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Automatizando tarefas com NetBox e Nornir

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IX.br Engineering

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Por que automatizar?

- Até 95% das alterações de rede são feitas manualmente;
- Mudanças manuais levam a erros de configuração e inconsistências na rede;
- Tarefas repetitivas demandam muito tempo de um profissional;
- Tempo elevado para solucionar problemas - troubleshooting;
- Tempo elevado para implantação de equipamentos na rede;
- Tempo elevado para ativação de serviços na rede;

Desafios

- Ter uma rede padronizada faz muita diferença;
- Rede bem documentada - Inventário;
- Conhecer a infraestrutura e seus protocolos;
- Conhecimento em outras áreas além de desenvolvimento de software;

Nornir - o que é?

- Framework de automação 100% em python (debugging);
- Open-source;
- Estrutura multithread;
- Gerenciamento de inventário;
- Suporta YAML e JINJA2 através de plugins;
- Muito rápido;

```python
from nornir import InitNornir
from nornir_rich.functions import print_result
from nornir_netmiko.tasks.netmiko_send_command import netmiko_send_command


nr = InitNornir(
    runner={"plugin": "threaded", "options": {"num_workers": 20}},
    config_file="hosts.yaml")


print_result(nr.run(netmiko_send_command, command_string="show interfaces brief"))

```

Function

Task

https://nornir.readthedocs.io/en/latest/

Inventory: hosts.yaml

```yaml
R1:
  hostname: '192.168.246.94'
  port: 22
  username: 'ixforum'
  password: 'ixforum'
  platform: 'ios'
R2:
  hostname: '192.168.246.95'
  port: 22
  username: 'ixforum'
  password: 'ixforum'
  platform: 'ios'
R3:
  hostname: '192.168.246.96'
  port: 22
  username: 'ixforum'
  password: 'ixforum'
  platform: 'ios'
R4:
  hostname: '192.168.246.102'
  port: 22
  username: 'ixforum'
  password: 'ixforum'
  platform: 'ios'
R5:
  hostname: '192.168.246.103'
  port: 22
  username: 'ixforum'
  password: 'ixforum'
  platform: 'ios'

```

Nornir Plugins

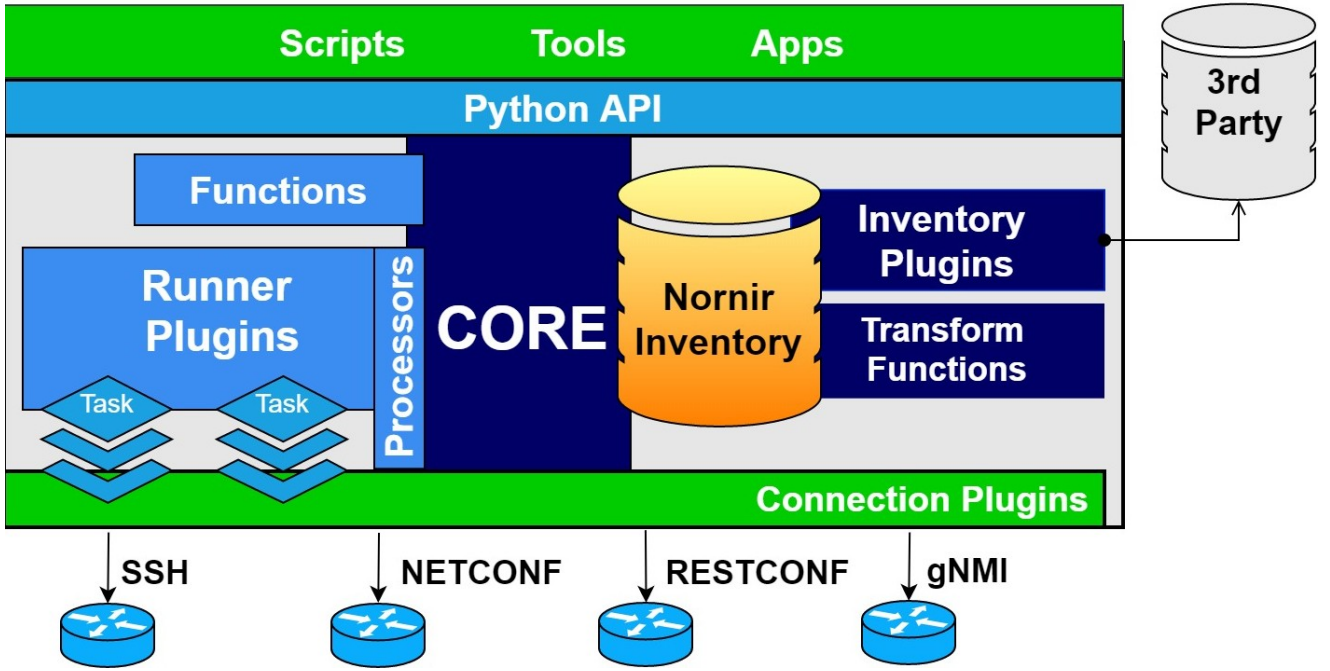
Plugin é um código utilizado para aumentar e melhorar as funcionalidades de um software;

Nornir permite adicionar funcionalidades através de plugins;

Plugins podem ser instalados usando pip:
pip install nornir_napalm

Nesta apresentação vamos usar:
- nornir_napalm
- nornir_netbox
- nornir_utils
- nornir_netmiko
- nornir_rich

Nornir Plugins Architecture



https://nornir.tech/nornir/plugins/

Nornir Tasks

- Task define as ações que serão executadas no host;
- Task é uma função python;
- Para executar uma task usamos **run**;
- Tasks são marcadas com failed em caso de exceções na execução;

```python
from nornir import InitNornir
from nornir_rich.functions import print_result
from nornir.core.task import Task, Result

def hello_world(task: Task) -> Result:
    return Result(host=task.host, result=f"{task.host.name} diga olá mundo!")

nr = InitNornir(
    runner={"plugin": "threaded", "options": {"num_workers": 20}},
    config_file="hosts.yaml")

result = nr.run(task=hello_world)

print_result(result)

```

```
hello_world
R1 diga olá mundo!
```

```
hello_world
R2 diga olá mundo!
```

```
hello_world
R3 diga olá mundo!
```

```
hello_world
R4 diga olá mundo!
```

```
hello_world
R5 diga olá mundo!
```

Nornir - Task 1: Netmiko

```python
from nornir import InitNornir
from nornir_rich.functions import print_result
from nornir_netmiko.tasks.netmiko_send_command import netmiko_send_command


nr = InitNornir(
    runner={"plugin": "threaded", "options": {"num_workers": 20}},
    config_file="hosts.yaml")


print_result(nr.run(netmiko_send_command, command_string="show interfaces brief"))
```

```
Overall Progress
Completed:  ━━━━━━━━━━━━━━━━━━━━  5/5 0:00:00 0:00:00
Concurrent:                                    0/5

netmiko_send_command
Successful: ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━  5/5
Changed:                                       0/5
Failed:                                        0/5
```

Nornir - Task 1: Netmiko - results

R1 | netmiko_send_command

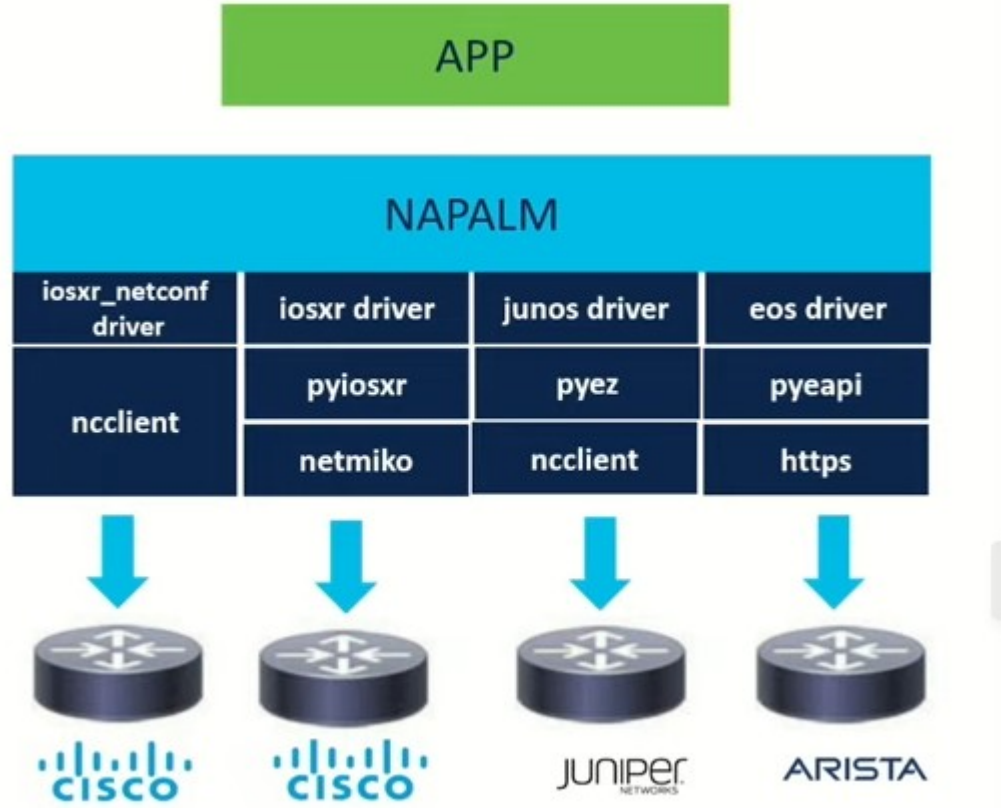
netmiko_send_command

```
Fri Nov 24 21:14:30.349 UTC

              Intf       Intf        LineP              Encap  MTU         BW
              Name       State       State               Type (byte)    (Kbps)
--------------------------------------------------------------------------------
               Lo0          up          up           Loopback  1500          0
           Lo1000           up          up           Loopback  1500          0
               Nu0          up          up               Null  1500          0
    Mg0/RP0/CPU0/0          up          up               ARPA  1514          0
         Gi0/0/0/0          up          up               ARPA  1514    1000000
         Gi0/0/0/1          up          up               ARPA  1514    1000000
         Gi0/0/0/2          up          up               ARPA  1514    1000000
         Gi0/0/0/3          up          up               ARPA  1514    1000000
```

Napalm – O que é?

- Biblioteca Python que disponibiliza funções para interagir com diferentes equipamentos de rede;
- Cisco IOS-XR, Cisco IOS, Cisco NX-OS, Junos e Arista EOS;
- Open Source;
- Camada de abstração para programação e Automação de Redes;
- Outras plataformas: https://github.com/napalm-automation-community

Functions	Functions	Functions	Functions
get_facts	get_route_to	get_arp_table	get_environment
get_interfaces	get_snmp_information	get_ntp_peers	cli
get_interfaces_counters	get_probes_config	get_ntp_servers	get_firewall_policies
get_interfaces_ip	get_probes_results	get_ntp_stats	get_ipv6_neighbors_table
get_bgp_config	traceroute	get_lldp_neighbors	get_network_instances
get_bgp_neighbors	get_users	get_lldp_neighbors_detail	get_optics
get_bgp_neighbors_detail	get_config	get_mac_address_table	ping



https://napalm.readthedocs.io/en/latest/

Napalm – Estrutura de Dados

IOS-XR

```
{
  "uptime": 35457914,
  "vendor": "Cisco",
  "hostname": "edge01.tab",
  "fqdn": "edge01.tab01",
  "os_version": "5.3.1",
  "serial_number": "FOX171",
  "model": "ASR-9904-AC”,
  "interface_list": [
      "TenGigE0/0/0/13",
      "TenGigE0/0/0/14",
      "TenGigE0/0/0/24”
   ]
}
```

IOS

```
{
  "uptime": 16676160,
  "vendor": "Cisco",
  "hostname": "NS2903",
  "fqdn": "NS2903-ASW"
  "os_version": "15.0(2)”,
  "serial_number": "FOC1",
  "model": "WS-C2960G",
  "interface_list": [
     "Vlan1",
     "GigabitEthernet0/1”,
     "GigabitEthernet0/5”
   ]
}
```

JUNOS

```
{
  "uptime": 4380,
  "vendor": "Juniper",
  "hostname": "vsrx",
  "fqdn": "vsrx",
  "os_version": "12.1X4",
  "serial_number": "beb91",
  "model": "FIREFLY",
  "interface_list": [
      "ge-0/0/0",
      "ge-0/0/1",
      "ge-0/0/2”
    ]
}
```

EOS

```
{
  "uptime": 123456,
  "vendor": "Arista”,
"hostname": "localhost",
  "fqdn": "localhost",
  "os_version": "4.15.5M",
  "serial_number": "",
  "model": "vEOS",
  "interface_list": [
    "Ethernet1",
    "Ethernet2",
    "Ethernet3",
    "Management1
  ],
}
```

Nornir - Task 2: Napalm

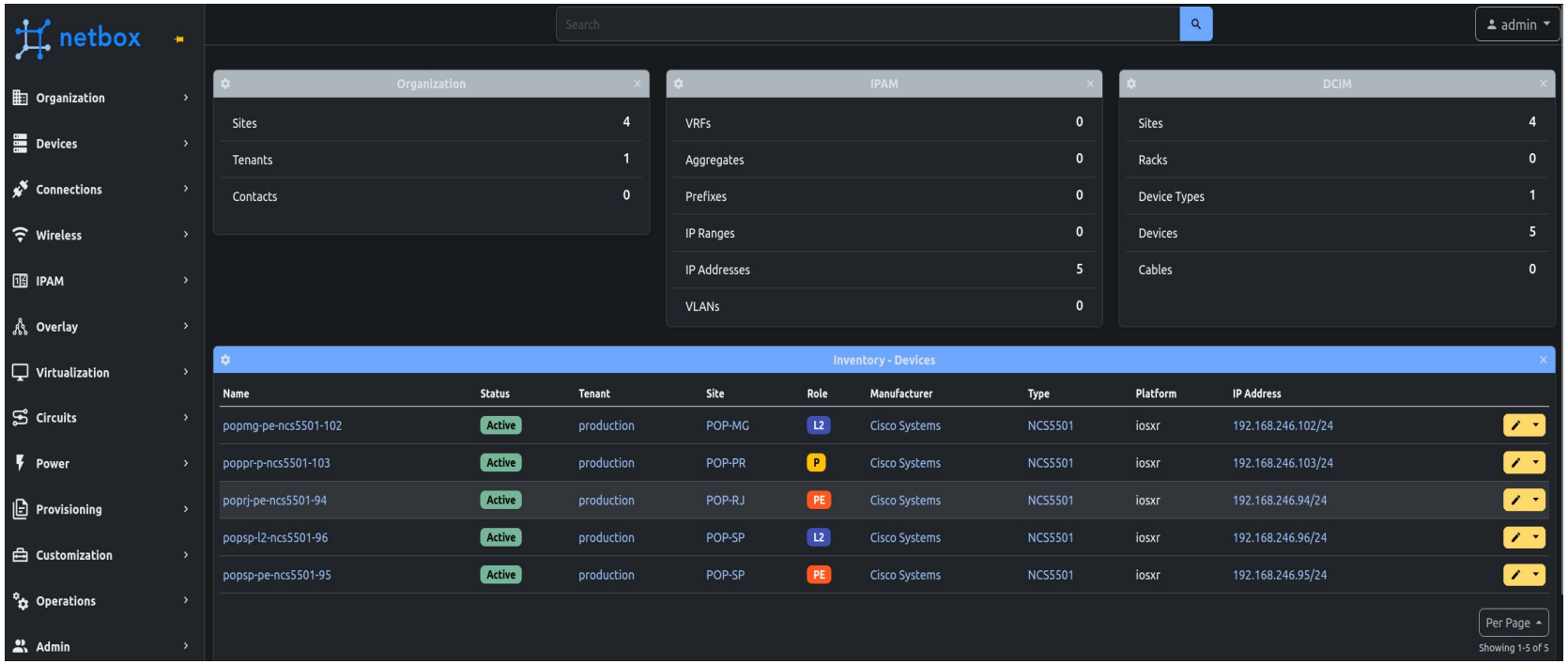
```python
from nornir import InitNornir
from nornir_napalm.plugins.tasks import napalm_get
from nornir_rich.functions import print_result

nr = InitNornir(
    runner={"plugin": "threaded", "options": {"num_workers": 20}},
    config_file="hosts.yaml")

r2 = nr.filter(name="R2")

print_result(r2.run(task=napalm_get, getters=["get_interfaces"]), vars=["result"])

```

Nornir - Task 2: Napalm - results

```
result = {
        'get_interfaces': {
            'Loopback0': {'is_enabled': True, 'is_up': True, 'description': '', 'mac_address': '', 'last_flapped': -1.0, 'mtu': 1500, 'speed': 0.0},
            'Loopback1000': {'is_enabled': True, 'is_up': True, 'description': '', 'mac_address': '', 'last_flapped': -1.0, 'mtu': 1500, 'speed': 0.0},
            'Null0': {'is_enabled': True, 'is_up': True, 'description': '', 'mac_address': '', 'last_flapped': -1.0, 'mtu': 1500, 'speed': 0.0},
            'MgmtEth0/RP0/CPU0/0': {'is_enabled': True, 'is_up': True, 'description': '', 'mac_address': '50:03:00:03:00:00', 'last_flapped': -1.0, 'mtu': 1514, 'speed': 0.0},
            'GigabitEthernet0/0/0/0': {
                'is_enabled': False,
                'is_up': False,
                'description': '',
                'mac_address': '50:03:00:03:00:03',
                'last_flapped': -1.0,
                'mtu': 9198,
                'speed': 1000.0
            },
            'GigabitEthernet0/0/0/1': {'is_enabled': True, 'is_up': True, 'description': '', 'mac_address': '50:03:00:03:00:04', 'last_flapped': -1.0, 'mtu': 1514, 'speed': 1000.0},
            'GigabitEthernet0/0/0/2': {'is_enabled': True, 'is_up': True, 'description': '', 'mac_address': '50:03:00:03:00:05', 'last_flapped': -1.0, 'mtu': 1514, 'speed': 1000.0}
        }
    }
```

O que é NetBox?

- Open-source IPAM/DCIM;
- Desenvolvido em Python (Django);
- Permite documentar sua infraestrutura;
- Peça chave em Automação de Redes;
- Atua como “Source of Truth” para sua infraestrutura/rede;
- Ideal para todos os times da empresa;
- API Support
  - REST and GraphQL;
  - Webhooks;
  - Pynetbox;



https://docs.netbox.dev/en/stable/
https://github.com/netbox-community/netbox-docker

NetBox - Inventory

Name	Status	Tenant	Site	Role	Manufacturer	Type	Platform	IP Address
popmg-pe-ncs5501-102	Active	production	POP-MG	L2	Cisco Systems	NCS5501	iosxr	192.168.246.102/24
poppr-pe-ncs5501-103	Active	production	POP-PR	PE	Cisco Systems	NCS5501	iosxr	192.168.246.103/24
poprj-pe-ncs5501-94	Active	production	POP-RJ	PE	Cisco Systems	NCS5501	iosxr	192.168.246.94/24
popsp-l2-ncs5501-96	Active	production	POP-SP	L2	Cisco Systems	NCS5501	iosxr	192.168.246.96/24
popsp-pe-ncs5501-95	Active	production	POP-SP	PE	Cisco Systems	NCS5501	iosxr	192.168.246.95/24

Per Page

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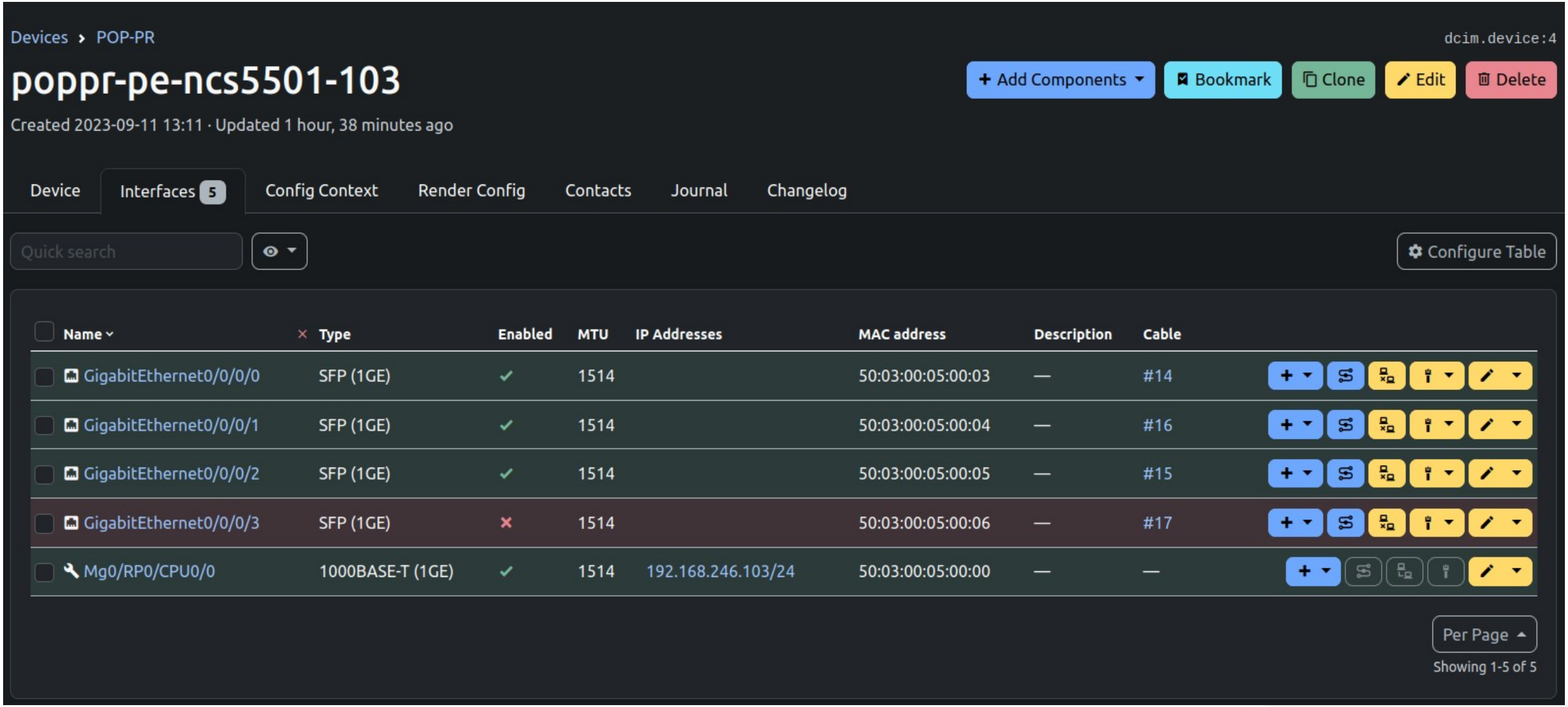
Nornir - Task 3: Napalm + Netbox

```
6   nr = InitNornir(
7           runner={"plugin": "threaded", "options": {"num_workers": 20}},
8           inventory={
9               "plugin": "NetBoxInventory2",
10              "options": {
11                  "nb_url": os.getenv("NETBOX_URL"),
12                  "nb_token": os.getenv("NETBOX_TOKEN"),
13                  "filter_parameters": {"tenant": "production",
14                                        "role": "l2",
15                                        "region": "mg",
16                                        "status": "active",
17                                        "platform": "iosxr"},
18                  "ssl_verify": False}
19          })
20
21  nr.inventory.defaults.username = os.getenv("USER")
22  nr.inventory.defaults.password = os.getenv("PASSWORD")
23  nr.inventory.defaults.port = os.getenv("SSH_PORT")
24
25  print_result(nr.run(task=napalm_get, getters=["get_interfaces"]), vars=["result"])
26
```

Nornir - Task 3: Napalm + NetBox - results

```
result = {
        'get_interfaces': {
            'Loopback0': {'is_enabled': True, 'is_up': True, 'description': '', 'mac_address': '', 'last_flapped': -1.0, 'mtu': 1500, 'speed': 0.0},
            'Loopback1000': {'is_enabled': True, 'is_up': True, 'description': '', 'mac_address': '', 'last_flapped': -1.0, 'mtu': 1500, 'speed': 0.0},
            'Null0': {'is_enabled': True, 'is_up': True, 'description': '', 'mac_address': '', 'last_flapped': -1.0, 'mtu': 1500, 'speed': 0.0},
            'MgmtEth0/RP0/CPU0/0': {'is_enabled': True, 'is_up': True, 'description': '', 'mac_address': '50:03:00:03:00:00', 'last_flapped': -1.0, 'mtu': 1514, 'speed': 0.0},
            'GigabitEthernet0/0/0/0': {
                'is_enabled': False,
                'is_up': False,
                'description': '',
                'mac_address': '50:03:00:03:00:03',
                'last_flapped': -1.0,
                'mtu': 9198,
                'speed': 1000.0
            },
            'GigabitEthernet0/0/0/1': {'is_enabled': True, 'is_up': True, 'description': '', 'mac_address': '50:03:00:03:00:04', 'last_flapped': -1.0, 'mtu': 1514, 'speed': 1000.0},
            'GigabitEthernet0/0/0/2': {'is_enabled': True, 'is_up': True, 'description': '', 'mac_address': '50:03:00:03:00:05', 'last_flapped': -1.0, 'mtu': 1514, 'speed': 1000.0}
        }
    }
```

NetBox – Source of Truth



Informações do NetBox – GraphQL API


```
{
  "data": {
    "interface_list": [
      {
        "name": "GigabitEthernet0/0/0/0",
        "enabled": true,
        "mac_address": "50:03:00:05:00:03",
        "description": "",
        "mtu": 1514
      },
      {
        "name": "GigabitEthernet0/0/0/1",
        "enabled": true,
        "mac_address": "50:03:00:05:00:04",
        "description": "",
        "mtu": 1514
      },
      {
        "name": "GigabitEthernet0/0/0/2",
        "enabled": true,
        "mac_address": "50:03:00:05:00:05",
        "description": "",
        "mtu": 1514
      },
      {
        "name": "GigabitEthernet0/0/0/3",
        "enabled": false,
        "mac_address": "50:03:00:05:00:06",
        "description": "",
        "mtu": 1514
      },
      {
        "name": "Mg0/RP0/CPU0/0",
        "enabled": true,
        "mac_address": "50:03:00:05:00:00",
        "description": "",
        "mtu": 1514
      }
    ]
  }
}
```

Informações do Device:

```
  name = 'napalm_get'
result = {
            'get_interfaces': {
                'GigabitEthernet0/0/0/0': {'is_enabled': True, 'is_up': True, 'mac_address': '50:03:00:05:00:03', 'description': '', 'speed': 1000.0, 'last_flapped': -1.0, 'mtu': 1514},
                'GigabitEthernet0/0/0/1': {'is_enabled': True, 'is_up': True, 'mac_address': '50:03:00:05:00:04', 'description': '', 'speed': 1000.0, 'last_flapped': -1.0, 'mtu': 1514},
                'GigabitEthernet0/0/0/2': {'is_enabled': True, 'is_up': True, 'mac_address': '50:03:00:05:00:05', 'description': '', 'speed': 1000.0, 'last_flapped': -1.0, 'mtu': 1514},
                'GigabitEthernet0/0/0/3': {
                    'is_enabled': False,
                    'is_up': False,
                    'mac_address': '50:03:00:05:00:06',
                    'description': '',
                    'speed': 1000.0,
                    'last_flapped': -1.0,
                    'mtu': 1514
                },
                'Loopback0': {'is_enabled': True, 'is_up': True, 'mac_address': '', 'description': '', 'speed': 0.0, 'last_flapped': -1.0, 'mtu': 1500},
                'MgmtEth0/RP0/CPU0/0': {'is_enabled': True, 'is_up': True, 'mac_address': '50:03:00:05:00:00', 'description': '', 'speed': 0.0, 'last_flapped': -1.0, 'mtu': 1514},
                'Null0': {'is_enabled': True, 'is_up': True, 'mac_address': '', 'description': '', 'speed': 0.0, 'last_flapped': -1.0, 'mtu': 1500}
            }
        }
```

Nornir - Task 5: Napalm + NetBox + Netmiko

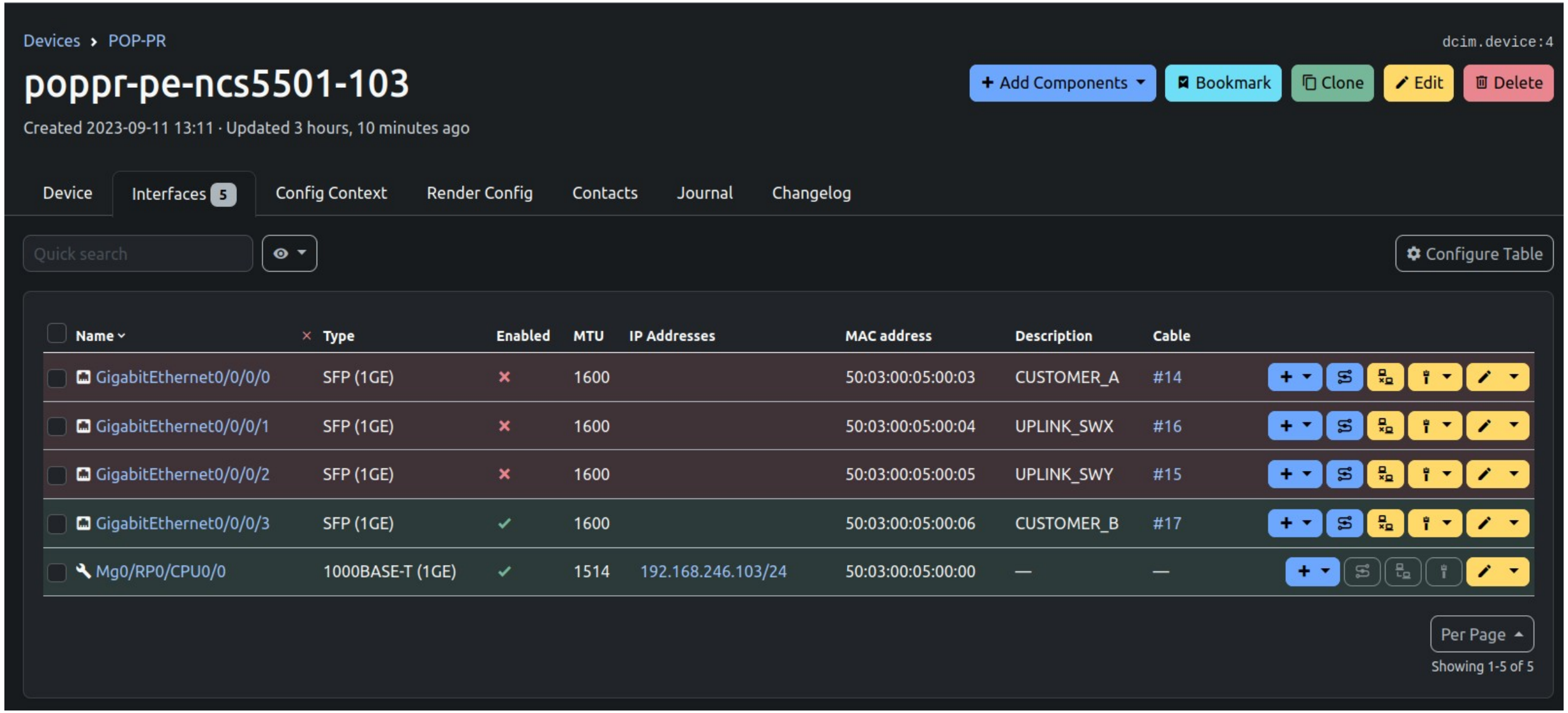
```python
def nornir_netmiko_configure(task):
    try:
        data_device = task.run(task=napalm_get, getters=["get_interfaces"])
        data_device = data_device.result['get_interfaces']

        url_netbox = str(os.getenv("NETBOX_URL"))+"/api/dcim/interfaces/?device="+str(task.host)
        response_device = requests.request("GET", url_netbox, headers=headers, verify=False)

        for interface_netbox in response_device.json()['results']:
            configurations=["interface "+str(interface_netbox['name'])]
            if data_device[interface_netbox['name']]['is_enabled'] != interface_netbox['enabled']:
                if interface_netbox['enabled'] == True:
                    configurations.append("no shutdown")
                if interface_netbox['enabled'] == False:
                    configurations.append("shutdown")
            if data_device[interface_netbox['name']]['description'] != interface_netbox['description']:
                if interface_netbox['description'] == "":
                    configurations.append("no description")
                else:
                    configurations.append("description "+str(interface_netbox['description']))
            if data_device[interface_netbox['name']]['mtu'] != interface_netbox['mtu']:
                configurations.append("mtu "+str(interface_netbox['mtu']))
            if len(configurations) > 1:
                command = task.run(netmiko_send_config, config_commands=configurations)
                print_result(command)
                commit = task.run(netmiko_commit)
                print_result(commit)
    except Exception as err:
        print(err)

```

NetBox – Alterações



Nornir - Task 5 – results (Configuração Automatizada)

```
netmiko_send_config
configure terminal

Tue Nov 28 19:38:32.431 UTC
RP/0/RP0/CPU0:poppr-p-ncs5501-103(config)#interface GigabitEthernet0/0/0/0

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#shutdown

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#description CUSTOMER_A

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#mtu 1600

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#
```

```
netmiko_commit
commit

Tue Nov 28 19:38:33.290 UTC
RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#
```

```
netmiko_send_config
configure terminal

Tue Nov 28 19:25:18.936 UTC
RP/0/RP0/CPU0:poppr-p-ncs5501-103(config)#interface GigabitEthernet0/0/0/1

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#shutdown

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#description UPLINK_SWX

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#mtu 1600

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#
```

```
netmiko_commit
commit

Tue Nov 28 19:38:35.126 UTC
RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#
```

Nornir - Task 5 – results (Configuração Automatizada)

```
netmiko_send_config
configure terminal

Tue Nov 28 19:25:20.888 UTC
RP/0/RP0/CPU0:poppr-p-ncs5501-103(config)#interface GigabitEthernet0/0/0/2

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#shutdown

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#description UPLINK_SWY

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#mtu 1600

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#
```

```
netmiko_commit
commit

Tue Nov 28 19:38:36.955 UTC
RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#
```

```
netmiko_send_config
configure terminal

Tue Nov 28 19:38:38.051 UTC
RP/0/RP0/CPU0:poppr-p-ncs5501-103(config)#interface GigabitEthernet0/0/0/3

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#no shutdown

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#description CUSTOMER_B

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#mtu 1600

RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#
```

```
netmiko_commit
commit

Tue Nov 28 19:38:38.913 UTC
RP/0/RP0/CPU0:poppr-p-ncs5501-103(config-if)#
```

Informações do Device (após alterações):

```
  name = 'napalm_get'
result = {
            'get_interfaces': {
                'GigabitEthernet0/0/0/0': {
                    'is_enabled': False,
                    'is_up': False,
                    'mac_address': '50:03:00:05:00:03',
                    'description': 'CUSTOMER_A',
                    'speed': 1000.0,
                    'last_flapped': -1.0,
                    'mtu': 1600
                },
                'GigabitEthernet0/0/0/1': {
                    'is_enabled': False,
                    'is_up': False,
                    'mac_address': '50:03:00:05:00:04',
                    'description': 'UPLINK_SWX',
                    'speed': 1000.0,
                    'last_flapped': -1.0,
                    'mtu': 1600
                },
                'GigabitEthernet0/0/0/2': {
                    'is_enabled': False,
                    'is_up': False,
                    'mac_address': '50:03:00:05:00:05',
                    'description': 'UPLINK_SWY',
                    'speed': 1000.0,
                    'last_flapped': -1.0,
                    'mtu': 1600
                },
                'GigabitEthernet0/0/0/3': {'is_enabled': True, 'is_up': True, 'mac_address': '50:03:00:05:00:06', 'description': 'CUSTOMER_B', 'speed': 1000.0, 'last_flapped': -1.0, 'mtu': 1600},
                'Loopback0': {'is_enabled': True, 'is_up': True, 'mac_address': '', 'description': '', 'speed': 0.0, 'last_flapped': -1.0, 'mtu': 1500},
                'MgmtEth0/RP0/CPU0/0': {'is_enabled': True, 'is_up': True, 'mac_address': '50:03:00:05:00:00', 'description': '', 'speed': 0.0, 'last_flapped': -1.0, 'mtu': 1514},
                'Null0': {'is_enabled': True, 'is_up': True, 'mac_address': '', 'description': '', 'speed': 0.0, 'last_flapped': -1.0, 'mtu': 1500}
            }
        }
```

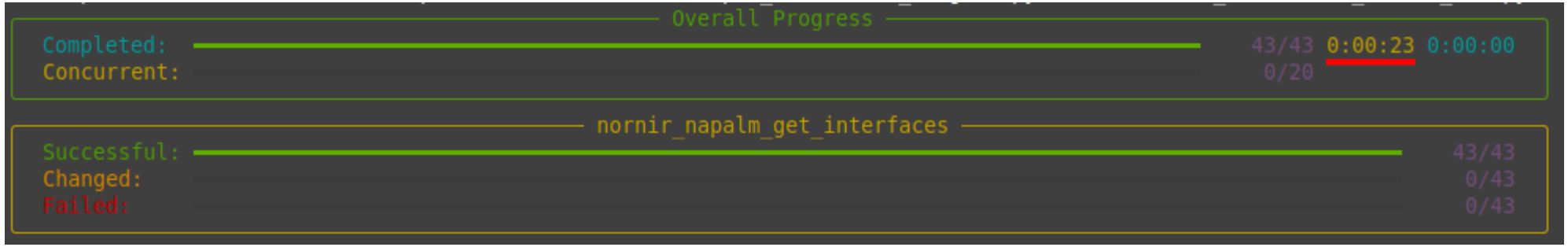
Informações do NetBox – GraphQL API (Antes x Depois)


```
{
  "data": {
    "interface_list": [
      {
        "name": "GigabitEthernet0/0/0/0",
        "enabled": true,
        "mac_address": "50:03:00:05:00:03",
        "description": "",
        "mtu": 1514
      },
      {
        "name": "GigabitEthernet0/0/0/1",
        "enabled": true,
        "mac_address": "50:03:00:05:00:04",
        "description": "",
        "mtu": 1514
      },
      {
        "name": "GigabitEthernet0/0/0/2",
        "enabled": true,
        "mac_address": "50:03:00:05:00:05",
        "description": "",
        "mtu": 1514
      },
      {
        "name": "GigabitEthernet0/0/0/3",
        "enabled": false,
        "mac_address": "50:03:00:05:00:06",
        "description": "",
        "mtu": 1514
      },
      {
        "name": "Mg0/RP0/CPU0/0",
        "enabled": true,
        "mac_address": "50:03:00:05:00:00",
        "description": "",
        "mtu": 1514
      }
    ]
  }
}
```

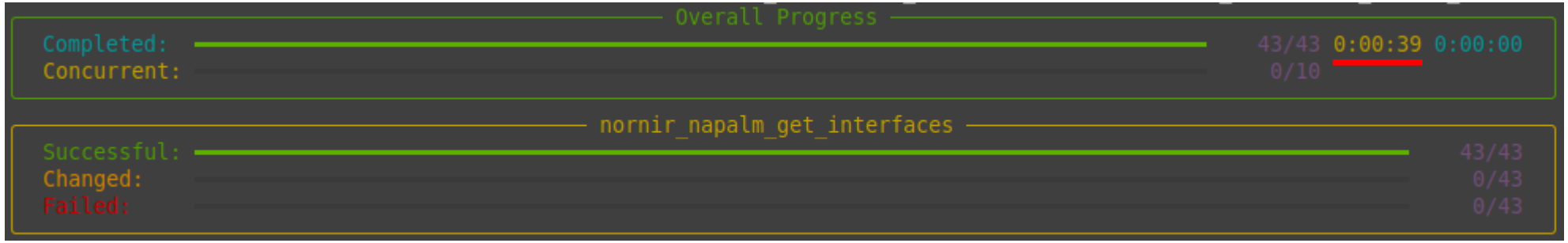


```
{
  "data": {
    "interface_list": [
      {
        "name": "GigabitEthernet0/0/0/0",
        "enabled": false,
        "mac_address": "50:03:00:05:00:03",
        "description": "CUSTOMER_A",
        "mtu": 1600
      },
      {
        "name": "GigabitEthernet0/0/0/1",
        "enabled": false,
        "mac_address": "50:03:00:05:00:04",
        "description": "UPLINK_SWX",
        "mtu": 1600
      },
      {
        "name": "GigabitEthernet0/0/0/2",
        "enabled": false,
        "mac_address": "50:03:00:05:00:05",
        "description": "UPLINK_SWY",
        "mtu": 1600
      },
      {
        "name": "GigabitEthernet0/0/0/3",
        "enabled": true,
        "mac_address": "50:03:00:05:00:06",
        "description": "CUSTOMER_B",
        "mtu": 1600
      },
      {
        "name": "Mg0/RP0/CPU0/0",
        "enabled": true,
        "mac_address": "50:03:00:05:00:00",
        "description": "",
        "mtu": 1514
      }
    ]
  }
}
```

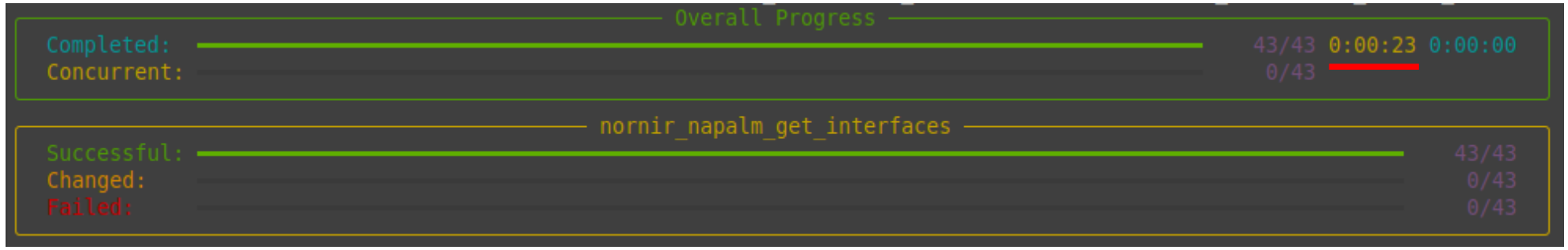
Curiosidades: Nornir Workers



20



10

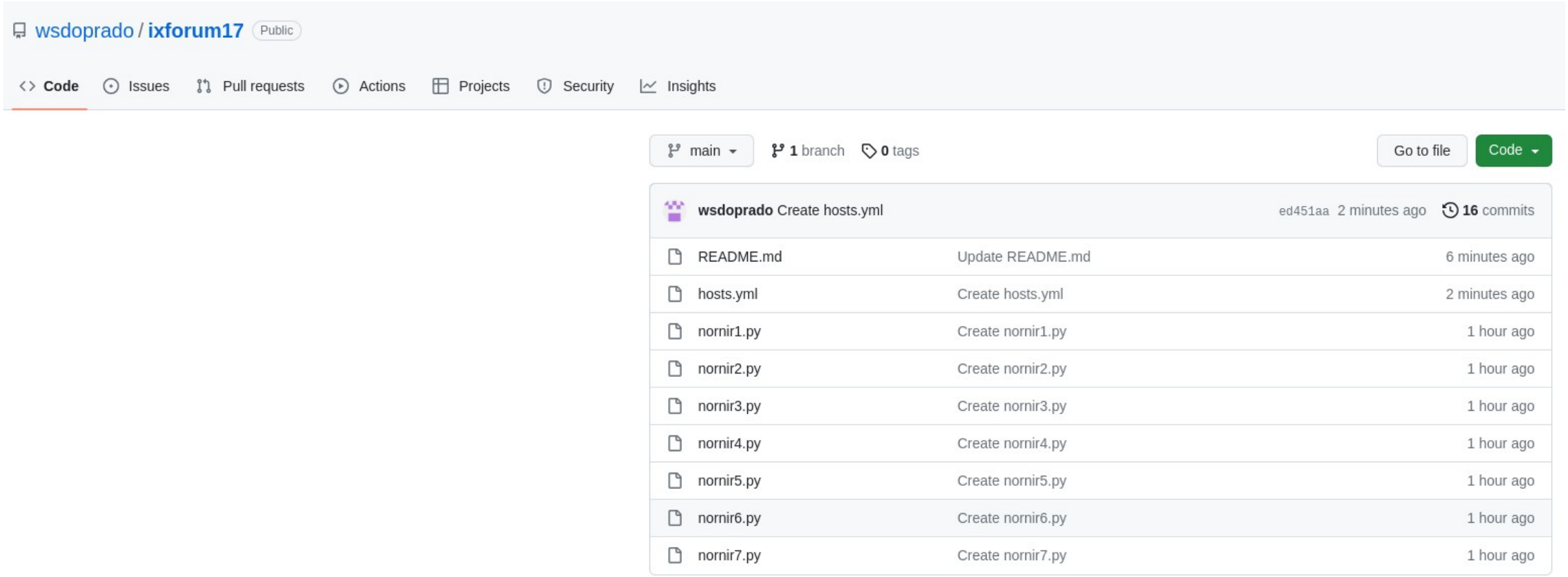


50

CONCLUSÕES

- Nornir é um framework de automação de redes com gerenciamento de inventário que ajuda a operar vários elementos de rede;
- A estrutura multithread do Nornir permite gerenciar configurações de múltiplos devices simultaneamente;
- Ter a documentação da Rede em sistemas como o NetBox facilita o processo de automação;
- Usar o NetBox como Source of Truth aumenta as possibilidades de automação;
- Tarefas automatizadas podem ser executadas muito mais rápido do que quando operadas em redes manualmente;
- Tarefas automatizadas diminuem o número de erros de configuração e também os custos de operação;
- Tarefas automatizadas aprimoram a escalabilidade da rede;

Repositório no GITHUB:



https://github.com/wsdoprado/ixforum17/

Obrigado

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7 de dezembro de 2023

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