



The bridge to possible

Using NetBox to Manage a Cisco Network Inventory

Jason Davis, Distinguished Engineer
@SNMPguy
DEVNET-2141

CISCO *Live!*

#CiscoLive

Cisco Webex App

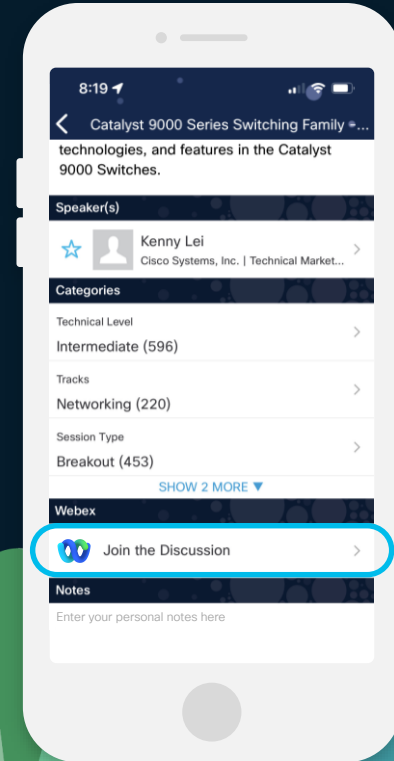
Questions?

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

How

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

Webex spaces will be moderated by the speaker until June 7, 2024.





Agenda

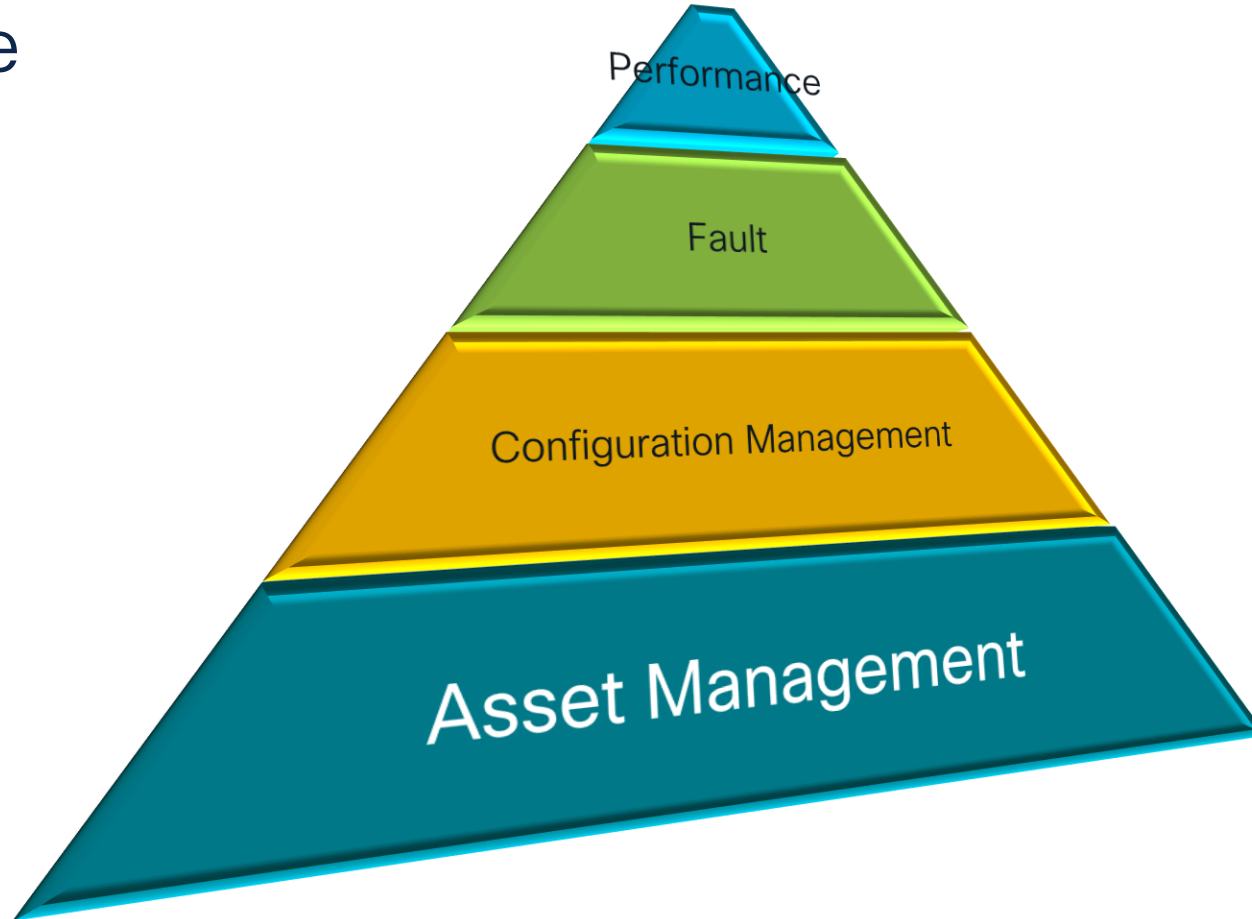
- Introduction
- Asset Management
- NetBox Overview
- Strategies for Data Import
- How Used in CLNOC / Repos
- Conclusion

As we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns—the ones we don't know we don't know.

Donald Rumsfeld, US Secretary of Defense 2002



Prioritize



Benefits

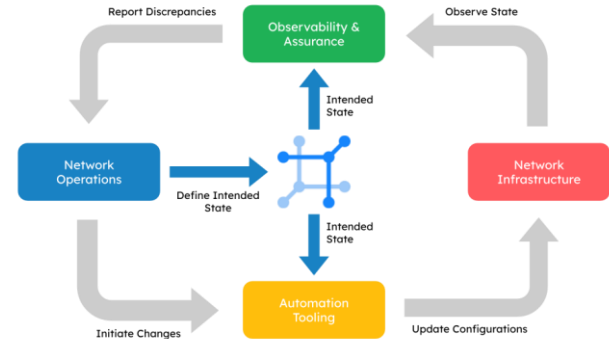


- Visibility
- Understanding PiN
- Ability to assess proper function more quickly
- Ability to assess impact more quickly
- Find exceptions/deviations

NetBox



- Commonly used platform for modeling & documenting networks
- Site/Locations, Devices, Device Types/Models, Interfaces, IPAM, Virtualization, Circuits, Rack elevations, Power and more!
- <https://github.com/netbox-community/netbox>
- Open source - Apache-2.0 license
- Released in 2016
- Built on the Django Python framework with a PostgreSQL database. It runs as a WSGI service on nginx or Apache
- Public Demo - <https://demo.netbox.dev/>



netbox

Organization

Devices

Connections

Wireless

IPAM

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Virtualization

Circuits

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Circuits0

Provider Networks0

Provider Accounts0

Virtualization

Clusters0

Virtual Machines0

Bookmarks

No bookmarks have been added yet.

Change Log

ID	Time	Username	Full Name	Action	Type	Object	Request ID
----	------	----------	-----------	--------	------	--------	------------

Functional,
cross-platform
web-based UI
with a strong
REST API

netbox

Search

Devices

+ Add

Import

Export


Results647

Filters

Quick search

Configure Table

<input type="checkbox"/>	Name	Status	Site	Location
<input type="checkbox"/>	clus-core9606	Awaiting Deployment	MBCC	MB1
<input type="checkbox"/>	davisnet-3560CG	Faulty	Jason's house	Jason's house
<input type="checkbox"/>	fsh-1-palm-1	Investigate	FSH	FSH Lev - Palm Room
<input type="checkbox"/>	fsh-1-palm-2	Faulty	FSH	FSH Lev - Palm Room
<input type="checkbox"/>	fsh-2-acacia-1	Offline	FSH	FSH Lev - Acacia Ballroom
<input type="checkbox"/>	fsh-2-acacia-2	Unused	FSH	FSH Lev - Acacia Ballroom
<input type="checkbox"/>	fsh-2-acacia-	Awaiting Deployment	FSH	FSH Lev - Acacia



Organization

SITES

Sites

Regions

Site Groups

Locations

RACKS

Racks

Rack Roles

Reservations

Elevations

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Contact Assignments

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admin

Sites

+ Add

Import

Export

Results 6

Filters

Quick search

Configure Table

<input type="checkbox"/>	Name	Status	Facility	Region	Group	Tenant	Description	
<input type="checkbox"/>	FSH	Planned	—	USA	Las Vegas	NOC	—	
<input type="checkbox"/>	Jason's house	Active	—	USA	Apex	—	—	
<input type="checkbox"/>	LUX	Planned	—	USA	Las Vegas	NOC	—	
<input type="checkbox"/>	Luxor	Planned	—	USA	Las Vegas	NOC	—	
<input type="checkbox"/>	MBCC	Planned	—	USA	Las Vegas	—	—	
<input type="checkbox"/>	MGM	Planned	—	USA	Las Vegas	—	—	

Edit Selected

Delete Selected

Manual

Partial Automated

Per Page

Showing 1-6 of 6

2024-04-22 14:13 UTC

netbox (v3.7.4)

Sites associate devices to a broad location like a campus, city

At CLNOC - defines as hotel

Parent - Site-Group is 'Las Vegas'

Organization

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Racks

Rack Roles

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admin

Locations

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Filters

Quick search

Configure Table

Name	Site	Status	Tenant	Racks	Devices	Description
109	MGM	Planned	NOC	0	5	—
Banyan A	MBCC	Planned	NOC	0	5	—
Banyan B	MBCC	Planned	NOC	0	1	—
Banyan C	MBCC	Planned	NOC	0	1	—
Banyan D	MBCC	Planned				—
Banyan F	MBCC	Planned				—
Bayside A	MBCC	Planned				—
Bayside B	MBCC	Planned				—
Bayside B, CL3	MBCC	Planned				—
Bayside C	MBCC	Planned				—
Bayside D	MBCC	Planned				—
Bayside D Office	MBCC	Planned				—
Bayside E	MBCC	Planned				—
Bayside E Foyer		Planned				—
Bayside Foyer ABCDEF		Planned	NOC	0	4	—
Breakers A		Planned	NOC	0	2	—

Partial Automated

Fully Automated

Locations associate devices to a narrow place like a room, floor, building Can be layered

At CLNOC - defines as Hall, Ballroom, Breakout Room, Floor

Organization

Devices

DEVICES

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Device Roles

Platforms

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Virtual Device Contexts

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Device Types

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Module Bays

Device Bays

Inventory Items

Inventory Item Roles

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Configure Table

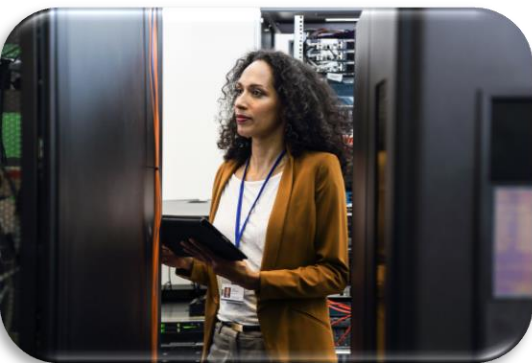
Name	Status	Site	Location	Role	Type	IP Address
clus-core9606	Awaiting Deployment	MBCC	MB1	CORE	C9606R	10.11.0.251/32
davisnet-3560CG	Faulty	Jason's house	Jason's house	Access	Catalyst 3560CG-8PC-S	192.168.1.11/32
fsh-1-palm-1	Investigate	FSH	FSH Level 1 - Palm Room	Access	Catalyst 3560-CX-12PD-S	10.102.1.51/32
fsh-1-palm-2	Faulty	FSH	FSH Level 1 - Palm Room	Access	WS-C3560CX-12PD	10.102.1.52/32
fsh-2-acacia-1	Offline	FSH	FSH Level 2 - Acacia Ballroom			1/32
fsh-2-acacia-2	Unused	FSH	FSH Level 2 - Acacia Ballroom			2/32
fsh-2-acacia-foyer-1	Awaiting Deployment	FSH	FSH Level 2 - Acacia Foyer			3/32
fsh-2a-idf	Awaiting Deployment	FSH	FSH			/32
fsh-2-ball-foyer-1	Awaiting Deployment	FSH	FSH Level 2 - Four Seasons Ballroom			/32
fsh-2-ballrm1_3-1	Awaiting Deployment	FSH	FSH Level 2 - Four Seasons Ballroom			/32
fsh-2-ballrm1_3-2	Awaiting Deployment	FSH	FSH Level 2 - Four Seasons Ballroom			/32
fsh-2-ballrm4-1	Awaiting Deployment	FSH	FSH Level 2 - Four Seasons Ballroom			32
fsh-2b-idf	Awaiting Deployment	FSH	FSH			2
fsh-2-cottonwood-1	Awaiting Deployment		ood			32
fsh-2-cottonwood-2	Awaiting Deployment		ood	Access	WS-C3560CX-12PD	10.102.2.55/32
fsh-2-cottonwood-3	Awaiting Deployment		ood	Access	WS-C3560CX-12PD	10.102.2.56/32

Partial Automated

Fully Automated

Automating device import is table stakes

At CLNOC - importing with Python scripts from Excel, WLC, Catalyst Center and vCenter



cisco Live!

netbox

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Racks > DM-Akron

Rack Comms closet

Created 12/20/2020 midnight · Updated 3 years ago

Rack Non-Racked Devices Reservations Contacts Journal Changelog

Rack

RegionNorth America / United States / Ohio

SiteDM-Akron

Location—

Facility ID—

TenantCustomers / Dunder-Mifflin, Inc.

StatusActive

Role—

Description—

Serial Number—

Asset Tag—

Space Utilization41.7%

Power Utilization0.0%

Dimensions

TypeWall-mounted cabinet

Width19 inches

Height12U (ascending)

Starting Unit1

Outer Width—

Outer Depth—

Mounting Depth—

Rack Weight—

Maximum Weight—

Total Weight0 Kilograms (0 Pounds)

Front

1248-Port Patch Panel

11

10dmi01-akron-sw01

9

8

7

6

5

4dmi01-akron-rtr01

3

2

1dmi01-akron-pdu01

Download SVG

Rear

12

11

10dmi01-akron-sw01

9

8

7

6

5

4

3

2

1

Download SVG

Related Objects

Devices

Power Feeds

Partial Automated

Documenting rack for major wiring closets and DCs is optimal

At CLNOC - we're too short-term to invest for devices outside of the NOC Shipping Container

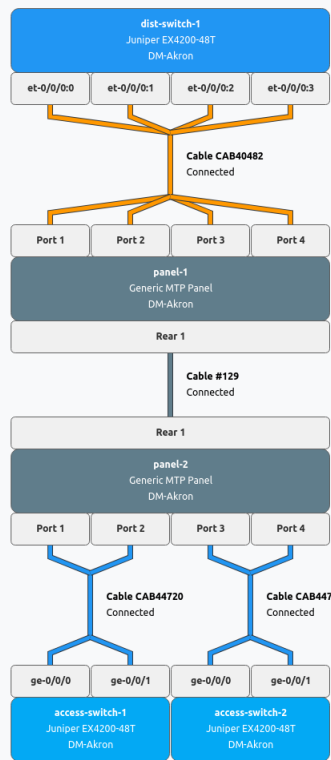
#CiscoLive

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Cable Trace for Interface et-0/0/0:0

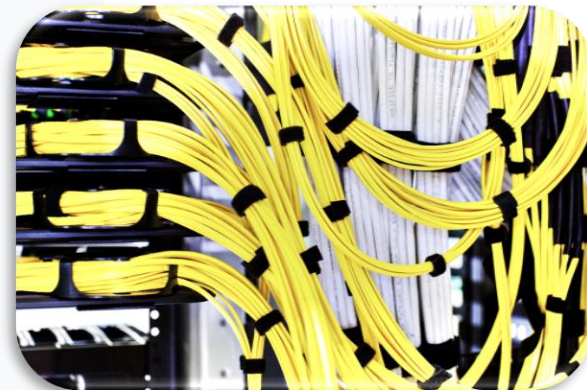
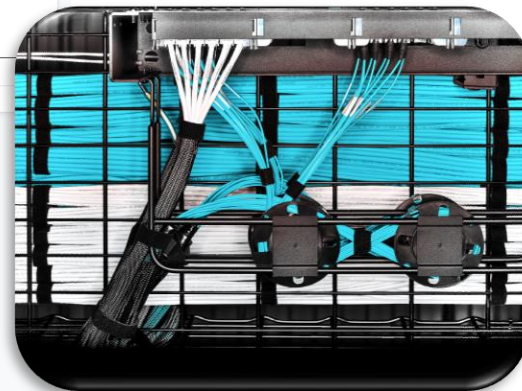


Related Paths

Origin	Destination	Segments
None found		

Download SVG

Trace Completed



Getting NetBox

- Main docs at <https://docs.netbox.dev/en/stable/>
- Installation Guide at <https://docs.netbox.dev/en/stable/installation/>
NetBox Docker <https://github.com/netbox-community/netbox-docker>
- NetBox Labs also offers commercially supported cloud-based deployments - <https://netboxlabs.com/netbox-cloud/>

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Bookmarks

No bookmarks have been added yet.

Change Log

ID

Time

Username

Full Name


Action

Type

Object

Request ID

Add and orient panels to suit your work-style



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Devices

+ Add+ Import+ Export

ResultsFilters


Quick search

Configure Table

▲ Before you can add a device you must first create a **site**.

Name	Status	Tenant	Site	Location	Rack	Role	Manufacturer	Type	IP Address
— No devices found —									

+ Add Components+ Edit Selected+ Rename+ Delete Selected



If you jump too quickly into creating devices this is what you get...

So let's create a site...

Devices

Results

Filters

Quick search

Configure Table

⚠ Before you can add a device you must first create a **device role**.

+ Add

<input type="checkbox"/>	Name	Status	Tenant	Site	Location	Rack	Role	Manufacturer	Type	IP Address
— No devices found —										

+ Add Components

Edit Selected


Rename

Delete Selected

⚠ Before you can add a device you must first create a **device role**.

OK...site complete.
Now let's create a
Device.

Wait. Now we have
to create a device
role...



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Configure Table

Before you can add a device you must first create a **device type**.

Name	Status	Tenant	Site	Location	Rack	Role	Manufacturer	Type	IP Address
— No devices found —									

+ Add Components

Edit Selected

Rename

Delete Selected

Before you can add a device you must first create a **device type**.

OK...device role complete.
Now let's create a device.

Wait. Now create a device type...

SO Many Dependencies!

netbox

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admin

Add a new device type

Create

Before you can add a device type you must first create a **manufacturer**.

+ Add

Help

Device Type

Manufacturer * -----

Model * Model

Slug * Slug

URL-friendly unique shorthand

Default platform -----

Description

Tags Select Tags

Chassis

Height (U) * 1.0

☐ Exclude from utilization

Devices of this type are excluded when calculating rack utilization.

☒ Is full depth

Device consumes both front and rear rack faces.

Yikes...

Now a Manufacturer...

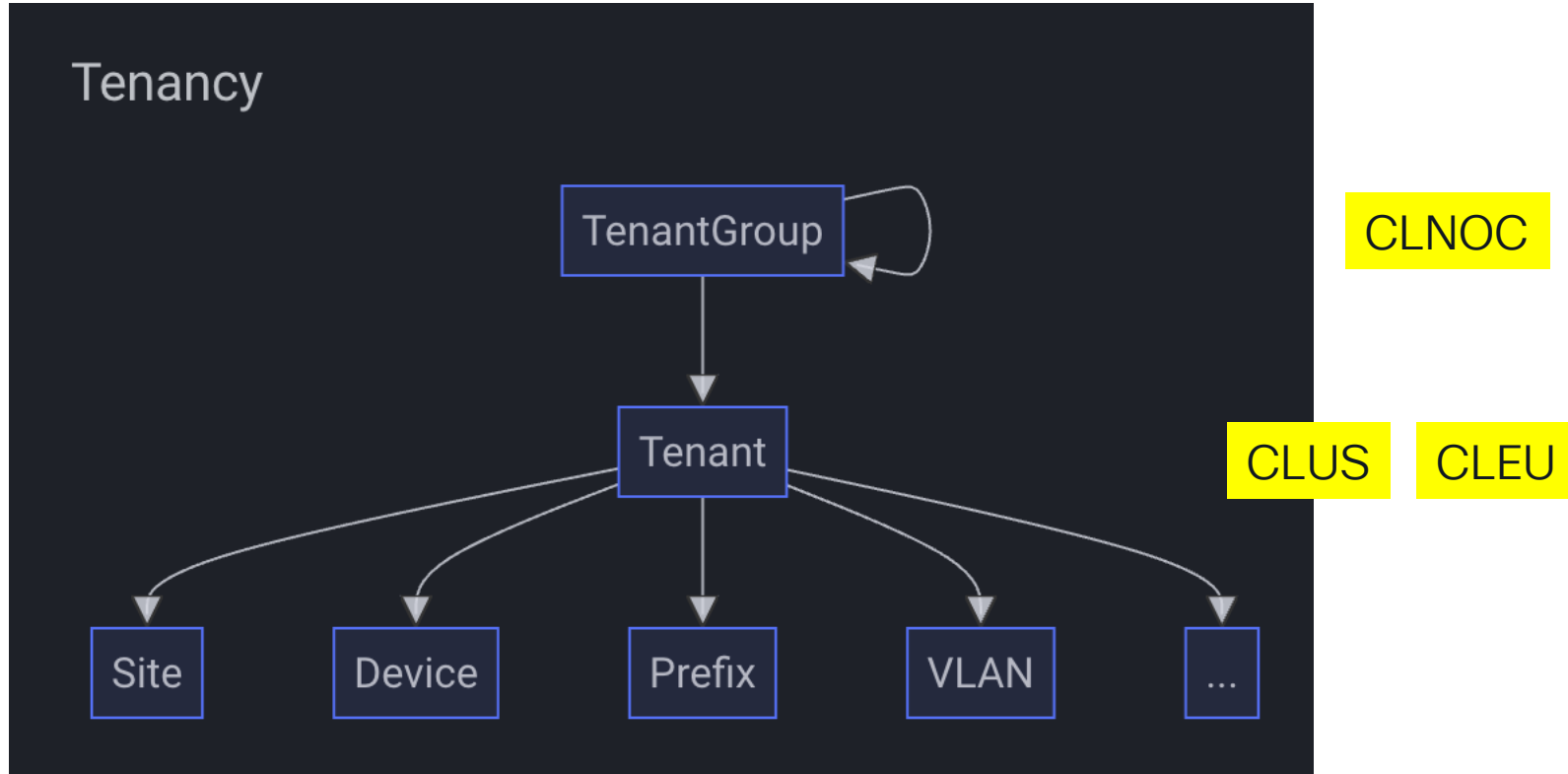
Save yourself time! Use the NetBox Community Device-Type Library Import project!

Over 660 Cisco Device-Types (models) available

<https://github.com/netbox-community/Device-Type-Library-Import>

```
[jason@netbox] - [~/Device-Type-Library-Import] - [581]
[~$] source .venv/bin/activate [14:59:28]
(.venv) [jason@netbox] - [~/Device-Type-Library-Import] - [582]
[~$] ls -l [14:59:33]
total 68
-rw-rw-r-- 1 jason jason 394 Mar 29 13:21 Dockerfile
-rw-rw-r-- 1 jason jason 1075 Mar 29 13:21 LICENSE
-rw-rw-r-- 1 jason jason 1854 Mar 29 13:21 log_handler.py
-rwxrwxr-x 1 jason jason 1977 Mar 29 13:21 nb-dt-import.py
-rw-rw-r-- 1 jason jason 24964 Mar 29 13:58 netbox_api.py
drwxrwxr-x 2 jason jason 4096 Mar 29 13:59 __pycache__
-rw-rw-r-- 1 jason jason 3330 Mar 29 13:21 README.md
drwxrwxr-x 11 jason jason 4096 Mar 29 13:40 repo
-rw-rw-r-- 1 jason jason 4094 Mar 29 13:21 repo.py
-rw-rw-r-- 1 jason jason 68 Mar 29 13:21 requirements.txt
-rw-rw-r-- 1 jason jason 2255 Mar 29 13:21 settings.py
(.venv) [jason@netbox] - [~/Device-Type-Library-Import] - [583]
[~$] python nb-dt-import.py --vendors cisco [14:59:35]
Package devicetype-library is already installed, updating /home/jason/Device-Type-Library-Import/repo
1 Vendors Found
667 Device-Types Found
---
667 devices created
17 images uploaded
21114 interfaces/ports updated
1 manufacturers created
(.venv) [jason@netbox] - [~/Device-Type-Library-Import] - [584]
[~$] [15:08:09]
```

Let's understand Netbox Hierarchy



Sites, Racks, and Devices

```
graph TD; Region --> Site; SiteGroup --> Site; Site --> Location; Site --> Device; Location --> Rack; Location --> Device; Rack --> Device; DeviceRole --> Device; Platform --> Device; Manufacturer --> DeviceType; Manufacturer --> ModuleType; DeviceType --> Device; ModuleType --> Module; Module --> Interface; Device --> Interface; Interface --> GigE0/0/4; Region --> Region; SiteGroup --> SiteGroup; Location --> Location;
```

Diagram illustrating the relationships between Sites, Racks, and Devices:

- Region** and **SiteGroup** are associated with **Site**.
- Site** is associated with **Location** and **Device**.
- Location** is associated with **Rack** and **Device**.
- Rack** is associated with **Device**.
- DeviceRole** and **Platform** are associated with **Device**.
- Manufacturer** is associated with **DeviceType** and **ModuleType**.
- DeviceType** is associated with **Device**.
- ModuleType** is associated with **Module**.
- Module** is associated with **Interface**.
- Device** is associated with **Interface**.
- Interface** is associated with **GigE0/0/4**.

CLUS

San Diego

Luxor

MGM

WAN
AP

{SW ver}

ap-12345

CISCO *Live!*

Cisco

Catalyst 9136 AP
ASR 1009-X

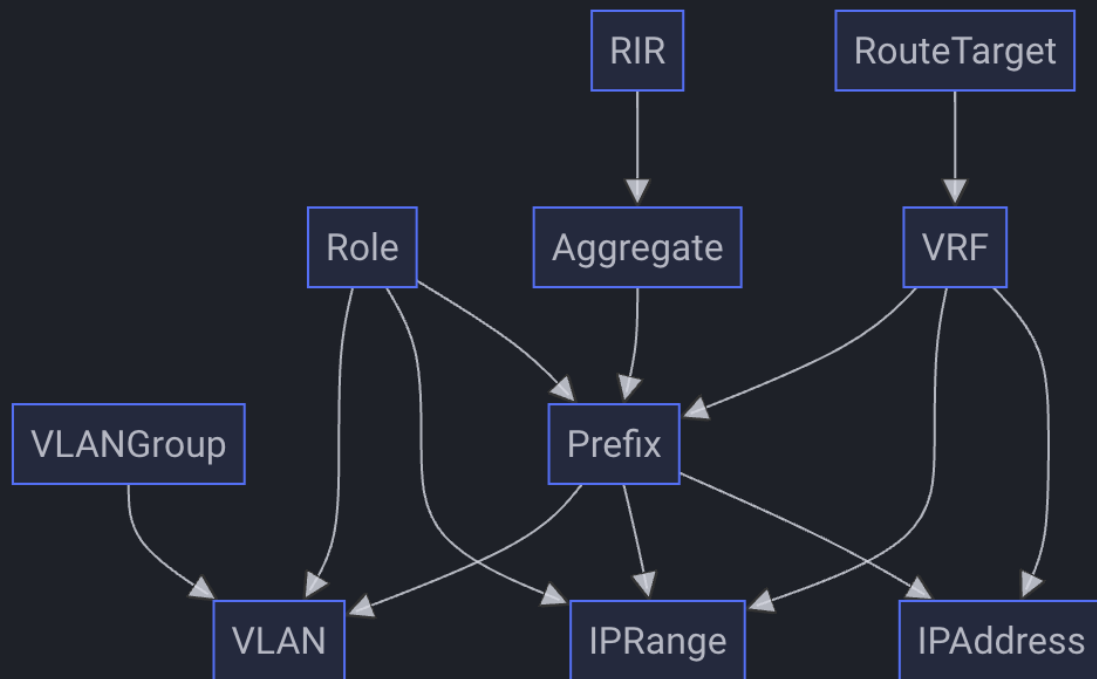
GigE0/0/4

Manual

Partially Automated

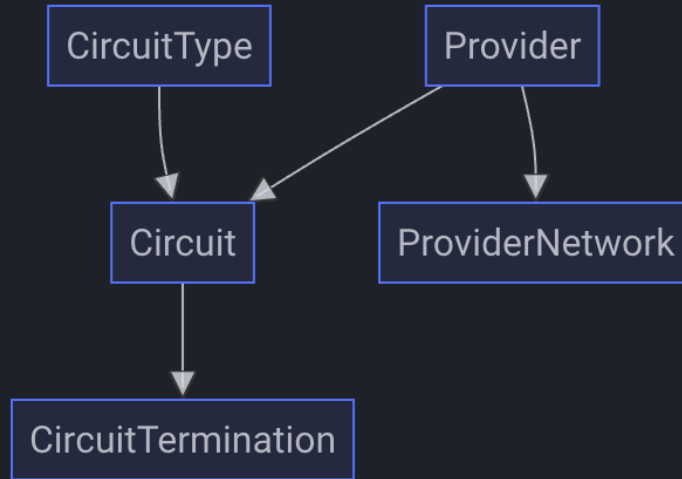
Fully Automated

VRFs, Prefixes, IP Addresses, and VLANs

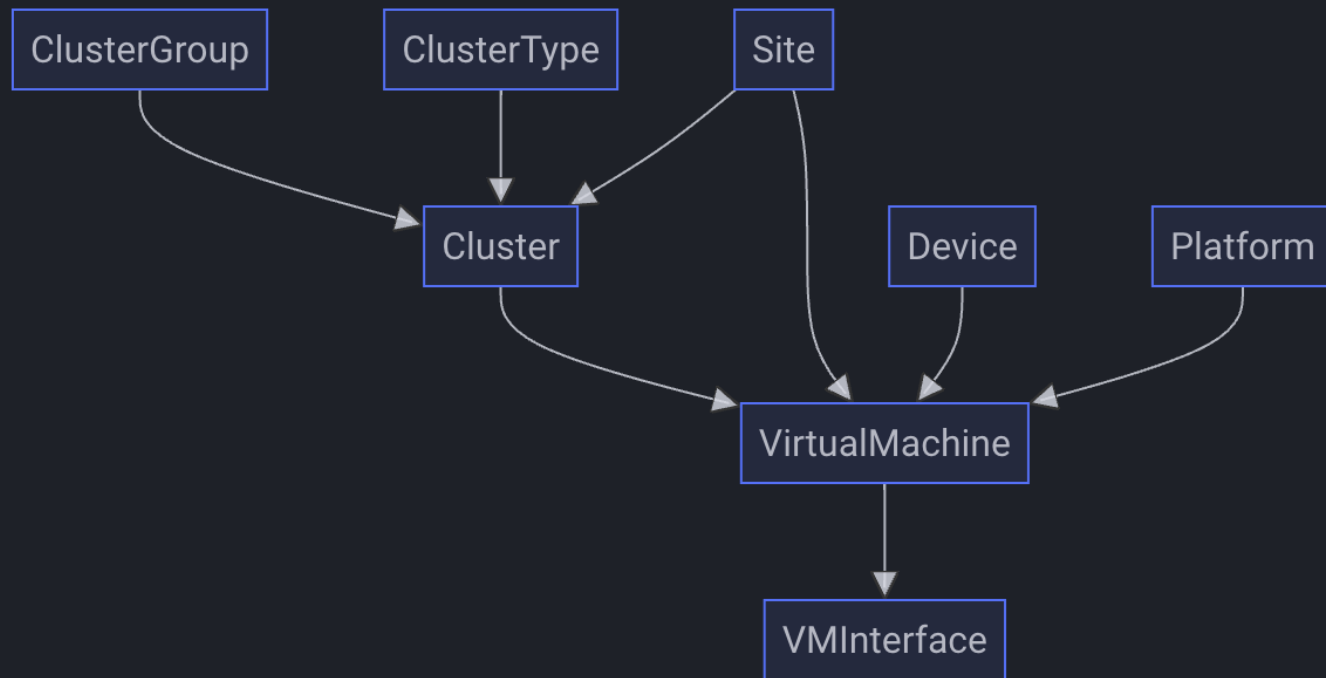


10.1.2.3/24

Circuits



Clusters and Virtual Machines



netbox

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AUTHENTICATION

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API Tokens

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admin

Add a new token

Create

User * admin

Key * 2c51fa46...43c8874

Keys must be at least 40 characters in length. **Be sure to record your key** prior to submitting this form, as it may no longer be accessible once the token has been created.

☒ Write enabled

Permit create/update/delete operations using this key

Expires YYYY-MM-DD hh:mm:ss

Description Description

Allowed IPs Allowed IPs

Allowed IPv4/IPv6 networks from where the token can be used. Leave blank for no restrictions.
Example: 10.1.1.0/24,192.168.10.16/32,2001:db8:1::/64

Create Create & Add Another Cancel

2024-03-21 13:57 UTC netbox (v3.7.4)

https://<server>/api

NetBox

admin

API Root

API Root

GET

This is the root of NetBox's REST API. API endpoints are arranged by app and model name; e.g. `/api/dcim/sites/`.

GET /api/

HTTP 200 OK

Allow: GET, HEAD, OPTIONS

Content-Type: application/json

Vary: Accept

```
{
  "circuits": "https://netbox.pennylane.home.arpa/api/circuits/",
  "core": "https://netbox.pennylane.home.arpa/api/core/",
  "dcim": "https://netbox.pennylane.home.arpa/api/dcim/",
  "extras": "https://netbox.pennylane.home.arpa/api/extras/",
  "ipam": "https://netbox.pennylane.home.arpa/api/ipam/",
  "plugins": "https://netbox.pennylane.home.arpa/api/plugins/",
  "status": "https://netbox.pennylane.home.arpa/api/status/",
  "tenancy": "https://netbox.pennylane.home.arpa/api/tenancy/",
  "users": "https://netbox.pennylane.home.arpa/api/users/",
  "virtualization": "https://netbox.pennylane.home.arpa/api/virtualization/",
  "vpn": "https://netbox.pennylane.home.arpa/api/vpn/",
  "wireless": "https://netbox.pennylane.home.arpa/api/wireless/"
}
```

https://<server>/api/schema/swagger-ui/

NetBox REST API

3.7.4 (3.7) OAS 3.0

/api/schema/

Apache v2 License

Servers

- NetBox

Authorize

circuits

GET

/api/circuits/circuit-terminations/

POST

/api/circuits/circuit-terminations/

PUT

/api/circuits/circuit-terminations/

PATCH

/api/circuits/circuit-terminations/

DELETE

/api/circuits/circuit-terminations/

GET

/api/circuits/circuit-terminations/{id}/

PUT

/api/circuits/circuit-terminations/{id}/

PATCH

/api/circuits/circuit-terminations/{id}/

DELETE

/api/circuits/circuit-terminations/{id}/

GET

/api/circuits/circuit-terminations/{id}/paths/

GET

/api/circuits/circuit-types/

DELETE /api/tenancy/contacts/{id}/

GET /api/tenancy/tenant-groups/

Get a list of tenant group objects.

Parameters

Name	Description
created array[string] (query)	<input type="text" value="Add string item"/>
created__empty array[string] (query)	<input type="text" value="Add string item"/>
created__gt array[string] (query)	<input type="text" value="Add string item"/>
created__gte array[string] (query)	<input type="text" value="Add string item"/>
created__lt array[string] (query)	<input type="text" value="Add string item"/>
created__lte array[string] (query)	<input type="text" value="Add string item"/>
created__n array[string] (query)	<input type="text" value="Add string item"/>
created_by_request string(\$uuid) (query)	<input type="text" value="created_by_request"/>
description array[string]	<input type="text" value="Add string item"/>

Embedded
Swagger doc
viewer provides full
API schema...

updated_by_request
string(\$uuid)
(query)

updated_by_request

Execute

Clear

Responses

Curl

```
curl -X 'GET' \  
  'https://netbox.pennylane.home.arpa/api/tenancy/tenant-groups/' \  
  -H 'accept: application/json'
```

Request URL

https://netbox.pennylane.home.arpa/api/tenancy/tenant-groups/

Server response

Code Details

200

Response body

```
{  
  "count": 0,  
  "next": null,  
  "previous": null,  
  "results": []  
}
```



Download

Response headers

```
allow: GET, POST, PUT, PATCH, DELETE, HEAD, OPTIONS  
connection: keep-alive  
content-length: 52  
content-type: application/json  
cross-origin-opener-policy: same-origin  
date: Thu, 21 Mar 2024 14:03:55 GMT  
referrer-policy: same-origin  
server: nginx/1.18.0 (Ubuntu)  
vary: HX-Request, Cookie, origin  
x-content-type-options: nosniff  
x-frame-options: SAMEORIGIN  
x-request-id: 37936cda-cbab-40f1-be2d-b6e20e21b052
```

Responses

Code Description

Links

200

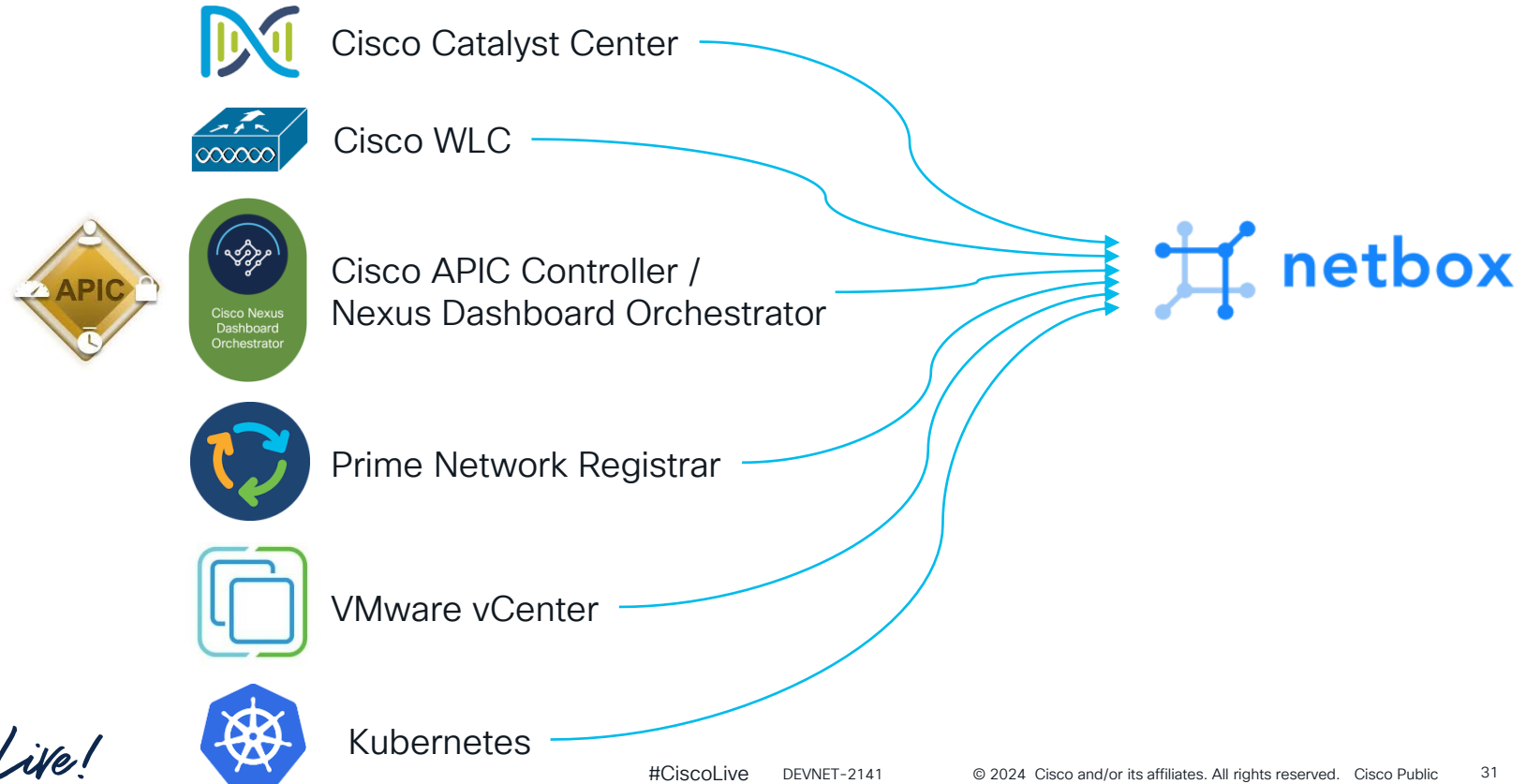
Media type

application/json


Controls Accent header

... and 'try it yourself' functionality

What May Be 'Discovery Engines' for NetBox?



Hot Potato



[Review 'Awaiting Deployment' Queue](#)


[Review 'Investigate' Queue](#)

[Update Device Status](#)

[Get Current Device Status](#)

[Show Devices in 'Deployed' State](#)

[Show Devices in 'Online' State](#)




Devices with status **Awaiting Deployment** in **Mandalay Bay**

Device	Type
noc-threatwall-idf	Catalyst 9300-24UX
noc-vidwall-idf	Catalyst 9300-24UX

Selected 0 row


[Return to Main Menu](#)



[Return to Main Menu](#)

Input device hostname or serial number (scan barcode):

[Submit](#) [Reset](#)




Requested device is... **fsh-2-acacia-1**
Serial Number **FJC**
Model **Catalyst C9200CX-12P-2X2G**
IP address **10.102.1.51/32**
Located at Site **Four Seasons Hotel** / Location **Level 2**
Current Deployment Status: **Deployed**
[Mark 'Deployed' in NetBox](#)
[Upload deployment image](#)
[Enter deployment comments](#)
[Return to Main Menu](#)

Hot Potato

The screenshot displays the NetBox web interface for a device named 'fsh-2-acacia-1' under the 'Four Seasons Hotel' organization. The interface is divided into several sections:

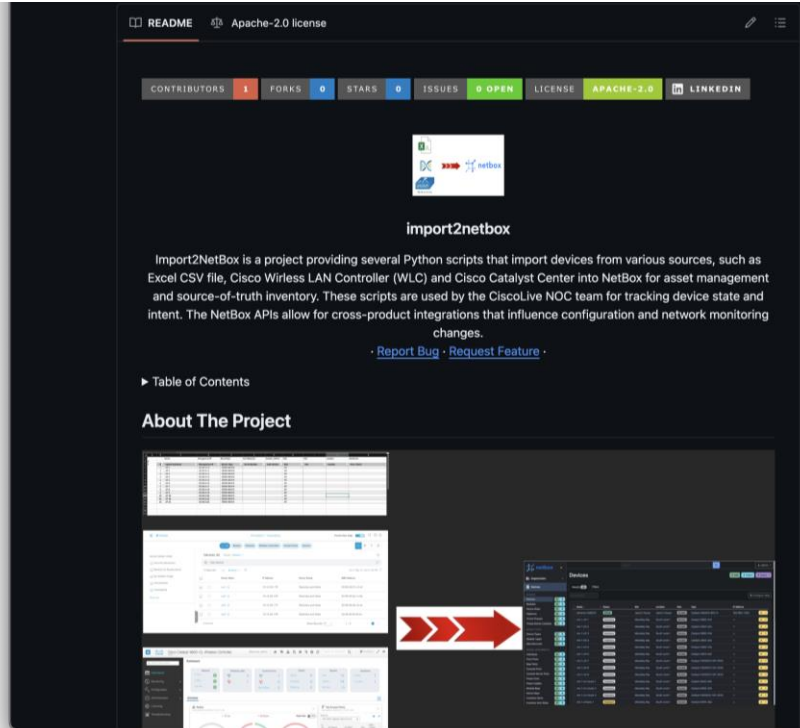
- Left Sidebar:** Contains navigation links for Organization, Devices, and various configuration categories like Device Types, Device Components, Connections, and Wireless.
- Header:** Includes a search bar, user profile (admin), and a breadcrumb trail: Devices > Four Seasons Hotel.
- Device Details:** Shows the device name 'fsh-2-acacia-1', creation/update timestamps, and a set of action buttons: Add Components, Bookmark, Clone, Edit, and Delete.
- Navigation Tabs:** A row of tabs for different views: Device, Interfaces (17), Console Ports (2), Power Ports (1), Config Context, Render Config, Contacts, Journal (2), and Changelog.
- Device Information Table:** A table listing key attributes such as Region (USA), Site (Four Seasons Hotel), Location (Level 2), Rack, Position, GPS Coordinates, Tenant (CiscoLive / NOC), Device Type (Cisco Catalyst C9200CX-12P-2X2G (1U)), and Description.
- Management Section:** Displays the device's status (Deployed), role (Access), platform, and IP addresses (Primary IPv4: 10.102.1.51, Primary IPv6, Out-of-band IP).
- Image Gallery:** A section for images, currently showing a photo of a server rack. It includes a description field and an 'Add a service' button.
- Custom Fields Table:** A table with columns for Area/Room, Created, and other custom attributes. One entry is visible for 'Acacia Ballroom'.

Points to Remember

- NetBox is meant to be inventory/asset management – NOT real-time Ops/Status
- You can add some status indicators, but 
- Use Status indicators to drive intent – eg. This device is/should be offline – drive changes to other tools to stop active management

Reuse our work!

<https://github.com/jasoncdavis/import2netbox>



*Import WLC Access Points
into NetBox
Import from CSV
Import from Catalyst Center*

Another DevNet
open source project

Continue your education

- Visit the Cisco Showcase for related demos
- Book your one-on-one Meet the Engineer meeting
- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
- Visit the On-Demand Library for more sessions at www.CiscoLive.com/on-demand

Contact me at: jadavis@cisco.com or on X @SNMPguy



The bridge to possible

Thank you

CISCO *Live!*

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