Red Hat OpenShift

OpenShift Workloads

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Migration Toolkit for Applications

Migration Guidance

Help organizations safely migrate and modernize their application portfolio to leverage OpenShift

Ease OpenShift adoption

Gather Insight

Enable adoption leads to make informed decisions and keep the migration and modernization process measurable and predictable

Reduce risks

Extended Scope

Fully integrated toolkit leveraging tools from the CNCF project Konveyor with a seamless user experience

Provide value on each stage of adoption

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Red Hat

Product Manager: Ramon Roman Nissen

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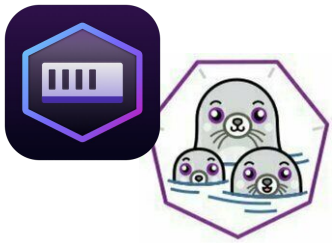
Developer Experience

Onboarding

- Accelerate onboarding of Red Hat platforms via IDPs in customer environments.
- Gain recognition in Backstage.io, the leading open source IDP project

Local Development

- Improve developer productivity of building and testing containerized applications in local environments
- Increase adoption of existing local development tools to drive growth of Red Hat platforms



Cloud-hosted Services

- Grow overall trial/evaluation impact with Dev Sandbox for Red Hat platforms and services
- Launch a managed service offering to import, build, and deploy applications for enterprise-grade applications
- Define a competitive free to fee journey for advanced capabilities and Red Hat platforms/services

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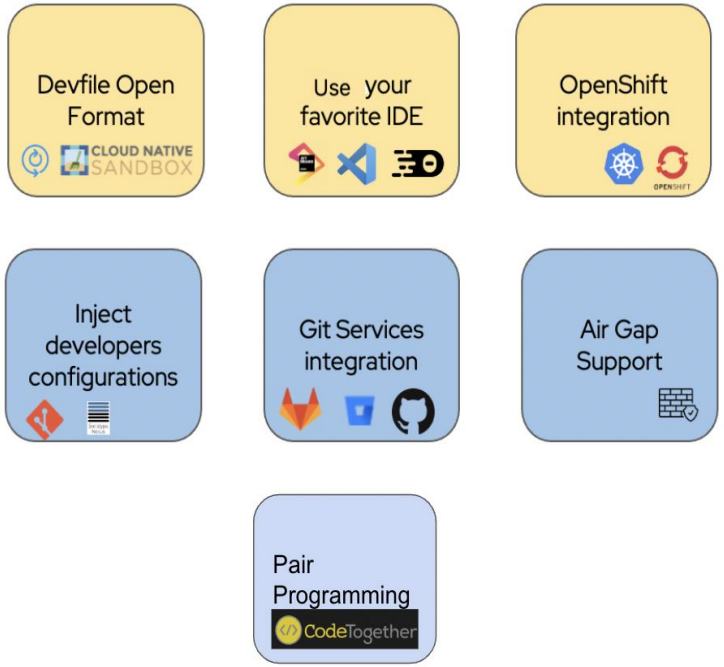
Red Hat OpenShift Dev Spaces

What's New

- Microsoft Visual Studio Code - Open Source is the default editor
- Supported Github Enterprise Server
- Improved workspace startup time



Resources

Dev Spaces Documentation

- Admin Guide
- User Guide
- Known Issues and Release Notes
- Upstream roadmap

IDE Supported	VS Code, Eclipse Theia,(Tech Preview: JetBrains IntelliJ)
Languages	Languages that the above IDE Supports
Repositories	GitHub, Gitlab, Bitbucket
Browser	Chrome,Firefox
Platforms	OCP 4.10, 4.11

PM: Kasturi Mohan

Red Hat

Dev Sandbox for OpenShift

Product Manager: Brad Bazemore

Developer Sandbox

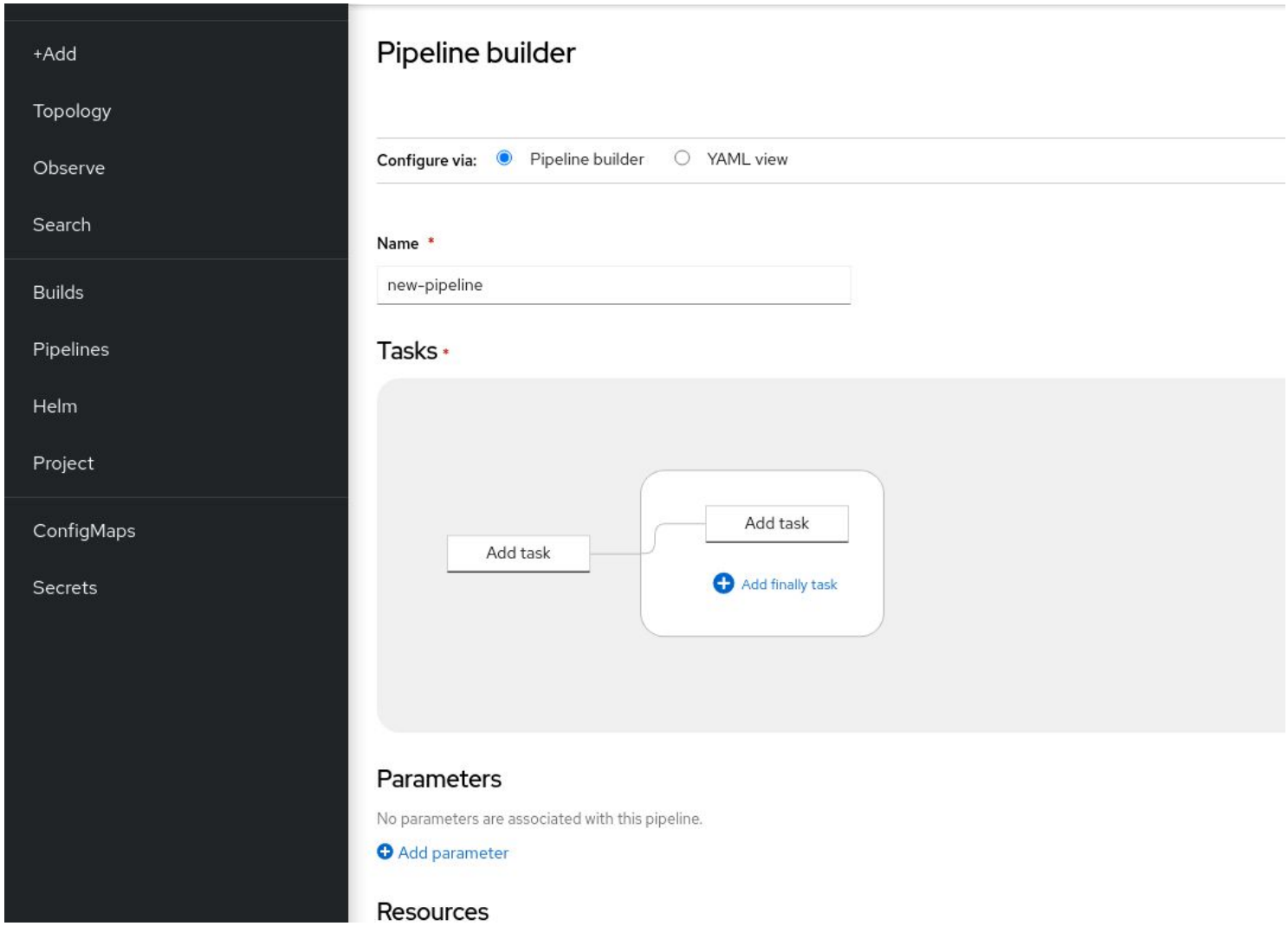
✅ Will be upgraded to 4.12 in Feb

Operators recently added

- Pipelines
- Updated RHODA with AWS Controller for Kubernetes - RDS

Key deliverables

- Add proxy for IDE integration
- Added 3rd Cluster



Red Hat

Product Manager: Brad Bazemore

Podman Desktop

Product Manager: Stevan Le Meur

podman desktop

Podman Desktop

Containers and Kubernetes for Application Developers

Podman and Kubernetes/OpenShift Local

- Install and run anywhere: Windows, Mac and Linux
- Keep it up-to-date

Containers and Pods

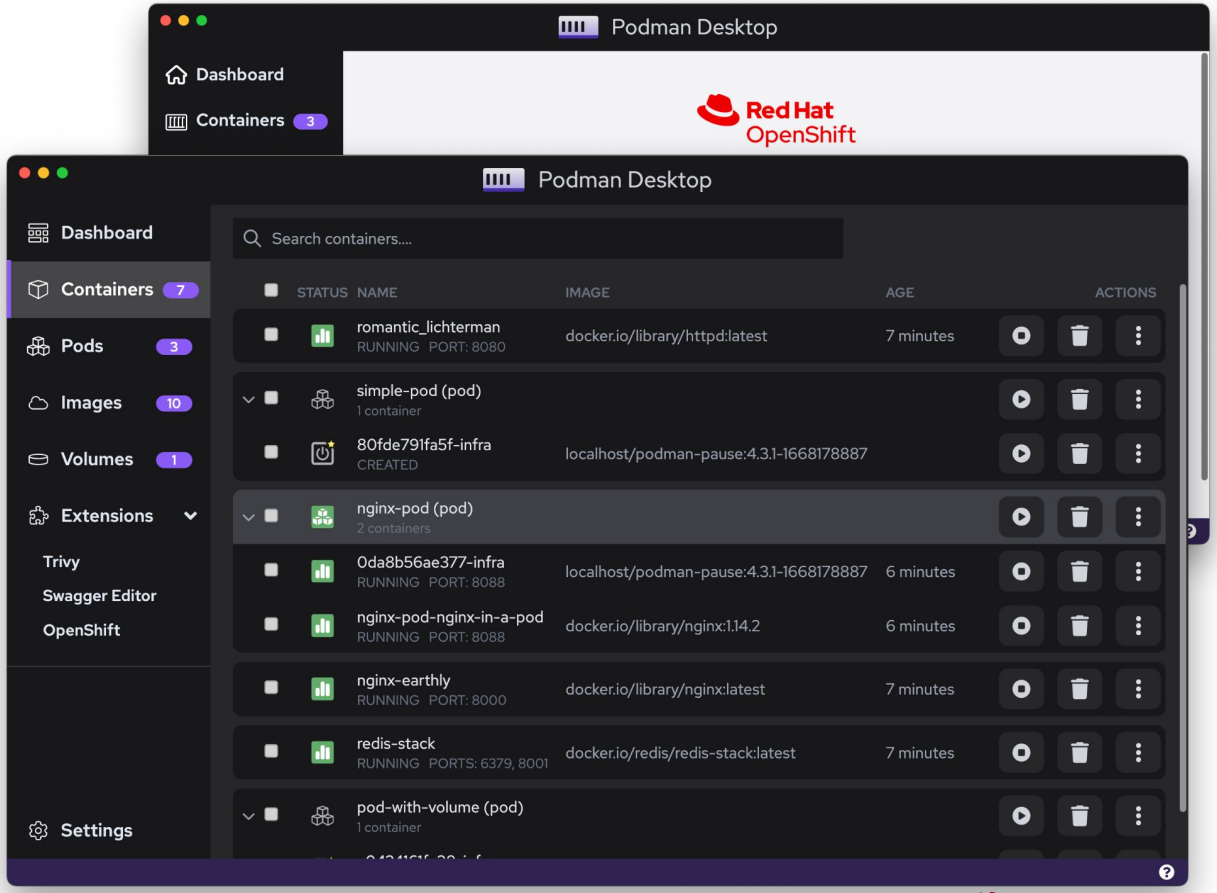
- Build, run, manage and debug Containers and Pods
- Run Pods with or without Kubernetes
- Podifying capabilities
- Manage multiple container Engines

Enterprise Readiness

- VPN and Proxies configuration
- Image registry management

Bridge between local and remote

- Connect and deploy to remote OpenShift clusters
- Enable remote managed services locally



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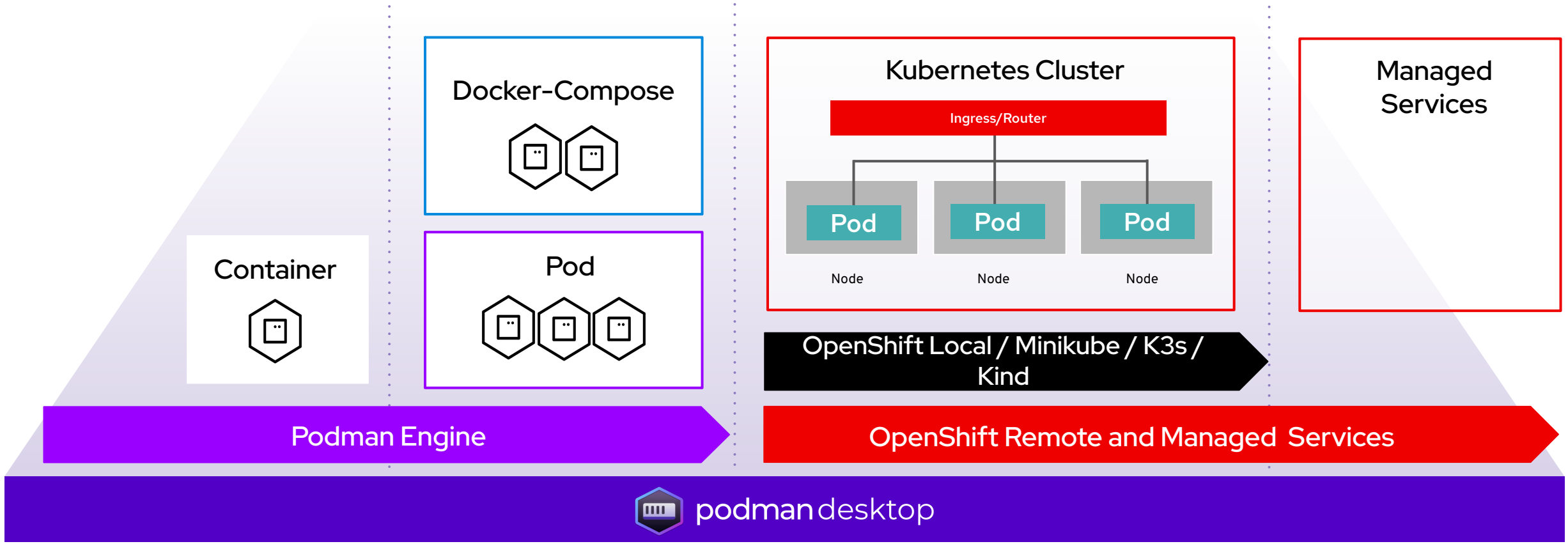
Podman Desktop covers the full spectrum

Offering a smooth transition from containers to pods and to Kubernetes



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OpenShift Local

Previously known as "CodeReady Containers"

Product Manager: Stevan Le Meur

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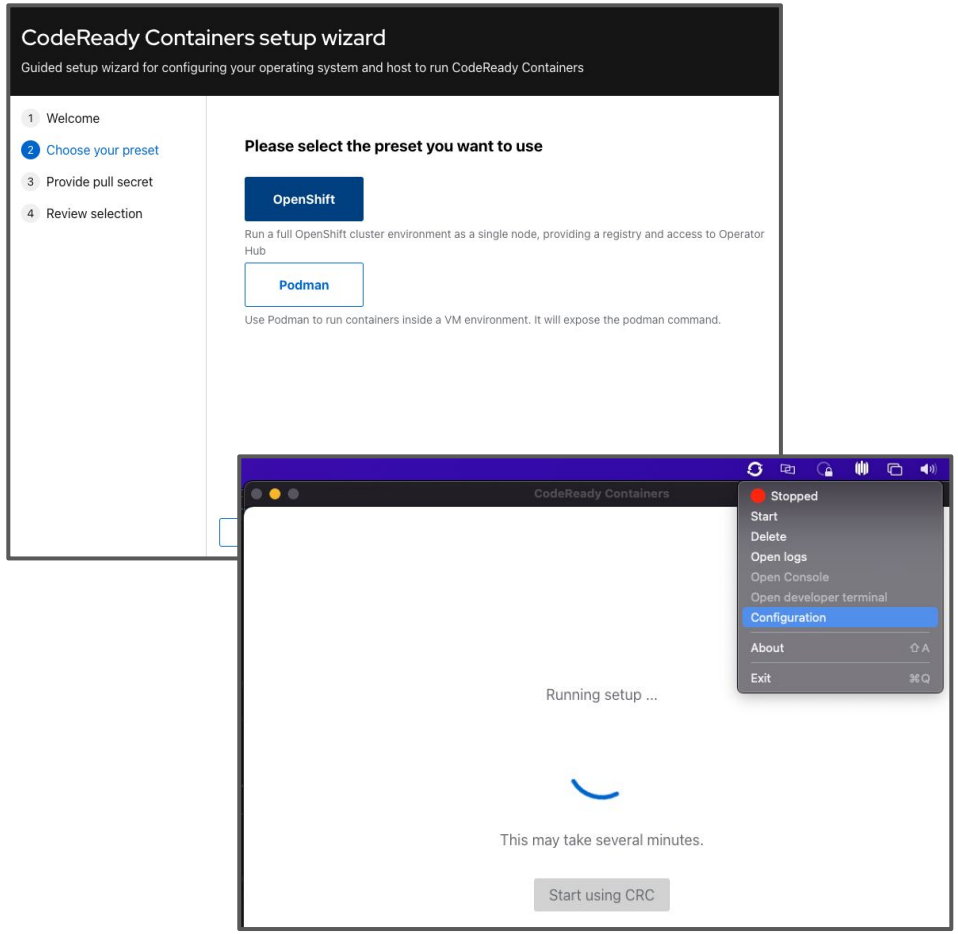
OpenShift Local (formerly CodeReady Containers)

- **Renamed OpenShift Local (no longer CodeReady Containers)**
- **Smaller download** - bundle will be downloaded as part of the setup process.
- **4 different presets are provided**
  - **OpenShift** based on OCP with the latest 4.12 bits
  - **OpenShift** based on OKD with the latest upstream bits
  - **podman** with 4.2.x
  - Experimental microshift

- Support M1 for all presets.



Product Manager: Stevan Le Meur

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Red Hat OpenShift

OpenShift Virtualization

Technical presentation

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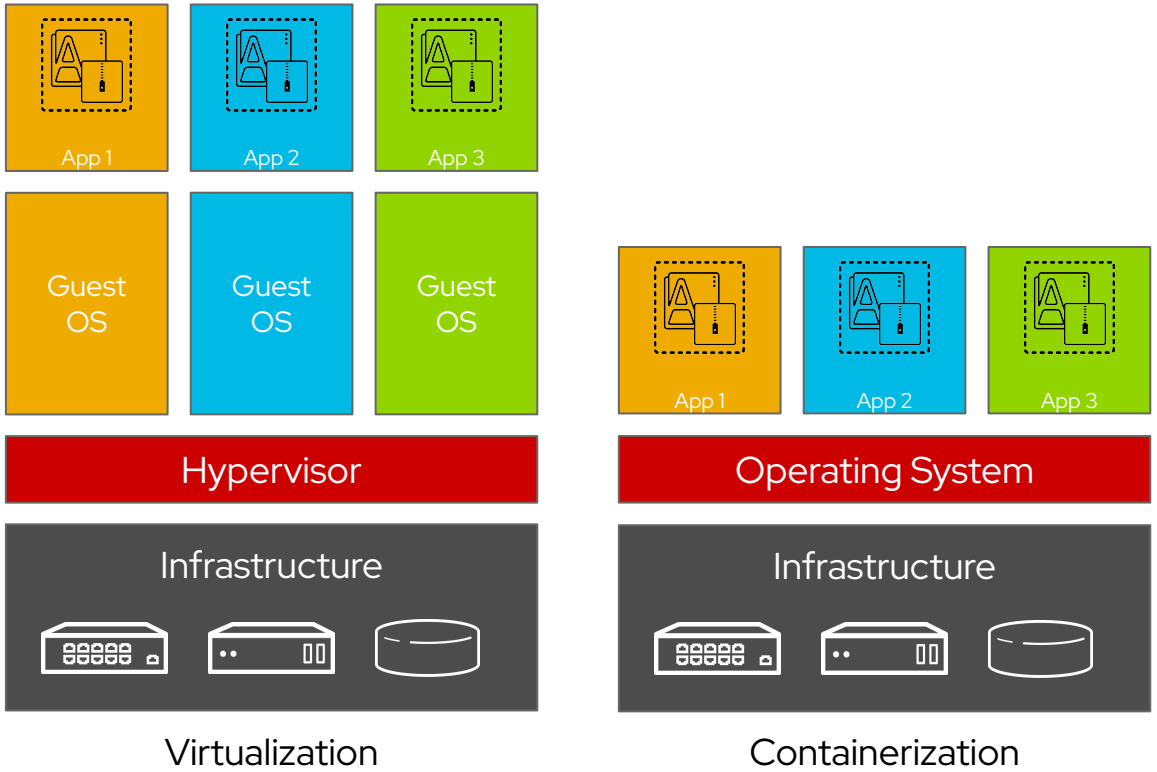
Containers are not virtual machines

- Containers are process isolation
- Kernel namespaces provide isolation and cgroups provide resource controls
- No hypervisor needed for containers
- Contain only binaries, libraries, and tools which are needed by the application
- Ephemeral



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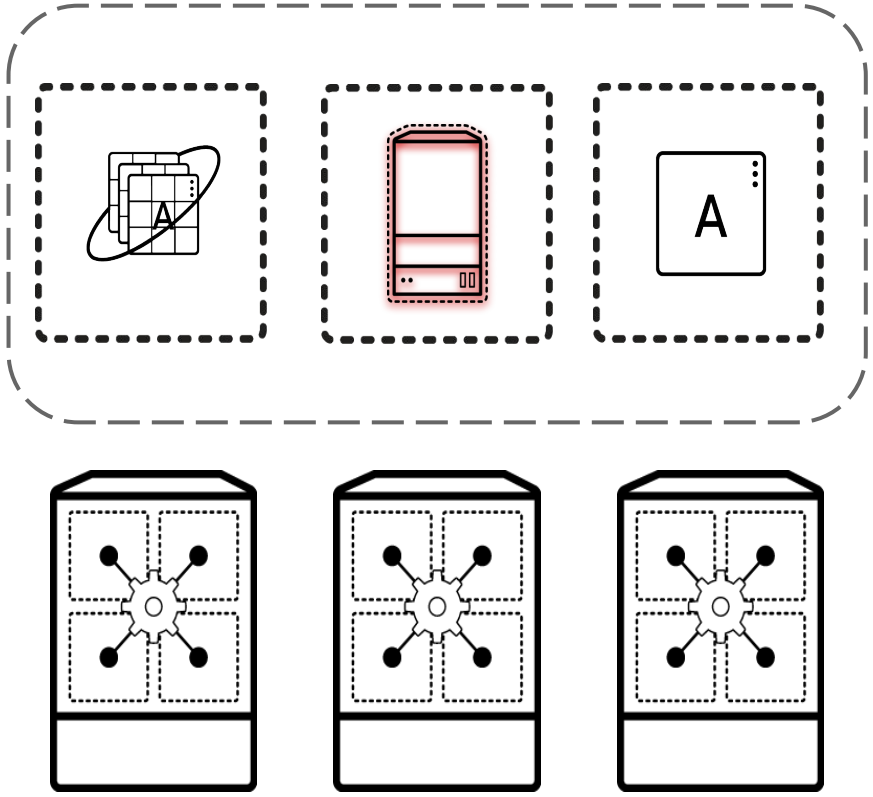
Virtual machines can be put into containers

- A KVM virtual machine is a process
- Containers encapsulate processes
- Both have the same underlying resource needs:
  - Compute
  - Network
  - (sometimes) Storage



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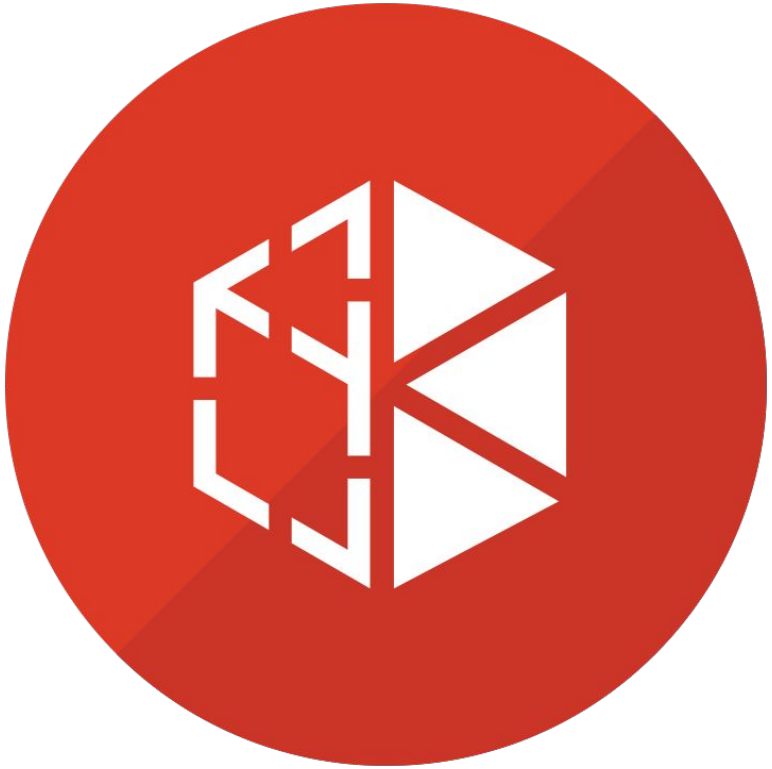
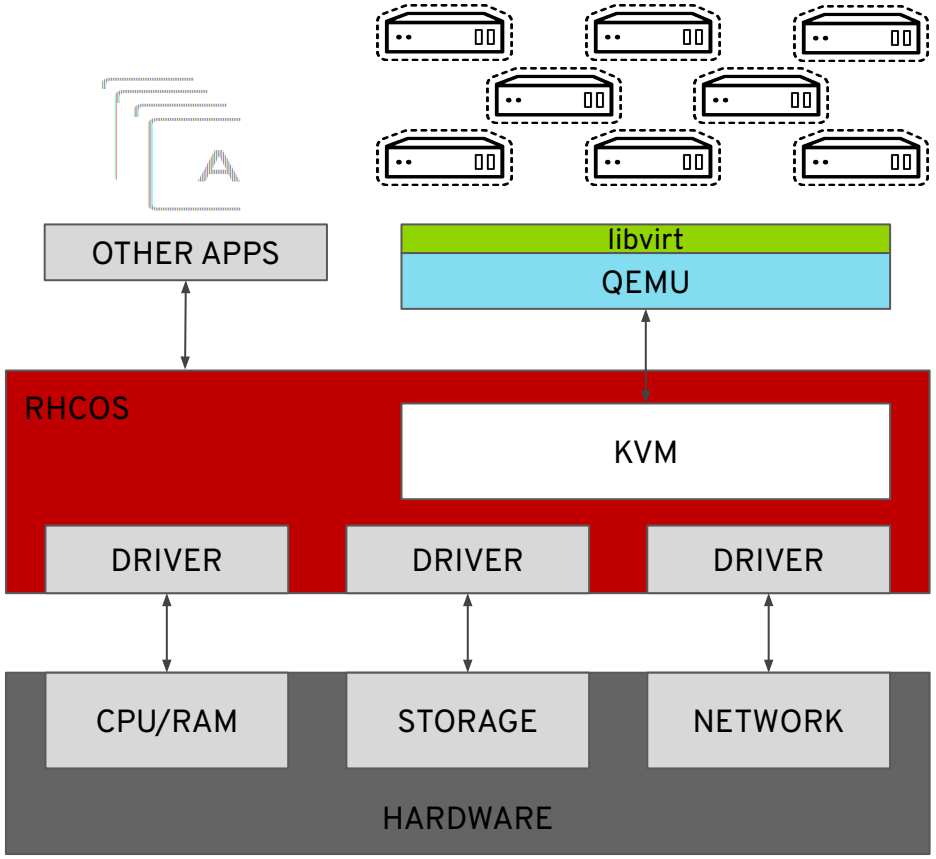
OpenShift Virtualization

- Virtual machines
  - Running in containers
  - Using the KVM hypervisor
- Scheduled, deployed, and managed by Kubernetes
- Integrated with container orchestrator resources and services
  - Traditional Pod-like SDN connectivity and/or connectivity to external VLAN and other networks via multus
  - Persistent storage paradigm (PVC, PV, StorageClass)



VM containers use KVM

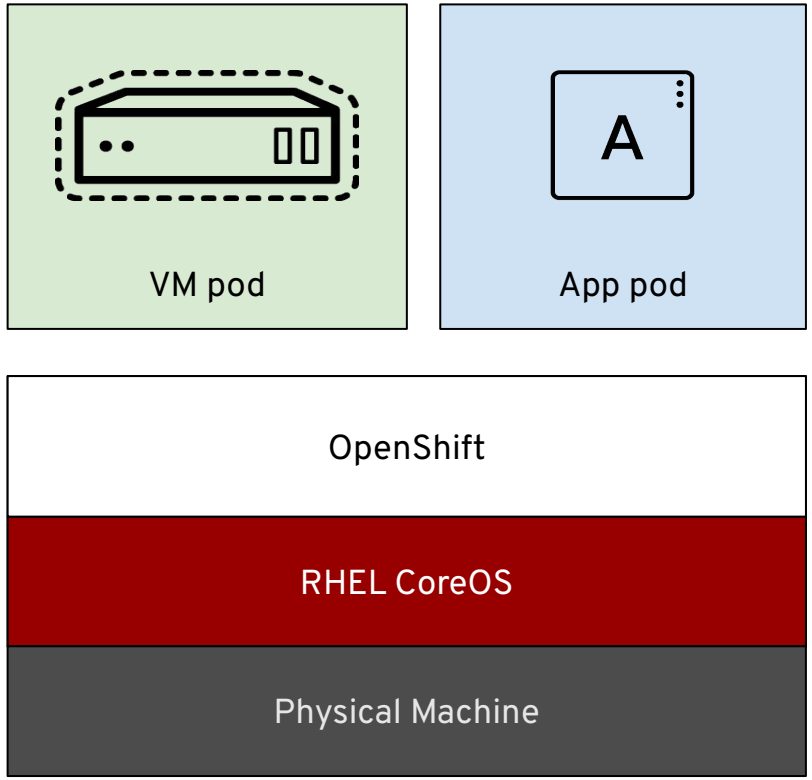
- OpenShift Virtualization uses KVM, the Linux kernel hypervisor
- KVM is a core component of the Red Hat Enterprise Linux kernel
  - KVM has 10+ years of production use: Red Hat Virtualization, Red Hat OpenStack Platform, and RHEL all leverage KVM, QEMU, and libvirt
- QEMU uses KVM to execute virtual machines
- `libvirt` provides a management abstraction layer



Built with Kubernetes

Virtual machines in a container world

- Provides a way to transition application components which can't be directly containerized into a Kubernetes system
  - Integrates directly into existing k8s clusters
  - Follows Kubernetes paradigms:
    - Container Networking Interface (CNI)
    - Container Storage Interface (CSI)
    - Custom Resource Definitions (CRD, CR)
- Schedule, connect, and consume VM resources as container-native

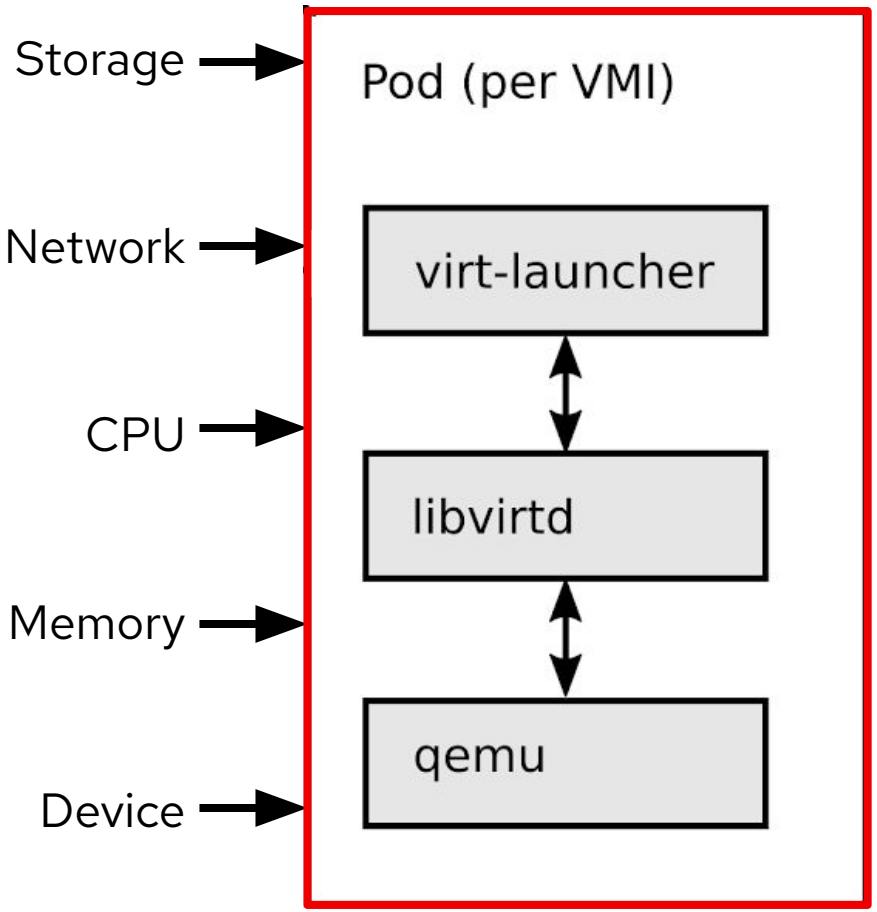


Virtualization native to Kubernetes

- Operators are a Kubernetes-native way to introduce new capabilities
- New CustomResourceDefinitions (CRDs) for native VM integration, for example:
  - `VirtualMachine`
  - `VirtualMachineInstance`
  - `VirtualMachineInstanceMigration`
  - `DataVolume`

```yaml
apiVersion: kubevirt.io/v1alpha3
kind: VirtualMachine
metadata:
  labels:
    app: demo
    flavor.template.kubevirt.io/small: "true"
  name: rhel
spec:
  dataVolumeTemplates:
  - apiVersion: cdi.kubevirt.io/v1alpha1
    kind: DataVolume
    metadata:
      creationTimestamp: null
      name: rhel-rootdisk
    spec:
      pvc:
        accessModes:
        - ReadWriteMany
        resources:
          requests:
            storage: 20Gi
        storageClassName: managed-nfs-storage
        volumeMode: Filesystem
```

Containerized virtual machines



Kubernetes resources

- Every VM runs in a launcher pod. The launcher process will supervise, using libvirt, and provide pod integration.

Red Hat Enterprise Linux

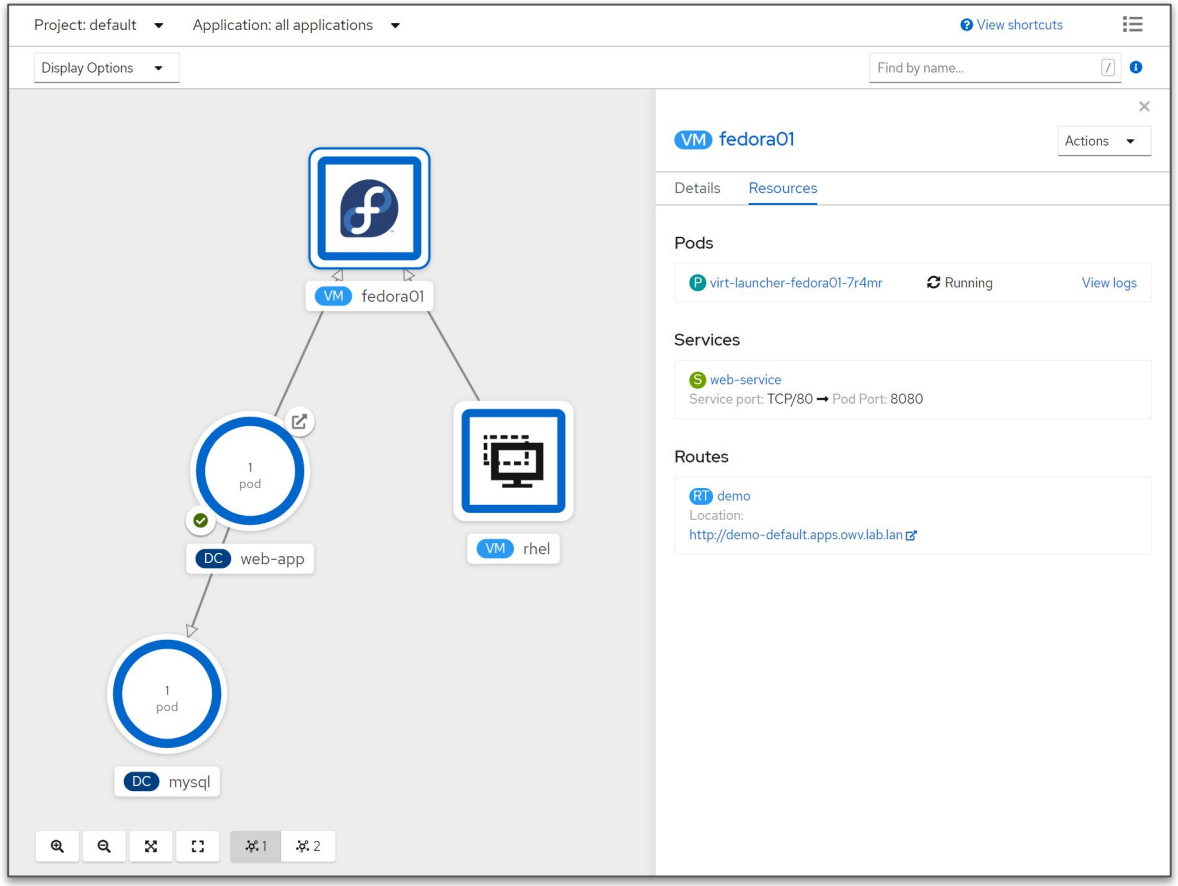
- libvirt and qemu from RHEL are mature, have high performance, provide stable abstractions, and have a minimal overhead.

Security - Defense in depth

- Immutable RHCOS by default, SELinux MCS, plus KVM isolation - inherited from the Red Hat Portfolio stack

Using VMs and containers together

- Virtual Machines connected to pod networks are accessible using standard Kubernetes methods:
  - Service
  - Route
  - Ingress
- Network policies apply to VM pods the same as application pods
- VM-to-pod, and vice-versa, communication happens over SDN or ingress depending on network connectivity



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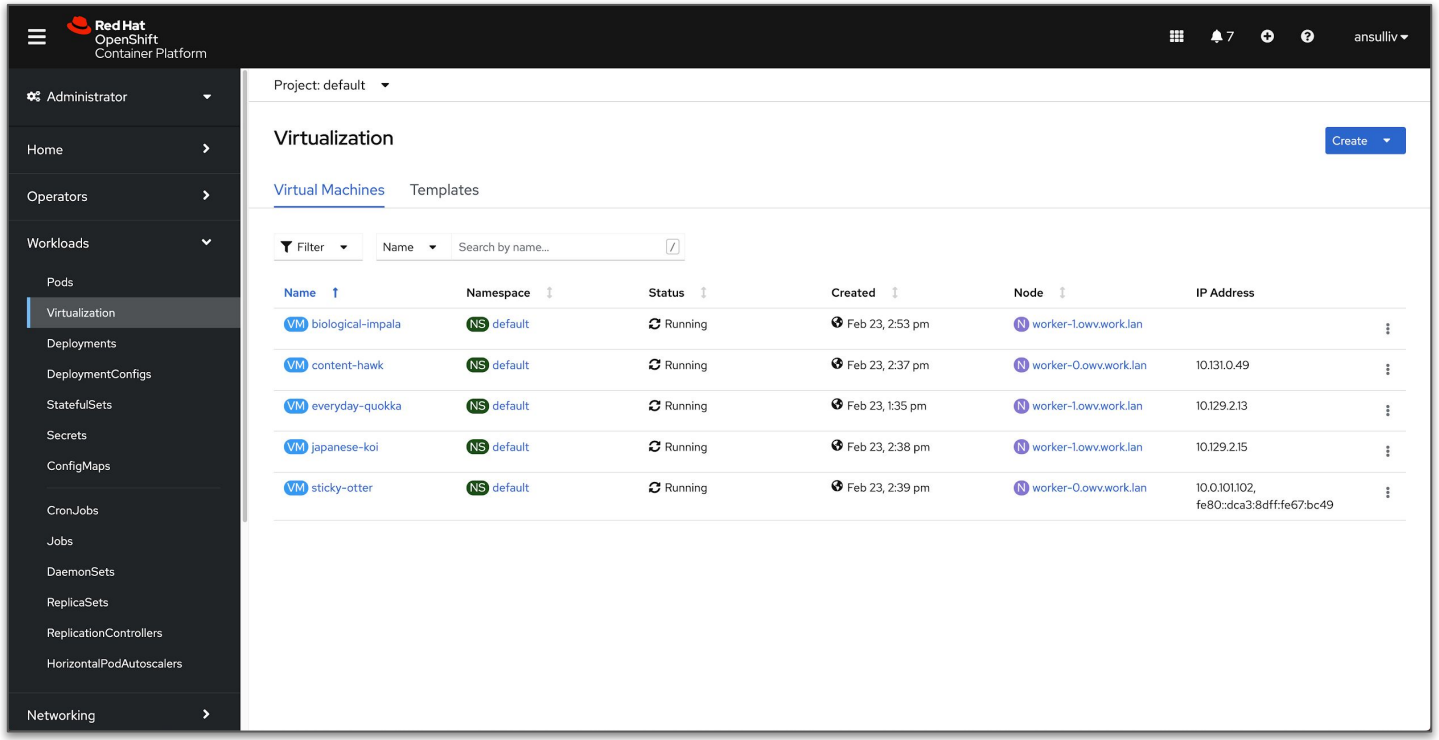
Managed with OpenShift

Virtual Machine Management

- Create, modify, and destroy virtual machines, and their resources, using the OpenShift web interface or CLI
- Use the `virtctl` command to simplify virtual machine interaction from the CLI



Create VMs

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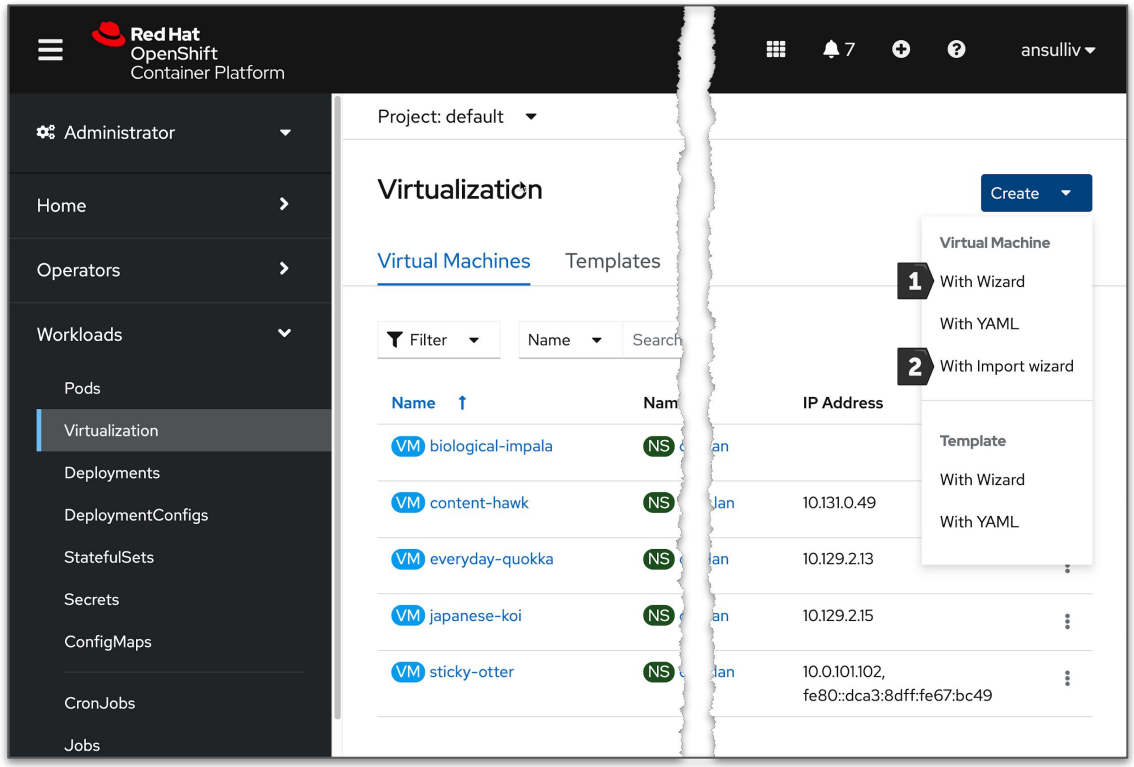
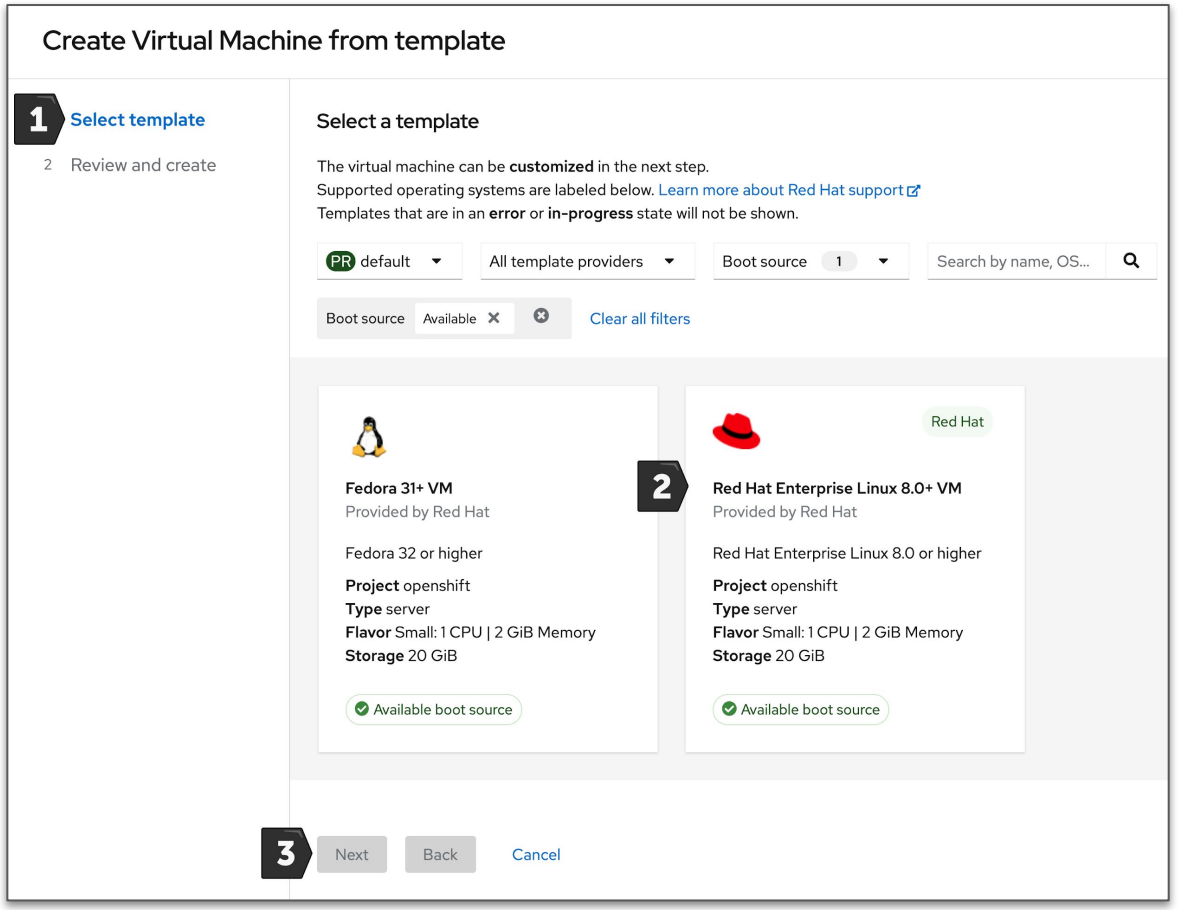
Virtual Machine creation

- Streamlined and simplified creation via the GUI or create VMs programmatically using YAML
- Full configuration options for compute, network, and storage resources
  - Clone VMs from templates or import disks using DataVolumes
  - Pre-defined and customizable presets for CPU/RAM allocations
  - Workload profile to tune KVM for expected behavior
- Import VMs from VMware vSphere or Red Hat Virtualization



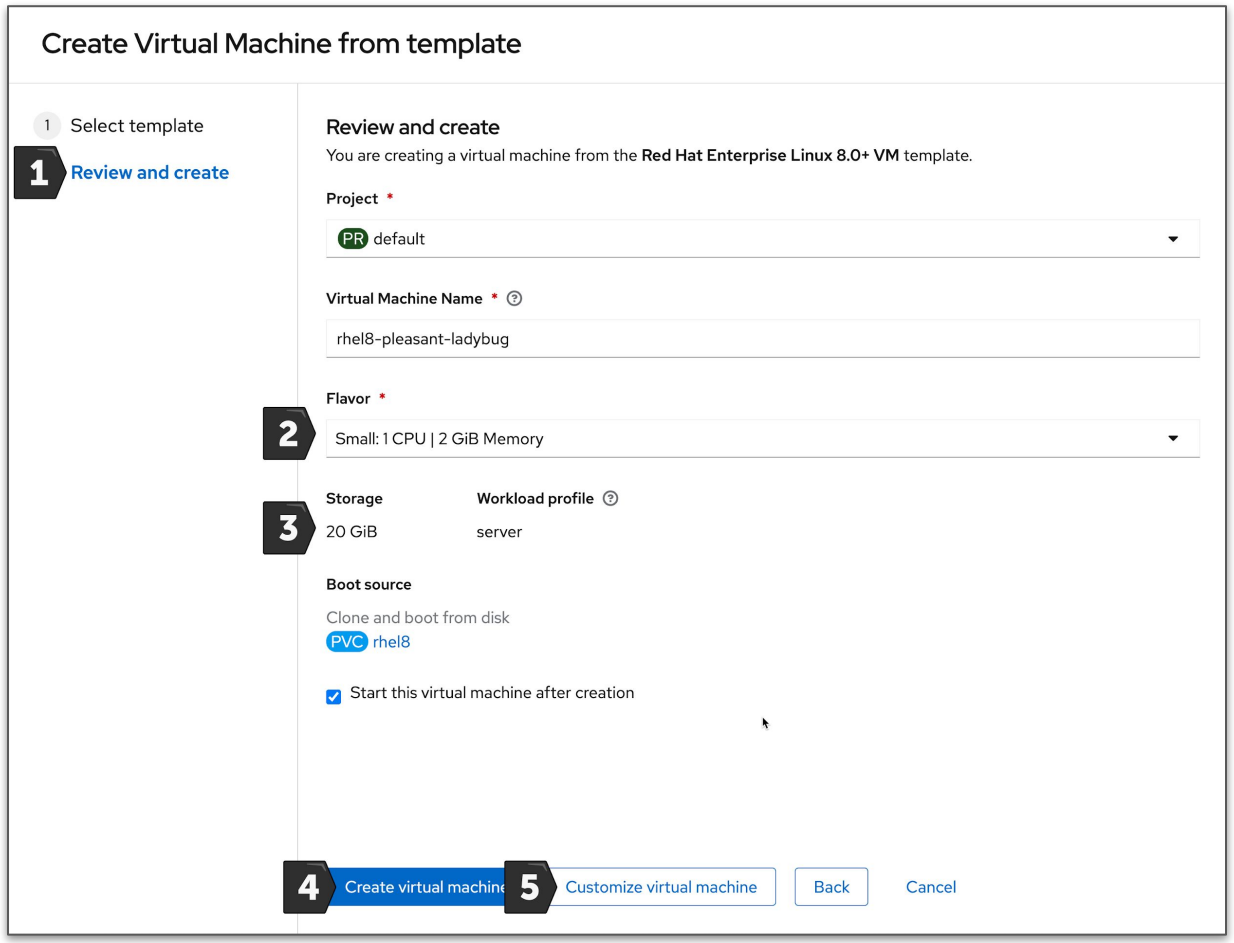
Using templates for virtual machines

- Simplified and streamlined virtual machine creation experience for VM consumers
- Administrators configure templates with an OS disk, consumers select from the options



Creating a virtual machine

- Flavor represents the preconfigured CPU and RAM assignments
- Storage, including PVC size and storage class, are determined by the template administrator
- A default network configuration is defined in the template
- Workload profile defines the category of workload expected and is used to set KVM performance flags
- The VM can be further customized by selecting the option, or immediately created and deployed
    - Additional customization includes CPU/memory, storage, network, cloud-init, and more



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VM Templates

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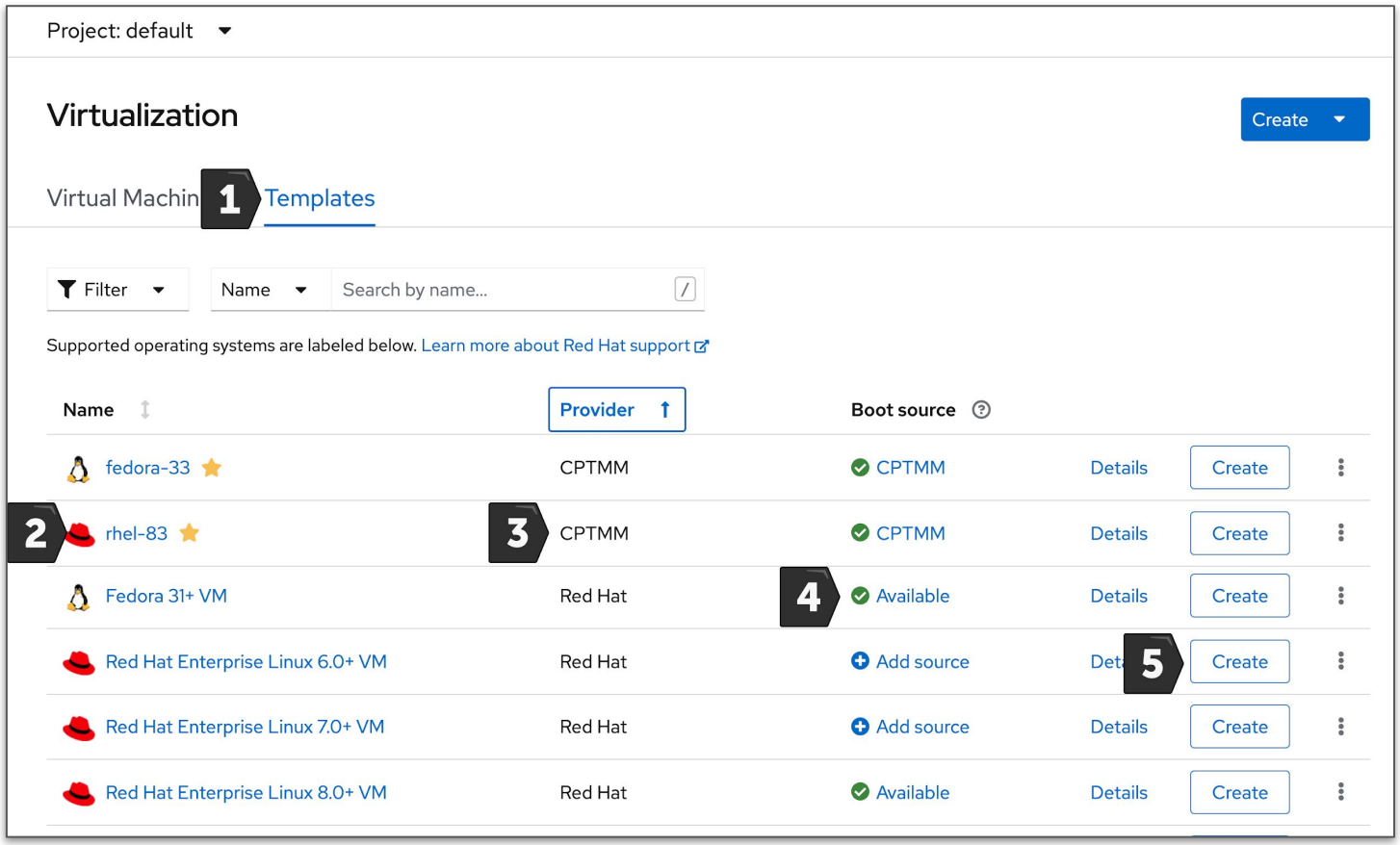
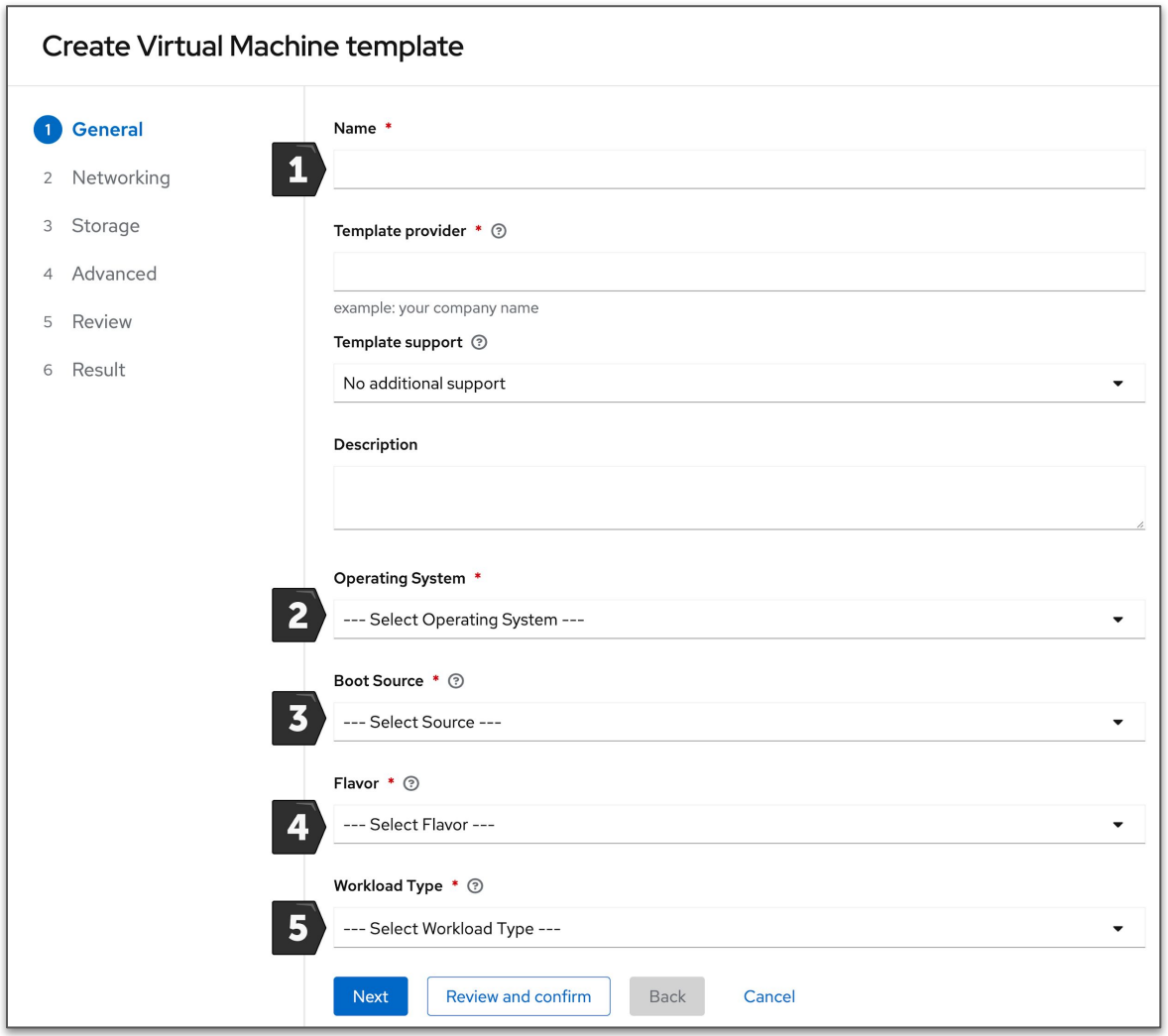
Templates

- Templates are a core concept for virtual machine creation with OpenShift Virtualization 2.6
- Red Hat provides default templates, administrators can create and customize additional as needed
- Boot sources provide disk images for the template
- Creating VMs can be done from the template page in just a few clicks



Create a template - General

- In addition to unique names, each template is associated with a provider
  - Providers represent who created the template, with optional support information
- The guest operating system and source boot disk are provided. A boot disk can be imported during the process, or an ISO can be used to boot and install the OS
- A default flavor, representing CPU and memory allotments, is provided
- Workload type determines KVM optimization to balance between performance and efficiency



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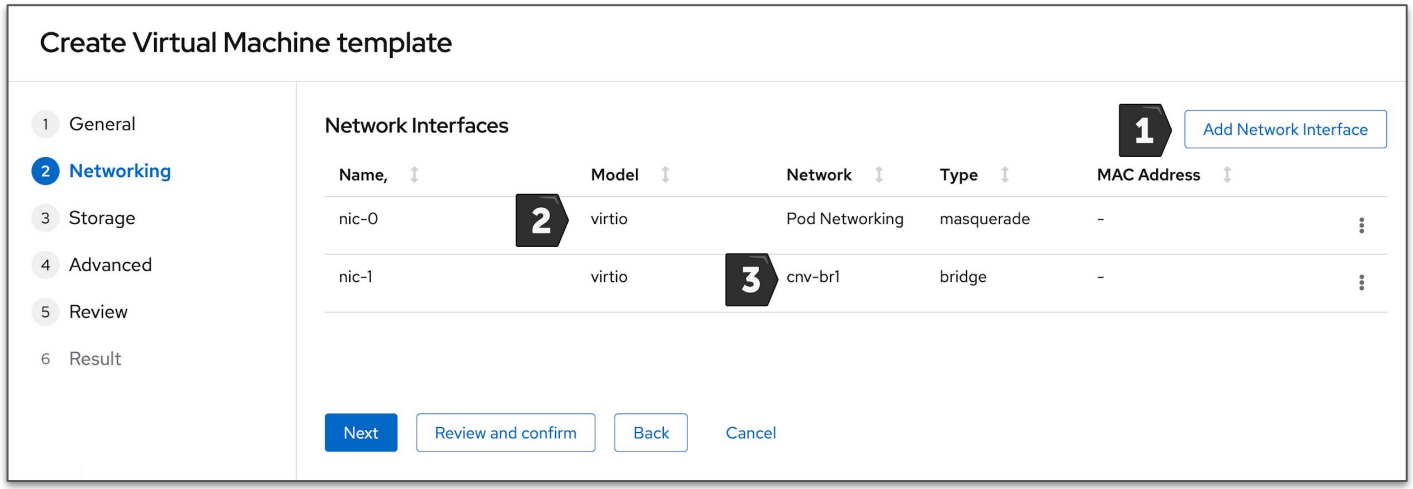
Create a template - Networks

- Add or edit network adapters
- One or more network connections
  - Pod network for the default SDN
  - Additional multus-based interfaces for specific connectivity
- Multiple NIC models for guest OS compatibility or paravirtualized performance with VirtIO
- Masquerade, bridge, or SR-IOV connection types
- MAC address customization if desired



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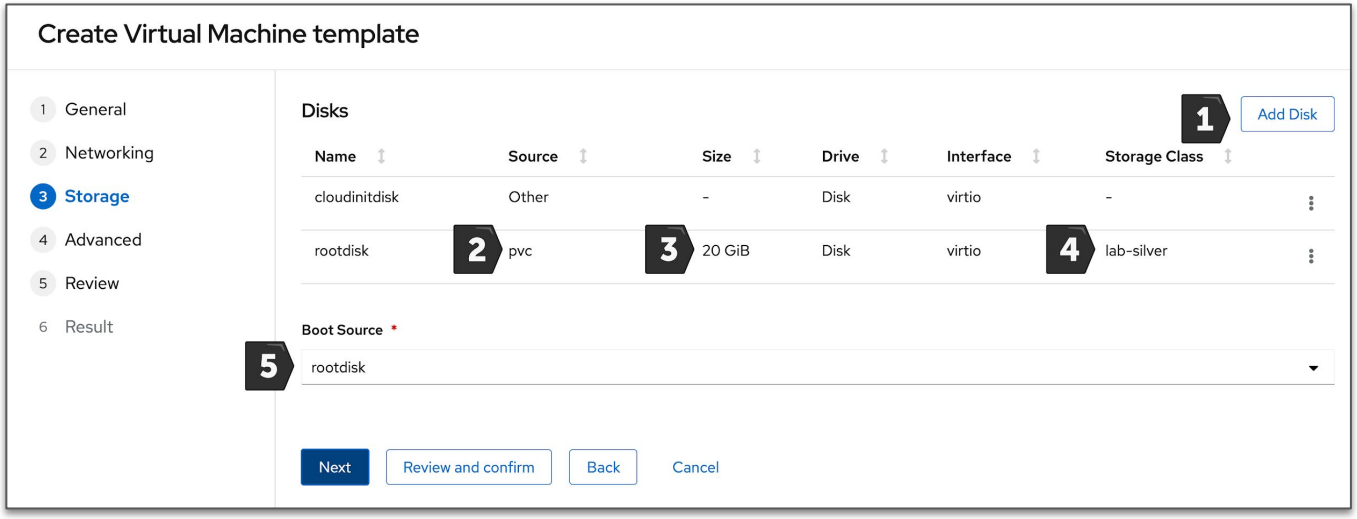
Create a template - Storage

- Add or edit persistent storage
- Disks can be sourced from
  - Imported QCOW2 or raw images
  - New or existing PVCs
  - Clone existing PVCs
- Use SATA/SCSI interface for compatibility or VirtIO for paravirtual performance
- For new or cloned disks, select from available storage classes
  - Customize volume and access mode as needed
  - RWX PVCs are required for live migration



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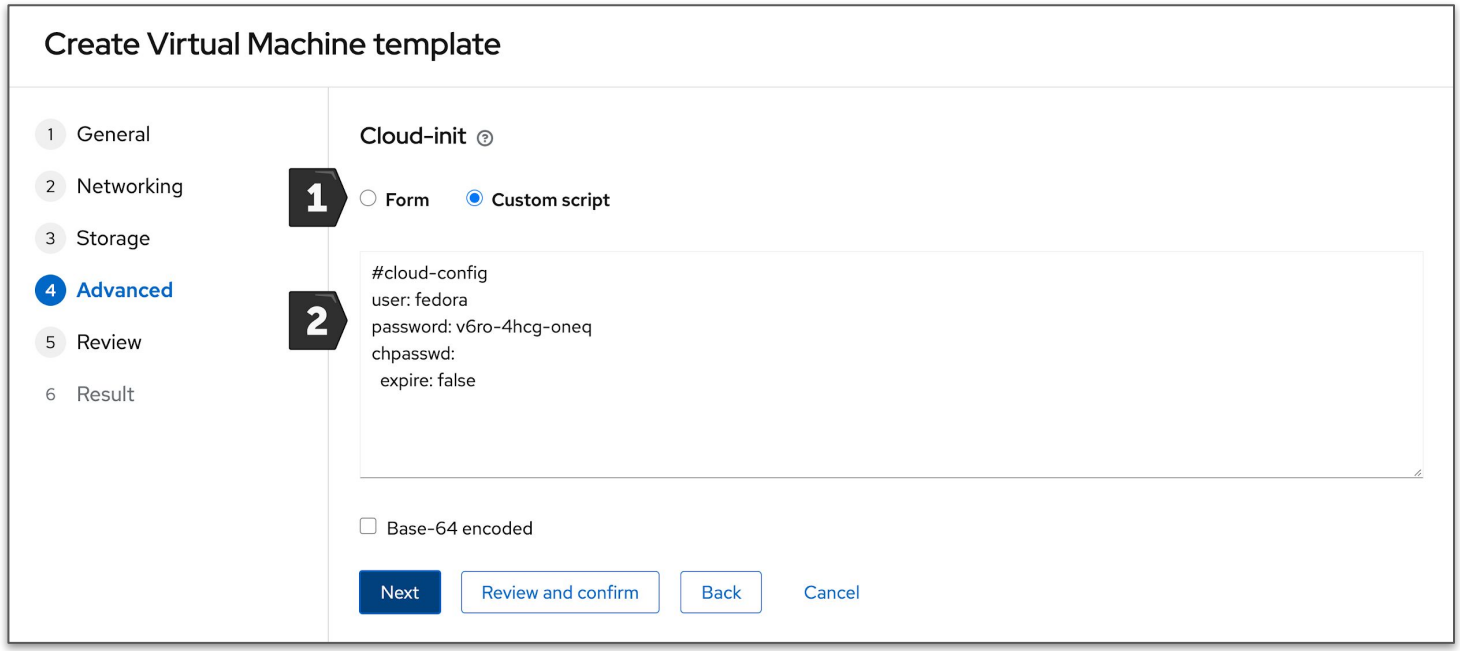
Create a template - Advanced

- Customize the operating system deployment using cloud-init scripts
  - Guest OS must have cloud-init installed
  - RHEL, Fedora, etc. cloud images
  - Default templates will auto-generate a simple `cloud-init` to set the password



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Import VMs

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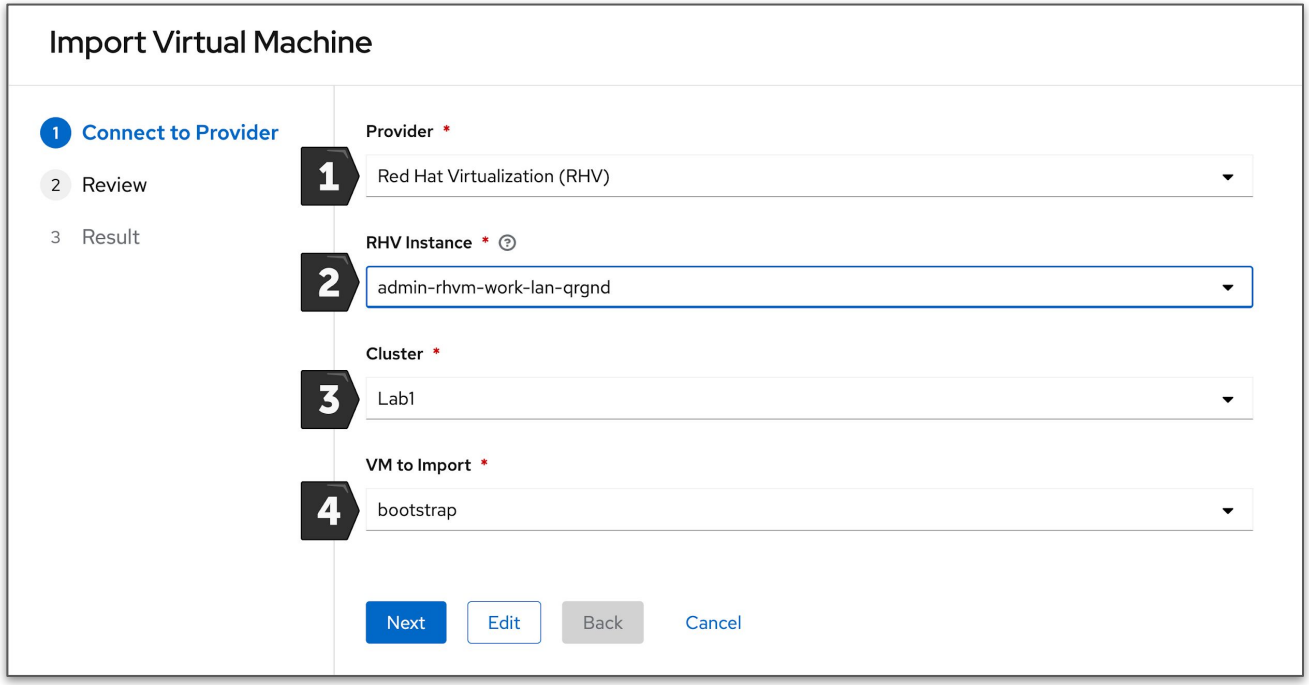
Virtual Machine Import

- Wizard supports importing from VMware or Red Hat Virtualization
  - Single-VM workflow
- VMware import uses VDDK to expedite the disk import process
  - User is responsible for downloading the VDDK from VMware and adding it to a container image
- Credentials stored as Secrets
- `ResourceMapping` CRD configures default source -> destination storage and network associations



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View / manage VMs

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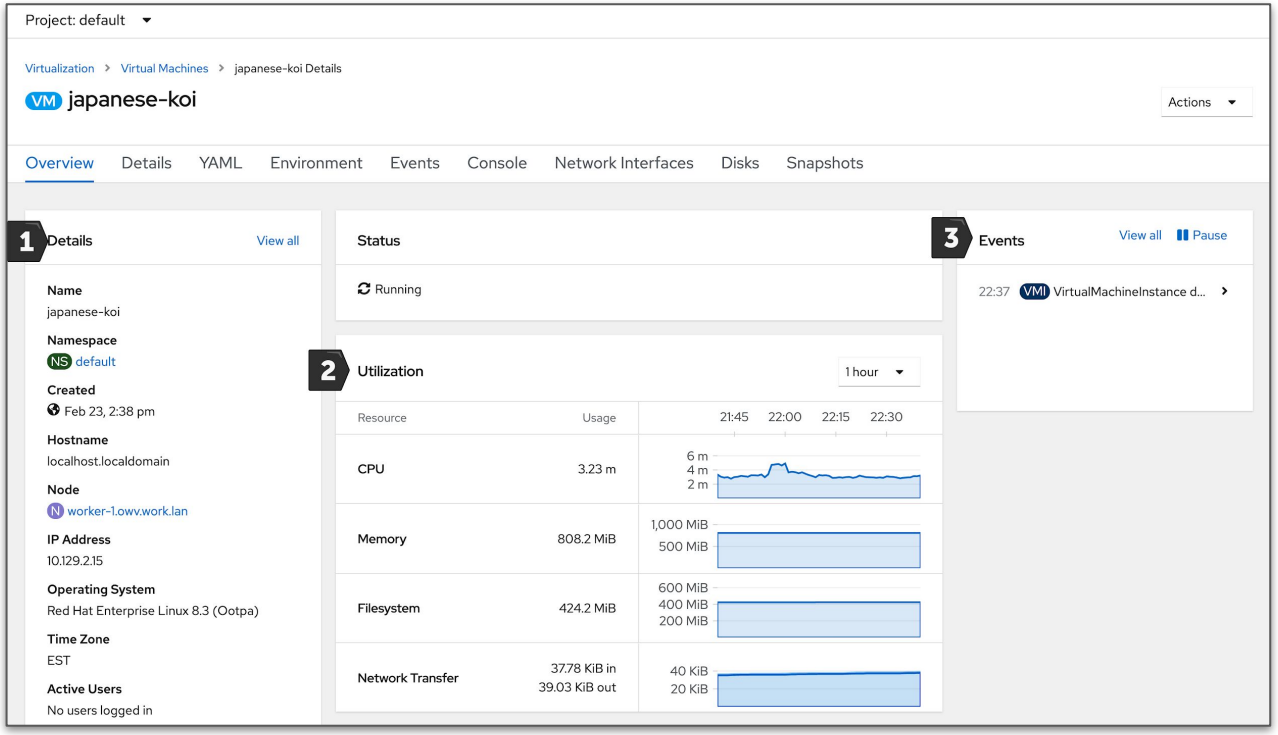
Virtual Machine - Overview

- General overview about the virtual machine
- Information populated from guest when integrations are available
  - IP address
- Inventory quickly shows configured hardware with access to view/manage
- Utilization reporting for CPU, RAM, disk, and network
- Events related to the Pod, scheduling, and resources are displayed



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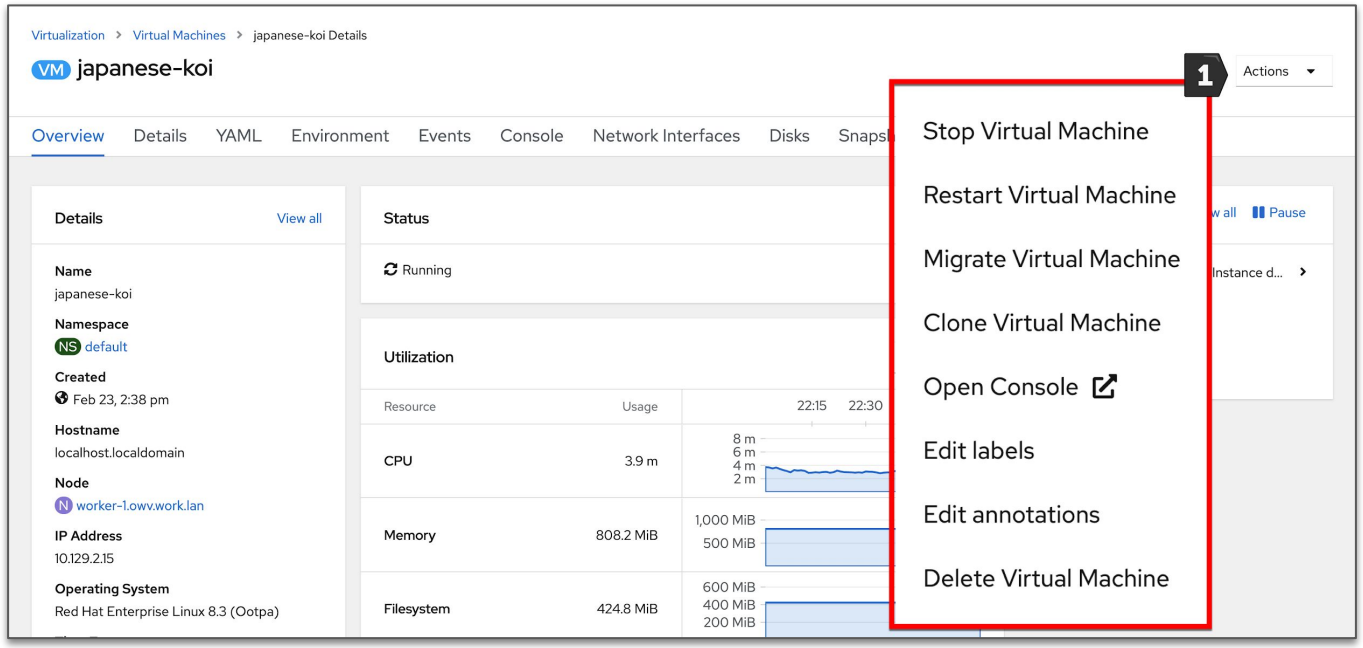
Virtual Machine - Actions

- Actions menu allows quick access to common VM tasks
  - Start/stop/restart
  - Live migration
  - Clone
  - Edit application group, labels, and annotations
  - Delete
- Accessible from all tabs of VM details screen and the VM list



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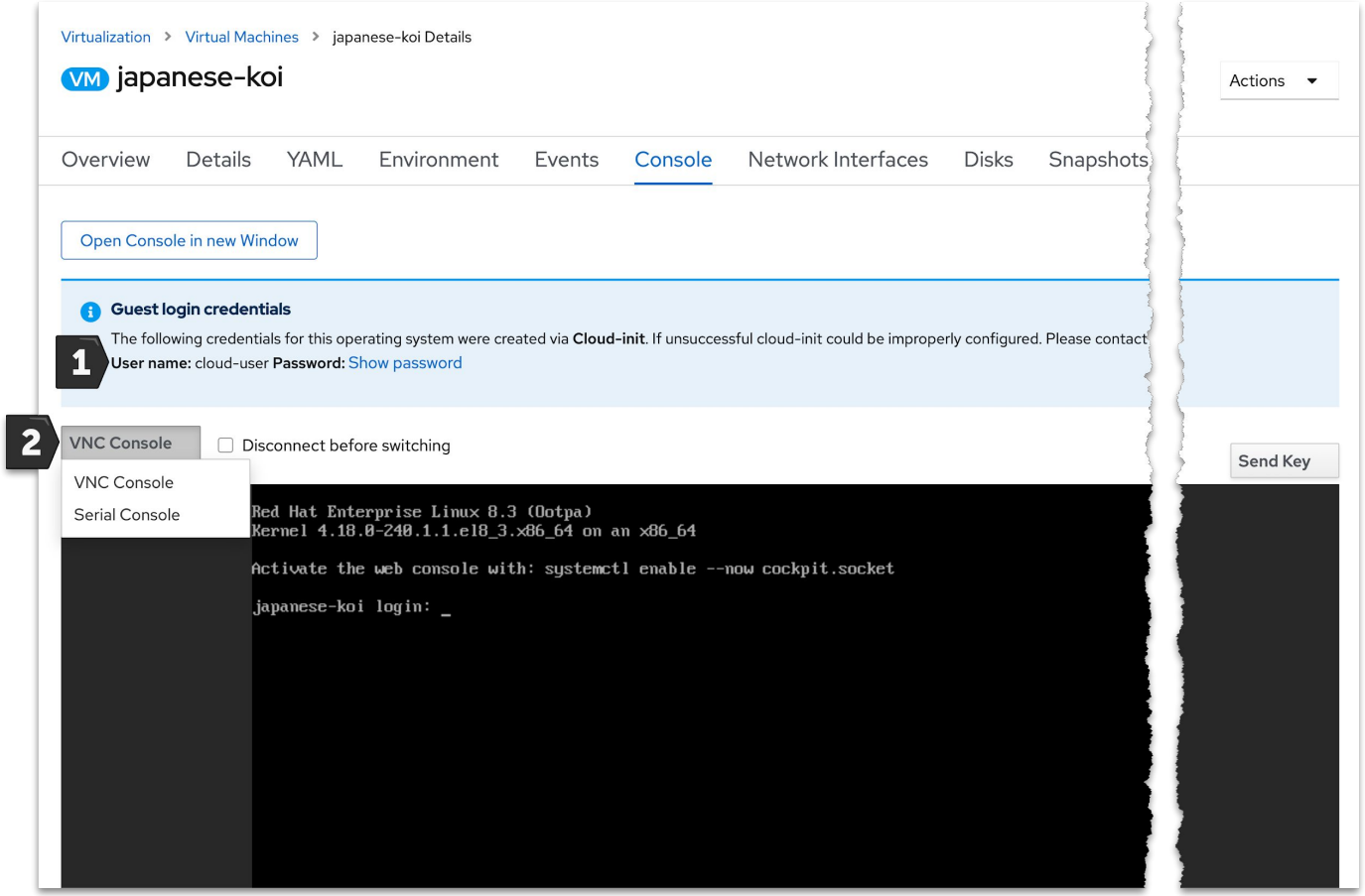
Virtual Machine - Console

- Browser-based access to the serial and graphical console of the virtual machine
- Access the console using native OS tools, e.g. `virt-viewer`, using the `virtctl` CLI command
  - `virtctl console vmname`
  - `virtctl vnc vmname`



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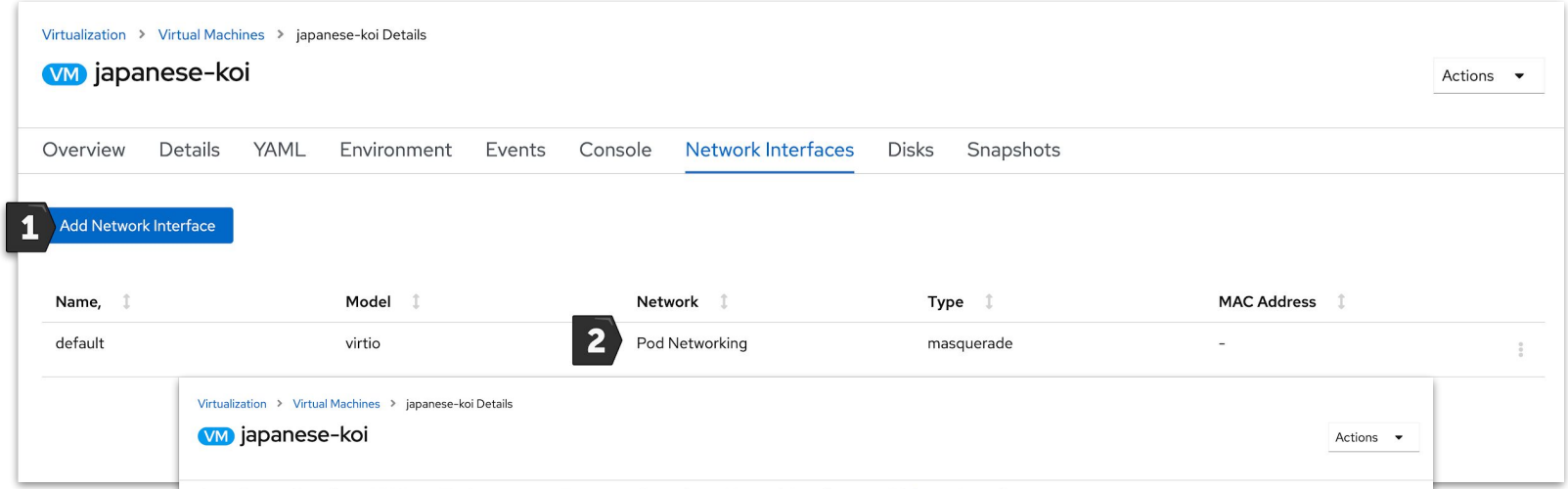
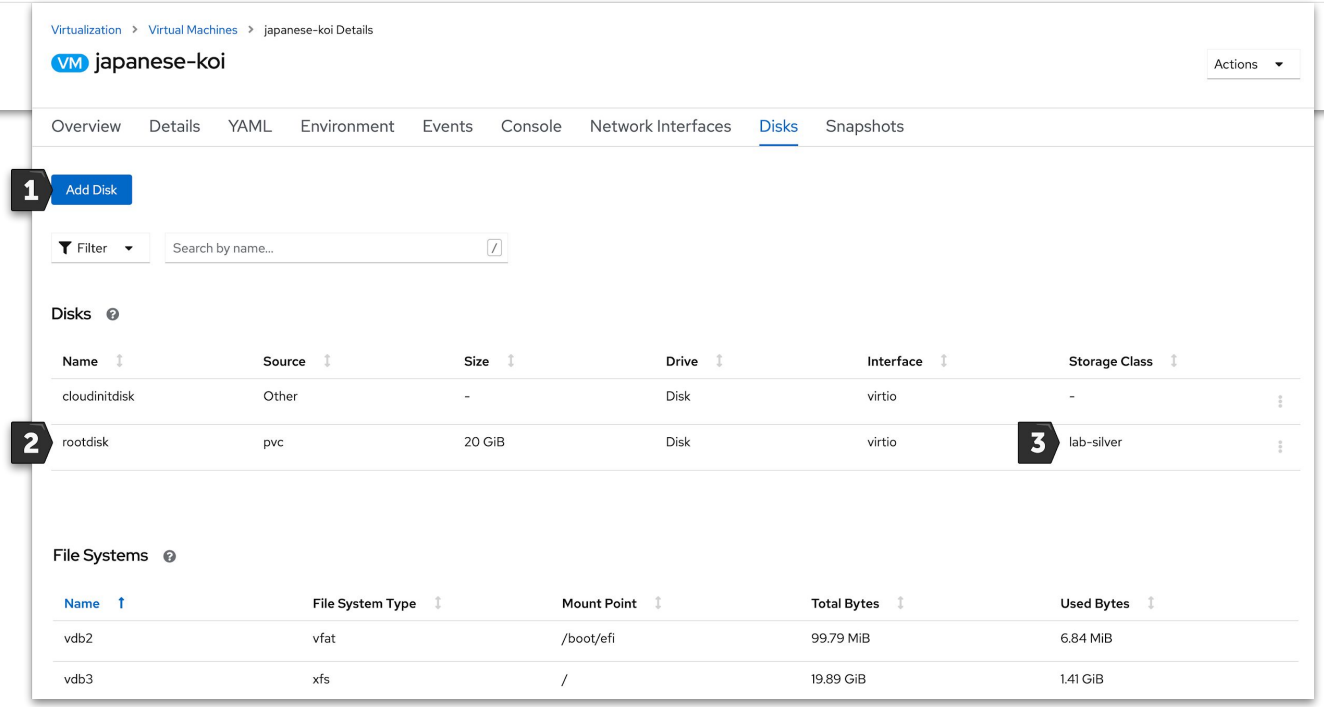
Virtual Machine - Disks and NICs

- Add, edit, and remove NICs and disks for non-running virtual machines





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