Red Hat Satellite 6.2

Provisioning Guide

A guide to provisioning physical and virtual hosts on Red Hat Satellite Servers.

Edition 1.0

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Legal Notice

Abstract

The Red Hat Satellite Provisioning Guide is a scenario-based document with instructions on provisioning physical and virtual hosts. This includes setting up the required network topology, configuring the necessary services, and providing all of the other configuration information needed to provision hosts on your network. This guide is aimed primarily at Satellite administrators with sound networking knowledge and skills.

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CHAPTER 1. INTRODUCTION

Provisioning refers to a process that starts with a bare physical or virtual machine and ends with a fully configured, ready-to-use operating system. Red Hat Satellite provides an ability to define and automate fine-grained provisioning for a large number of hosts. Provisioning can be achieved through various methods. For example, the Satellite Server can provision bare metal systems using both PXE based and non-PXE based methods. Likewise, the Satellite Server can provision cloud instances from specific providers through their APIs. These provisioning methods are part of the Red Hat Satellite 6 application life cycle which allows users to create new systems, manage them, and keep them up-to-date with Red Hat content.

1.1. PROVISIONING SYSTEMS IN THE APPLICATION LIFE CYCLE

The **application life cycle** defines how a particular system and its software are provisioned at a particular stage. For example, an application life cycle might be simple, and only contain two stages, such as the following:

- Development
- Production

However, a more complex application life cycle might have further stages, such as a phase for testing or a beta release. This adds extra stages to the application life cycle:

- Development
- Testing
- Beta Release
- Production

The Satellite Server allows you to provision new hosts at any stage of the application life cycle. For example, to create a set of hosts for product development, you provision a set of hosts within the **`Development`** environment. Likewise, to create a set of hosts for product testing, you provision a set of hosts within the **`Testing`** environments.

1.2. DEFINING PROVISIONING TYPES

Red Hat Satellite 6 provides different methods for provisioning hosts. This includes:

Bare Metal Provisioning

The Satellite Server provisions bare metal systems primarily through PXE boot and MAC address identification. A system administrator creates new host entries and specifies the MAC address of the physical host to be provisioned. A system administrator can also boot blank hosts to use the Satellite Server's discovery service, which creates a pool of ready-to-provision hosts. Systems can also boot and be provisioned through PXE-less methods.

Cloud Providers

The Satellite Server connects to private (Red Hat OpenStack Platform) and public (Amazon EC2) cloud providers. This provides a way to provision new instances from images stored with the Cloud environment. This also includes the ability to define which hardware profile (or flavor) to use.

Virtualization Infrastructure

The Satellite Server connects to virtualization infrastructure services such as Red Hat Enterprise Virtualization and VMware. This provides a method to provision virtual machines from virtual image templates or using the same PXE-based boot methods as bare metal providers.

Linux Containers

The Satellite Server has the ability to create and manage containers on Red Hat Enterprise Linux Atomic Server.

1.3. DEFINING OUR SCENARIO

This guide follows on from the scenario in the Red Hat Satellite 6 Content Management Guide . In this guide, a software development company called **ACME** aims to use Red Hat Satellite 6 to provision new systems using a variety of provisioning types. The goal is to provide multiple use case scenarios that ACME can follow to achieve their provisioning purpose.

At this point, ACME has a Satellite Server synchronized with content from Red Hat's Content Delivery Network and other sources. Likewise, your own Satellite Server should contain synchronized content before any provisioning attempts, which is why it is recommended to follow the scenario in the Red Hat Satellite 6 Content Management Guide before following this guide.

NOTE

If you have not followed steps in the Content Management Guide and would like to proceed the examples in this guide, use the script in Appendix A, *Initialization Script for Provisioning Examples* to import the necessary Red Hat content for these examples.

This guide provides steps for using either the Red Hat Satellite 6 Web UI or its CLI tool (`hammer`). Use either depending on your preferred method of interacting with Red Hat Satellite 6. If you are using the CLI and you do not want to include authentication details each time you run the `hammer` command, create a CLI configuration file for the local user:

```
mkdir ~/.hammer
cat > .hammer/cli_config.yml <<EOF
:foreman:
    :host: 'https://satellite.example.com/'
    :username: 'admin'
    :password: 'p@55w0rd!'

EOF
```

IMPORTANT

All uses of the `hammer` command in this guide omit the authentication details, which you can add through the configuration file.

1.4. CHAPTER SUMMARY

In this chapter, we explored the concept of provisioning in the context of Red Hat Satellite 6. This included discussing how provisioning fits into the Red Hat Satellite 6 application life cycle. This chapter also provided a brief summary of different provisioning types in Red Hat Satellite 6. This provides multiple provisioning scenarios that this guide explores in future chapters.

The next chapter looks at defining our provisioning context, which you define using organizations and locations.

CHAPTER 2. CONFIGURING PROVISIONING CONTEXTS

This chapter defines some of the foundational elements required for your Satellite Server before you start provisioning new hosts. This includes defining placement strategies using a provisioning context.

2.1. DEFINING A PROVISIONING CONTEXT

A provisioning context defines the organization and location to use for a host and its associated resources. In other words, the combination of organization and location defines who owns the system and where it is located.

Organizations divide Red Hat Satellite 6 resources into logical groups based on ownership, purpose, content, security level, or other divisions. You can create and manage multiple organizations through Red Hat Satellite 6 and assign resources to each individual organization. This ensures the Satellite Server provisions hosts within a certain organization and only uses resources assigned to that organization. For more information about organizations, see Creating Organizations in the *Content Management Guide*.

Locations function similar to organizations in that they provide a method to group resources and assign hosts. The difference is that locations are based on physical or geographical setting. In addition, users can nest locations in a hierarchy. For example, consider the following location map:

- United States
  - New York
    - Datacenter 1
    - Datacenter 2
    - Datacenter 3
  - San Francisco
    - Datacenter 4
    - Datacenter 5
    - Datacenter 6
- Japan
  - Tokyo
    - Datacenter 7
    - Datacenter 8
    - Datacenter 9

This example uses nine data centers spread across three cities. The Satellite Server manages resources and provisions hosts in each data center.

This scenario uses a simple provisioning context. The Red Hat Satellite 6 Content Management Guide shows how to create an organization for ACME, which we also use for scenarios in this guide. This guide also shows how to create a location.

2.2. CREATING AN ORGANIZATION

This procedure shows how to create an organization. This procedure is also contained in the Red Hat Satellite 6 Content Management Guide. If you followed the organization creation scenario in that guide and already have an organization, you do not need to follow this procedure. Note that some modifications to the organization are required, which require you to edit the organization's properties.

For Web UI Users

Navigate to **Administer > Organizations**. This displays the list of organizations that your Satellite Server currently manages.

Click **New Organization**.

A creation wizard appears with three sections:

Create Organization

Provide the base details for the organization. This includes:

- **Name** - A plain text name for the organization. For example: **ACME**.
- **Label** - A unique identifier for the organization. This is used for creating and mapping certain assets, such as directories for content storage. Use letters, numbers, underscores, and dashes, but no spaces. For example: **ACME**.
- **Description** - An optional plain text description for our organization. For example: **`Our example organization`**.

Select Hosts

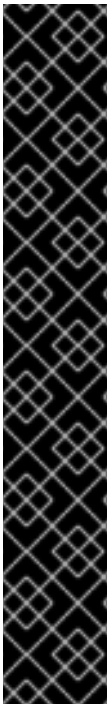
All hosts should have an organization. However, in some circumstances, hosts might become orphaned. For example:

- Deleting an old organization might orphan its hosts.
- Hosts not provisioned but imported through Puppet.
- Hosts not provisioned but registered through **`subscription-manager`**.

In these situations, you can assign orphaned hosts to your newly created organization if necessary. Choose **Assign All** to assign all orphaned hosts or **Manually Assign** to select which orphaned hosts to assign. In our scenario for ACME, no orphaned hosts should exist yet, so click **Proceed to Edit** to move to the **Edit Properties** section.

Edit Properties

This section allows us to assign certain infrastructure resources to our organization. This includes networking resources, installation media, kickstart templates, and other parameters. You can return to this screen at any time by navigating to **Administer > Organization** and then selecting an organization to edit.



IMPORTANT

The ACME organization should have the following resources attached for this scenario:

- **Capsules:** The Satellite Server's integrated Capsule, which uses the same host name as the Satellite Server.
- **Media:** The Red Hat Enterprise Linux 7.2 kickstart tree synchronized from the Red Hat Satellite 6 Content Management Guide .
- **Provisioning Templates:** All templates selected.
- **Partition Tables:** All tables selected.
- **Domains:** The domain this organization uses and manages.
- **Environments:** All Puppet environments, including **`production`** and the ones created in the Red Hat Satellite 6 Content Management Guide .

Check each resource type in the Edit Properties section for these resources.

After completing your organization creation, click **Submit**.

For CLI Users

```
# hammer organization create --name "ACME" --label "ACME" \
--description "Our example organization"
```

This creates our example organization.

2.3. CREATING A LOCATION

This procedure shows how to create a location, which helps define the provisioning context for new hosts and their resources.

For Web UI Users

Navigate to **Administer > Locations**. This displays the list of locations that your Satellite Server currently manages.

Click **New Location**.

A creation wizard appears with three sections:

Create Organization

Provide the base details for the location. This includes:

- **Parent** - Defines the parent location for this location. This creates a location hierarchy. Since the Satellite has no locations, leave this blank to create a top-level location.
- **Name** - A plain text name for the location. For example: **`New York`**.
- **Description** - An optional plain text description for our organization. For example: **`Our example location`**.

Select Hosts

All hosts should have a location. However, in some circumstances, hosts might become orphaned. For example,

- Deleting an old location might orphan its hosts.
- Hosts not provisioned but imported through Puppet.
- Hosts not provisioned but registered through `subscription-manager`.

In these situations, you can assign orphaned hosts to your newly created location if necessary. Choose **Assign All** to assign all orphaned hosts or **Manually Assign** to select which orphaned hosts to assign. In our scenario for ACME, no orphaned hosts should exist yet, so click **Proceed to Edit** to move to the **Edit Properties** section.

Edit Properties

This section allows us to assign certain infrastructure resources to our location. This includes networking resources, installation media, kickstart templates, and other parameters. You can return to this screen at any time by navigating to **Administer > Location** and then selecting a location to edit.

IMPORTANT

The New York location should have the following resources attached for this scenario:

- **Capsules:** The Satellite Server's integrated Capsule, which uses the same host name as the Satellite Server.
- **Media:** The Red Hat Enterprise Linux 7.2 kickstart tree synchronized from the Red Hat Satellite 6 Content Management Guide .
- **Provisioning Templates:** All templates selected.
- **Partition Tables:** All tables selected.
- **Domains:** The domain this location uses and manages.
- **Environments:** All Puppet environments, including `production` and the ones created in the Red Hat Satellite 6 Content Management Guide .
- **Organizations:** The ACME organization.

Check each resource type in the Edit Properties section for these resources.

After completing your location creation, click **Submit**.

For CLI Users

```
# hammer location create --name "New York" \
--description "Our example location"
```

This creates our example location.

2.4. SETTING THE CONTEXT

Before provisioning in Red Hat Satellite 6, we must set the context. A context defines which organization and location to use for provisioning new systems. In addition, any new infrastructure resources are added to this context.

For Web UI Users

The **Context** menu is in the top-left corner of the screen. If you have not selected a context, the menu will say "Any Context". Hover over this menu, then select **ACME** for the **Organization** selector. This changes the context to our ACME organization. Next, hover over the context menu, then select **New York** for the **Location** selector. This changes the context to our example location.

NOTE

Each user can set their default context in their account settings. Navigate to the username in the top-right corner of the Web UI and select **My account** to edit your user account settings.

For CLI Users

If using the CLI, ensure to include either **`--organization`** or **`--organization-id`** and **`--location`** or **`--location-id`** as an option at the end of your command. For example:

```
# hammer host list --organization "ACME" --location "New York"
```

This sets the context for each interaction through the CLI.

2.5. CHAPTER SUMMARY

This chapter showed how to create new organizations and locations, and set them as our context for provisioning.

The next chapter explores some of the resources that compose the Red Hat Satellite 6 provisioning infrastructure.

CHAPTER 3. CONFIGURING PROVISIONING RESOURCES

Red Hat Satellite 6 provides a set of provisioning resources that contribute to the creation of a new host. This section explores some of these resources and how they contribute to host provisioning.

Supported Architectures

Only Intel x86_64 architecture is supported for provisioning via PXE, Discovery, and boot disk. For full details see Red Hat Knowledgebase solution Architectures Supported for Satellite 6 Provisioning .

3.1. CREATING INSTALLATION MEDIA

Installation media are sources of files the Satellite Server uses to install the base operating system on a machine. Installation media must be in the format of an operating system installation tree, and must be accessible to the machine hosting the installer through a HTTP URL. Available installation media appears in the **Hosts > Installation Media** menu.

Importing kickstart trees from Red Hat's CDN creates new entries in the **Installation Media** page. This process is described in Selecting Red Hat Repositories to Synchronize in the *Red Hat Satellite 6 Content Management Guide*. For installation media that has been synchronized from a repository, there is no need to define it manually. The installation media will be available as **Synced content** in the **Operating System** tab when creating a host or a host group.

For other installation media, for example, a locally mounted ISO image, users can add their own custom media paths using the following procedure:

For Web UI Users

Navigate to **Hosts > Installation Media** and click **New Medium**. The UI provides a set of fields where you can input details for the installation medium:

- **Name** - A name to represent the installation media entry in the user interface.
- **Path** - The URL containing the installation tree. The following variables can be used in the path to represent multiple different system architectures and versions:
  - **`$arch`** - The system architecture, for example x86_64.
  - **`$version`** - The operating system version, for example 7.2.
  - **`$major`** - The operating system major version, for example 7.
  - **`$minor`** - The operating system minor version, for example 2.
    Example HTTP path:

    ```
    http://download.example.com/rhel/$version/Server/$arch/os/
    ```

    NOTE

    Synchronized content on Capsule Servers always use a HTTP path.
- **Operating system family** - The distribution or family of the medium. For example, Red Hat Enterprise Linux, CentOS, and Fedora would be in the **`Red Hat`** family.

The Satellite Server adds the installation medium to the current provisioning context. You can choose additional contexts from the **Organizations** and **Locations** tabs, which will help with future debugging.

Click **Submit** to save your installation medium.

For CLI Users

Create the installation medium using the **`hammer medium create`** command:

```
# hammer medium create --name "CustomOS" --os-family "Redhat" \
--path 'http://download.example.com/rhel/$version/Server/$arch/os/' \
--organizations "ACME" --locations "New York"
```

3.2. CREATING PARTITION TABLES

A partition table is a set of directives that defines the way the Satellite Server configures the disks available on a new host. Red Hat Satellite 6 contains a set of default partition tables to use, including a **`Kickstart default`**. You can also edit partition table entries to configure the preferred partitioning scheme, or create a new partition table entry and add it to the Red Hat Enterprise Linux operating system entry.

For Web UI Users

Navigate to **Hosts > Partition tables** and click **New Partition Table**. The UI provides a set of fields where you can input details for the partition table:

- **Name** - A name to represent the partition table.
- **Default** - Defines if the partition is automatically associated with new organizations or locations.
- **Snippet** - Defines if the partition is a reusable snippet for other partition table layouts.
- **Operating system family** - The distribution or family of the partitioning layout. For example, Red Hat Enterprise Linux, CentOS, and Fedora would be in the **`Red Hat`** family.
- **Template editor** - A text area to enter the layout for the disk partition. For example:

  ```
  zerombr
  clearpart --all --initlabel
  autopart
  ```

  You can also use the **Template** file browser to upload a template file.

  NOTE

  The format of the layout must match that for the intended operating system. For example, Red Hat Enterprise Linux 7.2 requires a layout that matches a kickstart file.

- **Audit Comment** - A field for a summary of changes to the partition layout.

Satellite adds the partition table to the current provisioning context. You can choose additional contexts from the **Organizations** and **Locations** tabs.

Click **Submit** to save your partition table.

For CLI Users

Before creating a partition table with the CLI, create a plain text file that contains the partition layout. This example uses the **~/my-partition** file. Create the installation medium using the **hammer partition-table create** command:

```
# hammer partition-table create --name "My Partition" --snippet false \
--os-family Redhat --file ~/my-partition --organizations "ACME" \
--locations "New York"
```

3.3. CREATING PROVISIONING TEMPLATES

A provisioning template defines the way the Satellite Server installs an operating system on a host. There are various types of provisioning templates, including:

- **provision** - The main template that defines the provisioning process. For example, a kickstart template. For more information about kickstart template syntax, see the Kickstart Syntax Reference in the *Red Hat Enterprise Linux 7 Installation Guide*
- **PXELinux**, **iPXE**, **PXEGrub** - PXE-based network boot templates.
- **finish** - Post-configuration scripts for after the completion of the main provisioning process. This is completed as a SSH task.
- **Bootdisk** - Templates for PXE-less boot methods.
- **kexec** - Kernel execution templates for PXE-less boot methods.
- **user_data** - Post-configuration scripts for providers that accept user data, such as **cloud-init** scripts.
- **script** - An arbitrary script not used by default but useful for custom tasks.
- **ZTP** - Zero Touch Provisioning templates.
- **POAP** - PowerOn Auto Provisioning templates.

Red Hat Satellite includes many template examples. Navigate to **Hosts > Provisioning templates** to view them. You can clone and adjust any of them, or create your own. Templates accept the Embedded Ruby (ERB) syntax, for more information see Template Writing Reference in the *Red Hat Satellite 6 Host Configuration Guide*.

Provisioning templates can be downloaded. In order to be allowed to do that, you will need to create a debug certificate first, see Creating an Organization Debug Certificate in the *Red Hat Satellite 6 Server Administration Guide*.

NOTE

To view the history of changes applied to a template, navigate to **Hosts > Provisioning templates**, select one of the templates, and click **History**. Click **Revert** to override the editor content with the previous version. It is possible to revert to an earlier change as well. Click **Show Diff** to see information about a specific change:

1. **Template Diff** tab shows changes in the body of a provisioning template.
2. **Details** tab shows changes in the template description.
3. **History** tab shows the user who made a change to the template and date of the change.

NOTE

Finishing templates are only designed to be used for imaged based provisioning in virtual environments. Do not confuse an image with a foreman discovery ISO, which is sometimes called a Foreman discovery image. An image in this context is an install image in a virtualized environment for easy deployment.

For Web UI Users

Navigate to **Hosts > Provisioning templates** and click **New Template**. The UI provides a set of fields where you can input details for the provisioning template. Alternatively, you can select one of the template examples, click **Clone** to duplicate it, and modify its preset details:

- In the **Template** tab:
  - **Name** - Plain text name for the provisioning template.
  - **Default** - Defines if the template is automatically associated with new organizations or locations.
  - **Template editor** - A text area to enter the body of the provisioning template. You can also use the **Template** file browser to upload a template file.
  - **Audit Comment** - A field for a summary of changes to the provisioning template.
- In the **Type** tab:
  - **Snippet** - Designates the provisioning template as a snippet. A snippet is not a standalone provisioning template, but a part of a provisioning template that can be inserted into other provisioning templates.
  - **Type** - Defines the type of template. For example, `Provisioning template`.
- In the **Association** tab.
  - From the **All items** list in the **Applicable Operating Systems** section, click the name of an operating system entry to move that operating system entry to the **Selected items** list and make the provisioning template available to that operating system entry.
  - Optionally, click **Add combination** and select a host group from the **Host Group** list or an environment from the **Environment** list to make the provisioning template available to the specified combination of host groups and environments.

Satellite adds the provisioning template to the current provisioning context. You can choose additional contexts from the **Organizations** and **Locations** tabs.

Click **Submit** to save your provisioning template.

For CLI Users

Before creating a template with the CLI, create a plain text file that contains the template. This example uses the `~/my-template` file. Create the installation medium using the `hammer template create` command and specify the type with the `--type` option:

```
# hammer template create --name "My Provisioning Template" \
--file ~/my-template --type provision --organizations "ACME" \
--locations "New York"
```

3.4. CREATING OPERATING SYSTEMS

An operating system is a collection of resources that define how the Satellite Server installs a base operating system on a host. Operating system entries combine previously defined resources, such as installation media, partition tables, provisioning templates, and others.

Importing operating systems from Red Hat's CDN creates new entries in the **Hosts > Operating Systems** page. Users can also add custom operating systems using the following procedure:

For Web UI Users

Navigate to **Hosts > Operating systems** and click **New Operating** system. The UI provides a set of fields where you can input details for the operating system:

- In the **Operating System** tab:
  - **Name** - A plain text name to represent the operating system entry.
  - **Major version** - The number corresponding to the major version of the operating system.
  - **Minor version** - The number corresponding to the minor version of the operating system.
  - **Description** - A text field for the operating system's description.
  - **Family** - The operating system family to categorize the new operating system.
  - **Root password hash** - Defines the encoding method for the root password.
  - **Architectures** - Select the architectures the operating system uses. Create additional architectures in the **Hosts > Architectures** menu.
- In the **Partition table** tab:
  - Select the possible partition tables that apply to this operating system.
- In the **Installation media** tab:
  - Select the installation media that apply to this operating system. Kickstart trees should be available automatically upon repository synchronization. See Section 3.1, "Creating Installation Media" for more information.
- In the **Templates** tab:

- Select a template for each type applicable to the operating system.

Click **Submit** to save your provisioning template.

For CLI Users

Create the operating system using the **`hammer os create`** command:

```
# hammer os create --name "MyOS" \
--description "My custom operating system" \
--major 7 --minor 3 --family "Redhat" --architectures "x86_64" \
--partition-tables "My Partition" --media "Red Hat" \
--provisioning-templates "My Provisioning Template"
```

Note the following:

- We use the resources created in previous sections in this example: installation media, partition tables, and provisioning templates.
- Operating systems do not have a provisioning context. Only the resources that form an operating system have a provisioning context.

3.5. CREATING COMPUTE PROFILES

Compute profiles are used in conjunction with compute resources, such as virtualization infrastructure and cloud providers. Compute profiles allow users to predefine hardware such as CPUs, memory, and storage. A default installation of Red Hat Satellite 6 contains three predefined profiles:

- **`1-Small`**
- **`2-Medium`**
- **`3-Large`**

For our example, we create a fourth profile called **`4-Example`**.

For Web UI Users

Navigate to **Infrastructure > Compute profiles**, which displays a list of existing profiles. Click **New Compute Profile**.

Enter the **Name** of the profile (for example **`4-Example`**) and click **Submit**.

For CLI Users

The compute profile CLI commands are not yet implemented in Red Hat Satellite 6.2.

3.6. CREATING AN ACTIVATION KEY

Before creating new hosts, it is recommended to have an activation key. This activation key is used to register systems in the provisioning scenarios. For the scenarios in this guide, the aim is to create an example activation key to attach subscriptions and repositories from the Red Hat Satellite 6 Content Management Guide.

For Web UI Users

Navigate to **Content > Activation keys** and click **Create Activation Key**. Provide the activation key

with the following information:

- **Name** - The name of the activation key. We use this name during the system registration process. Enter **`example`**.
- **Content Host Limit** - Defines how many systems the Satellite Server allows to register for this activation key. Select **`Unlimited Content Hosts`**.
- **Description** - A plain text description for the activation key. Enter **`Example activation key`**.
- **Environment** - The environment to use. Select **`Production`**.
- **Content View** - The Content View (and, by extension, the repository) in the environment to use. Select **`Base`**.

Click **Save**. The activation key details screen displays.

Now we must define which products to attach and repositories to enable upon registration. Navigate to the **Subscriptions** tab. An empty subscription listing appears. Click **Add**, select both the Red Hat Enterprise Linux subscription, and click **Add Selected**.

NOTE

The **Auto-Attach** option is enabled by default. When auto-attach is enabled on an activation key and there are subscriptions associated with the key, the subscription management service selects and attaches the best-matched associated subscriptions based on a set of criteria. You can enable auto-attach and have no subscriptions associated with the key. This type of key is commonly used to register virtual machines when you do not want the virtual machine to consume a RHEL subscription but to inherit a RHEL Virtual Data Center (VDC) subscription from the hypervisor. If auto-attach is disabled, the subscription management service will attempt to attach all associated subscriptions during host registration. If any of the subscriptions cannot be attached, host registration will fail.

Navigate to the **Product Content** page. This displays all the repositories associated with the activation key's products. As default, the Satellite Server only enables:

- The repository that best matches the system requirements. In this case, it is only the Red Hat Enterprise Linux 7 Server RPMs.
- Any custom content.

Our scenario should have the following defaults set:

Red Hat Enterprise Linux Server:

- Red Hat Enterprise Linux 7 Server (Kickstart) - Enabled: **`No (Default)`**
- Red Hat Satellite Tools 6.2 (for RHEL 7 Server) (RPMs) - Enabled: **`No (Default)`**
- Red Hat Enterprise Linux 7 Server (RPMs) - Enabled: **`Yes (Default)`**

Enable the Red Hat Satellite Tools repository because that contains the configuration tools (such as **`katello-agent`** and **`puppet`**). Change it to the following:

- Red Hat Satellite Tools 6.2 (for RHEL 7 Server) (RPMs) - Enabled: **`Override to Yes`**

Click **Save**

For CLI Users

Create the activation key:

```
# hammer activation-key create --name "example" \
--unlimited-content-hosts true --description "Example activation key" \
--lifecycle-environment "Production" --content-view "Base"  \
--organization "ACME"
```

Obtain a list of your subscription IDs:

```
# hammer subscription list --organization "ACME"
```

Attach the Red Hat Enterprise Linux subscription UUID to the activation key:

```
# hammer activation-key add-subscription --name "example" \
--subscription-id ff808181533518d50152354246e901aa \
--organization "ACME"
```

List the product content associated with the activation key:

```
# hammer activation-key product-content --name "example" \
--organization "ACME"
```

Override the default auto-enable status for the Red Hat Satellite Tools 6.2 repository. The default status is set to disabled. This command enables it:

```
# hammer activation-key content-override --name "example" \
--content-label rhel-7-server-satellite-tools-6.2-rpms \
--value 1 --organization "ACME"
```

The example activation key is ready for registering our provisioned systems.

3.7. CHAPTER SUMMARY

In this chapter, we examined the resources used for provisioning new hosts. This includes installation media, partition tables, provisioning templates, compute profiles, and activation keys. Future scenarios in this guide show how to apply these resources to the host provisioning process.

The next chapter looks at configuring our network infrastructures for provisioning.

CHAPTER 4. CONFIGURING NETWORKING

Each provisioning type requires some network configuration. Ensure that new hosts can access either your Satellite Server's integrated Capsule or an external Capsule Server. Configuring your Satellite Server or Capsule Server has two basic requirements:

- Configuration of network services on the integrated Capsule or Capsule Server. This includes:
  - Content delivery services
  - Network services (DHCP, DNS, and TFTP)
  - Puppet configuration
- Defining network resource data in the Satellite Server to help configure network interfaces on new hosts.

This chapter focuses on configuring network services on the Satellite Server's integrated Capsule. However, these instructions have similar applications to configuring standalone Capsule Servers managing a specific network.

For this example, ACME has a private network to provision hosts. The details for this private network are:

Subnet	192.168.140.0/24	
External Gateway	192.168.140.1	
Satellite Server	192.168.140.2	
DHCP Allocation Pool for Discovered and Unmanaged Hosts	192.168.140.10 - 192.168.140.110	
DHCP Allocation Pool for Host Provisioning	192.168.140.111 - 192.168.140.250	

While it is possible to define the same DHCP range on the Satellite Server for both Discovered and Provisioned systems, it is recommended to use a separate range for each service but still within the same subnet.

4.1. CONSIDERATIONS FOR IMAGE BASED PROVISIONING

Post-Boot Configuration Method

Images that use the **finish** post-boot configuration scripts require a managed DHCP server, such as Satellite's integrated Capsule or an external Capsule. The host must be created with a subnet associated with a DHCP Capsule, and the IP address of the host must be a valid IP address from the DHCP range. It is possible to use an external DHCP service, but IP addresses must be entered manually. The SSH credentials corresponding to the configuration in the image must be configured in Satellite to enable the post-boot configuration to be made.

The following items should be checked when troubleshooting a virtual machine booted from an image that depends on post-configuration scripts:

- The host has a subnet assigned in Satellite Server.
- The subnet has a DHCP Capsule assigned in Satellite Server.
- The host has a valid IP address assigned in Satellite Server.
- The IP address acquired by the virtual machine from DHCP matches the address configured in Satellite Server.
- The virtual machine created from an image responds to SSH requests.
- The virtual machine created from an image authorizes the user and password, via SSH, which are associated with the image being deployed.

Pre-Boot Initialization Configuration Method

Images that use the **cloud-init** scripts usually require a DHCP server to avoid having to include the IP address in the image. A managed DHCP Capsule is preferred. The image must have the **cloud-init** service configured to start when the system boots and fetch a script or configuration data to use in completing the configuration.

The following items should be checked when troubleshooting a virtual machine booted from an image that depends on initialization scripts included in the image:

- There is a DHCP server on the subnet.
- The virtual machine has the **cloud-init** service installed and enabled.

For information on the differing levels of support for **finish** and **cloud-init** scripts in virtual-machine images, see the Red Hat Knowledgebase Solution What are the supported compute resources for the finish and cloud-init scripts on the Red Hat Customer Portal.

4.2. CONFIGURING NETWORK SERVICES

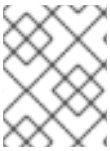
Some of our provisioning methods use Capsule Server services for various purposes. For example, a network might require the Capsule Server to act as a DHCP server. A network might also require PXE boot services as a means to install the operating system to new hosts. This requires configuring the Capsule Server to use the main PXE boot services: DHCP, DNS, and TFTP. To accomplish this, we run the `satellite-installer` script with the options to configure these services.

In this example, ACME aims to connect the Satellite Server's integrated Capsule to a provisioning network to provide PXE boot services. The Satellite Server uses the following NIC configuration:

```
# ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state
UP qlen 1000
    link/ether 52:54:00:33:e3:1c brd ff:ff:ff:ff:ff:ff
    inet 192.168.125.35/24 brd 192.168.125.255 scope global dynamic ens3
```

```
       valid_lft 3042sec preferred_lft 3042sec
    inet6 fe80::5054:ff:fe33:e31c/64 scope link
       valid_lft forever preferred_lft forever
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state
UP qlen 1000
   link/ether 52:54:00:fd:24:ae brd ff:ff:ff:ff:ff:ff
   inet 192.168.140.2/24 brd 192.168.140.255 scope global ens8
      valid_lft forever preferred_lft forever
   inet6 fe80::5054:ff:fefd:24ae/64 scope link
      valid_lft forever preferred_lft forever
```

The Satellite Server uses **eth0** for external communication, such as connection to Red Hat's CDN. ACME aims to use the **eth1** interface to connect to a private provisioning network for hosts using the **192.168.140.0/24** subnet. The goal is for the Satellite Server's integrated Capsule to act as a DHCP, DNS, and TFTP server for new hosts on this network.



NOTE

The Satellite Server's integrated Capsule provides these services. You can also configure these services on additional Satellite Capsules in other networks.

For this example, the **satellite-installer** script uses the following options to configure these services:

DHCP Options

--foreman-proxy-dhcp

Enables the DHCP service. Set this option to **true**.

--foreman-proxy-dhcp-gateway

Defines the DHCP pool gateway. For this example, set this to **192.168.140.1**, which is the address of the external gateway for hosts on ACME's private network.

--foreman-proxy-dhcp-interface

Sets the interface for the DHCP service to listen for requests. For this example, set this to **eth1**.

--foreman-proxy-dhcp-nameservers

Sets the addresses of the nameservers provided to clients through DHCP. For this example, set this to **192.168.140.1**, which is the address for the Satellite Server on **eth1**.

--foreman-proxy-dhcp-range

Defines a space-separated DHCP pool range for Discovered and Unmanaged services. For this example, set this to **192.168.140.10 192.168.140.110**, which provides a pool with 100 addresses.

--foreman-proxy-dhcp-server

Sets the address of the DHCP server to manage. For this example, it is **192.168.140.2**.

DNS Options

--foreman-proxy-dns

Enables DNS service. Set this option to **true**.

--foreman-proxy-dns-forwarders

Sets the DNS forwarders. This example sets this to **`8.8.8.8; 4.4.4.4`**, which uses two public DNS servers. For your purposes, use your own DNS servers instead.

--foreman-proxy-dns-interface

Sets the interface to listen for DNS requests. For this example, set this to **`eth1`**.

--foreman-proxy-dns-reverse

Defines DNS reverse zone name. This example uses **`140.168.192.in-addr.arpa`**.

--foreman-proxy-dns-server

Sets the address of the DNS server to manage. For this example, it is **`192.168.140.2`**.

--foreman-proxy-dns-zone

Sets the DNS zone name. This example uses **`example.com`**.

TFTP Options

--foreman-proxy-tftp

Enables TFTP service. Set this option to **`true`**.

NOTE

Run **`satellite-installer --scenario capsule --help`** to view more options related to DHCP, DNS, TFTP, and other Satellite Capsule services

The following is an example configuration command:

```
# satellite-installer --foreman-proxy-dhcp true \
--foreman-proxy-dhcp-gateway "192.168.140.1" \
--foreman-proxy-dhcp-interface "eth1" \
--foreman-proxy-dhcp-nameservers "192.168.140.2" \
--foreman-proxy-dhcp-range "192.168.140.10 192.168.140.110" \
--foreman-proxy-dhcp-server "192.168.140.2" \
--foreman-proxy-dns true \
--foreman-proxy-dns-forwarders "8.8.8.8; 4.4.4.4" \
--foreman-proxy-dns-interface "eth1" \
--foreman-proxy-dns-reverse "140.168.192.in-addr.arpa" \
--foreman-proxy-dns-server "192.168.140.2" \
--foreman-proxy-dns-zone "example.com" \
--foreman-proxy-tftp true
```

The **`satellite-installer`** script applies these configuration options and sets up the required network services. After the configuration completes, use the **`hammer proxy info`** command to verify these services on the chosen Capsule Server. In this example, we use **`satellite.example.com`** as the domain name of the Satellite Server's integrated Capsule:

```
# hammer proxy info --name "satellite.example.com"
```

The output shows a list of enabled features, including DNS, DHCP, and TFTP:

```
Features:
    Pulp
    TFTP
    DNS
```

```
DHCP
Puppet
Puppet CA
Dynflow
SSH
```

4.3. ADDING A DOMAIN TO THE SATELLITE SERVER

The Satellite Server defines domain names for each host on the network. This means the Satellite Server needs to know about the domain and the Capsule Server responsible for domain name assignment. For this example, we create the **`example.com`** domain for ACME's internal network.

NOTE

The Satellite Server might already have the relevant domain created as part of the Satellite Server installation. Switch the context to **`Any Organization`** and **`Any Location`** then check the domain list to see if it exists. If so, modify this domain entry, define the DNS capsule, set the organization, and set the location.

For Web UI Users

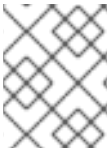
Navigate to **Infrastructure > Domains** and click **New Domain**. The UI provides a set of fields where you can input details for the domain:

- In the **Domain** tab:
  - **DNS Domain** - The domain name. For this example: **`example.com`**
  - **Description** - A plain text description of the domain. For this example: **`ACME's example domain`**.
  - **DNS Capsule** - The capsule to use for DNS assignments. For this example, use the Satellite Server's integrated Capsule.
- In the **Locations** tab:
  - Select the locations that use this domain. For example, select the **`New York`** location.
- In the **Organizations** tab:
  - Select the organizations that use this domain. For example, select **ACME**.

For CLI Users

Create the domain with the following command:

```
# hammer domain create --name "example.com" \
--description "ACME's example domain" --dns_id 1 \
--locations "New York" --organizations "ACME"
```



NOTE

In this example, the **`--dns-id`** option uses 1, which is the ID of the Satellite Server's integrated Capsule.

4.4. ADDING A SUBNET TO THE SATELLITE SERVER

The Satellite Server configures interfaces for new hosts. This is why the Satellite Server needs to know about the network that connects these interfaces. This means you must add information for each of your subnets into the Satellite Server. This includes information such as the gateway, DHCP, and DNS. For this example, we create a subnet mapping for the '192.168.140.0/24' network, which the Satellite Server's integrated Capsule manages.

For Web UI Users

Navigate to **Infrastructure > Subnets** and click **New Subnet**. The UI provides a set of fields where you can input details for the subnet:

- In the **Subnet** tab:
  - **Name** - Plain text name for the subnet. For this example: **`ACME's Internal Network`**
  - **Network address** - The network address for the subnet. For this example: **`192.168.140.0`**
  - **Network mask** - The network mask for the subnet. For this example: **`255.255.255.0`**
  - **Gateway address** - The external gateway for the subnet. For this example: **`192.168.140.1`**
  - **Primary DNS server** - Primary DNS for the subnet. For this example: **`192.168.140.2`**
  - **Secondary DNS server** - Primary DNS for the subnet. For this example: **`8.8.8.8`**
  - **IPAM** - The method to use for IP address management (IPAM):
    - **DHCP** - The subnet contains a DHCP server.
    - **Internal DB** - The subnet does not contain a DHCP server but you aim for the Satellite to manage IP address assignment and record IP addresses in its internal database.
    - **None** - No IP address management.
      For this example, use **DHCP** since the Satellite Server acts as a DHCP server.
  - **Start of IP range** - Defines the start of the IP assignment range for provisioning services. For this example: **`192.168.140.111`**.
  - **End of IP range** - Defines the end of the IP assignment range for provisioning services. For this example: **`192.168.140.250`**.
  - **VLAN ID** - Defines a VLAN ID number for the subnet to isolate broadcasts. This example does not use VLANs, so leave this field blank.
  - **Boot mode** - Defines the default boot mode for network interfaces on this network.
    - **Static** boot mode means that network interfaces assigned to this subnet will set the IP address and network mask directly to the configuration file, avoiding using DHCP to obtain them. Note that gateway and DNS servers won't be fetched from DHCP. Therefore, if you need to configure them, provide correct values in **Gateway address** and **Primary DNS server** fields. You can omit these only if you don't route traffic outside your network (installation medium is local) and you use IP addresses directly without DNS resolution.

        - **DHCP** boot mode means that network interfaces assigned to this subnet are configured via DHCP.

- In the **Remote Execution** tab:
    - Select the capsule that controls the remote execution. In this example, it is the Satellite Server itself.
- In the **Domains** tab:
    - Select the domains that apply to this subnet.
- In the **Capsules** tab:
    - Select the capsule that applies to each service in the subnet, including DHCP, TFTP, and reverse DNS services. This example uses the Satellite Server's integrated Capsule for each.
- In the **Locations** tab:
    - Select the locations that use this capsule. For example, select the **`New York`** location.
- In the **Organizations** tab:
    - Select the organizations that use this capsule. For example, select **`ACME`**.

Click **Submit** to save the subnet information.

For CLI Users

Create the subnet with the following command:

```
# hammer subnet create --name "ACME's Internal Network" \
--network "192.168.140.0" --mask "255.255.255.0" \
--gateway "192.168.140.1" --dns-primary "192.168.140.2" \
--dns-secondary "8.8.8.8" --ipam "DHCP" \
--from "192.168.140.111" --to "192.168.140.250" --boot-mode "DHCP" \
--domains "example.com" --dhcp-id 1 --dns-id 1 --tftp-id 1 \
--locations "New York" --organizations "ACME"
```

NOTE

In this example, the **`--dhcp-id`**, **`--dns-id`**, and **`--tftp-id`** options use 1, which is the ID of the integrated Capsule on the Satellite Server.

4.5. CHAPTER SUMMARY

In this chapter, we examined how to configure certain network services on the Satellite Server's integrated Capsule and map the domain and subnet details of the network that the Satellite Server controls. This provides a network for our new hosts and provides the hosts with key services, such as PXE booting and network configuration.

The next chapter looks at the basic provisioning workflow, which includes how to create new hosts and host groups.

CHAPTER 5. UNDERSTANDING THE PROVISIONING WORKFLOW

This chapter explores the basic workflow for provisioning in Red Hat Satellite 6. The content in this chapter becomes the foundation for further chapters that use specific provisioning methods.

5.1. DEFINING THE PROVISIONING WORKFLOW

The provisioning process follows a basic workflow that is outlined as the following:

1. You create a new host, either through the **New Host** page at **Hosts > New host** in the Web UI or through the Hammer CLI. The Satellite Server also requests an unused IP address from the DHCP Capsule Server associated with the subnet. The **New Hosts** page uses this IP address for the IP address field. After completing all options for the new host, you submit the new host request.
2. The DHCP Capsule Server associated with the subnet reserves an entry for the host.
3. The Satellite Server configures DNS records:
    - A forward DNS record is created on the Capsule Server associated with the domain.
    - A reverse DNS record is created on the DNS Capsule Server associated with the subnet.
4. A PXELinux menu is created for the host in the TFTP Capsule Server associated with the subnet.
5. The new host requests a DHCP lease from the DHCP server.
6. The DHCP server responds to the lease request and returns TFTP options (`next-server`, `filename`).
7. The host requests the bootloader and menu from the TFTP server.
8. The PXELinux menu and OS installer for the host is returned over TFTP.
9. The installer requests the chosen `provision` template or script from the Satellite Server.
10. The Satellite Server renders the template and returns the resulting kickstart to the host.
11. The host enters a build process that installs the operating system, registers the host to the Satellite Server, and installs management tools (`katello-agent`, `puppet`).
12. The installer notifies the Satellite of a successful build in the `postinstall` script.
13. The PXELinux menu reverts to a local boot template.
14. The host boots its operating system. If you configured the host to use any Puppet classes, the host configures itself using the modules stored on the Satellite Server.

This workflow differs depending on certain options, which are explored in detail in later chapters. For example:

- **Discovery** - If using the Discovery service, the Satellite Server automatically detects the MAC address of the new host and reboots the host after you submit a request. Note that TCP port 8443 must be reachable by the Capsule to which the host is attached for the Satellite to be

able to reboot the host.

- **PXE-less Provisioning** - After you submit a new host request, you need to boot the specific host with a boot disk that you download from the Satellite Server.
- **Compute Resources** - The compute resource creates the virtual machine for the new host and returns the MAC address to the Satellite Server. Also, if using image-based provisioning, the host does not follow the standard PXE boot and operating system installation. Instead, the compute resource creates a copy of the chosen image for the new host to use.
- **Containers** - The container provisioning process does not follow the workflow process.

5.2. CREATING A HOST ON SATELLITE SERVER

To configure host provisioning, start with creating a host entry on Satellite Server. You can achieve this through either the Web UI or the Hammer CLI. This provides the fundamentals for host provisioning, which you can use as a reference for later chapters on specific provisioning methods.

For Web UI Users

Navigate to **Hosts > New host**. The UI provides a set of fields where you can input details for the host:

In the **Host** tab, you define the main details about the host and its placement.

- **Name** - The name of the host.
- **Organization** - The organization that owns this host.
- **Location** - The location of this host.
- **Host Group** - Defines which host group to use as a template for this host.
- **Deploy on** - Defines the type of host deployment, either on a bare metal host or through a Compute resource.
- **Lifecycle Environment** - Defines the host's stage in the application life cycle.
- **Content View** - Defines the Content View to use for repositories.
- **Puppet Environment** - Defines the Puppet environment containing the host. This is usually defined using the previously selected Content View and life cycle environment.
- **Content Source** - The Capsule Server to use for providing content from the Content View.
- **Puppet CA** - The Capsule Server to use for agent certification.
- **Puppet Master** - The Capsule Server to use as the master server for agent communication.
- **Openscap Capsule** - The Capsule Server to use as an OpenSCAP proxy.

In the **Puppet Classes** tab, you select which Puppet classes to apply to the host after provisioning. These classes are taken from the Content View and Puppet environment selected on the **Hosts** tab. The **Included Classes** section shows the classes to apply to the host and the **Available Classes** section shows what classes you can add to the host.

In the **Interfaces** tab, you define the network interface configuration for the host. Click **Add Interface** to create a new interface or **Edit** to edit a specific interface. New or modified interfaces use a form with the following fields:

- **Type** - The type of interface to use, which not only includes basic Ethernet connections (`Interface`), but also baseboard management controller (`BMC`), bonds (**Bond**), and bridges (`Bridge`). This allows you to create complex networking configurations for a host.
- **MAC address** - The interface's MAC address, which allows you to map network details to a specific interface. In addition, the MAC address for a provisioning interface is used to identify bare metal hosts during PXE boot.
- **Device identifier** - The interface ID, such as `eth0`, `ens8`, `bond0`, and `br0`.
- **DNS name** - The domain name of the host. This is usually automatically populated with the host name from the **Host** tab.
- **Domain** - The domain to provision the host. This combines with the **DNS name** to create a fully qualified domain name (FQDN) for the host.
- **Subnet** - The network that connects this interface.
- **IP address** - The IP address for this interface. Depending on the **Subnet** chosen and its options, this field might automatically populate.
- A selection of interface types, including:
  - **Managed** - This interface provides DHCP, DNS, and TFTP services during provisioning. Additionally, the interface settings are used to generate an interface configuration file for the host. To disable an individual service, go to **Infrastructure** > **Subnets** and **Infrastructure** > **Domains** and set the corresponding Capsule setting to **None**.
  - **Primary** - This defines the main interface and constructs the host's FQDN from the interface details.
  - **Provision** - This interface is used for PXE boot services. In the case of image based provisioning, the IP address from this interface is used for the SSH connection to the client.
  - **Remote execution** - This interface is used for remote execution features.

NOTE

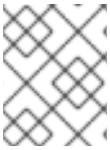
This form also displays additional fields relevant to the network interface **Type** chosen. For example, choosing **Bond** provides options for setting the bonding mode, bonding options, and choosing which devices to attach to the bond.

In the **Operating System** tab, you define the operating system and related aspects to install on the host. You select the host's **Architecture** and then choose an **Operating System** related to that architecture. The form provides further options based on the chosen operating system:

- **Build mode** - Defines whether to provision the host and install the operating system. This option is required for all provisioning tasks. You only need to disable this option if creating an entry for an already existing and provisioned host.
- **Media Selection** - Defines whether to select from only synchronized kickstart repositories or

from all repositories. Select the installation media type that will be used to provision this host. Choose **Synced Content** for synchronized kickstart repositories, or **All Media** to select from other installation media, typically those that have been added manually under **Hosts > Installation media > New Medium**.

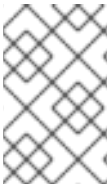
- **Media** - Defines the operating system's installation media. This is usually a kickstart tree, but it can also be a locally mounted ISO image.
- **Partition Table** - Defines the partition table template to use for the root disk layout. You can also define a **Custom partition table** directly on this form.
- **Root password** - The password for the root user on the operating system.
- **Provisioning templates** - This shows the templates chosen to provision the host. Click **Resolve** to see how the Satellite Server assigns templates to specific functions in the provisioning process (PXE, provisioning, user data, and others).



NOTE

Operating System tab provides additional options if you selected a Compute resource from **Deploy on** in the **Host** tab. These options are covered in a later chapter.

In the **Parameters** tab, you set variable data for both the provisioning process and Puppet configuration. The **Puppet class parameters** section allows you to modify data sent to Puppet's parameters. The **Global parameters** and **Host parameters** define custom parameters that you can use within the Satellite Server, such as provisioning templates.



NOTE

If you aim to attach your activation key to the host, add a new host parameter with the **Name** set to **kt_activation_keys** and the **Value** set to the name of your activation key.

In the **Additional Information** tab, you define miscellaneous data about the host including it's owner, whether to include it in reporting, the hardware model, and any additional comments.

To save the host entry, click **Submit**.

For CLI Users

Create the host with the **hammer host create** command. For example:

```
# hammer host create --name "testhost" --organization "ACME" \
--location "New York" --environment "Test" --architecture "x86_64" \
--build true --domain "example.com" --enabled true \
--mac "aa:aa:aa:aa:aa:aa" --subnet "ACME's Internal Network" \
--managed true --medium "Red Hat Kickstart Tree" \
--operatingsystem "RedHat 7.2" --owner admin \
--partition-table "Kickstart Default" \
--puppet-proxy "satellite.example.com" \
--puppet-ca-proxy "satellite.example.com" --root-password "p@55w0rd!"
```

Use the **--interface** option to configure specific interface settings. See Appendix B, *Additional Host Parameters for Hammer CLI* for more information. You can also define specific network interface configurations with the **hammer host interface create** command. Use the **--host** or **--host-**

id options to choose the host that receives the interface. For example:

```
# hammer host interface create --host "testhost" --type interface \
--mac "aa:aa:aa:aa:aa:aa" --identifier "eth0" --name "testhost" \
--domain "example.com" --subnet "ACME's Internal Network" \
--managed true --primary true --provision true
```

This procedure acts as foundation for most provisioning methods. However, the process of defining all this information for each host is time consuming. Therefore, it is recommended to create a host group to define common settings among all hosts.

5.3. CREATING A HOST GROUP ON SATELLITE SERVER

If provisioning many hosts, it is time consuming to enter all host details each time. However, Red Hat Satellite 6 uses the concept of *host groups* to help reduce the time to provision a host.

A host group acts as a template for common host settings. It contains a lot of the same details that you provide to hosts. When you provision a new host with a host group, the host inherits the defined settings from the host group. You can then provide additional details where necessary to individualize the host.

In addition, you can create a hierarchy of host groups. Typically, you will aim to have one base level host group that will represent all hosts in your organization and provide general settings, and then nested groups to provide specific settings. For example, you can have a base host level (parent) group that defines the operating system, and two nested (child) host groups that inherit the base level host group:

- **Hostgroup: `Base`** (Red Hat Enterprise Linux 7.2)
  - **Hostgroup: `Webserver`** (applies the **`httpd`** Puppet class)
    - **Host: `webserver1.example.com`** (web server)
    - **Host: `webserver2.example.com`** (web server)
  - **Hostgroup: `Storage`** (applies the **`nfs`** Puppet class)
    - **Host: `storage1.example.com`** (storage server)
    - **Host: `storage2.example.com`** (storage server)
  - **Host: `custom.example.com`** (custom host)

In this example, all provisioned hosts use Red Hat Enterprise Linux 7.2 as their operating system due to their inheritance of the **`Base`** host group. The two web server hosts inherit the settings from the **`Webserver`** host group, which includes the **`httpd`** Puppet class and the settings from the **`Base`** host group. Likewise, the two storage servers inherit the settings from the **`Storage`** host group, which includes the **`nfs`** Puppet class and the settings from the **`Base`** host group. The custom host only inherits the settings from the **`Base`** host group.

This scenario shows how to create a host group for ACME. Later chapters in this guide use this host group to help with the provisioning process.

For Web UI Users

Navigate to **Configure > Host groups** and click **New Host Group**. The UI provides a form with fields similar to the host creation form. Enter the following details:

- In the **Host Group** tab:
  - **Parent** - The parent host group to inherit basic settings from. Not applicable when creating the very parent group, so leave blank in this scenario.
  - **Name** - The name of the host group. For this scenario, enter **`Base`**.
  - **Lifecycle Environment** - Defines the hosts' stage in the application life cycle. Choose the **`Production`** environment created in the Red Hat Satellite 6 Content Management Guide .
  - **Content View** - Defines the Content View to use for repositories. Choose the **`Base`** view created in the Red Hat Satellite 6 Content Management Guide .
  - **Puppet Environment** - Defines the Puppet environment containing the hosts. This is usually defined using the previously selected Content View and life cycle environment. For this example, choose the **`production`** environment, which does not contain Puppet modules.
  - **Content Source** - The Capsule Server to use for providing content from the Content View. Choose the Satellite Server's integrated Capsule.
  - **Puppet CA** - The Capsule Server to use for agent certification. Choose the Satellite Server's integrated Capsule.
  - **Puppet Master** - The Capsule Server to use as the master server for agent communication. Choose the Satellite Server's integrated Capsule.
  - **Openscap Proxy** - The server to use as an OpenSCAP proxy. Leave this blank.
- In the **Puppet Classes** tab, you select which Puppet classes to apply to the host after provisioning. This scenario does not use Puppet classes, so skip this tab for the moment.
- In the **Network** tab:
  - **Domain** - The domain to provision the host. This combines with the **DNS name** to create a fully qualified domain name (FQDN) for the host. Select ACME's **`example.com`** domain.
  - **Subnet** - The network that connects this interface. Select **`ACME's Internal Network`**.
  - **Realm** - Defines authentication realm for the host. This scenario does not use realms so leave this field blank.
- In the **Operating System** tab:
  - **Architecture** - The hosts' architecture. Select **`x86_64`**.
  - **Operating System** - The base operating system to install. An entry for Red Hat Enterprise Linux 7.2 should appear after performing the synchronization steps, which are described in Synchronizing Red Hat Repositories in the *Red Hat Satellite 6 Content Management Guide* Select the entry. **Media Selection** - Defines whether to select from only synchronized kickstart repositories or from all repositories. Select the installation media type that will be used to provision this host group: **`Synced Content`** for synchronized kickstart repositories, or **`All Media`** for other installation media, typically those that have been added manually under **Hosts > Installation media > New Medium** .

- **Media** - Defines the operating system's installation media. Select the kickstart tree from Red Hat Enterprise Linux 7.2, which should be present after performing the synchronization steps, which are described in Synchronizing Red Hat Repositories in the *Red Hat Satellite 6 Content Management Guide*
- **Partition Table** - Defines the partition table template to use for the root disk layout. Select **`Default Kickstart`**.
- **Root password** - The password for the root user on the operating system. Enter a root password.

- In the **Parameters** tab, you set variable data for both the provisioning process and Puppet configuration. Leave this section empty.
- In the **Locations** tab, set the location for the host group. For this example, select **`New York`**.
- In the **Organizations** tab, set the organizations that are allowed to use the host group. For this example, select **ACME**.
- In the **Activation Keys** tab, select the **`example`** activation key. This adds a new parameter (**`kt_activation_keys`**) to each host that defines the activation key to use for registration.

Click **Submit** to save the host group.

For CLI Users

Create the host group with the **`hammer hostgroup create`** command. For example:

```
# hammer hostgroup create --name "Base" \
--lifecycle-environment "Production" --content-view "Base" \
--environment "production" --content-source-id 1 \
--puppet-ca-proxy-id 1 --puppet-proxy-id 1 --domain "example.com" \
--subnet `ACME's Internal Network` --architecture "x86_64" \
--operatingsystem "RedHat 7.2" --medium-id 9 \
--partition-table "Kickstart default" --root-pass "p@55w0rd!" \
--locations "New York" --organizations "ACME"
```

The server creates the host group entry. This scenario uses this host group for provisioning examples.

5.4. CHAPTER SUMMARY

This chapter showed the basic workflow for creating new hosts entries in Red Hat Satellite 6. This chapter also demonstrated how to create a host group to predefine certain parameters when creating new hosts.

The next chapter explores how to provision bare metal hosts. We use the **Base** host group to predefine settings for hosts in the next chapter.

CHAPTER 6. PROVISIONING BARE METAL HOSTS

In this chapter, we explore four main ways to provision bare metal instances with Red Hat Satellite 6. These include:

- **Unattended Provisioning** - You identify a host using a MAC address and the Satellite Server provisions it using a PXE boot process.
- **Unattended Provisioning with Discovery** - New hosts use PXE boot to load the Satellite Discovery service. This service identifies hardware information about the host and lists it as an available host to provision.
- **PXE-less Provisioning** - The ability to provision new hosts using a boot disk or PXE-less discovery image that the Satellite Server generates.
- **PXE-less Provisioning with Discovery** - New hosts use an ISO boot disk that loads the Satellite Discovery service. This service identifies hardware information about the host and lists it as an available host to provision.

NOTE

Previous versions of Red Hat Satellite provided the use of a host group-based template rendering feature during provisioning. This feature allowed users to render templates for a host group instead of a single host. This feature is not supported for Red Hat Satellite 6.2 due to certain limitations such as a lack of host records or audit trail. It is recommended to use Discovery features, which provide similar functionality.

6.1. DEFINING REQUIREMENTS FOR BARE METAL PROVISIONING

The requirements for bare metal provisioning include:

- Synchronized content repositories for Red Hat Enterprise Linux 7. See Synchronizing Red Hat Repositories in the *Red Hat Satellite 6 Content Management Guide* for more information.
- A Capsule Server managing the network for bare metal hosts. For unattended provisioning and discovery-based provisioning, the Satellite Server requires PXE server settings. See Chapter 4, *Configuring Networking* for more information.
- An example activation key for host registration. See Section 3.6, “Creating an Activation Key” for more information.
- A blank bare metal host for testing purposes.

6.2. CREATING NEW HOSTS WITH UNATTENDED PROVISIONING

Unattended provisioning is the simplest form of host provisioning. This method requires you to enter the host details on the Satellite Server and boot your host. The Satellite Server automatically manages the PXE configuration, organizes networking services, and provides the operating system and configuration for the host. This method of provisioning hosts uses minimal interaction during the process.

This scenario demonstrates how to provision a host on ACME’s private network. In this example, the bare metal host connects to ACME’s private network at 192.168.140.0/24 and uses an interface with **aa:aa:aa:aa:aa:aa** as the MAC address.

For Web UI Users

Navigate to **Hosts > New host**. The UI provides a set of fields where you can input details for the host.

- In the **Host** tab:
  - Enter the **Name** of the host. This becomes the provisioned system's host name. For this example, enter `baremetal-test1`.
  - The provisioning context (**Organization** and **Location**) automatically sets to `ACME` and `New York`.
  - Select `Base` from the **Host Group** field. This should automatically populate most of the new host's fields.
- In the **Interface** tab:
  - Click **Edit** on the host's interface.
  - Most of the fields should automatically contain values. Note in particular:
    - The **Name** from the **Host** tab becomes the **DNS name**.
    - The Satellite Server automatically assigns an IP address for the new host.
  - Enter the MAC address for the host. In this example, the MAC address is `aa:aa:aa:aa:aa:aa`. This is important as it ensures the identification of the host during the PXE boot process.
  - The Satellite Server should automatically select the **Managed**, **Primary**, and **Provision** options for the first interface on the host. If not, select them.
- In the **Operating System** tab:
  - All fields should automatically contain values. Confirm each aspect of the operating system.
  - Click **Resolve** in **Provisioning template** to check the new host can identify the right provisioning templates to use. This should include:
    - **PXELinux Template:** `Kickstart default PXELinux`
    - **provision Template:** `Satellite Kickstart Default`
      For instructions on associating provisioning templates, see Section 3.3, "Creating Provisioning Templates".
- In the **Parameters** tab:
  - Confirm the `kt_activation_keys` parameter exists and is using the `example` activation key.

Click **Submit**.

For CLI Users

Create the host with the `hammer host create` command. For example:

```
# hammer host create --name "baremetal-test1" --organization "ACME" \
--location "New York" --hostgroup "Base" --mac "aa:aa:aa:aa:aa:aa" \
--build true --enabled true --managed true
```

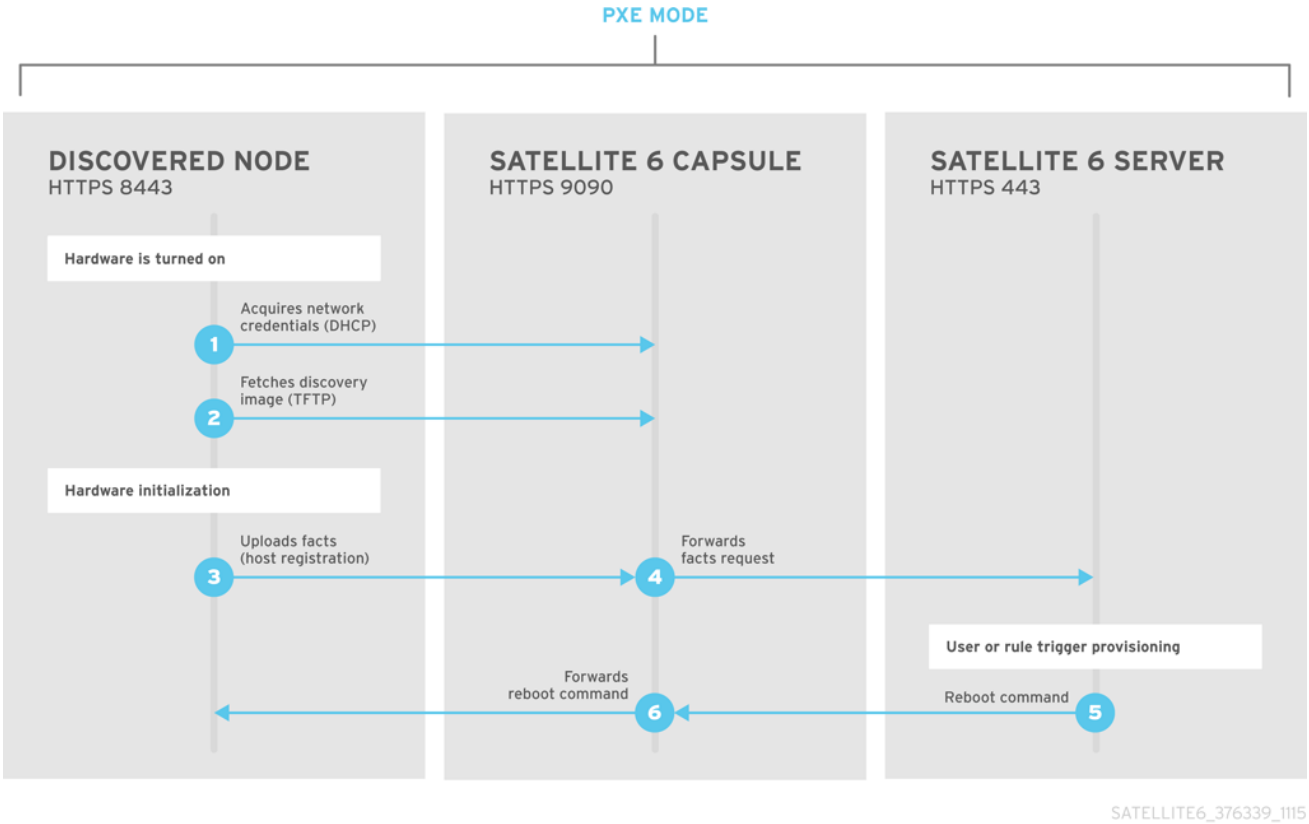
Ensure our network interface options are set using the **`hammer host interface update`** command. For example:

```
# hammer host interface update --host "test1" --managed true \
--primary true --provision true
```

This creates the host entry and the relevant provisioning settings. This also includes creating the necessary directories and files for PXE booting the bare metal host. If you power the physical host and set its boot mode to PXE, the host detects the DHCP service of the Satellite Server's integrated Capsule and starts installing Red Hat Enterprise Linux 7.2 from its kickstart tree. When installation completes, the host also registers to the Satellite Server using the **`example`** activation key and installs the necessary configuration and management tools from the Red Hat Satellite Tools repository.

6.3. CONFIGURING RED HAT SATELLITE'S DISCOVERY SERVICE

Red Hat Satellite provides a Discovery feature. This provides a method to automatically detect blank hosts on a network. These hosts boot a special image that performs hardware detection and relays this information back to the Satellite Server. This provides a method to create a pool of ready-to-provision hosts on the Satellite Server and without needing to enter the MAC address of each host.



Installation

Before using the Discovery service, you must install the Discovery image and enable the Discovery plugin on the Satellite Server.

Enable the plugin using the **`--enable-foreman-plugin-discovery`** option with the **`satellite-installer`** command:

```
# satellite-installer --enable-foreman-plugin-discovery
```

This installs and enables the Discovery service plugin on the Satellite Server. After installation completes, install the following packages:

```
# yum install foreman-discovery-image rubygem-smart_proxy_discovery
```

- The **foreman-discovery-image** package installs the Discovery ISO to the **/usr/share/foreman-discovery-image/** directory and also creates a PXE boot image from this ISO using the **livecd-iso-to-pxeboot** tool. The tool saves this PXE boot image in the **/var/lib/tftpboot/boot** directory.
- The **rubygem-smart_proxy_discovery** package configures a Capsule Server (such as the Satellite Server's integrated Capsule) to act as a proxy for the Discovery service.

After installation completes, a new menu option appears in the Satellite Server's Web UI under **Hosts > Discovered hosts**.

Enabling Discovery service on a Capsule Server

Complete the following procedure to enable the Discovery service on a Capsule Server.

1. Run the following commands in order on the Capsule Server that you want:

```
# yum install foreman-discovery-image rubygem-smart_proxy_discovery
-y
```

```
# katello-service restart
```

2. Log in to the Satellite web UI, navigate to **Infrastructure > Capsule**.
3. Click on the Capsule Server and click on the refresh button. The Capsule Server will have responded to the commands that you have run. If you look at the services configured, you will now see that *discovery* is listed. This means that the Discovery service is now running.

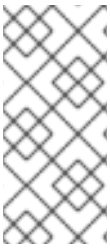
Provisioning Templates

The **PXELinux global default** template in the **Hosts > Provisioning templates** section includes an entry for the Discovery service.

```
LABEL discovery
   MENU LABEL (discovery)
   KERNEL boot/fdi-image-rhel_7-vmlinuz
   APPEND initrd=boot/fdi-image-rhel_7-img rootflags=loop
root=live:/fdi.iso rootfstype=auto ro rd.live.image acpi=force rd.luks=0
rd.md=0 rd.dm=0 rd.lvm=0 rd.bootif=0 rd.neednet=0 nomodeset
proxy.url=https://SATELLITE_CAPSULE_URL:9090 proxy.type=proxy
   IPAPPEND 2
```

The **KERNEL** and **APPEND** options boot the Discovery image and ramdisk. Also note the **APPEND** option contains a **proxy.url** parameter, which specifies the URL of the Capsule Server to use for provisioning. Edit the **SATELLITE_CAPSULE_URL** to the name of the provisioning capsule that you want. In this scenario, it is the Satellite Server's integrated Capsule:

```
proxy.url=https://satellite.example.com:9090
```



NOTE

You can change the Discovery service to be the default service that boots for blank hosts. Edit the ONTIMEOUT value in the **`PXELinux global default`** to the following

```
ONTIMEOUT discovery
```

You need to push the changes from the **`PXELinux global default`** template to the Satellite Server's default PXE template. Navigate to **Hosts > Provisioning templates** and click **Build PXE Default**. This refreshes the default PXE template on the Satellite Server.

Subnets

All subnets with discoverable hosts require an appropriate Capsule Server selected to provide the Discovery service. To do this, navigate to **Infrastructure > Capsules** and verify if the Capsule Server that you want to use lists the Discovery feature. If not, click **Refresh features** and it appears immediately.

Navigate to **Infrastructure > Subnets**, select a subnet, click the Capsules tab, and select the **Discovery Proxy** that you want to use. Perform this for each appropriate subnet.

Testing

Test the Discovery service and boot a blank bare metal host on the 192.168.140.0/24 network. A boot menu displays and shows two options:

- **`(local)`**, which boots from the hard disk
- **`(discovery)`**, which boots to the Discovery service

Select **`(discovery)`** to boot the Discovery image. After a few minutes, the Discovery image completes booting and shows a status screen.

Navigate to **Hosts > Discovered hosts** and the list includes the newly discovered host. The discovered hosts automatically define their host name based on their MAC address. For example, Satellite sets a discovered host with a MAC address of ab:cd:ef:12:34:56 to have **`macabcdef123456`** as the host name. You can change this host name when provisioning the host.

NOTE

The Satellite Server assigns organization and location to discovered hosts according to the following rules from top to bottom:

- Setting the `discovery_organization` or `discovery_location`, if present. These can be set under **Administer > Settings > Discovered**.
- Setting `foreman_organization` or `foreman_location` facts for a host. The fact names that are looked up can be configured in **Administer > Settings > Puppet** section as the **Organization** and **Location** fact setting.
- If a discovered host uses a subnet defined in Satellite, use the first organization and location associated with the subnet.
- Select the first Organization and Location ordered by name.

Organization or Location can be changed using the bulk actions menu of the **Discovered hosts** page. Select the discovered hosts to modify and select **Assign Organization** or **Assign Location** from the **Select Action** menu.

6.4. CREATING NEW HOSTS FROM DISCOVERED HOSTS

Provisioning discovered hosts follows the same basic provisioning process. The difference is we identify the host to provision from the list of discovered hosts instead of manually entering the host's MAC address.

For Web UI Users

Navigate to **Hosts > Discovered host**. This displays a list of ACME's discovered hosts. Select one and click **Provision** on the right side of the list. The UI provides a set of fields where you can input details for the host.

- In the **Host** tab:
  - Enter a new **Name** of the Host. This becomes the provisioned system's host name. For this example, enter `baremetal-test2`.
  - The provisioning context (**Organization** and **Location**) should automatically set to `ACME` and `New York`.
  - Select **Base** from the **Host Group** field. This should automatically populate most of the new host's fields.
- In the **Interface** tab:
  - Click **Edit** on the host's interface.
  - Most of the fields should automatically contain values. Note in particular:
    - The **Name** from the **Host** tab becomes the **DNS name**.
    - The Satellite Server automatically assigns an IP address for the new host.
    - The Satellite Server automatically populates the MAC address from the Discovery results.

- Confirm these details.
- The Satellite Server should automatically select the **Managed**, **Primary**, and **Provision** options for this host. If not, select them.

- In the **Operating System** tab:
  - All fields should automatically contain values. Confirm each aspect of the operating system.
  - Click **Resolve** in **Provisioning template** to check the new host can identify the right provisioning templates to use. This should include:
    - **PXELinux Template: `Kickstart default PXELinux`**
    - **provision Template: `Satellite Kickstart Default`**

  For instructions on associating provisioning templates, see Section 3.3, "Creating Provisioning Templates".

- In the **Parameters** tab:
  - Confirm the **`kt_activation_keys`** parameter exists and is using the **`example`** activation key.

Click **Submit**.

For CLI Users

Identify the discovered host to use for provisioning:

```
# hammer discovery list
```

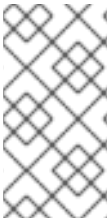
Select a host and provision it using the **`Base`** host group. Set a new host name with the **`--new-name`** options:

```
# hammer host create --name "macaaaaaaaaaaaa" \
--new-name "baremetal-test2" --organization "ACME" \
--location "New York" --hostgroup "Base" --build true \
--enabled true --managed true
```

This removes the host from the discovered host listing and creates a host entry with the relevant provisioning settings. The Discovery image automatically resets the host so that it can boot to PXE. The host detects the DHCP service on the Satellite Server's Integrated Capsule and starts installing Red Hat Enterprise Linux 7.2 from its kickstart tree. When installation completes, the host also registers to the Satellite Server using the **`example`** activation key and installs the necessary configuration and management tools from the Red Hat Satellite Tools repository.

6.5. CREATING DISCOVERY RULES

As a method of automating the provisioning process for discovered hosts, Red Hat Satellite 6 provides a feature to create discovery rules. These rules define how discovered hosts automatically provision themselves, based on the assigned host group. For example, you might aim to automatically provision hosts with a high CPU count as hypervisors. Likewise, you might aim to provision hosts with large hard disks as storage servers.



NOTE

Auto provisioning does not currently allow configuring NICs; all systems are being provisioned with the NIC configuration that was detected during discovery. However, NIC can be set in an Anaconda kickstart, scriptlet, or via configuration management later on.

For Web UI Users

To create a rule, navigate to **Configure > Discovery rules**. This displays a list of existing rules. Select **New Rule** and the UI provides a set of fields for the rule details:

- **Name** - A plain text name to represent the rule. For example: `Hypervisor`
- **Search** - Defines the rules to use to determine whether to provision a host. This field provides suggestions for values you enter and allows operators for multiple rules. For example: `cpu_count > 8`
- **Host Group** - Defines the host group to use.
- **Hostname** - Defines a pattern for determining host names for multiple hosts. This uses the same ERB syntax that provisioning templates use. The host name can use the `@host` attribute for host-specific values and the `rand` function for a random number. For example:
  - `myhost-<%= rand(99999) %>`
  - `abc-<%= @host.facts['bios_vendor'] + '-' + rand(99999) %>`
  - `xyz-<%= @host.hostgroup.name %>`
  - `srv-<%= @host.discovery_rule.name %>`
  - `server-<%= @host.ip.gsub('.','-') + '-' + @host.hostgroup.subnet.name %>`

  When creating host name patterns, make sure the resulting host names are unique. Hostnames must not start with numbers. A good approach is to use unique information provided by Facter, such as the MAC address, BIOS, or serial ID.
- **Hosts limit** - The maximum hosts you can provision with the rule. Use 0 for unlimited.
- **Priority** - Defines the precedence a rule has over other rules. Rules with lower values have a higher priority.
- **Enabled** - Defines whether the rule is currently in action or not.

The Satellite Server uses current provisioning context for the rule. You can choose additional contexts from the **Organizations** and **Locations** tabs.

Click **Submit** to save your rule.

Navigate to **Hosts > Discovered host** and select either:

- `Auto-Provision` from a discovered host's menu on the right. This automatically provisions a single host.
- `Auto-Provision All` from the top-right of the table. This automatically provisions all hosts.

For CLI Users

Create the rule with the **hammer discovery_rule create** command:

```
# hammer discovery_rule create --name "Hypervisor" \
--search "cpu_count  > 8" --hostgroup "Base" \
--hostname "hypervisor-<%= rand(99999) %>" \
--hosts-limit 5 --priority 5 --enabled true
```

Automatically provision a host with the **hammer discovery auto-provision** command:

```
# hammer discovery auto-provision --name "macabcdef123456"
```

6.6. CREATING NEW HOSTS WITH PXE-LESS PROVISIONING

Some hardware does not provide a PXE boot interface. However, it is possible to provision a new host in Red Hat Satellite 6 without the need for PXE boot. This involves generating a boot ISO that hosts can use. This ISO enables the host to connect to the Satellite Server, boot the installation media, and install the operating system. The process for creating a boot ISO for a host follows the same basic provisioning process. The difference is you generate an ISO file from the new host entry.

For Web UI Users

Navigate to **Hosts > New host**. The UI provides a set of fields where you can input details for the host.

- In the **Host** tab:
  - Enter the **Name** of the Host. This becomes the provisioned system's host name. For this example, enter **baremetal-test3**.
  - The provisioning context (**Organization** and **Location**) should automatically set to **ACME** and **New York**.
  - Select **Base** from the **Host Group** field. This should automatically populate most of the new host's fields.
- In the **Interface** tab:
  - Click **Edit** on the host's interface.
  - Most of the fields should automatically contain values. Note in particular:
    - The **Name** from the **Host** tab becomes the **DNS name**.
    - The Satellite Server automatically assigns an IP address for the new host.
  - Enter the MAC address for the host. In this example, the MAC address is **aa:aa:aa:aa:aa:aa**.
  - The Satellite Server should automatically select the **Managed**, **Primary**, and **Provision** options for this host. If not, select them.
- In the **Operating System** tab:
  - All fields should automatically contain values. Confirm each aspect of the operating system.

- Click **Resolve** in **Provisioning template** to check the new host can identify the right provisioning templates to use. This should include:
  - **bootdisk Template: `Boot disk iPXE - host`**
  - **kexec Template: `Discovery Red Hat kexec`**
  - **provision Template: `Satellite Kickstart Default`**

  For instructions on associating provisioning templates, see Section 3.3, "Creating Provisioning Templates".

- In the **Parameters** tab:
  - Confirm the **`kt_activation_keys`** parameter exists and is using the **`example`** activation key.

Click **Submit**.

This creates a host entry and the host details page appears. The options on the top-right of the page show a **Boot disk** menu, which provides:

- **Host image** - A boot ISO for the specific host. This only contains the boot files necessary to access the installation media on the Satellite Server.
- **Full host image** - A boot ISO containing the kernel and initial RAM disk image for the specific host.
- **Generic image** - A boot ISO not tied to any specific host. In this situation, the ISO sends the host's MAC address to the Satellite Server, which matches it against the host entry. This image is also available from the **`/bootdisk/disks/generic`** URL on your Satellite Server. For example, **`https://satellite.example.com/bootdisk/disks/generic`**.
- **Subnet image** - A generic boot ISO that communicates through a Capsule Server.

NOTE

The **Full host image** is based on SYSLINUX and works with most hardware. When using an iPXE-based boot disk (**Host image**, **Generic image**, or **Subnet image**), see http://ipxe.org/appnote/hardware_drivers for a list of hardware drivers expected to work with an iPXE-based boot disk.

For CLI Users

Create the host with the **`hammer host create`** command. For example:

```
# hammer host create --name "baremetal-test3" --organization "ACME" \
--location "New York" --hostgroup "Base" --mac "aa:aa:aa:aa:aa:aa" \
--build true --enabled true --managed true
```

Ensure our network interface options are set using the **`hammer host interface update`** command. For example:

```
# hammer host interface update --host "test3" --managed true \
--primary true --provision true
```

Download the boot disk from Satellite Server with the **`hammer bootdisk host`** command:

```
# hammer bootdisk host --host test3.example.com
```

Use the **`--full`** option to download the full host image.

```
# hammer bootdisk host --host test3.example.com --full true
```

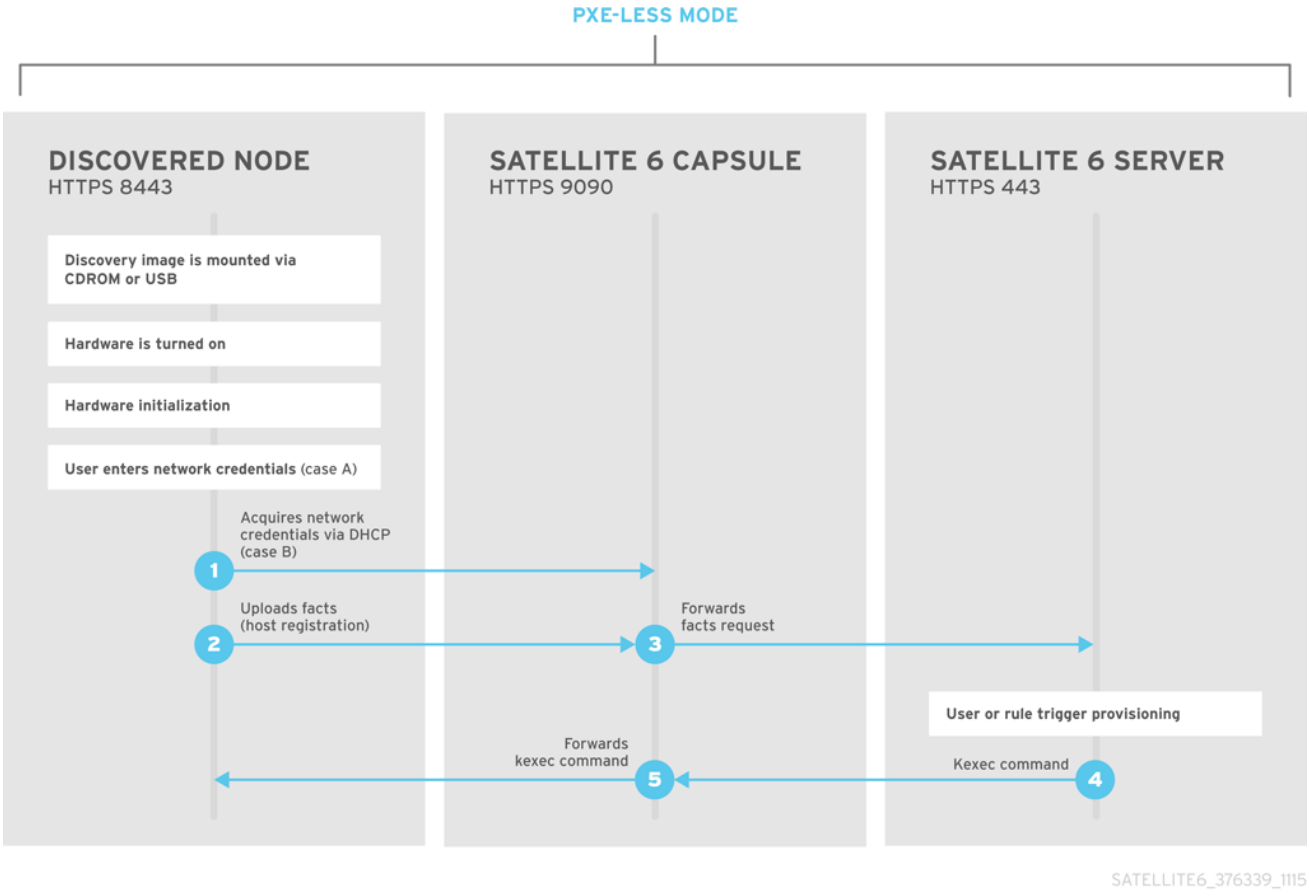
Download the generic image with the **`hammer bootdisk generic`** command:

```
# hammer bootdisk generic
```

This creates a boot ISO for your host to use. If you power the physical host and boot from the ISO, the host connects to the Satellite Server and starts installing Red Hat Enterprise Linux 7.2 from its kickstart tree. When installation completes, the host also registers to the Satellite Server using the **`example`** activation key and installs the necessary configuration and management tools from the Red Hat Satellite Tools repository.

6.7. IMPLEMENTING PXE-LESS DISCOVERY

Red Hat Satellite 6 also provides a PXE-less Discovery service that operates without the need for PXE-based services (DHCP and TFTP). You accomplish this using the Satellite Server's Discovery image.



If you have not yet installed the Discovery service or image, follow the *"Installation"* section in Section 6.3, "Configuring Red Hat Satellite's Discovery Service" .

The ISO for the Discovery service resides at **`/usr/share/foreman-discovery-image/`** and is installed using the **`foreman-discover-image`** package.

Attended Use

This ISO acts as bootable media. Copy this media to either a CD, DVD, or a USB stick. For example, to copy to a USB stick at **/dev/sdb**:

```
# dd bs=4M \
if=/usr/share/foreman-discovery-image/foreman-discovery-image-3.1.1-10.iso
\
of=/dev/sdb
```

Insert the Discovery boot media into a bare metal host, start the host, and boot from the media. The Discovery Image displays an option for either **Manual network setup** or **Discovery with DHCP**:

- If selecting **Manual network setup**, the Discovery image requests a set of network options. This includes the primary network interface that connects to the Satellite Server. This Discovery image also asks for network interface configuration options, such as an **IPv4 Address**, **IPv4 Gateway**, and an **IPv4 DNS** server. As an example, ACME might use the following details:
  - **IPv4 Address:** 192.168.140.20
  - **IPv4 Gateway:** 192.168.140.1
  - **IPv4 DNS:** 192.168.140.2 (The Satellite Server's integrated Capsule)
    After entering these details, select **Next**.
- If selecting **Discovery with DHCP**, the Discovery image requests only the primary network interface that connects to the Satellite Server. It attempts to automatically configure the network interface using a DHCP server, such as one that a Capsule Server provides.

After the primary interface configuration, the Discovery image requests the **Server URL**, which is the URL of the Satellite Server or Capsule Server offering the Discovery service. For example, to use the integrated Capsule on ACME's Satellite Server, use the following URL:

`https://satellite.example.com:9090`

And set the **Connection type** to **`Proxy`**. When ready, select **Next**.

The Discovery image also provides a set of fields to input **Custom facts** for the Facter tool to relay back to the Satellite Server. These are entered in a **name-value** format. Provide any custom facts you require and select **Confirm** to continue.

The Satellite reports a successful communication with the Satellite Server's Discovery service. Navigate to **Hosts > Discovered hosts** and the list includes the newly discovered host.

To provision discovered hosts, see Section 6.4, "Creating New Hosts from Discovered Hosts" .

Unattended Use and Customization

It is possible to create a customized Discovery ISO, which automates the process of configuring the image after booting. The Discovery image uses a Linux kernel for the operating system, which means you pass kernel parameters to the configure the image's operating system. These kernel parameters include:

proxy.url

The URL of the Capsule Server providing the Discovery service.

proxy.type

The proxy type. This is usually set to **proxy** to connect to the Capsule Server. This parameter also supports a legacy **foreman** option, where communication goes directly to the Satellite Server instead of a Capsule Server.

fdi.pxmac

The MAC address of the primary interface in the format of **AA:BB:CC:DD:EE:FF**. This is the interface you aim to use for communicating with the Capsule Server. In automated mode, the first NIC (using network identifiers in alphabetical order) with a link is used. In semi-automated mode, a screen appears and requests you to select the correct interface.

fdi.pxip, fdi.pxgw, fdi.pxdns

Manually configures IP address (**fdi.pxip**), the gateway (**fdi.pxgw**), and the DNS (**fdi.pxdns**) for the primary network interface. If your omit these parameters, the image uses DHCP to configure the network interface.

fdi.pxfactname1, fdi.pxfactname2 ... fdi.pxfactnameN

Allows you to specify custom fact names.

fdi.pxfactvalue1, fdi.pxfactvalue2 ... fdi.pxfactvalueN

The values for each custom fact. Each value corresponds to a fact name. For example, **fdi.pxfactvalue1** sets the value for the fact named with **fdi.pxfactname1**.

fdi.pxauto

Defines whether to use automatic or semi-automatic mode. If set to 0, the image uses semi-automatic mode, which allows you to confirm your choices through a set of dialog options. If set to 1, the image uses automatic mode and proceeds without any confirmation.

The Satellite Server also provides a tool (**discovery-remaster**) in the **foreman-discovery-image** package. This tool remasters the image to include these kernel parameters. To remaster the image, run the **discovery-remaster** tool. For example:

```
# discovery-remaster ~/iso/foreman-discovery-image-3.1.1-10.iso \
"fdi.pxip=192.168.140.20/24 fdi.pxgw=192.168.140.1 \
fdi.pxdns=192.168.140.2 proxy.url=https://satellite.example.com:9090 \
proxy.type=proxy fdi.pxfactname1=customhostname \
fdi.pxfactvalue1=myhost fdi.pxmac=52:54:00:be:8e:8c fdi.pxauto=1"
```

The tool creates a new ISO file in the same directory as the original discovery image. In this scenario, it saves under **/usr/share/foreman-discovery-image/**.

Copy this media to either a CD, DVD, or a USB stick. For example, to copy to a USB stick at **/dev/sdb**:

```
# dd bs=4M \
if=/usr/share/foreman-discovery-image/foreman-discovery-image-3.1.1-10.iso
\
of=/dev/sdb
```

Insert the Discovery boot media into a bare metal host, start the host, and boot from the media.

To provision discovered hosts, see Section 6.4, “Creating New Hosts from Discovered Hosts” .

Final Notes

The host needs to resolve to the following provisioning templates:

- **kexec Template: Discovery Red Hat kexec**

- **provision Template: `Satellite Kickstart Default`**

For instructions on associating provisioning templates, see Section 3.3, “Creating Provisioning Templates”.

6.8. CHAPTER SUMMARY

This chapter explored bare metal host provisioning, which includes several different methods such as unattended provisioning, discovery-based provisioning, and PXE-less provisioning. You can use some of these same methods when provisioning hosts from virtualization infrastructure, such as Kernel-based Virtual Machine (KVM) servers, Red Hat Enterprise Virtualization, and VMware vSphere.

The next chapter explores methods of provisioning from a KVM server using **`libvirt`** virtualization.

CHAPTER 7. PROVISIONING VIRTUAL MACHINES ON A KVM SERVER (LIBVIRT)

Kernel-based Virtual Machines (KVMs) use an open source virtualization daemon and API called **libvirt** running on Red Hat Enterprise Linux. Red Hat Satellite 6 can connect to the **libvirt** API on a KVM server, provision hosts on the hypervisor, and control certain virtualization functions. In this chapter, the aim is to add a connection to ACME's KVM server and provision a virtual machine.

7.1. DEFINING REQUIREMENTS FOR KVM PROVISIONING

The requirements for KVM provisioning include:

- Synchronized content repositories for Red Hat Enterprise Linux 7. See Synchronizing Red Hat Repositories in the *Red Hat Satellite 6 Content Management Guide* for more information.
- A Capsule Server managing a network on the KVM server. Ensure no other DHCP services run on this network to avoid conflicts with the Capsule Server. See Chapter 4, *Configuring Networking* for more information on network service configuration for Capsule Servers.
- An example activation key for host registration. See Section 3.6, "Creating an Activation Key" for more information.
- A Red Hat Enterprise Linux server running KVM virtualization tools. For more information, see the Red Hat Enterprise Linux 7 Virtualization Getting Started Guide .
- An existing virtual machine image if you aim to use image-based provisioning. Make sure this image exists in a storage pool on the KVM host. The **default** storage pool is usually located in **/var/lib/libvirt/images**.

7.2. CONFIGURING THE SATELLITE SERVER FOR KVM CONNECTIONS

Before adding the KVM connection, the Satellite Server requires some configuration to ensure a secure connection. This means creating an SSH key pair for the user that performs the connection, which is the **foreman** user.

On the Satellite Server, switch to the **foreman** user:

```
# su foreman -s /bin/bash
```

Generate the key pair:

```
$ ssh-keygen
```

Copy the public key to the KVM server. For example:

```
$ ssh-copy-id root@kvm.example.com
```

Use the following command to test the connection to the KVM server:

```
$ virsh -c qemu+ssh://root@kvm.example.com/system list
```

When you add the KVM connection in Satellite Server, use the **qemu+ssh** protocol and the address to the server. For example, **qemu+ssh://root@kvm.example.com/system**.

7.3. ADDING A KVM CONNECTION TO THE SATELLITE SERVER

This process adds the KVM connection in the Satellite Server's compute resources.

For Web UI Users

Navigate to **Infrastructure > Compute resource** and click **New Compute Resource**. The UI provides a set of fields for the compute resource:

- **Name** - A plain text name for the resource. For example, **ACME's KVM Server**.
- **Provider** - A field for selecting the compute resource provider. Select **Libvirt** and a new set of fields appear.
- **Description** - A plain text description for the resource. For example, **KVM server at kvm.example.com**.
- **URL** - The **libvirt** connection URL to the KVM server. For example, **qemu+ssh://root@kvm.example.com/system**.
- **Display type** - Selects the remote access protocol to use, either **VNC** or **Spice**.
- **Console passwords** - Secures console access for new hosts with a randomly generated password.

Click **Test Connection** to make sure the Satellite Server connects to the KVM server without fault.

The **Locations** and **Organizations** tabs are automatically set to your current context. Add additional contexts to these tabs.

Click **Submit** to save the KVM connection.

For CLI Users

Create the connection with the **hammer compute-resource create** command:

```
# hammer compute-resource create --name "ACME's KVM Server" \
--provider "Libvirt" --description "KVM server at kvm.example.com" \
--url "qemu+ssh://root@kvm.example.com/system" --locations "New York" \
--organizations "ACME"
```

7.4. ADDING KVM IMAGES ON THE SATELLITE SERVER

If using image-based provisioning to create new hosts, you need to add image details to your Satellite Server. This includes access details and image location.

For Web UI Users

Navigate to **Infrastructure > Compute resource** and click the name of your KVM connection. The UI displays information about the connection, including an **Images** tab. This tab contains no images for new providers but you can add new ones. Click **New Image** and the UI provides a set of fields for the KVM image:

- **Name** - A plain text name for the image. For example, **`Test KVM Image`**.
- **Operatingsystem** - A field for selecting the image's base operating system. For example, **`RedHat 7.2`**.
- **Architecture** - A field for selecting the operating system architecture. For example, **`x86_64`**.
- **Username** - The SSH user name for image access. This is normally the **`root`** user.
- **Password** - The SSH password for image access.
- **User data** - Defines if the image supports user data input, such as **`cloud-init`** data.
- **Image path** - The full path pointing to the image on the KVM server. For example, **`/var/lib/KVM/images/TestImage.qcow2`**.

Click **Submit** to save the image details.

For CLI Users

Create the image with the **`hammer compute-resource image create`** command. Use the **`--uuid`** field to store the full path of the image location on the KVM server.

```
# hammer compute-resource image create --name "Test KVM Image" \
--operatingsystem "RedHat 7.2" --architecture "x86_64" --username root \
--user-data false --uuid "/var/lib/libvirt/images/TestImage.qcow2" \
--compute-resource "ACME's KVM Server"
```

7.5. ADDING KVM DETAILS TO A COMPUTE PROFILE

We can predefine certain hardware settings for KVM-based virtual machines. You achieve this through adding these hardware settings to a compute profile. For this example, we aim to include some basic hardware settings to the **`4-Example`** profile you created in Section 3.5, "Creating Compute Profiles".

For Web UI Users

Navigate to **Infrastructure > Compute profiles** and click the name of your profile. For example, use the **`4-Example`** profile you previously created in Section 3.5, "Creating Compute Profiles". The UI displays a list of your compute resources. Click on the KVM connection.

The UI provides a set of fields where you can input KVM-specific details for the profile. This includes:

- **CPUs** - The number of CPUs to allocate to the new host.
- **Memory** - The amount of memory to allocate to the new host.
- **Image** - The image to use if performing image-based provisioning. For this example, use the **`Test KVM Image`**.
- **Network Interfaces** - Defines the KVM network parameters for the host's network interface. You can create multiple network interfaces. However, at least one interface should point to a Capsule-managed network. The network interface options include:
  - **Network Type** - Defines the type of network for the host and its NIC. This can either be **`Physical (Bridge)`** or **`Virtual(Nat)`**.

- **Network** - Depending on your choice for **Network Type**, this is either the physical interface for hosts to use or the virtual network on the KVM server.
- **NIC type** - Defines the virtual NIC type, such as `virtio`.

- **Storage** - Defines volumes for the host. You can create multiple volumes for the host. The storage options include:
  - **Storage pool** - Defines the pool on the KVM server that contains the volume.
  - **Size** - Defines the size of volume in GB.
  - **Allocation** - Defines the size of physical preallocated space for the volume.
  - **Type** - Defines the volume type. Either `RAW` or `QCOW2`.

Click **Submit** to save the compute profile.

For CLI Users

The compute profile CLI commands are not yet implemented in Red Hat Satellite 6.2. As an alternative, you can include the same settings directly during the host creation process.

7.6. CREATING NETWORK-BASED HOSTS ON A KVM SERVER

The KVM provisioning process provides the option to create new hosts over a network connection. This requires the new host to access either the Satellite Server's integrated Capsule or an external Capsule Server on a KVM virtual network. This is so the host has access to PXE provisioning services.

IMPORTANT

If using a virtual network on the KVM server for provisioning, make sure to select one that does not provide DHCP assignments. This causes DHCP conflicts with the Satellite Server when booting new hosts.

For Web UI Users

Navigate to **Hosts > New host**. The UI provides a set of fields where you can input details for the host.

- In the **Host** tab:
  - Enter the **Name** of the Host. This becomes the provisioned system's host name. For this example: `kvm-test1`.
  - The provisioning context (**Organization** and **Location**) should automatically set to the current context. For example: **ACME** and `New York`.
  - Select `Base` from the **Host Group** field. This should automatically populate most of the new host's fields.
  - In **Deploy on**, select the KVM connection. For our example, `ACME's KVM Server`. A new tab for virtual machines appears.
  - In **Compute profile**, select a profile to use to automatically populate virtual machine-based settings. For our example: `4-Example`.

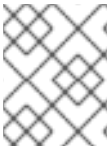
- In the **Interface** tab:
  - Click **Edit** on the host's interface.
  - Most of the fields should automatically contain values. Note in particular:
    - The **Name** from the **Host** tab becomes the **DNS name**.
    - The Satellite Server automatically assigns an IP address for the new host.
  - Leave the **MAC address** blank. The KVM server assigns one to the host.
  - The Satellite Server should automatically select the **Managed**, **Primary**, and **Provision** options for the first interface on the host. If not, select them.
  - The interface screen shows the KVM-specific fields populated with settings from our compute profile. Modify these settings to suit your needs.
- In the **Operating System** tab:
  - All fields should automatically contain values. Confirm each aspect of the operating system.
  - Make sure the **Provisioning Method** is set to **`Network Based`**
  - Click **Resolve** in **Provisioning templates** to check the new host can identify the right provisioning templates to use.
- In the **Virtual Machine** tab:
  - These settings should be populated with details from the chosen host group and compute profile. Modify these settings to suit your needs.
- In the **Parameters** tab:
  - Confirm the **`kt_activation_keys`** parameter exists and is using the **`example`** activation key.

Click **Submit**.

For CLI Users

Create the host with the **`hammer host create`** command and include **`--provision-method build`** to use network-based provisioning. For example:

```
# hammer host create --name "kvm-test1" --organization "ACME" \
--location "New York" --hostgroup "Base" \
--compute-resource "ACME's KVM Server" --provision-method build \
--build true --enabled true --managed true \
--interface
"managed=true,primary=true,provision=true,compute_type=network,compute_net
work=acmenetwork" \
--compute-attributes="cpus=1,memory=1073741824" \
--volume="pool_name=default,capacity=20G,format_type=qcow2"
```



NOTE

See Appendix B, *Additional Host Parameters for Hammer CLI* for more information on additional host creation parameters for this compute resource.

This new host entry triggers the KVM server to create the virtual machine and start it. If the virtual machine detects the defined Capsule Server through the virtual network, the virtual machine boots to PXE and begins to install the chosen operating system.

7.7. CREATING IMAGE-BASED HOSTS ON A KVM SERVER

The KVM provisioning process also provides the option to create new hosts from existing images on the KVM server.

For Web UI Users

Navigate to **Hosts > New host**. The UI provides a set of fields where you can input details for the host.

- In the **Host** tab:
  - Enter the **Name** of the Host. This becomes the provisioned system's host name. For this example, enter **`kvm-test2`**.
  - The provisioning context (**Organization** and **Location**) should automatically set to **`ACME`** and **`New York`**.
  - Select **`Base`** from the **Host Group** field. This should automatically populate most of the new host's fields.
  - In **Deploy on**, select the KVM connection. For our example, **`ACME's KVM Server`**. A new tab for virtual machines appears.
  - In **Compute profile**, select a profile to use to automatically populate virtual machine-based settings. For our example: **`4-Example`**.
- In the **Interface** tab:
  - Click **Edit** on the host's interface.
  - Most of the fields should automatically contain values. Note in particular:
    - The **Name** from the **Host** tab becomes the **DNS name**.
    - The Satellite Server automatically assigns an IP address for the new host.
  - Leave the **MAC address** blank. The KVM server assigns one to the host.
  - The Satellite Server should automatically select the **Managed**, **Primary**, and **Provision** options for this host. If not, select them.
  - The interface screen shows the KVM-specific fields populated with settings from our compute profile. Modify these settings to suit your needs.
- In the **Operating System** tab:
  - All fields should automatically contain values. Confirm each aspect of the operating system.

- Make sure the **Provisioning Method** is set to **Image Based**. A new **Image** field appears. This field allows you to select the image as a basis for the new host's root volume. This is also automatically populated from the compute profile you chose in the **Host** tab.
- Click **Resolve** in **Provisioning templates** to check the new host can identify the right provisioning templates to use.

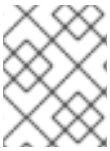
- In the **Virtual Machine** tab:
  - These settings should be populated with details from the chosen host group and compute profile. Modify these settings to suit your needs.
- In the **Parameters** tab:
  - Confirm the **kt_activation_keys** parameter exists and is using the **example** activation key.

Click **Submit**.

For CLI Users

Create the host with the **hammer host create** command and include **--provision-method image** to use image-based provisioning. For example:

```
# hammer host create --name "kvm-test2" --organization "ACME" \
--location "New York" --hostgroup "Base" \
--compute-resource "ACME's KVM Server" --provision-method image \
--image "Test KVM Image" --enabled true --managed true \
--interface
"managed=true,primary=true,provision=true,compute_type=network,compute_net
work=acmenetwork" \
--compute-attributes="cpus=1,memory=1073741824" \
--volume="pool_name=default,capacity=20G,format_type=qcow2"
```



NOTE

See Appendix B, *Additional Host Parameters for Hammer CLI* for more information on additional host creation parameters for this compute resource.

This new host entry triggers the KVM server to create the virtual machine, using the pre-existing image as a basis for the new volume.

7.8. CHAPTER SUMMARY

This chapter showed how to configure Red Hat Satellite 6 to use a KVM server and how to provision new hosts through a KVM server. This included both network-based hosts and image-based hosts.

If you have no further compute resources to configure with Red Hat Satellite 6, see Chapter 13, *Finalizing Provisioning* for some final notes on provisioning.

The next chapter explores methods of provisioning from a Red Hat Enterprise Virtualization environment.

CHAPTER 8. PROVISIONING VIRTUAL MACHINES IN RED HAT ENTERPRISE VIRTUALIZATION

Red Hat Enterprise Virtualization is an enterprise-grade server and desktop virtualization platform built on Red Hat Enterprise Linux. Red Hat Satellite 6 can mange virtualization functions through Red Hat Enterprise Virtualization's REST API. This include creating new virtual machines and controlling their power states. In this chapter, the aim is to add a connection to ACME's Red Hat Enterprise Virtualization environment and provision a virtual machine.

8.1. DEFINING REQUIREMENTS FOR RED HAT ENTERPRISE VIRTUALIZATION PROVISIONING

The requirements for Red Hat Enterprise Virtualization provisioning include:

- Synchronized content repositories for Red Hat Enterprise Linux 7. See Synchronizing Red Hat Repositories in the *Red Hat Satellite 6 Content Management Guide*for more information.
- A Capsule Server managing a logical network on the Red Hat Enterprise Virtualization environment. Ensure no other DHCP services run on this network to avoid conflicts with the Capsule Server. See Chapter 4, *Configuring Networking* for more information.
- An existing template, other than the **blank** template, if you aim to use image-based provisioning. See Templates in the *Virtual Machine Management Guide*for information on creating templates for virtual machines.
- An example activation key for host registration. See Section 3.6, "Creating an Activation Key" for more information.

8.2. CREATING A RED HAT ENTERPRISE VIRTUALIZATION USER

The Red Hat Enterprise Virtualization server requires an administration-like user for Satellite Server communication. For security reasons, Red Hat advises against using the **admin@internal** user for such communication. Instead, create a new Red Hat Enterprise Virtualization user with the following permissions:

- System
  - Configure System
    - Login Permissions
- Network
  - Configure vNIC Profile
    - Create
    - Edit Properties
    - Delete
    - Assign vNIC Profile to VM
    - Assign vNIC Profile to Template

- Template
  - Provisioning Operations
    - Import/Export
- VM
  - Provisioning Operations
    - Create
    - Delete
    - Import/Export
    - Edit Storage
- Disk
  - Provisioning Operations
    - Create
  - Disk Profile
    - Attach Disk Profile

For information on how to create a new user and add permissions in Red Hat Enterprise Virtualization, see Adding Users and Assigning User Portal Permissions in the *Red Hat Enterprise Virtualization Administration Guide*.

8.3. ADDING A RED HAT ENTERPRISE VIRTUALIZATION CONNECTION TO THE SATELLITE SERVER

This process adds a Red Hat Enterprise Virtualization connection in the Satellite Server's compute resources.

For Web UI Users

Navigate to **Infrastructure > Compute resource** and click **New Compute Resource**. The UI provides a set of fields for the compute resource:

- **Name** - A plain text name for the resource. For example, `ACME's RHEV`.
- **Provider** - A field for selecting the compute resource provider. Select **RHEV** and a new set of fields appear.
- **Description** - A plain text description for the resource. For example, `RHEV-M server at rhevm.example.com`.
- **URL** - The connection URL to the Red Hat Enterprise Virtualization Manager's API. For example, in versions of RHV less than 4.0, this URL is of the form `https://rhevm.example.com/api`. In versions of RHV 4.0 and higher, this URL is of the form `https://rhevm.example.com/ovirt-engine/api/v3`.
- **Username** - The user with permission to access the Red Hat Enterprise Virtualization Manager's resources. For example, `satellite@internal`.

- **Password** - The password for the chosen user.
- **Datacenter** - Once the **URL**, **Username**, and **Password** are entered, click **Load Datacenters** to populate the list of data centers from your Red Hat Enterprise Virtualization environment. Select a specific data center to manage from this list.
- **Quota ID** - Select a quota to limit resources available to the Satellite Server.
- **X509 Certification Authorities** - The certificate authority for SSL/TLS access.

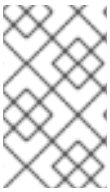
The **Locations** and **Organizations** tabs are automatically set to your current context. Add additional contexts to these tabs.

Click **Submit** to save the connection.

For CLI Users

Create the connection with the **`hammer compute-resource create`** command. Select **`Ovirt`** as the **`--provider`** and set the UUID of the data center to use as **`--uuid`**:

```
# hammer compute-resource create --name "ACME's RHEV" \
--provider "Ovirt" --description "RHEV-M server at rhevm.example.com" \
--url "https://rhevm.example.com/api" --user "satellite@internal" \
--password "p@55w0rd!" --locations "New York" --organizations "ACME" \
--uuid 72cb9454-81cd-4231-a863-d9baf0f399f8
```



NOTE

In versions of RHV less than 4.0, this URL is of the form **`https://rhevm.example.com/api`**. In versions of RHV 4.0 and higher, this URL is of the form **`https://rhevm.example.com/ovirt-engine/api/v3`**.

8.4. ADDING RED HAT ENTERPRISE VIRTUALIZATION IMAGES ON THE SATELLITE SERVER

Red Hat Enterprise Virtualization uses templates as images for creating new virtual machines. If using image-based provisioning to create new hosts, you need to add Red Hat Enterprise Virtualization template details to your Satellite Server. This includes access details and the template name.

For Web UI Users

Navigate to **Infrastructure > Compute resource** and click the name of your Red Hat Enterprise Virtualization connection. The UI displays information about the connection, including an **Images** tab. This tab contains no images for new providers but you can add new ones. Click **New Image** and the UI provides a set of fields for the Red Hat Enterprise Virtualization template:

- **Name** - A plain text name for the image. For example, **`Test RHEV Image`**.
- **Operatingsystem** - A field for selecting the image's base operating system. For example, **`RedHat 7.2`**.
- **Architecture** - A field for selecting the operating system architecture. For example, **`x86_64`**.
- **Username** - The SSH user name for image access. This is normally the **`root`** user.

- **Password** - The SSH password for image access.
- **Image** - The name of the image on Red Hat Enterprise Virtualization. Select the image name from the list.

Click **Submit** to save the image details.

For CLI Users

Create the image with the **`hammer compute-resource image create`** command. Use the **`--uuid`** field to store the template UUID on the Red Hat Enterprise Virtualization server.

```
# hammer compute-resource image create --name "Test RHEV Image" \
--operatingsystem "RedHat 7.2" --architecture "x86_64" --username root \
--uuid "9788910c-4030-4ae0-bad7-603375dd72b1" \
--compute-resource "ACME's RHEV"
```

8.5. ADDING RED HAT ENTERPRISE VIRTUALIZATION DETAILS TO A COMPUTE PROFILE

You can predefine certain hardware settings for virtual machines on Red Hat Enterprise Virtualization. You achieve this through adding these hardware settings to a compute profile. For this example, the aim is to include some basic hardware settings to the **`4-Example`** profile.

For Web UI Users

Navigate to **Infrastructure > Compute profiles** and click the name of your profile. For example, use the **`4-Example`** profile you previously created. The UI displays a list of your compute resources. Click on the Red Hat Enterprise Virtualization connection.

The UI provides a set of fields where you can input Red Hat Enterprise Virtualization-specific details for the profile. This includes:

- **Cluster** - The target host cluster in the Red Hat Enterprise Virtualization environment.
- **Template** - The RHEV template to use for the **Cores** and **Memory** settings.
- **Cores** - The number of CPU cores to allocate to the new host.
- **Memory** - The amount of memory to allocate to the new host.
- **Image** - The image to use if performing image-based provisioning. For this example, use the **`Test RHEV Image`**.
- **Network Interfaces** - Defines the network parameters for the host's network interface. You can create multiple network interfaces. However, at least one interface should point to a Capsule-managed network. The network interface options include:
  - **Name** - Defines the name of the network interface.
  - **Network** - Defines the logical network to use.
- **Storage** - Defines volumes for the host. You can create multiple volumes for the host. The storage options include:
  - **Size (GB)** - Defines the size of volume in GB.

- **Storage domain** - Defines the storage domain for the volume.
- **Preallocate disk** - Defines whether to use thin provisioning or preallocation of the full disk.
- **Bootable** - Defines the boot volume.

Click **Submit** to save the compute profile.

For CLI Users

The compute profile CLI commands are not yet implemented in Red Hat Satellite 6.2. As an alternative, you can include the same settings directly during the host creation process.

8.6. CREATING NETWORK-BASED HOSTS ON A RED HAT ENTERPRISE VIRTUALIZATION SERVER

The Red Hat Enterprise Virtualization provisioning process provides the option to create new hosts over a network connection. This requires the new host to access either the Satellite Server's integrated Capsule or an external Capsule Server on a Red Hat Enterprise Virtualization virtual network. This is so the host has access to PXE provisioning services.

IMPORTANT

If using a virtual network on the Red Hat Enterprise Virtualization server for provisioning, make sure to select one that does not provide DHCP assignments. This causes DHCP conflicts with the Satellite Server when booting new hosts.

For Web UI Users

Navigate to **Hosts > New host**. The UI provides a set of fields where you can input details for the host.

- In the **Host** tab:
  - Enter the **Name** of the Host. This becomes the provisioned system's host name. For this example, enter `rhev-test1`.
  - The provisioning context (**Organization** and **Location**) should automatically set to the current context. For example: **ACME** and **New York**.
  - Select **Base** from the **Host Group** field. This should automatically populate most of the new host's fields.
  - In **Deploy on**, select the Red Hat Enterprise Virtualization connection. For our example, **ACME's RHEV**. A new tab for virtual machines appears.
  - In **Compute profile**, select a profile to use to automatically populate virtual machine-based settings. For our example: **4-Example**.
- In the **Interface** tab:
  - Click **Edit** on the host's interface.
  - Most of the fields should automatically contain values. Note in particular:
    - The **Name** from the **Host** tab becomes the **DNS name**.

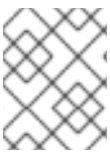
        - The Satellite Server automatically assigns an IP address for the new host.
    - Leave the **MAC address** blank. The server assigns one to the host.
    - The Satellite Server should automatically select the **Managed**, **Primary**, and **Provision** options for the first interface on the host. If not, select them.
    - The interface screen shows the Red Hat Enterprise Virtualization-specific fields populated with settings from our compute profile. Modify these settings to suit your needs.
- In the **Operating System** tab:
    - All fields should automatically contain values. Confirm each aspect of the operating system.
    - Make sure the **Provisioning Method** is set to **`Network Based`**
    - Click **Resolve** in **Provisioning templates** to check the new host can identify the right provisioning templates to use.
- In the **Virtual Machine** tab:
    - These settings should be populated with details from the chosen host group and compute profile. Modify these settings to suit your needs.
- In the **Parameters** tab:
    - Confirm the **`kt_activation_keys`** parameter exists and is using the **`example`** activation key.

Click **Submit**.

For CLI Users

Create the host with the **`hammer host create`** command and include **`--provision-method build`** to use network-based provisioning. For example:

```
# hammer host create --name "rhev-test1" --organization "ACME" \
--location "New York" --hostgroup "Base" \
--compute-resource "ACME's RHEV" --provision-method build \
--build true --enabled true --managed true \
--interface
"managed=true,primary=true,provision=true,compute_name=eth0,compute_networ
k=satnetwork" \
--compute-
attributes="cluster=Default,cores=1,memory=1073741824,start=true" \
--volume="size_gb=20G,storage_domain=Data,bootable=true"
```



NOTE

See Appendix B, *Additional Host Parameters for Hammer CLI* for more information on additional host creation parameters for this compute resource.

This new host entry triggers the Red Hat Enterprise Virtualization server to create the virtual machine. If the virtual machine detects the defined Capsule Server through the virtual network, the virtual machine boots to PXE and begins to install the chosen operating system.

8.7. CREATING IMAGE-BASED HOSTS ON A RED HAT ENTERPRISE VIRTUALIZATION SERVER

The Red Hat Enterprise Virtualization provisioning process also provides the option to create new hosts from existing images on the Red Hat Enterprise Virtualization server.

For Web UI Users

Navigate to **Hosts > New host**. The UI provides a set of fields where you can input details for the host.

- In the **Host** tab:
  - Enter the **Name** of the Host. This becomes the provisioned system's host name. For this example, enter `rhev-test2`.
  - The provisioning context (**Organization** and **Location**) should automatically set to the current context. For example: **ACME** and **New York**.
  - Select **Base** from the **Host Group** field. This should automatically populate most of the new host's fields.
  - In **Deploy on**, select the Red Hat Enterprise Virtualization connection. For our example, **ACME's RHEV**. A new tab for virtual machines appears.
  - In **Compute profile**, select a profile to use to automatically populate virtual machine-based settings. For our example: **4-Example**.
- In the **Interface** tab:
  - Click **Edit** on the host's interface.
  - Most of the fields should automatically contain values. Note in particular:
    - The **Name** from the **Host** tab becomes the **DNS name**.
    - The Satellite Server automatically assigns an IP address for the new host.
  - Leave the **MAC address** blank. The Red Hat Enterprise Virtualization server assigns one to the host.
  - The Satellite Server should automatically select the **Managed**, **Primary**, and **Provision** options for this host. If not, select them.
  - The interface screen shows the Red Hat Enterprise Virtualization-specific fields populated with settings from our compute profile. Modify these settings to suit your needs.
- In the **Operating System** tab:
  - All fields should automatically contain values. Confirm each aspect of the operating system.
  - Make sure the **Provisioning Method** is set to **Image Based**. A new **Image** field appears. This field allows you to select the image as a basis for the new host's root volume. This is also automatically populated from the compute profile you chose in the **Host** tab.
  - Click **Resolve** in **Provisioning templates** to check the new host can identify the right provisioning templates to use.

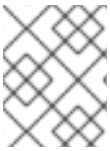
- In the **Virtual Machine** tab:
  - These settings should be populated with details from the chosen host group and compute profile. Modify these settings to suit your needs.
- In the **Parameters** tab:
  - Confirm the **kt_activation_keys** parameter exists and is using the **example** activation key.

Click **Submit**.

For CLI Users

Create the host with the **hammer host create** command and include **--provision-method image** to use image-based provisioning. For example:

```
# hammer host create --name "rhev-test2" --organization "ACME" \
--location "New York" --hostgroup "Base" \
--compute-resource "ACME's RHEV" --provision-method image \
--image "Test RHEV Image" --enabled true --managed true \
--interface
"managed=true,primary=true,provision=true,compute_name=eth0,compute_networ
k=satnetwork" \
--compute-
attributes="cluster=Default,cores=1,memory=1073741824,start=true" \
--volume="size_gb=20G,storage_domain=Data,bootable=true"
```



NOTE

See Appendix B, *Additional Host Parameters for Hammer CLI* for more information on additional host creation parameters for this compute resource.

This new host entry triggers the Red Hat Enterprise Virtualization server to create the virtual machine, using the pre-existing image as a basis for the new volume.

8.8. CHAPTER SUMMARY

This chapter showed how to configure Red Hat Satellite 6 to use a Red Hat Enterprise Virtualization server and how to provision new hosts through a Red Hat Enterprise Virtualization server. This included both network-based hosts and image-based hosts.

If you have no further compute resources to configure with Red Hat Satellite 6, see Chapter 13, *Finalizing Provisioning* for some final notes on provisioning.

The next chapter explores methods of provisioning from a VMware vSphere platform.

CHAPTER 9. PROVISIONING VIRTUAL MACHINES IN VMWARE VSPHERE

VMware vSphere is an enterprise-level virtualization platform from VMware. Red Hat Satellite 6 can interact with the vSphere platform, including creating new virtual machines and controlling their power management states. In this chapter, the aim is to add a connection to ACME's vSphere environment and provision a virtual machine.

9.1. DEFINING REQUIREMENTS FOR VMWARE VSPHERE PROVISIONING

The requirements for VMware vSphere provisioning include:

- Synchronized content repositories for Red Hat Enterprise Linux 7. See Synchronizing Red Hat Repositories in the *Red Hat Satellite 6 Content Management Guide* for more information.
- A Capsule Server managing a network on the vSphere environment. Ensure no other DHCP services run on this network to avoid conflicts with the Capsule Server. See Chapter 4, *Configuring Networking* for more information.
- An existing VMware template if you aim to use image-based provisioning.
- An example activation key for host registration. See Section 3.6, "Creating an Activation Key" for more information.

9.2. CREATING A VMWARE VSPHERE USER

The VMware vSphere server requires an administration-like user for Satellite Server communication. For security reasons, Red Hat advises against using the `administrator` user for such communication. Instead, create a new user with the following permissions:

- All Privileges → Datastore → Allocate Space
- All Privileges → Network → Assign Network
- All Privileges → Resource → Assign virtual machine to resource pool
- All Privileges → Virtual Machine → Configuration (All)
- All Privileges → Virtual Machine → Interaction
- All Privileges → Virtual Machine → Inventory
- All Privileges → Virtual Machine → Provisioning

9.3. ADDING A VMWARE VSPHERE CONNECTION TO THE SATELLITE SERVER

This process adds a VMware vSphere connection in the Satellite Server's compute resources.

For Web UI Users

Navigate to **Infrastructure > Compute resource** and click **New Compute Resource**. The UI provides a set of fields for the compute resource:

- **Name** - A plain text name for the resource. For example, **`ACME's vSphere`**.
- **Provider** - A field for selecting the compute resource provider. Select **`VMware`** and a new set of fields appear.
- **Description** - A plain text description for the resource. For example, **`VMware vSphere at vsphere.example.com`**.
- **VCenter/Server** - The IP address or host name of the vCenter server. For example, **`vsphere.example.com`**.
- **Username** - The user with permission to access the vCenter's resources. For example, **`SatelliteUser`**.
- **Password** - The password for the chosen user.
- **Datacenter** - Once the **URL**, **Username**, and **Password** are entered, click **Load Datacenters** to populate the list of data centers from your VMware vSphere environment. Select a specific data center to manage from this list.
- **Fingerprint** - The certificate fingerprint for accessing your vSphere environment. This field is usually populated with the fingerprint from your chosen data center.
- **Console passwords** - Secures console access for new hosts with a randomly generated password.

The **Locations** and **Organizations** tabs are automatically set to your current context. Add additional contexts to these tabs.

Click **Submit** to save the connection.

For CLI Users

Create the connection with the **`hammer compute-resource create`** command. Select **`Vmware`** as the **`--provider`** and set the instance UUID of the data center as the **`--uuid`**:

```
# hammer compute-resource create --name "ACME's vSphere" \
--provider "Vmware" \
--description "vSphere server at vsphere.example.com" \
--server "vsphere.example.com" --user "SatelliteUser" \
--password "p@55w0rd!" --locations "New York" --organizations "ACME" \
--uuid 72cb9454-81cd-4231-a863-d9baf0f399f8
```

NOTE

Ensure that the host and network-based firewalls are configured to allow Satellite to vCenter communication on TCP port 443. Verify that Satellite is able to resolve the host name of vCenter and vCenter is able to resolve the Satellite Server host name.

9.4. ADDING VMWARE VSPHERE IMAGES ON THE SATELLITE SERVER

VMware vSphere uses templates as images for creating new virtual machines. If using image-based provisioning to create new hosts, you need to add VMware template details to your Satellite Server. This includes access details and the template name.

For Web UI Users

Navigate to **Infrastructure > Compute resource** and click the name of your VMware vSphere connection. The UI displays information about the connection, including an **Images** tab. This tab contains no images for new providers but you can add new ones. Click **New Image** and the UI provides a set of fields for the VMware vSphere template:

- **Name** - A plain text name for the image. For example, **`Test vSphere Image`**.
- **Operatingsystem** - A field for selecting the image's base operating system. For example, **`RedHat 7.2`**.
- **Architecture** - A field for selecting the operating system architecture. For example, **`x86_64`**.
- **Username** - The SSH user name for image access. This is normally the **`root`** user.
- **User data** - Defines if the image supports user data input, such as **`cloud-init`** data.
- **Password** - The SSH password for image access.
- **Image** - The relative path and name of the template on the vSphere environment. For example **`Templates/RHEL72`**. Do not include the data center in the relative path.

Click **Submit** to save the image details.

For CLI Users

Create the image with the **`hammer compute-resource image create`** command. Use the **`--uuid`** field to store the relative template path on the vSphere environment.

```
# hammer compute-resource image create --name "Test vSphere Image" \
--operatingsystem "RedHat 7.2" --architecture "x86_64" \
--username root --uuid "Templates/RHEL72" \
--compute-resource "ACME's vSphere"
```

9.5. ADDING VMWARE VSPHERE DETAILS TO A COMPUTE PROFILE

You can predefine certain hardware settings for virtual machines on VMware vSphere. You achieve this through adding these hardware settings to a compute profile. For this example, the aim is to include some basic hardware settings to the **`4-Example`** profile.

For Web UI Users

Navigate to **Infrastructure > Compute profiles** and click the name of your profile. For example, use the **`4-Example`** profile you previously created. The UI displays a list of your compute resources. Click on the vSphere connection.

The UI provides a set of fields where you can input VMware-specific details for the profile. This includes:

- **CPUs** - The number of CPUs to allocate to the new host.
- **Cores per socket** - The number of cores to allocate to each CPU.
- **Memory** - The amount of memory to allocate to the new host.
- **Cluster** - The target host cluster on the VMware environment.

- **Resource pool** - The resource pool containing the available resource allocations for the host.
- **Folder** - The folder to organize the host.
- **Guest OS** - Defines the underlying operating system in VMware vSphere.
- **SCSI controller** - Defines the disk access method.
- **Virtual H/W version** - Defines the underlying VMware hardware abstraction to use for virtual machines.
- **Memory hot add** or **CPU hot add** - Define whether you can add more resources while the virtual machine is powered.
- **Image** - The image to use if performing image-based provisioning. For this example, use the **`Test VMware Image`**.
- **Network Interfaces** - Defines the network parameters for the host's network interface. You can create multiple network interfaces. However, at least one interface should point to a Capsule-managed network. The network interface options include:
  - **NIC type** - Defines the VMware network interface type.
  - **Network** - Defines the virtual network to use.
- **Storage** - Defines volumes for the host. You can create multiple volumes for the host. The storage options include:
  - **Data store** - Defines the storage location for the volume.
  - **Size (GB)** - Defines the size of the volume in GB.
  - **Thin provision** - Defines whether to use thin provisioning or preallocation of the full disk.
  - **Eager zero** - Defines whether to use eager zero thick provisioning. If unchecked, the disk uses lazy zero thick provisioning.

Click **Submit** to save the compute profile.

For CLI Users

The compute profile CLI commands are not yet implemented in Red Hat Satellite 6.2. As an alternative, you can include the same settings directly during the host creation process.

9.6. CREATING NETWORK-BASED HOSTS ON A VMWARE VSPHERE SERVER

The VMware vSphere provisioning process provides the option to create new hosts over a network connection. This requires the new host to access either the Satellite Server's integrated Capsule or an external Capsule Server on a VMware vSphere virtual network. This is so the host has access to PXE provisioning services.

IMPORTANT

If using a virtual network on the VMware vSphere server for provisioning, make sure to select one that does not provide DHCP assignments. This causes DHCP conflicts with the Satellite Server when booting new hosts.

For Web UI Users

Navigate to **Hosts > New host**. The UI provides a set of fields where you can input details for the host.

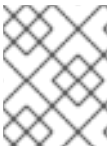
- In the **Host** tab:
  - Enter the **Name** of the Host. This becomes the provisioned system's host name. For this example: **`vmware-test1`**.
  - The provisioning context (**Organization** and **Location**) should automatically set to the current context. For this example: **ACME** and **`New York`**.
  - Select the **Host Group**. This should automatically populate most of the new host's fields. For this example: **Base**.
  - In **Deploy on**, select the VMware vSphere connection. For this example: **`ACME's vSphere`**. A new tab for virtual machines appears.
  - In **Compute profile**, select a profile to use to automatically populate virtual machine-based settings. For our example: **`4-Example`**.
- In the **Interface** tab:
  - Click **Edit** on the host's interface.
  - Most of the fields should automatically contain values. Note in particular:
    - The **Name** from the **Host** tab becomes the **DNS name**.
    - The Satellite Server automatically assigns an IP address for the new host.
  - Leave the **MAC address** blank. The VMware vSphere server assigns one to the host.
  - The Satellite Server should automatically select the **Managed**, **Primary**, and **Provision** options for the first interface on the host. If not, select them.
  - The interface screen shows the VMware vSphere-specific fields populated with settings from our compute profile. Modify these settings to suit your needs.
- In the **Operating System** tab:
  - All fields should automatically contain values. Confirm each aspect of the operating system.
  - Make sure the **Provisioning Method** is set to **`Network Based`**
  - Click **Resolve** in **Provisioning templates** to check the new host can identify the right provisioning templates to use.
- In the **Virtual Machine** tab:
  - These settings should be populated with details from the chosen host group and compute profile. Modify these settings to suit your needs.
- In the **Parameters** tab:
  - Confirm the **`kt_activation_keys`** parameter exists and is using the **`example`** activation key.

Click **Submit**.

For CLI Users

Create the host with the **`hammer host create`** command and include **`--provision-method build`** to use network-based provisioning. For example:

```
# hammer host create --name "vmware-test1" --organization "ACME" \
--location "New York" --hostgroup "Base" \
--compute-resource "ACME's vSphere" --provision-method build \
--build true --enabled true --managed true \
--interface
"managed=true,primary=true,provision=true,compute_type=VirtualE1000,comput
e_network=mynetwork" \
--compute-
attributes="cpus=1,corespersocket=2,memory_mb=1024,cluster=MyCluster,path=
MyVMs,start=true" \
--volume="size_gb=20G,datastore=Data,name=myharddisk,thin=true"
```



NOTE

See Appendix B, *Additional Host Parameters for Hammer CLI* for more information on additional host creation parameters for this compute resource.

This new host entry triggers the VMware vSphere server to create the virtual machine. If the virtual machine detects the defined Capsule Server through the virtual network, the virtual machine boots to PXE and begins to install the chosen operating system.

9.7. CREATING IMAGE-BASED HOSTS ON A VMWARE VSPHERE SERVER

The VMware vSphere provisioning process also provides the option to create new hosts from existing images on the VMware vSphere server.

For Web UI Users

Navigate to **Hosts > New host**. The UI provides a set of fields where you can input details for the host.

- In the **Host** tab:
  - Enter the **Name** of the Host. This becomes the provisioned system's host name. For this example: **`vmware-test1`**.
  - The provisioning context (**Organization** and **Location**) should automatically set to the current context. For this example: **`ACME`** and **`New York`**.
  - Select the **Host Group**. This should automatically populate most of the new host's fields. For this example: **`Base`**.
  - In **Deploy on**, select the VMware vSphere connection. For this example: **`ACME's vSphere`**. A new tab for virtual machines appears.
  - In **Compute profile**, select a profile to use to automatically populate virtual machine-based settings. For our example: **`4-Example`**.

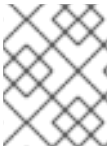
- In the **Interface** tab:
  - Click **Edit** on the host's interface.
  - Most of the fields should automatically contain values. Note in particular:
    - The **Name** from the **Host** tab becomes the **DNS name**.
    - The Satellite Server automatically assigns an IP address for the new host.
  - Leave the **MAC address** blank. The VMware vSphere server assigns one to the host.
  - The Satellite Server should automatically select the **Managed**, **Primary**, and **Provision** options for the first interface on the host. If not, select them.
  - The interface screen shows the VMware vSphere-specific fields populated with settings from our compute profile. Modify these settings to suit your needs.
- In the **Operating System** tab:
  - All fields should automatically contain values. Confirm each aspect of the operating system.
  - Make sure the **Provisioning Method** is set to **`Image Based`**. A new **Image** field appears. This field allows you to select the image as a basis for the new host's root volume. This is also automatically populated from the compute profile you chose in the **Host** tab.
  - Click **Resolve** in **Provisioning templates** to check the new host can identify the right provisioning templates to use.
- In the **Virtual Machine** tab:
  - These settings should be populated with details from the chosen host group and compute profile. Modify these settings to suit your needs.
- In the **Parameters** tab:
  - Confirm the **`kt_activation_keys`** parameter exists and is using the **`example`** activation key.

Click **Submit**.

For CLI Users

Create the host with the **`hammer host create`** command and include **`--provision-method image`** to use image-based provisioning. For example:

```
# hammer host create --name "vmware-test2" --organization "ACME" \
--location "New York" --hostgroup "Base" \
--compute-resource "ACME's RHEV" --provision-method image \
--image "Test RHEV Image" --enabled true --managed true \
--interface
"managed=true,primary=true,provision=true,compute_type=VirtualE1000,comput
e_network=mynetwork" \
--compute-
attributes="cpus=1,corespersocket=2,memory_mb=1024,cluster=MyCluster,path=
MyVMs,start=true" \
--volume="size_gb=20G,datastore=Data,name=myharddisk,thin=true"
```



NOTE

See Appendix B, *Additional Host Parameters for Hammer CLI* for more information on additional host creation parameters for this compute resource.

This new host entry triggers the VMware vSphere server to create the virtual machine, using the pre-existing image as a basis for the new volume.

9.8. CHAPTER SUMMARY

This chapter showed how to configure Red Hat Satellite 6 to use a VMware vSphere server and how to provision new hosts through a VMware vSphere server. This included both network-based hosts and image-based hosts.

If you have no further compute resources to configure with Red Hat Satellite 6, see Chapter 13, *Finalizing Provisioning* for some final notes on provisioning.

The next chapter explores methods of provisioning from a Red Hat OpenStack Platform environment.

CHAPTER 10. PROVISIONING CLOUD INSTANCES IN RED HAT OPENSTACK PLATFORM

Red Hat OpenStack Platform provides the foundation to build a private or public Infrastructure-as-a-Service (IaaS) cloud on Red Hat Enterprise Linux. It offers a massively scalable, fault-tolerant platform for the development of cloud-enabled workloads. Red Hat Satellite 6 can interact with Red Hat OpenStack Platforms REST API to create new cloud instances and control their power management states. In this chapter, the aim is to add a connection to ACME's Red Hat OpenStack Platform environment and provision a cloud instance.

10.1. DEFINING REQUIREMENTS FOR RED HAT OPENSTACK PLATFORM PROVISIONING

The requirements for Red Hat OpenStack Platform provisioning include:

- Synchronized content repositories for Red Hat Enterprise Linux 7. See Synchronizing Red Hat Repositories in the *Red Hat Satellite 6 Content Management Guide*for more information.
- A Capsule Server managing a network in your OpenStack environment. See Chapter 4, *Configuring Networking* for more information.
- An image added to OpenStack Image Storage (glance) service for image-based provisioning. See the Red Hat OpenStack Platform Instances and Images Guide for more information.
- An example activation key for host registration. See Section 3.6, "Creating an Activation Key" for more information.

10.2. ADDING A RED HAT OPENSTACK PLATFORM CONNECTION TO THE SATELLITE SERVER

This process adds the Red Hat OpenStack Platform connection in the Satellite Server's compute resources.

For Web UI Users

Navigate to **Infrastructure > Compute resource** and click **New Compute Resource**. The UI provides a set of fields for the compute resource:

- **Name** - A plain text name for the resource. For example, **`ACME's OpenStack`**.
- **Provider** - A field for selecting the compute resource provider. Select **`RHEL OpenStack Platform`** and a new set of fields appear.
- **Description** - A plain text description for the resource. For example, **`ACME's OpenStack environment at openstack.example.com`**.
- **URL** - A URL pointing to the OpenStack Authentication (keystone) service's API at the **`tokens`** resource. For example: **`http://openstack.example.com:5000/v2.0/tokens`**
- **Username** and **Password** - The authentication user and password for Satellite to access the environment.
- **Tenant** - Defines the tenant or project for the Satellite Server to manage.

- **Allow external network as main network** - Select to allow external networks for use as primary networks for hosts.

The **Locations** and **Organizations** tabs are automatically set to your current context. Add additional contexts to these tabs.

Click **Submit** to save the Red Hat OpenStack Platform connection.

For CLI Users

Create the connection with the **`hammer compute-resource create`** command:

```
# hammer compute-resource create --name "ACME's OpenStack" \
--provider "OpenStack" \
--description "ACME's OpenStack environment at openstack.example.com" \
--url "http://openstack.example.com:5000/v2.0/tokens" --user "admin" \
--password "p@55w0rd!" --tenant "openstack" --locations "New York" \
--organizations "ACME"
```

10.3. ADDING RED HAT OPENSTACK PLATFORM IMAGES ON THE SATELLITE SERVER

Red Hat OpenStack Platform uses image-based provisioning to create new hosts. This means you need to add image details to your Satellite Server. This includes access details and image location.

For Web UI Users

Navigate to **Infrastructure > Compute resource** and click the name of your Red Hat OpenStack Platform connection. The UI displays information about the connection, including an **Images** tab. This tab contains no images for new providers but you can add new ones. Click **New Image** and the UI provides a set of fields for the Red Hat OpenStack Platform image:

- **Name** - A plain text name for the image. For example, **`Test OpenStack Image`**.
- **Operatingsystem** - A field for selecting the image's base operating system. For example, **`RedHat 7.2`**.
- **Architecture** - A field for selecting the operating system architecture. For example, **`x86_64`**.
- **Username** - The SSH user name for image access. This is normally the **`root`** user.
- **Password** - The SSH password for image access.
- **Image** - The image in OpenStack Image Storage.
- **User data** - Defines if the image supports user data input, such as **`cloud-init`** data.

Click **Submit** to save the image details.

For CLI Users

Create the image with the **`hammer compute-resource image create`** command. Use the **`--uuid`** field to store the full path of the image location on the Red Hat OpenStack Platform server.

```
# hammer compute-resource image create --name "Test OpenStack Image" \
--operatingsystem "RedHat 7.2" --architecture "x86_64" \
```

```
--username root --user-data true \
--compute-resource "ACME's OpenStack Platform"
```

10.4. ADDING RED HAT OPENSTACK PLATFORM DETAILS TO A COMPUTE PROFILE

You can predefine certain hardware settings for instances on Red Hat OpenStack Platform. You achieve this through adding these hardware settings to a compute profile. For this example, the aim is to include some basic hardware settings to the **`4-Example`** profile.

For Web UI Users

Navigate to **Infrastructure > Compute profiles** and click the name of your profile. For example, use the **`4-Example`** profile you previously created. The UI displays a list of your compute resources. Click on the OpenStack Platform connection.

The UI provides a set of fields where you can input Amazon-specific details for the profile. This includes:

- **Flavor** - The hardware profile on OpenStack Platform to use for the host.
- **Availability zone** - The target cluster to use within the OpenStack Platform environment.
- **Image** - The image to use for image-based provisioning. For this example, use the **`Test OpenStack Image`**.
- **Tenant** - The tenant or project for the OpenStack Platform instance.
- **Security Group** - Defines the cloud-based access rules for ports and IP addresses.
- **Internal network** - Defines the private networks for the host to join.
- **Floating IP network** - Defines the external networks for the host to join and assign a floating IP address.
- **Boot from volume** - Defines whether to create a volume from the image. If not selected, the instance boots the image directly.
- **New boot volume size (GB)** - Defines the size of the new boot volume in GB.

Click **Submit** to save the compute profile.

For CLI Users

The compute profile CLI commands are not yet implemented in Red Hat Satellite 6.2. As an alternative, you can include the same settings directly during the host creation process.

10.5. CREATING IMAGE-BASED HOSTS ON RED HAT OPENSTACK PLATFORM

The Red Hat OpenStack Platform provisioning process creates new hosts from existing images on the Red Hat OpenStack Platform server.

For Web UI Users

Navigate to **Hosts > New host**. The UI provides a set of fields where you can input details for the host.

- In the **Host** tab:
  - Enter the **Name** of the Host. This becomes the provisioned system's host name. For this example, enter **`openstack-test1`**.
  - The provisioning context (**Organization** and **Location**) should automatically set to the current context. For this example: **ACME** and **`New York`**.
  - Select the **Host Group**. This should automatically populate most of the new host's fields. For this example: **Base**.
  - In **Deploy on**, select the OpenStack Platform connection. For this example: **`ACME's OpenStack Platform`**. A new tab for virtual machines appears.
  - In **Compute profile**, select a profile to use to automatically populate cloud instance-based settings. For our example: **`4-Example`**.
- In the **Interface** tab:
  - Click **Edit** on the host's interface.
  - Most of the fields should automatically contain values. Note in particular:
    - The **Name** from the **Host** tab becomes the **DNS name**.
    - The Satellite Server automatically assigns an IP address for the new host.
  - Leave the **MAC address** blank. The Red Hat OpenStack Platform server assigns one to the host.
  - The Satellite Server should automatically select the **Managed**, **Primary**, and **Provision** options for the first interface on the host. If not, select them.
- In the **Operating System** tab:
  - All fields should automatically contain values. Confirm each aspect of the operating system.
  - The **Image** field contains the chosen image from your compute profile. This field also allows you to select a different image to base the new host's root volume.
  - Click **Resolve** in **Provisioning templates** to check the new host can identify the right provisioning templates to use.
- In the **Virtual Machine** tab:
  - These settings should be populated with details from the chosen host group and compute profile. Modify these settings to suit your needs.
- In the **Parameters** tab:
  - Confirm the **`kt_activation_keys`** parameter exists and is using the **`example`** activation key.

Click **Submit**.

For CLI Users

Create the host with the **`hammer host create`** command and include **`--provision-method`**

image to use image-based provisioning. For example:

```
# hammer host create --name "openstack-test1" --organization "ACME" \
--location "New York" --hostgroup "Base" \
--compute-resource "ACME's OpenStack Platform" --provision-method image \
--image "Test OpenStack Image" --enabled true --managed true \
--interface "managed=true,primary=true,provision=true" \
--compute-
attributes="flavor_ref=m1.small,tenant_id=openstack,security_groups=defaul
t,network=mynetwork"
```

NOTE

See Appendix B, *Additional Host Parameters for Hammer CLI* for more information on additional host creation parameters for this compute resource.

This new host entry triggers the Red Hat OpenStack Platform server to create the instance, using the pre-existing image as a basis for the new volume.

10.6. CHAPTER SUMMARY

This chapter showed how to configure Red Hat Satellite 6 to use a Red Hat OpenStack Platform server and how to provision new hosts through a Red Hat OpenStack Platform server. This included both network-based hosts and image-based hosts.

If you have no further compute resources to configure with Red Hat Satellite 6, see Chapter 13, *Finalizing Provisioning* for some final notes on provisioning.

The next chapter explores methods of provisioning from Amazon's EC2 public cloud service.

CHAPTER 11. PROVISIONING CLOUD INSTANCES IN AMAZON EC2

Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides public cloud compute resources. Red Hat Satellite 6 can interact with Amazon EC2's public API to create new cloud instances and control their power management states. In this chapter, the aim is to add a connection to ACME's Amazon EC2 account and provision a cloud instance.

11.1. DEFINING REQUIREMENTS FOR AMAZON EC2 PROVISIONING

The requirements for Amazon EC2 provisioning include:

- Synchronized content repositories for Red Hat Enterprise Linux 7. See Synchronizing Red Hat Repositories in the *Red Hat Satellite 6 Content Management Guide*for more information.
- A Capsule Server managing a network in your EC2 environment. Ideally, this should be a Virtual Private Cloud (VPC) to ensure a secure network between the hosts and the Capsule Server.
- A chosen Amazon Machine Image (AMI) for image-based provisioning.
- An example activation key for host registration. See Section 3.6, "Creating an Activation Key" for more information.

11.2. ADDING A AMAZON EC2 CONNECTION TO THE SATELLITE SERVER

This process adds the Amazon EC2 connection in the Satellite Server's compute resources.

IMPORTANT

Amazon Web Services uses time settings as part of the authentication process. This means the time on the Satellite Server should be correctly synchronized. Ensure that an NTP service, such as **ntpd** or **chronyd**, is running properly on the Satellite Server. Failure to provide the correct time to Amazon Web Services can lead to authentication failures. For more information, see Synchronizing Time in the *Red Hat Satellite 6 Installation Guide*.

For Web UI Users

Navigate to **Infrastructure > Compute resource** and click **New Compute Resource**. The UI provides a set of fields for the compute resource:

- **Name** - A plain text name for the resource. For example, **ACME's EC2**.
- **Provider** - A field for selecting the compute resource provider. Select **EC2** and a new set of fields appear.
- **Description** - A plain text description for the resource. For example, **Amazon EC2 Public Cloud**.
- **Access Key** and **Secret Key** - The access keys for your Amazon EC2 account. You generate these keys on the Amazon EC2 Management Console under **Security Credentials**. For more information, see Managing Access Keys for your AWS Account on the Amazon documentation

website.

- **Region** - Defines the Amazon EC2 region/data center to use. Once you enter your access keys, click **Load Regions** to show the regions available.

The **Locations** and **Organizations** tabs are automatically set to your current context. Add additional contexts to these tabs.

Click **Submit** to save the Amazon EC2 connection.

For CLI Users

Create the connection with the **`hammer compute-resource create`** command. The **`--user`** and **`--password`** fields acts as the access key and secret key respectively. For example:

```
# hammer compute-resource create --name "ACME's EC2" --provider "EC2" \
--description "Amazon EC2 Public Cloud` --user "ABCDEFGHIJ1234567" \
--password "*********" --region "us-east-1" --locations "New York" \
--organizations "ACME"
```

11.3. ADDING AMAZON EC2 IMAGES ON THE SATELLITE SERVER

Amazon EC2 uses image-based provisioning to create new hosts. This means you need to add image details to your Satellite Server. This includes access details and image location.

For Web UI Users

Navigate to **Infrastructure > Compute resource** and click the name of your Amazon EC2 connection. The UI displays information about the connection, including an **Images** tab. This tab contains no images for new providers but you can add new ones. Click **New Image** and the UI provides a set of fields for the Amazon EC2 image:

- **Name** - A plain text name for the image. For example, **`Test Amazon EC2 Image`**.
- **Operatingsystem** - A field for selecting the image's base operating system. For example, **`RedHat 7.2`**.
- **Architecture** - A field for selecting the operating system architecture. For example, **`x86_64`**.
- **Username** - The SSH user name for image access. This is normally the **`root`** user.
- **Password** - The SSH password for image access.
- **Image ID** - The Amazon Machine Image (AMI) ID for the image. This is usually in the following format: **`ami-xxxxxxxx`**. For example, **`ami-b32c14ad`**.
- **User data** - Defines if the image supports user data input, such as **`cloud-init`** data.
- **IAM role** - The Amazon security role used for creating the image.

Click **Submit** to save the image details.

For CLI Users

Create the image with the **`hammer compute-resource image create`** command. Use the **`--uuid`** field to store the full path of the image location on the Amazon EC2 server.

```
# hammer compute-resource image create --name "Test Amazon EC2 Image" \
--operatingsystem "RedHat 7.2" --architecture "x86_64" --username root \
--user-data true --uuid "ami-b32c14ad" --compute-resource "ACME's EC2"
```

11.4. ADDING AMAZON EC2 DETAILS TO A COMPUTE PROFILE

We can predefine certain hardware settings for instances on Amazon EC2. You achieve this through adding these hardware settings to a compute profile. For this example, we aim to include some basic hardware settings to the **`4-Example`** profile.

For Web UI Users

Navigate to **Infrastructure > Compute profiles** and click the name of your profile. For example, use the **`4-Example`** profile you previously created. The UI displays a list of your compute resources. Click on the EC2 connection.

The UI provides a set of fields where you can input Amazon-specific details for the profile. This includes:

- **Flavor** - The hardware profile on EC2 to use for the host.
- **Image** - The image to use for image-based provisioning. For this example, use the **`Test EC2 Image`**.
- **Availability zone** - The target cluster to use within the chosen EC2 region.
- **Subnet** - The subnet for the EC2 instance. If you have a VPC for provisioning new hosts, use its subnet.
- **Security Groups** - Defines the cloud-based access rules for ports and IP addresses. Select the groups to apply to the host.
- **Managed IP** - Defines the IP address assignment type. This is either a **`Public`** IP or a **`Private`** IP.

Click **Submit** to save the compute profile.

For CLI Users

The compute profile CLI commands are not yet implemented in Red Hat Satellite 6.2. As an alternative, you can include the same settings directly during the host creation process.

11.5. CREATING IMAGE-BASED HOSTS ON AMAZON EC2

The Amazon EC2 provisioning process creates new hosts from existing images on the Amazon EC2 server.

For Web UI Users

Navigate to **Hosts > New host** . The UI provides a set of fields where you can input details for the host.

- In the **Host** tab:
  - Enter the **Name** of the Host. This becomes the provisioned system's host name. For this example, enter **`ec2-test1`**.

- The provisioning context (**Organization** and **Location**) should automatically set to the current context. For this example: **ACME** and **New York**.
- Select the **Host Group**. This should automatically populate most of the new host's fields. For this example: **Base**.
- In **Deploy on**, select the EC2 connection. For this example: **ACME's EC2**. A new tab for virtual machines appears.
- In **Compute profile**, select a profile to use to automatically populate virtual machine-based settings. For our example: **4-Example**.

- In the **Interface** tab:
  - Click **Edit** on the host's interface.
  - Most of the fields should automatically contain values. Note in particular:
    - The **Name** from the **Host** tab becomes the **DNS name**.
    - The Satellite Server automatically assigns an IP address for the new host.
  - Leave the **MAC address** blank. The Amazon EC2 server assigns one to the host.
  - The Satellite Server should automatically select the **Managed**, **Primary**, and **Provision** options for the first interface on the host. If not, select them.
- In the **Operating System** tab:
  - All fields should automatically contain values. Confirm each aspect of the operating system.
  - The **Image** field contains the chosen image from your compute profile. This field also allows you to select a different image to base the new host's root volume.
  - Click **Resolve** in **Provisioning templates** to check the new host can identify the right provisioning templates to use.
- In the **Virtual Machine** tab:
  - These settings should be populated with details from the chosen host group and compute profile. Modify these settings to suit your needs.
- In the **Parameters** tab:
  - Confirm the **kt_activation_keys** parameter exists and is using the **example** activation key.

Click **Submit**.

For CLI Users

Create the host with the **hammer host create** command and include **--provision-method image** to use image-based provisioning. For example:

```
# hammer host create --name "ec2-test1" --organization "ACME" \
--location "New York" --hostgroup "Base" \
--compute-resource "ACME's EC2" --provision-method image \
```

```
--image "Test Amazon EC2 Image" --enabled true --managed true \
--interface "managed=true,primary=true,provision=true,subnet_id=EC2" \
--compute-
attributes="flavor_id=m1.small,image_id=TestImage,availability_zones=us-
east-1a,security_group_ids=Default,managed_ip=Public"
```

NOTE

See Appendix B, *Additional Host Parameters for Hammer CLI* for more information on additional host creation parameters for this compute resource.

This new host entry triggers the Amazon EC2 server to create the instance, using the pre-existing image as a basis for the new volume.

11.6. CHAPTER SUMMARY

This chapter showed how to configure Red Hat Satellite 6 to use a Amazon EC2 server and how to provision new hosts through a Amazon EC2 server. This included both network-based hosts and image-based hosts.

If you have no further compute resources to configure with Red Hat Satellite 6, see Chapter 13, *Finalizing Provisioning* for some final notes on provisioning.

The next chapter explores methods of provisioning containers on a Red Hat Enterprise Linux Atomic Server.

CHAPTER 12. PROVISIONING CONTAINERS

Containerization is a virtualization method that uses the kernel of an operating system to provide multiple isolated user-space instances. Docker is an open source project that automates the deployment of applications inside Linux containers, and provides the capability to package an application with its runtime dependencies into a container. Linux containers enable rapid application deployment, simpler testing, maintenance, and troubleshooting while improving security.

Red Hat Enterprise Linux Atomic Host is a secure, lightweight, and minimal-footprint operating system optimized to run Linux containers. Red Hat Satellite 6 provides the ability to connect to Red Hat Enterprise Linux Atomic Host and other Docker-based servers. This includes creating new containers from images. In this chapter, the aim is to add a connection to ACME's Red Hat Enterprise Linux Atomic Host and provision a container.

12.1. DEFINING REQUIREMENTS FOR CONTAINER PROVISIONING

The requirements for provisioning on Red Hat Enterprise Linux Atomic Host include:

- A source for images, such as a Docker registry. Red Hat Satellite 6 uses three sources of container images:
  - Synchronized Docker images that are a part of the Satellite Server's application life cycle.
  - Public images from Docker Hub.
  - Other External registries, including Red Hat's container image registry. This is explored in Section 12.4, "Adding External Registries to the Satellite Server".

12.2. CONFIGURING THE RED HAT ENTERPRISE LINUX ATOMIC HOST

The Atomic Host requires some configuration before adding it to Satellite. This includes exposing the Docker API to the Satellite Server.

Log into the Atomic Host and edit the **`/etc/sysconfig/docker`** file:

```
$ vi /etc/sysconfig/docker
```

Find the **`OPTIONS`** parameter and modify it to expose the API:

```
OPTIONS='--selinux-enabled -H unix:///var/run/docker.sock -H
tcp://0.0.0.0:2375'
```

IMPORTANT

Use either port 2375 or 2376 for the connection. This is because the Satellite Server contains special SELinux rules to allow access to these ports. Using an alternative port results in authentication failure.

Import the Satellite Server certificate:

```
$ curl http://satellite.example.com/pub/katello-server-ca.crt \
-o /etc/pki/ca-trust/source/anchors/katello-server-ca.crt
$ update-ca-trust
```

Restart the **docker** service:

```
$ systemctl restart docker
```

Check the port is exposed:

```
$ netstat -tulnp | grep 2375
```

12.3. ADDING AN ATOMIC HOST CONNECTION TO THE SATELLITE SERVER

This process adds the Red Hat Enterprise Linux Atomic connection in the Satellite Server's compute resources.

For Web UI Users

Navigate to **Infrastructure > Compute resource** and click **New Compute Resource**. The UI provides a set of fields for the compute resource:

- **Name** - A plain text name for the resource. For example, **`ACME's Atomic`**.
- **Provider** - A field for selecting the compute resource provider. Select **`Docker`** and a new set of fields appear.
- **Description** - A plain text description for the resource. For example, **`ACME's Atomic Host at atomic.example.com`**.
- **URL** - A URL pointing to the Docker API on the Atomic Host. For example: **`http://atomic.example.com:2375`**
- **Username**, **Password**, **Email** - The authentication details for the Docker hub. The Satellite Server uses these details to make the Atomic host download images from the Docker hub. These details are not required if using public images or images managed on the Satellite Server.

The **Locations** and **Organizations** tabs are automatically set to your current context. Add additional contexts to these tabs.

Click **Submit** to save the Red Hat OpenStack Platform connection.

For CLI Users

Create the connection with the **`hammer compute-resource create`** command:

```
# hammer compute-resource create --provider docker \
--name "ACME's Atomic" --url "http://atomic.example.com:2375" \
--organizations 'Default Organization' --locations 'Default Location'
```

12.4. ADDING EXTERNAL REGISTRIES TO THE SATELLITE SERVER

The Red Hat Satellite 6 Content Management Guide discusses how Red Hat Satellite 6 can synchronize Docker images and manage them through Content Views. However, in others circumstances, you might only require access to an external registry without needing to synchronize the content. Red Hat Satellite 6 provides the ability to add an external Docker registry.

For Web UI Users

Navigate to **Containers > Registries** and click **New Registry**. The UI displays a set of fields for the new registry:

- **Name** - A plain text name for the registry. For example: **`Red Hat`**.
- **URL** - The location of the registry. For example: **`https://registry.access.redhat.com`**.
- **Description** - A plain text description of the registry. For example: **`Red Hat Docker Image Registry`**.
- **Username** and **Password** - Authentication details for private registries.

The **Locations** and **Organizations** tabs are automatically set to your current context. Add additional contexts to these tabs.

Click **Submit** to save the external registry.

For CLI Users

Create the registry with the **`hammer docker registry create`** command:

```
# hammer docker registry create --name "Red Hat" \
--url "https://registry.access.redhat.com" \
--description "Red Hat Docker Image Registry"
```

12.5. CREATING CONTAINERS WITH THE SATELLITE SERVER

The container provisioning process differs from the standard host creation process. Instead of creating containers through the **Hosts > New host** menu, you use the **Containers > New container** option.

For Web UI Users

Navigate to **Containers > New container** . The UI provides a wizard to create the container:

Preliminary

This section defines the Atomic host to use and the provisioning context.

- Select the Docker compute resource. For our example: "ACME's Atomic"
- The provisioning context (**Organization** and **Location**) should automatically set to the current context. For this example: **ACME** and **`New York`**.

Image

This section provides the image selection methods, which includes three different methods:

- **Content View** - Select an image from the Satellite Server's application life cycle. Select the **Lifecycle Environment**, the **Content View**, the **Repository**, the Docker **Tag**, and the **Capsule** Server containing the docker content.
- **Docker Hub** - Provides a search feature for Docker images on the Docker hub. Type a **Search** keyword, click the magnifying glass icon, and a list of images displays. Select an image, then select a **Tag** for that image.

- **External registry** - Provides a search feature for Docker images on external Docker registries. Type a **Search** keyword, click the magnifying glass icon, and a list of images displays. Select an image, then select a **Tag** for that image.

Configuration

This section provides some initial configuration for the container:

- In the **Basic options**:
  - Enter a **Name** for the container.
  - Enter a **Command** to run on the container.
  - Enter an **Entry point**. The default is **`/bin/sh -c`**.
- In the **Compute options**:
  - Enter the **CPU sets**, which assigns individual CPUs.
  - Enter the **CPU share**, which set the share of CPU time available to containerized tasks.
  - Enter an amount for **Memory**, which allocates memory usage for the container.

Environment

This section provides some configuration to the Atomic host for when the container runs:

- **Environment variables** - Allows you to define a set of environment variables. For example: **`LANG=en_US.UTF-8`**.
- **Exposed Ports** - Opens ports in the container. For example, you can open SSH communication to the container on port 22.
- **DNS** - Enter DNS servers for the container.
- **Run?** - Choose whether to run the container after creation.
- **Shell** - Provides shell options, including a TTY console and standard streams (**`STDIN`**, **`STDOUT`**, and **`STDERR`**).

After completing all options in the wizard, click **Submit**.

For CLI Users

The following are three examples of the **`hammer docker container create`** command. First, creating a container from a Content View:

```
# hammer docker container create --compute-resource "ACME's Atomic" \
--repository-name "rhel7" --tag "latest" --name "docker-test1" \
--command "bash" --organizations "ACME" --locations "New York"
```

Next, provisioning from the Docker hub:

```
# hammer docker container create --compute-resource "ACME's Atomic" \
--repository-name "docker.io/fedora" --tag latest \
--name "docker-test2" --command bash --organizations "ACME" \
```

```
--locations "New York"
```

And finally, provisioning from an external registry:

```
# hammer docker container create --compute-resource "ACME's Atomic" \
--registry-id 1 --repository-name "rhel" --tag latest \
--name "docker-test3 --command bash --organizations "ACME" \
--locations "New York"
```

This creates a new container from the chosen image and runs it on the chosen Red Hat Enterprise Linux Atomic Host.

12.6. CHAPTER SUMMARY

This chapter showed how to configure Red Hat Satellite 6 to add and manage a Red Hat Enterprise Linux Atomic Host and how to provision containers on the Atomic host.

This guide has no further provisioning scenarios. See Chapter 13, *Finalizing Provisioning* for some final notes on provisioning.

CHAPTER 13. FINALIZING PROVISIONING

Provisioning new hosts is a central part of Red Hat Satellite 6's functionality. This chapter recaps on the topics discussed through the course of this guide and how it impacts other Red Hat Satellite 6 features.

13.1. COMPLETING SCENARIO OBJECTIVES

This guide presented multiple provisioning scenarios involving a fictional company called ACME. Through this scenario, this guide has demonstrated how to achieve the following:

Configuring Red Hat Satellite 6 for Provisioning

This guide has explored how to configure Red Hat Satellite 6's resources and services for provisioning purposes. This includes the installation media, templates, compute resources, and networking. In addition, this guide demonstrated how to configure a Capsule Server to use DHCP, DNS, and TFTP services for PXE-based provisioning.

Provisioning Bare Metal Hosts

This guide showed how to provision bare metal hosts through different methods, such as unattended provisioning, Discovery-based provisioning, and PXE-less provisioning.

Provisioning Virtual Machines

This guide provided examples on provisioning from virtualization environments, such as KVM servers, Red Hat Enterprise Virtualization, and VMware vSphere.

Provisioning Cloud Instances

This guide demonstrated how to provision cloud instances from public clouds (Amazon EC2) and private clouds (Red Hat OpenStack Platform).

Provisioning Container

This guide showed how to provision containers on Red Hat Enterprise Linux Atomic Host.

13.2. INTEGRATING WITH OTHER APPLICATIONS

Red Hat Satellite 6 extends the provisioning process with the following applications:

Puppet

Each Capsule Server (including the integrated Capsule) can act as a Puppet Master. The Satellite Server installs a Puppet Agent on each new host. This provides a method to automatically configure resources and services on hosts. You can add Puppet classes during the host provisioning process under the **Puppet Classes** tab. For more information, see the Red Hat Satellite 6 Puppet Guide .

Red Hat CloudForms

Red Hat CloudForms can connect to Red Hat Satellite 6 and control certain levels of provisioning and host management. For more information, see the Red Hat CloudForms Integration with Red Hat Satellite 6 Guide.

13.3. REFERRING TO OTHER DOCUMENTATION

The following guides provide information on related aspects of Red Hat Satellite 6 and provide further examples:

Red Hat Satellite 6 Host Configuration Guide

A guide to using the main Red Hat Satellite 6 features, including infrastructure management and provisioning.

https://access.redhat.com/documentation/en/red-hat-satellite/6.2/paged/host-configuration-guide/

Red Hat Satellite 6 Server Administration Guide

A guide on administering a Red Hat Satellite 6 Server.
https://access.redhat.com/documentation/en/red-hat-satellite/6.2/paged/server-administration-guide

Red Hat Satellite 6 Virtual Instances Guide

A guide on managing virtual instances with the `virt-who` tool.
https://access.redhat.com/documentation/en/red-hat-satellite/6.2/paged/virtual-instances-guide

Red Hat Satellite 6 Puppet Guide

A guide to building your own Puppet module and importing it into Red Hat Satellite 6.
https://access.redhat.com/documentation/en/red-hat-satellite/6.2/paged/puppet-guide/

APPENDIX A. INITIALIZATION SCRIPT FOR PROVISIONING EXAMPLES

If you have not followed the examples in the Red Hat Satellite 6 Content Management Guide, you can use the following initialization script to create an environment for provisioning examples.

Create a script file (**sat6-content-init.sh**) and include the following:

```
#!/bin/bash

MANIFEST=$1

# Import the content from Red Hat CDN
hammer organization create --name "ACME" --label "ACME" \
--description "Our example organization for managing content."
hammer subscription upload --file ~/$MANIFEST --organization "ACME"
hammer repository-set enable \
--name "Red Hat Enterprise Linux 7 Server (RPMs)" \
--releasever "7Server" --basearch "x86_64" \
--product "Red Hat Enterprise Linux Server" --organization "ACME"
hammer repository-set enable \
--name "Red Hat Enterprise Linux 7 Server (Kickstart)" \
--releasever "7Server" --basearch "x86_64" \
--product "Red Hat Enterprise Linux Server" --organization "ACME"
hammer repository-set enable \
--name "Red Hat Satellite Tools 6.2 (for RHEL 7 Server) (RPMs)" \
--basearch "x86_64" --product "Red Hat Enterprise Linux Server" \
--organization "ACME"
hammer product synchronize --name "Red Hat Enterprise Linux Server" \
--organization "ACME"

# Create our application life cycle
hammer lifecycle-environment create --name "Development" \
--description "Environment for ACME's Development Team" \
--prior "Library" --organization "ACME"
hammer lifecycle-environment create --name "Testing" \
--description "Environment for ACME's Quality Engineering Team" \
--prior "Development" --organization "ACME"
hammer lifecycle-environment create --name "Production" \
--description "Environment for ACME's Product Releases" \
--prior "Testing" --organization "ACME"

# Create and publish our Content View
hammer content-view create --name "Base" \
--description "Base operating system" \
--repositories "Red Hat Enterprise Linux 7 Server RPMs x86_64 7Server,Red
Hat Satellite Tools 6.2 for RHEL 7 Server RPMs x86_64" \
--organization "ACME"
hammer content-view publish --name "Base" \
--description "Initial content view for our operating system" \
--organization "ACME"
hammer content-view version promote --content-view "Base" --version 1 \
--to-lifecycle-environment "Development" --organization "ACME"
hammer content-view version promote --content-view "Base" --version 1 \
```

```
--to-lifecycle-environment "Testing" --organization "ACME"
hammer content-view version promote --content-view "Base" --version 1 \
--to-lifecycle-environment "Production" --organization "ACME"
```

Set executable permissions on the script:

```
# chmod +x sat6-content-init.sh
```

Download a copy of your Subscription Manifest from the Red Hat Customer Portal and run the script on the manifest:

```
# ./sat6-content-init.sh manifest_98f4290e-6c0b-4f37-ba79-3a3ec6e405ba.zip
```

This imports the necessary Red Hat content for the provisioning examples in this guide.

APPENDIX B. ADDITIONAL HOST PARAMETERS FOR HAMMER CLI

This appendix provides some information on additional parameters for the **`hammer host create`** command.

B.1. COMMON INTERFACE PARAMETERS

These parameters are used with the **`--interface`** option for all provisioning types:

Parameter	Description	
mac	MAC address for the interface	
ip	IP address for the interface	
type	The type of interface. For example: **`interface`**, **`bmc`**, or **`bond`**	
name	The host name associated with this interface`	
subnet_id	The subnet ID on the Satellite Server	
domain_id	The domain ID on the Satellite Server	
identifier	The device identifier. For example: **`eth0`**	
managed	Boolean for managed interfaces. Set to **`true`** or **`false`**	
primary	Boolean for primary interfaces. Managed hosts needs to have one primary interface. Set to **`true`** or **`false`**	
provision	Boolean for whether to provision on this interface. Set to **`true`** or **`false`**	
virtual	Boolean for whether the interface is a VLAN interface. Set to **`true`** or **`false`**	

Use the following parameters if **`virtual`** is **`true`**:

Parameter	Description	
tag	VLAN tag, this attribute has precedence over the subnet VLAN ID. Only for virtual interfaces.	
attached_to	Identifier of the interface to which this interface belongs. For example: `eth1`.	

Use the following parameters if `type` is `bond`:

Parameter	Description	
mode	The bonding mode. One of `balance-rr`, `active-backup`, `balance-xor`, `broadcast`, `802.3ad`, `balance-tlb`, `balance-alb`	
attached_devices	Identifiers of slave interfaces. For example: `[eth1,eth2]`	

Use the following parameters if `type` is `bmc`:

Parameter	Description	
provider	The BMC provider. Only `IPMI` is supported	
username	The username for the BMC device	
password	The password for the BMC device	

B.2. EC2 PARAMETERS

Available parameters for `--compute-attributes`:

Parameter	Description	
flavor_id	The EC2 flavor to use	
image_id	The AMI ID of the image to use	

Parameter	Description	
availability_zone	The availability zone within the region of the EC2 provider	
security_group_ids	The IDs for security groups to use	
managed_ip	Defines whether to use a public or private IP	

B.3. LIBVIRT PARAMETERS

Available keys for **`--compute-attributes`**:

Parameter	Description	
cpus	Number of CPUs	
memory	Amount of memory in bytes	
start	Boolean value that defines whether to start the machine or not	

Available keys for **`--interface`**:

Parameter	Description	
compute_type	Either **`bridge`** or **`network`**	
compute_network / compute_bridge	Name of the network or physical interface	
compute_model	The interface model. One of **`virtio`**, **`rtl8139`**, **`ne2k_pci`**, **`pcnet`**, or **`e1000`**	

Available keys for **`--volume`**:

Parameter	Description	
pool_name	The storage pool to store the volume	
capacity	The capacity of the volume. For example: **`10G`**	

Parameter	Description	
format_type	The disk type. Either `raw` or `qcow2`	

B.4. RED HAT OPENSTACK PLATFORM PARAMETERS

Available keys for `--compute-attributes`:

Parameter	Description	
flavor_ref	The flavor to use	
image_ref	The image to use	
tenant_id	The tenant to use	
security_groups	A list of security groups to use	
network	The network to connect the instance	

B.5. RED HAT ENTERPRISE VIRTUALIZATION PARAMETERS

Available keys for `--compute-attributes`:

Parameter	Description	
cluster	The cluster ID to contain the host	
template	The hardware profile to use	
cores	The number of CPU cores to use	
memory	The amount of memory in bytes	

Available keys for `--interface`:

Parameter	Description	
compute_name	The interface name. For example: `eth0`	
compute_network	The network in the cluster to use	

Available keys for `--volume`:

Parameter	Description	
size_gb	Volume size in GB	
storage_domain	Defines the storage domain to use	
bootable	Boolean value that defines the root volume. Only one volume can be bootable	

B.6. VMWARE INTERFACE PARAMETERS

Available keys for `--compute-attributes`:

Parameter	Description	
cpus	Number of CPUs for the host	
corespersocket	Number of cores per CPU socket. Applicable to hosts using hardware versions less than v10.	
memory_mb	Amount of memory in MB	
cluster	Cluster ID for the host	
path	Path to folder to organize the host	
guest_id	Guest OS ID	
scsi_controller_type	ID of the VMware controller	
hardware_version	VMware hardware version ID	
start	Boolean value that defines whether to start the machine or not	

Available keys for `--interface`:

Parameter	Description

Parameter	Description	
compute_type	Type of the network adapter. One of **`VirtualVmxnet`**, **`VirtualVmxnet2`**, **`VirtualVmxnet3`**, **`VirtualE1000`**, **`VirtualE1000e`**, **`VirtualPCNet32`**.	
compute_network	VMware network ID	

Available keys for **`--volume`**:

Parameter	Description	
datastore	The datastore ID	
name	The name of the volume	
size_gb	The size in GB	
thin	Boolean value that defines whether to use thin provisioning or not	
eager_zero	Boolean value that defines whether to use Eager Zero thick provisioning	

APPENDIX C. PROVISIONING FIPS COMPLIANT HOSTS

Red Hat Satellite 6 supports provisioning hosts that comply with the National Institute of Standards and Technology's Security Requirements for Cryptographic Modules standard, reference number FIPS 140-2, referred to here as FIPS.

Red Hat Satellite 6 is not supported on a FIPS enabled host.

To enable the provisioning of hosts that are FIPS compliant, complete the following changes:

- Identify the relevant operating systems, locations, and organizations
- Create and enable the FIPS provisioning templates
- Change the provisioning password hashing algorithm
- Change the Puppet message digest algorithm
- Set the FIPS enabled parameter

When these changes are complete, the new provisioning templates will be associated with those operating systems, locations, and organizations you specify. When you provision a host to those operating systems, locations, and organizations, the host will have the FIPS-compliant settings applied. To confirm that these settings have been successful, complete the steps in Section C.6, "Verifying FIPS Mode is Enabled".

Prerequisites

- Complete the configuration steps from the Authentication section in the *Red Hat Satellite 6 Hammer CLI Guide*. This allows you to run Hammer commands without providing your Satellite username and password each time.

C.1. IDENTIFYING THE RELEVANT OPERATING SYSTEMS, LOCATIONS, AND ORGANIZATIONS

Before creating the FIPS-compliant templates in Satellite, you must identify those locations, organizations and operating systems to which you want to deploy FIPS-compliant hosts. For example, if you will only deploy Red Hat Enterprise Linux 7 hosts as FIPS compliant, associate the template with only Red Hat Enterprise Linux 7.

1. List all locations.

   Example

   ```
   $ hammer location list
   ---|-----------------
   ID | NAME
   ---|-----------------
   2  | Default Location
   ---|-----------------
   ```

   Note the value in the **NAME** column of those locations to which you want to deploy FIPS-compliant hosts.

2. List all organizations.

Example

```
---|----------------------|----------------------|------------
ID | NAME                 | LABEL                | DESCRIPTION
---|----------------------|----------------------|------------
1  | Default Organization | Default_Organization |
2  | Sales                | Sales_Department     |
---|----------------------|----------------------|------------
```

Note the value in the **NAME** column of those organizations to which you want to deploy FIPS-compliant hosts.

3. List all operating systems.

Example

```
$ hammer os list
---|-----------------|--------------|-------
ID | TITLE           | RELEASE NAME | FAMILY
---|-----------------|--------------|-------
2  | RedHat 6.6      |              | Redhat
3  | RedHat 7.1      |              | Redhat
1  | RedHat 7.2      |              | Redhat
4  | RedHat 6.7      |              | Redhat
---|-----------------|--------------|-------
```

Note the value in the **TITLE** column of those operating systems to which you want to deploy FIPS-compliant hosts.

C.2. CREATING AND ENABLING THE FIPS PROVISIONING TEMPLATES

The FIPS provisioning templates are provided in a git repository. In this procedure you import them into the Satellite environment, then associate them with the desired operating systems, locations, and organizations.

1. On the Satellite Server, clone the git repository containing the FIPS enabled templates, then change into the repository's directory.

```
$ git clone https://github.com/RedHatSatellite/satellite6-fips-client
$ cd satellite6-fips-client
```

This repository contains the following Embedded RuBy (ERB) templates. These are plain text files, which you can view to see in detail the configuration settings they contain.

- **`Kickstart_Default_PXELinux_FIPS.erb`**
  - Updated PXELinux template
- **`fips_packages.erb`**
  - Packages required by FIPS mode (for example, **`dracut-fips`**)
- **`Satellite_Kickstart_Default_FIPS.erb`**

    - Kickstart template with modifications to call the **fips_packages** snippet

- **puppet.conf.erb**
    - Updated **puppet.conf** configuration file with updated (SHA256) message digest algorithm

2. Add the *PXELinux FIPS* template.

```
$ hammer template create  --name "Kickstart Default PXELinux FIPS" \
  --file Kickstart_Default_PXELinux_FIPS.erb  \
  --locations LOCATIONS \
  --organizations ORGANIZATION \
  --operatingsystems OS \
  --type PXELinux
```

Replace the placeholder values **LOCATIONS**, **ORGANIZATION**, and **OS** with the values you noted in Section C.1, “Identifying the Relevant Operating Systems, Locations, and Organizations” . If any value contains non-aphabetical characters, enclose the value in quotation marks (").

The message **Config template created** indicates success.

Example

```
$ hammer template create  --name "Kickstart Default PXELinux FIPS" \
  --file Kickstart_Default_PXELinux_FIPS.erb \
  --locations "Default Location" \
  --organizations "Default Organization","Sales" \
  --operatingsystems "RedHat 6.6","RedHat 7.1","RedHat 7.2","RedHat
6.7" \
  --type PXELinux
```

3. Add the *Satellite Kickstart Default FIPS* template.

```
$ hammer template create  --name "Satellite Kickstart Default FIPS"
\
  --file Satellite_Kickstart_Default_FIPS.erb  \
  --locations LOCATIONS \
  --organizations ORGANIZATION \
  --operatingsystems OS \
  --type provision
```

Replace the placeholder values **LOCATIONS**, **ORGANIZATION**, and **OS** with the values you noted in Section C.1, “Identifying the Relevant Operating Systems, Locations, and Organizations” . If any value contains non-aphabetical characters, enclose the value in quotation marks (").

The message **Config template created** indicates success.

Example

```
$ hammer template create  --name "Satellite Kickstart Default FIPS"
\
  --file Satellite_Kickstart_Default_FIPS.erb  \
  --locations "Default Location" \
  --organizations "Default Organization","Sales" \
```

```
  --operatingsystems "RedHat 6.6","RedHat 7.1","RedHat 7.2","RedHat
6.7" \
  --type provision
```

4. Add the *FIPS Packages* snippet.

```
$ hammer template create  --name "fips_packages" \
  --file fips_packages.erb \
  --locations LOCATIONS \
  --organizations ORGANIZATION \
  --type snippet
```

Replace the placeholder values *LOCATIONS* and *ORGANIZATION* with the values you noted in Section C.1, “Identifying the Relevant Operating Systems, Locations, and Organizations” . If any value contains non-aphabetical characters, enclose the value in quotation marks (").

The message **`Config template created`** indicates success.

Example

```
$ hammer template create  --name "fips_packages" \
  --file fips_packages.erb \
  --locations "Default Location" \
  --organizations "Default Organization","Sales" \
  --type snippet
```

5. Update the default Puppet configuration snippet.

```
$ hammer template update --name puppet.conf \
  --file puppet.conf.erb  \
  --type snippet
```

The message **`Config template created`** indicates success.

6. Update the Operating System Object to use the new templates.
Now that the new FIPS templates have been added to Satellite, they must be set as *default* templates for the desired operating system.

   a. Identify the IDs of the *Satellite Kickstart Default FIPS* and *Kickstart Default PXELinux FIPS* templates.

   Example

```
$ hammer template list
---|--------------------------------------|----------
ID | NAME                                 | TYPE
---|--------------------------------------|----------
41 | redhat_register                      | snippet
42 | saltstack_minion                     | snippet
53 | Kickstart Default PXELinux FIPS      | PXELinux
46 | Satellite Kickstart Default          | provision
48 | Satellite Kickstart Default Finish   | finish
54 | Satellite Kickstart Default FIPS     | provision
47 | Satellite Kickstart Default User Data | user_data
50 | subscription_manager_registration    | snippet
```

```
29 | UserData default                          | user_data
30 | WAIK default PXELinux                     | PXELinux
---|-----------------------------------------|----------
```

In this example, the IDs are 54 and 53 respectively. These IDs are installation specific.

b. Specify the FIPS templates as default.

```
$ hammer os set-default-template --config-template-id TEMPLATE \
--id OS
```

Replace the placeholders *TEMPLATE* and *OS* with the IDs of the FIPS templates, and the desired operating system, noted earlier. Repeat this command for every combination of FIPS template and operating system. It does not accept a comma-separated list of values.

In this example, the FIPS templates are set as default for Red Hat Enterprise Linux 7.2, identified in an earlier example as ID 1.

Example

```
$ hammer os set-default-template --config-template-id 54 --id 1
$ hammer os set-default-template --config-template-id 53 --id 1
```

C.3. CHANGE THE PROVISIONING PASSWORD HASHING ALGORITHM

This sets the password hashing algorithm used in provisioning to SHA256. This configuration setting must be applied for each operating system you want to deploy as FIPS compliant.

NOTE

This is required **ONLY** if Red Hat Satellite 6 was upgraded from Satellite 6.1. Satellite 6.2 uses SHA256 by default.

1. Identify the Operating System IDs.

Example

```
$ hammer os list
---|-----------------|--------------|-------
ID | TITLE           | RELEASE NAME | FAMILY
---|-----------------|--------------|-------
2  | RedHat 6.6      |              | Redhat
3  | RedHat 7.1      |              | Redhat
1  | RedHat 7.2      |              | Redhat
4  | RedHat 6.7      |              | Redhat
---|-----------------|--------------|-------
```

2. Update each operating system's password hash value.

```
$ hammer os update --title OS \
  --password-hash SHA256
```

Repeat this command for each of the desired operating systems, using the matching value in the **TITLE** column. It does not accept a comma-separated list of values.

Example

```
$ hammer os update --title "RedHat 7.2" \
  --password-hash SHA256
```

C.4. SWITCHING TO A FIPS COMPLIANT MESSAGE ALGORITHM FOR PUPPET

On the Satellite Server, all external Capsule Servers, and **all** existing hosts, configure Puppet to use the SHA256 message digest algorithm.

Edit the **/etc/puppet/puppet.conf** file, adding the line **digest_algorithm = sha256** in the **[main]** stanza.

NOTE

This change will be overwritten on every upgrade of Satellite, so needs to be reapplied afterward.

Because the Puppet message digest algorithm is changed on the Satellite Server and all Capsule Servers, it must also be changed on **all** hosts, including those that are not FIPS compliant.

In the event of a message digest algorithm mismatch, the client will download its facts again. This will result in a noticeable increased load on the Satellite Server or external Capsule Servers.

C.5. SETTING THE FIPS ENABLED PARAMETER

To provision a FIPS compliant host, the FIPS templates require a parameter named *fips_enabled* to be set to **true**. If this is not set to **true**, or is absent, the FIPS specific changes will not be applied. This parameter may be specified when provisioning an individual host, or set for a hostgroup. Retrospectively enabling FIPS compliance on a host is outside the scope of this guide and likely to cause issues.

To set this parameter when provisioning a host, append **--parameters fips_enabled=true** to the Hammer command.

To set this parameter on an existing host group, use the Hammer sub-command **set-parameter**. For more information, see the output of the command **hammer hostgroup set-parameter --help**. Any host provisioned to this hostgroup will inherit the *fips_enabled* parameter from the hostgroup.

Example

```
$ hammer hostgroup set-parameter --name fips_enabled \
 --value true \
 --hostgroup prod_servers
```

C.6. VERIFYING FIPS MODE IS ENABLED

To verify these FIPS compliance changes have been successful, you must provision a host and check its configuration.

1. Deploy a host using the FIPS templates, ensuring that parameter named *fips_enabled* is set to **`true`**.

2. Log in to the new host as a root-equivalent account.

3. Enter the command **`cat /proc/sys/crypto/fips_enabled`**. A value of **`1`** confirms that FIPS mode is enabled.