Welcome to the Session!

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OneKE Appliance

CNCF-certified hyperconverged Kubernetes platform for OpenNebula

- Kubernetes version 1.27
- Based on RKE2
- CNCF Longhorn distributed storage
- Multi-master ready
- Canal CNI networking
- Traefik Ingress Controller
- MetalLB load balancer
1. **Create Multi-Cloud**
   - Use OpenNebula to expand your on-premise infrastructure with bare-metal resources from public cloud/edge providers.

2. **Deploy K8s Cluster**
   - Import the OneKE Appliance from the OpenNebula Public Marketplace and instantiate a Kubernetes cluster.

3. **Launch Application**
   - Deploy an application on the new Kubernetes cluster using `kubectl` and the official image from Docker Hub.

*Today's Demo*

*A View From the Eagle's Eye*
RKE2 & Longhorn

Andrés Valero
SUSE
apiVersion: user.kubernetes.io/v1
groups: Cloud Technical Marketing Manager
kind: User
metadata:
  name: Andrés Valero
  email: andres.valero@suse.com
background:
  - Solution Architect
  - Consultant
  - Sales
social:
  - twitter.com/anvarui
  - linkedin.com/in/avaleror
RKE 2
origin & features
RKE2 origins

- Rancher Government Solutions (RGS) was born to address the unique needs of the U.S. Government and military as it relates to application modernization, containers and Kubernetes.
  - Security oriented
  - Easy to operate
  - Close to upstream Kubernetes
  - Single binary deployment
The best of two worlds

- From K3s, it inherits the usability, ease-of-operations, and deployment model.

- From RKE1, it inherits close alignment with upstream Kubernetes. K3s has diverged from upstream Kubernetes to optimize for edge deployments, but RKE1 and RKE2 stay closely aligned with upstream.

- As a result of its origin, RKE2 is a secure, easy to operate and lightweight distribution that can be used for data centers and at the Edge.
Requirements & Deployments

- Linux or Windows operative system (control plane always runs Linux)
  - OpenSUSE, SLES, SLE Micro, Ubuntu, CentOS/RHEL, Rocky
  - Windows Server 2019 LTSC, Windows Server 2022 LTSC

- Minimum Hardware
  - 4 GB (8 GB recommended)
  - 2 CPU (4CPU recommended)
  - RKE2 uses ETCD as a Database, SSD disks are recommended

- Deployments
  - Single node
  - Compact Cluster (3 Nodes)
  - HA
Main features

- Provides defaults and configuration options that allow clusters to pass the CIS Kubernetes Benchmark v1.6 or v1.23
- Containerd as a runtime
- Enables FIPS 140-2 compliance
- Compatible with AppArmor, SELinux and Multi-Category Security (MCS)
- Scans components for CVEs in the build pipeline.

- Hardened images based on SLE Base Container Image (BCI)
- Fast and simple installation from a single binary. Easy to configure and scale
- Windows Workers
- Full integration with Rancher Manager
- CNI plugins available
  - Canal
  - Calico
  - Cilium
  - Multus/SR-IOV
Architecture

RKE2 Server Node:
- RKE Supervisor*
  - kubelet
  - etcd
  - controller-manager
  - cloud-controller-manager
  - scheduler

Static pods:

RKE2 Agent Node:
- RKE Supervisor
  - kubelet
  - CRI: containerd
- RKE2 K8s Deployments
  - Helm or raw manifests
    - kube-proxy
    - helm-controller
    - metric-server
- User-defined workloads
  - CNI: canal
  - CoreDNS
  - Ingress
  - Service Mesh
  - Other Apps

Managed processes:
Longhorn
What is Longhorn?

- Highly available, software-defined persistent block and file storage for k8s.
- Lightweight, reliable, and easy-to-use.
- DevOps can deploy Longhorn from Rancher with just one-click.
- Adds persistent volume support to any certified K8s cluster.
- Any ext4 file system in the Kubernetes host can be added to a Longhorn cluster.
- NFS and S3 compatible (backup storage)
- Kubernetes-first design –implemented in CRDs and controller pattern

Longhorn is Open source and part of the CNCF
Longhorn origins

- Longhorn started as a closed source pre-k8s era application written in C++ in 2014.
- 2016: Open sourced and re-written in Go to work with Docker.
- Added support for S3, K8s, backups, disaster recovery and other interesting features.
- In 2019 it became a CNCF sandbox project.
- Version 1.0 becomes the first GA Release in 2020.
- 2021, Version 1.2, becomes an CNCF incubating project.
- December 2022, version 1.4 is released.
Requirements

- Kubernetes >= v1.21

- Minimum Hardware
  - 3 Nodes
  - 4 GB RAM per node
  - 4 vCPU per node
  - SSD/NVMe or similar recommended

- Linux OS
  - Supported on openSUSE, SLES, SLE Micro, CentOS, RHEL, Oracle Linux, Rocky Linux, ...

- Architectures: ARM64, AMD64

- More information and script to check:
  - https://longhorn.io/docs/1.4.1/deploy/install/
How does Longhorn work?

Architecture - Engine

Pod 1
- Volume
- Engine
- Replica
- Replica

Pod 2
- Volume
- Engine
- Replica
- Replica

Pod 3
- Volume
- Engine
- Replica
- Replica

Node 1
- SSD
- SSD
- SSD
- SSD
- RAM
- CPU

Node 2
- SSD
- SSD
- SSD
- SSD
- RAM
- CPU

Orchestrated by Kubernetes
Longhorn Architecture - Manager

Container Storage Interface API

Longhorn CSI Plugin

Longhorn API

Longhorn Manager (Orchestrates all the volumes)

Engine

Replica 1

Replica 2

Engine

Replica 1

Replica 2

Engine

Replica 1

Replica 2

Kubernetes API Server

Kubernetes Cluster

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Longhorn Key Feature List

- Enterprise-grade distributed block storage software for Kubernetes
- Volume thin-provisioning
- Volume snapshots
- Volume backup and restore
- Online volume expansion
- Cross-availability-zone replica scheduling
- TRIM Support
- Encryption at-rest and in-transit
- s390x Support (experimental)
- Storage Tag for node and disk selection
- Cross-cluster disaster recovery volume with defined RTO and RPO
- RWX (File) Support
- Live upgrade of Longhorn software without impacting running volumes
- Policy based recurring jobs
- ARM64 Support
- Intuitive UI
- Bitrot protection
- CRD-based interfaces
Thank you
Kubernetes as a Service with OneKE

Jesús Macías Portela
Telefónica
Thank you!

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