RED HAT SERVICES

MitziCom Openshift POC

MITZICOM

Table of Contents

Document Control

Version	Date	Author	Reason for update
V1.0	11/06/2018	Joe Kenny	Document Creation

1.0 Document Summary

The purpose of the POC is to determine the feasibility of using OpenShift as a target for an existing Java-based microservices workload.

It demonstrates a fully integrated CI/CD pipeline using Gogs source code control system, a Nexus artifact repository, SonarQube code analysis tool and is deployed to production in a blue-green strategy orchestrated by Jenkins.

The application used in the POC is an application with three microservices—two back-end services and one front-end service calling the back-end services.

2.0 Environment

The OPENTLC shared environment was used to host this POC.

https://master.na37.openshift.opentlc.com/

Name: OTLC-LAB-jkenny-redhat.com-PROD_SHARED_DEVELOPER_ENV-632f

Description:	OPENTLC OpenShift 3.7 Shared Access
Management Engine GUID:	8c9e176a-6892-11e8-8f36-001a4a16015a
Lifecycle: Retirement Date	06/16/18

Note: Due to resource constraints, in order to avoid the following memory quota limit:

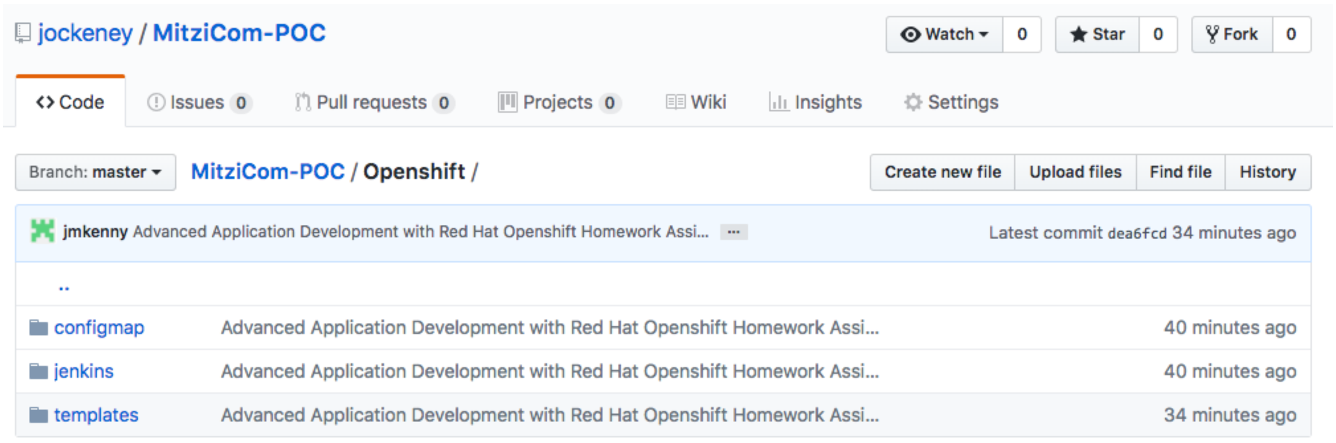
Error creating deployer pod: pods ~" is forbidden: exceeded quota: clusterquota-jkenny-redhat.com-20a0, requested: requests.memory=256Mi, used: requests.memory=6Gi, limited: requests.memory=6Gi

the Development project resources can not be active at the same time as the Production project resources. Additional resources have been requested so this may not be an issue when viewing the POC.

2.1 Git

The Openshift templates, Jenkins pipeline scripts and configmaps used throughout the POC are publicly available on Github:

https://github.com/jockeney/MitziCom-POC



jmkenny Advanced Application Development with Red Hat Openshift Homework Assi... Latest commit dea6fcd 34 minutes ago

..

configmap	Advanced Application Development with Red Hat Openshift Homework Assi...	40 minutes ago
jenkins	Advanced Application Development with Red Hat Openshift Homework Assi...	40 minutes ago
templates	Advanced Application Development with Red Hat Openshift Homework Assi...	34 minutes ago

2.2 POC resources

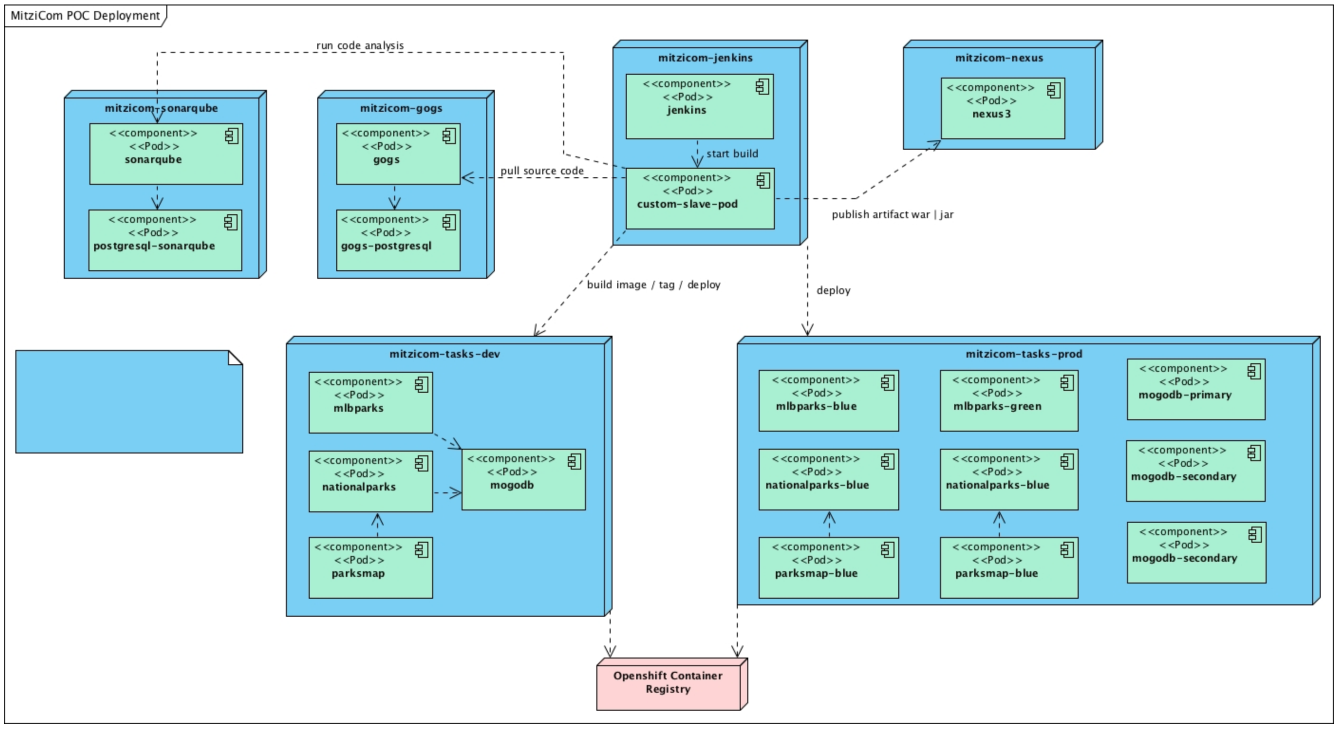
Here is a list of the Openshift Projects created to manage the POC:

Project Name	Display Name	Comment
mitzicom-gogs	MitziCom Gogs GitHub Repository.	Gogs is our open source Git repository for the POC.
mitzicom-nexus	MitziCom Nexus Repository.	Nexus manages software "artifacts" required for developing the POC.
mitzicom-sonarqube	MitziCom SonarQube code quality tool.	This tool provides code quality analysis.
mitzicom-jenkins	MitziCom Jeknins CI/CD	The development/production pipelines are managed by Jenkins.
mitzicom-tasks-dev	MitziCom Dev Runtime Environment	The development runtime environment for the POC's 3 microservices.
mitzicom-tasks-prod	MitziCom Prod Runtime Environment	The production runtime environment for the POC's 3 microservices.

2.3 POC urls

Project Name	Credentials
gogs-jmk.apps.na37.openshift.opentlc.com/poc	poc/admin
nexus.apps.na37.openshift.opentlc.com	admin/admin123
sonarqube-mitzicom-sonarqube.apps.na37.openshift.opentlc.com/projects	admin/admin
jenkins-mitzicom-jenkins.apps.na37.openshift.opentlc.com	

3.0 POC High Level Deployment Diagram


MitziCom POC Deployment
run code analysis
mitzicom-sonarqube
<<component>> <<Pod>> sonarqube
<<component>> <<Pod>> postgresql-sonarqube
mitzicom-gogs
<<component>> <<Pod>> gogs
<<component>> <<Pod>> gogs-postgresql
pull source code
mitzicom-jenkins
<<component>> <<Pod>> jenkins
start build
<<component>> <<Pod>> custom-slave-pod
mitzicom-nexus
<<component>> <<Pod>> nexus3
publish artifact war | jar
build image / tag / deploy
deploy
mitzicom-tasks-dev
<<component>> <<Pod>> mlbparks
<<component>> <<Pod>> nationalparks
<<component>> <<Pod>> mogodb
<<component>> <<Pod>> parksmap
mitzicom-tasks-prod
<<component>> <<Pod>> mlbparks-blue
<<component>> <<Pod>> mlbparks-green
<<component>> <<Pod>> mogodb-primary
<<component>> <<Pod>> nationalparks-blue
<<component>> <<Pod>> nationalparks-blue
<<component>> <<Pod>> mogodb-secondary
<<component>> <<Pod>> parksmap-blue
<<component>> <<Pod>> parksmap-blue
<<component>> <<Pod>> mogodb-secondary
Openshift Container Registry

4.0 CI/CD Infrastructure Setup.

4.1 Nexus setup

Setup up Nexus 3 (Repository Manager) with persistent storage from a template.

```
$ oc new-project mitzicom-nexus --display-name "MitziCom Nexus Repository"
```

The git repo contains an OpenShift template for deploying Sonatype Nexus 3 and pre-configuring Red Hat and JBoss maven repositories on Nexus via post deploy hooks. You can modify the post hook in the templates and add other Nexus repositories if required:

```
post:
  execNewPod:
    containerName: ${SERVICE_NAME}
    command:
      - "/bin/bash"
      - "-c"
      - "add scripts here"
```

Import Templates

In order to add this template to the OpenShift project run the following commands:

```
$ oc create -f https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/templates/mitzicom_nexus_template.yaml -n mitzicom-nexus
```

Deploy Nexus 3

Deploy Sonatype Nexus 3 using the provided templates:

```
$ oc new-app mitzicom-nexus3-persistent --param=HOSTNAME=nexus3-jmk.apps.na37.openshift.opentlc.com --param=MAX_MEMORY=1.5Gi
```

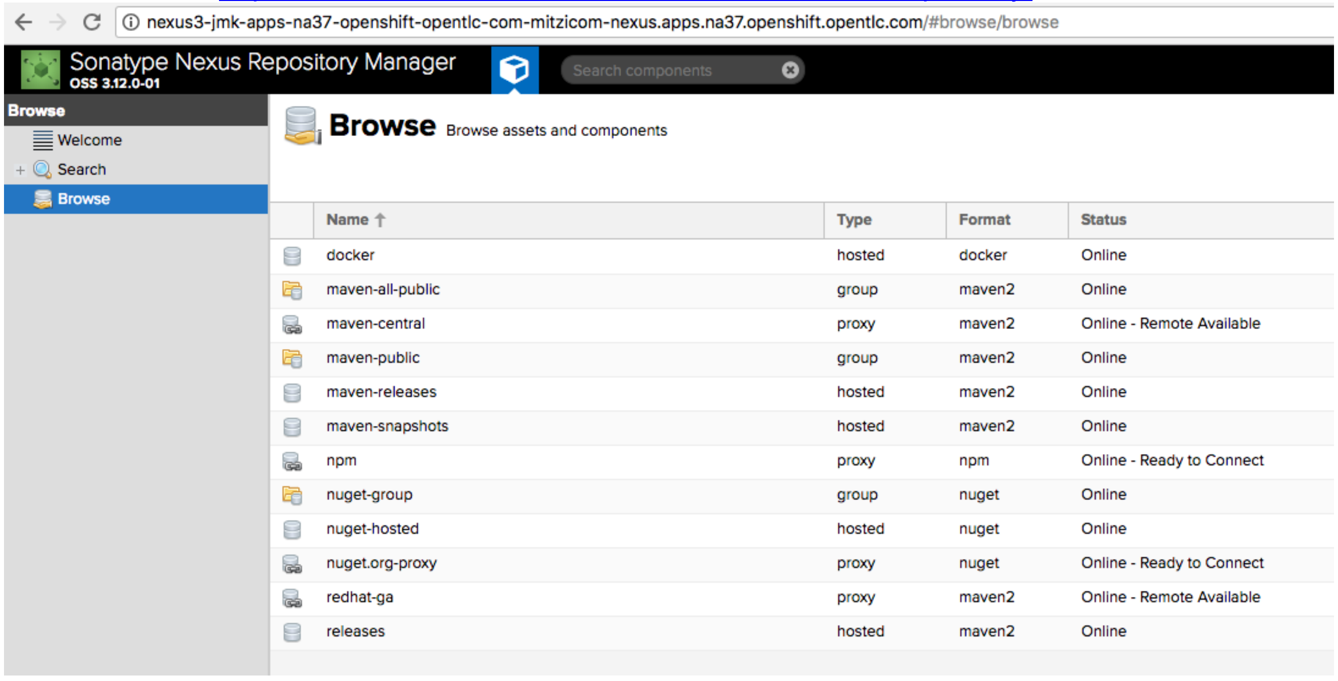
The template comes with additional parameters, use the –-param to add:

parameters
NEXUS_VERSION=2.14.3
HOSTNAME
SERVICE_NAME
VOLUME_CAPACITY (default 4Gi)
MAX_MEMORY (default 2Gi)

The template also comes preconfigured with a persistent volume claim (PVC) nexus-pvc mounted at /nexus-data and liveness and readiness probes for Nexus.

Access the nexus application via route 'nexus3-jmk-apps-na37-openshift-opentlc-com-mitzicom-nexus.apps.na37.openshift.opentlc.com'

Internal service: http://nexus3.mitzicom-nexus.svc.cluster.local:8081/repository/


nexus3-jmk-apps-na37-openshift-opentlc-com-mitzicom-nexus.apps.na37.openshift.opentlc.com/#browse/browse
Sonatype Nexus Repository Manager
OSS 3.12.0-01
Search components
Browse
Welcome
Search
Browse
Browse
Browse assets and components

Name	Type	Format	Status
docker	hosted	docker	Online
maven-all-public	group	maven2	Online
maven-central	proxy	maven2	Online - Remote Available
maven-public	group	maven2	Online
maven-releases	hosted	maven2	Online
maven-snapshots	hosted	maven2	Online
npm	proxy	npm	Online - Ready to Connect
nuget-group	group	nuget	Online
nuget-hosted	hosted	nuget	Online
nuget.org-proxy	proxy	nuget	Online - Ready to Connect
redhat-ga	proxy	maven2	Online - Remote Available
releases	hosted	maven2	Online

The following repositories shown above are now available.

4.2 Gogs setup

Setup up Gogs (Source code Repository Manager) with persistent storage from a template.

Gogs is the Go Git service see https://gogs.io/ This open source GitHub clone can be deployed in a local infrastructure. It requires a PostgreSQL or MySQL database with persistent storage as well as a persistent volume to store its own data.

$ *oc new-project mitzicom-gogs --display-name "MitziCom Gogs GitHub Repository"*

Import Templates

oc create -f https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/templates/mitzicom_gogs_persistent_template.yaml-n mitzicom-gogs

This persistent template comes preconfigured with two persistent volume claims (PVC's), gogs-pvc mounted at /data and postgresql pvc mounted at /var/lib/pgsql/data. These persistent volumes come available with default size required of 1Gi and the volume size can be specified with the template variables: GOGS_VOLUME_CAPACITY and DB_VOLUME_CAPACITY.

The template also comes preconfigured with a ConfigMap. Gogs writes it's configuration to a file on the local container and this configuration file needs to be saved in persistent storage, so a ConfigMap is used to provide this. This ConfigMap is mounted as a volume at /opt/gogs/custom/conf and has the following definition :

```
- kind: ConfigMap
  apiVersion: v1
  metadata:
    name: gogs-config
    labels:
      app: ${APPLICATION_NAME}
  data:
    app.ini: |
      RUN_MODE = prod
      RUN_USER = gogs
      [database]
      DB_TYPE  = postgres
      HOST     = ${APPLICATION_NAME}-postgresql:5432
      NAME     = ${DATABASE_NAME}
      USER     = ${DATABASE_USER}
      PASSWD   = ${DATABASE_PASSWORD}
      [repository]
      ROOT = /opt/gogs/data/repositories
      [server]
      ROOT_URL=http://${HOSTNAME}
      SSH_DOMAIN=${HOSTNAME}
      [security]
```

```
INSTALL_LOCK = ${INSTALL_LOCK}
[service]
ENABLE_CAPTCHA = false
[webhook]
SKIP_TLS_VERIFY = ${SKIP_TLS_VERIFY}
```

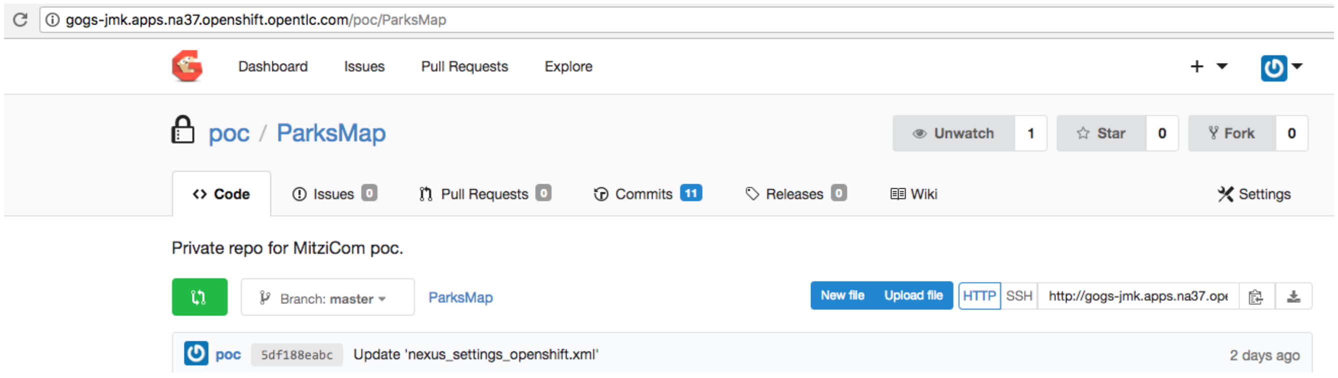
In addition the template also provide some customization via paramters, the following are available:

parameters
APPLICATION_NAME (default gogs)
HOSTNAME
GOGS_VOLUME_CAPACITY (default 4Gi)
DB_VOLUME_CAPACITY (default 1Gi)
DATABASE_USER (default gogs)
Database Password (default gogs)
DATABASE_NAME (default gogs)
DATABASE_ADMIN_PASSWORD
GOGS_VERSION (default 0.9.97)
INSTALL_LOCK (default true, meaning the installation (/install) page will be disabled. Set to false if you want to run the installation wizard via web')
SKIP_TLS_VERIFY (default false, skip TLS verification on webhooks)

Finally the template also come preconfigured with liveness and readiness probes for Gogs.

Deploy Gogs
$ oc new-app mitzicom-gogs-persistent --param=HOSTNAME=gogs-jmk.apps.na37.openshift.opentlc.com

Access the application via route http://gogs-jmk.apps.na37.openshift.opentlc.com



Private repo for MitziCom poc.

poc 5df188eabc Update 'nexus_settings_openshift.xml' 2 days ago

Register a new user, noting the first registered user becomes the administrator for Gogs.

Install Source Code into Gogs
We want the ParksMap source code for the 3 microservices available in a private Gogs repository, so the following needs to performed:

New Repository - ParksMap (private)

$ git clone https://github.com/wkulhanek/ParksMap.git
$ cd ParksMap
$ edit nexus_settings.xml (note: Set up nexus_settings.xml for local builds, making sure that <url> points the installed Nexus URL)
$ git add .
$ git commit -m "first commit"
$ git remote add gogsPoc http://poc:admin@gogsjmk.apps.na37.openshift.opentlc.com/poc/ParksMap.git
$ git push -u gogsPoc master

note: Make sure to replace <gogs_user> and <gogs_password> with your credentials

4.3 SonarQube setup

Setup up SonarQube (code analysis) with persistent storage from a template.

```
$ oc new-project mitzicom-sonarqube --display-name "MitziCom SonarQube code quality tool"
```

Import Templates

In order to add this templates to OpenShift project run the following commands:

```
oc create -f https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/templates/mitzicom_sonarqube_persistent_template.yaml -n mitzicom-sonarqube
```

The template comes preconfigured with a persistent volume claim (PVC) postgresql-sonarqube-data mounted at /var/lib/pgsql/data and liveness and readiness probes for SonarQube.

Deploy SonarQube

Deploy SonarQube using the provided templates:

```
$ oc new-app mitzicom-sonarqube-persistent --param=SONARQUBE_VERSION=6.7
```

The template comes with additional parameters, use the –-param to add:

parameters
SONARQUBE_VERSION (default 6.7)
POSTGRESQL_PASSWORD
POSTGRESQL_VOLUME_CAPACITY (default 1Gi)
SONAR_VOLUME_CAPACITY (default 1Gi)

Access the application once deployed at http://sonarqube-mitzicom-sonarqube.apps.na37.openshift.opentlc.com using the credentials admin/admin.

4.4 Jenkins setup

Setup up Jenkins with persistent storage from a template.

$ oc new-project mitzicom-jenkins --display-name "MitziCom Jeknins CI/CD"

Import Templates

In order to add this template to OpenShift project run the following commands:

oc create -f https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/templates/mitzicom_jenkins_persistent_template.yaml -n mitzicom-jenkins

Deploy Jenkins

Deploy Jenkins using the provided templates:

$ oc new-app mitzicom-jenkins-persistent --param=MEMORY_LIMIT=2Gi --param=VOLUME_CAPACITY=4Gi --param=ENABLE_OAUTH=true -n mitzicom-jenkins

The template comes with additional parameters, use the –-param to add:

parameters
JENKINS_SERVICE_NAME (default jenkins)
JNLP_SERVICE_NAME (default jenkins-jnlp)
ENABLE_OAUTH (default true)
MEMORY_LIMIT (default 512Mi)
VOLUME_CAPACITY (default 1Gi)
JENKINS_IMAGE_STREAM_TAG (default jenkins:2)

The template also comes preconfigured with a persistent volume claim (PVC) jenkins mounted at /var/lib/jenkins and liveness and readiness probes for Jenkins.

Setup Jenkins

The stock Jenkins Maven slave pod does not have Skopeo installed. Skopeo is a tool that allows you to move your built container images into another registry. To build this custom slave image perform the following:

// Build a new slave Image and tag it in the Openshift registry

$ wget https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/scripts/Dockerfile

This downloads a Dockerfile which is using docker.io/openshift/jenkins-slave-maven-centos7:v3.9 as the base image and installs Skopeo on top of it.

On your local VM add the Openshift Container Registry to /etc/containers/registries.conf

```
$ sudo systemctl restart docker
$ mkdir jenkins-slave-appdev

$ sudo docker login -u jkenny-redhat.com -p $(oc whoami -t) docker-registry-default.apps.na37.openshift.opentlc.com (test connection)

// Build and tag Custom Slave Image - note -t <repository_name>/<image_name>:<tag>
$ sudo docker build . -t docker-registry-default.apps.na37.openshift.opentlc.com/mitzicom-jenkins/jenkins-slave-maven-appdev:v3.9

$ sudo docker images
$ sudo docker push docker-registry-default.apps.na37.openshift.opentlc.com/mitzicom-jenkins/jenkins-slave-maven-appdev:v3.9
```

Now the Custom Slave Image with Skopeo is built, tagged and available in the Openshift Container registry, we can now use this Slave image in Jenkins.

// SLAVE POD REGISTER IN JENKINS -
Manage Jenkins -> Configure System -> Cloud -> Add Pod Template -> Kubernetes Pod Template
Docker image:docker-registry.default.svc:5000/mitzicom-jenkins/jenkins-slave-maven-appdev:v3.9
Labels: 'maven-custom-slavepod'

// SLAVE POD TEST IN JENKINS
create a Pipeline, Test skopeo with node('maven-dev')

```
node('maven-custom-slavepod') {
   stage('Test skopeo') {
      sh('skopeo --version')
      sh('oc whoami')
   }
}
```

when you run the pipleline you should see this message in the console:

```
// Pulled         Successfully pulled image "docker-registry.default.svc:5000/mitzicom-jenkins/jenkins-slave-maven-appdev:v3.9"
```

The final test of CI/CD Infrastructure involves testing your Local VM builds to verify all the build tools are working as expected:

// Test the Local Build environment in the VM
$ *oc project mitzicom-gogs*
$ *cd ParksMap*

// Test MLBParks backend application
$ *cd mlbparks/*
$ *mvn -s ../nexus_settings.xml clean package -DskipTests=true*
This will create a war file target/mlbparks.jar that can be used in a binary build for OpenShift. The S2I Builder image to use is jboss-eap70-openshift:1.7.

// Nationalparks backend application
$ *mvn -s ../nexus_settings.xml clean package -Dmaven.test.skip=true*
This will create a jar file target/nationalparks.jar that can be used in a binary build for OpenShift. The S2I Builder image to use is redhat-openjdk18-openshift:1.2.

// Parksmap application (This Spring Boot application is a frontend web gateway to backend services that provide geolocation data on services)
$ *cd parksmap*
$ *mvn -s ../nexus_settings.xml clean package spring-boot:repackage -DskipTests -Dcom.redhat.xpaas.repo.redhatga*

see https://github.com/wkulhanek/ParksMap/tree/master/mlbparks

This will create a jar file target/parksmap.jar that can be used in a binary build for OpenShift. The S2I Builder image to use is redhat-openjdk18-openshift:1.2.

As part of this verification you need to confirm the output of the build to verify that the local Maven dependencies come from Nexus and not the public Internet repository. Post the build step, check Nexus maven-all-public to confirm dependencies have been added.

5.0 OpenShift Setup

The next part of the POC invloves creating two Openshift projects for development and production, these projects will be the runtime for the output of a successful pipeline build. Both projects will have MongoDB persistence, with the addition of a stateful set for production with three replicas.

Both projects will have include the necessary build and deployment configurations, including ConfigMaps for each microservice. Both projects will also grant the necessary permissions to Jenkins to allow it to manipulate objects in these environments.

Development setup

```
oc new-project mitzicom-tasks-dev --display-name "MitziCom Dev Runtime Environment"
```

// Setup a MongoDB database in Dev (used empheral template with)

- MongoDB Connection Username: mitzicomuser
- MongoDB Connection Password: redhat
- MongoDB Database Name: mitzicomdb

// Set up the permissions for Jenkins to be able to manipulate objects in the mitzicom-tasks-dev project

```
$ oc policy add-role-to-user edit system:serviceaccount:mitzicom-jenkins:jenkins -n mitzicom-tasks-dev
```

NOTE: Two backend services providing geospatial data about Nationalparks and Major League Baseball park. The backend services are exposed as routes with label "type=parksmap-backend".

Configure the MLBParks backend application

The following needs to be performed:

- Create a binary build using the jboss-eap70-openshift:1.6 image stream.
- Create a new deployment configuration pointing to mlbparks:0.0-0.
- Turn off automatic building and deployment.
- Expose the deployment configuration as a service (on port 8080) and the service as a route.
- Create a ConfigMap
- Attach the ConfigMap to the deployment configuration

```
$ oc new-build --binary=true --name="mlbparks" jboss-eap70-openshift:1.6 -n mitzicom-tasks-dev

$ oc new-app mitzicom-tasks-dev/mlbparks:0.0-0 --name=mlbparks --allow-missing-imagestream-tags=true -n mitzicom-tasks-dev

$ oc set triggers dc/mlbparks --remove-all -n mitzicom-tasks-dev
$ oc expose dc mlbparks --port 8080 -n mitzicom-tasks-dev
$ oc expose svc mlbparks -n mitzicom-tasks-dev -l type=parksmap-backend
```

The ParksMap microservices require configuration data e.g. Database name. These configuration artifacts should be externalized form the application. ConfigMaps allow you to decouple configuration artifacts from image content to keep containerized applications portable.

The ConfigMap object in OpenShift provides mechanisms to provide configuration data to the application container, it can be used to store key-value properties, configuration files, JSON blobs and alike. You can create a ConfigMap by pointing at a file containing the application configuration The configuration files for the microservices is available on github. First download these files locally:

```
$ wget https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/configmap/mlbparks.ini
```

```
$ oc create configmap config --from-file=mlbparks.ini -n mitzicom-tasks-dev
```

Use envFrom to define all of the ConfigMap's data as Pod environment variables. The key from the ConfigMap becomes the environment variable name in the Pod.

```
$ oc describe configmap config
Name:          config
Namespace:     mitzicom-tasks-dev
Labels:        <none>
Annotations:<none>

Data
====
mlbparks.ini:
----
DB_HOST=mitzicomdb
DB_PORT=27017
DB_USERNAME=mitzicomdb
DB_PASSWORD=redhat
DB_NAME=parks
APPNAME=MLB Parks
Events:        <none>
```

Edit the deployment configuration to wire in the configMap's data as environment variables:

```
$ oc edit dc mlbparks -o json
                "env": [
                  {
```

```
  "name": "DB_HOST",
  "valueFrom": {
    "configMapKeyRef": {
      "name": "config",
      "key": "mlbparks.ini"
    }
  }
},
{
  "name": "DB_PORT",
  "valueFrom": {
    "configMapKeyRef": {
      "name": "config",
      "key": "mlbparks.ini"
    }
  }
},
{
  "name": "DB_USERNAME",
  "valueFrom": {
    "configMapKeyRef": {
      "name": "config",
      "key": "mlbparks.ini"
    }
  }
},
{
  "name": "DB_PASSWORD",
  "valueFrom": {
    "configMapKeyRef": {
      "name": "config",
      "key": "mlbparks.ini"
    }
  }
},
{
  "name": "DB_NAME",
  "valueFrom": {
    "configMapKeyRef": {
      "name": "config",
      "key": "mlbparks.ini"
    }
  }
},
{
```

```
          "name": "APPNAME",
          "valueFrom": {
            "configMapKeyRef": {
              "name": "config",
              "key": "mlbparks.ini"
            }
          }
        }
      ]
```

Configure the Nationalparks backend application
The following needs to be performed:

- Create a binary build using the redhat-openjdk18-openshift:1.2 image stream.
- Create a new deployment configuration pointing to nationalparks:0.0-0.
- Turn off automatic building and deployment.
- Expose the deployment configuration as a service (on port 8080) and the service as a route.
- Create a ConfigMap
- Attach the ConfigMap to the deployment configuration

// Set up the Dev Nationalparks backend application

```
$ oc new-build --binary=true --name="nationalparks" redhat-openjdk18-openshift:1.2 -n mitzicom-tasks-dev
$ oc new-app mitzicom-tasks-dev/nationalparks:0.0-0 --name=nationalparks --allow-missing-imagestream-tags=true -n mitzicom-tasks-dev
$ oc set triggers dc/nationalparks --remove-all -n mitzicom-tasks-dev
$ oc expose dc nationalparks --port 8080 -n mitzicom-tasks-dev
$ oc expose svc nationalparks -n mitzicom-tasks-dev -l type=parksmap-backend

$ wget https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/configmap/nationalParks.ini

$ oc create configmap nationalparksconfig --from-file=nationalParks.ini -n mitzicom-tasks-dev
```

Again edit the deployment configuration to wire in the configMap's data as environement variables:

```
$ oc edit dc nationalparks -o json
        "env": [
          {
            "name": "DB_HOST",
            "valueFrom": {
              "configMapKeyRef": {
                "name": "nationalparksconfig",
                "key": "nationalParks.ini"
        }
      }
    },
    {
      "name": "DB_PORT",
      "valueFrom": {
        "configMapKeyRef": {
          "name": "nationalparksconfig",
          "key": "nationalParks.ini"
        }
      }
    },
    {
      "name": "DB_USERNAME",
      "valueFrom": {
        "configMapKeyRef": {
          "name": "nationalparksconfig",
          "key": "nationalParks.ini"
        }
      }
    },
    {
      "name": "DB_PASSWORD",
      "valueFrom": {
        "configMapKeyRef": {
          "name": "nationalparksconfig",
          "key": "nationalParks.ini"
        }
      }
    },
    {
      "name": "DB_NAME",
      "valueFrom": {
        "configMapKeyRef": {
          "name": "nationalparksconfig",
          "key": "nationalParks.ini"
        }
      }
    },
    {
      "name": "APPNAME",
      "valueFrom": {
        "configMapKeyRef": {
          "name": "nationalparksconfig",
          "key": "nationalParks.ini"
```

```
            }
        }
    }
]
```

Configure the Parksmap frontend application
The following needs to be performed:

- Create a binary build using the redhat-openjdk18-openshift:1.2 image stream.
- Create a new deployment configuration pointing to *parksmap*:0.0-0.
- Turn off automatic building and deployment.
- Expose the deployment configuration as a service (on port 8080) and the service as a route.

// Set up the Dev Parksmap frontend application (This is a Spring Boot application)

```
$ oc new-build --binary=true --name="parksmap" redhat-openjdk18-openshift:1.2 -n mitzicom-tasks-
dev
$ oc new-app mitzicom-tasks-dev/parksmap:0.0-0 --name=parksmap --allow-missing-imagestream-
tags=true -n mitzicom-tasks-dev
$ oc set triggers dc/parksmap --remove-all -n mitzicom-tasks-dev
$ oc expose dc parksmap --port 8080 -n mitzicom-tasks-dev
$ oc expose svc parksmap -n mitzicom-tasks-dev
```

Production setup

```
$ oc new-project mitzicom-tasks-prod --display-name "MitziCom Prod Runtime Environment"
```

The production project requires a stateful set with 3 replicas. We set up a StatefulSet for MongoDB that consists of three copies of the MongoDB database that replicate the data amongst themselves. This requires three pods and three persistent volume claims. It also requires a headless service for the pods of the set to communicate, as well as a regular service for clients to connect to the database. Install the following template to create it:

//Setup a StatefulSet for MongoDB in Prod
```
$ oc create -f https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/templates/mitzicom_statefulset_template.yaml(note 3.7 apiVersion: apps/v1beta1)
```

The StatefulSet requires a headless service
```
$ oc process -f  https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/templates/mitzicom_headlessservice_template.yaml| oc create -f -
```

// Allow the production project to pull images from development project
```
$ oc policy add-role-to-group system:image-puller system:serviceaccounts:mitzicom-tasks-prod -n mitzicom-tasks-dev
```

// Set up the permissions for Jenkins to be able to manipulate objects in the production project
```
$ oc policy add-role-to-user edit system:serviceaccount:mitzicom-jenkins:jenkins -n mitzicom-tasks-prod
```

As before we now setup the 3 microservices, but this time we configure it to use a Blue/Green deployment. Using blue-green deployment, you serve one application at a time and switch from one application to the other.

Configure the MIBParks Blue backend application
The following needs to be performed:

- Create a binary build using the jboss-eap70-openshift:1.6 image stream.
- Create a new deployment configuration pointing to *mlbparks*:0.0-0.
- Turn off automatic building and deployment.
- Expose the deployment configuration as a service (on port 8080) and the service as a route.
- Create a ConfigMap
- Attach the ConfigMap to the deployment configuration

```
$ oc new-app mitzicom-tasks-dev/mlbparks:0.0 --name=mlbparks-blue --allow-missing-imagestream-tags=true -n mitzicom-tasks-prod
$ oc set triggers dc/mlbparks-blue --remove-all -n mitzicom-tasks-prod
$ oc expose dc mlbparks-blue --port 8080 -n mitzicom-tasks-prod
$ oc create configmap mlbparks-blue-config --from-file=mlbparks.ini -n mitzicom-tasks-prod
$ oc edit dc mlbparks-blue -o json (note key= mlbparks-blue-config for configmap)

# Expose Blue service as route to make blue application active
$ oc expose svc/mlbparks-blue --name mlbparks-blue -n mitzicom-tasks-prod -l type=parksmap-backend
```

Configure the MLBParks Green backend application

The following needs to be performed:

- Create a binary build using the jboss-eap70-openshift:1.6 image stream.
- Create a new deployment configuration pointing to *mlbparks*:0.0-0.
- Turn off automatic building and deployment.
- Expose the deployment configuration as a service (on port 8080) and the service as a route.
- Create a ConfigMap
- Attach the ConfigMap to the deployment configuration

```
$ oc new-app mitzicom-tasks-dev/mlbparks:0.0 --name=mlbparks-green --allow-missing-imagestream-tags=true -n mitzicom-tasks-prod
$ oc set triggers dc/mlbparks-green --remove-all -n mitzicom-tasks-prod
$ oc expose dc mlbparks-green --port 8080 -n mitzicom-tasks-prod
$ oc create configmap mlbparks-green-config --from-file=mlbparks.ini -n mitzicom-tasks-prod
$ oc edit dc mlbparks-green -o json (note key= mlbparks-green-config for configmap)
```

Configure the NationalParks Blue backend application

The following needs to be performed:

- Create a binary build using the redhat-openjdk18-openshift:1.2 image stream.
- Create a new deployment configuration pointing to *nationalparks*:0.0-0.
- Turn off automatic building and deployment.
- Expose the deployment configuration as a service (on port 8080) and the service as a route.
- Create a ConfigMap
- Attach the ConfigMap to the deployment configuration

```
$ oc new-app mitzicom-tasks-dev/nationalparks:0.0 --name=nationalparks-blue --allow-missing-imagestream-tags=true -n mitzicom-tasks-prod
$ oc set triggers dc/nationalparks-blue --remove-all -n mitzicom-tasks-prod
$ oc expose dc nationalparks-blue --port 8080 -n mitzicom-tasks-prod
$ oc create configmap nationalparks-blue-config --from-file=nationalParks.ini -n mitzicom-tasks-prod
```

$ oc edit dc nationalparks-blue -o json (note key= nationalparks-blue-config for configmap)

# Expose Blue service as route to make blue application active
$ oc expose svc/nationalparks-blue --name nationalparks-blue -n mitzicom-tasks-prod -l type=parksmap-backend

Configure the Nationalparks Green backend application
The following needs to be performed:
- Create a binary build using the redhat-openjdk18-openshift:1.2 image stream.
- Create a new deployment configuration pointing to *nationalparks*:0.0-0.
- Turn off automatic building and deployment.
- Expose the deployment configuration as a service (on port 8080) and the service as a route.
- Create a ConfigMap
- Attach the ConfigMap to the deployment configuration

$ oc new-app mitzicom-tasks-dev/nationalparks:0.0 --name=nationalparks-green --allow-missing-imagestream-tags=true -n mitzicom-tasks-prod
$ oc set triggers dc/nationalparks-green --remove-all -n mitzicom-tasks-prod
$ oc expose dc nationalparks-green --port 8080 -n mitzicom-tasks-prod
$ oc create configmap nationalparks-green-config --from-file=nationalParks.ini -n mitzicom-tasks-prod
$ oc edit dc nationalparks-green -o json (note key= nationalparks-green-config for configmap)

Configure the parksMap Blue frontend application
The following needs to be performed:
- Create a binary build using the redhat-openjdk18-openshift:1.2 image stream.
- Create a new deployment configuration pointing to *parksmap*:0.0-0.
- Turn off automatic building and deployment.
- Expose the deployment configuration as a service (on port 8080) and the service as a route.

$ oc new-app mitzicom-tasks-dev/parksmap:0.0 --name=parksmap-blue --allow-missing-imagestream-tags=true -n mitzicom-tasks-prod
$ oc set triggers dc/parksmap-blue --remove-all -n mitzicom-tasks-prod
$ oc expose dc parksmap-blue --port 8080 -n mitzicom-tasks-prod
# Expose Blue service as route to make blue application active
$ oc expose svc/parksmap-blue --name parksmap-blue -n mitzicom-tasks-prod

Configure the parksMap Green frontend application

```
$ oc new-app mitzicom-tasks-dev/parksmap:0.0 --name=parksmap-green --allow-missing-imagestream-tags=true -n mitzicom-tasks-prod
$ oc set triggers dc/parksmap-green --remove-all -n mitzicom-tasks-prod
$ oc expose dc parksmap-green --port 8080 -n mitzicom-tasks-prod
```

6.0 Development Pipeline

The development pipleline performs the following stages:

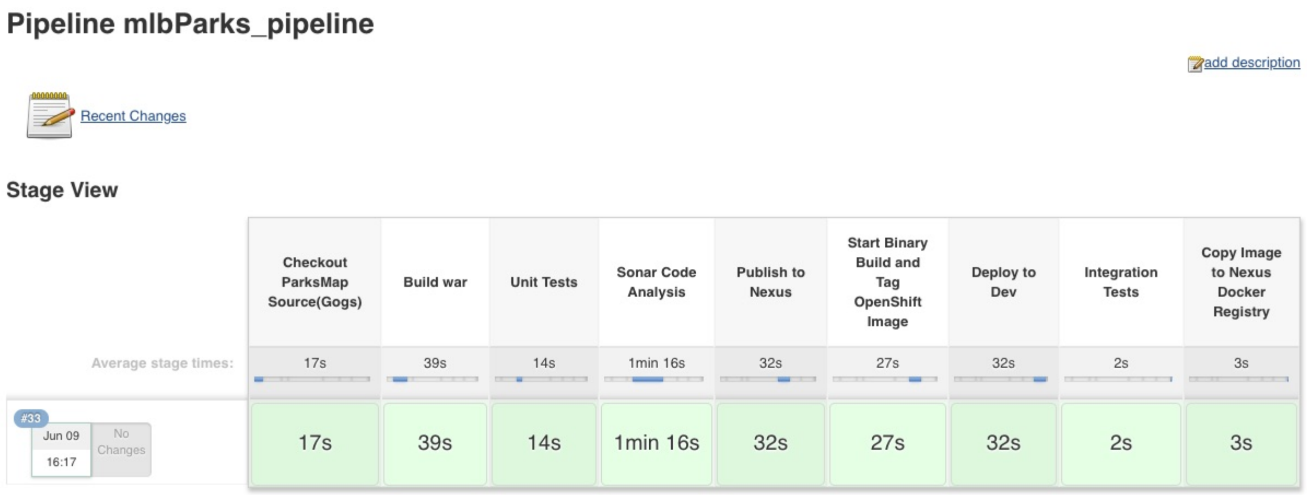
- Builds the source code, using the artifact repository as a Maven proxy cache.
- Executes the Unit tests
- Executes coverage tests
- Tags the image with the version and build number
- Upload the generated artifact to the Nexus artifact repository
- Runs an integration test if applicable i.e a back-end service
- Upload the tested container image to the Nexus Docker registry

The Jenkins console is available at https://jenkins-mitzicom-jenkins.apps.na37.openshift.opentlc.com/

mlbparks pipeline

The Jenkins file is available in Gogs under the mlbparks folder in ParksMap source code project and is also available here: https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/jenkins/mlparks_pipeline_script

The pipeline successfully ran from start to finish:

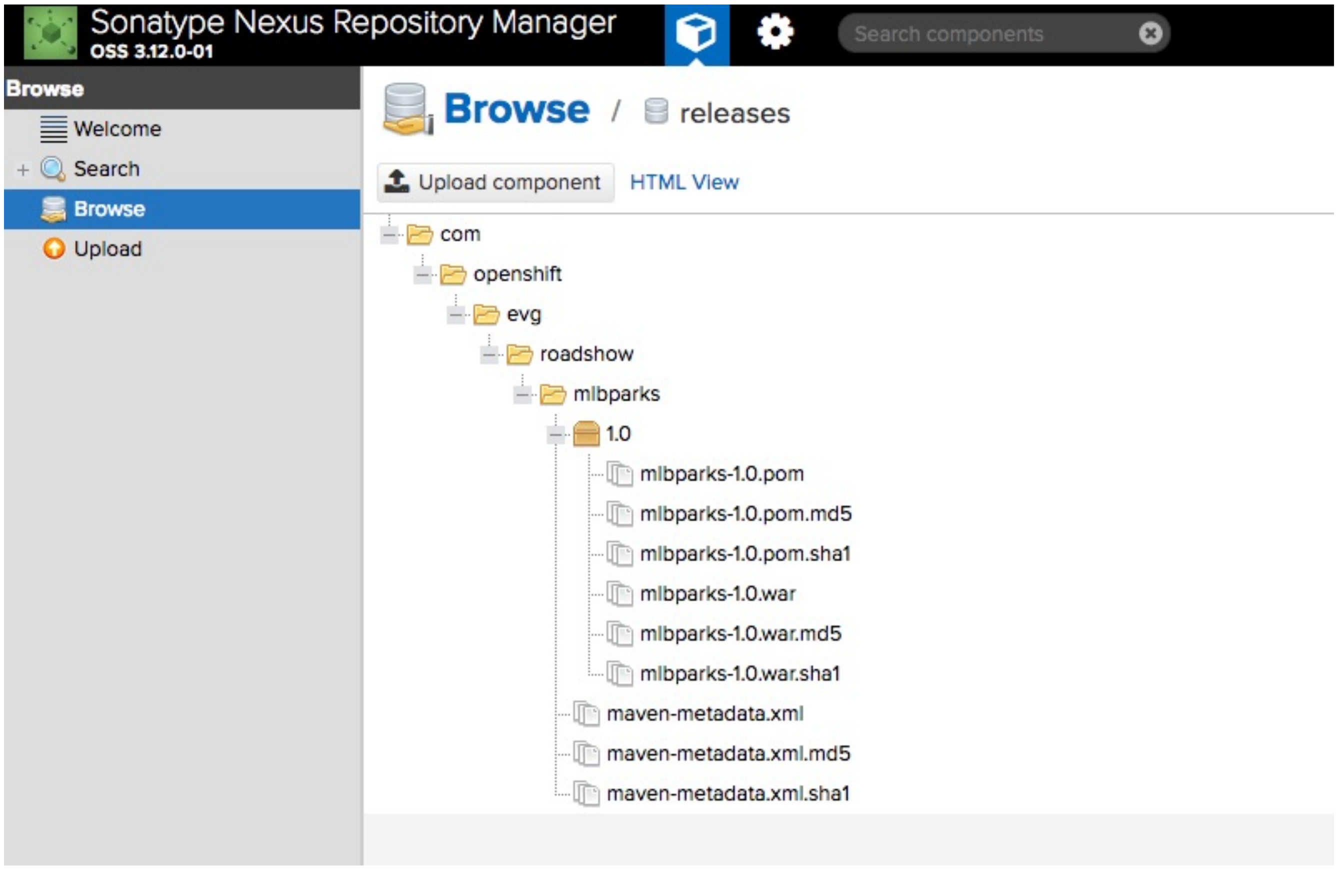


Pipeline mlbParks_pipeline

Stage View

	Checkout ParksMap Source(Gogs)	Build war	Unit Tests	Sonar Code Analysis	Publish to Nexus	Start Binary Build and Tag OpenShift Image	Deploy to Dev	Integration Tests	Copy Image to Nexus Docker Registry
Average stage times:	17s	39s	14s	1min 16s	32s	27s	32s	2s	3s
#33 Jun 09 16:17 No Changes	17s	39s	14s	1min 16s	32s	27s	32s	2s	3s

The Nexus release repository was successfully updated:



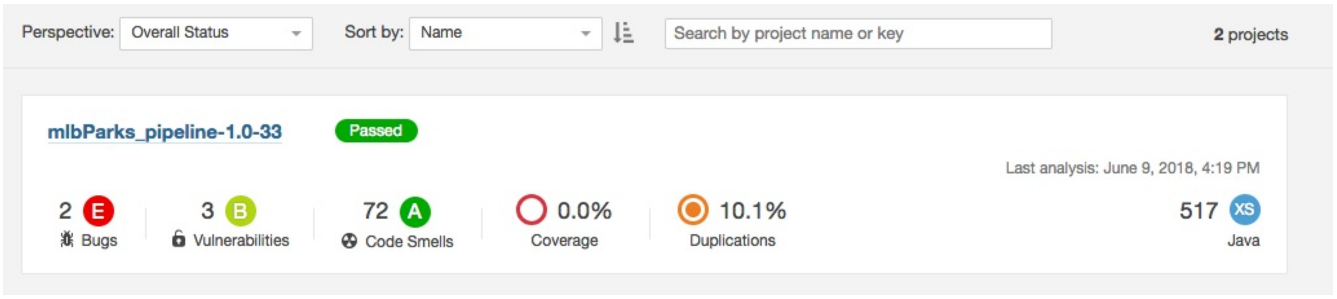
```
com
  openshift
    evg
      roadshow
        mlbparks
          1.0
            mlbparks-1.0.pom
            mlbparks-1.0.pom.md5
            mlbparks-1.0.pom.sha1
            mlbparks-1.0.war
            mlbparks-1.0.war.md5
            mlbparks-1.0.war.sha1
          maven-metadata.xml
          maven-metadata.xml.md5
          maven-metadata.xml.sha1
```

The Unit tests / Coverage tests / Integration test results are available in the Jenkins build log here:

https://jenkins-mitzicom-jenkins.apps.na37.openshift.opentlc.com/job/mlbParks_pipeline/33/consoleFull

https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/pipeline_results/mlbparks/pipeline_build_log

SonarQube was able to apply code analysis on the build artifact:

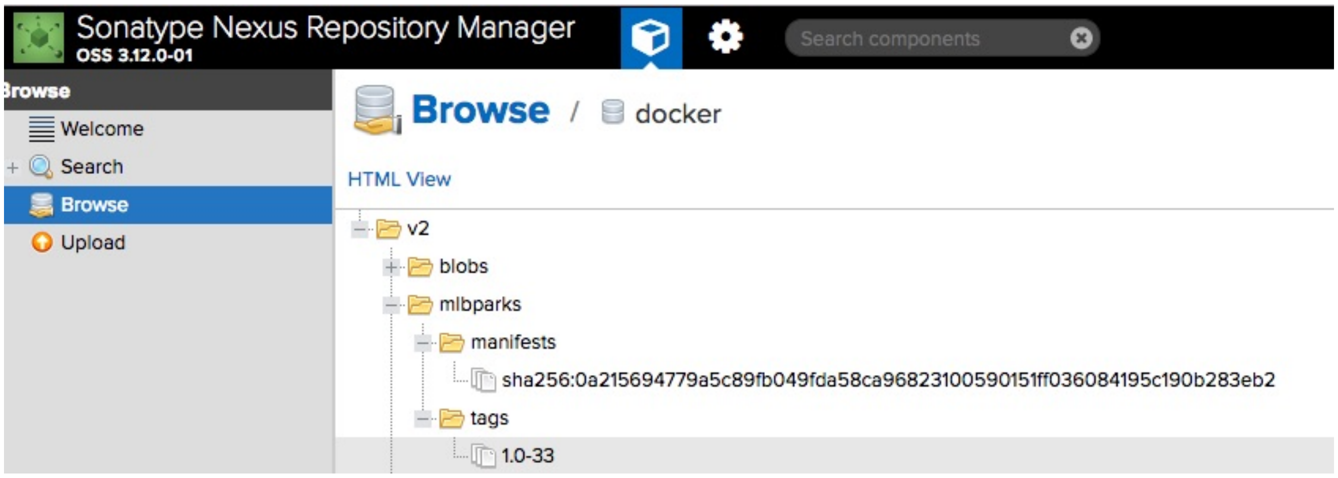


mlbParks_pipeline-1.0-33 Passed

Last analysis: June 9, 2018, 4:19 PM

2 E	3 B	72 A	0.0%	10.1%	517 XS
Bugs	Vulnerabilities	Code Smells	Coverage	Duplications	Java

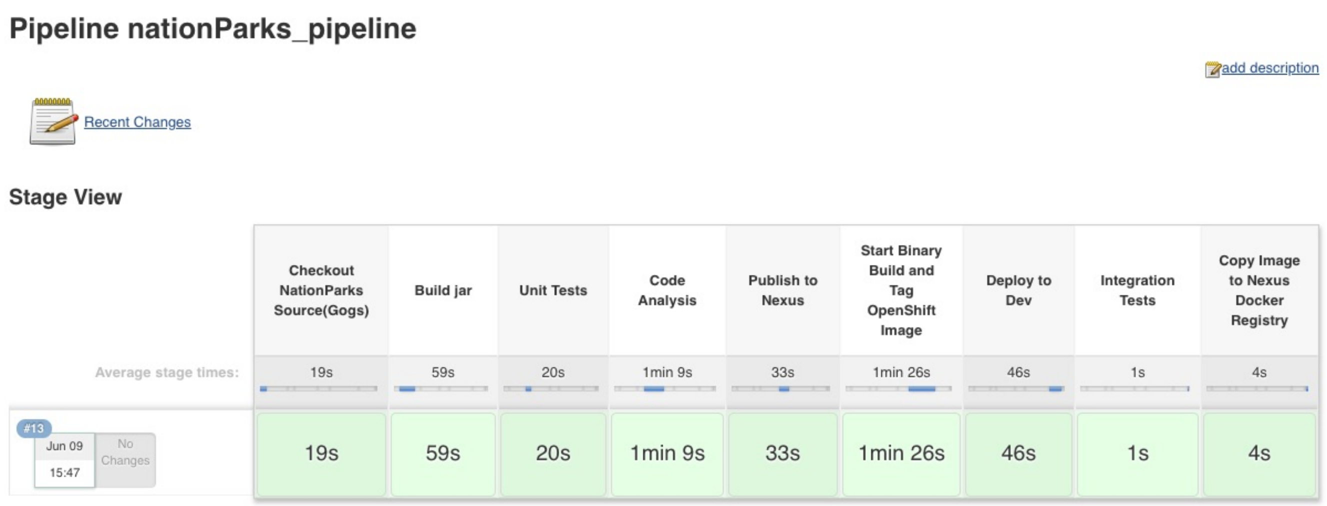
The tested container was successfully uploaded to the Nexus Docker repository:



```
v2
  blobs
  mlbparks
    manifests
      sha256:0a215694779a5c89fb049fda58ca96823100590151ff036084195c190b283eb2
    tags
      1.0-33
```

nationalparks pipeline
The Jenkins file is available in Gogs under the nationalparks folder in ParksMap source code and is also available here: https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/jenkins/nationalparks_pipeline_script

The pipeline successfully ran from start to finish:



Pipeline nationParks_pipeline

add description

Recent Changes

Stage View

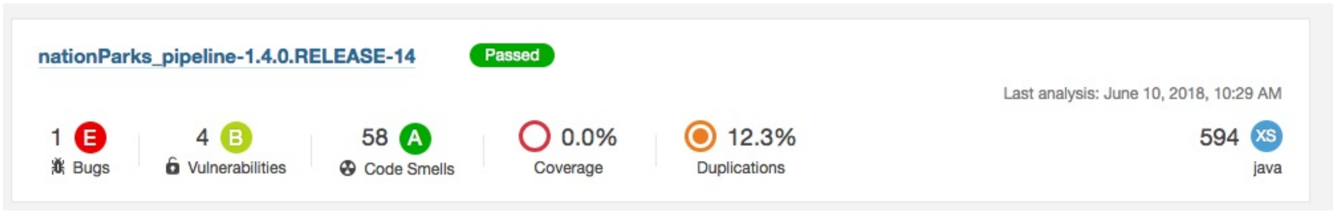
	Checkout NationParks Source(Gogs)	Build jar	Unit Tests	Code Analysis	Publish to Nexus	Start Binary Build and Tag OpenShift Image	Deploy to Dev	Integration Tests	Copy Image to Nexus Docker Registry
Average stage times:	19s	59s	20s	1min 9s	33s	1min 26s	46s	1s	4s
#13 Jun 09 15:47 No Changes	19s	59s	20s	1min 9s	33s	1min 26s	46s	1s	4s

The Unit tests / Coverage tests / Integration test results are available in the Jenkins build log here:

https://jenkins-mitzicom-jenkins.apps.na37.openshift.opentlc.com/job/nationParks_pipeline/13/consoleFull

https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/pipeline_results/nationalparks/pipeline_build_log

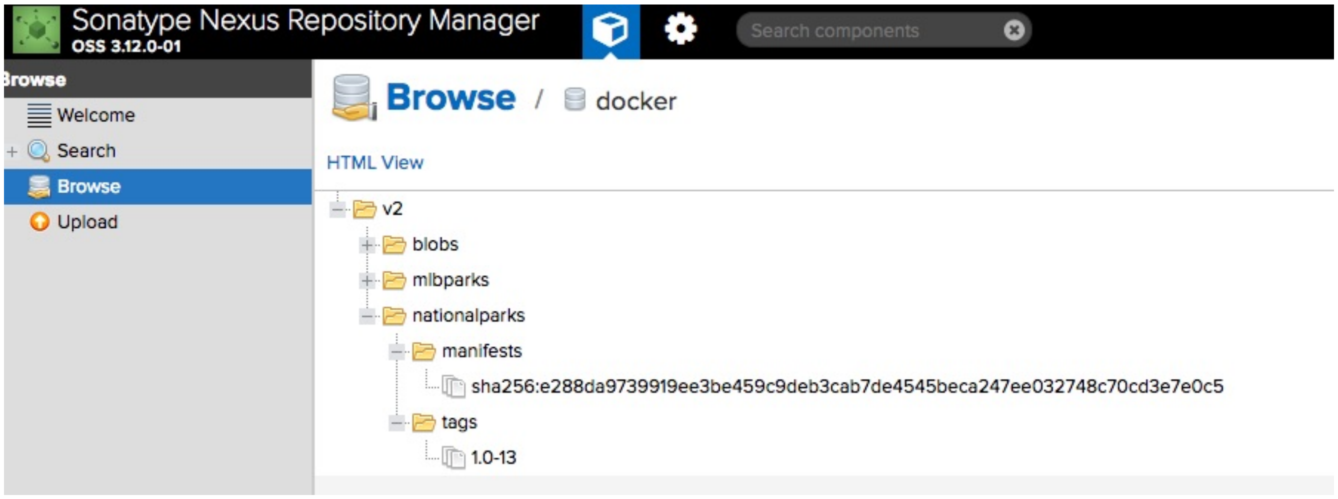
SonarQube was able to apply code analysis on the build artifact:


nationParks_pipeline-1.4.0.RELEASE-14 Passed

Last analysis: June 10, 2018, 10:29 AM

1 E	4 B	58 A	0.0%	12.3%	594 XS
Bugs	Vulnerabilities	Code Smells	Coverage	Duplications	java

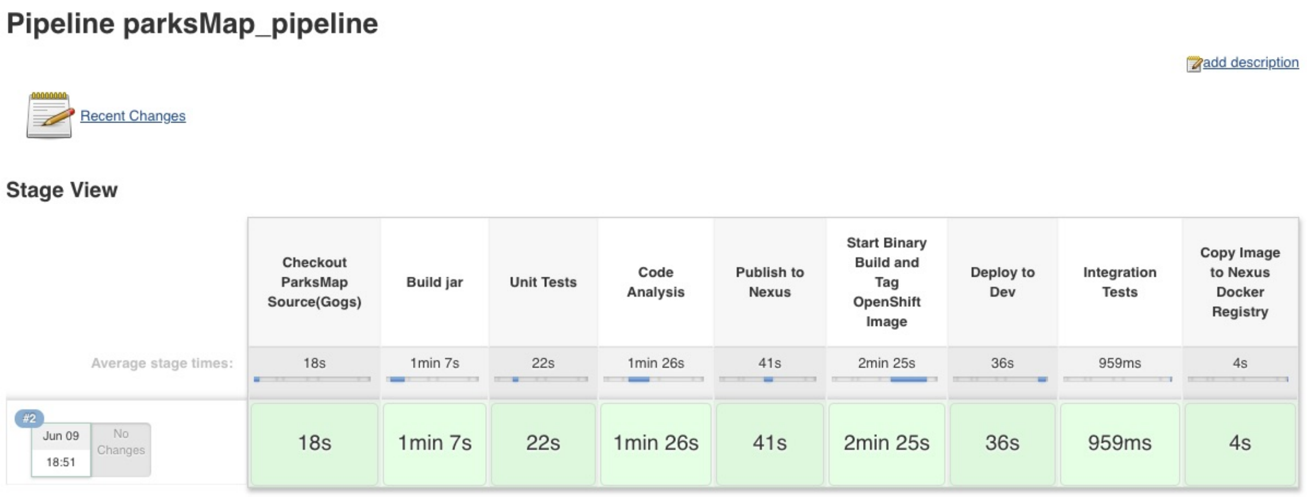
The tested container was successfully uploaded to the Nexus Docker repository:



```
v2
  blobs
  mlbparks
  nationalparks
    manifests
      sha256:e288da9739919ee3be459c9deb3cab7de4545beca247ee032748c70cd3e7e0c5
    tags
      1.0-13
```

parksmap pipeline
The Jenkins file is available in Gogs under the parksmap folder in the ParksMap source code project and is also available here: https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/jenkins/parksmap_pipeline_script

The pipeline successfully ran from start to finish:



Pipeline parksMap_pipeline

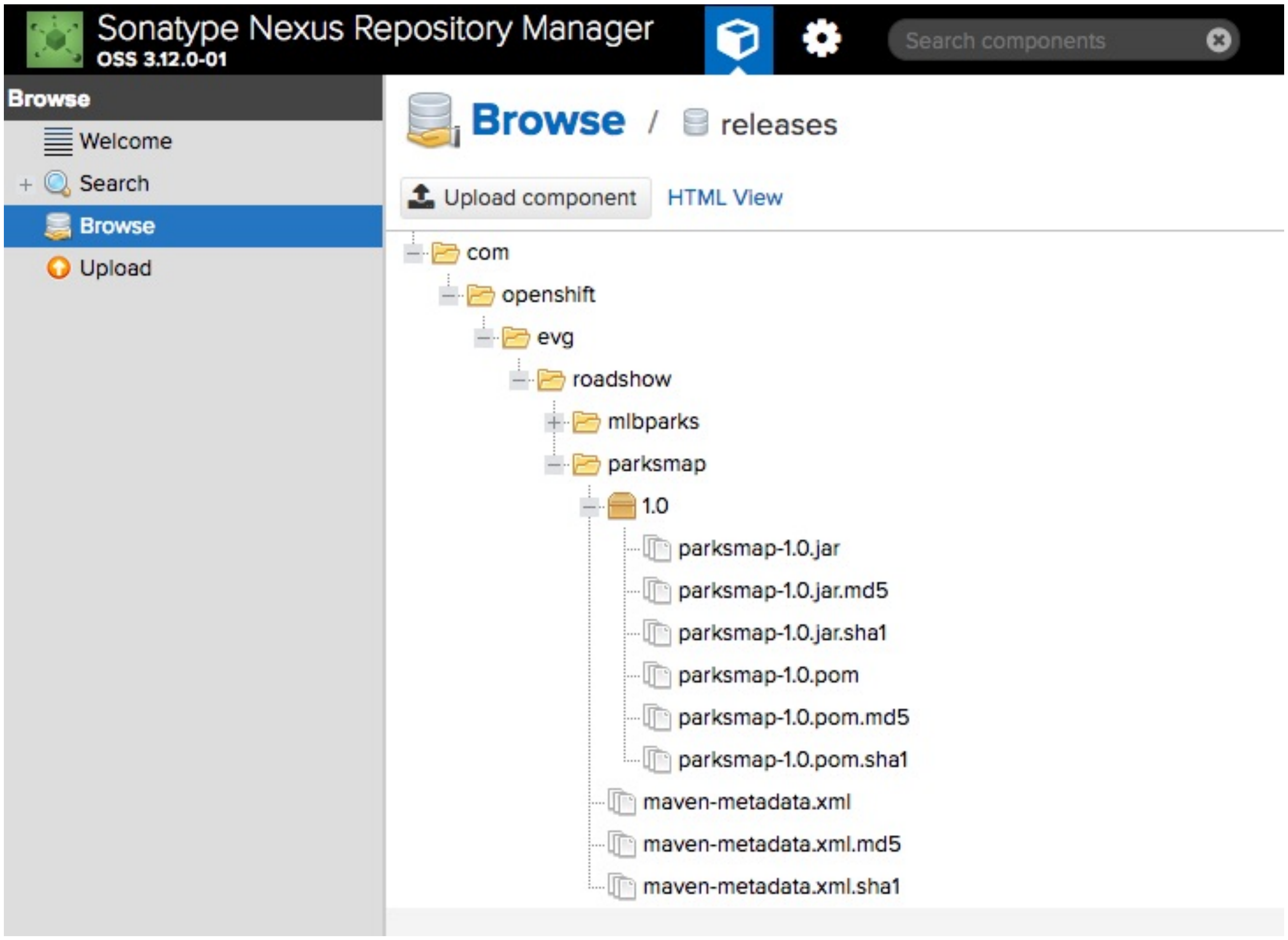
add description

Recent Changes

Stage View

	Checkout ParksMap Source(Gogs)	Build jar	Unit Tests	Code Analysis	Publish to Nexus	Start Binary Build and Tag OpenShift Image	Deploy to Dev	Integration Tests	Copy Image to Nexus Docker Registry
Average stage times:	18s	1min 7s	22s	1min 26s	41s	2min 25s	36s	959ms	4s
#2 Jun 09 18:51 No Changes	18s	1min 7s	22s	1min 26s	41s	2min 25s	36s	959ms	4s

The Nexus release repository was successfully updated:



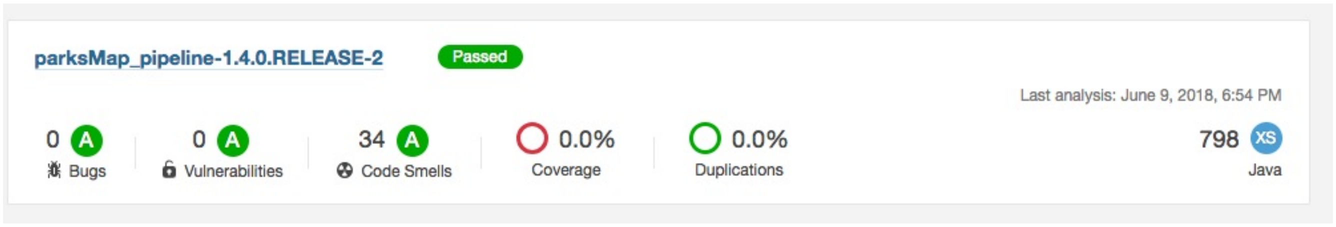
```
com
  openshift
    evg
      roadshow
        mlbparks
        parksmap
          1.0
            parksmap-1.0.jar
            parksmap-1.0.jar.md5
            parksmap-1.0.jar.sha1
            parksmap-1.0.pom
            parksmap-1.0.pom.md5
            parksmap-1.0.pom.sha1
          maven-metadata.xml
          maven-metadata.xml.md5
          maven-metadata.xml.sha1
```

The Unit tests / Coverage tests / Integration test results are available in the Jenkins build log here:

https://jenkins-mitzicom-jenkins.apps.na37.openshift.opentlc.com/job/parksMap_pipeline/2/consoleFull

https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/pipeline_results/parksmap/pipeline_build_log

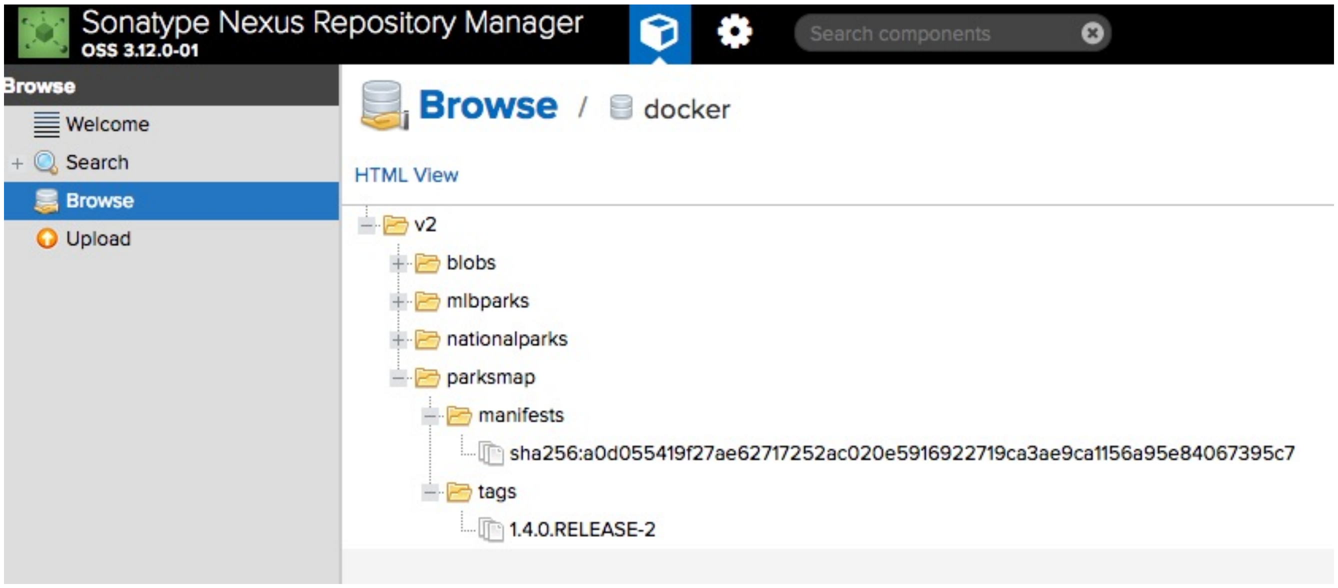
SonarQube was able to apply code analysis on the build artifact:


parksMap_pipeline-1.4.0.RELEASE-2 Passed

Last analysis: June 9, 2018, 6:54 PM

Bugs	Vulnerabilities	Code Smells	Coverage	Duplications	Java
0 A	0 A	34 A	0.0%	0.0%	798 XS

The tested container was successfully uploaded to the Nexus Docker repository:



```
v2
  blobs
  mlbparks
  nationalparks
  parksmap
    manifests
      sha256:a0d055419f27ae62717252ac020e5916922719ca3ae9ca1156a95e84067395c7
    tags
      1.4.0.RELEASE-2
```

7.0 Deployment Pipeline

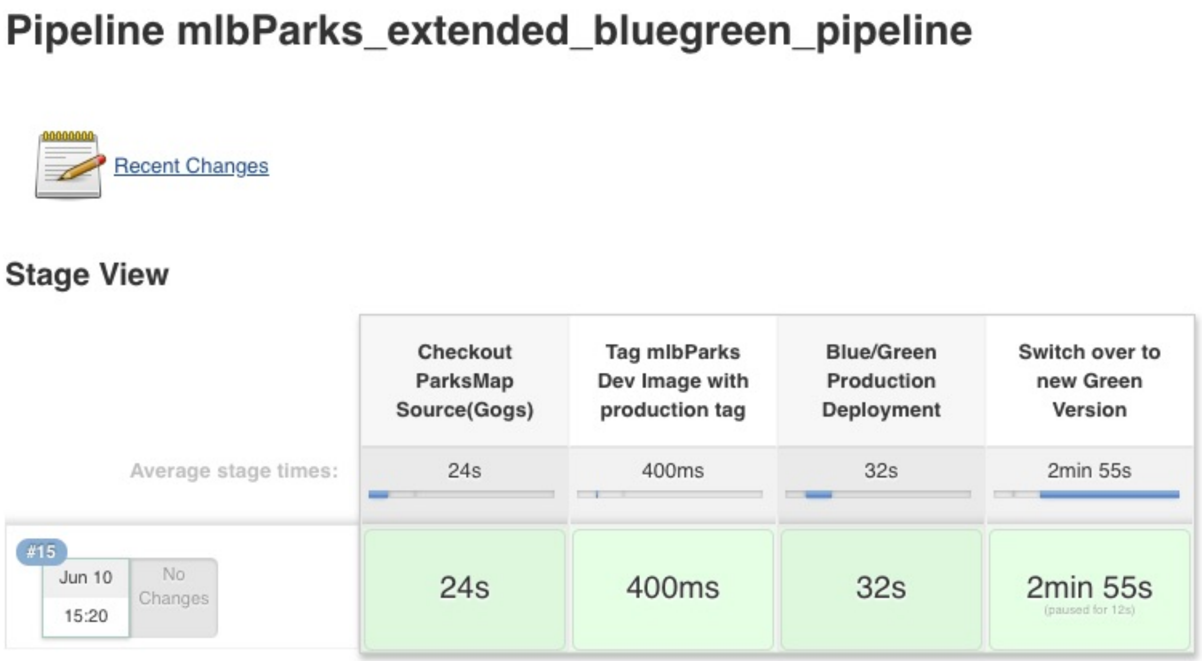
The Deployment Pipeline included the following additions:

- Tags the image as 'version' for production deployment
- Deploys only the newly built microservice using a blue-green strategy
- Waits for approval to execute the final go-live switch
- Jenkins pipeline switches the route to the newly built microservice

Note: The Shared OpenTLC Openshift environment did not have sufficient memory resources to run all the CI/CD tooling and the development and production environments simultaneously. Therefore to work around this constraint and still demonstrate a blue/green deployment, I created an extended pipeline just for Production that only worked with the Development resources switched off. As these extended pipelines built upon the original pipeline scripts they expected all the development pipeline stages to have completed successfully.

mlbparks pipeline extended
The Jenkins file is available here: https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/jenkins/mlparks_extended_bluegreen_pipeline_script

The pipeline successfully ran from start to finish:



Pipeline mlbParks_extended_bluegreen_pipeline

Recent Changes

Stage View

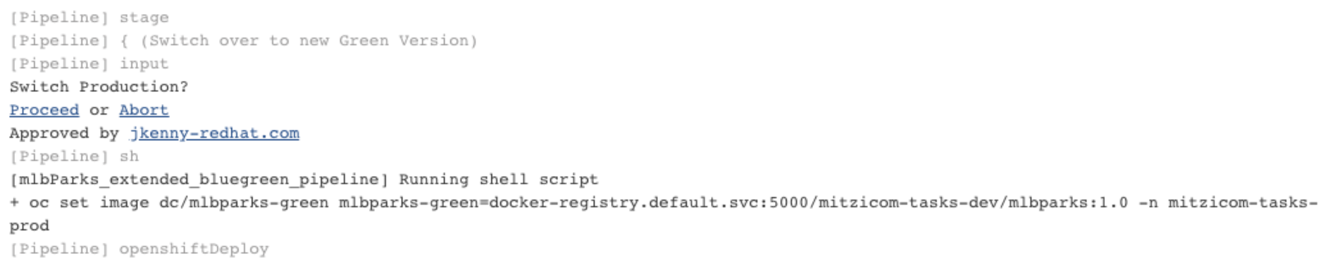
	Checkout ParksMap Source(Gogs)	Tag mlbParks Dev Image with production tag	Blue/Green Production Deployment	Switch over to new Green Version
Average stage times:	24s	400ms	32s	2min 55s
#15 Jun 10 15:20 No Changes	24s	400ms	32s	2min 55s (paused for 12s)

The Jenkins build log is available here:

https://jenkins-mitzicom-jenkins.apps.na37.openshift.opentlc.com/job/mlbParks_extended_bluegreen_pipeline/15/console

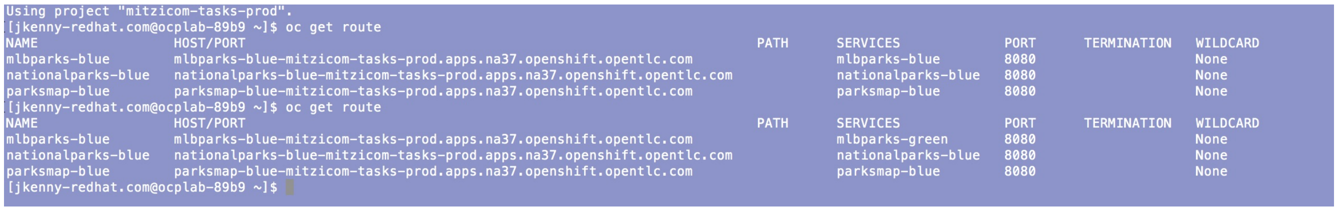
https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/pipeline_results/mlbparks/blue_green/pipeline_build_log

The pipeline Waits for approval to execute the final go-live switch



```
[Pipeline] stage
[Pipeline] { (Switch over to new Green Version)
[Pipeline] input
Switch Production?
Proceed or Abort
Approved by jkenny-redhat.com
[Pipeline] sh
[mlbParks_extended_bluegreen_pipeline] Running shell script
+ oc set image dc/mlbparks-green mlbparks-green=docker-registry.default.svc:5000/mitzicom-tasks-dev/mlbparks:1.0 -n mitzicom-tasks-
prod
[Pipeline] openshiftDeploy
```

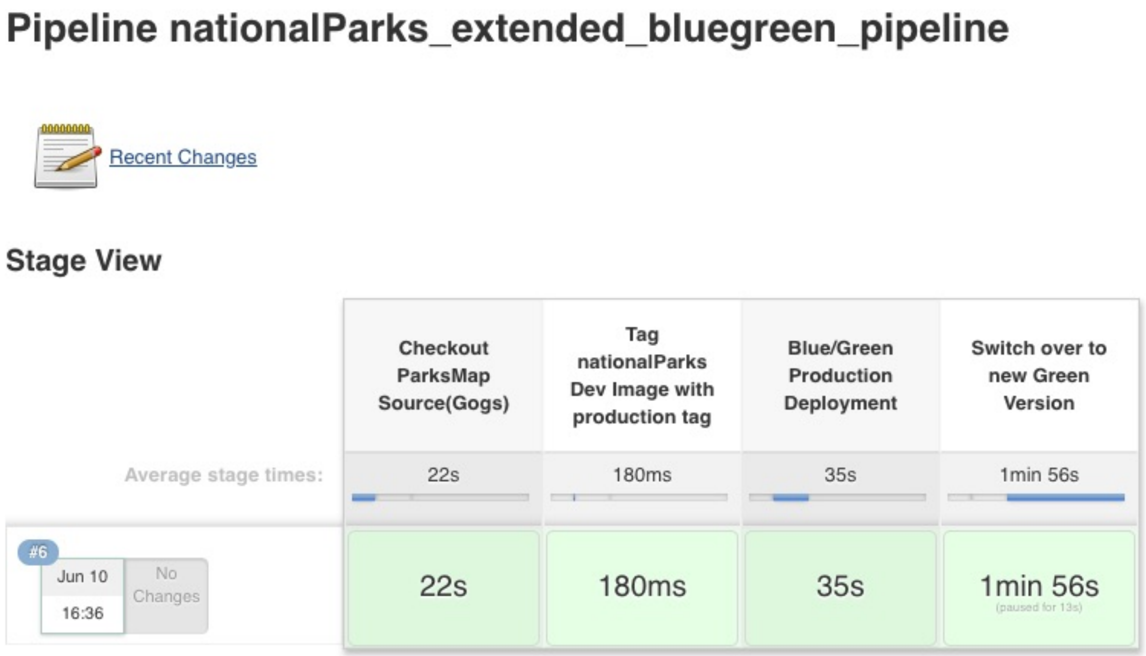
Jenkins pipeline switches the route to the newly built microservice



```
Using project "mitzicom-tasks-prod".
[jkenny-redhat.com@ocplab-89b9 ~]$ oc get route
NAME                HOST/PORT                                                         PATH      SERVICES            PORT      TERMINATION   WILDCARD
mlbparks-blue       mlbparks-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com             mlbparks-blue       8080                    None
nationalparks-blue  nationalparks-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com        nationalparks-blue  8080                    None
parksmap-blue       parksmap-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com             parksmap-blue       8080                    None
[jkenny-redhat.com@ocplab-89b9 ~]$ oc get route
NAME                HOST/PORT                                                         PATH      SERVICES            PORT      TERMINATION   WILDCARD
mlbparks-blue       mlbparks-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com             mlbparks-green      8080                    None
nationalparks-blue  nationalparks-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com        nationalparks-blue  8080                    None
parksmap-blue       parksmap-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com             parksmap-blue       8080                    None
[jkenny-redhat.com@ocplab-89b9 ~]$
```

nationalparks pipeline extended
The Jenkins file is available here: https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/jenkins/nationalParks_extended_bluegreen_pipeline_script

The pipeline successfully ran from start to finish:


Pipeline nationalParks_extended_bluegreen_pipeline

Recent Changes

Stage View

	Checkout ParksMap Source(Gogs)	Tag nationalParks Dev Image with production tag	Blue/Green Production Deployment	Switch over to new Green Version
Average stage times:	22s	180ms	35s	1min 56s
#6 Jun 10 16:36 No Changes	22s	180ms	35s	1min 56s (paused for 13s)

The Jenkins build log is available here:

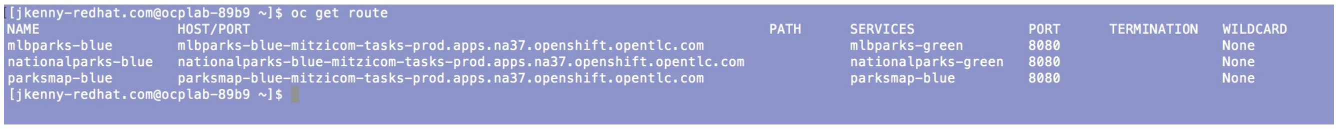
https://jenkins-mitzicom-jenkins.apps.na37.openshift.opentlc.com/job/nationalParks_extended_bluegreen_pipeline/6/console

https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/pipeline_results/mlbparks/blue_green/pipeline_build_log

The pipeline Waits for approval to execute the final go-live switch

```
[Pipeline] { (Switch over to new Green Version)
[Pipeline] input
Switch Production to Green application?
Proceed or Abort
Approved by jkenny-redhat.com
[Pipeline] sh
[nationalParks_extended_bluegreen_pipeline] Running shell script
+ oc set image dc/nationalparks-green nationalparks-green=docker-registry.default.svc:5000/mitzicom-tasks-
dev/nationalparks:1.4.0.RELEASE -n mitzicom-tasks-prod
[Pipeline] openshiftDeploy
```

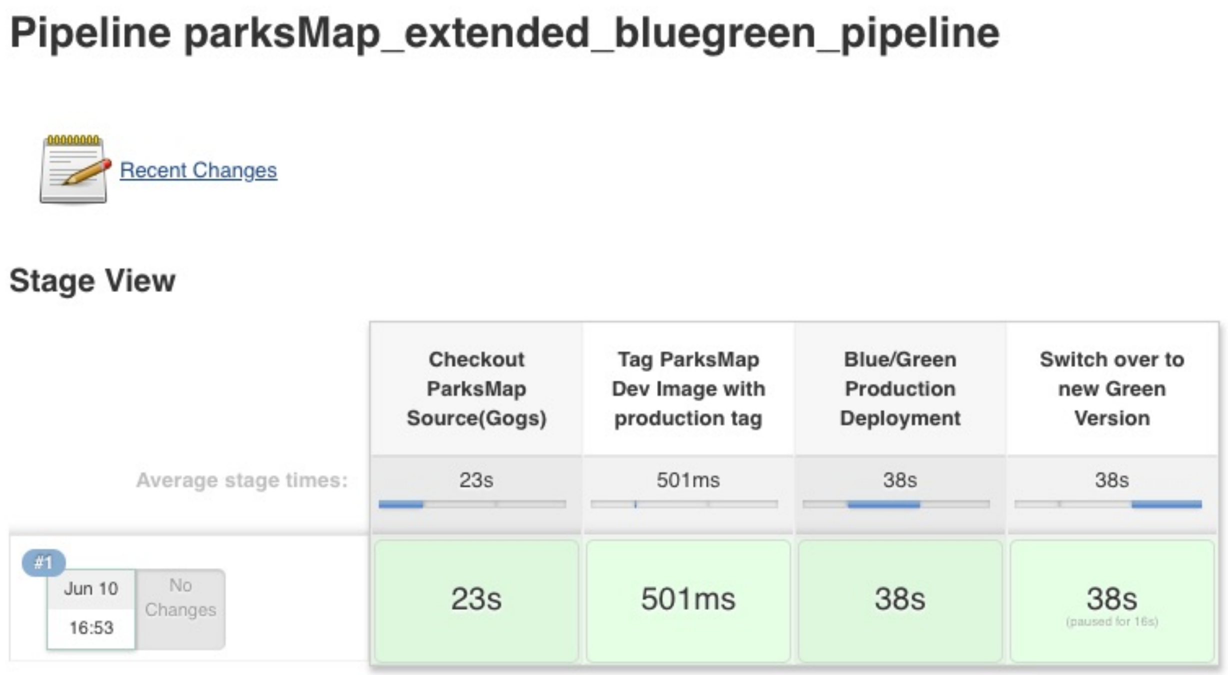
Jenkins pipeline switches the route to the newly built microservice



```
[jkenny-redhat.com@ocplab-89b9 ~]$ oc get route
NAME                HOST/PORT                                                  PATH      SERVICES             PORT      TERMINATION   WILDCARD
mlbparks-blue       mlbparks-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com               mlbparks-green       8080                    None
nationalparks-blue  nationalparks-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com          nationalparks-green  8080                    None
parksmap-blue       parksmap-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com               parksmap-blue        8080                    None
[jkenny-redhat.com@ocplab-89b9 ~]$
```

parksmap pipeline extended
The Jenkins file is available here: https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/jenkins/parksMap_extended_bluegreen_pipeline_script

The pipeline successfully ran from start to finish:



Pipeline parksMap_extended_bluegreen_pipeline

Recent Changes

Stage View

	Checkout ParksMap Source(Gogs)	Tag ParksMap Dev Image with production tag	Blue/Green Production Deployment	Switch over to new Green Version
Average stage times:	23s	501ms	38s	38s
#1 Jun 10 16:53 No Changes	23s	501ms	38s	38s (paused for 16s)

The Jenkins build log is available here:

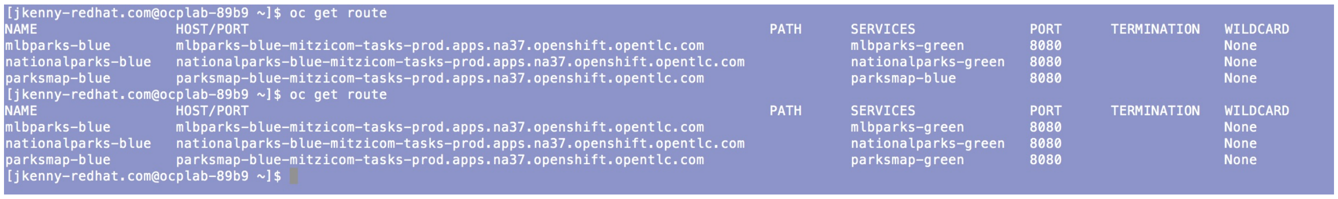
https://jenkins-mitzicom-jenkins.apps.na37.openshift.opentlc.com/job/parksMap_extended_bluegreen_pipeline/1/console

https://raw.githubusercontent.com/jockeney/MitziCom-POC/master/Openshift/pipeline_results/parksmap/blue_green/pipeline_build_log

The pipeline Waits for approval to execute the final go-live switch

```
[Pipeline] { (Switch over to new Green Version)
[Pipeline] input
Switch Production to Green application?
Proceed or Abort
Approved by jkenny-redhat.com
[Pipeline] sh
[parksMap_extended_bluegreen_pipeline] Running shell script
+ oc set image dc/parksmap-green parksmap-green=docker-registry.default.svc:5000/mitzicom-tasks-dev/parksmap:1.4.0.RELEASE -n
mitzicom-tasks-prod
deploymentconfig "parksmap-green" image updated
[Pipeline] openshiftDeploy
```

Jenkins pipeline switches the route to the newly built microservice



```
[jkenny-redhat.com@ocplab-89b9 ~]$ oc get route
NAME                 HOST/PORT                                                                PATH      SERVICES              PORT      TERMINATION   WILDCARD
mlbparks-blue        mlbparks-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com                  mlbparks-green        8080                    None
nationalparks-blue   nationalparks-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com             nationalparks-green   8080                    None
parksmap-blue        parksmap-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com                  parksmap-blue         8080                    None
[jkenny-redhat.com@ocplab-89b9 ~]$ oc get route
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parksmap-blue        parksmap-blue-mitzicom-tasks-prod.apps.na37.openshift.opentlc.com                  parksmap-green        8080                    None
[jkenny-redhat.com@ocplab-89b9 ~]$
```