We’re ready.
Are you?

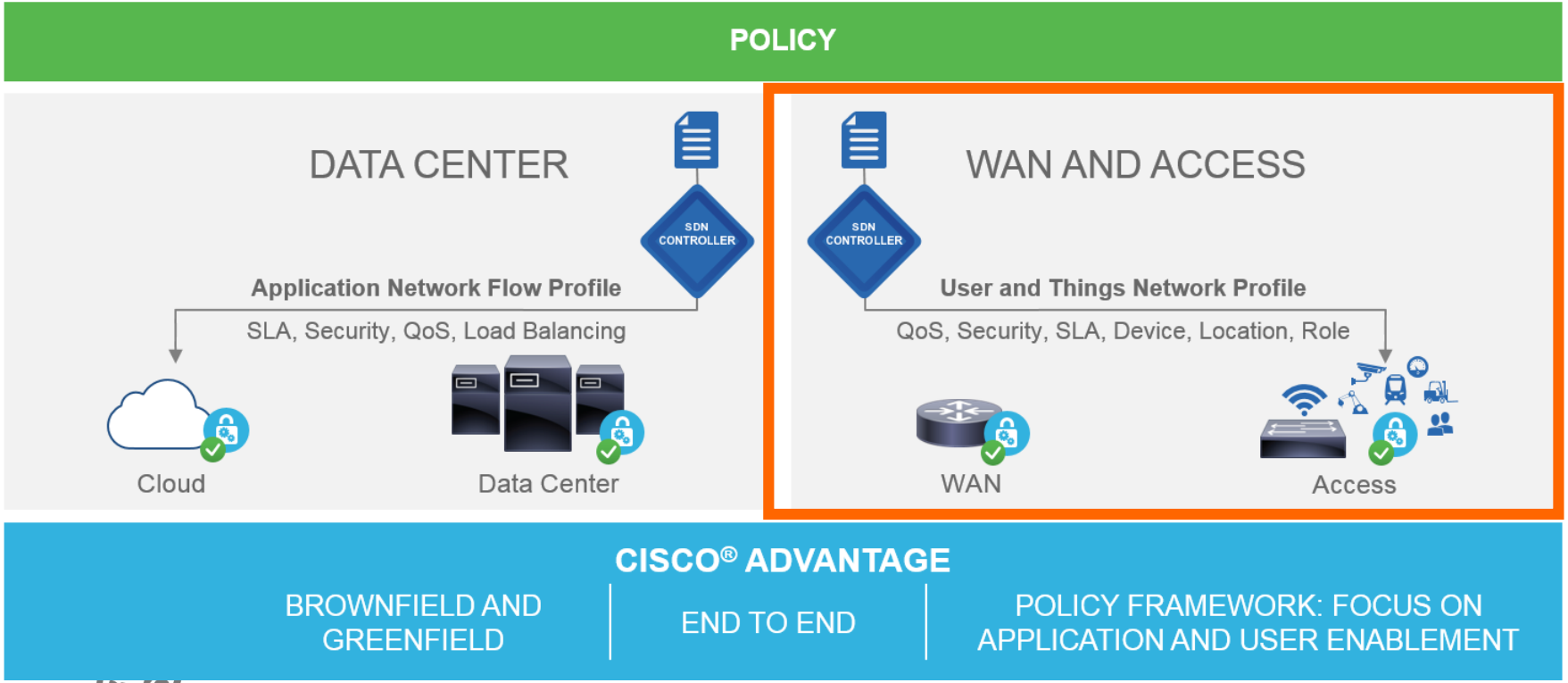
APIC-EM

Adam Radford – Distinguished Systems Engineer

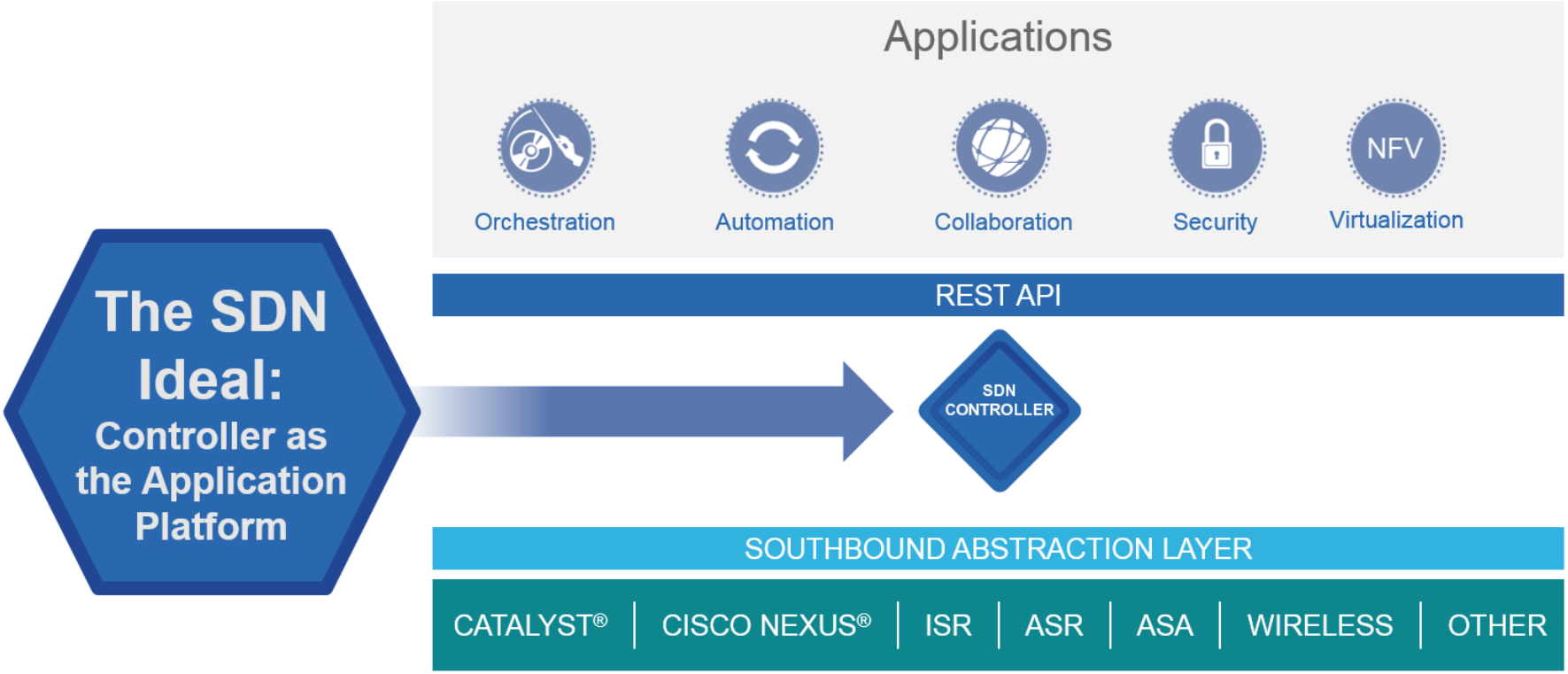
Agenda

- Introduction
- Inventory/Topology
- Path Trace
- Plug and Play
- IWAN
- EasyQoS

Common Policy Model from Branch to Data Center



Network-Wide Abstractions Simplify the Network



APIC-EM Controller Architecture

Scalable Platform

Elastic service infrastructure and auto scale service model

Highly Available

Maximum uptime for mission-critical applications and seamless upgrade

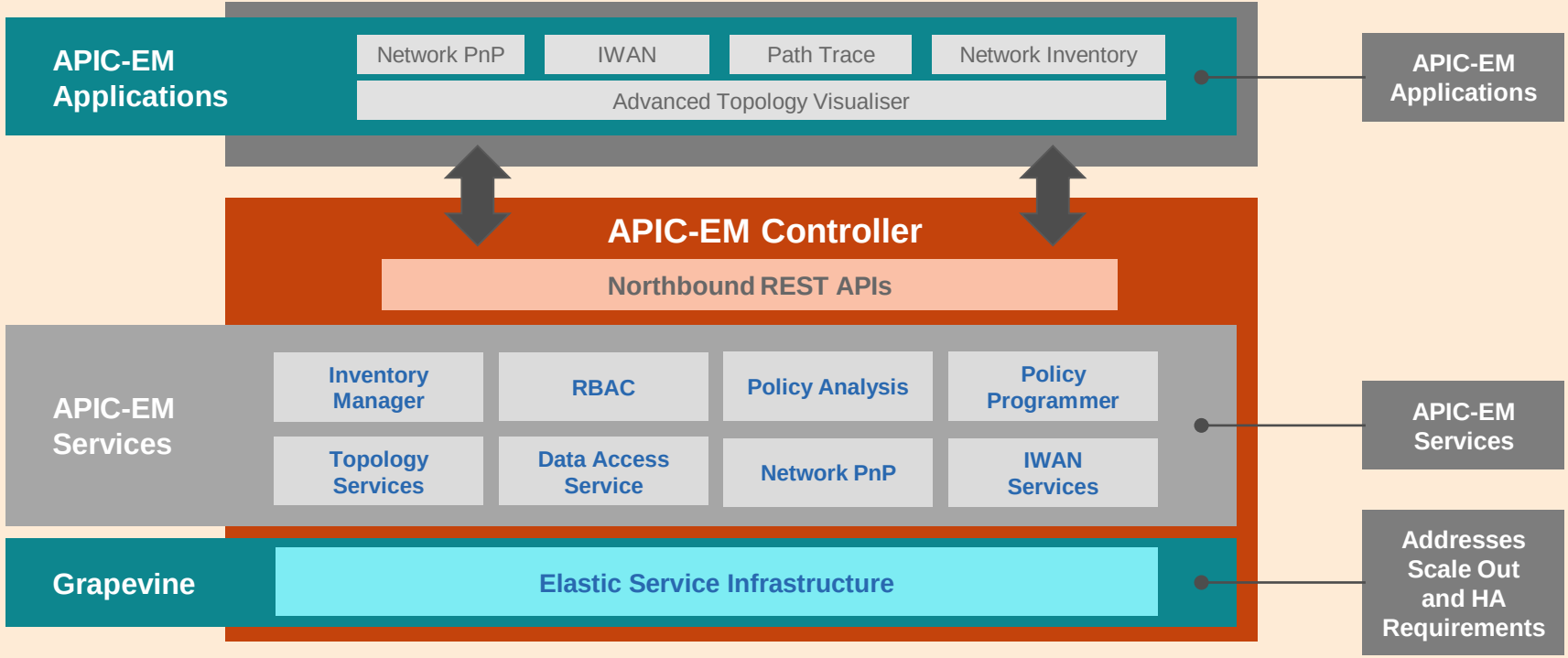
Single Touch Point

Fast and easy installation

Northbound RESTful APIs

RBAC-enabled

APIC-EM - Platform Architecture



Manual to Systemic Policy Deployment

Manual Policy Deployment

Admin Driven

The What

"Security Policy for Branches A-N"

The How

"Change ACLs in the following elements"

Controller Led Policy Deployment

The What

"Security Policy for Branches A-N"

Admin Driven

API

The How

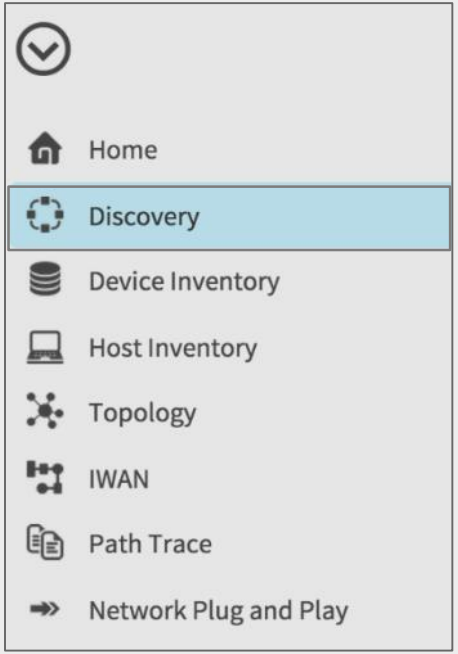
"Change ACLs in the following elements"

System Driven

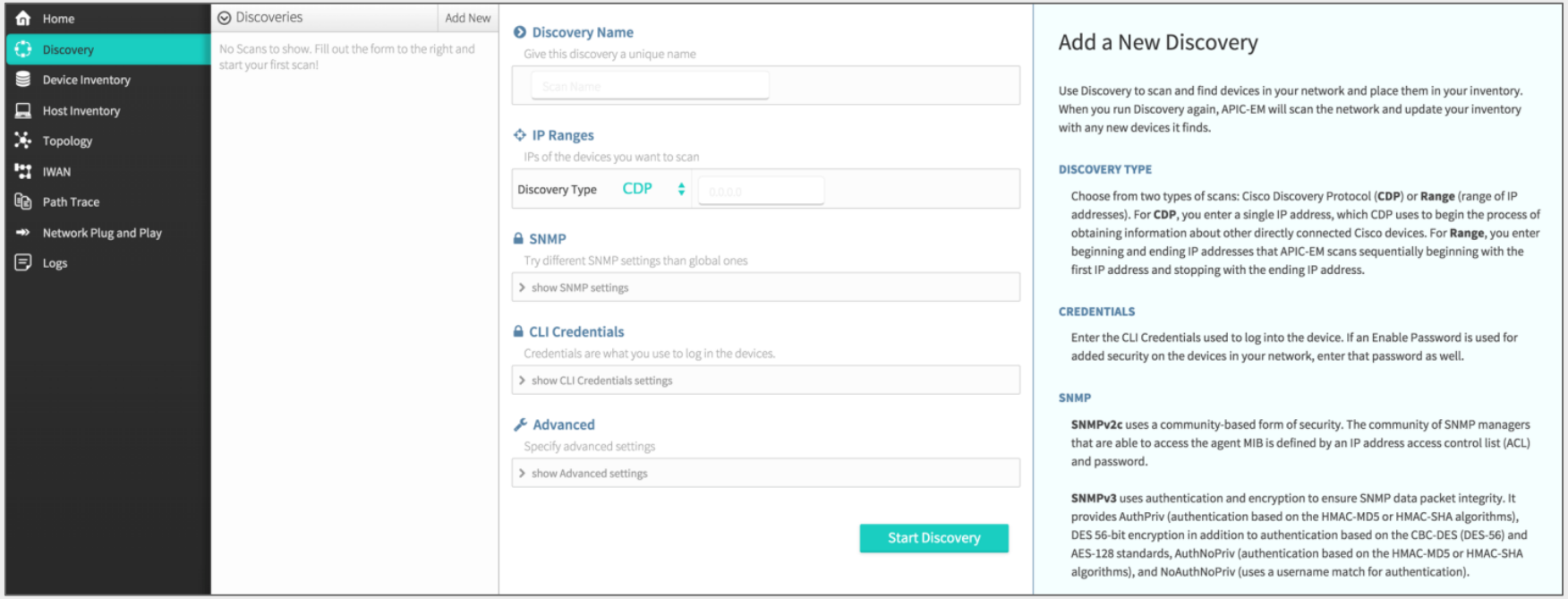
Inventory/Topology

Controller Application - Network Discovery

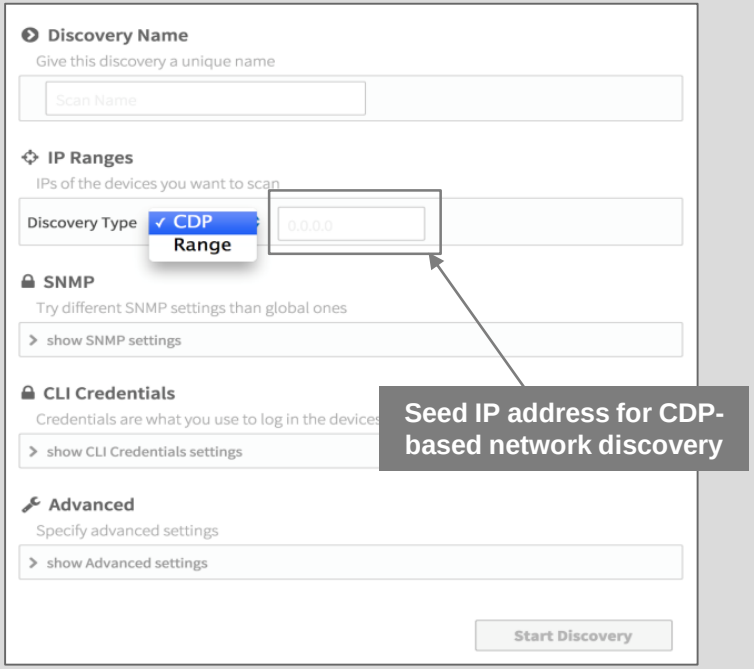
- Quick, easy, and efficient network discovery functionality
- Flexible discovery options -
  - Based on CDP and IP address range
- Ability to start, stop, and delete the scan at anytime
- Auto-discovery of newly added network devices
- Ability to initiate a discovery job through the UI or northbound REST APIs

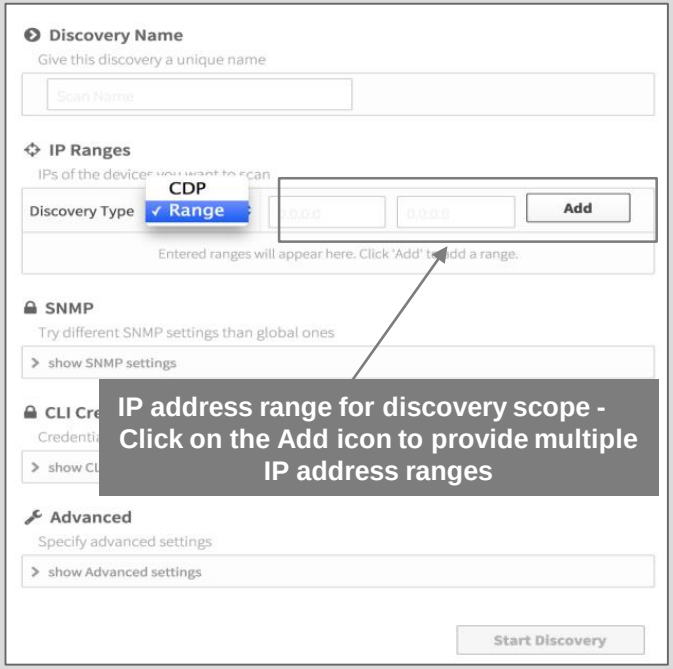


Controller Application - Network Discovery



Network Discovery - Input Parameters

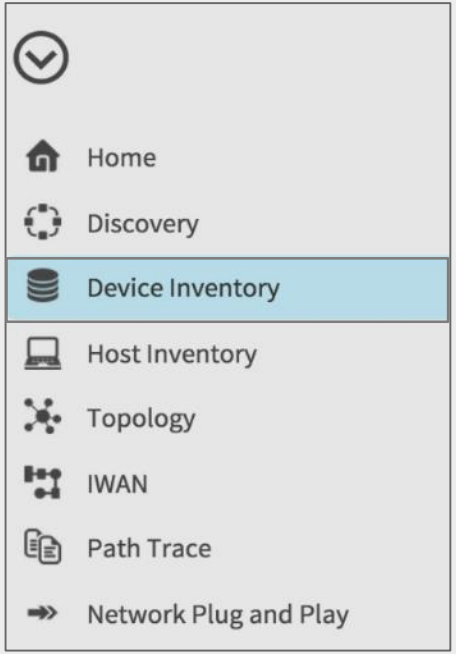




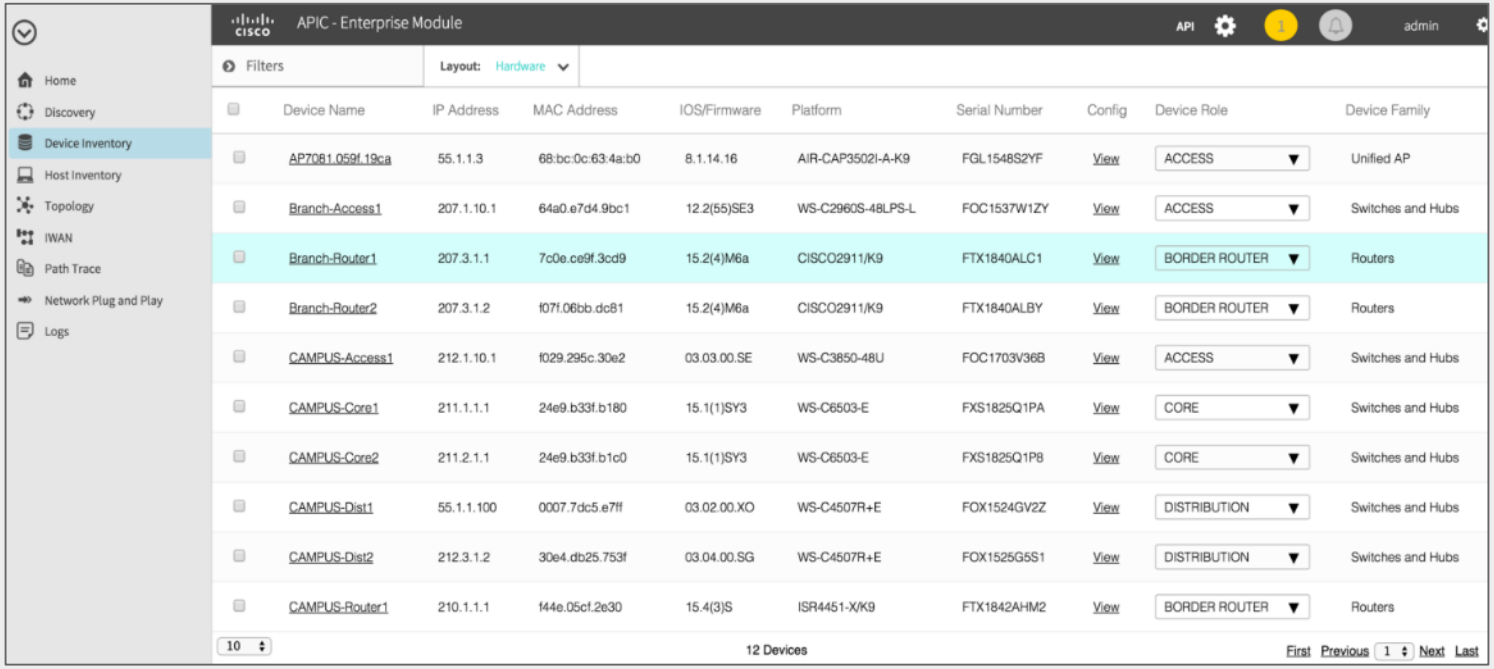
Controller Applications - Device Inventory

Single Source of Truth

- Real-time network device inventory and asset service management
- Includes all network devices with an abstraction for the entire network:
  - **Full knowledge** of network
  - Awareness of the overall **operational health** of the physical network
  - **Detailed inventory** information for easier consumption by controller services and applications
  - Allows applications to be device-agnostic
- Inventory service runs in the background to maintain an accurate database



Controller Applications - Device Inventory



Device Inventory - Hardware Layout

APIC - Enterprise Module

API admin

Filters

Layout: Hardware

Device Name	IP Address	MAC Address	IOS/Firmware	Platform	Serial Number	Config	Device Role	Device Family
AP7081.059f.19ca	55.1.1.3	68:bc:0c:63:4a:b0	8.1.14.16	AIR-CAP3502I-A-K9	FGL1548S2YF	View	ACCESS	Unified AP
Branch-Access1	207.1.10.1	64a0.e7d4.9bc1	12.2(55)SE3	WS-C2960S-48LPS-L	FOC1537W1ZY	View	ACCESS	Switches and Hubs
Branch-Router1	207.3.1.1	7c0e.ce9f.3cd9	15.2(4)M6a	CISCO2911/K9	FTX1840ALC1	View	BORDER ROUTER	Routers
Branch-Router2	207.3.1.2	f07f.06bb.dc81	15.2(4)M6a	CISCO2911/K9	FTX1840ALBY	View	BORDER ROUTER	Routers
CAMPUS-Access1	212.1.10.1	f029.295c.30e2	03.03.00.SE	WS-C3850-48U	FOC1703V36B	View	ACCESS	Switches and Hubs

Detailed device inventory information

Device Inventory - Tagging Layout

APIC - Enterprise Module

API admin

Filters

Layout: Tagging

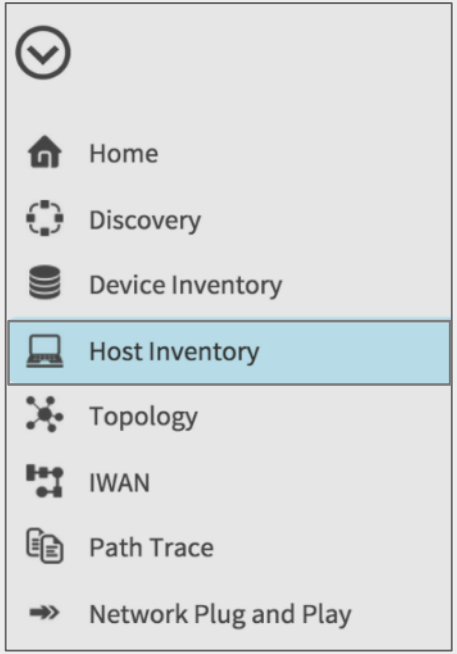
Device Name	IP Address	MAC Address	Device Role	Location	Tag
AP7081.059f.19ca	55.1.1.3	68:bc:0c:63:4a:b0	ACCESS	San Jose, CA	3
Branch-Access1	207.1.10.1	64a0.e7d4.9bc1	ACCESS	New York, NY	1
Branch-Router1	207.3.1.1	7c0e.ce9f.3cd9	BORDER ROUTER	New York, NY	1
Branch-Router2	207.3.1.2	f07f.06bb.dc81	BORDER ROUTER	New York, NY	1
CAMPUS-Access1	212.1.10.1	f029.295c.30e2	ACCESS	San Jose, CA	3

Sophisticated and automated devices are given a role assignment based on intelligent matching against pre-set templates and attributes

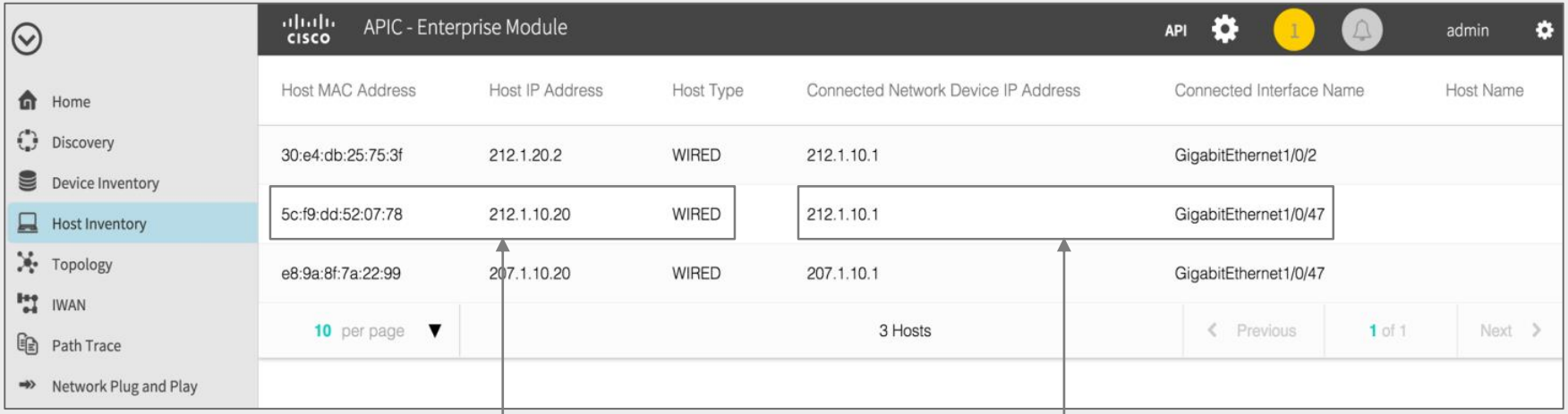
Geo-site (location) and custom tags for complete flexibility in grouping and classification of devices based on business logic (for example, lines of business, service mix, etc.)

Controller Applications - Host Inventory

- Real-time network host and endpoint inventory (PCs, wireless devices, IP phones, printers, etc.)
- Detailed information about each host and endpoint:
  - Network attachment point for the host to the network device
  - Host name, IP, and MAC address information
- Host inventory service runs in the background to maintain the accuracy of the database:
  - Information collected through CDP, LLDP, and P device-tracking database lookup
  - SNMP traps are used to update the host inventory database (wireless host only for Release 1.0)



Controller Applications - Host Inventory



Detailed host information

Network attachment point for host

Scale Numbers – General Availability

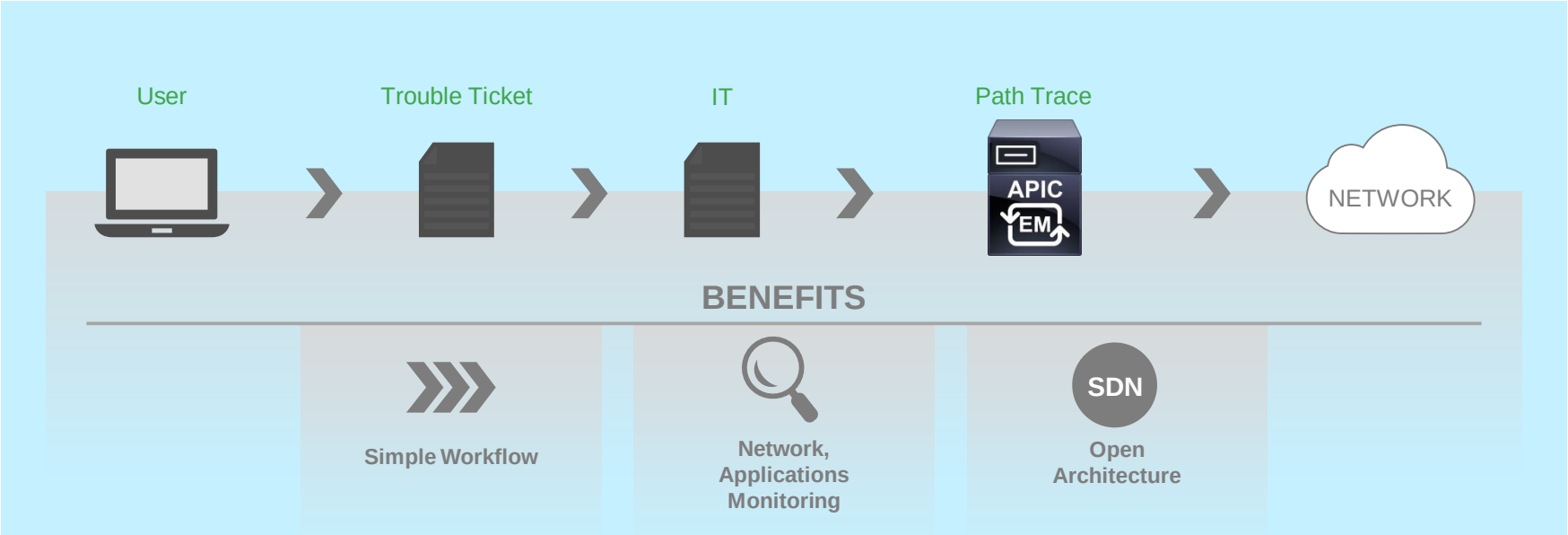
Network Devices: 2000	Access Points: 2000	End Hosts: 20,000

Note: These scale numbers are for the APIC-EM platform and the base applications. Some other APIC-EM applications might have different scale numbers.

Path Trace Application: Controller based Troubleshooting

APIC-EM Path Trace Application

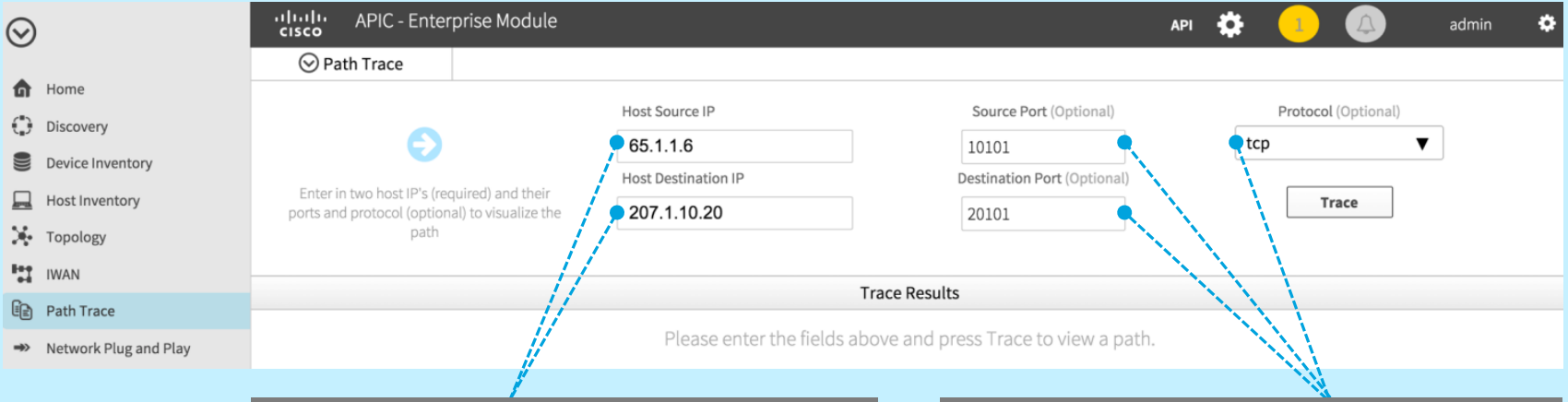
Accelerate Trouble-Ticket Processing



Easy visual discovery of trouble spots in the communication path based on 5-tuple info

OpEx for ticket processing decreased by 98% from 1.6 hours to 1 minute

Path Trace App: 5-Tuple Input Through User Interface



Required Information

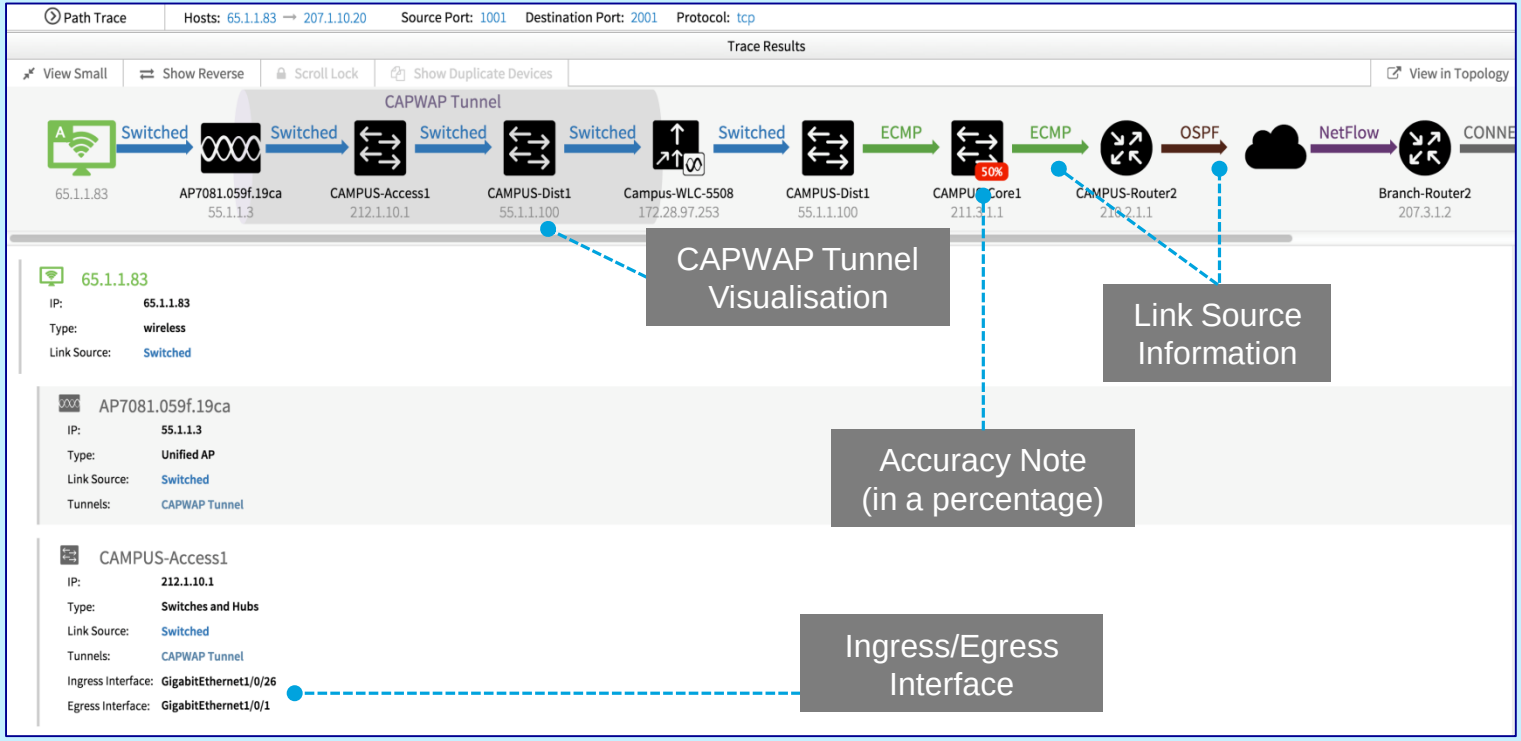
SRC and DEST IP address
[End host or L3 interface]

Optional Information

SRC and DEST L4 port numbers;
L4 protocol (TCP or UDP)

Note: Layer 4 port and protocol information is optional but highly recommended for accurate path calculation

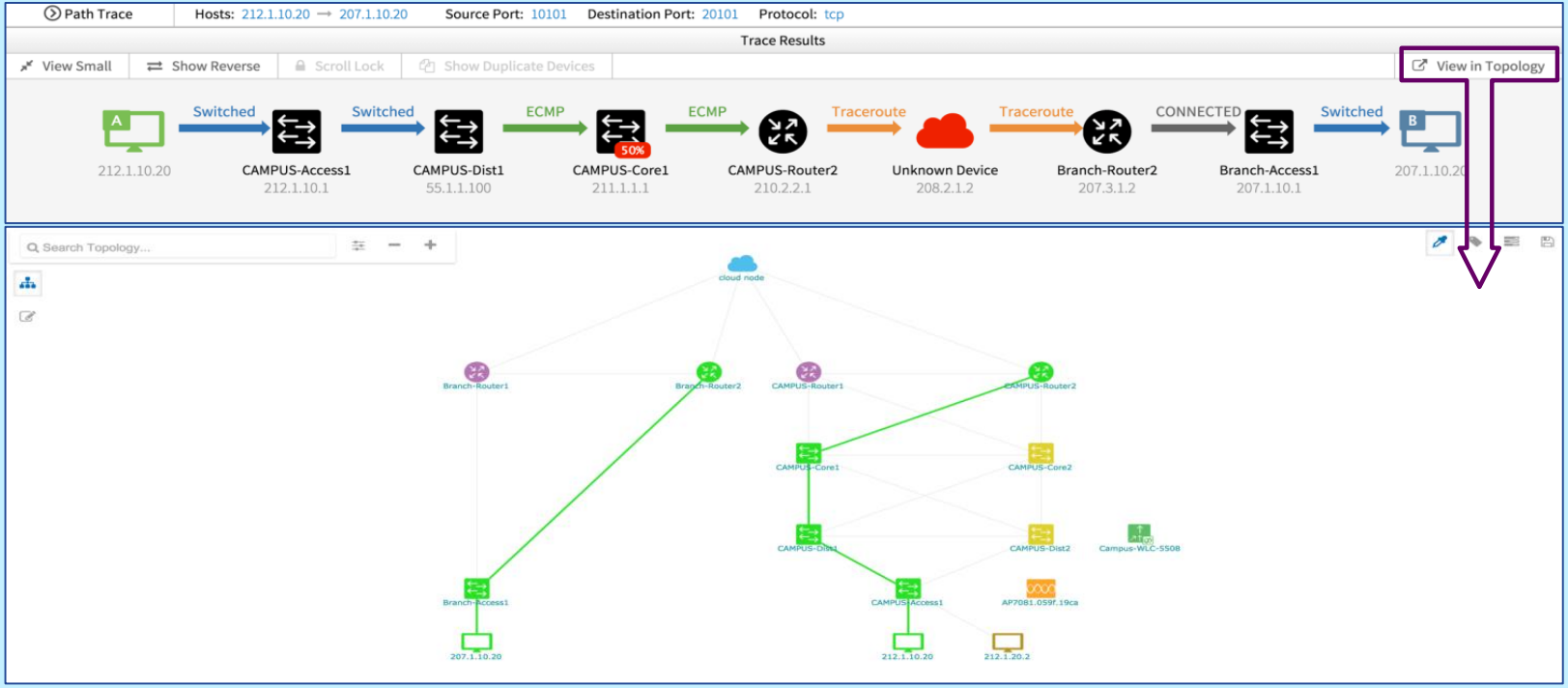
Path Trace App: Enhanced Application Flow Visibility



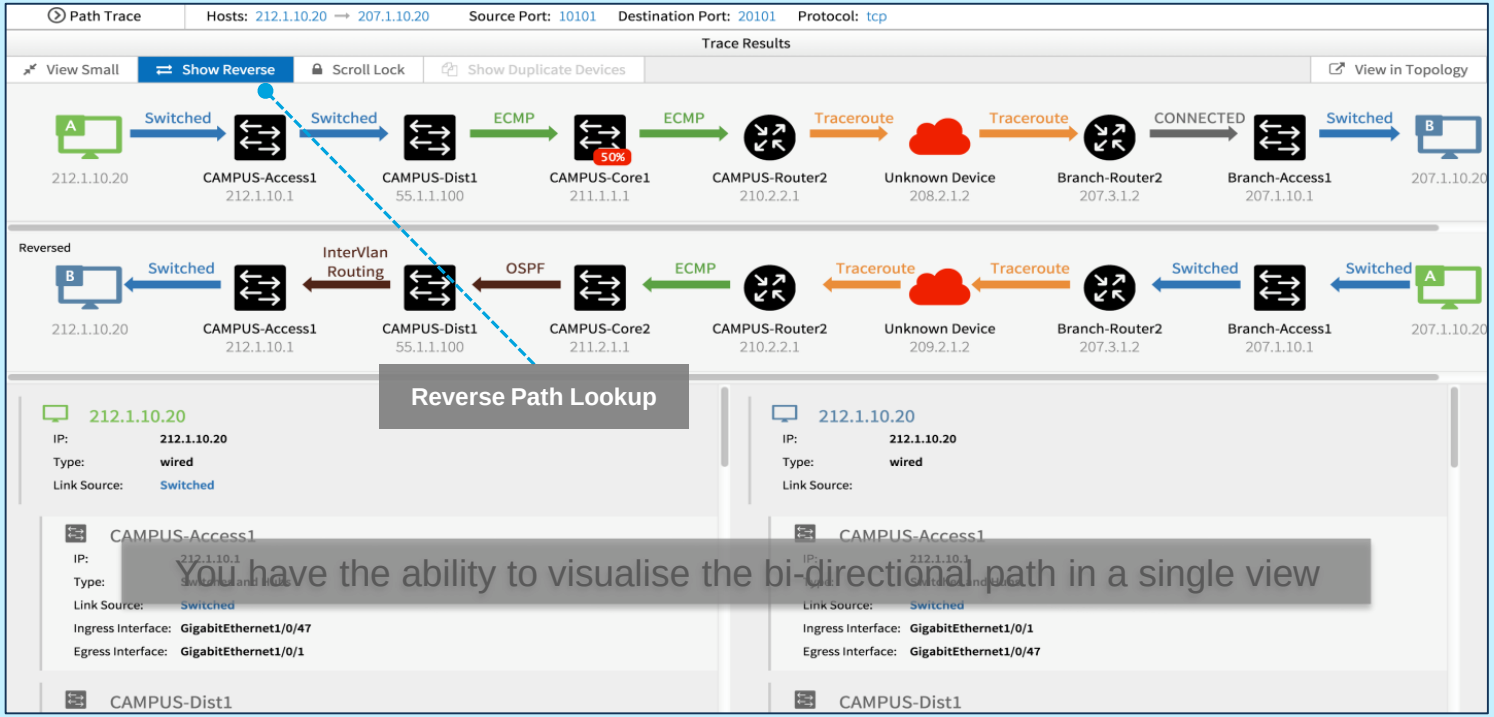
Path Trace App: Detailed Device Information

Device Information	Description
Device IP address	IP address of the network device or end host
Type	Type of network device or end host
Link information source	For all the links along the application flow path trace, the link information source is displayed. Some examples for this particular field include: ▪ Routing protocols (OSPF, BGP etc.) - The link is based on the routing protocol table ▪ ECMP - The link is based upon a Cisco® Express Forwarding load-balancing decision ▪ NetFlow - The link is based upon NetFlow cache records collected on the device ▪ Static - The link is based on a static routing table ▪ Wired and wireless - The end host is a wired or wireless endpoint connected to the network device ▪ Switched - The link is based on Layer 2 VLAN forwarding information ▪ Traceroute - The link is based on information collected by the trace route app
Tunnels	Relevant tunnel information is present along the application flow path trace. For APIC-EM Release 1.0, only CAPWAP and mobility tunnels are supported. Note: The Path Trace UI provides a visual graphic of the CAPWAP tunnel along the path trace
Ingress interface	Ingress interface of the device for the application flow path trace (physical or virtual)
Egress interface	Egress interface of the device for the application flow path trace (physical or virtual)
Accuracy note	If there is uncertainty about the path trace on a segment between devices, a note about the accuracy of the computed path on this segment will be displayed as a percentage. Click on the note to view suggestions of corrective actions to take to improve the path trace accuracy. The accuracy note is not displayed unless the APIC-EM is certain about the path. Example: If the APIC-EM is unable to obtain the exact egress interface for an ECMP scenario with two paths, the accuracy value would be calculated as 50%.

Path Trace App: Topology View

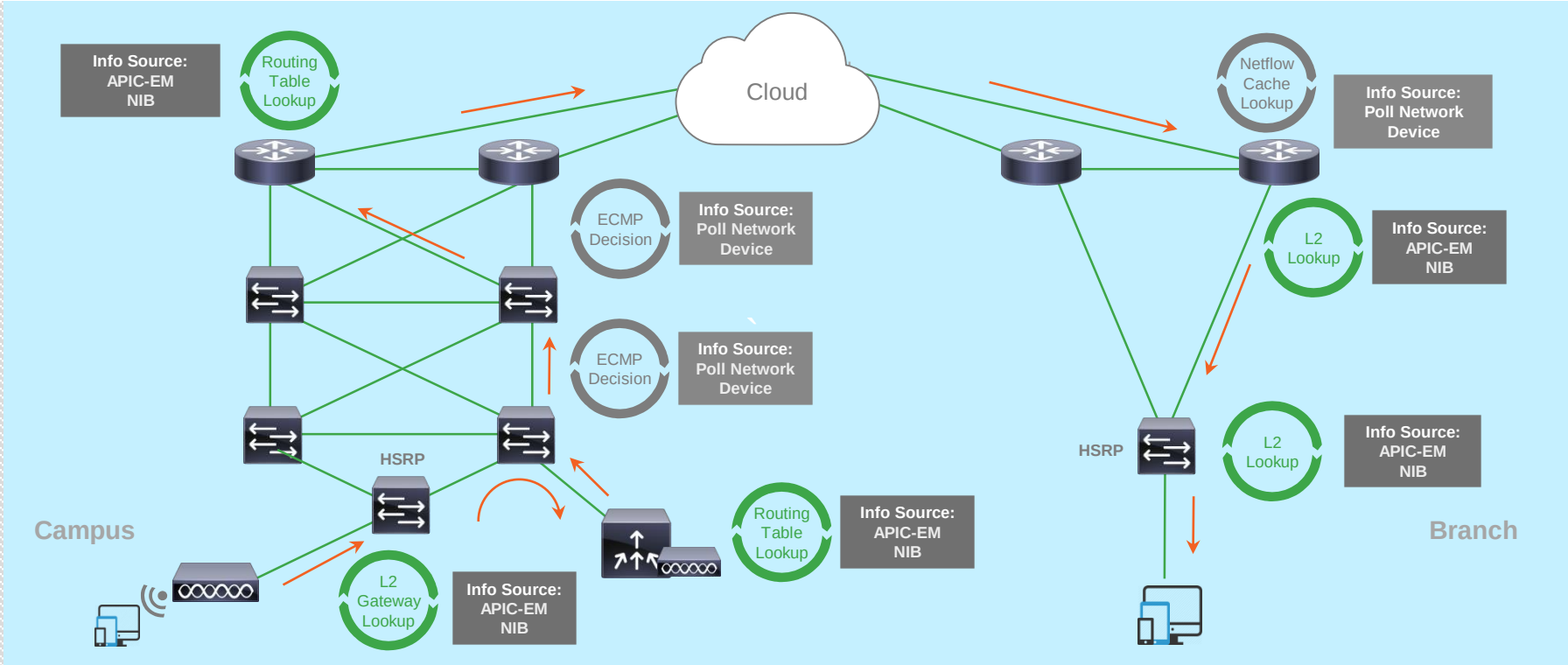


Path Trace App: Enhanced Application Flow Visibility



You have the ability to visualise the bi-directional path in a single view

Path Trace App: Path Trace Flow Diagram



Network Plug and Play: Controller based Deployment

Network PnP with the Cisco APIC-EM Automates Device Provisioning

Network Admin

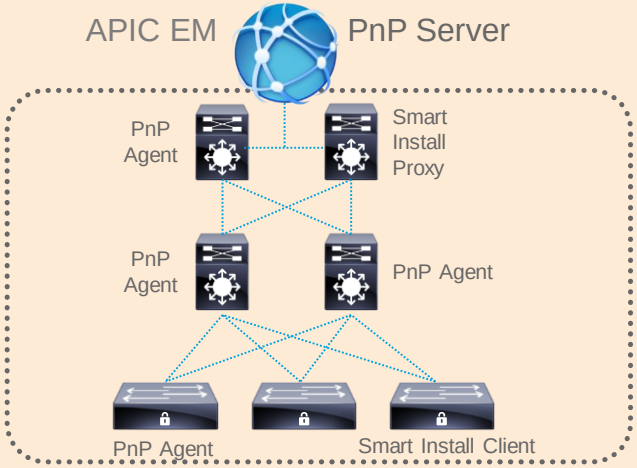
Pre-Provision Projects and Sites

- Policies
- Match rules
- Configurations, images
- IP addressing

Installer

Remote Installer

- Mount and cable devices
- Power on



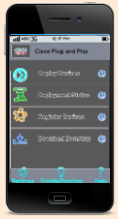
The network admin remotely monitors the installation status while in progress

Booting devices call home to the PnP server, and request instructions

Unskilled Installer	GUI-Based	Consistent for Devices and Pin (Campus, Branch)	Highly Secure	End to End	Greenfield and Brownfield

Network Plug and Play - Components

4



PnP Helper App

Delivers bootstrap status and troubleshooting checks

PnP Protocol

Runs between Agent and Server

Open schema

3

2

PnP Server

Central server - APIC-EM

Manages sites, devices, images, licenses

Provides northbound REST APIs

1

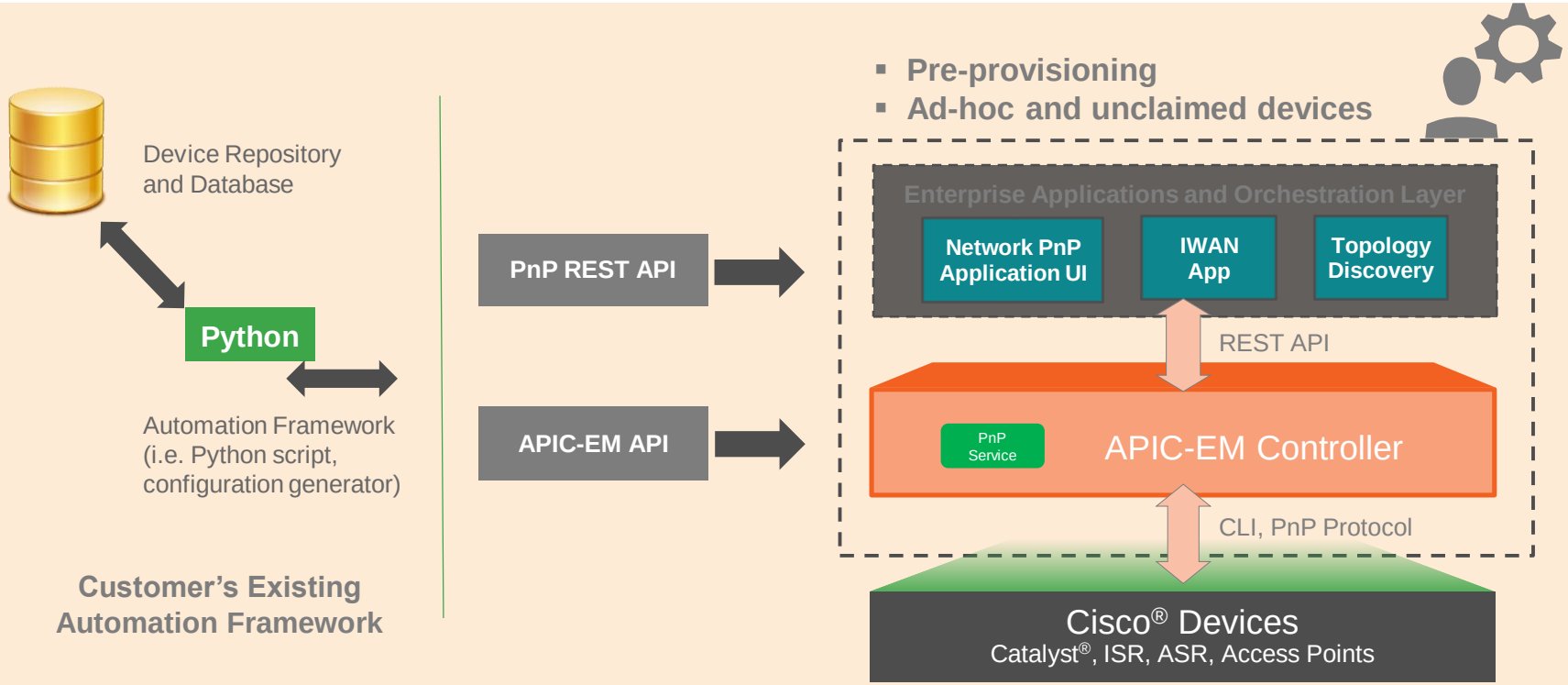
PnP Agent

Runs on Cisco® switches, routers, and wireless access points

Automates the deployment process

Option

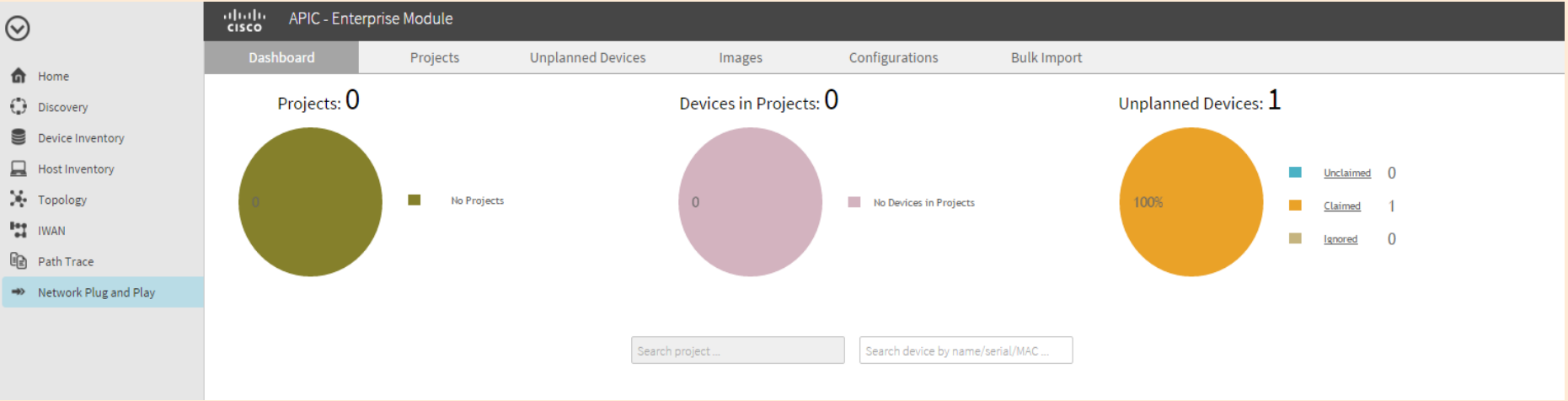
Cisco APIC EM: PnP Server Workflow-Based and REST API



PnP Server Discovery Options

	Switches (Catalyst®)	Routers (ISR, ASR)	Wireless Access Points
1	DHCP Server	**DHCP with options 60 and 43** PnP string: 5A1D;B2;K4;I172.19.45.222;J80	
2	DNS Server	**DNS lookup** pnpserver.localdomain ---- 172.19.45.222 (PnP Server)	
3	cisco	**Cloud re-direction - roadmap (Q4CY2015)** https://devicehelper.cisco.com/device-helper re-directs to 172.19.45.22 (PnP Server)	
4		**USB-based bootstrapping**	
5		**Manual - using the Cisco® Installer App** iPhone, iPad, Android, (roadmap - Windows mobile and PC)	

APIC-EM PnP Login Screen



Workflow on the APIC-EM

Step 3. Add devices

If any external TFTP server is used for configurations and images, for a given site information must be entered here. This is not recommended.

SRDL-SPOKE

Deploy configuration/image files from external TFTP sever

Notes

ISR-4THFLOOR | WS-C4510R-E | 21390989 | Add Device

Name of device | Device type | Serial Number of device

Select the image from an available list already loaded into the APIC-EM

Refresh

Filter

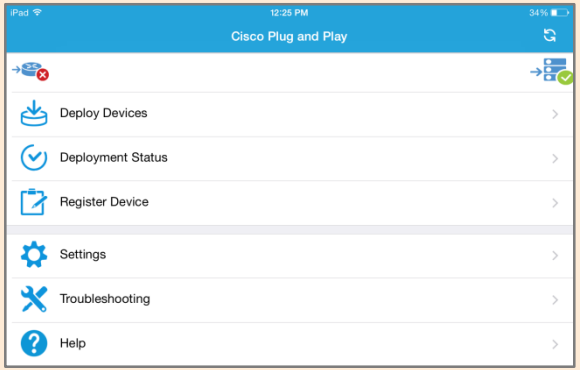
	Device Name		Product ID	Serial Number/MAC Address	Config	Bootstrap	Image	Device Certificate	SUDI Required	Last Contact Time	Status
	SRDL-SPOKE		ISR4331/K9	FLM1923W0LQ			isr4300-universalk9.BLD_V155_3_S_XE...			2015-10-27 01:05:18	Deploying Image

10 | Displaying 1 to 1 of 1 device | First Previous 1 Next Last

Drag and drop the device configuration here as a txt file or select from uploaded configurations

Option

Network PnP: Installer App



Apple

Android

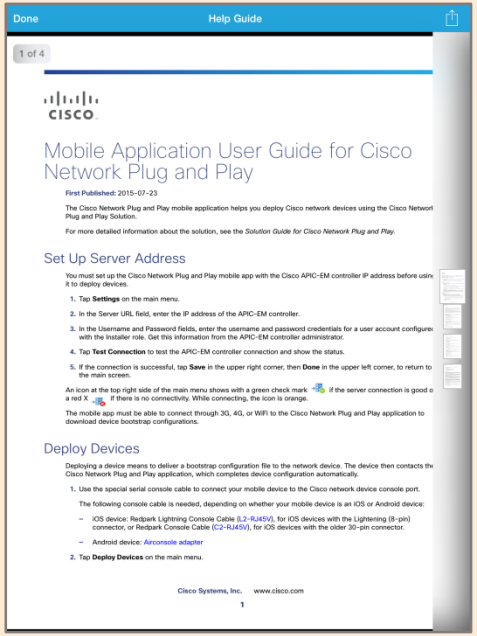
Redpark

RJ45 to
Apple 8pin

RJ45 to
Apple 30pin

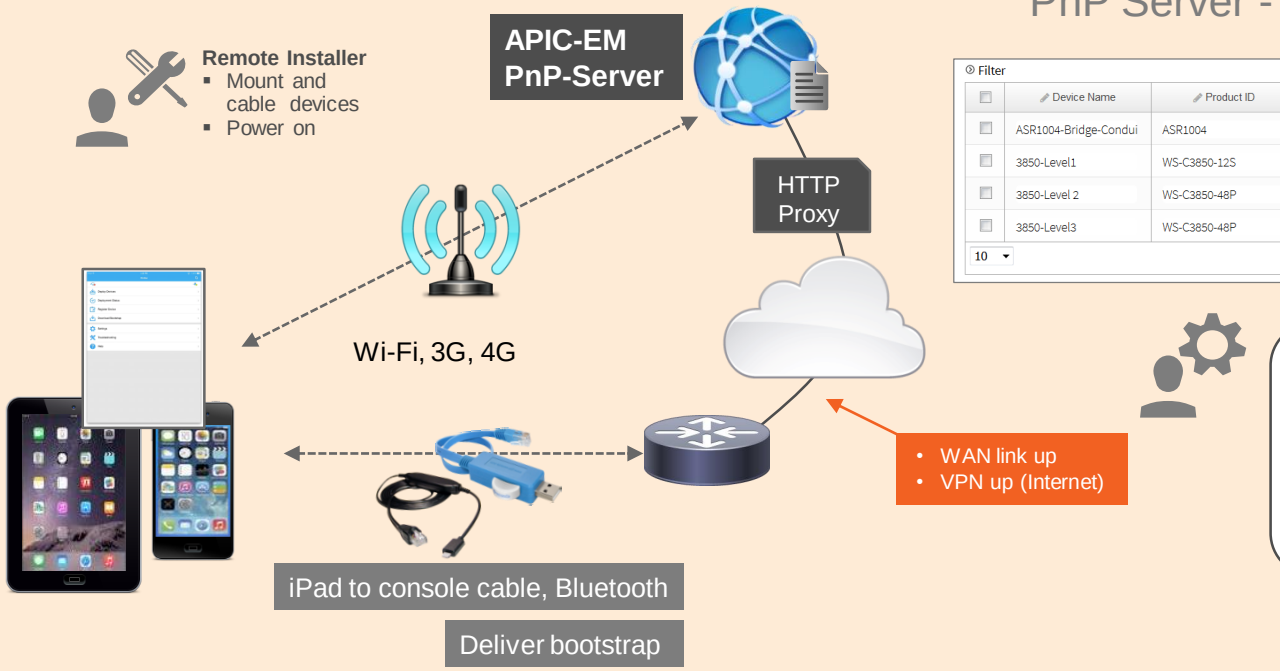
Get Console

Airconsole 2.0
Bluetooth Adapter



* Tested with Network-PnP Solution

Installer App - Workflow



PnP Server - Sites and Devices

Filter

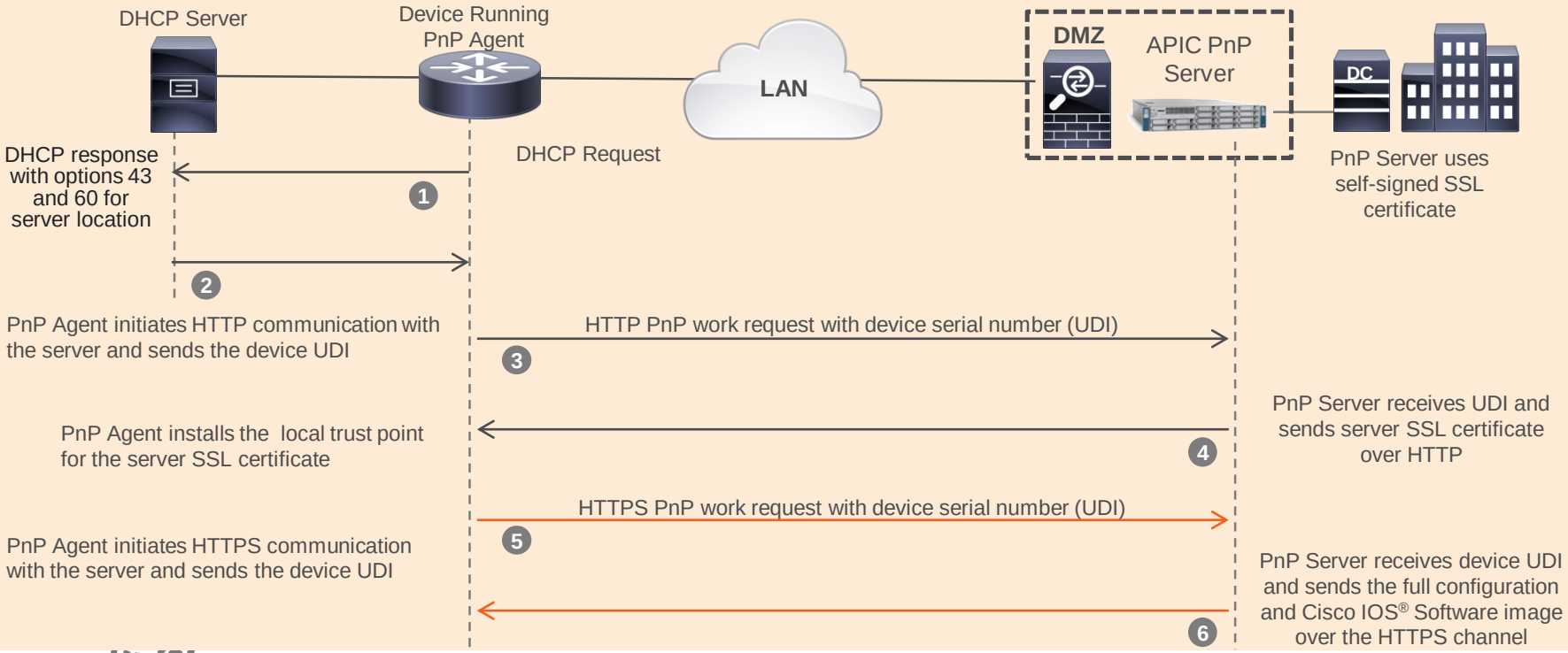
	Device Name	Product ID	Serial Number	Config	Bootstrap
	ASR1004-Bridge-Condui	ASR1004	00110		
	3850-Level1	WS-C3850-12S	0123		
	3850-Level 2	WS-C3850-48P	0321		
	3850-Level3	WS-C3850-48P	091231		

10 Displaying 1 to 4 of 4 devices

```
!
interface GigabitEthernet0/0
 description To Corp Network
 ip address 171.71.223.88 255.255.254.0
no shutdown
!
! PnP Server Config
pnp profile pnp-wan
transport https ipv4 172.19.45.222 port 443
```

Custom WAN Configuration

PnP Deployment for Campus - Self-Signed Certificate Method



NG Plug-N-Play – Supported Platforms

IOS-XE	IOS

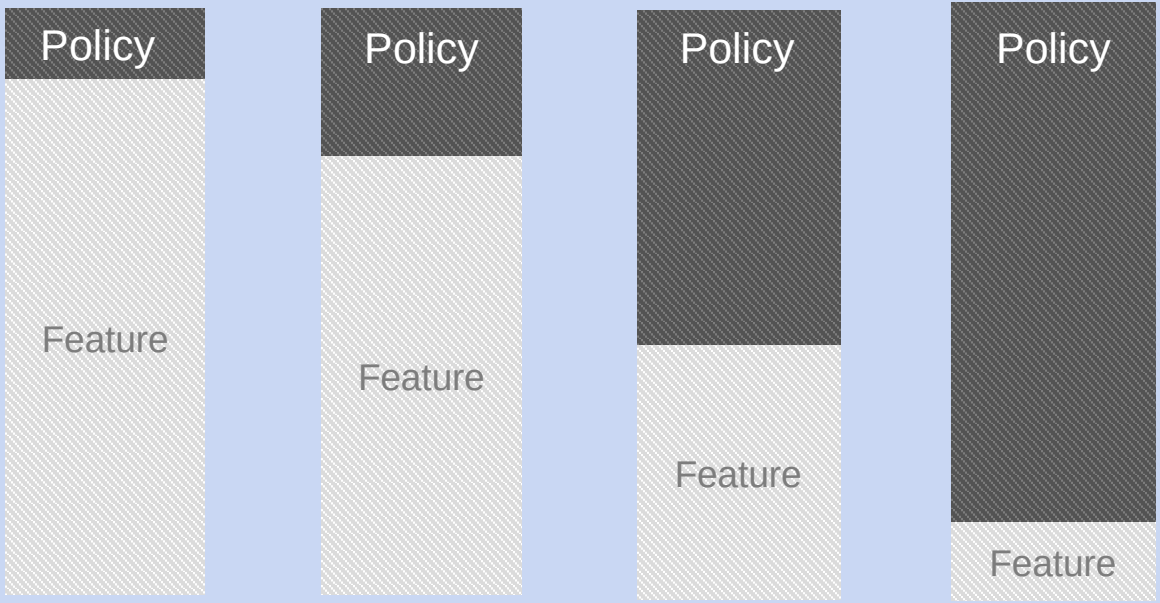
Platform	PnP Agent Support on Products	Recommended Release
Access Switches	Cisco Catalyst 4500E Switches (Sup8-E, 7-E/7L-E, 6-E/6L-E) Cisco Catalyst 3850, 3650 Series Switches Cisco Catalyst 4500-X, 4900 Series Switches Cisco Catalyst 3750-X, 3560-X Series Switches Cisco Catalyst 2960-C, 3560-C Series Compact Switches Cisco Catalyst 2960-S/SF, 2960-X/XR Series Switches	IOS-XE 3.6.3E IOS 15.2.2E3
	Cisco Catalyst 3850XU/XS Series Switches Cisco Catalyst 2960-CX, 3560-CX Series Compact Switches	IOS-XE 3.7.2E IOS 15.2.3E2
Core Switches	Cisco Catalyst 6500 Series Switches: Sup2T/Sup720 Cisco Catalyst 6880-X, 6807-XL Series Switches	IOS 15.2(2)SY1 (Mar2016)
Access Routers	Cisco 4300/4400 Integrated Services Router Cisco ASR 1000 Series Aggregation Services Routers, Cisco CSR 1000v Cisco Cloud Services Router 1000V Series Cisco 800, 1900, 2900, 3900 Series Integrated Services Routers (ISR G2)	IOS-XE 3.16.S (ED) IOS 15.5.3M (ED)
Industrial Ethernet Switches	Cisco Industrial Ethernet 2000, 3000 Series Switches	IOS 15.2.2E3
Indoor Access Points	Gen2 802.11n AP 1600, 2600,, 3600, 702-W/I 802.11ac Wave1 - 1700, 2700, 3700, Wave 2 802.11ac & Outdoor AP support (Roadmap) WLC Supported : AireOS and IOS-XE	Nov2015

iWAN Application: Controller based Policy

Evolution to Policy Automation

Policy-based Automation:
- Dynamic
- Business intent to network intent
- Executed by APIC-EM apps
- Prescriptive
- Business driven

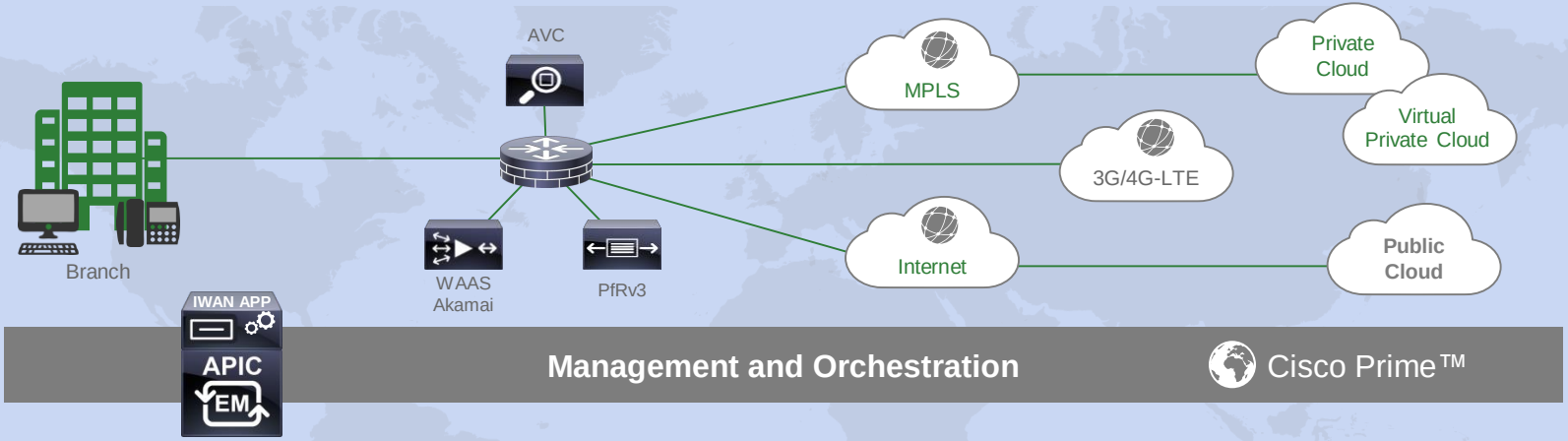
Feature-based Configuration:
- Static
- Focused on configuration
- Executed by Prime™ Infrastructure
- Customisable
- Expert-led



Steady State:
- Cisco leads market adoption so that a large majority of enterprises adopt policy-based automation
- A small set of larger enterprises or MSPs will continue to use customisable feature configuration

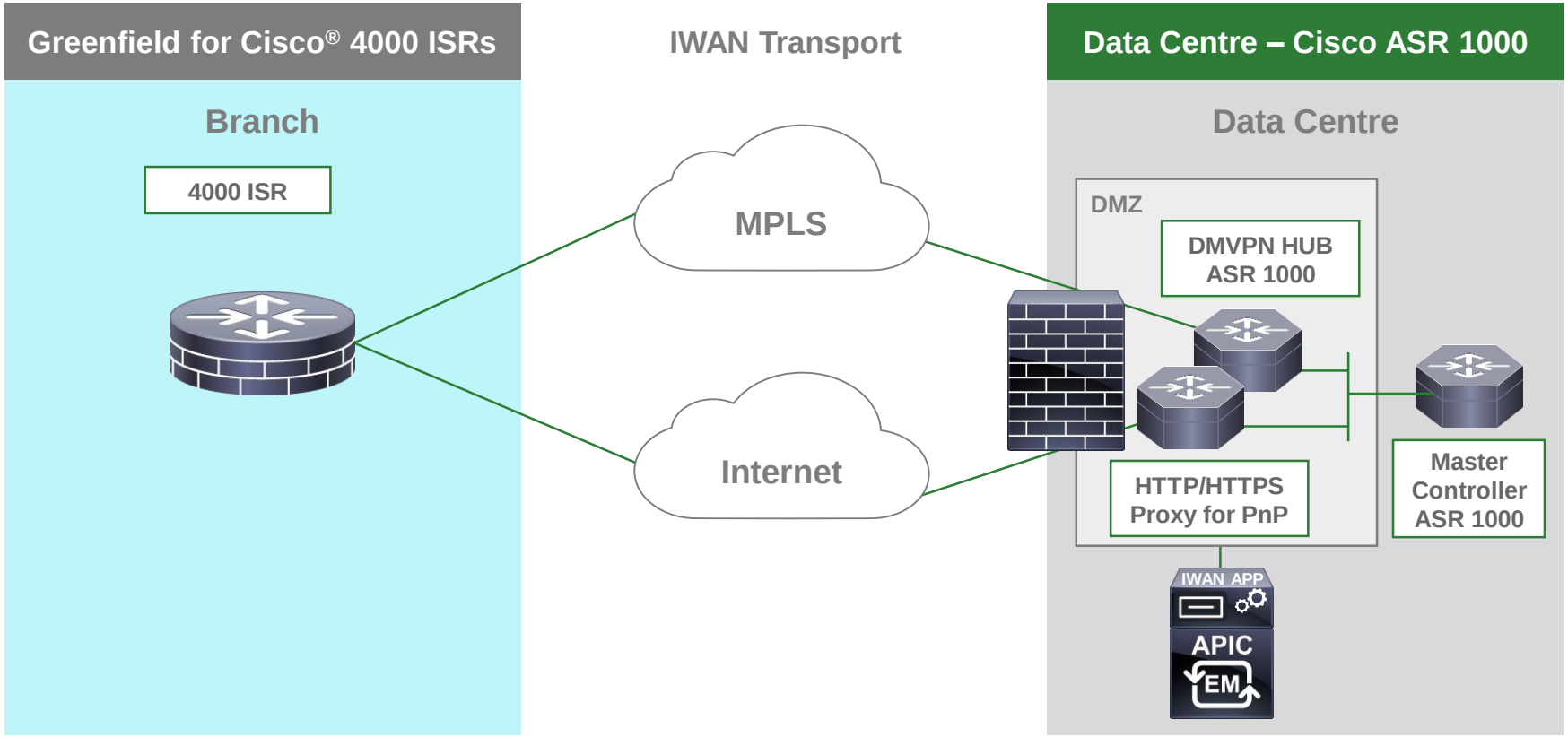
Increasing Policy Coverage Through More Apps and Services

Intelligent WAN (IWAN) Solution Components



Management and Orchestration — Cisco Prime™

Transport Independence	Intelligent Path Control	Application Optimisation	Secure Connectivity
IPSec WAN overlay	Optimal application routing	Performance monitoring	NG strong encryption
Consistent operational model	Efficient use of bandwidth	Optimisation and caching	Threat defence
DMVPN, PKI	**Performance Routing (PfR) QoS**	**AVC, WAAS, Akamai**	**Suite-B, CWS, ZBFW**



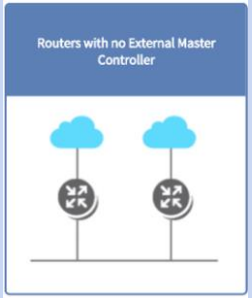
Possible Architectures – General Availability

SP links can be:
Internet + MPLS
Internet + Internet

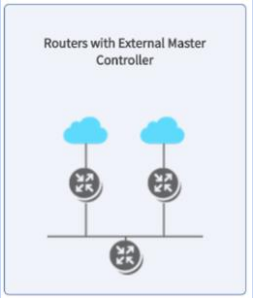
Data Centre

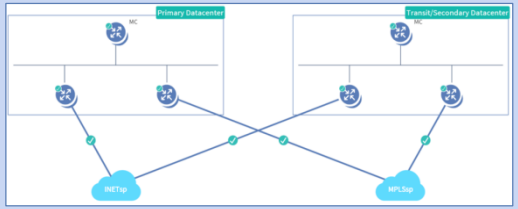
1. For a lab or POC, MC can run in one of the DMVPN hubs
2. Single data centre with a separate MC
3. Dual data centre with primary and transit

1



2



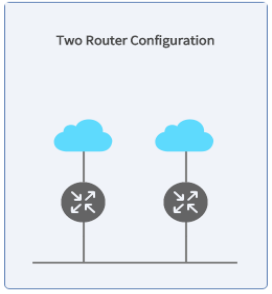


3

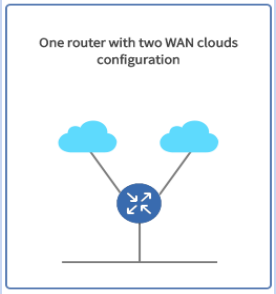
Branch

1. Dual router dual links
2. Single router dual links
3. Single router single links

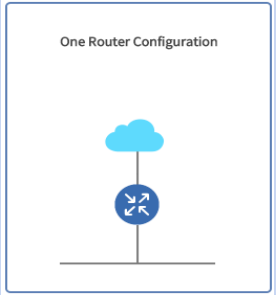
1



2



3



APIC - Enterprise Module

Application Policy

Categorize Applications

voice-and-video 35
consumer-streaming 20
business-and-product... 18
file-sharing 11
consumer-file-sharin... 10
Top 5 Application Categories

Define Application Policy

Business Critical Scavenger Default

Apply Changes

Add Application

Search Apps

Applications can be dragged and dropped to other categories; By default not all the app
Not all Categories are shown by default, Show hidden categories.

backup-and-storage 0
consumer-internet 10
email 9
instant-messaging 7
voice-and-video 35
browsing
consumer-messaging
epayement
other
10
3
1
9

Add Application

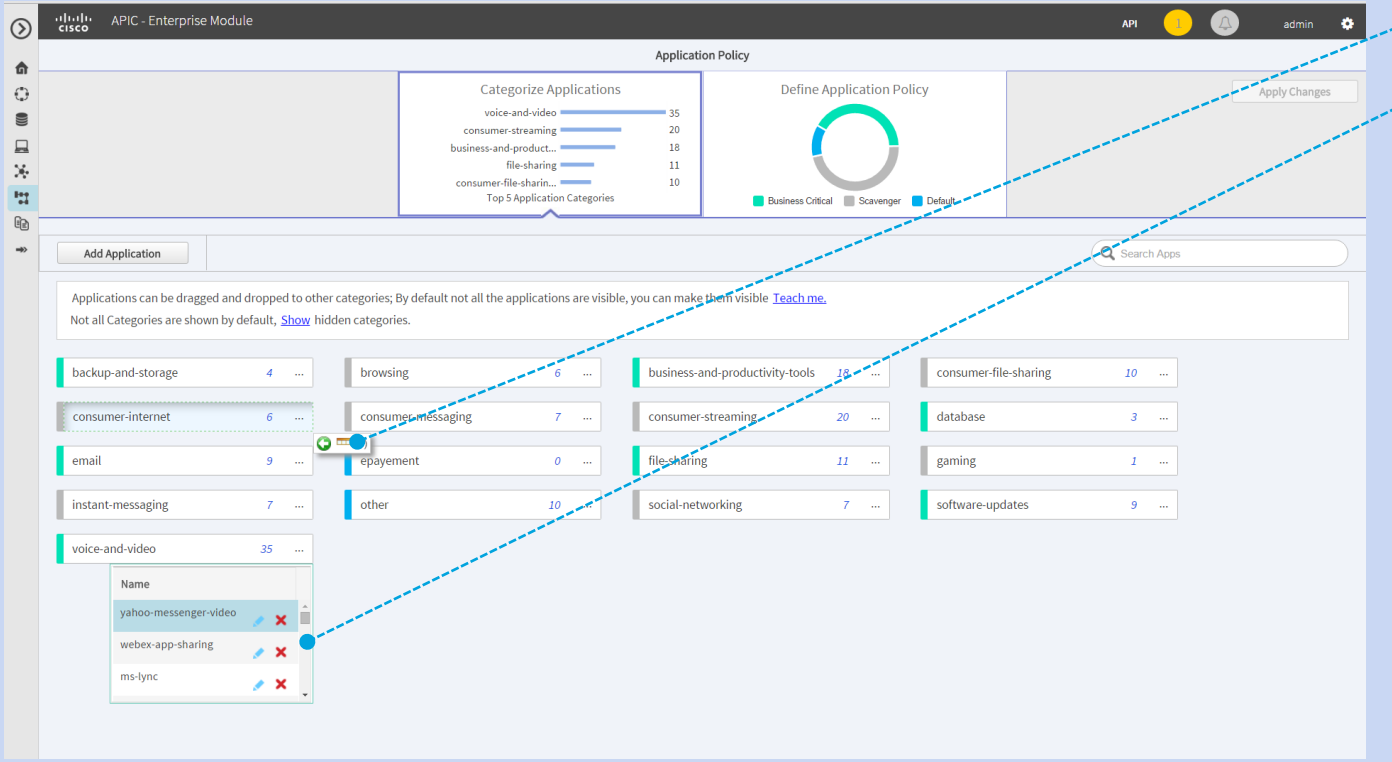
* Name My-Custom-App1
Type URL Server IP/Port DSCP
Protocol UDP TCP
* Value 172.16.3.2 : 5500
* Similar to App sip-tls
* Category voice-and-video
Jitter(ms) 1
Packet loss(%) 5
Delay(ms) 100

Add Cancel

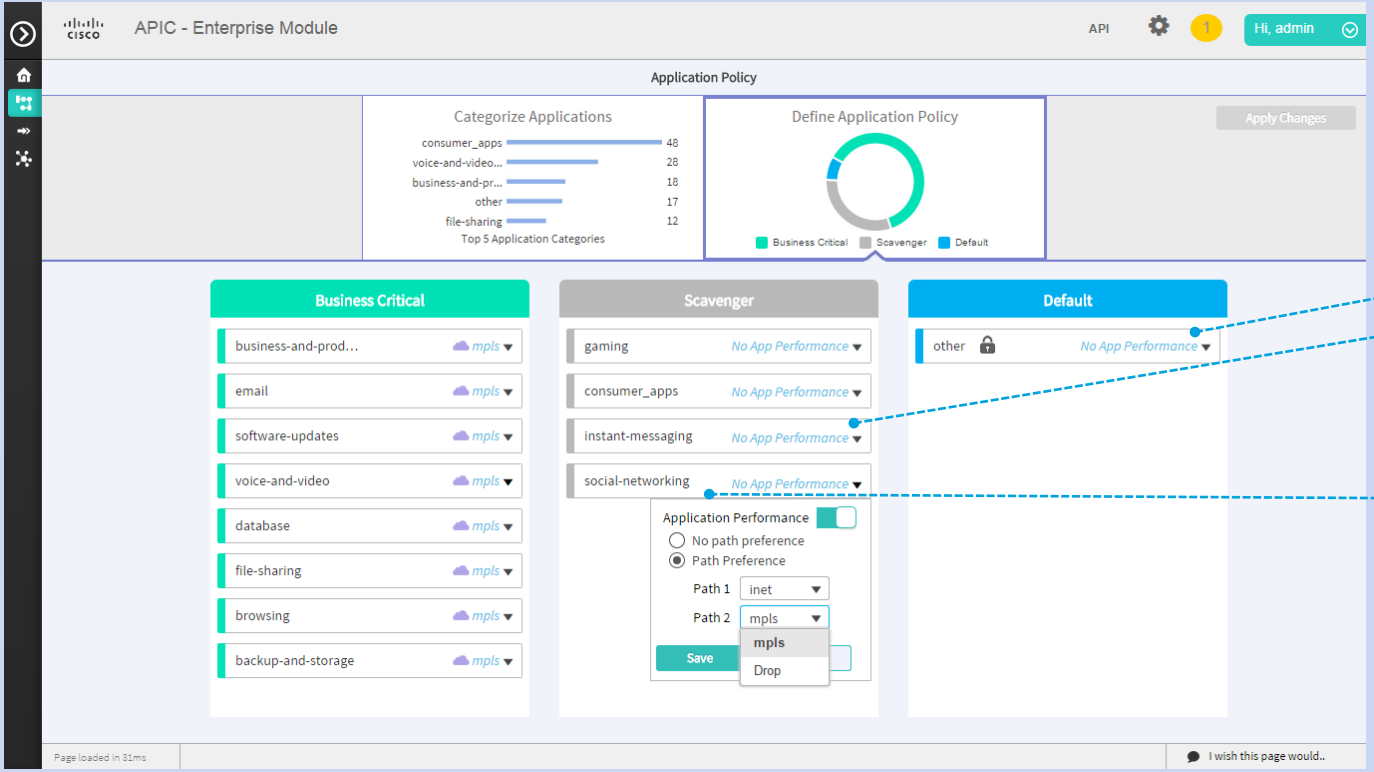
Page loaded in 296ms

I wish this page would..

Categorise applications
Add custom applications



Drag and drop each application (one ore more) from one business class to the other



Drag and Drop a business category among: business critical | scavenger | default

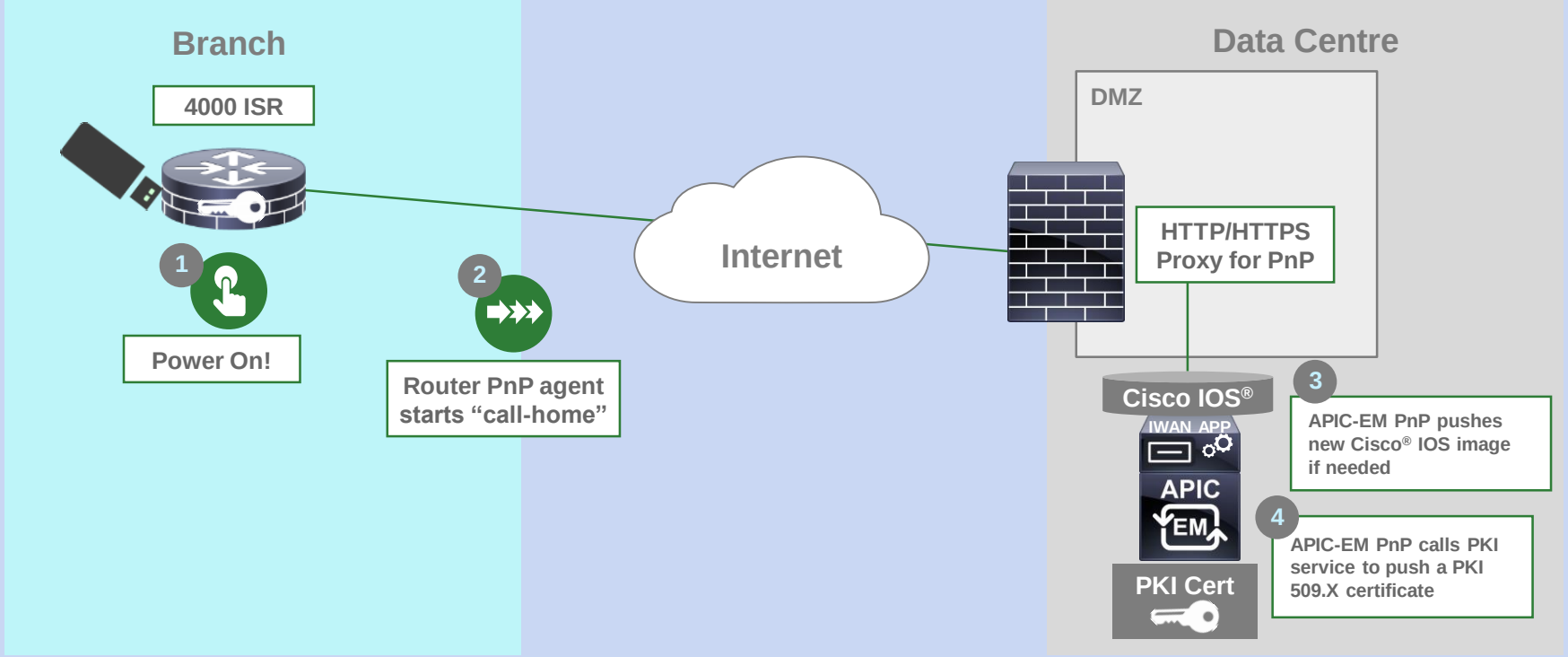
Application priority policy setting in IWAN app

- Path preference: Set primary and action on threshold crossing, which can be a second path or drop traffic
- Drag and drop business buckets

- Connect Internet and MPLS cables
- Insert PnP bootstrap USB stick
- Power up the Cisco 4000 ISR

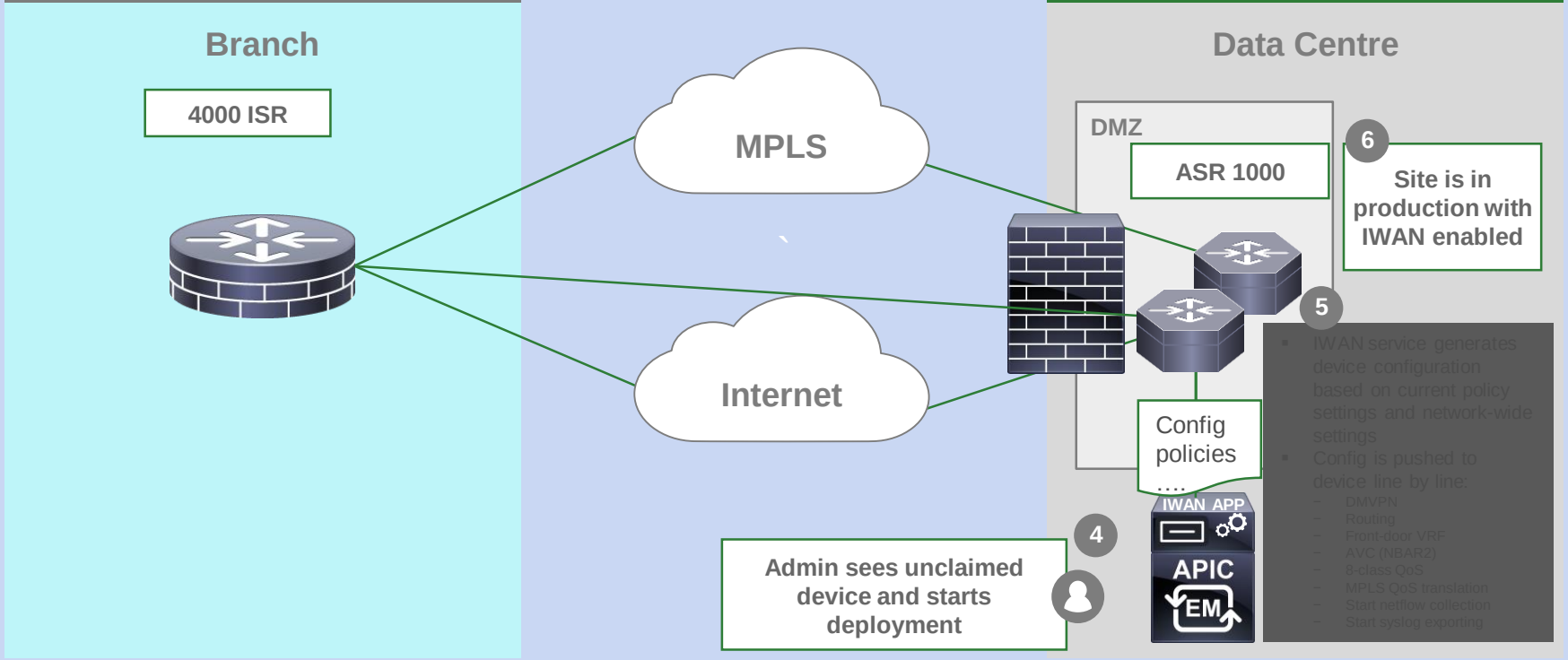
IWAN Transport

- Network-wide settings have been defined
- Data centre has been configured
- Application policies have been set



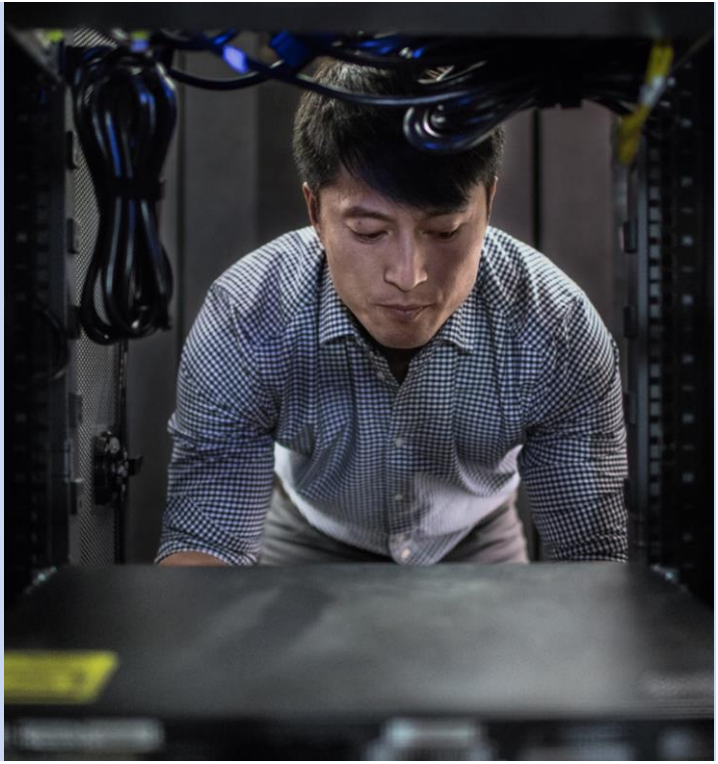
- IWAN configuration is applied
- Hybrid WAN tunnel comes up

- Controller generates the IWAN config
- Controller pushes the config to device

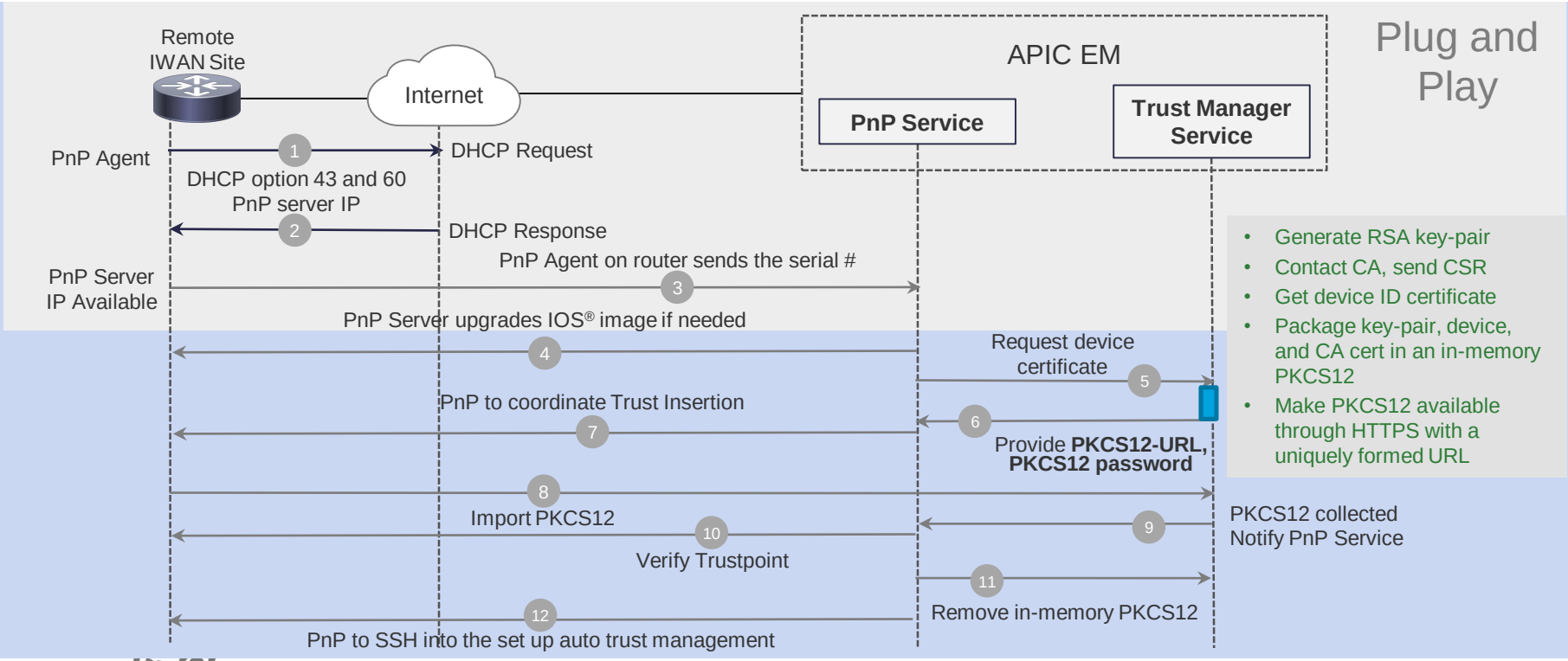


PKI Service and Trust Manager Settings

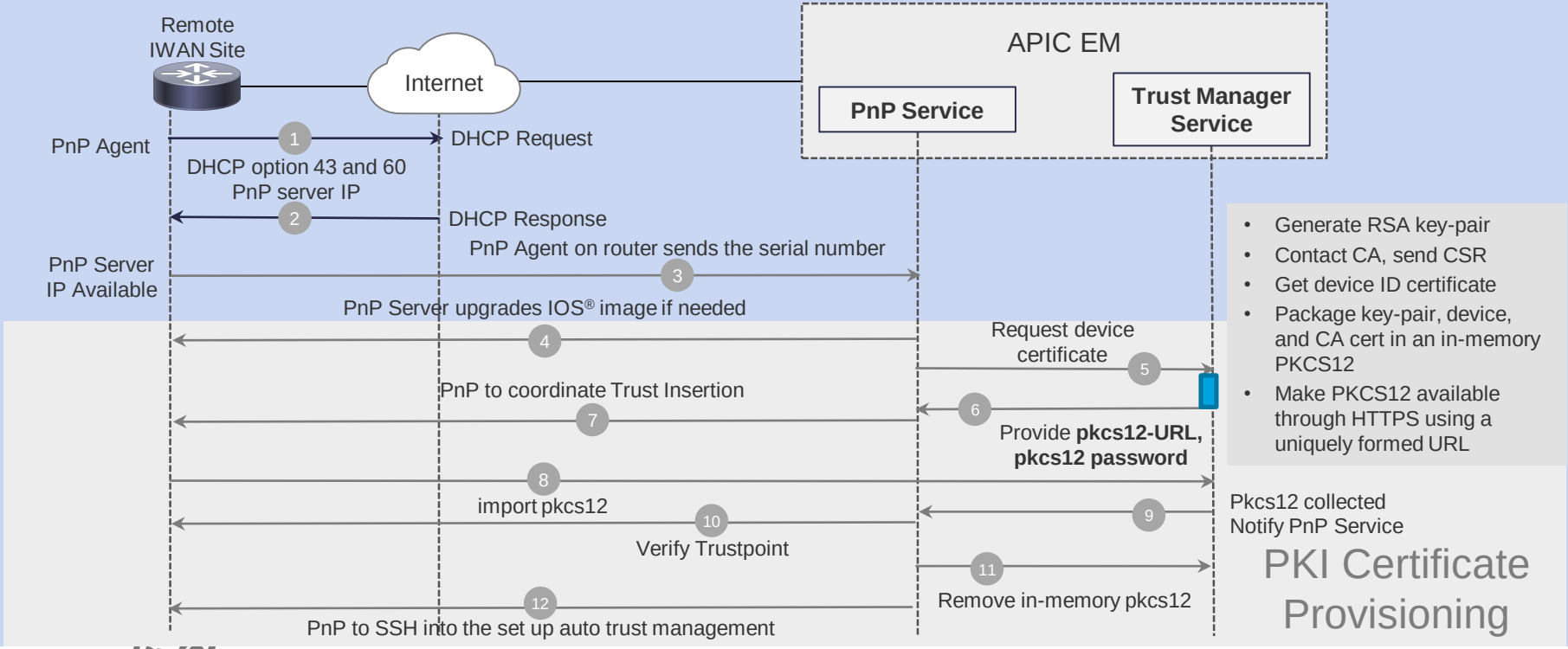
- PKI lifecycle is automated and simplified - deploy, renew, revoke - are driven using NB API calls
- APIC-EM runs a “CA Server” internally. This CA comes with APIs, which makes it a Trust Manager. It is designed for the purpose of DMVPN during ISAKMP authentication
- Root certificate has a 10-year lifecycle
- Device certificates have a 2-year lifecycle
- Certificates are renewed automatically when they pass 80% of their life
- RSA keys for devices generate with a 2048 key length
- PKI certificates are pushed to devices using PKCS12 encapsulation with an internal random password
  - PKCS12 includes private RSA keys and an X.509 certificate
- PKCS12 is encrypted with: SSLv3/TLSv1 - RSA Key Exchange; RSA Authentication; 256-bit AES encryption; and SHA1 HMAC
- PKCS12 files are pushed to devices using HTTPS
- PKI certificate reports are available through REST APIs into the PKI broker service. These include certificate management operations, as well as PKI broker services. Choose “API” in the APIC-EM to get more information



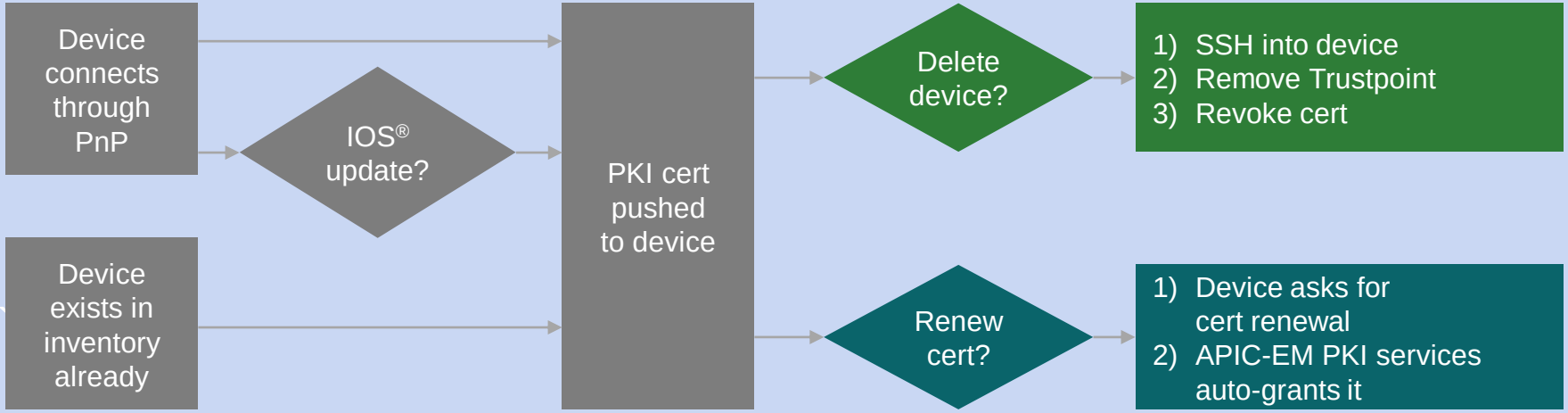
IWAN Greenfield Deployment with Ethernet Hand-Off



IWAN Greenfield Deployment with Ethernet Hand-Off



PKI Lifecycle



Notes:

- With the IWAN app, branch sites connect using PnP
- Data centre DMVPN hubs are discovered into the controller
- Both DMVPN hubs and branch sites get a PKI certificate

Easy QoS Application: Controller based Policy

Levels of QoS Policy Abstraction

Strategic vs Tactical

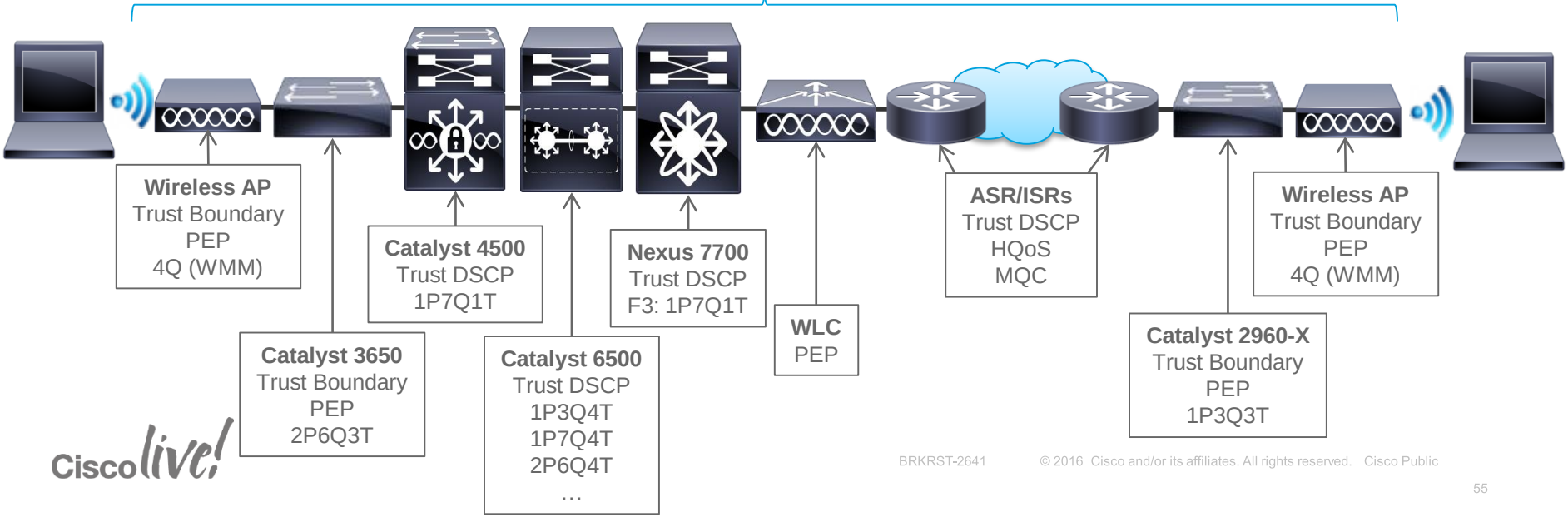
- Strategic QoS Policy (The **WHY** / **WHAT** you want to do)
  - reflects business ***intent***
  - is *not* constrained by any technical or administrative limitation
  - is end-to-end

- Tactical QoS Policy (The **HOW** is it to be done)
  - adapts the strategic business intent to the maximum of platform's capabilities
  - is limited by various ***tactical constraints***, including:
    - PIN-specific constraints
    - Platform constraints
    - Interface constraints
    - Role constraints

Converting Business Intent to Tactical Policies

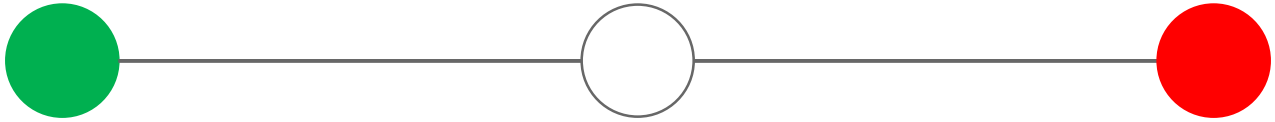
- the ***principle goal*** of the tactical QoS policy is to ***express the strategic QoS policy with maximum fidelity***

- QoS design ***best practices*** will be used to generate platform-specific configurations
- QoS features will be ***selectively enabled*** if they directly contribute to expressing the strategic policy on a given platform



Determining Business Relevance

How Important is a Given Application to Business Objectives



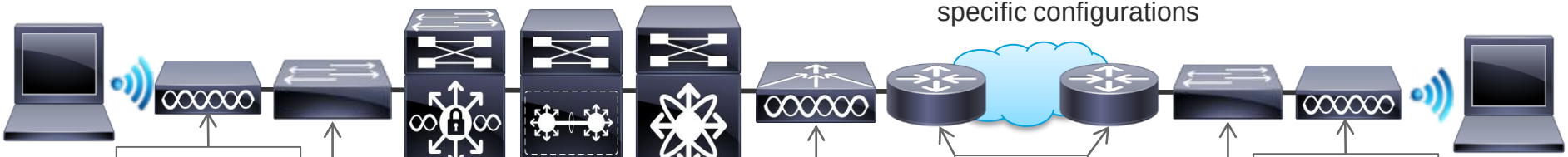
Business Relevant	Default / Maybe / Unknown	Business Irrelevant
• These applications directly supports business objectives	• These applications may/may not support business objectives • E.g. HTTP/HTTPS • Alternatively, administrator may not know the application (or how its being used in the org)	• These applications are known and do not directly support any business objectives; this class includes ***all personal/consumer applications***
• Applications should be classified and marked according to **RFC 4594**-based rules	• Applications in this class should be marked DF and provisioned with a **default** best-effort service (**RFC 2474**)	• Applications in this class should be marked CS1 and provisioned with a "**less-than-best-effort**" service (**RFC 3662**)

EasyQoS Solution

Applications can interact with APIC-EM via Northbound APIs, informing the network of application-specific and dynamic QoS requirements

Network Operators express high-level business-intent to APIC-EM EasyQoS

Southbound APIs translate business-intent to platform-specific configurations



Wireless AP
Trust Boundary
PEP
4Q (WMM)

Catalyst 3650
Trust Boundary
PEP
2P6Q3T

Catalyst 4500
1P7Q1T

Catalyst 6500
1P3Q4T
1P7Q4T
2P6Q4T
…

Nexus 7700
F3: 1P7Q1T

WLC
PEP

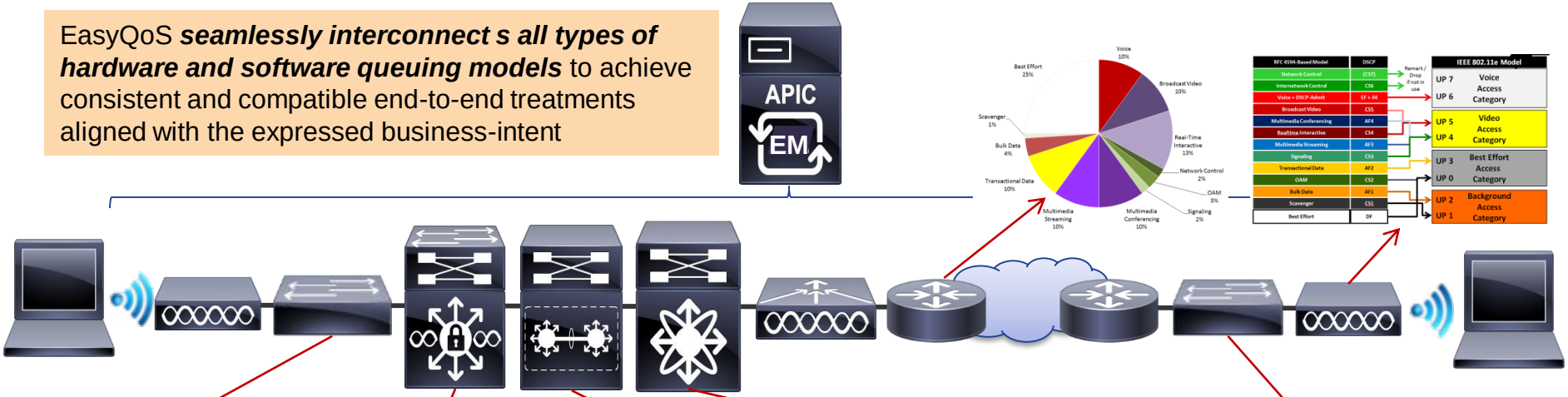
ASR/ISRs
MQC

Catalyst 2960-X
Trust Boundary
PEP
1P3Q3T

Wireless AP
Trust Boundary
PEP
4Q (WMM)

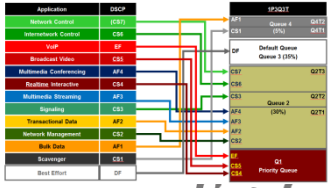
Deploy End-to-End DSCP-Based Queuing Policies

EasyQoS ***seamlessly interconnect s all types of hardware and software queuing models*** to achieve consistent and compatible end-to-end treatments aligned with the expressed business-intent



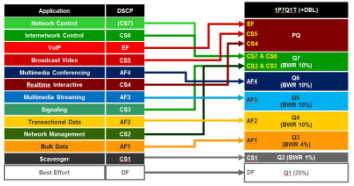
Catalyst 2960-X

1P3Q3T Egress Queuing Model



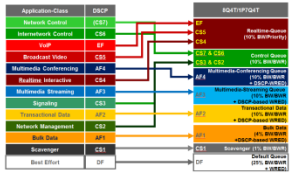
Catalyst 4500

1P7Q1T+Dynamic Buffer Limiting (DBL) Egress Queuing Model



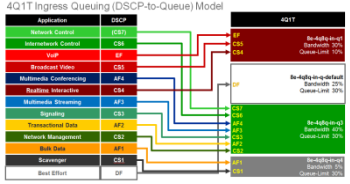
Cisco Catalyst 6500/6800

8Q4T Ingress & 1P7Q4T Egress Queuing Models (6908-10GE)



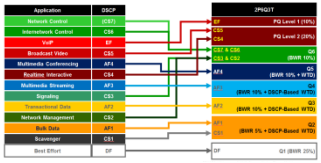
Cisco Nexus 7700 (F3)

4Q1T Ingress Queuing (DSCP-to-Queue) Model



Catalyst 3650/3850

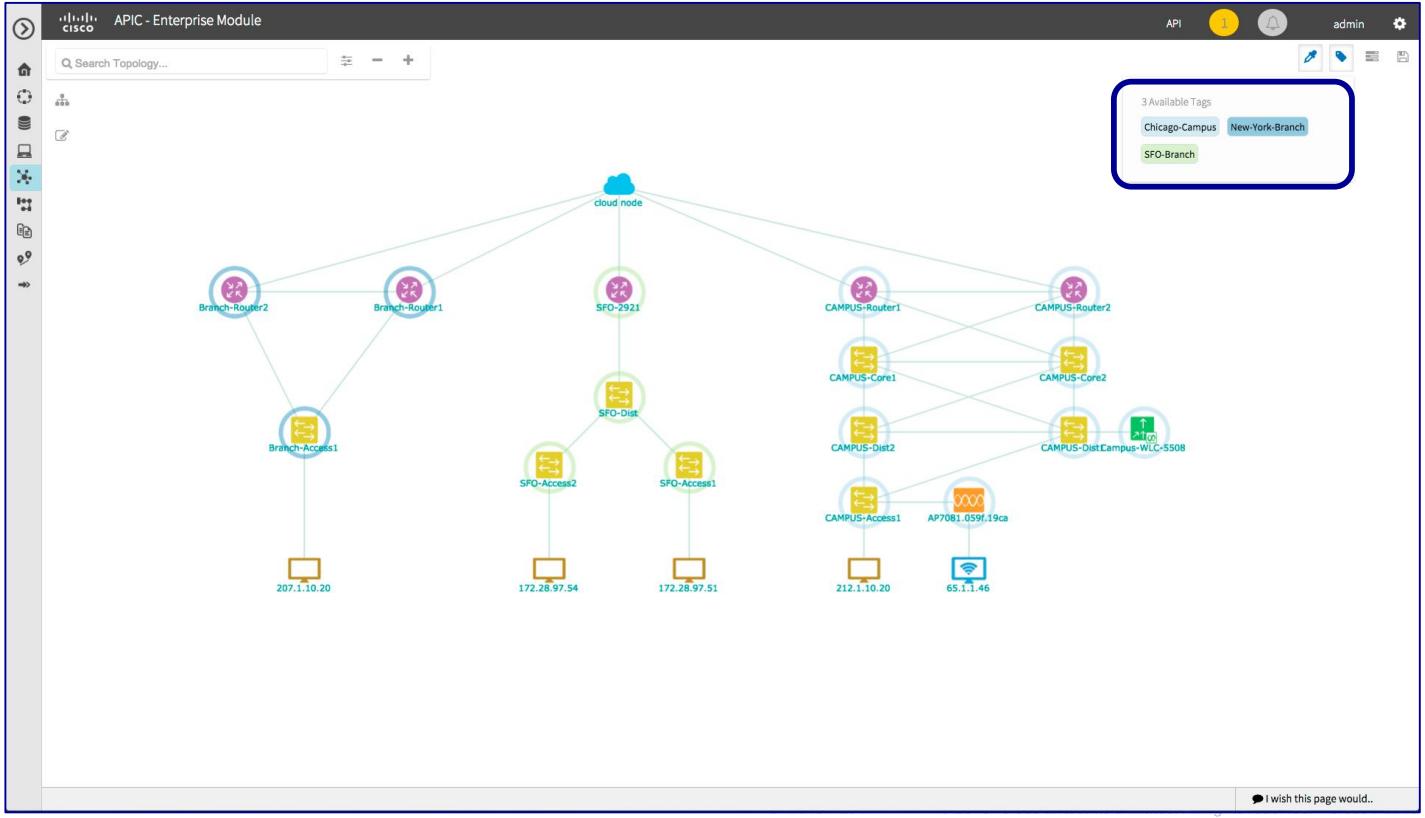
2P6Q3T with Weighted Tail Drop (WTD) Wired Port Egress Queuing Model



EasyQoS GUI

Preview

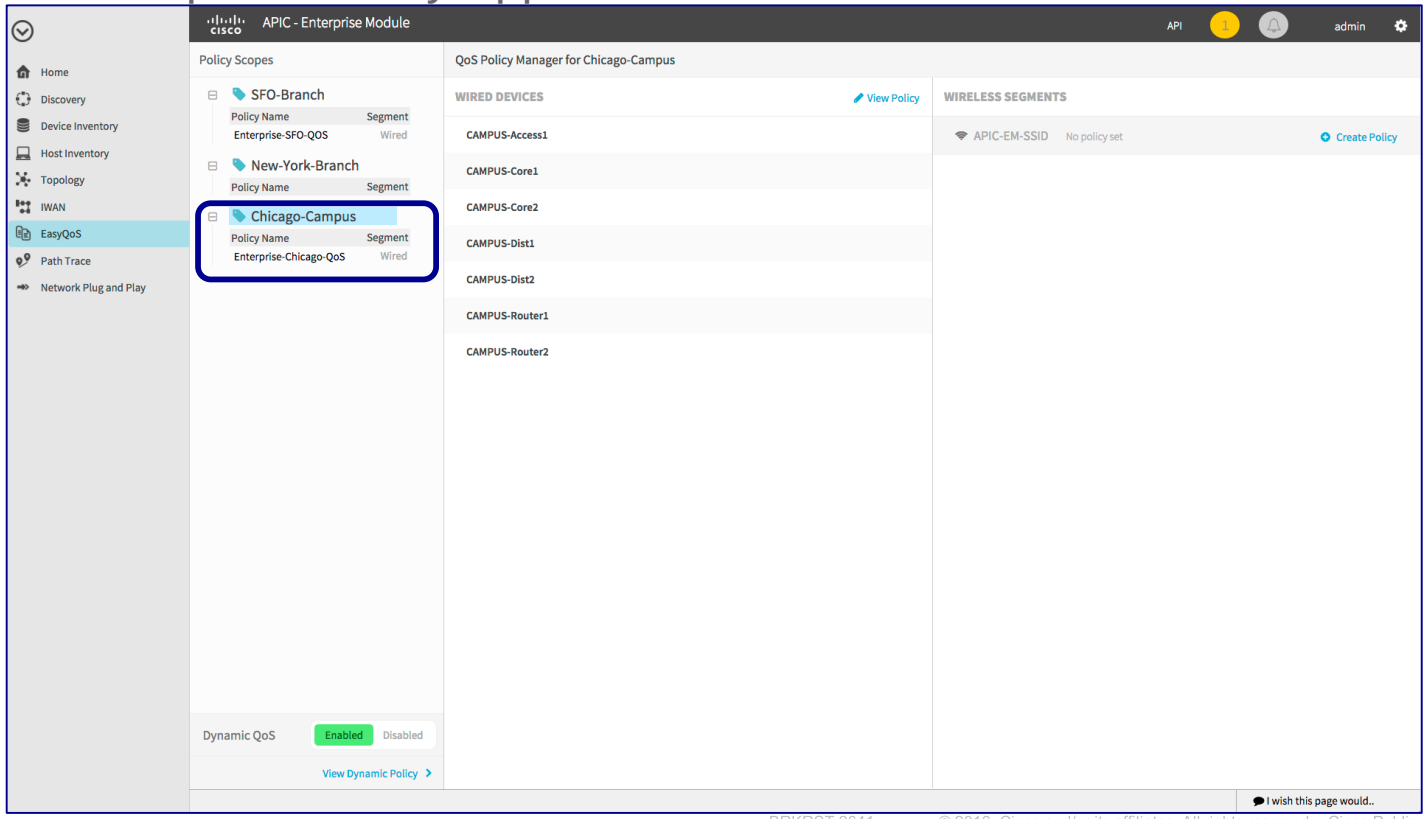
Step 1: Select a Scope for Policy Application



EasyQoS GUI

Preview

Step 1: Select a Scope for Policy Application



EasyQoS GUI

Step 2: (Optional) Change Application Business-Relevance

Preview

APIC - Enterprise Module

Policy Scopes

- SFO-Branch
- New-York-Branch
- Chicago-Campus

Policy Name	Segment
Enterprise-Chicago-QoS	Wired

Dynamic QoS Enabled Disabled

View Dynamic Policy

Applications — Scope Chicago-Campus — Reapply Policy — Revert to CVD

Add Application — Top 25

3Com AMP3 (tcp 629 udp 629)	Default
3Com TSMUX (tcp 106 udp 106)	Default
4chan - Website that hosts found images and discussions on them. (tcp 80,443)	Business-Irrelevant
58 City - Classified information about 58 cities in China. (tcp 80,443)	Business-Irrelevant
A network traffic monitoring and IP information collection protocol	Default
A network traffic monitoring and IP information collection protocol	Default
A remote network server system (tcp 384 udp 384)	Default
ABC - Web Portal for television network. (tcp 80,443)	Business-Irrelevant
ACA Services (tcp 62 udp 62)	Default
ACAP (tcp 674 udp 674)	Business-Relevant
ACR-NEMA Digital Img (tcp 104 udp 104)	Default

411	539	377
BUSINESS RELEVANT	DEFAULT	BUSINESS IRRELEVANT

BUSINESS RELEVANT	
Bulk Data	56 apps
Transactional Data	57 apps
Ops Admin Mgmt	
Network Control	
Voip Telephony	
Multimedia Conferencing	
Multimedia Streaming	
Broadcast Video	
Real Time Interactive	
Signaling	25 apps
DEFAULT	
Other	539 apps
BUSINESS IRRELEVANT (SCAVENGER)	
Scavenger	377 apps

Business-Irrelevant
- Business Relevant
- Default
- Business Irrelevant

I wish this page would..

EasyQoS GUI

Step 3: (Optional) Add Custom Applications

Preview

APIC - Enterprise Module

API admin

Policy Scopes

- SFO-Branch
- New-York-Branch
- Chicago-Campus

Policy Name	Segment
Enterprise-Chicago-QoS	Wired

Dynamic QoS Enabled Disabled

View Dynamic Policy

Scope Chicago-Campus Reapply Policy

Revert to CVD

Add Application

Add Application

Top 25

Name: Application Name

Type: URL Server IP/Port DSCP

Protocol: TCP UDP

Value:

Traffic Class: BULK_DATA

- or -

Similar To: Application

Create Application

411	539	377
BUSINESS RELEVANT	DEFAULT	BUSINESS IRRELEVANT

BUSINESS RELEVANT	
Bulk Data	56 apps
Transactional Data	57 apps
Ops Admin Mgmt	190 apps
Network Control	41 apps
Voip Telephony	7 apps
Multimedia Conferencing	22 apps
Multimedia Streaming	8 apps
Broadcast Video	2 apps
Real Time Interactive	3 apps
Signaling	25 apps
DEFAULT	
Other	539 apps
BUSINESS IRRELEVANT (SCAVENGER)	
Scavenger	377 apps

What Do We Do Under-the-Hood?

Apply RFC 4594-based Marking / Queuing / Dropping Treatments

	Application Class	Per-Hop Behaviour	Queuing & Dropping	Application Examples
Relevant	VoIP Telephony	EF	Priority Queue (PQ)	Cisco IP Phones (G.711, G.729)
	Broadcast Video	CS5	(Optional) PQ	Cisco IP Video Surveillance / Cisco Enterprise TV
	Real-Time Interactive	CS4	(Optional) PQ	Cisco TelePresence
	Multimedia Conferencing	AF4	BW Queue + DSCP WRED	Cisco Jabber, Cisco WebEx
	Multimedia Streaming	AF3	BW Queue + DSCP WRED	Cisco Digital Media System (VoDs)
	Network Control	CS6	BW Queue	EIGRP, OSPF, BGP, HSRP, IKE
	Signalling	CS3	BW Queue	SCCP, SIP, H.323
	Ops / Admin / Mgmt (OAM)	CS2	BW Queue	SNMP, SSH, Syslog
	Transactional Data	AF2	BW Queue + DSCP WRED	ERP Apps, CRM Apps, Database Apps
	Bulk Data	AF1	BW Queue + DSCP WRED	E-mail, FTP, Backup Apps, Content Distribution
Default	Default Forwarding	DF	Default Queue + RED	Default Class
Irrelevant	Scavenger	CS1	Min BW Queue (Deferential)	YouTube, Netflix, iTunes, BitTorrent, Xbox Live

Current Differences between IWAN and EQ Policy

	IWAN	EasyQoS
Scope	Global (until May)	Tag based
Relevance Categorisation	Per Application Category	Per Application
Devices Supported	Routers – IWAN deployed	Routers/switches/WLAN
Dynamic Policy	NA	Yes, Voice, Video

Dynamic QoS

APIC - Enterprise Module

API 1 admin

Policy Scopes

SFO-Branch

Policy Name	Segment
Enterprise-SFO-QOS	Wired

New-York-Branch

Policy Name	Segment

Chicago-Campus

Dynamic QoS Policies

Status	Source IP	Source Port	Dest IP	Dest Port	Flow Type	Protocol
CONFIG_ADD_SUCCESS	172.28.97.51	30672	172.28.97.54	28452	VIDEO	udp
CONFIG_ADD_SUCCESS	172.28.97.54	21054	172.28.97.51	23614	VOICE	udp
CONFIG_ADD_SUCCESS	172.28.97.54	28452	172.28.97.51	30672	VIDEO	udp
CONFIG_ADD_SUCCESS	172.28.97.51	23614	172.28.97.54	21054	VOICE	udp

Dynamic QoS Policies

Dynamic QoS Enabled

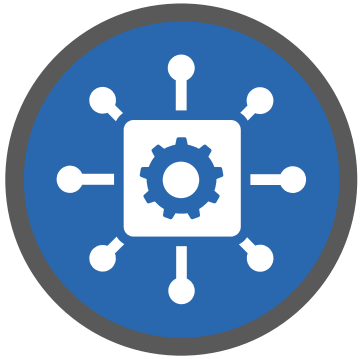
Dynamic QoS Enabled Disabled

View Dynamic Policy

I wish this page would..

Summary

Changes



Simplification

Network-wide abstraction supporting both Greenfield and Brownfield

Automation

OPEX reduction through adoption of Cisco best practices

Abstraction - Policy

Dynamic network that adapts to business intent policy

Open Programmability

Open NB REST API's with agnostic SB interfacing

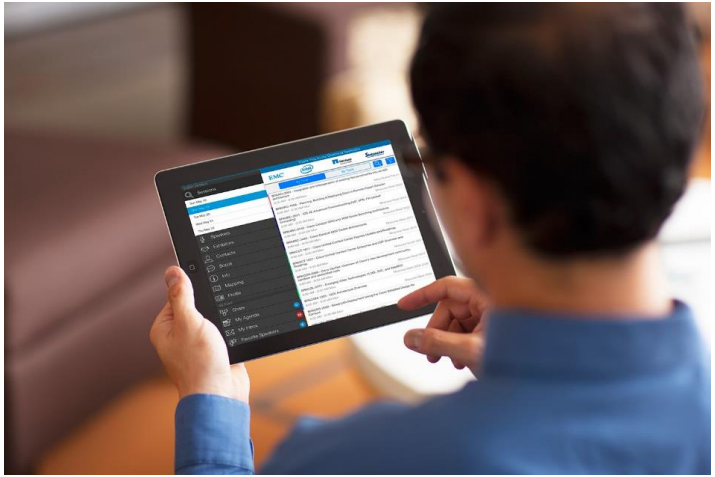
Q & A

Complete Your Online Session Evaluation

Give us your feedback and receive a **Cisco 2016 T-Shirt** by completing the Overall Event Survey and 5 Session Evaluations.

- Directly from your mobile device on the Cisco Live Mobile App
- By visiting the Cisco Live Mobile Site http://showcase.genie-connect.com/ciscolivemelbourne2016/
- Visit any Cisco Live Internet Station located throughout the venue

T-Shirts can be collected Friday 11 March at Registration



Learn online with Cisco Live!
Visit us online after the conference for full access to session videos and presentations.
www.CiscoLiveAPAC.com

Thank you

CISCO