Red Hat OpenShift Data Science self-managed 1.32

Installing OpenShift Data Science self-managed in a disconnected environment

Use Red Hat OpenShift Container Platform to install Red Hat OpenShift Data Science as an Operator to your OpenShift cluster in a disconnected environment

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Abstract

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CHAPTER 1. ARCHITECTURE OF OPENSHIFT DATA SCIENCE SELF-MANAGED

Red Hat OpenShift Data Science self-managed is an Operator that is available on a self-managed environment, such as Red Hat OpenShift Container Platform.

OpenShift Data Science integrates the following components and services:

- At the service layer:

  OpenShift Data Science dashboard

  A customer-facing dashboard that shows available and installed applications for the OpenShift Data Science environment as well as learning resources such as tutorials, quick starts, and documentation. Administrative users can access functionality to manage users, clusters, notebook images, and model-serving runtimes. Data scientists can use the dashboard to create projects to organize their data science work.

  Model serving

  Data scientists can deploy trained machine-learning models to serve intelligent applications in production. After deployment, applications can send requests to the model using its deployed API endpoint.

  Data science pipelines

  Data scientists can build portable machine learning (ML) workflows with data science pipelines, using Docker containers. This enables your data scientists to automate workflows as they develop their data science models.

  Jupyter (self-managed)

  A self-managed application that allows data scientists to configure their own notebook server environment and develop machine learning models in JupyterLab.

- At the management layer:

  The Red Hat OpenShift Data Science Operator

  A meta-operator that deploys and maintains all components and sub-operators that are part of OpenShift Data Science.

  Monitoring services

  Prometheus gathers metrics from OpenShift Data Science for monitoring purposes.

When you install the OpenShift Data Science Operator in the OpenShift Container Platform cluster, the following new projects are created:

- The **redhat-ods-operator** project contains the OpenShift Data Science operator.
- The **redhat-ods-applications** project installs the dashboard and other required components of OpenShift Data Science.
- The **redhat-ods-monitoring** project contains services for monitoring.
- The **rhods-notebooks** project is where notebook environments are deployed by default.

You or your data scientists must create additional projects for the applications that will use your machine learning models.

Do not install independent software vendor (ISV) applications in namespaces associated with OpenShift Data Science.

Additional resources

- Installing OpenShift Data Science on OpenShift Container Platform in a disconnected environment

CHAPTER 2. OVERVIEW OF DEPLOYING OPENSHIFT DATA SCIENCE IN A DISCONNECTED ENVIRONMENT

Read this section to understand how to deploy Red Hat OpenShift Data Science as a development and testing environment for data scientists in a disconnected environment. Disconnected clusters are on a restricted network, typically behind a firewall. In this case, clusters cannot access the remote registries where Red Hat provided OperatorHub sources reside. Instead, the OpenShift Data Science Operator can be deployed to a disconnected environment using a private registry to mirror the images.

Installing OpenShift Data Science in a disconnected environment involves the following high-level tasks:

1. Confirm that your OpenShift Container Platform cluster meets all requirements. See Requirements for OpenShift Data Science self-managed .
2. Configure an identity provider for OpenShift Container Platform. See Understanding identity provider configuration.
3. Add administrative users for OpenShift Container Platform. See Adding administrative users for OpenShift Container Platform.
4. Mirror images to a private registry. See Mirroring images to a private registry for a disconnected installation.
5. Install the OpenShift Data Science Operator. See Installing OpenShift Data Science on OpenShift Container Platform for more information.
6. Configure user and administrator groups to provide user access to OpenShift Data Science. See Adding users for OpenShift Data Science .
7. Provide your users with the URL for the OpenShift Container Platform cluster on which you deployed OpenShift Data Science. See Accessing the OpenShift Data Science dashboard .

CHAPTER 3. REQUIREMENTS FOR OPENSHIFT DATA SCIENCE SELF-MANAGED

Your environment must meet certain requirements to receive support for Red Hat OpenShift Data Science.

Installation requirements

You must meet the following requirements before you are able to install OpenShift Data Science on your Red Hat OpenShift Container Platform cluster.

- **Product subscriptions**
  - A subscription for Red Hat OpenShift Data Science self-managed
    Contact your Red Hat account manager to purchase new subscriptions. If you do not yet have an account manager, complete the form at https://www.redhat.com/en/contact to request one.
- **An OpenShift Container Platform cluster 4.10 or greater**
  - Use an existing cluster or create a new cluster by following the OpenShift Container Platform documentation: OpenShift Container Platform installation overview .
    Your cluster must have at least 2 worker nodes with at least 8 CPUs and 32 GiB RAM available for OpenShift Data Science to use when you install the Operator. The installation process fails to start and an error is displayed if this requirement is not met. To ensure that OpenShift Data Science is usable, additional cluster resources are required beyond the minimum requirements.
  - A default storage class that can be dynamically provisioned must be configured.
    Confirm that a default storage class is configured by running the **oc get storageclass** command. If no storage classes are noted with **(default)** beside the name, follow the OpenShift Container Platform documentation to configure a default storage class: Changing the default storage class . For more information about dynamic provisioning, see Dynamic provisioning.
  - Open Data Hub must not be installed on the cluster.
    For more information about managing the machines that make up an OpenShift cluster, see Overview of machine management.
- **An identity provider configured for OpenShift Container Platform**
  Access to the cluster as a user with the **cluster-admin** role; the **kubeadmin** user is not allowed.

  Red Hat OpenShift Data Science supports the same authentication systems as Red Hat OpenShift Container Platform. See Understanding identity provider configuration for more information on configuring identity providers.
- **Internet access**
  Along with Internet access, the following domains must be accessible to mirror images required for the OpenShift Data Science self-managed installation:
  - cdn.redhat.com
  - subscription.rhn.redhat.com
  - registry.access.redhat.com

- registry.redhat.io
- quay.io

For CUDA-based images, the following domains must be accessible:

- ngc.download.nvidia.cn
- developer.download.nvidia.com

- **OpenShift Pipelines operator installation**
  - The Red Hat OpenShift Pipelines operator enables support for installation of pipelines in a self-managed environment.
    Before you use data science pipelines in OpenShift Data Science, you must install the Red Hat OpenShift Pipelines Operator. For more information, see Installing OpenShift Pipelines.
    If your deployment is in a disconnected self-managed environment, see Red Hat OpenShift Pipelines Operator in a restricted environment.
  - Before you can execute a pipeline in a disconnected environment, you must mirror any images used by your pipelines to a private registry.
  - You can store your pipeline artifacts in an Amazon Web Services (AWS) Simple Storage Service (S3) bucket to ensure that you do not consume local storage. To do this, you must first configure write access to your S3 bucket on your AWS account.
    If you do not have access to Amazon S3 storage, you must configure your own storage solution for use with pipelines.

CHAPTER 4. ADDING ADMINISTRATIVE USERS FOR OPENSHIFT CONTAINER PLATFORM

Before you can install and configure OpenShift Data Science for your data scientist users, you must define administrative users. Only users with the **cluster-admin** role can install and configure OpenShift Data Science.

For more information about creating a cluster admin user, see Creating a cluster admin .

CHAPTER 5. MIRRORING IMAGES TO A PRIVATE REGISTRY FOR A DISCONNECTED INSTALLATION

You can install the Red Hat OpenShift Data Science Operator to your OpenShift cluster in a disconnected environment by mirroring the required container images to a private container registry. After mirroring the images to a container registry, you can install OpenShift Data Science Operator using the OperatorHub.

You can use the *mirror registry for Red Hat OpenShift* , a small-scale container registry that you can use as a target for mirroring the required container images for OpenShift Data Science in a disconnected environment. Use of the mirror registry for Red Hat OpenShift is optional if another container registry is already available in your installation environment.

Prerequisites

- You have **cluster-admin** access to a running OpenShift Container Platform cluster, version 4.10 or greater.
- Your host machine has access to the Internet so that it can obtain the images to populate the mirror repository.
- You have installed the OpenShift CLI (**oc**).
- You have mirrored and deployed the NVIDIA GPU Operator. See Configuring mediated devices - Virtual machines.
- You have a GitHub account linked to a verified email address.
- If you plan to use the OpenShift Data Science disconnected installer helper, you have installed the following:
  - Bash (version 4.0 or above)
  - yq
  - jq
  - skopeo
- If you plan to use the OpenShift Data Science disconnected installer helper, you have cloned the OpenShift Data Science disconnected installer helper repository. For more information about how to clone a GitHub repository, see Cloning a repository

Procedure

1. Create a mirror registry. See Creating a mirror registry with mirror registry for Red Hat OpenShift.
2. Install the **oc-mirror** OpenShift CLI plug-in (version 4.12 or greater) to mirror registry images. See Installing the oc-mirror OpenShift CLI plug-in .
3. Configure registry authentication. See Configuring credentials that allow images to be mirrored .
4. Determine the version of OpenShift you want to use (version 4.10 or greater). To view a list of the available OpenShift versions:

```
oc-mirror list operators
```

5. Get the RHODS Operator package name and channel for your chosen OpenShift version. For example, for OpenShift version 4.13:

```
oc-mirror list operators --catalog=registry.redhat.io/redhat/redhat-operator-index:v4.13 --
package=rhods-operator
```

The result looks similar to this output:

```
NAME            DISPLAY NAME                DEFAULT CHANNEL
 rhods-operator  {productname-long}  stable
PACKAGE          CHANNEL  HEAD
 rhods-operator  beta     rhods-operator.1.27.0
 rhods-operator  stable   rhods-operator.1.27.0
```

6. Get the OpenShift Pipelines Operator package name and channel for your chosen OpenShift version. For example, for OpenShift version 4.13:

```
oc-mirror list operators --catalog=registry.redhat.io/redhat/redhat-operator-index:v4.13 --
package=openshift-pipelines-operator-rh
```

The result looks similar to this output:

```
NAME                          DISPLAY NAME               DEFAULT CHANNEL
openshift-pipelines-operator-rh  Red Hat OpenShift Pipelines  latest
PACKAGE                       CHANNEL        HEAD
openshift-pipelines-operator-rh  latest         openshift-pipelines-operator-rh.v1.10.3
openshift-pipelines-operator-rh  pipelines-1.10  openshift-pipelines-operator-rh.v1.10.3
openshift-pipelines-operator-rh  pipelines-1.9   openshift-pipelines-operator-rh.v1.9.2
```

7. Run the OpenShift Data Science disconnected installer helper to obtain the values for your image set configuration.

IMPORTANT

If you decide not to use the OpenShift Data Science disconnected installer helper, you can instead use an example image set configuration file (**rhods-<version>.md**) from the OpenShift Data Science disconnected installer helper repository.

The example image set configurations are for demonstration purposes only and might need further alterations depending on your deployment.

To identify the attributes most suitable for your deployment, examine the documentation and use cases in Mirroring images for a disconnected installation using the oc-mirror plugin.

Open the relevant **rhods-<version>.md** file and skip to step 8.

a. At a command-line terminal, change to the directory that contains the OpenShift Data Science disconnected installer helper repository.

b. Enter the following command to run the OpenShift Data Science disconnected installer helper:

```
./rhods-disconnected-helper.sh -v rhods-<version>
```

Replace **version** with the relevant version of OpenShift Data Science.

This example command generates a file containing an image set configuration for OpenShift Data Science version 1.31:

```
./rhods-disconnected-helper.sh -v rhods-1.31
```

The OpenShift Data Science disconnected installer helper generates a file (**rhods-<version>.md**) that contains an example image set configuration along with a separate list of notebook image values.

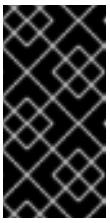
8. Open the **rhods-<version>.md** file in a text editor and examine its contents.

9. Create a file called **imageset-config.yaml** file and populate it with values suitable for the image set configuration in your deployment. As a start, you can use the example image set configuration that you obtained earlier. You might need to make additional alterations to the example image set configuration that are suitable for your deployment.

10. Run the **oc mirror** command to mirror the specified image set configuration to disk:

```
$ oc mirror --config=./imageset-config.yaml file://mirror-rhods
```

- Replace **mirror-rhods** with the target directory where you want to output the image set file.
- The target directory path must start with **file://**.



IMPORTANT

To successfully mirror the image set configuration to disk, ensure that you have installed **oc-mirror** OpenShift CLI (**oc**) plug-in, version 4.12 or greater. Versions of **oc-mirror** preceding version 4.12 do not allow you to mirror the full image set configuration provided.

11. Verify that the image set **.tar** files were created:

```
$ ls mirror-rhods
mirror_seq1_000000.tar mirror_seq1_000001.tar
```

If an **archiveSize** value was specified in the image set configuration file, the image set might be separated into multiple **.tar** files.

12. Mirror the contents of the generated image set to the target mirror registry:

```
$ oc mirror --from=./mirror-rhods docker://registry.example.com:5000
```

- Replace **mirror-rhods** with the directory that contains your image set **.tar** files.
- Replace **registry.example.com:5000** with your mirror registry.

13. Verify that the YAML files are present for the **ImageContentSourcePolicy** and **CatalogSource** resources:

```
$ ls oc-mirror-workspace/results-1639608488/

catalogSource-rhods-operator-live-catalog.yaml
charts
imageContentSourcePolicy.yaml
mapping.txt
release-signatures
```

Replace **results-1639608488** with the name of your results directory.

14. Log in to the OpenShift CLI as a user with the cluster-admin role.

15. Install the generated **ImageContentSourcePolicy** and **CatalogSource** resources into the cluster:

```
$ oc apply -f ./oc-mirror-workspace/results-1639608488/imageContentSourcePolicy.yaml
$ oc apply -f ./oc-mirror-workspace/results-1639608488/catalogSource-rhods-operator-live-catalog.yaml
```

Replace **results-1639608488** with the name of your results directory.

Verification

- Run the following command to verify that the **CatalogSource** and pod were created successfully:

```
$ oc get catalogsource,pod -n openshift-marketplace | grep redhat-operators
```

- Check that the Red Hat OpenShift Data Science Operator exists in the OperatorHub:

  a. Log in to the OpenShift Container Platform cluster web console.

  b. Click **Operators → OperatorHub**.
  The **OperatorHub** page opens.

  c. Locate the Red Hat OpenShift Data Science Operator.

Additional resources

- Installing OpenShift Data Science on OpenShift Container Platform in a disconnected environment
- Before you can execute a pipeline in a disconnected environment, you must upload the relevant images to your private registry. For more information, see Mirroring images to run pipelines in a restricted environment.
- Configuring Samples Operator for a restricted cluster
- Creating a cluster with a mirrored registry

CHAPTER 6. INSTALLING OPENSHIFT DATA SCIENCE ON OPENSHIFT CONTAINER PLATFORM IN A DISCONNECTED ENVIRONMENT

You can install the Red Hat OpenShift Data Science Operator to your Red Hat OpenShift Container Platform cluster in a disconnected environment using the OpenShift Container Platform web console.

IMPORTANT

Upgrading directly from the Red Hat OpenShift Data Science self-managed Beta version to the Generally Available (GA) release is not supported. To install the OpenShift Data Science self-managed GA release, you must remove the Beta version first and then proceed with the following procedure. See Uninstalling Red Hat OpenShift Data Science self-managed Beta version prior to installing a General Availability (GA) release for more information.

Prerequisites

- Purchase entitlements for OpenShift Data Science self-managed.
- A running OpenShift Container Platform cluster, version 4.10 or greater.
- Open Data Hub must not be installed on the same OpenShift cluster.
- Access to the OpenShift Container Platform cluster as a user with the **cluster-admin** role.
- Content mirrored to private registry. See Mirroring images to a private registry for a disconnected installation for more information.

Procedure

1. Log in to the OpenShift Container Platform cluster web console.
2. Click **Operators → OperatorHub**.
   The **OperatorHub** page opens.
3. Locate the Red Hat OpenShift Data Science Operator.
   a. Scroll through available Operators or type Red Hat OpenShift Data Science into the **Filter by keyword** box to find the Red Hat OpenShift Data Science Operator.
4. Select the Operator to display additional information.
5. Read the information about the Operator and click **Install**.
   The **Install Operator** page opens.
6. For **Installation mode**, select the **All namespaces on the cluster (default)**to install the Operator in the default **redhat-ods-operator** namespace and make it available to all namespaces in the cluster.
   Note: The option to select **A specific namespace on the cluster**is not available.
7. Under **Update approval**, select either **Automatic** or **Manual**.
8. Click **Install**.

Verification

- In the OpenShift Container Platform web console , click **Operators → Installed Operators** and confirm that the Red Hat OpenShift Data Science Operator shows one of the following statuses:
  - **Installing** - installation is in progress; wait for this to change to **Succeeded**. This takes around 10 minutes.
  - **Succeeded** - installation is successful.
- In OpenShift Container Platform, click **Home → Projects** and confirm that the following project namespaces are visible and listed as **Active**:
  - **redhat-ods-applications**
  - **redhat-ods-monitoring**
  - **redhat-ods-operator**
  - **rhods-notebooks**

Additional resources

- Adding users for OpenShift Data Science
- Adding Operators to a cluster
- Mirroring images to a private registry for a disconnected installation

CHAPTER 7. ENABLING GPU SUPPORT IN OPENSHIFT DATA SCIENCE

Optionally, to ensure that your data scientists can use compute-heavy workloads in their models, you can enable graphics processing units (GPUs) in OpenShift Data Science. To enable GPUs on OpenShift, you must install the NVIDIA GPU Operator. As a prerequisite to installing the NVIDIA GPU Operator, you must install the Node Feature Discovery (NFD) Operator. For information about how to install these operators, see GPU Operator on OpenShift.

Follow the instructions in this chapter only if you want to enable GPU support in a disconnected self-managed environment. For more information on GPU enablement on a OpenShift cluster in a disconnected or airgapped environment, see Deploy GPU Operators in a disconnected or airgapped environment.

Additional resources

- GPU Operator on OpenShift.
- Cluster NFD Operator

CHAPTER 8. ACCESSING THE OPENSHIFT DATA SCIENCE DASHBOARD

After you have installed OpenShift Data Science and added users, you can access the URL for your OpenShift Data Science console and share the URL with the users to let them log in and work on their data models.

Prerequisites

- You have installed OpenShift Data Science on your OpenShift Container Platform cluster.
- You have added at least one user to the user group for OpenShift Data Science.

Procedure

1. Log in to OpenShift Container Platform web console.
2. Click the application launcher ().
3. Right-click on **Red Hat OpenShift Data Science** and copy the URL for your OpenShift Data Science instance.
4. Provide this instance URL to your data scientists to let them log in to OpenShift Data Science.

Verification

- Confirm that you and your users can log in to OpenShift Data Science by using the instance URL.

Additional resources

- Logging in to OpenShift Data Science
- Adding users for OpenShift Data Science