

Microsoft

OPENSIFT on Azure



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TABLE OF CONTENTS

Objectives and initial setup	3
Introduction to openshift.....	4
Lab1: Deploy Openshift on azure	5
Lab2: Create and manage projects	10
Lab3: Create and manage Applications	12
Lab4: Configuring automated builds	16
Lab5: Continuous deployment	18
End the lab	21
References	21
Useful links	21
Redhat and Microsoft partnership.....	21

Figure 1: OpenShift capabilities	4
Figure 2: OpenShift on Azure.....	5
Figure 3: OpenShift ARM template resources.....	5
Figure 4: Deployment diagram	9
Figure 5: OpenShift logical architecture	9
Figure 6: clone ruby-ex sample application.....	10
Figure 7: OpenShift login console	11
Figure 8: OpenShift new project.....	11
Figure 9: Create ruby builder.....	12
Figure 10: Build and run ruby.....	13
Figure 11: Create a ruby application.....	13
Figure 12: Ruby application pod.....	14
Figure 13: ruby sample application.....	14
Figure 14: Scaling out the application	14
Figure 15: scaled out pods	15
Figure 16: openshift github webhook url.....	16
Figure 17: github webhook configuration.....	17
Figure 18: webhook ping	17
Figure 19: Continuous deployment pipeline.....	18
Figure 20: Automated build.....	19
Figure 21: Automated deployment	20
Figure 22: Automated deployment - progressive.....	20
Figure 23: Updated application.....	20

OBJECTIVES AND INITIAL SETUP

This document describes the steps necessary to deploy and manage OpenShift.org (Red Hat OpenShift container platform) environment on Azure. OpenShift.org is the upstream project and is a test bed incubator for Red Hat OpenShift container platform. The labs will be based on OpenShift version 3.3.

You don't need a Red Hat subscription to perform the lab instructions. But you will need a valid Azure account.

- Create your [free azure account](https://azure.microsoft.com/en-us/free/) (<https://azure.microsoft.com/en-us/free/>), today.
- You need to have an account on [GitHub](https://github.com/) (<https://github.com/>).
- If you are using Windows 10, you can [install Bash shell on Ubuntu on Windows](http://www.windowcentral.com/how-install-bash-shell-command-line-windows-10) (<http://www.windowcentral.com/how-install-bash-shell-command-line-windows-10>). To install Azure CLI, download and [install the latest Node.js and npm](https://nodejs.org/en/download/package-manager/#debian-and-ubuntu-based-linux-distributions) for Ubuntu (<https://nodejs.org/en/download/package-manager/#debian-and-ubuntu-based-linux-distributions>). Then, follow the [instructions](https://azure.microsoft.com/en-us/documentation/articles/xplat-cli-install/) (**Option-1**): <https://azure.microsoft.com/en-us/documentation/articles/xplat-cli-install/>
- If you are using MAC or another windows version, install Azure CLI, following **Option-2**: <https://azure.microsoft.com/en-us/documentation/articles/xplat-cli-install/>
- [Optional] [Download](https://code.visualstudio.com/) and install Visual Studio Code: <https://code.visualstudio.com/>

The Labs cover:

- o Introduction to OpenShift3
- o Deployment of OpenShift.org on Azure
- o Creating and managing OpenShift projects on azure
- o Creating and managing OpenShift applications on Azure
- o Automating builds with Linux Containers on Azure.

INTRODUCTION TO OPENSIFT

OpenShift containers platform is Red Hat's Platform-as-a-Service (PaaS) that allows developers to quickly develop, host, and scale applications in a cloud environment.

Microsoft and Red Hat have signed a partnership that includes support to run Red Hat OpenShift on Microsoft Azure and potentially Azure Stack.

OpenShift offers multiple access mode including: developer CLI, admin CLI, web console and IDE plugins. Click2cloud is a plugin that allows Visual studio to deploy code to OpenShift, directly.

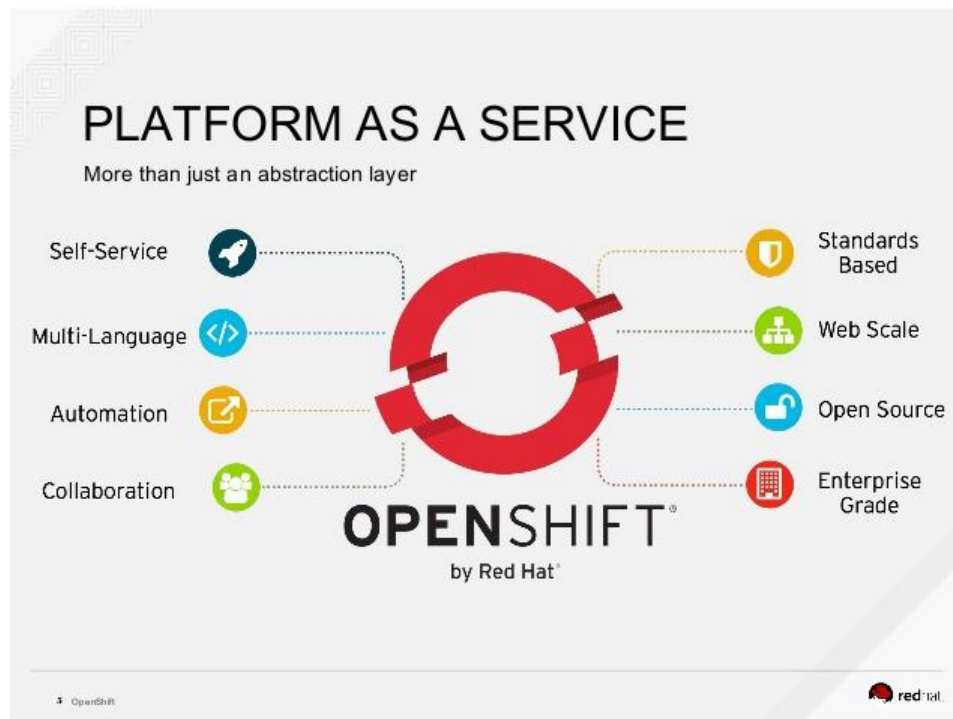


Figure 1: OpenShift capabilities

LAB1: DEPLOY OPENSIFT ON AZURE

OpenShift, leverages multiple Azure services such as *VM scale sets*, *VM extensions*, and *Key vaults* to provide an Enterprise grade offering for customers who would like to containerize and manage their applications, without investing long time and hard effort configuring and integrating various tools.

OpenShift offers another alternative to multiple CaaS (container as a service) solutions available on Azure, such as *Azure container service* and *Pivotal from CloudFoundry*.

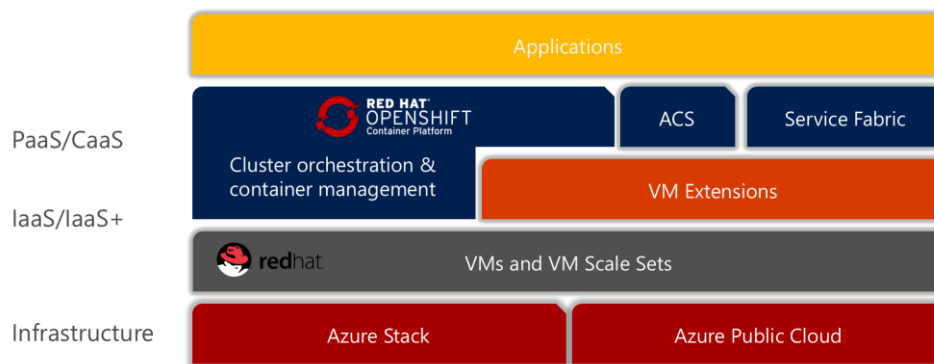


Figure 2: OpenShift on Azure

1. OpenShift is available as an Azure Resource Manager quick deploy [template](https://github.com/khaled99b/azure-quickstart-templates/tree/master/openshift-origin-rhel) at <https://github.com/khaled99b/azure-quickstart-templates/tree/master/openshift-origin-rhel>. Click on the *Visualize* button and navigate the Azure resources that will be deployed by the template.



Figure 3: OpenShift ARM template resources

2. Start a *Bash* session and login to your Azure account by following the login instructions

```
# azure login
```

3. Make sure the Azure CLI is using Resource Manager mode

```
# azure config mode arm
info:      Executing command config mode
info:      New mode is arm
info:      config mode command OK
```

4. List available account subscriptions and note the default one

```
# azure account list
```

5. Create a new Azure storage account *openshiftRG* in your preferred region

```
# azure group create openshiftRG northeurope
info:      Executing command group create
+ Getting resource group openshiftRG
+ Creating resource group openshiftRG
info:      Created resource group openshiftRG
data:      Id:                /subscriptions/f2a5dfdb-
e853-42d9-b23c-752c817c0290/resourceGroups/ openshiftRG
data:      Name:                openshiftRG
data:      Location:             northeurope
data:      Provisioning State:   Succeeded
data:      Tags: null
data:
info:      group create command OK
```

6. Create an *ssh* keypair with a blank passphrase

```
# ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key
(/home/azureuser/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
```

```
Enter same passphrase again:
Your identification has been saved in
/home/azureuser/.ssh/id_rsa.
Your public key has been saved in
/home/azureuser/.ssh/id_rsa.pub.
The key fingerprint is:
... output omitted ...
```

7. Create an Azure *Key vault* for private *ssh* key storage

```
# azure keyvault create -u my-key-vault -g openshiftRG -
l northeurope
```

8. Create a secret to protect the private key

```
# azure keyvault secret set -u my-key-vault -s my-os-
secret --file .ssh/id_rsa
```

9. Enable the Key Vault for Template Deployments:

```
# azure keyvault set-policy -u my-key-vault --enabled-
for-template-deployment true
```

10. To deploy from the template, you have multiple options. You could use the graphical or command line interface:

Option1: Click on the link “*Deploy to Azure*” and fill the form with the required information as per the bellow table. Note, that, if you have to redeploy because of any error, you would have to delete and recreate the resource group.

Field	Value
Subscription	Select the subscription to use
Resource group	openshiftRG
Location	North Europe
_artifacts Location	Keep default option
Master Vm Size	Standard_A4
Node Vm Size	Standard_A4
Os Image	centos
Openshift Master Hostname	master
Openshift Master Public Ip Dns Label Prefix	os-master-XXX (globally unique)
Node Lb Public Ip Dns Label Prefix	os-node-XXX (globally unique)
Node Prefix	node
Node Instance Count	2
Admin Username	azureuser
Admin Password	Choose your password
Ssh Public Key	Copy the contents of <i>id_rsa.pub</i>

Key Vault Resource Group	openshiftRG
Key Vault Name	my-key-vault
Key Vault Secret	my-os-secret
Default Sub Domain Type	xipio
Default Sub Domain	xipio

Agree on the terms and conditions and purchase. The template will deploy the VMs infrastructure and the custom script extensions, will call *Ansible* for the deployment of OpenShift and the configuration of the cluster. The process will take around 30 minutes. From the Azure portal, click on the openshiftRG resource group and keep an eye on the progress of the deployment of the different resources.

Option2: Alternatively, you can download a local copy of the *github* repository and use your preferred editor (visual studio code, vim, emacs...) to modify the *azuredeploy.parameters.json*. You can use “*readme*” file as a reference to the parameters. Save the file under a different name, example: *azuredeploy.parameters.local.json*. Then, use the Azure CLI, to deploy from the local template.

```
azure group deployment create openshiftRG TestDeploy1 --
template-file azuredeploy.json --parameters-file
azuredeploy.parameters.local.json
```

Once successfully finished. Navigate the newly created resource group in the Azure portal. Select Deployments -> OpenShiftDeployment and note the *OPENSIFTMASTERPUBLICIPFQDN*

12. Ssh into the master node and escalate the user’s privileges to admin level

```
ssh -i .ssh/id_rsa azureuser@OPENSIFTMASTERPUBLICIPFQDN
[master-node]# sudo oadm policy add-cluster-role-to-user
cluster-admin azureuser
```

The following diagrams explain the physical and logical architecture of the deployed cluster.

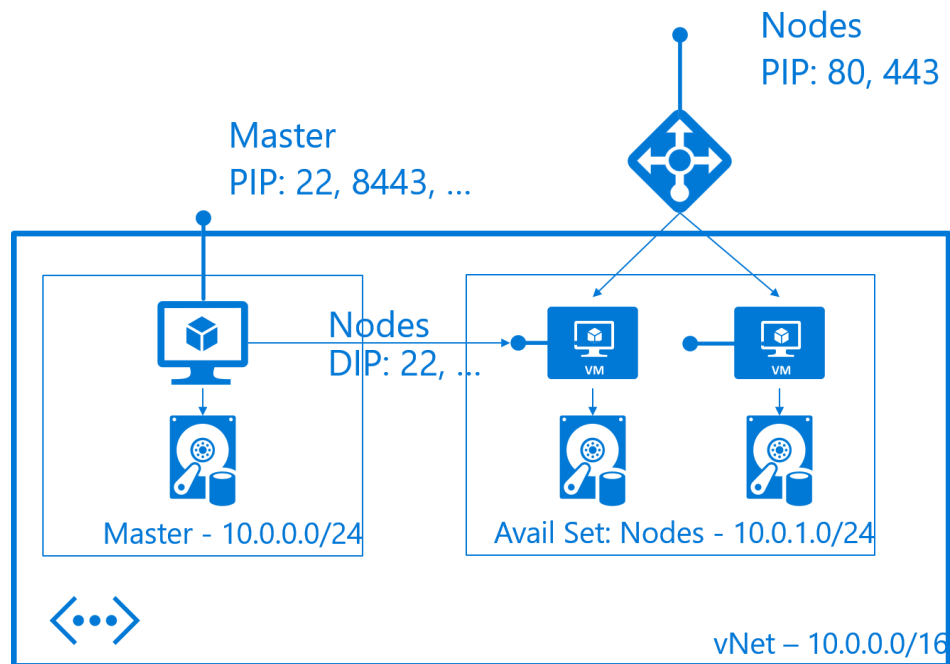


Figure 4: Deployment diagram

How OpenShift Enterprise Works

OpenShift Enterprise 3 is built around a core of application containers powered by Docker, with orchestration and management provided by Kubernetes, on a foundation of Red Hat Enterprise Linux.

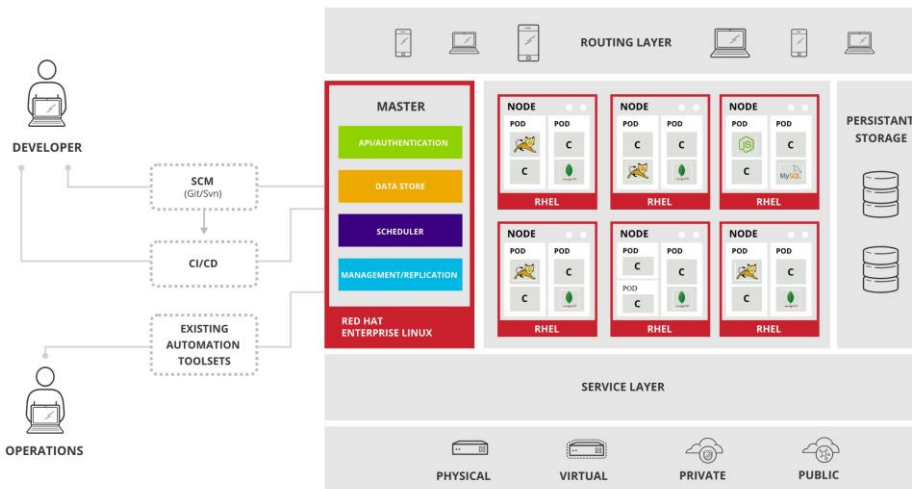


Figure 5: OpenShift logical architecture

LAB2: CREATE AND MANAGE PROJECTS

There are many ways to launch images within an OpenShift project. For the sake of simplicity, we will focus on the quickest and easiest method.

To create an *application*, you must first create a new *project*, then select an *InstantApp* template. From there, OpenShift begins the build process and creates a new deployment.

1. Login to your *github* account, or create one if you didn't.
2. Browse to *openshift/ruby-ex* repository and clone it into your *github* account

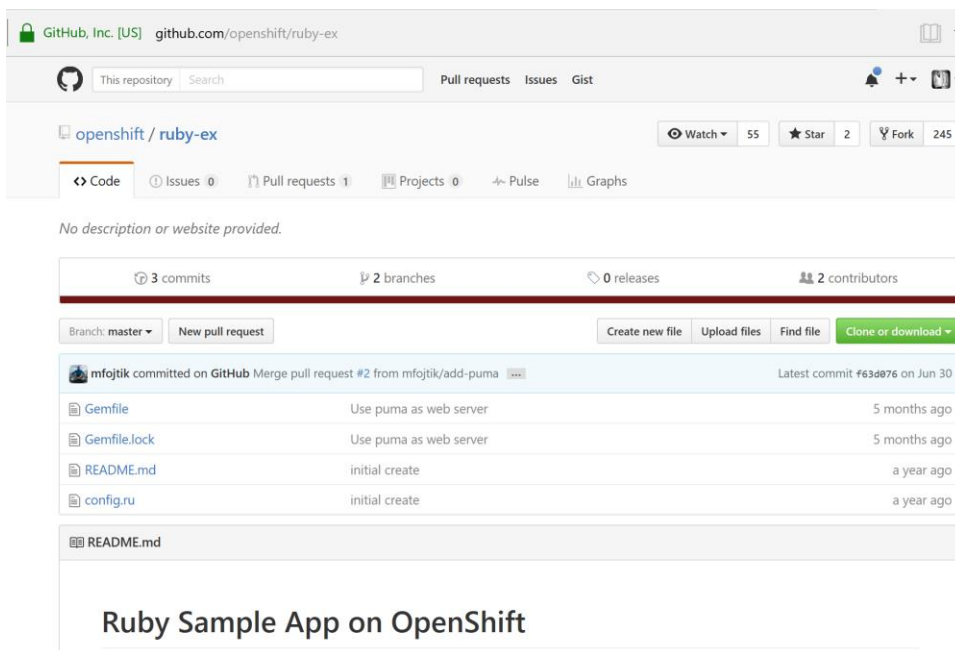


Figure 6: clone ruby-ex sample application

3. From your browser, visit the OpenShift web console at *https://FQDN-master-node:8443*. The web site, uses a self-signed certificate, so if prompted, continue and ignore the browser warning.
4. Log in using your username and password.

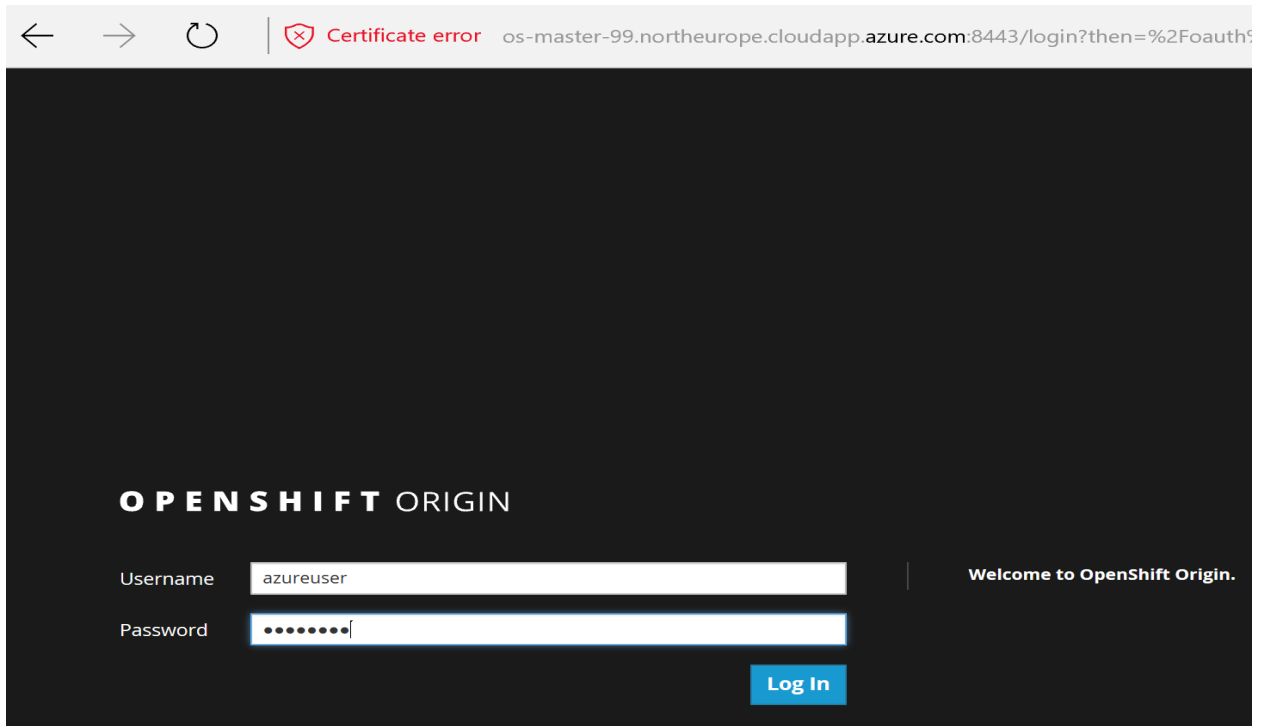


Figure 7: OepnShift login console

5. To create a new project, click **New Project**.
6. Type a unique name, display name, and description for the new project.
7. Click **Create**. The web console's welcome screen should start loading.

Figure 8: OepnShift new project

LAB3: CREATE AND MANAGE APPLICATIONS

The *Select Image* or *Template* page gives you the option to create from a publicly accessible *Git* repository, or from a *template*:

1. If creating a new project did not automatically redirect you to the *Select Image* or *Template* page, you might need to click **Add to Project**.
2. Click **Browse**, then select **ruby** from the drop-down list.

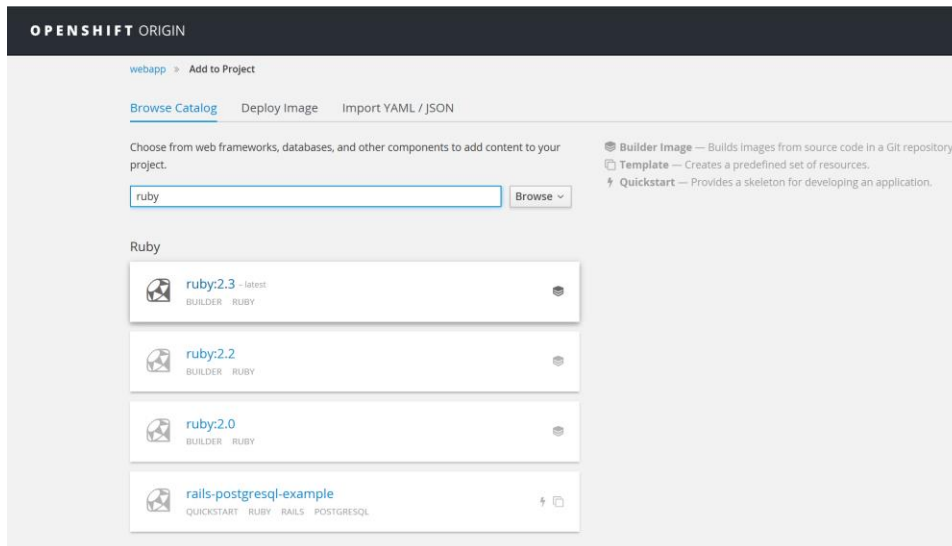



Figure 9: Create ruby builder

3. Click the **ruby:latest** builder image.
4. Type a **name** for your application, and specify the git repository url you previously cloned: https://github.com/<your_github_username>/ruby-ex.git.

webapp » Add to Project » ruby



ruby

Version 2.3
Build and run Ruby 2.3 applications

* Name
nice-ruby
Identifies the resources created for this application.

* Git Repository URL
https://github.com/YOUR-GITHUB-LOGIN/ruby-ex.git
Sample repository for ruby: https://github.com/openshift/ruby-ex.git Try it ↗

Show advanced routing, build, and deployment options

Create Cancel

Figure 10: Build and run ruby

- Optionally, click **Show advanced routing, build, and deployment options**. Explore the build configuration and other options and note that this example application automatically creates a route, *webhook* trigger, and builds change triggers.
- Click **Create**. Creating your application might take some time. note the *payload url*, we will use it later to set a webhook in the github repository.

webapp » Add to Project » nice-ruby » Next Steps

Application created. [Continue to overview.](#)

Manage your app

The web console is convenient, but if you need deeper control you may want to try our command line tools.

Command line tools

Download and install the `oc` command line tool. After that, you can start by logging in, switching to this particular project, and displaying an overview of it, by doing:

```
oc login https://os-master-99.northeurope.cloudapp.azure.com:8443
oc project devops
oc status
```

For more information about the command line tools, check the [CLI Reference](#) and [Basic CLI Operations](#).

Making code changes

A GitHub **webhook trigger** has been created for the **nice-ruby** build config.

You can now set up the webhook in the **GitHub repository** settings if you own it, in <https://github.com/khaled99b/ruby-ex> Copy to clipboard the following payload URL:

```
https://os-master-99.northeurope.cloudap
```

Figure 11: Create a ruby application

- You can follow along on the **Overview** page of the web console to see the new resources being created, and watch the progress of the build and deployment. While the Ruby *pod* is being created, its status is shown as pending. The Ruby *pod* then starts up and displays its newly-assigned IP address. When the Ruby *pod* is running, the build is complete.

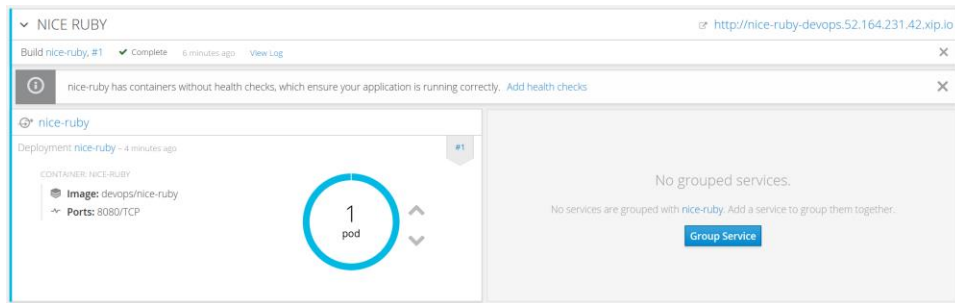


Figure 12: Ruby application pod

- From the overview page, click the web address for the application in the up right corner. Verify that the web application is up and available.

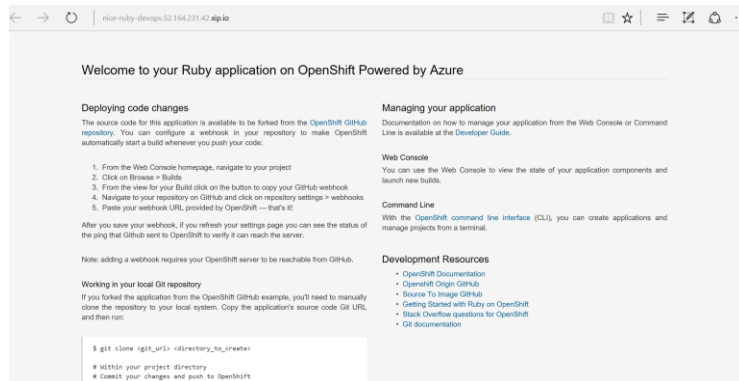


Figure 13: ruby sample application

- Return to the *OpenShift* admin console. Browse to the project's overview page, and test scaling out and scaling in your application by increasing or decreasing the number of *pods*. Scale out the app into 3 pods.

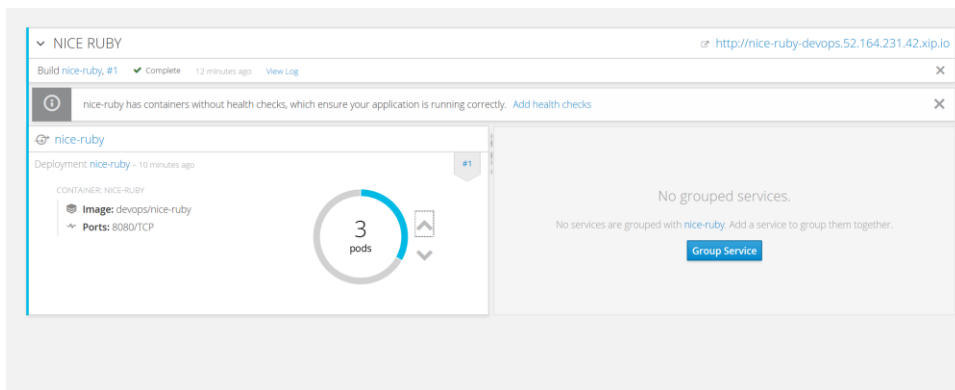


Figure 14: Scaling out the application

10. Browse to **Applications** -> **Pods**, and make sure 3 pods serving the same application are now up and running.

Pods				
Filter by label Add				
Name	Status	Containers Ready	Container Restarts	Age
nice-ruby-1-1ezus	Running	1/1	0	6 minutes
nice-ruby-1-1h8w8	Running	1/1	0	6 minutes
nice-ruby-1-uroqs	Running	1/1	0	16 minutes
nice-ruby-1-build	Completed	0/1	0	18 minutes

Figure 15: scaled out pods

LAB4: CONFIGURING AUTOMATED BUILDS

Since we forked the source code of the application from the [OpenShift GitHub repository](#), we can use a *webhook* to automatically trigger a rebuild of the application whenever code changes are pushed to the forked repository.

To set up a *webhook* for your application:

1. From the Web Console, navigate to the project containing your application.
2. Click the **Browse** tab, then click **Builds**.
3. Click your build name, then click the **Configuration** tab.
4. Click next to **GitHub webhook URL** to copy your *webhook* payload URL.

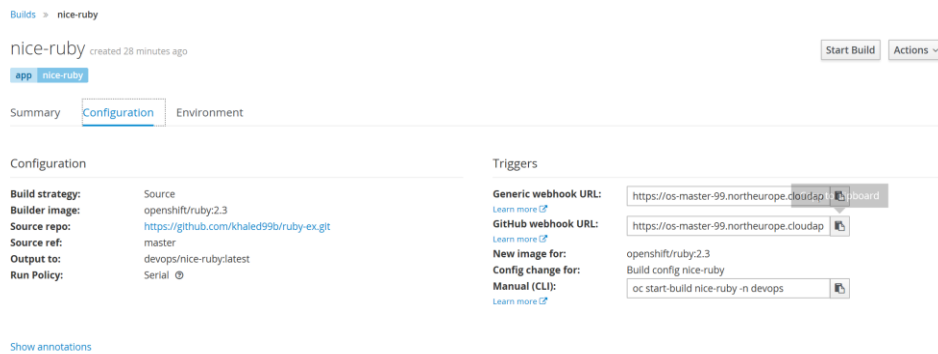


Figure 16: openshift github webhook url

5. Navigate to your forked repository on GitHub, then click **Settings**.
6. Click **Webhooks & Services**.
7. Click **Add webhook**.

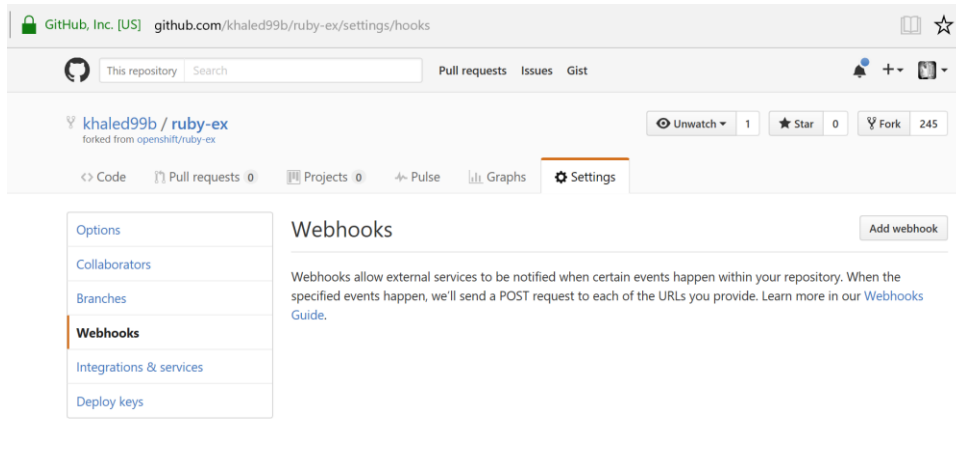


Figure 17: github webhook configuration

8. Paste your *webhook* URL into the **Payload URL** field.
9. Disable SSL verification and click **Add webhook** to save.

GitHub will now attempt to send a ping payload to your *OpenShift* server to ensure that communication is successful. If you see a green check mark appear next to your *webhook* URL, then it is correctly configured. Hover your mouse over the check mark to see the status of the last delivery.

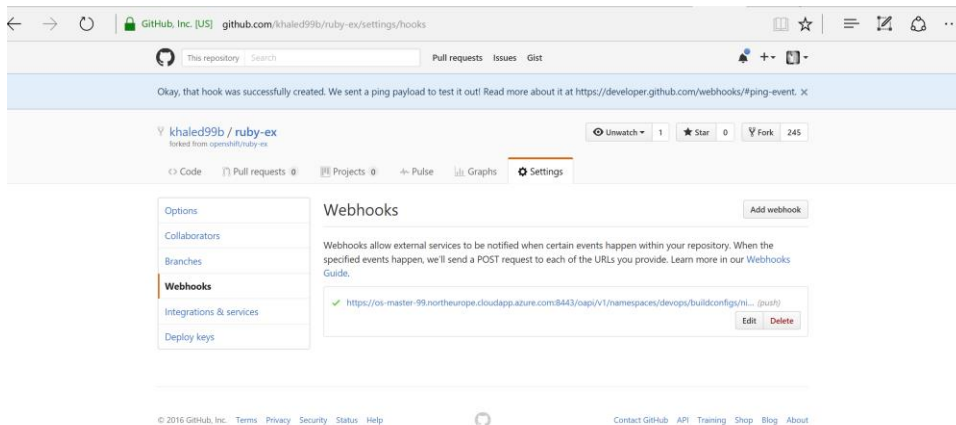


Figure 18: webhook ping

Next time you push a code change to your forked repository, your application will automatically rebuild.

LAB5: CONTINUOUS DEPLOYMENT

In this section, we demonstrate one of the most powerful features of *OpenShift*. We will see how we can trigger a continuous deployment pipeline, just by committing code change to Github.

Once there is a code change, the Github *webhook* will trigger the build of a new container image that combines a blueprint image from the registry with the updated code and generate a new image. This feature is called *S2I*, or source to image. Once the build finishes, *OpenShift* will automatically deploy the new application based on the new image. This capability enables multiple deployment strategies such as A/B testing, Rolling upgrades...

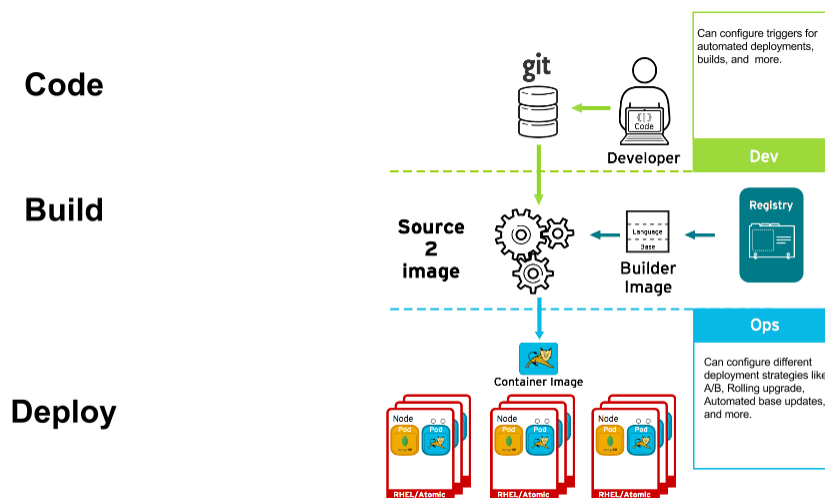


Figure 19: Continuous deployment pipeline

1. Install *Git* into your local machine

```
[azure-vm]# sudo apt-get install git
```

2. Create a "dev" folder and change into.

```
[azure-vm]# mkdir dev && cd dev
```

3. Clone the forked repository to your local system

```
[azure-vm dev]# git clone  
https://github.com/<YourGithubUsername>/ruby-ex.git
```

4. Make sure your local *git* repository is referencing to your *ruby-ex git*, on *github*:

```
[azure-vm dev]# cd ruby-ex
[azure-vm ruby-ex]# git remote -v
```

5. On your local machine, use your preferred text editor to change the sample application's source for the file *config.ru*

Make a code change that will be visible from within your application. For example: on line 229, change the title to “Welcome to your Ruby application on OpenShift powered by Azure!”, then save your changes.

6. Verify the working tree status

```
[azure-vm ruby-ex]# git status
```

7. Add config.ru content to the index, Commit the change in *git*, and push the change to your fork. You will need to authenticate with your *github* credentials

```
[azure-vm ruby-ex]# git add config.ru
[azure-vm ruby-ex]# git commit -m "simple message"
[azure-vm ruby-ex]# git status
[azure-vm ruby-ex]# git push
```

8. If your *webhook* is correctly configured, your application will immediately rebuild itself based on your changes. Monitor the build from the graphical console. Once the rebuild is successful, view your updated application using the route that was created earlier. Now going forward, all you need to do is push code updates and OpenShift handles the rest.

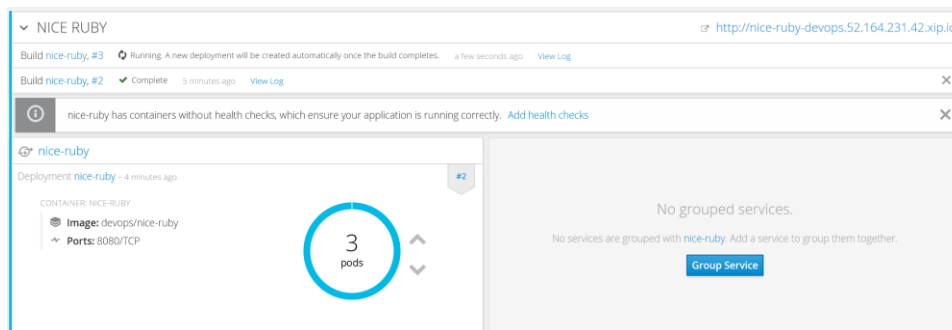


Figure 20: Automated build

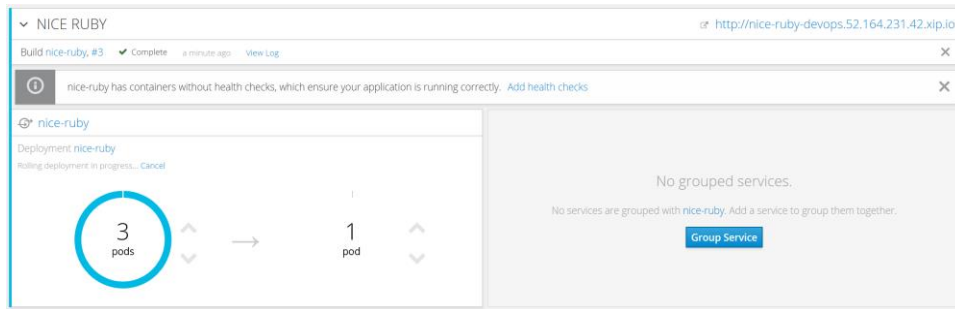


Figure 21: Automated deployment

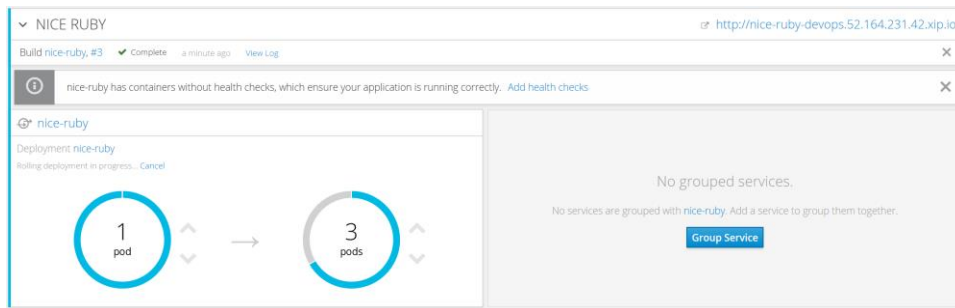


Figure 22: Automated deployment - progressive

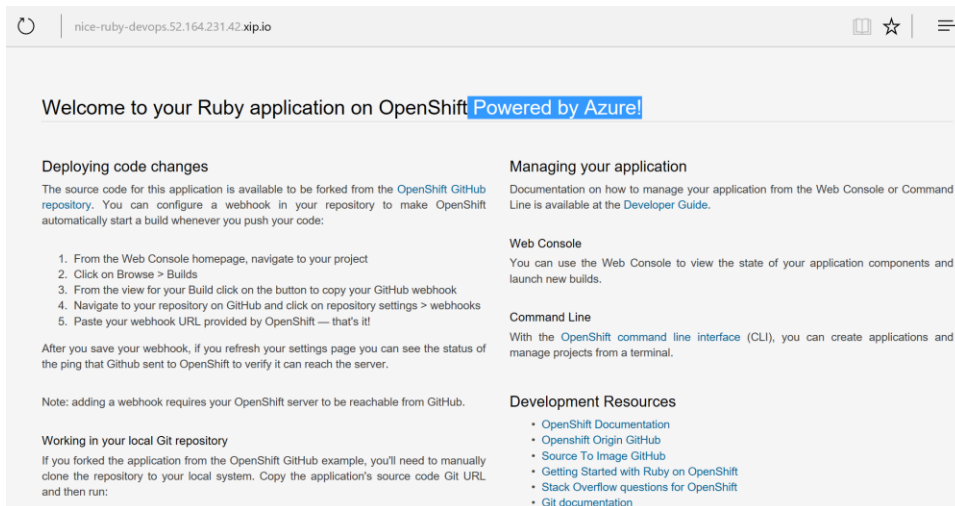


Figure 23: Updated application

9. You may find it useful to manually rebuild an image if your webhook is not working, or if a build fails and you do not want to change the code before restarting the build. To manually rebuild the image based on your latest committed change to your forked repository:
 - a. Click the **Browse** tab, then click **Builds**.
 - b. Find your build, then click **Start Build**.

END THE LAB

To end the lab, simply delete the resource group openshiftRG from the Azure portal or from the Azure CLI. And delete the created *webhook* from your *git* repository.

```
# azure group delete openshiftRG
```

REFERENCES

Need to add a table of contents or a bibliography? No sweat.

USEFUL LINKS

<https://access.redhat.com/documentation/en/openshift-container-platform/>

<https://visualstudiogallery.msdn.microsoft.com/9a5b8b19-dadf-4b46-8712-527303d32231>

<http://open.microsoft.com/>

<https://github.com/microsoft/>

REDHAT AND MICROSOFT PARTNERSHIP

<http://openness.microsoft.com/2016/04/15/microsoft-red-hat-partnership-accelerating-partner-opportunities/>

<https://www.redhat.com/en/microsoft>