The bridge to possible

Experience From the Field – How we use Cisco DNA Center to Level up at Region Värmland in Sweden

Fredrik Carlén, IT Operations manager, Infrastructure
David Järpestam, Senior Network Engineer

Agenda

- IT-operations and challenges
- Our network infrastructure
- DNA Center Use Cases
- Insights and final thoughts

Click here for more details

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Who are we?

Fredrik Carlén

Multi-studies at university:
Informatics, management, history, sociology and project management

IT Operations manager, Infrastructure
(ex Network Engineer)

Spend a lot of time in the forest with my dachshund.

David Järpestam

Philosophy Bachelor's Degree
Computer Science,
Network Engineering

Senior Network Engineer
Scrum master for the network team
IoT-geek and father of two small ones

Riding my homebuilt 1000W e-MTB

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Region Värmland – whereabouts in Sweden?

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Region Värmland – Into the wild, still high tech ☺

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What about the organization Region Värmland?

Is responsible for all the county of Värmland's publicly funded:

Health care
Public transport
Culture
Education

Region Värmland

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Karlstad – our main site

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IT-operations & Challenges

Our unit – IT Platform and Client solutions

40 colleugues in different roles

- Infrastructure
- Client
- Telephone

Operations, 2/3-line support, development and strategy

Agile teams inspired by scrum with a 2-week sprint beat.

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The network team

Seven happy network engineers!

"Our mission is to maintain, operate, and develop the network platform to meet the needs of the the users, staff and vistors in our organzation."

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The Network Infrastructure

The Network Infrastructure

- Hierarchical network model
- 2500 network devices
- 16000 endpoints
- **Core**: Catalyst 9600R
- **Distribution**: Catalyst 9500-48Y4C
- **Access**: Catalyst 9200/9300
- **AAA**: Identity Service Engine 3655

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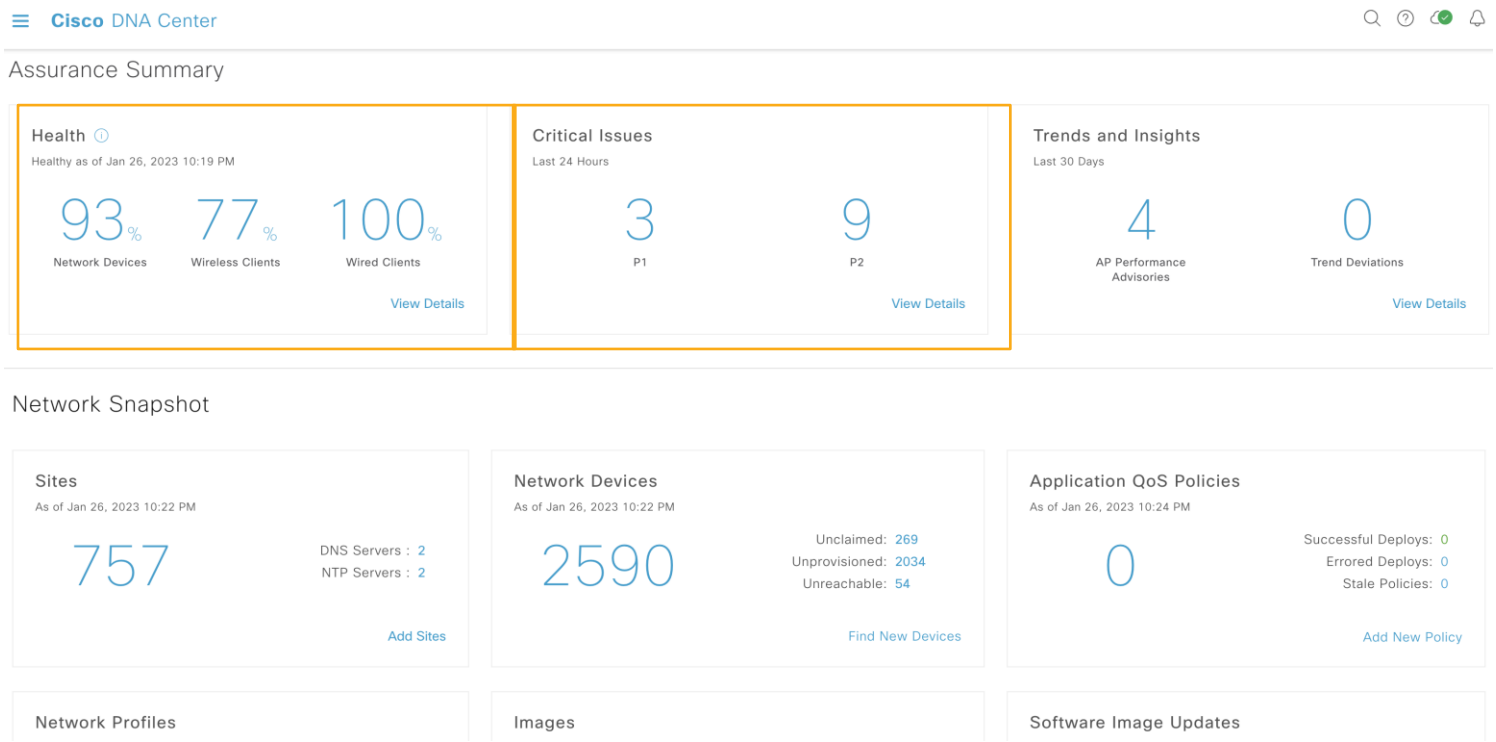
Cisco DNA Center

Cisco DNA Center Appliance 44 Core (Gen 2), 3 node cluster (DN2-HW-APL-U)



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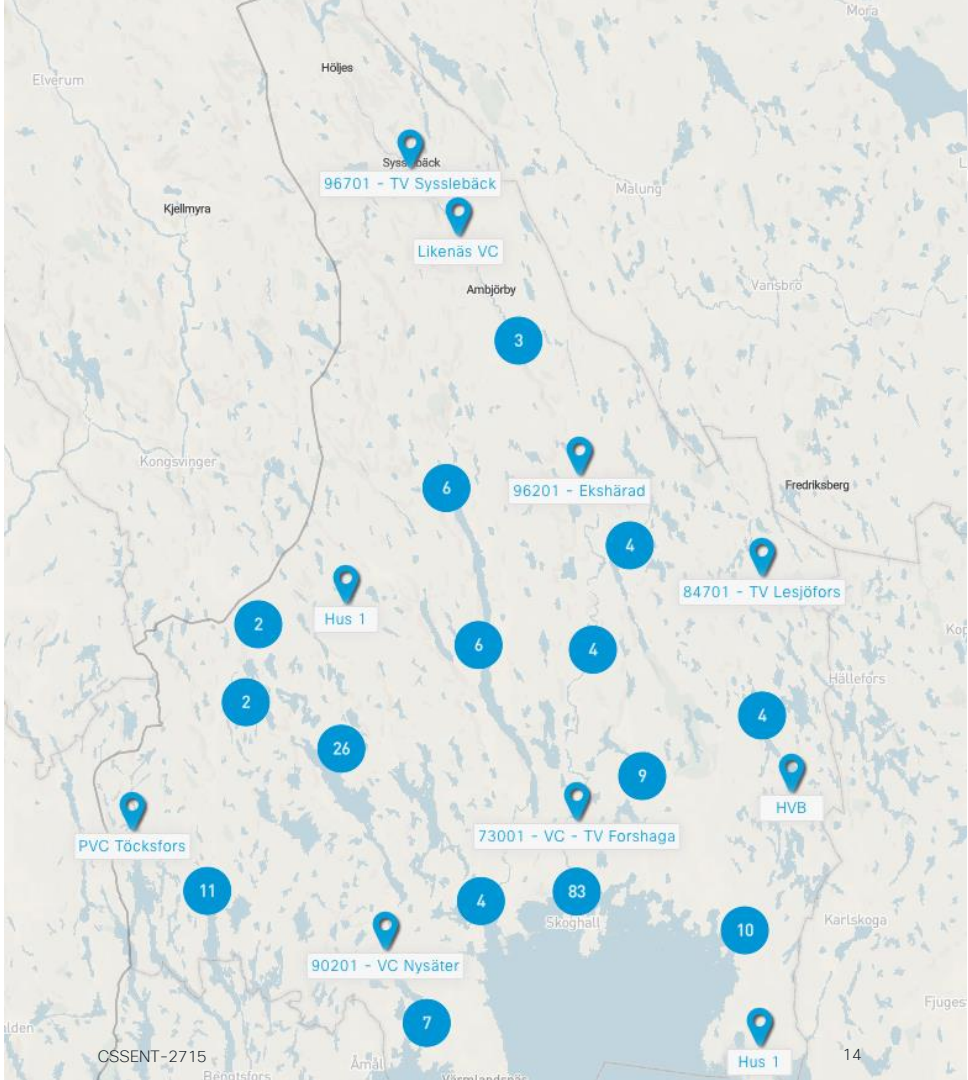
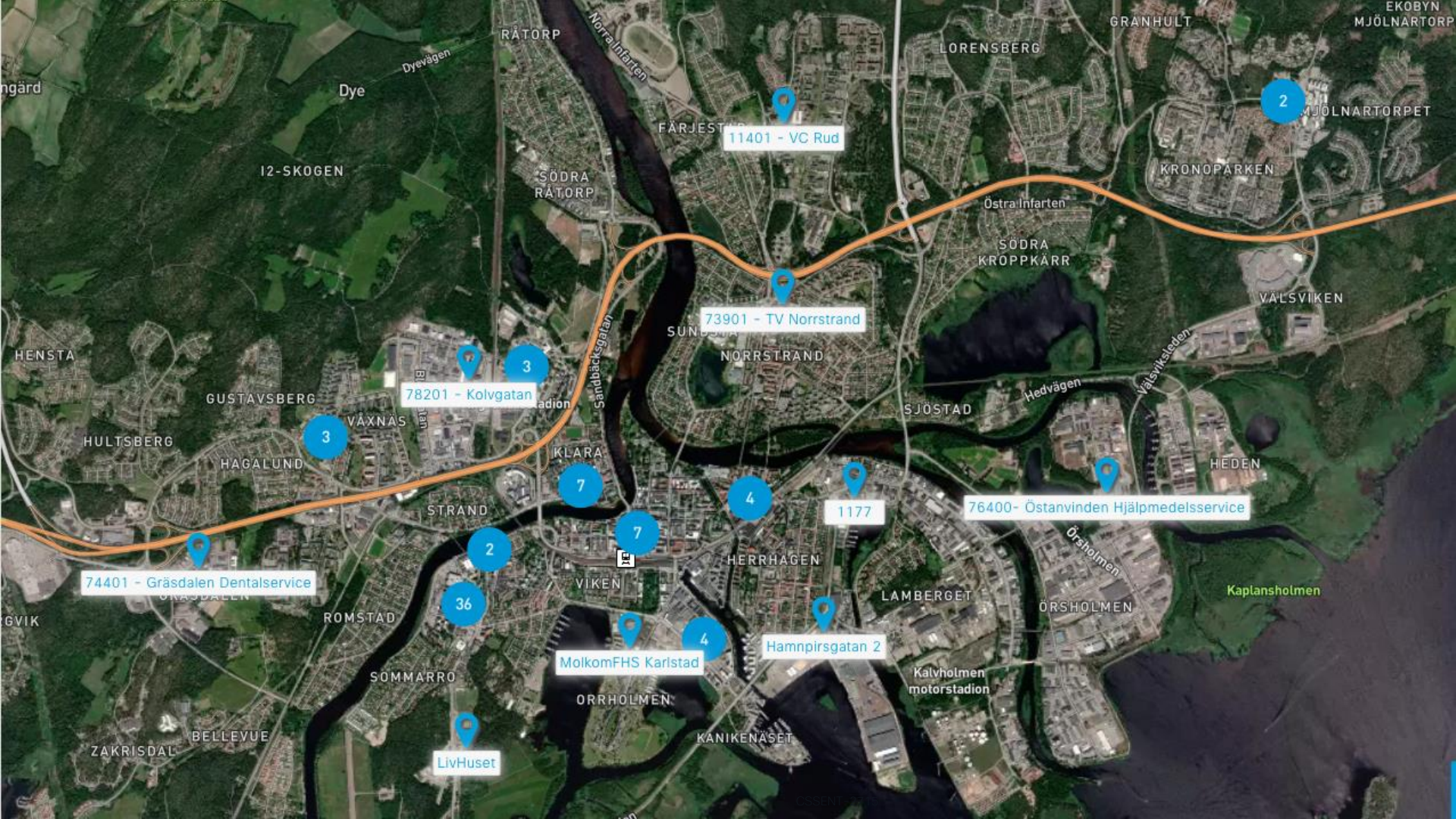
DNA Center Site Hierarchy

- Geographical area/site
- Buildings/Floors with x/y coordinates
- Get maps for your buildings!

Why? Unique Network profiles & Network settings per site




11401 - VC Rud
73901 - TV Norrstrand
78201 - Kolvgatan
74401 - Gräsdalen Dentalservice
1177
76400- Östanvinden Hjälpmedelsservice
MolkomFHS Karlstad
Hamnpirsgatan 2
LivHuset
RÅTORP
Norra Infarten
Dyevägen
Dye
I2-SKOGEN
SÖDRA RÅTORP
FÄRJESTA
LORENSBERG
GRANHULT
EKOBYN MJÖLNARTORP
MJÖLNARTORPET
KRONOPARKEN
Östra Infarten
SÖDRA KROPPKÄRR
VÄLSVIKEN
Sandbäcksgatan
SUNDBYN
NORRSTRAND
Hedvägen
Välsviksleden
SJÖSTAD
HENSTA
GUSTAVSBERG
VÄXNÄS
HULTSBERG
HAGALUND
KLARA
STRAND
HERRHAGEN
VIKEN
HEDEN
Örsholmen
LAMBERGET
ÖRSHOLMEN
Kaplansholmen
ROMSTAD
SOMMARRO
ORRHOLMEN
KANIKENÄSET
Kalvholmen motorstadion
BELLEVUE
ZAKRISDAL

DNA Center Use Cases

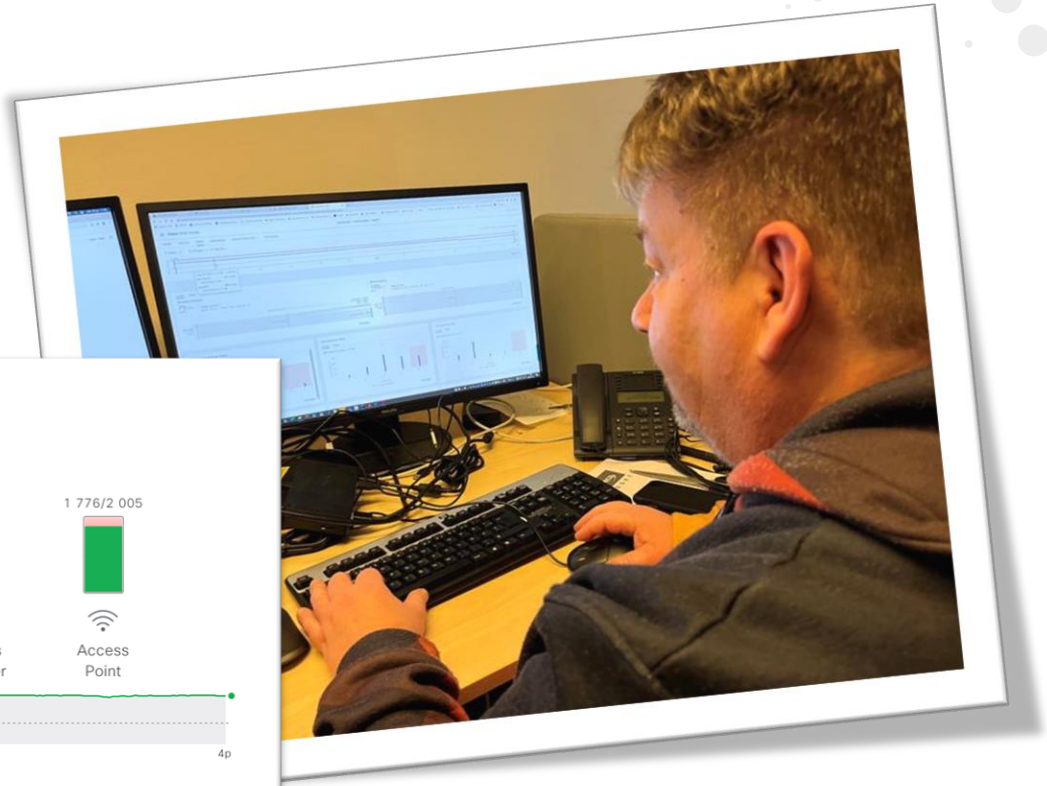
cisco Live!

Network Assurance

Network Automation

Cisco DNA Center Network Assurance

- Network view
- Client view
- Issues (P1, P2, P3, AI)



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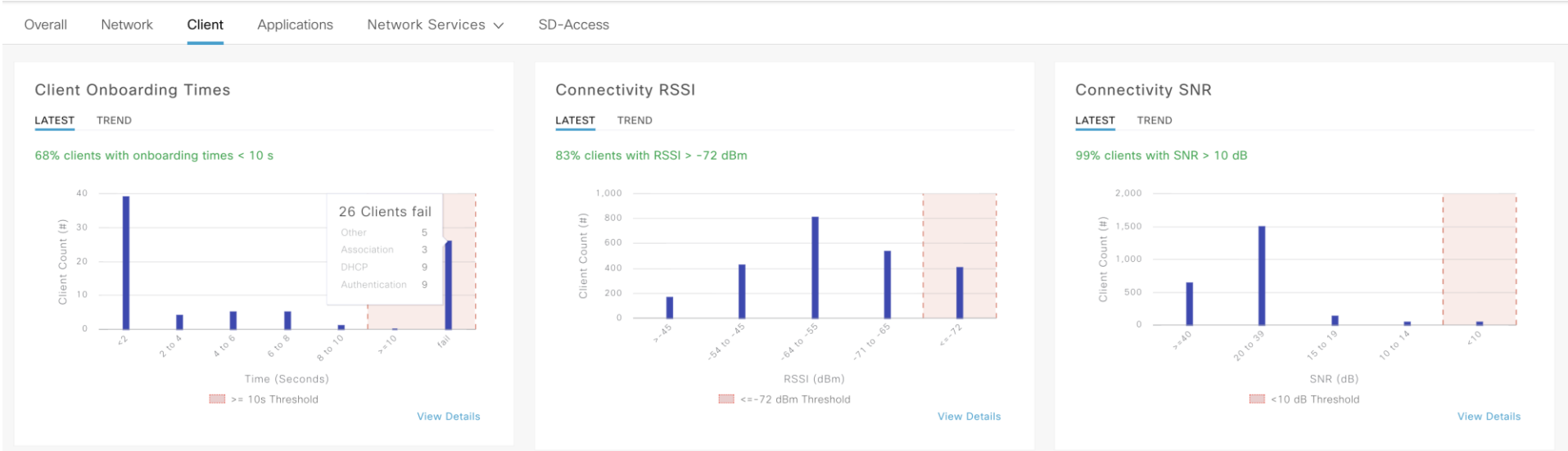
Assurance – Client dashboard



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Client / Client 360

Client 360

24 Hours

Intelligent Capture | Webex 360

Jan 22, 2023 9:07 AM - Jan 23, 2023 9:07 AM

4/10 CLIENT DETAILS

Device: iPad mini 5th Gen | OS: iPad11,1 hwp/t8020 build/19G82 | MAC: B6:DF:33:10:BC:E5 | IPv4: 10.28.25.64 | IPv6: -- | L3 Virtual Network: -- | L2 Virtual Network: -- | VLAN ID: 1624 | Status: Connected

Capability: 11ac | Last seen: Jan 23, 2023 9:04:00 AM | Connected Network Device: ce1ap-53-3-D | SSID: RV | View All Details

Issues | Onboarding | Path Trace | Application Experience | Device Info | Connectivity | RF | iOS Analytics | Event Viewer

Issues (1)

P3 Connected
Wireless client exhibiting sticky behavior on AP "ce1ap-53-4-F"
Instance Count: 32

Jan 22, 2023 10:28 PM - Jan 23, 2023 5:48 AM

1 Records

Show Records: 10 1

Resolved Issues | Ignored Issues

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Cisco DNA Center

Client / Client 360

Wireless client exhibiting sticky behavior on AP "ce1ap-53-4-F"

Open

Issue Profile: global Edit Issue Settings

Description

This client maintained an association with AP "ce1ap-53-4-F" at -72dBm, which is a weaker signal. It should have roamed to an available AP that has a stronger signal. This client was connected to SSID "RV" on 5.0 GHz radio on AP "ce1ap-53-4-F" in location Global/10100 - CSK/Hus 53/Plan 4. The AP is connected to WLC "ce1wlc-Intern".

Last Occurred: Jan 23, 2023 5:48 AM

Impact of Last Occurrence

Jan 22, 2023 9:07 AM - Jan 23, 2023 9:07 AM

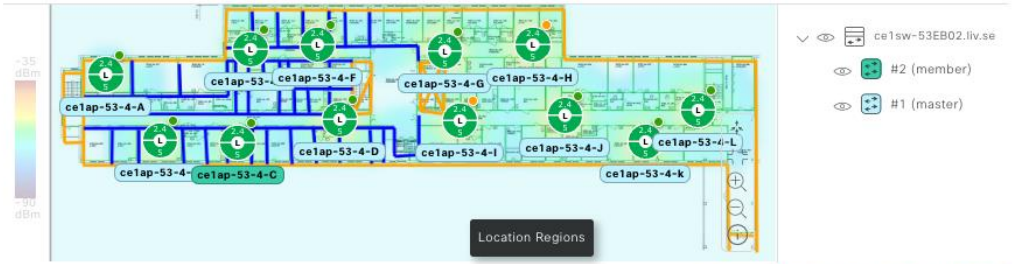
Location: Global/10100 - CSK/Hus 53/Plan 4
1 Building

Clients
15 Wireless Clients

Floor Map

Jan 23, 2023 5:48 AM

Show 5 GHz



View Most Recent Fullscreen Heatmap

Impacted Client Count Ranking

Suggested Actions (2)

1. If available, increase the roaming aggressiveness within the client driver, which might fix the problem for clients supporting this option.
2. Update the client driver to the latest version, which might resolve this issue.

4/10 CLIENT DETAILS

Device: iPad mini 5th Gen OS: iPa

Last seen: Jan 23, 2023 9:04:00 AM

Issues (1)

P3 Connecte
Wireless
Instance C

1 Records

Onboarding

DHCP AAA

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24 Hours

Intelligent Capture | Webex 360

Jan 22, 2023 9:07 AM - Jan 23, 2023 9:07 AM

4/10 CLIENT DETAILS

Device: iPad mini 5th Gen | OS: iPad11,1 hwp/t8020 build/19G82 | MAC: B6:DF:33:10:BC:E5 | IPv4: 10.28.25.64 | IPv6: -- | L3 Virtual Network: -- | L2 Virtual Network: -- | VLAN ID: 1624 | Status: Connected

Capability: 11ac | Last seen: Jan 23, 2023 9:04:00 AM | Connected Network Device: ce1ap-53-3-D | SSID: RV | View All Details

Issues | Onboarding | Path Trace | Application Experience | Device Info | Connectivity | RF | iOS Analytics | Event Viewer

Issues (1)

P3

Connected

Wireless client exhibiting sticky behavior on AP "ce1ap-53-4-F"

Instance Count: 32

Jan 22, 2023 10:28 PM - Jan 23, 2023 5:48 AM

1 Records

Show Records: 10

1

Resolved Issues | Ignored Issues

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Client / Client 360

Detail Information

Jan 31, 2023 12:53 PM

Device Info | Connectivity | RF | iOS Analytics

Neighbor APs (8)

Export

Search Table

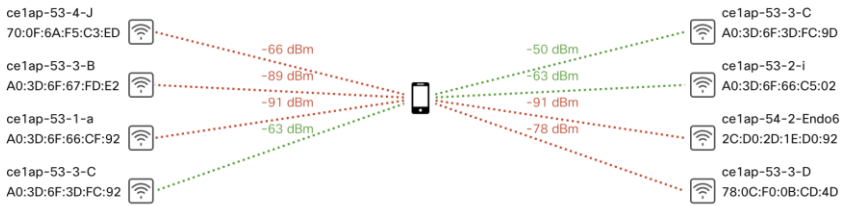
BSSID	AP Name	Channel	RSSI (dBm)	Location
A0:3D:6F:67:FD:E2	ce1ap-53-3-B	6	-89	Global/10100 - CSK
A0:3D:6F:66:CF:92	ce1ap-53-1-a	1	-91	Global/10100 - CSK
A0:3D:6F:66:C5:02	ce1ap-53-2-i	6	-63	Global/10100 - CSK
A0:3D:6F:3D:FC:9D	ce1ap-53-3-C	52	-50	Global/10100 - CSK

Show Records: 10 1

Client Disassoci

Search Table

Time	Disassocia



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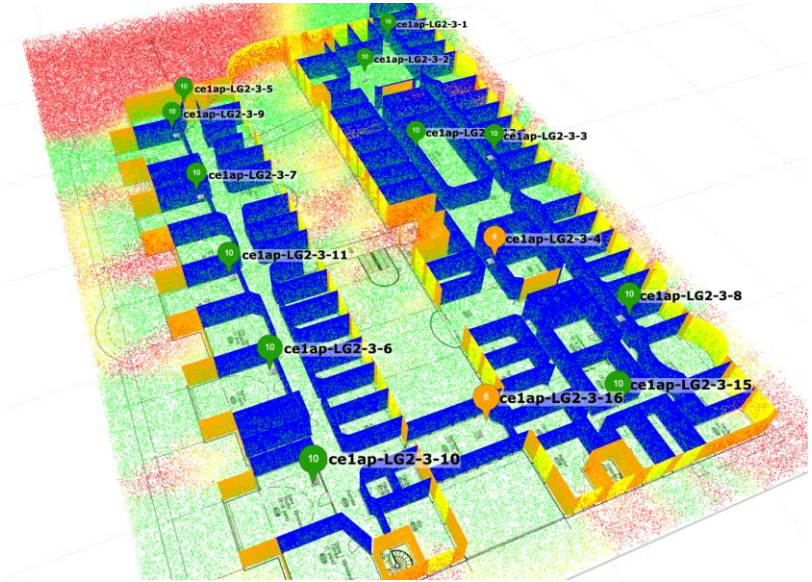
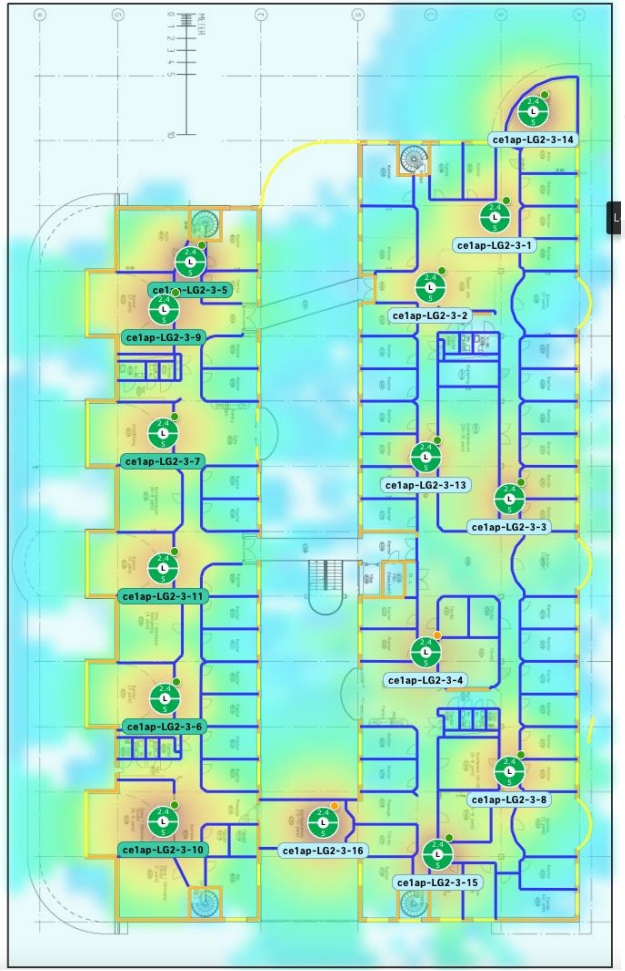
Network Heatmap

- 2D & 3D





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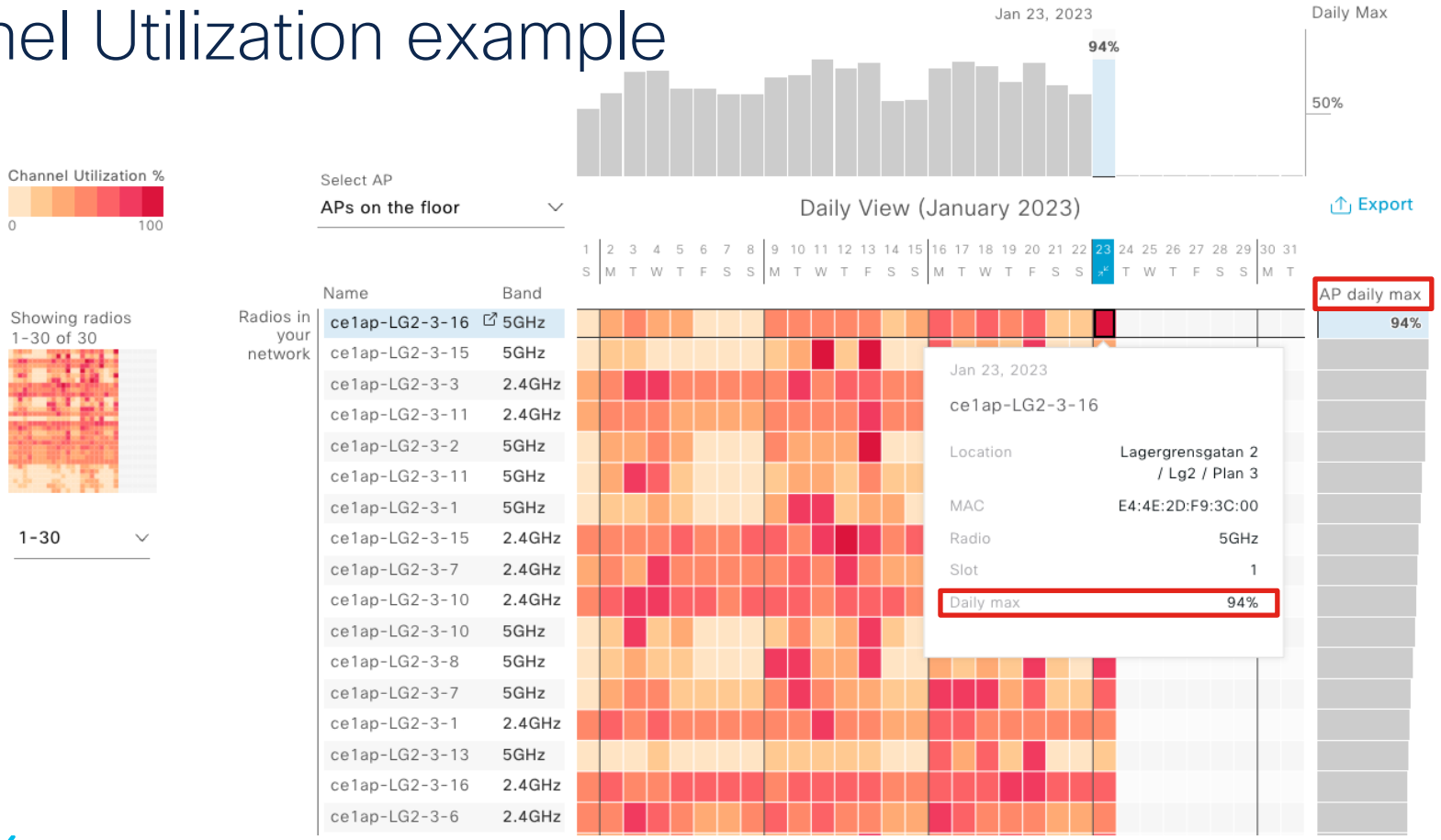
Channel Utilization example



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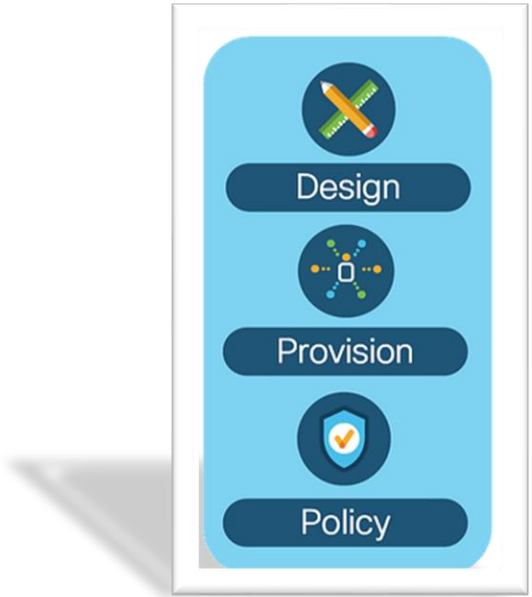
Cisco DNA Center Network Automation

- Configuration Archive & Config drift
- Plug and Play (Day 0)
- Provision (Day 2)
- Software Image Management (SWIM)



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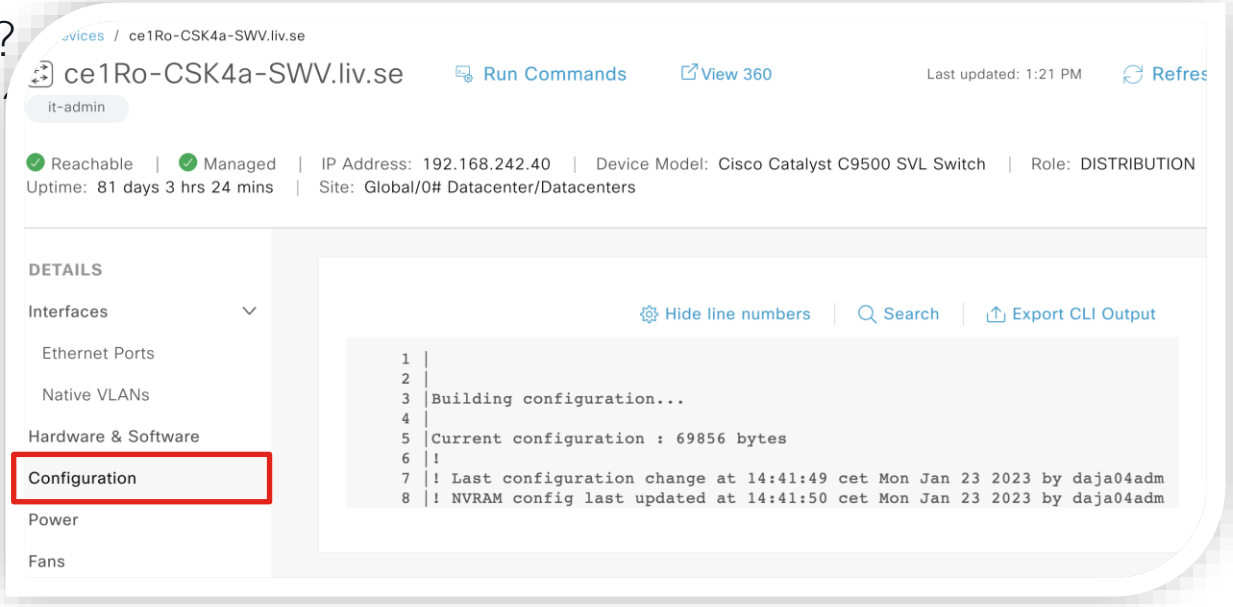
Network Device Configuration Backup and Archive

- Latest config in the inventory
- Incremental changes?
- DNA-C is unavaliable!



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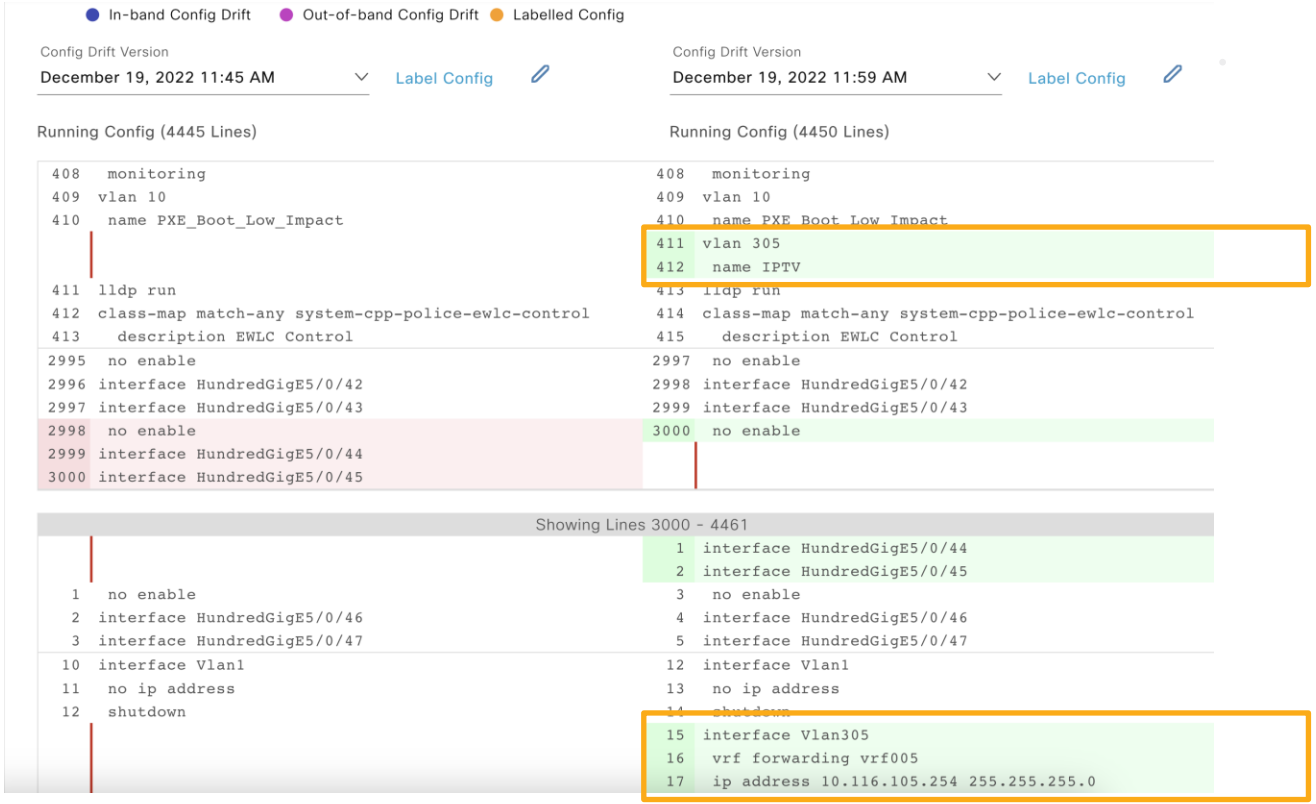
Network Device Configuration Backup and Archive

Config Drift



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Network Device Configuration Backup and Archive

Settings / Device Settings

Configuration Archive

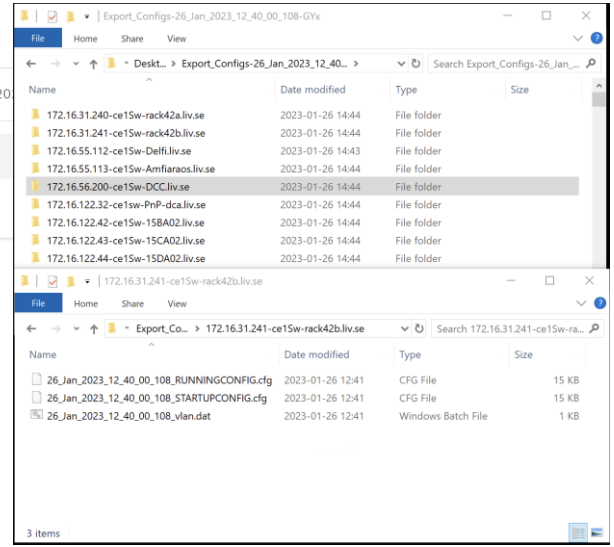
Cisco DNA Center internal server will periodically back up your device's running configuration. You can select the day and time for the backup and select the total number of config drifts being backed up (note: total config drifts being saved included all the labelled configs for the device). To archive all the device's running configurations, you can configure an external server.

Internal | External

External Repository

Search Table

Host	Protocol	User Name	Backup Format	Backup Cycle	Connectivity
10.16.92.22	SFTP	root	RAW	Daily Time 01:40 PM	Connected



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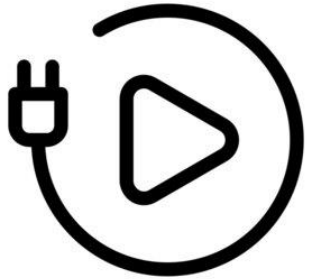
Network Automation - Plug and Pl



- How do we use it here at Region Värmland?
  - Option 43 `"5A1N;B2;I10.1.1.1;J80;K4";`
- One workflow to rule them all
- PNP Startup VLAN

  - The Karlstad University incident...

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Provision switches using templates

- How about adding the more advanced configurat
  - Using TAG's
  - Variables
  - Jinja scripts

Template

```
 96 vlan 317
 97 name vrf017-fallback
 98 !
 99 vlan 305
100 name vrf005-IPTV
101 !
102 vlan $Management-vlan-AP
103 name RV-accesspoint
104 !
105 vlan $vlan-eklient
106 name RV-eklient
107 !
108 vlan $vlan-IPT
109 name RV-IPT
110 !
111 vlan $vlan-Printer
112 name RV-Printer
```


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```
interface range g{{ stack_num }}/0/1 - 40
{{ user_port() }}


int range g{{ stack_num }}/0/45 - 48
{{ ap_port() }}

int ten{{ stack_num }}/1/4
{{ uplink_trunk() }}

{% endblock %}
```

Template

```
{% if 10 < 6 %}
  That's not correct
{% elif 6 > 10 %}
  That's also wrong
{% else %}
  {% if 'o' in "Router" %}
    Seems to be true
  {% endif %}
{% endif %}
```

Template

```
##--- First uplink interface ------------------------------
#if ( $skipconfig.contains('uplinks') )
#else
#if(${VLAN_Link_1} != '' && ${VLAN_Link_1} != 0 )
  vlan ${VLAN_Link_1}
  #if( ${VLAN_Link_1}  < '200' )
   name REF-D1
  #elseif( ${VLAN_Link_1} < '300' )
   name REF-D2
  #elseif( ${VLAN_Link_1} < '400' )
   name REF-RADIO_LINK
  #end
!
interface vlan${VLAN_Link_1}
 dampening
 #set( $fourthrest_link1 = $fourthnumber_link1%2 )
  #if($fourthrest_link1 == 0 )
    #set( $fourthnumber_link1 = $fourthnumber_link1+1 )
  #end
 ip address ${IP_Link_1} ${netmask_Link_1}
 no ip redirects
 no ip proxy-arp
 ip pim sparse-mode
 ip router isis Core
 no shutdown
 mpls ip
 bfd interval 750 min_rx 750 multiplier 3
 isis network point-to-point
 #if(( ${VLAN_Link_1} > 299) && (${VLAN_Link_1} < 400))
 isis metric 5000 level-2
 #end
#end
```


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Software Image Management (SWIM+ISSU)

Stay up to the with the current image

Image Update

1 Analyze Selection | 2 Distribute | 3 Activate | 4 Schedule and Cleanup | 5 Summary

Analyze Selection

Before you proceed for the Update, analyze your selection.

Devices to Update: 1 | Device Family: 1 | Sites: 1

Search Table

0 Selected Update ISSU

Device	From Image	To Image	Comment
ce1Ro-CSK4b-SWV.liv.se (192.168.242.41)	cat9k_iosxe_npe.17.06.03.SPA.bin	cat9k_iosxe.17.06.04.SPA.bin ISSU	ISSU Validation Successful Update Readiness Report

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The IOS Upgrade incident

- Our colleague
- 30+ years network engineer
- “Old school” ☺

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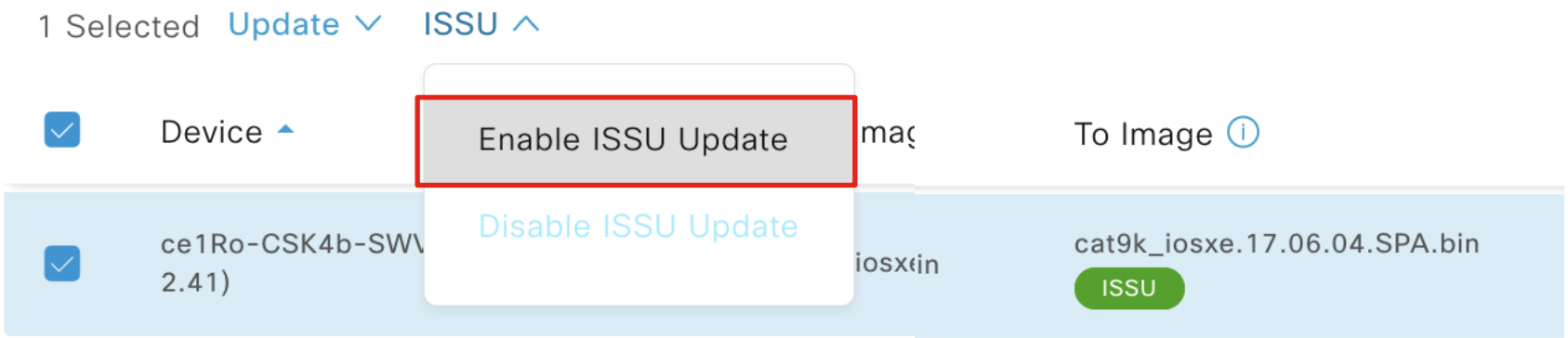
Software Image Management (SWIM+ISSU)

What did he forget?



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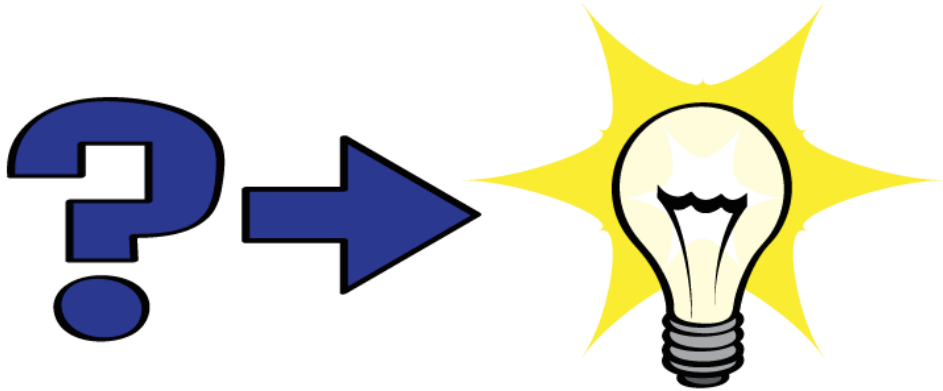
Insights & final thoughts

Final thoughts

- Use Cisco CX for guidance/best practice
- Cisco TAC – a good way to get fast help
- Think about your logical site structure
- Push Docker apps via DNAC
- EoX report is very valuable!



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The bridge to possible

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