Creating customized RHEL images using the Image Builder service

Creating customized system images with Image Builder and uploading them to cloud environments
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Creating customized system images with Image Builder and uploading them to cloud environments
Abstract

Red Hat Image Builder bundled with Insights enables you to create customized images and upload the image to the target cloud environments, such as Amazon Web Services, Microsoft Azure and Google Cloud Platform, download customized images and upload them to the VMware vSphere client, or to create customized Bare Metal and Guest images. Learn how to create images and upload them to the target cloud platforms.
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MAKING OPEN SOURCE MORE INCLUSIVE

Red Hat is committed to replacing problematic language in our code, documentation, and web properties. We are beginning with these four terms: master, slave, blacklist, and whitelist. Because of the enormity of this endeavor, these changes will be implemented gradually over several upcoming releases. For more details, see our CTO Chris Wright’s message.
We appreciate your input on our documentation. Please let us know how we could make it better.

- For simple comments on specific passages:
  1. Make sure you are viewing the documentation in the *Multi-page HTML* format. In addition, ensure you see the **Feedback** button in the upper right corner of the document.
  2. Use your mouse cursor to highlight the part of text that you want to comment on.
  3. Click the **Add Feedback** pop-up that appears below the highlighted text.
  4. Follow the displayed instructions.

- For submitting feedback via Bugzilla, create a new ticket:
  1. Go to the [Bugzilla](https://bugzilla.redhat.com/) website.
  2. As the Component, use **Documentation**.
  3. Fill in the **Description** field with your suggestion for improvement. Include a link to the relevant part(s) of documentation.
  4. Click **Submit Bug**.
CHAPTER 1. INTRODUCING RED HAT IMAGE BUILDER ON CONSOLE.REDHAT.COM

1.1. RED HAT IMAGE BUILDER ON CONSOLE.REDHAT.COM

Red Hat Image Builder is a tool bundled with Red Hat Insights, within console.redhat.com. The console experience is also known as the Red Hat Hybrid Cloud Console.

With Red Hat Image Builder, RHEL customers can:

- Create customized system images, that can have a subscription activation key already embedded
- Add additional packages to the image during image creation
- Upload the customized images to the targeted clouds such as Amazon Web Services, Microsoft Azure, and Google Cloud Platform
- Download your customized images and upload it to the private VMware vSphere client
- Create customized Bare Metal and Guest images

RHEL customers can create images for a variety of deployment types, built according to the standards that are recommended for each deployment type.
2.1. GETTING ACCESS TO RED HAT IMAGE BUILDER ON CONSOLE.REDHAT.COM

Follow the steps to access Red Hat Image Builder on console.redhat.com.

Prerequisites

- An account at Red Hat Customer Portal.
- A Red Hat Insights subscription for your account. Red Hat Insights is included with your Red Hat Enterprise Linux subscription.

Procedure

2. Login with your Red Hat credentials.

You are now able to create and monitor your composes.

Additional resources

- Create a Red Hat account
- Product Documentation for Red Hat Insights
- Registration Assistant
CHAPTER 3. CREATING A CUSTOMIZED SYSTEM IMAGE WITH AN EMBED SUBSCRIPTION USING RED HAT IMAGE BUILDER

You can create customized system images using Red Hat Image Builder that have a subscription activation key already embedded and upload those images to the cloud target environment.

3.1. EMBEDDING AN AUTOMATIC SUBSCRIPTION DURING THE IMAGE CREATION BY USING RED HAT IMAGE BUILDER

You can create images that have a subscription activation key already embedded in the image. Then, you can perform the registration during image creation time.

Prerequisites

- An account at Red Hat Customer Portal with an Insights subscription.
- An Activation key. For more information on how to locate your key, see Understanding activation keys.

Procedure

1. Access Red Hat Image Builder on the browser.
   The Red Hat Image Builder dashboard appears.

2. Click Create image.
   The Create image dialog wizard opens.

3. On the Image output page, complete the following steps:
   a. From the Release list, select the Release that you want to use: for example, choose Red Hat Enterprise Linux (RHEL).
   b. From the Select target environments option, select the desired target(s) cloud environment.
      Click Next.

4. On the Registration page, select the type of registration that you want to use. You can select from these options:
   - Register images with Red Hat - Register and connect image instances, subscriptions and insights with Red Hat. For details on how to embed an activation key and register systems on first boot, see Chapter 3, Creating a customized system image with an embed subscription using Red Hat Image Builder.
   - Register image instances only - Register and connect only image instances and subscriptions with Red Hat.
   - Register later - Register the system after the image creation.
      Click Next.

5. Optional: On the Packages page, add packages to your image. See Chapter 4, Adding packages during image creation by Using Red Hat Image Builder.

6. On the Name image page, enter a name for your image and click Next. If you do not enter a name, you can find the image you created by its UUID.
7. On the Review page, review the information and click Create image. After you complete the steps in the Create image wizard, the Image Builder dashboard is displayed. Red Hat Image Builder starts the compose of a RHEL image for the x86_64 architecture.

The Red Hat Image Builder Images dashboard opens. You can see details such as the Image UUID, the cloud target environment, the image OS release and the status of the image creation.

**NOTE**

The image build, upload and cloud registration processes can take up to ten minutes to complete.

Additional resources

- Using Red Hat Subscription Management
CHAPTER 4. ADDING PACKAGES DURING IMAGE CREATION BY USING RED HAT IMAGE BUILDER

You can customize your images during the creation process by adding additional packages from the BaseOS and AppStream RHEL repositories, through the UI. With that, you do not need to install the desired packages on first boot, which can be error-prone.

4.1. ADDING ADDITIONAL PACKAGES DURING THE IMAGE CREATION

When creating a customized image using Image Builder, you can add additional packages from the BaseOS and AppStream repositories. For that, follow the steps:

Prerequisites

- You have an account on Red Hat Customer Portal with an Insights subscription.
- Access to the Red Hat Image Builder dashboard.
- You have already completed the following steps:
  - Image output
  - Target cloud environment
  - Optionally, Registration

Procedure

1. On the Packages page:
   a. Type the name of the package you want to add to your image in the Available options search bar.
      Optionally, you can enter the first two letters of the package name to see the available package options. The packages are listed on the Available options dual list box.
   b. Click the package or packages you want to add.
      i. Click the >> button to add all packages shown in the package search results to the Chosen options dual list box.
      Optionally, you can click the > button to add all selected packages.
   c. After you have finished adding the additional packages, click Next.

2. On the Name image page, enter a name for your image and click Next. If you do not enter a name, you can find the image you created by its UUID.

3. On the Review page, review the details about the image creation and click Create image. After you complete the steps in the Create image wizard, the Image Builder dashboard is displayed. Red Hat Image Builder starts the compose of a RHEL image for the x86_64 architecture.

The Red Hat Image Builder Images dashboard opens. You can see details such as the Image UUID, the cloud target environment, the image OS release and the status of the image creation.
NOTE

The image build, upload and cloud registration processes can take up to ten minutes to complete.
CHAPTER 5. CUSTOMIZING FILE SYSTEMS DURING THE IMAGE CREATION

By using Red Hat Image Builder you can customize your filesystem layouts to set up the desired partitions and sizes during the image creation process.

5.1. MANUALLY CONFIGURING PARTITIONS DURING IMAGE CREATION

When creating a customized image using Image Builder, you can customize the system configuration to use manual or automatic partitioning. Red Hat recommends using automatic partitioning, which is the default. Note that partitions can still be extended or reordered when using manual partitioning. To manually configure the partitioning of the image you are creating, complete the following steps:

Prerequisites

- You have an account on Red Hat Customer Portal with an Insights subscription.
- You have access to the Red Hat Image Builder dashboard.
- You have already completed the following steps:
  - Image output
  - Target cloud environment
  - Optionally, Registration

Procedure

1. On the System Configuration - File system configuration page:
   You can select Use automatic partitioning or Manually configure partitions for your image file system.
   a. Click the Manually configure partitions button.
      The Configure partitions section opens, showing the configuration based on Red Hat standards and security guides.

2. From the dropdown menu, provide details to configure the partitions:
   a. For the Mount point field, select one of the following mount point type options:
      - /app
      - /data
      - /home
      - /opt
      - /srv
      - /tmp
      - /usr
- /usr/local
- /var
- /

You can also add an additional path to the **Mount point**, such as /tmp. For example: /var as a prefix and /tmp as an additional path results in /var/tmp.

**NOTE**
Depending on the **Mount point** type you choose, the file system type changes to **xfs**, and so on.

b. For the **Minimum size** partition field of the file system, enter the desired minimum partition size. In the **Minimum size** dropdown menu, you can use common size units such as **GiB**, **MiB**, or **KiB**. The default unit is **GiB**.

**NOTE**
**Minimum size** means that Image builder can still increase the partition sizes, in case they are too small to create a working image.

3. To add more partitions, click the **Add partition** button. Repeat step 2 for each partition. If you see the following error message: “Duplicate partitions: Only one partition at each mount point can be created.”, you can:

- Click the **remove** button to remove the duplicated partition.
- Choose a new mount point for the partition you want to create. After you finish the partitioning configuration, click **Next**.

4. Optional: On the **Packages** page, add packages to your image. Click **Next**.

5. On the **Name image** page, enter a name for your image and click **Next**. If you do not enter a name, you can find the image you created by its **UUID**.

6. On the **Review** page, review the information.

a. Click the **System Configuration** tab to review the file system configuration partitioning.

b. Click **Create image**.

After you complete the steps in the **Create image** wizard, the **Image Builder** dashboard is displayed. Red Hat Image Builder starts the compose of a RHEL image for the **x86_64** architecture.

The Red Hat Image Builder Images dashboard opens. You can see details such as the Image **UUID**, the cloud target environment, the image OS release and the status of the image creation.

**NOTE**
The image build, upload and cloud registration processes can take up to ten minutes to complete.
Additional resources

- Partition Naming Schemes and Mount Points
- Recommended partitioning scheme
- Customizing a mount point file system
CHAPTER 6. CREATING AND UPLOADING A CUSTOMIZED RHEL SYSTEM IMAGE TO AMAZON WEB SERVICE USING RED HAT IMAGE BUILDER

You can create customized RHEL system images using Red Hat Image Builder, and upload those images to the Amazon Web Services (AWS) target environment.

6.1. CREATING AND UPLOADING A CUSTOMIZED RHEL SYSTEM IMAGE TO AWS USING IMAGE BUILDER

Follow the steps to create customized system images using Red Hat Image Builder and upload those images to Amazon Web Services (AWS).

Prerequisites
- You have an AWS account created.
- You have a Red Hat account. Access Portal.

Procedure

1. Access Red Hat Image Builder on the browser.
   The Red Hat Image Builder dashboard appears.

2. Click Create image.
   The Create image dialog wizard opens.

3. On the Image output page, complete the following steps:
   a. From the Release list, select the Release that you want to use: for example, choose Red Hat Enterprise Linux (RHEL).
   b. From the Select target environments option, select Amazon Web Services as the target environment.
      Click Next.

4. On the Target Environment - Amazon Web Service page, enter your AWS account ID and click Next.
   You can find your AWS account ID by accessing the option Account on the AWS console.

5. On the Registration page, select the type of registration that you want to use. You can select from these options:
   - Register images with Red Hat - Register and connect image instances, subscriptions and insights with Red Hat. For details on how to embed an activation key and register systems on first boot, see Chapter 3, Creating a customized system image with an embed subscription using Red Hat Image Builder.
   - Register image instances only - Register and connect only image instances and subscriptions with Red Hat.
   - Register later - Register the system after the image creation.
      Click Next.
6. Optional: On the Packages page, add packages to your image. See Chapter 4, Adding packages during image creation by Using Red Hat Image Builder.

7. On the Name image page, enter a name for your image and click Next. If you do not enter a name, you can find the image you created by its UUID.

8. On the Review page, review the details about the image creation and click Create image. After you complete the steps in the Create image wizard, the Image Builder dashboard is displayed.

Red Hat Image Builder starts the compose of a RHEL Amazon Machine Image (AMI) for the x86_64 architecture and uploads it to AWS EC2. Then, it will share the AMI image with the account you specified.

On the dashboard, you can see details such as the Image UUID, the cloud target environment, the image OS release and the status of the image creation.

Possible statuses:
- Pending: the image upload and cloud registration is being processed.
- In Progress: the image upload and cloud registration is ongoing.
- Ready: the image upload and cloud registration is completed
- Failed: the image upload and cloud registration failed.

**NOTE**
The image build, upload and cloud registration processes can take up to ten minutes to complete.

**Verification**
- Check if the image status is Ready. It means that the image upload and cloud registration is completed successfully.

6.2. ACCESSING YOUR CUSTOMIZED RHEL SYSTEM IMAGE FOR AWS FROM YOUR ACCOUNT

After the image is built, uploaded, and the cloud registration process status is marked as Ready, you can access the Amazon Web Services (AWS) image you created and shared with your AWS EC2 account.

**Prerequisites**
- You have access to your AWS Management Console.

**Procedure**

1. Access your AWS account and navigate to Service→EC2.

2. In the upper right menu, verify if you are under the correct region: us-east-1.

3. In the left side menu, under Images, click AMIs. The dashboard with the Owned by me images opens.
4. From the dropdown menu, choose **Private images**. You can see the image successfully shared with the **AWS** account you specified.

### 6.3. LAUNCHING YOUR CUSTOMIZED RHEL SYSTEM IMAGE FOR AWS FROM YOUR AWS EC2

You can launch the image you successfully shared with the **AWS EC2** account you have specified. To do so, follow the steps:

**Prerequisites**
- You have access to your customized image on AWS. See Accessing your customized RHEL system image for AWS from your account.

**Procedure**

1. From the list of images, select the image you want to launch.

2. On the top of the panel, **click** Launch. You are redirected to the **Choose an Instance Type** window.

3. Choose the instance type according to the resources you need to launch your image. **Click Review and Launch**.

4. Review your instance launch details. You can edit each section, such as **Security**, **Storage**, for example, if you need to make any changes. After you finish the review, click **Launch**.

5. To launch the instance, you must select a public key to access it. Create a new key pair in EC2 and attach it to the new instance.
   - From the drop-down menu list, select **Create a new key pair**.
   - Enter the name to the new key pair. It generates a new key pair.
   - Click **Download Key Pair** to save the new key pair on your local system.

6. Then, you can click **Launch Instance** to launch your instance. You can check the status of the instance, it shows as **Initializing**.

7. After the instance status is running, the **Connect** button turns available.

8. Click **Connect**. A popup window appears with instructions on how to connect using SSH.
   - Select the preferred connection method to **A standalone SSH client** and open a terminal.
   - In the location you store your private key, make sure that your key is publicly viewable for SSH to work. To do so, run the command:
     ```
     $ chmod 400 <your-instance-name.pem>
     ```
   - Connect to your instance using its Public DNS:
     ```
     $ ssh -i "<your-instance-name.pem_> ec2-user@<your-instance-IP-address_>
     ```
   - Type **yes** to confirm that you want to continue connecting.
As a result, you are connected to your instance using SSH.

**Verification**

- From a terminal, check if you are able to perform any action while connected to your instance using SSH.

---

### 6.4. COPYING YOUR CUSTOMIZED RHÉL SYSTEM IMAGE FOR AWS TO A DIFFERENT REGION ON YOUR AWS EC2

You can copy the image you successfully shared with the Amazon Web Services EC2 to your own account. Doing so, you grant that the image you shared and copied is available until you delete it, instead of expiring after some time. To copy your image to your own account, follow the steps:

**Prerequisites**

- You have access to your customized image on AWS. See [Accessing your customized RHEL system image for AWS from your account](#).

**Procedure**

1. From the list of Public images, select the image you want to copy.

2. On the top of the panel, click **Actions**.

3. From the dropdown menu, choose **Copy AMI**. A popup window appears.

4. Choose the Destination region and click **Copy AMI**
   
   After the copying process is complete, you are provided with the new AMI ID. You can launch a new instance in the new region. See [Launching your customized RHÉL system image for AWS from your AWS EC2](#).

---

**NOTE**

- When you copy an image to a different region, it results in a separate and new AMI in the destination region, with a unique AMI ID.
CHAPTER 7. CREATING RHEL SYSTEM IMAGE AND UPLOADING TO MICROSOFT AZURE USING RED HAT IMAGE BUILDER

You can create customized RHEL system images using Red Hat Image Builder, and upload those images to the Microsoft Azure cloud target environment. Then, you can create a Virtual Machine (VM) from the image you shared with the Microsoft Azure Cloud account.

7.1. AUTHORIZING RED HAT IMAGE BUILDER TO PUSH IMAGES TO MICROSOFT AZURE CLOUD

Authorize Red Hat Image Builder to push images to the Microsoft Azure cloud. For that, you must:

- Configure Red Hat Image Builder as an authorized application for your tenant GUID
- Give it the role of Contributor to at least one resource group.

To authorize Red Hat Image Builder as an authorized application, follow the steps:

Prerequisites

- You have a Subscription account created in Microsoft Azure.
- You have an existing Resource Group in Azure portal.
- You have the User Access Administrator role rights.
- Your Microsoft Azure subscription has Microsoft.Storage and Microsoft.Compute as a resource provider.

Procedure

1. Access Red Hat Image Builder on a browser.
   The Red Hat Image Builder dashboard appears.

2. Click Create image.
   The Create image dialog wizard opens.

3. On the Image output page, complete the following steps:
   a. From the Release list, select the Release that you want to use: for example, choose Red Hat Enterprise Linux (RHEL).
   b. From the Select target environments option, select Microsoft Azure. Click Next.

4. On the Target Environment - Microsoft Azure window, to add Red Hat Image Builder as an authorized application, complete the following steps:
   a. Insert your Tenant GUID.
      Image Builder checks if your Tenant GUID is correctly formatted and the Authorize Image Builder button becomes available.
   b. Click Authorize Image Builder to authorize Red Hat Image Builder to push images to the Microsoft Azure cloud.
This redirects you to the Microsoft Azure portal.

i. Login with your credentials.

ii. Click Accept the Permission requested.

c. Confirm that Red Hat Image Builder is authorized for your tenant.

i. Search for Azure Active Directory and choose Enterprise applications, from the left menu.

ii. Search for Red Hat Image Builder and confirm it is authorized.

d. Add the Enterprise application as a contributor to your Resource Group.

i. In the search bar, type Resource Groups and select the first entry under Services. This redirects you to the Resource Groups dashboard.

ii. Select your Resource Group.

iii. On the left menu, click Access control (IAM) to add a permission so the Red Hat Image Builder application can access your resource group.

iv. From the menu, click the tab Role assignments.

v. Click +Add.

vi. From the dropdown menu, choose Add role assignment. A menu appears on the left side.

vii. Insert the following details:

A. Role: Assign the Contributor role

B. Assign access to: User, group, service principal. Add members: Click +Select members and type Red Hat in the search bar. Press enter.

C. Select: Red Hat Image Builder application

The Red Hat Image Builder application is now authorized to push images to Microsoft Azure cloud.

**NOTE**

Even though any user can add an application to the resources group, the application is not able to locate any resource unless the account administrator adds the shared application to the IAM image.

**Verification**

- From the menu, click the tab Role assignments.
  You can see Red Hat Image Builder set as a Contributor of the Resource Group you selected.

**Additional resources**

- Manage Azure Resource Manager resources group by using the Azure portal
7.2. CREATING A CUSTOMIZED RHEL SYSTEM IMAGE FOR MICROSOFT AZURE USING IMAGE BUILDER

After you authorize Image Builder to push images to Microsoft Azure, create customized system images using Image Builder and upload those images to Microsoft Azure. For that, follow the steps:

Prerequisites

- You have created an Azure Storage Account.
- You have a Storage account created.

Procedure

1. On the Target Environment - Microsoft Azure window, complete the following steps:
   a. Enter your Tenant GUID: you can find your Tenant ID in the Azure Active Directory application in Microsoft Azure Portal.
   b. Enter your Subscription ID: you can find your Subscription ID account by accessing the Microsoft Azure console.
   c. Enter your Resource group: is the name of your Resource Group in Microsoft Azure Portal. Click Next.

2. On the Registration page, select the type of registration that you want to use. You can select from these options:
   - Register images with Red Hat - Register and connect image instances, subscriptions and insights with Red Hat. For details on how to embed an activation key and register systems on first boot, see Chapter 3, Creating a customized system image with an embed subscription using Red Hat Image Builder.
   - Register image instances only - Register and connect only image instances and subscriptions with Red Hat.
   - Register later - Register the system after the image creation. Click Next.

3. Optional: On the Packages page, add packages to your image. See Chapter 4, Adding packages during image creation by Using Red Hat Image Builder.

4. On the Name image page, enter a name for your image and click Next. If you do not enter a name, you can find the image you created by its UUID.

5. On the Review page, review the details about the image creation and click Create image. After you complete the steps in the Create image wizard, the Image Builder dashboard is displayed.

Red Hat Image Builder starts the compose of a RHEL Azure Disk Image image for the x86_64 architecture, uploads it to the resource group account you specified, and creates an Azure Image.
The Red Hat Image Builder Images dashboard opens. You can see details such as the **Image UUID**, the **cloud target environment**, the **image OS release** and the **status** of the image creation. After the status is **Ready**, the Azure Disk Image is shared with the specified account.

On the dashboard, you can see details such as the **Image UUID**, the **cloud target environment**, the **image OS release** and the **status** of the image creation.

Possible statuses:

- **Pending**: the image upload and cloud registration is being processed.
- **In Progress**: the image upload and cloud registration is ongoing.
- **Ready**: the image upload and cloud registration is completed
- **Failed**: the image upload and cloud registration failed.

**NOTE**

The image build, upload and cloud registration processes can take up to ten minutes to complete.

**Verification**

- Check if the image status is **Ready**. It means that the image upload and cloud registration completed successfully.

**Additional resources**

- How to find your Azure Active Directory tenant ID

### 7.3. ACCESSING YOUR CUSTOMIZED RHEL SYSTEM IMAGE FROM YOUR MICROSOFT AZURE ACCOUNT

After you have built and uploaded the image, and the cloud registration process status is marked as **Ready**, you can access the Azure Disk Image from your **Microsoft Azure** account.

**Prerequisites**

- You have access to your **Microsoft Azure dashboard**.

**Procedure**

- Access your **Microsoft Azure** dashboard and navigate to the **Resource group** page.

**Verification**

1. After you access your Microsoft Azure Account, you can see that the image successfully shared with the resource group account you specified.
NOTE
If the image is not visible there, you may have issues with the upload process. Return to the Red Hat Image Builder dashboard and check if the image is marked as Ready.

7.4. CREATING A VM FROM THE RHEL SYSTEM IMAGE SHARED WITH THE AZURE ACCOUNT

You can create a Virtual Machine (VM) from the image you shared with the Microsoft Azure Cloud account by using Red Hat Image Builder.

Prerequisites

- You must have a Microsoft Azure Storage Account created.
- You must have uploaded the required image to the Microsoft Azure Cloud account.

Procedure

1. Click + Create VM. You are redirected to the Create a virtual machine dashboard.

2. In the Basic tab under Project Details, your Subscription and the Resource Group are pre-set. Optional: If you want to create a new resource Group:
   a. Click Create new.
      A pop-up prompts you to create the Resource Group Name container.
   b. Insert a name and click OK.
      If you want to keep the Resource Group that is already pre-set.

3. Under Instance Details, insert:
   a. Virtual machine name
   b. Region
   c. Image
   d. Size: Choose a VM size that better suits your needs. Keep the remaining fields as in the default choice.

4. Under Administrator account, enter the following details:
   a. Username: the name of the account administrator.
   b. SSH public key source: from the drop-down menu, select Generate new key pair.
   c. Key pair name: insert a name for the key pair.

5. Under Inbound port rules
   a. Public inbound ports: select Allow selected ports.
   b. Select inbound ports: Use the default set SSH (22).
6. Click **Review + Create**. You are redirected to the **Review + create** tab. You receive a confirmation that the validation passed.

7. Review the details and click **Create**.
   To change options, click **Previous**.

8. A **Generates New Key Pair** pop-up opens. Click **Download private key and create resources**.
   Save the key file in the **yourKey.pem** file format.

9. After the deployment is complete, click **Go to resource**.
   You are redirected to a new window with your VM details.

10. Select the public IP address on the top right side of the page and copy it to your clipboard.

**Verification**

Create an SSH connection to connect to the Virtual Machine you created. For that, follow the steps:

1. Open a terminal.

2. At your prompt, open an SSH connection to your virtual machine. Replace the IP address with the one from your VM, and replace the path to the **.pem** file with the path to where the key file was downloaded.

   ```
   # ssh -i <yourKey.pem file location> <username>@<IP_address>
   ```

   - Add the user name and replace the IP address with the one from your VM.
   - Replace the path to the **.pem** file with the path to where the key file was downloaded.
     For example:

   ```
   # ssh -i ./Downloads/yourKey.pem azureuser@10.111.12.123
   ```

3. You are required to confirm if you want to continue to connect. Type **yes** to continue.
   As a result, the output image you shared with the Azure Storage account is started and ready to be provisioned.

**NOTE**

The default user is **azureuser** and the password is **azureuser**.
CHAPTER 8. CREATING AND UPLOADING A CUSTOMIZED RHEL SYSTEM IMAGE TO GCP USING RED HAT IMAGE BUILDER

You can create customized RHEL system images by using Red Hat Image Builder and upload those images to the Google Cloud Platform target environment.

8.1. CREATING A CUSTOMIZED RHEL SYSTEM IMAGE FOR GOOGLE CLOUD PLATFORM USING RED HAT IMAGE BUILDER

You can create customized system images by using Red Hat Image Builder and upload those images to Google Cloud Platform. Then, you can start an instance from the image you uploaded.

Prerequisites

- You have a valid Google account to share your image.
- You have a Red Hat account. Access Portal.
- You have access to the Red Hat Image Builder.

Procedure

1. Access Red Hat Image Builder on the browser.
   The Red Hat Image Builder dashboard appears.

2. Click Create image.
   The Create image dialog wizard opens.

3. On the Image output page, complete the following steps:
   a. From the dropdown menu, select the Release: Red Hat Enterprise Linux (RHEL).
   b. From the Select target environments option, select Google Cloud Platform.
      Click Next.

4. On the Target environment- Google Cloud Platform window, select a valid account type to share your image with: a Google account, a Service account or a domain name.
   - Google account: A Google account which interacts with Google Cloud, for example: alice@gmail.com.
   - Service account: An application account, for example: myapp@appspot.gserviceaccount.com.
   - Google group: A named collection of Google accounts and service accounts, for example: admins@example.com.
   - Google workspace domain/Cloud identity domain: A virtual group of all the Google accounts in a named organization. For example, the domain name mycompany.com.

5. Enter the account email address or domain name, depending on the type of target environment you chose.
   Click Next.
6. On the **Registration** page, select the type of registration that you want to use. You can select from these options:

- **Register images with Red Hat** - Register and connect image instances, subscriptions and insights with Red Hat. For details on how to embed an activation key and register systems on first boot, see Chapter 3, Creating a customized system image with an embed subscription using Red Hat Image Builder.

- **Register image instances only** - Register and connect only image instances and subscriptions with Red Hat.

- **Register later** - Register the system after the image creation. Click **Next**.

7. Optional: On the **Packages** page, add packages to your image. See Chapter 4, Adding packages during image creation by Using Red Hat Image Builder.

8. On the **Name image** page, enter a name for your image and click **Next**. If you do not enter a name, you can find the image you created by its UUID

9. On the **Review** page, review the details about the image creation and click **Create image**. After you complete the steps in the **Create image** wizard, the **Image Builder** dashboard is displayed.

Red Hat Image Builder starts to compose the RHEL image for the **x86_64** architecture and upload it to Google Cloud Platform. Then, it shares the image with the account you specified.

On the dashboard you can see details such as, the Image UUID, the cloud target environment, the image OS release and the status of the image creation. After the new image displays a **Ready** status in the **Status** column, Red Hat Image Builder shares the image with the account you specified.

Possible statuses:

- Pending: the image upload and cloud registration is being processed.

- In Progress: the image upload and cloud registration is ongoing.

- Ready: the image upload and cloud registration is completed

- Failed: the image upload and cloud registration failed.

**NOTE**

The image build, upload and cloud registration processes can take up to ten minutes to complete.

**Verification**

- Check the status in the **Images** Dashboard. Click the image name to expand and show details.

  - The **Ready** status indicates that the image has been successfully created and shared with the Google account.
    - In addition, the window shows the number of days until image expiration.
  - You can check which account the image is shared with.
8.2. CREATING A VM INSTANCE USING YOUR GCE IMAGE

After the image is built, uploaded and the cloud registration process status is marked as **Ready**, you can create a Virtual Machine (VM) instance using the GCE image.

**Prerequisites**
- You have the universally unique identifier (UUID) of the image you created.
- You have access to the Image-builder service API endpoint.
- You have access to your project details at Google Cloud Platform.
- You can access Google Cloud Shell from your browser.

**Procedure**

1. From the Red Hat Image Builder dashboard, copy the image **UUID** of the image you created.

2. Access `/composes/`{composeId} API endpoint.

3. Click the **Try it Out** button to activate the **composeId** string path.

4. Enter the **UUID** into the `composes/{composeId}` field in the API endpoint.

5. Click **Execute**. The API endpoint generates a response in the **Response body**, for example:

   ```
   {
     "image_status": {
       "status": "success",
       "upload_status": {
         "options": {
           "image_name": "composer-api-03f0e19c-0050-4c8a-a69e-88790219b086",
           "project_id": "red-hat-image-builder"
         },
         "status": "success",
         "type": "gcp"
       }
     }
   }
   ```

6. From the **Response body** field, copy the **image_name** and **project_id** to access the image from the Google Cloud Platform environment.

7. From your browser, access Google Cloud Shell.

8. Set your Google Cloud Platform **Project ID** as the default GCP project. You can find the Product ID of your project by accessing the Google Cloud Platform dashboard.

   ```
   $ gcloud config set project PROJECT_ID
   ```

9. In the **Authorize Cloud Shell** window prompt, click **Authorize** to allow this and future calls that require your credentials.

10. Create a VM instance with the image by using the gcloud command in the Google Cloud Shell:
$ gcloud compute instances create INSTANCE_NAME
  --image-project PROJECT_ID_FROM_RESPONSE
  --image IMAGE_NAME
  --zone GCP_ZONE

Where:

- INSTANCE_NAME is the name you give to your instance;
- PROJECT_ID_FROM_RESPONSE is the project_id generated by Response body;
- IMAGE_NAME is the image_name generated by Response body;
- GCP_ZONE is the GCP zone in which the instance will be created.

Verification

1. Verify that Compute Engine created the VM:

   $ gcloud compute instances describe INSTANCE_NAME

2. Connect to the VM instance via SSH:

   $ gcloud compute ssh --project=PROJECT_ID --zone=ZONE INSTANCE_NAME

Additional resources

- Google Cloud Shell documentation
- Default region and zone

8.3. COPYING THE GCE IMAGE TO YOUR PROJECT GROUP

After the image is built, uploaded and the cloud registration process status is marked as Ready, you can create a Virtual Machine (VM) instance using the GCE image.

Prerequisites

- The universally unique identifier (UUID) of the image you created.
- Access to the Image-builder service API endpoint.
- Access to the Google Cloud Shell from your browser.

Procedure

1. From the Image Builder dashboard, copy the UUID image of the image you created.
2. Access /composes/{composeId} API endpoint.
3. Click the Try it Out button to activate the composeId string path.
4. Enter the UUID into the composes/{composeId} field in the API endpoint.
5. Click Execute. The API endpoint generates a response in the **Response body**, for example:

```json
{
  "image_status": {
    "status": "success",
    "upload_status": {
      "options": {
        "image_name": "composer-api-03f0e19c-0050-4c8a-a69e-88790219b086",
        "project_id": "red-hat-image-builder"
      },
      "status": "success",
      "type": "gcp"
    }
  }
}
```

6. From the **Response body** field, copy the **image_name** and **project_id** to access the image from the Google Cloud Platform environment. From the **Response body**:

```
"image_name": "composer-api-03f0e19c-0050-4c8a-a69e-88790219b086",
"project_id": "red-hat-image-builder"
```

7. From your browser, access **Google Cloud Shell**.

8. Set your Google Cloud Platform **Project ID** as the default GCP project. You can find the Product ID of your project by accessing the **Google Cloud Platform dashboard**.

```bash
$ gcloud config set project PROJECT_ID
```

9. In the **Authorize Cloud Shell** window prompt, click **Authorize** to allow this and future calls that require your credentials.

10. Copy the image to your project by using the `gcloud` command:

```bash
$ gcloud compute images create MY_IMAGE_NAME
  --source-image-project red-hat-image-builder
  --source-image IMAGE_NAME
```

Where:
- **MY_IMAGE_NAME** is the name you give to your instance;
- red-hat-image-builder is the **project_id** generated by **Response body**;
- **IMAGE_NAME** is the **image_name** generated by **Response body**;

**Verification**

Confirm that the image has been successfully copied to your project:

- Using the Google Cloud Platform UI, by accessing the **Compute Engine / Images** section.
- Using the `gcloud` tool, by running the command in **Google Cloud Shell**:

  ```bash
  $ gcloud compute images list --no-standard-images
  ```
Additional resources

- Google Cloud Shell documentation
CHAPTER 9. CREATING AND UPLOADING A CUSTOMIZED RHEL VMDK SYSTEM IMAGE TO VSPHERE

You can create customized RHEL system images by using Red Hat Image Builder and upload those images to the VMware vSphere client.

9.1. CREATING A CUSTOMIZED RHEL VMDK SYSTEM IMAGE USING IMAGE BUILDER

You can create customized system images using Red Hat Image Builder and upload those images to VMware vSphere client.

Procedure


2. Click Create image. The Create image dialog wizard opens.

3. On the Image output page, complete the following steps:
   a. From the Release list, select the Release that you want to use: for example, choose Red Hat Enterprise Linux (RHEL).
   b. From the Select target environments option, select VMWare. Click Next.

4. On the Registration page, select the type of registration that you want to use. You can select from these options:
   - Register images with Red Hat - Register and connect image instances, subscriptions and insights with Red Hat. For details on how to embed an activation key and register systems on first boot, see Chapter 3, Creating a customized system image with an embed subscription using Red Hat Image Builder.
   - Register image instances only - Register and connect only image instances and subscriptions with Red Hat.
   - Register later - Register the system after the image creation. Click Next.

5. Optional: On the Packages page, add packages to your image. See Chapter 4, Adding packages during image creation by Using Red Hat Image Builder.

6. On the Name image page, enter a name for your image and click Next. If you do not enter a name, you can find the image you created by its UUID.

7. On the Review page, review the details about the image creation and click Create image. After you complete the steps in the Create image wizard, the Image Builder dashboard is displayed.

8. When the new image displays a Ready status in the Status column, click Download .vmdk in the Instance column. The .vmdk image is saved to your system and is ready for deployment.
9.2. UPLOADING AND DEPLOYING A VMDK IMAGE TO VMWARE VSPHERE

Upload a .vmdk image to VMware vSphere via HTTP.

Prerequisites

- You created an .vmdk image by using Image Builder.
- You have access to VMware vSphere.

Procedure

1. In the vCenter, click Upload Files . After you upload the image to vCenter, you can deploy it into a virtual machine (VM).

2. Use your preferred method for VM creation in VMWare to create a virtual machine.

3. In the New Virtual Machine wizard, complete the steps to create a new VM. The following is required for your .vmdk image to function correctly:
   - For the Customize hardware step: When you create a VM, on the Device Configuration button on the upper right, delete the default New Hard Disk and use the drop-down to select an Existing Hard Disk disk image.

   **NOTE**
   
   You must use an IDE device as the Virtual Device Node for the disk you create. The default SCSI value results in an unbootable virtual machine.

   - For the Ready to complete step: Review the details and click Finish to create the image. The new VM is created and available in vSphere Client.

9.3. CREATING A USER FOR THE VMDK IMAGE WITH CLOUD-INIT

To be able to login into your VM, you must create a user account. For that, follow the steps on the CLI.

**NOTE**

The GUI wizard does not support cloud-init.

Prerequisites

- You configured the govc VMware CLI tool client.
  - To use the govc VMware CLI tool client, you must set the following values in the environment:
    
    GOVC_URL
    GOVC_DATACENTER
    GOVC_FOLDER
    GOVC_DATASTORE
    GOVCRESOURCE_POOL
    GOVC_NETWORK
Procedure

1. Access the directory where you downloaded your .vmdk image.

2. Create a file named metadata.yaml. Add the following information to this file:

   ```yaml
   instance-id: cloud-vm
   local-hostname: vmname
   ```

3. Create a file named userdata.yaml. Add the following information to the file:

   ```yaml
   #cloud-config
   users
   - name: admin
     sudo: "ALL=(ALL) NOPASSWD:ALL"
   ssh_authorized_keys:
     - ssh-rsa AAA...fhHQ== your.email@example.com
   ```

   * **ssh_authorized_keys** is your SSH public key. You can find your SSH public key in ~/.ssh/id_rsa.pub.

4. Export the metadata.yaml and userdata.yaml files to the environment, compressed with gzip, encoded in base64 as follows. They will be used in further steps.

   ```bash
   export METADATA=$(gzip -c9 <metadata.yaml | { base64 -w0 2>/dev/null || base64; })
   export USERDATA=$(gzip -c9 <userdata.yaml | { base64 -w0 2>/dev/null || base64; })
   ```

5. Launch the image on vSphere with the metadata.yaml and userdata.yaml files:

   a. Import the .vmdk image in to vSphere:

      ```bash
      $ govc import.vmdk ./composer-api.vmdk foldername
      ```

   b. Create the VM in VSphere without powering it on:

      ```bash
      govc vm.create \n      -net.adapter=vmxnet3 \n      -m=4096 -c=2 -g=rhel8_64Guest \n      -firmware=bios -disk="foldername/composer-api.vmdk" \n      -disk.controller=ide -on=false \n      vmname
      ```

   c. Change the VM to add ExtraConfig variables, the cloud-init config:

      ```bash
      govc vm.change -vm vmname \n      -e guestinfo.metadata="${METADATA}" \n      -e guestinfo.metadata.encoding="gzip;base64" \n      -e guestinfo.userdata="${USERDATA}" \n      -e guestinfo.userdata.encoding="gzip;base64"
      ```

   d. Power-on the VM:

      ```bash
      govc vm.power -on vmname
      ```
e. Retrieve the VM IP address:

```
HOST=$(govc vm.ip vmname)
```

f. Use SSH to log in to the VM, using the user-data specified in `cloud-init` file configuration:

```
$ ssh admin@HOST
```

Additional resources

- The `govc` documentation
- The VMware - `cloud init 22.2` documentation
CHAPTER 10. CREATING A CUSTOMIZED RHEL GUEST IMAGE USING RED HAT IMAGE BUILDER

You can create customized RHEL guest system images using Red Hat Image Builder. You can then download these images to create virtual machines from these guest images as per your requirements.

10.1. CREATING A CUSTOMIZED RHEL GUEST SYSTEM IMAGE USING IMAGE BUILDER

Follow the steps to create customized RHEL guest .qcow2 images using Red Hat Image Builder.

Procedure

1. Access Red Hat Image Builder on the browser.
   You are redirected to the Red Hat Image Builder dashboard.

2. Click Create image.
   The Create image wizard opens.

3. On the Image output page, complete the following steps:
   a. From the Releases list, select the release of Red Hat Enterprise Linux (RHEL) that you want to use to create the image.
   b. From the Select target environments options, select Virtualization - Guest image.
      Click Next.

4. On the Registration page, select the type of registration that you want to use. You can select from these options:
   a. Register images with Red Hat - Register and connect image instances, subscriptions and insights with Red Hat. For details on how to embed an activation key and register systems on first boot, see Chapter 3, Creating a customized system image with an embed subscription using Red Hat Image Builder.
   b. Register image instances only - Register and connect only image instances and subscriptions with Red Hat.
   c. Register later - Register the system after the image creation.
      Click Next.

5. Optional: On the Packages page, add packages to your image. See Chapter 4, Adding packages during image creation by Using Red Hat Image Builder.

6. On the Name image page, enter a name for your image and click Next. If you do not enter a name, you can find the image you created by its UUID.

7. On the Review page, review the details about the image creation and click Create image.
   After you complete the steps in the Create image wizard, the Image Builder dashboard is displayed.

8. When the new image displays a Ready status in the Status column, click Download .qcow2 image in the Instance column.
   The .qcow2 image is saved to your system and is ready for deployment.
10.2. CREATING A VIRTUAL MACHINE FROM THE CUSTOMIZED RHEL GUEST SYSTEM IMAGE

You can create a Virtual Machine (VM) from the qcow2 image that you created using Red Hat Image Builder.

**Prerequisites**

- You created and downloaded a .qcow2 image using Image Builder.

**Procedure**

1. Access the directory where you downloaded your .qcow2 image.

2. Create a file named **meta-data**. Add the following information to this file:

   ```
   instance-id: nocloud
   local-hostname: vmname
   ```

3. Create a file named **user-data**. Add the following information to the file:

   ```
   #cloud-config
   user: admin
   password: password
   chpasswd: {expire: False}
   ssh_pwauth: True
   ssh_authorized_keys:
     - ssh-rsa AAA...fhHQ== your.email@example.com
   
   ssh_authorized_keys is your SSH public key. You can find your SSH public key in ~/.ssh/id_rsa.pub.
   ```

4. Use the **genisoimage** command to create an ISO image that includes the **user-data** and **meta-data** files.

   ```
   # genisoimage -output cloud-init.iso -volid cidata -joliet -rock user-data meta-data
   ```

5. Create a new VM from the KVM Guest Image using the **virt-install** command. Include the ISO image you created on step 4 as an attachment to the VM image.

   ```
   # virt-install \
   --memory 4096 \
   --vcpus 4 \
   --name myvm \
   --disk composer-api.qcow2,device=disk,bus=virtio,format=qcow2 \ 
   --disk cloud-init.iso,device=cdrom \
   ```
--os-variant rhel8.5 \
--virt-type kvm \
--graphics none \
--import

Where,

- --graphics none - indicates that it is a headless RHEL Virtual Machine.
- --vcpus 4 - indicates that it uses 4 virtual CPUs.
- --memory 4096 - indicates that it uses 4096 MB RAM.

6. The VM installation starts:

Starting install...
Connected to domain myvm
...
[ OK ] Started Execute cloud user/final scripts.

Red Hat Enterprise Linux 8.5 (Ootpa)
Kernel 4.18.0-221.el8.x86_64 on an x86_64

Additional resources

- Creating virtual machines using the command-line interface
CHAPTER 11. CREATING A CUSTOMIZED RHEL BARE METAL IMAGE USING RED HAT IMAGE BUILDER

You can create customized RHEL ISO system images using the Red Hat Image Builder. You can then download these images and install them on a bare metal system as per your requirements.

11.1. CREATING A CUSTOMIZED RHEL ISO SYSTEM IMAGE USING IMAGE BUILDER

Follow the steps to create custom RHEL .iso images using the Red Hat Image Builder.

Procedure


2. Click Create image. The Create image dialog wizard opens.

3. On the Image output page, complete the following steps:
   a. From the Release list, select the Release that you want to use: for example, choose Red Hat Enterprise Linux (RHEL).
   b. From the Select target environments option, select Bare metal - Installer. Click Next.

4. On the Registration page, select the type of registration that you want to use. You can select from these options:
   - Register images with Red Hat - Register and connect image instances, subscriptions and insights with Red Hat. For details on how to embed an activation key and register systems on first boot, see Chapter 3, Creating a customized system image with an embed subscription using Red Hat Image Builder.
   - Register image instances only - Register and connect only image instances and subscriptions with Red Hat.
   - Register later - Register the system after the image creation. Click Next.

5. Optional: On the Packages page, add packages to your image. See Chapter 4, Adding packages during image creation by Using Red Hat Image Builder.

6. On the Name image page, enter a name for your image and click Next. If you do not enter a name, you can find the image you created by its UUID.

7. On the Review page, review the details about the image creation and click Create image. Your image is created as a .iso image.

8. When the new image displays a Ready status in the Status column, click Download .iso image. The .iso image is saved to your system and is ready for deployment.
11.2. INSTALLING THE CUSTOMIZED RHEL ISO SYSTEM IMAGE TO A BARE METAL SYSTEM

You can create a virtual machine (VM) from the .iso image that you created using the Red Hat Image Builder.

Prerequisites

- You created and downloaded a .iso image using the Image Builder.
- A 8 GB USB flash drive.

Procedure

1. Access the directory where you downloaded your .iso image.
2. Place the bootable ISO image file on a USB flash drive.
3. Connect the USB flash drive to the port of the computer you want to boot.
4. Boot the ISO image from the USB flash drive.
5. Perform the steps to install the customized bootable ISO image. The boot screen shows you the following options:
   - Install Red Hat Enterprise Linux 8
   - Test this media & install Red Hat Enterprise Linux 8

Additional resources

- Booting the installation
CHAPTER 12. LOCATING THE IMAGES YOU CREATED USING RED HAT IMAGE BUILDER

By accessing the Red Hat Image Builder dashboard, you are able to locate the images built for you.

12.1. LOCATING YOUR CUSTOMIZED IMAGES IN THE IMAGE BUILDER DASHBOARD

After your customized images are uploaded to the cloud or clouds, you can still locate these images and, if they are still valid, you have the option to copy them and also launch them directly from the dashboard.

To locate your images in Image Builder, complete the following steps:

Prerequisites

- You have an account on Red Hat Customer Portal with an Insights subscription.
- You have access to the Red Hat Image Builder dashboard.
- You created images using Image Builder.

Procedure

1. Access the Red Hat Image Builder dashboard.
   You are redirected to the Red Hat Image Builder dashboard and can see all the images that were built for you.

2. Locate your image by name.
   a. Type your image name in the search bar on the top left menu.
   b. If your image exists, image details appear, showing: the Image name, Creation date, Release version, cloud Target, and image Status. You can also see information about any customizations applied to the image, such as packages and file system configuration.

3. Under Uploads, you can find the uploaded images.
   - For Amazon Web Services images:
     o After the image status is marked as Ready, click the Launch instance link. You are redirected to the image on AWS from where you can launch the instance. See Launching your customized RHEL system image for AWS from your AWS EC2.
   - For Google Cloud Platform images:
     o After the image status is marked as Ready, click the copy symbol. You can create a Virtual Machine (VM) instance using the GCE image. See Creating a VM instance using your GCE image.
   - For Microsoft Azure images:
     o After the image status is marked as Ready, click the View uploaded image link. You are redirected to the image on Microsoft Azure from where you can view the uploaded image from your Microsoft Azure account. See Creating a Virtual Machine from the
customized RHEL system image you shared with the Microsoft Azure account.

- For **VMWare** images:
  - After the image status is marked as **Ready**, click the **Download .vmdk** link. The image is saved to your system and is ready for deployment. See Uploading and deploying a VMDK image to VMware vSphere.

- For **Guest images** images:
  - After the image status is marked as **Ready**, click the **Download .qcow2** image. The image is saved to your system and is ready for deployment. See Creating a Virtual Machine from the customized RHEL Guest system image.

- For **Bare metal images** images:
  - After the image status is marked as **Ready**, click the **Download .iso** image. The image is saved to your system and is ready for deployment. See Installing the customized RHEL ISO system image to a bare metal system.