The bridge to possible

Cisco Catalyst Center Platform:

APIs, Event Notifications, Integrations, and DevOps Resources

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DEVNET-1087

Agenda

- Catalyst Center Platform Overview
- REST APIs
- Event Notifications
- Integrations
- Developer Resources
- Summary

Cisco Webex App

https://ciscolive.ciscoevents.com/ciscolivebot/#DEVNET-1087

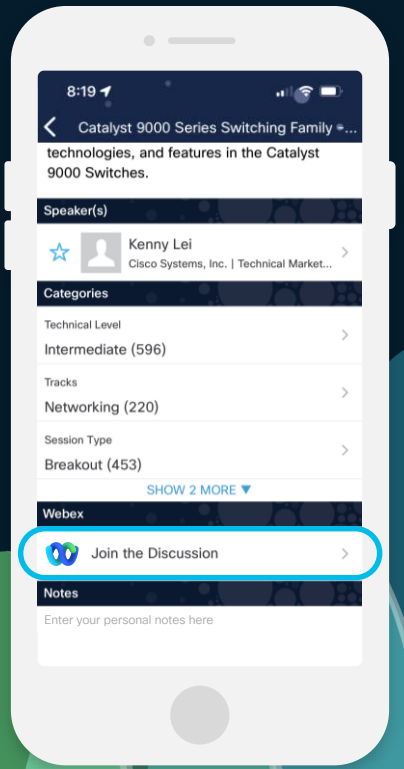
Questions?

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 7, 2024.



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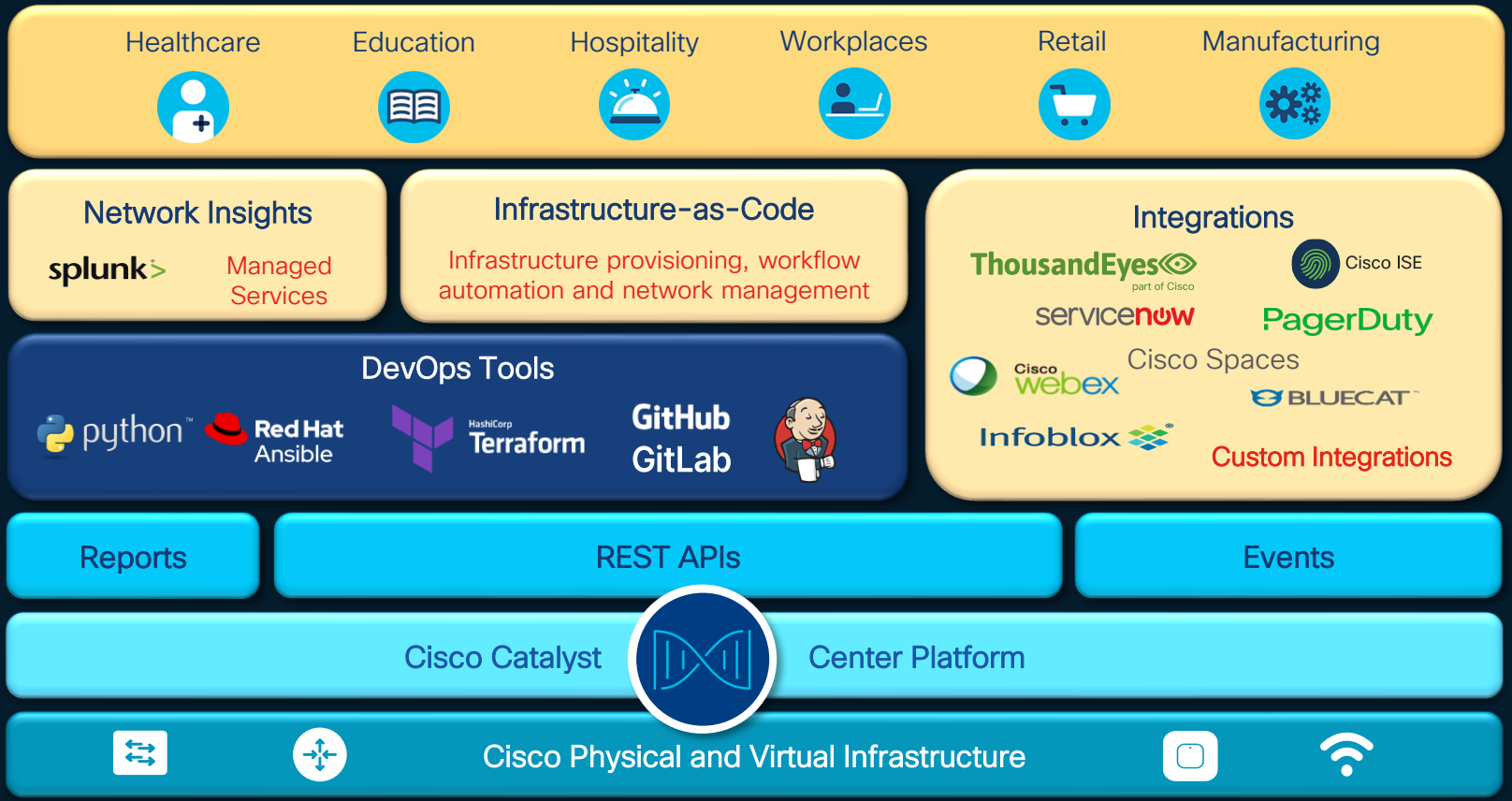
Cisco Catalyst Center Platform



Catalyst Center Platform

Event Notifications

- Assurance Issues
- AI/ML Insights
- System Health
- Integration Connectivity
- License Management
- Webhooks
- PagerDuty
- Webex
- Syslog
- SNMP

Northbound REST APIs

- Network Inventory
- Network Topology
- Network Design
- Provisioning
- SWIM, PnP
- Path Trace
- Assurance
- SDA
- Templates
- RMA
- Config Archive
- Sensors

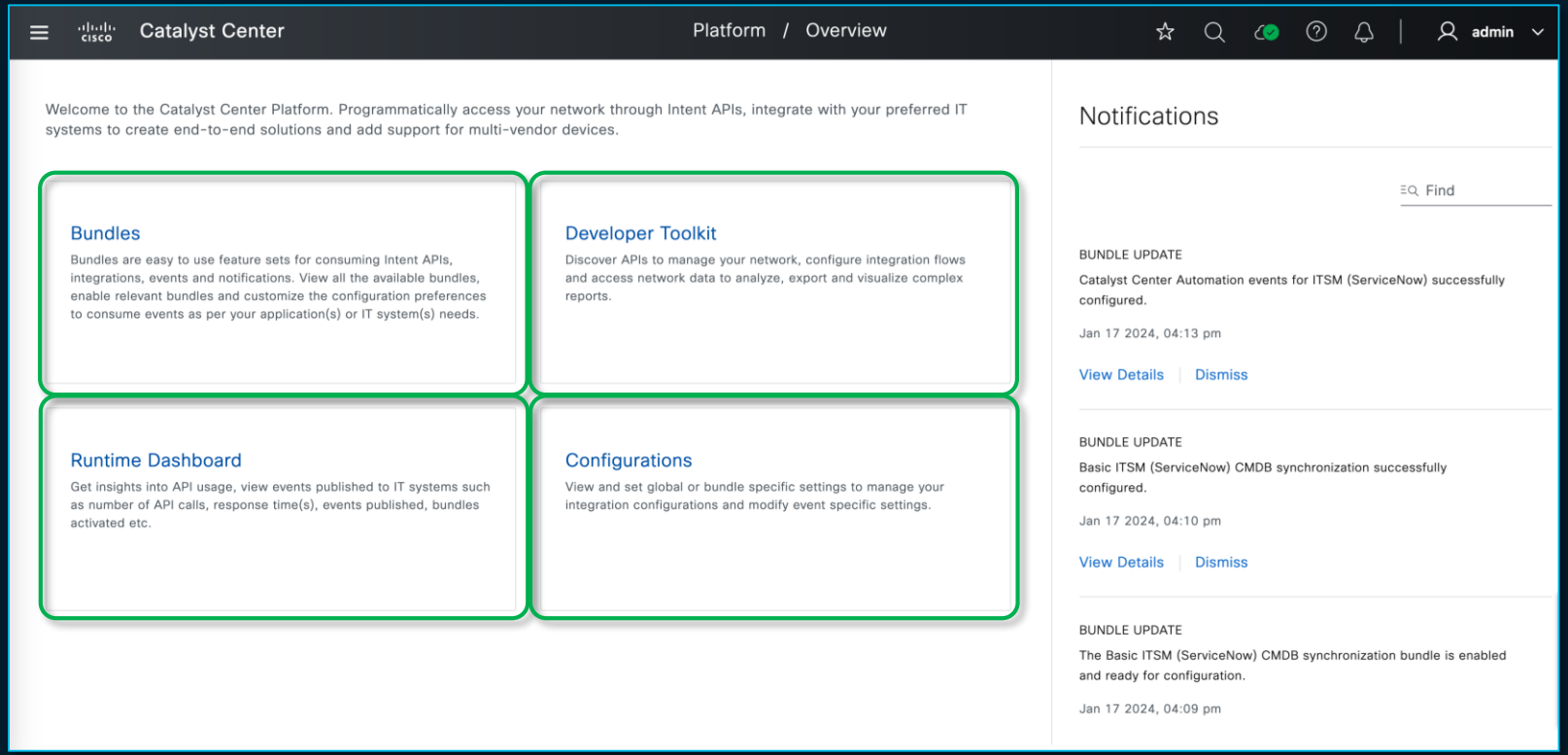
IT Ecosystem Integrations

- IT Service Management
- IP Address Management
- Reporting
- Wireless Planning
- Alerting
- Network Insights

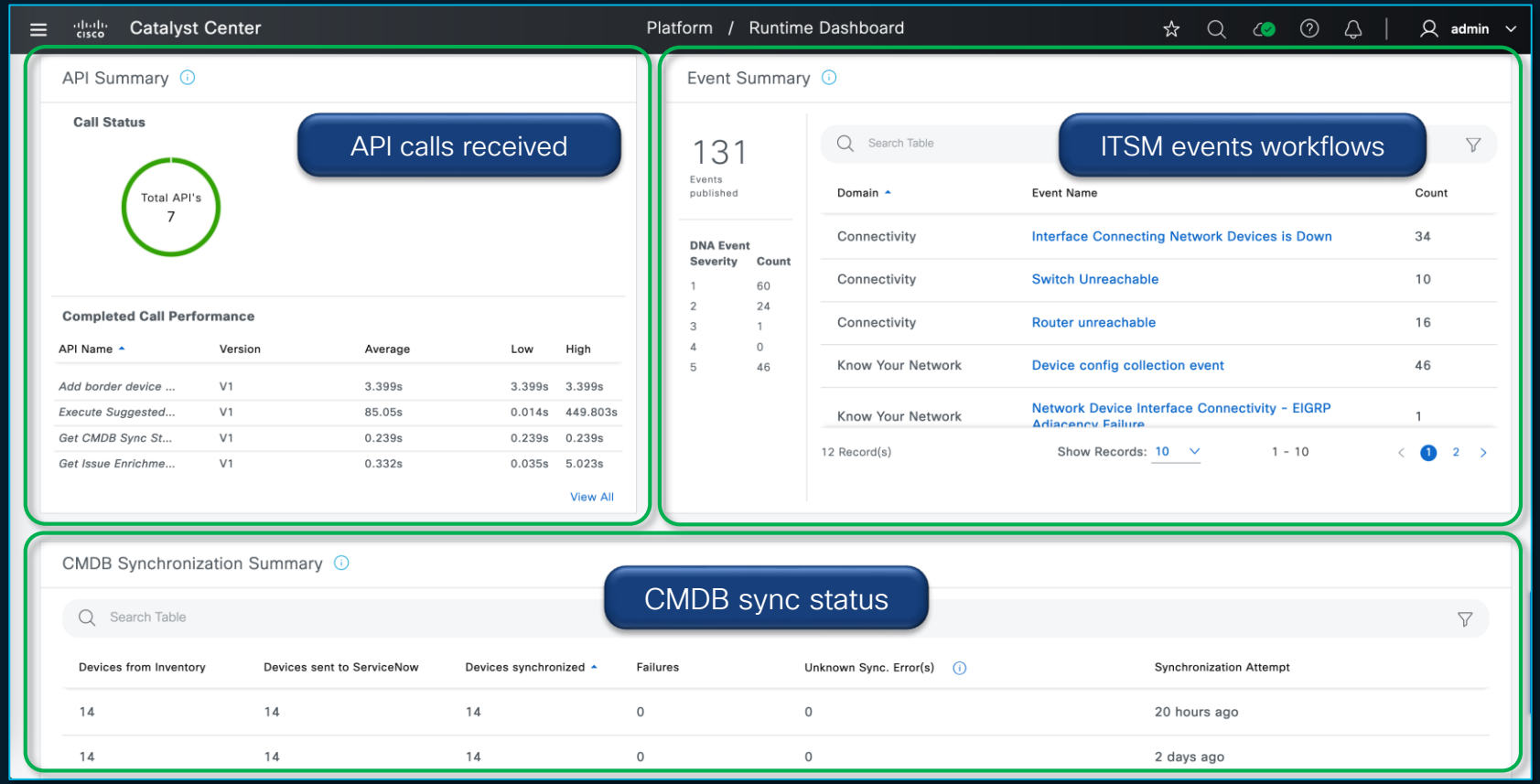
Developer Resources

- Sample Code, Videos
- Python SDK, Ansible, Terraform
- Cisco DevNet
  - Sandboxes, Learning Labs
  - Developer Guides
  - Community

Catalyst Center Platform – Overview



Platform Runtime Dashboard



Catalyst Center Managed Networks

```yaml
configuration_templates:
  - project: Jenkins with variables
    name: Variables testing
    file: template_with_variables.j2
    variables:
      - parameterName: interface_name
        dataType: STRING
        required: True
        order: 1
      - parameterName: ip_address
        dataType: STRING
        required: True
        order: 2
    devices:
      - name: C9K-Branch-SFO.clus-demo.com
        variables:
          interface_name: Loopback 200
          ip_address: 172.30.200.1
    product_family:
      - Routers
      - Switches and Hubs
```

REST APIs

Webhooks

ITSM, SIEM, Notifications, IPAM, Custom Integrations

- ✓ Declarative – abstracted configuration state
- ✓ Increase compliance, reduce configuration drift
- ✓ Consistent processes and outcomes
- ✓ Rich visibility and assurance data
- ✓ Faster deployment, while reducing cost

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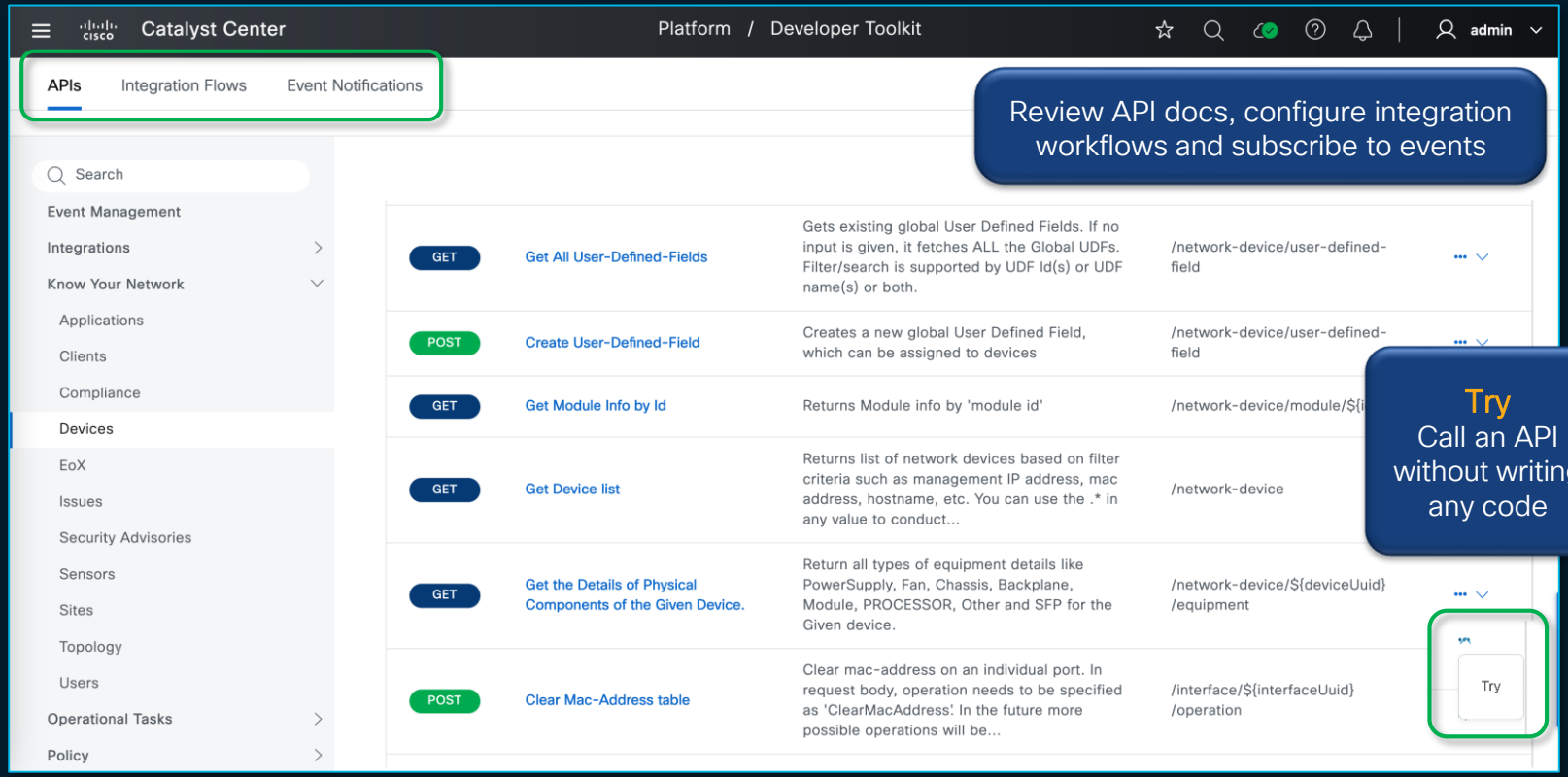
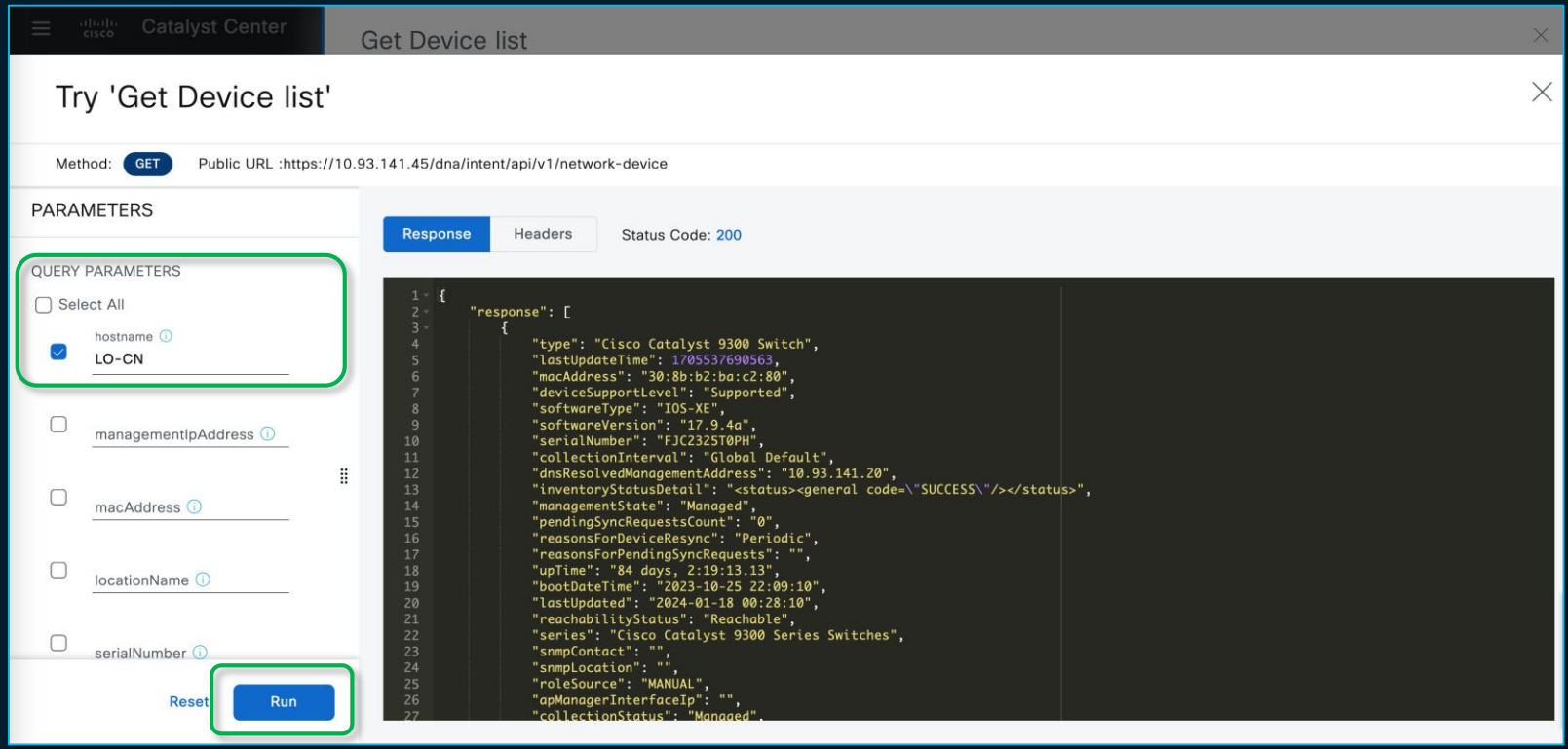
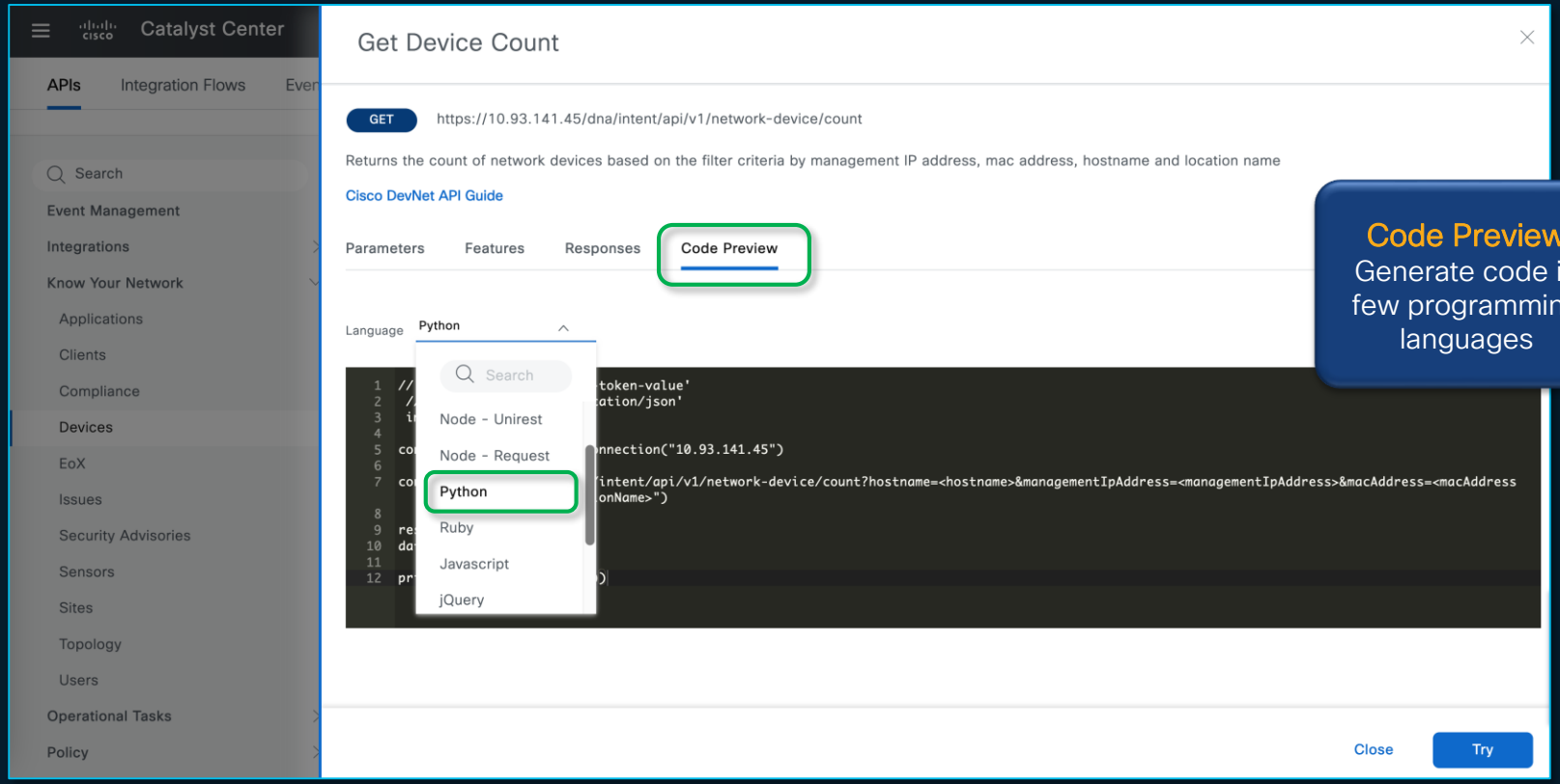
Catalyst Center Platform – Developer Toolkit



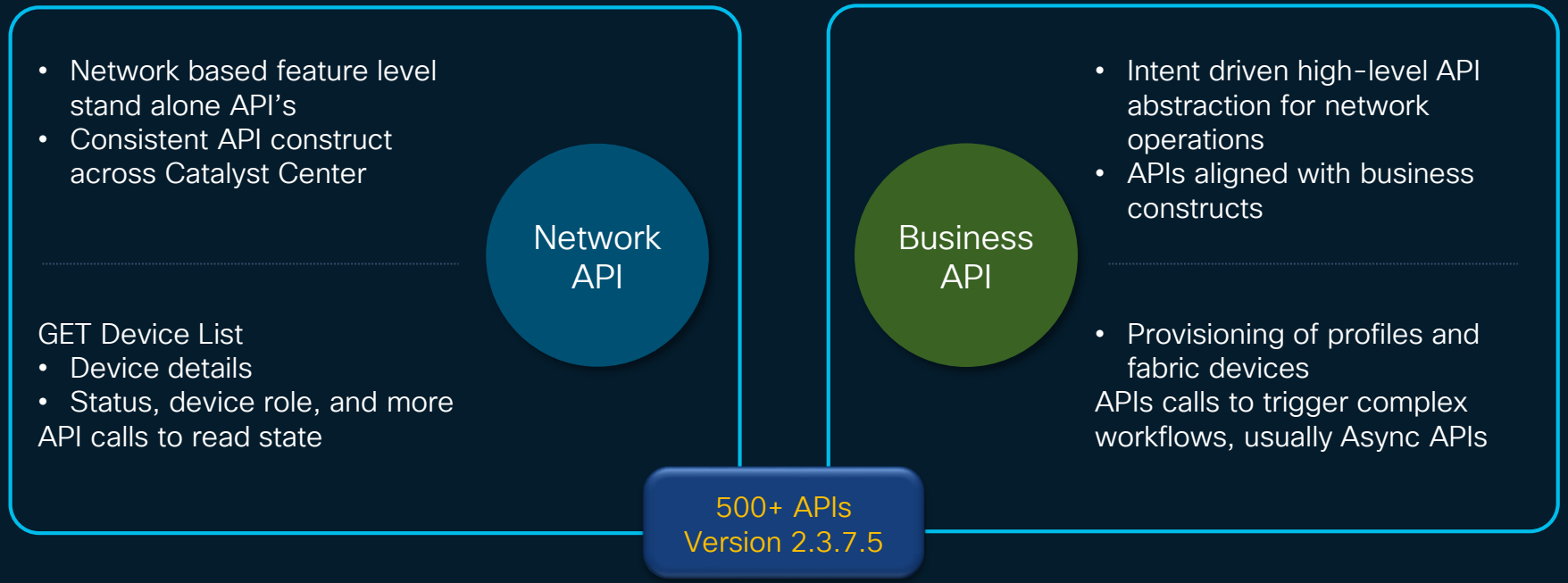
Try an API Call



Code Preview

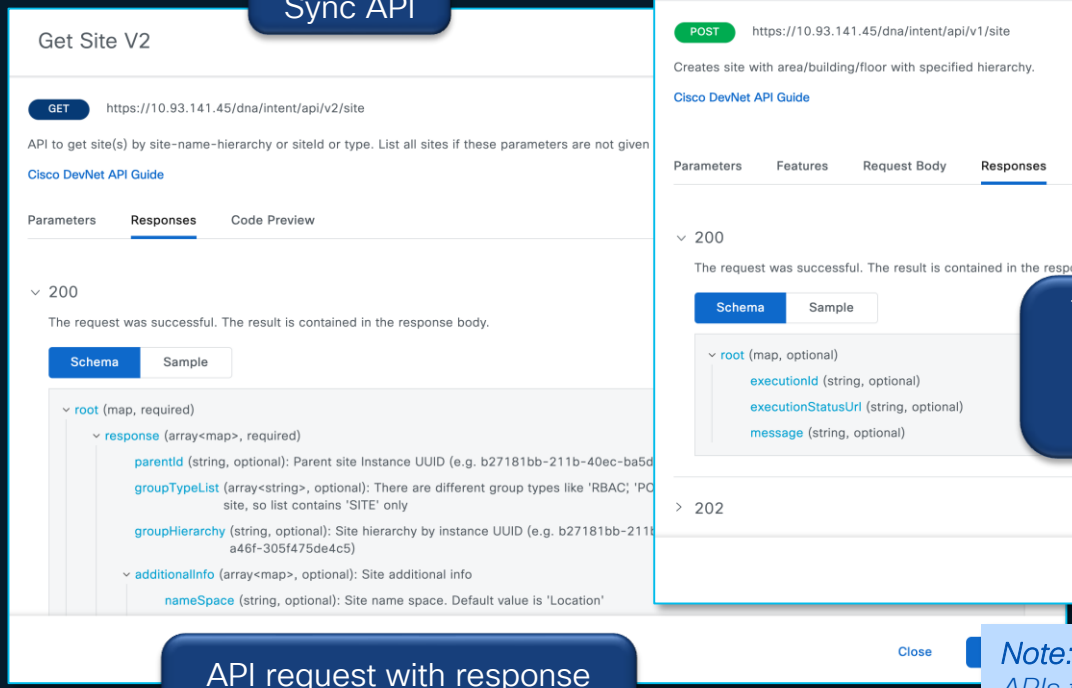


Catalyst Center REST APIs Variants



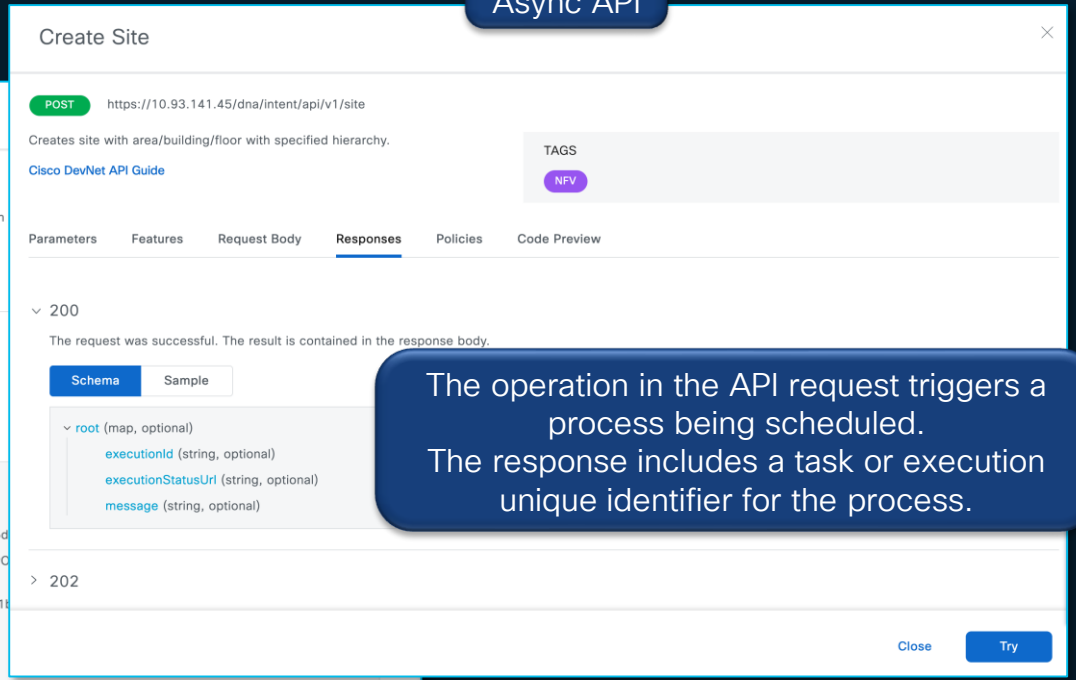
Sync and Async APIs

Sync API



API request with response including the requested data

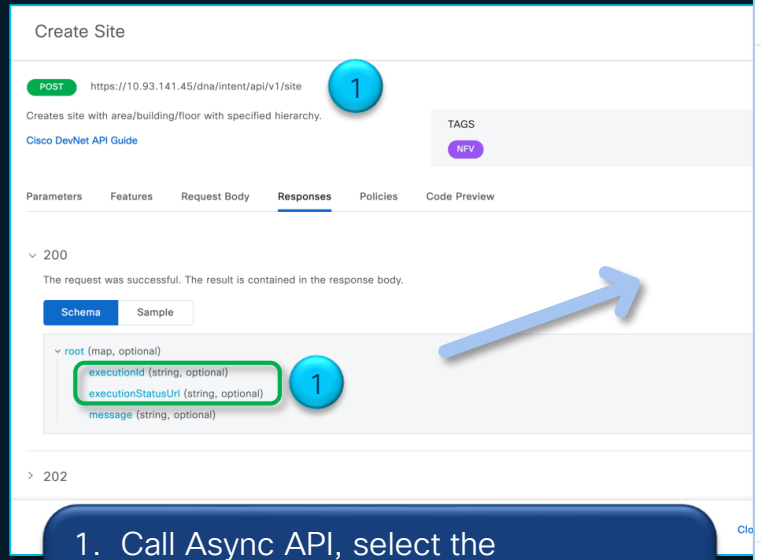
Async API

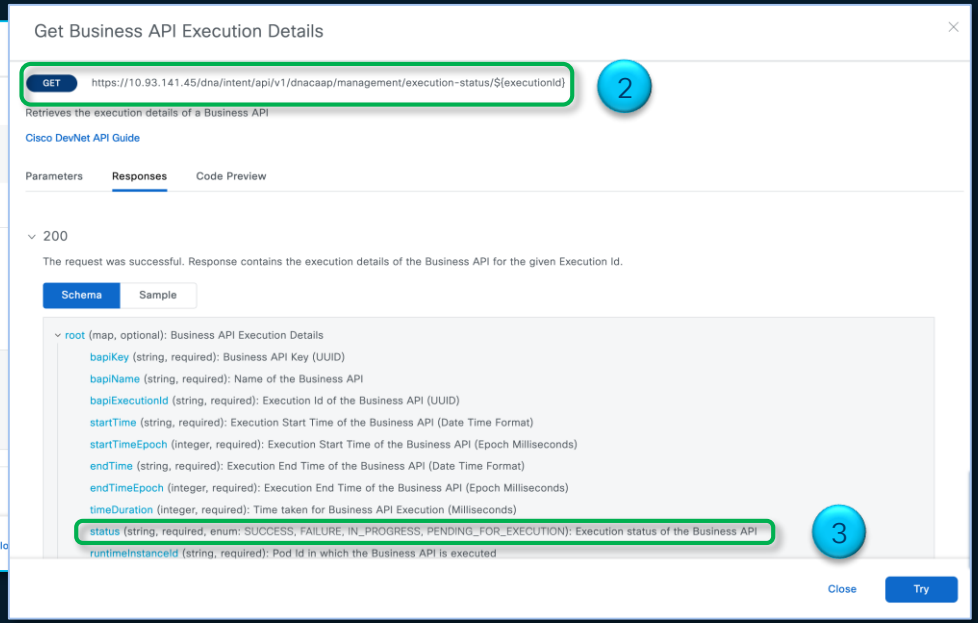


The operation in the API request triggers a process being scheduled.
The response includes a task or execution unique identifier for the process.

Note:
*APIs for which we are unable to **ensure** a response in 60 seconds are implemented as Async*

Async APIs Workflow

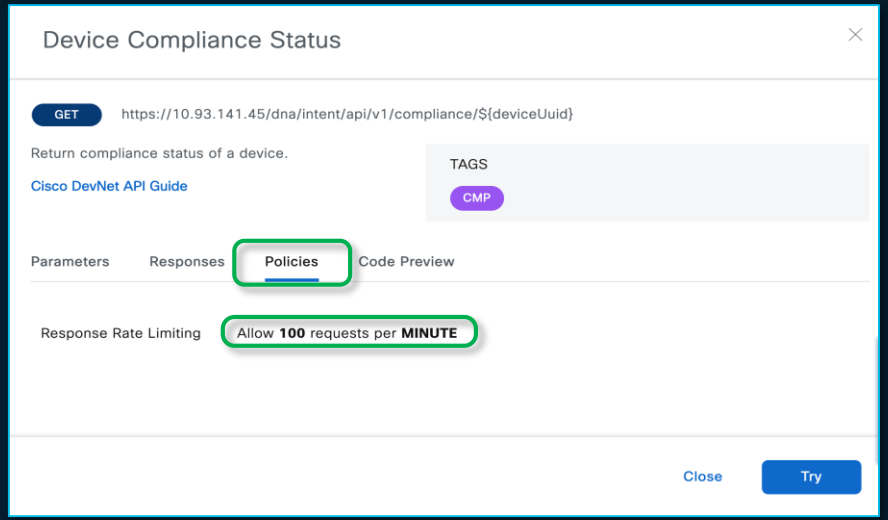




1. Call Async API, select the {executionId} or {executionStatusUrl} from response
2. Call the business execution details API using the {executionId}. Repeat this call until execution is completed
3. Select the execution status

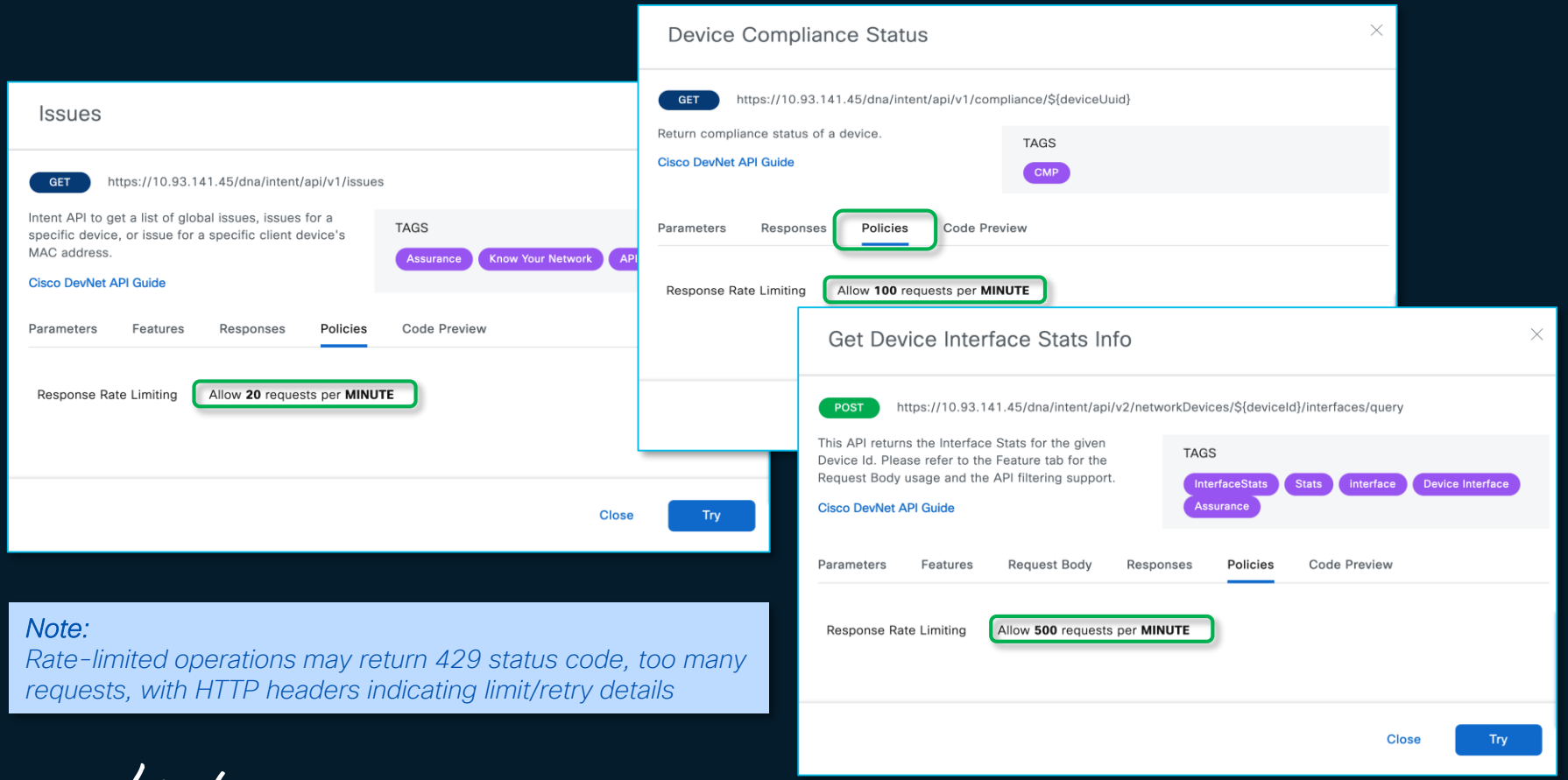
Note:
Async APIs execution may complete in few seconds, minutes, or longer.

API Policies – Rate Limit



- Catalyst Center API rate limit is defined at the API level, not at a Platform level
- Default rate limit is 100 API calls/minute
- There are APIs with 20, 50, 100 or 500 calls/minute
- Example:
  - Workflows calling 20 different API endpoints
  - Total number of API calls/minute = 2,000

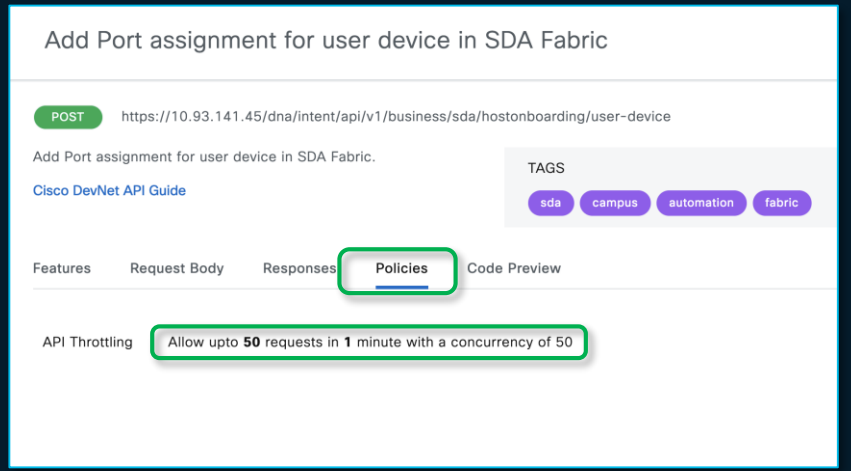
API Rate Limit Documentation



Note:
Rate-limited operations may return 429 status code, too many requests, with HTTP headers indicating limit/retry details

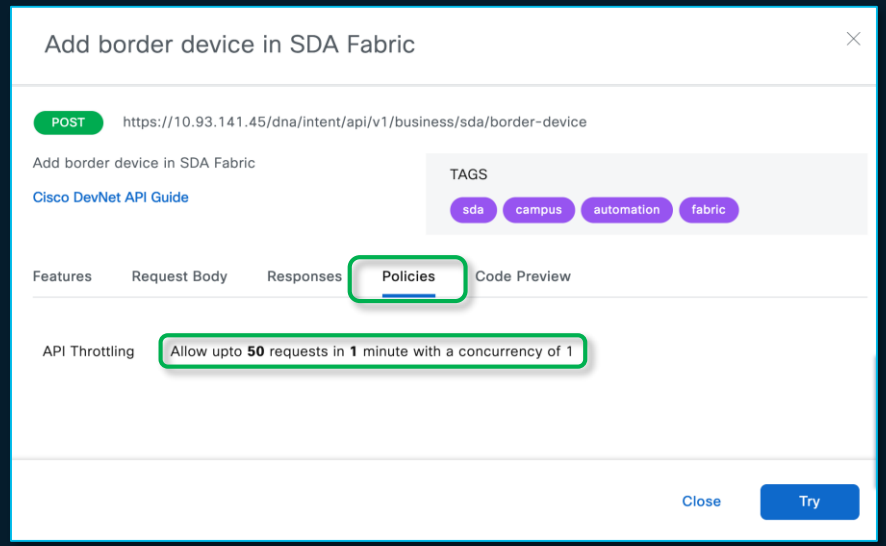
API Policies – Concurrency

- Default API concurrency limit is the API rate limit
- There are APIs with a concurrency of 1, 5, 10, 50, 100, 500 calls
- This is very important for Async APIs



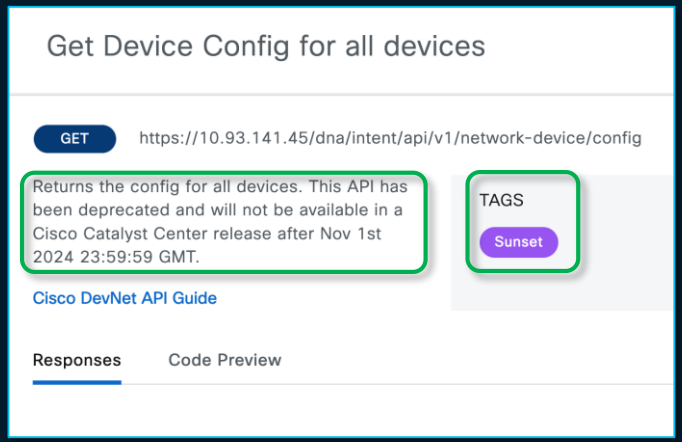
Parallel Processing

- Ansible default parallel processing is on 5 hosts
- Terraform default is 10 concurrent operations
- Other programming languages or automation platforms may vary
- Results may be unpredictable when grossly exceeding API concurrency and rate limits
- Understand the Catalyst Center resources for various processes



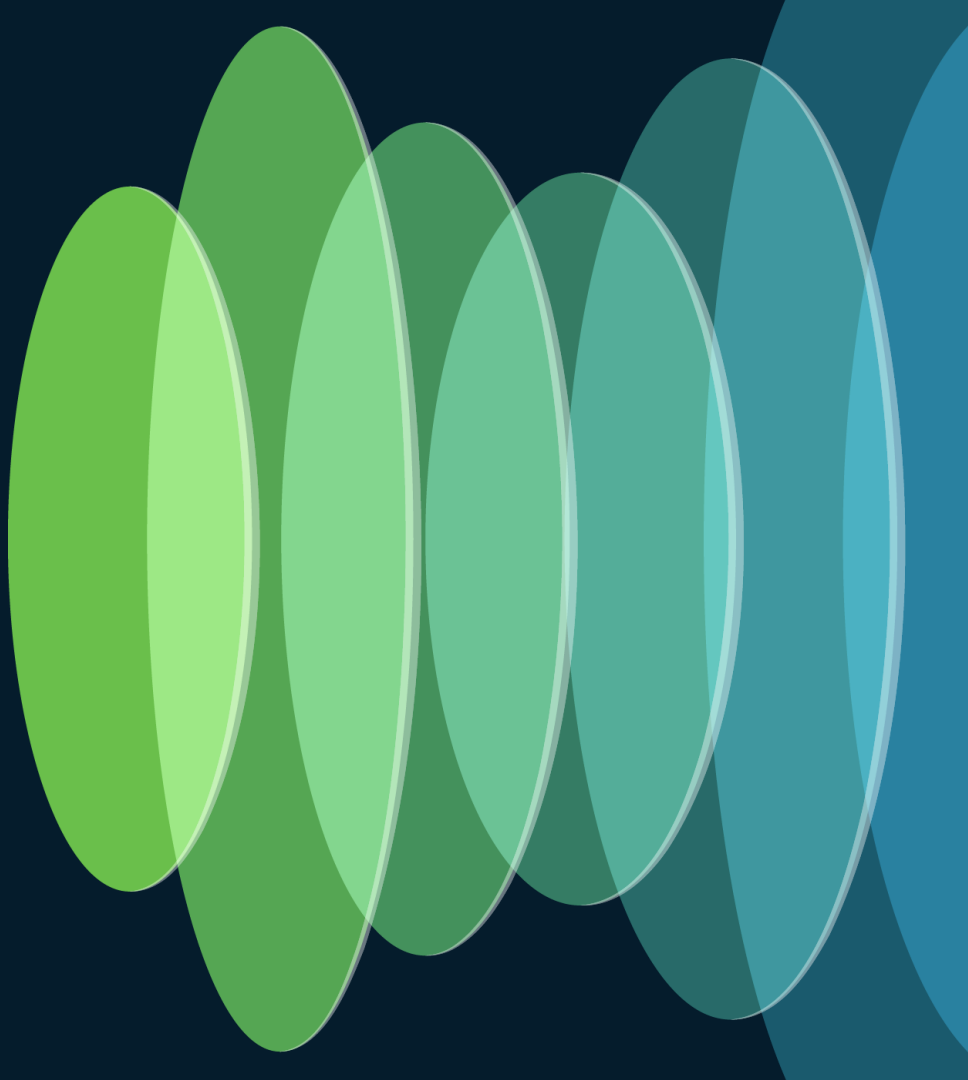
Note:
Best practice is to trigger the first operation, check for completion, trigger the next operation, etc.

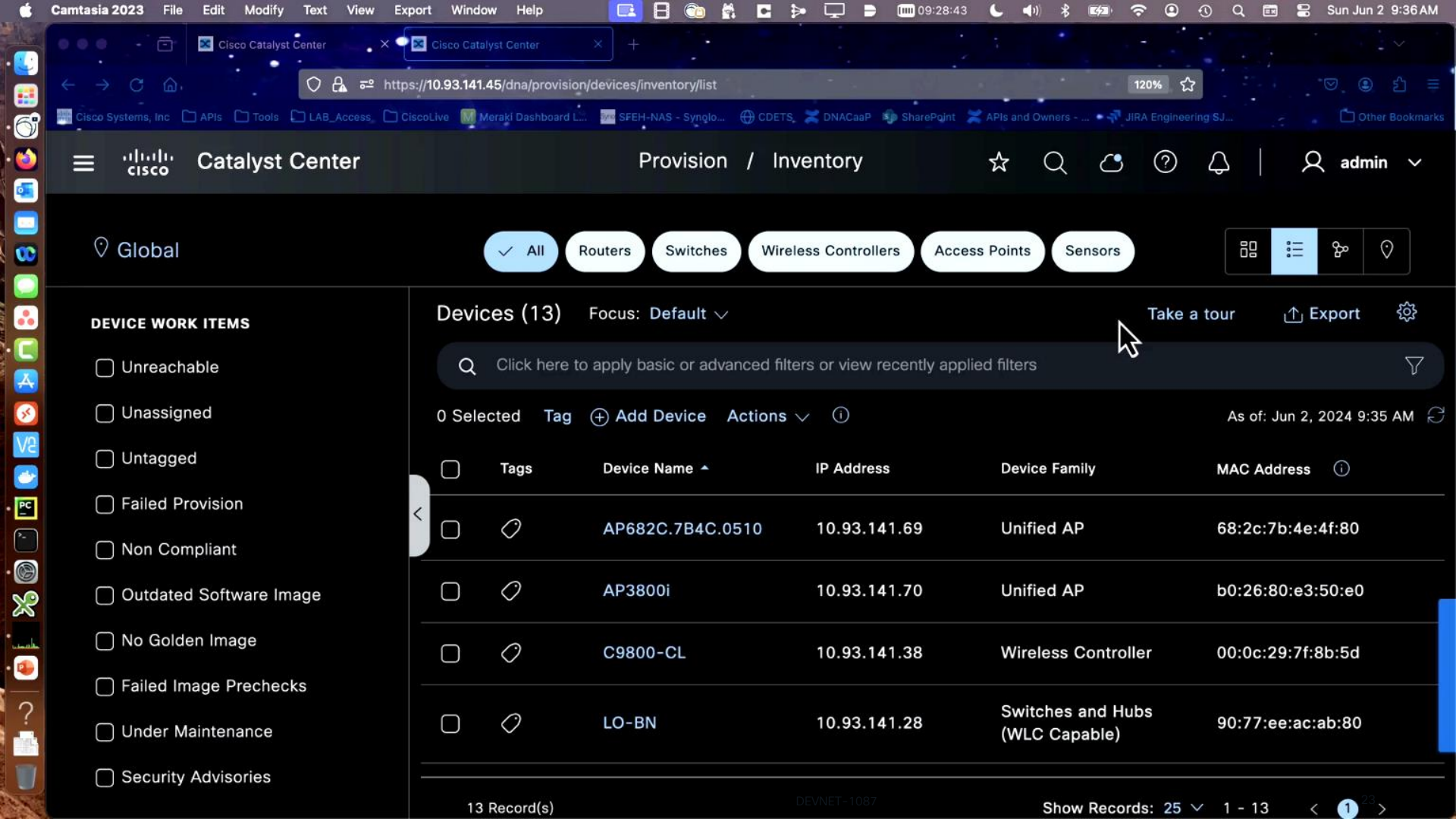
API Lifecycle Management



- Beta - The API has been released in Beta for feedback and will be supported in the future. However, the API design is not frozen and therefore may include changes in the future: request/response payload, URL change, query/header parameters.
- Supported - In production and supported. The design is frozen - breaking changes will require a new API version to be released
- Deprecated - Still supported but will soon be sunset. A Sunset header will be used to programmatically communicate when it will be sunset. API endpoint may be removed from the system after two major version releases of Catalyst Center, or 1 year whichever comes later

Demo
Device Inventory




Camtasia 2023 File Edit Modify Text View Export Window Help
Sun Jun 2 9:36 AM
Cisco Catalyst Center
Cisco Catalyst Center
https://10.93.141.45/dna/provision/devices/inventory/list
120%
Cisco Systems, Inc APIs Tools LAB_Access CiscoLive Meraki Dashboard L... SFEH-NAS - Synglo... CDETS DNACaaP SharePoint APIs and Owners - ... JIRA Engineering SJ... Other Bookmarks
Catalyst Center
Provision / Inventory
admin
Global
All
Routers
Switches
Wireless Controllers
Access Points
Sensors
DEVICE WORK ITEMS
Unreachable
Unassigned
Untagged
Failed Provision
Non Compliant
Outdated Software Image
No Golden Image
Failed Image Prechecks
Under Maintenance
Security Advisories
Devices (13)
Focus: Default
Take a tour
Export
Click here to apply basic or advanced filters or view recently applied filters
0 Selected
Tag
Add Device
Actions
As of: Jun 2, 2024 9:35 AM
Tags
Device Name
IP Address
Device Family
MAC Address
AP682C.7B4C.0510
10.93.141.69
Unified AP
68:2c:7b:4e:4f:80
AP3800i
10.93.141.70
Unified AP
b0:26:80:e3:50:e0
C9800-CL
10.93.141.38
Wireless Controller
00:0c:29:7f:8b:5d
LO-BN
10.93.141.28
Switches and Hubs (WLC Capable)
90:77:ee:ac:ab:80
13 Record(s)
Show Records: 25
1 - 13
DEVNET-1087

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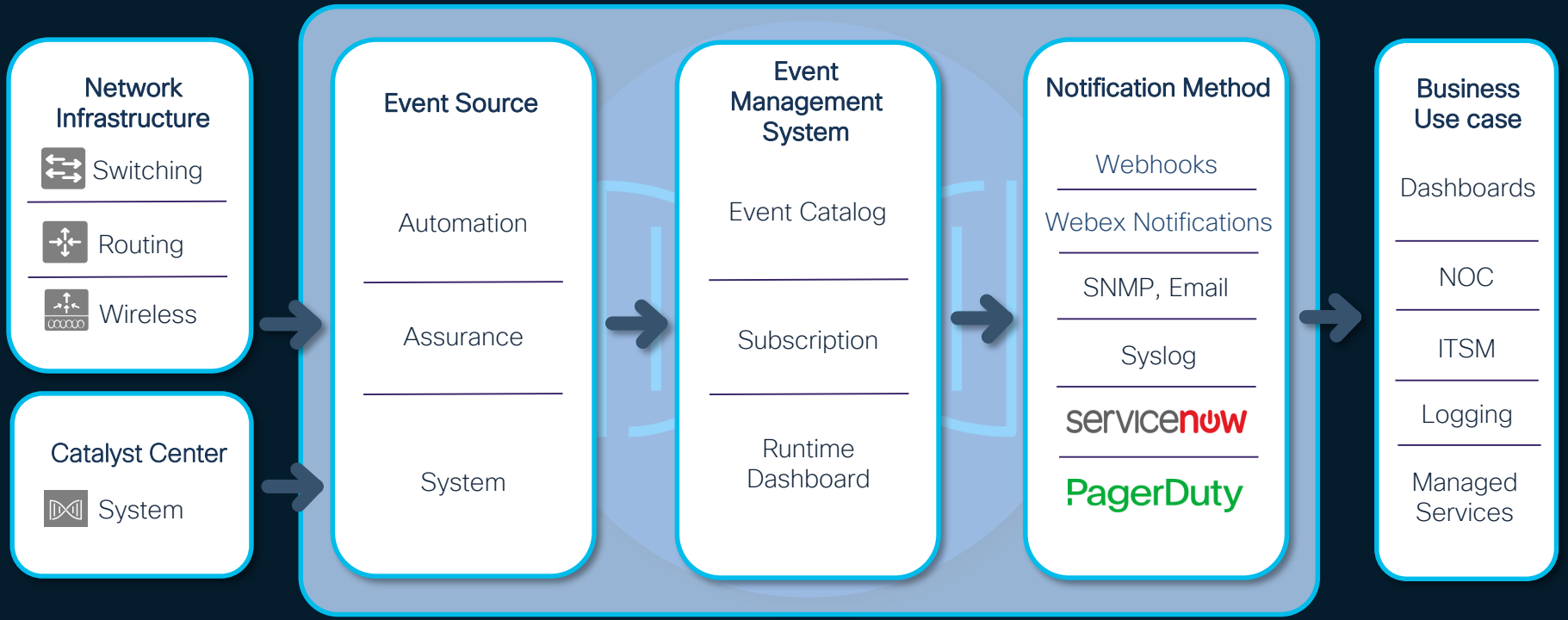
Event Notifications Framework



Note: Two steps process, configure destination followed by subscribe to events

250+ Events in Different Areas ...

Backup/Restore

Fabric

AP Anomaly

Wired Connectivity

CPU and Memory Utilization

Onboarding

Software Image Management

Compliance

Device hardware and software

Application Experience

Device Availability

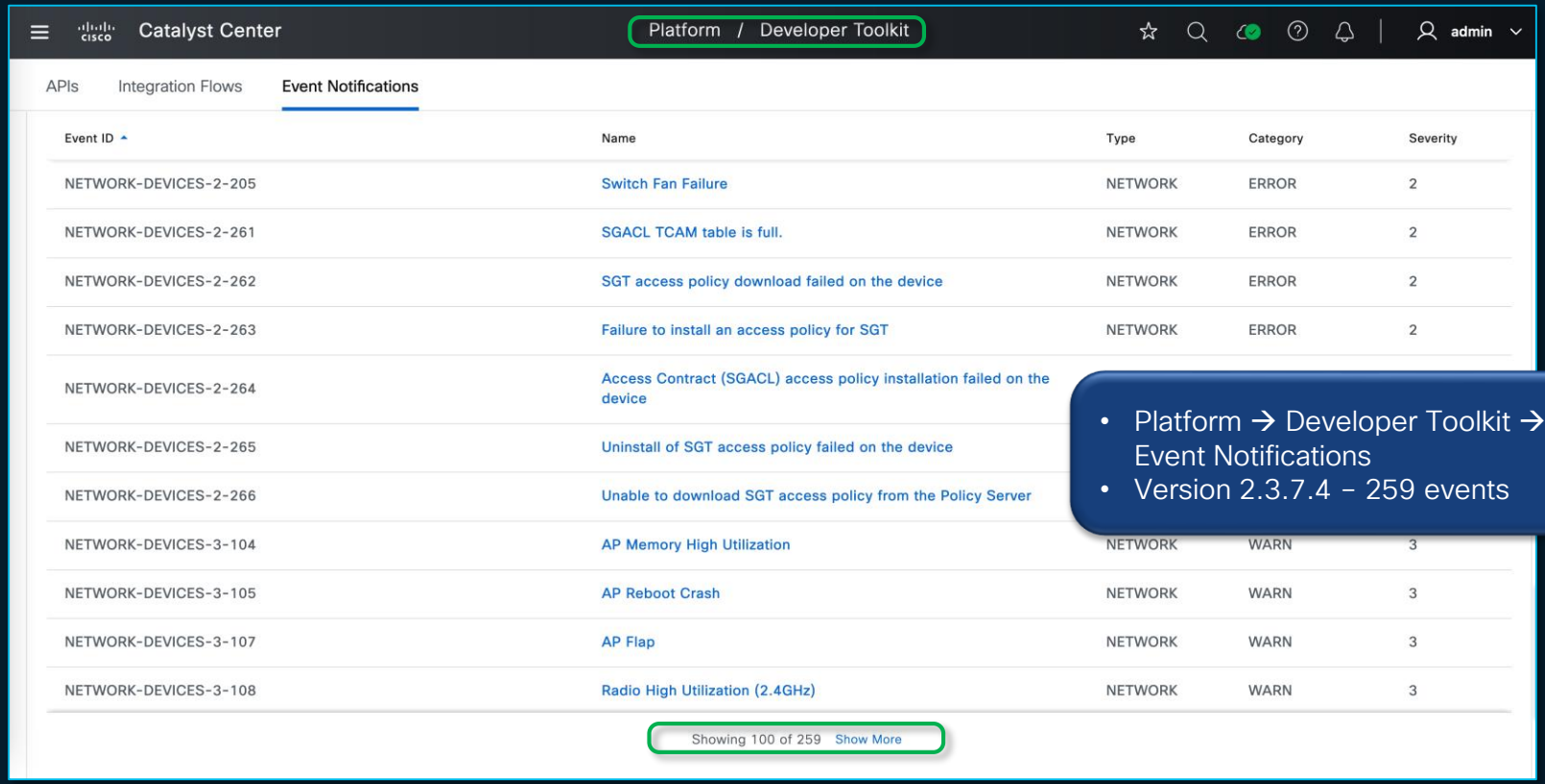
Wireless Connectivity

Sensor Test Troubleshooting

Webhooks

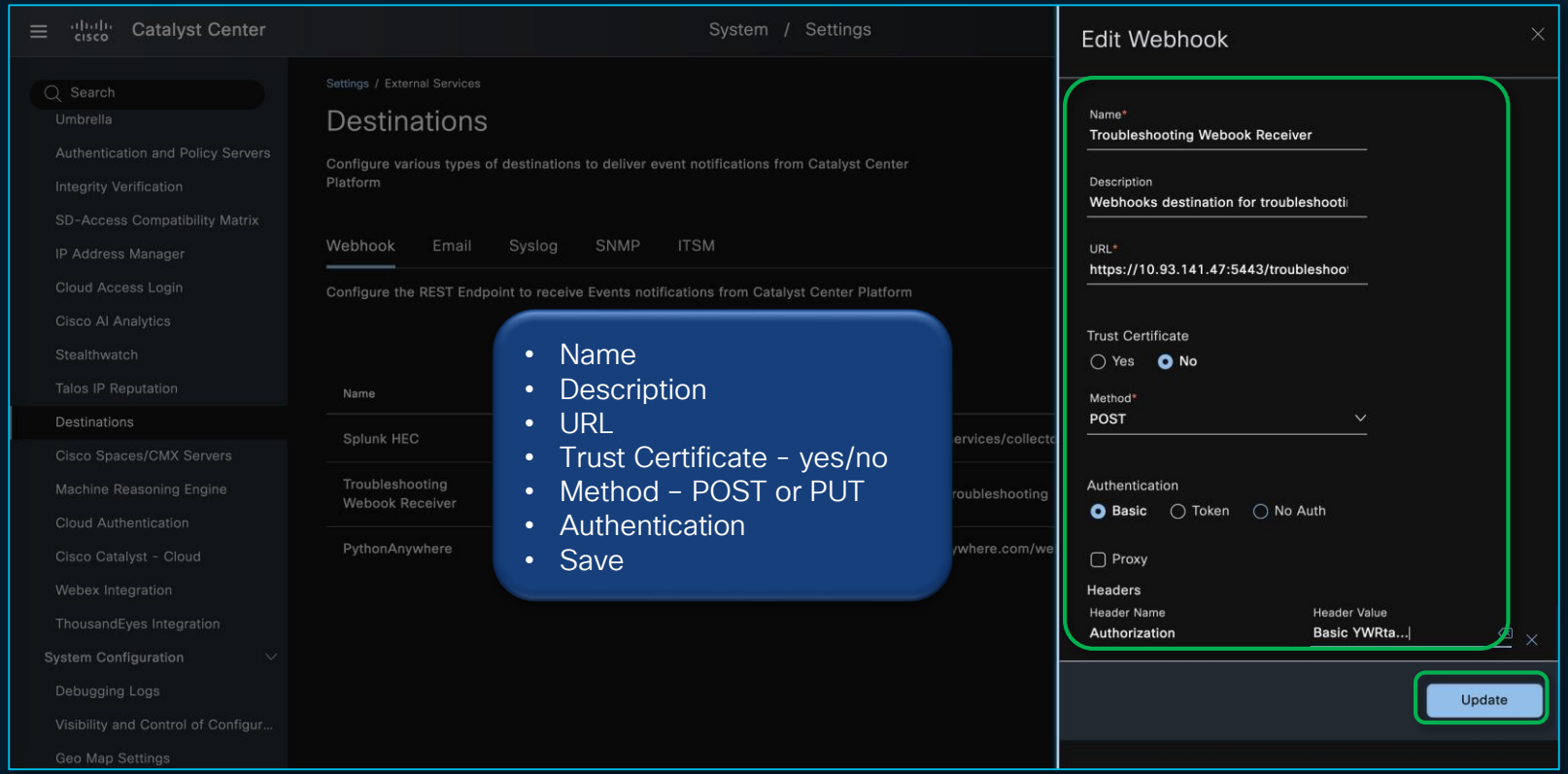
- Used by servers to publish data, (or event notifications)
- Pre-configured destinations to send data to
- Using POST or PUT methods, typically
- Server sends data when something new
- Push Model

Event Catalog

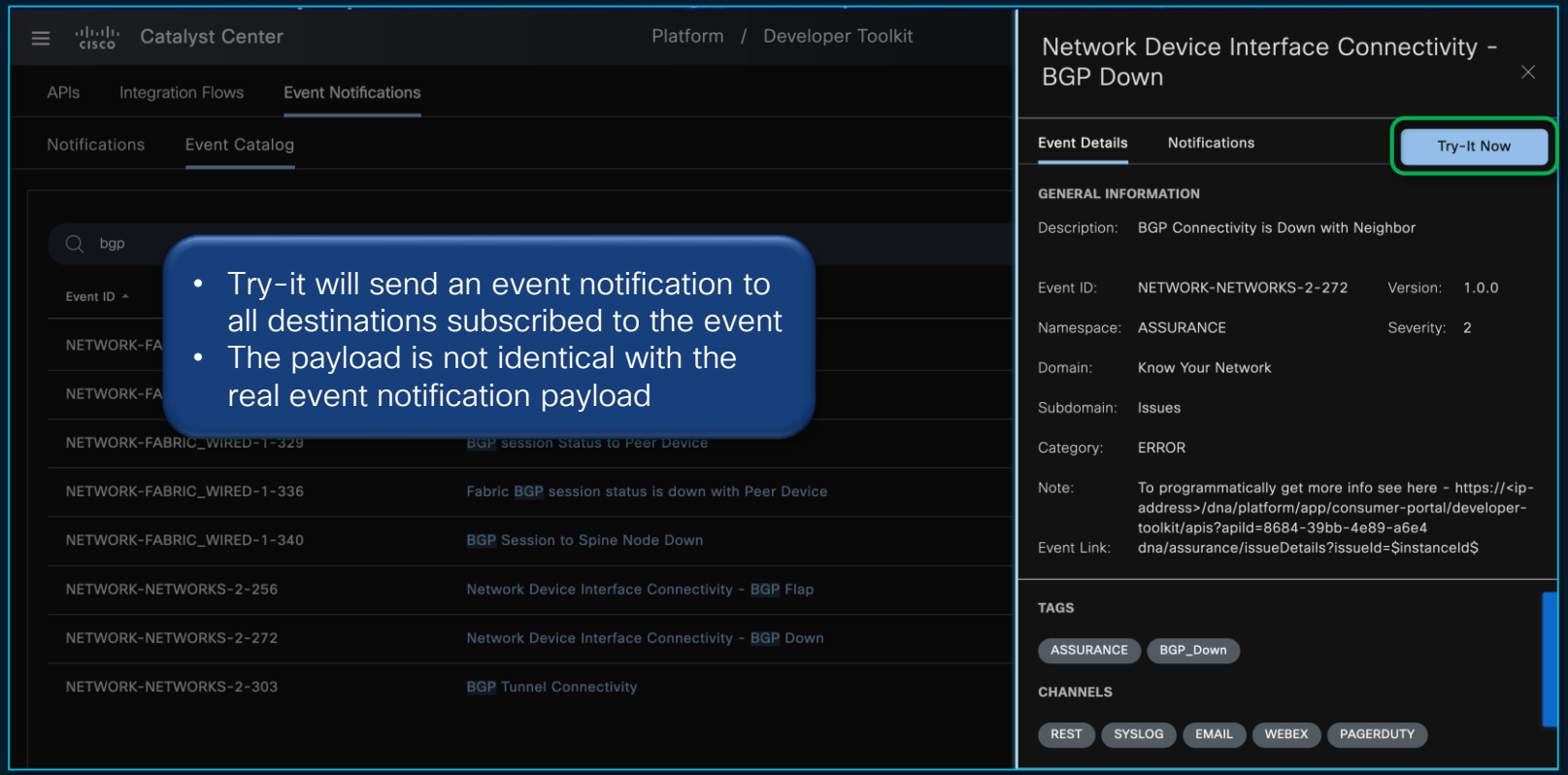


- Platform → Developer Toolkit → Event Notifications
- Version 2.3.7.4 – 259 events

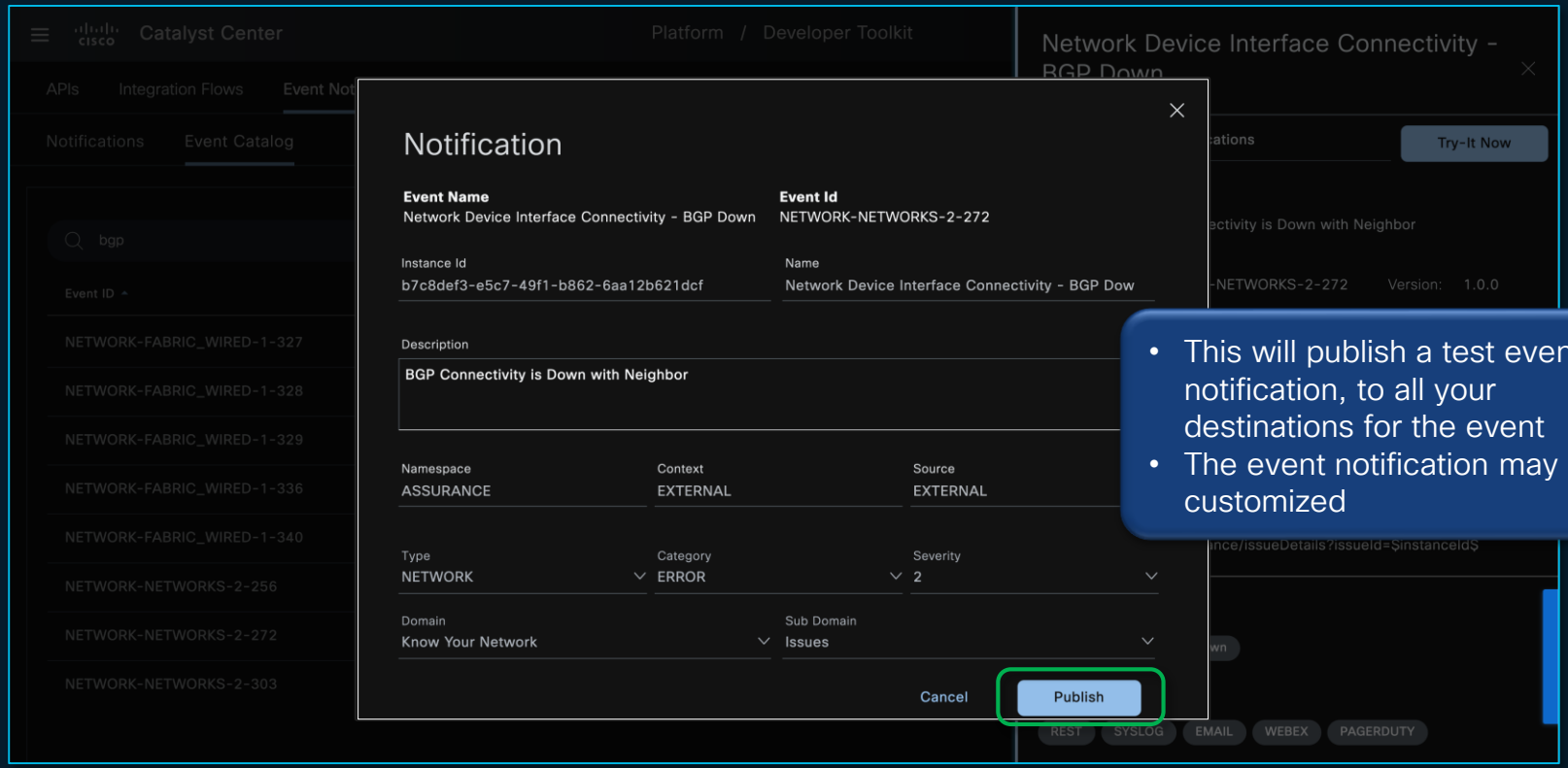
Create a new Webhook Destination



Verify Webhook Receiver

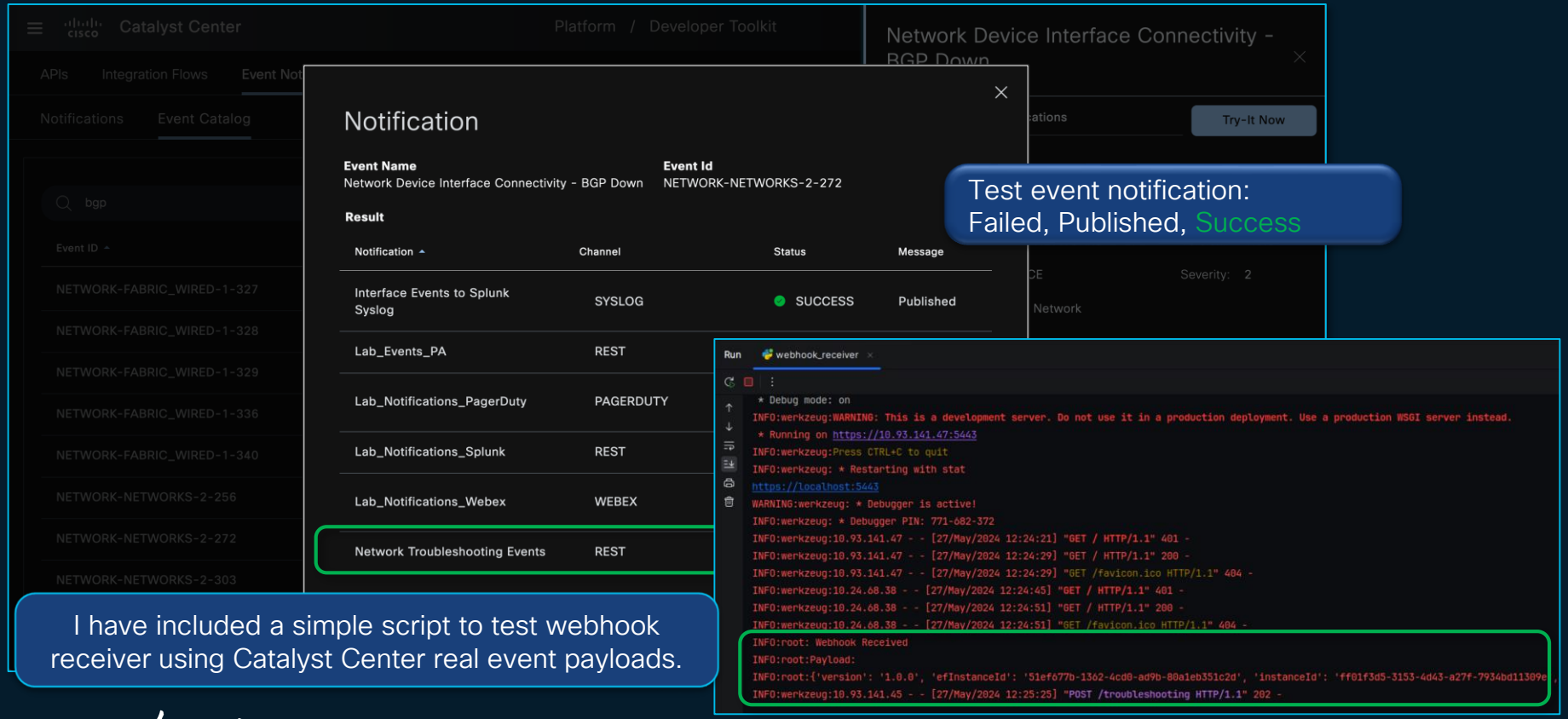


Verify Webhook Receiver - continued



- This will publish a test event notification, to all your destinations for the event
- The event notification may be customized

Verify Webhook Receiver – continued



I have included a simple script to test webhook receiver using Catalyst Center real event payloads.

Catalyst Center Webhook Sample Payload

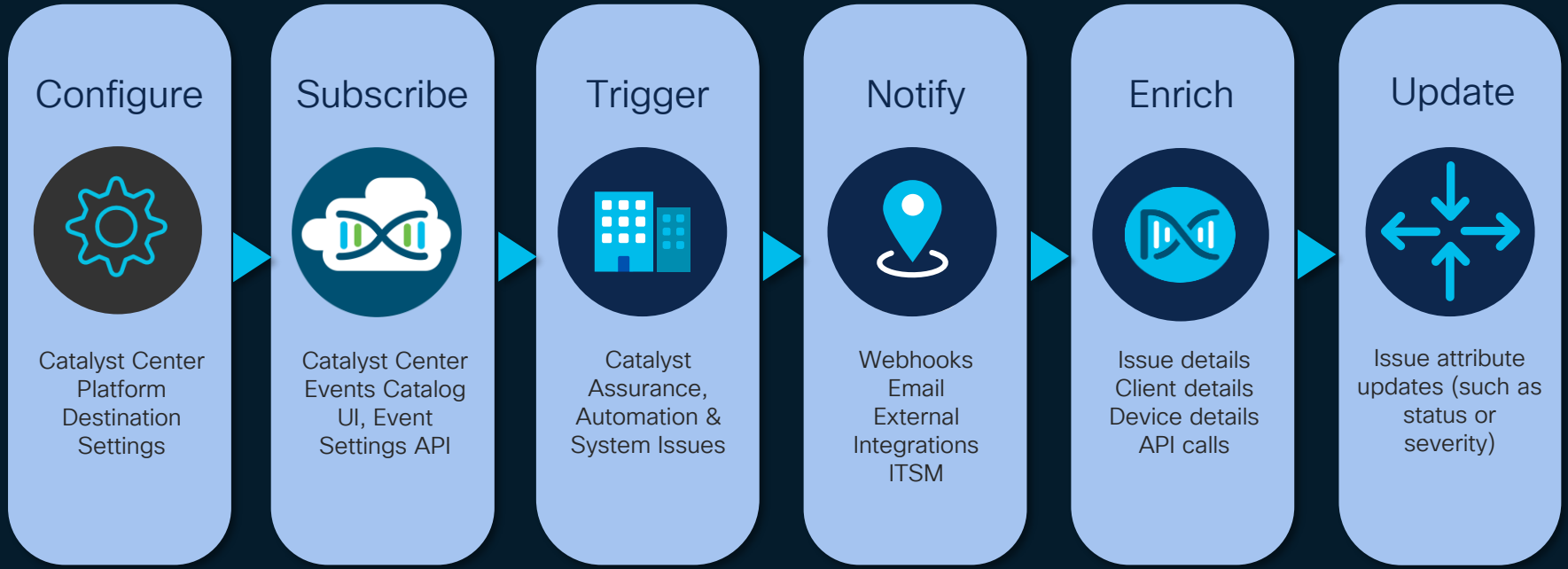
Interface Connecting Network Devices is Down

Details Included:

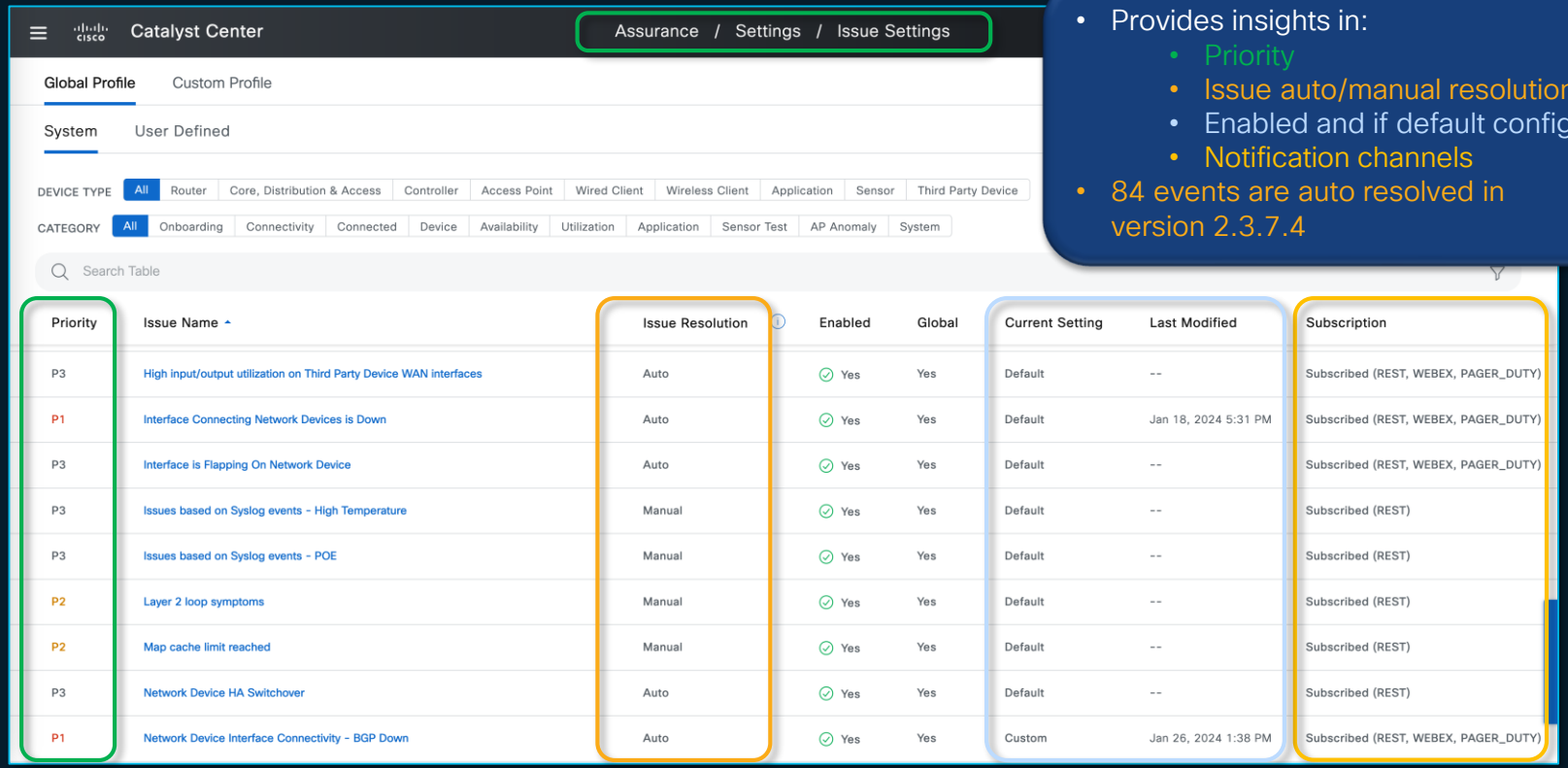
- Cisco Assurance Issue Link
- Issue details: name, description, device management IP Address, priority and status
- Catalyst Center IP Address
- Event Id
- Event unique identifier

...

Event Notifications Workflow

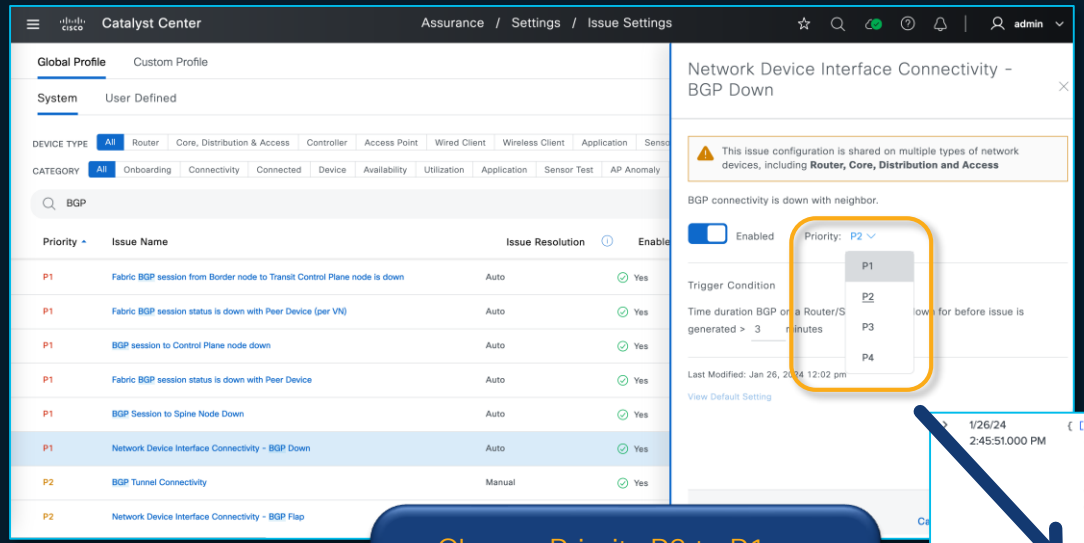


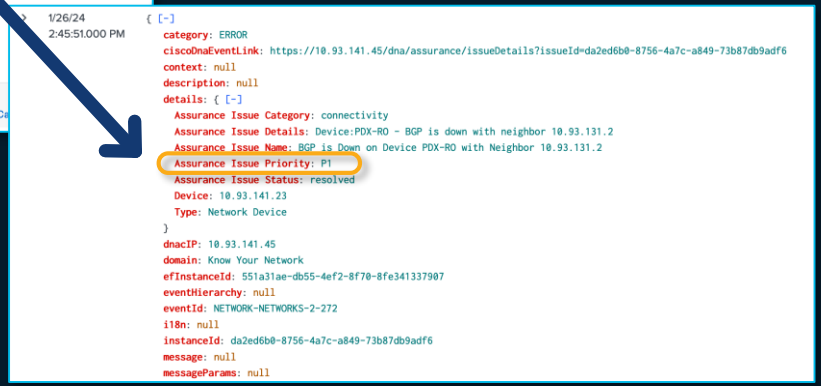
Assurance Issue Settings



- Provides insights in:
  - Priority
  - Issue auto/manual resolution
  - Enabled and if default config
  - Notification channels
- 84 events are auto resolved in version 2.3.7.4

Changing Assurance Issue Settings

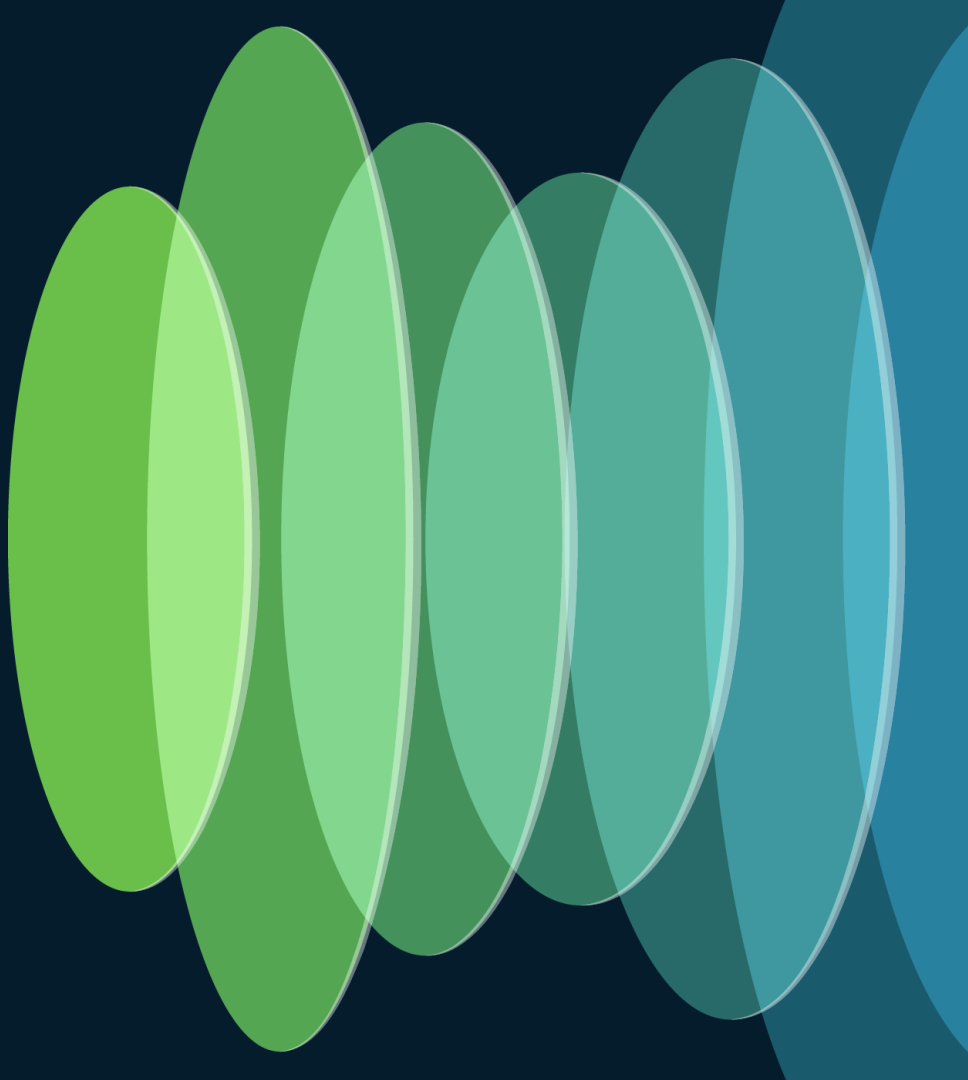


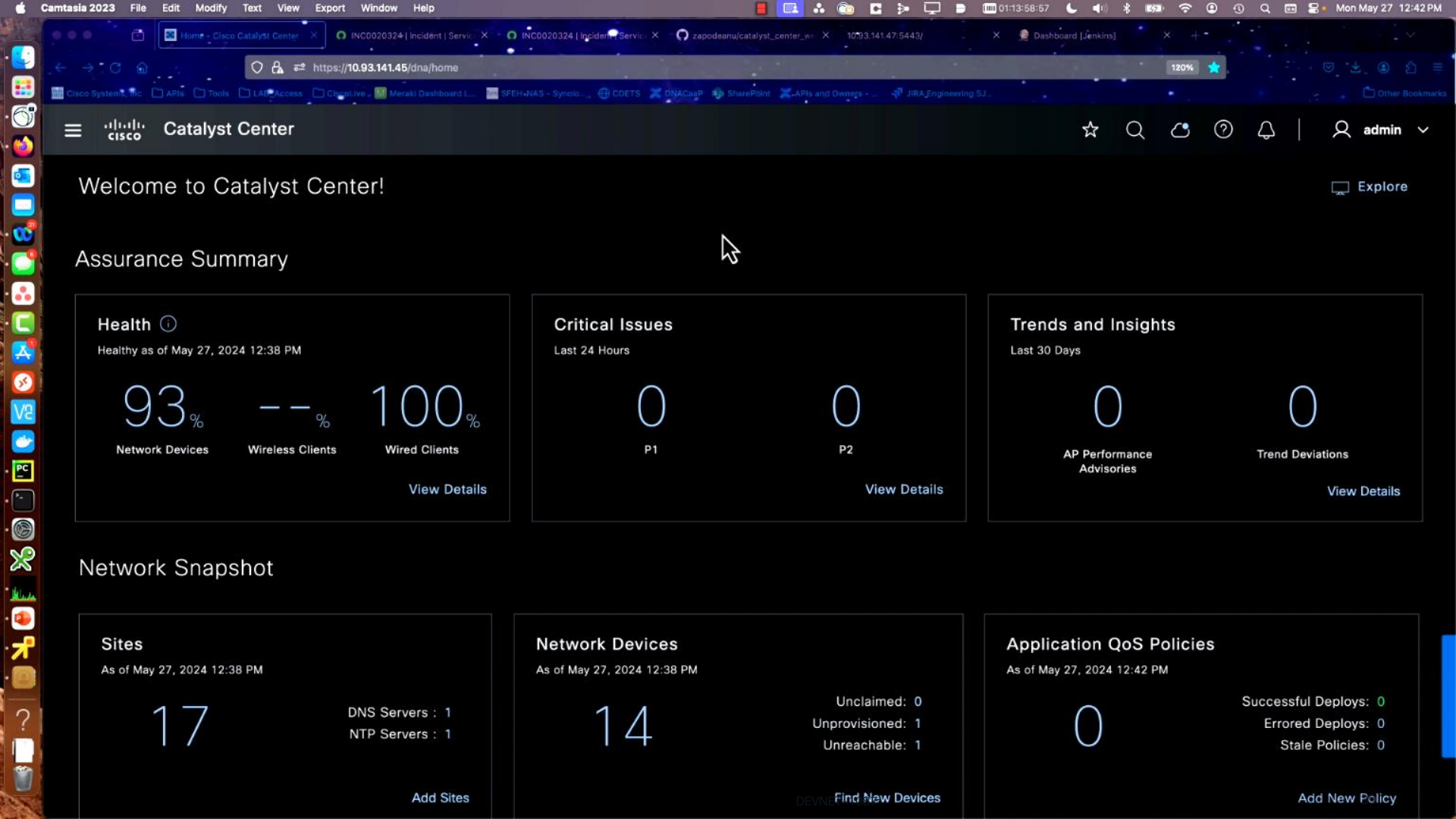


- Change Priority P2 to P1
- Enable or disable event
- Options to change the KPIs
- The changes will impact all notifications, and the UI

Catalyst Center Webhook Update

Demo Webhook Receiver




Camtasia 2023
File
Edit
Modify
Text
View
Export
Window
Help
Mon May 27 12:42 PM
https://10.93.141.45/dna/home
Catalyst Center
admin
Welcome to Catalyst Center!
Explore
Assurance Summary
Health
Healthy as of May 27, 2024 12:38 PM
93%
Network Devices
--%
Wireless Clients
100%
Wired Clients
View Details
Critical Issues
Last 24 Hours
0
P1
0
P2
View Details
Trends and Insights
Last 30 Days
0
AP Performance Advisories
0
Trend Deviations
View Details
Network Snapshot
Sites
As of May 27, 2024 12:38 PM
17
DNS Servers : 1
NTP Servers : 1
Add Sites
Network Devices
As of May 27, 2024 12:38 PM
14
Unclaimed: 0
Unprovisioned: 1
Unreachable: 1
Find New Devices
Application QoS Policies
As of May 27, 2024 12:42 PM
0
Successful Deploys: 0
Errored Deploys: 0
Stale Policies: 0
Add New Policy

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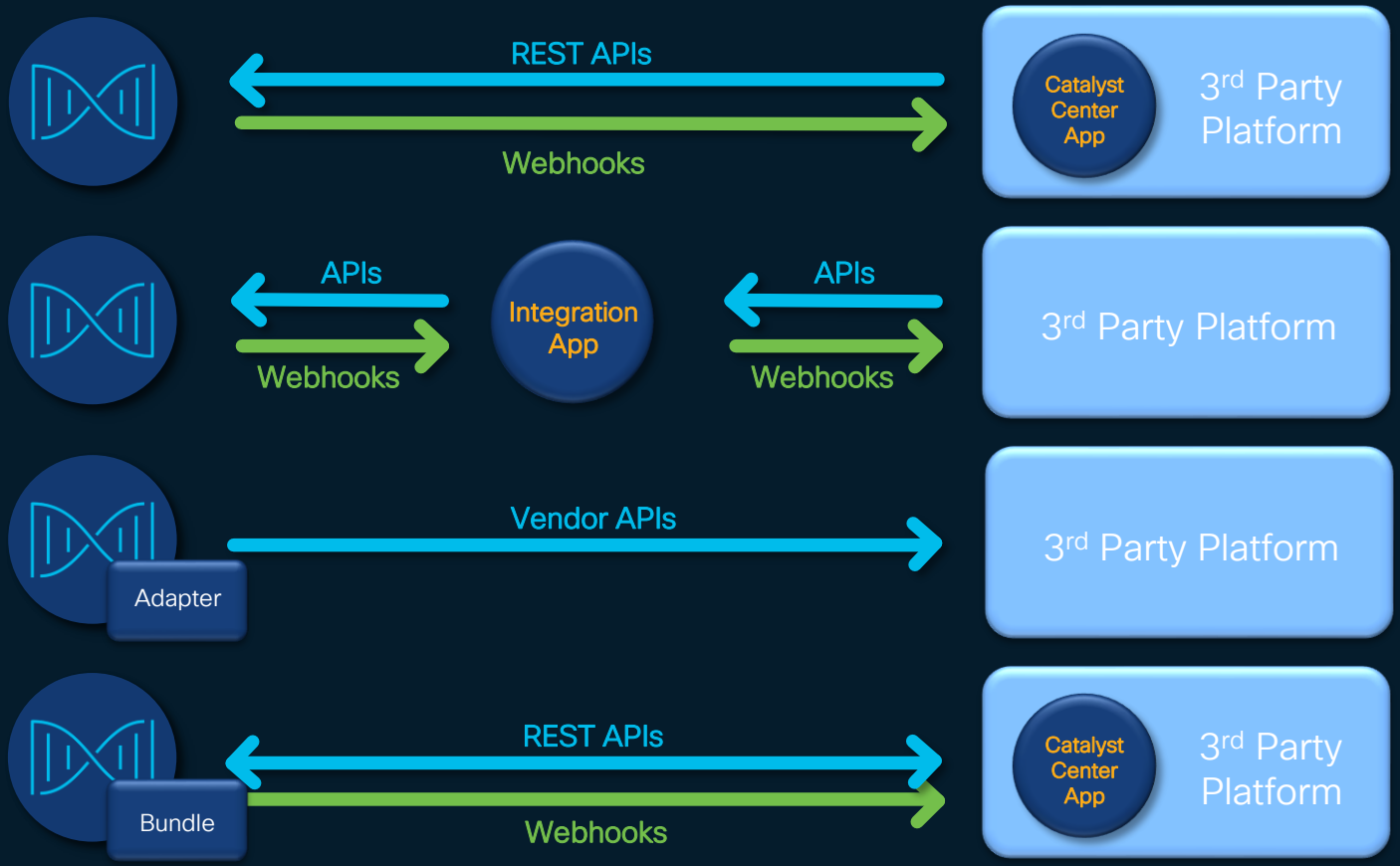
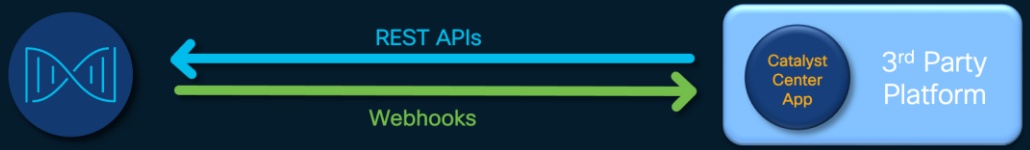
Catalyst Center Integration Options



Direct Integrations

- Catalyst Center Notifications sent using Webhooks
- App may call Catalyst Center REST APIs to:
  - Enrich the issue, client, device
  - Collect additional information: health, compliance, …
  - Run other automations workflows
- Forward the collected data, store for long term
- Log events, correlate with other platforms
- Build dashboards

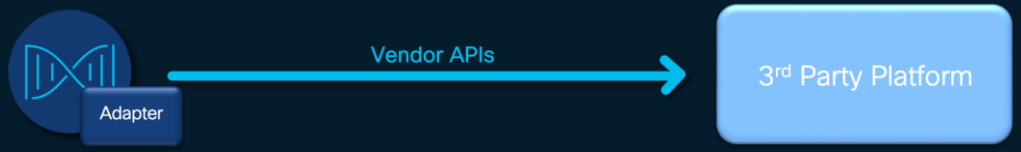


Integration Apps

- Rich features, innovation and maximum extensibility
- Enable GenAI use cases
- Supports non-matching API architectures, auth options, data encoding and data structures
- Ability to build custom integrations with any platforms
- May be required as a proxy between Catalyst Center and cloud platforms

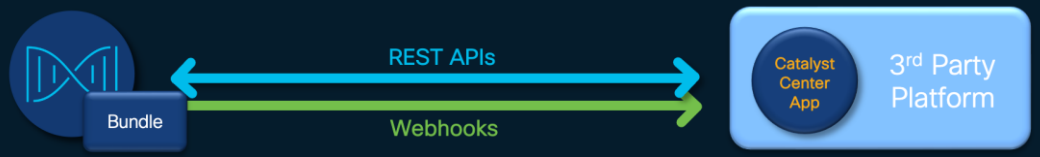
Adapter Integrations

- Catalyst Center software adapters developed for interoperability with other platforms
- The adapter will transform the event notification auth, header, data format and payload structure to match the destination
- Simple Catalyst Center workflows to integrate with 3rd Party Platforms
- Ready to use out-of-the-box

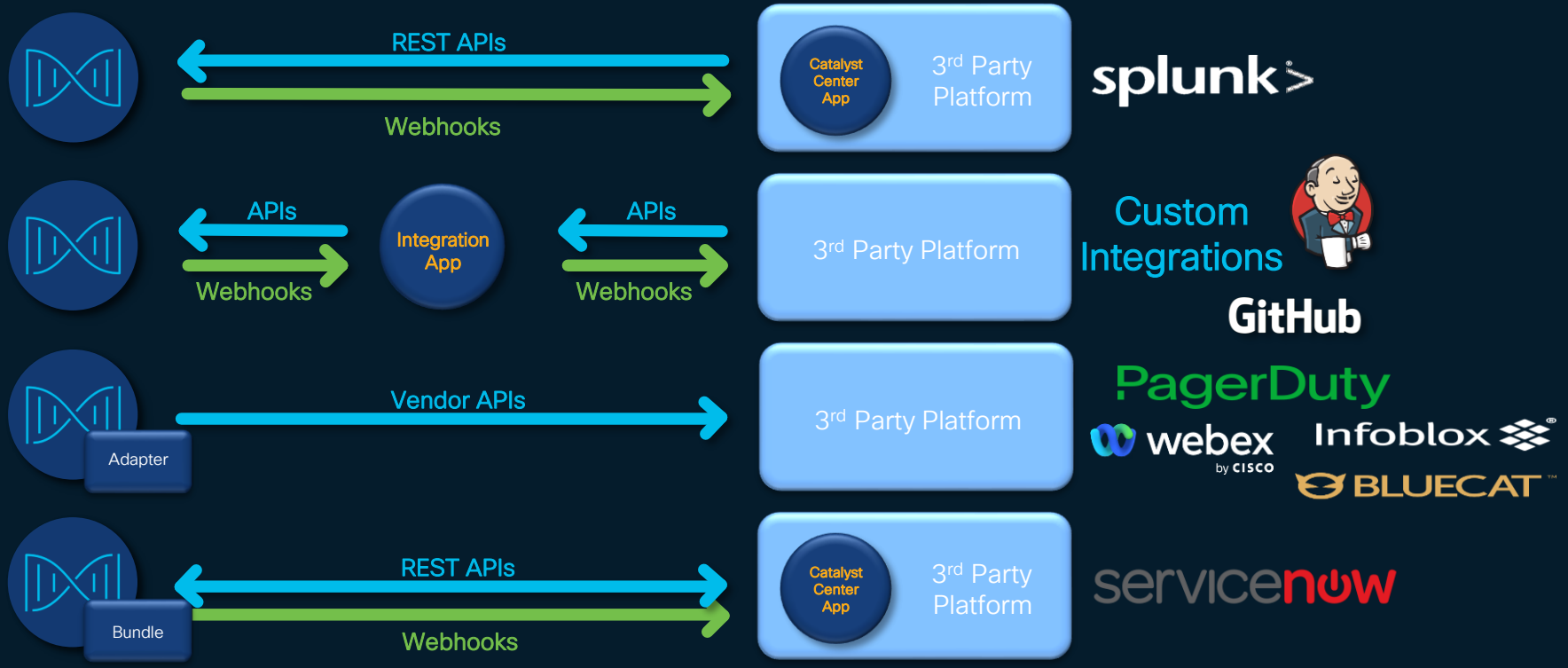


Bundle Integrations

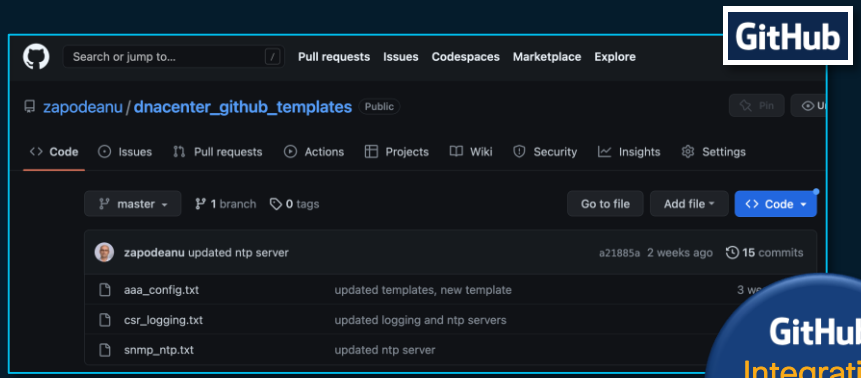
- High value bi-directional, closed-loop integrations between Catalyst Center and 3rd Party Platforms
- Catalyst Center bundles and Integration Apps developed for interoperability between platforms
- Complex Catalyst Center workflows, processes and automations
- Integration App and bundle compatibility and certifications required
- Ready to use out-of-the-box, and customizable

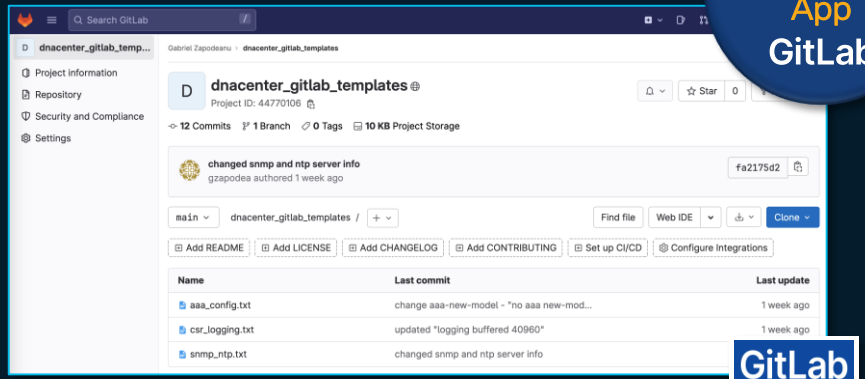


Catalyst Center Integration Options

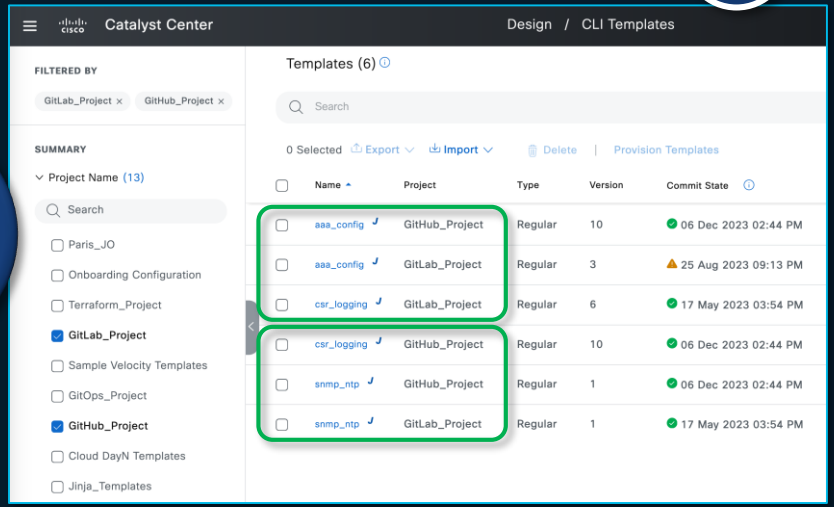


Version Control Tools Integration App





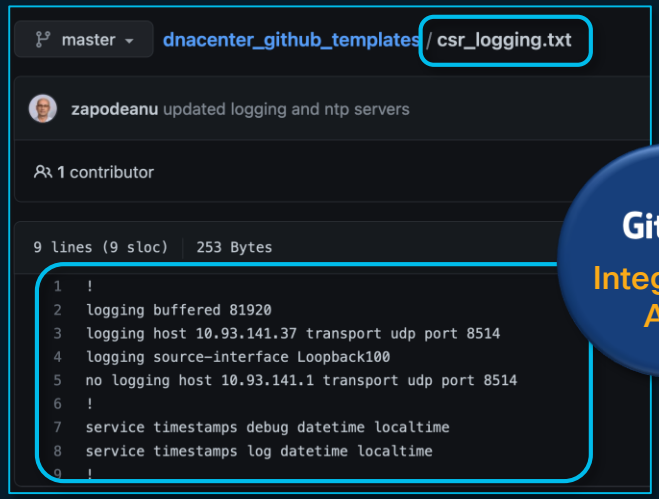
GitHub Integration App GitLab



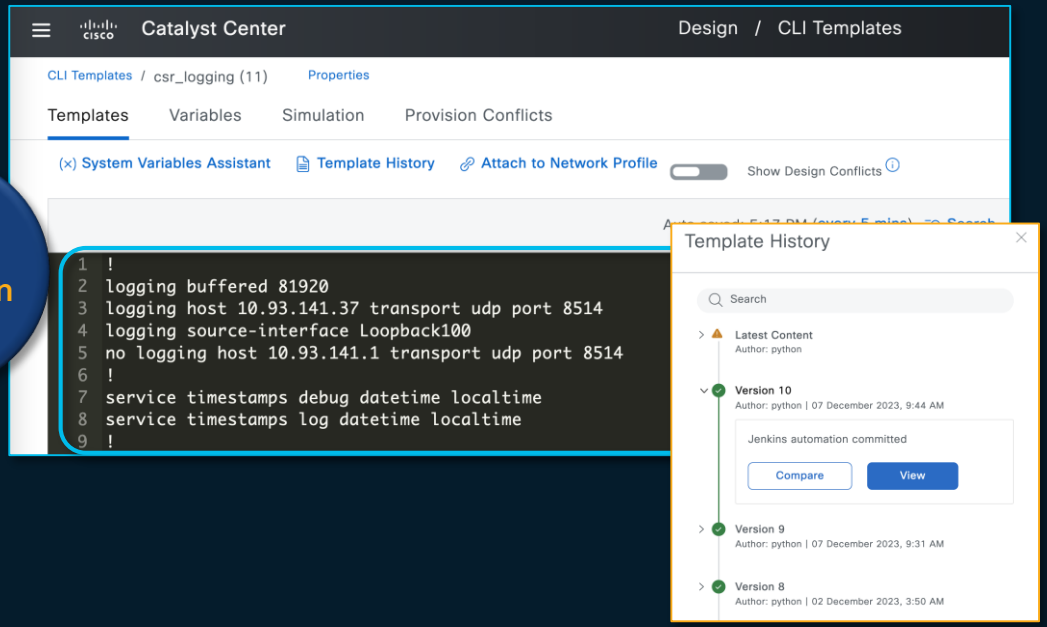
GitHub Integration App Baseline

- Verify if repo exists
- Retrieve the content of each file

- Create or update project
- Create or update CLI template



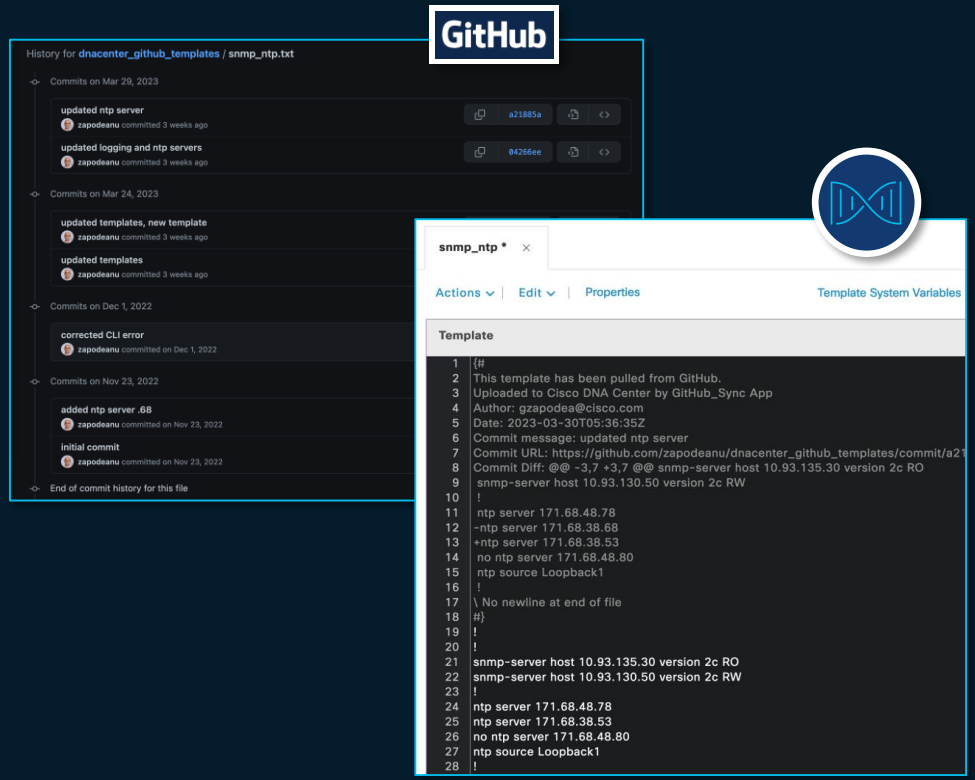
GitHub Integration App



GitHub Integration App Enhancement

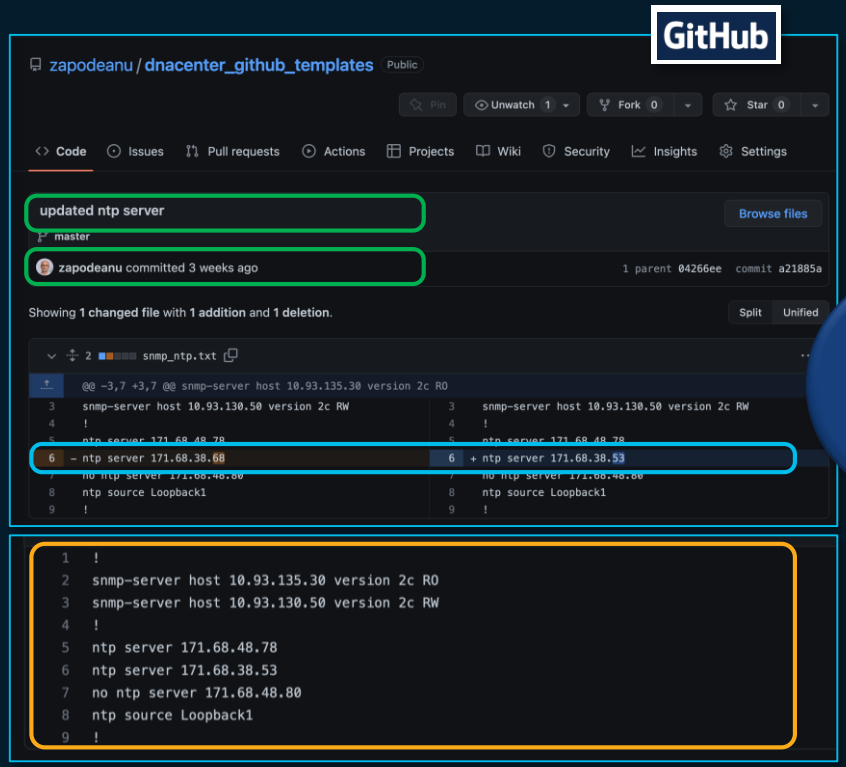
GitHub Commit Details to Cisco Catalyst Center

- Provide visibility in Cisco Catalyst Center for:
  - Commit author
  - Date
  - Comment
  - Changes
- Catalyst Center Templates will include the real source of change from GitHub



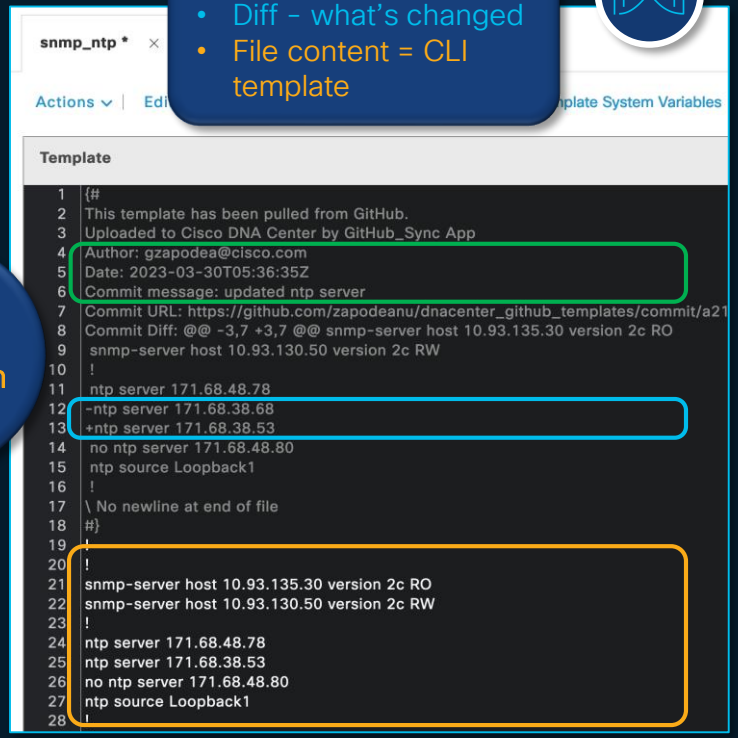
GitHub Integration App Enhancement

GitHub Commit Details to Cisco Catalyst Center

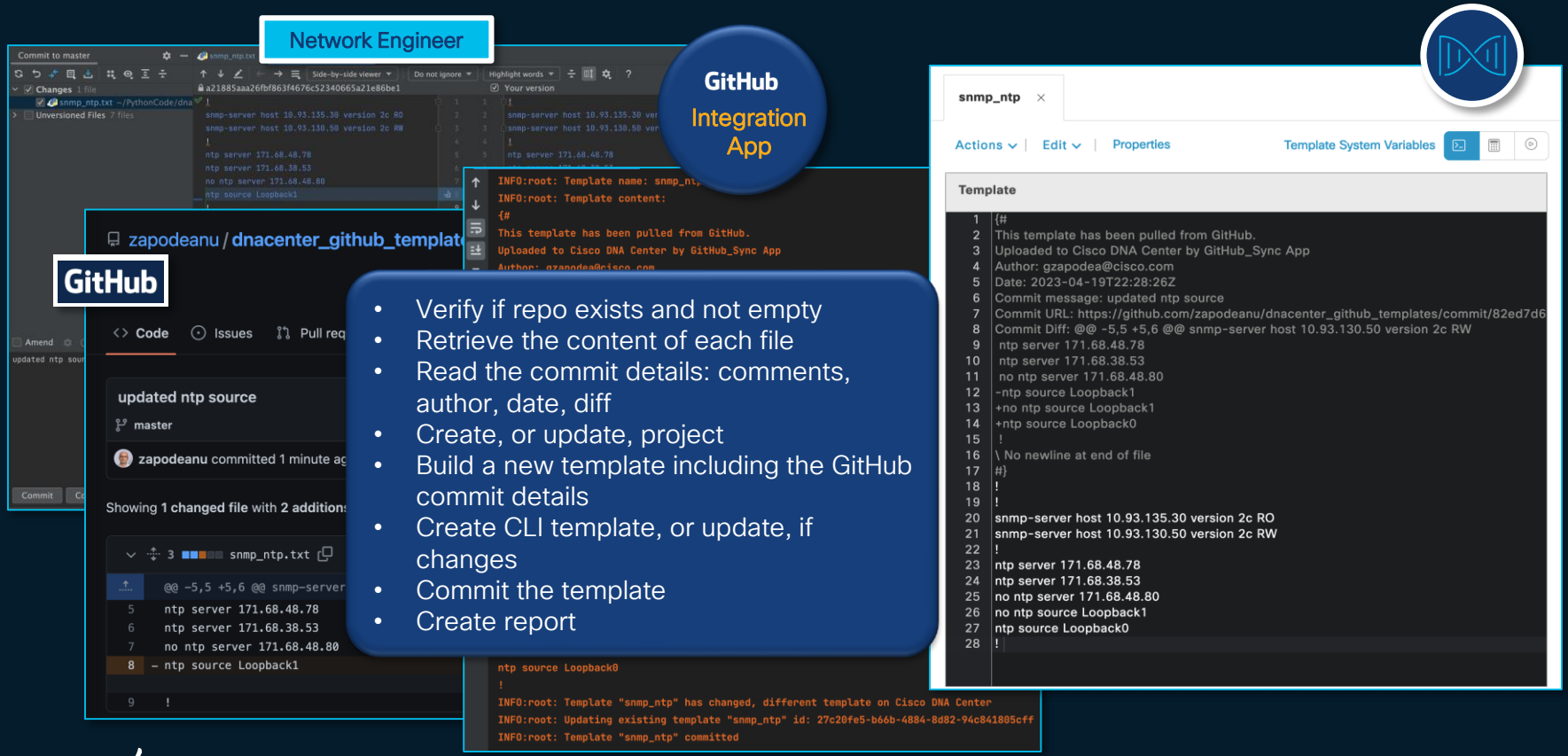


GitHub Integration App

- Commit message, date and author
- Diff - what's changed
- File content = CLI template



GitHub Integration App Summary



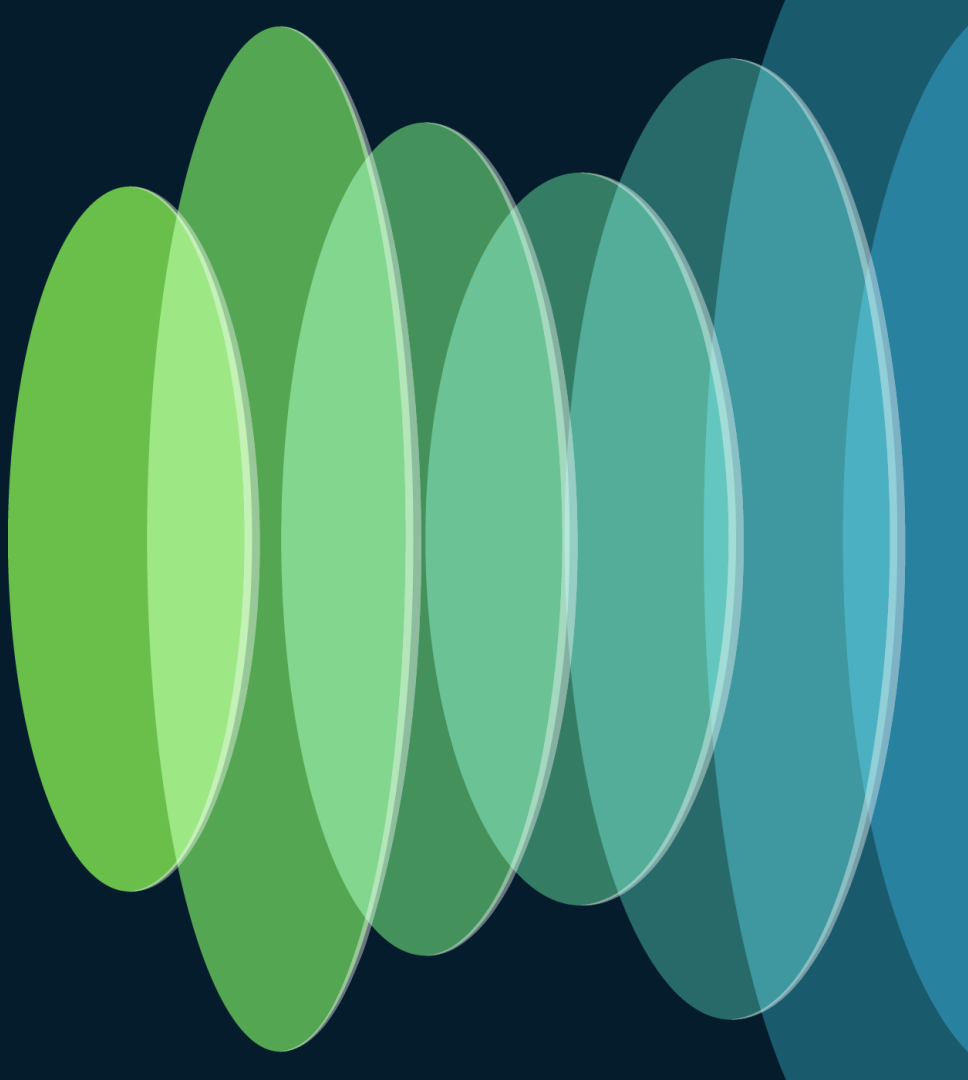
- Verify if repo exists and not empty
- Retrieve the content of each file
- Read the commit details: comments, author, date, diff
- Create, or update, project
- Build a new template including the GitHub commit details
- Create CLI template, or update, if changes
- Commit the template
- Create report

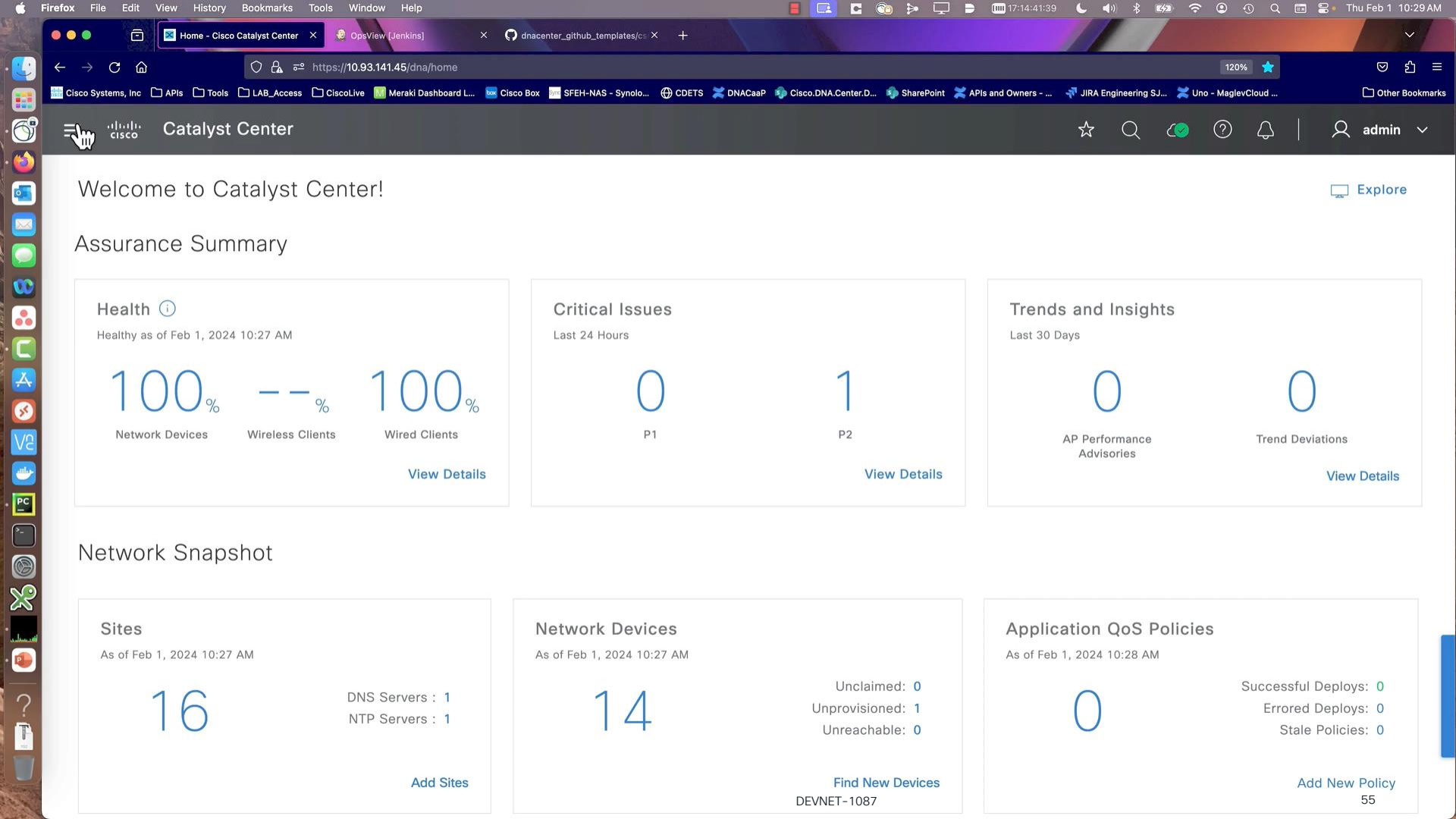
Running the Integration App

- Manually, on-demand
- CI/CD pipelines
- Scheduled – every hour, daily, …
- GitHub Actions triggered when repo changes
- API calls to run sync

GitHub Sync - Jenkins Dashboard

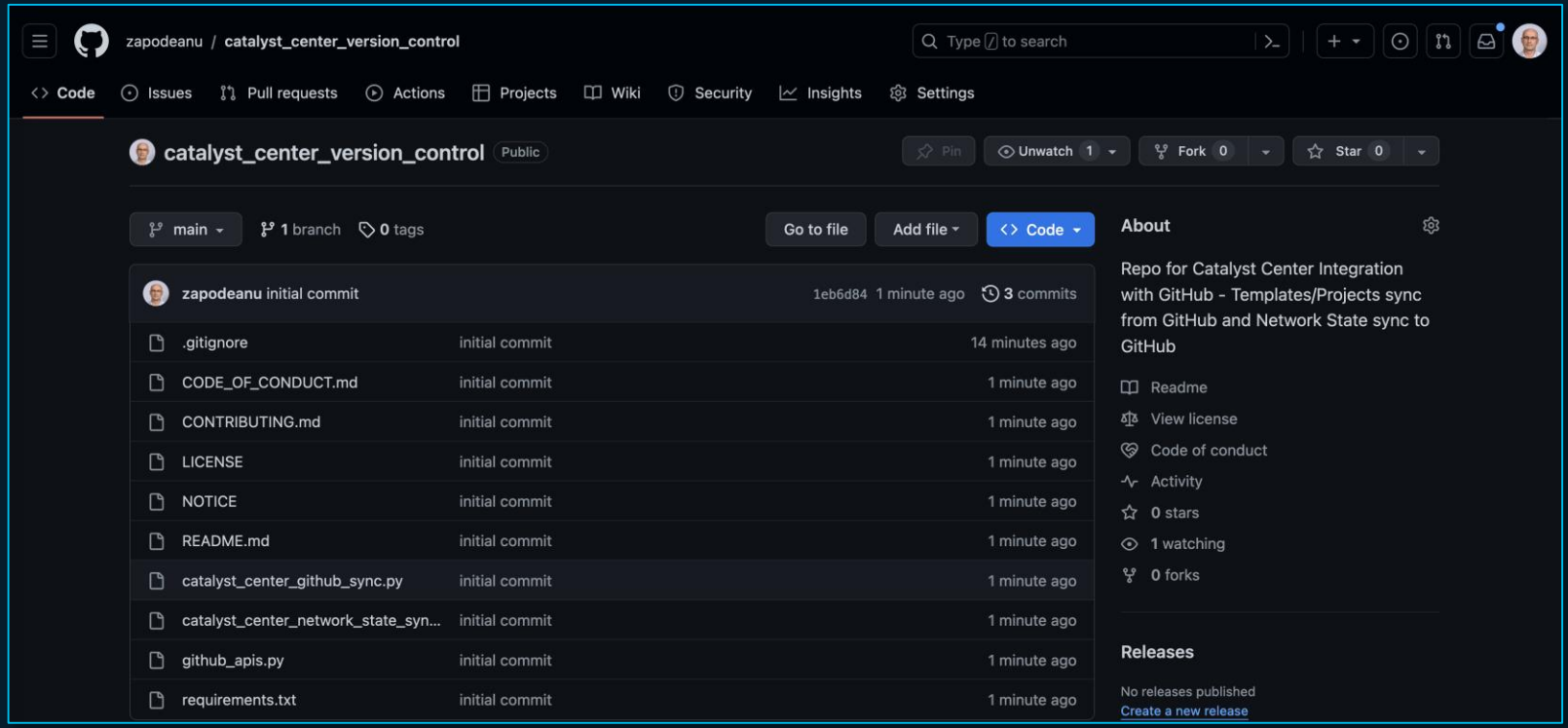
Demo
GitHub Sync Integration App




Firefox File Edit View History Bookmarks Tools Window Help
Thu Feb 1 10:29 AM
Home - Cisco Catalyst Center
OpsView [Jenkins]
https://10.93.141.45/dna/home
Catalyst Center
admin
Welcome to Catalyst Center!
Explore
Assurance Summary
Health
Healthy as of Feb 1, 2024 10:27 AM
100%
Network Devices
--%
Wireless Clients
100%
Wired Clients
View Details
Critical Issues
Last 24 Hours
0
P1
1
P2
View Details
Trends and Insights
Last 30 Days
0
AP Performance Advisories
0
Trend Deviations
View Details
Network Snapshot
Sites
As of Feb 1, 2024 10:27 AM
16
DNS Servers : 1
NTP Servers : 1
Add Sites
Network Devices
As of Feb 1, 2024 10:27 AM
14
Unclaimed: 0
Unprovisioned: 1
Unreachable: 0
Find New Devices
Application QoS Policies
As of Feb 1, 2024 10:28 AM
0
Successful Deploys: 0
Errored Deploys: 0
Stale Policies: 0
Add New Policy

Catalyst Center Version Control Integration

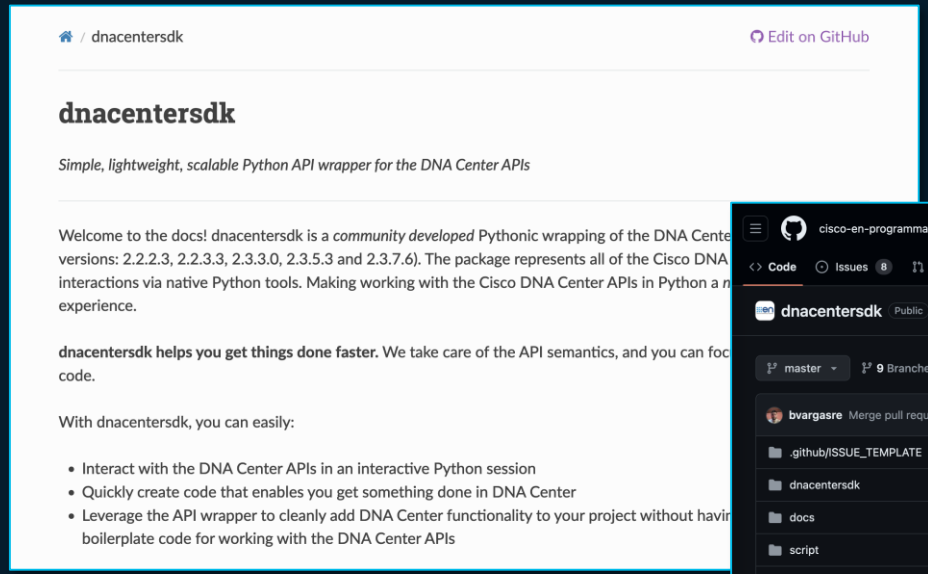
https://github.com/zapodeanu/catalyst_center_version_control



Agenda

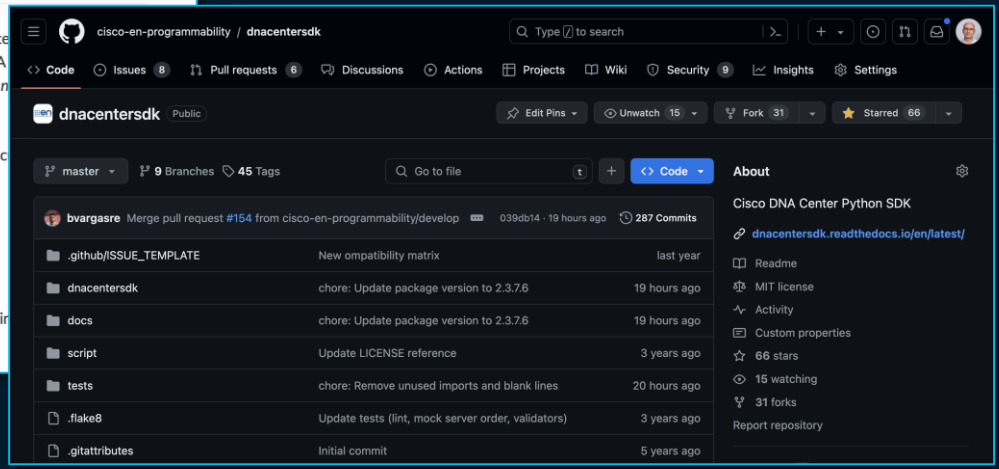
- Catalyst Center Platform Overview
- REST APIs
- Event Notifications
- Integrations
- Developer Resources
- Summary

Catalyst Center Python SDK



https://dnacentersdk.readthedocs.io

- Covers all Cisco Catalyst Center REST APIs
- Support for Cisco Catalyst Center version 2.3.7.6
- First SDK version August 2019
- Average downloads/month 4,500+



https://github.com/cisco-en-programmability/dnacentersdk

How to Use the Python SDK

```python
# create a DNACenterAPI "Connection Object" to use the Python SDK
catalyst_center_api = DNACenterAPI(username=CATALYST_CENTER_USER, password=CATALYST_CENTER_PASS,
                                   base_url=CATALYST_CENTER_URL, version='2.3.5.3', verify=False)

# collect device inventory
# get the device count
response = catalyst_center_api.devices.get_device_count()
device_count = response['response']
logging.info(' Number of devices managed by Cisco DNA Center: ' + str(device_count))

# get the device info list
offset = 1
limit = 500
device_list = []
while offset <= device_count:
    response = catalyst_center_api.devices.get_device_list(offset=offset)
    offset += limit
    device_list.extend(response['response'])
logging.info(' Collected the device list from Cisco DNA Center')
```

Specify Cisco Catalyst Center credentials and version

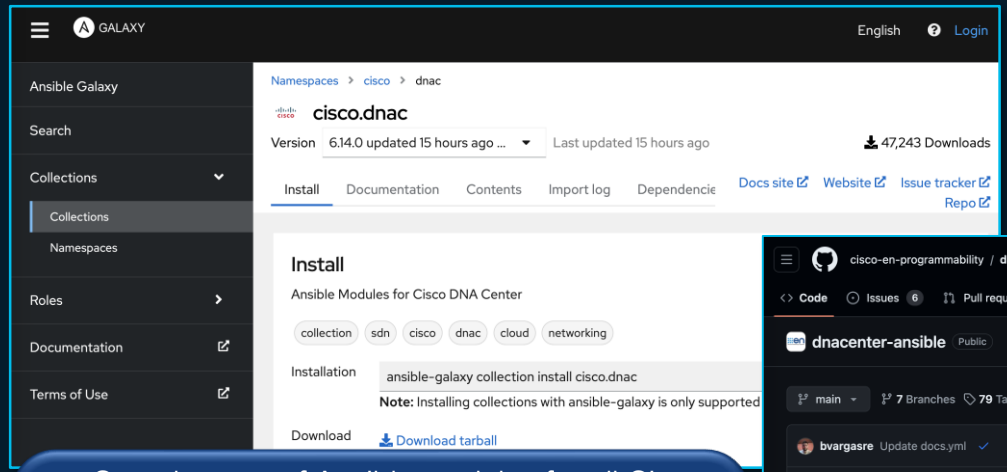
Get the device count

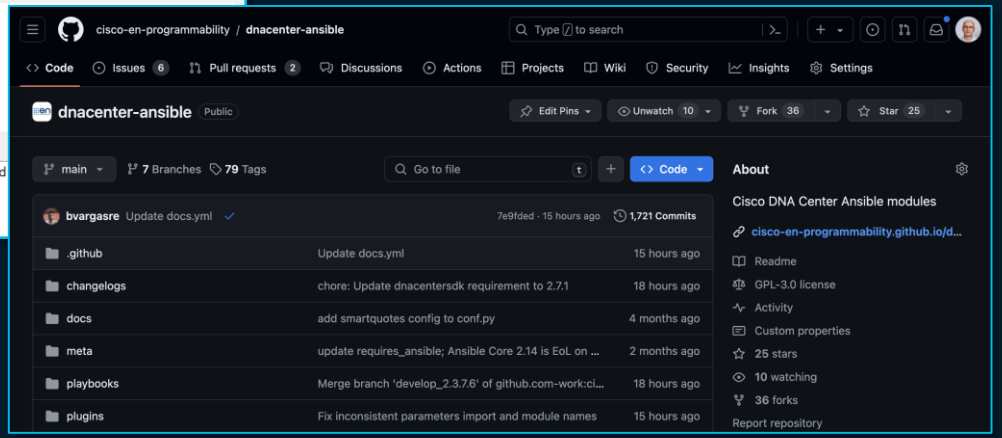
Get the device list using the API pagination

- Accelerates and simplifies apps development
- Developer focus on the use case, and not each API call

Cisco Catalyst Center Ansible Modules

https://galaxy.ansible.com/ui/repo/published/cisco/dnac

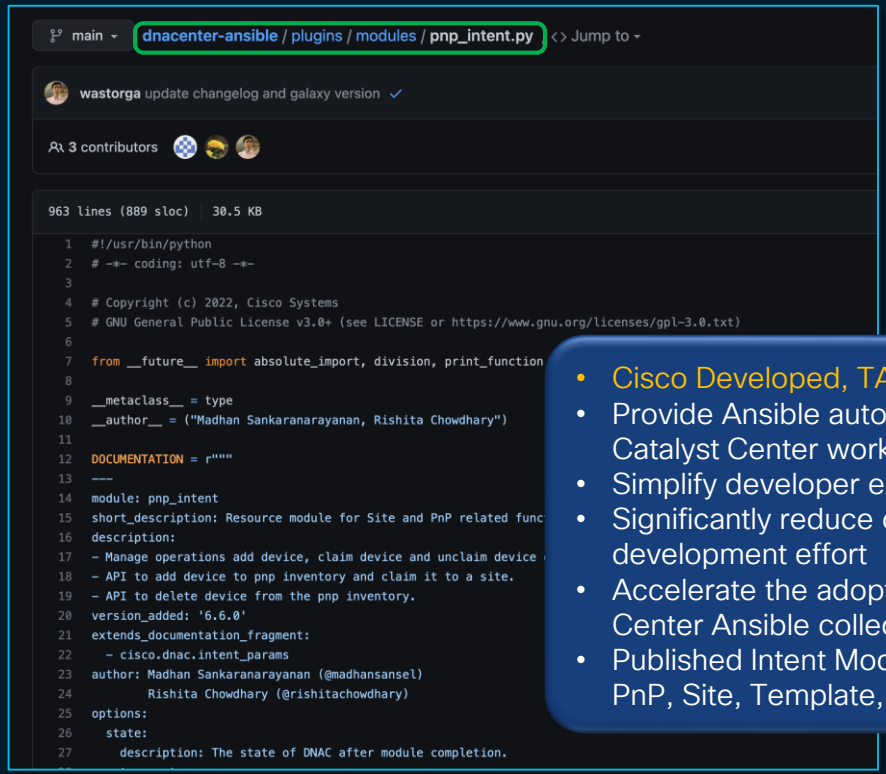


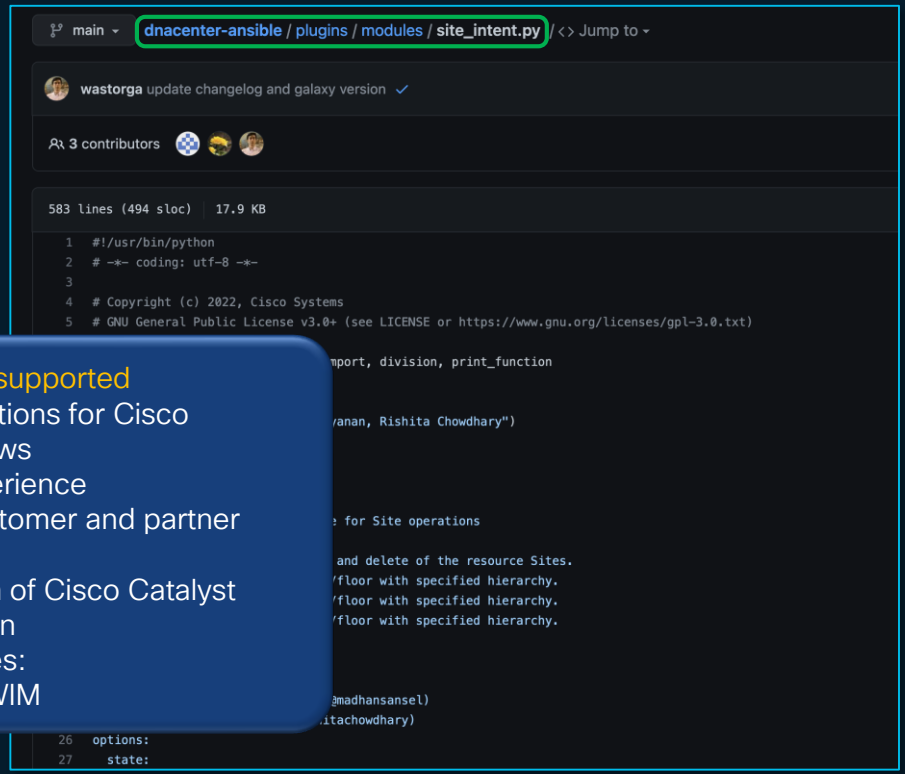


- Complete set of Ansible modules for all Cisco Catalyst Center REST APIs
- First library version Dec 2020
- Certified by RedHat v 2.9 – 04/2021
- Community certified - 05/2022
- Support for Cisco Catalyst Center version 2.3.7.6
- 47,200+ downloads

https://github.com/cisco-en-programmability/dnacenter-ansible

Intent Modules - Cisco Developed and Supported

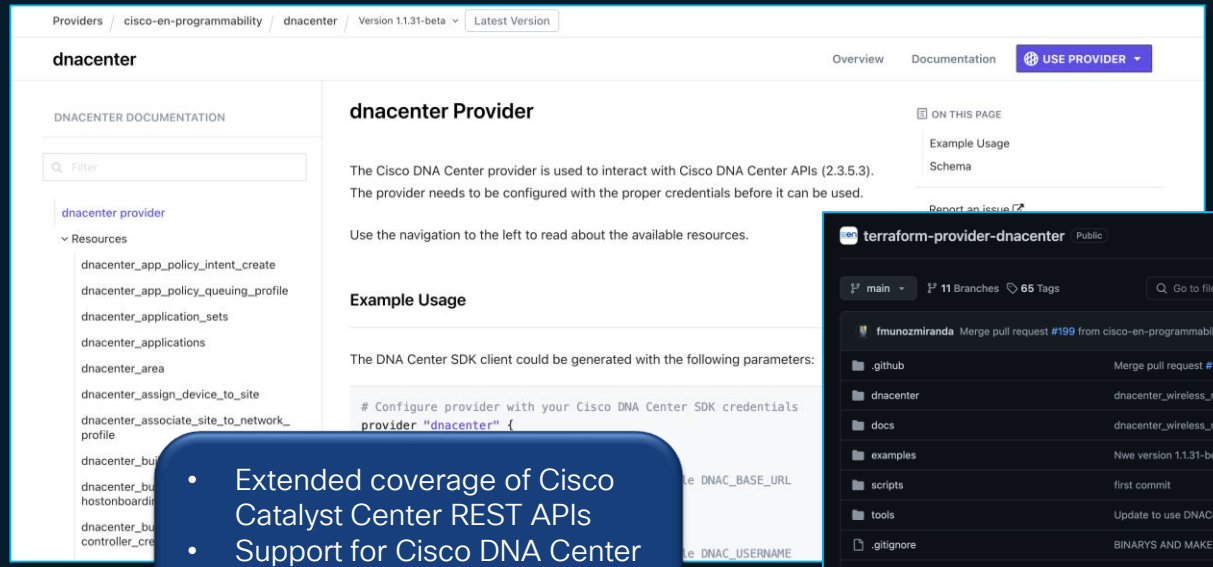


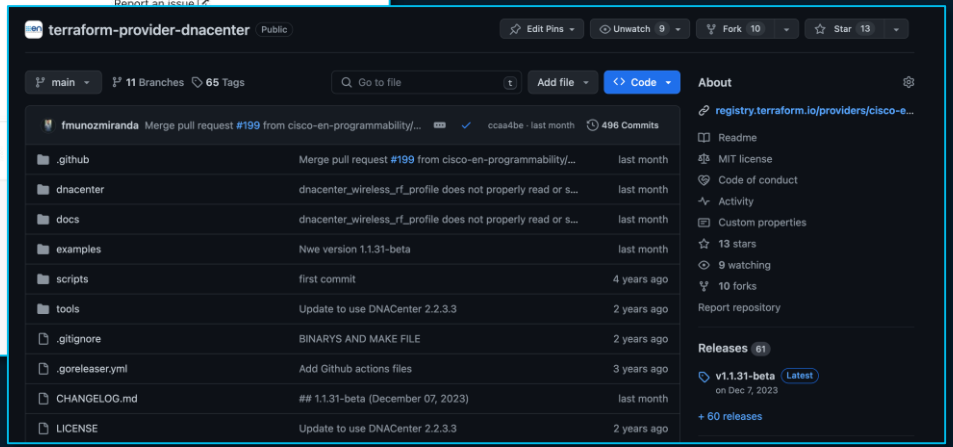


- Cisco Developed, TAC supported
- Provide Ansible automations for Cisco Catalyst Center workflows
- Simplify developer experience
- Significantly reduce customer and partner development effort
- Accelerate the adoption of Cisco Catalyst Center Ansible collection
- Published Intent Modules: PnP, Site, Template, SWIM

Terraform Provider and Go SDK

https://registry.terraform.io/providers/cisco-en-programmability/dnacenter

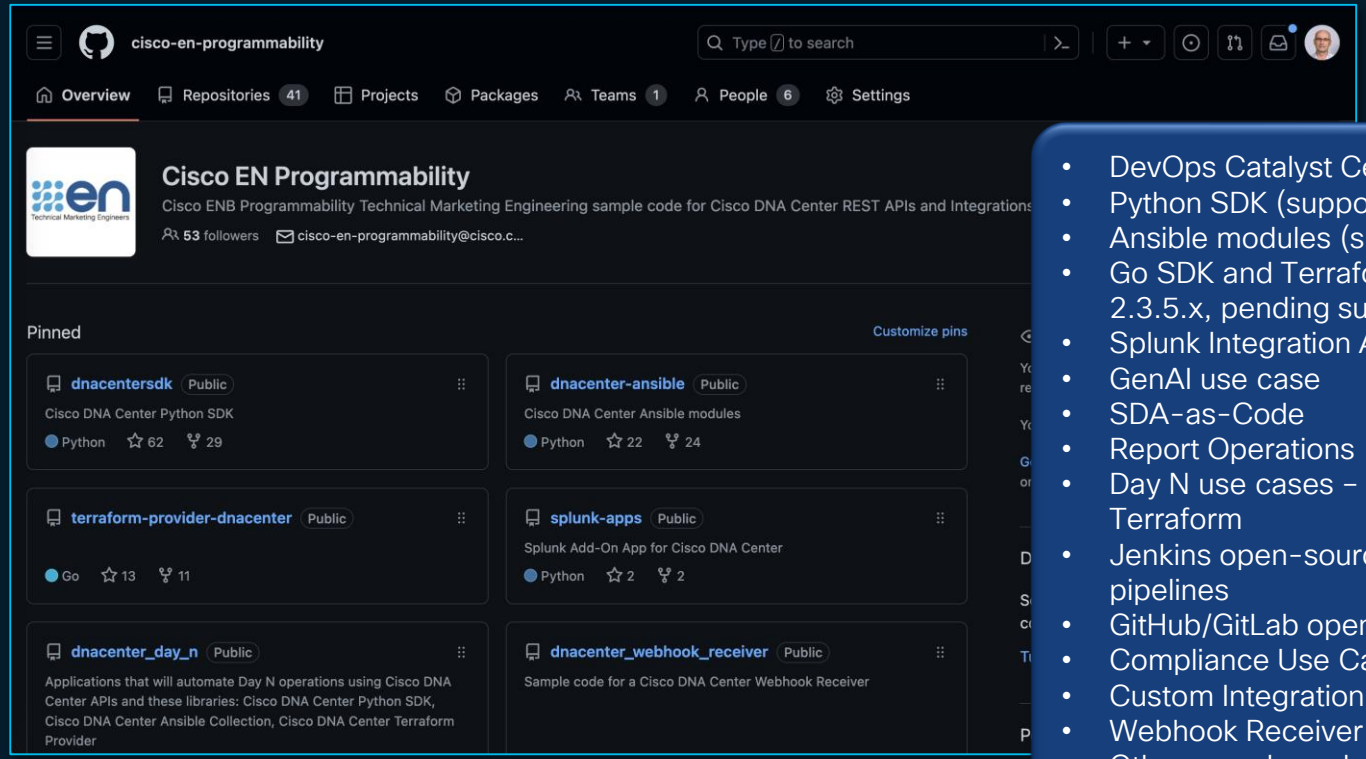




- Extended coverage of Cisco Catalyst Center REST APIs
- Support for Cisco DNA Center version 2.3.5.3 (2.3.7.x pending release)
- Released January 2021
- 41,700+ downloads

https://github.com/cisco-en-programmability/terraform-provider-dnacenter

Cisco EN Programmability GitHub Org



- DevOps Catalyst Center use cases
- Python SDK (support 2.3.7.6)
- Ansible modules (support 2.3.7.6)
- Go SDK and Terraform provider (support 2.3.5.x, pending support 2.3.7.6)
- Splunk Integration Apps
- GenAI use case
- SDA-as-Code
- Report Operations
- Day N use cases – Python SDK, Ansible, Terraform
- Jenkins open-source Integration and pipelines
- GitHub/GitLab open-source Integrations
- Compliance Use Cases
- Custom Integration App (Jira Service Desk)
- Webhook Receiver
- Other sample code

https://github.com/cisco-en-programmability

Agenda

- Catalyst Center Platform Overview
- REST APIs
- Event Notifications
- Integrations
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- Summary

Catalyst Center APIs, Events, Integrations

- Manage Catalyst Center and the infrastructure efficiently, consistent and at scale
- Real-time insights and notifications with webhooks, rich Assurance data available via APIs
- Ready-to-use Integrations or build custom integrations
- Enable GenAI use cases

Catalyst Center Platform Sessions

Session	Title	Room	Date
BRKOPS-2548	Network Troubleshooting Using Cisco Catalyst Center APIs	L2, Mandalay Bay I	06/03/24, 8:00 AM
IBOOPS-2882	Let's Talk about Catalyst Center Integrations	L2, Lagoon D	06/03/24, 1:00 PM
DEVNET-1087	Cisco Catalyst Center Platform: APIs, Event Notifications, Integrations, and DevOps Resources	WoS - DevNet Classroom 2	06/04/24, 12:00 PM
BRKOPS-2032	3 Cisco Catalyst Center and ITSM Workflows: CMDB, Incident Management, and SWIM	L2, Mandalay Bay E	06/05/24, 10:30 AM
DEVNET-3000	ChatBot for Catalyst Center – an Open-Source GenAI based Bot	WoS - DevNet Classroom 2	06/05/24, 3:00 PM
SKILLS-1660	Introduction to Catalyst Center	WoS - DevNet & Cisco U. Skills Stage	06/06/24, 9:00 AM
SKILLS-1661	Introduction to Catalyst Center Platform	WoS - DevNet & Cisco U. Skills Stage	06/06/24, 10:00 AM

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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 2025.

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- Book your one-on-one Meet the Engineer meeting
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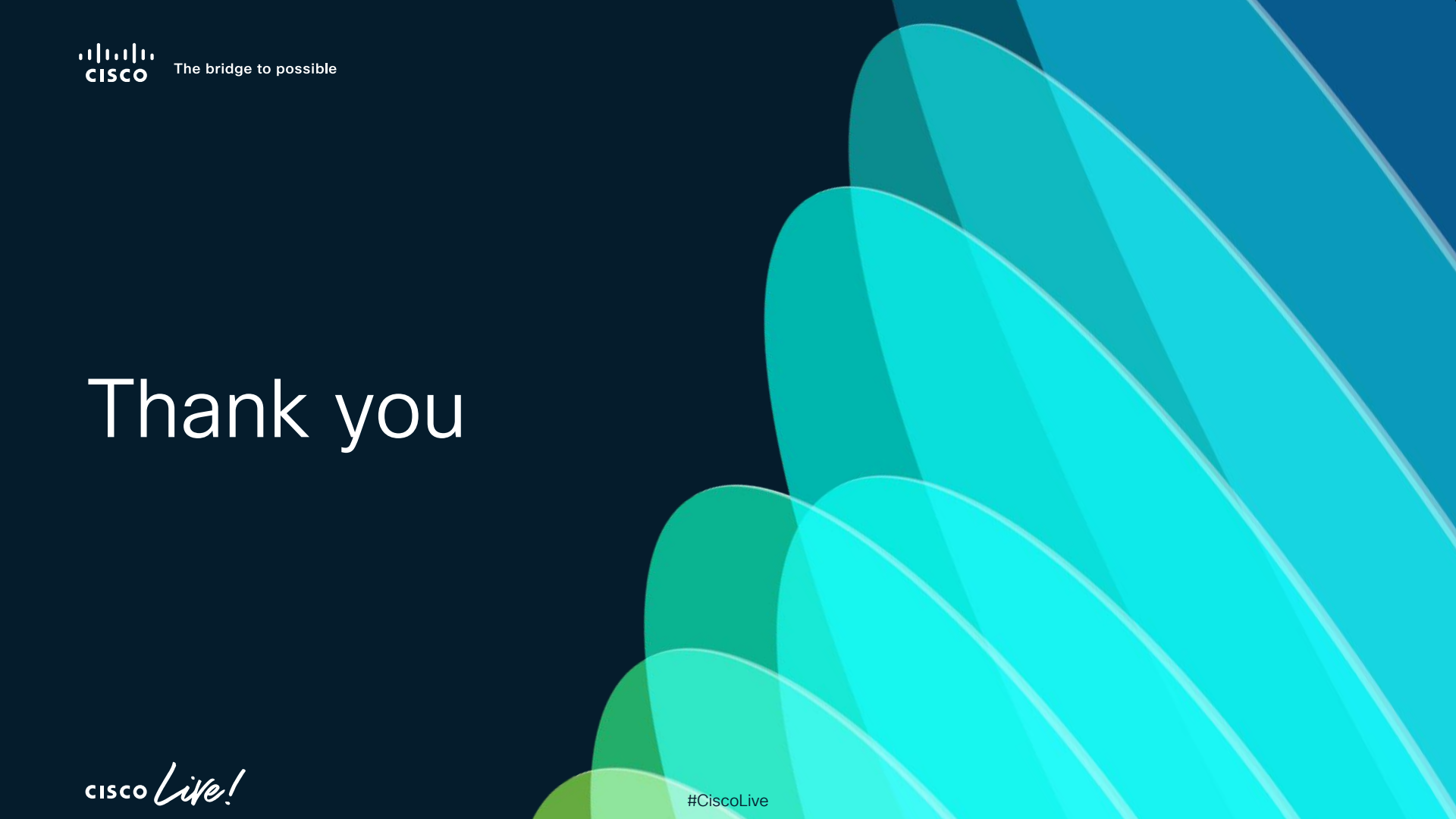
- Visit the On-Demand Library for more sessions at www.CiscoLive.com/on-demand

Contact me at: gabi@cisco.com


The bridge to possible
Thank you
cisco Live!
#CiscoLive