Campus Switching Evolution
Digital Campus for Digital Business

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Regional Manager Enterprise Networks – ASEAN
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Cisco Digital Network Architecture

- **Cloud Service Management**: Policy | Orchestration
- **Automation**: Abstraction & Policy Control from Core to Edge
- **Analytics**: Network Data, Contextual Insights
- **Virtualization**: Physical & Virtual Infrastructure | App Hosting

**Principles**

- Insights & Experiences
- Automation & Assurance
- Security & Compliance

Network-enabled Applications

Open & Programmable | Standards-Based

Cloud-enabled | Software-delivered
Enterprise Campus Today

VLAN Based | Disparate Networks | Complex Provisioning | Not Scalable
Digital Campus of Future: Logical Virtual Network

DNA Campus Fabric

Agile Fabric Services

Mobility
Collaboration
Security

Users & Devices
Building Devices

Private & Public Cloud Resources

WAN

Remote

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Remote
DNA Campus Fabric Vision

Fabric Services
- Mobility
- Collaboration
- Security

Orchestration and Policy

Infrastructure
- Endpoints
- Branch

Fabric Services
- Mobility
  - Seamless roaming
  - Elastic WLC

Collaboration
- Quality of experience (QoE)
- Voice/Video performance

Security
- Identity, NAC, Encryption
- Device Onboarding
Building a DNA Campus

Unified Access Data Plane
Foundational Technology for DNA Fabric

UADP ASIC

Cisco IOS
Foundational Technology for DNA Fabric

IOS XE

Programmable Hardware

Programmable Custom ASICs

Converged Software Services

Campus Switching

Switching
## Building a DNA Campus

- Enables Wired + WLAN Convergence
- Hardware performance with software flexibility
- QoS happens in ASIC for line rate performance
- Flexparser enables new software features (like SDN) over the product lifetime

<table>
<thead>
<tr>
<th>Programmable Hardware</th>
<th>Converged Software Services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Programmable Custom ASICs</strong></td>
<td><strong>Control-Plane / Data-plane Separation</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Contextual Troubleshooting isolates network issues faster</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Compliance Management for Image</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Orchestration &amp; Provisioning with data models</strong></td>
</tr>
</tbody>
</table>

- Modular & Converged OS
- Control-Plane / Data-plane Separation
- Contextual Troubleshooting isolates network issues faster
- Compliance Management for Image
- Orchestration & Provisioning with data models
Benefits of DNA Campus Fabric

**Simplified Provisioning**
- Consistent Policy Rollout
- Flexible User/Device Groups
- Secure Network Segmentation

**Investment Protection**
- Greenfield/Brownfield
- Significant OPEX reduction
- Future-proofed

**Agile Services**
- On Demand Service Onboarding
- Single Pane of Management
- Contextual Analytics

**Automation and Assurance**
- Day 0/1/N Workflow Automation
- Open/3rd Party Applications
- Orchestrated Data Models

Business Transformation for Programmable Enterprise
DNA Campus Product Innovation
Preparing for the Impact of Digitization

**FIXED**
- Catalyst 3850 MGig
- Catalyst 3850 1G & 10G Fiber
- Catalyst 4500-X 10G

**MODULAR(*)&
- Catalyst 6807-XL/6500-E
- Sup 2T/6T

Industry-Leading Campus Backbone Platform
Introducing Supervisor 6T
Taking Catalyst 6800 to a New Level

Feature Parity with Sup2T from Day 1: 3000+ Features

### Scalability & Performance

<table>
<thead>
<tr>
<th></th>
<th>SUP2T</th>
<th>SUP6T</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6807-XL Bandwidth</strong></td>
<td>220G /Slot</td>
<td>440G /Slot</td>
</tr>
<tr>
<td><strong>6500-E Bandwidth</strong></td>
<td>80G /Slot</td>
<td>80G /Slot</td>
</tr>
<tr>
<td><strong>RP CPU</strong></td>
<td>1.5Ghz MPC8572</td>
<td>2.5Ghz X86 Dual Core</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>2 x 4GB DDR2 667Mhz</td>
<td>4 GB DDR3 1333Mhz</td>
</tr>
<tr>
<td><strong>Uplinks</strong></td>
<td>2 x 10G (X2) &amp; 3 x 1G (SFP)</td>
<td>2 x 40G (QSFP) &amp; 8 x 1/10G (SFP+)</td>
</tr>
<tr>
<td><strong>Advanced Features</strong></td>
<td>VSS, MACSEC, SGT</td>
<td>VSS, IA, MACSEC, SGT, LISP, UCI</td>
</tr>
<tr>
<td><strong>Bootdisk</strong></td>
<td>Compact Flash</td>
<td>eUSB</td>
</tr>
<tr>
<td><strong>Mgmt Port</strong></td>
<td>RJ45 CMP</td>
<td>RJ45 / SFP Mgmt0</td>
</tr>
</tbody>
</table>

**High-Performance Control Plane with 2.5GHz CPU**

**2 x 40G (QSFP) and 8 x 10G (SFP+) Uplinks Support for IA, LISP, etc**

**Fabric Ready**

**Improved Fabric Provides 440G/slot in C6807-XL**

**Fiber / Copper Management Ports**

* No CFC or Service Module Support
Introducing Catalyst 3650 Mini Series Switches

- **Converged Access**
  - Fixed Power Supply, Fixed Fans, RPS2300
  - 11.62 inch depth, 1RU
  - Cisco StackWise®-160

- **2 SKU’s**
  - 24 x 1Gbe
  - 48 x1Gbe

- **Upto 775W PoE+ budget**

- **IP Base/IP Services**

- **48 Ports – 4xSFP+**
  - 24 Ports - 2xSFP & 2xSFP+

Built on Cisco “UADP” ASIC - 11.62” = 295mm deep

Shipping May'16
Catalyst 3650 Mini: 24 Port and 48 Port Switches

- UADP ASIC
- Converged Access
- StackWise-160
- 11.62” deep
- RPS 2300 support
- Flexible Netflow

WS-C3650-24PDM
WS-C3650-48FQM

Fixed Power Supply & Fans
Front to Back Airflow
Impact of DNA Campus
Smart Workplace
Convergence of Building Services
Enables Workspace Transformation

Disparate building devices

(IP Fabric Infrastructure)
Simplified management
Scalable
Secure

Converge to IP based system
Network as a Platform
Enabling Intelligent Building Services

<table>
<thead>
<tr>
<th>Applications (Hosted / Cloud)</th>
<th>SDA</th>
<th>AV Provisioning</th>
<th>Telemetry</th>
<th>Analytics</th>
<th>Video Surveillance</th>
<th>Hosted Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller</td>
<td></td>
<td>APIC-EM</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Provisioning</td>
<td>Monitoring</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport (Infra)</td>
<td></td>
<td>Network</td>
<td>(Secure Fabric, Discovery, Inventory Management, Deterministic Ethernet)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low Voltage Power (PoE)</td>
<td></td>
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</tr>
<tr>
<td>End Devices</td>
<td>Luminaires</td>
<td>VAV Air Controllers (HVAC)</td>
<td>Sensors (Occupancy, Light, Temp)</td>
<td>Access (Badge Readers, Biometric)</td>
<td>Surveillance Cameras</td>
<td>AV Endpoints</td>
</tr>
</tbody>
</table>
Low Voltage UPOE
Enabling converged building infrastructures

30W
Cat5e
30W
60W total

Fast

Easier Installation
Cat cables are easy to pull, terminate and test

Efficient

Low Voltage
Does not need conduits required for 277V
DC based
Does not require expensive AC-DC conversion

Scalable

Cisco UPOE
For applications up to 60W
IEEE 802.3bt
For applications beyond 60W
Cisco Leadership With Innovation in PoE

A Historical Perspective

- **2000**: 7W Inline Power
- **2003**: 15W (PoE)
- **2007**: 30W (PoE+)
- **2011**: 60W (UPOE)

**Industry Standard**
- IEEE 802.3af (15W PoE)
- IEEE 802.3at (30W PoE+)

**Applications**
- Virtual Desktop
- Trading Floor
- Campus, Retail, Hospitality
- Building Management
- Healthcare
- Compact Switches
- Telepresence
- DEP Lighting
- nULEDs
- Hospital
- FieldServer Technologies
- UL Certified

**Benefits**
- Wider Choice of End Points
- Efficient Power Delivery
- Extend HA to critical devices
- Universal RJ45
- Lower CapEx/OpEx
Traditional Lighting Infrastructure

- Lighting Control Module
- A/C Power
- Control Network (DMX, DALI, LonWorks, BACnet, KNX, RS-485)
- Digital Lighting Control Driver Modules
Connected Ceiling Infrastructure

Wiring Closet
LED Lighting
WiFi Access Point
IP Video Surveillance Camera
Sensors

Cisco/Partner Cloud Services
**Connected Lighting**
Enables Energy Savings and Other Workspace Outcomes

**LED lighting** delivers power efficiency, longer life, superior light quality

**PoE results** in lower TCO (single cable for power and control) & software enabled lighting policies

**Integrated Sensors** enable smart controls and analytics

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**Energy Savings**
- Electrical load shedding
- Personalized workspaces
- Granular occupancy
- Granular daylight harvesting
- Highly flexible scheduling

**Productivity / Health Comfort**
- Real time analytics
- Emergency pathway for first responder
- Human centric: color temperature/adjustments
- Customized lighting for retail stores
Cisco Catalyst “Ceiling” Switch
Custom built and Optimized for IOT Deployments

<table>
<thead>
<tr>
<th>Innovative Design</th>
<th>Enhanced for IoT</th>
<th>Simplified OT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimized for lighting</td>
<td>Cisco UPOE and PoE+ innovation</td>
<td>Day 0 out of band (OOB) config</td>
</tr>
<tr>
<td>• Power efficient (low standby)</td>
<td>• Perpetual PoE</td>
<td>• USB and Bluetooth connectivity</td>
</tr>
<tr>
<td>• Plenum &quot;UL&quot; Rated</td>
<td>• Fast PoE</td>
<td>• Configure and diagnostics</td>
</tr>
<tr>
<td>Sturdy reliable design: “built to last”</td>
<td>Optimized for IOT connectivity</td>
<td>Day 1/Day 2 management</td>
</tr>
<tr>
<td>• Passive cooling</td>
<td>• CoAP protocol support</td>
<td>• Image upgrades</td>
</tr>
<tr>
<td>• Long MTBF</td>
<td>• Energy monitoring</td>
<td>• Diagnostics and alerts</td>
</tr>
<tr>
<td>Simplified and Secure ceiling mounting</td>
<td>Cisco IOS Security</td>
<td>Available on iOS and Android</td>
</tr>
</tbody>
</table>

Compact Design
8 x 10/100

Cisco UPOE and PoE+ options

Power Efficient

Ceiling Mounted

Simplified Configuration and Management

Low Voltage compliance

Perpetual PoE

Cisco Catalyst “Ceiling” Switch
Custom built and Optimized for IOT Deployments

Innovative Design

- Optimized for lighting
  - Power efficient (*low standby*)
  - Plenum "UL" Rated
- Sturdy reliable design: “built to last”
  - Passive cooling
  - Long MTBF
- Simplified and Secure ceiling mounting

Cisco UPOE and PoE+ options

Power Efficient

Ceiling Mounted

Simplified Configuration and Management

Low Voltage compliance

Perpetual PoE

Cisco IOS Security

Target
FCS: Q4’CY16
Enterprise Media Networks
Less Cables and a Seamless Collaboration Experience

Traditional AV Networks

Converged AV Network (over IP)

Quality of Experience
- Time synchronized audio / video
- Low latency, low jitter
- Reliable resource reservation

Standards Based
- Allows device interoperability
- Eliminates proprietary networks
- Easier IP based management

Low Cost
- Lower cost and complexity (60% CAPEX and 35% OPEX savings)
- Increases flexibility to add new media applications
Workspace Simplification
Recharge Your USB Devices with Cisco UPOE

Cisco UPOE

USB-C

Only one port (USB-C)

Power resiliency  |  Scalability  |  Simplicity
Network Deployment Options

**Distributed**
“Utility Network”

- Dedicated IOT Network
- Short(er) PoE Cables
- To IDF
- Ceiling Switches
- PoE powered luminaires

Switches in the ceiling
Energy efficient, shorter cables

**Centralized**
“Converged IT Network”

- Converged IT/OT Network
- Access Switch in IDF
- Long(er) cable Runs
- PoE powered luminaires

Switches in the wiring closet
Higher resiliency due to HA features
Enabling Next Generation Mobility
Multigigabit Technology for 802.11ac Wave2

Cisco Multigigabit

Available on 3800

Standard Cat 5e/Cat6 Cables

5 Gigabit Port

1 Gigabit Port

Supports PoE Up to 60W

Delivers up to 5X Speeds in Enterprise Without Replacing Cabling Infrastructure
Cisco Multigigabit Ethernet
Key Differentiators

Maintain Switch to AP Reach at Higher Speeds
Adaptive Rate Technology (FE, 1G, 2.5G, 5G, and 10G)
Future proofed for higher speeds

Infrastructure Investment Protection
Supports 5G speeds up to 100m distance over Cat5e cabling in Brownfield
Supports higher speeds over Cat6a cabling in Greenfield deployments

POE / POE+ / UPOE
Cisco Innovation over 10GT standard to support high end point power needs

Standards Compliant
1G and 10G BaseT IEEE standards, intermediate speeds standards in progress
MultiGigabit Use Cases

11ac Wave2 APs
3800 APs

GigE Vision over NBASE-T

Uplinks for Access Extension
C3560-CX

Servers Connectivity at Higher Speeds
mGig NIC

BioScience Research & Tools
The Cisco Catalyst Multigigabit Product Family

- Best In Class Modular Access
- New 48 Ports Line Card
- 12 Ports of Multigigabit per slot
- Up to 96 multigigabit ports per system

- Industry leading Fixed Access
- 24 & 48 Port Stackable Switches
- 24 & 12 Multigigabit Ports
- New Uplinks

- NG Workspace switch
- Multigigabit in smallest form factor
- POE/POE+
- Instant Access support

Innovation in multiple form factors!!
Distributed Stacking
Distributed Stacking
Simplify Management and Control

1. Aggregation
   - A
   - S

2. Access
   - A
   - S

3. Access & Aggregation
   - A
   - S

One Management Touchpoint
Unified Control Plane
Distributed Forwarding – Max Performance

Simple | Reliable | Flexible | Scalable | Unconstrained
AVC & Netflow
Application Visibility & Control (AVC) at Access

Visibility
Threats (worms and trojans) move laterally (east-west). Central application sensor will not see this at all.

Detection
Path to server may be different than return path—may not be able to determine application.

Troubleshooting
Essential to have visibility at multiple points to break down the problem and get to resolution faster.

Control
Latency metrics such as response time, transaction time, network and application delay needed to control the apps.
## Cisco Application Sensors

Innovative approach for Application Awareness and Control

<table>
<thead>
<tr>
<th>Visibility</th>
<th>Applications</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granular knowledge of apps</td>
<td><img src="app_icons.png" alt="App Icons" /></td>
<td>QoS – Optimize Applications</td>
</tr>
<tr>
<td>Performance monitoring</td>
<td></td>
<td>Rate-limit non-business critical</td>
</tr>
<tr>
<td>Granular Network Security</td>
<td></td>
<td>Disallow malicious applications</td>
</tr>
</tbody>
</table>

- Proactively **identify** application degradation
- **Visualize** and determine problem
- **Awareness**: move from **Reactive to Proactive**

Cisco AVC: The Key to Contextual Insights and Assurance
Flexible NetFlow
Unprecedented Application Visibility

Control with EEM Integration

Visibility

Day 0 Attacks
Detect Anomaly
Compliance

Flexible NetFlow

IP, Ports
TCP Flags
L2 MAC
L2 VLAN
UDP Flags
IPv6
IP Options
Multicast
...

Benefits

• Lower CAPEX/OPEX
• Better insights for network capacity planning
• Better service and user experience
• Increased IT staff productivity, IT security

Capabilities

• Unprecedented visibility with new L2–L7 fields
• Scalable, flexible flow monitors
• Customizable policy action with EEM
• Broad collector partner ecosystem

Collector Ecosystem

Campus Branch
Security
"SWIFT is aware of a number of recent cyber incidents in which malicious insiders or external attackers have managed to submit SWIFT messages from financial institutions' back-offices, PCs or workstations connected to their local interface to the SWIFT network," the SWIFT group warned customers in a notice seen by Reuters.
Security Challenges

- Growing Attack Surface
- Dynamic Threat Landscape
- Complexity and Fragmentation
A Threat-Centric Security Model

ATTACK CONTINUUM

BEFORE
Discover
Enforce
Harden

DURING
Detect
Block
Defend

AFTER
Access
Contain
Remediate

Network as a Sensor

Network as an Enforcer
Visibility with Cisco Identity Services Engine (ISE)
Discover Known and Unknown in Your Network

Network / User Context
- Who
- What
- When
- Where
- How

Partner Context Data
- PxGrid

ACCESS POLICY

Consistent Secure Access Policy Across Wired, Wireless, and VPN
Network as a Sensor: Lancope StealthWatch

Cisco ISE

Context Information

PxGrid

Mitigation Action

Real-time visibility at all network layers

- Data intelligence throughout network
- Assets discovery
- Network profile
- Security policy monitoring
- Anomaly detection
- Accelerated incident response
Network as an Enforcer

with TrustSec

Flexible and Scalable Policy Enforcement
How TrustSec Simplifies Network Segmentation

Traditional Segmentation

- Static ACL
- Routing
- Redundancy
- DHCP Scope
- Address
- VLAN

- Voice VLAN
- Data VLAN
- Guest VLAN
- BYOD VLAN

Security Policy based on Topology
High cost and complex maintenance

TrustSec

- Micro/Macro Segmentation
- Central Policy Provisioning
- No Topology Change
- No VLAN Change

- Use existing topology and automate security policy to reduce OpEx

- Employee Tag
- Supplier Tag
- Non-Compliant Tag

DC Firewall / Switch
ISE
DC Servers

Access Layer

Enterprise Backbone

Aggregation Layer

Access Layer

Voice
Employee
Supplier
BYOD

Voice
Employee
Supplier
BYOD

Internal Quarantine VLAN

Non-Compliant

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Architecting a Secure Network
Combining Network as a Sensor / Network as an Enforcer

Network Sensors

Cisco Collective Security Intelligence

Network Enforcers

NGIPS

PxGRID

ISE

TrustSec Software-Defined Segmentation

Campus/DC Switches/WLC

NGFW

Confidential Data

Cisco Routers / 3rd Vendor Devices

Network as a Sensor

Network as an Enforcer

Policy & Context Sharing

Network Sensors

PxGRID

Cisco Routers / 3rd Vendor Devices

Confidential Data

Network Enforcers

Threat

PxGRID

Network Sensor (Lancope)
DNA Campus Automation
**Plug-n-Play with APIC-EM**

1. **PROVISION**
   - Pre Provision Projects/Sites
     - Policies
     - Match Rules
     - Configs/Image
     - IP Addressing

2. **INSTALL**
   - Remote Installer
     - Mount and cable devices
     - Power-on

3. **MONITOR**
   - Network Admin Remotely Monitors Status of Install While in Progress
   - Booting Devices Call Out to PnP Server, Requesting Instructions

---

**Unskilled Installer**
**GUI Based**
**Consistent For Devices and Pin (Campus/Branch)**
**Secure**
**RMA Use Case**
**Greenfield and Brownfield**
New: APIC-EM QoS Automation - Easy QoS

1. Client A calls Client B
2. CUCM calls APIC-EM to setup Policy
3. QoS Policy enabled on network device

Optimal Experience
Dynamic QoS in 250 ms
Reduce voice jitter by 300%
50% improvement for video traffic

1. Calls End
2. CUCM calls APIC-EM to setup Policy
3. QoS Policy enabled on network device

REST API

Cisco Solutions Summit 2016
There’s Never Been A Better Time
Connect, Optimize, Innovate

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Cisco Powered Programmable Digital Campus

**Lower Risk & Meet Compliance**
- Standards Based Interfaces
- Programmable Access
- Secure Hosting Environment

**Reduced Cost & Complexity**
- Programmable Management
- Model driven infrastructure
- Automate Repetitive tasks

**Greater Business Agility**
- Automated Operations
- Zero Touch On-boarding
- Secure Scripting

**Resource Optimization**
- Granular Network-Device Visibility
- Rich Streaming Telemetry
- Provision on Demand

**Complete Device Automation**
How to Build DNA Campus
Journey to Cisco DNA Campus

Current Digital Readiness

Identify Digital Strategies:
- Security
- Compliance requirements
- Key business challenges
- Key Business Priorities

Cisco Tools based Network Assessment
- Network Capability GAP
- Current Architecture limitations
- Obsolete Products
- Security Vulnerabilities

DNA Assessment

Cisco Assisted
- KTN (Know the Network)

Customer Driven
- CAA (Cisco Active Advisor)

Prepare & Deploy Digital Campus Capabilities

DNA Campus:
- Fabric Enabled Network
- APIC-EM Campus Automation
- Software Defined Segmentation (NaaS & NaaE)
- Coverage & Support Simplification
- Network Simplification
- Operational Efficiency
- Energy Efficiency

Increasing Business Value while Reducing Operational Expenses and Risk
Cisco Digital Network Architecture Journey
Log in to Cisco Active Advisor using your cisco.com username and password.
Discover your network

Access ‘Add Devices’ to discover your network or add devices from a file.
Scan your Network

Enter Network Details, Apply Label and Scan My Network

Discovery results will be shown at the bottom of the screen
Review your Inventory Status

- **232 Devices**
- **1330 Advisories**
- **3 Contract Issues**
- **269 Warranty Issues**
- **371 End of Life Warnings**

Each Device is profiled for:
- Security Advisories
- End of Sale / End of Support

Coverage Status:
- Warranty
- Service Contract

Click on a single row to see individual device information
Assess your Network

Go to ‘Tools’
Choose the Assessment you’d like to run:
Switching Wireless Security (coming soon)
Assess your Network

Select the devices you’d like to assess

Cisco Active Advisor will assess your network based on published Best Practices. Browse failed tests per topic, and access the recommendation in the Best Practices document.
Key Takeaways

DNA Assessment & Refresh Campus

Intelligent & Programmable Access – Catalyst 3K

Security IN the Network – NaaS & NaaE

Converged Network – Connected Lighting & AV

Adopt Orchestration & Automation – APIC-EM
Thank you!