TOMORROW starts here.
IT Operations Management in the SDN Era – Prime Infra with APIC-EM

BRKNMS - 1036

Phil Casini, Director, Product Management
Ronnie Ray, Sr. Director, Product Management
Agenda

• Introduction to Campus / Branch SDN
• Evolution to SDN led IT Operations
• SDN led Provisioning
• SDN led Monitoring and Assurance
• SDN led IT Process Automation
• SDN led Management Product Packaging
• Conclusion
Industry Transforming to Solutions Networking

Rapid IT Expansion Driver

Business Applications and Networking Components offered With “Some Assembly Required”

OPEX Reduction + LOB Agility Drivers

Delivery Model Shifts to Realign

Seamlessly Fused Business Applications And Networking Components “Out of the Box”

Piece Parts Delivery Model Must Evolve to a Business Solutions Model to Re-align with Today’s Operations Drivers and Network Complexities
This Transformation is Anchored in SDN (Abstractions and Intent Policies)

SDN Stack Model

- **Simplicity via Controllers**
  (one manageable source of truth to base network changes)
- **Automation via Apps**
  (rapid translation of intended business outcomes to required network behavior)
- **Flexibility via Loosely Coupled Abstractions**
  (harmonizes disparate network pieces to create a network as a “system”)

SDN Model Adds the Essential Ingredients that Makes Solutions Networking Possible for Complex Networks
Fast IT: The Effect of Solutions Networking

Transformation

Manual → Automated
Device by device → Network-wide
Configuration → Policy

Innovation

Closed Systems → Open and Programmable
Network Data → Business Intelligence
New Installations → Legacy + New Installations

Enterprise Networks Become More Agile, Effective, and Efficient to Operate
# Cisco Fast IT: Leading This Enterprise Transformation

<table>
<thead>
<tr>
<th>SECURITY</th>
<th>COLLABORATION</th>
<th>SERVICES</th>
<th>ORCHESTRATION</th>
<th>WAN</th>
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</table>

**Published REST APIs**

Application Centric Infrastructure (ACI) Compatible
Software Driven Enterprise Network Control and Management Platform

**Universal Network Element Plug and Play Layer**

- CATALYST
- NEXUS
- ISR
- ASR
- ASA
- WIRELESS
- Non Cisco Network Elements

A New Software Driven Platform for Solutions Development
Network Control and Management Are Foundational…

…Components of the Platform for Building Applications
Evolution to SDN Led Management
Common Policy Model from Branch to DC

Consistent Policy Across Cloud, DC, WAN and Access

Application Network Profile
SLA, Security, QoS, Load Balancing

User/Things Network Profile
QoS, Security, SLA, Device

Cloud
Data Center
WAN
Access
Changing Nature of IT Ops with SDN led Management

Traditional Management

SDN Led Management
Changing Nature of IT Ops with SDN led Management

Traditional Management

Customer developed provisioning tools, manual CLI changes, and run book automation for IT Operations support

SDN Led Management

Management (NMS)

NE  NE  NE  NE
Changing Nature of IT Ops with SDN led Management

Traditional Management

Customer developed provisioning tools, manual CLI changes, and run book automation for IT Operations support

SDN Led Management

Customer input on business / service intent

Automation (Workflow / Orchestration)

Management (Provisioning and Assurance)

Controller (APIC-EM)
Changing Nature of IT Ops with SDN led Management

Traditional Management

Feature Configuration

SDN Led Management

Customer input on business / service intent

Automation (Workflow / Orchestration)

Management (Provisioning and Assurance)

Controller (APIC-EM)

NE  NE  NE  NE
Changing Nature of IT Ops with SDN led Management

Traditional Management

Feature Configuration

SDN Led Management

Policy Automation

Customer developed provisioning tools, manual CLI changes, and run book automation for IT Operations support.
Systemic View of Management / Control Roles

- **Network Infra**: Owns the communication to/from the network and drives programmability.
- **System of Change**: Orchestrates sequential changes and enables IT process execution.
- **System of Automation**: Stores, processes and visualizes all historical data for monitoring and network change.

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Cisco Management Tool Portfolio for the Campus/Branch in 2014

- **System of Automation**: Manual or Custom Scripted by Customers / Partners
  - **Feature Configurable Provisioning**: Prime Infrastructure
  - **Common Controller Layer For Campus/Branch**: No Controller Existed in 2014

- **Common Automation Layer**:
- **Common Monitoring / Assurance**:
- **System of Record**: Prime Infrastructure

- **System of Change**:
- NE
- NE
- NE
- NE
- NE
- NE
Cisco APIC-EM: Campus/ Branch Controller

Network Abstraction and Automation

Software or Appliance Based

NB RESTful APIs

Existing and New Device Support

Agile Integration Model

Masking Network Complexity, Exposing Network Intelligence
## Key Milestones to SDN Led Management Evolution in 2015

<table>
<thead>
<tr>
<th>Q1 2015</th>
<th>Mid-2015</th>
<th>Q4 2015</th>
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<tbody>
<tr>
<td><strong>APIC-EM CA</strong>&lt;br&gt;Path Visualization application for network path tracing</td>
<td><strong>APIC-EM GA</strong>&lt;br&gt;Scalable controller foundation supporting multiple use case / apps</td>
<td><strong>APIC-EM Updates</strong>&lt;br&gt;Expanded application support across multiple enterprise use cases</td>
</tr>
<tr>
<td><strong>Prime Infra 2.2 FCS (Dec 2014)</strong>&lt;br&gt;Cross domain monitoring across WAN, Access, DC</td>
<td><strong>Prime Infra Niihau</strong>&lt;br&gt;Integration with APIC-EM for core network service automation</td>
<td><strong>Prime Infra Lanai</strong>&lt;br&gt;Integration with APIC-EM and Automation as System of Record</td>
</tr>
<tr>
<td><strong>APIC-EM Apps</strong>&lt;br&gt;IWAN app EFT with policy based provisioning of Secure WAN</td>
<td><strong>APIC EM Apps</strong>&lt;br&gt;IWAN App GA with dynamic QoS changes; BSA app EFT</td>
<td><strong>APIC-EM Apps</strong>&lt;br&gt;Multiple apps across Wireless, Access, Collab, Security and Automation</td>
</tr>
</tbody>
</table>
Cisco Controller and Management System Portfolio for the Campus/Branch in 12-24 Months

- Common Automation Layer
- Common Monitoring / Assurance
- Feature Configurable Provisioning
- Policy Prescriptive Provisioning
- Common Controller Layer for Campus/Branch
- System of Automation
- System of Record
- System of Change
- Branch Service Automation
- Prime Infrastructure
- Multiple APIC-EM Apps
- APIC-EM
Two Modes of System of Change Programmability with NB APIs

**FEATURE PROGRAMMABILITY**

- Traditional mode of network management focused on custom network design and individual feature configuration and deployment
- Network programmability through REST API’s for feature configuration and monitoring data
- Gradual progression into SDN-led automation through Zero Touch Deployment, Secure key automation and other core network services
- Needs deep technical expertise in Network Engineering (design) and IT Ops (deployment)

**POLICY PROGRAMMABILITY**

- Intent based policy abstraction of network wide device configuration with embedded CVDs and best practices
- Network programmability through NB API’s for policy deployment and telemetry access
- Rich selection of policy prescriptive apps that can be complemented with custom applications to suit organization needs
- Needs clear understanding of intent rather than deep Network Engineering expertise

Direction of market evolution with need for greater simplicity, agility and automation.
Two Deployment Modes for SDN led Provisioning with Distinct Network Scope

**FEATURE CONFIGURABLE NMS with APIC-EM**
- Custom apps utilizing feature programmability via Prime NB APIs for configuration and data
- Prime Infra NMS integrated with APIC-EM providing full GUI based configuration and FCAPS management orchestrated by the System of Automation

**POLICY PRESCRIPTIVE APPS on APIC-EM**
- Cisco developed modular, policy automated management apps with common UI/UX framework with and embedded service automation
- Custom apps utilizing policy programmability via APIC-EM NB REST APIs

**Prime Infrastructure**

**Device Scope A**

**Device Scope B**

**Common Controller Layer Across the Enterprise**
Core Value of Different System of Change Approaches

**FEATURE CONFIGURABLE**
- Customizable Templates
- Guided Workflows
- Full CLI Access

**POLICY PRESCRIPTIVE**
- Massive Simplification
- Policy Automated
- NO CLI Changes
Policy Maturity to Cover Enterprise System of Change Use Cases will Evolve

Today

Controller-based Automation

ACI

Policy based Configuration: Dynamic, able to be automated, managed by the controller; Policy grows, static shrinks
SDN Led Provisioning
Policy Based Automation
Cisco Intelligent WAN App for APIC-EM

Business Policy Dictates Network Action
Site topology choices in IWAN app
Link type selection in IWAN app
Application priority policy setting in IWAN app
SDN Led Provisioning
Feature Configuration
Step 1: Start IWAN Workflow

Guided Workflow to help design and deploy IWAN on your branch or hub
Step 2: Role Selection

Select the PIN (hub or branch)

Identify the device role

Select the IWAN features to be configured:

- DMVPN
- PFR
- AVC
- QOS
Step 3: Device Selection

Select the devices
- Hub device
- Branch devices by location
- Enables configuration of more than one branch
Step 4: DMVPN Configuration

DMVPN Configuration - Can be part of Hub or Spoke configuration
Step 5: PfR Configuration

PfR Configuration
- PfR Policy on Hub
- PfR at the spoke with reference to MC
- Out of the Box 3 class model
Step 6: Quality of Service Configuration

QoS Configuration
- On the hub (8 class model)
- On the spoke (8 class model)
- NBAR based classification and shaping
Step 7: AVC Configuration

AVC Configuration
- Pick and choose the technologies to enable
- Out of the box Cisco CVD design
SDN Led Monitoring and Assurance
Cisco Prime Infrastructure
One Management from the Branch to the Datacenter

Lifecycle
Converged Management with Integrated Best Practices

Assurance
End-to-End Application Experience and Visibility

Data Center
Simplified Operations Management

Convergence
Consolidation
Cisco Advantage
## Full Support of Cisco WAN/Access Infrastructure

### Unified Access On-Premise

<table>
<thead>
<tr>
<th>Large Campus Controllers</th>
<th>Stackable Switches</th>
<th>Switching Platform</th>
</tr>
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<tbody>
<tr>
<td>5760</td>
<td>3850</td>
<td>Catalyst</td>
</tr>
<tr>
<td>5508</td>
<td>3650</td>
<td></td>
</tr>
</tbody>
</table>

- **Small to Midsize Enterprise**: 1700, 3700 w/HDx
- **Feature-Optimized Enterprise**: 2700 w/HDx
- **High-Density Enterprise**: 2700 w/HDx

- **Low Profile**: 1530
- **High Powered**: 1570
- **Larger Deployments**: 1550

- **CUWN 8.0**
- **IOS-XE 3.6**
- **IOS-XE 3.7**

### Meraki

- **Wired Components Available in Future Release**
  - MR3
  - MR2
  - MR1

### IWAN

- **ISR**
  - 800
  - 1900
  - 2900
  - 3900
  - 4300
  - 4400

- **UCS**
  - 1000
  - 1001
  - 1002

- **ASR**
  - 1004
  - 1006
  - 1013

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Full Coverage of Datacenter Infrastructure

- **Edge Network**: ASR 9000/1000
- **Core and Distribution**: Nexus 9000, Nexus 7000/5000, Nexus 3000, Nexus 2000, CAT 6500, 6800
- **Compute and Storage**: UCS B and C Series, MDS Switches
- **Network Services**: ASA, CAT 6500 w/FWSM
- **Virtualized Network Services**: CSR1000v, Nexus 1000v, VSG, vASA, vNAM, vWAAS
Rich Interface for Visualization and Troubleshooting

- **Grey**: Disconnected AP
- **Yellow**: AP w/ unresolved non-critical alarms
- **Red**: AP w/ critical alarms
- **Active rogue APs**
- **802.11u location specific service**
- **Zoom & Pan controls**
Application Visibility Across the Enterprise

Prime Infrastructure

- NAM Appliance (23XX)
  - NBAR2, Voice, ART, SPAN, ERSPAN

- NGA 3240
  - Netflow, SPAN, ERSPAN

- Netflow, NAM module

- AP 3700
  - NBAR2

- Wireless Controllers
  - NBAR2

- Cisco Catalyst 3850-X w/ 3K-X 10G
  - Netflow, MediaNet

- Cisco ISR & NAM on SRE
  - NBAR2, PA, Medianet

- Cisco ASR
  - NBAR2, AVC, Medianet

- Cisco 6800 & NAM Blade
  - Netflow, MediaNet

- SNMP/CLI Polling
- SPAN/ERSPAN
- Netflow
- WAAS
- PA
- MEDIANET
- NBAR
- NBAR2

NGA 3240
Netflow, SPAN, ERSPAN

Cisco Public

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Service Health for Sites, Users and Applications

- Automated Base lining
- Proactive Performance Troubleshooting
- Service Health Dashboard
- AVC Configuration for ISR/ASR
  - One-click AVC Configuration
  - AVC Monitoring Customization
- NBAR2 Custom Applications
- Embedded Packet Capture for ASR
- Top URL/Domain Views
User 360 Views and Diagnostics

- **Simplified troubleshooting and remediation improves application, services and end user experience**
  - Brings together multiple sources of information for effective problem isolation

- **Quick “Prime 360” Views:**
  - User 360: Quickly isolate and fix end-user or end-point issues
  - Device 360: Identify and fix device related problems
  - Interface 360: Identify application load and related stats
Network Topology Visualization
UCS Blade Server – 360 View
Virtualization Management
Introducing Branch Service Automation

- Design, catalog, deploy with zero touch and automatically manage different branch types including IWAN, Access and WLAN architectures

- The value of Branch Service Automation is to dramatically reduce TCO of large-scale Branch roll out across 10’s to 1000’s of sites
  - Automation
  - Operational consistency
  - Compliance to security and application policy
Branch Service Automation in the Enterprise Stack

**System of Automation:**
- Branch Design
- Prescriptive or Customizable
- Service Ordering
- Service Provisioning

**System of Record:**
- Knowledge Repository
- Service Monitoring
- Trending and Reporting
- Troubleshooting

**System of Change:**
- Network abstraction
- Configuration and Change
- Policy resolution and enforcement

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**Branch Service Automation**
- Enterprise Service Design (Knowledge Pack Integration)
- Configuration Automation for Approvals and Provisioning

**Prime Infrastructure**
- CVD based Knowledge Pack repository
- Automated Service Monitoring, Reporting and Historical Analytics

**APIC-EM**
- Configuration Change and Policy Compliance
- Network Services Automation

**Branch Infrastructure**
- (Physical / Virtual)
Branch Service Automation – Process Architecture

Service Design
- Branch Design for Wireless, Routing and Switching
- Embedded CVD best practices
- Custom and prescriptive designs
- User, Application, Security, Access and Quality of Experience policy definition

Service Catalog
- Branch designs (e.g. Small, Medium, Large) committed to Service Catalog as a service offering
- Setting up of business entities and groups for which services can be ordered

Service Request
- Ordering of Branch type when new site(s) or new services are needed
- Approval workflow with embedded test / validation
- SLA definition for branch users and applications

Service Provisioning
- Orchestration of devices and network services enablement for the Branch using PnP and PKI Automation on APIC-EM
- APIC-EM led Policy compliance enforcement

Service Management
- Business and Service level dashboard / reporting for Network, SLA’s, Security Status and Changes
- Drill down into events, monitoring and analytics tools for troubleshooting

Process

Role
- Network Architect, Security Admin
- Network Architect, Security Admin
- Network Operations, Application Admin
- Network Operations, Security Operations
- Network Operations, Security Operations
SDN Led Management Product Packaging
## Cisco ONE Software Suites

<table>
<thead>
<tr>
<th>Data Center</th>
<th>WAN</th>
<th>Access</th>
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<tbody>
<tr>
<td>Threat Defense for Data Center</td>
<td>Threat Defense for WAN</td>
<td>Identity Services for Access</td>
</tr>
<tr>
<td>Advanced Security</td>
<td>Advanced Application</td>
<td>Foundation</td>
</tr>
<tr>
<td>Data Center Fabric</td>
<td>Enterprise Cloud Suite</td>
<td>Foundation for Networking</td>
</tr>
<tr>
<td>Advanced Mobility Services</td>
<td>Advanced Application</td>
<td>Foundation for Compute</td>
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<tr>
<td>Switching</td>
<td>Wireless</td>
<td>Wireless</td>
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</table>
Common Licensing to Ease Evolution into SDN Led Management

- APIC-EM as a platform with a set of published apps and NB API’s will be available for free on Devnet

This will enable ISVs, Partner and your internal teams to build their own custom applications based on policy programmability

- Both traditional and SDN led applications for a particular device domain will be offered in a single license as part of Cisco ONE or a la carte

For example, Prime Infrastructure Lifecycle & Assurance AND IWAN App on APIC-EM will be part of the WAN foundation offer for the Routing domain

- This will enable phased adoption at a pace that works for your organization without additional cost

For example, policy prescriptive apps could be used for deployment in simpler branch types first and then moved to more complex branch types as policy maturity evolves
Conclusion
Conclusion

Cisco’s SDN Led IT Operations Management will:

- Empower IT Ops to manage the Network as a System, not as a collection of resources
- Drive massive simplicity through intent based policy automation
- Deliver application-centric visibility from the Branch to Datacenter
- Support existing and new devices for full investment protection
- Offer open, programmable API’s for bespoke innovation
- Realize cost savings from automation and abstraction
- Require new skills in intent based and programmable network management
Call to Action

• Visit the World of Solutions for
  – Cisco Campus: EN and ACI areas for Prime Infra and APIC-EM Demos
    • Lifecycle Management of Wired and Wireless Networks
    • Software Defined WAN with Prime Infrastructure and APIC-EM
    • SDN for Branch Service Automation (Prime Infrastructure & Plug and Play: routing & switching)
    • SDN and Collaboration Solutions (APIC-EM MapleCollab with EasyQOS)
    • SDN and Network Security (APIC EM &SourceFire, MACsec integration)
  – Walk in Labs – LABNMS-2999 (Converged Access and Prime)
  – Whisper Suites: Get in touch with your Cisco Account/Partner team to schedule 1-0-1 meetings with Product Teams at SDN and Network Transformation Whisper Suites

• DevNet zone related labs and sessions
  • DevNet-1007: API Deep Dive: APIC EM Rest API
  • DevNet-1044: Create a Hello World with APIC EM APIs
  • DevNet-1022: Let’s discuss: Cisco’s Controllers – Why, What, How, When

• Recommended Reading: for reading material and further resources for this session, please visit www.pearson-books.com/CLMilan2015
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- Please complete your online session evaluations after each session. Complete 4 session evaluations & the Overall Conference Evaluation (available from Thursday) to receive your Cisco Live T-shirt.

- All surveys can be completed via the Cisco Live Mobile App or the Communication Stations.
Thank you.