

Webinar: Getting Started with Nornir and NetBox for Network Automation

The logo for NetBox Labs, featuring the text "netbox labs" in a white, lowercase, sans-serif font. The word "netbox" is in white and "labs" is in a light blue color. The logo is centered on a dark blue background with a network diagram of overlapping circles and nodes in various colors (orange, blue, white).

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Today's Goal:

Gain enough knowledge and motivation to get started on your network automation journey with NetBox and Nornir!

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Agenda

- Nornir Vs Ansible: How to Choose?
 - What is Ansible?
 - What is Nornir?
- What Are the Primary Differences between Nornir and Ansible?
- Nornir and NetBox - Getting started
 - Nornir building blocks
 - How NetBox powers Network Automation with Nornir
 - nornir_netbox Inventory Plugin
- Demo
 - Nornir Installation
 - Get the API token for Nornir script use
 - Nornir and NetBox Inventory
 - Example 1 - Get device facts
 - Example 2 - Get LLDP Neighbor Information
 - Example 3 - Backup device configurations





Agenda (continued)

- What Next?
- Useful Resources
- New NetBox Cloud Features
 - Backups
 - IP Allow Lists
 - NetBox Version Upgrades
- Q&A



What is Ansible?



- Open source automation tool, created as a configuration management system
- Software provisioning to application deployment
- More than just a tool, it's a force in IT orchestration
- Agentless. Only SSH access is required
- Human readable declarative language (YAML) - easy to outline and execute complex tasks/workflows
- Extensible (modules)
- Very popular as a network automation tool
- Low barrier to entry

What is Nornir?

- Automation framework written in python to be used with python
- Allows users to integrate with other Python tools and libraries
- Designed for network Automation tasks
- Fast (concurrency), flexible and extensible (plugins)
- Smooth learning curve if familiar with Python - don't be put off if you're not though :)



Differences Between Ansible and Nornir



ANSIBLE



Declarative dynamo (human readable)	Python powerhouse
Steady and reliable	Lightning efficiency
YAML playbooks are easy to understand	Familiar and intuitive to Python users
Extensible with modules	Extremely flexible with plugins and Python tools
Huge community, not just around network automation	Passionate community continually contributing

Code Comparison



ANSIBLE

```
# get_facts.yaml

---
- name: Gather EOS Facts
  connection: ansible.netcommon.network_cli
  gather_facts: false
  hosts: all
  tasks:
    - name: Gather all facts
      arista.eos.eos_facts:
        gather_subset: all
        register: eos_facts

    - name: Display gathered facts
      debug:
        var: eos_facts
```



```
# get_facts.py

import os
from nornir import InitNornir
from nornir_napalm.plugins.tasks import napalm_get
from nornir_utils.plugins.functions import print_result

nr = InitNornir(config_file="config.yaml")

def napalm_get_facts(task):
    task.run(task=napalm_get, getters=["facts"])

results=nr.run(task=napalm_get_facts)

print_result(results)
```




Which is Best - It Depends!

- If you're a Pythonista (or even just starting out with Python) and require high-speed network automation, Nornir might be your best bet.
- Ansible is a strong contender if you're looking for a more general-purpose automation tool with a vast community and prefer a declarative approach.

Remember, the best tool is the one that suits your project and skill set.



Nornir Building Blocks - Configuration File

```
# config.yaml

---
inventory:
  plugin: SimpleInventory
  options:
    host_file: "inventory/hosts.yaml"
    group_file: "inventory/groups.yaml"
    defaults_file: "inventory/defaults.yaml"
runner:
  plugin: threaded
  options:
    num_workers: 100
```

Nornir Building Blocks - Inventory Files

```
# inventory/hosts.yaml
```

```
---
```

```
Switch1:
```

```
  hostname: 172.21.21.1
  platform: junos
  username: juniper
  password: junosrules!
  groups:
    - juniper
    - americas
```

```
Router1:
```

```
  hostname: 192.168.10.1
  platform: ios
  username: cisco
  password: cisco
  groups:
    - cisco
    - emea
```

```
# inventory/groups.yaml
```

```
---
```

```
routers:
```

```
  platform: 'ios'
```

```
corporate:
```

```
  groups:
```

- emea
- americas

```
emea:
```

```
  data:
```

```
    vlans:
```

- 100: frontend
- 200: backend

```
# inventory/defaults.yaml
```

```
---
```

```
username: admin
```

```
password: admin123
```

NetBox - Your Network Source of Truth

Your system of record for network management & automation:

- ➔ Eliminate spreadsheets
- ➔ Break down DCIM & IPAM data silos
- ➔ Accelerate network automation (REST API, Webhooks etc)
- ➔ Everything is in NetBox and everything is correlated

The screenshot displays the NetBox web interface for a site named 'DM-Scranton'. The interface is organized into several sections:

- Organization:** A sidebar menu on the left lists various categories like Sites, Racks, Racks Roles, Reservations, Elevations, TENANCY, CONTACTS, Connections, Wireless, IPAM, Overlay, and Virtualization.
- Site Details:** The main content area shows the configuration for 'DM-Scranton', including its location (North America / United States / Pennsylvania), status (Active), tenant (Customers / Dunder-Mifflin, Inc.), and physical address (1728 Slough Avenue, Suite 200, Scranton, PA, 18540).
- Related Objects:** A section on the right lists related objects such as Locations, Racks, Devices, Virtual Machines, Prefixes, VLAN Groups, VLANs, ASNs, and Circuits, each with a count.
- Tags:** A section for tags with buttons for 'Add', 'Edit', and 'Delete'.
- Comments:** A section for comments, currently showing a 'Parking Notice'.
- Contacts:** A table listing contacts with columns for Name, Role, Priority, Phone, and Email.

Name	Role	Priority	Phone	Email
Dwight Schrute	Operational	Primary	272-555-3827	dschrute@dunder-mifflin.com
Pamela Halpert	Administrative	Primary	272-555-1261	phalper@dunder-mifflin.com
Michael Scott	Administrative	Secondary	272-555-9194	m.scott@dunder-mifflin.com



nornir_netbox Inventory Plugin

- Allows retrieval of NetBox device and VM inventory data
- Nornir Host objects will be created from the data in your NetBox database:
 - Name = name defined in NetBox
 - Hostname = primary IP address in NetBox, or name if no primary IP
 - Platform = platform in NetBox
 - All other attributes of a device/VM object in NetBox stored under the data attribute of the Nornir Host
- Nornir Group Objects are created for **site**, **platform**, **device_role**, **device_type** and **manufacturer** in the format ***attribute_slug***
- `groups.yaml` and `defaults.yaml` can still be used alongside



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Demo



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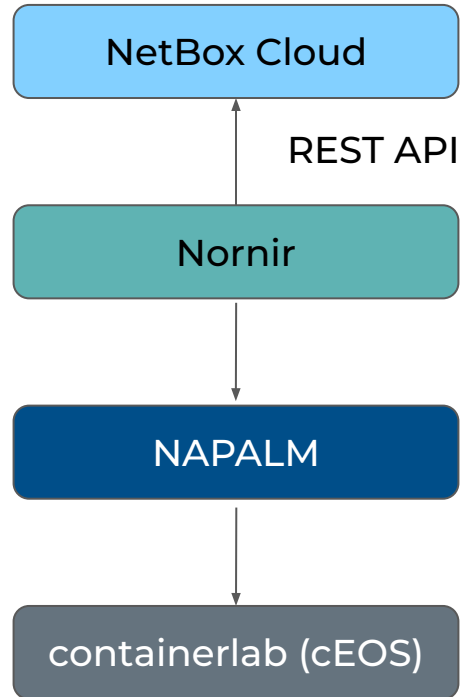
Demo Environment

Network Source of Truth (NSoT)

Network Automation Framework

Python Library (Abstraction Layer)

Virtualized Network Devices





What Next?

- Set up your own lab/playground for testing (containerlab is great!)
- Explore the Nornir + NAPALM functionality further
- Explore other Nornir python libraries/plugins. Netmiko, Scrapli etc
- Render full or partial device configurations in NetBox and deploy them with Nornir
- The possibilities are endless.....





Useful Resources

- Webinar Code: <https://github.com/netboxlabs/netbox-learning> (under the nornir-netbox-webinar directory)
- Blogs:
 - <https://netboxlabs.com/blog/nornir-python-tutorial-get-started-with-network-automation/>
 - <https://www.packetcoders.io/how-to-build-a-network-automation-stack-with-nornir-napalm-and-netbox/>
- IPvZero Youtube channel:
https://www.youtube.com/playlist?list=PLZ-4ZnYRIJplwW7_6-zfdJ6dejC1a1T_L
- Docs:
 - Nornir: <https://nornir.readthedocs.io/en/latest/>
 - nornir_netbox: <https://nornir-netbox.readthedocs.io/en/latest/>
 - NAPALM: <https://napalm.readthedocs.io/en/latest/index.html>
 - containerlab: <https://containerlab.dev/>



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New NetBox Cloud Features

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Q & A

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Thank you!

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