OpenShift Container Platform 4.9

CLI tools

Learning how to use the command-line tools for OpenShift Container Platform
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Learning how to use the command-line tools for OpenShift Container Platform
Abstract

This document provides information about installing, configuring, and using the command-line tools for OpenShift Container Platform. It also contains a reference of CLI commands and examples of how to use them.
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CHAPTER 1. OPENSFIGHT CONTAINER PLATFORM CLI TOOLS
OVERVIEW

A user performs a range of operations while working on OpenShift Container Platform such as the following:

- Managing clusters
- Building, deploying, and managing applications
- Managing deployment processes
- Developing Operators
- Creating and maintaining Operator catalogs

OpenShift Container Platform offers a set of command-line interface (CLI) tools that simplify these tasks by enabling users to perform various administration and development operations from the terminal. These tools expose simple commands to manage the applications, as well as interact with each component of the system.

1.1. LIST OF CLI TOOLS

The following set of CLI tools are available in OpenShift Container Platform:

- **OpenShift CLI (oc):** This is the most commonly used CLI tool by OpenShift Container Platform users. It helps both cluster administrators and developers to perform end-to-end operations across OpenShift Container Platform using the terminal. Unlike the web console, it allows the user to work directly with the project source code using command scripts.

- **Knative CLI (kn):** The *kn* CLI tool provides simple and intuitive terminal commands that can be used to interact with OpenShift Serverless components, such as Knative Serving and Eventing.

- **Pipelines CLI (tkn):** OpenShift Pipelines is a continuous integration and continuous delivery (CI/CD) solution in OpenShift Container Platform, which internally uses Tekton. The *tkn* CLI tool provides simple and intuitive commands to interact with OpenShift Pipelines using the terminal.

- **opm CLI:** The *opm* CLI tool helps the Operator developers and cluster administrators to create and maintain the catalogs of Operators from the terminal.

- **Operator SDK:** The Operator SDK, a component of the Operator Framework, provides a CLI tool that Operator developers can use to build, test, and deploy an Operator from the terminal. It simplifies the process of building Kubernetes-native applications, which can require deep, application-specific operational knowledge.
2.1. GETTING STARTED WITH THE OPENSHIFT CLI

2.1.1. About the OpenShift CLI

With the OpenShift command-line interface (CLI), the `oc` command, you can create applications and manage OpenShift Container Platform projects from a terminal. The OpenShift CLI is ideal in the following situations:

- Working directly with project source code
- Scripting OpenShift Container Platform operations
- Managing projects while restricted by bandwidth resources and the web console is unavailable

2.1.2. Installing the OpenShift CLI

You can install the OpenShift CLI (`oc`) either by downloading the binary or by using an RPM.

2.1.2.1. Installing the OpenShift CLI by downloading the binary

You can install the OpenShift CLI (`oc`) to interact with OpenShift Container Platform from a command-line interface. You can install `oc` on Linux, Windows, or macOS.

**IMPORTANT**

If you installed an earlier version of `oc`, you cannot use it to complete all of the commands in OpenShift Container Platform 4.9. Download and install the new version of `oc`.

Installing the OpenShift CLI on Linux

You can install the OpenShift CLI (`oc`) binary on Linux by using the following procedure.

**Procedure**


2. Select the appropriate version in the Version drop-down menu.

3. Click Download Now next to the OpenShift v4.9 Linux Client entry and save the file.

4. Unpack the archive:

   ```
   $ tar xvzf <file>
   ```

5. Place the `oc` binary in a directory that is on your PATH.

   To check your PATH, execute the following command:

   ```
   $ echo $PATH
   ```

After you install the OpenShift CLI, it is available using the `oc` command:
Installing the OpenShift CLI on Windows
You can install the OpenShift CLI (oc) binary on Windows by using the following procedure.

Procedure


2. Select the appropriate version in the Version drop-down menu.

3. Click Download Now next to the OpenShift v4.9 Windows Client entry and save the file.

4. Unzip the archive with a ZIP program.

5. Move the oc binary to a directory that is on your PATH.
   To check your PATH, open the command prompt and execute the following command:

   ```
   C:\> path
   ```

After you install the OpenShift CLI, it is available using the oc command:

```
C:\> oc <command>
```

Installing the OpenShift CLI on macOS
You can install the OpenShift CLI (oc) binary on macOS by using the following procedure.

Procedure


2. Select the appropriate version in the Version drop-down menu.

3. Click Download Now next to the OpenShift v4.9 MacOSX Client entry and save the file.

4. Unpack and unzip the archive.

5. Move the oc binary to a directory on your PATH.
   To check your PATH, open a terminal and execute the following command:

   ```
   $ echo $PATH
   ```

After you install the OpenShift CLI, it is available using the oc command:

```
$ oc <command>
```

2.1.2.2. Installing the OpenShift CLI by using the web console
You can install the OpenShift CLI (oc) to interact with OpenShift Container Platform from a web console. You can install oc on Linux, Windows, or macOS.
IMPORTANT

If you installed an earlier version of oc, you cannot use it to complete all of the commands in OpenShift Container Platform 4.9. Download and install the new version of oc.

2.1.2.2.1. Installing the OpenShift CLI on Linux using the web console

You can install the OpenShift CLI (oc) binary on Linux by using the following procedure.

Procedure

1. From the web console, click ?.

2. Click Command Line Tools.

3. Select appropriate oc binary for your Linux platform, and then click Download oc for Linux.

4. Save the file.

5. Unpack the archive.

   $ tar xvzf <file>

6. Move the oc binary to a directory that is on your PATH.

   To check your PATH, execute the following command:

   $ echo $PATH

   After you install the OpenShift CLI, it is available using the oc command:

   $ oc <command>

2.1.2.2.2. Installing the OpenShift CLI on Windows using the web console
You can install the OpenShift CLI (oc) binary on Windows by using the following procedure.

Procedure

1. From the web console, click ?.

2. Click Command Line Tools.

3. Select the oc binary for Windows platform, and then click Download oc for Windows for x86_64.

4. Save the file.

5. Unzip the archive with a ZIP program.

6. Move the oc binary to a directory that is on your PATH.
   To check your PATH, open the command prompt and execute the following command:

   ```
   C:> path
   ```

After you install the OpenShift CLI, it is available using the oc command:

```
C:> oc <command>
```

2.1.2.2.3. Installing the OpenShift CLI on macOS using the web console

You can install the OpenShift CLI (oc) binary on macOS by using the following procedure.

Procedure

1. From the web console, click ?.
2. Click Command Line Tools

3. Select the oc binary for macOS platform, and then click Download oc for Mac for x86_64

4. Save the file.

5. Unpack and unzip the archive.

6. Move the oc binary to a directory on your PATH.
   To check your PATH, open a terminal and execute the following command:

   ```
   $ echo $PATH
   ```

   After you install the OpenShift CLI, it is available using the oc command:

   ```
   $ oc <command>
   ```

2.1.2.3. Installing the OpenShift CLI by using an RPM

For Red Hat Enterprise Linux (RHEL), you can install the OpenShift CLI (oc) as an RPM if you have an active OpenShift Container Platform subscription on your Red Hat account.

**Prerequisites**

- Must have root or sudo privileges.

**Procedure**

1. Register with Red Hat Subscription Manager:

   ```
   # subscription-manager register
   ```

2. Pull the latest subscription data:
3. List the available subscriptions:

   # subscription-manager list --available --matches "OpenShift"

4. In the output for the previous command, find the pool ID for an OpenShift Container Platform subscription and attach the subscription to the registered system:

   # subscription-manager attach --pool=<pool_id>

5. Enable the repositories required by OpenShift Container Platform 4.9.
   - For Red Hat Enterprise Linux 8:
     # subscription-manager repos --enable="rhocp-4.9-for-rhel-8-x86_64-rpms"
   - For Red Hat Enterprise Linux 7:
     # subscription-manager repos --enable="rhel-7-server-ose-4.9-rpms"

6. Install the openshift-clients package:

   # yum install openshift-clients

After you install the CLI, it is available using the `oc` command:

$ oc <command>

2.1.3. Logging in to the OpenShift CLI

You can log in to the OpenShift CLI (`oc`) to access and manage your cluster.

Prerequisites

- You must have access to an OpenShift Container Platform cluster.
- You must have installed the OpenShift CLI (`oc`).

NOTE

To access a cluster that is accessible only over an HTTP proxy server, you can set the `HTTP_PROXY`, `HTTPS_PROXY` and `NO_PROXY` variables. These environment variables are respected by the `oc` CLI so that all communication with the cluster goes through the HTTP proxy.

Procedure

1. Enter the `oc login` command and pass in a user name:

   $ oc login -u user1
When prompted, enter the required information:

**Example output**

Server [https://localhost:8443]: https://openshift.example.com:6443

The server uses a certificate signed by an unknown authority.
You can bypass the certificate check, but any data you send to the server could be intercepted by others.

Use insecure connections? (y/n): y

Authentication required for https://openshift.example.com:6443 (openshift)
Username: user1
Password:

Login successful.

You don’t have any projects. You can try to create a new project, by running

```
oc new-project <projectname>
```

Welcome! See ‘oc help’ to get started.

1. Enter the OpenShift Container Platform server URL.
2. Enter whether to use insecure connections.
3. Enter the user’s password.

**NOTE**

If you are logged in to the web console, you can generate an `oc login` command that includes your token and server information. You can use the command to log in to the OpenShift Container Platform CLI without the interactive prompts. To generate the command, select **Copy login command** from the username drop-down menu at the top right of the web console.

You can now create a project or issue other commands for managing your cluster.

### 2.1.4. Using the OpenShift CLI

Review the following sections to learn how to complete common tasks using the CLI.

#### 2.1.4.1. Creating a project

Use the `oc new-project` command to create a new project.

```
$ oc new-project my-project
```

**Example output**

```
Now using project "my-project" on server "https://openshift.example.com:6443".
```
2.1.4.2. Creating a new app

Use the `oc new-app` command to create a new application.

```
$ oc new-app https://github.com/sclorg/cakephp-ex
```

**Example output**

```
--> Found image 40de956 (9 days old) in imagestream "openshift/php" under tag "7.2" for "php"
...
Run 'oc status' to view your app.
```

2.1.4.3. Viewing pods

Use the `oc get pods` command to view the pods for the current project.

```
$ oc get pods -o wide
```

**Example output**

```
<table>
<thead>
<tr>
<th>NAME</th>
<th>READY</th>
<th>STATUS</th>
<th>RESTARTS</th>
<th>AGE</th>
<th>IP</th>
<th>NODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOMINATED NODE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cakephp-ex-1-build</td>
<td>0/1</td>
<td>Completed</td>
<td>0</td>
<td>5m45s</td>
<td>10.131.0.10</td>
<td>ip-10-0-141-74.ec2.internal</td>
</tr>
<tr>
<td>cakephp-ex-1-deploy</td>
<td>0/1</td>
<td>Completed</td>
<td>0</td>
<td>3m44s</td>
<td>10.129.2.9</td>
<td>ip-10-0-147-65.ec2.internal</td>
</tr>
<tr>
<td>cakephp-ex-1-ktz97</td>
<td>1/1</td>
<td>Running</td>
<td>0</td>
<td>3m33s</td>
<td>10.128.2.11</td>
<td>ip-10-0-168-105.ec2.internal</td>
</tr>
</tbody>
</table>
```

2.1.4.4. Viewing pod logs

Use the `oc logs` command to view logs for a particular pod.

```
$ oc logs cakephp-ex-1-deploy
```

**Example output**

```
--> Scaling cakephp-ex-1 to 1
--> Success
```

2.1.4.5. Viewing the current project

Use the `oc project` command to view the current project.

```
$ oc project
```

**Example output**

```
Using project "my-project" on server "https://openshift.example.com:6443".
```
2.1.4.6. Viewing the status for the current project

Use the `oc status` command to view information about the current project, such as services, deployments, and build configs.

```
$ oc status
```

Example output

In project my-project on server https://openshift.example.com:6443

```
svc/cakephp-ex - 172.30.236.80 ports 8080, 8443
dc/cakephp-ex deploys istag/cakephp-ex:latest ->
   bc/cakephp-ex source builds https://github.com/sclorg/cakephp-ex on openshift/php:7.2
   deployment #1 deployed 2 minutes ago - 1 pod
```

3 infos identified, use 'oc status --suggest' to see details.

2.1.4.7. Listing supported API resources

Use the `oc api-resources` command to view the list of supported API resources on the server.

```
$ oc api-resources
```

Example output

```
NAME                                  SHORTNAMES       APIGROUP                              NAMESPACED   KIND
bindings                                                                                     true         Binding
componentstatuses                     cs                                                     false        ComponentStatus
configmaps                            cm                                                     true         ConfigMap
...                                     ...
```

2.1.5. Getting help

You can get help with CLI commands and OpenShift Container Platform resources in the following ways.

- Use `oc help` to get a list and description of all available CLI commands:

  Example: Get general help for the CLI

  ```
  $ oc help
  ```

  Example output

  OpenShift Client

  This client helps you develop, build, deploy, and run your applications on any OpenShift or Kubernetes compatible platform. It also includes the administrative commands for managing a cluster under the 'adm' subcommand.
Use the `--help` flag to get help about a specific CLI command:

**Example: Get help for the oc create command**

```
$ oc create --help
```

**Example output**

Create a resource by filename or stdin

JSON and YAML formats are accepted.

```
Usage:
oc create -f FILENAME [flags]
```

Use the `oc explain` command to view the description and fields for a particular resource:

**Example: View documentation for the Pod resource**

```
$ oc explain pods
```

**Example output**

```
KIND:     Pod
VERSION:  v1

DESCRIPTION:
  Pod is a collection of containers that can run on a host. This resource is
  created by clients and scheduled onto hosts.

FIELDS:
  apiVersion <string>
    APIVersion defines the versioned schema of this representation of an
    object. Servers should convert recognized schemas to the latest internal
    value, and may reject unrecognized values. More info:
    https://git.k8s.io/community/contributors/devel/api-conventions.md#resources
```

2.1.6. Logging out of the OpenShift CLI
You can log out the OpenShift CLI to end your current session.

- Use the `oc logout` command.

  ```
  $ oc logout
  ```

**Example output**

Logged "user1" out on "https://openshift.example.com"

This deletes the saved authentication token from the server and removes it from your configuration file.

### 2.2. CONFIGURING THE OPENSHIFT CLI

#### 2.2.1. Enabling tab completion

After you install the `oc` CLI tool, you can enable tab completion to automatically complete `oc` commands or suggest options when you press Tab.

**Prerequisites**

- You must have the `oc` CLI tool installed.
- You must have the package `bash-completion` installed.

**Procedure**

The following procedure enables tab completion for Bash.

1. Save the Bash completion code to a file.

  ```
  $ oc completion bash > oc_bash_completion
  ```

2. Copy the file to `/etc/bash_completion.d/`

  ```
  $ sudo cp oc_bash_completion /etc/bash_completion.d/
  ```

You can also save the file to a local directory and source it from your `.bashrc` file instead.

Tab completion is enabled when you open a new terminal.

### 2.3. MANAGING CLI PROFILES

A CLI configuration file allows you to configure different profiles, or contexts, for use with the CLI tools overview. A context consists of user authentication and OpenShift Container Platform server information associated with a nickname.

#### 2.3.1. About switches between CLI profiles

Contexts allow you to easily switch between multiple users across multiple OpenShift Container Platform servers, or clusters, when using CLI operations. Nicknames make managing CLI configurations easier by providing short-hand references to contexts, user credentials, and cluster details. After logging in with the CLI for the first time, OpenShift Container Platform creates a `~/.kube/config` file if one does
not already exist. As more authentication and connection details are provided to the CLI, either automatically during an `oc login` operation or by manually configuring CLI profiles, the updated information is stored in the configuration file:

**CLI config file**

```yaml
apiVersion: v1
clusters: 1
  - cluster:
      insecure-skip-tls-verify: true
      server: https://openshift1.example.com:8443
      name: openshift1.example.com:8443
  - cluster:
      insecure-skip-tls-verify: true
      server: https://openshift2.example.com:8443
      name: openshift2.example.com:8443
contexts: 2
  - context:
      cluster: openshift1.example.com:8443
      namespace: alice-project
      user: alice/openshift1.example.com:8443
      name: alice-project/openshift1.example.com:8443/alice
  - context:
      cluster: openshift1.example.com:8443
      namespace: joe-project
      user: alice/openshift1.example.com:8443
      name: joe-project/openshift1/alice
current-context: joe-project/openshift1.example.com:8443/alice
kind: Config
preferences: {}
users: 4
  - name: alice/openshift1.example.com:8443
    user:
      token: xZHd2pi5_9vQrg-SKXRJ2Dsl9SceNJdhNTljEKTb8k
```

1. The **clusters** section defines connection details for OpenShift Container Platform clusters, including the address for their master server. In this example, one cluster is nicknamed `openshift1.example.com:8443` and another is nicknamed `openshift2.example.com:8443`.

2. This **contexts** section defines two contexts: one nicknamed `alice-project/openshift1.example.com:8443/alice`, using the `alice-project` project, `openshift1.example.com:8443` cluster, and `alice` user, and another nicknamed `joe-project/openshift1.example.com:8443/alice`, using the `joe-project` project, `openshift1.example.com:8443` cluster and `alice` user.

3. The **current-context** parameter shows that the `joe-project/openshift1.example.com:8443/alice` context is currently in use, allowing the `alice` user to work in the `joe-project` project on the `openshift1.example.com:8443` cluster.

4. The **users** section defines user credentials. In this example, the user nickname `alice/openshift1.example.com:8443` uses an access token.
The CLI can support multiple configuration files which are loaded at runtime and merged together along with any override options specified from the command line. After you are logged in, you can use the `oc status` or `oc project` command to verify your current working environment:

### Verify the current working environment

```bash
$ oc status
```

**Example output**

```
oc status
In project Joe's Project (joe-project)

service database (172.30.43.12:5434 -> 3306)
database deploys docker.io/openshift/mysql-55-centos7:latest
#1 deployed 25 minutes ago - 1 pod

service frontend (172.30.159.137:5432 -> 8080)
frontend deploys origin-ruby-sample:latest <-
    builds https://github.com/openshift/ruby-hello-world with joe-project/ruby-20-centos7:latest
#1 deployed 22 minutes ago - 2 pods
```

To see more information about a service or deployment, use `oc describe service <name>` or `oc describe dc <name>`.

You can use `oc get all` to see lists of each of the types described in this example.

### List the current project

```bash
$ oc project
```

**Example output**

```
Using project "joe-project" from context named "joe-project/openshift1.example.com:8443/alice" on server "https://openshift1.example.com:8443".
```

You can run the `oc login` command again and supply the required information during the interactive process, to log in using any other combination of user credentials and cluster details. A context is constructed based on the supplied information if one does not already exist. If you are already logged in and want to switch to another project the current user already has access to, use the `oc project` command and enter the name of the project:

```bash
$ oc project alice-project
```

**Example output**

```
Now using project "alice-project" on server "https://openshift1.example.com:8443".
```

At any time, you can use the `oc config view` command to view your current CLI configuration, as seen in the output. Additional CLI configuration commands are also available for more advanced usage.
NOTE

If you have access to administrator credentials but are no longer logged in as the default system user `system:admin`, you can log back in as this user at any time as long as the credentials are still present in your CLI config file. The following command logs in and switches to the default project:

```
$ oc login -u system:admin -n default
```

2.3.2. Manual configuration of CLI profiles

NOTE

This section covers more advanced usage of CLI configurations. In most situations, you can use the `oc login` and `oc project` commands to log in and switch between contexts and projects.

If you want to manually configure your CLI config files, you can use the `oc config` command instead of directly modifying the files. The `oc config` command includes a number of helpful sub-commands for this purpose:

Table 2.1. CLI configuration subcommands

<table>
<thead>
<tr>
<th>Subcommand</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>set-cluster</code></td>
<td>Sets a cluster entry in the CLI config file. If the referenced cluster nickname already exists, the specified information is merged in.</td>
</tr>
<tr>
<td></td>
<td>$ oc config set-cluster &lt;cluster_nickname&gt; [--server=&lt;master_ip_or_fqdn&gt;]</td>
</tr>
<tr>
<td></td>
<td>[--certificate-authority=&lt;path/to/certificate/authority&gt;]</td>
</tr>
<tr>
<td></td>
<td>[--api-version=&lt;apiversion&gt;] [--insecure-skip-tls-verify=true]</td>
</tr>
<tr>
<td><code>set-context</code></td>
<td>Sets a context entry in the CLI config file. If the referenced context nickname already exists, the specified information is merged in.</td>
</tr>
<tr>
<td></td>
<td>$ oc config set-context &lt;context_nickname&gt; [--cluster=&lt;cluster_nickname&gt;]</td>
</tr>
<tr>
<td></td>
<td>[--user=&lt;user_nickname&gt;] [--namespace=&lt;namespace&gt;]</td>
</tr>
<tr>
<td><code>use-context</code></td>
<td>Sets the current context using the specified context nickname.</td>
</tr>
<tr>
<td></td>
<td>$ oc config use-context &lt;context_nickname&gt;</td>
</tr>
<tr>
<td><code>set</code></td>
<td>Sets an individual value in the CLI config file.</td>
</tr>
<tr>
<td></td>
<td>$ oc config set &lt;property_name&gt; &lt;property_value&gt;</td>
</tr>
</tbody>
</table>

The `<property_name>` is a dot-delimited name where each token represents either an attribute name or a map key. The `<property_value>` is the new value being set.
### unset
Unsets individual values in the CLI config file.

```
$ oc config unset <property_name>
```

The `<property_name>` is a dot-delimited name where each token represents either an attribute name or a map key.

### view
Displays the merged CLI configuration currently in use.

```
$ oc config view
```

Displays the result of the specified CLI config file.

```
$ oc config view --config=<specific_filename>
```

### Example usage
- Log in as a user that uses an access token. This token is used by the `alice` user:

```
$ oc login https://openshift1.example.com --
token=ns7yVhuRNpDM9cgzfhhxQ7bM5s7N2ZVrkZepSRf4LC0
```

- View the cluster entry automatically created:

```
$ oc config view
```

### Example output
```yaml
apiVersion: v1
clusters:
- cluster:
  insecure-skip-tls-verify: true
  server: https://openshift1.example.com
  name: openshift1-example-com
contexts:
- context:
  cluster: openshift1-example-com
  namespace: default
  user: alice/openshift1-example-com
  name: default/openshift1-example-com/alice
current-context: default/openshift1-example-com/alice
kind: Config
preferences: {}
users:
- name: alice/openshift1.example.com
  user:
    token: ns7yVhuRNpDM9cgzfhhxQ7bM5s7N2ZVrkZepSRf4LC0
```
Update the current context to have users log in to the desired namespace:

```
$ oc config set-context `oc config current-context` --namespace=<project_name>
```

Examine the current context, to confirm that the changes are implemented:

```
$ oc whoami -c
```

All subsequent CLI operations uses the new context, unless otherwise specified by overriding CLI options or until the context is switched.

### 2.3.3. Load and merge rules

You can follow these rules, when issuing CLI operations for the loading and merging order for the CLI configuration:

- CLI config files are retrieved from your workstation, using the following hierarchy and merge rules:
  - If the `--config` option is set, then only that file is loaded. The flag is set once and no merging takes place.
  - If the `$KUBECONFIG` environment variable is set, then it is used. The variable can be a list of paths, and if so the paths are merged together. When a value is modified, it is modified in the file that defines the stanza. When a value is created, it is created in the first file that exists. If no files in the chain exist, then it creates the last file in the list.
  - Otherwise, the `~/.kube/config` file is used and no merging takes place.

- The context to use is determined based on the first match in the following flow:
  - The value of the `--context` option.
  - The `current-context` value from the CLI config file.
  - An empty value is allowed at this stage.

- The user and cluster to use is determined. At this point, you may or may not have a context; they are built based on the first match in the following flow, which is run once for the user and once for the cluster:
  - The value of the `--user` for user name and `--cluster` option for cluster name.
  - If the `--context` option is present, then use the context’s value.
  - An empty value is allowed at this stage.

- The actual cluster information to use is determined. At this point, you may or may not have cluster information. Each piece of the cluster information is built based on the first match in the following flow:
  - The values of any of the following command line options:
    - `--server`,
    - `--api-version`
- `--certificate-authority`
- `--insecure-skip-tls-verify`

  - If cluster information and a value for the attribute is present, then use it.
  - If you do not have a server location, then there is an error.

- The actual user information to use is determined. Users are built using the same rules as clusters, except that you can only have one authentication technique per user; conflicting techniques cause the operation to fail. Command line options take precedence over config file values. Valid command line options are:
  - `--auth-path`
  - `--client-certificate`
  - `--client-key`
  - `--token`

- For any information that is still missing, default values are used and prompts are given for additional information.

### 2.4. EXTENDING THE OPENSHIFT CLI WITH PLUG-INS

You can write and install plug-ins to build on the default `oc` commands, allowing you to perform new and more complex tasks with the OpenShift Container Platform CLI.

#### 2.4.1. Writing CLI plug-ins

You can write a plug-in for the OpenShift Container Platform CLI in any programming language or script that allows you to write command-line commands. Note that you can not use a plug-in to overwrite an existing `oc` command.

**Procedure**

This procedure creates a simple Bash plug-in that prints a message to the terminal when the `oc foo` command is issued.

1. Create a file called `oc-foo`. When naming your plug-in file, keep the following in mind:

   - The file must begin with `oc-` or `kubectl-` to be recognized as a plug-in.
   - The file name determines the command that invokes the plug-in. For example, a plug-in with the file name `oc-foo-bar` can be invoked by a command of `oc foo bar`. You can also use underscores if you want the command to contain dashes. For example, a plug-in with the file name `oc-foo_bar` can be invoked by a command of `oc foo-bar`.

2. Add the following contents to the file.

```bash
#!/bin/bash

# optional argument handling
if [[ "$1" == "version" ]]
```
After you install this plug-in for the OpenShift Container Platform CLI, it can be invoked using the `oc foo` command.

**Additional resources**
- Review the [Sample plug-in repository](#) for an example of a plug-in written in Go.
- Review the [CLI runtime repository](#) for a set of utilities to assist in writing plug-ins in Go.

### 2.4.2. Installing and using CLI plug-ins

After you write a custom plug-in for the OpenShift Container Platform CLI, you must install it to use the functionality that it provides.

**Prerequisites**
- You must have the `oc` CLI tool installed.
- You must have a CLI plug-in file that begins with `oc-` or `kubectl-`.

**Procedure**

1. If necessary, update the plug-in file to be executable.

   ```bash
   $ chmod +x <plugin_file>
   ```

2. Place the file anywhere in your `PATH`, such as `/usr/local/bin`.

   ```bash
   $ sudo mv <plugin_file> /usr/local/bin/
   ```

3. Run `oc plugin list` to make sure that the plug-in is listed.

   ```bash
   $ oc plugin list
   ```

**Example output**

The following compatible plugins are available:

```
/usr/local/bin/<plugin_file>
```
If your plug-in is not listed here, verify that the file begins with `oc-` or `kubectl-`, is executable, and is on your `PATH`.

4. Invoke the new command or option introduced by the plug-in.
   For example, if you built and installed the `kubectl-ns` plug-in from the Sample plug-in repository, you can use the following command to view the current namespace.

   ```
   $ oc ns
   ```

   Note that the command to invoke the plug-in depends on the plug-in file name. For example, a plug-in with the file name of `oc-foo-bar` is invoked by the `oc foo bar` command.

### 2.5. OPENSHIFT CLI DEVELOPER COMMAND REFERENCE

This reference provides descriptions and example commands for OpenShift CLI (oc) developer commands. For administrator commands, see the OpenShift CLI administrator command reference.

Run `oc help` to list all commands or run `oc <command> --help` to get additional details for a specific command.

#### 2.5.1. OpenShift CLI (oc) developer commands

##### 2.5.1.1. oc annotate

Update the annotations on a resource

**Example usage**

```bash
# Update pod 'foo' with the annotation 'description' and the value 'my frontend'
# If the same annotation is set multiple times, only the last value will be applied
oc annotate pods foo description='my frontend'

# Update a pod identified by type and name in "pod.json"
oc annotate -f pod.json description='my frontend'

# Update pod 'foo' with the annotation 'description' and the value 'my frontend running nginx', overwriting any existing value
oc annotate --overwrite pods foo description='my frontend running nginx'

# Update all pods in the namespace
oc annotate pods --all description='my frontend running nginx'

# Update pod 'foo' only if the resource is unchanged from version 1
oc annotate pods foo description='my frontend running nginx' --resource-version=1

# Update pod 'foo' by removing an annotation named 'description' if it exists
# Does not require the --overwrite flag
oc annotate pods foo description=
```

##### 2.5.1.2. oc api-resources

Print the supported API resources on the server
Example usage

```bash
# Print the supported API resources
oc api-resources

# Print the supported API resources with more information
oc api-resources -o wide

# Print the supported API resources sorted by a column
oc api-resources --sort-by=name

# Print the supported namespaced resources
oc api-resources --namespaced=true

# Print the supported non-namespaced resources
oc api-resources --namespaced=false

# Print the supported API resources with a specific APIGroup
oc api-resources --api-group=extensions
```

2.5.1.3. oc api-versions

Print the supported API versions on the server, in the form of "group/version"

Example usage

```bash
# Print the supported API versions
oc api-versions
```

2.5.1.4. oc apply

Apply a configuration to a resource by file name or stdin

Example usage

```bash
# Apply the configuration in pod.json to a pod
oc apply -f ./pod.json

# Apply resources from a directory containing kustomization.yaml - e.g. dir/kustomization.yaml
oc apply -k dir/

# Apply the JSON passed into stdin to a pod
cat pod.json | oc apply -f -

# Note: --prune is still in Alpha
# Apply the configuration in manifest.yaml that matches label app=nginx and delete all other resources that are not in the file and match label app=nginx
oc apply --prune -f manifest.yaml -l app=nginx

# Apply the configuration in manifest.yaml and delete all the other config maps that are not in the file
oc apply --prune -f manifest.yaml --all --prune-whitelist=core/v1/ConfigMap
```

2.5.1.5. oc apply edit-last-applied
Edit latest last-applied-configuration annotations of a resource/object

Example usage

```
# Edit the last-applied-configuration annotations by type/name in YAML
oc apply edit-last-applied deployment/nginx

# Edit the last-applied-configuration annotations by file in JSON
oc apply edit-last-applied -f deploy.yaml -o json
```

2.5.1.6. `oc apply set-last-applied`

Set the last-applied-configuration annotation on a live object to match the contents of a file

Example usage

```
# Set the last-applied-configuration of a resource to match the contents of a file
oc apply set-last-applied -f deploy.yaml

# Execute set-last-applied against each configuration file in a directory
oc apply set-last-applied -f path/

# Set the last-applied-configuration of a resource to match the contents of a file; will create the annotation if it does not already exist
oc apply set-last-applied -f deploy.yaml --create-annotation=true
```

2.5.1.7. `oc apply view-last-applied`

View the latest last-applied-configuration annotations of a resource/object

Example usage

```
# View the last-applied-configuration annotations by type/name in YAML
oc apply view-last-applied deployment/nginx

# View the last-applied-configuration annotations by file in JSON
oc apply view-last-applied -f deploy.yaml -o json
```

2.5.1.8. `oc attach`

Attach to a running container

Example usage

```
# Get output from running pod mypod; use the 'oc.kubernetes.io/default-container' annotation for selecting the container to be attached or the first container in the pod will be chosen
oc attach mypod

# Get output from ruby-container from pod mypod
oc attach mypod -c ruby-container

# Switch to raw terminal mode; sends stdin to 'bash' in ruby-container from pod mypod and sends stdout/stderr from 'bash' back to the client
```
2.5.1.9. oc auth can-i

Check whether an action is allowed

Example usage

```bash
# Check to see if I can create pods in any namespace
oc auth can-i create pods --all-namespaces

# Check to see if I can list deployments in my current namespace
oc auth can-i list deployments.apps

# Check to see if I can do everything in my current namespace ("***" means all)
oc auth can-i ***

# Check to see if I can get the job named "bar" in namespace "foo"
oc auth can-i list jobs.batch/bar -n foo

# Check to see if I can read pod logs
oc auth can-i get pods --subresource=log

# Check to see if I can access the URL /logs/
oc auth can-i get /logs/

# List all allowed actions in namespace "foo"
oc auth can-i --list --namespace=foo
```

2.5.1.10. oc auth reconcile

Reconciles rules for RBAC role, role binding, cluster role, and cluster role binding objects

Example usage

```bash
# Reconcile RBAC resources from a file
oc auth reconcile -f my-rbac-rules.yaml
```

2.5.1.11. oc autoscale

Autoscale a deployment config, deployment, replica set, stateful set, or replication controller

Example usage

```bash
# Auto scale a deployment "foo", with the number of pods between 2 and 10, no target CPU utilization specified so a default autoscaling policy will be used
oc autoscale deployment foo --min=2 --max=10
```
# Auto scale a replication controller "foo", with the number of pods between 1 and 5, target CPU utilization at 80%
oc autoscale rc foo --max=5 --cpu-percent=80

2.5.1.12. oc cancel-build
Cancel running, pending, or new builds

Example usage

# Cancel the build with the given name
oc cancel-build ruby-build-2

# Cancel the named build and print the build logs
oc cancel-build ruby-build-2 --dump-logs

# Cancel the named build and create a new one with the same parameters
oc cancel-build ruby-build-2 --restart

# Cancel multiple builds
oc cancel-build ruby-build-1 ruby-build-2 ruby-build-3

# Cancel all builds created from the 'ruby-build' build config that are in the 'new' state
oc cancel-build bc/ruby-build --state=new

2.5.1.13. oc cluster-info
Display cluster information

Example usage

# Print the address of the control plane and cluster services
oc cluster-info

2.5.1.14. oc cluster-info dump
Dump relevant information for debugging and diagnosis

Example usage

# Dump current cluster state to stdout
oc cluster-info dump

# Dump current cluster state to /path/to/cluster-state
oc cluster-info dump --output-directory=/path/to/cluster-state

# Dump all namespaces to stdout
oc cluster-info dump --all-namespaces

# Dump a set of namespaces to /path/to/cluster-state
oc cluster-info dump --namespaces default,kube-system --output-directory=/path/to/cluster-state

2.5.1.15. oc completion
Output shell completion code for the specified shell (bash or zsh)

Example usage

```bash
# Installing bash completion on macOS using homebrew
## If running Bash 3.2 included with macOS
brew install bash-completion
## or, if running Bash 4.1+
brew install bash-completion@2
## If oc is installed via homebrew, this should start working immediately
## If you've installed via other means, you may need add the completion to your completion directory
oc completion bash > $(brew --prefix)/etc/bash_completion.d/oc

# Installing bash completion on Linux
## If bash-completion is not installed on Linux, install the 'bash-completion' package
## via your distribution's package manager.
## Load the oc completion code for bash into the current shell
source <(oc completion bash)
## Write bash completion code to a file and source it from .bash_profile
oc completion bash > ~/.kube/completion.bash.inc
printf "
# Kubectl shell completion
source "$HOME/.kube/completion.bash.inc"
" >> $HOME/.bash_profile
source $HOME/.bash_profile

# Load the oc completion code for zsh into the current shell
source <(oc completion zsh)
# Set the oc completion code for zsh to autoload on startup
oc completion zsh > "${fpath[1]}/_oc"
```

2.5.1.16. oc config current-context

Display the current-context

Example usage

```bash
# Display the current-context
oc config current-context
```

2.5.1.17. oc config delete-cluster

Delete the specified cluster from the kubeconfig

Example usage

```bash
# Delete the minikube cluster
oc config delete-cluster minikube
```

2.5.1.18. oc config delete-context

Delete the specified context from the kubeconfig
Example usage

```bash
# Delete the context for the minikube cluster
oc config delete-context minikube
```

2.5.1.19. oc config delete-user
Delete the specified user from the kubeconfig

Example usage

```bash
# Delete the minikube user
oc config delete-user minikube
```

2.5.1.20. oc config get-clusters
Display clusters defined in the kubeconfig

Example usage

```bash
# List the clusters that oc knows about
oc config get-clusters
```

2.5.1.21. oc config get-contexts
Describe one or many contexts

Example usage

```bash
# List all the contexts in your kubeconfig file
oc config get-contexts

# Describe one context in your kubeconfig file
oc config get-contexts my-context
```

2.5.1.22. oc config get-users
Display users defined in the kubeconfig

Example usage

```bash
# List the users that oc knows about
oc config get-users
```

2.5.1.23. oc config rename-context
Rename a context from the kubeconfig file

Example usage
2.5.1.24. `oc config set`

Set an individual value in a kubeconfig file

**Example usage**

```bash
# Rename the context 'old-name' to 'new-name' in your kubeconfig file
oc config rename-context old-name new-name

# Set the server field on the my-cluster cluster to https://1.2.3.4
oc config set clusters.my-cluster.server https://1.2.3.4

# Set the certificate-authority-data field on the my-cluster cluster
oc config set clusters.my-cluster.certificate-authority-data $(echo "cert_data_here" | base64 -i -)

# Set the cluster field in the my-context context to my-cluster
oc config set contexts.my-context.cluster my-cluster

# Set the client-key-data field in the cluster-admin user using --set-raw-bytes option
oc config set users.cluster-admin.client-key-data cert_data_here --set-raw-bytes=true
```

2.5.1.25. `oc config set-cluster`

Set a cluster entry in kubeconfig

**Example usage**

```bash
# Set only the server field on the e2e cluster entry without touching other values
oc config set-cluster e2e --server=https://1.2.3.4

# Embed certificate authority data for the e2e cluster entry
oc config set-cluster e2e --embed-certs --certificate-authority=~/.kube/e2e/kubernetes.ca.crt

# Disable cert checking for the dev cluster entry
oc config set-cluster e2e --insecure-skip-tls-verify=true

# Set custom TLS server name to use for validation for the e2e cluster entry
oc config set-cluster e2e --tls-server-name=my-cluster-name
```

2.5.1.26. `oc config set-context`

Set a context entry in kubeconfig

**Example usage**

```bash
# Set the user field on the gce context entry without touching other values
oc config set-context gce --user=cluster-admin
```

2.5.1.27. `oc config set-credentials`

Set a user entry in kubeconfig
Example usage

```
# Set only the "client-key" field on the "cluster-admin" entry, without touching other values
oc config set-credentials cluster-admin --client-key=~/.kube/admin.key

# Set basic auth for the "cluster-admin" entry
oc config set-credentials cluster-admin --username=admin --password=uXFGweU9I35qcif

# Embed client certificate data in the "cluster-admin" entry
oc config set-credentials cluster-admin --client-certificate=~/.kube/admin.crt --embed-certs=true

# Enable the Google Compute Platform auth provider for the "cluster-admin" entry
oc config set-credentials cluster-admin --auth-provider=gcp

# Enable the OpenID Connect auth provider for the "cluster-admin" entry with additional args
oc config set-credentials cluster-admin --auth-provider=oidc --auth-provider-arg=client-id=foo --auth-provider-arg=client-secret=bar

# Remove the "client-secret" config value for the OpenID Connect auth provider for the "cluster-admin" entry
oc config set-credentials cluster-admin --auth-provider=oidc --auth-provider-arg=client-secret=

# Enable new exec auth plugin for the "cluster-admin" entry
oc config set-credentials cluster-admin --exec-command=/path/to/the/executable --exec-api-version=client.authentication.k8s.io/v1beta1

# Define new exec auth plugin args for the "cluster-admin" entry
oc config set-credentials cluster-admin --exec-arg=arg1 --exec-arg=arg2

# Create or update exec auth plugin environment variables for the "cluster-admin" entry
oc config set-credentials cluster-admin --exec-env=key1=val1 --exec-env=key2=val2

# Remove exec auth plugin environment variables for the "cluster-admin" entry
oc config set-credentials cluster-admin --exec-env=var-to-remove-
```

### 2.5.1.28. oc config unset

Unset an individual value in a kubeconfig file

Example usage

```
# Unset the current-context
oc config unset current-context

# Unset namespace in foo context
oc config unset contexts.foo.namespace
```

### 2.5.1.29. oc config use-context

Set the current-context in a kubeconfig file

Example usage
2.5.1.30. oc config view

Display merged kubeconfig settings or a specified kubeconfig file

Example usage

- # Show merged kubeconfig settings
  oc config view

- # Show merged kubeconfig settings and raw certificate data
  oc config view --raw

- # Get the password for the e2e user
  oc config view -o jsonpath='{.users[?(@.name == "e2e")].user.password}''

2.5.1.31. oc cp

Copy files and directories to and from containers

Example usage

- # !!!Important Note!!!
  # Requires that the 'tar' binary is present in your container
  # image. If 'tar' is not present, 'oc cp' will fail.
  #
  # For advanced use cases, such as symlinks, wildcard expansion or
  # file mode preservation, consider using 'oc exec'.

- # Copy /tmp/foo local file to /tmp/bar in a remote pod in namespace <some-namespace>
  tar cf - /tmp/foo | oc exec -i -n <some-namespace> <some-pod> -- tar xf - -C /tmp/bar

- # Copy /tmp/foo from a remote pod to /tmp/bar locally
  oc exec -n <some-namespace> <some-pod> -- tar cf - /tmp/foo | tar xf - -C /tmp/bar

- # Copy /tmp/foo_dir local directory to /tmp/bar_dir in a remote pod in the default namespace
  oc cp /tmp/foo_dir <some-pod>:/tmp/bar_dir

- # Copy /tmp/foo local file to /tmp/bar in a remote pod in a specific container
  oc cp /tmp/foo <some-pod>:/tmp/bar -c <specific-container>

- # Copy /tmp/foo local file to /tmp/bar in a remote pod in namespace <some-namespace>
  oc cp /tmp/foo <some-namespace>/<some-pod>:/tmp/bar

- # Copy /tmp/foo from a remote pod to /tmp/bar locally
  oc cp <some-namespace>/<some-pod>:/tmp/foo /tmp/bar

2.5.1.32. oc create

Create a resource from a file or from stdin
Example usage

```shell
# Create a pod using the data in pod.json
oc create -f ./pod.json

# Create a pod based on the JSON passed into stdin
cat pod.json | oc create -f -

# Edit the data in docker-registry.yaml in JSON then create the resource using the edited data
oc create -f docker-registry.yaml --edit -o json
```

2.5.1.33. oc create build

Create a new build

Example usage

```shell
# Create a new build
oc create build myapp
```

2.5.1.34. oc create clusterresourcequota

Create a cluster resource quota

Example usage

```shell
# Create a cluster resource quota limited to 10 pods
oc create clusterresourcequota limit-bob --project-annotation-selector=openshift.io/requester=user-bob --hard=pods=10
```

2.5.1.35. oc create clusterrole

Create a cluster role

Example usage

```shell
# Create a cluster role named "pod-reader" that allows user to perform "get", "watch" and "list" on pods
oc create clusterrole pod-reader --verb=get,list,watch --resource=pods

# Create a cluster role named "pod-reader" with ResourceName specified
oc create clusterrole pod-reader --verb=get --resource=pods --resource-name=readablepod --resource-name=anotherpod

# Create a cluster role named "foo" with API Group specified
oc create clusterrole foo --verb=get,list,watch --resource=rs.extensions

# Create a cluster role named "foo" with SubResource specified
oc create clusterrole foo --verb=get,list,watch --resource=pods,pods/status

# Create a cluster role name "foo" with NonResourceURL specified
oc create clusterrole "foo" --verb=get --non-resource-url=/logs/
```
2.5.1.36. `oc create clusterrolebinding`

Create a cluster role binding for a particular cluster role

**Example usage**

```bash
# Create a cluster role binding for user1, user2, and group1 using the cluster-admin cluster role
oc create clusterrolebinding cluster-admin --clusterrole=cluster-admin --user=user1 --user=user2 --
group=group1
```

2.5.1.37. `oc create configmap`

Create a config map from a local file, directory or literal value

**Example usage**

```bash
# Create a new config map named my-config based on folder bar
oc create configmap my-config --from-file=path/to/bar

# Create a new config map named my-config with specified keys instead of file basenames on disk
oc create configmap my-config --from-file=key1=/path/to/bar/file1.txt --from-file=key2=/path/to/bar/file2.txt

# Create a new config map named my-config with key1=config1 and key2=config2
oc create configmap my-config --from-literal=key1=config1 --from-literal=key2=config2

# Create a new config map named my-config from the key=value pairs in the file
oc create configmap my-config --from-file=path/to/bar

# Create a new config map named my-config from an env file
oc create configmap my-config --from-env-file=path/to/bar.env
```

2.5.1.38. `oc create cronjob`

Create a cron job with the specified name

**Example usage**

```bash
# Create a cron job
oc create cronjob my-job --image=busybox --schedule="*/1 * * * *"

# Create a cron job with a command
oc create cronjob my-job --image=busybox --schedule="*/1 * * * *" -- date
```

2.5.1.39. `oc create deployment`

Create a deployment with the specified name

**Example usage**

```bash
# Create a cluster role name "monitoring" with AggregationRule specified
oc create clusterrole monitoring --aggregation-rule="rbac.example.com/aggregate-to-monitoring=true"
```
# Create a deployment named my-dep that runs the busybox image
oc create deployment my-dep --image=busybox

# Create a deployment with a command
oc create deployment my-dep --image=busybox --date

# Create a deployment named my-dep that runs the nginx image with 3 replicas
oc create deployment my-dep --image=nginx --replicas=3

# Create a deployment named my-dep that runs the busybox image and expose port 5701
oc create deployment my-dep --image=busybox --port=5701

2.5.1.40. oc create deploymentconfig
Create a deployment config with default options that uses a given image

Example usage

# Create an nginx deployment config named my-nginx
oc create deploymentconfig my-nginx --image=nginx

2.5.1.41. oc create identity
Manually create an identity (only needed if automatic creation is disabled)

Example usage

# Create an identity with identity provider "acme_ldap" and the identity provider username "adamjones"
oc create identity acme_ldap:adamjones

2.5.1.42. oc create imagestream
Create a new empty image stream

Example usage

# Create a new image stream
oc create imagestream mysql

2.5.1.43. oc create imagestreamtag
Create a new image stream tag

Example usage

# Create a new image stream tag based on an image in a remote registry
oc create imagestreamtag mysql:latest --from-image=myregistry.local/mysql/mysql:5.0

2.5.1.44. oc create ingress
Create an ingress with the specified name

Example usage

```bash
# Create a single ingress called 'simple' that directs requests to foo.com/bar to svc
# svc1:8080 with a tls secret "my-cert"
oc create ingress simple --rule="foo.com/bar=svc1:8080,tls=my-cert"

# Create a catch all ingress of "/path" pointing to service svc:port and Ingress Class as "otheringress"
oc create ingress catch-all --class=otheringress --rule="/path=svc:port"

# Create an ingress with two annotations: ingress.annotation1 and ingress.annotations2
oc create ingress annotated --class=default --rule="foo.com/bar=svc:port" \ 
    --annotation ingress.annotation1=foo \ 
    --annotation ingress.annotation2=bla

# Create an ingress with the same host and multiple paths
oc create ingress multipath --class=default \ 
    --rule="foo.com/=svc:port" \ 
    --rule="foo.com/admin/=svcadmin:portadmin"

# Create an ingress with multiple hosts and the pathType as Prefix
oc create ingress ingress1 --class=default \ 
    --rule="foo.com/path*=svc:8080" \ 
    --rule="bar.com/admin*=svc2:http"

# Create an ingress with TLS enabled using the default ingress certificate and different path types
oc create ingress ingtls --class=default \ 
    --rule="foo.com/=svc:https,tls" \ 
    --rule="foo.com/path/subpath*=othersvc:8080"

# Create an ingress with TLS enabled using a specific secret and pathType as Prefix
oc create ingress ingsecret --class=default \ 
    --rule="foo.com/*=svc:8080,tls=secret1"

# Create an ingress with a default backend
oc create ingress ingdefault --class=default \ 
    --default-backend=defaultsvc:http \ 
    --rule="foo.com/*=svc:8080,tls=secret1"
```

2.5.145. oc create job

Create a job with the specified name

Example usage

```bash
# Create a job
oc create job my-job --image=busybox

# Create a job with a command
oc create job my-job --image=busybox -- date

# Create a job from a cron job named "a-cronjob"
oc create job test-job --from=cronjob/a-cronjob
```
2.5.1.46. oc create namespace

Create a namespace with the specified name

Example usage

```
# Create a new namespace named my-namespace
oc create namespace my-namespace
```

2.5.1.47. oc create poddisruptionbudget

Create a pod disruption budget with the specified name

Example usage

```
# Create a pod disruption budget named my-pdb that will select all pods with the app=rails label
# and require at least one of them being available at any point in time
oc create poddisruptionbudget my-pdb --selector=app=rails --min-available=1

# Create a pod disruption budget named my-pdb that will select all pods with the app=nginx label
# and require at least half of the pods selected to be available at any point in time
oc create pdb my-pdb --selector=app=nginx --min-available=50%
```

2.5.1.48. oc create priorityclass

Create a priority class with the specified name

Example usage

```
# Create a priority class named high-priority
oc create priorityclass high-priority --value=1000 --description="high priority"

# Create a priority class named default-priority that is considered as the global default priority
oc create priorityclass default-priority --value=1000 --global-default=true --description="default priority"

# Create a priority class named high-priority that cannot preempt pods with lower priority
oc create priorityclass high-priority --value=1000 --description="high priority" --preemption-policy="Never"
```

2.5.1.49. oc create quota

Create a quota with the specified name

Example usage

```
# Create a new resource quota named my-quota
oc create quota my-quota --hard=cpu=1,memory=1G,pods=2,services=3,replicationcontrollers=2,resourcequotas=1,secrets=5,persistentvolumeclaims=10

# Create a new resource quota named best-effort
oc create quota best-effort --hard=pods=100 --scopes=BestEffort
```
2.5.1.50. `oc create role`
Create a role with single rule

Example usage

```bash
# Create a role named "pod-reader" that allows user to perform "get", "watch" and "list" on pods
oc create role pod-reader --verb=get --verb=list --verb=watch --resource=pods

# Create a role named "pod-reader" with ResourceName specified
oc create role pod-reader --verb=get --resource=pods --resource-name=readablepod --resource-name=anotherpod

# Create a role named "foo" with API Group specified
oc create role foo --verb=get,list,watch --resource=rs.extensions

# Create a role named "foo" with SubResource specified
oc create role foo --verb=get,list,watch --resource=pods,pods/status
```

2.5.1.51. `oc create rolebinding`
Create a role binding for a particular role or cluster role

Example usage

```bash
# Create a role binding for user1, user2, and group1 using the admin cluster role
oc create rolebinding admin --clusterrole=admin --user=user1 --user=user2 --group=group1
```

2.5.1.52. `oc create route edge`
Create a route that uses edge TLS termination

Example usage

```bash
# Create an edge route named "my-route" that exposes the frontend service
oc create route edge my-route --service=frontend

# Create an edge route that exposes the frontend service and specify a path
# If the route name is omitted, the service name will be used
oc create route edge --service=frontend --path /assets
```

2.5.1.53. `oc create route passthrough`
Create a route that uses passthrough TLS termination

Example usage

```bash
# Create a passthrough route named "my-route" that exposes the frontend service
oc create route passthrough my-route --service=frontend

# Create a passthrough route that exposes the frontend service and specify
# a host name. If the route name is omitted, the service name will be used
oc create route passthrough --service=frontend --hostname=www.example.com
```
2.5.1.54. oc create route reencrypt

Create a route that uses reencrypt TLS termination

Example usage

```
# Create a route named "my-route" that exposes the frontend service
oc create route reencrypt my-route --service=frontend --dest-ca-cert cert.cert

# Create a reencrypt route that exposes the frontend service, letting the
# route name default to the service name and the destination CA certificate
# default to the service CA
oc create route reencrypt --service=frontend
```

2.5.1.55. oc create secret docker-registry

Create a secret for use with a Docker registry

Example usage

```
# If you don't already have a .dockercfg file, you can create a dockercfg secret directly by using:
oc create secret docker-registry my-secret --docker-server=DOCKER_REGISTRY_SERVER --
docker-username=DOCKER_USER --docker-password=DOCKER_PASSWORD --docker-
email=DOCKER_EMAIL

# Create a new secret named my-secret from ~/.docker/config.json
oc create secret docker-registry my-secret --from-file=.dockerconfigjson=path/to/.docker/config.json
```

2.5.1.56. oc create secret generic

Create a secret from a local file, directory, or literal value

Example usage

```
# Create a new secret named my-secret with keys for each file in folder bar
oc create secret generic my-secret --from-file=path/to/bar

# Create a new secret named my-secret with specified keys instead of names on disk
oc create secret generic my-secret --from-file=ssh-privatekey=path/to/id_rsa --from-file=ssh-
publickey=path/to/id_rsa.pub

# Create a new secret named my-secret with key1=supersecret and key2=topsecret
oc create secret generic my-secret --from-literal=key1=supersecret --from-literal=key2=topsecret

# Create a new secret named my-secret using a combination of a file and a literal
oc create secret generic my-secret --from-file=ssh-privatekey=path/to/id_rsa --from-
literal=passphrase=topsecret

# Create a new secret named my-secret from an env file
oc create secret generic my-secret --from-env-file=path/to/bar.env
```

2.5.1.57. oc create secret tls

Create a route that uses reencrypt TLS termination

Example usage

```
# Create a route named "my-route" that exposes the frontend service
oc create route reencrypt my-route --service=frontend --dest-ca-cert cert.cert

# Create a reencrypt route that exposes the frontend service, letting the
# route name default to the service name and the destination CA certificate
# default to the service CA
oc create route reencrypt --service=frontend
```

2.5.1.58. oc create secret docker-registry

Create a secret for use with a Docker registry

Example usage

```
# If you don't already have a .dockercfg file, you can create a dockercfg secret directly by using:
oc create secret docker-registry my-secret --docker-server=DOCKER_REGISTRY_SERVER --
docker-username=DOCKER_USER --docker-password=DOCKER_PASSWORD --docker-
email=DOCKER_EMAIL

# Create a new secret named my-secret from ~/.docker/config.json
oc create secret docker-registry my-secret --from-file=.dockerconfigjson=path/to/.docker/config.json
```

2.5.1.59. oc create secret generic

Create a secret from a local file, directory, or literal value

Example usage

```
# Create a new secret named my-secret with keys for each file in folder bar
oc create secret generic my-secret --from-file=path/to/bar

# Create a new secret named my-secret with specified keys instead of names on disk
oc create secret generic my-secret --from-file=ssh-privatekey=path/to/id_rsa --from-file=ssh-
publickey=path/to/id_rsa.pub

# Create a new secret named my-secret with key1=supersecret and key2=topsecret
oc create secret generic my-secret --from-literal=key1=supersecret --from-literal=key2=topsecret

# Create a new secret named my-secret using a combination of a file and a literal
oc create secret generic my-secret --from-file=ssh-privatekey=path/to/id_rsa --from-
literal=passphrase=topsecret

# Create a new secret named my-secret from an env file
oc create secret generic my-secret --from-env-file=path/to/bar.env
```
Create a TLS secret

Example usage

```
# Create a new TLS secret named tls-secret with the given key pair
oc create secret tls tls-secret --cert=path/to/tls.cert --key=path/to/tls.key
```

2.5.1.58. oc create service clusterip

Create a ClusterIP service

Example usage

```
# Create a new ClusterIP service named my-cs
oc create service clusterip my-cs --tcp=5678:8080

# Create a new ClusterIP service named my-cs (in headless mode)
oc create service clusterip my-cs --clusterip="None"
```

2.5.1.59. oc create service externalname

Create an ExternalName service

Example usage

```
# Create a new ExternalName service named my-ns
oc create service externalname my-ns --external-name bar.com
```

2.5.1.60. oc create service loadbalancer

Create a LoadBalancer service

Example usage

```
# Create a new LoadBalancer service named my-lbs
oc create service loadbalancer my-lbs --tcp=5678:8080
```

2.5.1.61. oc create service nodeport

Create a NodePort service

Example usage

```
# Create a new NodePort service named my-ns
oc create service nodeport my-ns --tcp=5678:8080
```

2.5.1.62. oc create serviceaccount

Create a service account with the specified name

Example usage

-
2.5.1.63. oc create user
Manually create a user (only needed if automatic creation is disabled)

Example usage

# Create a user with the username "ajones" and the display name "Adam Jones"
occ create user ajones --full-name="Adam Jones"

2.5.1.64. oc create useridentitymapping
Manually map an identity to a user

Example usage

# Map the identity "acme_ldap:adamjones" to the user "ajones"
occ create useridentitymapping acme_ldap:adamjones ajones

2.5.1.65. oc debug
Launch a new instance of a pod for debugging

Example usage

# Start a shell session into a pod using the OpenShift tools image
oc debug

# Debug a currently running deployment by creating a new pod
oc debug deploy/test

# Debug a node as an administrator
oc debug node/master-1

# Launch a shell in a pod using the provided image stream tag
oc debug istag/mysql:latest -n openshift

# Test running a job as a non-root user
oc debug job/test --as-user=1000000

# Debug a specific failing container by running the env command in the 'second' container
oc debug daemonset/test -c second -- /bin/env

# See the pod that would be created to debug
oc debug mypod-9xbc -o yaml

# Debug a resource but launch the debug pod in another namespace
# Note: Not all resources can be debugged using --to-namespace without modification. For example,
# volumes and service accounts are namespace-dependent. Add '-o yaml' to output the debug pod
2.5.1.66. `oc delete`

Delete resources by file names, stdin, resources and names, or by resources and label selector

Example usage

```bash
# Delete a pod using the type and name specified in pod.json
oc delete -f ./pod.json

# Delete resources from a directory containing kustomization.yaml - e.g. dir/kustomization.yaml
oc delete -k dir

# Delete a pod based on the type and name in the JSON passed into stdin
cat pod.json | oc delete -f -

# Delete pods and services with same names "baz" and "foo"
oc delete pod,service baz foo

# Delete pods and services with label name=myLabel
oc delete pods,services -l name=myLabel

# Delete a pod with minimal delay
oc delete pod foo --now

# Force delete a pod on a dead node
oc delete pod foo --force

# Delete all pods
oc delete pods --all
```

2.5.1.67. `oc describe`

Show details of a specific resource or group of resources

Example usage

```bash
# Describe a node
oc describe nodes kubernetes-node-emt8.c.myproject.internal

# Describe a pod
oc describe pods/nginx

# Describe a pod identified by type and name in "pod.json"
oc describe -f pod.json

# Describe all pods
oc describe pods

# Describe pods by label name=myLabel
oc describe pod -l name=myLabel
```
2.5.1.68. oc diff

Diff the live version against a would-be applied version

Example usage

```
# Diff resources included in pod.json
oc diff -f pod.json

# Diff file read from stdin
cat service.yaml | oc diff -f -
```

2.5.1.69. oc edit

Edit a resource on the server

Example usage

```
# Edit the service named 'docker-registry'
oc edit svc/docker-registry

# Use an alternative editor
KUBE_EDITOR="nano" oc edit svc/docker-registry

# Edit the job 'myjob' in JSON using the v1 API format
oc edit job.v1.batch/myjob -o json

# Edit the deployment 'mydeployment' in YAML and save the modified config in its annotation
oc edit deployment/mydeployment -o yaml --save-config
```

2.5.1.70. oc ex dockergc

Perform garbage collection to free space in docker storage

Example usage

```
# Perform garbage collection with the default settings
oc ex dockergc
```

2.5.1.71. oc exec

Execute a command in a container

Example usage

```
# Get output from running the 'date' command from pod mypod, using the first container by default
oc exec mypod -- date
```
2.5.1.72. oc explain

Get documentation for a resource

Example usage

- Get the documentation of the resource and its fields
  ```
  oc explain pods
  ```

- Get the documentation of a specific field of a resource
  ```
  oc explain pods.spec.containers
  ```

2.5.1.73. oc expose

Expose a replicated application as a service or route

Example usage

- Create a route based on service nginx. The new route will reuse nginx’s labels
  ```
  oc expose service nginx
  ```

- Create a route and specify your own label and route name
  ```
  oc expose service nginx -l name=myroute --name=fromdowntown
  ```

- Create a route and specify a host name
  ```
  oc expose service nginx --hostname=www.example.com
  ```

- Create a route with a wildcard
  ```
  oc expose service nginx --hostname=x.example.com --wildcard-policy=Subdomain
  # This would be equivalent to *.example.com. NOTE: only hosts are matched by the wildcard;
  # subdomains would not be included
  ```
# Expose a deployment configuration as a service and use the specified port
oc expose dc ruby-hello-world --port=8080

# Expose a service as a route in the specified path
oc expose service nginx --path=/nginx

# Expose a service using different generators
oc expose service nginx --name=exposed-svc --port=12201 --protocol="TCP" --generator="service/v2"
oc expose service nginx --name=my-route --port=12201 --generator="route/v1"

# Exposing a service using the "route/v1" generator (default) will create a new exposed route with the "--name" provided
# (or the name of the service otherwise). You may not specify a "--protocol" or "--target-port" option when using this generator

2.5.1.74. oc extract

Extract secrets or config maps to disk

Example usage

# Extract the secret "test" to the current directory
oc extract secret/test

# Extract the config map "nginx" to the /tmp directory
oc extract configmap/nginx --to=/tmp

# Extract the config map "nginx" to STDOUT
oc extract configmap/nginx --to=-

# Extract only the key "nginx.conf" from config map "nginx" to the /tmp directory
oc extract configmap/nginx --to=/tmp --keys=nginx.conf

2.5.1.75. oc get

Display one or many resources

Example usage

# List all pods in ps output format
oc get pods

# List all pods in ps output format with more information (such as node name)
oc get pods -o wide

# List a single replication controller with specified NAME in ps output format
oc get replicationcontroller web

# List deployments in JSON output format, in the "v1" version of the "apps" API group
oc get deployments.v1.apps -o json

# List a single pod in JSON output format
2.5.1.76. oc idle

Idle scalable resources

Example usage

# Idle the scalable controllers associated with the services listed in to-idle.txt
$ oc idle --resource-names-file to-idle.txt

2.5.1.77. oc image append

Add layers to images and push them to a registry

Example usage

# Remove the entrypoint on the mysql:latest image
oc image append --from mysql:latest --to myregistry.com/myimage:latest --image '{"Entrypoint":null}'

# Add a new layer to the image
oc image append --from mysql:latest --to myregistry.com/myimage:latest layer.tar.gz

# Add a new layer to the image and store the result on disk
# This results in $(pwd)/v2/mysql/blobs,manifests
oc image append --from mysql:latest --to file://mysql:local layer.tar.gz

# Add a new layer to the image and store the result on disk in a designated directory
# This will result in $(pwd)/mysql-local/v2/mysql/blobs,manifests
oc image append --from mysql:latest --to file://mysql:local --dir mysql-local layer.tar.gz

# Add a new layer to an image that is stored on disk (~/mysql-local/v2/image exists)
oc image append --from-dir ~/mysql-local --to myregistry.com/myimage:latest layer.tar.gz

# Add a new layer to an image that was mirrored to the current directory on disk ($(pwd)/v2/image
2.5.1.78. oc image extract

Copy files from an image to the file system

Example usage

```
# Extract the busybox image into the current directory
oc image extract docker.io/library/busybox:latest

# Extract the busybox image into a designated directory (must exist)
oc image extract docker.io/library/busybox:latest --path /:/tmp/busybox

# Extract the busybox image into the current directory for linux/s390x platform
# Note: Wildcard filter is not supported with extract. Pass a single os/arch to extract
oc image extract docker.io/library/busybox:latest --filter-by-os=linux/s390x

# Extract a single file from the image into the current directory
oc image extract docker.io/library/centos:7 --path /bin/bash:.  

# Extract all .repo files from the image's /etc/yum.repos.d/ folder into the current directory
oc image extract docker.io/library/centos:7 --path /etc/yum.repos.d/*.repo:

# Extract all .repo files from the image's /etc/yum.repos.d/ folder into a designated directory (must exist)
# This results in /tmp/yum.repos.d/*.repo on local system
oc image extract docker.io/library/centos:7 --path /etc/yum.repos.d/*.repo:/tmp/yum.repos.d

# Extract an image stored on disk into the current directory ($(/pwd)/v2/busybox/blobs, manifests exists)
# --confirm is required because the current directory is not empty
oc image extract file://busybox:local --confirm

# Extract an image stored on disk in a directory other than $pwd/v2 into the current directory
# --confirm is required because the current directory is not empty ($pwd/busybox-mirror-dir/v2/busybox exists)
oc image extract file://busybox:local --dir busybox-mirror-dir --confirm

# Extract an image stored on disk in a directory other than $pwd/v2 into a designated directory (must exist)
oc image extract file://busybox:local --dir busybox-mirror-dir --path /:/tmp/busybox

# Extract the last layer in the image
oc image extract docker.io/library/centos:7[-1]

# Extract the first three layers of the image
oc image extract docker.io/library/centos:7[:3]
```
2.5.1.79. oc image info

Display information about an image

Example usage

```bash
# Show information about an image
oc image info quay.io/openshift/cli:latest

# Show information about images matching a wildcard
oc image info quay.io/openshift/cli:4.*

# Show information about a file mirrored to disk under DIR
oc image info --dir=DIR file://library/busybox:latest

# Select which image from a multi-OS image to show
oc image info library/busybox:latest --filter-by-os=linux/arm64
```

2.5.1.80. oc image mirror

Mirror images from one repository to another

Example usage

```bash
# Copy image to another tag
oc image mirror myregistry.com/myimage:latest myregistry.com/myimage:stable

# Copy image to another registry
oc image mirror myregistry.com/myimage:latest docker.io/myrepository/myimage:stable

# Copy all tags starting with mysql to the destination repository
oc image mirror myregistry.com/myimage:mysql* docker.io/myrepository/myimage

# Copy image to disk, creating a directory structure that can be served as a registry
oc image mirror myregistry.com/myimage:latest file://myrepository/myimage:latest

# Copy image to S3 (pull from <bucket>.s3.amazonaws.com/image:latest)

# Copy image to S3 without setting a tag (pull via @<digest>)
oc image mirror myregistry.com/myimage:latest s3://s3.amazonaws.com/<region>/</bucket>/image

# Copy image to multiple locations
oc image mirror myregistry.com/myimage:latest docker.io/myrepository/myimage:stable \
docker.io/myrepository/myimage:dev

# Copy multiple images
oc image mirror myregistry.com/myimage:latest=myregistry.com/other:test \
myregistry.com/myimage:new=myregistry.com/other:target
```
2.5.1.81. `oc import-image`

Import images from a container image registry

**Example usage**

```bash
# Import tag latest into a new image stream
oc import-image mystream --from=registry.io/repo/image:latest --confirm
```

```bash
# Update imported data for tag latest in an already existing image stream
oc import-image mystream
```

```bash
# Update imported data for tag stable in an already existing image stream
oc import-image mystream:stable
```

```bash
# Update imported data for all tags in an existing image stream
oc import-image mystream --all
```

```bash
# Import all tags into a new image stream
oc import-image mystream --from=registry.io/repo/image --all --confirm
```

```bash
# Import all tags into a new image stream using a custom timeout
oc --request-timeout=5m import-image mystream --from=registry.io/repo/image --all --confirm
```

2.5.1.82. `oc kustomize`

Build a kustomization target from a directory or URL.

**Example usage**

```bash
# Build the current working directory
oc kustomize
```
2.5.1.83. oc label

Update the labels on a resource

Example usage

```
# Update pod 'foo' with the label 'unhealthy' and the value 'true'
oc label pods foo unhealthy=true

# Update pod 'foo' with the label 'status' and the value 'unhealthy', overwriting any existing value
oc label --overwrite pods foo status=unhealthy

# Update all pods in the namespace
oc label pods --all status=unhealthy

# Update a pod identified by the type and name in "pod.json"
oc label -f pod.json status=unhealthy

# Update pod 'foo' only if the resource is unchanged from version 1
oc label pods foo status=unhealthy --resource-version=1

# Update pod 'foo' by removing a label named 'bar' if it exists
# Does not require the --overwrite flag
oc label pods foo bar-
```

2.5.1.84. oc login

Log in to a server

Example usage

```
# Log in interactively
oc login --username=myuser

# Log in to the given server with the given certificate authority file
oc login localhost:8443 --certificate-authority=/path/to/cert.crt

# Log in to the given server with the given credentials (will not prompt interactively)
oc login localhost:8443 --username=myuser --password=mypass
```

2.5.1.85. oc logout

End the current server session

Example usage
2.5.1.86. oc logs
Print the logs for a container in a pod

Example usage

# Start streaming the logs of the most recent build of the openldap build config
oc logs -f bc/openldap

# Start streaming the logs of the latest deployment of the mysql deployment config
oc logs -f dc/mysql

# Get the logs of the first deployment for the mysql deployment config. Note that logs
# from older deployments may not exist either because the deployment was successful
# or due to deployment pruning or manual deletion of the deployment
oc logs --version=1 dc/mysql

# Return a snapshot of ruby-container logs from pod backend
oc logs backend -c ruby-container

# Start streaming of ruby-container logs from pod backend
oc logs -f pod/backend -c ruby-container

2.5.1.87. oc new-app
Create a new application

Example usage

# List all local templates and image streams that can be used to create an app
oc new-app --list

# Create an application based on the source code in the current git repository (with a public remote)
and a container image
oc new-app . --image=registry/repo/langimage

# Create an application myapp with Docker based build strategy expecting binary input
oc new-app --strategy=docker --binary --name=myapp

# Create a Ruby application based on the provided [image]~[source code] combination
oc new-app centos/ruby-25-centos7~https://github.com/sclorg/ruby-ex.git

# Use the public container registry MySQL image to create an app. Generated artifacts will be
labeled with db=mysql
oc new-app mysql MYSQL_USER=user MYSQL_PASSWORD=pass MYSQL_DATABASE=testdb -l db=mysql

# Use a MySQL image in a private registry to create an app and override application artifacts’
names
oc new-app --image=myregistry.com/mycompany/mysql --name=private
### 2.5.1.88. oc new-build

Create a new build configuration

**Example usage**

- # Create a build config based on the source code in the current git repository (with a public remote) and a container image
  oc new-build . --image=repo/langimage

- # Create a NodeJS build config based on the provided [image]-[source code] combination
  oc new-build centos/nodejs-8-centos7~https://github.com/sclorg/nodejs-ex.git

- # Create a build config from a remote repository using its beta2 branch
  oc new-build https://github.com/openshift/ruby-hello-world#beta2

- # Create a build config using a Dockerfile specified as an argument
  oc new-build -D $'FROM centos:7
  RUN yum install -y httpd'

- # Create a build config from a remote repository and add custom environment variables
  oc new-build https://github.com/openshift/ruby-hello-world -e RACK_ENV=development

- # Create a build config from a remote private repository and specify which existing secret to use
  oc new-build https://github.com/youruser/yourgitrepo --source-secret=yoursecret

- # Create a build config from a remote repository and inject the npmrc into a build
  oc new-build https://github.com/openshift/ruby-hello-world --build-secret npmrc:.npmrc

- # Create a build config from a remote repository and inject environment data into a build
# Create a build config that gets its input from a remote repository and another container image

2.5.1.89. oc new-project

Request a new project

Example usage

# Create a new project with minimal information
oc new-project web-team-dev

# Create a new project with a display name and description
oc new-project web-team-dev --display-name="Web Team Development" --description="Development project for the web team."

2.5.1.90. oc observe

Observe changes to resources and react to them (experimental)

Example usage

# Observe changes to services
oc observe services

# Observe changes to services, including the clusterIP and invoke a script for each
oc observe services --template '{ .spec.clusterIP }' -- register_dns.sh

# Observe changes to services filtered by a label selector
oc observe namespaces -l regist-dns=true --template '{ .spec.clusterIP }' -- register_dns.sh

2.5.1.91. oc patch

Update fields of a resource

Example usage

# Partially update a node using a strategic merge patch, specifying the patch as JSON
oc patch node k8s-node-1 -p '{"spec":{"unschedulable":true}}'

# Partially update a node using a strategic merge patch, specifying the patch as YAML
oc patch node k8s-node-1 -p $'spec:\n unschedulable: true'

# Partially update a node identified by the type and name specified in "node.json" using strategic merge patch
oc patch -f node.json -p '{"spec":{"unschedulable":true}}'

# Update a container's image; spec.containers[*].name is required because it's a merge key
oc patch pod valid-pod -p '{"spec":{"containers":{{"name":"kubernetes-serve-hostname","image":"new image"}}}}'
2.5.1.92. oc policy add-role-to-user

Add a role to users or service accounts for the current project

Example usage

```
# Add the 'view' role to user1 for the current project
oc policy add-role-to-user view user1

# Add the 'edit' role to serviceaccount1 for the current project
oc policy add-role-to-user edit -z serviceaccount1
```

2.5.1.93. oc policy scc-review

Check which service account can create a pod

Example usage

```
# Check whether service accounts sa1 and sa2 can admit a pod with a template pod spec specified in my_resource.yaml
# Service Account specified in myresource.yaml file is ignored
oc policy scc-review -z sa1,sa2 -f my_resource.yaml

# Check whether service accounts system:serviceaccount:bob:default can admit a pod with a template pod spec specified in my_resource.yaml
oc policy scc-review -z system:serviceaccount:bob:default -f my_resource.yaml

# Check whether the service account specified in my_resource_with_sa.yaml can admit the pod
oc policy scc-review -f my_resource_with_sa.yaml

# Check whether the default service account can admit the pod; default is taken since no service account is defined in myresource_with_no_sa.yaml
oc policy scc-review -f myresource_with_no_sa.yaml
```

2.5.1.94. oc policy scc-subject-review

Check whether a user or a service account can create a pod

Example usage

```
# Check whether user bob can create a pod specified in myresource.yaml
oc policy scc-subject-review -u bob -f myresource.yaml

# Check whether user bob who belongs to projectAdmin group can create a pod specified in myresource.yaml
oc policy scc-subject-review -u bob -g projectAdmin -f myresource.yaml
```
2.5.1.95. oc port-forward

Forward one or more local ports to a pod

Example usage

- # Listen on ports 5000 and 6000 locally, forwarding data to/from ports 5000 and 6000 in the pod
  - `oc port-forward pod/mypod 5000 6000`

- # Listen on ports 5000 and 6000 locally, forwarding data to/from ports 5000 and 6000 in a pod
  - selected by the deployment
  - `oc port-forward deployment/mydeployment 5000 6000`

- # Listen on port 8443 locally, forwarding to the targetPort of the service’s port named ”https” in a pod
  - selected by the service
  - `oc port-forward service/myservice 8443:https`

- # Listen on port 8888 locally, forwarding to 5000 in the pod
  - `oc port-forward pod/mypod 8888:5000`

- # Listen on port 8888 on all addresses, forwarding to 5000 in the pod
  - `oc port-forward --address 0.0.0.0 pod/mypod 8888:5000`

- # Listen on port 8888 on localhost and selected IP, forwarding to 5000 in the pod
  - `oc port-forward --address localhost,10.19.21.23 pod/mypod 8888:5000`

- # Listen on a random port locally, forwarding to 5000 in the pod
  - `oc port-forward pod/mypod :5000`

2.5.1.96. oc process

Process a template into list of resources

Example usage

- # Convert the template.json file into a resource list and pass to create
  - `oc process -f template.json | oc create -f -`

- # Process a file locally instead of contacting the server
  - `oc process -f template.json --local -o yaml`

- # Process template while passing a user-defined label
  - `oc process -f template.json -l name=mytemplate`

- # Convert a stored template into a resource list
  - `oc process foo`

- # Convert a stored template into a resource list by setting/overriding parameter values
  - `oc process foo PARM1=VALUE1 PARM2=VALUE2`
# Convert a template stored in different namespace into a resource list
oc process openshift//foo

# Convert template.json into a resource list
cat template.json | oc process -f -

## 2.5.1.97. oc project

Switch to another project

**Example usage**

```
# Switch to the 'myapp' project
oc project myapp

# Display the project currently in use
oc project
```

## 2.5.1.98. oc projects

Display existing projects

**Example usage**

```
# List all projects
oc projects
```

## 2.5.1.99. oc proxy

Run a proxy to the Kubernetes API server

**Example usage**

```
# To proxy all of the Kubernetes API and nothing else
oc proxy --api-prefix=/

# To proxy only part of the Kubernetes API and also some static files
# You can get pods info with 'curl localhost:8001/api/v1/pods'
oc proxy --www=/my/files --www-prefix=/static/ --api-prefix=/api/

# To proxy the entire Kubernetes API at a different root
# You can get pods info with 'curl localhost:8001/custom/api/v1/pods'
oc proxy --api-prefix=/custom/

# Run a proxy to the Kubernetes API server on port 8011, serving static content from ./local/www/
oc proxy --port=8011 --www=./local/www/

# Run a proxy to the Kubernetes API server on an arbitrary local port
# The chosen port for the server will be output to stdout
oc proxy --port=0
```
2.5.1.100. oc registry info

Print information about the integrated registry

Example usage

```bash
# Display information about the integrated registry
oc registry info
```

2.5.1.101. oc registry login

Log in to the integrated registry

Example usage

```bash
# Log in to the integrated registry
oc registry login

# Log in as the default service account in the current namespace
oc registry login -z default

# Log in to different registry using BASIC auth credentials
oc registry login --registry quay.io/myregistry --auth-basic=USER:PASS
```

2.5.1.102. oc replace

Replace a resource by file name or stdin

Example usage

```bash
# Replace a pod using the data in pod.json
oc replace -f ./pod.json

# Replace a pod based on the JSON passed into stdin
cat pod.json | oc replace -f -

# Update a single-container pod's image version (tag) to v4
oc get pod mypod -o yaml | sed 's/\(image: myimage\):.*$/\1:v4/' | oc replace -f -

# Force replace, delete and then re-create the resource
oc replace --force -f ./pod.json
```

2.5.1.103. oc rollback

Revert part of an application back to a previous deployment

Example usage

```bash
# Run a proxy to the Kubernetes API server, changing the API prefix to k8s-api
# This makes e.g. the pods API available at localhost:8001/k8s-api/v1/pods/
oc proxy --api-prefix=k8s-api
```
2.5.1.104. oc rollout cancel
Cancel the in-progress deployment

Example usage

```bash
# Cancel the in-progress deployment based on 'nginx'
oc rollout cancel dc/nginx
```

2.5.1.105. oc rollout history
View rollout history

Example usage

```bash
# View the rollout history of a deployment
oc rollout history dc/nginx

# View the details of deployment revision 3
oc rollout history dc/nginx --revision=3
```

2.5.1.106. oc rollout latest
Start a new rollout for a deployment config with the latest state from its triggers

Example usage

```bash
# Start a new rollout based on the latest images defined in the image change triggers
oc rollout latest dc/nginx

# Print the rolled out deployment config
oc rollout latest dc/nginx -o json
```

2.5.1.107. oc rollout pause
Mark the provided resource as paused

Example usage

```bash
# Perform a rollback to the last successfully completed deployment for a deployment config
oc rollout frontend

# See what a rollback to version 3 will look like, but do not perform the rollback
oc rollout frontend --to-version=3 --dry-run

# Perform a rollback to a specific deployment
oc rollout frontend-2

# Perform the rollback manually by piping the JSON of the new config back to oc
oc rollout frontend -o json | oc replace dc/frontend -f -

# Print the updated deployment configuration in JSON format instead of performing the rollback
oc rollout frontend -o json
```
Example usage

```
# Mark the nginx deployment as paused. Any current state of
# the deployment will continue its function, new updates to the deployment will not
# have an effect as long as the deployment is paused
oc rollout pause dc/nginx
```

### 2.5.1.108. oc rollout restart

Restart a resource

Example usage

```
# Restart a deployment
oc rollout restart deployment/nginx

# Restart a daemon set
oc rollout restart daemonset/abc
```

### 2.5.1.109. oc rollout resume

Resume a paused resource

Example usage

```
# Resume an already paused deployment
oc rollout resume dc/nginx
```

### 2.5.1.110. oc rollout retry

Retry the latest failed rollout

Example usage

```
# Retry the latest failed deployment based on 'frontend'
# The deployer pod and any hook pods are deleted for the latest failed deployment
oc rollout retry dc/frontend
```

### 2.5.1.111. oc rollout status

Show the status of the rollout

Example usage

```
# Watch the status of the latest rollout
oc rollout status dc/nginx
```

### 2.5.1.112. oc rollout undo

Undo a previous rollout
Example usage

```bash
# Roll back to the previous deployment
oc rollout undo dc/nginx

# Roll back to deployment revision 3. The replication controller for that version must exist
oc rollout undo dc/nginx --to-revision=3
```

2.5.1.113. oc rsh
Start a shell session in a container

Example usage

```bash
# Open a shell session on the first container in pod 'foo'
oc rsh foo

# Open a shell session on the first container in pod 'foo' and namespace 'bar'
# (Note that oc client specific arguments must come before the resource name and its arguments)
oc rsh -n bar foo

# Run the command 'cat /etc/resolv.conf' inside pod 'foo'
oc rsh foo cat /etc/resolv.conf

# See the configuration of your internal registry
oc rsh dc/docker-registry cat config.yml

# Open a shell session on the container named 'index' inside a pod of your job
oc rsh -c index job/scheduled
```

2.5.1.114. oc rsync
Copy files between a local file system and a pod

Example usage

```bash
# Synchronize a local directory with a pod directory
oc rsync .:/local/dir/ POD:/remote/dir

# Synchronize a pod directory with a local directory
oc rsync POD:/remote/dir/ .:/local/dir
```

2.5.1.115. oc run
Run a particular image on the cluster

Example usage

```bash
# Start a nginx pod
oc run nginx --image=nginx

# Start a hazelcast pod and let the container expose port 5701
oc run hazelcast --image=hazelcast/hazelcast --port=5701
```
# Start a hazelcast pod and set environment variables "DNS_DOMAIN=cluster" and "POD_NAMESPACE=default" in the container
oc run hazelcast --image=hazelcast/hazelcast --env="DNS_DOMAIN=cluster" --env="POD_NAMESPACE=default"

# Start a hazelcast pod and set labels "app=hazelcast" and "env=prod" in the container
oc run hazelcast --image=hazelcast/hazelcast --labels="app=hazelcast,env=prod"

# Dry run; print the corresponding API objects without creating them
oc run nginx --image=nginx --dry-run=client

# Start a nginx pod, but overload the spec with a partial set of values parsed from JSON
oc run nginx --image=nginx --overrides='{"apiVersion": "v1", "spec": { ... }}'

# Start a busybox pod and keep it in the foreground, don't restart it if it exits
oc run -i -t busybox --image=busybox --restart=Never

# Start the nginx pod using the default command, but use custom arguments (arg1 .. argN) for that command
oc run nginx --image=nginx -- <arg1> <arg2> ... <argN>

# Start the nginx pod using a different command and custom arguments
oc run nginx --image=nginx --command -- <cmd> <arg1> ... <argN>

## 2.5.116. oc scale

Set a new size for a deployment, replica set, or replication controller

### Example usage

# Scale a replica set named 'foo' to 3
oc scale --replicas=3 rs/foo

# Scale a resource identified by type and name specified in "foo.yaml" to 3
oc scale --replicas=3 -f foo.yaml

# If the deployment named mysql's current size is 2, scale mysql to 3
oc scale --current-replicas=2 --replicas=3 deployment/mysql

# Scale multiple replication controllers
oc scale --replicas=5 rc/foo rc/bar rc/baz

# Scale stateful set named 'web' to 3
oc scale --replicas=3 statefulset/web

## 2.5.117. oc secrets link

Link secrets to a service account

### Example usage

# Add an image pull secret to a service account to automatically use it for pulling pod images
oc secrets link serviceaccount-name pull-secret --for=pull
# Add an image pull secret to a service account to automatically use it for both pulling and pushing build images
oc secrets link builder builder-image-secret --for=pull,mount

# If the cluster's serviceAccountConfig is operating with limitSecretReferences: True, secrets must be added to the pod's service account whitelist in order to be available to the pod
oc secrets link pod-sa pod-secret

2.5.1.118. oc secrets unlink

Detach secrets from a service account

Example usage

# Unlink a secret currently associated with a service account
oc secrets unlink serviceaccount-name secret-name another-secret-name ...

2.5.1.119. oc serviceaccounts create-kubeconfig

Generate a kubeconfig file for a service account

Example usage

# Create a kubeconfig file for service account 'default'
oc serviceaccounts create-kubeconfig 'default' > default.kubeconfig

2.5.1.120. oc serviceaccounts get-token

Get a token assigned to a service account

Example usage

# Get the service account token from service account 'default'
oc serviceaccounts get-token 'default'

2.5.1.121. oc serviceaccounts new-token

Generate a new token for a service account

Example usage

# Generate a new token for service account 'default'
oc serviceaccounts new-token 'default'

# Generate a new token for service account 'default' and apply # labels 'foo' and 'bar' to the new token for identification
oc serviceaccounts new-token 'default' --labels foo=foo-value,bar=bar-value

2.5.1.122. oc set build-hook

Update a build hook on a build config
Example usage

```
# Clear post-commit hook on a build config
oc set build-hook bc/mybuild --post-commit --remove

# Set the post-commit hook to execute a test suite using a new entrypoint
oc set build-hook bc/mybuild --post-commit --command -- /bin/bash -c /var/lib/test-image.sh

# Set the post-commit hook to execute a shell script
oc set build-hook bc/mybuild --post-commit --command=/var/lib/test-image.sh param1 param2 && /var/lib/done.sh
```

2.5.1.123. oc set build-secret

Update a build secret on a build config

Example usage

```
# Clear the push secret on a build config
oc set build-secret --push --remove bc/mybuild

# Set the pull secret on a build config
oc set build-secret --pull bc/mybuild mysecret

# Set the push and pull secret on a build config
oc set build-secret --push --pull bc/mybuild mysecret

# Set the source secret on a set of build configs matching a selector
oc set build-secret --source -l app=myapp gitsecret
```

2.5.1.124. oc set data

Update the data within a config map or secret

Example usage

```
# Set the 'password' key of a secret
oc set data secret/foo password=this_is_secret

# Remove the 'password' key from a secret
oc set data secret/foo password-

# Update the 'haproxy.conf' key of a config map from a file on disk
oc set data configmap/bar --from-file=../haproxy.conf

# Update a secret with the contents of a directory, one key per file
oc set data secret/foo --from-file=secret-dir
```

2.5.1.125. oc set deployment-hook

Update a deployment hook on a deployment config

Example usage
2.5.1.126. oc set env

Update environment variables on a pod template

Example usage

```shell
# Clear pre and post hooks on a deployment config
oc set deployment-hook dc/myapp --remove --pre --post

# Set the pre deployment hook to execute a db migration command for an application
# using the data volume from the application
oc set deployment-hook dc/myapp --pre --volumes=data -- /var/lib/migrate-db.sh

# Set a mid deployment hook along with additional environment variables
oc set deployment-hook dc/myapp --mid --volumes=data -e VAR1=value1 -e VAR2=value2 -- /var/lib/prepare-deploy.sh
```

2.5.1.127. oc set image

Update the image of a pod template

Example usage

```shell
# Update deployment config 'myapp' with a new environment variable
oc set env dc/myapp STORAGE_DIR=/local

# List the environment variables defined on a build config 'sample-build'
oc set env bc/sample-build --list

# List the environment variables defined on all pods
oc set env pods --all --list

# Output modified build config in YAML
oc set env bc/sample-build STORAGE_DIR=/data -o yaml

# Update all containers in all replication controllers in the project to have ENV=prod
oc set env rc --all ENV=prod

# Import environment from a secret
oc set env --from=secret/mysecret dc/myapp

# Import environment from a config map with a prefix
oc set env --from=configmap/myconfigmap --prefix=MYSQL_ dc/myapp

# Remove the environment variable ENV from container 'c1' in all deployment configs
oc set env dc --all --containers="c1" ENV-

# Remove the environment variable ENV from a deployment config definition on disk and
# update the deployment config on the server
oc set env -f dc.json ENV-

# Set some of the local shell environment into a deployment config on the server
oc set env | grep RAILS_ | oc set env -e - dc/myapp
```
2.5.1.128. oc set image-lookup
Change how images are resolved when deploying applications

Example usage

# Print all of the image streams and whether they resolve local names
oc set image-lookup

# Use local name lookup on image stream mysql
oc set image-lookup mysql

# Force a deployment to use local name lookup
oc set image-lookup deploy/mysql

# Show the current status of the deployment lookup
oc set image-lookup deploy/mysql --list

# Disable local name lookup on image stream mysql
oc set image-lookup mysql --enabled=false

# Set local name lookup on all image streams
oc set image-lookup --all

2.5.1.129. oc set probe
Update a probe on a pod template

Example usage

# Clear both readiness and liveness probes off all containers
oc set probe dc/myapp --remove --readiness --liveness

# Set an exec action as a liveness probe to run 'echo ok'
oc set probe dc/myapp --liveness -- echo ok
2.5.1.130. `oc set resources`

Update resource requests/limits on objects with pod templates

Example usage

```
# Set a readiness probe to try to open a TCP socket on 3306
oc set probe rc/mysql --readiness --open-tcp=3306

# Set an HTTP startup probe for port 8080 and path /healthz over HTTP on the pod IP
oc set probe dc/webapp --startup --get-url=http://:8080/healthz

# Set an HTTP readiness probe for port 8080 and path /healthz over HTTP on the pod IP
oc set probe dc/webapp --readiness --get-url=http://:8080/healthz

# Set an HTTP readiness probe over HTTPS on 127.0.0.1:1936 for a hostNetwork pod
oc set probe dc/router --readiness --get-url=https://127.0.0.1:1936/stats

# Set only the initial-delay-seconds field on all deployments
oc set probe dc --all --readiness --initial-delay-seconds=30
```

```
# Set a deployments nginx container CPU limits to "200m and memory to 512Mi"
oc set resources deployment nginx -c=nginx --limits=cpu=200m,memory=512Mi

# Set the resource request and limits for all containers in nginx
oc set resources deployment nginx --limits=cpu=200m,memory=512Mi --requests=cpu=100m,memory=256Mi

# Remove the resource requests for resources on containers in nginx
oc set resources deployment nginx --limits=cpu=0,memory=0 --requests=cpu=0,memory=0

# Print the result (in YAML format) of updating nginx container limits locally, without hitting the server
oc set resources -f path/to/file.yaml --limits=cpu=200m,memory=512Mi --local -o yaml
```

2.5.1.131. `oc set route-backends`

Update the backends for a route

Example usage

```
# Print the backends on the route 'web'
oc set route-backends web

# Set two backend services on route 'web' with 2/3rds of traffic going to 'a'
oc set route-backends web a=2 b=1

# Increase the traffic percentage going to b by 10%% relative to a
oc set route-backends web --adjust b=+10%%

# Set traffic percentage going to b to 10%% of the traffic going to a
oc set route-backends web --adjust b=10%%

# Set weight of b to 10
oc set route-backends web --adjust b=10
```
2.5.1.132. oc set selector

Set the selector on a resource

Example usage

```
# Set the weight to all backends to zero
oc set route-backends web --zero
```

2.5.1.133. oc set serviceaccount

Update the service account of a resource

Example usage

```
# Set the labels and selector before creating a deployment/service pair.
oc create service clusterip my-svc --clusterip="None" -o yaml --dry-run | oc set selector --local -f
'venvironment=qa' -o yaml | oc create -f
oc create deployment my-dep -o yaml --dry-run | oc label --local -f - environment=qa -o yaml | oc create -f
```

2.5.1.134. oc set subject

Update the user, group, or service account in a role binding or cluster role binding

Example usage

```
# Set deployment nginx-deployment's service account to serviceaccount1
oc set serviceaccount deployment nginx-deployment serviceaccount1

# Print the result (in YAML format) of updated nginx deployment with service account from a local file, without hitting the API server
oc set sa -f nginx-deployment.yaml serviceaccount1 --local --dry-run -o yaml
```

2.5.1.135. oc set triggers

Update the triggers on one or more objects

Example usage

```
# Print the triggers on the deployment config 'myapp'
```
2.5.1.136. oc set volumes

Example volumes on a pod template

Example usage

```bash
# List volumes defined on all deployment configs in the current project
oc set volume dc --all

# Add a new empty dir volume to deployment config (dc) 'myapp' mounted under
# /var/lib/myapp
oc set volume dc/myapp --add --mount-path=/var/lib/myapp

# Use an existing persistent volume claim (pvc) to overwrite an existing volume 'v1'
oc set volume dc/myapp --add --name=v1 -t pvc --claim-name=pvc1 --overwrite

# Remove volume 'v1' from deployment config 'myapp'
oc set volume dc/myapp --remove --name=v1

# Create a new persistent volume claim that overwrites an existing volume 'v1'
oc set volume dc/myapp --add --name=v1 -t pvc --claim-size=1G --overwrite

# Change the mount point for volume 'v1' to /data
oc set volume dc/myapp --add --name=v1 -m /data --overwrite

# Modify the deployment config by removing volume mount "v1" from container "c1"
# (and by removing the volume "v1" if no other containers have volume mounts that reference it)
oc set volume dc/myapp --remove --name=v1 --containers=c1
```
2.5.1.137. oc start-build

Start a new build

Example usage

```
# Starts build from build config "hello-world"
oc start-build hello-world

# Starts build from a previous build "hello-world-1"
oc start-build --from-build=hello-world-1

# Use the contents of a directory as build input
oc start-build hello-world --from-dir=src/

# Send the contents of a Git repository to the server from tag 'v2'
oc start-build hello-world --from-repo=../hello-world --commit=v2

# Start a new build for build config "hello-world" and watch the logs until the build
# completes or fails
oc start-build hello-world --follow

# Start a new build for build config "hello-world" and wait until the build completes. It
# exits with a non-zero return code if the build fails
oc start-build hello-world --wait
```

2.5.1.138. oc status

Show an overview of the current project

Example usage

```
# See an overview of the current project
oc status

# Export the overview of the current project in an svg file
oc status -o dot | dot -T svg -o project.svg

# See an overview of the current project including details for any identified issues
oc status --suggest
```

2.5.1.139. oc tag

Tag existing images into image streams

Example usage

```
# Tag the current image for the image stream 'openshift/ruby' and tag '2.0' into the image stream
# yourproject/ruby with tag 'tip'
```
2.5.1.140. oc version

Print the client and server version information

Example usage

```bash
# Print the OpenShift client, kube-apiserver, and openshift-apiserver version information for the current context
oc version

# Print the OpenShift client, kube-apiserver, and openshift-apiserver version numbers for the current context
oc version --short

# Print the OpenShift client version information for the current context
oc version --client
```

2.5.1.141. oc wait

Experimental: Wait for a specific condition on one or many resources

Example usage

```bash
# Wait for the pod “busybox1” to contain the status condition of type “Ready”
oc wait --for=condition=Ready pod/busybox1

# The default value of status condition is true; you can set it to false
oc wait --for=condition=Ready=false pod/busybox1

# Wait for the pod “busybox1” to be deleted, with a timeout of 60s, after having issued the “delete” command
oc delete pod/busybox1
oc wait --for=delete pod/busybox1 --timeout=60s
```

2.5.1.142. oc whoami

Return information about the current session
Example usage

```
# Display the currently authenticated user
oc whoami
```

2.5.2. Additional resources

- OpenShift CLI administrator command reference

2.6. OPENSShift CLI ADMINISTRATOR COMMAND REFERENCE

This reference provides descriptions and example commands for OpenShift CLI (oc) administrator commands. You must have `cluster-admin` or equivalent permissions to use these commands.

For developer commands, see the OpenShift CLI developer command reference.

Run `oc adm help` to list all administrator commands or run `oc <command> --help` to get additional details for a specific command.

2.6.1. OpenShift CLI (oc) administrator commands

2.6.1.1. `oc adm build-chain`

Output the inputs and dependencies of your builds

Example usage

```
# Build the dependency tree for the 'latest' tag in <image-stream>
oc adm build-chain <image-stream>

# Build the dependency tree for the 'v2' tag in dot format and visualize it via the dot utility
oc adm build-chain <image-stream>:v2 -o dot | dot -T svg -o deps.svg

# Build the dependency tree across all namespaces for the specified image stream tag found in the 'test' namespace
oc adm build-chain <image-stream> -n test --all
```

2.6.1.2. `oc adm catalog mirror`

Mirror an operator-registry catalog

Example usage

```
# Mirror an operator-registry image and its contents to a registry
oc adm catalog mirror quay.io/my/image:latest myregistry.com

# Mirror an operator-registry image and its contents to a particular namespace in a registry
oc adm catalog mirror quay.io/my/image:latest myregistry.com/my-namespace

# Mirror to an airgapped registry by first mirroring to files
oc adm catalog mirror quay.io/my/image:latest file:///local/index
oc adm catalog mirror file:///local/index/my/image:latest my-airgapped-registry.com
```
2.6.1.3. oc adm certificate approve

Approve a certificate signing request

Example usage

```bash
# Approve CSR 'csr-sqgzp'
oc adm certificate approve csr-sqgzp
```

2.6.1.4. oc adm certificate deny

Deny a certificate signing request

Example usage

```bash
# Deny CSR 'csr-sqgzp'
oc adm certificate deny csr-sqgzp
```

2.6.1.5. oc adm completion

Output shell completion code for the specified shell (bash or zsh)

Example usage

```bash
# Installing bash completion on macOS using homebrew
## If running Bash 3.2 included with macOS
brew install bash-completion
## or, if running Bash 4.1+
brew install bash-completion@2
## If oc is installed via homebrew, this should start working immediately
## If you've installed via other means, you may need add the completion to your completion directory
oc completion bash > $(brew --prefix)/etc/bash_completion.d/oc

# Installing bash completion on Linux
## If bash-completion is not installed on Linux, install the 'bash-completion' package
## via your distribution's package manager.
## Load the oc completion code for bash into the current shell
source <(oc completion bash)
## Write bash completion code to a file and source it from .bash_profile
oc completion bash > ~/.kube/completion.bash.inc
printf 
```

# Kubectl shell completion
source 'HOME/.kube/completion.bash.inc'
" " >> HOME/.bash_profile
source HOME/.bash_profile

# Load the oc completion code for zsh[1] into the current shell
source <(oc completion zsh)
# Set the oc completion code for zsh[1] to autoload on startup
oc completion zsh > "$(path[1])/_oc"

2.6.1.6. oc adm config current-context

Display the current-context

Example usage

    # Display the current-context
    oc config current-context

2.6.1.7. oc adm config delete-cluster

Delete the specified cluster from the kubeconfig

Example usage

    # Delete the minikube cluster
    oc config delete-cluster minikube

2.6.1.8. oc adm config delete-context

Delete the specified context from the kubeconfig

Example usage

    # Delete the context for the minikube cluster
    oc config delete-context minikube

2.6.1.9. oc adm config delete-user

Delete the specified user from the kubeconfig

Example usage

    # Delete the minikube user
    oc config delete-user minikube

2.6.1.10. oc adm config get-clusters

Display clusters defined in the kubeconfig

Example usage
2.6.1.11. oc adm config get-contexts
Describe one or many contexts

Example usage

```shell
# List all the contexts in your kubeconfig file
oc config get-contexts

# Describe one context in your kubeconfig file
oc config get-contexts my-context
```

2.6.1.12. oc adm config get-users
Display users defined in the kubeconfig

Example usage

```shell
# List the users that oc knows about
oc config get-users
```

2.6.1.13. oc adm config rename-context
Rename a context from the kubeconfig file

Example usage

```shell
# Rename the context 'old-name' to 'new-name' in your kubeconfig file
oc config rename-context old-name new-name
```

2.6.1.14. oc adm config set
Set an individual value in a kubeconfig file

Example usage

```shell
# Set the server field on the my-cluster cluster to https://1.2.3.4
oc config set clusters.my-cluster.server https://1.2.3.4

# Set the certificate-authority-data field on the my-cluster cluster
oc config set clusters.my-cluster.certificate-authority-data $(echo "cert_data_here" | base64 -i -)

# Set the cluster field in the my-context context to my-cluster
oc config set contexts.my-context.cluster my-cluster

# Set the client-key-data field in the cluster-admin user using --set-raw-bytes option
oc config set users.cluster-admin.client-key-data cert_data_here --set-raw-bytes=true
```
2.6.15. oc adm config set-cluster

Set a cluster entry in kubeconfig

Example usage

```bash
# Set only the server field on the e2e cluster entry without touching other values
oc config set-cluster e2e --server=https://1.2.3.4

# Embed certificate authority data for the e2e cluster entry
oc config set-cluster e2e --embed-certs --certificate-authority=~/.kube/e2e/kubernetes.ca.crt

# Disable cert checking for the dev cluster entry
oc config set-cluster e2e --insecure-skip-tls-verify=true

# Set custom TLS server name to use for validation for the e2e cluster entry
oc config set-cluster e2e --tls-server-name=my-cluster-name
```

2.6.16. oc adm config set-context

Set a context entry in kubeconfig

Example usage

```bash
# Set the user field on the gce context entry without touching other values
oc config set-context gce --user=cluster-admin
```

2.6.17. oc adm config set-credentials

Set a user entry in kubeconfig

Example usage

```bash
# Set only the "client-key" field on the "cluster-admin" entry, without touching other values
oc config set-credentials cluster-admin --client-key=~/.kube/admin.key

# Set basic auth for the "cluster-admin" entry
oc config set-credentials cluster-admin --username=admin --password=uXFGweU9l35qcif

# Embed client certificate data in the "cluster-admin" entry
oc config set-credentials cluster-admin --client-certificate=~/.kube/admin.crt --embed-certs=true

# Enable the Google Compute Platform auth provider for the "cluster-admin" entry
oc config set-credentials cluster-admin --auth-provider=gcp

# Enable the OpenID Connect auth provider for the "cluster-admin" entry with additional args
oc config set-credentials cluster-admin --auth-provider=oidc --auth-provider-arg=client-id=foo --auth-provider-arg=client-secret=bar

# Remove the "client-secret" config value for the OpenID Connect auth provider for the "cluster-admin" entry
oc config set-credentials cluster-admin --auth-provider=oidc --auth-provider-arg=client-secret=
```
2.6.18. oc adm config unset

Unset an individual value in a kubeconfig file

**Example usage**

```bash
# Unset the current-context
oc config unset current-context

# Unset namespace in foo context
oc config unset contexts.foo.namespace
```

2.6.19. oc adm config use-context

Set the current-context in a kubeconfig file

**Example usage**

```bash
# Use the context for the minikube cluster
oc config use-context minikube
```

2.6.20. oc adm config view

Display merged kubeconfig settings or a specified kubeconfig file

**Example usage**

```bash
# Show merged kubeconfig settings
oc config view

# Show merged kubeconfig settings and raw certificate data
oc config view --raw

# Get the password for the e2e user
oc config view -o jsonpath='{.users[?(@.name == "e2e")]}.user.password'}
```

2.6.21. oc adm cordon

Mark node as unschedulable
Example usage

```bash
# Mark node "foo" as unschedulable
oc adm cordon foo
```

2.6.1.22. `oc adm create-bootstrap-project-template`
Create a bootstrap project template

Example usage

```bash
# Output a bootstrap project template in YAML format to stdout
oc adm create-bootstrap-project-template -o yaml
```

2.6.1.23. `oc adm create-error-template`
Create an error page template

Example usage

```bash
# Output a template for the error page to stdout
oc adm create-error-template
```

2.6.1.24. `oc adm create-login-template`
Create a login template

Example usage

```bash
# Output a template for the login page to stdout
oc adm create-login-template
```

2.6.1.25. `oc adm create-provider-selection-template`
Create a provider selection template

Example usage

```bash
# Output a template for the provider selection page to stdout
oc adm create-provider-selection-template
```

2.6.1.26. `oc adm drain`
Drain node in preparation for maintenance

Example usage

```bash
# Drain node "foo", even if there are pods not managed by a replication controller, replica set, job, daemon set or stateful set on it
oc adm drain foo --force
```
2.6.1.27. oc adm groups add-users

Add users to a group

Example usage

```bash
# Add user1 and user2 to my-group
oc adm groups add-users my-group user1 user2
```

2.6.1.28. oc adm groups new

Create a new group

Example usage

```bash
# Add a group with no users
oc adm groups new my-group

# Add a group with two users
oc adm groups new my-group user1 user2

# Add a group with one user and shorter output
oc adm groups new my-group user1 -o name
```

2.6.1.29. oc adm groups prune

Remove old OpenShift groups referencing missing records from an external provider

Example usage

```bash
# Prune all orphaned groups
oc adm groups prune --sync-config=/path/to/ldap-sync-config.yaml --confirm

# Prune all orphaned groups except the ones from the blacklist file
oc adm groups prune --blacklist=/path/to/blacklist.txt --sync-config=/path/to/ldap-sync-config.yaml --confirm

# Prune all orphaned groups from a list of specific groups specified in a whitelist file
oc adm groups prune --whitelist=/path/to/whitelist.txt --sync-config=/path/to/ldap-sync-config.yaml --confirm

# Prune all orphaned groups from a list of specific groups specified in a whitelist
oc adm groups prune groups/group_name groups/other_name --sync-config=/path/to/ldap-sync-config.yaml --confirm
```

2.6.1.30. oc adm groups remove-users

Remove users from a group

```bash
# As above, but abort if there are pods not managed by a replication controller, replica set, job, daemon set or stateful set, and use a grace period of 15 minutes
oc adm drain foo --grace-period=900
```
Example usage

# Remove user1 and user2 from my-group
oc adm groups remove-users my-group user1 user2

2.6.1.31. oc adm groups sync

Sync OpenShift groups with records from an external provider

Example usage

# Sync all groups with an LDAP server
oc adm groups sync --sync-config=/path/to/ldap-sync-config.yaml --confirm

# Sync all groups except the ones from the blacklist file with an LDAP server
oc adm groups sync --blacklist=/path/to/blacklist.txt --sync-config=/path/to/ldap-sync-config.yaml --confirm

# Sync specific groups specified in a whitelist file with an LDAP server
oc adm groups sync --whitelist=/path/to/whitelist.txt --sync-config=/path/to/sync-config.yaml --confirm

# Sync all OpenShift groups that have been synced previously with an LDAP server
oc adm groups sync --type=openshift --sync-config=/path/to/ldap-sync-config.yaml --confirm

# Sync specific OpenShift groups if they have been synced previously with an LDAP server
oc adm groups sync groups/group1 groups/group2 groups/group3 --sync-config=/path/to/sync-config.yaml --confirm

2.6.1.32. oc adm inspect

Collect debugging data for a given resource

Example usage

# Collect debugging data for the "openshift-apiserver" clusteroperator
oc adm inspect clusteroperator/openshift-apiserver

# Collect debugging data for the "openshift-apiserver" and "kube-apiserver" clusteroperators
oc adm inspect clusteroperator/openshift-apiserver clusteroperator/kube-apiserver

# Collect debugging data for all clusteroperators
oc adm inspect clusteroperator

# Collect debugging data for all clusteroperators and clusterversions
oc adm inspect clusteroperators,clusterversions

2.6.1.33. oc adm migrate template-instances

Update template instances to point to the latest group-version-kinds

Example usage
2.6.1.34. oc adm must-gather

Launch a new instance of a pod for gathering debug information

**Example usage**

```bash
# Perform a dry-run of updating all objects
oc adm migrate template-instances

# To actually perform the update, the confirm flag must be appended
oc adm migrate template-instances --confirm
```

```bash
# Gather information using the default plug-in image and command, writing into ./must-gather.local.
oc adm must-gather

# Gather information with a specific local folder to copy to
oc adm must-gather --dest-dir=/local/directory

# Gather audit information
oc adm must-gather -- /usr/bin/gather_audit_logs

# Gather information using multiple plug-in images
oc adm must-gather --image=quay.io/kubevirt/must-gather --image=quay.io/openshift/origin-must-gather

# Gather information using a specific image stream plug-in
oc adm must-gather --image-stream=openshift/must-gather:latest

# Gather information using a specific image, command, and pod-dir
oc adm must-gather --image=my/image:tag --source-dir=/pod/directory -- myspecial-command.sh
```

2.6.1.35. oc adm new-project

Create a new project

**Example usage**

```bash
# Create a new project using a node selector
oc adm new-project myproject --node-selector='type=user-node,region=east'
```

2.6.1.36. oc adm node-logs

Display and filter node logs

**Example usage**

```bash
# Show kubelet logs from all masters
oc adm node-logs --role master -u kubelet

# See what logs are available in masters in /var/logs
oc adm node-logs --role master --path=/
```
# Display cron log file from all masters
oc adm node-logs --role master --path=cron

2.6.1.37. oc adm pod-network isolate-projects

Isolate project network

Example usage

# Provide isolation for project p1
oc adm pod-network isolate-projects <p1>

# Allow all projects with label name=top-secret to have their own isolated project network
oc adm pod-network isolate-projects --selector='name=top-secret'

2.6.1.38. oc adm pod-network join-projects

Join project network

Example usage

# Allow project p2 to use project p1 network
oc adm pod-network join-projects --to=<p1> <p2>

# Allow all projects with label name=top-secret to use project p1 network
oc adm pod-network join-projects --to=<p1> --selector='name=top-secret'

2.6.1.39. oc adm pod-network make-projects-global

Make project network global

Example usage

# Allow project p1 to access all pods in the cluster and vice versa
oc adm pod-network make-projects-global <p1>

# Allow all projects with label name=share to access all pods in the cluster and vice versa
oc adm pod-network make-projects-global --selector='name=share'

2.6.1.40. oc adm policy add-role-to-user

Add a role to users or service accounts for the current project

Example usage

# Add the 'view' role to user1 for the current project
oc policy add-role-to-user view user1

# Add the 'edit' role to serviceaccount1 for the current project
oc policy add-role-to-user edit -z serviceaccount1
2.6.1.41. `oc adm policy add-scc-to-group`  
Add a security context constraint to groups  

Example usage  

```
# Add the 'restricted' security context constraint to group1 and group2  
oc adm policy add-scc-to-group restricted group1 group2
```

2.6.1.42. `oc adm policy add-scc-to-user`  
Add a security context constraint to users or a service account  

Example usage  

```
# Add the 'restricted' security context constraint to user1 and user2  
oc adm policy add-scc-to-user restricted user1 user2

# Add the 'privileged' security context constraint to serviceaccount1 in the current namespace  
oc adm policy add-scc-to-user privileged -z serviceaccount1
```

2.6.1.43. `oc adm policy scc-review`  
Check which service account can create a pod  

Example usage  

```
# Check whether service accounts sa1 and sa2 can admit a pod with a template pod spec specified in my_resource.yaml  
# Service Account specified in myresource.yaml file is ignored  
oc policy scc-review -z sa1,sa2 -f my_resource.yaml

# Check whether service accounts system:serviceaccount:bob:default can admit a pod with a template pod spec specified in my_resource.yaml  
oc policy scc-review -z system:serviceaccount:bob:default -f my_resource.yaml

# Check whether the service account specified in my_resource_with_sa.yaml can admit the pod  
oc policy scc-review -f my_resource_with_sa.yaml

# Check whether the default service account can admit the pod; default is taken since no service account is defined in myresource_with_no_sa.yaml  
oc policy scc-review -f myresource_with_no_sa.yaml
```

2.6.1.44. `oc adm policy scc-subject-review`  
Check whether a user or a service account can create a pod  

Example usage  

```
# Check whether user bob can create a pod specified in myresource.yaml  
oc policy scc-subject-review -u bob -f myresource.yaml

# Check whether user bob who belongs to projectAdmin group can create a pod specified in
```
### 2.6.1.45. oc adm prune builds

Remove old completed and failed builds

**Example usage**

```bash
# Dry run deleting older completed and failed builds and also including all builds whose associated build config no longer exists
oc adm prune builds --orphans

# To actually perform the prune operation, the confirm flag must be appended
oc adm prune builds --orphans --confirm
```

### 2.6.1.46. oc adm prune deployments

Remove old completed and failed deployment configs

**Example usage**

```bash
# Dry run deleting all but the last complete deployment for every deployment config
oc adm prune deployments --keep-complete=1

# To actually perform the prune operation, the confirm flag must be appended
oc adm prune deployments --keep-complete=1 --confirm
```

### 2.6.1.47. oc adm prune groups

Remove old OpenShift groups referencing missing records from an external provider

**Example usage**

```bash
# Prune all orphaned groups
oc adm prune groups --sync-config=/path/to/ldap-sync-config.yaml --confirm

# Prune all orphaned groups except the ones from the blacklist file
oc adm prune groups --blacklist=/path/to/blacklist.txt --sync-config=/path/to/ldap-sync-config.yaml --confirm

# Prune all orphaned groups from a list of specific groups specified in a whitelist file
oc adm prune groups --whitelist=/path/to/whitelist.txt --sync-config=/path/to/ldap-sync-config.yaml --confirm

# Prune all orphaned groups from a list of specific groups specified in a whitelist
oc adm prune groups groups/group_name groups/other_name --sync-config=/path/to/ldap-sync-config.yaml --confirm
```
2.6.1.48. oc adm prune images

Remove unreferenced images

Example usage

```bash
# See what the prune command would delete if only images and their referrers were more than an hour old
# and obsoleted by 3 newer revisions under the same tag were considered
oc adm prune images --keep-tag-revisions=3 --keep-younger-than=60m

# To actually perform the prune operation, the confirm flag must be appended
oc adm prune images --keep-tag-revisions=3 --keep-younger-than=60m --confirm

# See what the prune command would delete if we are interested in removing images
# exceeding currently set limit ranges ('openshift.io/Image')
oc adm prune images --prune-over-size-limit

# To actually perform the prune operation, the confirm flag must be appended
oc adm prune images --prune-over-size-limit --confirm

# Force the insecure http protocol with the particular registry host name
oc adm prune images --registry-url=http://registry.example.org --confirm

# Force a secure connection with a custom certificate authority to the particular registry host name
oc adm prune images --registry-url=registry.example.org --certificate-authority=/path/to/custom/ca.crt --confirm
```

2.6.1.49. oc adm release extract

Extract the contents of an update payload to disk

Example usage

```bash
# Use git to check out the source code for the current cluster release to DIR
oc adm release extract --git=DIR

# Extract cloud credential requests for AWS
oc adm release extract --credentials-requests --cloud=aws
```

2.6.150. oc adm release info

Display information about a release

Example usage

```bash
# Show information about the cluster's current release
oc adm release info

# Show the source code that comprises a release
oc adm release info 4.2.2 --commit-urls

# Show the source code difference between two releases
oc adm release info 4.2.0 4.2.2 --commits
```
2.6.1.51. oc adm release mirror

Mirror a release to a different image registry location

Example usage

```
# Perform a dry run showing what would be mirrored, including the mirror objects
oc adm release mirror 4.3.0 --to myregistry.local/openshift/release \
--release-image-signature-to-dir /tmp/releases --dry-run

# Mirror a release into the current directory
oc adm release mirror 4.3.0 --to file://openshift/release \
--release-image-signature-to-dir /tmp/releases

# Mirror a release to another directory in the default location
oc adm release mirror 4.3.0 --to-dir /tmp/releases

# Upload a release from the current directory to another server
oc adm release mirror --from file://openshift/release --to myregistry.com/openshift/release \
--release-image-signature-to-dir /tmp/releases

# Mirror the 4.3.0 release to repository registry.example.com and apply signatures to connected cluster
oc adm release mirror --from=quay.io/openshift-release-dev/ocp-release:4.3.0-x86_64 \
--to=registry.example.com/your/repository --apply-release-image-signature
```

2.6.1.52. oc adm release new

Create a new OpenShift release

Example usage

```
# Create a release from the latest origin images and push to a DockerHub repo
oc adm release new --from-image-stream=4.1 -n origin --to-image docker.io/mycompany/myrepo:latest

# Create a new release with updated metadata from a previous release
oc adm release new --from-release registry.svc.ci.openshift.org/origin/release:v4.1 --name 4.1.1 \
--previous 4.1.0 --metadata ... --to-image docker.io/mycompany/myrepo:latest

# Create a new release and override a single image
oc adm release new --from-release registry.svc.ci.openshift.org/origin/release:v4.1 \
cli=docker.io/mycompany/cli:latest --to-image docker.io/mycompany/myrepo:latest

# Run a verification pass to ensure the release can be reproduced
oc adm release new --from-release registry.svc.ci.openshift.org/origin/release:v4.1
```

2.6.1.53. oc adm taint

Update the taints on one or more nodes
Example usage

# Update node 'foo' with a taint with key 'dedicated' and value 'special-user' and effect 'NoSchedule'
# If a taint with that key and effect already exists, its value is replaced as specified
oc adm taint nodes foo dedicated=special-user:NoSchedule

# Remove from node 'foo' the taint with key 'dedicated' and effect 'NoSchedule' if one exists
oc adm taint nodes foo dedicated:NoSchedule-

# Remove from node 'foo' all the taints with key 'dedicated'
oc adm taint nodes foo dedicated-

# Add a taint with key 'dedicated' on nodes having label mylabel=X
oc adm taint node -l myLabel=X dedicated=foo:PreferNoSchedule

# Add to node 'foo' a taint with key 'bar' and no value
oc adm taint nodes foo bar:NoSchedule

2.6.154. oc adm top images

Show usage statistics for images

Example usage

# Show usage statistics for images
oc adm top images

2.6.155. oc adm top imagestreams

Show usage statistics for image streams

Example usage

# Show usage statistics for image streams
oc adm top imagestreams

2.6.156. oc adm top node

Display resource (CPU/memory) usage of nodes

Example usage

# Show metrics for all nodes
oc adm top node

# Show metrics for a given node
oc adm top node NODE_NAME

2.6.157. oc adm top pod

Display resource (CPU/memory) usage of pods
Example usage

```bash
# Show metrics for all pods in the default namespace
oc adm top pod

# Show metrics for all pods in the given namespace
oc adm top pod --namespace=NAMESPACE

# Show metrics for a given pod and its containers
oc adm top pod POD_NAME --containers

# Show metrics for the pods defined by label name=myLabel
oc adm top pod -l name=myLabel
```

2.6.158. oc adm uncordon

Mark node as schedulable

Example usage

```bash
# Mark node "foo" as schedulable
oc adm uncordon foo
```

2.6.159. oc adm verify-image-signature

Verify the image identity contained in the image signature

Example usage

```bash
# Verify the image signature and identity using the local GPG keychain
oc adm verify-image-signature
sha256:c841e9b64e4579bd56c794bdd7c36e1c257110fd2404bebb8b613e4935228c4 \  
  --expected-identity=registry.local:5000/foo/bar:v1

# Verify the image signature and identity using the local GPG keychain and save the status
oc adm verify-image-signature
sha256:c841e9b64e4579bd56c794bdd7c36e1c257110fd2404bebb8b613e4935228c4 \  
  --expected-identity=registry.local:5000/foo/bar:v1 --save

# Verify the image signature and identity via exposed registry route
oc adm verify-image-signature
sha256:c841e9b64e4579bd56c794bdd7c36e1c257110fd2404bebb8b613e4935228c4 \  
  --expected-identity=registry.local:5000/foo/bar:v1 \  
  --registry-url=docker-registry.foo.com

# Remove all signature verifications from the image
oc adm verify-image-signature
sha256:c841e9b64e4579bd56c794bdd7c36e1c257110fd2404bebb8b613e4935228c4 --remove-all
```

2.6.2. Additional resources

- OpenShift CLI developer command reference
2.7. USAGE OF OC AND KUBECTL COMMANDS

The Kubernetes command-line interface (CLI), `kubectl`, can be used to run commands against a Kubernetes cluster. Because OpenShift Container Platform is a certified Kubernetes distribution, you can use the supported `kubectl` binaries that ship with OpenShift Container Platform, or you can gain extended functionality by using the `oc` binary.

2.7.1. The oc binary

The `oc` binary offers the same capabilities as the `kubectl` binary, but it extends to natively support additional OpenShift Container Platform features, including:

- Full support for OpenShift Container Platform resources
  Resources such as `DeploymentConfig`, `BuildConfig`, `Route`, `ImageStream`, and `ImageStreamTag` objects are specific to OpenShift Container Platform distributions, and build upon standard Kubernetes primitives.

- Authentication
  The `oc` binary offers a built-in `login` command that allows authentication and enables you to work with OpenShift Container Platform projects, which map Kubernetes namespaces to authenticated users. See Understanding authentication for more information.

- Additional commands
  The additional command `oc new-app`, for example, makes it easier to get new applications started using existing source code or pre-built images. Similarly, the additional command `oc new-project` makes it easier to start a project that you can switch to as your default.

**IMPORTANT**

If you installed an earlier version of the `oc` binary, you cannot use it to complete all of the commands in OpenShift Container Platform 4.9. If you want the latest features, you must download and install the latest version of the `oc` binary corresponding to your OpenShift Container Platform server version.

Non-security API changes involve, at minimum, two minor releases (4.1 to 4.2 to 4.3, for example) to allow older `oc` binaries to update. Using new capabilities might require newer `oc` binaries. A 4.3 server might have additional capabilities that a 4.2 `oc` binary cannot use and a 4.3 `oc` binary might have additional capabilities that are unsupported by a 4.2 server.

**Table 2.2. Compatibility Matrix**

<table>
<thead>
<tr>
<th>X.Y (oc binary)</th>
<th>X.Y+N (oc binary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X.Y (Server)</td>
<td><img src="1" alt="1" /></td>
</tr>
<tr>
<td>X.Y+N (Server)</td>
<td><img src="2" alt="2" /></td>
</tr>
</tbody>
</table>
1. Fully compatible.

2. `oc` binary might be unable to access server features.

3. `oc` binary might provide options and features that might not be compatible with the accessed server.

### 2.7.2. The kubectl binary

The `kubectl` binary is provided as a means to support existing workflows and scripts for new OpenShift Container Platform users coming from a standard Kubernetes environment, or for those who prefer to use the `kubectl` CLI. Existing users of `kubectl` can continue to use the binary to interact with Kubernetes primitives, with no changes required to the OpenShift Container Platform cluster.

You can install the supported `kubectl` binary by following the steps to Install the OpenShift CLI. The `kubectl` binary is included in the archive if you download the binary, or is installed when you install the CLI by using an RPM.

For more information, see the `kubectl` documentation.
CHAPTER 3. DEVELOPER CLI (ODO)

3.1. odo RELEASE NOTES

3.1.1. Notable changes and improvements in odo version 2.5.0

- Creates unique routes for each component, using `adler32` hashing
- Supports additional fields in the devfile for assigning resources:
  - `cpuRequest`
  - `cpuLimit`
  - `memoryRequest`
  - `memoryLimit`
- Adds the `--deploy` flag to the `odo delete` command, to remove components deployed using the `odo deploy` command:
  
  ```
  $ odo delete --deploy
  ```
- Adds mapping support to the `odo link` command
- Supports ephemeral volumes using the `ephemeral` field in `volume` components
- Sets the default answer to `yes` when asking for telemetry opt-in
- Improves metrics by sending additional telemetry data to the devfile registry
- Updates the bootstrap image to `registry.access.redhat.com/ocp-tools-4/odo-init-container-rhel8:1.1.11`
- The upstream repository is available at `https://github.com/redhat-developer/odo`

3.1.2. Bug fixes

- Previously, `odo deploy` would fail if the `.odo/env` file did not exist. The command now creates the `.odo/env` file if required.
- Previously, interactive component creation using the `odo create` command would fail if disconnect from the cluster. This issue is fixed in the latest release.

3.1.3. Getting support

For Product

If you find an error, encounter a bug, or have suggestions for improving the functionality of odo, file an issue in Bugzilla. Choose `OpenShift Developer Tools and Services` as a product type and `odo` as a component.

Provide as many details in the issue description as possible.
For Documentation

If you find an error or have suggestions for improving the documentation, file an issue in Bugzilla. Choose the OpenShift Container Platform product type and the Documentation component type.

3.2. UNDERSTANDING ODO

Red Hat OpenShift Developer CLI (odo) is a tool for creating applications on OpenShift Container Platform and Kubernetes. With odo, you can develop, test, debug, and deploy microservices-based applications on a Kubernetes cluster without having a deep understanding of the platform.

odo follows a create and push workflow. As a user, when you create, the information (or manifest) is stored in a configuration file. When you push, the corresponding resources are created on the Kubernetes cluster. All of this configuration is stored in the Kubernetes API for seamless accessibility and functionality.

odo uses service and link commands to link components and services together. odo achieves this by creating and deploying services based on Kubernetes Operators in the cluster. Services can be created using any of the Operators available on the Operator Hub. After linking a service, odo injects the service configuration into the component. Your application can then use this configuration to communicate with the Operator-backed service.

3.2.1. odo key features

odo is designed to be a developer-friendly interface to Kubernetes, with the ability to:

- Quickly deploy applications on a Kubernetes cluster by creating a new manifest or using an existing one
- Use commands to easily create and update the manifest, without the need to understand and maintain Kubernetes configuration files
- Provide secure access to applications running on a Kubernetes cluster
- Add and remove additional storage for applications on a Kubernetes cluster
- Create Operator-backed services and link your application to them
- Create a link between multiple microservices that are deployed as odo components
- Remotely debug applications you deployed using odo in your IDE
- Easily test applications deployed on Kubernetes using odo

3.2.2. odo core concepts

odo abstracts Kubernetes concepts into terminology that is familiar to developers:

Application

A typical application, developed with a cloud-native approach, that is used to perform a particular task.
Examples of applications include online video streaming, online shopping, and hotel reservation systems.

Component
A set of Kubernetes resources that can run and be deployed separately. A cloud-native application is a collection of small, independent, loosely coupled components. Examples of components include an API back-end, a web interface, and a payment back-end.

**Project**
A single unit containing your source code, tests, and libraries.

**Context**
A directory that contains the source code, tests, libraries, and odo config files for a single component.

**URL**
A mechanism to expose a component for access from outside the cluster.

**Storage**
Persistent storage in the cluster. It persists the data across restarts and component rebuilds.

**Service**
An external application that provides additional functionality to a component. Examples of services include PostgreSQL, MySQL, Redis, and RabbitMQ.

In odo, services are provisioned from the OpenShift Service Catalog and must be enabled within your cluster.

**devfile**
An open standard for defining containerized development environments that enables developer tools to simplify and accelerate workflows. For more information, see the documentation at https://devfile.io.

You can connect to publicly available devfile registries, or you can install a Secure Registry.

### 3.2.3. Listing components in odo

odo uses the portable devfile format to describe components and their related URLs, storage, and services. odo can connect to various devfile registries to download devfiles for different languages and frameworks. See the documentation for the odo registry command for more information on how to manage the registries used by odo to retrieve devfile information.

You can list all the devfiles available of the different registries with the odo catalog list components command.

**Procedure**

1. Log in to the cluster with odo:

   ```
   $ odo login -u developer -p developer
   ```

2. List the available odo components:

   ```
   $ odo catalog list components
   ```

**Example output**

Odo Devfile Components:
### NAME | DESCRIPTION | REGISTRY
---|---|---
dotnet50 | Stack with .NET 5.0 | DefaultDevfileRegistry
dotnet60 | Stack with .NET 6.0 | DefaultDevfileRegistry
dotnetcore31 | Stack with .NET Core 3.1 | DefaultDevfileRegistry
golang | Stack with the latest Go version | DefaultDevfileRegistry
java-maven | Upstream Maven and OpenJDK 11 | DefaultDevfileRegistry
java-openliberty | Java application Maven-built stack using the Open Liberty runtime | DefaultDevfileRegistry
java-openliberty-gradle | Java application Gradle-built stack using the Open Liberty runtime | DefaultDevfileRegistry
java-quarkus | Quarkus with Java | DefaultDevfileRegistry
java-springboot | Spring Boot® using Java | DefaultDevfileRegistry
java-vertx | Upstream Vert.x using Java | DefaultDevfileRegistry
java-websphereliberty | Java application Maven-built stack using the WebSphere Liberty runtime | DefaultDevfileRegistry
java-websphereliberty-gradle | Java application Gradle-built stack using the WebSphere Liberty runtime | DefaultDevfileRegistry
java-wildfly | Upstream WildFly | DefaultDevfileRegistry
java-wildfly-bootable-jar | Java stack with WildFly in bootable Jar mode, OpenJDK 11 and... | DefaultDevfileRegistry
nodejs | Stack with Node.js 14 | DefaultDevfileRegistry
nodejs-angular | Stack with Angular 12 | DefaultDevfileRegistry
nodejs-nextjs | Stack with Next.js 11 | DefaultDevfileRegistry
nodejs-nuxtjs | Stack with Nuxt.js 2 | DefaultDevfileRegistry
nodejs-react | Stack with React 17 | DefaultDevfileRegistry
nodejs-svelte | Stack with Svelte 3 | DefaultDevfileRegistry
nodejs-vue | Stack with Vue 3 | DefaultDevfileRegistry
php-laravel | Stack with Laravel 8 | DefaultDevfileRegistry
python | Python Stack with Python 3.7 | DefaultDevfileRegistry
python-django | Python3.7 with Django | DefaultDevfileRegistry

#### 3.2.4. Telemetry in odo

**odo** collects information about how it is being used, including metrics on the operating system, RAM, CPU, number of cores, **odo** version, errors, success/failures, and how long **odo** commands take to complete.
You can modify your telemetry consent by using the `odo preference` command:

- `odo preference set ConsentTelemetry true` consents to telemetry.
- `odo preference unset ConsentTelemetry` disables telemetry.
- `odo preference view` shows the current preferences.

### 3.3. INSTALLING ODO

You can install the `odo` CLI on Linux, Windows, or macOS by downloading a binary. You can also install the OpenShift VS Code extension, which uses both the `odo` and the `oc` binaries to interact with your OpenShift Container Platform cluster. For Red Hat Enterprise Linux (RHEL), you can install the `odo` CLI as an RPM.

**NOTE**

Currently, `odo` does not support installation in a restricted network environment.

### 3.3.1. Installing odo on Linux

The `odo` CLI is available to download as a binary and as a tarball for multiple operating systems and architectures including:

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Binary</th>
<th>Tarball</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linux</td>
<td><code>odo-linux-amd64</code></td>
<td><code>odo-linux-amd64.tar.gz</code></td>
</tr>
<tr>
<td>Linux on IBM Power</td>
<td><code>odo-linux-ppc64le</code></td>
<td><code>odo-linux-ppc64le.tar.gz</code></td>
</tr>
<tr>
<td>Linux on IBM Z and LinuxONE</td>
<td><code>odo-linux-s390x</code></td>
<td><code>odo-linux-s390x.tar.gz</code></td>
</tr>
</tbody>
</table>

#### Procedure

1. Navigate to the content gateway and download the appropriate file for your operating system and architecture.

   - If you download the binary, rename it to `odo`:

     ```
     ```

   - If you download the tarball, extract the binary:

     ```
     $ curl -L https://developers.redhat.com/content-gateway/rest/mirror/pub/openshift-v4/clients/odo/latest/odo-linux-amd64.tar.gz -o odo.tar.gz
     $ tar xzvf odo.tar.gz
     ```

2. Change the permissions on the binary:

   ```
   $ chmod +x <filename>
   ```
3. Place the odo binary in a directory that is on your `PATH`. To check your `PATH`, execute the following command:

```
$ echo $PATH
```

4. Verify that odo is now available on your system:

```
$ odo version
```

### 3.3.2. Installing odo on Windows

The odo CLI for Windows is available to download as a binary and as an archive.

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Binary</th>
<th>Tarball</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows</td>
<td>odo-windows-amd64.exe</td>
<td>odo-windows-amd64.exe.zip</td>
</tr>
</tbody>
</table>

**Procedure**

1. Navigate to the content gateway and download the appropriate file:
   - If you download the binary, rename it to `odo.exe`.
   - If you download the archive, unzip the binary with a ZIP program and then rename it to `odo.exe`.

2. Move the `odo.exe` binary to a directory that is on your `PATH`. To check your `PATH`, open the command prompt and execute the following command:

```
C:\> path
```

3. Verify that odo is now available on your system:

```
C:\> odo version
```

### 3.3.3. Installing odo on macOS

The odo CLI for macOS is available to download as a binary and as a tarball.

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Binary</th>
<th>Tarball</th>
</tr>
</thead>
<tbody>
<tr>
<td>macOS</td>
<td>odo-darwin-amd64</td>
<td>odo-darwin-amd64.tar.gz</td>
</tr>
</tbody>
</table>

**Procedure**

1. Navigate to the content gateway and download the appropriate file:
If you download the binary, rename it to odo:

```
```

If you download the tarball, extract the binary:

```
$ curl -L https://developers.redhat.com/content-gateway/rest/mirror/pub/openshift-v4/clients/odo/latest/odo-darwin-amd64.tar.gz -o odo.tar.gz
$ tar xvzf odo.tar.gz
```

2. Change the permissions on the binary:

```
# chmod +x odo
```

3. Place the odo binary in a directory that is on your PATH. To check your PATH, execute the following command:

```
$ echo $PATH
```

4. Verify that odo is now available on your system:

```
$ odo version
```

### 3.3.4. Installing odo on VS Code

The OpenShift VS Code extension uses both odo and the oc binary to interact with your OpenShift Container Platform cluster. To work with these features, install the OpenShift VS Code extension on VS Code.

**Prerequisites**

- You have installed VS Code.

**Procedure**

1. Open VS Code.

2. Launch VS Code Quick Open with Ctrl+P.

3. Enter the following command:

```
$ ext install redhat.vscode-openshift-connector
```

### 3.3.5. Installing odo on Red Hat Enterprise Linux (RHEL) using an RPM

For Red Hat Enterprise Linux (RHEL), you can install the odo CLI as an RPM.

**Procedure**

1. Register with Red Hat Subscription Manager:

```
$ curl -L https://developers.redhat.com/content-gateway/rest/mirror/pub/openshift-v4/clients/odo/latest/odo-darwin-amd64.tar.gz -o odo.tar.gz
$ tar xvzf odo.tar.gz
```

```
# chmod +x odo
```

```
$ echo $PATH
```

```
$ odo version
```

OpenShift Container Platform 4.9 CLI tools
3. Pull the latest subscription data:
   ```
   # subscription-manager refresh
   ```

3. List the available subscriptions:
   ```
   # subscription-manager list --available --matches "OpenShift Developer Tools and Services"
   ```

4. In the output of the previous command, find the Pool ID field for your OpenShift Container Platform subscription and attach the subscription to the registered system:
   ```
   # subscription-manager attach --pool=<pool_id>
   ```

5. Enable the repositories required by odo:
   ```
   # subscription-manager repos --enable="ocp-tools-4.9-for-rhel-8-x86_64-rpms"
   ```

6. Install the odo package:
   ```
   # yum install odo
   ```

7. Verify that odo is now available on your system:
   ```
   $ odo version
   ```

### 3.4. CREATING AND DEPLOYING APPLICATIONS WITH ODO

#### 3.4.1. Working with projects

Project keeps your source code, tests, and libraries organized in a separate single unit.

##### 3.4.1.1. Creating a project

Create a project to keep your source code, tests, and libraries organized in a separate single unit.

**Procedure**

1. Log in to an OpenShift Container Platform cluster:
   ```
   $ odo login -u developer -p developer
   ```

2. Create a project:
   ```
   $ odo project create myproject
   ```

**Example output**
3.4.2. Creating a single-component application with odo

With odo, you can create and deploy applications on clusters.

Prerequisites

- odo is installed.
- You have a running cluster. You can use CodeReady Containers (CRC) to deploy a local cluster quickly.

3.4.2.1. Creating a project

Create a project to keep your source code, tests, and libraries organized in a separate single unit.

Procedure

1. Log in to an OpenShift Container Platform cluster:
   
   $ odo login -u developer -p developer

2. Create a project:

   $ odo project create myproject

Example output

✓ Project 'myproject' is ready for use
✓ New project created and now using project : myproject

3.4.2.2. Creating a Node.js application with odo

To create a Node.js component, download the Node.js application and push the source code to your cluster with odo.

Procedure

1. Create a directory for your components:

   $ mkdir my_components && cd my_components

2. Download the example Node.js application:

   $ git clone https://github.com/openshift/nodejs-ex

3. Change the current directory to the directory with your application:

   $ cd <directory_name>
4. Add a component of the type Node.js to your application:

```bash
$ odo create nodejs
```

**NOTE**

By default, the latest image is used. You can also explicitly specify an image version by using `odo create openshift/nodejs:8`.

5. Push the initial source code to the component:

```bash
$ odo push
```

Your component is now deployed to OpenShift Container Platform.

6. Create a URL and add an entry in the local configuration file as follows:

```bash
$ odo url create --port 8080
```

7. Push the changes. This creates a URL on the cluster.

```bash
$ odo push
```

8. List the URLs to check the desired URL for the component.

```bash
$ odo url list
```

9. View your deployed application using the generated URL.

```bash
$ curl <url>
```

### 3.4.2.3. Modifying your application code

You can modify your application code and have the changes applied to your application on OpenShift Container Platform.

1. Edit one of the layout files within the Node.js directory with your preferred text editor.

2. Update your component:

```bash
$ odo push
```

3. Refresh your application in the browser to see the changes.

### 3.4.2.4. Adding storage to the application components

Use the `odo storage` command to add persistent data to your application. Examples of data that must persist include database files, dependencies, and build artifacts, such as a `.m2` Maven directory.

**Procedure**

1. Add the storage to your component:
$ odo storage create <storage_name> --path=<path_to_the_directory> --size=<size>

2. Push the storage to the cluster:

$ odo push

3. Verify that the storage is now attached to your component by listing all storage in the component:

$ odo storage list

Example output

The component 'nodejs' has the following storage attached:
NAME SIZE PATH STATE
mystorage 1Gi /data Pushed

4. Delete the storage from your component:

$ odo storage delete <storage_name>

5. List all storage to verify that the storage state is Locally Deleted:

$ odo storage list

Example output

The component 'nodejs' has the following storage attached:
NAME SIZE PATH STATE
mystorage 1Gi /data Locally Deleted

6. Push the changes to the cluster:

$ odo push

3.4.2.5. Adding a custom builder to specify a build image

With OpenShift Container Platform, you can add a custom image to bridge the gap between the creation of custom images.

The following example demonstrates the successful import and use of the redhat-openjdk-18 image:

**Prerequisites**

- The OpenShift CLI (oc) is installed.

**Procedure**

1. Import the image into OpenShift Container Platform:
### 3.4.2.6. Connecting your application to multiple services using OpenShift Service Catalog

The OpenShift service catalog is an implementation of the Open Service Broker API (OSB API) for Kubernetes. You can use it to connect applications deployed in OpenShift Container Platform to a variety of services.

**Prerequisites**

- You have a running OpenShift Container Platform cluster.
- The service catalog is installed and enabled on your cluster.

**Procedure**

- To list the services:

  ```bash
  $ odo catalog list services
  ```

- To use service catalog-related operations:

  ```bash
  $ odo service <verb> <service_name>
  ```

### 3.4.2.7. Deleting an application

Use the `odo app delete` command to delete your application.

**Procedure**

1. List the applications in the current project:

   ```bash
   $ odo app list
   ```

**Example output**

```
The project '<project_name>' has the following applications:
NAME
app
```
2. List the components associated with the applications. These components will be deleted with the application:

```bash
$ odo component list
```

**Example output**

```
APP  NAME                      TYPE       SOURCE        STATE
app  nodejs-nodejs-ex-elyf     nodejs     file://./     Pushed
```

3. Delete the application:

```bash
$ odo app delete <application_name>
```

**Example output**

```
? Are you sure you want to delete the application: <application_name> from project: <project_name>
```

4. Confirm the deletion with Y. You can suppress the confirmation prompt using the -f flag.

### 3.4.3. Creating a multicomponent application with odo

**odo** allows you to create a multicomponent application, modify it, and link its components in an easy and automated way.

This example describes how to deploy a multicomponent application – a shooter game. The application consists of a front-end Node.js component and a back-end Java component.

**Prerequisites**

- **odo** is installed.
- You have a running cluster. Developers can use CodeReady Containers (CRC) to deploy a local cluster quickly.
- Maven is installed.

#### 3.4.3.1. Creating a project

Create a project to keep your source code, tests, and libraries organized in a separate single unit.

**Procedure**

1. Log in to an OpenShift Container Platform cluster:

   ```bash
   $ odo login -u developer -p developer
   ```

2. Create a project:

   ```bash
   $ odo project create myproject
   ```
3.4.3.2. Deploying the back-end component

To create a Java component, import the Java builder image, download the Java application and push the source code to your cluster with odo.

Procedure

1. Import openjdk18 into the cluster:

   $ oc import-image openjdk18
   --from=registry.access.redhat.com/redhat-openjdk-18/openjdk18-openshift --confirm

2. Tag the image as builder to make it accessible for odo:

   $ oc annotate istag/openjdk18:latest tags=builder

3. Run odo catalog list components to see the created image:

   $ odo catalog list components

Example output

<table>
<thead>
<tr>
<th>Odo Devfile Components:</th>
<th>NAME</th>
<th>DESCRIPTION</th>
<th>REGISTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>java-maven</td>
<td>java-maven</td>
<td>Upstream Maven and OpenJDK 11</td>
<td>DefaultDevfileRegistry</td>
</tr>
<tr>
<td>java-openliberty</td>
<td>java-openliberty</td>
<td>Open Liberty microservice in Java</td>
<td>DefaultDevfileRegistry</td>
</tr>
<tr>
<td>java-quarkus</td>
<td>java-quarkus</td>
<td>Upstream Quarkus with Java+GraalVM</td>
<td>DefaultDevfileRegistry</td>
</tr>
<tr>
<td>java-springboot</td>
<td>java-springboot</td>
<td>Spring Boot® using Java</td>
<td>DefaultDevfileRegistry</td>
</tr>
<tr>
<td>nodejs</td>
<td>nodejs</td>
<td>Stack with NodeJS 12</td>
<td>DefaultDevfileRegistry</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Odo OpenShift Components:</th>
<th>NAME</th>
<th>PROJECT</th>
<th>TAGS</th>
<th>SUPPORTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>java</td>
<td>openshift</td>
<td>11,8,latest</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>dotnet</td>
<td>openshift</td>
<td>2.1,3.1,latest</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>golang</td>
<td>openshift</td>
<td>1.13.4-ubi7,1.13.4-ubi8,latest</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>httpd</td>
<td>openshift</td>
<td>2.4-el7,2.4-el8,latest</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>nginx</td>
<td>openshift</td>
<td>1.14-el7,1.14-el8,1.16-el7,1.16-el8,latest</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>nodejs</td>
<td>openshift</td>
<td>10-ubi7,10-ubi8,12-ubi7,12-ubi8,latest</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>perl</td>
<td>openshift</td>
<td>5.26-el7,5.26-ubi8,5.30-el7,latest</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>php</td>
<td>openshift</td>
<td>7.2-ubi7,7.2-ubi8,7.3-ubi7,7.3-ubi8,latest</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>python</td>
<td>openshift</td>
<td>2.7-ubi7,2.7-ubi8,3.6-ubi7,3.6-ubi8,3.8-ubi7,3.8-ubi8,latest</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>ruby</td>
<td>openshift</td>
<td>2.5-ubi7,2.5-ubi8,2.6-ubi7,2.6-ubi8,2.7-ubi7,latest</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>wildfly</td>
<td>openshift</td>
<td>10.0,10.1,11.0,12.0,13.0,14.0,15.0,16.0,17.0,18.0,19.0,20.0,8.1,9.0,latest</td>
<td>NO</td>
<td></td>
</tr>
</tbody>
</table>

4. Create a directory for your components:
5. Download the example back-end application:

```bash
$ git clone https://github.com/openshift-evangelists/Wild-West-Backend backend
```

6. Change to the back-end source directory:

```bash
$ cd backend
```

7. Check that you have the correct files in the directory:

```bash
$ ls
```

**Example output**

```
debg.sh  pom.xml  src
```

8. Build the back-end source files with Maven to create a JAR file:

```bash
$ mvn package
```

**Example output**

```
... [INFO] --------------------------------------
[INFO] BUILD SUCCESS
[INFO] --------------------------------------
[INFO] Total time: 2.635 s
[INFO] Final Memory: 30M/91M
[INFO] --------------------------------------
```

9. Create a component configuration of Java component-type named **backend**:

```bash
$ odo create --s2i openjdk18 backend --binary target/wildwest-1.0.jar
```

**Example output**

```
✓ Validating component [1ms]
Please use `odo push` command to create the component with source deployed
```

Now the configuration file **config.yaml** is in the local directory of the back-end component that contains information about the component for deployment.

10. Check the configuration settings of the back-end component in the **config.yaml** file using:

```bash
$ odo config view
```

**Example output**
11. Push the component to the OpenShift Container Platform cluster.

$ odo push

**Example output**

**Validation**
✓ Checking component [6ms]

**Configuration changes**
✓ Initializing component
✓ Creating component [124ms]

**Pushing to component backend of type binary**
✓ Checking files for pushing [1ms]
✓ Waiting for component to start [48s]
✓ Syncing files to the component [811ms]
✓ Building component [3s]

Using **odo push**, OpenShift Container Platform creates a container to host the back-end component, deploys the container into a pod running on the OpenShift Container Platform cluster, and starts the **backend** component.

12. Validate:

- The status of the action in odo:

  $ odo log -f

**Example output**

```
: Starting WildWestApplication v1.0 onbackend-app-1-9tnhc with PID 444
(/deployments/wildwest-1.0.jar started by jboss in /deployments)
```

- The status of the back-end component:
3.4.3.3. Deploying the front-end component

To create and deploy a front-end component, download the Node.js application and push the source code to your cluster with `odo`.

**Procedure**

1. Download the example front-end application:
   
   ```bash
   $ git clone https://github.com/openshift/nodejs-ex frontend
   ```

2. Change the current directory to the front-end directory:
   
   ```bash
   $ cd frontend
   ```

3. List the contents of the directory to see that the front end is a Node.js application.
   
   ```bash
   $ ls
   ```

   **Example output**
   
   ```
   README.md openshift server.js views
   helm package.json tests
   ```

   **NOTE**

   The front-end component is written in an interpreted language (Node.js); it does not need to be built.

4. Create a component configuration of Node.js component-type named `frontend`:
   
   ```bash
   $ odo create --s2i nodejs frontend
   ```

   **Example output**
   
   ```
   ✓ Validating component [5ms]
   Please use `odo push` command to create the component with source deployed
   ```

5. Push the component to a running container.
   
   ```bash
   $ odo push
   ```

   **Example output**
3.4.3.4. Linking both components

Components running on the cluster need to be connected to interact. OpenShift Container Platform provides linking mechanisms to publish communication bindings from a program to its clients.

Procedure

1. List all the components that are running on the cluster:

   $ odo list

   **Example output**

   OpenShift Components:
   APP      NAME       PROJECT   TYPE            SOURCETYPE     STATE
   app      backend    testpro   openjdk18       binary         Pushed
   app      frontend   testpro   nodejs          local          Pushed

2. Link the current front-end component to the back end:

   $ odo link backend --port 8080

   **Example output**

   ✓ Component backend has been successfully linked from the component frontend

   Following environment variables were added to frontend component:
   - COMPONENT_BACKEND_HOST
   - COMPONENT_BACKEND_PORT

   The configuration information of the back-end component is added to the front-end component and the front-end component restarts.

3.4.3.5. Exposing components to the public

Procedure

1. Navigate to the **frontend** directory:
3.4.3.6. Modifying the running application

$ cd frontend

2. Create an external URL for the application:

$ odo url create frontend --port 8080

Example output

✓ URL frontend created for component: frontend
To create URL on the OpenShift cluster, use `odo push`

3. Apply the changes:

$ odo push

Example output

<table>
<thead>
<tr>
<th>Validation</th>
<th>✓ Checking component [21ms]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration changes</td>
<td>✓ Retrieving component data [35ms]</td>
</tr>
<tr>
<td></td>
<td>✓ Applying configuration [29ms]</td>
</tr>
</tbody>
</table>

Applying URL changes

✓ URL frontend: http://frontend-app-myproject.192.168.42.79.nip.io created

Pushing to component frontend of type local

✓ Checking file changes for pushing [1ms]
✓ No file changes detected, skipping build. Use the `-f` flag to force the build.

4. Open the URL in a browser to view the application.

NOTE

If an application requires permissions to the active service account to access the OpenShift Container Platform namespace and delete active pods, the following error may occur when looking at `odo log` from the back-end component:

Message: Forbidden! Configured service account doesn’t have access. Service account may have been revoked

To resolve this error, add permissions for the service account role:

$ oc policy add-role-to-group view system:serviceaccounts -n <project>

$ oc policy add-role-to-group edit system:serviceaccounts -n <project>

Do not do this on a production cluster.
Procedure

1. Change the local directory to the front-end directory:

   $ cd frontend

2. Monitor the changes on the file system using:

   $ odo watch

3. Edit the index.html file to change the displayed name for the game.

   NOTE
   A slight delay is possible before odo recognizes the change.

   odo pushes the changes to the front-end component and prints its status to the terminal:

   File /root/frontend/index.html changed
   File  changed
   Pushing files...
   ✓ Waiting for component to start
   ✓ Copying files to component
   ✓ Building component

4. Refresh the application page in the web browser. The new name is now displayed.

3.4.3.7. Deleting an application

Use the odo app delete command to delete your application.

Procedure

1. List the applications in the current project:

   $ odo app list

   Example output

   The project '<project_name>' has the following applications:
   NAME
   app

2. List the components associated with the applications. These components will be deleted with the application:

   $ odo component list

   Example output

   APP    NAME                      TYPE       SOURCE        STATE
   app    nodejs-nodejs-ex-elyf     nodejs     file://./     Pushed
3. Delete the application:

```
$ odo app delete <application_name>
```

Example output

```
? Are you sure you want to delete the application: <application_name> from project: <project_name>
```

4. Confirm the deletion with Y. You can suppress the confirmation prompt using the -f flag.

### 3.4.4. Creating an application with a database

This example describes how to deploy and connect a database to a front-end application.

#### Prerequisites

- `odo` is installed.
- `oc` client is installed.
- You have a running cluster. Developers can use [CodeReady Containers (CRC)](https://openpitrix.io/) to deploy a local cluster quickly.
- The Service Catalog is installed and enabled on your cluster.

**NOTE**

Service Catalog is deprecated on OpenShift Container Platform 4 and later.

#### 3.4.4.1. Creating a project

Create a project to keep your source code, tests, and libraries organized in a separate single unit.

**Procedure**

1. Log in to an OpenShift Container Platform cluster:

```
$ odo login -u developer -p developer
```

2. Create a project:

```
$ odo project create myproject
```

Example output

```
✓ Project 'myproject' is ready for use
✓ New project created and now using project: myproject
```

### 3.4.4.2. Deploying the front-end component
To create and deploy a front-end component, download the Node.js application and push the source code to your cluster with odo.

**Procedure**

1. Download the example front-end application:
   ```bash
   $ git clone https://github.com/openshift/nodejs-ex frontend
   ```

2. Change the current directory to the front-end directory:
   ```bash
   $ cd frontend
   ```

3. List the contents of the directory to see that the front end is a Node.js application.
   ```bash
   $ ls
   README.md       openshift       server.js       views
   helm            package.json    tests
   ```

   **NOTE**
   The front-end component is written in an interpreted language (Node.js); it does not need to be built.

4. Create a component configuration of Node.js component-type named `frontend`:
   ```bash
   $ odo create --s2i nodejs frontend
   ```

   **Example output**
   ✓ Validating component [5ms]
   Please use `odo push` command to create the component with source deployed

5. Create a URL to access the frontend interface.
   ```bash
   $ odo url create myurl
   ```

   **Example output**
   ✓ URL myurl created for component: nodejs-nodejs-ex-pmdp

6. Push the component to the OpenShift Container Platform cluster.
   ```bash
   $ odo push
   ```

   **Example output**
3.4.4.3. Deploying a database in interactive mode

odo provides a command-line interactive mode which simplifies deployment.

Procedure

- Run the interactive mode and answer the prompts:

  ```shell
  $ odo service create
  ```

Example output

```
? Which kind of service do you wish to create database
? Which database service class should we use mongodb-persistent
? Enter a value for string property DATABASE_SERVICE_NAME (Database Service Name): mongodb
? Enter a value for string property MEMORY_LIMIT (Memory Limit): 512Mi
? Enter a value for string property MONGODB_DATABASE (MongoDB Database Name): sampledb
? Enter a value for string property MONGODB_VERSION (Version of MongoDB Image): 3.2
? Enter a value for string property VOLUME_CAPACITY (Volume Capacity): 1Gi
? Provide values for non-required properties No
? How should we name your service mongodb-persistent
? Output the non-interactive version of the selected options No
? Wait for the service to be ready No
✓ Creating service [32ms]
✓ Service 'mongodb-persistent' was created
Progress of the provisioning will not be reported and might take a long time.
You can see the current status by executing 'odo service list'
```

NOTE

Your password or username will be passed to the front-end application as environment variables.

3.4.4.4. Deploying a database manually
1. List the available services:

   $ odo catalog list services

**Example output**

<table>
<thead>
<tr>
<th>NAME</th>
<th>PLANS</th>
</tr>
</thead>
<tbody>
<tr>
<td>django-psql-persistent</td>
<td>default</td>
</tr>
<tr>
<td>jenkins-ephemeral</td>
<td>default</td>
</tr>
<tr>
<td>jenkins-pipeline-example</td>
<td>default</td>
</tr>
<tr>
<td>mariadb-persistent</td>
<td>default</td>
</tr>
<tr>
<td>mongodb-persistent</td>
<td>default</td>
</tr>
<tr>
<td>mysql-persistent</td>
<td>default</td>
</tr>
<tr>
<td>nodejs-mongo-persistent</td>
<td>default</td>
</tr>
<tr>
<td>postgresql-persistent</td>
<td>default</td>
</tr>
<tr>
<td>rails-pgsql-persistent</td>
<td>default</td>
</tr>
</tbody>
</table>

2. Choose the **mongodb-persistent** type of service and see the required parameters:

   $ odo catalog describe service mongodb-persistent

**Example output**

| *********************** | ****************************************************|
| -----------------      | | |
| Name                | | default |
| Display Name        | | |
| Short Description   | | Default plan |
| Required Params without a default value | | |
| Required Params with a default value | | DATABASE_SERVICE_NAME |
| value               | | (default: 'mongodb'), |
|                     | | MEMORY_LIMIT (default: |
|                     | | '512Mi'), MONGODB_VERSION |
|                     | | (default: '3.2'), |
|                     | | MONGODB_DATABASE (default: |
|                     | | 'sampledb'), VOLUME_CAPACITY |
|                     | | (default: '1Gi') |
| Optional Params     | | MONGODB_ADMIN_PASSWORD, |
|                     | |NAMESPACE, MONGODB_PASSWORD, |
|                     | |MONGODB_USER |

3. Pass the required parameters as flags and wait for the deployment of the database:

   $ odo service create mongodb-persistent --plan default --wait -p DATABASE_SERVICE_NAME=mongodb -p MEMORY_LIMIT=512Mi -p MONGODB_DATABASE=sampledb -p VOLUME_CAPACITY=1Gi

**3.4.4.5. Connecting the database to the front-end application**
1. Link the database to the front-end service:

```sh
$ odo link mongodb-persistent
```

**Example output**

- Service mongodb-persistent has been successfully linked from the component nodejs-nodejs-ex-mhbb
- Following environment variables were added to nodejs-nodejs-ex-mhbb component:
  - database_name
  - password
  - uri
  - username
  - admin_password

2. See the environment variables of the application and the database in the pod:
   a. Get the pod name:

```sh
$ oc get pods
```

**Example output**

<table>
<thead>
<tr>
<th>NAME</th>
<th>READY</th>
<th>STATUS</th>
<th>RESTARTS</th>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>mongodb-1-gsznc</td>
<td>1/1</td>
<td>Running</td>
<td>0</td>
<td>28m</td>
</tr>
<tr>
<td>nodejs-nodejs-ex-mhbb-app-4-vkn9l</td>
<td>1/1</td>
<td>Running</td>
<td>0</td>
<td>1m</td>
</tr>
</tbody>
</table>

b. Connect to the pod:

```sh
$ oc rsh nodejs-nodejs-ex-mhbb-app-4-vkn9l
```

c. Check the environment variables:

```sh
sh-4.2$ env
```

**Example output**

- uri=mongodb://172.30.126.3:27017
- password=dHIOpYneSkX3rTLn
- database_name=sampledb
- username=user43U
- admin_password=NCn41tqmx7Rlqmfv

3. Open the URL in the browser and notice the database configuration in the bottom right:

```sh
$ odo url list
```

**Example output**

- Request information
- Page view count: 24
3.4.5. Creating a Java application with a database

This example describes how to deploy a Java application by using devfile and connect it to a database service.

Prerequisites

- A running cluster.
- odo is installed.
- A Service Binding Operator is installed in your cluster. To learn how to install Operators, contact your cluster administrator or see Installing Operators from OperatorHub.
- A Dev4Devs PostgreSQL Operator Operator is installed in your cluster. To learn how to install Operators, contact your cluster administrator or see Installing Operators from OperatorHub.

3.4.5.1. Creating a project

Create a project to keep your source code, tests, and libraries organized in a separate single unit.

Procedure

1. Log in to an OpenShift Container Platform cluster:

   $ odo login -u developer -p developer

2. Create a project:

   $ odo project create myproject

Example output

✓ Project 'myproject' is ready for use
✓ New project created and now using project : myproject

3.4.5.2. Creating a Java MicroServices JPA application

With odo, you can create and manage a sample Java MicroServices JPA application.

Procedure

1. Clone the sample application:

   $ git clone -b jpa-sample https://github.com/redhat-developer/application-stack-samples.git

2. Navigate to the application directory:
3. Initialize the project:

   $ cd ./application-stack-samples/jpa

4. Push the application to the cluster:

   $ odo push

   The application is now deployed to the cluster.

5. View the status of the cluster by streaming the OpenShift Container Platform logs to the terminal:

   $ odo log

   Notice the test failures and **UnknownDatabaseHostException** error. This is because your application does not have a database yet:

   ```
   [INFO] [err] java.net.UnknownHostException: ${DATABASE_CLUSTERIP}
   [INFO] [err]     at java.base/java.net.AbstractPlainSocketImpl.connect(AbstractPlainSocketImpl.java:220)
   [INFO] [err]     at java.base/java.net.SocksSocketImpl.connect(SocksSocketImpl.java:403)
   [INFO] [err]     at java.base/java.net.Socket.connect(Socket.java:609)
   [INFO] [err]     at org.postgresql.core.PGStream.<init>(PGStream.java:68)
   [INFO] [err]     at org.postgresql.core.v3.ConnectionFactoryImpl.openConnectionImpl(ConnectionFactoryImpl.jav
   a:144)
   [INFO] [err]     ... 86 more
   [ERROR] Tests run: 2, Failures: 1, Errors: 1, Skipped: 0, Time elapsed: 0.706 s <<<
   FAILURE! - in org.example.app.it.DatabaseIT
   [ERROR] testGetAllPeople  Time elapsed: 0.33 s  <<< FAILURE!
   org.opentest4j.AssertionFailedError: Expected at least 2 people to be registered, but there were only: [] ==> expected: <true> but was: <false>
   at org.example.app.it.DatabaseIT.testGetAllPeople(DatabaseIT.java:57)

   [ERROR] testGetPerson  Time elapsed: 0.047 s  <<< ERROR!
   java.lang.NullPointerException
   at org.example.app.it.DatabaseIT.testGetPerson(DatabaseIT.java:41)
   ```

   Notice the test failures and **UnknownDatabaseHostException** error. This is because your application does not have a database yet:
6. Create an ingress URL to access the application:

   $ odo url create --port 8080

7. Push the changes to your cluster:

   $ odo push

8. Display the created URL:

   $ odo url list

**Example output**

```
Found the following URLs for component mysboproj
NAME             STATE      URL                                           PORT     SECURE     KIND
java-application-8080 Pushed  http://java-application-8080.apps-crc.testing 8080 false ingress
```

The application is now deployed to the cluster and you can access it by using the URL that is created.

9. Use the URL to navigate to the `CreatePerson.xhtml` data entry page and enter a username and age by using the form. Click **Save**.
   Note that you cannot see the data by clicking the `View Persons Record List` link since your application does not have a database connected yet.

### 3.4.5.3. Creating a database with `odo`

To create a database, you must have an access to the database Operator. For this example, Dev4Devs PostgreSQL Operator is used.

**Procedure**

1. View the list of the services in your project:

   $ odo catalog list services

**Example output**

```
Operators available in the cluster
NAME                  CRDs
postgresql-operator.v0.1.1 Backup, Database
```

2. Store the YAML of the service in a file:

   $ odo service create postgresql-operator.v0.1.1/Database --dry-run > db.yaml

3. Add the following values under the **metadata:** section in the `db.yaml` file:

   ```
   name: sampledatabase
   annotations:
   ```
This configuration ensures that when a database service is started, appropriate annotations are added to it. Annotations help the Service Binding Operator in injecting the values for `databaseName`, `databasePassword`, and `databaseUser` into the application.

4. Change the following values under the `spec` section of the YAML file:

   ```yaml
   serviceName: "sampledb"
   databasePassword: "samplepwd"
   databaseUser: "sampleuser"
   ```

5. Create a database from the YAML file:

   ```bash
   $ odo service create --from-file db.yaml
   ```

   A database instance is now present in your project.

### 3.4.5.4. Connecting a Java application to a database

To connect your Java application to the database, use the `odo link` command.

**Procedure**

1. Display the list of services:

   ```bash
   $ odo service list
   ```

   **Example output**

   ```
   NAME                AGE
   Database/sampledb  6m31s
   ```

2. Connect the database to your application:

   ```bash
   $ odo link Database/sampledb
   ```

3. Push the changes to your cluster:

   ```bash
   $ odo push
   ```

   After the link has been created and pushed, a secret that contains the database connection data is created.

4. Check the component for values injected from the database service:

   ```bash
   $ odo exec -- bash -c 'env | grep DATABASE'  
declare -x DATABASE_CLUSTERIP="10.106.182.173"  
declare -x DATABASE_DB_NAME="sampledb"  
declare -x DATABASE_DB_PASSWORD="samplepwd"  
declare -x DATABASE_DB_USER="sampleuser"
```
5. Open the URL of your Java application and navigate to the CreatePerson.xhtml data entry page. Enter a username and age by using the form. Click Save. Note that now you can see the data in the database by clicking the View Persons Record List link.

You can also use a CLI tool such as `psql` to manipulate the database.

3.4.6. Using devfiles in odo

3.4.6.1. About the devfile in odo

The devfile is a portable file that describes your development environment. With the devfile, you can define a portable developmental environment without the need for reconfiguration.

With the devfile, you can describe your development environment, such as the source code, IDE tools, application runtimes, and predefined commands. To learn more about the devfile, see the devfile documentation.

With odo, you can create components from the devfiles. When creating a component by using a devfile, odo transforms the devfile into a workspace consisting of multiple containers that run on OpenShift Container Platform, Kubernetes, or Docker. odo automatically uses the default devfile registry but users can add their own registries.

3.4.6.2. Creating a Java application by using a devfile

Prerequisites

- You have installed odo.
- You must know your ingress domain cluster name. Contact your cluster administrator if you do not know it. For example, `apps-crc.testing` is the cluster domain name for Red Hat CodeReady Containers.

NOTE

Currently odo does not support creating devfile components with --git or --binary flags. You can only create S2I components when using these flags.

3.4.6.2.1. Creating a project

Create a project to keep your source code, tests, and libraries organized in a separate single unit.

Procedure

1. Log in to an OpenShift Container Platform cluster:

   `$ odo login -u developer -p developer`

2. Create a project:

   `$ odo project create myproject`

Example output
3.4.6.2.2. Listing available devfile components

With odo, you can display all the components that are available for you on the cluster. Components that are available depend on the configuration of your cluster.

Procedure

1. To list available devfile components on your cluster, run:

   `$ odo catalog list components`

The output lists the available odo components:

```
Odo Devfile Components:
NAME         DESCRIPTION                                REGISTRY
java-maven   Upstream Maven and OpenJDK 11             DefaultDevfileRegistry
java-openliberty Open Liberty microservice in Java    DefaultDevfileRegistry
java-quarkus  Upstream Quarkus with Java+GraalVM      DefaultDevfileRegistry
java-springboot Spring Boot® using Java               DefaultDevfileRegistry
nodejs       Stack with NodeJS 12                      DefaultDevfileRegistry

Odo OpenShift Components:
NAME        PROJECT       TAGS                                                                           SUPPORTED
java         openshift     11,8,latest                                                                    YES
dotnet       openshift     2.1,3.1,latest
olang        openshift     1.13.4-ubi7,1.13.4-ubi8,latest                                                 NO
httpd        openshift     2.4-el7,2.4-el8,latest                                                                 NO
nginx        openshift     1.14-el7,1.14-el8,1.16-el7,1.16-el8,latest                                    NO
nodejs       openshift     10-ubi7,10-ubi8,12-ubi7,12-ubi8,latest                                      NO
perl         openshift     5.26-el7,5.26-ubi8,5.30-el7,latest                                                NO
php          openshift     7.2-ubi7,7.2-ubi8,7.3-ubi7,7.3-ubi8,latest                                       NO
python       openshift     2.7-ubi7,2.7-ubi8,3.6-ubi7,3.6-ubi8,3.8-ubi7,3.8-ubi8,latest,3.8-ubi8,latest NO
ruby         openshift     2.5-ubi7,2.5-ubi8,2.6-ubi7,2.6-ubi8,2.7-ubi7,latest                          NO
wildfly      openshift     10.0,10.1,11.0,12.0,13.0,14.0,15.0,16.0,17.0,18.0,19.0,20.0,8.1,9.0,latest NO
```

3.4.6.2.3. Deploying a Java application using a devfile

In this section, you will learn how to deploy a sample Java project that uses Maven and Java 8 JDK using a devfile.

Procedure

1. Create a directory to store the source code of your component:

   `$ mkdir <directory-name>`

2. Create a component configuration of Spring Boot component type named `myspring` and download its sample project:
$ odo create java-springboot myspring --starter

The previous command produces the following output:

Validation
✓ Checking devfile compatibility [195728ns]
✓ Creating a devfile component from registry: DefaultDevfileRegistry [170275ns]
✓ Validating devfile component [281940ns]

Please use `odo push` command to create the component with source deployed

The odo create command downloads the associated devfile.yaml file from the recorded devfile registries.

3. List the contents of the directory to confirm that the devfile and the sample Java application were downloaded:

   $ ls

   The previous command produces the following output:

   README.md  devfile.yaml  pom.xml  src

4. Create a URL to access the deployed component:

   $ odo url create --host apps-crc.testing

   The previous command produces the following output:

   ✓ URL myspring-8080.apps-crc.testing created for component: myspring

   To apply the URL configuration changes, please use odo push

   **NOTE**

   You must use your cluster host domain name when creating the URL.

5. Push the component to the cluster:

   $ odo push

   The previous command produces the following output:

   Validation
✓ Validating the devfile [81808ns]

Creating Kubernetes resources for component myspring
✓ Waiting for component to start [5s]

Applying URL changes
✓ URL myspring-8080: http://myspring-8080.apps-crc.testing created
6. List the URLs of the component to verify that the component was pushed successfully:

   $ odo url list

   The previous command produces the following output:

<table>
<thead>
<tr>
<th>NAME</th>
<th>URL</th>
<th>PORT</th>
<th>SECURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>myspring-8080</td>
<td><a href="http://myspring-8080.apps-crc.testing">http://myspring-8080.apps-crc.testing</a></td>
<td>8080</td>
<td>false</td>
</tr>
</tbody>
</table>

7. View your deployed application by using the generated URL:

   $ curl http://myspring-8080.apps-crc.testing

3.4.6.3. Converting an S2I component into a devfile component

With odo, you can create both Source-to-Image (S2I) and devfile components. If you have an existing S2I component, you can convert it into a devfile component using the odo utils command.

**Procedure**

Run all the commands from the S2I component directory.

1. Run the odo utils convert-to-devfile command, which creates devfile.yaml and env.yaml based on your component:

   $ odo utils convert-to-devfile

2. Push the component to your cluster:

   $ odo push

   **NOTE**

   If the devfile component deployment failed, delete it by running: odo delete -a

3. Verify that the devfile component deployed successfully:

   $ odo list

4. Delete the S2I component:
3.4.7. Working with storage

Persistent storage keeps data available between restarts of odo.

3.4.7.1. Adding storage to the application components

Use the odo storage command to add persistent data to your application. Examples of data that must persist include database files, dependencies, and build artifacts, such as a .m2 Maven directory.

Procedure

1. Add the storage to your component:
   ```bash
   $ odo storage create <storage_name> --path=<path_to_the_directory> --size=<size>
   ```
2. Push the storage to the cluster:
   ```bash
   $ odo push
   ```
3. Verify that the storage is now attached to your component by listing all storage in the component:
   ```bash
   $ odo storage list
   ```

Example output

```
The component 'nodejs' has the following storage attached:
NAME SIZE PATH STATE
mystorage 1Gi /data Pushed
```

4. Delete the storage from your component:
   ```bash
   $ odo storage delete <storage_name>
   ```
5. List all storage to verify that the storage state is Locally Deleted:
   ```bash
   $ odo storage list
   ```

Example output

```
The component 'nodejs' has the following storage attached:
NAME SIZE PATH STATE
mystorage 1Gi /data Locally Deleted
```

6. Push the changes to the cluster:
   ```bash
   $ odo push
   ```

3.4.7.2. Adding storage to a specific container
If your devfile has multiple containers, you can use the `--container` flag to specify the container you want to attach storage to.

**Procedure**

1. Create a devfile with multiple containers:

   ```yaml
   components:
     - name: runtime
       container:
         image: registry.access.redhat.com/ubi8/nodejs:12:1-36
         memoryLimit: 1024Mi
     - name: funtime
       container:
         image: registry.access.redhat.com/ubi8/nodejs:12:1-36
         memoryLimit: 1024Mi
   
   ![The runtime container.](image1)
   ![The funtime container.](image2)

2. To create storage for the `runtime` container:

   ```bash
   $ odo storage create store --path /data --size 1Gi --container runtime
   
   ✓ Added storage store to nodejs-testing-xnfg
   Please use `odo push` command to make the storage accessible to the component
   
   $ odo storage list
   The component 'nodejs-testing-xnfg' has the following storage attached:
<table>
<thead>
<tr>
<th>NAME</th>
<th>SIZE</th>
<th>PATH</th>
<th>CONTAINER</th>
<th>STATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>store</td>
<td>1Gi</td>
<td>/data</td>
<td>runtime</td>
<td>Not Pushed</td>
</tr>
</tbody>
</table>
   
   ![Example output](image3)

3. Push the changes to the cluster:

   ```bash
   $ odo push
   
   ![OpenShift Container Platform 4.9 CLI tools](image4)
   ```

3.4.7.3. Switching between ephemeral and persistent storage
You can switch between ephemeral and persistent storage in your project by using the `odo preference` command. `odo preference` modifies the global preference in your cluster.

When persistent storage is enabled, the cluster stores the information between the restarts.

When ephemeral storage is enabled, the cluster does not store the information between the restarts.

Ephemeral storage is enabled by default.

Procedure

1. See the preference currently set in your project:

   ```
   $ odo preference view
   ```

   Example output

   ```
   PARAMETER             CURRENT_VALUE
   UpdateNotification    
   NamePrefix            
   Timeout               
   BuildTimeout          
   PushTimeout           
   Experimental         
   PushTarget            
   Ephemeral             true
   ```

2. To unset the ephemeral storage and set the persistent storage:

   ```
   $ odo preference set Ephemeral false
   ```

3. To set the ephemeral storage again:

   ```
   $ odo preference set Ephemeral true
   ```

   The `odo preference` command changes the global settings of all your currently deployed components as well as ones you will deploy in future.

4. Run `odo push` to make `odo` create a specified storage for your component:

   ```
   $ odo push
   ```

Additional resources

- Understanding ephemeral storage.
- Understanding persistent storage

3.4.8. Deleting applications

You can delete applications and all components associated with the application in your project.

3.4.8.1. Deleting an application
Use the `odo app delete` command to delete your application.

**Procedure**

1. List the applications in the current project:
   
   ```
   $ odo app list
   ```

   **Example output**
   
   The project '<project_name>' has the following applications:
   
   NAME
   app

2. List the components associated with the applications. These components will be deleted with the application:

   ```
   $ odo component list
   ```

   **Example output**
   
<table>
<thead>
<tr>
<th>APP</th>
<th>NAME</th>
<th>TYPE</th>
<th>SOURCE</th>
<th>STATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>app</td>
<td>nodejs-nodejs-ex-elyf</td>
<td>nodejs</td>
<td>file://./</td>
<td>Pushed</td>
</tr>
</tbody>
</table>

3. Delete the application:

   ```
   $ odo app delete <application_name>
   ```

   **Example output**
   
   ? Are you sure you want to delete the application: <application_name> from project: <project_name>

4. Confirm the deletion with Y. You can suppress the confirmation prompt using the `-f` flag.

**3.4.9. Debugging applications in odo**

With `odo`, you can attach a debugger to remotely debug your application. This feature is only supported for NodeJS and Java components.

Components created with `odo` run in the debug mode by default. A debugger agent runs on the component, on a specific port. To start debugging your application, you must start port forwarding and attach the local debugger bundled in your Integrated development environment (IDE).

**3.4.9.1. Debugging an application**

You can debug your application in `odo` with the `odo debug` command.

**Procedure**

1. Download the sample application that contains the necessary `debugrun` step within its devfile:
$ odo create nodejs --starter

Example output

Validation
✓ Checking devfile existence [11498ns]
✓ Checking devfile compatibility [15714ns]
✓ Creating a devfile component from registry: DefaultDevfileRegistry [17565ns]
✓ Validating devfile component [113876ns]

Starter Project
✓ Downloading starter project nodejs-starter from https://github.com/odo-devfiles/nodejs-ex.git [428ms]

Please use `odo push` command to create the component with source deployed

2. Push the application with the `--debug` flag, which is required for all debugging deployments:

$ odo push --debug

Example output

Validation
✓ Validating the devfile [29916ns]

Creating Kubernetes resources for component nodejs
✓ Waiting for component to start [38ms]

Applying URL changes
✓ URLs are synced with the cluster, no changes are required.

Syncing to component nodejs
✓ Checking file changes for pushing [1ms]
✓ Syncing files to the component [778ms]

Executing devfile commands for component nodejs
✓ Executing install command "npm install" [2s]
✓ Executing debug command "npm run debug" [1s]

Pushing devfile component nodejs
✓ Changes successfully pushed to component

NOTE

You can specify a custom debug command by using the `--debug-command="custom-step"` flag.

3. Port forward to the local port to access the debugging interface:

$ odo debug port-forward

Example output
3.4.9.2. Configuring debugging parameters

You can specify a remote port with `odo config` command and a local port with the `odo debug` command.

**Procedure**

- To set a remote port on which the debugging agent should run, run:

  ```bash
  $ odo config set DebugPort 9292
  ```

  **NOTE**

  You must redeploy your component for this value to be reflected on the component.

- To set a local port to port forward, run:

  ```bash
  $ odo debug port-forward --local-port 9292
  ```

  **NOTE**

  The local port value does not persist. You must provide it every time you need to change the port.

3.4.10. Sample applications

`odo` offers partial compatibility with any language or runtime listed within the OpenShift Container Platform catalog of component types. For example:

<table>
<thead>
<tr>
<th>NAME</th>
<th>PROJECT</th>
<th>TAGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>dotnet</td>
<td>openshift</td>
<td>3.1,latest</td>
</tr>
<tr>
<td>httpd</td>
<td>openshift</td>
<td>2.4,latest</td>
</tr>
</tbody>
</table>
NOTE

For odo Java and Node.js are the officially supported component types. Run odo catalog list components to verify the officially supported component types.

To access the component over the web, create a URL using odo url create.

3.4.10.1. Git repository example applications

Use the following commands to build and run sample applications from a Git repository for a particular runtime.

3.4.10.1.1. httpd

This example helps build and serve static content using httpd on CentOS 7. For more information about using this builder image, including OpenShift Container Platform considerations, see the Apache HTTP Server container image repository.

$ odo create httpd --git https://github.com/openshift/httpd-ex.git

3.4.10.1.2. java

This example helps build and run fat JAR Java applications on CentOS 7. For more information about using this builder image, including OpenShift Container Platform considerations, see the Java S2I Builder image.

$ odo create java --git https://github.com/spring-projects/spring-petclinic.git

3.4.10.1.3. nodejs

Build and run Node.js applications on CentOS 7. For more information about using this builder image, including OpenShift Container Platform considerations, see the Node.js 8 container image.

$ odo create nodejs --git https://github.com/openshift/nodejs-ex.git

3.4.10.1.4. perl

This example helps build and run Perl applications on CentOS 7. For more information about using this builder image, including OpenShift Container Platform considerations, see the Perl 5.26 container image.

$ odo create perl --git https://github.com/openshift/dancer-ex.git
3.4.10.1.5. php

This example helps build and run PHP applications on CentOS 7. For more information about using this builder image, including OpenShift Container Platform considerations, see the PHP 7.1 Docker image.

$ odo create php --git https://github.com/openshift/cakephp-ex.git

3.4.10.1.6. python

This example helps build and run Python applications on CentOS 7. For more information about using this builder image, including OpenShift Container Platform considerations, see the Python 3.6 container image.

$ odo create python --git https://github.com/openshift/django-ex.git

3.4.10.1.7. ruby

This example helps build and run Ruby applications on CentOS 7. For more information about using this builder image, including OpenShift Container Platform considerations, see Ruby 2.5 container image.

$ odo create ruby --git https://github.com/openshift/ruby-ex.git

3.4.10.2. Binary example applications

Use the following commands to build and run sample applications from a binary file for a particular runtime.

3.4.10.2.1. java

Java can be used to deploy a binary artifact as follows:

$ git clone https://github.com/spring-projects/spring-petclinic.git
$ cd spring-petclinic
$ mvn package
$ odo create java test3 --binary target/*.jar
$ odo push

3.5. USING ODO IN A RESTRICTED ENVIRONMENT

3.5.1. About odo in a restricted environment

To run odo in a disconnected cluster or a cluster provisioned in a restricted environment, you must ensure that a cluster administrator has created a cluster with a mirrored registry.

To start working in a disconnected cluster, you must first push the odo init image to the registry of the cluster and then overwrite the odo init image path using the ODO_BOOTSTRAPPER_IMAGE environment variable.

After you push the odo init image, you must mirror a supported builder image from the registry, overwrite a mirror registry and then create your application. A builder image is necessary to configure a runtime environment for your application and also contains the build tool needed to build your
application, for example npm for Node.js or Maven for Java. A mirror registry contains all the necessary dependencies for your application.

Additional resources

- Mirroring images for a disconnected installation
- Accessing the registry

3.5.2. Pushing the odo init image to the restricted cluster registry

Depending on the configuration of your cluster and your operating system you can either push the odo init image to a mirror registry or directly to an internal registry.

3.5.2.1. Prerequisites

- Install oc on the client operating system.
- Install odo on the client operating system.
- Access to a restricted cluster with a configured internal registry or a mirror registry.

3.5.2.2. Pushing the odo init image to a mirror registry

Depending on your operating system, you can push the odo init image to a cluster with a mirror registry as follows:

3.5.2.2.1. Pushing the init image to a mirror registry on Linux

Procedure

1. Use base64 to encode the root certification authority (CA) content of your mirror registry:

   ```bash
   $ echo <content_of_additional_ca> | base64 --decode > disconnect-ca.crt
   ```

2. Copy the encoded root CA certificate to the appropriate location:

   ```bash
   $ sudo cp ./disconnect-ca.crt /etc/pki/ca-trust/source/anchors/<mirror-registry>.crt
   ```

3. Trust a CA in your client platform and log in to the OpenShift Container Platform mirror registry:

   ```bash
   $ sudo update-ca-trust enable && sudo systemctl daemon-reload && sudo systemctl restart /docker && docker login <mirror-registry>:5000 -u <username> -p <password>
   ```

4. Mirror the odo init image:

   ```bash
   $ oc image mirror registry.access.redhat.com/openshiftdo/odo-init-image-rhel7:<tag> <mirror-registry>:5000/openshiftdo/odo-init-image-rhel7:<tag>
   ```

5. Override the default odo init image path by setting the ODO_BOOTSTRAPPER_IMAGE environment variable:
3.5.2.2.2. Pushing the init image to a mirror registry on MacOS

Procedure

1. Use `base64` to encode the root certification authority (CA) content of your mirror registry:
   
   ```bash
   $ echo <content_of_additional_ca> | base64 --decode > disconnect-ca.crt
   ```

2. Copy the encoded root CA certificate to the appropriate location:
   
   a. Restart Docker using the Docker UI.
   
   b. Run the following command:
      
      ```bash
      $ docker login <mirror-registry>:5000 -u <username> -p <password>
      ```

3. Mirror the `odo` init image:
   
   ```bash
   $ oc image mirror registry.access.redhat.com/openshiftdo/odo-init-image-rhel7:<tag> 
   <mirror-registry>:5000/openshiftdo/odo-init-image-rhel7:<tag>
   ```

4. Override the default `odo` init image path by setting the `ODO_BOOTSTRAPPER_IMAGE` environment variable:
   
   ```bash
   $ export ODO_BOOTSTRAPPER_IMAGE=<mirror-registry>:5000/openshiftdo/odo-init-image-rhel7:<tag>
   ```

3.5.2.2.3. Pushing the init image to a mirror registry on Windows

Procedure

1. Use `base64` to encode the root certification authority (CA) content of your mirror registry:
   
   ```powershell
   PS C:\> echo <content_of_additional_ca> | base64 --decode > disconnect-ca.crt
   ```

2. As an administrator, copy the encoded root CA certificate to the appropriate location by executing the following command:

   ```powershell
   PS C:\WINDOWS\system32> certutil -addstore -f "ROOT" disconnect-ca.crt
   ```

3. Trust a CA in your client platform and log in to the OpenShift Container Platform mirror registry:
   
   a. Restart Docker using the Docker UI.
   
   b. Run the following command:

   ```powershell
   PS C:\WINDOWS\system32> docker login <mirror-registry>:5000 -u <username> -p <password>
   ```
4. Mirror the odo init image:

   ```
   PS C:\> oc image mirror registry.access.redhat.com/openshiftdo/odo-init-image-rhel7:<tag>
            <mirror-registry>:5000/openshiftdo/odo-init-image-rhel7:<tag>
   ```

5. Override the default odo init image path by setting the ODO_BOOTSTRAPPER_IMAGE environment variable:

   ```
   PS C:\> $env:ODO_BOOTSTRAPPER_IMAGE="<mirror-registry>:5000/openshiftdo/odo-
                     init-image-rhel7:<tag>"
   ```

3.5.2.3. Pushing the odo init image to an internal registry directly

If your cluster allows images to be pushed to the internal registry directly, push the odo init image to the registry as follows:

3.5.2.3.1. Pushing the init image directly on Linux

**Procedure**

1. Enable the default route:

   ```
   $ oc patch configs.imageregistry.operator.openshift.io cluster -p '{"spec":
      {"defaultRoute":true}}' --type='merge' -n openshift-image-registry
   ```

2. Get a wildcard route CA:

   ```
   $ oc get secret router-certs-default -n openshift-ingress -o yaml
   ```

   **Example output**

   ```
   apiVersion: v1
data:
tls.crt: ***********************
tls.key: ####################
kind: Secret
metadata:
[...]
type: kubernetes.io/tls
   ```

3. Use `base64` to encode the root certification authority (CA) content of your mirror registry:

   ```
   $ echo <tls.crt> | base64 --decode > ca.crt
   ```

4. Trust a CA in your client platform:

   ```
   $ sudo cp ca.crt /etc/pki/ca-trust/source/anchors/externalroute.crt && sudo update-ca-trust
   enable && sudo systemctl daemon-reload && sudo systemctl restart docker
   ```

5. Log in to the internal registry:

   ```
   $ oc get route -n openshift-image-registry
   ```
6. Push the `odo` init image:

   $ docker pull registry.access.redhat.com/openshiftdo/odo-init-image-rhel7:<tag>
   $ docker tag registry.access.redhat.com/openshiftdo/odo-init-image-rhel7:<tag> <registry_path>/openshiftdo/odo-init-image-rhel7:<tag>
   $ docker push <registry_path>/openshiftdo/odo-init-image-rhel7:<tag>

7. Override the default `odo` init image path by setting the `ODO_BOOTSTRAPPER_IMAGE` environment variable:

   $ export ODO_BOOTSTRAPPER_IMAGE=<registry_path>/openshiftdo/odo-init-image-rhel7:1.0.1

3.5.2.3.2. Pushing the init image directly on MacOS

**Procedure**

1. Enable the default route:

   $ oc patch configs.imageregistry.operator.openshift.io cluster -p '{"spec":
   {"defaultRoute":true}}' --type='merge' -n openshift-image-registry

2. Get a wildcard route CA:

   $ oc get secret router-certs-default -n openshift-ingress -o yaml

**Example output**

```
apiVersion: v1
data:
tls.crt: **************
tls.key: ################
kind: Secret
metadata:
  [...] type: kubernetes.io/tls
```

3. Use `base64` to encode the root certification authority (CA) content of your mirror registry:

   $ echo <tls.crt> | base64 --decode > ca.crt

4. Trust a CA in your client platform:

   $ sudo security add-trusted-cert -d -r trustRoot -k /Library/Keychains/System.keychain ca.crt
5. Log in to the internal registry:

```bash
$ oc get route -n openshift-image-registry
NAME             HOST/PORT PATH   SERVICES     PORT  TERMINATION WILDCARD
default-route    <registry_path> image-registry <all> reencrypt None

$ docker login <registry_path> -u kubeadmin -p $(oc whoami -t)
```

6. Push the `odo` init image:

```bash
$ docker pull registry.access.redhat.com/openshiftdo/odo-init-image-rhel7:<tag>
$ docker tag registry.access.redhat.com/openshiftdo/odo-init-image-rhel7:<tag> <registry_path>/openshiftdo/odo-init-image-rhel7:<tag>
$ docker push <registry_path>/openshiftdo/odo-init-image-rhel7:<tag>
```

7. Override the default `odo` init image path by setting the `ODO_BOOTSTRAPPER_IMAGE` environment variable:

```bash
$ export ODO_BOOTSTRAPPER_IMAGE=<registry_path>/openshiftdo/odo-init-image-rhel7:1.0.1
```

### 3.5.2.3.3. Pushing the init image directly on Windows

**Procedure**

1. Enable the default route:

   ```bash
   PS C:\> oc patch configs.imageregistry.operator.openshift.io cluster -p '{"spec":
   {
   "defaultRoute":true}}' --type=merge -n openshift-image-registry
   ```

2. Get a wildcard route CA:

   ```bash
   PS C:\> oc get secret router-certs-default -n openshift-ingress -o yaml
   ```

**Example output**

```yaml
apiVersion: v1
data:
tls.crt: *********************
tls.key: **********************
kind: Secret
metadata:
[...]
type: kubernetes.io/tls
```

3. Use `base64` to encode the root certification authority (CA) content of your mirror registry:

   ```bash
   PS C:\> echo <tls.crt> | base64 --decode > ca.crt
   ```

4. As an administrator, trust a CA in your client platform by executing the following command:
5. Log in to the internal registry:

```powershell
PS C:\WINDOWS\system32> certutil -addstore -f "ROOT" ca.crt
```

6. Push the `odo` init image:

```powershell
PS C:\> oc get route -n openshift-image-registry
NAME        HOST/PORT    PATH   SERVICES     PORT  TERMINATION   WILDCARD
default-route  <registry_path>          image-registry   <all>   reencrypt     None

PS C:\> docker login <registry_path> -u kubeadmin -p $(oc whoami -t)

PS C:\> docker pull registry.access.redhat.com/openshiftdo/odo-init-image-rhel7:<tag>

PS C:\> docker tag registry.access.redhat.com/openshiftdo/odo-init-image-rhel7:<tag> <registry_path>/openshiftdo/odo-init-image-rhel7:<tag>

PS C:\> docker push <registry_path>/openshiftdo/odo-init-image-rhel7:<tag>

PS C:\> $env:ODO_BOOTSTRAPPER_IMAGE="<registry_path>/openshiftdo/odo-init-image-rhel7:<tag>"
```

7. Override the default `odo` init image path by setting the `ODO_BOOTSTRAPPER_IMAGE` environment variable:

```powershell
PS C:\> $env:ODO_BOOTSTRAPPER_IMAGE="<registry_path>/openshiftdo/odo-init-image-rhel7:<tag>"
```

**3.5.3. Creating and deploying a component to the disconnected cluster**

After you push the `init` image to a cluster with a mirrored registry, you must mirror a supported builder image for your application with the `oc` tool, overwrite the mirror registry using the environment variable, and then create your component.

**3.5.3.1. Prerequisites**

- Install `oc` on the client operating system.
- Install `odo` on the client operating system.
- Access to an restricted cluster with a configured internal registry or a mirror registry.
- Push the `odo` init image to your cluster registry.

**3.5.3.2. Mirroring a supported builder image**

To use npm packages for Node.js dependencies and Maven packages for Java dependencies and configure a runtime environment for your application, you must mirror a respective builder image from the mirror registry.

**Procedure**

1. Verify that the required images tag is not imported:

```powershell
$ oc describe is nodejs -n openshift
```
Example output

Name: nodejs
Namespace: openshift

10
tagged from <mirror-registry>:<port>/rhoar-nodejs/nodejs-10
  prefer registry pullthrough when referencing this tag

Build and run Node.js 10 applications on RHEL 7. For more information about using this
builder image, including OpenShift considerations, see https://github.com/nodeshift/centos7-
s2i-nodejs.
Tags: builder, nodejs, hidden
Example Repo: https://github.com/sclorg/nodejs-ex.git

! error: Import failed (NotFound): dockerimage.image.openshift.io "<mirror-registry>:<port>/rhoar-nodejs/nodejs-10:latest" not found
    About an hour ago

10-SCL (latest)
tagged from <mirror-registry>:<port>/rhscl/nodejs-10-rhel7
  prefer registry pullthrough when referencing this tag

Build and run Node.js 10 applications on RHEL 7. For more information about using this
builder image, including OpenShift considerations, see https://github.com/nodeshift/centos7-
s2i-nodejs.
Tags: builder, nodejs
Example Repo: https://github.com/sclorg/nodejs-ex.git

! error: Import failed (NotFound): dockerimage.image.openshift.io "<mirror-registry>:<port>/rhscl/nodejs-10-rhel7:latest" not found
    About an hour ago

[...]

2. Mirror the supported image tag to the private registry:

   $ oc image mirror registry.access.redhat.com/rhscl/nodejs-10-rhel7:<tag>
   <private_registry>/rhscl/nodejs-10-rhel7:<tag>

3. Import the image:

   $ oc tag <mirror-registry>:<port>/rhscl/nodejs-10-rhel7:<tag> nodejs-10-rhel7:latest --scheduled

   You must periodically re-import the image. The --scheduled flag enables automatic re-import
   of the image.

4. Verify that the images with the given tag have been imported:

   $ oc describe is nodejs -n openshift

Example output

CHAPTER 3. DEVELOPER CLI (ODO)
3.5.3.3. Overwriting the mirror registry

To download npm packages for Node.js dependencies and Maven packages for Java dependencies from a private mirror registry, you must create and configure a mirror npm or Maven registry on the cluster. You can then overwrite the mirror registry on an existing component or when you create a new component.

**Procedure**

1. To overwrite the mirror registry on an existing component:

   ```bash
   $ odo config set --env NPM_MIRROR=<npm_mirror_registry>
   $ odo component create nodejs --env NPM_MIRROR=<npm_mirror_registry>
   ```

2. To overwrite the mirror registry when creating a component:

   ```bash
   $ odo config set --env NPM_MIRROR=<npm_mirror_registry>
   $ odo component create nodejs
   ```

3.5.3.4. Creating a Node.js application with odo

To create a Node.js component, download the Node.js application and push the source code to your cluster with **odo**.

**Procedure**

1. Change the current directory to the directory with your application:

   ```bash
   $ cd <directory_name>
   ```

2. Add a component of the type Node.js to your application:

   ```bash
   $ odo create nodejs
   ```
NOTE
By default, the latest image is used. You can also explicitly specify an image version by using `odo create openshift/nodejs:8`.

3. Push the initial source code to the component:
   ```
   $ odo push
   
   Your component is now deployed to OpenShift Container Platform.
   ```

4. Create a URL and add an entry in the local configuration file as follows:
   ```
   $ odo url create --port 8080
   ```

5. Push the changes. This creates a URL on the cluster.
   ```
   $ odo push
   ```

6. List the URLs to check the desired URL for the component.
   ```
   $ odo url list
   ```

7. View your deployed application using the generated URL.
   ```
   $ curl <url>
   ```

3.5.4. Creating and deploying devfile components to the disconnected cluster

3.5.4.1. Creating a NodeJS application by using a devfile in a disconnected cluster

WARNING
This procedure is using external dependencies such as `nodejs-ex.git` application that are not maintained by Red Hat. These dependencies are not maintained with the documentation and their functionality cannot be guaranteed.

Prerequisites
- You have created and logged into a disconnected cluster.
- You have added `raw.githubusercontent.com`, `registry.access.redhat.com`, and `registry.npmjs.org` URLs in your proxy.

Procedure
1. Define your NodeJS application in a devfile:
Example of a devfile

```yaml
schemaVersion: 2.0.0
metadata:
  name: nodejs
starterProjects:
  - name: nodejs-starter
git:
  remotes:
    origin: "https://github.com/odo-devfiles/nodejs-ex.git"
components:
  - name: runtime
    container:
      image: registry.access.redhat.com/ubi8/nodejs-12:1-36
      memoryLimit: 1024Mi
    endpoints:
      - name: "3000/tcp"
        targetPort: 3000
    env:
      - name: HTTP_PROXY
        value: http://<proxy-host>:<proxy-port>
      - name: HTTPS_PROXY
        value: http://<proxy-host>:<proxy-port>
    mountSources: true
commands:
  - id: devbuild
    exec:
      component: runtime
      commandLine: npm install
      workingDir: ${PROJECTS_ROOT}
      group:
        kind: build
        isDefault: true
  - id: build
    exec:
      component: runtime
      commandLine: npm install
      workingDir: ${PROJECTS_ROOT}
      group:
        kind: build
  - id: devrun
    exec:
      component: runtime
      commandLine: npm start
      workingDir: ${PROJECTS_ROOT}
      group:
        kind: run
        isDefault: true
  - id: run
    exec:
      component: runtime
      commandLine: npm start
      workingDir: ${PROJECTS_ROOT}
      group:
        kind: run
```

OpenShift Container Platform 4.9 CLI tools
2. Create the application and push the changes to the cluster:

```
$ odo create nodejs --devfile <path-to-your-devfile> --starter $$ odo push
```

**Example output**

```
[...]
Pushing devfile component nodejs
✓ Changes successfully pushed to component
```

3. Create a URL to access your application and push it to the cluster:

```
$ odo url create url1 --port 3000 --host example.com --ingress && odo push
```

**Example output**

```
Validation
✓ Validating the devfile [145374ns]

Creating Kubernetes resources for component nodejs
✓ Waiting for component to start [14s]

Applying URL changes
✓ URL url1: http://url1.abcdr.com/ created

Syncing to component nodejs
✓ Checking file changes for pushing [2ms]
✓ Syncing files to the component [3s]

Executing devfile commands for component nodejs
✓ Executing devbuild command "npm install" [4s]
✓ Executing devrun command "npm start" [3s]

Pushing devfile component nodejs
✓ Changes successfully pushed to component
```

4. Add the storage to your application

```
$ odo storage create <storage-name> --path /data --size 5Gi
```

**Example output**

```
✓ Added storage abcde to nodejs

Please use `odo push` command to make the storage accessible to the component
```

5. Push the changes to the cluster:

```
$ odo push
```

**3.5.4.2. Creating a Java application by using a devfile in a disconnected cluster**
WARNING

This procedure is using external dependencies such as `quay.io/eclipse/che-java11-maven:nightly` or an example application `springboot-ex` that are not maintained by Red Hat. These dependencies are not maintained with the documentation and their functionality cannot be guaranteed.

Prerequisites

- You have created and logged into a disconnected cluster.
- You have added `quay.io`, `registry.access.redhat.com`, `apache.org`, `quayio-production-s3.s3.amazonaws.com` URLs in your proxy configuration.

Procedure

1. Define your Java application in a devfile:

   **Example of a devfile**

   ```yaml
   schemaVersion: 2.0.0
   metadata:
     name: java-maven
     version: 1.1.0
   starterProjects:
     - name: springbootproject
       git:
         remotes:
           origin: "https://github.com/odo-devfiles/springboot-ex.git"
   components:
     - name: tools
       container:
         image: quay.io/eclipse/che-java11-maven:nightly
         memoryLimit: 512Mi
         mountSources: true
         endpoints:
           - name: 'http-8080'
             targetPort: 8080
         volumeMounts:
           - name: m2
             path: /home/user/.m2
           - name: m2
             volume: {}
   commands:
     - id: mvn-package
       exec:
         component: tools
         commandLine: "mvn -Dmaven.repo.local=/home/user/.m2/repository -Dhttp.proxyHost=<proxy-host> -Dhttp.proxyPort=<proxy-port> -Dhttps.proxyHost=<proxy-host> -Dhttps.proxyPort=<proxy-port> package"
   group:
   ```
kind: build
isDefault: true
- id: run
dev
  component: tools
commandLine: "java -jar target/*.jar"
group:
  kind: run
  isDefault: true
- id: debug
  dev
  component: tools
  commandLine: "java -Xdebug -Xrunjdwp:server=y,transport=dt_socket,address=${DEBUG_PORT},suspend=n -jar target/*.jar"
group:
  kind: debug
  isDefault: true

2. Create a Java application:

   $ odo create java-maven --devfile <path-to-your-devfile> --starter

**Example output**

**Validation**

 ✓ Checking devfile existence [87716ns]
 ✓ Creating a devfile component from registry: DefaultDevfileRegistry [107247ns]
 ✓ Validating devfile component [396971ns]

**Starter Project**

 ✓ Downloading starter project springbootproject from https://github.com/odo-devfiles/springboot-ex.git [2s]

Please use `odo push` command to create the component with source deployed

3. Push the changes to the cluster:

   $ odo push

**Example output**

[...]
Downloaded from central:
https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-utils/3.2.1/plexus-utils-3.2.1.jar (262 kB at 813 kB/s)
[INFO] Replacing main artifact with repackaged archive
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
4. Display the logs to verify that the application has started:

$ odo log

**Example output**

```
time="2021-02-24T08:58:58Z" level=info msg="create process:devrun"
time="2021-02-24T08:58:58Z" level=info msg="create process:debugrun"
time="2021-02-24T08:59:32Z" level=debug msg="no auth required"
time="2021-02-24T08:59:32Z" level=debug msg="succeed to find process:devrun"
time="2021-02-24T08:59:32Z" level=debug msg="succeed to find process:debugrun"
time="2021-02-24T08:59:32Z" level=info msg="try to start program" program=devrun
time="2021-02-24T08:59:32Z" level=info msg="success to start program" program=devrun
ODO_COMMAND_RUN is java -jar target/*.jar
Executing command java -jar target/*.jar
[…]
```

5. Create storage for your application:

$ odo storage create storage-name --path /data --size 5Gi

**Example output**

- Added storage storage-name to java-maven

Please use `odo push` command to make the storage accessible to the component

6. Push the changes to the cluster:

$ odo push

**Output**

- Waiting for component to start [310ms]

**Validation**

- Validating the devfile [100798ns]

Creating Kubernetes resources for component java-maven
3.6. CREATING INSTANCES OF SERVICES MANAGED BY OPERATORS

Operators are a method of packaging, deploying, and managing Kubernetes services. With odo, you can create instances of services from the custom resource definitions (CRDs) provided by the Operators. You can then use these instances in your projects and link them to your components.

To create services from an Operator, you must ensure that the Operator has valid values defined in its metadata to start the requested service. odo uses the metadata.annotations.alm-examples YAML file of an Operator to start the service. If this YAML has placeholder values or sample values, a service cannot start. You can modify the YAML file and start the service with the modified values. To learn how to modify YAML files and start services from it, see Creating services from YAML files.

3.6.1. Prerequisites

- Install the oc CLI and log in to the cluster.
  - Note that the configuration of the cluster determines the services available to you. To access the Operator services, a cluster administrator must install the respective Operator on the cluster first. To learn more, see Adding Operators to the cluster.

- Install the odo CLI.

3.6.2. Creating a project

Create a project to keep your source code, tests, and libraries organized in a separate single unit.

Procedure

1. Log in to an OpenShift Container Platform cluster:

   ```
   $ odo login -u developer -p developer
   ```

2. Create a project:
3.6.3. Listing available services from the Operators installed on the cluster

With odo, you can display the list of the Operators installed on your cluster, and the services they provide.

- To list the Operators installed in current project, run:

  ```bash
  $ odo catalog list services
  ```

  The command lists Operators and the CRDs. The output of the command shows the Operators installed on your cluster. For example:

  ```
  Operators available in the cluster
  NAME                  CRDs
  etcdoperator.v0.9.4   EtcdCluster, EtcdBackup, EtcdRestore
  mongodb-enterprise.v1.4.5 MongoDB, MongoDBUser, MongoDBOpsManager
  ``

  `etcdoperator.v0.9.4` is the Operator, `EtcdCluster`, `EtcdBackup` and `EtcdRestore` are the CRDs provided by the Operator.

3.6.4. Creating a service from an Operator

If an Operator has valid values defined in its metadata to start the requested service, you can use the service with `odo service create`.

1. Print the YAML of the service as a file on your local drive:

   ```bash
   $ oc get csv/etcdoperator.v0.9.4 -o yaml
   ```

2. Verify that the values of the service are valid:

   ```
   apiVersion: etcd.database.coreos.com/v1beta2
   kind: EtcdCluster
   metadata:
     name: example
   spec:
     size: 3
     version: 3.2.13
   ```

3. Start an `EtcdCluster` service from the `etcdoperator.v0.9.4` Operator:

   ```bash
   $ odo service create etcdoperator.v0.9.4 EtcdCluster
   ```

4. Verify that a service has started:
3.6.5. Creating services from YAML files

If the YAML definition of the service or custom resource (CR) has invalid or placeholder data, you can use the \texttt{--dry-run} flag to get the YAML definition, specify the correct values, and start the service using the corrected YAML definition. Printing and modifying the YAML used to start a service \texttt{odo} provides the feature to print the YAML definition of the service or CR provided by the Operator before starting a service.

1. To display the YAML of the service, run:

\texttt{$ odo service create \langle operator-name\rangle --dry-run}$

For example, to print YAML definition of \texttt{EtcdCluster} provided by the \texttt{etcdoperator.v0.9.4} Operator, run:

\texttt{$ odo service create etcdoperator.v0.9.4 --dry-run}$

The YAML is saved as the \texttt{etcd.yaml} file.

2. Modify the \texttt{etcd.yaml} file:

\begin{verbatim}
apiVersion: etcd.database.coreos.com/v1beta2
kind: EtcdCluster
metadata:
  name: my-etcd-cluster ①
spec:
  size: 1 ②
version: 3.2.13
\end{verbatim}

① Change the name from \texttt{example} to \texttt{my-etcd-cluster}

② Reduce the size from 3 to 1

3. Start a service from the YAML file:

\texttt{$ odo service create --from-file etcd.yaml}$

4. Verify that the \texttt{EtcdCluster} service has started with one pod instead of the pre-configured three pods:

\texttt{$ oc get pods | grep my-etcd-cluster}$

3.7. MANAGING ENVIRONMENT VARIABLES

\texttt{odo} stores component-specific configurations and environment variables in the \texttt{config} file. You can use the \texttt{odo config} command to set, unset, and list environment variables for components without the need to modify the \texttt{config} file.

3.7.1. Setting and unsetting environment variables
Procedure

- To set an environment variable in a component:
  
  `$ odo config set --env <variable>=<value>`

- To unset an environment variable in a component:
  
  `$ odo config unset --env <variable>`

- To list all environment variables in a component:
  
  `$ odo config view`

3.8. CONFIGURING THE ODO CLI

You can find the global settings for odo in the `preference.yaml` file which is located by default in your `$HOME/.odo` directory.

You can set a different location for the `preference.yaml` file by exporting the `GLOBALODOCONFIG` variable.

3.8.1. Viewing the current configuration

You can view the current odo CLI configuration by using the following command:

`$ odo preference view`

Example output

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CURRENT_VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>UpdateNotification</td>
<td></td>
</tr>
<tr>
<td>NamePrefix</td>
<td></td>
</tr>
<tr>
<td>Timeout</td>
<td></td>
</tr>
<tr>
<td>BuildTimeout</td>
<td></td>
</tr>
<tr>
<td>PushTimeout</td>
<td></td>
</tr>
<tr>
<td>Ephemeral</td>
<td></td>
</tr>
<tr>
<td>ConsentTelemetry</td>
<td>true</td>
</tr>
</tbody>
</table>

3.8.2. Setting a value

You can set a value for a preference key by using the following command:

`$ odo preference set <key> <value>`

**NOTE**

Preference keys are case-insensitive.

Example command
3.8.3. Setting a value
You can unset a value for a preference key by using the following command:

```
$ odo preference unset <key>
```

**NOTE**
You can use the -f flag to skip the confirmation.

Example command

```
$ odo preference unset updatenotification
? Do you want to unset updatenotification in the preference (y/N) y
```

Example output

```
Global preference was successfully updated
```

3.8.4. Preference key table
The following table shows the available options for setting preference keys for the odo CLI:

<table>
<thead>
<tr>
<th>Preference key</th>
<th>Description</th>
<th>Default value</th>
</tr>
</thead>
<tbody>
<tr>
<td>UpdateNotification</td>
<td>Control whether a notification to update odo is shown.</td>
<td>True</td>
</tr>
<tr>
<td>NamePrefix</td>
<td>Set a default name prefix for an odo resource. For example,</td>
<td>Current directory name</td>
</tr>
<tr>
<td></td>
<td>component or storage.</td>
<td></td>
</tr>
<tr>
<td>Timeout</td>
<td>Timeout for the Kubernetes server connection check.</td>
<td>1 second</td>
</tr>
<tr>
<td>BuildTimeout</td>
<td>Timeout for waiting for a build of the git component to</td>
<td>300 seconds</td>
</tr>
<tr>
<td></td>
<td>complete.</td>
<td></td>
</tr>
<tr>
<td>PushTimeout</td>
<td>Timeout for waiting for a component to start.</td>
<td>240 seconds</td>
</tr>
<tr>
<td>Ephemeral</td>
<td>Controls whether odo should create an emptyDir volume to</td>
<td>True</td>
</tr>
<tr>
<td></td>
<td>store source code.</td>
<td></td>
</tr>
</tbody>
</table>
3.8.5. Ignoring files or patterns

You can configure a list of files or patterns to ignore by modifying the `.odoignore` file in the root directory of your application. This applies to both `odo push` and `odo watch`.

If the `.odoignore` file does not exist, the `.gitignore` file is used instead for ignoring specific files and folders.

To ignore `.git` files, any files with the `.js` extension, and the folder `tests`, add the following to either the `.odoignore` or the `.gitignore` file:

```
.git
*.js
tests/
```

The `.odoignore` file allows any glob expressions.

3.9. ODO CLI REFERENCE

3.9.1. Basic odo CLI commands

3.9.1.1. app

Perform application operations related to your OpenShift Container Platform project.

Example using app

```
# Delete the application
odo app delete myapp

# Describe 'webapp' application,
odo app describe webapp

# List all applications in the current project
odo app list

# List all applications in the specified project
odo app list --project myproject
```

3.9.1.2. catalog

Perform catalog-related operations.

Example using catalog

```
# Get the supported components
```
odo catalog list components

# Get the supported services from service catalog
odo catalog list services

# Search for a component
odo catalog search component python

# Search for a service
odo catalog search service mysql

# Describe a service
odo catalog describe service mysql-persistent

### 3.9.1.3. component

Manage components of an application.

**Example using component**

```bash
# Create a new component
odo component create

# Create a local configuration and create all objects on the cluster
odo component create --now
```

### 3.9.1.4. config

Modify `odo` specific settings within the `config` file.

**Example using config**

```bash
# For viewing the current local configuration
odo config view

# Set a configuration value in the local configuration
odo config set Type java
odo config set Name test
odo config set MinMemory 50M
odo config set MaxMemory 500M
odo config set Memory 250M
odo config set Ignore false
odo config set MinCPU 0.5
odo config set MaxCPU 2
odo config set CPU 1

# Set an environment variable in the local configuration
odo config set --env KAFKA_HOST=kafka --env KAFKA_PORT=6639

# Create a local configuration and apply the changes to the cluster immediately
odo config set --now

# Unset a configuration value in the local config
odo config unset Type
```
odo config unset Name
odo config unset MinMemory
odo config unset MaxMemory
odo config unset Memory
odo config unset Ignore
odo config unset MinCPU
odo config unset MaxCPU
odo config unset CPU

# Unset an env variable in the local config
odo config unset --env KAFKA_HOST --env KAFKA_PORT

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Application is the name of application the component needs to be part of</td>
</tr>
<tr>
<td>CPU</td>
<td>The minimum and maximum CPU a component can consume</td>
</tr>
<tr>
<td>Ignore</td>
<td>Consider the .odoignore file for push and watch</td>
</tr>
<tr>
<td>MaxCPU</td>
<td>The maximum CPU a component can consume</td>
</tr>
<tr>
<td>MaxMemory</td>
<td>The maximum memory a component can consume</td>
</tr>
<tr>
<td>Memory</td>
<td>The minimum and maximum memory a component can consume</td>
</tr>
<tr>
<td>MinCPU</td>
<td>The minimum CPU a component can consume</td>
</tr>
<tr>
<td>MinMemory</td>
<td>The minimum memory a component is provided</td>
</tr>
<tr>
<td>Name</td>
<td>The name of the component</td>
</tr>
<tr>
<td>Ports</td>
<td>Ports to be opened in the component</td>
</tr>
<tr>
<td>Project</td>
<td>The name of the project that the component is part of</td>
</tr>
</tbody>
</table>

Table 3.1. Available Local Parameters:
<table>
<thead>
<tr>
<th>Ref</th>
<th>Git ref to use for creating component from git source</th>
</tr>
</thead>
<tbody>
<tr>
<td>SourceLocation</td>
<td>The path indicates the location of binary file or git source</td>
</tr>
<tr>
<td>SourceType</td>
<td>Type of component source - git/binary/local</td>
</tr>
<tr>
<td>Storage</td>
<td>Storage of the component</td>
</tr>
<tr>
<td>Type</td>
<td>The type of component</td>
</tr>
<tr>
<td>Url</td>
<td>The URL to access the component</td>
</tr>
</tbody>
</table>

3.9.15. create

Create a configuration describing a component to be deployed on OpenShift Container Platform. If a component name is not provided, it is autogenerated.

By default, builder images are used from the current namespace. To explicitly supply a namespace, use: `odo create namespace/name:version`. If a version is not specified, the version defaults to `latest`.

Use `odo catalog list` to see a full list of component types that can be deployed.

Example using create

```bash
# Create new Node.js component with the source in current directory.
odo create nodejs

# Create new Node.js component and push it to the cluster immediately.
odo create nodejs --now

# A specific image version may also be specified
odo create nodejs:latest

# Create new Node.js component named 'frontend' with the source in './frontend' directory
odo create nodejs frontend --context ./frontend

# Create a new Node.js component of version 6 from the 'openshift' namespace
odo create openshift/nodejs:6 --context /nodejs-ex

# Create new Wildfly component with binary named sample.war in './downloads' directory
odo create wildfly wildfly --binary ./downloads/sample.war

# Create new Node.js component with source from remote git repository
odo create nodejs --git https://github.com/openshift/nodejs-ex.git

# Create new Node.js git component while specifying a branch, tag or commit ref
odo create nodejs --git https://github.com/openshift/nodejs-ex.git --ref master

# Create new Node.js git component while specifying a tag
odo create nodejs --git https://github.com/openshift/nodejs-ex.git --ref v1.0.1
```
3.9.1.6. debug

Debug a component.

Example using debug

```
# Displaying information about the state of debugging
odo debug info

# Starting the port forwarding for a component to debug the application
odo debug port-forward

# Setting a local port to port forward
odo debug port-forward --local-port 9292
```
3.9.1.9. link

Link a component to a service or component.

**Example using link**

```
# Link the current component to the 'my-postgresql' service
odo link my-postgresql

# Link component 'nodejs' to the 'my-postgresql' service
odo link my-postgresql --component nodejs

# Link current component to the 'backend' component (backend must have a single exposed port)
odo link backend

# Link component 'nodejs' to the 'backend' component
odo link backend --component nodejs

# Link current component to port 8080 of the 'backend' component (backend must have port 8080 exposed)
odo link backend --port 8080
```

Link adds the appropriate secret to the environment of the source component. The source component can then consume the entries of the secret as environment variables. If the source component is not provided, the current active component is assumed.

3.9.1.10. list

List all the components in the current application and the states of the components.

**The states of the components**

**Pushed**

A component is pushed to the cluster.

**Not Pushed**

A component is not pushed to the cluster.

**Unknown**

*odo* is disconnected from the cluster.

**Example using list**

```
# List all components in the application
odo list

# List all the components in a given path
odo list --path <path_to_your_component>
```

3.9.1.11. log

Retrieve the log for the given component.

**Example using log**

-
3.9.1.12. login

Log in to the cluster.

Example using login

```
# Log in interactively
odo login

# Log in to the given server with the given certificate authority file
odo login localhost:8443 --certificate-authority=/path/to/cert.crt

# Log in to the given server with the given credentials (basic auth)
odo login localhost:8443 --username=myuser --password=mypass

# Log in to the given server with the given credentials (token)
odo login localhost:8443 --token=xxxxxxxxxxxxxxxxxxxxxxxxxx
```

3.9.1.13. logout

Log out of the current OpenShift Container Platform session.

Example using logout

```
# Log out
odo logout
```

3.9.1.14. preference

Modify odo specific configuration settings within the global preference file.

Example using preference

```
# For viewing the current preferences
odo preference view

# Set a preference value in the global preference
odo preference set UpdateNotification false
odo preference set NamePrefix "app"
odo preference set Timeout 20

# Enable experimental mode
odo preference set experimental true

# Unset a preference value in the global preference
odo preference unset UpdateNotification
odo preference unset NamePrefix
odo preference unset Timeout

# Disable experimental mode
```
By default, the path to the global preference file is ~/.odo/preferece.yaml and it is stored in the environment variable GLOBALODOCONFIG. You can set up a custom path by setting the value of the environment variable to a new preference path, for example GLOBALODOCONFIG="new_path/preference.yaml"

<table>
<thead>
<tr>
<th>NamePrefix</th>
<th>The default prefix is the current directory name. Use this value to set a default name prefix.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timeout</td>
<td>The timeout (in seconds) for OpenShift Container Platform server connection checks.</td>
</tr>
<tr>
<td>UpdateNotification</td>
<td>Controls whether an update notification is shown.</td>
</tr>
</tbody>
</table>

3.9.15. project

Perform project operations.

Example using project

```bash
# Set the active project
odo project set

# Create a new project
odo project create myproject

# List all the projects
odo project list

# Delete a project
odo project delete myproject

# Get the active project
odo project get
```

3.9.16. push

Push source code to a component.

Example using push

```bash
# Push source code to the current component
odo push
```
3.9.1.17. registry

Create and modify custom registries.

Example using registry

```bash
# Add a registry to the registry list
odo registry add <registry name> <registry URL>

# List a registry in the registry list
odo registry list

# Delete a registry from the registry list
odo registry delete <registry name>

# Update a registry in the registry list
odo registry update <registry name> <registry URL>

# List a component with a corresponding registry
odo catalog list components

# Create a component that is hosted by a specific registry
odo create <component type> --registry <registry name>
```

3.9.1.18. service

Perform service catalog operations.

Example using service

```bash
# Create new postgresql service from service catalog using dev plan and name my-postgresql-db.
odo service create dh-postgresql-apb my-postgresql-db --plan dev -p postgresql_user=luke -p postgresql_password=secret

# Delete the service named 'mysql-persistent'
odo service delete mysql-persistent

# List all services in the application
odo service list
```

3.9.1.19. storage

Perform storage operations.

Example using storage
# Create storage of size 1Gb to a component
odo storage create mystorage --path=/opt/app-root/src/storage/ --size=1Gi

# Delete storage mystorage from the currently active component
odo storage delete mystorage

# List all storage attached or mounted to the current component and
# all unattached or unmounted storage in the current application
odo storage list

# Set the `-o json` flag to get a JSON formatted output
odo storage list -o json

3.9.1.20. unlink

Unlink component or a service.

For this command to be successful, the service or component must have been linked prior to the invocation using `odo link`.

Example using unlink

# Unlink the 'my-postgresql' service from the current component
odo unlink my-postgresql

# Unlink the 'my-postgresql' service from the 'nodejs' component
odo unlink my-postgresql --component nodejs

# Unlink the 'backend' component from the current component (backend must have a single exposed port)
odo unlink backend

# Unlink the 'backend' service from the 'nodejs' component
odo unlink backend --component nodejs

# Unlink the backend's 8080 port from the current component
odo unlink backend --port 8080

3.9.1.21. update

Update the source code path of a component

Example using update

# Change the source code path of a currently active component to local (use the current directory as a source)
odo update --local

# Change the source code path of the frontend component to local with source in ./frontend directory
odo update frontend --local ./frontend

# Change the source code path of a currently active component to git
odo update --git https://github.com/openshift/nodejs-ex.git
3.9.1.22. url

Expose a component to the outside world.

**Example using url**

```
# Change the source code path of the component named node-ex to git
odo update node-ex --git https://github.com/openshift/nodejs-ex.git

# Change the source code path of the component named wildfly to a binary named sample.war in
# /downloads directory
odo update wildfly --binary ./downloads/sample.war
```

---

**Example using url**

```
# Create a URL for the current component with a specific port
odo url create --port 8080

# Create a URL with a specific name and port
odo url create example --port 8080

# Create a URL with a specific name by automatic detection of port (only for components which
# expose only one service port)
odo url create example

# Create a URL with a specific name and port for component frontend
odo url create example --port 8080 --component frontend

# Delete a URL to a component
odo url delete myurl

# List the available URLs
odo url list

# Create a URL in the configuration and apply the changes to the cluster
odo url create --now

# Create an HTTPS URL
odo url create --secure
```

The URLs that are generated using this command can be used to access the deployed components from outside the cluster.

3.9.1.23. utils

Utilities for terminal commands and modifying odo configurations.

**Example using utils**

```
# Bash terminal PS1 support
source <(odo utils terminal bash)

# Zsh terminal PS1 support
source <(odo utils terminal zsh)
```

3.9.1.24. version
Print the client version information.

Example using version

```bash
# Print the client version of odo
odo version
```

3.9.1.25. watch

odo starts watching for changes and updates the component upon a change automatically.

Example using watch

```bash
# Watch for changes in directory for current component
odo watch

# Watch for changes in directory for component called frontend
odo watch frontend
```

3.10. ODO ARCHITECTURE

This section describes odo architecture and how odo manages resources on a cluster.

3.10.1. Developer setup

With odo you can create and deploy application on OpenShift Container Platform clusters from a terminal. Code editor plug-ins use odo which allows users to interact with OpenShift Container Platform clusters from their IDE terminals. Examples of plug-ins that use odo: VS Code OpenShift Connector, OpenShift Connector for Intellij, Codewind for Eclipse Che.

odo works on Windows, macOS, and Linux operating systems and from any terminal. odo provides autocompletion for bash and zsh command line shells.

odo supports Node.js and Java components.

3.10.2. OpenShift source-to-image

OpenShift Source-to-Image (S2I) is an open-source project which helps in building artifacts from source code and injecting these into container images. S2I produces ready-to-run images by building source code without the need of a Dockerfile. odo uses S2I builder image for executing developer source code inside a container.

3.10.3. OpenShift cluster objects

3.10.3.1. Init Containers

Init containers are specialized containers that run before the application container starts and configure the necessary environment for the application containers to run. Init containers can have files that application images do not have, for example setup scripts. Init containers always run to completion and the application container does not start if any of the init containers fails.

The pod created by odo executes two Init Containers:
- The **copy-supervisord** Init container.

- The **copy-files-to-volume** Init container.

### 3.10.3.1.1. copy-supervisord

The **copy-supervisord** Init container copies necessary files onto an **emptyDir** volume. The main application container utilizes these files from the **emptyDir** volume.

**Files that are copied onto the emptyDir volume:**

- **Binaries:**
  - **go-init** is a minimal init system. It runs as the first process (PID 1) inside the application container. **go-init** starts the **SupervisorD** daemon which runs the developer code. **go-init** is required to handle orphaned processes.
  - **SupervisorD** is a process control system. It watches over configured processes and ensures that they are running. It also restarts services when necessary. For odo, **SupervisorD** executes and monitors the developer code.

- **Configuration files:**
  - **supervisor.conf** is the configuration file necessary for the **SupervisorD** daemon to start.

- **Scripts:**
  - **assemble-and-restart** is an OpenShift S2I concept to build and deploy user-source code. The **assemble-and-restart** script first assembles the user source code inside the application container and then restarts **SupervisorD** for user changes to take effect.
  - **Run** is an OpenShift S2I concept of executing the assembled source code. The **run** script executes the assembled code created by the **assemble-and-restart** script.
  - **s2i-setup** is a script that creates files and directories which are necessary for the **assemble-and-restart** and **run** scripts to execute successfully. The script is executed whenever the application container starts.

- **Directories:**
  - **language-scripts**: OpenShift S2I allows custom **assemble** and **run** scripts. A few language specific custom scripts are present in the **language-scripts** directory. The custom scripts provide additional configuration to make odo debug work.

The **emptyDir** volume is mounted at the **/opt/odo** mount point for both the Init container and the application container.

### 3.10.3.1.2. copy-files-to-volume

The **copy-files-to-volume** Init container copies files that are in **/opt/app-root** in the S2I builder image onto the persistent volume. The volume is then mounted at the same location (**/opt/app-root**) in an application container.

Without the persistent volume on **/opt/app-root** the data in this directory is lost when the persistent volume claim is mounted at the same location.

The PVC is mounted at the **/mnt** mount point inside the Init container.
3.10.3.2. Application container

Application container is the main container inside of which the user-source code executes.

Application container is mounted with two volumes:

- **emptyDir** volume mounted at /opt/odo
- The persistent volume mounted at /opt/app-root

`go-init` is executed as the first process inside the application container. The `go-init` process then starts the `SupervisorD` daemon.

`SupervisorD` executes and monitors the user assembled source code. If the user process crashes, `SupervisorD` restarts it.

3.10.3.3. Persistent volumes and persistent volume claims

A persistent volume claim (PVC) is a volume type in Kubernetes which provisions a persistent volume. The life of a persistent volume is independent of a pod lifecycle. The data on the persistent volume persists across pod restarts.

The `copy-files-to-volume` Init container copies necessary files onto the persistent volume. The main application container utilizes these files at runtime for execution.

The naming convention of the persistent volume is `<component_name>-s2idata`.

<table>
<thead>
<tr>
<th>Container</th>
<th>PVC mounted at</th>
</tr>
</thead>
<tbody>
<tr>
<td>copy-files-to-volume</td>
<td>/mnt</td>
</tr>
<tr>
<td>Application container</td>
<td>/opt/app-root</td>
</tr>
</tbody>
</table>

3.10.3.4. emptyDir volume

An `emptyDir` volume is created when a pod is assigned to a node, and exists as long as that pod is running on the node. If the container is restarted or moved, the content of the `emptyDir` is removed. Init container restores the data back to the `emptyDir`. `emptyDir` is initially empty.

The `copy-supervisord` Init container copies necessary files onto the `emptyDir` volume. These files are then utilized by the main application container at runtime for execution.

<table>
<thead>
<tr>
<th>Container</th>
<th>emptyDir volume mounted at</th>
</tr>
</thead>
<tbody>
<tr>
<td>copy-supervisord</td>
<td>/opt/odo</td>
</tr>
<tr>
<td>Application container</td>
<td>/opt/odo</td>
</tr>
</tbody>
</table>

3.10.3.5. Service

A service is a Kubernetes concept of abstracting the way of communicating with a set of pods.
odo creates a service for every application pod to make it accessible for communication.

3.10.4. odo push workflow

This section describes odo push workflow. odo push deploys user code on an OpenShift Container Platform cluster with all the necessary OpenShift Container Platform resources.

1. Creating resources
   If not already created, odo push creates the following OpenShift Container Platform resources:
   - **DeploymentConfig** object:
     - Two init containers are executed: **copy-supervisord** and **copy-files-to-volume**. The init containers copy files onto the **emptyDir** and the **PersistentVolume** type of volumes respectively.
     - The application container starts. The first process in the application container is the **go-init** process with PID=1.
     - **go-init** process starts the SupervisorD daemon.
     
     **NOTE**
     
     The user application code has not been copied into the application container yet, so the **SupervisorD** daemon does not execute the **run** script.
   - **Service** object
   - **Secret** objects
   - **PersistentVolumeClaim** object

2. Indexing files
   - A file indexer indexes the files in the source code directory. The indexer traverses through the source code directories recursively and finds files which have been created, deleted, or renamed.
   - A file indexer maintains the indexed information in an odo index file inside the **.odo** directory.
   - If the odo index file is not present, it means that the file indexer is being executed for the first time, and creates a new odo index JSON file. The odo index JSON file contains a file map - the relative file paths of the traversed files and the absolute paths of the changed and deleted files.

3. Pushing code
   Local code is copied into the application container, usually under **/tmp/src**.

4. Executing **assemble-and-restart**
   On a successful copy of the source code, the **assemble-and-restart** script is executed inside the running application container.
CHAPTER 4. KNATIVE CLI (KN) FOR USE WITH OPENSHIFT SERVERLESS

The Knative kn CLI enables simple interaction with Knative components on OpenShift Container Platform.

4.1. KEY FEATURES

The kn CLI is designed to make serverless computing tasks simple and concise. Key features of the kn CLI include:

- Deploy serverless applications from the command line.
- Manage features of Knative Serving, such as services, revisions, and traffic-splitting.
- Create and manage Knative Eventing components, such as event sources and triggers.
- Create sink bindings to connect existing Kubernetes applications and Knative services.
- Extend the kn CLI with flexible plug-in architecture, similar to the kubectl CLI.
- Configure autoscaling parameters for Knative services.
- Scripted usage, such as waiting for the results of an operation, or deploying custom rollout and rollback strategies.

4.2. INSTALLING THE KNATIVE CLI

See Installing the Knative CLI.
CHAPTER 5. PIPELINES CLI (TKN)

5.1. INSTALLING TKN

Use the tkn CLI to manage Red Hat OpenShift Pipelines from a terminal. The following section describes how to install tkn on different platforms.

You can also find the URL to the latest binaries from the OpenShift Container Platform web console by clicking the ? icon in the upper-right corner and selecting Command Line Tools.

5.1.1. Installing Red Hat OpenShift Pipelines CLI (tkn) on Linux

For Linux distributions, you can download the CLI directly as a tar.gz archive.

Procedure

1. Download the relevant CLI.
   - Linux (x86_64, amd64)
   - Linux on IBM Z and LinuxONE (s390x)
   - Linux on IBM Power Systems (ppc64le)
2. Unpack the archive:
   
   ```bash
   $ tar xvzf <file>
   
   # subscription-manager register
   
   $ echo $PATH
   ``
3. Place the tkn binary in a directory that is on your PATH.
4. To check your PATH, run:
   
   ```bash
   $ echo $PATH
   
   # subscription-manager register
   ``

5.1.2. Installing Red Hat OpenShift Pipelines CLI (tkn) on Linux using an RPM

For Red Hat Enterprise Linux (RHEL) version 8, you can install the Red Hat OpenShift Pipelines CLI (tkn) as an RPM.

Prerequisites

- You have an active OpenShift Container Platform subscription on your Red Hat account.
- You have root or sudo privileges on your local system.

Procedure

1. Register with Red Hat Subscription Manager:
   
   ```bash
   # subscription-manager register
   ``
2. Pull the latest subscription data:
3. List the available subscriptions:
   
   ```
   # subscription-manager list --available --matches "*pipelines*
   ```

4. In the output for the previous command, find the pool ID for your OpenShift Container Platform subscription and attach the subscription to the registered system:
   
   ```
   # subscription-manager attach --pool=<pool_id>
   ```

5. Enable the repositories required by Red Hat OpenShift Pipelines:

   - Linux (x86_64, amd64)
     ```
     # subscription-manager repos --enable="pipelines-1.6-for-rhel-8-x86_64-rpms"
     ```
   - Linux on IBM Z and LinuxONE (s390x)
     ```
     # subscription-manager repos --enable="pipelines-1.6-for-rhel-8-s390x-rpms"
     ```
   - Linux on IBM Power Systems (ppc64le)
     ```
     # subscription-manager repos --enable="pipelines-1.6-for-rhel-8-ppc64le-rpms"
     ```

6. Install the `openshift-pipelines-client` package:
   
   ```
   # yum install openshift-pipelines-client
   ```

After you install the CLI, it is available using the `tkn` command:

```
$ tkn version
```

### 5.1.3. Installing Red Hat OpenShift Pipelines CLI (tkn) on Windows

For Windows, the `tkn` CLI is provided as a `zip` archive.

**Procedure**

1. Download the CLI.
2. Unzip the archive with a ZIP program.
3. Add the location of your `tkn.exe` file to your `PATH` environment variable.
4. To check your `PATH`, open the command prompt and run the command:
   ```
   C:\> path
   ```

### 5.1.4. Installing Red Hat OpenShift Pipelines CLI (tkn) on macOS
For macOS, the `tkn` CLI is provided as a `tar.gz` archive.

**Procedure**

1. Download the CLI.
2. Unpack and unzip the archive.
3. Move the `tkn` binary to a directory on your PATH.
4. To check your PATH, open a terminal window and run:

   ```
   $ echo $PATH
   ```

**5.2. CONFIGURING THE OPENShift PIPELINES TKN CLI**

Configure the Red Hat OpenShift Pipelines `tkn` CLI to enable tab completion.

**5.2.1. Enabling tab completion**

After you install the `tkn` CLI, you can enable tab completion to automatically complete `tkn` commands or suggest options when you press Tab.

**Prerequisites**

- You must have the `tkn` CLI tool installed.
- You must have `bash-completion` installed on your local system.

**Procedure**

The following procedure enables tab completion for Bash.

1. Save the Bash completion code to a file:

   ```
   $ tkn completion bash > tkn_bash_completion
   ```

2. Copy the file to `/etc/bash_completion.d/`:

   ```
   $ sudo cp tkn_bash_completion /etc/bash_completion.d/
   ```

   Alternatively, you can save the file to a local directory and source it from your `.bashrc` file instead.

   Tab completion is enabled when you open a new terminal.

**5.3. OPENSShift PIPELINES TKN REFERENCE**

This section lists the basic `tkn` CLI commands.

**5.3.1. Basic syntax**

`tkn [command or options] [arguments...]`
5.3.2. Global options

--help, -h

5.3.3. Utility commands

5.3.3.1. tkn

Parent command for tkn CLI.

Example: Display all options

   $ tkn

5.3.3.2. completion [shell]

Print shell completion code which must be evaluated to provide interactive completion. Supported shells are bash and zsh.

Example: Completion code for bash shell

   $ tkn completion bash

5.3.3.3. version

Print version information of the tkn CLI.

Example: Check the tkn version

   $ tkn version

5.3.4. Pipelines management commands

5.3.4.1. pipeline

Manage pipelines.

Example: Display help

   $ tkn pipeline --help

5.3.4.2. pipeline delete

Delete a pipeline.

Example: Delete the mypipeline pipeline from a namespace

   $ tkn pipeline delete mypipeline -n myspace

5.3.4.3. pipeline describe
Describe a pipeline.

Example: Describe the mypipeline pipeline

$ tkn pipeline describe mypipeline

5.3.4.4. pipeline list
Display a list of pipelines.

Example: Display a list of pipelines

$ tkn pipeline list

5.3.4.5. pipeline logs
Display the logs for a specific pipeline.

Example: Stream the live logs for the mypipeline pipeline

$ tkn pipeline logs -f mypipeline

5.3.4.6. pipeline start
Start a pipeline.

Example: Start the mypipeline pipeline

$ tkn pipeline start mypipeline

5.3.5. Pipeline run commands

5.3.5.1. pipelinerun
Manage pipeline runs.

Example: Display help

$ tkn pipelinerun -h

5.3.5.2. pipelinerun cancel
Cancel a pipeline run.

Example: Cancel the mypipelinerun pipeline run from a namespace

$ tkn pipelinerun cancel mypipelinerun -n myspace

5.3.5.3. pipelinerun delete
Delete a pipeline run.

**Example: Delete pipeline runs from a namespace**

$ tkn pipelinerun delete mypipelinerun1 mypipelinerun2 -n myspace

**Example: Delete all pipeline runs from a namespace, except the five most recently executed pipeline runs**

$ tkn pipelinerun delete -n myspace --keep 5

1. Replace 5 with the number of most recently executed pipeline runs you want to retain.

**Example: Delete all pipelines**

$ tkn pipelinerun delete --all

**NOTE**

Starting with Red Hat OpenShift Pipelines 1.6, the `tkn pipelinerun delete --all` command does not delete any resources that are in the running state.

### 5.3.5.4. pipelinerun describe

Describe a pipeline run.

**Example: Describe the mypipelinerun pipeline run in a namespace**

$ tkn pipelinerun describe mypipelinerun -n myspace

### 5.3.5.5. pipelinerun list

List pipeline runs.

**Example: Display a list of pipeline runs in a namespace**

$ tkn pipelinerun list -n myspace

### 5.3.5.6. pipelinerun logs

Display the logs of a pipeline run.

**Example: Display the logs of the mypipelinerun pipeline run with all tasks and steps in a namespace**

$ tkn pipelinerun logs mypipelinerun -a -n myspace

### 5.3.6. Task management commands
5.3.6.1. task
Manage tasks.

Example: Display help

$ tkn task -h

5.3.6.2. task delete
Delete a task.

Example: Delete mytask1 and mytask2 tasks from a namespace

$ tkn task delete mytask1 mytask2 -n myspace

5.3.6.3. task describe
Describe a task.

Example: Describe the mytask task in a namespace

$ tkn task describe mytask -n myspace

5.3.6.4. task list
List tasks.

Example: List all the tasks in a namespace

$ tkn task list -n myspace

5.3.6.5. task logs
Display task logs.

Example: Display logs for the mytaskrun task run of the mytask task

$ tkn task logs mytask mytaskrun -n myspace

5.3.6.6. task start
Start a task.

Example: Start the mytask task in a namespace

$ tkn task start mytask -s <ServiceAccountName> -n myspace

5.3.7. Task run commands
5.3.7.1. taskrun
Manage task runs.

Example: Display help

$ tkn taskrun -h

5.3.7.2. taskrun cancel
Cancel a task run.

Example: Cancel the mytaskrun task run from a namespace

$ tkn taskrun cancel mytaskrun -n myspace

5.3.7.3. taskrun delete
Delete a TaskRun.

Example: Delete the mytaskrun1 and mytaskrun2 task runs from a namespace

$ tkn taskrun delete mytaskrun1 mytaskrun2 -n myspace

Example: Delete all but the five most recently executed task runs from a namespace

$ tkn taskrun delete -n myspace --keep 5

Replace 5 with the number of most recently executed task runs you want to retain.

5.3.7.4. taskrun describe
Describe a task run.

Example: Describe the mytaskrun task run in a namespace

$ tkn taskrun describe mytaskrun -n myspace

5.3.7.5. taskrun list
List task runs.

Example: List all the task runs in a namespace

$ tkn taskrun list -n myspace

5.3.7.6. taskrun logs
Display task run logs.
Example: Display live logs for the `mytaskrun` task run in a namespace

```bash
$ tkn taskrun logs -f mytaskrun -n myspace
```

5.3.8. Condition management commands

5.3.8.1. `condition`
Manage Conditions.

Example: Display help

```bash
$ tkn condition --help
```

5.3.8.2. `condition delete`
Delete a Condition.

Example: Delete the `mycondition1` Condition from a namespace

```bash
$ tkn condition delete mycondition1 -n myspace
```

5.3.8.3. `condition describe`
Describe a Condition.

Example: Describe the `mycondition1` Condition in a namespace

```bash
$ tkn condition describe mycondition1 -n myspace
```

5.3.8.4. `condition list`
List Conditions.

Example: List Conditions in a namespace

```bash
$ tkn condition list -n myspace
```

5.3.9. Pipeline Resource management commands

5.3.9.1. `resource`
Manage Pipeline Resources.

Example: Display help

```bash
$ tkn resource -h
```

5.3.9.2. `resource create`
Create a Pipeline Resource.

**Example: Create a Pipeline Resource in a namespace**

![command]

$ tkn resource create -n myspace

This is an interactive command that asks for input on the name of the Resource, type of the Resource, and the values based on the type of the Resource.

**5.3.9.3. resource delete**

Delete a Pipeline Resource.

**Example: Delete the myresource Pipeline Resource from a namespace**

![command]

$ tkn resource delete myresource -n myspace

**5.3.9.4. resource describe**

Describe a Pipeline Resource.

**Example: Describe the myresource Pipeline Resource**

![command]

$ tkn resource describe myresource -n myspace

**5.3.9.5. resource list**

List Pipeline Resources.

**Example: List all Pipeline Resources in a namespace**

![command]

$ tkn resource list -n myspace

**5.3.10. ClusterTask management commands**

**5.3.10.1. clustertask**

Manage ClusterTasks.

**Example: Display help**

![command]

$ tkn clustertask --help

**5.3.10.2. clustertask delete**

Delete a ClusterTask resource in a cluster.

**Example: Delete mytask1 and mytask2 ClusterTasks**

![command]

$ tkn clustertask delete mytask1 mytask2
5.3.10.3. clustertask describe
Describe a ClusterTask.

**Example: Describe the mytask ClusterTask**

```bash
$ tkn clustertask describe mytask1
```

5.3.10.4. clustertask list
List ClusterTasks.

**Example: List ClusterTasks**

```bash
$ tkn clustertask list
```

5.3.10.5. clustertask start
Start ClusterTasks.

**Example: Start the mytask ClusterTask**

```bash
$ tkn clustertask start mytask
```

5.3.11. Trigger management commands

5.3.11.1. eventlistener
Manage EventListeners.

**Example: Display help**

```bash
$ tkn eventlistener -h
```

5.3.11.2. eventlistener delete
Delete an EventListener.

**Example: Delete mylistener1 and mylistener2 EventListeners in a namespace**

```bash
$ tkn eventlistener delete mylistener1 mylistener2 -n myspace
```

5.3.11.3. eventlistener describe
Describe an EventListener.

**Example: Describe the mylistener EventListener in a namespace**

```bash
$ tkn eventlistener describe mylistener -n myspace
```
5.3.11.4. eventlistener list
List EventListeners.

Example: List all the EventListeners in a namespace

$ tkn eventlistener list -n myspace

5.3.11.5. eventlistener logs
Display logs of an EventListener.

Example: Display the logs of the mylistener EventListener in a namespace

$ tkn eventlistener logs mylistener -n myspace

5.3.11.6. triggerbinding
Manage TriggerBindings.

Example: Display TriggerBindings help

$ tkn triggerbinding -h

5.3.11.7. triggerbinding delete
Delete a TriggerBinding.

Example: Delete mybinding1 and mybinding2 TriggerBindings in a namespace

$ tkn triggerbinding delete mybinding1 mybinding2 -n myspace

5.3.11.8. triggerbinding describe
Describe a TriggerBinding.

Example: Describe the mybinding TriggerBinding in a namespace

$ tkn triggerbinding describe mybinding -n myspace

5.3.11.9. triggerbinding list
List TriggerBindings.

Example: List all the TriggerBindings in a namespace

$ tkn triggerbinding list -n myspace

5.3.11.10. triggertemplate
Manage TriggerTemplates.

Example: Display TriggerTemplate help

$ tkn triggertemplate -h

5.3.11.11. triggertemplate delete
Delete a TriggerTemplate.

Example: Delete mytemplate1 and mytemplate2 TriggerTemplates in a namespace

$ tkn triggertemplate delete mytemplate1 mytemplate2 -n `myspace`

5.3.11.12. triggertemplate describe
Describe a TriggerTemplate.

Example: Describe the mytemplate TriggerTemplate in a namespace

$ tkn triggertemplate describe mytemplate -n `myspace`

5.3.11.13. triggertemplate list
List TriggerTemplates.

Example: List all the TriggerTemplates in a namespace

$ tkn triggertemplate list -n myspace

5.3.11.14. clustertriggerbinding
Manage ClusterTriggerBindings.

Example: Display ClusterTriggerBindings help

$ tkn clustertriggerbinding -h

5.3.11.15. clustertriggerbinding delete
Delete a ClusterTriggerBinding.

Example: Delete myclusterbinding1 and myclusterbinding2 ClusterTriggerBindings

$ tkn clustertriggerbinding delete myclusterbinding1 myclusterbinding2

5.3.11.16. clustertriggerbinding describe
Describe a ClusterTriggerBinding.
Example: Describe the myclusterbinding ClusterTriggerBinding

$ tkn clustertriggerbinding describe myclusterbinding

5.3.11.17. clustertriggerbinding list

List ClusterTriggerBindings.

Example: List all ClusterTriggerBindings

$ tkn clustertriggerbinding list

5.3.12. Hub interaction commands

Interact with Tekton Hub for resources such as tasks and pipelines.

5.3.12.1. hub

Interact with hub.

Example: Display help

$ tkn hub -h

Example: Interact with a hub API server

$ tkn hub --api-server https://api.hub.tekton.dev

**NOTE**

For each example, to get the corresponding sub-commands and flags, run `tkn hub <command> --help`.

5.3.12.2. hub downgrade

Downgrade an installed resource.

Example: Downgrade the mytask task in the mynamespace namespace to it’s older version

$ tkn hub downgrade task mytask --to version -n mynamespace

5.3.12.3. hub get

Get a resource manifest by its name, kind, catalog, and version.

Example: Get the manifest for a specific version of the myresource pipeline or task from the tekton catalog

$ tkn hub get [pipeline | task] myresource --from tekton --version version
5.3.12.4. hub info
Display information about a resource by its name, kind, catalog, and version.

Example: Display information about a specific version of the mytask task from the tekton catalog

$$ tkn hub info task mytask --from tekton --version version $$

5.3.12.5. hub install
Install a resource from a catalog by its kind, name, and version.

Example: Install a specific version of the mytask task from the tekton catalog in the mynamespace namespace

$$ tkn hub install task mytask --from tekton --version version -n mynamespace $$

5.3.12.6. hub reinstall
Reinstall a resource by its kind and name.

Example: Reinstall a specific version of the mytask task from the tekton catalog in the mynamespace namespace

$$ tkn hub reinstall task mytask --from tekton --version version -n mynamespace $$

5.3.12.7. hub search
Search a resource by a combination of name, kind, and tags.

Example: Search a resource with a tag cli

$$ tkn hub search --tags cli $$

5.3.12.8. hub upgrade
Upgrade an installed resource.

Example: Upgrade the installed mytask task in the mynamespace namespace to a new version

$$ tkn hub upgrade task mytask --to version -n mynamespace $$
6.1. INSTALLING THE OPM CLI

6.1.1. About the opm CLI

The **opm** CLI tool is provided by the Operator Framework for use with the Operator bundle format. This tool allows you to create and maintain catalogs of Operators from a list of Operator bundles that are similar to software repositories. The result is a container image which can be stored in a container registry and then installed on a cluster.

A catalog contains a database of pointers to Operator manifest content that can be queried through an included API that is served when the container image is run. On OpenShift Container Platform, Operator Lifecycle Manager (OLM) can reference the image in a catalog source, defined by a **CatalogSource** object, which polls the image at regular intervals to enable frequent updates to installed Operators on the cluster.

**Additional resources**

- See [Operator Framework packaging format](#) for more information about the bundle format.
- To create a bundle image using the Operator SDK, see [Working with bundle images](#).

6.1.2. Installing the opm CLI

You can install the **opm** CLI tool on your Linux, macOS, or Windows workstation.

**Prerequisites**

- For Linux, you must provide the following packages. RHEL 8 meets these requirements:
  - **podman** version 1.9.3+ (version 2.0+ recommended)
  - **glibc** version 2.28+

**Procedure**

1. Navigate to the [OpenShift mirror site](#) and download the latest version of the tarball that matches your operating system.
2. Unpack the archive.
   - For Linux or macOS:
     ```
     $ tar xvf <file>
     ```
   - For Windows, unzip the archive with a ZIP program.
3. Place the file anywhere in your **PATH**.
   - For Linux or macOS:
     ```
     a. Check your **PATH**:
     ```
Move the file. For example:

```
$ sudo mv ./opm /usr/local/bin/
```

For Windows:

a. Check your **PATH**:

```
C:\> path
```

b. Move the file:

```
C:\> move opm.exe <directory>
```

### Verification

- After you install the **opm** CLI, verify that it is available:

```
$ opm version
```

**Example output**

```
Version: version.Version{OpmVersion:"v1.18.0", GitCommit:"32eb2591437e394bdc58a58371c5cd1e6fe5e63f", BuildDate:"2021-09-21T10:41:00Z", GoOs:"linux", GoArch:"amd64"}
```

### 6.1.3. Additional resources

- See [Managing custom catalogs](#) for **opm** procedures including creating, updating, and pruning catalogs.

### 6.2. OPM CLI REFERENCE

The **opm** command-line interface (CLI) is a tool for creating and maintaining Operator catalogs.

**opm CLI syntax**

```
$ opm <command> [<subcommand>] [<argument>] [<flags>]
```

**Table 6.1. Global flags**

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>--skip-tls</code></td>
<td>Skip TLS certificate verification for container image registries while pulling bundles or indexes.</td>
</tr>
</tbody>
</table>
The SQLite-based catalog format, including the related CLI commands, is a deprecated feature. Deprecated functionality is still included in OpenShift Container Platform and continues to be supported; however, it will be removed in a future release of this product and is not recommended for new deployments.

For the most recent list of major functionality that has been deprecated or removed within OpenShift Container Platform, refer to the Deprecated and removed features section of the OpenShift Container Platform release notes.

6.2.1. index

Generate Operator index container images from pre-existing Operator bundles.

Command syntax

```
$ opm index <subcommand> [<flags>]
```

Table 6.2. index subcommands

<table>
<thead>
<tr>
<th>Subcommand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>add</td>
<td>Add Operator bundles to an index.</td>
</tr>
<tr>
<td>export</td>
<td>Export an Operator from an index in the appregistry format.</td>
</tr>
<tr>
<td>prune</td>
<td>Prune an index of all but specified packages.</td>
</tr>
<tr>
<td>prune-stranded</td>
<td>Prune an index of stranded bundles, which are bundles that are not associated with a particular image.</td>
</tr>
<tr>
<td>rm</td>
<td>Delete an entire Operator from an index.</td>
</tr>
</tbody>
</table>

6.2.1.1. add

Add Operator bundles to an index.

Command syntax

```
$ opm index add [<flags>]
```

Table 6.3. index add flags

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-i, --binary-image</td>
<td>Container image for on-image opm command</td>
</tr>
<tr>
<td>-u, --build-tool</td>
<td>Tool to build container images: podman (the default value) or docker.</td>
</tr>
<tr>
<td></td>
<td>Overrides part of the --container-tool flag.</td>
</tr>
</tbody>
</table>
Flag | Description
---|---
-b, --bundles (strings) | Comma-separated list of bundles to add.
-c, --container-tool (string) | Tool to interact with container images, such as for saving and building: docker or podman.
-f, --from-index (string) | Previous index to add to.
--generate | If enabled, only creates the Dockerfile and saves it to local disk.
--mode (string) | Graph update mode that defines how channel graphs are updated: replaces (the default value), semver, or semver-skippatch.
-d, --out-dockerfile (string) | Optional: If generating the Dockerfile, specify a file name.
--permissive | Allow registry load errors.
-p, --pull-tool (string) | Tool to pull container images: none (the default value), docker, or podman. Overrides part of the --container-tool flag.
-t, --tag (string) | Custom tag for container image being built.

6.2.1.2. export

Export an Operator from an index in the appregistry format.

Command syntax

$ opm index export [<flags>]

Table 6.4. index export flags

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-i, --index (string)</td>
<td>Index to get the packages from.</td>
</tr>
<tr>
<td>-f, --download-folder (string)</td>
<td>Directory where the downloaded Operator bundles are stored. The default directory is downloaded.</td>
</tr>
<tr>
<td>-c, --container-tool (string)</td>
<td>Tool to interact with container images, such as for saving and building: docker or podman.</td>
</tr>
<tr>
<td>-h, --help</td>
<td>Help for the export command.</td>
</tr>
<tr>
<td>-p, --package (string)</td>
<td>Comma-separated list of packages to export.</td>
</tr>
</tbody>
</table>
6.2.1.3. prune

Prune an index of all but specified packages.

Command syntax

```
$ opm index prune [<flags>]
```

Table 6.5. index prune flags

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-i, --binary-image</td>
<td>Container image for on-image <strong>opm</strong> command</td>
</tr>
<tr>
<td>-c, --container-tool</td>
<td>Tool to interact with container images, such as for saving and building: <strong>docker</strong> or <strong>podman</strong>.</td>
</tr>
<tr>
<td>-f, --from-index</td>
<td>Index to prune.</td>
</tr>
<tr>
<td>--generate</td>
<td>If enabled, only creates the Dockerfile and saves it to local disk.</td>
</tr>
<tr>
<td>-d, --out-dockerfile</td>
<td>Optional: If generating the Dockerfile, specify a file name.</td>
</tr>
<tr>
<td>-p, --packages</td>
<td>Comma-separated list of packages to keep.</td>
</tr>
<tr>
<td>--permissive</td>
<td>Allow registry load errors.</td>
</tr>
<tr>
<td>-t, --tag</td>
<td>Custom tag for container image being built.</td>
</tr>
</tbody>
</table>

6.2.1.4. prune-stranded

Prune an index of stranded bundles, which are bundles that are not associated with a particular image.

Command syntax

```
$ opm index prune-stranded [<flags>]
```

Table 6.6. index prune-stranded flags

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-i, --binary-image</td>
<td>Container image for on-image <strong>opm</strong> command</td>
</tr>
<tr>
<td>-c, --container-tool</td>
<td>Tool to interact with container images, such as for saving and building: <strong>docker</strong> or <strong>podman</strong>.</td>
</tr>
<tr>
<td>Flag</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>-f, --from-index (string)</td>
<td>Index to prune.</td>
</tr>
<tr>
<td>--generate</td>
<td>If enabled, only creates the Dockerfile and saves it to local disk.</td>
</tr>
<tr>
<td>-d, --out-dockerfile (string)</td>
<td>Optional: If generating the Dockerfile, specify a file name.</td>
</tr>
<tr>
<td>--permissive</td>
<td>Allow registry load errors.</td>
</tr>
<tr>
<td>-t, --tag (string)</td>
<td>Custom tag for container image being built.</td>
</tr>
</tbody>
</table>

### 6.2.1.5. rm

Delete an entire Operator from an index.

**Command syntax**

```
$ opm index rm [flags]
```

**Table 6.7. index rm flags**

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-i, --binary-image</td>
<td>Container image for on-image <em>opm</em> command</td>
</tr>
<tr>
<td>-u, --build-tool     (string)</td>
<td>Tool to build container images: <em>podman</em> (the default value) or <em>docker</em>.</td>
</tr>
<tr>
<td></td>
<td>Overrides part of the --container-tool flag.</td>
</tr>
<tr>
<td>-c, --container-tool (string)</td>
<td>Tool to interact with container images, such as for saving and building: <em>docker</em> or <em>podman</em>.</td>
</tr>
<tr>
<td>-f, --from-index     (string)</td>
<td>Previous index to delete from.</td>
</tr>
<tr>
<td>--generate</td>
<td>If enabled, only creates the Dockerfile and saves it to local disk.</td>
</tr>
<tr>
<td>-o, --operators      (strings)</td>
<td>Comma-separated list of Operators to delete.</td>
</tr>
<tr>
<td>-d, --out-dockerfile (string)</td>
<td>Optional: If generating the Dockerfile, specify a file name.</td>
</tr>
<tr>
<td>--permissive</td>
<td>Allow registry load errors.</td>
</tr>
</tbody>
</table>
Tool to pull container images: **none** (the default value), **docker**, or **podman**. Overrides part of the **--container-tool** flag.

**-t, --tag** (string)
Custom tag for container image being built.

### 6.2.2. init

Generate an **olm.package** declarative config blob.

**Command syntax**

```
$ opm init <package_name> [flags]
```

**Table 6.8. init flags**

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>-c, --default-channel</strong> (string)</td>
<td>The channel that subscriptions will default to if unspecified.</td>
</tr>
<tr>
<td><strong>-d, --description</strong> (string)</td>
<td>Path to the Operator’s <strong>README.md</strong> or other documentation.</td>
</tr>
<tr>
<td><strong>-i, --icon</strong> (string)</td>
<td>Path to package’s icon.</td>
</tr>
<tr>
<td><strong>-o, --output</strong> (string)</td>
<td>Output format: <strong>json</strong> (the default value) or <strong>yaml</strong>.</td>
</tr>
</tbody>
</table>

### 6.2.3. render

Generate a declarative config blob from the provided index images, bundle images, and SQLite database files.

**Command syntax**

```
$ opm render <index_image | bundle_image | sqlite_file> [flags]
```

**Table 6.9. render flags**

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>-o, --output</strong> (string)</td>
<td>Output format: <strong>json</strong> (the default value) or <strong>yaml</strong>.</td>
</tr>
</tbody>
</table>

### 6.2.4. validate

Validate the declarative config JSON file(s) in a given directory.
6.2.5. serve

Serve declarative configs via a GRPC server.

**NOTE**

The declarative config directory is loaded by the `serve` command at startup. Changes made to the declarative config after this command starts are not reflected in the served content.

Command syntax

```bash
$ opm validate <directory> [flags]
```

Command syntax

```bash
$ opm serve <source_path> [flags]
```

### Table 6.10. serve flags

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>--debug</code></td>
<td>Enable debug logging.</td>
</tr>
<tr>
<td><code>-p, --port (string)</code></td>
<td>Port number to serve on. Default: 50051.</td>
</tr>
<tr>
<td><code>-t, --termination-log (string)</code></td>
<td>Path to a container termination log file. Default: /dev/termination-log.</td>
</tr>
</tbody>
</table>
7.1. INSTALLING THE OPERATOR SDK CLI

The Operator SDK provides a command-line interface (CLI) tool that Operator developers can use to build, test, and deploy an Operator. You can install the Operator SDK CLI on your workstation so that you are prepared to start authoring your own Operators.

Operator authors with cluster administrator access to a Kubernetes-based cluster, such as OpenShift Container Platform, can use the Operator SDK CLI to develop their own Operators based on Go, Ansible, or Helm. Kubebuilder is embedded into the Operator SDK as the scaffolding solution for Go-based Operators, which means existing Kubebuilder projects can be used as is with the Operator SDK and continue to work.

See Developing Operators for full documentation on the Operator SDK.

NOTE

OpenShift Container Platform 4.9 and later supports Operator SDK v1.10.1.

7.1.1. Installing the Operator SDK CLI

You can install the OpenShift SDK CLI tool on Linux.

Prerequisites

- **Go** v1.16+
- **docker** v17.03+, **podman** v1.9.3+, or **buildah** v1.7+

Procedure

1. Navigate to the OpenShift mirror site.
2. From the latest 4.9.0 directory, download the latest version of the tarball for Linux.
3. Unpack the archive:
   
   $ tar xvf operator-sdk-v1.10.1-ocp-linux-x86_64.tar.gz

4. Make the file executable:
   
   $ chmod +x operator-sdk

5. Move the extracted **operator-sdk** binary to a directory that is on your **PATH**.

**TIP**

To check your **PATH**:

$ echo $PATH
Verifying

- After you install the Operator SDK CLI, verify that it is available:

  ```bash
  $ operator-sdk version
  ```

**Example output**

- `operator-sdk version: "v1.10.1-ocp", ...

## 7.2. OPERATOR SDK CLI REFERENCE

The Operator SDK command-line interface (CLI) is a development kit designed to make writing Operators easier.

### Operator SDK CLI syntax

```bash
$ operator-sdk <command> [subcommand] [argument] [flags]
```

See [Developing Operators](#) for full documentation on the Operator SDK.

### 7.2.1. bundle

The **operator-sdk bundle** command manages Operator bundle metadata.

#### 7.2.1.1. validate

The **bundle validate** subcommand validates an Operator bundle.

**Table 7.1. bundle validate flags**

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-h, --help</code></td>
<td>Help output for the <strong>bundle validate</strong> subcommand.</td>
</tr>
<tr>
<td><code>--index-builder</code></td>
<td>Tool to pull and unpack bundle images. Only used when validating a bundle image. Available options are <strong>docker</strong>, which is the default, <strong>podman</strong>, or <strong>none</strong>.</td>
</tr>
<tr>
<td><code>--list-optional</code></td>
<td>List all optional validators available. When set, no validators are run.</td>
</tr>
<tr>
<td><code>--select-optional</code></td>
<td>Label selector to select optional validators to run. When run with the <code>--list-optional</code> flag, lists available optional validators.</td>
</tr>
</tbody>
</table>

### 7.2.2. cleanup

The **operator-sdk cleanup** command destroys and removes resources that were created for an Operator that was deployed with the **run** command.
Table 7.2. cleanup flags

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-h, --help</td>
<td>Help output for the run bundle subcommand.</td>
</tr>
<tr>
<td>--kubeconfig</td>
<td>Path to the kubeconfig file to use for CLI requests.</td>
</tr>
<tr>
<td>n, --namespace</td>
<td>If present, namespace in which to run the CLI request.</td>
</tr>
<tr>
<td>--timeout &lt;duration&gt;</td>
<td>Time to wait for the command to complete before failing. The default value is 2m0s.</td>
</tr>
</tbody>
</table>

7.2.3. completion

The operator-sdk completion command generates shell completions to make issuing CLI commands quicker and easier.

Table 7.3. completion subcommands

<table>
<thead>
<tr>
<th>Subcommand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bash</td>
<td>Generate bash completions.</td>
</tr>
<tr>
<td>zsh</td>
<td>Generate zsh completions.</td>
</tr>
</tbody>
</table>

Table 7.4. completion flags

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-h, --help</td>
<td>Usage help output.</td>
</tr>
</tbody>
</table>

For example:

$ operator-sdk completion bash

Example output

```
# bash completion for operator-sdk   -*- shell-script -*
...# ex: ts=4 sw=4 et filetype=sh
```

7.2.4. create

The operator-sdk create command is used to create, or scaffold, a Kubernetes API.

7.2.4.1. api
The **create api** subcommand scaffolds a Kubernetes API. The subcommand must be run in a project that was initialized with the **init** command.

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>-h, --help</code></td>
<td>Help output for the <strong>run bundle</strong> subcommand.</td>
</tr>
</tbody>
</table>

### 7.2.5. generate

The **operator-sdk generate** command invokes a specific generator to generate code or manifests.

#### 7.2.5.1. bundle

The **generate bundle** subcommand generates a set of bundle manifests, metadata, and a **bundle.Dockerfile** file for your Operator project.

**NOTE**

Typically, you run the **generate kustomize manifests** subcommand first to generate the input Kustomize bases that are used by the **generate bundle** subcommand. However, you can use the **make bundle** command in an initialized project to automate running these commands in sequence.

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>--channels</code> (string)</td>
<td>Comma-separated list of channels to which the bundle belongs. The default value is <strong>alpha</strong>.</td>
</tr>
<tr>
<td><code>--crds-dir</code> (string)</td>
<td>Root directory for <strong>CustomResoureDefinition</strong> manifests.</td>
</tr>
<tr>
<td><code>--default-channel</code> (string)</td>
<td>The default channel for the bundle.</td>
</tr>
<tr>
<td><code>--deploy-dir</code> (string)</td>
<td>Root directory for Operator manifests, such as deployments and RBAC. This directory is different from the directory passed to the <code>--input-dir</code> flag.</td>
</tr>
<tr>
<td><code>-h, --help</code></td>
<td>Help for <strong>generate bundle</strong></td>
</tr>
<tr>
<td><code>--input-dir</code> (string)</td>
<td>Directory from which to read an existing bundle. This directory is the parent of your bundle <strong>manifests</strong> directory and is different from the <code>--deploy-dir</code> directory.</td>
</tr>
<tr>
<td><code>--kustomize-dir</code> (string)</td>
<td>Directory containing Kustomize bases and a <strong>kustomization.yaml</strong> file for bundle manifests. The default path is <strong>config/manifests</strong>.</td>
</tr>
<tr>
<td><code>--manifests</code> (string)</td>
<td>Generate bundle manifests.</td>
</tr>
</tbody>
</table>
Flag | Description
--- | ---
--metadata | Generate bundle metadata and Dockerfile.
--output-dir (string) | Directory to write the bundle to.
--overwrite | Overwrite the bundle metadata and Dockerfile if they exist. The default value is true.
--package (string) | Package name for the bundle.
-q --quiet | Run in quiet mode.
--stdout | Write bundle manifest to standard out.
--version (string) | Semantic version of the Operator in the generated bundle. Set only when creating a new bundle or upgrading the Operator.

Additional resources
- See Bundling an Operator and deploying with Operator Lifecycle Manager for a full procedure that includes using the make bundle command to call the generate bundle subcommand.

7.2.5.2. kustomize

The generate kustomize subcommand contains subcommands that generate Kustomize data for the Operator.

7.2.5.2.1. manifests

The generate kustomize manifests subcommand generates or regenerates Kustomize bases and a kustomization.yaml file in the config/manifests directory, which are used to build bundle manifests by other Operator SDK commands. This command interactively asks for UI metadata, an important component of manifest bases, by default unless a base already exists or you set the --interactive=false flag.

Table 7.7. generate kustomize manifests flags

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--apis-dir (string)</td>
<td>Root directory for API type definitions.</td>
</tr>
<tr>
<td>-h, --help</td>
<td>Help for generate kustomize manifests.</td>
</tr>
<tr>
<td>--input-dir (string)</td>
<td>Directory containing existing Kustomize files.</td>
</tr>
<tr>
<td>--interactive</td>
<td>When set to false, if no Kustomize base exists, an interactive command prompt is presented to accept custom metadata.</td>
</tr>
<tr>
<td>Flag</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>--output-dir</td>
<td>Directory where to write Kustomize files.</td>
</tr>
<tr>
<td>--package</td>
<td>Package name.</td>
</tr>
<tr>
<td>-q, --quiet</td>
<td>Run in quiet mode.</td>
</tr>
</tbody>
</table>

7.2.6. init

The `operator-sdk init` command initializes an Operator project and generates, or scaffolds, a default project directory layout for the given plug-in.

This command writes the following files:

- Boilerplate license file
- `PROJECT` file with the domain and repository
- `Makefile` to build the project
- `go.mod` file with project dependencies
- `kustomization.yaml` file for customizing manifests
- Patch file for customizing images for manager manifests
- Patch file for enabling Prometheus metrics
- `main.go` file to run

Table 7.8. init flags

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--help, -h</td>
<td>Help output for the init command.</td>
</tr>
<tr>
<td>--plugins</td>
<td>Name and optionally version of the plug-in to initialize the project with. Available plug-ins are ansible.sdk.operatorframework.io/v1, go.kubebuilder.io/v2, go.kubebuilder.io/v3, and helm.sdk.operatorframework.io/v1.</td>
</tr>
<tr>
<td>--project-version</td>
<td>Project version. Available values are 2 and 3-alpha, which is the default.</td>
</tr>
</tbody>
</table>

7.2.7. run

The `operator-sdk run` command provides options that can launch the Operator in various environments.

7.2.7.1. bundle
The **run bundle** subcommand deploys an Operator in the bundle format with Operator Lifecycle Manager (OLM).

### Table 7.9. run bundle flags

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--index-image (string)</td>
<td>Index image in which to inject a bundle. The default image is <code>quay.io/operator-framework/upstream-opm-builder:latest</code>.</td>
</tr>
<tr>
<td>--install-mode</td>
<td>Install mode supported by the cluster service version (CSV) of the Operator, for example <code>AllNamespaces</code> or <code>SingleNamespace</code>.</td>
</tr>
<tr>
<td>--timeout &lt;duration&gt;</td>
<td>Install timeout. The default value is <code>2m0s</code>.</td>
</tr>
<tr>
<td>--kubeconfig (string)</td>
<td>Path to the <code>kubeconfig</code> file to use for CLI requests.</td>
</tr>
<tr>
<td>n. --namespace (string)</td>
<td>If present, namespace in which to run the CLI request.</td>
</tr>
<tr>
<td>-h, --help</td>
<td>Help output for the <strong>run bundle</strong> subcommand.</td>
</tr>
</tbody>
</table>

#### Additional resources

- See [Operator group membership](#) for details on possible install modes.

### 7.2.7.2. bundle-upgrade

The **run bundle-upgrade** subcommand upgrades an Operator that was previously installed in the bundle format with Operator Lifecycle Manager (OLM).

### Table 7.10. run bundle-upgrade flags

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--timeout &lt;duration&gt;</td>
<td>Upgrade timeout. The default value is <code>2m0s</code>.</td>
</tr>
<tr>
<td>--kubeconfig (string)</td>
<td>Path to the <code>kubeconfig</code> file to use for CLI requests.</td>
</tr>
<tr>
<td>n. --namespace (string)</td>
<td>If present, namespace in which to run the CLI request.</td>
</tr>
<tr>
<td>-h, --help</td>
<td>Help output for the <strong>run bundle</strong> subcommand.</td>
</tr>
</tbody>
</table>

### 7.2.8. scorecard

The **operator-sdk scorecard** command runs the scorecard tool to validate an Operator bundle and provide suggestions for improvements. The command takes one argument, either a bundle image or directory containing manifests and metadata. If the argument holds an image tag, the image must be
present remotely.

### Table 7.11. scorecard flags

<table>
<thead>
<tr>
<th>Flag</th>
<th>Description</th>
</tr>
</thead>
</table>
| -c, --config (string) | Path to scorecard configuration file. The default path is
|                       | `bundle/tests/scorecard/config.yaml`.                                        |
| -h, --help            | Help output for the scorecard command.                                       |
| --kubeconfig (string) | Path to kubeconfig file.                                                    |
| -L, --list            | List which tests are available to run.                                      |
| -n, --namespace (string) | Namespace in which to run the test images.                                 |
| -o, --output (string) | Output format for results. Available values are text, which is the default, and json. |
| -l, --selector (string) | Label selector to determine which tests are run.                           |
| -s, --service-account (string) | Service account to use for tests. The default value is default.       |
| -x, --skip-cleanup    | Disable resource cleanup after tests are run.                              |
| -w, --wait-time <duration> | Seconds to wait for tests to complete, for example 35s. The default value is 30s. |

### Additional resources

- See [Validating Operators using the scorecard tool](#) for details about running the scorecard tool.