CORD platform evolution

Cutting edge

innovate

Initial CORD prototype (ONS 2015)

operationalize

Production-ready system

Container technology plays an important role

Container-based VNFs + ONOS VTN overlay

Deploying, maintaining, operating CORD infrastructure services
Goals of this talk

- What containers and VMs are currently running on the CORD 4.0 head node and compute nodes?
- What plans does the community have for deploying and managing CORD infrastructure services using Kubernetes?
- What plans does the community have for using CORD to orchestrate VNFs on Kubernetes?
- How can I get involved with this work?
CORD 4.0 Management Plane
CORD 4.0 management plane

head node

XOS core and service synchronizers: ~20 Docker containers (R-CORD)

OpenStack control services: 11 LXC containers

MAAS automation services: 6 Docker containers

ONOS

management

fabric

registry, mavenrepo, consul
CORD containers on the head node

Commands to inspect Docker containers on the head node:
XOS: $ cd /opt/cord_profile; docker-compose -p rcord ps
ONOS VTN: $ cd /opt/onos_cord; docker-compose ps
ONOS fabric: $ cd /opt/onos_fabric; docker-compose ps
MaaS: $ cd /etc/maas; docker-compose -f automation-compose.yml ps
Docker registry: $ cd /etc/maas; docker-compose -f registry-compose.yml ps
OpenStack: $ sudo lxc list

(Services not containerized: MaaS, Bind/DNS)
CORD 4.0 management plane

OpenStack compute node

- service1 VM
- service2 VM
- vSG VM

- mgmtbr
- br-int
- fabric

OVS

management

fabric

Neutron API calls

ONOS VTN app
XOS Service consists of:

- Model
- Ansible playbook
Kubernetes Container Orchestration

- Client-Server Architecture
  - Server provides, API, Controller and Scheduler
  - Client provides container management, metrics and service proxy
- Independent cluster state in ETCD key-value store
- Dynamic service composition (with Pods and services)
- Network access control (with CNI plugin)
- Distributed systems guarantees (availability, scalability, consistency)
- Lot more...
Kubernetes in CORD

- Infrastructure Orchestration (Eg: Openstack)
- VNF Orchestration
- Service Abstraction
- Hybrid Container-VM environment
Infrastructure Orchestration
Infrastructure Orchestration update

• Collaboration with 99Cloud
• Ubuntu 16.04 with 4.4 kernel or later
• Kubernetes as an infrastructure component of CORD
• Openstack as containers orchestrated by Kubernetes
• Using Kolla framework: https://wiki.openstack.org/wiki/Kolla
Deployment Architecture (in the near future)

CORD Platform

Security Policy

Kubernetes/Helm

UI/LB/DNS/Log/Sec/Store/Metrics/Monitors

XOS

VNF

ONOS

Open Stack

VNF

ONOS Apps

VM based VNF

VM based VNF

VM based VNF

VM based VNF

Docker

OVS based Overlay Network

Ansible

MaaS

Hardware Infrastructure
Challenges

- Complex dependencies (OS, Kernel, Component versions)
- Complex integration (several infrastructure pieces)
VNF Orchestration
VNF Orchestration status

• Collaboration with Linker Networks
• Pure OVS based Overlay network implementation
• ONOS-VTN control of Kubernetes OVS Overlay network
Overlay Network Architecture

1. ONOS-VTN to Kubernetes API Service
2. VNF to Kubelet/CNI
3. OVS Overlay to DHCP/IPAM
4. ONOS-VTN to XOS
5. Node to Kubelet/CNI
Challenges

• Subnet distribution
• Independent IPAM and DHCP service
• Modifications to ONOS-VTN (use K8S API and delink with Neutron to use independent DHCP and IPAM services)
• Multiple OVS networks attached to PODS
Call to Arms!

• ISTIO based service abstraction and load balancing
• Kubernetes based orchestration of ONOS Apps and XOS
• Other openflow based networks for Kubernetes overlays and ONOS Overlays