Enterprise CORD

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CORD Build, QCT headquarters, San Jose
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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

**Residential**
vOLT, vSG, vRouter, vCDN

**Mobile**
Disaggregated/Virtualized RAN & EPC, Mobile Edge Service

**Enterprise**
Virtual network on demand, many value-add services

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**Leaf-Spine Fabric**

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**Leaf-Spine Fabric**

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**ONOS + Trellis + XOS + OpenStack/Docker**

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**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
  - ...

+ SDN Control Plane
  - ONOS

+ NFV Orchestration
  - XOS

SDN Fabric

- Commodity servers, switches, network access

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
- ...

Delay and Jitter Stats

vNaaS Map

ELine Overview

Current Delay Bin

Current Jitter Bin
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

UNI

NNI

Access ONOS

CPE/EE drivers

CPEs

Ethernet Edge (EE) switch

Edge topology

GLOBAL

HTTP-channel

GLOBAL Transport Network

ONOS access

Central Office (CORD site)

Branch Transport Domain Controller

ONOS fabric
Local to Global Registration

GLOBAL

Big Switch

HTTP-channel

Fabric ONOS

OFDPA 3.0 Fabric drivers

CORD Fabric

ONOS Fabric

ONOS Fabric

Transport Domain Controller

Transport Network

Central Office (CORD site)

Branch
Local to Global Registration

GLOBAL

HTTP-channel

Transport ONOS

Optical/Roadm drivers

Transport Network

Big Switch

NNI

ONOS access
Central Office (CORD site)

Branch

Transport Domain Controller

Transport Network

ROADM/Switch

ROADM/Switch

ROADM/Switch

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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

ONOS

NI

GLOBAL
Global to Local Orchestration

EVC request

GLOBAL

Forwarding Constructs

Access ONOS
Fabric ONOS
Fabric ONOS
Access ONOS

Central Office 1
Transport ONOS
Central Office 2

Admission control
Orchestration
Break down EVC into forwarding constructs
PCE
Resource management
Service tag generation
Global to Local Orchestration: Access

- Admission control
- QoS profile setup
- Service tagging

Access ONOS

CPE/EE drivers

CPEs

Ethernet Edge (EE) switch

Forwarding Construct

Edge topology
Global to Local Orchestration: Fabric

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

Fabric ONOS

OFDPA 3.0 Fabric drivers

CORD Fabric
Global to Local Orchestration: Transport

- Admission control
- Routing and Wavelength Assignment (RWA)

HTTP-channel

Transport ONOS
- Optical/Roadm drivers

Transport Network

Forwarding Construct

GLOBAL

Transport Domain Controller
- Central Office (CORD site)
- Branch

ONOS access

Central Office (CORD site)
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
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

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• E-CORD 1.0 Release!
Partners
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 1\textsuperscript{st}, 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

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
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

Not in order of priority

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Further Reading

CORD website:
http://opencord.org
Tutorials, documentation and general reading at:
CORD is on Github at:
https://github.com/opencord
ONOS Transport wiki:
https://goo.gl/UiMauo
Mailing List:
cord-dev@opencord.org
cord-discuss@opencord.org

By email:
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Questions