Red Hat Infrastructure Migration Solution 1.2

Infrastructure Migration Solution Guide

Migrating from VMware to Red Hat Virtualization or Red Hat OpenStack Platform
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Migrating from VMware to Red Hat Virtualization or Red Hat OpenStack Platform

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Abstract

This guide describes how to migrate VMware virtual machines to Red Hat Virtualization 4.3 or Red Hat OpenStack Platform 13 or 14, using Red Hat CloudForms 4.7.6 or later.
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PREFACE

Red Hat Infrastructure Migration Solution (IMS) 1.2 enables you to migrate virtual machines from VMware 5.5 (and later) to Red Hat Virtualization or Red Hat OpenStack Platform, using Red Hat CloudForms:

Red Hat Virtualization 4.3

Red Hat Virtualization provides a virtualization platform built on Red Hat Enterprise Linux. You can manage your virtual infrastructure, including hosts, virtual machines, networks, storage, and users, from a centralized graphical user interface or with a REST API. See Red Hat Virtualization 4.3 documentation for more information.

See Part I, “Migrating from VMware to Red Hat Virtualization”.

Red Hat OpenStack Platform 13 and 14

Red Hat OpenStack Platform provides a scaleable, fault-tolerant, private or public cloud based on Red Hat Enterprise Linux. See Red Hat OpenStack Platform 13 or Red Hat OpenStack Platform 14 documentation for more information.

See Part II, “Migrating from VMware to Red Hat OpenStack Platform”.

Red Hat CloudForms 4.7.6 or later

Red Hat CloudForms is the environment in which you perform the migration. Red Hat CloudForms is a unified set of management tools for use across virtualized, private cloud, and public cloud platforms. See Red Hat CloudForms 4.7 documentation for more information.
PART I. MIGRATING FROM VMWARE TO RED HAT VIRTUALIZATION

The migration process involves the following tasks:

1. Planning the migration. See Chapter 1, Planning the migration.

2. Preparing the VMware, Red Hat Virtualization, and CloudForms environments. See Chapter 2, Preparing the environment for migration.

3. Migrating the virtual machines. See Chapter 3, Migrating the virtual machines.

4. Troubleshooting, if necessary. See Chapter 4, Troubleshooting.
CHAPTER 1. PLANNING THE MIGRATION

During the planning phase, you will formulate a specific migration goal, for example, “I want to migrate 2000 virtual machines, with 200 TB of data, in less than 6 months”.

Review the following information to plan your migration:

- **Section 1.1, “Questions to ask before migration”** includes the following:
  - What operating systems are supported?
  - How long will the migration take?
  - How many conversion hosts do I need?

- **Section 1.2, “Recommendations and best practices”** provides guidelines on the following topics:
  - Scheduling the migration
  - Distributing the workload
  - Deploying the conversion hosts
  - Controlling the migration process

The migration workflow describes the migration process in greater detail.

*Figure 1.1. VMware to Red Hat Virtualization migration workflow*
You create and run a migration plan in CloudForms.

CloudForms uses the migration plan to locate the source virtual machines.

CloudForms captures the ESXi host fingerprint for authentication during the virtual machine conversion process.

Using the attributes defined for the Red Hat Virtualization environment, CloudForms initiates communication with the conversion hosts (Red Hat Virtualization hosts with virt-v2v and virt-v2v-wrapper installed).

virt-v2v-wrapper connects to the source datastore through the ESXi host. virt-v2v streams the source disks to the target data domain and converts the source disks.

virt-v2v-wrapper creates a target Red Hat Virtualization virtual machine, using the source virtual machine’s metadata in order to maintain its attributes (tags, power state, MAC address, CPU count, memory, disks, and virtual machine name) after migration.

virt-v2v attaches the converted disks to the Red Hat Virtualization virtual machine. (The virtual machine’s power state is the same as the source virtual machine’s power state.)

The migration process is complete and the migration plan’s status is displayed in CloudForms.

1.1. QUESTIONS TO ASK BEFORE MIGRATION

The following questions can help you to estimate the resources and time required for migration.

What am I migrating?

- Identify the VMware virtual machines that you will be migrating.

What is the maximum number of disks or virtual machines that I can migrate?

- There is no maximum number of disks or virtual machines that you can migrate. However, you may not want to migrate all your virtual machines at the same time, in order to minimize the impact on your users.

**IMPORTANT**

If you exceed the capabilities of your environment, the migrations will fail. This situation could affect existing applications running on virtual machines attached to the network and storage.

What operating systems can I migrate?

- You can migrate any guest operating system that is certified and supported for use with the Red Hat Virtualization Hypervisor. See Certified Guest Operating Systems in Red Hat OpenStack Platform and Red Hat Virtualization.
What am I missing?

- Identify resource gaps, such as bandwidth, storage, licenses, or a suitable maintenance window, before you begin the migration.

What impact will the migration have on my users?

- Assess the effects the migration may have on a production environment. It may be possible to migrate your applications in phases, without downtime at the application layer, if the applications are distributed in a high-availability architecture.
- Check whether users will lose access to critical applications.

How long will the migration take?

There is no formula to estimate how long the actual migration will take. This is determined on a case-by-case basis.

The following example is provided as a guide:

Example 1.1. Red Hat Virtualization migration

- Duration of migration: 1:15:53 (hh:mm:ss)
- 10 virtual machines
- Total data migrated: 1000 GB
- Hardware:
  - Strong host (40 cores, 500 GB RAM)
  - Fast SSD XtremIO storage
  - Fibre Channel 8 interface for host-to-storage connection
  - 10 GbE network interface cards for all other connections

How many conversion hosts do I need?

The number of conversion hosts you create depends on the size of your migration. All the virtual machines in a migration plan are migrated at the same time, in parallel. The number of virtual machines that you can migrate simultaneously depends on your infrastructure capabilities. Each migration requires a certain amount of network bandwidth, I/O throughput, and processing power for the conversion process. Multiple conversion hosts provide load-balancing and better performance, even for small migrations.

Conversion hosts are limited to a maximum of ten concurrent migrations, unless you change the default values.

You should test your environment thoroughly before the migration to determine how many migrations it can support without negative effects, for example, five conversion hosts, each running ten concurrent migrations.

Should I migrate my virtual machines with VDDK or SSH?

You can migrate your virtual machines with either the VMware Virtual Disk Development Kit (VDDK) or SSH. VDDK is the default because it is much faster than SSH and easier to configure.
VDDK is limited to 20 concurrent migrations per conversion host, because of network limitations, and 10 concurrent migrations per VMware hypervisor, unless you increase the hypervisor’s NFC service memory.

If you cannot use VDDK, SSH transformation is a fallback option.

1.2. RECOMMENDATIONS AND BEST PRACTICES

The following recommendations will help to minimize the impact of the migration on your environment.

Scheduling the migration

- Schedule your migration carefully, to minimize the impact on your users.
- Prepare your users for downtime.

**IMPORTANT**

Currently, IMS supports only cold migration. Virtual machines are powered off gracefully as part of the migration process.

- Stagger the migration schedules.
- Move critical applications during maintenance windows.

Distributing the migration workload

- Create migration groups, so that you are not migrating all of your virtual machines at the same time, keeping in mind the following considerations:
  - How are the virtual machines grouped now?
  - Which virtual machines should be migrated together?
  - Which workloads or linked applications should be migrated together?
  - What applications must remain available?
- Consider which parts of the workload to migrate first:
  - Databases
  - Applications
  - Web servers
  - Load balancers

Deploying the conversion hosts

- Create a sufficient number of conversion hosts for your migration, with sufficient resources.
- Create multiple conversion hosts for load-balancing. The virtual machines in a migration plan are automatically distributed among the conversion hosts. This decreases the load on the
conversion hosts and allows you to increase the concurrent migrations beyond the limits of a single conversion host.

**Controlling the migration process**

- Create multiple migration plans for finer control.
- Perform test migrations with different maximum numbers of concurrent migrations to assess the capabilities of your environment’s infrastructure.
CHAPTER 2. PREPARING THE ENVIRONMENT FOR MIGRATION

Preparing your environment for migration involves the following tasks:

1. Preparing the VMware environment. See Section 2.1, “Preparing the VMware environment”.

2. Preparing the target environment. See Section 2.2, “Preparing the Red Hat Virtualization environment”.

3. Configuring the conversion hosts. See Section 2.2.4, “Configuring the conversion hosts”.

NOTE

The virtual disks are converted with the VMware Virtual Disk Development Kit (VDDK). If you cannot use VDDK, SSH transformation is a fallback option. See Appendix A, Configuring the Red Hat Virtualization environment for SSH transformation.

2.1. PREPARING THE VMWARE ENVIRONMENT

Preparing the VMware environment for migration involves the following tasks:

1. Extending the VMware network. See Section 2.1.1, “Preparing the VMware network”.

2. Preparing the VMware virtual machines. See Section 2.1.2, “Preparing the VMware virtual machines”.

3. (Optional) Configuring a VMware hypervisor for more than ten concurrent migrations from that hypervisor. See Section 2.1.3, “Configuring a VMware hypervisor for more than ten concurrent migrations”.

2.1.1. Preparing the VMware network

Extend the VMware network to the Red Hat Virtualization environment.

IMPORTANT

- The network configuration must not be changed in any way during the migration.
- IP addresses, VLANs, and other network configuration must not be changed before or after migration because the conversion process preserves the source virtual machine MAC addresses.

2.1.2. Preparing the VMware virtual machines

Perform the following steps on each VMware virtual machine that you are migrating:

1. Install VMware Tools to capture IP addresses. To download and install VMware Tools, see VMware Workstation 5.0: Installing VMware Tools.

2. Unmount mounted ISO/CDROM disks.

3. Ensure that attached disks are not encrypted.
4. Ensure that each NIC has no more than one IPv4 and/or one IPv6 address.

5. Ensure that the virtual machine names contain only upper- or lower-case letters, numbers, underscores (_), hyphens (-), or periods (.)

   **NOTE**
   International characters and spaces are not permitted.

6. Ensure that the virtual machine names do not duplicate names of virtual machines in the Red Hat Virtualization environment.

If you are performing more than ten concurrent migrations from a VMware hypervisor, you must configure the hypervisor to support the additional connections. See Section 2.1.3, “Configuring a VMware hypervisor for more than ten concurrent migrations”.

### 2.1.3. Configuring a VMware hypervisor for more than ten concurrent migrations

If you are performing more than ten concurrent migrations from a VMware hypervisor using VDDK transformation, the migration will fail because the hypervisor’s NFC service memory buffer is limited to ten parallel connections. See VMware vSphere 6.5 NFC session connection limits and Virt-v2v. VDDK: ESXi NFC service memory limits for details.

You can increase the hypervisor’s NFC service memory to enable additional connections for migrations.

**Procedure**

1. Log in to a VMware hypervisor.

2. Change the value of `maxMemory` to `1000000000` in `/etc/vmware/hostd/config.xml`:

   ```xml
   <nfcsvc>
   <path>libnfcsvc.so</path>
   <enabled>true</enabled>
   <maxMemory>1000000000</maxMemory>
   <maxStreamMemory>10485760</maxStreamMemory>
   </nfcsvc>
   ```

3. Restart `hostd`:

   ```
   # /etc/init.d/hostd restart
   ```

   You do not need to reboot the VMware hypervisor.

### 2.2. PREPARING THE RED HAT VIRTUALIZATION ENVIRONMENT

Preparing the Red Hat Virtualization environment involves the following key steps:

1. Installing and configuring Red Hat Virtualization 4.3. See Section 2.2.2, “Installing and configuring Red Hat Virtualization 4.3”.

2. Installing and configuring CloudForms 4.7.6 or later. See Section 2.2.3, “Installing and configuring CloudForms 4.7.6”.
NOTE
The virtual disks are converted with the VMware Virtual Disk Development Kit (VDDK). If you cannot use VDDK, SSH transformation is a fallback option. See Appendix A, Configuring the Red Hat Virtualization environment for SSH transformation.

2.2.1. Prerequisites
Ensure that the following prerequisites are met:

1. Set the BIOS settings of physical hosts for optimal performance (rather than power-saving), according to the vendor’s recommendations.

2. Disable C1E halt state, if applicable.

3. Enable the following ports in the conversion host network:
   - 22 - SSH
   - 443 - CloudForms, Red Hat Virtualization Manager, and VDDK
   - 902 - CloudForms to VMware
   - 5480 - Conversion hosts to vCenter
   For details, see Configuring Firewall Ports.

4. Ensure that the software versions are compatible.

Software compatibility

<table>
<thead>
<tr>
<th>Software</th>
<th>IMS 1.1</th>
<th>IMS 1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMware</td>
<td>5.5 or later</td>
<td>5.5 or later</td>
</tr>
<tr>
<td>Red Hat Virtualization</td>
<td>4.2.8</td>
<td>4.3.4 or later</td>
</tr>
<tr>
<td>CloudForms</td>
<td>4.7.0, with CFME 5.10.3</td>
<td>4.7.6 or later, with CFME 5.10.5</td>
</tr>
</tbody>
</table>

*CFME 5.10.4 does not support migration.* You can use CFME 5.10.4 to manage the Red Hat Virtualization environment. Only the migration functionality is affected.

2.2.2. Installing and configuring Red Hat Virtualization 4.3

Procedure

1. Install Red Hat Virtualization Manager 4.3.4 on the Manager machine. See Installing the Red Hat Virtualization Manager in the Red Hat Virtualization Installation Guide.

2. Install Red Hat Virtualization Host 4.3.4 or Red Hat Enterprise Linux 7.6 on the host machines. See Installing Red Hat Virtualization Host or Installing Red Hat Enterprise Linux Hosts in the Red Hat Virtualization Installation Guide.
NOTE
Some of these hosts will be deployed as conversion hosts. The number of conversion hosts depends on your migration size and infrastructure capabilities.

3. Create and attach data and ISO storage domains to the data center, ensuring that the data domains have sufficient space for the migrated virtual machines. See Storage in the Red Hat Virtualization Administration Guide.

NOTE
IMS only supports shared storage, such as NFS, iSCSI, or FCP. Local storage is not supported.

Although the ISO storage domain has been deprecated in RHV 4.3, it is required for migration.

4. Upload the VirtIO and RHV Guest Tools image files to the ISO storage domain. See Uploading the VirtIO and Guest Tool Image Files to an ISO Storage Domain in the Red Hat Virtualization Administration Guide. The VirtIO file name must include the version number (virtio-win-version.iso). The guest tools are required for migrating Windows virtual machines.

5. Optionally, you can create a MAC address pool that includes the MAC addresses of the VMware virtual machines to be migrated. See Creating MAC Address Pools in the Red Hat Virtualization Administration Guide.

IMPORTANT
If the Red Hat Virtualization MAC address pool range overlaps the VMware MAC address range, you must ensure that the MAC addresses of the migrating virtual machines do not duplicate those of existing virtual machines. Otherwise, the migration will fail.

If you do not create a MAC address pool, the migrated virtual machines will not have MAC addresses in the same range as virtual machines created in Red Hat Virtualization.

2.2.3. Installing and configuring CloudForms 4.7.6

CAUTION
Removing or changing a provider will cause errors in the infrastructure mappings and migration plans.

Procedure

1. Install Red Hat CloudForms 4.7.6 or later on the Manager machine. See Installing Red Hat CloudForms on Red Hat Virtualization.

NOTE
CFME 5.10.4 does not support migration.
2. Add VMware to CloudForms as a provider. See Adding a VMware vCenter Provider.

3. Add Red Hat Virtualization to CloudForms as a provider. Adding a Red Hat Virtualization Provider in Red Hat CloudForms: Managing Providers.

Configure your conversion hosts with CloudForms to use the VMware Virtual Disk Development Kit (VDDK).

**NOTE**

The virtual disks are converted with the VMware Virtual Disk Development Kit (VDDK). If you cannot use VDDK, SSH transformation is a fallback option. See Appendix A, Configuring the Red Hat Virtualization environment for SSH transformation.

### 2.2.4. Configuring the conversion hosts

**Prerequisites**

- Download and save the VMware Virtual Disk Development Kit.

- If the Red Hat Virtualization provider has been active for a while, verify that the hosts have valid subscriptions and repositories:

  ```
  # subscription-manager list --consumed
  # yum repolist
  ```

**Downloading the VMware Virtual Disk Development Kit**

**Procedure**

1. In a browser, navigate to VMware Documentation.

2. Click VMware SDK & API Product Documentation → VMware Virtual Disk Development Kit (VDDK).

3. Select the latest VDDK release.

4. Click Download SDKs to download the tar.gz VDDK archive file.

5. Save the VDDK archive file in an HTTP-accessible location and record its path.

**Procedure**

1. In CloudForms, click Compute → Migration → Migration Settings.

2. In the Conversion Hosts tab, click Configure Conversion Host. The Configure Conversion Host wizard is displayed.
3. In the Location screen, add the provider details:
   a. Select a Provider Type.
   b. Select a Provider.
   c. Select a Cluster and click Next.

4. In the Host(s) screen, select one or more hosts from the dropdown list and click Next.

5. In the Authentication screen, add the conversion hosts' SSH key and the transformation method:
   a. Click Browse to browse to the SSH private key or paste it in the Conversion host SSH private key field.
      The Manager deploys a private SSH key on the conversion hosts in order to send commands and run playbooks. The default key file is /etc/pki/ovirt-engine/keys/engine_id_rsa on the Manager machine.
   b. Select VDDK as the Transformation method.
   c. Enter the path of the VDDK package in the VDDK library path field and click Validate. Wait for validation to complete.
   d. Click Configure.

6. In the Results screen, wait for the conversion host configuration to finish and click Close.
   The configured conversion hosts and status information, including error messages, appear in the Configured Conversion Hosts list.
If an error occurs, you can download a host’s log by clicking the More Actions icon ( ) and selecting Download Log.

You can click the Retry button if the conversion host configuration failed for reasons unconnected with your environment.

(Optional) Click Remove to remove the configuration from a configured conversion host.

You can migrate your virtual machines.

(Optional) You can verify the conversion hosts in a browser. See Section 2.2.5, “Verifying the conversion hosts in a browser”.

2.2.5. Verifying the conversion hosts in a browser

You can verify your conversion hosts in a browser by using the CloudForms API:

1. In the address bar of a browser, enter the following:

   https://CloudForms_FQDN/api/conversion_hosts

   CloudForms_FQDN is the FQDN of the CloudForms machine.

   A log-in screen is displayed.

2. Enter your CloudForms Username and Password and click Sign in.
   The conversion hosts and their IDs are displayed in JSON format:

   ```json
   {
   "name":"conversion_hosts","count":3,"subcount":3,"pages":1,"resources":
   [{"href":"https://cloudforms.example.com/api/conversion_hosts/10000000000001"},
   {"href":"https://cloudforms.example.com/api/conversion_hosts/10000000000002"},
   {"href":"https://cloudforms.example.com/api/conversion_hosts/10000000000003"}],
   "actions":
   [{"name":"create","method":"post","href":"https://cloudforms.example.com/api/conversion_hosts"},
   {"name":"edit","method":"post","href":"https://cloudforms.example.com/api/conversion_hosts"},
   {"name":"delete","method":"post","href":"https://cloudforms.example.com/api/conversion_hosts"}]
   },
   "links":{
   ```
CHAPTER 3. MIGRATING THE VIRTUAL MACHINES

Migrating the virtual machines involves the following key tasks:

1. Mapping the resources of your VMware and Red Hat Virtualization environments. See Section 3.1, “Creating an infrastructure mapping”.

2. Checking for migration conditions with prerequisites. See Section 3.2, “Checking for migration prerequisites”.

3. Creating and running a migration plan. See Section 3.3, “Creating and running a migration plan”.

Optionally, you can change the maximum number of concurrent migrations for conversion hosts or providers to control the migration process.

3.1. CREATING AN INFRASTRUCTURE MAPPING

The infrastructure mapping maps the resources of your VMware and Red Hat Virtualization environments.

**IMPORTANT**

If you add or remove providers or provider objects from an infrastructure mapping, the mapping will have missing resource errors. You must delete the infrastructure mapping and create a new one.

**Procedure**

1. Click Compute → Migration → Infrastructure Mappings.

2. Click Create Infrastructure Mapping The Create Infrastructure Mapping wizard is displayed.
3. In the General screen, add the infrastructure mapping details:
   a. Enter the infrastructure mapping Name and (optional) Description.
   b. Select the Target Provider.
   c. Click Next.

4. In the Map Compute screen, map the source and target clusters:
   a. Select a Source Provider \ Datacenter \ Cluster and a Target Provider \ Datacenter \ Cluster.
      If the target cluster does not contain a conversion host, a warning icon (⚠️) appears. You can create and save an infrastructure mapping, but you must configure the conversion hosts before running a migration plan.
   b. Click Add Mapping. You can map additional clusters.
   c. Click Next.

5. In the Map Storage screen, map the source and target storage:
   a. Select a Source Provider \ Datacenter \ Datastore and Target Datastores.
   b. Click Add Mapping. You can map additional datastores.
   c. Click Next.
6. In the **Map Networks** screen, map the source and target networks:
   a. Select a source cluster from the drop-down list.
   b. Select one or more networks from **Source Provider \ Datacenter \ Network** and **Target Project \ Network**.
   c. Click **Add Mapping**. You can map the networks of additional source clusters.
   d. Click **Create**.

7. In the **Results** screen, click **Close**. The infrastructure mapping is saved in **Compute → Migration → Infrastructure Mappings**.

You can click an infrastructure mapping element to view its details:

### Infrastructure Mappings list

![Infrastructure Mappings list](image)

After you have created an infrastructure mapping, check for migration prerequisites.

If these conditions do not apply, you can create a migration plan. See [Section 3.3, “Creating and running a migration plan”](#).

### 3.2. CHECKING FOR MIGRATION PREREQUISITES

Check your migration for the following conditions, which have prerequisites:

**You are migrating previously migrated virtual machines**

Add previously migrated machines to the migration plan with a CSV file. A CSV file is also recommended for large migrations.

See [Section 3.2.1, “Creating a CSV file to add virtual machines to the migration plan”](#).

**You are using Ansible playbooks for premigration/postmigration tasks**

Create an Ansible repository and add credentials and playbooks to CloudForms.

See [Section 3.2.2, “Adding Ansible playbooks to CloudForms for premigration and postmigration tasks”](#).

**You are migrating virtual machines running RHEL or other Linux operating system**

Create a RHEL premigration playbook to preserve IP addresses and select this playbook when you create a migration plan.
3.2.1. Creating a CSV file to add virtual machines to the migration plan

If you are migrating virtual machines that were migrated in the past, you should create a CSV file to add the virtual machines to the migration plan, because the migration plan cannot discover them automatically.

NOTE

A CSV file is recommended for large migrations because it is faster than manually selecting individual virtual machines.

Table 3.1. CSV file fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Virtual machine name. Required</td>
</tr>
<tr>
<td>Host</td>
<td>Optional. Only required if virtual machines have identical Name fields.</td>
</tr>
<tr>
<td>Provider</td>
<td>Optional. Only required if virtual machines have identical Name and Host fields.</td>
</tr>
</tbody>
</table>

CSV file example

```
Name,Host,Provider
vm01,host1,vSphere3
vm02,host1,vSphere3
vm03,host1,vSphere3
```

3.2.2. Adding Ansible playbooks to CloudForms for premigration and postmigration tasks

You can add Ansible playbooks to CloudForms to perform automated premigration and postmigration tasks on specific virtual machines, for example:

- Removing webservers from a load-balancing pool before migration and returning them to the pool after migration
- Running `fstrim` after migration to reduce the space required by virtual machines migrating to Red Hat OpenStack Platform with Ceph storage

Procedure

1. Enable the **Embedded Ansible** server role in CloudForms. See [Enabling the Embedded Ansible Server Role](#) in *Red Hat CloudForms: Managing Providers*.

2. Add an Ansible playbook repository. See [Adding a Playbook Repository](#) in *Red Hat CloudForms: Managing Providers*.
3. Add the credentials of each virtual machine that you are migrating. See Credentials in Red Hat CloudForms: Managing Providers.

4. Add your playbook as an Ansible service catalog item. See Creating an Ansible Playbook Service Catalog Item in Red Hat CloudForms: Provisioning Virtual Machines and Instances.

You will select the playbooks and the virtual machines on which they run in the Advanced Options screen when you create the migration plan.

3.2.3. Creating a RHEL premigration playbook for RHEL/Linux source virtual machines

If you are migrating virtual machines running RHEL or other Linux operating system, you can create a RHEL premigration playbook to ensure that the IP addresses are accessible after migration. The RHEL premigration playbook calls the Ansible ims.rhel_premigration role.

To install the role with Ansible Galaxy, see ims_rhel_pre_migration. This role is not included in the IMS installation.

The ims.rhel_premigration role performs the following tasks on the VMware virtual machines:

- Preserves the static IP address configuration by creating udev rules to associate the virtual machine’s MAC address with its interface name
- Installs the Red Hat Virtualization guest agent. The guest agent reports the new virtual machine’s IP address and installed applications to the Manager.

**NOTE**

The ims.rhel_premigration role assumes that either the rhel-6-server-rpms or the rhel-7-server-rpms repository is enabled in the source virtual machine when it installs qemu-guest-agent. If you have disabled the repository, re-enable it in the RHEL premigration playbook.

**RHEL premigration playbook example**

```yaml
---
- hosts: all
  roles:
    - role: ims.rhel_pre_migration
```

You can create a migration plan. See Section 3.3, “Creating and running a migration plan”.

3.3. CREATING AND RUNNING A MIGRATION PLAN

Before you perform a large migration, you should perform several test migrations with different maximum numbers of concurrent migrations for your conversion hosts or providers. This will enable you to assess the capabilities of your environment’s infrastructure.

You can create and run a migration plan in CloudForms with the following options:

- Running a migration plan immediately
- Scheduling a migration plan to run in the future
- Viewing a migration plan in progress
- Canceling a migration plan in progress
- Retrying a failed migration plan

**NOTE**

A CSV file is optional, but recommended, for large migrations because it is faster than manually selecting each virtual machine.

**Procedure**

1. Click **Compute → Migration → Migration Plans**.

2. Click **Create Migration Plan**. The **Create Migration Plan** wizard is displayed.

3. In the **General** screen, add the details of the migration plan:
   a. Select an infrastructure mapping from the drop-down list.
   b. Enter the migration plan **Name** and (optional) **Description**.
   c. Select a virtual machine discovery method:
      - **Choose from a list of VMs discovered in the selected infrastructure mapping**
      - **Import a CSV file with a list of VMs to be migrated**

If the virtual machines cannot be discovered, check that the source datastores and networks in the infrastructure mapping are correct.
• **Import a CSV file with a list of VMs to be migrated**
  A CSV file is required for previously migrated source virtual machines and recommended for large migrations.

d. Click **Next**.

4. In the **VMs** screen, select the virtual machines for migration:

   • If you selected **Choose from a list of VMs discovered in the selected infrastructure mapping**, select the virtual machines for migration.
     You can search for virtual machines by **VM Name, Data Center, Cluster**, and **Folder**.

   • If you selected **Import a CSV file with a list of VMs to be migrated**
     
     a. Click **Import**.

     b. Browse to the CSV file and click **Open**.
     
     If the virtual machines cannot be added to the migration plan, check the CSV file format and fields for errors.

     **NOTE**

     If the **Create Migration Plan** wizard freezes, refresh the web page, check the CSV file for errors (for example, virtual machines with duplicate **Name** fields and no other fields to distinguish them), and create a new migration plan.

     c. Click **Next**.

5. In the **Advanced Options** screen, select the playbook service options:

   a. Select a premigration and/or postmigration playbook service from the dropdown lists.

   b. Select the virtual machines on which to run the playbook services.

   c. Click **Next**.

6. In the **Schedule** screen, select a schedule option and click **Create**:

   • **Save migration plan to run later**
     The migration plan is saved in **Migration Plans Not Started** and will not run unless you schedule it or click **Migrate** to run the scheduled migration plan immediately.

   • **Start migration immediately**
     The migration plan may take some time to complete. Progress bars indicate the amount of transferred data, the number of migrated virtual machines, and the elapsed time. See **Section 3.3.2, “Viewing a migration plan in progress”** for details.

7. In the **Results** screen, click **Close**.

When the migration plan has finished, click **Migration Plans Complete** to view the status of the migration plan. The completed migration plan shows the status of the migrated virtual machines.

In the migration plans list, you can click the **More Actions** icon ( ![icon](icon.png) ) to archive, edit, or delete a migration plan.
3.3.1. Scheduling a saved migration plan

To schedule a saved migration plan to run in the future:

1. Click Migration Plans Not Started
2. Click the Schedule button of a migration plan.
3. In the Schedule Migration Plan window, select a date and time and click Schedule. The plan’s status is Migration Scheduled with the date and time.

3.3.2. Viewing a migration plan in progress

To view the progress of a migration plan:

1. Click Migration Plans in Progress
2. Click a migration plan name to view its details, including the status of the migrating virtual machines.

NOTE

The counter in Compute → Migration → Migration Plans may be a few seconds ahead of the counter in the migration plan details view. This is because the Migration Plans counter displays the total time for running the migration plan, while the details counter displays the time for migrating the virtual machines.

3.3.3. Canceling a migration plan in progress

To cancel a migration plan in progress:

1. Click Migration Plans in Progress
2. Select a migration plan and click Cancel Migration.
3. Click Cancel Migrations to confirm the cancellation. The canceled migration appears in Migration Plans Complete with a red x indicating that the plan did not complete successfully.

3.3.4. Retrying a failed migration plan

To retry a migration plan that failed because of external circumstances (for example, power outage):

1. Delete all objects created by the failed migration plan:
   - Delete newly created virtual machines to avoid name conflicts with migrating VMware virtual machines.
   - Delete converted disks to free up space.
2. Click Compute → Migration → Migration Plans.
3. Click Migration Plans Complete.
4. Click the Retry button beside the failed migration plan.
3.4. CHANGING THE MAXIMUM NUMBER OF CONCURRENT MIGRATIONS

You can change the maximum number of concurrent migrations for conversion hosts or providers to control the impact of the migration process on your infrastructure.

The provider setting has priority over the conversion host setting. For example, if the maximum number of concurrent migrations is 20 for a provider and 3 for five conversion hosts, the maximum number of concurrent migrations is 20, not 15 (5 conversion hosts × 3 concurrent migrations per host).

An increase in the maximum number of concurrent migrations affects all migration plans immediately. Virtual machines that are queued to migrate will migrate in greater numbers.

A decrease maximum number of concurrent migrations affects only future migration plans. Migration plans that are in progress will use the limit that was set when the plan was created.

Changing the maximum number of concurrent migrations for all conversion hosts or providers

CAUTION

If you are using VDDK transformation, the number of concurrent migrations must not exceed 20. Otherwise, network overload will cause the migration to fail.

1. Click Compute → Migration → Migration Settings.
2. In the Migration Throttling tab, select a value for Maximum concurrent migrations per conversion host or Maximum concurrent migrations per provider and click Apply.
   The value of Maximum concurrent migrations per conversion host is constrained so that it cannot be greater than Maximum concurrent migrations per provider.

NOTE

In the current release, the Maximum concurrent migrations per conversion host interface control does not work.

Changing the maximum number of concurrent migrations for a specific conversion host

1. Enter the following command:

   ```
   # curl -sk -u username:password https://CloudForms_FQDN/api/conversion_hosts/conversion_host_id -X POST -d "{"action": "edit", "resource": {"max_concurrent_tasks": 15}}"
   ```

   username and password are the username and password for CloudForms.

   CloudForms_FQDN is the FQDN of the CloudForms machine.

   To obtain a conversion_host_id, enter the following command:

   ```
   # curl -sk -u username:password https://CloudForms_FQDN/api/conversion_hosts/
   ```

   max_concurrent_tasks is the maximum number of concurrent migrations. The default is 10.
CHAPTER 4. TROUBLESHOOTING

To identify errors, you can review the migration logs. See Section 4.1, “Migration logs”.

You can check these common issues and mistakes:

- Infrastructure mapping errors. See Section 4.2, “Infrastructure mapping errors”.
- Migration plan errors. See Section 4.3, “Migration plan errors”.
- IP address errors. See Section 4.4, “IP address errors”.
- Environment configuration errors. See Section 4.5, “Environment configuration errors”.

Section 4.6, “Known Issues” provides information about issues that will be addressed in a future release.

4.1. MIGRATION LOGS

You can check the following logs to identify the cause of a migration error:

- Conversion host logs. See Section 4.1.1, “Downloading the conversion host and playbook logs”.
- Playbook logs, if you are using premigration or postmigration Ansible playbooks. See Section 4.1.1, “Downloading the conversion host and playbook logs”.
- CloudForms migration log. See Section 4.1.2, “Accessing the CloudForms migration log”.

4.1.1. Downloading the conversion host and playbook logs

You can download the conversion host and playbooks logs in CloudForms.

When disk migration starts, two logs are created in the conversion host:

- **virt-v2v**: Debug output from `virt-v2v` itself. This log tracks the core of the virtual machine migration process, including `libguestfs` traces and disk migration details.

- **virt-v2v-wrapper**: Log of the daemonizing wrapper for `virt-v2v`. This log traces the orchestration of the virtual machine conversion on the conversion host, including disk migration percentages and `virt-v2v` error reporting.

**IMPORTANT**

If you open a Red Hat Support call, you will need to submit both the `virt-v2v` log and `virt-v2v-wrapper` log for analysis and troubleshooting.

To access the conversion host logs and the playbook logs:

1. Click **Compute → Migration → Migration Plans**.
2. Click a completed migration plan to view its details.
3. Click **Download Log** of a virtual machine and select a log from the dropdown list:
   - **Premigration log** This option only appears if a premigration playbook is used.
4.1.2. Accessing the CloudForms migration log

1. Log into the CloudForms machine using SSH.

2. The migration log is `/var/www/miq/vmdb/log/automation.log`.

4.2. INFRASTRUCTURE MAPPING ERRORS

- **Networks missing**, **Datastores missing**, and **Clusters missing** error messages: If you create an infrastructure mapping and then change a provider or refresh the Red Hat Virtualization hosts, the provider’s object IDs change. Delete the infrastructure mapping and create a new one.

4.3. MIGRATION PLAN ERRORS

- If the virtual machines are being migrated for the first time and are not discovered by the migration plan, check the source datastores and networks in the infrastructure mapping.

- If the virtual machines have been migrated in the past, they cannot be discovered by the migration plan. Use a CSV file to add the virtual machines to the migration plan.

- If the virtual machines cannot be added to the migration plan with a CSV file, check the CSV file format and fields. Create a new migration plan with the updated CSV file.

- **Create Migration Plan** wizard hangs while importing a CSV file. This error is caused by an invalid CSV file (for example, virtual machines with a duplicate Name field and no Host/Provider field to distinguish them, or with a duplicate Name field and duplicate Host/Provider fields). Refresh the web page.

- **Denied State** error (IMS 1.1). If a migration plan fails immediately and the migration plan displays a Denied State error message, check that you have created and configured the conversion hosts correctly. Cancel the migration plan and run it again.

- **Unable to migrate VMs because no conversion host was configured at the time of the attempted migration. See the product documentation for information on configuring conversion hosts.** (IMS 1.2) You can create and save a migration plan whose infrastructure mapping does not contain conversion hosts, but you cannot run the migration plan without conversion hosts. Cancel the migration plan, create the conversion hosts, and run the migration plan again.

4.4. IP ADDRESS ERRORS

- If the IP address of a migrated RHEL (or other Linux-based operating system) virtual machine is not accessible, you must create a **RHEL premigration** playbook and add it to the migration plan.

- If a migrated virtual machine does not have an IP address:
  - Check that you installed VMware Tools on the VMware virtual machine before migration.
4.5. ENVIRONMENT CONFIGURATION ERRORS

VMware

- A VMware virtual machine cannot be migrated if it has any of the following conditions:
  - Mounted ISO/CDROM disk
  - Encrypted disk
  - Invalid name, containing spaces or special characters
- If you are performing more than ten concurrent migrations from a single VMware hypervisor, you must increase the hypervisor’s NFC service memory.

Red Hat Virtualization

- Name conflict: VMware virtual machine has the same name as a Red Hat Virtualization virtual machine.
- MAC address conflict: VMware virtual machine has the same MAC address as a Red Hat Virtualization virtual machine in a MAC address pool.
- SSH transformation only:
  - If you are using SSSD with single sign-on, you must reinstall **ipa-client** without OpenSSH.
  - Check that the conversion host does not have an existing private SSH key in `/var/lib/vdsm/.ssh/id_rsa`. Conversion host configuration does not overwrite old SSH keys. They must be deleted manually.
  - Check that you enabled SSH access on the VMware hypervisors and correctly configured your conversion hosts for SSH transformation.

4.6. KNOWN ISSUES

The following issues will be addressed in a future release:

- **BZ#1666799**: Canceling migration does not stop creating volume, instance, and network port on OpenStack Platform or VMs on Red Hat Virtualization
- **BZ#1678385**: Virtual machine with name containing spaces (rhel 7) fails to migrate using SSH and VDDK transformation
- **BZ#1699343**: Migration plan CSV import validation does not work if file contains empty/archived/orphan/invalid VM name
- **BZ#1698761**: "Maximum concurrent migrations per conversion host" interface control does not work
- **BZ#716283**: Migrating virtual machines are not distributed correctly among the conversion hosts
- **BZ#1726939**: Run the preflight check of migration task before waiting for a conversion host. Currently, the preflight check that monitors the migration is performed after a conversion host is assigned to the task. As a result, the total volume of the Datastores reported in Migration
**Plans In Progress** reflects the total volume of the virtual machines that are currently migrating, not the total volume of the migration plan. When all the virtual machines have started to migrate, the correct value of the total volume is displayed.

- **BZ#666799**: Canceling migration does not stop creating virtual machines on RHV. If you cancel a migration, you must delete migrated virtual machines and disks in the Administration Portal.

- **BZ#1669176**: Refreshing the hosts causes the network(s) and datastore to disappear from infrastructure mappings

- CloudForms CFME 5.10.4 does not support migration. Use the following versions for migration:
  - Red Hat Virtualization 4.2: CFME 5.10.3
  - Red Hat Virtualization 4.3: CFME 5.10.5

**NOTE**

You can use CFME 5.10.4 to manage Red Hat Virtualization 4.3. Only the migration functionality is affected.
APPENDIX A. CONFIGURING THE RED HAT VIRTUALIZATION ENVIRONMENT FOR SSH TRANSFORMATION

You can configure your environment for SSH transformation if you cannot use VDDK.

Configuring your environment involves the following additional steps:

1. Configuring the VMware hypervisors. See Section A.1, “Configuring the VMware hypervisors for SSH transformation”.
2. Optional) Reinstalling `ipa-client` if you are configuring your conversion hosts for SSSD with single sign-on. See Section A.2, “Reinstalling `ipa-client`”.
3. Configuring the conversion hosts. See Section A.3, “Configuring the conversion hosts”.
4. Copying the VMware keys to the conversion hosts. See Section A.4, “Copying the VMware SSH keys to the conversion hosts”.

A.1. CONFIGURING THE VMWARE HYPERVISORS FOR SSH TRANSFORMATION

For SSH transformation, you must configure the VMware hypervisors for passwordless access by sharing a conversion host’s public SSH key with the hypervisors.

**IMPORTANT**

A single SSH key pair is recommended because the key pair is used only for virtual machine conversion and it simplifies conversion host management.

If you wish to use a dedicated SSH key pair for each conversion host, you can copy the public key of each conversion host to all the VMware hypervisors.

**Procedure**

1. Enable SSH access on each VMware hypervisor. For instructions, navigate to VMware vSphere Documentation and enter Enable ESXi Shell and SSH Access with the Direct Console User Interface in the Search field.
   You can collect the SSH public keys of the VMware hypervisors at this stage, to copy to the conversion hosts.

2. Generate an SSH key pair without a passphrase:

   ```bash
   # ssh-keygen -N ""
   ```

3. Copy the public SSH key to `/etc/ssh/keys-root/authorized_keys` on each VMware hypervisor.
   You will use the private SSH key to configure the conversion hosts.

A.2. REINSTALLING `ipa-client`

If you are using SSH transformation and configuring your conversion hosts for SSSD with single sign-on, you must reinstall `ipa-client` without the OpenSSH client. Otherwise, SSH will fail for the `vdsm` user. See BZ#1544379: ipa-client-install changes system-wide SSH configuration for more information. This
issue cannot be resolved by modifying the configuration file because the file is restored during upgrades.

1. Log in to the Manager machine using SSH.

2. Uninstall **ipa-client**:

   ```bash
   # ipa-client-install --uninstall
   ```

3. Reinstall **ipa-client** without OpenSSH:

   ```bash
   # ipa-client-install --no-ssh
   ```

A.3. CONFIGURING THE CONVERSION HOSTS

Prerequisites

- If the Red Hat Virtualization provider has been active for a while, verify that the hosts have valid subscriptions and repositories:

  ```bash
  # subscription-manager list --consumed
  # yum repolist
  ```

- If a host has an SSH private key in `/var/lib/vdsm/.ssh/id_rsa`, delete the key manually before configuring the host. Conversion host configuration does not overwrite existing keys.

Procedure

1. In CloudForms, click **Compute → Migration → Migration Settings**.

2. In the **Conversion Hosts** tab, click **Configure Conversion Host**. The **Configure Conversion Host** wizard is displayed.
3. In the **Location** screen, add the provider details:
   a. Select a **Provider Type**.
   b. Select a **Provider**.
   c. Select a **Cluster**.
   d. Click **Next**.

4. In the **Host(s)** screen, select one or more hosts from the dropdown list and click **Next**.

5. In the **Authentication** screen, add the conversion hosts' SSH key and the transformation method:
   a. Click **Browse** to browse to the SSH private key or paste it in the **Conversion host SSH private key** field.  
      The Manager deploys a private SSH key on the conversion hosts in order to send commands and run playbooks. The default key file is `/etc/pki/ovirt-engine/keys/engine_id_rsa` on the Manager machine.
   b. Select **SSH** as the **Transformation method**.
   c. Click **Browse** to browse to the SSH private key you created for enabling SSH access on the VMware hypervisors or paste it in the **VMware hypervisors SSH private key** field.
   d. Click **Configure**.

6. In the **Results** screen, wait for the conversion host configuration to finish and click **Close**.
The configured conversion hosts and status information, including error messages, appear in the Configured Conversion Hosts list.

If an error occurs, you can download a host’s log by clicking the More Actions icon ( ) and selecting Download Log.

You can click the Retry button if the conversion host configuration failed for reasons unconnected with your environment.

(Optional) Click Remove to remove the configuration from a configured conversion host.

A.4. COPYING THE VMWARE SSH KEYS TO THE CONVERSION HOSTS

Copy the SSH public keys of the VMware hypervisors to the conversion hosts. You can collect the VMware keys either when you configure the VMware hypervisors for SSH transformation or by using ssh-keyscan:

- Copying keys collected during VMware hypervisor configuration
- Copying keys collected with ssh-keyscan

A.4.1. Copying keys collected during VMware hypervisor configuration

1. Copy the VMware keys to /var/lib/vdsm/.ssh/known_hosts on each conversion host.

2. Verify the SSH connection by connecting to each VMware hypervisor as vdsm:

   ```
   # sudo -u vdsm ssh root@esx1.example.com
   ```

   If the connection fails, check that the VMware hypervisor has SSH access enabled and that you copied the correct keys.

A.4.2. Copying keys collected with ssh-keyscan

**CAUTION**

You must run ssh-keyscan for each VMware hypervisor. Otherwise your conversion hosts will not have all the VMware hypervisor keys and the migration will fail.

1. Run ssh-keyscan for each VMware hypervisor and copy its public key to known_hosts, as in the following example:

   ```
   # ssh-keyscan esx1_IP > /var/lib/vdsm/.ssh/known_hosts
   # ssh-keyscan esx2_IP >> /var/lib/vdsm/.ssh/known_hosts
   # ssh-keyscan esx3_IP >> /var/lib/vdsm/.ssh/known_hosts
   ```

   You must use the IP address, not the host name, of the VMware hypervisor.

2. Change the ownership of the known_hosts file to vdsm user and kvm group:

   ```
   # chown 36:36 /var/lib/vdsm/.ssh/known_hosts
   ```
3. Verify the SSH connection by connecting to each VMware hypervisor as `vdsm`:

```bash
# sudo -u vdsm ssh root@esx1.example.com
```

If the connection fails, check that the VMware hypervisor has SSH access enabled and that you copied the correct keys.
PART II. MIGRATING FROM VMWARE TO RED HAT OPENSTACK PLATFORM

The migration process involves the following tasks:

1. Planning the migration. See Chapter 5, Planning the migration.

2. Preparing the VMware, Red Hat OpenStack Platform, and CloudForms environments. See Chapter 6, Preparing the environment for migration.

3. Migrating the virtual machines. See Chapter 7, Migrating the virtual machines.

4. Troubleshooting, if necessary. See Chapter 8, Troubleshooting.

NOTE

The virtual disks are converted with the VMware Virtual Disk Development Kit (VDDK). If you cannot use VDDK, SSH transformation is a fallback option. See Appendix B, Configuring the Red Hat OpenStack Platform environment for SSH transformation.
CHAPTER 5. PLANNING THE MIGRATION

During the planning phase, you will formulate a specific migration goal, for example, “I want to migrate 2000 virtual machines, with 200 TB of data, in less than 6 months”.

Review the following information to plan your migration:

- **Section 5.1, “Questions to ask before migration”** includes the following:
  - What operating systems are supported?
  - How long will the migration take?
  - How many conversion hosts do I need?

- **Section 5.2, “Recommendations and best practices”** provides guidelines on the following topics:
  - Scheduling the migration
  - Distributing the workload
  - Deploying the conversion hosts
  - Controlling the migration process

The migration workflow describes the migration process in greater detail.
You create and run a migration plan in CloudForms.

CloudForms uses the migration plan to locate the source virtual machines.

CloudForms captures the ESXi host fingerprint for authentication during the virtual machine conversion process.

Using the attributes defined for the Red Hat OpenStack Platform environment, CloudForms initiates communication with the conversion hosts (Red Hat OpenStack Platform instances created from a conversion host appliance, with `virt-v2v` and `virt-v2v-wrapper` installed).

`virt-v2v-wrapper` connects to the source datastore through the ESXi host. `virt-v2v` streams the source disks to the target data domain and converts the source disks.

After the source disks are converted, `virt-v2v` detaches the volumes from the conversion host, migrates the volumes to the destination project, and creates the network ports defined in the infrastructure mapping.
virt-v2v-wrapper creates the target Red Hat OpenStack Platform instance with the flavor and security group defined in the migration plan. virt-v2v attaches the newly created network ports and the disks mapped in the block storage to the instance and the instance is powered on.

The migration process is complete and the migration plan’s status is displayed in CloudForms.

5.1. QUESTIONS TO ASK BEFORE MIGRATION

The following questions can help you to estimate the resources and time required for migration.

What am I migrating?

- Identify the VMware virtual machines that you will be migrating.

What is the maximum number of disks or virtual machines that I can migrate?

- There is no maximum number of disks or virtual machines that you can migrate. However, you may not want to migrate all your virtual machines at the same time, in order to minimize the impact on your users.

IMPORTANT

If you exceed the capabilities of your environment, the migrations will fail. This situation could affect existing applications running on virtual machines attached to the network and storage.

What operating systems can I migrate?

- You can migrate any guest operating system that is certified and supported for use with the Red Hat Virtualization Hypervisor. See Certified Guest Operating Systems in Red Hat OpenStack Platform and Red Hat Virtualization.

What am I missing?

- Identify resource gaps, such as bandwidth, storage, licenses, or a suitable maintenance window, before you begin the migration.

What impact will the migration have on my users?

- Assess the effects the migration may have on a production environment. It may be possible to migrate your applications in phases, without downtime at the application layer, if the applications are distributed in a high-availability architecture.

- Check whether users will lose access to critical applications.

How long will the migration take?

There is no formula to estimate how long the actual migration will take. This is determined on a case-by-case basis. The following example is provided as a guide:

Example 5.1. Red Hat OpenStack Platform migration

- Duration of migration: 2:13:00 (hh:mm:ss)
- 20 virtual machines
- 2 conversion hosts, maximum of 10 concurrent conversions
- Total data migrated: 1000 GB
- Hardware:
  - Strong host (40 cores, 500 GB RAM)
  - Fast SSD XtremIO storage
  - Fibre Channel 8 interface for host-to-storage connection
  - 10 GbE network interface cards for all other connections

**How many conversion hosts do I need?**

The number of conversion hosts you create depends on the size of your migration. All the virtual machines in a migration plan are migrated at the same time, in parallel. The number of virtual machines that you can migrate simultaneously depends on your infrastructure capabilities. Each migration requires a certain amount of network bandwidth, I/O throughput, and processing power for the conversion process.

Multiple conversion hosts provide load-balancing and better performance, even for small migrations.

Conversion hosts are limited to a maximum of ten concurrent migrations, unless you change the default values.

You should test your environment thoroughly before the migration to determine how many migrations it can support without negative effects, for example, five conversion hosts, each running ten concurrent migrations.

**Should I migrate my virtual machines with VDDK or SSH?**

You can migrate your virtual machines with either the VMware Virtual Disk Development Kit (VDDK) or SSH. VDDK is the default because it is much faster than SSH and easier to configure.

VDDK is limited to 20 concurrent migrations per conversion host, because of network limitations, and 10 concurrent migrations per VMware hypervisor, unless you increase the hypervisor’s NFC service memory.

If you cannot use VDDK, SSH transformation is a fallback option.

### 5.2. RECOMMENDATIONS AND BEST PRACTICES

The following recommendations will help to minimize the impact of the migration on your environment.

**Scheduling the migration**

- Schedule your migration carefully, to minimize the impact on your users.
- Prepare your users for downtime.
IMPORTANT
Currently, IMS supports only cold migration. Virtual machines are powered off gracefully as part of the migration process.

- Stagger the migration schedules.
- Move critical applications during maintenance windows.

Distributing the migration workload

- Create migration groups, so that you are not migrating all of your virtual machines at the same time, keeping in mind the following considerations:
  - How are the virtual machines grouped now?
  - Which virtual machines should be migrated together?
  - Which workloads or linked applications should be migrated together?
  - What applications must remain available?
- Consider which parts of the workload to migrate first:
  - Databases
  - Applications
  - Web servers
  - Load balancers

Deploying the conversion hosts

- Create a sufficient number of conversion hosts for your migration, with sufficient resources.
- Create multiple conversion hosts for load-balancing. The virtual machines in a migration plan are automatically distributed among the conversion hosts. This decreases the load on the conversion hosts and allows you to increase the concurrent migrations beyond the limits of a single conversion host.

Controlling the migration process

- Create multiple migration plans for finer control.
- Perform test migrations with different maximum numbers of concurrent migrations to assess the capabilities of your environment’s infrastructure.
CHAPTER 6. PREPARING THE ENVIRONMENT FOR MIGRATION

Preparing your environment for migration involves the following tasks:

1. Preparing the VMware environment. See Section 6.1, “Preparing the VMware environment”.

2. Preparing the target environment. See Section 6.2, “Preparing the Red Hat OpenStack Platform environment”.

3. Configuring the conversion hosts. See Section 6.2.5, “Configuring the conversion hosts”.

NOTE

The virtual disks are converted with the VMware Virtual Disk Development Kit (VDDK). If you cannot use VDDK, SSH transformation is a fallback option. See Appendix B, Configuring the Red Hat OpenStack Platform environment for SSH transformation.

6.1. PREPARING THE VMWARE ENVIRONMENT

Preparing the VMware environment for migration involves the following tasks:

1. Extending the VMware network. See Section 6.1.1, “Preparing the VMware network”.

2. Preparing the VMware virtual machines. See Section 6.1.2, “Preparing the VMware virtual machines”.

3. (Optional) Configuring a VMware hypervisor for more than ten concurrent migrations from that hypervisor. See Section 6.1.3, “Configuring a VMware hypervisor for more than ten concurrent migrations”.

6.1.1. Preparing the VMware network

Extend the VMware network to the Red Hat OpenStack Platform environment.

IMPORTANT

- The network configuration must not be changed in any way during the migration.
- IP addresses, VLANs, and other network configuration must not be changed before or after migration because the conversion process preserves the source virtual machine MAC addresses.

6.1.2. Preparing the VMware virtual machines

Perform the following steps on each VMware virtual machine that you are migrating:

1. Install VMware Tools to capture IP addresses.
   To download and install VMware Tools, see VMware Workstation 5.0: Installing VMware Tools.

2. Unmount mounted ISO/CDROM disks.

3. Ensure that attached disks are not encrypted.
4. Ensure that each NIC has no more than one IPv4 and/or one IPv6 address.

5. Ensure that the virtual machine names contain only upper- or lower-case letters, numbers, underscores (\_), hyphens (-), or periods (.).

**NOTE**

International characters and spaces are not permitted.

6. Ensure that the virtual machine names do not duplicate names of virtual machines in the Red Hat OpenStack Platform tenant.

If you are performing more than ten concurrent migrations from a VMware hypervisor, you must configure the hypervisor to support the additional connections. See Section 6.1.3, “Configuring a VMware hypervisor for more than ten concurrent migrations”.

### 6.1.3. Configuring a VMware hypervisor for more than ten concurrent migrations

If you are performing more than ten concurrent migrations from a VMware hypervisor using VDDK transformation, the migration will fail because the hypervisor’s NFC service memory buffer is limited to ten parallel connections. See VMware vSphere 6.5 NFC session connection limits and Virt-v2v. VDDK: ESXi NFC service memory limits for details.

You can increase the hypervisor’s NFC service memory to enable additional connections for migrations.

**Procedure**

1. Log in to a VMware hypervisor.

2. Change the value of `maxMemory` to `1000000000` in `/etc/vmware/hostd/config.xml`:

   ```xml
   <nfcsvc>
   <path>libnfcsvc.so</path>
   <enabled>true</enabled>
   <maxMemory>1000000000</maxMemory>
   <maxStreamMemory>10485760</maxStreamMemory>
   </nfcsvc>
   ```

3. Restart `hostd`:

   ```
   # /etc/init.d/hostd restart
   ```

   You do not need to reboot the VMware hypervisor.

### 6.2. PREPARING THE RED HAT OPENSTACK PLATFORM ENVIRONMENT

Preparing the Red Hat OpenStack Platform environment involves the following key steps:

1. Installing and configuring Red Hat OpenStack Platform 13 or 14. See Section 6.2.2, “Installing and configuring Red Hat OpenStack Platform 13 or 14”.

2. Installing and configuring CloudForms 4.7.6 or later. See Section 6.2.3, “Installing and configuring CloudForms 4.7.6”.
3. Creating the conversion hosts. See Section 6.2.4, “Creating the conversion hosts”.

NOTE

The virtual disks are converted with the VMware Virtual Disk Development Kit (VDDK). If you cannot use VDDK, SSH transformation is a fallback option. See Appendix B, Configuring the Red Hat OpenStack Platform environment for SSH transformation.

6.2.1. Prerequisites

Ensure that the following prerequisites are met:

1. Set the BIOS settings of physical hosts for optimal performance (rather than power-saving), according to the vendor’s recommendations.

2. Disable C1E halt state, if applicable.

3. Configure security groups with the following ports enabled:
   - For the conversion hosts and CloudForms: port 22 (SSH)
   - For CloudForms: port 443 (HTTPS)

   NOTE

   Outbound traffic is enabled by default. If you have changed this setting, enable ports 902 (CloudForms to VMware) and 5480 (conversion hosts to vCenter).

4. Ensure that the software versions are compatible.

Software compatibility

<table>
<thead>
<tr>
<th>Software</th>
<th>IMS 1.1</th>
<th>IMS 1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMware</td>
<td>5.5 or later</td>
<td>5.5 or later</td>
</tr>
<tr>
<td>CloudForms</td>
<td>4.7.0, with CFME 5.10.3</td>
<td>4.7.6 or later, with CFME 5.10.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CFME 5.10.4 does not support migration.</td>
</tr>
<tr>
<td>Red Hat OpenStack Platform</td>
<td>13 or later</td>
<td>13 or later</td>
</tr>
<tr>
<td>RHOSP V2V Image for Red Hat OpenStack Director</td>
<td>14.0.2</td>
<td>14.0.3</td>
</tr>
</tbody>
</table>

6.2.2. Installing and configuring Red Hat OpenStack Platform 13 or 14

1. Install Red Hat OpenStack Platform 13 or 14. See Red Hat OpenStack Platform Director Installation and Usage 13 or Red Hat OpenStack Platform Director Installation and Usage 14.

2. Create provider networks for the target instances to preserve the IP addresses of the source virtual machines. See Create a network in the Red Hat OpenStack Platform Networking Guide.
3. Create a project for the conversion hosts and whatever destination projects you require for the target instances. See Create a Project in the Red Hat OpenStack Platform Users and Identity Management Guide.

4. Ensure that the admin user has member and admin roles in the conversion and destination projects. See Edit a Project in the Red Hat OpenStack Platform Users and Identity Management Guide.

5. Set at least one volume type for the target block storage. See Create a Volume and Changing a Volume’s Type (Volume Re-typing) in the Red Hat OpenStack Platform Storage Guide. Otherwise, CloudForms cannot detect the storage when you create the infrastructure mapping.

6. Ensure that the storage backends have sufficient space for the migrated virtual machines.

   **IMPORTANT**
   
   If you are using Red Hat Ceph Storage, you will require three times the space of the source virtual machines for the migrated virtual machines. A Ceph storage cluster, by default, creates two copies of an object in a replicated storage pool, for a total of three copies. See Data Copies in the Red Hat Ceph Storage Architecture Guide.

   The migrated disks use all of the space because it is preallocated. For example, a source virtual machine with a 100 GB disk requires 300 GB of storage, regardless of how much data the disk actually contains. To save storage space, you can use the `fstrim` command on the migrated virtual machines as a postmigration task or playbook.

7. Create flavors for the source virtual machines. If you do not create custom flavors, CloudForms will try to map each source virtual machine to an existing flavor.

8. Ensure that the event monitor workers are running. See Server Diagnostics in Red Hat CloudForms General Configuration.

6.2.3. Installing and configuring CloudForms 4.7.6

**CAUTION**

Removing or changing a provider will cause errors in the infrastructure mappings and migration plans.

**Procedure**

1. Install Red Hat CloudForms 4.7.6 or later. See Installing Red Hat CloudForms on Red Hat OpenStack Platform.

   **NOTE**
   
   CFME 5.10.4 does not support migration.

2. Enable SmartState Analysis:
   a. In the header bar, click Administrator → Configuration.
   b. In the left pane, in Settings, click CFME Regions → Zones → Server.
c. In the right pane, in the Server tab, set SmartState Analysis to On and click Save.

3. Add VMware to CloudForms as a provider. See Adding a VMware vCenter Provider in Red Hat CloudForms: Managing Providers.

4. Add Red Hat OpenStack Platform to CloudForms as a cloud provider. See Adding an OpenStack Infrastructure Provider in Red Hat CloudForms: Managing Providers.

**IMPORTANT**

Do not complete the fields in the RSA key pair tab. You will add the SSH private key when you configure the conversion hosts.

**NOTE**

If Red Hat OpenStack Platform has been active for a while, you must wait for CloudForms to update its event history before attempting to use the provider. Check the cloud provider timeline to verify that all events have been processed.

**Viewing the cloud provider timeline in CloudForms**

To view the cloud provider timeline:

1. Click Compute → Clouds → Providers.
2. Click the cloud provider to view its details.
3. Click Monitoring → Timelines.
4. Select the following options:
   - Events: Management Events
   - Category: Select All
   - Severity: Select All
5. Click Apply.

**6.2.4. Creating the conversion hosts**

You can create the Red Hat OpenStack Platform conversion hosts with the conversion appliance (RHOSP V2V Image for Red Hat OpenStack Director). The number of conversion hosts you deploy depends on your migration size and infrastructure capabilities.

**NOTE**

For optimal performance, deploy conversion hosts on compute nodes with nested virtualization enabled. See Configure DevStack with KVM-based Nested Virtualization. Nested virtualization is a technology preview.

To create a Red Hat OpenStack Platform conversion host:

1. Navigate to Red Hat Product Downloads.
2. In the A-Z tab, click Red Hat OpenStack Platform.
3. Click the green Download Latest button to go to the Download Red Hat OpenStack Platform page.

4. In the Product Software tab, locate the RHOSP V2V Image for Red Hat OpenStack Director 14.0.x (x86_64), click Download Now, and save the image.

   **IMPORTANT**
   
   IMS 1.1 requires Red Hat OpenStack Director 14.0.2.
   
   IMS 1.2 requires Red Hat OpenStack Director 14.0.3 or later.

5. Upload the image to Red Hat OpenStack Platform.

6. Launch the image as a conversion host instance, with the following resources:
   
   - 4 vCPUs
   
   - 10 GB RAM, if you use the default maximum number of concurrent migrations per conversion host, which is **10**. If you increase the number of concurrent migrations, you must add 1 GB RAM for each additional concurrent migration. If you reduce the number, you can reduce the RAM but the conversion host cannot have less than 8 GB RAM.
   
   - `/tmp` (10 GB, or 1 GB for each concurrent migration)
   
   - `/var/tmp` (10 GB, or 1 GB for each concurrent migration)
   
   - `/var/logs` (5 GB)

   See **Launch an Instance** in the **Red Hat OpenStack Platform Instances and Images Guide**.

7. Increase the disk space of the instance to accommodate its file system. See **Resize an Instance** in the **Red Hat OpenStack Platform Instances and Images Guide**.
   
   The instance is created from an image, but the disk space defined in the image will not be sufficient. You can either extend the partition (and subsequently, extend the physical volume in the volume group) to the required size, or you can create a new partition and add it as a physical volume to the volume group.

   **NOTE**
   
   You must resize `lv_root` to use all available disk space because the image will not use it by default.

Configure your conversion hosts with CloudForms to use the VMware Virtual Disk Development Kit (VDDK).

   **NOTE**
   
   The virtual disks are converted with the VMware Virtual Disk Development Kit (VDDK). If you cannot use VDDK, SSH transformation is a fallback option. See **Appendix B, Configuring the Red Hat OpenStack Platform environment for SSH transformation**.

### 6.2.5. Configuring the conversion hosts

**Prerequisites**
- Download and save the VMware Virtual Disk Development Kit.

**Downloading the VMware Virtual Disk Development Kit**

**Procedure**

1. In a browser, navigate to [VMware Documentation](https://docs.vmware.com/).

2. Click **VMware SDK & API Product Documentation** → **VMware Virtual Disk Development Kit (VDDK)**.

3. Select the latest VDDK release.

4. Click **Download SDKs** to download the **.tar.gz** VDDK archive file.

5. Save the VDDK archive file in an HTTP-accessible location and record its path.

**Procedure**

1. In CloudForms, click **Compute → Migration → Migration Settings**.

2. In the **Conversion Hosts** tab, click **Configure Conversion Host**. The **Configure Conversion Host** wizard is displayed.

3. In the **Location** screen, add the provider details:
   a. Select a **Provider Type**.
   b. Select a **Provider**.
c. Select a **Project** and click **Next**.

4. In the **Host(s)** screen, select one or more hosts from the dropdown list and click **Next**.

5. In the **Authentication** screen, add the conversion hosts’ SSH key and the transformation method:

   a. Click **Browse** to browse to the SSH private key or paste it in the **Conversion host SSH private key** field. The Red Hat OpenStack Platform user uses a private SSH key to connect to the conversion hosts.

   b. Select **VDDK** as the **Transformation method**.

   c. Enter the path of the VDDK package in the **VDDK library path** field and click **Validate**. Wait for validation to complete.

   d. Click **Configure**.

6. In the **Results** screen, wait for the conversion host configuration to finish and click **Close**. The configured conversion hosts and status information, including error messages, appear in the **Configured Conversion Hosts** list.

If an error occurs, you can download a host’s log by clicking the **More Actions** icon (.GeneratedValue) and selecting **Download Log**.

You can click the **Retry** button if the conversion host configuration failed for reasons unconnected with your environment.

(Optional) Click **Remove** to remove the configuration from a configured conversion host.

You can migrate your virtual machines.

(Optional) You can verify the conversion hosts in a browser. See **Section 6.2.6, “Verifying the conversion hosts in a browser”**.

### 6.2.6. Verifying the conversion hosts in a browser

You can verify your conversion hosts in a browser by using the CloudForms API:

1. In the address bar of a browser, enter the following:

   ```
   https://CloudForms_FQDN/api/conversion_hosts
   ```

   **CloudForms_FQDN** is the FQDN of the CloudForms machine.

   A log-in screen is displayed.

2. Enter your CloudForms **Username** and **Password** and click **Sign in**. The conversion hosts and their IDs are displayed in JSON format:

   ```
   {"name": "conversion_hosts","count":3,"subcount":3,"pages":1,"resources":
   ["href":"https://cloudforms.example.com/api/conversion_hosts/10000000000001"],
   ["href":"https://cloudforms.example.com/api/conversion_hosts/10000000000002"],
   ["href":"https://cloudforms.example.com/api/conversion_hosts/10000000000003"], "actions":
   ```
[{"name":"create","method":"post","href":"https://cloudforms.example.com/api/conversion_hosts"},
{"name":"edit","method":"post","href":"https://cloudforms.example.com/api/conversion_hosts"},
{"name":"delete","method":"post","href":"https://cloudforms.example.com/api/conversion_hosts"}]
Migrating the virtual machines involves the following key tasks:

1. Mapping the resources of your VMware and Red Hat OpenStack Platform environments. See Section 7.1, “Creating an infrastructure mapping”.

2. Checking for migration conditions with prerequisites. See Section 7.2, “Checking for migration prerequisites”.

3. Creating and running a migration plan. See Section 7.3, “Creating and running a migration plan”.

Optionally, you can change the maximum number of concurrent migrations for conversion hosts or providers to control the migration process.

### 7.1. CREATING AN INFRASTRUCTURE MAPPING

The infrastructure mapping maps the resources of your VMware and Red Hat OpenStack Platform environments.

**IMPORTANT**

If you add or remove providers or provider objects from an infrastructure mapping, the mapping will have missing resource errors. You must delete the infrastructure mapping and create a new one.

**Procedure**

1. Click **Compute → Migration → Infrastructure Mappings**.

2. Click **Create Infrastructure Mapping**. The **Create Infrastructure Mapping** wizard is displayed.
3. In the **General** screen, add the infrastructure mapping details:
   
   a. Enter the infrastructure mapping **Name** and (optional) **Description**.
   
   b. Select the **Target Provider**.
   
   c. Click **Next**.

4. In the **Map Compute** screen, map the source and target clusters:
   
   a. Select a **Source Provider \ Datacenter \ Cluster** source cluster and a **Target Provider \ Project**.
      
      If the target project does not contain a conversion host, a warning icon (⚠️) appears. You can create and save an infrastructure mapping, but you must configure the conversion hosts before running a migration plan.
   
   b. Click **Add Mapping**. You can map additional projects.
   
   c. Click **Next**.

5. In the **Map Storage** screen, map the source and target storage:
   
   a. Select a **Source Provider \ Datacenter \ Datastore** and **Target Provider \ Volume Type**.
      
      If the volume type is missing, check that the volume type has been set. Block storage requires at least one volume type. See Create a Volume and Changing a Volume’s Type (Volume Re-typing) in the Red Hat OpenStack Platform Storage Guide.
b. Click **Add Mapping**. You can map additional datastores.

c. Click **Next**.

6. In the **Map Networks** screen, map the source and target networks:

a. Select a source cluster from the drop-down list.

b. Select one or more networks from **Source Provider \ Datacenter \ Network** and **Target Project \ Network**.
   IMS supports both provider and tenant networks.

c. Click **Add Mapping**. You can map the networks of additional source clusters.

d. Click **Create**.

7. In the **Results** screen, click **Close**. The infrastructure mapping is saved in **Compute → Migration → Infrastructure Mappings**.

You can click an infrastructure mapping element to view its details:

**Infrastructure Mappings list**

After you have created an infrastructure mapping, check for migration prerequisites.

If these conditions do not apply, you can create a migration plan. See **Section 7.3, “Creating and running a migration plan”**.

### 7.2. CHECKING FOR MIGRATION PREREQUISITES

Check your migration for the following conditions, which have prerequisites:

**You are migrating previously migrated virtual machines**

Add previously migrated machines to the migration plan with a CSV file. A CSV file is also recommended for large migrations.

See **Section 7.2.1, “Creating a CSV file to add virtual machines to the migration plan”**.

**You are using Ansible playbooks for premigration/postmigration tasks**

Create an Ansible repository and add credentials and playbooks to CloudForms.

See **Section 7.2.2, “Adding Ansible playbooks to CloudForms for premigration and postmigration tasks”**.
You are migrating virtual machines running RHEL or other Linux operating system

Create a RHEL premigration playbook to preserve IP addresses and select this playbook when you create a migration plan.
See \[ and xref:Creating_a_rhel_premigration_playbook_osp[.]

### 7.2.1. Creating a CSV file to add virtual machines to the migration plan

If you are migrating virtual machines that were migrated in the past, you should create a CSV file to add the virtual machines to the migration plan, because the migration plan cannot discover them automatically.

**NOTE**

A CSV file is recommended for large migrations because it is faster than manually selecting the security group and flavor of each virtual machine.

<table>
<thead>
<tr>
<th>Field</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Virtual machine name. <strong>Required</strong></td>
</tr>
<tr>
<td>Host</td>
<td><strong>Optional.</strong> Only required if virtual machines have identical Name fields.</td>
</tr>
<tr>
<td>Provider</td>
<td><strong>Optional.</strong> Only required if virtual machines have identical Name and Host fields.</td>
</tr>
<tr>
<td>Security Group</td>
<td><strong>Optional.</strong> The default is Default.</td>
</tr>
<tr>
<td>Flavor</td>
<td><strong>Optional</strong> If you do not create flavors for the migration or if you leave this field blank, CloudForms tries to map the source virtual machines to existing flavors.</td>
</tr>
</tbody>
</table>

**CSV file example**

```
Name,Host,Provider,Security Group,Flavor
vm01,host1,vSphere3,webservers,x1.medium
vm02,host1,vSphere3,webservers,x1.medium
vm03,host1,vSphere3,webservers,x1.medium
```

### 7.2.2. Adding Ansible playbooks to CloudForms for premigration and postmigration tasks

You can add Ansible playbooks to CloudForms to perform automated premigration and postmigration tasks on specific virtual machines, for example:

- Removing webservers from a load-balancing pool before migration and returning them to the pool after migration
- Running `fstrim` after migration to reduce the space required by virtual machines migrating to Red Hat OpenStack Platform with Ceph storage
Procedure

1. Enable the Embedded Ansible server role in CloudForms. See Enabling the Embedded Ansible Server Role in Red Hat CloudForms: Managing Providers.

2. Add an Ansible playbook repository. See Adding a Playbook Repository in Red Hat CloudForms: Managing Providers.

3. Add the credentials of each virtual machine that you are migrating. See Credentials in Red Hat CloudForms: Managing Providers.

4. Add your playbook as an Ansible service catalog item. See Creating an Ansible Playbook Service Catalog Item in Red Hat CloudForms: Provisioning Virtual Machines and Instances.

You will select the playbooks and the virtual machines on which they run in the Advanced Options screen when you create the migration plan.

7.2.3. Creating a RHEL premigration playbook for RHEL/Linux source virtual machines

If you are migrating virtual machines running RHEL or other Linux operating system, you can create a RHEL premigration playbook to ensure that the IP addresses are accessible after migration. The RHEL premigration playbook calls the Ansible ims.rhel_premigration role.

To install the role with Ansible Galaxy, see ims_rhel_pre_migration. This role is not included in the IMS installation.

The ims.rhel_premigration role performs the following tasks on the VMware virtual machines:

- Preserves the static IP address configuration by creating udev rules to associate the virtual machine’s MAC address with its interface name

**NOTE**

The ims.rhel_premigration role assumes that either the rhel-6-server-rpms or the rhel-7-server-rpms repository is enabled in the source virtual machine when it installs qemu-guest-agent. If you have disabled the repository, re-enable it in the RHEL premigration playbook.

RHEL premigration playbook example

```yaml
---
- hosts: all
  roles:
    - role: ims.rhel_pre_migration
```

You can create a migration plan. See Section 7.3, “Creating and running a migration plan”.

7.3. CREATING AND RUNNING A MIGRATION PLAN

Before you perform a large migration, you should perform several test migrations with different maximum numbers of concurrent migrations for your conversion hosts or providers. This will enable you to assess the capabilities of your environment’s infrastructure.

You can create and run a migration plan in CloudForms with the following options:
• Running a migration plan immediately
• Scheduling a migration plan to run in the future
• Viewing a migration plan in progress
• Canceling a migration plan in progress
• Retrying a failed migration plan

NOTE
A CSV file is optional, but recommended, for large migrations because it is faster than manually selecting the security group and flavor of each virtual machine.

Procedure

1. Click **Compute → Migration → Migration Plans.**

2. Click **Create Migration Plan.** The **Create Migration Plan** wizard is displayed.

3. In the **General** screen, add the details of the migration plan:
   a. Select an infrastructure mapping from the drop-down list.
   b. Enter the migration plan **Name** and (optional) **Description**.
c. Select a virtual machine discovery method:
   
   - **Choose from a list of VMs discovered in the selected infrastructure mapping**
     If the virtual machines cannot be discovered, check that the source datastores and networks in the infrastructure mapping are correct.
   
   - **Import a CSV file with a list of VMs to be migrated**
     A CSV file is required for previously migrated source virtual machines and recommended for large migrations.

d. Click Next.

4. In the **VMs** screen, select the virtual machines for migration:
   
   - If you selected **Choose from a list of VMs discovered in the selected infrastructure mapping**, select the virtual machines for migration. You can search for virtual machines by **VM Name**, **Data Center**, **Cluster**, and **Folder**.
   
   - If you selected **Import a CSV file with a list of VMs to be migrated**
     
     a. Click **Import**.
     
     b. Browse to the CSV file and click **Open**. If the virtual machines cannot be added to the migration plan, check the CSV file format and fields for errors.

     **NOTE**
     
     If the Create Migration Plan wizard freezes, refresh the web page, check the CSV file for errors (for example, virtual machines with duplicate **Name** fields and no other fields to distinguish them), and create a new migration plan.

c. Click Next.

5. In the **Instance Properties** screen, select the networks and/or flavors:
   
   a. Click the pencil icon to edit the network or flavor of each selected virtual machine. Flavors that are too small for the virtual machine are marked with an asterisk (*). If you have not created flavors for the migration, CloudForms tries to map the source virtual machines to existing flavors.
   
   b. Click Next.

6. In the **Advanced Options** screen, select the playbook service options:
   
   a. Select a premigration and/or postmigration playbook service from the dropdown lists.
   
   b. Select the virtual machines on which to run the playbook services.
   
   c. Click Next.

7. In the **Schedule** screen, select a schedule option and click **Create**:
   
   - **Save migration plan to run later**
     The migration plan is saved in **Migration Plans Not Started** and will not run unless you schedule it or click **Migrate** to run the scheduled migration plan immediately.
• Start migration immediately
  The migration plan may take some time to complete. Progress bars indicate the amount of
  transferred data, the number of migrated virtual machines, and the elapsed time. See
  Section 7.3.2, “Viewing a migration plan in progress” for details.

8. In the Results screen, click Close.

When the migration plan has finished, click Migration Plans Complete to view the status of the
migration plan. The completed migration plan shows the status of the migrated virtual machines.

In the migration plans list, you can click the More Actions icon ( ) to archive, edit, or delete a migration
plan.

7.3.1. Scheduling a saved migration plan

To schedule a saved migration plan to run in the future:

1. Click Migration Plans Not Started

2. Click the Schedule button of a migration plan.

3. In the Schedule Migration Plan window, select a date and time and click Schedule. The plan’s
   status is Migration Scheduled with the date and time.

7.3.2. Viewing a migration plan in progress

To view the progress of a migration plan:

1. Click Migration Plans in Progress

2. Click a migration plan name to view its details, including the status of the migrating virtual
   machines.

NOTE

The counter in Compute → Migration → Migration Plans may be a few seconds ahead of
the counter in the migration plan details view. This is because the Migration Plans
counter displays the total time for running the migration plan, while the details counter
displays the time for migrating the virtual machines.

7.3.3. Canceling a migration plan in progress

To cancel a migration plan in progress:

1. Click Migration Plans in Progress

2. Select a migration plan and click Cancel Migration.

3. Click Cancel Migrations to confirm the cancellation. The canceled migration appears in
   Migration Plans Complete with a red x indicating that the plan did not complete successfully.

7.3.4. Retrying a failed migration plan

To retry a migration plan that failed because of external circumstances (for example, power outage):
1. Delete all objects created by the failed migration plan:
   - Delete newly created instances to avoid name conflicts with migrating VMware virtual machines.
   - Delete network ports of failed instances.

2. Click **Compute → Migration → Migration Plans**.

3. Click **Migration Plans Complete**.

4. Click the **Retry** button beside the failed migration plan.

### 7.4. CHANGING THE MAXIMUM NUMBER OF CONCURRENT MIGRATIONS

You can change the maximum number of concurrent migrations for conversion hosts or providers to control the impact of the migration process on your infrastructure.

The provider setting has priority over the conversion host setting. For example, if the maximum number of concurrent migrations is **20** for a provider and **3** for five conversion hosts, the maximum number of concurrent migrations is **20**, not **15** (5 conversion hosts \( \times 3 \) concurrent migrations per host).

An increase in the maximum number of concurrent migrations affects all migration plans immediately. Virtual machines that are queued to migrate will migrate in greater numbers.

A decrease maximum number of concurrent migrations affects only future migration plans. Migration plans that are in progress will use the limit that was set when the plan was created.

#### Changing the maximum number of concurrent migrations for all conversion hosts or providers

**CAUTION**

Red Hat OpenStack Platform conversion hosts require an additional 1 GB RAM for each additional concurrent migration above **10**.

If you are using VDDK transformation, the number of concurrent migrations must not exceed **20**. Otherwise, network overload will cause the migration to fail.

1. Click **Compute → Migration → Migration Settings**.

2. In the **Migration Throttling** tab, select a value for **Maximum concurrent migrations per conversion host** or **Maximum concurrent migrations per provider** and click **Apply**. The value of **Maximum concurrent migrations per conversion host** is constrained so that it cannot be greater than **Maximum concurrent migrations per provider**.

**NOTE**

In the current release, the **Maximum concurrent migrations per conversion host** interface control does not work.

#### Changing the maximum number of concurrent migrations for a specific conversion host

1. Enter the following command:
username and password are the username and password for CloudForms.

CloudForms_FQDN is the FQDN of the CloudForms machine.

To obtain a conversion_host_id, enter the following command:

```bash
# curl -sk -u username:password https://CloudForms_FQDN/api/conversion_hosts/
```

max_concurrent_tasks is the maximum number of concurrent migrations. The default is 10.
CHAPTER 8. TROUBLESHOOTING

To identify errors, you can review the migration logs. See Section 8.1, “Migration logs”.

You can check these common issues and mistakes:

- Infrastructure mapping errors. See Section 8.2, “Infrastructure mapping errors”.
- Migration plan errors. See Section 8.3, “Migration plan errors”.
- IP address errors. See Section 8.4, “IP address errors”.
- Environment configuration errors. See Section 8.5, “Environment configuration errors”.

Section 8.6, “Known Issues” provides information about issues that will be addressed in a future release.

8.1. MIGRATION LOGS

You can check the following logs to identify the cause of a migration error:

- Conversion host logs. See Section 8.1.1, “Downloading the conversion host and playbook logs”.
- Playbook logs, if you are using premigration or postmigration Ansible playbooks. See Section 8.1.1, “Downloading the conversion host and playbook logs”.
- CloudForms migration log. See Section 8.1.2, “Accessing the CloudForms migration log”.

8.1.1. Downloading the conversion host and playbook logs

You can download the conversion host and playbooks logs in CloudForms.

When disk migration starts, two logs are created in the conversion host:

- **virt-v2v**: Debug output from **virt-v2v** itself. This log tracks the core of the virtual machine migration process, including **libguestfs** traces and disk migration details.

- **virt-v2v-wrapper**: Log of the daemonizing wrapper for **virt-v2v**. This log traces the orchestration of the virtual machine conversion on the conversion host, including disk migration percentages and **virt-v2v** error reporting.

**IMPORTANT**

If you open a Red Hat Support call, you will need to submit both the **virt-v2v** log and **virt-v2v-wrapper** log for analysis and troubleshooting.

To access the conversion host logs and the playbook logs:

1. Click **Compute → Migration → Migration Plans**.
2. Click a completed migration plan to view its details.
3. Click **Download Log** of a virtual machine and select a log from the dropdown list:
   - **Premigration log** This option only appears if a premigration playbook is used.
- **Migration log** The Migration log is the virt-v2v log.
- **Virt-v2v-wrapper log**
- **Postmigration log** This option only appears if a postmigration playbook is used.

### 8.1.2. Accessing the CloudForms migration log

1. Log into the CloudForms machine using SSH.
2. The migration log is `/var/www/miq/vmdb/log/automation.log`.

### 8.2. INFRASTRUCTURE MAPPING ERRORS

- **Networks missing, Datastores missing**, and **Clusters missing** error messages: If you create an infrastructure mapping and then change a provider, the provider’s object IDs change. Delete the infrastructure mapping and create a new one.

- Storage volume type not detected: Check that you have set at least one volume type. See Group Volume Settings with Volume Types in the Red Hat OpenStack Platform Storage Guide for the storage.

### 8.3. MIGRATION PLAN ERRORS

- If the virtual machines are being migrated for the first time and are not discovered by the migration plan, check the source datastores and networks in the infrastructure mapping.

- If the virtual machines have been migrated in the past, they cannot be discovered by the migration plan. Use a CSV file to add the virtual machines to the migration plan.

- If the virtual machines cannot be added to the migration plan with a CSV file, check the CSV file format and fields. Create a new migration plan with the updated CSV file.

- **Create Migration Plan** wizard hangs while importing a CSV file. This error is caused by an invalid CVS file (for example, virtual machines with a duplicate Name field and no Host/Provider field to distinguish them, or with a duplicate Name field and duplicate Host/Provider fields). Refresh the web page.

- **Denied State** error (IMS 1.1). If a migration plan fails immediately and the migration plan displays a Denied State error message, check that you have created and configured the conversion hosts correctly. Cancel the migration plan and run it again.

- **Unable to migrate VMs because no conversion host was configured at the time of the attempted migration.** See the product documentation for information on configuring conversion hosts. (IMS 1.2) You can create and save a migration plan whose infrastructure mapping does not contain conversion hosts, but you cannot run the migration plan without conversion hosts. Cancel the migration plan, create the conversion hosts, and run the migration plan again.

### 8.4. IP ADDRESS ERRORS

- If the IP address of a migrated RHEL (or other Linux-based operating system) virtual machine is not accessible, you must create a RHEL premigration playbook and add it to the migration plan.

- If a migrated virtual machine does not have an IP address:
- Check that you installed VMware Tools on the VMware virtual machine before migration.
- Check the VMware virtual machine for an interface configuration file mapped to a non-existent interface (for example, `/etc/sysconfig/network-scripts/ifcfg-eth1` exists, but `eth1` interface does not). Log example:

```
date time:ERROR: Command output:
BadRequestException: Unknown errors
```

8.5. ENVIRONMENT CONFIGURATION ERRORS

VMware
- A VMware virtual machine cannot be migrated if it has any of the following conditions:
  - Mounted ISO/CDROM disk
  - Encrypted disk
  - Invalid name, containing spaces or special characters
  - Powered off during migration
- If you are performing more than ten concurrent migrations from a single VMware hypervisor, you must increase the hypervisor’s NFC service memory.

Red Hat OpenStack Platform
- `disallowed by policy` error: The Red Hat OpenStack Platform `admin` user in CloudForms does not have `admin` role privileges within the target project. Add the `admin` user as `member` and `admin` to your target project. See Edit a Project in the Red Hat OpenStack Platform Users and Identity Management Guide.

```
ERROR: Command exited with non-zero return code 1, output:HttpException: 403: Client Error for url: https://FQDN:13696/v2.0/ports, {'NeutronError': {'message': '{"rule:create_port and rule:create_port:mac_address) and rule:create_port:fixed_ips) is disallowed by policy", "type": "PolicyNotAuthorized", "detail": ""} }}
```

8.6. KNOWN ISSUES

The following issues will be addressed in a future release:
- BZ#1666799: Canceling migration does not stop creating volume, instance, and network port on OpenStack Platform or VMs on Red Hat Virtualization
- BZ#1678385: Virtual machine with name containing spaces (rhel 7) fails to migrate using SSH and VDDK transformation
- **BZ#1699343**: Migration plan CSV import validation does not work if file contains empty/archived/orphan/invalid VM name

- **BZ#1698761**: "Maximum concurrent migrations per conversion host" interface control does not work

- **BZ#716283**: Migrating virtual machines are not distributed correctly among the conversion hosts

- **BZ#1726939**: Run the preflight check of migration task before waiting for a conversion host. Currently, the preflight check that monitors the migration is performed after a conversion host is assigned to the task. As a result, the total volume of the Datastores reported in Migration Plans In Progress reflects the total volume of the virtual machines that are currently migrating, not the total volume of the migration plan. When all the virtual machines have started to migrate, the correct value of the total volume is displayed.

- **BZ#1668049**: Instance is not created after disk conversion

- **BZ#1669133**: Names of virtual machines migrated using SSH transformation are changed

- CloudForms CFME 5.10.4 does not support migration. Use CFME 5.10.3.
APPENDIX B. CONFIGURING THE RED HAT OPENSTACK PLATFORM ENVIRONMENT FOR SSH TRANSFORMATION

You can configure your environment for SSH transformation if you cannot use VDDK.

Configuring your environment involves the following additional steps:

1. Configuring the VMware hypervisors. See Section B.1, “Configuring the VMware hypervisors for SSH transformation”.

2. Configuring the conversion hosts. See Section B.2, “Configuring the conversion hosts”.

3. Copying the VMware keys to the conversion hosts. See Section B.3, “Copying the VMware SSH keys to the conversion hosts”.

B.1. CONFIGURING THE VMWARE HYPERVISORS FOR SSH TRANSFORMATION

For SSH transformation, you must configure the VMware hypervisors for passwordless access by sharing a conversion host’s public SSH key with the hypervisors.

IMPORTANT

A single SSH key pair is recommended because the key pair is used only for virtual machine conversion and it simplifies conversion host management.

If you wish to use a dedicated SSH key pair for each conversion host, you can copy the public key of each conversion host to all the VMware hypervisors.

Procedure

1. Enable SSH access on each VMware hypervisor. For instructions, navigate to VMware vSphere Documentation and enter Enable ESXi Shell and SSH Access with the Direct Console User Interface in the Search field.

   You can collect the SSH public keys of the VMware hypervisors at this stage, to copy to the conversion hosts.

2. Generate an SSH key pair without a passphrase:

   ```
   # ssh-keygen -N ''
   ```

3. Copy the public SSH key to /etc/ssh/keys-root/authorized_keys on each VMware hypervisor. You will use the private SSH key to configure the conversion hosts.

B.2. CONFIGURING THE CONVERSION HOSTS

Procedure

1. In CloudForms, click Compute → Migration → Migration Settings.

2. In the Conversion Hosts tab, click Configure Conversion Host. The Configure Conversion Host wizard is displayed.
3. In the Location screen, add the provider details:
   a. Select a Provider Type.
   b. Select a Provider.
   c. Select a Project.
   d. Click Next.

4. In the Host(s) screen, select one or more hosts from the dropdown list and click Next.

5. In the Authentication screen, add the conversion hosts’ SSH key and the transformation method:
   a. Click Browse to browse to the SSH private key or paste it in the Conversion host SSH private key field.
      The Red Hat OpenStack Platform user uses a private SSH key to connect to the conversion hosts.
   b. Select SSH as the Transformation method.
   c. Click Browse to browse to the SSH private key you created for enabling SSH access on the VMware hypervisors or paste it in the VMware hypervisors SSH private key field.
   d. Click Configure.

6. In the Results screen, wait for the conversion host configuration to finish and click Close.
The configured conversion hosts and status information, including error messages, appear in the Configured Conversion Hosts list.

If an error occurs, you can download a host’s log by clicking the More Actions icon ( ) and selecting Download Log.

You can click the Retry button if the conversion host configuration failed for reasons unconnected with your environment.

(Optional) Click Remove to remove the configuration from a configured conversion host.

**B.3. COPYING THE VMWARE SSH KEYS TO THE CONVERSION HOSTS**

Copy the SSH public keys of the VMware hypervisors to the conversion hosts. You can collect the VMware keys either when you configure the VMware hypervisors for SSH transformation or by using ssh-keyscan:

- Copying keys collected during VMware hypervisor configuration
- Copying keys collected with ssh-keyscan

**B.3.1. Copying keys collected during VMware hypervisor configuration**

1. Copy the VMware keys to /root/.ssh/known_hosts on each conversion host.

2. On each conversion host, verify the SSH connection by connecting to each VMware hypervisor as cloud-user:

   ```sh
   # sudo -u cloud-user ssh root@esx1.example.com
   ```

   If the connection fails, check that the VMware hypervisor has SSH access enabled and that you copied the correct keys.

**B.3.2. Copying keys collected with ssh-keyscan**

**CAUTION**

You must run ssh-keyscan for each VMware hypervisor. Otherwise your conversion hosts will not have all the VMware hypervisor keys and the migration will fail.

1. Run ssh-keyscan for each VMware hypervisor and copy its public key to known_hosts, as in the following example:

   ```sh
   # ssh-keyscan esx1_IP > /root/.ssh/known_hosts
   # ssh-keyscan esx2_IP >> /root/.ssh/known_hosts
   # ssh-keyscan esx3_IP >> /root/.ssh/known_hosts
   ```

   You must use the IP address, not the host name, of the VMware hypervisor.

2. On each conversion host, verify the SSH connection by connecting to each VMware hypervisor as cloud-user.
# sudo -u cloud-user ssh root@esx1.example.com

If the connection fails, check that the VMware hypervisor has SSH access enabled and that you copied the correct keys.