APNIC

Introduction to Network Documentation with NetBox

A. S. M. Shamim Reza

Objectives

Participants will have a clear understanding of the followings:

- a) What is Source of Truth?
- b) What does Network Documentation (ND) mean ?
- c) How a ND can be fruitful in any Operational process ?
- d) How an IP address management (IPAM) system works ?
- e) Inventory Management (IM) workflow!
- f) Features of NetBox
- g) Netbox Application architecture
- h) Workflow of Netbox with DCIM Module





What is Source of Truth?



"The **Source of Truth** can be defined as a conceptual practice that help an organization to control and manage the necessary data and assets from a specific place in an efficient way.

Some people would like to call it **System of Record**."

Let's have an example

A scenario of an enterprise company, where –

- It has several branch offices.
- Assets information is kept by the IT team; for non-IT domain assets as well.
- Non-IT domain information is required by different teams.
 - Like quantity of online UPS, and its connectivity.
 - Concerned team is Power-Team; but required by NOC, IT and Procurement as well.

What is Source of Truth?

Questions to think about?

- Should they store information separately?

 assuming procurement and power team maintain it individually.
- Or manage it from a single place?

 more of a library, where books are arranged categorically based on the genre!

Focal Point!

- This is where *Single Source of Truth* takes place, which ensures:
 - Reuse of content or data
 - Eliminate information duplicity

"The Single Source of Truth is the authorized

component of *Network Documentation* service where necessary information is categorized and managed to help automate network infrastructure."

" Network Documentation is a processoriented practice, to maintain the records of network components."

Network Documentation in Operational Process



Difference Between Traditional and Automated Approach

Traditional Approach	SoT for Automation
Hosts/devices are configured in each NoC tools	Host/device related information are coming only
separately.	from SoT.
– probability of missing a device to configure.	– You get to know the missing point.
Data being imported from one tool to another depending information availability.	All tools are being populated from SoT by push/pull method.
Example	Example
CPU utilization and NIC bandwidth of a router are	With SoT, it can be defined based on the policy that
monitored by two monitoring systems. e.g -	Nagios will monitor the <i>uptime</i> , and LibreNMS will
LibreNMS and Nagios.	monitoring utilization of CPU and Interface.

* SoT – Source of Truth * CPU - Central Processing Unit * NIC - Network Interface Card



Network Documentation in Operational Process





To describe the scenario:

- Netadmin added a Cisco router to a distribution point.

- Once the deployment is done, an entry was made to the SoT
- Using REST-API ansible will pull the new device information
- And then, ansible will push the device info in predefined format to the Monitoring system

- NMS will monitor device performance and utilization based on the NMS policy.

- If anything goes wrong, as alert triggers to a Ticketing system and Alert channels



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Network Documentation in Operational Process



Benefits of maintaining Network Documentation!

- Can have a clear understanding, how the network is being operated!
- Get to know, how the data center is being managed!
- One can have a historical overview of what has been done a few months ago.
- In case of any senior or teammate's absence, other team members can troubleshoot the issue as required.



Network Documentation – an example for operations?



A multinational company wants to deploy a media service for its employee.

- IT admin has placed a requisition to purchase 2 server hardware, 1 NAS *(Network-attached storage)*.
- The **IT Manager** got the request and followed a predefined *checklist* to validate.

Checklist?

Adequate rack space to host new server hardware.

Free socket ports of power strip.

Network cable capacity specifications. like - 1.00 GbE or 10.00 GbE?

Network cable types. Like - ethernet or fiber optics?

Availability of IP address.

Power consumption availability from online UPS.

Length of network cable.

"What could happen, to evaluate the requisition paper, if there is no Network Documentation in place?"

Network Documentation Policy



A documentation policy has to be defined –

- What are the responsibilities of each team and teammates? *Who will take care of which part?*
- Does the network topology diagram have up-to-date details? *Like a server's connectivity as a whole*.
- Process to check task integrity! *Did the network admin followed every step to upgrade a router OS?*
- What should be the methodology for the naming pattern, to identify devices, cables, connectivity, etc?

Network Documentation Policy – example



Everything should be labeled in a comprehensive manner.

- Devices servers, routers, switches, servers, KVM, power strips, etc.
- Cabling of power cord and network connectivity.
- Racks; which data center or region it belongs.



Network Documentation Policy – example



Labeling format	Device Naming Format
Device Tag: Format: Rack_Number/Device_Number Example: R-06/SRV05 Cable Tag : Format: Source_Device_ID/Destination_Device_ID-Port_Number/Name Example: R-01/RTR02/R-13/SWC03-1/1/1	 Router -> RTR Switch -> SWC Server -> SRV Appliance -> APL Modem -> MDM SAN Storage -> SAN NAS Storage -> NAS WL Access Point -> AP Temperature Meter -> TMP KVM -> KVM Cable Manager -> CM IP Phone -> IPP

What is NetBox?

- NetBox is an Open-Source Network Documentation application.
- Written in python with Django web-framework
- Provide integration with API, webhooks, plugins, custom python scripts, etc.
- Developed by *Jeremy Stretch* of *Digital Ocean* at late 2015.
- Serve at Django web framework with PostgreSQL.

Features of NetBox

- IP address management (IPAM) IP networks and addresses, AS numbers, VLANs
- Data Center Infrastructure Management
 - Physical Infrastructure
 - **Racks** Arranged by specific sites
 - **Devices** Types of devices and where they are installed
 - **Connections** KVM console, network and power connections among devices.
 - **Virtualization** Specifications of virtual machines.



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Why NetBox? Comparison or Facts!

An ISP Using a *spreadsheet* for IP address management. Let's see the scenario of issues they are having.

– IP address calculation is manual; the chance of error is high

– No correlation between the IPs with Network/Server components; *like which IP is assigned to which interface of the network components*.

– NO way of network automation.

****** Spreadsheets are easy to use, and Ideal for a small group of people or organizations.

Few things that NetBox **doesn't do** –

- It does not do network monitoring.
- It doesn't have the mechanism to serve as a DNS server.
- Doesn't have AAA mechanism to support RADIUS server. (AAA = Authentication, Authorization and Accounting)
- Configuration management
- Facilities management



NetBox – The Network Documentation Application



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NetBox – The Network Documentation Application

Application Integration

- JSON format data is being transmitted through **REST API**.
- In response to an event, **Webhook** is used to send the HTTP request.
- Custom scripts are used with python from the **Netbox UI/API.**

Application Integration – REST API

When a developer creates an API, they used to follow a set of rules, which is called REST. *(Representational State Transfer), The main advantage of REST API is its human friendly.*

To work with the API, here are the standard HTTP verbs to know-

- *GET*: Use to retrieve a list of objects or an object
- **POST:** Use to create an object
- **PUT / PATCH:** Use to modify an existing object.
- **DELETE:** Use to delete an existing object

NetBox – The Network Documentation Application

Application Integration – *REST API*

NetBox	apnic
API Root / IPAM / IP Address	
IP Address	GET 🝷
GET /api/ipam/ip-addresses/	
<pre>HTTP 200 OK Allow: GET, POST, PUT, PATCH, DELETE, HEAD, OPTIONS Content-Type: application/json Vary: Accept { "count": 1, "next": null, "previous": null, "results": [{</pre>	



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NetBox – The Network Documentation Application



Application Integration – *REST API*



- The SNMP of network device and server hardware are predefined at LibreNMS
- Device Naming has to follow the same format always.
- a CRON job is running with a python script at LibreNMS
- It call the REST API, if any new device is added
- A network admin add a new network router, and he doesn't have to call the Sysadmin to add the device into NMS.



Application Integration – Webhook

- **Webhook** is used to send/respond to an external receiver regarding an event, and it is basically an HTTP request.
- Webhook can be configured for specific devices or object type.
- It can be limit to administrative options, like create, delete, or modify.



NetBox – The Network Documentation Application

Organization	
Sites	0
Geographic locations	
Tenants	0
Customers or departments	
DCIM	
Racks	0
Equipment racks, optionally organized by group	
Device Types	0
Physical hardware models by manufacturer	
Devices	0
Rack-mounted network equipment, servers, and other de	vices
Connections	-
Cables	0
Interfaces	0
Console	0
Power	0

IPAM	
VRFs Virtual routing and forwarding tables	٥
Aggregates Top-level IP allocations	٥
Prefixes IPv4 and IPv6 network assignments	٥
IP Addresses Individual IPv4 and IPv6 addresses	٥
VLANS Layer two domains, identified by VLAN ID	0

Circuits	
Providers Organizations which provide circuit connectivity	0
Circuits Communication links for Internet transit, peering, and other services	0

Power	
Power Feeds Electrical circuits delivering power from panels	0
Power Panels Electrical panels receiving utility power	0

Virtualization Clusters Clusters of physical hosts in which VMs reside Virtual Machines Virtual compute instances running inside clusters

Major Modules of NetBox





NetBox – The Network Documentation Application

NetBox Workflow



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NetBox – Lets Play with the DCIM Module



Let's say an Enterprise company is going to document their Data Center. What should they be doing?

- Creating a list of what they have; from passive to active network components.
- Label all the assets; so that any person can correlate the soft labeling info to the actual one.
- And get a simple logical view of the RACK as it is physically.

NetBox – DCIM Module

We will see how the below list works with DCIM module according to the flow diagram.

- Organization, to define the physical instance
- DCIM, to define all the components
- Power, to get the actual view of NetBox.



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LAB: Network Documentation with NetBox

Note

• The LAB Demo would be performed with TWO modules of NetBox.

Lab target

- Explore Data Center Managemnet DCIM
- Explore IP address management IPAM

Requirements

- HTTP server running Nginx or Apache. As like the previous LAB modules, here we will use Apache.
- Python version 3.6 or greater.
- Python extensions setuptools, graphviz, libpq-dev, and xml2
- PostgreSQL database version 9.6 or greater. (According to the official document, till December 20, 2020, MySQL and other relational databases are not supported at NetBox.)
- Redis server version 4 or greater.

Data Center Managemnet

We will cover the fundamental part of NetBox from the flow diagram.

NetBox Workflow



10. Explore the NetBox service - DCIM

We will practice the following steps to explore NetBox application.

- Create the first site
- Create the first region

- Connect the region with the site
- Create the tenant to define the department
- Connect the tenant with the site
- Add new Rack
- Define device role
- Define device type
- Add devices
- Add power-panels
- Add power-feeds
- Add power distribution unit (PDU)
- Add a few components to the server

Create the first site:

Go to the homepage and click Sites under the Organization tab.

New page will comeup, click on the +Add button and fill in the form.

ld a new site		
ite		
Name	First APNIC Lab	
	Full name of the site	
Slug	first-apnic-lab	с
	URL-friendly unique shorthand	
Status	Active	× -
Region		v
Facility	Facility	
	Data center provider and facility (e.g. Equinix NY7)	
ASN	ASN	
	BGP autonomous system number	
Time zone	Australia/Brisbane	× ×
	Local time zone	
Description	APNIC Data Center	
	Short description (will appear in sites list)	

Create the first region:

Next, we have to create the region to complete the first part of the Organization tab.

To do that, again go to the homepage and click Regions under the Organization tab.

New page will comeup, click on the +Add button and fill in the form.

Add a new region

Region		
Parent		*
Name	APNIC-HQ	
Slug	apnic-hq	C
	URL-friendly unique shorthand	
Description	Description	
	Create Create and Add Another	Canca

Connect the region with the site:

Now we need connect Regions to Sites . Go to Sites from the Organization tab, Select the First APNIC Lab and click on Edit Selected .

A new window come up. Next, right side of the window there are few options, select APNIC-HQ from the drop down menu at Region field, and click on Apply

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NetBox-LAB.html

Name	Status	Facility	Region	Tenant	ASN	Description	Attributes	
First APNIC Lab	Active	_	1	_	_	APNIC Data Center		
							Status	
							Region	
							Tenant	APNIC-HQ
								Set null
							ASN	ASN
								Set null
							Description	None
								Set null
							Time zone	
								Set null
							Add tags	
							Remove tags	

Now it should look like this.

S	ites							
	Name	Status	Facility	Region	Tenant	ASN	Description	
	First APNIC Lab	Active	_	APNIC-HQ	-	_	APNIC Data Center	

Create a tenant:

Lets create a tenant to define the department.

Go to the home page, and nevigate Tenants option from the Organization block. Click it, new window will popup, click on the +Add button to add a new one. Fillup the gap and click on Create button.

Add a new tenant		?
Tenant		
Name	DC Management	
Slug	dc-management	G
	URL-friendly unique shorthand	
Group		*
Description	Data Center Management Team	

Connect the tenant with the site:

Go to Sites from the Organization tab, Select the First APNIC Lab and click on Edit Selected .

Next, right side of the window there are few options, select DC Management from the drop down menu at Tenant field, and click on Apply

/2/2021					Net	tBox-LAB.html		
Name	Status	Facility	Region	Tenant	ASN	Description	Attributes	
First APNIC Lab	Active	_	APNIC-HQ	_	-	APNIC Data Center	Status	
							Region	
								Set null
							Tenant	
							ACN	DC Management
							ASN	Set null
							Description	None
								Set null
							Time zone	
							Add tags	
							Pemove tags	
							Remove tags	

Now it should it look like this.

Sites

Name	Status	Facility	Region	Tenant	ASN	Description
First APNIC Lab	Active	_	APNIC-HQ	DC Management	_	APNIC Data Center

Add new RACK:

To add a new rack, go to the home page, and nevigate Racks option from the DCIM block. Click it, new window will popup, click on the +Add button to add a new one. Fillup the gap, use First APNIC Lab as site, use APNIC-HQ for region, DC Management for tenant, from the drop down option respectively; use the name of the rack as APNICHQ/Rack01 and click on Create button.

Add a new rack			?
Rack			
Region	APNIC-HQ	×	*
Site	First APNIC Lab	×	*
Name	APNICHQ/Rack01		
	Organizational rack name		
Facility ID	Facility ID		
	The unique rack ID assigned by the facility		
Group			*
Status	Active	×	-
Role			*
Serial number	R2020233333		
Asset tag	AHQ/R01		
	A unique tag used to identify this rack		

NetBox-LAB.html

Tenancy			
Tenant group			•
Tenant	DC Management	×	*
Dimensions			
Туре	4-post cabinet	×	•
Width	23 inches	×	-
	Rail-to-rail width		
Height (U)	42		
	Height in rack units		
Outer dimensions	Outer width Outer depth		
	Descending units Units are numbered top-to-bottom		

The output will be like this.

Rack APNICHQ/Rack01

Rack Change Log							Show Images
Rack				Front		Rear	
Site	APNIC-HQ / First APNIC Lab		42		42		
Group	None		40		40		
Facility ID	_		- 39		20		-
Tenant	DC Management		37		37		
Status	Active		30		85		
Role	None		- 24		34		_
Serial Number	R2020233333		. 32		32		
Asset Tag	AHQ/R01		30		20		
Devices	0		29 28		29		_
Space Utilization		0%	27		27		
Power Utilization		0%	25		25		_
T ONCE OUR LABORT		·/	24		24		
Dimensions					22		
Туре	4-post cabinet		21		21		_
Width	19 inches		10		19		
			- 18		18		

Define device role:

Before adding new device, we have to create few necessary definition for devices.

To create device role, navigate Device Roles option from the drop down menu Devices . Click it, new window will popup, click on the +Add button to add a new one. Add router, server, etc with assigning the color code.

Note: make sure you uncheck the option VM Role

it should look like this.

file:///home/shamim/LAB/NetBox-LAB.html

< Previous Rack > Next Rack + Clone / Edit 🗊 Delete

0

Device Roles

O Name	Devices	VMs	Color	VM Role	Description
Core Router	0	0		×	_
Core Switch	0	0		×	-
Distribution Router	0	0		×	-
Distribution Switch	0	0		×	_
□ NAS	0	0		×	_
Power Strip	0	0		×	_
Server	0	0		×	-

Delete Selected

Define device type:

Need to create the Manufacturers first, before creating device types.

From the Devices drop down menu, select Manufacturers and then click +Add from the new window.

Create Cisco and Dell, by fill in the gap, and it will look like below.

Add a new manufacturer

Manufacturer		
Name	Dell	
Slug	dell	C
	URL-friendly unique shorthand	
Description	Description	
	Create Create and Add Another	Cancel

Configure + Add 😒 Import 😒 Export Manufacturers Name Device Types Descrip Slug tory Iter Cisco 0 Ð 🖊 🗉 0 0 cisco D Dell 0 0 0 dell 49 🖊 🔟 50 V per page Showing 1-2 of 2

Next, from the Devices drop down menu, select Device Types and then click +Add from the new window.

Fill the gap with sample specification of Dell. Assuming the server is Dell PowerEdge 420, which is 2U rack.

Note: As this is 2U rack server, it will cover from Front to Rear, and that is why option Full Depth should be checked. But for the Cisco switch, Full Depth option should be unchecked.

Confi

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?

du a new device i	уре	
Device Type		
Manufacturer	Dell	× ×
Model	PowerEdge 420	
Slug	poweredge-420	G
	URL-friendly unique shorthand	
Part number	D32494020022	
	Discrete part number (optional)	
Height (U)	2	
	Is full depth	
	Device consumes both front and rear rack faces	
Parent/child status	Parent	× ×
	Parent devices house child devices in device bays. Leave blank if thi parent nor a child.	s device type is neither

Add a new device type Device Type Manufacturer x Ŧ Cisco Model Nexus 3550 С Slug nexus-3550 URL-friendly unique shorthand Part number C129485677650 Discrete part number (optional) Height (U) 1 Is full depth Device consumes both front and rear rack faces Parent/child status Parent × × Parent devices house child devices in device bays. Leave blank if this device type is neither a parent nor a child.

Add devices:

Finally, we are adding devices now.

Select Devices option from the drop down menu Devices . New window will popup, click on the +Add button to add a new one. Add switch and server, and select all the option from the drop down menu accordingly, keep in mind to check, Hardware , Location Tenancy .

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/2/2021			Net	Box-LA	۱B.ł
Add a new devic	е				?
Device					
Nan	пе	SRV02			
Device ro	le	Server		×	*
Hardware					
Manufactur	er	Dell		×	•
Device typ	be	PowerEdge 420		×	•
Serial numb	er	D1234567788			
Asset ta	ag	Chassis serial number			
		A unique tag used to identify this device			
Location					
Region	A	PNIC-HQ	× *		
Site	Fi	rst APNIC Lab	× *		
Rack group			-		
Rack	A	PNICHQ/Rack01	× -		
Rack face	F	ront	~		
Position	U	40	× -		
	The	lowest-numbered unit occupied by the device			
Management					
Status	A	ctive	× -		

Add power-panels:

Platfor Primary IPv4 Primary IPv6

Add two different Power Panels to ensure redundant power supply from two separate main power grid. Its the main power source.

e.g: APNIC-DC-Power and APNIC-DC-Power-Sec.

Add a new power pai	iel		?
Power Panel			
Region	APNIC-HQ	х	*
Site	First APNIC Lab	х	*
Rack group			*
Name	APNIC-DC-Power		
Tags			
	Create	Create and Add Another	Cancel

Add power-feeds:

Every rack should have two different power feeds from two separate power panels, asumming two separate online UPS in place.

e.g: APNICDC/UPS-A/R01 and APNICDC/UPS-B/R01; for second one, change the Power-Panel to APNIC-DC-Power-Sec and assign name as APNICDC/UPS-B/R01 .

Add a new power fee	d		?
Power Panel			
Region	APNIC-HQ	×	•
Site	First APNIC Lab	x	•
Power panel	APNIC-DC-Power	×	*
Power Feed			
Rack	NMM-Lab-Devices	×	*
Name	APNICDC/UPS-A/R01		
Status	Active	×	•

Add PDU

PDU = *Power distribution unit*

Before creating a new PDU device, create Manufacturer as XYZ , device role Power Strip , and device type PDU01 , then Go to the Devices and click on +add .

× Ŧ

× ×

~

Give the PDU a name Rack01/PDU01 , Asset Tag as R01/PDU01 , and carefully choose all the options accordingly.

Device		
Name	Rack01/PDU01	
Device role	Power Strip ×	•
Hardware		
Manufacturer	XYZ ×	•
Device type	PDU01 ×	•
Serial number	Serial number	
Asset tag	R01/PDU01	
	A unique tag used to identify this device	
Location		
Region	APNIC-HQ × ·	•
Site	First APNIC Lab ×	•
Rack group		-

Rack

Rack face

Position

APNICHQ/Rack01

The lowest-numbered unit occupied by the device

Front

U35

NetBox-LAB.html

Next, create power ports as the power inlets and power outlets as power outlet, of the PDU, from the Add New Components option.

Power port	
Device	Rack01/PDU01
Name	PDU/P01
Label	R01/PDU01/P01
	Physical label
Туре	NEMA 1-15P 🗸
	Physical port type
Maximum draw	1
	Maximum power draw (watts)
Allocated draw	Allocated draw
	Allocated power draw (watts)
Description	Power Inlet
Tags	
Description	Power Inlet

Device	Rack01/PDU01	· -
Name	Plug[1-8]	
	Alphanumeric ranges are supported for bulk creation. Mixed cases and type within a single range are not supported. Examples: • [ge, xc]-0/0/[0-9] • e[0-3][a-d, f]	S
Label	Plug[1-8]	
	Alphanumeric ranges are supported. (Must match the number of names bei created.)	ıg
Туре	Alphanumeric ranges are supported. (Must match the number of names being created.)	1g (-
Type Power port	Alphanumeric ranges are supported. (Must match the number of names being created.) NEMA 1-15R PDU/P01 (R01/PDU01/P01)	1g
Type Power port Feed leg	Alphanumeric ranges are supported. (Must match the number of names bei created.) NEMA 1-15R PDU/P01 (R01/PDU01/P01) A	ig < - -
Type Power port Feed leg Description	Alphanumeric ranges are supported. (Must match the number of names bei created.) NEMA 1-15R PDU/P01 (R01/PDU01/P01) A PDU Outlet	ig < - -

The power outlet should look like this.

Device Power P	orts 1 Pov	ver Outlets 🚯 S	Status LLDP Neighbors Configuration	n Config Context Chang	je Log			
Power Outlets								Configure
O Name	Label	Туре	Power port	Feed leg	Description	Cable	Connection	
🗆 🙆 Plug1	Plug1	NEMA 1-15R	PDU/P01 (R01/PDU01/P01)	А	-	-	-	F 🗄 🚹 🚺
O Plug2	Plug2	NEMA 1-15R	PDU/P01 (R01/PDU01/P01)	A	_	_	_	5 G 🚏 🖊 🔳
🗆 🙆 Plug3	Plug3	NEMA 1-15R	PDU/P01 (R01/PDU01/P01)	A	_	_	-	5 to 👔 🖉 🔟
🗆 🙆 Plug4	Plug4	NEMA 1-15R	PDU/P01 (R01/PDU01/P01)	А	_	-	-	5 🔓 👔 💋 🔟
Plug5	Plug5	NEMA 1-15R	PDU/P01 (R01/PDU01/P01)	А	-	-	-	5 6 📍 🖊 🔟
🗆 🙆 Plug6	Plug6	NEMA 1-15R	PDU/P01 (R01/PDU01/P01)	A	_	-	-	5 to 👔 🖉 🔟
🗆 🙆 Plug7	Plug7	NEMA 1-15R	PDU/P01 (R01/PDU01/P01)	A	_	_	_	5 🔓 👔 💋 🔟
O 🙆 Plug8	Plug8	NEMA 1-15R	PDU/P01 (R01/PDU01/P01)	A	_	_	_	5 6 👔 🖊 🔟
🖍 Rename 📝 Ec	lit 🕅 🦎 Disconnec	t 🔲 Delete						+ Add power outlets

Now create another PDU for the rack01 to get power feed from the different power supply.

NetBox-LAB.html

Let us connect the PDU01 and PDU02 inlet to the power feed. Follow the options from the screeshots. You need to click on green colored connection icon and select Power Feed .

Connect Rack01/PDU01 PDU/P01 (R01/PDU01/P01) to Power Feed

	A Side						B Side	
Region	APNIC-HQ		-		Region	APNIC-HQ		× *
Site	First APNIC Lab		÷*		Site	First APNK	C Lab	× -
Rack	APNICHQ/Rack01				Rack Group			*
Device	Rack01/PDU01				Power Panel	APNIC-DC	-Power	× *
Туре	Power port				Туре	Power feed		
Name	PDU/P01 (R01/PDU01/P01)				Name	APNICDC/	UPS-A/R01	× *
		Cable Status Type Label Color Length Tags	Connected Power R01/PDU01/PP Amber 10	Met	ters	> > >		
Device Power Ports	Power Outlets Status LLDP	Neighbors Configuration Config	Context Change Log					
Power Ports								Configure
Name	Label	Туре	Maximum draw	Allocated draw	Description	Cable	Connection	
C C Rack01/PDU02/Po	rt02 R01/PDU02/P01	1 NEMA 1-15P	1	_	-	-	-	5 5 1 2

Connect Rack01/PDU02 Rack01/PDU02/Port02 (R01/PDU02/P01) to Power Feed

🖍 Rename 🧪 Edit 🦹 Disconnect 🗐 Delete

		•	,		
	A Side				B Side
Region	APNIC-HQ		_	Region	APNIC-HQ × *
Site	First APNIC Lab		F	Site	First APNIC Lob × ~
Rack	APNICHQ/Rack01			Rack Group	
Device	Rack01/PDU02			Power Panel	APNIC-DC-Power-Sec × *
Туре	Power port			Туре	Power feed
Name	Rack01/PDU02/Port02 (R01/PDU02/P01)			Name	APNICDC/UPS-B/R01 × *
		Cable Status Type Label Color Length Tags	Connected Power R01PPU02/PPSec Dark orange 10	Meters	
		Tags			

Let us check the connection from PDU to power feed.

5 🗞 👔 🖊 🔟

Power Outlet Power Feed

Cable Trace for Power Port PDU/P01 (R01/PDU01/P01)

		Related Paths		
Rack01/PD XYZ PDU	U01 01	Origin	Destination	Segments
First APNIC Lab / APN	IICHQ/Rack01	None found		
 PDU/P01 (R01/PD Power Port (NEM	0001/P01) IA 1-15P)			
	R01/PDU01/PP Power (10 Meiers) Connected			
 APNICDC/UPS Power Feed (P	-A/R01 /rimary)			
APNIC-DC-P Power Par First APNIC	lower nel Lab			
Trace com Total segmer Total length: 10	pleted			

Add a few components to the server

Let us add few components for the device, first we add few components for server-01, Selecting SRV01 from the Devices tab, choose Power Ports from the Add Components drop down menu. Power ports are named like - Rack01/SRV01/Port01.

To add Interfaces , again click Add Components and give it a name Eth0 with 1GE from Types .

Device	SRV01
Name	Rack01/SRV01/Port01
Label	R01/SRV01/P01
	Physical label
Туре	NEMA 1-15P
	Physical port type
Maximum draw	1
	Maximum power draw (watts)
Allocated draw	Allocated draw
	Allocated power draw (watts)
Description	Description
Tags	
rface	
rface Device	SRV01 × +
rface Device Name	SRV01 × -
rface Device Name 2	SRV01 × - EB01 EB01 Uphanumeric ranges are supported for bulk creation. Mixed cases and types within a single range are not upported. Examples: • [ce_xs]-vov[ce-9] • [ce_xs]-vov[ce-9]
rface Device (Name /	SRV01 x + Eth01
rface Device Name Label	SRV01 × = Eth01 Uptanumeric ranges are supported for bulk creation. Mixed cases and types within a single range are not upported. Examples: = [cp-sp]=sdr([-s]] = ==================================
rface Device (Name (Label (Type (SRV01 x Eh01 Uptanumeric ranges are supported for bulk creation. Mixed cases and types within a single range are not supported. Examples: (cs.vs.2) (cs.vs.2
rface Device Name Label Type Parent LAG	SRV01 * • Etb01 * Liphanumeric ranges are supported for bulk creation. Mixed cases and types within a single range are not supported. Complex: * (ap.val = 000 [10-9] * * =[0-3][a-0,1] Eth01 * 1000BASE-T (LGE) * * 2 mabled *
rface Device Rame Label Type Parent LAG MTU	SRV01 × • Eth01 Upportunetic ranges are supported for bulk creation. Mixed cases and types within a single range are not supported. Camples: • • (ge.xg)-/v(f(e))] • • • (ge.xg)-/v(f(e))] Eth01 • Upport of ranges are supported. (Must match the number of names being created.) 1000BASE-T (LGE) × 2 reated
rface Device Name Label Parent LAG MTU MAC Address	SRV01 * • Eth01
rface Periode Label Parent LAG MTU MAC Address Description	SRV01 × * Eth01
rface Device Name Label Parent LAG MTU MAC:Address Description	SRV01 * • Eh01
rtace Perice Label Type Parent LAG MTU MAC Address Cescription Mode	SRV01 × • Eh01 Uptanumeric ranges are supported for bulk creation. Mixed cases and types within a single range are not supported. Examples: • [cs.yc]*04(5e)] Eh01 Uptanumeric ranges are supported. (Must match the number of names being created.) 1000BA-SE-T (LGR) × • 1000 Anac Address Noor Noor Noor Noor Noor Noor Noor No

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Add one more power port.

Now connect those two Power Ports with the PDU unit 01 and 02 accordingly, use the option power outlet to make the connection and check the status. Power cable tagging can be done following Rack/Server/Power_port/PDU_number/Port_number

Device Interfaces Power Por	ts 2 Status LLDF	P Neighbors Confi	guration Config Conte	oxt Change Log					
Power Ports									Configure
Name	Label	Туре	Maximum draw	Allocated draw	Description	Cable	Connection		
C & Rack01/SRV01/Port01	R01/SRV01/P01	NEMA 1-15P	1	-	-	R01/SRV01/P01/PDU01/P01	Rack01/PDU01 > Plug1 (Plu	1 1)	5 🛼 🏌 🖊 🗊
C C Rack01/SRV01/Port02	R01/SRV01/P02	NEMA 1-15P	1	_	-	-	-		F 🖞 👔 🖊 🔳
🧨 Rename 🥒 Edit 🧏 Disconnect 🛽	Delete							Power Outlet	wer port
K particular in the second sec								Power Feed	iner port

Connect SRV01 Rack01/SRV01/Port02 (R01/SRV01/P02) to Power Outlet

	A Side				B Side
Region	APNIC-HQ			Region	APNIC-HQ × ×
Site	First APNIC Lab		F	Site	First APNIC Lab × ~
Rack	APNICHQ/Rack01			Rack	APNICHQ/Rack01 × -
Device	SRV01			Device	Rack01/PDU02 × *
Туре	Power port			Туре	Power outlet
Name	Rack01/SRV01/Port02 (R01/SRV01/P02)			Name	Plug1 × *
		Cable			
		Status	Connected		X *
		Туре	Power		x *
		Label	R01/SRV01/P02/PDU02/P01		
		Color	Red		
		Length	3	Meters	x *
		Tags			
		ings			

Next, let us add few ports to the switch, that we have created. It will be time consuming to add 24 or 48 ports, to simplify the LAB we will add 8 ports only to the Cisco Nexus 3550 switch, dont forget to add two power port for switch, and connect from two separate PDU as well.

Go to SWC01 from the Devices tab, and click on Add Components to add Interfaces . Naming can be done e01, e02, e03, select 1000BASE-T (1GE) from the Type option. After creating all the 8 ports it should look like -

$ mathcal{H} $ netbox	Organization -	Devices - IPAM - Virtualizat	ion - Circi	uits + F	ower -	Secrets - Other -			Search 🔍 🛓 apnic 🗸
Devices / First	APNIC Lab / SWC	01							Search devices Q
SWC01 Created Dec. 23, 2021 Device Interfa	D - Updated 1 day, 13 h acces 3 Status	surs ago LLDP Neighbors Configuration	Config Co	ntext C	hange Log				+ Add Components - + Clone / Edit Delete
Interfaces									Filter Configure
Name	Label Enab	led Type	LAG	мти	Mode	Description	Cable	Connection	IP Addresses
🗆 🔝 e01	e01 🗸	1000BASE-T (1GE)	-	-	-	-	-	-	+ 5 t. 1 🖊 🔟
🗆 🔝 e02	e02 🗸	1000BASE-T (1GE)	-	-	-	-	-	-	+ 5 % 1 🖊 🗉
🗆 🔝 e03	e03 🗸	1000BASE-T (1GE)	-	-	_	_	_	_	+ 5 % 1 🖊 🗎
🗆 🔝 e04	e04 🖌	1000BASE-T (1GE)	-	-	-	-	-	-	+ 5 % ? 🖊 🗃
🗆 🔚 e05	e05 🗸	1000BASE-T (1GE)	-	-	-	-	-	-	🛨 🛱 🚼 🚼 🚺 🚺
🗆 🔚 e06	e06 🖌 🖌	1000BASE-T (1GE)	-	-	-	-	-	-	+ 5 % 1 / 0
🗆 📠 e07	e07 🗸	1000BASE-T (1GE)	-	-	-	-	-	-	+ 5 % 1 🖊 📵
🗆 🔝 e08	e08 🗸	1000BASE-T (1GE)	-	-	-	-	-	-	+ 5 t. 1 🖊 📵
Rename 🖊	Edit 🕅 Disconnect	I Delete							+ Add interfaces

Let us connect the server ethernet port to the switch port. click on the connect icon, choose interface , a window will popup, A Side is the server side, and B Side is the destination side, for us here it is the switch that we have in our rack-01. Choose swc01 the Device option, and then chose one port below to the Interface .

From the Cable box, select CAT6 from the Type , use Label like we discuss at our presentation slides, APNICHQ/R01/SRV01/APNICHQ/R01/SWC01/e01 (Format: Source_Device_ID/Destination_Device_ID-Port_Number/Name) .

Device	Interfaces 1	Power P	Ports (2)	Status	LLDP Neighbors	Configura	tion Co	nfig Context	Change Log						
Interfac	es												Filter		Configure
Name	ne Lab	el En	abled	Туре		LAG	MTU	Mode	Description	Cable	Connection	IP Addresses			
0 🔜 e	Eth01 Eth	01 🗸		1000BAS	E-T (1GE)	_	1500	_	_	-	_			• S &	👔 🖊 🔳
		-											Interface		-
/ Rena	ame 🖍 Edit 🕅	Disconnect	U Delete										Front Port		terraces
													Rear Port		
													Circuit Termination		

Connect SRV01 Eth01 (Eth01) to Interface

Region APNIC-HQ Site First APNIC Lab Rack APNICHQ/Rack01 Device SRV01 Type Interface Name Eth01 (Eth01) Cable Connected Type Connected		A Side				B Side
Site First APNIC Lab Rack APNICHQ/Rack01 Device SRV01 Type Interface Name Eth01 (Eth01) Cable e01 Status Connected Type e03 e04	Region	APNIC-HQ			Region	APNIC-HQ
Rack APNICHQ/Rack01 Rack APNICHQ/Rack01 Device SRV01 Device SWC01 Type Interface Type Interface Name Eth01 (Eth01) Name	Site	First APNIC Lab		*	Site	First APNIC Lab
Device SRV01 Type Interface Name Eth01 (Eth01) Cable 601 Status Connected Type e02 e03 e04 e04 e04	Rack	APNICHQ/Rack01			Rack	APNICHQ/Rack01
Type Interface Name Eth01 (Eth01) Cable e01 Status Connected Tupe e03 e04	Device	SRV01			Device	SWC01
Name Eth01 (Eth01) Name Cable Cable Cable Cable Cable Cable Connected Cable Connected Cable Connected Cable Connected Cable Connected Cable Cable Ca	Туре	Interface			Туре	Interface
Cable e01 e02 e03 e04 e04	Name	Eth01 (Eth01)			Name	
Cable e01 Status Connected e03 Time e04						
Cable e02 Status Connected e03 e04 E04						e01
Status Connected , e03 e04			Cable			e02
e04			Status	Connected		, e03
			Tupo			e04
			Label	Label		evb

Type CAT6 Label APNICH Color Blue	× HQ/R01/SRV01/APNICHQ/R01/SWC01/e01
Label APNICH Color Blue	HQ/R01/SRV01/APNICHQ/R01/SWC01/e01
Color	
Length 1	Meters ×
Tags	

Now it should look like below, to check this status, click on the Trace icon from the SRV01 Interface details.

🛱 netbox

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Search

💄 aprilo

race for Interface Eth01 (Eth0)1)

Organization - Devices - IPAM - Virtualization - Circuits - Power - Secrets - Other -

		Related Paths			
SRV01 Dell PowerEdge 420		Origin	Destination	Segments	
First APNIC Lab / APNICHQ/Rack01		None found			
Eth01 (Eth01) Interface (1000BASE-T (1GE))					
APRICHQ/R0J/SRV0J/APRICHQ/R0J CAT6 (1 Meters) #Hanned	SWC01/e	01			
 e01 (e01) Interface (1000BASE-T (1GE))	_				
SWC01 Cisco Nexus 3550 First APNIC Lab / APNICHQ/Rack01					
Trace completed					

Total segments: 1 Total length: 1 Meters

So, till now, we have created a server and switch; gave them redundant power supply and network interface, and placed them inside the rack.

IP Address Management

11. Explore the NetBox service - IPAM

Now we will work on IPAM, and then go back to DCIM to see the full picture.

- Create Aggregates
- Create Prefixes
- Create IP address

Create Aggregates:

First, select RIRs from the IPAM tab, and create new one with APNIC



Add a new RIR		0
RIR		
Name	APNIC	
Slug	apnic	G
	URL-friendly unique shorthand	
	Private	
	IP space managed by this RIR is considered private	
Description	Description	
	Create and Add A	nother Cancel

It will take you to a new window, where you have to create Aggregate IPs. Here we assume the IP Prefix is 10.0.0/8 .

Add a new aggregate	9	0
Aggregate		
Prefix	10.0.0.0/8 IPv4 or IPv6 network	
RIR	APNIC	× *
Date added	2020-12-25	
Description	APNIC Data Center LAB IPs	
Tenancy		
Tenant group		Ŧ
Tenant	DC Management	× *
Tags		
Tags		
	Create Create and Add Another	Cancel

Create Prefixes

Select Prefixes from the IPAM tab to add new prefixes. we will use 10.20.0.0/16 as our prefix for the Data Center.

Add a new prefix			?
Prefix			
Prefix	10.20.0.0/16		
	IPv4 or IPv6 network with mask		
Status	Active	× ×	
	Operational status of this prefix		
VRF		Ŧ	
Role		Ŧ	
Description	Data Center IPs		
	□ Is a pool		
	All IP addresses within this prefix are considered usable		

So the prefix window will showup, there you can see different sub-tab; go to the Child Prefixes , and create a new one 10.20.20.0/24 for Media Service Solution

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dd a new prefix		(
Prefix		
Prefix	10.20.20.0/24	
	IPv4 or IPv6 network with mask	
Status	Active	× *
	Operational status of this prefix	
VRF		Ŧ
Role		Ŧ
Description	Media Service Solution IPs	
	🗌 Is a pool	
	All IP addresses within this prefix are considered usable	

You will see the window like this.

🕂 netbox Organiza	ation - Devices -	IPAM - Virtualizi	ation - Circuit	s - Power - Secrets	s - Other -				Search Q 🛓 apric 🗸
Prefixes / 10.20.0.0/16								Search	prefixes Q
10.20.0.0/1	6 - Prefixe	es						+ Add 0	Child Prefix + Clone / Edit Delete
Created Dec. 25, 2020 - Updated 3	minutes ago	-							
Prefix Child Prefixes	IP Addresses	Change Log							Show available & Hide available
Child Prefixes									
Prefix	Status	Children	VRF	Utilization	Tenant	Site	VLAN	Role	Description
10.20.0.0/20	Available	-	Global	-	-	-	-	-	-
10.20.16.0/22	Available	-	Global	_	-	-	_	-	_
• 10.20.20.0/24	Active	0	Global	0%	DC Management	First APNIC Lab	-	-	Media Service Solution IPs
10.20.21.0/24	Available	-	Global	-	-	-	-	-	_
10.20.22.0/23	Available	-	Global	-	-	-	-	-	-
10.20.24.0/21	Available	-	Global	-	-	-	-	-	-
10.20.32.0/19	Available	-	Global	-	_	-	-	-	-
10.20.64.0/18	Available	-	Global	-	_	-	-	-	-
10.20.128.0/17	Available	-	Global	-	-	-	-	-	-
✓ Edit Selected	Selected								50 v per page
									Showing 1-9 of 9

 $Click \ on \ the \ child-prefix \ that \ we \ just \ now \ defined. from \ the \ go \ to \ the \ IP \ \ Addresses \ \ sub-tab. \ And \ create \ a \ IP \ for \ the \ first \ server \ as \ 10.20.20.10/30 \ .$

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Add a new ID address

?

Add a new iF addie	.55
New IP Bulk Create	
IP Address	
Address	10.20.20.10/30
	IPv4 or IPv6 address (with mask)
Status	Active × *
	The operational status of this IP
Role	·
	The functional role of this IP
VRF	*
DNS Name	DNS Name
	Hostname or FQDN (not case-sensitive)
Description	Rack01/Server01

You will get a window like below to see the status.

10.20.20.10/30

Created Dec. 25,	2020 · Updated 0 minutes ago
IP Address	Change Log

IP Address		Parent Prefixes						
Family	IPv4	Prefix	Status	Tenant	Site	VLAN	Role	Description
/RF	Global	10.20.0.0/16	Active	DC Management	First APNIC Lab	_	-	Data Center IPs
Fenant	DC Management	10.20.20.0/24	Active	DC Management	First APNIC Lab	-	-	Media Service Solution IPs
Status	Active							
Role	None	Related IP Addresses	1					
ONS Name	-	None						
Description	Rack01/Server01							
ssignment	-							30 •
IAT (inside)	None							
NAT (outside)	None							
Tags								
No tags assigned								

Now, lets us go back to the DCIM module, and assign an IP to the server 01 interface.

To do that, select srv01 from the Devices lists, go to the sub-tab Interfaces and click on the green + sign , to add the IP address. It will take you to a new page, provide all the info accordingly.

Devices / First/	Devices / First APNIC Lab / SRV01										Search devices				
SRV01									I	+ Add Components +	+ Clone / Ed	it 🔲 Delete			
Created Dec. 23, 2020	- Updated 1	7 hours, 32 minu	ites ago												
Device Interfa	ces 🕦	Power Ports	Status LLDP N	leighbors	Confi	guration	Config Context	Change Log							
Interfaces										Filter		Configure			
Name	Label	Enabled	Туре	LAG	MTU	Mode	Description	Cable	Connection	IP Addresses					
🔘 🔝 Eth01	Eth01	1	1000BASE-T (1GE)	-	1500	-	-	APNICHQ/R01/SRV01/APNICHQ/R01/SWC01/e01	SWC01 > e01 (e0	1)	+ 56	· 🖹 🖊 🔟			
/ Rename /	Edit 🏋 🛛	isconnect 🕕	Delete								Add II	Paddress 😖			

+ Clone 📝 Edit 🔟 Delete

Add a new IP address

New IP Assign IP

?

IP Address	
Address	10.20.20.2/32
	IPv4 or IPv6 address (with mask)
Status	Active × -
	The operational status of this IP
Role	v
	The functional role of this IP
VRF	v
DNS Name	DNS Name
	Hostname or FQDN (not case-sensitive)
Description	Web Service IP
Interface Assignment	

Interface Assignment					
Device	Virtual Machine				
	Device	SRV01	×	Ŧ	
	Interface	Eth01 (Eth01)	×	*	
		Make this the primary IP for the device/VM			

So, as of now our one server is connected with a switch, and both the devices are connected with the power source.

Exercise:

- Create another server
- Create NAS
- Connect server and NAS with switch
- Create Router, and connect with switch as gateway.
- Create the Circuits, and connect with Rotuer.

End of Lab