OpenShift Container Platform 3.9

Ansible Playbook Bundle Development Guide

Developing with Ansible Playbook Bundle (APB)
Developing with Ansible Playbook Bundle (APB)
Abstract

This guide outlines the design concepts and workflow of APB
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CHAPTER 1. INTRODUCTION

1.1. ABOUT THIS GUIDE

This guide outlines the design concepts and workflow of Ansible Playbook Bundles (APBs), shows how to install and use the `apb` CLI tooling, and provides a tutorial and reference material on writing your own APBs.

1.2. DESIGN OVERVIEW

An APB is a lightweight application definition that borrows several concepts from the Nulecule and Atomicapp projects, namely the concept of a short-lived container with the sole purpose of orchestrating the deployment of the intended application. For the case of APBs, this short-lived container is the APB itself: a container with an Ansible runtime environment plus any files required to assist in orchestration, such as playbooks, roles, and extra dependencies.

The OpenShift Ansible broker (OAB) is an implementation of the Open Service Broker (OSB) API that manages applications defined by APBs. The OAB is supported and deployed by default starting in OpenShift Container Platform 3.7.

Specification of an APB is intended to be lightweight, consisting of several named playbooks and a metadata file to capture information such as parameters to pass into the application.

1.3. WORKFLOW

The APB workflow is broken up into the following steps:

1. Preparation
   a. APB initialization
   b. APB spec file
   c. Actions (provision, deprovision, bind, unbind)

2. Build

3. Deploy

1.3.1. Preparation

You must prepare your APB’s directory structure and spec file before you can build and deploy it. The Getting Started topic provides a step by step tutorial on creating your first APB, while the following sections briefly cover this workflow.

1.3.1.1. APB Initialization

The `apb init` command creates the required skeleton directory structure and a few required files (for example, the `apb.yml` spec file) for the APB.

The following shows an example directory structure of an APB:

Directory Structure
example-apb/
├── Dockerfile
├── apb.yml
├── roles/
│   └── example-apb-openshift
│       ├── defaults
│       │   └── main.yml
│       └── tasks
│           └── main.yml
└── playbooks/
    └── provision.yml
    └── deprovision.yml
    └── bind.yml
    └── unbind.yml

1.3.1.2. APB Spec File

An APB spec file (apb.yml) must be edited for your specific application. For example, the default spec file after running `apb init` looks as follows:

```yaml
version: 1.0
name: my-test-apb
description: This is a sample application generated by apb init
bindable: False
async: optional
metadata:
  displayName: my-test
plans:
  - name: default
description: This default plan deploys my-test-apb
free: True
metadata: {}
parameters: []
```

1. The `metadata` field is optional and used when integrating with the OpenShift Container Platform service catalog.

2. For APBs that do not have any parameters, the `parameters` field should be blank.

NOTE

See the Reference topic for a fully-defined example APB spec file.

1.3.1.3. Actions

The following are the actions for an APB. At a minimum, an APB must implement the provision and deprovision actions:

`provision.yml`

Playbook called to handle installing application to the cluster.

`deprovision.yml`

Playbook called to handle uninstalling.
**bind.yml**

Playbook to grant access to another service to use this service, such as generating credentials.

**unbind.yml**

Playbook to revoke access to this service.

**test.yml**

(Optional) Playbook to test that the APB is valid.

The required named playbooks correspond to methods defined by the OSB API. For example, when the OAB needs to provision an APB it will execute *provision.yml*.

After the required named playbooks have been generated, the files can be used directly to test management of the application. A developer may want to work with this directory of files, make tweaks, run, repeat until they are happy with the behavior. They can test the playbooks by invoking Ansible directly with the playbook and any required variables.

### 1.3.2. Build

The build step is responsible for building a container image from the named playbooks for distribution. Packaging combines a base image containing an Ansible runtime with Ansible artifacts and any dependencies required to run the playbooks.

The result is a container image with an **ENTRYPOINT** set to take in several arguments, one of which is the method to execute, such as provision and deprovision.

![Figure 1.1. APB Build](openshift_463015_117)

### 1.3.3. Deploy

Deploying an APB means invoking the container and passing in the name of the playbook to execute along with any required variables. It is possible to invoke the APB directly without going through the OAB. Each APB is packaged so its **ENTRYPOINT** will invoke Ansible when run. The container is intended to be short-lived, coming up to execute the Ansible playbook for managing the application then exiting.

In a typical APB deploy, the APB container will provision an application by running the *provision.yml* playbook, which executes an Ansible role. The role is responsible for creating the OpenShift Container Platform resources, perhaps through calling `oc create` commands or leveraging Ansible modules. The end result is that the APB runs Ansible to talk to OpenShift Container Platform to orchestrate the provisioning of the intended application.

The following diagrams illustrate this deployment flow in two phases: a user discovering a list of available APBs and then requesting their chosen APB be provisioned to their project:
An OpenShift Container Platform user is interested in provisioning a service into their project, so they interact with the service catalog by accessing the OpenShift Container Platform UI (web console or CLI) to discover any APBs that are already available.

The service catalog requests a list of APBs from the OAB to show the user.

The OAB searches all configured container registries (the cluster’s OpenShift Container Registry or any other remote registry) for any APBs (images with a specific label, for example `LABEL=apb-1.0`).

The OAB returns the discovered list to the service catalog, to be viewed by the user in the OpenShift Container Platform UI.
The user now chooses an APB from the discovered list provided by the service catalog.

The service catalog communicates with the OAB that the user has requested use of the chosen APB.

The OAB initiates the image pull from the appropriate container registry.

After the image is pulled, the OAB defers the logic for orchestrating the application to the APB. The service is deployed by running the APB container with a few parameters. To do so, the following command is issued against the OpenShift Container Platform cluster in a temporary namespace:

```bash
$ oc run $IMAGE $METHOD $VARS ansible-playbook ${METHOD}.yaml ${VARS}
```

To break this command down further:

1. The `oc run` command runs the APB image.

2. In the short-lived container that is created as a result, Ansible is launched using the `ansible-playbook` command, which runs the appropriate playbook (for example, `provision.yaml`) to execute the requested action. This creates OpenShift Container Platform resources in the user’s project.

3. The container exits at the end of the run, and the temporary namespace is removed.
As a result, the user views via the OpenShift Container Platform UI that their requested service has been successfully provisioned in their project.
CHAPTER 2. CLI TOOLING

2.1. OVERVIEW

The `apb` CLI tool helps Ansible Playbook Bundle (APB) authors create, build, and publish their APBs to container registries. It enforces best practices and takes care of the details so they should be easy to deploy.

2.2. INSTALLING THE TOOL

2.2.1. Prerequisites

2.2.1.1. Docker Daemon

The `docker` daemon must be correctly installed and running on the system.

2.2.1.2. Access Permissions

The `apb` tool requires you to be logged in as a tokened cluster user; the default `system:admin` system user is not sufficient because it does not have a token that can be used for the tool’s authentication. In addition, there are a number of local roles (project-scoped) and cluster roles (cluster-wide) that must exist to permit the full breadth of the `apb` tool’s functions (see Cluster and Local RBAC).

The easiest option is to ensure the user has the `cluster-admin` cluster role. To add this role to another user, you can run the following as a user that already has such permissions (for example, the `system:admin` default system user):

```bash
$ oc adm policy add-cluster-role-to-user cluster-admin <user>
$ oc login -u <user> <openshift_server>
```

If you would like a more strictly permissioned environment, an OpenShift template is provided that by default will permission a user called `developer`. The template must be run by a user with sufficient permissions to create the various roles. The `developer` user does not have such permissions, but the `system:admin` user is sufficient.

To run the template:

1. Download the `openshift-permissions.template.yaml` file locally.
2. Run the following command:

   ```bash
   $ oc process -f openshift-permissions.template.yaml \\   -p BROKER_NAMESPACE=openshift-ansible-service-broker \\   ```

   WARNING
   
   This is effectively cluster root and should only be used in a development setting.
By default, the template will permission the developer user. You can optionally use the -p flag to override this default value with your desired user.

2.2.2. Installing via RPM

The APB CLI tool is provided by the apb package, which is available from the rhel-7-server-ose-3.7-rpms channel:

$ sudo yum install apb

2.2.3. Verifying the Installation

Run apb help to make sure the tool is installed correctly:

$ apb help
usage: apb [-h] [--debug] [--project BASE_PATH]
{init,help,prepare,push,bootstrap,list,remove,build} ...

APB tooling for assisting in building and packaging APBs.

optional arguments:
  -h, --help            show this help message and exit
  --debug               Enable debug output
  --project BASE_PATH, -p BASE_PATH
                        Specify a path to your project. Defaults to CWD.

subcommand:
{init,help,prepare,push,bootstrap,list,remove,build}
  init                Initialize the directory for APB development
  help                Display this help message
  prepare             Prepare an ansible-container project for APB
  packaging
    push               Push local APB spec to an OAB
    bootstrap          Tell OAB to reload APBs from the
                        container repository
    list               List APBs from the target OAB
    remove             Remove APBs from the target OAB
    build              Build and package APB container

2.3. TYPICAL WORKFLOWS

2.3.1. Local Registry

In order to use the OpenShift Container Registry to source APBs, you must have configured the OpenShift Ansible broker to use the local_openshift type registry adapter. See the config section for more information.
$ apb init my-new-apb
$ cd my-new-apb
$ apb build
$ apb push
$ apb list

If you are using a namespace other than the default `openshift` namespace to host your APBs, then you can use the following command:

$ apb push --namespace <namespace>

### 2.3.2. Remote Registry

OAB can also be configured to use a remote registry and organization such as `docker.io/ansibleplaybookbundle` or your own personal account. In order to use this for developing APBs, you can build and push to your remote registry and then `bootstrap` to reload your APBs:

$ apb init my-new-apb
$ cd my-new-apb
$ apb build --tag docker.io/my-org/my-new-apb
$ docker push docker.io/my-org/my-new-apb
$ apb bootstrap
$ apb list

### 2.4. APB CREATION COMMANDS

#### 2.4.1. init

**Description**

Initializes a directory structure for a new APB. Also creates example files for the new APB with sensible defaults.

**Usage**

$ apb init [OPTIONS] NAME

**Arguments**

**NAME:** Name of the APB and directory to be created.

**Options**

<table>
<thead>
<tr>
<th>Option, Shorthand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--help, -h</td>
<td>Show help message</td>
</tr>
<tr>
<td>--force</td>
<td>Force re-init and overwrite the directory</td>
</tr>
<tr>
<td>--async {required,optional,unsupported}</td>
<td>Specify asynchronous operation on application. Usually defaulted to <code>optional</code>.</td>
</tr>
<tr>
<td>--bindable</td>
<td>Generate an application with bindable settings</td>
</tr>
<tr>
<td>Option, Shorthand</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>--skip-provision</td>
<td>Do not generate provision playbook and role</td>
</tr>
<tr>
<td>--skip-deprovision</td>
<td>Do not generate deprovision playbook and role</td>
</tr>
<tr>
<td>--skip-bind</td>
<td>Do not generate bind playbook and role</td>
</tr>
<tr>
<td>--skip-unbind</td>
<td>Do not generate unbind playbook and role</td>
</tr>
<tr>
<td>--skip-roles</td>
<td>Do not generate any roles</td>
</tr>
</tbody>
</table>

**NOTE**

Async bind and unbind is an experimental feature and is not supported or enabled by default.

**Examples**

Create directory *my-new-apb*:

```bash
$ apb init my-new-apb
# my-new-apb/
# ├── apb.yml
# ├── Dockerfile
# ├── playbooks
# │   ├── deprovision.yml
# │   └── provision.yml
# ├── roles
# │   ├── deprovision-my-new-apb
# │       └── tasks
# │           └── main.yml
# │   └── provision-my-new-apb
#       └── tasks
#           └── main.yml
```

Create directory *my-new-apb*, but skip generating deprovision playbook and roles:

```bash
$ apb init my-new-apb --skip-deprovision
# my-new-apb/
# ├── apb.yml
# ├── Dockerfile
# ├── playbooks
# │   ├── provision.yml
# └── roles
#     └── provision-my-new-apb
#         └── tasks
#             └── main.yml
```

Create directory *my-new-apb*, overwriting any old versions. The APB will be configured to be bindable and set async to optional:
2.4.2. prepare

**Description**
Compiles the APB into base64 encoding and writes it as a label to the Dockerfile.

This will allow the OAB to read the APB metadata from the registry without downloading the images. This command must be run from inside the APB directory. Running the build command will automatically run prepare as well, meaning you generally do not need to run prepare by itself.

**Usage**

$ apb prepare [OPTIONS]

**Options**

<table>
<thead>
<tr>
<th>Option, Shorthand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--help, -h</td>
<td>Show help message</td>
</tr>
<tr>
<td>--dockerfile DOCKERFILE, -f DOCKERFILE</td>
<td>Writes the APB spec to the target file name instead of a file named Dockerfile</td>
</tr>
</tbody>
</table>

**Examples**

Writes the label for the spec field in the Dockerfile:

$ apb prepare

Writes the label for the spec field in Dockerfile-custom:

$ apb prepare --dockerfile Dockerfile-custom
2.4.3. build

Description
Builds the image for the APB.

Similar to running `apb prepare` and `docker build` with a tag.

Usage

```
$ apb build [OPTIONS]
```

Options

<table>
<thead>
<tr>
<th>Option, Shorthand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--help, -h</td>
<td>Show help message</td>
</tr>
<tr>
<td>--tag TAG</td>
<td>Sets the tag of the built image to a string in the format <code>&lt;registry&gt;/&lt;org&gt;/&lt;name&gt;</code></td>
</tr>
<tr>
<td>--registry</td>
<td>Registry portion of the tag of the image (e.g., <code>docker.io</code>)</td>
</tr>
<tr>
<td>--org, -o</td>
<td>User or organization portion of the tag of the image</td>
</tr>
</tbody>
</table>

Examples

Build the image and use the name field from `apb.yml` as the tag:

```
$ apb build
```

Build the image and use the tag `docker.io/my-org/my-new-apb`:

```
$ apb build --tag docker.io/my-org/my-new-apb
```

Build the image and use the tag `docker.io/my-org/<my-apb-name>`:

```
$ apb build --registry docker.io --org my-org
```

Build the image using the file `Dockerfile-custom` as the `Dockerfile` definition:

```
$ apb build --dockerfile Dockerfile-custom
```

2.4.4. push

Description
Uploads the APB to an OpenShift Container Registry or a broker mock registry where it will be read by the OAB.

When using the broker’s mock registry, the spec is uploaded and will be displayed in OpenShift Container Platform, but OpenShift Container Platform will pull the image from the registry normally. Usually that means the registry where `oc cluster up` was performed.
When using the OpenShift Container Registry, the image is uploaded to OpenShift Container Platform directly.

Usage

$ apb push [OPTIONS]

Options

<table>
<thead>
<tr>
<th>Option, Shorthand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--help, -h</td>
<td>Show help message</td>
</tr>
<tr>
<td>--broker BROKER_URL</td>
<td>Route to the OAB</td>
</tr>
<tr>
<td>--namespace NAMESPACE</td>
<td>Namespace to push to the OpenShift Container Registry</td>
</tr>
<tr>
<td>--openshift, -o</td>
<td>Use the OpenShift Container Registry</td>
</tr>
<tr>
<td>--dockerfile DOCKERFILE, -f DOCKERFILE</td>
<td>Dockerfile to build internal registry image. Usually defaults to Dockerfile but can be set to any file name.</td>
</tr>
<tr>
<td>--secure</td>
<td>Use secure connection to OAB</td>
</tr>
<tr>
<td>--username USERNAME</td>
<td>Basic authentication user name to be used in broker communication</td>
</tr>
<tr>
<td>--password PASSWORD</td>
<td>Basic authentication password to be used in broker communication</td>
</tr>
<tr>
<td>--no-relist</td>
<td>Do not relist the catalog after pushing an APB to the broker</td>
</tr>
<tr>
<td>--broker-name</td>
<td>Name of the ServiceBroker Kubernetes resource</td>
</tr>
</tbody>
</table>

Examples

Push to the OAB development endpoint:

$ apb push

Push to the local OpenShift Container Registry:

$ apb push

Push to the local OpenShift Container Registry under namespace myproject:

$ apb push --namespace myproject
2.4.5. **test**

**Description**
Runs the APB unit tests.

**Usage**

```
$ apb test [OPTIONS]
```

**Options**

<table>
<thead>
<tr>
<th>Option, Shorthand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--help, -h</td>
<td>Show help message</td>
</tr>
<tr>
<td>--tag TAG</td>
<td>Sets the tag of the built image to a string in the format <code>&lt;registry&gt;/&lt;org&gt;/&lt;name&gt;</code></td>
</tr>
</tbody>
</table>

**Examples**

Run the tests:

```
$ apb test
```

Run the tests but use a specific tag on the built image:

```
$ apb test --tag docker.io/my-org/my-new-apb
```

2.5. **BROKER UTILITY COMMANDS**

2.5.1. **list**

**Description**
Lists all the APBs the broker has loaded.

**Usage**

```
$ apb list [OPTIONS]
```

**Options**

<table>
<thead>
<tr>
<th>Option, Shorthand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--help, -h</td>
<td>Show help message</td>
</tr>
<tr>
<td>--broker BROKER_URL</td>
<td>Route to the OAB</td>
</tr>
<tr>
<td>--secure</td>
<td>Use secure connection to OAB</td>
</tr>
<tr>
<td>--verbose, -v</td>
<td>Output verbose spec information from OAB</td>
</tr>
</tbody>
</table>
### Option, Shorthand | Description
--- | ---
--output {yaml, json}, -o {yaml, json} | Specify verbose output format in yaml (default) or json
--username BASIC_AUTH_USERNAME, -u BASIC_AUTH_USERNAME | Specify the basic authentication user name to be used
--password BASIC_AUTH_PASSWORD, -p BASIC_AUTH_PASSWORD | Specify the basic authentication password to be used

### Examples
Basic list of APBs including name, ID, and description:

```bash
$ apb list
```  
List verbose, easily readable specs:

```bash
$ apb list -v
```  
List all the JSON output:

```bash
$ apb list -v -o json
```  

### 2.5.2. bootstrap

**Description**
Requests the OAB to reload all APBs from the registries.

**Usage**

```bash
$ apb bootstrap [OPTIONS]
```  

**Options**

### Option, Shorthand | Description
--- | ---
--help, -h | Show help message
--broker BROKER_URL | Route to the OAB
--secure | Use secure connection to OAB
--no-relist | Do not relist the catalog after bootstrapping the broker
--username BASIC_AUTH_USERNAME, -u BASIC_AUTH_USERNAME | Specify the basic authentication user name to be used
### Options

<table>
<thead>
<tr>
<th>Option, Shorthand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--password BASIC_AUTH_PASSWORD, -p BASIC_AUTH_PASSWORD</td>
<td>Specify the basic authentication password to be used</td>
</tr>
<tr>
<td>--broker-name BROKER_NAME</td>
<td>Name of the ServiceBroker Kubernetes resource</td>
</tr>
</tbody>
</table>

#### Examples

Basic reload of APBs:

```
$ apb bootstrap
```

### 2.5.3. remove

#### Description

Removes one (or all) APBs from the OAB.

#### Usage

```
$ apb remove [OPTIONS]
```

#### Options

<table>
<thead>
<tr>
<th>Option, Shorthand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--help, -h</td>
<td>Show help message</td>
</tr>
<tr>
<td>--broker BROKER_URL</td>
<td>Route to the OAB</td>
</tr>
<tr>
<td>--secure</td>
<td>Use secure connection to OAB</td>
</tr>
<tr>
<td>--all</td>
<td>Remove all stored APBs</td>
</tr>
<tr>
<td>--id ID</td>
<td>ID of APB to remove</td>
</tr>
<tr>
<td>--secure</td>
<td>Use secure connection to OAB</td>
</tr>
<tr>
<td>--username BASIC_AUTH_USERNAME, -u BASIC_AUTH_USERNAME</td>
<td>Specify the basic authentication user name to be used</td>
</tr>
<tr>
<td>--password BASIC_AUTH_PASSWORD, -p BASIC_AUTH_PASSWORD</td>
<td>Specify the basic authentication password to be used</td>
</tr>
<tr>
<td>--no-relist</td>
<td>Do not relist the catalog after deletion</td>
</tr>
</tbody>
</table>

#### Examples

Remove an APB using an ID:

```
```

---

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NOTE

If you need an ID of an APB, use:

$ apb list

<table>
<thead>
<tr>
<th>ID</th>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>ca91b61da8476984f18fc13883ae2fdb</td>
<td>dh-etherpad-apb</td>
</tr>
<tr>
<td>taking web application</td>
<td></td>
</tr>
</tbody>
</table>

Remove all APBs:

$ apb remove --all

2.5.4. relist

Description
Forces service catalog to relist the provided services to match the broker.

Usage

$ apb relist [OPTIONS]

Options

<table>
<thead>
<tr>
<th>Option, Shorthand</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>--help, -h</td>
<td>Show help message</td>
</tr>
<tr>
<td>--broker-name</td>
<td>Name of the ServiceBroker Kubernetes resource</td>
</tr>
<tr>
<td>--secure</td>
<td>Use secure connection to OAB</td>
</tr>
<tr>
<td>--username</td>
<td>Specify the basic authentication user name to be used</td>
</tr>
<tr>
<td>--password</td>
<td>Specify the basic authentication password to be used</td>
</tr>
</tbody>
</table>

Examples

$ apb relist

2.6. OTHER COMMANDS

2.6.1. help
**Description**
Displays a help message.

**Usage**

```
$ apb help
```

**Examples**

```
$ apb help
$ apb -h
```
CHAPTER 3. WRITING APBS

3.1. WRITING APBS: GETTING STARTED

3.1.1. Overview

In this tutorial, you will walk through the creation of some sample Ansible Playbook Bundles (APBs). You will create actions for them to allow provision, deprovision, bind, and unbind. You can find more information about the design of APBs in the Design topic. More in-depth information about writing APBs is available in the Reference topic.

NOTE

For the remainder of this tutorial, substitute your own information for items marked in brackets; for example, \(<host>:<port>\) might need to be replaced with \(172.17.0.1.nip.io:8443\).

3.1.2. Before You Begin

Before getting started creating your own APBs, you must set up your development environment:

1. Ensure you have access to an OpenShift Container Platform cluster. The cluster should be running both the service catalog and the OpenShift Ansible broker (OAB), which is supported starting with OpenShift Container Platform 3.7.

2. Install the APB tools as documented in the CLI Tooling topic. To verify, you can run the `apb help` command and check for a valid response.

3.1.3. Creating Your First APB

In this tutorial, you will create an APB for a containerized hello world application. You will work through a basic APB that will mirror the APB `hello-world-apb`.

1. Your first task is to initialize the APB using the `apb` CLI tool. This creates the skeleton for your APB. The command for this is simple:

   $ apb init my-test-apb

After initialization, you will see the following file structure:

```
my-test-apb/
├── apb.yml
├── Dockerfile
├── playbooks
│   ├── deprovision.yml
│   └── provision.yml
└── roles
    ├── deprovision-my-test-apb
    │   └── tasks
    │       └── main.yml
    └── provision-my-test-apb
        └── tasks
            └── main.yml
```
Two files were created at the root directory: an **apb.yml** (the APB spec file) and a **Dockerfile**. These are the minimum files required for any APB. For more information about the APB spec file, see the Reference topic. There is also an explanation of what you can do in the **Dockerfile**.

*apb.yml*

```yaml
version: 1.0
name: my-test-apb
description: This is a sample application generated by apb init
bindable: False
async: optional
metadata:
  displayName: my-test
plans:
  - name: default
description: This default plan deploys my-test-apb
  free: True
  metadata: {}
  parameters: []
```

*Dockerfile*

```bash
FROM ansibleplaybookbundle/apb-base
LABEL "com.redhat.apb.spec"=
COPY playbooks /opt/apb/actions
COPY roles /opt/ansible/roles
RUN chmod -R g=u /opt/{ansible,apb}
USER apb
```

2. In the **Dockerfile**, there are two updates to make:

   a. Change the **FROM** directive to use the image from the Red Hat Container Catalog. The first line should now read:

   ```bash
   FROM openshift3/apb-base
   ```

   b. Update **com.redhat.apb.spec** in the **LABEL** instruction with a base64 encoded version of **apb.yml**. To do this, run **apb prepare**:

   ```bash
   $ cd my-test-apb
   $ apb prepare
   ```

   This updates the **Dockerfile** as follows:

   ```bash
   FROM openshift3/apb-base
   LABEL "com.redhat.apb.spec"="dmVyc2lvbjogMS4wCm5hbWU6IG15LXRlc3QtYXBiCmRlc2NyaXB0aW9uOiBUaGlz
   IGlzIGEgc2Ft
   ```
3. At this point, you have a fully formed APB that you can build. If you skipped using `apb prepare`, the `apb build` command will still prepare the APB before building the image:

   ```bash
   $ apb build
   ```

4. You can now push the new APB image to the local OpenShift Container Registry:

   ```bash
   $ apb push
   ```

5. Querying the OAB will now show your new APB listed:

   ```bash
   $ apb list
   ID                                NAME            DESCRIPTION
   < ------------ ID ------------->  dh-my-test-apb  This is a sample application generated by apb init
   
   Similarly, visiting the OpenShift Container Platform web console will now display the new APB named `my-test-apb` in the service catalog under the **All** and **Other** tabs.

### 3.1.4. Adding Actions

The brand new APB created in the last section does not do much in its current state. For that, you must add some actions. The actions supported are:

- provision
- deprovision
- bind
- unbind
- test

You will add each of these actions in the following sections. But before beginning:

1. Ensure that you are logged in to your OpenShift Container Platform cluster via the `oc` CLI. This will ensure the `apb` tool can interact with OpenShift Container Platform and the OAB:

   ```bash
   # oc login <cluster_host>:<port> -u <user_name> -p <password>
   ```
2. Log in to the OpenShift Container Platform web console and verify your APB listed in the catalog:

Figure 3.1. OpenShift Container Platform Web Console

3. Create a project named **getting-started** where you will deploy OpenShift Container Platform resources. You can create it using the web console or CLI:

   ```
   $ oc new-project getting-started
   ```

### 3.1.4.1. Provision

During the `apb init` process, two parts of the provision task were stubbed out. The playbook, `playbooks/provision.yml`, and the associated role in `roles/provision-my-test-apb`:

```
my-test-apb
├── apb.yml
├── Dockerfile
├── playbooks
│   └── provision.yml  ①
├── roles
│   └── provision-my-test-apb
│       └── tasks
│           └── main.yml  ②
```

1. Inspect this playbook.
2. Edit this role.

The `playbooks/provision.yml` file is the Ansible playbook that will be run when the provision action is called from the OAB. You can change the playbook, but for now you can just leave the code as is.

```
playbooks/provision.yml
```

- name: my-test-apb playbook to provision the application
The playbook will execute on **localhost** and execute the role **provision-my-test-apb**. This playbook works on its local container created by the service broker. The **ansible.kubernetes-modules** role allow you to use the **kubernetes-modules** to create your OpenShift Container Platform resources. The **asb-modules** provide additional functionality for use with the OAB.

Currently, there are no tasks in the role. The contents of the **roles/provision-my-test-apb/tasks/main.yml** only contains comments showing common resource creation tasks. You can currently execute the provision task, but since there are no tasks to perform, it would simply launch the APB container and exit without deploying anything.

You can try this now by clicking on the **my-test** APB and deploying it to the **getting-started** project using the web console:

**Figure 3.2. Provisioning my-test**

When the provision is executing, a new namespace is created with the name **dh-my-test-apb-prov-<random>**. In development mode, it will persist, but usually this namespace would be deleted after successful completion. If the APB fails provisioning, the namespace will persist by default.

By looking at the pod resources, you can see the log for the execution of the APB. To view the pod’s logs:

```yaml
hosts: localhost
gather_facts: false
collection: local
roles:
  - role: ansible.kubernetes-modules
    install_python_requirements: no
  - role: ansibleplaybookbundle.asb-modules
  - role: provision-my-test-apb
playbook_debug: false
```
1. Find the namespaces by either using the web console to view all namespaces and sort by creation date, or using the following command:

```
$ oc get ns
NAME                                STATUS    AGE
ansible-service-broker              Active    1h
default                             Active    1h
dh-my-test-apb-prov-<random>        Active    4m
```

2. Switch to the project:

```
$ oc project dh-my-test-apb-prov-<random>
Now using project "dh-my-test-apb-prov-<random>" on server "<cluster_host>:<port>".
```

3. Get the pod name:

```
$ oc get pods
NAME                READY   STATUS      RESTARTS AGE
<apb_pod_name>      0/1      Completed   0         3m
```

4. View the logs:

```
$ oc logs -f <apb_pod_name>
...
+ ansible-playbook /opt/apb/actions/provision.yml --extra-vars "{_apb_plan_id":"default","namespace":"getting-started"}
PLAY [my-test-apb playbook to provision the application]
*******************************
skipping: [localhost]
PLAY RECAP
********************************************************************
* localhost                  : ok=0    changed=0    unreachable=0
  failed=0
```

### 3.1.4.1.1. Creating a Deploying Configuration

At the minimum, your APB should deploy the application pods. You can do this by specifying a deployment configuration:

1. One of the first tasks that is commented out in the `provision-my-test-apb/tasks/main.yml` file is the creation of the deployment configuration. You can uncomment it or paste the following:

```
NOTE
Normally, you would replace the `image` value with your own application image.
```
Designates which namespace the deployment configuration should be in.

Used to help organize, group, and select objects.

Specifies that you only want one pod.

The selector section is a labels query over pods.

This containers section specifies a container with a hello-world application running on port 8080 on TCP. The image is stored at docker.io/ansibleplaybookbundle/hello-world.

For more information, Writing APBs: Reference has more detail, and you can see the ansible-kubernetes-modules documentation for a full accounting of all fields.

2. Build and push the APB:

   $ apb build
   $ apb push

3. Provision the APB using the web console.

4. After provisioning, there will be a new running pod and a new deployment configuration. Verify by checking your OpenShift Container Platform resources:

   $ oc project getting-started
   $ oc get all
   NAME        REVISION  DESIRED  CURRENT  TRIGGERED BY
   dc/my-test   1         1        1         config
   NAME        DESIRED  CURRENT  READY  AGE
   rc/my-test-1 1        1        1     35s
NAME     READY  STATUS    RESTARTS  AGE
po/my-test-1-2pw4t  1/1     Running   0    33s

You will also be able to see the deployed application in the web console on the project’s Overview page.

The only way to use this pod in its current state is to use:

```
$ oc describe pods/<pod_name>
```

to find its IP address and access it directly. If there were multiple pods, they would be accessed separately. To treat them like a single host, you need to create a service, described in the next section.

**TIP**

To clean up before moving on and allow you to provision again, you can delete the getting-started project and recreate it or create a new one.

### 3.1.4.1.2. Creating a Service

You will want to use multiple pods, load balance them, and create a service so that a user can access them as a single host:

1. Modify the `provision-my-test-apb/tasks/main.yml` file and add the following:

   ```yaml
   - name: create my-test service
     k8s_v1_service:
       name: my-test
       namespace: '{{ namespace }}'
       labels:
         app: my-test
         service: my-test
       selector:
         app: my-test
         service: my-test
       ports:
         - name: web
           port: 80
           target_port: 8080
   
   The selector section will allow the my-test service to include the correct pods. The ports will take the target port from the pods (8080) and expose them as a single port for the service (80). Notice the application was running on 8080 but has now been made available on the default HTTP port of 80.

   The name field of the port allows you to specify this port in the future with other resources. More information is available in the k8s_v1_service module.

2. Build and push the APB:

   ```
   $ apb build
   $ apb push
   ```

3. Provision the APB using the web console.
After provisioning, you will see a new service in the web console or CLI. In the web console, you can click on the new service under **Networking** in the application on the **Overview** page or under **Applications → Services**. The service’s IP address will be shown which you can use to access the load balanced application.

To view the service information from the command line, you can do the following:

```bash
$ oc project getting-started
$ oc get services
$ oc describe services/my-test
```

The `describe` command will show the IP address to access the service. However, using an IP address for users to access your application is not generally what you want. Instead, you should create a `route`, described in the next section.

**TIP**

To clean up before moving on and allow you to provision again, you can delete the `getting-started` project and recreate it or create a new one.

### 3.1.4.1.3. Creating a Route

You can expose external access to your application through a reliable named `route`:

1. Modify the `provision-my-test-apb/tasks/main.yml` file and adding the following:

   ```yaml
   - name: create my-test route
     openshift_v1_route:
       name: my-test
       namespace: '{{ namespace }}'
       labels:
         app: my-test
         service: my-test
       to_name: my-test
       spec_port_target_port: web
   ```

   The `to_name` is the name of the target service. The `spec_port_target_port` refers to the name of the target service’s port. More information is available in the `openshift_v1_route` module.

2. Build and push the APB:

   ```bash
   $ apb build
   $ apb push
   ```

3. Provision the APB using the web console.

After provisioning, you will see the new route created. On the web console’s **Overview** page for the `getting-started` project, you will now see an active and clickable route link listed on the application. Clicking on the route or visiting the URL will bring up the `hello-world` application.

You can also view the route information from the CLI:

```bash
$ oc project getting-started
```
At this point, your my-test application is fully functional, load balanced, scalable, and accessible. You can compare your finished APB to the hello-world APB in the hello-world-apb example repository.

3.1.4.2. Deprovision

For the deprovision task, you must destroy all provisioned resources, usually in reverse order from how they were created.

To add the deprovision action, you need a deprovision.yml file under playbooks/directory and related tasks in the roles/deprovision-my-test-apb/tasks/main.yml. Both these files should already be created for you:

```
my-test-apb/
├── apb.yml
├── Dockerfile
├── playbooks
│   └── deprovision.yml 1
└── roles
    └── deprovision-my-test-apb
        ├── tasks
        └── main.yml 2
```

1. Inspect this file.
2. Edit this file.

The content of the deprovision.yml file looks the same as the provision task, except it is calling a different role:

```
playbooks/deprovision.yml
```

```
- name: my-test-apb playbook to deprovision the application
  hosts: localhost
  gather_facts: false
  connection: local
  roles:
  - role: ansible.kubernetes-modules
    install_python_requirements: no
  - role: ansibleplaybookbundle.asb-modules
  - role: deprovision-my-test-apb
    playbook_debug: false
```
Edit that role in the file `roles/deprovision-my-test-apb/tasks/main.yml`. By uncommenting the tasks, the resulting file without comments should look like the following:

```
- openshift_v1_route:
    name: my-test
    namespace: '{{ namespace }}'
    state: absent

- k8s_v1_service:
    name: my-test
    namespace: '{{ namespace }}'
    state: absent

- openshift_v1_deployment_config:
    name: my-test
    namespace: '{{ namespace }}'
    state: absent
```

In the `provision.yml` file created earlier, you created a deployment configuration, service, then route. For the deprovision action, you should delete the resources in reverse order. You can do so by identifying the resource by `namespace` and `name`, and then marking it as `state: absent`.

To run the deprovision template, click on the menu on the list of Deployed Services and select Delete.

### 3.1.4.2.1. Bind

From the previous sections, you learned how to deploy a standalone application. However, in most cases applications will need to communicate with other applications, and often with a data source. In the following sections, you will create a PostgreSQL database that the `hello-world` application deployed from `my-test-apb` can use.

#### 3.1.4.2.1.1. Preparation

For a good starting point, create the necessary files for provision and deprovisioning PostgreSQL.

**NOTE**

A more in-depth example can be found at the [PostgreSQL example APB](https://example.com).

1. Initialize the APB using the `--bindable` option:

   ```bash
   $ apb init my-pg-apb --bindable
   ```

   This creates the normal APB file structure with a few differences:
**bindable** flag set to **true**

1. New file
2. New file
3. New file
4. New empty file
5. Encoded binding credentials
6. New empty file

In addition to the normal files, new playbooks **bind.yml**, **unbind.yml**, and their associated roles have been stubbed out. The **bind.yml** and **unbind.yml** files are both empty and, because you are using the default binding behavior, will remain empty.

2. Edit the **apb.yml** file. Notice the setting **bindable: true**. In addition to those changes, you must add some parameters to the **apb.yml** for configuring PostgreSQL. They will be available fields in the web console when provisioning your new APB:

```yaml
version: 1.0
name: my-pg-apb
description: This is a sample application generated by apb init
bindable: True
async: optional
metadata:
  displayName: my-pg
plans:
  - name: default
description: This default plan deploys my-pg-apb
free: True
metadata: {}
# edit the parameters and add the ones below.
parameters:
  - name: postgresql_database
title: PostgreSQL Database Name
type: string
default: admin
  - name: postgresql_user
title: PostgreSQL User
type: string
default: admin
```
The `playbooks/provision.yml` will look like the following:

```yaml
- name: my-pg-apb playbook to provision the application
  hosts: localhost
  gather_facts: false
  connection: local
  roles:
  - role: ansible.kubernetes-modules
    install_python_requirements: no
  - role: ansibleplaybookbundle.asb-modules
  - role: provision-my-pg-apb
    playbook_debug: false
```

The `playbooks/deprovision.yml` will look like the following:

```yaml
- name: my-pg-apb playbook to deprovision the application
  hosts: localhost
  gather_facts: false
  connection: local
  roles:
  - role: ansible.kubernetes-modules
    install_python_requirements: no
  - role: deprovision-my-pg-apb
    playbook_debug: false
```

3. Edit the `roles/provision-my-pg-apb/tasks/main.yml` file. This file mirrors your `hello-world` application in many respects, but adds a persistent volume (PV) to save data between restarts and various configuration options for the deployment configuration. In addition, a new task has been added at the very bottom after the provision tasks. To save the credentials created during the provision process, you must encode them for retrieval by the OAB. The new task, using the module `asb_encode_binding`, will do so for you.

You can safely delete everything in that file and replace it with the following:

```yaml
# New persistent volume claim
- name: create volumes
  k8s_v1_persistent_volume_claim:
    name: my-pg
    namespace: '{{ namespace }}'
    state: present
    access_modes:
      -ReadWriteOnce
    resources_requests:
      storage: 1Gi

- name: create deployment config
  openshift_v1_deployment_config:
    name: my-pg
    namespace: '{{ namespace }}'
    labels:
```
app: my-pg
  service: my-pg
replicas: 1
selector:
  app: my-pg
  service: my-pg
spec_template_metadata_labels:
  app: my-pg
  service: my-pg
containers:
  - env:
    - name: POSTGRESQL_PASSWORD
      value: '{{ postgresql_password }}'
    - name: POSTGRESQL_USER
      value: '{{ postgresql_user }}'
    - name: POSTGRESQL_DATABASE
      value: '{{ postgresql_database }}'
image: docker.io/centos/postgresql-94-centos7
name: my-pg
ports:
  - container_port: 5432
    protocol: TCP
termination_message_path: /dev/termination-log
volume_mounts:
  - mount_path: /var/lib/pgsql/data
    name: my-pg
    working_dir: /
volumes:
  - name: my-pg
    persistent_volume_claim:
      claim_name: my-pg
test: false
triggers:
  - type: ConfigChange

- name: create service
  k8s_v1_service:
    name: my-pg
    namespace: '{{ namespace }}'
    state: present
    labels:
      app: my-pg
      service: my-pg
    selector:
      app: my-pg
      service: my-pg
    ports:
      - name: port-5432
        port: 5432
        protocol: TCP
        target_port: 5432

# New encoding task makes credentials available to future bind operations
- name: encode bind credentials
  asb_encode_binding:
The `encode bind credentials` task will make available several fields as environment variables: `DB_TYPE`, `DB_HOST`, `DB_PORT`, `DB_USER`, `DB_PASSWORD`, and `DB_NAME`. This is the default behavior when the `bind.yml` file is left empty. Any application (such as `hello-world`) can use these environment variables to connect to the configured database after performing a bind operation.

4. Edit the `roles/deprovision-my-pg-apb/tasks/main.yml` and uncomment the following lines so that the created resources will be deleted during deprovisioning:

    - k8s_v1_service:
      name: my-pg
      namespace: '{{ namespace }}'
      state: absent

    - openshift_v1_deployment_config:
      name: my-pg
      namespace: '{{ namespace }}'
      state: absent

    - k8s_v1_persistent_volume_claim:
      name: my-pg
      namespace: '{{ namespace }}'
      state: absent

5. Finally, build and push your APB:

    $ apb build
    $ apb push

At this point, the APB can create a fully functional PostgreSQL database to your cluster. You can test it out in the next section.

### 3.1.4.2.1.2. Executing From the UI

To test your application, you can bind a `hello-world` application to the provisioned PostgreSQL database. You can use the application previously created in the Provision section of this tutorial, or you can use the `hello-world-apb`:

1. First, provision `my-test-apb`.

2. Then, provision `my-pg-apb` and select the option to Create a secret:
This default plan deploys my-pg-apib
This is a sample application generated by apib ini.
3. Now, if you have not already done so, navigate to the project. You can see both your `hello-world` application and your PostgreSQL database. If you did not select to create a binding at provision time, you can also do so here with the `Create binding` link.

4. After you the binding has been created, you must add the secret created by the binding into the application. First, navigate to the secrets on the `Resources → Secrets` page:
5. Add the secret as environment variables:
6. After this addition, you can return to the **Overview** page. The **my-test** application may still be redeploying from the configuration change. If so, wait until you can click on the route to view the application:
After clicking the route, you will see the **hello-world** application has detected and connected to the **my-pg** database:

### Hello World

Welcome to Ansible Playbook Bundles

Database information:

- **Type:** PostgreSQL
- **Host:** hello-world-db
- **Port:** 5432
- **DB Name:** hello-world
- **User:** hello-world-user
- **Version:** PostgreSQL 9.5.7 on x86_64-redhat-linux-gnu, compiled by gcc (GCC) 4.8.5 28159623 (Red Hat 4.8.5-11), 64-bit
- **Uptime:** 0:01:55.785883s
- **Connection Count:** 1

3.1.4.2.2. Test

Test actions are intended to check that an APB passes a basic sanity check before publishing to the service catalog. They are not meant to test a live service. OpenShift Container Platform provides the ability to test a live service using **liveness and readiness probes**, which you can add when provisioning.

The actual implementation of your test is left to you as the APB author. The following sections provide guidance and best practices.

3.1.4.2.2.1. Writing a Test Action
To create a test action for your APB:

- Include a `playbooks/test.yml` file.
- Include defaults for the test in the `playbooks/vars/` directory.

To orchestrate the testing of an APB, you should use the `include_vars` and `include_role` modules in your `test.yml` file:

```yaml
- name: test media wiki abp
  hosts: localhost
  gather_facts: false
  connection: local

  roles:
  - role: ansible.kubernetes-modules
    install_python_requirements: no

  post_tasks:
  - name: Load default variables for testing
    include_vars: test_defaults.yaml
  - name: create project for namespace
    openshift_v1_project:
      name: '{{ namespace }}'
  - name: Run the provision role.
    include_role:
      name: provision-mediawiki123-apb
  - name: Run the verify role.
    include_role:
      name: verify-mediawiki123-apb
```

1. Load the Ansible Kubernetes modules.
2. Include the default values needed for provision from the test role.
3. Include the provision role to run.
4. Include the verify role to run. See Writing a Verify Role.

### 3.1.4.2.2.2. Writing a Verify Role

A `verify role` allows you to determine if the provision has failed or succeeded. The `verify_<name>` role should be in the `roles/` directory. This should be a normal Ansible role.
An example task in the `main.yml` file could look like:

```yaml
- name: url check for media wiki
  uri:
    url: "http://{{ route.route.spec.host }}"
  return_content: yes
  register: webpage
  failed_when: webpage.status != 200
```

### 3.1.4.2.2.3. Saving Test Results

The `asb_save_test_result` module can also be used in the verify role, allowing the APB to save test results so that the `apb test` command can return them. The APB pod will stay alive for the tool to retrieve the test results.

For example, adding `asb_save_test_result` usage to the previous `main.yml` example:

```yaml
- name: url check for media wiki
  uri:
    url: "http://{{ route.route.spec.host }}"
  return_content: yes
  register: webpage

- name: Save failure for the web page
  asb_save_test_result:
    fail: true
    msg: "Could not reach route and retrieve a 200 status code. Recieved status - {{ webpage.status }}"
    when: webpage.status != 200

- fail:
  msg: "Could not reach route and retrieve a 200 status code. Recieved status - {{ webpage.status }}"
  when: webpage.status != 200

- name: Save test pass
  asb_save_test_result:
    fail: false
    when: webpage.status == 200
```

### 3.1.4.2.2.4. Running a Test Action

After you have defined your test action, you can use the CLI tooling to run the test:

```bash
$ apb test
```
The test action will:

- build the image,
- start up a pod as if it was being run by the service broker, and
- retrieve the test results if any were saved.

The status of pod after execution has finished will determine the status of the test. If the pod is in an error state, then something failed and the command reports that the test was unsuccessful.

### 3.2. WRITING APBS: REFERENCE

#### 3.2.1. Overview

While the Getting Started topic provides a step by step walkthrough on creating your first Ansible Playbook Bundle (APB), this topic provides more in-depth reference material. The fundamental components that make up an APB are explained in further detail to help an experienced APB developer get a better understanding of each individual component within an APB.

For completed APB examples, you can browse APBs in the ansibleplaybookbundle organization on GitHub.

#### 3.2.2. Directory Structure

The following shows an example directory structure of an APB:

```text
example-apb/
├── Dockerfile
├── apb.yml
roles/
│   └── example-apb-openshift
│       ├── defaults
│       │   └── main.yml
│       └── tasks
│           └── main.yml
├── playbooks/
│   ├── provision.yml
│   └── deprovision.yml
│       └── bind.yml
└── unbind.yml
```

#### 3.2.3. APB Spec File

The APB spec file is located at `apb.yml` and is where the outline of your application is declared. The following is an example APB spec:

```yaml
version: 1.0
name: example-apb
description: A short description of what this APB does
bindable: True
async: optional
metadata:
documentationUrl: <link_to_documentation>
```
Async bind and unbind is an experimental feature and is not supported or enabled by default.

### 3.2.3.1. Top-level Structure

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>version</td>
<td>Version of the APB spec. See <a href="#">APB Spec Versioning</a> for details.</td>
</tr>
<tr>
<td>name</td>
<td>Name of the APB. Names must be valid ASCII and may contain lowercase letters, digits, underscores, periods, and dashes. See <a href="#">Docker’s guidelines</a> for valid tag names.</td>
</tr>
<tr>
<td>description</td>
<td>Short description of this APB.</td>
</tr>
<tr>
<td>bindable</td>
<td>Boolean option of whether or not this APB can be bound to. Accepted fields are <code>true</code> or <code>false</code>.</td>
</tr>
<tr>
<td>metadata</td>
<td>Dictionary field declaring relevant metadata information.</td>
</tr>
<tr>
<td>plans</td>
<td>A list of plans that can be deployed. See <a href="#">Plans</a> for details.</td>
</tr>
</tbody>
</table>
3.2.3.2. Metadata

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>documentationUrl</td>
<td>URL to the application’s documentation.</td>
</tr>
<tr>
<td>imageUrl</td>
<td>URL to an image which will be displayed in the web console for the service catalog.</td>
</tr>
<tr>
<td>dependencies</td>
<td>List of images which are consumed from within the APB.</td>
</tr>
<tr>
<td>displayName</td>
<td>The name that will be displayed in the web console for this APB.</td>
</tr>
<tr>
<td>longDescription</td>
<td>Longer description that will be displayed when the APB is clicked in the web console.</td>
</tr>
<tr>
<td>providerDisplayName</td>
<td>Name of who is providing this APB for consumption.</td>
</tr>
</tbody>
</table>

3.2.3.3. Plans

Plans are declared as a list. This section explains what each field in a plan describes.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Unique name of plan to deploy. This will be displayed when the APB is clicked from the service catalog.</td>
</tr>
<tr>
<td>description</td>
<td>Short description of what will be deployed from this plan.</td>
</tr>
<tr>
<td>free</td>
<td>Boolean field to determine if this plan is free or not. Accepted fields are true or false.</td>
</tr>
<tr>
<td>metadata</td>
<td>Dictionary field declaring relevant plan metadata information. See Plan Metadata for details.</td>
</tr>
<tr>
<td>parameters</td>
<td>List of parameter dictionaries used as input to the APB. See Parameters for details.</td>
</tr>
</tbody>
</table>

3.2.3.4. Plan Metadata

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>displayName</td>
<td>Name to display for the plan in the web console.</td>
</tr>
</tbody>
</table>
3.2.3.5. Parameters

Each item in the **parameters** section can have several fields. The **name** field is required. The order of the parameters will be displayed in sequential order in the form in the OpenShift Container Platform web console.

```yaml
parameters:
  - name: my_param
    title: My Parameter
    type: enum
    enum: ['X', 'Y', 'Z']
    required: True
    default: X
    display_type: select
    display_group: Group 1
```

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>longDescription</strong></td>
<td>Longer description of what this plan deploys.</td>
</tr>
<tr>
<td><strong>cost</strong></td>
<td>How much the plan will cost to deploy. Accepted field is $x.yz.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>name</strong></td>
<td>Unique name of the parameter passed into the APB.</td>
</tr>
<tr>
<td><strong>title</strong></td>
<td>Displayed label in the web console.</td>
</tr>
<tr>
<td><strong>type</strong></td>
<td>Data type of the parameters as specified by link json-schema, such as string, number, int, boolean, or enum. Default input field type in the web console will be assigned if no display_type is assigned.</td>
</tr>
<tr>
<td><strong>required</strong></td>
<td>Whether or not the parameter is required for APB execution. Required field in the web console.</td>
</tr>
<tr>
<td><strong>default</strong></td>
<td>Default value assigned to the parameter.</td>
</tr>
<tr>
<td><strong>display_type</strong></td>
<td>Display type for the web console. For example, you can override a string input as a password to hide it in the web console. Accepted fields include text, textarea, password, checkbox, or select.</td>
</tr>
<tr>
<td>Field</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>display_group</td>
<td>Will cause a parameter to display in groups with adjacent parameters with matching <code>display_group</code> fields. In the above example, adding another field below with <code>display_group</code>: <strong>Group 1</strong> will visually group them together in the web console under the heading <strong>Group 1</strong>.</td>
</tr>
</tbody>
</table>

When using a long list of parameters, it can be useful to use a shared parameter list. For an example of this, see the [rhscl-postgresql-apb](https://example.com).**

### 3.2.3.6. APB Spec Versioning

The APB spec uses semantic versioning with the format of `x.y` where `x` is a major release and `y` is a minor release.

The current spec version is **1.0**.

#### 3.2.3.6.1. Major Version

The APB spec will increment the major version whenever an API breaking change is introduced to the spec. Some examples include:

- Introduction or deletion of a required field.
- Changing the YAML format.
- New features.

#### 3.2.3.6.2. Minor Version

The APB spec will increment the minor version whenever a non-breaking change is introduced to the spec. Some examples include:

- Introduction or deletion of an optional field.
- Spelling change.
- Introduction of new options to an existing field.

### 3.2.4. Dockerfile

The **Dockerfile** is what is used to actually build the APB image. As a result, sometimes you will need to customize it for your own needs. For example, if running a playbook that requires interactions with PostgreSQL, you may want to install the required packages by adding the `yum install` command:

```bash
FROM ansibleplaybookbundle/apb-base
MAINTAINER Ansible Playbook Bundle Community
```
LABEL "com.redhat.apb.spec"="<--------base64-encoded-spec-------->

COPY roles /opt/ansible/roles
COPY playbooks /opt/apb/actions
RUN chmod -R g=u /opt/{ansible,apb}

### INSTALL THE REQUIRED PACKAGES
RUN yum -y install python-boto postgresql && yum clean all

USER apb

3.2.5. APB Actions (Playbooks)

An action for an APB is the command that the APB is run with. The standard actions that are supported are:

- provision
- deprovision
- bind
- unbind
- test

For an action to be valid, there must be a valid file in the playbooks/ directory named `<action>.yml`. These playbooks can do anything, which also means that you can technically create any action you would like. For example, the mediawiki-apb has playbook creating an **update** action.

Most APBs will normally have a provision action to create resources and a deprovision action to destroy the resources when deleting the service.

The bind and unbind actions are used when the coordinates of one service needs to be made available to another service. This is often the case when creating a data service and making it available to an application. Currently, the coordinates are made available during the provision.

To properly make your coordinates available to another service, use the **asb_encode_binding** module. This module should be called at the end of the APB’s provision role, and it will return bind credentials to the OpenShift Ansible broker (OAB):

```yaml
- name: encode bind credentials
  asb_encode_binding:
    fields:
      EXAMPLE_FIELD: foo
      EXAMPLE_FIELD2: foo2
```

3.2.6. Working With Common Resources

This section describes a list of common OpenShift Container Platform resources that are created when developing APBs. See the Ansible Kubernetes Module for a full list of available resource modules.
3.2.6.1. Service

The following is a sample Ansible task to create a service named `hello-world`. The `namespace` variable in an APB will be provided by the OAB when launched from the web console.

**Provision**

```yaml
- name: create hello-world service
  k8s_v1_service:
    name: hello-world
    namespace: '{{ namespace }}'
    labels:
      app: hello-world
      service: hello-world
    selector:
      app: hello-world
      service: hello-world
    ports:
      - name: web
        port: 8080
        target_port: 8080
```

**Deprovision**

```yaml
- k8s_v1_service:
  name: hello-world
  namespace: '{{ namespace }}'
  state: absent
```

3.2.6.2. Deployment Configuration

The following is a sample Ansible task to create a deployment configuration for the image `docker.io/ansibleplaybookbundle/hello-world` which maps to service `hello-world`.

**Provision**

```yaml
- name: create deployment config
  openshift_v1_deployment_config:
    name: hello-world
    namespace: '{{ namespace }}'
    labels:
      app: hello-world
      service: hello-world
    replicas: 1
    selector:
      app: hello-world
      service: hello-world
    spec_template_metadata_labels:
      app: hello-world
      service: hello-world
    containers:
      - env:
          image: docker.io/ansibleplaybookbundle/hello-world:latest
            name: hello-world
            ports:
3.2.6.3. Route

The following is an example of creating a route named `hello-world` which maps to the service `hello-world`.

**Provision**

```yaml
- name: create hello-world route
  openshift_v1_route:
    name: hello-world
    namespace: '{{ namespace }}'
    spec_port_target_port: web
    labels:
      app: hello-world
      service: hello-world
    to_name: hello-world
```

**Deprovision**

```yaml
- openshift_v1_route:
  name: hello-world
  namespace: '{{ namespace }}'
  state: absent
```

3.2.6.4. Persistent Volume

The following is an example of creating a persistent volume claim (PVC) resource and deployment configuration that uses it.

**Provision**

```yaml
# Persistent volume resource
- name: create volume claim
  k8s_v1_persistent_volume_claim:
    name: hello-world-db
    namespace: '{{ namespace }}'
    state: present
    access_modes:
    - ReadWriteOnce
    resources_requests:
      storage: 1Gi
```

In addition to the resource, add your volume to the deployment configuration declaration:
### 3.2.7. Optional Variables

You can add optional variables to an APB by using environment variables. To pass variables into an APB, you must escape the variable substitution in your `.yml` files.

For example, consider the following `roles/provision-etherpad-apb/tasks/main.yml` file in the `etherpad-apb`:

```yaml
- name: create hello-world-db deployment config
  openshift_v1_deployment_config:
    name: hello-world-db
    ---
    volumes:
    - name: hello-world-db
      persistent_volume_claim:
        claim_name: hello-world-db
test: false
  triggers:
  - type: ConfigChange

Deprovision

- openshift_v1_deployment_config:
  name: hello-world-db
  namespace: '{{ namespace }}'
  state: absent

- k8s_v1_persistent_volume_claim:
  name: hello-world-db
  namespace: '{{ namespace }}'
  state: absent

Variables for the APB are defined in the `roles/provision-etherpad-apb/defaults/main.yml` file:

```yaml
playbook_debug: no
mariadb_root_password: "{{ lookup('env','MYSQL_ROOT_PASSWORD') | default('admin', true) }}"
mariadb_name: "{{ lookup('env','MYSQL_DATABASE') | default('etherpad', true) }}"
```

For example, consider the following `roles/provision-etherpad-apb/tasks/main.yml` file in the `etherpad-apb`:

```yaml
- name: create mariadb deployment config
  openshift_v1_deployment_config:
    name: mariadb
    namespace: '{{ namespace }}'
    ...```

  - env:
    - name: MYSQL_ROOT_PASSWORD
      value: '{{ mariadb_root_password }}'
    - name: MYSQL_DATABASE
      value: '{{ mariadb_name }}'
    - name: MYSQL_USER
      value: '{{ mariadb_user }}'
    - name: MYSQL_PASSWORD
      value: '{{ mariadb_password }}'
```

Variables for the APB are defined in the `roles/provision-etherpad-apb/defaults/main.yml` file:

```yaml
playbook_debug: no
mariadb_root_password: "{{ lookup('env','MYSQL_ROOT_PASSWORD') | default('admin', true) }}"
mariadb_name: "{{ lookup('env','MYSQL_DATABASE') | default('etherpad', true) }}"
3.2.8. Working With the Restricted SCC

When building an OpenShift Container Platform image, it is important that you do not have your application running as the root user when at all possible. When running under the restricted security context, the application image is launched with a random UID. This causes problems if your application folder is owned by the root user.

A good way to work around this is to add a user to the root group and make the application folder owned by the root group. See OpenShift Container Platform-Specific Guidelines for details on supporting arbitrary user IDs.

The following is a Dockerfile example of a node application running in /usr/src. This command would be run after the application is installed in /usr/src and the associated environment variables set:

```bash
ENV USER_NAME=haste \
    USER_UID=1001 \ 
    HOME=/usr/src \

RUN useradd -u ${USER_UID} -r -g 0 -M -d /usr/src -b /usr/src -s /sbin/nologin -c "<username> user" ${USER_NAME} \ 
    && chown -R ${USER_NAME}:0 /usr/src \ 
    && chmod -R g=u /usr/src /etc/passwd 

USER 1001
```

3.2.9. Using a ConfigMap Within an APB

There is a temporary workaround for creating ConfigMaps from Ansible due to a bug in the Ansible modules.

One common use case for ConfigMaps is when the parameters of an APB will be used within a configuration file of an application or service. The ConfigMap module allows you to mount a ConfigMap into a pod as a volume, which can be used to store the configuration file. This approach allows you to also leverage the power of Ansible’s template module to create a ConfigMap out of APB parameters.

The following is an example of creating a ConfigMap from a Jinja template mounted into a pod as a volume:

```yaml
- name: Create hastebin config from template 
  template: 
    src: config.js.j2 
    dest: /tmp/config.js 

- name: Create hastebin configmap
```
shell: oc create configmap haste-config --from-file=haste-config=/tmp/config.js

- name: create deployment config
  openshift_v1_deployment_config:
    name: hastebin
    namespace: '{{ namespace }}'
    labels:
      app: hastebin
      service: hastebin
    replicas: 1
    selector:
      app: hastebin
      service: hastebin
    spec_template_metadata_labels:
      app: hastebin
      service: hastebin
    containers:
    - env:
        image: docker.io/dymurray/hastebin:latest
        name: hastebin
        ports:
        - container_port: 7777
          protocol: TCP
        volumeMounts:
        - mountPath: /usr/src/haste-server/config
          name: config
    - env:
        image: docker.io/modularitycontainers/memcached:latest
        name: memcached
        ports:
        - container_port: 11211
          protocol: TCP
    volumes:
    - name: config
      configMap:
        name: haste-config
        items:
        - key: haste-config
          path: config.js