SEBA Tutorial

SDN Enabled Broadband Access

ONF Connect
Sept 10th, 2019

Tutorial Overview (Morning)

- Session 1 (9AM-10:30AM)
  - The big picture - an overview of PON networking and SEBA
  - Lab: Setting up SEBA-in-a-Box

- Session 2 (11AM-12:30PM)
  - Community - who's involved in SEBA and VOLTHA
  - Operating the POD
  - Lab: Exploring and operating SEBA-in-a-Box

Tutorial Overview (Afternoon)

- Session 3 (1:30PM-3PM)
  - Operator Workflow and FCAPS
  - Lab: Workflow and FCAPS Exploration

- Session 4 (3:30PM-5PM)
  - SEBA Development Loop
  - Testing SEBA
  - Next steps for SEBA (4:30PM) - Roadmap & Operator Trials

Overview of SEBA and PON Networking

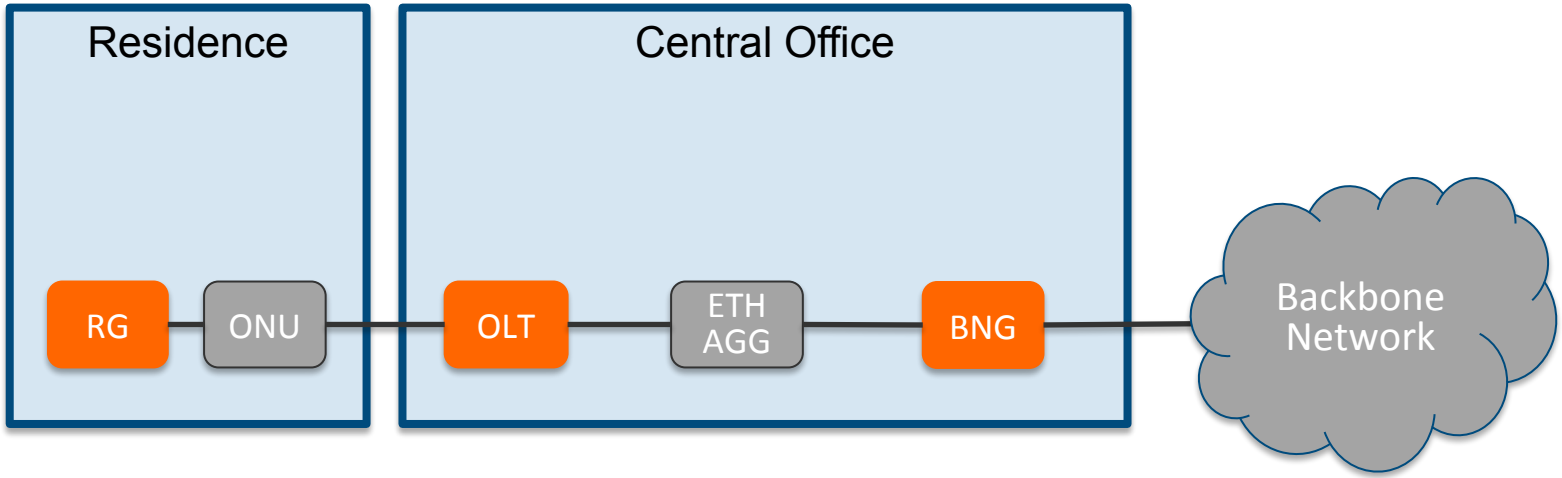
Session 1: 9am - 10:30am

In this session

- What are all the parts of a PON networking solution?
- What is VOLTHA and how is it abstracting the PON?
- How is the SEBA profile launched on the CORD platform with Kubernetes and Helm charts?
- What is SEBA-in-a-Box and why is it useful?

Traditional FTTH Residential Access

RG – Residential Gateway
ONU - Optical Network Unit
OLT – Optical Line Termination
BNG – Broadband Network Gateway

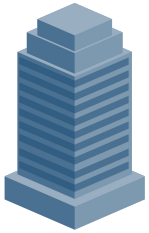


- Each device closed, proprietary, and not programmable
- Source of high capex and opex for operators
- Opportunity to bring SDN, disaggregation, and open source as operators deploy next gen broadband with GPON, XGS-PON, G.Fast, …

CORD – Central Office Rearchitected as a Datacenter

Residential
vOLT, vSG, vRouter, vCDN

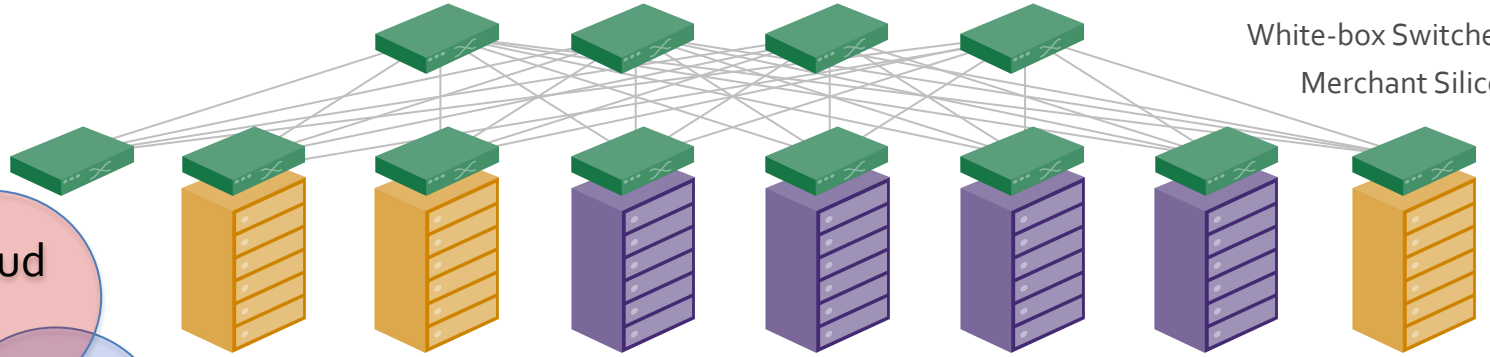
Mobile
vBBU. vMME, vSGW, vPGW, vCDN



Enterprise
vCarrierEthernet, vOAM, vWanEx, vIDS

Access Service Orchestration & Control

White-box Switches with Merchant Silicon

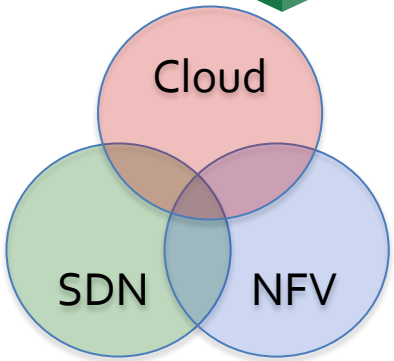


BBUs

PON OLTs

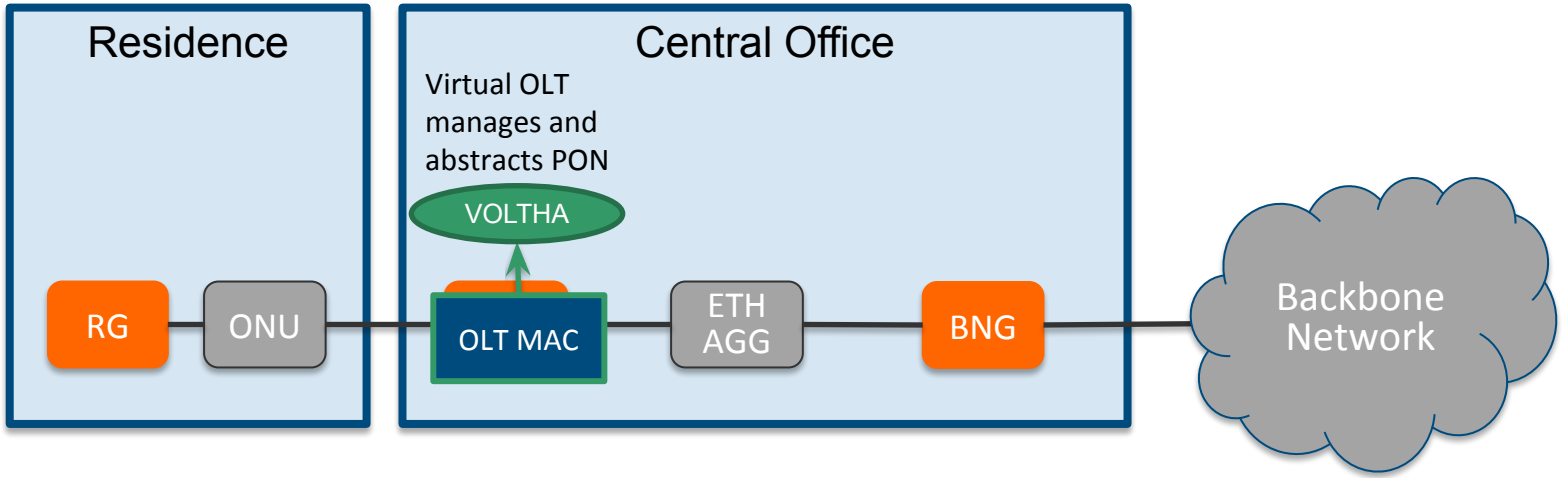
COTS (Off-the-Shelf) x86 Compute

ROADM (Core)

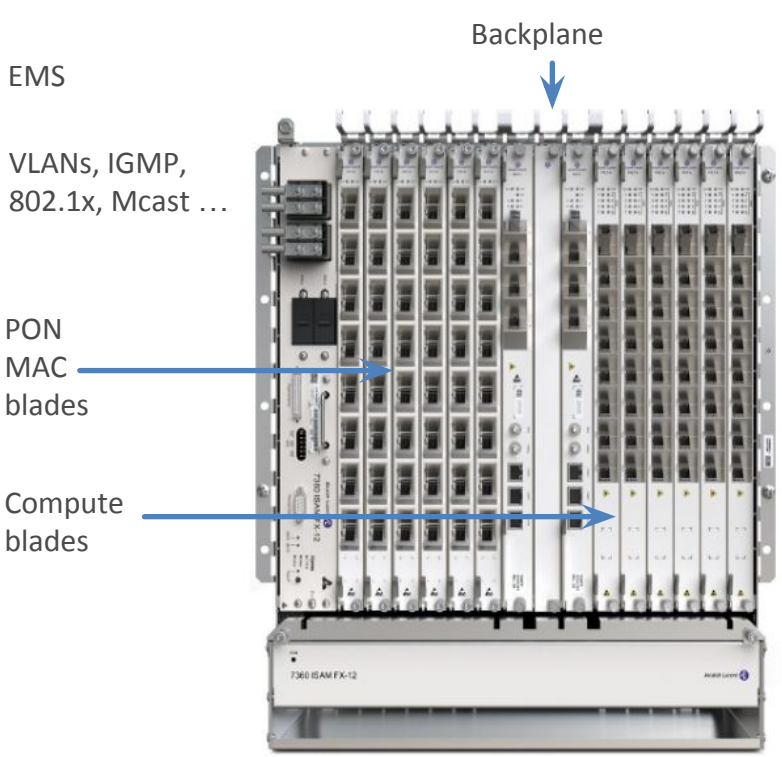


Economies of a datacenter, Agility of a cloud provider

SEBA: SDN Enabled Broadband Access

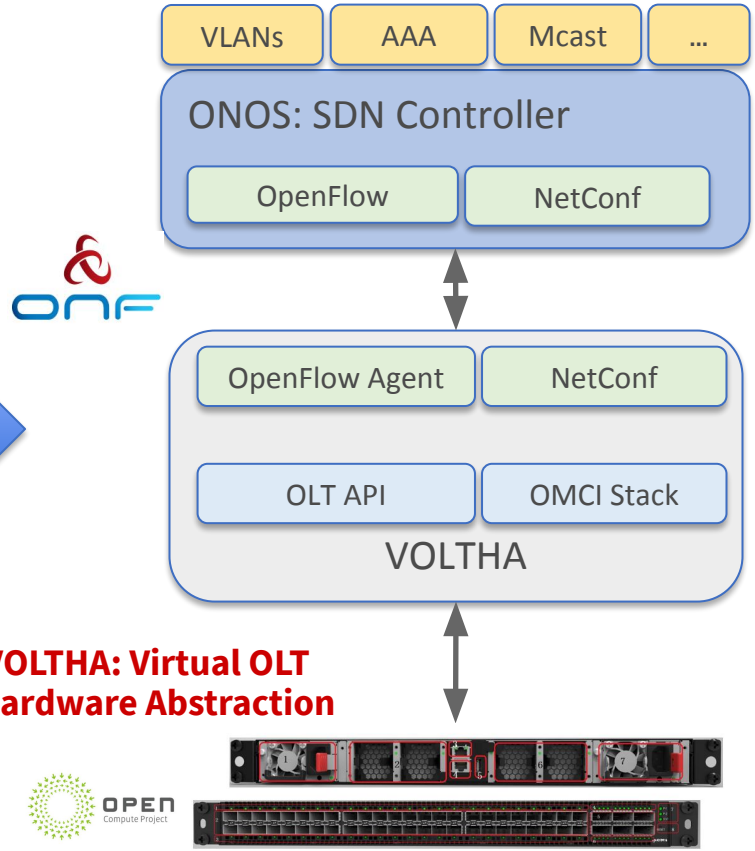


OLT Disaggregation → VOLTHA



Traditional Chassis based Vendor OLT for PONs (Passive Optical Networks)

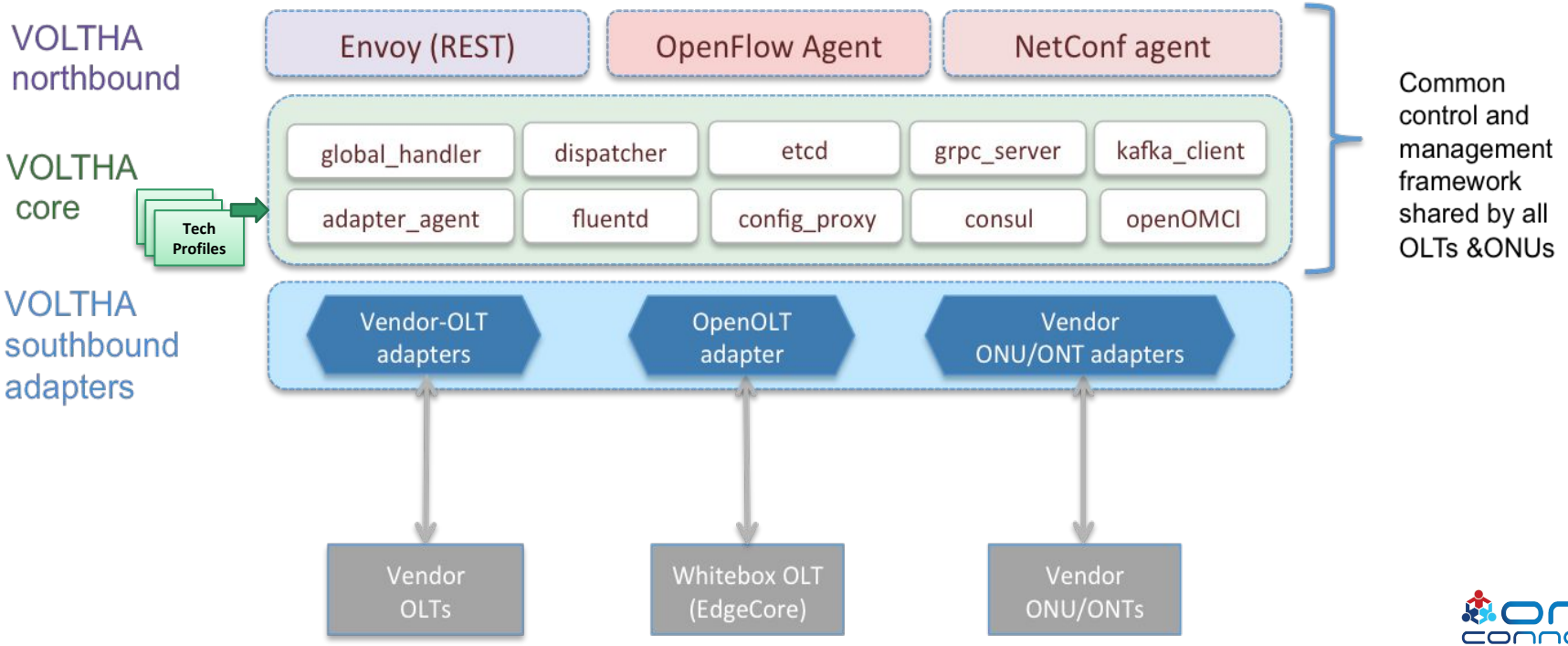
SDNize



VOLTHA
VIRTUAL OLT HARDWARE ABSTRACTION

VOLTHA Architecture

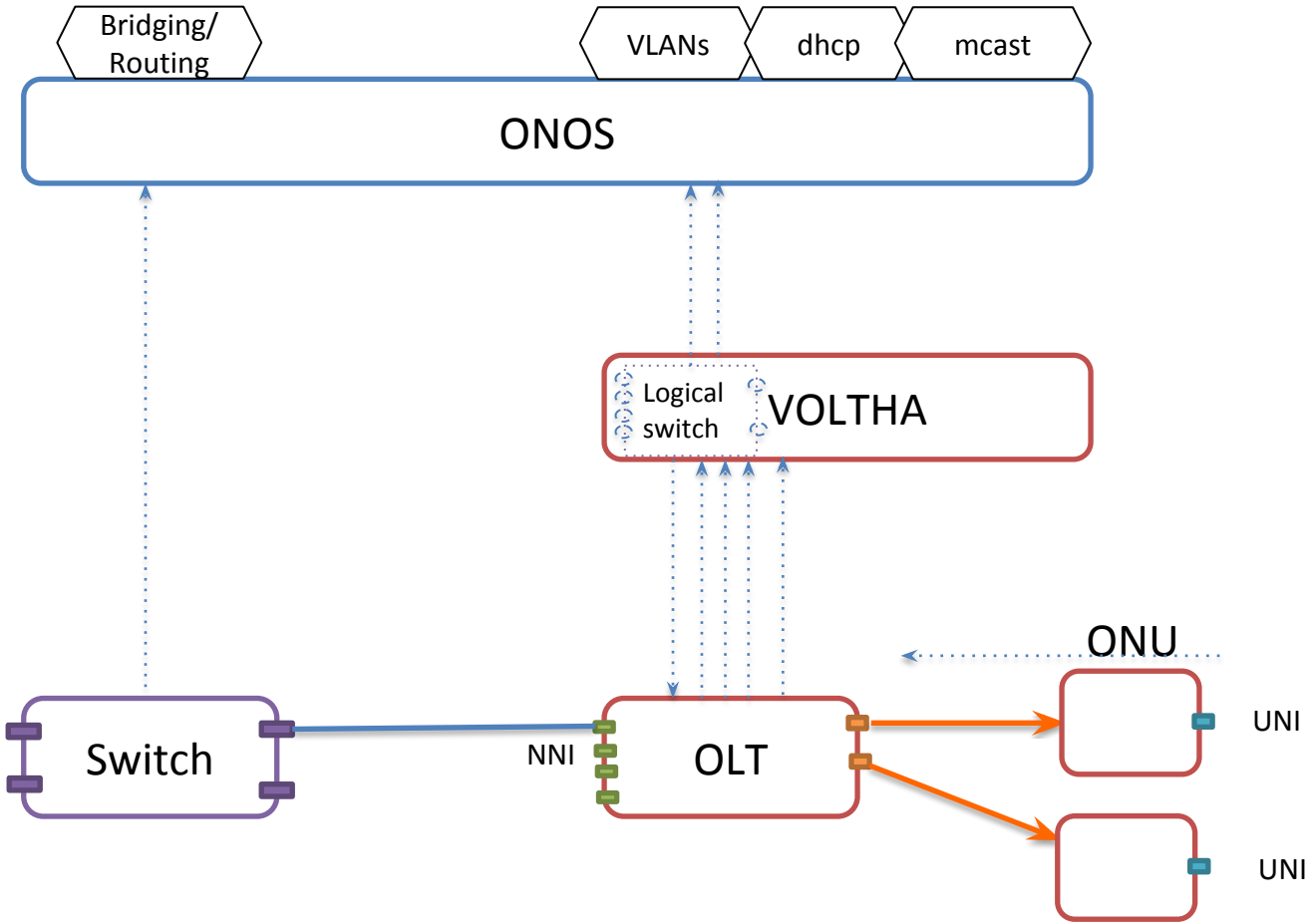
VOLTHA hides PON-level details (T-CONT, GEM ports, OMCI etc.) from the SDN controller, and abstracts each PON as a pseudo-Ethernet switch easily programmed by the SDN controller



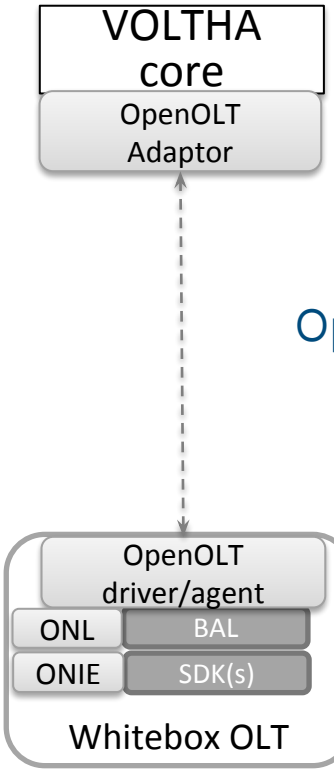
ONF CONNECT

VOLTHA
VIRTUAL OLT HARDWARE ABSTRACTION

VOLTHA Operation



Industry's First White-Box XGS-PON OLT

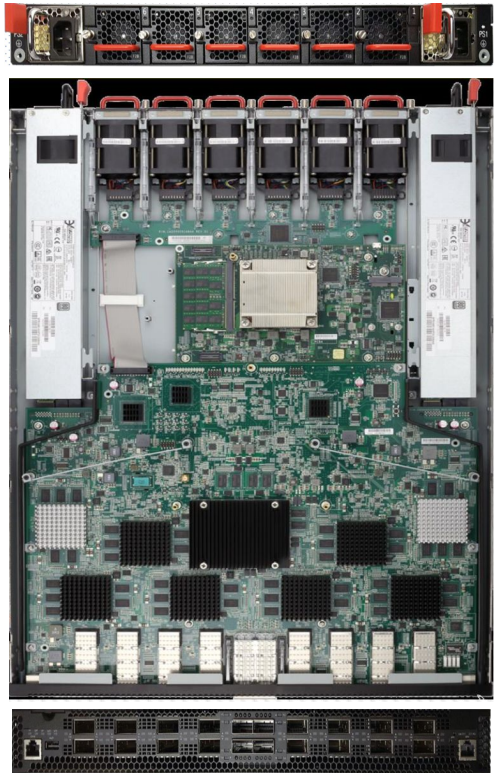


White-Box =
Open-Hardware Specs (OCP)
+ Open-Source Software (ONF & OCP)

OpenOLT

Edgecore
ASFvOLT16
Whitebox OLT

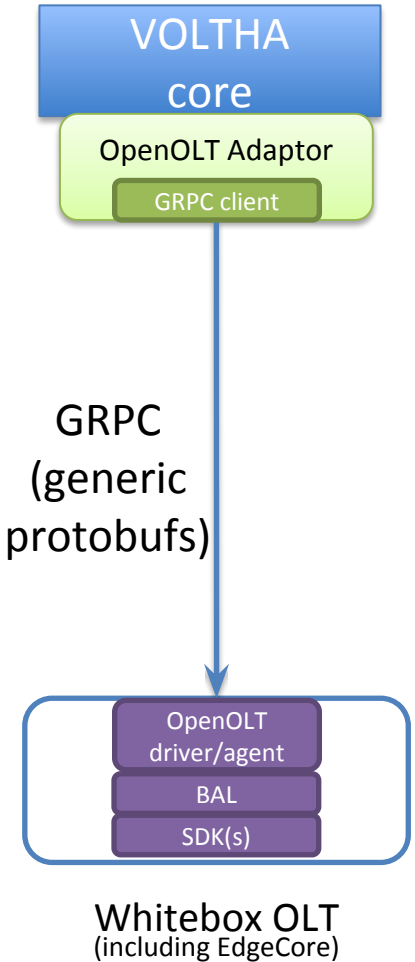
OPEN ACCEPTED™

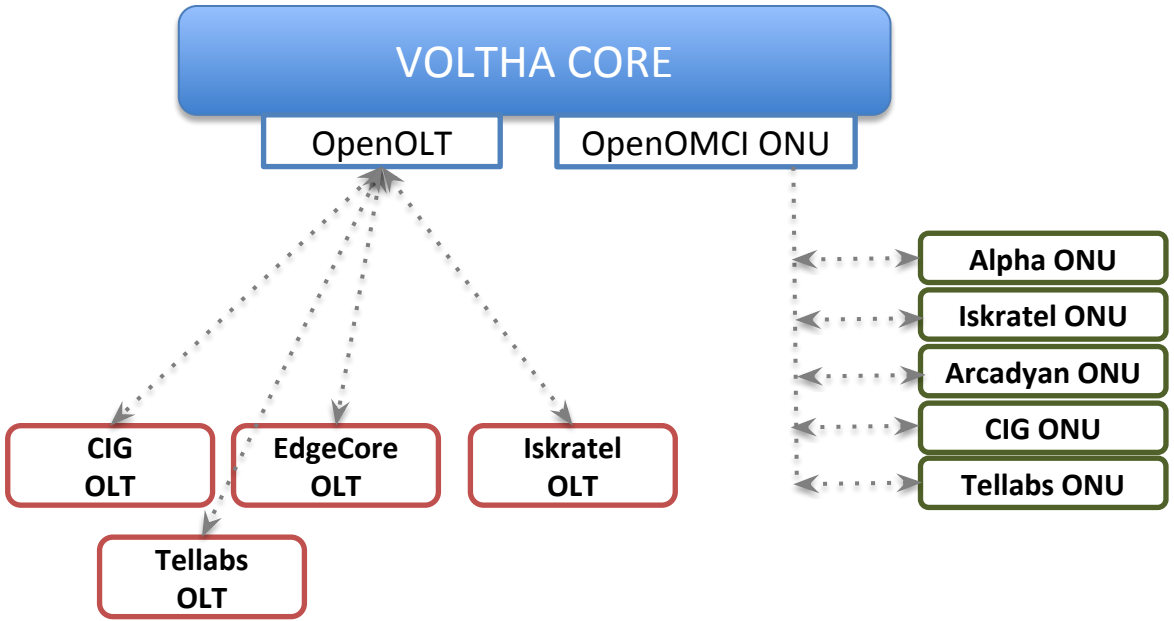


March 2018

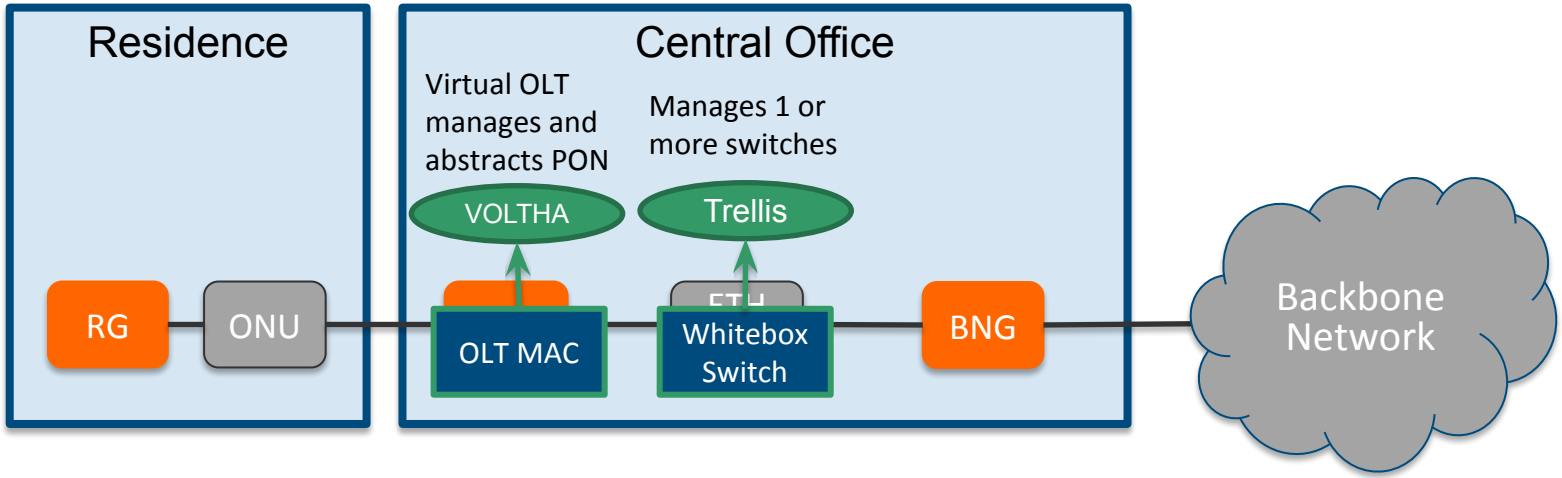
Why OpenOLT Adaptor?

Generic OLT adaptor - ease of onboarding for new vendors (including whitebox vendors)

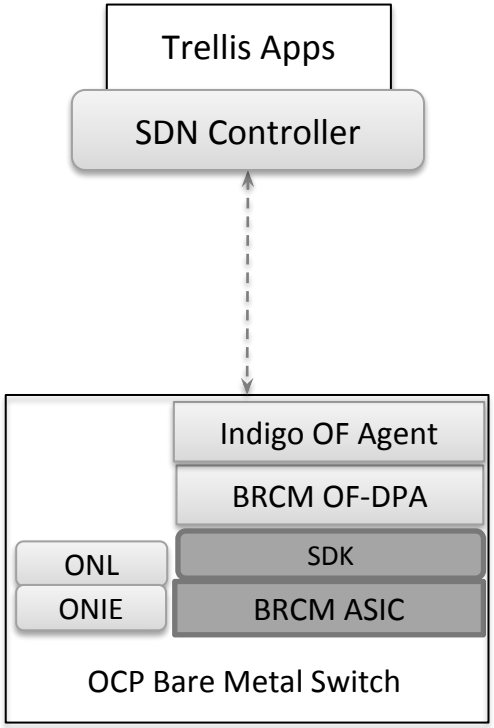




SEBA: SDN Enabled Broadband Access



Trellis: Whitebox Switching



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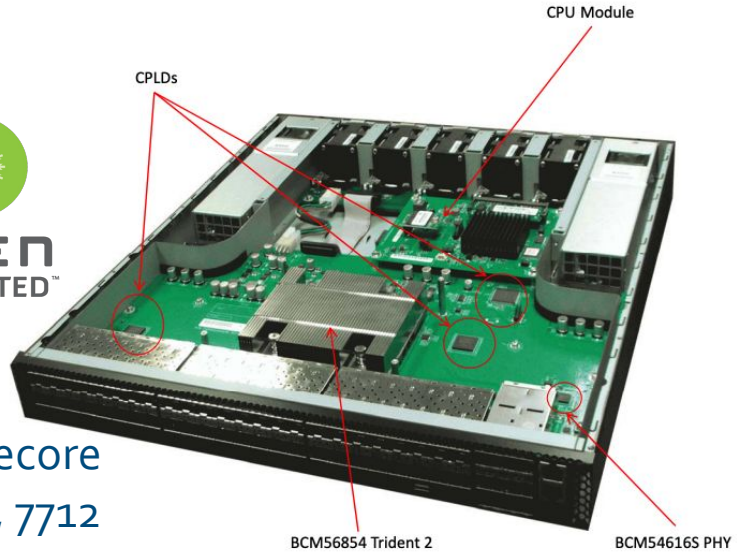
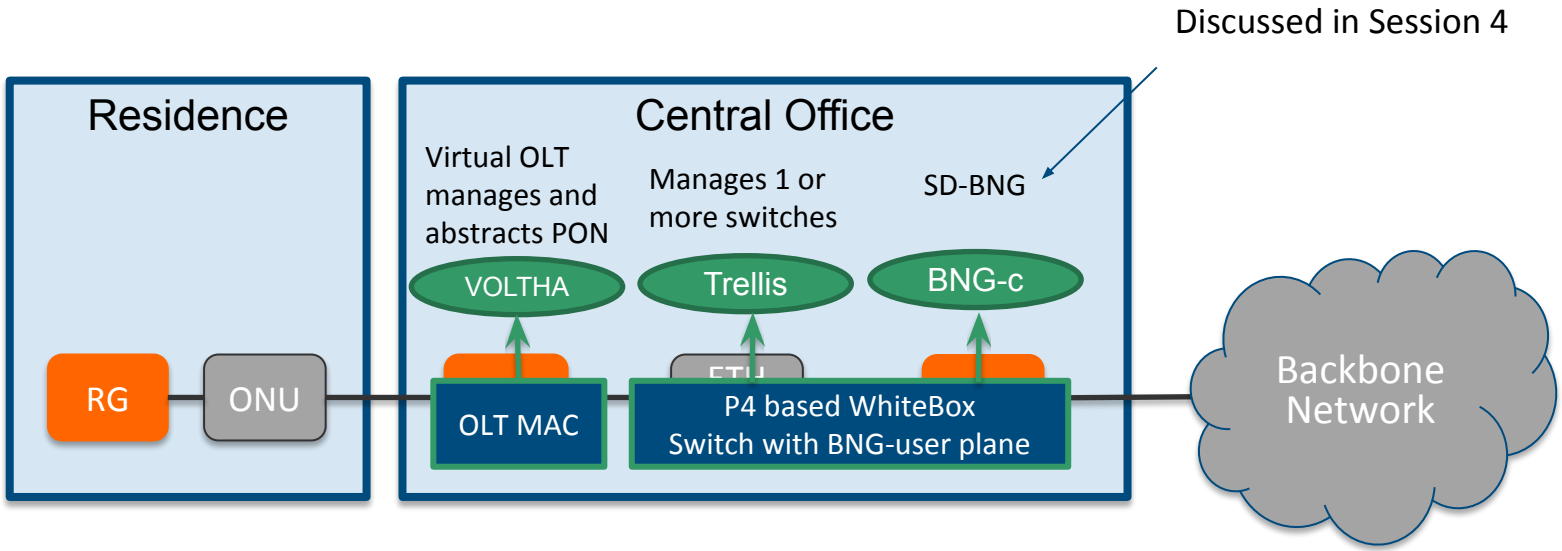


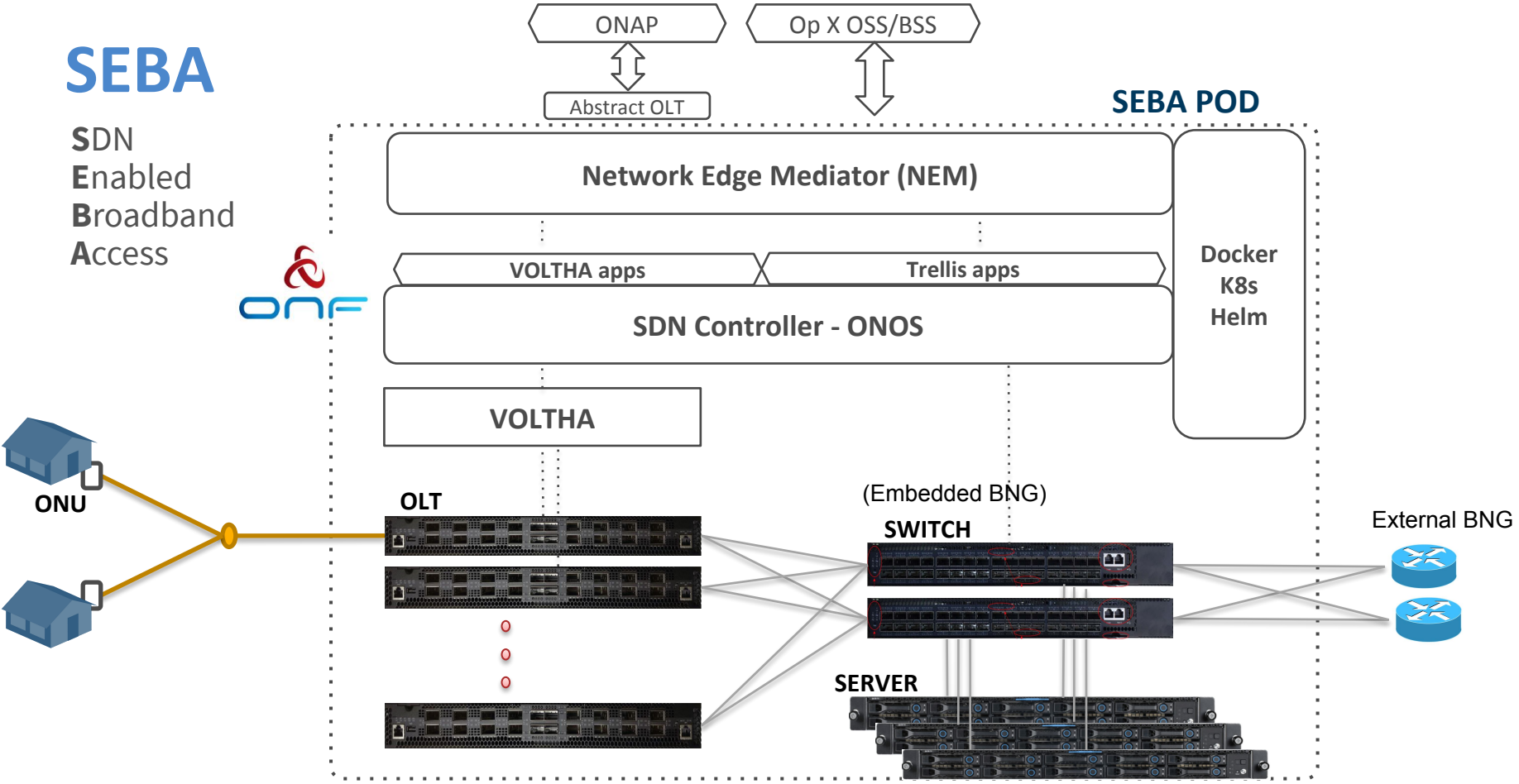
Edgecore
5712, 6712, 7712

SEBA with SD-BNG

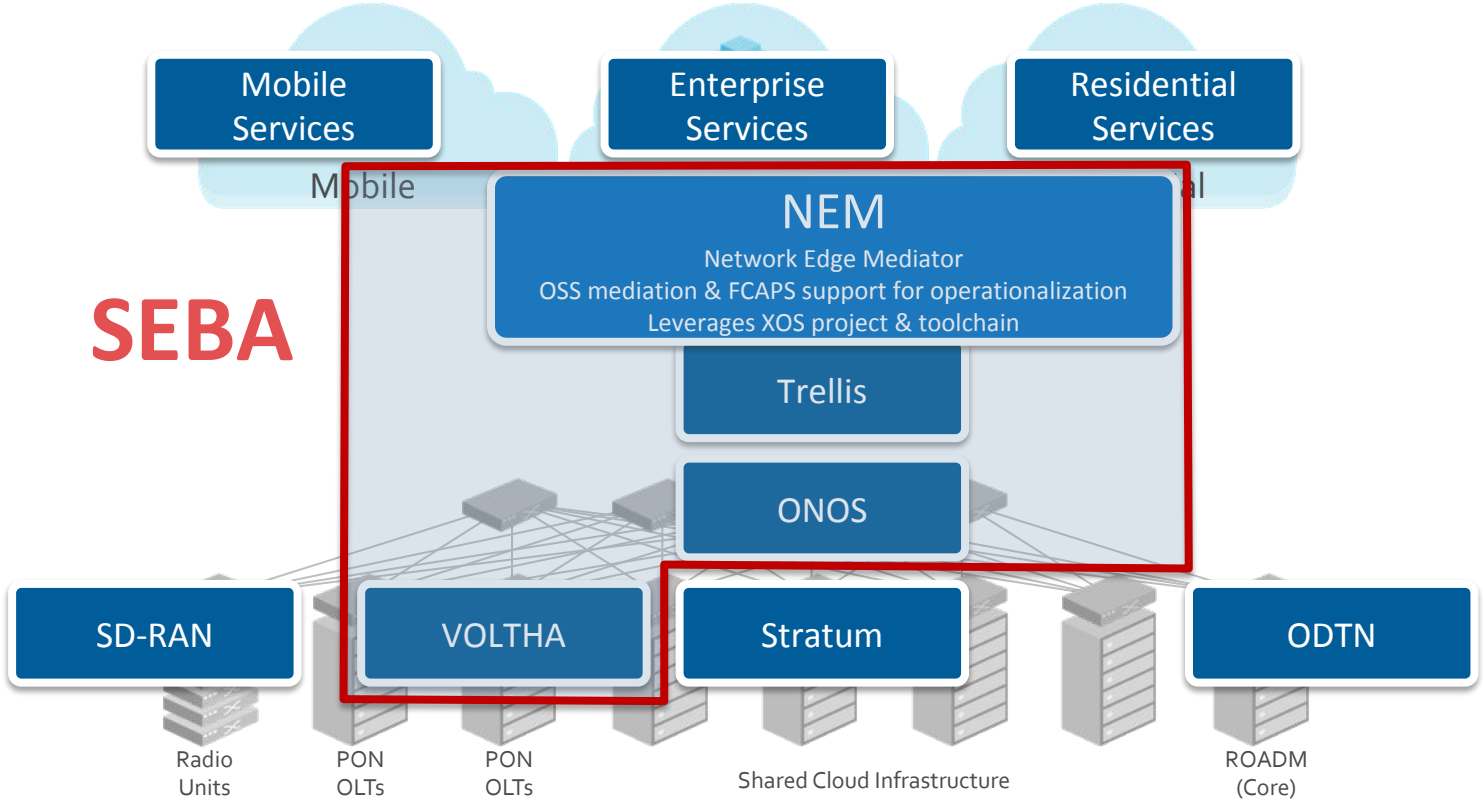


SEBA

SDN
Enabled
Broadband
Access



SEBA: Built on CORD



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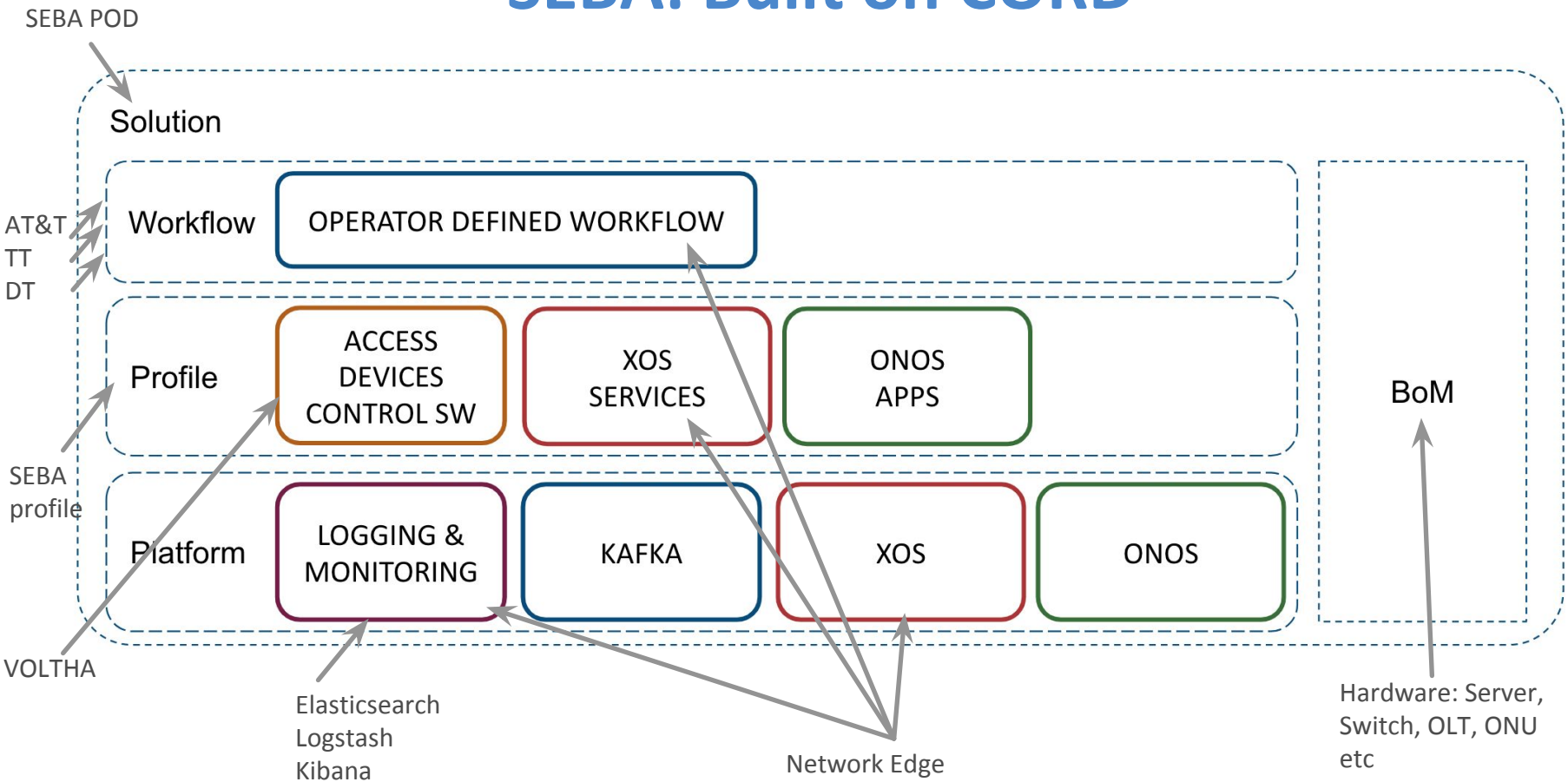


SEBA deployment: basic concepts

- **Microservices**: structure applications as a set of modular, lightweight services
- **Docker**: deploy containerized applications
  - An **image** packages all dependencies needed by an application
  - A **container** is a running image - like a lightweight VM
- **Kubernetes** (k8s): automate application deployment, scale, management
  - A **cluster** consists of one or more **nodes** running pods
  - A **pod** is a set of co-located Docker containers
  - A **service** represents an application endpoint
  - A **namespace** is a partition of k8s resources
- **Helm**: deploy sets of k8s resources
  - A **chart** is a set of YAML templates for k8s resources
  - A **values file** is a YAML file with values for instantiating the templates

SEBA deployment summary

- Deploy microservices in a k8s cluster using Helm charts
  - SEBA 2.0-alpha release based on CORD 7.0 (July 2019)
  - Helm charts enable a modular, layered deployment process
- Install CORD platform charts
  - ONOS, Kafka, XOS core, Monitoring, Logging
- Install SEBA profile charts
  - VOLTHA, etcd, XOS services, ONOS apps
- Install operator-specific workflow chart
  - XOS's att-workflow-driver service
- Site-specific configuration (e.g., via TOSCA)

Configuring SEBA using TOSCA

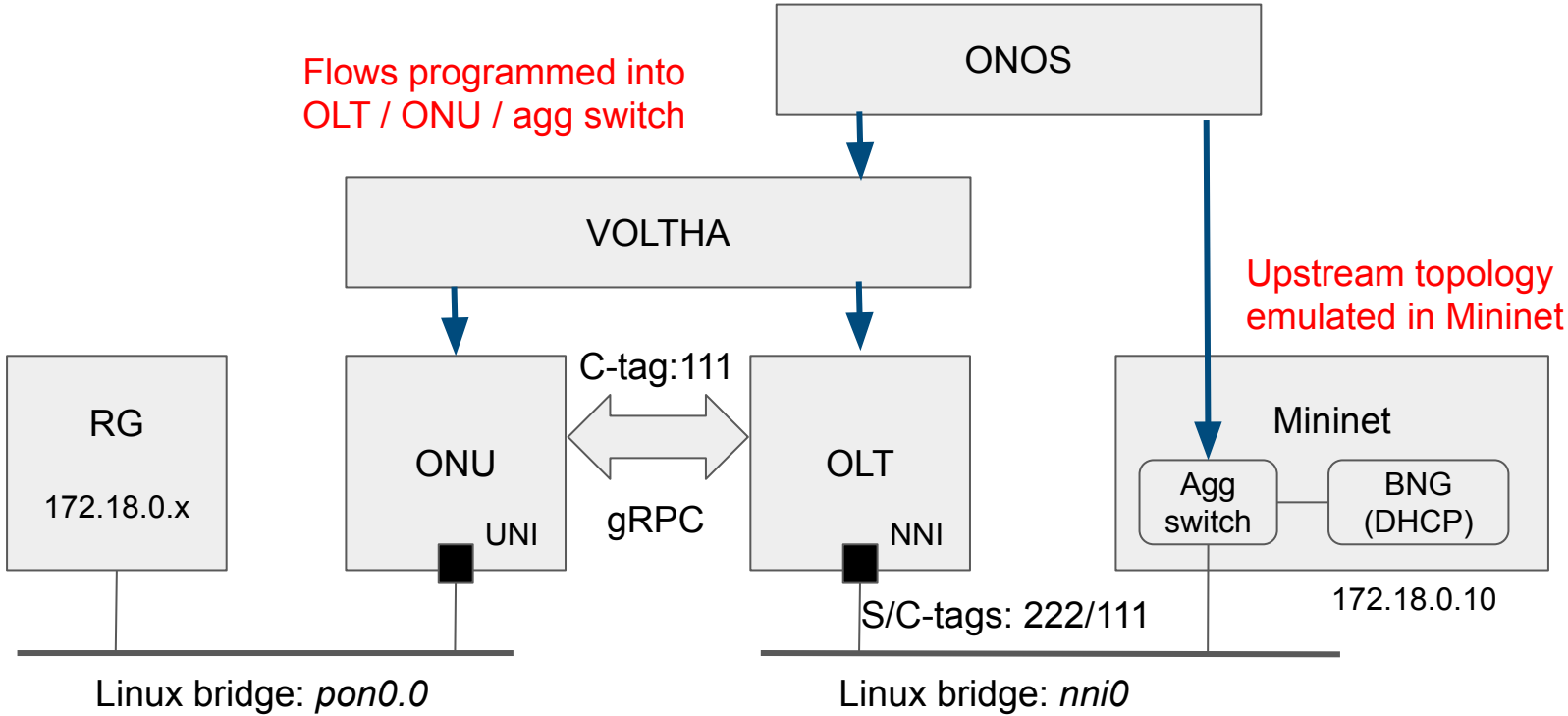
https://guide.opencord.org/profiles/seba/configuration.html

- Configure Switch ports (location of BNG, DHCP server)
- Configure Technology Profiles (T-CONTs, GEM Ports)
- Provision OLTs (OLT S/N, VOLTHA host+port, connection point)
- Configure ONU whitelist (ONU S/N -> PON port map)
- Configure Bandwidth Profiles for subscribers
- Provision subscribers (ONU S/N, c/s-tags, BwProf)

SEBA-in-a-Box

- SiaB: Virtual SEBA pod for development and testing
  - VOLTHA's PONSIM module virtualizes the RG / ONU / OLT
  - Use Mininet to virtualize the agg switch / BNG / DHCP server
- **Fast**: Installs in 10 minutes
  - Downloads pre-built Docker images from Docker Hub
- **Easy**: Download a repo and run "make"
  - Sets up a single-node K8S cluster, VOLTHA, ONOS, NEM, Mininet
- **Lightweight**: run in a VM (on EC2 or a laptop)
  - m1.large VM on EC2: 8GB RAM, 2 vCPUs, 10 cents / hour
- **Customizable**: Use local copies of Helm charts, Docker images during development

SEBA-in-a-Box Dataplane



Lab #1: Install SiaB

- https://tinyurl.com/SEBALabManual
- Get a CloudLab machine and login with SSH
  - Username: seba
  - Password: OnfConnect2019!
- Perform the steps under Lab #1 in the Lab Manual
- Raise your hand if you run into problems
- Add comments to the Lab Manual where things are unclear

Connect to your node now!

ssh seba@nodeX.seba-tutorial.cord-testdrive-pg0.utah.cloudlab.us

password: OnfConnect2019!