Tutorial 2 – OpenShift & CGI Programming

CSCI 4140: Open-Source Software Project Development Spring 2018

WANG, Yue
01/25/2018

Outlines

- OpenShift v3 deployment
- Basic Python CGI programming

Background

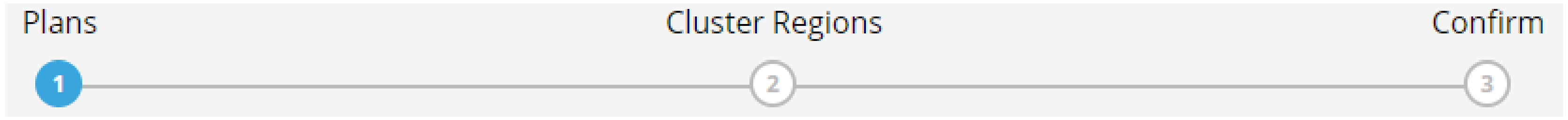
- RedHatCloud Service
  - https://www.openshift.com/
  - Platform as a Service (PaaS)
  - **OpenShift v3** (many differences)

- Free (starter plan)
  - Up to one project
  - 1GiB of persistent storage
  - 1GiB of memory

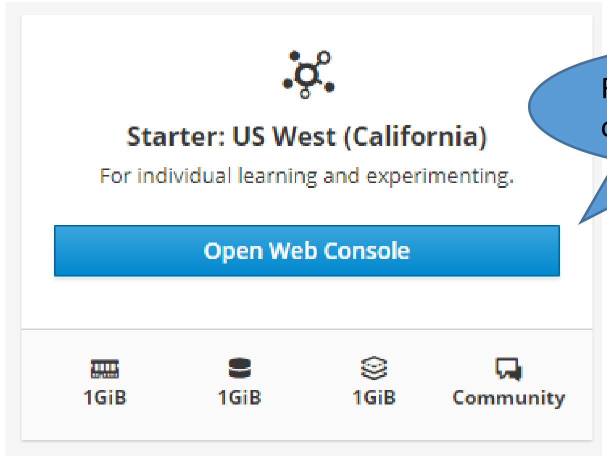
- Setup web ‘server’ easily
  - Support perl, PHP, node.js, ruby etc.
  - One click to setup database

Get started

- Create an account for openshift.com
- Then go to here (https://manage.openshift.com/register/plan) to choose a plan (starter plan)



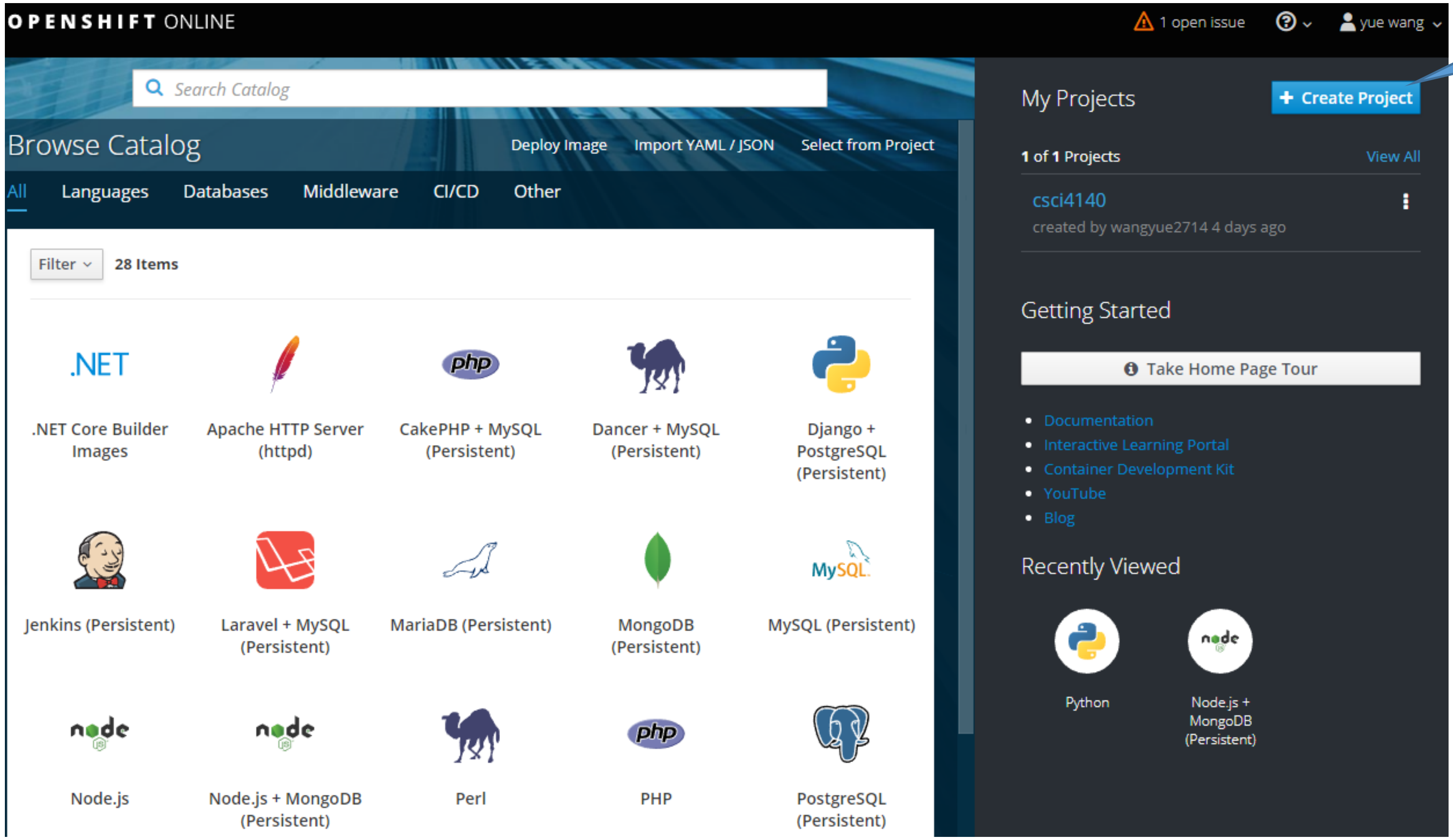
- After done, you will get this:


Starter: US West (California)

For individual learning and experimenting.

Follow this link to the openshift console

Web Console



OPENSHIFT ONLINE

1 open issue · yue wang

Search Catalog

Browse Catalog · Deploy Image · Import YAML / JSON · Select from Project

All · Languages · Databases · Middleware · CI/CD · Other

Filter · 28 Items

.NET Core Builder Images · Apache HTTP Server (httpd) · CakePHP + MySQL (Persistent) · Dancer + MySQL (Persistent) · Django + PostgreSQL (Persistent)

Jenkins (Persistent) · Laravel + MySQL (Persistent) · MariaDB (Persistent) · MongoDB (Persistent) · MySQL (Persistent)

Node.js · Node.js + MongoDB (Persistent) · Perl · PHP · PostgreSQL (Persistent)

My Projects · Create Project

1 of 1 Projects · View All

csci4140
created by wangyue2714 4 days ago

Getting Started

Take Home Page Tour

- Documentation
- Interactive Learning Portal
- Container Development Kit
- YouTube
- Blog

Recently Viewed

Python · Node.js + MongoDB (Persistent)

Create your own project here

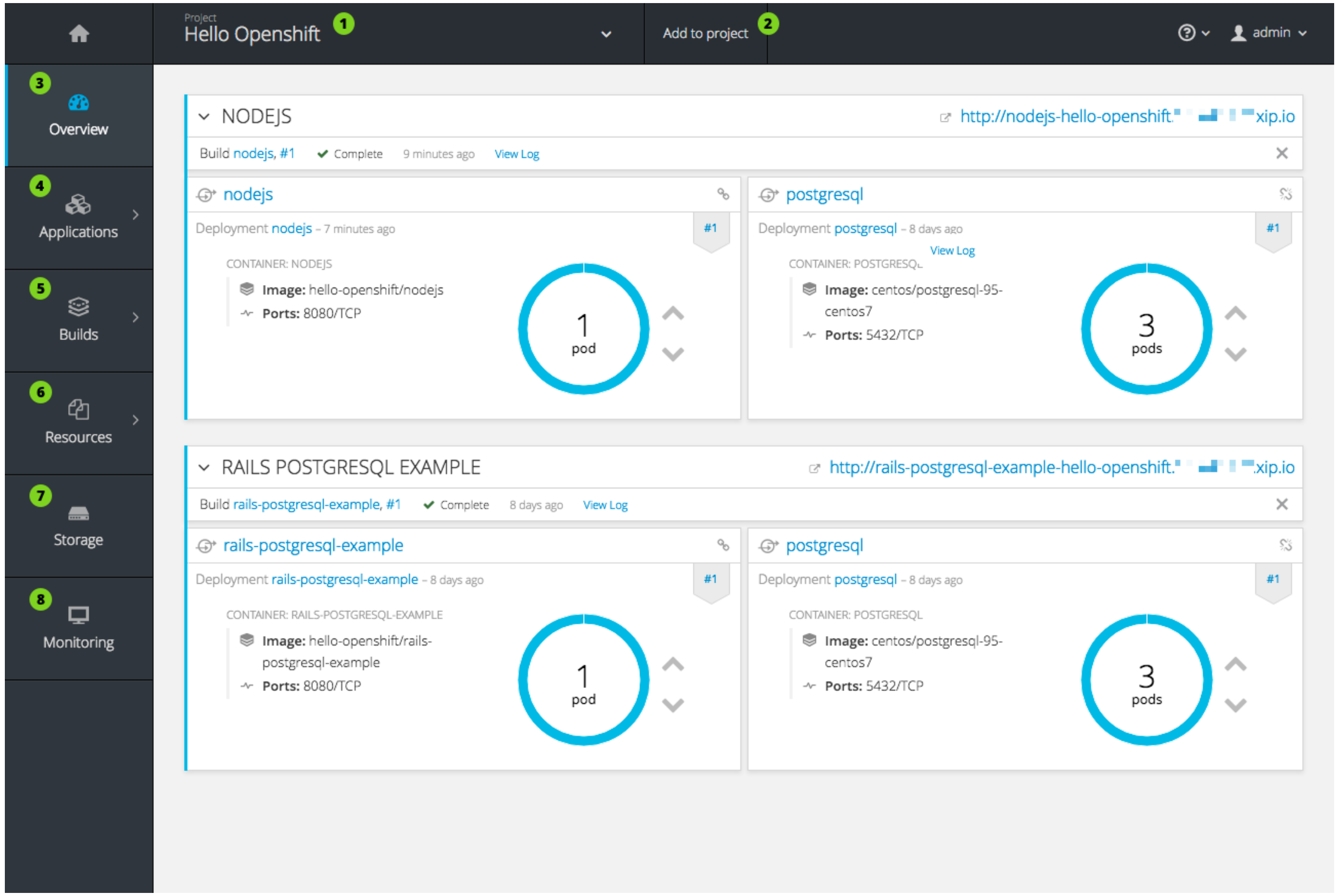
https://docs.openshift.com/online/getting_started/basic_walkthrough.html

Web Console

- The OpenShift Online web console is a user interface accessible from a web browser. Developers can use the web console to visualize, browse, and manage the contents of projects.

- Another way to manage your project
  - **Command Line Tools (CLI)**
  - Download it from here (https://console.starter-us-west-1.openshift.com/console/command-line)
  - E.g. $ oc new-project <project_name>

Project Overviews



NODEJS http://nodejs-hello-openshift.[redacted]xip.io

Build nodejs, #1 ✓ Complete 9 minutes ago View Log

nodejs

Deployment nodejs – 7 minutes ago #1

CONTAINER: NODEJS

Image: hello-openshift/nodejs

Ports: 8080/TCP

1 pod

postgresql

Deployment postgresql – 8 days ago #1

View Log

CONTAINER: POSTGRESQL

Image: centos/postgresql-95-centos7

Ports: 5432/TCP

3 pods

RAILS POSTGRESQL EXAMPLE http://rails-postgresql-example-hello-openshift.[redacted]xip.io

Build rails-postgresql-example, #1 ✓ Complete 8 days ago View Log

rails-postgresql-example

Deployment rails-postgresql-example – 8 days ago #1

CONTAINER: RAILS-POSTGRESQL-EXAMPLE

Image: hello-openshift/rails-postgresql-example

Ports: 8080/TCP

1 pod

postgresql

Deployment postgresql – 8 days ago #1

CONTAINER: POSTGRESQL

Image: centos/postgresql-95-centos7

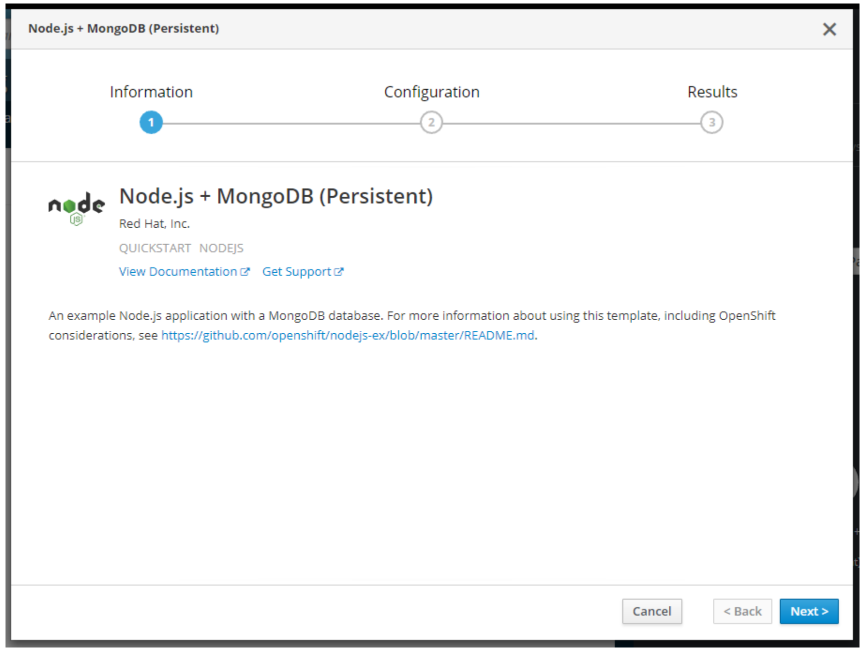
Ports: 5432/TCP

3 pods

1. The project selector allows you to switch between projects you have access to.
2. Create new applications using a source repository or using a template.
3. The Overview tab (currently selected) visualizes the contents of your project with a high-level view of each component.
4. Applications tab: Browse and perform actions on your deployments, pods, services, and routes.
5. Builds tab: Browse and perform actions on your builds and image streams.
6. Resources tab: View your current quota consumption and other resources.
7. Storage tab: View persistent volume claims and request storage for your applications.
8. Monitoring tab: View logs for builds, pods, and deployments, as well as event notifications for all objects in your project.

Create your first project

- Press the create project button
- Edit the project specification
- Deploy applications on your project, e.g.



Node.js + MongoDB (Persistent)

Red Hat, Inc.

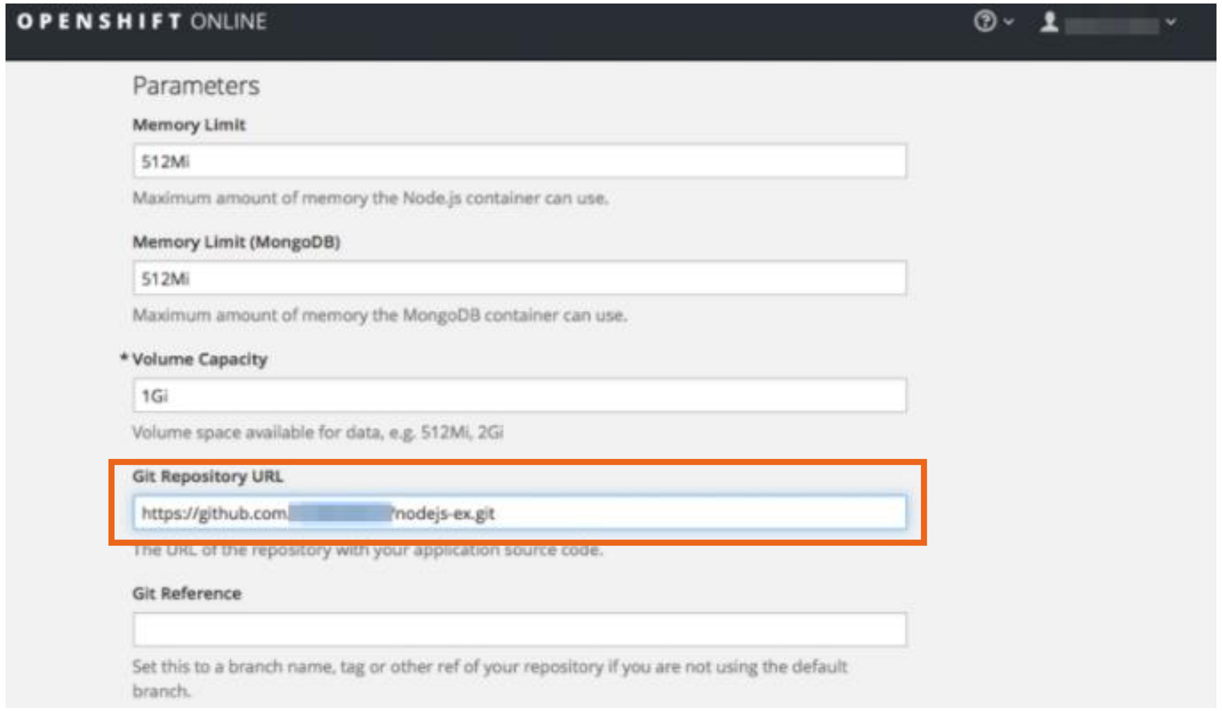
QUICKSTART NODEJS

View Documentation Get Support

An example Node.js application with a MongoDB database. For more information about using this template, including OpenShift considerations, see https://github.com/openshift/nodejs-ex/blob/master/README.md.

Connect your github with openshift project

- You need to place all your codes in your github
- When configuring the selected application, add your git repo like:



OPENSHIFT ONLINE [redacted]

Parameters

Memory Limit

512Mi

Maximum amount of memory the Node.js container can use.

Memory Limit (MongoDB)

512Mi

Maximum amount of memory the MongoDB container can use.

* **Volume Capacity**

1Gi

Volume space available for data, e.g. 512Mi, 2Gi

Git Repository URL

https://github.com/[redacted]/nodejs-ex.git

The URL of the repository with your application source code.

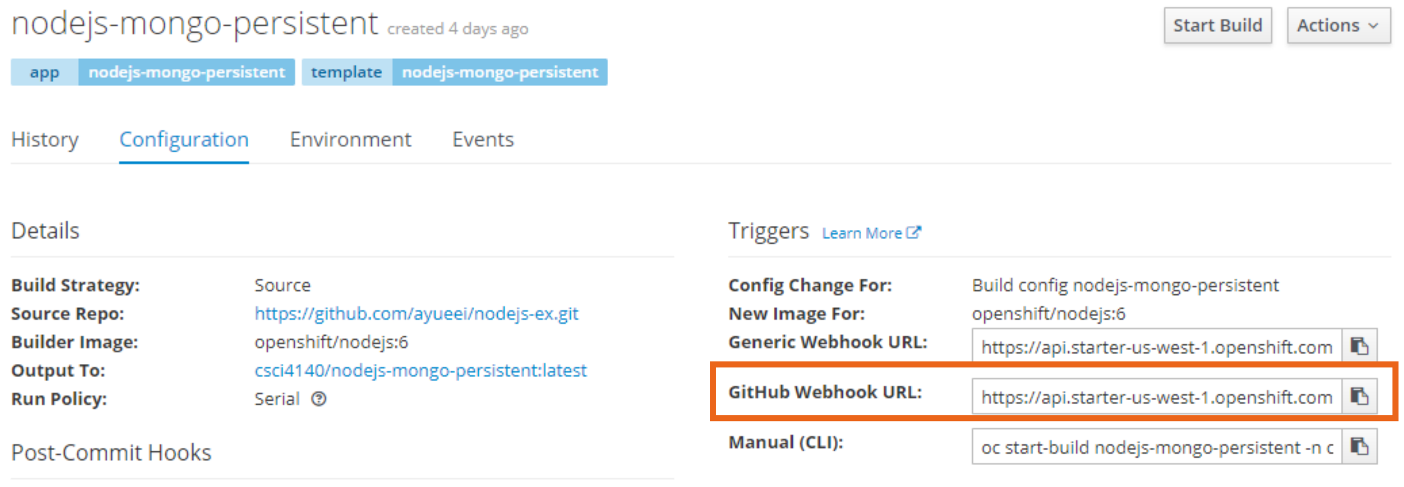
Git Reference

Set this to a branch name, tag or other ref of your repository if you are not using the default branch.

- Finally, click Create to deploy your application.

Configuring Automated Builds

- GitHub webhook: automatically trigger a rebuild of your application whenever you push code changes to your forked repository.
- In the OpenShift Online web console:
  - Navigate to the project containing your application.
  - Click the Browse tab, then click Builds, then click the name of the build for your Node.js application.
  - From the Configuration tab, click copy next to GitHub webhook URL to copy your GitHub webhook.

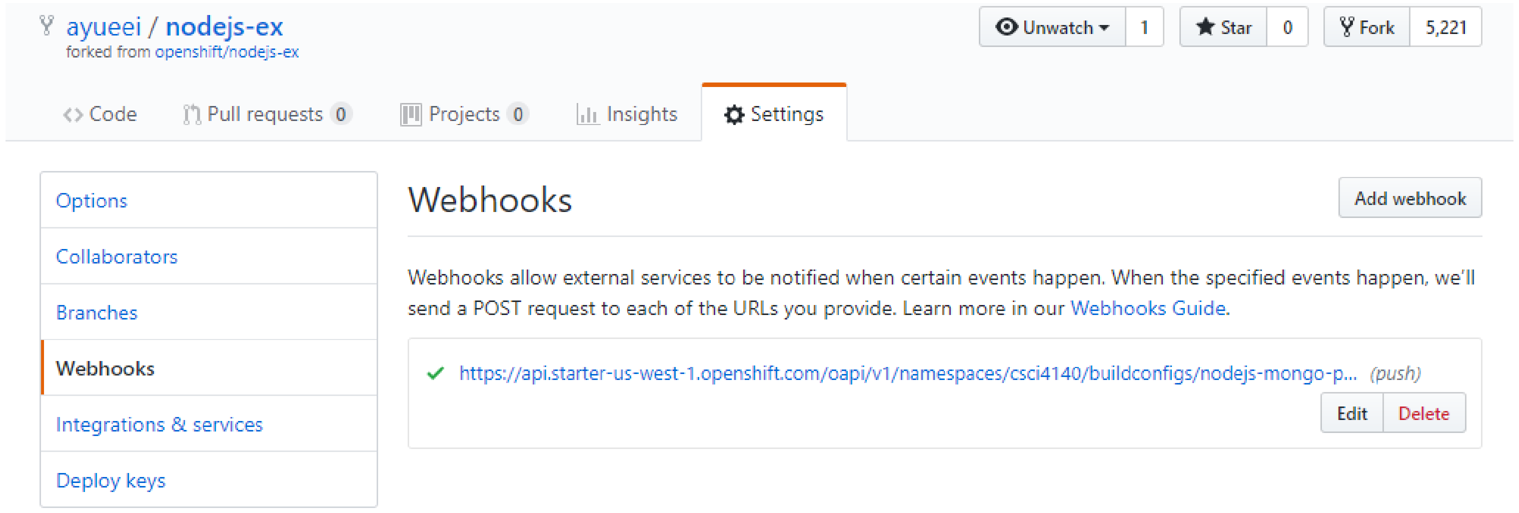

nodejs-mongo-persistent created 4 days ago
Start Build
Actions
app nodejs-mongo-persistent
template nodejs-mongo-persistent
History
Configuration
Environment
Events
Details
Triggers
Learn More
Post-Commit Hooks

Build Strategy:	Source
Source Repo:	https://github.com/ayueei/nodejs-ex.git
Builder Image:	openshift/nodejs:6
Output To:	csci4140/nodejs-mongo-persistent:latest
Run Policy:	Serial

Config Change For:	Build config nodejs-mongo-persistent
New Image For:	openshift/nodejs:6
Generic Webhook URL:	https://api.starter-us-west-1.openshift.com
GitHub Webhook URL:	https://api.starter-us-west-1.openshift.com
Manual (CLI):	oc start-build nodejs-mongo-persistent -n c

Configuring Automated Builds

- Paste the copied payload URL in github
- Choose the content type as **application/json**
- After done, you will see:



Webhooks

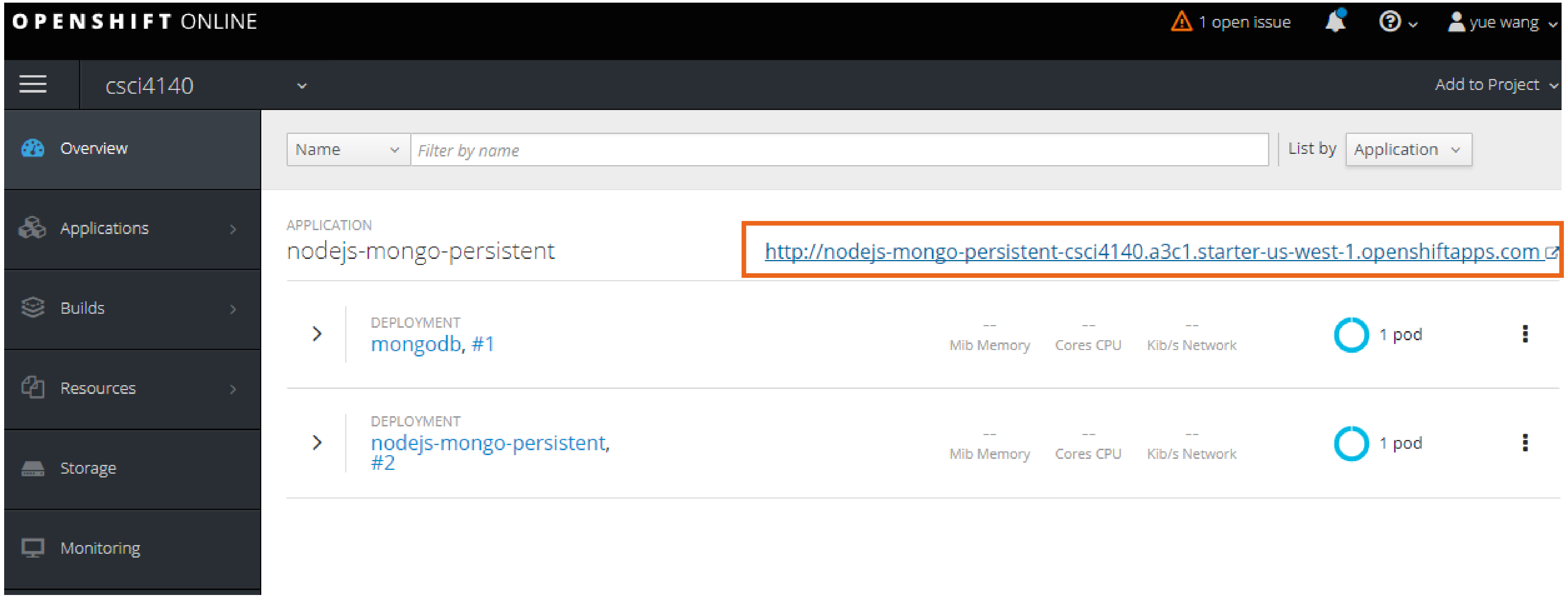
Webhooks allow external services to be notified when certain events happen. When the specified events happen, we'll send a POST request to each of the URLs you provide. Learn more in our Webhooks Guide.

✓ https://api.starter-us-west-1.openshift.com/oapi/v1/namespaces/csci4140/buildconfigs/nodejs-mongo-p... *(push)*

- The next time you push a code change to your connected git repository, your application will automatically rebuild.

Viewing Your Running Application

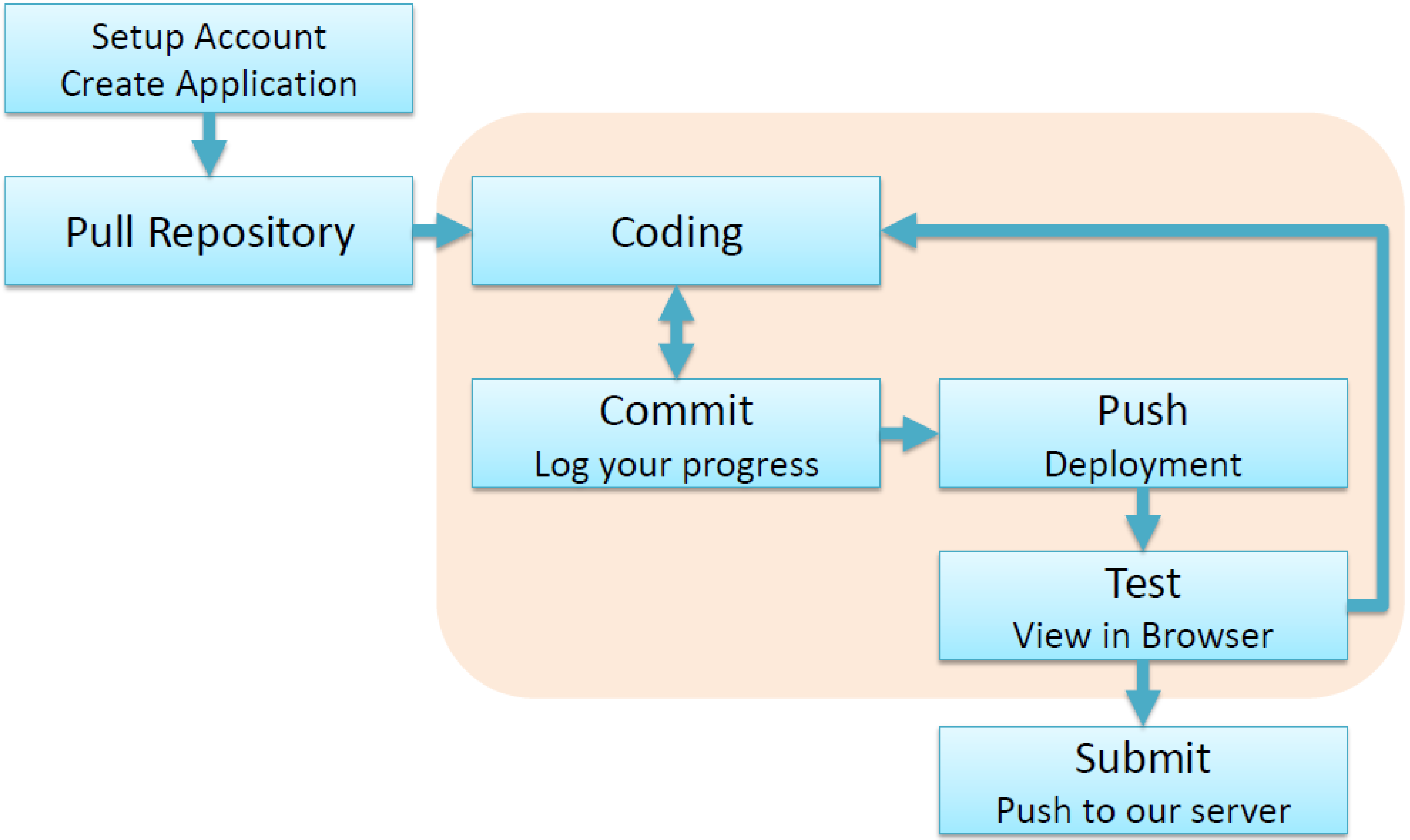
- Follow the link in the Overview page



APPLICATION
nodejs-mongo-persistent
http://nodejs-mongo-persistent-csci4140.a3c1.starter-us-west-1.openshiftapps.com

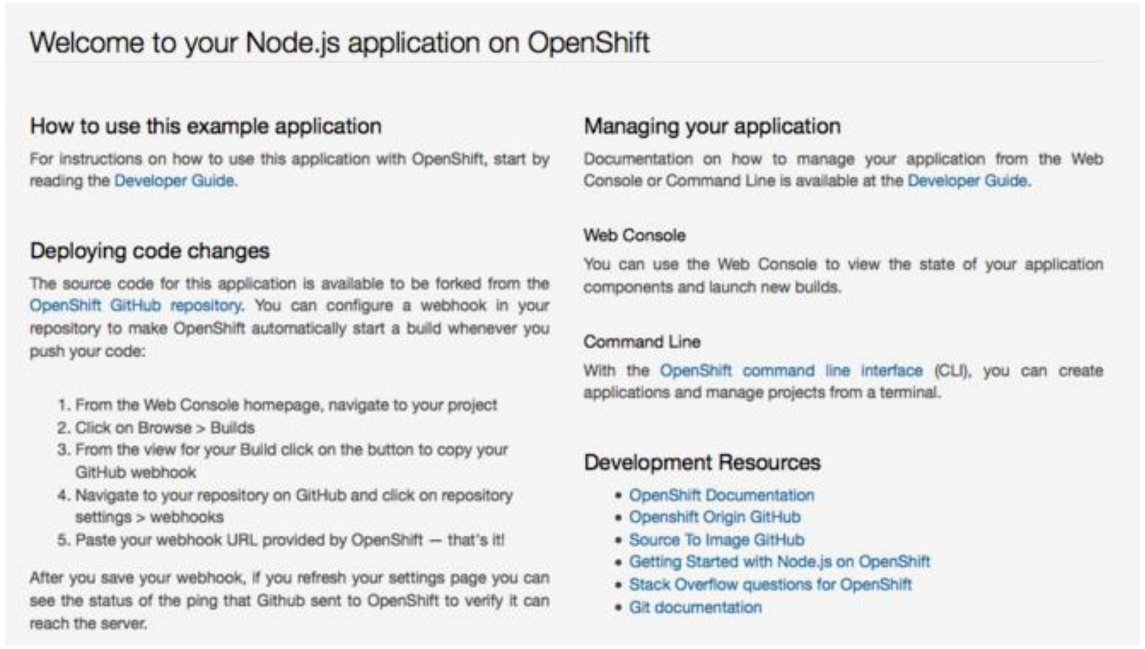
DEPLOYMENT mongodb, #1	-- Mib Memory	-- Cores CPU	-- Kib/s Network	1 pod
DEPLOYMENT nodejs-mongo-persistent, #2	-- Mib Memory	-- Cores CPU	-- Kib/s Network	1 pod

Develop using OpenShift



A case study

- Fork https://github.com/openshift/nodejs-ex into your github repo and then follow the previous processes to create a project using two applications (Mongodb and Nodejs) .
- After clicking the generated link, you will see the page like:



Welcome to your Node.js application on OpenShift

How to use this example application

For instructions on how to use this application with OpenShift, start by reading the Developer Guide.

Deploying code changes

The source code for this application is available to be forked from the OpenShift GitHub repository. You can configure a webhook in your repository to make OpenShift automatically start a build whenever you push your code:

1. From the Web Console homepage, navigate to your project
2. Click on Browse > Builds
3. From the view for your Build click on the button to copy your GitHub webhook
4. Navigate to your repository on GitHub and click on repository settings > webhooks
5. Paste your webhook URL provided by OpenShift — that's it!

After you save your webhook, if you refresh your settings page you can see the status of the ping that Github sent to OpenShift to verify it can reach the server.

Managing your application

Documentation on how to manage your application from the Web Console or Command Line is available at the Developer Guide.

Web Console

You can use the Web Console to view the state of your application components and launch new builds.

Command Line

With the OpenShift command line interface (CLI), you can create applications and manage projects from a terminal.

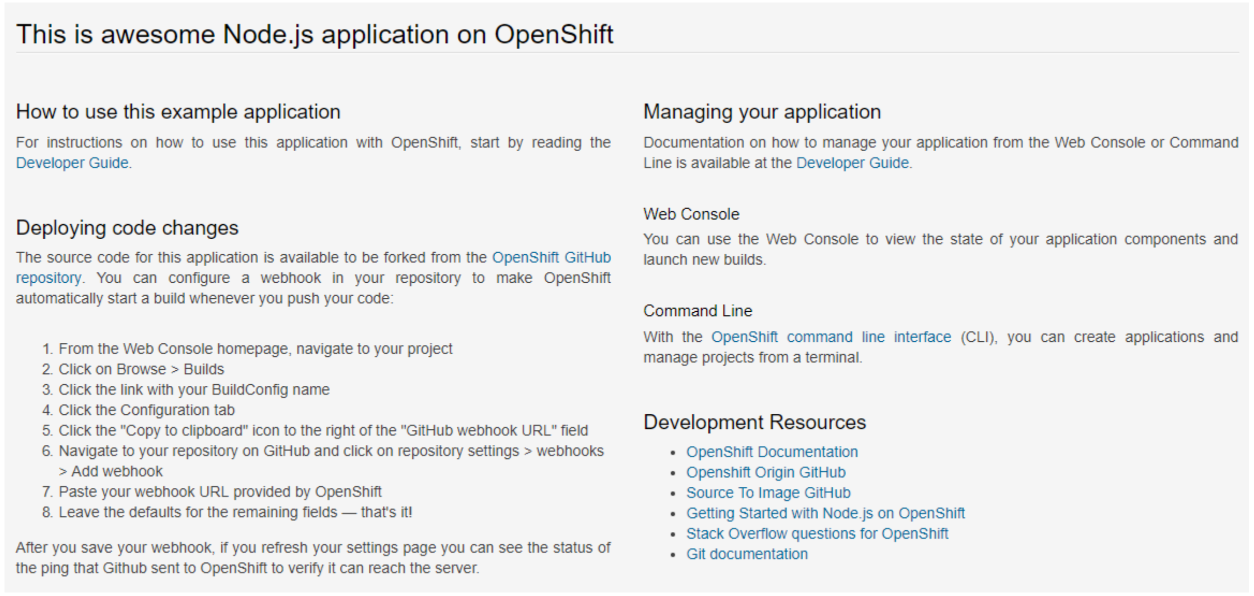
Development Resources

- OpenShift Documentation
- Openshift Origin GitHub
- Source To Image GitHub
- Getting Started with Node.js on OpenShift
- Stack Overflow questions for OpenShift
- Git documentation

https://docs.openshift.com/online/getting_started/basic_walkthrough.html

A case study

- Then you set the webhook in the github to openshift.
- You revise the code (index.html) in the local repo to modify the title (from "welcome to your Node.js" into "This is awesome Node.js")
- Commit the change and push to the remote server.
- Refresh your page and you will get:



This is awesome Node.js application on OpenShift

How to use this example application

For instructions on how to use this application with OpenShift, start by reading the Developer Guide.

Deploying code changes

The source code for this application is available to be forked from the OpenShift GitHub repository. You can configure a webhook in your repository to make OpenShift automatically start a build whenever you push your code:

1. From the Web Console homepage, navigate to your project
2. Click on Browse > Builds
3. Click the link with your BuildConfig name
4. Click the Configuration tab
5. Click the "Copy to clipboard" icon to the right of the "GitHub webhook URL" field
6. Navigate to your repository on GitHub and click on repository settings > webhooks > Add webhook
7. Paste your webhook URL provided by OpenShift
8. Leave the defaults for the remaining fields — that's it!

After you save your webhook, if you refresh your settings page you can see the status of the ping that Github sent to OpenShift to verify it can reach the server.

Managing your application

Documentation on how to manage your application from the Web Console or Command Line is available at the Developer Guide.

Web Console

You can use the Web Console to view the state of your application components and launch new builds.

Command Line

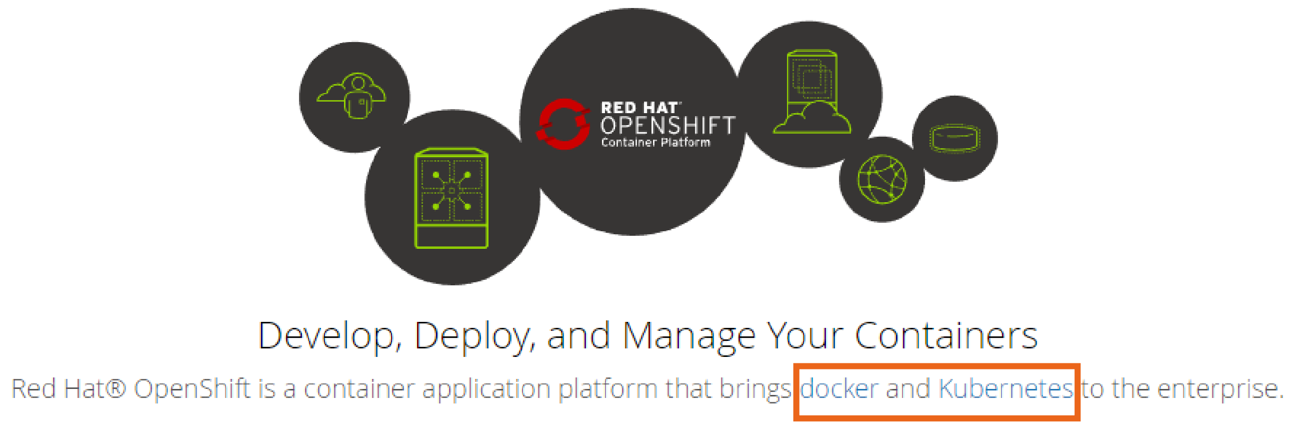
With the OpenShift command line interface (CLI), you can create applications and manage projects from a terminal.

Development Resources

- OpenShift Documentation
- Openshift Origin GitHub
- Source To Image GitHub
- Getting Started with Node.js on OpenShift
- Stack Overflow questions for OpenShift
- Git documentation

Core concept of openshift v3

- **Containers and images** are the building blocks for deploying your applications.
- **Pods and services** allow for containers to communicate with each other and proxy connections.
- **Projects and users** provide the space and means for communities to organize and manage their content together.
- **Builds and image streams** allow you to build working images and react to new images.
- **Deployments** add expanded support for the software development and deployment lifecycle.
- **Routes** announce your service to the world.
- **Templates** allow for many objects to be created at once based on customized parameters.



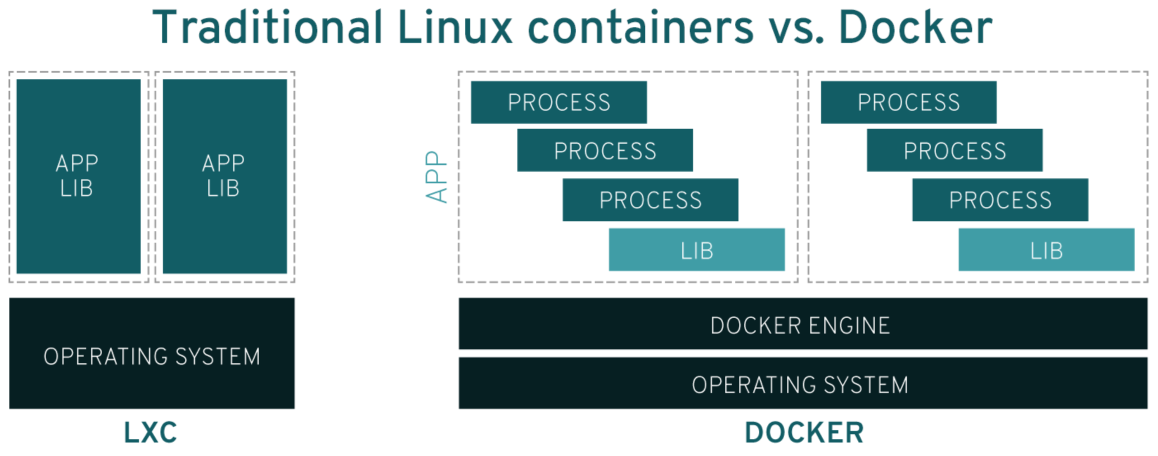
Develop, Deploy, and Manage Your Containers

Red Hat® OpenShift is a container application platform that brings docker and Kubernetes to the enterprise.

https://docs.openshift.com/online/architecture/core_concepts/index.html

Core concept of openshift v3

- **Docker**
  - It is built on top of Linux containers
  - Provide an image-based deployment model
  - Separate processes so they can run independently
  - Share an application with all of its dependencies across multiple environments
  - Automates deploying the application inside the container environment
- **Kubernetes**
  - Efficiently manage those clusters of hosts running containers



Python - CGI Programming

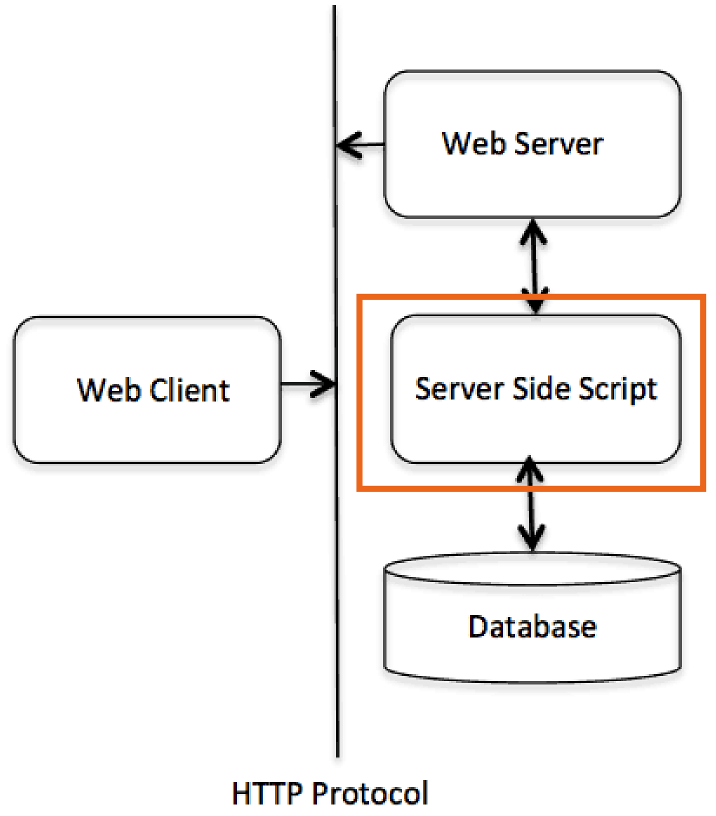
- What is CGI?
  - The Common Gateway Interface, or CGI, is a standard for external gateway programs to interface with information servers such as HTTP servers.
- Web Browsing
  1. Your browser contacts the HTTP web server and demands for the URL, i.e., filename.
  2. Web Server parses the URL and looks for the filename. If it finds that file then sends it back to the browser, otherwise sends an error message indicating that you requested a wrong file.
  3. Web browser takes response from web server and displays either the received file or error message.

https://www.tutorialspoint.com/python/python_cgi_programming.htm

Python - CGI Programming

- These CGI programs can be a Python Script, PERL Script, Shell Script, C or C++ program, etc

CGI Architecture Diagram



Python - CGI Programming

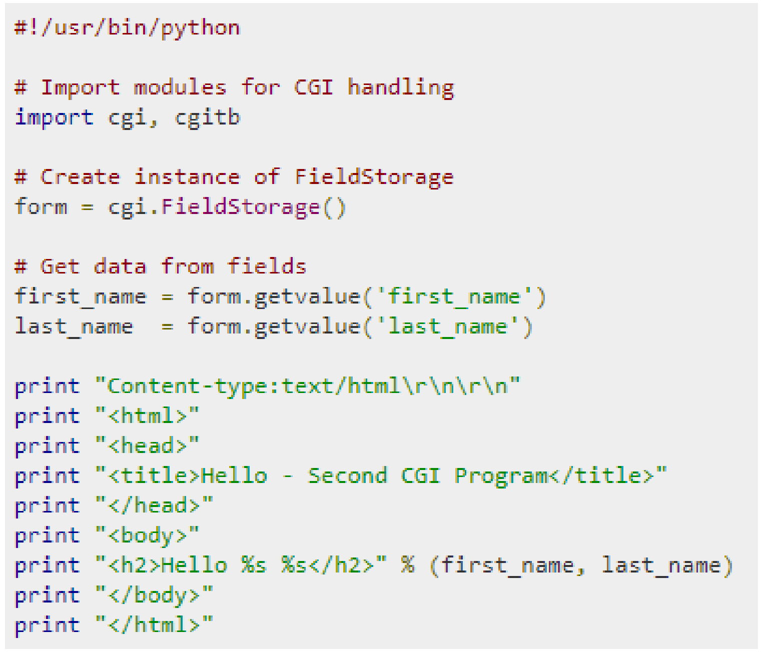
- Web Server Support and Configuration
  - Store your scripts under /var/www/cgi-bin in your http server (default)
  - CGI files have extension as. **cgi**
- First CGI Program

HTTP header which is sent to the browser to understand the content

```
#!/usr/bin/python

print "Content-type:text/html\r\n\r\n"
print '<html>'
print '<head>'
print '<title>Hello Word - First CGI Program</title>'
print '</head>'
print '<body>'
print '<h2>Hello Word! This is my first CGI program</h2>'
print '</body>'
print '</html>'
```

Python - CGI Programming

- Passing Information using GET method
  - The GET method sends the encoded user information appended to the page request.
  - E.g. http://www.test.com/cgi-bin/hello.py?key1=value1&key2=value2
  - An simple example:



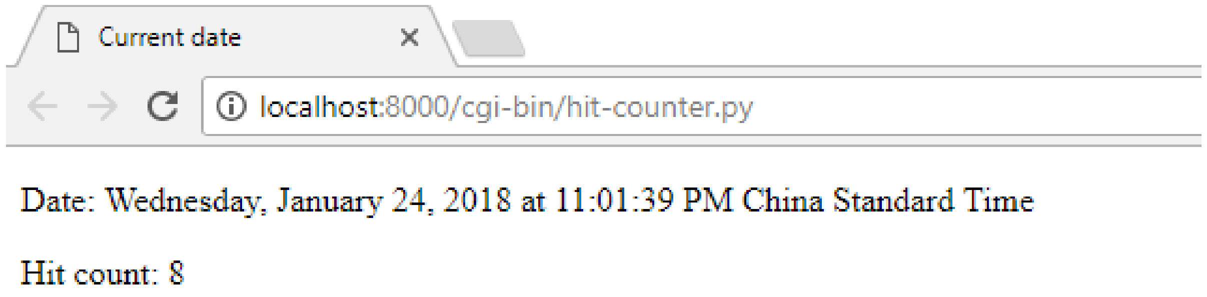
```
#!/usr/bin/python

# Import modules for CGI handling
import cgi, cgitb

# Create instance of FieldStorage
form = cgi.FieldStorage()

# Get data from fields
first_name = form.getvalue('first_name')
last_name  = form.getvalue('last_name')

print "Content-type:text/html\r\n\r\n"
print "<html>"
print "<head>"
print "<title>Hello - Second CGI Program</title>"
print "</head>"
print "<body>"
print "<h2>Hello %s %s</h2>" % (first_name, last_name)
print "</body>"
print "</html>"
```

Input from browser:
/cgi-bin/hello_get.py?first_name=ZARA&last_name=ALI

Output: Hello ZARA ALI

An example-hit counter

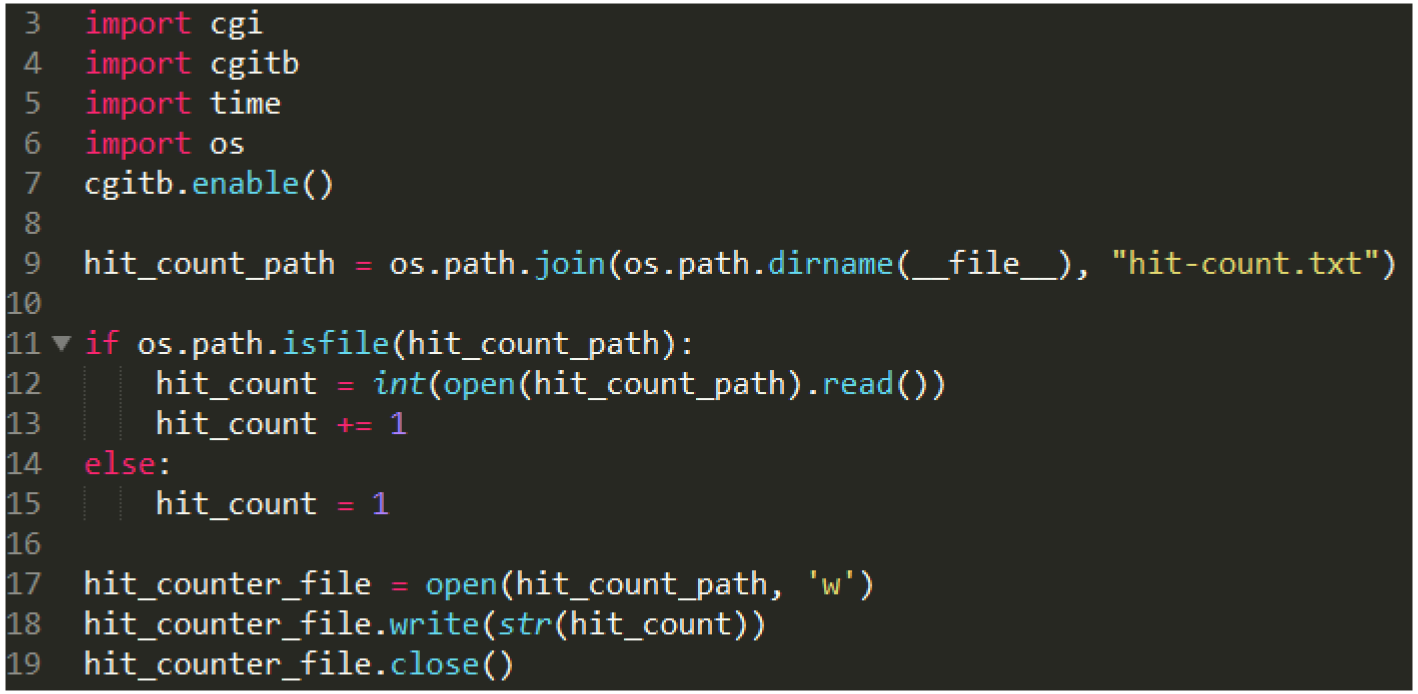
- Fork the repo (https://github.com/ayueei/python-cgi-example) into your github
- Run the script http-server.py in your local machine (use python2), you will get:



```
Date: Wednesday, January 24, 2018 at 11:01:39 PM China Standard Time

Hit count: 8
```

An example-hit counter

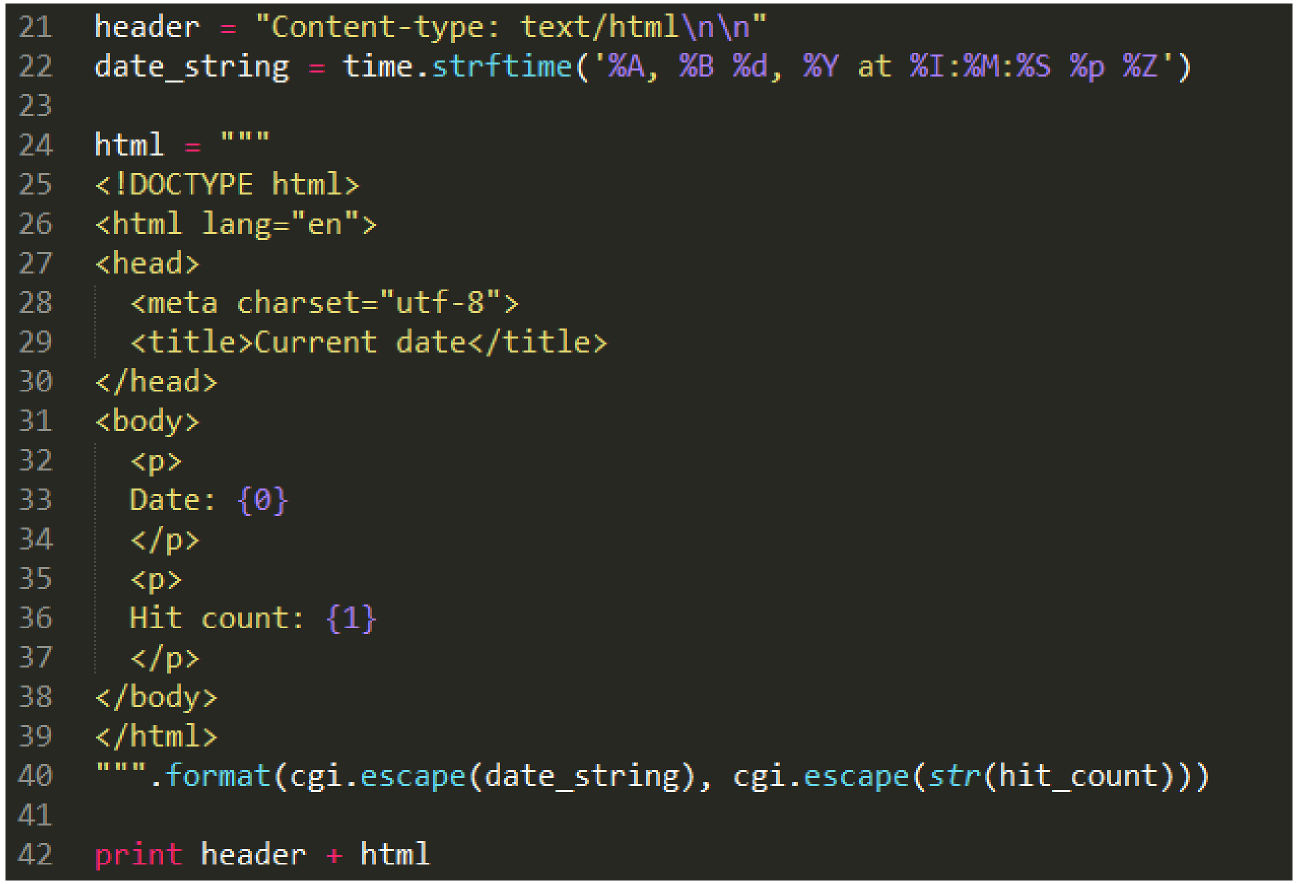
- Calculate the hit count and write to a file



```python
import cgi
import cgitb
import time
import os
cgitb.enable()

hit_count_path = os.path.join(os.path.dirname(__file__), "hit-count.txt")

if os.path.isfile(hit_count_path):
    hit_count = int(open(hit_count_path).read())
    hit_count += 1
else:
    hit_count = 1

hit_counter_file = open(hit_count_path, 'w')
hit_counter_file.write(str(hit_count))
hit_counter_file.close()
```

An example-hit counter

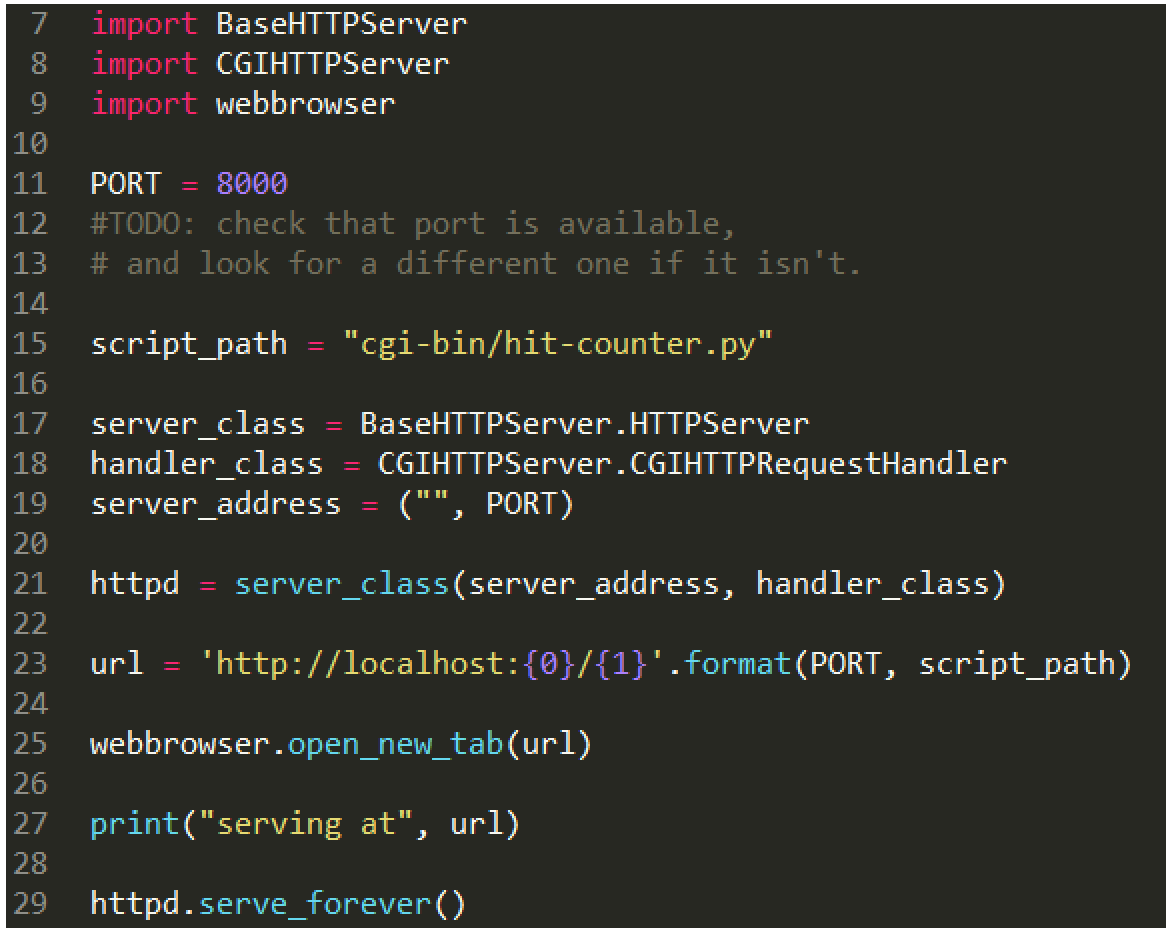
- Return a html header with a html file



```python
header = "Content-type: text/html\n\n"
date_string = time.strftime('%A, %B %d, %Y at %I:%M:%S %p %Z')

html = """
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="utf-8">
  <title>Current date</title>
</head>
<body>
  <p>
  Date: {0}
  </p>
  <p>
  Hit count: {1}
  </p>
</body>
</html>
""".format(cgi.escape(date_string), cgi.escape(str(hit_count)))

print header + html
```

An example-hit counter

- Set up a local http server and trigger the scripts:



```python
import BaseHTTPServer
import CGIHTTPServer
import webbrowser

PORT = 8000
#TODO: check that port is available,
# and look for a different one if it isn't.

script_path = "cgi-bin/hit-counter.py"

server_class = BaseHTTPServer.HTTPServer
handler_class = CGIHTTPServer.CGIHTTPRequestHandler
server_address = ("", PORT)

httpd = server_class(server_address, handler_class)

url = 'http://localhost:{0}/{1}'.format(PORT, script_path)

webbrowser.open_new_tab(url)

print("serving at", url)

httpd.serve_forever()
```

Things to do

- How to set up this hit counter in your openshift server?
- How to interact with database in a python cgi program?
- More advanced python cgi programming…

Some useful links

- https://www.tutorialspoint.com/openshift/openshift_getting_started.htm
- https://docs.openshift.com/online/welcome/index.html
- https://www.tutorialspoint.com/python/python_cgi_programming.htm

Thanks for listening !