You make **possible**

ConfigMon

Configuration Monitoring and Compliance using Cisco DNA Center

Gabriel Zapodeanu
Technology Solutions Architect, Cisco Systems

gzapodea@cisco.com @zapodeanu
GitHub github.com/zapodeanu

DEVWKS-2840

Cisco Webex Teams

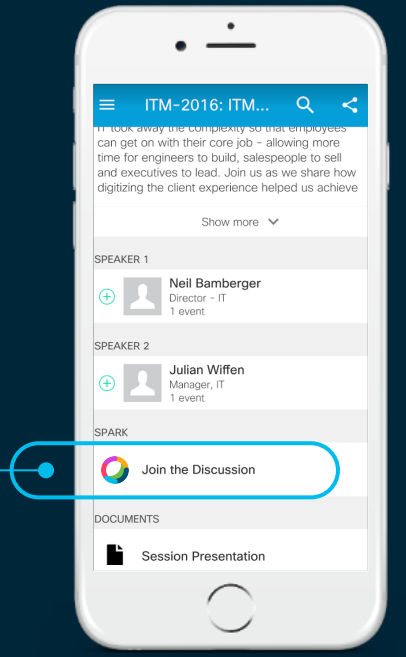
Questions?

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

Webex Teams will be moderated by the speaker until June 16, 2019.



cs.co/ciscolivebot#DEVWKS-2840

Gabriel Zapodeanu

- Technical Marketing Engineer, ENB, Cisco Systems

- Gabriel Zapodeanu is a Network Programmability Technical Marketing Engineer.
- He recently joined the Cisco Enterprise Networking Business, focused on controllers programmability – Cisco DNA Center, SD-WAN and ISE.
- Prior to his current role he was a Programmability Technology Architect, part of the Global Partner Organization, focused on partner technical enablement programs, APIs use case development across various technologies, as well as learning and certifications programs.
- After joining Cisco in 2006 he was an Systems Engineer in the West Area Enterprise Organization, Oregon USA. His work included large architectures for a variety of Enterprise customers from manufacturing, utilities, retail, transportation, healthcare, education, and financial industries.
- Gabriel completed his Cisco Business Architecture Certification #373 ,and recently, co-authored the book "IOS XE Programmability: Automating Device Lifecycle Management".

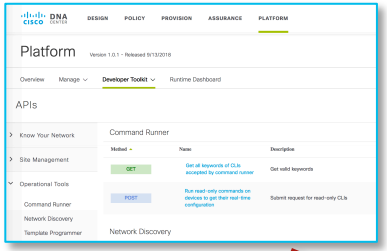
ConfigMon

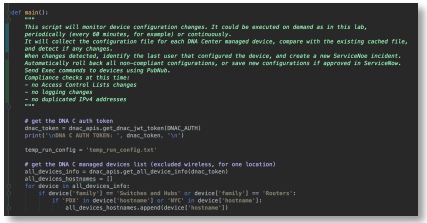
Configuration Monitoring and Compliance using Cisco DNA Center

- The Challenge
  - 70% of policy violations are due to user errors
  - Configuration drifting
- The Goals
  - Automated roll back of non-compliant changes
  - Alert on all network configuration changes
- The Solution
  - Integration between DNA Center, Cisco IOS XE, and Webex Teams
  - ITSM Integration and Change Control Approval Process
- The Results
  - Non-compliant configuration changes are mitigated in minutes
  - Real time view of all device configuration changes

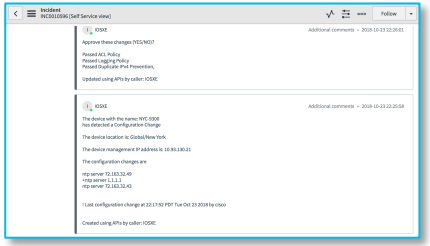
ConfigMon App

DNA Center



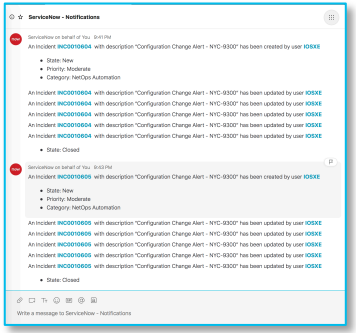


ServiceNow



Open IOS XE, Guest Shell

Webex Teams



ConfigMon Policies

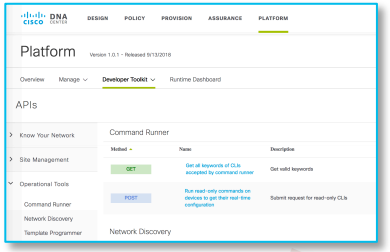
- Rules:
  - No Access Control configurations changes
  - No logging configurations changes
  - Configurations should not create duplicated IPv4 addresses with clients or network devices interfaces
- Actions:
  - If not compliant, role back the entire configuration, test if rollback successful
  - If compliant, create incident in ServiceNow, ask for Change Control Manager to approve – save or rollback configuration
- Easy to create additional rules

Demo:
ConfigMon

ConfigMon App

ServiceNow

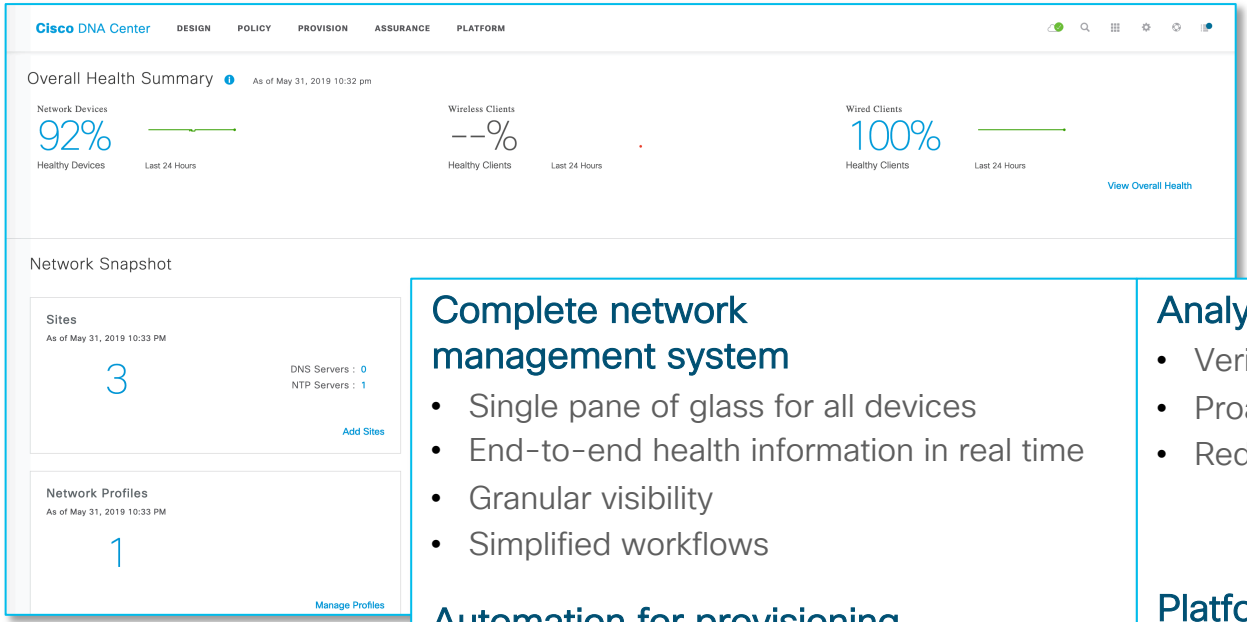
DNA Center



Open IOS XE, Guest Shell

Webex Teams

Cisco DNA Center



Complete network management system

- Single pane of glass for all devices
- End-to-end health information in real time
- Granular visibility
- Simplified workflows

Automation for provisioning

- Zero-touch deployment
- Device lifecycle management
- Policy enforcement

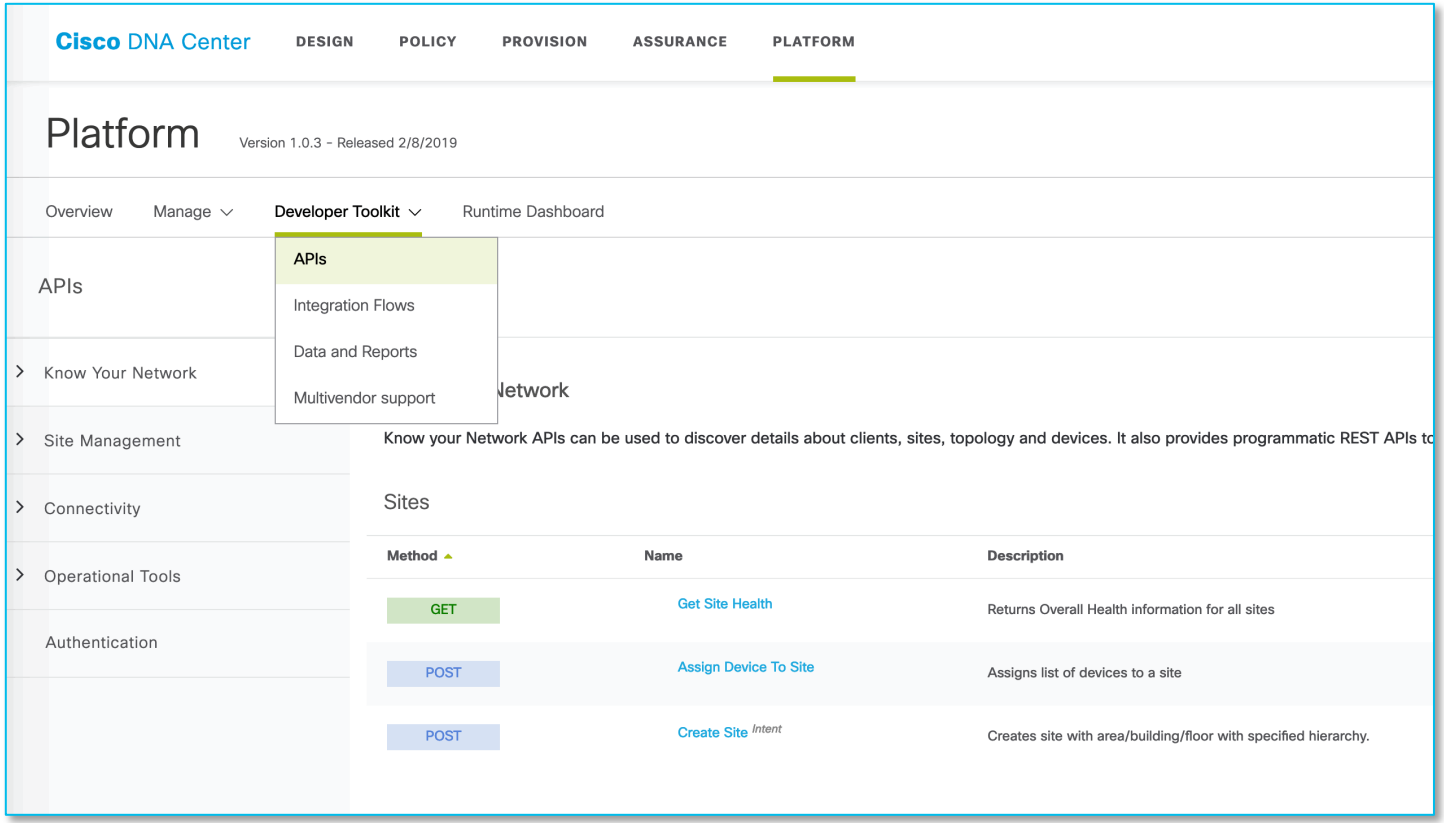
Analytics for assurance

- Verify intent of network settings
- Proactively resolve issues
- Reduce time spent troubleshooting

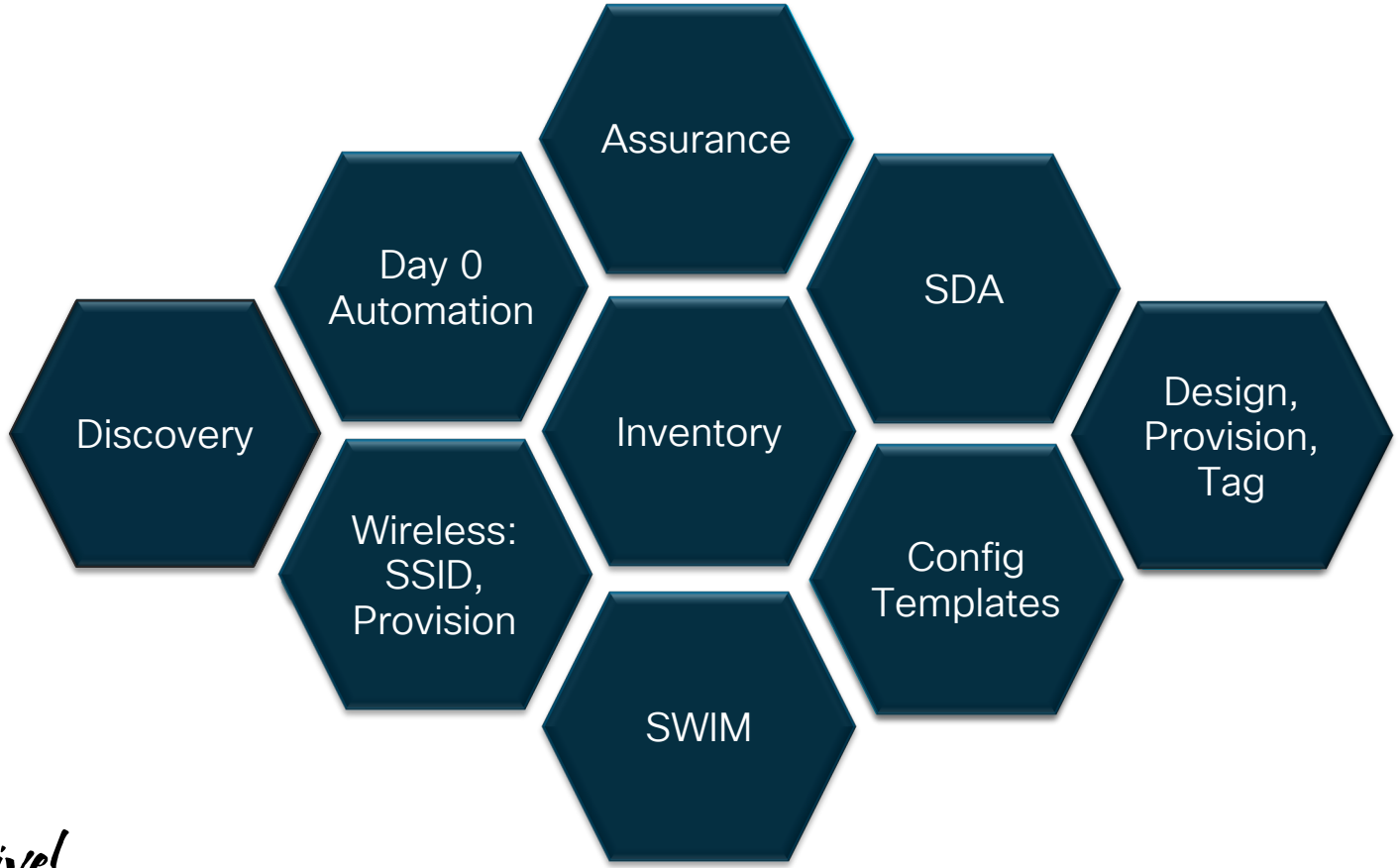
Platform for extensibility

- Integrate APIs with third-party solutions
- Integrate and customize ServiceNow
- Evolve operational tools and processes

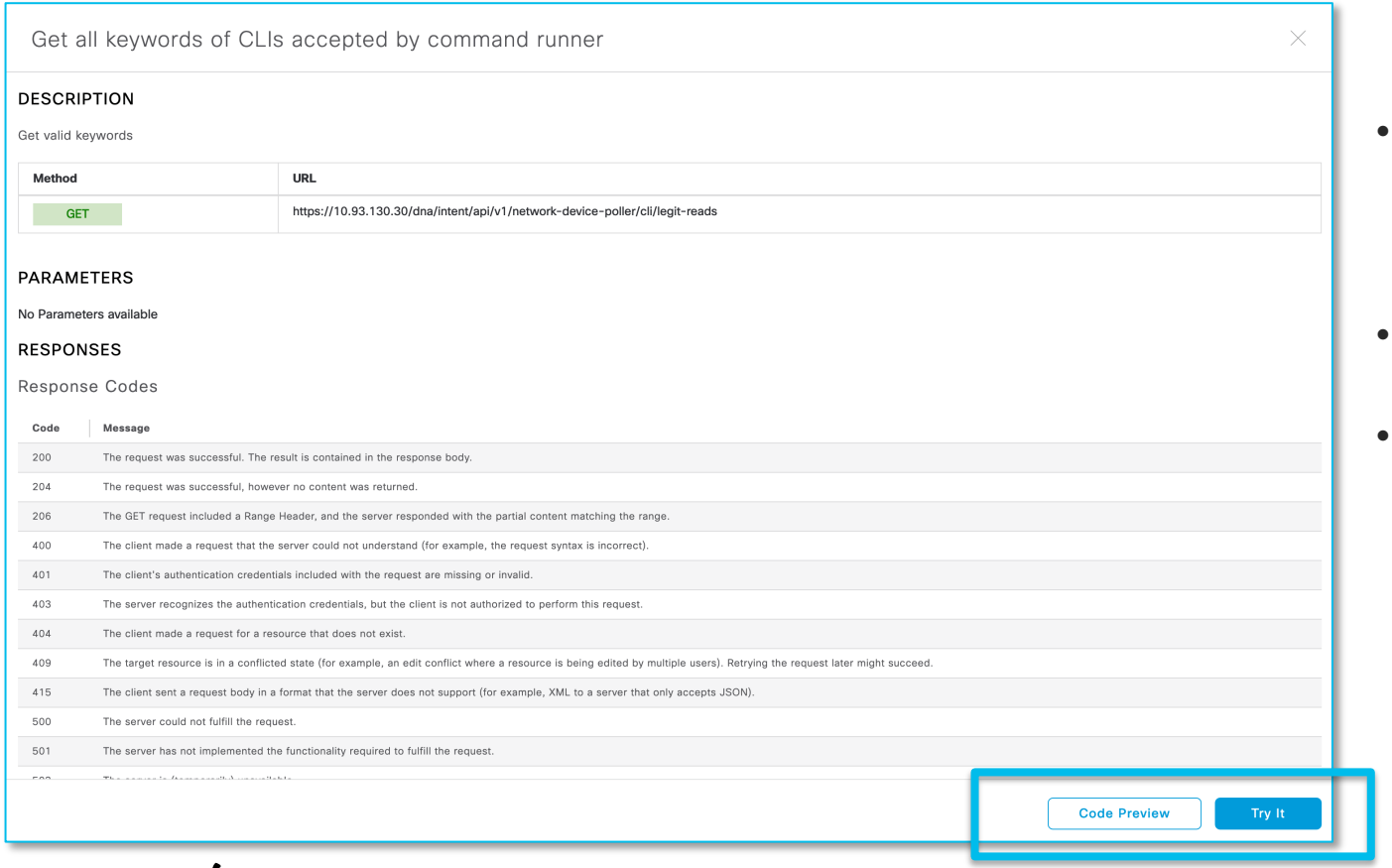
DNA Center Platform



APIs at a Glance

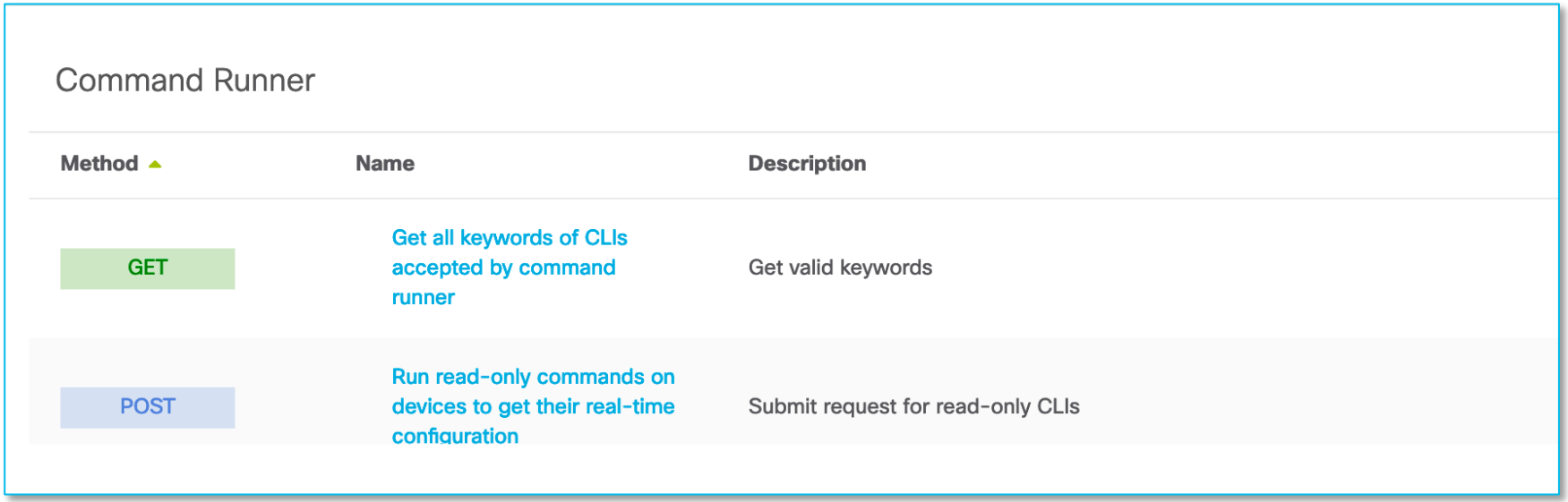


API Docs



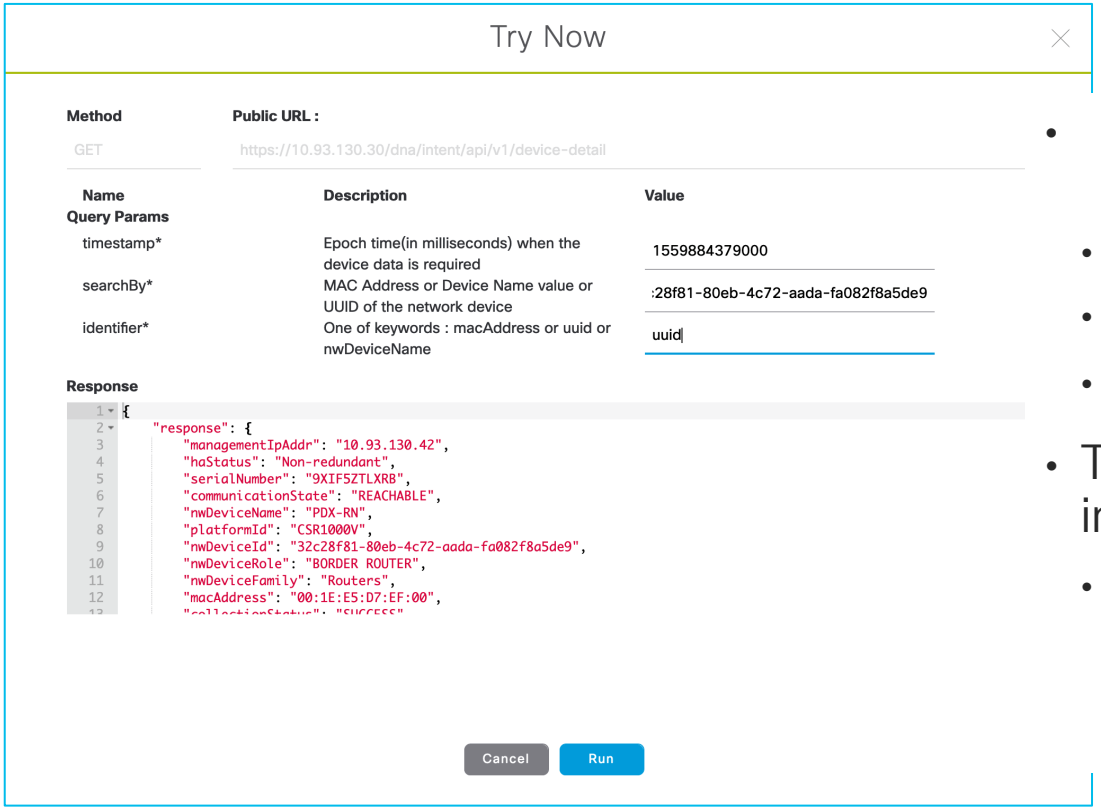
- Info of what you need to send and what you expect to receive
- Try APIs without writing code
- Get help to write the API Requests in few programming languages

Cisco DNA Center Command Runner APIs



- Get all the commands supported
- Submit the command to device(s) using the device Id(s)
- Retrieve the output from the file specified in the response

Cisco DNA Center Device Detail API



- The REST API Request Requires:
  - Device Identifier
  - Type of identifier used
  - Timestamp – Epoch time in msec
- The REST API Response includes:
  - Location, family, operating system version, serial number, management IP address, health score, …

Demo:
Cisco DNA Center in Action

Hands-On

- Find a folder with the name **“DEVWKS_2840_US19”** on the desktop
- Use PyCharm and open the project DEVWKS_2840_US19
- **Edit the file “config.py”**
- Enter the environment variables provided to you
  - Cisco DNA Center password
  - ServiceNow Instance number and password
  - Update the IOS XE IP Address and Hostname with the device number
  - IOS XE password
- **Run the Python script ”intro_to_dna_center.py” in PyCharm**
- **Find the information for your device**

ConfigMon App

DNA Center

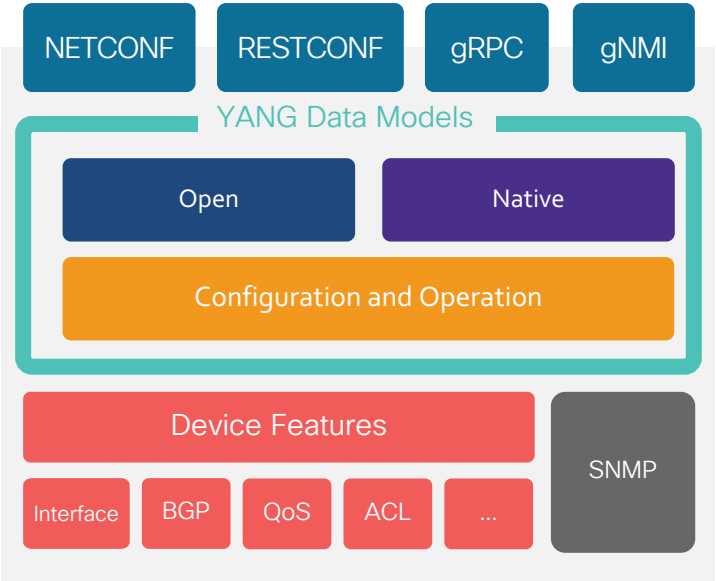
ServiceNow

Webex Teams

Open IOS XE, Guest Shell

NETCONF and RESTCONF

- Options to program network devices:
  - NETCONF – Network Configuration Protocol
  - RESTCONF – REST-like access to the YANG Data Model
  - gRPC – open-source universal RPC framework, started by Google
  - gNMI – gRPC Network Management Interface – configuration and operational data, telemetry
    - gRPC caries gNMI

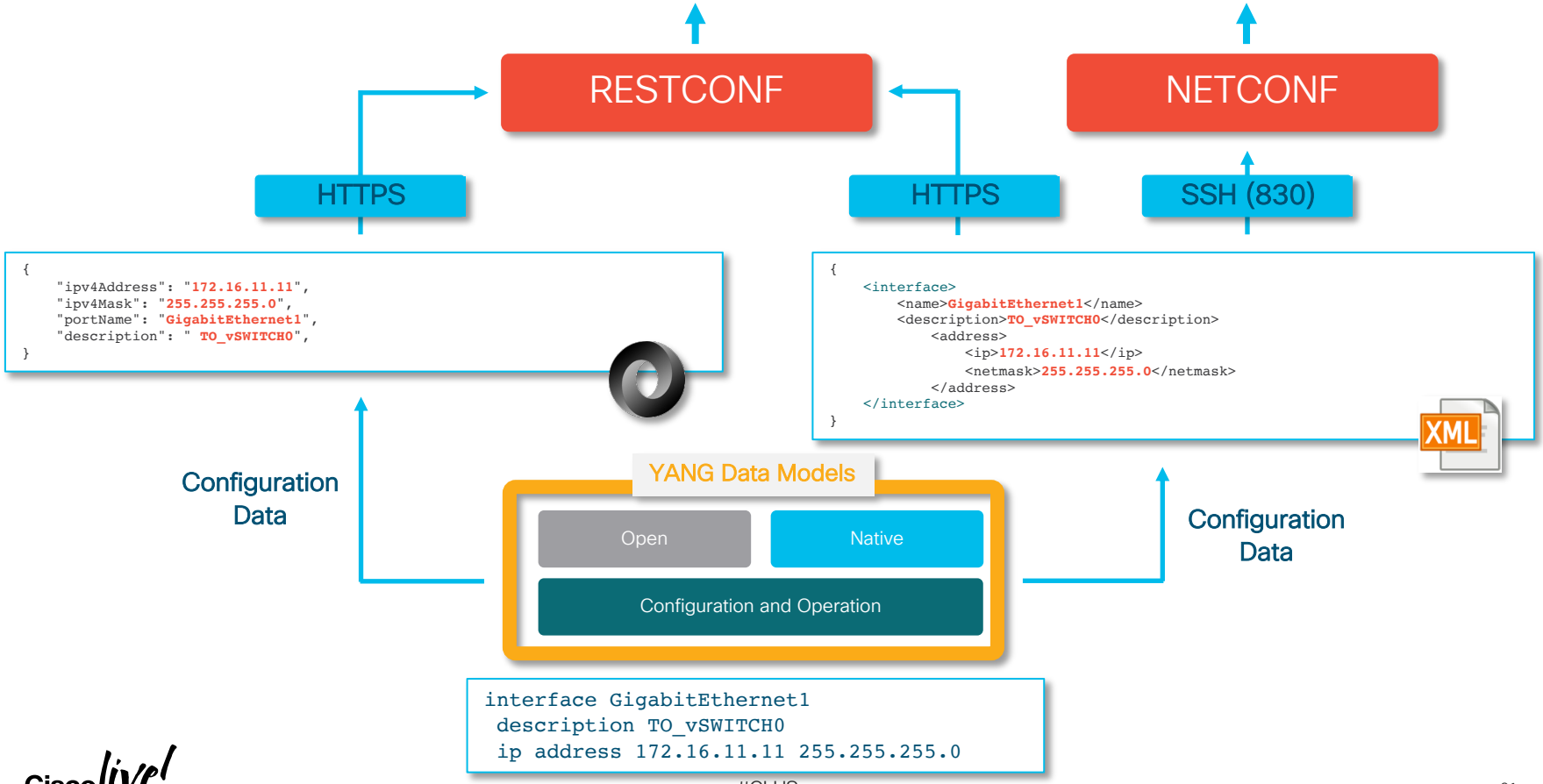


http://cs.co/IOS-XE-Programmability-Book

Protocol Summary

	NETCONF	RESTCONF	gRPC, gNMI
Standardization	RFC 6241	RFC 8040	Open Initiative
Encoding	XML	XML / JSON	JSON / GPB
Session-layer Service (RPC) Support	✓	✓	✓
Connection Oriented	✓	✗	✓
Session Security	SSH / SOAP	HTTPS	HTTPS

Network Device APIs



NETCONF and/or RESTCONF ?

```
<rpc-reply message-id="urn:uuid:50bf9d6e-7e5c-4182-ae6b-
972a055ceef7" xmlns="urn:ietf:params:xml:ns:netconf:base:1.0"
xmlns:nc="urn:ietf:params:xml:ns:netconf:base:1.0">
  <data>
    <interfaces-state xmlns="urn:ietf:params:xml:ns:yang:ietf-
interfaces">
      <interface>
        <name>GigabitEthernet1</name>
        <admin-status>up</admin-status>
        <oper-status>up</oper-status>
        <phys-address>00:0c:29:6c:81:06</phys-address>
        <speed>1024000000</speed>
        <statistics>
          <in-octets>5432293472</in-octets>
          <in-unicast-pkts>28518075</in-unicast-pkts>
          ..............
          <out-octets>2901845514</out-octets>
          <out-unicast-pkts>18850398</out-unicast-pkts>
        </statistics>
      </interface>
    </interfaces-state>
  </data></rpc-reply>
```

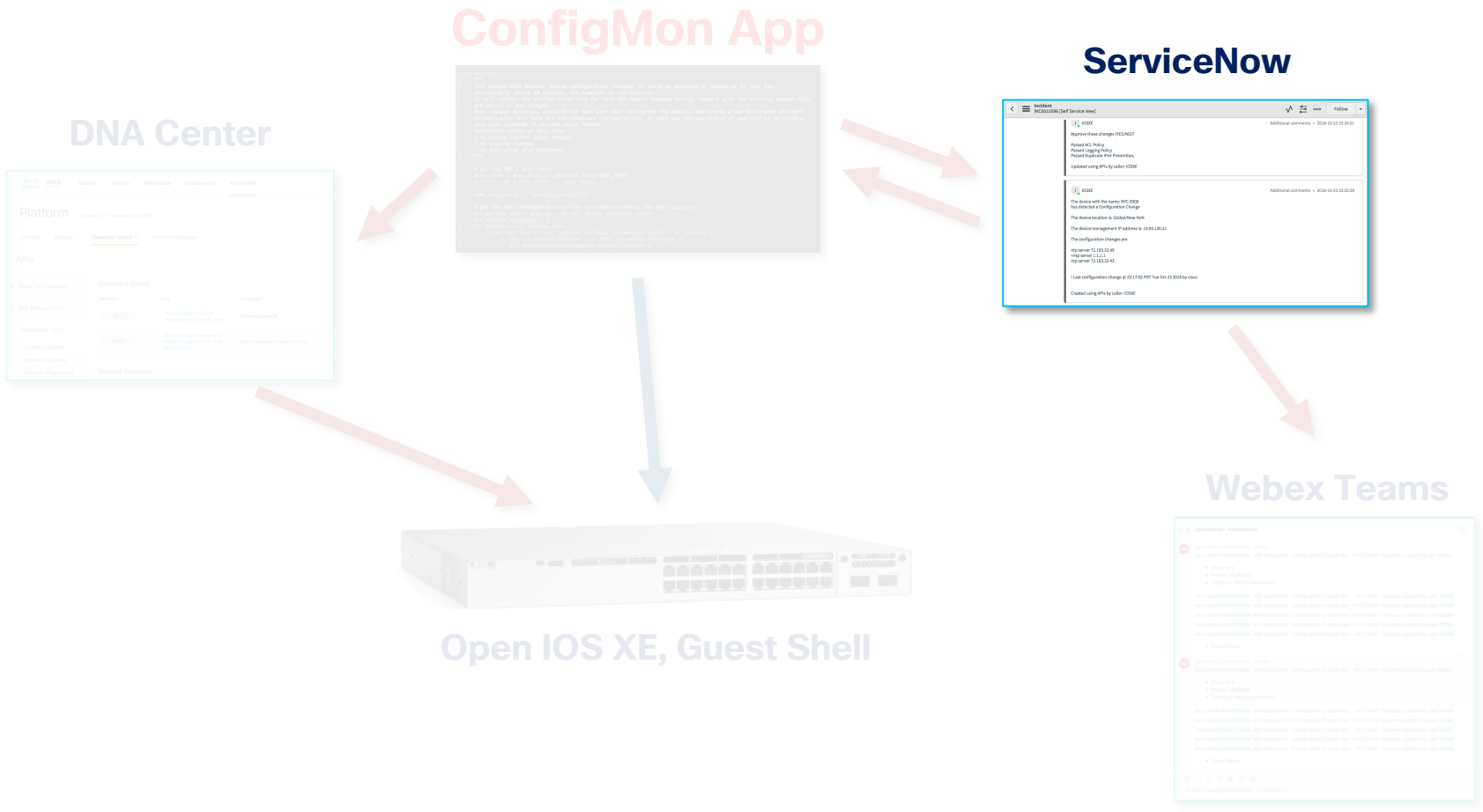

```
{
    "ietf-interfaces:interface": {
        "name": "GigabitEthernet1",
        "admin-status": "up",
        "oper-status": "up",
        "last-change": "2018-01-17T21:49:17.000387+00:00",
        "phys-address": "00:0c:29:6c:81:06",
        "speed": 1024000000,
        "statistics": {
            "in-octets": 5425386232,
            "in-unicast-pkts": 28489134,
            ..............
            "out-octets": 2899535736,
            "out-unicast-pkts": 18844784
        }
    }
}
```

YANG Data Models

Demo:
RESTCONF and NETCONF in Action

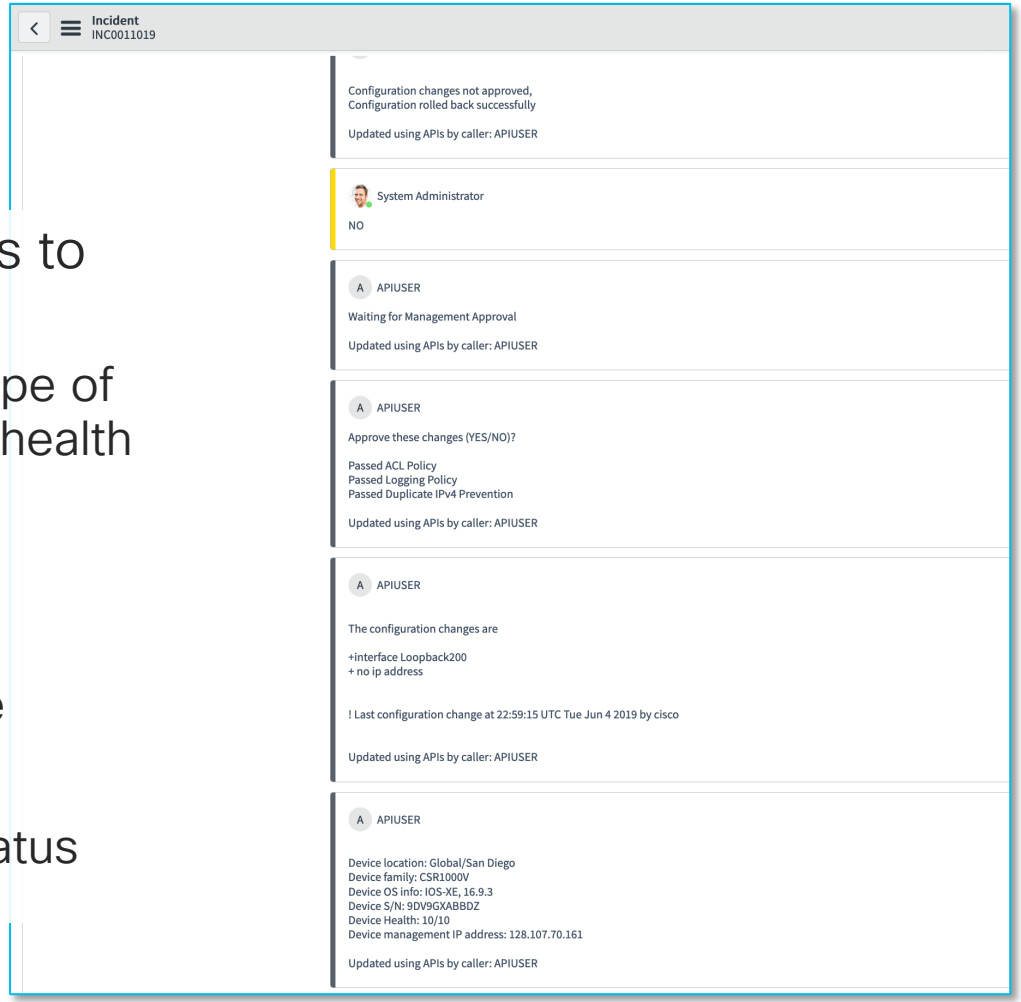
Hands-On

- Run the Python script “intro_to_NETCONF_RESTCONF.py” using PyCharm
- This script will:
  - Retrieve the device capabilities using RESTCONF
  - Find the device hostname using RESTCONF
  - Retrieve interface operational state using NETCONF
  - Retrieve the interface statistics using RESTCONF
  - Save running configuration to startup configuration using RESTCONF
  - Save running configuration to file using NETCONF
  - Rollback configuration from saved file using RESTCONF
- Question – What are the “device capabilities”? How can we get them?



ServiceNow

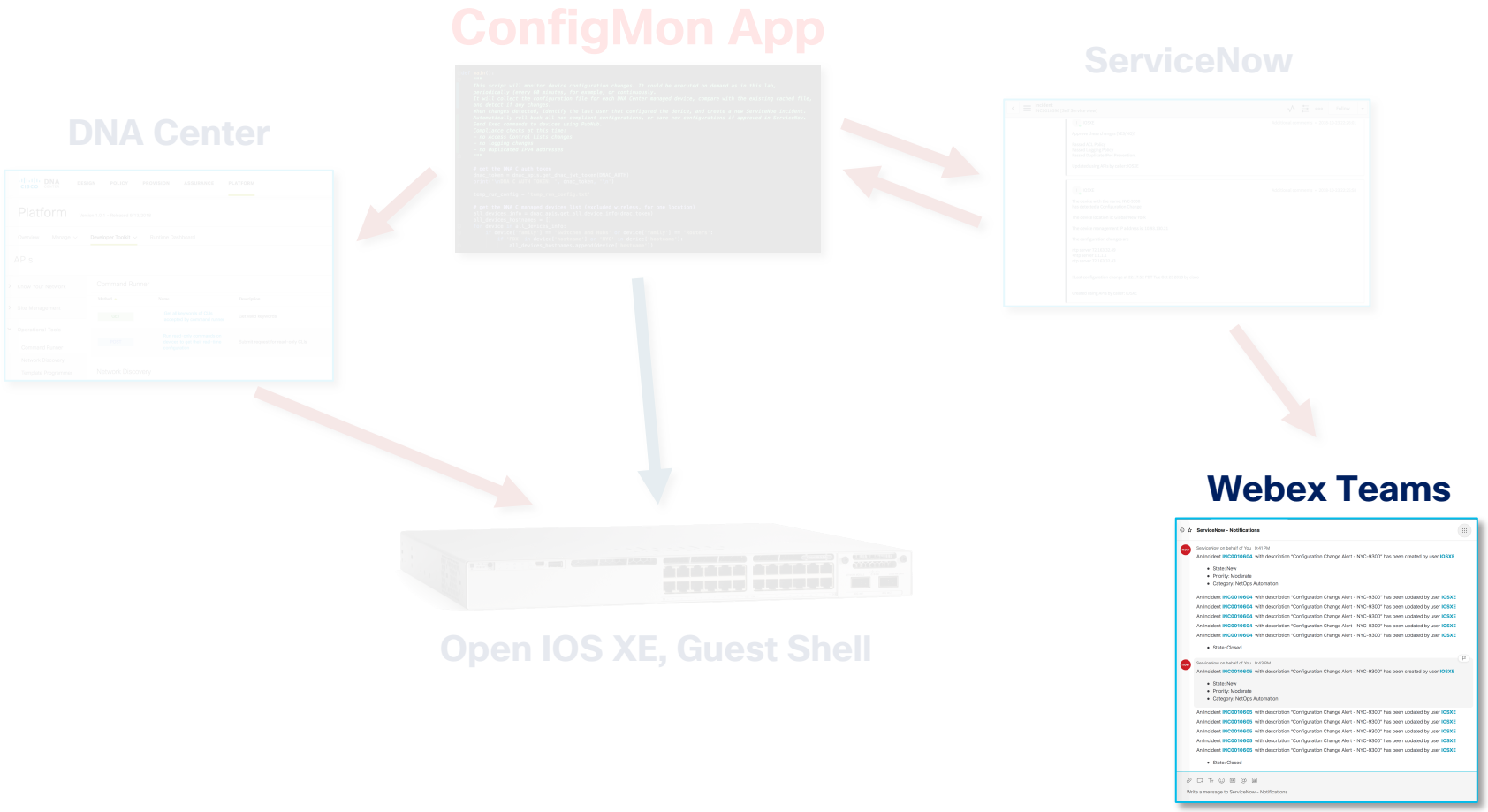
- ConfigMon will use REST APIs to create a new incident:
  - Device Information: location, type of device, software version, S/N, health score, management address
  - What is changed
  - Who made the change
  - Configuration compliance state
  - Approval request process
  - Save new config or rollback status



Demo:
Create ServiceNow Incident

Hands-On

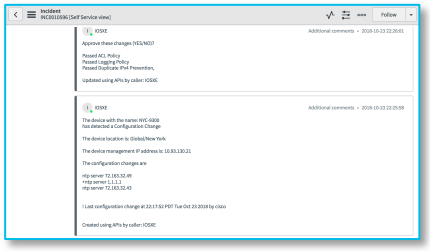
- Run the Python script “create_incident.py” using PyCharm
- This script will:
  - Find the ServiceNow sys_id for the API User account
  - Find out the device hostname using RESTCONF (for a specific IP address)
  - Create a new ServiceNow incident
- Troubleshooting – if not successful, verify the ServiceNow password in the config.py file
- Question – What is the user “sys_id”? Why do we need it?



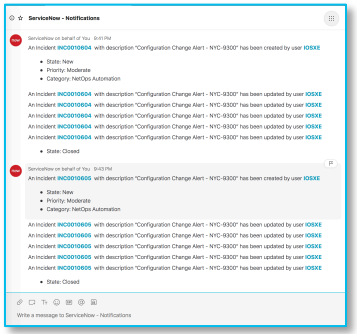
ServiceNow to WebEx Teams Integration

- Notifications sent from ServiceNow to WebEx Teams
- Create a Business Rule when to run the integration
- Sample code provided by WebEx teams
- Customize it for your environment

ServiceNow



New, updated, or closed Incident



Webex Teams

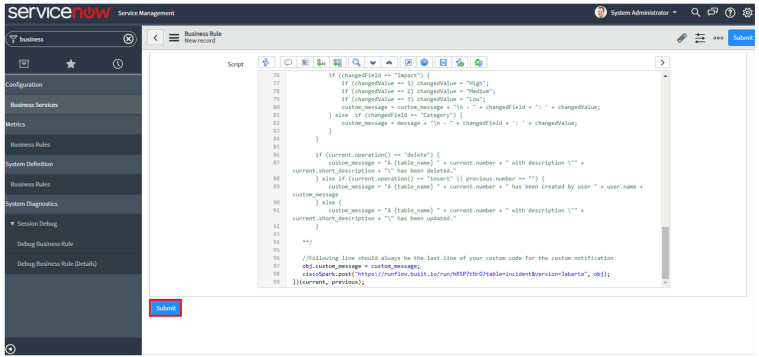
ServiceNow to Webex Teams

https://apphub.webex.com/categories/all/bots/servicenow-3117

```
        return res;
    },
};
var ciscoSpark = new Cisco();
var user = gs.getUser();
var gru = GlideScriptRecordUtil.get(current);
```

Step D

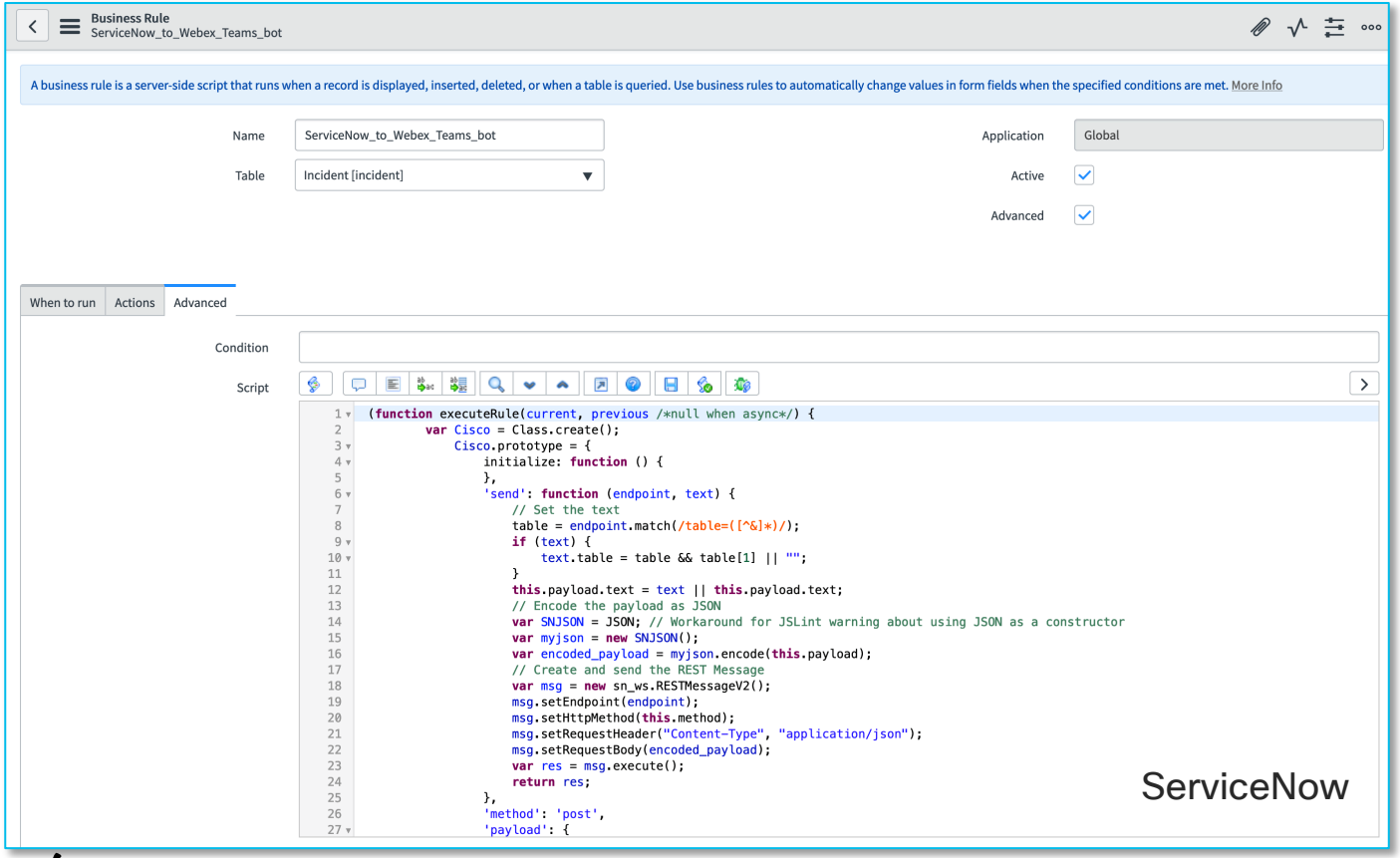
Above code contains the example code block (which is commented) for creating custom notifications. Refer the example to modify the code block as per your requirements. Please ensure to **assign your custom notification to the custom_message** variable, once you have created the custom notification.



Cancel Save

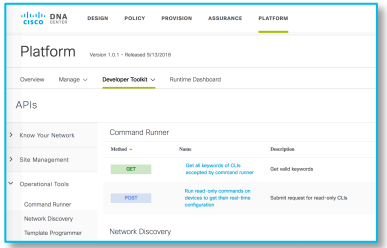
ServiceNow

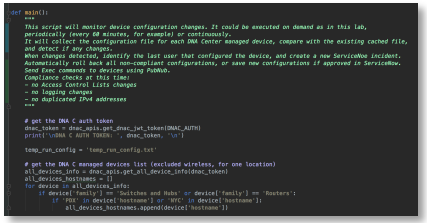
ServiceNow to Webex Teams - Code



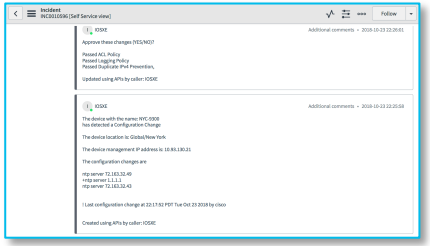
ConfigMon App

DNA Center

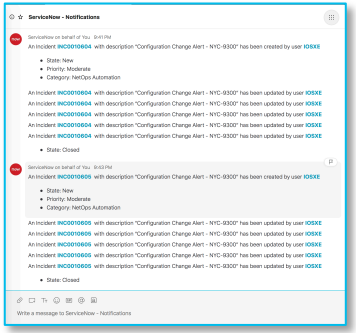




ServiceNow



Webex Teams



Open IOS XE, Guest Shell

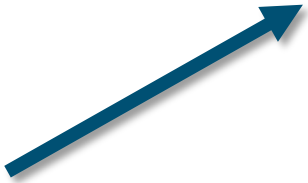
Compliance Checks

- Rules:
  - No Access Control configurations changes
  - No logging configurations changes
  - Configurations should not create duplicated IPv4 addresses with clients or network devices interfaces

- Question:
  - How do I write a new rule, for example ”No NTP configuration changes?”

Writing a Compliance Rule

- Save the running configuration as a baseline to a file
- Read current running configuration
- Identify delta, using the diff function
- Check for keywords that are matches, in the changed lines



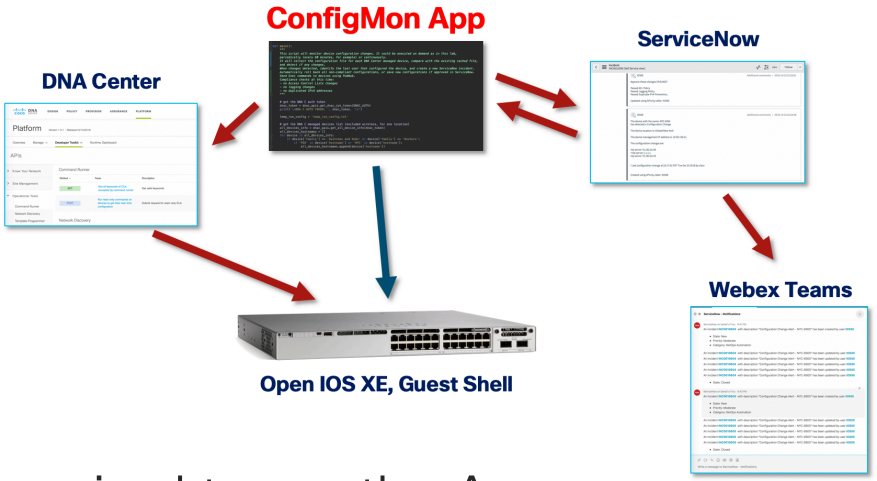
```
interface Loopback2019
- no ip address
+ description CL US San Diego
+ ip address 19.19.19.19 255.255.255.255

ip access-list extended NO_PING
deny icmp any any
permit ip any any
logging trap critical
logging host 10.93.130.30
+access-list 19 deny any
```

```
validation_result = 'Pass'
validation_comment = ''
if ('+access-list' in diff) or ('-access-list' in diff):
    updated_comment = '\nValidation against ACL changes failed'
    service_now_apis.update_incident(incident, updated_comment,
SNOW_DEV)
    validation_result = 'Failed'
else:
    validation_comment = '\nPassed ACL Policy'
```

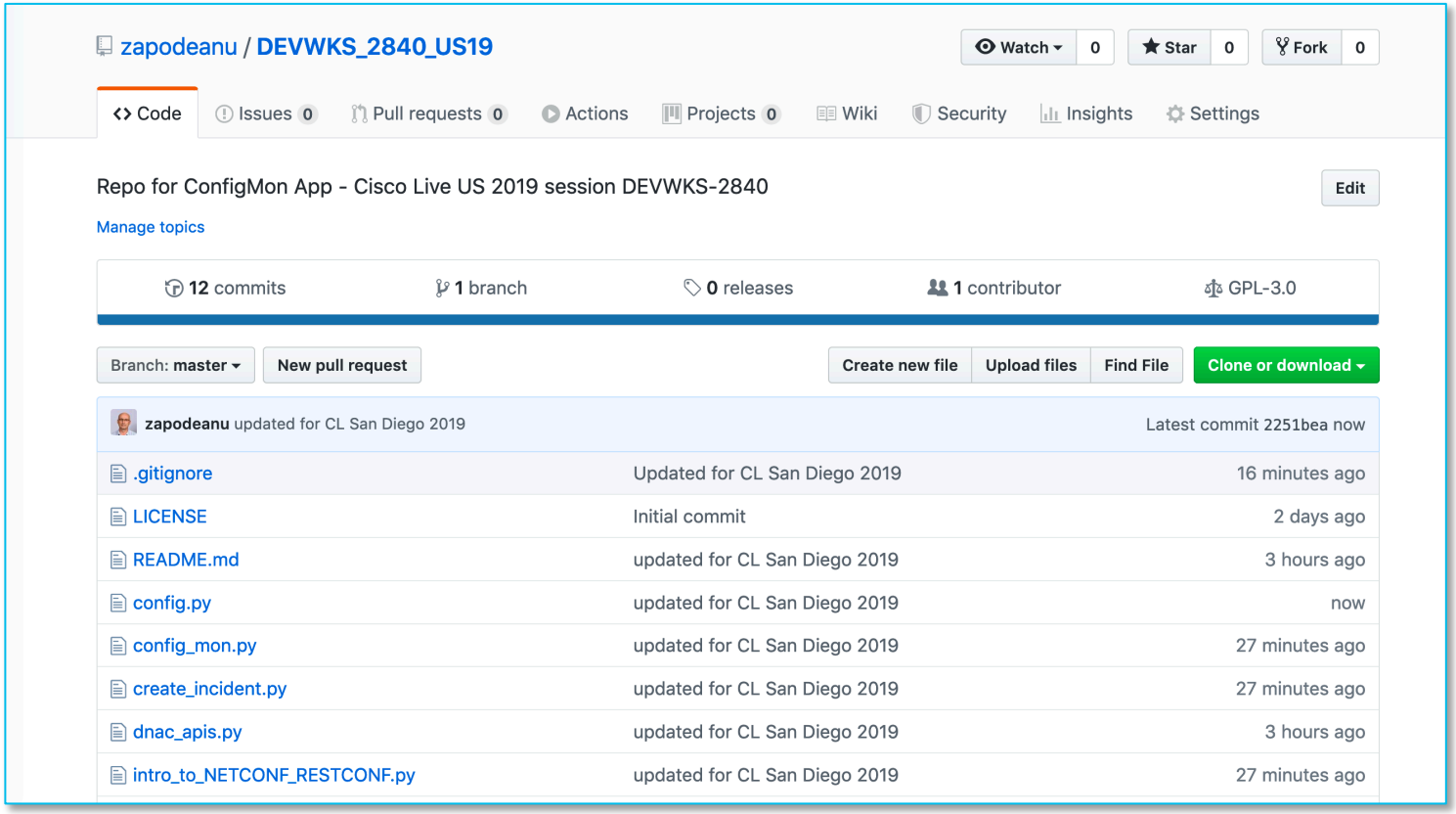
Demo:
ConfigMon

Hands-On



- We have tested all the software required to run the App
- Run the application “config_mon.py”
- SSH to the device using the public IP address and make a configuration change

ConfigMon Code github.com/zapodeanu/DEVWKS_2840_US19



Other Sessions

- DEVNET-3841 ”Project WhatsOp – IOS XE Messaging Platform”
  - Integration between Cisco DNA Center, IOS XE Guest Shell, ServiceNow, Webex Teams, PubNub, and Github
- BRKNMS-2935 “From Zero to Network Programmability in 120 Minutes”
  - Elastic Remote Network Access - Vendors remote access solution using Cisco DNA Center, RESTCONF, NETCONF, Webex Teams and ServiceNow

Enterprise Networks BookSprints

http://cs.co/cat9000book
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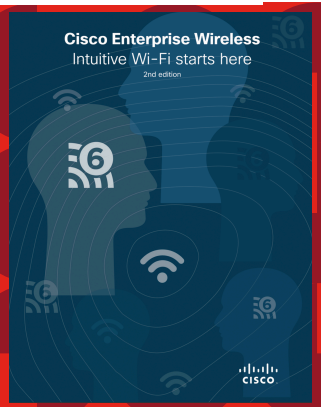
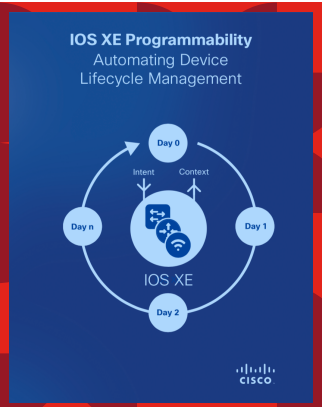
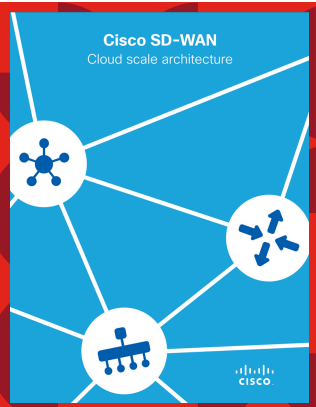
http://cs.co/wirelessbook
http://cs.co/programmabilitybook
http://cs.co/assurancebook
http://cs.co/sdwanbook







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