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Automating OT Services with Cisco Catalyst Center

Gain More Skills to Win Your Game

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BRKIOT-2016

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Agenda

- Introduction
- Use Case #1: Unleash the power of template
- Use Case #2: Streamline software upgrade
- Use Case #3: Automate replacement
- Use Case #4: Track compliance and configuration
- Use Case #5: Automate the ring
- Takeaway

Introduction



IT and OT are converging but OT is different

Know your game

- More distributed
- Increased security requirements
- Maximising uptime, minimising maintenance
- Enhanced redundancy
- Priority and low latency desired for industrial protocols

What are you asked to do with OT network?

Know your skills

Scale	Standardise	Maintain
Security service deployment	Software images	Consistent configurations
Scale	Establish	Expedite
Implementation & adjustments	Resilient network	Troubleshooting

What is Cisco Catalyst Center?

Know your tools



Cisco Catalyst Center



Physical and virtual infrastructure



NetOps



AIOps



SecOps



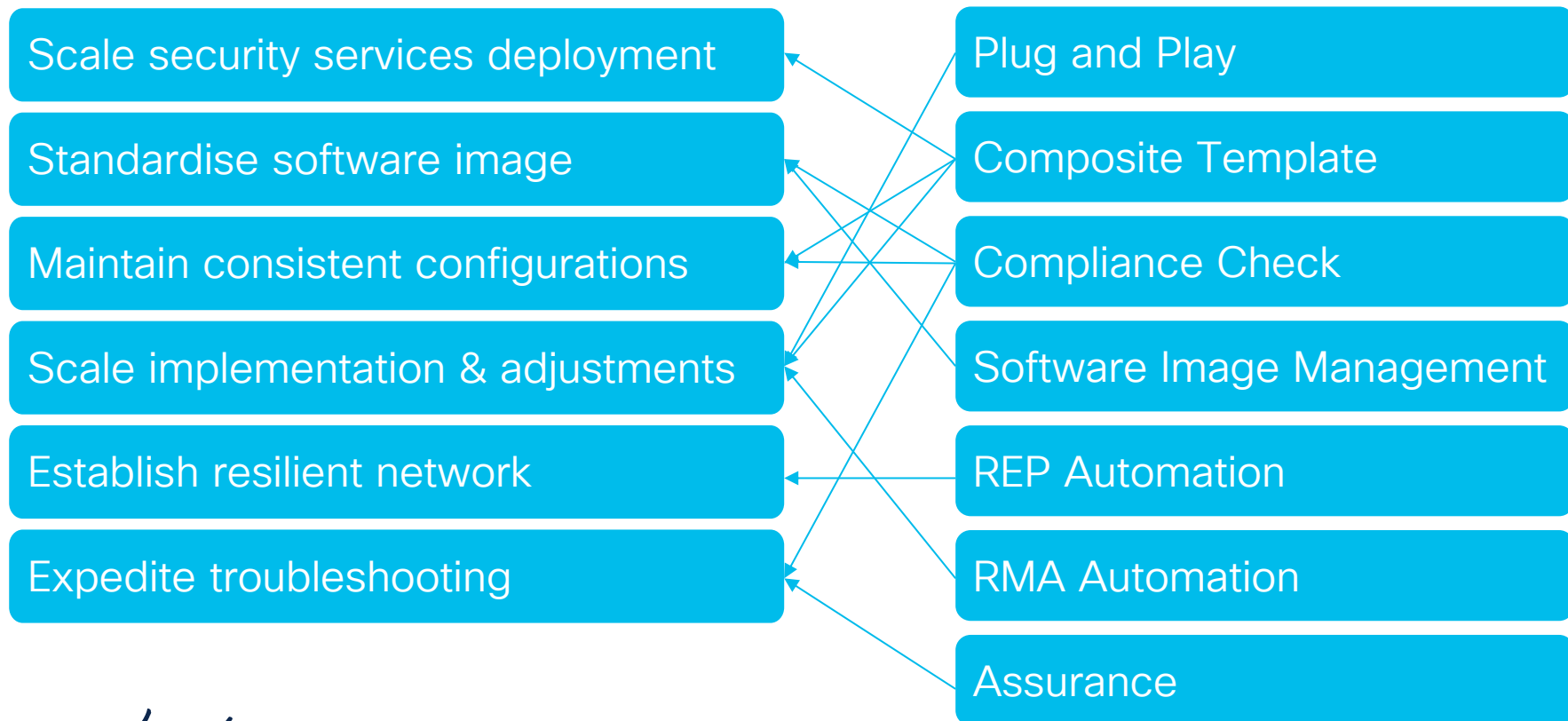
DevOps



Automation

Plug and Play
Composite Template
Compliance Check
Software Update
RMA Automation
REP Automation
Assurance

There are good matches here

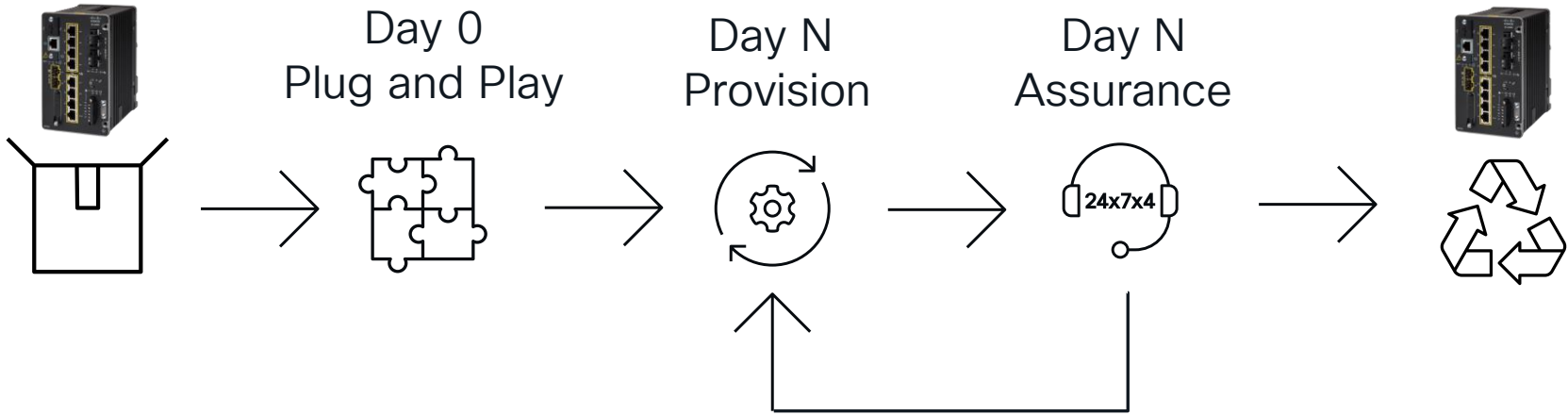


Use Case #1

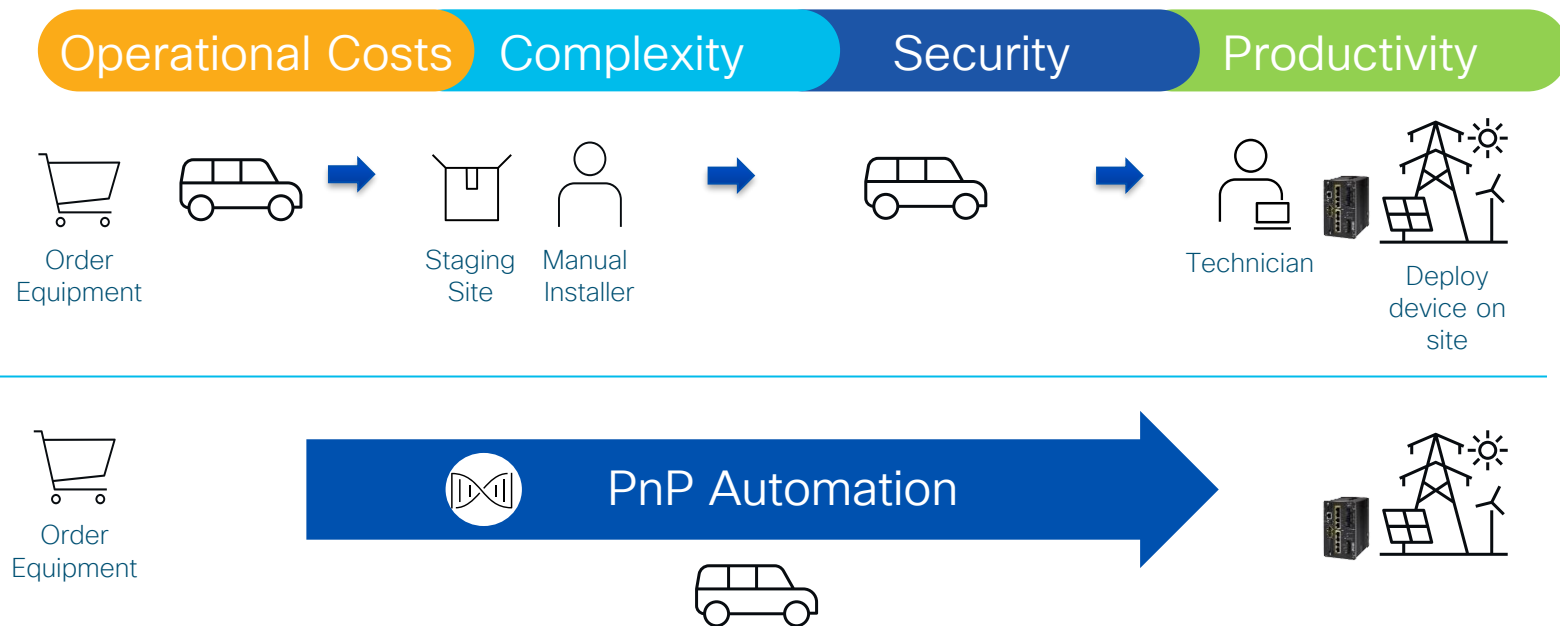
Unleash the power
of template



Lifecycle with Cisco Catalyst Center



Plug and Play (PnP) automation saves you time



Drop Ship | Device discovery (DHCP, DNS, Cloud) | Non-technical installer at site | **Template based**

What template structure do we have?

Template Language

{ Velocity, Jinja }

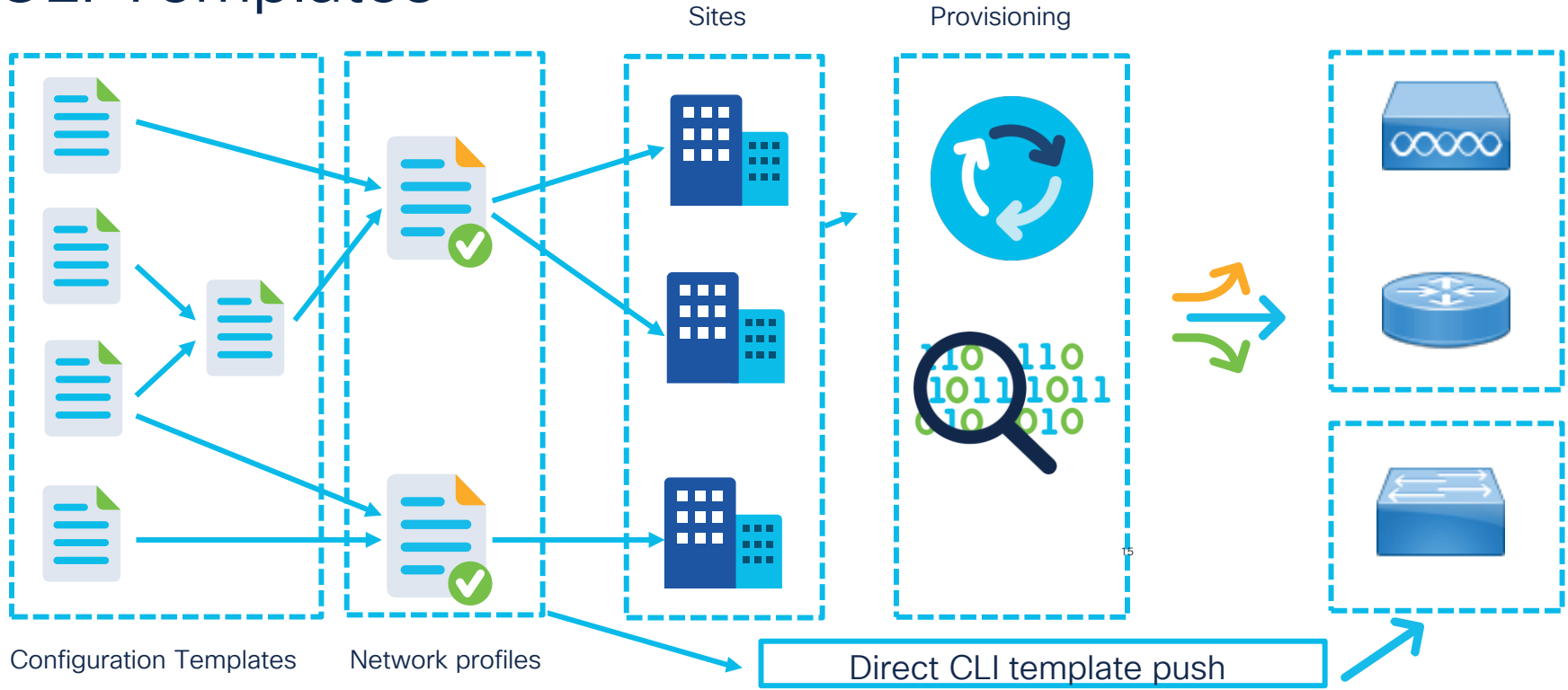
Plug and Play Template

{ Onboarding Configuration Project }

Day N Provision Template

{ User Defined Project }

CLI Templates



Plug and Play (PnP) Onboarding Template

The screenshot shows the Cisco Catalyst Center interface for managing CLI templates. The breadcrumb navigation at the top indicates the path: Design / CLI Templates. Below this, the specific template is identified as 'CLI Templates / IE_PnP (19)'. The interface includes tabs for Templates, Variables, Simulation, and Provision Conflicts. A toolbar at the top of the template editor contains options like 'System Variables Assistant', 'Template History', 'Attach to Network Profile', and 'Show Design Conflicts'. The main area displays the CLI configuration for the template, which includes comments and variable placeholders. A blue box labeled 'Variables' points to the variable placeholders in the configuration. Another blue box labeled 'Minimum configuration device needs' points to the entire configuration block. The configuration code is as follows:

```
1  {# Configure VLANs and Management VLAN interface #}
2  vlan {{ mgmt_vlan_id }}
3      name mgmt_vlan
4  interface Vlan{{ mgmt_vlan_id }}
5      ip address {{mgmt_vlan_ip}} {{mgmt_vlan_netmask}}
6      no shutdown
7  !
8  {# Configure default route for switch mangagement #}
9  ip route 0.0.0.0 0.0.0.0 {{mgmt_gateway_ip}}
10 !
11 netconf-yang
12 pnp startup-vlan {{ mgmt_vlan_id }}
```

Plug and Play (PnP) Onboarding Template

Cisco Catalyst Center Provision / Network Devices / Plug and Play

Assign Site Assign Configuration **3 Provision Templates** 4 Summary

Provision Templates

1 Day-0 templates do not support Interactive Commands.

Devices

Select devices to fill out provisioning parameters

Search

Show All Success Failed

IE_PnP (2)

- ✓ FDO2127U0KF (hostname: PLANT1-CELL2-IE3)
- ✓ FDO2137U0MQ (hostname: PLANT1-CELL2-IE2)

IE_PnP

Select Management VLAN*

10

Management VLAN IP*

10.24.10.16

Select Management VLAN Netmask*

/24

Management Default Gateway IP*

10.24.10.1

Export Template Parameters ⓘ Import Template Parameters ⓘ

Minimum configuration device needs

Multiple devices

	A	B	C	D	E	F
1	Project Name:Template Name	Device Name	mgmt_vlan_id	mgmt_vlan_ip	mgmt_vlan_netmask	mgmt_gateway_ip
2	Onboarding Configuration:IE_PnP	FOC2330V0TK (hostname: PLANT1-CELL1-IE1)	10	10.24.10.12	255.255.255.0	10.24.10.1
3						

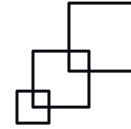
Use Composite Template for Day N Provision



Modularised



Organised



Scaled

Configuration Sequence	Composite Template – Full Configuration
1	Regular Template – Function 1
2	Regular Template – Function 2
3	Regular Template – Function 3
4	Regular Template – Function 4

Use Composite Template for Day N Provision

The screenshot shows the Cisco Catalyst Center interface for managing CLI templates. The breadcrumb navigation is "Design / CLI Templates". The current view is "CLI Templates / IE3x00-Full-Configuration (20)". A blue callout box labeled "Composite Template" points to the breadcrumb. Below the breadcrumb, there are tabs for "Templates", "Simulation", and "Provision Conflicts". A message states: "Add applicable templates to create your composite template's sequence." A checkbox "Abort sequence if deployment fails" is checked. A search bar "Search Table" is present. A blue callout box labeled "Control configuration sequence by Reorder" points to the "Reorder" button in the "More Actions" dropdown. A list of templates is shown, each with a description and a device series count. A blue callout box labeled "Regular Templates" points to the list. The templates are:

Template Name	Description	Device Series
IE3x00-Vlan-Interface-Template	VLAN and Interface Config	5
IE3x00-QoS-Template	QoS Config	5
IE3x00-L2NAT-Template	L2NAT Service Config	5
IE3x00-IOx-Template	IOx Service Config	3
IE3x00-SEA-Template	Secure Equipment Access Service Config	

Entering values for template variables is hard!

- Interface Name GigabitEthernet1/3
- IP Address 10.20.30.40
- Default Gateway 10.20.30.254
- Netmask 255.255.255.0
- VLAN ID 123
- URL developer.cisco.com/docs/iotod/welcome

Let's make it intuitive – Bound to Source with filter

Reduce human errors when provisioning devices

When you define Variable

machine_port

☒ Variable

Field Name
Select Machine Port

☒ Required Variable

Variable Data Value

Variable Data Source
☐ User Defined ☒ Bound to source

Data Entry Type
Multi Select

Source
Inventory

Entity
Interface

Attribute
portName

Filter By
portName

Condition*
Regular Expression

Filter Value*
^GigabitEthernet1/([3-9]|10)\$



When you provision device

IE3x00-Vlan-Interface-Template IE3x00-L2NAT-Template

Select Management VLAN*

10

Select Machine VLAN*

Cell 1 Machine Vlan

Select PC VLAN*

Cell 1 PC Vlan

Select Machine Port*

Reset Select All Find

Select Machine Port

GigabitEthernet1/10

GigabitEthernet1/6

GigabitEthernet1/7

GigabitEthernet1/3 x GigabitEthernet1/4 x GigabitEthernet1/5 x

Let's make it intuitive – Key Value Pair List

Reduce human errors when provisioning devices

When you define Variable

When you provision device

machine_vlan_id

☒ Variable

Field Name
Select Machine VLAN

☒ Required Variable

Variable Data Value

Variable Data Source
☒ User Defined ☐ Bound to source

Variable Type
String

Data Entry Type
Single Select

Key	Value
Cell 1 Machine Vlan	501
Cell 2 Machine Vlan	502
Cell 3 Machine Vlan	503



IE3x00-Vlan-Interface-Template IE3x00-L2NAT-Template

Select Management VLAN*

10

Select Machine VLAN*

Cell 1 Machine Vlan

Cell 1 Machine Vlan

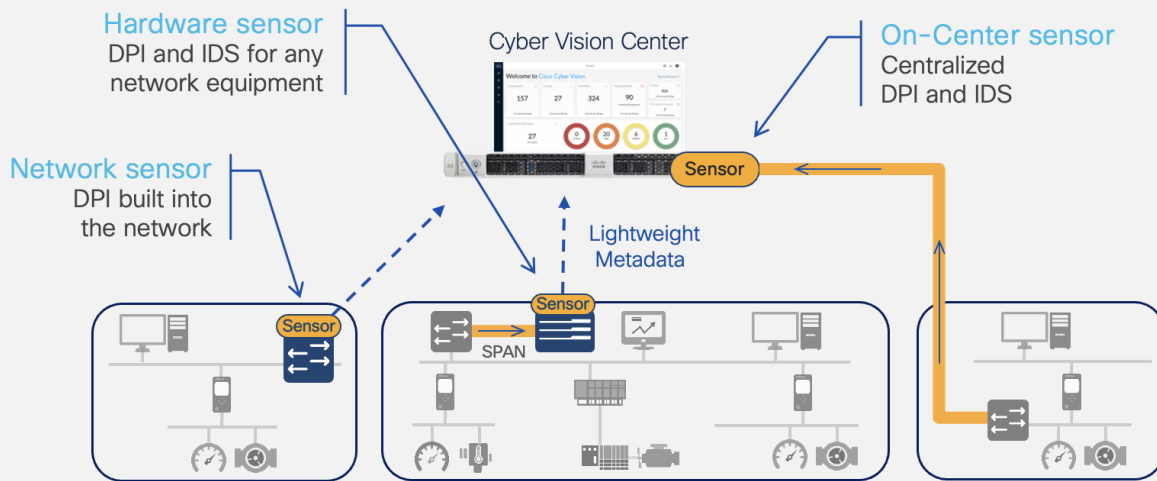
Cell 2 Machine Vlan

Cell 3 Machine Vlan

GigabitEthernet1/4, GigabitEthernet1/5, GigabitEthernet1/7

Cisco Cyber Vision to enhance OT visibility

Embedded sensors in industrial switches and routers



Network-sensors embedded in Cisco networking for simple and highly scalable deployments

Hardware-sensors capturing traffic on any switch with a single hop SPAN

On-Center sensor to leverage existing SPAN infrastructures, or collect traffic within the datacenter

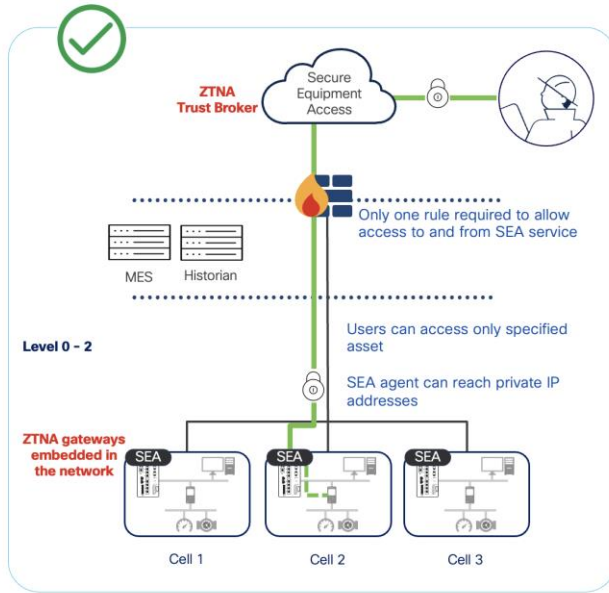
SPAN option and Hardware sensors to support brownfield

Network embedded sensors as you evolve and grow your operations

Cisco Secure Equipment Access for OT

Embedded ZTNA gateways in industrial switches and routers

Simple, Scalable, Distributed ZTNA



- ✓ Get remote access to assets using the same switch that provides secure connectivity
- ✓ Eliminate complexity of creating and managing multiple firewall rules across all your sites
- ✓ Maintain resource isolation by traversing NAT boundaries without exposing private IP addresses
- ✓ Prevent lateral movement by enforcing segmentation on the switch that runs the ZTNA gateway

Cyber Vision Service Template

SPAN all access ports
traffic for deep packet
inspection through Cyber
Vision sensor on the switch

Only one variable with
default value 2508

CLI Templates / IE3x00-CV-Extension-Template (9) Properties

Templates Variables Simulation Provision Conflicts

(x) System Variables Assistant Template History Attach to Network Profile Show Design Conflicts

Auto saved: 10:59 PM (eve)

```
1 vtp mode off
2 vlan {{remote_span_vlan}}
3 remote-span
4 {# Include all the access ports for SPAN including ports on expansion module if any #}
5 {% set access_port_array = [] %}
6 {% for interface in __interface %}
7   {% if interface.interfaceType == "Physical" && interface.portName.replaceAll("(^([a-zA-Z])+).*", "$1") == "GigabitEthernet" %}
8     {% if interface.portMode == "access" && interface.interfaceType == "Physical" %}
9       {% do access_port_array.append(interface.portName) %}
10    {% endif %}
11  {% endif %}
12 {% endfor %}
13 {% if access_port_array | length > 10 %}
14 monitor session 1 source interface GigabitEthernet 1/3 - 10 , GigabitEthernet 2/1 - {{ access_port_array | length - 8 }}
15 {% else %}
16 monitor session 1 source interface GigabitEthernet 1/3 - 10
17 {% endif %}
18 monitor session 1 destination remote vlan {{remote_span_vlan}}
19 monitor session 1 destination format-erspan 169.254.1.2
20
```

Catalyst Center

Design /

CLI Templates / IE3x00-CV-Extension-Template (10) Properties
Templates Variables Simulation Provision Conflicts

Search

remote_span_vlan

remote_span_vlan

Variable

Field Name

Enter Remote SPAN Vlan ID

Required Variable

Variable Data Value

Variable Data Source

User Defined Bound to source

Variable Type

String

Data Entry Type

Text Field

Default Variable Value

2508

Sensitive Value

Maximum Characters

Maximum Characters

Variable Notes

Hint Text

Use 2508 if it's not used in the switch

Additional Info

Additional Info

Secure Equipment Access Service Template

CLI Templates / IE3x00-SEA-Template (2) Properties

Templates Variables Simulation Provision Conflicts

(x) System Variables Assistant Template History Attach to Network Profile ☐ Show Design Conflicts ⓘ

```
1  {# Configure wsma profile #}
2  wsma agent exec
3  profile exec
4  wsma profile listener exec
5    transport http path /wsma/exec
6  cgna gzip
7  archive
8    path flash:/
9    maximum 3
10 {# Configure ida profile and activate #}
11 ida transport-profile wst
12   callhome-url wss://{iotod_region}/wst/cgna
13   active
14 {# Configure cgna profile and activate #}
15 cgna profile cg-nms-register
16   transport-profile wst
17   add-command show version | format flash:/managed/odm/cg-nms.odm
18   add-command show inventory | format flash:/managed/odm/cg-nms.odm
19   interval 3
20   active
21   url https://localhost/cgna/ios/registration
22   gzip
```

One variable for URL

Secure Equipment Access Service Template

VARIABLES

iotod_region

iotod_region

Variable

Field Name

IoT Operations Dashboard Region

☒ Required Variable

Variable Data Value

Variable Data Source

☒ User Defined

☐ Bound to source

Variable Type

String

Data Entry Type

Single Select

Data Values

Key	Value	Default Value
EU	device-eu.ciscoiot.com	☐
US	device-us.ciscoiot.com	☒

Use Key Value Pair to have drop down menu for users to pick EU or US region without entering the real URL

Tips for Template

- Keep onboarding template short
- Use composite template for Day N provisioning
- Spell the full word for CLI, switchport vs. switch. Affect compliance!
- Use Source Bound Variable to populate values for variables
- Use **Filter By / Condition / REGEX** to limit values selection
- Use **Key / Value** pairs as a list to make input intuitive

Use Case #2

Streamline software upgrade



Challenges with Software Upgrade in OT Network

- No visibility on how many outdated images in the network
- Updating software one by one takes too long time
- Takes long time to distribute software due to low WAN bandwidth
- Need to upgrade in a sequence to minimise downtime
- Need to upgrade in parallel to reduce the maintenance window
- Locally downloaded image might be corrupted

Visibility on Outdated Images

Devices (6) Focus: [Software Images](#) ▾

🔍 Click here to apply basic or advanced filters or view recently applied filters

0 Selected Tag [+](#) Add Device [Image Update](#) [Image Update Status](#) [Actions](#) ▾ ⓘ

☐	Tags	Device Name	IP Address	Device Family	Reachability ⓘ	Software Image
☐		PLANT1-RTR.ucslabstl.local	10.1.210.14	Routers	✔ Reachable	C1100[17.09.03.0.15] ✔ Needs Update
☐		PLANT1-CORE.ucslabstl.local	10.24.10.1	Switches and Hubs (WLC Capable)	✔ Reachable	cat9k_iosxe.17.06.02.SPA.bin ✔ Needs Update
☐		PLANT1-IDF1-SW1.ucslabstl.local	10.24.10.11	Switches and Hubs	✔ Reachable	cat9k_lite_iosxe.16.12.03.SPA.bin ✔ Needs Update
☐		PLANT1-CELL1-IE1.ucslabstl.local	10.24.10.12	Switches and Hubs	✔ Reachable	ie3x00-universalk9.17.12.01.SPA... ✔ Needs Update
☐		PLANT1-IDF2-SW1.ucslabstl.local	10.24.10.13	Switches and Hubs	✔ Reachable	cat9k_lite_iosxe.17.03.04b.SPA.bin ✔ Needs Update
☐		PLANT1-CELL2-IE1.ucslabstl.local	10.24.10.14	Switches and Hubs	✔ Reachable	ie4000-universalk9-mz.152-8.E5...

Image Distribution Server Makes Distribution Faster

Catalyst Center

Design / Network Settings

Servers

Device Credentials

IP Address Pools

Wireless

Telemetry

Security and Trust

Find Hierarchy

Search Help

Global

IoT Demo

USA

Configure external network servers, assign time zones to sites, and customize device CLI login banner messages. The system will deploy these settings when devices are provisioned.

Add DNS servers

Domain Name*
ucslabstl.local

IP Address*
10.1.2.10

Add Image Distribution servers

Primary*
10.24.10.222

Configure image distribution server for the site

Image distribution server caches images in advance

```
dnac-admin@region1-image-server:~/image/swinfiles $ ls
03bbc809-ab26-49ec-a162-6203473116c9  49e6d197-2cf5-4baa-b3b2-2bb91fa71bd6  7abc2b39-eba9-435d-89cb-2100c71d7068  952ae620-a09c-4594-9163-f6c02303d9c8  bad19b2b-2189-4a12-9802-0bcfd56a54ad  e9f2759b-ef85-4a2b-b29c-a60293b890c4
143fb02b-7e3d-4c7d-ab5e-3263ad931cae  547b1403-3575-4d99-b62c-0c19e1eb378f  83799978-094b-4657-9342-acc353bb57d8  96ca1930-5a28-4648-a299-330726086aee  bb8f28db-7eb7-4eeb-b374-c2642a799fdb  ed361be4-25ed-4fdb-b8b3-6875c6871efb
1b85e90d-9e85-4c14-87d2-ddd7dda70214  5adc6arc-a722-4cdd-8c0b-1ede36c5d0ac  842cd557-dc6e-4cd1-8c71-2659b6b22c4f  9908c23d-ad1d-428a-a086-8185a8aab3d5  c35ffdf1-2f99-4d40-b482-986a5da0397c  ee9e3c05-cb14-46df-ab1f-5f3775de69a8
3080e5cf-0129-465a-9234-d1ad1fe2020b  684c47fb-6f01-4060-e13c-325ca3208ff7  805b0221-0402-4c53-acc4-07e0c7839a20  9a5b9f95-010d-4d0c-bf2d-1a11c20e7c9b  c955c0d0-a00e-40a1-b39f-f070fec736b3  ef433b0e-1713-dcee-01f5-a38ca30d0c8
322414ff-4b7b-4ff3-8640-71e98c213381  68af28db-941c-48a9-8de6-a234ef10a48d  80b6f413-afaa-4866-9979-da0205ee61ea  9f4bf417-ced1-4b47-bfcc-de7f75b75a7b  d124f857-bb50-43c3-a087-73a523b192de  f8880204-6ecc-4bc4-9963-660d0dc0341a
4294c26c-233b-4c94-a5eb-b3fd5129e9f6  68d5d57d-a12d-45f9-bc22-03fcfafcba44  9029ed04-c63f-461e-b7b3-04dfbb4e44b9  a9f07e5c-ab7e-4e08-a478-a4a6b30ab1d5  db14a20f-0536-4786-ad27-ba2cf75d0eaf  fc5b45d1-4eac-4e55-049b-6d8a7565a7c4
468c92c0-12b1-4a6d-b7df-be9a9c4d5388  78cd8873-70b2-40fc-8c0b-09f61ed39913  927e071a-b020-4d0f-a425-25cb5897eab9  abf6d9be-a270-4174-a6b4-30a69a2561a9  e119ad43-1606-4cec-a0e2-fc466e9b0094  fef6747d-bd69-4bbb-ab7e-50d4ab24da7a
486dbae2-e375-4e8a-be91-8245578b0631  7a74790e-e75f-412a-9056-3e2bcadf7bbe  93ee318b-e0e8-4eba-af8b-2100d0a8a373  b98703ff-fa26-4e9e-b330-abf3d0a940c3  e7ef977a-0b6a-4be7-b738-1168cb88a66f
```

dnac-admin@region1-image-server:~/image/swinfiles \$ find -name ie3x*
./468c92c0-12b1-4a6d-b7df-be9a9c4d5388/ie3x00-universalk9.17.12.03.SPA.bin
./68d5d57d-a12d-45f9-bc22-03fcfafcba44/ie3x00-universalk9.17.09.04a.SPA.bin
./68af28db-941c-48a9-8de6-a234ef10a48d/ie3x00-universalk9.17.12.01.SPA.bin

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Image Distribution Server to Distribute Faster

PLANT1-CELL2-IE2.ucslabstl.local (10.24.10.15) Image Update

Date: Apr 14, 2024 12:56 PM Duration: 16 minutes 42 seconds Status: ✔ Successfully updated with ie4000-universalk9-mz.152-8.E5.bin

Operations

Checks

✔ Distribution 7 minutes 13 seconds

Distribution of image: ie4000-universalk9-mz.152-8.E5.bin on device: 10.24.10.15 from external file server: 10.24.10.222, with protocol: SCP completed successfully

✔ Image Integrity Verification(KGV)

1 second

Task Name Image Integrity Verification(KGV)

Task Status Success (Pre integrity verification of image: ie4000-universalk9-mz.152-8.E5.bin completed successfully)

✔ Pre Distribution Operation

2 seconds

Task Name Pre Distribution Script Execution

Task Status Success (Pre distribution process completed for image: ie4000-universalk9-mz.152-8.E5.bin on device: 10.24.10.15)

✔ Distribution

7 minutes 6 seconds

Task Name Primary Image Server

Task Status Success (Distribution of image: ie4000-universalk9-mz.152-8.E5.bin on device: 10.24.10.15 using protocol: SCP completed successfully)

Distributes image through
10.24.10.222 image
distribution server not
Catalyst Center over
WAN

Image Distribution Server to Distribute Faster (cont.)

~6 mins saving

☐	PLANT1-CELL2-IE2. ucslabstl.local (10.2 4.10.15)	Switches and Hubs	Apr 14, 2024	22 minutes 30 seconds	15.2(8)E5	IE-without-distribution	✓ Successfully updated with ie4000-uni versalk9-mz.152-8.E5.bin
☐	PLANT1-CELL2-IE2. ucslabstl.local (10.2 4.10.15)	Switches and Hubs	Apr 14, 2024	9 minutes 23 seconds	15.2(7)E10	Downgrade	✓ Successfully updated with ie4000-uni versalk9-mz.152-7.E10.bin
☐	PLANT1-CELL2-IE2. ucslabstl.local (10.2 4.10.15)	Switches and Hubs	Apr 14, 2024	16 minutes 42 seconds	15.2(8)E5	IE-with-image-distribution	✓ Successfully updated with ie4000-uni versalk9-mz.152-8.E5.bin

✓ Distribution
16 minutes 25 seconds

Task Name
Task Status

Primary Image Server
Failure (NCSW32001: Distribution failed from external file server: 10.24.10.222 using protocol: SCP. Image distribution to the device failed, due to temporary network error(s))

Task Name
Task Status

Primary Protocol
Success (Distribution of image: ie4000-universalk9-mz.152-8.E5.bin on device: 10.24.10.14 using protocol: HTTPS completed successfully)

Fall back to Catalyst
Center if
Distribution server is
not available.

Upgrade Multiple Devices at the Same Time

Devices (8) Focus: **Software Images** ▾

Q Click here to apply basic or advanced filters or view recently applied filters

3 Selected Tag + Add Device Image Update Image Update Status Actions ^ ⓘ

	Device Name	IP Address	Device	Inventory	Software Image
☐	PLANT1-CORE.ucslabstl.local	10.24.10.1	Switch (WLC)	Software Image	Image Update
☐	PLANT1-IDF1-SW1.ucslabstl.local	10.24.10.11	Switch	Provision	Image Update Status
☐	PLANT1-CELL1-IE1.ucslabstl.local	10.24.10.12	Switch	Telemetry	Download Update Readiness Report
☐	PLANT1-IDF2-SW1.ucslabstl.local	10.24.10.13	Switch	Device Replacement	Check Image Update Readiness
				Compliance	Needs Update
				More	cat9k_lite_iosxe.17.03.04b.SPA.bin
					Needs Update
☒	PLANT1-CELL2-IE1.ucslabstl.local	10.24.10.14	Switches and Hubs	Reachable	ie4000-universalk9-mz.152-7.E1...
					Needs Update
☒	PLANT1-CELL2-IE2.ucslabstl.local	10.24.10.15	Switches and Hubs	Reachable	ie4000-universalk9-mz.152-7.E1...
					Needs Update
☒	PLANT1-CELL2-IE3.ucslabstl.local	10.24.10.16	Switches and Hubs	Reachable	ie4000-universalk9-mz.152-7.E1...
					Needs Update

You can define the sequence to upgrade

Device Activation Order

You can use filters to sort devices and order the sequentially. After devices are sorted, you can r

Devices in Parallel(3) [Edit Order](#)

Parallel **Sequential**

Filter Devices

0 Selected [Move to Sequential Update Order](#)

☐	Device Name	IP Address
☐	PLANT1-CELL2-IE1.ucslabstl.local	10.24.10.14
☐	PLANT1-CELL2-IE2.ucslabstl.local	10.24.10.15
☐	PLANT1-CELL2-IE3.ucslabstl.local	10.24.10.16

Device Activation Order

You can use filters to sort devices and order their activation in parallel or sequentially. After devices are sorted, you can reorder them sequentially.

Devices in Parallel(3) [Edit Order](#)

Parallel **Sequential**

Filter Devices

1 Selected [Move to Sequential Update Order](#)

☐	Device Name	IP Address	Site
☒	PLANT1-CELL2-IE1.ucslabstl.local	10.24.10.14	.../IoT Demo/Plant1
☐	PLANT1-CELL2-IE2.ucslabstl.local	10.24.10.15	.../IoT Demo/Plant1
☐	PLANT1-CELL2-IE3.ucslabstl.local	10.24.10.16	.../IoT Demo/Plant1

You can define the sequence to upgrade

Devices Updates

Update Status **All (104)** In Progress (1) Waiting (2) Terminated (0) Success (69) Failure (32)

0 Selected [Retry](#) [Upcoming Tasks](#) As of: Apr

☐	Device Name	Device Family	Date Updated	Duration	Image Version	Task Name	Status
☐	PLANT1-CELL2-IE3. ucslabstl.local (10.2 4.10.16)	Switches and Hubs	Apr 13, 2024	4 minutes 10 seconds	NA	IE-ALL-Upgrade-Mix	Waiting
☐	PLANT1-CELL2-IE2. ucslabstl.local (10.2 4.10.15)	Switches and Hubs	Apr 13, 2024	4 minutes 10 seconds	NA	IE-ALL-Upgrade-Mix	Waiting
☐	PLANT1-CELL2-IE1. ucslabstl.local (10.2 4.10.14)	Switches and Hubs	Apr 13, 2024	4 minutes 10 seconds	15.2(8)E5	IE-ALL-Upgrade-Mix	<div><div></div>82% Activating Ie4000-Universalk...</div>

IE1 is upgraded
first, while the
other two IEs are in
Waiting status

You can define the sequence to upgrade

Devices Updates

Update Status **All (104)** In Progress (2) Waiting (0) Terminated (0) Success (70) Failure (32)

0 Selected [Retry](#) [Upcoming Tasks](#)

As of: Apr 1:

☐	Device Name	Device Family	Date Updated	Duration	Image Version	Task Name	Status
☐	PLANT1-CELL2-IE3. ucslabstl.local (10.2 4.10.16)	Switches and Hubs	Apr 13, 2024	20 minutes 10 seconds	15.2(8)E5	IE-ALL-Upgrade-Mix	25% Distributing ie4000-Universal...
☐	PLANT1-CELL2-IE2. ucslabstl.local (10.2 4.10.15)	Switches and Hubs	Apr 13, 2024	20 minutes 10 seconds	15.2(8)E5	IE-ALL-Upgrade-Mix	25% Distributing ie4000-Universal...
☐	PLANT1-CELL2-IE1. ucslabstl.local (10.2 4.10.14)	Switches and Hubs	Apr 13, 2024	19 minutes 58 seconds	15.2(8)E5	IE-ALL-Upgrade-Mix	Successfully updated with ie4000-uni versalk9-mz.152-8.E5.bin

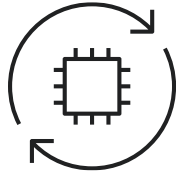
The other two IEs
are upgrading after
IE1 finishes

Use Case #3

Automate replacement



RMA Workflow



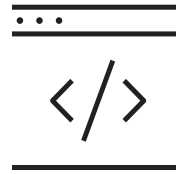
Image

Upgrade Software
Image



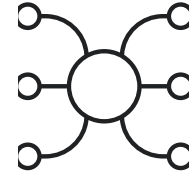
License

Register Cisco Smart
Software Manager



Configuration

Inherit faulty device
configuration



Integration

Replace faulty device
in ISE and Catalyst
Center Inventory



Fully automate all 15 manual steps Involved

Streamline RMA manual tasks in one shot

Devices (6) Focus: Inventory

Click here to apply basic or advanced filters or view recently applied filters

1 Selected Tag Add Device Edit Device Delete Device Actions

Tags	Device Name	IP Address	Inventory	Reachability	EoX Status
☐	☐	PLANT1-RTR.ucslabstl.local	10.1.210	Software Image	Unreachable 1 alert
☐	☐	PLANT1-CORE.ucslabstl.local	10.24.10	Provision	Unreachable 1 alert
☐	☐	PLANT1-IDF1-SW1.ucslabstl.local	10.24.10	Telemetry	Unreachable 1 alert
☐	☐	PLANT1-CELL1-IE1.ucslabstl.local	10.24.10	Device Replacement	Unreachable 1 alert
☐	☐	PLANT1-IDF2-SW1.ucslabstl.local	10.24.10.13	Compliance	Reachable 1 alert
☒	☐	PLANT1-CELL2-IE1.ucslabstl.local	10.24.10.14	More	Unreachable 2 alerts

Replace Device

Mark for Replacement

Unmark for Replacement

Replacement History

Choose Replacement Device

You have selected to replace PLANT1-CELL2-IE1.ucslabstl.local. Now, it is time to choose your replacement device.

Replacing PLANT1-CELL2-IE1.ucslabstl.local

IP Address	10.24.10.14	Serial Number	FDO2137U0MW
Platform	IE-4000-16T4G-E	Software Version	15.2(8)E5

Available Replacement Devices (1)

Below is the suitable replacements for your device. Unclaimed devices are ones that are onboarded through Plug and Play and Managed devices are the ones that are onboarded through Inventory or Disco

Source Plug and Play Inventory

Add Device Sync with Smart Account

Device Name	IP Address	Manageability	Serial Number	Platform
FDO2137U0MQ	10.24.10.221	Unclaimed	FDO2137U0MQ	IE-4000-16T4G-E

Device Replacement: PLANT1-CELL2-IE1.ucslabstl.local - FDO2137U0MW

Task - DEVICE REPLACEMENT

Completed - Success

Start: Apr 20, 2024 11:03 AM End: Apr 20, 2024 11:19 AM

This task was created to deploy configuration that was previously previewed as a work item. View Work Item Details

Steps

Adding the replacement device in CSSM

Status Message: The faulty device is not registered with CSSM. Skipping registration of the replacement device with CSSM. Success

Start Time: Apr 20, 2024 11:18:33 AM

End Time: Apr 20, 2024 11:18:33 AM

Syncing device in the ISE server

Status Message: ISE server sync is successful. Success

Start Time: Apr 20, 2024 11:18:33 AM

End Time: Apr 20, 2024 11:18:37 AM

Deleting the faulty device from the inventory

Status Message: The faulty device has been successfully deleted from the inventory and PnP. Success

Start Time: Apr 20, 2024 11:18:37 AM

End Time: Apr 20, 2024 11:18:44 AM

15 manual tasks
are automated
within 16 mins

SD Card Swap Comparison



For Your
Reference

	SD Card Swap	Catalyst Center RMA 
Simplicity	Simple: operator inserts SD card on new switch	Simple: operator starts workflow on Catalyst Center
Persona	Operator in the floor replaces hardware, cables and SD card	Operator on the floor replaces hardware and cables Catalyst Center operator starts RMA workflow
Completeness	SD card swap does not configure SNMPv3 credentials or replace device in ISE and Catalyst Center inventory	Replaces SNMPv3 credentials, replaces device in ISE and Catalyst Center inventory
Speed	Faster (Software Image is already in SD card) < 5mins (For urgency)	Fast, needs to distribute image to the device. Up to 25 mins

Use Case #4

Track compliance
and configuration



Compliance Summary

Automated Check on Lifecycle, Network Configuration, Software Version, Security Advisory

All Devices / PLANT1-CELL1-IE1.ucslabstl.local

PLANT1-CELL1-IE1.ucslabstl.local

Run Commands

View 360

Reachable Managed IP Address: 10.24.10.12 Device Model: Cisco Catalyst IE-3400-8T2S Rugged Switch Device Role: ACCESS Uptime: 4 days 19 hrs 46 mins Site: Global/IoT Demo/Plant1

DETAILS

Summary

System

Interfaces

Layer 2 Configuration **BETA**

Browse Configurations

User Defined Fields

REP Rings

SECURITY

Advisories

FIELD NOTICES

Field Notices

Potential Field Notices

COMPLIANCE

Summary

You can now fix all configuration compliance issues on this device. You will be able to review before the fix is applied. [Fix All Configuration Compliance Issues](#)

Compliance Summary

Next Compliance check is scheduled on Apr 20, 2024 06:20 PM [Run Compliance Check](#)

✓ EoX - End of Life

Compliance last run on: Apr 20th, 2024, 03:09:21 AM

Software : **Compliant**

Hardware : **Compliant**

Module : **Compliant**

✓ Network Settings

Compliant since Apr 16th, 2024, 06:34:23 AM

Compliance last run on: Apr 20th, 2024, 03:09:21 AM

0

Open Violations

✗ Startup vs Running Configuration

Compliance last run on: Apr 20th, 2024, 03:09:21 AM

3 days
since out of sync

Lines added: **80**

Lines removed: **2**

Lines modified: **0**

✓ Network Profiles

Compliant since Apr 17th, 2024, 01:14:22 AM

Compliance last run on: Apr 20th, 2024, 03:09:22 AM

0

Open Violations

✗ Software Image

Non-Compliant since Apr 15th, 2024, 07:54:12 PM

Compliance last run on: Apr 20th, 2024, 03:09:21 AM

17.12.03

Running Version: **17.12.1**

Golden Image Version

✗ Critical Security Advisories

Non-Compliant since Apr 20th, 2024, 03:09:21 AM

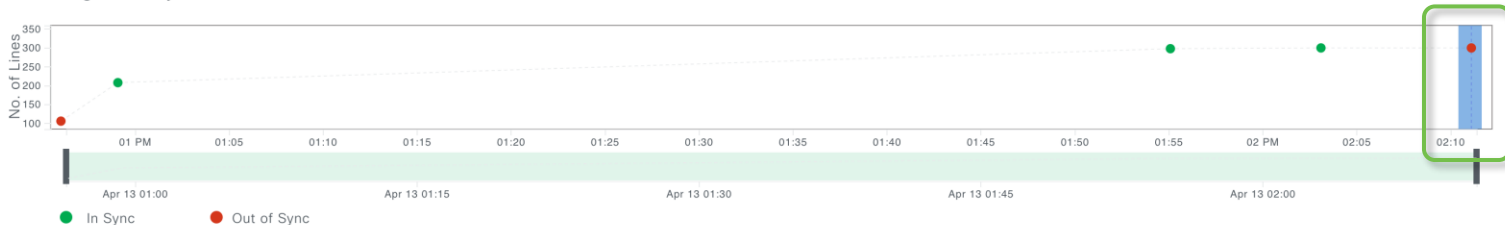
Compliance last run on: Apr 20th, 2024, 03:09:21 AM

1

Always Sync Your Configuration

Compliance Summary / Startup vs Running Configuration

Change History



Startup Config (299 Lines) - Apr 13, 2024 02:11 PM

Running Config (299 Lines) - Apr 13, 2024 02:11 PM

```
164 ip dhcp client client-id ascii FD02127U0KF
165 ip address 10.24.10.16 255.255.255.0
166 ip forward-protocol nd
167 ip http server
168 ip http authentication local
169 ip http secure-server
170 ip http client source-interface Vlan10
```

```
164 ip dhcp client client-id ascii FD02127U0KF
165 ip address 10.24.10.16 255.255.255.0
166 ip forward-protocol nd
167 no ip http server
168 ip http authentication local
169 ip http secure-server
170 ip http client source-interface Vlan10
```

ⓘ The tooltip indicates that the no. of lines added/removed/modified may not match with the contents listed in the diff viewer. This is because the position between the modified commands is either displayed as inappropriate lines or is displayed separately that does not represent the modification made.

Sync Device Config, will allow the system to overwrite startup config with running config to make the device configuration compliant.

Cancel

Sync Device Config

Detect Out-of-band configuration drift

PLANT1-CELL2-IE1.ucslabstl.local

Run Commands

View 360

Oops, a network admin changed ntp server IP through vty1 from 10.222.222.2

Last Updated: 3 minutes ago

Reachable Managed IP Address: 10.24.10.14 Device Model: Cisco IE-4000-16T4G-E Industrial Ethernet Switch

DETAILS

Summary

System

Interfaces

Browse Configurations

Configuration

Config Drift

User Defined Fields

REP Rings

SECURITY

Advisories

FIELD NOTICES

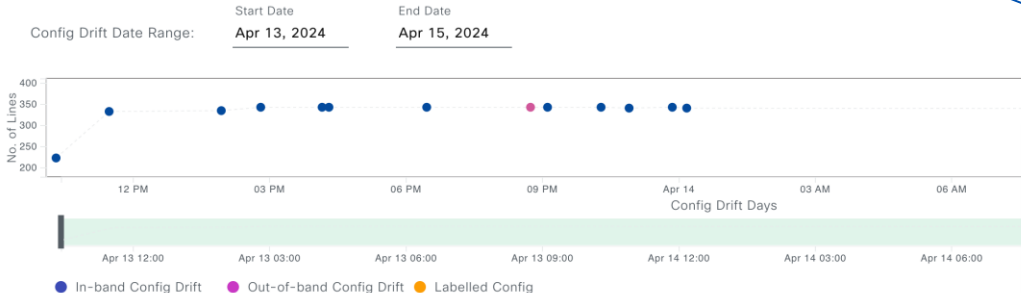
Field Notices

Potential Field Notices

COMPLIANCE

Summary

Change History (Running Config)



Config Drift Version

Apr 14, 2024 03:29 PM

Label Config

Running Config (338 Lines)

```
335 transport preferred none
336 transport input ssh
337 ntp source Vlan10
338 ntp server 10.1.104.12
339 netconf-yang
340 pnp profile pnp-zero-touch
341 transport https host pnpserver.ucslabstl.local port 443
```

Config Drift Version

Apr 14, 2024 03:50 PM

Running Config (338 Lines)

```
335 transport preferred none
336 transport input ssh
337 ntp source Vlan10
338 ntp server 10.1.2.10
339 netconf-yang
340 pnp profile pnp-zero-touch
341 transport https host pnpserver.ucslabstl.local port 443
```

Out-of-band Config Drift

Config version with changes made outside of Catalyst Center since it's previous version.

Lines Added: 0
Lines Removed: 0
Lines Modified: 1
Triggered By: Config Change Event
Terminal Name: vty1
Login IP: 10.222.222.2
Username: hailu
Config Method: console

Apr 14, 2024 03:50 PM

Detect changes deviated from template

PLANT1-CELL2-IE1.ucslabstl.local [Run Commands](#) [View](#)

Reachable | Managed | IP Address: 10.24.10.14 | Device Model: Cisco IE-4000-16T4G

DETAILS

Summary

System

Interfaces

Browse Configurations

User Defined Fields

REP Rings

SECURITY

Advisories

FIELD NOTICES

Field Notices

Potential Field Notices

COMPLIANCE

Summary

You can now fix all configuration compliance issues on this device.

Compliance Summary

No events detected to trigger compliance check [Run Cor](#)

Network Settings

Compliant since Apr 13th, 2024, 03:50:24 PM
Compliance last run on: Apr 13th, 2024, 08:54:01 PM

0

Open Violations

Network Profiles

Non-Compliant since Apr 13th, 2024, 08:54:01 PM
Compliance last run on: Apr 13th, 2024, 08:54:01 PM

1

CLI Template: 1

Open Violations

You can restore the original config by clicking here

You can now fix all configuration compliance issues on this device. You will be able to review before the fix is applied. [Fix All Configuration Compliance Issues](#)

Compliance Summary / Network Profiles

```
PLANT1-CELL2-IE1(config)#interface FastEthernet1/5
PLANT1-CELL2-IE1(config-if)#description pc port
PLANT1-CELL2-IE1(config-if)#switchport access vlan 602
PLANT1-CELL2-IE1(config-if)#
```

CLI Template (1)

CLI Deviations

As of: Apr 13, 2024 8:56 PM

Search Table

Open Violations (1) Acknowledged Violations (0)

Template	Action
IE4000-Vlan-Interface-Template	Acknowledge

1 Record(s) Show Records: 10 1 - 1

Realize Template: IE4000-Vlan-Interface-Template

6	6	
7	7	
8	8	interface FastEthernet1/5
9		description machine port
10		switchport access vlan 502
11	9	switchport mode access
12	10	snmp trap mac-notification change added
13	11	snmp trap mac-notification change removed

Use Case #5

Automate the ring



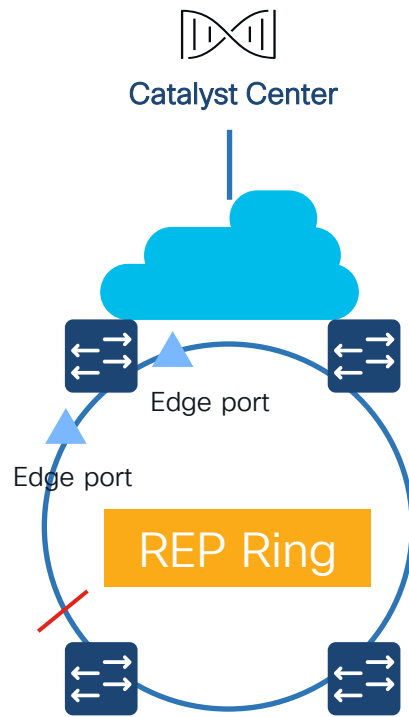
REP Ring (non-fabric) With Catalyst Center

Overview

- **Resilient Ethernet Protocol (REP)** is a Cisco proprietary resiliency protocol that manages network loops, provides fast recovery to link and node failures
- Catalyst Center seamlessly manage the creation, update, deletion of REP rings across network, centrally managed REP node inventory

*Supported Platform

- IE4000, IE4010, IE5000, Release 15.2(7)E3
- IE3100, Release 17.10
- IE3200, IE3300, IE3400, IE3400H, ESS3300, Stratix S5800, Release 17.3.4
- Catalyst Center 2.3.4 (2.3.7.3 for IE3100)



*Refer to product datasheet/Catalyst Center compatibility matrix for details.

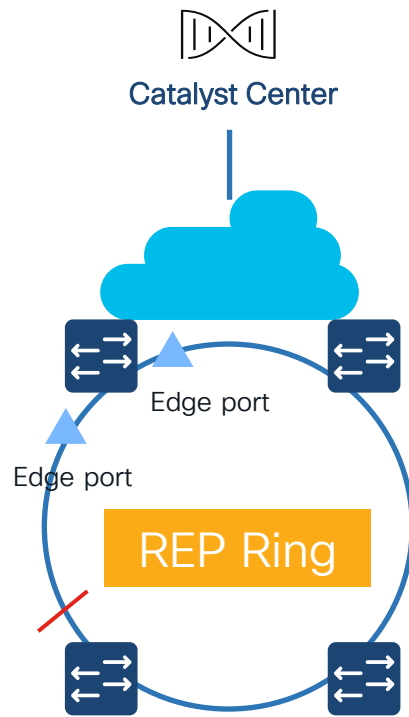
REP Ring (non-fabric) With Catalyst Center

Prerequisites

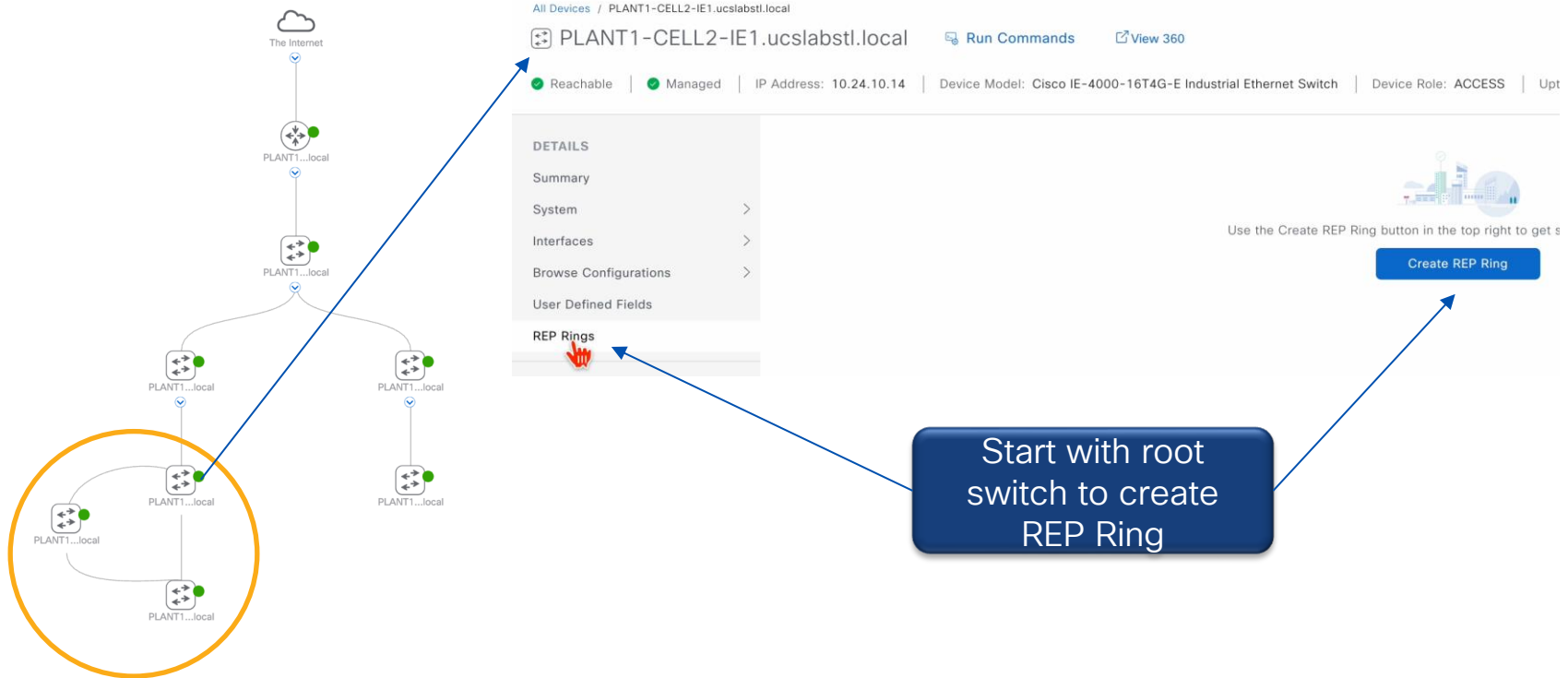
- If REP nodes are non-fabric nodes, then inside the ring all nodes must be non-fabric
- All devices are onboarded in Catalyst Center and are in reachable state and all ports in ring must be trunk ports.
- All devices must be connected in a STP ring and convert into a REP ring in the coming steps
- Root device must have upstream connections which are not the REP ring ports

Supported Topologies in Catalyst Center

- Closed rings, both edge ports are located at the root node
- Ring of rings/multiple rings within a ring is not supported

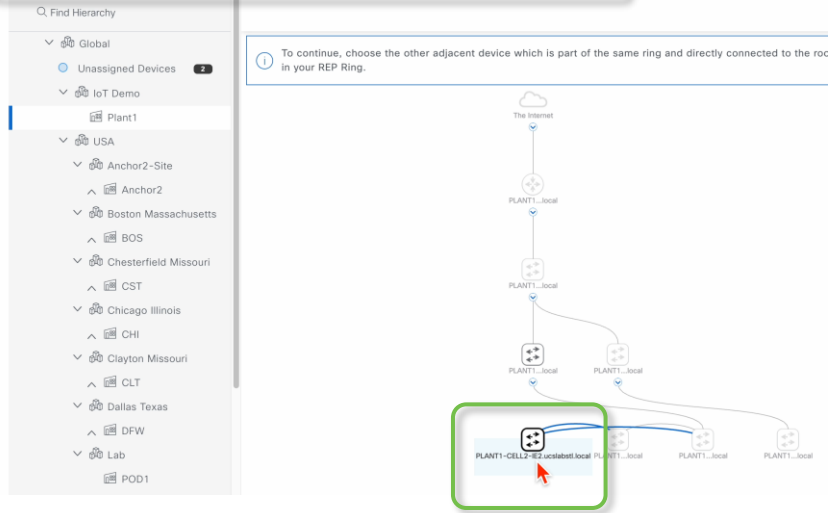


Automate the Ring in 1-2-3

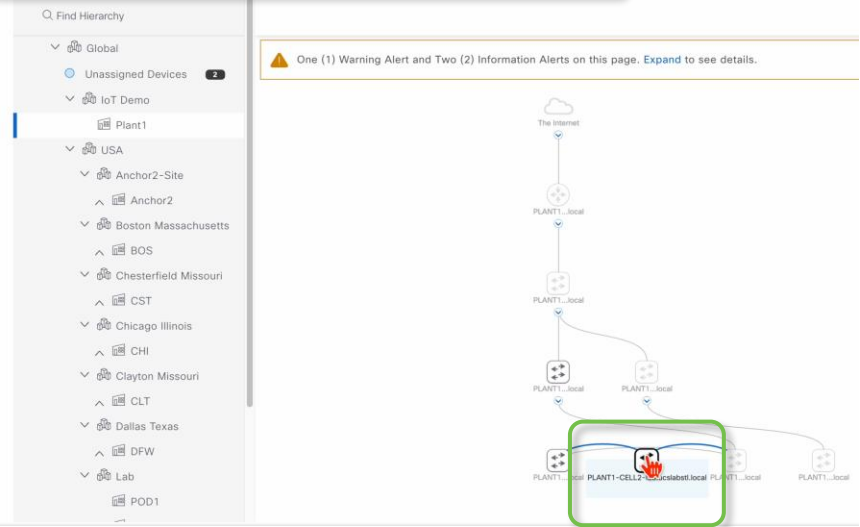


Automate the Ring in 1-2-3

Select adjacent devices connected to root device



Select adjacent devices connected to root device



Automate the Ring in 1-2-3

Catalyst CenterConfigure REP Ring (Non-Fabric)

50%

> Start Ring Discovery

> Discover Ring Members

> **Configure Devices**

- Started shutdown of port interface GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local at Apr 13, 2024, 6:57:30 PM.
- Completed shutdown of port interface GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local successfully at Apr 13, 2024, 6:57:40 PM.
- Started REP segmentation configuration in GigabitEthernet1/1 on PLANT1-CELL2-IE2.ucslabstl.local at Apr 13, 2024, 6:57:40 PM.
- Completed REP segmentation configuration in GigabitEthernet1/1 on PLANT1-CELL2-IE2.ucslabstl.local successfully at Apr 13, 2024, 6:57:51 PM.
- Started REP segmentation configuration in GigabitEthernet1/2 on PLANT1-CELL2-IE3.ucslabstl.local at Apr 13, 2024, 6:57:51 PM.
- Completed REP segmentation configuration in GigabitEthernet1/2 on PLANT1-CELL2-IE3.ucslabstl.local successfully at Apr 13, 2024, 6:58:01 PM.
- Started shutdown of port interface GigabitEthernet1/4 and enable of port interface GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local at Apr 13, 2024, 6:58:01 PM.
- Completed shutdown of port interface GigabitEthernet1/4 and enable of port interface GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local successfully at Apr 13, 2024, 6:58:11 PM.
- Started REP configuration in GigabitEthernet1/4 and GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local at Apr 13, 2024, 6:58:11 PM.
- Completed REP configuration in GigabitEthernet1/4 and GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local successfully at Apr 13, 2024, 6:58:22 PM.
- Started REP segmentation configuration in GigabitEthernet1/2 on PLANT1-CELL2-IE2.ucslabstl.local at Apr 13, 2024, 6:58:22 PM.

> Summary

Start configuration on switches with REP commands in sequence to avoid down time

REP Ring Summary

Summary of the discovered REP Ring Devices and REP Ring Configuration status

Ring_1

RING DETAILS

Root Device	PLANT1-CELL2-IE1.ucslabstl.local	Discovery Status	Success
Adjacent devices connected to Root Device	PLANT1-CELL2-IE3.ucslabstl.local, PLANT1-CELL2-IE2.ucslabstl.local	Number of devices discovered	3

DISCOVERED DEVICES

Ring Order	Devices	First Port	Second Port
1	PLANT1-CELL2-IE1.ucslabstl.local	GigabitEthernet1/4 (edge primary)	GigabitEthernet1/3 (edge)
2	PLANT1-CELL2-IE3.ucslabstl.local	GigabitEthernet1/1	GigabitEthernet1/2
3	PLANT1-CELL2-IE2.ucslabstl.local	GigabitEthernet1/2	GigabitEthernet1/1

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54

Check REP Status

All Devices / PLANT1-CELL2-IE1.ucslabstl.local

🔍 PLANT1-CELL2-IE1.ucslabstl.local [Run Commands](#) [View 360](#) Last Updated: a few seconds ago 🔄

● Reachable | ● Managed | IP Address: 10.24.10.14 | Device Model: Cisco IE-4000-16T4G-E Industrial Ethernet Switch | Device Role: ACCESS | Uptime: 4 hrs 6 mins | Site: Global/IoT Demo/Plant1

DETAILS

Summary

System >

Interfaces >

Browse Configurations >

User Defined Fields >

REP Rings

Rings (1) [Create REP Ring](#)

🔍 Search Table

Name	Ring Type	Ring Size	First/Last Adjacent Device	Provision Status	REP Topology Status	Actions
Ring_1	Non-Fabric	3	PLANT1-CELL2-IE3.ucslabstl.local/ PLANT1-CELL2-IE2.ucslabstl.local	● Success	View	***

Showing 1 of 1

All Devices / PLANT1-CELL2-IE1.ucslabstl.local

🔍 PLANT1-CELL2-IE1.ucslabstl.local [Run Commands](#) [View 360](#)

● Reachable | ● Managed | IP Address: 10.24.10.14 | Device Model: Cisco IE-4000-16T4G-E Indus

DETAILS

Summary

System >

Interfaces >

Browse Configurations >

User Defined Fields >

REP Rings

[REP Rings](#) > Ring_1

REP Topology Status:

REP Segment 2 BridgeName	PortName	Edge	Role
PLANT1-CELL2-IE1	Gi1/4	Pri	Alt
PLANT1-CELL2-IE3	Gi1/1		Open
PLANT1-CELL2-IE3	Gi1/2		Open
PLANT1-CELL2-IE2	Gi1/2		Open
PLANT1-CELL2-IE2	Gi1/1		Open
PLANT1-CELL2-IE1	Gi1/3	Sec	Open

All switches in REP ring will have this REP Rings page available to view status

Remove REP Ring in One Click

All Devices / PLANT1-CELL2-IE1.ucslabstl.local

PLANT1-CELL2-IE1.ucslabstl.local

Run Commands

View 360

Last Updated: an hour ago

Reachable Managed IP Address: 10.24.10.14 Device Model: Cisco IE-4000-16T4G-E Industrial Ethernet Switch Device Role: ACCESS Uptime: 13 hrs 54 mins Site: Global/IoT Demo/Plant1

DETAILS

Summary

System

Interfaces

Browse Configurations

User Defined Fields

REP Rings

SECURITY

REP Rings > Ring_1 - Workflow steps

Start Ring Deletion

Discover Ring Members

Configure Devices

- Started deletion of REP Edge configuration in GigabitEthernet1/4 and GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local at Apr 14, 2024, 8:25:26 PM.
- Completed deletion of REP Edge configuration in GigabitEthernet1/4 and GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local successfully at Apr 14, 2024, 8:25:36 PM.
- Started shutdown of port interface GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local at Apr 14, 2024, 8:25:36 PM.
- Completed shutdown of port interface GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local successfully at Apr 14, 2024, 8:25:45 PM.
- Started deletion of REP segmentation configuration in GigabitEthernet1/1 on PLANT1-CELL2-IE2.ucslabstl.local at Apr 14, 2024, 8:25:45 PM.
- Completed deletion of REP segmentation configuration in GigabitEthernet1/1 on PLANT1-CELL2-IE2.ucslabstl.local successfully at Apr 14, 2024, 8:25:57 PM.
- Started deletion of REP segmentation configuration in GigabitEthernet1/2 on PLANT1-CELL2-IE3.ucslabstl.local at Apr 14, 2024, 8:25:57 PM.
- Completed deletion of REP segmentation configuration in GigabitEthernet1/2 on PLANT1-CELL2-IE3.ucslabstl.local successfully at Apr 14, 2024, 8:26:07 PM.
- Started shutdown of port interface GigabitEthernet1/4 and enable of port interface GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local at Apr 14, 2024, 8:26:07 PM.
- Completed shutdown of port interface GigabitEthernet1/4 and enable of port interface GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local successfully at Apr 14, 2024, 8:26:17 PM.
- Started deletion of REP segmentation configuration in GigabitEthernet1/2 on PLANT1-CELL2-IE2.ucslabstl.local at Apr 14, 2024, 8:26:17 PM.
- Completed deletion of REP segmentation configuration in GigabitEthernet1/2 on PLANT1-CELL2-IE2.ucslabstl.local successfully at Apr 14, 2024, 8:26:27 PM.
- Started deletion of REP segmentation configuration in GigabitEthernet1/1 on PLANT1-CELL2-IE3.ucslabstl.local at Apr 14, 2024, 8:26:27 PM.
- Completed deletion of REP segmentation configuration in GigabitEthernet1/1 on PLANT1-CELL2-IE3.ucslabstl.local successfully at Apr 14, 2024, 8:26:37 PM.
- Started deletion of REP configuration in GigabitEthernet1/4 and GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local at Apr 14, 2024, 8:26:37 PM.
- Completed deletion of REP configuration in GigabitEthernet1/4 and GigabitEthernet1/3 on PLANT1-CELL2-IE1.ucslabstl.local successfully at Apr 14, 2024, 8:26:47 PM.
- Started enable of port interface GigabitEthernet1/4 on PLANT1-CELL2-IE1.ucslabstl.local at Apr 14, 2024, 8:26:47 PM.
- Completed enable of port interface GigabitEthernet1/4 on PLANT1-CELL2-IE1.ucslabstl.local successfully at Apr 14, 2024, 8:26:57 PM.

Summary

Rings (1)

Create REP Ring

Search Table

Name	Ring Type	Ring Size	First/Last Adjacent Device	Provision Status	REP Topology Status	Actions
Ring_1	Non-Fabric	3	PLANT1-CELL2-IE3.ucslabstl.local/ PLANT1-CELL2-IE2.ucslabstl.local	Success	View	...

Showing 1 of 1

Delete
Rediscover

Deletion of REP might interrupt the network traffic. It's back to STP loop.

Limitation and Advisories



For Your
Reference

- If multiple links present between two devices, then the links should be configured as port-channel before the REP ring is triggered.
- Ensure all the interfaces which are part of ring should be the trunk port.
- The device which is selected as a root bridge should have third link through which has reachability to Catalyst Center (other two links are part of the ring).
- Ring of rings and Open REP ring are not supported.
- Brown-field - learning of a REP Ring which is created outside Catalyst Center is not supported currently.
- Before Deleting a REP Ring from Catalyst Center make sure no errors are there in REP ring i.e. if a node gets deleted in a REP ring, before deleting the REP ring from Catalyst Center make sure the Adjacent nodes are connected and REP ring re-discovered.
- Works for “vanilla” REP, REP Fast is not supported.

Takeaway



Become an OT Network Champion!



- Simplify the provision of the template
- Upgrade software in controlled manner to minimise downtime
- Automate device replacement
- Use compliance to track configuration drift
- Leverage REP automation

Industrial IoT Summit@Cisco Live APJC Wed 14th

Time	Eureka 1	Eureka 2	Eureka 3
11:45 – 12:20	Lunch & Networking inside the Room	Lunch & Networking inside the Room	Lunch & Networking inside the Room
12:20 – 12:45	Utilities Cisco Executive Welcome Vikas Butaney, Senior Vice President, Cisco Ross Delacour, IIoT APJC Regional Director	Mining Cisco Executive Welcome Dave West, Senior Vice President Samuel Pasquier, Vice President, IIoT Product Management	Transportation Cisco Executive Welcome Stefan Leitl, Vice President, Global IIoT Sales Bryan Tantzen, Sr. Director, IIoT Solutions
12:45 – 4:30	<u>Utilities Summit Breakout</u>	<u>Mining Summit Breakout</u>	<u>Transportation Summit Breakout</u>
	Industry breakout sessions bring focused dialogue to the key topics you care about: Breakout sessions include curated presentations by industry leaders including an industry panel discussion with Q&A. These meaningful conversations related to current and emerging trends will empower you to navigate the ever-changing IT/OT landscape with actionable takeaways you can bring back to your environment.		
4:30 – 5:15	Cocktail Reception Interact with your Industry peers and Cisco Industrial IoT Executives		

Contact Alex Lynn (alelynn@cisco.com) or
Andrew Johnstone (ajohnst3@cisco.com) for admission

Keynote Deep Dives

Wednesday
10:30am – 11:30am



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How AI Can Fuel Better Employee and Customer Experiences

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Room 106



Smart, Secure, Seamless:
Transforming Experiences with Next-Generation Networking

Level 2
Room 204



Harness a Bold New Era:
Transform Data Centre and Service Provider Connectivity

Level 2
Room 203



Securing User to Application and Everything in Between

Level 2
Melbourne Room 2



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