LINUX FOUNDATION
COLLABORATIVE PROJECTS

The Virtual Central Office: A Cross-Project Approach

Heather Kirksey, VP, Community & Ecosystem Development

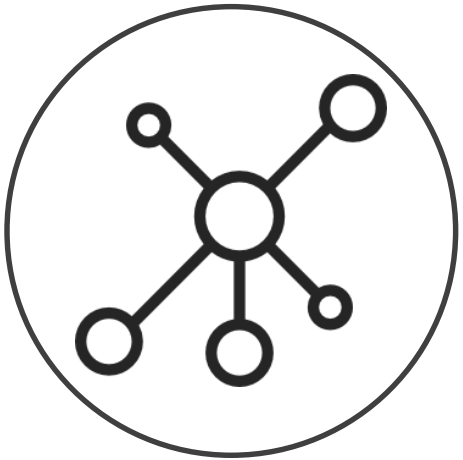
Networking is the fabric for Growth & Innovation Across Industries

Automotive

Connected Cars

Retail

Connected Stores



Networking

Carrier, Cloud, Enterprise

Energy

Connected Homes

Agriculture

Connected Cows

Revolution in the Networking Ecosystem

Proprietary

Vertically integrated, vendor-centric solutions to mix & match options at every level

Collaborative Design & Development

Vendors and users – instant feedback

Rapid, unified standards implementation

Shared development of basic capabilities - supply chain efficiency

New Strategic Vendor Profile

Broad, open portfolio

Focus on ecosystem interop - reduce integration time and risk

Strong implementation services & support

LF Networking (LFN) Projects combine best of breed open source networking projects

Virtual Central Office Collaboration

A Cross-Community Open Source Collaboration

Ecosystem Partners

Bell

中国移动 China Mobile

EXFO

MiTAC MITAC COMPUTING TECHNOLOGY CORP.

redhat

CUMULUS

f5

NETSCOUT Guardians of the Connected World

Quortus

Ettus Research™ A National Instruments Brand

PENGUIN COMPUTING

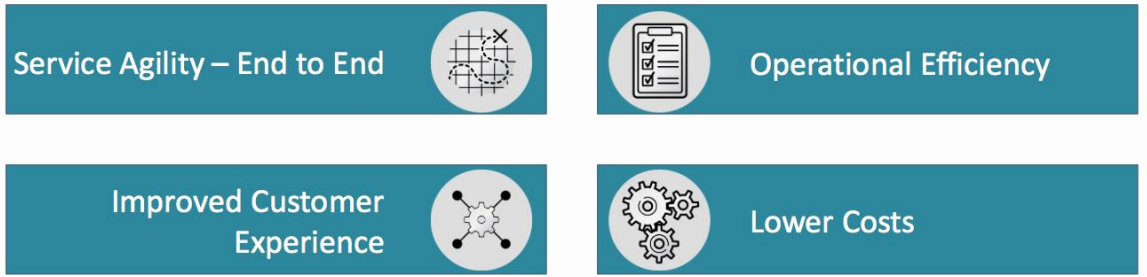
CIRCLE B Revolutionary IT Infrastructures

What is VCO?

- Approach to deploying NFV closest to subscriber
- One of the Edge Blueprints as discussed in the community
- Based on OpenStack and Kubernetes
- Massive Scale => Large Number of sites

Virtual Central Office

Define a cloud native approach for a virtualized central office leveraging NFV and open source technologies



- **>10,000 Central Offices in US Alone**
- **Primary Gateway to Customers for a Telco Operator**

VCO Progression

COs Serve Residential, Business & Mobile Customers

Telco CO - Traditional Status

- Closed, Rigid and Complex
- Variety of Access & Speeds
- Wide variety of hardware –
  - routers, switches, gateways, servers etc
- Lack of standard interfaces => lack of programmability

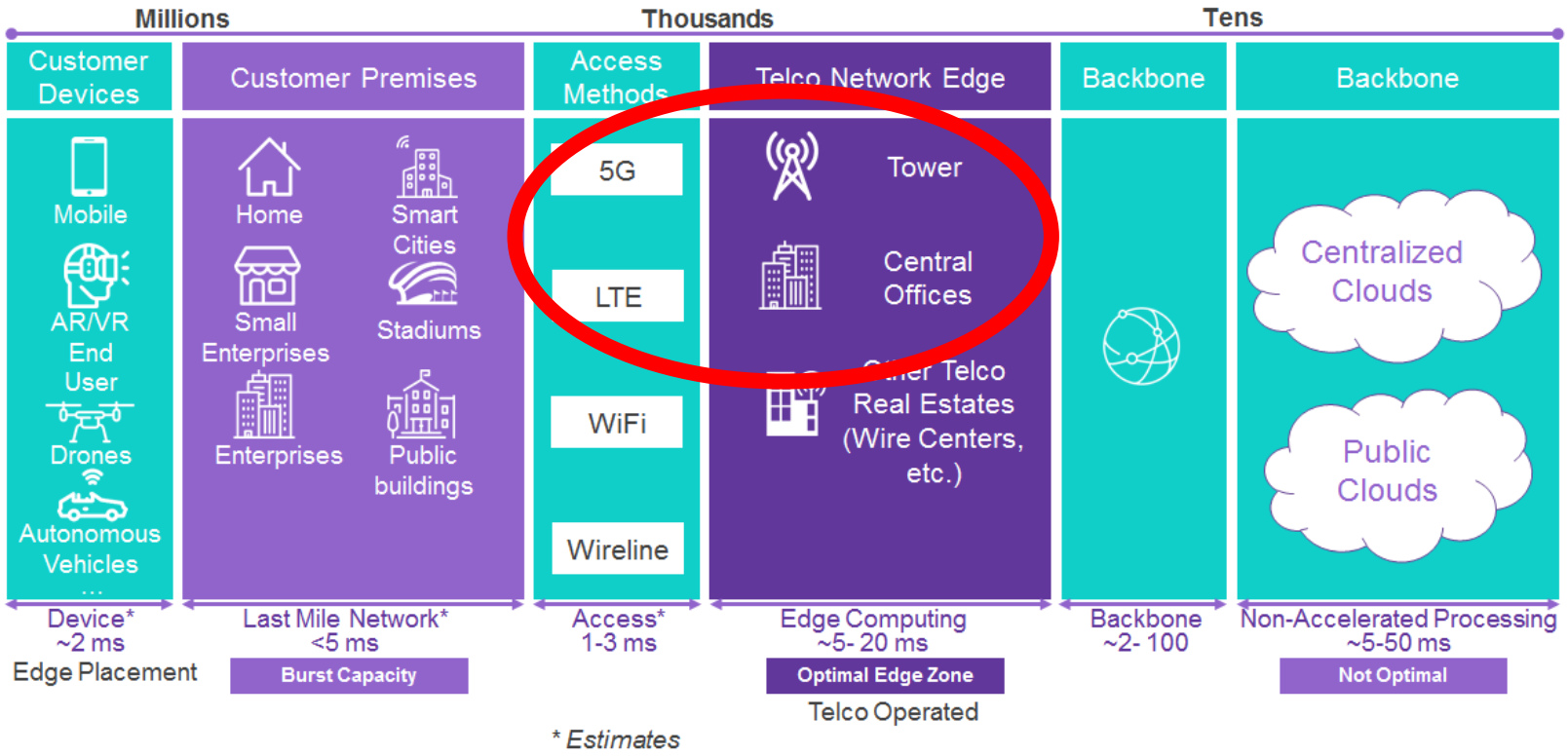
Telco COs - Modernization

- Virtualization
- Reduction in CAPEX and OPEX by >30%
- Open and Flexible & Standardized
- Software Defined
  - Network
  - Orchestration
- Programmability

Telco COs - Cloud Native

- Fully Software Defined
- Further Reduction in CAPEX and OPEX
- Disaggregated and flexible
- Massive Scale
- Edge Blueprint

Mobile Edge



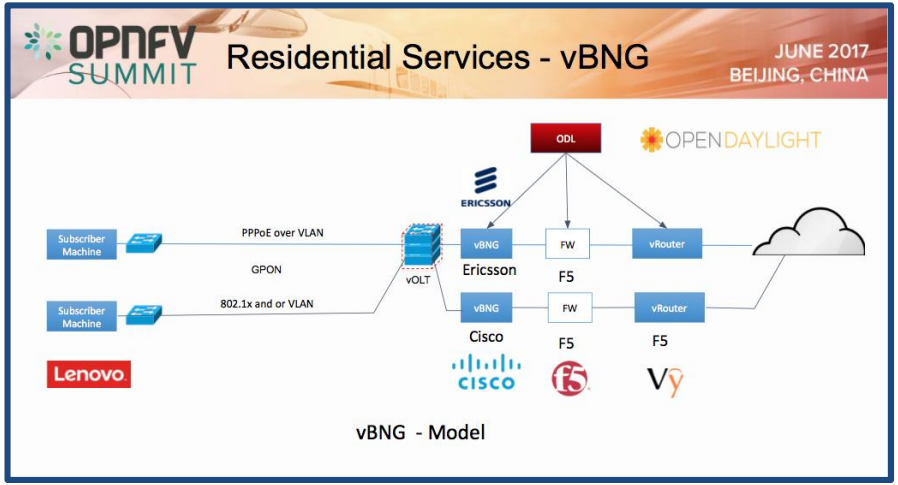
SOURCE: AKRAINO WIKI

VCO 1.0 Recap

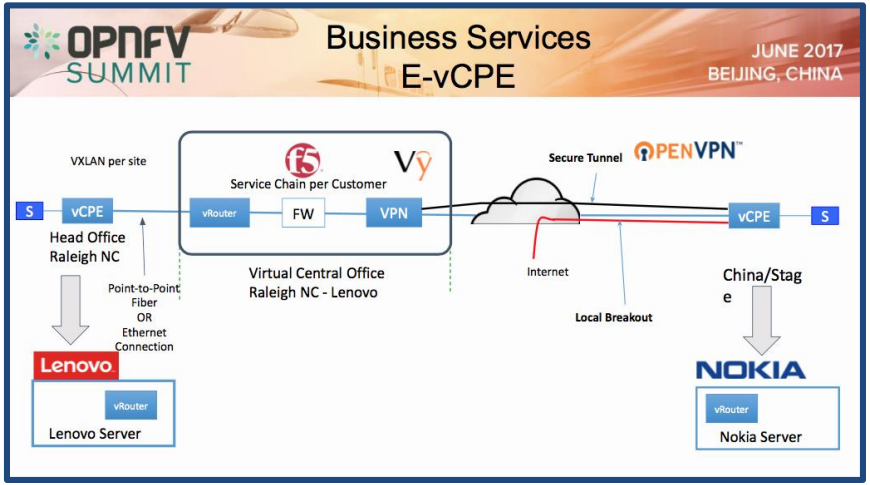
- 2017 OPNFV Summit in Beijing: Phase I of the Project: Residential Services and Enterprise Business Services live on stage (vOLT, VNFaaS, BNG, etc)
- Generic blueprint for Central Office with open source components and OpenDaylight SDN controller
- Focus on residential and enterprise VNF on-boarding and assurance

VCO 1.0 Blueprints

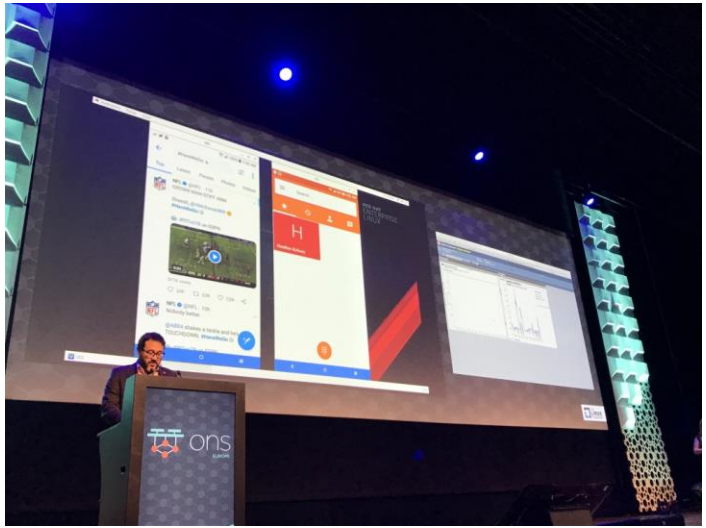
Residential



Business



VCO 2.0



ONS Europe, Sep 25, 2018

OCP Regional Summit, Oct 1, 2018

VCO 2.0 – Evolution of Requirements

Telecom Provider Requirements

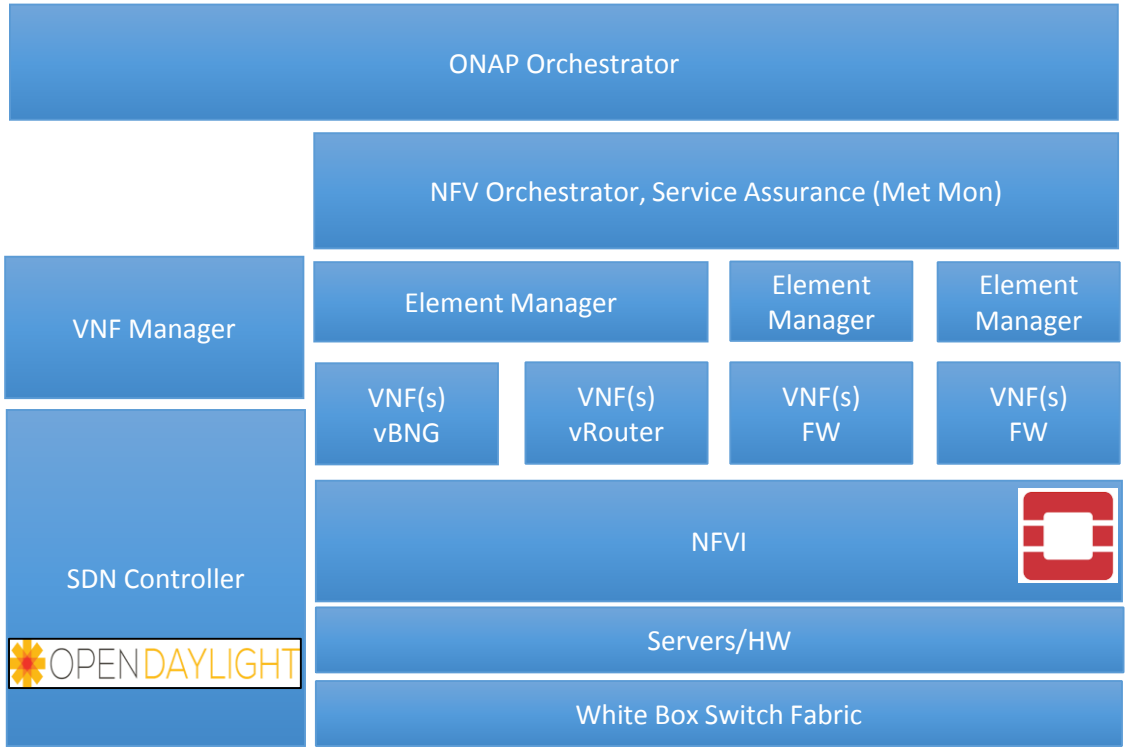
- Massive Scale → "Distributed Hyperscale"
- Common deployment model for Data Center and CO locations
- OpenStack and/or Kubernetes
- Flexible and Agile
- LTE and 5G Radio with vEPC & NG-Core
- Centralized Management and Troubleshooting
- Service assurance - Metrics and Events
- End-to-End Orchestration

VCO PoC Checklist

- vRAN/CRAN for LTE
- vRAN LTE low layer split (RoE)
- vRAN LTE high layer split (F1-like)
- Low latency service
- Network slicing*
- Single LTE vEPC
- IMS and VoLTE*
- Ansible based orchestration
- Service assurance & monitoring
- Mix of bare metal, VMs, (containers*)

* Goal for future VCO PoC

2.0 Hardware and Software Stack



OPNFV

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OPEN AIR INTERFACE Quortus

redhat

CUMULUS

Mellanox TECHNOLOGIES OPEN Compute Project® Ettus Research™ A National Instruments Brand

Branch Hardware for the VCO demo

- Total Servers – **4**
  - Based on Facebook Tioga Pass specification.
  - Each server has:
    - **CPU:** 2 Intel Xeon Gold 6130 (Skylake),16 cores, 22M cache
    - **Memory:** 16x16GB, 256GB
    - **Storage:** 1 Intel M.2 SSD 1TB for boot drive
    - **NIC Card**: 1 Intel OCP X520-DA2 dual 10G network

OCP ACCEPTED

Hardware for the VCO demo....Cont'd (1)

- Servers are in the **MiTAC ESA chassis**

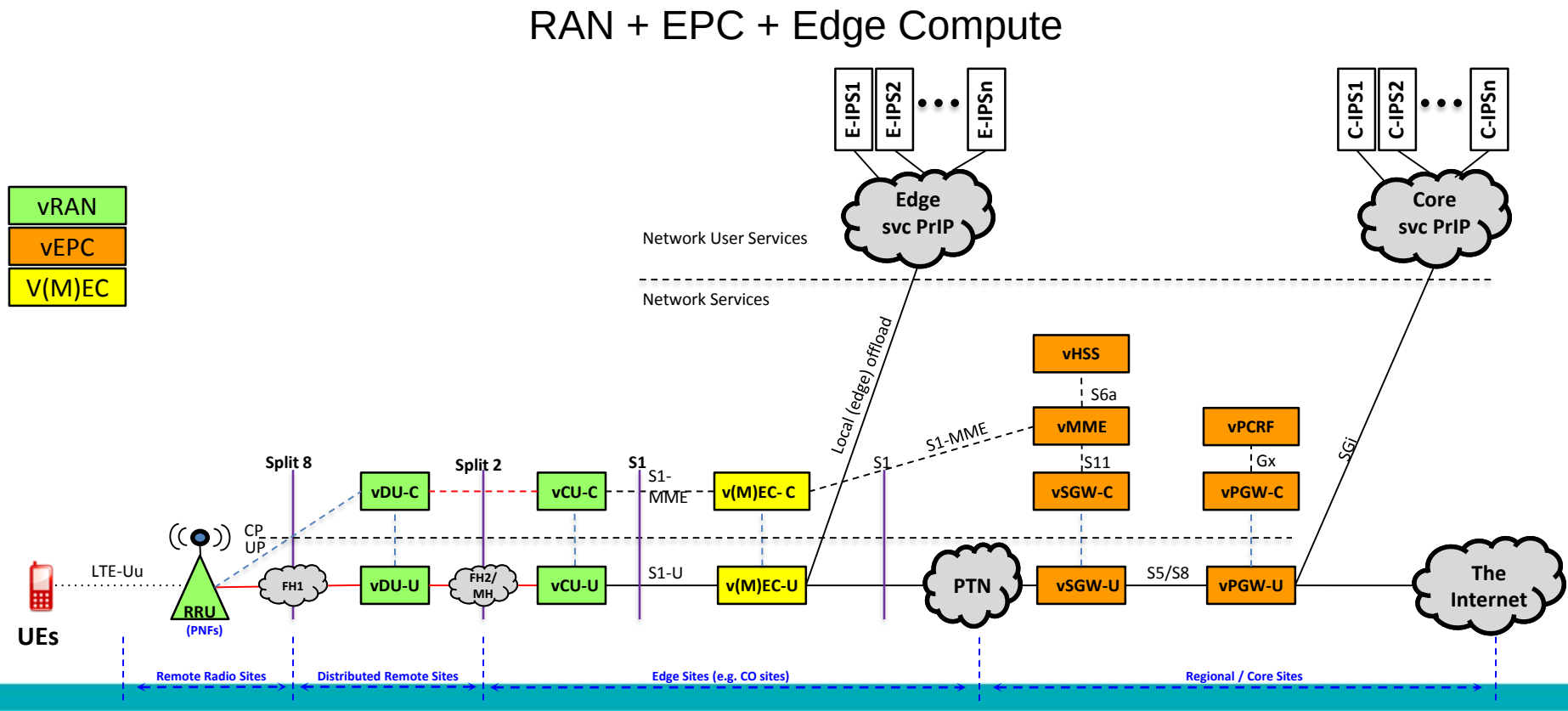
  - Solution to install an OCP 21'' Open Rack V2 server sleds into an EIA 21'' rack.
  - Included the rail kit, shelfs and 12V DC bus bar.
  - Power shelf – with power supplies to covert 230V AC to 12V DC
  - Currently under review to become OCP Accepted

Hardware for the VCO demo....Cont’d (2)

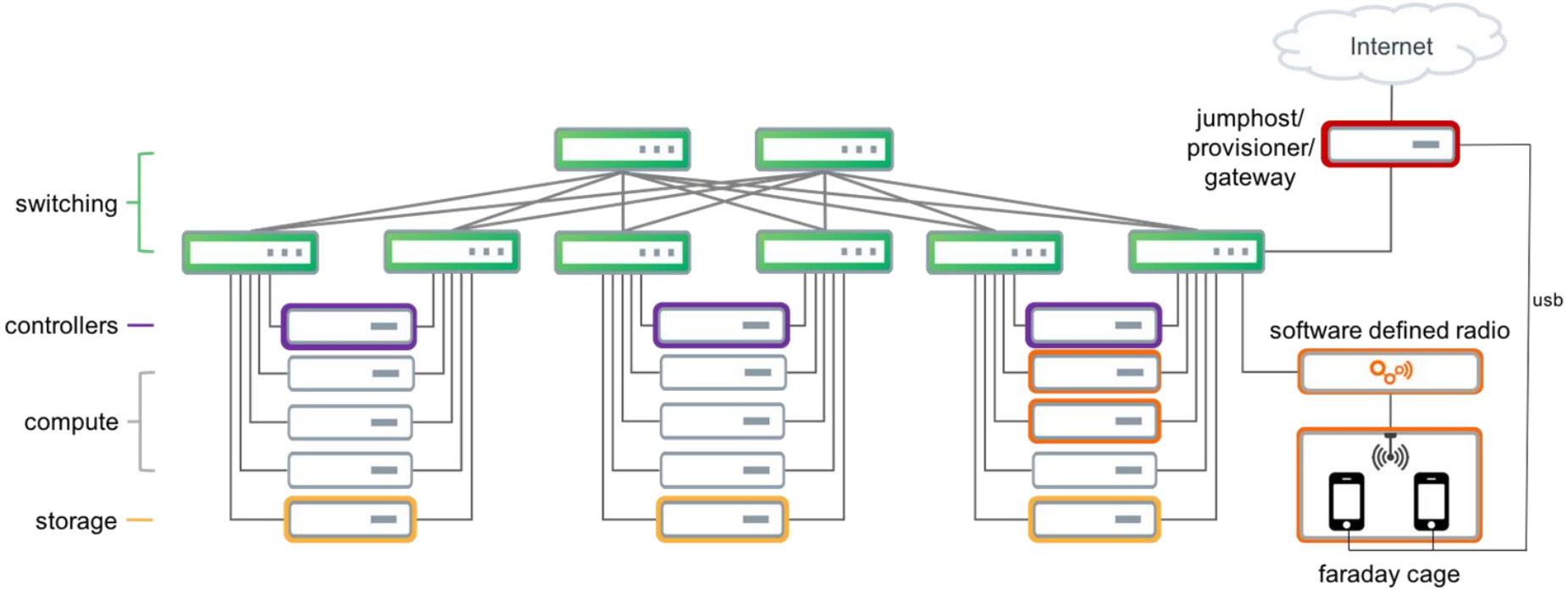
- **Switch used**:
  - Edgecore 6712 with Cumulus Linux provided by CircleB.
  - OCP Accepted

CircleB is an SP local to Amsterdam, provides turn-key solutio based on OCP hardware

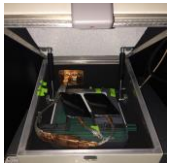
VCO-Mobile Architecture

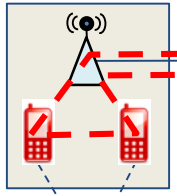


Lab Physical Topology



Demo Topology





SDR

RU

DU

CU

Baremetal Nodes
Managed by OpenStack

SG
W

MM
E

HSS

SD

PG
W

PG
W

GiLAN

OpenStack

Jumphost

Internet

Amsterdam Stage

VPN

OPENVPN®

Internet

Lessons Learned

- **Open source collaboration works**: 15 organizations, 30+ volunteers
- **Increasing Maturity**: Full interoperability of open source vRAN with commercial handsets and vEPC
- **Plan well ahead**: Specs, diagrams, and HW required up front
- **Technical considerations**
  - Upgraded Openstack Pike to Openstack Queens ○

    Need high performance machines for DU, vBBU functions ○
  - Baremetal the best option for RU, BM or containers for DU, VMs/containers for CU

VCO 3.0

- Planning and Execution Underway Currently
- Fully Cloud Native End-to-End
- Fully Compliant 5G End-to-End
- Open Source RAN
- ONAP Integration

Learn More and Get Involved!

- Learn more: https://www.opnfv.org/resources/virtual-central-office
- Join VCO Demo Mailing List & Calls: opnfv-vco@lists.opnfv.org
  - VCO 3.0 2019 Demo Development is underway
- Join the OPNFV CRAN, Pharos Edge, Rocket projects: wiki.opnfv.org
- Get involved in OCP Networking and Server Projects:

  https://www.opencompute.org/projects

Thank You!