cisco Live !

# ISE Deployment Improvement Tips and Tricks

Katherine McNamara
Cybersecurity Solutions Engineer,
@kmcnam1

BRKSEC-2347

# Cisco Webex App

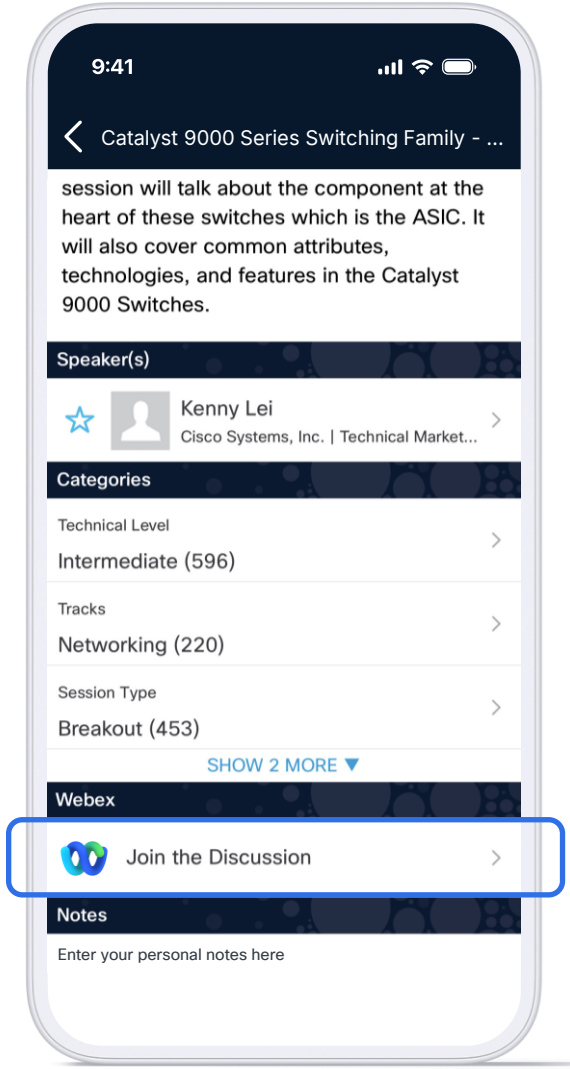
**Questions?**

Use Cisco Webex App 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 the Webex App or go directly to the Webex space
4. Enter messages/questions in the Webex space

**Webex spaces will be moderated by the speaker until June 13, 2026.**




https://ciscolive.ciscoevents.com/clamer26
/**BRKSEC-2347**

# Agenda

01 Where to Start

02 Laying the Foundation

03 A Phased Approach

04 Tuning Policy Sets

05 The Power of Profiling

06 Integrations

07 Post-Deployment

08 Conclusion

# A little about me

- Started as an early ISE 1.1 customer
- Almost 20 years of network & security experience
- Lots of paper: BS and MS in IT Security, 2x CCIE (Security & Data Center), GPEN, GCIH, CISSP, and various other industry certifications
- Co-authored the most recent CiscoPress SISE book
- Co-organize for the largest Cisco Meetup study group, Routergods
- Owner of network-node and sendthepayload blogs

# Where to Start

# Simplifying and optimizing your deployment is how you can lower the administrative burden of managing ISE

# The Swiss Army Knife of Network Access Control

ISE

- Device Administration
- Secure Access
- Guest Access
- Asset Visibility
- Compliance & Posture
- Context Exchange
- Segmentation
- Cisco SDA/DNAC
- BYOD
- Threat Containment


TACACS+ Migrating from Cisco Secure ACS or building a new Device Administration Policy Server, this allows for secure, identity-based access to the network devices

Allow wired, wireless, or VPN access to network resources based upon the identity of the user and/or endpoint. Use RADIUS with 802.1X, MAB, Easy Connect, or Passive ID

Differentiate between Corporate and Guest users and devices. Choose from Hotspot, Self-Registered Guest, and Sponsored Guest access options

Use the probes in ISE and Cisco network devices to classify endpoints and authorize them appropriately with Device Profiling. Automate access for many different IoT devices

Use agentless posture, Cisco Secure Client, MDM, or EMM to check endpoints to verify compliance with policies (Patches, AV, AM, USB, etc.) before allowing network access

pxGrid is an ecosystem that allows any application or vendor to integrate with ISE for endpoint identity and context to increase Network Visibility and facilitate automated Enforcement.

Group-based Policy allows for segmentation of the network through the use of Security Group Tags (SGT) and Security Group ACLs (SGACL) instead of VLAN/ACL segmentation.

ISE integrates with DNA Center to automate the network fabric and enforces the policies throughout the entire network infrastructure using Software-Defined Access (SDA)

Allow employees to use their own devices to access network resources by registering their device and downloading certificates for authentication through a simple onboarding process

Threat Analysis

# Where To Start...

- Define your business and security objectives
  - What is it that you want ISE to do for you?
- Determine which teams will be needed
  - Virtualization team?
  - Desktop support?
  - PKI?
  - etc
- Collaborate with those teams at the beginning of the project
- Get management buy-in early

# Laying the Foundation

# Where To Start...

- Administration Node (PAN)
  - Max 2 in a deployment
- Monitoring Node (MNT)
  - Max 2 in a deployment
- Policy Service Node (PSN)
  - Max 50 in a deployment
- pxGrid Node
  - Max 4 in a deployment

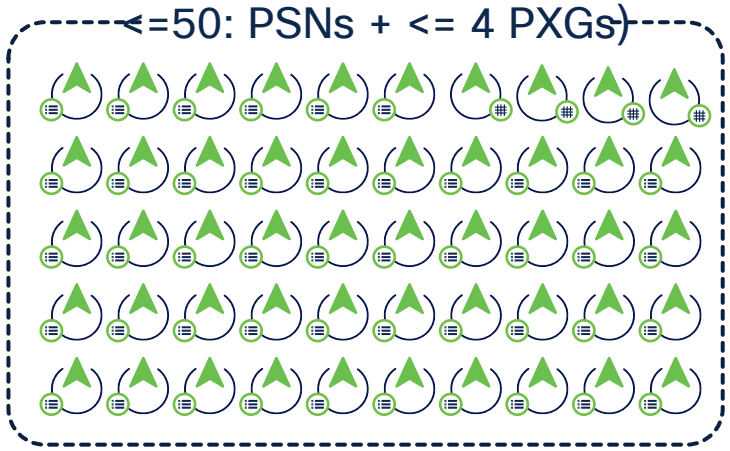
**Policy Administration Node (PAN)**
- Single plane of glass for ISE admin
- Replication hub for all database config changes

**Monitoring and Troubleshooting Node (MnT)**
- Reporting and logging node
- Syslog collector from ISE Nodes

**Policy Services Node (PSN)**
- Makes policy decisions
- RADIUS/TACACS+ Servers

**pXGrid Controller**
- Facilitates sharing of context

# ISE Deployment Scale




Lab and Evaluation

Small HA Deployment
2 x (PAN+MNT+PSN)

Medium Multi-node Deployment
2 x (PAN+MNT+PXG), <= 6 PSN

Large Deployment
2 PAN, 2 MNT, <=50: PSNs + <= 4 PXGs

| | | | |
|---|---|---|---|
| 100 Endpoints | Up to 50,000 Endpoints | Up to 2,000,000 Endpoints | 3600 |
| 100 Endpoints | Up to 150,000 Endpoints | Up to 2,000,000 Endpoints | 3700 |

# ISE Node Types

| Physical Appliances | Virtual Machines | Cloud Instances |
| --- | --- | --- |

SNS-3795
SNS-3755
SNS-3715
SNS-3695
SNS-3655
SNS-3615
SNS-3595

KVM

Microsoft

NUTANIX

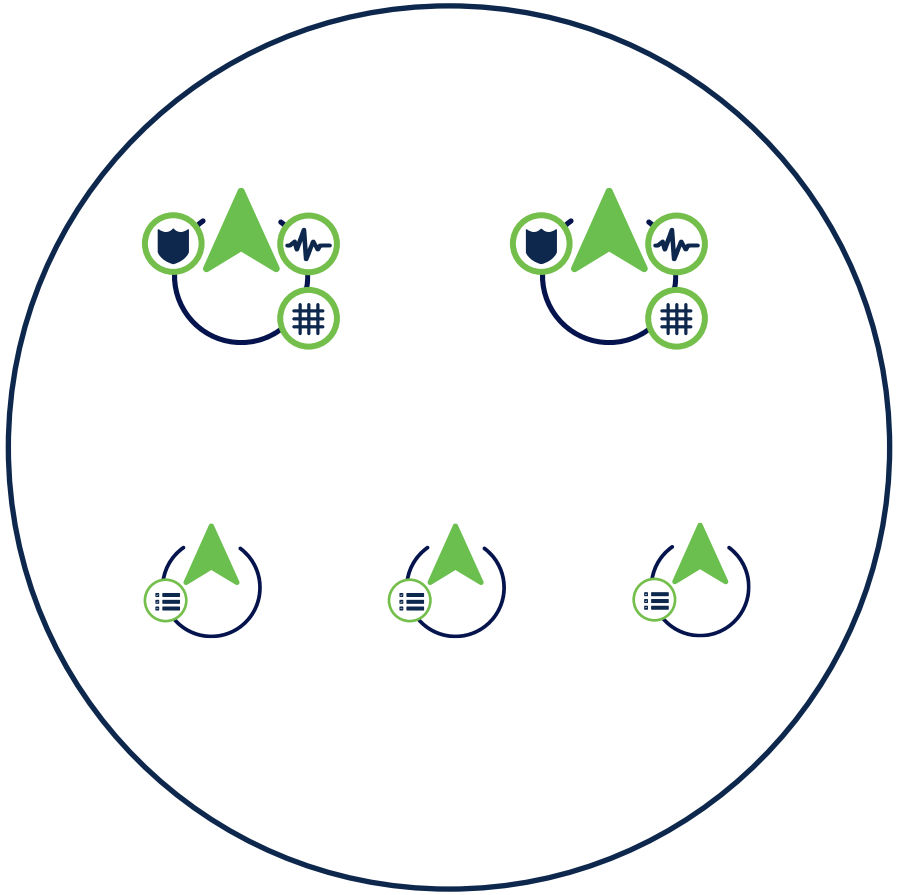
vmware®

aws

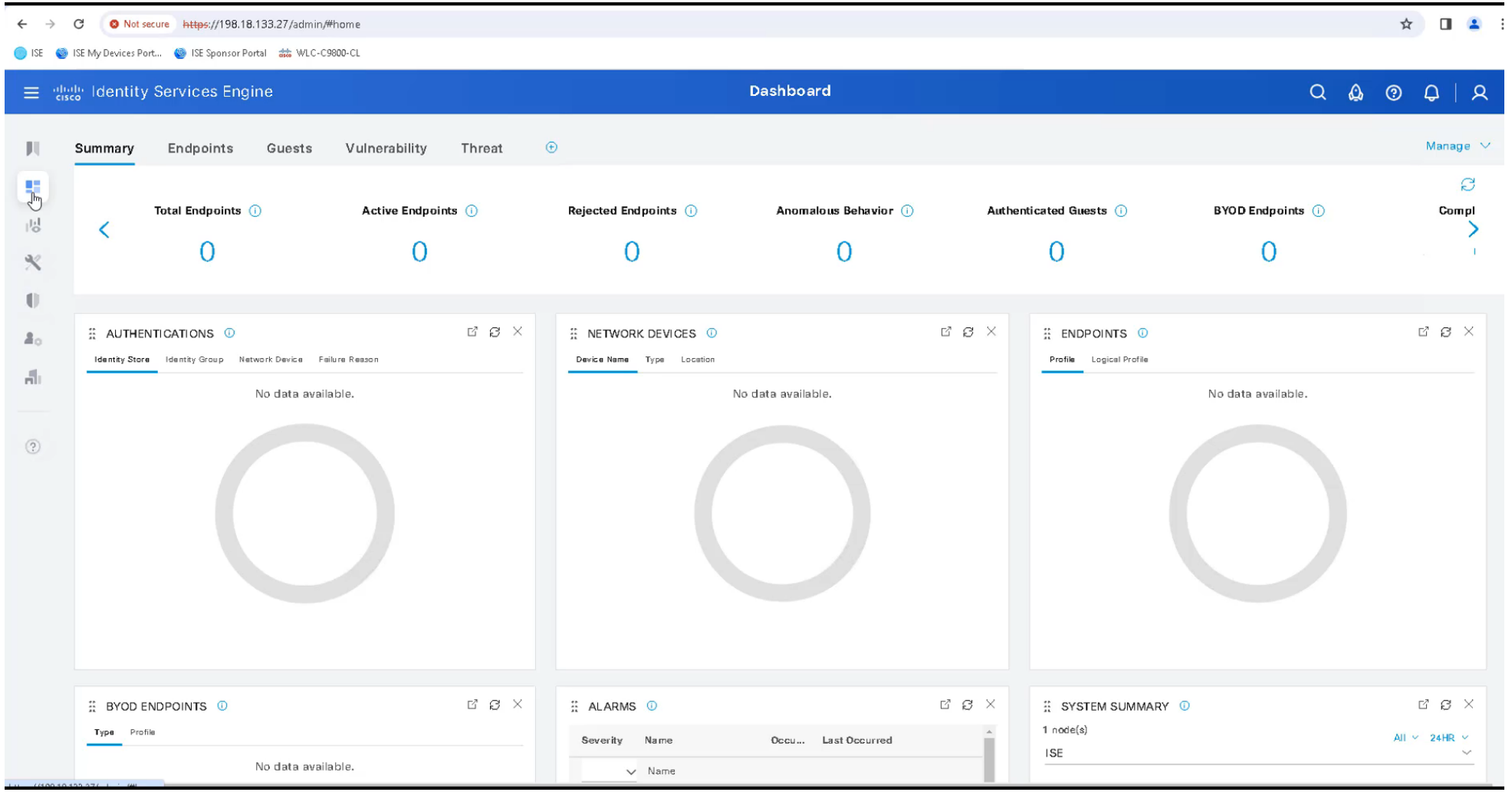
Azure

ORACLE

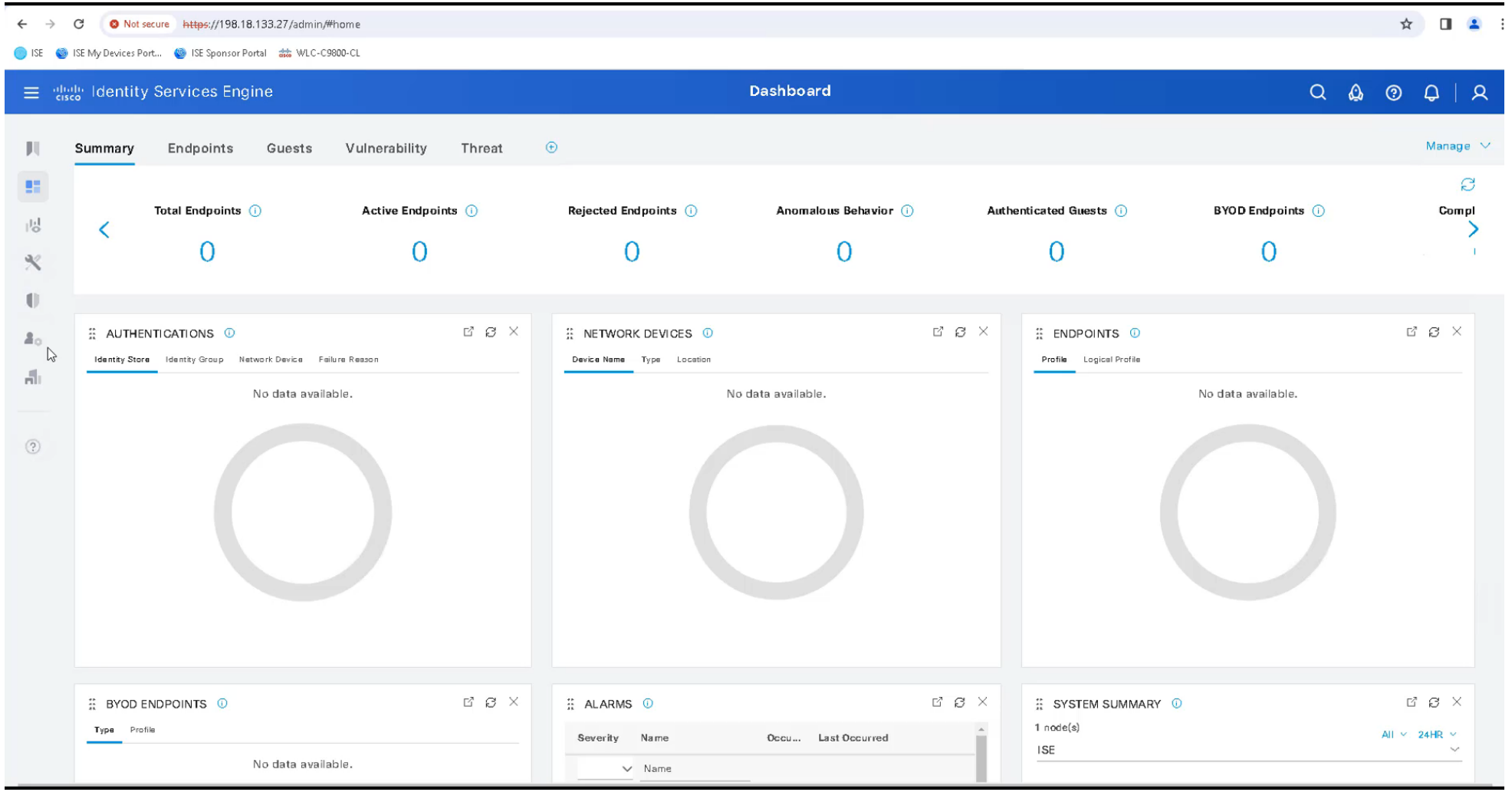
# Expanding your ISE deployment



# Add an ISE Node



# Changing the Persona

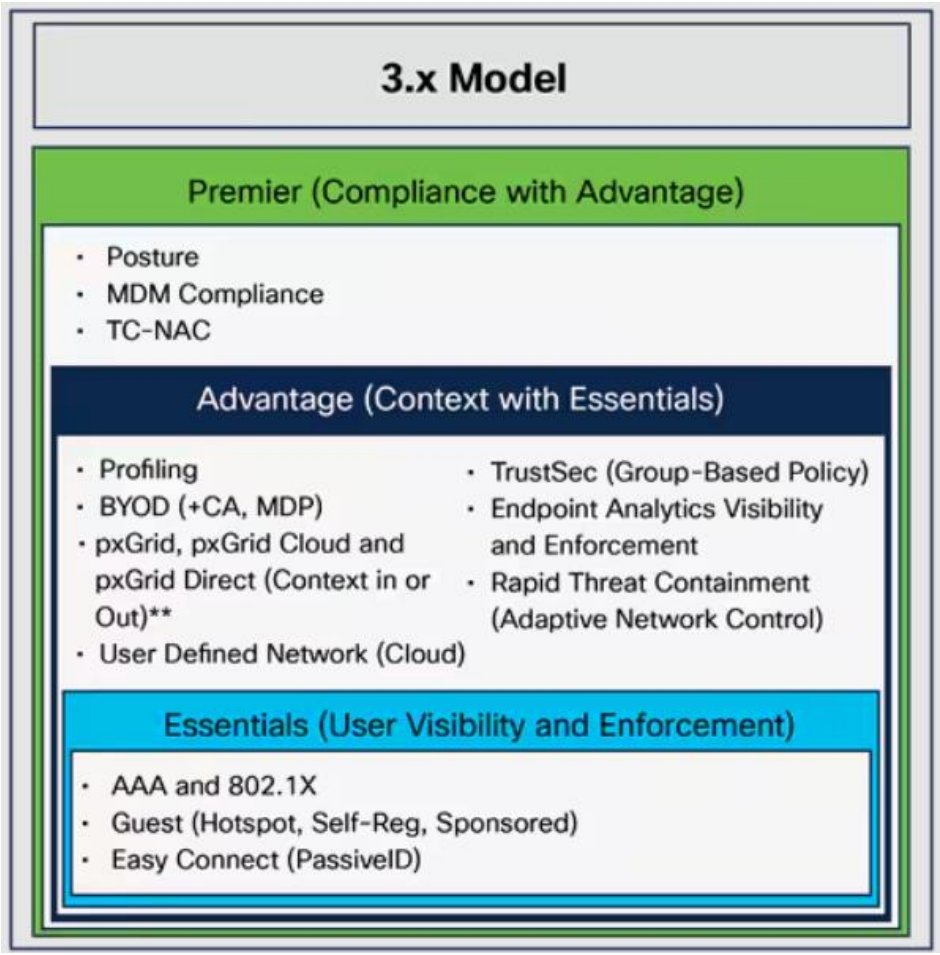


# Recommendations

- Make your life easier: Use load balancers
  - Easier to add PSNs
  - Easier to upgrade
  - Failover is more seamless
- Scale up as you grow
- VMs or appliances? Same specs!
- Device Admin? Think about separate PSNs for TACACS+
- Use the ISE Scalability Guide as a reference

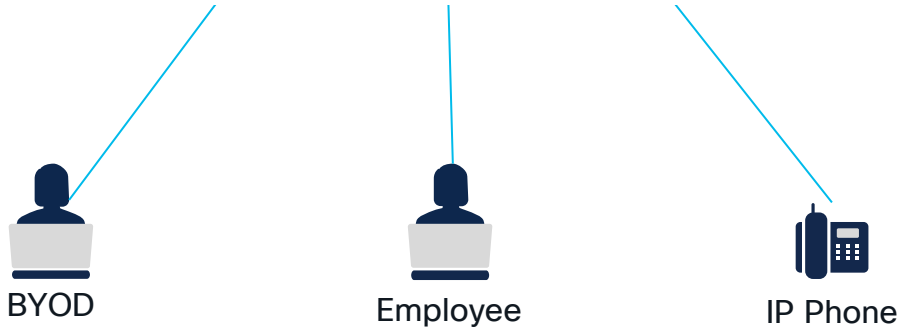
# Licensing

- Endpoint licenses are based on concurrently connected endpoints only
- Endpoint licenses are term-based
- Endpoint licenses does not include Secure Client/AnyConnect licenses
- Other license types:
  - Virtual Machine Licenses
  - Device Admin Licenses



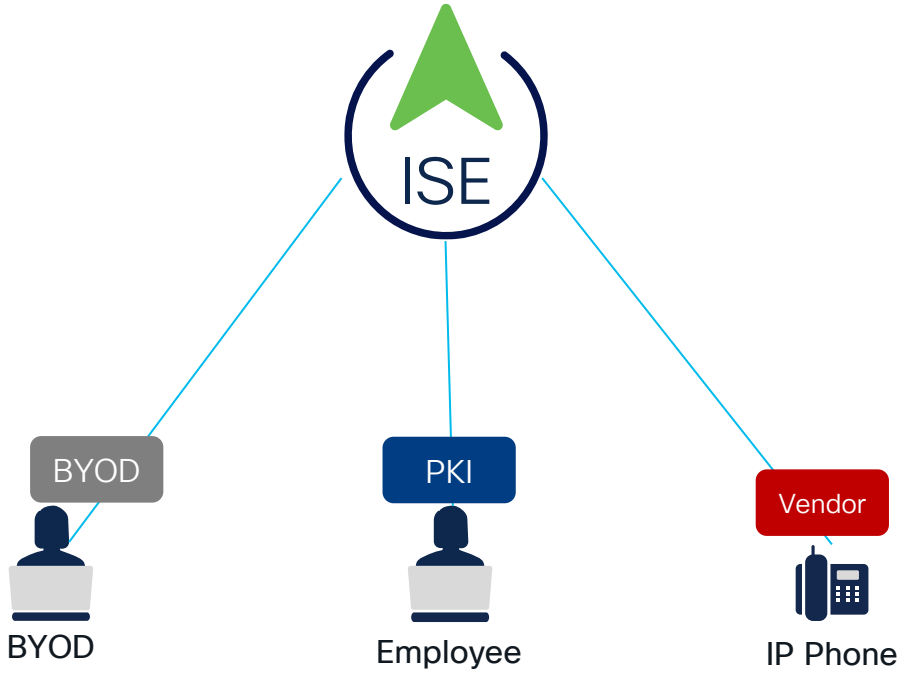
# Certificates

- ISE’s EAP Cert is only for ISE to identify/authenticate itself endpoint
- ISE can accept certificate-based authentication issued from various Root CAs



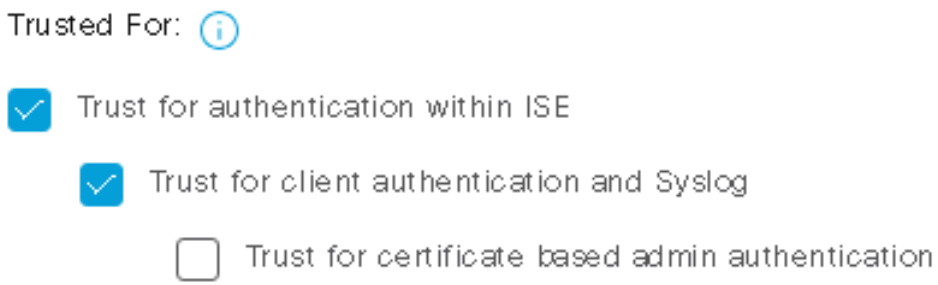
# Certificates

- ISE's EAP Cert is only for ISE to identify/authenticate itself endpoint
- ISE can accept certificate-based authentication issued from various Root CAs



# Certificates

- Pre-load trusted root certificates – including potentially:
  - Manufacturer certificates for phones, printers, etc
  - Internal PKI root certificate
  - etc
- “Trust for client authentication and Syslog”



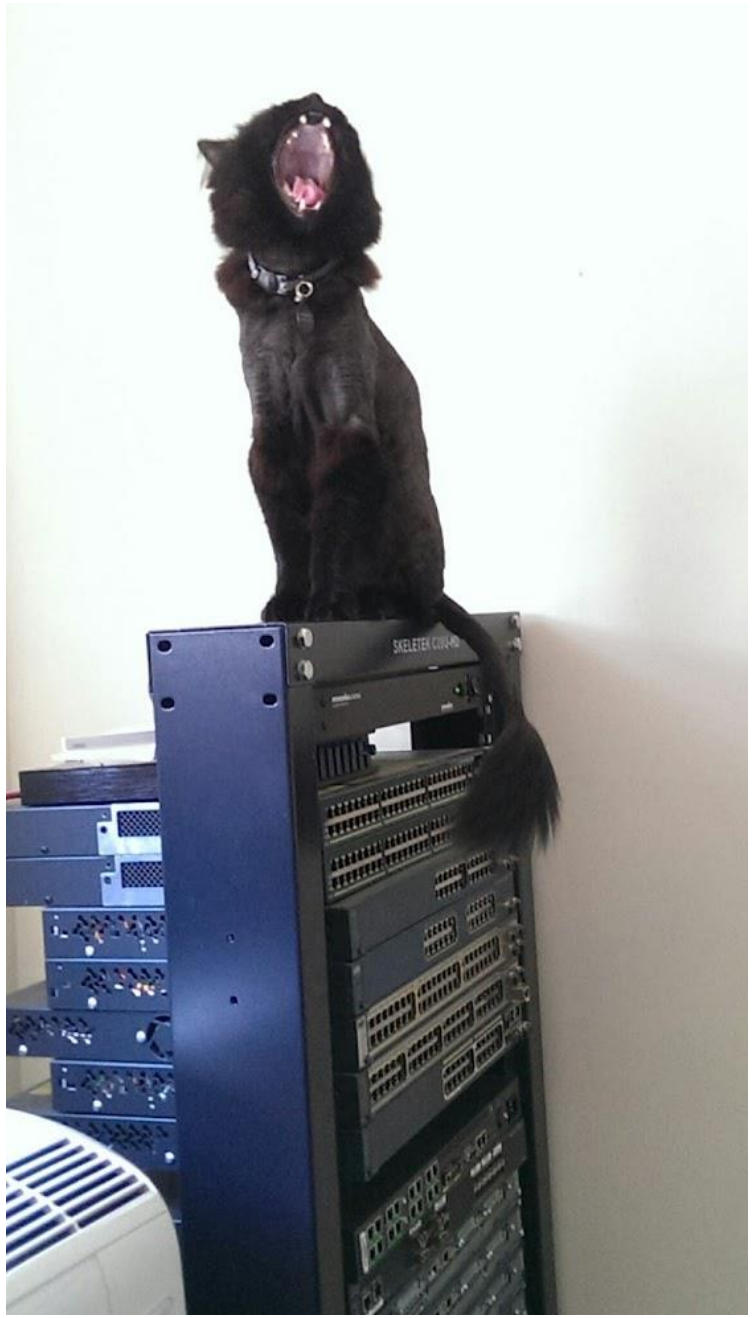
# Reduce Chaos and Unpredictability

- As best as you can: Standardize! Standardize! Standardize!
  - Switch IOS Versions
  - Wireless Controller Versions
  - Switch and Wireless Configuration Templates
- Check the versions and capabilities against the ISE Network Component Capability Releases
  - If possible, validated OS versions
- Enable SMTP for alerts, warnings of certificates expiring, etc

# Reduce Chaos and Unpredictability

- Create and deploy Active Directory GPO
  - Seamless native supplicant configuration for user
  - Seamless wired-to-wireless transition
  - Endpoint and Trusted Root Certificates
- Use SCCM or software delivery package if needed for Secure Client
- Utilize the 90-day VM evaluation – Lab It Up

# Lab It Up!



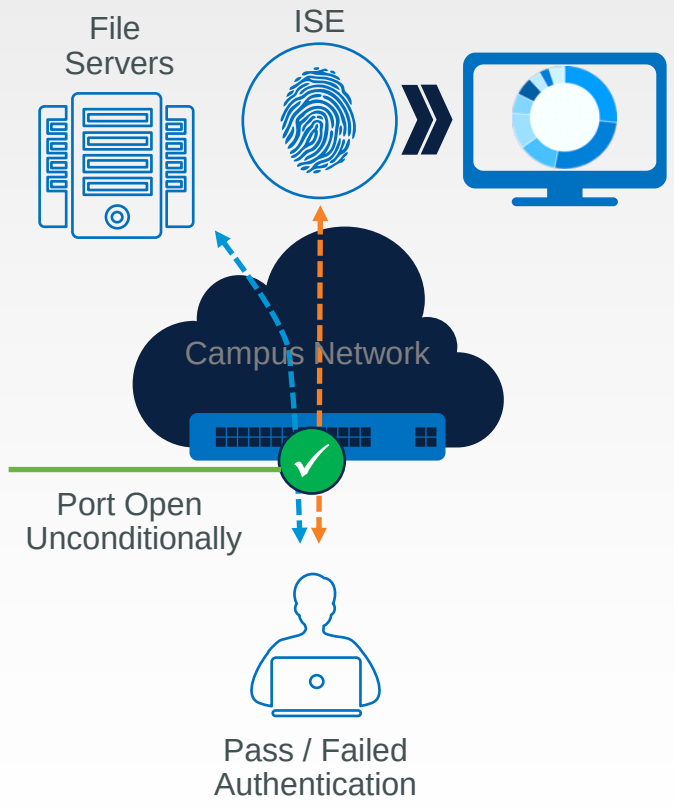
# A Phased Approach

# A Phased Approach to ISE

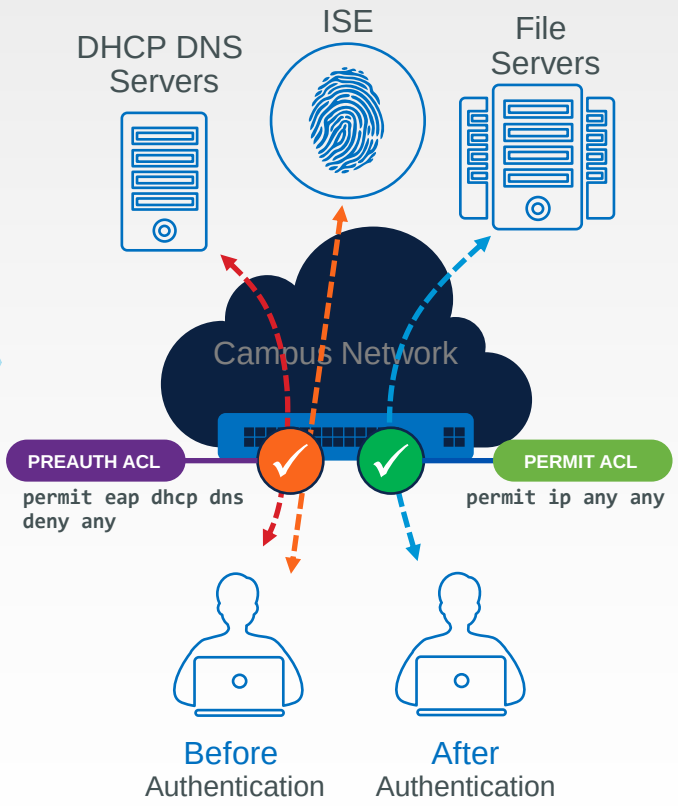
- VPN:
  - Create a test VPN profile
  - Migrate the profile to production after testing
- Wireless:
  - Create a test SSID
  - Migrate the profile to production after testing
- But what about wired?

# Wired Phases

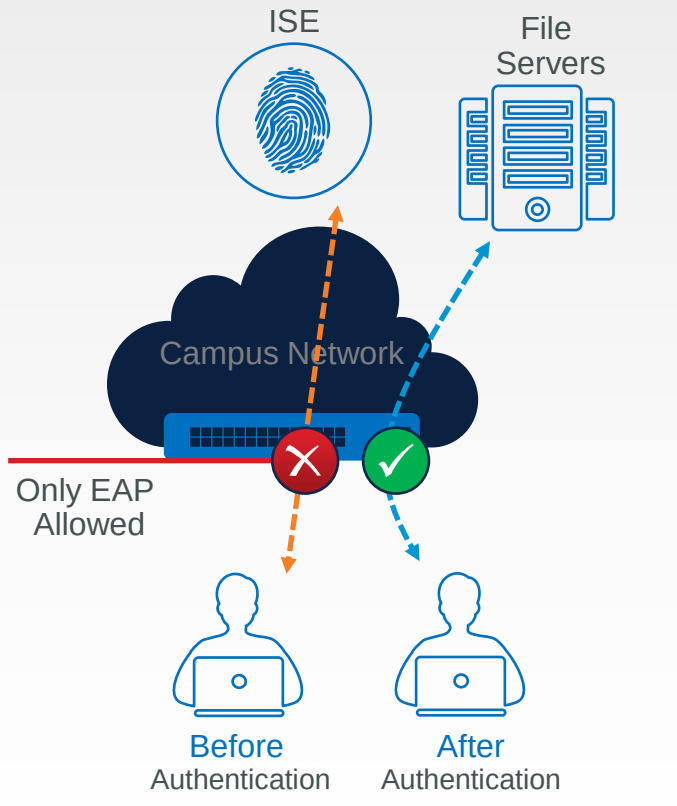
## Monitor Mode




## Low-Impact Mode



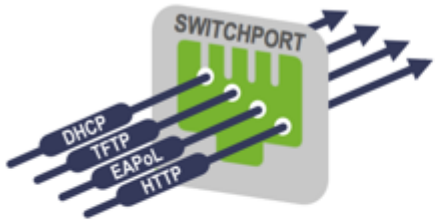

## Closed Mode



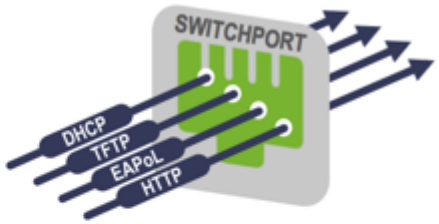
For your reference only

# Monitor Mode

- No impact to existing network
- Prepare for enforcement
- Visibility to:
  - Endpoints on network & their supplicant configuration
  - Passed/Failed 802.1x & MAB attempts
- To configure:
  - Enable 802.1X and MAB
  - Enable Open Access
  - Enable Multi-Auth host mode




Before Authentication




After Authentication

*Traffic always allowed irrespective of authentication status*

```
interface GigabitEthernet1/0/1
switchport access vlan 100
switchport mode access
switchport voice vlan 10
authentication host-mode multi-auth
authentication open
authentication port-control auto
mab
dot1x pae authenticator
authentication violation restrict
```

Monitor Mode

Basic 1X/MAB

# Low Impact Mode

- Begin to control/differentiate access
- Minimize impact to existing network while retaining visibility of Monitor Mode
- Start from Monitor Mode
- Add ACLs, dACLs, Flex-auth, etc
- Limit number of devices connecting to ports


*Pre-Auth and Post-Auth Access controlled by IP ACLs*

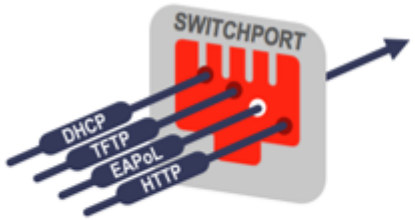
```
interface GigabitEthernet1/0/1
switchport access vlan 100
switchport mode access
switchport voice vlan 10
authentication host-mode multi-auth
ip access-group PRE-AUTH in
authentication open
authentication port-control auto
mab
dot1x pae authenticator
authentication violation restrict
```

Low-Impact Mode

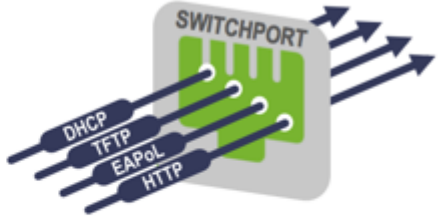
From Monitor Mode

# Closed Mode

- Not everyone goes to Closed Mode
- No access at all before authentication
- Rapid access for non-802.1x-capable corpora assets
- Logical isolation of traffic at the access layer
- Return to default “closed” access
- Implement identity-based access assignment




Before Authentication




After Authentication

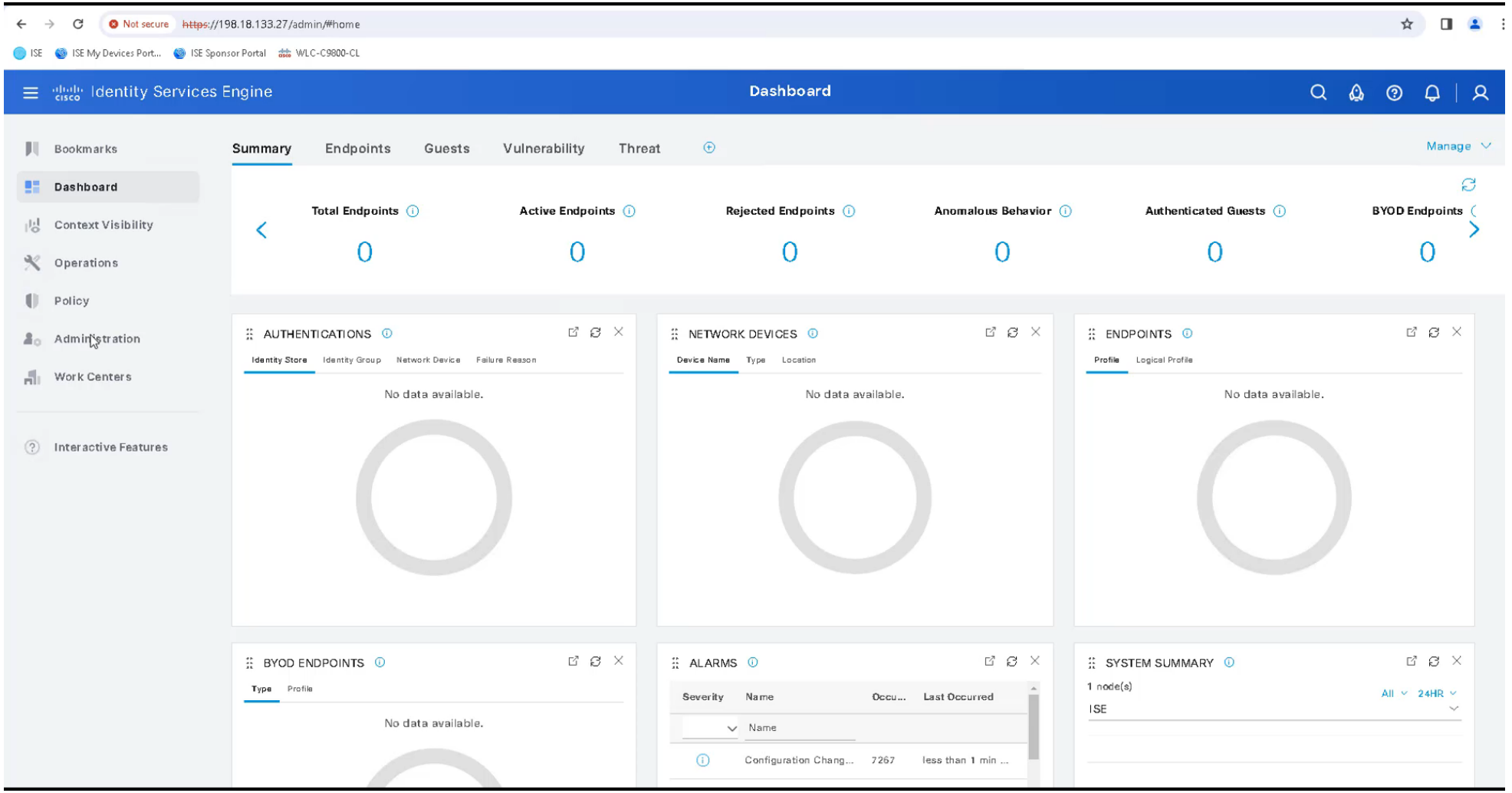
*No access prior authentication, Specific access on Auth-success*

```
interface GigabitEthernet1/0/1
switchport access vlan 100
switchport mode access
switchport voice vlan 10
no authentication open
authentication event fail authorize vlan 101
authentication event no-resp authorize vlan 101
authentication event server dead action \
  authorize vlan 101
authentication port-control auto
mab
dot1x pae authenticator
dot1x timer tx-period 10
```

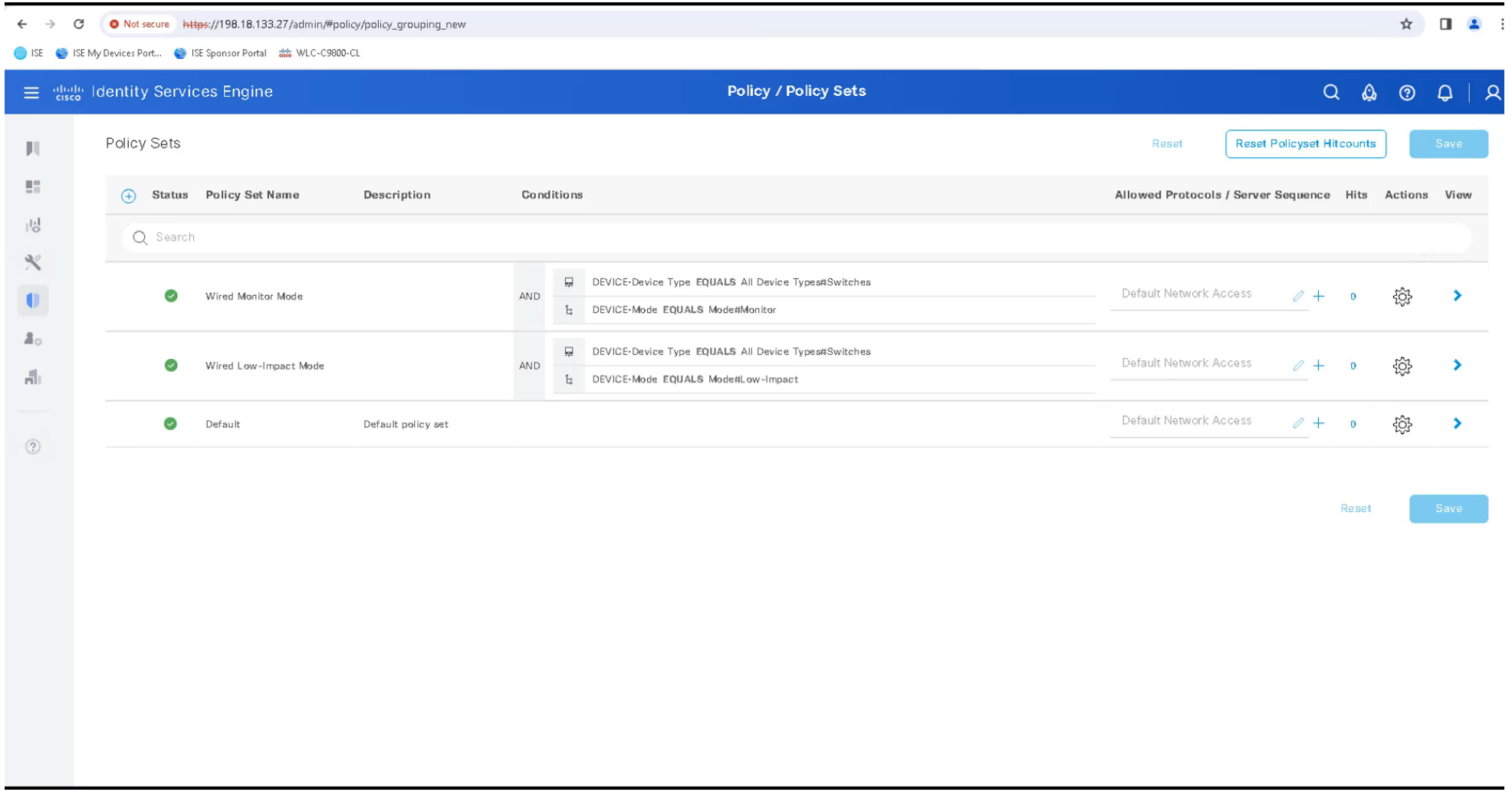
# More on Wired Access…

- Start as much as you can on Monitor Mode
  - Gathers contextual information about endpoints
  - Find the “Unknown” endpoints
  - What endpoints would have failed AuthC/AuthZ
- Build and test your policies in Monitor Mode
  - Note: Monitor Mode can still enforce/transition to low-impact mode if Authz is enabled/enforce
- Utilize Network Device Groups to make policy easier
  - Move switch-by-switch into low-impact mode this way

# Creating and Apply Network Device Groups



# Monitor Mode for Policy Rules

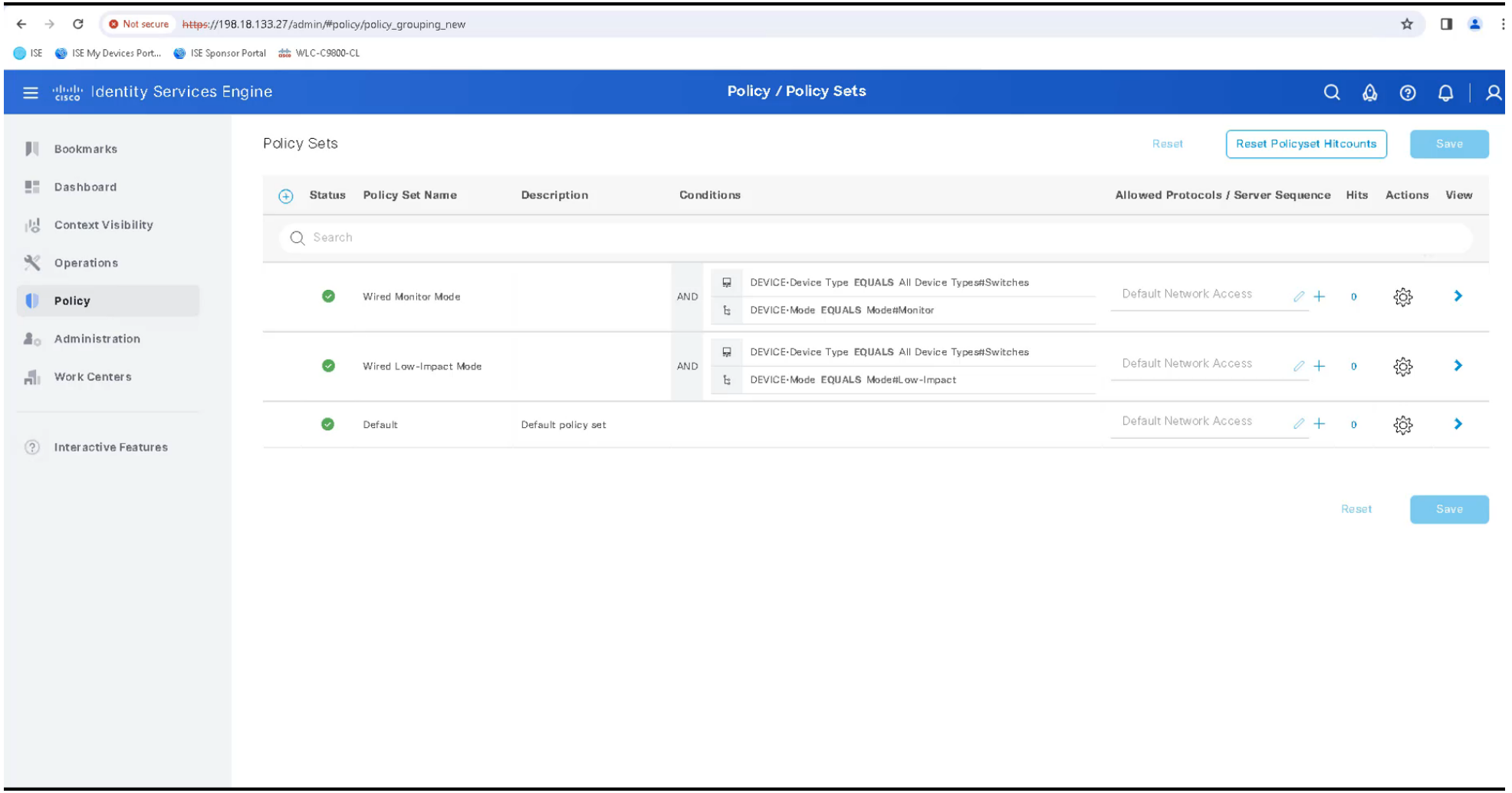


# Policy Set Example – Monitor vs Low-Impact

Policy Sets

| Status | Policy Set Name | Description | Conditions | |
|---|---|---|---|---|
| Search | | | | |
| ✓ | Wired Monitor Mode | | AND | DEVICE·Device Type **EQUALS** All Device Types#Switches<br>DEVICE·Mode **EQUALS** Mode#Monitor |
| ✓ | Wired Low-Impact Mode | | AND | DEVICE·Device Type **EQUALS** All Device Types#Switches<br>DEVICE·Mode **EQUALS** Mode#Low-Impact |

# Moving from Monitor to Low-Impact Mode



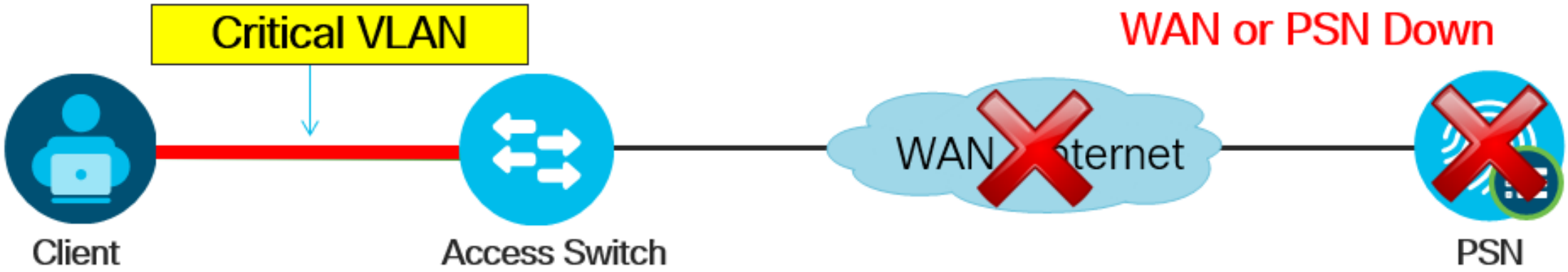
# Wired – High Availability

- More PSNs – Up to 50x
  - Failover to another PSN – Initial delay (deadtime)
  - Failover to another PSN (Load balancer)
  - Local PSN deployed to critical sites
- Switch configuration:
  - IBNS 1.0 Pros:
    - Fail Open/VLAN/Voice Authorization
    - Reauthorize once RADIUS server available
  - IBNS 1.0 Cons:
    - Not very dynamic

# Wired – High Availability

- Switch configuration:
  - IBNS 2.0 Pros:
    - Fail open/ACL/ACL with Conditions/SGT/VLAN/Voice Authorization/etc - Any number of options/conditions
    - Extremely dynamic
  - IBNS 2.0 Cons:
    - More complicated to configure
  - IBNS 1.0 is the “out-of-box” configuration style
  - Switch can be converted to IBNS 2.0 with a single command: **authentication display new-style**
    - Warning: Cannot change back to legacy style without formatting switch

# IBNS 1.0: Inaccessible Authentication Bypass



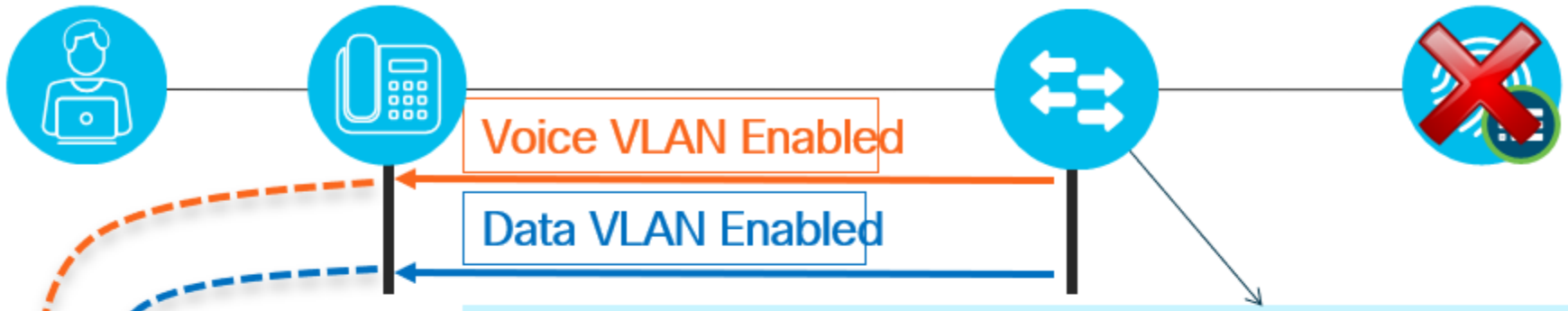

- Switch detects PSN unavailable
- Enables port in critical VLAN
- Existing sessions retain authorization status
- Recovery action can re-initialize port when AAA returns

Critical Data VLAN can be anything:
- Same as default access VLAN
- Same as guest/auth-fail VLAN
- New VLAN

```
authentication event server dead action authorize vlan 100
authentication event server alive action reinitialize
authentication event server dead action authorize voice
```

Critical Voice VLAN

# IBNS 1.0: Critical Auth for Data and Voice



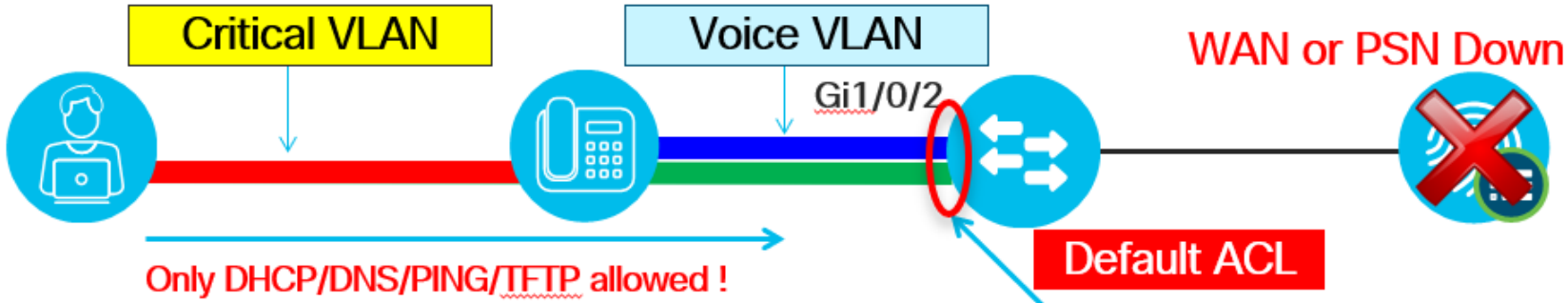

```
interface GigabitEthernet 3/48
 dot1x pae authenticator
 authentication port-control auto
 authentication event server dead action authorize vlan x
 authentication event server dead action authorize voice
```

```
# show authentication sessions interface fa3/48
...
Critical Authorization is in effect for domain(s) DATA and VOICE
```

# IBNS 1.0: Default Port ACL Issues with Critical VLAN

## Limited Access Even After Authorization to New VLAN

- Data VLAN reassigned to critical auth VLAN, but new (or reinitialized) connections are still restricted by existing port ACL




```
interface GigabitEthernet1/0/2
 switchport access vlan 10
 switchport voice vlan 13
 ip access-group ACL-DEFAULT in
 authentication event server dead action reinitialize vlan 11
 authentication event server dead action authorize voice
 authentication event server alive action reinitialize
```

```
ip access-list extended ACL-DEFAULT
 permit udp any eq bootpc any eq bootps
 permit udp any any eq domain
 permit icmp any any
 permit udp any any eq tftp
```

# IBNS 2.0: Authorize Port if AAA Down

For your reference only

- Event: Session started
  - Attempt to authenticate using 802.1x until failure
- Event: Authentication failure
  - If AAA is complete down: Stop 802.1x and authorize the port
  - If no response from AAA (but not down yet), authorize to guest VLAN
  - If 802.1x authentication failure, authorize to guest VLAN

```
interface g1/0/1
dot1x pae authenticator
spanning-tree portface
switchport access vlan 100
switchport mode access
mab
access-session port-control auto
service-policy type control subscriber POLICY-A
```

```
policy-map type control subscriber POLICY-A
event session-started match-all
   10 class always do-until-failure
   10 authenticate using dot1x
event authentication-failure match-first
   10 class AAA-DOWN do-all
   10 terminate dot1x
   20 authorize
20 class DOT1X_NO_RESP do-until-failure
   10 activate service-template GUEST_VLAN
30 class 1X-FAIL do-all
   10 activate service-template GUEST_VLAN
```

# IBNS 2.0: Assign Critical ACL if AAA down

For your reference only

- Event: Session started
  - Attempt to authenticate using 802.1x until failure
- Event: Authentication failure
  - If AAA is down, do the following:
    - Authorize the port
    - Activate service-template CRITICAL on the port which consists of a local ACL named “ACL-CRITICAL”
    - Terminate 802.1x authentication

```
interface g1/0/1
dot1x pae authenticator
spanning-tree portface
switchport access vlan 100
switchport mode access
mab
access-session port-control auto
service-policy type control subscriber POLICY-A
```

```
policy-map type control subscriber POLICY-B
event session-started match-all
  10 class always do-until-failure
   10 authenticate using dot1x
event authentication-failure match-all
  10 class AAA-DOWN do-all
   10 authorize
   20 activate service-template CRITICAL
   30 terminate dot1x
```

```
service-template CRITICAL
access-group ACL-CRITICAL
```

```
ip access-list extended ACL-CRITICAL
permit udp any eq bootpc any eq bootps
permit udp any any eq domain
…
```

# IBNS 2.0: Assign VLAN if AAA down

For your reference only

- Event: Session started
  - Attempt to authenticate using 802.1x until failure
- Event: Authentication failure
  - If AAA is down, do the following:
    - Authorize the port
    - Activate service-template CRITICAL on the port which consists of VLAN 110
    - Terminate 802.1x authentication

```
interface g1/0/1
dot1x pae authenticator
spanning-tree portface
switchport access vlan 100
switchport mode access
mab
access-session port-control auto
service-policy type control subscriber POLICY-A
```

```
policy-map type control subscriber POLICY-B
event session-started match-all
  10 class always do-until-failure
   10 authenticate using dot1x
event authentication-failure match-all
  10 class AAA-DOWN do-all
   10 authorize
   20 activate service-template CRITICAL
   30 terminate dot1x
```

```
service-template CRITICAL
   vlan 110
```

For your reference only

# IBNS 2.0: Assign Voice VLAN if AAA down

- Event: Session started
  - Attempt to authenticate using 802.1x until failure
- Event: Authentication failure
  - If AAA is down, do the following:
    - Authorize the port
    - Activate service-template CRITICAL which authorizes the voice VLAN
    - Terminate 802.1x authentication

```
interface g1/0/1
dot1x pae authenticator
spanning-tree portface
switchport access vlan 100
switchport mode access
mab
access-session port-control auto
service-policy type control subscriber POLICY-A
```

```
policy-map type control subscriber POLICY-B
event session-started match-all
  10 class always do-until-failure
   10 authenticate using dot1x
event authentication-failure match-all
  10 class AAA-DOWN do-all
   10 authorize
   20 activate service-template CRITICAL
   30 terminate dot1x
```

```
service-template CRITICAL
   voice vlan
```

# IBNS 2.0: Assign SGT if AAA down

For your reference only

- Event: Session started
  - Attempt to authenticate using 802.1x until failure
- Event: Authentication failure
  - If AAA is down, do the following:
    - Authorize the port
    - Activate service-template CRITICAL which assigns SGT 10 to the endpoint
    - Terminate 802.1x authentication

```
interface g1/0/1
dot1x pae authenticator
spanning-tree portface
switchport access vlan 100
switchport mode access
mab
access-session port-control auto
service-policy type control subscriber POLICY-A
```

```
policy-map type control subscriber POLICY-B
event session-started match-all
  10 class always do-until-failure
   10 authenticate using dot1x
event authentication-failure match-all
  10 class AAA-DOWN do-all
   10 authorize
   20 activate service-template CRITICAL
   30 terminate dot1x
```

```
service-template CRITICAL
   sgt 10
```

# IBNS 2.0: Assign CRITICAL ACL, Voice VLAN and VLAN if AAA down

For your reference only

- Event: Session started
  - Attempt to authenticate using 802.1x until failure
- Event: Authentication failure
  - If AAA is down, do the following:
    - Authorize the port
    - Activate service-template CRITICAL on the port which consists of a local ACL named “ACL-CRITICAL”, Voice VLAN, SGT 10, and VLAN 110
    - Terminate 802.1x authentication

```
interface g1/0/1
dot1x pae authenticator
spanning-tree portface
switchport access vlan 100
switchport mode access
mab
access-session port-control auto
service-policy type control subscriber POLICY-A
```

```
policy-map type control subscriber POLICY-B
event session-started match-all
  10 class always do-until-failure
   10 authenticate using dot1x
event authentication-failure match-all
  10 class AAA-DOWN do-all
   10 authorize
   20 activate service-template CRITICAL
   30 terminate dot1x
```

```
service-template CRITICAL
   access-group ACL-CRITICAL
   vlan 110
   voice vlan
   sgt 10
```

```
ip access-list extended ACL-CRITICAL
permit udp any eq bootpc any eq bootps
permit udp any any eq domain
…
```

# Authentication

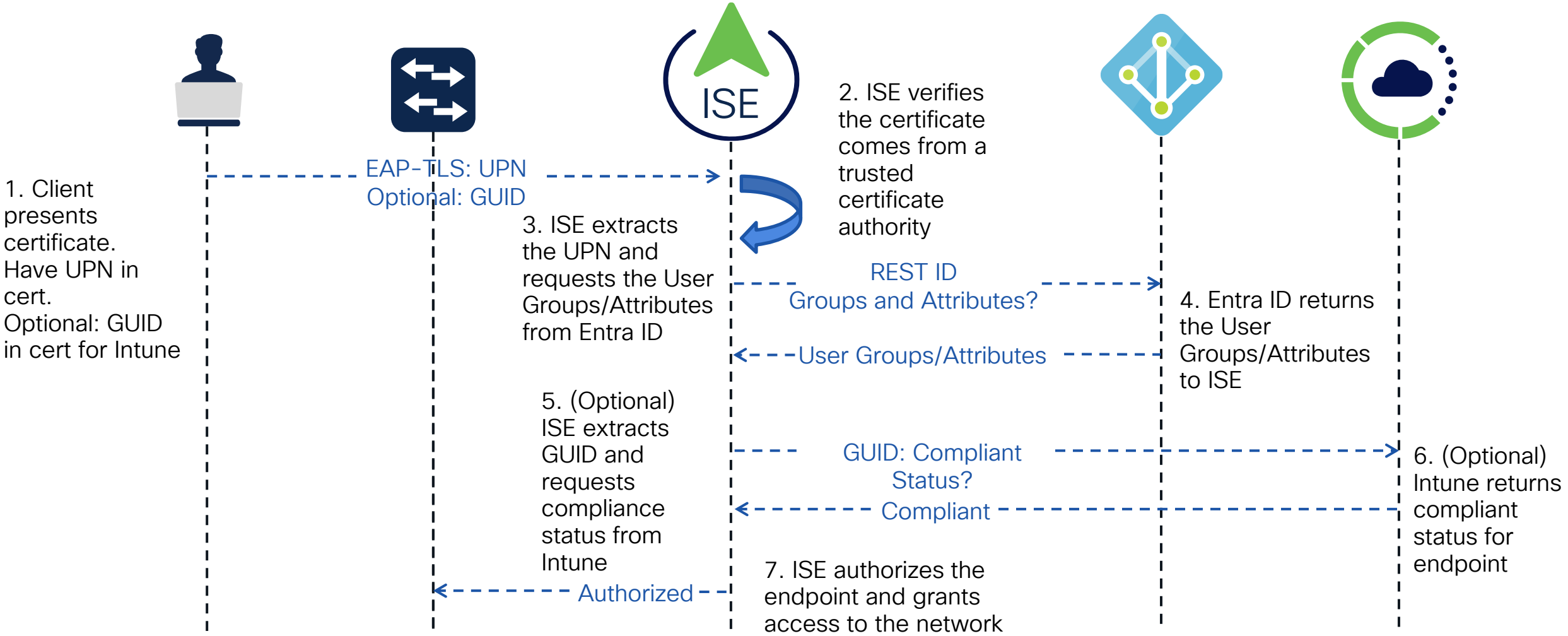
- Multiple authentication methods
  - 802.1x
    - Multiple 802.1X EAP methods simultaneously –
      - TEAP-EAP-TLS for Corporate Endpoints
      - EAP-TLS for supported printers and phones
      - PEAP-MSCHAPv2 for BYOD
  - Easy Connect
    - User authentication without 802.1x
  - Web Auth
  - MAB

# Allowed Protocols

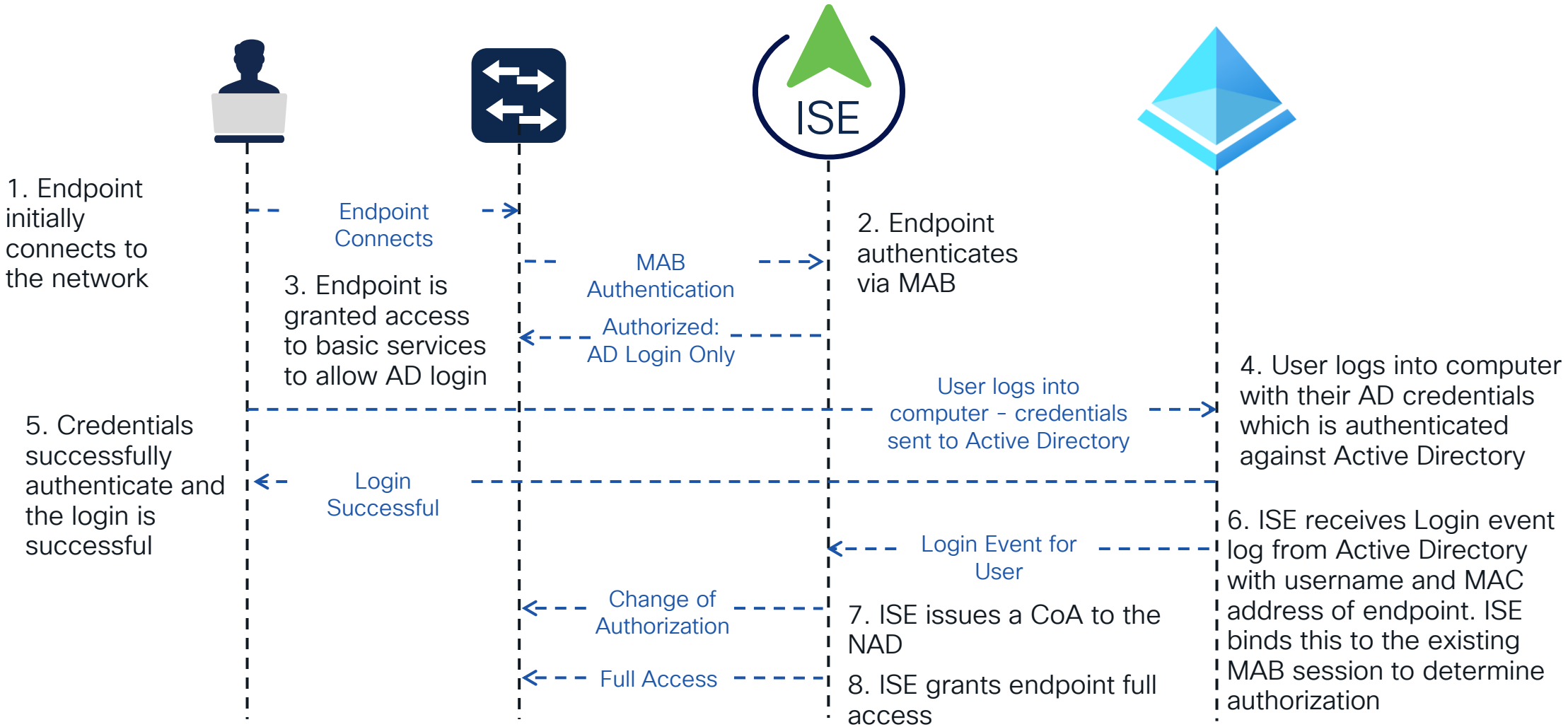
- ISE gives many options...
- Most common allowed protocols:
  - Process Host Lookup
  - EAP-TLS
  - PEAP-MSCHAPv2
  - PEAP-EAP-TLS
  - EAP-TEAP

# Azure AD/Entra ID Support

EAP-TTLS and EAP-TLS currently supported



# Easy Connect

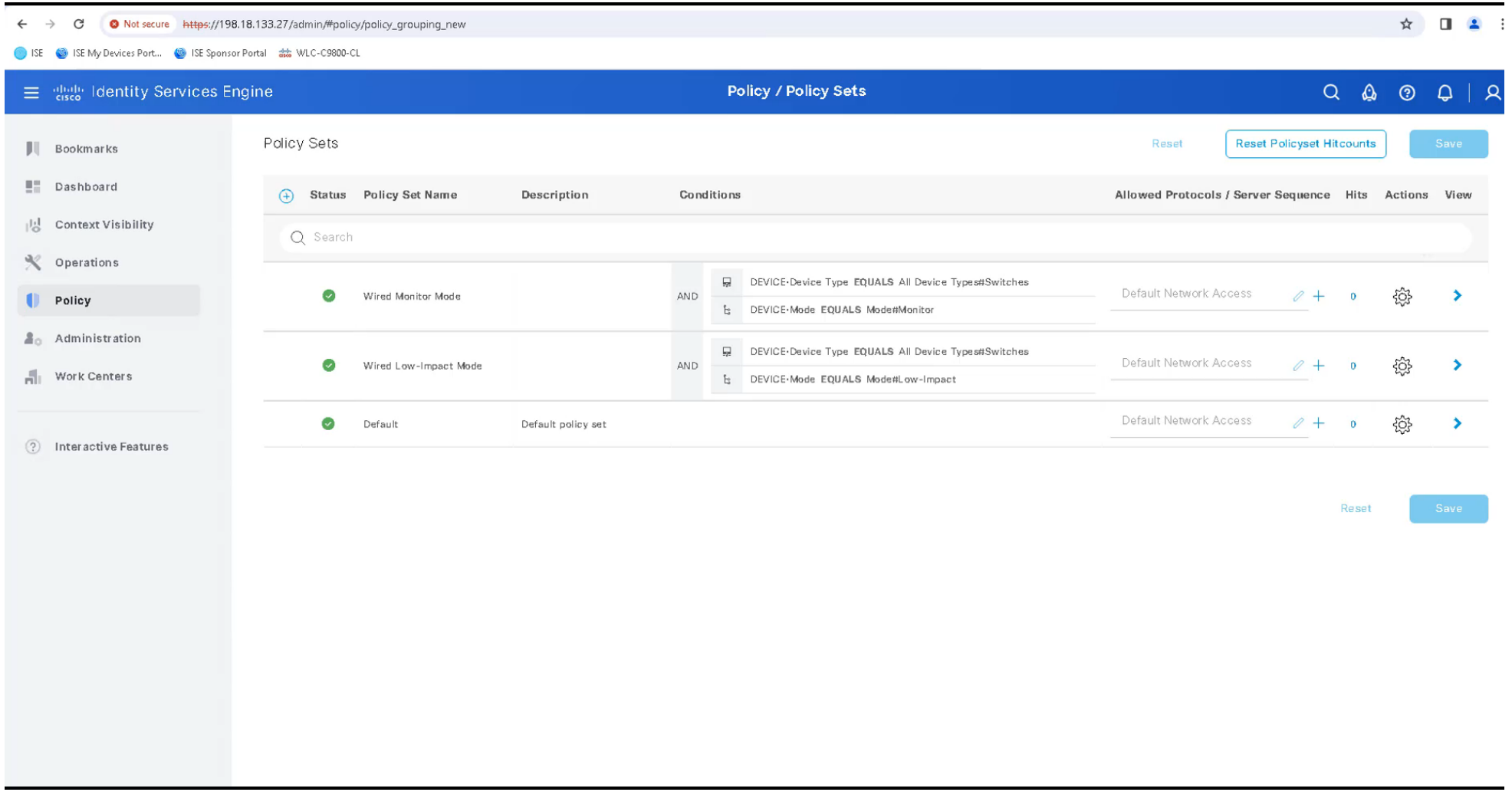


# Example of Easy Connect AD Only ACL

For your reference only

```
permit udp any eq bootpc any eq bootps
permit udp any any eq domain
permit icmp any any
permit tcp any host <AD-DC> eq 88
permit udp any host <AD-DC> eq 88
permit udp any host <AD-DC> eq ntp
permit tcp any host <AD-DC> eq 135
permit udp any host <AD-DC> eq netbios-ns
permit tcp any host <AD-DC> eq 139
permit tcp any host <AD-DC> eq 389
permit udp any host <AD-DC> eq 389
permit tcp any host <AD-DC> eq 445
permit tcp any host <AD-DC> eq 636
permit udp any host <AD-DC> eq 636
permit tcp any host <AD-DC> eq 1025
permit tcp any host <AD-DC> eq 1026
```

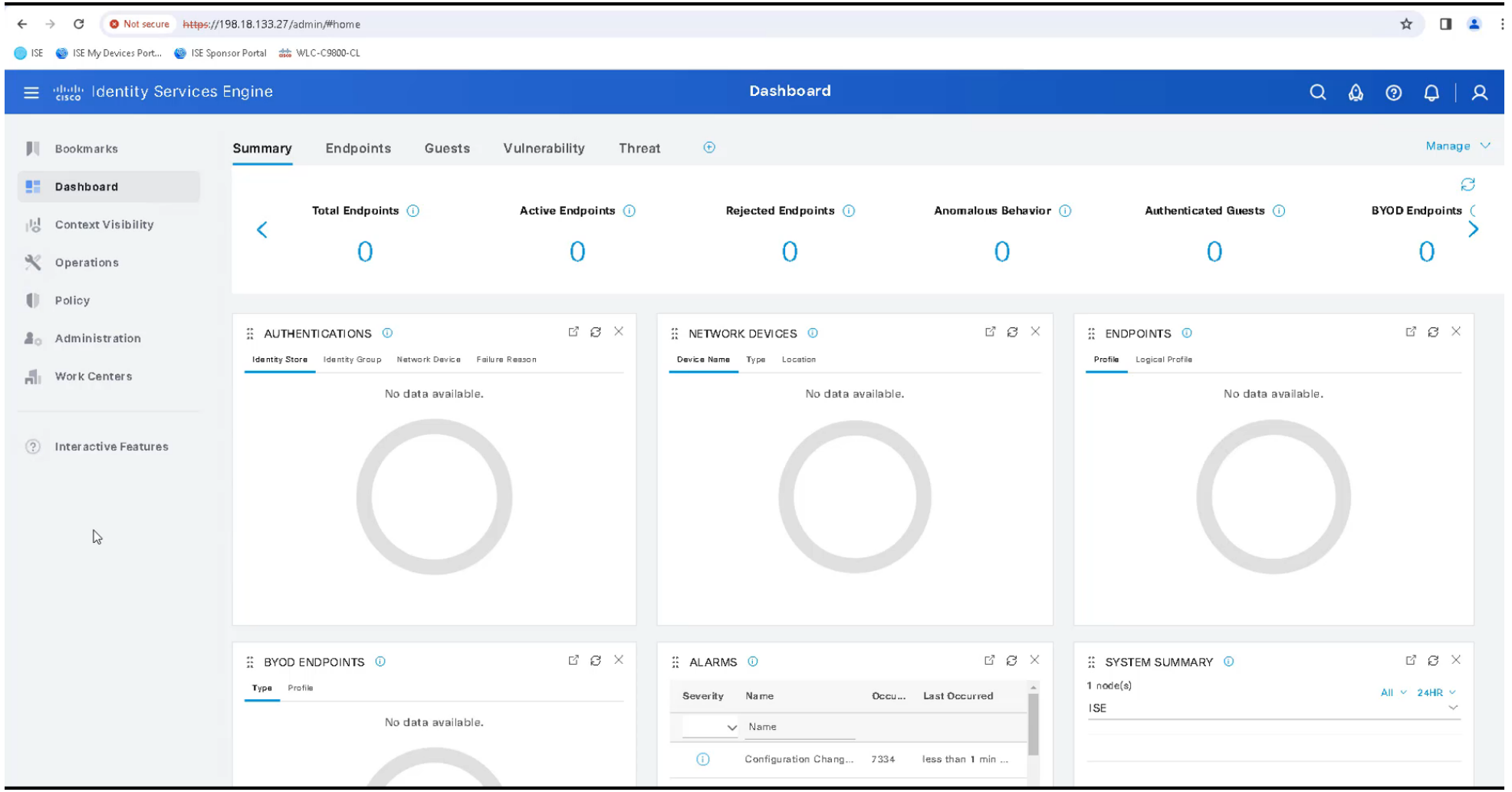
# Migrate to 802.1x? Make it easier with Easy Connect!



# Phased Posturing – Client Provisioning

- Determines which posture agent type
- Can be filtered to a test on a subset of endpoints based on:
  - Endpoint Identity Groups
  - Access Method
  - User Identity
  - etc
- Create a client provisioning policy for a test group first
- After testing, move the policy to production

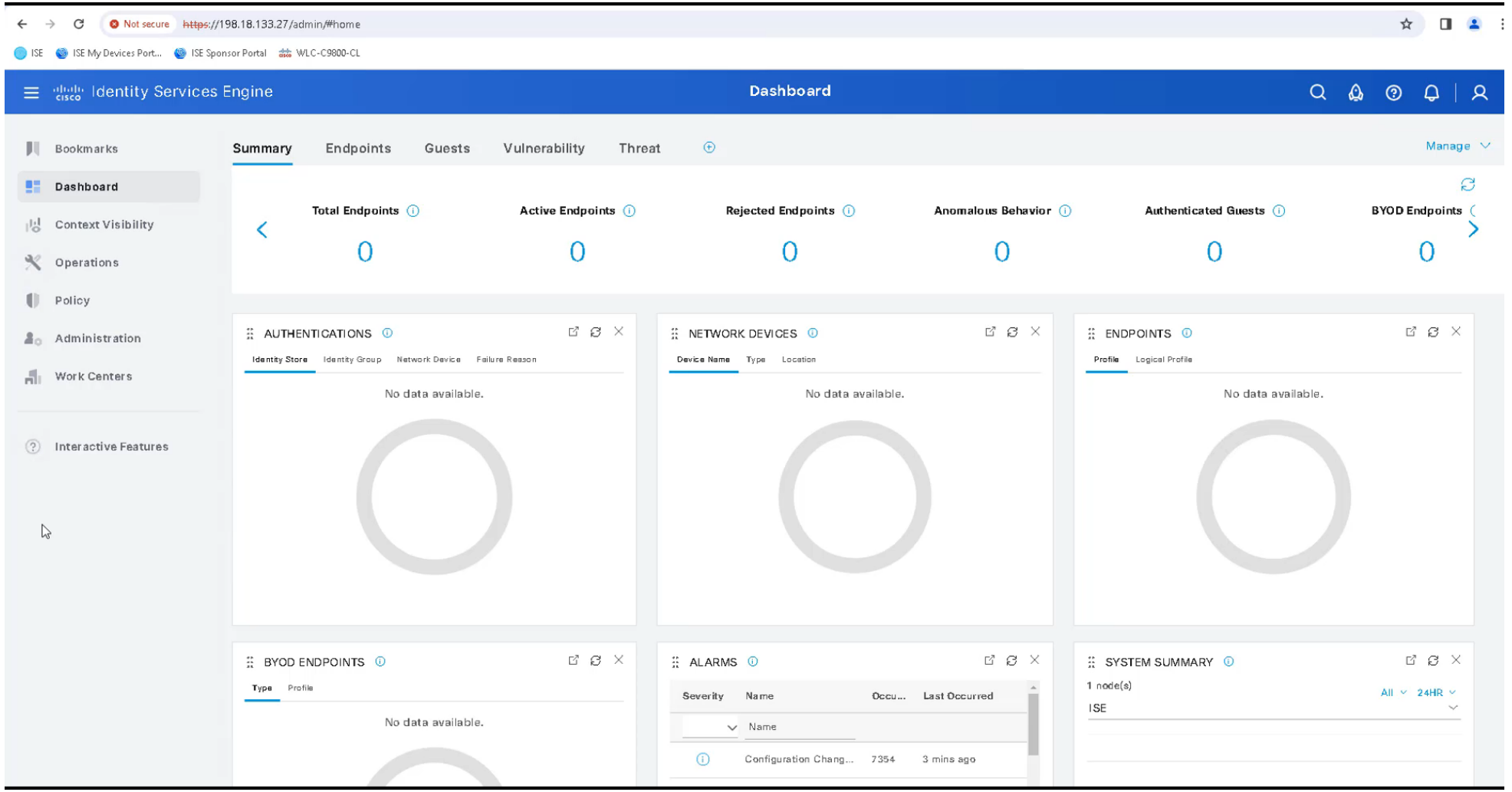
# Client Provisioning – Creating a Test Policy



# Phased Posturing – Posture Policy

- Determines which requirements will be checked
- Conditions can be applied similar to the Client Provisioning policy
- Requirements may be added over time
- Requirements have three modes:
  - Mandatory
  - Optional
  - Audit

# Posture Policy – Creating a Test Policy



# Tuning Policy Sets

# Policy Logic

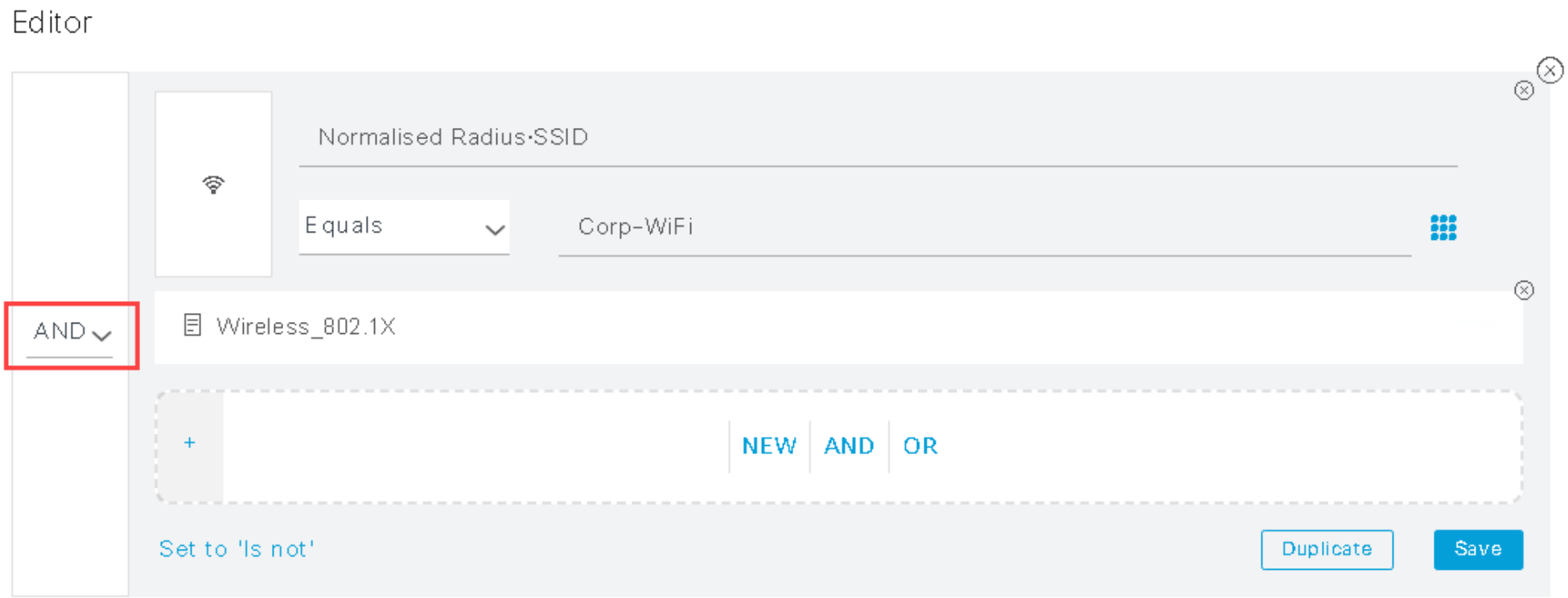
- All policies in ISE follow the same following policy logic:

  **if** *{condition}* **then** *{result}*

- Think about it in non-technical terms:
  - **If** *{the user is in the marketing department}* **then** *{let him/her on the network}*
  - **If** *{the user is using their laptop from home}* **then** *{only give them internet access}*
- Think about what you're trying to achieve in non-technical terms first, then create the policy in ISE using technical conditions/results that accomplish it
- Similar to an ACL: First matched rule

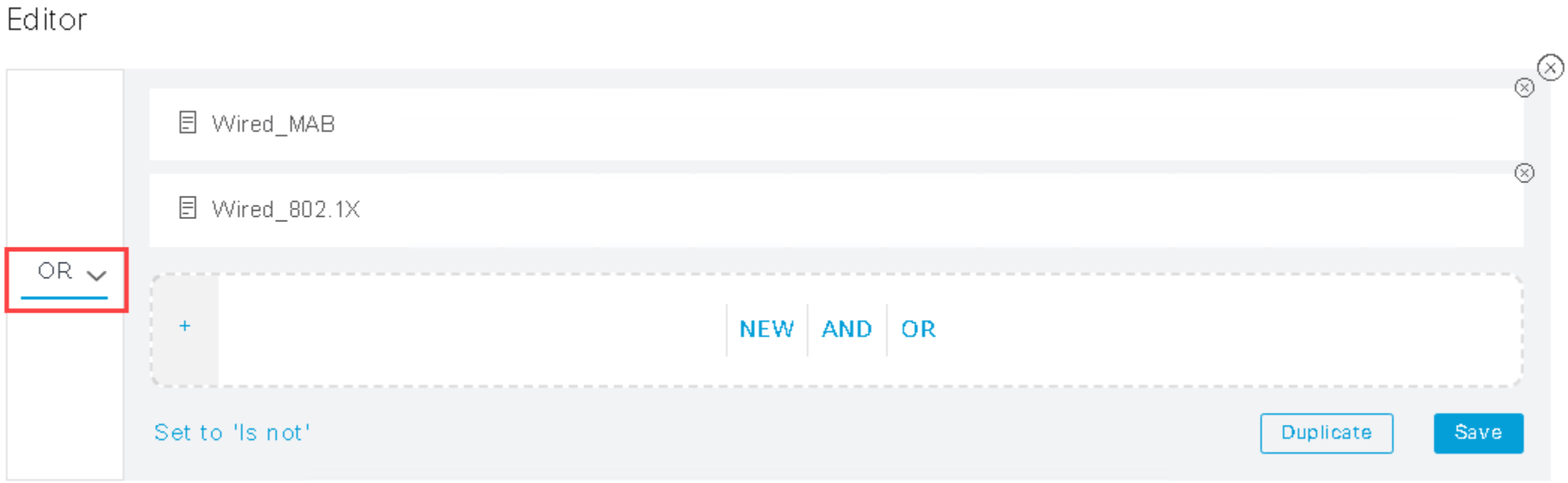
# Policy Conditions

- AND – Both Conditions MUST match
  - “SSID is Corp-WiFi AND endpoint needs to be authenticating with wireless



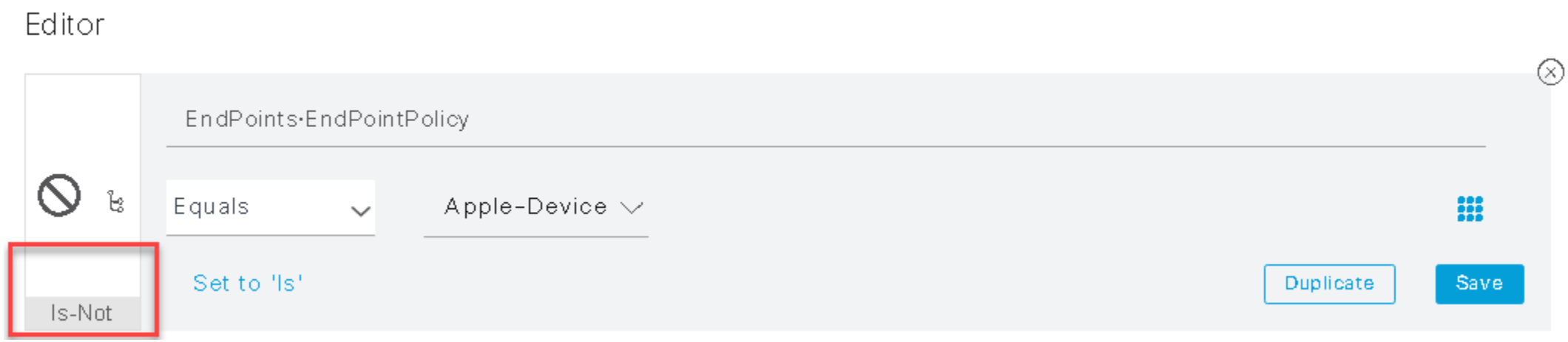
# Policy Conditions

- OR – At least one of the conditions must match
  - “Endpoint must be authenticating on the wired network with 802.1x OR MAB”



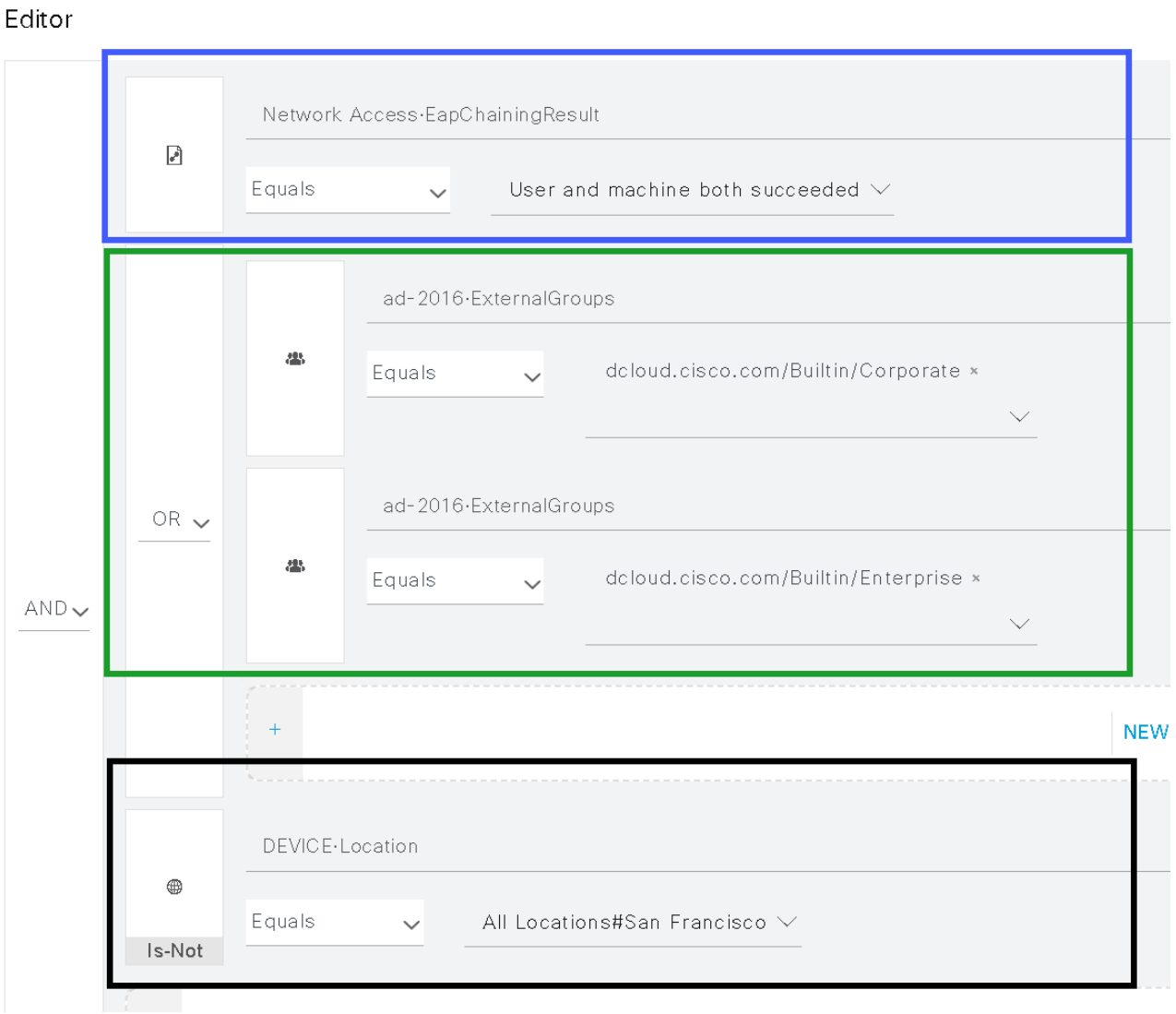
# Policy Conditions

- NOT – This condition must NOT be met
  - “Endpoint should NOT be an Apple device”

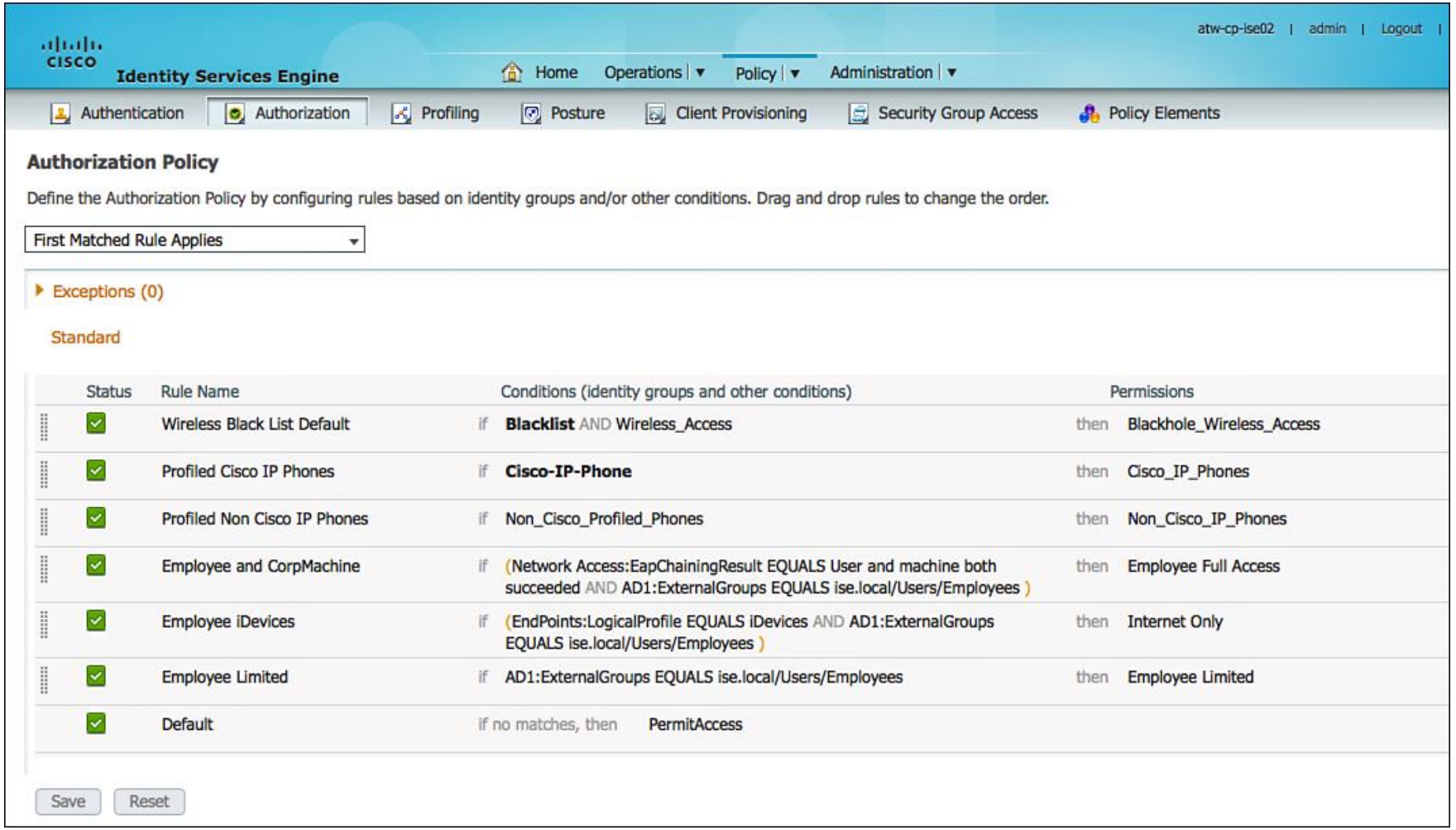


# Policy Conditions

- Combine them to create conditions required to meet your business use-case:
- "The endpoint's **user and machine must have both successfully authenticated** AND the user must be part of the **Corporate** OR **Enterprise** AD groups and they should NOT be trying to connect to a **network device in San Francisco**"



# A little history lesson....



# Introduced in ISE 1.3: Policy Sets

- Groups of authentication and authorization policies to manage network access control
- Create segmented authorization and authorization rules for specific use cases, locations, NAD times, authentication methods, and so much more…
- No more single running list of authentication/authorization rules to manage and troubleshoot
- Reduces the fault surface if there is a misconfiguration

# Policy Set Flow

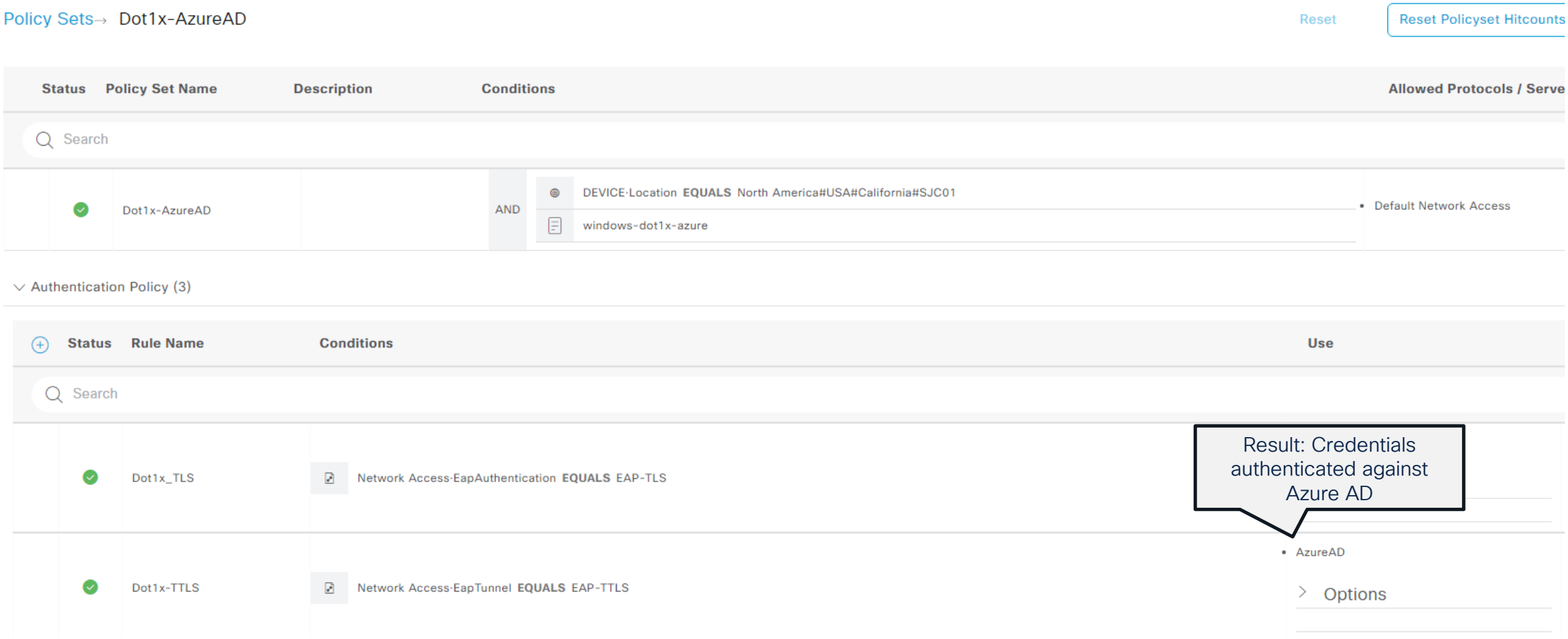
Policy Sets

Reset

| Status | Policy Set Name | Description | Conditions | Allowed Protocols / Se |
|---|---|---|---|---|
| | Search | | | |
| ✓ | VPN-Policy-Set | | AND<br>DEVICE·Device Type **EQUALS** All Device Types#VPN-Concentrators<br>VPN-list | • Default Network Access |
| ✓ | TC-NAC | | AND<br>DEVICE·Location **EQUALS** Location#All Locations#Global#North America#USA#California#SJC01 | • Default Network Access |
| ✓ | Dot1x-AzureAD | | AN<br>ca#USA#California#SJC01 | • Default Network Access |
| ✓ | MDM | | DEVICE·Location **EQUALS** All Locations#My-Territory#APAC-Region#India#Karnataka#Bengaluru<br>MDM-endpoints | • Default Network Access |
| ✓ | BYOD | | AND<br>DEVICE·Location **EQUALS** North America#USA#California#SJC01<br>Win-BYOD | • Default Network Access |
| ✓ | Guest-Access | | OR<br>DEVICE·Device Type **EQUALS** All Device Types#Wireless<br>Radius·Service-Type **EQUALS** Call Check<br>Windows-guest | • Default Network Access |

Result: First policy set matched checks allows protocols and processes packet

# Policy Set Flow



# Policy Set Flow

Authorization Policy (3)

| Status | Rule Name | Conditions | Results Profiles |
|---|---|---|---|
| Search | | | |
| ✓ | HR_Policy | AzureAD·ExternalGroups **EQUALS** HRGroup | • Full-Access |
| ✓ | Employee_Policy | AzureAD·ExternalGroups **EQUALS** EmployeeGroup | • Full-Access |
| ✓ | Default | | • DenyAccess |

Result: Endpoint is granted full access

# Grouping Policy Sets

- There is more than one way to make an omelettte!
- Many ways to overcomplicate, but many ways to simplify
- Embrace the KISS principle!
- Commonly two trains of thought:
  1. Policy Sets based on device type, location, and/or SSID:
     - Network Device Group: Switches, Wireless Controller, VPN
     - (Optional) Network Device Group Location: HQ
     - (Optional) SSID: Corp-Guest
  2. Policy Sets based Use-Case:
     - Use-Case: Wired 802.1x, Wireless 802.1x, Wired MAB, Wireless MAB, etc
     - (Optional) Network Device Group Location: HQ
     - (Optional) SSID: Corp-Guest

# Policy Set – Option 1 Example

Policy Sets

Reset | Reset Policyset Hitc

| Status | Policy Set Name | Description | Conditions | Allowed Protocols / Server Sequence |
|---|---|---|---|---|
| | Search | | | |
| ✓ | San Francisco Wired Access | | AND<br>DEVICE·Device Type **EQUALS** All Device Types#Switches<br>DEVICE·Location **EQUALS** All Locations#San Francisco | Default Network Access |
| ✓ | San Jose Wired Access | | AND<br>DEVICE·Device Type **EQUALS** All Device Types#Switches<br>DEVICE·Location **EQUALS** All Locations#San Jose | Default Network Access |
| ✓ | Guest SSID | | AND<br>DEVICE·Device Type **EQUALS** All Device Types#Wireless Controllers<br>Radius·Called-Station-ID **CONTAINS** Corp-Guest | Default Network Access |
| ✓ | Corp 802.1x | | AND<br>DEVICE·Device Type **EQUALS** All Device Types#Wireless Controllers<br>Radius·Called-Station-ID **CONTAINS** Corp-Dot1x | Default Network Access |
| ✓ | VPN | | DEVICE·Device Type **EQUALS** All Device Types#VPN | Default Network Access |

# Policy Set – Option 2 Example

Policy Sets

Reset | Reset Policyset Hitc

| Status | Policy Set Name | Description | Conditions | Allowed Protocols / Server Sequence |
|---|---|---|---|---|
| | | | Search | |
| ✓ | San Francisco Wired 802.1 | | AND DEVICE·Location **EQUALS** All Locations#San Francisco<br>Wired_802.1X | Default Network Access |
| ✓ | San Francisco Wired MAB | | AND DEVICE·Location **EQUALS** All Locations#San Francisco<br>Wired_MAB | Default Network Access |
| ✓ | San Jose Wired 802.1X | | AND DEVICE·Location **EQUALS** All Locations#San Jose<br>Wired_802.1X | Default Network Access |
| ✓ | San Jose Wired MAB | | AND DEVICE·Location **EQUALS** All Locations#San Jose<br>Wired_MAB | Default Network Access |
| ✓ | Guest SSID | | AND DEVICE·Device Type **EQUALS** All Device Types#Wireless Controllers<br>Radius·Called-Station-ID **CONTAINS** Corp-Guest | Default Network Access |
| ✓ | Corp 802.1x | | AND DEVICE·Device Type **EQUALS** All Device Types#Wireless Controllers<br>Radius·Called-Station-ID **CONTAINS** Corp-Dot1x | Default Network Access |
| ✓ | VPN | | DEVICE·Device Type **EQUALS** All Device Types#VPN | Default Network Access |

# The Power of Profiling

# Endpoint Profiling – Visibility Data Sources

The profiling service in Cisco ISE identifies the data that connects to your devices

Endpoints send interesting data, that reveal their device type


## ISE Data Collection Methods for Device Profiling

**Active Probes:** Netflow | DHCP | DNS | HTTP | RADIUS | NMAP | SNMP | AD

**Device Sensor:** CDP| LLDP | DHCP | HTTP | H323 | SIP | MDNS

**Cisco Secure Client (formerly AnyConnect):** ACIDex

Feed Service (Online/Offline)

| MAC Address | IPv4 Address | Username | Hostname | Endpoint Profile |
|---|---|---|---|---|
| 00:22:BD:D3:5B:2F | 10.34.75.13 | | | Cisco-IP-Camera |
| 00:02:4B:CC:D6:63 | 10.35.68.203 | | | Cisco-IP-Phone |
| 5C:F9:38:AA:1F:90 | 10.32.2.127 | jim | Jim-Air | Apple-MacBook |
| 30:46:9A:2E:C3:F0 | 10.86.98.138 | host/ALICE | win7pc | Microsoft-Workstation |

Cisco Secure Client Identity Extensions (ACIDex) | Device Sensor (DS)

# ISE Profiling Probes

For your reference only

- **RADIUS**
  - **Collects session attributes as well as CDP, LLDP, DCHP, HTTP, and MDM from IOS Device Sensor**
- SNMP Query and Traps
  - Collects information such as interface, CDP, LLDP, ARP, Linkup, Lidown, and MAC notifications
- **DHCP**
  - **Listens for DHCP Packets**
- **DNS**
  - **Performs a DNS lookup for the FQDN**
- **HTTP**
  - **Receives and parses HTTP packets to discover the User-Agent**

# ISE Profiling Probes

For your reference only

- Netflow
  - Collects Netflow packets – Don’t use this one!
- **Active Directory**
  - **Queries AD for Windows information**
- **NMAP**
  - **Scans endpoints for open ports, service information, and OS**
- **pxGrid**
  - **Fetches attributes of MAC or IP address of a subscriber**
- AnyConnect ACIDEX
  - Provides ACIDEX information to ISE over RADIUS – device public MAC and device platform

# RADIUS Probe Sample Configuration

For your reference only

```
aaa authentication dot1x default group ise-group
aaa authorization network default group ise-group
aaa accounting dot1x default start-stop group ise-group
aaa accounting update newinfo periodic 2880
!
radius server ise
address ipv4 <ISE-PSN-IP> auth-port 1812 acct-port 1813
key <Shared-Secret>
```

```
aaa group server radius ise-group
server name ise
!
ip radius source-interface <Interface>
!
radius-server attribute 6 on-for-login-auth
radius-server attribute 8 include-in-access-req
radius-server attribute 25 access-request include
radius-server vsa send accounting
radius-server vsa send authentication
```

# SNMP Probe Sample Configuration

For your reference only

```
interface <interface>
snmp trap mac-notification change added
snmp trap mac-notification change removed
!
mac address-table notification change
mac address-table notification mac-move
!
snmp-server trap-source <interface>
snmp-server enable traps snmp linkdown linkup
snmp-server enable traps mac-notification change move
snmp-server host <ISE-PSN-IP> version 2c <string>
snmp-server community <string> RO
cdp run
!
interface <interface>
cdp enable
lldp run
!
interface <interface>
lldp receive
lldp transmit
```

# HTTP Probe Sample Configuration

For your reference only

```
ip http server
ip http secure-server

ip access-list extended REDIRECT-ACL
deny ip any host <ISE-PSN-IP>
permit tcp any any eq http
permit tcp any any eq https
```

# DHCP Probe Sample Configuration

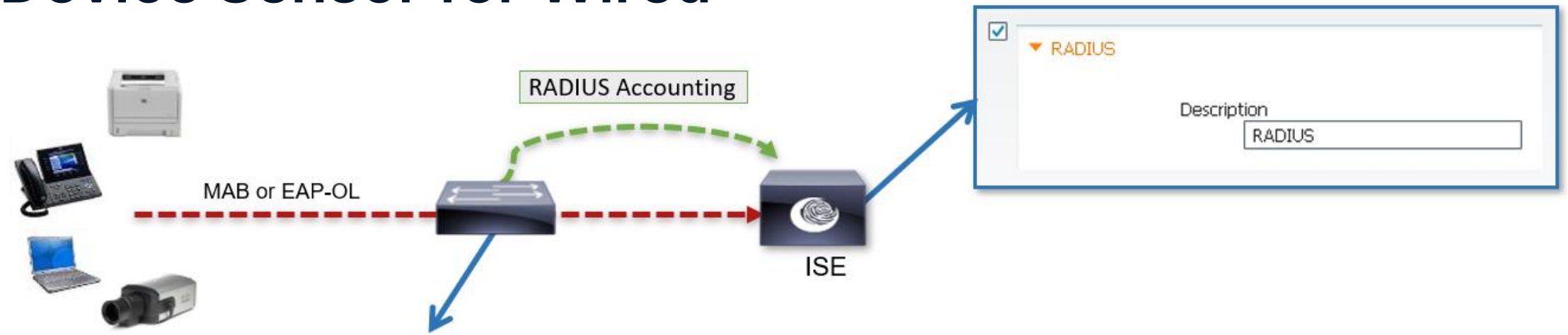
For your reference only

interface vlan 30

ip helper-address <PSN-IP-Address>

# Device Sensor for Wired

For your reference only




1) Filter DHCP, CDP, and LLDP options/TLVs

2) Enable sensor data to be sent in RADIUS Accounting including all changes

```
device-sensor accounting
device-sensor notify all-changes
```

3) Disable local analyzer if sending sensor updates to ISE (central analyzer)

```
no macro auto monitor
access-session template monitor
```

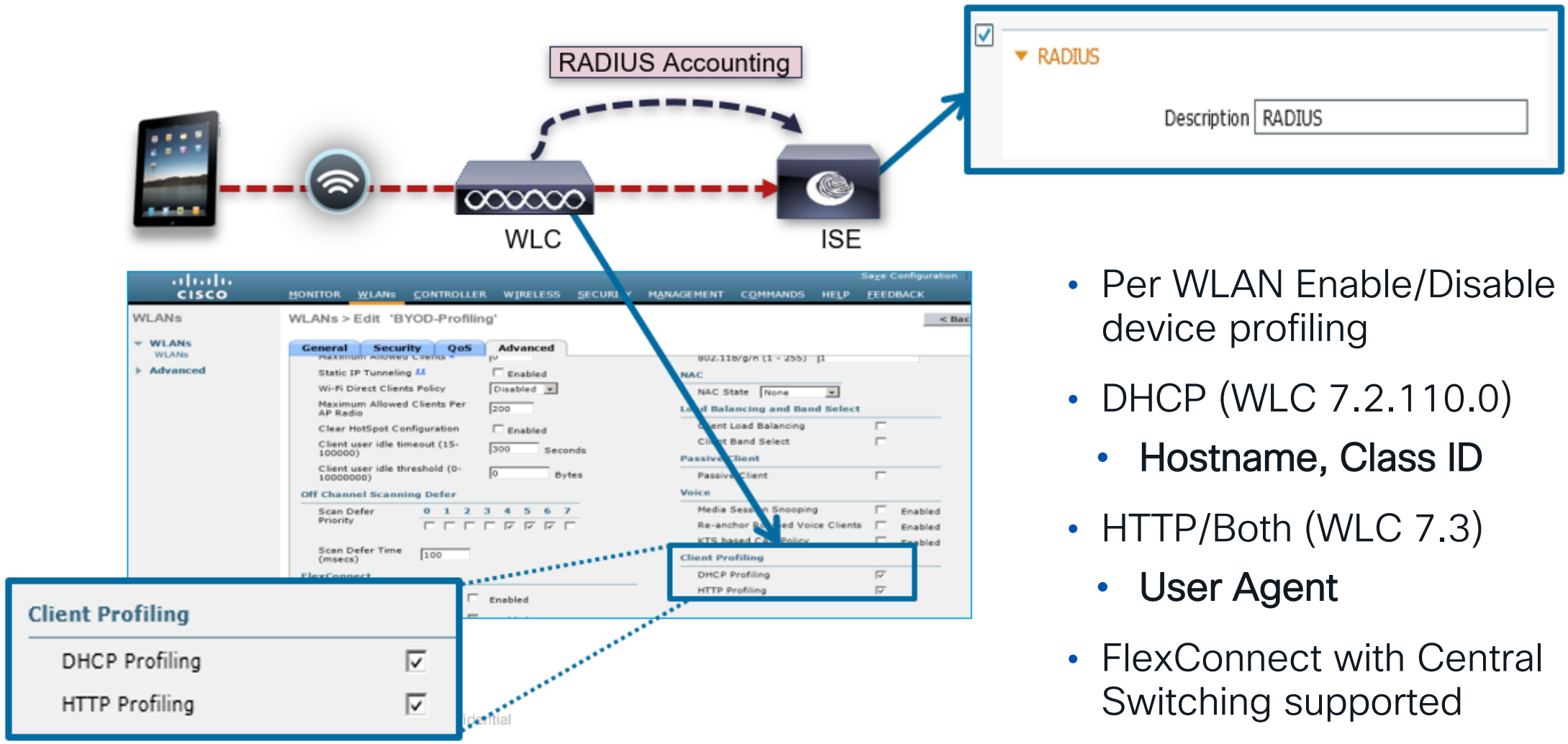
```
device-sensor filter-list cdp list my_cdp_list
 tlv name device-name
 tlv name platform-type
device-sensor filter-spec cdp include list my_cdp_list
```

```
device-sensor filter-list lldp list my_lldp_list
 tlv name system-name
 tlv name system-description
device-sensor filter-spec lldp include list my_lldp_list
```

```
device-sensor filter-list dhcp list my_dhcp_list
 option name host-name
 option name class-identifier
 option name client-identifier
device-sensor filter-spec dhcp include list my_dhcp_list
```

# Device Sensor for WLCs

For your reference only

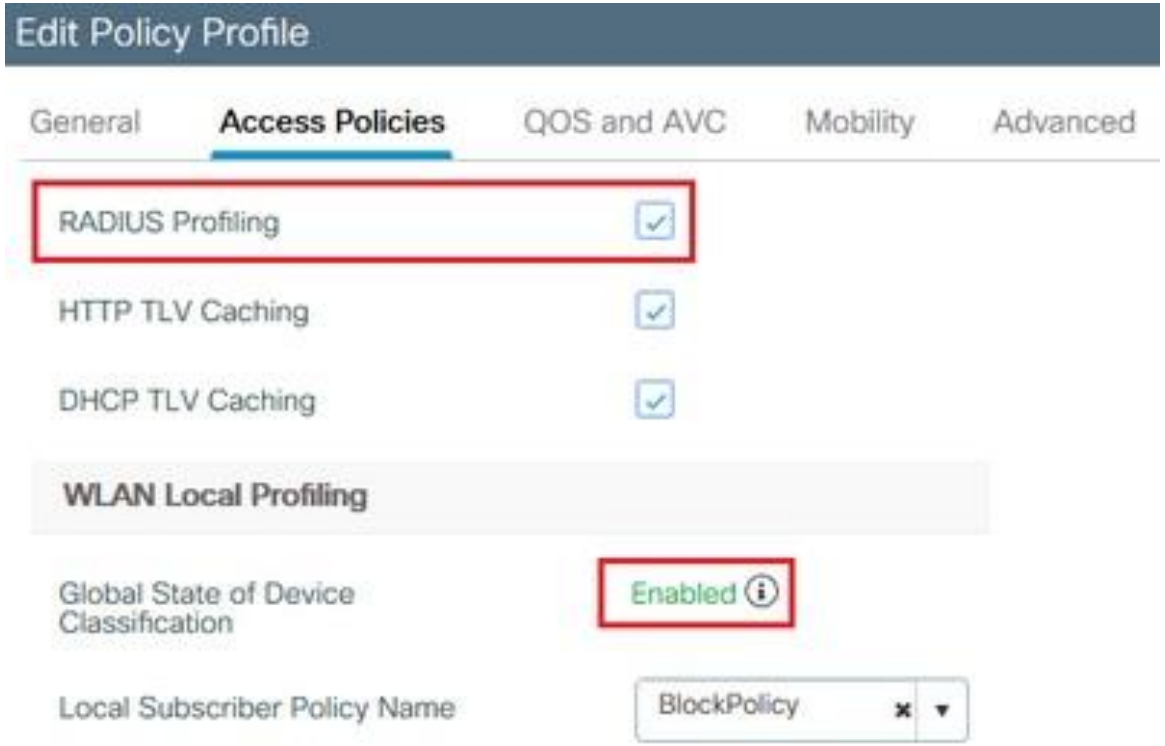



- Per WLAN Enable/Disable device profiling
- DHCP (WLC 7.2.110.0)
  - **Hostname, Class ID**
- HTTP/Both (WLC 7.3)
  - **User Agent**
- FlexConnect with Central Switching supported

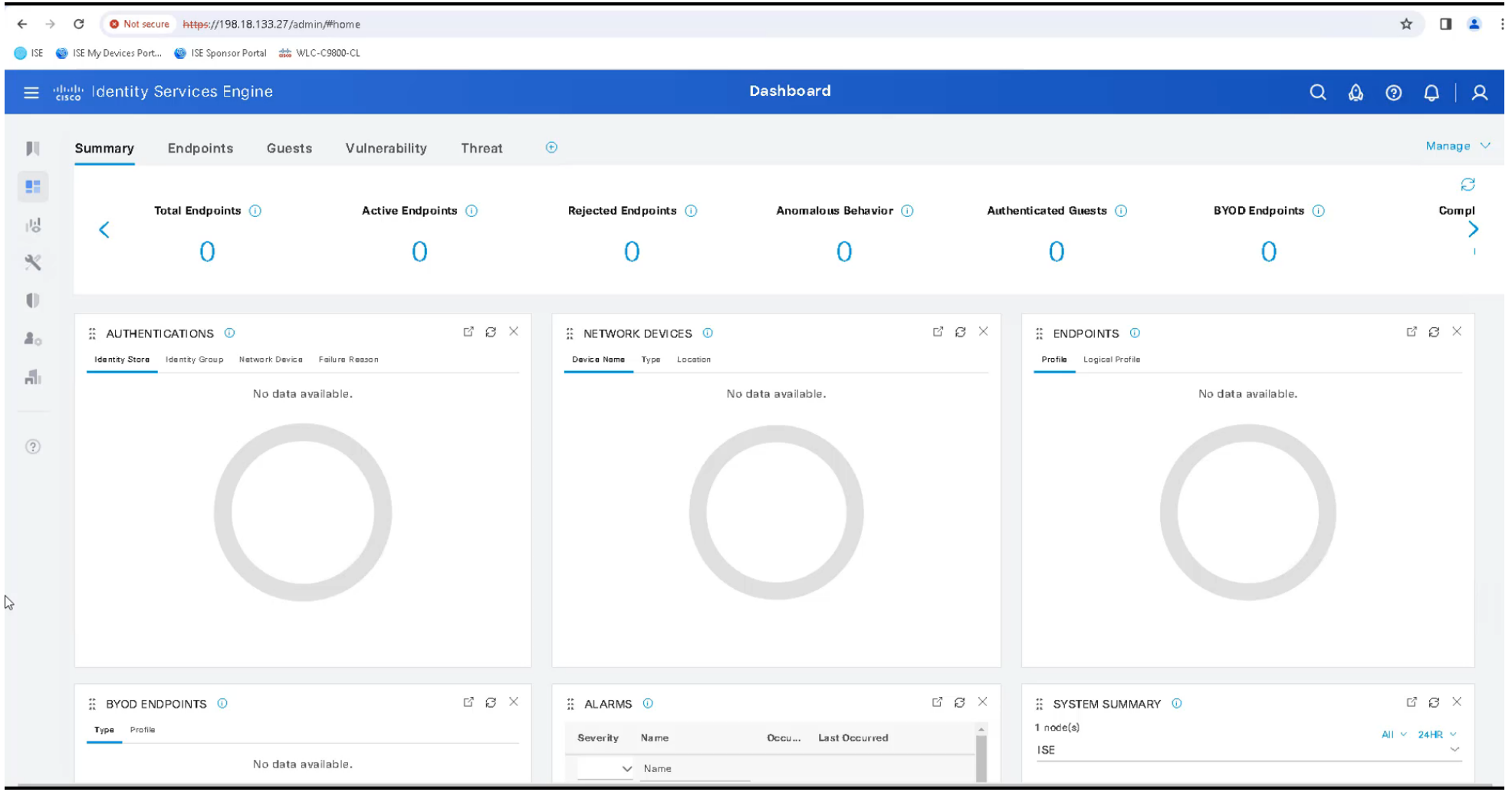
# Device Sensor for Catalyst 9800s

For your reference only

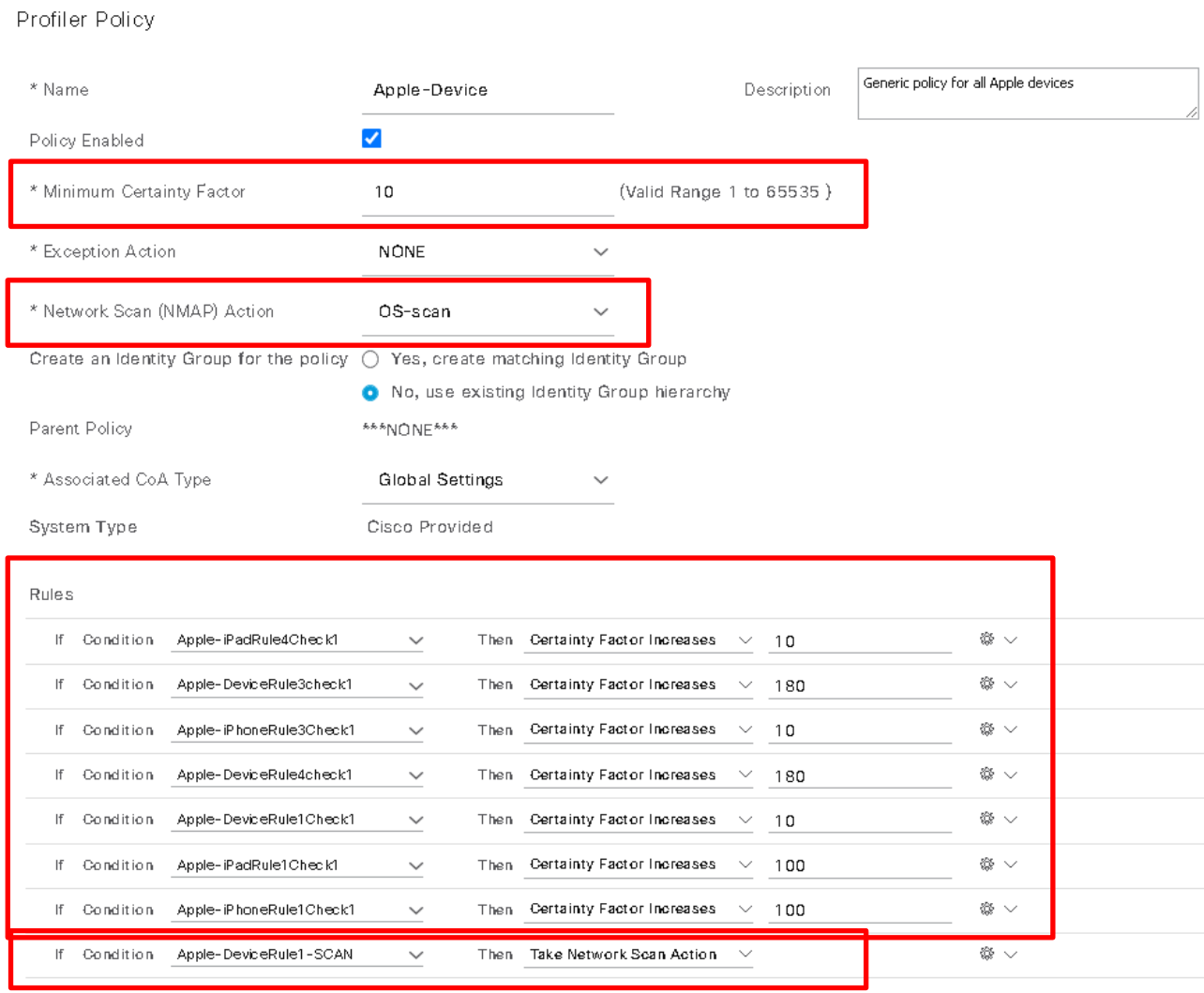
## Configuration> Tags & Profiles > Policy



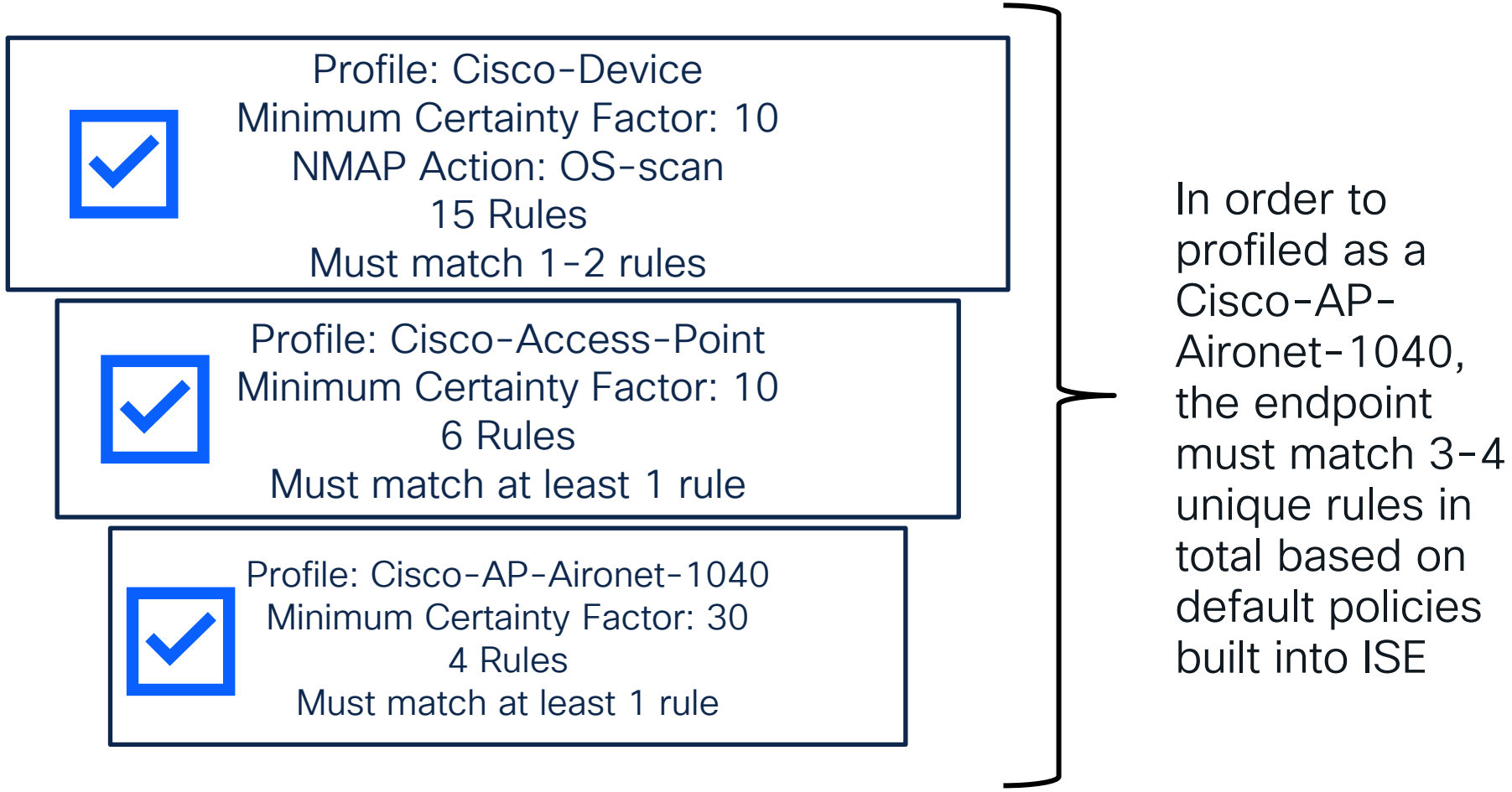
# Enabling Probes on ISE



# Profiling Logic



# Profile Hierarchy




In order to profiled as a Cisco-AP-Aironet-1040, the endpoint must match 3-4 unique rules in total based on default policies built into ISE

# Profile Packages and Integrations

## Medical Devices

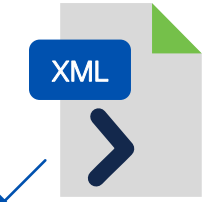
Hospital

250+ Medical device profiles

- Pharma-Smart-Device
- Philips-Analytical-X-Ray-Device
- Philips-CareServant-Device
- Philips-Healthcare-PCCI-Device
- Philips-Medical-Systems-Device
- Philips-Oral-Healthcare-Device
- Philips-Patient-Monitoring-Device
- Philips-Personal-Health-Device
- Philips-Respironics-Device
- Phonak-Communications-Device

## IOT Building & Automation

Library

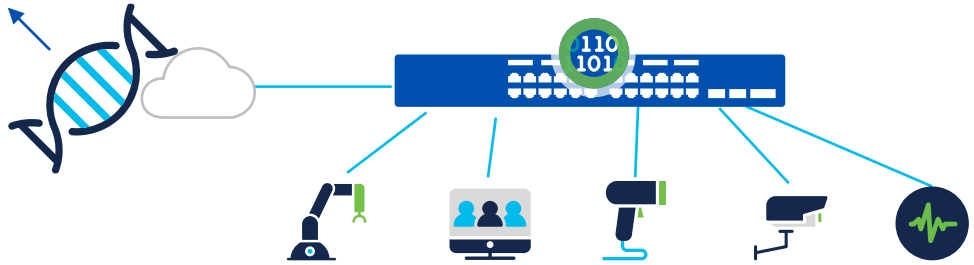



- Siemens-Device
  - Siemens-Automation-Drives-Device
  - Siemens-Building-Device
  - Siemens-Building-Technologies-Device
  - Siemens-Convergence-Device
  - Siemens-Digital-Factory-Device
  - Siemens-Energy-Automation-Device
  - Siemens-Energy-Management-Device
  - Siemens-Home-Office-Device
  - Siemens-Industrial-Automation-Device


pxGrid

Cisco CyberVision

pxGrid




## Cisco AI Endpoint Analytics

Profiles IOT devices and sends endpoint labels via pxGrid to ISE for authorization

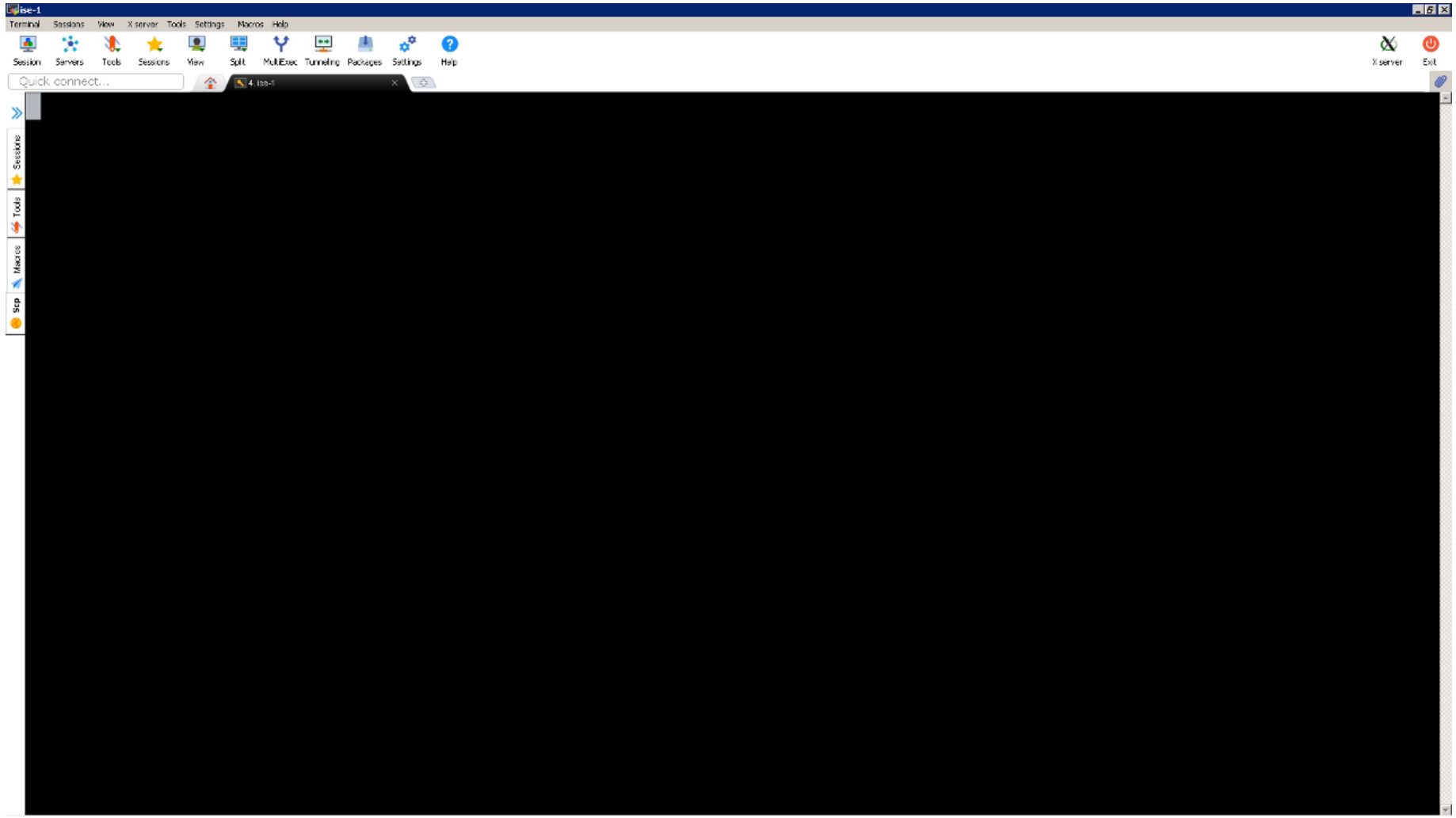
Factory

Industrial Devices

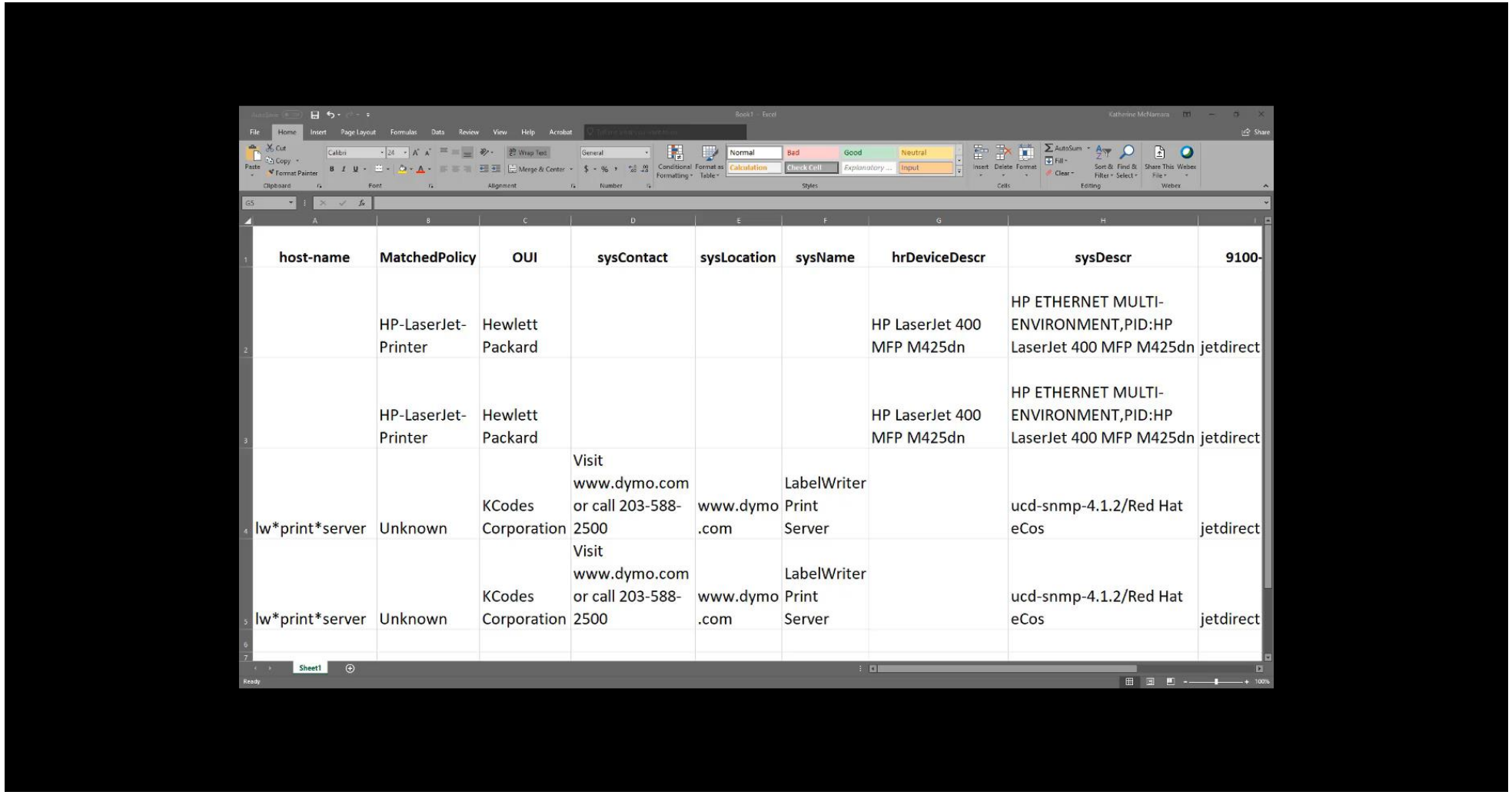
# Creating Custom Profiles

- Sometimes we need to create custom endpoint profiles
- GUI does not make it easier to view collective attributes across many endpoints
- Sadly, ISE Endpoint Analytics Tool is no longer supported after ISE 2.6
- How do we make it easier to create custom profiles?
  - Answer: Endpoint export to CSV from the CLI!
- Best practices:
  - Utilize hierarchical profiles if needed
  - Minimum certainty factor should be higher than pre-built profiles (aim for 500+)

# Creating Custom Profiles – Get All Endpoints



# Creating Custom Hierarchical Profiles



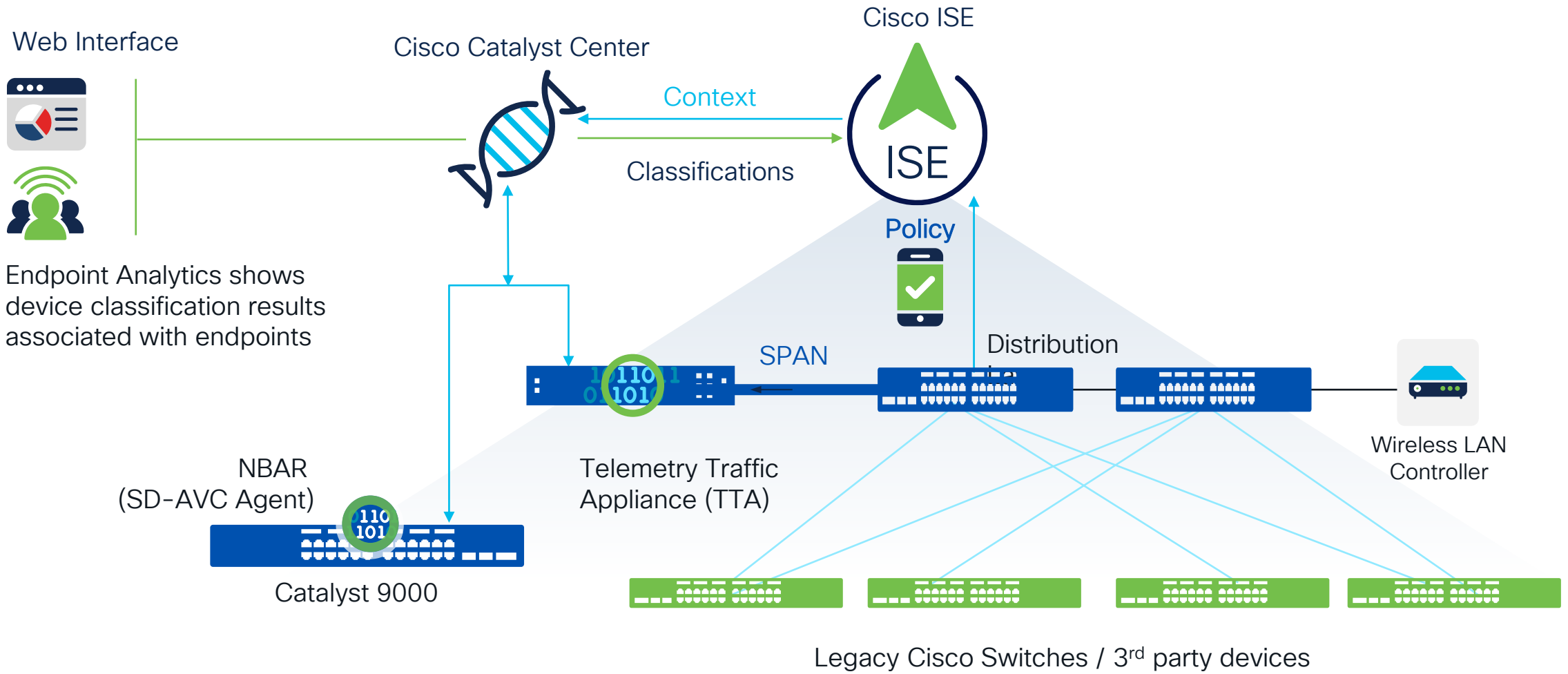
| host-name | MatchedPolicy | OUI | sysContact | sysLocation | sysName | hrDeviceDescr | sysDescr | 9100- |
|---|---|---|---|---|---|---|---|---|
| | HP-LaserJet-Printer | Hewlett Packard | | | | HP LaserJet 400 MFP M425dn | HP ETHERNET MULTI-ENVIRONMENT,PID:HP LaserJet 400 MFP M425dn | jetdirect |
| | HP-LaserJet-Printer | Hewlett Packard | | | | HP LaserJet 400 MFP M425dn | HP ETHERNET MULTI-ENVIRONMENT,PID:HP LaserJet 400 MFP M425dn | jetdirect |
| lw*print*server | Unknown | KCodes Corporation | Visit www.dymo.com or call 203-588-2500 | www.dymo.com | LabelWriter Print Server | | ucd-snmp-4.1.2/Red Hat eCos | jetdirect |
| lw*print*server | Unknown | KCodes Corporation | Visit www.dymo.com or call 203-588-2500 | www.dymo.com | LabelWriter Print Server | | ucd-snmp-4.1.2/Red Hat eCos | jetdirect |

# Profiling Attributes

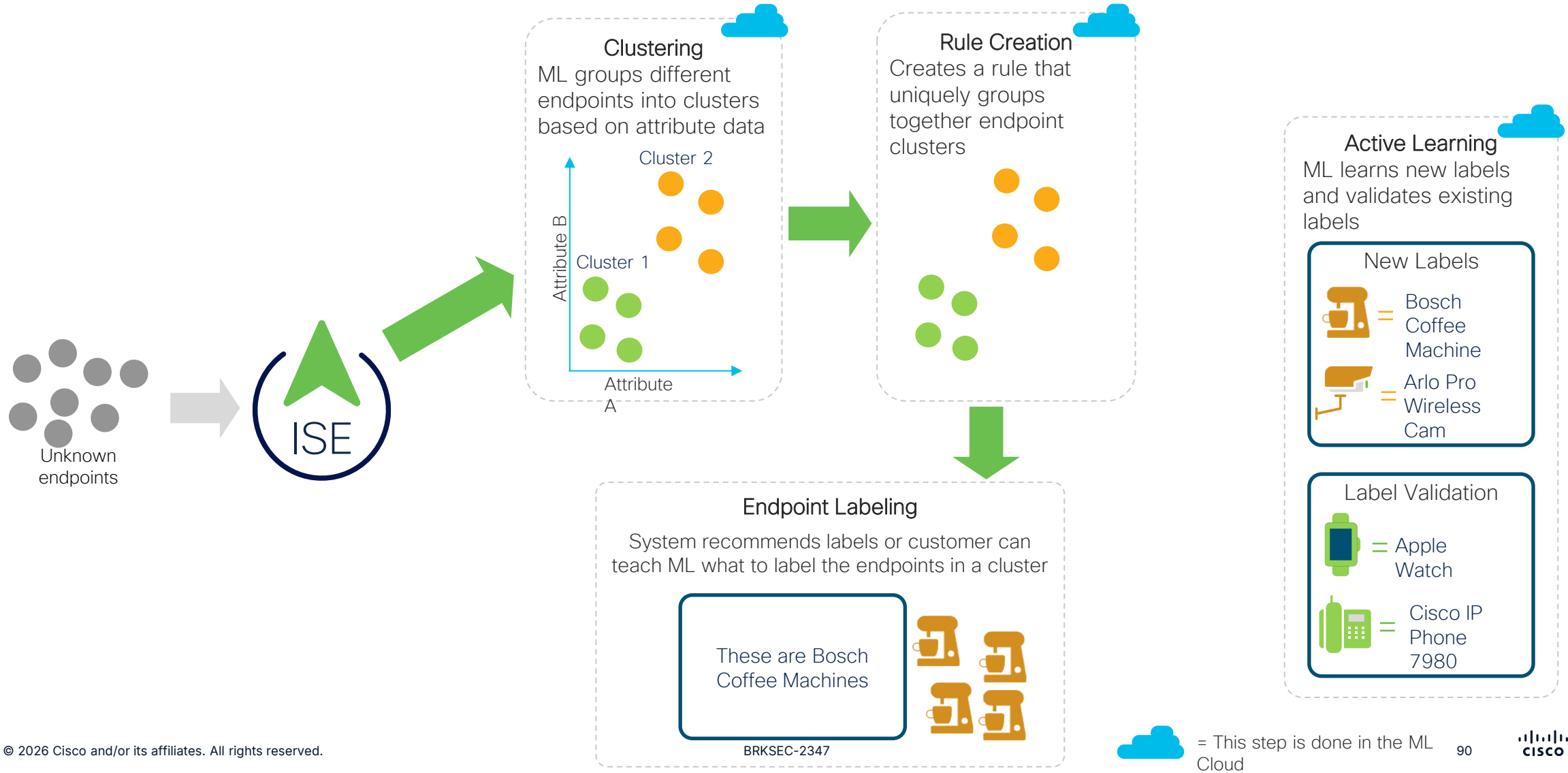
For your reference only

- OUI
- FQDN
- DHCP client-identifier
- DHCP class-identifier
- DHCP parameter-request-list
- DHCP host-name
- AD host-exists
- AD operating-system
- HTTP User-Agent
- CDP Cache Platform
- CDP System Name
- LLDP System Name
- LLDP System Description
- SNMP information

# Cisco AI Analytics



# Cisco AI Endpoint Analytics



# AI Endpoint Analytics on ISE

# Integrations

# Platform Exchange Grid (pxGrid)

- Open and scalable Security Product Integration Framework (SPIF) that allows for bi-directional any-to-any partner platform integration
- Introduced in ISE 1.3
- Integrations with 100+ Cisco and non-Cisco products
- Reduces silos by integrating your security architecture together to share context, respond to threats, and ingest information
- Tons of guides on integrations at cs.co/ise-guides
  - But also check out developer.cisco.com/site/pxgrid

# On-Prem pxGrid Integration

1. Both ISE and the pxGrid Client need to have an identity (pxGrid) certificate issued from a Root CA the other trusts. Note: Certificate EKU must have Client and Server Authentication


2. The pxGrid client is configured with the IP addresses of ISE's pxGrid nodes

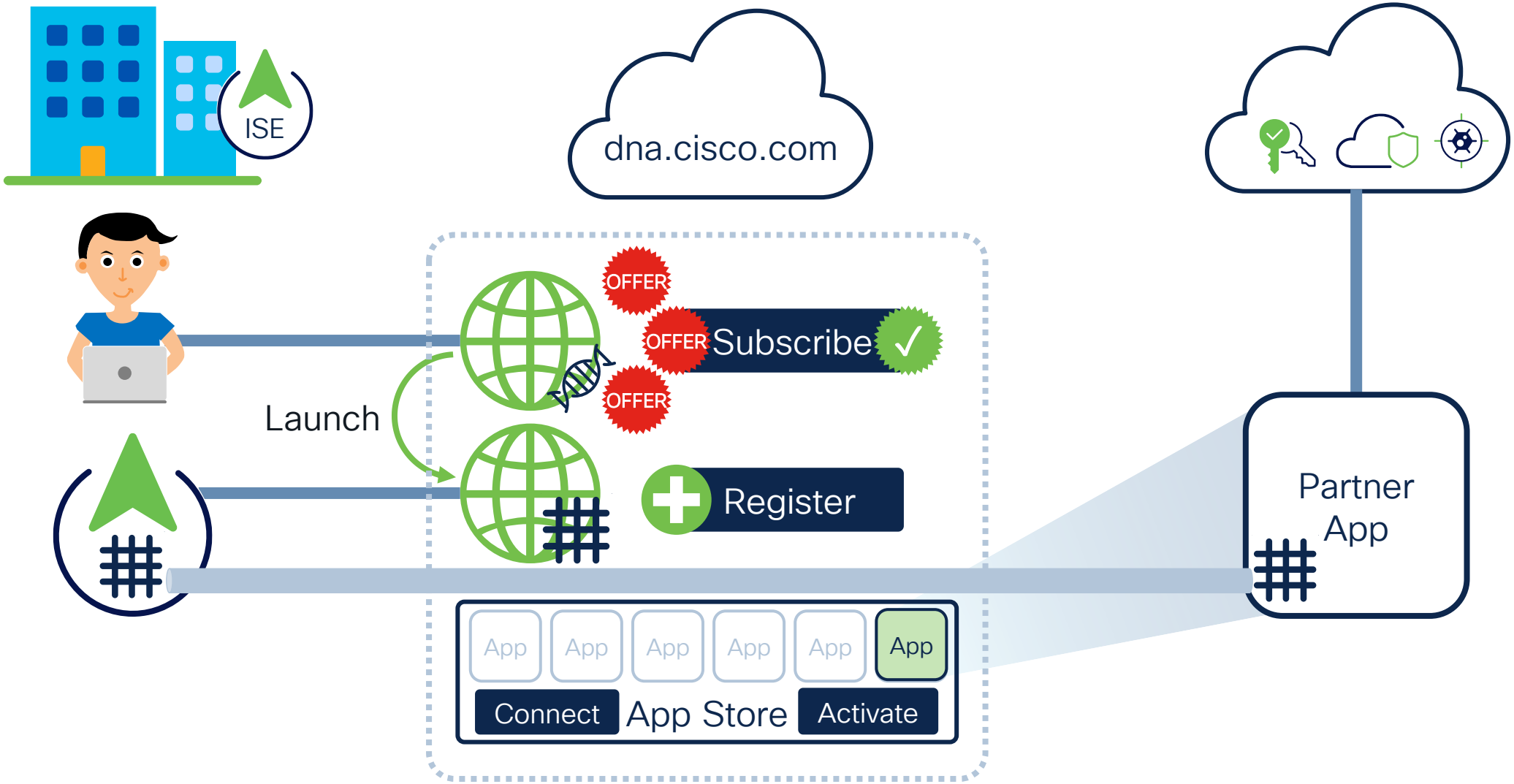
3. The pxGrid initiates the connection to ISE and authenticates itself with it's identity (pxGrid) certificate


4. ISE will authenticate itself back to the client with its own pxGrid certificate

5. ISE should now list the pxGrid client in the pxGrid dashboard and share session context with the client by default. In the pxGrid dashboard, this client can also be assigned additional permissions by being added pxGrid groups such as ANC

Note: Password-based pxGrid authentication is available but rarely used

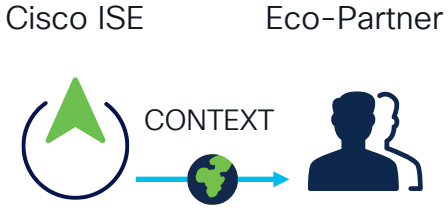
# pxGrid Cloud Integration



# Context Sharing with pxGrid

Eco system partnership to enrich, exchange context and enact

## Context to Partner

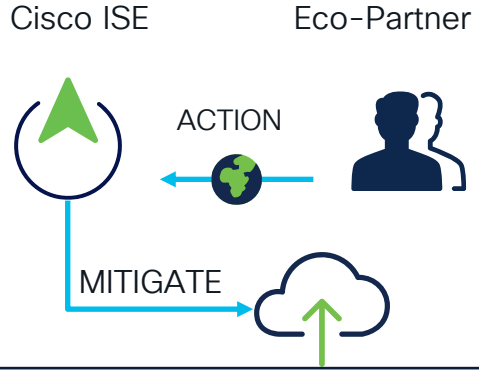



ISE makes Customer IT Platforms User/Identity, Device and Network Aware

## Enrich ISE Context

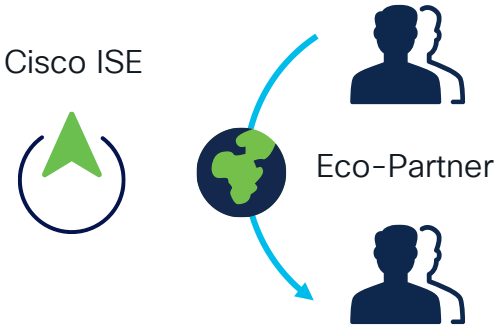

Enrich ISE context. Make ISE a better Policy Enforcement Platform

## Threat Mitigation




Enforce dynamic policies into the network based on Partner's request

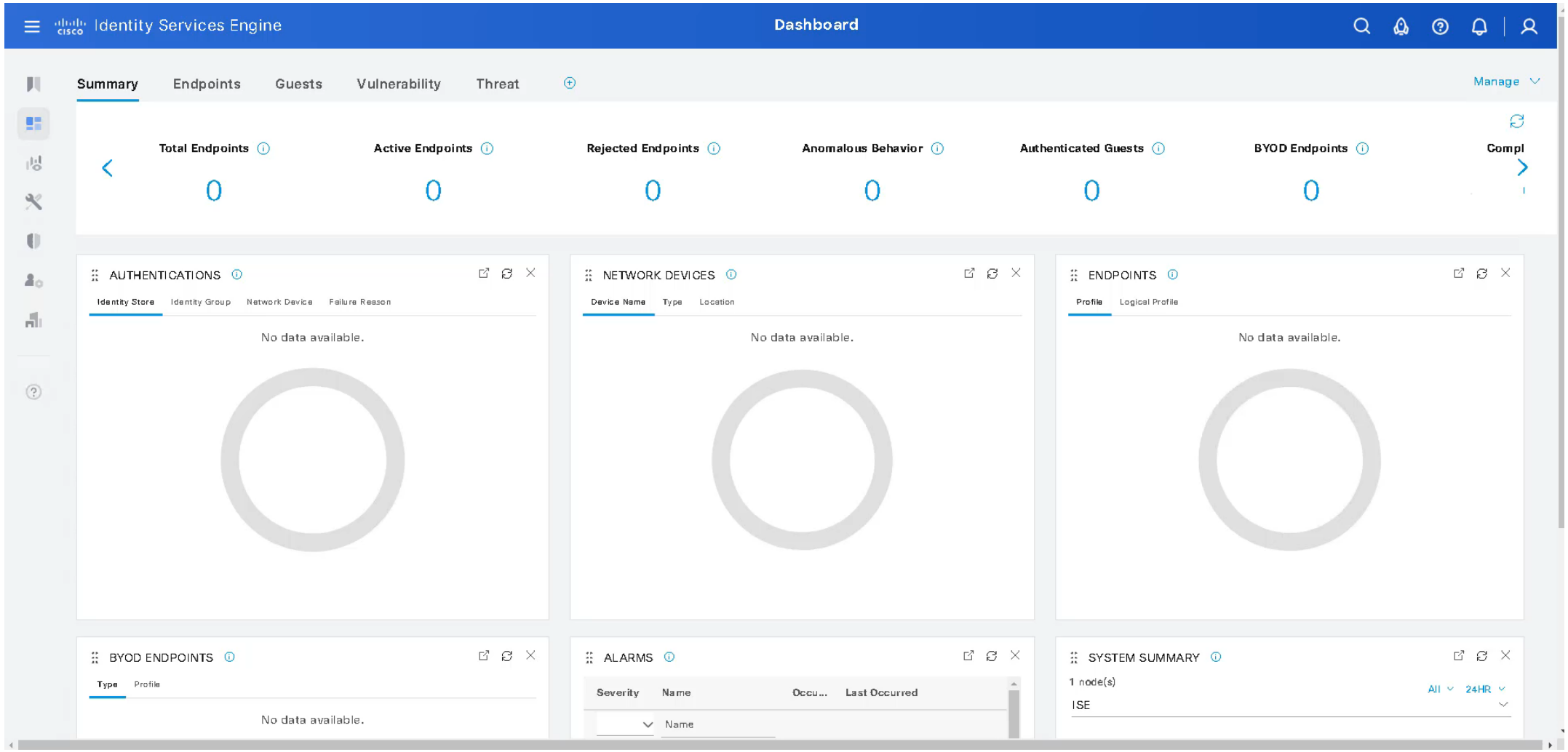
## Context Brokerage




ISE 2.2+

ISE brokers Customer's IT platforms to share data amongst themselves

# pxGrid/ANC Policies in ISE



# Other pxGrid Use Case Examples

- Secure Firewall
  - Share IP-to-Username binding, SGT, and profile information with Secure Firepower
  - Create ACPs in Firepower based on profile, identity/AD Group, and SGT
  - Quarantine endpoints from ISE based on detections from Secure Firewall
- Secure Network Analytics (SNA)
  - Shares IP-to-Username binding, SGT, and profile information with SNA
  - Create network-based detection policies in SNA that will quarantine or change access endpoint access level through ISE
- And much more...

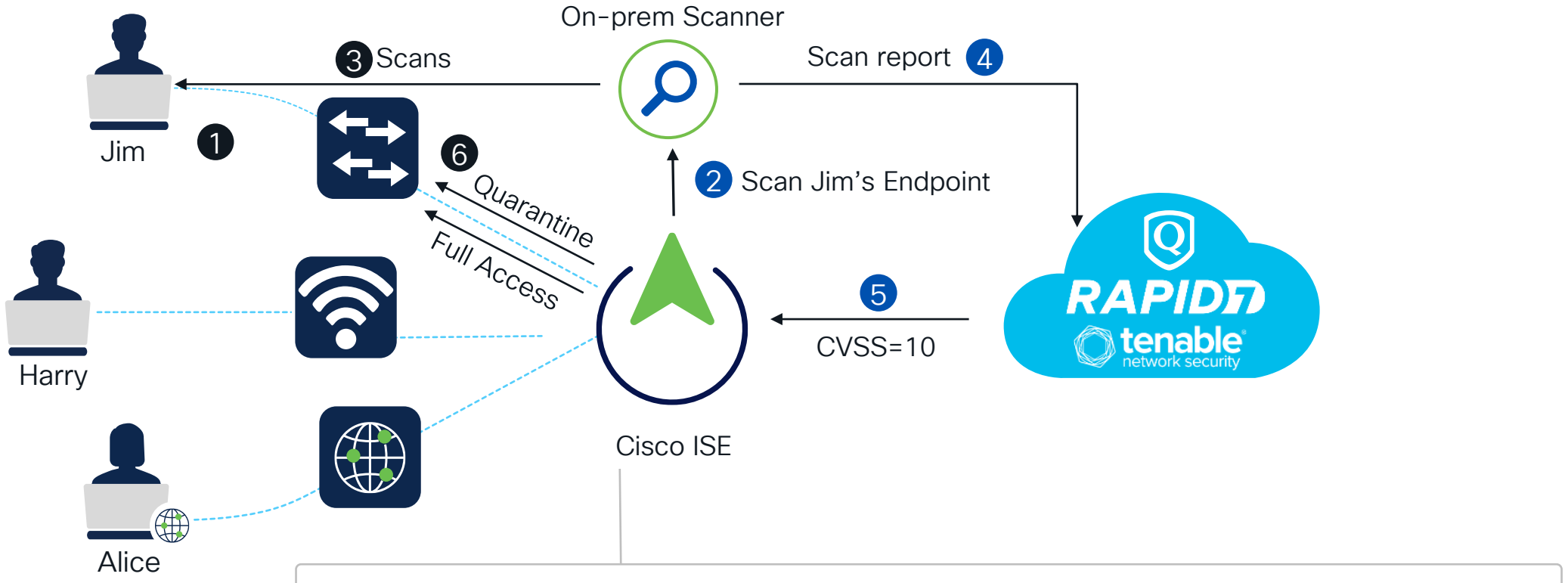
# pxGrid Integration Tips

- Start with integrating to share context out:
  - Gives information to a pxGrid  subscriber such as username-to-IP binding, profile, SGT, etc
- (Optional) Migrated data in for richer profiling:
  - Custom third party attributes don’t build the profiles themselves
  - Will still need to build profiles
  - Leverage AI Analytics to help
- Rapid Threat Containment:
  - Automates the change of access based on a trigger from a pxGrid subscriber
  - Start with the “low hanging fruit” – Don’t need to quarantine everything

# Threat-Centric NAC (TC-NAC)

- Integrates with third-party vulnerability scanners such as Qualys, Rapid7, and Tenable
  - Trigger an endpoint scan
  - Ingest vulnerability information into ISE
- Integrates with Cisco Secure Endpoint and Cognitive Threat Analytics
  - Ingests threat information about an endpoint
- Contextual information stored under endpoint attributes as well as Context Visibility dashboards to see overview of the data

# Vulnerability Assessment with Threat-Centric NAC



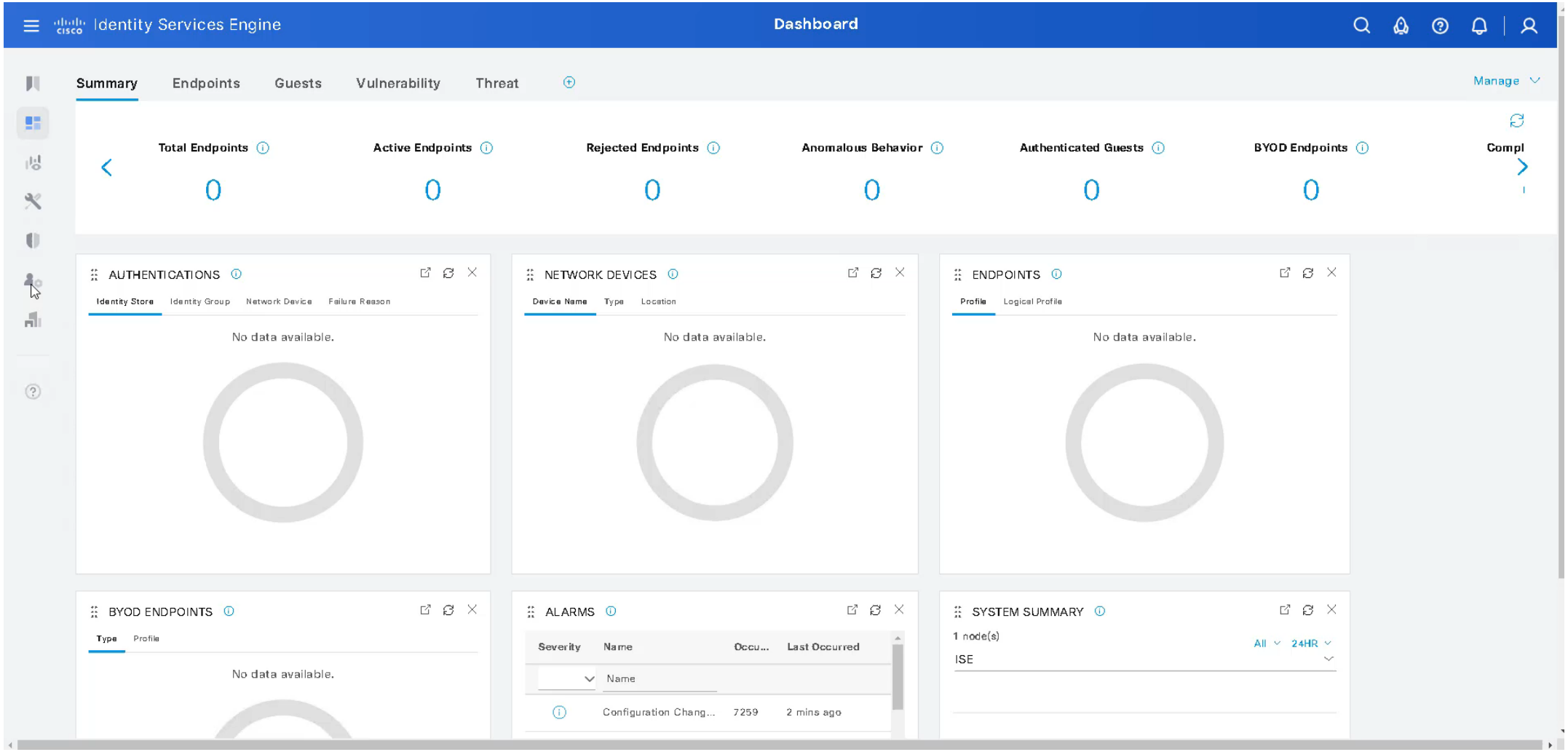

CVSS: Common Vulnerability Scoring System

# MDM Integrations

- Integrates with many third-party MDM vendors
- Onboard endpoints to MDM through ISE
- Control and visibility into non-corporate and mobile devices
- MDM posture checks in ISE authorization rules

| Name | Internal Name | Description |
|---|---|---|
| DaysSinceLastCheckin | days_since_lastc... | Number of days since last checkin |
| DeviceCompliantStatus | compliant_status | Compliant Status of device on MDM |
| DeviceRegisterStatus | register_status | Status of device registration on MDM |
| DiskEncryptionStatus | disk_encryption_on | Device disk encryption on MDM |
| IMEI | imei | IMEI |
| JailBrokenStatus | jail_broken | Is device jail broken |
| Manufacturer | manufacturer | Manufacturer name |
| MDMFailureReason | mdm_failure_reas... | Reason for MDM Server connection failure |
| MDMServerName | mdmServerName | MDM server name |
| MDMServerReachable | MDMserverReach... | MDM server reachability |
| MEID | meid | MEID |
| Model | model | Device model |
| OsVersion | os_version | Device Operating System |
| PhoneNumber | phone_number | Phone number |
| PinLockStatus | pin_lock_on | Device Pin lock status |
| SerialNumber | serial_number | Device serial number |
| ServerType | server_type | Type of device management server |
| UDID | udid | UDID |
| UserNotified | user_notified | Has the user been notified |

# MDM Integration Example

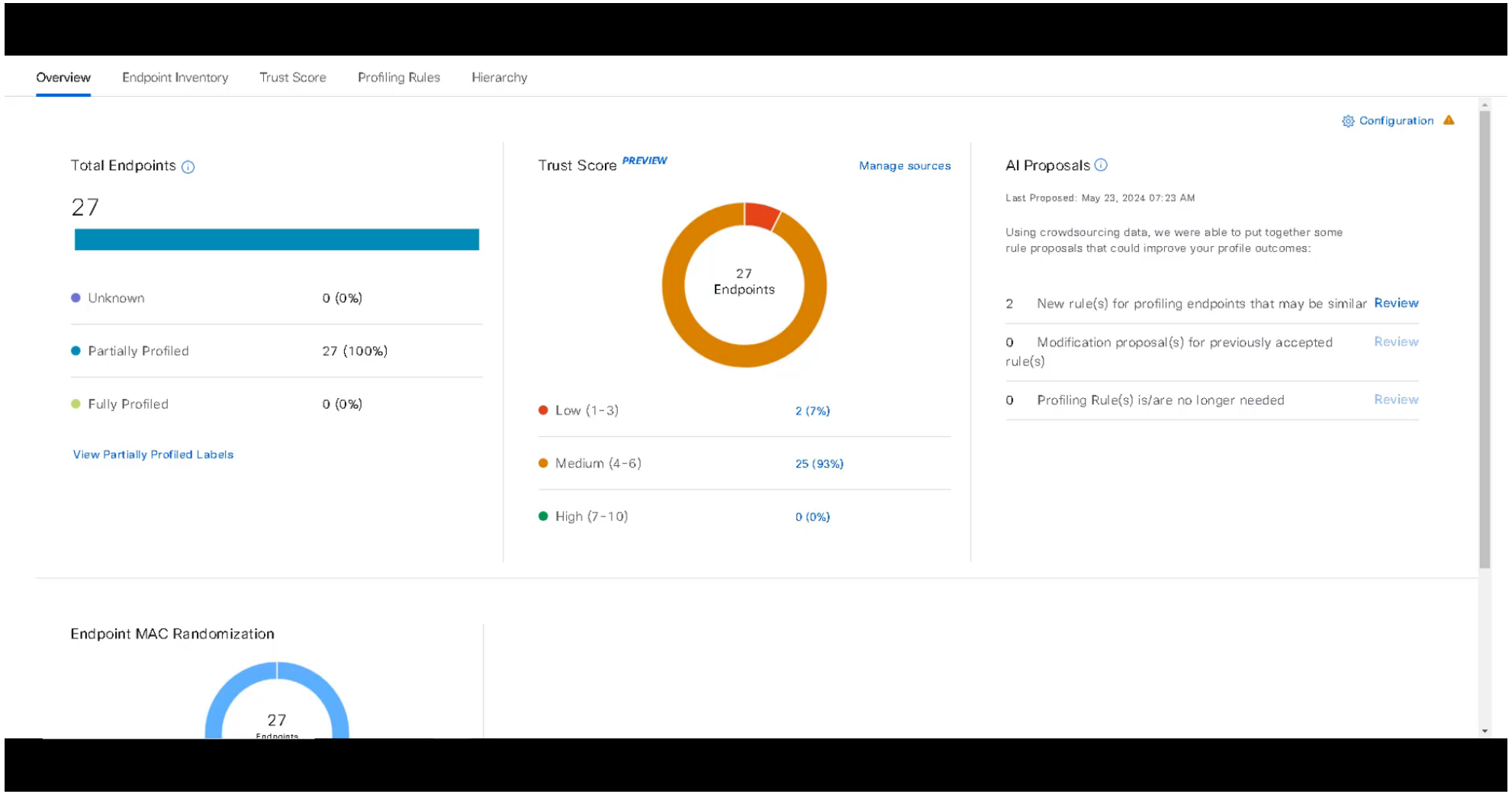


# ISE APIs and Automation

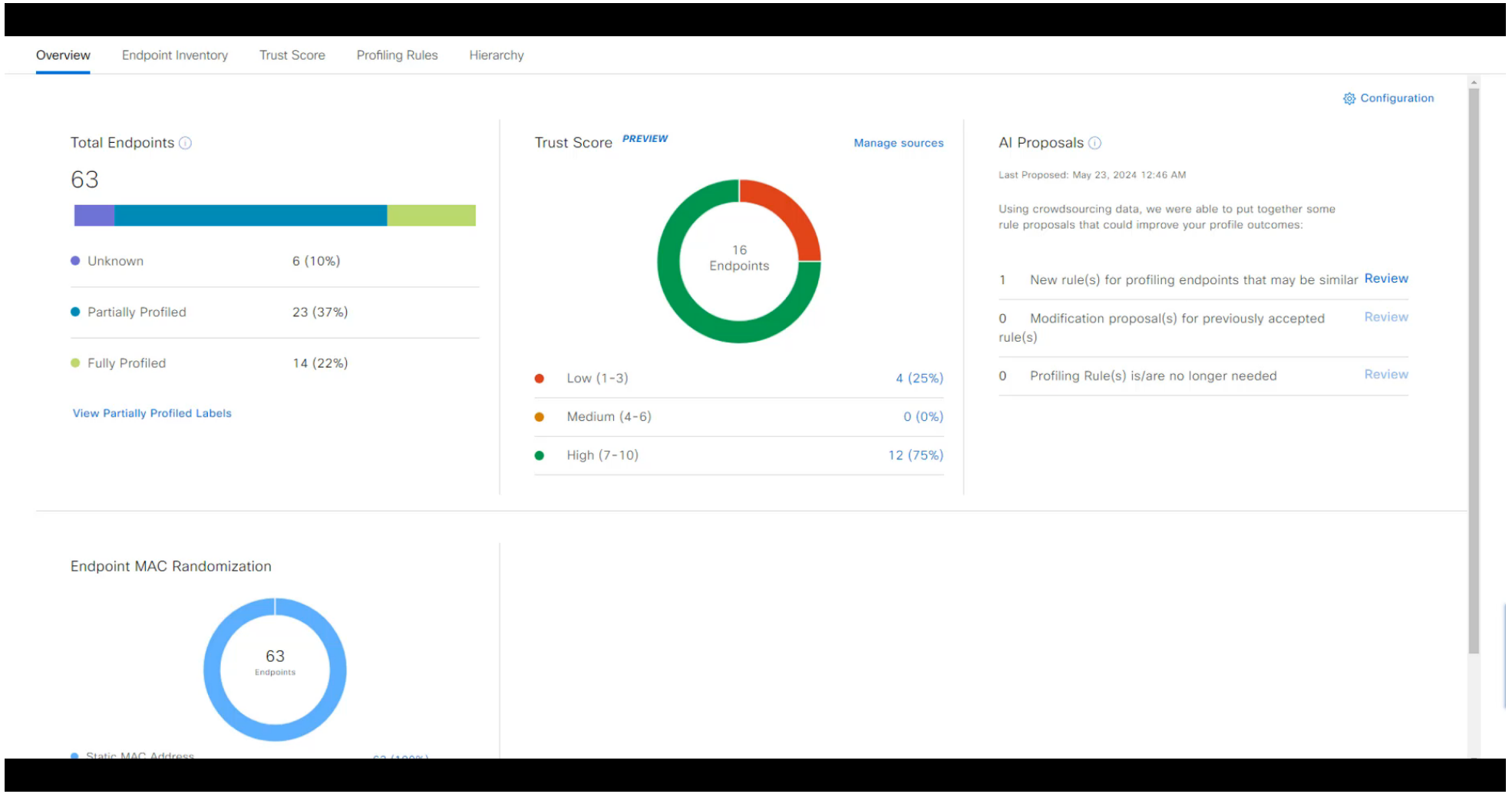
# Integration Example: Catalyst Center and ISE

- Catalyst Center supercharges AI Analytics
  - Granular profile recommendations utilizing telemetry and DPI
- Zero trust: Trust Score
  - Score based on:
    - Change in profile label
    - Traffic pattern anomaly
    - Unauthorized ports and weak credentials
    - and more
  - Quarantine low scoring endpoints via ISE integration
- Configure Trustsec SGACLs and policy utilizing historic traffic patterns

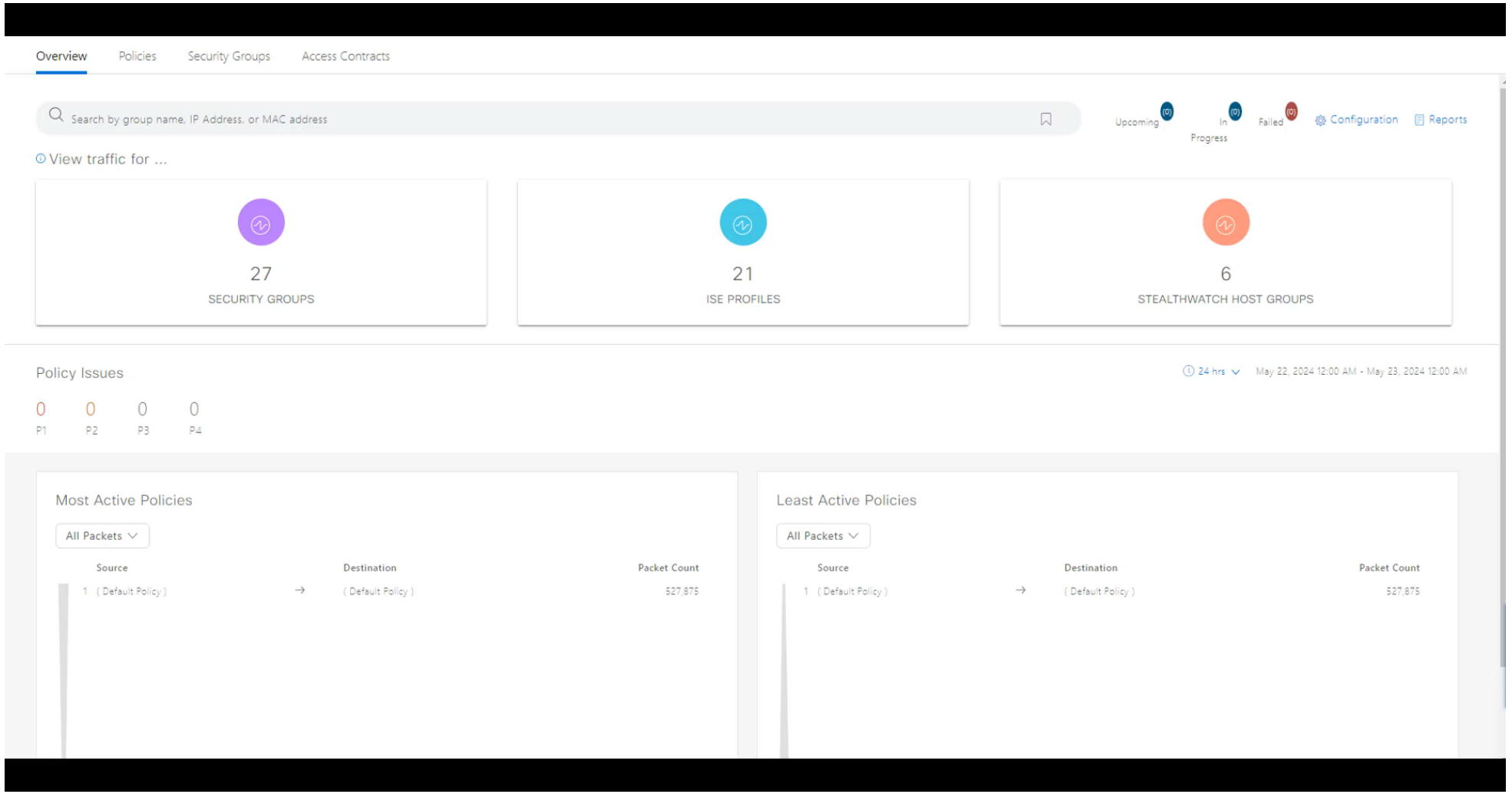
# Catalyst Center Trust Score and Spoofing Detection



# Catalyst Center AI Endpoint Telemetry



# TrustSec Policies with Catalyst Center Integration



# Post-Deployment

# Supporting your ISE Deployment

- Document, Document Document!
  - Policy Configuration
  - Supplicant Configuration
  - Certificate Information
  - Network Access Devices
  - Network Access Device Configuration
- Standardize above Configurations

# Supporting your ISE Deployment

- ISE Version
  - Patch Regularly
    - If possible, wait until patch is 1-2 weeks old
  - Upgrade when necessary
    - End of Support
    - Necessary feature
    - Preferably upgrade to gold star
- Backup Schedule
  - Operational Backup – Occasionally
  - Configuration Backup - Regularly

# Supporting your ISE Deployment

- Utilized built-in ISE roles for Helpdesk, NOC, etc
- Train your support
  - Avoid being called for every issue
  - Playbook for common issues for:
    - NOC
    - Helpdesk
- Know the tools you have to troubleshoot and monitor your deployment
  - Create your playbook for your support with these tools
  - Hidden Troubleshooting slides in this presentation for the playbook

# Troubleshooting Endpoint Issues

- ISE –
  - **Operations>RADIUS>Live Logs** - Click the Details for the failed authentication
  - **Operations>Troubleshooting> Diagnostic Tools>Endpoint Debug** – Add MAC address and start debug
- Endpoint –
  - Check the supplicant configuration for the endpoint
  - Check that all necessary certificates are installed on the endpoint
  - Check the OS version
  - Check if User, Computer or User and Computer authentication is picked
  - For wired access, ensure that the Wired AutoConfig service is turned on
  - Check if endpoint is joined to AD domain or BYOD onboarded

# Troubleshooting Network Access Device Issues

- ISE –
  - **Administration>Network Resources>Network Devices** – Check to see if NAD exists and shared secret
  - **Operations>RADIUS>Live Logs** – Check to see alerts for Misconfigured Network Devices and RADIUS drops
- Network Access Device –
  - Check OS version/model - Are similar NADs working with same OS/model?
  - Check configuration – Is it running the same template as others with same OS/model?
  - Are only some endpoints on the device failing? Check to see if CoA is working
  - Debug commands
  - RADIUS/TACACS source interface defined?

# Debugging Switches for ISE/CTS Issues

For your reference only

General CTS:

- **debug cts all**
- **debug cts condition level detail**
- **debug cts messages**
- **debug cts packets**

PAC Failure:

- **debug cts provision events**
- **debug cts provision packet**
- **debug cts ifc events**

AAA:

- **debug radius**
- **debug radius all**
- **debug cts aaa**
- **debug cts ifc events**
- **debug eap events**
- **debug eap errors**
- **debug authen event**
- **debug authen error**
- **debug dot1x all**
- **debug authen feature all**
- **debug mab all**

CTS Auth

- **debug cts authen details**
- **debug cts auth**
- **debug dot1x events**
- **debug dot1x packets**
- **debug dot1x errors**
- **debug cts ifc events**

CTS Policy dnload:

- **debug cts author event**
- **debug cts author**
- **debug cts author aaa**
- **debug cts aaa**
- **debug cts ifc events**

# Debugging Switches for ISE/CTS Issues

For your reference only

CTS Policy Install:

- **debug cts author event**
- **debug cts autho**
- **debug cts author aaa**
- **debug cts author rbacl**
- **debug rbm**
- **debug rbm policy**
- **debug rbm binding**
- **debug rbm api**
- **debug rbm platform**
- **debug cts ifc events**

CTS Env Data:

- **debug cts environment-data all**
- **debug cts env**
- **debug cts aaa**
- **debug radius**
- **debug cts ifc events**
- **debug cts authe**
- **debug cts autho**

CTS L3IF & Mapping:

- **debug rbm bindings**
- **debug cts ifc events**
- **debug cts sgt-map**

CTS SAP:

- **debug cts sap events**
- **debug cts ifc events**
- **debug cts errors**
- **debug cts sap packets**
- **debug macsec events**
- **debug cts sap pakdump**
- **debug cts dp info**
- **debug cts dp error**
- **debug macsec**
- **debug cts sap**

CTS Cache:

- **debug cts ifc events**
- **debug cts cache**

# Debugging Switches for ISE/CTS Issues

For your reference only

CTS HW Path:

- **debug platform cts dp api**
- **debug platform cts dp event**
- **debug platform cts dp error**
- **debug platform cts dp redundancy**

CTS HA/Sync:

- **debug cts ha core**
- **debug cts ha config**
- **debug cts ha infra**
- **debug cts err**
- **debug cts ifc ev**
- **debug cts cluster**
- **debug cts ha**

CTS SGT Cache:

- **debug rbm bindings**
- **debug rbm api**
- **debug fm rbacl caching packets**
- **debug fm rbacl caching events**
- **debug fm rbacl all**
- **debug fm rbacl monitoring**
- **debug cts sgt-caching**

SXP:

- **debug cts sxp connection**
- **debug cts sxp errors**
- **debug cts sxp all**
- **debug cts sxp**
- **debug cts sxp internal**
- **debug cts sxp mdb**
- **debug cts sxp message**
- **debug ip tcp trans**
- **debug up tcp packet**

IPv6:

- **debug ipv6 snooping binding**
- **debug ipv6 snooping fsm**
- **debug epm all**
- **debug epm events session details**
- **debug epm plugin cts error**
- **debug epm plugin cts event**
- **debug rbm all**

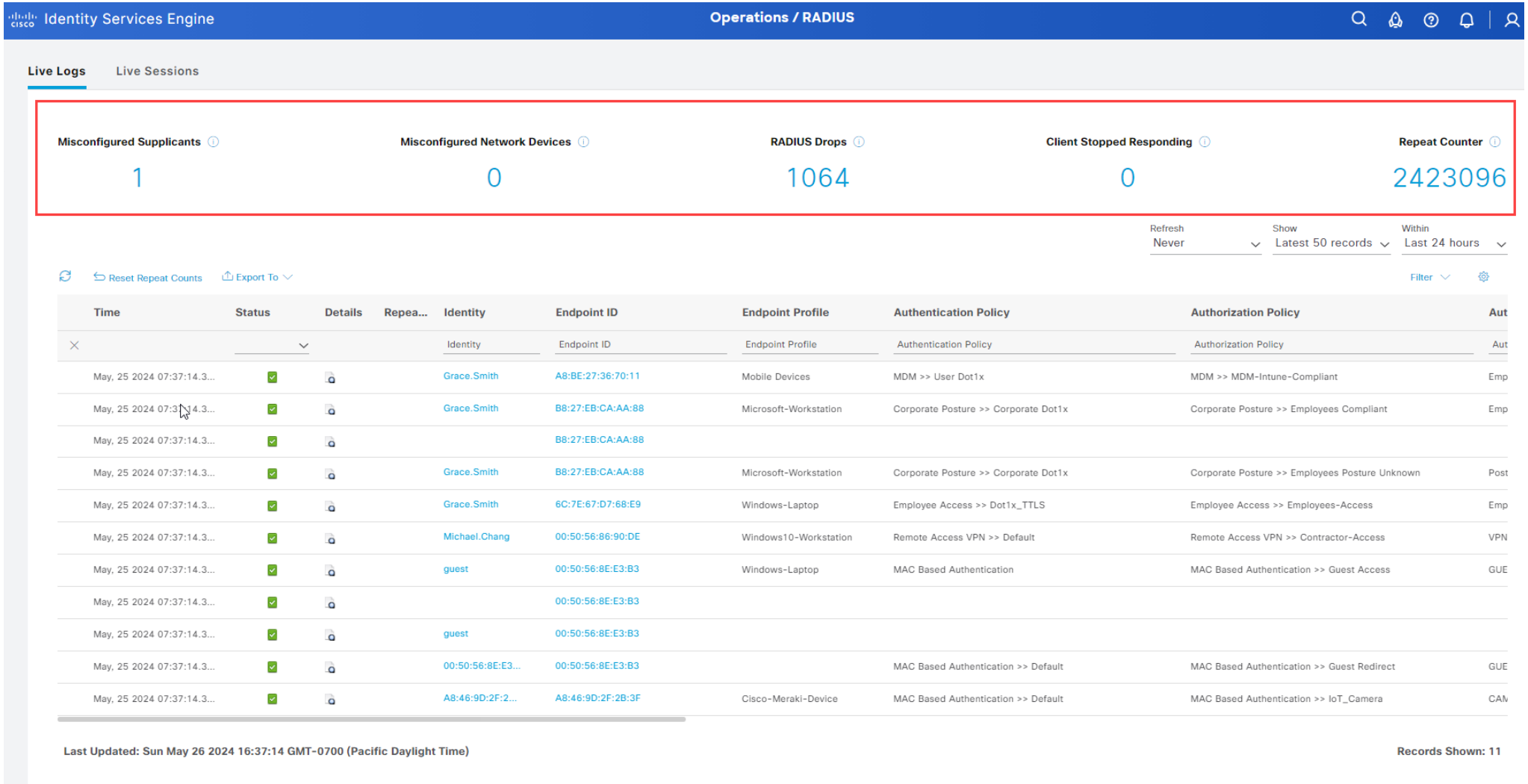
# Debugging Switches for ISE/CTS Issues

For your reference only

- CoA:
  - **debug cts coa event**
  - **debug aaa coa**
  - **debug radius dynamic-authorization**
- NX-OS Specific:
  - **show tech-support cts**
  - **show tech-support forward l3 unicast detail**
  - **show tech module <mod #>**
  - **show tech-support routing ip unicast**

# Troubleshoot Network Access Device Issues

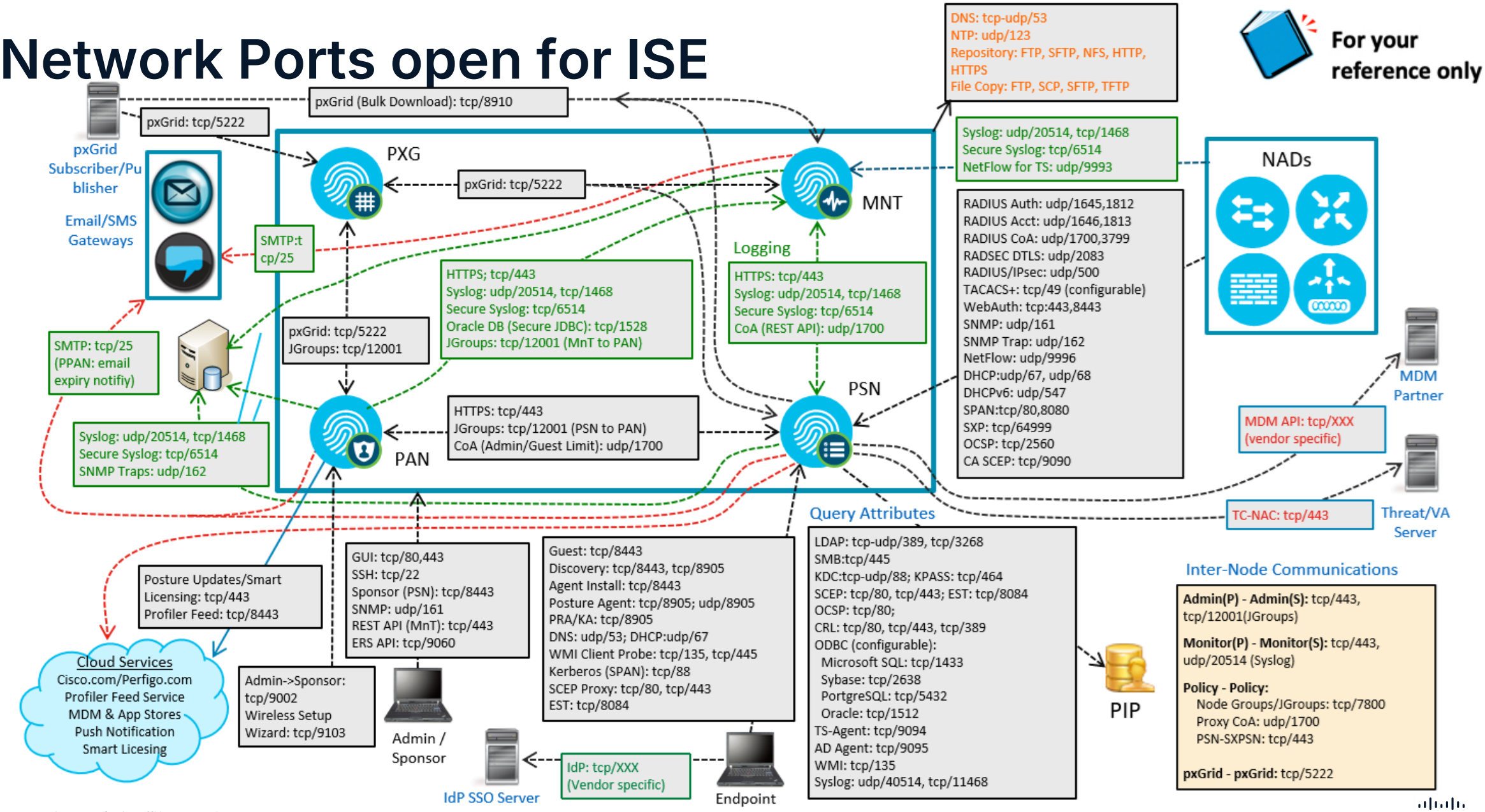
## **Operations>RADIUS>Live Logs** – Check Misconfigured Network Devices



# Troubleshooting Network Issues

- Check bandwidth utilization
- Check interfaces for dropped packets
- Check QoS – RADIUS being prioritized?
- IP connectivity
  - Traceroute
- Packet filtering?
  - To/from NAD PSNs to ISE
  - Ports allowed? 1812/UDP, 1813/UDP, 1700/UDP, etc

# Network Ports open for ISE

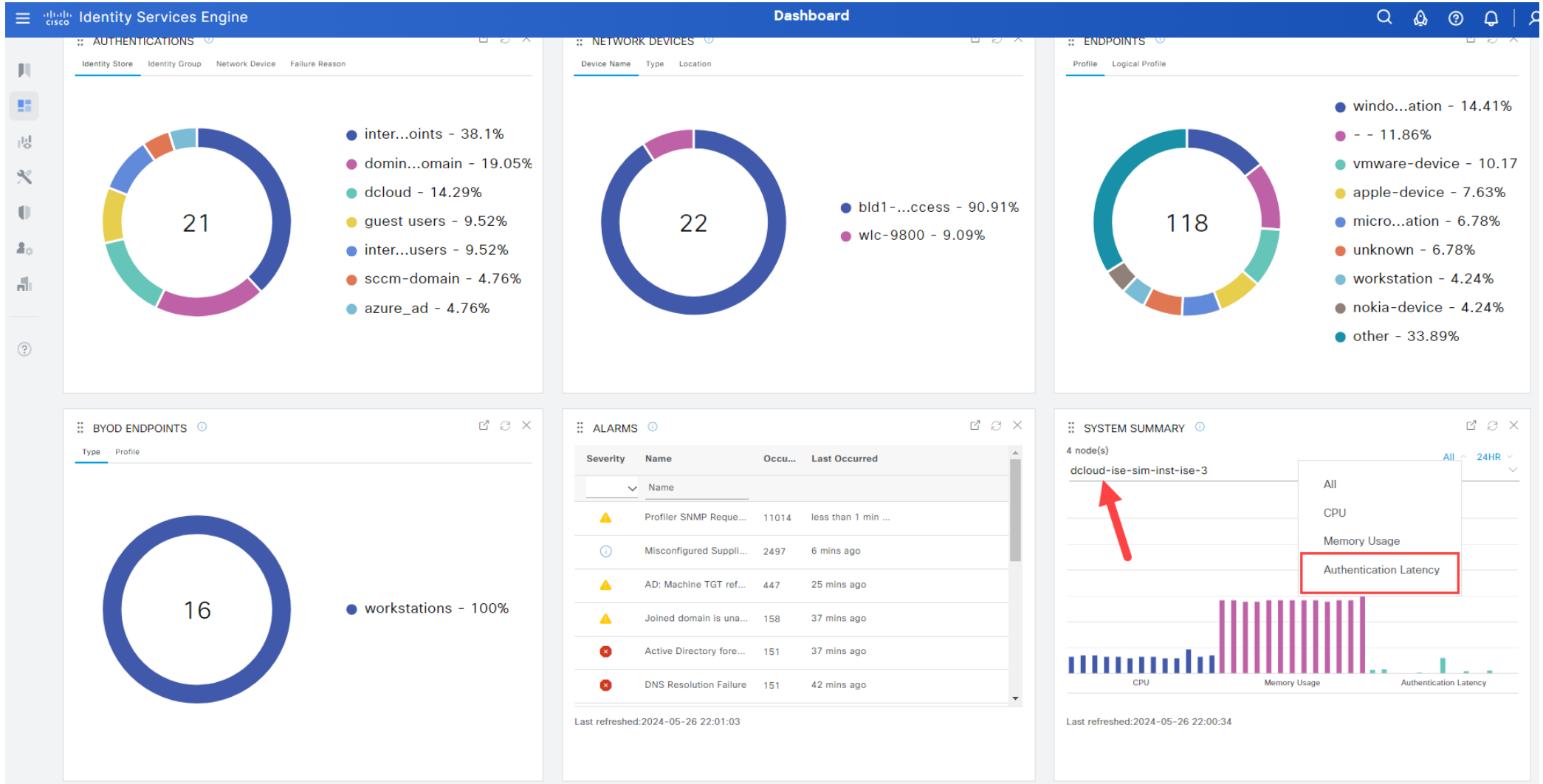


# Troubleshooting ISE Issues

- Check ISE health
  - RADIUS latency?
  - RADIUS packets on other PSNs?
  - Check load guidelines
  - ISE replication occurring?
- Certificates
  - Any expired certificates?
  - Missing trusted CAs?

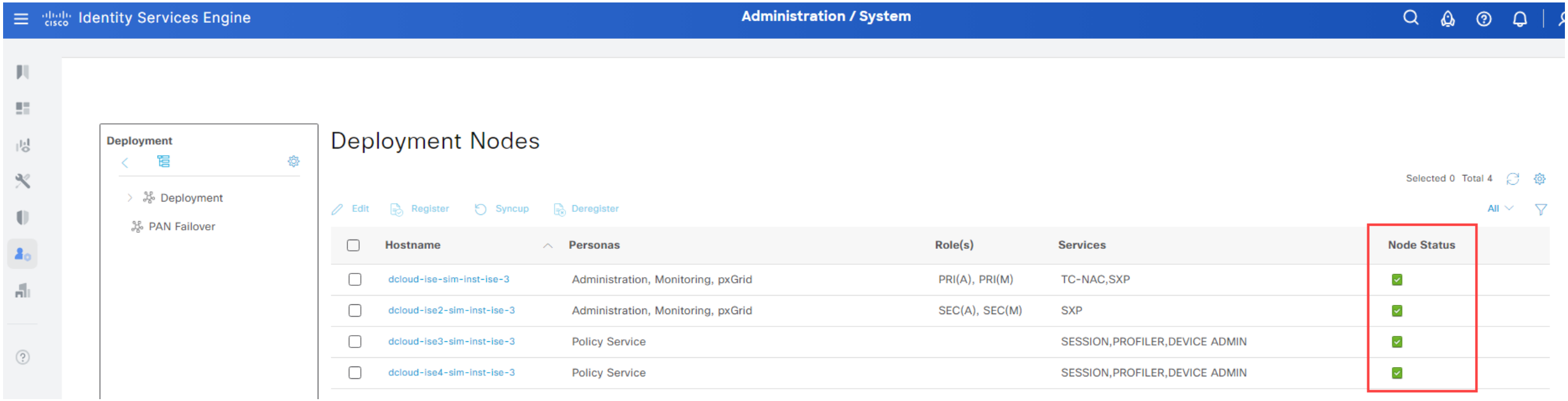
# Troubleshooting ISE Issues

## **Dashboard** – Check Authentication Latency per ISE Node



# Troubleshoot ISE Issues

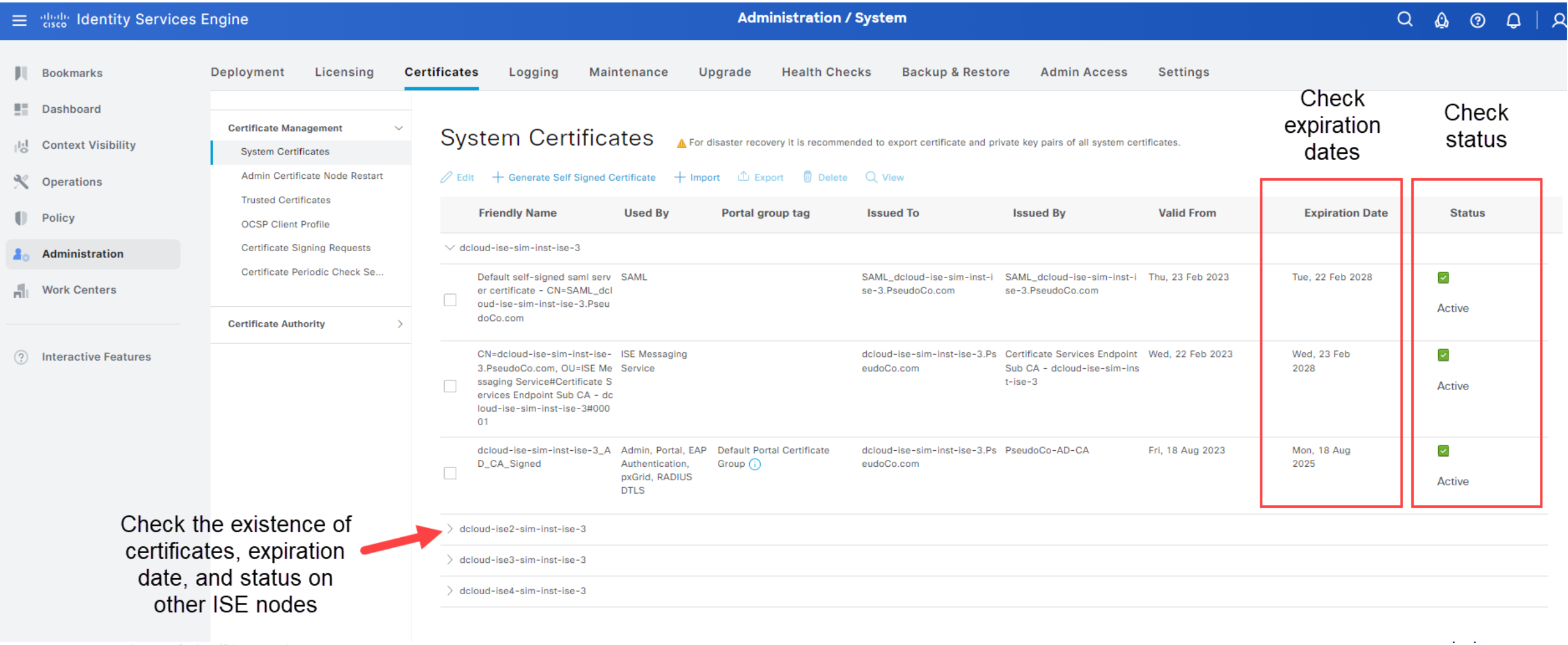
## **Administration>System Deployment** – Check Node Status for replication issues



# Troubleshooting ISE Issues

## Administration>System>Certificates>System Certificates – Check System

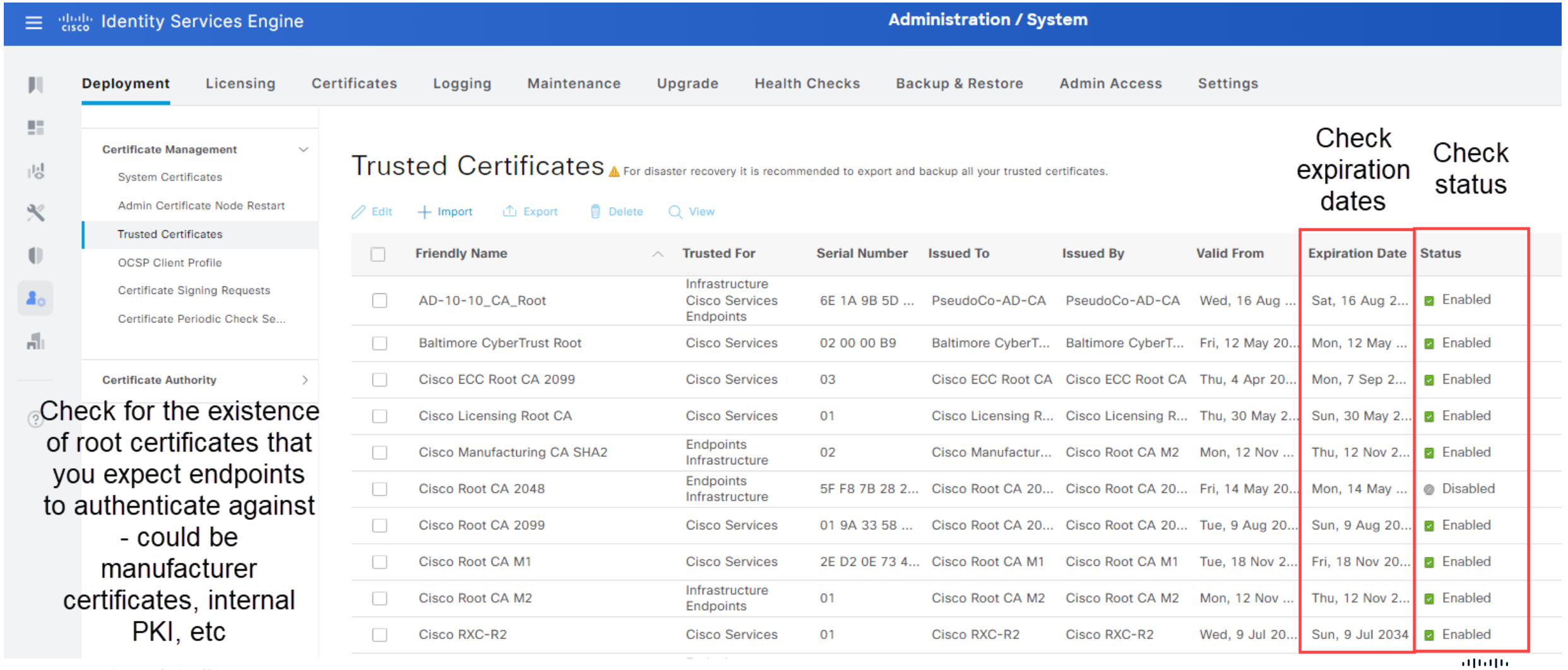
For your reference only




Check the existence of certificates, expiration date, and status on other ISE nodes

# Troubleshoot ISE Issues

## Administration>System>Certificates>Trusted Certificates – Check Trusted




Check for the existence of root certificates that you expect endpoints to authenticate against - could be manufacturer certificates, internal PKI, etc

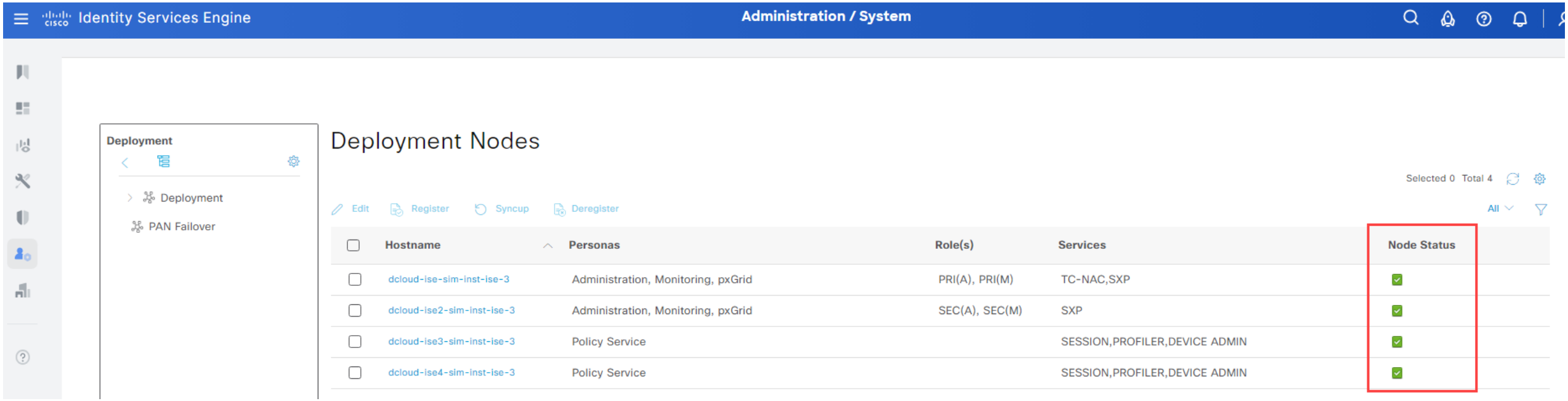
Check expiration dates

Check status

For your reference only

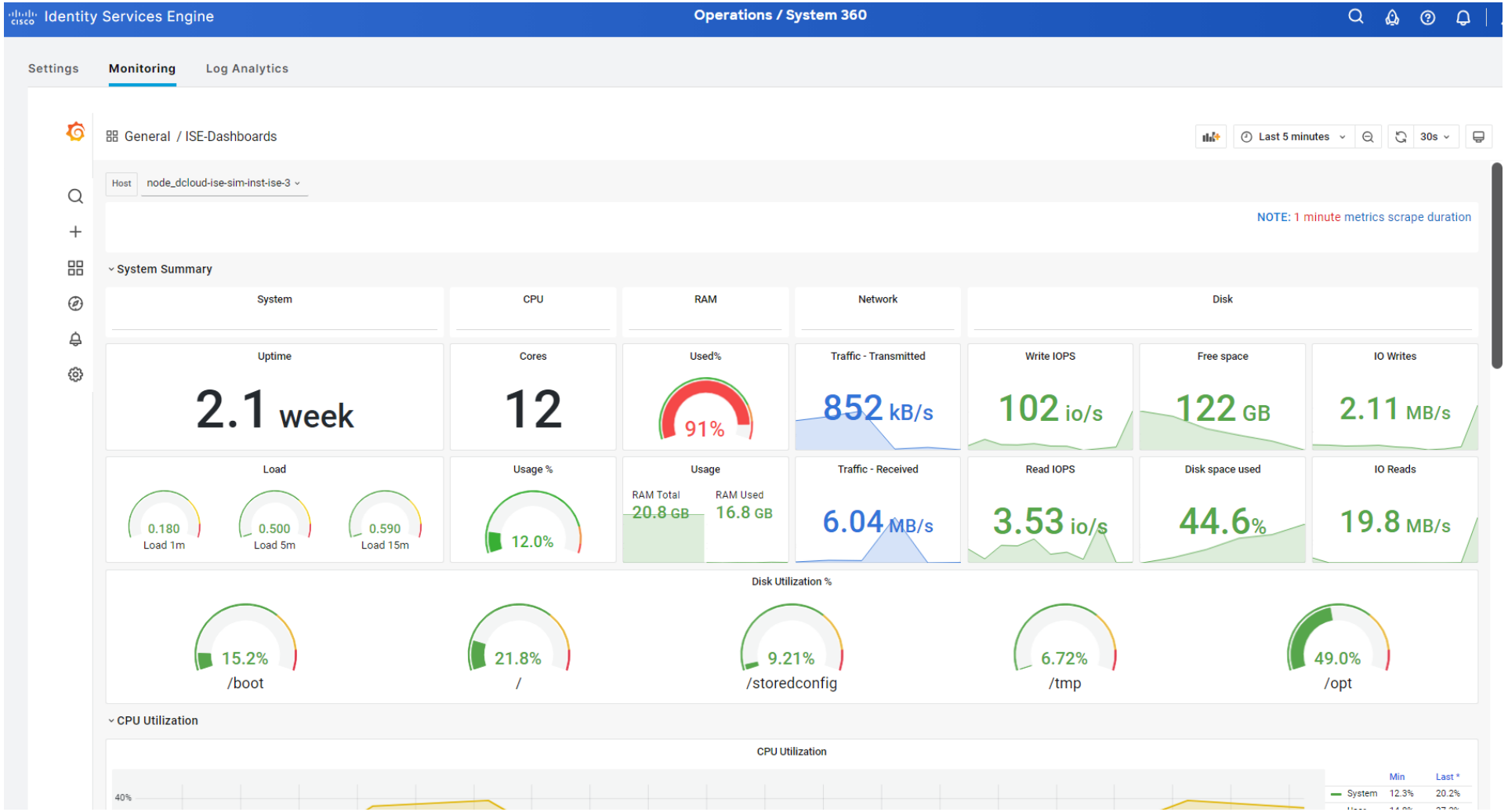
# Troubleshoot ISE Issues

## **Administration>Deployment** – Check Node Status for replication issues



# Troubleshoot ISE Issues

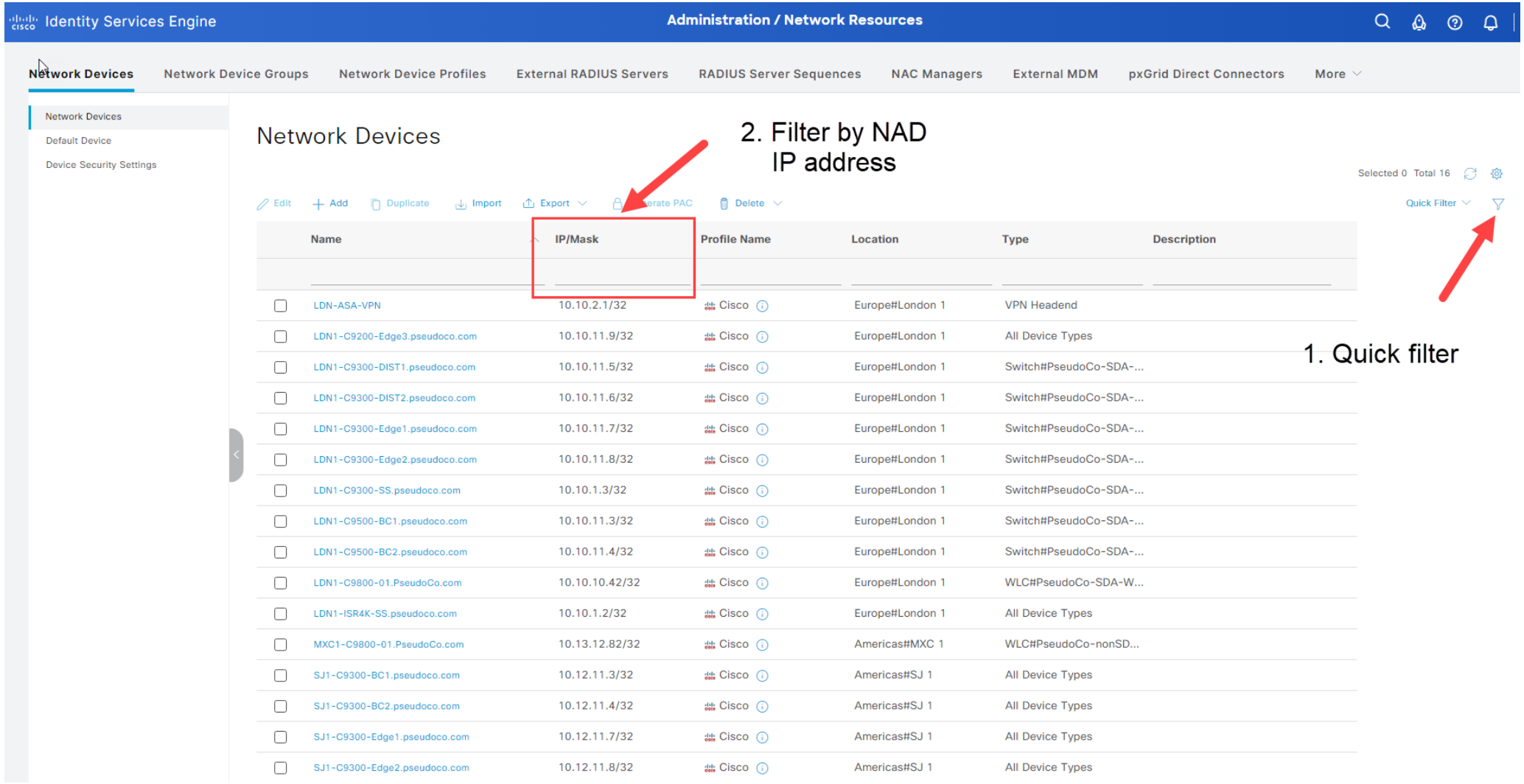
## **Operations>System 360>Monitoring** – ISE Node Health Monitoring



# Troubleshoot ISE Issues

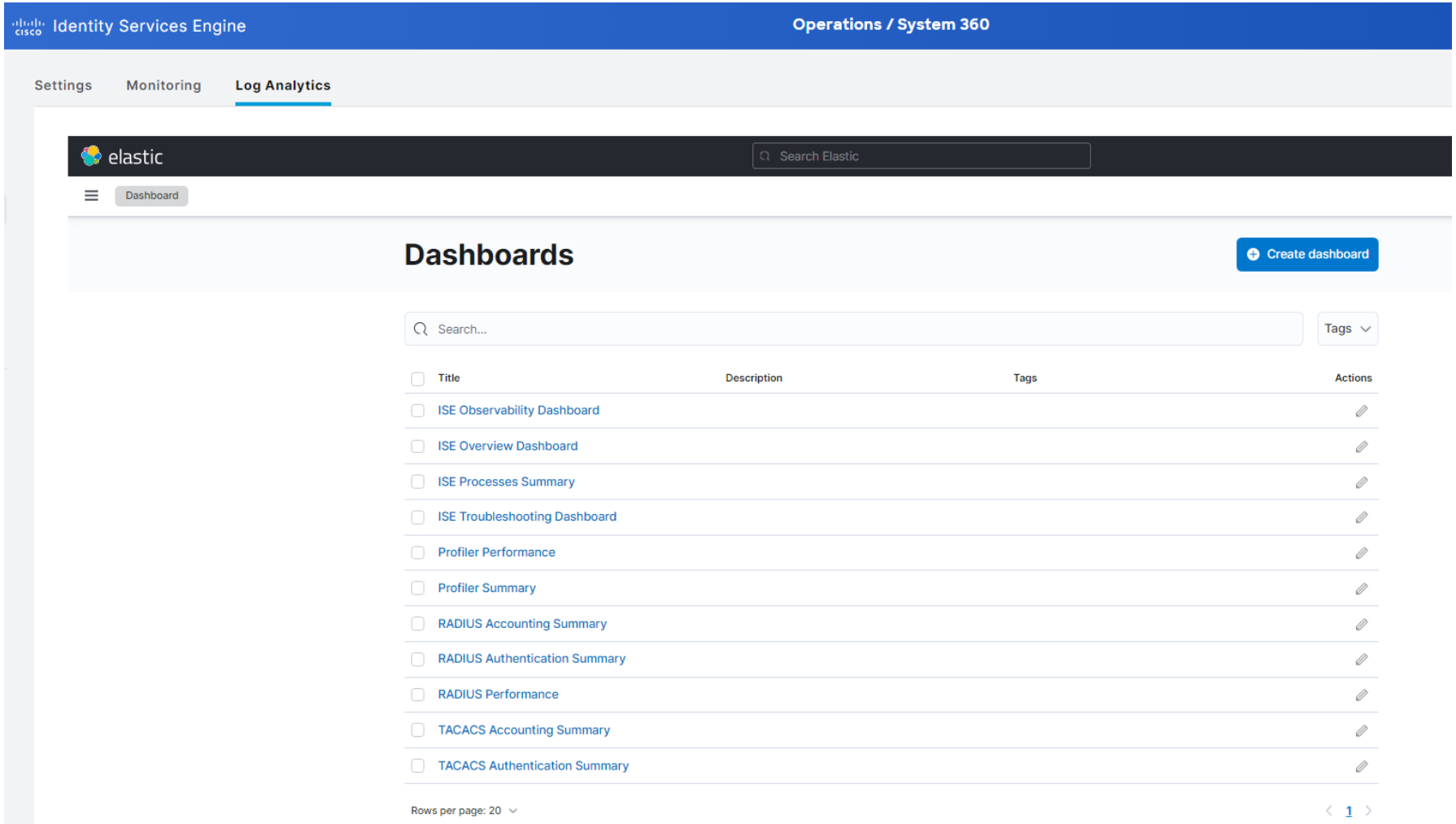
For your reference only

## Administration>Network Resources>Network Devices – Check to see if NAD exists



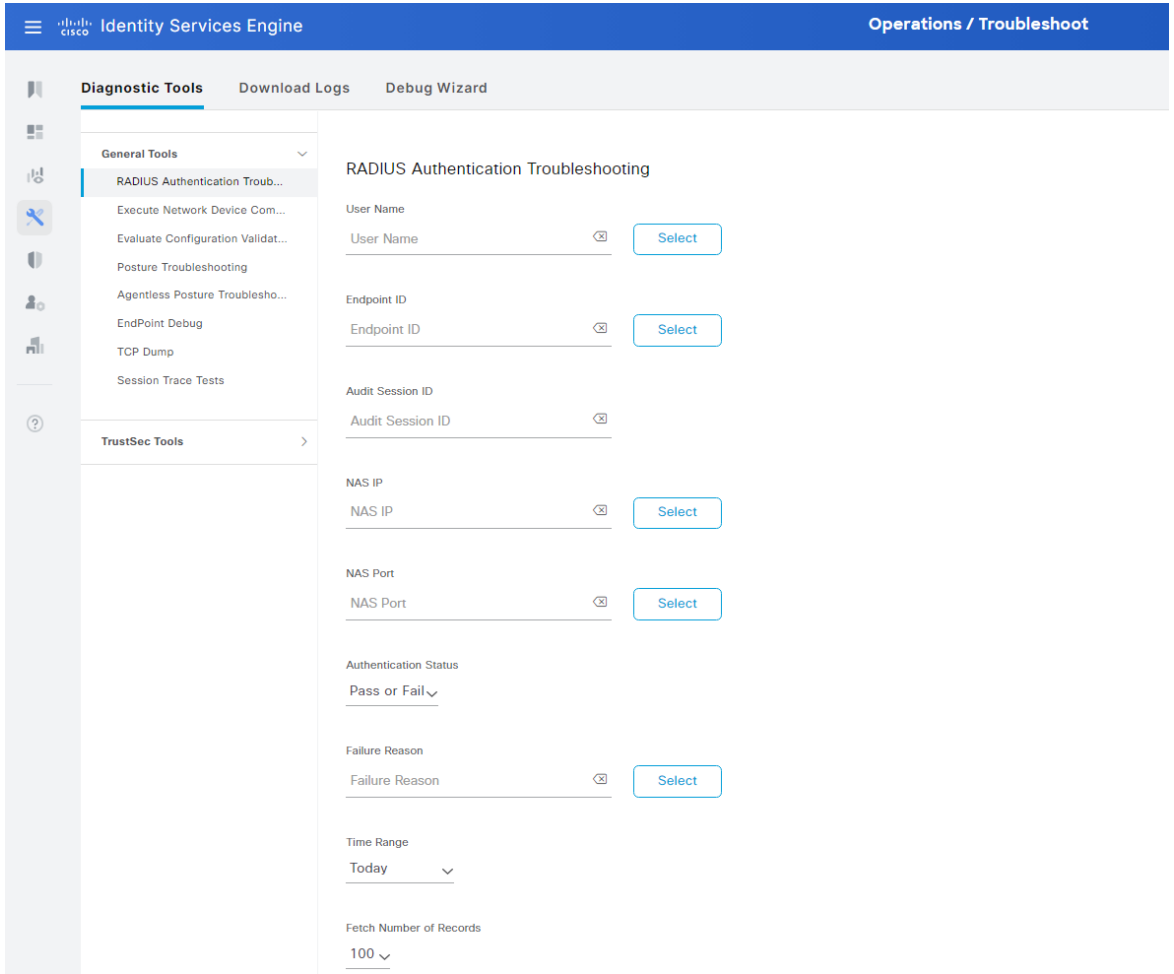
# Troubleshoot ISE Issues

## **Operations>System 360>Log Analytics** – ISE Node, RADIUS, and TACACS Health



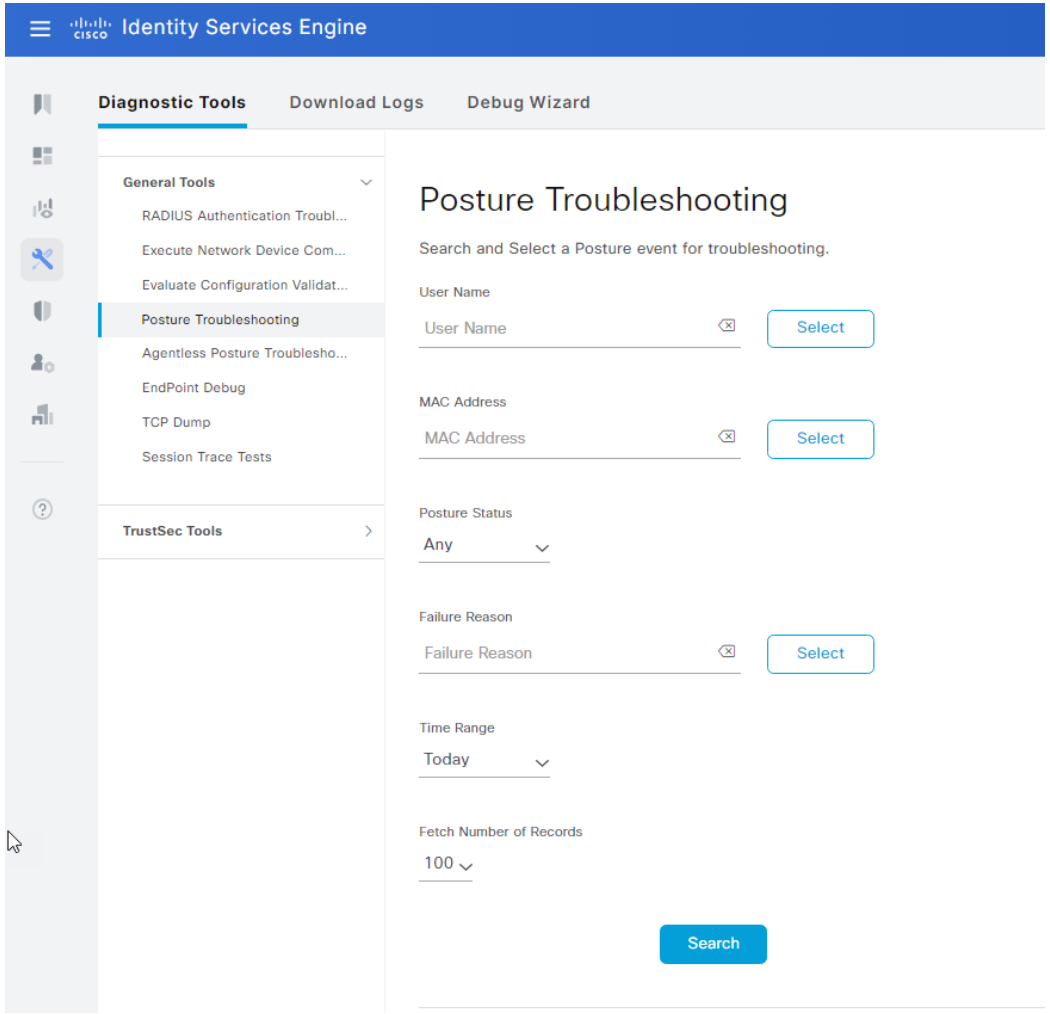
# Troubleshoot ISE Issues

## Operations>Troubleshooting>Diagnostic Tools>RADIUS Authentication Troubleshooting – Troubleshoot RADIUS Authentications



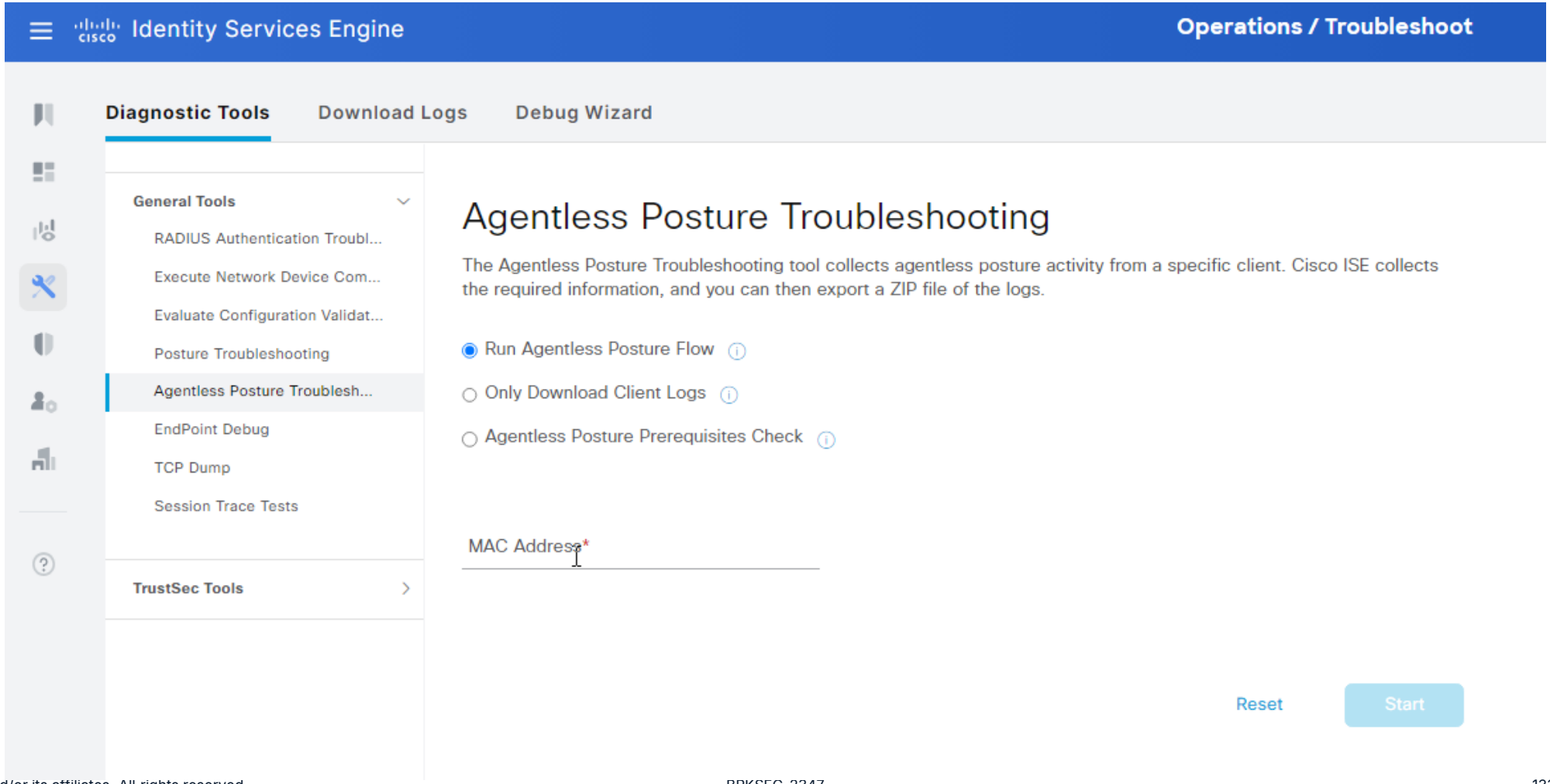
# Troubleshoot ISE Issues

## Operations>Troubleshooting>Diagnostic Tools>Posture Troubleshooting – Troubleshoot Posture Events



# Troubleshoot ISE Issues

## Operations>Troubleshooting>Diagnostic Tools>Agentless Posture Troubleshooting – Troubleshoot Agentless Posture Events

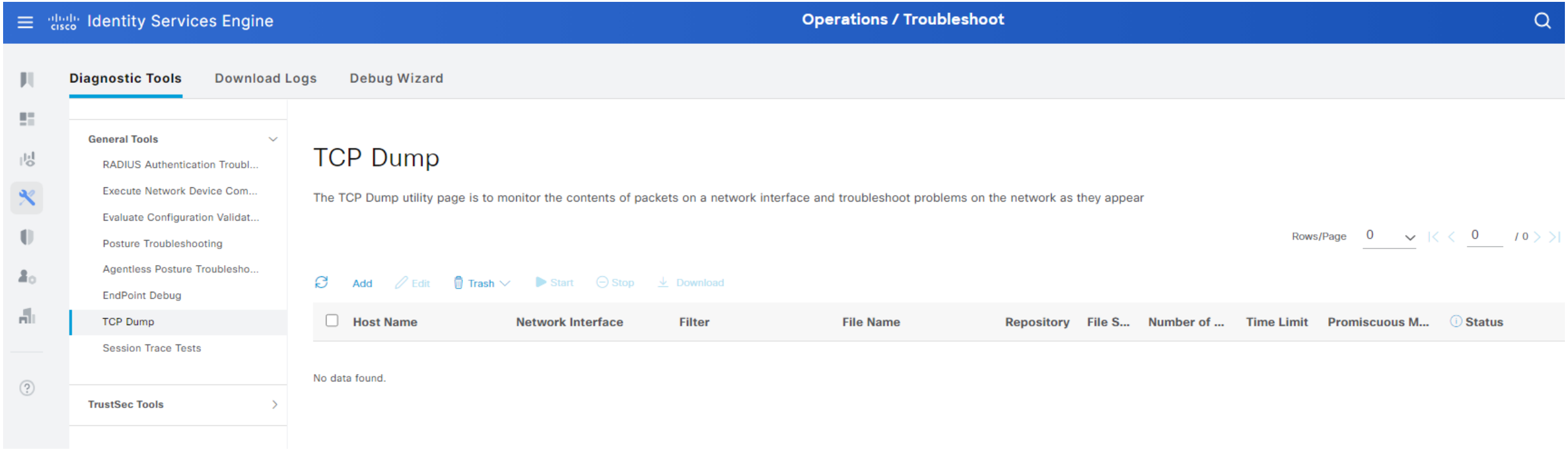



For your reference only

# Troubleshoot ISE Issues

For your reference only

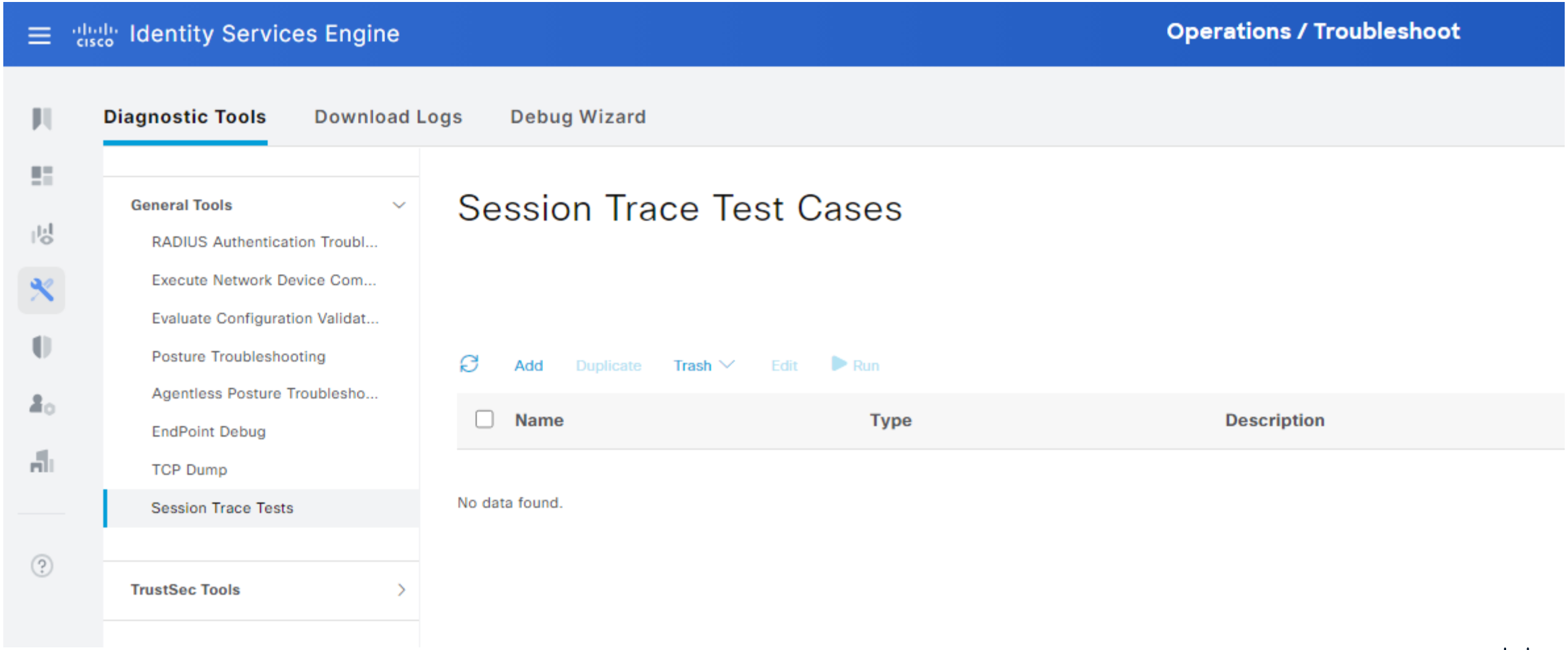
**Operations>Troubleshooting>Diagnostic Tools>TCP Dump –** Troubleshoot traffic a PSN is receiving



# Troubleshoot ISE Issues

For your reference only

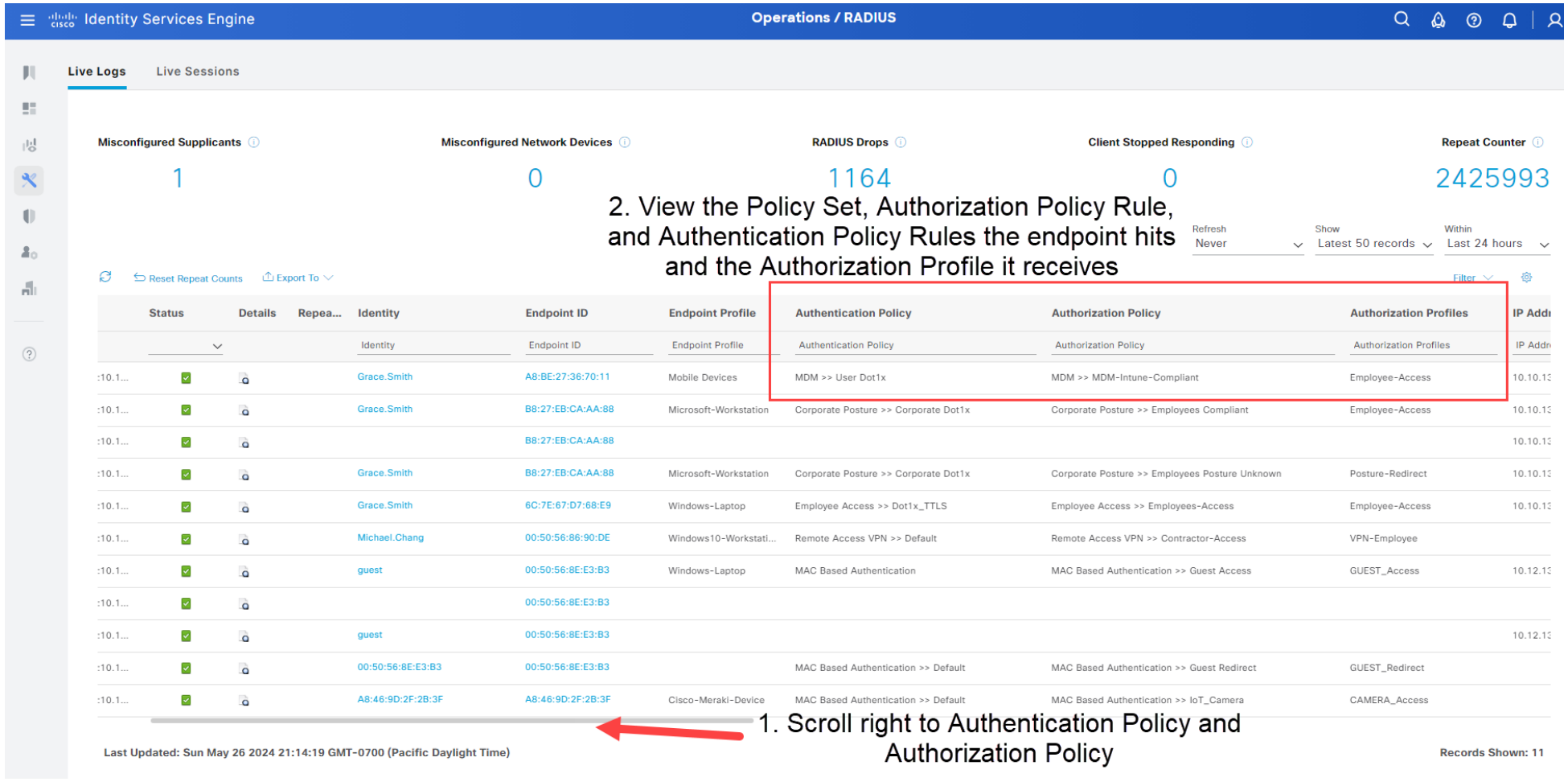
**Operations>Troubleshooting>Diagnostic Tools>Session Trace** – Test the policy flows in a predictable way without needing real traffic from a real device



# Troubleshoot ISE Issues – Policy Troubleshooting 1

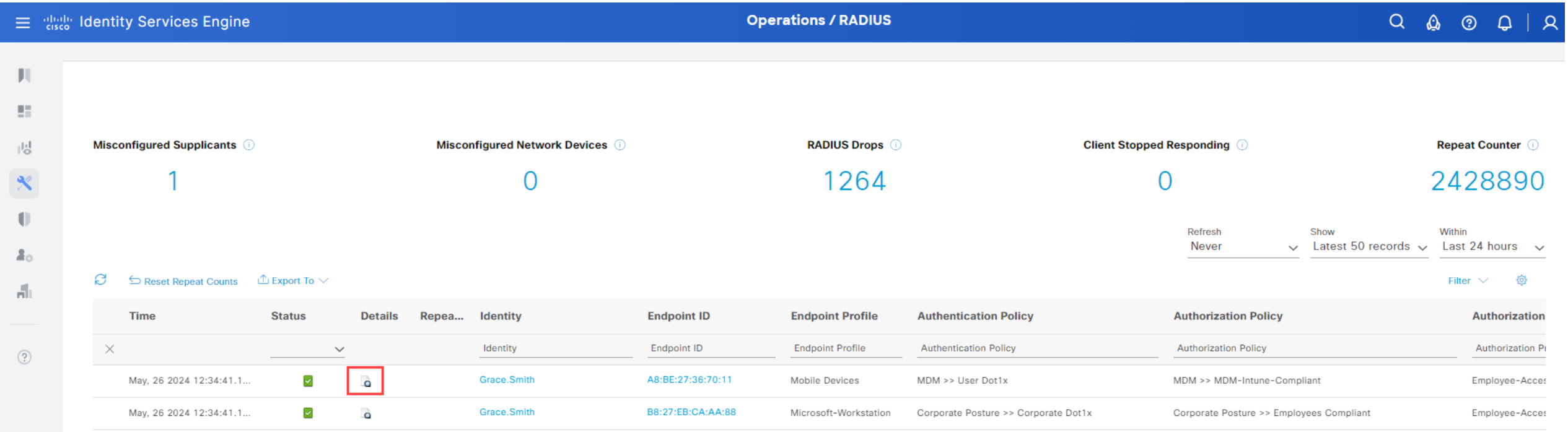
For your reference only

**Operations>RADIUS>Live Logs** – Check AuthC/AuthZ policy and rules the endpoint hits



# Troubleshoot ISE Issues – Policy Troubleshooting 2

## **Operations>RADIUS Live Logs** – Check Details for endpoint



# Troubleshoot ISE Issues – Policy Troubleshooting 3

## Detail: Check Steps on the right side to see authentication details

For your reference only

Steps

| Step ID | Description | Latency (ms) |
|---|---|---|
| 11001 | Received RADIUS Access-Request - AD-PseudoCo | |
| 11017 | RADIUS created a new session - pseudoco.com | 0 |
| 15049 | Evaluating Policy Group - AD-PseudoCo | 1 |
| 15008 | Evaluating Service Selection Policy | 0 |
| 15048 | Queried PIP - DEVICE.Deployment Type | 1 |
| 15048 | Queried PIP - Radius.Called-Station-ID | 0 |
| 15048 | Queried PIP - Radius.NAS-IP-Address | 0 |
| 15048 | Queried PIP - DEVICE.Location | 0 |
| 11507 | Extracted EAP-Response/Identity | 1 |
| 12500 | Prepared EAP-Request proposing EAP-TLS with challenge | 0 |
| 12625 | Valid EAP-Key-Name attribute received | 0 |
| 11006 | Returned RADIUS Access-Challenge | 0 |
| 11001 | Received RADIUS Access-Request | 5 |
| 11018 | RADIUS is re-using an existing session | 0 |
| 12301 | Extracted EAP-Response/NAK requesting to use PEAP instead | 0 |
| 12300 | Prepared EAP-Request proposing PEAP with challenge | 0 |
| 12625 | Valid EAP-Key-Name attribute received | 0 |
| 11006 | Returned RADIUS Access-Challenge | 0 |
| 11001 | Received RADIUS Access-Request | 7 |
| 11018 | RADIUS is re-using an existing session | 0 |
| 12302 | Extracted EAP-Response containing PEAP challenge-response and accepting PEAP as negotiated | 0 |
| 61025 | Open secure connection with TLS peer | 1 |
| 12318 | Successfully negotiated PEAP version 0 | 0 |
| 12800 | Extracted first TLS record; TLS handshake started | 0 |
| 12805 | Extracted TLS ClientHello message | 0 |
| 12806 | Prepared TLS ServerHello message | 0 |
| 12807 | Prepared TLS Certificate message | 0 |
| 12808 | Prepared TLS ServerKeyExchange message | 46 |
| 12810 | Prepared TLS ServerDone message | 0 |
| 12305 | Prepared EAP-Request with another PEAP challenge | 0 |

PEAP successfully negotiated as outer EAP Method

| | | |
|---|---|---|
| 12304 | Extracted EAP-Response containing PEAP challenge-response | 1 |
| 11808 | Extracted EAP-Response containing EAP-MSCHAP challenge-response for inner method and accepting EAP-MSCHAP as negotiated | 0 |
| 15041 | Evaluating Identity Policy | 0 |
| 25114 | Number of bad password attempts for AD instance is lower than the configuration in Active Directory, Continuing to AD authentication. | 5 |
| 15013 | Selected Identity Source - AD-PseudoCo | 1 |
| 24430 | Authenticating user against Active Directory - AD-PseudoCo | 0 |
| 24325 | Resolving identity - Grace.Smith | 1 |
| 24313 | Search for matching accounts at join point - pseudoco.com | 0 |
| 24319 | Single matching account found in forest - pseudoco.com | 0 |
| 24323 | Identity resolution detected single matching account | 0 |
| 24343 | RPC Logon request succeeded - Grace.Smith@pseudoco.com | 2 |
| 24402 | User authentication against Active Directory succeeded - AD-PseudoCo | 0 |
| 22037 | Authentication Passed | 0 |
| 11824 | EAP-MSCHAP authentication attempt passed | 0 |
| 12305 | Prepared EAP-Request with another PEAP challenge | 0 |
| 11006 | Returned RADIUS Access-Challenge | 0 |
| 11001 | Received RADIUS Access-Request | 4 |
| 11018 | RADIUS is re-using an existing session | 0 |
| 12304 | Extracted EAP-Response containing PEAP challenge-response | 0 |
| 11810 | Extracted EAP-Response for inner method containing MSCHAP challenge-response | 0 |
| 11814 | Inner EAP-MSCHAP authentication succeeded | 0 |
| 11519 | Prepared EAP-Success for inner EAP method | 0 |
| 12314 | PEAP inner method finished successfully | 0 |
| 12305 | Prepared EAP-Request with another PEAP challenge | 1 |

MSCHAP is the inner authentication method

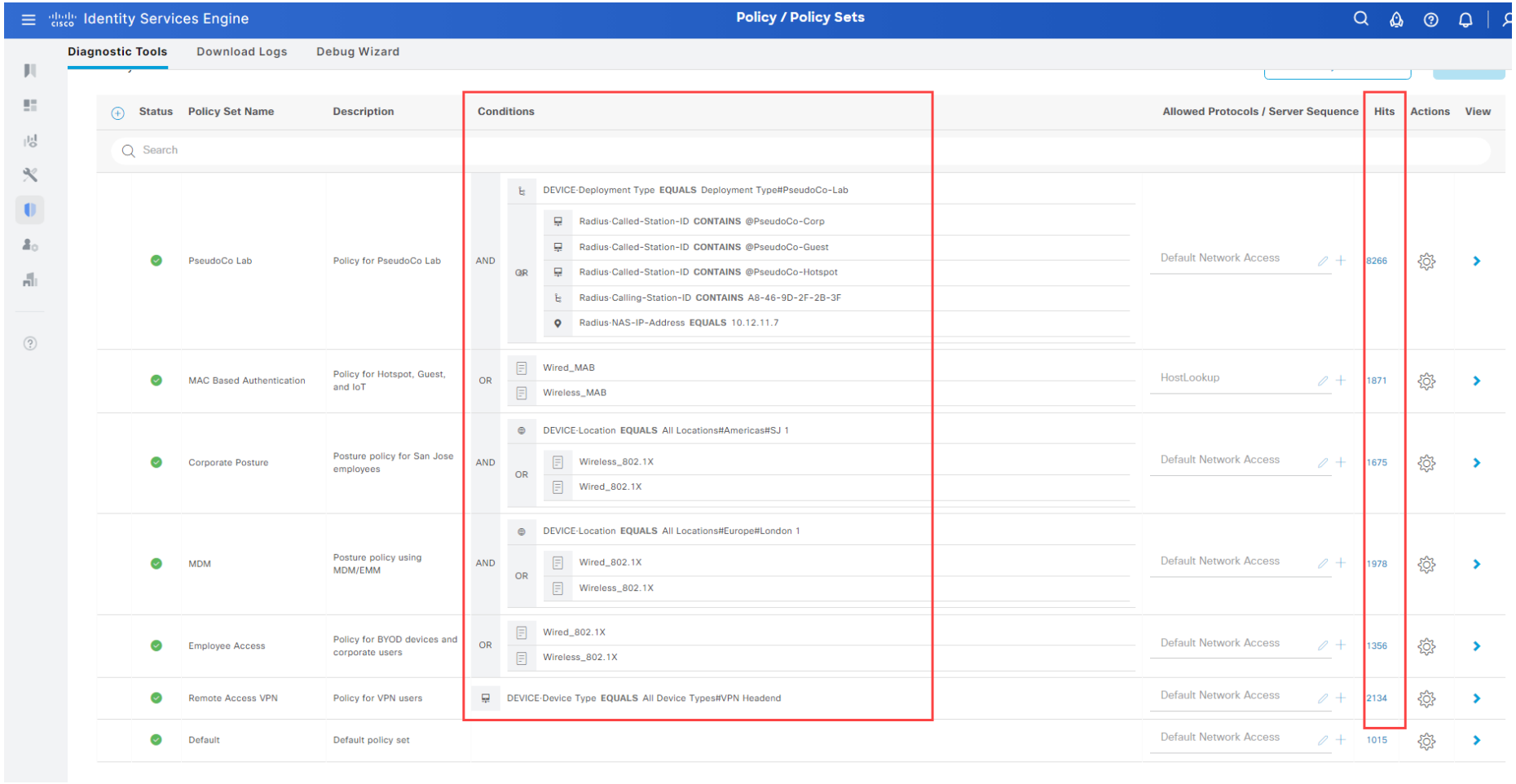
Credentials Grace.Smith @psuedoco.com are extracted and authenticated against pseudoco.com Active Directory domain

Authentication to Active Directory Successful

# Troubleshoot ISE Issues – Policy Troubleshooting 4

For your reference only

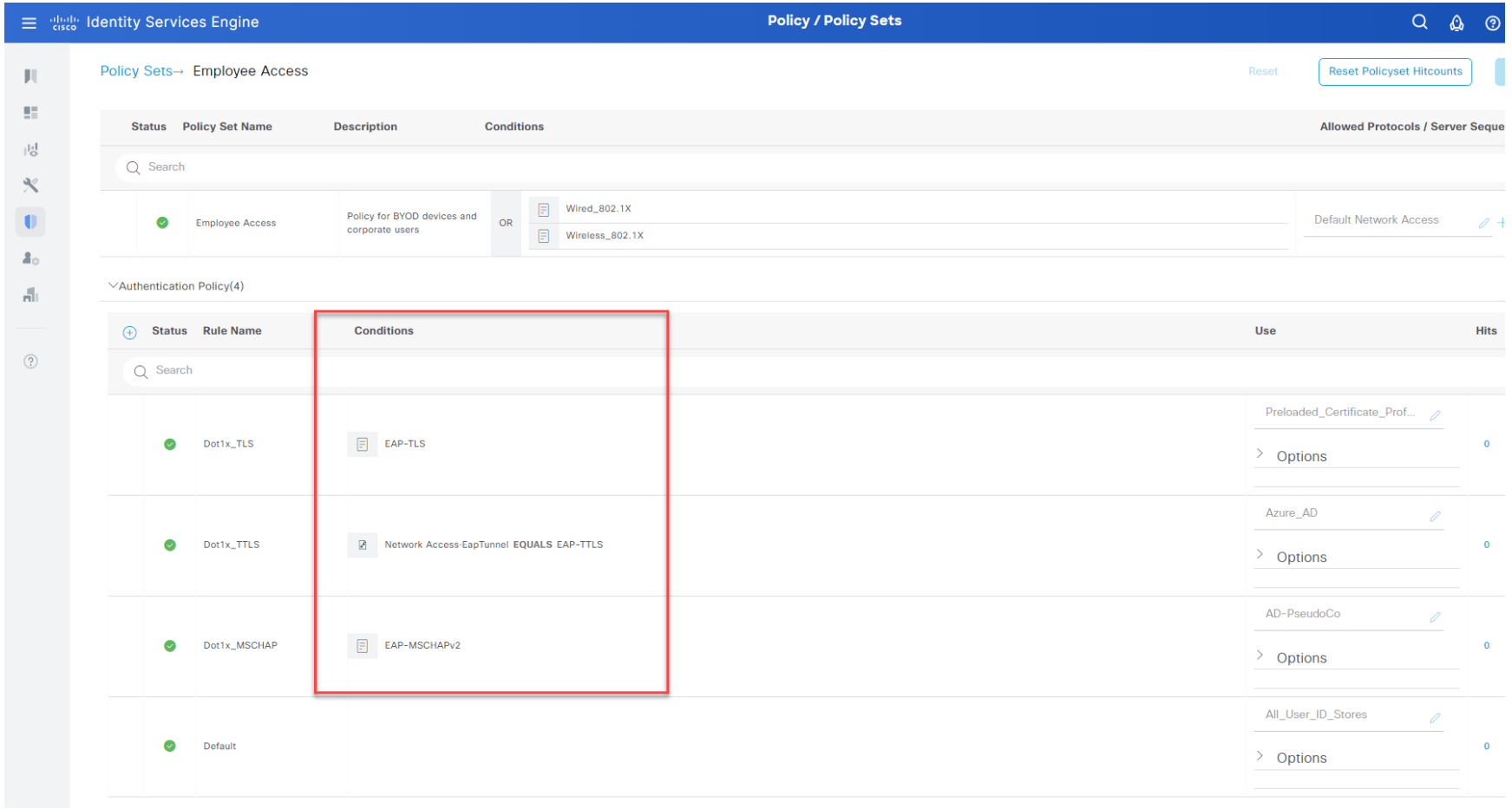
**Policy>Policy Sets** – Check Conditions compared to authentication details



# Troubleshoot ISE Issues – Policy Troubleshooting 5

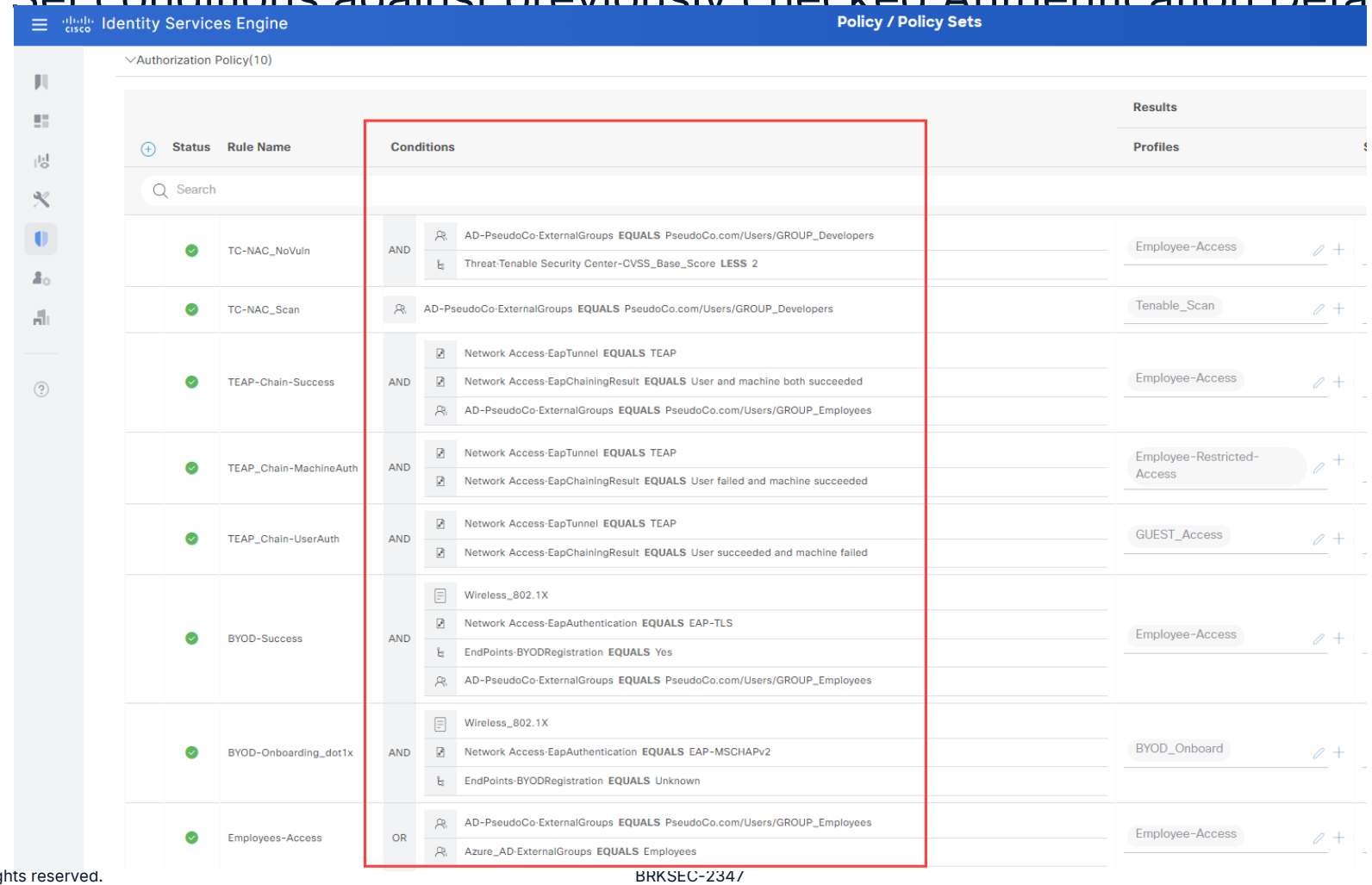
For your reference only

## Check Policy Set conditions against previously checked Authentication Detail



# Troubleshoot ISE Issues – Policy Troubleshooting 6

Check Policy Set conditions against previously checked Authentication Detail



# Conclusion

# Simplifying and optimizing your deployment is how you can lower the administrative burden of managing ISE

# Helpful Links and Training

- CiscoPress SISE Book - https://tinyurl.com/ciscopress-sise
- ISE Scalability Guide - https://tinyurl.com/ise-scale
- ISE Loadbalancing Guides - https://tinyurl.com/ise-loadbalancing
- ISE NAD Compatability Matrix - https://tinyurl.com/ise-compatibility
- ISE Mega-list of Integration/Configuration Guides - https://cs.co/ise-guides
- Cisco Security Technical Alliance Partners - https://cisco.com/go/csta
- Deploy ISE in Cloud - https://tinyurl.com/ise-cloud
- ISE APIs and Automation - https://github.com/CiscoISE

# Helpful Links and Training

- ISE Switch Deployment Guide - https://tinyurl.com/ise-switch-guide
- ISE WLC Deployment Guide - https://tinyurl.com/ise-wlc-config
- ISE Catalyst 9800 Wireless Guide - https://tinyurl.com/ISE-9800-Guide
- Profile Packs:
  - Medical NAC 2.0 Profiles - https://tinyurl.com/ise-medical-nac-2
  - Automation and Control Profiles - https://tinyurl.com/ise-automation-library
  - Industrial Network Director IoT Profiles - https://tinyurl.com/ind-profiles
  - Windows-Embedded IoT Profiles - https://tinyurl.com/windows-embedded
- ISE Licensing - https://cs.co/ise-licensing

# Helpful Links and Training

- TrustSec Troubleshooting Guide - https://tinyurl.com/TS-Troubleshooting
- ISE Webinars - https://cs.co/ise-webinars
- ISE Community - https://cs.co/ise-community
- Cisco's ISE YouTube Channel - https://cs.co/ise-videos
- Cisco U: Introduction to 802.1X – https://u.cisco.com/paths/introduction-8021x-operations-cisco-security-professionals-20909
- Cisco U: Implementing ISE - https://u.cisco.com/paths/implementing-configuring-cisco-identity-services-engine-21111

# Helpful Links and Training

- Network-Node Blog – https://www.network-node.com
- My ISE Videos - https://tinyurl.com/KM-ISE-Videos
- Labminutes ISE Configuration Videos - https://tinyurl.com/LM-ISE
- Aaron Woland's ISE Blog Posts – https://tinyurl.com/Woland-ISE
- Brad Johnson's ISE Support Blog - https://www.ise-support.com
- Steve McNutt's Blog –
  - PKI for Network Engineers - https://tinyurl.com/PKI-for-NE
  - ISE Posts - https://tinyurl.com/McNutt-ISE

# Complete your session evaluations

**Complete** a minimum of 4 session surveys and the Overall Event Survey to be entered in a drawing to win 1 of 5 full conference passes to Cisco Live 2027.

**Earn** 100 points per survey completed and compete on the Cisco Live Challenge leaderboard.

**Level up** and earn exclusive prizes!

**Complete your surveys** in the Cisco Live mobile app.

# Continue your education

**Visit** the Cisco Showcase for related demos

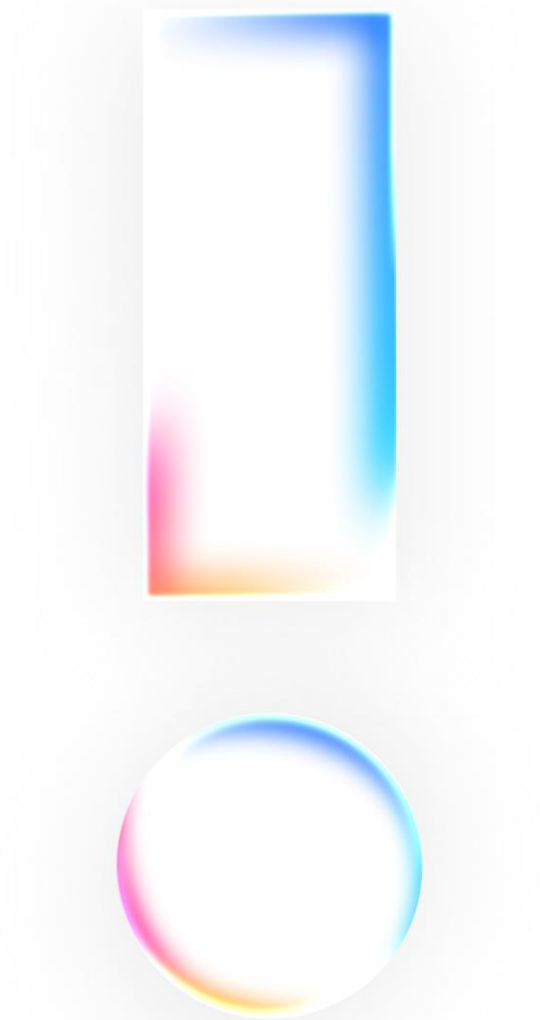
**Book** your one-on-one Meet the Engineer meeting

**Attend** the interactive education with DevNet, Capture the Flag, and Walk-in Labs

**Visit** the On-Demand Library for more sessions at www.CiscoLive.com/on-demand

cisco Live !

# Thank you




CISCO