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TechTalks

Next-Level VM Management: OpenShift Virtualization Image LifeCycle with CI/CD pipeline

Agenda

- Introduction to OpenShift virtualization
- Storage and Network
- Introduction to Tekton Pipelines
- Demo

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OpenShift virtualization

Why Containers?

Portable

Consistency

Lightweight/Efficient

Packaged with OS dependencies

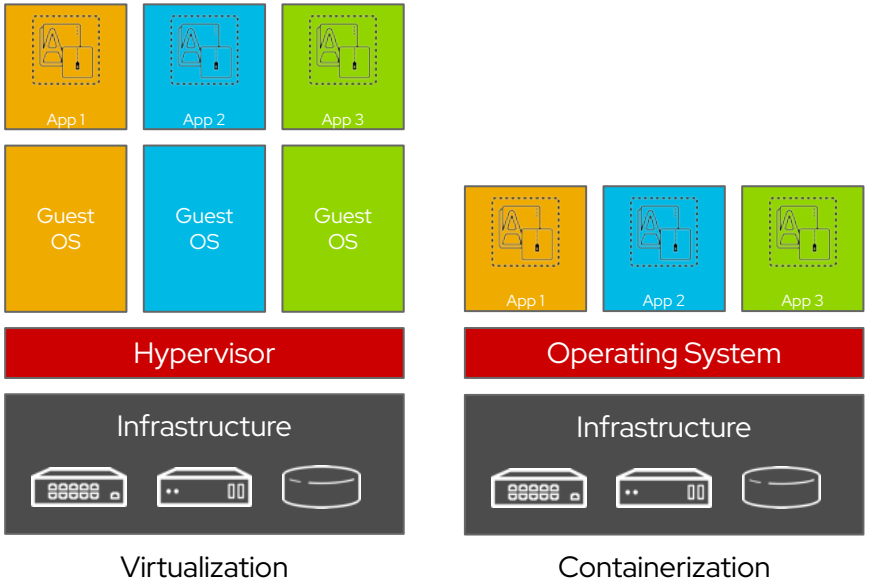
Scalable

Security

Microservice architectures

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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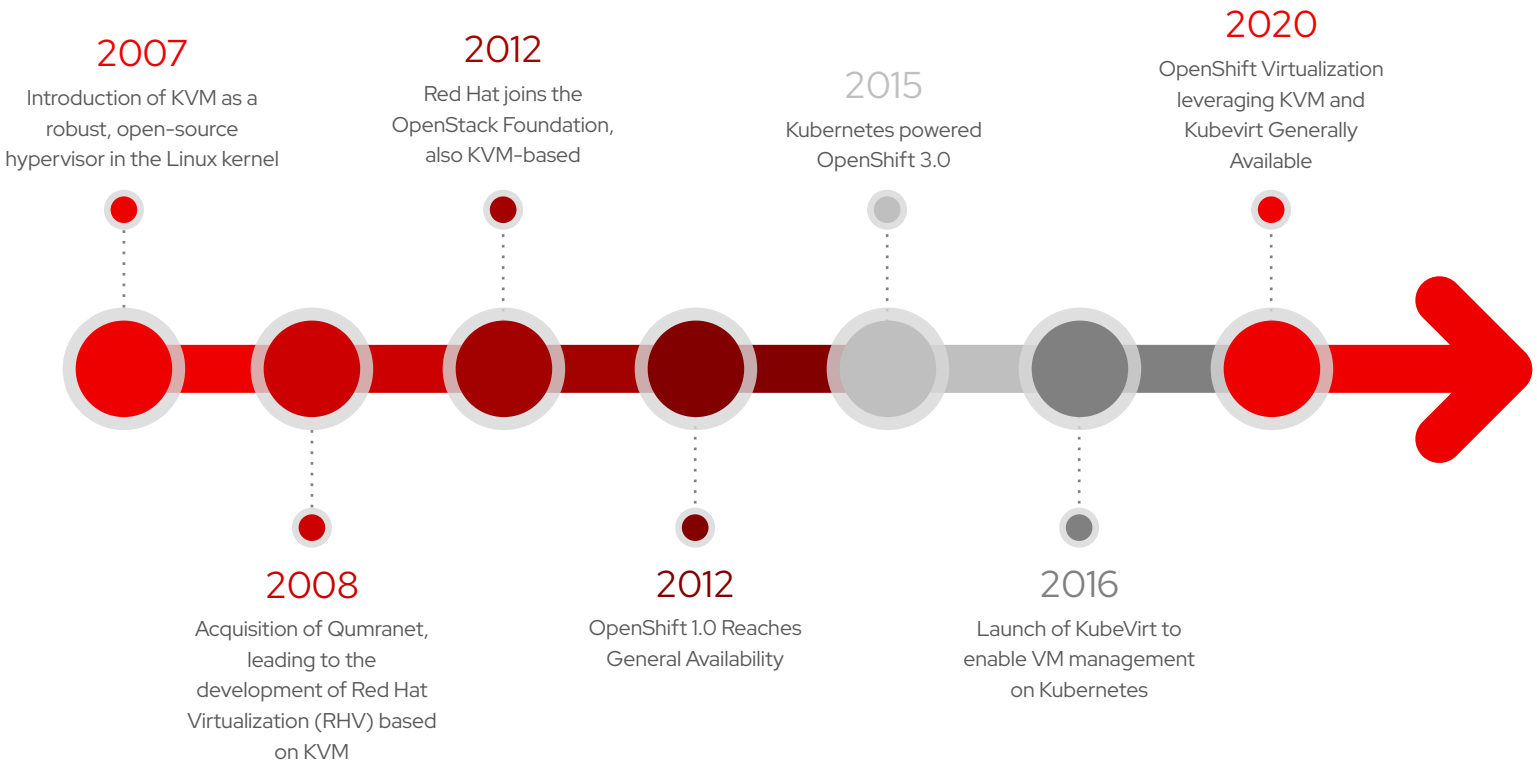
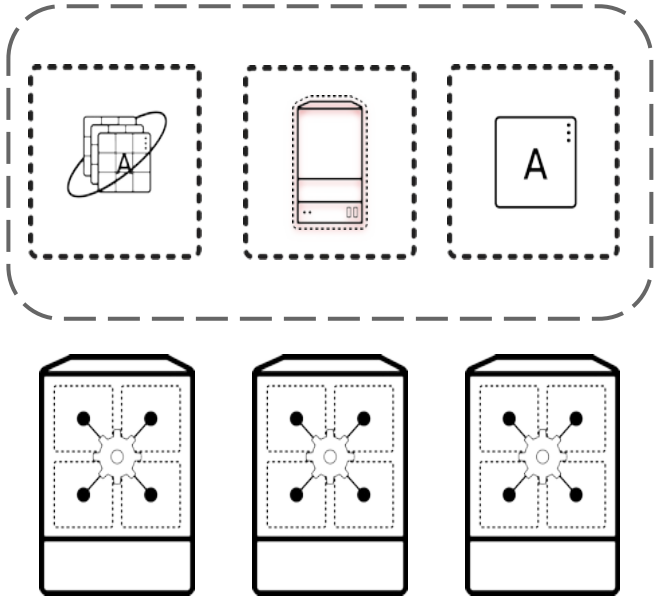
Red Hat has a long history with Virtualization



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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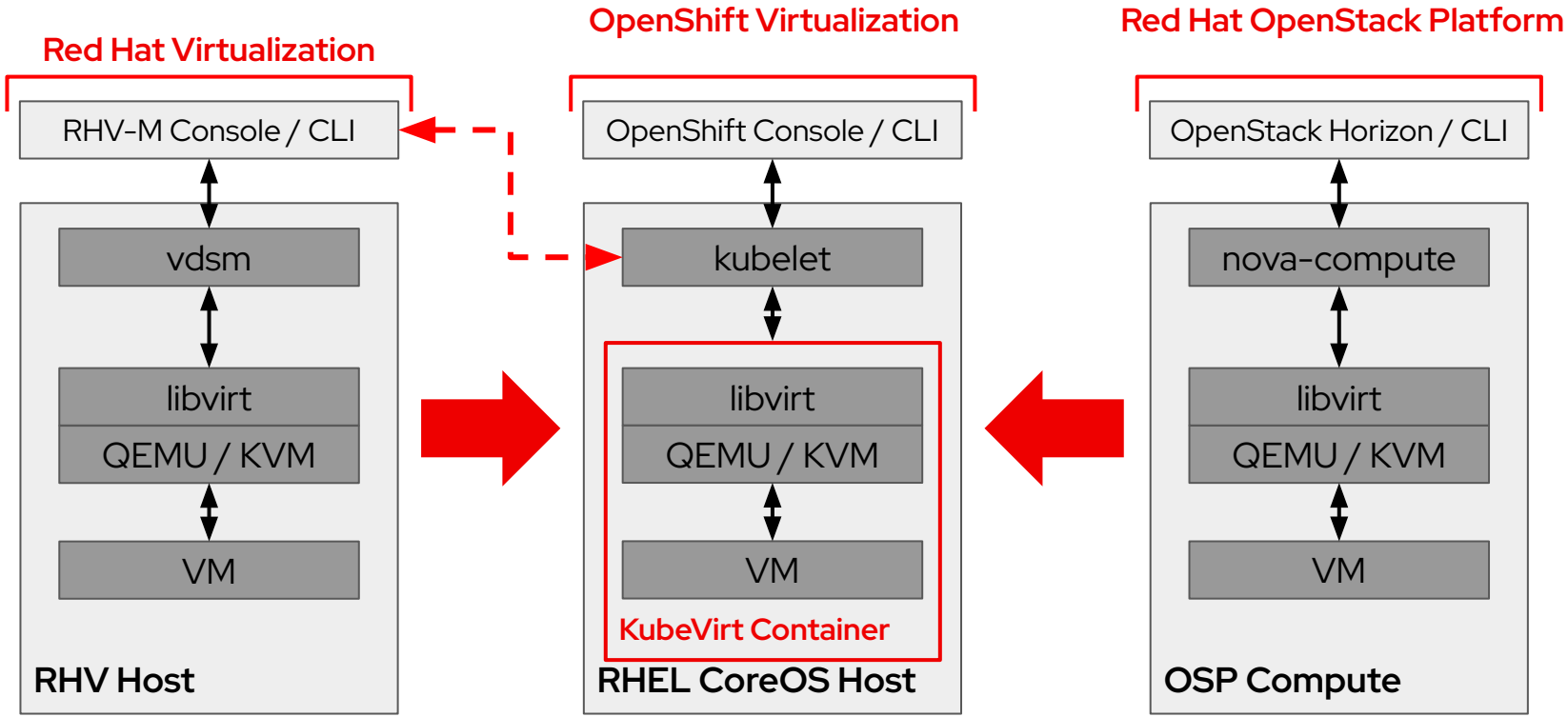
Containerizing KVM

Trusted, mature KVM wrapped in modern management and automation



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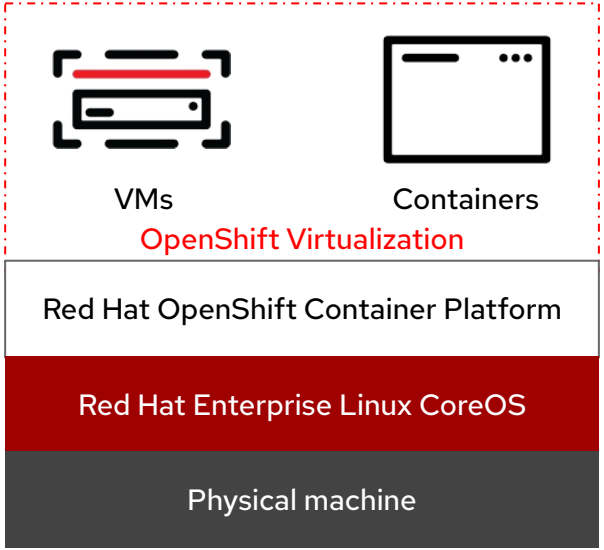
What is OpenShift Virtualization?

- Included feature of the OpenShift application platform
- Unified platform for running VMs and Containers
- Performance, stability, scalability, and reliability of KVM, the Linux kernel-based hypervisor (15+ years of production use)
- Certified Guest OS: RHEL, Windows
- Hypervisor support for: SLES, Ubuntu, Fedora, CentOS Stream
- Manageability and ecosystem of OpenShift



Complete the platform with your existing technology partners

Storage

Products for OpenShift Virt using CSI (container storage interface)

- portworx by Pure Storage
- HITACHI Inspire the Next
- DELL Technologies
- Red Hat OpenShift Data Foundation
- IBM
- INFINIDAT
- Hewlett Packard Enterprise
- NetApp

Backup / DR

Products for OpenShift

- COHESITY
- veeam Kasten
- TRILIOVAULT
- dt
- storware BACKUP AND RECOVERY
- VERITAS
- rubrik
- DELL
- NetApp
- IBM
- portworx by Pure Storage

Coming Soon:

- Commvault

Networking

Products for OpenShift Virt using CNI (container networking interface)

- ISOVALENT
- TIGERA
- CISCO
- f5

Cloud Services

Current public cloud providers offering OpenShift Virtualization

- aws
- ORACLE Cloud Infrastructure * Preview
- IBM
- Google Cloud * Preview
- Azure * Preview

Compute

Products for OpenShift

- IBM
- Hewlett Packard Enterprise
- DELL Technologies
- Lenovo
- CISCO

Note: This is not an exhaustive list of ISV partners, with new partners being added all the time.

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What we hear from customers …

“I want to modernize”

- Wants to modernize to containers, but also run VMs in a more modern way
- Stand up a secondary virtualization platform for new workloads
- Legacy and next-gen virtualization platforms co-exist

“I need to migrate”

- Migrate off their current traditional virtualization platform completely, as quickly and as safely as possible
- Modernization is subordinate to migration; containers and Kubernetes are implementation details
- Willing to take calculated risk with their production workloads

Options for VMs with Red Hat in the datacenter

Building virtualized environments however our customers want them

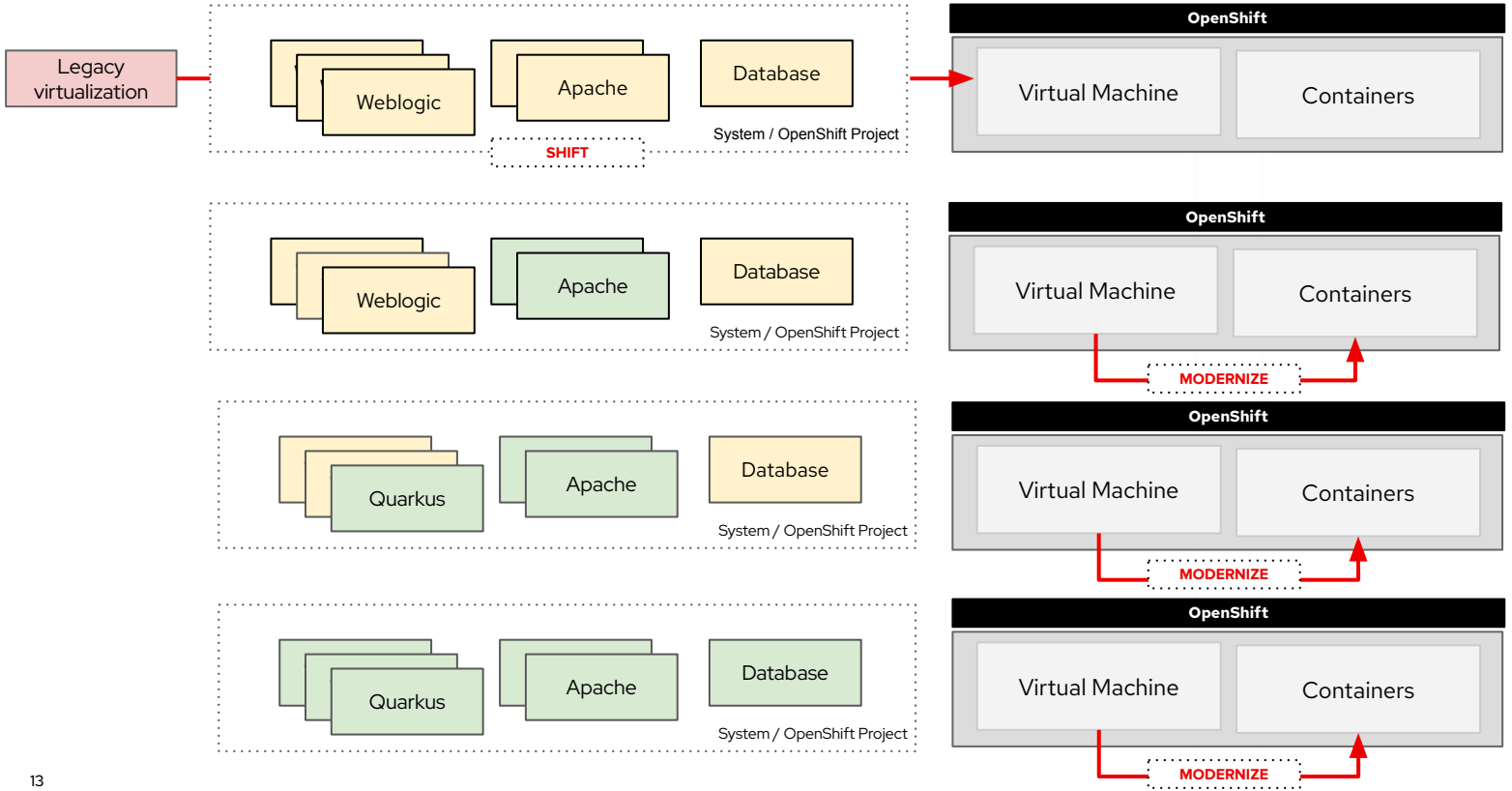
Red Hat OpenShift Virtualization Engine

A virtualization-only platform that simplifies VM migration and offers a cost-effective alternative for organizations seeking to run and manage VMs

Red Hat OpenShift

OpenShift Virtualization is functionality found within all OpenShift editions, enabling the management of VMs in a hybrid cloud environment

OpenShift Virtualization:Modernize Applications Iteratively



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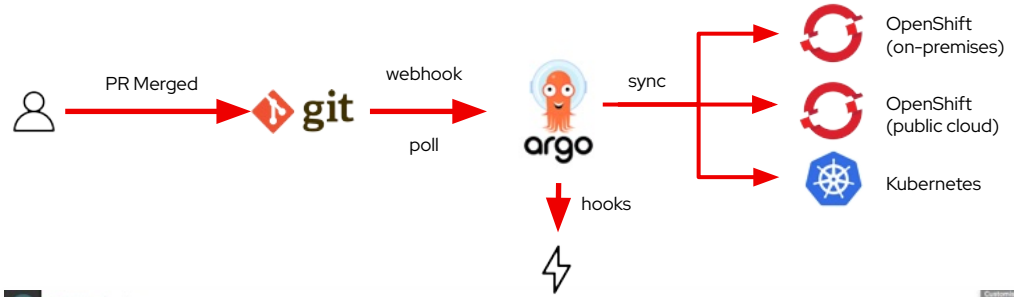
Virtualization native to Kubernetes

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

Argo CD for declarative GitOps continuous delivery

Deploy VMs as Code with CI/CD

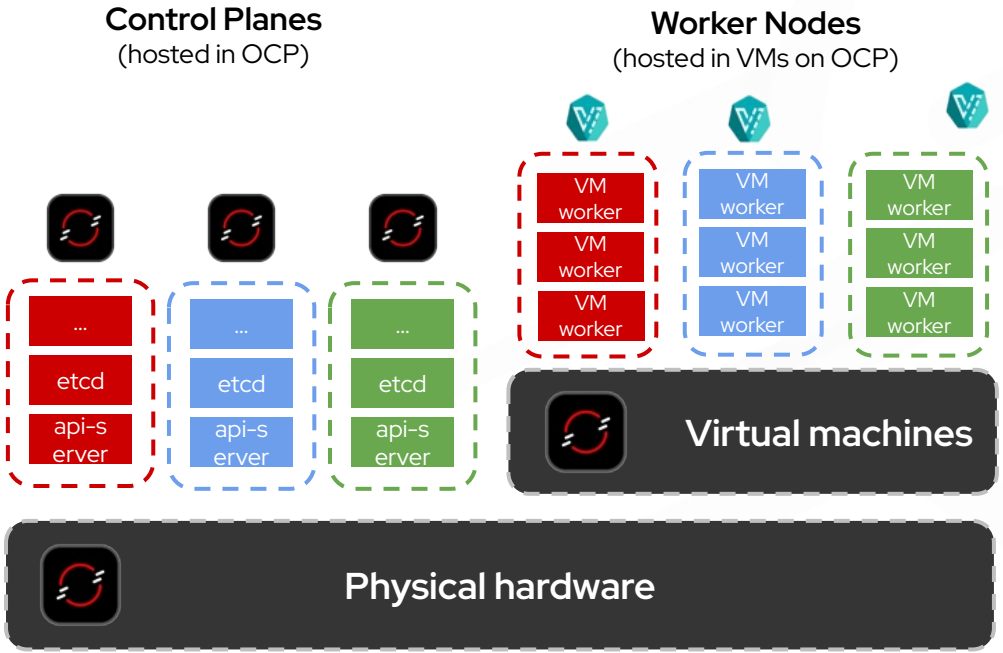


- Configurations versioned in Git
- Automatically syncs configuration from Git
- Drift detection, visualization and correction
- Granular control over sync order
- Rollback and rollforward to any Git commit
- Manifest templating support (Helm, Kustomize, etc)
- Visual insight into sync status

Utilizing OpenShift Virtualization to consolidate OpenShift clusters

Increase utilization of infrastructure

Reduce dependency on legacy virtualization



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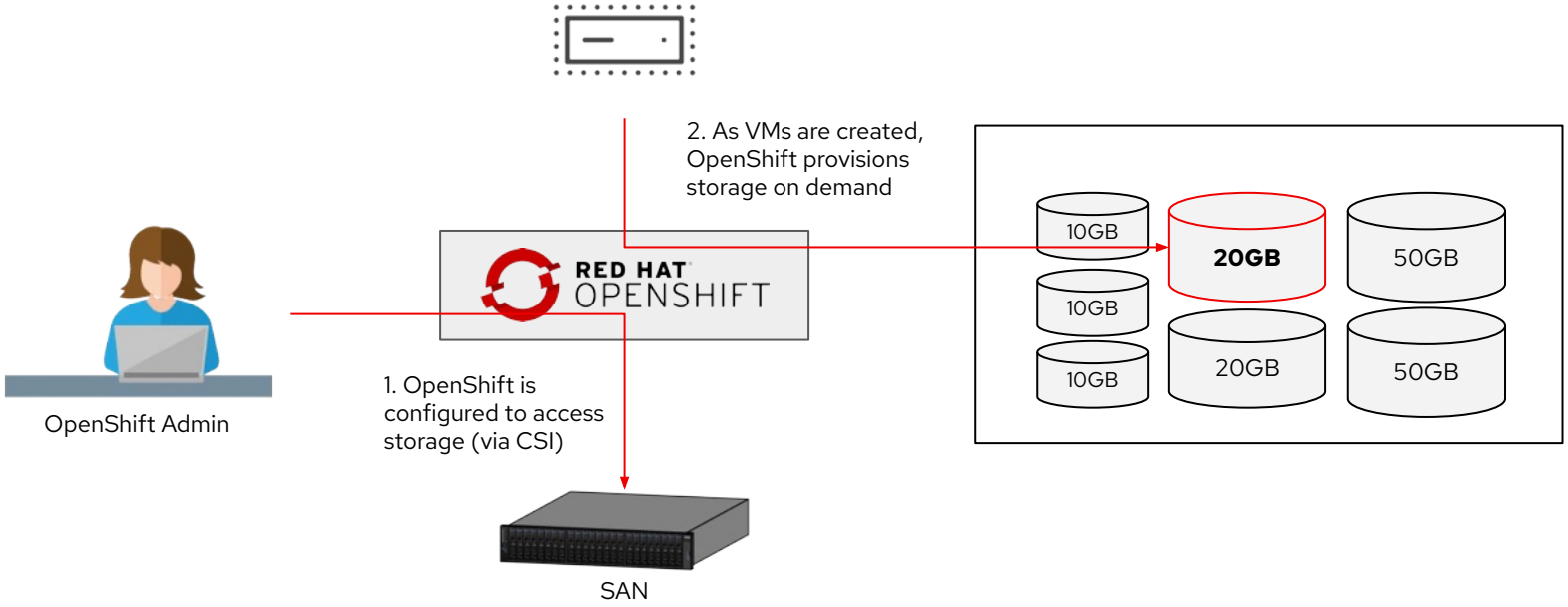
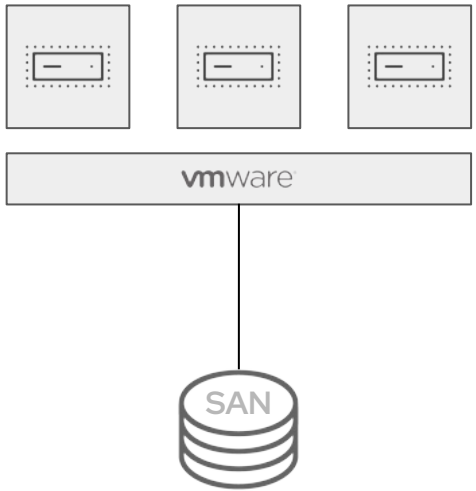
Storage and Network

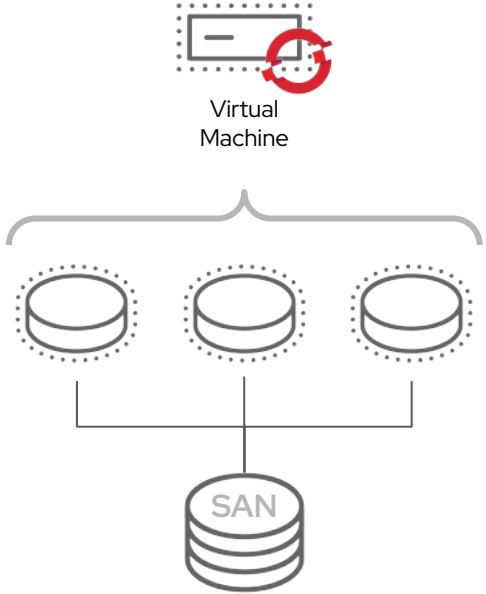
How does storage for Kubernetes differ?



How does storage for Kubernetes differ?



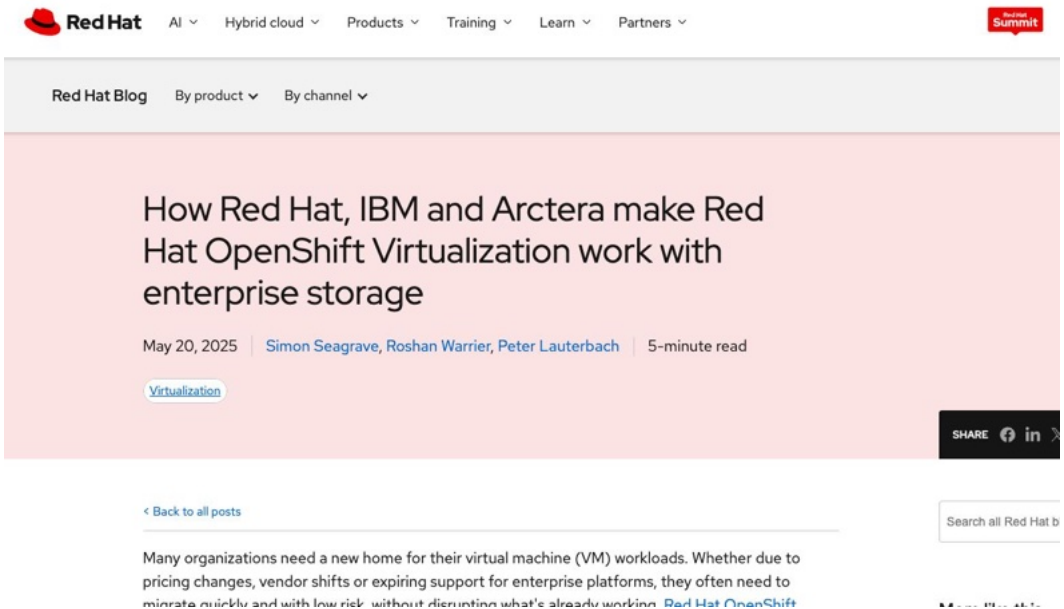
1 VMware Cluster: 1 LUN



1 OpenShift Virt VM disk : 1 PV : 1 LUN

Partners integrating with openshift virt

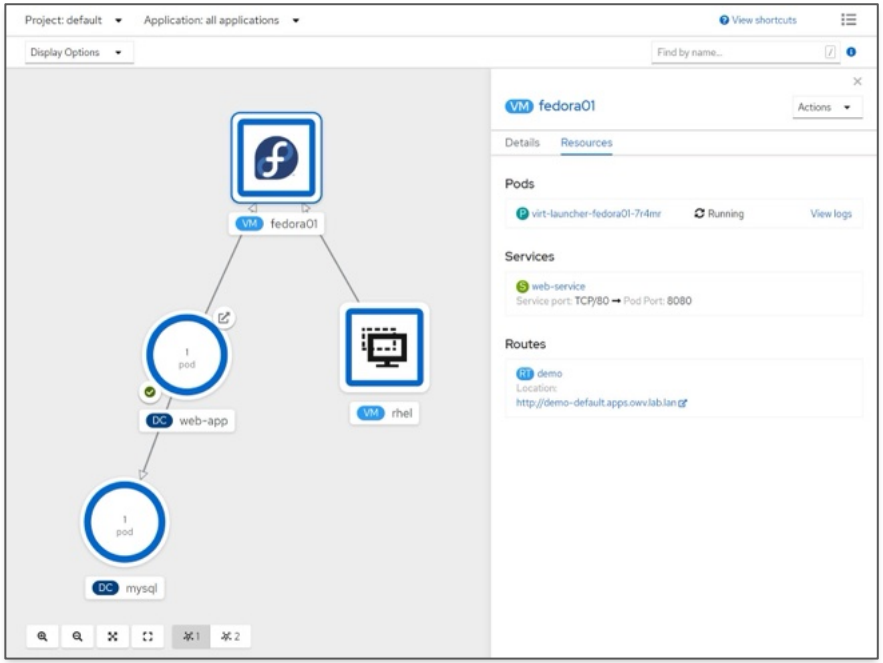
Using traditional block storage without CSI driver



https://www.redhat.com/en/blog/red-hat-ibm-arctera-make-openshift-virtualization-work-with-enterprise-storage

Using VMs and containers together

- Virtual machines connected to SDN networks are accessible using standard Kubernetes methods:
  - Service, Route, Ingress
  - Service Mesh
- 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
- OVN-Kubernetes, Calico, ...



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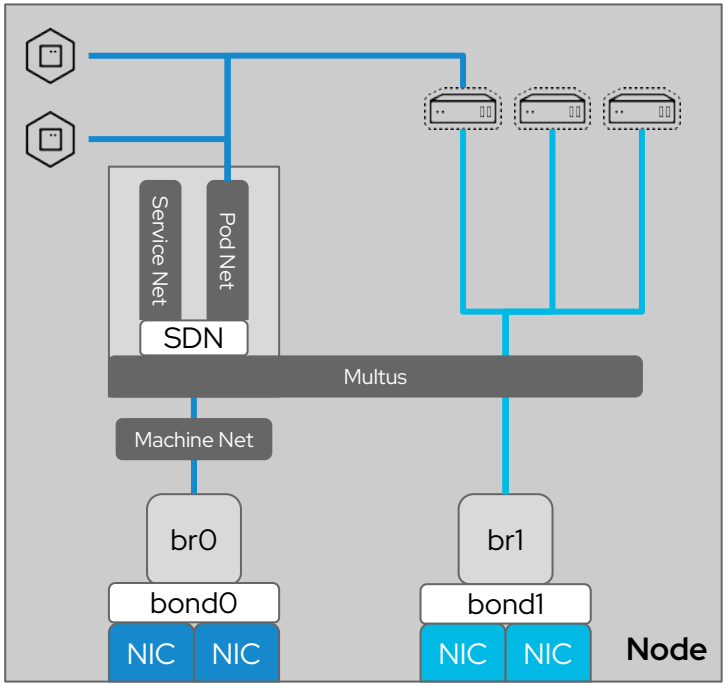
Virtual Machine Networking

- *optionally* connect to the standard pod network
  - (service, route, ingress, ….)
- Additional network interfaces accessible via Multus:
  - Bridge, SR-IOV, OVN secondary networks
  - VLAN and other networks can be created at the host level using nmstate



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Tekton Pipelines

TEKTON

An open-source project for providing a set of shared and standard components for building Kubernetes-style CI/CD systems

CD.FOUNDATION

Governed by the Continuous Delivery Foundation

Contributions from Google, Red Hat, Cloudbees, IBM, Pivotal and many more

OpenShift Pipelines

Built for Kubernetes

Cloud-native pipelines taking advantage of Kubernetes execution and , operational model and concepts

Scale on-demand

Pipelines run and scale on-demand in isolated containers, with repeatable and predictable outcomes

Secure pipeline execution

Kubernetes RBAC and security model ensures security consistently across pipelines and workloads

Flexible and powerful

Granular control over pipeline execution details on Kubernetes, to support your exact requirements

Powered by TEKTON

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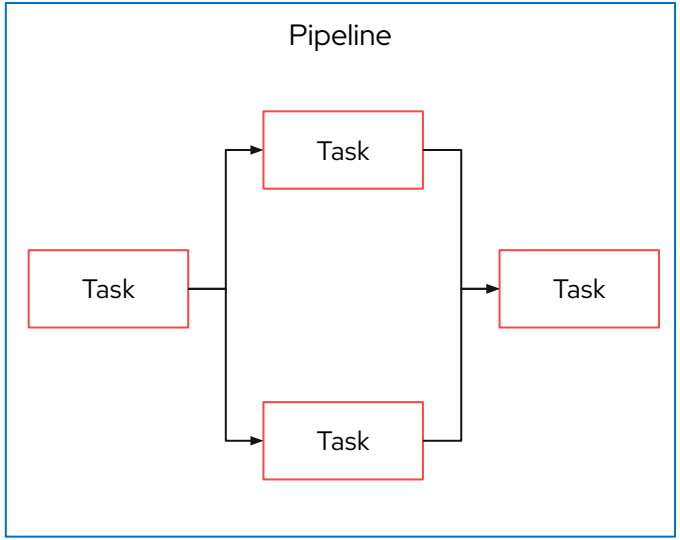
Task

- Defines a unit of work to be executed
- A list of steps run sequentially
- Step containers run in the task pod
- Has inputs, outputs and parameters
- Can run independent of pipelines

Source:
https://tekton.dev/docs/pipelines/

Pipeline

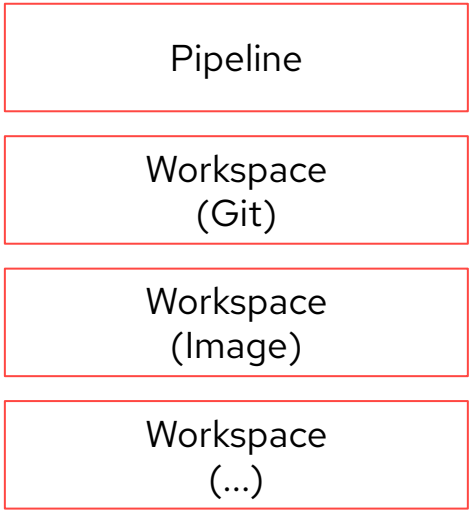
- Combine multiple tasks
- Expresses task order (graph)
- Has inputs and parameters
- Pipeline tasks run on different nodes



Source:
https://tekton.dev/docs/pipelines/

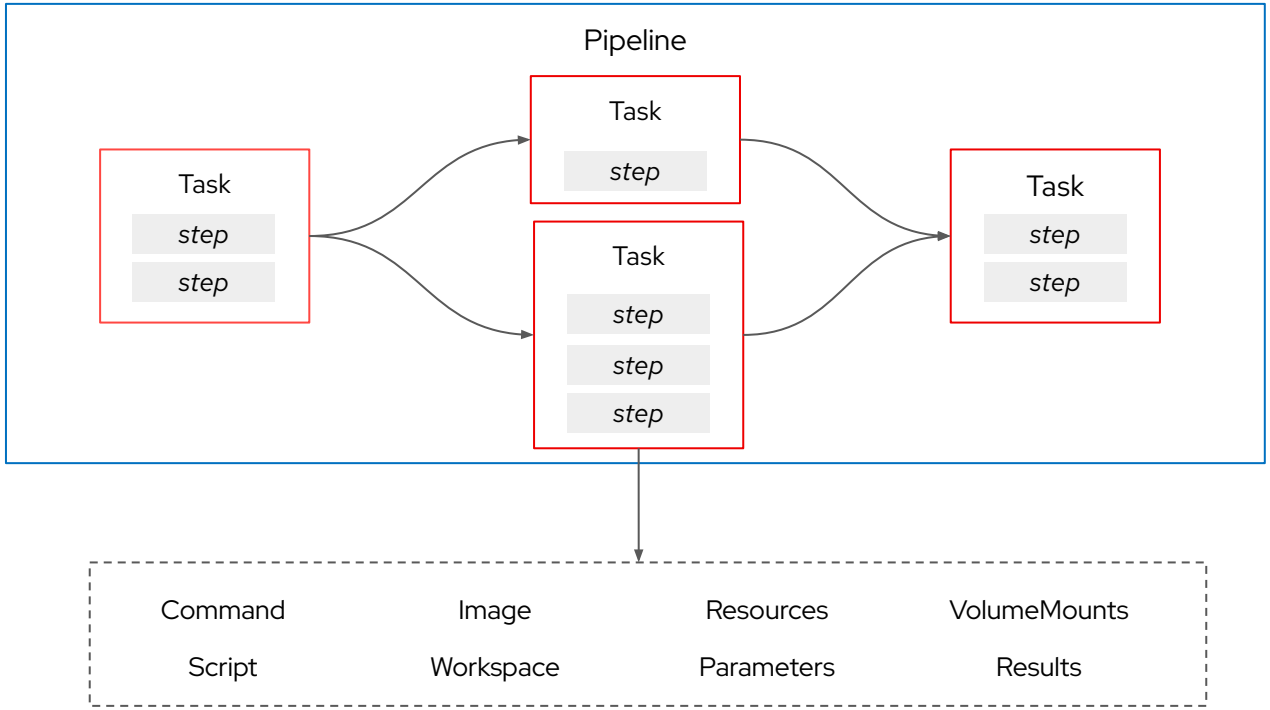
Workspaces

- Declare file systems needed by TaksRuns
  - Similar to Volume (mount points)
- Inputs and outputs of tasks and pipelines
- Sharing data between Tasks
- Decoupled from pipeline definition
- Reusable across pipelines



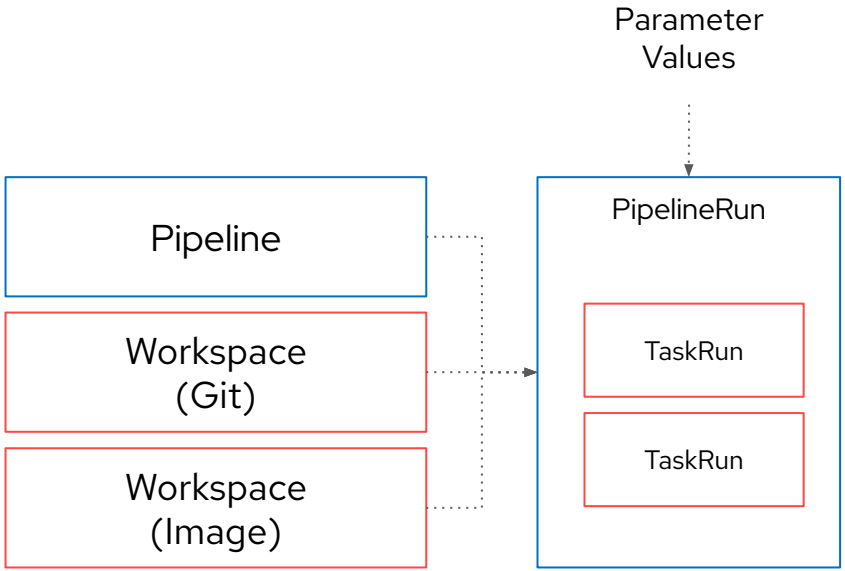
Source:
https://tekton.dev/docs/pipelines/workspaces/

Tekton Building Blocks



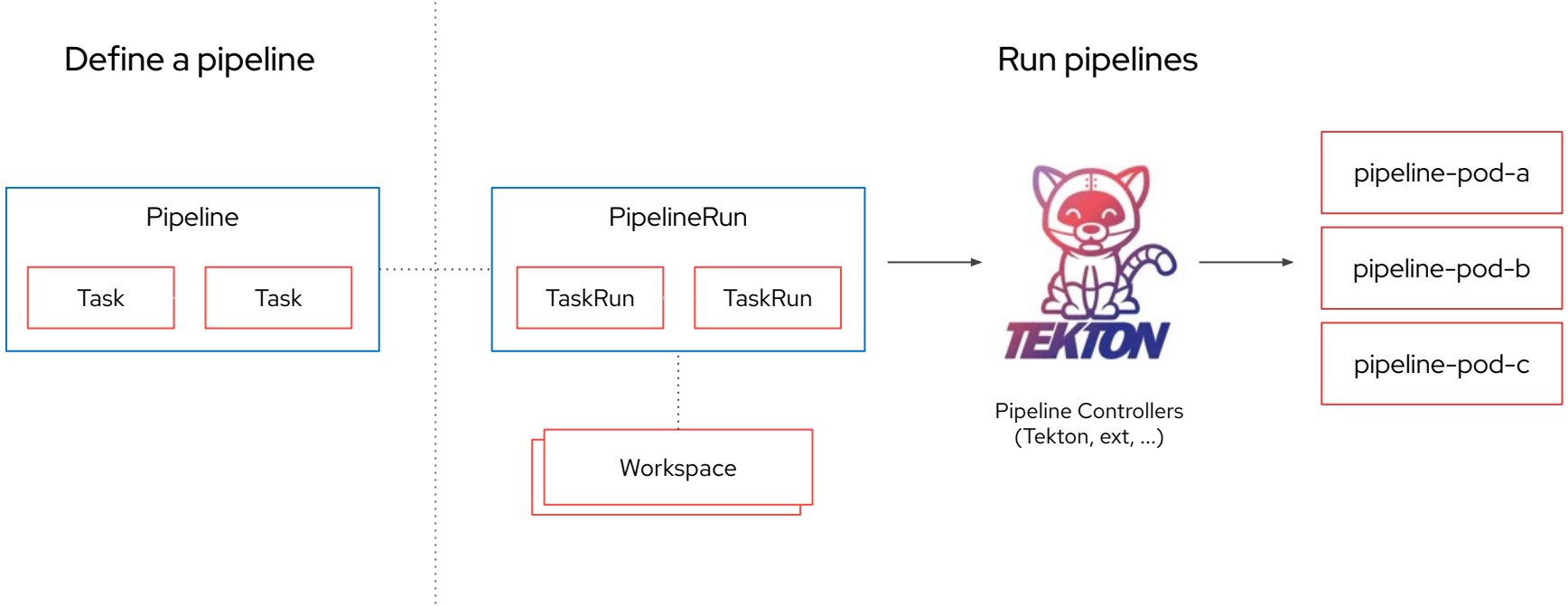
TaskRun and PipelineRun

- Runtime CRDs
- Invocation of Task and Pipeline
- Reference tasks and pipelines
- Provide inputs, outputs and params

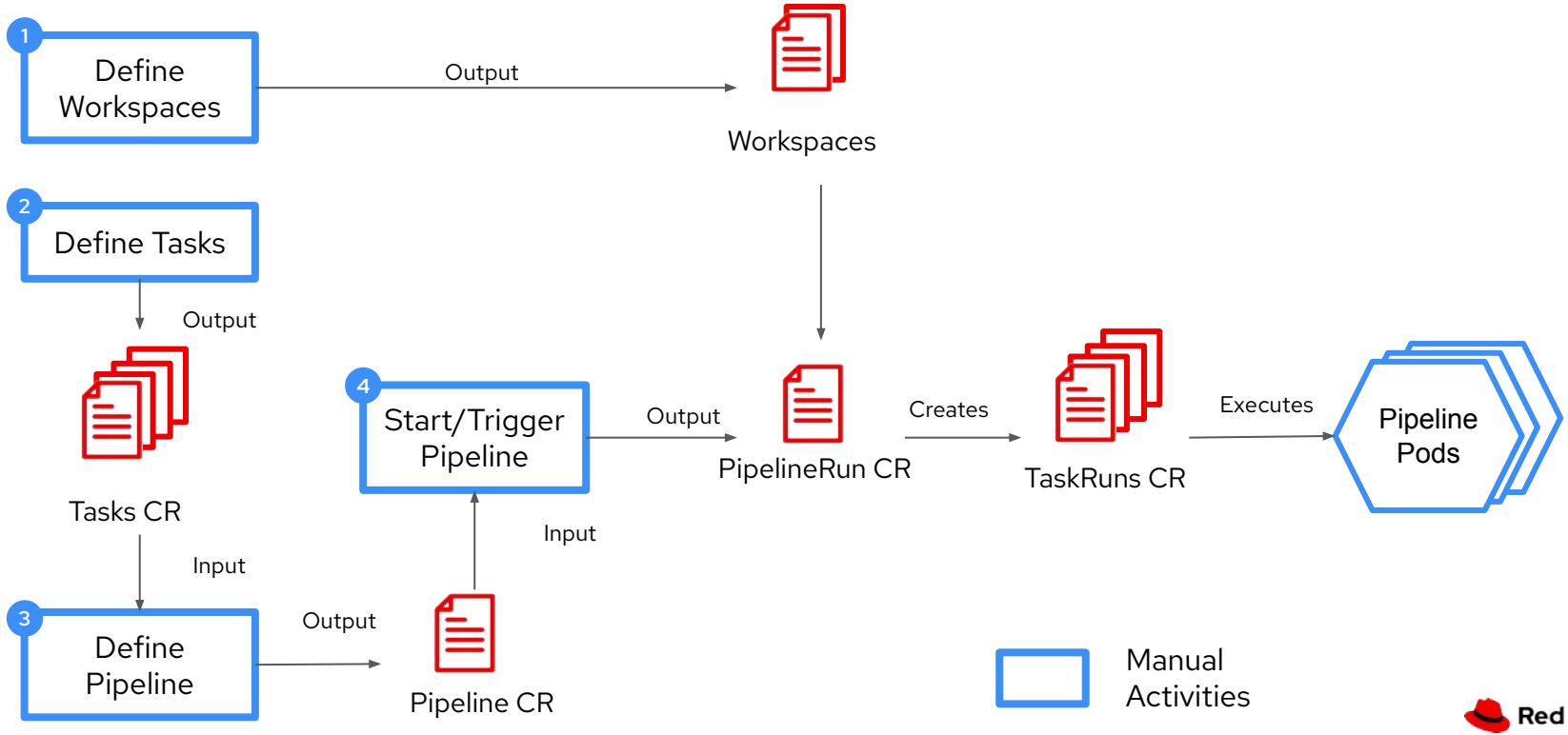


Source:
https://tekton.dev/docs/pipelines/pipelineruns/
https://tekton.dev/docs/pipelines/taskruns/

General Architecture



Entities Flow



Building a pipeline using standard components

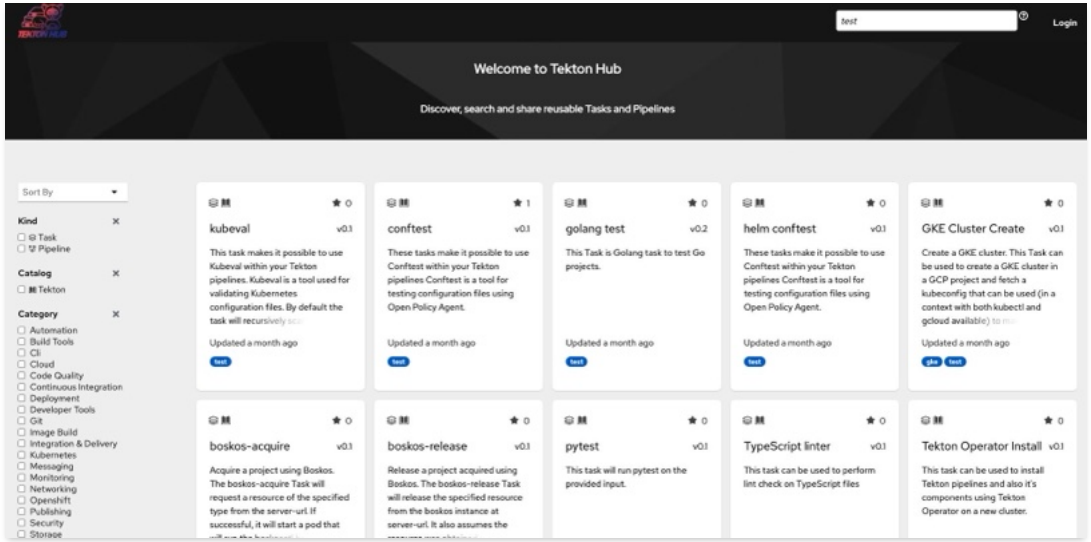
Install Tasks from Tekton Hub / Artifactory Hub

Tekton Project publishes Tasks generally used in CI pipelines in Tekton Hub.

It is possible to build a CI pipeline by combining these Tasks with minimum effort.

Example Tasks:

- **maven**: Build or test in Java
- **conftest**: Test manifest files
- **golang test**: Unit test of Golang
- **pytest**: Unit test of Python
- **sonarqube scanner**: Check vulnerability in code
- **Send message to Slack Channel**: Slack notification



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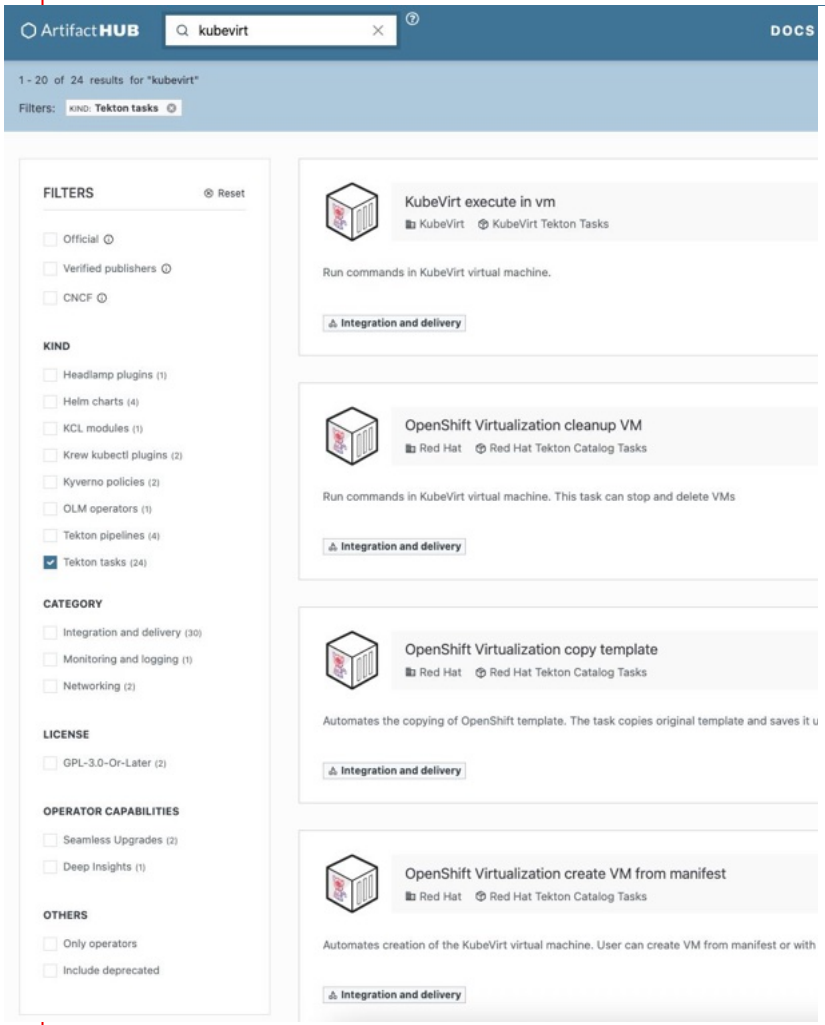


Table 9.2. Supported virtual machine tasks

Task	Description
`create-vm-from-manifest`	Create a virtual machine from a provided manifest or with `virtctl`.
`create-vm-from-template`	Create a virtual machine from a template.
`copy-template`	Copy a virtual machine template.
`modify-vm-template`	Modify a virtual machine template.
`modify-data-object`	Create or delete data volumes or data sources.
`cleanup-vm`	Run a script or a command in a virtual machine and stop or delete the virtual machine afterward.
`disk-virt-customize`	Use the `virt-customize` tool to run a customization script on a target PVC.
`disk-virt-sysprep`	Use the `virt-sysprep` tool to run a sysprep script on a target PVC.
`wait-for-vmi-status`	Wait for a specific status of a virtual machine instance and fail or succeed based on the status.

Project: openshift-cnv

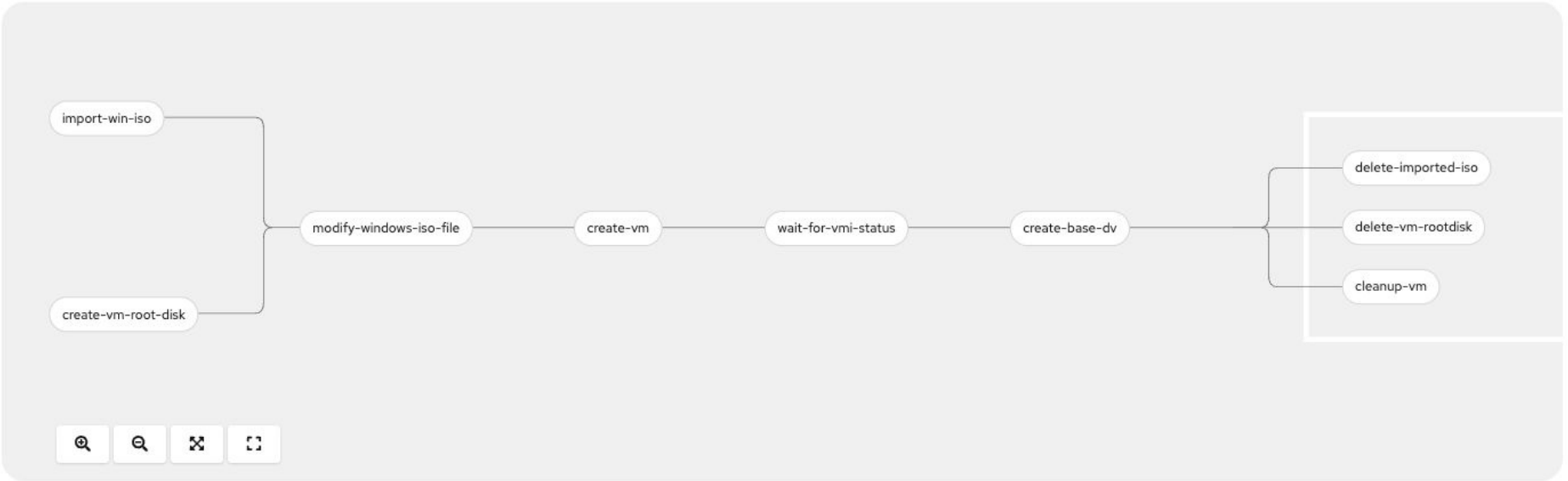
Pipelines > Pipeline details

PL windows-efi-installer

Actions

Details YAML Parameters Metrics PipelineRuns

Pipeline details



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Demo

How to create VMs?

- RHEL image mode
- Clone existing VM
- Ansible
- Red Hat Image builder
- OpenShift pipelines
- ….

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Thank you for joining!

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