

# INTUITIVE

Cisco *live!*  
June 10-14, 2018 • Orlando, FL

#CLUS



# DNA Center

Network Automation easy, fast,  
reliable for everyone

Markus Harbeck - Consulting Systems  
Engineer

BRKNMS-3005

CCIE #8087

CCDE #20130015



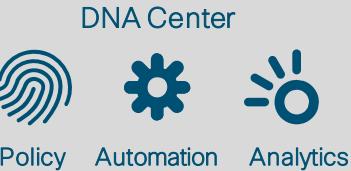
#CLUS

Cisco live!



INTUITIVE

# Agenda



- Warmup Cisco SDN and DNA Center
- TOP NEWS!
- What is DNA Center?
- Get started Deployment – what you get and how to use it
- Apps in action Demo time of many Apps!
- Vision, Conclusion & Summary
- Q&A



*Short Hint:*

*My English might be bad  
but although sexy*

*Source: Henning Bornemann -Thank you for Deutsche Bahn”*

# Transforming from CLI to automation let you focus on “what really matters”

Mobility in the past  
Horse drawn



Source: [www.pinterest.de](http://www.pinterest.de)

Mobility with cars today



Source: [www.welt.de](http://www.welt.de)

Autonomous driving



Source: [www.zeit.de](http://www.zeit.de)

Note: Who had / has control?

# Who is Markus Harbeck ???

## Personal:

- Location: Eschborn, Germany (near Frankfurt) but lives in Bavaria
- Other Interests: My family, 2 kids, Horse back riding, motor cycling

## My Background:

- CLI Junkie since 1996 for all Routing and Switching
- Joined CISCO October 2010
- Before; 12 years, operations, engineering, application engineering at Lufthansa Systems
- Drives DNA Center, Automation and Analytics in EMEAR and loops in the development team and Business Unit

## Current Projects:

- DNA Center since day1 in 2014
- Analytics, Assurance
- Network Transformation
- Network Automation
- SDA, ITSM

My Kids view on DNA Center and Network Design

Cisco live!



Copyright by Saskia

BRKNMS-3005

Copyright by Hanna



6

```
interface GigabitEthernet2/0/9
description 3650-SDA-3
no switchport
dampening
ip address 172.20.195.17 255.255.255.252
ip router isis 2010
logging event link-status
load-interval 30
carrier-delay msec 0
bfd interval 300 min_rx 300 multiplier 3
no bfd echo
!
interface GigabitEthernet2/0/10
description ucs1-vmnic3
switchport access vlan 2136
switchport mode access
device-tracking attach-policy IPDT_MAX_10
spanning-tree portfast
!
interface GigabitEthernet2/0/11
CI3850-SDA-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
CI3850-SDA-1(config)#router lisp
CI3850-SDA-1(config-router-lisp)#
```

18 Cis

# How to get the PDF and Video ?



PDF and all Demo Videos here:

<https://cisco.box.com/v/BRKNMS3005>

Or PDF:

<http://www.ciscolive.com/online>

**Note:** The PDF contains more detailed Slides  
& the Demo's for your reference !!!

# Why Video Demo's

*Just a hint*

- Risk of broken Internet Connectivity
- Risk of LAB Failure
- Videos are available after the session

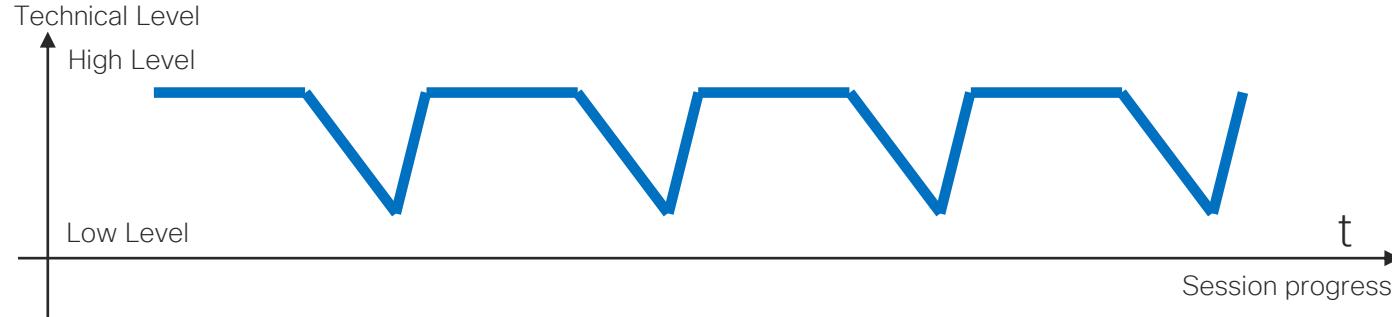
**→ FOR YOU !**

Note: I produced all demo's myself !



Source: <http://www.mysweety.eu>

# Session expectations



That is not a TCP Session! 😊 & not a SDA Session!

We will work from the “INTENT”, which is high level down to the “HOW” which is low level!

Note: TCP Slow Start is part of the congestion control algorithms put in place by TCP to help control the amount of data flowing through to a network. Source:

<https://www.keycdn.com/support/tcp-slow-start/>



DNA Center



Policy



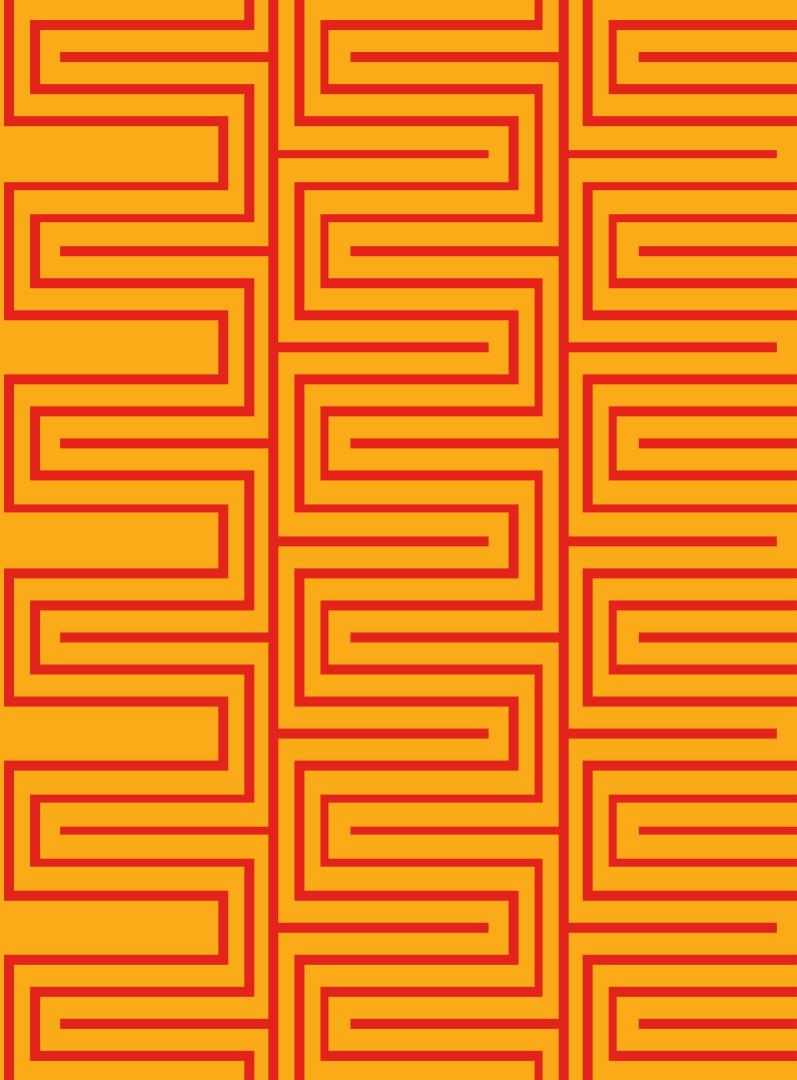
Automation



Analytics



# Warm Up: Introduction to Cisco SDN and DNA Center



# SDN - Still Don't kNow - Stanford Defined Networking

- The Promise of OF/SDN had been “Decoupling Policy from Configuration”

“An open solution for customized flow forwarding control in the Data-Center”

“A way to reduce the CAPEX of my network and leverage commodity switches”

“An open solution for VM mobility in the Data-Center”

“A means to scale my fixed/mobile gateways and optimize their placement  
“A solution to build virtual topologies for optimum multicast forwarding between tenants”

“A way to distribute policy/intent, e.g. firewalls prevention, in the network”

“A platform for developing new control planes”

“A way to avoid lock-in to a single networking vendor”

“With SDN I can develop solutions to my problems far faster – at software speeds”. I don’t have to work with my network or go through length standardization”

“to do traffic engineering without MPLS”

Software-defined  
networking

You can't just buy SDN.  
It's an architecture which you have to embrace and live



# Cisco SDN Domain specific Controller's

Data Center

REST API

Application Centric Infrastructure (ACI)



## APIC

(for Data Center)

(Nexus 9000)

Enterprise

REST API

DNA



1.2 Available now!

## DNA Center

(formerly APIC-EM)

(Catalyst, ISR, ASR, WLAN,  
Nexus 7k, NfV, vManage, Meraki)

# The Journey from APIC-EM to DNA Center



APIC-EM

0.9 → 1.6

Since 2015

APIC-EM  
1.x → 2.x



New Name  
DNA Center



DNA Center

Design, Automate and Assure your Network

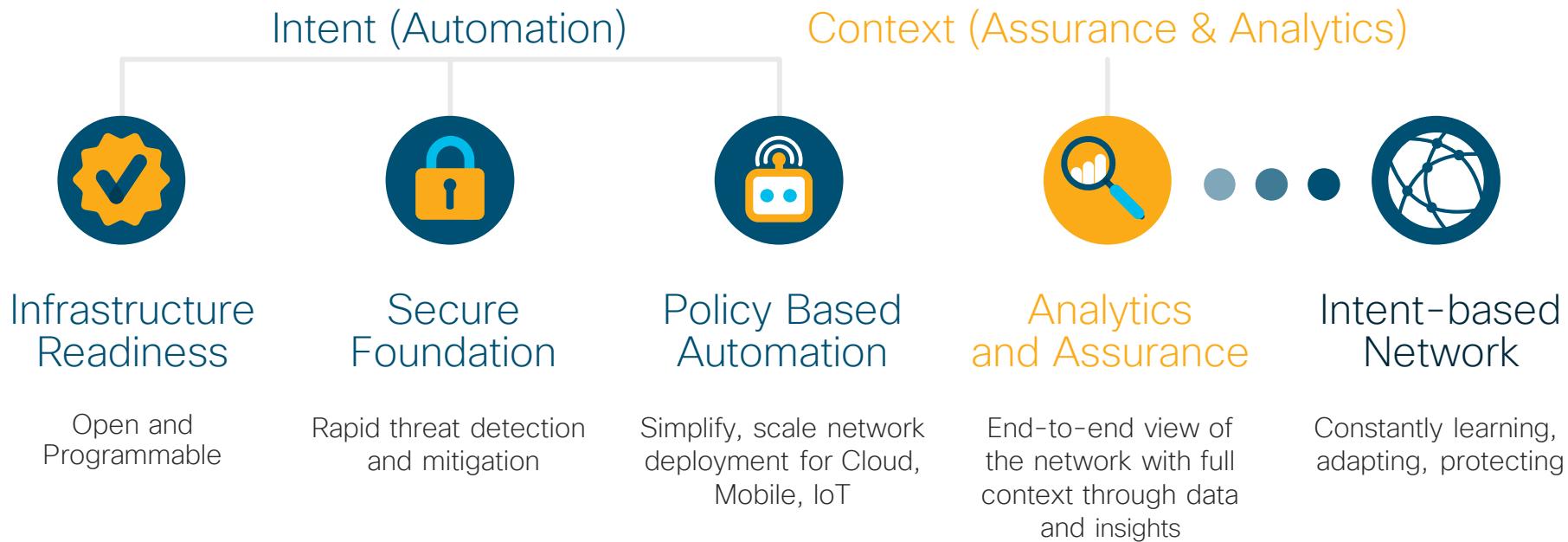
DNA Center 1.0 since  
August 2017  
(1.2 today)

- Building SDN foundation
- PnP, Easy QoS, CAA, IV

- Based on APIC-EM 2.x
- Design, Policy, Provision & Assurance
- Application Policy, Security Contracts, Troubleshooting Policies
- DNACenter 1.2 available

APIC-EM proofed the value of Policy and SDN Automation – DNA Center now closes the gaps

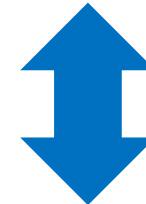
# APIC-EM & DNA Center started the journey



# What is network about?



Source: google.de images



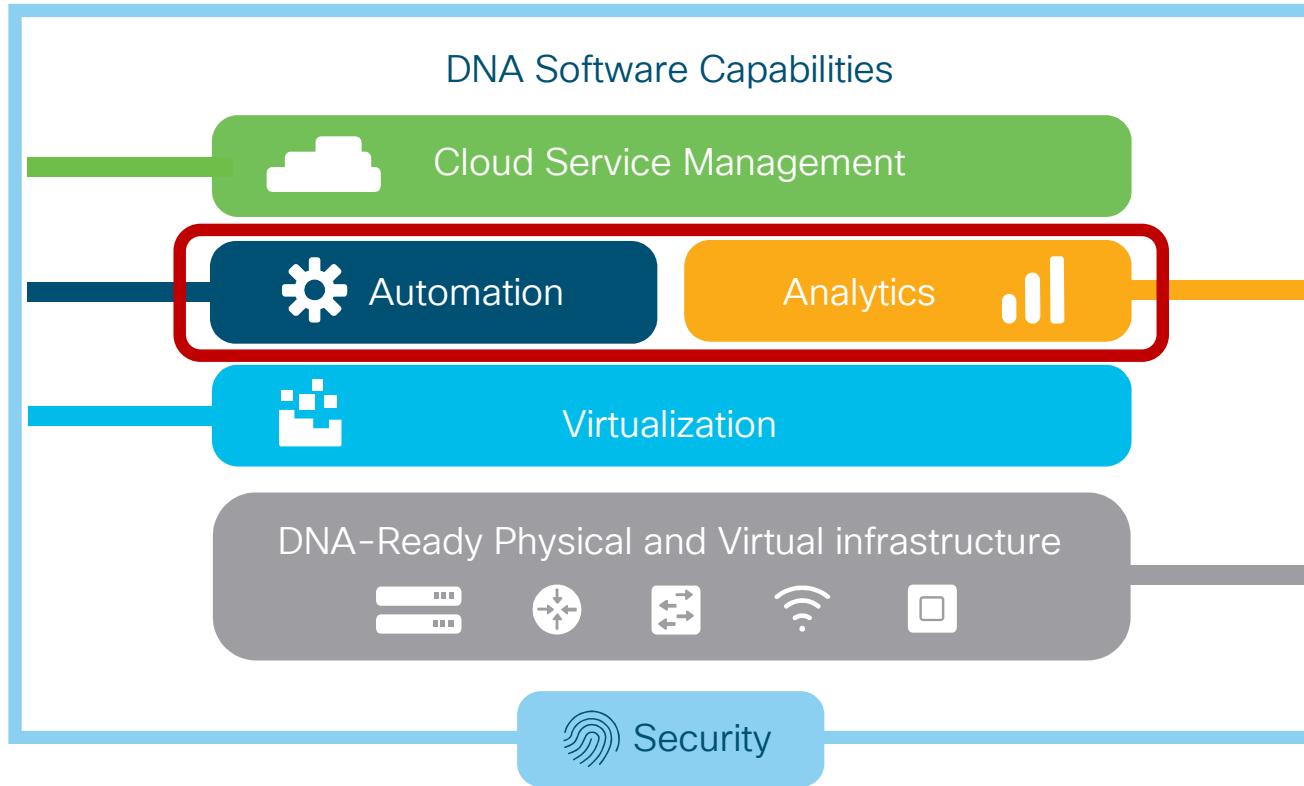
Source: google.de images

In the past...

Today...

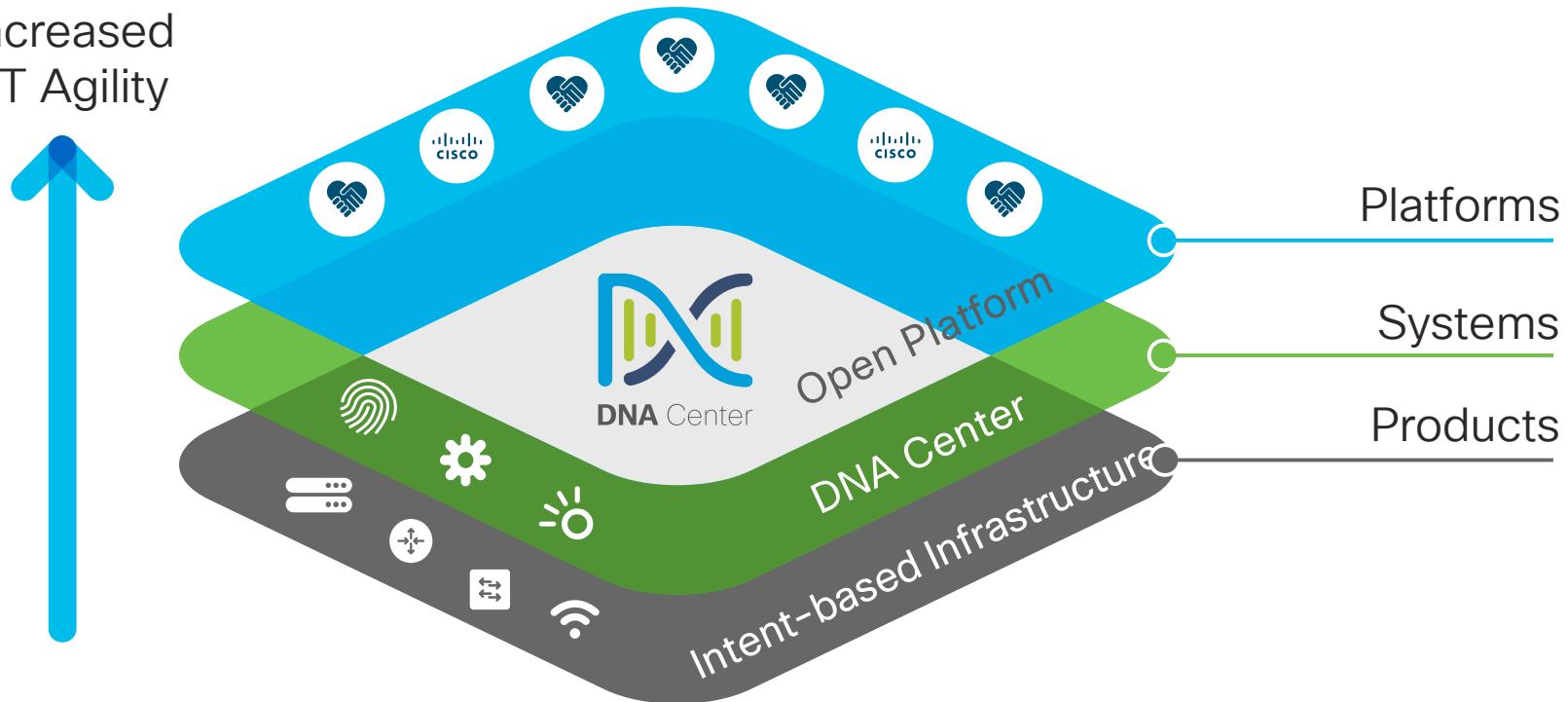
What really matters !!!

# DNA Center View

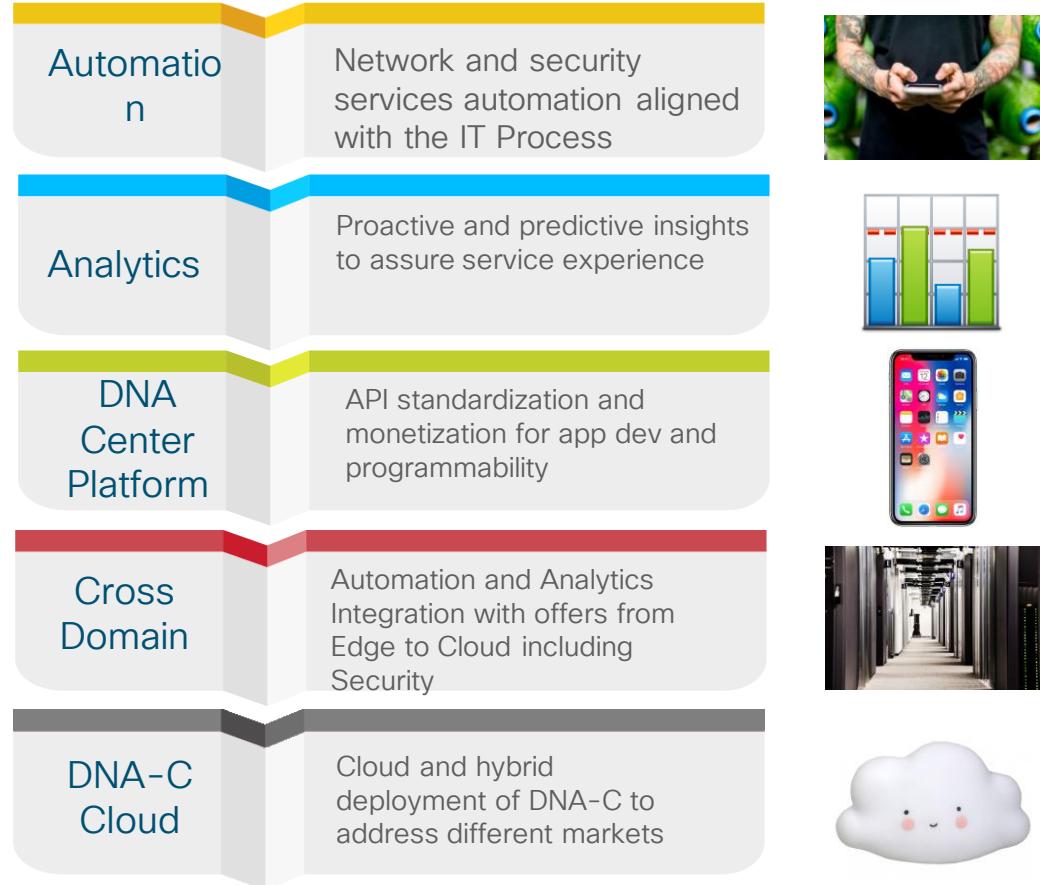
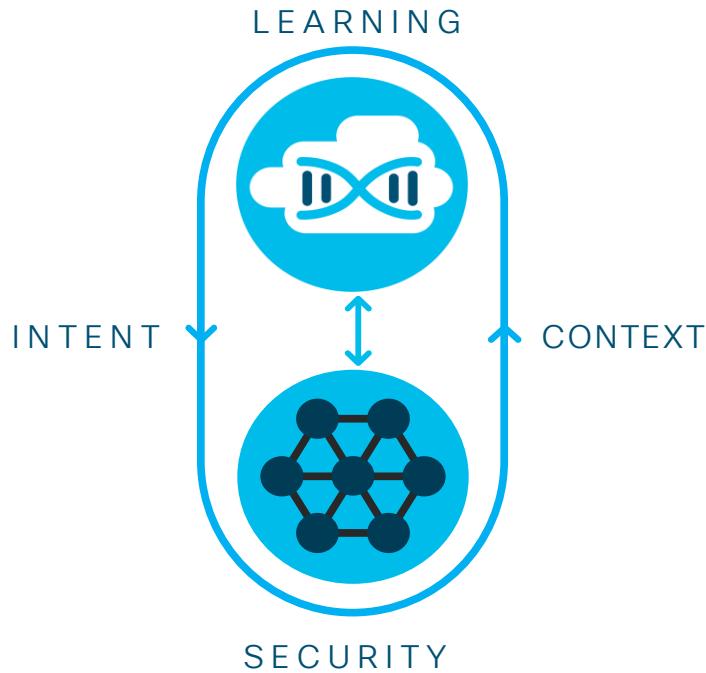


# The Layers

Increased  
IT Agility

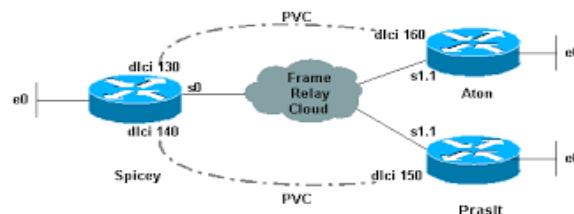


# DNA Center Focus Areas



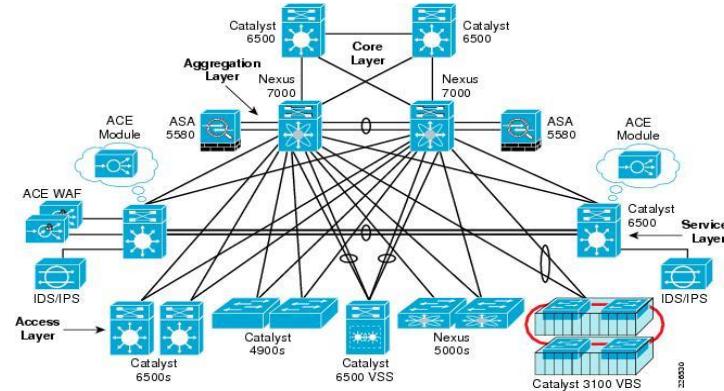
# Before and after – was that all?

1990s



```
hq>enable
hq# config terminal
hq(config)# interface fastethernet 1/1
hq(config-if)# ip address
  1.1.1.1 255.255.255.0
hq(config-if)# no shutdown
hq(config-if)# exit
hq(config)# router eigrp
hq(config-router)# network 1.1.1.0
hq(config-router)# exit
hq(config)# exit
hq# copy run start
```

Today



```
Catalyst>enable
Catalyst# config terminal
Catalyst(config)# interface
  Gigabitetherent 1/1/1
Catalyst(config-if)# no switchport
Catalyst(config-if)# ip address
  1.1.1.1 255.255.255.0
Catalyst(config-if)# no shutdown
Catalyst(config-if)# exit
```

```
Catalyst(config)# router eigrp Test1
Catalyst(config)# interface
  Te 1/1
Catalyst(config-if)# ip router
    eigrp Test1
Catalyst(config-if)# no shutdown
Catalyst(config-if)# end
Catalyst# copy run start
```

28 Years!

# Top 5 advantages



DNA Center supports Brownfield



Day 0 and Day N Supported (PnP, and Day 2 Day)



Simplification through abstraction



Open – REST API Northbound, SDK (Beta) Southbound



Combines Automation and Assurance or in other words:  
**INTENT and CONTEXT**

DNA Center



Policy



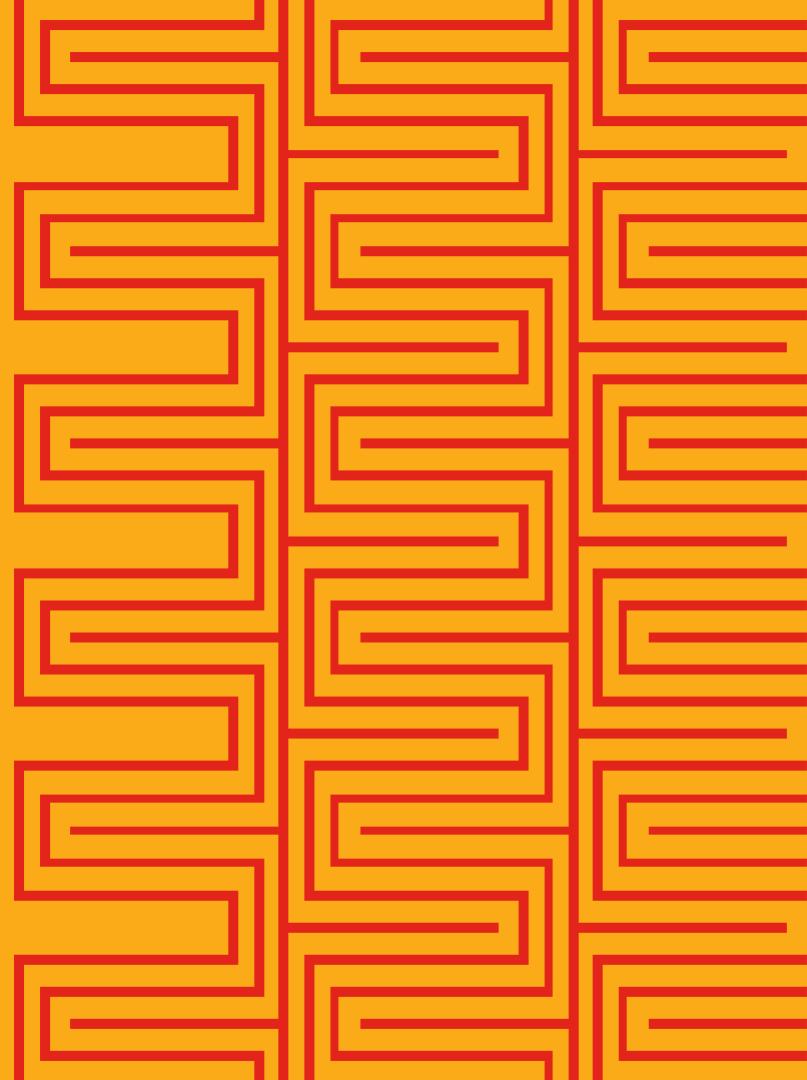
Automation



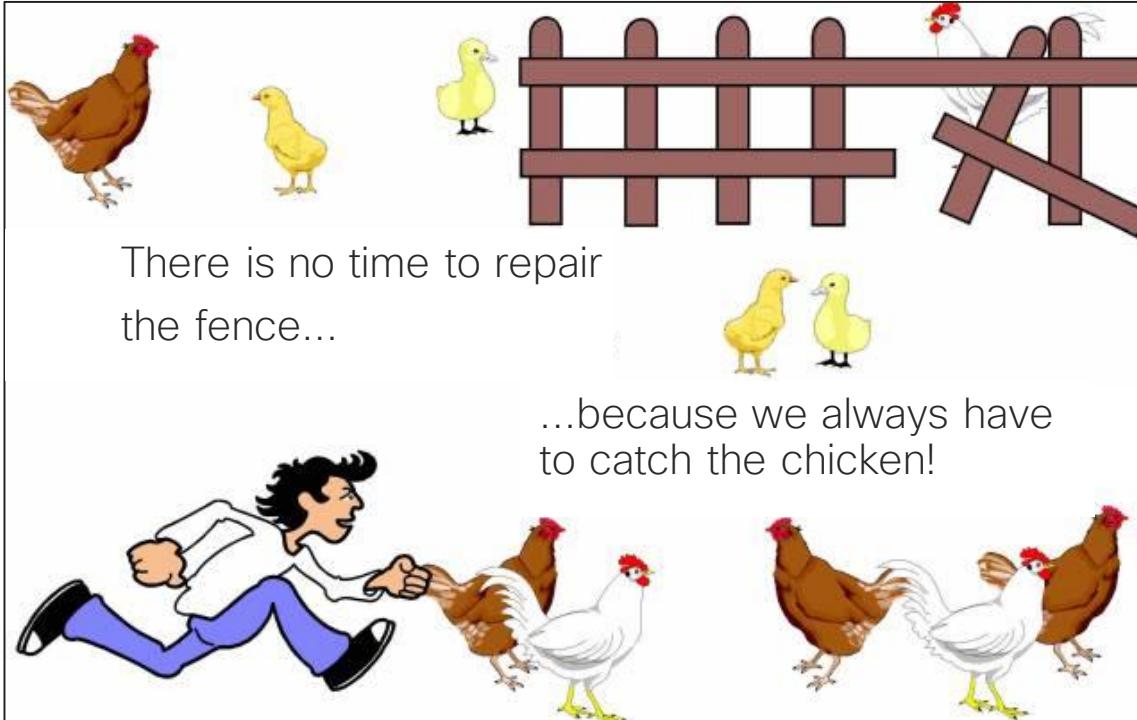
Analytics



# What is DNA Center ?



# Do you know this?



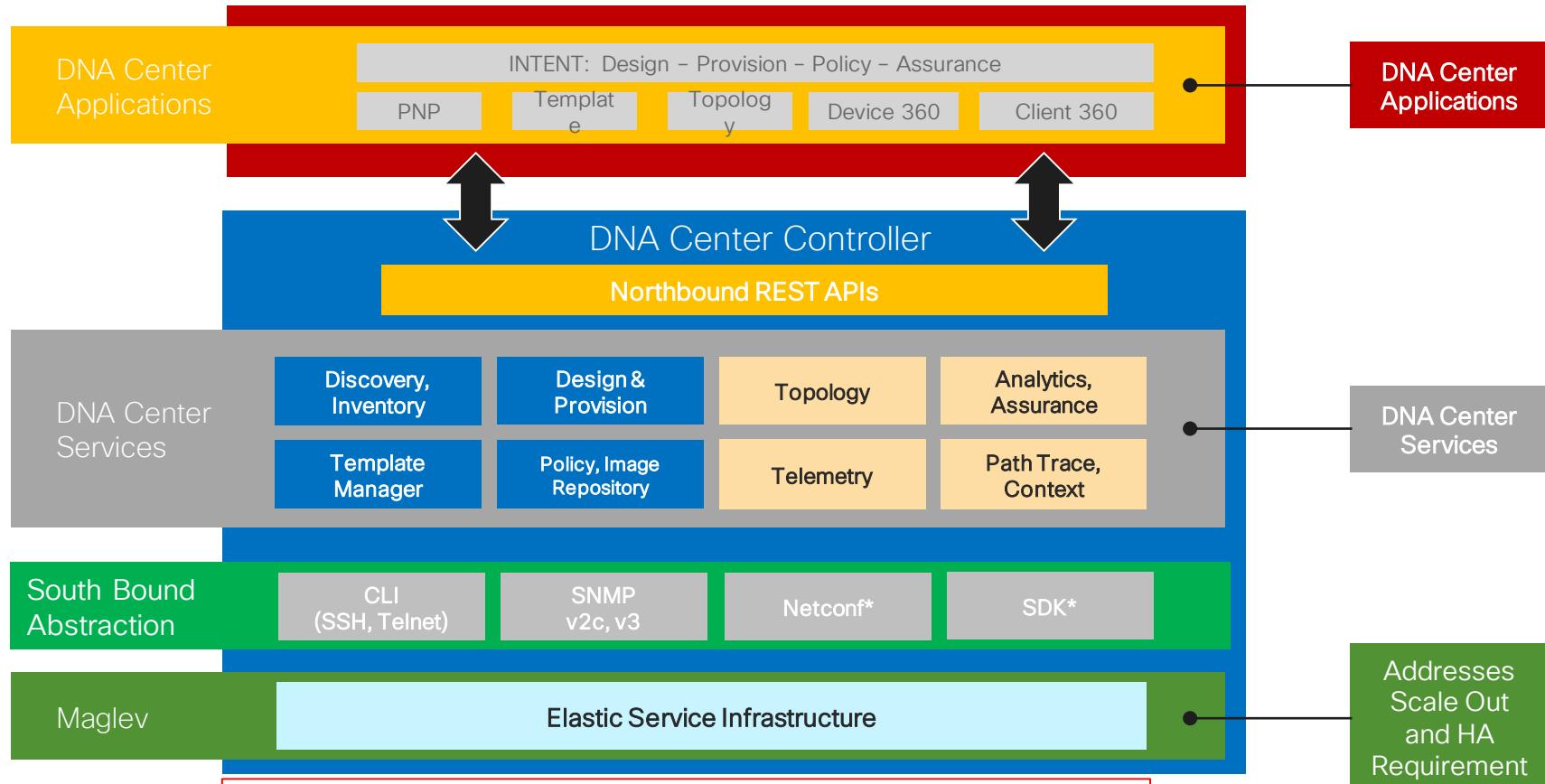
Return to  
PROACTIVE  
network  
operations

# The challenges for the Network Operations!

- Simplification
- Network can not be the bottleneck
- Roll out 100s of devices in minutes
- Change configurations quick and reliable
- Reduce complexity and keep the configuration consistent
- Know the real impact of an Incident
- Know the Root Cause
- Know the state of the network and your policies → **predictability!**



# DNA Center - Platform Architecture



# DNA Center - open and extensible

## Extensions

Extension points across automation and analytics



APIs



SDK



Connectors



Firehose

## Integrations

Integration with complementary platforms

Cisco assets

ACI Meraki Tetra

APPDYNAMICS

Industry integrations

Infoblox  splunk >

servicenow  tableau 

## Enablement

Enablement for developer community



DNAC  
Platform

# Controller in Action !

Controller creates and enforces  
Policies & Events:  
The “WHAT” → Intent

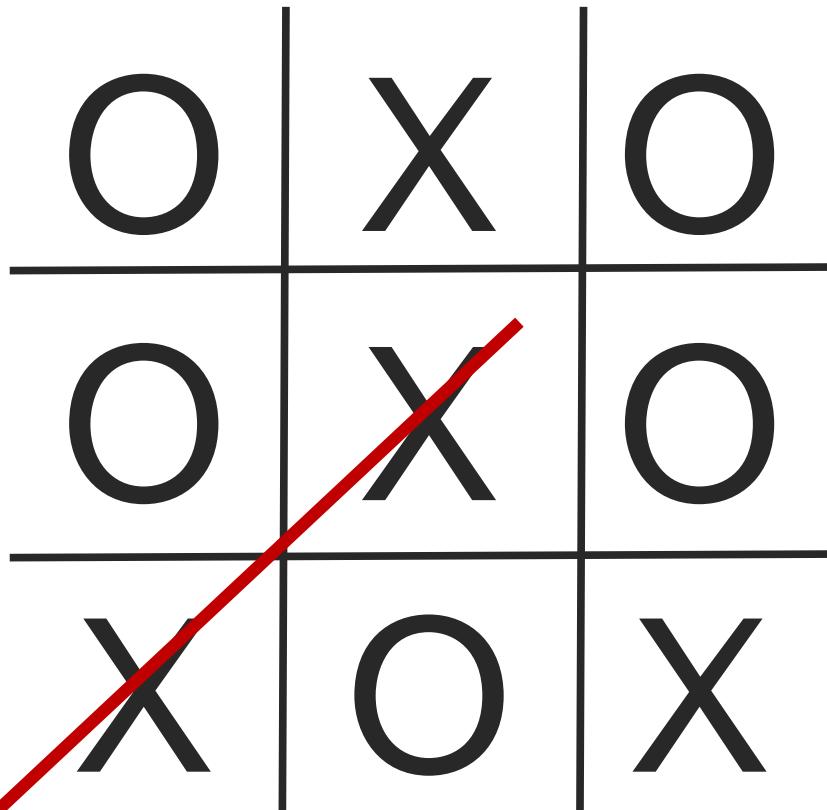
The horse takes care of:  
The “HOW”

Transforming from CLI to automation let  
you focus on “what really matters”



Source: <http://www.mysweety.eu>

Do You  
know Tic  
Tac Toe?



The Box

Cisco live!

DNA Center



Policy



Automation

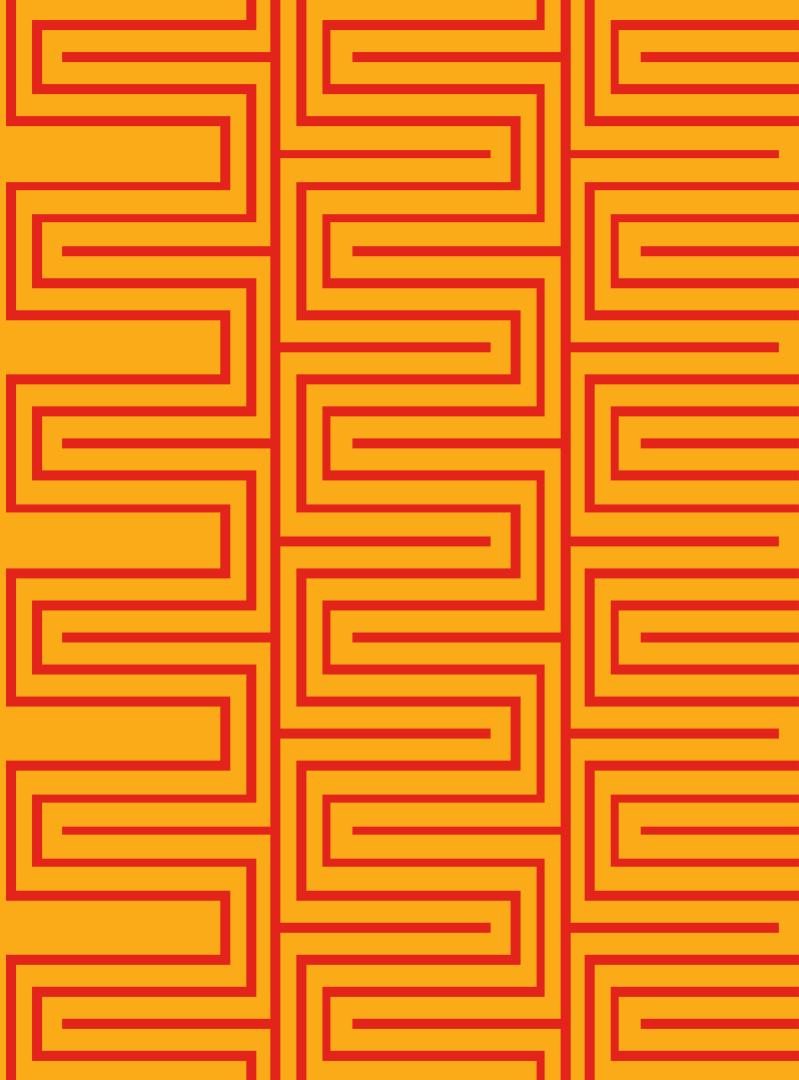


Analytics



# Get Started

Cisco *live!*



# Cisco DNA Center

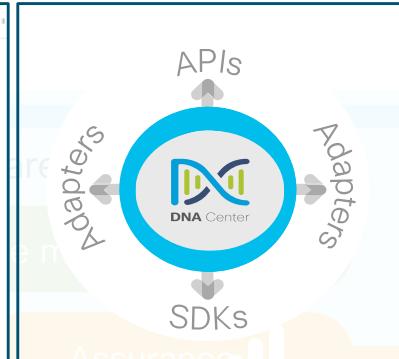
Design



Design your network using physical maps and logical topologies for quick visual reference

The screenshot shows the Cisco DNA Center interface with five main sections:

- Design:** Model your entire network, from sites and buildings to devices and sites, both physical and virtual, across campus, branch, WAN and cloud.
  - Add site locations to the network
  - Configure global images for device families
  - Create wireless profiles of SDDCs
- Policy:** Use policies to automate and simplify network management, reducing cost and risk while spending robust of new and enhanced services.
  - Segment your network in Virtual Networks
  - Create reusable groups to describe your critical assets
  - Define representation policies to meet your policy goals
- Provision:** Provide new services to users with ease, speed and security across your enterprise network, regardless of network size and complexity.
  - Discover and provision switches to defined sites
  - Provision ICX and APs to defined sites
  - Set up Campus Fabric across switches
- Assurance:** Use proactive monitoring and insights from the network, devices, and applications to predict problems faster and ensure that policy and configuration changes achieve the business intent and the user experience you want.
  - Assure Health
  - Assure Issues
- Platform:** Use DNA-C as a Platform to unlock the full potential of DNA-C using APIs and integration capabilities.
  - View the API Catalog
  - Provision ICX and APs via APIs
  - Configure DNA-C - Third Party Integration



Use policy-based automation to deliver services to the network based on business priority and to simplify device deployment

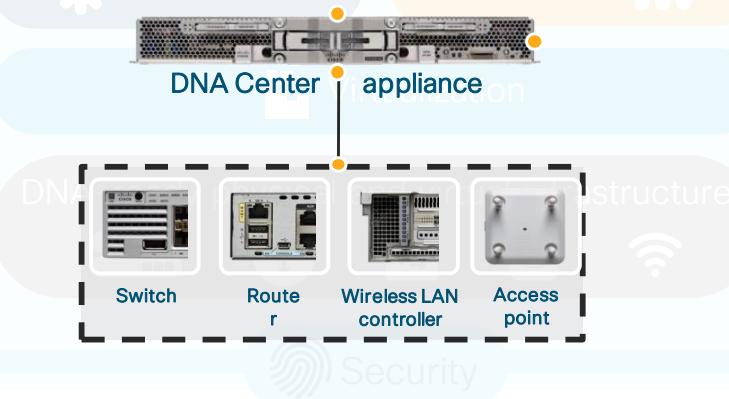
Provision



Policy



Define user and device profiles that facilitate highly secure access and network segmentation based on business needs



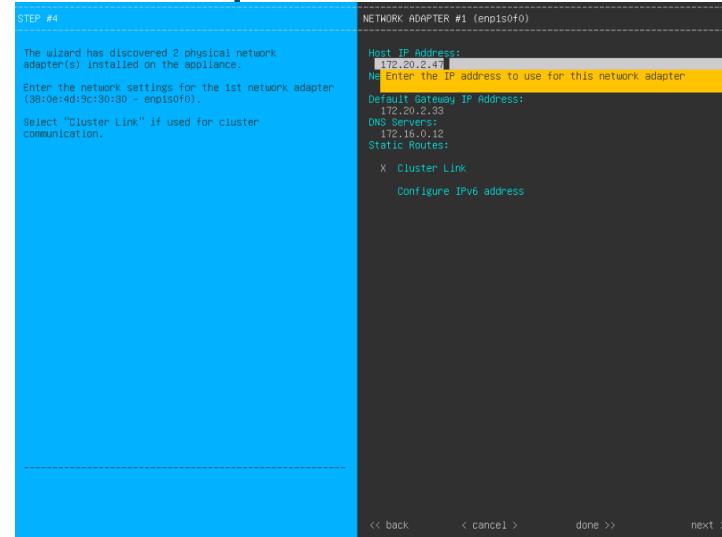
Combine deep insights with rich context to deliver a consistent experience and proactively optimize your network

Assurance

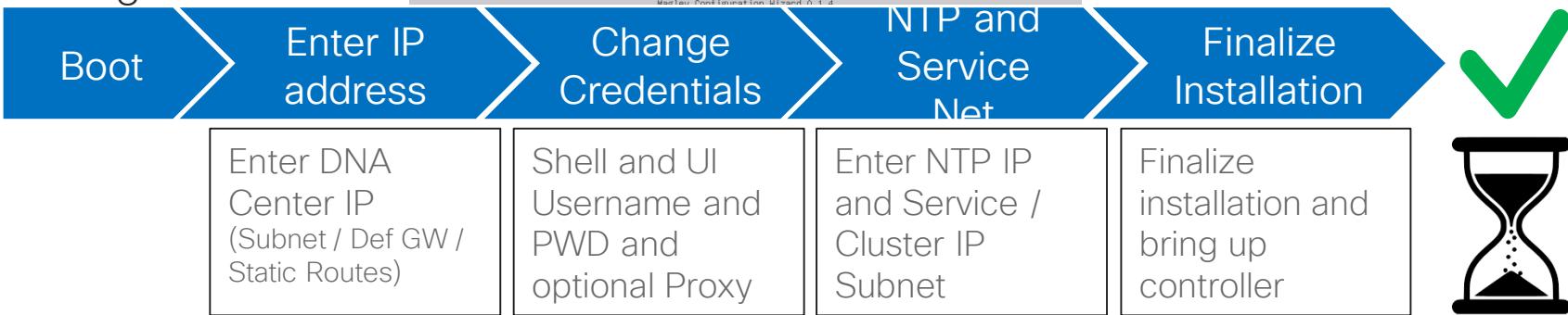


## You can use either the UI or the API

# DNA Center – 5 step installation



Config Wizard:



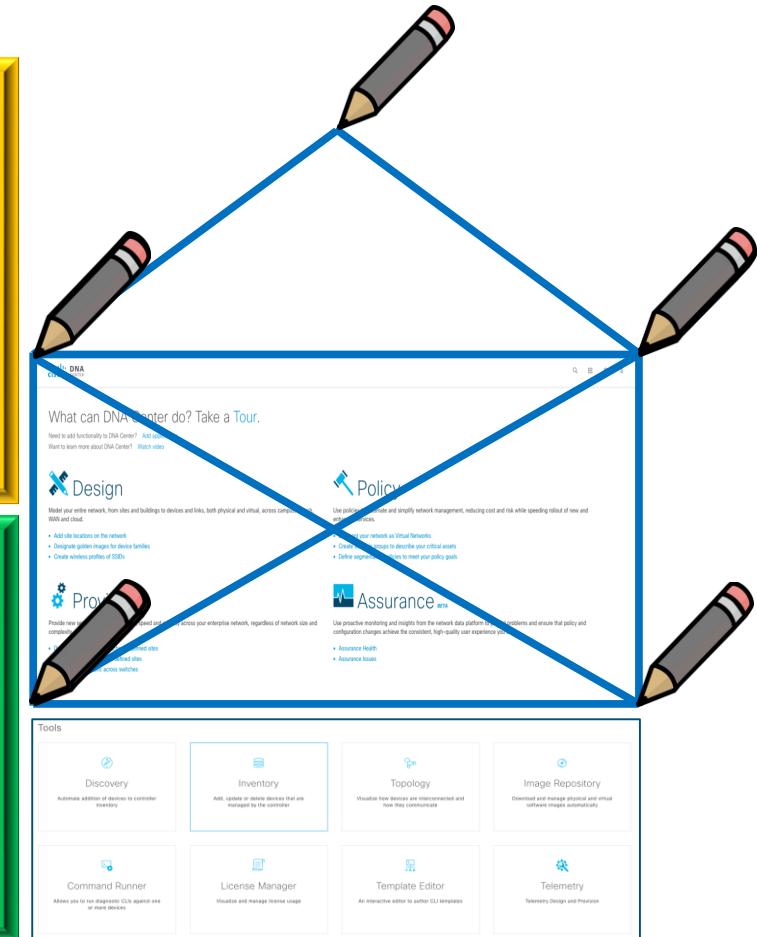
# How to use DNA Center

## Foundation / Basement

1. Discover
2. Inventory & Role assignment → Analytics
3. SWIM (Software & Image Management)
4. Network Profile & Template

## Operations / day to day tasks

5. Design
6. Provision
7. Policy
8. Assurance



# Demo Time

## DNA Center Overview

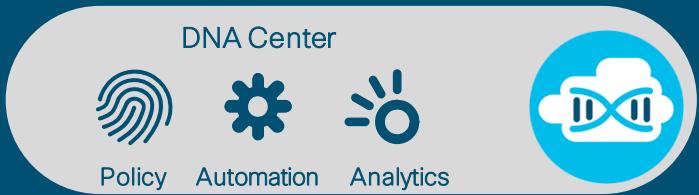


Download Demo Video here:

<https://cisco.box.com/v/BRKNMS3005>

# DNA Center

## Some Useful hints !!!



# Ensure connectivity

- Network connectivity
- NTP server connectivity – must be reachable
- To modify basic server settings use “sudo maglev-config update” to change the configuration. – **Be careful using this command on production device.**
- If you have multiple Ethernet Interface – set one with a default gateway and the others with static routes
- Do NOT change anything using Linux Shell!

**Note:** Be careful with *config wizard* syntax especially for the sub netmask

**Note2:** All Parameters will be validated – e.g. DNS Server reachability



# Special Settings information

| Description   | Example   |   |
|---|---|---|
| Services Subnet<br>DNA Center use in managing its own services                    | Used internally of DNA Center<br>The <b>minimum</b> size of the subnets is /21 bits; the <b>recommended</b> size is /20 bits to /16 bits. There is no default.<br><b>Note:</b> Must not conflict or overlap with any other subnets in use in the enterprise network | 10.60.0.0/21,<br>10.60.8.0/21   |
| Cluster Services Subnet<br>DNA Center to use in managing its clustering services. | Used internally of DNA Center<br>The default is 10.100.0.0/16<br><b>Note:</b> Must not conflict or overlap with any other subnets in use in the enterprise network  | 10.100.0.0/16   |
| NTP, DNS , Def GW etc   | Will be validated during installation – therefore need to be reachable!   | <a href="https://www.cisco.com/c/en/us/td/docs/cloud-systems-management/network-automation-and-management/dna-center/1-1/install/b_dnac_install_1_1_0P1/b_dnac_install_1_1_0P1_chapter_00.html">https://www.cisco.com/c/en/us/td/docs/cloud-systems-management/network-automation-and-management/dna-center/1-1/install/b_dnac_install_1_1_0P1/b_dnac_install_1_1_0P1_chapter_00.html</a> |

# Root Cause Analysis

- SSH into DNA Center

```
ssh -l maglev -p2222 <dnac-ip>
```

- Collects important:
  - log files
  - configuration files
  - output of various commands
- Creates a compressed tar ball containing the above information which can be sent to developers for further debugging and analysis
- → **Can be sent to support team!**

```
mharbeck@mharbeck:~$ ssh -l maglev -p2222 172.20.2.46
mharbeck@mharbeck:~$ ssh -l maglev -p2222 172.20.2.46
Welcome to the Maglev Appliance
maglev@172.20.2.46's password:
Welcome to the Maglev Appliance

System information as of Thu Jan 25 07:55:59 UTC 2018

System load: 3.85          Users logged in: 1
Usage of /: 51.8% of 28.03GB IP address for enp1s0f0: 172.20.2.46
Memory usage: 70%
Swap usage: 0%
Processes: 1719

=> There are 2 zombie processes.

Last login: Thu Jan 25 07:41:10 2018 from 172.20.2.55
[Thu Jan 25 07:56:00 UTC] maglev@172.20.2.46 (maglev-master-1) ~
$ rca
=====
Verifying ssh/sudo access
=====
[sudo] password for maglev:
```

Note: Please use Port **2222** for SSH and SCP

<...snip...>

```
2018-01-25 07:57:11 | INFO | Waiting for background processes to complete...
tee: /data/rca/maglev-172.20.2.46-rca-2018-01-25_07-56-49_UTC/rca.log: No such file or directory
2018-01-25 07:57:11 | INFO | Creating RCA package...
tar: Removing leading '/' from member names
tar: /data/rca/maglev-172.20.2.46-rca-2018-01-25_07-56-49_UTC: Warning: Cannot stat: No such file or directory
tee: /data/rca/maglev-172.20.2.46-rca-2018-01-25_07-56-49_UTC/rca.log: No such file or directory
2018-01-25 07:57:11 | INFO | Cleaning up RCA temp files

Created RCA package: /data/rca/maglev-172.20.2.46-rca-2018-01-25_07-56-49_UTC.tar.gz

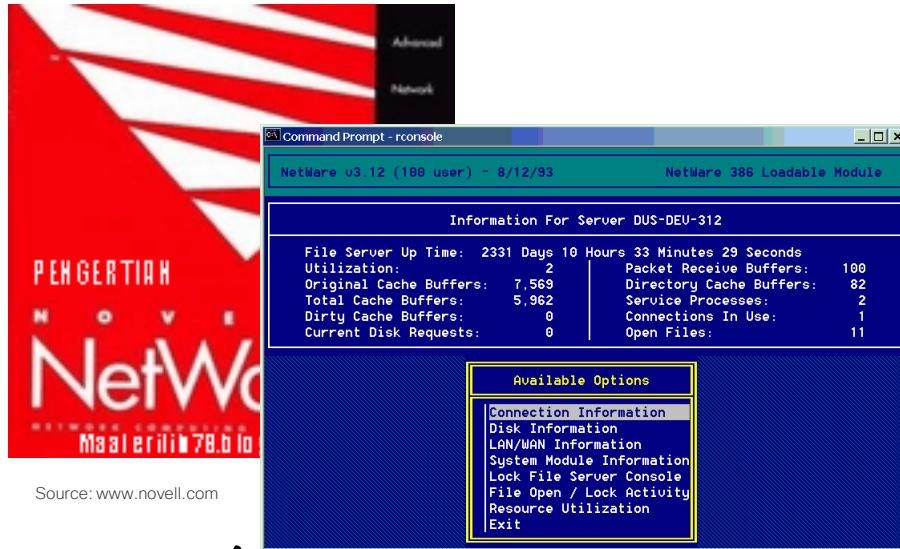
[Thu Jan 25 07:57:11 UTC] maglev@172.20.2.46 (maglev-master-1) ~
$
```

# Transforming from CLI to automation let you focus on “what really matters”



Note: that happens all the time

Server in the past



Source: www.novell.com

Cisco live!

Transformed server

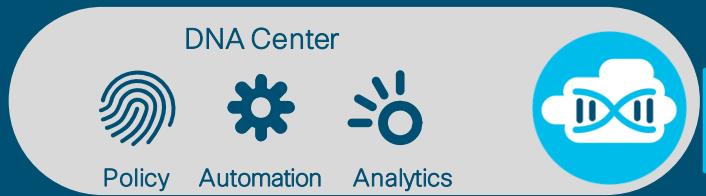
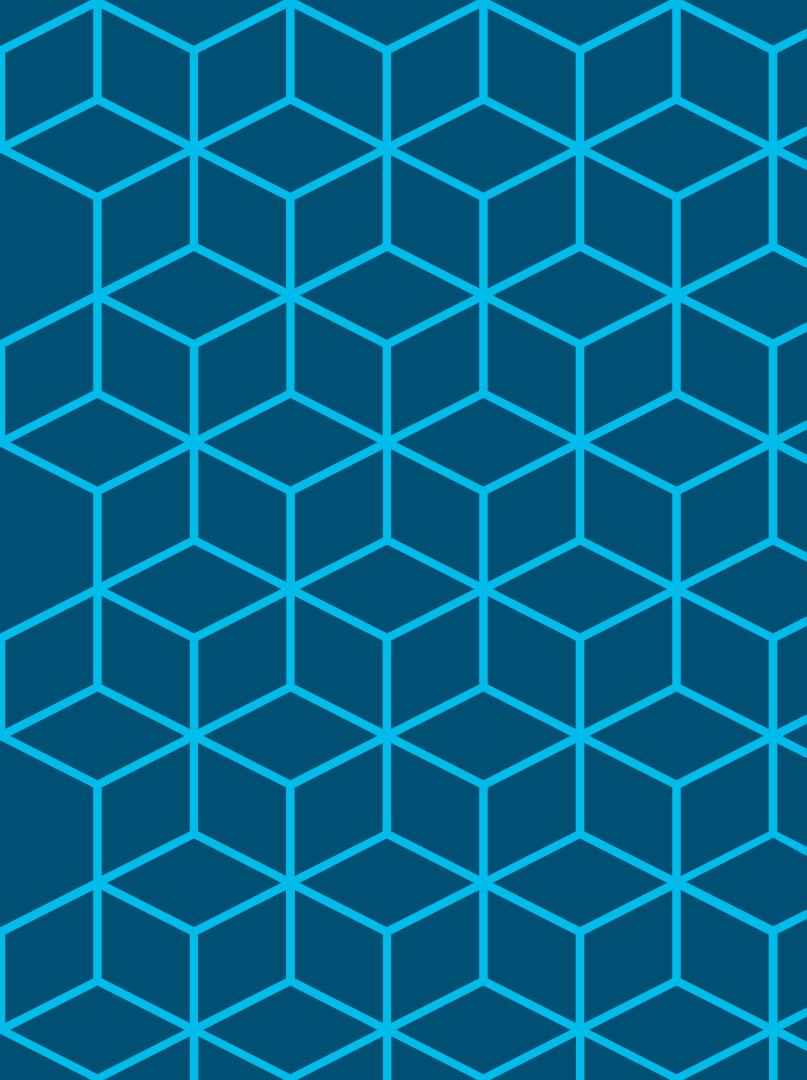


#CLUS

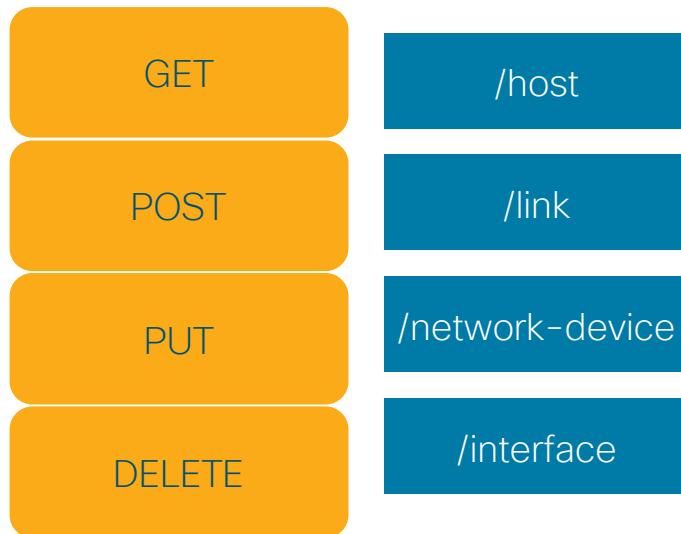
BRKNMS-3005

© Start Administrative Wizards System Policy Editor Disk Administrator Server Manager ... 11:42 PM

# Brief excursion into the REST API and programmability



# API: VERBS + NOUNS + Syntax



JSON Syntax:

```
{  
    "policyOwner": "Admin",  
    "networkUser":  
        { "userIdentifiers": ["40.0.0.15"],  
          "applications": [ { "raw": "12340;UDP" } ]  
        }  
}
```

Header: Content-Type: Application/JSON

<https://<dnacenter-ip>/api/v1/network-device> GET/POST

# Demo Time

## REST APIs



Download Demo Video here:

<https://cisco.box.com/v/BRKNMS3005>



DNA Center



Policy



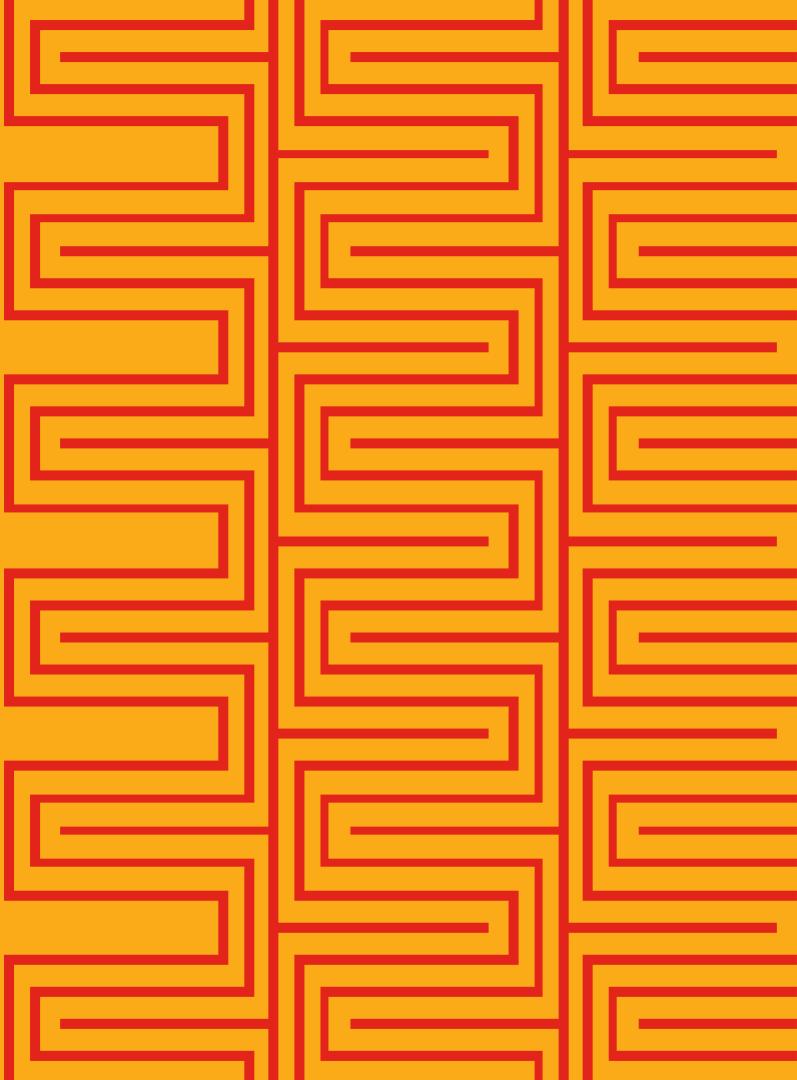
Automation



Analytics



# Apps in Action



# Network Plug and Play (PnP) - Components

Day 0

## PnP Agent

- Embedded in IOS / AirOS
- Requests for IP and DNA Center Address
- Authenticates
- Creates a PnP Profile
- Opens on http
- Operates on https / tcp !
- Secure and reliable



Routers  
(ISR, ASR)



Switches  
(Catalyst®)



Wireless  
Access Points

## PnP Protocol

Runs between  
Agent and DNA  
Center

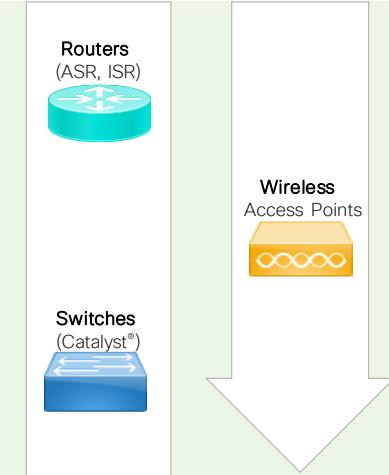
## DNA Center (pnpserver)

Service in DNA Center  
Manages sites, devices,  
images, licenses, workflow  
Provides Northbound REST  
APIs



# PnP Server Discovery Options

| Automated | <ol style="list-style-type: none"><li data-bbox="240 253 1449 351">1  DHCP with option 43<br/>PnP string: 5A1D;B2;K4;I<u>172.19.45.222</u>;J80 added to DHCP Server</li><li data-bbox="240 405 1449 502">2  DNS lookup<br/>pnpserver.localdomain resolves to DNA Center IP Address</li><li data-bbox="240 556 1449 653">3  Cloud re-direction <a href="https://devicehelper.cisco.com/device-helper">https://devicehelper.cisco.com/device-helper</a><br/>Cisco hosted cloud, re-directs to on-prem DNA Center IP Address</li></ol> |
|-----------|--|
| Manual    | <ol style="list-style-type: none"><li data-bbox="240 750 1449 847">4  USB-based bootstrapping*<br/><code>router-config/router.cfg/ciscotr.cfg</code></li><li data-bbox="240 901 1449 994">5  Manual - using the Cisco® Installer App**<br/>iPhone, iPad, Android</li></ol>   |

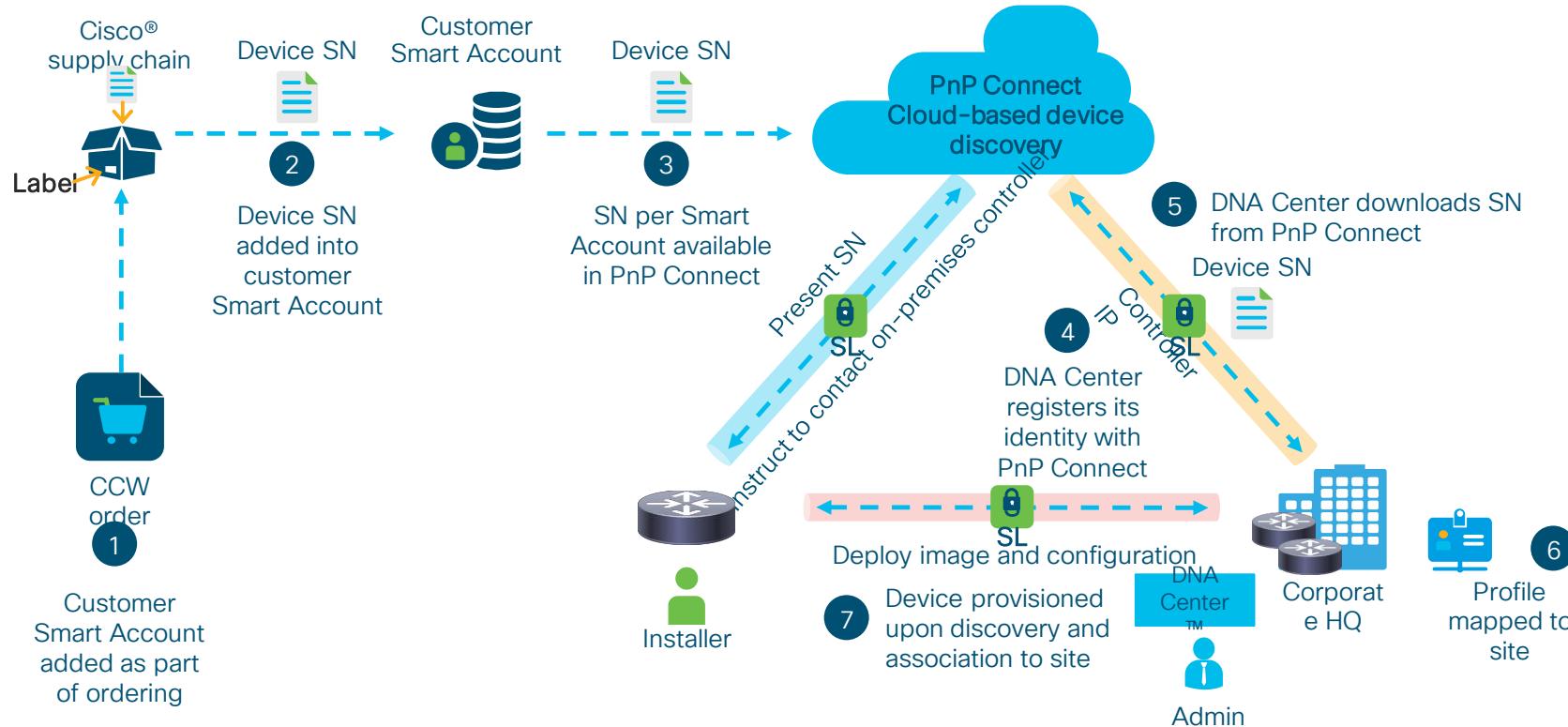


Manual discovery  
not supported for  
Access Points

\*Supported on Cat 9K only for switches

\*\*DNA Center Support in Roadmap

# Day-0 deployment using PnP Connect



For more details on PnP Connect please refer to  
<https://communities.cisco.com/docs/DOC-72466>

# Software and Image Management (SWIM)

The screenshot shows a table with columns: Version, Golden Image, and Device Role. There are two rows:

- Row 1: Version 15.7.1, Golden Image SMU (1), Device Role ALL.
- Row 2: Version 16.6.1, Golden Image SMU (2), Device Roles ACCESS, CORE, BORDER ROUTER.

1

The screenshot shows a list of recent tasks:

3. Distribute Operation ✓ (The image is already present in the device)
4. SMU Activate Operation ✓ (SMU Activation of image : ISR4400-universalk9.2017-07-20\_22\_36\_.epapouts.1.CSCvb73517.SSA.smu.bin on device : 10.104.62.16 completed successfully)

| Script Name             | Type       | Log Details          |
|-------------------------|------------|----------------------|
| CPU Health Check        | Pre Check  | <a href="#">View</a> |
| Verifying Disk Space    | Pre Check  | <a href="#">View</a> |
| Verifying Route Summary | Pre Check  | <a href="#">View</a> |
| CPU Health Check        | Post Check | <a href="#">View</a> |
| Verifying Disk Space    | Post Check | <a href="#">View</a> |
| Software Summary        | Post Check | <a href="#">View</a> |

2

The screenshot shows a list of SMU entries:

- ISR4400-universalk9.2017-07-20\_22\_36\_.epapouts.1.CSCvb73517.SSA.smu.bin (Cisco IOS-XE Patch pack..., Default in C9048-2811, Requested 0, Completed 0)
- ISR4400-universalk9.2017-07-20\_22\_41\_.epapouts.3.CSCvb73520.SSA.smu.bin (Cisco IOS-XE Patch pack..., Default in C9048-2811, Requested 0, Completed 0)
- ISR4400-universalk9.2017-06-19\_10\_09\_.epapouts.3.CSCvb73520.SSA.smu.bin (Cisco IOS-XE Patch pack..., Default in C9048-2811, Requested 0, Completed 0)

3

Intent based Network Upgrades

Intent based network upgrades allows for image standardization, much desired by all network admins.

Upgrade Pre/Post Checks

Pre and post checks allows network admins more control and visibility over network upgrades

Patching Support

Patches are supported in DNAC from intent to pre-post checks in same way we manage regular images

# Integrity/ Trustworthiness Verification

CISCO DNA CENTER

DESIGN POLICY PROVISION

Network Hierarchy Network Settings Image Repository Network Profiles Auth Template

Find Hierarchy Import Image/SMU Upgrade Devices Show Tasks Take a tour Physical Virtual

Global  
IWAN MAIN HUB  
SR3L-SPOKE  
SRDL WAAS CONTAINER

Filter Refresh Last updated: 3:13 pm

CCO credentials are not set. Please [click here](#) to update

| Family                                       | Image Name                                     | Using Image | Version             | Golden Image | Device Role | Action |
|--|--|-------------|---------------------|--------------|-------------|--------|
| Cisco 4331 Integrated Services Router        | isr4300-universalk9.16.06.02.SP...<br>Verified | 1           | 16.6.2<br>SMU (0)   | ★            | ALL ★       |        |
| Cisco 4431 Integrated Services Router        | isr4400-universalk9.16.06.02.SP...<br>Verified | 1           | 16.6.2<br>SMU (0)   | ★            | ALL ★       |        |
| Cisco 4451 Series Integrated Services Ro...  | isr4400-universalk9.16.06.02.SP...<br>Verified | 1           | 16.6.2<br>SMU (0)   | ★            | ALL ★       |        |
| Cisco Virtual Wide Area Application Servi... | NA   | 1           | 6.2.3d<br>SMU (N/A) | ★            |             |        |
| Unassigned                                   | isr4200-universalk9_ias.16.06.02...            | 0           | 16.6.2<br>SMU (N/A) | ★            |             |        |

Show 10 entries

Showing 1 - 5 of 5

Previous 1 Next

The screenshot shows the Cisco DNA Center interface, specifically the Image Repository section. A modal dialog box is open over the main table, listing five different Cisco router models and their corresponding software images. The modal has a title 'Image Name' and contains columns for 'Using Image', 'Version', 'Golden Image', 'Device Role', and 'Action'. The 'Golden Image' column includes a star icon and a 'ALL' button with a star icon. The 'Device Role' column includes a 'Device Role' button with a question mark icon. The 'Action' column includes a delete icon. The modal is centered over the table rows for the Cisco 4331, 4431, and 4451 models, while the rows for Cisco Virtual WSA and Unassigned are visible below it.

# Demo Time

## LAN Automation with PnP



Download Demo Video here:

<https://cisco.box.com/v/BRKNMS3005>



# Demo Time

## Software and Image Management



Download Demo Video here:

<https://cisco.box.com/v/BRKNMS3005>



# Our dog “Bessi” at break

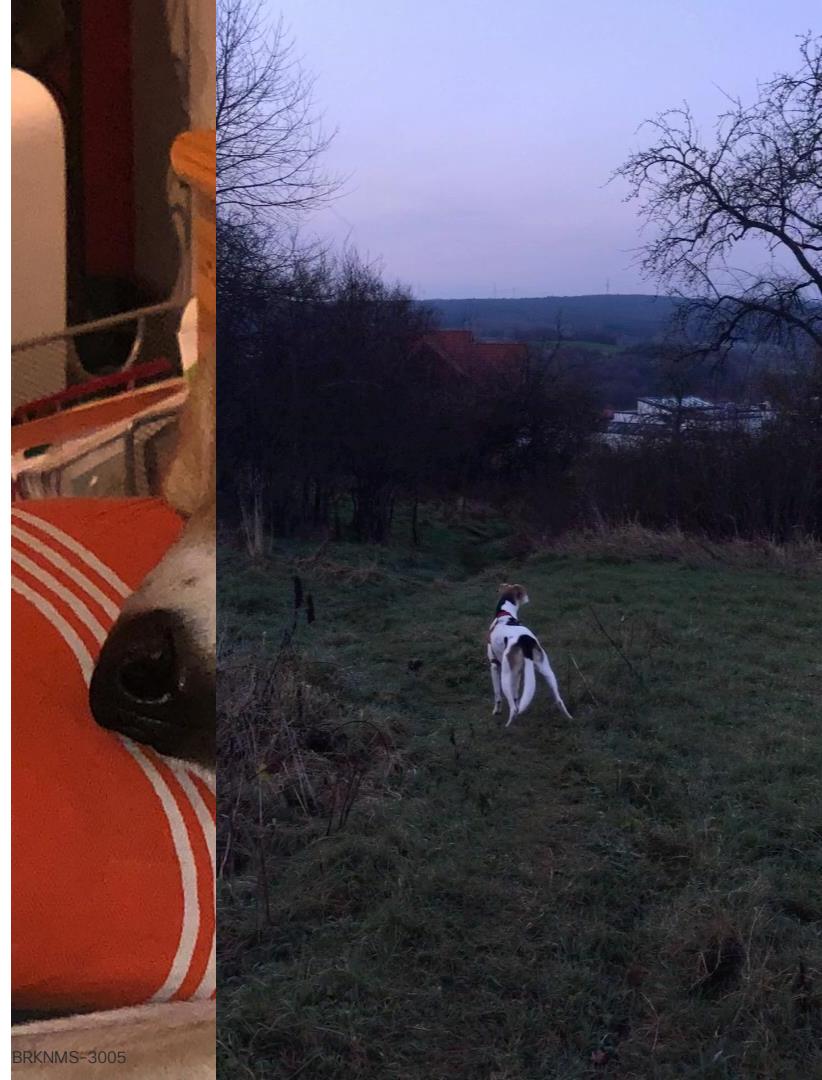
Transforming from CLI to automation let you focus on “what really matters”

Exhausted?

You need a break?

We still have cool things to see!

→ And yes she sleeps only!  
And transforms in her dreams ☺



# Demo Time

Design, Provision → Intent



Download Demo Video here:

<https://cisco.box.com/v/BRKNMS3005>

# Demo Time

## "Policy Protected" Template Programmer



Download Demo Video here:

<https://cisco.box.com/v/BRKNMS3005>

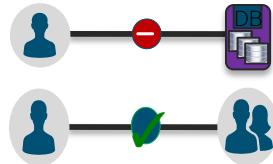
# What can a policy be? (an extract there are many more)

Access



Authentication & Authorization  
802.1x, static assignment – which group  
Allow or decline access

Access Control



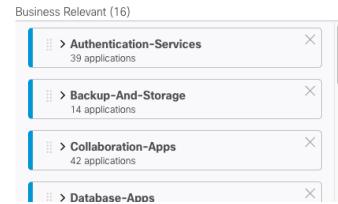
Who can access what?  
Rules for x-group access  
Permit/deny group to group

Traffic Copy



Mirror Traffic (ERSPAN)  
Configures ERSPAN for specific endpoint and traffic  
(source and destination SGT)

Quality of Experience  
(Application)



Assign Application QoS relevance  
Categorize applications (Relevant – Irrelevant – Default)  
Apply QoS config network wide

# Demo Time

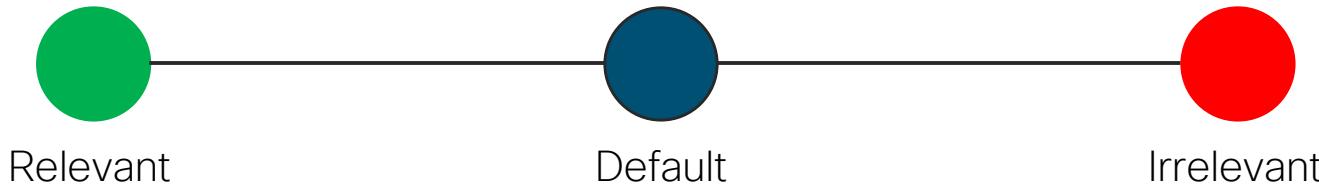
## Policy Intent



Download Demo Video here:

<https://cisco.box.com/v/BRKNMS3005>

# Solicit Application Business-Relevance



- These applications directly supports business objectives
- Applications should be classified and marked according to RFC 4594-based rules
- 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)
  - Applications in this class should be marked DF and provisioned with a default best-effort service (RFC 2474)
- These applications are known and do not directly support any business objectives; this class includes all personal/consumer applications
- Applications in this class should be marked CS1 and provisioned with a “less-than-best-effort” service , per (RFC 3662)

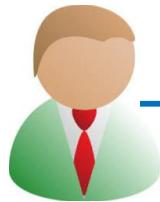
CVD: <https://www.cisco.com/c/en/us/td/docs/solutions/CVD/Dec2017/APIC-EM-EasyQoS-DesignGuide-Dec2017.html>

Or short link: <http://cs.co/apicem14easyqos>

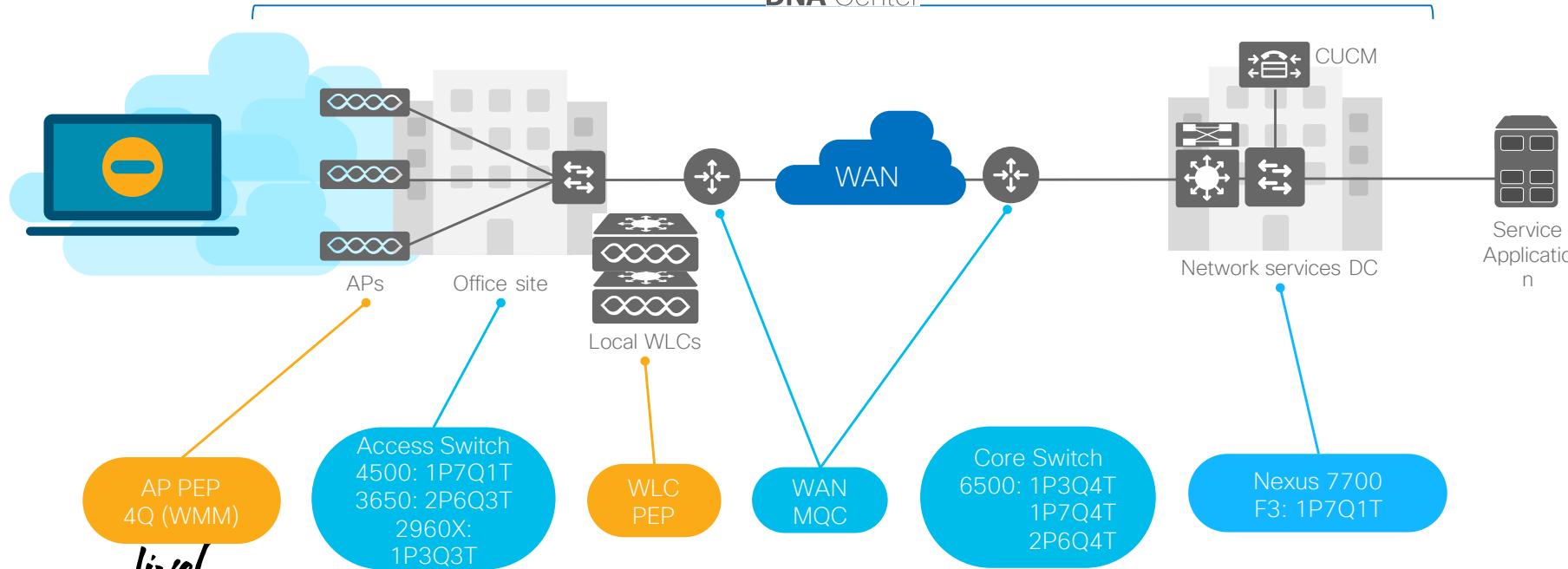
# Application Policy

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

Network Operators express high-level business-intent to DNA Center Application Policy



Southbound APIs translate business-intent to platform-specific configurations



# What Do We Do Under-the-Hood?

## Apply RFC 4594-based Marking / Queuing / Dropping Treatments

| Application Class        | Per-Hop Behavior | Queuing & Dropping         | Application Examples                              |
|--------------------------|------------------|----------------------------|---|
| 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                       |
| Signaling                | 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    |
| Best Effort              | DF               | Default Queue + RED        | Default Class                                     |
| Scavenger                | CS1              | Min BW Queue (Deferential) | YouTube, Netflix, iTunes, Bit Torrent, Xbox Live  |

Business Relevant

Default

Business Irrelevant

# Demo Time

## Application Policy (QoS)

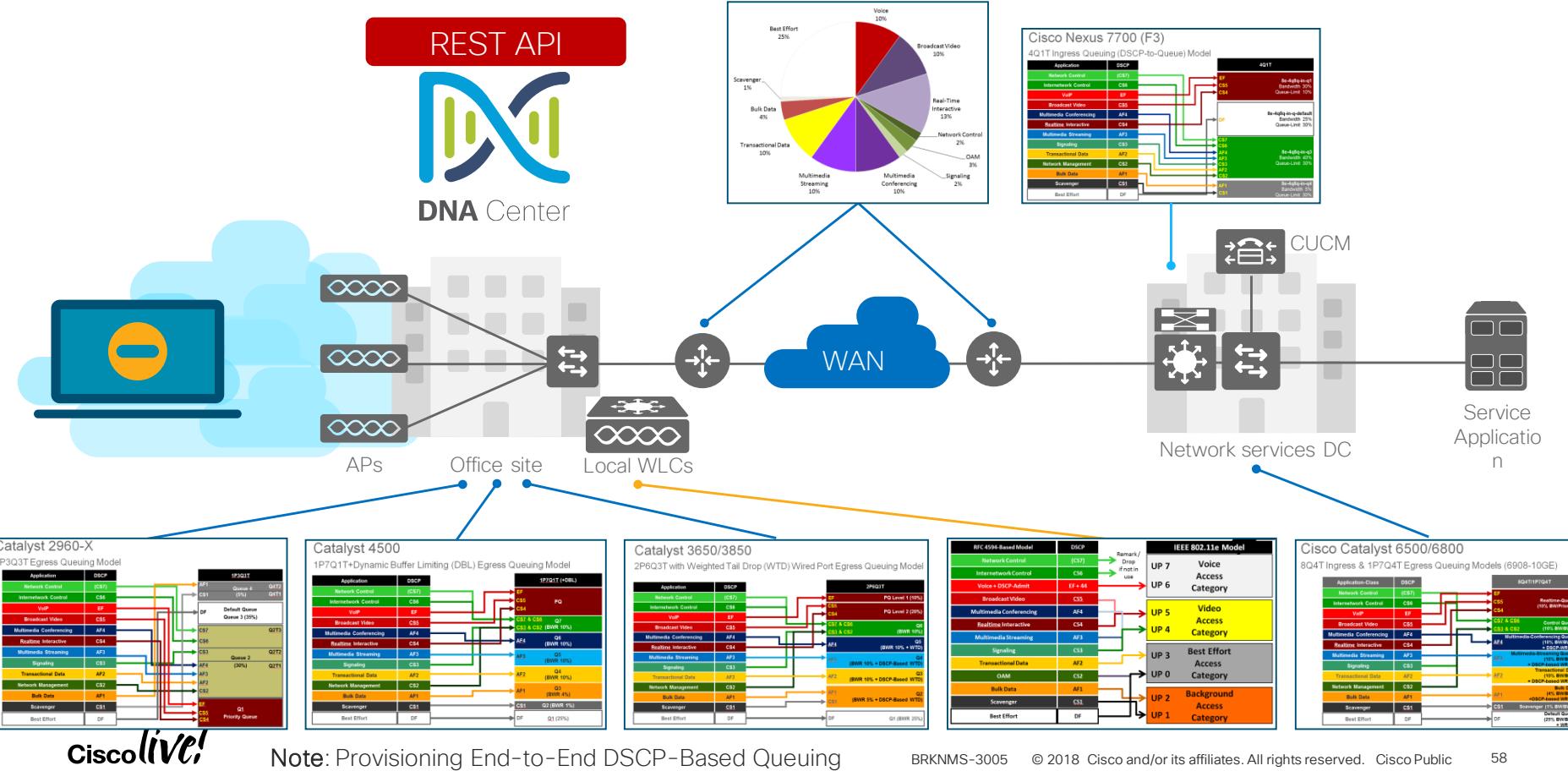


Download Demo Video here:

<https://cisco.box.com/v/BRKNMS3005>



# How will it work in my Network?



# Do you know or recognize your Network?



Did you ever asked yourself:  
Can I switch OFF one of my  
Core switches at NO risk?

...the view from my  
4 year old daughter !

# What's the Impact?

An Airline case  **LAX**

(Airlines think 3 letter Code)

Eg. FRA = Frankfurt

MCO = Orlando

etc .

Friday afternoon  
3pm somewhere  
in a german  
Airline NOC

Cisco *live!*



**IM1234546:**  
**ROW is down ROW = Roswell**

We are not flying to ROW lets requeue  
the IM to Monday – P3



Duty Manager  
10 Min later

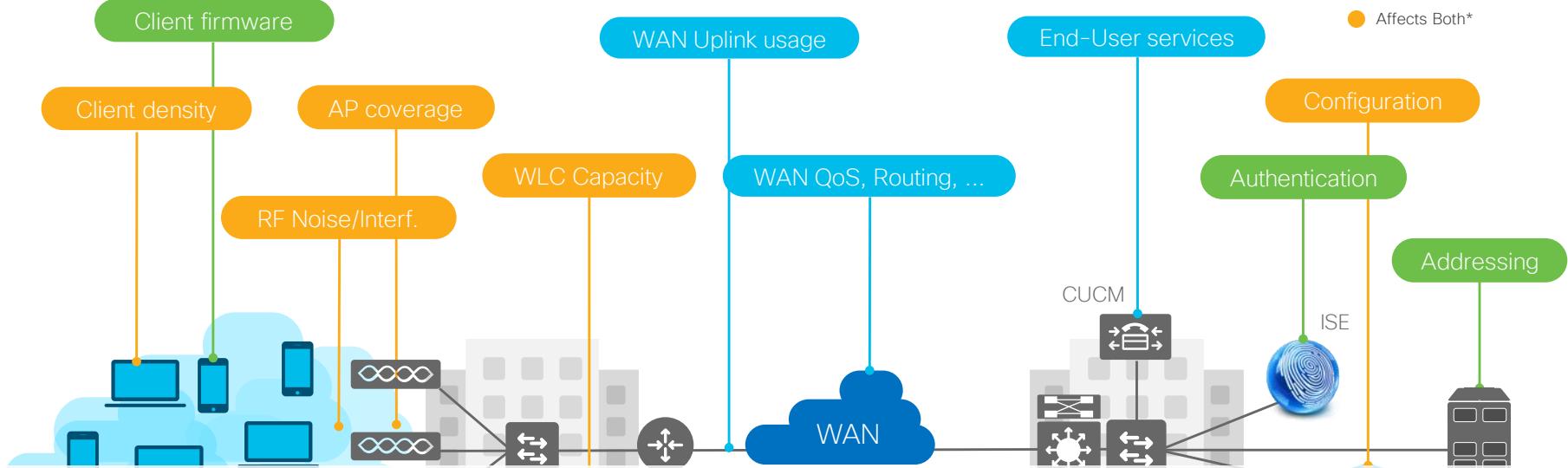
Sorry typo in the IM  
RoW – means **Rest of World**



The network monitoring is green



# Assurance



There are  
100+ points of  
failure between  
user and app

What is the problem?

Where is the problem?

How can I fix the problem fast?

Cisco Prime™

\* Both = Join/roam and quality/throughput

# 360



Time



Cisco Context

360-degree Visibility



Data Granularity



Historical, Real-time, Future

Context = know that your Policy works

# DNA Center Assurance

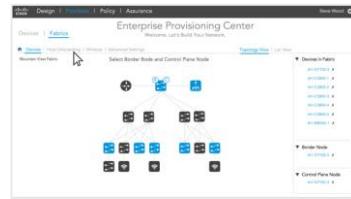
## Automation

### Design



- Global settings
- Site profiles
- DDI, SWIM, PNP
- User access

### Provision



- Fabric domains
- Device on-boarding
- Device inventory
- Host on-boarding

### Policy



- Virtual networks
- ISE, AAA, Radius
- Access control
- Application control

### Assurance



- Issues and trends
- Performance
- Proactive troubleshooting

Planning, installation and migration

Proactive and predictive network, client and application assurance

One License for Intent and Context! Either Essentials or Advantage

# Demo Time

## Assurance



Download Demo Video here:

<https://cisco.box.com/v/BRKNMS3005>



# A future Story with DNA Center of Network Operating



Angry user reports issue after encountering problem  
“My video was terrible, the network is terrible!”

All Data Sent to IM

“An issue was seen by **DNA Center** at the time”  
“fault was identified and fixed by our engineers”



“I’ve got another video meeting today. Can I trust you?”

“Let me verify the network state using **a Sensor test**”



“Yes. It looks good. I also checked via **PathTrace** that the correct path is being taken”



“If you like, I can run **the Sensor test** and **PathTrace** periodically until your meeting starts...”



# Assurance at Cisco Live BCN → NOC

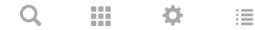


DESIGN

POLICY

PROVISION

ASSURANCE



Health

Dashboards

Issues

Manage

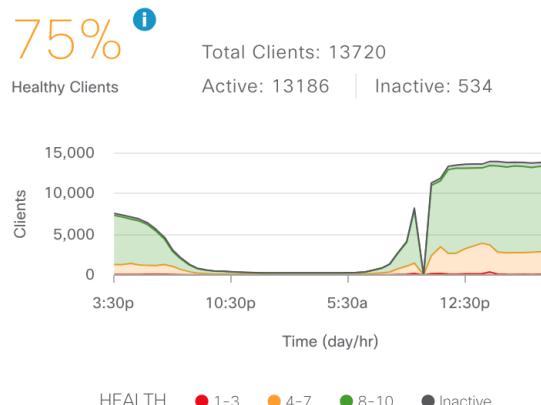
Location: All Sites



Show

## Client Health Summary

As of Jan 30, 2018 3:15 pm



Healthy Clients

| Clients with POOR Health | 93 |
|--------------------------|----|
| iPhone 7                 | 3  |
| Apple-iPhone             | 14 |
| iPhone X                 | 1  |
| Intel-Device             | 1  |
| Other                    | 74 |

[View Details](#)

Healthy Clients

| Clients with GOOD Health | 1 |
|--------------------------|---|
| Other                    | 1 |

[View Details](#)

DNA Center



Policy



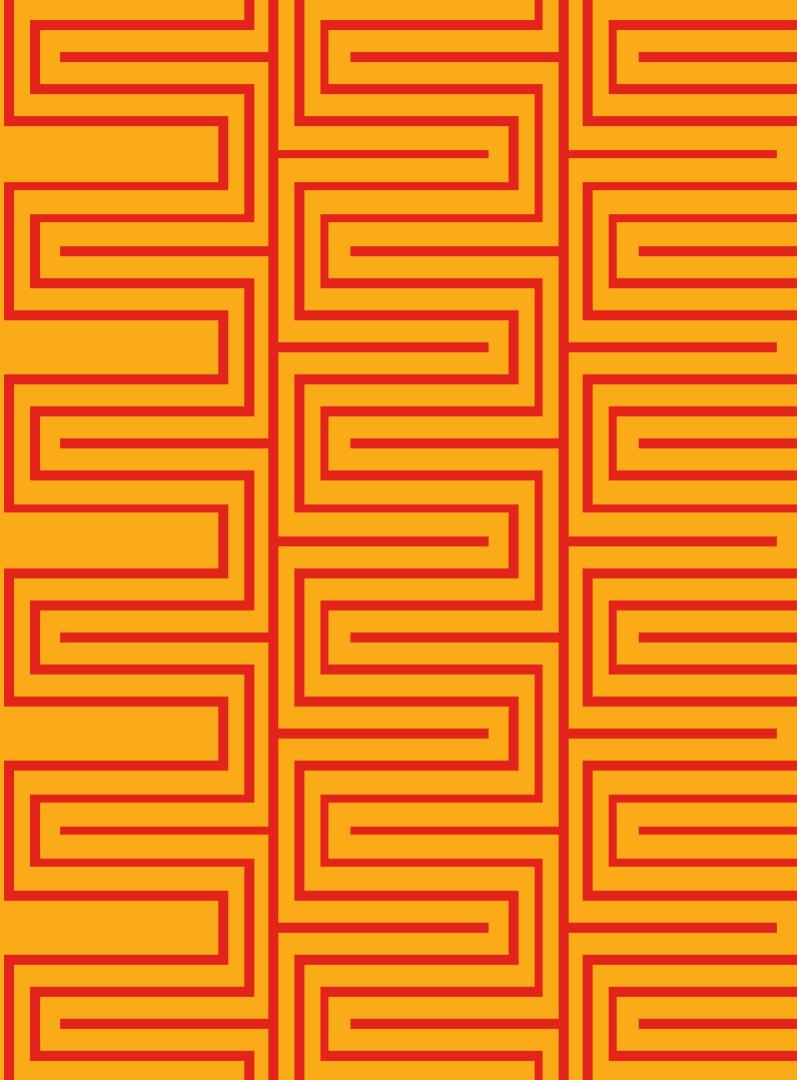
Automation



Analytics



# Summary & Conclusion



# The answer for network Operations!

- Simplification because of abstraction
- The network becomes agile and **predictable**
- Easy Roll Out and RMA in Minutes
- Changes and configurations predictable, policy protected
- Complexity reduction because of abstraction and policies
- Integration of Assurance and Analytics
  - Know that your policy works, get guidance
  - Know the Impact and the Root Cause



# How we get to an SDN “controlled network...!”

Do you remember?



Business Intelligent



Transforming ...!

# My Call to action !



You can start totally RISK free !!!

## Monitoring / Analytics

- Use DNA Center just for Analytics & Assurance (Read Only)
- Have a quick win information in the first 30 Minutes
- Get up to date visibility
- Proof value of DNA Center

## LAB and Pilot for automation

- Use DNA Center in the LAB to see automation in action
- Build a small pilot
- Pick and identify your use case PnP, SWIM...

# Session close to the end...



|| After the long journey →

BUT PLS  
ONE MORE SLIDE!!!!



Have a drink on me !

# Transforming from CLI to automation let you focus on “what really matters”



Note: that happens all the time - now you make it happen !!!

Traditional networking

```
interface GigabitEthernet2/0/9
description 3650-SDA-3
no switchport
dampening
ip address 172.20.195.17 255.255.255.252
ip router isis 2010
logging event link-status
load-interval 30
carrier-delay msec 0
bfd interval 300 min_rx 300 multiplier 3
no bfd echo
!
interface GigabitEthernet2/0/10
description ucsi-vmnic3
switchport access vlan 2136
switchport mode access
device-tracking attach-policy IPDT_MAX_10
spanning-tree portfast
!
interface GigabitEthernet2/0/11
!
CI3850-SDA-1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
CI3850-SDA-1(config)#router lisp
CI3850-SDA-1(config-router-lisp)#
Cisco live!
```

DNA Center

The screenshot shows the Cisco DNA Center web interface. It features five main sections: **Design**, **Policy**, **Provision**, **Assurance**, and **Platform**. Each section has a brief description and a list of associated tasks or features.

- Design:** Model your entire network, from sites and buildings to devices and links, both physical and virtual, across campus, branch, WAN and cloud.
  - Add site locations on the network
  - Designate golden images for device families
  - Create wireless profiles of SSIDs
- Policy:** Use policies to automate and simplify network management, reducing cost and risk while speeding rollout of new and enhanced services.
  - Segment your network as Virtual Networks
  - Create scalable groups to describe your critical assets
  - Define segmentation policies to meet your policy goals
- Provision:** Provide new services to users with ease, speed and security across your enterprise network, regardless of network size and complexity.
  - Discover and provision switches to defined sites
  - Provision WLCs and APs to defined sites
  - Set up Campus Fabric across switches
- Assurance:** Use proactive monitoring and insights from the network, devices, and applications to predict problems faster and ensure that policy and configuration changes achieve the business intent and the user experience you want.
  - Assurance Health
  - Assurance Issues
- Platform** BETA: Use DNA-C as a Platform to unlock the full potential of DNA-C using APIs and integration capabilities.
  - View the API Catalog
  - Configure DNA - to - Third Party Integrations

# Cisco Webex Teams



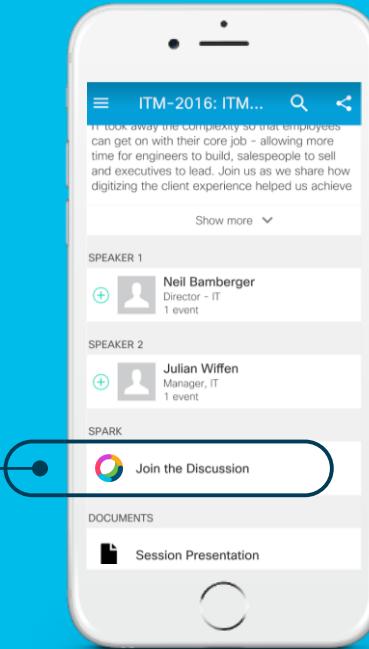
## Questions?

Use Cisco Webex Teams (formerly Cisco Spark)  
to chat with the speaker after the session

## How

- 1 Find this session in the Cisco Live Mobile App
- 2 Click “Join the Discussion”
- 3 Install Webex Teams or go directly to the team space
- 4 Enter messages/questions in the team space

Webex Teams will be moderated  
by the speaker until June 18, 2018.



[cs.co/ciscolivebot#BRKNMS-3005](https://cs.co/ciscolivebot#BRKNMS-3005)

# Complete your online session evaluation

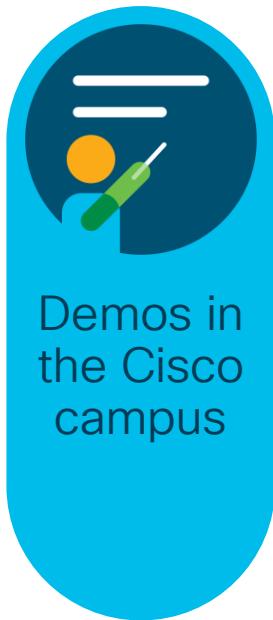
Give us your feedback to be entered into a Daily Survey Drawing.

Complete your session surveys through the Cisco Live mobile app or on [www.CiscoLive.com/us](http://www.CiscoLive.com/us).

Don't forget: Cisco Live sessions will be available for viewing on demand after the event at [www.CiscoLive.com/Online](http://www.CiscoLive.com/Online).



# Continue your education



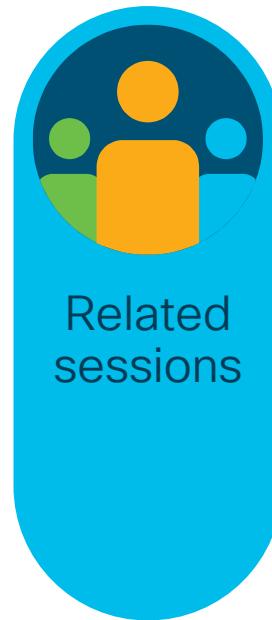
Demos in  
the Cisco  
campus



Walk-in  
self-paced  
labs



Meet the  
engineer  
1:1  
meetings



Related  
sessions



# Thank you



INTUITIVE



INTUITIVE

# Taking pictures?

Manual, no automation, high risk,

Expensive, complex

High Skill level needed

A lot of fun !

Automated, lower risk

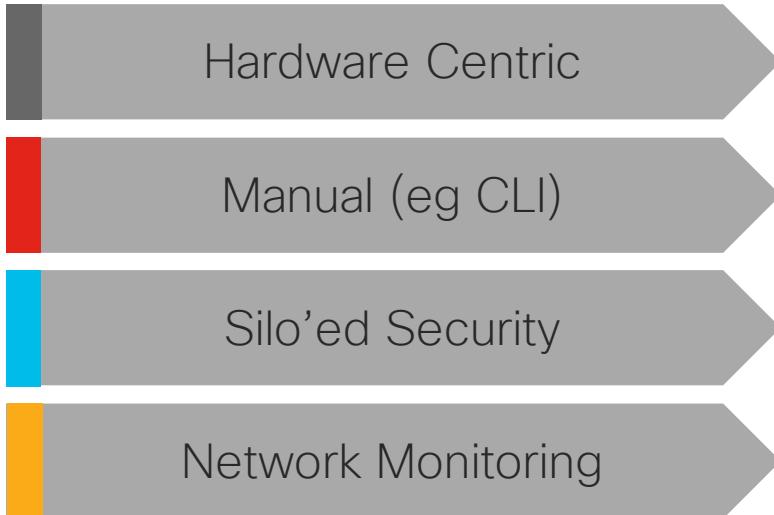
Average Skill needed for 1st / 2nd Level

Still a lot fun ! And space for more!

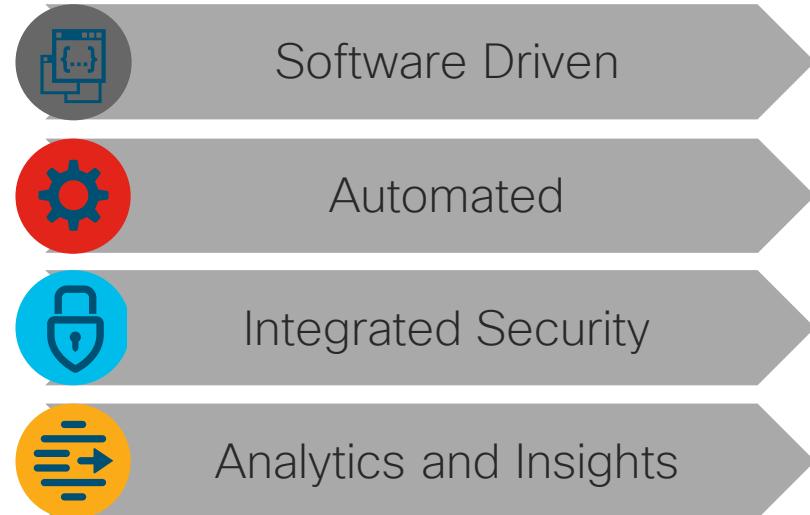


# Cisco Rewriting the Networking Playbook

## Historically



## Digital-Ready Network



You Need a Network that Drives your Digital Business

# APIC-EM into DNA Center

Independent App

Embedded Capability

APIC-EM 1.6

Inventory

Discovery

Topology

Easy QoS

IWAN App

Path-trace

Command  
Runner

Integrity  
Verification

Plug and Play

SD Bonjour

DNA Center

Nov 2017

Jan 2018

Mar 2018

Inventory

Discovery

Topology

Path-trace

Command  
Runner

Easy QoS

Plug and Play  
App

IWAN App

Integrity  
Verification

1.0

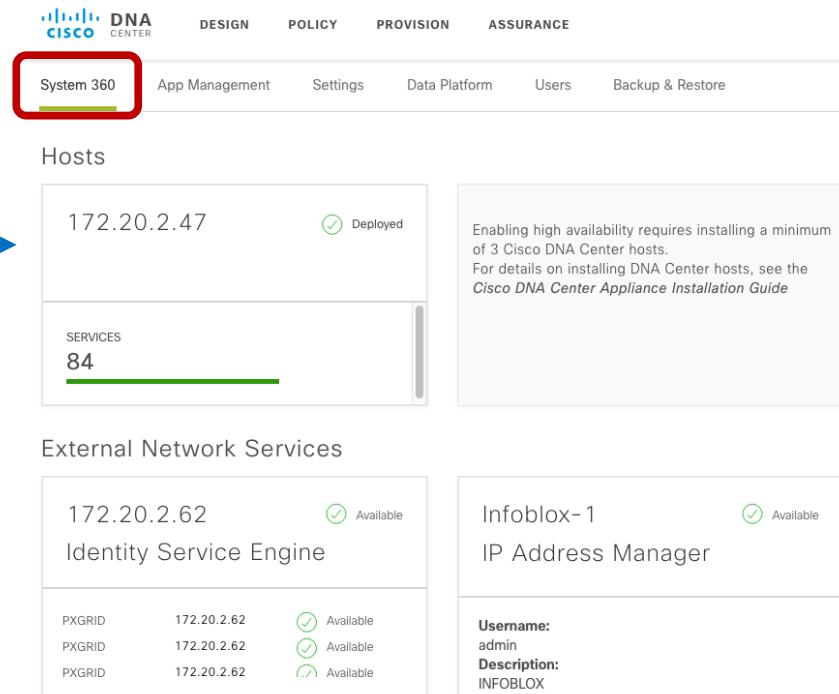
1.1

1.1.1

1.2

# System Monitoring

System Status  
and Monitoring



The screenshot shows the Cisco DNA Center interface with the 'System 360' tab selected (highlighted with a red box). The main content area displays two sections: 'Hosts' and 'External Network Services'.

**Hosts:**

| IP Address  | Status   |
|-------------|----------|
| 172.20.2.47 | Deployed |

Below the table, it says: "Enabling high availability requires installing a minimum of 3 Cisco DNA Center hosts. For details on installing DNA Center hosts, see the *Cisco DNA Center Appliance Installation Guide*".

**External Network Services:**

| IP Address              | Status      |           |
|-------------------------|-------------|-----------|
| 172.20.2.62             | Available   |           |
| Identity Service Engine |             |           |
| PXGRID                  | 172.20.2.62 | Available |
| PXGRID                  | 172.20.2.62 | Available |
| PXGRID                  | 172.20.2.62 | Available |

| Service Name                 | Status    |
|------------------------------|-----------|
| Infoblox-1                   | Available |
| IP Address Manager           |           |
| <b>Username:</b> admin       |           |
| <b>Description:</b> INFOBLOX |           |

# Logging Level

- Default Log Level is Info
- To change the Logging level
  - From Main Menu → System Settings  
→  
Settings → Logging Levels
  - Select the appropriate service and Debug Logging Level
  - Set the timeout for logging level to 15 / 30 / 60 minutes or forever

The screenshot shows the 'Settings' tab selected in the top navigation bar. On the left, a sidebar lists various system management options. The 'Debugging Logs' section is currently active, showing a dropdown menu titled 'Select Logging Level' with the following options: Debug, Error, Info, Trace, and More.

| Service     | Logging Level |
|-------------|---------------|
| pnp-service | Info          |

# DNAC 1.1 Platform: Scale and Hardware specification



Scale: Single Node

5,000 -> 4K Aps + 1K Network Devices\*  
25,000 -> Clients/Hosts\*

\*Scale will increase in the next releases

- Centralized deployment, cloud tethered
- 1 RU Small form factor
- 2 x 10Gbps Data links
- Built in Network Telemetry collection (FNF, SNMP, Syslog)
- Built in Contextual connectors (ISE/PxGrid, IPAM, Location)
- HA (3 Node, Automation),
- RBAC, Backup/Restore, Scheduler, APIs
- 64-bit x86 Processors
- Solid State Disks in RAID10
- Hardware MRAID Controller
- Dual PSU

Single Appliance for DNAC (Automation + Assurance)

# DNA Center Appliance Setup Workflow

- Unbox and Rack mount the DNA Appliance
- Power up and attach the cable
- Configure the CIMC settings (*optional*)
- Config-Wizard automatically starts



- Provide the following details
  - IP Address, GW, DNS, Virtual IP
  - NTP
  - HTTP Proxy
  - Cluster subnets
  - Admin password
- Automatic reboot



- Wait for system bring up as it automatically deploys
  - Kubernetes cluster
  - Maglev-system applications
  - Automation and Assurance applications
- When vKVM console displays the maglev login prompt, DNA-C is installed and ready to use!

# DNA Center Assurance - How to Get Started

## Prerequisites

- Review list of WLCs/APs and SW Ver supported:  
[Device Support Matrix](#)
- Make sure the WLCs are running or upgraded to 8.5.120 (8.5 MR2)
- Review prerequisites for DNA Center Deployment and best practices : [Watch Video](#)

## DNA Center Installation

- Review best practices for Installation
- Go through installation workflow
- Best practices for Cluster bring-up
- Turn on Cloud Updates

[Watch Video](#)

[\(Install and Admin Guides\)](#)

## DNA Assurance Setup

- Assurance Day1 Workflows
  - Discovery/Inventory Collection
  - Establish Streaming Telemetry with devices
  - Prepare Site Hierarchy
  - Provision Devices to Buildings
  - Assign APs to floor

[Watch Video](#)

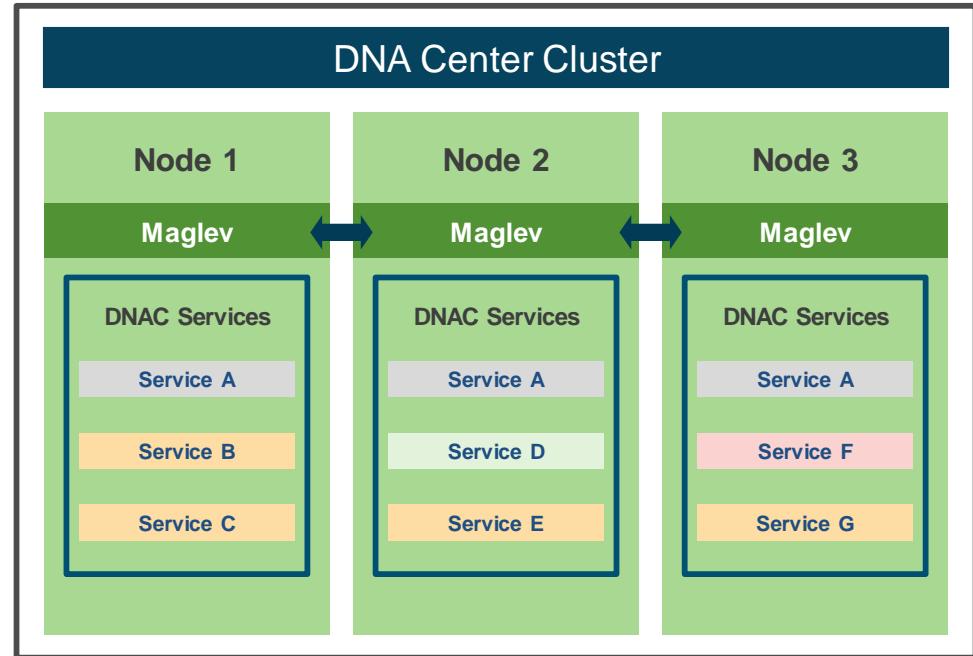
- Visit <http://dnac.cisco.com> for more resources
- DNA Center on SalesConnect: <https://salesconnect.cisco.com/#/program/PAGE-9982>
- DNA Center on Cisco.com: <https://cisco.com/go/dnacenter>

# Installation Best Practices

- Always treat DNA-C as a cluster: plan for a “cluster”
  - Standalone box is a “single node cluster”
- Provision for separate intra-cluster link on day 1
  - Changing the intra-cluster link from one interface to another is not supported
- Provision for Cluster Virtual IP on day 1
  - Network Devices will continue to see the same IP when more nodes are added
- Use a complete private network for intra-cluster link (no other machines should be in this network)
  - Use isolated L2 domain (all clusters must be in the same L2 domain)
  - Ensure < 10ms latency (RTT) across the intra-cluster link

# High-Availability (HA) Design

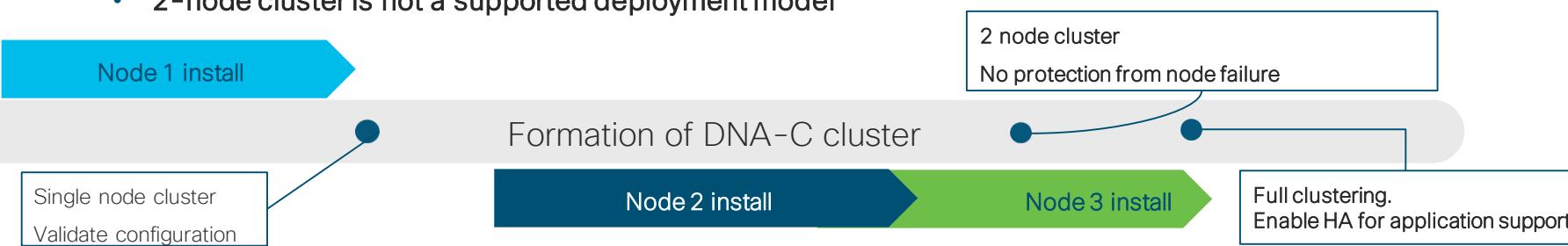
- DNA Center High Availability
  - Support for HW and SW failures
  - Fault tolerance: 1 node in a 3-node cluster
- Deployment Model
  - 1 or 3 node cluster
  - Cluster Nodes in the same subnet
  - Latency between nodes: < 10 ms RTT



*Note: HA Support for **Automation** workflows only in the DNAC 1.1 Release*

# Cluster Bring-up Best Practices

- Bring up first node: complete the installation (along-with Virtual IP, intra-cluster link) and let the services come up
- Bring up the second node: let the installation *complete*
- Bring up the third node
  - Remember 2-node DNAC cluster cannot withstand a node failure (One node crash will lead to stall of the other node)
  - 2-node cluster is not a supported deployment model



# DNA Center Authentication via REST API

**POST** <https://{{url}}/api/system/v1/auth/token>

**Authorization** **Basic Auth**

The authorization header will be automatically generated when you send the request. [Learn more about authorization](#)

**Body** **JSON**

```

1 "Token": "eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9
 .eyJzdWIiOiI1YTI1MjcxNTE3OWFlNDAwOGU5MDExNzUiLCJhdXRoU291cmNlIjoiaW50ZXJuYWwiLCJ0ZW5hbnR0YWI1IjoiVE5UMCIsInJvbG
 VzIjpBIjVhmjUyNmU1MzU3MDc5MGRlNTI5ZjJhOSJdLCJ0ZW5hbnRJZCI6IjVhMjUyNzEzMtc5YWWU0MDA4ZTkwMTE3NCIsImV4cCI6MTUxNTc2N
 zgyNywidXNlcm5hbWUiO1jhZG1pbj9qNRbrR7Lf4Itx02f0yMsypA0RQKBI9rJVT3xGM0dzg4"
 3

```

|                        | APIC-EM                               | DNAC        |
|------------------------|---------------------------------------|-------------|
| Authentication request | POST<br>JSON Body                     | Basic Auth  |
| Response               | [ "response" ]<br>[ "serviceTicket" ] | [ "Token" ] |

Roles:

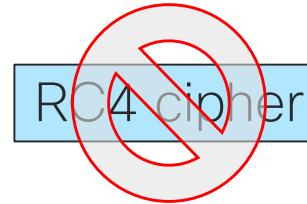
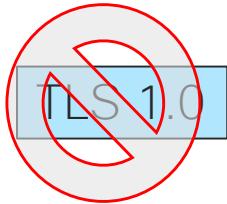
NETWORK-ADMIN-ROLE

OBSERVER-ROLE

TELEMETRY-ADMIN-ROLE

SUPER-ADMIN-ROLE

# TLS and Cipher Changes on DNAC



## Implications:

- Older versions of IOS cannot establish Plug and Play connection.
  - Need to upgrade software e.g. 3850 requires 16.3.3
- Unable to import software images from devices (uses TLS connection)
  - Import image from CCO/filesystem
- REST API connections from python may fail with Error: , ConnectionResetError(54, '
  - 'pip install pyOpenSSL'

# DNA Center Tools

## Tools



### Discovery

Automate addition of devices to controller inventory



### Inventory

Add, update or delete devices that are managed by the controller



### Topology

Visualize how devices are interconnected and how they communicate



### Image Repository

Download and manage physical and virtual software images automatically



### Command Runner

Allows you to run diagnostic CLIs against one or more devices



### License Manager

Visualize and manage license usage



### Template Editor

An interactive editor to author CLI templates



### Telemetry

Telemetry Design and Provision

# DNA Center Work Flow

- Site Hierarchy
- Network Settings and Credentials
- IP address mgmt
- SWIM
- Wireless
- Network Profiles



**Design**  
Model your entire network, from sites and buildings to devices and links, both physical and virtual, across campus, branch, WAN and cloud.

- Add site locations on the network
- Designate golden images for device families
- Create wireless profiles of SSIDs



- Base Provisioning
- SDA Provisioning
- Image Patch & Upgrade
- Profile Provisioning (Templates)

What can DNA Center do? Take a [Tour](#).  
Watch video

- Virtual Networks
- Contracts & SGT
- Microsegmentation
- Application Policy (QoS)
- Traffic Copy Policies



**Policy**  
Use policies to automate and simplify network management, reducing cost and risk while speeding rollout of new and enhanced services.

- Segment your network as Virtual Networks
- Create scalable groups to describe your critical assets
- Define segmentation policies to meet your policy goals

**ISE**

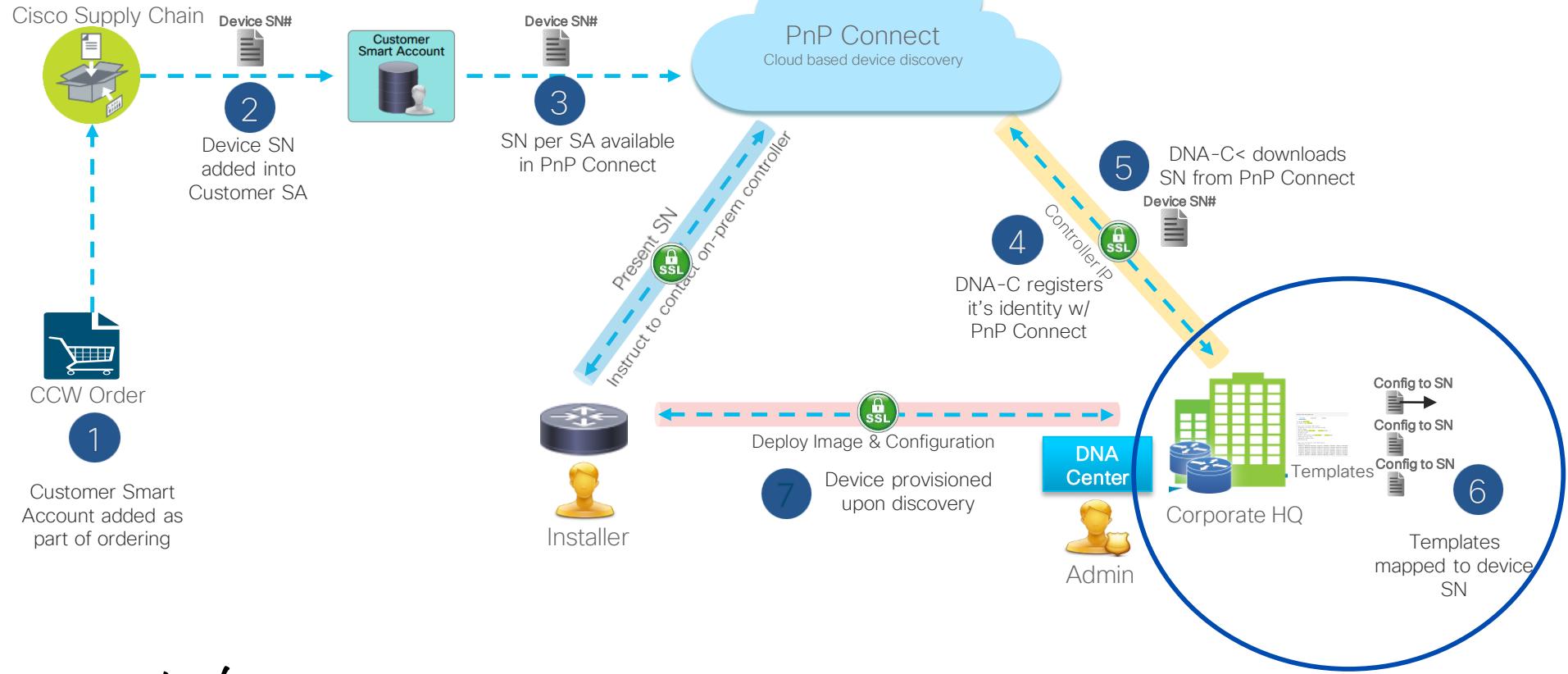


**Assurance BETA**  
Use proactive monitoring and insights from the network data platform to quickly identify issues and trends. Configuration changes achieve the consistent, high-quality user experience you expect.

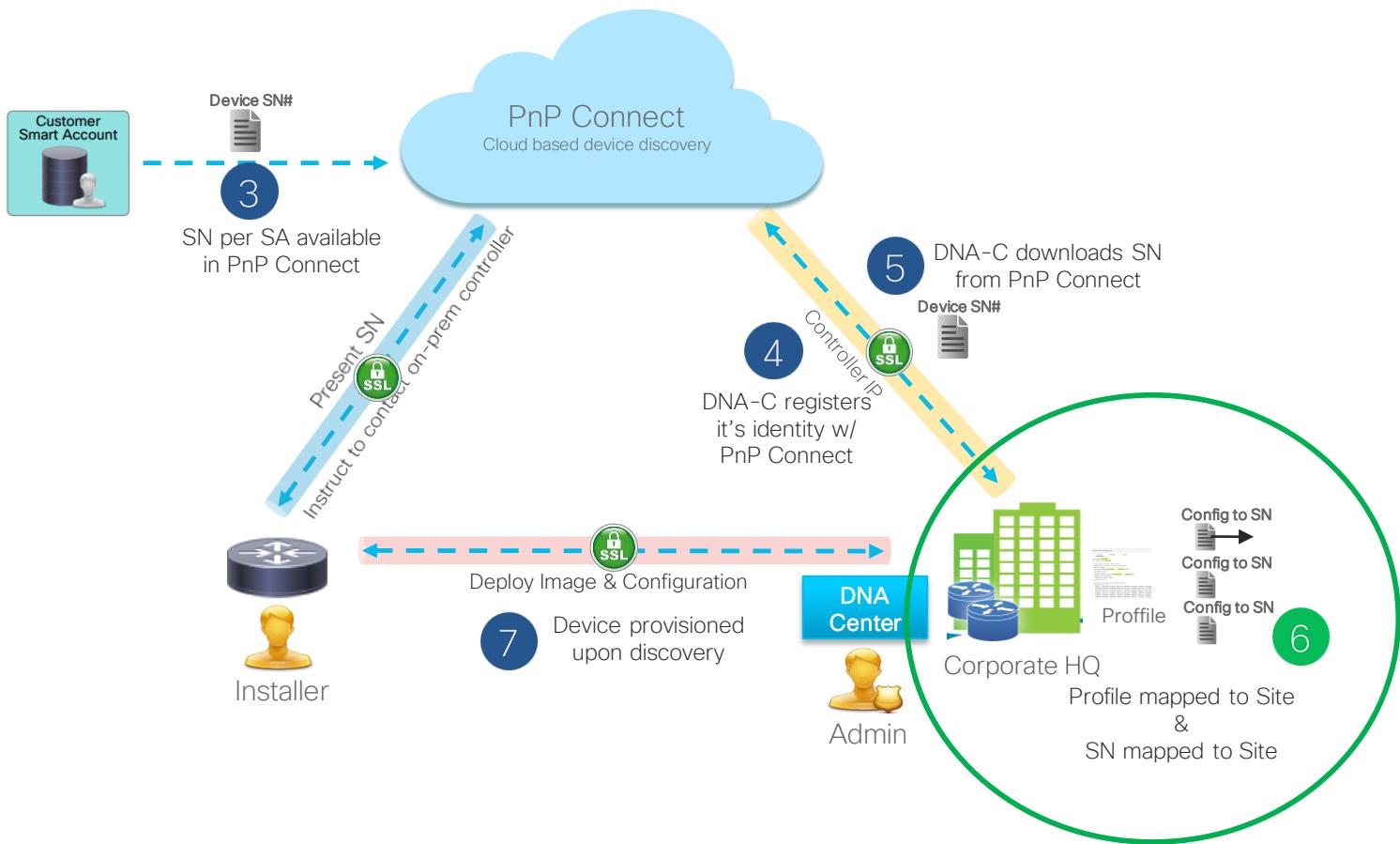
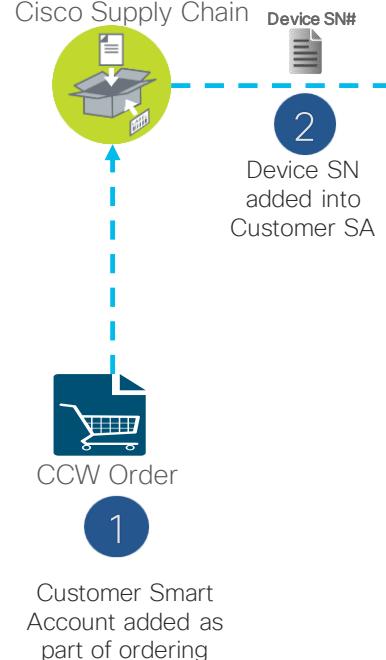
- Assurance Health
- Assurance Issues

- Overall, Network, Client & Application Health
- Analytics Device and Client 360
- Troubleshooting
- Issues and Trends
- Root Cause Analysis

# PnP Connect: End to End workflow (with PnP App)



# PnP Connect: End to End workflow (with Profiles)



# Software and Image Management

## A few Facts for DNA Center 1.1

- Parallel Device Upgrade/Threads for SWIM:
  - 25
- Pre Checks:
  - Both Image and SMU's
  - RAM & Flash
- Post Checks
  - SMU Only
  - CPU, Disk Space, Route Summary
- In case of failure during Image upgrade or Pre & Post checks, provide reason for failure and automatically Rollback

# Use Case#2: Customized Network Settings Update

The screenshot shows a web-based configuration interface for an 'IOS Banner Template'. The title bar says 'IOS Banner Template \*'. Below it are 'Actions' and 'Edit' buttons. The main area has two tabs: 'Template' and 'Rollback'. The 'Template' tab contains the following code:

```
1 #if(${message} != "")  
2 banner motd \'${message}\'  
3 #else  
4 no banner motd |  
5 #end
```

The 'Rollback' tab contains the following code:

```
1 //write your code here
```

## Use Case:

- Deploy customized configuration to devices in the network

## Core Capabilities:

- Will ensure policy CLI cannot be programmed
- Auto-complete gnome parser
- Provisioning: Form Viewer
- Mapped to profile to be deployed to the network

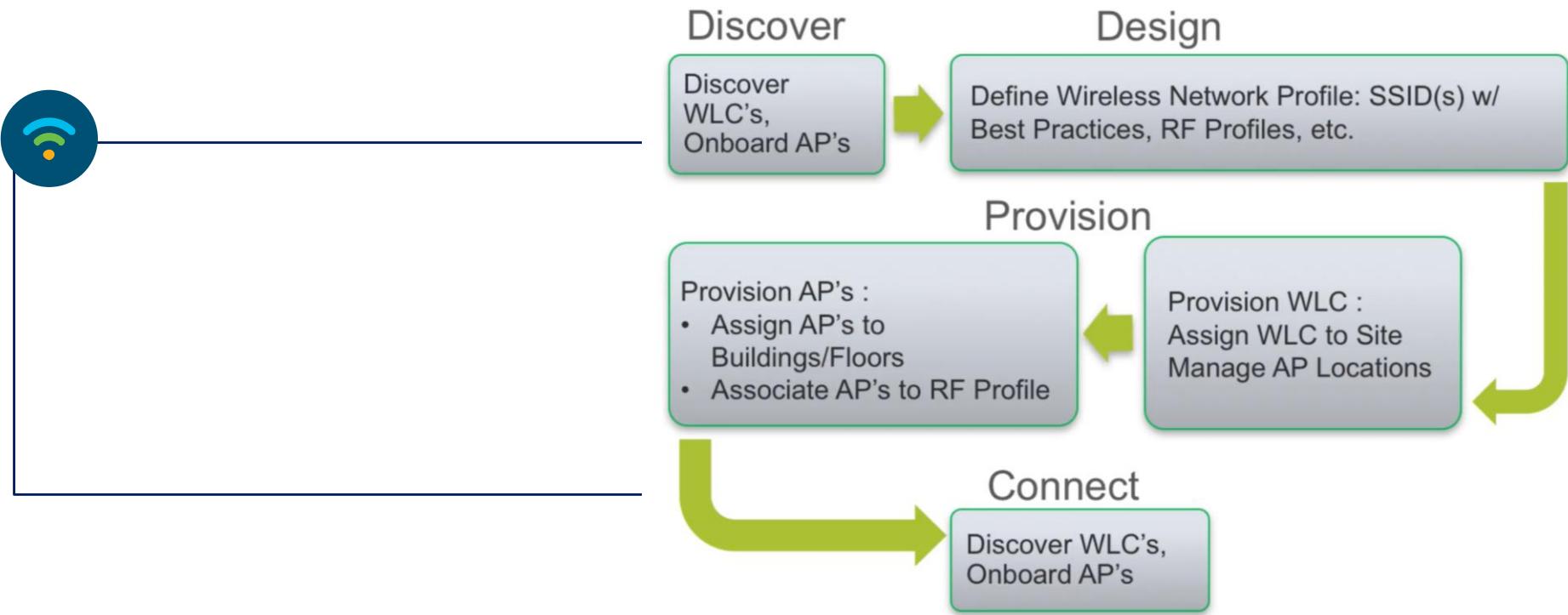
# Customized Network Settings Update

## Create the Template

The screenshot shows the Cisco DNA Center Template Editor interface. On the left, there's a sidebar with a search bar, a plus sign for creating new templates, and a list of device types: Access Switches, Branch-Access (which is selected and highlighted in green), Virtual Router, Virtual WAAS, Router, Virtual Firewall, and Virtual Platform. The main area is titled "Template Editor" and contains a window for "Branch-Access". Inside this window, there are tabs for "Actions", "Edit", and "Branch-Access". The "Edit" tab is active, showing a configuration template. The template code is as follows:

```
1 interface GigabitEthernet1/0/1
2 description DNA Center tag
3 !
4 ip dhcp excluded-address 10.204.61.1 10.204.61.100
5 !
6 ip dhcp pool kp-pnp
7   network 10.204.61.0 255.255.255.0
8   default-router 10.204.61.1
9 !
10 !
11 interface $interfaceName
12 description $description
13 !
14 alias exec showscavenger show ip access-lists prm-APIC_QOS_IN#SCAVANGER__acl
15 alias exec showmmconf show ip access-lists prm-APIC_QOS_IN#MM_CONF__acl
16 !!
```

# Use Case #3: Wireless Deployment Made Simple



# Use Case #4: Managing Software Lifecycle

The screenshot shows the Cisco DNA Center interface under the 'PROVISION' tab. The 'Devices' section is selected. The 'Device Inventory' table lists 15 devices, all of which are provisioned successfully. The columns include Device Type, IP Address, Site, Serial Number, Uptime, OS Version, OS Image, Sync Status, Last Provision, and Provision Status. A 'Actions' column contains options like 'Assign Device to Site', 'Provision', 'Update OS Image', and 'Delete Device'. One row for 'CAMPUS-Router1' is selected.

| Device Type                   | IP Address    | Site          | Serial Number | Uptime                | OS Version | OS Image                         | Sync Status | Last Provision          | Provision Status |
|-------------------------------|---------------|---------------|---------------|-----------------------|------------|----------------------------------|-------------|-------------------------|------------------|
| Branch-Router1                | 10.6.1.1      | SA/SJC/Branch | FTX1840ALC1   | 53 days, 11:48:39.66  | 15.2(4)M6a | c2900-univers...<br>Tag Golden   | Managed     | Nov 21 2017<br>16:32:28 | Success          |
| Branch-Router2                | 10.2.1.19     | SA/SJC/Branch | FTX1840ALBY   | 53 days, 12:03:58.06  | 15.2(4)M6a | c2900-univers...<br>Tag Golden   | Managed     | Nov 21 2017<br>16:32:48 | Success          |
| Branch2-Router.yourdomain.com | 218.1.100.100 |               | FTX1840ALCO   | 311 days, 7:57:38.86  | 15.2(4)M6a | c2900-univers...<br>Tag Golden   | Managed     | -                       | Not Provisioned  |
| CAMPUS-Router1                | 10.1.5.1      | SA/SJC/Campus | FTX1842AHM2   | 114 days, 18:57:52.92 | 15.5(3)S5  | 1924400-univer...<br>⚠️ Outdated | Managed     | -                       | Not Provisioned  |
| CAMPUS-Router2                | 10.1.4.2      | SA/SJC/Campus | FTX1842AHM1   | 168 days, 14:36:11.10 | 15.5(3)S5  | 1924400-univer...<br>⚠️ Outdated | Managed     | -                       | Not Provisioned  |

## Use Case:

- Ensure Consistency of Software for all network devices (by platform type)
- React to PSIRT and bugs fast
- Deploy software with confidence

## Benefits:

- Golden Image based workflows drive software consistency
- Pre/Post check ensures that software updates do not have adverse effects on the network
- Patching provides small updates to react quickly to security fixes

# Design

## Site Setup

- Set up sites, buildings and floor areas to mimic your network topology.
- Import floor maps and place access points.

## Global Settings

- Standardize DNS, DHCP, servers across sites.
- Standardize device credentials.
- Manage IP address pools effectively.
- Override global settings with site-specific settings.

## Network Profiles

- Standardize configurations for network devices and sites.
- Create once and use multiple times.

## Software Image and Patch Management

- Tag images and their corresponding patches as “golden”.
- Do automatic compliancy checks against the golden images.
- Update software images and patches on network devices.
- Perform pre- and postchecks for image deployment.

# Provision

Network Profiles

- When approved, associate the profiles to sites.
- Deploy the profiles.

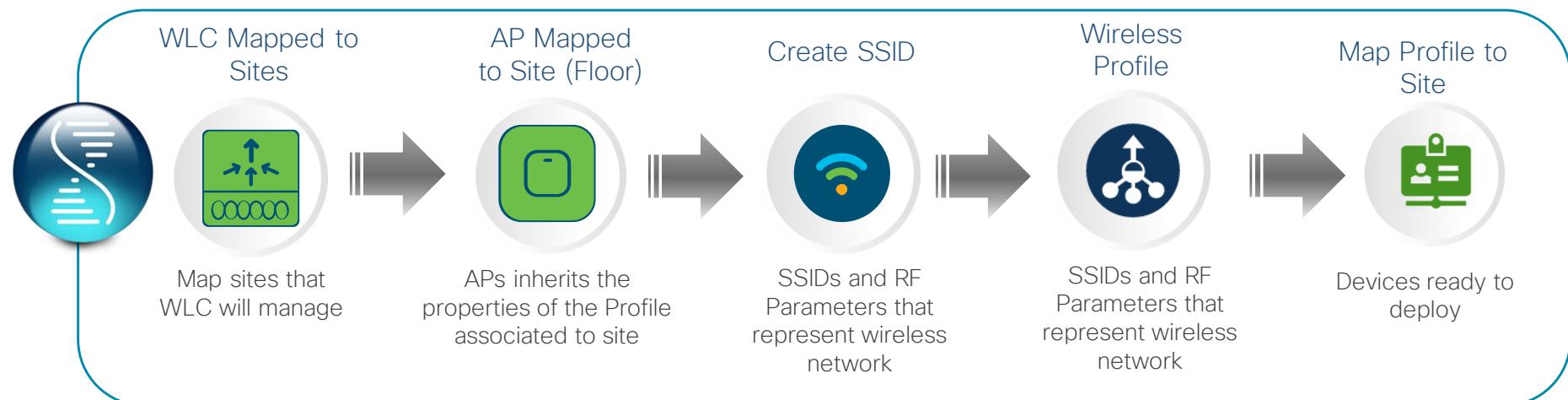
Fabric Domain

- Create fabric domains across your network.
- Associate the devices to sites.
- Add the SDA-capable devices to the fabric domain and assign roles.

Plug and Play

- Onboard routers, switches, and access points using PnP.
- Claim the devices that have been discovered with PnP and associate them to the respective sites.

# DNA Center Wireless Configuration Workflow



# Policy

## Scalable Groups

- Offers option to import groups from ISE (or AD groups)
- Offers option to create groups through static mapping
- Enables SGT ID on SDA-enabled devices

## Virtual Networks

- A “default” virtual network is created automatically
- Offers option to add or remove new virtual networks
- Enables VN ID on SDA-enabled devices

## Manage Groups and VN Policies

- Groups provide native SGT-based segmentation.
- Intra-VN policies are set to Default Permit or Deny
- VNs provide native VRF network segmentation.
- Inter-VN policies are mapped to firewall instances.

# Policy Overview for Device Role = Switching Access

Under the Hood:

## Ingress Marking Policies

- Applied on all interfaces which are not connected to another network device
- Decision is based on looking at the topology / link information in NIB

## Egress Queuing Policies

- Applied on all interfaces

# Policy Overview for Device Role – Switching Distribution & Core

Under the Hood

## Ingress Marking Policies

- No Marking policies applied on any interface

## Egress Queuing Policies

- Applied on all interfaces

# Policy Overview Device Role = Border Router

Under the Hood

## Ingress Marking Policies

- Marking policies applied on all interfaces except in the case where no SP Profile is specified for WAN interfaces (using #WAN# description)

## Egress Queuing Policies

- For LAN interfaces – LAN egress queuing policies are attached
- For WAN interfaces – egress queuing policies corresponding to the SP profile is attached to the interface

Note: WAN interface is identified by looking at the interface description field (#WAN# tag)

# Policy Overview Device Type = WLC

Under the Hood

## Upstream

- Trust DSCP at the Access Point
- DSCP re-marked as per the AVC policy on WLC

## Downstream

- DSCP re-marked as per the AVC policy on WLC
- DSCP → UP mapping at the Access Point

Note: IEEE 802.11 QoS consists of eight User Priorities (UPs) that are mapped to four Access Categories (ACs) Voice, Video, Best Effort, and Background.

# Application Summary

| api/v2/data/customer-facing-service/scalablegroup/application  | POST   | Create an application group<br>"scalableGroupType":"APPLICATION_GROUP |
|--|--------|---|
| api/v2/data/customer-facing-service/scalablegroup/application  | POST   | Create an application<br>"scalableGroupType": "APPLICATION"           |
| api/v2/data/customer-facing-service/scalablegroup/application?scalableGroupType=APPLICATION_GROUP&name=MyCustomSet | GET    | Look up application group by name                                     |
| api/v2/data/customer-facing-service/scalablegroup/application?scalableGroupType=APPLICATION&name=Adam-App          | GET    | Lookup application by name  |
| api/v2/data/customer-facing-service/scalablegroup/application/{{Id}}   | DELETE | Delete an Application or Application group                            |

# Assurance

Network Visualization

Global maps to depict the state of the network  
Health scores to color-code the areas needing attention  
Ability to drill down to a particular site, building, or floor

Health Scores

- Health scores to gauge the criticality of the network
- Health scores for clients, network devices, and applications

360 views

- Detailed 360 views for routers, switches, WLC, APs
- Automatic troubleshooting scripts run to pinpoint key concerns
- Assurance-enhanced path trace to provide relevant path analytics and statistics across nodes in the path



# Overall Health

Overall Health    All Sites Hide Sites/Topology    All Domains All Devices Actions

24 Hours 10:00a 8/11 10:00a 4:59 Export Find

Filter

NETWORK HEALTH All CLIENT HEALTH All

| Site/Building/Floor | Network Health (% Healthy Devices) | Client Health (% Healthy Devices) | Issues # | Clients #    | Network Devices # | Bandwidth Usage | Apply to Page |
|---------------------|------------------------------------|-----------------------------------|----------|--------------|-------------------|-----------------|---------------|
|                     | Network Lowest Group               | Client Lowest Group               |          |              |                   |                 |               |
| All Sites           | 52%                                | Wireless 52%                      | 52       | 5,232        | 5,232             | 65%             |               |
| San Jose            | 27%                                | Core 24%                          | 72%      | Wireless 52% | 25                | 2,777           | 75%           |
| Building 5          | 13%                                | Distribution 31%                  | 13%      | Wired 56%    | 12                | 162             | 62%           |
| Building 21         | 29%                                | Access 31%                        | 29%      | Wireless 31% | 5                 | 459             | 57%           |
| Building 3          | 38%                                | Access 31%                        | 38%      | Wireless 31% | 4                 | 622             | 42%           |
| Building 23         | 42%                                | Access 31%                        | 42%      | Wireless 31% | 8                 | 320             | 63%           |

Overall Health Summary Aug 11, 2017 10:00 am

**NETWORK** 40% Last 24 Hours  
Healthy Devices View Network Health

**LOWEST HEALTHY DEVICES** 1 Core 8% Healthy Devices  
Access 30% Healthy Devices  
Distribution 72% Healthy Devices  
View Client Health

**CLIENT** 55% Last 24 Hours  
Healthy Clients  
View Client Health

**CLIENTS** 30% Healthy Clients  
Wired 30% Healthy Clients  
Wireless 80% Healthy Clients

Top 10 Issues (3) Dec 06, 2017 12:00:00 to Dec 07, 2017 12:00:00

Onboarding  
Clients Failing DHCP Attempts Because DHCP IP Addressing Timed Out at \* Global/USA/SM/SM-Level1\*  
Total occurrences: 47

Dec 07, 2017 12:00:00 BRKNMS-3005

- Quick drill down to a site or Toggle between Geo, List or Topology View

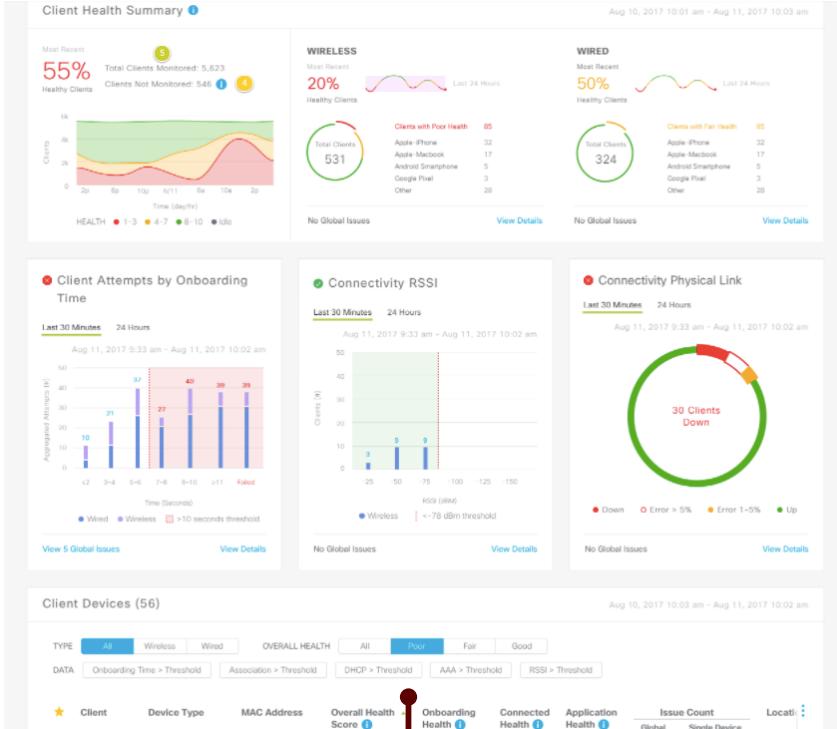
- Where in the world and on which site most serious issues are happening

- Overall health summary of network and clients

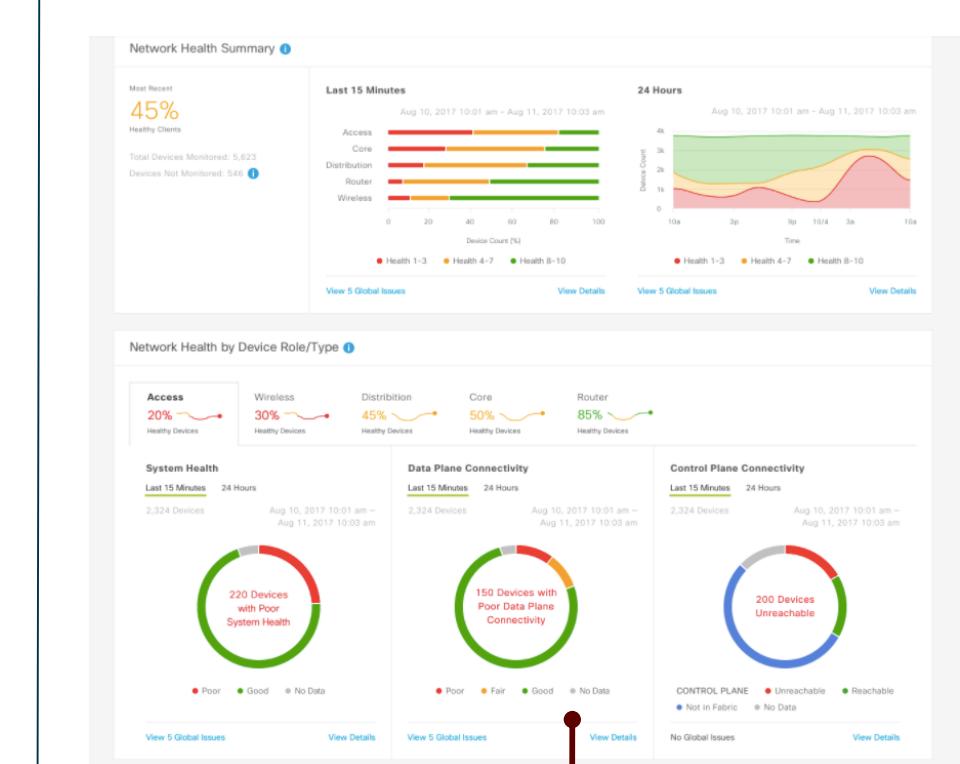
- Top 10 Global Insights



# Network Client Health



- Client Health Summary
- Onboarding, RF and Client Profile info

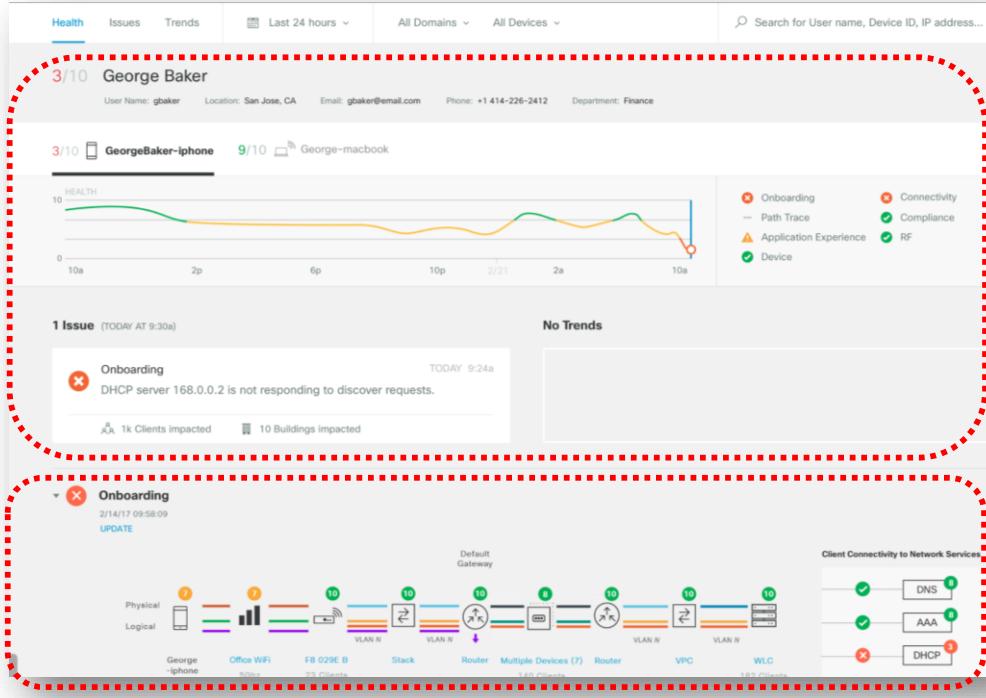


#CLUS

- Network Health Summary
- Control, Data, Policy Plane and Health Info



# 360 view Users and Devices



- Single location for all user information and every user device
- History of performance for each user device
- Proactive identification of any issues affecting user's experience

- Single location for all user device related user information
  - Connectivity graph with health score of all device on the path
  - Application performance
  - Device KPIs



# Time Travel



- History shows critical events
- Identifies when issues occurred!
- Rewind time to when the issue occurred
- All the information on the user or network device 360 changes to the selected time!



# Path Trace

Client 360

Last 24 hours ▾ All Domains ▾

**10/10** daphne.blake

Daphne-iPad Daphne-PC Daphne-iPhone

Issues (1)

Connected  
This client is exhibiting sticky behavior on "LA-Corporate3" and "LA1-AP1815-32" 2.4 Ghz.  
Total occurrences: 1

> Onboarding 12/06/17 12:50:00 am

✓ Path Trace

To find the location of an issue, perform a path trace between two nodes in your network – a source and destination.

Run New Path Trace

Dec 7, 2017 12:42 am

TenGigabitEthernet1/0/24

Egress

|                   |     |
|-------------------|-----|
| Used VLAN         | 120 |
| Input Queue Drops | 0   |
| Output Drops      | 0   |

GigabitEthernet1/0/24

Ingress details

|                       |                       |
|-----------------------|-----------------------|
| GigabitEthernet1/0/24 |                       |
| Used VLAN             | N/A                   |
| Admin status          | N/A                   |
| Input Queue Drops     | N/A                   |
| Input Queue Count     | N/A                   |
| Input Rate            | N/A                   |
| Output Drop           | N/A                   |
| Output Queue Count    | N/A                   |
| Output Rate           | N/A                   |
| Input Queue Max Depth | N/A                   |
| Input Queue Flushes   | N/A                   |
| Operational status    | N/A                   |
| ACL Name              | standard_acl_r1_ac2_4 |
| ACL Result            | DENY                  |
| Matching ACE Rule     | 10 deny 221.3.25.14   |
| Matching ACE Result   | BRKNMS-3005           |

- Run pathtrace from source to destination to quickly get key performance statistics for each device along the network path
- Identify ACLs that may be Blocking or affecting the traffic flow

Cisco live!



# Insights with Guided Remediation Actions

## Clients Failing DHCP Attempts Because DHCP IP Addressing Timed Out at "Global/USA/SM/SM-Level1"

Status: Open ▾

### Description

Clients located in "Global/USA/SM/SM-Level1" timed out and have not been assigned an IP address from the DHCP server.

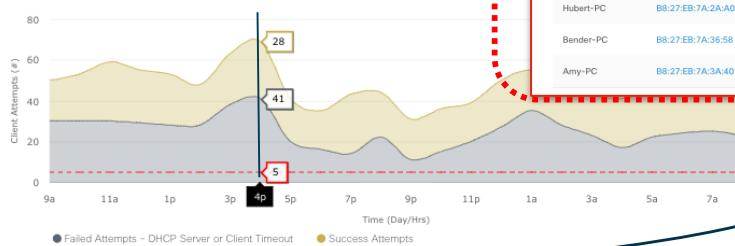
### Impact

Location:  
1 Building

Clients  
4 Wireless Clients

### DHCP Attempts

Dec 6, 2017 9:00 am to Dec 7, 2017 9:00 am



| Impacted Wireless Clients |                   | Impacted Locations |               |
|---------------------------|-------------------|--------------------|---------------|
| Hostname                  | Mac Address       | Device Type        | AP            |
| John-PC                   | B8:27:EB:7A:3E:28 | WIRELESS           | LA2-AP1815-33 |
| Hubert-PC                 | B8:27:EB:7A:2A:A0 | WIRELESS           | LA2-AP1815-33 |
| Bender-PC                 | B8:27:EB:7A:3E:58 | WIRELESS           | LA2-AP1815-33 |
| Amy-PC                    | B8:27:EB:7A:3A:40 | WIRELESS           | LA2-AP1815-33 |

- Detailed drill downs to identify the impact quickly

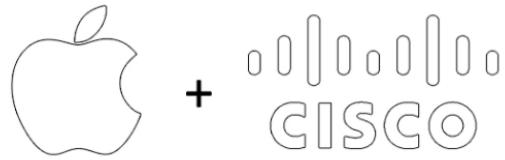
### Suggested Actions (6)

- 1 Verify that the DHCP scope is configured correctly. Best Practice - Design an IP address pool that is two to three times larger than the expected number of users.
- 2 Reduce the DHCP lease time. Best practice - DHCP lease time for high-density, high mobile environment is 15-30 min.

- Guided Actions to help remediate issues quickly



# Apple Insights



1

## Device Profile

- Client shares these details
1. Model e.g. iPhone 7
  2. OS Details e.g. iOS 11



Support per device-group Policies and Analytics

2

## Wi-Fi Analytics

- Client shares these details
1. BSSID
  2. RSSI
  3. Channel #



Insights into the clients view of the network

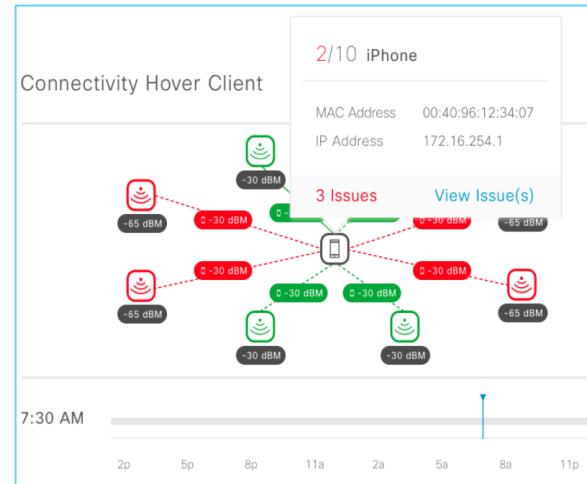
3

## Assurance

- Client shares these details  
Error code for why did it previously disconnected



Provide clarity into the reliability of connectivity





# Proactive Insights - Senor

**Sensor Management**

## Fourth Floor Sensors

All Domain

**Schedule Test** **Select Tests** **Select Sensors**

| Test Name            | Location | Days | Hours |
|----------------------|----------|------|-------|
| Fourth Floor Sensors | Milpitas | Days | Hours |

( Select "Radios To Test" to add to test )

**Network Tests**

- DHCP Tests
  - DHCPv4
  - DHCPv6
  - SLAAC
- DNS Tests
  - DNS (IPv4)
  - DNS (IPv6)
- Host Reachability Tests
  - User Defined Host (IPv4)

Internal IP Address: 172.14.253.12:5500  
External IP Address: 172.14.256.12



Create sensor test schedule and define the applications and test to run

**Sensor Management**

## Fourth Floor Sensors

All Domains

**Schedule Test** **Select Tests** **Select Sensors**

| Test Name            | Location | Days | Hours |
|----------------------|----------|------|-------|
| Fourth Floor Sensors | Milpitas | Days | Hours |

( Select "Radios To Test" to add to test )

**Sensor Coverage** 60% **Network Coverage** 100%

Cisco has selected AP candidates that will provide the best coverage. Use the list provided to modify which AP's should be converted to sensors, or select "save".

Reset to Recommendations

- SJC18FLR4AP5 3 Clients 3 APs
  - SJC18FLR4AP1 2.4GHz: -60 dBm 50Hz: -63 dBm
  - SJC18FLR4AP2 2.4GHz: -60 dBm 50Hz: -63 dBm
  - SJC18FLR4AP11 2.4GHz: -60 dBm 50Hz: -63 dBm
- SJC18FLR4AP6 3 Clients 3 APs
- SJC18FLR4AP7 4 Clients 3 APs
- SJC18FLR4AP8 3 Clients 3 APs
- SJC18FLR4AP9 3 Clients 3 APs



- Sensor tests raise issues/insights
- Detailed results shown at the floor level

# Execute Path Trace

Daphine said she was not able to use a printer with her PC

Let's run a Path Trace to the printer specific IP address and port to understand where is the problem

CISCO DNA CENTER DESIGN POLICY PROVISION ASSURANCE

Issues (4)

Onboarding

Client Unable to Connect to "LA-Guest3" SSID on "LA2-AP1815-33" AP 2.4 GHz at "Global/USA/SM/SM-Level1" - Client Side Timeout  
Total occurrences: 2

Onboarding

Wireless Client Taking a Long Time to Connect to "LA-Corporate3" SSID on "AP1880.90E7.23BA" AP 2.4 GHz - Excessive Time on Onboarding  
Total occurrences: 1

Onboarding

Wireless Client Taking a Long Time to Connect to "LA-Corporate3" SSID on "LA2-AP1815-33" AP 2.4 GHz at "Global/USA/SM/SM-Level1" - Exchange Because of Issues from the Client Side  
Total occurrences: 2

Connected

This client is exhibiting sticky behavior on "LA-Corporate3" and "LA1-AP1815-32" 2.4 Ghz.  
Total occurrences: 1

▼ Onboarding 12/12/17 11:21:46 pm

▼ Path Trace

To find the location of this issue, perform a path trace between two nodes in your network – a source device and a destination device.

**Run New Path Trace**

**Set up Path Trace**

**Source**  
Host/IP  
10.30.100.10

**Port (optional)**  
\_\_\_\_\_

**Destination**  
Host/IP  
10.30.120.10

**Port (optional)**  
9100

**Options**

Protocol  
\_\_\_\_\_

Refresh Every 30sec

ACL Trace

Include Stats  
 Device  
 Interface  
 QoS

**Start**

# Check Path Trace

**Path Trace**

To find the location of an issue, perform a path trace between two nodes in your network – a Daphne-PC and a printer.

10.30.100.10 (port: not specified) → 10.30.120.10 (port: 9100) [protocol: not specified]

**Egress details**

| TenGigabitEthernet1/0/24 |             |
|--------------------------|-------------|
| Used VLAN                | 120         |
| Admin status             | up          |
| Input Queue Drops        | 0           |
| Input Queue Count        | 0           |
| Input Rate               | 2679000 bps |
| Output Drop              | 0           |
| Output Queue Count       | 0           |
| Output Rate              | 1724000 bps |
| Input Queue Max Depth    | 2000        |
| Input Queue Flushes      | 0           |
| Operational status       | up          |
| ACL Name                 | N/A         |
| ACL Result               | NONE        |

**More Details**

| Vlan120               |                    |
|-----------------------|--------------------|
| Used VLAN             | 120                |
| Admin status          | up                 |
| Input Queue Drops     | 0                  |
| Input Queue Count     | 0                  |
| Input Rate            | 0 bps              |
| Output Drop           | 0                  |
| Output Queue Count    | 0                  |
| Output Rate           | 0 bps              |
| Input Queue Max Depth | 375                |
| Input Queue Flushes   | 0                  |
| Operational status    | up                 |
| ACL Name              | 120                |
| ACL Result            | DENY               |
| Matching ACE Rule     | 40 deny ip any any |
| Matching ACE Result   | DENY               |

**Detail Information**

**Device Info**

| Information |                   | Connection Information |         |
|-------------|-------------------|------------------------|---------|
| User Name   | daphne.blake      | Band                   | 2.4 GHz |
| Host Name   | Daphne-PC         | Spatial Streams        | 0       |
| MAC Address | B8:27:EB:D8:BB:5E | Channel Width          | 20 MHz  |

**Feedback**

Path Trace reports an ACL  
Denying traffic to the Printer

# DNA Assurance Platform Support (Release 1.1)

## CAT2K / CAT3K / CAT4K Switches

| CAT2K          | Recommended OS | Minimum OS    |
|----------------|----------------|---------------|
| C2960-L        | IOS 15.2(2)E7  | IOS 15.2(1)E1 |
| C2960-P        | IOS 15.2(2)E7  | IOS 15.2(1)E1 |
| C2960-C        | IOS 15.2(2)E8  | IOS 15.2(1)E1 |
| C2960-CPD      | IOS 15.2(2)E8  | IOS 15.2(1)E1 |
| C2960-X Stack  | IOS 15.2(2)E6  | IOS ≥ 12.1    |
| C2960-XR       | IOS 15.2(2)E6  | IOS ≥ 12.1    |
| C2960-XR Stack | IOS 15.2(2)E6  | IOS ≥ 12.1    |
| C2960-CX       | IOS 15.2(4)E3  | IOS ≥ 12.1    |

| CAT3K                      | Recommended OS | Minimum OS   |
|----------------------------|----------------|--------------|
| C3560-CX                   | IOS 15.2(6)E   | All Versions |
| C3650 (Copper)             | IOS-XE 16.6.1  | All Versions |
| C3650-Stack                | IOS-XE 16.6.1  | All Versions |
| C3850(Copper/Fiber)        | IOS-XE 16.6.1  | All Versions |
| C3850-Stack (Copper/Fiber) | IOS-XE 16.6.1  | All Versions |

| CAT4K                     | Recommended OS | Minimum OS   |
|---------------------------|----------------|--------------|
| C4500-X                   | IOS-XE 3.10E   | All Versions |
| C4500-E (SUP 7E 7LE 8LE)  | IOS-XE 3.10E   | All Versions |
| C4507R+E (SUP 7E 7LE 8LE) | IOS-XE 3.10E   | All Versions |
| C4503E (Sup 8E 9E)        | IOS-XE 3.10E   | All Versions |
| C4506E (Sup 8E 9E)        | IOS-XE 3.10E   | All Versions |
| C4507R+E (Sup 8E 9E)      | IOS-XE 3.10E   | All Versions |
| C4510R+E (Sup 8E 9E)      | IOS-XE 3.10E   | All Versions |

## Cisco Meraki Devices

| Device Type              | Recommended OS | Minimum OS   |
|--------------------------|----------------|--------------|
| All Cisco Meraki Devices | All Versions   | All Versions |

## CAT9K / CAT6K / N7K Switches

| CAT9K          | Recommended OS | Minimum OS    |
|----------------|----------------|---------------|
| C9300          | IOS-XE 16.6.2  | IOS-XE 16.6.1 |
| C9300 Stack    | IOS-XE 16.6.2  | IOS-XE 16.6.1 |
| C9400-LC-48UX  | IOS-XE 16.6.2  | IOS-XE 16.6.1 |
| C9400-LC-24XS  | IOS-XE 16.6.2  | IOS-XE 16.6.1 |
| C9400 (Sup1XL) | IOS-XE 16.6.2  | IOS-XE 16.6.1 |
| C9400 (Sup1E)  | IOS-XE 16.6.2  | IOS-XE 16.6.1 |
| C9500          | IOS-XE 16.6.2  | IOS-XE 16.6.1 |
| C9500 Stack    | IOS-XE 16.6.2  | IOS-XE 16.6.1 |

| CAT6K                | Recommended OS | Minimum OS |
|----------------------|----------------|------------|
| C6503E (Sup 2T 6T)   | IOS 15.5.1 SY  | ≥ 12.2     |
| C6504E (Sup 2T 6T)   | IOS 15.5.1 SY  | ≥ 12.2     |
| C6506E (Sup 2T 6T)   | IOS 15.5.1 SY  | ≥ 12.2     |
| C6509E (Sup 2T 6T)   | IOS 15.5.1 SY  | ≥ 12.2     |
| C6513E (Sup 2T 6T)   | IOS 15.5.1 SY  | ≥ 12.2     |
| C6807-XL (Sup 2T 6T) | IOS 15.5.1 SY  | ≥ 12.2     |
| C6840-X (Sup 2T 6T)  | IOS 15.5.1 SY  | ≥ 12.2     |
| C6880-X (Sup 2T 6T)  | IOS 15.5.1 SY  | ≥ 12.2     |

## Wireless Controllers / APs

| Wireless             | Recommended OS | Minimum OS     |
|----------------------|----------------|----------------|
| WLC (35xx,55xx,85xx) | AireOS 8.5 MR1 | AireOS 8.5 MR1 |
| AP 1700              | AireOS 8.5 MR1 | AireOS 8.5 MR1 |
| AP 1800              | AireOS 8.5 MR1 | AireOS 8.5 MR1 |
| AP 2700              | AireOS 8.5 MR1 | AireOS 8.5 MR1 |
| AP 2800              | AireOS 8.5 MR1 | AireOS 8.5 MR1 |
| AP 3700              | AireOS 8.5 MR1 | AireOS 8.5 MR1 |
| AP 3800              | AireOS 8.5 MR1 | AireOS 8.5 MR1 |

## ASR / ISR / CSRv Routers

| ISR 4K     | Recommended OS | Minimum OS  |
|------------|----------------|-------------|
| ISR 4431   | IOS-XE 3.16    | IOS-XE 3.9  |
| ISR 4221   | IOS-XE 16.4    | IOS-XE 16.4 |
| ISR 4351   | IOS-XE 3.16    | IOS-XE 3.10 |
| ISR 4451-X | IOS-XE 3.16    | IOS-XE 3.9  |

| ISR_ 1K (Selected PIDs Only)     | Recommended OS | Minimum OS    |
|----------------------------------|----------------|---------------|
| C1112-8P + (LTEA)                | IOS-XE 16.7.1  | IOS-XE 16.6.1 |
| C1113-8P + (M,LTE*,WE,WA,WZ,MWE) | IOS-XE 16.7.1  | IOS-XE 16.6.1 |
| C1114-8P + (LTEEA)               | IOS-XE 16.7.1  | IOS-XE 16.6.1 |
| C1115-8P + (PM, LTEEA, PMLTEEA)  | IOS-XE 16.7.1  | IOS-XE 16.6.1 |

| ASR 1K           | Recommended OS | Minimum OS    |
|------------------|----------------|---------------|
| ASR 1001-X       | IOS-XE 16.3.5  | IOS-XE 3.12.0 |
| ASR 1002-X       | IOS-XE 16.3.5  | IOS-XE 3.7.0  |
| ASR 1006-X (RP2) | IOS-XE 16.3.5  | IOS-XE 3.16.0 |
| ASR 1006-X (RP3) | IOS-XE 16.3.5  | IOS-XE 16.3.1 |
| ASR 1009-X (RP2) | IOS-XE 16.3.5  | IOS-XE 3.16.0 |
| ASR 1009-X (RP3) | IOS-XE 16.3.5  | IOS-XE 16.3.1 |
| ASR 1001-HX      | IOS-XE 16.3.5  | IOS-XE 16.3.1 |
| ASR 1002-HX      | IOS-XE 16.3.5  | IOS-XE 16.3.1 |

| Virtual Router  | Recommended OS | Minimum OS |
|-----------------|----------------|------------|
| CSRv            | WIP            | WIP        |
| ISRv            | WIP            | WIP        |
| ASA v           | WIP            | WIP        |
| vWAAS           | WIP            | WIP        |
| ENCS 5400       | WIP            | WIP        |
| ENCS 5100       | WIP            | WIP        |
| UCS-C220        | WIP            | WIP        |
| UCSE on ISR43xx | WIP            | WIP        |

# DNA+ITSM enable faster remediation

## ITSM Ecosystem Integration

Visibility into points of failure in network

Proactive incident and change management

Integrated IT value chain across operations, services and support

## The result?

- Actionable insights
- Agility for changing needs of the network

Client Metrics  
Health Scores  
Network Data

DNA

ITSM Tool

Scheduling  
CMDB  
Correlation  
Association

Most relevant issue routed to create an ITSM incident or change request with enriched data

Transforming network operations through actionable insights and simplicity

# DNA v1.1 Essentials and Advantage (Automation)

|            | Wireless  | Switching  | Routing  |
|------------|---|--|--|
| Advantage  | <ul style="list-style-type: none"><li>• Fabric Enabled Wireless</li><li>• Sensors – Lifecycle Mgmt</li></ul><br><ul style="list-style-type: none"><li>• SD Bonjour</li><li>• EasyQoS (NBAR Based)</li></ul>   | <ul style="list-style-type: none"><li>• SD-Access</li><li>• Access Policy</li><li>• Virtual Network</li></ul><br><ul style="list-style-type: none"><li>• SWIM: Patching Support</li></ul>  | <ul style="list-style-type: none"><li>• SD-WAN integration</li></ul>   |
| Essentials | <ul style="list-style-type: none"><li>• Centralized and Flex</li><li>• Zero Touch WLC and AP provisioning</li><li>• Guest with ISE</li></ul><br><ul style="list-style-type: none"><li>• Inventory</li><li>• Discovery</li><li>• Topology</li><li>• Search</li></ul> | <ul style="list-style-type: none"><li>• Automated Underlay</li><li>• Non-fabric – Profile based customizable</li></ul><br><ul style="list-style-type: none"><li>• Integrity Verification</li><li>• Software Update</li><li>• Network Settings Update</li><li>• Policy Protected CLI Template</li></ul> | <ul style="list-style-type: none"><li>• Router underlay design and provisioning</li><li>• ENFV</li></ul><br><ul style="list-style-type: none"><li>• Neighbor topology</li><li>• EasyQoS (DSCP Based)</li></ul> |

# DNA v1.1 Essentials and Advantage (Assurance)

|            | Wireless  | Switching  | Routing  |
|------------|---|--|--|
| Advantage  | <ul style="list-style-type: none"><li>• Apple device insights</li><li>• Sensors</li><li>• Heat maps</li></ul><br><ul style="list-style-type: none"><li>• Trends</li><li>• Global issues (across multiple devices)</li><li>• Situational dashboard</li></ul> | <ul style="list-style-type: none"><li>• SD-Access Assurance</li><li>• Control plane</li><li>• Data plane</li><li>• Policy plane</li></ul><br><ul style="list-style-type: none"><li>• App 360</li><li>• App performance in client/device 360s (Jitter, loss, latency – collected from a Router)</li></ul> | <ul style="list-style-type: none"><li>• TBD pending SD-WAN integration</li></ul>   |
| Essentials | <ul style="list-style-type: none"><li>• Client 360</li><li>• WLC 360</li><li>• AP 360</li></ul><br><ul style="list-style-type: none"><li>• Floor Maps</li></ul>   | <ul style="list-style-type: none"><li>• Switch 360</li><li>• Non-fabric insights</li><li>• ENFV</li></ul>  | <ul style="list-style-type: none"><li>• Router 360</li><li>• Router underlay insights</li><li>• ENFV</li></ul><br><ul style="list-style-type: none"><li>• App visibility</li><li>• KPIs</li><li>• Context info</li><li>• Reports</li></ul> |

# DNA Assurance supports both SDA and Non-SDA

| Non-SDA  | SDA   |
|--|---|
| <ul style="list-style-type: none"><li>• Traditional WLAN, LAN, and WAN (non fabric)</li><li>• Client wired and wireless service assurance</li><li>• Sensors for wireless</li><li>• Application experience</li><li>• WAN nonfabric (non-SD-WAN)</li><li>• ENFV and WAAS</li></ul> | <ul style="list-style-type: none"><li>• Adds fabric assurance (control-plane troubleshooting)</li><li>• Fabric overlay</li><li>• Fabric policy monitoring and troubleshooting</li></ul> |

# DNA Center in dCloud

<http://dcloud.cisco.com>

## Cisco 4D SD-Access v3

ID: 225435

Published Date: 17-Oct-2017 17:30

Demonstration

Enterprise Networks

English

Japanese

Demonstrate how the DNA Center acts as a single orchestration point to design, provision, and create policy for a Software Defined Access enabled network.

★ Favorite

Schedule

## Cisco SD-Access Lab v1

ID: 228966

Published Date: 30-Nov-2017 19:28

Demonstration

Enterprise Networks

English

Korean

SD-Access helps ensure policy consistency, enables faster launches of new business services and significantly improves issue resolution times while being open and extensible and reducing operational expenses.

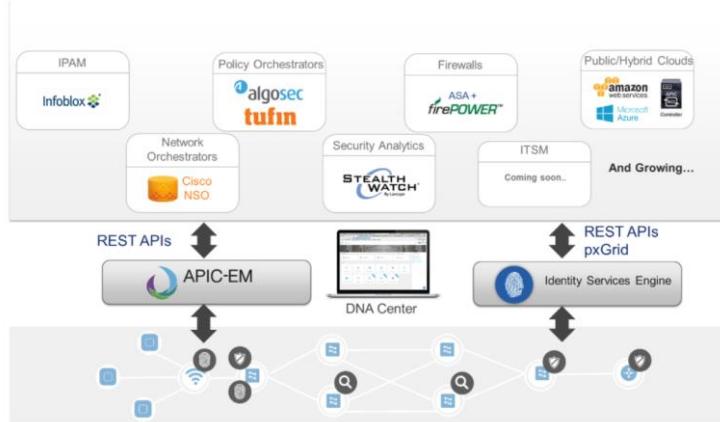
★ Favorite

Schedule

# DNA Center on DevNet

## Key Partnerships and Integrations

The SD-Access technology partnerships includes other Cisco solutions as well as solutions from 3rd party vendors. The capabilities for each of the solution and vendor integrations is evolving rapidly. Below is a sample of the various integrated technology partners currently in development, and the joint functionalities with SD-Access:



<https://developer.cisco.com/docs/sda/#sd-access-integrations>

<http://developer.cisco.com>

The screenshot shows the Cisco DevNet Learning Labs interface. At the top, there are tabs for Tracks, Modules, Labs, Challenges, Help, and Feedback. A user icon is in the top right. The main content area has two sections: "Network Controllers" and "Introduction to Device Level Interfaces (ex: NETCONF/YANG)".

**Network Controllers**  
Learn about developing with network controllers like APIC-EM.  
🕒 1 Hour 10 Minutes

**APIC-EM APIs with Python: Part 1 - The Basics**  
The purpose of this learning lab is to understand the basics of the APIC-EM Northbound REST API. APIC-EM allows you to develop your own custom controller or add dynamic SDN functionality directly into your own applications.

**APIC-EM APIs with Python: Part 2 - Path Trace**  
Learn about the APIC-EM Path Trace APIs and REST Fundamentals using Python

**APIC-EM APIs with Python: Part 3 - Policy Labs**  
Learn about and how to use the APIC-EM Policy based APIs

**Login to Start Module**

**Introduction to Device Level Interfaces (ex: NETCONF/YANG)**  
Understand model-driven programmability and how NETCONF, YANG, and RESTCONF fit into the next generation of standard device-level interfaces.  
🕒 1 Hour 15 Minutes

**Introduction to Standard Device Interfaces**  
Understanding how NETCONF/YANG fit into Network Management technologies.

**Introduction to YANG Data Modeling**  
Understand what a Data Model is and what YANG provides for Network Management.

**Introduction to the NETCONF Protocol**  
Explore the key elements of the NETCONF Protocol and how to use it.

**Introduction to the RESTCONF Protocol**  
Explore the key elements of the RESTCONF Protocol and how to use it.

<https://learninglabs.cisco.com/tracks/programming-dna>

# Some References

|  |   |
|--|---|
| DNA Center – BRKNMS-3005               |   |
| CL Session PDF and Demo Video Download | <a href="http://cs.co/BRKSDN3005">http://cs.co/BRKSDN3005</a>   |
| DNA Center Demo Video's incl. Audio    | <a href="http://cs.co/apicemvideo">http://cs.co/apicemvideo</a>   |
| DNA Center on Facebook                 | <a href="https://www.facebook.com/groups/apicem/">https://www.facebook.com/groups/apicem/</a>                     |
| German Blog                            | <a href="http://gblogs.cisco.com/de/category/DNA%20Center/">http://gblogs.cisco.com/de/category/DNA%20Center/</a> |
| DevNet and Download                    | <a href="https://developer.cisco.com/site/DNA%20Center/">https://developer.cisco.com/site/DNA%20Center/</a>       |
| DNA Center on YouTube                  | <a href="http://cs.co/video-apicem">http://cs.co/video-apicem</a>   |