Red Hat Ansible Automation Platform 2.4

Creating and consuming execution environments

Create and use execution environments with Ansible Builder

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Legal Notice

Abstract

This guide shows how to create consistent and reproducible automation execution environments for your Red Hat Ansible Automation Platform.

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PREFACE

Use Ansible Builder to create consistent and reproducible automation execution environments for your Red Hat Ansible Automation Platform needs.

PROVIDING FEEDBACK ON RED HAT DOCUMENTATION

If you have a suggestion to improve this documentation, or find an error, please contact technical support at https://access.redhat.com to create an issue on the Ansible Automation Platform Jira project using the **docs-product** component.

CHAPTER 1. INTRODUCTION TO AUTOMATION EXECUTION ENVIRONMENTS

Using Ansible content that depends on non-default dependencies can be complicated because the packages must be installed on each node, interact with other software installed on the host system, and be kept in sync.

Automation execution environments help simplify this process and can easily be created with Ansible Builder.

1.1. ABOUT AUTOMATION EXECUTION ENVIRONMENTS

All automation in Red Hat Ansible Automation Platform runs on container images called automation execution environments. Automation execution environments create a common language for communicating automation dependencies, and offer a standard way to build and distribute the automation environment.

An automation execution environment should contain the following:

- Ansible Core 2.15 or later
- Python 3.8-3.11
- Ansible Runner
- Ansible content collections and their dependencies
- System dependencies

1.1.1. Why use automation execution environments?

With automation execution environments, Red Hat Ansible Automation Platform has transitioned to a distributed architecture by separating the control plane from the execution plane. Keeping automation execution independent of the control plane results in faster development cycles and improves scalability, reliability, and portability across environments. Red Hat Ansible Automation Platform also includes access to Ansible content tools, making it easy to build and manage automation execution environments.

In addition to speed, portability, and flexibility, automation execution environments provide the following benefits:

- They ensure that automation runs consistently across multiple platforms and make it possible to incorporate system-level dependencies and collection-based content.
- They give Red Hat Ansible Automation Platform administrators the ability to provide and manage automation environments to meet the needs of different teams.
- They allow automation to be easily scaled and shared between teams by providing a standard way of building and distributing the automation environment.
- They enable automation teams to define, build, and update their automation environments themselves.
- Automation execution environments provide a common language to communicate automation dependencies.

CHAPTER 2. USING ANSIBLE BUILDER

Ansible Builder is a command line tool that automates the process of building automation execution environments by using metadata defined in various Ansible Collections or created by the user.

2.1. WHY USE ANSIBLE BUILDER?

Before Ansible Builder was developed, Red Hat Ansible Automation Platform users could run into dependency issues and errors when creating custom virtual environments or containers that included all of the required dependencies installed.

Now, with Ansible Builder, you can easily create a customizable automation execution environments definition file that specifies the content you want included in your automation execution environments such as Ansible Core, Python, Collections, third-party Python requirements, and system level packages. This allows you to fulfill all of the necessary requirements and dependencies to get jobs running.

2.2. INSTALLING ANSIBLE BUILDER

Prerequisites

- You have installed the Podman container runtime.
- You have valid subscriptions attached on the host. Doing so allows you to access the subscription-only resources needed to install **ansible-builder**, and ensures that the necessary repository for **ansible-builder** is automatically enabled. See Attaching your Red Hat Ansible Automation Platform subscription for more information.

Procedure

1. In your terminal, run the following command to activate your Ansible Automation Platform repo:

```
# dnf install --enablerepo=ansible-automation-platform-2.4-for-rhel-9-x86_64-rpms ansible-builder
```

2.3. BUILDING A DEFINITION FILE

After you install Ansible Builder, you can create a definition file that Ansible Builder uses to create your automation execution environment image. Ansible Builder makes an automation execution environment image by reading and validating your definition file, then creating a **Containerfile**, and finally passing the **Containerfile** to Podman, which then packages and creates your automation execution environment image. The definition file that you create must be in **yaml** format and contain different sections. The default definition filename, if not provided, is **execution-environment.yml**. For more information on the parts of a definition file, see Breakdown of definition file content .

The following is an example of a version 3 definition file. Each definition file must specify the major version number of the Ansible Builder feature set it uses. If not specified, Ansible Builder defaults to version 1, making most new features and definition keywords unavailable.

Example 2.1. Definition file example

```
version: 3

build_arg_defaults: 1
```

```
  ANSIBLE_GALAXY_CLI_COLLECTION_OPTS: '--pre'

dependencies: 2
  galaxy: requirements.yml
  python:
    - six
    - psutil
  system: bindep.txt

images: 3
  base_image:
    name: registry.redhat.io/ansible-automation-platform-24/ee-minimal-rhel9:latest

# Custom package manager path for the RHEL based images
 options: 4
 package_manager_path: /usr/bin/microdnf

additional_build_steps: 5
  prepend_base:
    - RUN echo This is a prepend base command!

  prepend_galaxy:
    # Environment variables used for Galaxy client configurations
    - ENV ANSIBLE_GALAXY_SERVER_LIST=automation_hub
    - ENV
ANSIBLE_GALAXY_SERVER_AUTOMATION_HUB_URL=https://console.redhat.com/api/automati
on-hub/content/xxxxxxx-synclist/
    - ENV
ANSIBLE_GALAXY_SERVER_AUTOMATION_HUB_AUTH_URL=https://sso.redhat.com/auth/real
ms/redhat-external/protocol/openid-connect/token
    # define a custom build arg env passthru - we still also have to pass
    # `--build-arg ANSIBLE_GALAXY_SERVER_AUTOMATION_HUB_TOKEN` to get it to pick it
up from the env
    - ARG ANSIBLE_GALAXY_SERVER_AUTOMATION_HUB_TOKEN

  prepend_final: |
    RUN whoami
    RUN cat /etc/os-release
  append_final:
    - RUN echo This is a post-install command!
    - RUN ls -la /etc
```

1. Lists default values for build arguments.
2. Specifies the location of various requirements files.
3. Specifies the base image to be used. Red Hat support is only provided for the redhat.registry.io base image.
4. Specifies options that can affect builder runtime functionality.
5. Commands for additional custom build steps.

Additional resources

Additional resources

- For more information about the definition file content, see Breakdown of definition file content .
- To read more about the differences between Ansible Builder versions 2 and 3, see the Ansible 3 Porting Guide.

2.4. BUILDING THE AUTOMATION EXECUTION ENVIRONMENT IMAGE

After you create a definition file, you can proceed to build an automation execution environment image.

Prerequisites

- You have created a definition file.

Procedure

To build an automation execution environment image, run the following from the command line:

```
$ ansible-builder build
```

By default, Ansible Builder looks for a definition file named **execution-environment.yml** but a different file path can be specified as an argument with the **-f** flag:

```
$ ansible-builder build -f definition-file-name.yml
```

where *definition-file-name* specifies the name of your definition file.

2.5. BREAKDOWN OF DEFINITION FILE CONTENT

A definition file is required for building automation execution environments with Ansible Builder, because it specifies the content that is included in the automation execution environment container image.

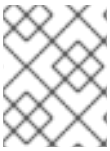
The following sections breaks down the different parts of a definition file.

2.5.1. Build args and base image

The **build_arg_defaults** section of the definition file is a dictionary whose keys can provide default values for arguments to Ansible Builder. See the following table for a list of values that can be used in **build_arg_defaults**:

Value	Description
ANSIBLE_GALAXY_CLI_COLLECTION_OPTS	Allows the user to pass arbitrary arguments to the ansible-galaxy CLI during the collection installation phase. For example, the –pre flag to enable the installation of pre-release collections, or -c to disable verification of the server's SSL certificate.
ANSIBLE_GALAXY_CLI_ROLE_OPTS	Allows the user to pass any flags, such as –no-deps, to the role installation.

The values given inside **build_arg_defaults** will be hard-coded into the **Containerfile**, so these values will persist if **podman build** is called manually.



NOTE

If the same variable is specified in the CLI **--build-arg** flag, the CLI value will take higher precedence.

You can include dependencies that must be installed into the final image in the dependencies section of your definition file.

To avoid issues with your automation execution environment image, make sure that the entries for Galaxy, Python, and system point to a valid requirements file, or are valid content for their respective file types.

2.5.1.1. Galaxy

The **galaxy** entry points to a valid requirements file or includes inline content for the **ansible-galaxy collection install -r ...** command.

The entry **requirements.yml** can be a relative path from the directory of the automation execution environment definition's folder, or an absolute path.

The content might look like the following:

Example 2.2. Galaxy entry

```
collections:
  - community.aws
  - kubernetes.core
```

2.5.1.2. Python

The **python** entry in the definition file points to a valid requirements file or to an inline list of Python requirements in PEP508 format for the **pip install -r ...** command.

The entry **requirements.txt** is a file that installs extra Python requirements on top of what the Collections already list as their Python dependencies. It may be listed as a relative path from the directory of the automation execution environment definition's folder, or an absolute path. The contents of a **requirements.txt** file should be formatted like the following example, similar to the standard output from a **pip freeze** command:

Example 2.3. Python entry

```
boto>=2.49.0
botocore>=1.12.249
pytz
python-dateutil>=2.7.0
awxkit
packaging
requests>=2.4.2
xmltodict
azure-cli-core==2.11.1
```

```
openshift>=0.6.2
requests-oauthlib
openstacksdk>=0.13
ovirt-engine-sdk-python>=4.4.10
```

2.5.1.3. System

The **system** entry in the definition points to a bindep requirements file or to an inline list of bindep entries, which install system-level dependencies that are outside of what the collections already include as their dependencies. It can be listed as a relative path from the directory of the automation execution environment definition's folder, or as an absolute path. At a minimum, the the collection(s) must specify necessary requirements for **[platform:rpm]**.

To demonstrate this, the following is an example **bindep.txt** file that adds the **libxml2** and **subversion** packages to a container:

Example 2.4. System entry

```
libxml2-devel [platform:rpm]
subversion [platform:rpm]
```

Entries from multiple collections are combined into a single file. This is processed by **bindep** and then passed to **dnf**. Only requirements with no profiles or no runtime requirements will be installed to the image.

2.5.2. Images

The **images** section of the definition file identifies the base image. Verification of signed container images is supported with the **podman** container runtime.

See the following table for a list of values that you can use in **images**:

Value	Description
base_image	Specifies the parent image for the automation execution environment which enables a new image to be built that is based on an existing image. This is typically a supported execution environment base image such as *ee-minimal* or *ee-supported*, but it can also be an execution environment image that you have created and want to customize further. A **name** key is required for the container image to use. Specify the **signature _original_name** key if the image is mirrored within your repository, but is signed with the image's original signature key. Image names must contain a tag, such as **:latest**. The default image is **registry.redhat.io/ansible-automation-platform-24/ee-minimal-rhel8:latest**.

NOTE

If the same variable is specified in the CLI **--build-arg** flag, the CLI value will take higher precedence.

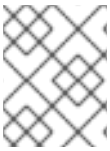
2.5.3. Additional build files

You can add any external file to the build context directory by referring or copying them to the **additional_build_steps** section of the definition file. The format is a list of dictionary values, each with a **src** and **dest** key and value.

Each list item must be a dictionary containing the following required keys:

src

Specifies the source files to copy into the build context directory. This can be an absolute path (for example, **/home/user/.ansible.cfg**), or a path that is relative to the execution environment file. Relative paths can be glob expressions matching one or more files (for example, **files/*.cfg**).



NOTE

Absolute paths can not include a regular expression. If **src** is a directory, the entire contents of that directory are copied to **dest**.

dest

Specifies a subdirectory path underneath the **_build** subdirectory of the build context directory that contains the source files (for example, **files/configs**). This can not be an absolute path or contain **..** within the path. Ansible Builder creates this directory for you if it does not already exist.

2.5.4. Additional custom build steps

You can specify custom build commands for any build phase in the **additional_build_steps** section of the definition file. This allows fine-grained control over the build phases.

Use the **prepend_** and **append_** commands to add directives to the **Containerfile** that run either before or after the main build steps are executed. The commands must conform to any rules required for the runtime system.

See the following table for a list of values that can be used in **additional_build_steps**:

Value	Description
prepend_base	Allows you to insert commands before building the base image.
append_base	Allows you to insert commands after building the base image.
prepend_galaxy	Allows you to insert before building the galaxy image.
append_galaxy	Allows you to insert after building the galaxy image.

Value	Description
prepend_builder	Allows you to insert commands before building the Python builder image.
append_builder	Allows you to insert commands after building the Python builder image.
prepend_final	Allows you to insert before building the final image.
append_final	Allows you to insert after building the final image.

The syntax for **additional_build_steps** supports both multi-line strings and lists. See the following examples:

Example 2.5. A multi-line string entry

```
prepend_final: |
  RUN whoami
  RUN cat /etc/os-release
```

Example 2.6. A list entry

```
append_final:
- RUN echo This is a post-install command!
- RUN ls -la /etc
```

2.5.5. Additional resources

- For example definition files for common scenarios, see the Common scenarios section of the *Ansible Builder Documentation*

2.6. OPTIONAL BUILD COMMAND ARGUMENTS

The **-t** flag will tag your automation execution environment image with a specific name. For example, the following command will build an image named **my_first_ee_image**:

```
$ ansible-builder build -t my_first_ee_image
```

NOTE

If you do not use **-t** with **build**, an image called **ansible-execution-env** is created and loaded into the local container registry.

If you have multiple definition files, you can specify which one to use by including the **-f** flag:

```
$ ansible-builder build -f another-definition-file.yml -t another_ee_image
```

In this example, Ansible Builder will use the specifications provided in the file named **another-definition-file.yml** instead of the default **execution-environment.yml** to build an automation execution environment image named **another_ee_image**.

For other specifications and flags that you can use with the **build** command, enter **ansible-builder build --help** to see a list of additional options.

2.7. CONTAINERFILE

After your definition file is created, Ansible Builder reads and validates it, creates a **Containerfile** and container build context, and optionally passes these to Podman to build your automation execution environment image. The container build occurs in several distinct stages: **base** , **galaxy**, **builder**, and **final**. The image build steps (along with any corresponding custom **prepend_** and **append_** steps defined in **additional_build_steps**) are:

1. During the **base** build stage, the specified base image is (optionally) customized with components required by other build stages, including Python, **pip**, **ansible-core**, and **ansible-runner**. The resulting image is then validated to ensure that the required components are available (as they may have already been present in the base image). Ephemeral copies of the resulting customized **base** image are used as the base for all other build stages.

2. During the **galaxy** build stage, collections specified by the definition file are downloaded and stored for later installation during the **final** build stage. Python and system dependencies declared by the collections, if any, are also collected for later analysis.

3. During the **builder** build stage, Python dependencies declared by collections are merged with those listed in the definition file. This final set of Python dependencies is downloaded and built as Python wheels and stored for later installation during the **final** build stage.

4. During the **final** build stage, the previously-downloaded collections are installed, along with system packages and any previously-built Python packages that were declared as dependencies by the collections or listed in the definition file.

2.8. CREATING A CONTAINERFILE WITHOUT BUILDING AN IMAGE

If you are required to use shared container images built in sandboxed environments for security reasons, you can create a shareable **Containerfile**.

```
$ ansible-builder create
```

CHAPTER 3. COMMON AUTOMATION EXECUTION ENVIRONMENT SCENARIOS

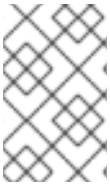
Use the following example definition files to address common configuration scenarios.

3.1. UPDATING THE AUTOMATION HUB CA CERTIFICATE

Use this example to customize the default definition file to include a CA certificate to the **additional-build-files** section, move the file to the appropriate directory and, finally, run the command to update the dynamic configuration of CA certificates to allow the system to trust this CA certificate.

Prerequisites

- A custom CA certificate, for example **rootCA.crt**.



NOTE

Customizing the CA certificate using **prepend_base** means that the resulting CA configuration appears in all other build stages and the final image, because all other build stages inherit from the base image.

```
additional_build_files:
  # copy the CA public key into the build context, we will copy and use it in the base image later
  - src: files/rootCA.crt
    dest: configs

additional_build_steps:
  prepend_base:
    # copy a custom CA cert into the base image and recompute the trust database
    # because this is in "base", all stages will inherit (including the final EE)
    - COPY _build/configs/rootCA.crt /usr/share/pki/ca-trust-source/anchors
    - RUN update-ca-trust

options:
  package_manager_path: /usr/bin/microdnf  # downstream images use non-standard package
manager

[galaxy]
server_list = automation_hub
```

3.2. USING AUTOMATION HUB AUTHENTICATION DETAILS WHEN BUILDING AUTOMATION EXECUTION ENVIRONMENTS

Use the following example to customize the default definition file to pass automation hub authentication details into the automation execution environment build without exposing them in the final automation execution environment image.

Prerequisites

- You have created an automation hub API token and stored it in a secure location, for example in a file named **token.txt**.

- Define a build argument that gets populated with the automation hub API token:

```
export ANSIBLE_GALAXY_SERVER_AUTOMATION_HUB_TOKEN=$(cat <token.txt>)
```

```
additional_build_steps:
  prepend_galaxy:
    # define a custom build arg env passthru- we still also have to pass
    # `--build-arg ANSIBLE_GALAXY_SERVER_AUTOMATION_HUB_TOKEN` to get it to pick it up
from the host env
    - ARG ANSIBLE_GALAXY_SERVER_AUTOMATION_HUB_TOKEN
    - ENV ANSIBLE_GALAXY_SERVER_LIST=automation_hub
    - ENV
ANSIBLE_GALAXY_SERVER_AUTOMATION_HUB_URL=https://console.redhat.com/api/automation-
hub/content/<yourhuburl>-synclist/
    - ENV
ANSIBLE_GALAXY_SERVER_AUTOMATION_HUB_AUTH_URL=https://sso.redhat.com/auth/realms/
redhat-external/protocol/openid-connect/token
```

3.3. ADDITIONAL RESOURCES

- For information regarding the different parts of an automation execution environment definition file, see Breakdown of definition file content .
- For additional example definition files for common scenarios, see Common scenarios section of the *Ansible Builder Documentation*

CHAPTER 4. PUBLISHING AN AUTOMATION EXECUTION ENVIRONMENT

4.1. CUSTOMIZING AN EXISTING AUTOMATION EXECUTION ENVIRONMENTS IMAGE

Ansible Controller includes the following default execution environments:

- **Minimal** - Includes the latest Ansible-core 2.15 release along with Ansible Runner, but does not include collections or other content
- **EE Supported** - Minimal, plus all Red Hat-supported collections and dependencies

While these environments cover many automation use cases, you can add additional items to customize these containers for your specific needs. The following procedure adds the **kubernetes.core** collection to the **ee-minimal** default image:

Procedure

1. Log in to **registry.redhat.io** via Podman:

```
$ podman login -u="[username]" -p="[token/hash]" registry.redhat.io
```

2. Ensure that you can pull the required automation execution environment base image:

```
podman pull registry.redhat.io/ansible-automation-platform-24/ee-minimal-rhel8:latest
```

3. Configure your Ansible Builder files to specify the required base image and any additional content to add to the new execution environment image.
   a. For example, to add the Kubernetes Core Collection from Galaxy to the image, use the Galaxy entry:

```
collections:
  - kubernetes.core
```

   b. For more information about definition files and their content, see the definition file breakdown section.

4. In the execution environment definition file, specify the original **ee-minimal** container's URL and tag in the **EE_BASE_IMAGE** field. In doing so, your final **execution-environment.yml** file will look like the following:

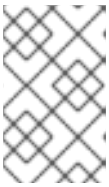
Example 4.1. A customized execution-environment.yml file

```
version: 3

images:
  base_image: 'registry.redhat.io/ansible-automation-platform-24/ee-minimal-rhel9:latest'

dependencies:
```

```
galaxy:
  collections:
    - kubernetes.core
```



NOTE

Since this example uses the community version of **kubernetes.core** and not a certified collection from automation hub, we do not need to create an **ansible.cfg** file or reference that in our definition file.

5. Build the new execution environment image by using the following command:

```
$ ansible-builder build -t [username]/new-ee
```

where **[username]** specifies your username, and **new-ee** specifies the name of your new container image.

NOTE

If you do not use **-t** with **build**, an image called **ansible-execution-env** is created and loaded into the local container registry.

- Use the **podman images** command to confirm that your new container image is in that list:

Example 4.2. Output of a podman images command with the image new-ee

```
REPOSITORY          TAG     IMAGE ID      CREATED         SIZE
localhost/new-ee    latest  f5509587efbb  3 minutes ago   769 MB
```

6. Verify that the collection is installed:

```
$ podman run [username]/new-ee ansible-doc -l kubernetes.core
```

7. Tag the image for use in your automation hub:

```
$ podman tag [username]/new-ee [automation-hub-IP-address]/[username]/new-ee
```

8. Log in to your automation hub using Podman:

NOTE

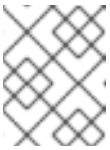
You must have **admin** or appropriate container repository permissions for automation hub to push a container. For more information, see the *Manage containers in private automation hub* section in Managing content in automation hub.

```
$ podman login -u="[username]" -p="[token/hash]" [automation-hub-IP-address]
```

9. Push your image to the container registry in automation hub:

```
$ podman push [automation-hub-IP-address]/[username]/new-ee
```

10. Pull your new image into your automation controller instance:
    a. Go to automation controller.
    b. From the navigation panel, select **Administration → Execution Environments**.
    c. Click **Add**.
    d. Enter the appropriate information then click **Save** to pull in the new image.



NOTE

If your instance of automation hub is password or token protected, ensure that you have the appropriate container registry credential set up.

4.2. ADDITIONAL RESOURCES (OR NEXT STEPS)

For more details on customizing execution environments based on common scenarios, see the following topics in the *Ansible Builder Documentation*:

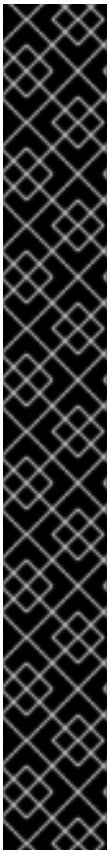
- Copying arbitratory files to an execution enviornment
- Building execution environments with environment variables
- Building execution environments with environment variables and **ansible.cfg**

CHAPTER 5. POPULATING YOUR PRIVATE AUTOMATION HUB CONTAINER REGISTRY

By default, private automation hub does not include container images. To populate your container registry, you must push a container image to it.

You must follow a specific workflow to populate your private automation hub container registry:

- Pull images from the Red Hat Ecosystem Catalog (registry.redhat.io)
- Tag them
- Push them to your private automation hub container registry



IMPORTANT

Image manifests and filesystem blobs were both originally served directly from **registry.redhat.io** and **registry.access.redhat.com**. As of 1 May 2023, filesystem blobs are served from **quay.io** instead.

- Ensure that the Network ports and protocols listed in *Table 5.10. Execution Environments (EE)* are available to avoid problems pulling container images.

Make this change to any firewall configuration that specifically enables outbound connections to **registry.redhat.io** or **registry.access.redhat.com**.

Use the hostnames instead of IP addresses when configuring firewall rules.

After making this change you can continue to pull images from **registry.redhat.io** and **registry.access.redhat.com**. You do not require a **quay.io** login, or need to interact with the **quay.io** registry directly in any way to continue pulling Red Hat container images.

However, manifests, sometimes called "subscription allocations", on the web-based Red Hat Subscription Management are no longer supported as of early 2024 with one exception: If a system is part of a closed network or "air gapped" system that does not receive its updates from Red Hat's servers directly, manifests are supported until the release of Red Hat Satellite 6.16. Keep up to date with Red Hat Satellite Release Dates for the announcement for Red Hat Satellite 6.16's release date announcement.

5.1. PULLING IMAGES FOR USE IN AUTOMATION HUB

Before you can push container images to your private automation hub, you must first pull them from an existing registry and tag them for use. The following example details how to pull an image from the Red Hat Ecosystem Catalog (registry.redhat.io).

IMPORTANT

As of early 2024, Red Hat no longer supports manifests or manifest lists on the Red Hat Subscription Management web platform, which has also been used interchangeably with "subscription allocations." Red Hat also no longer supports most manifest functionality in Red Hat Satellite with one exception: * Red Hat Satellite users in closed network or "air gapped" networks that do not receive their updates directly from Red Hat servers can currently still use **access.redhat.com** until the release of Red Hat Satellite 6.16.

New Red Hat accounts automatically use Simple Content Access for their subscription tooling. New Red Hat accounts and existing Satellite customers who can connect to Red Hat's servers can find their manifests at **console.redhat.com**.

Prerequisites

- You have permissions to pull images from registry.redhat.io.
- A Red Hat account with Simple Content Access enabled.

Procedure

1. If you need to access your manifest for your container images log in to Red Hat Console.
2. Click the three-dot menu for the manifest you need for your container images, and click **Export manifest**.
3. Log in to Podman by using your registry.redhat.io credentials:

```
$ podman login registry.redhat.io
```

4. Enter your username and password.
5. Pull a container image:

```
$ podman pull registry.redhat.io/<container_image_name>:<tag>
```

Verification

To verify that the image you recently pulled is contained in the list, take these steps:

1. List the images in local storage:

```
$ podman images
```

2. Check the image name, and verify that the tag is correct.

Additional resources

- See Red Hat Ecosystem Catalog Help for information on registering and getting images.
- See Creating and managing manifests for a connected Satellite Server to learn more about the changes coming to Red Hat subscription tooling

5.2. TAGGING IMAGES FOR USE IN AUTOMATION HUB

After you pull images from a registry, tag them for use in your private automation hub container registry.

Prerequisites

- You have pulled a container image from an external registry.
- You have the FQDN or IP address of the automation hub instance.

Procedure

- Tag a local image with the automation hub container repository:

```
$ podman tag registry.redhat.io/<container_image_name>:<tag>
<automation_hub_hostname>/<container_image_name>
```

Verification

1. List the images in local storage:

```
$ podman images
```

2. Verify that the image you recently tagged with your automation hub information is contained in the list.

5.3. PUSHING A CONTAINER IMAGE TO PRIVATE AUTOMATION HUB

You can push tagged container images to private automation hub to create new containers and populate the container registry.

Prerequisites

- You have permissions to create new containers.
- You have the FQDN or IP address of the automation hub instance.

Procedure

1. Log in to Podman using your automation hub location and credentials:

```
$ podman login -u=<username> -p=<password> <automation_hub_url>
```

2. Push your container image to your automation hub container registry:

```
$ podman push <automation_hub_url>/<container_image_name>
```

Troubleshooting

The **push** operation re-compresses image layers during the upload, which is not guaranteed to be reproducible and is client-implementation dependent. This may lead to image-layer digest changes and a failed push operation, resulting in **Error: Copying this image requires changing layer representation, which is not possible (image is signed or the destination specifies a digest)**.

Verification

1. Log in to your automation hub.
2. Navigate to **Container Registry**.
3. Locate the container in the container repository list.

CHAPTER 6. SETTING UP YOUR CONTAINER REPOSITORY

When you set up your container repository, you must add a description, include a README, add groups that can access the repository, and tag images.

6.1. PREREQUISITES TO SETTING UP YOUR CONTAINER REGISTRY

- You are logged in to a private automation hub.
- You have permissions to change the repository.

6.2. ADDING A README TO YOUR CONTAINER REPOSITORY

Add a README to your container repository to provide instructions to your users on how to work with the container. Automation hub container repositories support Markdown for creating a README. By default, the README is empty.

Prerequisites

- You have permissions to change containers.

Procedure

1. Log in to automation hub.
2. From the navigation panel, select **Execution Environments → Execution Environments**.
3. Select your container repository.
4. On the **Detail** tab, click **Add**.
5. In the **Raw Markdown** text field, enter your README text in Markdown.
6. Click **Save** when you are finished.

After you add a README, you can edit it at any time by clicking **Edit** and repeating steps 4 and 5.

6.3. PROVIDING ACCESS TO YOUR CONTAINER REPOSITORY

Provide access to your container repository for users who need to work with the images. Adding a group allows you to modify the permissions the group can have to the container repository. You can use this option to extend or restrict permissions based on what the group is assigned.

Prerequisites

- You have **change container namespace** permissions.

Procedure

1. Log in to automation hub.
2. From the navigation panel, select **Execution Environments → Execution Environments**.
3. Select your container repository.

4. From the **Access** tab, click **Select a group**.
5. Select the group or groups to which you want to grant access and click **Next**.
6. Select the roles that you want to add to this execution environment and click **Next**.
7. Click **Add**.

6.4. TAGGING CONTAINER IMAGES

Tag images to add an additional name to images stored in your automation hub container repository. If no tag is added to an image, automation hub defaults to **latest** for the name.

Prerequisites

- You have **change image tags** permissions.

Procedure

1. From the navigation panel, select **Execution Environments → Execution Environments**.
2. Select your container repository.
3. Click the **Images** tab.
4. Click the **More Actions** icon ⋮, and click **Manage tags**.
5. Add a new tag in the text field and click **Add**.
6. Optional: Remove **current tags** by clicking **x** on any of the tags for that image.
7. Click **Save**.

Verification

- Click the **Activity** tab and review the latest changes.

6.5. CREATING A CREDENTIAL IN AUTOMATION CONTROLLER

To pull container images from a password or token-protected registry, you must create a credential in automation controller.

In earlier versions of Ansible Automation Platform, you were required to deploy a registry to store execution environment images. On Ansible Automation Platform 2.0 and later, the system operates as if you already have a container registry up and running. To store execution environment images, add the credentials of only your selected container registries.

Procedure

1. Navigate to automation controller.
2. From the navigation panel, select **Resources → Credentials**.
3. Click **Add** to create a new credential.

4. Enter an authorization **Name**, **Description**, and **Organization**.
5. Select the **Credential Type**.
6. Enter the **Authentication URL**. This is the container registry address.
7. Enter the **Username** and **Password or Token** required to log in to the container registry.
8. Optional: To enable SSL verification, select **Verify SSL**.
9. Click **Save**.

CHAPTER 7. PULLING IMAGES FROM A CONTAINER REPOSITORY

Pull images from the automation hub container registry to make a copy to your local machine. Automation hub provides the **podman pull** command for each **latest** image in the container repository. You can copy and paste this command into your terminal, or use **podman pull** to copy an image based on an image tag.

7.1. PULLING AN IMAGE

You can pull images from the automation hub container registry to make a copy to your local machine.

Prerequisites

- You must have permission to view and pull from a private container repository.

Procedure

1. If you are pulling container images from a password or token-protected registry, create a credential in automation controller before pulling the image.
2. From the navigation panel, select **Execution Environments → Execution Environments**.
3. Select your container repository.
4. In the **Pull this image** entry, click **Copy to clipboard**.
5. Paste and run the command in your terminal.

Verification

- Run **podman images** to view images on your local machine.

7.2. SYNCING IMAGES FROM A CONTAINER REPOSITORY

You can pull images from the automation hub container registry to sync an image to your local machine. To sync an image from a remote container registry, you must first configure a remote registry.

Prerequisites

You must have permission to view and pull from a private container repository.

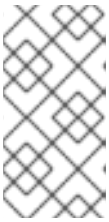
Procedure

1. From the navigation panel, select **Execution Environments → Execution Environments**.
2. Add https://registry.redhat.io to the registry.
3. Add any required credentials to authenticate.

NOTE

Some container registries are aggressive with rate limiting. Set a rate limit under **Advanced Options**.

4. From the navigation panel, select **Execution Environments → Execution Environments**.
5. Click **Add execution environment** in the page header.
6. Select the registry you want to pull from. The **Name** field displays the name of the image displayed on your local registry.



NOTE

The **Upstream name** field is the name of the image on the remote server. For example, if the upstream name is set to "alpine" and the **Name** field is "local/alpine", the alpine image is downloaded from the remote and renamed to "local/alpine".

7. Set a list of tags to include or exclude. Syncing images with a large number of tags is time consuming and uses a lot of disk space.

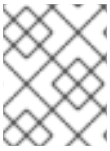
Additional resources

- See Red Hat Container Registry Authentication for a list of registries.
- See the What is Podman? documentation for options to use when pulling images.

APPENDIX A. AUTOMATION EXECUTION ENVIRONMENTS PRECEDENCE

Project updates will always use the control plane automation execution environments by default, however, jobs will use the first available automation execution environments as follows:

1. The **execution_environment** defined on the template (job template or inventory source) that created the job.
2. The **default_environment** defined on the project that the job uses.
3. The **default_environment** defined on the organization of the job.
4. The **default_environment** defined on the organization of the inventory the job uses.
5. The current **DEFAULT_EXECUTION_ENVIRONMENT** setting (configurable at **api/v2/settings/jobs/**)
6. Any image from the **GLOBAL_JOB_EXECUTION_ENVIRONMENTS** setting.
7. Any other global execution environment.



NOTE

If more than one execution environment fits a criteria (applies for 6 and 7), the most recently created one is used.