# County of Los Angeles Internal Services Department (ISD)

## OpenShift Storage Automation with Container-native Storage

Roya Vafadar, IT Specialist
Annette Clewett, Red Hat Storage Sr. Architect
May 10, 2018

# Forbes

## #133 County of Los Angeles

| | |
|---|---|
| Industries | Government Services |
| Country | United States |
| Website | http://www.lacounty.gov |
| Employees | 107,500 |
| Headquarters | Los Angeles, California |

**County of Los Angeles on Forbes Lists**

#133 America's Best Employers

# LACounty Video



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# Internal Services Department (ISD)

- Centrally support services for LA County Departments
- Provide  IT services, including managing the Countywide Data Center facilities, with 1100+ IT professionals
- Objective – To service all citizens of Los Angeles County
- Focus - Provide our customers (County Department's) with highest quality of service and reliable access to applications, data and technology
- Our Mission - Trusted Partner and Provider of Choice

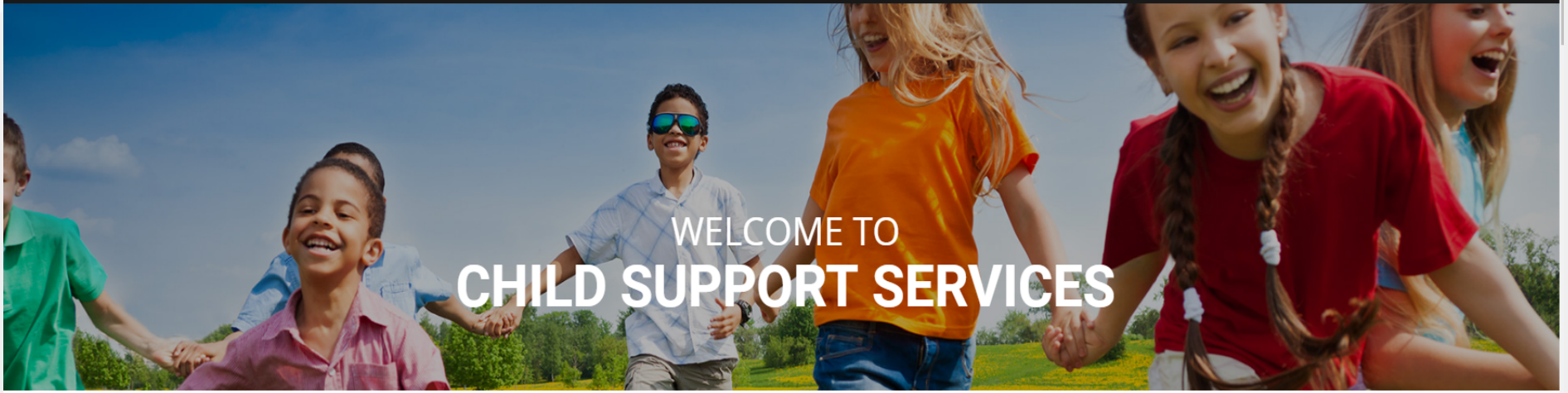
# Internal Services Dept. Supports

- 39 County Departments and supporting agencies who provide services to more than 11 million users
- 3500+ Virtual Machines
- 500+ Websites

LOS ANGELES COUNTY
# CHILD SUPPORT SERVICES

*"To enrich our community by providing child support services in an efficient, effective and professional manner, one family at a time."*

TELL ME ABOUT | QUICK LINKS | PARENTS & CARETAKERS | EMPLOYERS | LEGAL CORNER | TITLE COMPANIES | FAQS | ABOUT US | VIDEOS




We are responsible for establishing and enforcing support orders when a child receives public assistance or when a parent or legal caretaker requests our services. We act in the "public interest" and do not represent any individual. Our services include: opening a case; finding parents; establishing a legal parent-child relationship; establishing child and medical support orders; and enforcing support orders. We provide these services at no or little cost to you.

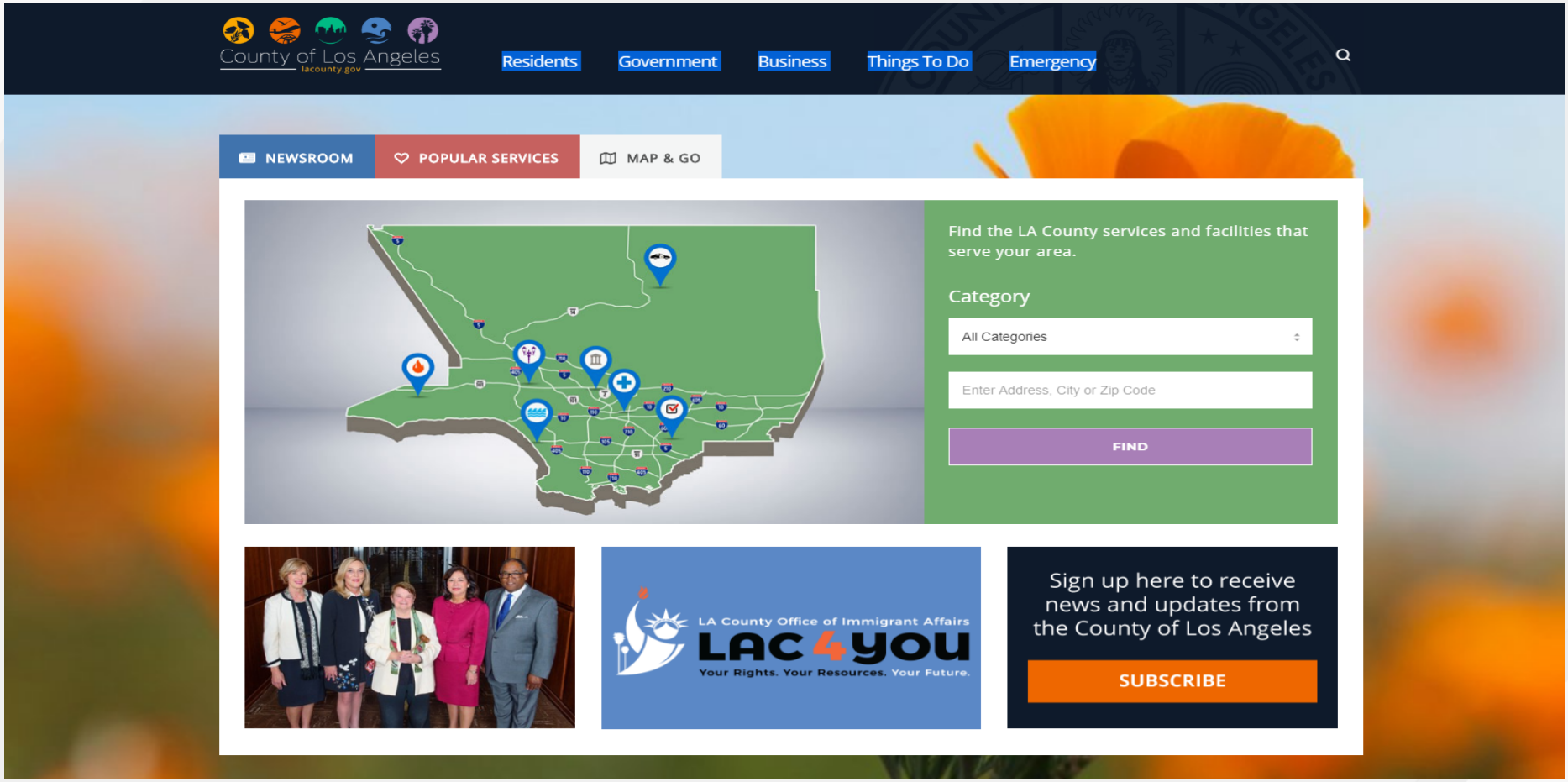
All issues regarding a child support case can often be resolved without you having to go to court. This is one reason it is important that you stay in contact with our office once a case has been opened.

LOS ANGELES COUNTY DEPARTMENT OF
Mental Health
hope. recovery. wellbeing.
Search...
Mental Health Help 24/7
800-854-7771
ABOUT DMH
OUR SERVICES
FOR PROVIDERS
CONTRACT OPPORTUNITIES
PRESS CENTER
CLIENT PORTAL
Las Enfermedades Mentales
Nos Afectan a Todos
Para Ayuda Llame al
1-800-854-7771
24/7 Mental Health Helpline
VER VIDEO
If you need mental health help, don't wait
Life-Threatening Emergencies
CALL 9-1-1
For other mental health needs:
Get Help 24/7
800-854-7771
LOCATE MENTAL HEALTH SERVICES

LOS ANGELES COUNTY
OFFICE OF
CANNABIS MANAGEMENT


HOME
ABOUT
NEWS
DRAFT POLICIES
FAQ
PUBLIC LISTENING SESSIONS
ADVISORY GROUP
REPORTING ILLEGAL DISPENSARIES
PERSONAL CULTIVATION
CONSUMERS
PARENTS AND TEENS

TOW-AWAY
NO STOPPING
ANY TIME
ONE WAY
EL PUEBLO
Civic Center
Historic Downtown
Alisa St
The Los Angeles County
HOMELESS INITIATIVE
REAL HELP. LASTING CHANGE.
Supportive Housing
Recuperative Care
Expanded Outreach
Help From Landlords
Los Angeles County Homeless Initiative Impact Dashboard
Thousands of individuals and families have been helped through our dynamic Countywide movement to combat and prevent homelessness. See the significant steps being made to advance our efforts through the Impact Dashboard.


County of Los Angeles
lacounty.gov
Residents
Government
Business
Things To Do
Emergency
NEWSROOM
POPULAR SERVICES
MAP & GO
Find the LA County services and facilities that serve your area.
Category
All Categories
Enter Address, City or Zip Code
FIND
LA County Office of Immigrant Affairs
LAC 4 you
Your Rights. Your Resources. Your Future.
Sign up here to receive news and updates from the County of Los Angeles
SUBSCRIBE

# Hosting Websites on Mainframe

- Hosting with WebSphere started in 2008
- Challenges

  Stop all services to apply updates

  Code Deployment scheduled once a week

  Onboarding process is typically 1 month

# Hosting Websites on VMs

- Hosting with LAMP stack started in 2015
- Challenges

  Need for multiple VMs (Web, DB) for production

  Patching, upgrades of multiple servers

  Cost of other environments (Dev/Test/QA,...)

  Takes minimum of one week to deliver to customer

# Why OpenShift?

The need for automation

- Faster provisioning and deployment
- Easy to use
- Quick recovery
- Standardizing images
- Self-service offerings

# Speed up Service Delivery with OpenShift

Consistent Environment

On-demand Infrastructure

Automated Build & Deploy

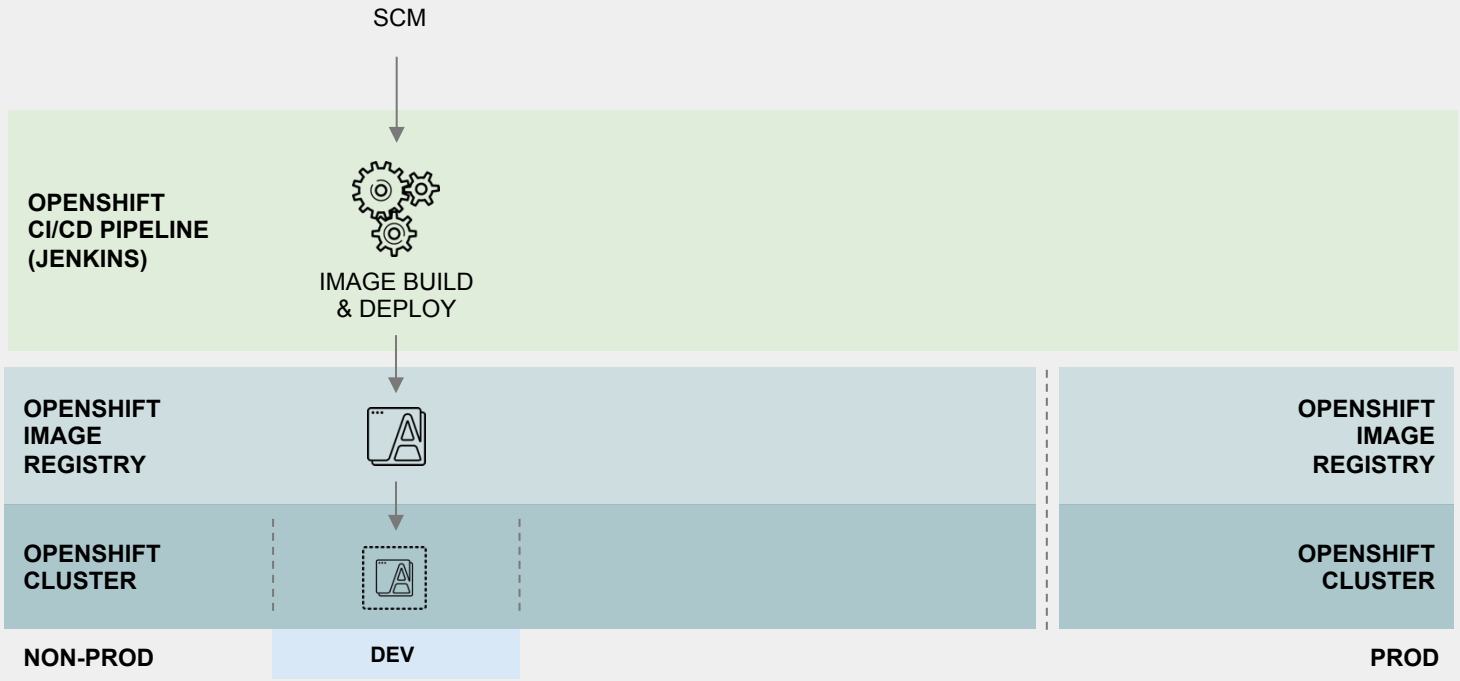
Delivery Pipeline

Security First

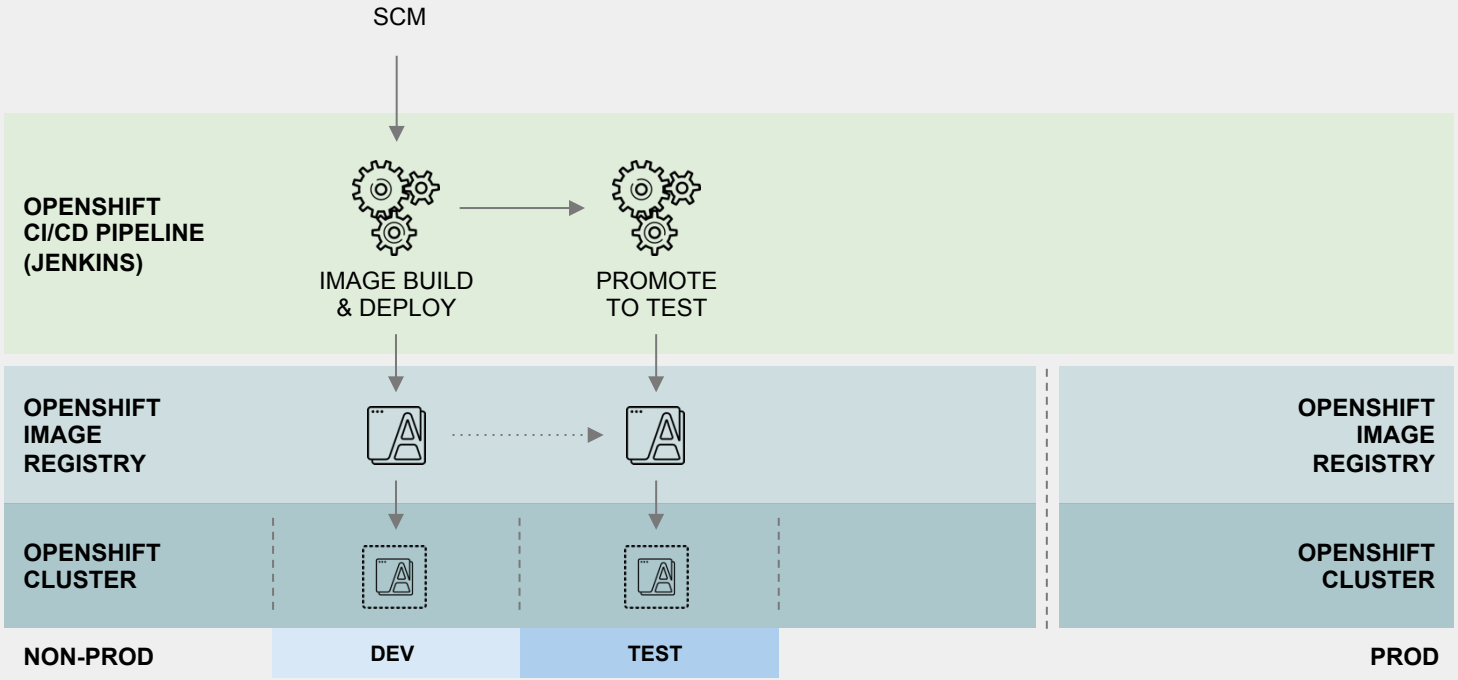
Unified Ops Model

RED HAT® OPENSHIFT

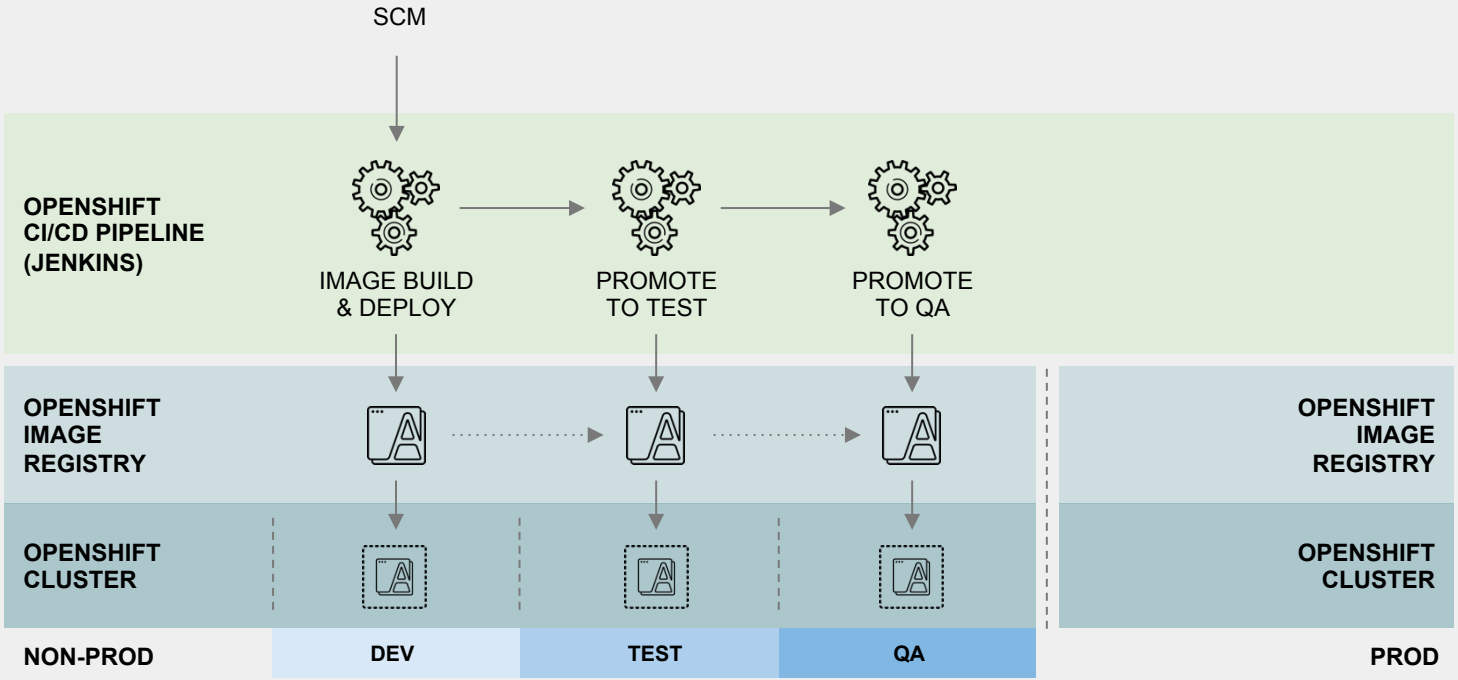
# Deployment with OpenShift



# Deployment with OpenShift



# Deployment with OpenShift



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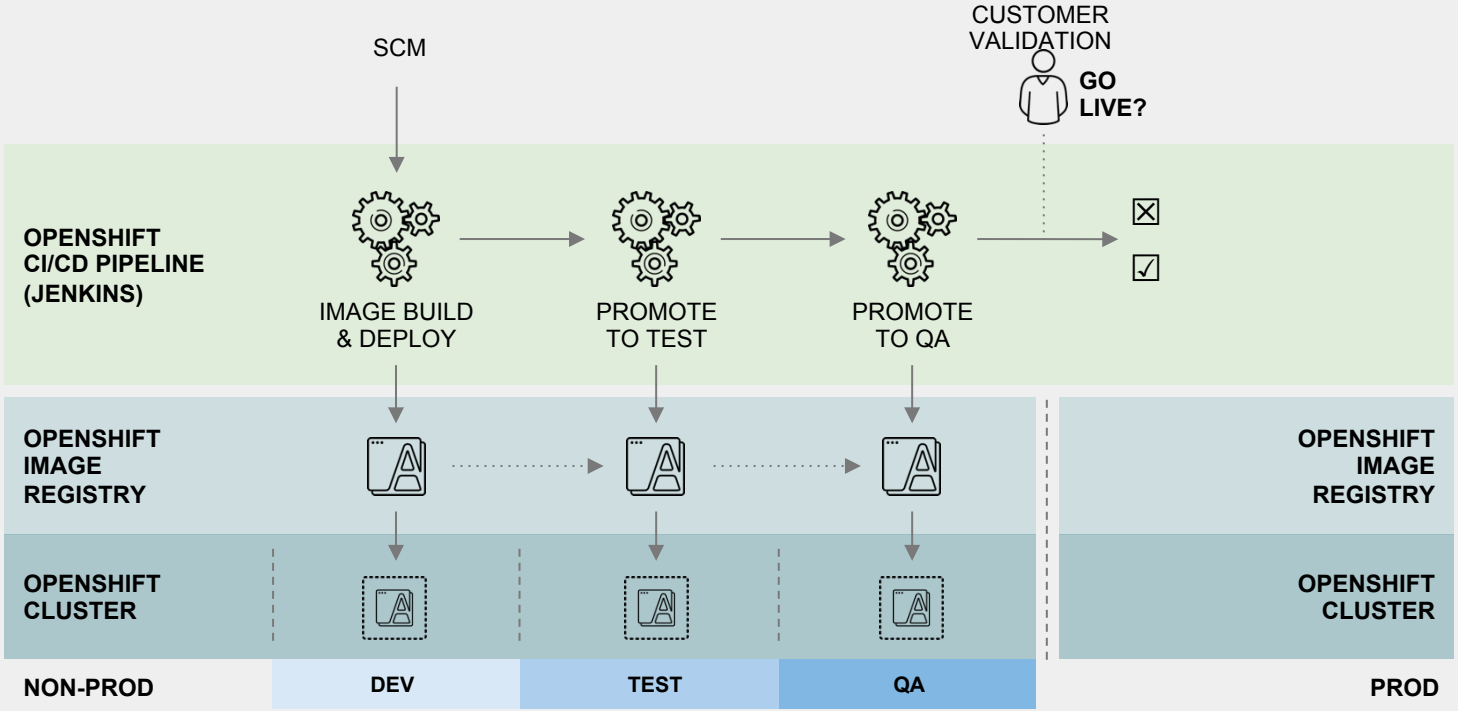
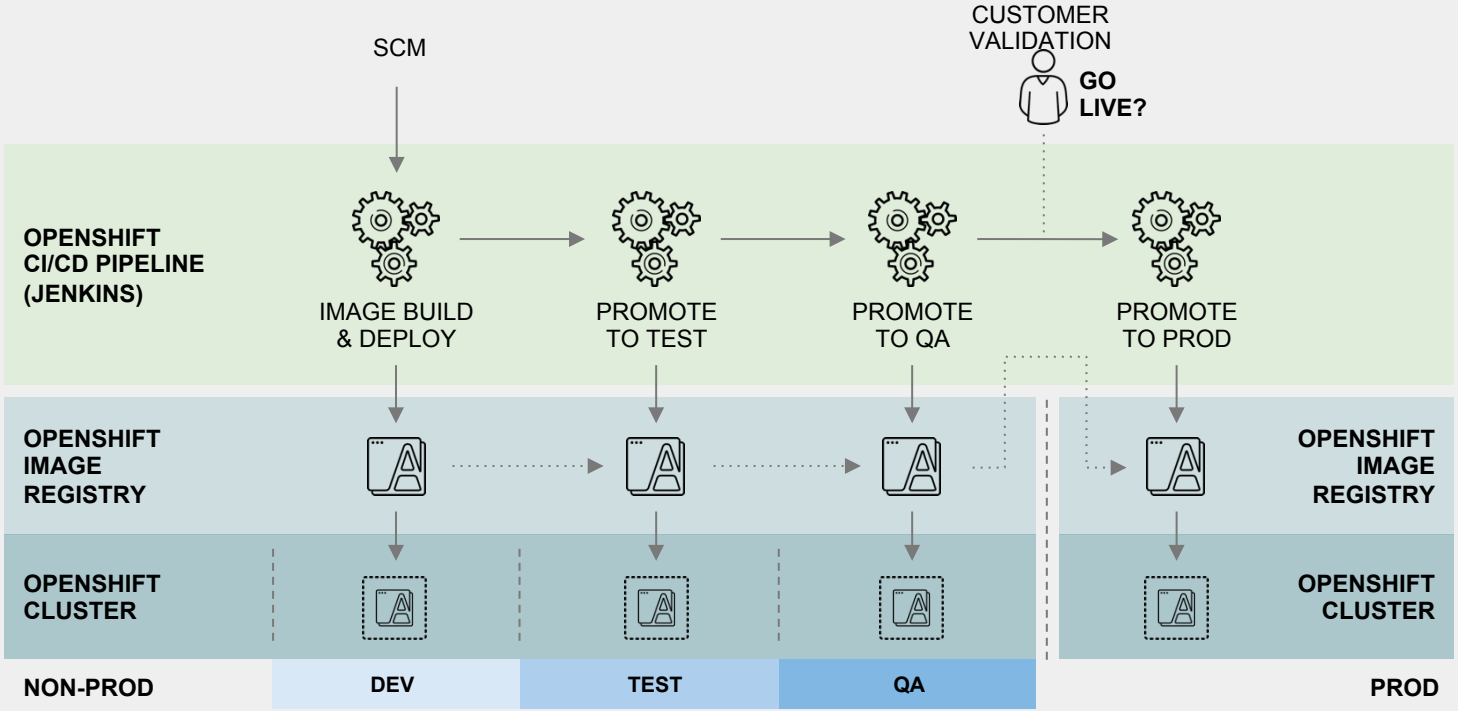


# Deployment with OpenShift



# OpenShift Cluster with NFS Storage

- Manually create/delete NFS exports for each environment (DEV, TEST, QA, PROD)
- Manually create corresponding OpenShift persistent volumes
- Single point of failure

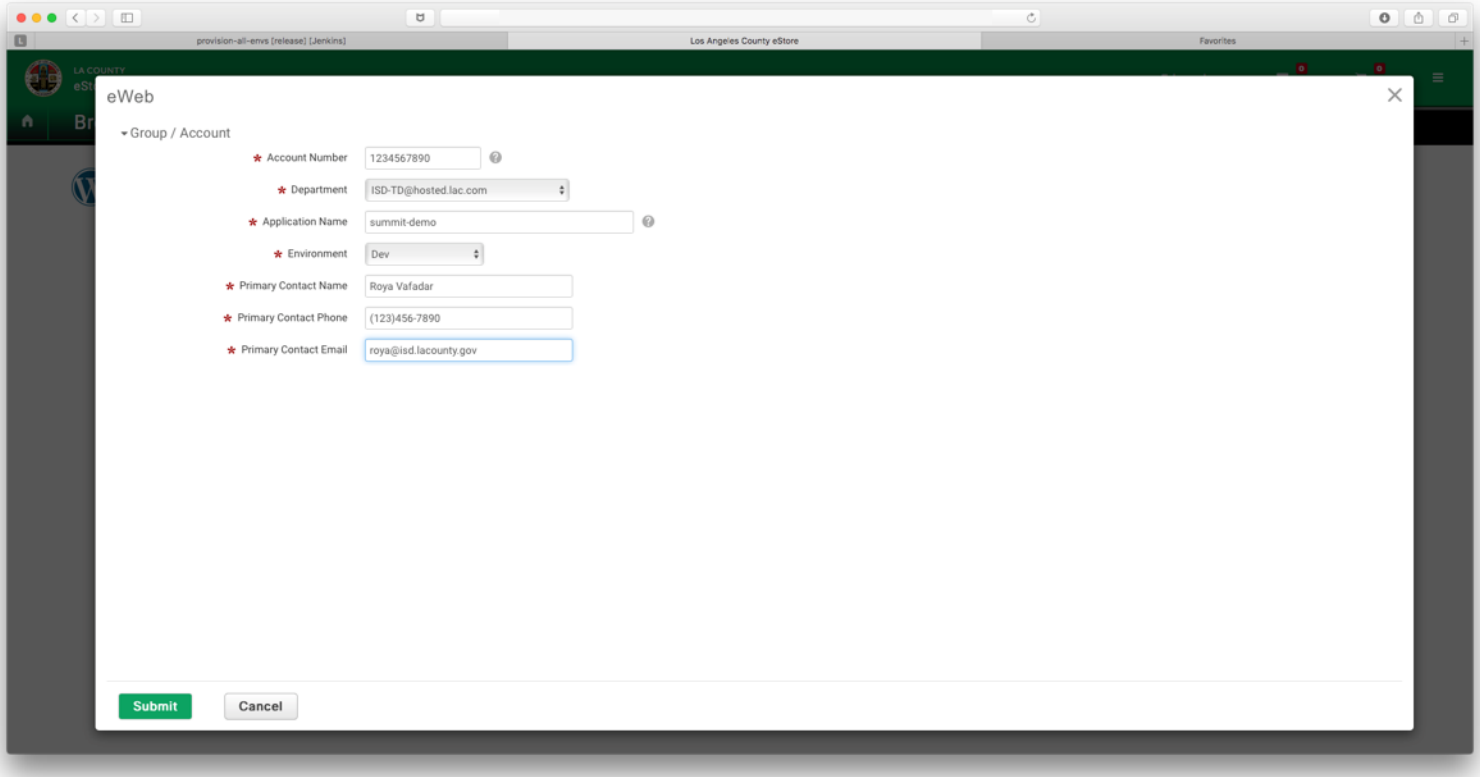
# OpenShift Cluster with GlusterFS

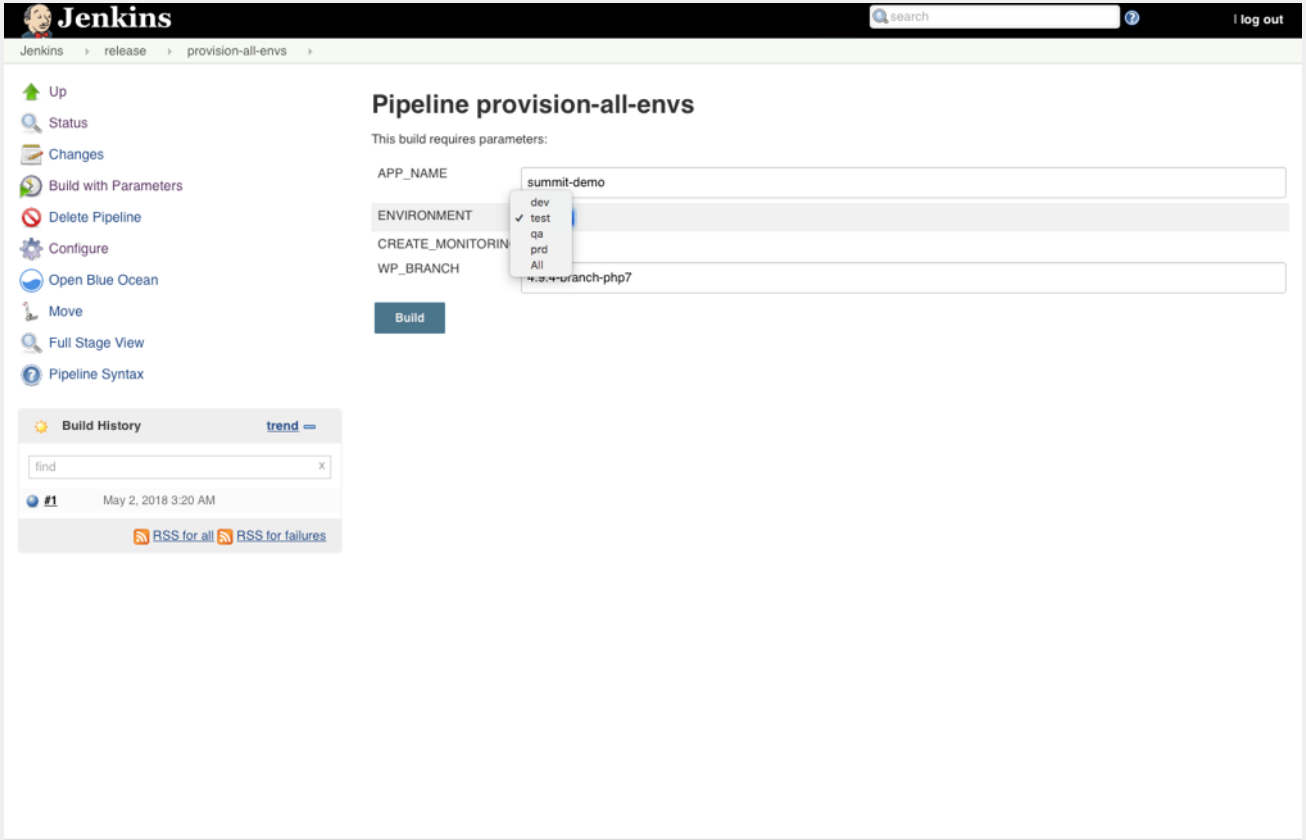
- Persistent volumes are automatically created/deleted using GlusterFS
- Define storage class in the OpenShift template with GlusterFS
- High availability

# What are we working on?

Using Jenkins and GlusterFS:

- 1-Click Project Provisioning
- More frequent updates
- Blue/Green Deployment


provision-all-envs [release] [Jenkins]
Los Angeles County eStore
Favorites
eWeb
Group / Account
Account Number
1234567890
Department
ISD-TD@hosted.lac.com
Application Name
summit-demo
Environment
Dev
Primary Contact Name
Roya Vafadar
Primary Contact Phone
(123)456-7890
Primary Contact Email
roya@isd.lacounty.gov
Submit
Cancel


Jenkins
search
log out
Jenkins
release
provision-all-envs
Up
Status
Changes
Build with Parameters
Delete Pipeline
Configure
Open Blue Ocean
Move
Full Stage View
Pipeline Syntax
Build History
trend
find
#1
May 2, 2018 3:20 AM
RSS for all
RSS for failures
Pipeline provision-all-envs
This build requires parameters:
APP_NAME
summit-demo
ENVIRONMENT
dev
test
qa
prd
All
CREATE_MONITORIN
WP_BRANCH
Build

## Stage View

| | Copy SCM Creds | Creating Application | Sending out email |
|---|---|---|---|
| Average stage times: (Average full run time: ~1min 52s) | 1s | 1min 27s | 1s |
| #80 Apr 20 14:26 No Changes | 730ms | | |
| | 1min 36s | | |
| #79 Apr 20 14:08 No Changes | 905ms | 1min 38s | 719ms |
| #78 Apr 19 20:21 No Changes | 839ms | 1min 55s | 5s |



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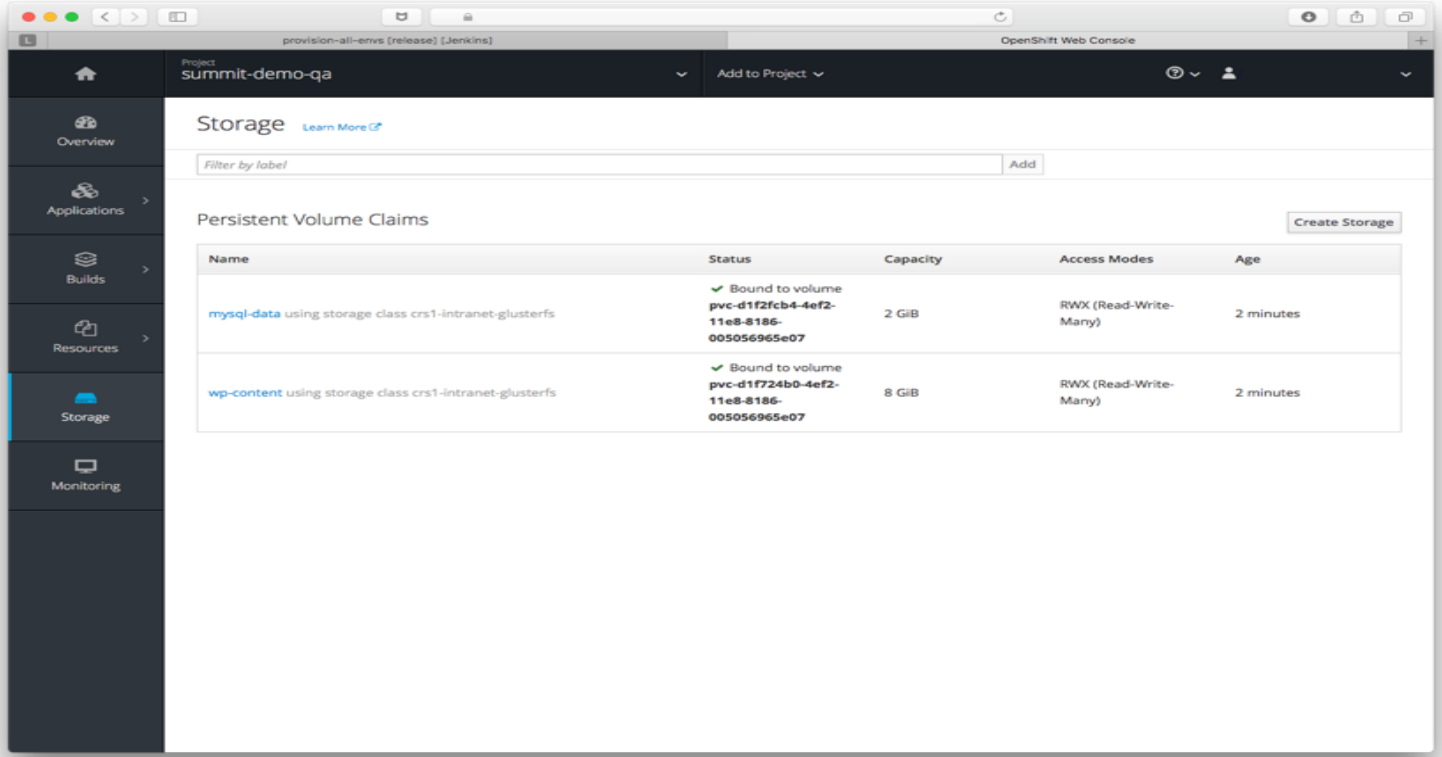
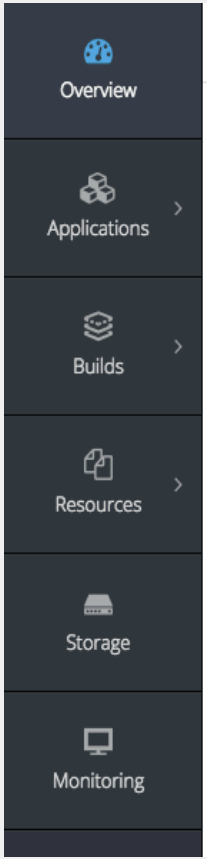

provision-all-envs [release] [Jenkins]
OpenShift Web Console
Project
summit-demo-qa
Add to Project
Overview
Applications
Builds
Resources
Storage
Monitoring
Storage
Learn More
Filter by label
Add
Persistent Volume Claims
Create Storage
Name
Status
Capacity
Access Modes
Age
mysql-data using storage class crs1-intranet-glusterfs
Bound to volume pvc-d1f2fcb4-4ef2-11e8-8186-005056965e07
2 GiB
RWX (Read-Write-Many)
2 minutes
wp-content using storage class crs1-intranet-glusterfs
Bound to volume pvc-d1f724b0-4ef2-11e8-8186-005056965e07
8 GiB
RWX (Read-Write-Many)
2 minutes

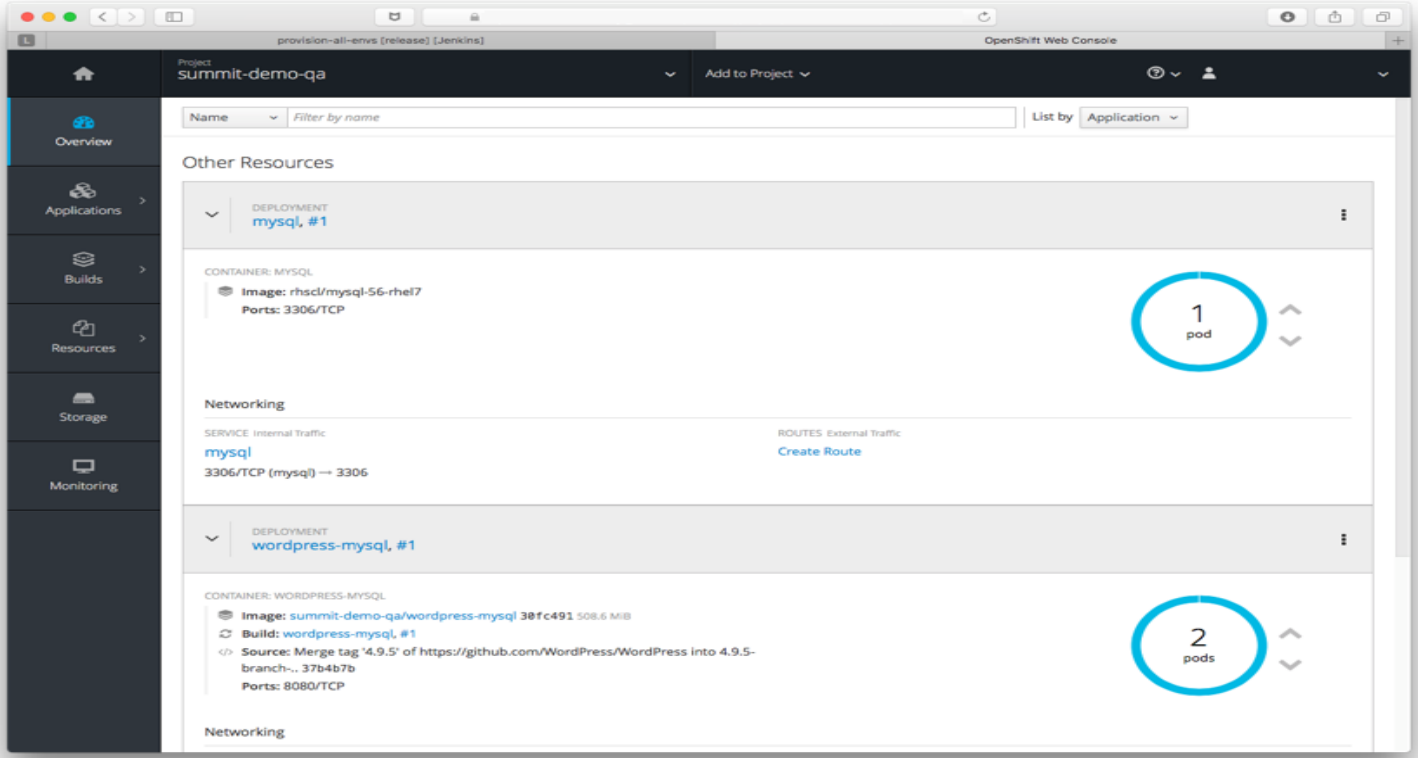



Name | Filter by name | List by Application

## Other Resources

DEPLOYMENT
mysql, #1
1 pod

DEPLOYMENT
wordpress-mysql
Builds 1
No deployments for wordpress-mysql


provision-all-envs [release] [Jenkins]
OpenShift Web Console
Project
summit-demo-qa
Add to Project
Overview
Applications
Builds
Resources
Storage
Monitoring
Name
Filter by name
List by
Application
Other Resources
DEPLOYMENT
mysql, #1
CONTAINER: MYSQL
Image: rhscl/mysql-56-rhel7
Ports: 3306/TCP
1
pod
Networking
SERVICE Internal Traffic
mysql
3306/TCP (mysql) → 3306
ROUTES External Traffic
Create Route
DEPLOYMENT
wordpress-mysql, #1
CONTAINER: WORDPRESS-MYSQL
Image: summit-demo-qa/wordpress-mysql 38fc491 508.6 MiB
Build: wordpress-mysql, #1
Source: Merge tag '4.9.5' of https://github.com/WordPress/WordPress into 4.9.5-branch-.. 37b4b7b
Ports: 8080/TCP
2
pods
Networking

# Build #80 (Apr 20, 2018 9:26:52 PM)

Progress:

Started 1 min 37 sec ago

add description

Started by user

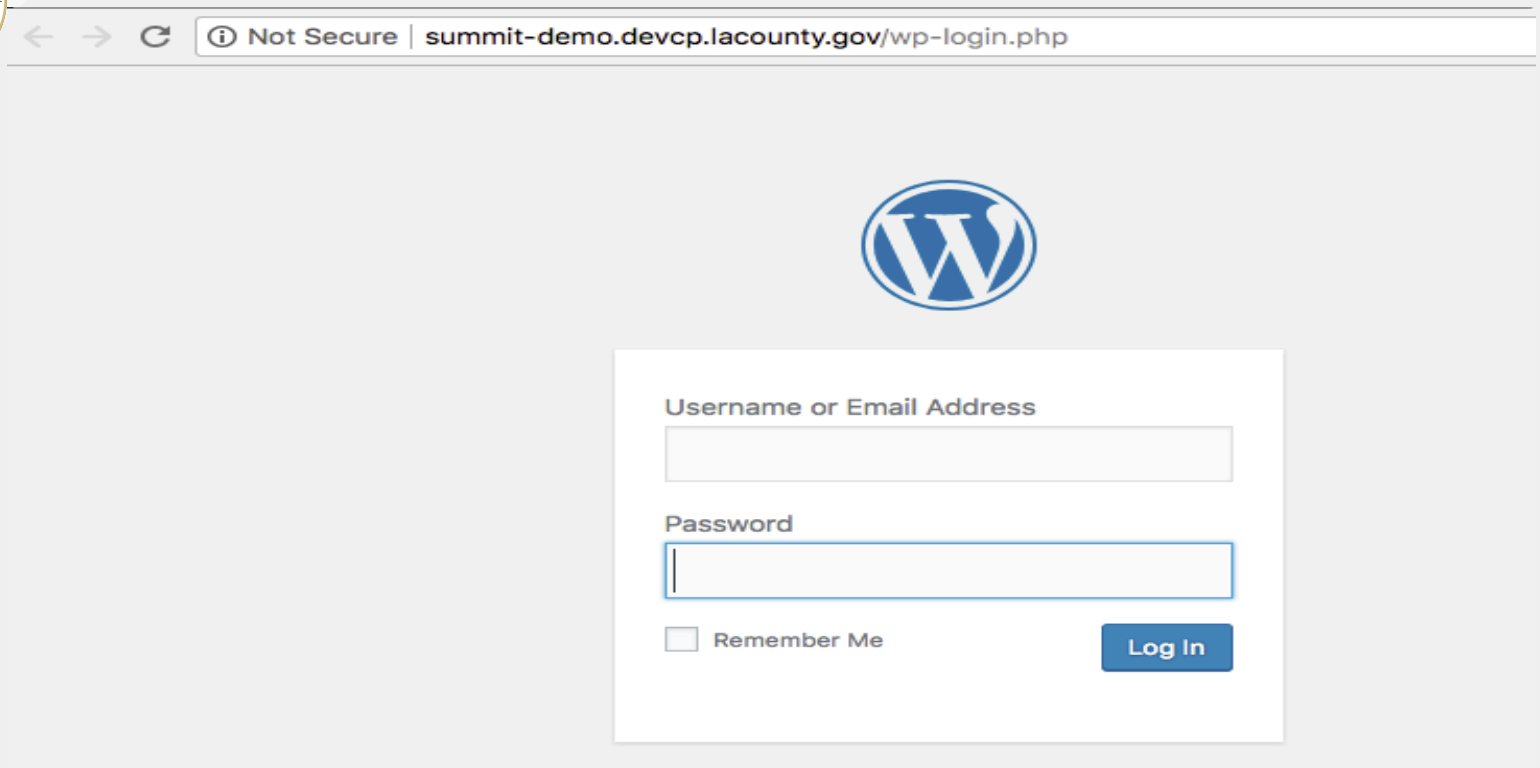
This run spent 1 ms waiting in the queue.

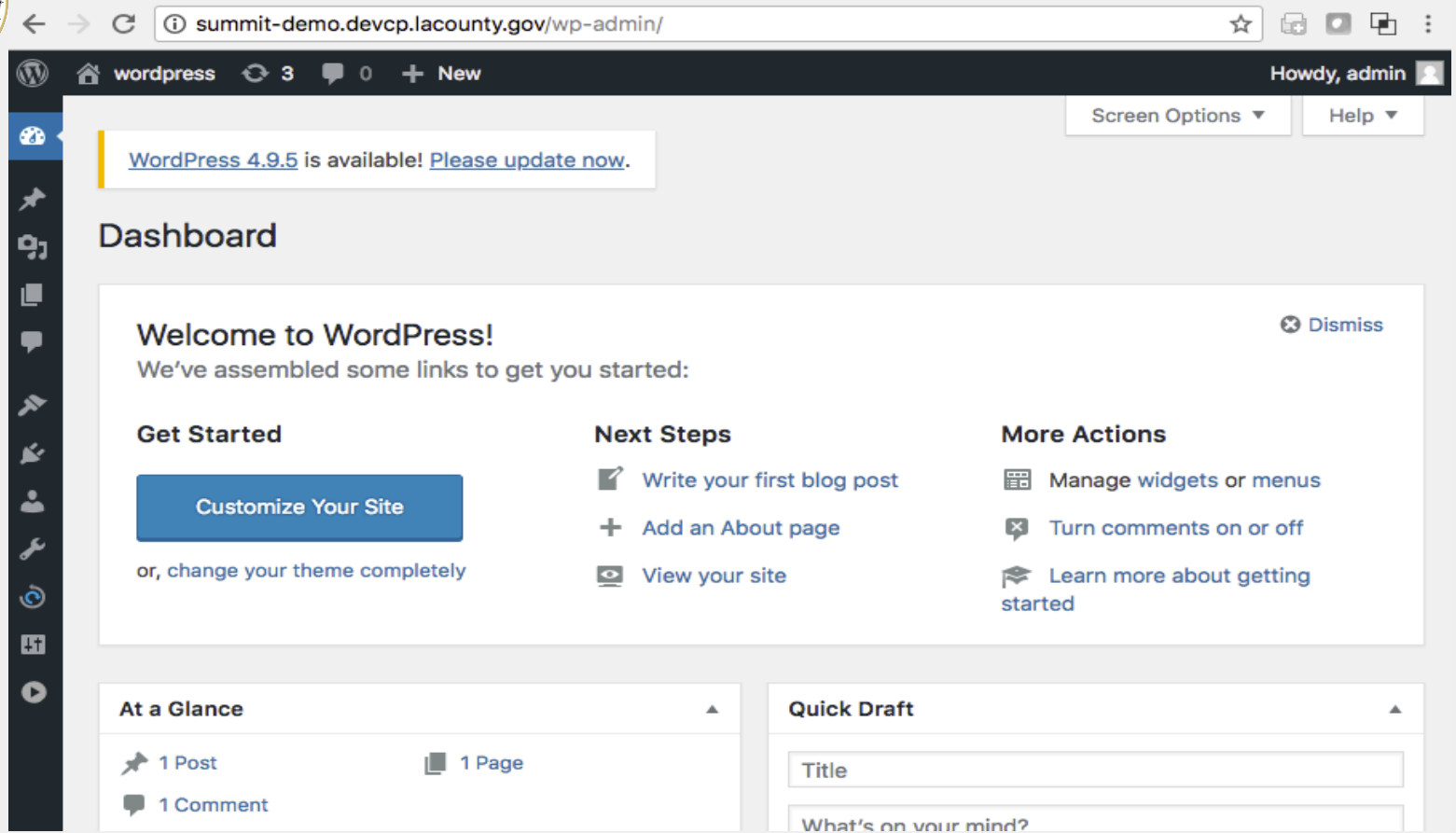
**Your WordPress instance is ready!**

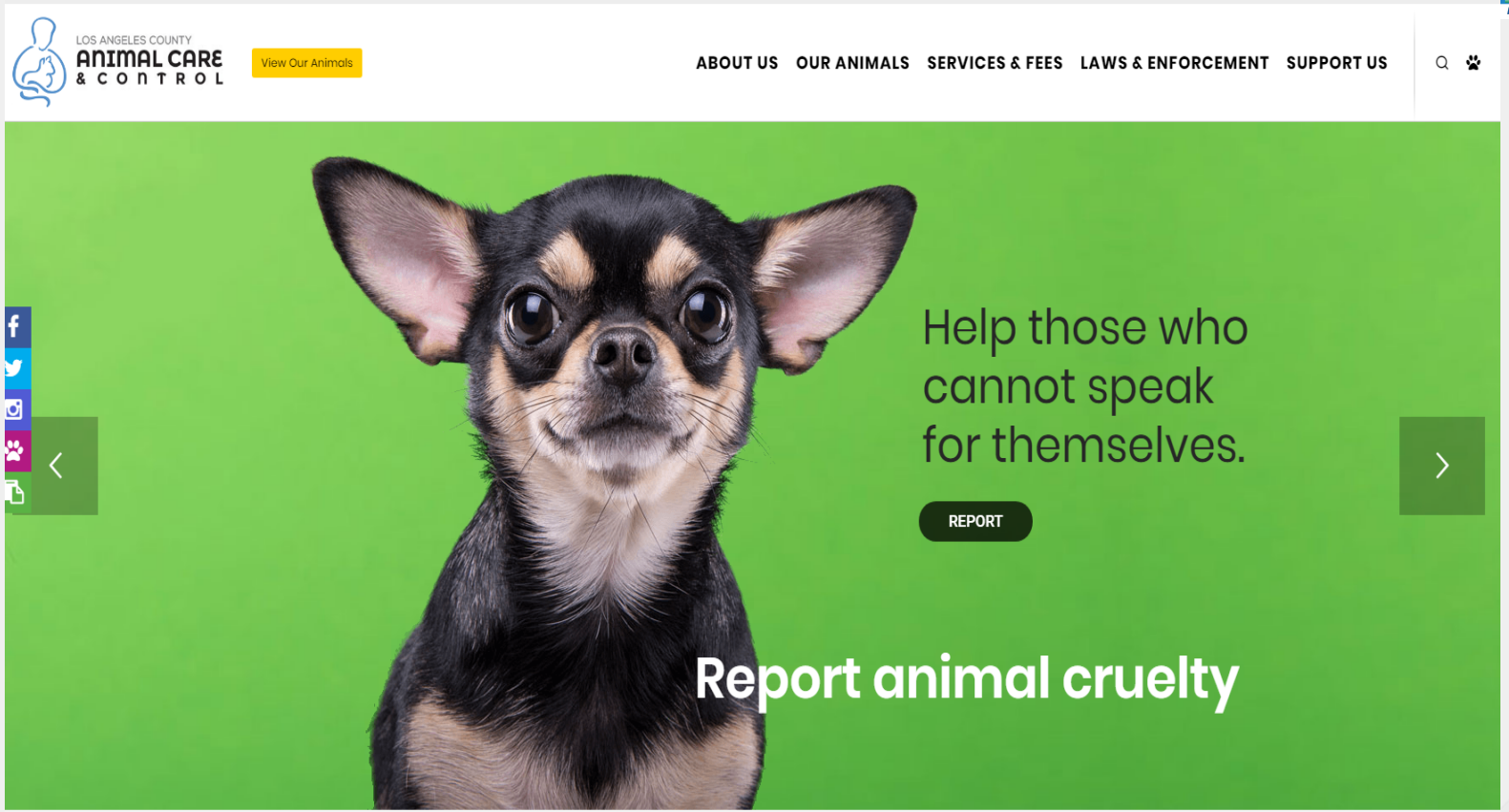
You can access your instance here: http://summit-demo/wp-login.php

**username** : admin
**password** : 4yqklghlg4uiy4lH)&*

Once logged in, you can import your site using the all-in-one-migration plugin tool.


Not Secure
summit-demo.devcp.lacounty.gov/wp-login.php
Username or Email Address
Password
Remember Me
Log In
Lost your password?
← Back to wordpress


summit-demo.devcp.lacounty.gov/wp-admin/
wordpress
3
0
New
Howdy, admin
Screen Options
Help
WordPress 4.9.5 is available! Please update now.
Dashboard
Welcome to WordPress!
We've assembled some links to get you started:
Dismiss
Get Started
Customize Your Site
or, change your theme completely
Next Steps
Write your first blog post
Add an About page
View your site
More Actions
Manage widgets or menus
Turn comments on or off
Learn more about getting started
At a Glance
1 Post
1 Page
1 Comment
Quick Draft
Title
What's on your mind?


LOS ANGELES COUNTY
ANIMAL CARE & CONTROL
View Our Animals
ABOUT US
OUR ANIMALS
SERVICES & FEES
LAWS & ENFORCEMENT
SUPPORT US
Help those who cannot speak for themselves.
REPORT
Report animal cruelty

Website Deployment
OpenShift
15
LA
M
0
5
10
20
25
30
35
Days
WOW!

# OpenShift Needs Two Kinds of Storage

**Persistent Storage**

**Ephemeral Storage**

**OCP Infrastructure**

Registry

Metrics

Logging

**Stateful Applications**

**Stateless Applications**

**pod image storage**



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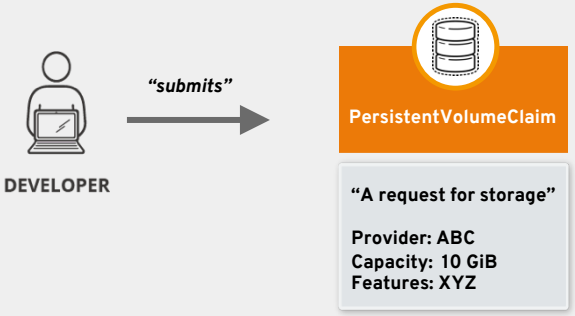
# OpenShift Persistent Storage Framework



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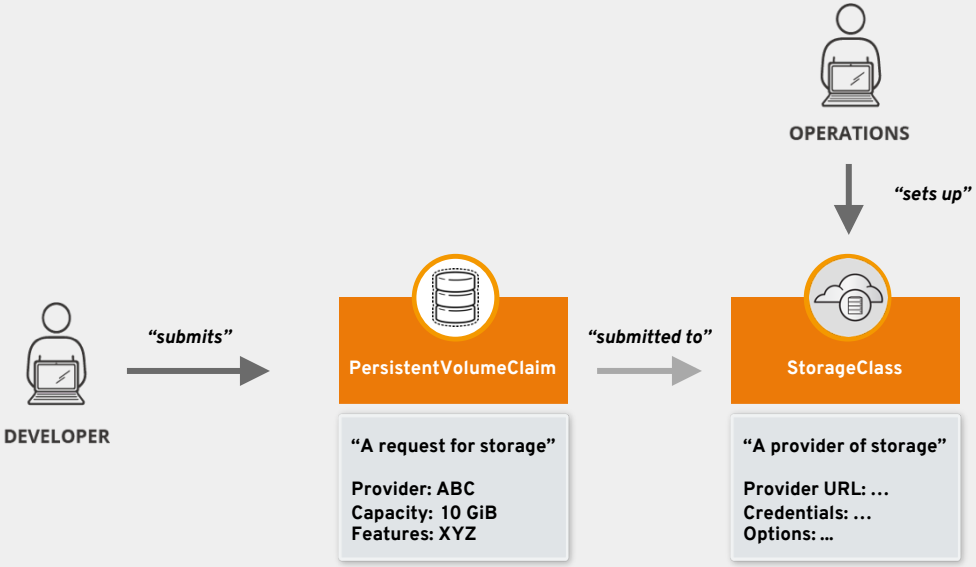




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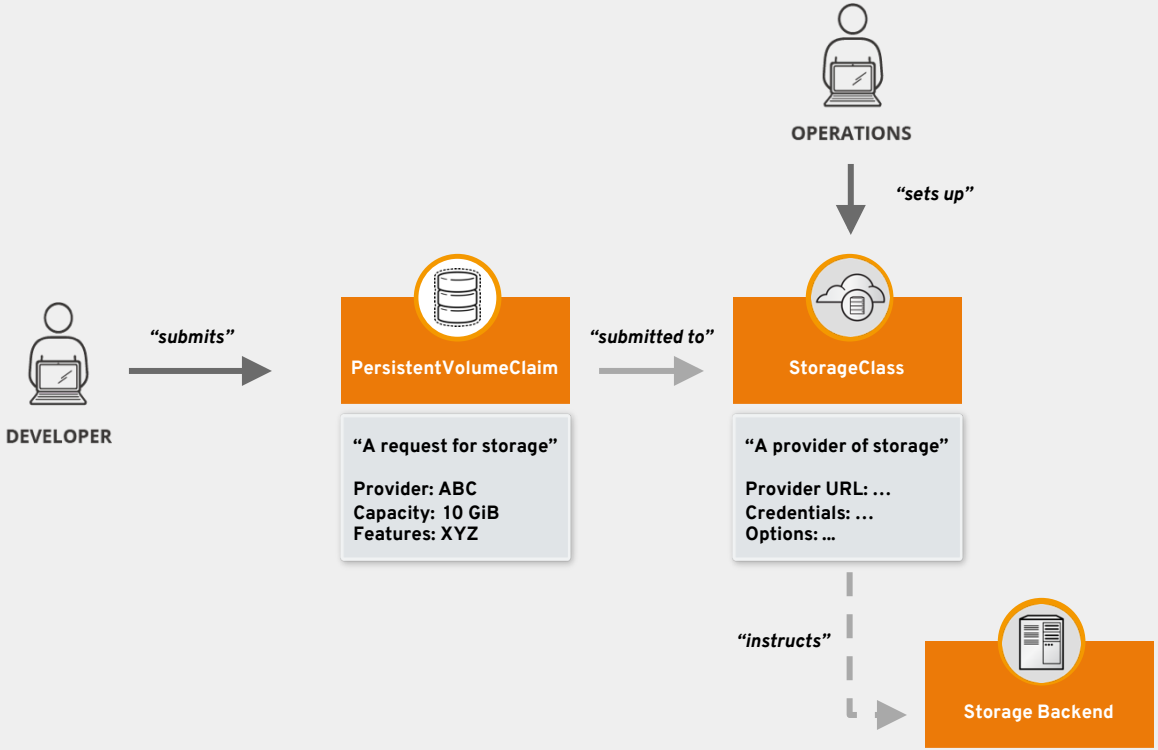




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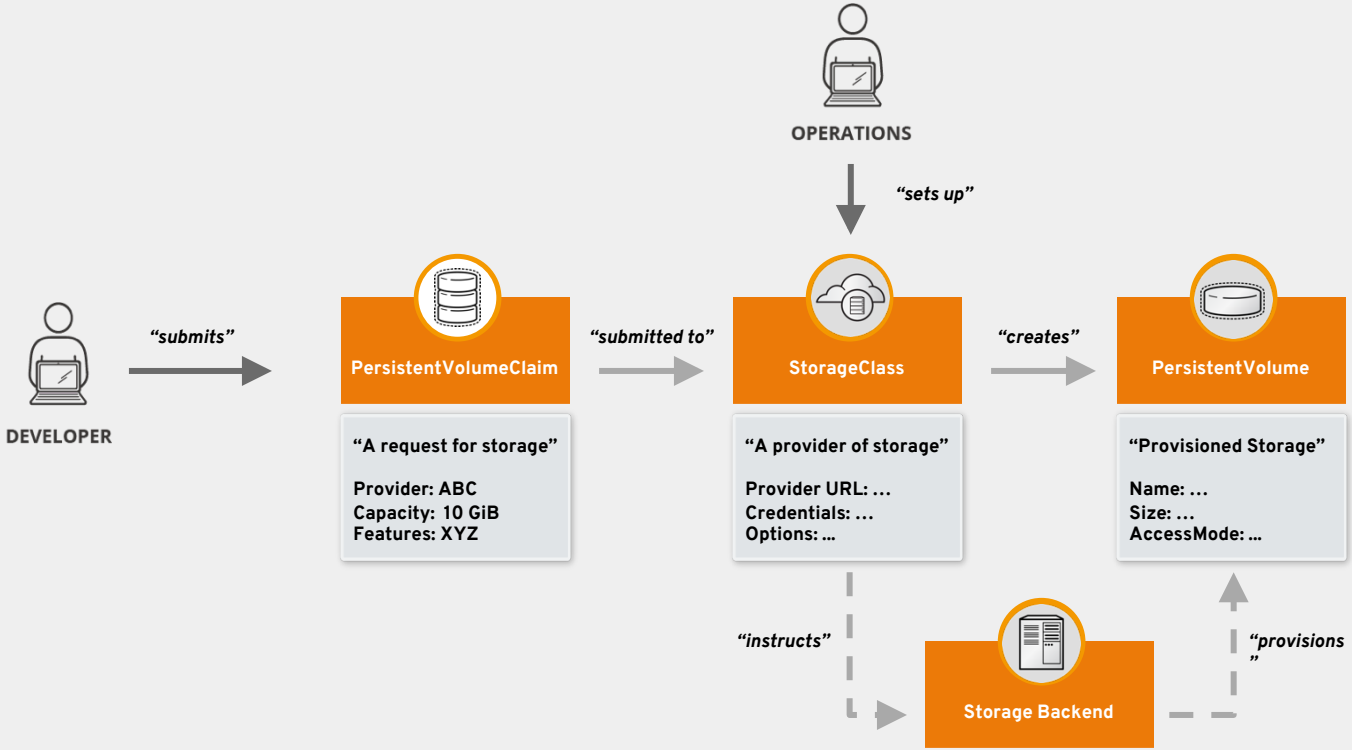
# OpenShift Persistent Storage Framework



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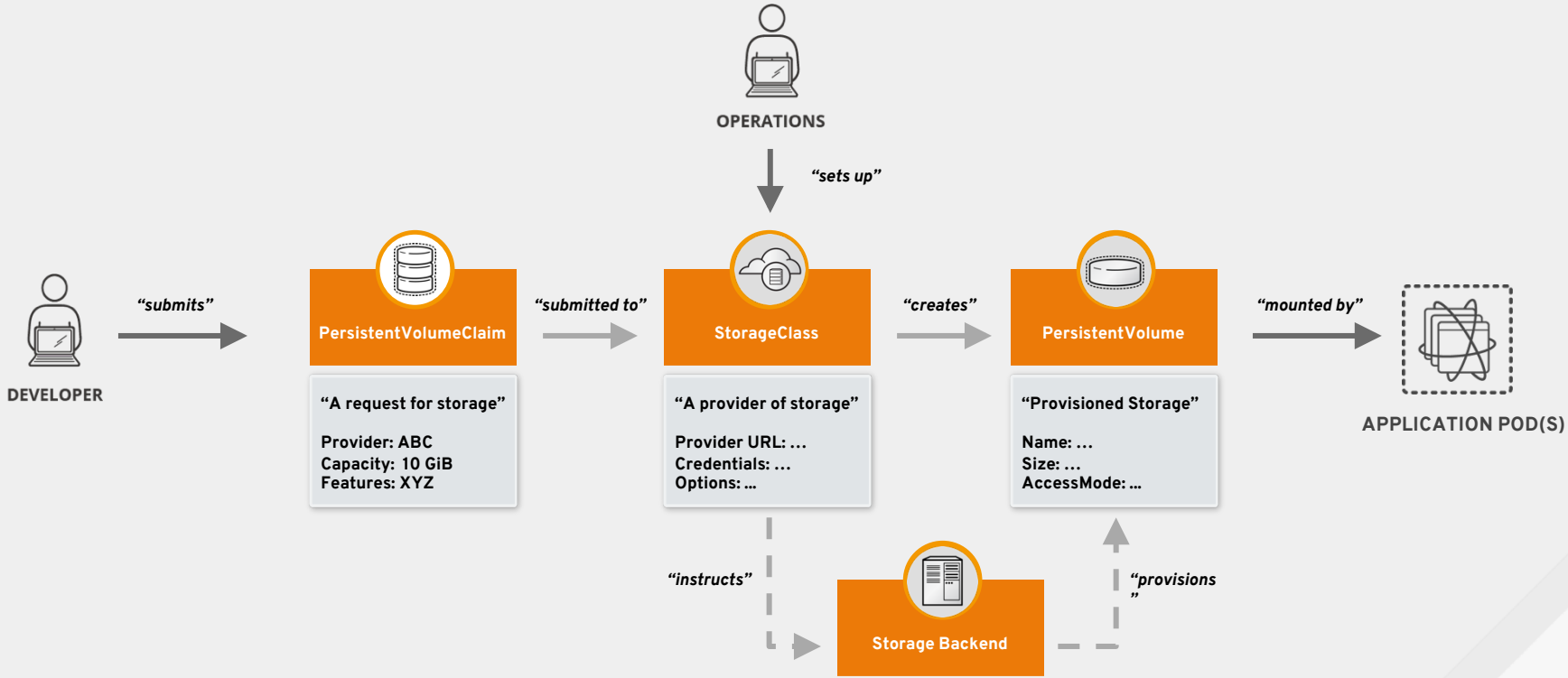
# OpenShift Persistent Storage Framework



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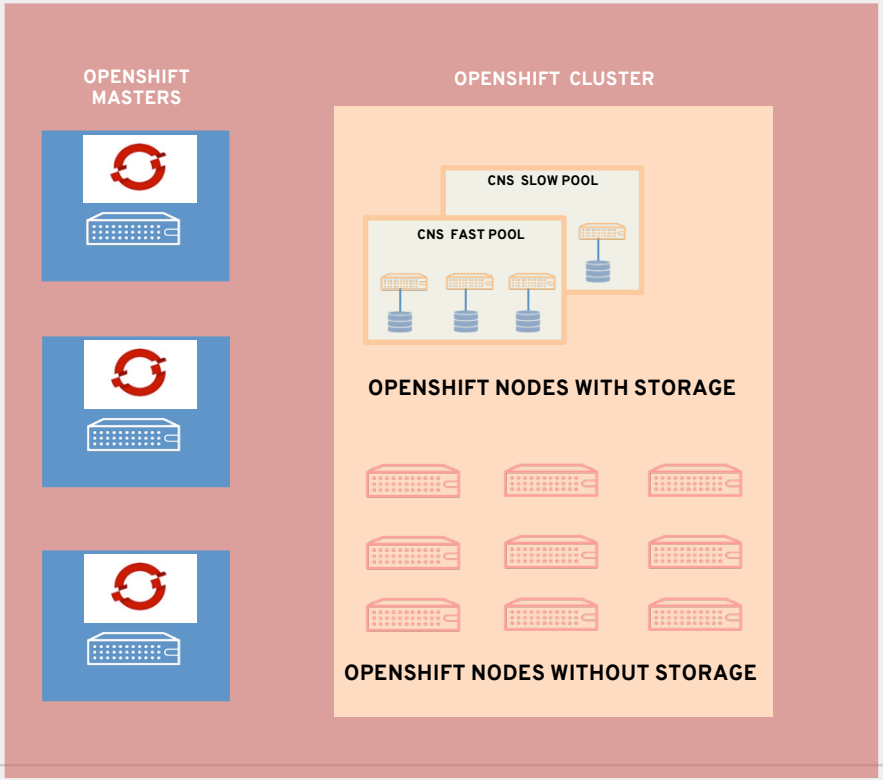
# Container Native Storage (CNS) with OpenShift

Storage Class Examples:

- Fast Pool = 3x OCP nodes with SSDs
- Slow Pool = 3x OCP nodes with HDDs

Pods on OCP nodes *without* local storage can mount volumes from Fast and Slow Storage Classes



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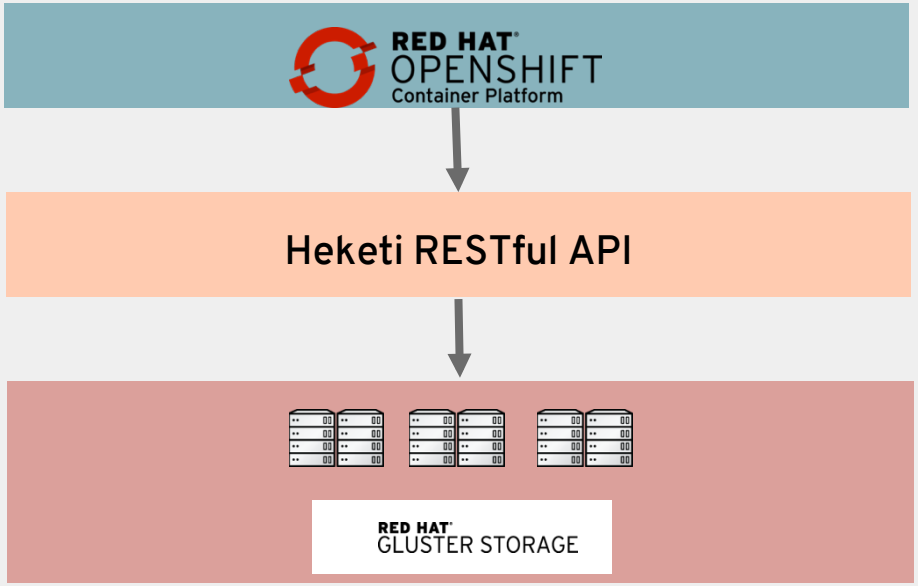
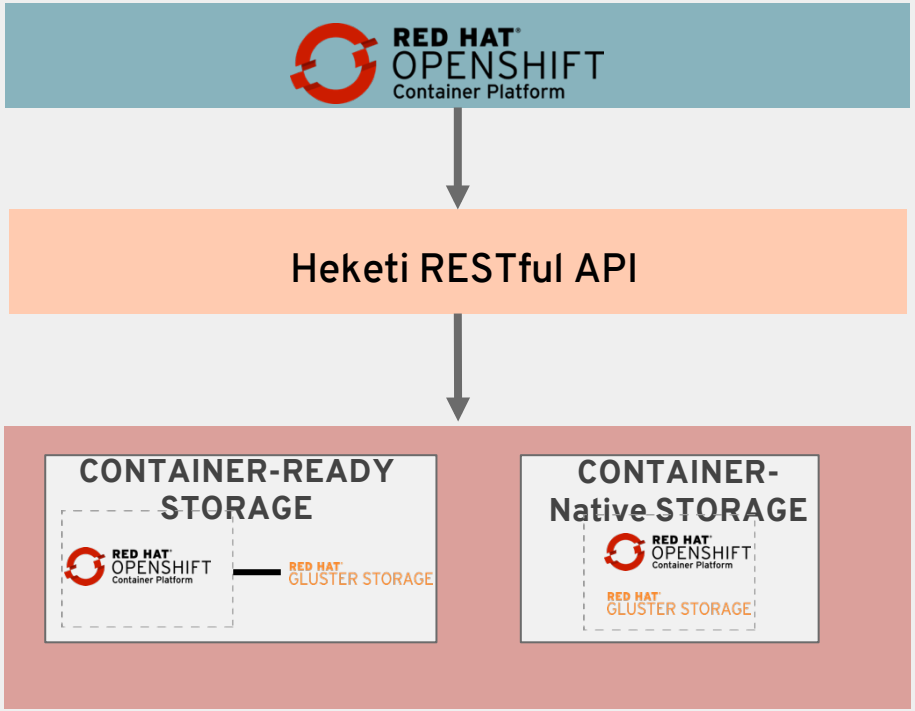
# How OpenShift Requests Persistent Volume




Steps:

- OpenShift calls Heketi through RESTful API found in Storage Class object
- Heketi provisions volume on Gluster
- 3x Gluster PODs in CNS on 3x OCP nodes
- 3x minimum due to 3-way replication for Gluster volumes

# Storage Class Use And Definition




Steps:

- Done after CNS or CRS cluster is created
- API call using Heketi route, Heketi clusterID and credentials

**Example: OpenShift Storage Class YAML File**

```
# cat cns-fast-storageclass.yaml
apiVersion: storage.k8s.io/v1beta1
kind: StorageClass
metadata:
  name: cns01-vmdk-gluster-fast
provisioner: kubernetes.io/glusterfs
parameters:
  resturl:
http://heketi-storage.apps.syseng.com
  clusterid: d0a035dc9022343480fcb0ec9de307
  restauthenabled: "true"
  restuser: "admin"
  secretNamespace: "default"
  secretName: "heketi-secret"
```



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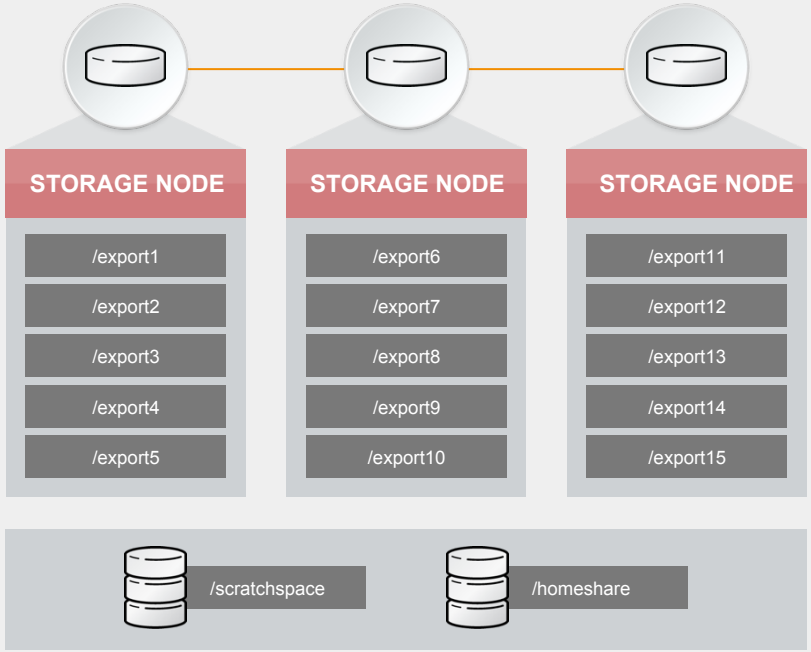
# CNS is Built from GlusterFS




**GlusterFS is POSIX-compliant distributed file system.**

**GlusterFS is user-space software running on Linux that takes local filesystem directories of standard servers and federates them in a pool across the network, to make them accessible to clients from a single mountpoint.**



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# NFS versus CNS Storage Demo



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