



UPS and OpenShift

**A Roadmap of Cloud Native
Software Upgrade Delivery**

Agenda

- UPS
- Background
- The Journey
- Why Red Hat OpenShift
- Monthly Operating System Patching
- OpenShift Upgrade version 3.4 to 3.9
- OpenShift Upgrade Version 3.9 to 3.11
- Lessons Learned
- Accomplishments and Roadmap
- Questions





What We Do

We are the world's largest package delivery company and a premier provider of global supply chain solutions.

Global Small Package



Retail Entry Points

Package Delivery Fleet
(package cars)
123,000



U.S. Domestic Package

Full spectrum of U.S. domestic guaranteed ground and air package transportation services



International Package

A wide selection of guaranteed day and time-definite international shipping services



Aircraft
248

UPS Global Logistics Network

Supply Chain & Freight

Logistics & Distribution

Solutions such as UPS Mail Innovations that manage the flow of goods from receiving to storage to processing to shipping

UPS Freight®

Less-than-truckload and full truckload services in North America and U.S. territories

UPS Capital®

Insurance, financing, and payment services

Delivery fleet: over 5,900 vehicles
Trailers: 22,000 vehicles



Coyote Logistics: Truckload Freight Brokerage

Brokerage and transportation management services for truckload, less-than-truckload, and intermodal services

Customs Brokerage

Customs clearance, trade management, and international trade consulting services



Freight Forwarding

A portfolio of global air and ocean freight services



Background

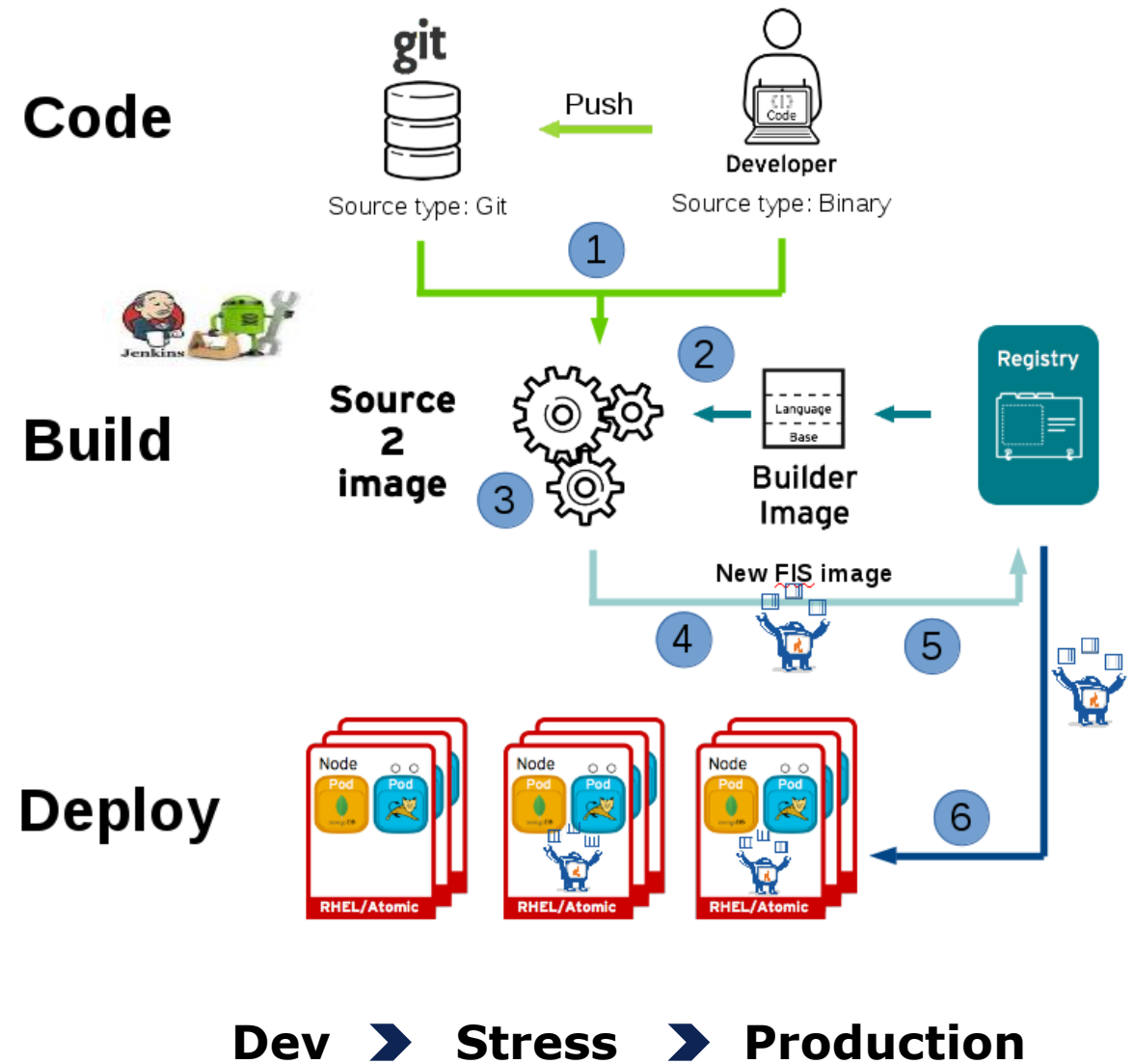
- Started with Openshift 2017
- Many of our mission critical applications are hosted on Red Hat OpenShift
- Criticality means that uptime is crucial
- Red Hat tools were utilized to ensure our migration occurred without incident
- Our Center Inside Planning and Execution solution won the Red Hat Innovator of the Year award in 2018

The Journey

Traditional Methods vs. DevOps Methods

Benefits:

- Create, modify, and rapid deploy on demand
 - for different environments using Jenkins pipeline
- Faster time to market
- Automation with error reduction
- Application team builds for operations
- Eliminates need for handoff to operations



Why Red Hat OpenShift



Multiple languages in a single platform

Availability

- OpenShift infrastructure provides 100% uptime
- Application Health Check can detect the failure of an application service & restart the pods

Noisy neighbor

- Reduces risk of one application impacting another at the server level by allowing limits to be placed on the CPU & memory

Application teams controls operation tasks

- Scale pods up and down
- Monitor CPU, memory, and network utilization
- Deploy new application code without operations direct involvement
- Create and manage database connectivity
- Self-help persistent storage request

Application portability

- Allows an application in the same OpenShift environment to run on an application node in an alternate datacenter



Monthly OS Patching

Monthly OS patching

- Over 400 Servers
- 14 OpenShift Clusters
- No Outages

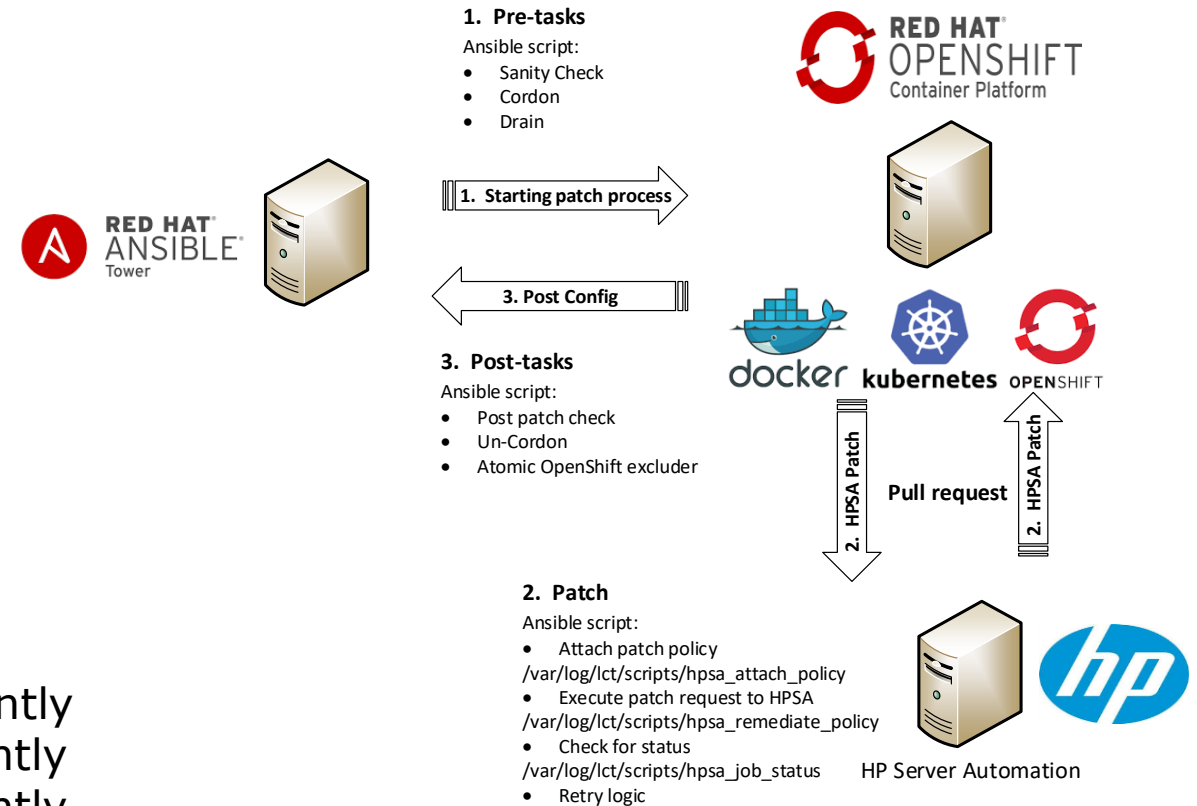
Using

- Automation through Ansible playbook
- Execution through Ansible Tower

Ansible Tower Scheduler

- Master Node Group, patch one server at a time
- Infra Node Group, patch one server at a time
- App Node Group1, patch all app nodes concurrently
- App Node group2, patch all app nodes concurrently
- App Node group3, patch all app nodes concurrently
- App Node group4, patch all app nodes concurrently
- Metrics Node group, patch all app nodes one server at a time

UPS OpenShift Monthly Patch Automation Diagram



OpenShift Upgrade version 3.4 to 3.9 (Blue Green Deployment)

Achieve 100% uptime

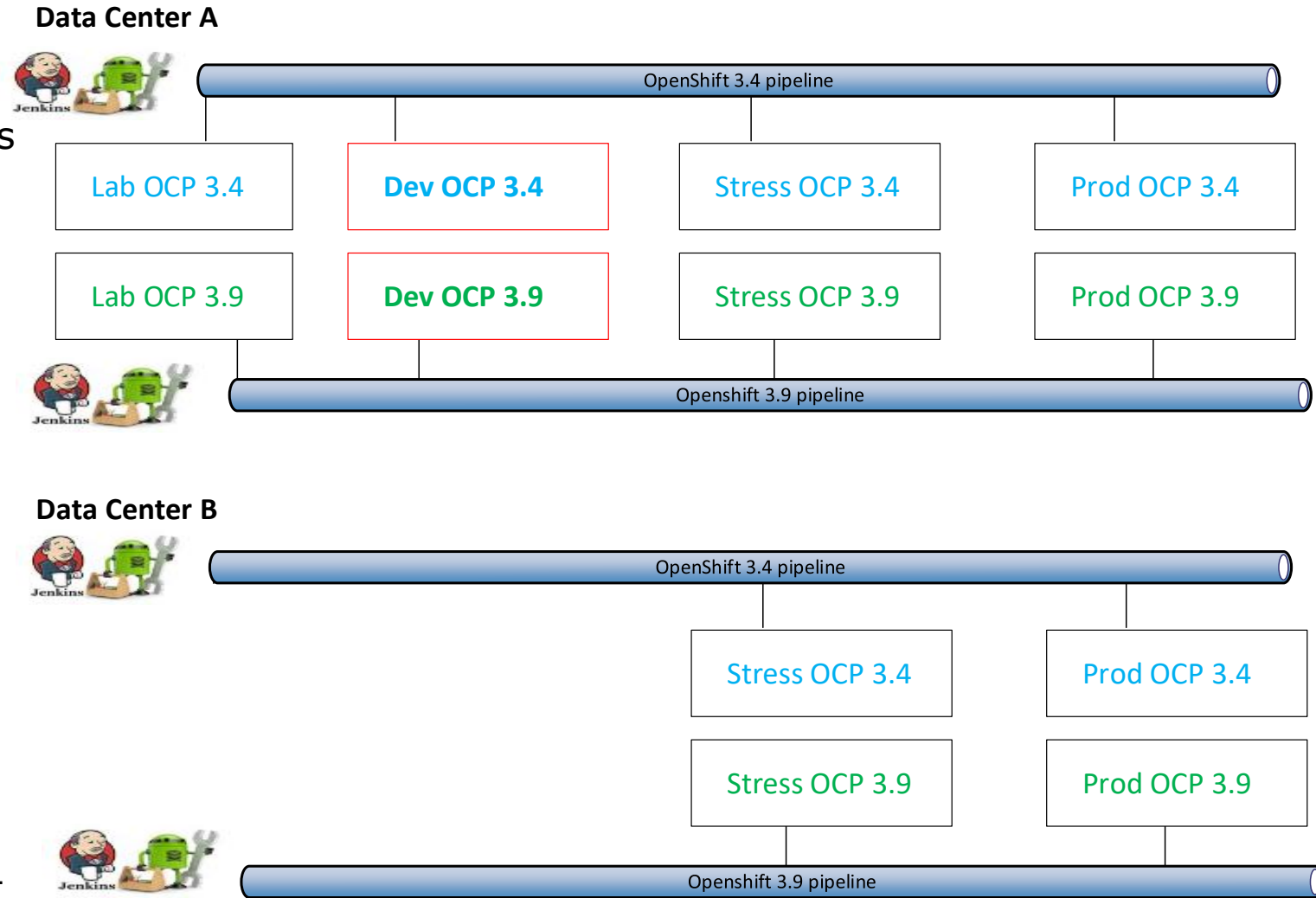
- OpenShift 3.4 to OpenShift 3.9 requires outage due to ETCD database upgrade
- Blue Green Deployment
- Pipeline design

OpenShift Infrastructure testing

- ETCD database validation
- Infrastructure routers
- Master API
- Docker registry
- OpenShift UI
- Metrics

Application testing

- Pipeline testing
- Application create new DNS alias for 3.9 environment
- Application testing on 3.9 environment
- Production cutover (DNS switchover)



OpenShift Upgrade Version 3.9 to 3.11 (In Place Upgrade)

Create Pre Ansible scripts

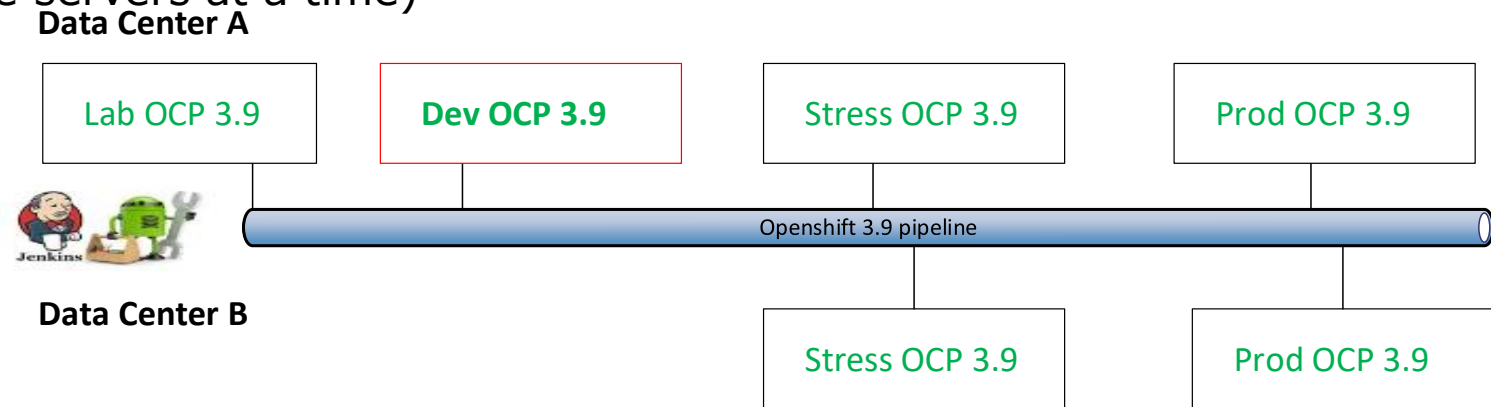
- Update openshift configurations for upgrade requirement (config and log location)
- Update ups environmental customization (hostnames, proxy settings)

Run Red Hat OpenShift upgrade playbook

- Run upgrade control plane (master node, one server at a time)
- Run upgrade node (infra node, one server at a time)
- Run upgrade node (app node, multiple servers at a time)

Create post Ansible scripts

- Performance customization
- Router customization
- Application logging requirement
- Time sync
- More..



Lessons Learned

OpenShift skill gaps to design, implement and support the infrastructure in a short period of time

- **Resolution: engaged Red Hat consulting service**

Complexity of the technology was more significant than anticipated

- **Resolution: adapt and learn the technology on the spot**

Resource planning is critical

- **2 full time UPSers and 2 consultants supporting 14 clusters and 400+ nodes**

Haproxy router (single thread/single processor)

- **Adding 8 additional pods per server on 4 infra nodes per cluster (32 pods total)**

Custom roles reset permissions

- **Reset custom role permission, review with app teams on what they need for permission**

OpenShift Uninstall job didn't clean up directories

- **Manual clean up of missed directories/files**

Performance saved mode

- **Ensure performance save mode is turned off**

Accomplishments and Road Map

2017

- Built out OpenShift 3.4 Infrastructure

2018

- On boarded new applications
- Built out infrastructures for capacity expansion
- Upgraded from OpenShift 3.4 to OpenShift to 3.9

2019/2020

- Onboarding new applications
- Upgrade to OpenShift 3.11
- Evaluation of OpenShift 4.x
- Building out infrastructures for capacity expansion
- Monitoring and alerting with Prometheus and Grafana
- Further automation for OpenShift
 - New application onboard process
 - Certificate renew process
 - Day to day tasks



Thank You

Questions?