Red Hat Summit

Connect

Estensione delle infrastrutture con modelli edge e multicloud: nuove necessità di business

Nicolò Amato

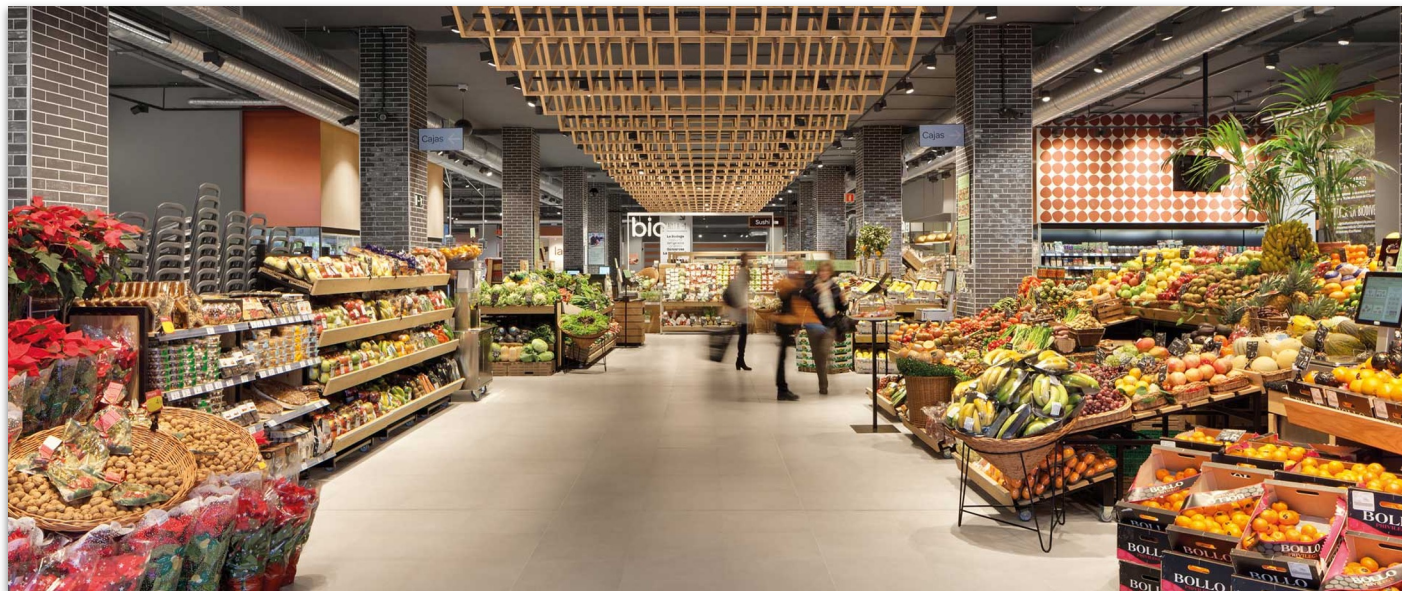Senior Solution Architect

Red Hat

Gianni Salinetti

Senior Solution Architect

Red Hat

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Evolving Company Retail Business

Tree of Taste

The Edge solutions offered by Red Hat can help the Tree of Taste company in its growth process by supporting retail stores interaction between ordering services and warehouse management. The same platform will be used in the future to introduce new edge-centric AI/ML features.

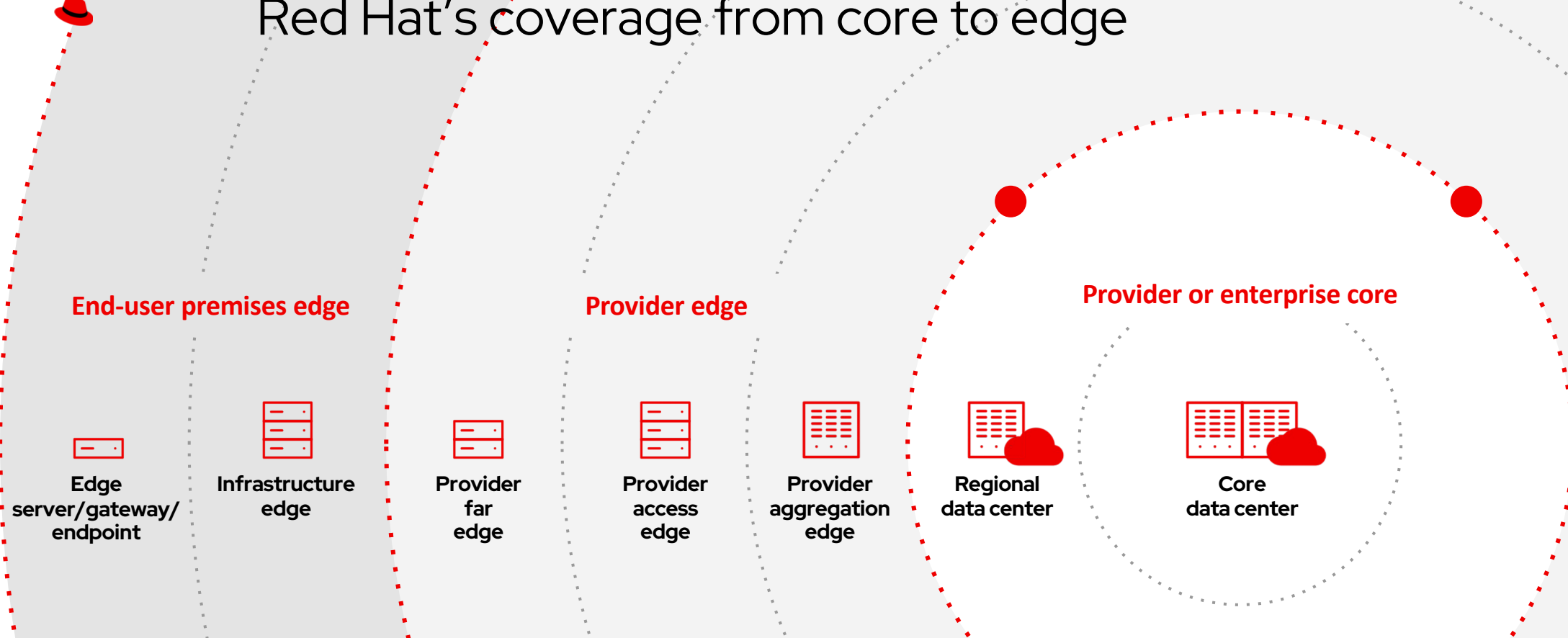# Edge computing extends digital transformation to where business happens

Software-defined platforms

Software-defined everyding

- ▸ Standard, scalable hardware
- ▸ Cloud-native applications
- ▸ Flexibility and agility
- ▸ Convergence of data platforms

- ▸ Real-world, real-time interaction
- ▸ Convergence of planning and execution
- ▸ Implementation of data-driven insights
- ▸ Integration of formerly closed systems

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Red Hat's coverage from core to edge

Scale ↑

Device or Sensor

Footprint ↓

End-user premises edge

Edge server/gateway/ endpoint

Infrastructure edge

Provider edge

Provider far edge

Provider access edge

Provider aggregation edge

Provider or enterprise core

Regional data center

Core data center

Sensor Data, Telemetry, Events, Operational Data, General Information, etc.

Code, Configuration, Master Data, ML Models, Control, Commands, etc.

* Edge computing = Fog computing (there is no real difference other than marketing)

RHEL for Edge: Small footprint edge OS

RHEL for Edge ensures operational stability and flexibility to easily adapt deployments. Quick image generation, transactional OS updates, and intelligent OS rollbacks, provide both traditional and containerized workloads the additional security and resiliency required for edge environments.

Use cases

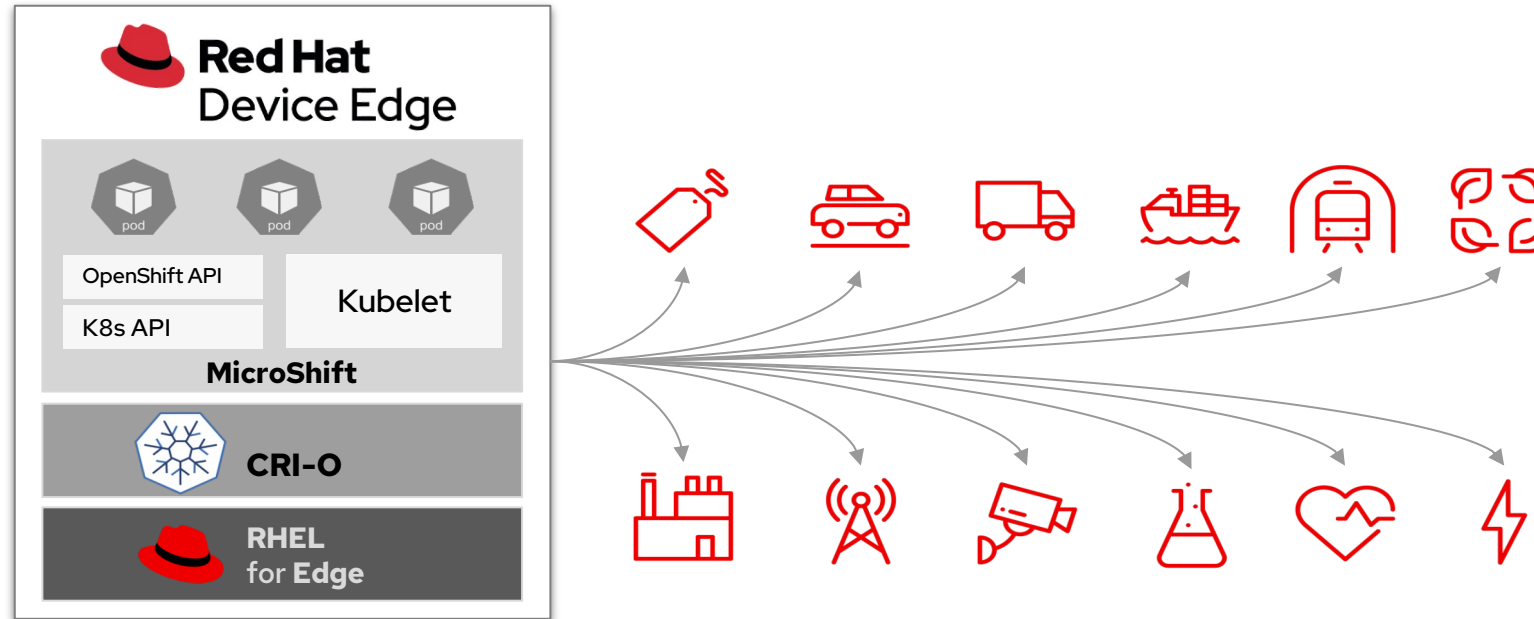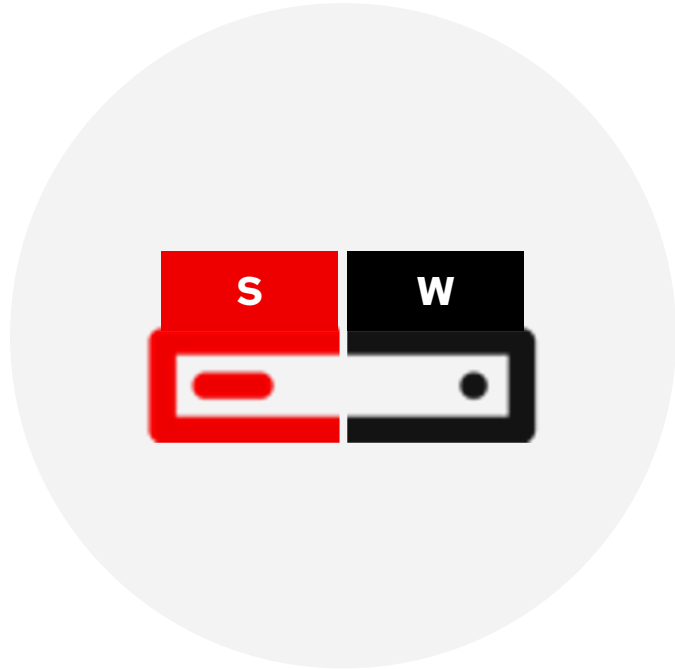| Edge servers and gateways* | Standalone container host | Customer premise equipment | Intermittently connected |

Emerging Technology

Red Hat Device Edge (R4E + MicroShift)

Red Hat Device Edge brings **MicroShift** (a minimal OpenShift implementation) and **RHEL for Edge** to small form factor devices optimized for edge computing and headless devices with as conservative a resource overhead as possible.
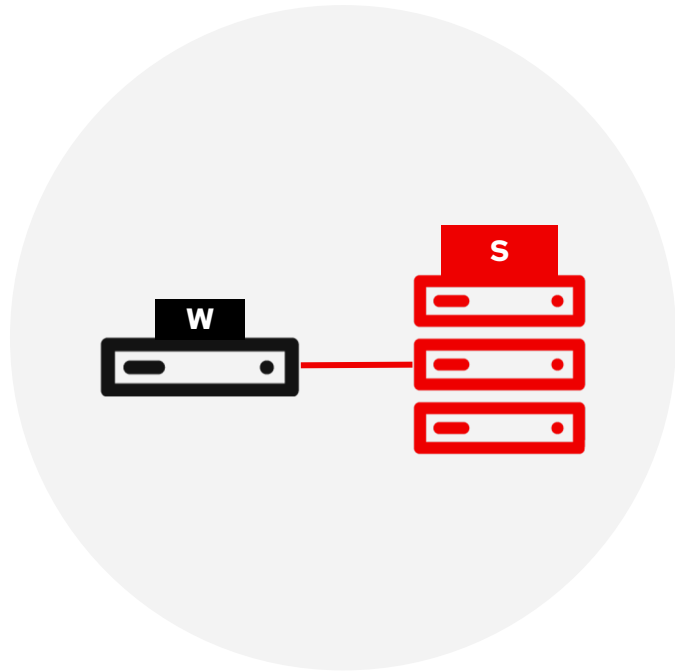
Single node edge cluster

Red Hat OpenShift deployment on a single box (supervisor + worker) with resources to run full a Kubernetes orchestrator as well as application workloads.

Use cases	Server class hardware	Telco 5G far edge - RAN	In-vehicle field operations	Asset monitoring	Telco 5G sparsely populated areas

S Supervisor node

W Worker node

Remote worker nodes

Red Hat OpenShift deployment with on-premise master and worker nodes combined with worker nodes located at the network edge that connect to the cluster.
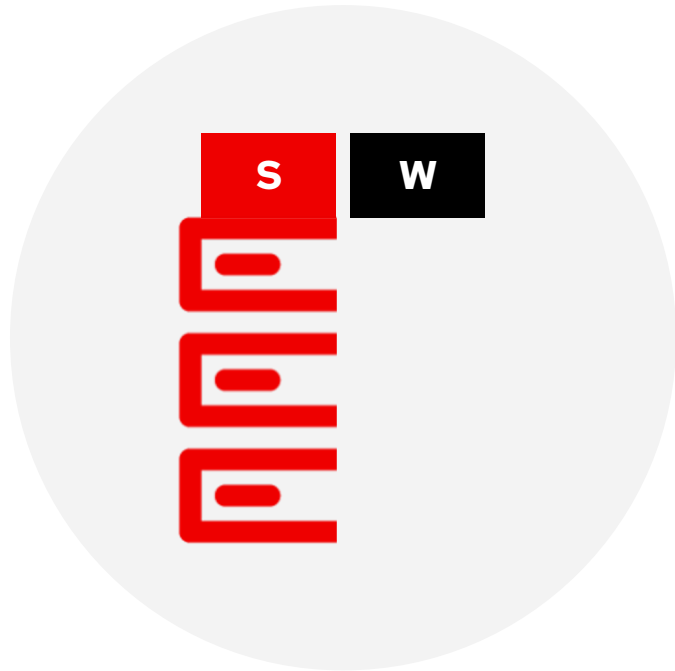
S Supervisor node

W Worker node

Use cases

Data aggregation and analysis	Telco 5G/RAN far edge (dense)	HA workloads (w/ 2 remote nodes)

Edge clusters (3+ node HA)

S Supervisor node

W Worker node

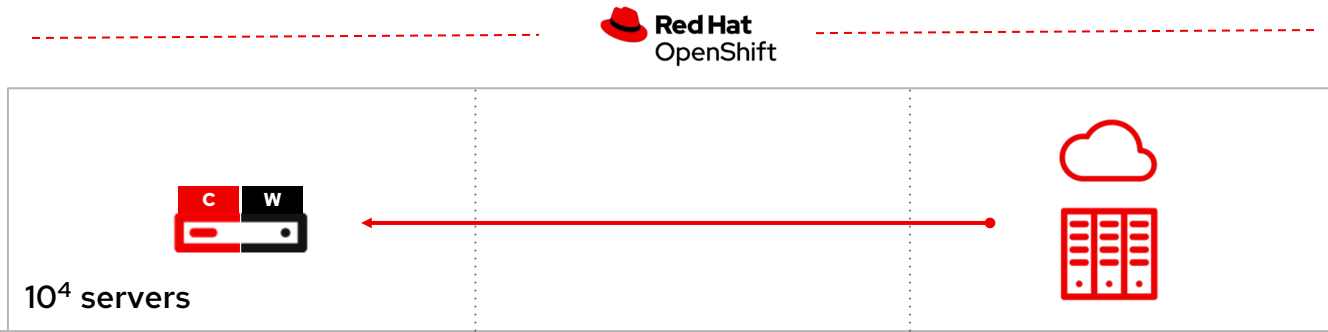Red Hat OpenShift supervisor and workers reside on the same node. High Availability (HA) setup with 3 servers.

Use cases

Edge AI and data pipelining

Telco 5G near edge and mobile edge computing

Disconnected clusters

Red Hat Enterprise Linux ✚ **Red Hat** OpenShift
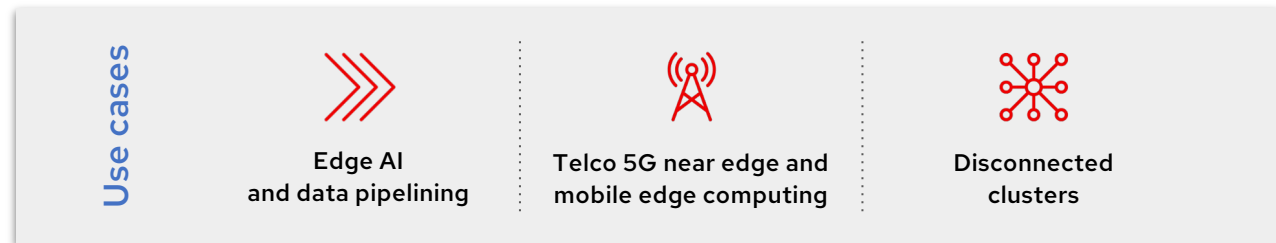
Device edge platform
RHEL minimal profile and tooling for Edge devices + MicroShift

10^4 devices

w/o k8s:
1 Core
2 GB RAM

with k8s::
2 Core
2GB RAM

Red Hat OpenShift

Single-node edge servers
Low bandwidth or disconnected sites

C W

10^4 servers

4 Cores
16GB RAM
min per node

Red Hat Management

(Remote) worker nodes
Space-constrained environments

W

C

10^4 servers 10^2 clusters

Worker:
1 Core
8 GB RAM

Control:
2 Core
16GB RAM
min per node
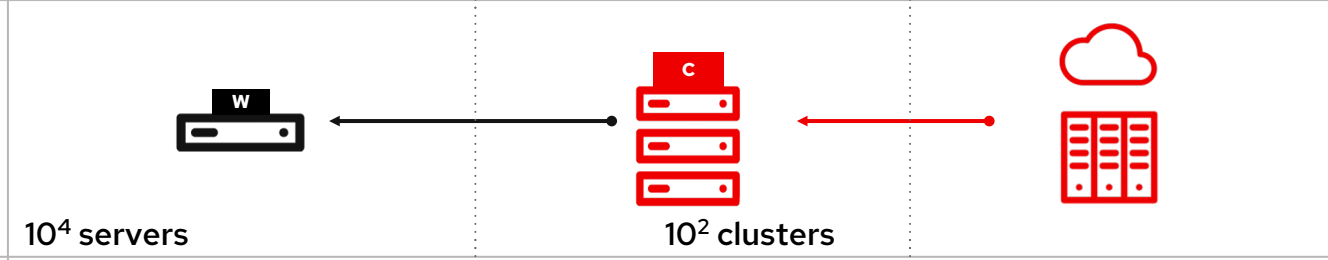
3 node Clusters
Low footprint clusters with high availability

C W

10^2 clusters

6 Cores
24GB RAM
min per node

Far Edge	Near Edge	Cloud(s) or DC

← Cluster management and application deployment

← Kubernetes node control

C Control node

W Worker node

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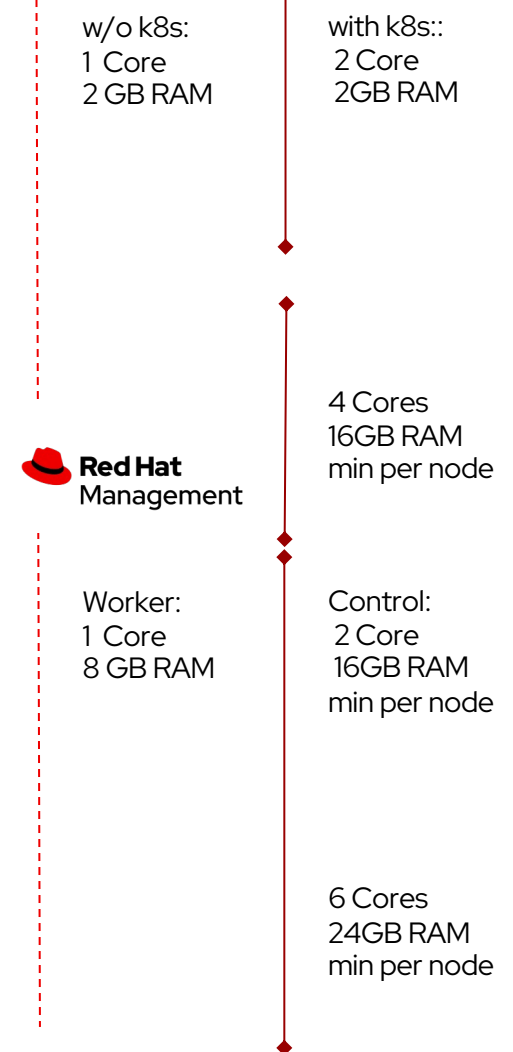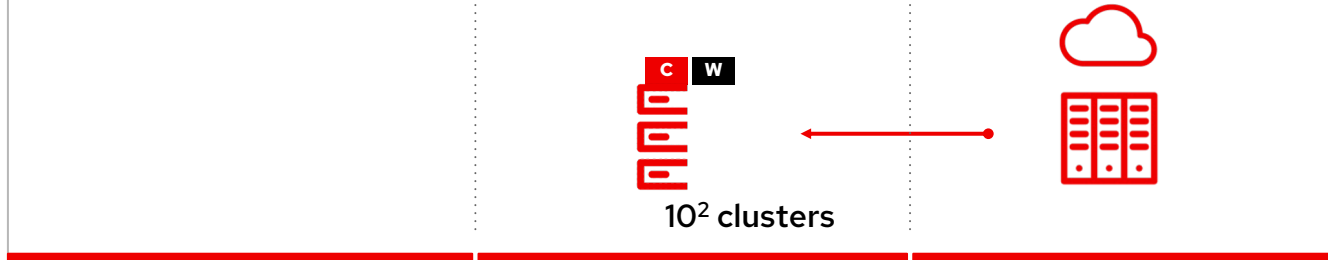
Defining and provisioning infrastructures with RHACM
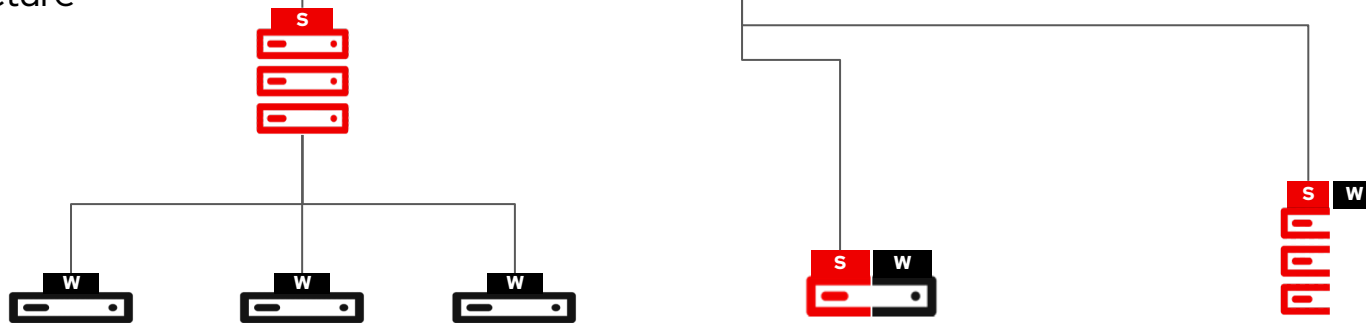

GitOps

Existing Infrastructure
Data Center`

Red Hat
Advanced Cluster
Management
for Kubernetes

ZTP Deployed
Infrastructure

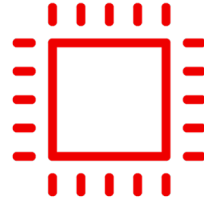**Zero Touch Provisioning** (ZTP) leverages RHACM and GitOps approach to remotely manage edge sites.

ACM manages clusters in a **hub/spoke** architecture, where a single hub cluster manages many spoke clusters
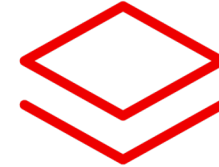
Single Node OpenShift

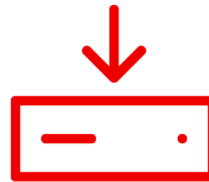Support on bare-metal, vSphere, Red Hat OpenStack
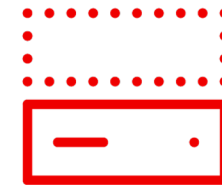
4 cores 16GB mem minimal requirements

Not have a dependency on a central control plane

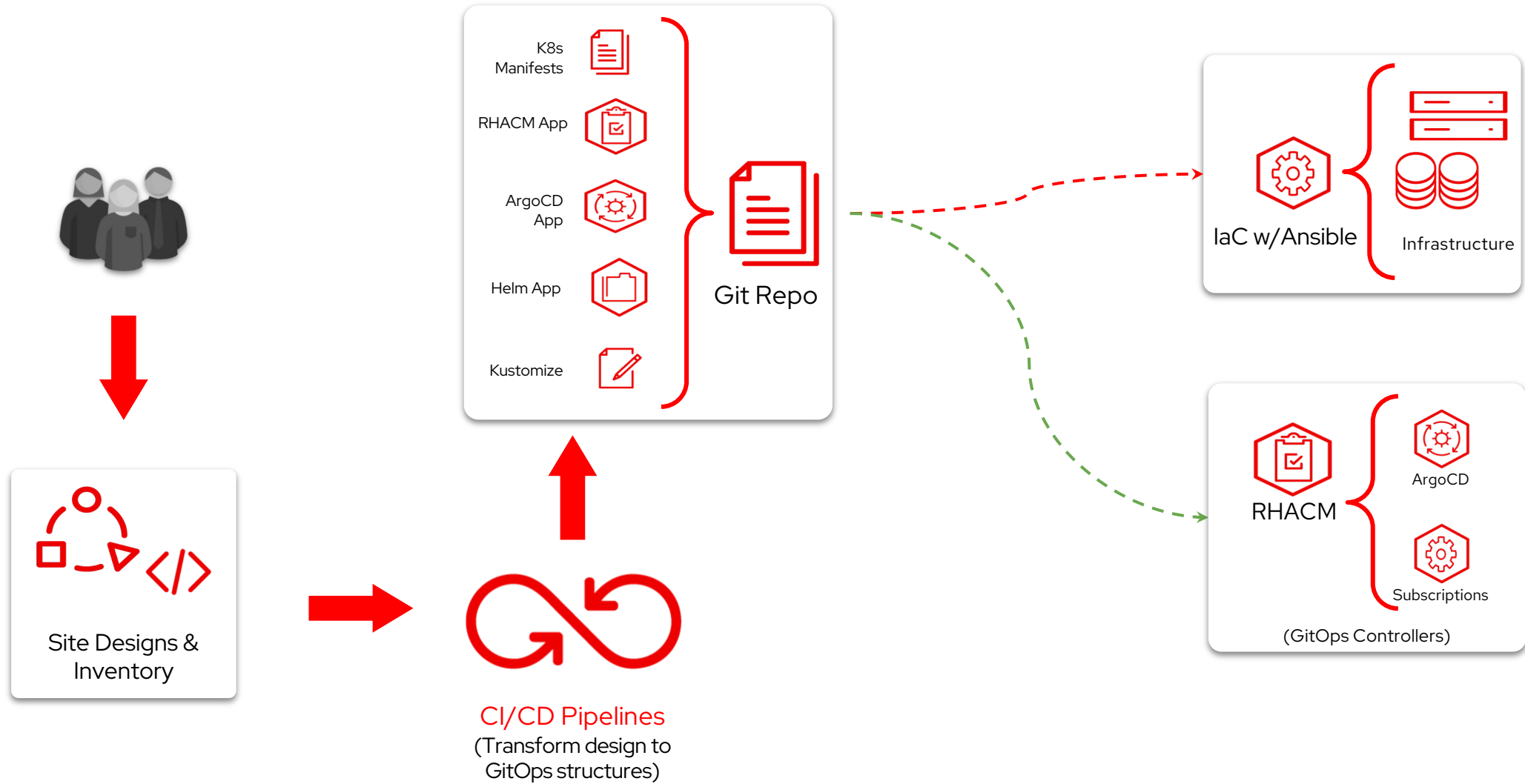Bootstrap In Place - no additional bootstrap node needed

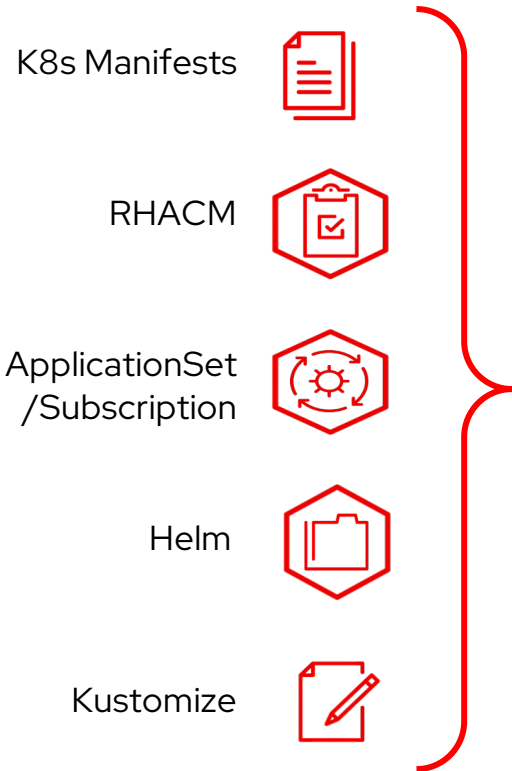Deployment via openshift-install or via RHACM (ZTP) /Assisted installer

Can manage additional worker nodes for per site capacity
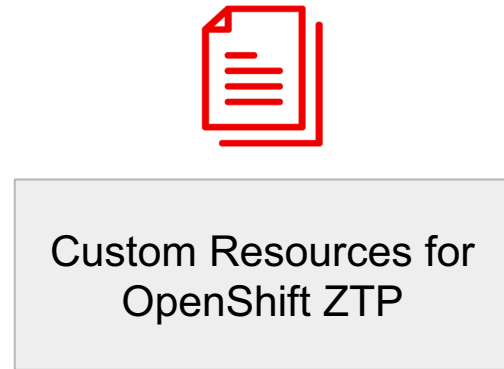
Operational Flow with GitOps

K8s Manifests

RHACM App

ArgoCD App

Helm App

Kustomize

Git Repo

IaC w/Ansible

Infrastructure

RHACM

ArgoCD

Subscriptions

(GitOps Controllers)

Site Designs & Inventory

CI/CD Pipelines
(Transform design to GitOps structures)

Zero Touch provisioning in OpenShift

Red Hat
OpenShift

STEP 1   STEP 2   STEP 3

K8s Manifests

RHACM

ApplicationSet
/Subscription

Helm

Kustomize

Custom Resources for
OpenShift ZTP

BareMetal
Operator

3rd-party
Automation

BMC-based
Virtual Media
boot

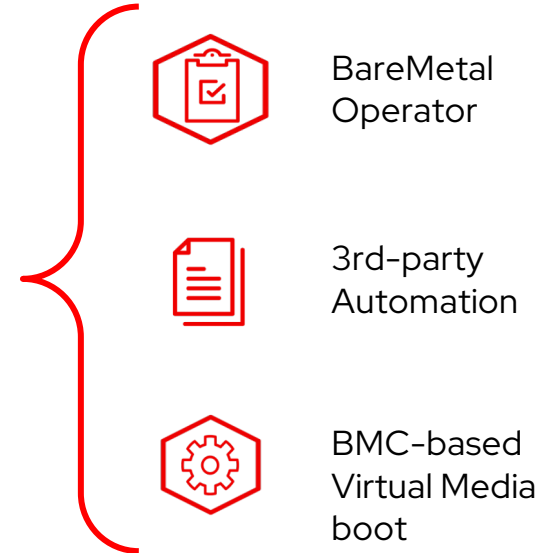Generate Custom Resource
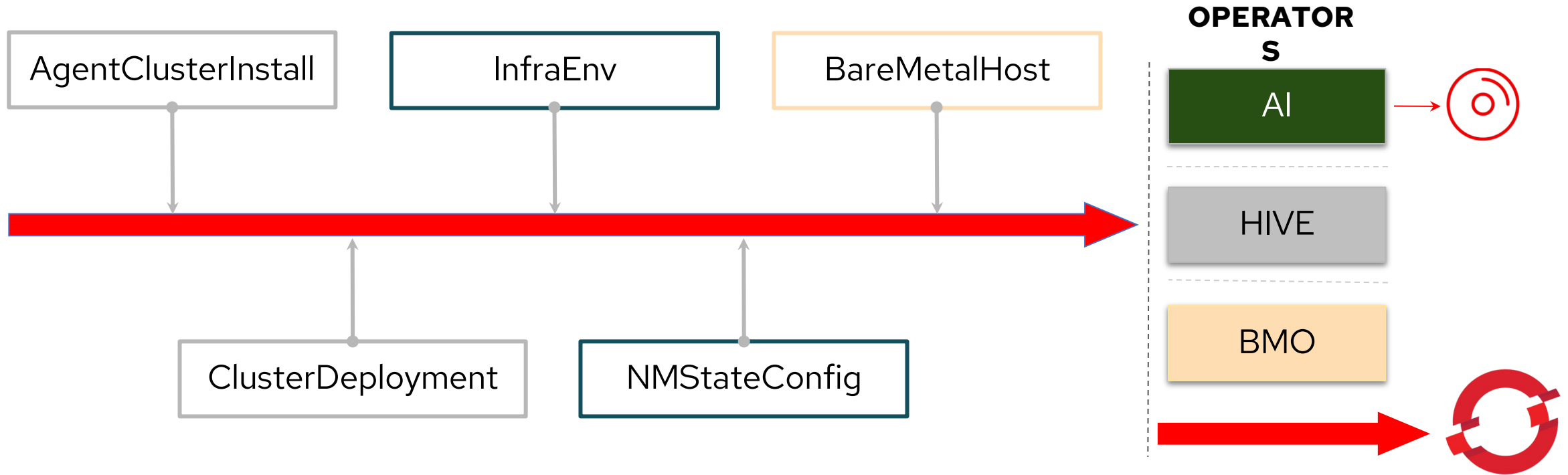Manifests using any tool that can
interact with K8s API

Assisted Installer discovery
ISO Image is generated by
Assisted Installer Operator

Boot the servers using a method
compatible with Virtual Media ISO

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Custom Resources (CRs) for OpenShift ZTP

AgentClusterInstall

InfraEnv

BareMetalHost

ClusterDeployment

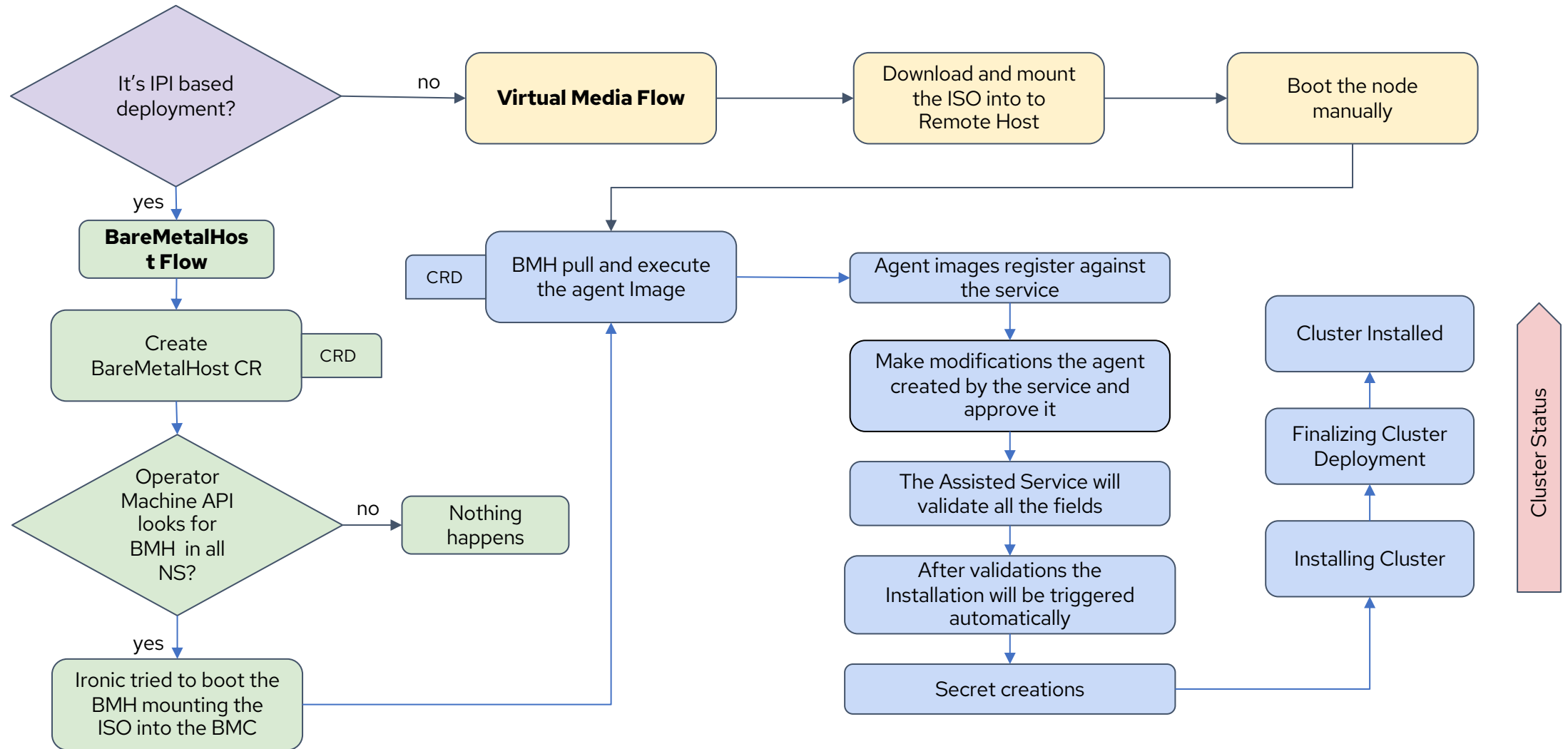NMStateConfig

OPERATORS

AI

HIVE

BMO

AI = Assisted Installer
BMO = Bare Metal Operator
Hive = API driven OpenShift 4 cluster provisioning and management
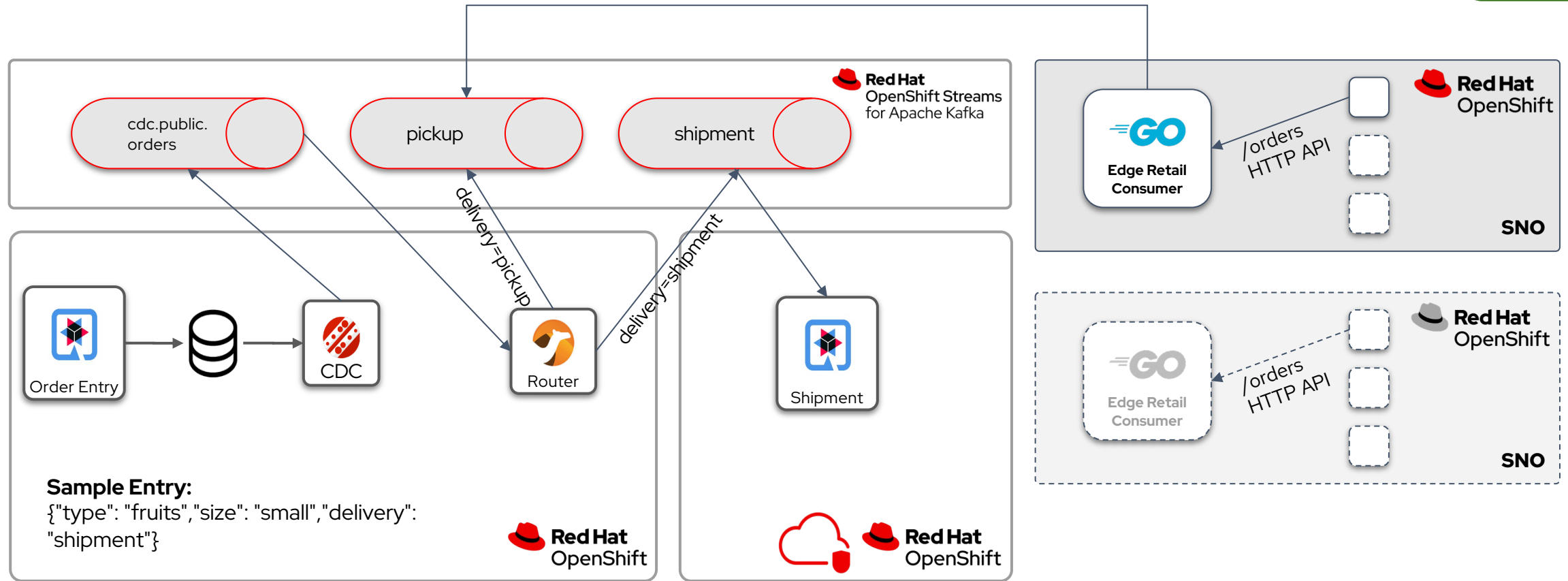
ZTP Flow on Connected Environments

Hands-on
GitOps-based
ZTP with RHACM

Consuming Topics from Retail Stores

A basic Kafka consumer is deployed on the Edge SNO using a GitOps approach with RHACM. It capture all the pickups for the store and exposes them via HTTPS to other remote services.

Hands-on
Connecting Edge Retail Services

Demo Sessions Repositories

Session 1: Application Modernization

- https://github.com/redhat-italy/order-entry

Session 2: Managed Services

- https://github.com/redhat-italy/rhosak-cdc-demo

Session 3: GitOps + DevSecOps

- https://github.com/redhat-italy/pac-demo
- https://github.com/redhat-italy/food-app
- https://github.com/redhat-italy/food-app-config
- https://github.com/redhat-italy/food-app-gatling

Session 4: Edge

- https://github.com/redhat-italy/summit-ztp-edge
- https://github.com/redhat-italy/edge-retail-consumer