KubeVirt

Making running virtual machines in a Kubernetes cluster a mainstream activity

Daniel Hiller

Red Hat

DEVOPS PRO EUROPE

Who am I?

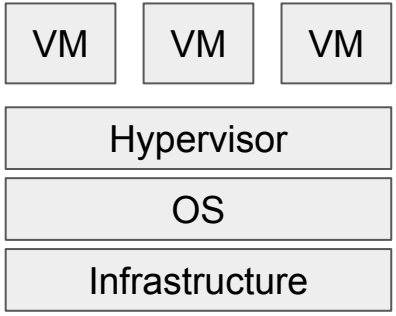
- Daniel Hiller
- Software Engineer @ Red Hat OpenShift Virtualization
- Maintaining CI infra and automation for KubeVirt org

- www.dhiller.de
- twitter.com/dhill3r
- github.com/dhiller

What is this about?

What is this about?

Virtual Machines



What is this about?

Virtual Machines

*“**Kubernetes***

is a** portable, extensible, open source **platform

***for managing containerized workloads** and services,*

that facilitates both declarative configuration and automation.”

source

What is this about?

*“**Kubernetes***

is a** portable, extensible, open source **platform

***for managing containerized workloads** and services,*

that facilitates both declarative configuration and automation.”

source

Virtual Machines

“a virtual machine (VM) is **the** virtualization/**emulation of a computer system**.

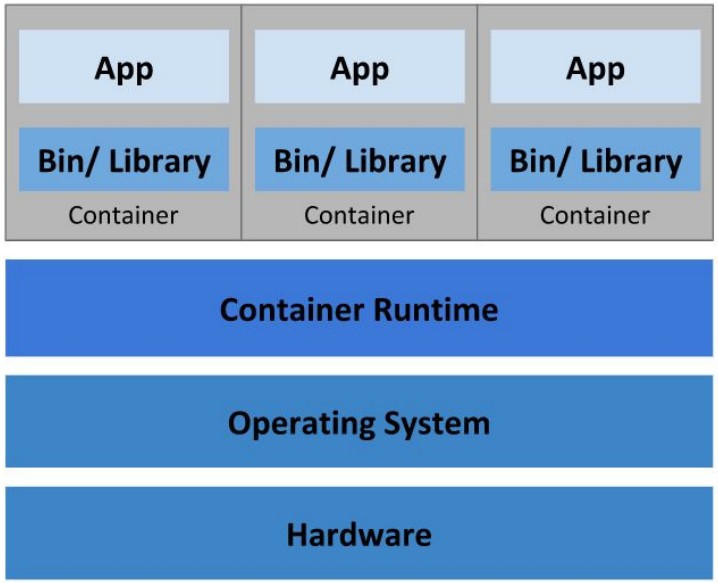
Virtual machines are **based on computer architectures** and

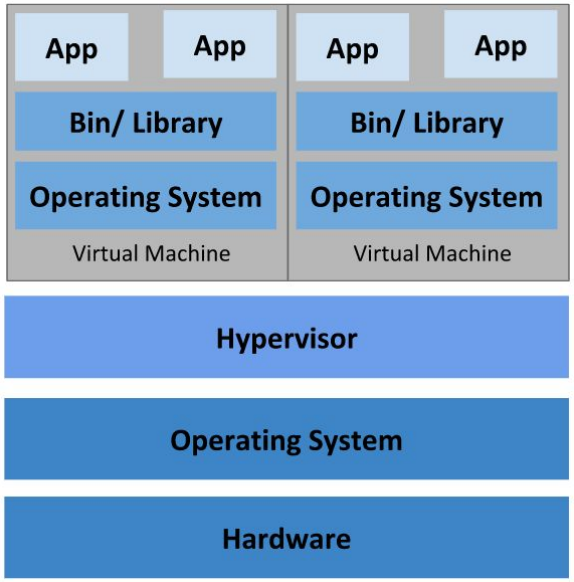
provide functionality **of a physical computer**.”

source

DEVOPS PRO EUROPE

Containers vs. Virtual Machines





source

The stories (imagined)

What if I could get rid of that computer sitting in the closet?

What if I could put that VM that is sitting on an old computer somewhere else?

What if I could get move that virtual machine that my containers are talking to more closely towards the containers?

What if I could get rid of that separate management layer that I have to maintain for VMs?

The stories (imagined)

“It works on that machine! - Then let’s ship that”

:)

What is KubeVirt?

What is KubeVirt?

“**KubeVirt** technology

addresses the needs of development teams that have adopted or want to adopt Kubernetes

and **possess existing Virtual Machine-based workloads that cannot be easily containerized**.”

source: https://kubevirt.io/

What is KubeVirt?

More specifically,

the technology **provides a unified development platform** where

developers can build, modify, and deploy applications

residing in **both Application Containers as well as Virtual Machines in a common, shared environment**.

source: https://kubevirt.io/

What is KubeVirt?

KubeVirt makes it possible to

- Manage VMs in the same environment as containers
- Manage VMs as first-class k8s objects
- Use k8s patterns for VMs (i.e. Service)
- Use Kubernetes Cluster Infrastructure (Networking/Storage/…)

What is KubeVirt?

File: vm.yaml

```yaml
apiVersion: kubevirt.io/v1
kind: VirtualMachine
metadata:
  name: testvm
spec:
  running: false
  template:
    metadata:
      labels:
        kubevirt.io/size: small
        kubevirt.io/domain: testvm
    spec:
      domain:
        devices:
          disks:
            - name: containerdisk
              disk:
                bus: virtio
            - name: cloudinitdisk
              disk:
                bus: virtio
          interfaces:
          - name: default
            masquerade: {}
        resources:
          requests:
            memory: 64M
      networks:
      - name: default
        pod: {}
      volumes:
        - name: containerdisk
          containerDisk:
            image: quay.io/kubevirt/cirros-container-disk-demo
        - name: cloudinitdisk
          cloudInitNoCloud:
            userDataBase64: SGkuXG4=
```

Performance

- VMs matching the host CPU topology yield good performance
- **in general as good as KVM (in a nutshell)**

source

So much for theory…

The process

- Prepare the VM for import
- Convert the disk image to an importable format
- Import the image into kubevirt
- Create the VM with the image

Demo time!

(ok, not yet)

Demo environment

- kubevirt/kubevirtci
  - Dockerized k8s cluster
  - Pre-pulled images to reduce component spin up time
  - Enabled components:
    - containerized-data-importer for storage integration with KubeVirt
    - rook-ceph as storage provider
    - Prometheus and Grafana for monitoring

Live demo

Live demo

- VM Import
- Live Migration
  - manual migration
  - node drain -> evictionPolicy
- Snapshot and Restore

About the project

- Open source (APL2.0)
- Latest release: v1.2
  - Release schedule in sync with Kubernetes releases
  - Releases are tested on latest three minor Kubernetes releases
- May 2024: 5.1K GitHub stars, 310 contributors, 1.3K forks, 8.7K PRs
- CNCF project in incubation state
- Contributions from Red Hat, IBM, SuSe, Google, Nvidia, ARM, SAP, Apple …
- Adopted by several vendors and end users

Outlook to features

- AMD SEV Memory encryption
- Intel TDX (fork)
- Multi-arch clusters (merged, but not officially supported yet)
- S390x support
- …

An incomplete list of features

Shown

- VM image import (i.e. vbox)
- Live migration
- Snapshot-Restore
- console and ssh access

Also

- HotPlug (CPU, Memory, Network, Volumes)
- Hugepages
- Memory Dump
- vGPU and Mediated Devices
- Cloud-init and sysprep
- graphical access (vnc, rdp)
- Zero downtime rolling updates
- VM Export
- VM Clone
- KSM
- ARM (not feature complete yet)

Easy to install

```
# Point at latest release
$ export RELEASE=$(curl https://storage.googleapis.com/kubevirt-prow/release/kubevirt/kubevirt/stable.txt)

# Deploy the KubeVirt operator
$ kubectl apply -f https://github.com/kubevirt/kubevirt/releases/download/${RELEASE}/kubevirt-operator.yaml

# Create the KubeVirt CR (instance deployment request) which triggers the actual installation
$ kubectl apply -f https://github.com/kubevirt/kubevirt/releases/download/${RELEASE}/kubevirt-cr.yaml

# wait until all KubeVirt components are up
$ kubectl -n kubevirt wait kv kubevirt --for condition=Available
```

source

Live demo

- VM Import
- Live Migration
  - manual migration
  - node drain -> evictionPolicy
- Snapshot and Restore

Q&A

Thank you for attending!

Have questions?

Feel free to send questions and comments to:

mailto:	dhiller@redhat.com
k8s slack:	kubernetes.slack.com/ @dhiller
mastodon:	@dhiller@fosstodon.org
web:	www.dhiller.de

kubevirt.io

KubeVirt welcomes all kinds of contributions!

- **Weekly community meeting every Wed 3PM CET**
- Links:
  - KubeVirt website
  - KubeVirt user guide
  - KubeVirt Contribution Guide
  - GitHub
  - Kubernetes Slack channels
    - #virtualization
    - #kubevirt-dev