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

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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

- 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
Red Hat’s coverage from core to edge

End-user premises edge
- Edge server/gateway/endpoint
- Infrastructure edge
- Provider far edge

Provider 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
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.
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
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.

Use cases
- Data aggregation and analysis
- Telco 5G/RAN far edge (dense)
- HA workloads (w/ 2 remote nodes)
Edge clusters (3+ node HA)

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 Edge Solutions

**Device edge platform**
RHEL minimal profile and tooling for Edge devices + MicroShift

**Single-node edge servers**
Low bandwidth or disconnected sites

**Remote worker nodes**
Space-constrained environments

**3 node Clusters**
Low footprint clusters with high availability

**Cluster management and deployment**
Kubernetes node control

**Far Edge**

**Near Edge**

**Cloud(s) or DC**

**Red Hat Enterprise Linux** + **Red Hat OpenShift**

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10⁴ devices

10⁴ servers

10² clusters

w/o k8s:
1 Core
2 GB RAM

with k8s:
2 Core
2 GB RAM

4 Cores
16 GB RAM

min per node

Worker:
1 Core
8 GB RAM

Control:
2 Core
16 GB RAM

min per node

6 Cores
24 GB RAM

min per node

Red Hat 10

4 Cores
16 GB RAM

min per node

Worker:
1 Core
8 GB RAM

Control:
2 Core
16 GB RAM

min per node

6 Cores
24 GB RAM

min per node

Red Hat 10

4 Cores
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min per node
Introducing the ZTP workflow

Defining and provisioning infrastructures with RHACM

Existing 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.
Introducing the ZTP workflow

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
Introducing the ZTP workflow

Operational Flow with GitOps

Git Repo

- KBs
- Manifests
- RHACM App
- ArgoCD App
- Helm App
- Kustomize

CI/CD Pipelines
(Transform design to GitOps structures)

IaC w/Ansible

Infrastructure

RHACM

ArgoCD

Subscriptions

(GitOps Controllers)
Introducing the ZTP workflow

**Zero Touch provisioning in OpenShift**

**STEP 1**

- K8s Manifests
- RHACM
- ApplicationSet/Subscription
- Helm
- Kustomize

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

**STEP 2**

Custom Resources for OpenShift ZTP

Assisted Installer discovery ISO Image is generated by Assisted Installer Operator

**STEP 3**

- BareMetal Operator
- 3rd-party Automation
- BMC-based Virtual Media boot

Boot the servers using a method compatible with Virtual Media ISO
Introducing the ZTP workflow

Custom Resources (CRs) for OpenShift ZTP

AI = Assisted Installer
BMO = Bare Metal Operator
Hive = API driven OpenShift 4 cluster provisioning and management
Introducing the ZTP workflow

It's IPI based deployment?

- Yes
  - BareMetalHost Flow
    - Create BareMetalHost CR
    - Operator Machine API looks for BMH in all NS?
      - Yes
        - Ironic tried to boot the BMH mounting the ISO into the BMC
      - No
        - Nothing happens
  - No
    - Virtual Media Flow
      - Download and mount the ISO into Remote Host
      - Boot the node manually

Agent images register against the service

Make modifications the agent created by the service and approve it

The Assisted Service will validate all the fields

After validations the Installation will be triggered automatically

Secret creations
Hands-on
GitOps-based
ZTP with RHACM
A basic Kafka consumer is deployed on the Edge SNO using a GitOps approach with RHACM. It captures 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