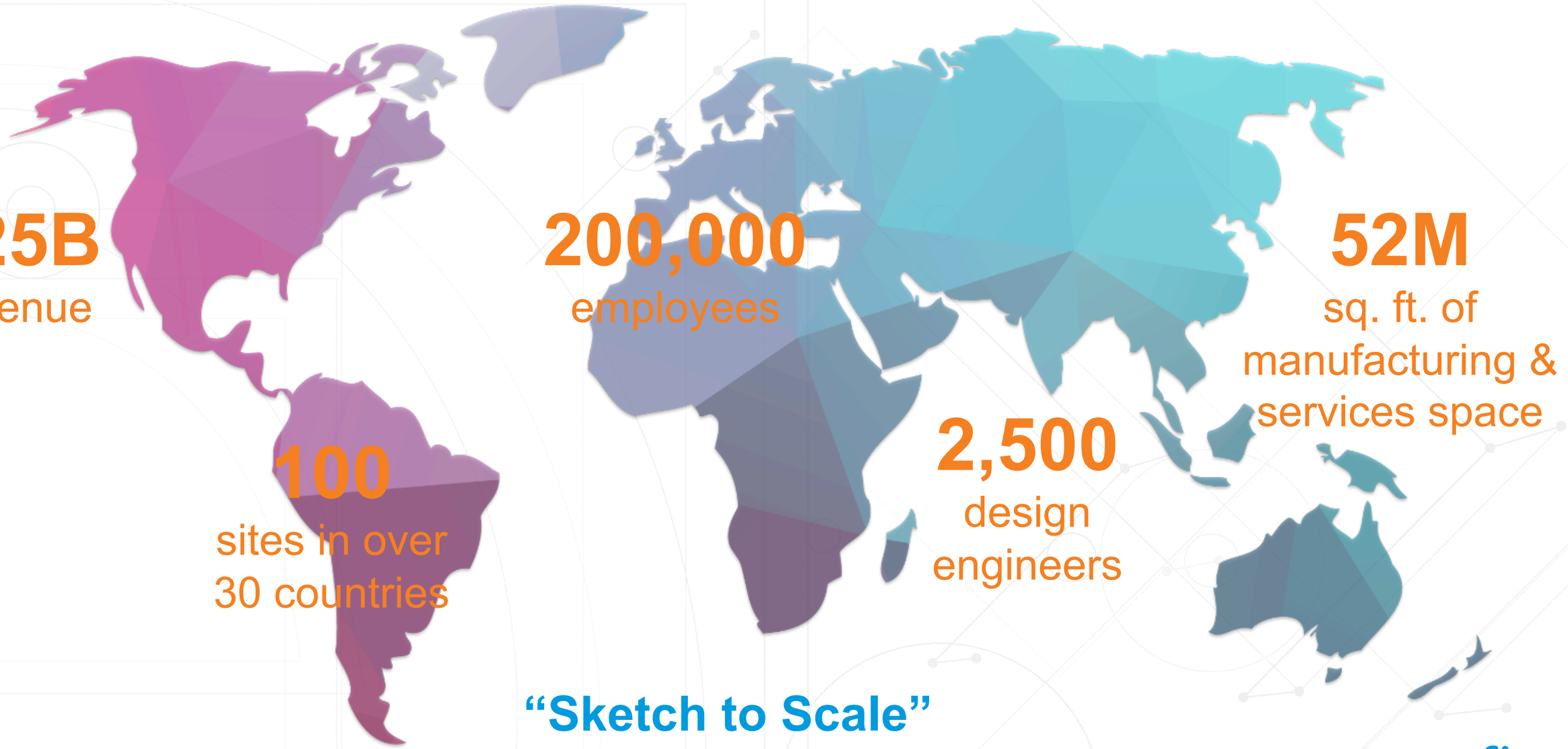
Agenda

- ❑ Overview of Flex
- ❑ ONF QA and Flex PODs
- ❑ CORD Certification Program
- ❑ SEBA POD
- ❑ SEBA Test Cases
- ❑ SEBA Test Results
- ❑ What’s next with Flex & ONF QA

We are Flex – Manufacturing & Design



$25B
revenue

200,000
employees

52M
sq. ft. of manufacturing & services space

100
sites in over 30 countries

2,500
design engineers

“Sketch to Scale”

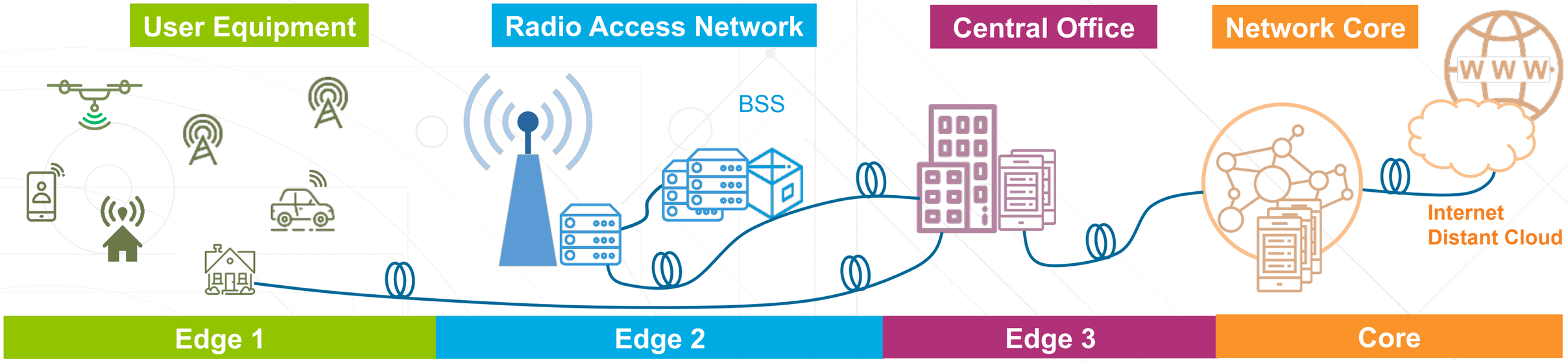
Compute redistributes due to new workloads demands

2000 - 2015

2015 - 2030

flex

Multiple edges, multiple technologies



Virtualization and Container Workloads

SDN/NFV

Multi-access Edge Computing

Fiber to business and residential premises

Fixed Wireless

IoT/M2M

flex

CORD: Next gen COs for the Service Providers

CORD: Central Office Rearchitected as Data Centers

Economies of a Datacenter

Infrastructure built with a few commodity building blocks using open source software and white boxes

Agility for Service Provider

SDN enabled datacenter platforms enable rapid creation of new services

Access to unique insights

Medical

Automotive

Industrial Goods

Home Appliances

Capital Equipment

Energy

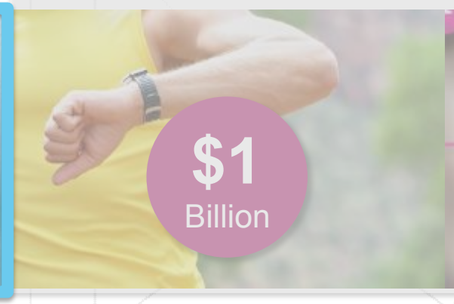
Cloud and Communications Solutions

Telecom

Networking

Compute / Storage

Wearables



Connected Living

Mobile

Flex and CORD Relationship

Collaborators

九州云 cloud | Accelleran Small Cells. Done Right | airhop communications
Akamai FASTER FORWARD | Aricent Engineering the Future | BROADCOM.
broadband forum | Calix | CAVIUM
Celestica | COBHAM | CRITERION NETWORKS
edge-corE NETWORKS | EQUINIX | flex

Joined CORD in 2016

Resource and Lab Contribution

Today QA Lab for CORD

flex

Flex journey from CORD 1.0 to CORD 6.0 and beyond

H2 2016

CORD 1.0

FIRST
Creamy-Vegetable

Key development:

- CORD-in-a-box deployments
- Single node cluster

H1 2017

CORD 2.0

SECOND
Mysterious-Decision

Key development:

- Manual CORD deployments in lab
- Multi-node POD with 10G fabric network

H1 2017

CORD 3.0

THIRD
Dangerous-Addition

Key development:

- Automated CORD deployments using Jenkins
- Multi-node POD with 40G fabric network

H2 2017

CORD 4.0

FOURTH
Shared-Delusion

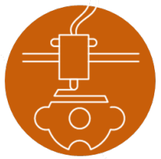
Key development:

- CORD community lab with remote connection facility
- Onboard partner test tools

H1 2018

CORD 5.0

FIFTH
Satisfying-Cactus



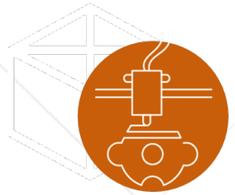
Key development:

- Published CORD 5.0 QA reports
- OCP based multi-node community POD

H2 2018

CORD 6.0

SIXTH
Quizzical-Purpose



Key development:

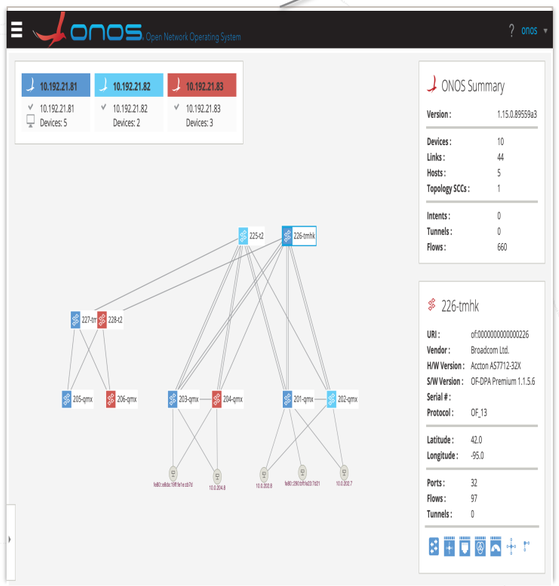
- Contribution to CORD Certification Program
- SEBA test plan demonstration

POD Level Deployments at Flex

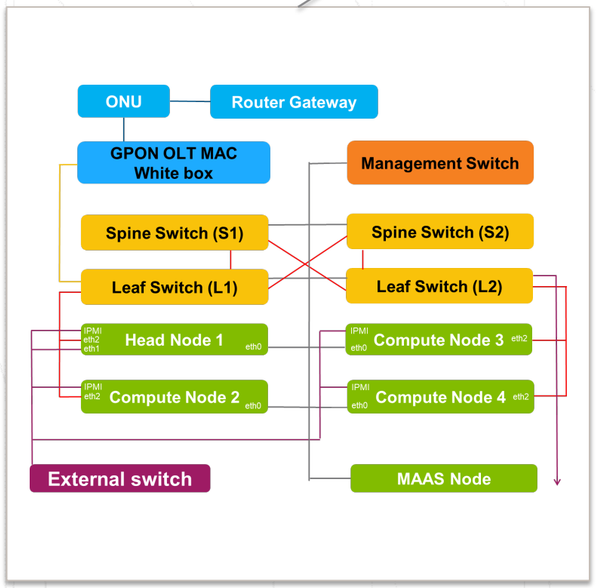
ONF

Jenkins

Flex “CloudLabs” VPN Network

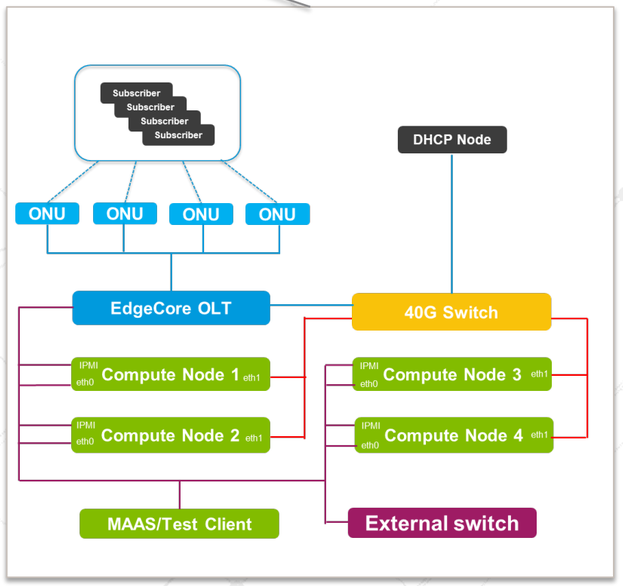


ONOS: Dev/Test



CORD: Full Fabric

CORD: Full Fabric on OCP

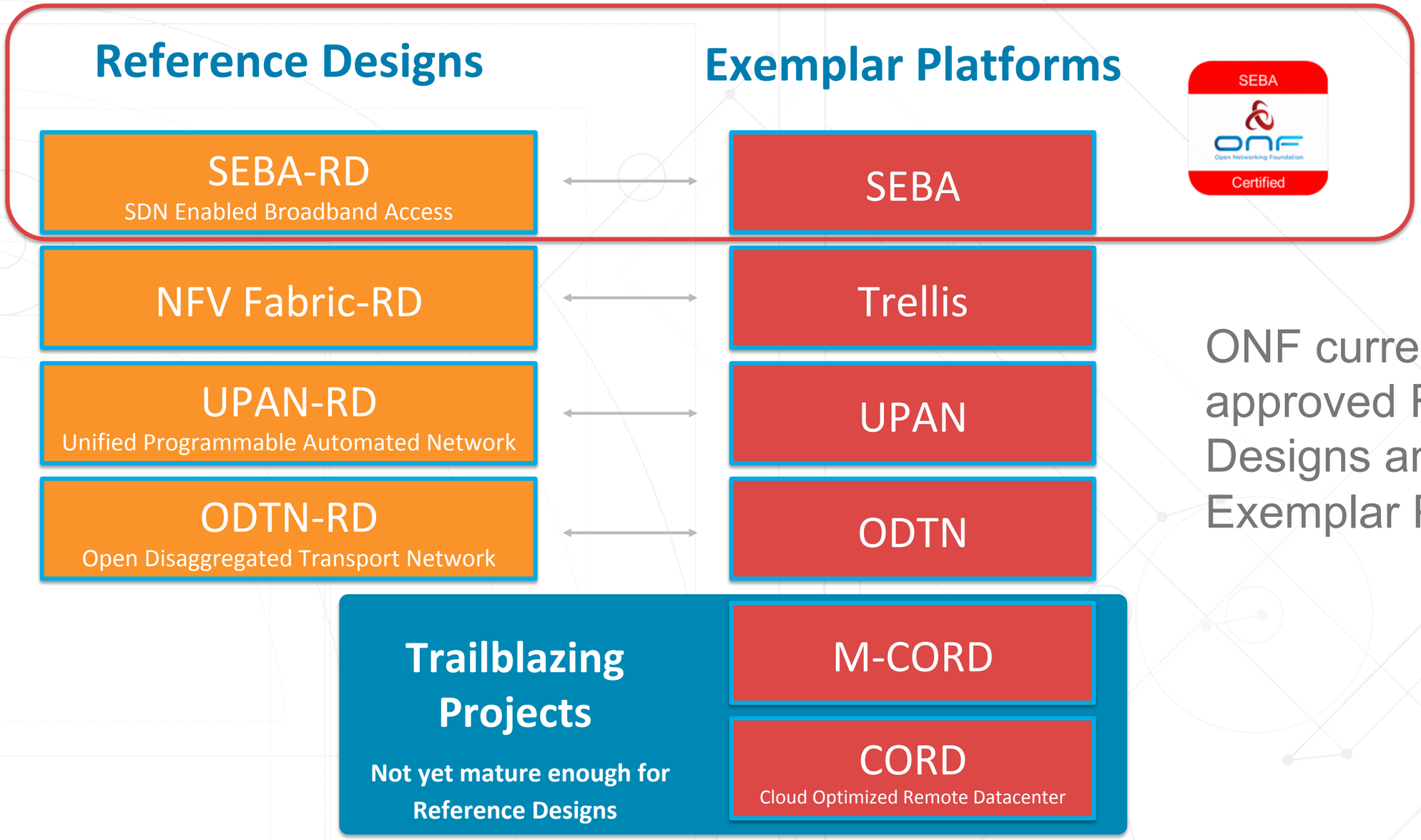


SEBA: Test Plan

flex

ONF CORD Certification Program

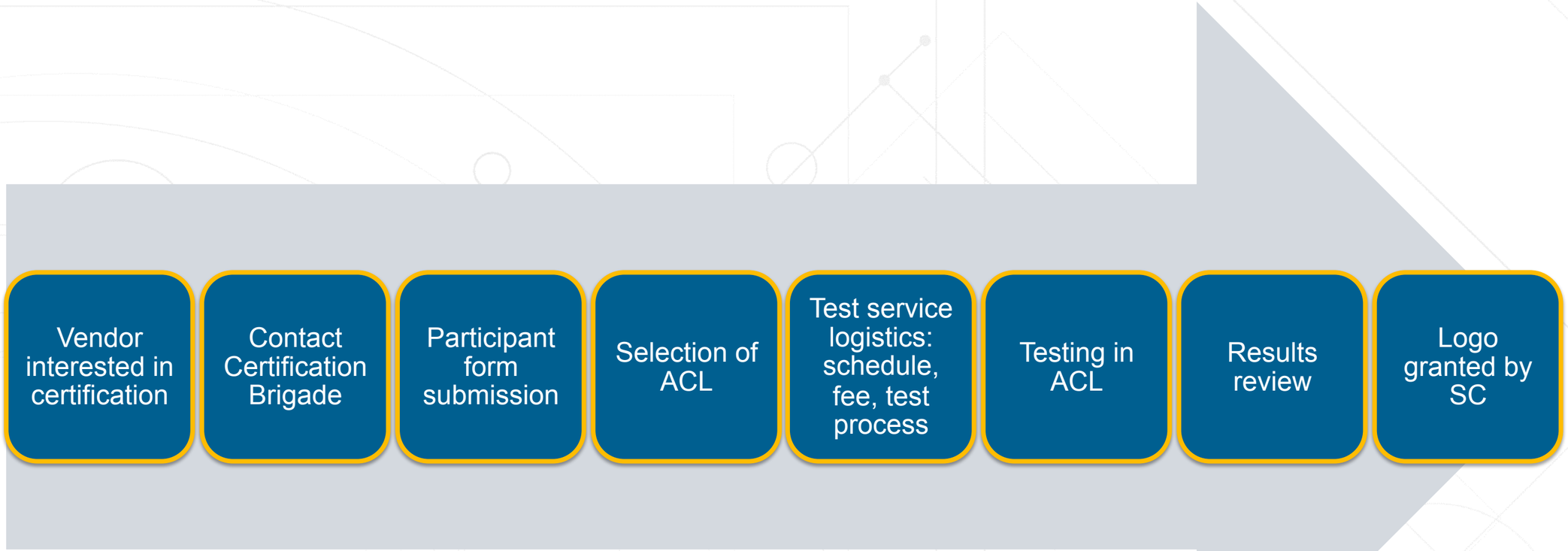
SEBA is first certification domain



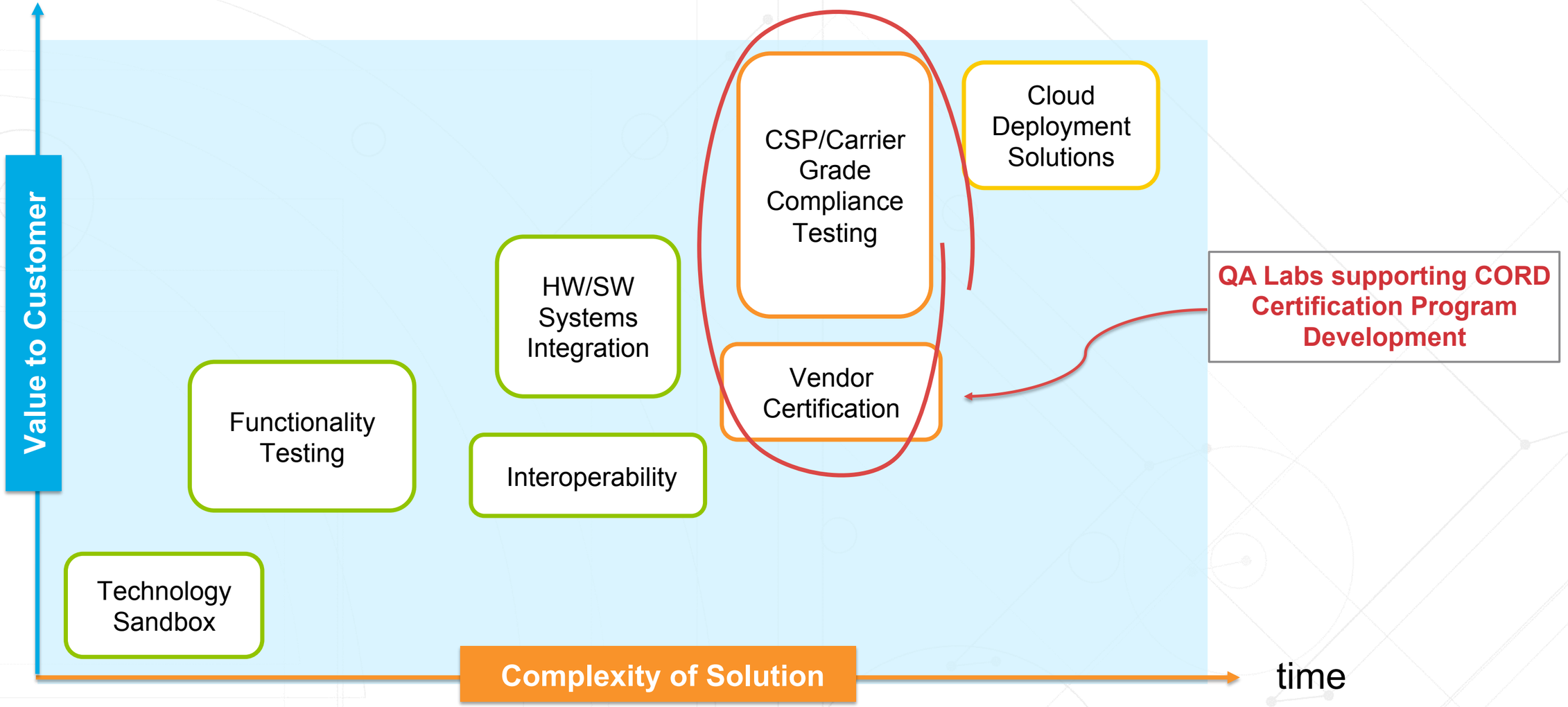
ONF currently approved Reference Designs and Exemplar Platforms

Source: https://wiki.opencord.org/display/CORD/Certification+Brigade

SEBA Certification flow



QA Labs and CORD Certification Program



SEBA (SDN Enabled Broadband Access) POD

SEBA POD Architecture

Hardware

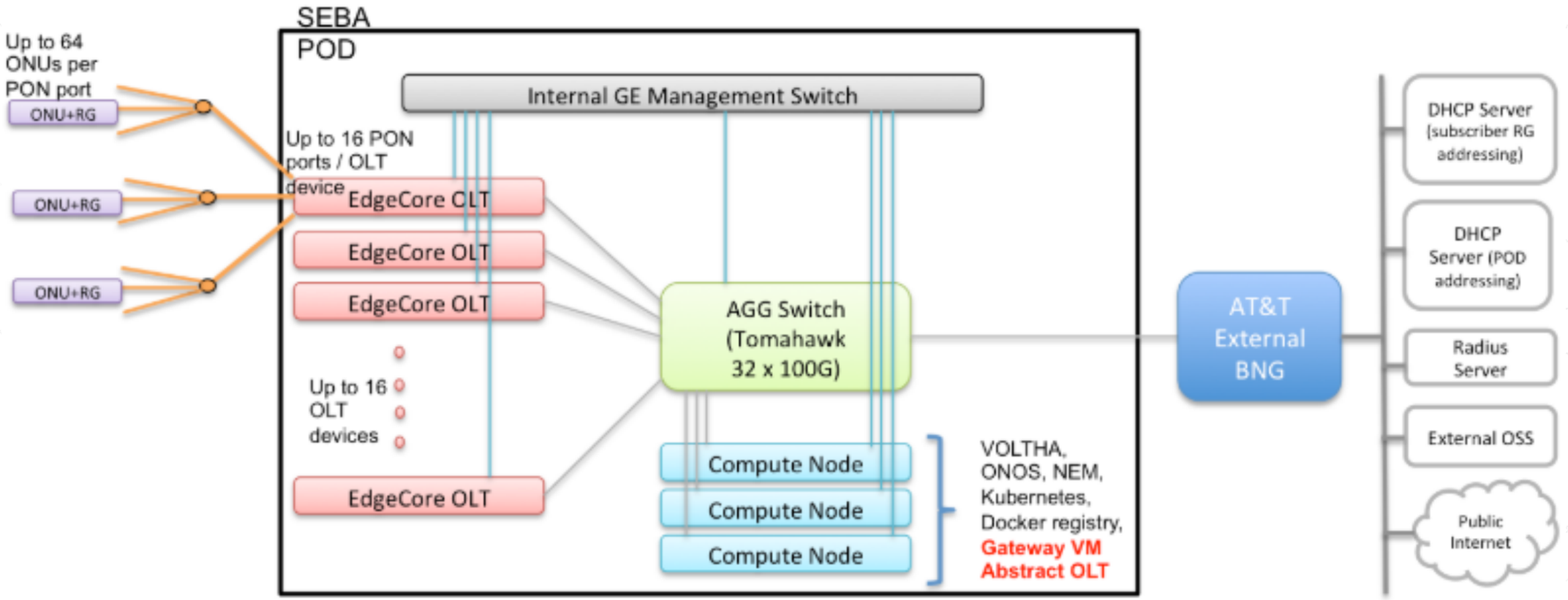
- 1 physical AGG switch (Tomahawk)
- 3 compute nodes connected to AGG switch
- Up to 16 EdgeCore OLTs with NNI port connected to the AGG switch
- Up to 64 ONUs on each PON port
- 1 GE management switch to which all OLTs AGG and compute node management ports

Virtualization

- Gateway VM instantiated on one of the compute nodes
- Abstract OLT instantiated on one of the compute nodes

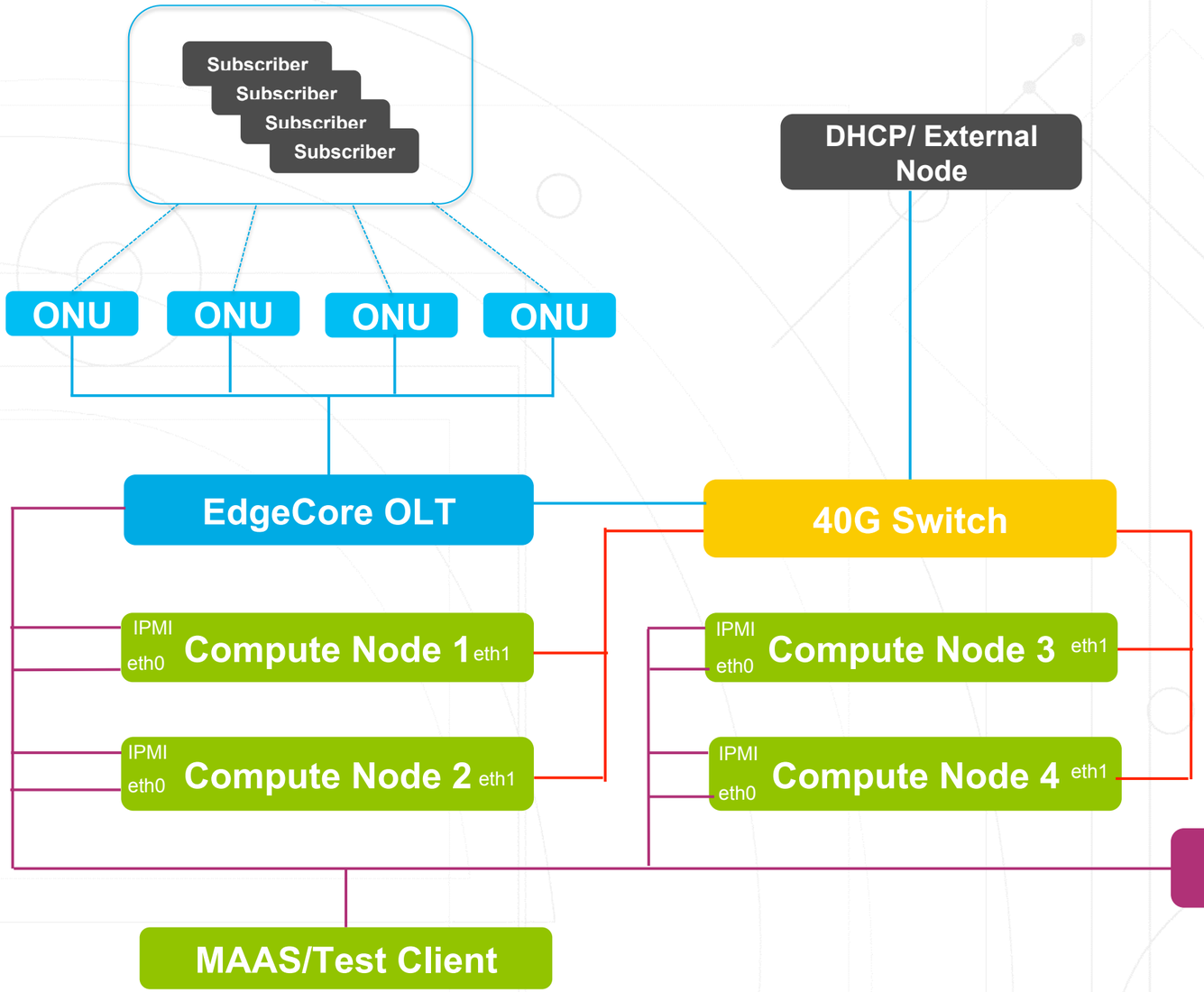
External

- BNG, DHCP Server(RG & POD), Radius Server, External OSS, Public Internet



Source: https://wiki.opencord.org/pages/viewpage.action?pageId=4982370

SEBA POD Architecture at Flex

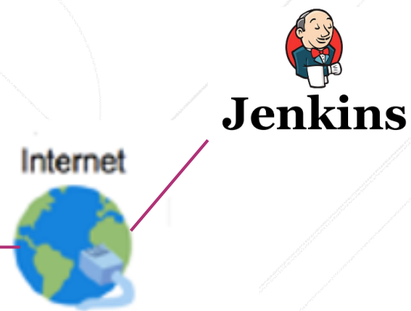


Accton AS6712-54X Leaf and Spine Switches
48x 40G, 6x 40G

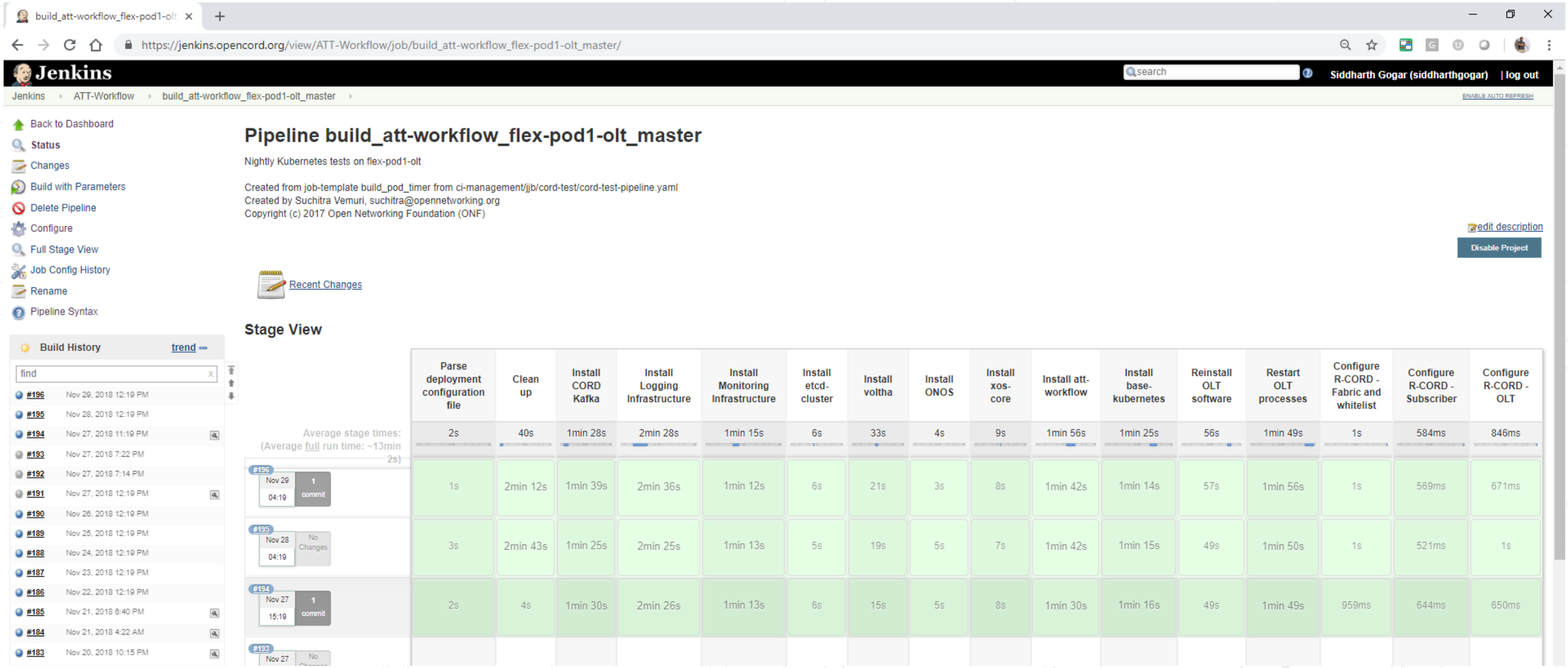
Flex Platform

- 2x Intel E5-2630v3 8c 2.4Ghz, 192GB RAM
- 2x1G, 2x40G dual port Mellanox NIC
- 1x Intel SSD 480GB

1G IPMI/Mgmt/External Network
40G Fabric Network
Subscriber Traffic Network

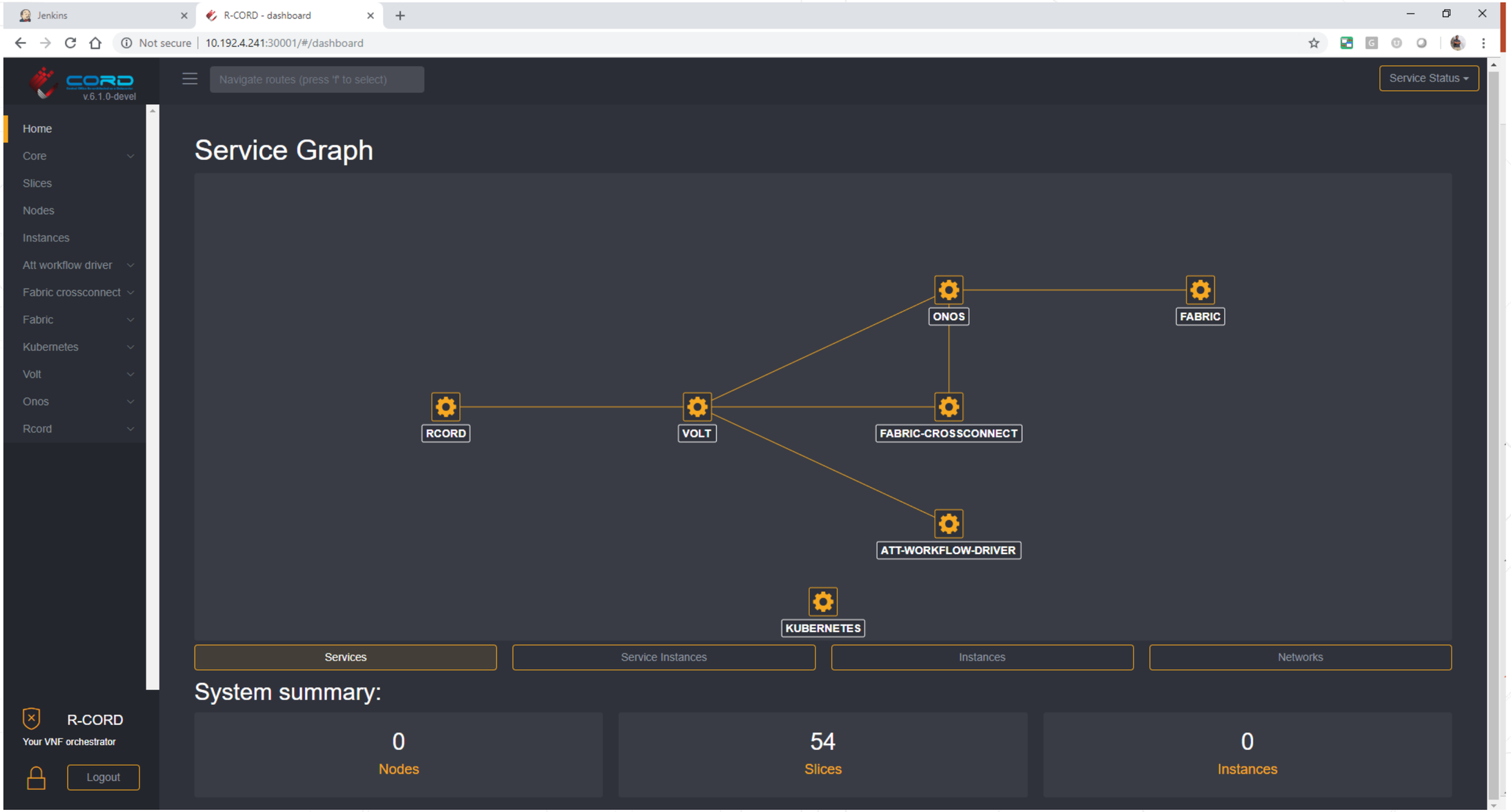


ONF Jenkins Nightly-Builds for Flex SEBA POD

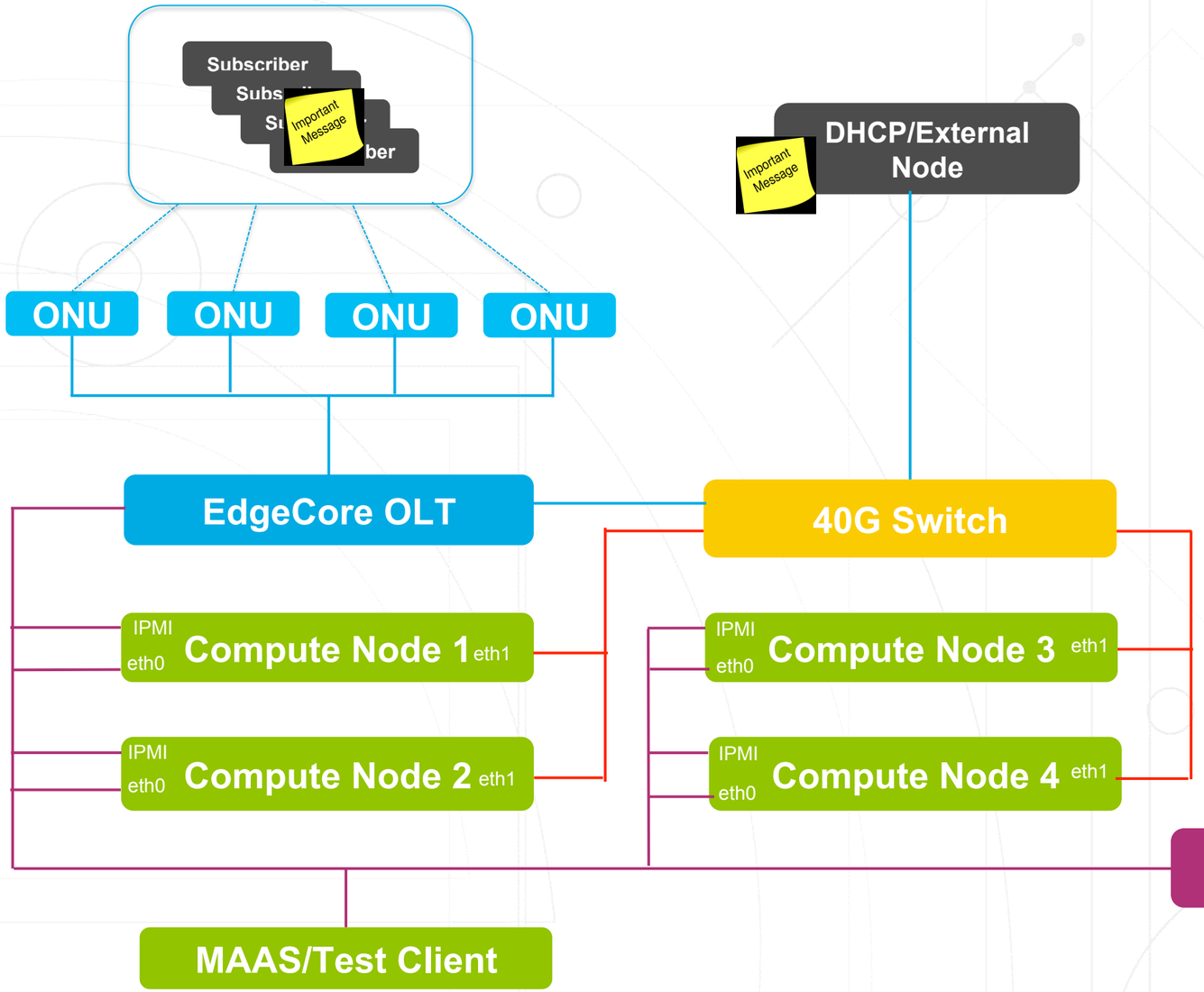


Source: https://jenkins.opencord.org/job/build_att-workflow_flex-pod1-olt_master/

SEBA POD UI: CORD 6.0



Validate: SEBA POD ‘Fastpath’ Network Traffic Flow



“SEBA is the residential use case and provides optimizations so that network traffic can run 'fastpath' straight to the backbone without requiring VNF processing on a server”

RG -> OLT -> Fabric -> Destination

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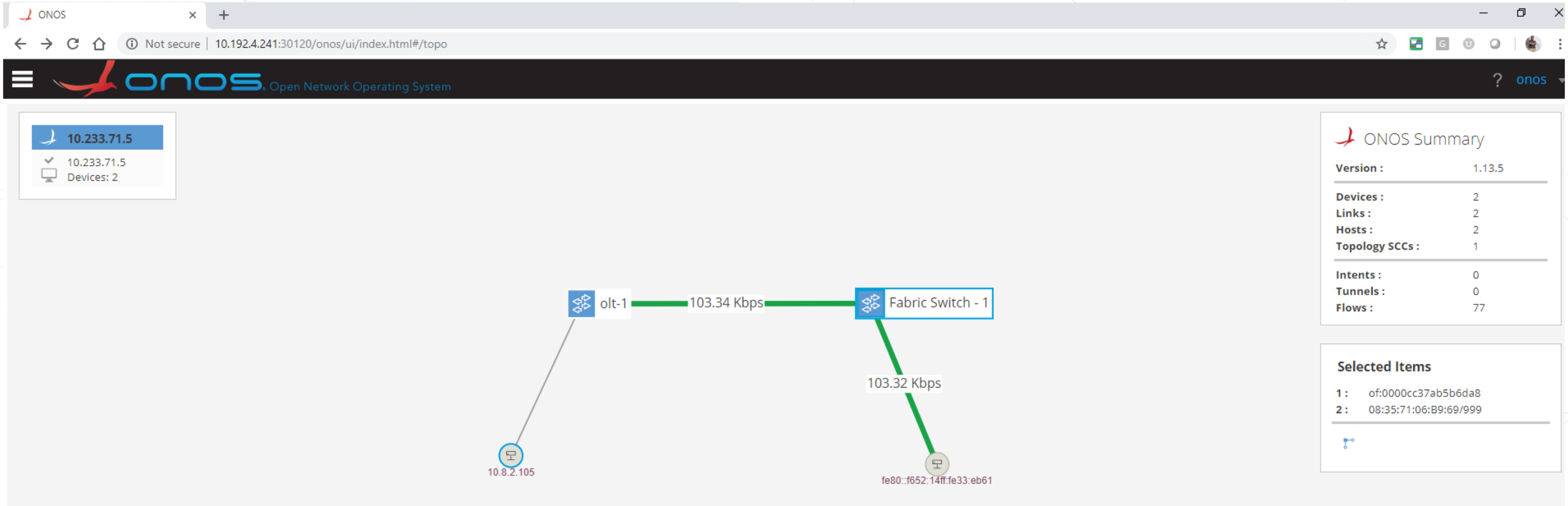
‘Fastpath’ Network Flow Validation on SEBA POD



RG@ubuntu:~$ nohup ping 10.8.2.100 > ping_log.txt &

RG -> OLT -> Fabric -> Destination

Onos ui: http://10.192.4.241:30120/onos/ui/index.html#/topo onos/rocks

Source: https://wiki.opencord.org/display/CORD/December+Release

Automated SEBA Test Plan

SN	Group	Test	TestCase ID	Results Pass/Fail
test1	Verify End-end ping with ONU in Correct Location	Validates E2E Ping Connectivity and object states for the given scenario: Configure whitelist with correct ONU location Validate successful authentication/DHCP/E2E ping	ATT_Test001	PASS
test2	Test by removing ONU from Whitelist, and re-add ONU to Whitelist for a successful ping	Validates E2E Ping Connectivity and object states for the given scenario: Configure whitelist with correct ONU location Validate successful authentication/DHCP/E2E ping Remove ONU from whitelist Validate failed authentication/DHCP/E2E ping Add ONU to whitelist Validate successful authentication/DHCP/E2E ping	ATT_Test001	FAIL
test3	Test with ONU in Wrong Location and re-add ONU in Correct Location for a successful ping	Validates E2E Ping Connectivity and object states for the given scenario: Configure whitelist with correct ONU location Validate successful authentication/DHCP/E2E ping Update whitelist with wrong ONU location Validate failed authentication/DHCP/E2E ping Update whitelist with correct ONU location Validate successful authentication/DHCP/E2E ping	ATT_Test001	FAIL
test4	Test by Removing Subscriber and re-creating the Subscriber for a successful ping	Validates E2E Ping Connectivity and object states for the given scenario: Configure whitelist with correct ONU location Validate successful authentication/DHCP/E2E ping Remove subscriber model Validate successful authentication (expected with the ONF pod setup) but failed DHCP/E2E ping Recreate subscriber model Validate successful authentication/DHCP/E2E ping	ATT_Test001	PASS
test5	Test by Skipping Subscriber Provisioning and re-provisioning Subscriber	Validates E2E Ping Connectivity and object states for the given scenario: Configure whitelist with correct ONU location and skip provisioning subscriber Validate successful authentication (expected with the ONF pod setup) but failed DHCP/E2E ping Provision subscriber Validate successful authentication/DHCP/E2E ping	ATT_Test001	PASS

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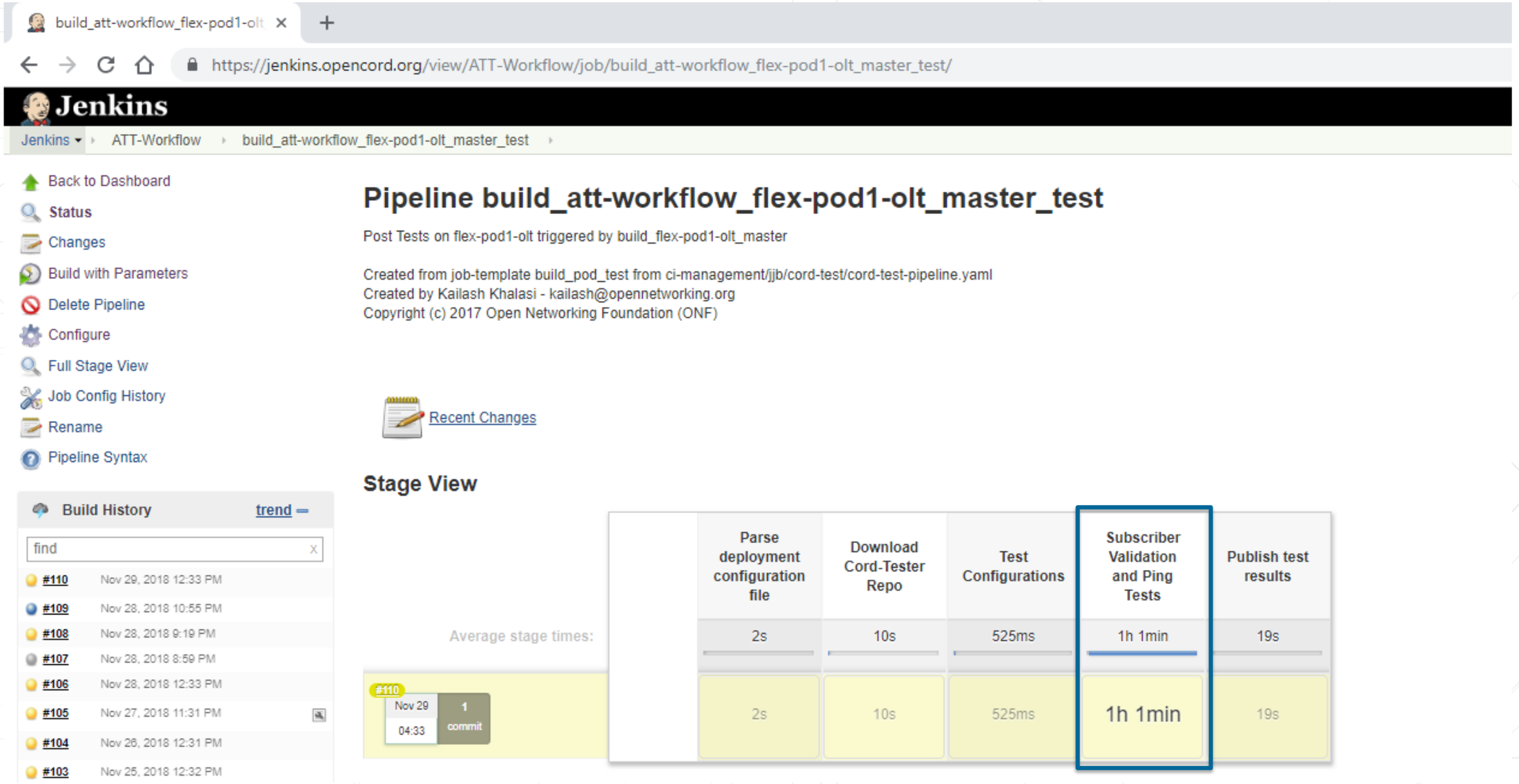
Automated SEBA Test Plan

SN	Group	Test	TestCase ID	Results Pass/Fail
test6	Test by skipping Authentication	Validates failed authentication/DHCP/E2E Ping with the following scenario: Configure whitelist with correct ONU location and skip RG authentication Validate failed authentication/DHCP/E2E Ping	ATT_Test001	PASS
test7	Test with ONU not in Whitelist	Validates failed E2E Ping Connectivity and object states for the given scenario: Skip whitelist configuration for ONU Validate failed authentication/DHCP/E2E ping	ATT_Test001	PASS
test8	Test with ONU not in Whitelist and by skipping Subscriber Provisioning	Validates E2E Ping Connectivity and object states for the given scenario: Skip whitelist configuration for ONU and subscriber provisioning Validate successful authentication but failed DHCP/E2E ping Configure whitelist with correct ONU location Validate successful authentication (expected with the ONF pod setup) but failed DHCP/E2E ping Provision subscriber Validate successful authentication/DHCP/E2E ping	ATT_Test001	PASS
test9	Test with ONU in Wrong Location	Validates E2E Ping Connectivity and object states for the given scenario: Configure whitelist with wrong ONU location Validate failed authentication/DHCP/E2E ping	ATT_Test001	PASS
test10	Test with ONU in Wrong Location and Skip Subscriber Provisioning, Then fix ONU in Correct Location and Provision Subscriber	Validates E2E Ping Connectivity and object states for the given scenario: Configure whitelist with wrong ONU location and skip subscriber provisioning Validate failed authentication/DHCP/E2E ping Configure whitelist with correct ONU location Validate successful authentication (expected with the ONF pod setup) but failed DHCP/E2E ping Provision subscriber Validate successful authentication/DHCP/E2E pingI	ATT_Test001	PASS

ONF Jenkins Test Automation for Flex SEBA POD



Flex SEBA POD: Test Summary

ATT Test001 Test Report

Generated
20181128 14:07:42 GMT-08:00
1 day 2 hours ago

Summary Information

Status:	2 critical tests failed
Documentation:	Test various end-to-end scenarios with ATT workflow
Start Time:	20181128 13:19:07.911
End Time:	20181128 14:07:29.210
Elapsed Time:	00:48:21.299
Log File:	log-ATT_Test001-20181128-140729.html

Test Statistics

Total Statistics	Total	Pass	Fail	Elapsed	Pass / Fail
Critical Tests	10	8	2	00:48:20	
All Tests	10	8	2	00:48:20	

Statistics by Tag	Total	Pass	Fail	Elapsed	Pass / Fail
test1	1	1	0	00:03:04	
test10	1	1	0	00:05:46	
test2	1	0	1	00:08:52	
test3	1	0	1	00:01:54	
test4	1	1	0	00:05:22	
test5	1	1	0	00:04:35	
test6	1	1	0	00:04:00	
test7	1	1	0	00:04:09	
test8	1	1	0	00:06:26	
test9	1	1	0	00:04:13	

Statistics by Suite	Total	Pass	Fail	Elapsed	Pass / Fail
ATT Test001	10	8	2	00:48:21	

Flex SEBA POD: Test Execution Log

Test Execution Log

SUITE ATT Test001

Full Name:	ATT Test001
Documentation:	Test various end-to-end scenarios with ATT workflow
Source:	/var/jenkins/workspace/build_att-workflow_flex-pod1-olt_master_test/cord-tester/src/test/cord-api/Tests/WorkflowValidations/ATT_Test001.robot
Start / End / Elapsed:	20181128 13:19:07.911 / 20181128 14:07:29.210 / 00:48:21.299
Status:	10 critical test, 8 passed, 2 failed 10 test total, 8 passed, 2 failed

SETUP Setup Suite

TEARDOWN Teardown Suite

TEST ONU in Correct Location

TEST ONU in Correct Location -> Remove ONU from Whitelist -> Add ONU to Whitelist

TEST ONU in Correct Location -> ONU in Wrong Location -> ONU in Correct Location

TEST ONU in Correct Location -> Remove Subscriber -> Create Subscriber

TEST ONU in Correct Location (Skip Subscriber Provisioning) -> Provision Subscriber

TEST ONU in Correct Location (Skip Authentication)

TEST ONU not in Whitelist

TEST ONU not in Whitelist (Skip Subscriber Provisioning) -> Add ONU to Whitelist -> Provision Subscriber

TEST ONU in Wrong Location

TEST ONU in Wrong Location (Skip Subscriber Provisioning) -> ONU in Correct Location -> Provision Subscriber

Demo

- **Subscriber node: cluser@10.192.4.61**

  nohup ping 10.8.2.100 > ping_log.txt &

- **DHCP node: cord@10.192.4.62**

  sudo tcpdump -eni ens3>tcpdump.txt (service tags)

- **ONOS UI: http://10.192.4.241:30120/onos/ui/index.html#/topo onos/rocks**
- **CORD UI: http://10.192.4.241:30001/#/dashboard**
- **Jenkins: https://jenkins.opencord.org/view/ATT-Workflow/job/build_att-workflow_flex-pod1-olt_master/**
- **Test Results:**

  https://jenkins.opencord.org/view/ATT-Workflow/job/build_att-workflow_flex-pod1-olt_master_test/

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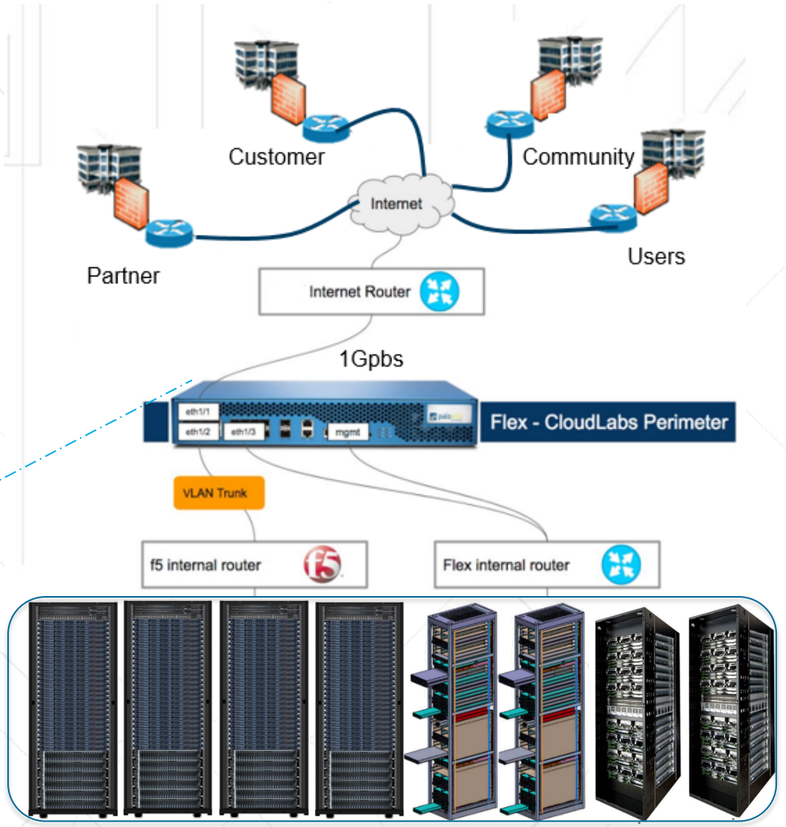
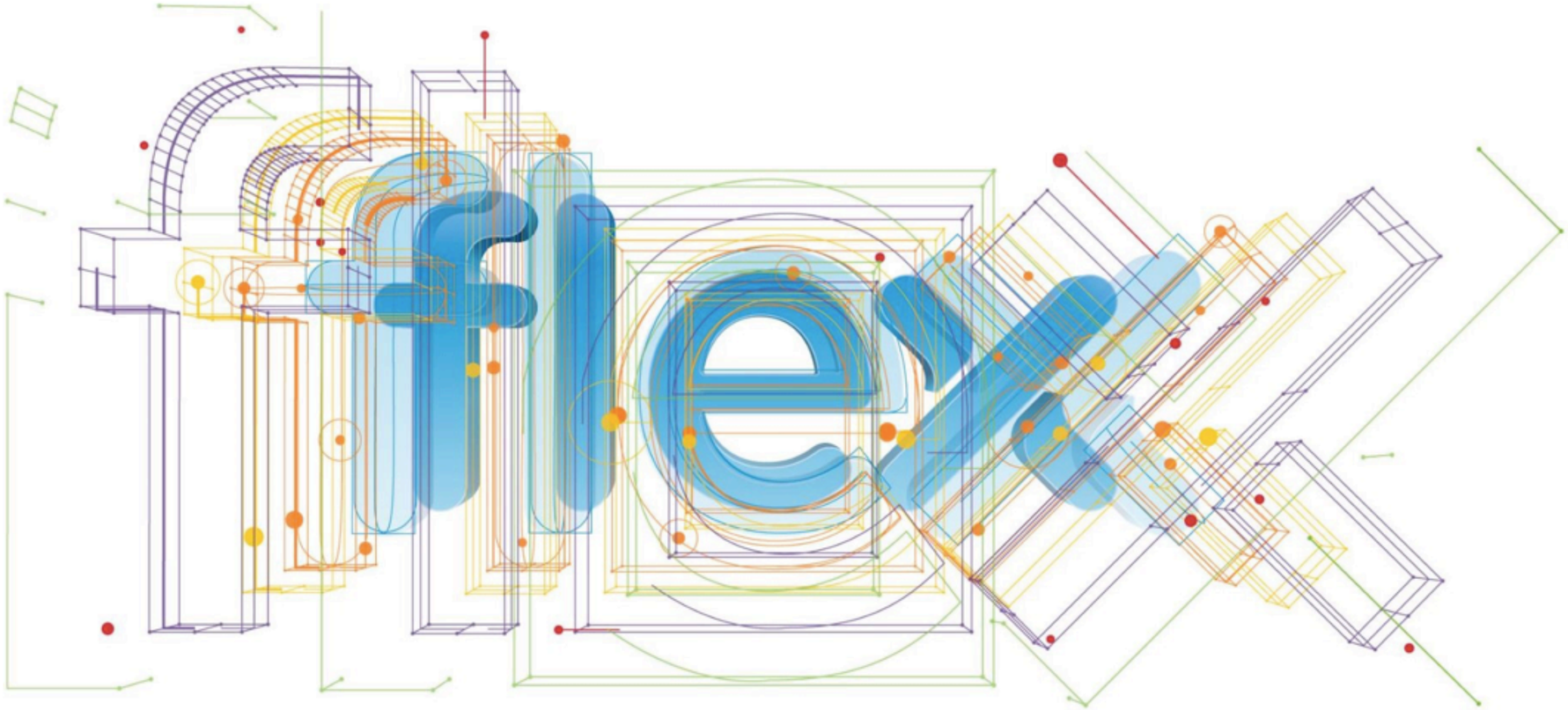
Summary and Next Steps

Customer, Partner and Community Engagement Lab

- Continue working on comprehensive plan to test, validate and certify CORD platform and components using Flex SEBA POD
- Continue collaborating with ONF Certification Brigade to define CORD Certification program (CCP) and its execution
- Extend in house automated test and validation framework to validate CORD platform and components with Flex SEBA POD
- Collaborate with Vendors & Service Providers to demonstrate Telco use-cases and support CORD deployments





Thank You!

For collaboration and questions please send email to Siddharth.Gogar@flex.com