Red Hat Summit

Connect

Jak będąc wirtualną maszyną przetrwać wśród kontenerów.

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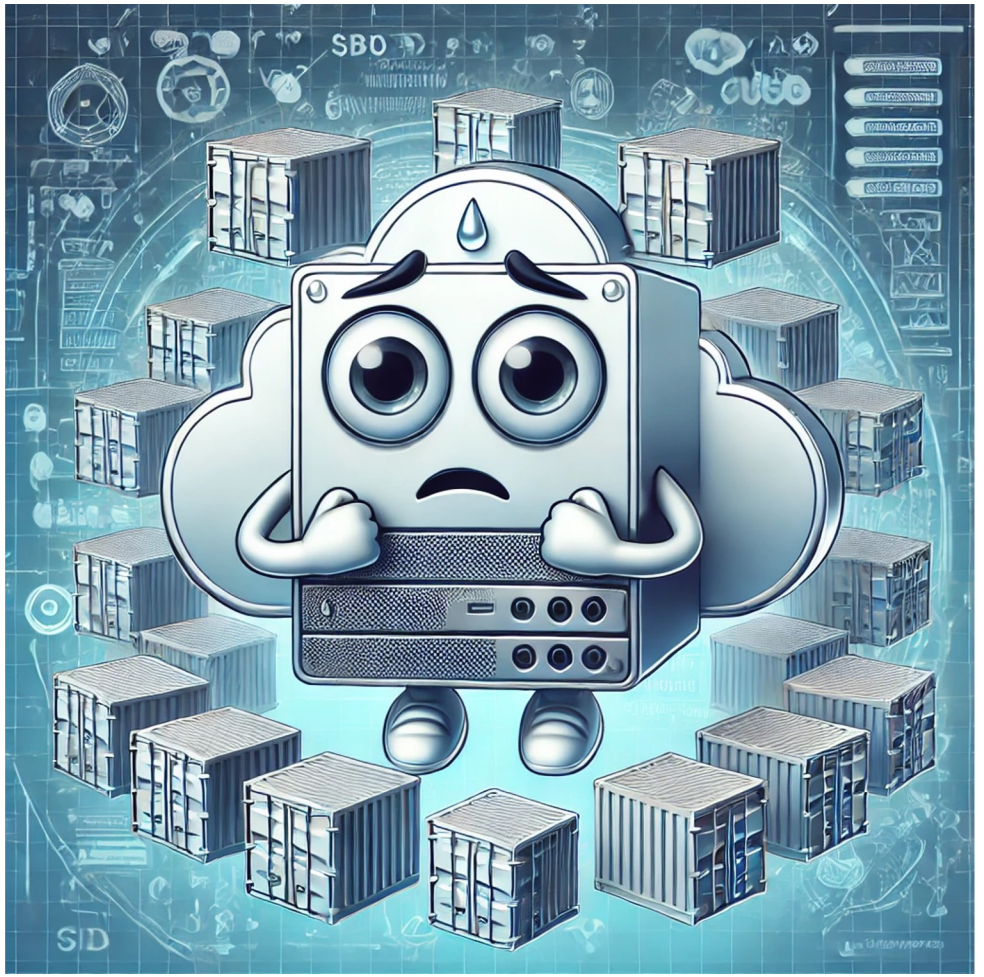
Specialist Solution Architect
OpenShift Virtualization

Red Hat

Virtual Machines are not containers!

- Typically containers run a single app process
- Containers don’t mind to be terminated and restarted
- Containers are often running as multiple replicas
- Containers don’t need a hypervisor (just a host)
- There is nothing unusual about being ephemeral and immutable when you’re a container



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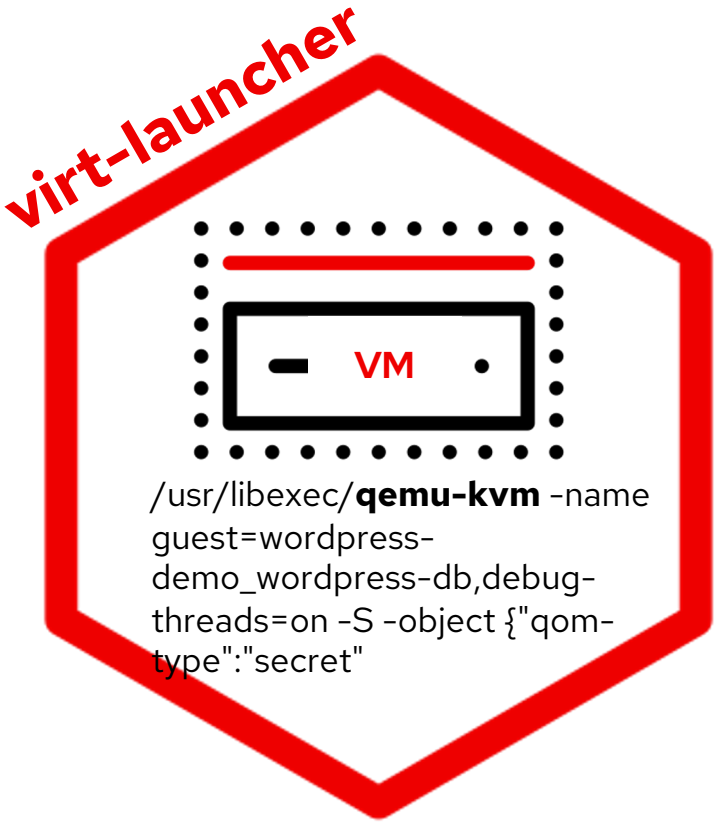
But Virtual Machine can be run INSIDE a container

- KVM virtual machine is a process
- Containers are meant to encapsulate processes
- Both have the same underlying resource needs
  - CPU, Memory, Storage, Network, etc
- Orchestration (K8s) layer is transparent for VM
- KVM has 10+ years of production use



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Getting virtualization to OpenShift

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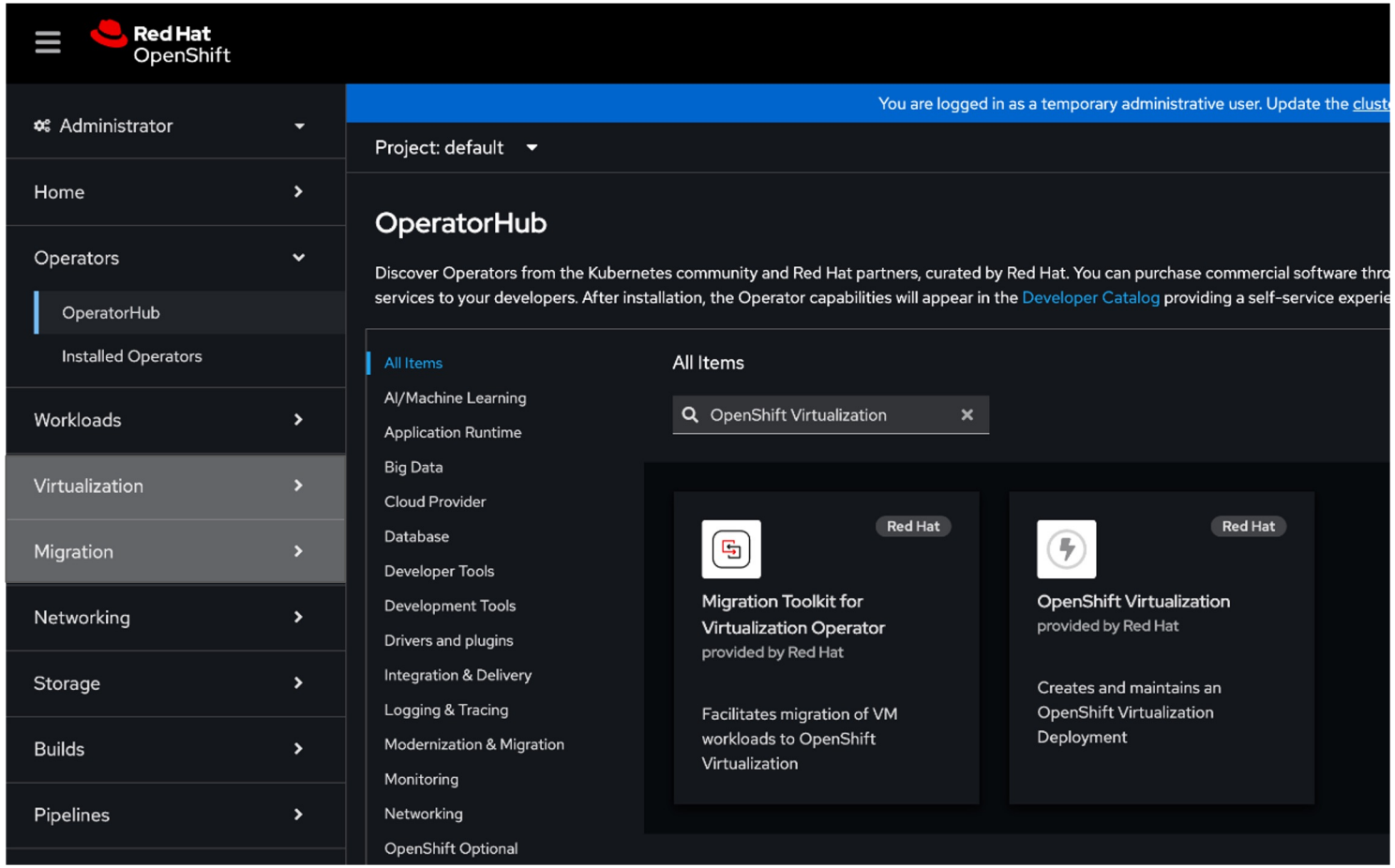
OpenShift Virtualization Operator

- Operators - packaging, deploying and managing a Kubernetes native applications
- Certified and supported way to extend platform capabilities (virtualization and many more, including 3rd party components)
- Easy lifecycle management



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Custom Resource Definition

- Custom Resources are extensions of the Kubernetes API
- CRDs make Kubernetes more modular
- Many of the core Kubernetes functions are now built using Custom Resources

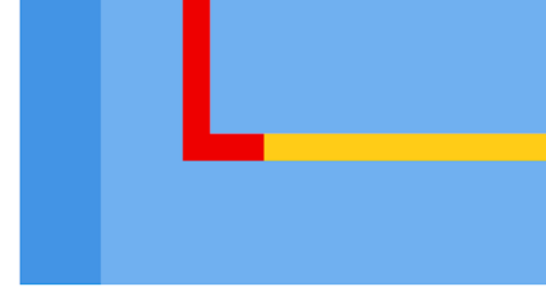
```
datasources.cdi.kubevirt.io
datavolumes.cdi.kubevirt.io
virtualmachineinstancemigrations.kubevirt.io
virtualmachineinstances.kubevirt.io
virtualmachineinstancetypes.instancetype.kubevirt.io
virtualmachinepools.pool.kubevirt.io
virtualmachines.kubevirt.io
virtualmachinesnapshots.snapshot.kubevirt.io
volumeclonesources.cdi.kubevirt.io
volumeimportsources.cdi.kubevirt.io
```

Live migration

Virtual Machine Live Migration

- CPU and Memory changes
- Adding/removing devices
- Infrastructure maintenance
- Workload rebalance (descheduling)

Storage and Network



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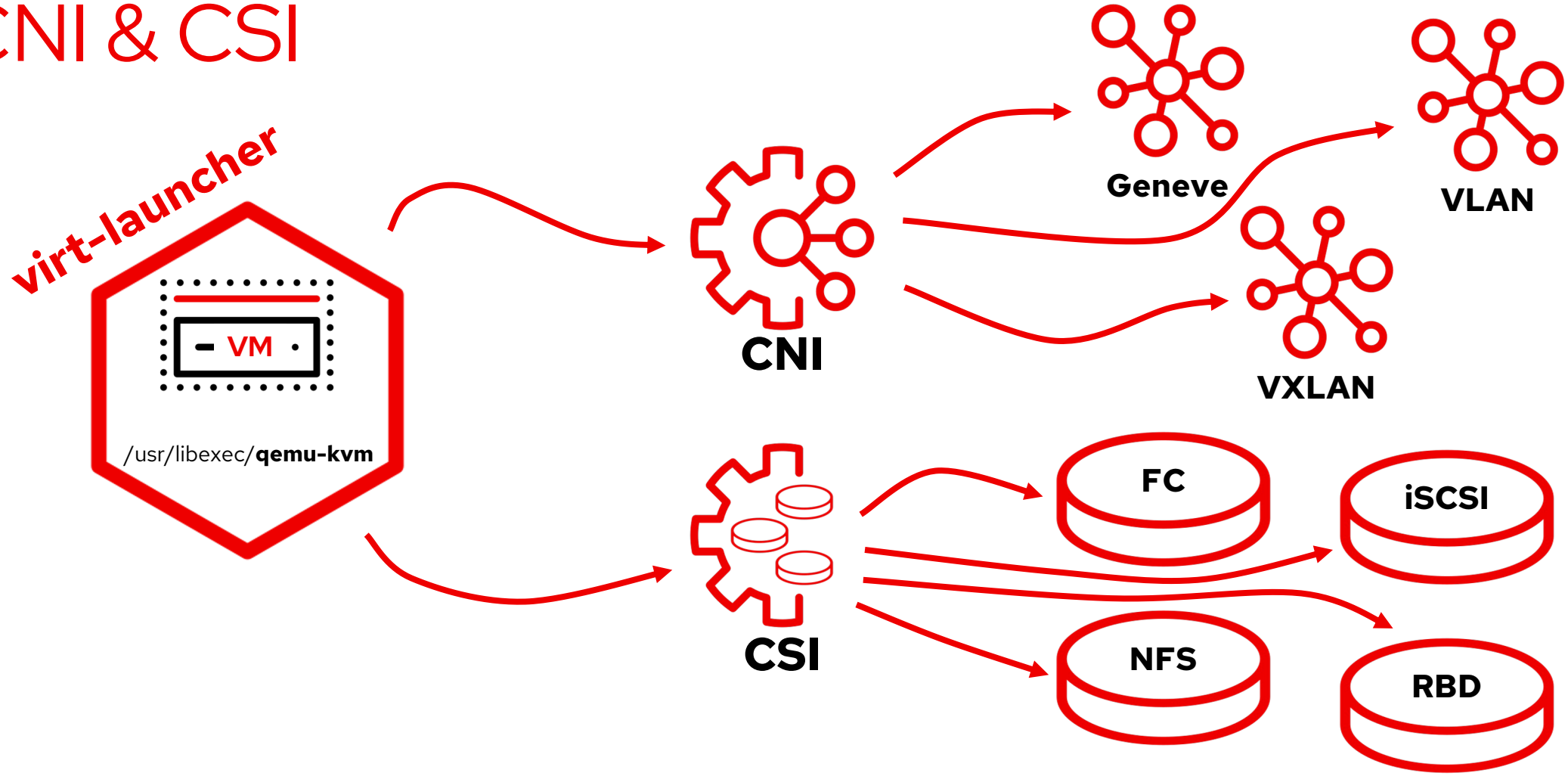
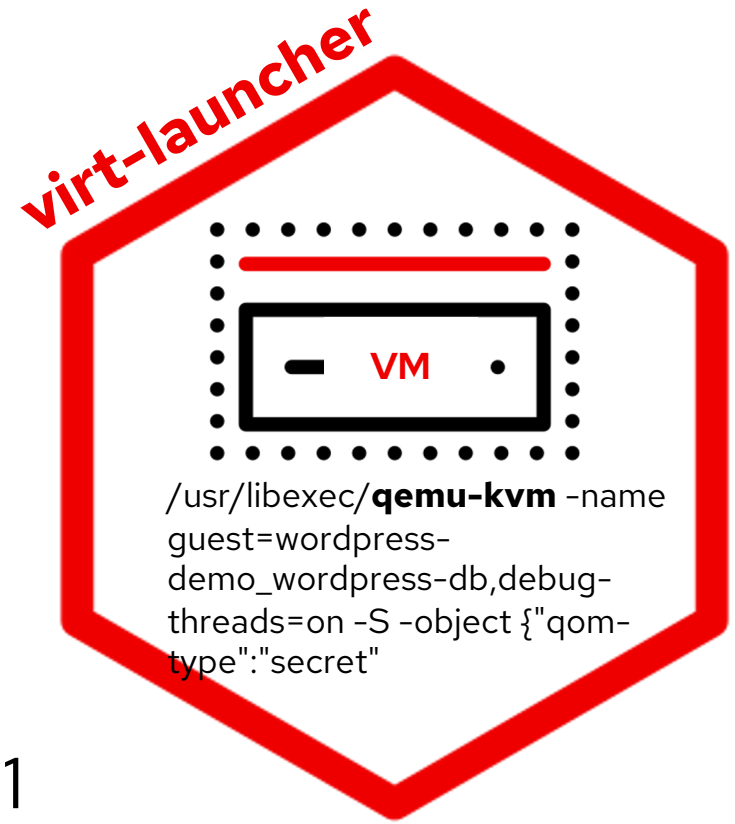
CNI & CSI



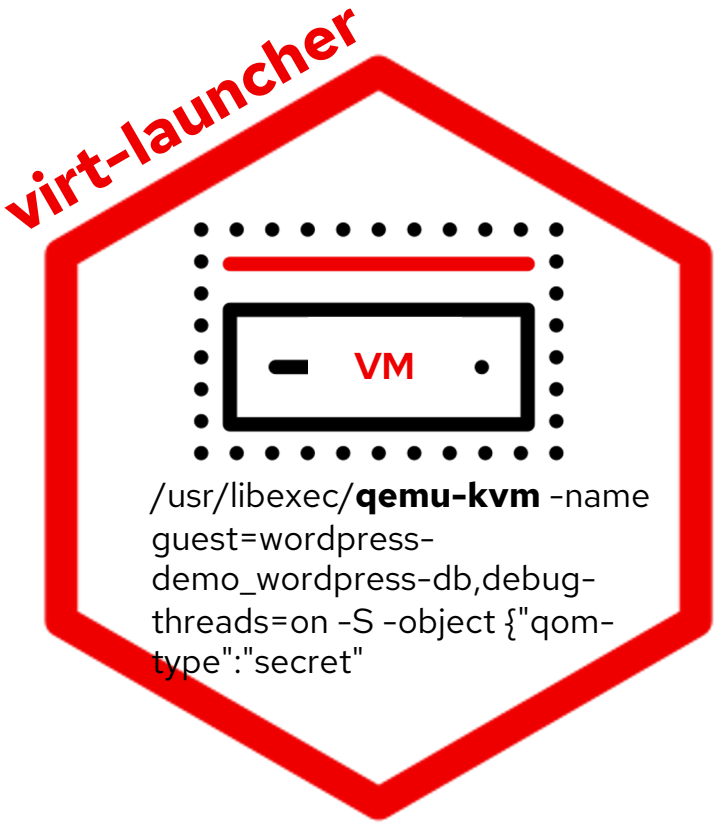
Networks for VMs

- The default pod network
- Multus networks
  - SR-IOV
  - VLANs
- User defined networks **Tech preview 4.17**
- 3rd party CNI plugins (https://access.redhat.com/articles/5436171)



Storage for VMs

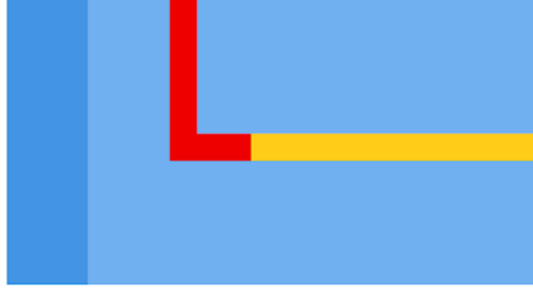
- Hot-plug disks
- Live disk expansion
- RWO, RWX, ROX
- Snapshots and clones

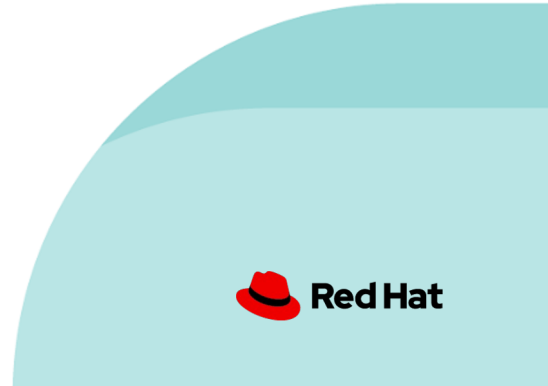


Do you remember virsh? It is still here!

```
# oc get pods
NAME                                     READY   STATUS    RESTARTS   AGE
virt-launcher-wordpress-db-g5wkv         2/2     Running   0          3m19s

# oc exec -it virt-launcher-wordpress-db-g5wkv -- virsh list
 Id   Name                           State
----------------------------------------------
 1    wordpress-demo_wordpress-db    running

# oc exec -it virt-launcher-wordpress-db-g5wkv -- virsh domiflist wordpress-demo_wordpress-db
 Interface        Type       Source   Model                       MAC
-------------------------------------------------------------------------------
 tap0             ethernet   -        virtio-non-transitional     02:69:be:00:00:01
 tap61005e00e2e   ethernet   -        virtio-non-transitional     02:69:be:00:00:02

# oc exec -it virt-launcher-wordpress-db-g5wkv -- virsh domblklist wordpress-demo_wordpress-db
 Target   Source
------------------------------------------------------------------------------------------
 vda      /dev/rootdisk
 vdb      /var/run/kubevirt-ephemeral-disks/cloud-init-data/wordpress-demo/wordpress-db/noCloud.iso
 sda      /var/run/kubevirt/hotplug-disks/extra-disk
```

Scheduling and Descheduling





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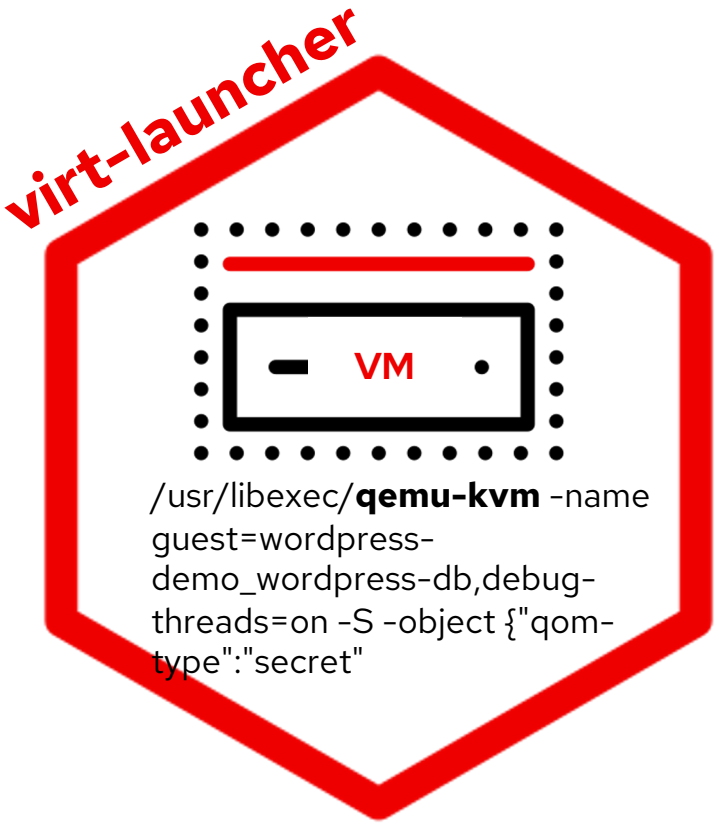
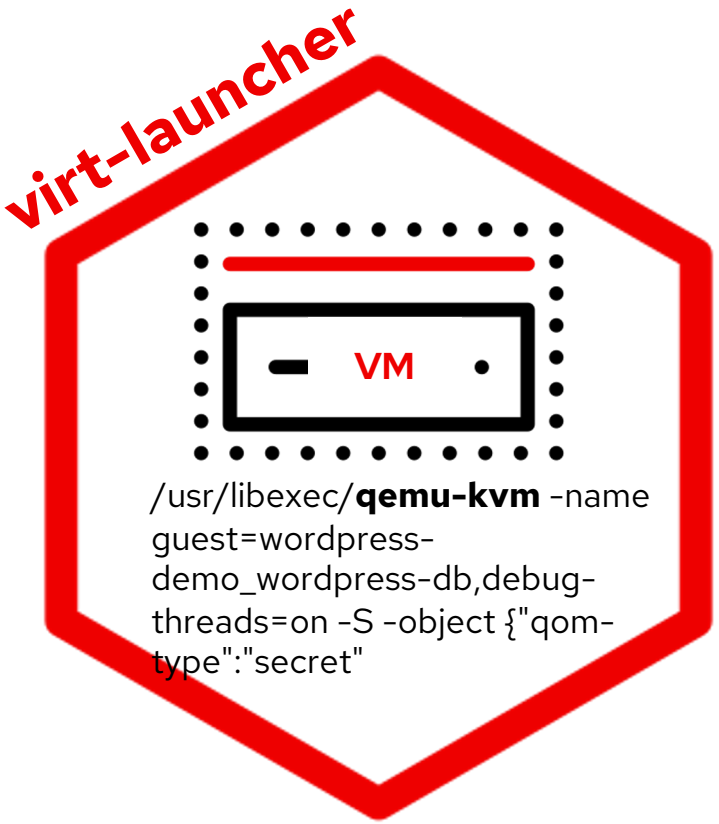
Workloads scheduling

- **nodeSelector** - label based node assignment
- **affinity/anti-affinity** - specify how to colocate VMs against other workloads (VMs and regular Pods)
- **tolerations** - make VMs running on nodes with specific taints (ignore the taints)

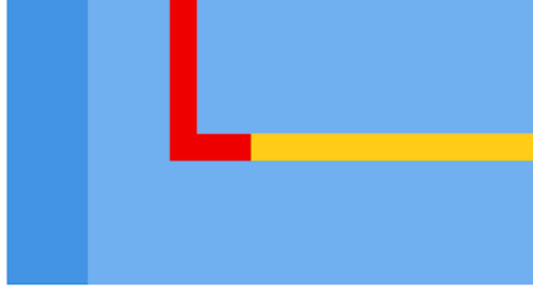


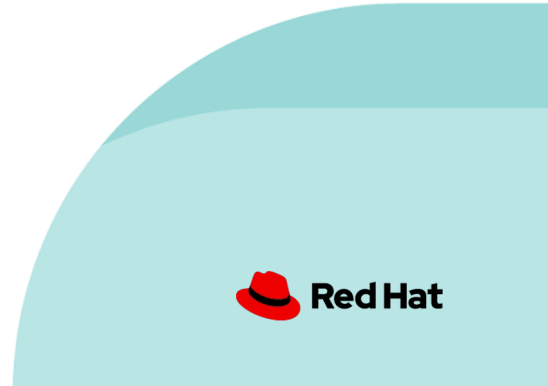
Descheduler / workload rebalance

- Live-migrate VM onto more appropriate node
  - **RemovePodsHavingTooManyRestarts** - moves pods whose containers have been restarted too many times
  - **LowNodeUtilization** - evicts pods from overutilized nodes when there are any underutilized nodes



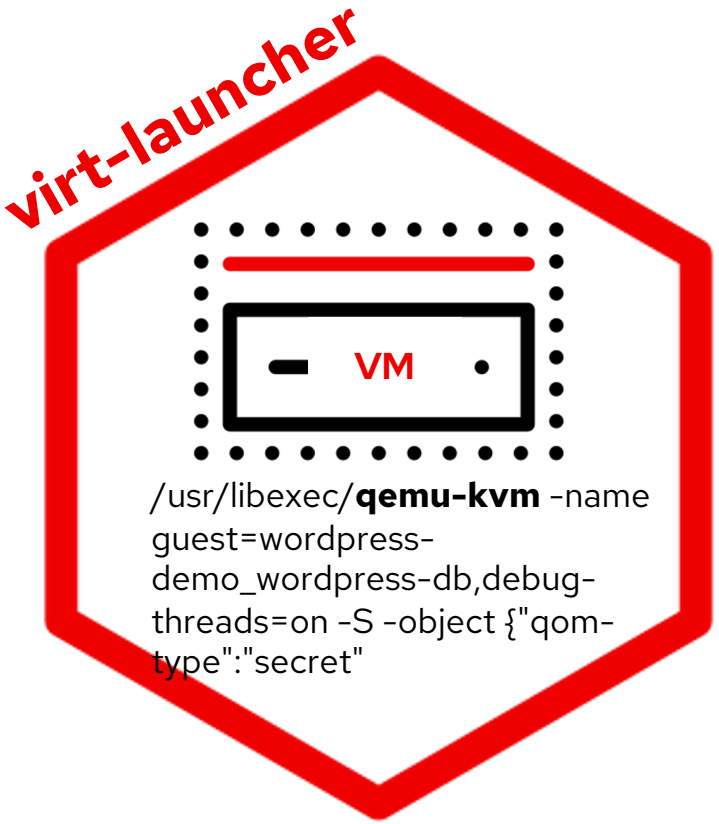
Performance & density optimisation



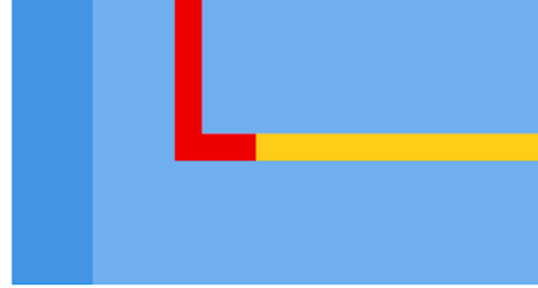


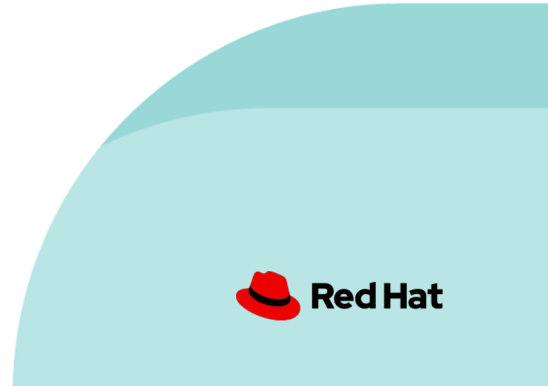
Performance & density optimisation

- CPU and Memory overcommitment
- Kernel samepage merging (KSM)
- Default CPU model
- UEFI support
- Huge pages for VMs
- CPU pinning
- PCI pass-through (incl. SR-IOV)
- vGPUs



Backups

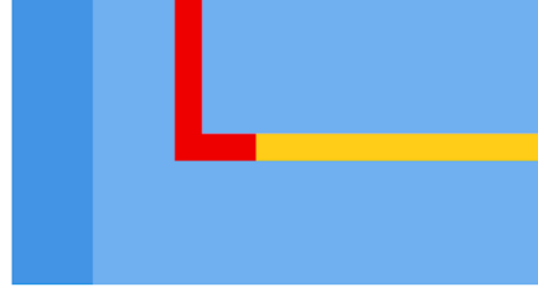


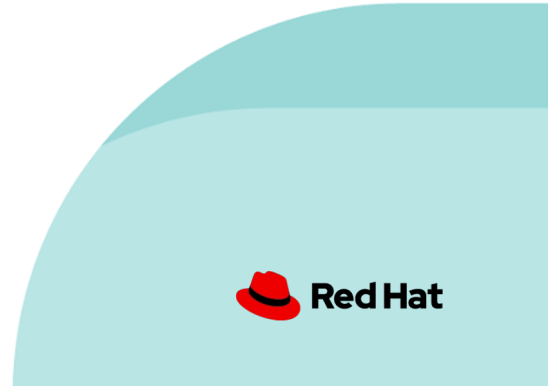


Backups

- OADP - (OpenShift APIs for Data Protection) is an operator that Red Hat has created to create backup and restore APIs in the OpenShift cluster
- Can be used standalone but for best experience use it with dedicated backup solution
- Operators from 3rd party backup specialised vendors available at OperatorHub

High availability





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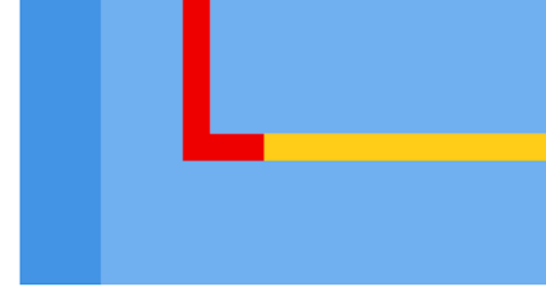
High availability

- Automated migration of VMs from impacted nodes
- Automated node remediation
  - Self-node remediation (poison pill)
  - Fence Agents Remediation Operator (OOBM)
  - Few others too...
- Built-in load-balancer

Automation



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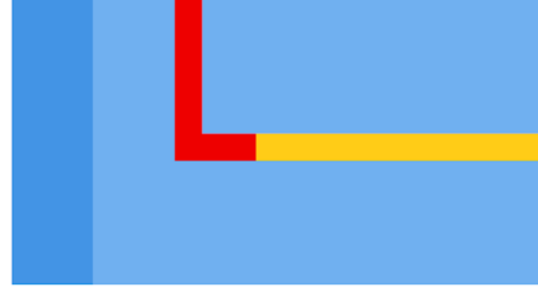
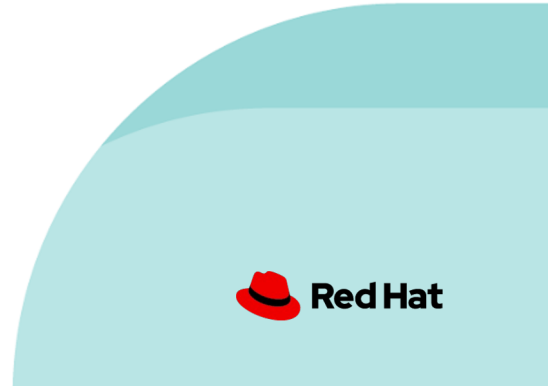
Automation

- API-first approach
- Ansible Automation Platform
- OpenShift ArgoCD
- OpenShift Pipelines
- Virtually anything what can speak with K8s

Service Mesh





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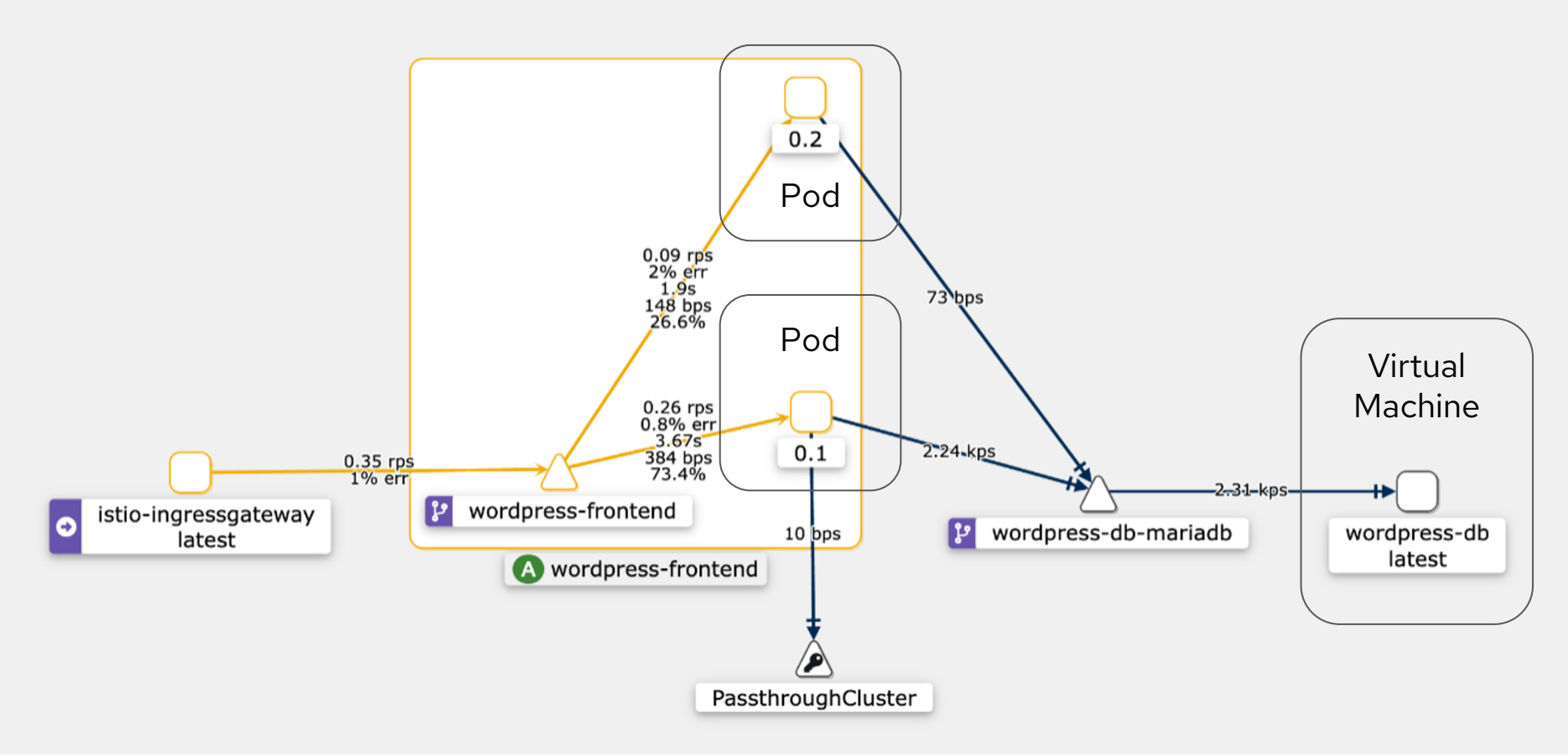
Service Mesh



Current Graph

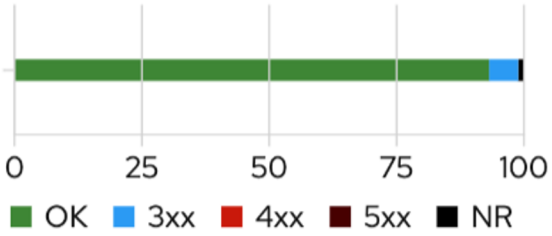
NS wordpress-demo

3 apps (4 versions)
3 services
7 edges

Inbound | Outbound | Total

HTTP (requests per second):

Total	%Success	%Error
0.35	98.86	1.14



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Reference Implementation Guide

https://access.redhat.com/articles/7067871

Implementation guidelines and a sample architecture, with best practices, regarding deploying Red Hat OpenShift as a hosting solution for virtualization workloads using OpenShift Virtualization.

VMs will benefit from living with containers under the same roof!

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