create a template based on the working virtual machine that will be used to create new, identical virtual machines as they are required.

Virtual machine pools are groups of virtual machines based on a given template that can be rapidly provisioned to users. Permission to use virtual machines in a pool is granted at the pool level; a user who is granted permission to use the pool will be assigned any virtual machine from the pool. Inherent in a virtual machine pool is the transitory nature of the virtual machines within it. Because users are assigned virtual machines without regard for which virtual machine in the pool they have used in the past, pools are not suited for purposes which require data persistence. Virtual machine pools are best suited for scenarios where either user data is stored in a central location and the virtual machine is a means to accessing and using that data, or data persistence is not important. The creation of a pool results in the creation of the virtual machines that populate the pool, in a stopped state. These are then started on user request.

## 7.2. TEMPLATES

To create a template, an administrator creates and customizes a virtual machine. Desired packages are installed, customized configurations are applied, the virtual machine is prepared for its intended purpose in order to minimize the changes that must be made to it after deployment. An optional but recommended step before creating a template from a virtual machine is generalization. Generalization is used to remove details like system user names, passwords, and timezone information that will change upon deployment. Generalization does not affect customized configurations. Generalization of Windows and Linux guests in the Red Hat Virtualization environment is discussed further in Templates in the *Virtual Machine Management Guide*. Red Hat Enterprise Linux guests are generalized using **sys-unconfig**. Windows guests are generalized using **sys-prep**.

When the virtual machine that provides the basis for a template is satisfactorily configured, generalized if desired, and stopped, an administrator can create a template from the virtual machine. Creating a template from a virtual machine causes a read-only copy of the specially configured virtual disk to be created. The read-only image forms the backing image for all subsequently created virtual machines that are based on that template. In other words, a template is essentially a customized read-only virtual disk with an associated virtual hardware configuration. The hardware can be changed in virtual machines created from a template, for instance, provisioning two gigabytes of RAM for a virtual machine created from a template that has one gigabyte of RAM. The template virtual disk, however, cannot be changed as doing so would result in changes for all virtual machines based on the template.

When a template has been created, it can be used as the basis for multiple virtual machines. Virtual machines are created from a given template using a **Thin** provisioning method or a **Clone** provisioning method. Virtual machines that are cloned from templates take a complete writable copy of the template base image, sacrificing the space savings of the thin creation method in exchange for no longer depending on the presence of the template. Virtual machines that are created from a template using the thin method use the read-only image from the template as a base image, requiring that the template and all virtual machines created from it be stored on the same storage domain. Changes to data and newly generated data are stored in a copy-on-write image. Each virtual machine based on a template

uses the same base read-only image, as well as a copy-on-write image that is unique to the virtual machine. This provides storage savings by limiting the number of times identical data is kept in storage. Furthermore, frequent use of the read-only backing image can cause the data being accessed to be cached, resulting in a net performance increase.

## 7.3. POOLS

Virtual machine pools allow for rapid provisioning of numerous identical virtual machines to users as desktops. Users who have been granted permission to access and use virtual machines from a pool receive an available virtual machine based on their position in a queue of requests. Virtual machines in a pool do not allow data persistence; each time a virtual machine is assigned from a pool, it is allocated in its base state. This is ideally suited to be used in situations where user data is stored centrally.

Virtual machine pools are created from a template. Each virtual machine in a pool uses the same backing read-only image, and uses a temporary copy-on-write image to hold changed and newly generated data. Virtual machines in a pool are different from other virtual machines in that the copy-on-write layer that holds user-generated and -changed data is lost at shutdown. The implication of this is that a virtual machine pool requires no more storage than the template that backs it, plus some space for data generated or changed during use. Virtual machine pools are an efficient way to provide computing power to users for some tasks without the storage cost of providing each user with a dedicated virtual desktop.

> **Example 7.1. Example Pool Usage**
>
> A technical support company employs 10 help desk staff. However, only five are working at any given time. Instead of creating ten virtual machines, one for each help desk employee, a pool of five virtual machines can be created. Help desk employees allocate themselves a virtual machine at the beginning of their shift and return it to the pool at the end.

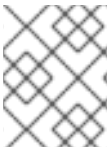
# CHAPTER 8. VIRTUAL MACHINE SNAPSHOTS

## 8.1. SNAPSHOTS

Snapshots are a storage function that allows an administrator to create a restore point of a virtual machine's operating system, applications, and data at a certain point in time. Snapshots save the data currently present in a virtual machine hard disk image as a COW volume and allow for a recovery to the data as it existed at the time the snapshot was taken. A snapshot causes a new COW layer to be created over the current layer. All write actions performed after a snapshot is taken are written to the new COW layer.

It is important to understand that a virtual machine hard disk image is a chain of one or more volumes. From the perspective of a virtual machine, these volumes appear as a single disk image. A virtual machine is oblivious to the fact that its disk is comprised of multiple volumes.

The term COW volume and COW layer are used interchangeably, however, layer more clearly recognizes the temporal nature of snapshots. Each snapshot is created to allow an administrator to discard unsatisfactory changes made to data **after** the snapshot is taken. Snapshots provide similar functionality to the **Undo** function present in many word processors.



**NOTE**

Snapshots of virtual machine hard disks marked **shareable** and those that are based on **Direct LUN** connections are not supported, live or otherwise.

The three primary snapshot operations are:

- Creation, which involves the first snapshot created for a virtual machine.
- Previews, which involves previewing a snapshot to determine whether or not to restore the system data to the point in time that the snapshot was taken.
- Deletion, which involves deleting a restoration point that is no longer required.

For task-based information about snapshot operations, see Snapshots in the *Red Hat Virtualization Virtual Machine Management Guide*.

## 8.2. LIVE SNAPSHOTS IN RED HAT VIRTUALIZATION

Snapshots of virtual machine hard disks marked **shareable** and those that are based on **Direct LUN** connections are not supported, live or otherwise.

Any other virtual machine that is not being cloned or migrated can have a snapshot taken when running, paused, or stopped.

When a live snapshot of a virtual machine is initiated, the Manager requests that the SPM host create a new volume for the virtual machine to use. When the new volume is ready, the Manager uses VDSM to communicate with libvirt and qemu on the host running the virtual machine that it should begin using the new volume for virtual machine write operations. If the virtual machine is able to write to the new volume, the snapshot operation is considered a success and the virtual machine stops writing to the previous volume. If the virtual machine is unable to write to the new volume, the snapshot operation is considered a failure, and the new volume is deleted.

The virtual machine requires access to both its current volume and the new one from the time when a live snapshot is initiated until after the new volume is ready, so both volumes are opened with read-write access.

Virtual machines with an installed guest agent that supports quiescing can ensure filesystem consistency across snapshots. Registered Red Hat Enterprise Linux guests can install the **qemu-guest-agent** to enable quiescing before snapshots.

If a quiescing compatible guest agent is present on a virtual machine when it a snapshot is taken, VDSM uses libvirt to communicate with the agent to prepare for a snapshot. Outstanding write actions are completed, and then filesystems are frozen before a snapshot is taken. When the snapshot is complete, and libvirt has switched the virtual machine to the new volume for disk write actions, the filesystem is thawed, and writes to disk resume.

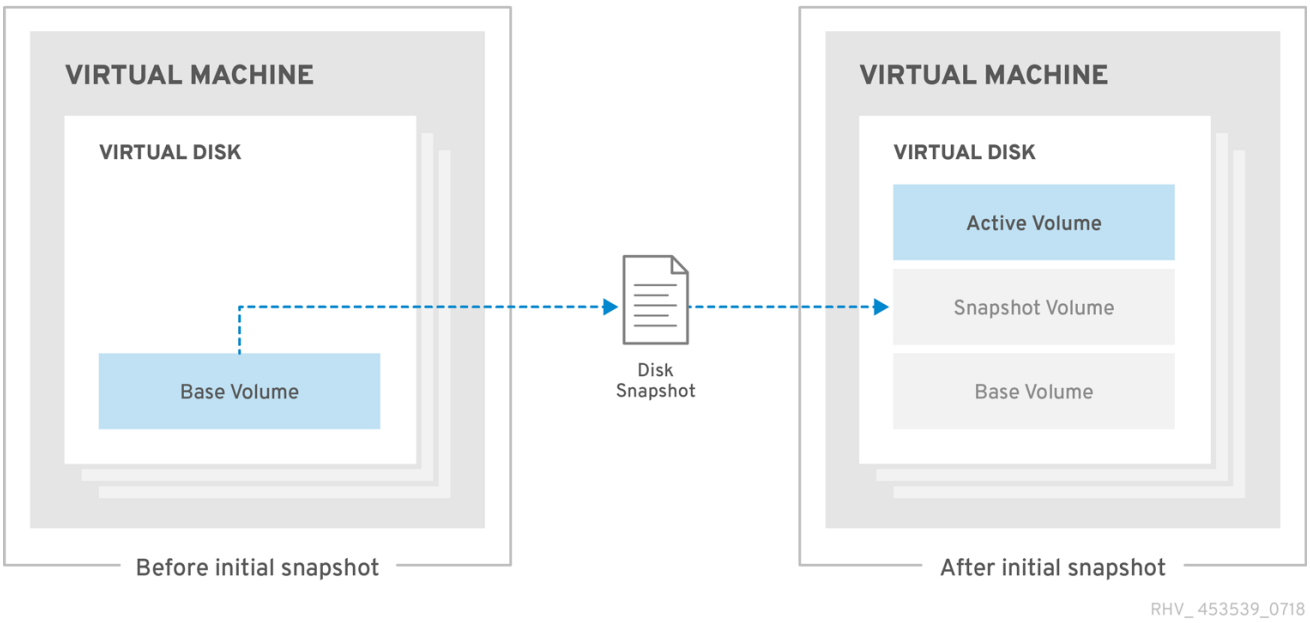
All live snapshots attempted with quiescing enabled. If the snapshot command fails because there is no compatible guest agent present, the live snapshot is re-initiated without the use-quiescing flag. When a virtual machine is reverted to its pre-snapshot state with quiesced filesystems, it boots cleanly with no filesystem check required. Reverting the previous snapshot using an un-quiesced filesystem requires a filesystem check on boot.

## 8.3. SNAPSHOT CREATION

In Red Hat Virtualization the initial snapshot for a virtual machine is different from subsequent snapshots in that the initial snapshot retains its format, either QCOW2 or raw. The first snapshot for a virtual machine uses existing volumes as a base image. Additional snapshots are additional COW layers tracking the changes made to the data stored in the image since the previous snapshot.

As depicted in Initial Snapshot Creation, the creation of a snapshot causes the volumes that comprise a virtual disk to serve as the base image for all subsequent snapshots.

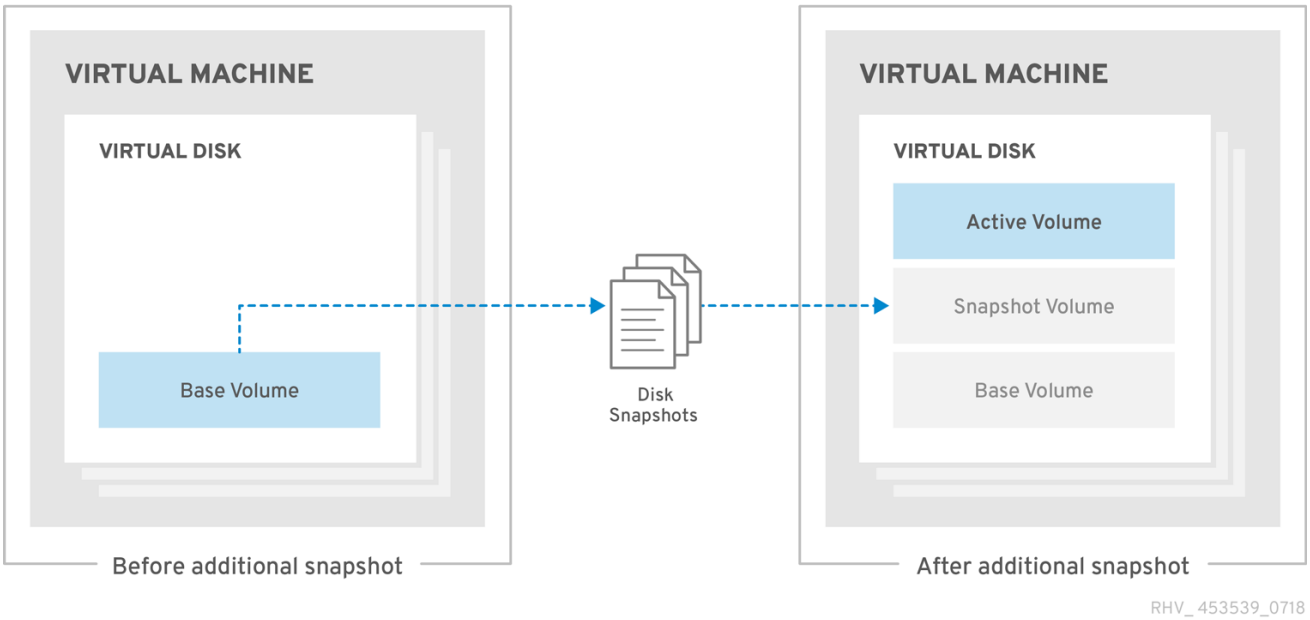
**Figure 8.1. Initial Snapshot Creation**




Snapshots taken after the initial snapshot result in the creation of new COW volumes in which data that is created or changed after the snapshot is taken will be stored. Each newly created COW layer contains only COW metadata. Data that is created by using and operating the virtual machine after a snapshot is taken is written to this new COW layer. When a virtual machine is used to modify data that exists in a

previous COW layer, the data is read from the previous layer, and written into the newest layer. Virtual machines locate data by checking each COW layer from most recent to oldest, transparently to the virtual machine.

**Figure 8.2. Additional Snapshot Creation**




## 8.4. MONITORING SNAPSHOT HEALTH WITH THE IMAGE DISCREPANCIES TOOL

The **RHV Image Discrepancies** tool analyzes image data in the Storage Domain and RHV Database. It alerts you if it finds discrepancies in volumes and volume attributes, but does not fix those discrepancies. Use this tool in a variety of scenarios, such as:

- Before upgrading versions, to avoid carrying over broken volumes or chains to the new version.
- Following a failed storage operation, to detect volumes or attributes in a bad state.
- After restoring the RHV database or storage from backup.
- Periodically, to detect potential problems before they worsen.
- To analyze a snapshot- or live storage migration-related issues, and to verify system health after fixing these types of problems.

### Prerequisites

- Required Versions: this tool was introduced in RHV version 4.3.8 with **rhv-log-collector-analyzer-0.2.15-0.el7ev**.
- Because data collection runs simultaneously at different places and is not atomic, stop all activity in the environment that can modify the storage domains. That is, do not create or remove snapshots, edit, move, create, or remove disks. Otherwise, false detection of inconsistencies may occur. Virtual Machines can remain running normally during the process.

### Procedure

1. To run the tool, enter the following command on the RHV Manager:

```
# rhv-image-discrepancies
```

2. If the tool finds discrepancies, rerun it to confirm the results, especially if there is a chance some operations were performed while the tool was running.

**NOTE**

This tool includes any Export and ISO storage domains and may report discrepancies for them. If so, these can be ignored, as these storage domains do not have entries for images in the RHV database.

### Understanding the results

The tool reports the following:

- If there are volumes that appear on the storage but are not in the database, or appear in the database but are not on the storage.
- If some volume attributes differ between the storage and the database.

Sample output:

```
Checking storage domain c277ad93-0973-43d9-a0ca-22199bc8e801
  Looking for missing images...
  No missing images found
  Checking discrepancies between SD/DB attributes...
  image ef325650-4b39-43cf-9e00-62b9f7659020 has a different attribute capacity on
storage(2696984576) and on DB(2696986624)
  image 852613ce-79ee-4adc-a56a-ea650dcb4cfa has a different attribute capacity on
storage(5424252928) and on DB(5424254976)

Checking storage domain c64637b4-f0e8-408c-b8af-6a52946113e2
  Looking for missing images...
  No missing images found
  Checking discrepancies between SD/DB attributes...
  No discrepancies found
```

## 8.5. SNAPSHOT PREVIEWS

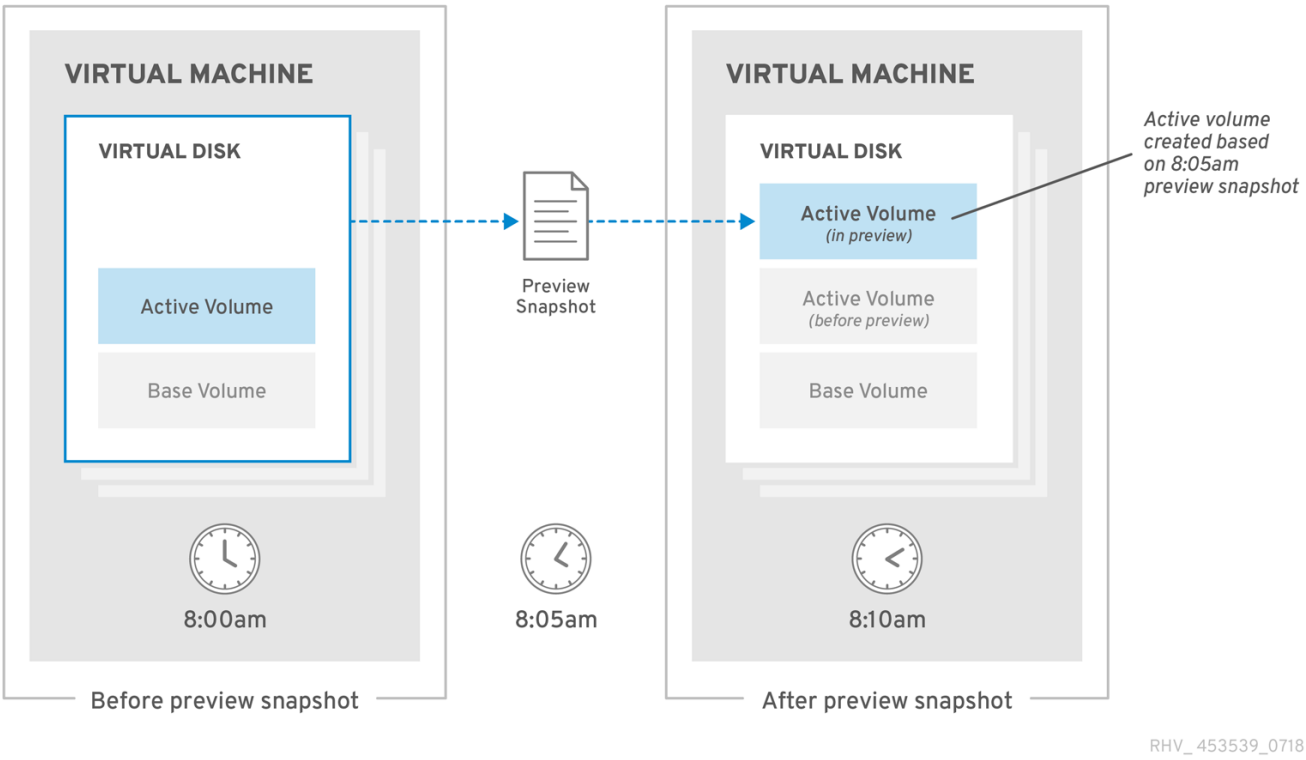
To select which snapshot a virtual disk will be reverted to, the administrator can preview all previously created snapshots.

From the available snapshots per guest, the administrator can select a snapshot volume to preview its contents. As depicted in Preview Snapshot, each snapshot is saved as a COW volume, and when it is previewed, a new preview layer is copied from the snapshot being previewed. The guest interacts with the preview instead of the actual snapshot volume.

After the administrator previews the selected snapshot, the preview can be committed to restore the guest data to the state captured in the snapshot. If the administrator commits the preview, the guest is attached to the preview layer.

After a snapshot is previewed, the administrator can select **Undo** to discard the preview layer of the viewed snapshot. The layer that contains the snapshot itself is preserved despite the preview layer being discarded.

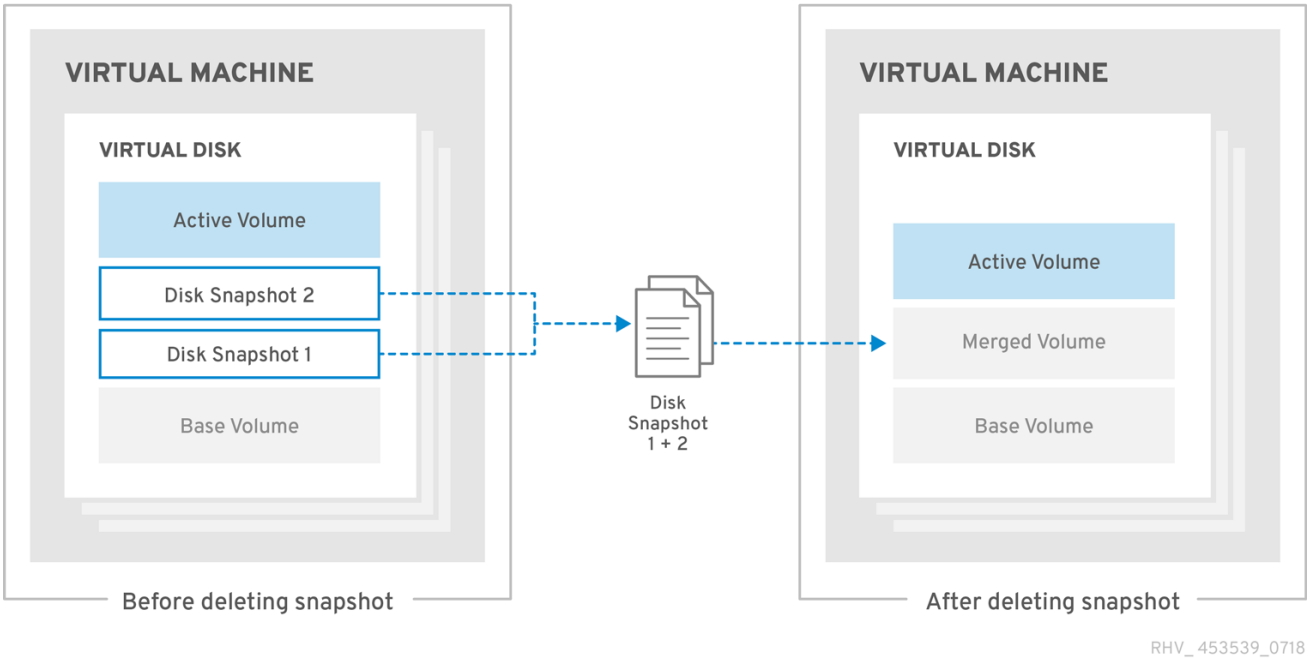
**Figure 8.3. Preview Snapshot**




## 8.6. SNAPSHOT DELETION

You can delete individual snapshots that are no longer required. Deleting a snapshot removes the ability to restore a virtual disk to that particular restoration point. It does not necessarily reclaim the disk space consumed by the snapshot, nor does it delete the data. The disk space will only be reclaimed if a subsequent snapshot has overwritten the data of the deleted snapshot. For example, if the third snapshot out of five snapshots is deleted, the unchanged data in the third snapshot must be preserved on the disk for the fourth and fifth snapshots to be usable; however, if the fourth or fifth snapshot has overwritten the data of the third, then the third snapshot has been made redundant and the disk space can be reclaimed. Aside from potential disk space reclamation, deleting a snapshot may also improve the performance of the virtual machine.

Figure 8.4. Snapshot Deletion




Snapshot deletion is handled as an asynchronous block job in which VDSM maintains a record of the operation in the recovery file for the virtual machine so that the job can be tracked even if VDSM is restarted or the virtual machine is shut down during the operation. Once the operation begins, the snapshot being deleted cannot be previewed or used as a restoration point, even if the operation fails or is interrupted. In operations in which the active layer is to be merged with its parent, the operation is split into a two-stage process during which data is copied from the active layer to the parent layer, and disk writes are mirrored to both the active layer and the parent. Finally, the job is considered complete once the data in the snapshot being deleted has been merged with its parent snapshot and VDSM synchronizes the changes throughout the image chain.

**NOTE**

If the deletion fails, fix the underlying problem (for example, a failed host, an inaccessible storage device, or even a temporary network issue) and try again.

# CHAPTER 9. HARDWARE DRIVERS AND DEVICES

## 9.1. VIRTUALIZED HARDWARE

Red Hat Virtualization presents three distinct types of system devices to virtualized guests. These hardware devices all appear as physically attached hardware devices to the virtualized guest but the device drivers work in different ways.

**Emulated devices**

Emulated devices, sometimes referred to as virtual devices, exist entirely in software. Emulated device drivers are a translation layer between the operating system running on the host (which manages the source device) and the operating systems running on the guests. The device level instructions directed to and from the emulated device are intercepted and translated by the hypervisor. Any device of the same type as that being emulated and recognized by the Linux kernel is able to be used as the backing source device for the emulated drivers.

**Para-virtualized Devices**

Para-virtualized devices require the installation of device drivers on the guest operating system providing it with an interface to communicate with the hypervisor on the host machine. This interface is used to allow traditionally intensive tasks such as disk I/O to be performed outside of the virtualized environment. Lowering the overhead inherent in virtualization in this manner is intended to allow guest operating system performance closer to that expected when running directly on physical hardware.

**Physically shared devices**

Certain hardware platforms allow virtualized guests to directly access various hardware devices and components. This process in virtualization is known as passthrough or device assignment. Passthrough allows devices to appear and behave as if they were physically attached to the guest operating system.

## 9.2. STABLE DEVICE ADDRESSES IN RED HAT VIRTUALIZATION

Virtual hardware PCI address allocations are persisted in the **ovirt-engine** database.

PCI addresses are allocated by **QEMU** at virtual machine creation time, and reported to **VDSM** by **libvirt**. **VDSM** reports them back to the Manager, where they are stored in the **ovirt-engine** database.

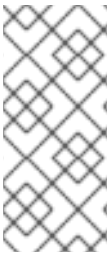
When a virtual machine is started, the Manager sends **VDSM** the device address out of the database. **VDSM** passes them to **libvirt** which starts the virtual machine using the PCI device addresses that were allocated when the virtual machine was run for the first time.

When a device is removed from a virtual machine, all references to it, including the stable PCI address, are also removed. If a device is added to replace the removed device, it is allocated a PCI address by **QEMU**, which is unlikely to be the same as the device it replaced.

## 9.3. CENTRAL PROCESSING UNIT (CPU)

Each host within a cluster has a number of virtual CPUs (vCPUs). The virtual CPUs are in turn exposed to guests running on the hosts. All virtual CPUs exposed by hosts within a cluster are of the type selected when the cluster was initially created via Red Hat Virtualization Manager. Mixing of virtual CPU types within a cluster is not possible.

Each available virtual CPU type has characteristics based on physical CPUs of the same name. The virtual CPU is indistinguishable from the physical CPU to the guest operating system.



NOTE

Support for x2APIC:

All virtual CPU models provided by Red Hat Enterprise Linux 7 hosts include support for x2APIC. This provides an Advanced Programmable Interrupt Controller (APIC) to better handle hardware interrupts.

## 9.4. SYSTEM DEVICES

System devices are critical for the guest to run and cannot be removed. Each system device attached to a guest also takes up an available PCI slot. The default system devices are:

- Host bridge
- ISA bridge and USB bridge (The USB and ISA bridges are the same device)
- Graphics card using the VGA or qxl driver
- Memory balloon device

For information about how to use PCI Express and conventional PCI devices with Intel Q35-based virtual machines, see Using PCI Express and Conventional PCI Devices with the Q35 Virtual Machine .

## 9.5. NETWORK DEVICES

Red Hat Virtualization is able to expose three different types of network interface controller to guests. The type of network interface controller to expose to a guest is chosen when the guest is created but is changeable from the Red Hat Virtualization Manager.

- The **e1000** network interface controller exposes a virtualized Intel PRO/1000 (e1000) to guests.
- The **virtio** network interface controller exposes a para-virtualized network device to guests.
- The **rtl8139** network interface controller exposes a virtualized **Realtek Semiconductor Corp RTL8139** to guests.

Multiple network interface controllers are permitted per guest. Each controller added takes up an available PCI slot on the guest.

## 9.6. GRAPHICS DEVICES

The SPICE or VNC graphics protocols can be used to connect to the emulated graphics devices.

You can select a **Video Type** in the Administration Portal:

- **QXL**: Emulates a para-virtualized video card that works best with QXL guest drivers
- **VGA**: Emulates a dummy VGA card with **Bochs** VESA extensions
- **BOCHS**: Emulates a dummy VGA card without legacy emulation for guest machines that that run with UEFI. This is the default display video card emulator for UEFI servers.

NOTE

For a virtual machine of type **server** that is set with UEFI and uses compatibility level 4.6 or above, **BOCHS** is the default value of **Video Type**.

In Red Hat Virtualization 4.4.5, you must do the following to enable this feature:

1. Run the following command:

```
engine-config --set EnableBochsDisplay=true --cver=<version>
```

   where **<version>** is the compatibility version.

2. Restart the engine.

3. Set **Video Type** to **BOCHS** manually.

## 9.7. STORAGE DEVICES

Storage devices and storage pools can use the block device drivers to attach storage devices to virtualized guests. Note that the storage drivers are not storage devices. The drivers are used to attach a backing storage device, file or storage pool volume to a virtualized guest. The backing storage device can be any supported type of storage device, file, or storage pool volume.

- The **IDE** driver exposes an emulated block device to guests. The emulated **IDE** driver can be used to attach any combination of up to four virtualized **IDE** hard disks or virtualized **IDE** CD-ROM drives to each virtualized guest. The emulated **IDE** driver is also used to provide virtualized DVD-ROM drives.

- The **VirtIO** driver exposes a para-virtualized block device to guests. The para-virtualized block driver is a driver for all storage devices supported by the hypervisor attached to the virtualized guest (except for floppy disk drives, which must be emulated).

## 9.8. SOUND DEVICES

Two emulated sound devices are available:

- The **ac97** emulates an **Intel 82801AA AC97 Audio** compatible sound card.

- The **es1370** emulates an **ENSONIQ AudioPCI ES1370** sound card.

## 9.9. SERIAL DRIVER

The para-virtualized serial driver (**virtio-serial**) is a bytestream-oriented, character stream driver. The para-virtualized serial driver provides a simple communication interface between the host's user space and the guest's user space where networking is not be available or unusable.

## 9.10. BALLOON DRIVER

The balloon driver allows guests to express to the hypervisor how much memory they require. The balloon driver allows the host to efficiently allocate and memory to the guest and allow free memory to be allocated to other guests and processes.

Guests using the balloon driver can mark sections of the guest's RAM as not in use (balloon inflation).

The hypervisor can free the memory and use the memory for other host processes or other guests on that host. When the guest requires the freed memory again, the hypervisor can reallocate RAM to the guest (balloon deflation).

# APPENDIX A. ENUMERATED VALUE TRANSLATION

The API uses Red Hat Virtualization Query Language to perform search queries. For more information, see Searches in the *Introduction to the Administration Portal*.

Note that certain enumerated values in the API require a different search query when using the Query Language. The following tables provides a translation for these key enumerated values according to resource type.

**Table A.1. Enumerated Value Translations**

| API Enumerable Type | API Enumerable Value | Query Language Value |
|---|---|---|
| **data_center_states** | **not_operational** | **notoperational** |
| **host_states** | **non_responsive** | **nonresponsive** |
| | **install_failed** | **installfailed** |
| | **preparing_for_maintenance** | **preparingformaintenance** |
| | **non_operational** | **nonoperational** |
| | **pending_approval** | **pendingapproval** |
| **vm_states** | **powering_up** | **poweringup** |
| | **powering_down** | **poweringdown** |
| | **migrating** | **migratingfrom** |
| | **migrating** | **migratingto** |
| | **not_responding** | **notresponding** |
| | **wait_for_launch** | **waitforlaunch** |
| | **reboot_in_progress** | **rebootinprogress** |
| | **saving_state** | **savingstate** |
| | **restoring_state** | **restoringstate** |

# APPENDIX B. EVENT CODES

This table lists all event codes.

**Table B.1. Event codes**

| Code | Name | Severity | Message |
|---|---|---|---|
| 0 | UNASSIGNED | Info | |
| 1 | VDC_START | Info | Starting oVirt Engine. |
| 2 | VDC_STOP | Info | Stopping oVirt Engine. |
| 12 | VDS_FAILURE | Error | Host ${VdsName} is non responsive. |
| 13 | VDS_DETECTED | Info | Status of host ${VdsName} was set to ${HostStatus}. |
| 14 | VDS_RECOVER | Info | Host ${VdsName} is rebooting. |
| 15 | VDS_MAINTENANCE | Normal | Host ${VdsName} was switched to Maintenance Mode. |
| 16 | VDS_ACTIVATE | Info | Activation of host ${VdsName} initiated by ${UserName}. |
| 17 | VDS_MAINTENANCE_FAILED | Error | Failed to switch Host ${VdsName} to Maintenance mode. |
| 18 | VDS_ACTIVATE_FAILED | Error | Failed to activate Host ${VdsName}. (User: ${UserName}). |
| 19 | VDS_RECOVER_FAILED | Error | Host ${VdsName} failed to recover. |
| 20 | USER_VDS_START | Info | Host ${VdsName} was started by ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 21 | USER_VDS_STOP | Info | Host ${VdsName} was stopped by ${UserName}. |
| 22 | IRS_FAILURE | Error | Failed to access Storage on Host ${VdsName}. |
| 23 | VDS_LOW_DISK_SPACE | Warning | Warning, Low disk space. Host ${VdsName} has less than ${DiskSpace} MB of free space left on: ${Disks}. |
| 24 | VDS_LOW_DISK_SPACE_ERROR | Error | Critical, Low disk space. Host ${VdsName} has less than ${DiskSpace} MB of free space left on: ${Disks}. Low disk space might cause an issue upgrading this host. |
| 25 | VDS_NO_SELINUX_ENFORCEMENT | Warning | Host ${VdsName} does not enforce SELinux. Current status: ${Mode} |
| 26 | IRS_DISK_SPACE_LOW | Warning | Warning, Low disk space. ${StorageDomainName} domain has ${DiskSpace} GB of free space. |
| 27 | VDS_STATUS_CHANGE_FAILED_DUE_TO_STOP_SPM_FAILURE | Warning | Failed to change status of host ${VdsName} due to a failure to stop the spm. |
| 28 | VDS_PROVISION | Warning | Installing OS on Host ${VdsName} using Hostgroup ${HostGroupName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 29 | USER_ADD_VM_TEMPLATE_SUCCESS | Info | Template ${VmTemplateName} was created successfully. |
| 31 | USER_VDC_LOGOUT | Info | User ${UserName} connected from '${SourceIP}' using session '${SessionID}' logged out. |
| 32 | USER_RUN_VM | Info | VM ${VmName} started on Host ${VdsName} |
| 33 | USER_STOP_VM | Info | VM ${VmName} powered off by ${UserName} (Host: ${VdsName})${OptionalReason}. |
| 34 | USER_ADD_VM | Info | VM ${VmName} was created by ${UserName}. |
| 35 | USER_UPDATE_VM | Info | VM ${VmName} configuration was updated by ${UserName}. |
| 36 | USER_ADD_VM_TEMPLATE_FAILURE | Error | Failed creating Template ${VmTemplateName}. |
| 37 | USER_ADD_VM_STARTED | Info | VM ${VmName} creation was initiated by ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 38 | USER_CHANGE_DISK_VM | Info | CD ${DiskName} was inserted to VM ${VmName} by ${UserName}. |
| 39 | USER_PAUSE_VM | Info | VM ${VmName} was suspended by ${UserName} (Host: ${VdsName}). |
| 40 | USER_RESUME_VM | Info | VM ${VmName} was resumed by ${UserName} (Host: ${VdsName}). |
| 41 | USER_VDS_RESTART | Info | Host ${VdsName} was restarted by ${UserName}. |
| 42 | USER_ADD_VDS | Info | Host ${VdsName} was added by ${UserName}. |
| 43 | USER_UPDATE_VDS | Info | Host ${VdsName} configuration was updated by ${UserName}. |
| 44 | USER_REMOVE_VDS | Info | Host ${VdsName} was removed by ${UserName}. |
| 45 | USER_CREATE_SNAPSHOT | Info | Snapshot '${SnapshotName}' creation for VM '${VmName}' was initiated by ${UserName}. |
| 46 | USER_TRY_BACK_TO_SNAPSHOT | Info | Snapshot-Preview ${SnapshotName} for VM ${VmName} was initiated by ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 47 | USER_RESTORE_FROM_SNAPSHOT | Info | VM ${VmName} restored from Snapshot by ${UserName}. |
| 48 | USER_ADD_VM_TEMPLATE | Info | Creation of Template ${VmTemplateName} from VM ${VmName} was initiated by ${UserName}. |
| 49 | USER_UPDATE_VM_TEMPLATE | Info | Template ${VmTemplateName} configuration was updated by ${UserName}. |
| 50 | USER_REMOVE_VM_TEMPLATE | Info | Removal of Template ${VmTemplateName} was initiated by ${UserName}. |
| 51 | USER_ADD_VM_TEMPLATE_FINISHED_SUCCESS | Info | Creation of Template ${VmTemplateName} from VM ${VmName} has been completed. |
| 52 | USER_ADD_VM_TEMPLATE_FINISHED_FAILURE | Error | Failed to complete creation of Template ${VmTemplateName} from VM ${VmName}. |
| 53 | USER_ADD_VM_FINISHED_SUCCESS | Info | VM ${VmName} creation has been completed. |
| 54 | USER_FAILED_RUN_VM | Error | Failed to run VM ${VmName}${DueToError} (User: ${UserName}). |
| 55 | USER_FAILED_PAUSE_VM | Error | Failed to suspend VM ${VmName} (Host: ${VdsName}, User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 56 | USER_FAILED_STOP_VM | Error | Failed to power off VM ${VmName} (Host: ${VdsName}, User: ${UserName}). |
| 57 | USER_FAILED_ADD_VM | Error | Failed to create VM ${VmName} (User: ${UserName}). |
| 58 | USER_FAILED_UPDATE_VM | Error | Failed to update VM ${VmName} (User: ${UserName}). |
| 59 | USER_FAILED_REMOVE_VM | Error | |
| 60 | USER_ADD_VM_FINISHED_FAILURE | Error | Failed to complete VM ${VmName} creation. |
| 61 | VM_DOWN | Info | VM ${VmName} is down. ${ExitMessage} |
| 62 | VM_MIGRATION_START | Info | Migration started (VM: ${VmName}, Source: ${VdsName}, Destination: ${DestinationVdsName}, User: ${UserName}). ${OptionalReason} |
| 63 | VM_MIGRATION_DONE | Info | Migration completed (VM: ${VmName}, Source: ${VdsName}, Destination: ${DestinationVdsName}, Duration: ${Duration}, Total: ${TotalDuration}, Actual downtime: ${ActualDowntime}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 64 | VM_MIGRATION_ABORT | Error | Migration failed: ${MigrationError} (VM: ${VmName}, Source: ${VdsName}). |
| 65 | VM_MIGRATION_FAILED | Error | Migration failed${DueToMigrationError} (VM: ${VmName}, Source: ${VdsName}). |
| 66 | VM_FAILURE | Error | VM ${VmName} cannot be found on Host ${VdsName}. |
| 67 | VM_MIGRATION_START_SYSTEM_INITIATED | Info | Migration initiated by system (VM: ${VmName}, Source: ${VdsName}, Destination: ${DestinationVdsName}, Reason: ${OptionalReason}). |
| 68 | USER_CREATE_SNAPSHOT_FINISHED_SUCCESS | Info | Snapshot '${SnapshotName}' creation for VM '${VmName}' has been completed. |
| 69 | USER_CREATE_SNAPSHOT_FINISHED_FAILURE | Error | Failed to complete snapshot '${SnapshotName}' creation for VM '${VmName}'. |
| 70 | USER_RUN_VM_AS_STATELESS_FINISHED_FAILURE | Error | Failed to complete starting of VM ${VmName}. |
| 71 | USER_TRY_BACK_TO_SNAPSHOT_FINISH_SUCCESS | Info | Snapshot-Preview ${SnapshotName} for VM ${VmName} has been completed. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 72 | MERGE_SNAPSHOTS_ON_HOST | Info | Merging snapshots (${SourceSnapshot} into ${DestinationSnapshot}) of disk ${Disk} on host ${VDS} |
| 73 | USER_INITIATED_SHUTDOWN_VM | Info | VM shutdown initiated by ${UserName} on VM ${VmName} (Host: ${VdsName})${OptionalReason}. |
| 74 | USER_FAILED_SHUTDOWN_VM | Error | Failed to initiate shutdown on VM ${VmName} (Host: ${VdsName}, User: ${UserName}). |
| 75 | VDS_SOFT_RECOVER | Info | Soft fencing on host ${VdsName} was successful. |
| 76 | USER_STOPPED_VM_INSTEAD_OF_SHUTDOWN | Info | VM ${VmName} was powered off ungracefully by ${UserName} (Host: ${VdsName})${OptionalReason}. |
| 77 | USER_FAILED_STOPPING_VM_INSTEAD_OF_SHUTDOWN | Error | Failed to power off VM ${VmName} (Host: ${VdsName}, User: ${UserName}). |
| 78 | USER_ADD_DISK_TO_VM | Info | Add-Disk operation of ${DiskAlias} was initiated on VM ${VmName} by ${UserName}. |
| 79 | USER_FAILED_ADD_DISK_TO_VM | Error | Add-Disk operation failed on VM ${VmName} (User: ${UserName}). |
| 80 | USER_REMOVE_DISK_FROM_VM | Info | Disk was removed from VM ${VmName} by ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 81 | USER_FAILED_REMOVE_DISK_FROM_VM | Error | Failed to remove Disk from VM ${VmName} (User: ${UserName}). |
| 88 | USER_UPDATE_VM_DISK | Info | VM ${VmName} ${DiskAlias} disk was updated by ${UserName}. |
| 89 | USER_FAILED_UPDATE_VM_DISK | Error | Failed to update VM ${VmName} disk ${DiskAlias} (User: ${UserName}). |
| 90 | VDS_FAILED_TO_GET_HOST_HARDWARE_INFO | Warning | Could not get hardware information for host ${VdsName} |
| 94 | USER_COMMIT_RESTORE_FROM_SNAPSHOT_START | Info | Committing a Snapshot-Preview for VM ${VmName} was initialized by ${UserName}. |
| 95 | USER_COMMIT_RESTORE_FROM_SNAPSHOT_FINISH_SUCCESS | Info | Committing a Snapshot-Preview for VM ${VmName} has been completed. |
| 96 | USER_COMMIT_RESTORE_FROM_SNAPSHOT_FINISH_FAILURE | Error | Failed to commit Snapshot-Preview for VM ${VmName}. |
| 97 | USER_ADD_DISK_TO_VM_FINISHED_SUCCESS | Info | The disk ${DiskAlias} was successfully added to VM ${VmName}. |
| 98 | USER_ADD_DISK_TO_VM_FINISHED_FAILURE | Error | Add-Disk operation failed to complete on VM ${VmName}. |
| 99 | USER_TRY_BACK_TO_SNAPSHOT_FINISH_FAILURE | Error | Failed to complete Snapshot-Preview ${SnapshotName} for VM ${VmName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 100 | USER_RESTORE_FROM_SNAPSHOT_FINISH_SUCCESS | Info | VM ${VmName} restoring from Snapshot has been completed. |
| 101 | USER_RESTORE_FROM_SNAPSHOT_FINISH_FAILURE | Error | Failed to complete restoring from Snapshot of VM ${VmName}. |
| 102 | USER_FAILED_CHANGE_DISK_VM | Error | Failed to change disk in VM ${VmName} (Host: ${VdsName}, User: ${UserName}). |
| 103 | USER_FAILED_RESUME_VM | Error | Failed to resume VM ${VmName} (Host: ${VdsName}, User: ${UserName}). |
| 104 | USER_FAILED_ADD_VDS | Error | Failed to add Host ${VdsName} (User: ${UserName}). |
| 105 | USER_FAILED_UPDATE_VDS | Error | Failed to update Host ${VdsName} (User: ${UserName}). |
| 106 | USER_FAILED_REMOVE_VDS | Error | Failed to remove Host ${VdsName} (User: ${UserName}). |
| 107 | USER_FAILED_VDS_RESTART | Error | Failed to restart Host ${VdsName}, (User: ${UserName}). |
| 108 | USER_FAILED_ADD_VM_TEMPLATE | Error | Failed to initiate creation of Template ${VmTemplateName} from VM ${VmName} (User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 109 | USER_FAILED_UPDATE_VM_TEMPLATE | Error | Failed to update Template ${VmTemplateName} (User: ${UserName}). |
| 110 | USER_FAILED_REMOVE_VM_TEMPLATE | Error | Failed to initiate removal of Template ${VmTemplateName} (User: ${UserName}). |
| 111 | USER_STOP_SUSPENDED_VM | Info | Suspended VM ${VmName} has had its save state cleared by ${UserName}${OptionalReason}. |
| 112 | USER_STOP_SUSPENDED_VM_FAILED | Error | Failed to power off suspended VM ${VmName} (User: ${UserName}). |
| 113 | USER_REMOVE_VM_FINISHED | Info | VM ${VmName} was successfully removed. |
| 115 | USER_FAILED_TRY_BACK_TO_SNAPSHOT | Error | Failed to preview Snapshot ${SnapshotName} for VM ${VmName} (User: ${UserName}). |
| 116 | USER_FAILED_RESTORE_FROM_SNAPSHOT | Error | Failed to restore VM ${VmName} from Snapshot (User: ${UserName}). |
| 117 | USER_FAILED_CREATE_SNAPSHOT | Error | Failed to create Snapshot ${SnapshotName} for VM ${VmName} (User: ${UserName}). |
| 118 | USER_FAILED_VDS_START | Error | Failed to start Host ${VdsName}, (User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 119 | VM_DOWN_ERROR | Error | VM ${VmName} is down with error. ${ExitMessage}. |
| 120 | VM_MIGRATION_TO_SERVER_FAILED | Error | Migration failed${DueToMigrationError} (VM: ${VmName}, Source: ${VdsName}, Destination: ${DestinationVdsName}). |
| 121 | SYSTEM_VDS_RESTART | Info | Host ${VdsName} was restarted by the engine. |
| 122 | SYSTEM_FAILED_VDS_RESTART | Error | A restart initiated by the engine to Host ${VdsName} has failed. |
| 123 | VDS_SLOW_STORAGE_RESPONSE_TIME | Warning | Slow storage response time on Host ${VdsName}. |
| 124 | VM_IMPORT | Info | Started VM import of ${ImportedVmName} (User: ${UserName}) |
| 125 | VM_IMPORT_FAILED | Error | Failed to import VM ${ImportedVmName} (User: ${UserName}) |
| 126 | VM_NOT_RESPONDING | Warning | VM ${VmName} is not responding. |
| 127 | VDS_RUN_IN_NO_KVM_MODE | Error | Host ${VdsName} running without virtualization hardware acceleration |

| Code | Name | Severity | Message |
|---|---|---|---|
| 128 | VM_MIGRATION_TRYING_RERUN | Warning | Failed to migrate VM ${VmName} to Host ${DestinationVdsName}${DueToMigrationError}. Trying to migrate to another Host. |
| 129 | VM_CLEARED | Info | Unused |
| 130 | USER_SUSPEND_VM_FINISH_FAILURE_WILL_TRY_AGAIN | Error | Failed to complete suspending of VM ${VmName}, will try again. |
| 131 | USER_EXPORT_VM | Info | VM ${VmName} exported to ${ExportPath} by ${UserName} |
| 132 | USER_EXPORT_VM_FAILED | Error | Failed to export VM ${VmName} to ${ExportPath} (User: ${UserName}) |
| 133 | USER_EXPORT_TEMPLATE | Info | Template ${VmTemplateName} exported to ${ExportPath} by ${UserName} |
| 134 | USER_EXPORT_TEMPLATE_FAILED | Error | Failed to export Template ${VmTemplateName} to ${ExportPath} (User: ${UserName}) |
| 135 | TEMPLATE_IMPORT | Info | Started Template import of ${ImportedVmTemplateName} (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 136 | TEMPLATE_IMPORT_FAILED | Error | Failed to import Template ${ImportedVmTemplateName} (User: ${UserName}) |
| 137 | USER_FAILED_VDS_STOP | Error | Failed to stop Host ${VdsName}, (User: ${UserName}). |
| 138 | VM_PAUSED_ENOSPC | Error | VM ${VmName} has been paused due to no Storage space error. |
| 139 | VM_PAUSED_ERROR | Error | VM ${VmName} has been paused due to unknown storage error. |
| 140 | VM_MIGRATION_FAILED_DURING_MOVE_TO_MAINTENANCE | Error | Migration failed${DueToMigrationError} while Host is in 'preparing for maintenance' state.\n Consider manual intervention\: stopping/migrating Vms as Host’s state will not\n turn to maintenance while VMs are still running on it.(VM: ${VmName}, Source: ${VdsName}, Destination: ${DestinationVdsName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 141 | VDS_VERSION_NOT_SUPPORTED_FOR_CLUSTER | Error | Host ${VdsName} is installed with VDSM version (${VdsSupportedVersions}) and cannot join cluster ${ClusterName} which is compatible with VDSM versions ${CompatibilityVersion}. |
| 142 | VM_SET_TO_UNKNOWN_STATUS | Warning | VM ${VmName} was set to the Unknown status. |
| 143 | VM_WAS_SET_DOWN_DUE_TO_HOST_REBOOT_OR_MANUAL_FENCE | Info | Vm ${VmName} was shut down due to ${VdsName} host reboot or manual fence |
| 144 | VM_IMPORT_INFO | Info | Value of field ${FieldName} of imported VM ${VmName} is ${FieldValue}. The field is reset to the default value |
| 145 | VM_PAUSED_EIO | Error | VM ${VmName} has been paused due to storage I/O problem. |
| 146 | VM_PAUSED_EPERM | Error | VM ${VmName} has been paused due to storage permissions problem. |
| 147 | VM_POWER_DOWN_FAILED | Warning | Shutdown of VM ${VmName} failed. |
| 148 | VM_MEMORY_UNDER_GUARANTEED_VALUE | Error | VM ${VmName} on host ${VdsName} was guaranteed ${MemGuaranteed} MB but currently has ${MemActual} MB |

| Code | Name | Severity | Message |
|---|---|---|---|
| 149 | USER_ADD | Info | User '${NewUserName}' was added successfully to the system. |
| 150 | USER_INITIATED_RUN_VM | Info | Starting VM ${VmName} was initiated by ${UserName}. |
| 151 | USER_INITIATED_RUN_VM_FAILED | Warning | Failed to run VM ${VmName} on Host ${VdsName}. |
| 152 | USER_RUN_VM_ON_NON_DEFAULT_VDS | Warning | Guest ${VmName} started on Host ${VdsName}. (Default Host parameter was ignored - assigned Host was not available). |
| 153 | USER_STARTED_VM | Info | VM ${VmName} was started by ${UserName} (Host: ${VdsName}). |
| 154 | VDS_CLUSTER_VERSION_NOT_SUPPORTED | Error | Host ${VdsName} is compatible with versions (${VdsSupportedVersions}) and cannot join Cluster ${ClusterName} which is set to version ${CompatibilityVersion}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 155 | VDS_ARCHITECTURE_NOT_SUPPORTED_FOR_CLUSTER | Error | Host ${VdsName} has architecture ${VdsArchitecture} and cannot join Cluster ${ClusterName} which has architecture ${ClusterArchitecture}. |
| 156 | CPU_TYPE_UNSUPPORTED_IN_THIS_CLUSTER_VERSION | Error | Host ${VdsName} moved to Non-Operational state as host CPU type is not supported in this cluster compatibility version or is not supported at all |
| 157 | USER_REBOOT_VM | Info | User ${UserName} initiated reboot of VM ${VmName}. |
| 158 | USER_FAILED_REBOOT_VM | Error | Failed to reboot VM ${VmName} (User: ${UserName}). |
| 159 | USER_FORCE_SELECTED_SPM | Info | Host ${VdsName} was force selected by ${UserName} |
| 160 | USER_ACCOUNT_DISABLED_OR_LOCKED | Error | User ${UserName} cannot login, as it got disabled or locked. Please contact the system administrator. |
| 161 | VM_CANCEL_MIGRATION | Info | Migration cancelled (VM: ${VmName}, Source: ${VdsName}, User: ${UserName}). |
| 162 | VM_CANCEL_MIGRATION_FAILED | Error | Failed to cancel migration for VM: ${VmName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 163 | VM_STATUS_RESTORED | Info | VM ${VmName} status was restored to ${VmStatus}. |
| 164 | VM_SET_TICKET | Info | User ${UserName} initiated console session for VM ${VmName} |
| 165 | VM_SET_TICKET_FAILED | Error | User ${UserName} failed to initiate a console session for VM ${VmName} |
| 166 | VM_MIGRATION_NO_VDS_TO_MIGRATE_TO | Warning | No available host was found to migrate VM ${VmName} to. |
| 167 | VM_CONSOLE_CONNECTED | Info | User ${UserName} is connected to VM ${VmName}. |
| 168 | VM_CONSOLE_DISCONNECTED | Info | User ${UserName} got disconnected from VM ${VmName}. |
| 169 | VM_FAILED_TO_PRESTART_IN_POOL | Warning | Cannot pre-start VM in pool '${VmPoolName}'. The system will continue trying. |
| 170 | USER_CREATE_LIVE_SNAPSHOT_FINISHED_FAILURE | Warning | Failed to create live snapshot '${SnapshotName}' for VM '${VmName}'. VM restart is recommended. Note that using the created snapshot might cause data inconsistency. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 171 | USER_RUN_VM_AS_STATELESS_WITH_DISKS_NOT_ALLOWING_SNAPSHOT | Warning | VM ${VmName} was run as stateless with one or more of disks that do not allow snapshots (User:${UserName}). |
| 172 | USER_REMOVE_VM_FINISHED_WITH_ILLEGAL_DISKS | Warning | VM ${VmName} has been removed, but the following disks could not be removed: ${DisksNames}. These disks will appear in the main disks tab in illegal state, please remove manually when possible. |
| 173 | USER_CREATE_LIVE_SNAPSHOT_NO_MEMORY_FAILURE | Error | Failed to save memory as part of Snapshot ${SnapshotName} for VM ${VmName} (User: ${UserName}). |
| 174 | VM_IMPORT_FROM_CONFIGURATION_EXECUTED_SUCCESSFULLY | Info | VM ${VmName} has been successfully imported from the given configuration. |
| 175 | VM_IMPORT_FROM_CONFIGURATION_ATTACH_DISKS_FAILED | Warning | VM ${VmName} has been imported from the given configuration but the following disk(s) failed to attach: ${DiskAliases}. |
| 176 | VM_BALLOON_DRIVER_ERROR | Error | The Balloon driver on VM ${VmName} on host ${VdsName} is requested but unavailable. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 177 | VM_BALLOON_DRIVER_UNCONTROLLED | Error | The Balloon device on VM ${VmName} on host ${VdsName} is inflated but the device cannot be controlled (guest agent is down). |
| 178 | VM_MEMORY_NOT_IN_RECOMMENDED_RANGE | Warning | VM ${VmName} was configured with ${VmMemInMb}MiB of memory while the recommended value range is ${VmMinMemInMb}MiB - ${VmMaxMemInMb} MiB |
| 179 | USER_INITIATED_RUN_VM_AND_PAUSE | Info | Starting in paused mode VM ${VmName} was initiated by ${UserName}. |
| 180 | TEMPLATE_IMPORT_FROM_CONFIGURATION_SUCCESS | Info | Template ${VmTemplateName} has been successfully imported from the given configuration. |
| 181 | TEMPLATE_IMPORT_FROM_CONFIGURATION_FAILED | Error | Failed to import Template ${VmTemplateName} from the given configuration. |
| 182 | USER_FAILED_ATTACH_USER_TO_VM | Error | Failed to attach User ${AdUserName} to VM ${VmName} (User: ${UserName}). |
| 183 | USER_ATTACH_TAG_TO_TEMPLATE | Info | Tag ${TagName} was attached to Templates(s) ${TemplatesNames} by ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 184 | USER_ATTACH_TAG_TO_TEMPLATE_FAILED | Error | Failed to attach Tag ${TagName} to Templates(s) ${TemplatesNames} (User: ${UserName}). |
| 185 | USER_DETACH_TEMPLATE_FROM_TAG | Info | Tag ${TagName} was detached from Template(s) ${TemplatesNames} by ${UserName}. |
| 186 | USER_DETACH_TEMPLATE_FROM_TAG_FAILED | Error | Failed to detach Tag ${TagName} from TEMPLATE(s) ${TemplatesNames} (User: ${UserName}). |
| 187 | VDS_STORAGE_CONNECTION_FAILED_BUT_LAST_VDS | Error | Failed to connect Host ${VdsName} to Data Center, due to connectivity errors with the Storage. Host ${VdsName} will remain in Up state (but inactive), as it is the last Host in the Data Center, to enable manual intervention by the Administrator. |
| 188 | VDS_STORAGES_CONNECTION_FAILED | Error | Failed to connect Host ${VdsName} to the Storage Domains ${failedStorageDomains}. |
| 189 | VDS_STORAGE_VDS_STATS_FAILED | Error | Host ${VdsName} reports about one of the Active Storage Domains as Problematic. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 190 | UPDATE_OVF_FOR_STORAGE_DOMAIN_FAILED | Warning | Failed to update VMs/Templates OVF data for Storage Domain ${StorageDomainName} in Data Center ${StoragePoolName}. |
| 191 | CREATE_OVF_STORE_FOR_STORAGE_DOMAIN_FAILED | Warning | Failed to create OVF store disk for Storage Domain ${StorageDomainName}.\n The Disk with the id ${DiskId} might be removed manually for automatic attempt to create new one. \n OVF updates won't be attempted on the created disk. |
| 192 | CREATE_OVF_STORE_FOR_STORAGE_DOMAIN_INITIATE_FAILED | Warning | Failed to create OVF store disk for Storage Domain ${StorageDomainName}. \n OVF data won't be updated meanwhile for that domain. |
| 193 | DELETE_OVF_STORE_FOR_STORAGE_DOMAIN_FAILED | Warning | Failed to delete the OVF store disk for Storage Domain ${StorageDomainName}.\n In order to detach the domain please remove it manually or try to detach the domain again for another attempt. |
| 194 | VM_CANCEL_CONVERSION | Info | Conversion cancelled (VM: ${VmName}, Source: ${VdsName}, User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 195 | VM_CANCEL_CONVERSION_FAILED | Error | Failed to cancel conversion for VM: ${VmName} |
| 196 | VM_RECOVERED_FROM_PAUSE_ERROR | Normal | VM ${VmName} has recovered from paused back to up. |
| 197 | SYSTEM_SSH_HOST_RESTART | Info | Host ${VdsName} was restarted using SSH by the engine. |
| 198 | SYSTEM_FAILED_SSH_HOST_RESTART | Error | A restart using SSH initiated by the engine to Host ${VdsName} has failed. |
| 199 | USER_UPDATE_OVF_STORE | Info | OVF_STORE for domain ${StorageDomainName} was updated by ${UserName}. |
| 200 | IMPORTEXPORT_GET_VMS_INFO_FAILED | Error | Failed to retrieve VM/Templates information from export domain ${StorageDomainName} |
| 201 | IRS_DISK_SPACE_LOW_ERROR | Error | Critical, Low disk space. ${StorageDomainName} domain has ${DiskSpace} GB of free space. |
| 202 | IMPORTEXPORT_GET_EXTERNAL_VMS_INFO_FAILED | Error | Failed to retrieve VMs information from external server ${URL} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 204 | IRS_HOSTED_ON_VDS | Info | Storage Pool Manager runs on Host ${VdsName} (Address: ${ServerIp}), Data Center ${StoragePoolName}. |
| 205 | PROVIDER_ADDED | Info | Provider ${ProviderName} was added. (User: ${UserName}) |
| 206 | PROVIDER_ADDITION_FAILED | Error | Failed to add provider ${ProviderName}. (User: ${UserName}) |
| 207 | PROVIDER_UPDATED | Info | Provider ${ProviderName} was updated. (User: ${UserName}) |
| 208 | PROVIDER_UPDATE_FAILED | Error | Failed to update provider ${ProviderName}. (User: ${UserName}) |
| 209 | PROVIDER_REMOVED | Info | Provider ${ProviderName} was removed. (User: ${UserName}) |
| 210 | PROVIDER_REMOVAL_FAILED | Error | Failed to remove provider ${ProviderName}. (User: ${UserName}) |
| 213 | PROVIDER_CERTIFICATE_IMPORTED | Info | Certificate for provider ${ProviderName} was imported. (User: ${UserName}) |
| 214 | PROVIDER_CERTIFICATE_IMPORT_FAILED | Error | Failed importing Certificate for provider ${ProviderName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 215 | PROVIDER_SYNCHRONIZED | Info | |
| 216 | PROVIDER_SYNCHRONIZED_FAILED | Error | Failed to synchronize networks of Provider ${ProviderName}. |
| 217 | PROVIDER_SYNCHRONIZED_PERFORMED | Info | Networks of Provider ${ProviderName} were successfully synchronized. |
| 218 | PROVIDER_SYNCHRONIZED_PERFORMED_FAILED | Error | Networks of Provider ${ProviderName} were incompletely synchronized. |
| 219 | PROVIDER_SYNCHRONIZED_DISABLED | Error | Failed to synchronize networks of Provider ${ProviderName}, because the authentication information of the provider is invalid. Automatic synchronization is deactivated for this Provider. |
| 250 | USER_UPDATE_VM_CLUSTER_DEFAULT_HOST_CLEARED | Info | ${VmName} cluster was updated by ${UserName}, Default host was reset to auto assign. |
| 251 | USER_REMOVE_VM_TEMPLATE_FINISHED | Info | Removal of Template ${VmTemplateName} has been completed. |
| 252 | SYSTEM_FAILED_UPDATE_VM | Error | Failed to Update VM ${VmName} that was initiated by system. |
| 253 | SYSTEM_UPDATE_VM | Info | VM ${VmName} configuration was updated by system. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 254 | VM_ALREADY_IN_REQUESTED_STATUS | Info | VM ${VmName} is already ${VmStatus}, ${Action} was skipped. User: ${UserName}. |
| 302 | USER_ADD_VM_POOL_WITH_VMS | Info | VM Pool ${VmPoolName} (containing ${VmsCount} VMs) was created by ${UserName}. |
| 303 | USER_ADD_VM_POOL_WITH_VMS_FAILED | Error | Failed to create VM Pool ${VmPoolName} (User: ${UserName}). |
| 304 | USER_REMOVE_VM_POOL | Info | VM Pool ${VmPoolName} was removed by ${UserName}. |
| 305 | USER_REMOVE_VM_POOL_FAILED | Error | Failed to remove VM Pool ${VmPoolName} (User: ${UserName}). |
| 306 | USER_ADD_VM_TO_POOL | Info | VM ${VmName} was added to VM Pool ${VmPoolName} by ${UserName}. |
| 307 | USER_ADD_VM_TO_POOL_FAILED | Error | Failed to add VM ${VmName} to VM Pool ${VmPoolName} (User: ${UserName}). |
| 308 | USER_REMOVE_VM_FROM_POOL | Info | VM ${VmName} was removed from VM Pool ${VmPoolName} by ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 309 | USER_REMOVE_VM_FROM_POOL_FAILED | Error | Failed to remove VM ${VmName} from VM Pool ${VmPoolName} (User: ${UserName}). |
| 310 | USER_ATTACH_USER_TO_POOL | Info | User ${AdUserName} was attached to VM Pool ${VmPoolName} by ${UserName}. |
| 311 | USER_ATTACH_USER_TO_POOL_FAILED | Error | Failed to attach User ${AdUserName} to VM Pool ${VmPoolName} (User: ${UserName}). |
| 312 | USER_DETACH_USER_FROM_POOL | Info | User ${AdUserName} was detached from VM Pool ${VmPoolName} by ${UserName}. |
| 313 | USER_DETACH_USER_FROM_POOL_FAILED | Error | Failed to detach User ${AdUserName} from VM Pool ${VmPoolName} (User: ${UserName}). |
| 314 | USER_UPDATE_VM_POOL | Info | VM Pool ${VmPoolName} configuration was updated by ${UserName}. |
| 315 | USER_UPDATE_VM_POOL_FAILED | Error | Failed to update VM Pool ${VmPoolName} configuration (User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 316 | USER_ATTACH_USER_TO_VM_FROM_POOL | Info | Attaching User ${AdUserName} to VM ${VmName} in VM Pool ${VmPoolName} was initiated by ${UserName}. |
| 317 | USER_ATTACH_USER_TO_VM_FROM_POOL_FAILED | Error | Failed to attach User ${AdUserName} to VM from VM Pool ${VmPoolName} (User: ${UserName}). |
| 318 | USER_ATTACH_USER_TO_VM_FROM_POOL_FINISHED_SUCCESS | Info | User ${AdUserName} successfully attached to VM ${VmName} in VM Pool ${VmPoolName}. |
| 319 | USER_ATTACH_USER_TO_VM_FROM_POOL_FINISHED_FAILURE | Error | Failed to attach user ${AdUserName} to VM ${VmName} in VM Pool ${VmPoolName}. |
| 320 | USER_ADD_VM_POOL_WITH_VMS_ADD_VDS_FAILED | Error | Pool ${VmPoolName} Created, but some Vms failed to create (User: ${UserName}). |
| 321 | USER_REMOVE_VM_POOL_INITIATED | Info | VM Pool ${VmPoolName} removal was initiated by ${UserName}. |
| 325 | USER_REMOVE_ADUSER | Info | User ${AdUserName} was removed by ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 326 | USER_FAILED_REMOVE_ADUSER | Error | Failed to remove User ${AdUserName} (User: ${UserName}). |
| 327 | USER_FAILED_ADD_ADUSER | Warning | Failed to add User '${NewUserName}' to the system. |
| 342 | USER_REMOVE_SNAPSHOT | Info | Snapshot '${SnapshotName}' deletion for VM '${VmName}' was initiated by ${UserName}. |
| 343 | USER_FAILED_REMOVE_SNAPSHOT | Error | Failed to remove Snapshot ${SnapshotName} for VM ${VmName} (User: ${UserName}). |
| 344 | USER_UPDATE_VM_POOL_WITH_VMS | Info | VM Pool ${VmPoolName} was updated by ${UserName}, ${VmsCount} VMs were added. |
| 345 | USER_UPDATE_VM_POOL_WITH_VMS_FAILED | Error | Failed to update VM Pool ${VmPoolName} (User: ${UserName}). |
| 346 | USER_PASSWORD_CHANGED | Info | Password changed successfully for ${UserName} |
| 347 | USER_PASSWORD_CHANGE_FAILED | Error | Failed to change password. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 348 | USER_CLEAR_UNKNOWN_VMS | Info | All VMs' status on Non Responsive Host ${VdsName} were changed to 'Down' by ${UserName} |
| 349 | USER_FAILED_CLEAR_UNKNOWN_VMS | Error | Failed to clear VMs' status on Non Responsive Host ${VdsName}. (User: ${UserName}). |
| 350 | USER_ADD_BOOKMARK | Info | Bookmark ${BookmarkName} was added by ${UserName}. |
| 351 | USER_ADD_BOOKMARK_FAILED | Error | Failed to add bookmark: ${BookmarkName} (User: ${UserName}). |
| 352 | USER_UPDATE_BOOKMARK | Info | Bookmark ${BookmarkName} was updated by ${UserName}. |
| 353 | USER_UPDATE_BOOKMARK_FAILED | Error | Failed to update bookmark: ${BookmarkName} (User: ${UserName}) |
| 354 | USER_REMOVE_BOOKMARK | Info | Bookmark ${BookmarkName} was removed by ${UserName}. |
| 355 | USER_REMOVE_BOOKMARK_FAILED | Error | Failed to remove bookmark ${BookmarkName} (User: ${UserName}) |
| 356 | USER_REMOVE_SNAPSHOT_FINISHED_SUCCESS | Info | Snapshot '${SnapshotName}' deletion for VM '${VmName}' has been completed. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 357 | USER_REMOVE_SNAPSHOT_FINISHED_FAILURE | Error | Failed to delete snapshot '${SnapshotName}' for VM '${VmName}'. |
| 358 | USER_VM_POOL_MAX_SUBSEQUENT_FAILURES_REACHED | Warning | Not all VMs where successfully created in VM Pool ${VmPoolName}. |
| 359 | USER_REMOVE_SNAPSHOT_FINISHED_FAILURE_PARTIAL_SNAPSHOT | Warning | Due to partial snapshot removal, Snapshot '${SnapshotName}' of VM '${VmName}' now contains only the following disks: '${DiskAliases}'. |
| 360 | USER_DETACH_USER_FROM_VM | Info | User ${AdUserName} was detached from VM ${VmName} by ${UserName}. |
| 361 | USER_FAILED_DETACH_USER_FROM_VM | Error | Failed to detach User ${AdUserName} from VM ${VmName} (User: ${UserName}). |
| 362 | USER_REMOVE_SNAPSHOT_FINISHED_FAILURE_BASE_IMAGE_NOT_FOUND | Error | Failed to merge images of snapshot '${SnapshotName}': base volume '${BaseVolumeId}' is missing. This may have been caused by a failed attempt to remove the parent snapshot; if this is the case, please retry deletion of the parent snapshot before deleting this one. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 370 | USER_EXTEND_DISK_SIZE_FAILURE | Error | Failed to extend size of the disk '${DiskAlias}' to ${NewSize} GB, User: ${UserName}. |
| 371 | USER_EXTEND_DISK_SIZE_SUCCESS | Info | Size of the disk '${DiskAlias}' was successfully updated to ${NewSize} GB by ${UserName}. |
| 372 | USER_EXTEND_DISK_SIZE_UPDATE_VM_FAILURE | Warning | Failed to update VM '${VmName}' with the new volume size. VM restart is recommended. |
| 373 | USER_REMOVE_DISK_SNAPSHOT | Info | Disk '${DiskAlias}' from Snapshot(s) '${Snapshots}' of VM '${VmName}' deletion was initiated by ${UserName}. |
| 374 | USER_FAILED_REMOVE_DISK_SNAPSHOT | Error | Failed to delete Disk '${DiskAlias}' from Snapshot(s) ${Snapshots} of VM ${VmName} (User: ${UserName}). |
| 375 | USER_REMOVE_DISK_SNAPSHOT_FINISHED_SUCCESS | Info | Disk '${DiskAlias}' from Snapshot(s) '${Snapshots}' of VM '${VmName}' deletion has been completed (User: ${UserName}). |
| 376 | USER_REMOVE_DISK_SNAPSHOT_FINISHED_FAILURE | Error | Failed to complete deletion of Disk '${DiskAlias}' from snapshot(s) '${Snapshots}' of VM '${VmName}' (User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 377 | USER_EXTENDED_DISK_SIZE | Info | Extending disk '${DiskAlias}' to ${NewSize} GB was initiated by ${UserName}. |
| 378 | USER_REGISTER_DISK_FINISHED_SUCCESS | Info | Disk '${DiskAlias}' has been successfully registered as a floating disk. |
| 379 | USER_REGISTER_DISK_FINISHED_FAILURE | Error | Failed to register Disk '${DiskAlias}'. |
| 380 | USER_EXTEND_DISK_SIZE_UPDATE_HOST_FAILURE | Warning | Failed to refresh volume size on host '${VdsName}'. Please try the operation again. |
| 381 | USER_REGISTER_DISK_INITIATED | Info | Registering Disk '${DiskAlias}' has been initiated. |
| 382 | USER_REDUCE_DISK_FINISHED_SUCCESS | Info | Disk '${DiskAlias}' has been successfully reduced. |
| 383 | USER_REDUCE_DISK_FINISHED_FAILURE | Error | Failed to reduce Disk '${DiskAlias}'. |
| 400 | USER_ATTACH_VM_TO_AD_GROUP | Info | Group ${GroupName} was attached to VM ${VmName} by ${UserName}. |
| 401 | USER_ATTACH_VM_TO_AD_GROUP_FAILED | Error | Failed to attach Group ${GroupName} to VM ${VmName} (User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 402 | USER_DETACH_VM_TO_AD_GROUP | Info | Group ${GroupName} was detached from VM ${VmName} by ${UserName}. |
| 403 | USER_DETACH_VM_TO_AD_GROUP_FAILED | Error | Failed to detach Group ${GroupName} from VM ${VmName} (User: ${UserName}). |
| 404 | USER_ATTACH_VM_POOL_TO_AD_GROUP | Info | Group ${GroupName} was attached to VM Pool ${VmPoolName} by ${UserName}. |
| 405 | USER_ATTACH_VM_POOL_TO_AD_GROUP_FAILED | Error | Failed to attach Group ${GroupName} to VM Pool ${VmPoolName} (User: ${UserName}). |
| 406 | USER_DETACH_VM_POOL_TO_AD_GROUP | Info | Group ${GroupName} was detached from VM Pool ${VmPoolName} by ${UserName}. |
| 407 | USER_DETACH_VM_POOL_TO_AD_GROUP_FAILED | Error | Failed to detach Group ${GroupName} from VM Pool ${VmPoolName} (User: ${UserName}). |
| 408 | USER_REMOVE_AD_GROUP | Info | Group ${GroupName} was removed by ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 409 | USER_REMOVE_AD_GROUP_FAILED | Error | Failed to remove group ${GroupName} (User: ${UserName}). |
| 430 | USER_UPDATE_TAG | Info | Tag ${TagName} configuration was updated by ${UserName}. |
| 431 | USER_UPDATE_TAG_FAILED | Error | Failed to update Tag ${TagName} (User: ${UserName}). |
| 432 | USER_ADD_TAG | Info | New Tag ${TagName} was created by ${UserName}. |
| 433 | USER_ADD_TAG_FAILED | Error | Failed to create Tag named ${TagName} (User: ${UserName}). |
| 434 | USER_REMOVE_TAG | Info | Tag ${TagName} was removed by ${UserName}. |
| 435 | USER_REMOVE_TAG_FAILED | Error | Failed to remove Tag ${TagName} (User: ${UserName}). |
| 436 | USER_ATTACH_TAG_TO_USER | Info | Tag ${TagName} was attached to User(s) ${AttachUsersNames} by ${UserName}. |
| 437 | USER_ATTACH_TAG_TO_USER_FAILED | Error | Failed to attach Tag ${TagName} to User(s) ${AttachUsersNames} (User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 438 | USER_ATTACH_TAG_TO_USER_GROUP | Info | Tag ${TagName} was attached to Group(s) ${AttachGroupsNames} by ${UserName}. |
| 439 | USER_ATTACH_TAG_TO_USER_GROUP_FAILED | Error | Failed to attach Group(s) ${AttachGroupsNames} to Tag ${TagName} (User: ${UserName}). |
| 440 | USER_ATTACH_TAG_TO_VM | Info | Tag ${TagName} was attached to VM(s) ${VmsNames} by ${UserName}. |
| 441 | USER_ATTACH_TAG_TO_VM_FAILED | Error | Failed to attach Tag ${TagName} to VM(s) ${VmsNames} (User: ${UserName}). |
| 442 | USER_ATTACH_TAG_TO_VDS | Info | Tag ${TagName} was attached to Host(s) ${VdsNames} by ${UserName}. |
| 443 | USER_ATTACH_TAG_TO_VDS_FAILED | Error | Failed to attach Tag ${TagName} to Host(s) ${VdsNames} (User: ${UserName}). |
| 444 | USER_DETACH_VDS_FROM_TAG | Info | Tag ${TagName} was detached from Host(s) ${VdsNames} by ${UserName}. |
| 445 | USER_DETACH_VDS_FROM_TAG_FAILED | Error | Failed to detach Tag ${TagName} from Host(s) ${VdsNames} (User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 446 | USER_DETACH_VM_FROM_TAG | Info | Tag ${TagName} was detached from VM(s) ${VmsNames} by ${UserName}. |
| 447 | USER_DETACH_VM_FROM_TAG_FAILED | Error | Failed to detach Tag ${TagName} from VM(s) ${VmsNames} (User: ${UserName}). |
| 448 | USER_DETACH_USER_FROM_TAG | Info | Tag ${TagName} detached from User(s) ${DetachUsersNames} by ${UserName}. |
| 449 | USER_DETACH_USER_FROM_TAG_FAILED | Error | Failed to detach Tag ${TagName} from User(s) ${DetachUsersNames} (User: ${UserName}). |
| 450 | USER_DETACH_USER_GROUP_FROM_TAG | Info | Tag ${TagName} was detached from Group(s) ${DetachGroupsNames} by ${UserName}. |
| 451 | USER_DETACH_USER_GROUP_FROM_TAG_FAILED | Error | Failed to detach Tag ${TagName} from Group(s) ${DetachGroupsNames} (User: ${UserName}). |
| 452 | USER_ATTACH_TAG_TO_USER_EXISTS | Warning | Tag ${TagName} already attached to User(s) ${AttachUsersNamesExists}. |
| 453 | USER_ATTACH_TAG_TO_USER_GROUP_EXISTS | Warning | Tag ${TagName} already attached to Group(s) ${AttachGroupsNamesExists}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 454 | USER_ATTACH_TAG_TO_VM_EXISTS | Warning | Tag ${TagName} already attached to VM(s) ${VmsNamesExists}. |
| 455 | USER_ATTACH_TAG_TO_VDS_EXISTS | Warning | Tag ${TagName} already attached to Host(s) ${VdsNamesExists}. |
| 456 | USER_LOGGED_IN_VM | Info | User ${GuestUser} logged in to VM ${VmName}. |
| 457 | USER_LOGGED_OUT_VM | Info | User ${GuestUser} logged out from VM ${VmName}. |
| 458 | USER_LOCKED_VM | Info | User ${GuestUser} locked VM ${VmName}. |
| 459 | USER_UNLOCKED_VM | Info | User ${GuestUser} unlocked VM ${VmName}. |
| 460 | USER_ATTACH_TAG_TO_TEMPLATE_EXISTS | Warning | Tag ${TagName} already attached to Template(s) ${TemplatesNamesExists}. |
| 467 | UPDATE_TAGS_VM_DEFAULT_DISPLAY_TYPE | Info | Vm ${VmName} tag default display type was updated |
| 468 | UPDATE_TAGS_VM_DEFAULT_DISPLAY_TYPE_FAILED | Info | Failed to update Vm ${VmName} tag default display type |
| 470 | USER_ATTACH_VM_POOL_TO_AD_GROUP_INTERNAL | Info | Group ${GroupName} was attached to VM Pool ${VmPoolName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 471 | USER_ATTACH_VM_POOL_TO_AD_GROUP_FAILED_INTERNAL | Error | Failed to attach Group ${GroupName} to VM Pool ${VmPoolName}. |
| 472 | USER_ATTACH_USER_TO_POOL_INTERNAL | Info | User ${AdUserName} was attached to VM Pool ${VmPoolName}. |
| 473 | USER_ATTACH_USER_TO_POOL_FAILED_INTERNAL | Error | Failed to attach User ${AdUserName} to VM Pool ${VmPoolName} (User: ${UserName}). |
| 493 | VDS_ALREADY_IN_REQUESTED_STATUS | Warning | Host ${HostName} is already ${AgentStatus}, Power Management ${Operation} operation skipped. |
| 494 | VDS_MANUAL_FENCE_STATUS | Info | Manual fence for host ${VdsName} was started. |
| 495 | VDS_MANUAL_FENCE_STATUS_FAILED | Error | Manual fence for host ${VdsName} failed. |
| 496 | VDS_FENCE_STATUS | Info | Host ${VdsName} power management was verified successfully. |
| 497 | VDS_FENCE_STATUS_FAILED | Error | Failed to verify Host ${VdsName} power management. |
| 498 | VDS_APPROVE | Info | Host ${VdsName} was successfully approved by user ${UserName}. |
| 499 | VDS_APPROVE_FAILED | Error | Failed to approve Host ${VdsName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 500 | VDS_FAILED_TO_RUN_VMS | Error | Host ${VdsName} will be switched to Error status for ${Time} minutes because it failed to run a VM. |
| 501 | USER_SUSPEND_VM | Info | Suspending VM ${VmName} was initiated by User ${UserName} (Host: ${VdsName}). |
| 502 | USER_FAILED_SUSPEND_VM | Error | Failed to suspend VM ${VmName} (Host: ${VdsName}). |
| 503 | USER_SUSPEND_VM_OK | Info | VM ${VmName} on Host ${VdsName} is suspended. |
| 504 | VDS_INSTALL | Info | Host ${VdsName} installed |
| 505 | VDS_INSTALL_FAILED | Error | Host ${VdsName} installation failed. ${FailedInstallMessage}. |
| 506 | VDS_INITIATED_RUN_VM | Info | Trying to restart VM ${VmName} on Host ${VdsName} |
| 509 | VDS_INSTALL_IN_PROGRESS | Info | Installing Host ${VdsName}. ${Message}. |
| 510 | VDS_INSTALL_IN_PROGRESS_WARNING | Warning | Host ${VdsName} installation in progress . ${Message}. |
| 511 | VDS_INSTALL_IN_PROGRESS_ERROR | Error | An error has occurred during installation of Host ${VdsName}: ${Message}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 512 | USER_SUSPEND_VM_FINISH_SUCCESS | Info | Suspending VM ${VmName} has been completed. |
| 513 | VDS_RECOVER_FAILED_VMS_UNKNOWN | Error | Host ${VdsName} cannot be reached, VMs state on this host are marked as Unknown. |
| 514 | VDS_INITIALIZING | Warning | Host ${VdsName} is initializing. Message: ${ErrorMessage} |
| 515 | VDS_CPU_LOWER_THAN_CLUSTER | Warning | Host ${VdsName} moved to Non-Operational state as host does not meet the cluster's minimum CPU level. Missing CPU features : ${CpuFlags} |
| 516 | VDS_CPU_RETRIEVE_FAILED | Warning | Failed to determine Host ${VdsName} CPU level - could not retrieve CPU flags. |
| 517 | VDS_SET_NONOPERATIONAL | Info | Host ${VdsName} moved to Non-Operational state. |
| 518 | VDS_SET_NONOPERATIONAL_FAILED | Error | Failed to move Host ${VdsName} to Non-Operational state. |
| 519 | VDS_SET_NONOPERATIONAL_NETWORK | Warning | Host ${VdsName} does not comply with the cluster ${ClusterName} networks, the following networks are missing on host: '${Networks}' |

| Code | Name | Severity | Message |
|---|---|---|---|
| 520 | USER_ATTACH_USER_TO_VM | Info | User ${AdUserName} was attached to VM ${VmName} by ${UserName}. |
| 521 | USER_SUSPEND_VM_FINISH_FAILURE | Error | Failed to complete suspending of VM ${VmName}. |
| 522 | VDS_SET_NONOPERATIONAL_DOMAIN | Warning | Host ${VdsName} cannot access the Storage Domain(s) ${StorageDomainNames} attached to the Data Center ${StoragePoolName}. Setting Host state to Non-Operational. |
| 523 | VDS_SET_NONOPERATIONAL_DOMAIN_FAILED | Error | Host ${VdsName} cannot access the Storage Domain(s) ${StorageDomainNames} attached to the Data Center ${StoragePoolName}. Failed to set Host state to Non-Operational. |
| 524 | VDS_DOMAIN_DELAY_INTERVAL | Warning | Storage domain ${StorageDomainName} experienced a high latency of ${Delay} seconds from host ${VdsName}. This may cause performance and functional issues. Please consult your Storage Administrator. |
| 525 | VDS_INITIATED_RUN_AS_STATELESS_VM_NOT_YET_RUNNING | Info | Starting VM ${VmName} as stateless was initiated. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 528 | USER_EJECT_VM_DISK | Info | CD was ejected from VM ${VmName} by ${UserName}. |
| 530 | VDS_MANUAL_FENCE_FAILED_CALL_FENCE_SPM | Warning | Manual fence did not revoke the selected SPM (${VdsName}) since the master storage domain\n was not active or could not use another host for the fence operation. |
| 531 | VDS_LOW_MEM | Warning | Available memory of host ${HostName} in cluster ${Cluster} [${AvailableMemory} MB] is under defined threshold [${Threshold} MB]. |
| 532 | VDS_HIGH_MEM_USE | Warning | Used memory of host ${HostName} in cluster ${Cluster} [${UsedMemory}%] exceeded defined threshold [${Threshold}%]. |
| 533 | VDS_HIGH_NETWORK_USE | Warning | |
| 534 | VDS_HIGH_CPU_USE | Warning | Used CPU of host ${HostName} [${UsedCpu}%] exceeded defined threshold [${Threshold}%]. |
| 535 | VDS_HIGH_SWAP_USE | Warning | Used swap memory of host ${HostName} [${UsedSwap}%] exceeded defined threshold [${Threshold}%]. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 536 | VDS_LOW_SWAP | Warning | Available swap memory of host ${HostName} [${AvailableSwapMemory} MB] is under defined threshold [${Threshold} MB]. |
| 537 | VDS_INITIATED_RUN_VM_AS_STATELESS | Info | VM ${VmName} was restarted on Host ${VdsName} as stateless |
| 538 | USER_RUN_VM_AS_STATELESS | Info | VM ${VmName} started on Host ${VdsName} as stateless |
| 539 | VDS_AUTO_FENCE_STATUS | Info | Auto fence for host ${VdsName} was started. |
| 540 | VDS_AUTO_FENCE_STATUS_FAILED | Error | Auto fence for host ${VdsName} failed. |
| 541 | VDS_AUTO_FENCE_FAILED_CALL_FENCE_SPM | Warning | Auto fence did not revoke the selected SPM (${VdsName}) since the master storage domain\n was not active or could not use another host for the fence operation. |
| 550 | VDS_PACKAGES_IN_PROGRESS | Info | Package update Host ${VdsName}. ${Message}. |
| 551 | VDS_PACKAGES_IN_PROGRESS_WARNING | Warning | Host ${VdsName} update packages in progress . ${Message}. |
| 552 | VDS_PACKAGES_IN_PROGRESS_ERROR | Error | Failed to update packages Host ${VdsName}. ${Message}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 555 | USER_MOVE_TAG | Info | Tag ${TagName} was moved from ${OldParnetTagName} to ${NewParentTagName} by ${UserName}. |
| 556 | USER_MOVE_TAG_FAILED | Error | Failed to move Tag ${TagName} from ${OldParnetTagName} to ${NewParentTagName} (User: ${UserName}). |
| 560 | VDS_ANSIBLE_INSTALL_STARTED | Info | Ansible host-deploy playbook execution has started on host ${VdsName}. |
| 561 | VDS_ANSIBLE_INSTALL_FINISHED | Info | Ansible host-deploy playbook execution has successfully finished on host ${VdsName}. |
| 562 | VDS_ANSIBLE_HOST_REMOVE_STARTED | Info | Ansible host-remove playbook execution started on host ${VdsName}. |
| 563 | VDS_ANSIBLE_HOST_REMOVE_FINISHED | Info | Ansible host-remove playbook execution has successfully finished on host ${VdsName}. For more details check log ${LogFile} |
| 564 | VDS_ANSIBLE_HOST_REMOVE_FAILED | Warning | Ansible host-remove playbook execution failed on host ${VdsName}. For more details please check log ${LogFile} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 565 | VDS_ANSIBLE_HOST_REMOVE_EXECUTION_FAILED | Info | Ansible host-remove playbook execution failed on host ${VdsName} with message: ${Message} |
| 600 | USER_VDS_MAINTENANCE | Info | Host ${VdsName} was switched to Maintenance mode by ${UserName} (Reason: ${Reason}). |
| 601 | CPU_FLAGS_NX_IS_MISSING | Warning | Host ${VdsName} is missing the NX cpu flag. This flag can be enabled via the host BIOS. Please set Disable Execute (XD) for an Intel host, or No Execute (NX) for AMD. Please make sure to completely power off the host for this change to take effect. |
| 602 | USER_VDS_MAINTENANCE_MIGRATION_FAILED | Warning | Host ${VdsName} cannot change into maintenance mode - not all Vms have been migrated successfully. Consider manual intervention: stopping/migrating Vms: ${failedVms} (User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 603 | VDS_SET_NONOPERATIONAL_IFACE_DOWN | Warning | Host ${VdsName} moved to Non-Operational state because interfaces which are down are needed by required networks in the current cluster: '${NicsWithNetworks}'. |
| 604 | VDS_TIME_DRIFT_ALERT | Warning | Host ${VdsName} has time-drift of ${Actual} seconds while maximum configured value is ${Max} seconds. |
| 605 | PROXY_HOST_SELECTION | Info | Host ${Proxy} from ${Origin} was chosen as a proxy to execute fencing on Host ${VdsName}. |
| 606 | HOST_REFRESHED_CAPABILITIES | Info | Successfully refreshed the capabilities of host ${VdsName}. |
| 607 | HOST_REFRESH_CAPABILITIES_FAILED | Error | Failed to refresh the capabilities of host ${VdsName}. |
| 608 | HOST_INTERFACE_HIGH_NETWORK_USE | Warning | Host ${HostName} has network interface which exceeded the defined threshold [${Threshold}%] (${InterfaceName}: transmit rate[${TransmitRate}%], receive rate [${ReceiveRate}%]) |
| 609 | HOST_INTERFACE_STATE_UP | Normal | Interface ${InterfaceName} on host ${VdsName}, changed state to up |

| Code | Name | Severity | Message |
|---|---|---|---|
| 610 | HOST_INTERFACE_STATE_DOWN | Warning | Interface ${InterfaceName} on host ${VdsName}, changed state to down |
| 611 | HOST_BOND_SLAVE_STATE_UP | Normal | Slave ${SlaveName} of bond ${BondName} on host ${VdsName}, changed state to up |
| 612 | HOST_BOND_SLAVE_STATE_DOWN | Warning | Slave ${SlaveName} of bond ${BondName} on host ${VdsName}, changed state to down |
| 613 | FENCE_KDUMP_LISTENER_IS_NOT_ALIVE | Error | Unable to determine if Kdump is in progress on host ${VdsName}, because fence_kdump listener is not running. |
| 614 | KDUMP_FLOW_DETECTED_ON_VDS | Info | Kdump flow is in progress on host ${VdsName}. |
| 615 | KDUMP_FLOW_NOT_DETECTED_ON_VDS | Info | Kdump flow is not in progress on host ${VdsName}. |
| 616 | KDUMP_FLOW_FINISHED_ON_VDS | Info | Kdump flow finished on host ${VdsName}. |
| 617 | KDUMP_DETECTION_NOT_CONFIGURED_ON_VDS | Warning | Kdump integration is enabled for host ${VdsName}, but kdump is not configured properly on host. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 618 | HOST_REGISTRATION_FAILED_INVALID_CLUSTER | Info | No default or valid cluster was found, Host ${VdsName} registration failed |
| 619 | HOST_PROTOCOL_INCOMPATIBLE_WITH_CLUSTER | Warning | Host ${VdsName} uses not compatible protocol during activation (xmlrpc instead of jsonrpc). Please examine installation logs and VDSM logs for failures and reinstall the host. |
| 620 | USER_VDS_MAINTENANCE_WITHOUT_REASON | Info | Host ${VdsName} was switched to Maintenance mode by ${UserName}. |
| 650 | USER_UNDO_RESTORE_FROM_SNAPSHOT_START | Info | Undoing a Snapshot-Preview for VM ${VmName} was initialized by ${UserName}. |
| 651 | USER_UNDO_RESTORE_FROM_SNAPSHOT_FINISH_SUCCESS | Info | Undoing a Snapshot-Preview for VM ${VmName} has been completed. |
| 652 | USER_UNDO_RESTORE_FROM_SNAPSHOT_FINISH_FAILURE | Error | Failed to undo Snapshot-Preview for VM ${VmName}. |
| 700 | DISK_ALIGNMENT_SCAN_START | Info | Starting alignment scan of disk '${DiskAlias}'. |
| 701 | DISK_ALIGNMENT_SCAN_FAILURE | Warning | Alignment scan of disk '${DiskAlias}' failed. |
| 702 | DISK_ALIGNMENT_SCAN_SUCCESS | Info | Alignment scan of disk '${DiskAlias}' is complete. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 809 | USER_ADD_CLUSTER | Info | Cluster ${ClusterName} was added by ${UserName} |
| 810 | USER_ADD_CLUSTER_FAILED | Error | Failed to add Host cluster (User: ${UserName}) |
| 811 | USER_UPDATE_CLUSTER | Info | Host cluster ${ClusterName} was updated by ${UserName} |
| 812 | USER_UPDATE_CLUSTER_FAILED | Error | Failed to update Host cluster (User: ${UserName}) |
| 813 | USER_REMOVE_CLUSTER | Info | Host cluster ${ClusterName} was removed by ${UserName} |
| 814 | USER_REMOVE_CLUSTER_FAILED | Error | Failed to remove Host cluster (User: ${UserName}) |
| 815 | USER_VDC_LOGOUT_FAILED | Error | Failed to log out user ${UserName} connected from '${SourceIP}' using session '${SessionID}'. |
| 816 | MAC_POOL_EMPTY | Warning | No MAC addresses left in the MAC Address Pool. |
| 817 | CERTIFICATE_FILE_NOT_FOUND | Error | Could not find oVirt Engine Certificate file. |
| 818 | RUN_VM_FAILED | Error | Cannot run VM ${VmName} on Host ${VdsName}. Error: ${ErrMsg} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 819 | VDS_REGISTER_ERROR_UPDATING_HOST | Error | Host registration failed - cannot update Host Name for Host ${VdsName2}. (Host: ${VdsName1}) |
| 820 | VDS_REGISTER_ERROR_UPDATING_HOST_ALL_TAKEN | Error | Host registration failed - all available Host Names are taken. (Host: ${VdsName1}) |
| 821 | VDS_REGISTER_HOST_IS_ACTIVE | Error | Host registration failed - cannot change Host Name of active Host ${VdsName2}. (Host: ${VdsName1}) |
| 822 | VDS_REGISTER_ERROR_UPDATING_NAME | Error | Host registration failed - cannot update Host Name for Host ${VdsName2}. (Host: ${VdsName1}) |
| 823 | VDS_REGISTER_ERROR_UPDATING_NAMES_ALL_TAKEN | Error | Host registration failed - all available Host Names are taken. (Host: ${VdsName1}) |
| 824 | VDS_REGISTER_NAME_IS_ACTIVE | Error | Host registration failed - cannot change Host Name of active Host ${VdsName2}. (Host: ${VdsName1}) |
| 825 | VDS_REGISTER_AUTO_APPROVE_PATTERN | Error | Host registration failed - auto approve pattern error. (Host: ${VdsName1}) |
| 826 | VDS_REGISTER_FAILED | Error | Host registration failed. (Host: ${VdsName1}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 827 | VDS_REGISTER_EXISTING_VDS_UPDATE_FAILED | Error | Host registration failed - cannot update existing Host. (Host: ${VdsName1}) |
| 828 | VDS_REGISTER_SUCCEEDED | Info | Host ${VdsName1} registered. |
| 829 | VM_MIGRATION_ON_CONNECT_CHECK_FAILED | Error | VM migration logic failed. (VM name: ${VmName}) |
| 830 | VM_MIGRATION_ON_CONNECT_CHECK_SUCCEEDED | Info | Migration check failed to execute. |
| 831 | USER_VDC_SESSION_TERMINATED | Info | User ${UserName} forcibly logged out user ${TerminatedSessionUsername} connected from '${SourceIP}' using session '${SessionID}'. |
| 832 | USER_VDC_SESSION_TERMINATION_FAILED | Error | User ${UserName} failed to forcibly log out user ${TerminatedSessionUsername} connected from '${SourceIP}' using session '${SessionID}'. |
| 833 | MAC_ADDRESS_IS_IN_USE | Warning | Network Interface ${IfaceName} has MAC address ${MACAddr} which is in use. |
| 834 | VDS_REGISTER_EMPTY_ID | Warning | Host registration failed, empty host id (Host: ${VdsHostName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 835 | SYSTEM_UPDATE_CLUSTER | Info | Host cluster ${ClusterName} was updated by system |
| 836 | SYSTEM_UPDATE_CLUSTER_FAILED | Info | Failed to update Host cluster by system |
| 837 | MAC_ADDRESSES_POOL_NOT_INITIALIZED | Warning | Mac Address Pool is not initialized. ${Message} |
| 838 | MAC_ADDRESS_IS_IN_USE_UNPLUG | Warning | Network Interface ${IfaceName} has MAC address ${MACAddr} which is in use, therefore it is being unplugged from VM ${VmName}. |
| 839 | HOST_AVAILABLE_UPDATES_FAILED | Error | Failed to check for available updates on host ${VdsName} with message '${Message}'. |
| 840 | HOST_UPGRADE_STARTED | Info | Host ${VdsName} upgrade was started (User: ${UserName}). |
| 841 | HOST_UPGRADE_FAILED | Error | Failed to upgrade Host ${VdsName} (User: ${UserName}). |
| 842 | HOST_UPGRADE_FINISHED | Info | Host ${VdsName} upgrade was completed successfully. |
| 845 | HOST_CERTIFICATION_IS_ABOUT_TO_EXPIRE | Warning | Host ${VdsName} certification is about to expire at ${ExpirationDate}. Please renew the host’s certification. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 846 | ENGINE_CERTIFICATION_HAS_EXPIRED | Info | Engine's certification has expired at ${ExpirationDate}. Please renew the engine's certification. |
| 847 | ENGINE_CERTIFICATION_IS_ABOUT_TO_EXPIRE | Warning | Engine's certification is about to expire at ${ExpirationDate}. Please renew the engine's certification. |
| 848 | ENGINE_CA_CERTIFICATION_HAS_EXPIRED | Info | Engine's CA certification has expired at ${ExpirationDate}. |
| 849 | ENGINE_CA_CERTIFICATION_IS_ABOUT_TO_EXPIRE | Warning | Engine's CA certification is about to expire at ${ExpirationDate}. |
| 850 | USER_ADD_PERMISSION | Info | User/Group ${SubjectName}, Namespace ${Namespace}, Authorization provider: ${Authz} was granted permission for Role ${RoleName} on ${VdcObjectType} ${VdcObjectName}, by ${UserName}. |
| 851 | USER_ADD_PERMISSION_FAILED | Error | User ${UserName} failed to grant permission for Role ${RoleName} on ${VdcObjectType} ${VdcObjectName} to User/Group ${SubjectName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 852 | USER_REMOVE_PERMISSION | Info | User/Group ${SubjectName} Role ${RoleName} permission was removed from ${VdcObjectType} ${VdcObjectName} by ${UserName} |
| 853 | USER_REMOVE_PERMISSION_FAILED | Error | User ${UserName} failed to remove permission for Role ${RoleName} from ${VdcObjectType} ${VdcObjectName} to User/Group ${SubjectName} |
| 854 | USER_ADD_ROLE | Info | Role ${RoleName} granted to ${UserName} |
| 855 | USER_ADD_ROLE_FAILED | Error | Failed to grant role ${RoleName} (User ${UserName}) |
| 856 | USER_UPDATE_ROLE | Info | ${UserName} Role was updated to the ${RoleName} Role |
| 857 | USER_UPDATE_ROLE_FAILED | Error | Failed to update role ${RoleName} to ${UserName} |
| 858 | USER_REMOVE_ROLE | Info | Role ${RoleName} removed from ${UserName} |
| 859 | USER_REMOVE_ROLE_FAILED | Error | Failed to remove role ${RoleName} (User ${UserName}) |
| 860 | USER_ATTACHED_ACTION_GROUP_TO_ROLE | Info | Action group ${ActionGroup} was attached to Role ${RoleName} by ${UserName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 861 | USER_ATTACHED_ACTION_GROUP_TO_ROLE_FAILED | Error | Failed to attach Action group ${ActionGroup} to Role ${RoleName} (User: ${UserName}) |
| 862 | USER_DETACHED_ACTION_GROUP_FROM_ROLE | Info | Action group ${ActionGroup} was detached from Role ${RoleName} by ${UserName} |
| 863 | USER_DETACHED_ACTION_GROUP_FROM_ROLE_FAILED | Error | Failed to attach Action group ${ActionGroup} to Role ${RoleName} by ${UserName} |
| 864 | USER_ADD_ROLE_WITH_ACTION_GROUP | Info | Role ${RoleName} was added by ${UserName} |
| 865 | USER_ADD_ROLE_WITH_ACTION_GROUP_FAILED | Error | Failed to add role ${RoleName} |
| 866 | USER_ADD_SYSTEM_PERMISSION | Info | User/Group ${SubjectName} was granted permission for Role ${RoleName} on ${VdcObjectType} by ${UserName}. |
| 867 | USER_ADD_SYSTEM_PERMISSION_FAILED | Error | User ${UserName} failed to grant permission for Role ${RoleName} on ${VdcObjectType} to User/Group ${SubjectName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 868 | USER_REMOVE_SYSTEM_PERMISSION | Info | User/Group ${SubjectName} Role ${RoleName} permission was removed from ${VdcObjectType} by ${UserName} |
| 869 | USER_REMOVE_SYSTEM_PERMISSION_FAILED | Error | User ${UserName} failed to remove permission for Role ${RoleName} from ${VdcObjectType} to User/Group ${SubjectName} |
| 870 | USER_ADD_PROFILE | Info | Profile created for ${UserName} |
| 871 | USER_ADD_PROFILE_FAILED | Error | Failed to create profile for ${UserName} |
| 872 | USER_UPDATE_PROFILE | Info | Updated profile for ${UserName} |
| 873 | USER_UPDATE_PROFILE_FAILED | Error | Failed to update profile for ${UserName} |
| 874 | USER_REMOVE_PROFILE | Info | Removed profile for ${UserName} |
| 875 | USER_REMOVE_PROFILE_FAILED | Error | Failed to remove profile for ${UserName} |
| 876 | HOST_CERTIFICATION_IS_INVALID | Error | Host ${VdsName} certification is invalid. The certification has no peer certificates. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 877 | HOST_CERTIFICATION_HAS_EXPIRED | Info | Host ${VdsName} certification has expired at ${ExpirationDate}. Please renew the host's certification. |
| 878 | ENGINE_CERTIFICATION_IS_ABOUT_TO_EXPIRE_ALERT | Info | Engine's certification is about to expire at ${ExpirationDate}. Please renew the engine's certification. |
| 879 | HOST_CERTIFICATION_IS_ABOUT_TO_EXPIRE_ALERT | Info | Host ${VdsName} certification is about to expire at ${ExpirationDate}. Please renew the host's certification. |
| 880 | HOST_CERTIFICATION_ENROLLMENT_STARTED | Normal | Enrolling certificate for host ${VdsName} was started (User: ${UserName}). |
| 881 | HOST_CERTIFICATION_ENROLLMENT_FINISHED | Normal | Enrolling certificate for host ${VdsName} was completed successfully (User: ${UserName}). |
| 882 | HOST_CERTIFICATION_ENROLLMENT_FAILED | Error | Failed to enroll certificate for host ${VdsName} (User: ${UserName}). |
| 883 | ENGINE_CA_CERTIFICATION_IS_ABOUT_TO_EXPIRE_ALERT | Info | Engine's CA certification is about to expire at ${ExpirationDate}. |
| 884 | HOST_AVAILABLE_UPDATES_STARTED | Info | Started to check for available updates on host ${VdsName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 885 | HOST_AVAILABLE_UPDATES_FINISHED | Info | Check for available updates on host ${VdsName} was completed successfully with message '${Message}'. |
| 886 | HOST_AVAILABLE_UPDATES_PROCESS_IS_ALREADY_RUNNING | Warning | Failed to check for available updates on host ${VdsName}: Another process is already running. |
| 887 | HOST_AVAILABLE_UPDATES_SKIPPED_UNSUPPORTED_STATUS | Warning | Failed to check for available updates on host ${VdsName}: Unsupported host status. |
| 890 | HOST_UPGRADE_FINISHED_MANUAL_HA | Warning | Host ${VdsName} upgrade was completed successfully, but the Hosted Engine HA service may still be in maintenance mode. If necessary, please correct this manually. |
| 900 | AD_COMPUTER_ACCOUNT_SUCCEEDED | Info | Account creation successful. |
| 901 | AD_COMPUTER_ACCOUNT_FAILED | Error | Account creation failed. |
| 918 | USER_FORCE_REMOVE_STORAGE_POOL | Info | Data Center ${StoragePoolName} was forcibly removed by ${UserName} |
| 919 | USER_FORCE_REMOVE_STORAGE_POOL_FAILED | Error | Failed to forcibly remove Data Center ${StoragePoolName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 925 | MAC_ADDRESS_IS_EXTERNAL | Warning | VM ${VmName} has MAC address(es) ${MACAddr}, which is/are out of its MAC pool definitions. |
| 926 | NETWORK_REMOVE_BOND | Info | Remove bond: ${BondName} for Host: ${VdsName} (User:${UserName}). |
| 927 | NETWORK_REMOVE_BOND_FAILED | Error | Failed to remove bond: ${BondName} for Host: ${VdsName} (User:${UserName}). |
| 928 | NETWORK_VDS_NETWORK_MATCH_CLUSTER | Info | Vds ${VdsName} network match to cluster ${ClusterName} |
| 929 | NETWORK_VDS_NETWORK_NOT_MATCH_CLUSTER | Error | Vds ${VdsName} network does not match to cluster ${ClusterName} |
| 930 | NETWORK_REMOVE_VM_INTERFACE | Info | Interface ${InterfaceName} (${InterfaceType}) was removed from VM ${VmName}. (User: ${UserName}) |
| 931 | NETWORK_REMOVE_VM_INTERFACE_FAILED | Error | Failed to remove Interface ${InterfaceName} (${InterfaceType}) from VM ${VmName}. (User: ${UserName}) |
| 932 | NETWORK_ADD_VM_INTERFACE | Info | Interface ${InterfaceName} (${InterfaceType}) was added to VM ${VmName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 933 | NETWORK_ADD_VM_INTERFACE_FAILED | Error | Failed to add Interface ${InterfaceName} (${InterfaceType}) to VM ${VmName}. (User: ${UserName}) |
| 934 | NETWORK_UPDATE_VM_INTERFACE | Info | Interface ${InterfaceName} (${InterfaceType}) was updated for VM ${VmName}. ${LinkState} (User: ${UserName}) |
| 935 | NETWORK_UPDATE_VM_INTERFACE_FAILED | Error | Failed to update Interface ${InterfaceName} (${InterfaceType}) for VM ${VmName}. (User: ${UserName}) |
| 936 | NETWORK_ADD_TEMPLATE_INTERFACE | Info | Interface ${InterfaceName} (${InterfaceType}) was added to Template ${VmTemplateName}. (User: ${UserName}) |
| 937 | NETWORK_ADD_TEMPLATE_INTERFACE_FAILED | Error | Failed to add Interface ${InterfaceName} (${InterfaceType}) to Template ${VmTemplateName}. (User: ${UserName}) |
| 938 | NETWORK_REMOVE_TEMPLATE_INTERFACE | Info | Interface ${InterfaceName} (${InterfaceType}) was removed from Template ${VmTemplateName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 939 | NETWORK_REMOVE_TEMPLATE_INTERFACE_FAILED | Error | Failed to remove Interface ${InterfaceName} (${InterfaceType}) from Template ${VmTemplateName}. (User: ${UserName}) |
| 940 | NETWORK_UPDATE_TEMPLATE_INTERFACE | Info | Interface ${InterfaceName} (${InterfaceType}) was updated for Template ${VmTemplateName}. (User: ${UserName}) |
| 941 | NETWORK_UPDATE_TEMPLATE_INTERFACE_FAILED | Error | Failed to update Interface ${InterfaceName} (${InterfaceType}) for Template ${VmTemplateName}. (User: ${UserName}) |
| 942 | NETWORK_ADD_NETWORK | Info | Network ${NetworkName} was added to Data Center: ${StoragePoolName} |
| 943 | NETWORK_ADD_NETWORK_FAILED | Error | Failed to add Network ${NetworkName} to Data Center: ${StoragePoolName} |
| 944 | NETWORK_REMOVE_NETWORK | Info | Network ${NetworkName} was removed from Data Center: ${StoragePoolName} |
| 945 | NETWORK_REMOVE_NETWORK_FAILED | Error | Failed to remove Network ${NetworkName} from Data Center: ${StoragePoolName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 946 | NETWORK_ATTACH_NETWORK_TO_CLUSTER | Info | Network ${NetworkName} attached to Cluster ${ClusterName} |
| 947 | NETWORK_ATTACH_NETWORK_TO_CLUSTER_FAILED | Error | Failed to attach Network ${NetworkName} to Cluster ${ClusterName} |
| 948 | NETWORK_DETACH_NETWORK_TO_CLUSTER | Info | Network ${NetworkName} detached from Cluster ${ClusterName} |
| 949 | NETWORK_DETACH_NETWORK_TO_CLUSTER_FAILED | Error | Failed to detach Network ${NetworkName} from Cluster ${ClusterName} |
| 950 | USER_ADD_STORAGE_POOL | Info | Data Center ${StoragePoolName}, Compatibility Version ${CompatibilityVersion} and Quota Type ${QuotaEnforcementType} was added by ${UserName} |
| 951 | USER_ADD_STORAGE_POOL_FAILED | Error | Failed to add Data Center ${StoragePoolName}. (User: ${UserName}) |
| 952 | USER_UPDATE_STORAGE_POOL | Info | Data Center ${StoragePoolName} was updated by ${UserName} |
| 953 | USER_UPDATE_STORAGE_POOL_FAILED | Error | Failed to update Data Center ${StoragePoolName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 954 | USER_REMOVE_STORAGE_POOL | Info | Data Center ${StoragePoolName} was removed by ${UserName} |
| 955 | USER_REMOVE_STORAGE_POOL_FAILED | Error | Failed to remove Data Center ${StoragePoolName}. (User: ${UserName}) |
| 956 | USER_ADD_STORAGE_DOMAIN | Info | Storage Domain ${StorageDomainName} was added by ${UserName} |
| 957 | USER_ADD_STORAGE_DOMAIN_FAILED | Error | Failed to add Storage Domain ${StorageDomainName}. (User: ${UserName}) |
| 958 | USER_UPDATE_STORAGE_DOMAIN | Info | Storage Domain ${StorageDomainName} was updated by ${UserName} |
| 959 | USER_UPDATE_STORAGE_DOMAIN_FAILED | Error | Failed to update Storage Domain ${StorageDomainName}. (User: ${UserName}) |
| 960 | USER_REMOVE_STORAGE_DOMAIN | Info | Storage Domain ${StorageDomainName} was removed by ${UserName} |
| 961 | USER_REMOVE_STORAGE_DOMAIN_FAILED | Error | Failed to remove Storage Domain ${StorageDomainName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 962 | USER_ATTACH_STORAGE_DOMAIN_TO_POOL | Info | Storage Domain ${StorageDomainName} was attached to Data Center ${StoragePoolName} by ${UserName} |
| 963 | USER_ATTACH_STORAGE_DOMAIN_TO_POOL_FAILED | Error | Failed to attach Storage Domain ${StorageDomainName} to Data Center ${StoragePoolName}. (User: ${UserName}) |
| 964 | USER_DETACH_STORAGE_DOMAIN_FROM_POOL | Info | Storage Domain ${StorageDomainName} was detached from Data Center ${StoragePoolName} by ${UserName} |
| 965 | USER_DETACH_STORAGE_DOMAIN_FROM_POOL_FAILED | Error | Failed to detach Storage Domain ${StorageDomainName} from Data Center ${StoragePoolName}. (User: ${UserName}) |
| 966 | USER_ACTIVATED_STORAGE_DOMAIN | Info | Storage Domain ${StorageDomainName} (Data Center ${StoragePoolName}) was activated by ${UserName} |
| 967 | USER_ACTIVATE_STORAGE_DOMAIN_FAILED | Error | Failed to activate Storage Domain ${StorageDomainName} (Data Center ${StoragePoolName}) by ${UserName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 968 | USER_DEACTIVATED_STORAGE_DOMAIN | Info | Storage Domain ${StorageDomainName} (Data Center ${StoragePoolName}) was deactivated and has moved to 'Preparing for maintenance' until it will no longer be accessed by any Host of the Data Center. |
| 969 | USER_DEACTIVATE_STORAGE_DOMAIN_FAILED | Error | Failed to deactivate Storage Domain ${StorageDomainName} (Data Center ${StoragePoolName}). |
| 970 | SYSTEM_DEACTIVATED_STORAGE_DOMAIN | Warning | Storage Domain ${StorageDomainName} (Data Center ${StoragePoolName}) was deactivated by system because it’s not visible by any of the hosts. |
| 971 | SYSTEM_DEACTIVATE_STORAGE_DOMAIN_FAILED | Error | Failed to deactivate Storage Domain ${StorageDomainName} (Data Center ${StoragePoolName}). |
| 972 | USER_EXTENDED_STORAGE_DOMAIN | Info | Storage ${StorageDomainName} has been extended by ${UserName}. Please wait for refresh. |
| 973 | USER_EXTENDED_STORAGE_DOMAIN_FAILED | Error | Failed to extend Storage Domain ${StorageDomainName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 974 | USER_REMOVE_VG | Info | Volume group ${VgId} was removed by ${UserName}. |
| 975 | USER_REMOVE_VG_FAILED | Error | Failed to remove Volume group ${VgId}. (User: UserName) |
| 976 | USER_ACTIVATE_STORAGE_POOL | Info | Data Center ${StoragePoolName} was activated. (User: ${UserName}) |
| 977 | USER_ACTIVATE_STORAGE_POOL_FAILED | Error | Failed to activate Data Center ${StoragePoolName}. (User: ${UserName}) |
| 978 | SYSTEM_FAILED_CHANGE_STORAGE_POOL_STATUS | Error | Failed to change Data Center ${StoragePoolName} status. |
| 979 | SYSTEM_CHANGE_STORAGE_POOL_STATUS_NO_HOST_FOR_SPM | Error | Fencing failed on Storage Pool Manager ${VdsName} for Data Center ${StoragePoolName}. Setting status to Non-Operational. |
| 980 | SYSTEM_CHANGE_STORAGE_POOL_STATUS_PROBLEMATIC | Warning | Invalid status on Data Center ${StoragePoolName}. Setting status to Non Responsive. |
| 981 | USER_FORCE_REMOVE_STORAGE_DOMAIN | Info | Storage Domain ${StorageDomainName} was forcibly removed by ${UserName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 982 | USER_FORCE_REMOVE_STORAGE_DOMAIN_FAILED | Error | Failed to forcibly remove Storage Domain ${StorageDomainName}. (User: ${UserName}) |
| 983 | RECONSTRUCT_MASTER_FAILED_NO_MASTER | Warning | No valid Data Storage Domains are available in Data Center ${StoragePoolName} (please check your storage infrastructure). |
| 984 | RECONSTRUCT_MASTER_DONE | Info | Reconstruct Master Domain for Data Center ${StoragePoolName} completed. |
| 985 | RECONSTRUCT_MASTER_FAILED | Error | Failed to Reconstruct Master Domain for Data Center ${StoragePoolName}. |
| 986 | SYSTEM_CHANGE_STORAGE_POOL_STATUS_PROBLEMATIC_SEARCHING_NEW_SPM | Warning | Data Center is being initialized, please wait for initialization to complete. |
| 987 | SYSTEM_CHANGE_STORAGE_POOL_STATUS_PROBLEMATIC_WITH_ERROR | Warning | Invalid status on Data Center ${StoragePoolName}. Setting Data Center status to Non Responsive (On host ${VdsName}, Error: ${Error}). |
| 988 | USER_CONNECT_HOSTS_TO_LUN_FAILED | Error | Failed to connect Host ${VdsName} to device. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 989 | SYSTEM_CHANGE_STORAGE_POOL_STATUS_PROBLEMATIC_FROM_NON_OPERATIONAL | Info | Try to recover Data Center ${StoragePoolName}. Setting status to Non Responsive. |
| 990 | SYSTEM_MASTER_DOMAIN_NOT_IN_SYNC | Warning | Sync Error on Master Domain between Host ${VdsName} and oVirt Engine. Domain: ${StorageDomainName} is marked as Master in oVirt Engine database but not on the Storage side. Please consult with Support on how to fix this issue. |
| 991 | RECOVERY_STORAGE_POOL | Info | Data Center ${StoragePoolName} was recovered by ${UserName} |
| 992 | RECOVERY_STORAGE_POOL_FAILED | Error | Failed to recover Data Center ${StoragePoolName} (User:${UserName}) |
| 993 | SYSTEM_CHANGE_STORAGE_POOL_STATUS_RESET_IRS | Info | Data Center ${StoragePoolName} was reset. Setting status to Non Responsive (Elect new Storage Pool Manager). |
| 994 | CONNECT_STORAGE_SERVERS_FAILED | Warning | Failed to connect Host ${VdsName} to Storage Servers |
| 995 | CONNECT_STORAGE_POOL_FAILED | Warning | Failed to connect Host ${VdsName} to Storage Pool ${StoragePoolName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 996 | STORAGE_DOMAIN_ERROR | Error | The error message for connection ${Connection} returned by VDSM was: ${ErrorMessage} |
| 997 | REFRESH_REPOSITORY_IMAGE_LIST_FAILED | Error | Refresh image list failed for domain(s): ${imageDomains}. Please check domain activity. |
| 998 | REFRESH_REPOSITORY_IMAGE_LIST_SUCCEEDED | Info | Refresh image list succeeded for domain(s): ${imageDomains} |
| 999 | STORAGE_ALERT_VG_METADATA_CRITICALLY_FULL | Error | The system has reached the 80% watermark on the VG metadata area size on ${StorageDomainName}.\nThis is due to a high number of Vdisks or large Vdisks size allocated on this specific VG. |
| 1000 | STORAGE_ALERT_SMALL_VG_METADATA | Warning | The allocated VG metadata area size is smaller than 50MB on ${StorageDomainName},\nwhich might limit its capacity (the number of Vdisks and/or their size). |
| 1001 | USER_RUN_VM_FAILURE_STATELESS_SNAPSHOT_LEFT | Error | Failed to start VM ${VmName}, because exist snapshot for stateless state. Snapshot will be deleted. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1002 | USER_ATTACH_STORAGE_DOMAINS_TO_POOL | Info | Storage Domains were attached to Data Center ${StoragePoolName} by ${UserName} |
| 1003 | USER_ATTACH_STORAGE_DOMAINS_TO_POOL_FAILED | Error | Failed to attach Storage Domains to Data Center ${StoragePoolName}. (User: ${UserName}) |
| 1004 | STORAGE_DOMAIN_TASKS_ERROR | Warning | Storage Domain ${StorageDomainName} is down while there are tasks running on it. These tasks may fail. |
| 1005 | UPDATE_OVF_FOR_STORAGE_POOL_FAILED | Warning | Failed to update VMs/Templates OVF data in Data Center ${StoragePoolName}. |
| 1006 | UPGRADE_STORAGE_POOL_ENCOUNTERED_PROBLEMS | Warning | Data Center ${StoragePoolName} has encountered problems during upgrade process. |
| 1007 | REFRESH_REPOSITORY_IMAGE_LIST_INCOMPLETE | Warning | Refresh image list probably incomplete for domain ${imageDomain}, only ${imageListSize} images discovered. |
| 1008 | NUMBER_OF_LVS_ON_STORAGE_DOMAIN_EXCEEDED_THRESHOLD | Warning | The number of LVs on the domain ${storageDomainName} exceeded ${maxNumOfLVs}, you are approaching the limit where performance may degrade. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1009 | USER_DEACTIVATE_STORAGE_DOMAIN_OVF_UPDATE_INCOMPLETE | Warning | Failed to deactivate Storage Domain ${StorageDomainName} as the engine was restarted during the operation, please retry. (Data Center ${StoragePoolName}). |
| 1010 | RELOAD_CONFIGURATIONS_SUCCESS | Info | System Configurations reloaded successfully. |
| 1011 | RELOAD_CONFIGURATIONS_FAILURE | Error | System Configurations failed to reload. |
| 1012 | NETWORK_ACTIVATE_VM_INTERFACE_SUCCESS | Info | Network Interface ${InterfaceName} (${InterfaceType}) was plugged to VM ${VmName}. (User: ${UserName}) |
| 1013 | NETWORK_ACTIVATE_VM_INTERFACE_FAILURE | Error | Failed to plug Network Interface ${InterfaceName} (${InterfaceType}) to VM ${VmName}. (User: ${UserName}) |
| 1014 | NETWORK_DEACTIVATE_VM_INTERFACE_SUCCESS | Info | Network Interface ${InterfaceName} (${InterfaceType}) was unplugged from VM ${VmName}. (User: ${UserName}) |
| 1015 | NETWORK_DEACTIVATE_VM_INTERFACE_FAILURE | Error | Failed to unplug Network Interface ${InterfaceName} (${InterfaceType}) from VM ${VmName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1016 | UPDATE_FOR_OVF_STORES_FAILED | Warning | Failed to update OVF disks ${DisksIds}, OVF data isn't updated on those OVF stores (Data Center ${DataCenterName}, Storage Domain ${StorageDomainName}). |
| 1017 | RETRIEVE_OVF_STORE_FAILED | Warning | Failed to retrieve VMs and Templates from the OVF disk of Storage Domain ${StorageDomainName}. |
| 1018 | OVF_STORE_DOES_NOT_EXISTS | Warning | This Data center compatibility version does not support importing a data domain with its entities (VMs and Templates). The imported domain will be imported without them. |
| 1019 | UPDATE_DESCRIPTION_FOR_DISK_FAILED | Error | Failed to update the meta data description of disk ${DiskName} (Data Center ${DataCenterName}, Storage Domain ${StorageDomainName}). |
| 1020 | UPDATE_DESCRIPTION_FOR_DISK_SKIPPED_SINCE_STORAGE_DOMAIN_NOT_ACTIVE | Warning | Not updating the metadata of Disk ${DiskName} (Data Center ${DataCenterName}. Since the Storage Domain ${StorageDomainName} is not in active. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1022 | USER_REFRESH_LUN_STORAGE_DOMAIN | Info | Resize LUNs operation succeeded. |
| 1023 | USER_REFRESH_LUN_STORAGE_DOMAIN_FAILED | Error | Failed to resize LUNs. |
| 1024 | USER_REFRESH_LUN_STORAGE_DIFFERENT_SIZE_DOMAIN_FAILED | Error | Failed to resize LUNs.\n Not all the hosts are seeing the same LUN size. |
| 1025 | VM_PAUSED | Info | VM ${VmName} has been paused. |
| 1026 | FAILED_TO_STORE_ENTIRE_DISK_FIELD_IN_DISK_DESCRIPTION_METADATA | Warning | Failed to store field ${DiskFieldName} as a part of ${DiskAlias}'s description metadata due to storage space limitations. The field ${DiskFieldName} will be truncated. |
| 1027 | FAILED_TO_STORE_ENTIRE_DISK_FIELD_AND_REST_OF_FIELDS_IN_DISK_DESCRIPTION_METADATA | Warning | Failed to store field ${DiskFieldName} as a part of ${DiskAlias}'s description metadata due to storage space limitations. The value will be truncated and the following fields will not be stored at all: ${DiskFieldsNames}. |
| 1028 | FAILED_TO_STORE_DISK_FIELDS_IN_DISK_DESCRIPTION_METADATA | Warning | Failed to store the following fields in the description metadata of disk ${DiskAlias} due to storage space limitations: ${DiskFieldsNames}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1029 | STORAGE_DOMAIN_MOVED_TO_MAINTENANCE | Info | Storage Domain ${StorageDomainName} (Data Center ${StoragePoolName}) successfully moved to Maintenance as it's no longer accessed by any Host of the Data Center. |
| 1030 | USER_DEACTIVATED_LAST_MASTER_STORAGE_DOMAIN | Info | Storage Domain ${StorageDomainName} (Data Center ${StoragePoolName}) was deactivated. |
| 1031 | TRANSFER_IMAGE_INITIATED | Info | Image ${TransferType} with disk ${DiskAlias} was initiated by ${UserName}. |
| 1032 | TRANSFER_IMAGE_SUCCEEDED | Info | Image ${TransferType} with disk ${DiskAlias} succeeded. |
| 1033 | TRANSFER_IMAGE_CANCELLED | Info | Image ${TransferType} with disk ${DiskAlias} was cancelled. |
| 1034 | TRANSFER_IMAGE_FAILED | Error | Image ${TransferType} with disk ${DiskAlias} failed. |
| 1035 | TRANSFER_IMAGE_TEARDOWN_FAILED | Info | Failed to tear down image ${DiskAlias} after image transfer session. |
| 1036 | USER_SCAN_STORAGE_DOMAIN_FOR_UNREGISTERED_DISKS | Info | Storage Domain ${StorageDomainName} has finished to scan for unregistered disks by ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1037 | USER_SCAN_STORAGE_DOMAIN_FOR_UNREGISTERED_DISKS_FAILED | Error | Storage Domain ${StorageDomainName} failed to scan for unregistered disks by ${UserName}. |
| 1039 | LUNS_BROKE_SD_PASS_DISCARD_SUPPORT | Warning | Luns with IDs: [${LunsIds}] were updated in the DB but caused the storage domain ${StorageDomainName} (ID ${storageDomainId}) to stop supporting passing discard from the guest to the underlying storage. Please configure these luns' discard support in the underlying storage or disable 'Enable Discard' for vm disks on this storage domain. |
| 1040 | DISKS_WITH_ILLEGAL_PASS_DISCARD_EXIST | Warning | Disks with IDs: [${DisksIds}] have their 'Enable Discard' on even though the underlying storage does not support it. Please configure the underlying storage to support discard or disable 'Enable Discard' for these disks. |
| 1041 | USER_REMOVE_DEVICE_FROM_STORAGE_DOMAIN_FAILED | Error | Failed to remove ${LunId} from Storage Domain ${StorageDomainName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1042 | USER_REMOVE_DEVICE_FROM_STORAGE_DOMAIN | Info | ${LunId} was removed from Storage Domain ${StorageDomainName}. (User: ${UserName}) |
| 1043 | USER_REMOVE_DEVICE_FROM_STORAGE_DOMAIN_STARTED | Info | Started to remove ${LunId} from Storage Domain ${StorageDomainName}. (User: ${UserName}) |
| 1044 | ILLEGAL_STORAGE_DOMAIN_DISCARD_AFTER_DELETE | Warning | The storage domain with id ${storageDomainId} has its 'Discard After Delete' enabled even though the underlying storage does not support discard. Therefore, disks and snapshots on this storage domain will not be discarded before they are removed. |
| 1045 | LUNS_BROKE_SD_DISCARD_AFTER_DELETE_SUPPORT | Warning | Luns with IDs: [${LunsIds}] were updated in the DB but caused the storage domain ${StorageDomainName} (ID ${storageDomainId}) to stop supporting discard after delete. Please configure these luns' discard support in the underlying storage or disable 'Discard After Delete' for this storage domain. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1046 | STORAGE_DOMAINS_COULD_NOT_BE_SYNCED | Info | Storage domains with IDs [${StorageDomainsIds}] could not be synchronized. To synchronize them, please move them to maintenance and then activate. |
| 1048 | DIRECT_LUNS_COULD_NOT_BE_SYNCED | Info | Direct LUN disks with IDs [${DirectLunDisksIds}] could not be synchronized because there was no active host in the data center. Please synchronize them to get their latest information from the storage. |
| 1052 | OVF_STORES_UPDATE_IGNORED | Normal | OVFs update was ignored - nothing to update for storage domain '${StorageDomainName}' |
| 1060 | UPLOAD_IMAGE_CLIENT_ERROR | Error | Unable to upload image to disk ${DiskId} due to a client error. Make sure the selected file is readable. |
| 1061 | UPLOAD_IMAGE_XHR_TIMEOUT_ERROR | Error | Unable to upload image to disk ${DiskId} due to a request timeout error. The upload bandwidth might be too slow. Please try to reduce the chunk size: 'engine-config -s UploadImageChunkSizeKB' |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1062 | UPLOAD_IMAGE_NETWORK_ERROR | Error | Unable to upload image to disk ${DiskId} due to a network error. Ensure that ovirt-imageio service is installed and configured and that ovirt-engine's CA certificate is registered as a trusted CA in the browser. The certificate can be fetched from ${EngineUrl}/ovirt-engine/services/pki-resource?resource |
| 1063 | DOWNLOAD_IMAGE_NETWORK_ERROR | Error | Unable to download disk ${DiskId} due to a network error. Make sure ovirt-imageio service is installed and configured, and ovirt-engine's certificate is registered as a valid CA in the browser. The certificate can be fetched from https://<engine_url>/ovirt-engine/services/pki-resource?resource |
| 1064 | TRANSFER_IMAGE_STOPPED_BY_SYSTEM_TICKET_RENEW_FAILURE | Error | Transfer was stopped by system. Reason: failure in transfer image ticket renewal. |
| 1065 | TRANSFER_IMAGE_STOPPED_BY_SYSTEM_MISSING_TICKET | Error | Transfer was stopped by system. Reason: missing transfer image ticket. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1067 | TRANSFER_IMAGE_STOPPED_BY_SYSTEM_MISSING_HOST | Error | Transfer was stopped by system. Reason: Could not find a suitable host for image data transfer. |
| 1068 | TRANSFER_IMAGE_STOPPED_BY_SYSTEM_FAILED_TO_CREATE_TICKET | Error | Transfer was stopped by system. Reason: failed to create a signed image ticket. |
| 1069 | TRANSFER_IMAGE_STOPPED_BY_SYSTEM_FAILED_TO_ADD_TICKET_TO_DAEMON | Error | Transfer was stopped by system. Reason: failed to add image ticket to ovirt-imageio-daemon. |
| 1070 | TRANSFER_IMAGE_STOPPED_BY_SYSTEM_FAILED_TO_ADD_TICKET_TO_PROXY | Error | Transfer was stopped by system. Reason: failed to add image ticket to ovirt-imageio. |
| 1071 | UPLOAD_IMAGE_PAUSED_BY_SYSTEM_TIMEOUT | Error | Upload was paused by system. Reason: timeout due to transfer inactivity. |
| 1072 | DOWNLOAD_IMAGE_CANCELED_TIMEOUT | Error | Download was canceled by system. Reason: timeout due to transfer inactivity. |
| 1073 | TRANSFER_IMAGE_PAUSED_BY_USER | Normal | Image transfer was paused by user (${UserName}). |
| 1074 | TRANSFER_IMAGE_RESUMED_BY_USER | Normal | Image transfer was resumed by user (${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1098 | NETWORK_UPDATE_DISPLAY_FOR_HOST_WITH_ACTIVE_VM | Warning | Display Network was updated on Host ${VdsName} with active VMs attached. The change will be applied to those VMs after their next reboot. Running VMs might loose display connectivity until then. |
| 1099 | NETWORK_UPDATE_DISPLAY_FOR_CLUSTER_WITH_ACTIVE_VM | Warning | Display Network (${NetworkName}) was updated for Cluster ${ClusterName} with active VMs attached. The change will be applied to those VMs after their next reboot. |
| 1100 | NETWORK_UPDATE_DISPLAY_TO_CLUSTER | Info | Update Display Network (${NetworkName}) for Cluster ${ClusterName}. (User: ${UserName}) |
| 1101 | NETWORK_UPDATE_DISPLAY_TO_CLUSTER_FAILED | Error | Failed to update Display Network (${NetworkName}) for Cluster ${ClusterName}. (User: ${UserName}) |
| 1102 | NETWORK_UPDATE_NETWORK_TO_VDS_INTERFACE | Info | Update Network ${NetworkName} in Host ${VdsName}. (User: ${UserName}) |
| 1103 | NETWORK_UPDATE_NETWORK_TO_VDS_INTERFACE_FAILED | Error | Failed to update Network ${NetworkName} in Host ${VdsName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1104 | NETWORK_COMMIT_NETWORK_CHANGES | Info | Network changes were saved on host ${VdsName} |
| 1105 | NETWORK_COMMIT_NETWORK_CHANGES_FAILED | Error | Failed to commit network changes on ${VdsName} |
| 1106 | NETWORK_HOST_USING_WRONG_CLUSER_VLAN | Warning | ${VdsName} is having wrong vlan id: ${VlanIdHost}, expected vlan id: ${VlanIdCluster} |
| 1107 | NETWORK_HOST_MISSING_CLUSER_VLAN | Warning | ${VdsName} is missing vlan id: ${VlanIdCluster} that is expected by the cluster |
| 1108 | VDS_NETWORK_MTU_DIFFER_FROM_LOGICAL_NETWORK | Info | |
| 1109 | BRIDGED_NETWORK_OVER_MULTIPLE_INTERFACES | Warning | Bridged network ${NetworkName} is attached to multiple interfaces: ${Interfaces} on Host ${VdsName}. |
| 1110 | VDS_NETWORKS_OUT_OF_SYNC | Warning | Host ${VdsName}'s following network(s) are not synchronized with their Logical Network configuration: ${Networks}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1111 | VM_MIGRATION_FAILED_DURING_MOVE_TO_MAINTENANCE_NO_DESTINATION_VDS | Error | Migration failed${DueToMigrationError} while Source Host is in 'preparing for maintenance' state.\n Consider manual intervention\: stopping/migrating Vms as Host’s state will not\n turn to maintenance while VMs are still running on it.(VM: ${VmName}, Source: ${VdsName}). |
| 1112 | NETWORK_UPDTAE_NETWORK_ON_CLUSTER | Info | Network ${NetworkName} on Cluster ${ClusterName} updated. |
| 1113 | NETWORK_UPDTAE_NETWORK_ON_CLUSTER_FAILED | Error | Failed to update Network ${NetworkName} on Cluster ${ClusterName}. |
| 1114 | NETWORK_UPDATE_NETWORK | Info | Network ${NetworkName} was updated on Data Center: ${StoragePoolName} |
| 1115 | NETWORK_UPDATE_NETWORK_FAILED | Error | Failed to update Network ${NetworkName} on Data Center: ${StoragePoolName} |
| 1116 | NETWORK_UPDATE_VM_INTERFACE_LINK_UP | Info | Link State is UP. |
| 1117 | NETWORK_UPDATE_VM_INTERFACE_LINK_DOWN | Info | Link State is DOWN. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1118 | INVALID_BOND_INTERFACE_FOR_MANAGEMENT_NETWORK_CONFIGURATION | Error | Failed to configure management network on host ${VdsName}. Host ${VdsName} has an invalid bond interface (${InterfaceName} contains less than 2 active slaves) for the management network configuration. |
| 1119 | VLAN_ID_MISMATCH_FOR_MANAGEMENT_NETWORK_CONFIGURATION | Error | Failed to configure management network on host ${VdsName}. Host ${VdsName} has an interface ${InterfaceName} for the management network configuration with VLAN-ID (${VlanId}), which is different from data-center definition (${MgmtVlanId}). |
| 1120 | SETUP_NETWORK_FAILED_FOR_MANAGEMENT_NETWORK_CONFIGURATION | Error | Failed to configure management network on host ${VdsName} due to setup networks failure. |
| 1121 | PERSIST_NETWORK_FAILED_FOR_MANAGEMENT_NETWORK | Warning | Failed to configure management network on host ${VdsName} due to failure in persisting the management network configuration. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1122 | ADD_VNIC_PROFILE | Info | VM network interface profile ${VnicProfileName} was added to network ${NetworkName} in Data Center: ${DataCenterName}. (User: ${UserName}) |
| 1123 | ADD_VNIC_PROFILE_FAILED | Error | Failed to add VM network interface profile ${VnicProfileName} to network ${NetworkName} in Data Center: ${DataCenterName} (User: ${UserName}) |
| 1124 | UPDATE_VNIC_PROFILE | Info | VM network interface profile ${VnicProfileName} was updated for network ${NetworkName} in Data Center: ${DataCenterName}. (User: ${UserName}) |
| 1125 | UPDATE_VNIC_PROFILE_FAILED | Error | Failed to update VM network interface profile ${VnicProfileName} for network ${NetworkName} in Data Center: ${DataCenterName}. (User: ${UserName}) |
| 1126 | REMOVE_VNIC_PROFILE | Info | VM network interface profile ${VnicProfileName} was removed from network ${NetworkName} in Data Center: ${DataCenterName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1127 | REMOVE_VNIC_PROFILE_FAILED | Error | Failed to remove VM network interface profile ${VnicProfileName} from network ${NetworkName} in Data Center: ${DataCenterName}. (User: ${UserName}) |
| 1128 | NETWORK_WITHOUT_INTERFACES | Warning | Network ${NetworkName} is not attached to any interface on host ${VdsName}. |
| 1129 | VNIC_PROFILE_UNSUPPORTED_FEATURES | Warning | VM ${VmName} has network interface ${NicName} which is using profile ${VnicProfile} with unsupported feature(s) '${UnsupportedFeatures}' by VM cluster ${ClusterName} (version ${CompatibilityVersion}). |
| 1131 | REMOVE_NETWORK_BY_LABEL_FAILED | Error | Network ${Network} cannot be removed from the following hosts: ${HostNames} in data-center ${StoragePoolName}. |
| 1132 | LABEL_NETWORK | Info | Network ${NetworkName} was labeled ${Label} in data-center ${StoragePoolName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1133 | LABEL_NETWORK_FAILED | Error | Failed to label network ${NetworkName} with label ${Label} in data-center ${StoragePoolName}. |
| 1134 | UNLABEL_NETWORK | Info | Network ${NetworkName} was unlabeled in data-center ${StoragePoolName}. |
| 1135 | UNLABEL_NETWORK_FAILED | Error | Failed to unlabel network ${NetworkName} in data-center ${StoragePoolName}. |
| 1136 | LABEL_NIC | Info | Network interface card ${NicName} was labeled ${Label} on host ${VdsName}. |
| 1137 | LABEL_NIC_FAILED | Error | Failed to label network interface card ${NicName} with label ${Label} on host ${VdsName}. |
| 1138 | UNLABEL_NIC | Info | Label ${Label} was removed from network interface card ${NicName} on host ${VdsName}. |
| 1139 | UNLABEL_NIC_FAILED | Error | Failed to remove label ${Label} from network interface card ${NicName} on host ${VdsName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1140 | SUBNET_REMOVED | Info | Subnet ${SubnetName} was removed from provider ${ProviderName}. (User: ${UserName}) |
| 1141 | SUBNET_REMOVAL_FAILED | Error | Failed to remove subnet ${SubnetName} from provider ${ProviderName}. (User: ${UserName}) |
| 1142 | SUBNET_ADDED | Info | Subnet ${SubnetName} was added on provider ${ProviderName}. (User: ${UserName}) |
| 1143 | SUBNET_ADDITION_FAILED | Error | Failed to add subnet ${SubnetName} on provider ${ProviderName}. (User: ${UserName}) |
| 1144 | CONFIGURE_NETWORK_BY_LABELS_WHEN_CHANGING_CLUSTER_FAILED | Error | Failed to configure networks on host ${VdsName} while changing its cluster. |
| 1145 | PERSIST_NETWORK_ON_HOST | Info | (${Sequence}/${Total}): Applying changes for network(s) ${NetworkNames} on host ${VdsName}. (User: ${UserName}) |
| 1146 | PERSIST_NETWORK_ON_HOST_FINISHED | Info | (${Sequence}/${Total}): Successfully applied changes for network(s) ${NetworkNames} on host ${VdsName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1147 | PERSIST_NETWORK_ON_HOST_FAILED | Error | (${Sequence}/${Total}): Failed to apply changes for network(s) ${NetworkNames} on host ${VdsName}. (User: ${UserName}) |
| 1148 | MULTI_UPDATE_NETWORK_NOT_POSSIBLE | Warning | Cannot apply network ${NetworkName} changes to hosts on unsupported data center ${StoragePoolName}. (User: ${UserName}) |
| 1149 | REMOVE_PORT_FROM_EXTERNAL_PROVIDER_FAILED | Warning | Failed to remove vNIC ${NicName} from external network provider ${ProviderName}. The vNIC can be identified on the provider by device id ${NicId}. |
| 1150 | IMPORTEXPORT_EXPORT_VM | Info | Vm ${VmName} was exported successfully to ${StorageDomainName} |
| 1151 | IMPORTEXPORT_EXPORT_VM_FAILED | Error | Failed to export Vm ${VmName} to ${StorageDomainName} |
| 1152 | IMPORTEXPORT_IMPORT_VM | Info | Vm ${VmName} was imported successfully to Data Center ${StoragePoolName}, Cluster ${ClusterName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1153 | IMPORTEXPORT_IMPORT_VM_FAILED | Error | Failed to import Vm ${VmName} to Data Center ${StoragePoolName}, Cluster ${ClusterName} |
| 1154 | IMPORTEXPORT_REMOVE_TEMPLATE | Info | Template ${VmTemplateName} was removed from ${StorageDomainName} |
| 1155 | IMPORTEXPORT_REMOVE_TEMPLATE_FAILED | Error | Failed to remove Template ${VmTemplateName} from ${StorageDomainName} |
| 1156 | IMPORTEXPORT_EXPORT_TEMPLATE | Info | Template ${VmTemplateName} was exported successfully to ${StorageDomainName} |
| 1157 | IMPORTEXPORT_EXPORT_TEMPLATE_FAILED | Error | Failed to export Template ${VmTemplateName} to ${StorageDomainName} |
| 1158 | IMPORTEXPORT_IMPORT_TEMPLATE | Info | Template ${VmTemplateName} was imported successfully to Data Center ${StoragePoolName}, Cluster ${ClusterName} |
| 1159 | IMPORTEXPORT_IMPORT_TEMPLATE_FAILED | Error | Failed to import Template ${VmTemplateName} to Data Center ${StoragePoolName}, Cluster ${ClusterName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1160 | IMPORTEXPORT_REMOVE_VM | Info | Vm ${VmName} was removed from ${StorageDomainName} |
| 1161 | IMPORTEXPORT_REMOVE_VM_FAILED | Error | Failed to remove Vm ${VmName} remove from ${StorageDomainName} |
| 1162 | IMPORTEXPORT_STARTING_EXPORT_VM | Info | Starting export Vm ${VmName} to ${StorageDomainName} |
| 1163 | IMPORTEXPORT_STARTING_IMPORT_TEMPLATE | Info | Starting to import Template ${VmTemplateName} to Data Center ${StoragePoolName}, Cluster ${ClusterName} |
| 1164 | IMPORTEXPORT_STARTING_EXPORT_TEMPLATE | Info | Starting to export Template ${VmTemplateName} to ${StorageDomainName} |
| 1165 | IMPORTEXPORT_STARTING_IMPORT_VM | Info | Starting to import Vm ${VmName} to Data Center ${StoragePoolName}, Cluster ${ClusterName} |
| 1166 | IMPORTEXPORT_STARTING_REMOVE_TEMPLATE | Info | Starting to remove Template ${VmTemplateName} remove ${StorageDomainName} |
| 1167 | IMPORTEXPORT_STARTING_REMOVE_VM | Info | Starting to remove Vm ${VmName} remove from ${StorageDomainName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1168 | IMPORTEXPORT_FAILED_TO_IMPORT_VM | Warning | Failed to read VM '${ImportedVmName}' OVF, it may be corrupted. Underlying error message: ${ErrorMessage} |
| 1169 | IMPORTEXPORT_FAILED_TO_IMPORT_TEMPLATE | Warning | Failed to read Template '${Template}' OVF, it may be corrupted. Underlying error message: ${ErrorMessage} |
| 1170 | IMPORTEXPORT_IMPORT_TEMPLATE_INVALID_INTERFACES | Normal | While importing Template ${EntityName}, the Network/s ${Networks} were found to be Non-VM Networks or do not exist in Cluster. Network Name was not set in the Interface/s ${Interfaces}. |
| 1171 | USER_ACCOUNT_PASSWORD_EXPIRED | Error | User ${UserName} cannot login, as the user account password has expired. Please contact the system administrator. |
| 1172 | AUTH_FAILED_INVALID_CREDENTIALS | Error | User ${UserName} cannot login, please verify the username and password. |
| 1173 | AUTH_FAILED_CLOCK_SKEW_TOO_GREAT | Error | User ${UserName} cannot login, the engine clock is not synchronized with directory services. Please contact the system administrator. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1174 | AUTH_FAILED_NO_KDCS_FOUND | Error | User ${UserName} cannot login, authentication domain cannot be found. Please contact the system administrator. |
| 1175 | AUTH_FAILED_DNS_ERROR | Error | User ${UserName} cannot login, there's an error in DNS configuration. Please contact the system administrator. |
| 1176 | AUTH_FAILED_OTHER | Error | User ${UserName} cannot login, unknown kerberos error. Please contact the system administrator. |
| 1177 | AUTH_FAILED_DNS_COMMUNICATION_ERROR | Error | User ${UserName} cannot login, cannot lookup DNS for SRV records. Please contact the system administrator. |
| 1178 | AUTH_FAILED_CONNECTION_TIMED_OUT | Error | User ${UserName} cannot login, connection to LDAP server has timed out. Please contact the system administrator. |
| 1179 | AUTH_FAILED_WRONG_REALM | Error | User ${UserName} cannot login, please verify your domain name. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1180 | AUTH_FAILED_CONNECTION_ERROR | Error | User ${UserName} cannot login, connection refused or some configuration problems exist. Possible DNS error. Please contact the system administrator. |
| 1181 | AUTH_FAILED_CANNOT_FIND_LDAP_SERVER_FOR_DOMAIN | Error | User ${UserName} cannot login, cannot find valid LDAP server for domain. Please contact the system administrator. |
| 1182 | AUTH_FAILED_NO_USER_INFORMATION_WAS_FOUND | Error | User ${UserName} cannot login, no user information was found. Please contact the system administrator. |
| 1183 | AUTH_FAILED_CLIENT_NOT_FOUND_IN_KERBEROS_DATABASE | Error | User ${UserName} cannot login, user was not found in domain. Please contact the system administrator. |
| 1184 | AUTH_FAILED_INTERNAL_KERBEROS_ERROR | Error | User ${UserName} cannot login, an internal error has ocurred in the Kerberos implementation of the JVM. Please contact the system administrator. |
| 1185 | USER_ACCOUNT_EXPIRED | Error | The account for ${UserName} got expired. Please contact the system administrator. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1186 | IMPORTEXPORT_NO_PROXY_HOST_AVAILABLE_IN_DC | Error | No Host in Data Center '${StoragePoolName}' can serve as a proxy to retrieve remote VMs information (User: ${UserName}). |
| 1187 | IMPORTEXPORT_HOST_CANNOT_SERVE_AS_PROXY | Error | Host ${VdsName} cannot be used as a proxy to retrieve remote VMs information since it is not up (User: ${UserName}). |
| 1188 | IMPORTEXPORT_PARTIAL_VM_MISSING_ENTITIES | Warning | The following entities could not be verified and will not be part of the imported VM ${VmName}: '${MissingEntities}' (User: ${UserName}). |
| 1189 | IMPORTEXPORT_IMPORT_VM_FAILED_UPDATING_OVF | Error | Failed to import Vm ${VmName} to Data Center ${StoragePoolName}, Cluster ${ClusterName}, could not update VM data in export. |
| 1190 | USER_RESTORE_FROM_SNAPSHOT_START | Info | Restoring VM ${VmName} from snapshot started by user ${UserName}. |
| 1191 | VM_DISK_ALREADY_CHANGED | Info | CD ${DiskName} is already inserted to VM ${VmName}, disk change action was skipped. User: ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1192 | VM_DISK_ALREADY_EJECTED | Info | CD is already ejected from VM ${VmName}, disk change action was skipped. User: ${UserName}. |
| 1193 | IMPORTEXPORT_STARTING_CONVERT_VM | Info | Starting to convert Vm ${VmName} |
| 1194 | IMPORTEXPORT_CONVERT_FAILED | Info | Failed to convert Vm ${VmName} |
| 1195 | IMPORTEXPORT_CANNOT_GET_OVF | Info | Failed to get the configuration of converted Vm ${VmName} |
| 1196 | IMPORTEXPORT_INVALID_OVF | Info | Failed to process the configuration of converted Vm ${VmName} |
| 1197 | IMPORTEXPORT_PARTIAL_TEMPLATE_MISSING_ENTITIES | Warning | The following entities could not be verified and will not be part of the imported Template ${VmTemplateName} : '${MissingEntities}' (User: ${UserName}). |
| 1200 | ENTITY_RENAMED | Info | ${EntityType} ${OldEntityName} was renamed from ${OldEntityName} to ${NewEntityName} by ${UserName}. |
| 1201 | UPDATE_HOST_NIC_VFS_CONFIG | Info | The VFs configuration of network interface card ${NicName} on host ${VdsName} was updated. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1202 | UPDATE_HOST_NIC_VFS_CONFIG_FAILED | Error | Failed to update the VFs configuration of network interface card ${NicName} on host ${VdsName}. |
| 1203 | ADD_VFS_CONFIG_NETWORK | Info | Network ${NetworkName} was added to the VFs configuration of network interface card ${NicName} on host ${VdsName}. |
| 1204 | ADD_VFS_CONFIG_NETWORK_FAILED | Info | Failed to add ${NetworkName} to the VFs configuration of network interface card ${NicName} on host ${VdsName}. |
| 1205 | REMOVE_VFS_CONFIG_NETWORK | Info | Network ${NetworkName} was removed from the VFs configuration of network interface card ${NicName} on host ${VdsName}. |
| 1206 | REMOVE_VFS_CONFIG_NETWORK_FAILED | Info | Failed to remove ${NetworkName} from the VFs configuration of network interface card ${NicName} on host ${VdsName}. |
| 1207 | ADD_VFS_CONFIG_LABEL | Info | Label ${Label} was added to the VFs configuration of network interface card ${NicName} on host ${VdsName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1208 | ADD_VFS_CONFIG_LABEL_FAILED | Info | Failed to add ${Label} to the VFs configuration of network interface card ${NicName} on host ${VdsName}. |
| 1209 | REMOVE_VFS_CONFIG_LABEL | Info | Label ${Label} was removed from the VFs configuration of network interface card ${NicName} on host ${VdsName}. |
| 1210 | REMOVE_VFS_CONFIG_LABEL_FAILED | Info | Failed to remove ${Label} from the VFs configuration of network interface card ${NicName} on host ${VdsName}. |
| 1211 | USER_REDUCE_DOMAIN_DEVICES_STARTED | Info | Started to reduce Storage ${StorageDomainName} devices. (User: ${UserName}). |
| 1212 | USER_REDUCE_DOMAIN_DEVICES_FAILED_METADATA_DEVICES | Error | Failed to reduce Storage ${StorageDomainName}. The following devices contains the domain metadata ${deviceIds} and can’t be reduced from the domain. (User: ${UserName}). |
| 1213 | USER_REDUCE_DOMAIN_DEVICES_FAILED | Error | Failed to reduce Storage ${StorageDomainName}. (User: ${UserName}). |
| 1214 | USER_REDUCE_DOMAIN_DEVICES_SUCCEEDED | Info | Storage ${StorageDomainName} has been reduced. (User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1215 | USER_REDUCE_DOMAIN_DEVICES_FAILED_NO_FREE_SPACE | Error | Can't reduce Storage ${StorageDomainName}. There is not enough space on the destination devices of the storage domain. (User: ${UserName}). |
| 1216 | USER_REDUCE_DOMAIN_DEVICES_FAILED_TO_GET_DOMAIN_INFO | Error | Can't reduce Storage ${StorageDomainName}. Failed to get the domain info. (User: ${UserName}). |
| 1217 | CANNOT_IMPORT_VM_WITH_LEASE_COMPAT_VERSION | Warning | The VM ${VmName} has a VM lease defined yet will be imported without it as the VM compatibility version does not support VM leases. |
| 1218 | CANNOT_IMPORT_VM_WITH_LEASE_STORAGE_DOMAIN | Warning | The VM ${VmName} has a VM lease defined yet will be imported without it as the Storage Domain for the lease does not exist or is not active. |
| 1219 | FAILED_DETERMINE_STORAGE_DOMAIN_METADATA_DEVICES | Error | Failed to determine the metadata devices of Storage Domain ${StorageDomainName}. |
| 1220 | HOT_PLUG_LEASE_FAILED | Error | Failed to hot plug lease to the VM ${VmName}. The VM is running without a VM lease. |
| 1221 | HOT_UNPLUG_LEASE_FAILED | Error | Failed to hot unplug lease to the VM ${VmName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1222 | DETACH_DOMAIN_WITH_VMS_AND_TEMPLATES_LEASES | Warning | The deactivated domain ${storageDomainName} contained leases for the following VMs/Templates: ${entitiesNames}, a part of those VMs will not run and need manual removal of the VM leases. |
| 1223 | IMPORTEXPORT_STARTING_EXPORT_VM_TO_OVA | Info | Starting to export Vm ${VmName} as a Virtual Appliance |
| 1224 | IMPORTEXPORT_EXPORT_VM_TO_OVA | Info | Vm ${VmName} was exported successfully as a Virtual Appliance to path ${OvaPath} on Host ${VdsName} |
| 1225 | IMPORTEXPORT_EXPORT_VM_TO_OVA_FAILED | Error | Failed to export Vm ${VmName} as a Virtual Appliance to path ${OvaPath} on Host ${VdsName} |
| 1226 | IMPORTEXPORT_STARTING_EXPORT_TEMPLATE_TO_OVA | Info | Starting to export Template ${VmTemplateName} as a Virtual Appliance |
| 1227 | IMPORTEXPORT_EXPORT_TEMPLATE_TO_OVA | Info | Template ${VmTemplateName} was exported successfully as a Virtual Appliance to path ${OvaPath} on Host ${VdsName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1228 | IMPORTEXPORT_EXPORT_TEMPLATE_TO_OVA_FAILED | Error | Failed to export Template ${VmTemplateName} as a Virtual Appliance to path ${OvaPath} on Host ${VdsName} |
| 1300 | NUMA_ADD_VM_NUMA_NODE_SUCCESS | Info | Add VM NUMA node successfully. |
| 1301 | NUMA_ADD_VM_NUMA_NODE_FAILED | Error | Add VM NUMA node failed. |
| 1310 | NUMA_UPDATE_VM_NUMA_NODE_SUCCESS | Info | Update VM NUMA node successfully. |
| 1311 | NUMA_UPDATE_VM_NUMA_NODE_FAILED | Error | Update VM NUMA node failed. |
| 1320 | NUMA_REMOVE_VM_NUMA_NODE_SUCCESS | Info | Remove VM NUMA node successfully. |
| 1321 | NUMA_REMOVE_VM_NUMA_NODE_FAILED | Error | Remove VM NUMA node failed. |
| 1322 | USER_ADD_VM_TEMPLATE_CREATE_TEMPLATE_FAILURE | Error | Failed to create Template ${VmTemplateName} or its disks from VM ${VmName}. |
| 1323 | USER_ADD_VM_TEMPLATE_ASSIGN_ILLEGAL_FAILURE | Error | Failed preparing Template ${VmTemplateName} for sealing (VM: ${VmName}). |
| 1324 | USER_ADD_VM_TEMPLATE_SEAL_FAILURE | Error | Failed to seal Template ${VmTemplateName} (VM: ${VmName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1325 | USER_SPARSIFY_IMAGE_START | Info | Started to sparsify ${DiskAlias} |
| 1326 | USER_SPARSIFY_IMAGE_FINISH_SUCCESS | Info | ${DiskAlias} sparsified successfully. |
| 1327 | USER_SPARSIFY_IMAGE_FINISH_FAILURE | Error | Failed to sparsify ${DiskAlias}. |
| 1328 | USER_AMEND_IMAGE_START | Info | Started to amend ${DiskAlias} |
| 1329 | USER_AMEND_IMAGE_FINISH_SUCCESS | Info | ${DiskAlias} has been amended successfully. |
| 1330 | USER_AMEND_IMAGE_FINISH_FAILURE | Error | Failed to amend ${DiskAlias}. |
| 1340 | VM_DOES_NOT_FIT_TO_SINGLE_NUMA_NODE | Warning | VM ${VmName} does not fit to a single NUMA node on host ${HostName}. This may negatively impact its performance. Consider using vNUMA and NUMA pinning for this VM. |
| 1400 | ENTITY_RENAMED_INTERNALLY | Info | ${EntityType} ${OldEntityName} was renamed from ${OldEntityName} to ${NewEntityName}. |
| 1402 | USER_LOGIN_ON_BEHALF_FAILED | Error | Failed to execute login on behalf - ${LoginOnBehalfLogInfo}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 1403 | IRS_CONFIRMED_DISK_SPACE_LOW | Warning | Warning, low confirmed disk space. ${StorageDomainName} domain has ${DiskSpace} GB of confirmed free space. |
| 2000 | USER_HOTPLUG_DISK | Info | VM ${VmName} disk ${DiskAlias} was plugged by ${UserName}. |
| 2001 | USER_FAILED_HOTPLUG_DISK | Error | Failed to plug disk ${DiskAlias} to VM ${VmName} (User: ${UserName}). |
| 2002 | USER_HOTUNPLUG_DISK | Info | VM ${VmName} disk ${DiskAlias} was unplugged by ${UserName}. |
| 2003 | USER_FAILED_HOTUNPLUG_DISK | Error | Failed to unplug disk ${DiskAlias} from VM ${VmName} (User: ${UserName}). |
| 2004 | USER_COPIED_DISK | Info | User ${UserName} is copying disk ${DiskAlias} to domain ${StorageDomainName}. |
| 2005 | USER_FAILED_COPY_DISK | Error | User ${UserName} failed to copy disk ${DiskAlias} to domain ${StorageDomainName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 2006 | USER_COPIED_DISK_FINISHED_SUCCESS | Info | User ${UserName} finished copying disk ${DiskAlias} to domain ${StorageDomainName}. |
| 2007 | USER_COPIED_DISK_FINISHED_FAILURE | Error | User ${UserName} finished with error copying disk ${DiskAlias} to domain ${StorageDomainName}. |
| 2008 | USER_MOVED_DISK | Info | User ${UserName} moving disk ${DiskAlias} to domain ${StorageDomainName}. |
| 2009 | USER_FAILED_MOVED_VM_DISK | Error | User ${UserName} failed to move disk ${DiskAlias} to domain ${StorageDomainName}. |
| 2010 | USER_MOVED_DISK_FINISHED_SUCCESS | Info | User ${UserName} finished moving disk ${DiskAlias} to domain ${StorageDomainName}. |
| 2011 | USER_MOVED_DISK_FINISHED_FAILURE | Error | User ${UserName} have failed to move disk ${DiskAlias} to domain ${StorageDomainName}. |
| 2012 | USER_FINISHED_REMOVE_DISK_NO_DOMAIN | Info | Disk ${DiskAlias} was successfully removed (User ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 2013 | USER_FINISHED_FAILED_REMOVE_DISK_NO_DOMAIN | Warning | Failed to remove disk ${DiskAlias} (User ${UserName}). |
| 2014 | USER_FINISHED_REMOVE_DISK | Info | Disk ${DiskAlias} was successfully removed from domain ${StorageDomainName} (User ${UserName}). |
| 2015 | USER_FINISHED_FAILED_REMOVE_DISK | Warning | Failed to remove disk ${DiskAlias} from storage domain ${StorageDomainName} (User: ${UserName}). |
| 2016 | USER_ATTACH_DISK_TO_VM | Info | Disk ${DiskAlias} was successfully attached to VM ${VmName} by ${UserName}. |
| 2017 | USER_FAILED_ATTACH_DISK_TO_VM | Error | Failed to attach Disk ${DiskAlias} to VM ${VmName} (User: ${UserName}). |
| 2018 | USER_DETACH_DISK_FROM_VM | Info | Disk ${DiskAlias} was successfully detached from VM ${VmName} by ${UserName}. |
| 2019 | USER_FAILED_DETACH_DISK_FROM_VM | Error | Failed to detach Disk ${DiskAlias} from VM ${VmName} (User: ${UserName}). |
| 2020 | USER_ADD_DISK | Info | Add-Disk operation of '${DiskAlias}' was initiated by ${UserName}. |
| 2021 | USER_ADD_DISK_FINISHED_SUCCESS | Info | The disk '${DiskAlias}' was successfully added. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 2022 | USER_ADD_DISK_FINISHED_FAILURE | Error | Add-Disk operation failed to complete. |
| 2023 | USER_FAILED_ADD_DISK | Error | Add-Disk operation failed (User: ${UserName}). |
| 2024 | USER_RUN_UNLOCK_ENTITY_SCRIPT | Info | |
| 2025 | USER_MOVE_IMAGE_GROUP_FAILED_TO_DELETE_SRC_IMAGE | Warning | Possible failure while deleting ${DiskAlias} from the source Storage Domain ${StorageDomainName} during the move operation. The Storage Domain may be manually cleaned-up from possible leftovers (User:${UserName}). |
| 2026 | USER_MOVE_IMAGE_GROUP_FAILED_TO_DELETE_DST_IMAGE | Warning | Possible failure while clearing possible leftovers of ${DiskAlias} from the target Storage Domain ${StorageDomainName} after the move operation failed to copy the image to it properly. The Storage Domain may be manually cleaned-up from possible leftovers (User:${UserName}). |
| 2027 | USER_IMPORT_IMAGE | Info | User ${UserName} importing image ${RepoImageName} to domain ${StorageDomainName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 2028 | USER_IMPORT_IMAGE_FINISHED_SUCCESS | Info | User ${UserName} successfully imported image ${RepoImageName} to domain ${StorageDomainName}. |
| 2029 | USER_IMPORT_IMAGE_FINISHED_FAILURE | Error | User ${UserName} failed to import image ${RepoImageName} to domain ${StorageDomainName}. |
| 2030 | USER_EXPORT_IMAGE | Info | User ${UserName} exporting image ${RepoImageName} to domain ${DestinationStorageDomainName}. |
| 2031 | USER_EXPORT_IMAGE_FINISHED_SUCCESS | Info | User ${UserName} successfully exported image ${RepoImageName} to domain ${DestinationStorageDomainName}. |
| 2032 | USER_EXPORT_IMAGE_FINISHED_FAILURE | Error | User ${UserName} failed to export image ${RepoImageName} to domain ${DestinationStorageDomainName}. |
| 2033 | HOT_SET_NUMBER_OF_CPUS | Info | Hotplug CPU: changed the number of CPUs on VM ${vmName} from ${previousNumberOfCpus} to ${numberOfCpus} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 2034 | FAILED_HOT_SET_NUMBER_OF_CPUS | Error | Failed to hot set number of CPUS to VM ${vmName}. Underlying error message: ${ErrorMessage} |
| 2035 | USER_ISCSI_BOND_HOST_RESTART_WARNING | Warning | The following Networks has been removed from the iSCSI bond ${IscsiBondName}: ${NetworkNames}. for those changes to take affect, the hosts must be moved to maintenance and activated again. |
| 2036 | ADD_DISK_INTERNAL | Info | Add-Disk operation of '${DiskAlias}' was initiated by the system. |
| 2037 | ADD_DISK_INTERNAL_FAILURE | Info | Add-Disk operation of '${DiskAlias}' failed to complete. |
| 2038 | USER_REMOVE_DISK_INITIATED | Info | Removal of Disk ${DiskAlias} from domain ${StorageDomainName} was initiated by ${UserName}. |
| 2039 | HOT_SET_MEMORY | Info | Hotset memory: changed the amount of memory on VM ${vmName} from ${previousMem} to ${newMem} |
| 2040 | FAILED_HOT_SET_MEMORY | Error | Failed to hot set memory to VM ${vmName}. Underlying error message: ${ErrorMessage} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 2041 | DISK_PREALLOCATION_FAILED | Error | |
| 2042 | USER_FINISHED_REMOVE_DISK_ATTACHED_TO_VMS | Info | Disk ${DiskAlias} associated to the VMs ${VmNames} was successfully removed from domain ${StorageDomainName} (User ${UserName}). |
| 2043 | USER_FINISHED_REMOVE_DISK_ATTACHED_TO_VMS_NO_DOMAIN | Info | Disk ${DiskAlias} associated to the VMs ${VmNames} was successfully removed (User ${UserName}). |
| 2044 | USER_REMOVE_DISK_ATTACHED_TO_VMS_INITIATED | Info | Removal of Disk ${DiskAlias} associated to the VMs ${VmNames} from domain ${StorageDomainName} was initiated by ${UserName}. |
| 2045 | USER_COPY_IMAGE_GROUP_FAILED_TO_DELETE_DST_IMAGE | Warning | Possible failure while clearing possible leftovers of ${DiskAlias} from the target Storage Domain ${StorageDomainName} after the operation failed. The Storage Domain may be manually cleaned-up from possible leftovers (User:${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 2046 | MEMORY_HOT_UNPLUG_SUCCESSFULLY_REQUESTED | Info | Hot unplug of memory device (${deviceId}) of size ${memoryDeviceSizeMb}MB was successfully requested on VM '${vmName}'. Physical memory guaranteed updated from ${oldMinMemoryMb} MB to ${newMinMemoryMb}MB}. |
| 2047 | MEMORY_HOT_UNPLUG_FAILED | Error | Failed to hot unplug memory device (${deviceId}) of size ${memoryDeviceSizeMb}MiB out of VM '${vmName}': ${errorMessage} |
| 2048 | FAILED_HOT_SET_MEMORY_NOT_DIVIDABLE | Error | Failed to hot plug memory to VM ${vmName}. Amount of added memory (${memoryAdded}MiB) is not dividable by ${requiredFactor}MiB. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 2049 | MEMORY_HOT_UNPLUG_SUCCESSFULLY_REQUESTED_PLUS_MEMORY_INFO | Info | Hot unplug of memory device (${deviceId}) of size ${memoryDeviceSizeMb}MiB was successfully requested on VM '${vmName}'. Defined Memory updated from ${oldMemoryMb}MiB to ${newMemoryMb}MiB. Physical memory guaranteed updated from ${oldMinMemoryMb} MiB to ${newMinMemoryMb }MiB. |
| 2050 | NO_MEMORY_DEVICE_TO_HOT_UNPLUG | Info | Defined memory can’t be decreased. There are no hot plugged memory devices on VM ${vmName}. |
| 2051 | NO_SUITABLE_MEMORY_DEVICE_TO_HOT_UNPLUG | Info | There is no memory device to hot unplug to satisfy request to decrement memory from ${oldMemoryMb}MiB to ${newMemoryMB}MiB on VM ${vmName}. Available memory devices (decremented memory sizes): ${memoryHotUnplugOptions}. |
| 3000 | USER_ADD_QUOTA | Info | Quota ${QuotaName} has been added by ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 3001 | USER_FAILED_ADD_QUOTA | Error | Failed to add Quota ${QuotaName}. The operation was initiated by ${UserName}. |
| 3002 | USER_UPDATE_QUOTA | Info | Quota ${QuotaName} has been updated by ${UserName}. |
| 3003 | USER_FAILED_UPDATE_QUOTA | Error | Failed to update Quota ${QuotaName}. The operation was initiated by ${UserName}.. |
| 3004 | USER_DELETE_QUOTA | Info | Quota ${QuotaName} has been deleted by ${UserName}. |
| 3005 | USER_FAILED_DELETE_QUOTA | Error | Failed to delete Quota ${QuotaName}. The operation was initiated by ${UserName}.. |
| 3006 | USER_EXCEEDED_QUOTA_CLUSTER_GRACE_LIMIT | Error | Cluster-Quota ${QuotaName} limit exceeded and operation was blocked. Utilization: ${Utilization}, Requested: ${Requested} - Please select a different quota or contact your administrator to extend the quota. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 3007 | USER_EXCEEDED_QUOTA_CLUSTER_LIMIT | Warning | Cluster-Quota ${QuotaName} limit exceeded and entered the grace zone. Utilization: ${Utilization} (It is advised to select a different quota or contact your administrator to extend the quota). |
| 3008 | USER_EXCEEDED_QUOTA_CLUSTER_THRESHOLD | Warning | Cluster-Quota ${QuotaName} is about to exceed. Utilization: ${Utilization} |
| 3009 | USER_EXCEEDED_QUOTA_STORAGE_GRACE_LIMIT | Error | Storage-Quota ${QuotaName} limit exceeded and operation was blocked. Utilization(used/requested): ${CurrentStorage}%/${Requested}% - Please select a different quota or contact your administrator to extend the quota. |
| 3010 | USER_EXCEEDED_QUOTA_STORAGE_LIMIT | Warning | Storage-Quota ${QuotaName} limit exceeded and entered the grace zone. Utilization: ${CurrentStorage}% (It is advised to select a different quota or contact your administrator to extend the quota). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 3011 | USER_EXCEEDED_QUOTA_STORAGE_THRESHOLD | Warning | Storage-Quota ${QuotaName} is about to exceed. Utilization: ${CurrentStorage}% |
| 3012 | QUOTA_STORAGE_RESIZE_LOWER_THEN_CONSUMPTION | Warning | Storage-Quota ${QuotaName}: the new size set for this quota is less than current disk utilization. |
| 3013 | MISSING_QUOTA_STORAGE_PARAMETERS_PERMISSIVE_MODE | Warning | Missing Quota for Disk, proceeding since in Permissive (Audit) mode. |
| 3014 | MISSING_QUOTA_CLUSTER_PARAMETERS_PERMISSIVE_MODE | Warning | Missing Quota for VM ${VmName}, proceeding since in Permissive (Audit) mode. |
| 3015 | USER_EXCEEDED_QUOTA_CLUSTER_GRACE_LIMIT_PERMISSIVE_MODE | Warning | Cluster-Quota ${QuotaName} limit exceeded, proceeding since in Permissive (Audit) mode. Utilization: ${Utilization}, Requested: ${Requested} - Please select a different quota or contact your administrator to extend the quota. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 3016 | USER_EXCEEDED_QUOTA_STORAGE_GRACE_LIMIT_PERMISSIVE_MODE | Warning | Storage-Quota ${QuotaName} limit exceeded, proceeding since in Permissive (Audit) mode. Utilization(used/requested): ${CurrentStorage}%/${Requested}% - Please select a different quota or contact your administrator to extend the quota. |
| 3017 | USER_IMPORT_IMAGE_AS_TEMPLATE | Info | User ${UserName} importing image ${RepoImageName} as template ${TemplateName} to domain ${StorageDomainName}. |
| 3018 | USER_IMPORT_IMAGE_AS_TEMPLATE_FINISHED_SUCCESS | Info | User ${UserName} successfully imported image ${RepoImageName} as template ${TemplateName} to domain ${StorageDomainName}. |
| 3019 | USER_IMPORT_IMAGE_AS_TEMPLATE_FINISHED_FAILURE | Error | User ${UserName} failed to import image ${RepoImageName} as template ${TemplateName} to domain ${StorageDomainName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4000 | GLUSTER_VOLUME_CREATE | Info | Gluster Volume ${glusterVolumeName} created on cluster ${clusterName}. |
| 4001 | GLUSTER_VOLUME_CREATE_FAILED | Error | Creation of Gluster Volume ${glusterVolumeName} failed on cluster ${clusterName}. |
| 4002 | GLUSTER_VOLUME_OPTION_ADDED | Info | Volume Option ${Key} |
| 4003 | GLUSTER_VOLUME_OPTION_SET_FAILED | Error | Volume Option ${Key} |
| 4004 | GLUSTER_VOLUME_START | Info | Gluster Volume ${glusterVolumeName} of cluster ${clusterName} started. |
| 4005 | GLUSTER_VOLUME_START_FAILED | Error | Could not start Gluster Volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4006 | GLUSTER_VOLUME_STOP | Info | Gluster Volume ${glusterVolumeName} stopped on cluster ${clusterName}. |
| 4007 | GLUSTER_VOLUME_STOP_FAILED | Error | Could not stop Gluster Volume ${glusterVolumeName} on cluster ${clusterName}. |
| 4008 | GLUSTER_VOLUME_OPTIONS_RESET | Info | Volume Option ${Key} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4009 | GLUSTER_VOLUME_OPTIONS_RESET_FAILED | Error | Could not reset Gluster Volume ${glusterVolumeName} Options on cluster ${clusterName}. |
| 4010 | GLUSTER_VOLUME_DELETE | Info | Gluster Volume ${glusterVolumeName} deleted on cluster ${clusterName}. |
| 4011 | GLUSTER_VOLUME_DELETE_FAILED | Error | Could not delete Gluster Volume ${glusterVolumeName} on cluster ${clusterName}. |
| 4012 | GLUSTER_VOLUME_REBALANCE_START | Info | Gluster Volume ${glusterVolumeName} rebalance started on cluster ${clusterName}. |
| 4013 | GLUSTER_VOLUME_REBALANCE_START_FAILED | Error | Could not start Gluster Volume ${glusterVolumeName} rebalance on cluster ${clusterName}. |
| 4014 | GLUSTER_VOLUME_REMOVE_BRICKS | Info | Bricks removed from Gluster Volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4015 | GLUSTER_VOLUME_REMOVE_BRICKS_FAILED | Error | Could not remove bricks from Gluster Volume ${glusterVolumeName} of cluster ${clusterName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4016 | GLUSTER_VOLUME_REPLACE_BRICK_FAILED | Error | Replace Gluster Volume ${glusterVolumeName} Brick failed on cluster ${clusterName} |
| 4017 | GLUSTER_VOLUME_REPLACE_BRICK_START | Info | Gluster Volume ${glusterVolumeName} Replace Brick started on cluster ${clusterName}. |
| 4018 | GLUSTER_VOLUME_REPLACE_BRICK_START_FAILED | Error | Could not start Gluster Volume ${glusterVolumeName} Replace Brick on cluster ${clusterName}. |
| 4019 | GLUSTER_VOLUME_ADD_BRICK | Info | ${NoOfBricks} brick(s) added to volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4020 | GLUSTER_VOLUME_ADD_BRICK_FAILED | Error | Failed to add bricks to the Gluster Volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4021 | GLUSTER_SERVER_REMOVE_FAILED | Error | Failed to remove host ${VdsName} from Cluster ${ClusterName}. |
| 4022 | GLUSTER_VOLUME_PROFILE_START | Info | Gluster Volume ${glusterVolumeName} profiling started on cluster ${clusterName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4023 | GLUSTER_VOLUME_PROFILE_START_FAILED | Error | Could not start profiling on gluster volume ${glusterVolumeName} of cluster ${clusterName} |
| 4024 | GLUSTER_VOLUME_PROFILE_STOP | Info | Gluster Volume ${glusterVolumeName} profiling stopped on cluster ${clusterName}. |
| 4025 | GLUSTER_VOLUME_PROFILE_STOP_FAILED | Error | Could not stop Profiling on gluster volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4026 | GLUSTER_VOLUME_CREATED_FROM_CLI | Warning | Detected new volume ${glusterVolumeName} on cluster ${ClusterName}, and added it to engine DB. |
| 4027 | GLUSTER_VOLUME_DELETED_FROM_CLI | Info | Detected deletion of volume ${glusterVolumeName} on cluster ${ClusterName}, and deleted it from engine DB. |
| 4028 | GLUSTER_VOLUME_OPTION_SET_FROM_CLI | Warning | Detected new option ${key} |
| 4029 | GLUSTER_VOLUME_OPTION_RESET_FROM_CLI | Warning | Detected option ${key} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4030 | GLUSTER_VOLUME_PROPERTIES_CHANGED_FROM_CLI | Warning | Detected changes in properties of volume ${glusterVolumeName} of cluster ${ClusterName}, and updated the same in engine DB. |
| 4031 | GLUSTER_VOLUME_BRICK_ADDED_FROM_CLI | Warning | Detected new brick ${brick} on volume ${glusterVolumeName} of cluster ${ClusterName}, and added it to engine DB. |
| 4032 | GLUSTER_VOLUME_BRICK_REMOVED_FROM_CLI | Info | Detected brick ${brick} removed from Volume ${glusterVolumeName} of cluster ${ClusterName}, and removed it from engine DB. |
| 4033 | GLUSTER_SERVER_REMOVED_FROM_CLI | Info | Detected server ${VdsName} removed from Cluster ${ClusterName}, and removed it from engine DB. |
| 4034 | GLUSTER_VOLUME_INFO_FAILED | Error | Failed to fetch gluster volume list from server ${VdsName}. |
| 4035 | GLUSTER_COMMAND_FAILED | Error | Gluster command [${Command}] failed on server ${Server}. |
| 4038 | GLUSTER_SERVER_REMOVE | Info | Host ${VdsName} removed from Cluster ${ClusterName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4039 | GLUSTER_VOLUME_STARTED_FROM_CLI | Warning | Detected that Volume ${glusterVolumeName} of Cluster ${ClusterName} was started, and updated engine DB with it's new status. |
| 4040 | GLUSTER_VOLUME_STOPPED_FROM_CLI | Warning | Detected that Volume ${glusterVolumeName} of Cluster ${ClusterName} was stopped, and updated engine DB with it's new status. |
| 4041 | GLUSTER_VOLUME_OPTION_CHANGED_FROM_CLI | Info | Detected change in value of option ${key} from ${oldValue} to ${newValue} on volume ${glusterVolumeName} of cluster ${ClusterName}, and updated it to engine DB. |
| 4042 | GLUSTER_HOOK_ENABLE | Info | Gluster Hook ${GlusterHookName} enabled on cluster ${ClusterName}. |
| 4043 | GLUSTER_HOOK_ENABLE_FAILED | Error | Failed to enable Gluster Hook ${GlusterHookName} on cluster ${ClusterName}. ${FailureMessage} |
| 4044 | GLUSTER_HOOK_ENABLE_PARTIAL | Warning | Gluster Hook ${GlusterHookName} enabled on some of the servers on cluster ${ClusterName}. ${FailureMessage} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4045 | GLUSTER_HOOK_DISABLE | Info | Gluster Hook ${GlusterHookName} disabled on cluster ${ClusterName}. |
| 4046 | GLUSTER_HOOK_DISABLE_FAILED | Error | Failed to disable Gluster Hook ${GlusterHookName} on cluster ${ClusterName}. ${FailureMessage} |
| 4047 | GLUSTER_HOOK_DISABLE_PARTIAL | Warning | Gluster Hook ${GlusterHookName} disabled on some of the servers on cluster ${ClusterName}. ${FailureMessage} |
| 4048 | GLUSTER_HOOK_LIST_FAILED | Error | Failed to retrieve hook list from ${VdsName} of Cluster ${ClusterName}. |
| 4049 | GLUSTER_HOOK_CONFLICT_DETECTED | Warning | Detected conflict in hook ${HookName} of Cluster ${ClusterName}. |
| 4050 | GLUSTER_HOOK_DETECTED_NEW | Info | Detected new hook ${HookName} in Cluster ${ClusterName}. |
| 4051 | GLUSTER_HOOK_DETECTED_DELETE | Info | Detected removal of hook ${HookName} in Cluster ${ClusterName}. |
| 4052 | GLUSTER_VOLUME_OPTION_MODIFIED | Info | Volume Option ${Key} changed to ${Value} from ${oldvalue} on ${glusterVolumeName} of cluster ${clusterName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4053 | GLUSTER_HOOK_GETCONTENT_FAILED | Error | Failed to read content of hook ${HookName} in Cluster ${ClusterName}. |
| 4054 | GLUSTER_SERVICES_LIST_FAILED | Error | Could not fetch statuses of services from server ${VdsName}. Updating statuses of all services on this server to UNKNOWN. |
| 4055 | GLUSTER_SERVICE_TYPE_ADDED_TO_CLUSTER | Info | Service type ${ServiceType} was not mapped to cluster ${ClusterName}. Mapped it now. |
| 4056 | GLUSTER_CLUSTER_SERVICE_STATUS_CHANGED | Info | Status of service type ${ServiceType} changed from ${OldStatus} to ${NewStatus} on cluster ${ClusterName} |
| 4057 | GLUSTER_SERVICE_ADDED_TO_SERVER | Info | Service ${ServiceName} was not mapped to server ${VdsName}. Mapped it now. |
| 4058 | GLUSTER_SERVER_SERVICE_STATUS_CHANGED | Info | Status of service ${ServiceName} on server ${VdsName} changed from ${OldStatus} to ${NewStatus}. Updating in engine now. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4059 | GLUSTER_HOOK_UPDATED | Info | Gluster Hook ${GlusterHookName} updated on conflicting servers. |
| 4060 | GLUSTER_HOOK_UPDATE_FAILED | Error | Failed to update Gluster Hook ${GlusterHookName} on conflicting servers. ${FailureMessage} |
| 4061 | GLUSTER_HOOK_ADDED | Info | Gluster Hook ${GlusterHookName} added on conflicting servers. |
| 4062 | GLUSTER_HOOK_ADD_FAILED | Error | Failed to add Gluster Hook ${GlusterHookName} on conflicting servers. ${FailureMessage} |
| 4063 | GLUSTER_HOOK_REMOVED | Info | Gluster Hook ${GlusterHookName} removed from all servers in cluster ${ClusterName}. |
| 4064 | GLUSTER_HOOK_REMOVE_FAILED | Error | Failed to remove Gluster Hook ${GlusterHookName} from cluster ${ClusterName}. ${FailureMessage} |
| 4065 | GLUSTER_HOOK_REFRESH | Info | Refreshed gluster hooks in Cluster ${ClusterName}. |
| 4066 | GLUSTER_HOOK_REFRESH_FAILED | Error | Failed to refresh gluster hooks in Cluster ${ClusterName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4067 | GLUSTER_SERVICE_STARTED | Info | ${servicetype} service started on host ${VdsName} of cluster ${ClusterName}. |
| 4068 | GLUSTER_SERVICE_START_FAILED | Error | Could not start ${servicetype} service on host ${VdsName} of cluster ${ClusterName}. |
| 4069 | GLUSTER_SERVICE_STOPPED | Info | ${servicetype} services stopped on host ${VdsName} of cluster ${ClusterName}. |
| 4070 | GLUSTER_SERVICE_STOP_FAILED | Error | Could not stop ${servicetype} service on host ${VdsName} of cluster ${ClusterName}. |
| 4071 | GLUSTER_SERVICES_LIST_NOT_FETCHED | Info | Could not fetch list of services from ${ServiceGroupType} named ${ServiceGroupName}. |
| 4072 | GLUSTER_SERVICE_RESTARTED | Info | ${servicetype} service re-started on host ${VdsName} of cluster ${ClusterName}. |
| 4073 | GLUSTER_SERVICE_RESTART_FAILED | Error | Could not re-start ${servicetype} service on host ${VdsName} of cluster ${ClusterName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4074 | GLUSTER_VOLUME_OPTIONS_RESET_ALL | Info | All Volume Options reset on ${glusterVolumeName} of cluster ${clusterName}. |
| 4075 | GLUSTER_HOST_UUID_NOT_FOUND | Error | Could not find gluster uuid of server ${VdsName} on Cluster ${ClusterName}. |
| 4076 | GLUSTER_VOLUME_BRICK_ADDED | Info | Brick [${brickpath}] on host [${servername}] added to volume [${glusterVolumeName}] of cluster ${clusterName} |
| 4077 | GLUSTER_CLUSTER_SERVICE_STATUS_ADDED | Info | Status of service type ${ServiceType} set to ${NewStatus} on cluster ${ClusterName} |
| 4078 | GLUSTER_VOLUME_REBALANCE_STOP | Info | Gluster Volume ${glusterVolumeName} rebalance stopped of cluster ${clusterName}. |
| 4079 | GLUSTER_VOLUME_REBALANCE_STOP_FAILED | Error | Could not stop rebalance of gluster volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4080 | START_REMOVING_GLUSTER_VOLUME_BRICKS | Info | Started removing bricks from Volume ${glusterVolumeName} of cluster ${clusterName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4081 | START_REMOVING_GLUSTER_VOLUME_BRICKS_FAILED | Error | Could not start remove bricks from Volume ${glusterVolumeName} of cluster ${clusterName} |
| 4082 | GLUSTER_VOLUME_REMOVE_BRICKS_STOP | Info | Stopped removing bricks from Volume ${glusterVolumeName} of cluster ${clusterName} |
| 4083 | GLUSTER_VOLUME_REMOVE_BRICKS_STOP_FAILED | Error | Failed to stop remove bricks from Volume ${glusterVolumeName} of cluster ${clusterName} |
| 4084 | GLUSTER_VOLUME_REMOVE_BRICKS_COMMIT | Info | Gluster volume ${glusterVolumeName} remove bricks committed on cluster ${clusterName}. ${NoOfBricks} brick(s) removed from volume ${glusterVolumeName}. |
| 4085 | GLUSTER_VOLUME_REMOVE_BRICKS_COMMIT_FAILED | Error | Gluster volume ${glusterVolumeName} remove bricks could not be commited on cluster ${clusterName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4086 | GLUSTER_BRICK_STATUS_CHANGED | Warning | Detected change in status of brick ${brickpath} of volume ${glusterVolumeName} of cluster ${clusterName} from ${oldValue} to ${newValue} via ${source}. |
| 4087 | GLUSTER_VOLUME_REBALANCE_FINISHED | Info | ${action} ${status} on volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4088 | GLUSTER_VOLUME_MIGRATE_BRICK_DATA_FINISHED | Info | ${action} ${status} for brick(s) on volume ${glusterVolumeName} of cluster ${clusterName}. Please review to abort or commit. |
| 4089 | GLUSTER_VOLUME_REBALANCE_START_DETECTED_FROM_CLI | Info | Detected start of rebalance on volume ${glusterVolumeName} of Cluster ${ClusterName} from CLI. |
| 4090 | START_REMOVING_GLUSTER_VOLUME_BRICKS_DETECTED_FROM_CLI | Info | Detected start of brick removal for bricks ${brick} on volume ${glusterVolumeName} of Cluster ${ClusterName} from CLI. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4091 | GLUSTER_VOLUME_REBALANCE_NOT_FOUND_FROM_CLI | Warning | Could not find information for rebalance on volume ${glusterVolumeName} of Cluster ${ClusterName} from CLI. Marking it as unknown. |
| 4092 | REMOVE_GLUSTER_VOLUME_BRICKS_NOT_FOUND_FROM_CLI | Warning | Could not find information for remove brick on volume ${glusterVolumeName} of Cluster ${ClusterName} from CLI. Marking it as unknown. |
| 4093 | GLUSTER_VOLUME_DETAILS_REFRESH | Info | Refreshed details of the volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4094 | GLUSTER_VOLUME_DETAILS_REFRESH_FAILED | Error | Failed to refresh the details of volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4095 | GLUSTER_HOST_UUID_ALREADY_EXISTS | Error | Gluster UUID of host ${VdsName} on Cluster ${ClusterName} already exists. |
| 4096 | USER_FORCE_SELECTED_SPM_STOP_FAILED | Error | Failed to force select ${VdsName} as the SPM due to a failure to stop the current SPM. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4097 | GLUSTER_GEOREP_SESSION_DELETED_FROM_CLI | Warning | Detected deletion of geo-replication session ${geoRepSessionKey} from volume ${glusterVolumeName} of cluster ${clusterName} |
| 4098 | GLUSTER_GEOREP_SESSION_DETECTED_FROM_CLI | Warning | Detected new geo-replication session ${geoRepSessionKey} for volume ${glusterVolumeName} of cluster ${clusterName}. Adding it to engine. |
| 4099 | GLUSTER_GEOREP_SESSION_REFRESH | Info | Refreshed geo-replication sessions for volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4100 | GLUSTER_GEOREP_SESSION_REFRESH_FAILED | Error | Failed to refresh geo-replication sessions for volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4101 | GEOREP_SESSION_STOP | Info | Geo-replication session on volume ${glusterVolumeName} of cluster ${clusterName} has been stopped. |
| 4102 | GEOREP_SESSION_STOP_FAILED | Error | Failed to stop geo-replication session on volume ${glusterVolumeName} of cluster ${clusterName} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4103 | GEOREP_SESSION_DELETED | Info | Geo-replication session deleted on volume ${glusterVolumeName} of cluster ${clusterName} |
| 4104 | GEOREP_SESSION_DELETE_FAILED | Error | Failed to delete geo-replication session on volume ${glusterVolumeName} of cluster ${clusterName} |
| 4105 | GLUSTER_GEOREP_CONFIG_SET | Info | Configuration ${key} has been set to ${value} on the geo-rep session ${geoRepSessionKey}. |
| 4106 | GLUSTER_GEOREP_CONFIG_SET_FAILED | Error | Failed to set the configuration ${key} to ${value} on geo-rep session ${geoRepSessionKey}. |
| 4107 | GLUSTER_GEOREP_CONFIG_LIST | Info | Refreshed configuration options for geo-replication session ${geoRepSessionKey} |
| 4108 | GLUSTER_GEOREP_CONFIG_LIST_FAILED | Error | Failed to refresh configuration options for geo-replication session ${geoRepSessionKey} |
| 4109 | GLUSTER_GEOREP_CONFIG_SET_DEFAULT | Info | Configuration of ${key} of session ${geoRepSessionKey} reset to its default value . |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4110 | GLUSTER_GEOREP_CONFIG_SET_DEFAULT_FAILED | Error | Failed to set ${key} of session ${geoRepSessionKey} to its default value. |
| 4111 | GLUSTER_VOLUME_SNAPSHOT_DELETED | Info | Gluster volume snapshot ${snapname} deleted. |
| 4112 | GLUSTER_VOLUME_SNAPSHOT_DELETE_FAILED | Error | Failed to delete gluster volume snapshot ${snapname}. |
| 4113 | GLUSTER_VOLUME_ALL_SNAPSHOTS_DELETED | Info | Deleted all the gluster volume snapshots for the volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4114 | GLUSTER_VOLUME_ALL_SNAPSHOTS_DELETE_FAILED | Error | Failed to delete all the gluster volume snapshots for the volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4115 | GLUSTER_VOLUME_SNAPSHOT_ACTIVATED | Info | Activated the gluster volume snapshot ${snapname} on volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4116 | GLUSTER_VOLUME_SNAPSHOT_ACTIVATE_FAILED | Error | Failed to activate the gluster volume snapshot ${snapname} on volume ${glusterVolumeName} of cluster ${clusterName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4117 | GLUSTER_VOLUME_SNAPSHOT_DEACTIVATED | Info | De-activated the gluster volume snapshot ${snapname} on volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4118 | GLUSTER_VOLUME_SNAPSHOT_DEACTIVATE_FAILED | Error | Failed to de-activate gluster volume snapshot ${snapname} on volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4119 | GLUSTER_VOLUME_SNAPSHOT_RESTORED | Info | Restored the volume ${glusterVolumeName} of cluster ${clusterName} to the state of gluster volume snapshot ${snapname}. |
| 4120 | GLUSTER_VOLUME_SNAPSHOT_RESTORE_FAILED | Error | Failed to restore the volume ${glusterVolumeName} of cluster ${clusterName} to the state of gluster volume snapshot ${snapname}. |
| 4121 | GLUSTER_VOLUME_SNAPSHOT_CONFIG_UPDATED | Info | Updated Gluster volume snapshot configuration(s). |
| 4122 | GLUSTER_VOLUME_SNAPSHOT_CONFIG_UPDATE_FAILED | Error | Failed to update gluster volume snapshot configuration(s). |
| 4123 | GLUSTER_VOLUME_SNAPSHOT_CONFIG_UPDATE_FAILED_PARTIALLY | Error | Failed to update gluster volume snapshot configuration(s) ${failedSnapshotConfigs}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4124 | NEW_STORAGE_DEVICE_DETECTED | Info | Found new storage device ${storageDevice} on host ${VdsName}, and added it to engine DB." |
| 4125 | STORAGE_DEVICE_REMOVED_FROM_THE_HOST | Info | Detected deletion of storage device ${storageDevice} on host ${VdsName}, and deleting it from engine DB." |
| 4126 | SYNC_STORAGE_DEVICES_IN_HOST | Info | Manually synced the storage devices from host ${VdsName} |
| 4127 | SYNC_STORAGE_DEVICES_IN_HOST_FAILED | Error | Failed to sync storage devices from host ${VdsName} |
| 4128 | GEOREP_OPTION_SET_FROM_CLI | Warning | Detected new option ${key} |
| 4129 | GEOREP_OPTION_CHANGED_FROM_CLI | Warning | Detected change in value of option ${key} from ${oldValue} to ${value} for geo-replication session on volume ${glusterVolumeName} of cluster ${ClusterName}, and updated it to engine. |
| 4130 | GLUSTER_MASTER_VOLUME_STOP_FAILED_DURING_SNAPSHOT_RESTORE | Error | Could not stop master volume ${glusterVolumeName} of cluster ${clusterName} during snapshot restore. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4131 | GLUSTER_MASTER_VOLUME_SNAPSHOT_RESTORE_FAILED | Error | Could not restore master volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4132 | GLUSTER_VOLUME_SNAPSHOT_CREATED | Info | Snapshot ${snapname} created for volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4133 | GLUSTER_VOLUME_SNAPSHOT_CREATE_FAILED | Error | Could not create snapshot for volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4134 | GLUSTER_VOLUME_SNAPSHOT_SCHEDULED | Info | Snapshots scheduled on volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4135 | GLUSTER_VOLUME_SNAPSHOT_SCHEDULE_FAILED | Error | Failed to schedule snapshots on the volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4136 | GLUSTER_VOLUME_SNAPSHOT_RESCHEDULED | Info | Rescheduled snapshots on volume ${glusterVolumeName} of cluster ${clusterName}. |
| 4137 | GLUSTER_VOLUME_SNAPSHOT_RESCHEDULE_FAILED | Error | Failed to reschedule snapshots on volume ${glusterVolumeName} of cluster ${clusterName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4138 | CREATE_GLUSTER_BRICK | Info | Brick ${brickName} created successfully on host ${vdsName} of cluster ${clusterName}. |
| 4139 | CREATE_GLUSTER_BRICK_FAILED | Error | Failed to create brick ${brickName} on host ${vdsName} of cluster ${clusterName}. |
| 4140 | GLUSTER_GEO_REP_PUB_KEY_FETCH_FAILED | Error | Failed to fetch public keys. |
| 4141 | GLUSTER_GET_PUB_KEY | Info | Public key fetched. |
| 4142 | GLUSTER_GEOREP_PUBLIC_KEY_WRITE_FAILED | Error | Failed to write public keys to ${VdsName} |
| 4143 | GLUSTER_WRITE_PUB_KEYS | Info | Public keys written to ${VdsName} |
| 4144 | GLUSTER_GEOREP_SETUP_MOUNT_BROKER_FAILED | Error | Failed to setup geo-replication mount broker for user ${geoRepUserName} on the slave volume ${geoRepSlaveVolumeName}. |
| 4145 | GLUSTER_SETUP_GEOREP_MOUNT_BROKER | Info | Geo-replication mount broker has been setup for user ${geoRepUserName} on the slave volume ${geoRepSlaveVolumeName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4146 | GLUSTER_GEOREP_SESSION_CREATE_FAILED | Error | Failed to create geo-replication session between master volume : ${glusterVolumeName} of cluster ${clusterName} and slave volume : ${geoRepSlaveVolumeName} for the user ${geoRepUserName}. |
| 4147 | CREATE_GLUSTER_VOLUME_GEOREP_SESSION | Info | Created geo-replication session between master volume : ${glusterVolumeName} of cluster ${clusterName} and slave volume : ${geoRepSlaveVolumeName} for the user ${geoRepUserName}. |
| 4148 | GLUSTER_VOLUME_SNAPSHOT_SOFT_LIMIT_REACHED | Info | Gluster Volume Snapshot soft limit reached for the volume ${glusterVolumeName} on cluster ${clusterName}. |
| 4149 | HOST_FEATURES_INCOMPATIBILE_WITH_CLUSTER | Error | Host ${VdsName} does not comply with the list of features supported by cluster ${ClusterName}. ${UnSupportedFeature} is not supported by the Host |
| 4150 | GLUSTER_VOLUME_SNAPSHOT_SCHEDULE_DELETED | Info | Snapshot schedule deleted for volume ${glusterVolumeName} of ${clusterName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4151 | GLUSTER_BRICK_STATUS_DOWN | Info | Status of brick ${brickpath} of volume ${glusterVolumeName} on cluster ${ClusterName} is down. |
| 4152 | GLUSTER_VOLUME_SNAPSHOT_DETECTED_NEW | Info | Found new gluster volume snapshot ${snapname} for volume ${glusterVolumeName} on cluster ${ClusterName}, and added it to engine DB." |
| 4153 | GLUSTER_VOLUME_SNAPSHOT_DELETED_FROM_CLI | Info | Detected deletion of gluster volume snapshot ${snapname} for volume ${glusterVolumeName} on cluster ${ClusterName}, and deleting it from engine DB." |
| 4154 | GLUSTER_VOLUME_SNAPSHOT_CLUSTER_CONFIG_DETECTED_NEW | Info | Found new gluster volume snapshot configuration ${snapConfigName} with value ${snapConfigValue} on cluster ${ClusterName}, and added it to engine DB." |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4155 | GLUSTER_VOLUME_SNAPSHOT_VOLUME_CONFIG_DETECTED_NEW | Info | Found new gluster volume snapshot configuration ${snapConfigName} with value ${snapConfigValue} for volume ${glusterVolumeName} on cluster ${ClusterName}, and added it to engine DB." |
| 4156 | GLUSTER_VOLUME_SNAPSHOT_HARD_LIMIT_REACHED | Info | Gluster Volume Snapshot hard limit reached for the volume ${glusterVolumeName} on cluster ${clusterName}. |
| 4157 | GLUSTER_CLI_SNAPSHOT_SCHEDULE_DISABLE_FAILED | Error | Failed to disable gluster CLI based snapshot schedule on cluster ${clusterName}. |
| 4158 | GLUSTER_CLI_SNAPSHOT_SCHEDULE_DISABLED | Info | Disabled gluster CLI based scheduling successfully on cluster ${clusterName}. |
| 4159 | SET_UP_PASSWORDLESS_SSH | Info | Password-less SSH has been setup for user ${geoRepUserName} on the nodes of remote volume ${geoRepSlaveVolumeName} from the nodes of the volume ${glusterVolumeName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4160 | SET_UP_PASSWORDLESS_SSH_FAILED | Error | Failed to setup Passwordless ssh for user ${geoRepUserName} on the nodes of remote volume ${geoRepSlaveVolumeName} from the nodes of the volume ${glusterVolumeName}. |
| 4161 | GLUSTER_VOLUME_TYPE_UNSUPPORTED | Warning | Detected a volume ${glusterVolumeName} with type ${glusterVolumeType} on cluster ${Cluster} and it is not fully supported by engine. |
| 4162 | GLUSTER_VOLUME_BRICK_REPLACED | Info | Replaced brick '${brick}' with new brick '${newBrick}' of Gluster Volume ${glusterVolumeName} on cluster ${clusterName} |
| 4163 | GLUSTER_SERVER_STATUS_DISCONNECTED | Info | Gluster server ${vdsName} set to DISCONNECTED on cluster ${clusterName}. |
| 4164 | GLUSTER_STORAGE_DOMAIN_SYNC_FAILED | Info | Failed to synchronize data from storage domain ${storageDomainName} to remote location. |
| 4165 | GLUSTER_STORAGE_DOMAIN_SYNCED | Info | Successfully synchronized data from storage domain ${storageDomainName} to remote location. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4166 | GLUSTER_STORAGE_DOMAIN_SYNC_STARTED | Info | Successfully started data synchronization data from storage domain ${storageDomainName} to remote location. |
| 4167 | STORAGE_DOMAIN_DR_DELETED | Error | Deleted the data synchronization schedule for storage domain ${storageDomainName} as the underlying geo-replication session ${geoRepSessionKey} has been deleted. |
| 4168 | GLUSTER_WEBHOOK_ADDED | Info | Added webhook on ${clusterName} |
| 4169 | GLUSTER_WEBHOOK_ADD_FAILED | Error | Failed to add webhook on ${clusterName} |
| 4170 | GLUSTER_VOLUME_RESET_BRICK_FAILED | Error | |
| 4171 | GLUSTER_VOLUME_BRICK_RESETED | Info | |
| 4172 | GLUSTER_VOLUME_CONFIRMED_SPACE_LOW | Warning | Warning! Low confirmed free space on gluster volume ${glusterVolumeName} |
| 4436 | GLUSTER_SERVER_ADD_FAILED | Error | Failed to add host ${VdsName} into Cluster ${ClusterName}. ${ErrorMessage} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 4437 | GLUSTER_SERVERS_LIST_FAILED | Error | Failed to fetch gluster peer list from server ${VdsName} on Cluster ${ClusterName}. ${ErrorMessage} |
| 4595 | GLUSTER_VOLUME_GEO_REP_START_FAILED_EXCEPTION | Error | Failed to start geo-replication session on volume ${glusterVolumeName} of cluster ${clusterName} |
| 4596 | GLUSTER_VOLUME_GEO_REP_START | Info | Geo-replication session on volume ${glusterVolumeName} of cluster ${clusterName} has been started. |
| 4597 | GLUSTER_VOLUME_GEO_REP_PAUSE_FAILED | Error | Failed to pause geo-replication session on volume ${glusterVolumeName} of cluster ${clusterName} |
| 4598 | GLUSTER_VOLUME_GEO_REP_RESUME_FAILED | Error | Failed to resume geo-replication session on volume ${glusterVolumeName} of cluster ${clusterName} |
| 4599 | GLUSTER_VOLUME_GEO_REP_RESUME | Info | Geo-replication session on volume ${glusterVolumeName} of cluster ${clusterName} has been resumed. |
| 4600 | GLUSTER_VOLUME_GEO_REP_PAUSE | Info | Geo-replication session on volume ${glusterVolumeName} of cluster ${clusterName} has been paused. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 9000 | VDS_ALERT_FENCE_IS_NOT_CONFIGURED | Info | Failed to verify Power Management configuration for Host ${VdsName}. |
| 9001 | VDS_ALERT_FENCE_TEST_FAILED | Info | Power Management test failed for Host ${VdsName}.${Reason} |
| 9002 | VDS_ALERT_FENCE_OPERATION_FAILED | Info | Failed to power fence host ${VdsName}. Please check the host status and it's power management settings, and then manually reboot it and click "Confirm Host Has Been Rebooted" |
| 9003 | VDS_ALERT_FENCE_OPERATION_SKIPPED | Info | Host ${VdsName} became non responsive. Fence operation skipped as the system is still initializing and this is not a host where hosted engine was running on previously. |
| 9004 | VDS_ALERT_FENCE_NO_PROXY_HOST | Info | There is no other host in the data center that can be used to test the power management settings. |
| 9005 | VDS_ALERT_FENCE_STATUS_VERIFICATION_FAILED | Info | Failed to verify Host ${Host} ${Status} status, Please ${Status} Host ${Host} manually. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 9006 | CANNOT_HIBERNATE_RUNNING_VMS_AFTER_CLUSTER_CPU_UPGRADE | Warning | Hibernation of VMs after CPU upgrade of Cluster ${Cluster} is not supported. Please stop and restart those VMs in case you wish to hibernate them |
| 9007 | VDS_ALERT_SECONDARY_AGENT_USED_FOR_FENCE_OPERATION | Info | Secondary fence agent was used to ${Operation} Host ${VdsName} |
| 9008 | VDS_HOST_NOT_RESPONDING_CONNECTING | Warning | Host ${VdsName} is not responding. It will stay in Connecting state for a grace period of ${Seconds} seconds and after that an attempt to fence the host will be issued. |
| 9009 | VDS_ALERT_PM_HEALTH_CHECK_FENCE_AGENT_NON_RESPONSIVE | Info | Health check on Host ${VdsName} indicates that Fence-Agent ${AgentId} is non-responsive. |
| 9010 | VDS_ALERT_PM_HEALTH_CHECK_START_MIGHT_FAIL | Info | Health check on Host ${VdsName} indicates that future attempts to Start this host using Power-Management are expected to fail. |
| 9011 | VDS_ALERT_PM_HEALTH_CHECK_STOP_MIGHT_FAIL | Info | Health check on Host ${VdsName} indicates that future attempts to Stop this host using Power-Management are expected to fail. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 9012 | VDS_ALERT_PM_HEALTH_CHECK_RESTART_MIGHT_FAIL | Info | Health check on Host ${VdsName} indicates that future attempts to Restart this host using Power-Management are expected to fail. |
| 9013 | VDS_ALERT_FENCE_OPERATION_SKIPPED_BROKEN_CONNECTIVITY | Info | Host ${VdsName} became non responsive and was not restarted due to Fencing Policy: ${Percents} percents of the Hosts in the Cluster have connectivity issues. |
| 9014 | VDS_ALERT_NOT_RESTARTED_DUE_TO_POLICY | Info | Host ${VdsName} became non responsive and was not restarted due to the Cluster Fencing Policy. |
| 9015 | VDS_ALERT_FENCE_DISABLED_BY_CLUSTER_POLICY | Info | Host ${VdsName} became Non Responsive and was not restarted due to disabled fencing in the Cluster Fencing Policy. |
| 9016 | FENCE_DISABLED_IN_CLUSTER_POLICY | Info | Fencing is disabled in Fencing Policy of the Cluster ${ClusterName}, so HA VMs running on a non-responsive host will not be restarted elsewhere. |
| 9017 | FENCE_OPERATION_STARTED | Info | Power management ${Action} of Host ${VdsName} initiated. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 9018 | FENCE_OPERATION_SUCCEEDED | Info | Power management ${Action} of Host ${VdsName} succeeded. |
| 9019 | FENCE_OPERATION_FAILED | Error | Power management ${Action} of Host ${VdsName} failed. |
| 9020 | FENCE_OPERATION_USING_AGENT_AND_PROXY_STARTED | Info | Executing power management ${Action} on Host ${Host} using Proxy Host ${ProxyHost} and Fence Agent ${AgentType}:${Agentlp}. |
| 9021 | FENCE_OPERATION_USING_AGENT_AND_PROXY_FAILED | Warning | Execution of power management ${Action} on Host ${Host} using Proxy Host ${ProxyHost} and Fence Agent ${AgentType}:${Agentlp} failed. |
| 9022 | ENGINE_NO_FULL_BACKUP | Info | There is no full backup available, please run engine-backup to prevent data loss in case of corruption. |
| 9023 | ENGINE_NO_WARM_BACKUP | Info | Full backup was created on ${Date} and it’s too old. Please run engine-backup to prevent data loss in case of corruption. |
| 9024 | ENGINE_BACKUP_STARTED | Normal | Engine backup started. |
| 9025 | ENGINE_BACKUP_COMPLETED | Normal | Engine backup completed successfully. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 9026 | ENGINE_BACKUP_FAILED | Error | Engine backup failed. |
| 9028 | VDS_ALERT_NO_PM_CONFIG_FENCE_OPERATION_SKIPPED | Info | Host ${VdsName} became non responsive. It has no power management configured. Please check the host status, manually reboot it, and click "Confirm Host Has Been Rebooted" |
| 9500 | TASK_STOPPING_ASYNC_TASK | Info | Stopping async task ${CommandName} that started at ${Date} |
| 9501 | TASK_CLEARING_ASYNC_TASK | Info | Clearing asynchronous task ${CommandName} that started at ${Date} |
| 9506 | USER_ACTIVATE_STORAGE_DOMAIN_FAILED_ASYNC | Warning | Failed to autorecover Storage Domain ${StorageDomainName} (Data Center ${StoragePoolName}). |
| 9600 | IMPORTEXPORT_IMPORT_VM_INVALID_INTERFACES | Warning | While importing VM ${EntityName}, the Network/s ${Networks} were found to be Non-VM Networks or do not exist in Cluster or are missing a suitable VM network interface profile. Network Name was not set in the Interface/s ${Interfaces}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 9601 | VDS_SET_NON_OPERATIONAL_VM_NETWORK_IS_BRIDGELESS | Warning | Host ${VdsName} does not comply with the cluster ${ClusterName} networks, the following VM networks are non-VM networks: '${Networks}'. The host will become NonOperational. |
| 9602 | HA_VM_FAILED | Error | Highly Available VM ${VmName} failed. It will be restarted automatically. |
| 9603 | HA_VM_RESTART_FAILED | Error | Restart of the Highly Available VM ${VmName} failed. |
| 9604 | EMULATED_MACHINES_INCOMPATIBLE_WITH_CLUSTER | Warning | Host ${VdsName} does not comply with the cluster ${ClusterName} emulated machine. The cluster emulated machine is ${clusterEmulatedMachines} and the host emulated machines are ${hostSupportedEmulatedMachines}. |
| 9605 | EXCEEDED_MAXIMUM_NUM_OF_RESTART_HA_VM_ATTEMPTS | Error | Highly Available VM ${VmName} could not be restarted automatically, exceeded the maximum number of attempts. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 9606 | IMPORTEXPORT_SNAPSHOT_VM_INVALID_INTERFACES | Warning | While previewing a snapshot of VM ${EntityName}, the Network/s ${Networks} were found to be Non-VM Networks or do not exist in Cluster. Network Name was not set in the Interface/s ${Interfaces}. |
| 9607 | ADD_VM_FROM_SNAPSHOT_INVALID_INTERFACES | Warning | While adding vm ${EntityName} from snapshot, the Network/s ${Networks} were found to be Non-VM Networks or do not exist in Cluster. Network Name was not set in the Interface/s ${Interfaces}. |
| 9608 | RNG_SOURCES_INCOMPATIBLE_WITH_CLUSTER | Warning | Host ${VdsName} does not comply with the cluster ${ClusterName} Random Number Generator sources. The Hosts supported sources are: ${hostSupportedRngSources}; and the cluster requirements are: ${clusterRequiredRngSources}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 9609 | EMULATED_MACHINES_INCOMPATIBLE_WITH_CLUSTER_LEVEL | Warning | Host ${VdsName} does not comply with the cluster ${ClusterName} emulated machines. The current cluster compatibility level supports ${clusterEmulatedMachines} and the host emulated machines are ${hostSupportedEmulatedMachines}. |
| 9610 | MIXING_RHEL_VERSIONS_IN_CLUSTER | Warning | Not possible to mix RHEL 6.x and 7.x hosts in one cluster. Tried adding ${addingRhel} host to a cluster with ${previousRhel} hosts. |
| 9611 | COLD_REBOOT_VM_DOWN | Info | VM ${VmName} is down as a part of cold reboot process |
| 9612 | COLD_REBOOT_FAILED | Error | Cold reboot of VM ${VmName} failed |
| 9613 | EXCEEDED_MAXIMUM_NUM_OF_COLD_REBOOT_VM_ATTEMPTS | Error | VM ${VmName} could not be rebooted, exceeded the maximum number of attempts. |
| 9700 | DWH_STARTED | Info | ETL Service started. |
| 9701 | DWH_STOPPED | Info | ETL Service stopped. |
| 9704 | DWH_ERROR | Error | Error in ETL Service. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 9801 | EXTERNAL_EVENT_NORMAL | Info | An external event with NORMAL severity has been added. |
| 9802 | EXTERNAL_EVENT_WARNING | Warning | An external event with WARNING severity has been added. |
| 9803 | EXTERNAL_EVENT_ERROR | Error | An external event with ERROR severity has been added. |
| 9804 | EXTERNAL_ALERT | Info | An external event with ALERT severity has been added. |
| 9901 | WATCHDOG_EVENT | Warning | Watchdog event (${wdaction}) triggered on ${VmName} at ${wdevent} (host time). |
| 9910 | USER_ADD_CLUSTER_POLICY | Info | Scheduling Policy ${ClusterPolicy} was added. (User: ${UserName}) |
| 9911 | USER_FAILED_TO_ADD_CLUSTER_POLICY | Error | Failed to add Scheduling Policy: ${ClusterPolicy}. (User: ${UserName}) |
| 9912 | USER_UPDATE_CLUSTER_POLICY | Info | Scheduling Policy ${ClusterPolicy} was updated. (User: ${UserName}) |
| 9913 | USER_FAILED_TO_UPDATE_CLUSTER_POLICY | Error | Failed to update Scheduling Policy: ${ClusterPolicy}. (User: ${UserName}) |
| 9914 | USER_REMOVE_CLUSTER_POLICY | Info | Scheduling Policy ${ClusterPolicy} was removed. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 9915 | USER_FAILED_TO_REMOVE_CLUSTER_POLICY | Error | Failed to remove Scheduling Policy: ${ClusterPolicy}. (User: ${UserName}) |
| 9920 | FAILED_TO_CONNECT_TO_SCHEDULER_PROXY | Error | Failed to connect to external scheduler proxy. External filters, scoring functions and load balancing will not be performed. |
| 10000 | VDS_UNTRUSTED | Error | Host ${VdsName} was set to non-operational. Host is not trusted by the attestation service. |
| 10001 | USER_UPDATE_VM_FROM_TRUSTED_TO_UNTRUSTED | Warning | The VM ${VmName} was updated from trusted cluster to non-trusted cluster. |
| 10002 | USER_UPDATE_VM_FROM_UNTRUSTED_TO_TRUSTED | Warning | The VM ${VmName} was updated from non-trusted cluster to trusted cluster. |
| 10003 | IMPORTEXPORT_IMPORT_VM_FROM_TRUSTED_TO_UNTRUSTED | Warning | The VM ${VmName} was created in trusted cluster and imported into a non-trusted cluster |
| 10004 | IMPORTEXPORT_IMPORT_VM_FROM_UNTRUSTED_TO_TRUSTED | Warning | The VM ${VmName} was created in non-trusted cluster and imported into a trusted cluster |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10005 | USER_ADD_VM_FROM_TRUSTED_TO_UNTRUSTED | Warning | The VM ${VmName} was created in an untrusted cluster. It was originated from the Template ${VmTemplateName} which was created in a trusted cluster. |
| 10006 | USER_ADD_VM_FROM_UNTRUSTED_TO_TRUSTED | Warning | The VM ${VmName} was created in a trusted cluster. It was originated from the Template ${VmTemplateName} which was created in an untrusted cluster. |
| 10007 | IMPORTEXPORT_IMPORT_TEMPLATE_FROM_TRUSTED_TO_UNTRUSTED | Warning | The Template ${VmTemplateName} was created in trusted cluster and imported into a non-trusted cluster |
| 10008 | IMPORTEXPORT_IMPORT_TEMPLATE_FROM_UNTRUSTED_TO_TRUSTED | Warning | The Template ${VmTemplateName} was created in non-trusted cluster and imported into a trusted cluster |
| 10009 | USER_ADD_VM_TEMPLATE_FROM_TRUSTED_TO_UNTRUSTED | Warning | The non-trusted Template ${VmTemplateName} was created from trusted Vm ${VmName}. |
| 10010 | USER_ADD_VM_TEMPLATE_FROM_UNTRUSTED_TO_TRUSTED | Warning | The trusted template ${VmTemplateName} was created from non-trusted Vm ${VmName}. |
| 10011 | USER_UPDATE_VM_TEMPLATE_FROM_TRUSTED_TO_UNTRUSTED | Warning | The Template ${VmTemplateName} was updated from trusted cluster to non-trusted cluster. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10012 | USER_UPDATE_VM_TEMPLATE_FROM_UNTRUSTED_TO_TRUSTED | Warning | The Template ${VmTemplateName} was updated from non-trusted cluster to trusted cluster. |
| 10013 | IMPORTEXPORT_GET_EXTERNAL_VMS_NOT_IN_DOWN_STATUS | Warning | The following VMs retrieved from external server ${URL} are not in down status: ${Vms}. |
| 10100 | USER_ADDED_NETWORK_QOS | Info | Network QoS ${QosName} was added. (User: ${UserName}) |
| 10101 | USER_FAILED_TO_ADD_NETWORK_QOS | Error | Failed to add Network QoS ${QosName}. (User: ${UserName}) |
| 10102 | USER_REMOVED_NETWORK_QOS | Info | Network QoS ${QosName} was removed. (User: ${UserName}) |
| 10103 | USER_FAILED_TO_REMOVE_NETWORK_QOS | Error | Failed to remove Network QoS ${QosName}. (User: ${UserName}) |
| 10104 | USER_UPDATED_NETWORK_QOS | Info | Network QoS ${QosName} was updated. (User: ${UserName}) |
| 10105 | USER_FAILED_TO_UPDATE_NETWORK_QOS | Error | Failed to update Network QoS ${QosName}. (User: ${UserName}) |
| 10110 | USER_ADDED_QOS | Info | QoS ${QoSName} was added. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10111 | USER_FAILED_TO_ADD_QOS | Error | Failed to add QoS ${QoSName}. (User: ${UserName}) |
| 10112 | USER_REMOVED_QOS | Info | QoS ${QoSName} was removed. (User: ${UserName}) |
| 10113 | USER_FAILED_TO_REMOVE_QOS | Error | Failed to remove QoS ${QoSName}. (User: ${UserName}) |
| 10114 | USER_UPDATED_QOS | Info | QoS ${QoSName} was updated. (User: ${UserName}) |
| 10115 | USER_FAILED_TO_UPDATE_QOS | Error | Failed to update QoS ${QoSName}. (User: ${UserName}) |
| 10120 | USER_ADDED_DISK_PROFILE | Info | Disk Profile ${ProfileName} was successfully added (User: ${UserName}). |
| 10121 | USER_FAILED_TO_ADD_DISK_PROFILE | Error | Failed to add Disk Profile (User: ${UserName}). |
| 10122 | USER_REMOVED_DISK_PROFILE | Info | Disk Profile ${ProfileName} was successfully removed (User: ${UserName}). |
| 10123 | USER_FAILED_TO_REMOVE_DISK_PROFILE | Error | Failed to remove Disk Profile ${ProfileName} (User: ${UserName}). |
| 10124 | USER_UPDATED_DISK_PROFILE | Info | Disk Profile ${ProfileName} was successfully updated (User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10125 | USER_FAILED_TO_UPDATE_DISK_PROFILE | Error | Failed to update Disk Profile ${ProfileName} (User: ${UserName}). |
| 10130 | USER_ADDED_CPU_PROFILE | Info | CPU Profile ${ProfileName} was successfully added (User: ${UserName}). |
| 10131 | USER_FAILED_TO_ADD_CPU_PROFILE | Error | Failed to add CPU Profile (User: ${UserName}). |
| 10132 | USER_REMOVED_CPU_PROFILE | Info | CPU Profile ${ProfileName} was successfully removed (User: ${UserName}). |
| 10133 | USER_FAILED_TO_REMOVE_CPU_PROFILE | Error | Failed to remove CPU Profile ${ProfileName} (User: ${UserName}). |
| 10134 | USER_UPDATED_CPU_PROFILE | Info | CPU Profile ${ProfileName} was successfully updated (User: ${UserName}). |
| 10135 | USER_FAILED_TO_UPDATE_CPU_PROFILE | Error | Failed to update CPU Profile ${ProfileName} (User: ${UserName}). |
| 10200 | USER_UPDATED_MOM_POLICIES | Info | Mom policy was updated on host ${VdsName}. |
| 10201 | USER_FAILED_TO_UPDATE_MOM_POLICIES | Warning | Mom policy could not be updated on host ${VdsName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10250 | PM_POLICY_UP_TO_MAINTENANCE | Info | Host ${Host} is not currently needed, activating maintenance mode in preparation for shutdown. |
| 10251 | PM_POLICY_MAINTENANCE_TO_DOWN | Info | Host ${Host} is not currently needed, shutting down. |
| 10252 | PM_POLICY_TO_UP | Info | Reactivating host ${Host} according to the current power management policy. |
| 10300 | CLUSTER_ALERT_HA_RESERVATION | Info | Cluster ${ClusterName} failed the HA Reservation check, HA VMs on host(s): ${Hosts} will fail to migrate in case of a failover, consider adding resources or shutting down unused VMs. |
| 10301 | CLUSTER_ALERT_HA_RESERVATION_DOWN | Info | Cluster ${ClusterName} passed the HA Reservation check. |
| 10350 | USER_ADDED_AFFINITY_GROUP | Info | Affinity Group ${affinityGroupName} was added. (User: ${UserName}) |
| 10351 | USER_FAILED_TO_ADD_AFFINITY_GROUP | Error | Failed to add Affinity Group ${affinityGroupName}. (User: ${UserName}) |
| 10352 | USER_UPDATED_AFFINITY_GROUP | Info | Affinity Group ${affinityGroupName} was updated. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10353 | USER_FAILED_TO_UPDATE_AFFINITY_GROUP | Error | Failed to update Affinity Group ${affinityGroupName}. (User: ${UserName}) |
| 10354 | USER_REMOVED_AFFINITY_GROUP | Info | Affinity Group ${affinityGroupName} was removed. (User: ${UserName}) |
| 10355 | USER_FAILED_TO_REMOVE_AFFINITY_GROUP | Error | Failed to remove Affinity Group ${affinityGroupName}. (User: ${UserName}) |
| 10356 | VM_TO_HOST_CONFLICT_IN_ENFORCING_POSITIVE_AND_NEGATIVE_AFFINITY | Error | The affinity groups: ${AffinityGroups}, with hosts :${Hosts} and VMs : ${Vms}, have VM to host conflicts between positive and negative enforcing affinity groups. |
| 10357 | VM_TO_HOST_CONFLICT_IN_POSITIVE_AND_NEGATIVE_AFFINITY | Warning | The affinity groups: ${AffinityGroups}, with hosts: ${Hosts} and VMs: ${Vms}, have VM to host conflicts between positive and negative affinity groups. |
| 10358 | VM_TO_HOST_CONFLICTS_POSITIVE_VM_TO_VM_AFFINITY | Warning | The affinity groups: ${AffinityGroups}, with hosts : ${Hosts} and VMs: ${Vms}, have conflicts between VM to host affinity and VM to VM positive affinity. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10359 | VM_TO_HOST_CONFLICTS_NEGATIVE_VM_TO_VM_AFFINITY | Warning | The affinity groups: ${AffinityGroups}, with hosts : ${Hosts} and VMs: ${Vms}, have conflicts between VM to host affinity and VM to VM negative affinity. |
| 10360 | NON_INTERSECTING_POSITIVE_HOSTS_AFFINITY_CONFLICTS | Warning | The affinity groups: ${AffinityGroups}, with hosts : ${Hosts} and VMs : ${Vms} , have non intersecting positive hosts conflicts. |
| 10361 | VM_TO_VM_AFFINITY_CONFLICTS | Error | |
| 10380 | USER_ADDED_AFFINITY_LABEL | Info | Affinity Label ${labelName} was added. (User: ${UserName}) |
| 10381 | USER_FAILED_TO_ADD_AFFINITY_LABEL | Error | Failed to add Affinity Label ${labelName}. (User: ${UserName}) |
| 10382 | USER_UPDATED_AFFINITY_LABEL | Info | Affinity Label ${labelName} was updated. (User: ${UserName}) |
| 10383 | USER_FAILED_TO_UPDATE_AFFINITY_LABEL | Error | Failed to update Affinity Label ${labelName}. (User: ${UserName}) |
| 10384 | USER_REMOVED_AFFINITY_LABEL | Info | Affinity Label ${labelName} was removed. (User: ${UserName}) |
| 10385 | USER_FAILED_TO_REMOVE_AFFINITY_LABEL | Error | Failed to remove Affinity Label ${labelName}. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10400 | ISCSI_BOND_ADD_SUCCESS | Info | iSCSI bond '${IscsiBondName}' was successfully created in Data Center '${StoragePoolName}'. |
| 10401 | ISCSI_BOND_ADD_FAILED | Error | Failed to create iSCSI bond '${IscsiBondName}' in Data Center '${StoragePoolName}'. |
| 10402 | ISCSI_BOND_EDIT_SUCCESS | Info | iSCSI bond '${IscsiBondName}' was successfully updated. |
| 10403 | ISCSI_BOND_EDIT_FAILED | Error | Failed to update iSCSI bond '${IscsiBondName}'. |
| 10404 | ISCSI_BOND_REMOVE_SUCCESS | Info | iSCSI bond '${IscsiBondName}' was removed from Data Center '${StoragePoolName}' |
| 10405 | ISCSI_BOND_REMOVE_FAILED | Error | Failed to remove iSCSI bond '${IscsiBondName}' from Data Center '${StoragePoolName}' |
| 10406 | ISCSI_BOND_EDIT_SUCCESS_WITH_WARNING | Warning | iSCSI bond '${IscsiBondName}' was successfully updated but some of the hosts encountered connection issues. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10407 | ISCSI_BOND_ADD_SUCCESS_WITH_WARNING | Warning | iSCSI bond '${IscsiBondName}' was successfully created in Data Center '${StoragePoolName}' but some of the hosts encountered connection issues. |
| 10450 | USER_SET_HOSTED_ENGINE_MAINTENANCE | Info | Hosted Engine HA maintenance mode was updated on host ${VdsName}. |
| 10451 | USER_FAILED_TO_SET_HOSTED_ENGINE_MAINTENANCE | Error | Hosted Engine HA maintenance mode could not be updated on host ${VdsName}. |
| 10452 | VDS_MAINTENANCE_MANUAL_HA | Warning | Host ${VdsName} was switched to Maintenance mode, but Hosted Engine HA maintenance could not be enabled. Please enable it manually. |
| 10453 | USER_VDS_MAINTENANCE_MANUAL_HA | Warning | Host ${VdsName} was switched to Maintenance mode by ${UserName}, but Hosted Engine HA maintenance could not be enabled. Please enable it manually. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10454 | VDS_ACTIVATE_MANUAL_HA | Warning | Host ${VdsName} was activated by ${UserName}, but the Hosted Engine HA service may still be in maintenance mode. If necessary, please correct this manually. |
| 10455 | VDS_ACTIVATE_MANUAL_HA_ASYNC | Warning | Host ${VdsName} was autorecovered, but the Hosted Engine HA service may still be in maintenance mode. If necessary, please correct this manually. |
| 10456 | HOSTED_ENGINE_VM_IMPORT_SUCCEEDED | Normal | Hosted Engine VM was imported successfully |
| 10460 | HOSTED_ENGINE_DOMAIN_IMPORT_SUCCEEDED | Normal | Hosted Engine Storage Domain imported successfully |
| 10461 | HOSTED_ENGINE_DOMAIN_IMPORT_FAILED | Error | Failed to import the Hosted Engine Storage Domain |
| 10500 | EXTERNAL_SCHEDULER_PLUGIN_ERROR | Error | Running the external scheduler plugin '${PluginName}' failed: '${ErrorMessage}' |
| 10501 | EXTERNAL_SCHEDULER_ERROR | Error | Running the external scheduler failed: '${ErrorMessage}' |
| 10550 | VM_SLA_POLICY_CPU | Info | VM ${VmName} SLA Policy was set. CPU limit is set to ${cpuLimit} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10551 | VM_SLA_POLICY_STORAGE | Info | VM ${VmName} SLA Policy was set. Storage policy changed for disks: [${diskList}] |
| 10552 | VM_SLA_POLICY_CPU_STORAGE | Info | VM ${VmName} SLA Policy was set. CPU limit is set to ${cpuLimit}. Storage policy changed for disks: [${diskList}] |
| 10553 | FAILED_VM_SLA_POLICY | Error | Failed to set SLA Policy to VM ${VmName}. Underlying error message: ${ErrorMessage} |
| 10600 | USER_REMOVE_AUDIT_LOG | Info | Event list message ${AuditLogId} was removed by User ${UserName}. |
| 10601 | USER_REMOVE_AUDIT_LOG_FAILED | Error | User ${UserName} failed to remove event list message ${AuditLogId}. |
| 10602 | USER_CLEAR_ALL_AUDIT_LOG_EVENTS | Info | All events were removed. (User: ${UserName}) |
| 10603 | USER_CLEAR_ALL_AUDIT_LOG_EVENTS_FAILED | Error | Failed to remove all events. (User: ${UserName}) |
| 10604 | USER_DISPLAY_ALL_AUDIT_LOG | Info | All events were displayed. (User: ${UserName}) |
| 10605 | USER_DISPLAY_ALL_AUDIT_LOG_FAILED | Error | Failed to display all events. (User: ${UserName}) |
| 10606 | USER_CLEAR_ALL_AUDIT_LOG_ALERTS | Info | All alerts were removed. (User: ${UserName}) |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10607 | USER_CLEAR_ALL_AUDIT_LOG_ALERTS_FAILED | Error | Failed to remove all alerts. (User: ${UserName}) |
| 10700 | MAC_POOL_ADD_SUCCESS | Info | MAC Pool '${MacPoolName}' (id |
| 10701 | MAC_POOL_ADD_FAILED | Error | Failed to create MAC Pool '${MacPoolName}'. (User: ${UserName}) |
| 10702 | MAC_POOL_EDIT_SUCCESS | Info | MAC Pool '${MacPoolName}' (id |
| 10703 | MAC_POOL_EDIT_FAILED | Error | Failed to update MAC Pool '${MacPoolName}' (id |
| 10704 | MAC_POOL_REMOVE_SUCCESS | Info | MAC Pool '${MacPoolName}' (id |
| 10705 | MAC_POOL_REMOVE_FAILED | Error | Failed to remove MAC Pool '${MacPoolName}' (id |
| 10750 | CINDER_PROVIDER_ERROR | Error | An error occurred on Cinder provider: '${CinderException}' |
| 10751 | CINDER_DISK_CONNECTION_FAILURE | Error | Failed to retrieve connection information for Cinder Disk '${DiskAlias}'. |
| 10752 | CINDER_DISK_CONNECTION_VOLUME_DRIVER_UNSUPPORTED | Error | Unsupported volume driver for Cinder Disk '${DiskAlias}'. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10753 | USER_FINISHED_FAILED_REMOVE_CINDER_DISK | Error | Failed to remove disk ${DiskAlias} from storage domain ${StorageDomainName}. The following entity id could not be deleted from the Cinder provider '${imageId}'. (User: ${UserName}). |
| 10754 | USER_ADDED_LIBVIRT_SECRET | Info | Authentication Key ${LibvirtSecretUUID} was added. (User: ${UserName}). |
| 10755 | USER_FAILED_TO_ADD_LIBVIRT_SECRET | Error | Failed to add Authentication Key ${LibvirtSecretUUID}. (User: ${UserName}). |
| 10756 | USER_UPDATE_LIBVIRT_SECRET | Info | Authentication Key ${LibvirtSecretUUID} was updated. (User: ${UserName}). |
| 10757 | USER_FAILED_TO_UPDATE_LIBVIRT_SECRET | Error | Failed to update Authentication Key ${LibvirtSecretUUID}. (User: ${UserName}). |
| 10758 | USER_REMOVED_LIBVIRT_SECRET | Info | Authentication Key ${LibvirtSecretUUID} was removed. (User: ${UserName}). |
| 10759 | USER_FAILED_TO_REMOVE_LIBVIRT_SECRET | Error | Failed to remove Authentication Key ${LibvirtSecretUUID}. (User: ${UserName}). |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10760 | FAILED_TO_REGISTER_LIBVIRT_SECRET | Error | Failed to register Authentication Keys for storage domain ${StorageDomainName} on host ${VdsName}. |
| 10761 | FAILED_TO_UNREGISTER_LIBVIRT_SECRET | Error | Failed to unregister Authentication Keys for storage domain ${StorageDomainName} on host ${VdsName}. |
| 10762 | FAILED_TO_REGISTER_LIBVIRT_SECRET_ON_VDS | Error | Failed to register Authentication Keys on host ${VdsName}. |
| 10763 | NO_LIBRBD_PACKAGE_AVAILABLE_ON_VDS | Error | Librbd1 package is not available on host ${VdsName}, which is mandatory for using Cinder storage domains. |
| 10764 | FAILED_TO_FREEZE_VM | Warning | Failed to freeze guest filesystems on VM ${VmName}. Note that using the created snapshot might cause data inconsistency. |
| 10765 | FAILED_TO_THAW_VM | Warning | Failed to thaw guest filesystems on VM ${VmName}. The filesystems might be unresponsive until the VM is restarted. |
| 10766 | FREEZE_VM_INITIATED | Normal | Freeze of guest filesystems on VM ${VmName} was initiated. |
| 10767 | FREEZE_VM_SUCCESS | Normal | Guest filesystems on VM ${VmName} have been frozen successfully. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10768 | THAW_VM_SUCCESS | Normal | Guest filesystems on VM ${VmName} have been thawed successfully. |
| 10769 | USER_FAILED_TO_FREEZE_VM | Warning | Failed to freeze guest filesystems on ${VmName} (Host: ${VdsName}, User: ${UserName}). |
| 10770 | USER_FAILED_TO_THAW_VM | Warning | Failed to thaw guest filesystems on ${VmName} (Host: ${VdsName}, User: ${UserName}). |
| 10771 | VDS_CANNOT_CONNECT_TO_GLUSTERFS | Error | Host ${VdsName} cannot connect to Glusterfs. Verify that glusterfs-cli package is installed on the host. |
| 10780 | AFFINITY_RULES_ENFORCEMENT_MANAGER_START | Normal | Affinity Rules Enforcement Manager started. |
| 10781 | AFFINITY_RULES_ENFORCEMENT_MANAGER_INTERVAL_REACHED | Normal | |
| 10800 | VM_ADD_HOST_DEVICES | Info | Host devices ${NamesAdded} were attached to Vm ${VmName} by User ${UserName}. |
| 10801 | VM_REMOVE_HOST_DEVICES | Info | Host devices ${NamesRemoved} were detached from Vm ${VmName} by User ${UserName}. |
| 10802 | VDS_BROKER_COMMAND_FAILURE | Error | VDSM ${VdsName} command ${CommandName} failed: ${message} |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10803 | IRS_BROKER_COMMAND_FAILURE | Error | VDSM command ${CommandName} failed: ${message} |
| 10804 | VDS_UNKNOWN_HOST | Error | The address of host ${VdsName} could not be determined |
| 10810 | SYSTEM_CHANGE_STORAGE_POOL_STATUS_UP_REPORTING_HOSTS | Normal | Data Center ${StoragePoolName} status was changed to UP as some of its hosts are in status UP. |
| 10811 | SYSTEM_CHANGE_STORAGE_POOL_STATUS_NON_RESPONSIVE_NO_REPORTING_HOSTS | Info | Data Center ${StoragePoolName} status was changed to Non Responsive as none of its hosts are in status UP. |
| 10812 | STORAGE_POOL_LOWER_THAN_ENGINE_HIGHEST_CLUSTER_LEVEL | Info | Data Center ${StoragePoolName} compatibility version is ${dcVersion}, which is lower than latest engine version ${engineVersion}. Please upgrade your Data Center to latest version to successfully finish upgrade of your setup. |
| 10900 | HOST_SYNC_ALL_NETWORKS_FAILED | Error | Failed to sync all host ${VdsName} networks |
| 10901 | HOST_SYNC_ALL_NETWORKS_FINISHED | Info | Managed to sync all host ${VdsName} networks. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10902 | PERSIST_HOST_SETUP_NETWORK_ON_HOST | Info | (${Sequence}/${Total}): Applying network's changes on host ${VdsName}. (User: ${UserName}) |
| 10903 | PERSIST_SETUP_NETWORK_ON_HOST_FINISHED | Info | (${Sequence}/${Total}): Successfully applied changes on host ${VdsName}. (User: ${UserName}) |
| 10904 | PERSIST_SETUP_NETWORK_ON_HOST_FAILED | Error | (${Sequence}/${Total}): Failed to apply changes on host ${VdsName}. (User: ${UserName}) |
| 10905 | CLUSTER_SYNC_ALL_NETWORKS_FAILED | Error | Failed to sync all cluster ${ClusterName} networks |
| 10906 | CLUSTER_SYNC_ALL_NETWORKS_STARTED | Info | Started sync of all cluster ${ClusterName} networks. |
| 10910 | NETWORK_REMOVE_NIC_FILTER_PARAMETER | Info | Network interface filter parameter (id ${VmNicFilterParameterId}) was successfully removed by ${UserName}. |
| 10911 | NETWORK_REMOVE_NIC_FILTER_PARAMETER_FAILED | Error | Failed to remove network interface filter parameter ((id ${VmNicFilterParameterId}) by ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10912 | NETWORK_ADD_NIC_FILTER_PARAMETER | Info | Network interface filter parameter ${VmNicFilterParameterName} (id ${VmNicFilterParameterId}) was successfully added to Interface with id ${VmInterfaceId} on VM ${VmName} by ${UserName}. |
| 10913 | NETWORK_ADD_NIC_FILTER_PARAMETER_FAILED | Error | Failed to add network interface filter parameter ${VmNicFilterParameterName} (id ${VmNicFilterParameterId}) to Interface with id ${VmInterfaceId} on VM ${VmName} by ${UserName} by ${UserName}. |
| 10914 | NETWORK_UPDATE_NIC_FILTER_PARAMETER | Info | Network interface filter parameter ${VmNicFilterParameterName} (id ${VmNicFilterParameterId}) on Interface with id ${VmInterfaceId} on VM ${VmName} was successfully updated by ${UserName}. |
| 10915 | NETWORK_UPDATE_NIC_FILTER_PARAMETER_FAILED | Error | Failed to update network interface filter parameter ${VmNicFilterParameterName} (id ${VmNicFilterParameterId}) on Interface with id ${VmInterfaceId} on VM ${VmName} by ${UserName}. |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10916 | MAC_ADDRESS_HAD_TO_BE_REALLOCATED | Warning | Some MAC addresses had to be reallocated because they are duplicate. |
| 10917 | MAC_ADDRESS_VIOLATES_NO_DUPLICATES_SETTING | Error | Duplicate MAC addresses had to be introduced into mac pool violating no duplicates setting. |
| 10918 | MAC_ADDRESS_COULDNT_BE_REALLOCATED | Error | Some MAC addresses had to be reallocated, but operation failed because of insufficient amount of free MACs. |
| 10920 | NETWORK_IMPORT_EXTERNAL_NETWORK | Info | Successfully initiated import of external network ${NetworkName} from provider ${ProviderName}. |
| 10921 | NETWORK_IMPORT_EXTERNAL_NETWORK_FAILED | Error | Failed to initiate external network ${NetworkName} from provider ${ProviderName}. |
| 10922 | NETWORK_IMPORT_EXTERNAL_NETWORK_INTERNAL | Info | |
| 10923 | NETWORK_IMPORT_EXTERNAL_NETWORK_INTERNAL_FAILED | Error | |

| Code | Name | Severity | Message |
|---|---|---|---|
| 10924 | NETWORK_AUTO_DEFINE_NO_DEFAULT_EXTERNAL_PROVIDER | Warning | Cannot create auto-defined network connected to ${NetworkName}. Cluster ${ClusterName} does not have default external network provider. |
| 11000 | USER_ADD_EXTERNAL_JOB | Info | New external Job ${description} was added by user ${UserName} |
| 11001 | USER_ADD_EXTERNAL_JOB_FAILED | Error | Failed to add new external Job ${description} |
| 11500 | FAULTY_MULTIPATHS_ON_HOST | Warning | Faulty multipath paths on host ${VdsName} on devices: [${MpathGuids}] |
| 11501 | NO_FAULTY_MULTIPATHS_ON_HOST | Normal | No faulty multipath paths on host ${VdsName} |
| 11502 | MULTIPATH_DEVICES_WITHOUT_VALID_PATHS_ON_HOST | Warning | Multipath devices without valid paths on host ${VdsName} : [${MpathGuids}] |
| 12000 | MIGRATION_REASON_AFFINITY_ENFORCEMENT | Info | Affinity rules enforcement |
| 12001 | MIGRATION_REASON_LOAD_BALANCING | Info | Load balancing |
| 12002 | MIGRATION_REASON_HOST_IN_MAINTENANCE | Info | Host preparing for maintenance |

| Code | Name | Severity | Message |
|---|---|---|---|
| 12003 | VM_MIGRATION_NOT_ALL_VM_NICS_WERE_PLUGGED_BACK | Error | After migration of ${VmName}, following vm nics failed to be plugged back: ${NamesOfNotPluggedNics}. |
| 12004 | VM_MIGRATION_PLUGGING_VM_NICS_FAILED | Error | After migration of ${VmName} vm nics failed to be plugged back. |
| 12005 | CLUSTER_CANNOT_UPDATE_VM_COMPATIBILITY_VERSION | Error | Cannot update compatibility version of Vm/Template: [${VmName}], Message: ${Message} |
| 13000 | DEPRECATED_API | Warning | Client from address "${ClientAddress}" is using version ${ApiVersion} of the API, which has been \ |
| 13001 | DEPRECATED_IPTABLES_FIREWALL | Warning | Cluster ${ClusterName} uses IPTables firewall, which has been deprecated in \ |

# APPENDIX C. TIMEZONES

The API maps Windows Standard Format timezone names to tz database format when specifying a timezone for a virtual machine or VM template. This means the API only accepts certain tz database codes, which the following table lists:

Table C.1. Accepted tz database codes

| tz database Format | Windows Standard Format |
|---|---|
| **Africa/Cairo** | **Egypt Standard Time** |
| **Africa/Casablanca** | **Morocco Standard Time** |
| **Africa/Johannesburg** | **South Africa Standard Time** |
| **Africa/Lagos** | **W. Central Africa Standard Time** |
| **Africa/Nairobi** | **E. Africa Standard Time** |
| **Africa/Reykjavik** | **Greenwich Standard Time** |
| **Africa/Windhoek** | **Namibia Standard Time** |
| **America/Anchorage** | **Alaskan Standard Time** |
| **America/Bogota** | **SA Pacific Standard Time** |
| **America/Buenos_Aires** | **Argentina Standard Time** |
| **America/Caracas** | **Venezuela Standard Time** |
| **America/Chicago** | **Central Standard Time** |
| **America/Chihuahua** | **Mexico Standard Time** |
| **America/Chihuahua** | **Mountain Standard Time** |
| **America/Denver** | **Mountain Standard Time** |
| **America/Godthab** | **Greenland Standard Time** |
| **America/Guatemala** | **Central America Standard Time** |
| **America/Halifax** | **Atlantic Standard Time** |
| **America/La_Paz** | **SA Western Standard Time** |

| tz database Format | Windows Standard Format |
|---|---|
| America/Los_Angeles | Pacific Standard Time |
| America/Manaus | Central Brazilian Standard Time |
| America/Mexico_City | Central Standard Time |
| America/Mexico_City | Mexico Standard Time |
| America/Montevideo | Montevideo Standard Time |
| America/New_York | Eastern Standard Time |
| America/Phoenix | US Mountain Standard Time |
| America/Regina | Canada Central Standard Time |
| America/Santiago | Pacific SA Standard Time |
| America/Sao_Paulo | E. South America Standard Time |
| America/St_Johns | Newfoundland Standard Time |
| America/Tijuana | Pacific Standard Time |
| Asia/Amman | Jordan Standard Time |
| Asia/Baghdad | Arabic Standard Time |
| Asia/Baku | Azerbaijan Standard Time |
| Asia/Bangkok | SE Asia Standard Time |
| Asia/Beirut | Middle East Standard Time |
| Asia/Calcutta | India Standard Time |
| Asia/Colombo | Sri Lanka Standard Time |
| Asia/Dhaka | Central Asia Standard Time |
| Asia/Dubai | Arabian Standard Time |
| Asia/Irkutsk | North Asia East Standard Time |

| tz database Format | Windows Standard Format |
|---|---|
| Asia/Jerusalem | Israel Standard Time |
| Asia/Kabul | Afghanistan Standard Time |
| Asia/Karachi | Pakistan Standard Time |
| Asia/Katmandu | Nepal Standard Time |
| Asia/Krasnoyarsk | North Asia Standard Time |
| Asia/Novosibirsk | N. Central Asia Standard Time |
| Asia/Rangoon | Myanmar Standard Time |
| Asia/Riyadh | Arab Standard Time |
| Asia/Seoul | Korea Standard Time |
| Asia/Shanghai | China Standard Time |
| Asia/Singapore | Singapore Standard Time |
| Asia/Taipei | Taipei Standard Time |
| Asia/Tashkent | West Asia Standard Time |
| Asia/Tehran | Iran Standard Time |
| Asia/Tokyo | Tokyo Standard Time |
| Asia/Vladivostok | Vladivostok Standard Time |
| Asia/Yakutsk | Yakutsk Standard Time |
| Asia/Yekaterinburg | Ekaterinburg Standard Time |
| Asia/Yerevan | Armenian Standard Time |
| Asia/Yerevan | Caucasus Standard Time |
| Atlantic/Azores | Azores Standard Time |
| Atlantic/Cape_Verde | Cape Verde Standard Time |
| Atlantic/South_Georgia | Mid-Atlantic Standard Time |

| tz database Format | Windows Standard Format |
|---|---|
| Australia/Adelaide | Cen. Australia Standard Time |
| Australia/Brisbane | E. Australia Standard Time |
| Australia/Darwin | AUS Central Standard Time |
| Australia/Hobart | Tasmania Standard Time |
| Australia/Perth | W. Australia Standard Time |
| Australia/Sydney | AUS Eastern Standard Time |
| Etc/GMT-3 | Georgian Standard Time |
| Etc/GMT+12 | Dateline Standard Time |
| Etc/GMT+3 | SA Eastern Standard Time |
| Etc/GMT+5 | US Eastern Standard Time |
| Europe/Berlin | W. Europe Standard Time |
| Europe/Budapest | Central Europe Standard Time |
| Europe/Istanbul | GTB Standard Time |
| Europe/Kiev | FLE Standard Time |
| Europe/London | GMT Standard Time |
| Europe/Minsk | E. Europe Standard Time |
| Europe/Moscow | Russian Standard Time |
| Europe/Paris | Romance Standard Time |
| Europe/Warsaw | Central European Standard Time |
| Indian/Mauritius | Mauritius Standard Time |
| Pacific/Apia | Samoa Standard Time |
| Pacific/Auckland | New Zealand Standard Time |
| Pacific/Fiji | Fiji Standard Time |

| tz database Format | Windows Standard Format |
|---|---|
| **Pacific/Guadalcanal** | **Central Pacific Standard Time** |
| **Pacific/Honolulu** | **Hawaiian Standard Time** |
| **Pacific/Port_Moresby** | **West Pacific Standard Time** |
| **Pacific/Tongatapu** | **Tonga Standard Time** |

# APPENDIX D. LEGAL NOTICE