You make **possible**

Automating Highly Critical ACI Data Center Operations

A Customer Use-Case

Sebastian Jeuk, Architect, CX
Dylan Pedavoli, Consultant, CX

DEVLIT-4039

cisco Live!
Barcelona | January 27-31, 2020

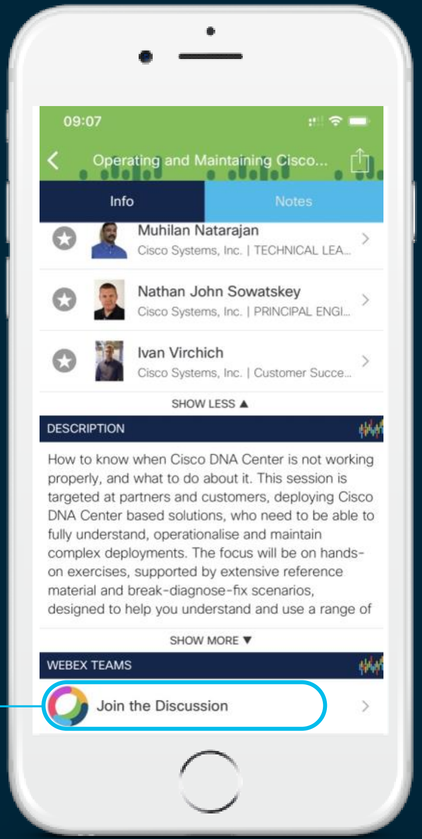
Cisco Webex Teams

Questions?

Use Cisco Webex Teams to chat
with the speaker after the session

How

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



09:07

Operating and Maintaining Cisco...

Info | Notes

Muhilan Natarajan
Cisco Systems, Inc. | TECHNICAL LEA...

Nathan John Sowatskey
Cisco Systems, Inc. | PRINCIPAL ENGI...

Ivan Virchich
Cisco Systems, Inc. | Customer Succe...

SHOW LESS ▲

DESCRIPTION

How to know when Cisco DNA Center is not working properly, and what to do about it. This session is targeted at partners and customers, deploying Cisco DNA Center based solutions, who need to be able to fully understand, operationalise and maintain complex deployments. The focus will be on hands-on exercises, supported by extensive reference material and break-diagnose-fix scenarios, designed to help you understand and use a range of

SHOW MORE ▼

WEBEX TEAMS

Join the Discussion

Wondering if Automation is the Solution for your DC Migration?

Agenda

- A Customer Migration Use-Case
- Why Automation helped solving the Customer’s Use-Case
- How the Customer’s Use-Case was Automated
- Migration Demo
- Lessons Learnt

The Customer Migration Use-Case

A Customer Migration Use-Case

The Customer Requirements

Migrate Legacy Environment to Cisco ACI (SDN-Solution) without any Downtime and Risk to Production Environment.

- Large and Complex Legacy Environment
  - Hundreds of IOS and NX-OS devices to be migrated
  - Tens of Thousands of Endpoints
  - Custom-build STP-based layer-2 legacy architecture
- Migration during live production with no to minimal failover times
- Complete Migration within a 3-Month window
- Migration Rollback capabilities at every stage of the way

A Customer Migration Use-Case

The Migration Preparation and Decision to Automate

- Develop understanding of Legacy Network and Application Interactions
- Define Method of Procedure for every Scenario, Network Element Type and Configuration
- Network continuously changing (no freeze window)

An ever-changing, complex and large legacy Network and ad-hoc migration execution led to the decision to fully automate the migration

A Customer Migration Use-Case

Why Automation solved the Customers Migration Use-Case

- No Manual intervention during Migration (except for cable move)
- Simplify a complex Migration
- Eliminate human Errors
- Reduce Migration Windows
- Pre-validate full Migration in Cisco Lab

A Customer Migration Use-Case

What we Automated

Network Analyzes

Method of Procedure

Rollback

End-to-End Automation

Verification

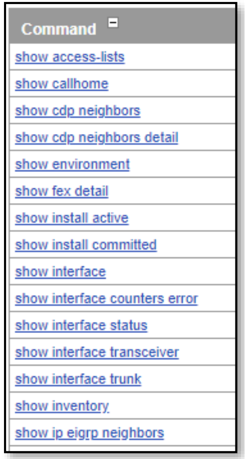
Testing

ACI Configuration

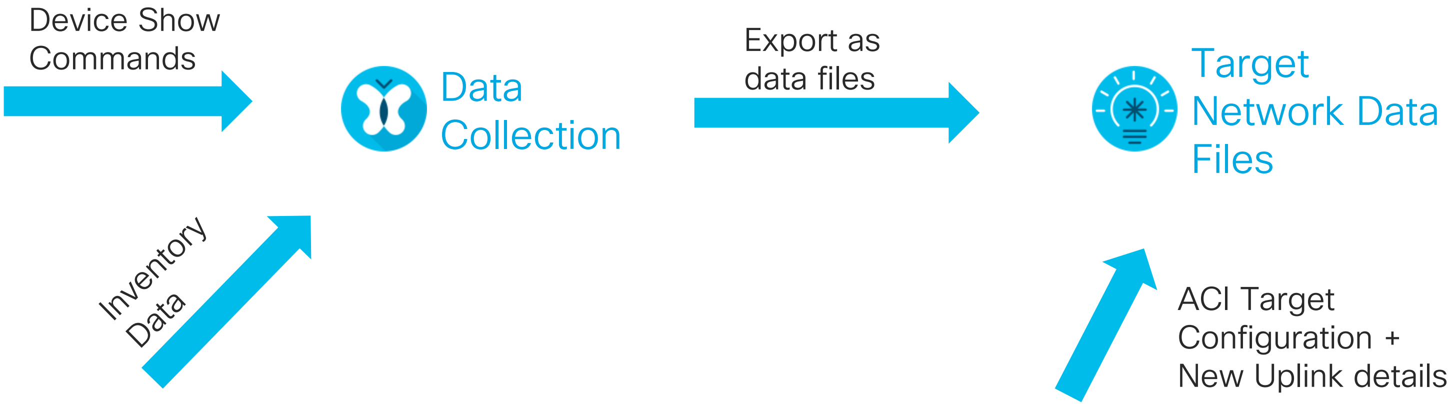
Automation is the Solution

How Did We Automate?

Step 1: Collect Network Data



Command
show access-lists
show callhome
show cdp neighbors
show cdp neighbors detail
show environment
show fex detail
show install active
show install committed
show interface
show interface counters error
show interface status
show interface transceiver
show interface trunk
show inventory
show ip eigrp neighbors



Device Show Commands

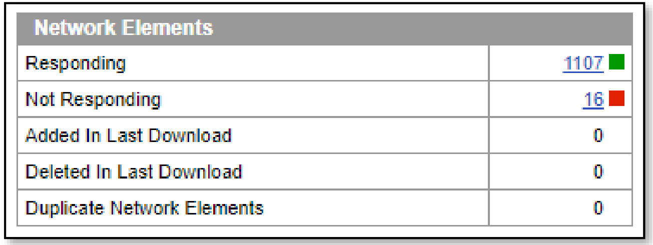
Data Collection

Export as data files

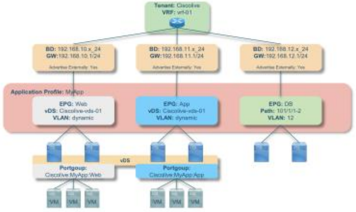
Target Network Data Files

Inventory Data

ACI Target Configuration + New Uplink details

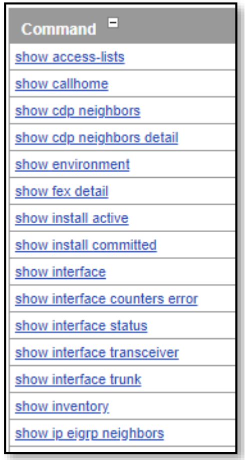


Network Elements	
Responding	1107 🟩
Not Responding	16 🟥
Added In Last Download	0
Deleted In Last Download	0
Duplicate Network Elements	0

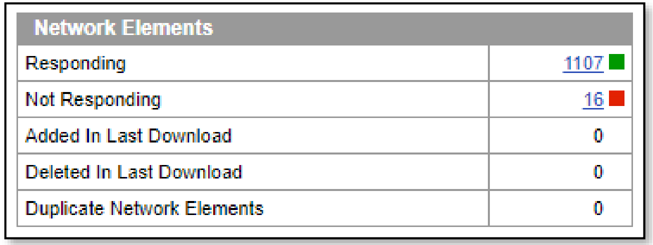


Step 1: Collect Network Data

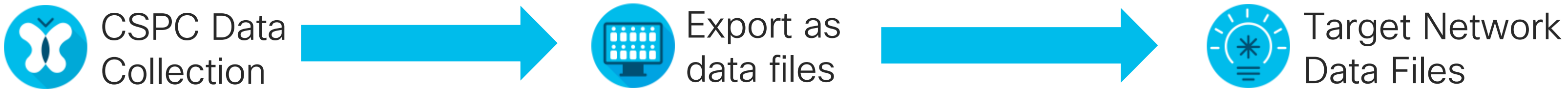
- Having a source of truth for the network. How does the network look?
  - Some internal application that collects configuration backups, output etc.
  - In our case: Collected from CSPC (Common Platform Services Collector)
- All initial data needed to be exported as data files.
  - Inventory information in .xls files (such as software version, hardware platforms)
  - Command output files as .txt (show commands, cdp neighbors, interface status)
  - Configuration files as .txt or .cfg
- Create data files to be used for the target network.
  - Any information that cannot be retrieved from the legacy devices.
    - New configuration items required post-migration
    - New uplink information.



Command ⊟
show access-lists
show callhome
show cdp neighbors
show cdp neighbors detail
show environment
show fex detail
show install active
show install committed
show interface
show interface counters error
show interface status
show interface transceiver
show interface trunk
show inventory
show ip eigrp neighbors



Network Elements	
Responding	1107 🟩
Not Responding	16 🟥
Added In Last Download	0
Deleted In Last Download	0
Duplicate Network Elements	0

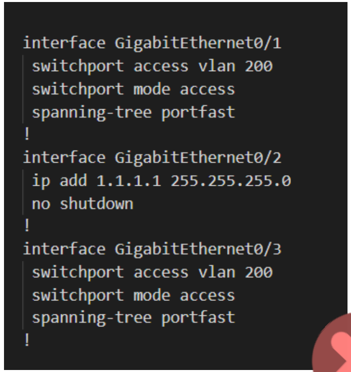


CSPC Data Collection

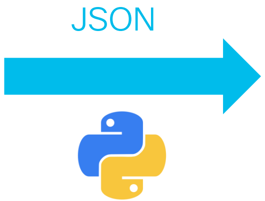
Export as data files

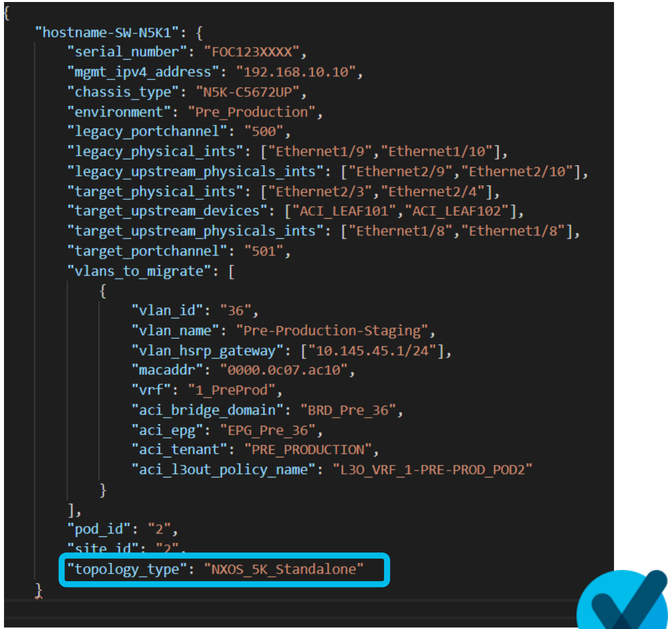
Target Network Data Files

Step 2: Convert Data to Structured Data



```
interface GigabitEthernet0/1
 switchport access vlan 200
 switchport mode access
 spanning-tree portfast
!
interface GigabitEthernet0/2
 ip add 1.1.1.1 255.255.255.0
 no shutdown
!
interface GigabitEthernet0/3
 switchport access vlan 200
 switchport mode access
 spanning-tree portfast
!
```

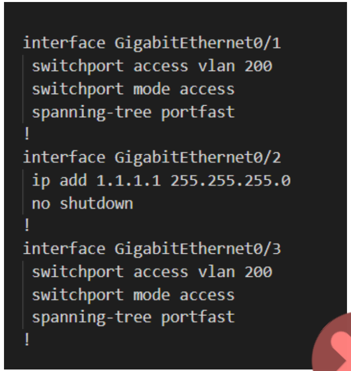




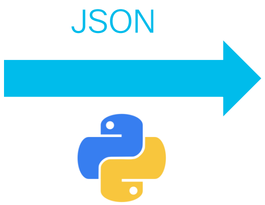
```
{
    "hostname-SW-N5K1": {
        "serial_number": "FOC123XXXX",
        "mgmt_ipv4_address": "192.168.10.10",
        "chassis_type": "N5K-C5672UP",
        "environment": "Pre_Production",
        "legacy_portchannel": "500",
        "legacy_physical_ints": ["Ethernet1/9","Ethernet1/10"],
        "legacy_upstream_physicals_ints": ["Ethernet2/9","Ethernet2/10"],
        "target_physical_ints": ["Ethernet2/3","Ethernet2/4"],
        "target_upstream_devices": ["ACI_LEAF101","ACI_LEAF102"],
        "target_upstream_physicals_ints": ["Ethernet1/8","Ethernet1/8"],
        "target_portchannel": "501",
        "vlans_to_migrate": [
            {
                "vlan_id": "36",
                "vlan_name": "Pre-Production-Staging",
                "vlan_hsrp_gateway": ["10.145.45.1/24"],
                "macaddr": "0000.0c07.ac10",
                "vrf": "1_PreProd",
                "aci_bridge_domain": "BRD_Pre_36",
                "aci_epg": "EPG_Pre_36",
                "aci_tenant": "PRE_PRODUCTION",
                "aci_l3out_policy_name": "L3O_VRF_1-PRE-PROD_POD2"
            }
        ],
        "pod_id": "2",
        "site_id": "2",
        "topology_type": "NXOS_5K_Standalone"
    }
```

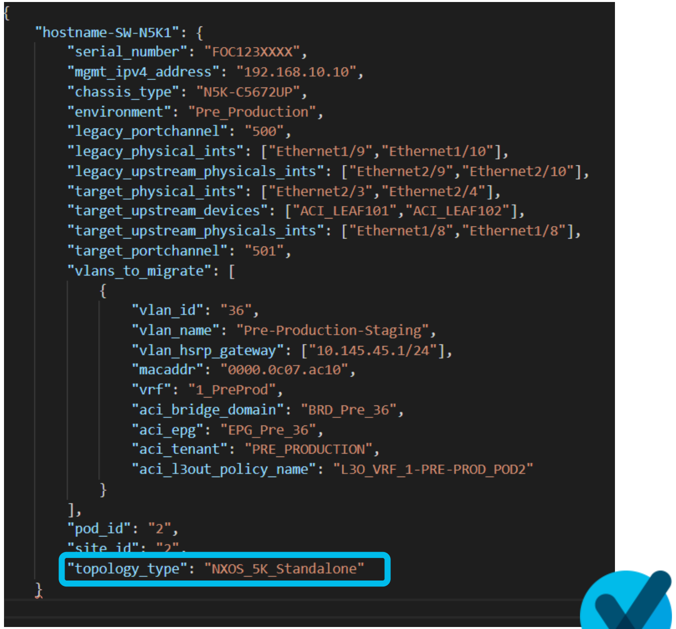
Step 2: Convert Data to Structured Data

- A Python script was used to grab all relevant data to create a master.json file.
  - All inventory information now in the form of structured data (200MB JSON File)
- The JSON data can now be used for all automation functions.
  - Data is static and required only a script re-run in order to pull updated legacy data and devices.
  - Easy access of device data for python applications and network programmability



```
interface GigabitEthernet0/1
 switchport access vlan 200
 switchport mode access
 spanning-tree portfast
!
interface GigabitEthernet0/2
 ip add 1.1.1.1 255.255.255.0
 no shutdown
!
interface GigabitEthernet0/3
 switchport access vlan 200
 switchport mode access
 spanning-tree portfast
!
```

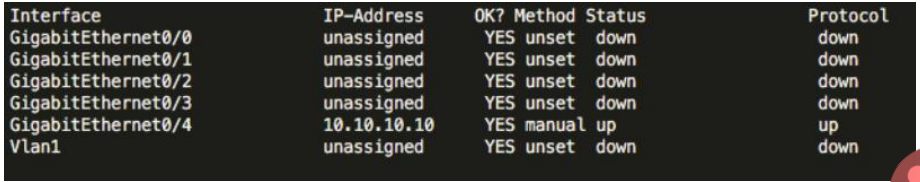




```
{
    "hostname-SW-N5K1": {
        "serial_number": "FOC123XXXX",
        "mgmt_ipv4_address": "192.168.10.10",
        "chassis_type": "N5K-C5672UP",
        "environment": "Pre_Production",
        "legacy_portchannel": "500",
        "legacy_physical_ints": ["Ethernet1/9","Ethernet1/10"],
        "legacy_upstream_physicals_ints": ["Ethernet2/9","Ethernet2/10"],
        "target_physical_ints": ["Ethernet2/3","Ethernet2/4"],
        "target_upstream_devices": ["ACI_LEAF101","ACI_LEAF102"],
        "target_upstream_physicals_ints": ["Ethernet1/8","Ethernet1/8"],
        "target_portchannel": "501",
        "vlans_to_migrate": [
            {
                "vlan_id": "36",
                "vlan_name": "Pre-Production-Staging",
                "vlan_hsrp_gateway": ["10.145.45.1/24"],
                "macaddr": "0000.0c07.ac10",
                "vrf": "1_PreProd",
                "aci_bridge_domain": "BRD_Pre_36",
                "aci_epg": "EPG_Pre_36",
                "aci_tenant": "PRE_PRODUCTION",
                "aci_l3out_policy_name": "L3O_VRF_1-PRE-PROD_POD2"
            }
        ],
        "pod_id": "2",
        "site_id": "2",
        "topology_type": "NXOS_5K_Standalone"
    }
```

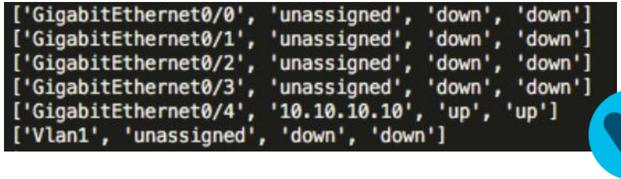
cisco Live!

Step 3: Automated Scripts & Method of Procedure

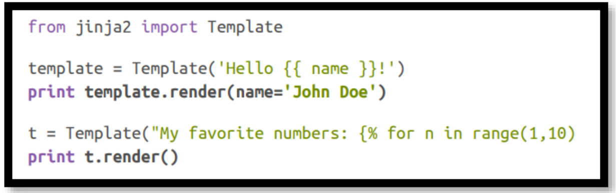


```
Interface                  IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0         unassigned       YES unset  down                  down
GigabitEthernet0/1         unassigned       YES unset  down                  down
GigabitEthernet0/2         unassigned       YES unset  down                  down
GigabitEthernet0/3         unassigned       YES unset  down                  down
GigabitEthernet0/4         10.10.10.10      YES manual up                    up
Vlan1                      unassigned       YES unset  down                  down
```

TextFSM

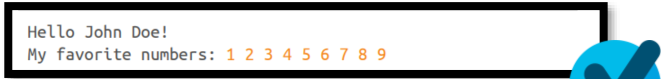


```
['GigabitEthernet0/0', 'unassigned', 'down', 'down']
['GigabitEthernet0/1', 'unassigned', 'down', 'down']
['GigabitEthernet0/2', 'unassigned', 'down', 'down']
['GigabitEthernet0/3', 'unassigned', 'down', 'down']
['GigabitEthernet0/4', '10.10.10.10', 'up', 'up']
['Vlan1', 'unassigned', 'down', 'down']
```



```
from jinja2 import Template

template = Template('Hello {{ name }}!')
print template.render(name='John Doe')

t = Template("My favorite numbers: {% for n in range(1,10)
print t.render()
```

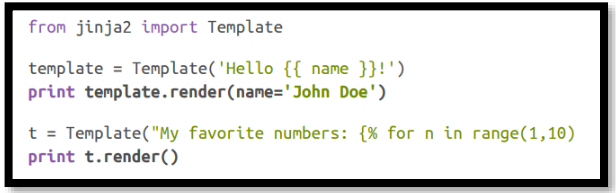
JINJA2



```
Hello John Doe!
My favorite numbers: 1 2 3 4 5 6 7 8 9
```

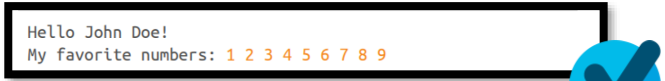
Step 3: Automated Scripts & Method of Procedure

- Structured JSON data now supports…..
  - Automated documentation for migration procedures – JINJA2 (python library for templating)
  - Automated migrations using Netmiko, TextFSM, RestAPI
    - Stick to open source, don’t reinvent the wheel!
  - Automated testing using the Cisco Labs (ROBOT Framework)
    - Layer 1 switch > automated cable change testing
    - Setup and baseline verifications

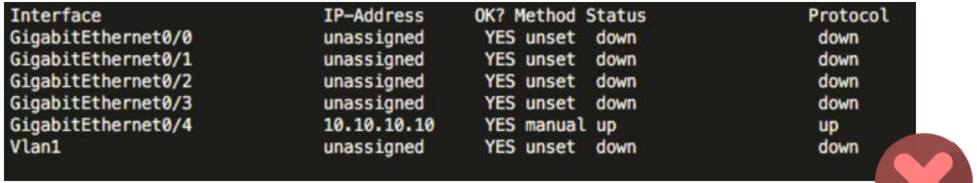


```
from jinja2 import Template

template = Template('Hello {{ name }}!')
print template.render(name='John Doe')

t = Template("My favorite numbers: {% for n in range(1,10)
print t.render()
```

JINJA2

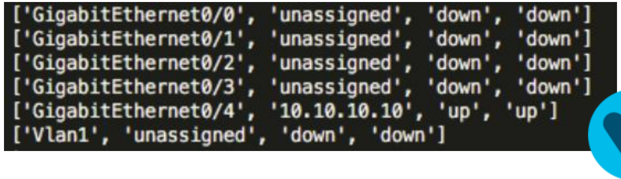


```
Hello John Doe!
My favorite numbers: 1 2 3 4 5 6 7 8 9
```



```
Interface                  IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0         unassigned      YES unset  down                  down
GigabitEthernet0/1         unassigned      YES unset  down                  down
GigabitEthernet0/2         unassigned      YES unset  down                  down
GigabitEthernet0/3         unassigned      YES unset  down                  down
GigabitEthernet0/4         10.10.10.10     YES manual up                    up
Vlan1                      unassigned      YES unset  down                  down
```

TextFSM



```
['GigabitEthernet0/0', 'unassigned', 'down', 'down']
['GigabitEthernet0/1', 'unassigned', 'down', 'down']
['GigabitEthernet0/2', 'unassigned', 'down', 'down']
['GigabitEthernet0/3', 'unassigned', 'down', 'down']
['GigabitEthernet0/4', '10.10.10.10', 'up', 'up']
['Vlan1', 'unassigned', 'down', 'down']
```

Demo

Lessons Learnt

Lessons Learnt

Automation enabled a successful and timely Migration

- Prior Migration
  - A complete understanding of legacy environment is critical
  - Upfront planning reduces risk at later stages
  - Extensive testing shifts risk away from Production

- During Migration
  - Rollback capabilities are key to recover from unforeseen events

- Programmability
  - Custom functions require additional testing and can cause overhead
  - Open Source Tools/Methods validated by community and readily available

Key Takeaways

Automation is the Solution, but …

Automation only as good as Preparation

Data Center Migration not possible without Automation

Even Automation can’t solve 100% of the Migration Scenarios

Complete your online session survey

- Please complete your session survey after each session. Your feedback is very important.
- Complete a minimum of 4 session surveys and the Overall Conference survey (starting on Thursday) to receive your Cisco Live t-shirt.
- All surveys can be taken in the Cisco Events Mobile App or by logging in to the Content Catalog on ciscolive.com/emea.

Cisco Live sessions will be available for viewing on demand after the event at ciscolive.com.

Continue your education

Demos in the Cisco Showcase

Walk-In Labs

Meet the Engineer 1:1 meetings

Related sessions

Related Session

- Coding 1001 - Intro to APIs and REST - DEVNET-1897
- Coding 1002 - Getting Started with Python - DEVNET-1893

- Automated & Reliable Nexus to ACI Migration Best Practices - BRKDCN-2937
- Automating ACI - BRKACI-2770
- ACI Infrastructure as code - Automating ACI with Terraform - LABACI-1007

Automation is the Solution

cisco

You make **possible**