Red Hat
OpenShift

Technical Overview

Red Hat

OpenShift - technical overview

	Modules
OpenShift Architecture	20 min
OpenShift Network and Storage	20 min
OpenShift Installation	20 min
OpenShift Usage	20 min
OpenShift HandsOn Intro	5 min

GENERAL DISTRIBUTION

Red Hat
OpenShift

OpenShift Architecture

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your choice of infrastructure

COMPUTE

NETWORK

STORAGE

Red Hat

workers run workloads

Red Hat

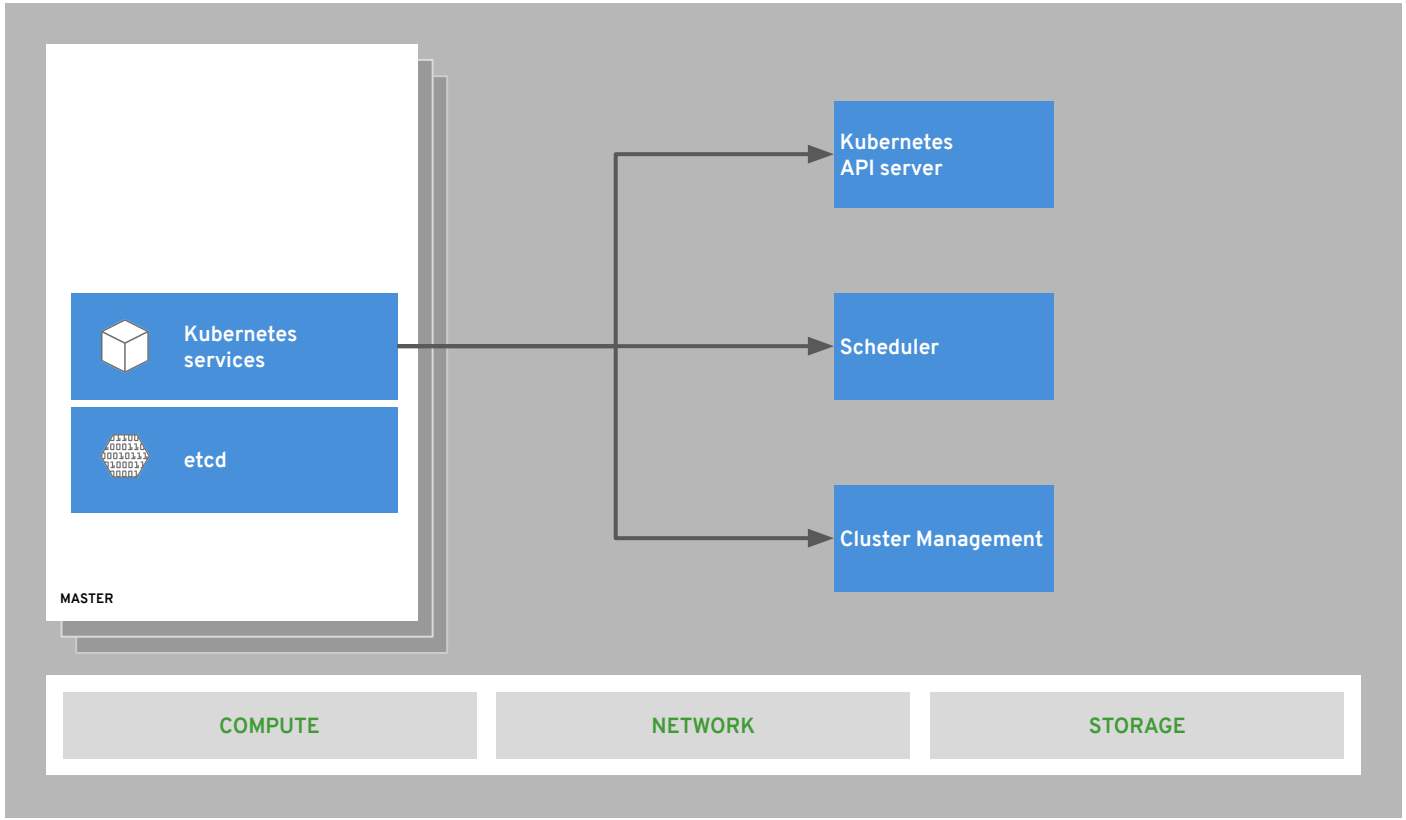
masters are the control plane

Red Hat

state of everything

Red Hat

core kubernetes components



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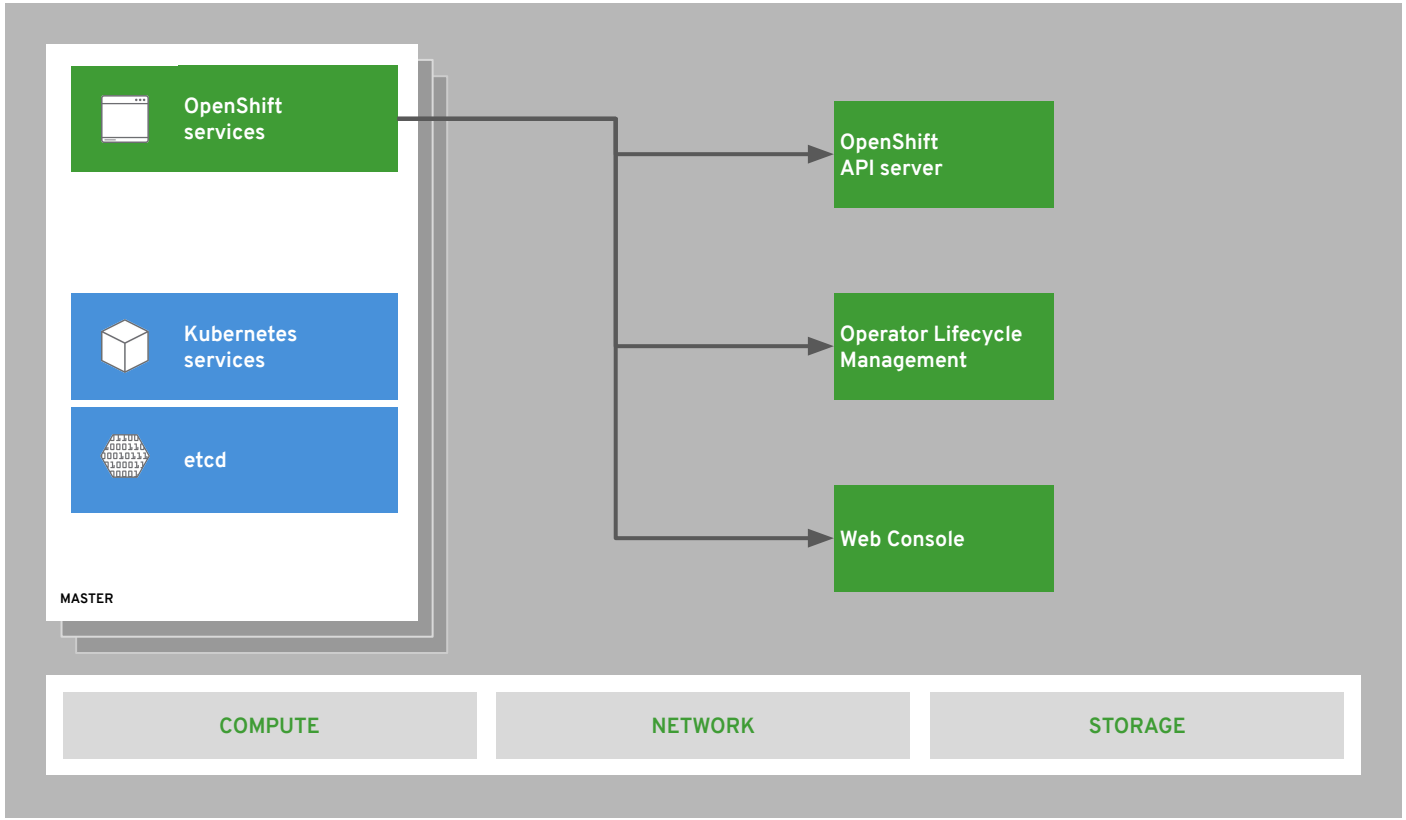
core OpenShift components



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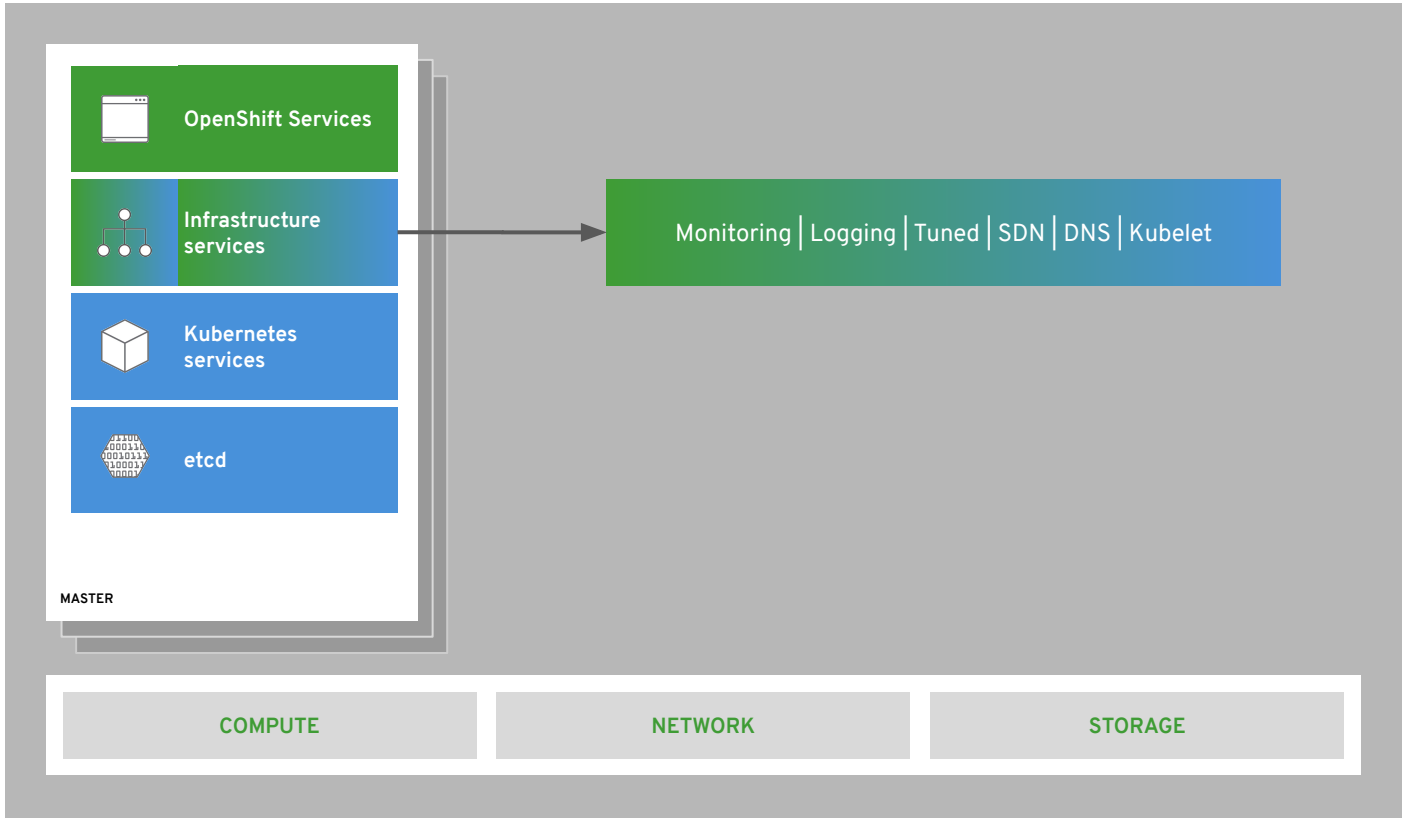
internal and support infrastructure services



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run on all hosts

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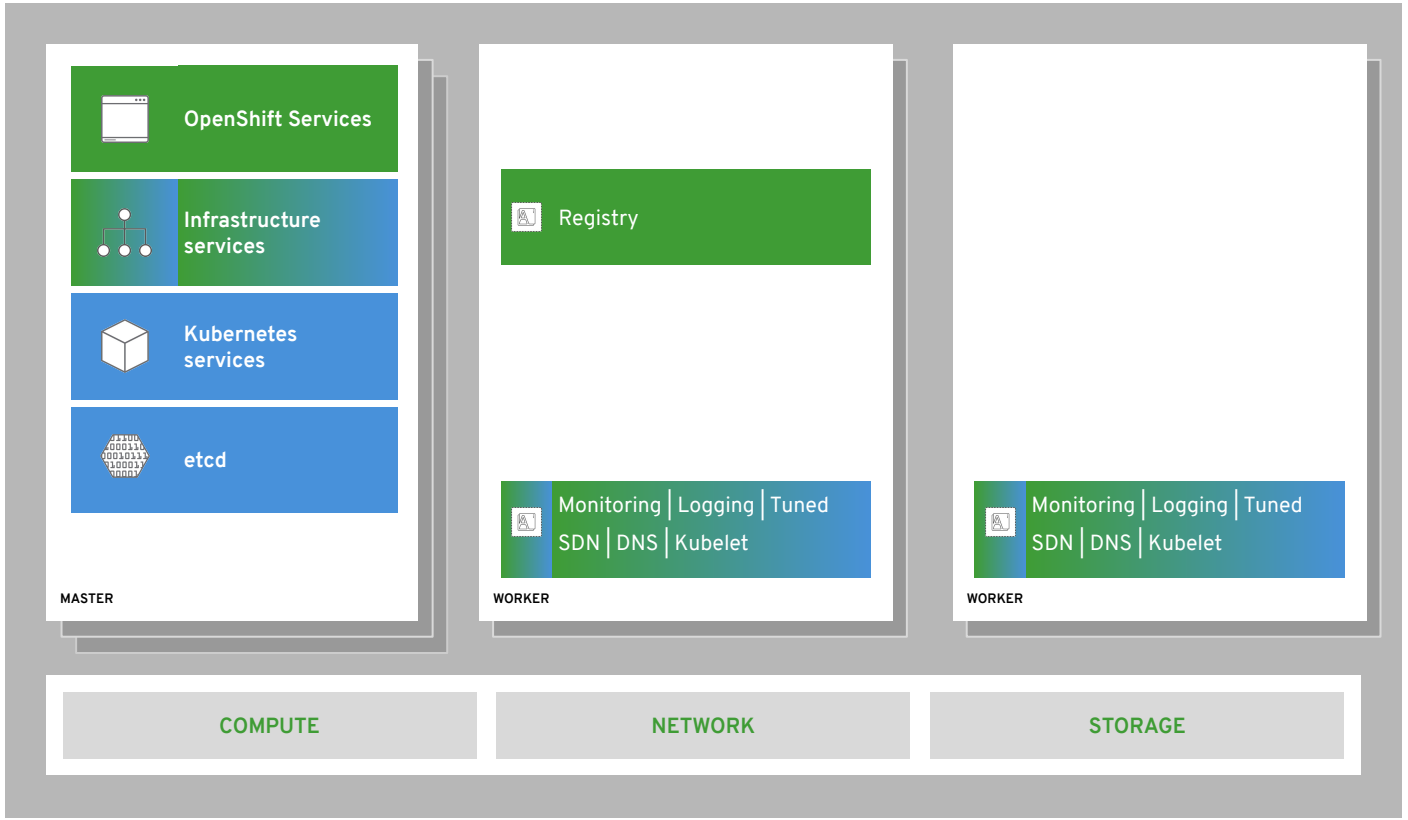
integrated image registry



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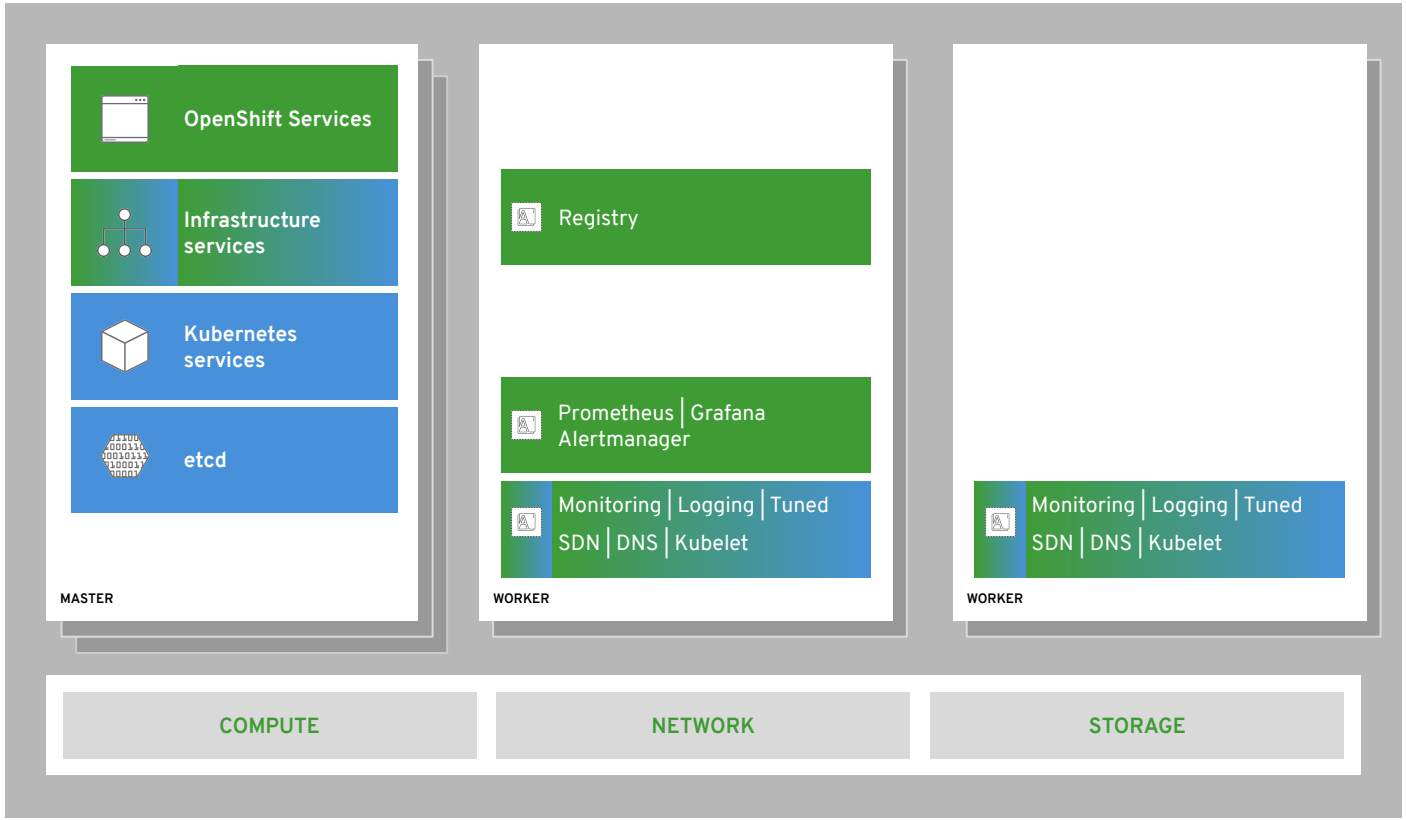
cluster monitoring



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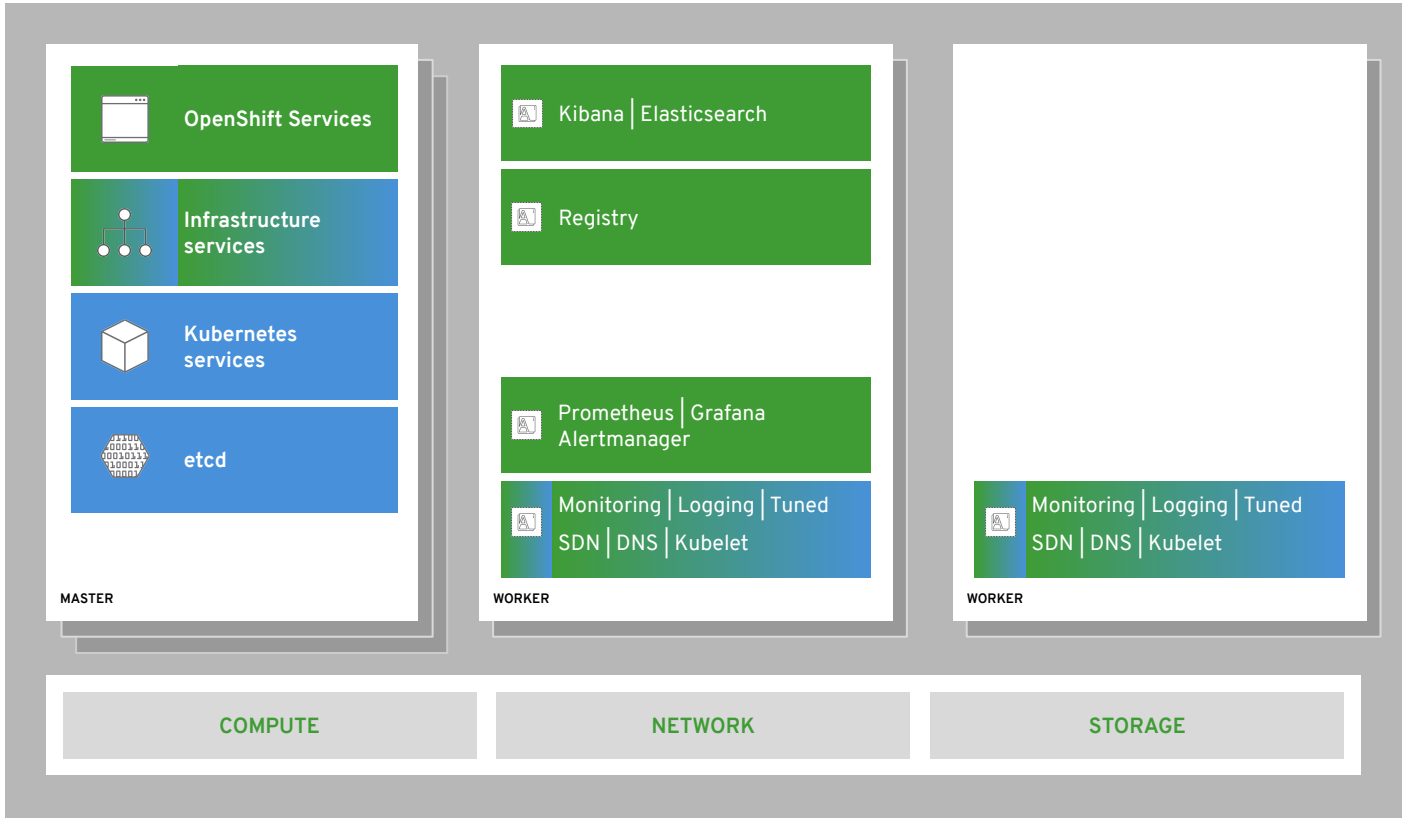
log aggregation



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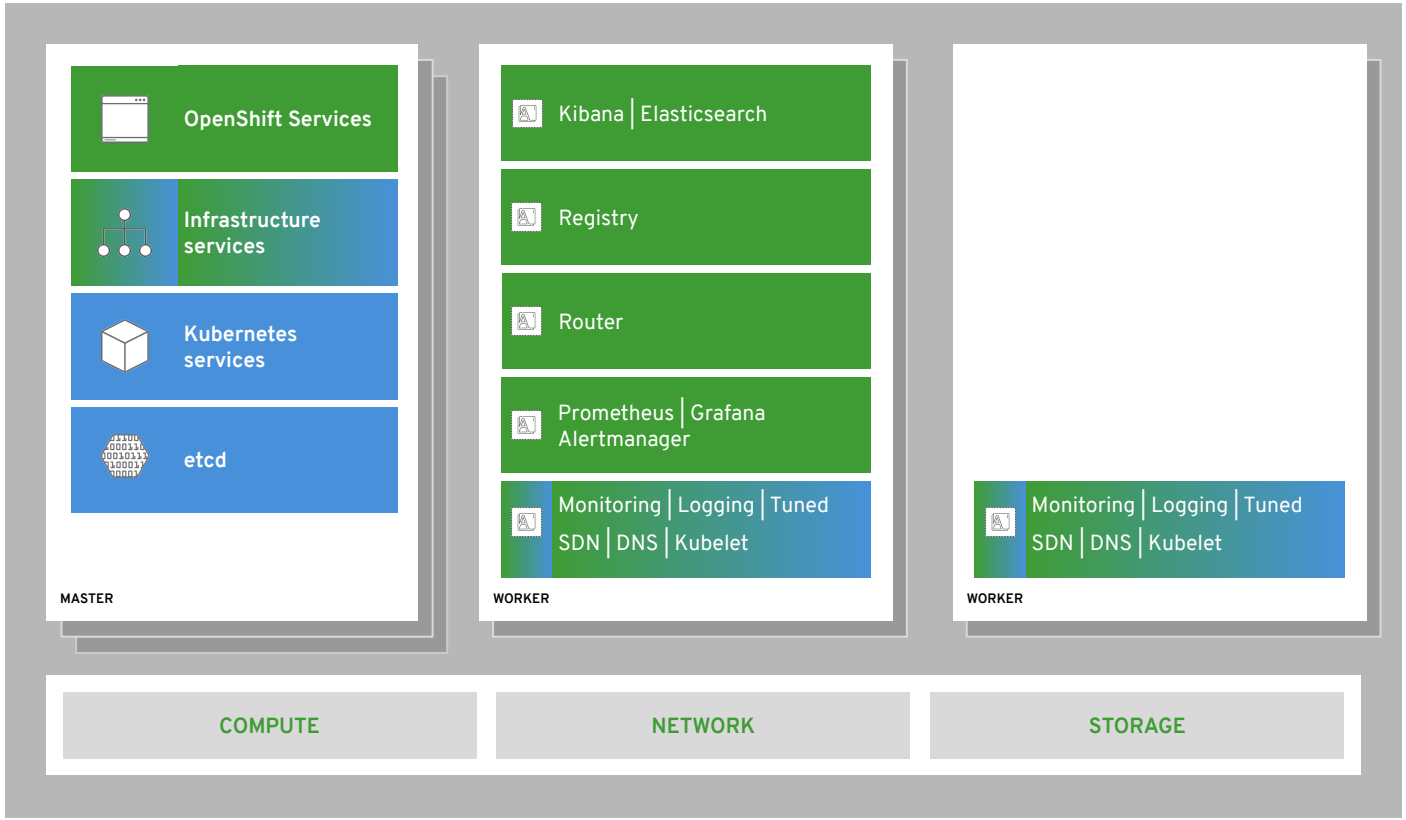
integrated routing



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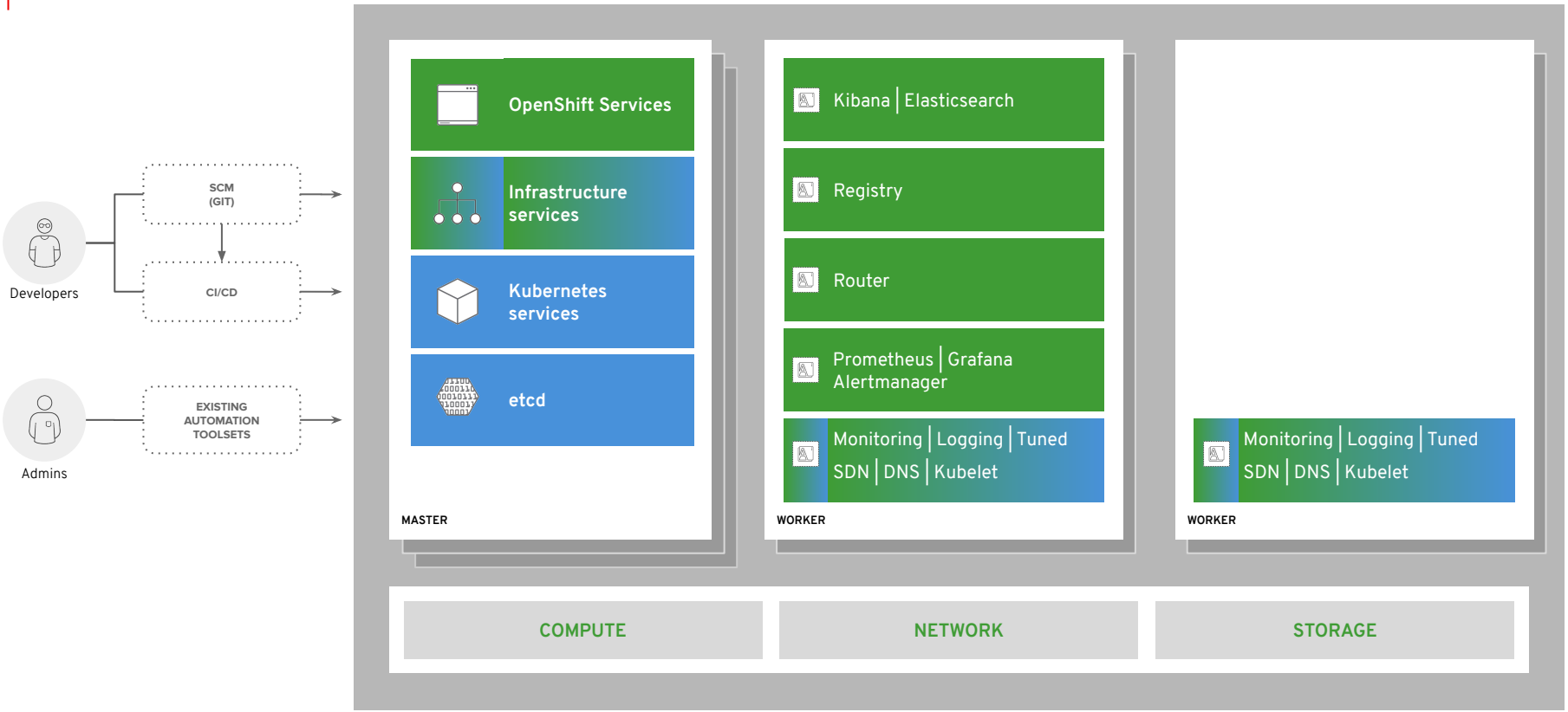
dev and ops via web, cli, API, and IDE



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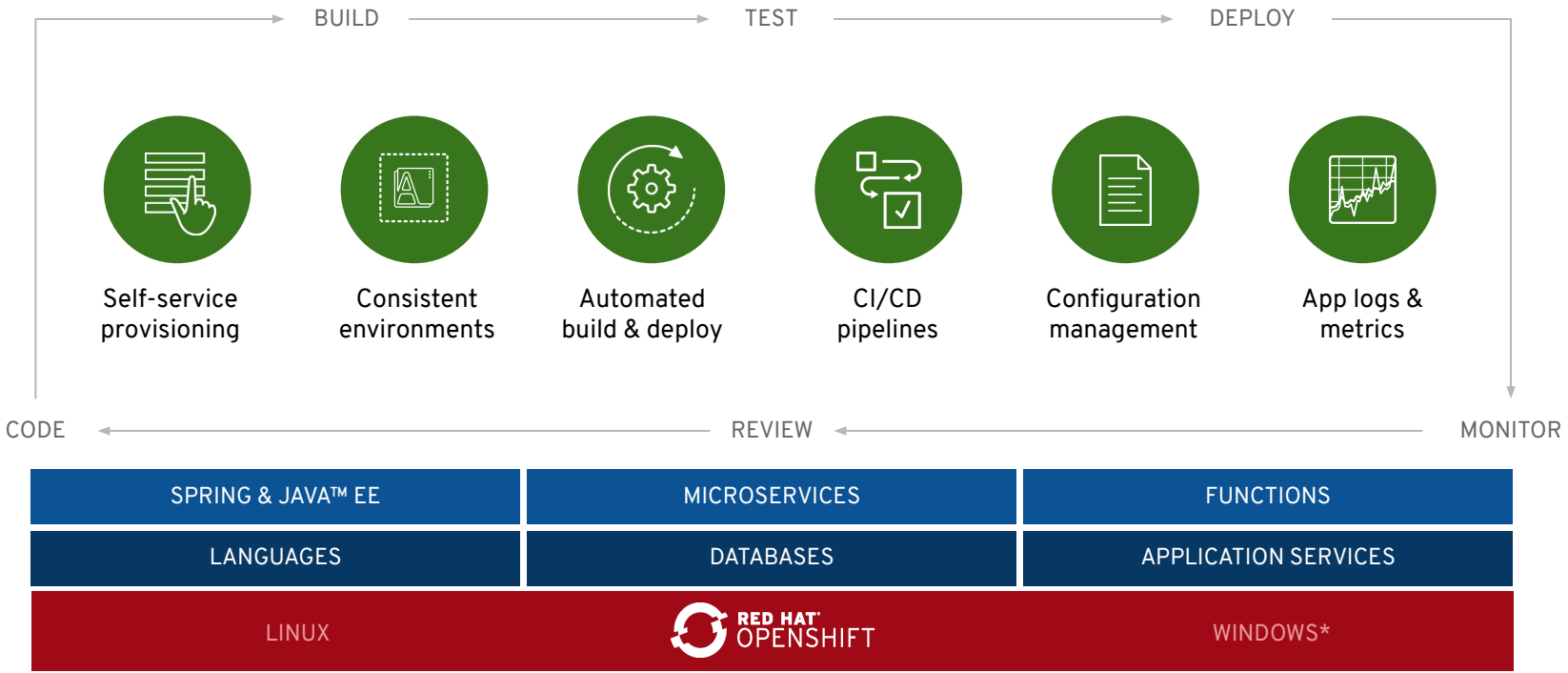
OpenShift enables developer productivity



* coming soon

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OpenShift Network and Storage

Persistent Storage

Connecting real-world storage to your containers to enable stateful applications

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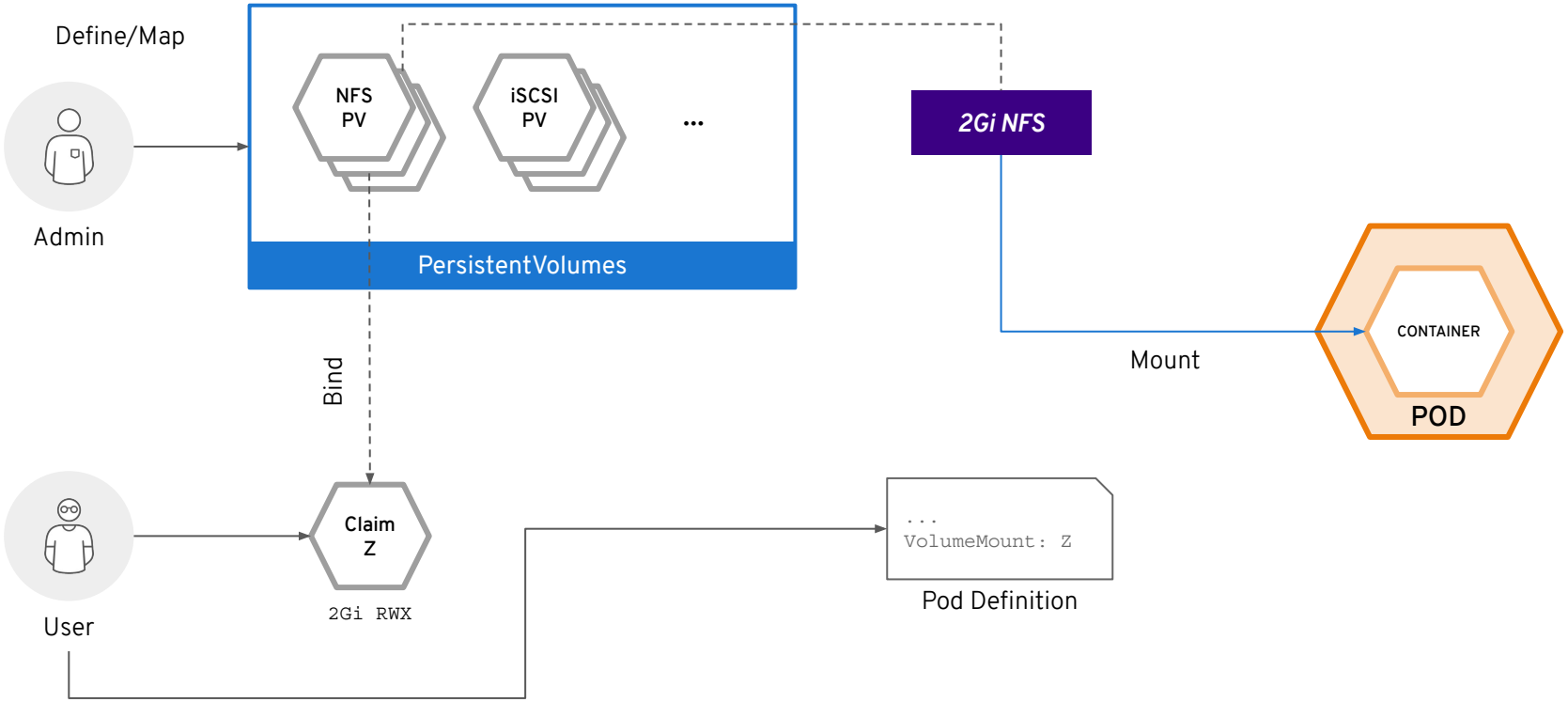
CONFIDENTIAL Designator

A broad spectrum of static and dynamic storage endpoints

NFS	OpenStack Cinder	iSCSI	Azure Disk	AWS EBS	FlexVolume
GlusterFS	Ceph RBD	Fiber Channel	Azure File	GCE Persistent Disk	VMWare vSphere VMDK
		NetApp Trident*	Container Storage Interface (CSI)**		

CONFIDENTIAL Designator

Static Storage Provisioning



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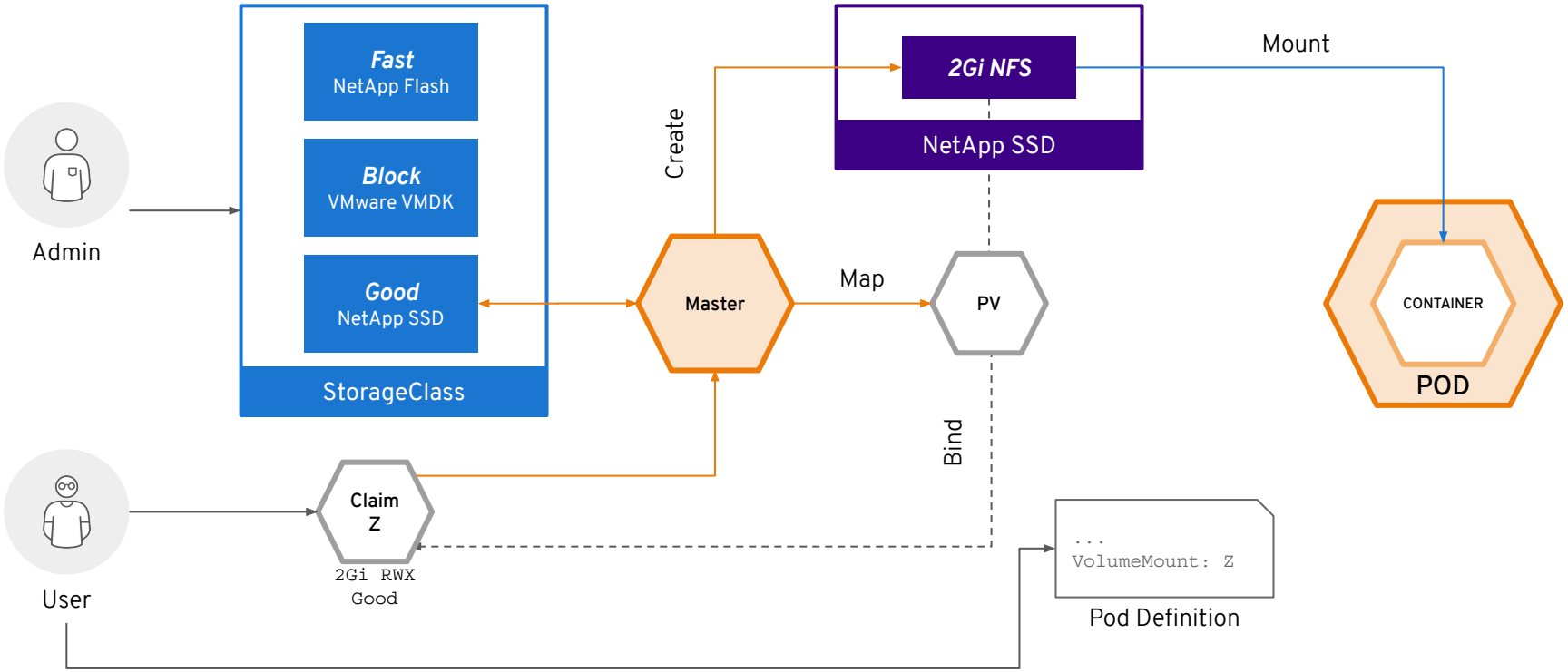
Dynamic Storage Provisioning



RED HAT®
OPENSHIFT
Container Storage

What is it?

Add-On for OpenShift for running stateful apps

Highly scalable, production-grade persistent storage

- For **stateful applications** running in Red Hat® OpenShift
- Optimized for Red Hat **OpenShift Infrastructure services**
- Developed, released and deployed in synch with Red Hat OpenShift
- Supported via a single contract with Red Hat OpenShift
- Complete persistent storage fabric across hybrid cloud for OCP

OCS 4.X - Focus Areas

EASE OF USE

HYBRID CLOUD
& DATA SERVICES

kubernetes

STORAGE
ENHANCEMENTS

Red Hat

Presenter's Name

Title

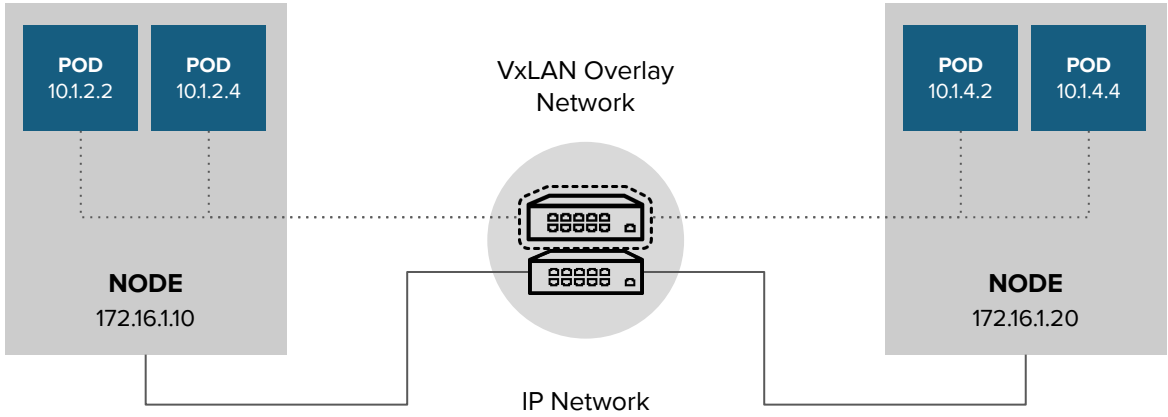
OpenShift Networking

Presenter's Name

Title

Red Hat

OPENSHIFT NETWORKING



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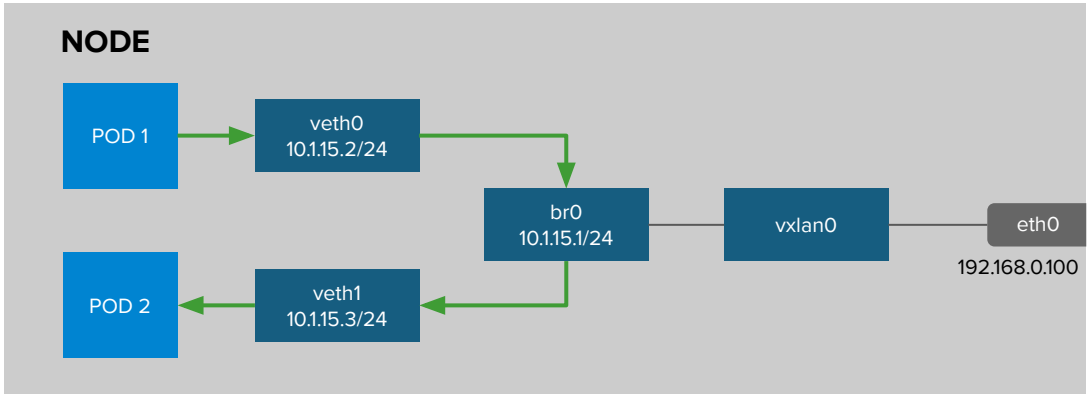
OPENSHIFT SDN - OVS PACKET FLOW

Container to Container on the Same Host



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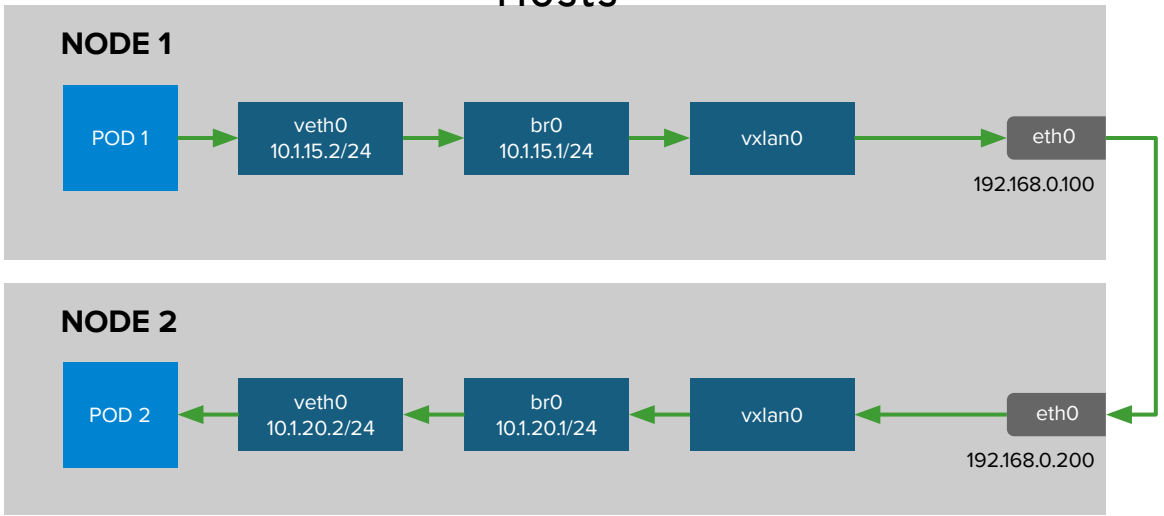
OPENSHIFT SDN - OVS PACKET FLOW

Container to Container on the Different Hosts



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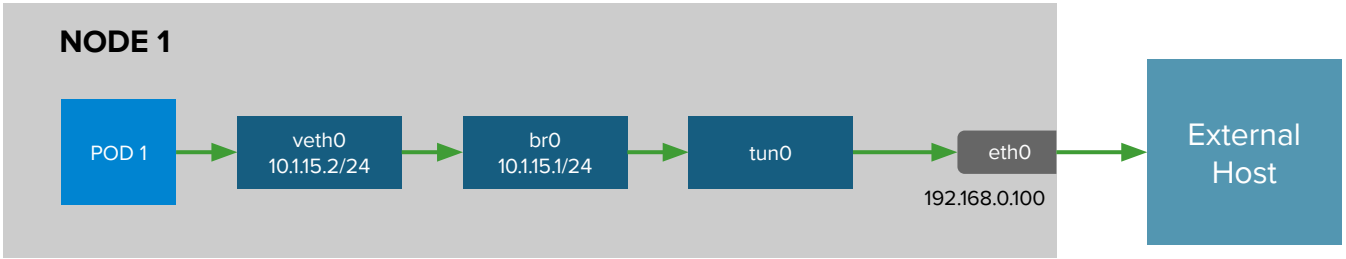
OPENSHIFT SDN - OVS PACKET FLOW

Container Connects to External Host



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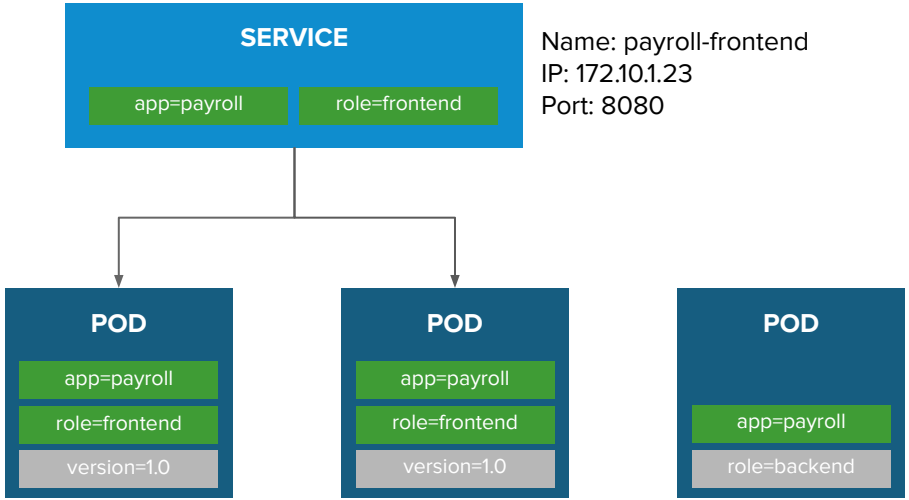
BUILT-IN SERVICE DISCOVERY
INTERNAL LOAD-BALANCING



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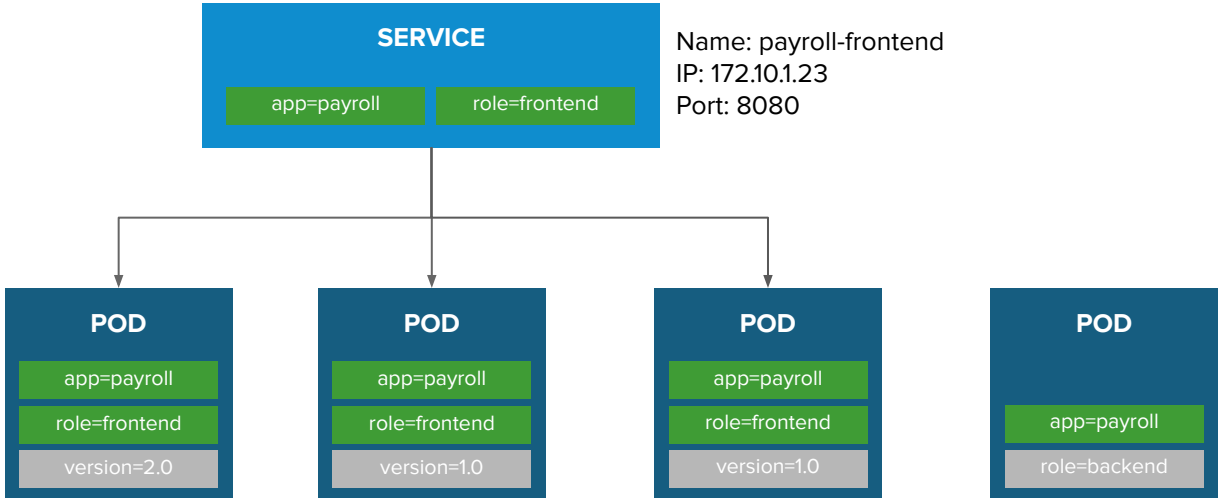
BUILT-IN SERVICE DISCOVERY
INTERNAL LOAD-BALANCING



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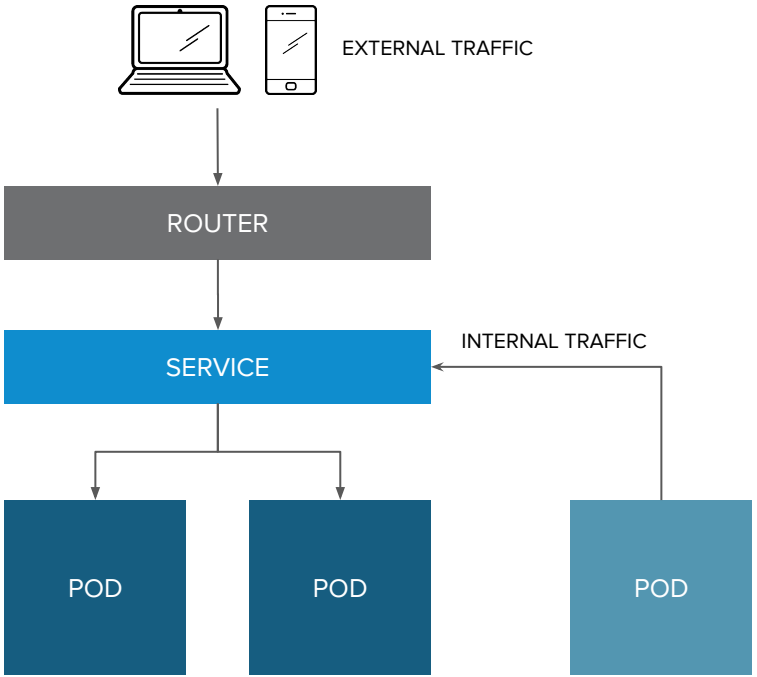
ROUTE EXPOSES SERVICES EXTERNALLY



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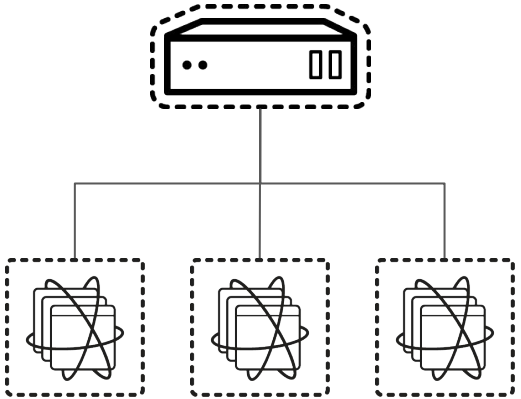
ROUTING AND EXTERNAL LOAD-BALANCING

- Pluggable routing architecture
  - HAProxy Router
  - F5 Router
- Multiple-routers with traffic sharding
- Router supported protocols
  - HTTP/HTTPS
  - WebSockets
  - TLS with SNI
- Non-standard ports via cloud load-balancers, external IP, and NodePort



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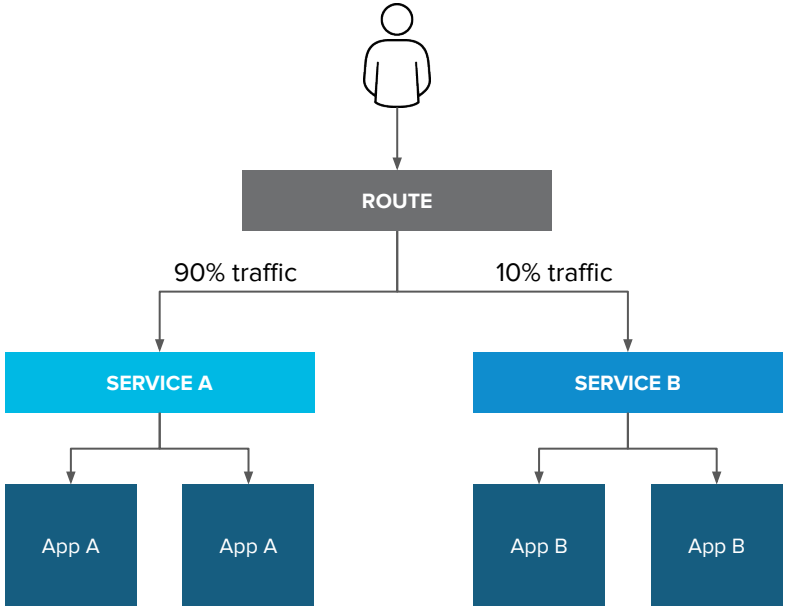
ROUTE SPLIT TRAFFIC

Split Traffic Between Multiple Services For A/B Testing, Blue/Green and Canary Deployments



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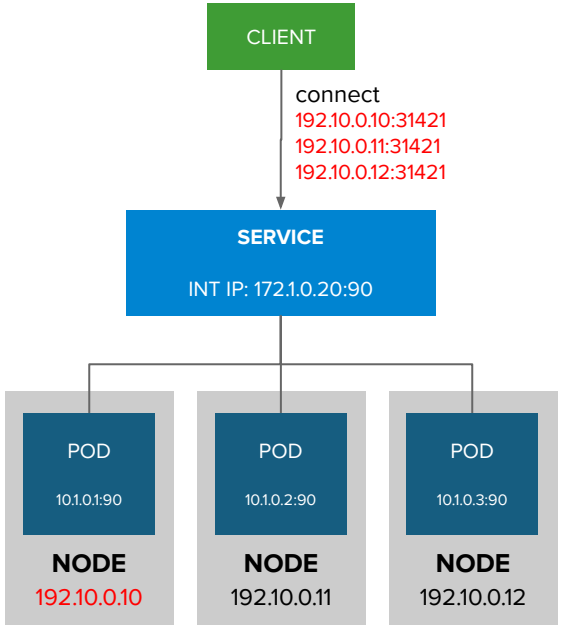
EXTERNAL TRAFFIC TO A SERVICE ON A RANDOM PORT WITH NODEPORT

- NodePort binds a service to a unique port on all the nodes
- Traffic received on any node redirects to a node with the running service
- Ports in 30K-60K range which usually differs from the service
- Firewall rules must allow traffic to all nodes on the specific port



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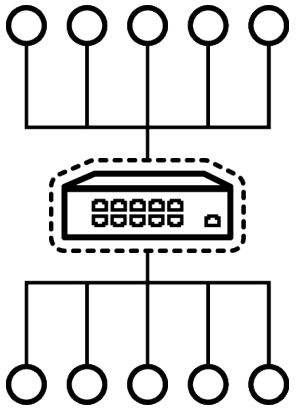
OPENSHIFT NETWORKING

- Built-in internal DNS to reach services by name
- Split DNS is supported via CoreDNS
  - Master answers DNS queries for internal services
  - Other name servers serve the rest of the queries
- Software Defined Networking (SDN) for a unified cluster network to enable pod-to-pod communication
- OpenShift follows the Kubernetes Container Networking Interface (CNI) plug-in model



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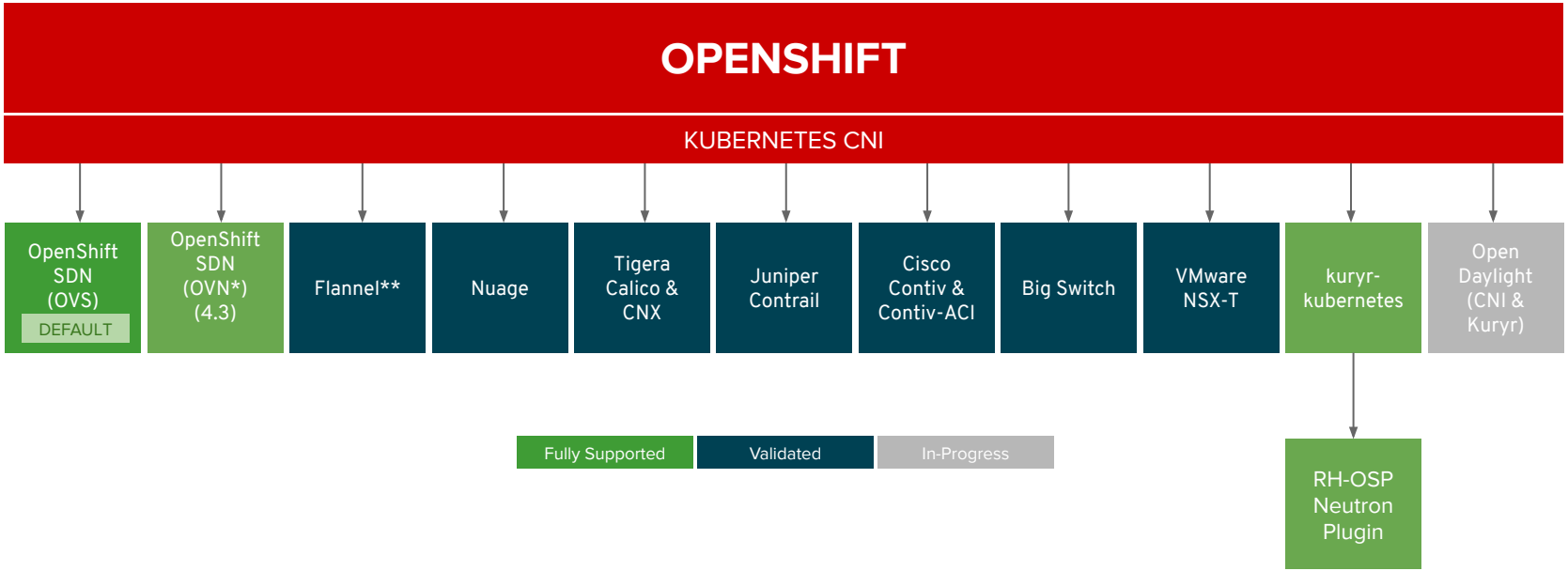
OPENSHIFT NETWORK PLUGINS



* Coming as default in OCP 4.4
** Flannel is minimally verified and is supported only and exactly as deployed in the OpenShift on OpenStack reference architecture

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OpenShift Installation

Installation Paradigms

OPENSHIFT CONTAINER PLATFORM

Full Stack Automated (IPI)

Simplified opinionated "Best Practices" for cluster provisioning

Fully automated installation and updates including host container OS.

Red Hat Enterprise Linux CoreOS

Pre-existing Infrastructure (UPI)

Customer managed resources & infrastructure provisioning

Plug into existing DNS and security boundaries

Red Hat Enterprise Linux CoreOS

Red Hat Enterprise Linux

HOSTED OPENSHIFT

Red Hat OpenShift on IBM Cloud *

Deploy directly from the IBM Cloud console. An IBM service, master nodes are managed by IBM Cloud engineers.

Azure Red Hat OpenShift **

Deploy directly from the Azure console. A MSFT service, jointly managed by Red Hat and Microsoft

OpenShift Dedicated **

Get a powerful cluster, fully managed by Red Hat engineers and support; a Red Hat service.

* Based on OCP v4.3 GA slated for March; public beta available now

** Entitlements of OCP obtained through a Cloud Pak purchase are not transferable to these environments

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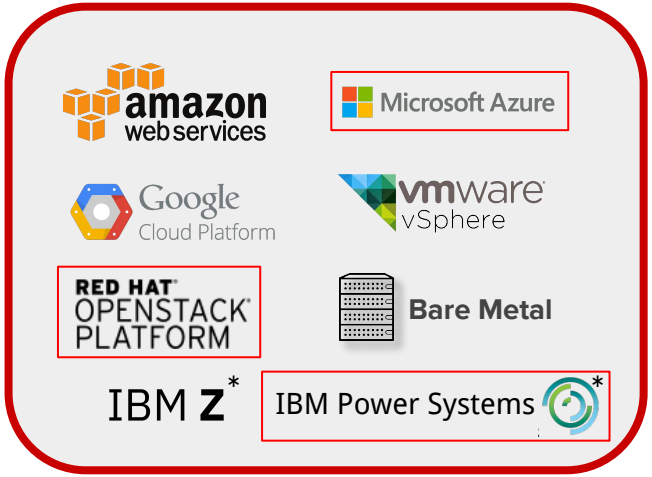
4.4 Supported Providers

Full Stack Automation (IPI)

Pre-existing Infrastructure (UPI)



* Note: Planned for an upcoming 4.3.z release on April 30th

Denotes new addition in OCP 4.4

Generally Available

PMs: Katherine Dubé (AWS, Azure, GCP), Maria Bracho (BM UPI, VMware & Upgrades), Peter Lauterbach (RHV & OCP Virtualization), Ramon Acedo Rodriguez (OSP, BM IPI), & Duncan Hardie (IBM Z & Power)

Provider Roadmap & Minimum Supported Version

Provider	Full Stack Automation (Installer provisioned infra)	Pre-existing Infrastructure (User provisioned infra)
amazon web services	4.1	4.1
Microsoft Azure	4.2	4.3+ *(z-stream)*
Bare Metal	4.4 (TBD)	4.1
Google Cloud Platform	4.2	4.2
RED HAT OPENSTACK PLATFORM	4.2	4.4
RED HAT VIRTUALIZATION	4.4	4.4
vmware vSphere	4.4	4.1
IBM Z	-	4.2+ *(z-stream)*
IBM Power Systems	-	4.3+ *(z-stream)*
Alibaba Cloud	4.5	-

PMs: Katherine Dubé (AWS, Azure, GCP), Maria Bracho (BM UPI, VMware, Alibaba), Peter Lauterbach (RHV), Ramon Acedo Rodriguez (OSP, BM IPI), Mike Barrett (IBM Z & Power)

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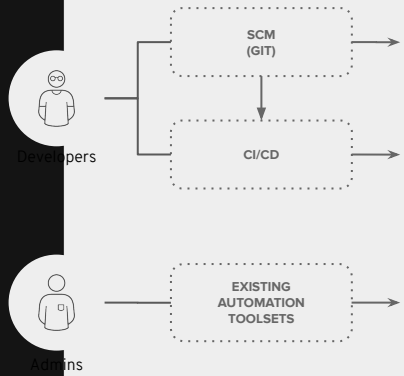
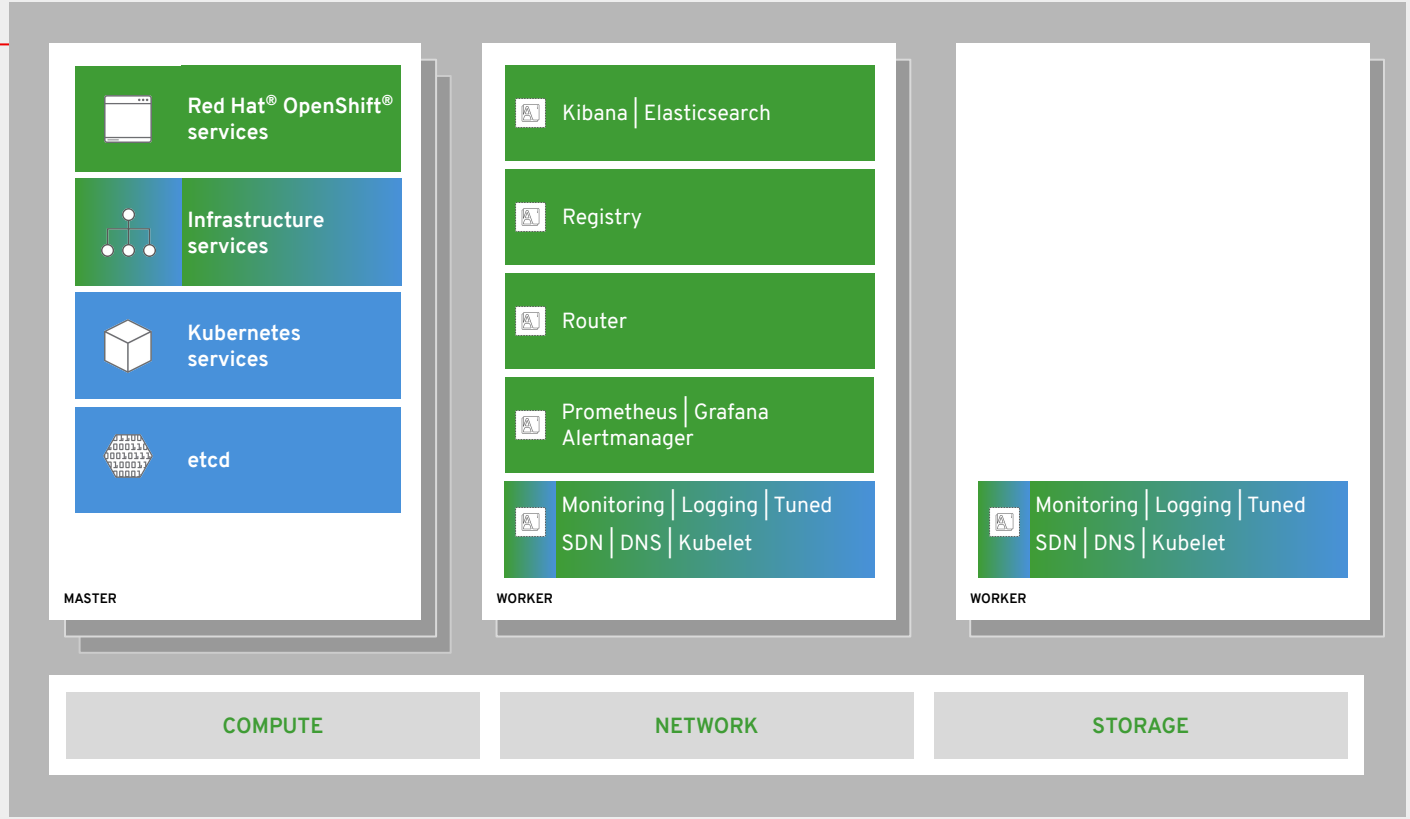
OpenShift Architecture





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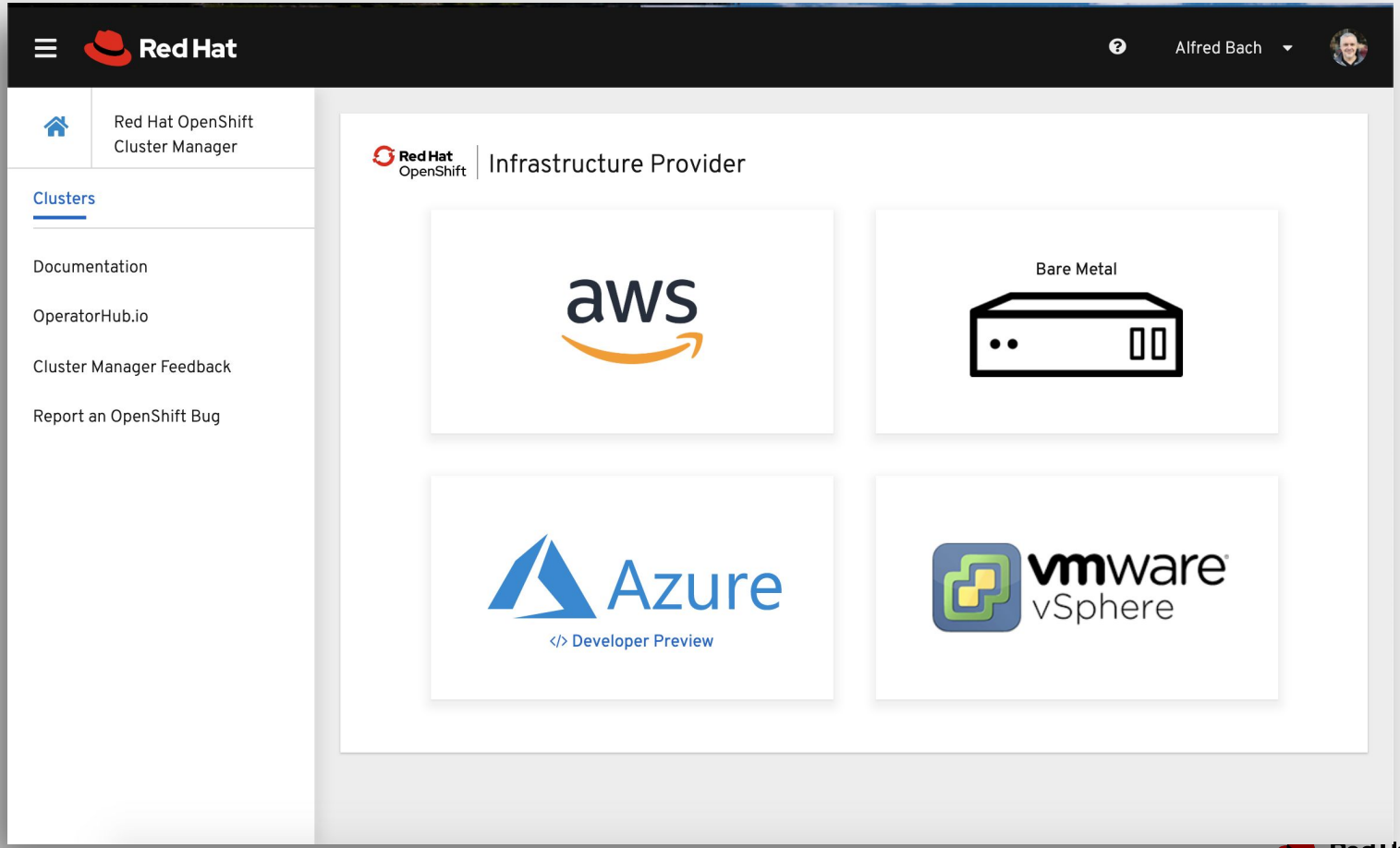
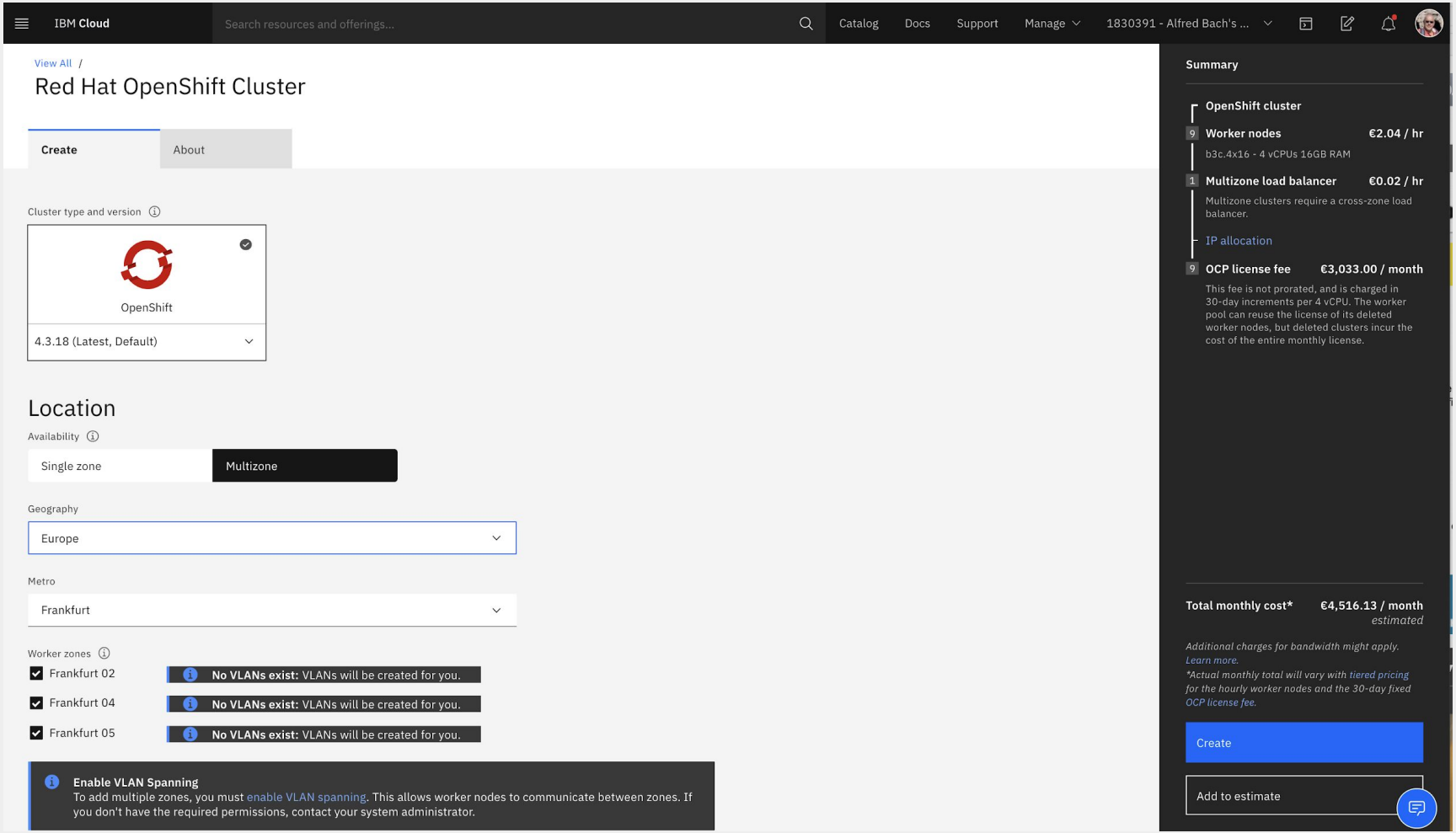
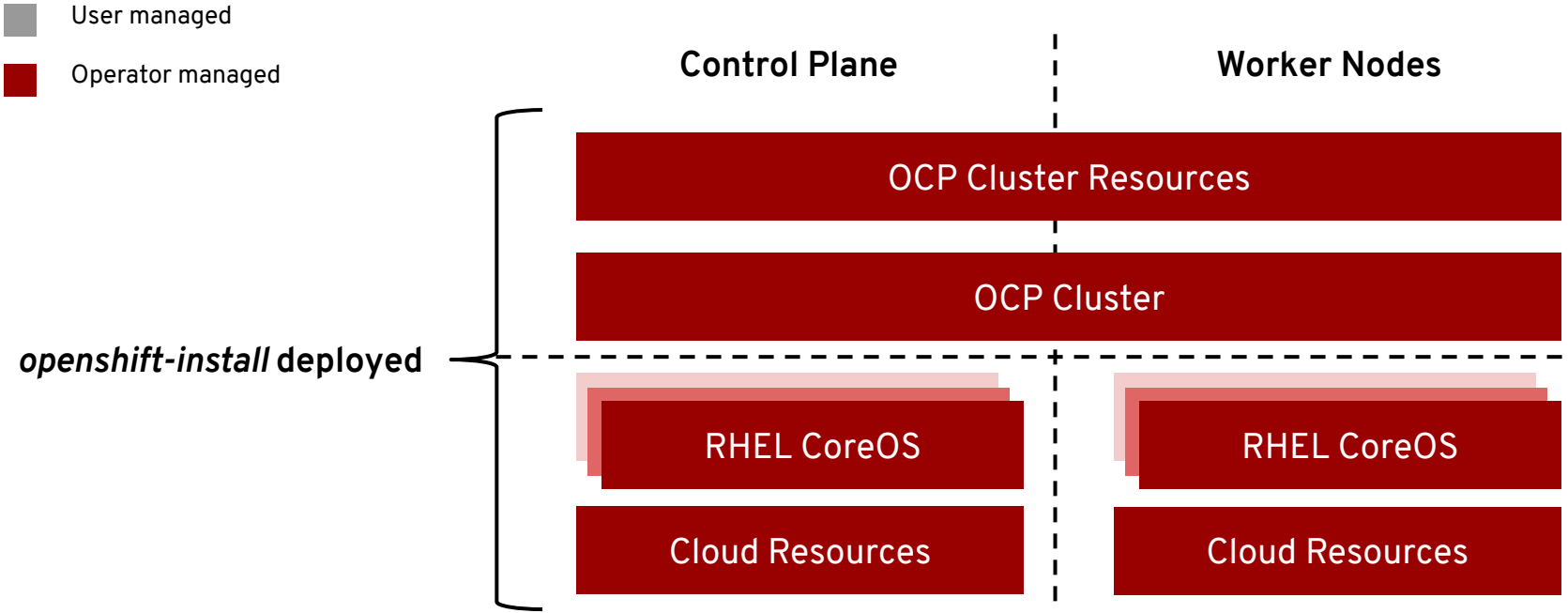
OpenShift 4 Installer




IBM Cloud
Search resources and offerings...
Catalog
Docs
Support
Manage
1830391 - Alfred Bach's ...
View All /
Red Hat OpenShift Cluster
Create
About
Cluster type and version
OpenShift
4.3.18 (Latest, Default)
Location
Availability
Single zone
Multizone
Geography
Europe
Metro
Frankfurt
Worker zones
Frankfurt 02
Frankfurt 04
Frankfurt 05
No VLANs exist: VLANs will be created for you.
No VLANs exist: VLANs will be created for you.
No VLANs exist: VLANs will be created for you.
Enable VLAN Spanning
To add multiple zones, you must enable VLAN spanning. This allows worker nodes to communicate between zones. If you don't have the required permissions, contact your system administrator.
Summary
OpenShift cluster
9 Worker nodes €2.04 / hr
b3c.4x16 - 4 vCPUs 16GB RAM
1 Multizone load balancer €0.02 / hr
Multizone clusters require a cross-zone load balancer.
IP allocation
9 OCP license fee €3,033.00 / month
This fee is not prorated, and is charged in 30-day increments per 4 vCPU. The worker pool can reuse the license of its deleted worker nodes, but deleted clusters incur the cost of the entire monthly license.
Total monthly cost* €4,516.13 / month
estimated
Additional charges for bandwidth might apply. Learn more.
*Actual monthly total will vary with tiered pricing for the hourly worker nodes and the 30-day fixed OCP license fee.
Create
Add to estimate

Full-stack Automated Installation (aka IPI)



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Full Stack Automated Deployments

Simplified Cluster Creation

Designed to easily provision a “best practices” OpenShift cluster

- New CLI-based installer with interactive guided workflow that allows for customization at each step
- Installer takes care of provisioning the underlying Infrastructure significantly reducing deployment complexity
- Leverages RHEL CoreOS for all node types enabling full stack automation of installation and updates of both platform and host OS content

Faster Install

The installer typically finishes within 30 minutes

- Only minimal user input needed with all non-essential install config options now handled by component operator CRD’s
- See the OpenShift documentation for more details

```
$ ./openshift-install --dir ./demo create cluster
? SSH Public Key /Users/demo/.ssh/id_rsa.pub
? Platform aws
? Region us-west-2
? Base Domain example.com
? Cluster Name demo
? Pull Secret [? for help]
************************************************************
INFO Creating cluster...
INFO Waiting up to 30m0s for the Kubernetes API...
INFO API v1.11.0+c69f926354 up
INFO Waiting up to 30m0s for the bootstrap-complete event...
INFO Destroying the bootstrap resources...
INFO Waiting up to 10m0s for the openshift-console route to be created...
INFO Install complete!
INFO Run 'export KUBECONFIG=<your working directory>/auth/kubeconfig' to
manage the cluster with 'oc', the OpenShift CLI.
INFO The cluster is ready when 'oc login -u kubeadmin -p <provided>'
succeeds (wait a few minutes).
INFO Access the OpenShift web-console here:
https://console-openshift-console.apps.demo.example.com
INFO Login to the console with user: kubeadmin, password: <provided>
```


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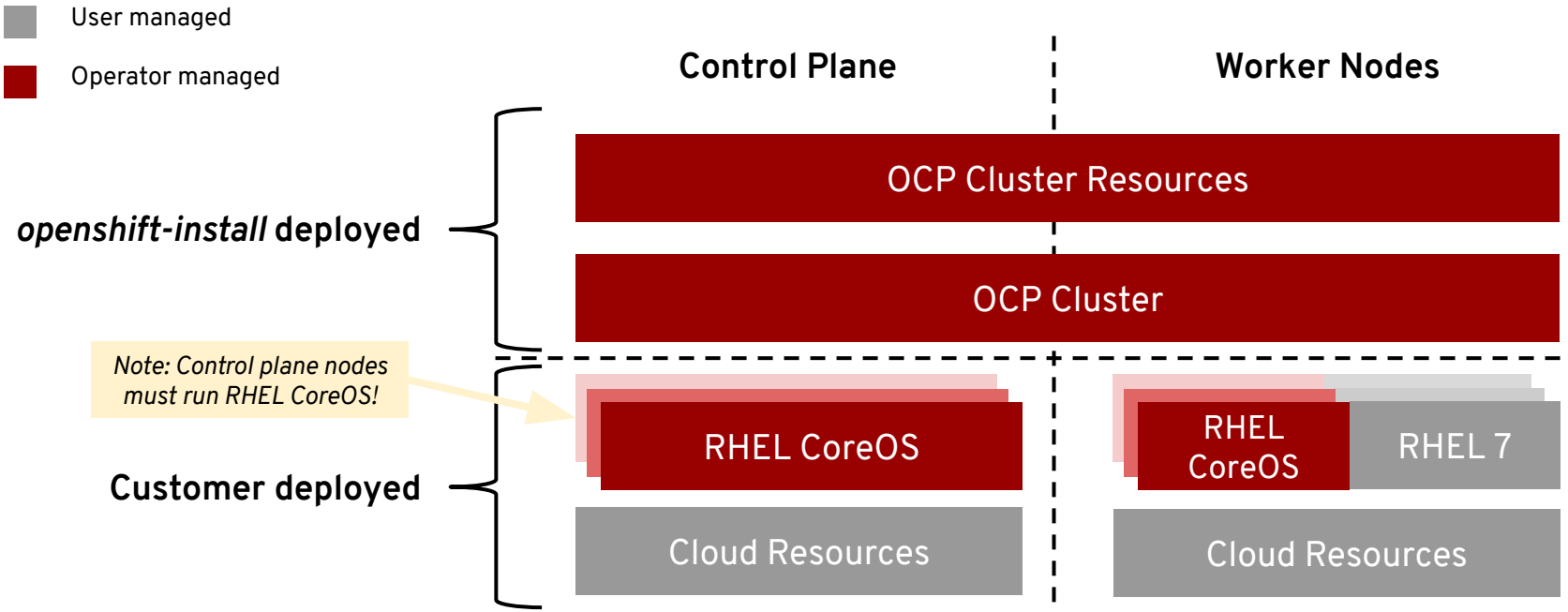
Pre-existing Infrastructure Installation (aka UPI)



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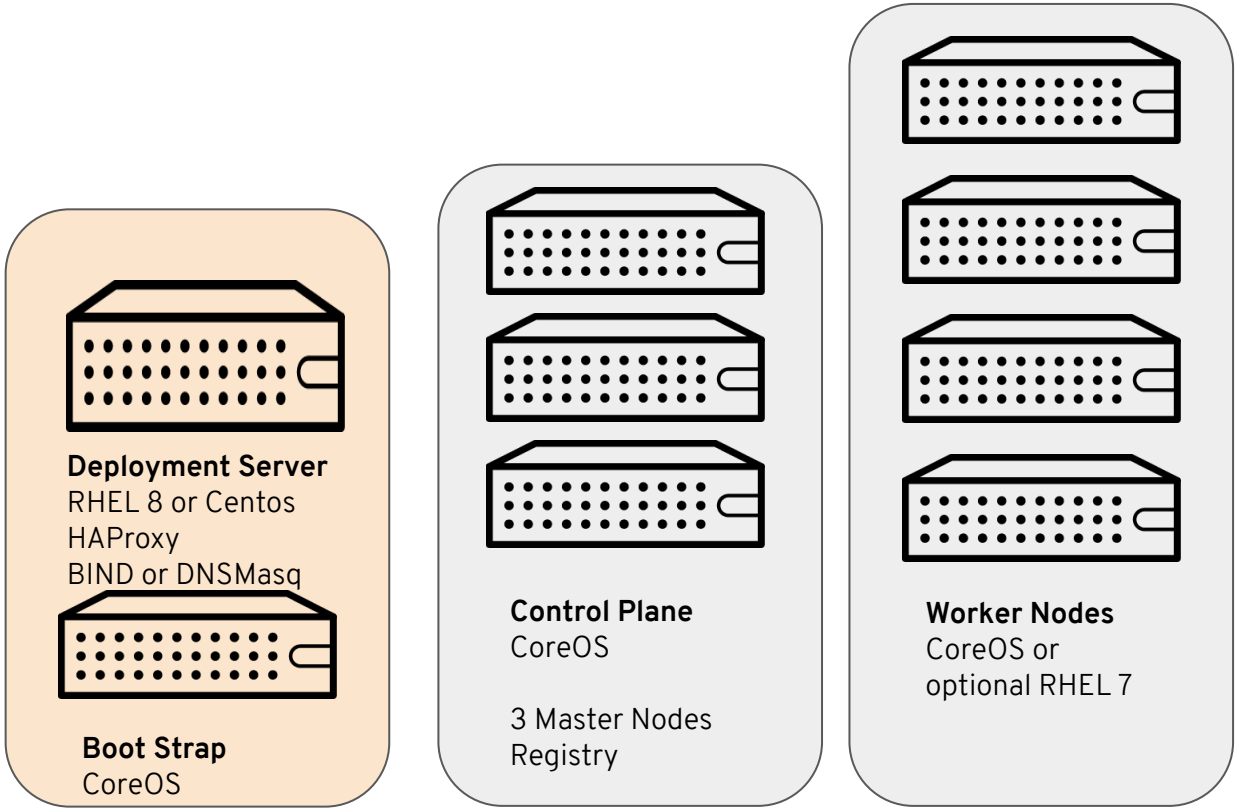
INSTALL A OPENSHIFT CLUSTER



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Comparison of Paradigms

	Full Stack Automation	Pre-existing Infrastructure
Build Network	Installer	User
Setup Load Balancers	Installer	User
Configure DNS	Installer	User
Hardware/VM Provisioning	Installer	User
OS Installation	Installer	User
Generate Ignition Configs	Installer	Installer
OS Support	Installer: RHEL CoreOS	User: RHEL CoreOS + RHEL 7
Node Provisioning / Autoscaling	Yes	Only for providers with OpenShift Machine API support

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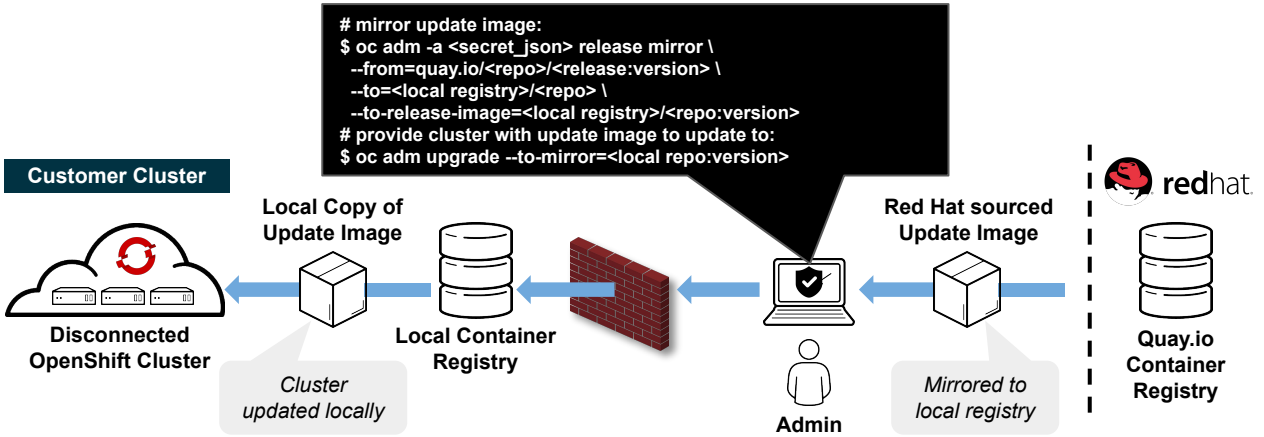
Disconnected “Air-gapped” Installation & Upgrading



Overview

- 4.2 introduces support for installing and updating OpenShift clusters in disconnected environments
- Requires local Docker 2.2 spec compliant container registry to host OpenShift content
- Designed to work with the user provisioned infrastructure deployment method
  - *Note: Will not work with Installer provisioned infrastructure deployments*

Installation Procedure

- Mirror OpenShift content to local container registry in the disconnected environment
- Generate install-config.yaml: $ ./openshift-install create install-config --dir <dir>
  - Edit and add pull secret (PullSecret), CA certificate (AdditionalTrustBundle), and image content sources (ImageContentSources) to install-config.yaml
- Set the OPENSHIFT_INSTALL_RELEASE_IMAGE_OVERRIDE environment variable during the creation of the ignition configs
- Generate the ignition configuration: $ ./openshift-install create ignition-configs --dir <dir>
- Use the resulting ignition files to bootstrap the cluster deployment

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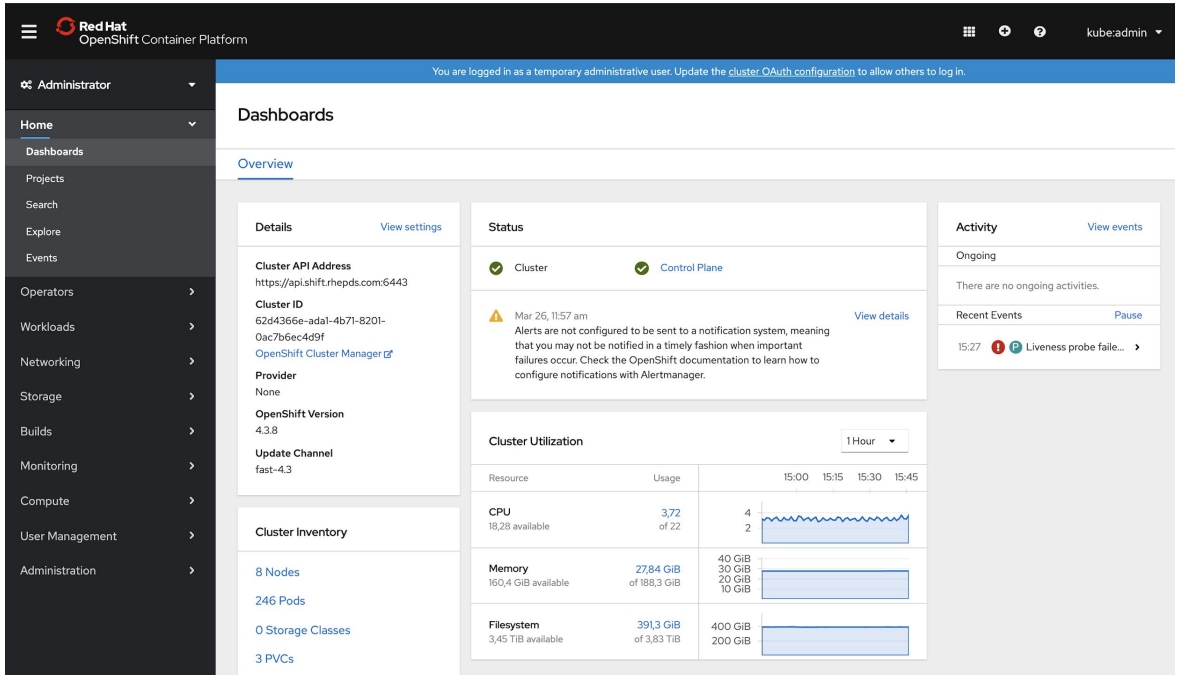
OpenShift Usage

Operations



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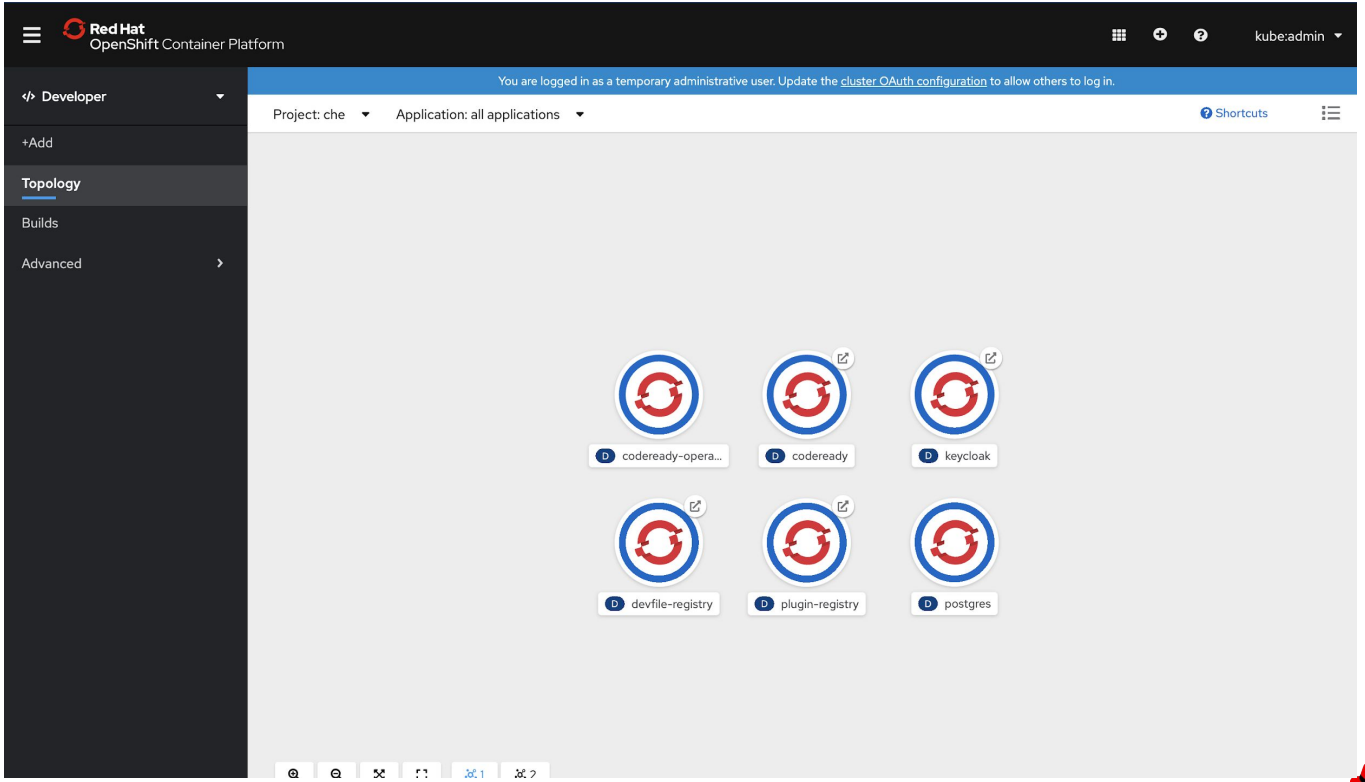
Development



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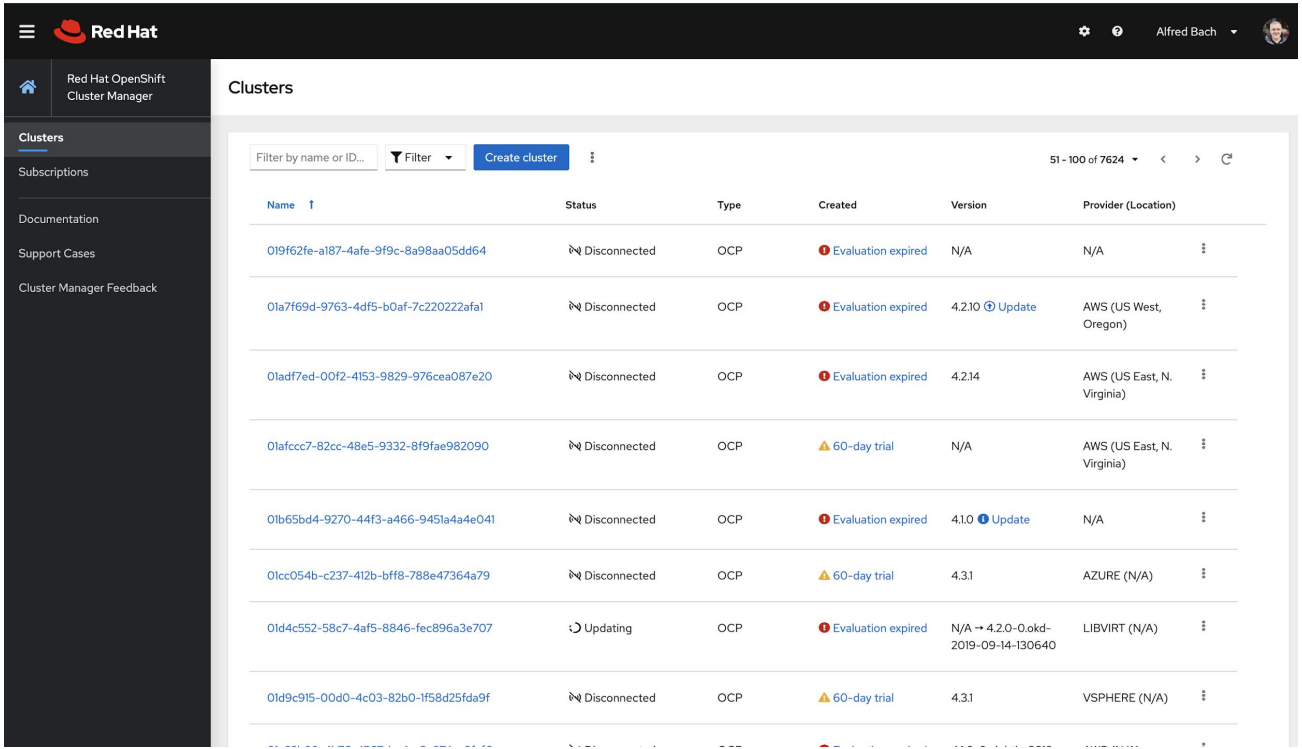
Multi Cluster Management



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OpenShift Hands-On Lab and Summary

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Interactive Learning Scenarios provide you with a pre-configured OpenShift instance, accessible from your browser without any downloads or configuration.

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https://developer.redhat.com

Red Hat OCP Install portal

cloud.redhat.com

Install OCP on IBM Z

https://docs.openshift.com/container-platform/4.2/installing/installing_ibm_z/installing-ibm-z.htm

Learn OpenShift

https://learn.openshift.com

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OpenShift - technical overview

Modules	
OpenShift Architecture	20 min
OpenShift Network and Storage	20 min
OpenShift Installation	20 min
OpenShift Usage	20 min
OpenShift Hands-On Intro	5 min

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abach@redhat.com

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