SEBA Implementation Walkthrough

Session 2: 11am - 12:30am
In this session

● SEBA Community
  ○ ONF & Brigades

● NEM
  ○ What are the collections of containers that make up NEM?
  ○ What does XOS do?

● ONOS & Apps
  ○ What do the apps written on the SDN controller (ONOS) do?
  ○ How are multiple OLTs aggregated by the AGG switch?
SEBA and VOLTHA Community
## SEBA/VOLTHA Brigades

<table>
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<tr>
<th>Brigade</th>
<th>VOLTHA 2.x Stability</th>
<th>BAL 3.1 upgrade</th>
<th>VOLTHA FCAPS</th>
<th>ONOS FCAPS</th>
<th>Multicast</th>
<th>BBSim</th>
<th>Certification</th>
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<tr>
<td>ONF Mentor</td>
<td>David B. (Ciena)</td>
<td>Saurav</td>
<td>Scott</td>
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<td>Matteo</td>
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<td>and potentially many others</td>
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And many others
### Technology Profile Brigade(s)

<table>
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<tr>
<th>Bridging/Routing</th>
<th>Kafka</th>
<th>AAA</th>
<th>sadis</th>
<th>vOLT</th>
<th>dhcp</th>
<th>mcast</th>
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</thead>
</table>

#### ONOS

- Logical switch

#### VOLTHA

- Logical switch

#### Contributors

- Radisys
- NETSIA
- Infosys
- Jabil

#### Speed Profile

- Per subscriber
- up/down bw profile
- cir/eir/cbs/ebs

#### Tech Profile

- Access Tech type
- # Gems/TCONTs
- Sched policy
- Pbit mapping
- Discard policy

#### Access

- AGG
- OLT
- ONU
BAL 3.0 Brigade

**VOLTHA core**
- OpenOLT Adaptor

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

**Contributors**

- BAL
- Edgecore
  - ASFvOLT16
  - Whitebox OLT

**OpenOLT**

**Whitebox OLT**

**OpenOLT Driver**
- ONL
- ONIE
- Chip Driver
- SDK(s)

**White-Box = Open-Hardware Specs (OCP) + Open-Source Software (ONF & OCP)**
SEBA Pod Management & VOLTHA FCAPS Brigade

- Edgecore XGS PON vOLT
- Edgecore GPON OLT
- Edgecore Switch
- Server

HTTP/REST & REDFISH API

- Redfish Agent
- Redfish Agent
- Redfish Agent
- Redfish Agent

Redfish Importer

- Kafka
- Prometheus
- Grafana
- XOS

NEM
ONOS FCAPS Brigade

Contributors

Kafka

Prometheus

Grafana
BBSim Brigade

Network Edge Mediator (NEM)

SDN Controller - ONOS

VOLTHA

BBSim
BBSim
BBSim
BBSim

Contributors

Radisys
NETSIA
NTT
NORTHFORGE
SEBA Distributed DevOps – ONF Responsibilities

Joint Development with AT&T Foundry
- Daily scrum
- Bugs - issue analysis; root-cause;
- Design discussions for new features
- Documentation
- Recommend best-practices/training

Support VOLTHA/SEBA Community
- Weekly SEBA public meetings
- JIRA issues – kanban methodology
- Mailing lists, Slack community support
- VOLTHA meetings, TST, architectural guidance

Deliver New Features
- ONF team responsible for all ONOS and NEM feature development
- FCAPS features – kpis, alarms & logs in SEBA monitoring infrastructure
- AT&T workflow development
- Integrate with new ONU and OLT vendors
- AGG switch features

SEBA/VOLTHA Stability & Scale
- Focus on stability of VOLTHA – robustness and repeatability
- Investigate scalability and performance of full SEBA system

Tooling
- BBSim – Work with NTT in the development of PON simulator for scale testing
- SEBA-in-a-BOX: Complete end to end emulation of SEBA system with ponsim & mininet

QA
- Developing automated feature tests
- Extending framework for hardware based end-to-end tests
- Work with community to develop test automation and certification procedures
Demo setup BBWF 2018

Network Edge Mediator (NEM)

Software Stack

Hardware

ONU

SEBA Peripheral/PNF/Pod

Elasticsearch

Grafana/Kibana

Kafka

XOS GUI

Chameleon

Tosca

Logstash

Prometheus

Exporter

XOS Core

Synchronizers

Database

vOLT
dhcp
aaa
sadis
kafka-i
SR

ONOS

VOLTHA

BBSim

EdgeCore OLT

Adtran OLT

CIG OLT

Iskratel OLT (X)

Iskratel OLT (G)

EdgeCore AGG Switch

Compute Nodes

RG

Iskratel

Arcadyan

Adtran

CIG

Iskratel

Iskratel

Iskratel

BNG

DHCP Server

(subscriber RG addressing)

Public Internet

Radius Server

Configuration

RG

RG

RG

RG

RG

RG

RG

RG
Demo setup BBWF 2018

**ONUs**: Arcadyan, Alpha, Adtran, CIG, Iskratel

**OLTs**: Adtran, CIG, EdgeCore & Iskratel

**AGG switch**: EdgeCore

**Servers**: VOLTHA, ONOS, XOS, K8s, ELK, Docker, Prometheus, Grafana, Kibana
NEM Overview

- Bridge the gap between Operator OSS and SEBA services
- Set of optional components
- FCAPS
- Message bus
- Service Abstraction / Modeling
  - XOS Core
  - Service extensions using Synchronizers
  - Workflows
What does XOS do?

**XOS: SEBA/CORD Controller**

- **Configured Applications (Ctrl App)**
- **VNFs**
- **ONOS**
- **Kubernetes**

**TOSCA Recipes**
- Provision & Configure Services
- Runtime Operation

**Protobuf (xproto) Models**
- Schema that Model Services
- Core set Loaded at Boot Time
- Dynamically Updated at Runtime

**Helm Charts**
- Containers that Implement Services
- Core set Loaded at Boot Time
- Dynamically Updated at Runtime

**Lifecycle Management**

**CORD POD**

**OCP Hardware**

**Kubernetes**
XOS Implements the Data Model

- Traditional Relational Database Management System (RDBMS) with support for inheritance
- Service-independent “core” models (Users, etc)
- Three kinds of service models
  - *Service* - global service configuration
  - *ServiceInstance* - per-subscriber config and state, often formed into subscriber-specific *chains*.
  - *Auxiliary* - additional related models
Data Model Example: VOLT Service

- RCORD Service
- RCORD Subscriber
- Fabric XC Service
- Fabric XC ServiceInstance
- VOLT Service
- VOLT ServiceInstance
- OLT Device
- NNI Port
- ONU Device
- UNI Port
- PON Port
Subscriber Model

- **Subscriber**
  - **Location**
    - ONU Serial num
    - OLT/PON port
    - ONU Whitelist

- **Tagging**
  - C-tag
  - S-tag

- **Bandwidth Profile**
  - Upstream: cir, cbs, eir, ebs, air
  - Downstream: cir, cbs, eir, ebs, air
  - Num GEM/TCONT
  - Traffic priorities
  - Gem-port mappings
  - Queuing policy
  - Scheduling policy
  - Discard policy

- **Service Type**
  - Residential, Business,..
SEBA

SDN Enabled Broadband Access

SDN Controller - ONOS

VOLTHA apps

Trellis apps

Network Edge Mediator (NEM)

ONAP

Op X OSS/BSS

Abstract OLT

DOCKER

K8s

Helm

OLT

ONU

External BNG

SERVER

SWITCH

(Embedded BNG)
ONOS Apps overview

ONOS Apps are responsible for:

- Bringing SDN principles into the PON network
  - Enabling discovery (OLT, AAA, DHCP)
  - Reporting network analytics

- Configuring networking connectivity:
  - On the PON network through VOLTHA
  - On the aggregation switch via Openflow
Sadis (Subscriber and Device Information Service) is responsible to store information related to:

- OLTs
  - Serial Number, MAC Address, ....
- Subscribers:
  - C/S Tags, Bandwidth Profile ID, Technology Profile ID, ...
- Bandwidth profiles:
  - Cir, Cbs, Eir, Ebs, ...
The OLT application configures the access side of the network via the logical OpenFlow switch presented by VOLTHA.
The AAA App is responsible for relaying subscribers authentication requests to an external Radius server.
Fabric Crossconnect aggregates traffic from subscribers on the same OLT.

*Functionality is provided by Trellis*
The DHCP Layer 2 Relay App relays DHCP packets to the BNG.
org.opencord.kafka

The kafka integration app publishes events from ONOS apps to kafka topics