Enterprise CORD

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CORD Build, QCT headquarters, San Jose
November 10, 2017

Today's Schedule

Type: **E-CORD Track** [Clear Filter]

Tuesday, November 7

4:30pm	ONAP Roundtable

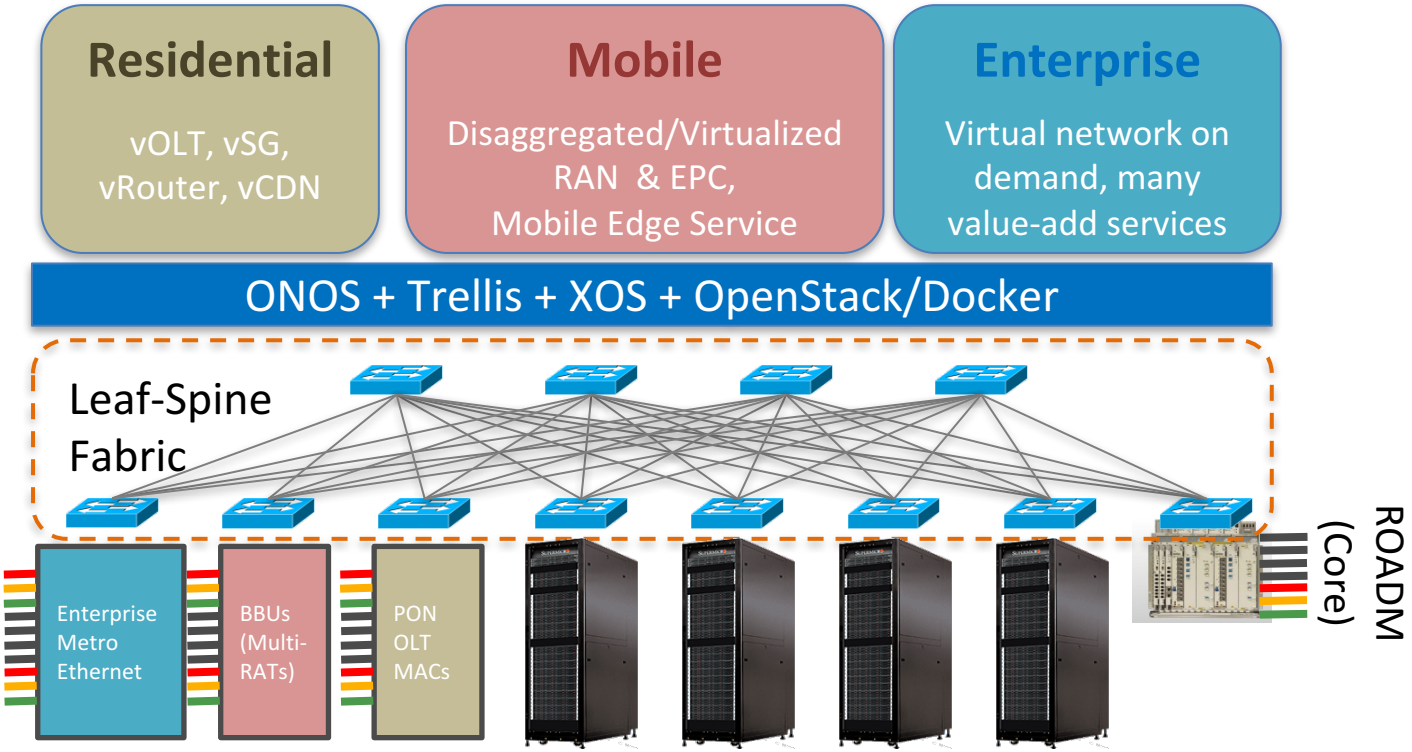
Thursday, November 9

10:00am	E-CORD Platform and Roadmap
11:15am	Demo: Installation, Deployment, Service Provisioning & Activation
2:00pm	Service Provider Experiences with E-CORD: China Mobile
2:30pm	Service Provider Experiences with E-CORD: TIM
3:00pm	Service Provider Experiences with E-CORD: NTT Communications & OOL
3:30pm	Vendor Perspectives with E-CORD: Microsemi

Outline

- Value Proposition
- Architecture
- Services
- Roadmap, Partners & Results

CORD Value Proposition



Commodity Servers, Storage, Switches, and I/O

E-CORD Value Proposition

Virtual Network as a Service

- ✓ Self-serve portal
- ✓ Zero touch provisioning
- ✓ Simple on-prem
- ✓ Combination of broadband and SLA connections

Integrated Analytics

- ✓ Observe, Control, Adapt
- ✓ Programmable probes
- ✓ On-demand monitoring

Custom Services for Enterprises

- ✓ Security
- ✓ Application policy control
- ✓ WAN acceleration
- ✓ …

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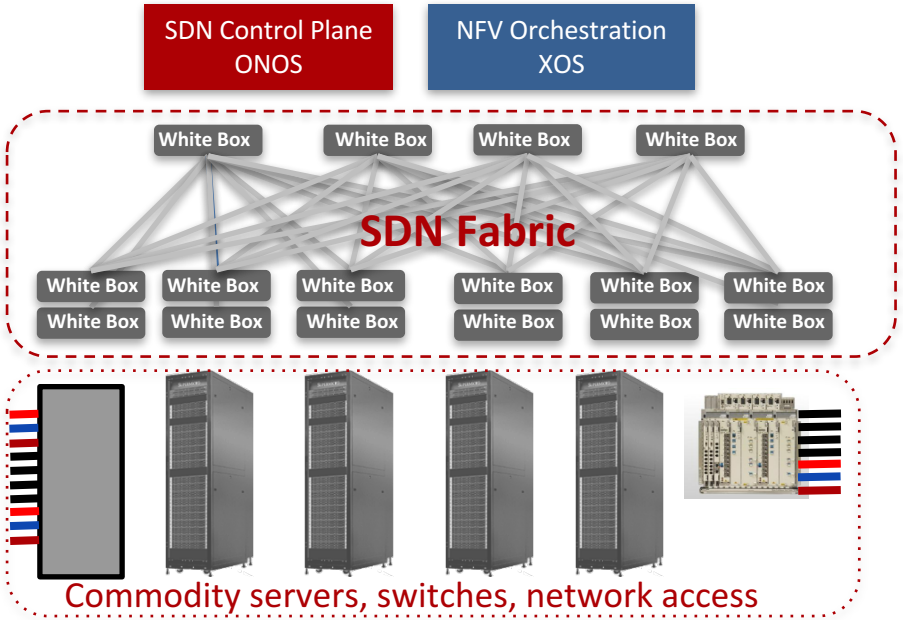
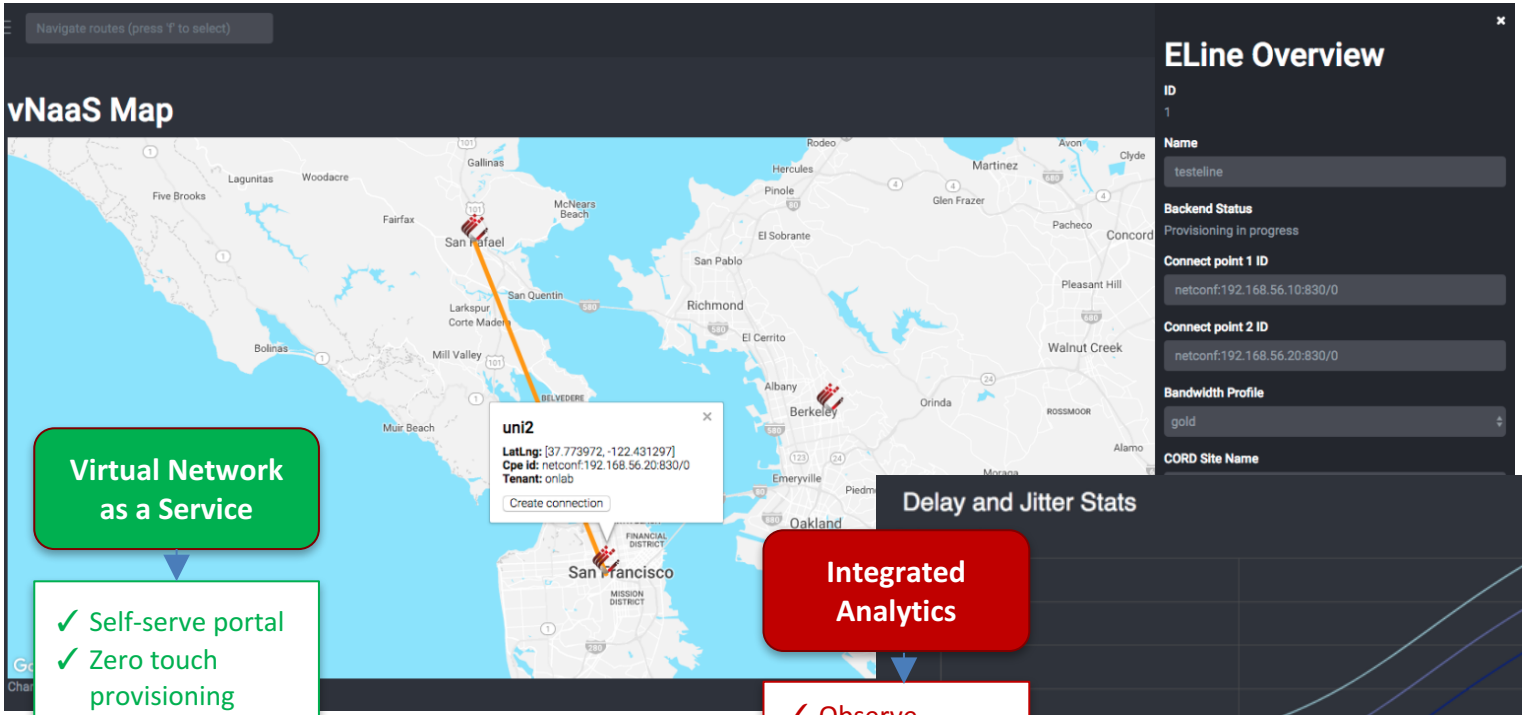


Carrier-grade Network as a Service

Built on an open platform

Bring data center economy and cloud agility

E-CORD Value Proposition



Virtual Network as a Service

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Integrated Analytics

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Custom Services for Enterprises

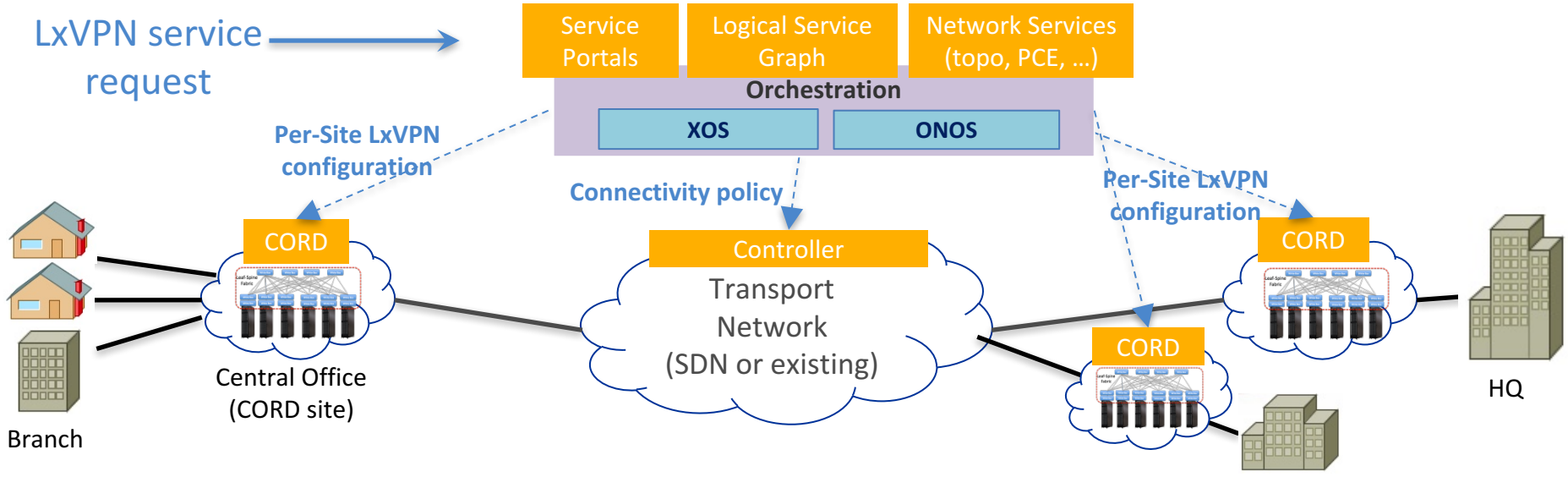
- ✓ Security
- ✓ Application policy control
- ✓ WAN acceleration
- ✓ SAAS
- ✓ …

Outline

- Value Proposition
- Architecture
  - Overview
  - Control & Communication Patterns
- Services
- Roadmap, Partners & Results

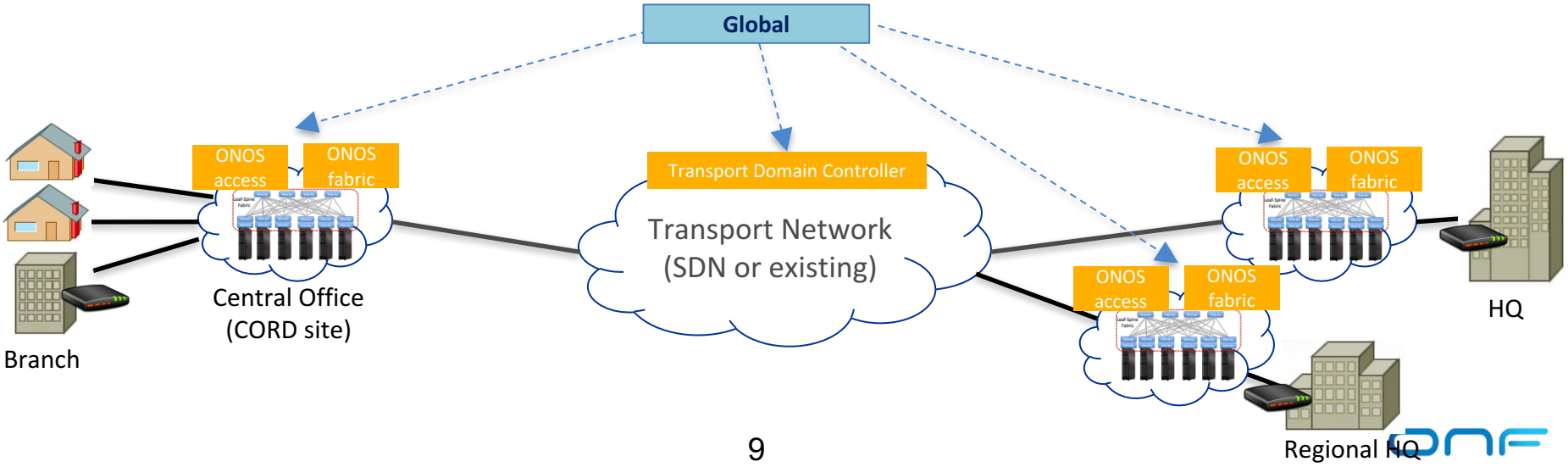
High-Level Overview

- Orchestration:
  - Identifies transport path(s) and end-to-end resource constraints given services and virtual network type
  - Conveys constraints and service requirements to each CORD site(s)
- CORD sites configure fabric and service(s) for LxVPN

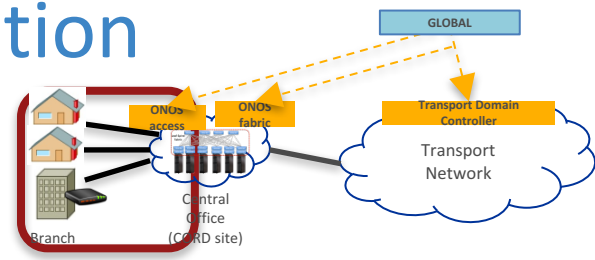


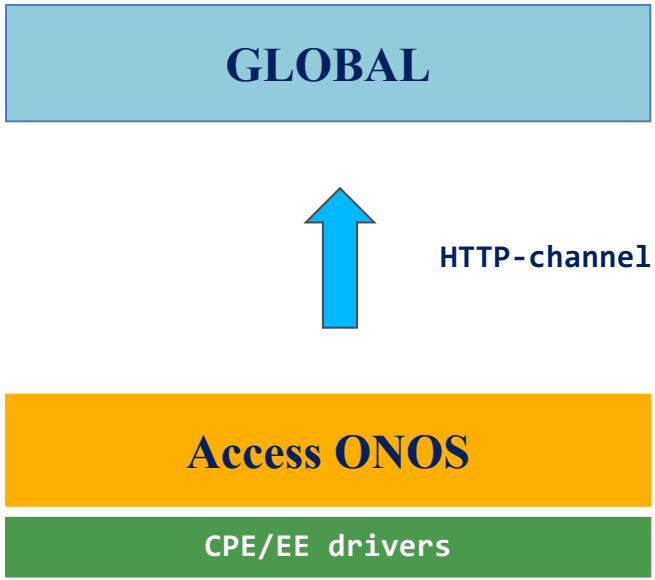
Hierarchical End-to-End Network Control

- Global domain-agnostic controller
  - Maintains an aggregated view of the underlying topology
  - Handle service requests from global orchestrator
- Local domain-specific controllers
  - Controls an actual portion of the network



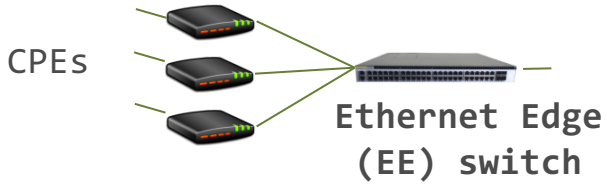
Local to Global Registration





Big Switch

Edge topology



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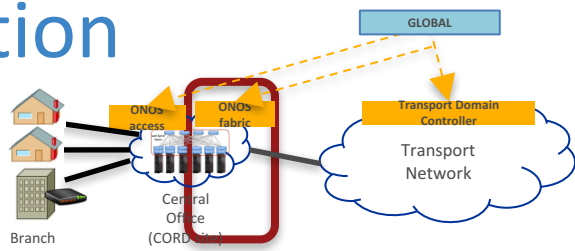
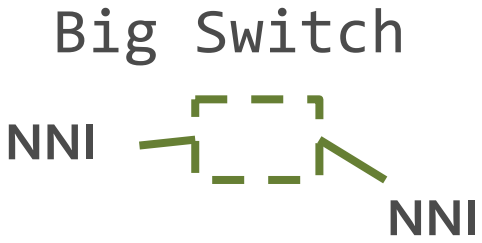
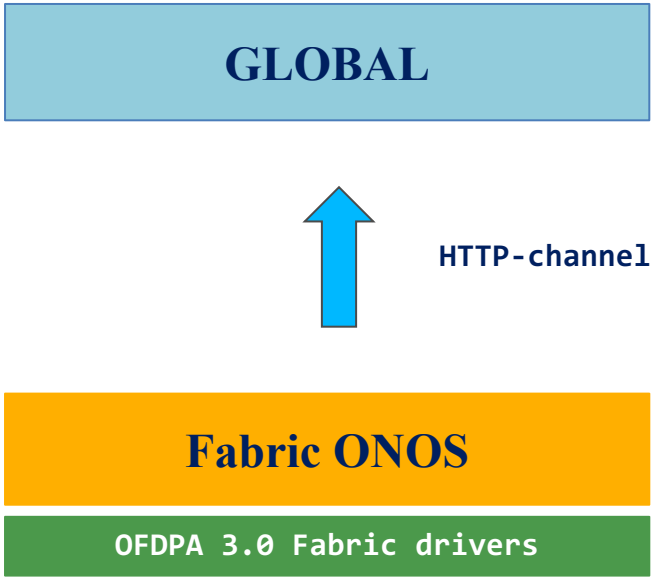
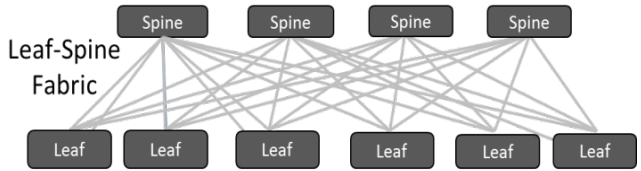






CORD Fabric



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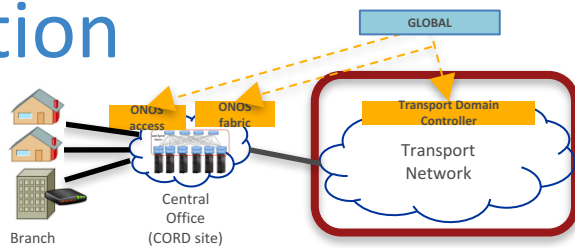


GLOBAL

HTTP-channel

Big Switch

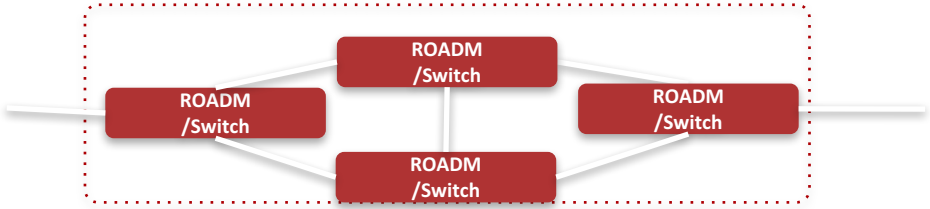
NNI

NNI

Transport ONOS

Optical/Roadm drivers

Transport Network



Optical Transport Network

ONOS based

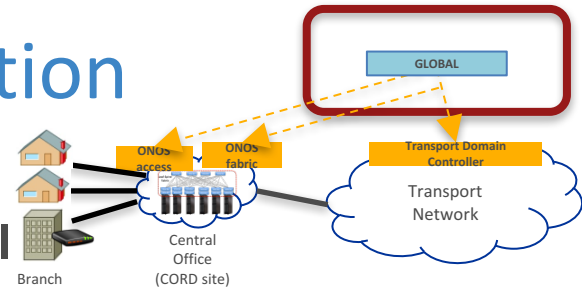
- Handles request from orchestration layer to provide connectivity between CORD sites
- Demonstrated for: traditional WDM, **disaggregated optical network**, MEF LSO Presto
- Other options: VPLS, ONF T-API, EVPN, OpenROADM, ACTN, SPTN (MPLS-TP)

Existing/legacy

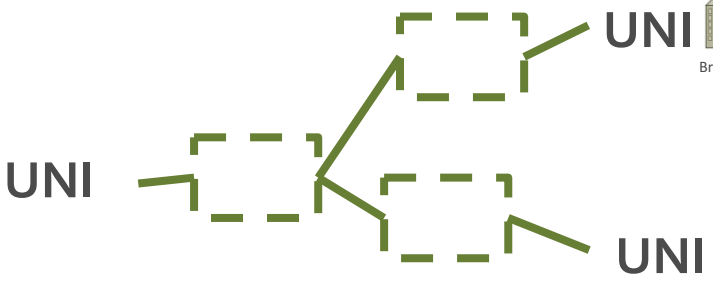
- MPLS

ONOS provides further **optimized transport solution** but **service providers don't need to radically change everything**

Local to Global Registration

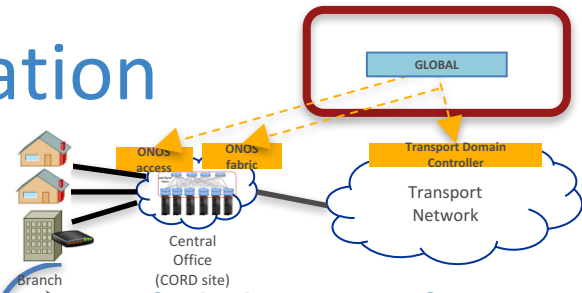


Enterprise high level topology



Big Switch

Global to Local Orchestration



EVC request

GLOBAL

- Admission control
- Orchestration
  - Break down EVC into forwarding constructs
- PCE
- Resource management
  - Service tag generation

Forwarding Constructs

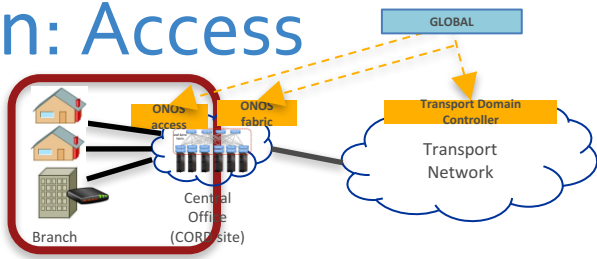
Access ONOS | Fabric ONOS | Fabric ONOS | Access ONOS

Central Office 1

Transport ONOS

Central Office 2

Global to Local Orchestration: Access



GLOBAL

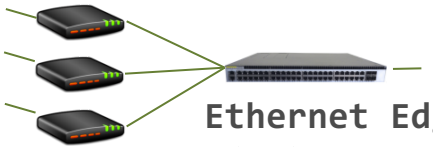
HTTP-channel

Forwarding Construct

- Admission control
- QoS profile setup
- Service tagging

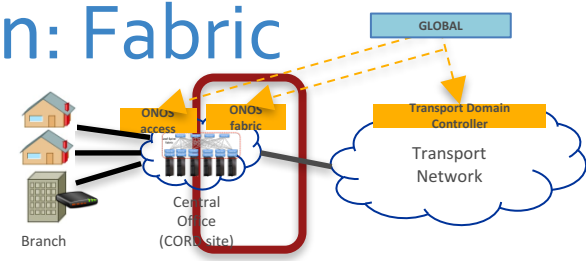
Access ONOS

CPE/EE drivers



Edge topology

Global to Local Orchestration: Fabric



GLOBAL

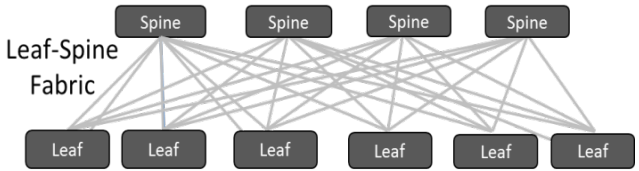
HTTP-channel

Forwarding Construct

- Segment routing config
  - Pseudowire
  - VLAN xconnect
- INNI configuration

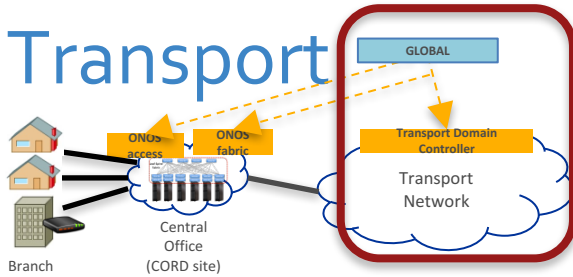
Fabric ONOS

OFDPA 3.0 Fabric drivers



CORD Fabric

Global to Local Orchestration: Transport



GLOBAL

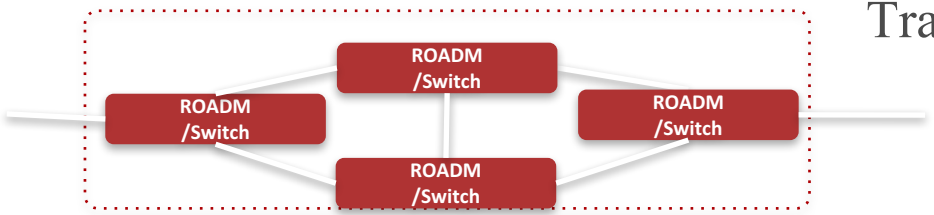
HTTP-channel

Forwarding Construct

- Admission control
- Routing and Wavelength Assignment (RWA)

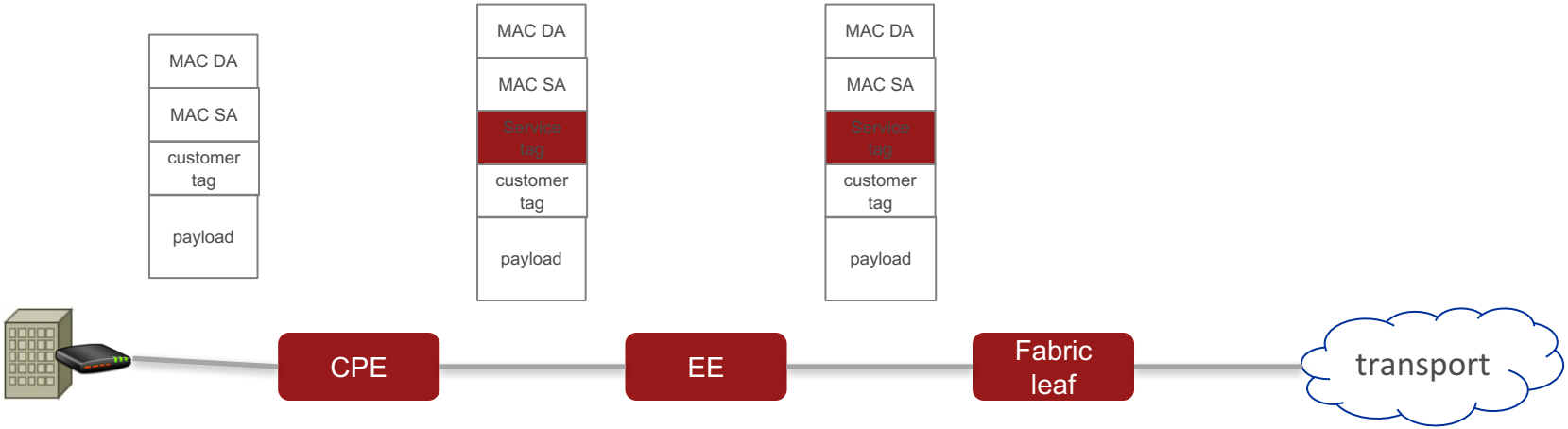
Transport ONOS

Optical/Roadm drivers



Transport Network

Local CORD POD Packet Operations



- Push/pop service tag
- QoS
- OAM

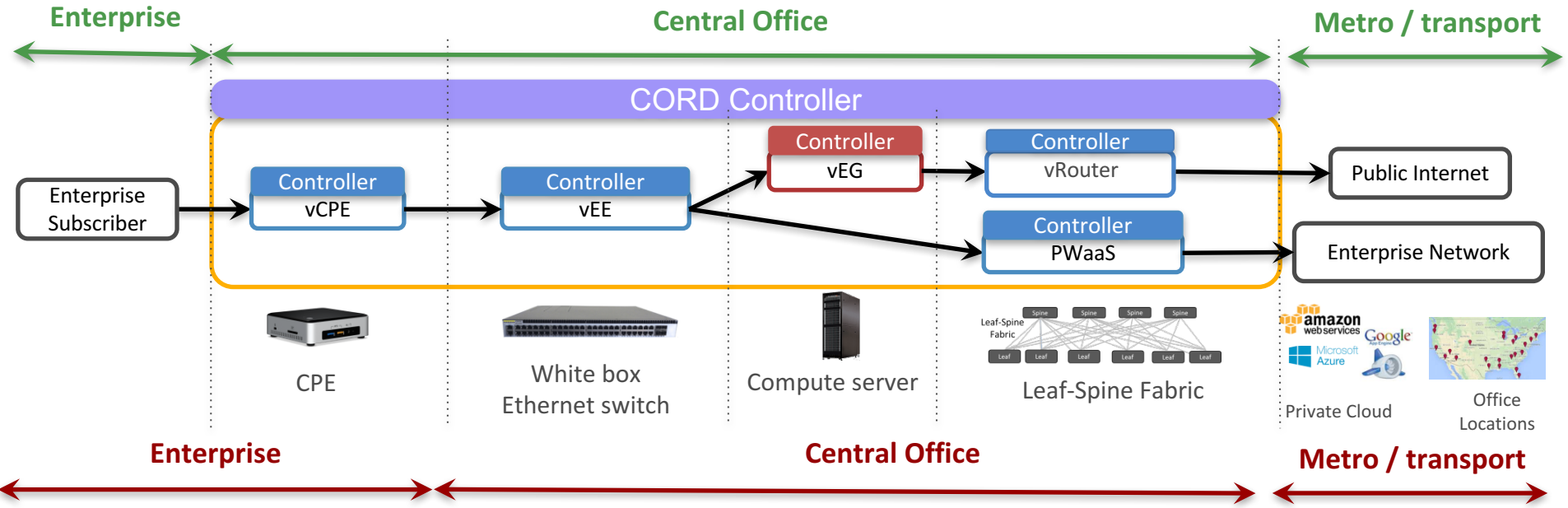
- Policing/QoS
- Forward to Fabric

- Cross-connection to transport network

Outline

- Value Proposition
- Architecture
- Services
  - Logical service graphs for local and global level
- Roadmap, Partners & Results

Logical Local Service Graph

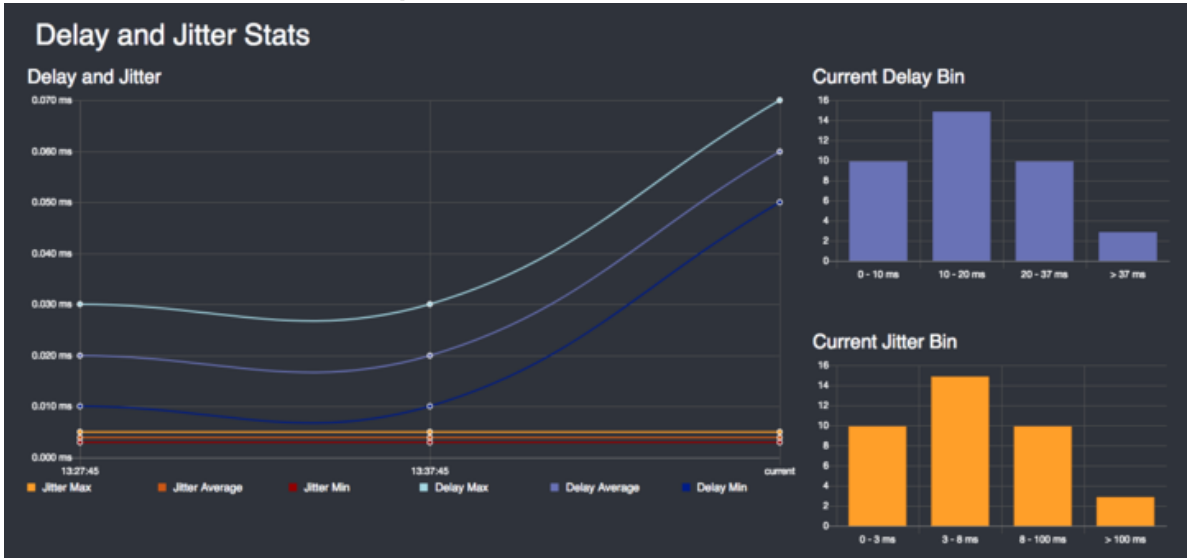


Local Services

- **vCPE**
  - Service classification
  - Programmable and on-demand OAM
  - Off-loaded to hardware
- **vEG**
  - DHCP for all, NAT for Internet traffic, firewall
  - Extensible encryption, etc.
- **vEE**
  - QoS: metering & queueing
  - Differentiate between public (go to vEG) and private traffic (go to PW)
  - Register to global level
- **Pseudo wire / VLAN xconnect**
  - Fast path through fabric
  - Connect EE-NNI, or EE-vEG and vEG-NNI
  - Applies NNI VLAN tag (at ingress)

OAM & CFM

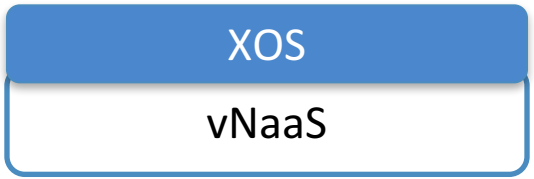
- Enabled by core ONOS platform APIs
- XOS offers on-demand OAM and visualization
- Implemented in Microsemi drivers, more to follow
- Talk in afternoon session by Sean Condon, Microsemi



Logical Global Service Graph

vNaaS: Virtual Network as a Service

- High level multi branch and pod topology
- LxVPN orchestration
- Generates abstract configuration of local service chain



Outline

- Value Proposition
- Architecture
- Services
- Roadmap, Partners & Results
  - E-CORD 1.0 Release!

Partners


CORD
Central Office Re-architected as a Datacenter


ONF
Open Networking Foundation


China
unicom中国联通


中国移动
China Mobile


NOKIA


Microsemi

Results

- Supports Carrier Ethernet services with strong SLA
- Basic enterprise service portfolio, rapidly growing
- Community growth
  - China Mobile, China Unicom, NTT, Telecom Italia
  - Nokia, Argela, Microsemi
- China Mobile has deployed E-CORD pod in their lab

  Pushing forward with additional services

E-CORD 1.0 Release

- E-CORD is already available!
  - In pre-release format
- Official release 1.0 coincides with CORD 4.1 release
  - December 1st, 2017
  - Gone through rigorous testing for automated build and deploy
  - Includes tests for service activation, API, and end-to-end data plane

Roadmap

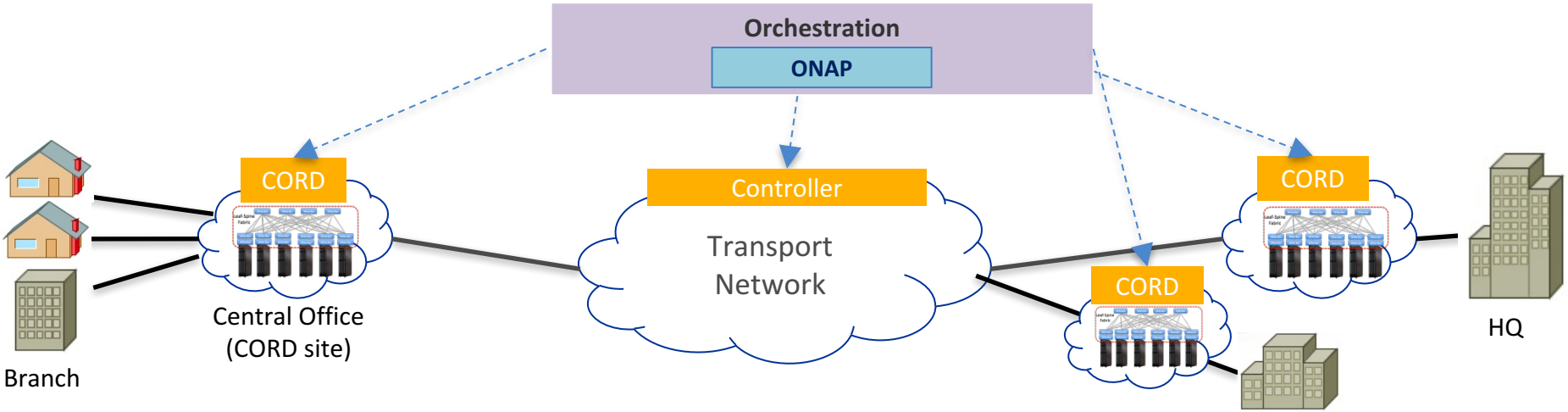
- Services, services, services
  - Firewall, WAN-X, SD-WAN, encryption, …
  - Both open and closed source
- CORD Fabric: Fastpath, additional VNF support
- Multi-Access CORD

- LxVPN provisioning
- Universal CPE

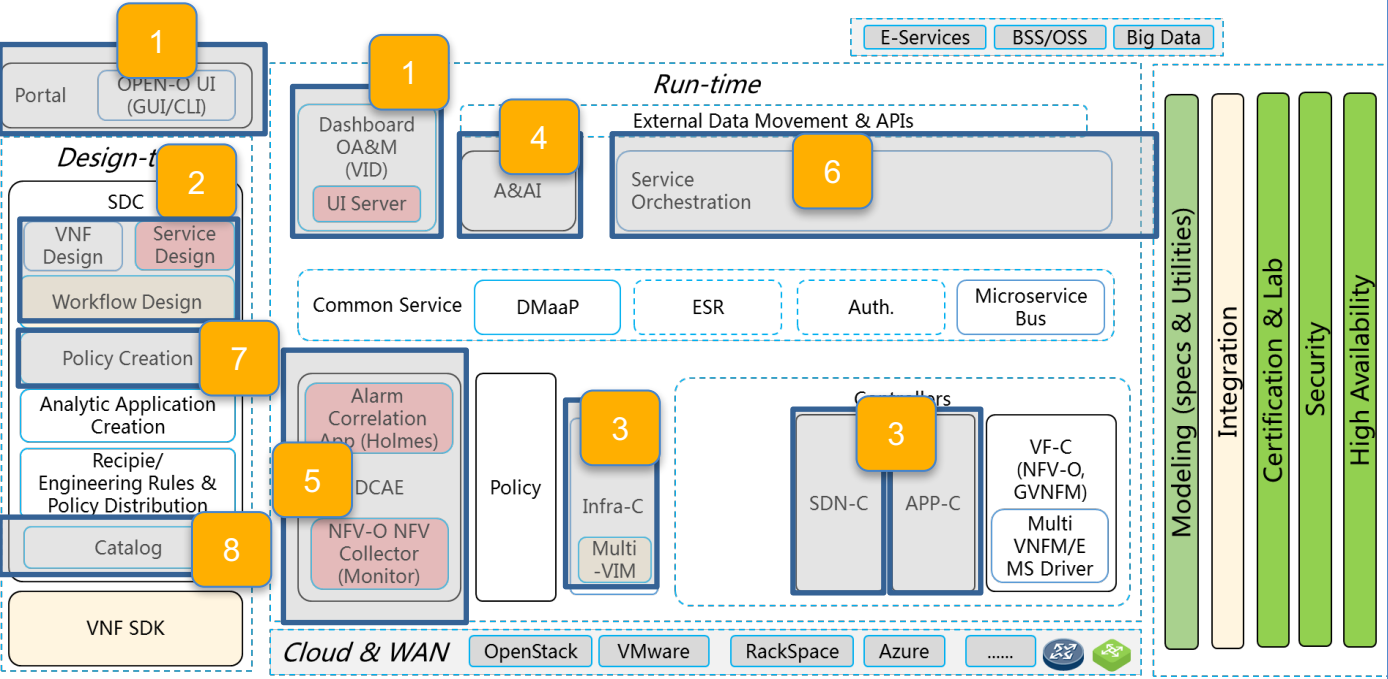
- ONAP integration

ONAP Future Plan

- Current implementation of global is based on XOS+ONOS
- Industry is showing strong interest in ONAP-based orchestrator
- Plan to demonstrate integration global ONAP orchestrator and CORD-based edge



ONAP Project Impact



Not in order of priority

1. CORD-specific portal/dashboard enhancements
2. E-CORD service design: L2VPN and vEG, and workflow definition to combine them (as used by MSO)
3. Integrate with CORD's external API for connectivity and application services, OR
   Integrate with Multi-VIM/Cloud mediation layer
4. Define CORD resource and service models
5. Alarm and event handling from CORD infrastructure. Monitoring data from CPE and possibly CORD fabric/VNFs.
6. Service orchestration to combine configuration of (a) multiple CPEs, (b) multiple CORD sites, and (c) transport network into end-to-end service delivery
7. Policy definitions for
8. Define catalog of CORD resources and services

Further Reading

CORD website:

http://opencord.org

Tutorials, documentation and general reading at:

https://wiki.opencord.org/ and https://guide.opencord.org

CORD is on Github at:

https://github.com/opencord

ONOS Transport wiki:
https://goo.gl/UiMauo

Mailing List:

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andrea@opennetworking.org

Questions