Game changing scalability for Cable Operators

Cisco Knowledge Network (CKN)

December 3 2019
Agenda

- Cloud CMTS
- DAA + Automation & Orchestration
- Single Pane of Glass Management
Evolution of Cable to Webscale Architecture

- **Cloud CMTS**
  - Virtualized CCAP Core
  - Flexible MAC

- **DAA**
  - Physical Core
  - RPHY
  - CIN network

- **Automation**
  - RPD, CCAP core and CIN onboarding
  - SW Upgrade, Change Management

- **SPOG Cloud & DAA Mgmt**
  - DC, DAA and CCAP Health Management
  - Analytics and Cross Domain Orchestration
Cisco Cloud Native Broadband Router

A containerized, cloud native, CCAP, unifying multivendor solutions into a single, secure, standards-based architecture

<table>
<thead>
<tr>
<th>Cloud native</th>
<th>Operational Simplicity</th>
<th>Automation &amp; API Driven</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFV done right. Containerized software architecture that is elastic, resilient and composable simplifying the transition to CI/CD.</td>
<td>Microservices architectural pattern for high portability, scalability, and elasticity. Moving from SNMP and CLI to API and dashboard driven architecture.</td>
<td>APIs enabling Intent driven networking. Transform network operations with closed-loop automation.</td>
</tr>
</tbody>
</table>
cnBR Architecture

Operations Hub (OpsHub)
- Health Monitoring
- Automation
- Provisioning

cnBR Cluster
- DOCSIS APP Services
- DOCSIS CP Services
- DOCSIS Real Time
- DOCSIS DP Services

Common Cloud Native Stack for vEPC, Cloud CMTS and vBNG

High-Perf Container networking
- vSwitch, FD.io, Ligato.io, etc

Cloud Native Infra: K8s, Docker, etc

Host OS

Server HW / FW (Bare metal or VM)
cnBR Enables Convergence At The Edge for 5G

End2End Automation Integration

- cnBR for Cable
- vEPC for Mobility
- Telco vBNG

Common Cloud Native Stack

Kubernetes Cluster

Host OS

Server HW

Compute

Storage

Network

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cnBR Managed from a Single Pane of Glass

Operations Hub
- Health Monitoring
- Analytics
- Optimization
- Automation
- Cross Domain Orchestration
- Cloud CMTS LifeCycle Mgmt

Data & Messaging Infra: KAFKA, etcd, ...

DOCSIS APP Services
- CM Load Balancing
- Packetcable / PCMM
- RPHY Manager
- App upgrader
- DSG
- IPDR...

Data & Messaging Infra: KAFKA, etcd, ...

DOCSIS Real Time
- US Scheduler
- Ranging

DOCSIS CP Services
- DOCSIS core protocol
- PTP
- BPI
- OFDM...

DOCSIS DP Services
- VPP vSwitch
- VPP DP
- DHCP Relay Agent

vSwitch (FD.io (VPP), Ligato.io)

Internet
- cnBR Managed from a Single Pane of Glass
- Operations Hub
- DOCSIS APP Services
- DOCSIS Real Time
- DOCSIS CP Services
- DOCSIS DP Services
- vSwitch (FD.io (VPP), Ligato.io)
- Internet
- Data Center Fabric
- CIN
- RPD
- CM
Operational Efficiency
Feature, Test and validation lifecycle efficiency

- Legacy operations
  - New Functions
  - Design
  - Test
  - Provision
  - Deploy
  - Monitor
  - Every 2 weeks
  - 6+ Months

- Cloud Native operations
  - New Service Container
  - Design
  - Deploy
  - Provision
  - Monitor
  - Test
  - Every 2 weeks

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cnBR Supported Services

- DOCSIS 3.0
- DOCSIS 3.1
- Voice
- DSG
- BSOD
- RPHY
- Health Visualization
- Infrastructure Resiliency
- Service Resiliency
Highly Scalable System

**Base system:** 3-node cluster, 2 active and one standby, running cnBR and Cloud Native Software Infrastructure

<table>
<thead>
<tr>
<th>Features</th>
<th>Base cnBR System</th>
<th>Expansion Server (Server 3+)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throughput</td>
<td>100G</td>
<td>100G (Server 3+)</td>
</tr>
<tr>
<td>CMs</td>
<td>20000</td>
<td>20000</td>
</tr>
<tr>
<td>Service Group</td>
<td>160</td>
<td>160</td>
</tr>
</tbody>
</table>
DAA + Automation and Orchestration
Cross Domain Orchestration
Evolution to Intent based Automation

- GUI
  - Operations catalog
    - Upgrade/Downgrade MCP
    - Golden Config
    - cBR8 to cnBR offload
    - Service Group onboarding
    - Resource Validation
    - Device Onboarding & activation
    - Pre & Post Checks
    - Device Migration
- Cross Domain Orchestration Platform – workflow engine
- Service Design Platform
  - Modelling
  - Template editor
  - Simulation
- Service instantiation Platform
  - Configuration Management
  - Inventory Management
  - Image Management
  - Policy Management
- Service Assurance Platform
  - Collector
  - Event correlation
  - Expert system
  - Health monitor
- Recommendation Engine Platform
  - AI/ML
- Domains
  - PTP controller
  - CIN controller
  - CCAP controller
  - RPD controller
  - cnBR controller
  - Fabric controller
  - Node controller
  - MPEG Video controller
  - Cable Modem controller

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DAA Management Architecture

- Monitoring & Analytics
- BPA Workflow Engine
- Smart PHY
- Network Services Orchestrator

- BSS/OSS
- Modular and flexible DAA workflows

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DAA Automation Service Offer

End-to-End Solution to Onboard and Activate elements of a Remote-PHY Network.

5 Use Cases that leverage Smart-PHY, BPA, and NSO
DAA Automation Service Offer

Service request, configuration and fulfillment Portal

User interface
- Workflow manager
- Automation and orchestration

Backend system
- Team Coordination
- Configuration Standardization
- Deployment at Speed and Scale
  - CIN O&A
  - cBR8 / RPD O&A
  - OS Upgrades
  - Golden Config Templates

DAA Automation Platform
- Service Readiness
- Deployment Status

Provisioning
Operations
# DAA-A 1.0 Offer

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Automated RPD Onboarding and Activation</strong></td>
<td>RPD can be onboarded via GUI or REST API call from 3rd party application</td>
</tr>
<tr>
<td><strong>Automated CIN Onboarding and Activation</strong></td>
<td>Onboarding (BPA and NSO) of existing CIN Devices via Zero Touch Provisioning</td>
</tr>
<tr>
<td><strong>Automated cBR-8 Onboarding and Activation</strong></td>
<td>Onboarding of existing cBR-8 devices into BPA and NSO</td>
</tr>
<tr>
<td><strong>OS Upgrade</strong></td>
<td>Upgrade of CIN and cBR-8 devices. Defined process template leveraged from workflows.</td>
</tr>
<tr>
<td><strong>Configuration Compliance</strong></td>
<td>Predefined configurations that allows to maintain consistent configuration on devices.</td>
</tr>
</tbody>
</table>
DAA Automation Evolution
Support Multi-vendor Environments

CCAP Core Vendor

CCAP Vendor 2

CCAP Vendor 3

CIN Vendor

CIN Vendor 2

CIN Vendor 3

RPD Vendor

RPD Vendor 2

RPD Vendor 3

Current Offer
In Production
TBD
Single Pane of Glass
Operations Hub
Operations Hub Business Drivers

OpsHub Drivers

**Simplification**
- Provide common tools and framework for DAA deployments
- Deliver single pane of glass & core functionality to manage, automate and simplify DAA deployments
- Provide a common interface and tooling for CBR-8 and cnBR environments
- Ease integration into existing back-office

**Ease Migration to Cloud**
- Simplify deployment of cnBR
- Single pane of glass to ease migration to cloud
- Provide core management and configuration capability for cnBR
- Create an ecosystem for new applications innovation by operators and partners
Operations Hub (OpsHub)

01 Ecosystem Health Monitoring
02 Automation
03 Performance
04 Security & accounting

A Cloud Native Applications Ecosystem to Manage, Operate and Optimize DAA + Cloud Deployments

40% Health management

20% Performance Management
30% Configuration and Automation
10% Security & Accounting

API First, Insight Based, Telemetry Driven and Analytics Focused
# Operations Hub Functional Components

## OpsHub Applications

<table>
<thead>
<tr>
<th>Health Monitoring</th>
<th>Configuration</th>
<th>Accounting</th>
<th>Performance</th>
<th>Controllers</th>
<th>Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Service Health</td>
<td>• cnBR Deployer</td>
<td>• Inventory</td>
<td>• D3.1 Profile Optimization</td>
<td>• GCPP Core</td>
<td>• Authentication</td>
</tr>
<tr>
<td>• Network Health</td>
<td>• RPD Configuration</td>
<td>• Usage metrics</td>
<td>• RF Optimization</td>
<td>• GCP Redirect</td>
<td>• Infra security</td>
</tr>
<tr>
<td>• System Health</td>
<td>• CIN Configuration</td>
<td>• Fault metrics</td>
<td>• Capacity Planning</td>
<td>• Aux Core</td>
<td>• Application security</td>
</tr>
<tr>
<td>• CCAP health</td>
<td>• iNode Manager</td>
<td>• Audit metrics</td>
<td>• CIN optimization</td>
<td>• Cross Domain Orchestration (SmartPHY 3.0)</td>
<td></td>
</tr>
</tbody>
</table>
A Single Pane of Glass Management for Current and future DAA Deployments

- Operations Hub
  - Health Monitoring
  - Analytics
  - Automation
  - Cross Domain Orchestration
  - Optimization
  - Cloud CMTS LifeCycle Mgmt

- Other OSS/BSS
  - IPDR Collector
  - AIOps
  - Topology Mgmt
  - HFC Health Insight

- cBR-8 CCAP
  - 100s – 1,000s RPDs & SGs

- Mini-Data-Center 1 (cnBR Cluster 1)
  - cnBR Ins A
    - Server N
    - Server 2
    - Server 1
  - 100s – 1,000s RPDs & SGs

- cnBR Clusters
  - Mini-Data-Center 2 (cnBR Cluster 2)
    - CNBR Inst B
      - Server N
      - Server 2
      - Server 1
    - 100s – 1,000s RPDs & SGs

- Mini-Data-Center M (cnBR Cluster M)
  - CNBR Inst Y
    - Server N
    - Server 2
    - Server 1
  - CNBR Inst X
    - Server N
    - Server 2
    - Server 1
  - 100s – 1,000s RPDs & SGs
Customer Deployment Model Examples

Our Vision

On-Premise
- SMI Deployed Operations Hub Infrastructure
- Individual Applications with Helm charts
- Support Both Basic and Advanced Features

Hybrid
- Local On-Prem Data lake
- Application in the cloud

SaaS
- Option for some applications
cnBR Management

- OpsHub
- CX Cross Domain Orchestration Offer*
Cloud CMTS Mgmt Architecture
Cisco Cable Cloud Base Stack

- Cable Software Package
  - Instantiation of Cisco cnBR Core Infra
  - Deployment of Cisco cnBR CNF
  - Lifecycle Management of cnBR Core
  - Telemetry from cnBR Core
  - Config API Representation

- Base-stack
  - Hypervisor
  - Host OS
  - Compute / Storage
  - Switch Fabric
Full-stack: Cross-Domain Orchestration and Base-Stack

- **Top-stack**
  - Instantiation of cnBR Core Infra
  - Deployment of cnBR Core NF
  - Lifecycle Management of cnBR
  - Service Assurance of cnBR Core
  - cnBR Core Function Pack (NSO)

- **Base-stack**
  - VMware or Baremetal
  - Cisco UCS
  - Cisco Switch Fabric (ACI / Nexus)
Summary

Cable’s Evolution to Webscale has started but to get to cloud scale, you need to...

- Deploy DAA – RPHY + CIN
- Automate your operations
- Implement cross domain orchestration
- Simplify management with a Single Pane of Glass