Connecting Workloads Across Kubernetes Clusters

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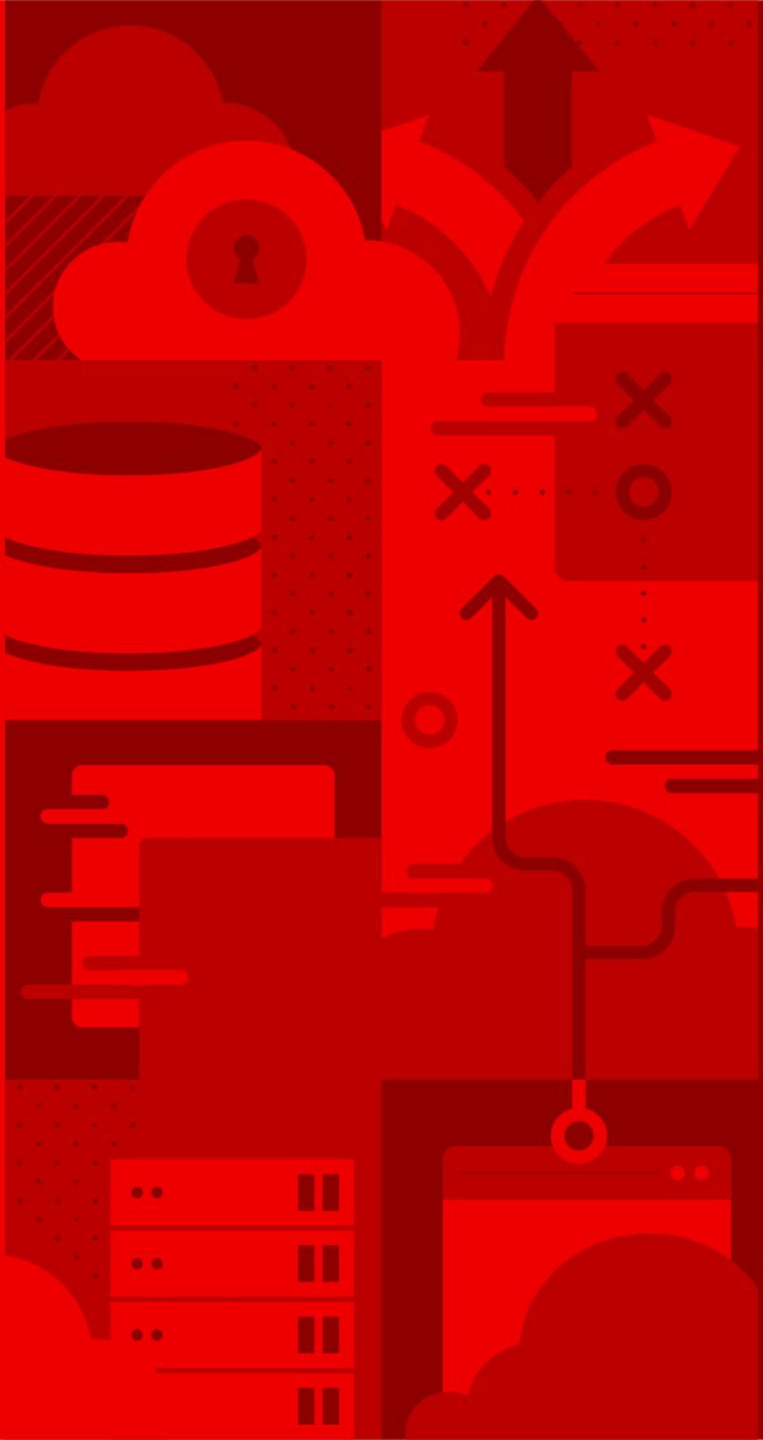
Disclaimer

This is active research and development, with support expected in a future OpenShift release.

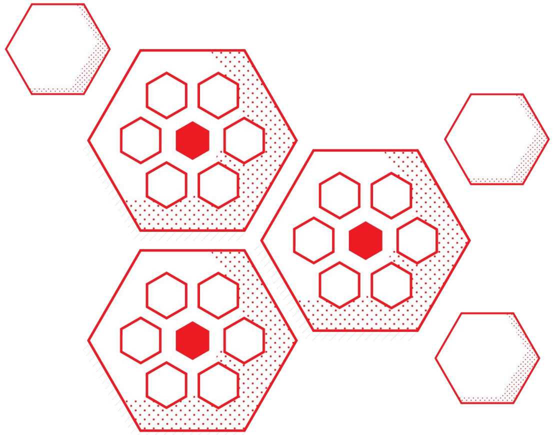
Agenda

- Market Trends and Challenges
- Introducing Submariner
- Architecture Overview
- Resources & Next Steps



Market Trends and Challenges

Kubernetes adoption leads to multicluster



"As Kubernetes gains adoption across the industry, scenarios are arising in which teams are finding they must deploy and manage multiple clusters, either in a single region on-premises or in the cloud, or across multiple regions.... for a number of reasons, including multi-tenancy, disaster recovery, and with hybrid, multi-cloud, or edge deployments."

Source:
Assessing Patterns for Deploying Distributed Kubernetes Clusters doc # G00465217, by Tony Iams

Where is the growth in cluster deployments?

Small Scale Dev Teams

Managing clusters across Dev/QA/Prod clusters

Medium Scale Organizations

Local retails with clusters across 100s of locations

Large Scale Organizations

Global organizations with 100s of clusters, hosting thousand of applications

Edge Scale Telco

100s of zones, 1000s of clusters and nodes across complex topologies

Reasons for deploying multiple clusters

Application availability

Reduced latency

Address industry standards

Geopolitical data residency guidelines

Disaster recovery

Edge deployments

CapEx cost reduction

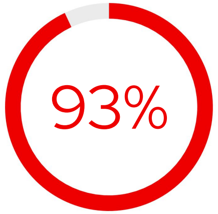
Avoid vendor lock-in

But hybrid cloud management is hard

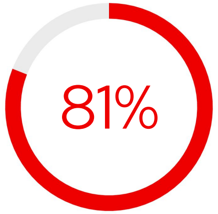
As organizations deploy more across multiple clouds, new challenges arise.

- **Difficult and error prone** to manage at scale
- **Inconsistent security controls** across environments
- **Overwhelming to verify** components, configurations, policies, and compliance

IDC Survey of 200 US-based $1B companies actively using two or more "infrastructure clouds" for production applications



Using multiple infrastructure clouds*

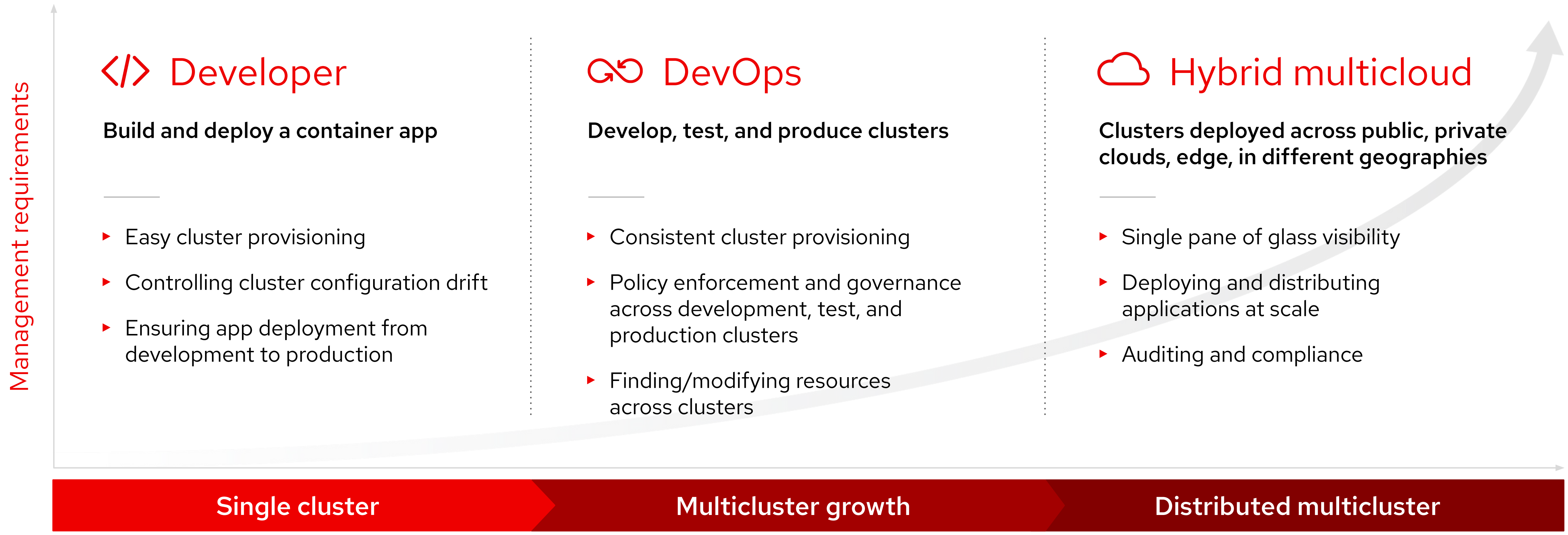


Using multiple public clouds and one or more private/dedicated clouds*

Source:
DC Multicloud Management Survey, 2019: Special Study, Doc # US45020919, April 2019
*IDC Survey of 200 US-based $1B companies actively using two or more "infrastructure clouds" for production applications

Multicluster management challenges

How do I normalize and centralize key functions across environments?



Management requirements

Developer

Build and deploy a container app

- Easy cluster provisioning
- Controlling cluster configuration drift
- Ensuring app deployment from development to production

DevOps

Develop, test, and produce clusters

- Consistent cluster provisioning
- Policy enforcement and governance across development, test, and production clusters
- Finding/modifying resources across clusters

Hybrid multicloud

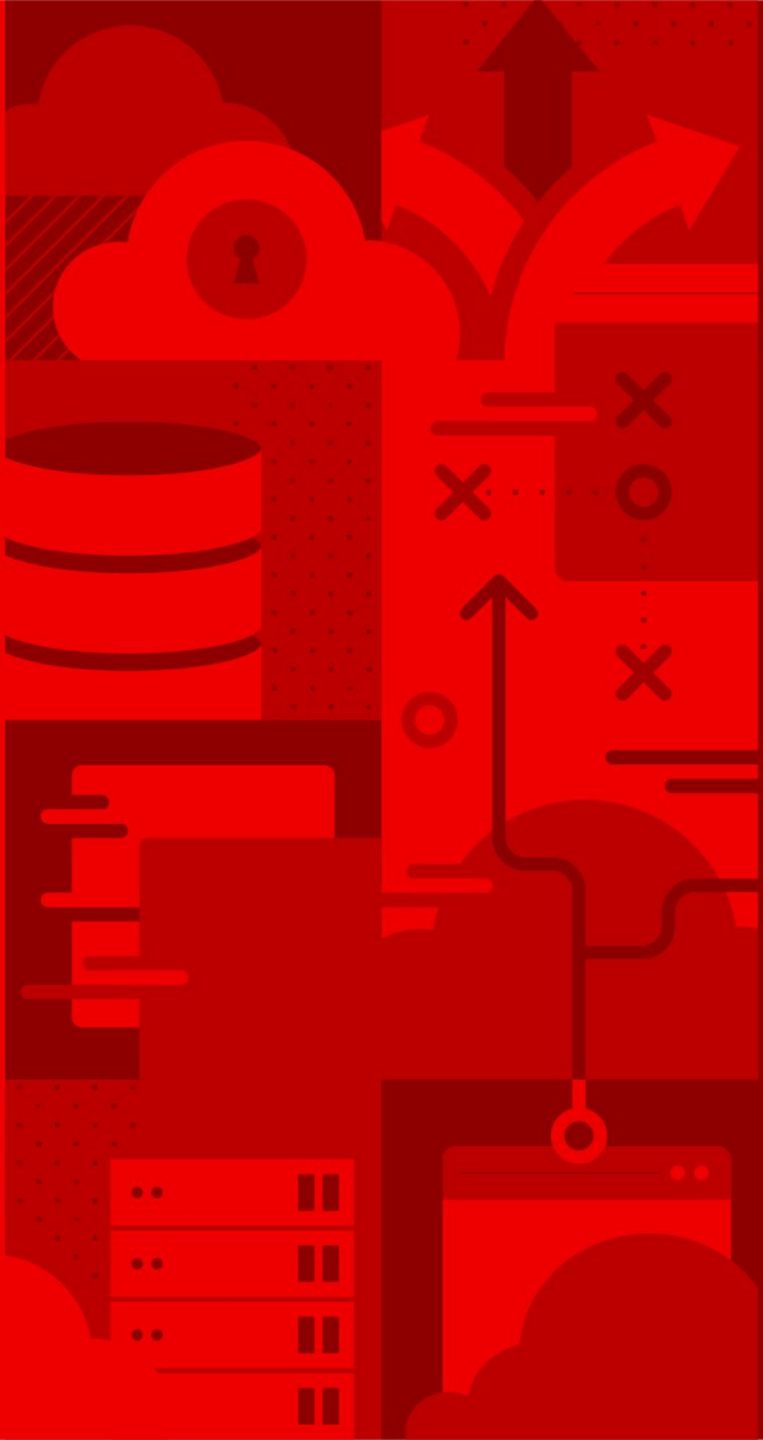
Clusters deployed across public, private clouds, edge, in different geographies

- Single pane of glass visibility
- Deploying and distributing applications at scale
- Auditing and compliance

Single cluster

Multicluster growth

Distributed multicluster



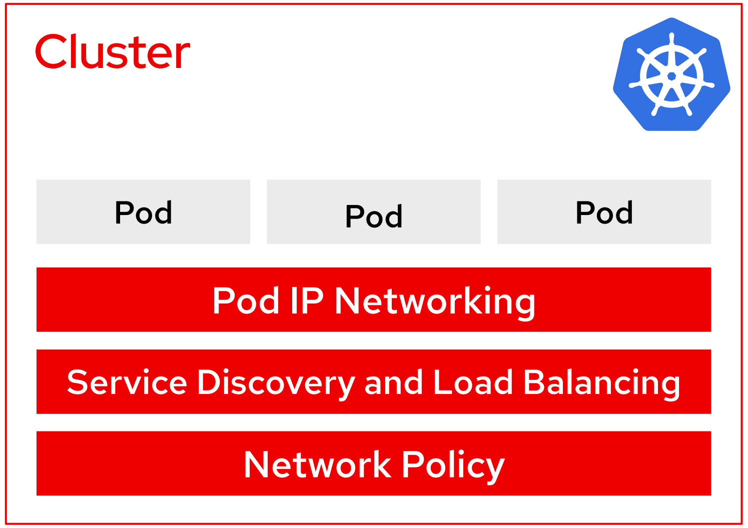
Introducing Submariner

Multicluster networking for OpenShift

- An add-on to OpenShift Container Platform that enables direct network connectivity between multiple clusters
- Exposes a set of new custom resources (CRDs) backed by the Kubernetes datastore
- Available as a *Developer Preview* via OperatorHub.io
- Open source, vendor neutral project: https://submariner.io/

SUBMARINER

Multicluster networking for OpenShift


Cluster

Pod

Pod

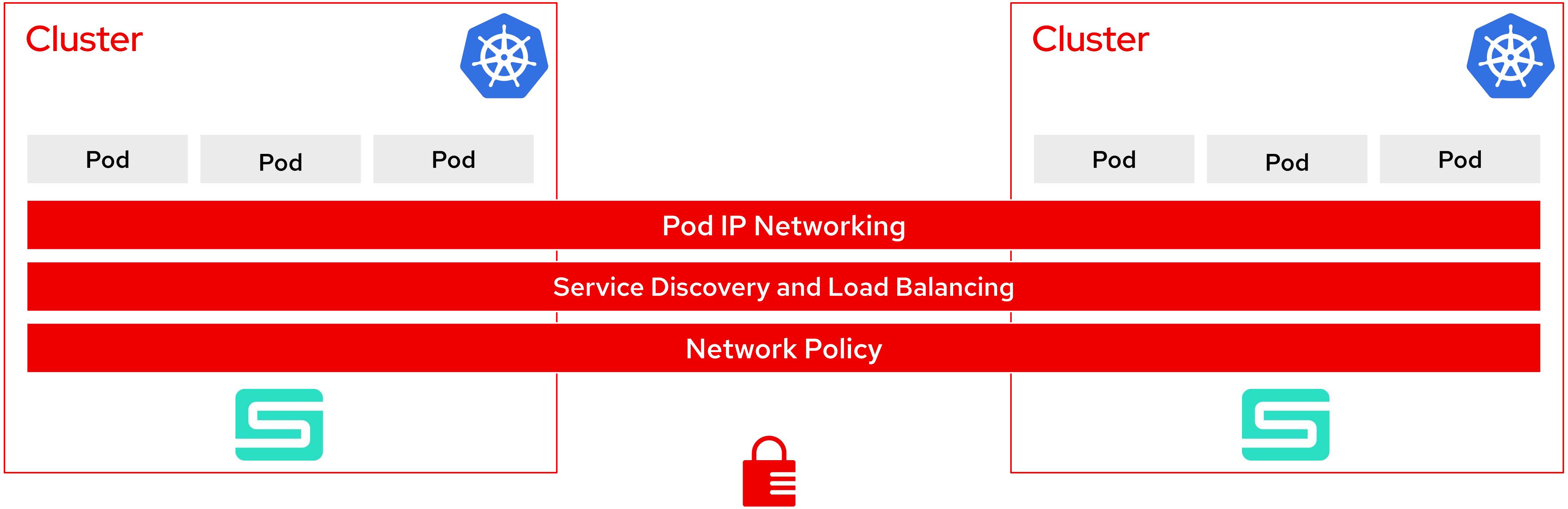
Pod

Pod IP Networking

Service Discovery and Load Balancing

Network Policy

Multicluster networking for OpenShift



Cluster

Pod

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Cluster

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Pod IP Networking

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Benefits

Direct pod-to-pod and pod-to-service communication across clusters

Provides L3 network reachability to support any application (TCP/UDP) on top

Enhanced security

All traffic flow between clusters is encrypted by default

Deploy services across clusters

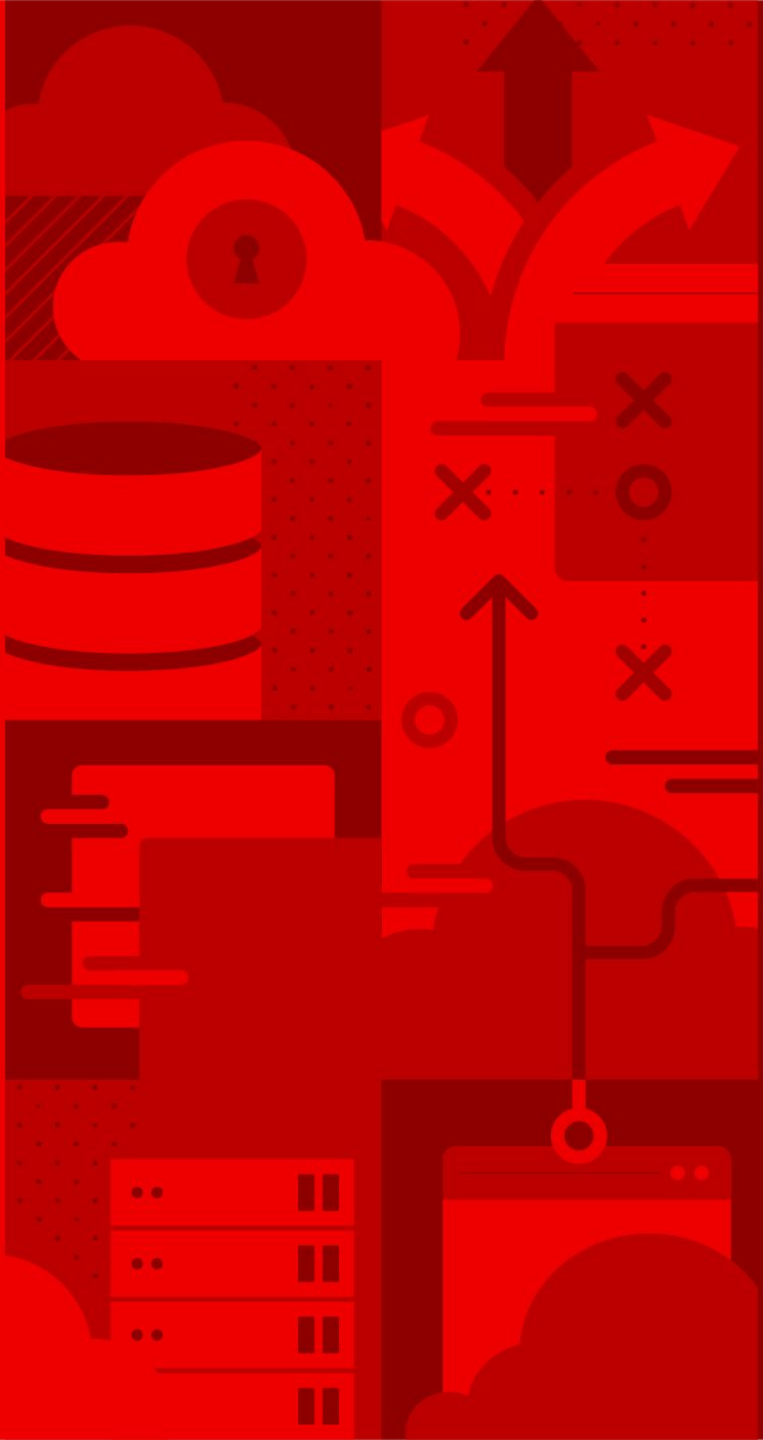
Beyond connectivity, also addresses the challenge of cross-cluster service discovery (DNS) and network policy

Extend existing OpenShift deployments

Compatible with different cloud providers and network (CNI) plugins; benefits the wider OpenShift ecosystem

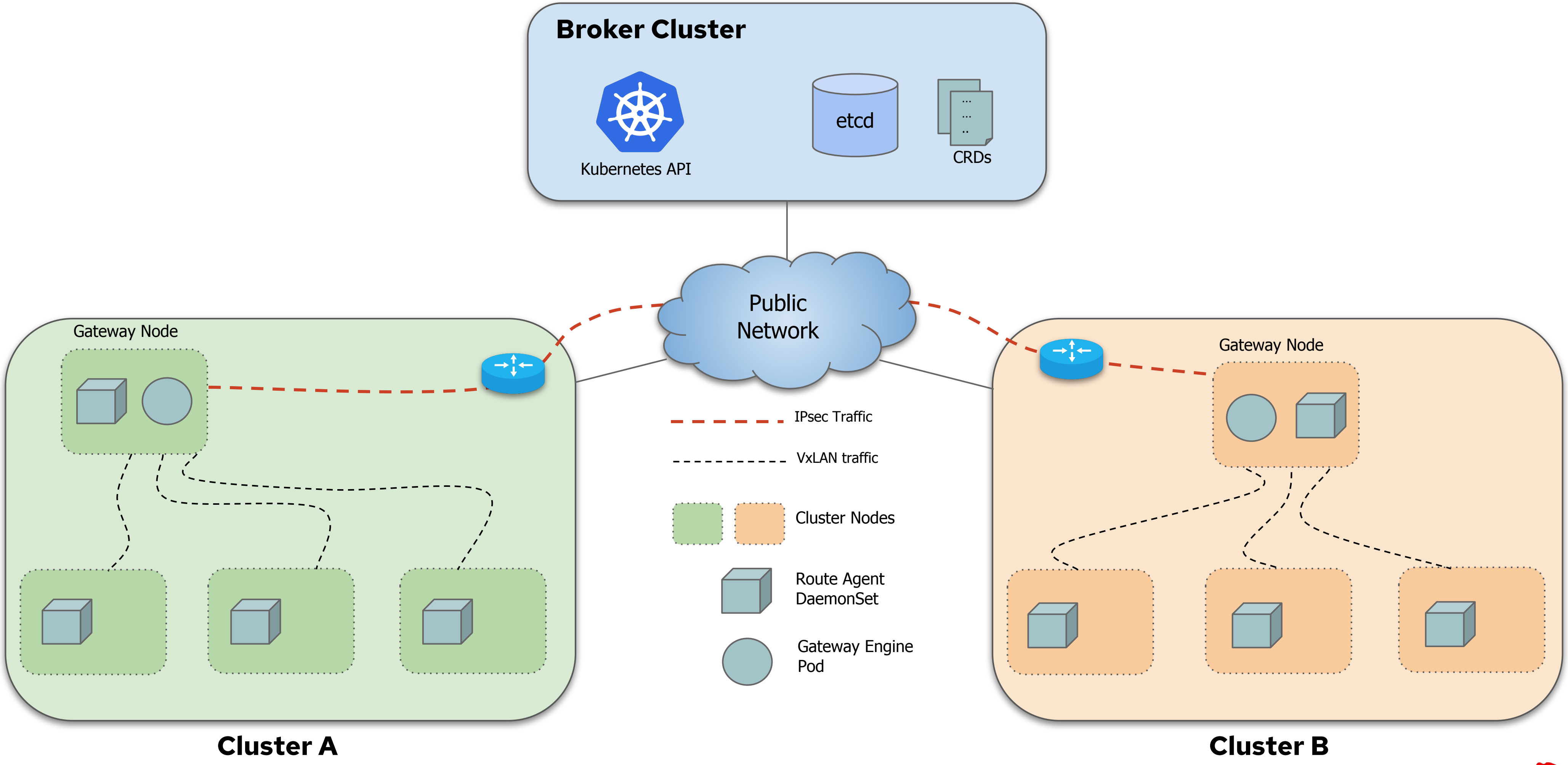
Key features

- Cross-cluster L3 connectivity
  - Using encrypted VPN tunnels | demo recording
- An operator-based deployment
  - A single line installation process | demo recording
- Service Discovery across clusters (“Lighthouse”)
  - To facilitate multi-cluster DNS | demo recording
- Support for overlapping IP addresses (“Globalnet”)
  - Can interconnect clusters with overlapping CIDRs | demo in the works, check our YouTube channel!



Architecture Overview

Draw me a picture!



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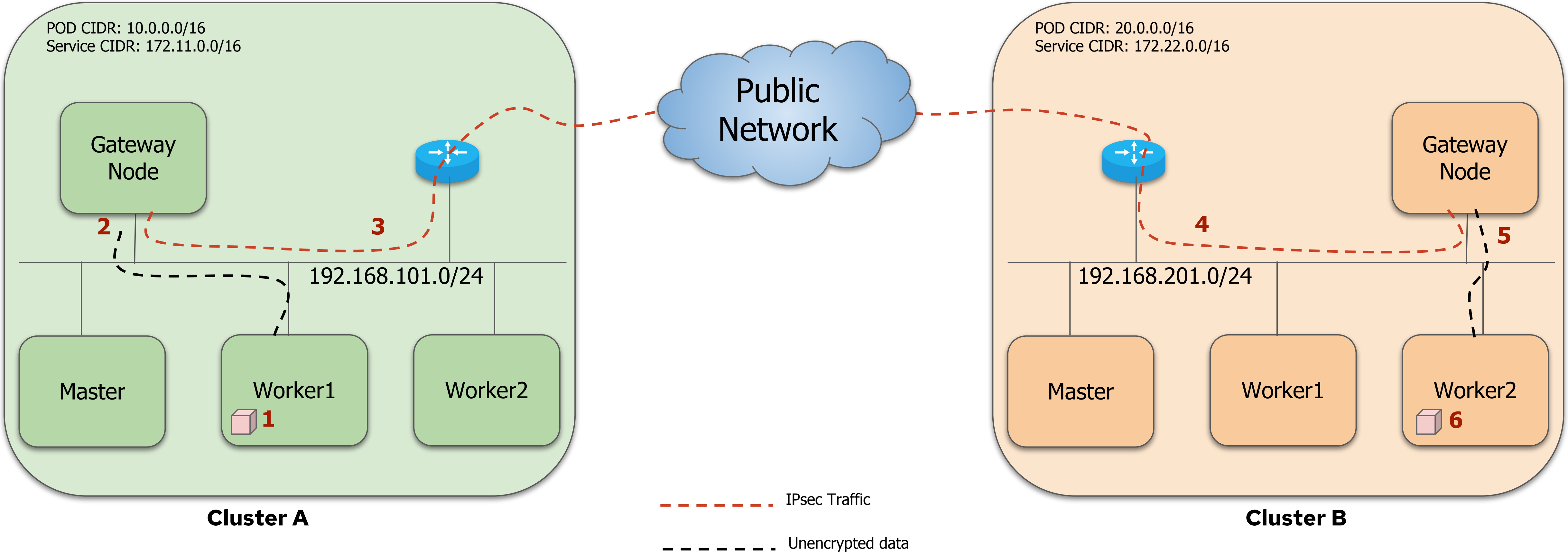

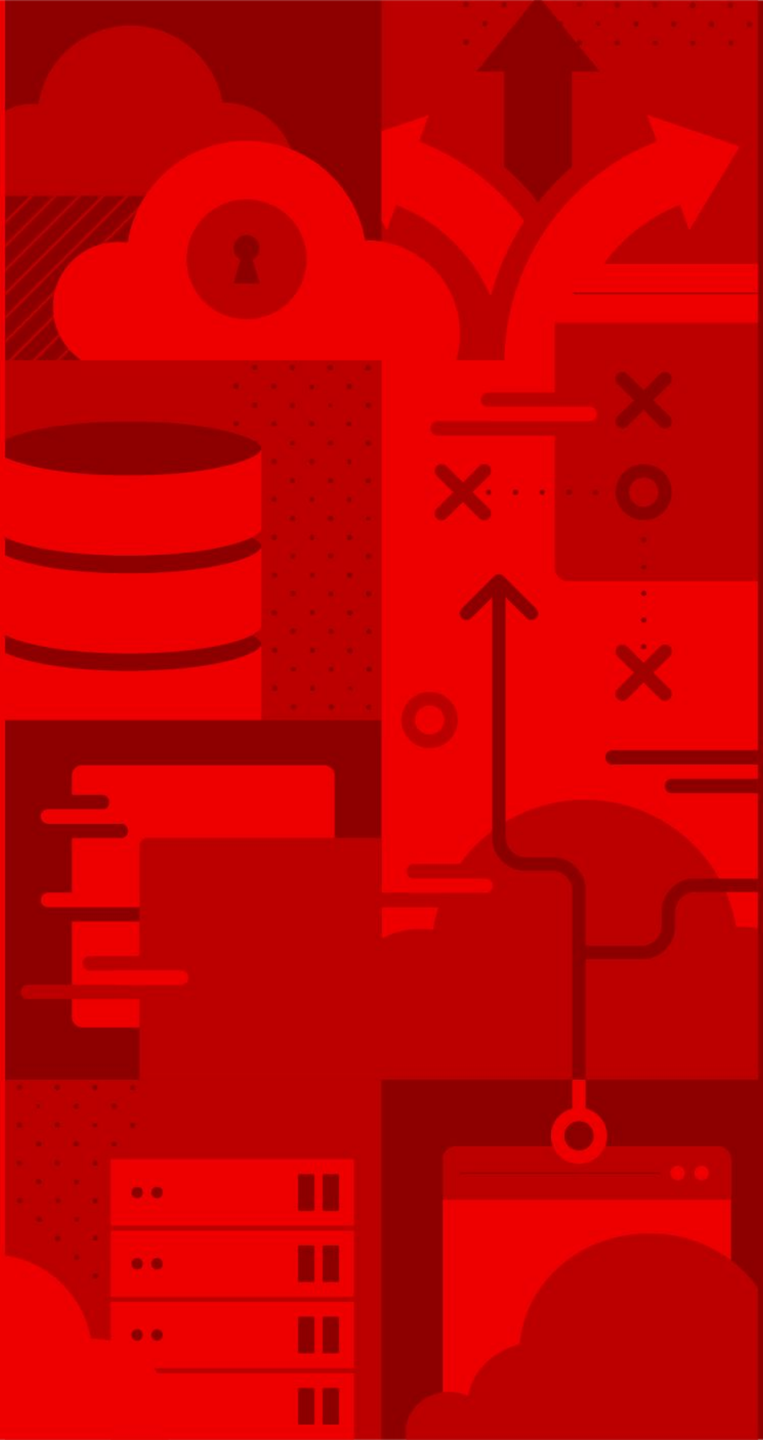

Resources & Next Steps

subctl

Deploy and run Submariner in three commands

Deploy cluster1 as broker:

```
subctl deploy-broker --kubeconfig output/kubeconfigs/config-cluster1 --service-discovery
```

Join cluster2 and cluster3 to the broker:

```
subctl join --kubeconfig output/kubeconfigs/config-cluster2 broker-info.subm
```

```
subctl join --kubeconfig output/kubeconfigs/config-cluster3 broker-info.subm
```

Give it a try

- Upstream community
    - Website: https://submariner.io
        - https://submariner.io/quickstart/
    - GitHub: https://github.com/submariner-io
    - YouTube: https://tinyurl.com/submariner-youtube
    - Slack (Kubernetes space): #submariner

- Red Hat
    - We are currently seeking design partners and early adopters willing to try out Submariner and give us feedback!

Thank you

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