Cable DAA Automation Solution Offer
Cisco Knowledge Network

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9/11/2019
Agenda

- State of Automation in SPs
- Cable Automation Strategy
- Cable DAA Automation Solution
- Cable “DAA Automation Offer”
- Automation Business Outcome
- Overview of SCTE 2019 Cable Tec Expo
State of SPs- Digital Transformation
Where are SPs in the Digital Journey?
Cisco SP Digital Transformation Study

“The most successful SPs are defined as “pioneers.” But they represent only a small percentage of all SPs. Most SPs run their business using “ad-hoc” approaches or simple “manual” methods.

Source: IDC
Business Outcome of DX

They have improved key business metrics

- Revenue: 14%
- Profit: 22%
- Customer Retention: 30%
- Customer Satisfaction: 40%

They have reduced costs and cycle times

- Operational costs: -49%
- Time to market: -88%

Source: IDC-Cisco IDI’s with 20 Mature SPs
“Automation applied to an inefficient system will magnify the inefficiency. Conversely, automation applied to an efficient system will magnify the efficiency.”

Bill Gates
Cable Automation Strategy
Cable Core Transformation Strategy

digitize
Remote PHY

to
virtualize
Cloud CCAP

to
densify
FDX & MBH

<table>
<thead>
<tr>
<th>Automation Apps</th>
<th>Cable Apps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated Apps</td>
<td>Cable Apps</td>
</tr>
</tbody>
</table>

Enabled by IP, Open Source and Data - Powered by Innovation
Transforming Cable with Automation

Improve time to activation
Simplify network operations
Enable end-to-end visibility
Improve Mean Time to Repair (MTTR)

Cross Domain Workflow Automation & Orchestration
End to End Network Monitoring, Assurance and Optimization
Real Time Analytics, Business Insights and Correlation
SP Automation Framework

<table>
<thead>
<tr>
<th>Business &amp; Operations Processes &amp; Systems</th>
<th>Service Automation</th>
<th>Application Automation</th>
<th>Data &amp; Analytics</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Product Catalog</td>
<td>• Design &amp; Modeling</td>
<td>• CI/CD Toolchain</td>
<td>• Performance</td>
</tr>
<tr>
<td>• Order Management</td>
<td>• Simulation &amp; Staging</td>
<td>• API Management</td>
<td>• Availability &amp; Continuity</td>
</tr>
<tr>
<td>• Mobile Device Mgmt</td>
<td>• Service Catalog</td>
<td>• Definition &amp; Development</td>
<td>• Revenue Assurance</td>
</tr>
<tr>
<td></td>
<td>• Service Lifecycle</td>
<td>• Scheduling &amp; Orchestration</td>
<td>• Event Management</td>
</tr>
<tr>
<td></td>
<td>• Service Orchestration</td>
<td>• Coordination &amp; Discovery</td>
<td>• KPI Management</td>
</tr>
<tr>
<td></td>
<td>• Service Monitoring</td>
<td>• Service Management</td>
<td>• Diagnostics &amp; RCA</td>
</tr>
<tr>
<td></td>
<td>• Service Assurance</td>
<td>• Application Assurance</td>
<td>• Correlation</td>
</tr>
<tr>
<td></td>
<td>• Naming &amp; Discovery</td>
<td>• Performance &amp; Scaling</td>
<td>• Prediction, Insight</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Security &amp; Policy</th>
<th>Infrastructure Automation</th>
<th>DAA Automation Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Data Protection &amp; Availability</td>
<td>• Network Design</td>
<td></td>
</tr>
<tr>
<td>• Identity Management</td>
<td>• Capacity Planning</td>
<td></td>
</tr>
<tr>
<td>• Access Control</td>
<td>• Element Modeling</td>
<td></td>
</tr>
<tr>
<td>• Certificate Management</td>
<td>• Network Optimization</td>
<td></td>
</tr>
<tr>
<td>• Fraud Management</td>
<td>• Workflow Management</td>
<td></td>
</tr>
<tr>
<td>• Risk Management</td>
<td>• Workforce Management</td>
<td></td>
</tr>
<tr>
<td>• Intrusion Detection &amp; Prevention</td>
<td>• Element Lifecycle</td>
<td></td>
</tr>
<tr>
<td>• Distributed Firewall</td>
<td>• Software Lifecycle</td>
<td></td>
</tr>
<tr>
<td>• Policy &amp; Rules Mgmt</td>
<td>• Resource Lifecycle</td>
<td></td>
</tr>
<tr>
<td>• Lawful Intercept</td>
<td>• Resource Configuration</td>
<td></td>
</tr>
<tr>
<td>• Regulatory &amp; Compliance</td>
<td>• Resource Monitoring</td>
<td></td>
</tr>
</tbody>
</table>

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DAA Management Architecture
Cross Domain Orchestration
Evolution to Intent based Automation

GUI

Operations catalog
- Upgrade/Downgrade MGP
- Golden Config
- cBR8 to cnBR offload
- Service Group onboarding
- Resource Validation
- Device Onboarding & activation
- Pre & Post Checks
- Device Migration

Service Design Platform
- Modelling
- Template editor
- Simulation

Service instantiation Platform
- Configuration Management
- Inventory Management
- Image Management
- Policy Management

Service Assurance Platform
- Collector
- Health monitor
- Event correlation
- Expert system

Recommendation Engine Platform
- AI/ML

Domains
- PTP controller
- CIN controller
- cBR8 controller
- RPD controller
- Router controller
- cnBR controller
- Fabric controller
- iNode controller
- MPEG Video controller
- Cable Modem controller

Cross Domain Orchestration Platform – workflow engine

API Gateway

Security
DAA Automation Solution

Customer Experience
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
From complexity... to simplicity with automation
A platform for innovation

Timeframe: Weeks

Design  Build  Provision  Val  Automated  Deployment  Operate

Manual

Service-oriented

Deployment at Scale

Faster time to revenue

Increase operational efficiency

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DAA Automation Architecture
Components, Interfaces and Functions

DAA Automation Platform
- BPA
- SmartPHY
- NSO

R-PHY Components
- CCAP-CORE
- CIN Devices
- RPD

3rd Party App
- REST API
- SSH
- PTP 1582
- DHCP
- GCP

R-PHY Components

- PTP Master
- DHCP Server (RPD's)

Provide PTP Clocking
Provide DHCP Address, CCAP-CORE, Timing-offset, syslog Server, ToD

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## Baseline Capabilities

<table>
<thead>
<tr>
<th>Capabilities</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre/Post Checks</td>
<td>Execute series of commands before and after an specific activity to analyze changes or impact of the executed activity.</td>
</tr>
<tr>
<td>3rd Party Integration</td>
<td>Allow 2-way (if needed) with 3rd part applications to trigger workflows in BPA or Allow BPA to notify events on an activity taking place.</td>
</tr>
<tr>
<td>Batch Configuration</td>
<td>Configured 1 or more devices following an specific configuration template.</td>
</tr>
<tr>
<td>Batch OS Upgrade</td>
<td>Execute OS Upgrades in Serial or Batch mode.</td>
</tr>
<tr>
<td>Market Variances</td>
<td>Define key variables associated to device configuration based on the requirements define for an specific region.</td>
</tr>
<tr>
<td>Workflow Engine</td>
<td>Open source workflow engine</td>
</tr>
<tr>
<td>Email Notification</td>
<td>Provide email notification based on specific events or requirements.</td>
</tr>
</tbody>
</table>
### DAA-A 1.0 Solution

#### BPA Capabilities + Remote-PHY Specific needs

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

- CCAP-Core O&A (*)
- OS Upgrade (*)
- Device Golden Configuration (*)
- CIN O&A (*)
- CIN RPD’s
- CCAP Core
- RPD’s

(*): Use Cases included in the Release 1.0
As a cable operator, I can automatically coordinate and execute RPD deployment tasks, so that RPD deployment is easy, accurate and fast.
RPD O&A: Automated Actions and Coordinated activities

1. Initiate workflow through API call or GUI
2. Notification and coordination with the Outside Plant Technician to install RPD
3. Automated IP connectivity verification
4. Automated L3 Connectivity between cBR_8 and CIN switch along with switch Port Activation
5. Configure cBR-8 to add requested RPD
6. Verify RPD is online and notify teams or applications accordingly.

Converged Interconnect Network (CIN)
Remote PHY Device (RPD)
Cisco cBR-8
As a cable operator, I can automatically coordinate and execute CIN device deployment tasks so that CIN device deployment is easy, accurate, and fast.
Automated cBR-8 Onboarding

The process of onboarding a cBR-8 is time consuming and prone to errors when performed manually. While the size of a cBR-8 configuration can be rather large much of it is repeatable both within sections of a chassis and across multiple chassis. Automating cBR-8 onboarding can reduce the risk of errors and increase onboarding time significantly.

MSOs must deploy large numbers of RPDs, necessitating automation. Logically, automating the other elements in a R-PHY network (cBR-8s, CIN devices) enable a complete end-to-end automated deployment process.

In user story form:

As a cable operator, I can automatically onboard cBR-8s significantly speeding up deployment time and greatly reducing the chance for errors.
As a cable operator, I can automatically coordinate, Schedule and execute OS Upgrades on CCAP-CORE and/or CIN Devices.
Golden Configuration Templates

CCAP-Core devices require to have a set of global commands critical for a smooth R-PHY network operation.

MSOs must deploy a relative large numbers of CIN Devices that will be geographically dispersed that require standardized configuration for ease of operation.

In user story form:

As a cable operator, I can automatically apply standardized configuration templates to CCAP-Core and CIN devices.
What DAA Automation Can Offer ??

- Improve Team Coordination
- Faster Deployment
- Deployment Success Rate

Execute the Deployment of an RPD when the outside plant work is finished.

An OS Upgrade reduced from 40 manual steps to 4

Standardization across Network
Why Automation?

Complexity Drivers

- Geographical Dispersion
- Team Coordination
- Transport Constraints

Number of Devices:

- #CMTS ~ n
- #CIN ~ n x ~14 (*)
- #RPD ~ n x ~448 (*)

(*) Number of times a new configuration will need to be applied for every CMTS.
Why Automation?

- **Complexity Drivers**
  - Geographical Dispersion
  - Team Coordination
  - Transport Constraints

Number of Devices

Deployment Coordination Complexity

- #CMTS ~ n
- #CIN ~ n x ~14 (*)
- #RPD ~ n x ~448 (*)

(*) Number of times a new configuration will need to be applied for every CMTS
I-CMTS Architecture (Legacy)

**I-CMTS Architecture (Legacy)**

<table>
<thead>
<tr>
<th>IP Domain</th>
<th>HFC Domain</th>
<th>IP Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCF network limit higher speeds due to Noise and Analog Modulation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Definitions:**
- CMTS: Cable Modem Termination System
- DOC MAC: DOCSIS MAC Layer
- DOC/VID PHY: DOCSIS/Video PHY Layer

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Remote-PHY Architecture

Fiber from CCAP-CORE to Fiber node (GS7000) allows speed increase because HCF domain is smaller which improves Signal to Noise Ratio.

CIN: Converged Interconnect Network
RPD: Remote-PHY Device
With R-PHY the Access to the network is or could be distributed across a large region through the implementation of a L2/L3 network.

CIN: Converged Interconnect Network
RPD: Remote-PHY Device
Automated RPD Onboarding and Activation

1. Workflow triggered via Form Order or API call

2a. Outside Plant work: RPD Installation
2b. Inside Plant work: CIN Verification

DAA Automation Platform
- SmartPHY Mobile App
- BPA
- SmartPHY
- NSO

Cisco cBR-8

Converged Interconnect Network (CIN)

Remote PHY Device (RPD)
DAA Automation Service Offer

Customer Experience
DAA Automation Service Offer

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

• 5 Automation related use cases that will allow to manage the Life cycle of the Remote-PHY components.
## DAA-A 1.0 Offer

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</table>
Delivering DAA Business Outcomes

Open Automation Platform
Multi-vendor, extensible and programmable deployment at scale increases standardization, reduces risk

End-to-End Deployment
R-PHY deployed from one tool

From Days to Minutes
Deployment of new devices done in minutes and right the first time round

Innovation
Business Transformation via Cross Domain Workflow Automation &Orchestration
DAA Automation *Evolution*  
*Support Multi-vendor Environments*
Quantifying the Business Impact of Automation
### Business Value of Automation & Cross Domain Orchestration Based on customer performance stats

<table>
<thead>
<tr>
<th>Operational Processes</th>
<th>Avg. volumes / y</th>
<th>FTE avoided*</th>
<th>Efficiency gain</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPD onboarding</td>
<td>10-20k</td>
<td>~221</td>
<td>74%</td>
<td>~460K man-hours avoided</td>
</tr>
<tr>
<td>CIN onboarding</td>
<td>1000-2000</td>
<td>~25</td>
<td>66%</td>
<td>~52K man-hours avoided</td>
</tr>
<tr>
<td>CCAP on-boarding</td>
<td>100-500</td>
<td>~10</td>
<td>50%</td>
<td>~20K man-hours avoided</td>
</tr>
<tr>
<td>MOP Operations</td>
<td>2000-4000</td>
<td>~117</td>
<td>66%</td>
<td>~236K man-hours avoided</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tier 1 SP Business Case analysis</th>
<th>Ops efficiency gain</th>
<th>ROI</th>
<th>Savings</th>
<th>Pay-back</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>~60-71%</td>
<td>88-138%**</td>
<td>$2-54 M**</td>
<td>12-18 months**</td>
</tr>
</tbody>
</table>

**Assumptions:**
- 5 year savings.
- Analysis based on estimated number of operations transactions per year

**Notes:**
- * Based on 40 Hrs per week
- ** Preliminary data

*Target is Web Scale!*
# OpEx Reduction & Efficiency Through Automation

## Operating Cost

### CCAP Onboarding*

<table>
<thead>
<tr>
<th>Operation</th>
<th>% of Service Op Cost</th>
<th>Op Cost Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change order</td>
<td>6%</td>
<td>25%</td>
</tr>
<tr>
<td>Order Entry*</td>
<td>6%</td>
<td>33%</td>
</tr>
<tr>
<td>Order processing</td>
<td>13%</td>
<td>30%</td>
</tr>
<tr>
<td>Config Validation</td>
<td>26%</td>
<td>70%</td>
</tr>
<tr>
<td>Provisioning</td>
<td>19%</td>
<td>75%</td>
</tr>
<tr>
<td>Network Configuration</td>
<td>17%</td>
<td>78%</td>
</tr>
<tr>
<td>Post-Check TTU</td>
<td>25%</td>
<td>50%</td>
</tr>
</tbody>
</table>

### CIN Onboarding

<table>
<thead>
<tr>
<th>Operation</th>
<th>% of Service Op Cost</th>
<th>Op Cost Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change order</td>
<td>6%</td>
<td>25%</td>
</tr>
<tr>
<td>Order Entry</td>
<td>5%</td>
<td>25%</td>
</tr>
<tr>
<td>Order fulfillment &amp; Processing</td>
<td>17%</td>
<td>45%</td>
</tr>
<tr>
<td>Service config generation/valid</td>
<td>24%</td>
<td>53%</td>
</tr>
<tr>
<td>provisioning</td>
<td>17%</td>
<td>94%</td>
</tr>
<tr>
<td>Network configuration</td>
<td>23%</td>
<td>90%</td>
</tr>
<tr>
<td>Post Check &amp; Test</td>
<td>14%</td>
<td>50%</td>
</tr>
</tbody>
</table>

### RPD Onboarding*

<table>
<thead>
<tr>
<th>Operation</th>
<th>% of Service Op Cost</th>
<th>Op Cost Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change order</td>
<td>6%</td>
<td>50%</td>
</tr>
<tr>
<td>Fulfillment</td>
<td>6%</td>
<td>50%</td>
</tr>
<tr>
<td>Order processing</td>
<td>14%</td>
<td>80%</td>
</tr>
<tr>
<td>Config Validation</td>
<td>28%</td>
<td>40%</td>
</tr>
<tr>
<td>Provisioning</td>
<td>8%</td>
<td>70%</td>
</tr>
<tr>
<td>Network Configuration</td>
<td>26%</td>
<td>85%</td>
</tr>
<tr>
<td>Post Check &amp; TTU</td>
<td>12%</td>
<td>50%</td>
</tr>
</tbody>
</table>

### MOP

<table>
<thead>
<tr>
<th>Operation</th>
<th>% of Service Op Cost</th>
<th>Op Cost Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOP order</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>Route Order</td>
<td>12%</td>
<td>40%</td>
</tr>
<tr>
<td>Order processing</td>
<td>12%</td>
<td>86%</td>
</tr>
<tr>
<td>Config Generation</td>
<td>8%</td>
<td>93%</td>
</tr>
<tr>
<td>Pre-check</td>
<td>10%</td>
<td>90%</td>
</tr>
<tr>
<td>Network Configuration</td>
<td>33%</td>
<td>90%</td>
</tr>
<tr>
<td>Post Check &amp; Document</td>
<td>20%</td>
<td>60%</td>
</tr>
</tbody>
</table>

*Preliminary data for DAA

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Transforming Cable with Automation
Executive Summary

Manage Network & Service Lifecycle

Automate Operations

Monitor and Optimize network performance

Provide real Time Analytics and Insights

Faster Time to Market

Reduce Opex

Improve Customer Satisfaction

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Overview of SCTE 2019 Cable Tec Expo
SCTE Cable-Tec Expo 2019

- Conference: September 30 - October 3
- Exhibition: October 1-3
- New Orleans: Ernest N. Morial Convention Center
- Booth #1301 – 40x40
- Show times:
  - Tuesday, October 1: 11:30 – 6:00
  - Wednesday, October 2: 11:30– 6:00
  - Thursday, October 3: 9:00 – 1:00
2019 Expo Floorplan
Exhibit Hall

Cisco Booth
#1301, 40x40
Cisco Booth at SCTE 2019
40’ x 40’

Exhibit Hours:
Tuesday, October 1 | 11:30AM–6:00 PM
Wednesday, October 2 | 11:30PM–6:00 PM
Thursday, October 3 | 9:00AM–1:00 PM
Additional Resources

• Cisco Cable Page: www.cisco.com/go/cable

• Automation White Paper:
Automation Business Benefits

- 1,681,843 Man-Hours Saved*
- 70% Improvement in MTTR
- 61% Faster Customer On-Boarding
- 74% Improvement in network Operations

* Example based on RPD, CIN, CCAP onboarding, disconnects and MOP process.
Impact of Automation

Automation Impact on Opex

Before Automation

- RPD Onboarding: 10-18%
- MOP: 10-16%
- CIN onboarding: 5-13%
- CCAP Onboarding: 3-7%
- Incidents: 2-10%

After Automation

- 50-60% improvement in Opex

Cable Automation Journey

Source: Cisco CABU
Identify Automation Areas of Focus
71% More Efficient Labor Force

**People-hours by department**

<table>
<thead>
<tr>
<th>Department</th>
<th>People-hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSR</td>
<td>480 K</td>
</tr>
<tr>
<td>Field Tech.</td>
<td>849 K</td>
</tr>
<tr>
<td>Engineer</td>
<td>176 K</td>
</tr>
<tr>
<td>NOC</td>
<td>175 K</td>
</tr>
</tbody>
</table>

2.36 M total people-hours*

**People-hour savings by department**

<table>
<thead>
<tr>
<th>Department</th>
<th>People-hour savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSR</td>
<td>72%</td>
</tr>
<tr>
<td>Field Tech.</td>
<td>67%</td>
</tr>
<tr>
<td>Engineer</td>
<td>78%</td>
</tr>
<tr>
<td>NOC</td>
<td>85%</td>
</tr>
</tbody>
</table>

71% people-hour savings

*Over 5 years