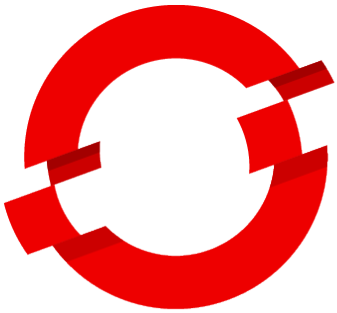

Red Hat OpenShift

Full DevEx Workshop

UKI DSA Team

Version 1.0.0, June 09, 2020

Table of Contents

Introduction

Attendee details

Name:	
User ID (userX):	

This workshop is designed to introduce Developers to **OpenShift 4** and explain the usage and technologies around it from a developer perspective.

What is Openshift

Red Hat® OpenShift® is a hybrid cloud, enterprise, secure Kubernetes application platform.

OpenShift is an Enterprise strength, secure implementation of the Kubernetes container orchestration project with additional tooling designed to make the lives of Developer and Administrators as easy as possible.

Links

- https://www.openshift.com/learn/what-is-openshift, window="_blank"
- https://en.wikipedia.org/wiki/OpenShift, window="_blank"
- https://www.openshift.com/products/container-platform, window="_blank"
- https://example.manifest.com, window="_blank" (the Web Console URL for the Workshop)

Contributors

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Original asciidoc documentation for DevEx3.x by Phillip Kruger, Red Hat CEMEA

Workshop Pre-requisites

Setting up the UI and Terminal

The workshop was designed and tested on the Chrome browser and it is advised to avoid issues that this browser be used whenever possible

For a number of the labs you will be interacting with the OpenShift cluster using a number of different command line tools. In order to avoid you having to install them on your own machine we have taken advantage of the nature of OpenShift and produced a Container that does it all for you, and provides a terminal experience in the browser. In this section you will create that application; this terminal is used throughout the workshop.

If you leave the Terminal window open for a long time without using it it will disconnect. To reconnect simply refresh the page.

Open the browser and navigate to the console url https://example.manifest.com, window="_blank"

Logon using the user provided by the course administrator (user*x* where **x** is a unique number for your session)

When logged on you will be presented with a screen listing the projects, of which there are currently none

Hit *Create Project*

For *Name* enter terminal*x*, where **x** is the same unique number from your UserID (user*X*)

Display Name and *Description* are optional labels

Once the project has been created (you will be given a dashboard) change the mode of the UI from Administrator to Developer by clicking on the top left of the UI where it says *Administrator* and selecting *Developer*

On the Topology page it will state *No workloads found* - Click on *Container Image*

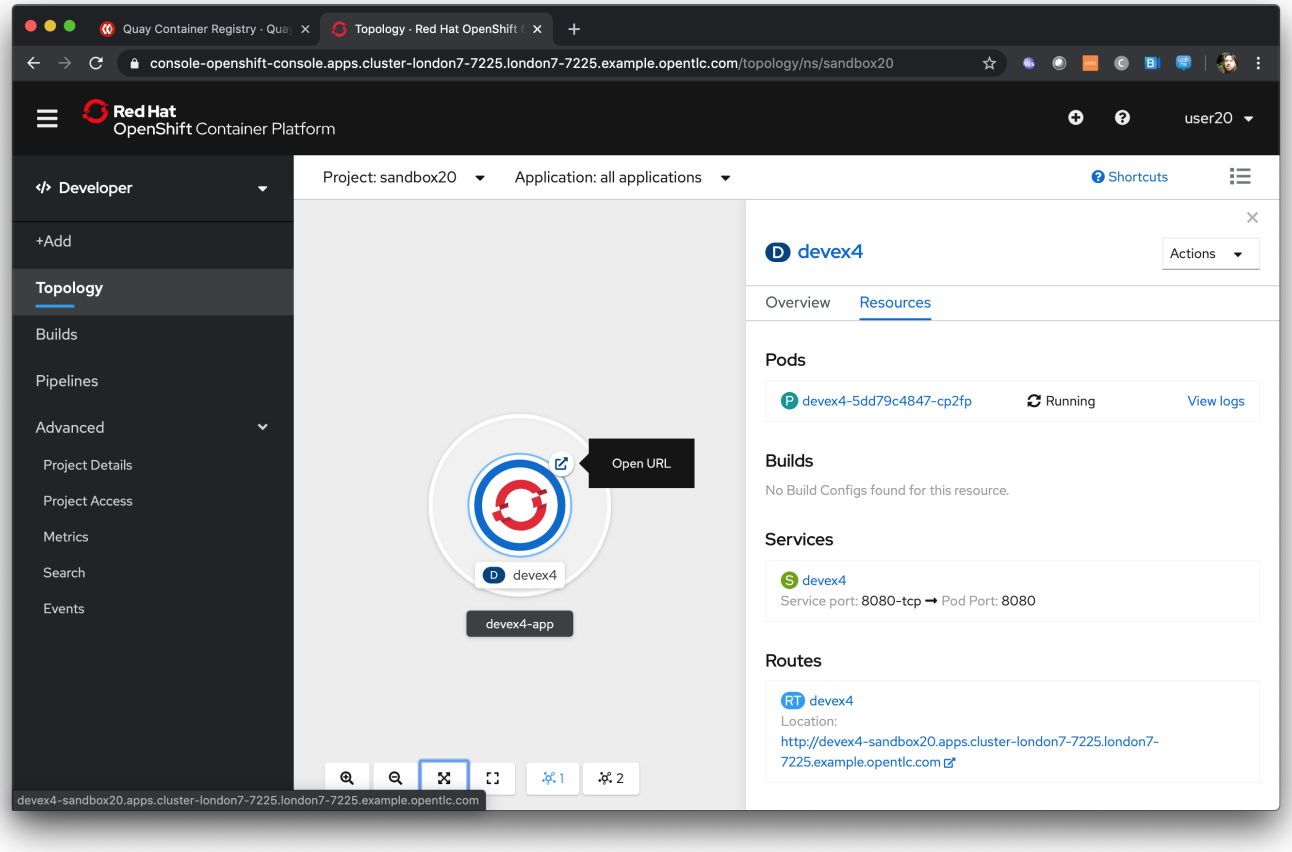
In *Image Name* enter *quay.io/ilawson/devex4*

Click on the search icon to the right of the text box

Leave everything else as default and scroll down to the bottom of the page. Hit *Create*

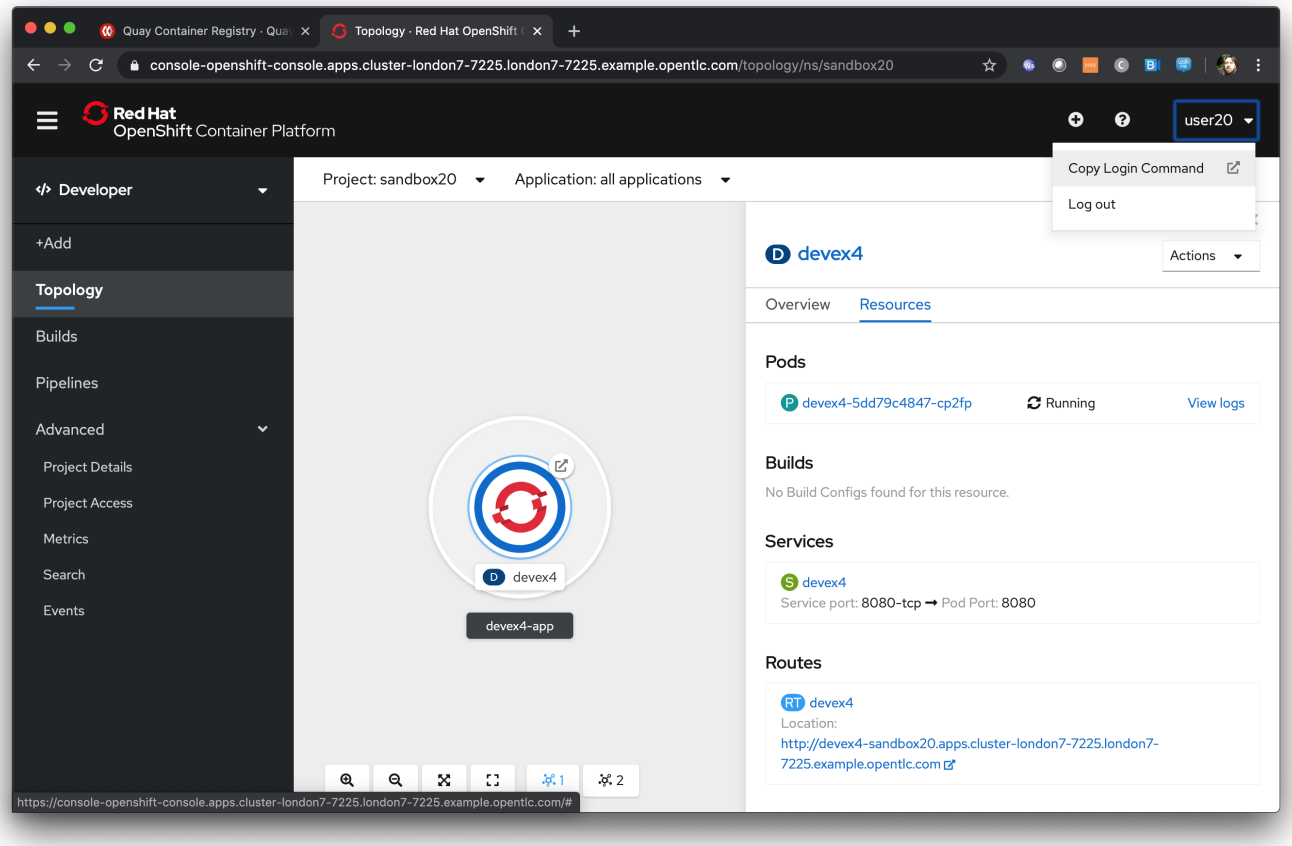
Wait for the ring around the application icon to change to dark blue - this indicates the application has been started

In the topology page click on the *Open URL* icon as shown below



This will open another tab with a command line in it - this is your terminal for the duration of the basic workshop

Switch back to the UI and click on the userx displayed at the top right and select *Copy Login Command* as shown below



In the new tab that appears login with your userx (unique number instead of x) and password *openshift*

Click on *Display Token*

Copy the command given for *Log in with this token* - this may require using the browser *copy* command after highlighting the command

Close this tab and switch to the terminal tab - if you have closed the terminal tab go back to the UI and select the *Show URL* from the topology view in the Developer UI

Paste and execute the command

Press *y* to use insecure connections

The terminal should now be logged on - to check it try

```
oc whoami
oc version
```

The terminal should display your user for the first command and the client and Kubernetes versions for the second command

One last command is needed to clone the material needed for the workshop in a writeable way for the attendee. Enter the following commands:

```
cd /workspace
git clone https://github.com/utherp0/workshop4
```

Introduction to *oc* [ESSENTIALS]

Author: Ian Lawson (feedback to ian.lawson@redhat.com)

Introduction

This lab introduces the command line interface to OpenShift, *oc*, and the concepts of the interactions you can have with the OpenShift system through it.

The attendee will be using the terminal application created in the pre-requisites step (for command line exercises). It is strongly suggested the attendee uses Chrome or Firefox. All of this lab is done with the terminal.

A quick overview of *oc*

OpenShift is built around Kubernetes, which is a fantastically complex and elegant orchestration system for containers. It works by maintaining a state vision of the entire system, which is a set of what are called *objects*.

An *object* has a type - i.e. Service, Pod, User, Namesapce and the like. This type tells Kubernetes how and what it can do with the object; in fact Kubernetes has a number of processes called *controllers* whose only job is to create, monitor and maintain these *objects*.

In order for a user to interact with the system, be it OpenShift or Kubernetes, an API is provided that allows you to create, manipulate and remove these objects. But it's very complicated, because of the nature of the systems.

So, for Kubernetes, there was a command line utility created called *kubectl*. OpenShift's own command line, *oc*, derives from this utility but adds the extra features, and access to the additional objects that OpenShift offers above and beyond Kubernetes.

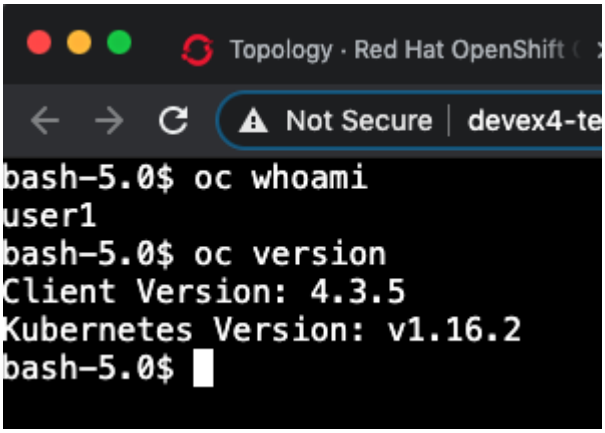
What we will be doing in this lab is using the oc client to work with OpenShift from a developers perspective. OpenShift provides a number of ways that you can interact with it; for example the Developer UI, the Administration UI, odo. But oc is the most powerful because it exposes the entire set of objects through the RESTful API provided.

You will find that, once you understand the nature of the underlying objects and the way you can interact with them, that *oc* is a fantastic tool for developers wanting to use OpenShift to orchestrate their applications.

Creating a Project/Namespace

Let's start by going to the terminal window as defined in the pre-requisites. To make sure we are working in the correct context type the following:

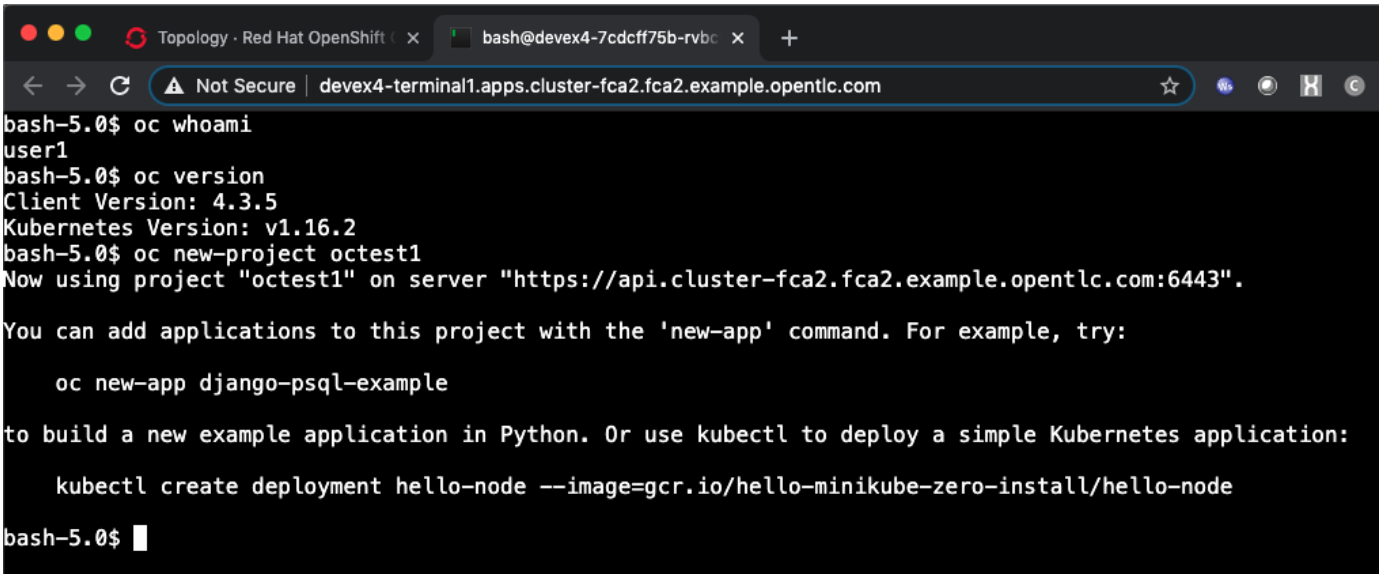
```
oc whoami
oc version
```



The oc client works using something called a *context*. This is a valid login to a target OpenShift system. If the commands do not return the successful output (see above for a similar output) then please repeat the login steps listed in the pre-requisites.

What we are going to do is create a Project to work in. This is equivalent, but not the same as, the Kubernetes *namespace*. Type the following (remembering to replace the *x* in the name with your user number):

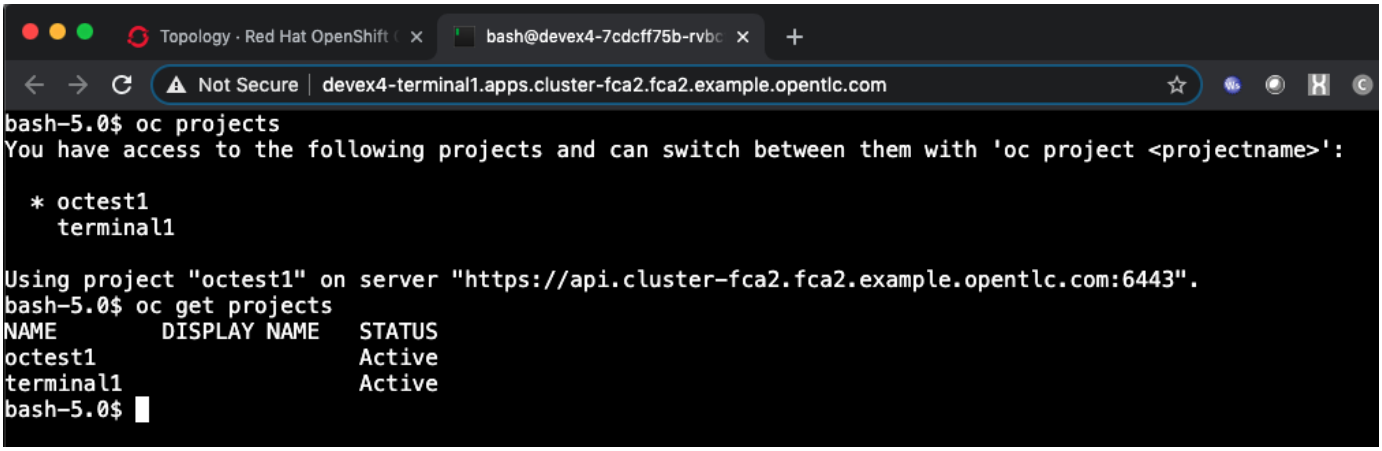
```
oc new-project octestx
```



What we have done is create a context within our user's object space on the OpenShift Cluster. As creators we have admin access and rights to this space - we can create and delete objects, that we have the rights to create, as much as we like here.

Now type:

```
oc projects
oc get projects
```



The *oc projects* is an opinionated command - because we work with Projects so much there is a shortcut for them. The second command is the standard way of getting any object that you have the rights to via the oc command.

Now type:

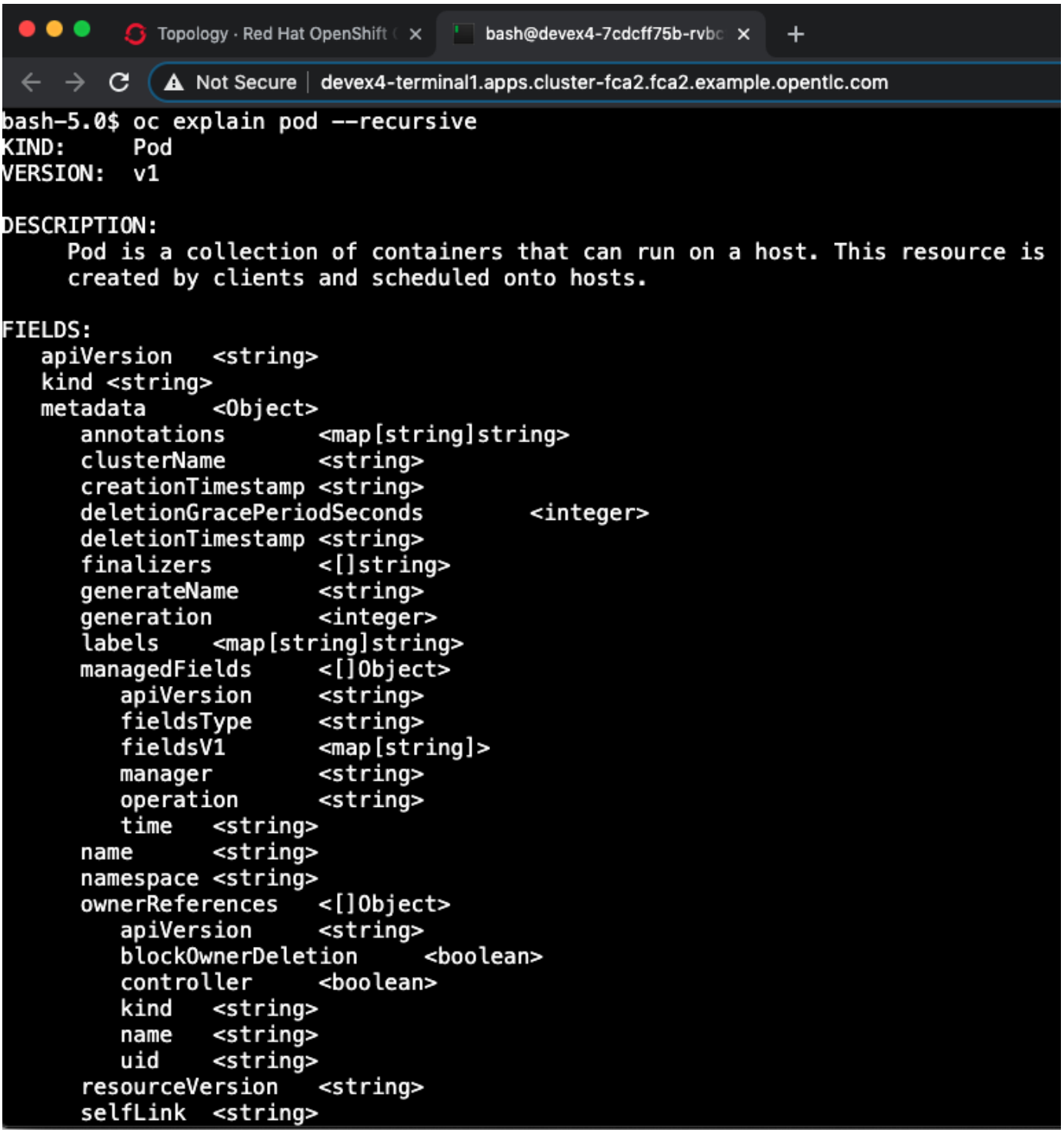
```
oc api-resources
```

This command goes to the OpenShift Cluster and gets a list of the all the object types/resources you can see. There are a lot of them. Try this command:

```
oc explain pods
```

This command will show an explanation of that API object type, namely *Pods*. Now the cool bit - type the following:

```
oc explain pods --recursive
```



Every object can be described using JSON or YAML - this command returns, from the Server, the exact definition of that object. This is incredibly useful when we get to editing the objects via oc.

Adding some Applications

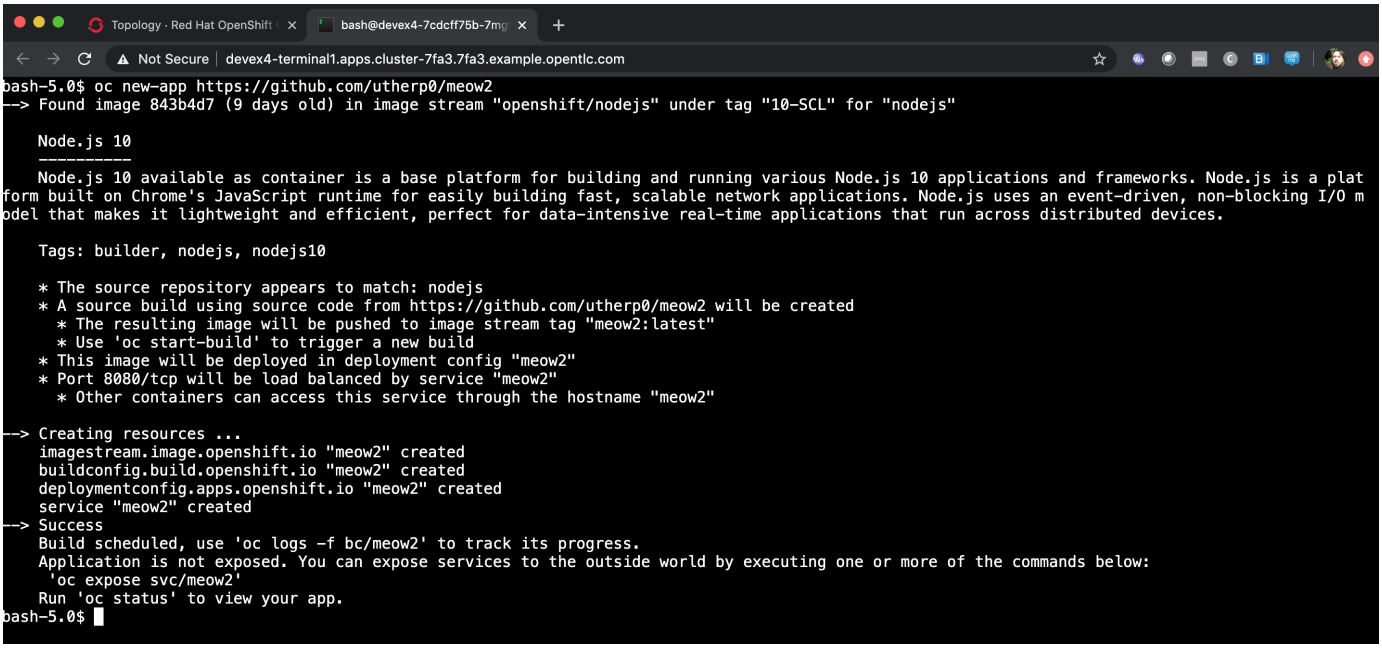
We are going to take advantage of some of the OpenShift's opinionated developer features with the next part. Rather than manually create all the objects we would need for an Application from scratch on OpenShift, which would include a BuildConfig, which describes how to build the Image that will contain our Application, a Build, which is the actual task that executes the BuildConfig, in a Pod, to

generate out Application Image, a Service, which is the IP endpoint for the Application within the OpenShift Cluster and an ImageStream, which is a wrapper around the created Image.

We can shortcut this as developers, if we have, for example, a GitHub repo with existing code. Type the following:

```
oc new-app https://github.com/utherp0/meow2
```

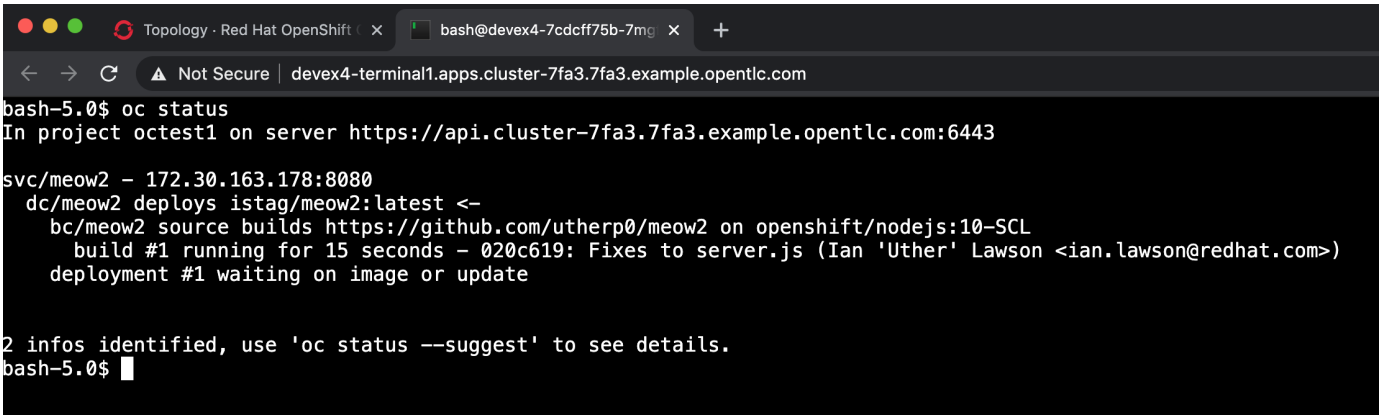
The oc command will cause OpenShift to create all the contents it needs for an Application based on the source code it finds at the GitHub repo. In this case the source code contains the building blocks for a node.js application. The image belows shows the output you should receive:



Note the Resources Created part of the output - from a single command to create an App it has created the core required components.

Now type the follow, as suggested by the output:

```
oc status
```

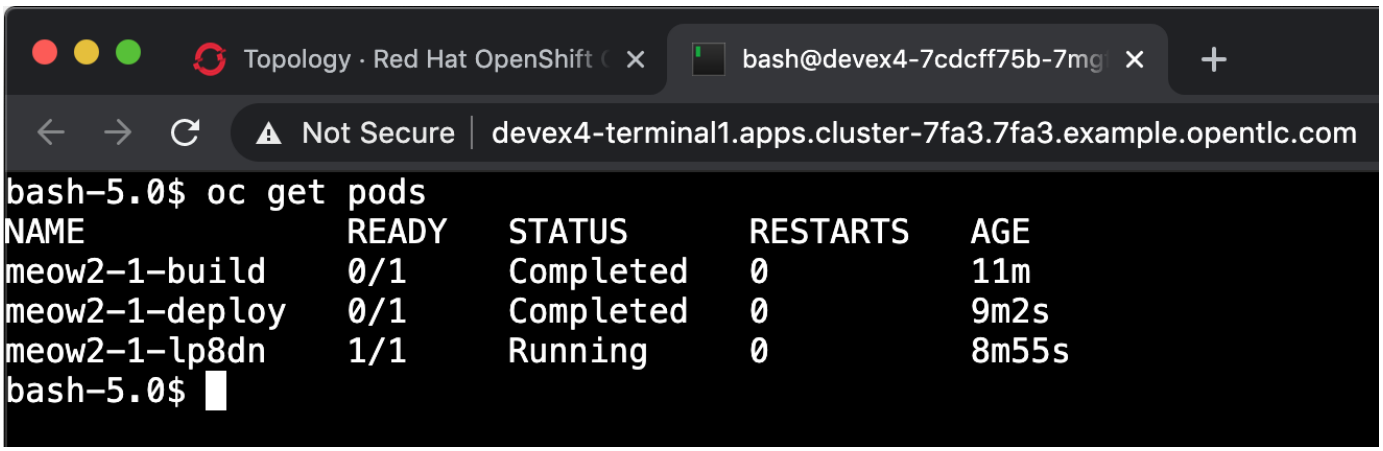


The system is performing a build, defined by the buildconfig that has been created using the chosen technology deduced by OpenShift from the repo. When the build finishes it will deploy the application - the deployment is shown as the *dc*, which is the deployment config object. This is waiting on the image to be created by the build. It also creates a Service, which is the internal endpoint for the application.

If you wait a little (feel free to repeat the *oc status* command) the build will complete and the application will be deployed. You can check for when it deploys by typing:

```
oc get pods
```

Once deployed the output should look like this:



You will notice there are three Pods - two have completed and one is running. This is because those actions of building an Application into an Image and then deploying the Application are executed as Pods themselves.

Now, for the sake of the lab, we will create a second application. Type:

```
oc new-app https://github.com/utherp0/nodenews
```

Again use the *oc get pods* and *oc status* to watch the build of the second application. When it completes it will look like this:

```
[Ians-MacBook-Pro-2:workshop4 uther$ oc get pods
NAME                READY   STATUS      RESTARTS   AGE
meow2-1-build       0/1     Completed   0          4m17s
meow2-1-deploy      0/1     Completed   0          3m1s
meow2-1-f5xvz       1/1     Running     0          2m58s
nodenews-1-build    0/1     Completed   0          88s
nodenews-1-deploy   0/1     Completed   0          21s
nodenews-1-qqnfx    1/1     Running     0          18s
```

Using oc for manipulating existing objects

Now we will show the power of the oc command. First, type the following:

```
oc get pods | grep Running
```

This will list the Pods running, i.e. the applications. We will now scale the *meow2* application to three Pods and the *nodenews* application to two Pods. Type the following:

```
oc scale dc/meow2 --replicas=3
oc scale dc/nodenews --replicas=2
```

Once the commands come back successfully type:

```
oc get pods | grep Running
```

```
[Ians-MacBook-Pro-2:workshop4 uther$ oc get pods | grep Running
meow2-1-85v7m       1/1     Running     0          56s
meow2-1-f5xvz       1/1     Running     0          10m
meow2-1-pjlqh       1/1     Running     0          56s
nodenews-1-fs9n7    1/1     Running     0          45s
nodenews-1-qqnfx    1/1     Running     0          8m17s
```

We are now going to look at the composition of a single *object*, in this case a pod. Using the output of the command above, pick one of the three Running meow2 Pods. You will need the name, which will be meow2-1-xxxxx, where xxxxx are random characters. Using the five characters from your chosen Pod type the following:

```
oc get pod meow2-1-[PUT YOUR CHOSEN POD'S CHARACTERS HERE]
```

That will give you a simple overview of the object, in this case the Pod. Now type this:

```
oc get pod meow2-1-[PUT YOUR CHOSEN POD'S CHARACTERS HERE] -o json
```

You will get a huge amount of information. What this command has done is returned the entire object in JSON. Now type this:

```
oc get pod meow2-1-[PUT YOUR CHOSEN POD'S CHARACTERS HERE] -o yaml
```

Now you will see the entire object listed in YAML. This is the complete object from OpenShift/Kubernetes, so as well as seeing the definition, which is all the components under *spec:*, you will also see the metadata for the object, listed under *metadata:* and the current status of the object, listed under *status:*.

Using jsonpath to extract specific object values

And this is where the oc command becomes incredibly powerful. Type the following:

```
oc get dc -o jsonpath='{.items[*].metadata.name}'
```

We can use the output of an object in json through a jsonpath filter and access **any** component of the object. Here's a more useful example - type the following:

```
for pod in $(oc get pods -o jsonpath='{.items[*].metadata.name}'); \
do echo $pod; \
echo "  "$(oc get pod $pod -o jsonpath='{.status.phase}'); \
done
```

```
Ians-MacBook-Pro-2:~ uther$ for pod in $(oc get pods -o jsonpath='{.items[*].metadata.name}'); \
> do echo $pod; \
> echo "  "$(oc get pod $pod -o jsonpath='{.status.phase}'); \
> done
meow2-1-85v7m
  Running
meow2-1-build
  Succeeded
meow2-1-deploy
  Succeeded
meow2-1-f5xvz
  Running
meow2-1-pjlqh
  Running
nodenews-1-build
  Succeeded
nodenews-1-deploy
  Succeeded
nodenews-1-fs9n7
  Running
nodenews-1-qqnfx
  Running
Ians-MacBook-Pro-2:~ uther$
```

What we will do now is to scale down **all** of the applications to a single Pod using the oc command - this may seem a little pithy but imagine if you had operations to run over hundreds or thousands of objects. This approach makes it very easy to automate tasks. Type the following:

```
for dc in $(oc get dc -o jsonpath='{.items[*].metadata.name}'); \
do oc scale dc/$dc --replicas=1; \
done

oc get pods | grep Running
```

This command will scale **all** of the deployment configs to one copy.

The oc command gives access to **all** the objects available for the logged on User. In the case of a standard user, such as the one we are using for this lab, this will be the objects created in the namespace. In the case of what is called a *Cluster Admin* user this is effectively all the objects in the entire system.

Cleanup the lab

We will finally use the oc command to clean the project. Type the following, replacing the x with your user number (i.e. octest84):

```
oc delete project octestx
```

Application Basics [ESSENTIALS]

Author: Ian Lawson (feedback to ian.lawson@redhat.com)

Introduction

This chapter will introduce the attendee to the mechanics of creating and manipulating Applications using OpenShift Container Platform. It will introduce the two distinct contexts of the User Interface, the Administrator and Developer views, and guide the attendee through creating some Applications.

The attendee will be using a browser for interacting with both the OpenShift Container Platform UI and the terminal application created in the pre-requisites step (for command line exercises). It is strongly suggested the attendee uses Chrome or Firefox.

Starting up - logging on and creating a project

Log on to cluster at https://example.manifest.com, window="_blank" as *userx*, where x is the number assigned to you by the course administrator, password *openshift*

Ensure you are on the Administrator View - at the top left of the UI is a selection box which describes the current view selected.

The Administrator view provides you with an extended functionality interface that allows you to deep dive into the objects available to your user. The Developer view is an opinionated interface designed to ease the use of the system for developers. This workshop will have you swapping between the contexts for different tasks.

Click on *Create Project*

Name - ‘sandboxX’ where x is user number

Display Name, Description are labels

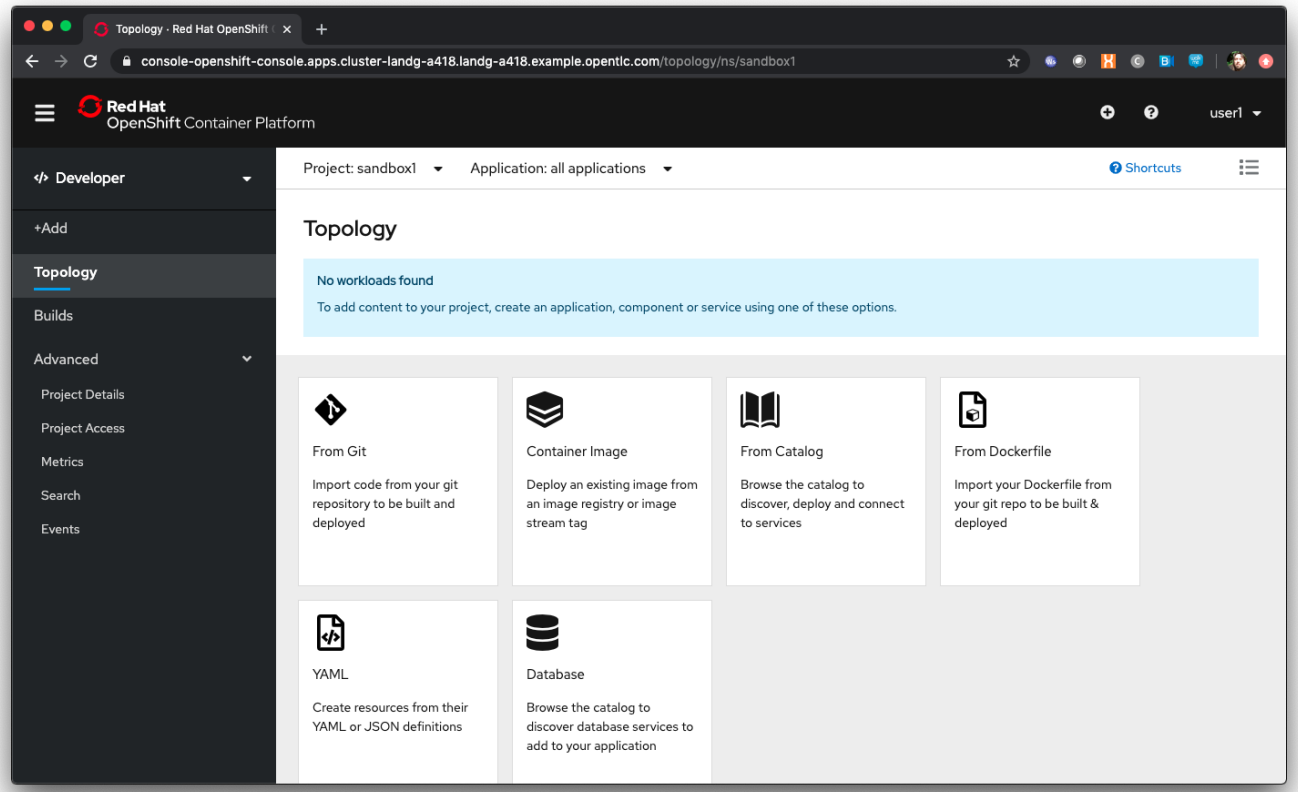
When created click on *Role Bindings*

By default when you create a Project within OpenShift your user is given administration rights. This allows the user to create any objects that they have rights to create and to change the security and access settings for the project itself, i.e. add users as Administrators, Edit Access, Read access or disable other user’s abilities to even see the project and the objects within.

Creating your first Application

In the top left of the UI, where the label indicates the view mode, change the mode from Administrator

to Developer



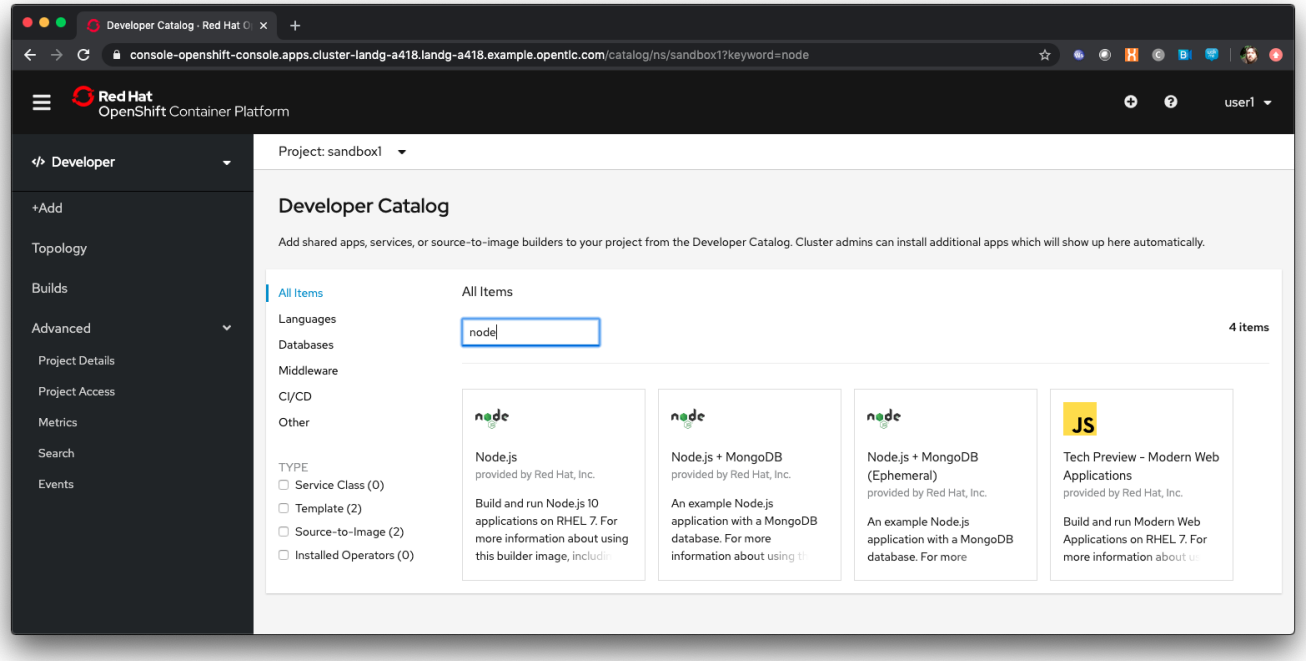
Click *Add*

The Catalog screen for the developer combines all the ways components can be added into the Project. These are:

- **From Git - this provides another way to do a Source-2-Image build by first choosing the Git repo and then the builder image to use**
- **Container Image - this provides a way to directly deploy an Image from a repository**
- **From Catalog - this allows the Developer to browse all available templates, which are predefined sets of Objects to create an application**
- **From Dockerfile - this allows the Developer to do a controlled build of an Image from a Dockerfile**
- **YAML - this allows the Developer to provide a set of populated YAML to define the objects to be added to the Project**
- **Database - this allows the Developer to browse pre-created Database services to add to the Project**

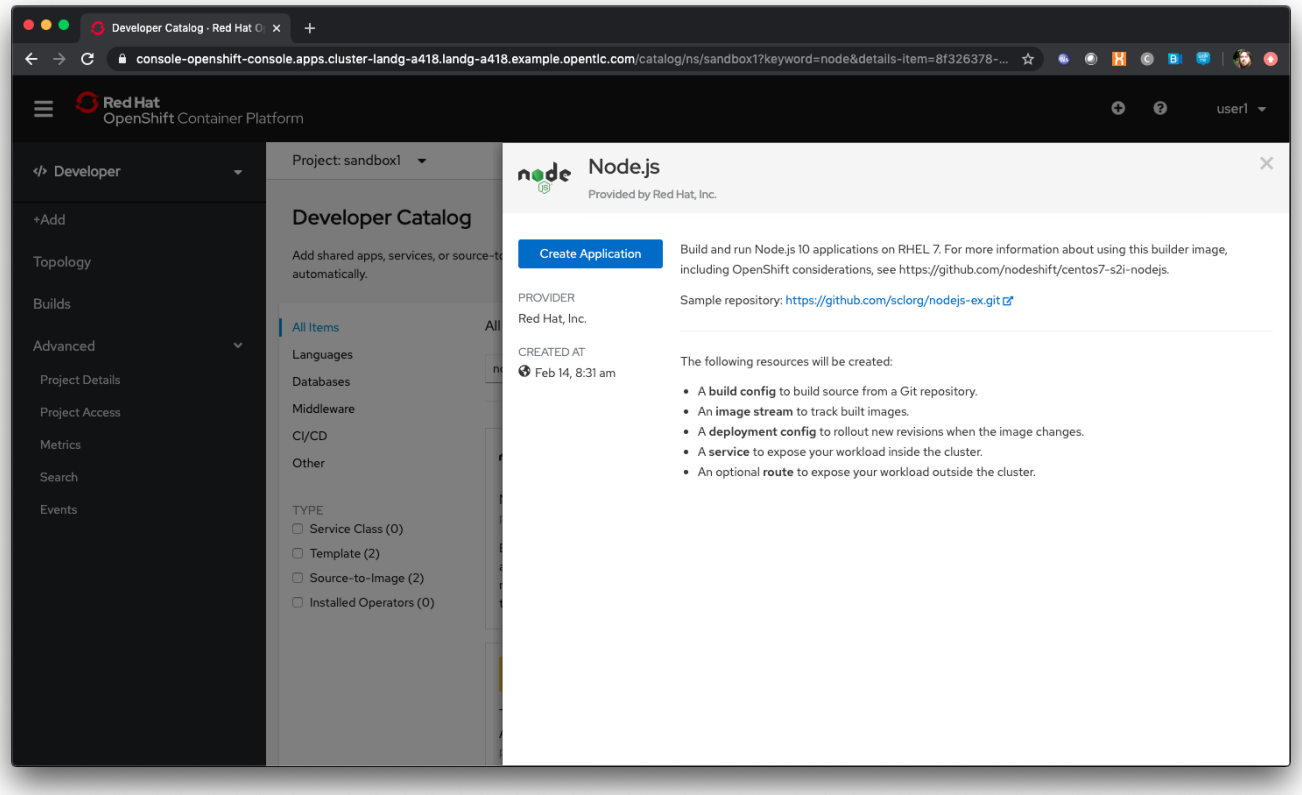
Select ‘From Catalog’

Enter ‘node’ in the search box



OpenShift allows for multiple base images to be built upon - the selection of node searches for any images or templates registered into the system with the label *node*. In the screenshot above, and in the catalog you will be presented with, there will be a selection of base images.

Select ‘Node.js’



When you select an option, in this case the Node.js builder one, you are presented with a wizard that shows you exactly what components will be created as part of your Project. In this case, with Node.js, the template will create a build config, that will build the Image that will contain your Application, an ImageStream which is the OpenShift representation of an Image, a deployment config, which defines exactly how the image will be deployed as a running Container within the Project, a service which is the internal endpoint for the application within the Project and a route, optionally, which will provide access to the Application for external consumers.

Click on *Create Application*

This approach uses the OpenShift *'source-2-image'* concept, which is a controlled mechanism provided by OpenShift that automates the creation of application images using a base image and a source repository.

Change the Builder Image Version to 8

The *'source-2-image'* approach allows you to use differing versions of a base image - in this case you can execute the Node build against a number of supported Node versions.

Enter the following for the Git repo for the application - https://github.com/utherp0/nodenews, window="_blank"

In a separate browser tab go to https://github.com/utherp0/nodenews, window="_blank"

If you visit the URL you will see there is no OpenShift specific code in the repository at all.

Close the github tab

Back at the OCP4.3 UI click on the *Application Name* entry box. It will auto-fill with the Application Name and the Name will auto-fill as well.

OpenShift 4 introduces the concept of Application Grouping. This allows a visualisation of multiple Applications in the same *group*, making visibility of the Application much simpler.

Ensure the application name is 'nodenews-app'

Ensure the Name is 'nodenews'

Scroll down to *Resources*. Click the selection box for *Deployment Config* rather than the default of *Deployment*

OpenShift supports the Kubernetes mechanism of *Deployment* but DeploymentConfigs are more advanced and offer more features for deploying an application, including strategies.

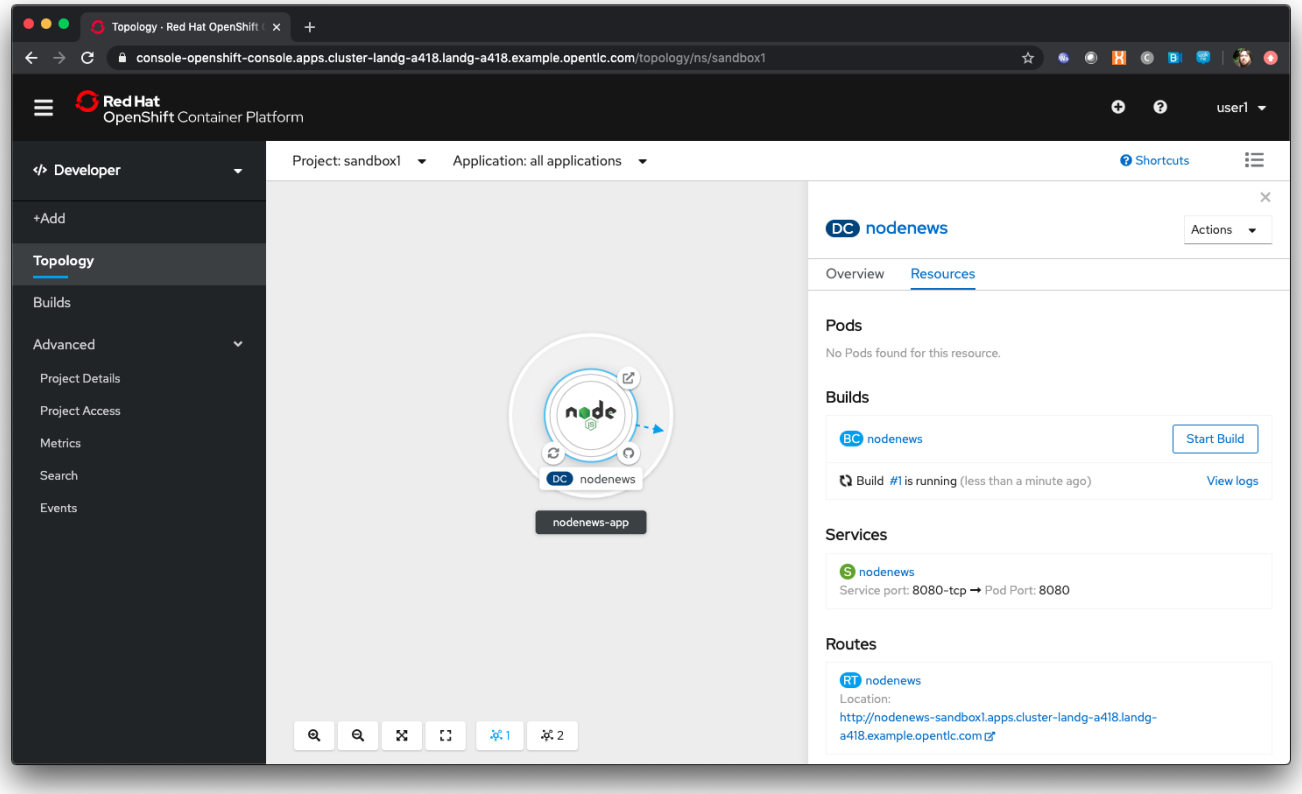
Ensure the 'Create Route is checked'

Click *Create*

The Topology view is a new feature of OpenShift 4 that provides a dynamic and useful

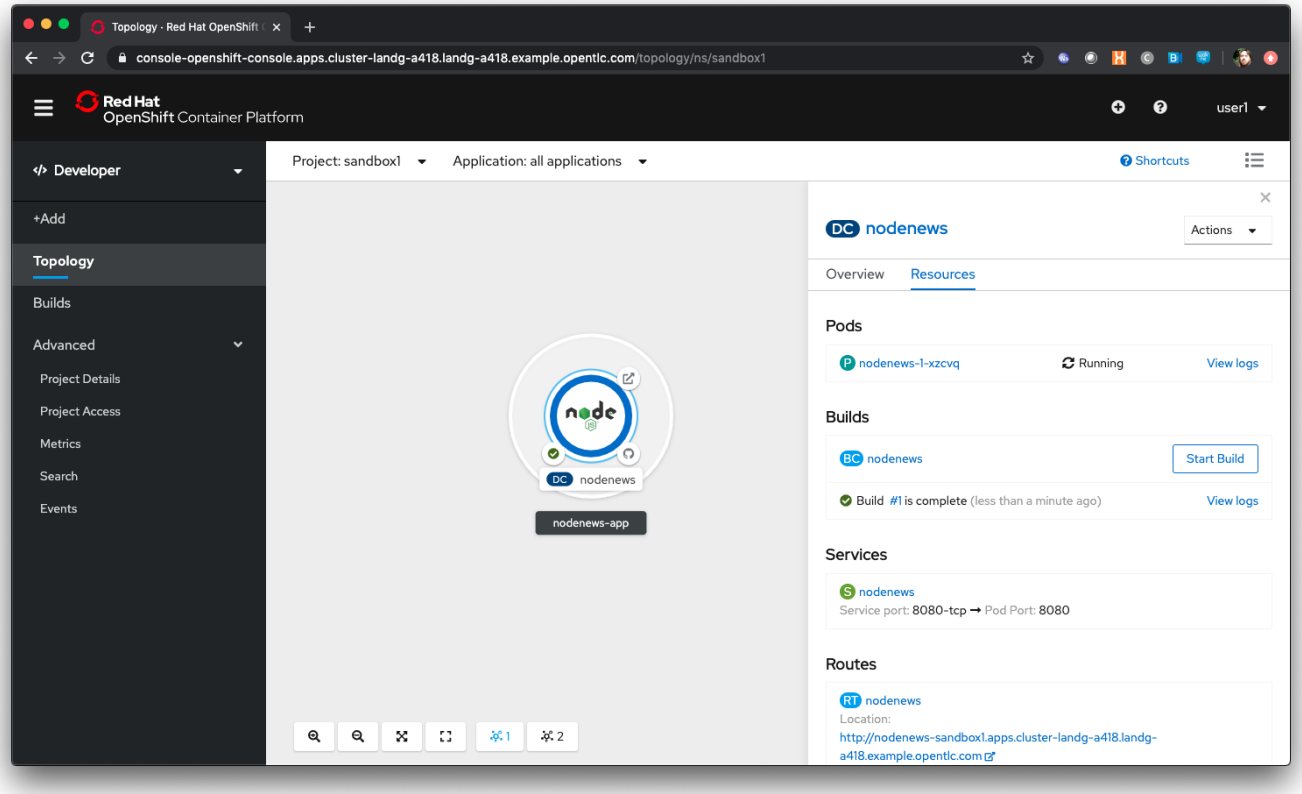
visualisation of all of your Applications in a given Project.

Click on the Icon marked *Node*



The side-panel contains an overview of the Application you chose. In this case it will cover the build. Once a build has completed this side panel shows the Pods that are running, the builds that have completed, the services exported for the Application and the routes, if the Application has any.

Wait for the Build to finish, the Pod to change from Container Creating to Running



When an Application is created the Pod ring will be empty, indicating that an Application will appear once the build has completed. When the build completes the Pod ring will switch to light blue, indicating the Pod is being pulled (the image is being pulled from the registry to the Node where the Pod will land) and is starting (the Pod is physically in place but the Containers within it are not reporting as ready). Once the Pod is placed and running the colour of the Pod ring will change to dark blue.

Click on the Tick at the bottom left of the Pod

If you scroll the log of the Build output you will see the steps that the build takes. This includes laying the foundational file layers for the base image, performing the code specific build operations (in this case an *'npm install'*) and then pushing the file layers for the image into the OpenShift integrated registry.

Adding additional Applications

Click *Add+*

Click *From Catalog*

Search for 'httpd'

Select the Apache HTTP Server (httpd) template - Note that there are two options, you want to choose the one that is labelled (httpd) and starts with the text *Build and serve static content*

Click on *Create Application*

Leave Image Version as 2.4

Enter the following for the Git repo for the application - https://github.com/utherp0/forumstaticassets, window="_blank"

Make sure the Application is ‘nodenews-app’

Click on the entry point for *Name* - it should autofill

Make sure the Name is forumstaticassets

In the Resources section leave the Deployment as *Deployment*

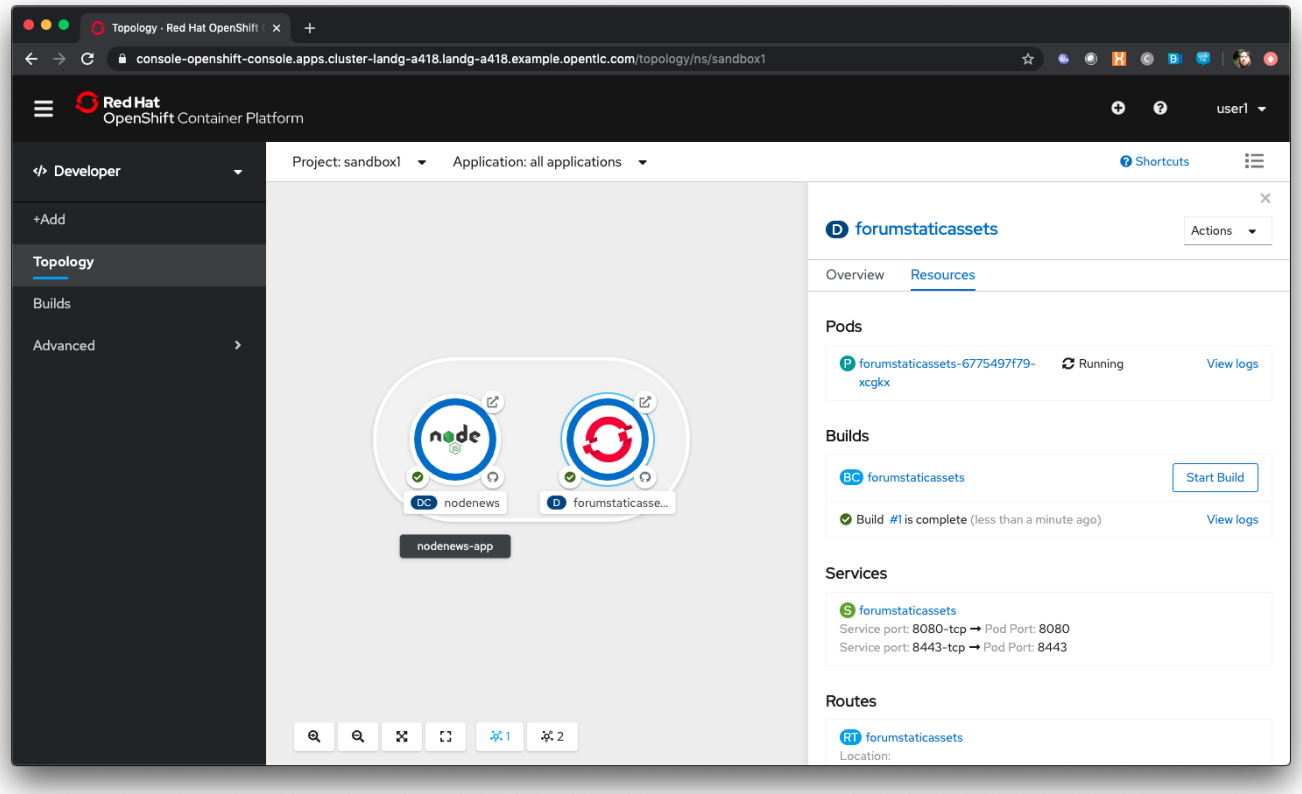
Make sure the ‘Create a Route’ checkbox is clicked

Click *Create*

Note that the new Application icon appears within a bounded area on the Topology page labelled with the *Application* chosen above. If you click on the area between the Pods you can move the group as a single action.

Click on the forumstaticassets Pod

Watch the build complete, the Container Creating and the Running event.



Click *Add*

Click *From Catalog*

Search for ‘node’

Select ‘Node.js’

Click *Create Application*

Leave at Builder Image Version 10

Enter the following for the Git repo for the application - https://github.com/utherp0/ocpnode, window="_blank"

In the ‘Application’ pulldown select ‘Create Application‘

In the ‘Application Name’ enter ‘ocpnode-app’

Ensure the Name is ‘ocpnode’

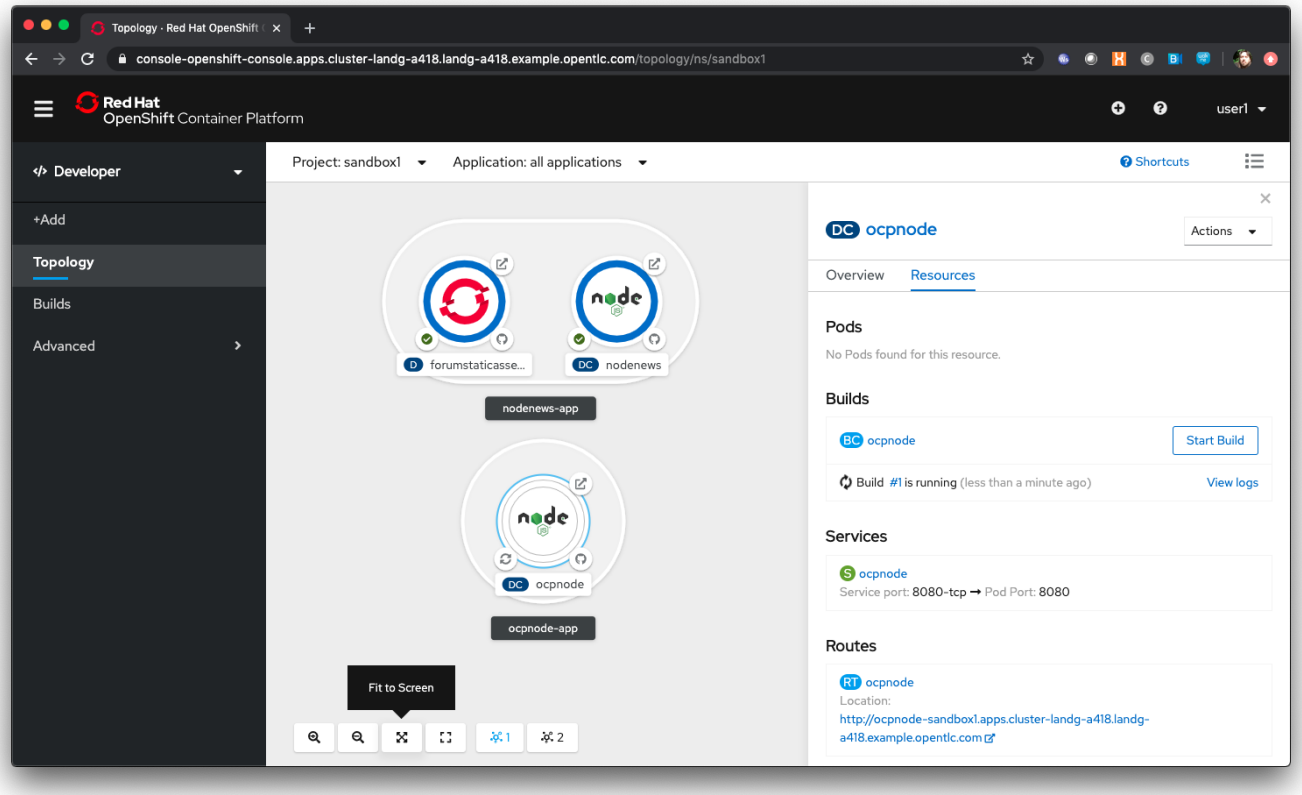
In *Resources* set the deployment type to DeploymentConfig

Ensure the ‘Create Route’ is checked

Click *Create*

Click on the ‘ocpnode’ Application in the topology - click on the  icon (if you hang over it it will say *Fit To Screen*) situated at the bottom left of the Topology panel to centralise the topology

Now we have created a new Application grouping you will see two *'cloud*' groupings, labelled with the appropriate Application name you entered.



Interacting with OpenShift through the Command Line

With the OpenShift Enterprise command line interface (CLI), you can create applications and manage OpenShift projects from a terminal. The CLI is ideal in situations where you are:

- Working directly with project source code.
- Scripting OpenShift Enterprise operations.
- Restricted by bandwidth resources and cannot use the web console.

As part of the pre-requisites for the workshop we created and started a terminal app. Go to that tab now (if you have closed it go back to the pre-reqs and follow the instructions for opening it).

Make sure `oc` is working, type:

```
oc whoami
oc version
```

Also see the **Command-Line Reference**: https://docs.openshift.com/container-platform/4.2/cli_reference/openshift_cli/getting-started-cli.html, window="_blank"

To explore the command line further execute the following commands and observe the results.

Change the X at the end of sandbox to your user number

```
oc projects
oc project sandboxX
```

User should now be using the sandboxX project created and configured earlier

Next we will try a command that will fail because of OpenShift's security controls

```
oc get users
```

There is a level of permission within the OpenShift system called *'Cluster Admin'*. This permission allows a User to access any of the objects on the system regardless of Project. It is effectively a super-user and as such normal users do not normally have this level of access.

```
oc get pods
```

If you look carefully at the Pods shown you will notice there are additional Pods above and beyond the ones expected for your Applications. If you look at the state of these Pods they will be marked as Completed. Everything in OpenShift is executed as a Pod, including Builds. These completed Pods are the Builds we have run so far.

```
oc get pods | grep Completed
```

```
oc get pods | grep Running
```

```
oc get dc
```

DC is an abbreviation for Deployment Config. These are Objects that directly define how an Application is deployed within OpenShift. This is the *'ops'* side of the OpenShift system. Deployment Configs are different to Kubernetes Deployments in that they are an extension and contain things such as Config Maps, Secrets, Volume Mounts, labelled targetting of Nodes and the like.

Enter the command below to tell OpenShift to scale the number of instances of the Deployment Config *nodenews* to two rather than the default one.

```
oc scale dc/nodenews --replicas=2
```

A Summary of Application Interactions

Go back to the UI and make sure you are on Developer mode. Click on Topology.

Click on the ‘nodenews’ application

Note the ‘DC’ reference to the application under the icon

In the pop-up panel on the right click on *Resources*

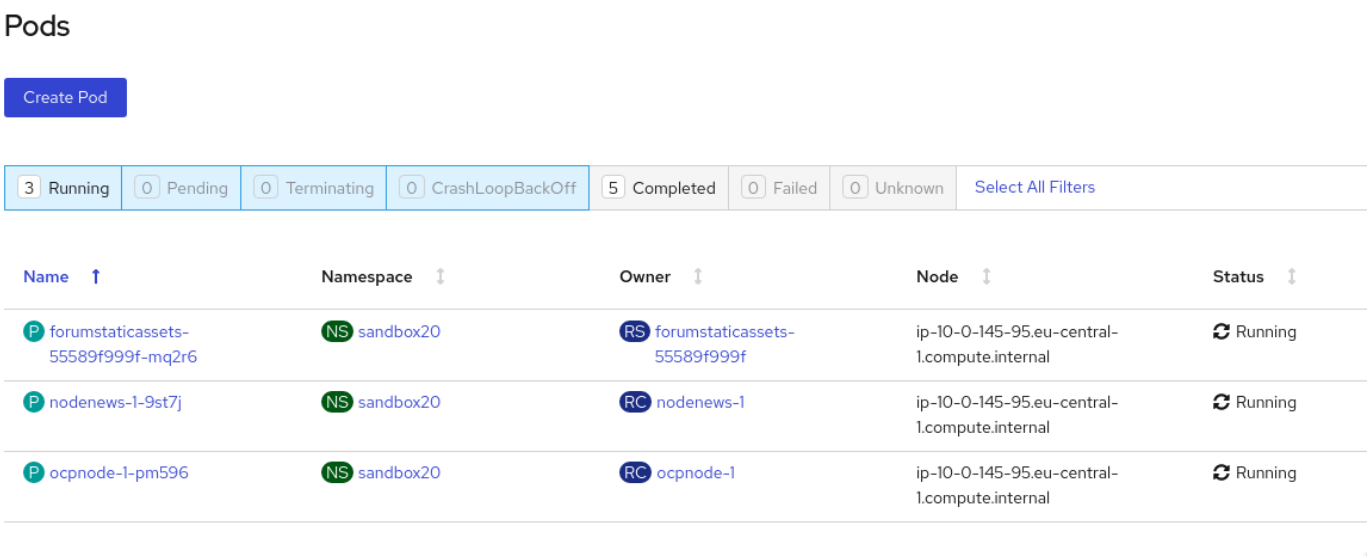
Note that there are two pods running with the application now

Change the mode from Developer to Administrator

Select the *sandboxx* project in the project list

Note the metrics for the project

Click on *Workloads* on the left menu (not the project overview) and then select Pods to see the list of pods for the project as shown in the image below.



It is possible to filter groups of pods that are displayed based on the headings of Running, Pending, Terminating etc. The classifications in dark blue are currently being displayed and those in grey are not being displayed. Click on the *Completed* heading to switch on the display of completed pods (there should be five). Click on *Running* to toggle the display of running pods off. Click on the appropriate headings again to switch off the display of completed pods and to switch back on the display of running pods.

Note that all the builds and deployments you have done, for the deployments that have a DeploymentConfig, have completed Pods. All of the actions are executed in separate Pods which is one of the key features that makes OpenShift so scalable

Change to Developer mode and then select Topology if the Topology page isn’t already shown

Hold down the shift button, click and hold on the forumstaticassets icon, and pull it out of the application grouping graphic. Release the hold on the forumstaticassets icon.

The UI will now prompt you if you wish to remove the application component. Select Remove. This component is now separated from the application group

Now hold down the shift button again, click and hold on the free floating forumstaticassets icon, and drag back over the boundary displayed for the nodenews-app application group. Release the hold and the application should be re-grouped.

Continue on with the Deployments chapter, which uses the applications created here to show the capabilities of the deployment configuration and how to alter the behaviour and file system of a Container without changing the image.

Understanding Deployments and Configuration [ESSENTIALS]

Author: Ian Lawson (feedback to ian.lawson@redhat.com)

Introduction

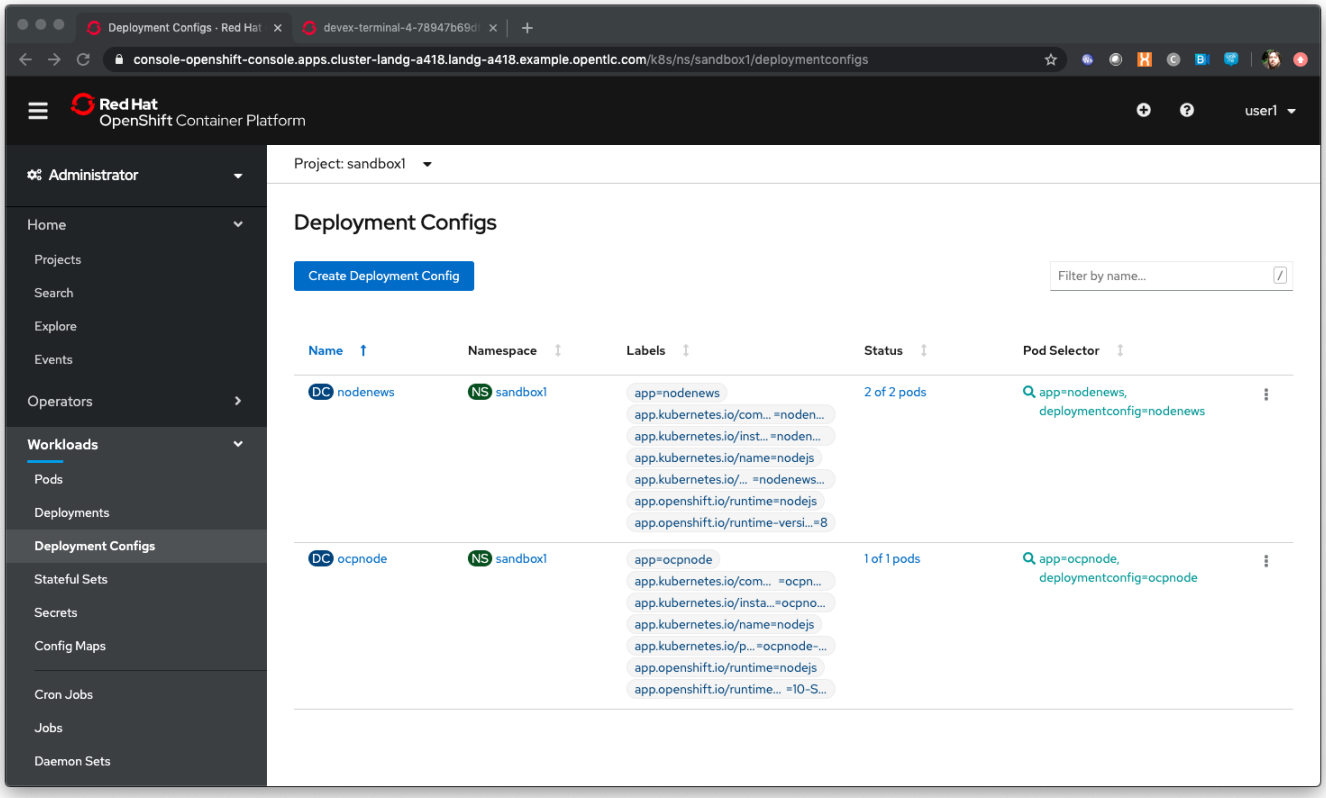
This chapter will introduce the attendee to concepts of deployments and configuration injection using OpenShift Container Platform.

The attendee will be using a browser for interacting with both the OpenShift Container Platform UI and the provided terminal (for command line exercises). It is suggested the attendee uses Chrome or Firefox.

This chapter follows directly on from the Application Basics one so it is assumed the attendee is logged on to the system and has the applications pre-created. If you are starting at this chapter please repeat the commands from the Application Basics chapter. You should start this chapter with two application running in the project, nodenews and ocpnode

Introducing Deployment Configurations

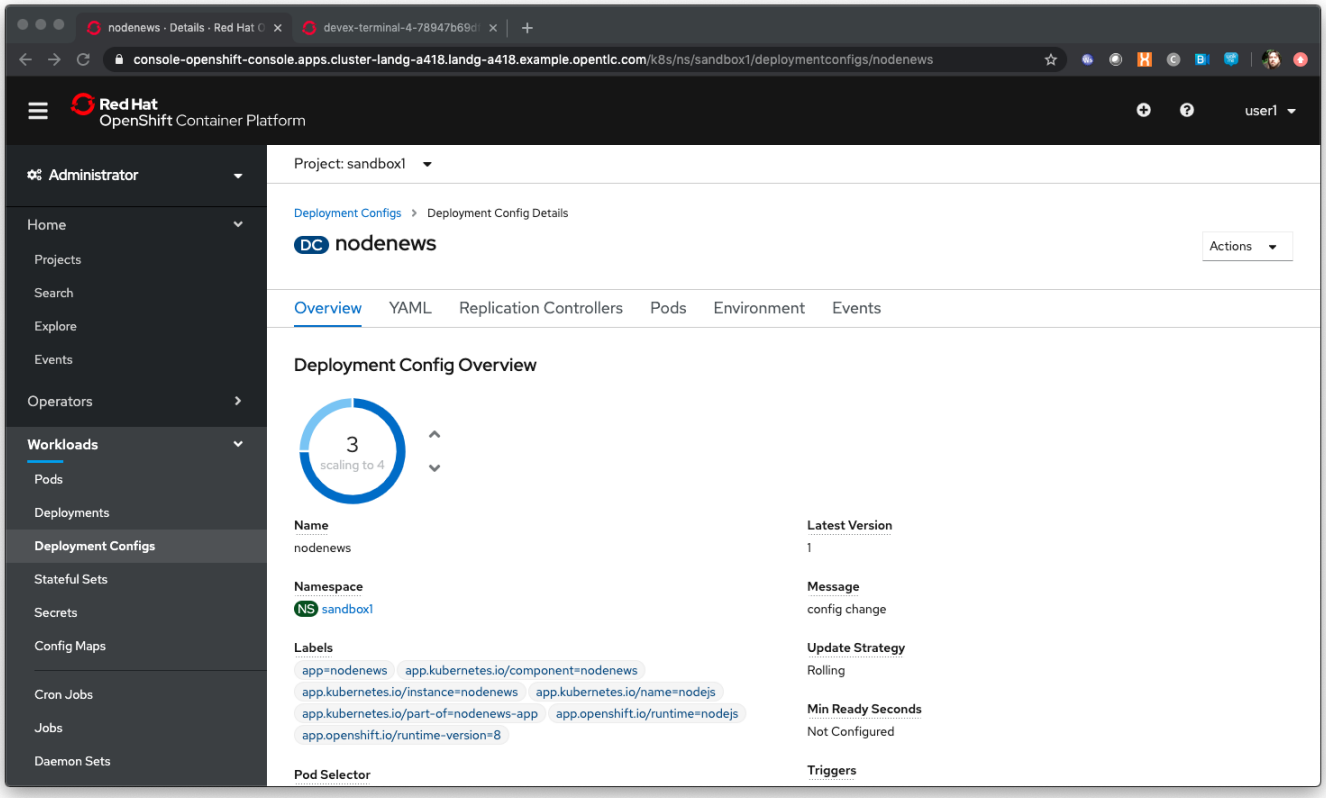
Ensure you are on the Administrator View (top level, select *Administrator*) Select *Workloads/Deployment Configs*



Observe the information provided on the Deployment Configs screen. DC indicates the Deployment Config by name, NS is the project/namespace, Labels are the OpenShift labels applied to the DC for collating and visualisation, status indicates the active Pod count for the Deployment and pod selector indicates the labels used for the Pods attributed to the Deployment Config.

Click on the *nodenews* deployment-config

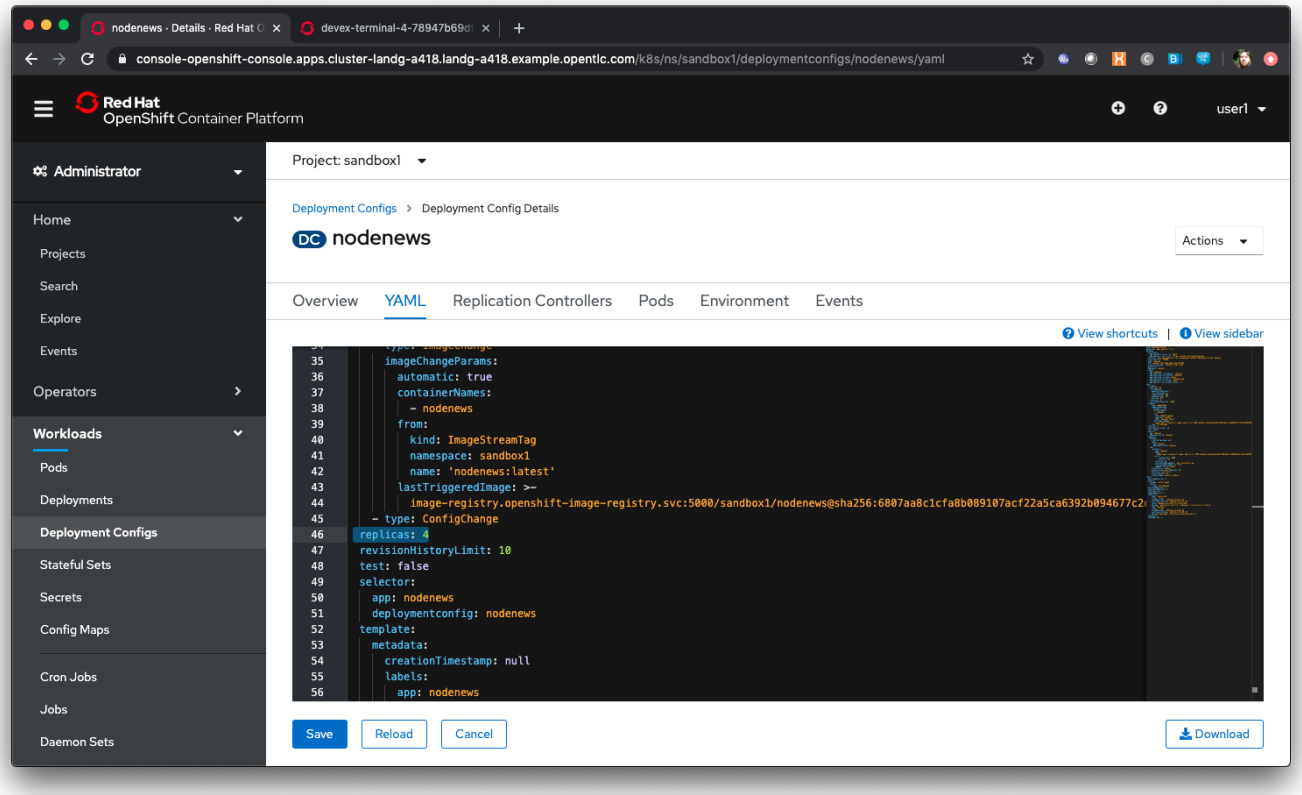
Next to the Pod icon, with the count in it which should be set to two, click on the up arrow twice



We have told the deployment config to run four replicas. The system now updated the replication controller, whose job is to make sure that x replicas are running healthily, and once the replication controller is updated the system will ensure that number of replicas is running

Click on ‘YAML’

In the YAML find an entry for replicas. It should say 4. Set it to 2, then save.



Click on ‘Deployment Configs’ near the top of the panel.

Select the nodenews deployment config by clicking on the nodenews DC link

Ensure the Pod count is now two

Dependency Injection using Config Maps

Click on *Workloads/Config Maps*

Config Maps allow you to create groups of name/value pairs in objects that can be expressed into the Applications via the Deployment Configs and can change the file system, environment and behaviour of the Application without having to change the *image* from whence the Application was created. This is extremely useful for dependency injection without having to rebuild the Application image

Click on ‘Create Config Map’

In the editor change the name: from example to ‘nodenewsconfig’

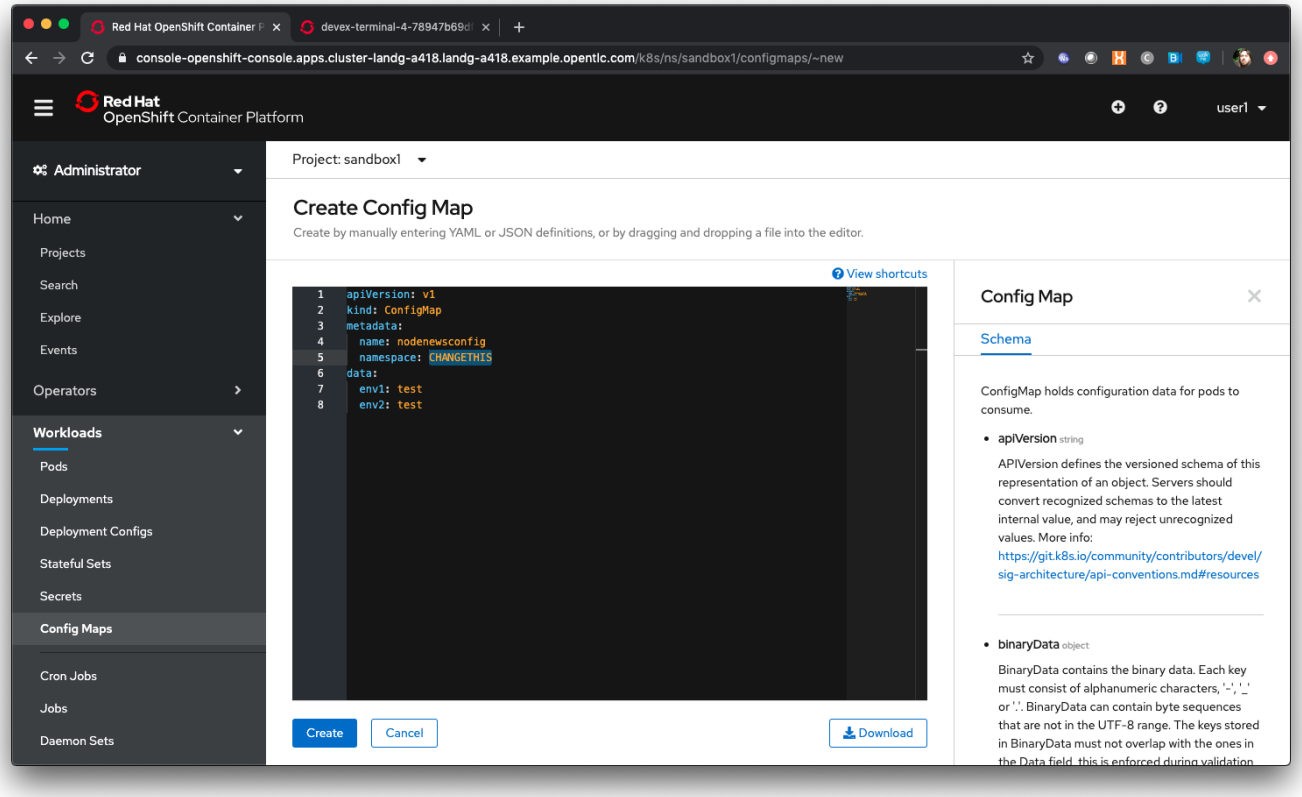
Delete all of the lines below **data:**

Add “ env1: test”

Add “ env2: test”

Make sure there is a space between the *:* and the data itself, otherwise it is invalid YAML and the editor will not allow you to save it.

The YAML should look similar to the screenshot below, with your project name instead of sandbox99 and the name you have entered rather than CHANGETHIS.



Press *Create*

Go back to the command line tab

Type ‘oc get configmaps’

Type ‘oc describe configmap nodenewsconfig’

Go back to UI, select *Workloads/Deployment Configs*

Click on the *nodenews* dc

Click on *Environment*

In ‘All Values from existing config maps’ select nodenewsconfig from the pulldown on the left and add nodenewsconfig as the prefix in the righthand textbox (labelled PREFIX (OPTIONAL))

Click *Save*

Click on *Workloads/Pods* - if you are quick enough you will see the nodenews Pods being redeployed

By default when you create a Deployment Config in OpenShift, as part of an Application or as a standalone object via YAML, the Deployment Config will have two distinct triggers for automation. These make the Deployment redeploy when a: the image that the Deployment Config is based on changes in the registry or b: the defined configuration of the Deployment changes via a change to the DC object itself

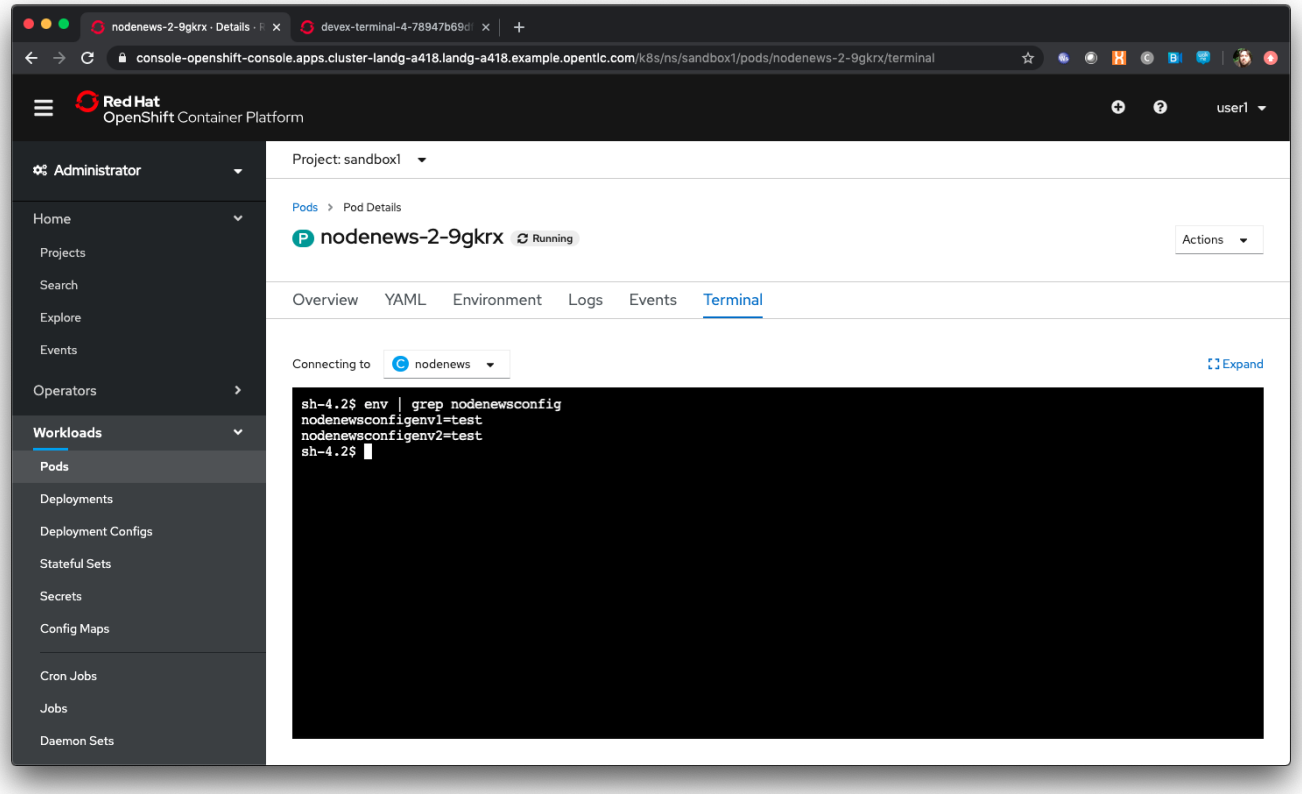
These are default behaviours but can be overridden. They are designed to make sure that the current deployment exactly matches the Images and the definition of the deployment by default.

Click on one of the Pods for *nodenews*

In the Pod Details page click on *Terminal*

In the terminal type 'env | grep nodenewsconfig'

Note that the env variables from the config map have been expressed within the Pod as env variables (with the nodenewsconfig prefixed)



Go back to the Terminal tab you created in the pre-requisites. We are going to use some material pre-loaded into the terminal image. Type the following commands in the Terminal tab.:

```
cd /workspace/workshop4/attendee
cat testfile.yaml
```

This file is the one to be used. If it, or any of the directories, don't exist, please follow the pre-requisite instructions and recreate the Terminal application.

All objects in Kubernetes/Openshift can be expressed as yaml and this is a basic configmap for a file. What is very nice about the API and it's object oriented nature is that you can export any object that you have the RBAC rights to view and import them directly back into OpenShift, which is what we will do now with the following commands in the terminal

```
oc create -f testfile.yaml
oc get configmaps
```

Go back to the UI, select *Workloads/Deployment Configs*

Select *nodenews* dc

Click on *YAML*

In order to add the config-map as a volume we need to change the container specification within the deployment config.

Find the setting for 'imagePullPolicy'. Put the cursor to the end of the line. Hit return. Underneath enter:

```
        volumeMounts:
          - name: workshop-testfile
            mountPath: /workshop/config
```

Make sure the indentation is the same as for the 'imagePullPolicy'.

Now in the 'spec:' portion we need to add our config-map as a volume.

Find 'restartPolicy'. Put the cursor to the end of the line and press return. Underneath enter:

```
      volumes:
        - name: workshop-testfile
          configMap:
            name: testfile
            defaultMode: 420
```

Save the deployment config.

Click on *Workloads/Pods*. Watch the new versions of the nodenews application deploy.

When they finish deploying click on one of the nodenews Pods. Click on *Terminal*.

In the terminal type:

```
cd /workshop
ls
cd config
```

Note that we have a new file called 'app.conf' in this directory. This file is NOT part of the image that generated the container.

In the terminal type:

```
cat app.conf
```

This is the value from the configmap object expressed as a file into the running container.

In the terminal type:

```
vi app.conf
```

Press 'i' to insert, then type anything. Then press ESC. Then type ':wq'

You will not be able to save it. The file expressed into the Container from the configmap is ALWAYS readonly which ensures any information provided via the config map is controlled and immutable.

Type ':q!' to quit out of the editor

Dependency Injection of sensitive information using Secrets

The config map to be written as a file is actually written to the Container Hosts as a file, and then expressed into the running Container as a symbolic link. This is good but can be seen as somewhat insecure because the file is stored *as-is* on the Container Hosts, where the Containers are executed

For secure information, such as passwords, connection strings and the like, OpenShift has the

concept of *Secrets*. These act like config maps *but* importantly the contents of the secrets are encrypted at creation, encrypted at storage when written to the Container Hosts and then unencrypted only when expressed into the Container, meaning only the running Container can see the value of the secret.

In the UI select *Workloads/Secrets*

Click on *Create*

Choose ‘Key/Value Secret'

For ‘Secret Name’ give ‘nodenewssecret’

Set ‘Key’ to ‘password’

Set ‘Value’ textbox to ‘mypassword’

Click ‘Create’

When created click on the ‘YAML’ box in the Secrets/Secret Details overview

Note that the type is ‘Opaque’ and the data is encrypted

Click on ‘Add Secret To Workload’

In the ‘Select a workload’ pulldown select the nodenews DC

Ensure the ‘Add Secret As’ is set to Environment Variables

Add the Prefix ‘secret’

Click ‘Save’

Watch the Pods update on the subsequent ‘DC Nodenews’ overview

When they have completed click on ‘Pods’

Choose one of the nodenews running pods, click on it, choose Terminal

In the terminal type ‘env | grep secret’

Understanding the Deployment Strategies

Click on *Workloads/Deployment Configs*

Click on the DC for *nodenews*

Scale the Application up to four copies using the up arrow next to the Pod count indicator

Once the count has gone to 4 and all the Pods are indicated as healthy (the colour of the Pod ring is blue for all Pods) select Action/Start Rollout.

The DC panel will now render the results of the deployment.

Deployments can have one of two strategies. This example uses the *Rolling* strategy which is designed for zero downtime deployments. It works but spinning up a single copy of the new Pod, and when that Pod reports as being healthy only then is one of the old Pods removed. This ensures that at all times the required number of replicas are running healthy with no downtime for the Application itself.

Click on *Actions/Edit Deployment Config*

Scroll the editor down to the 'spec:' tag as shown below

```
spec:
 strategy:
   type: Rolling
   rollingParams:
```

Change the type: tag of the strategy to Recreate as shown below

```
spec:
 strategy:
   type: Recreate
```

Click on *Save*

Click on *Workloads/Deployment Configs*, select nodenews dc

Click on 'Action/Start Rollout'

Watch the colour of the Pod rings as the system carries out the deployment

In the case of a Recreate strategy the system ensures that NO copies of the old deployment are running simultaneously with the new ones. It deletes all the running Pods, regardless of the required number of replicas, and when all Pods report as being fully deleted it will start spinning up the new copies. This is for a scenario when you must NOT have any users interacting with the old Application once the new one is deployed, such as a security flaw in the old Application

Cleaning up

From the OpenShift browser window, click on *Home* and then *Projects* on the left hand side menu.

In the triple dot menu next to your own project (sandboxX) select ‘Delete Project’ Type ‘sandboxX’ (where X is your user number) such that the Delete button turns red and is active.

Press Delete to remove the project.

Application Deployment Configurations and DevOps Approaches [ESSENTIALS]

Author: Mark Roberts (feedback to mroberts@redhat.com)

Introduction

DevOps is a much overloaded term that is used to describe a variety of concepts in the creation of modern applications. In a simple definition DevOps is concerned with the interface between development practices used for the creative elements of software engineering and the procedural rigour of operationally running applications in production. Clearly these concepts have different objectives so it is important for teams (whether tasked with development or operations) to have a good understanding of the concepts, objectives and concerns of their counterparts on the other side of the fence.

In terms of this workshop it is important to highlight the capabilities of containerised platforms with respect to the roll out of new versions of applications and how they get introduced to production and to end users. Terms such as blue/green deployments, black and white deployments, A/B deployments and canary deployments are used in various text books on *DevOps* principles and some of these areas will be used in this chapter of the workshop.

The activities in this workshop will introduce a new version of a simple application to use in two different manners.

Workshop Content

The application to be used in this workshop is a simple NodeJS REST interface. Version 1 exists on the master branch of the GIT Repository and version 2 exists on the experimental branch.

To begin the creation of the application use the following commands in an command line window. :

Creation of version 1

```
oc new-project master-slaveX
```

(Where X is your user number)

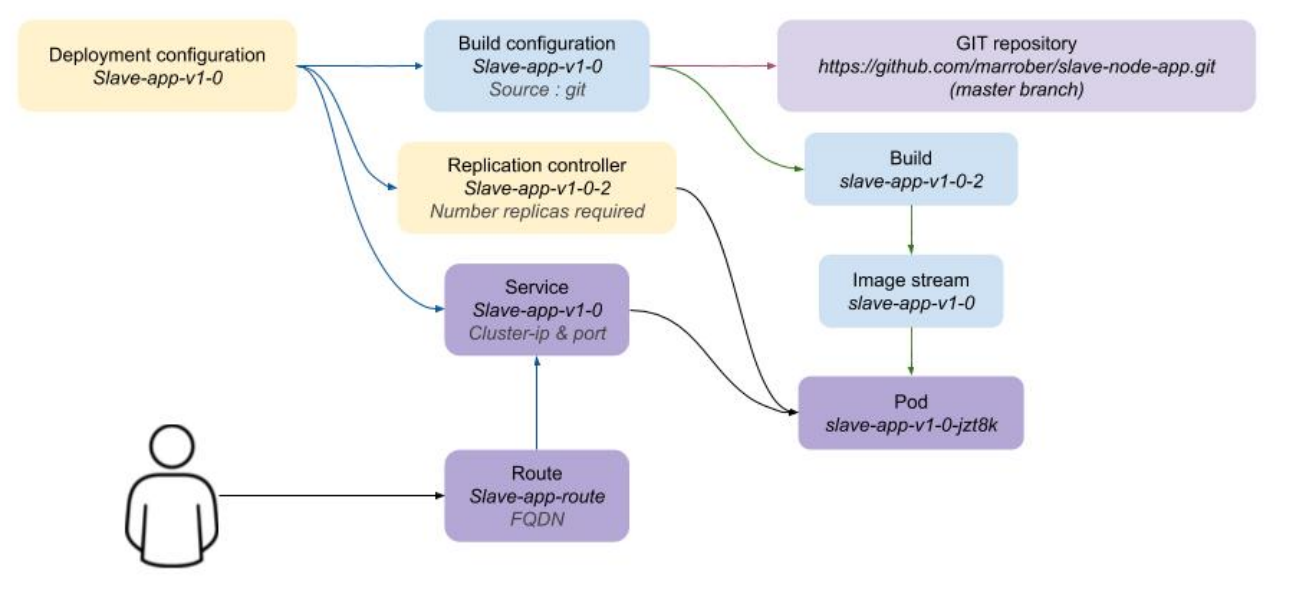
```
oc new-app --name slave-app-v1-0  https://github.com/marrober/slave-node-app.git

oc expose service slave-app-v1-0 --name="slave-app-route"
```

What got created ?

It is important to understand the artefacts and content that are created by the above commands within OpenShift:

- A new project is created called master-slaveX.
- A deployment configuration is created called slave-app-v1-0.
- A replication controller is created associated with the application and the built objects. This defines the scaling of the application in terms of the number of pods and the deployment strategy (rolling or recreate).
- A build configuration is created to compile the application source code which is extracted from the associated GIT repository.
- The build configuration will create a build instance which includes logs of the build process and a reference to the built image.
- The newly created image is deployed as a running pod (or pods depending on the number of pods defined in the deployment configuration).
- A service is created as part of the application creation process. The service endpoints will point to the pod(s) created by the build process. In the case of a rebuild and redeploy operation the service endpoints are updated to point to the new pods in accordance with the deployment strategy of the deployment configuration.
- The service is then exposed external to the cluster by the creation of a route. The route has a fully qualified domain name for access from machines outside the cluster.

The diagram below shows the above and how they relate together.



To identify the URL of the route execute the command shown below:

```
oc get route slave-app-route -o jsonpath='{"http://"}{.spec.host}{"/ip\n"}'
```

This will display a formatted URL with the *http://* part at the beginning which will be similar to :

http://slave-app-route-master-slave.apps.cluster-xxxx-yyyy.xxxx-yyyy.example.opentlc.com/ip

To test the application use the command line window to issue a curl command to:

```
curl -k <url from the above command>
```

The response should be as shown below (example ip address) :

"10.131.0.114 v1.0"

Creation of version 2

The development team now wants to introduce an experimental version 2 of the application and introduce it to the users in a number of different ways. The first action is to create the new build process for the experimental version using the command below.

```
oc new-app --name slave-app-v2-0 https://github.com/marrober/slave-node-
app.git#experimental
```

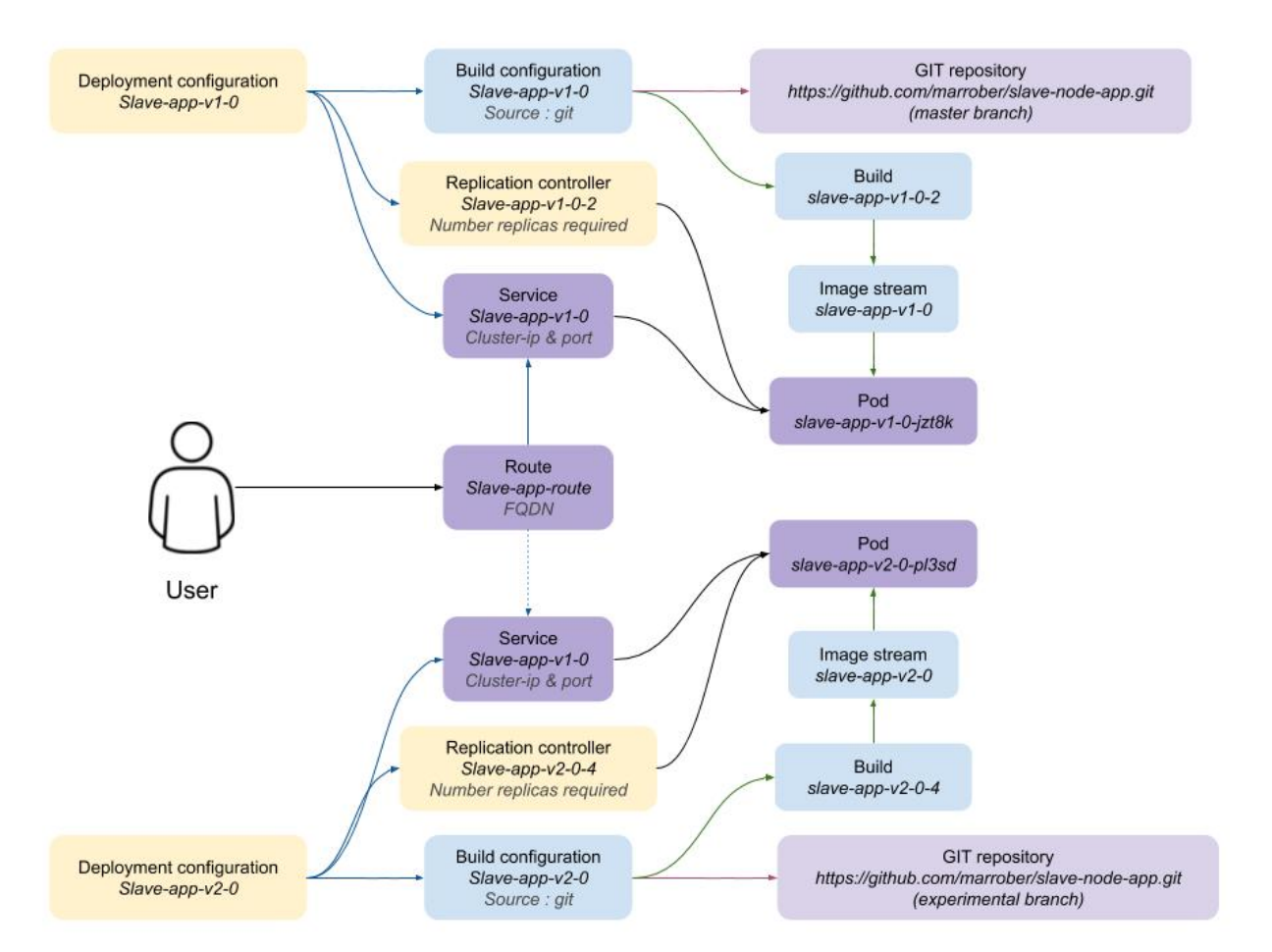
Note the use of the #experimental branch identifier in the end of the GIT repository. This syntax cannot be used through the web interface to openshift so any requirements for non-standard GIT connectivity must be done through the command line interface. It is also possible to configure the source-2-image capability to reference a specific sub directory of the repository using the --context option.

What got added to the project ?

New content was added to the project as a result of the above command specific to the experimental (v2) version of the application.

- A deployment configuration
- A replication controller
- A build configuration
- A running container in a pod
- A service

The diagram below shows the above and how the relate together.



At this point the version 2 application is operational but not accessible externally to the cluster.

Blue / Green Deployment

The benefit of creating the new version of the application alongside the old is that it is quick and easy to migrate users to a new version of the application. It also allows teams to validate that the pods are running correctly.

Switching the route from v1 to v2 involves patching the route to change configuration. Before executing this operation open a new command window and execute the command below to send requests to the route every second. The responses received should all include the ip address of the pod and the version (v1) of the application.

Get the URI of the route using the command :

```
oc get route slave-app-route -o jsonpath='{"http://"}{.spec.host}{"/ip\n"}'
```

Copy the result of the above command and paste it into the shell script below:

```
for i in {1..1000}; do curl -k <URI> ; echo ""; sleep 1; done
```

A series of reports of ip address and version 1 of the application will then start to scroll up the screen. Leave this running.

Switch back to the original command window and execute the command below to patch the route to version 2 of the application.

```
oc patch route/slave-app-route -p '{"spec":{"to":{"name":"slave-app-v2-0"}}}'
```

Switch back to the command window with the shell script running and you should see the responses have a new ip address and now report v2 of the application. This has completed a migration from the old version of the application to the new.

The details of the route patched by the above command are displayed by the command:

```
oc get route/slave-app-route -o yaml
```

The output of the above command is shown below, and the nested information from spec → to → name is easy to see.

```
apiVersion: route.openshift.io/v1
kind: Route
metadata:
  annotations:
    openshift.io/host.generated: "true"
  creationTimestamp: 2019-12-04T17:16:37Z
  labels:
    app: slave-app-v1-0
  name: slave-app-route
  namespace: master-slave
  resourceVersion: "884652"
  selfLink: /apis/route.openshift.io/v1/namespaces/master-slave/routes/slave-app-route
  uid: d4910fef-16b9-11ea-a6c5-0a580a800048
spec:
  host: slave-app-route-master-slave.apps.cluster-telf-c8e6.telf-c8e6.example.opentlc.com
  port:
    targetPort: 8080-tcp
  subdomain: ""
  to:
    kind: Service
    name: slave-app-v2-0
    weight: 100
  wildcardPolicy: None
status:
  ingress:
  - conditions:
    - lastTransitionTime: 2019-12-04T17:16:38Z
      status: "True"
      type: Admitted
    host: slave-app-route-master-slave.apps.cluster-telf-c8e6.telf-
c8e6.example.opentlc.com
    routerCanonicalHostname: apps.cluster-telf-c8e6.telf-c8e6.example.opentlc.com
    routerName: default
    wildcardPolicy: None
```

Before moving to the A/B deployment strategy switch back to version v1 with the command:

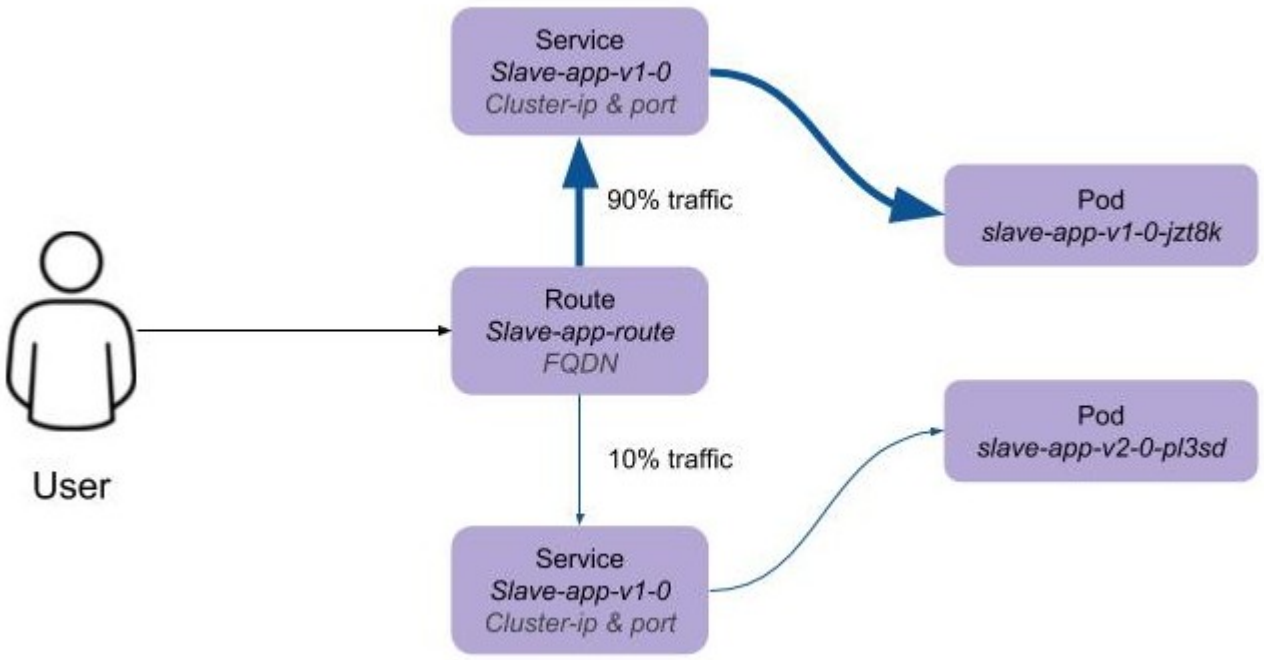
```
oc patch route/slave-app-route -p '{"spec":{"to":{"name":"slave-app-v1-0"}}}'
```

Confirm this has worked in the command window executing the shell script.

A/B Deployment

The benefit of an A/B deployment strategy is that it is possible to gradually migrate workload to the new version. This example presents a simple process of gradually migrating a higher and higher percentage of traffic to the new version, however more advanced options are available for migrating traffic based on headers or source ip address to name just two. Red Hat OpenShift Service Mesh is another topic that is worth investigation if advanced traffic routing operations are required.

Gradually migrating traffic from v1 to v2 involves patching the route to change configuration as shown below.



To migrate 10% of traffic to version 2 execute the following command:

```
oc set route-backends slave-app-route slave-app-v1-0=90 slave-app-v2-0=10
```

Switch back to the command window running the shell script and after a short wait you will see the occasional report from version 2.

To balance the workload between the two versions execute the following command:

```
oc set route-backends slave-app-route slave-app-v1-0=50 slave-app-v2-0=50
```

Switch back to the command window running the shell script and after a short wait you will see a more even distribution of calls between versions 1 and 2.

The details of the route patched by the above command are displayed by the command:

```
oc get route/slave-app-route -o yaml
```

A section of the output of the above command is included below, showing the split of traffic between versions 1 and 2.

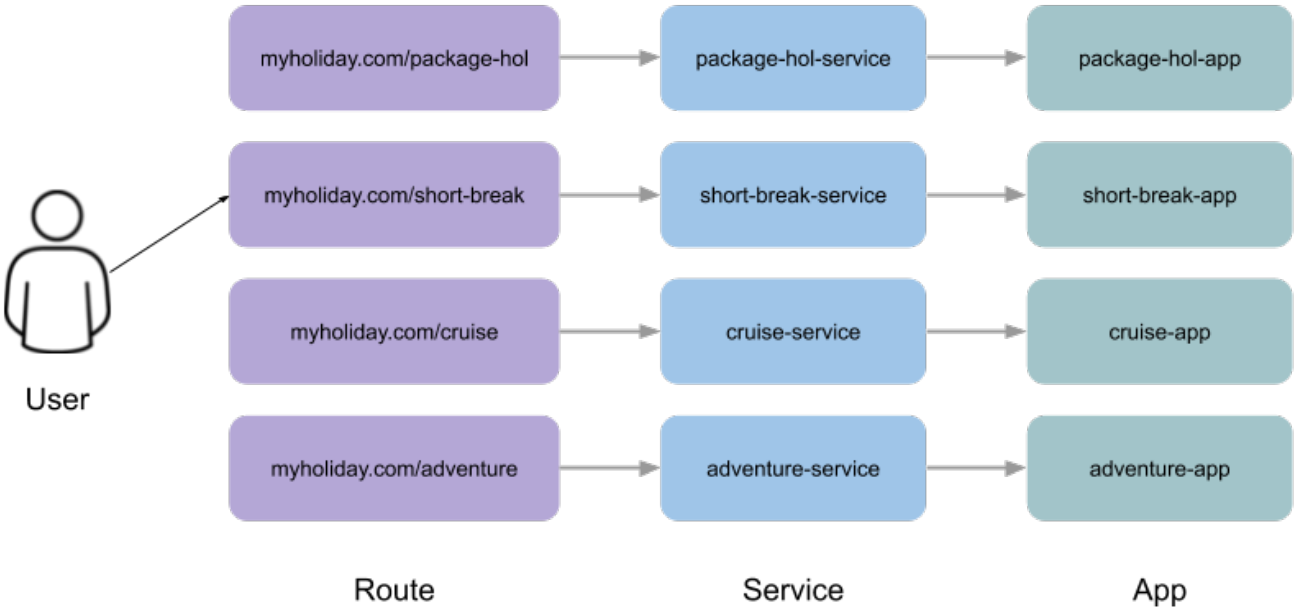
```
spec:
  alternateBackends:
  - kind: Service
    name: slave-app-v2-0
    weight: 50
  host: slave-app-route-master-slave.apps.cluster-telf-c8e6.telf-c8e6.example.opentlc.com
  port:
    targetPort: 8080-tcp
  subdomain: ""
  to:
    kind: Service
    name: slave-app-v1-0
    weight: 50
```

When satisfied that version 2 is working as required the following command will switch all traffic to that version and will remove the references to version 1 from the route.

```
oc set route-backends slave-app-route slave-app-v1-0=0 slave-app-v2-0=100
```

URL based routing

Many organisations want to use a common URL for their web sites so that it is easy for users. This is often achieved by pointing a specific URL at an OpenShift cluster route within a global load balancer function, however this is not essential and it is possible to use routes to achieve the same result. Take as an example a holiday company called myholiday.com. The company wishes to sell package holidays, short breaks, cruises and adventure holidays and they create different applications for these purposes. By using a common host name in a series of route it is possible to ensure that traffic flows to the right location, based on the path of the url used. The diagram below shows the descried sceanrio and how the routes, services and applications work together



In this example you will create an application that mirrors that shown above and you will use a single URL for access to the four different elements of the application.

Creating the applications

This example uses a common code base to create the specific applications for the above four holiday types. To create the four applications in a single project use the steps below substituting your student number for *X* so that you get a separate project to other users in the workshop.

```
oc new-project myholidayX
oc new-app https://github.com/marrober/workshop4.git --context-dir=attendee/myholiday \
--name=short-holiday -l app.kubernetes.io/part-of=holidays HOLIDAY_TYPE=short-break
oc new-app https://github.com/marrober/workshop4.git --context-dir=attendee/myholiday \
--name=package-holiday -l app.kubernetes.io/part-of=holidays HOLIDAY_TYPE=package
oc new-app https://github.com/marrober/workshop4.git --context-dir=attendee/myholiday \
--name=cruise-holiday -l app.kubernetes.io/part-of=holidays HOLIDAY_TYPE=cruise
oc new-app https://github.com/marrober/workshop4.git --context-dir=attendee/myholiday \
--name=adventure-holiday -l app.kubernetes.io/part-of=holidays HOLIDAY_TYPE=adventure
```

Switch to the web user interface and select the project that you have just created. Then select the topology view from the left hand side developer menu and watch the applications build and deploy. Progress of the build phase can also be tracked using the command :

```
oc get build
```

When all of the builds are complete the applications will take a few seconds to deploy and then will be ready.

At this stage the applications have services but they do not have any routes exposing them outside the cluster. Ordinarily users would create a route for each application which would result in a different URL for each. In this activity a common URL is required for all four.

To identify the cluster specific element of the hostname to use for the route, create a temporary route using the command below. The second command is used to get the hostname for the route.

```
oc expose service/adventure-holiday
oc get route adventure-holiday -o jsonpath='{.spec.host}'
```

This will result in a new route being created and the hostname will be displayed similar to :

```
adventure-holiday-myholiday2.apps.cluster-c2d5.c2d5.example.opentlc.com
```

The element of the path that we need for the new common hostname is from the .apps part forward, and a new part will be created to replace *adventure-holiday-myholiday2* based on the project name. A shell script is used to configure the four route creation yaml files which are downloaded from the workshop git repository. If you have not already done so clone the git repository using the command below and then switch directory and examine one of the yaml files.

```
git clone https://github.com/utherp0/workshop4.git
cd workshop4/attendee/myholiday
cat adventure-route.yaml
```

The YAML file is shown below :

```
apiVersion: route.openshift.io/v1
kind: Route
metadata:
  labels:
    app: adventure-holiday
  name: adventure-route
spec:
  host: URL
  path: "/adventure"
  to:
    kind: Service
    name: adventure-holiday
    weight: 100
```

The host *URL* will be replaced by the configure-routes.sh shell script. The path shows /adventure, and a similar path exists in the cruise, package and short-break files to point to their specific paths.

Execute the shell script *configure-routes.sh* with this command:

```
./configure-routes.sh
```

Now take another look at adventure-route.yaml, which will be similar to that which is shown below.

```
apiVersion: route.openshift.io/v1
kind: Route
metadata:
  labels:
    app: adventure-holiday
  name: adventure-route
spec:
  host: myholiday2.apps.cluster-c2d5.c2d5.example.opentlc.com
  path: "/adventure"
  to:
    kind: Service
    name: adventure-holiday
    weight: 100
```

The host path is now made up of the common element from the project name and the common cluster specific path.

Delete the temporary route used to generate the hostname with the command below.

```
oc delete route/adventure-holiday
```

Execute the following commands to create the four routes.

```
oc create -f adventure-route.yaml
oc create -f cruise-route.yaml
oc create -f package-route.yaml
oc create -f short-break-route.yaml
```

Examine the new routes using the command :

```
oc get routes
```

An example of the important information from the above command is shown below.

```
NAME                  HOST/PORT                                                  PATH
SERVICES
adventure-route       myholiday2.apps.cluster-c2d5.c2d5.example.opentlc.com   /adventure
adventure-holiday
cruise-route          myholiday2.apps.cluster-c2d5.c2d5.example.opentlc.com   /cruise
cruise-holiday
package-route         myholiday2.apps.cluster-c2d5.c2d5.example.opentlc.com   /package
package-holiday
short-holiday-route   myholiday2.apps.cluster-c2d5.c2d5.example.opentlc.com   /short-
break   short-holiday
```

Test the routes (copy and paste from your result of the *oc get routes* command) by accessing the four different holiday types from the common url with the curl commands below. The text responses will show that the correct application is responding to each request.

```
curl myholiday2.apps.cluster-c2d5.c2d5.example.opentlc.com/adventure
curl myholiday2.apps.cluster-c2d5.c2d5.example.opentlc.com/cruise
curl myholiday2.apps.cluster-c2d5.c2d5.example.opentlc.com/package
curl myholiday2.apps.cluster-c2d5.c2d5.example.opentlc.com/short-break
```

Cleaning up

From the OpenShift browser window click on *Advanced* and then *Projects* on the left hand side menu.

In the triple dot menu next to your own project (master-slaveX) select ‘Delete Project’ Type ‘master-slaveX’ (where X is your user number) such that the Delete button turns red and is active. Press Delete to remove the project.

Repeat the above process for the myholidayX project too.

Understanding the Software Defined Network [ESSENTIALS]

Introduction

This chapter provides a developer-centric view of the fundamentals and capabilities of the SDN (Software Defined Network) that is used within OpenShift for Application connectivity.

If you are not already logged on go to the UI URL at https://example.manifest.com, window="_blank" and logon as *userx* (x is the number provided to you) and password openshift.

The basics of Service Addressing

In this section we will create a couple of simple applications and show how they are represented via the Service and load-balancing of Pods within the SDN itself.

If you do not already have a terminal tab running as defined in the pre-requisites please open one following the instructions in the pre-requisites

Ensure you are on the Administrator View (top level, select Administrator)

Select Home/Projects

Click on ‘Create Project’

For the project name give it networktestx where x is your user number

Display Name and Description are optional

Click on *Create*

Using the top left selection switch the UI from Administrator to Developer

In the Topology Tab click on ‘From Catalog’

In the search box enter ‘node’. Select the Node.js option

Click ‘Create Application’

Default the image to version 10

For the git repo enter ‘https://github.com/utherp0/nodenews’

Set the *Application Name* to ‘application1-app’

Set the *Name* to *application1*

In Resources set the deployment type to DeploymentConfig

Click *Create*

Click on '+Add'

Click on 'From Catalog'

In the search box enter 'node'. Again select the Node.js option

Click 'Create Application'

For the git repo enter 'https://github.com/utherp0/nodenews'

Choose *Create Application* from the Application pulldown

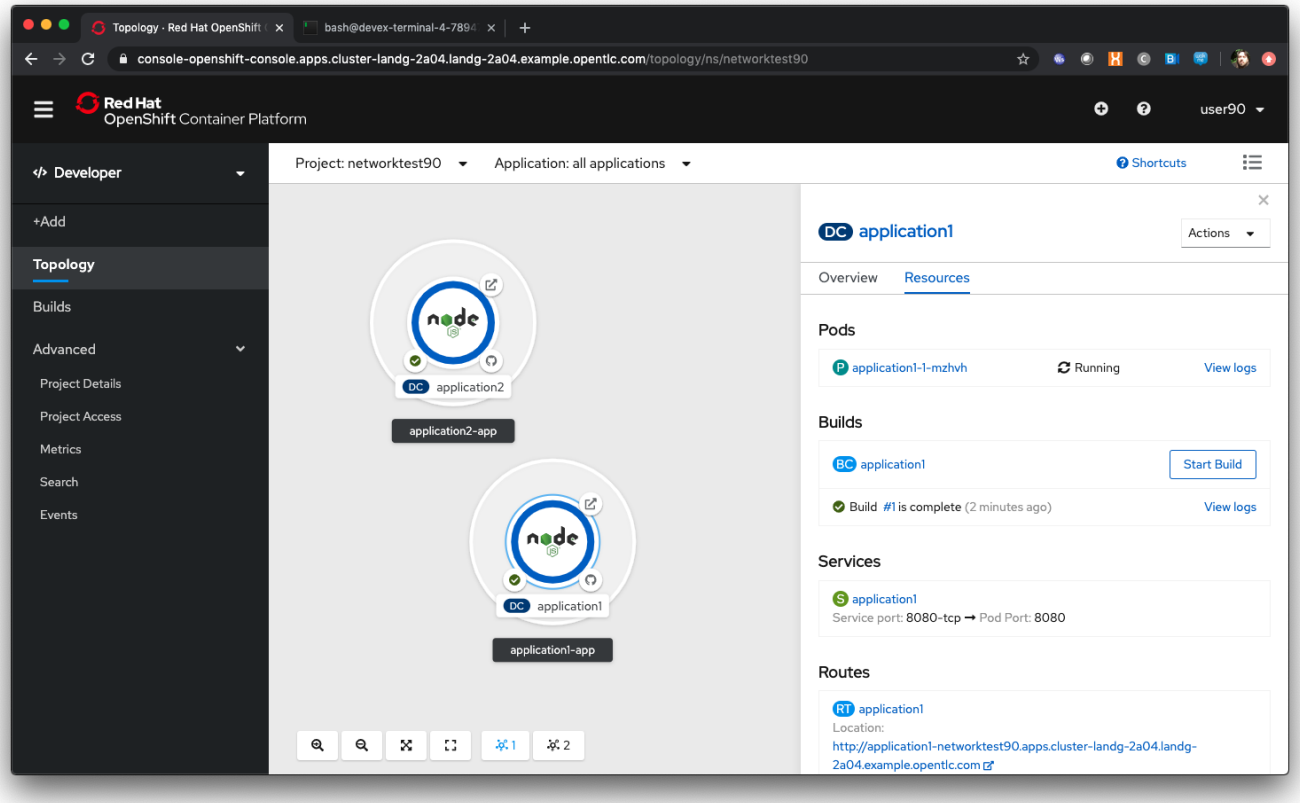
Set the *Application Name* to *application2-app*

Set the Name to 'application2'

In Resources set the deployment type to DeploymentConfig

Click *Create*

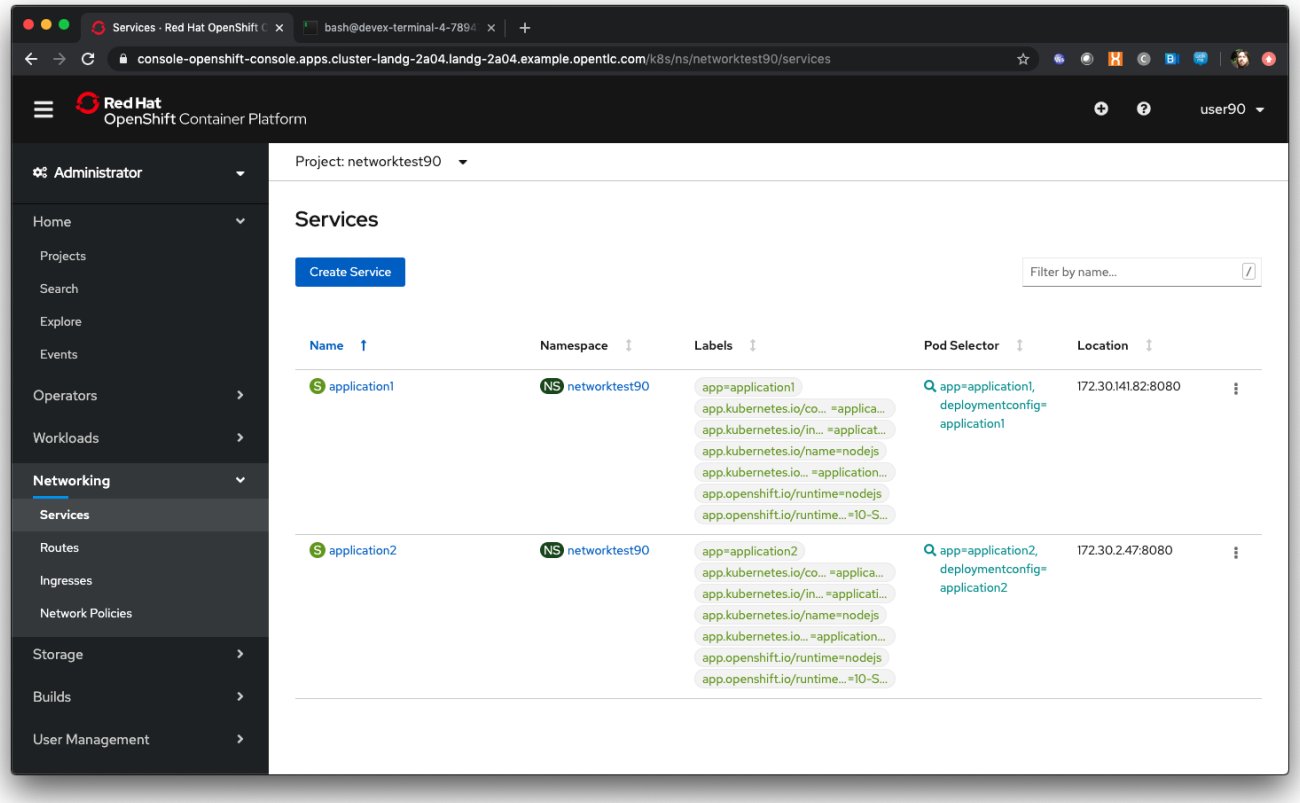
Wait until both applications have built and deployed. The Topology view will look similar to the image below:



Once the applications have created change the mode from Developer to Administrator using the top left selection point

Click on *Projects*. Select the networktestx project

Click on *Networking/Services*



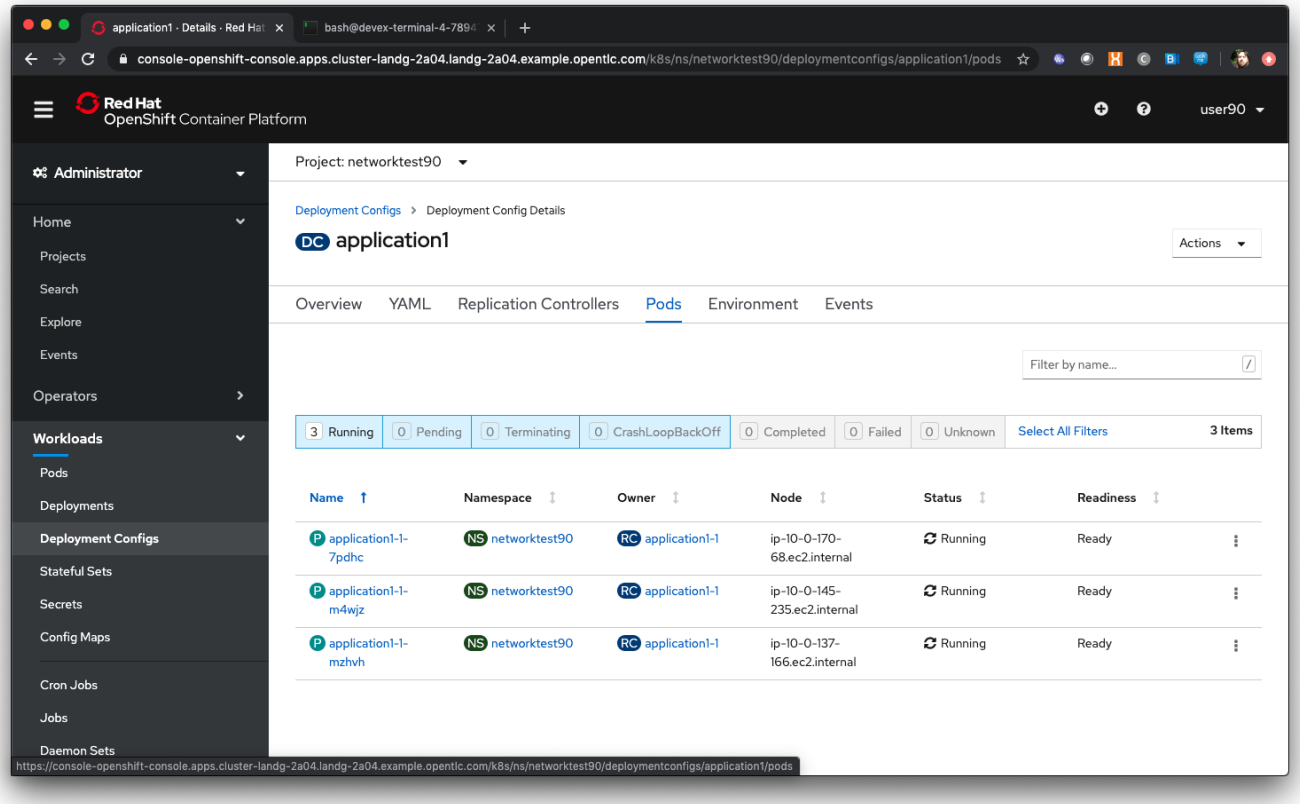
The Services UI shows the services currently available in the Project. Note that there is a Service per application, so in this case there are two Services, application1 and application2. The Location is a singular IP address for each Service within the SDN - more on this later.

Click on *Workloads/Deployment Configs*

Click on the application1 dc

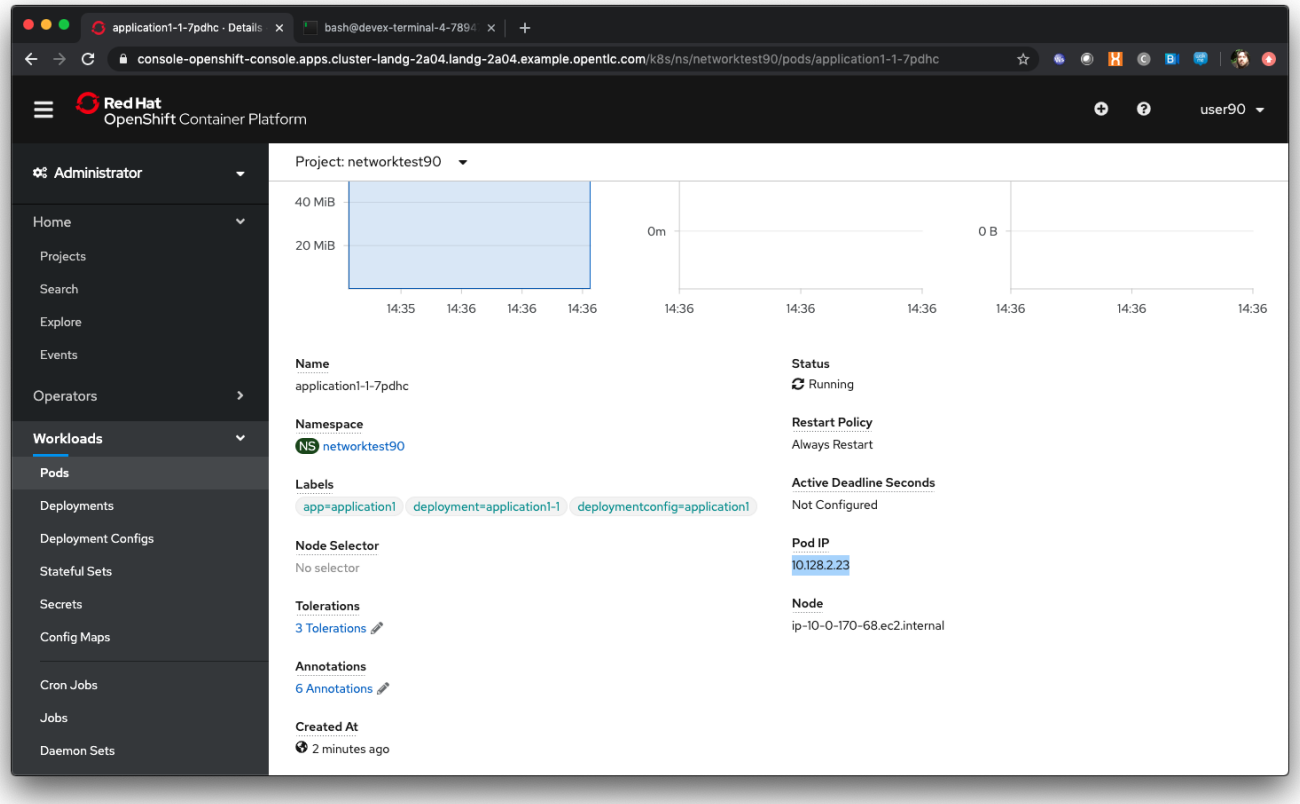
Using the arrows next to the Pod indicator scale the application to three replicas

Click on 'Pods' in the DC view (not Workloads/Pods)



Click on the first active Pod for application1 listed

Scroll down and take a note of the IP address for the Pod



Click on *Networking/Services*

Click on the application1 service

Note that the IP address for the Service has NOT changed. Scaling the Application has no impact on the singular IP address for the Service, which in actuality acts as a load-balancer across ALL of the IP addresses for the Pods of that Application.

Using the shorthand Service name directly

Click on *Workloads/Pods*

Click on the first running Pod for application1 (the name will be application1-1-(something)

Click on Terminal

In the Terminal window type:

```
curl http://localhost:8080
```

You will see the webpage for the Application as a return from the curl statement. The Container sees itself as localhost. Also note that because we are calling from within the Container we use the port address - if you were using the Routes their would be a Route for every Service, with no port address.

In the Terminal window type:

```
curl http://application1:8080
```

This is where it starts to get interesting. The Service *name* itself is exported into the network namespace of the Container so it can refer to it as a short name. The SDN translates the service name into the service IP - in reality this Container could be getting a webpage back from any of the Application Pods that satisfy this Service.

Using the Fully Qualified Domain Name for accessing Services

In the Terminal window type (and replace x with your number):

```
curl http://application1.networktestx.svc.cluster.local:8080
```

And this is the fully qualified version of the Service. by including the namespace/project name we can reach, effectively, any service on the SDN assuming the SDN has been configured to allow that. In this case we are just targeting our own Service from the application Container, now we will try the other application in the namespace.*

In the Terminal window hit the up arrow to get the last command, edit the name and change application1 to application2, hit return at the end of the statement

You should get the contents of a webpage. This is the output of the other application. This long format makes it easy to refer to other applications without having to leave and come back into the SDN (via a Route).

In the terminal type:

```
curl http://application2:8080
```

We can also connect to any of the Services hosted within the namespace/project by default

Ask the person sat next to you what their project name is and make a note of it

In the terminal type:

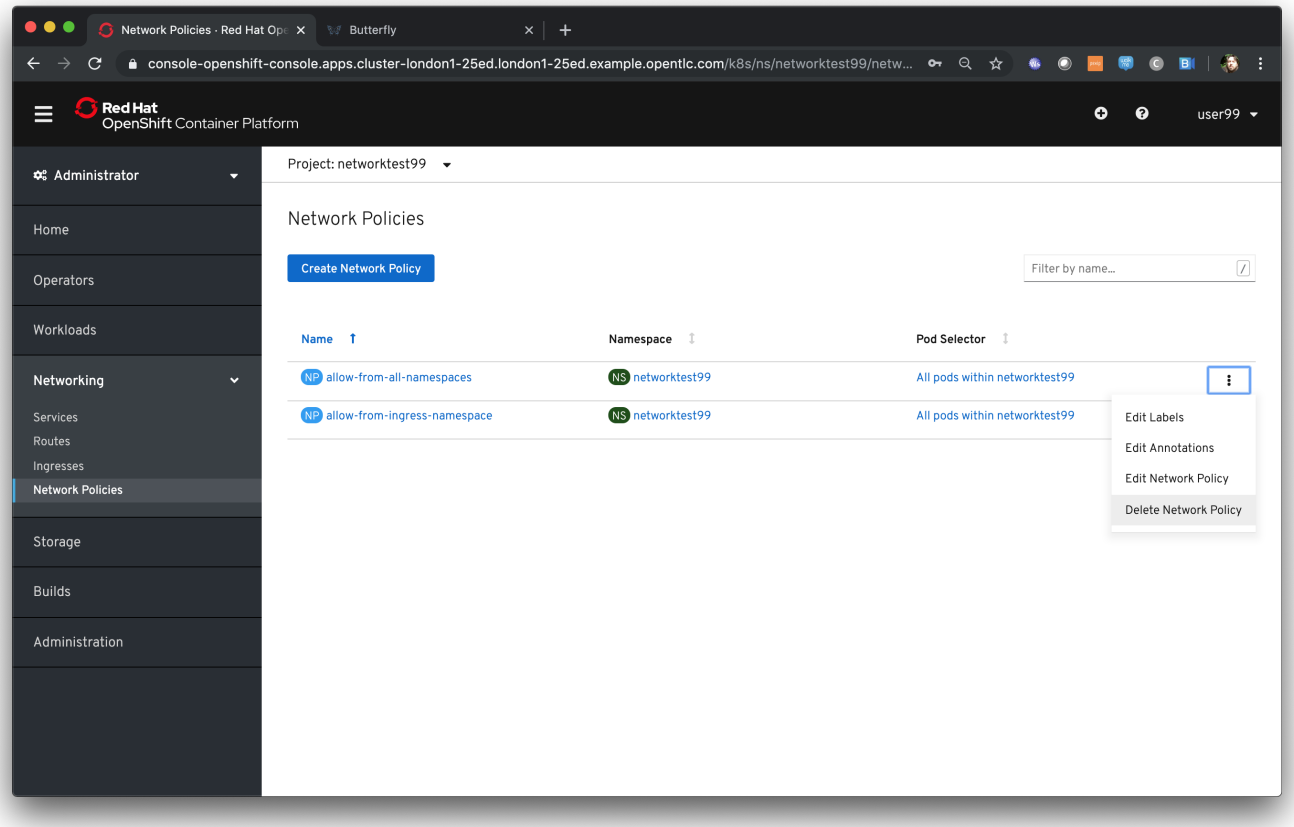
```
curl http://application1.(the project name from the person next to
you).svc.cluster.local:8080
```

OpenShift Container Platform can be installed with two different modes of SDN. The first is subnet, which exposes all Services in all Namespace/Projects to each other. This instance has a subnet SDN which is why you should be able to call other peoples Services directly from your own via the internal FQDN address.

Controlling Access through Network Policies

Click on *Network/Network Policies*

For each of the policies listed click on the triple dot icon on the far right and choose ‘Delete Network Policy’.



The Network Policy tab should display ‘No Network Policies Found’.

Go to Workloads/Pods, click on one of the application1 Pods, choose Terminal

Repeat the ‘curl’ command listed above for the person sat next to you, i.e. curl their application1

Ensure you get a webpage

Go to Network/Network Policies

Click on ‘Create Network Policy’

Enter the following - remember to change YOURNUMBERHERE to your user number

```
apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
 name: example
 namespace: networktestYOURNUMBERHERE
spec:
 podSelector:
   matchLabels:
     app: application1
 ingress: []
```

Click ‘Create’

Wait until the person next to you has done the same

Click on *Workloads/Pods*, click on one of the application1 Pods, choose Terminal

Repeat the ‘curl’ command listed above for the person sat next to you, i.e. curl their application1

The call will eventually fail - feel free to hit Ctrl-C to interrupt

The creation of a Network Policy that prohibits ingress to the Application Service has stopped access to the Service from external namespaces AND internal Services.

Click on *Workloads/Pods*

Click on the active pod for application2

Click on Terminal

Type:

```
curl http://application1:8080
```

The call will eventually fail

This shows that the Service is prohibited even from Services in its own namespace/project. This application of Network Policy allows for fine-grain control of traffic egress/ingress at the Service level. The other installation mode for SDN for OpenShift 4 is with Network Policies enabled, with default Network Policies providing a fully multitenanted environment.

Click on *Projects*

On the triple dot icon on the far right for networktestxx select ‘Delete Project’

In the pop-up enter the name of the project (‘networktestxx’ with your number) and hit Delete

The RBAC model for Developers [ESSENTIALS]

Introduction

This chapter will introduce the attendee to the concepts around the Role Based Access Control model integrated into OpenShift. This will cover the use of Users, Service Accounts and Permissions.

For the majority of this chapter the attendee will need to pair up with another. If the numbers are odd the presenter should fill the gap of the missing attendee - pair the attendees up before the chapter starts and get them to exchange numbers - remember the numbers as MYUSER and PARTNERUSER

If you are not already logged on go to the UI URL https://example.manifest.com, window="_blank" and logon as *userx* (x is the number provided to you) and password openshift.

If you do not already have a terminal tab running as defined in the pre-requisites please open one following the instructions in the pre-requisites

Ensure you are on the Administrator View (top level, select Administrator)

In the UI click on *Home/Projects*

Click on *Create Project*

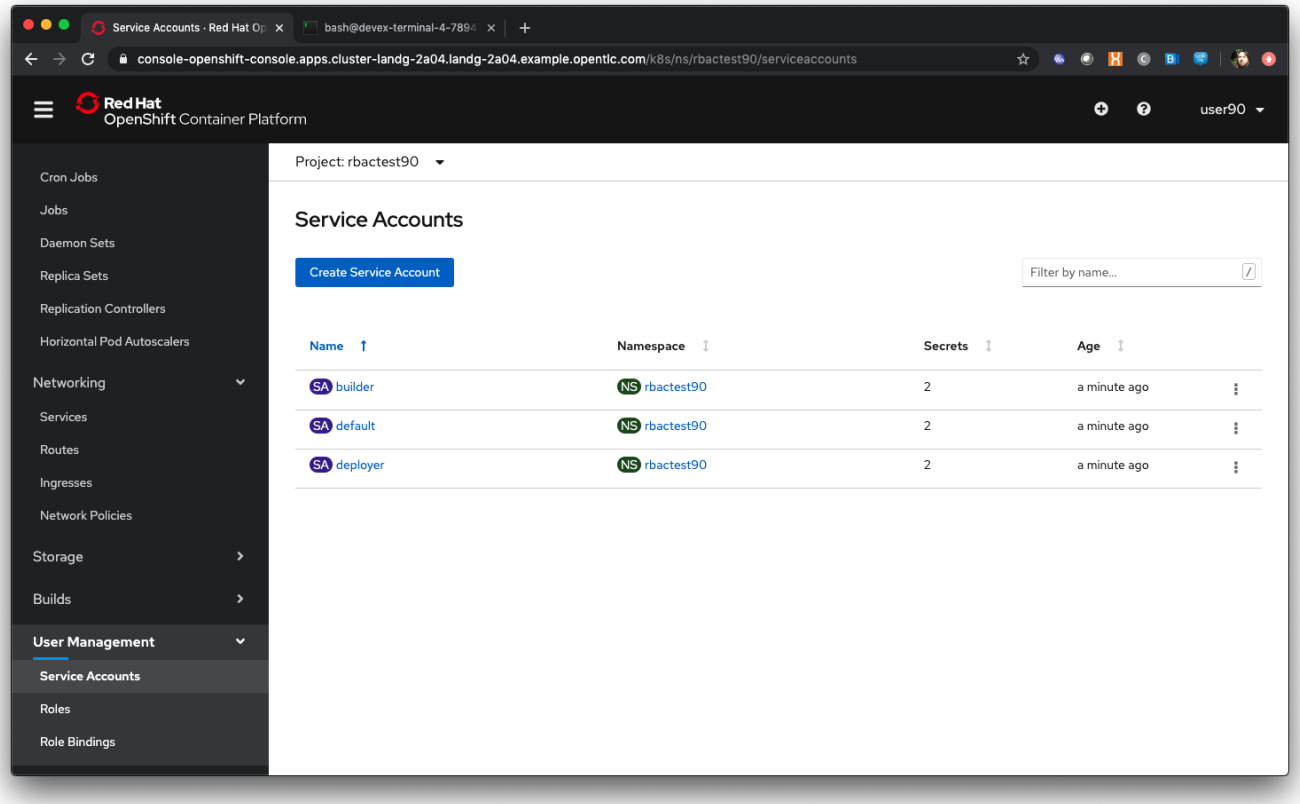
For the project name give it rbactestx where x is your user number

Display Name and Description are optional

Click on *Create*

Examining Service Accounts

Once the project has been created, click on *User Management/Service Accounts*



Service Accounts are effectively virtual users - even though you have logged on when you do anything within the namespace, such as a build or a deployment, the namespace uses a virtual user, with appropriate permissions, to do the actual tasks internally, like pushing a built image to the registry, or pulling an image to start a Container.

Each project gets a Service Account by default, named default or to give it its full name system:serviceaccount:rbactestx:default (where x is your number). There are also Service Accounts for doing the appropriate actions, such as Builder and Deployer

In addition further Service Accounts can be created by the project owner and given additional security details and roles, such as being able to execute Containers as root, or giving Containers specific controlled sec-comp profiles (like changing the Group ID for the process)

Switch to the Developer view using the top left pulldown

In the Topology Tab click on ‘From Catalog’

In the search box enter ‘node’. Select the Node.js option

Click ‘Create Application’

Default the image to version 10

For the git repo enter ‘https://github.com/utherp0/nodenews’

Set the Application Name to ‘rbac’

Set the Name to ‘rbactest’

In Resources set the deployment to DeploymentConfig

Click *Create*

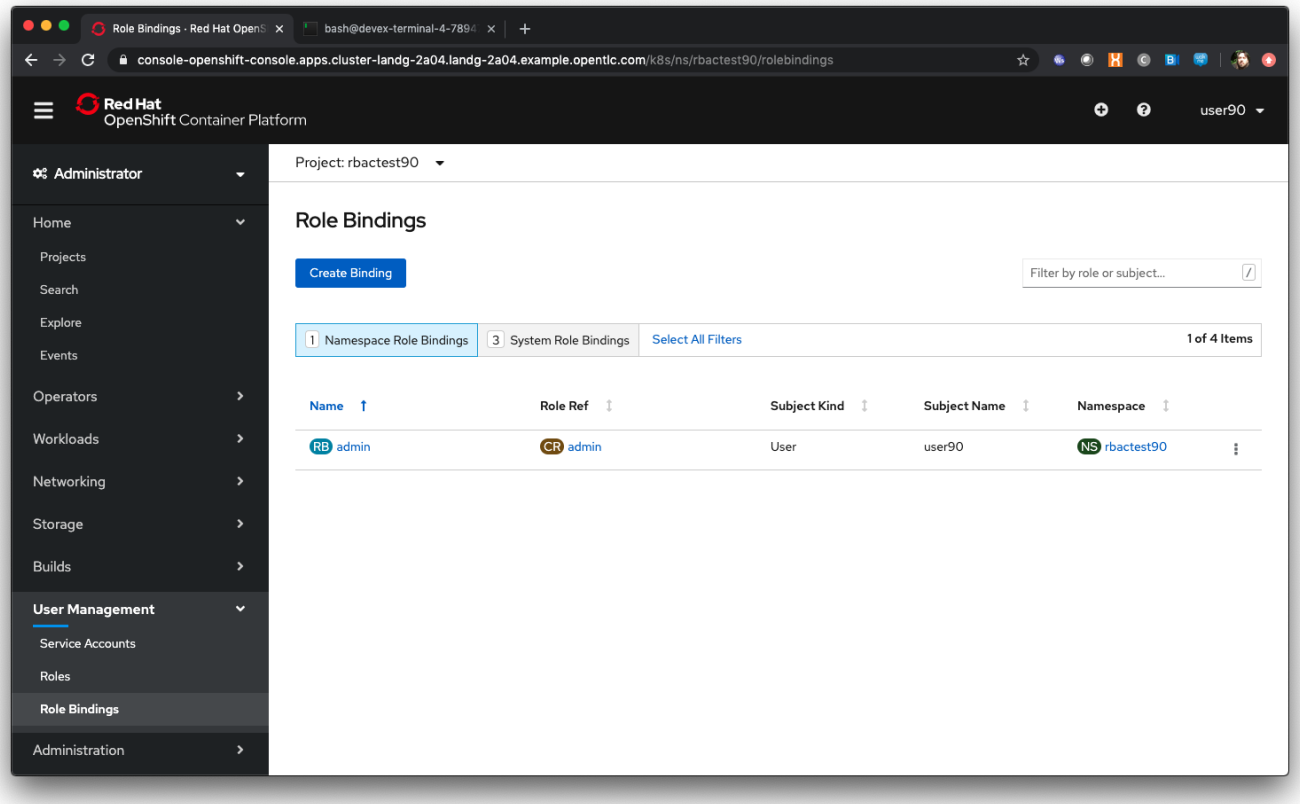
Click on the Node pod indicator so the informational panel appears

Watch the build and ensure it completes

Once the build is complete ensure the deployment occurs. The Pod ring will turn dark blue

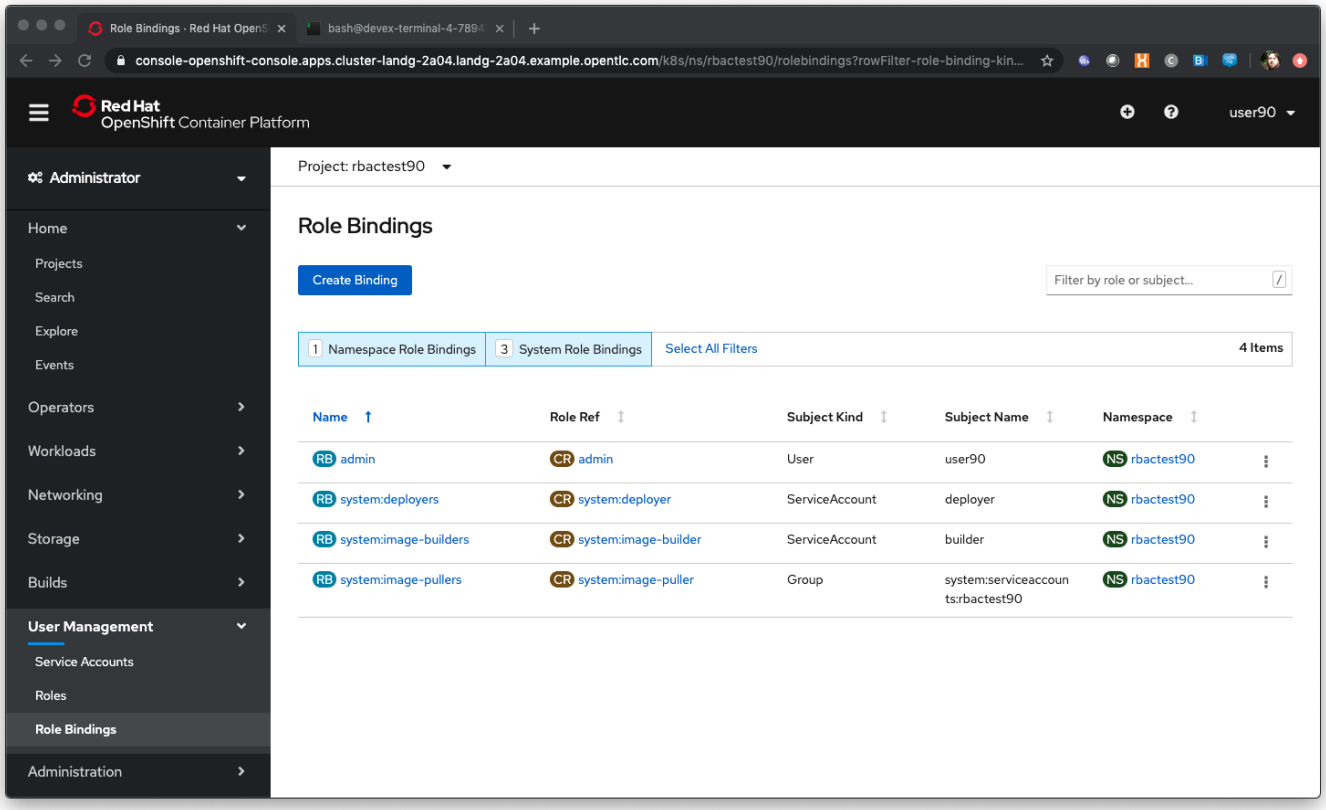
Switch back to Administrator view using the top left selection point

Click on User Management/Role Bindings



Note that we have one Role Binding shown at the moment, which is for Admin and applies to a kind of *user* and a subject name of *userx*. This is the binding of your user to the administration role within the project.

Click on the *System Role Bindings*



Note that with the addition of System Role Bindings to the screen we can now see the three Service Accounts also created. Deployer is part of the system:deployers binding, builder is part of the system:image-builders binding and the group of users under system:serviceaccounts:rbactestx (where x is your number) have the system:image-pullers binding.

Click on the (CR) admin Role Ref

This screen displays ALL the actions, via API, that this role has access to grouped by the API groups. This mapping is what controls what the user can do via the bindings they have.

Adding Role Bindings to your namespace/project

Click on *User Management/Role Bindings*

Click on *Create Binding*

Set Name to ‘partneraccess’

Select ‘rbactestx’ from the Namespace pulldown; it should be the only one.

As a user with the admin role within the namespace/project you can add other users with role bindings within your project.

Select ‘Admin’ in the Role Name pulldown

Ensure ‘User’ is selected in the radiobox for Subject

Enter ‘userPARTNERUSER’ for the Subject Name

What we are doing is adding the user you have chosen to pair with as an admin role binding within your project.

Click *Create*

Ensure the partner has done the same with your userx

Click on Home/Projects

If the partner user has set the role binding appropriately you will now see two projects - your own and the other person’s

Click on the partner’s project (rbactestPARTNERUSER)

Change to the Developer view using the top left selection point

Ensure you can see the Topology page

Change back to the Administrator view using the top left selection point

Select *Workloads/Deployment Configs*

Ensure that the ‘rbactest’ DC shown has a Namespace that is the Partner’s project

Click on the DC rbactest

Using the arrows scale the deployment to 4 pods

Click on *Home/Projects* and select your project (rbactestMYUSER)

Click on ‘Role Bindings’ in the project overview pane

On the triple dot for ‘partneraccess’ choose ‘Delete’

Confirm deletion in the pop-up message box

Giving Users lower levels of permission

Click on *User Management/Role Bindings*

Click on *Create Binding*

Set Name to ‘partneraccess’

Choose the ‘rbactestMYUSER’ in the Namespace pulldown

Select ‘view’ in the Role Name pull down

Ensure the Subject radiobox is set to ‘User’

In the Subject Name enter the user name for the partner (userPARTNERUSER)

Click Create

Ensure the partner has done the same with your userx

Click on *Home/Projects*

Select the partner project (rbactestPARTNERUSER)

In the Project overview pane click on Role Bindings

You now do not have the appropriate access rights to interact with the role bindings as you only have View access to the target project

Click on *Workloads/Deployment Config*

Click on the rbactest (DC)

Try and scale down the Pod to one pod

View access allows you to see the state of objects but NOT to change them.

Click on *Home/Projects*

In the triple dot menu next to the rbactestPARTNERUSER select ‘Delete Project’

Type ‘rbactestPARTNERUSER’ in the message box and press ‘Delete’

Note that you cannot delete the other persons project.

Hit Cancel

In the triple dot menu next to your own project (rbactestMYUSER) select ‘Delete Project’

Type ‘rbactestMYUSER’ in the message box and press ‘Delete’

Understanding Persistent Volumes [ESSENTIALS]

Author: Ian Lawson (feedback to ian.lawson@redhat.com)

Introduction

If you are not already logged on go to the UI URL https://example.manifest.com, window="_blank" and logon as userx (x is the number provided to you) and password openshift.

If you do not already have a terminal tab running as defined in the pre-requisites please open one following the instructions in the pre-requisites

Ensure you are on the Administrator View (top level, select Administrator)

Click on ‘Create Project’

Enter ‘pvtestx’ for the name, where x is your user number

Enter ‘PV Test’ for the Display Name and Description

Hit ‘Create’

Switch to the Developer UI (click on Developer in the top left pulldown)

Select ‘From Catalog’

Search for ‘node’

Click on the ‘node.js’ option

Click ‘Create Application’

Leave the Builder Image Version as ‘10’

Enter the following for the Git Repo URL - ‘https://github.com/utherp0/workshop4’

Click on ‘Show Advanced Git Options’

In Context Dir put ‘/apps/nodeatomic’

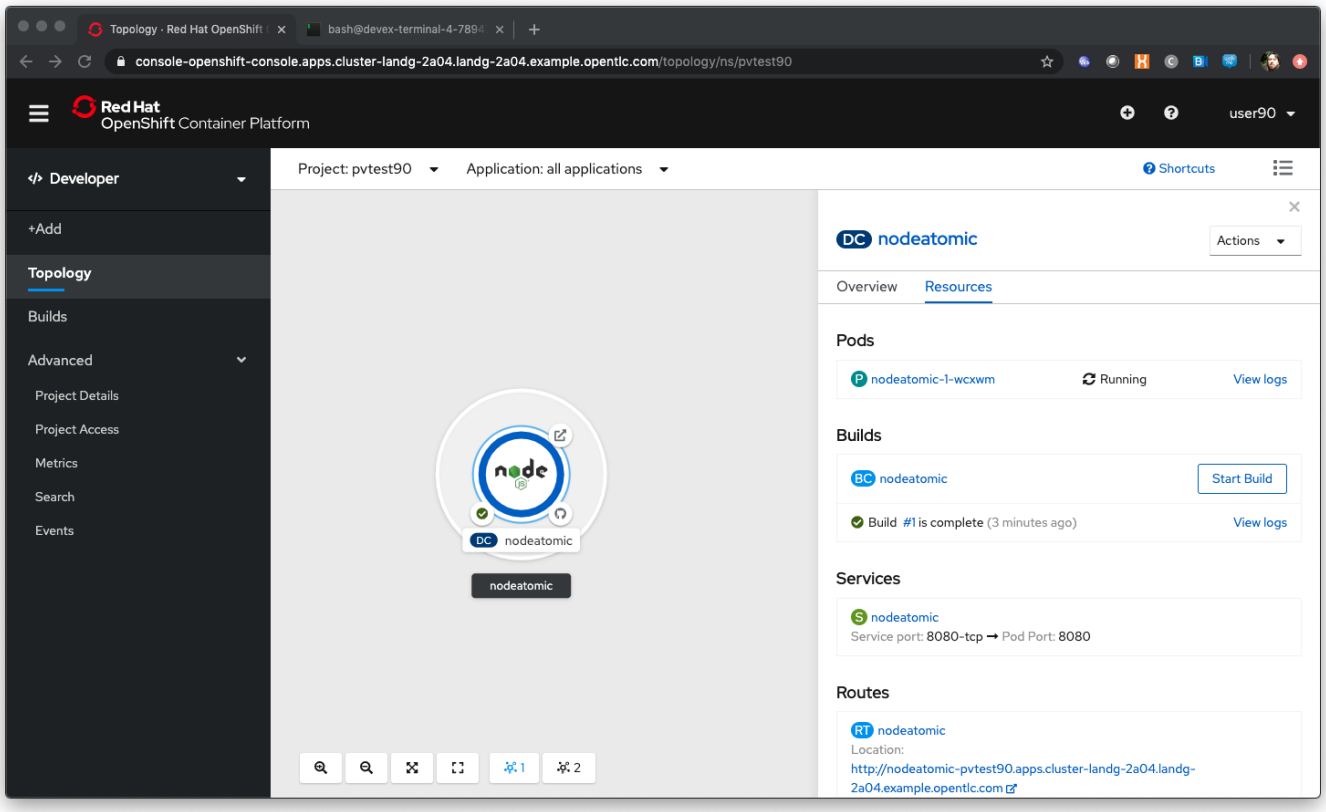
In Application Name put ‘nodeatomic’

In Name put ‘nodeatomic’

In Resources set the deployment to DeploymentConfig

Click on ‘Create’

When the Topology page appears click on the node Pod to see the information window



Ensure the build completes correctly

In the informational panel choose ‘Action/Edit Count’

Up the count to 4 and hit ‘Save’

Watch the Topology and ensure four copies of the Pod appear and are healthy

Adding a Persistent Volume to an Application

Switch to the Administrator view (top left pulldown)

Click on *Storage/Persistent Volume Claims*

Click on ‘Create Persistent Volume Claim’

Leave the Storage Class as ‘gp2’

Storage Classes are objects configured by the Administrator of the Cluster which allow you to request externalised persistent storage for your Applications. In this case we are using the default storage class for the Cluster which happens to be AWS storage

Set the Persistent Volume Claim Name to ‘testpvx’ where x is your user number

Ensure the Access Mode is set to ‘RWO’

The Access Mode for a Persistent Volume defines how the storage is offered to the Applications. If you choose RWO, Read/Write/Once, a single piece of storage is allocated which is shared across ALL instances of the Application. If you choose RWM, Read/Write/Many, the volume will be created independently on all Nodes where the Application runs, meaning the storage will only be shared by co-resident Pods on Nodes.

Set the size to 1Gi

Ensure the Use Label Selectors checkbox is not set

Click on ‘Create’

Click on Storage/Persistent Volume Claims

The status of the claim will sit at *Pending*. This is because the Persistent Volume itself is not created until it is assigned to a Deployment Config.

Click on *Workloads/Deployment Configs*

Click on the nodeatomic DC

Click on *Actions/Add Storage*

In the Add Storage page ensure ‘Use existing claim’ is checked

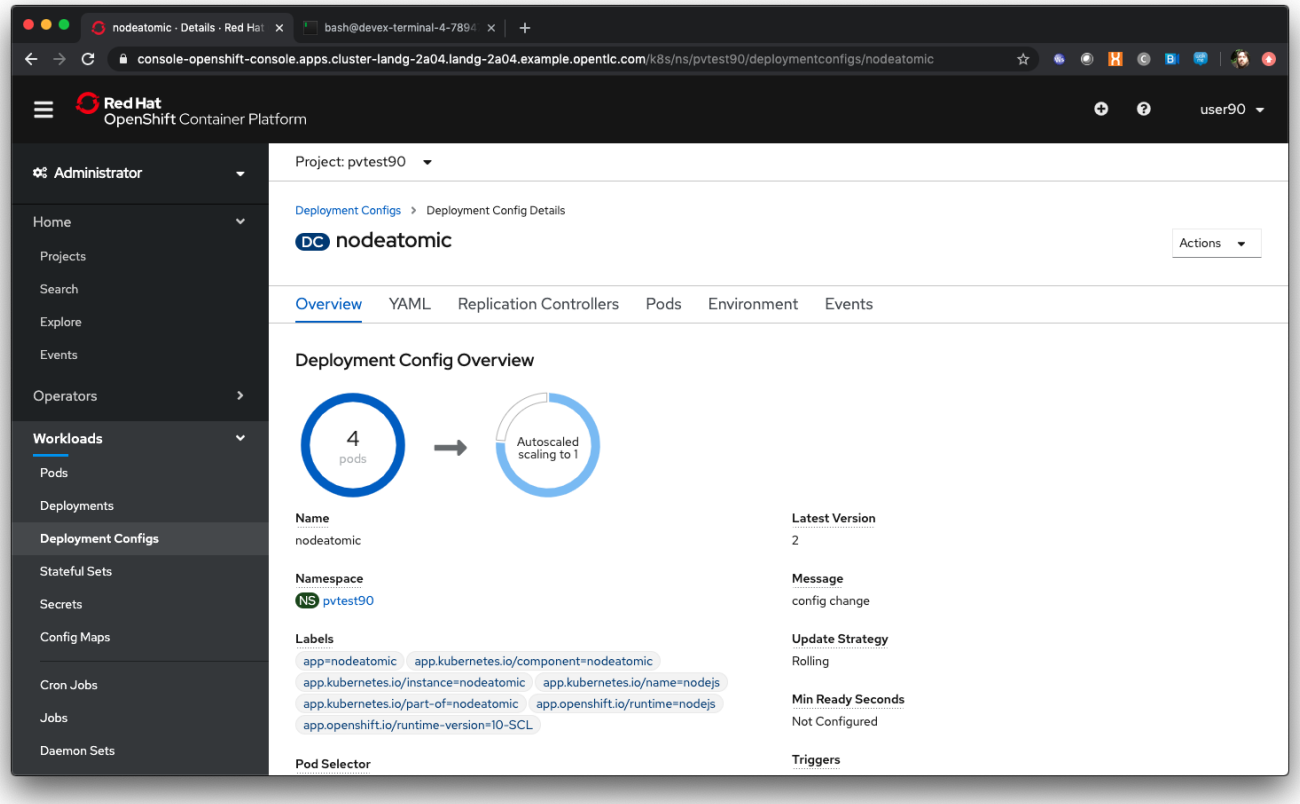
In the ‘Select Claim’ pulldown select the created claim (testpvx based on your user number)

Set the Mount Path to ‘/pvtest/files’

What this will do is to export the Persistent Volume into the file space of the Containers at the mount point stated.

Click on ‘Save’

As we have changed the configuration of the Deployment, and the default triggers are set to redeploy if the Image changes OR the configuration of the Deployment changes, a redeployment will now occur.



When the deployment has completed, click on ‘Pods’ in the DeploymentConfig display (not Workloads/Pods)

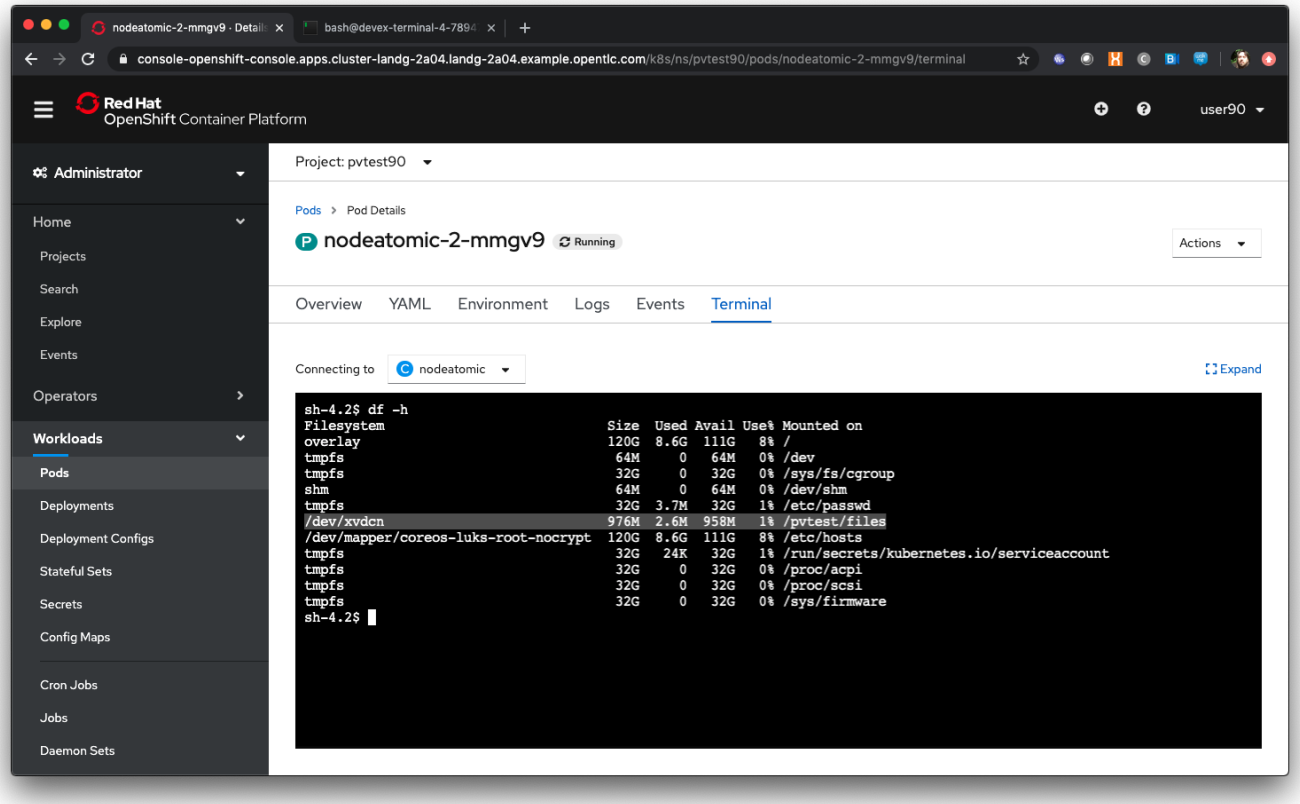
Select the first running Pod - take a note of its name (nodeatomic-2-xxxxx) - click on the Pod

Click on Terminal

In the terminal window type:

```
df -h’
```

Note the additional file system mount as shown below



In the terminal window type:

```
ls -alZ /pvtest/files
```

Click on *Networking/Routes*

Click on the Route address for the nodeatomic route - it should open in a separate tab

Ensure the OpenShift NodeAtomic Example webpage is displayed

Add ‘/containerip’ to the end of the URL in the browser window and hit return

Take a note of the address returned

Switch back to the OCP UI and choose Workloads/Pods

Click on **each** of the Pods until you find the one that has the IP returned by the webpage, take a note of the Pod name (**1*)

Go back to the tab with the nodeatomic webpage in it

Remove ‘/containerip’ from the end of the URL and replace it with ‘/fileappend?file=/pvtest/files/webfile1.txt&text=Hello%20World’ and then press return

Ensure the webservice returns 'Updated */pvtest/files/webfile1.txt* with *Hello World*'

Switch back to the browser tab with the OCP UI in it. Select *Workloads/Pods* and click on the Pod with the name that matches the IP discovered in (**1*)

Click on *Terminal*

In the terminal type:

```
cat /pvtest/files/webfile1.txt
```

Ensure 'Hello World' is displayed

The Webservice endpoint provided appends the given text to the given file.

Click on *Workloads/Pods*

Select another Pod (**NOT** the one that matched the IP from the (*1) step)

Click on *Terminal*

In the terminal type:

```
cat /pvtest/files/webfile1.txt
```

Note that this separate Pod has the SAME file with the same contents

Switch back to the nodeatomic webservice browser tab

Alter the end of the URL to read 'Hello%20Again' and press return

Return to the OCP UI tab window (the terminal should still be active) and type:

```
cat /pvtest/files/webfile1.txt
```

Again note the file has been updated by another container but this container shares the same file system.

Close the web service browser tab

Demonstrating survivability of removal of all Pods

Click on *Workloads/Deployment Configs*

Click on the nodeatomic DC

Scale to ZERO pods by clicking the down arrow displayed next to the Pod icon until the count reaches 0

Ensure the Pod graphic displays zero running Pods.

Scale the deployment back up to ONE Pod using the arrows

When the Pod indicator goes to dark blue indicating the Pod has started, click on Pods

Select the one active Pod and click on it

Click on *Terminal*

In the terminal window type:

```
---
cat /pvtest/files/webfile1.txt
----
```

Note that the contents of the file have survived the destruction of ALL Pods

Click on *Home/Projects*

On the triple dot next to the ‘pvtestx’ project (where x is your user number) select Delete Project

In the pop-up type ‘pvtestx’ (where x is your user number) and hit Delete

Pod Health Probes [ESSENTIALS]

Author: Mark Roberts (feedback to mroberts@redhat.com)

Introduction

Liveness and Readiness probes are Kubernetes capabilities that enable teams to make their containerised applications more reliable and robust. However, if used inappropriately they can result in none of the intended benefits, and can actually make a microservice based application unstable.

The purpose of each probe is quite simple and is described well in the OpenShift documentation here. The use of each probe is best understood by examining the action that will take place if the probe is activated.

Liveness : Under what circumstances is it appropriate to restart the pod?

Readiness : under what circumstances should we take the pod out of the list of service endpoints so that it no longer responds to requests?

Coupled with the action of the probe is the type of test that can be performed within the pod :

Http GET request : For success, a request to a specific http endpoint must result in a response between 200 and 399.

Execute a command : For success, the execution of a command within the container must result in a return code of 0.

TCP socket check : For success, a specific TCP socket must be successfully opened on the container.

Creating the project and application

Log on to cluster as userx, password openshift

Ensure you are on the Administrator View (top level, select Administrator)

The Administrator view provides you with an extended functionality interface that allows you to deep dive into the objects available to your user. The Developer view is an opinionated interface designed to ease the use of the system for developers. This workshop will have you swapping between the contexts for different tasks.

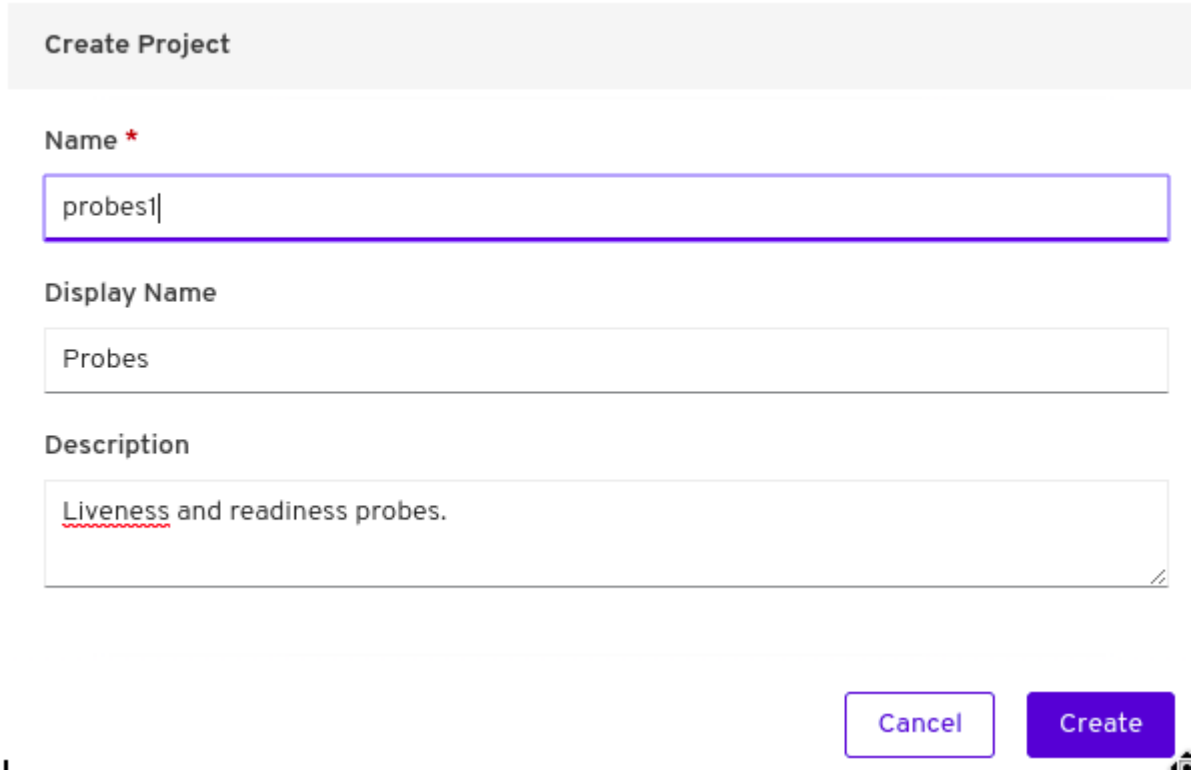
Click on *Create Project*

Name - ‘probesX’ where X is your assigned user number

Display Name - *Probes*

Description - *Liveness and readiness probes*

as shown in the image below:



By default when you create a Project within OpenShift your user is given administration rights. This allows the user to create any objects that they have rights to create and to change the security and access settings for the project itself, i.e. add users as Administrators, Edit Access, Read access or disable other user's abilities to even see the project and the objects within.

In the top left of the UI, where the label indicates the view mode, change the mode from Administrator to Developer and select the Topology view.

Select 'From Catalog'

Enter 'node' in the search box

The various catalogue items present different configurations of applications that can be created. For example the node selections include a simple node.js application or node.js with a database platform that is pre-integrated and ready to use within the application. For this workshop you will use a simple node.js application.

Select 'Node.js'

A wizard page will then pop up on the right hand side with details of exactly what will be created through the process.

Source-2-Image

One of the most exciting features of OpenShift from a developer's perspective is the concept of S2I, or **Source-2-Image** which provides a standardised way of taking a base image, containing, for example, the framework for running a node.js application, a source code repository, containing the code of the application that matches the framework provided in the base image, and constructing and delivering a composite Application image to the Registry. Simply put this enables a developer to create source code for an application and OpenShift will convert that to a running application within a container with minimal effort. The process that you will use below is the Source-2-Image capability.

Click on 'Create Application'

The wizard process has a number of options that the user may elect to use. These include:

- Selecting a specific version of Node to use
- Selecting a GIT repository and choosing to use code from a specific directory within the repository.

Select the default offering for the Builder Image Version

For the GIT repository use : https://github.com/marrober/slave-node-app.git, window="_blank"

In a separate browser tab go to https://github.com/marrober/slave-node-app.git, window="_blank"

You can see that the GIT repository at this location only has a small number of files specific to the application. There is no content specific to how the application should be built or deployed into a container.

Close the github tab

Back at the OCP4.2 user interface complete the following information in the section titled *General*.

For the Application drop down menu select *Create Application*.

For the Application name enter *Slave-application*.

For the Name field enter *node-app-slave*

The application name field is used to group together multiple items under a single grouping within the topology view. The name field is used to identify the specific containerised application.

In the Resources section ensure that you select *Deployment Config*

In the Advanced Options section ensure the 'Create a route to the application' checkbox is checked.

Click Create

The user interface will then change to display the Topology view. This is a pictorial representation of the various items (applications, databases etc.) that have been created from the catalogue and added to an application grouping.

Multiple application groupings can exist within a single project.

Viewing the running application

Click on the Icon marked ‘Node’

A side panel will appear with information on the Deployment Configuration that has just been created. The overview tab shows summary information and allows the user to scale the number of pods up and down. The resources tab shows information on the building process, the pods and the services and route to reach the application (if these have been created).

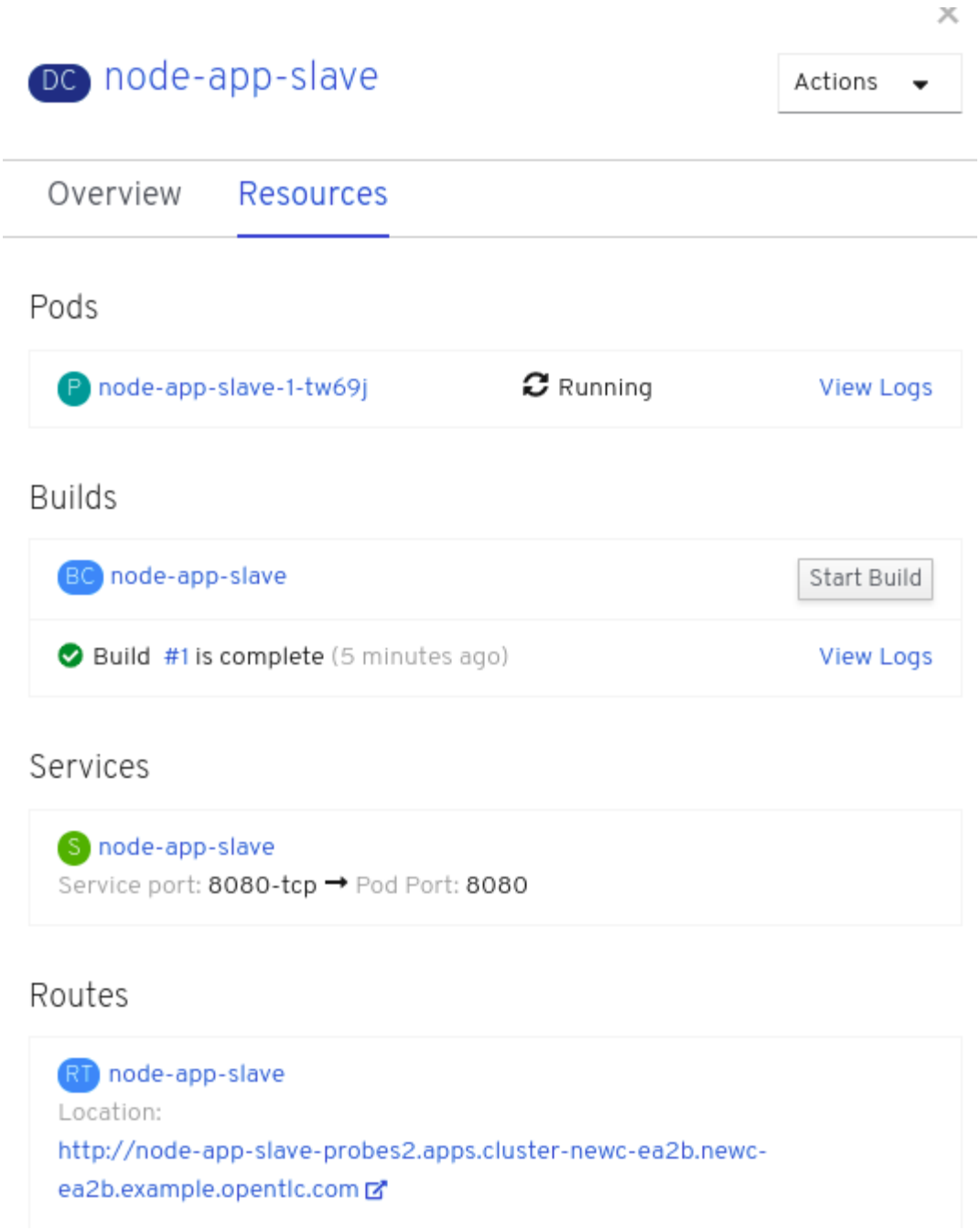
Wait for the Build to finish, the Pod to change from Container Creating to Running.

Pod Colour Scheme

The colour scheme of the pods is important and conveys information about the pod health and status. The following colours are used :

- Running - Dark blue
- Not Ready - Mid blue
- Warning - Orange
- Failed - Red
- Pending - light blue
- Succeeded - Green
- Terminating - Black
- Unknown - Purple

When the build has completed the right hand side panel will shown something similar to the image below. Note that the route will be different to that which is shown below.



Click on the Tick at the bottom left of the Pod. Note that this display can also be shown by clicking on the 'View Logs' section on the right hand side panel.

The build log will show information on the execution of the source-2-image process.

Click on the arrow on the top right corner of the Pod, or click on the route URL shown in the right hand side resource details window. The application window will launch in a new browser window and should display text as shown below:

```
Hello - this is the simple slave REST interface v1.0
```

Liveness Probe

A number of probes will be created to show the different behaviours. The first probe will be a liveness probe that will result in the restart of the pod.

Since this work will be done using the oc command line you need to switch the current oc command line to work with the new project using the command:

```
oc project probesX
```

(Where X is the number that you used when you created the project)

To create the probe use the OC command line interface to execute the following command.

```
oc set probe dc/node-app-slave --liveness --initial-delay-seconds=30 --failure
-threshold=1 --period-seconds=10 --get-url=http://:8080/health
```

The above probe will create a new liveness probe with the characteristics:

- Become active after 30 seconds
- Initiated a reboot after 1 instance of a failure to respond
- Probe the application every 10 seconds *Note that ordinarily a gap of 10 seconds between probes would be considered very long, but we use this time delay within the workshop to allow time for observing the behaviour of the probe.*
- Use the URL /health on the application at port 8080. Note that there is no need to specify a URL for the application.

The command line response should be as shown below.

```
deploymentconfig.apps.openshift.io/node-app-slave probes updated
```

Review the liveness probe information by executing the command:

```
oc describe dc/node-app-slave
```

The output of this command will include the following section that highlights the new liveness probe

```
Pod Template:
  Labels:   app=node-app-slave
            deploymentconfig=node-app-slave
  Containers:
   node-app-slave:
    Image:      image-registry.openshift-image-registry.svc:5000/probes2/node-app-
slave@sha256:bf377...241
    Port:           8080/TCP
    Host Port:      0/TCP
    Liveness:       http-get http://:8080/health delay=30s timeout=1s period=10s
#success=1 #failure=1
    Environment:    <none>
    Mounts:         <none>
  Volumes:          <none>
```

Alternatively to view the probe in a different format use the command below:

```
oc get dc/node-app-slave -o yaml
```

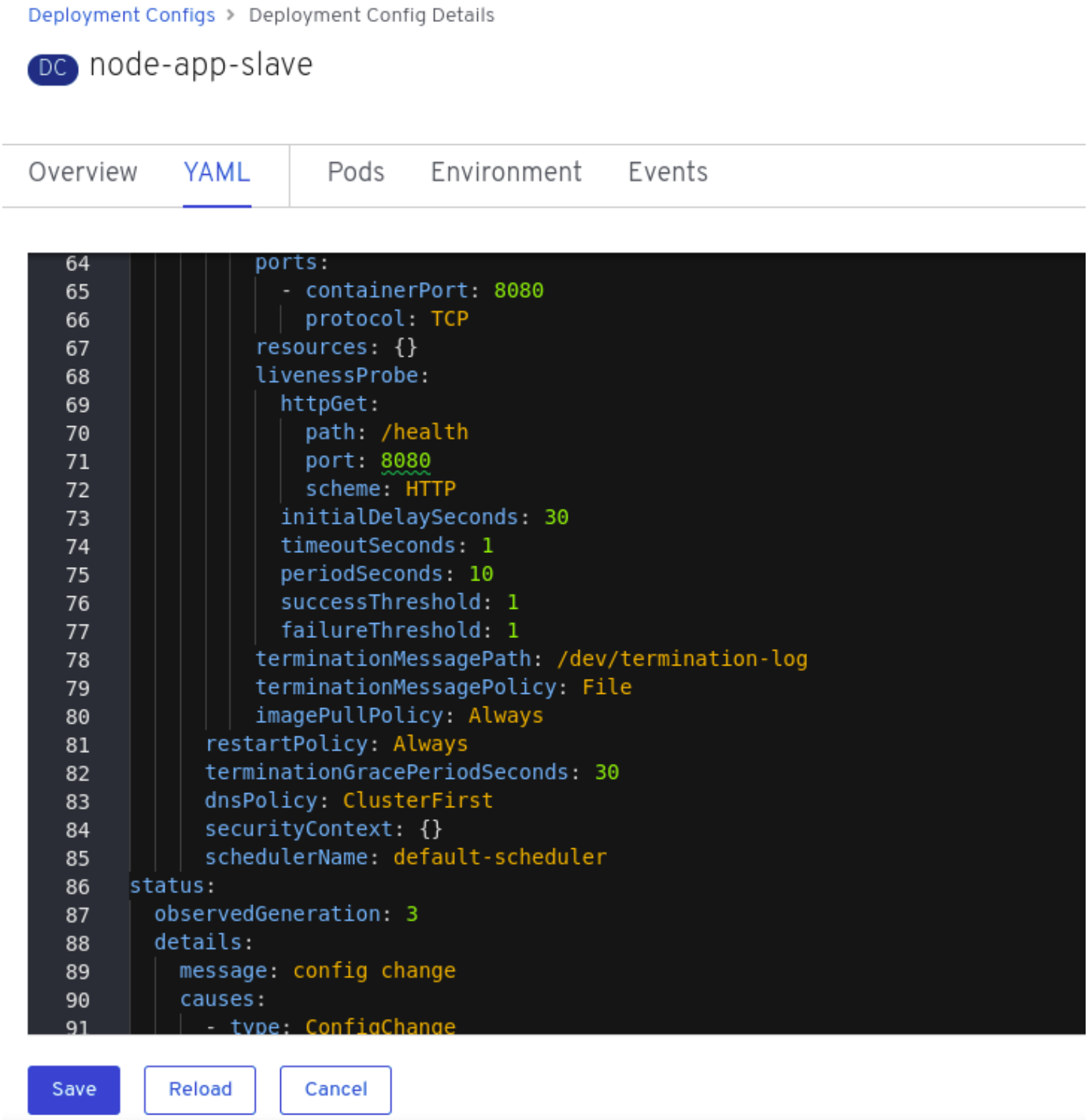
Part of the output will show:

```
livenessProbe:
    failureThreshold: 1
    httpGet:
        path: /health
        port: 8080
        scheme: HTTP
    initialDelaySeconds: 30
    periodSeconds: 10
    successThreshold: 1
    timeoutSeconds: 1
```

To view the above information graphically then use the following steps:

Select the Topology view of the application.

Click on the pod in the centre of the screen to display the information panel on the right hand side. From the action menu on the right hand side click **Edit Deployment Configuration** as shown in the image below.



On the Deployment Configuration page that is displayed ensure that the YAML tab is selected and scroll down to aroundline 68 to see the YAML definition for the liveness probe. It is also possible to edit the parameters of the probe from this screen if necessary.

In order to execute the probe it is necessary to simulate a pod failure that will stop the application from responding to the health check. A specific REST interface on the application has been created for this purpose called `/ignore`.

Activation of the Liveness Prove

To view the activity of the probe it is necessary to open two windows.

Select the Topology view of the application.

Click on the arrow on the top right hand corner of the node icon to open the application URL in a new browser tab.

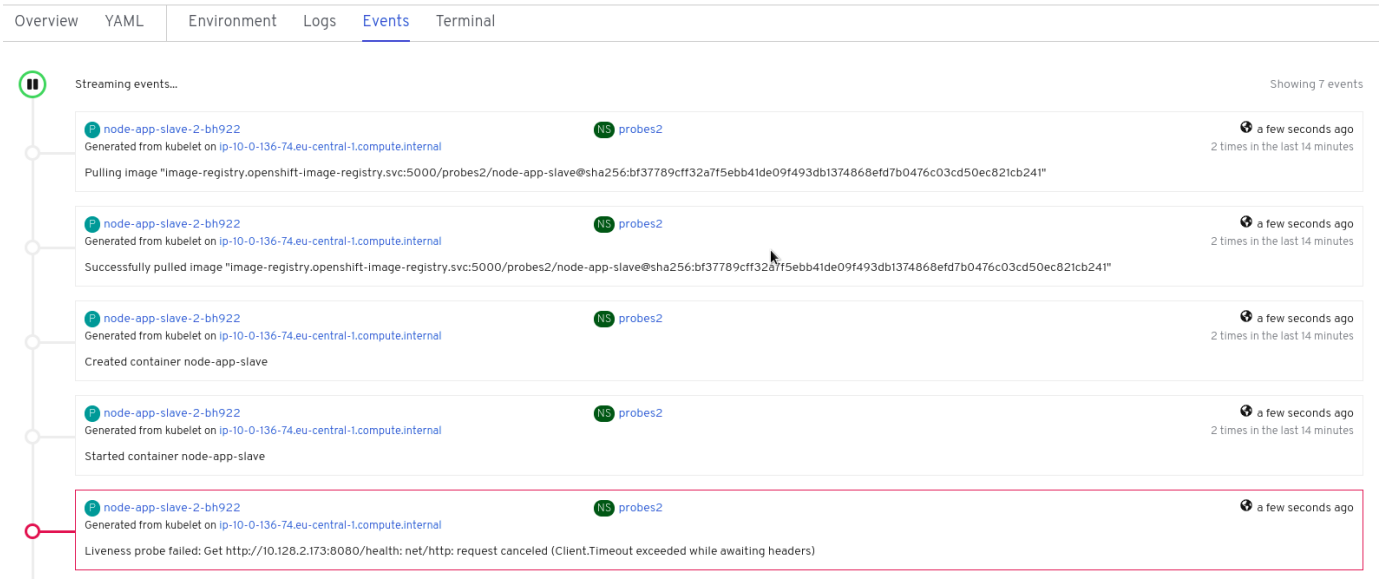
Back on the OpenShift browser tab, Click on the pod to open the details window on the right hand side and then click on the pod link on the resources tab. This will display a multi-tab window with details of the pod, select the events tab.

Switch to the application tab and put /ip on the end of the url and hit return. This will display the ip address of the pod.

Change the url to have /health on the end and hit return. This will display the amount of time that the pod has been running.

Change the url to have /ignore on the end and hit return. Quickly move to the browser tab showing the pod events and watch for the probe event.

The pod will restart after 1 failed probe event which takes up to 10 seconds depending on where the schedule is between the probe cycles. The events for the pod on the details screen will be similar to that shown below.



The events after the firing of the liveness probe are the re-pulling and starting of the container image in a new pod.

Switch to the application tab and put /health on the end of the url and hit return. This will display the amount of time that the new pod has been running, which will understandably be a small number.

In order to experiment with the readiness probe it is necessary to switch off the liveness probe. This can either be done by changing the deployment configuration YAML definition using the web interface or by executing the following command line:

```
oc set probe dc/node-app-slave --liveness --remove
```

Readiness Probe

To create the probe use the OC command line interface to execute the following command.

```
oc set probe dc/node-app-slave --readiness --initial-delay-seconds=30 --failure
-threshold=3 --success-threshold=1  --period-seconds=5 --get-url=http://:8080/health
```

The above command will create a new readiness probe with the characteristics:

- Become active after 30 seconds
- Remove the pod from the service endpoint after 3 instances of a failure to respond
- Cancel the removal of the pod and add it back to the service endpoint after 1 successful response
- Probe the application every 5 seconds
- Use the URL /health on the application at port 8080. Note that there is no need to specify a URL for the application.

The command line response should be as shown below

```
deploymentconfig.apps.openshift.io/node-app-slave probes updated
```

Review the probe created using the commands above:

```
oc describe dc/node-app-slave
```

and

```
oc get dc/node-app-slave -o yaml
```

View the state of the pod within the endpoints using the command below:

```
oc get ep/node-app-slave -o yaml
```

The output of the above command will list the details of the service endpoint which will include information on the pod to which the health probe is attached as shown below.

```
apiVersion: v1
kind: Endpoints
metadata:
  annotations:
    endpoints.kubernetes.io/last-change-trigger-time: 2019-11-26T16:04:50Z
  creationTimestamp: 2019-11-26T09:37:12Z
  labels:
    app: node-app-slave
    app.kubernetes.io/component: node-app-slave
    app.kubernetes.io/instance: node-app-slave
    app.kubernetes.io/name: nodejs
    app.kubernetes.io/part-of: master-slave
    app.openshift.io/runtime: nodejs
    app.openshift.io/runtime-version: "10"
  name: node-app-slave
  namespace: probes1
  resourceVersion: "1172051"
  selfLink: /api/v1/namespaces/probes1/endpoints/node-app-slave
  uid: 534139aa-1030-11ea-af1c-024039909e8a
subsets:
- addresses:
  - ip: 10.128.2.145
    nodeName: ip-10-0-136-74.eu-central-1.compute.internal
    targetRef:
      kind: Pod
      name: node-app-slave-5-hwj89
      namespace: probes1
      resourceVersion: "1172049"
      uid: ad6cc0e5-1043-11ea-af1c-024039909e8a
  ports:
  - name: 8080-tcp
    port: 8080
    protocol: TCP
```

The lines of interest above are:

```
subsets:
- addresses:
  - ip: 10.128.2.145
```

This shows that the address is currently part of the endpoint (it will participate in servicing requests) prior to the readiness probe activation.

Activation of the Readiness Probe

Select the Topology view of the application.

Click on the arrow on the top right hand corner of the node icon to open the application URL in a new browser tab (unless you already have one open).

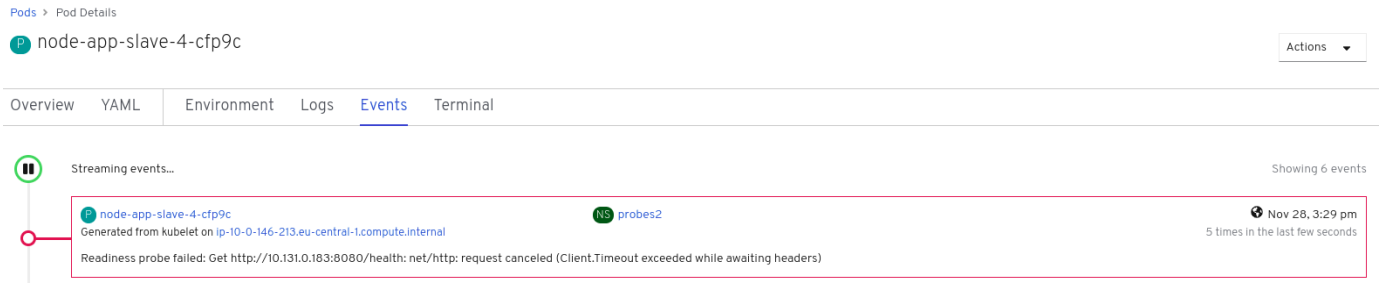
On the OpenShift browser tab, click on the pod to open the details window on the right hand side and then click on the pod link on the resources tab. This will display a multi-tab window with details of the pod, select the events tab.

Switch to the application tab and put /ip on the end of the url and hit return. This will display the ip address of the pod.

Change the url to have /health on the end and hit return. This will display the amount of time that the pod has been running.

Change the url to have /ignore on the end and hit return. Quickly move to the browser tab showing the pod events and watch for the probe event.

The pod events will show a screen similar to that which is shown below.



Note that you will see the count of the readiness *events* incrementing every 5 seconds.

You will also see that the events continue counting up since readiness probes do not stop firing just because the pod has been removed from the endpoint list. It is important that they continue to probe since the conditions may change and it may be appropriate to add the pod back into the endpoint list.

View the state of the pod within the endpoints using the command below:

```
oc get ep/node-app-slave -o yaml
```

The output of the above command will list the details of the service endpoint which will include information on the pod to which the health probe is attached as shown below.

```
subsets:
- notReadyAddresses:
  - ip: 10.128.2.145
```

The subset of the command output shown above indicates that the address is now listed as ‘not ready’ and is not currently part of the endpoint.

Under production use conditions for the application may change and the pod may recover from the inability to respond to the readiness probe. If this happens then it will be added back to the endpoint list.

To simulate this the Node application has a REST endpoint at /restore. Since the pod is currently not receiving communications from outside the cluster the call to the restore endpoint is done from within the pod command window.

Switch to the OpenShift browser window that was showing the pod events.

Note that you will see a large number of pod readiness probe failures while you were reading the notes.

In the OpenShift Console choose Adminstrator View, then Workloads/Pods. Click on the Pod that is active and in the Pod information page click on the Terminal option.

Within the Pod Terminal enter the command :

```
curl -k localhost:8080/restore
```

You should see a response similar to that shown below (with a different IP address):

```
"10.128.2.146 restore switch activated"sh-4.2$
```

Now go back to the Terminal tab where you enter *oc* commands

View the state of the pod within the endpoints using the command below:

```
oc get ep/node-app-slave -o yaml
```

You should see that the line of interest, previously shown above, has changed back to that shown below:

```
subsets:
- addresses:
  - ip: <ip address of the pod>
```

On the OpenShift browser page switch back to the events tab and you should see that the readiness probe failure count is no longer increasing.

Finally, switch to the application browser page and change the URL to end in /health. You should see that the application has been running for some time (compared to the liveness probe that showed a restart had taken place) and it should be responding successfully to the health probe.

Cleaning up

From the OpenShift browser window click on *Advanced* and then *Projects* on the left hand side menu.

In the triple dot menu next to your own project (ProbesX) select ‘Delete Project’ Type ‘ProbesX’ (where X is your user number) such that the Delete button turns red and is active.

Press Delete to remove the project.

Camel K on Openshift [INNOVATION]

Author: Phil Prosser (feedback to pprosser@redhat.com)

Introduction

Apache Camel is based on a book called Enterprise Integration Patterns, window="_blank" that was written by Gregor Hohpe and Bobby Woolf. The purpose of the book was to describe all of the patterns required to successfully implement enterprise integrations. Apache Camel is an implementation of the Enterprise Integration Patterns. These patterns are expressed in Camel Routes using a Domain Specific Language, window="_blank" (DSL)

Apache Camel K is a lightweight integration framework built from Apache Camel that runs natively on Kubernetes and is specifically designed for serverless and microservice architectures.

Users of Camel K can instantly run integration code written in Camel DSL on their preferred cloud (Kubernetes or OpenShift).

The purpose of this lab is to show you how easy it is to build, deploy, and delete Camel K integations using very simple examples. It is not the goal of this lab to demonstrate the integration capabilities of Camel K.

This workshop requires you to be logged on to both the OpenShift console and the terminal as described in the pre-requisites. If you do not have both tabs logged in please follow the instructions before continuing

Check the project is ready to use

In the browser based terminal window, check you are still logged on and using the correct project by typing:

```
oc whoami
oc project
```

If the response from the commands indicates that you are not userX (where X is your assigned user number) and not using the project sandboxX please repeat the commands in the pre-requisites.

Camel K and the Operator Lifecycle Manager

Camel K and the Operator Lifecycle Manager

Camel K uses the Operator Lifecycle manager, this means that new Custom Resource Definitions (CRDs) will be added to Openshift. These CRDs will extend the Openshift data model and allow Camel K to be managed using the standard 'oc' command. Installing operators requires a higher cluster privilage. All the required operators for the workshop should have been pre-installed for you

The examples required for this workshop have been pre-created as part of the terminal. In the terminal type:

```
cd /workspace/examples
ls
```

These are the example files we will be using.

To allow a developer to easily interact with an Openshift cluster, Camel K has it's own command line interface. The cli is called *kamel* and is preinstalled in the terminal app

Before we can create an integration, we need to add a Camel K *IntegrationPlatform*.

In the terminal window, type

```
cd /workspace/workshop4/camelfiles/camelkplatform/
oc apply -f integrationplatform.yaml
```

now type

```
oc get integrationplatform
```

The output should look similar to below

```
NAME      PHASE
camel-k   Ready
```

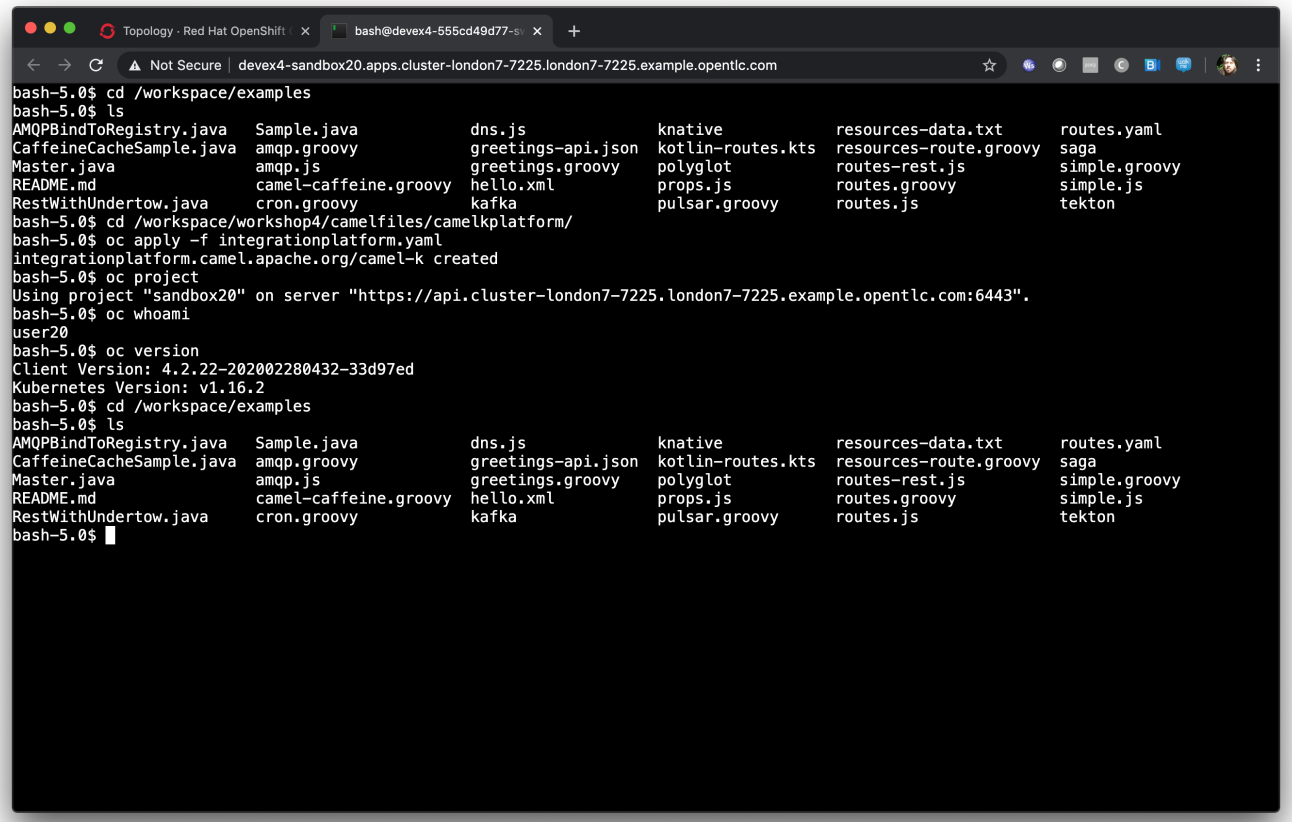
Once the "Phase" says "Ready", you can continue

You should now have all the pieces you need to start creating and deploying lightweight Camel Integrations to Openshift.

Now enter the following commands:

```
oc project
oc whoami
oc version
cd /workspace/examples
ls
```

You should see an output similar to the one shown below:



Deploy a Camel K Integration

Firstly, let's start by deploying a simple integration, type

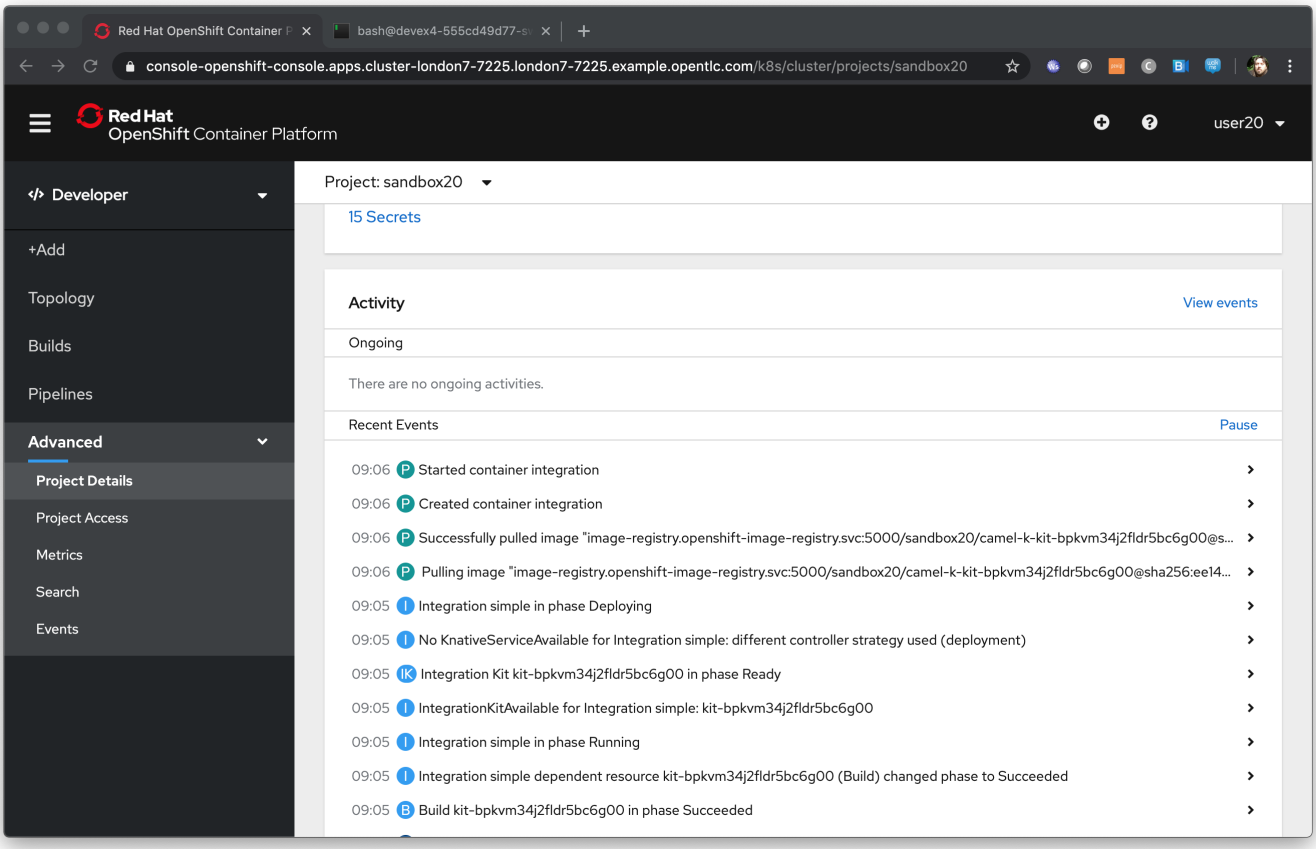
```
kamel run simple.groovy
```

The first time you deploy an Integration, it will take a few minutes. The operator manages all dependencies required by the Integration and downloads these from the Red Hat repository on demand. Once downloaded, the operator caches dependancies therefore subsequent deployments are significantly quicker. If you want to see what's happen, in the terminal window type *oc get pods*, you will see that there are builds running

To see what is going on go to the console UI in the Browser, make sure you are switched to *Developer view*

Click on *Advanced/Project Details*

If your screen is wide enough the Activity pane will appear on the right hand side. If not, scroll down to the *Activity* pane - this shows the events and actions currently occuring within the project. It will look similar to this:



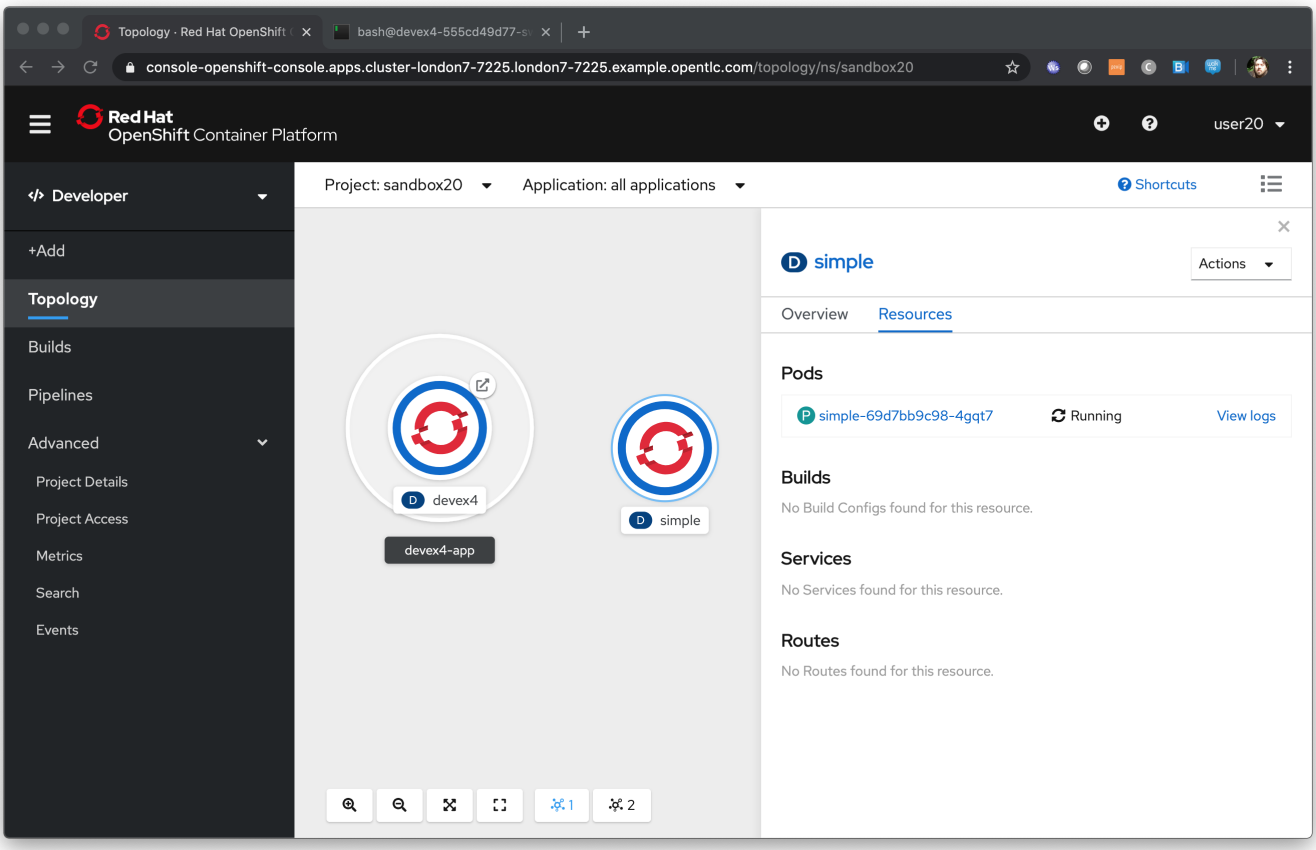
Switch back to the project Topology view by clicking on *Topology*

Once the deployment is complete, you will see *Simple* deployed on the topology view

Click on *Simple* (this is your integration), and you can see what's going on.

Once the pod has a dark blue ring around it, it is running, as per the screenshot below. The devex4

application is your terminal application and can be ignored for the duration of this chapter

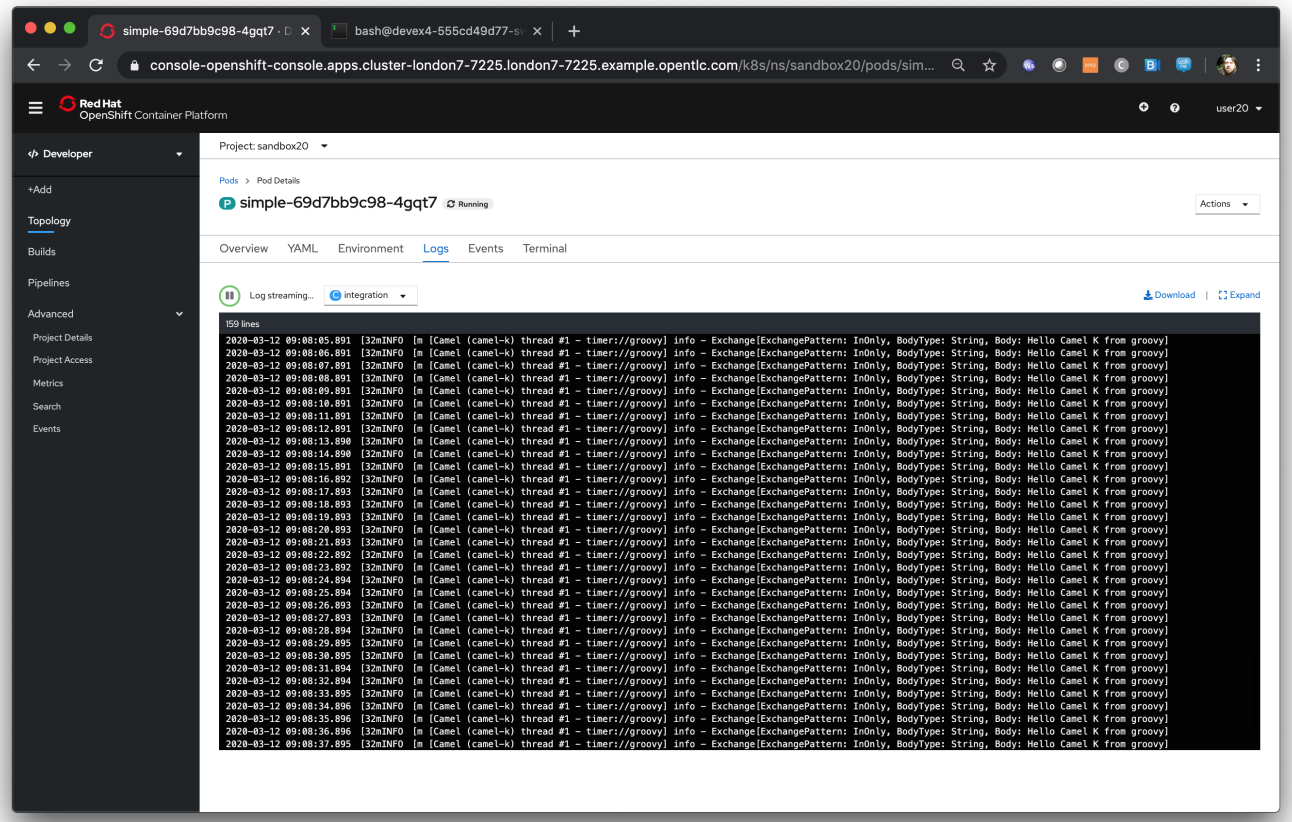


If you haven't already, click *inside the circle* to open the overview window

Click on *Resources*

There will be one Pod running with a name similar to simple-xxxxxxx-yyyyy (randomly generated). Next to it will be an indicator that it is running. Next to that is a clickable point labelled *View Logs*. Click on this.

The output of the log should look as shown below:



The integration is a simple timer that triggers every 1 second and writes to the log file.

In the Terminal Browser window type

```
oc get integrations
```

You should now see an integration called *simple* in the list similar to this:

```
NAME     PHASE     KIT                          REPLICAS
simple   Running   kit-bpj4ns3tvn0va7c7gs9g   1
```

In the Terminal browser window type

```
oc describe integration simple
```

If you scan to the top of the output you will see some code in the *from* component that represents the integration's behaviour

We will now make a change to the integration

In the browser terminal window

```
vi simple.groovy
```

You will see the text - *Hello Camel K from ${routeId}* in the code definition of the integration

Change the text to the following by pressing [ESC] then I to insert:

```
'Hello Camel K from ${routeId}. Added some more text'
```

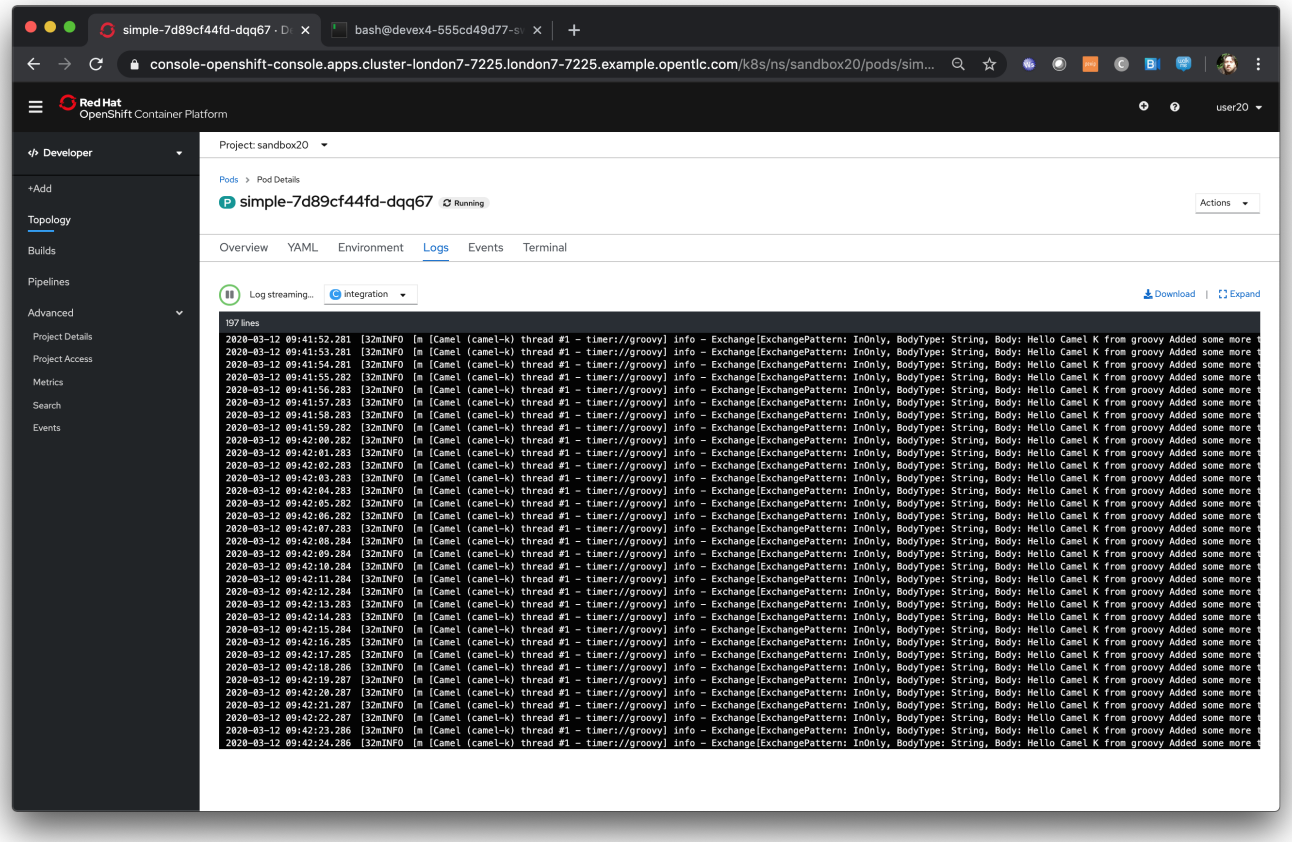
To save the change now hit [ESC]:wq[RETURN]

Now, you need to deploy this integration to Openshift again to test by typing:

```
kamel run simple.groovy
```

If you are quick enough (you need to be really quick) switch back to the OpenShift console and hit *Topology*, you'll see the integration doing a re-deployment

Look at the log file again (as above) to make sure the change has been deployed



Deploy Camel K in Developer mode

While the process of redeploying is simple, it isn't very developer friendly. The *kamel* cli has a developer friendly "hot deploy" mode that makes this experience much better

First delete the integration.

There are 2 ways you can do this in the Terminal Browser window (your choice). Either use the "kamel" cli:

```
kamel delete simple
```

Or use the Openshift cli:

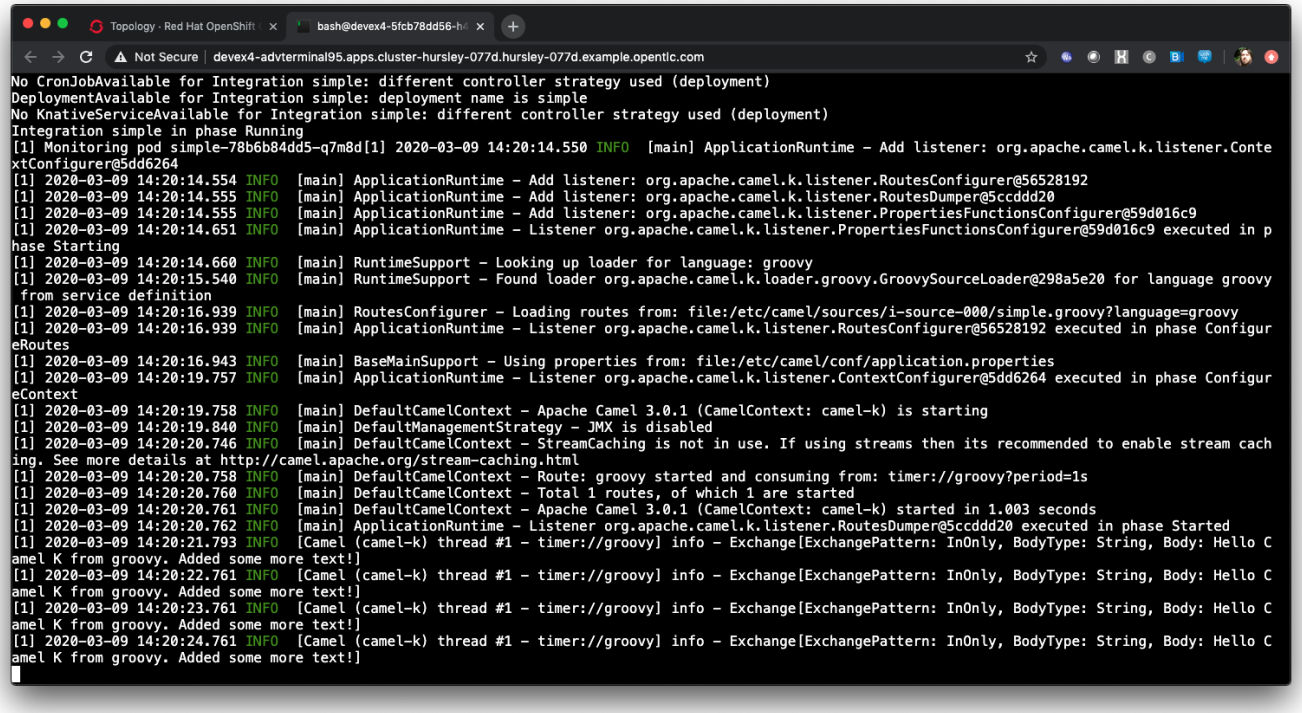
```
oc delete integration simple
```

This is the great thing about CRDs, you can use the normal Openshift cli to managed the custom data model (integrations in this case)

To deploy the integration in developer mode, type:

```
kamel run simple.groovy --dev
```

You will see the deployment phases logged on the screen, followed by the log outputting automatically from the integration pod, useful for a developer to see what's going on. The output should look similar to the screenshot below



For the next exercise, you will need 2 terminal windows. Go to the OpenShift Console, which should be on the Developer view. Click on Topology if the Topology window is not currently in focus. Click on the URL icon at the top right of the *Devex4* application as you did to originally open the terminal. This will open another Terminal for you to use.

In the first terminal tab, which will be the one furthest to the right, you will notice that the terminal window is outputting the log of the active and running integration

In the **new** terminal now type:

```
cd /workspace/examples
```

Make another change to the text in “simple.groovy” by following the same instructions above - make sure the text outputted is different and that you save it as described above

Once you have saved the changes, go back to the browser terminal tab outputting the log

Switch to the original output tab. The integration will shutdown and restart with the new code and new text

You should see that the changes have been automatically applied to the running integration, without the need to redeploy

Go back to the browser terminal that’s outputting the log, press ‘ctrl c’

Look at the Topology view in the Openshift console(or *oc get integrations* in the terminal)

The integration should have been deleted and no Pods should now be running (other than the Terminal pod), just like a developer would see by pressing *ctrl c* on a Java application running on their laptop

Close down one of the terminal window tabs so you only have one terminal and the OpenShift console

If you followed the lab, the Integration should be gone, however, lets make sure we clean up the project.

In the terminal window, type

```
kamel get
```

If there is no Integration running then proceed to the next lab of your choice

If an Integration is running, then please delete it by typing

```
kamel delete simple
```

Camel K and OpenShift Serverless Eventing [INNOVATION]

Author: Phil Prosser (feedback to pprosser@redhat.com)

Introduction

OpenShift Serverless

OpenShift Serverless, based on Knative is the serverless technology that was introduced in OpenShift 4.2. OpenShift Serverless enables Pods running on OpenShift to be scaled to 0 therefore taking zero processing power. Only when called, OpenShift Serverless will scale the Pod up on demand before processing the request. OpenShift Serverless also has the ability to autoscale based on load before eventually scaling back to zero when no requests are being received.

OpenShift Serverless supports "Serving" and "Eventing"

At the time of writing, Serving is in Technology Preview, and Eventing is in Developer Preview

"Serving" enables request/response workloads, and Eventing enables asynchronous event based workloads using cloudevents.

Eventing has become an important part of a Microservice architecture. It enables services to notify other services of change (typically, change in state) in a loosely coupled manner. To enable this, Knative Eventing uses a publish and subscribe architecture. This enables the source service to publish events without having the knowledge of who maybe wanting to consume the events. It allows any number of sink services to subscribe to the event and act upon it.

In this lab, we are going to look at eventing, and how easy it is to integration with Camel K.

Check the project is ready to use

In the browser based terminal window, check you are still logged on and using the correct project by typing:

```
oc whoami
oc project
```

If the response from the commands indicates that you are not userX (where X is your assigned user number) and not using the project sandboxX please repeat the commands in the pre-requisites.

Whilst OpenShift Serverless has it's own cli (kn), the purpose of this lab is to show the integration of Camel K into OpenShift Serverless and how easy this is to use.

OpenShift Serverless and the Operator Lifecycle Manager

OpenShift Serverless and the Operator Lifecycle Manager

OpenShift Serverless uses the Operator Lifecycle manager, this means that its operator and Custom Resource Definitions (CRDs) will be added to OpenShift via "OLM". Once created, the new CRDs will extend the OpenShift data model allowing OpenShift Serverless to be managed using the standard 'oc' command. Installing operators requires a higher cluster privilege so the presenter will have already set these up for you.

Creating the pre-requisites for the chapter

Before we can create an integration, we need to check that the camel-k integration added in a previous chapter is still active

In the terminal window, type

```
cd /workspace/workshop4/camelfiles/camelkplatform
oc apply -f integrationplatform.yaml
```

This will either create the integration platform or, if it is still active, indicate it is unchanged

now type

```
oc get integrationplatform
```

The output should look similar to below

```
NAME      PHASE
camel-k   Ready
```

Once the "Phase" says "Ready", you can continue

Create Knative Messaging Channel

OpenShift Serverless uses Knative eventing. Knative eventing is a loosely coupled asynchronous architecture allowing event producers to send an event to one or more event consumers. Event Consumers can be scaled to zero when no events are following through the system.

By default, Knative uses an in-memory messaging channel. In this lab we will configure two of these channels to use with Camel K

Options are also available to replace in-memory messaging with other event sources such as the Kafka Channel. By combining Camel K and Red Hat AMQ Streams (Red Hat's Kafka Implementation) on OpenShift you create a powerful and reliable cloud native eventing platform for your applications.

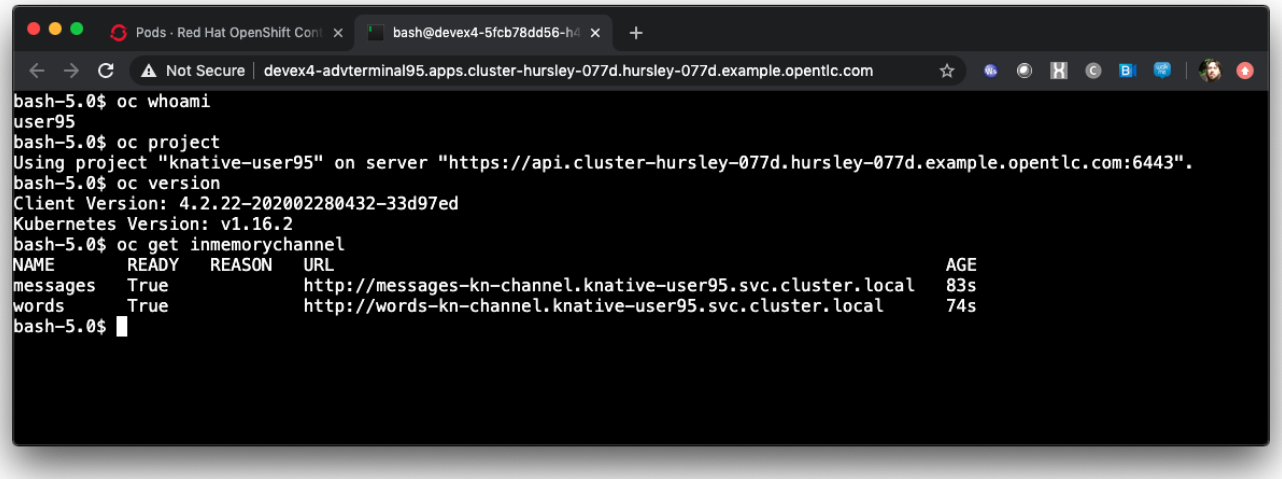
In the browser terminal window type the following:

```
cd /workspace/examples/knative
oc apply -f messages-channel.yaml
oc apply -f words-channel.yaml
```

To make sure the channels have been created correctly type:

```
oc get inmemorychannel
```

You should see a screenshot like the one below



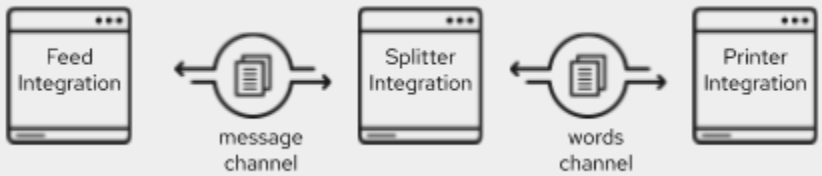
You are looking for *READY* to be *True*

Deploy the Integrations

Introduction to the integrations that we will use

Now that we have deployed 2 message channels, we will deploy 3 Camel K Integrations. *feed.groovy* will generate a simple sentence every 3 seconds, and send this to the *message channel*, *splitter.groovy* will subscribe to the *message channel*, take the message, split the message into individual words before sending the individual words to *words channel*. Finally, *printer.groovy* will subscribe to the *words.channel*, read the words from the channel and print them to the output log.

The flow looks like:



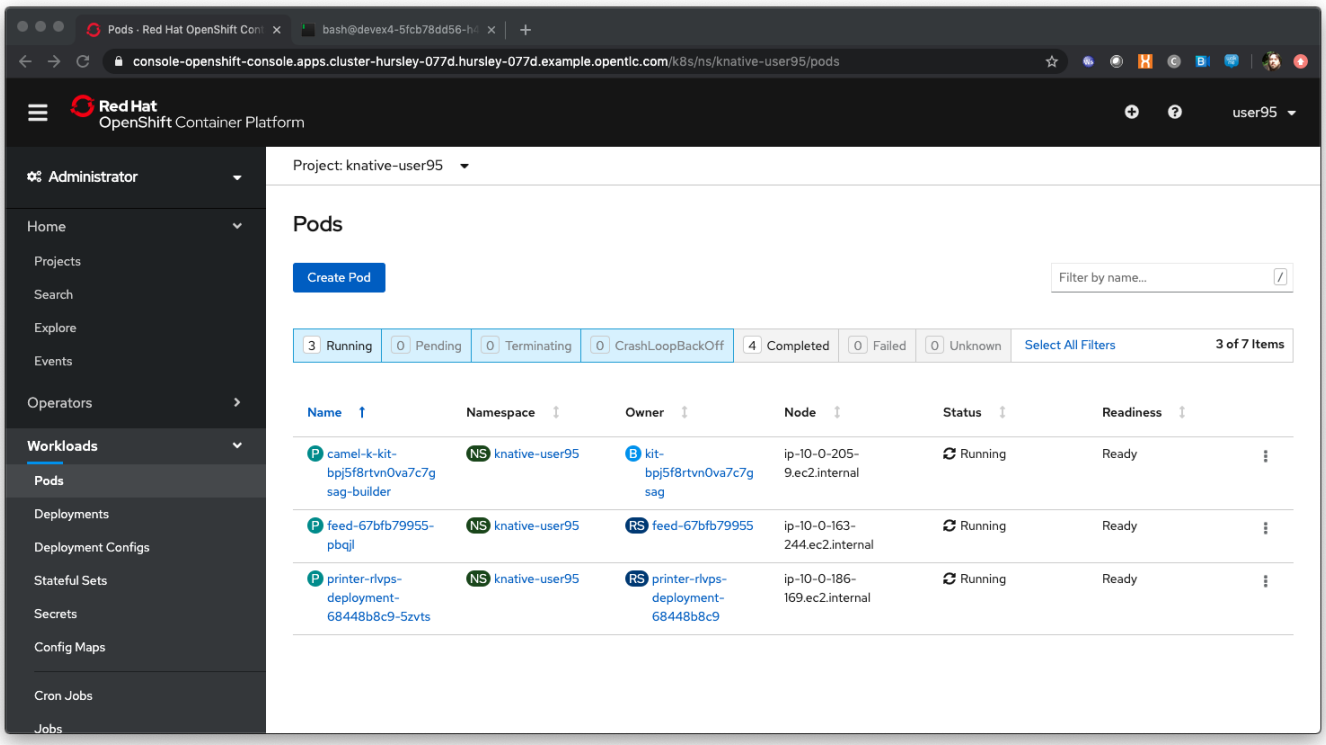
In the terminal window, deploy the 3 integrations

```
kamel run feed.groovy
kamel run splitter.groovy
kamel run printer.groovy
```

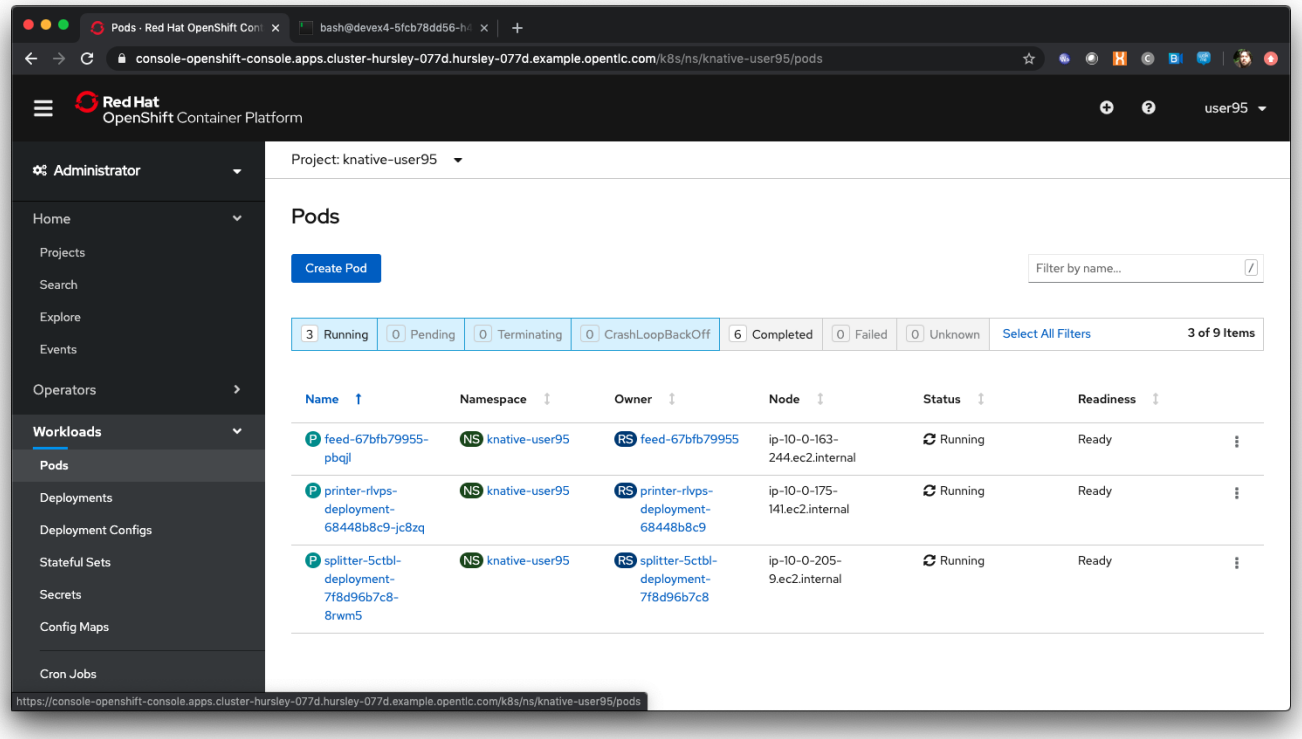
First go to the Administrator view in the OpenShift console - at the top left make sure the view is set to Administrator

Go to Workloads/Pods. As you are using a single namespace for the workshop this should display the active Pods in sandboxX, where X is your user number

Watch as the integrations are created using builder and deployment containers. This may take a little while.



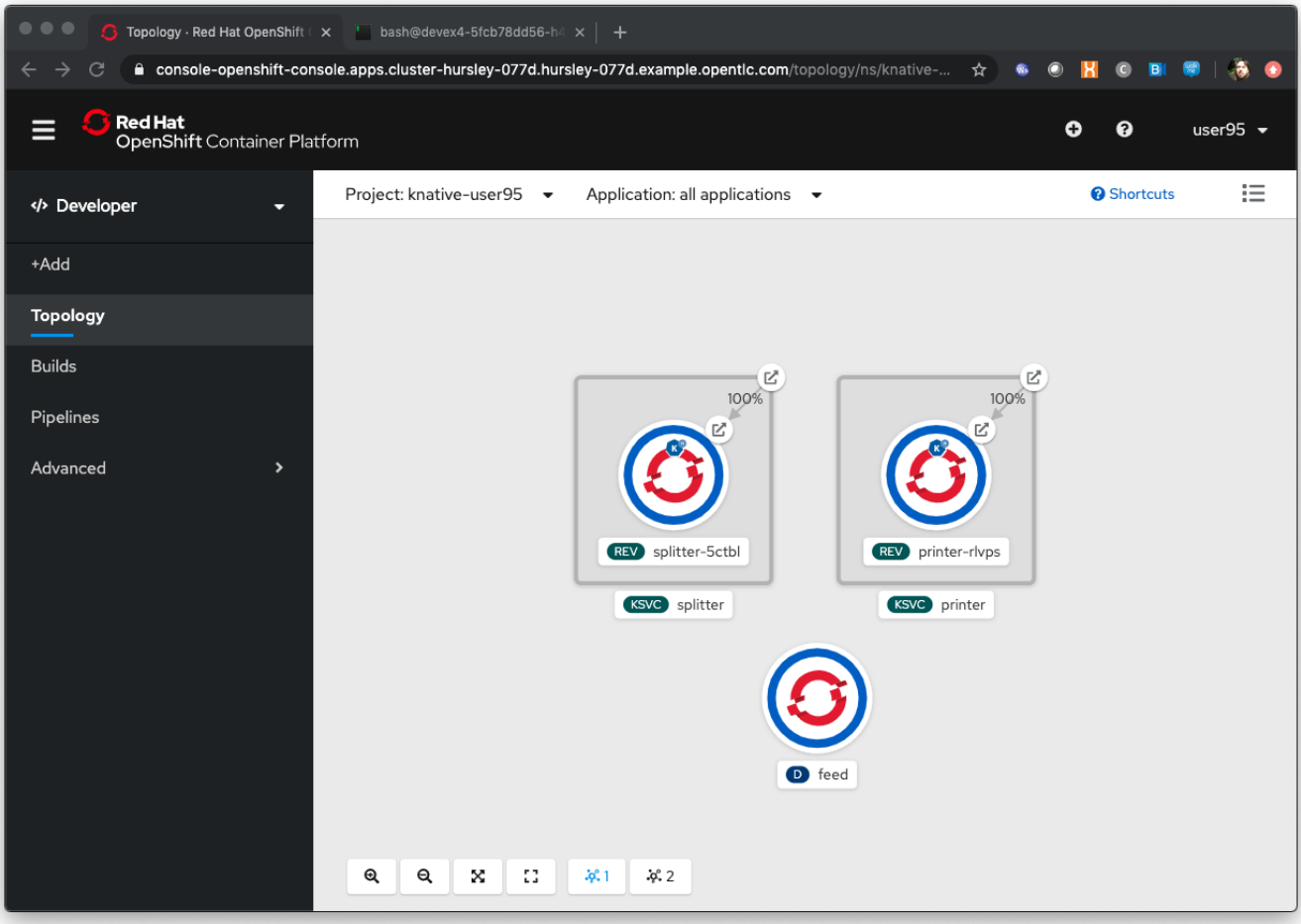
Once it has finished deploying the integrations you will have three Pods active as shown similar to the screenshot below (ignore the devex Pod, this is your terminal Pod)



Now go to the developer view in the OpenShift Console

Now that all 3 of the Integrations are deployed, the topology view should look like the screenshot

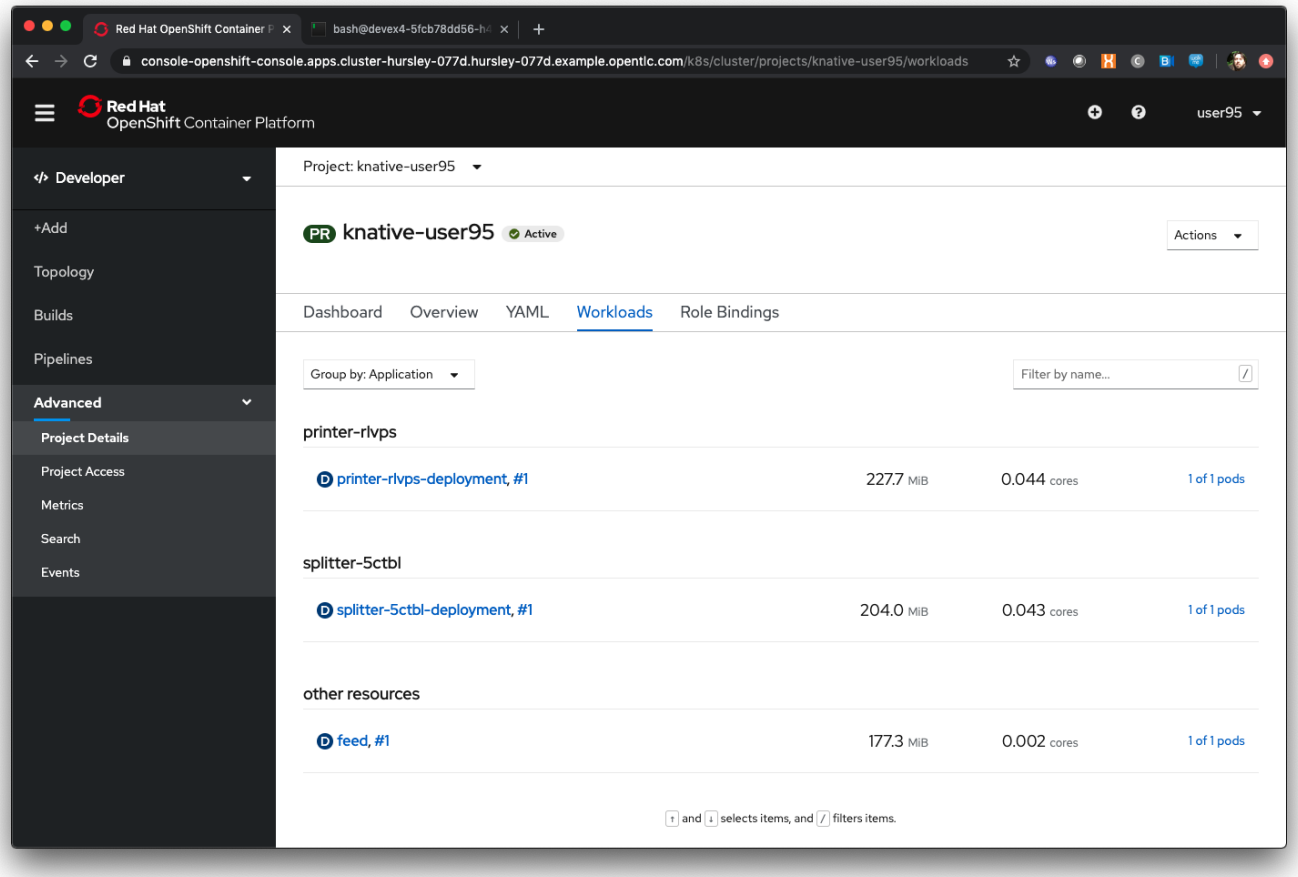
below



The Knative service is represented by the square box. You should see 2 of these in the topology view. On the OpenShift red logo in the middle of the service you will see the Knative "K" logo. You definitely know that you have a Knative service now. You will also notice an artefact called "KSVC", this is the Knative Service defined to OpenShift. There is also an artefact called "REV", this is the Knative revision that is current running. Revisions can be used to implement a Canary Release strategy. The diagram shows that 100% of the traffic is routed to the revision shown on the topology view. If you click on one of the "KSVC" on the topology view you will see an option to set the traffic distribution

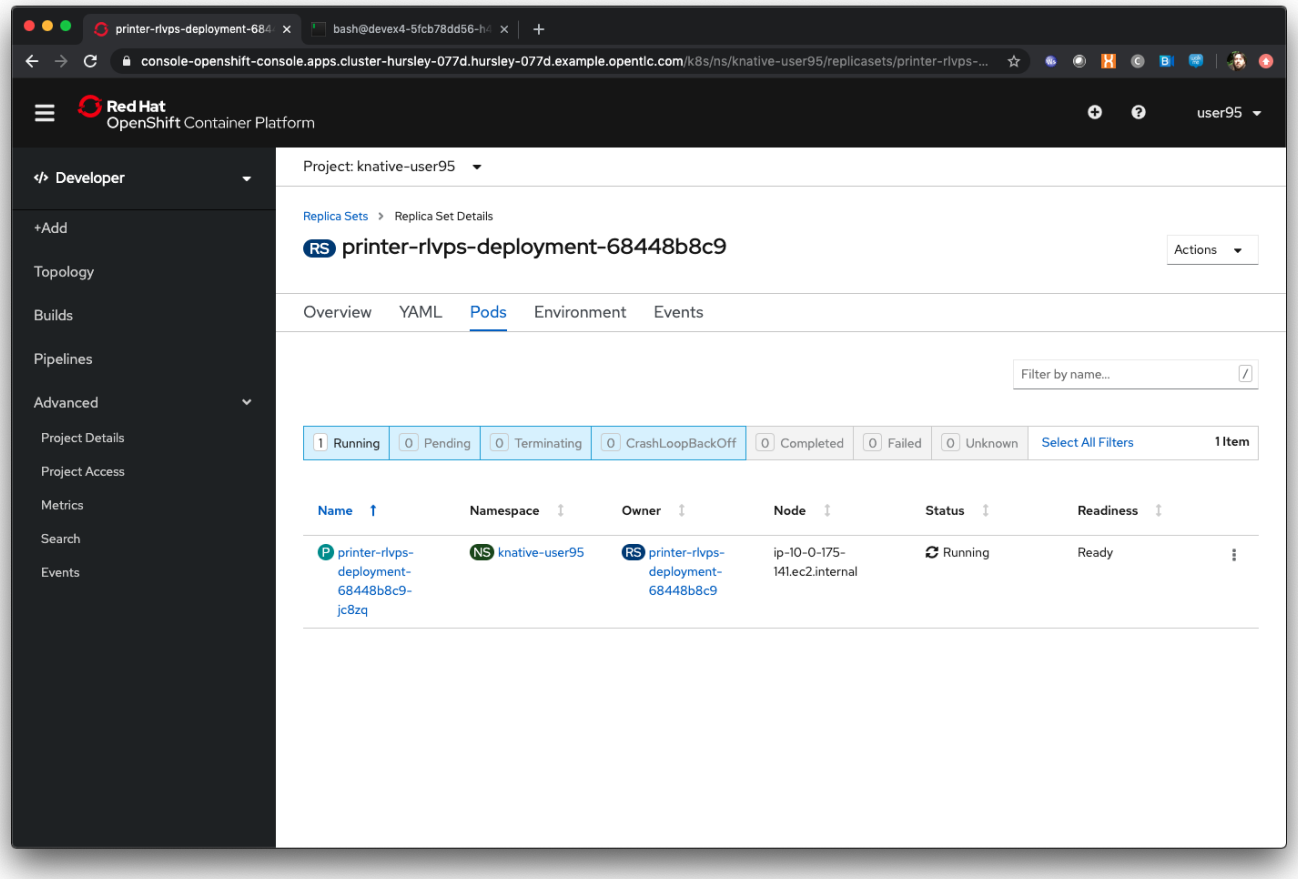
Each of the integrations is producing log information.

At the time of writing, there is no easy way to view the pod log files of a knative service in the console, so in the developer view click on Advanced/Project Details and choose Workloads



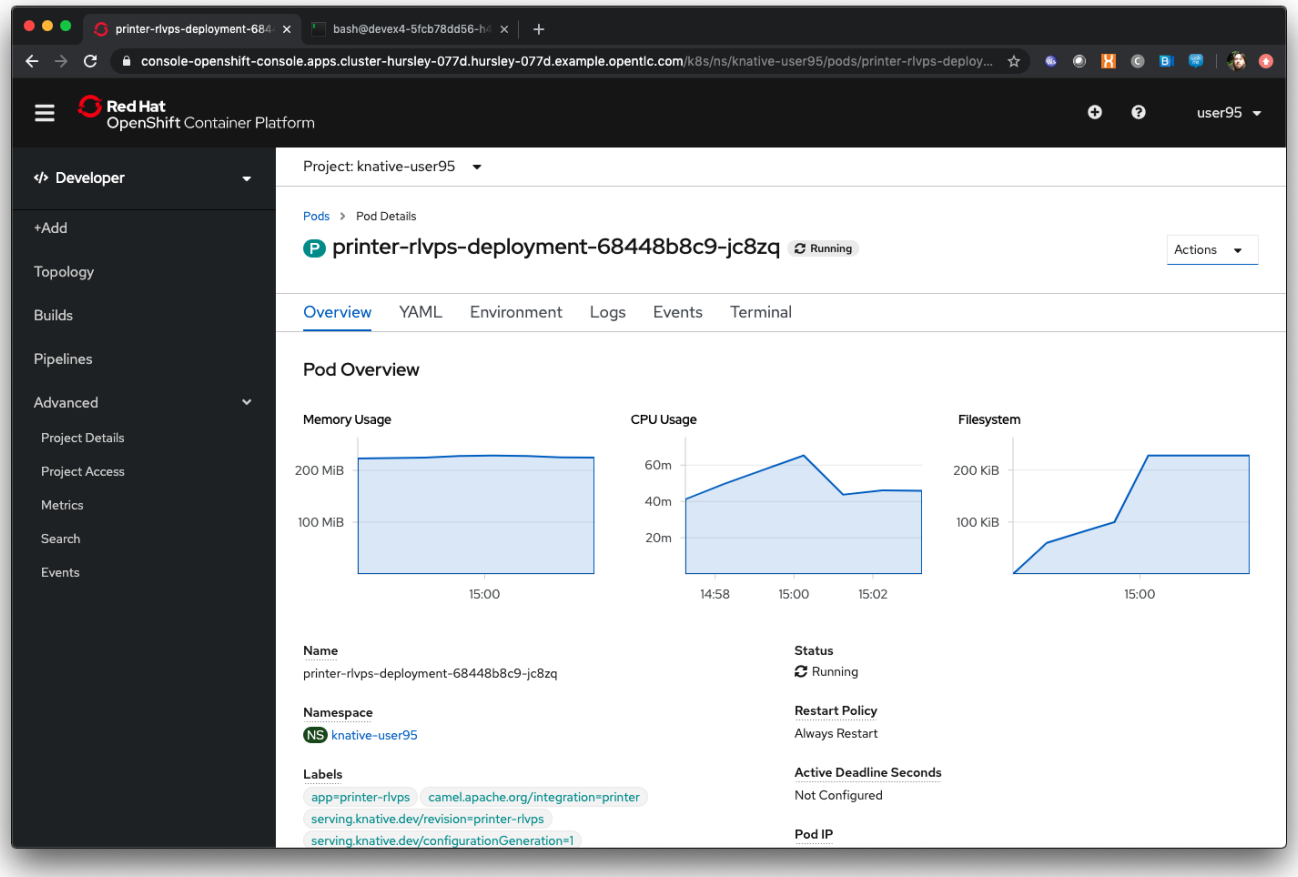
For each workload, you should see a *1 of 1 pods* on the right hand side. *Click* on the *1 of 1 pods*.

You should see a screen similar to the one below

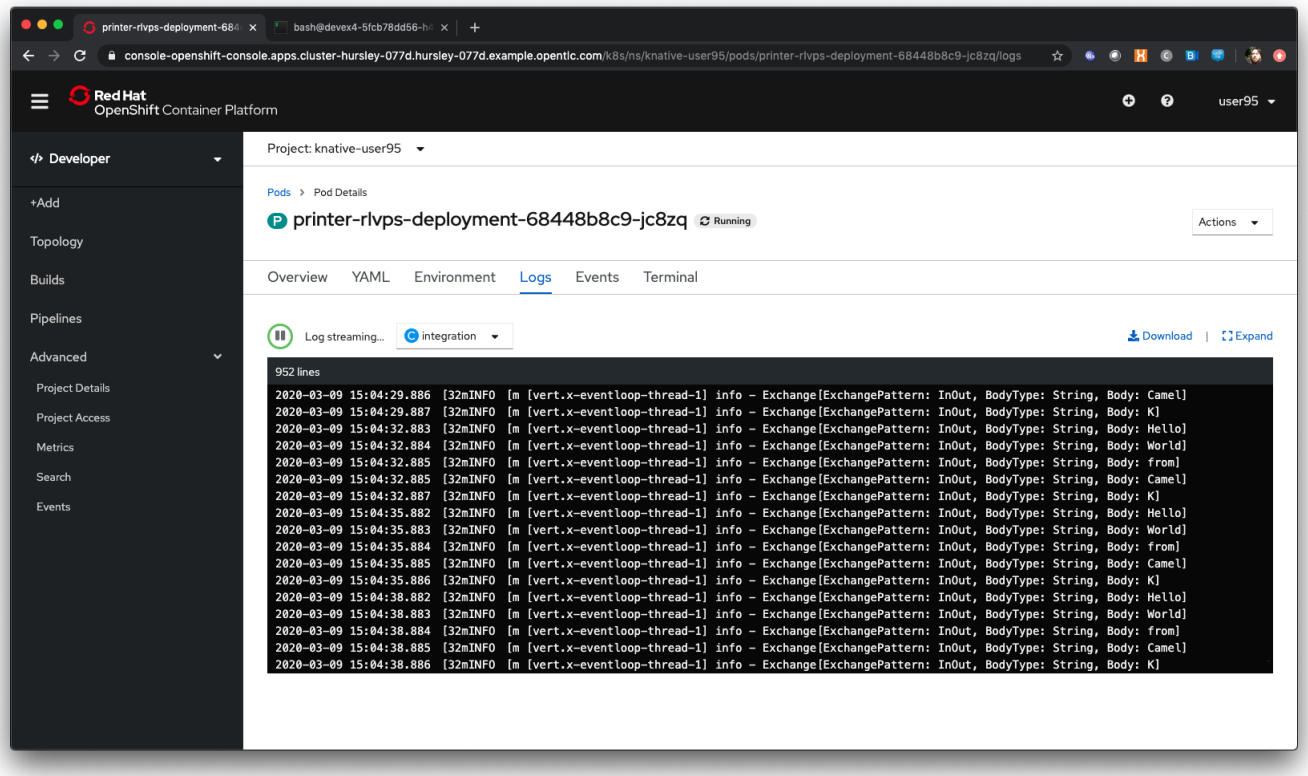


Click on the Pod name on the left e.g. printer-xxxxxxxxxxxx

This should show you a screen similar to the one below



Click on *Logs* to view the log for the pod. It should look something like the one below



Repeat the steps above for the other Integrations if you like.

Edit the Integration to use a Counter and Cache

NOTE

Because the output from the Feed Integation doesn't change, it's hard to see if all the messages are being processed, or indeed if some are being dropped. Lets make a small change to the Integration. The change will add a cache, and a counter to ensure that each message has a counter in it.

In the terminal window edit the Integration called feed.groovy

```
cd /workspace/examples/knative
vi feed.groovy
```

Between the line starting with **from** and the line starting with **.setBody** insert the follow code (copy the code by higlightling it and copying it)

```
        .setHeader("CamelCaffeineAction", constant("GET"))
        .setHeader("CamelCaffeineKey", constant("count"))
        .toF("caffeine-cache://%s", "messagecount")
        .choice()
                .when().simple('${body} == null') // When no counter stored, default to
zero
                        .setHeader('counter').constant(0)
                .otherwise() // retrieve the counter
                        .setHeader('counter').simple('${body}')
        .end()
        .setHeader('counter').ognl('request.headers.counter + 1')
        .setBody().simple('${header.counter}')
        .setHeader("CamelCaffeineAction", constant("PUT"))
        .setHeader("CamelCaffeineKey", constant("count"))
        .toF("caffeine-cache://%s", "messagecount")
        .setBody().simple('Hello${header.counter} World${header.counter}
from${header.counter} Camel${header.counter} K${header.counter}')
```

TIP

I'm no vi expert, but if you don't know vi, use the keyboard arrow keys to move to the line beginning with **from**, then to go to the end of the line press **$**, press **i**, press the **right arrow** once to move the cursor to the end of the line and press **enter** (this shoud insert a blank line and move the cursor to the beginning of that line. Paste in the code by pressing **ctrl v**. Don't worry about the indentation too much. Once pasted in press **esc**.

The final line pasted in is **.setBody**. There is an existing **.setBody** line that we need to delete, the line looks like :-

```
.setBody().constant("Hello World from Camel K")
```

TIP

To delete, move the cursor to the line and press **dd** Finally save your work by typing **:wq** and press **enter**

Once complete, the integration should look like :-

```
// camel-k: language=groovy
/*
 * Licensed to the Apache Software Foundation (ASF) under one or more
 * contributor license agreements.  See the NOTICE file distributed with
 * this work for additional information regarding copyright ownership.
 * The ASF licenses this file to You under the Apache License, Version 2.0
 * (the "License"); you may not use this file except in compliance with
 * the License.  You may obtain a copy of the License at
 *
 *      http://www.apache.org/licenses/LICENSE-2.0
 *
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */

from('timer:clock?period=3s')
        .setHeader("CamelCaffeineAction", constant("GET"))
        .setHeader("CamelCaffeineKey", constant("count"))
        .toF("caffeine-cache://%s", "messagecount")
        .choice()
                .when().simple('${body} == null') // When no counter stored, default to
zero
                        .setHeader('counter').constant(0)
                .otherwise() // retrieve the counter
                        .setHeader('counter').simple('${body}')
        .end()
        .setHeader('counter').ognl('request.headers.counter + 1')
        .setBody().simple('${header.counter}')
        .setHeader("CamelCaffeineAction", constant("PUT"))
        .setHeader("CamelCaffeineKey", constant("count"))
        .toF("caffeine-cache://%s", "messagecount")
        .setBody().simple('Hello${header.counter} World${header.counter}
from${header.counter} Camel${header.counter} K${header.counter}')
        .to('knative:channel/messages')
        .log('sent message to messages channel')
```

Each word should now have the counter appended to it

Test your work by typing :-

```
kamel run feed.groovy
```

Use the skills you've learned to view the output of the container logs to check that the messages now contain a counter.

Knative in action

Make sure you are in the developer view of the console, looking at the Topology view before continuing

The 2 Integrations "hooked" into Knative Eventing are the *splitter* and *printer* integrations (you can visually see this on the topology view).

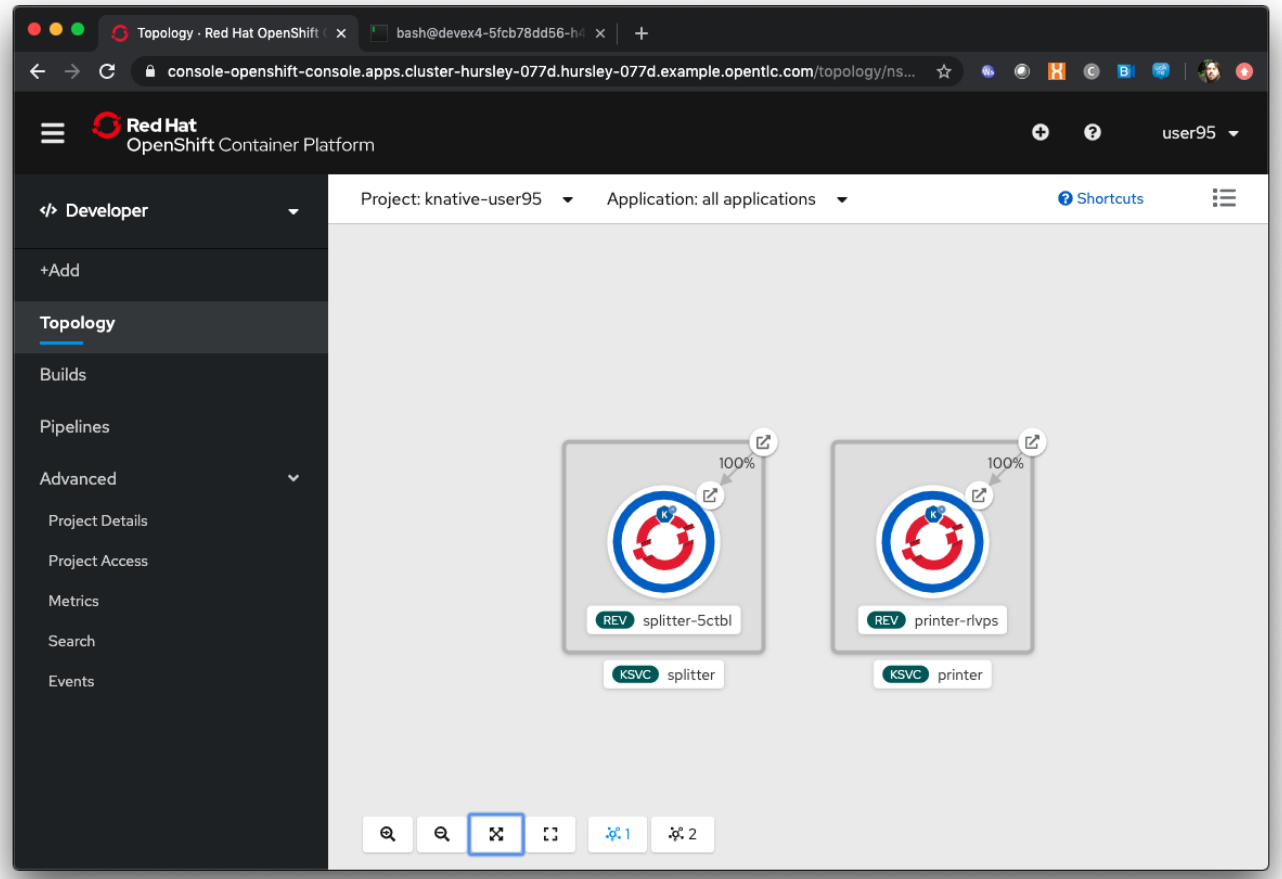
Let's see if the promise of scale to zero works.

To stop the integrations, we need to stop messages arriving at the "messages.channel". To do this, we need to stop the feed integration.

In the terminal browser window, type

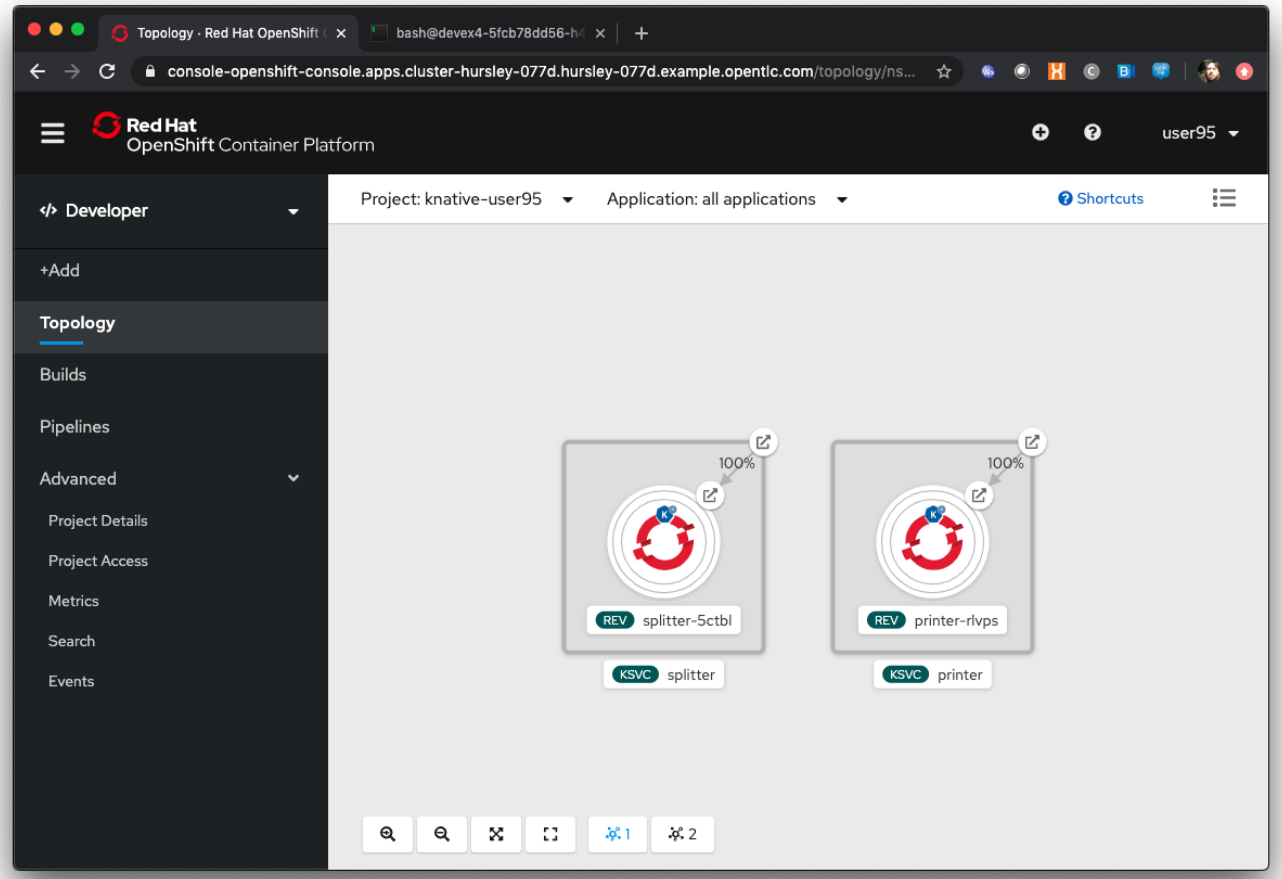
```
kamel delete feed
```

Go back to the topology view, you will notice that the feed integration has gone.



Show some patience now, keep looking at the topology view, we are waiting (and hoping!) that the integrations scale down to zero.

You will know when this starts as the rings around the circles will change from the normal blue to a very dark blue, before going white. Once they are white, the integrations are scaled to zero just like the screenshot below



To wake the Integrations up again, redeploy the *feed* integration.

```
kamel run feed.groovy
```

Go back to the topology view and you should see the *feed* integration redeploy, and the *splitter* and *printer* integrations awake from their slumber.

This shows the potential for effective serverless behaviour by the down-scaling of unused applications, combined with the ease of Camel-K integrations.

To clean up before the next chapter run the following commands in the terminal:

```
kamel delete feed
kamel delete splitter
kamel delete printer
```

Knative Revisions

Knative Revisions are for all Knative service deployed on OpenShift, not just Camel K. Knative revisions are a point in time snapshot of the code and configuration for each modification made to a service deployed on OpenShift. Revisions enable progressive rollout and rollback of chanages by rerouting traffic between service names and revision instances.

This is powerful as it means the Knative route can be configured to balance traffic between different version of the revision ensuring a low risk release of new versions into production e.g. New revision is created, and we'll start by only giving it 10% of the traffic whilst the old version takes the main load. Gradually, the percentage can be moved to 100% before retiring the old version of the service.

This part of the lab will demonstrate doing this will the OpenShift Developer console, and also the Knative cli

Using the console

To demonstrate multiple revisions, you need to make a small change to the Camel K integration.

In the terminal window

```
vi greetings.groovy
```

You will see the following line:

```
*.simple('Hello from ${headers.name}')*
```

This is the message returned to the caller with the query parameter "name" appended; change the line to (or something similar) by pressing [ESC] then I

```
*.simple('Hello from ${headers.name} from the newer revision')*
```

Save it by pressing [ESC] then :wq[RETURN]

Now deploy this version of the integraton API using:

```
kamel run --name greetings --dependency=camel-rest --dependency camel-undertow --property
camel.rest.port=8080 --open-api greetings-api.json greetings.groovy
```

By running the integration again, you will automatically create a new revision of the integration

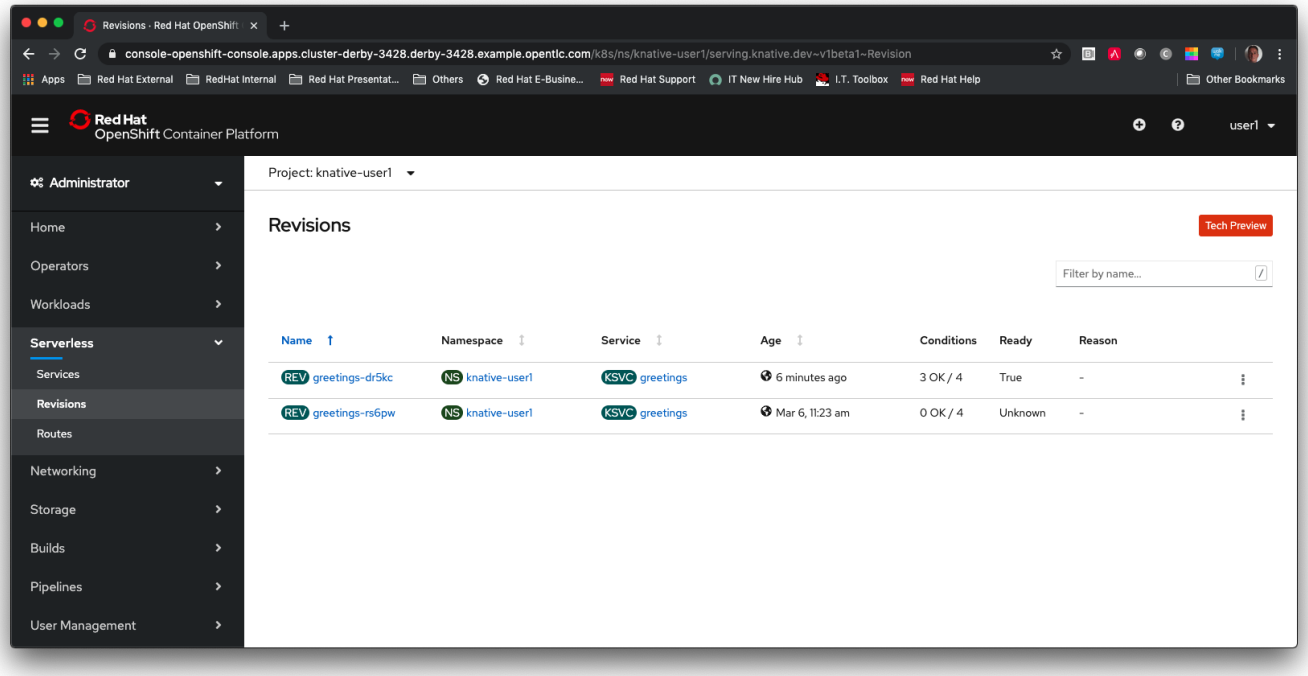
Test the integration again (don't forget to replace the URL as before)

```
curl -m 60 URLFROMABOVE/camel/greetings/YOURNAMEHERE
```

You should see the new response message returned

For information, in the console, if you switch to Administrator view you can see the deployed revisions.

In the OpenShift Console select the Administrator View using the top level selector, then Serverless/Revisions



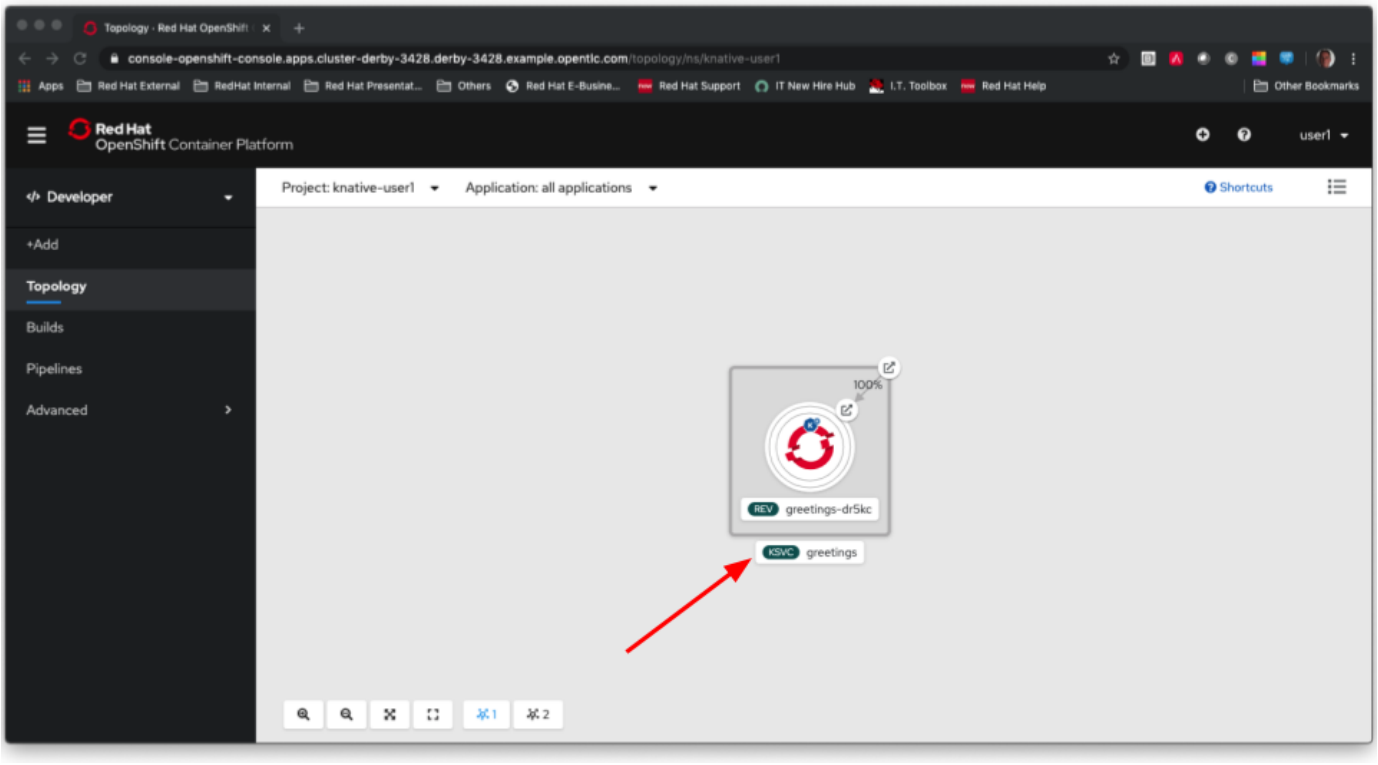
Now select Serverless/Services

You will see one Knative Service. Rather than just going big bang to the new revision, you want to direct 50% of the traffic to the orginal revision, and 50% of the traffic to the new revision. To achieve this, we need to modify the routing rules in the Knative Service.

Fortunately, in the OpenShift consoles developer view, there is a really easy way to achieve this

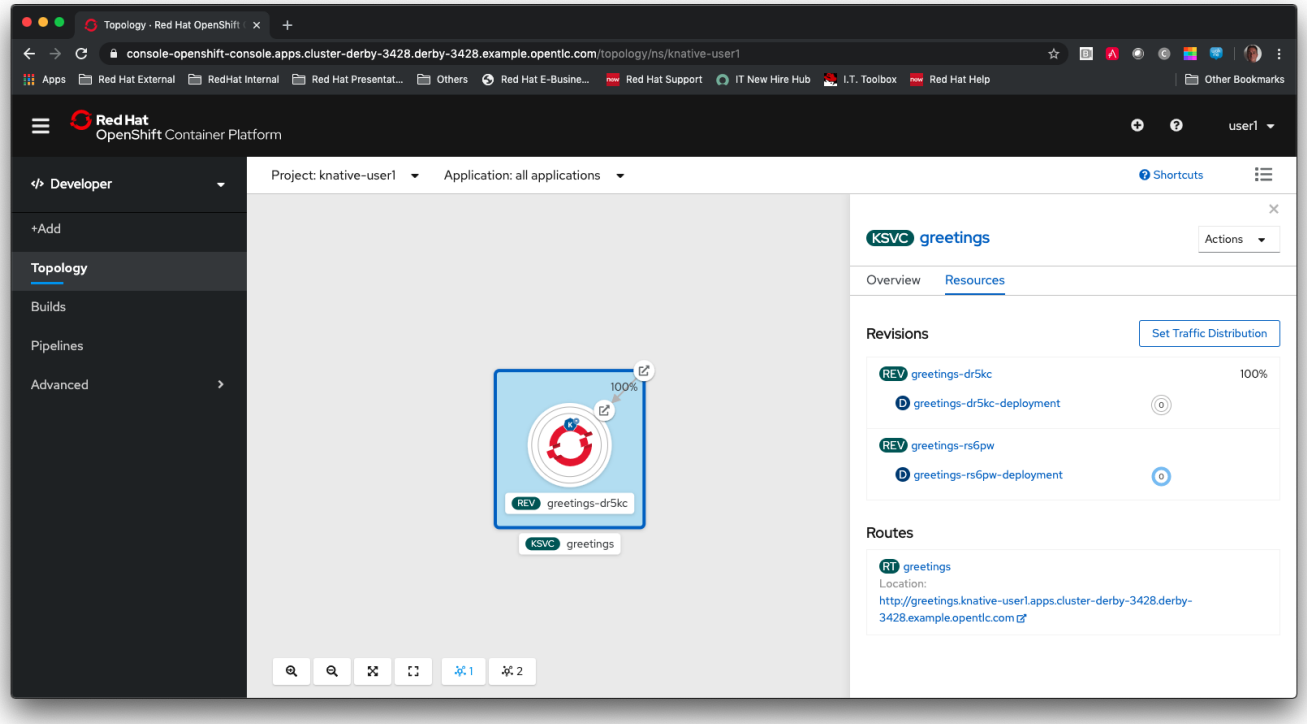
Switch back to the developer view, looking at the topology.

It probably looks similar to the one below (without the arrow).



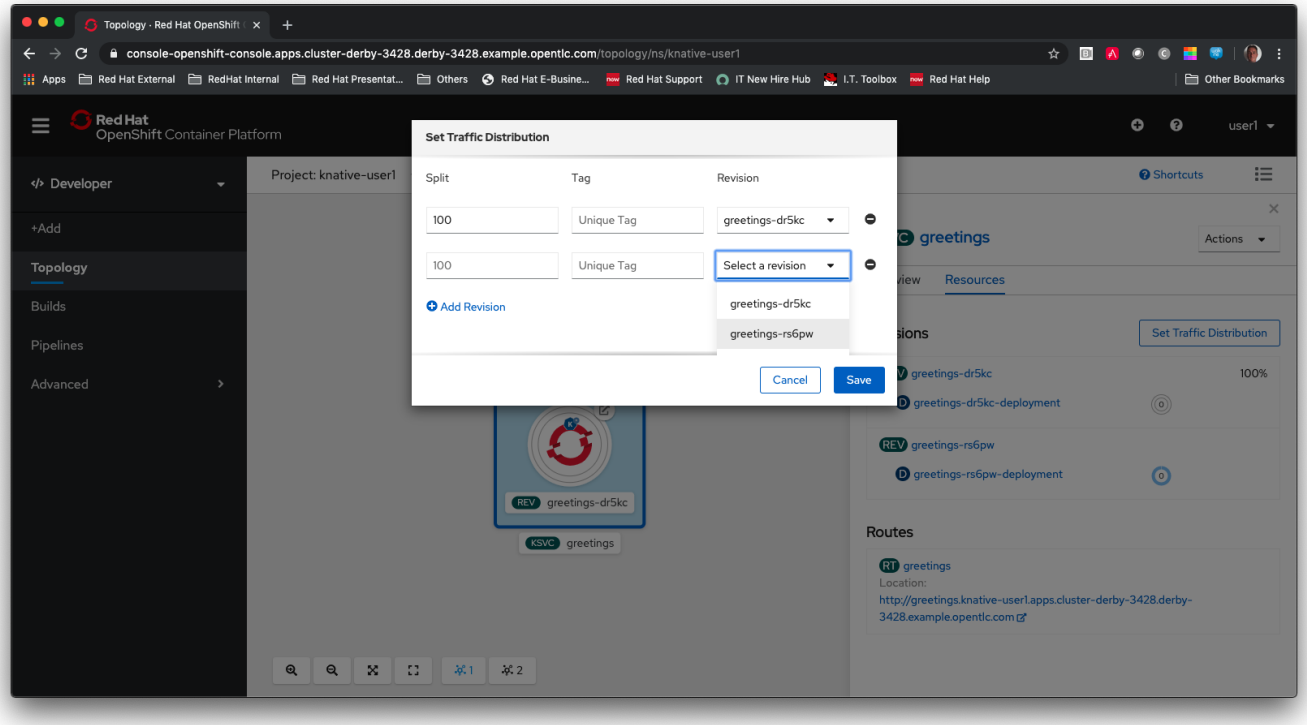
Click on **KSVC greetings**

This should open a panel on the right hand side that shows both revisions with 100% traffic distribution going to the first revision in the list. As per the screenshot below



Click on **Set Traffic Distribution** Click on **Add Revision**

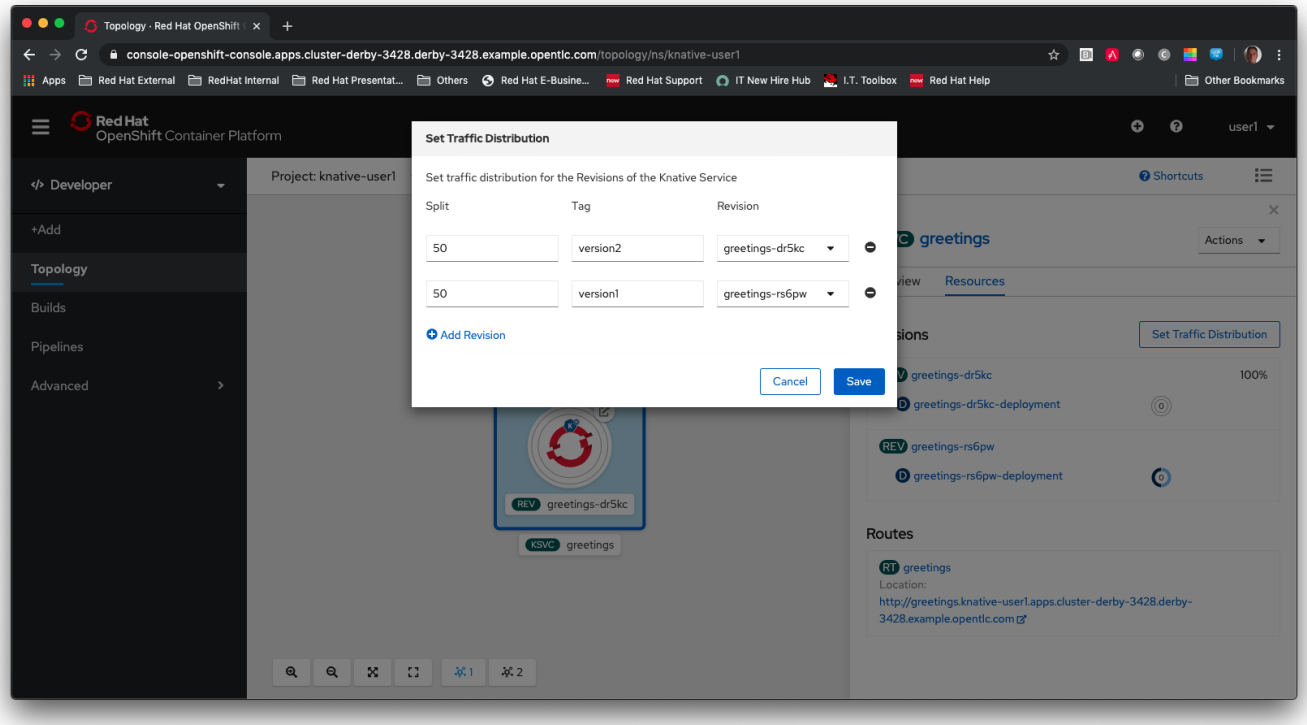
Select the other revision from the selection box as per the screenshot below



Now, change the routing percentage split between the 2 revisions and add a tag to each revision.

The tag is used by the Knative service to perform the routing.

Your configuration should look similar to the screenshot below



Using the Knative cli

To demonstrate multiple revisions, you need to make a small change to the Camel K integration.

In the terminal window

```
vi greetings.groovy
```

You will see the following line :-

.simple(*Hello from ${headers.name}*)

This is the message returned to the caller with the query parameter "name" appended

change the line to (or something similar)

.simple(*Hello from ${headers.name} from the newer revision*)

Now deploy the new version of the integraton API

```
kamel run --name greetings --dependency=camel-rest --dependency camel-undertow --property
camel.rest.port=8080 --open-api greetings-api.json greetings.groovy
```

Keep looking at the **revision list** to see when the new revision is ready. Once ready = *True* split the traffic.

Lets tag the current version as stable, get the name of the revision running by typing the following in the terminal window

```
kn revision list
```

In the terminal below, replace **greetings-8j7cb** with what you see on your screen

```
kn service update greetings --tag greetings-8j7cb=stable
```

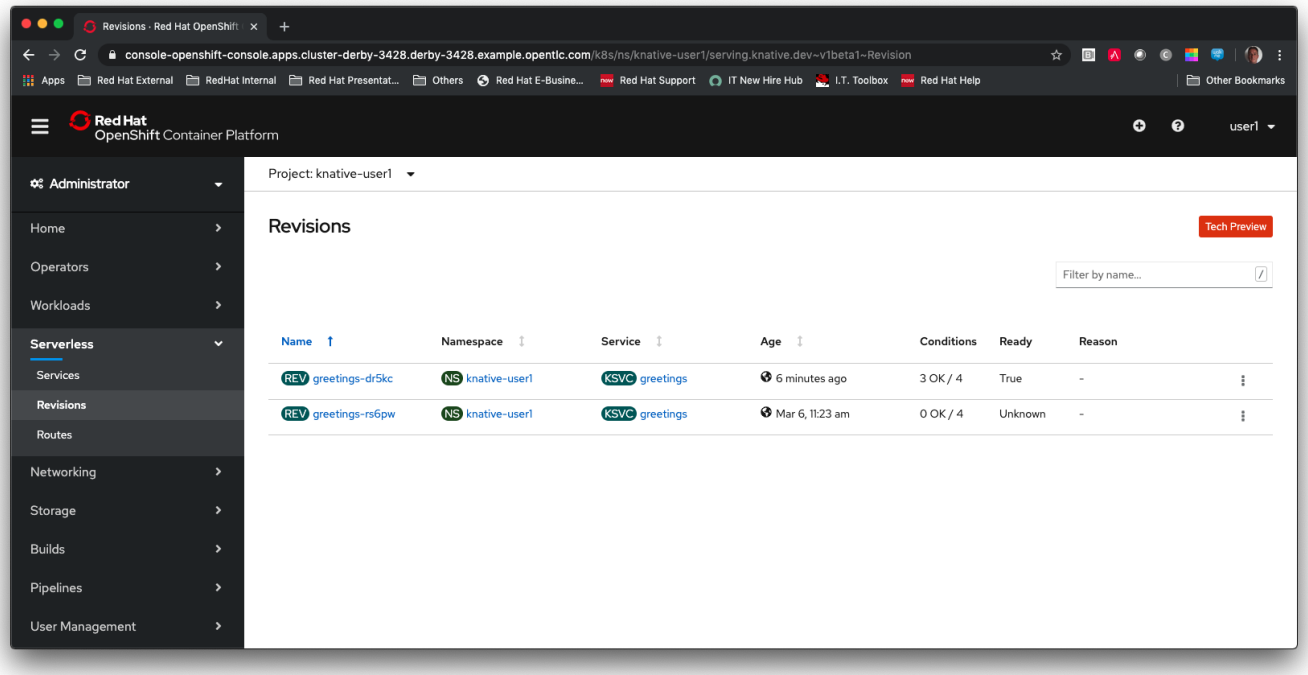
Test the integration again (don't forget to replace the URL as before)

```
curl -m 60 http://Substitute with your URL from about/camel/greetings/YourName
```

You should see the new response message returned

For information, in the console, if you switch to Administrator view you can see the deployed revisions.

Administrator View -→ Serverless -→ Revisions



If you look at

Administrator View -→ Serverless -→ Services

You will see one Knative Service. Rather than just going big bang to the new revision, you want to direct 50% of the traffic to the orginal revision, and 50% of the traffic to the new revision. To achieve

this, we need to modify the routing rules in the Knative Service.

Now, update the service to route 50% of the traffic to the latest version, and 50% to the stable version

```
kn service update greetings --traffic stable=50,@latest=50
```

Check that the service has been updated correctly

```
kn service describe greetings
```

You should be able to see the split between each revision.

Also, if you look at the topology view in the console. The routing should be visible there as well.

Test the service by using curl to hit the endpoint again

curl -m 60 http://Substitute with your URL from about/camel/greetings/YourName

Repeat this a few times, you should see the result alternative between the revisions