



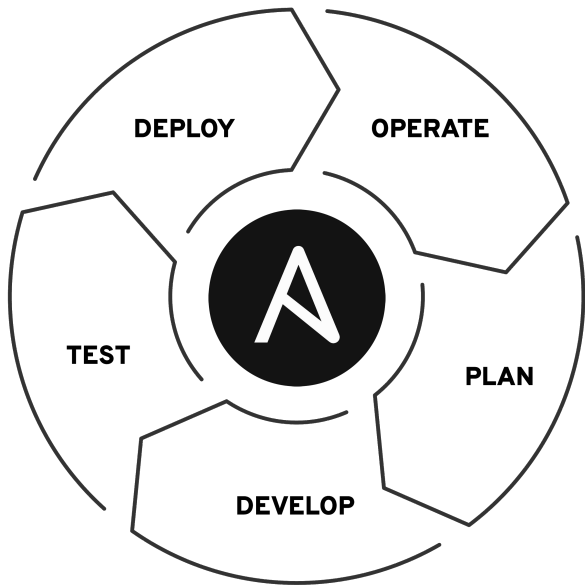
RED HAT[®]
ANSIBLE[®]
Network Automation

ANSIBLE

Managing 15,000 network devices with Ansible

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Combining the foundation of Ansible Engine with the enterprise abilities of Ansible Tower to automate physical networking devices.



INFRASTRUCTURE AS YAML

- Automate backup & restores
- Manage “golden” versions of configurations

CONFIGURATION MANAGEMENT

- Changes can be incremental or wholesale
- Make it part of the process: agile, waterfall, etc.

ENSURE AN ONGOING STEADY STATE

- Schedule tasks daily, weekly, or monthly
- Perform regular state checking and validation

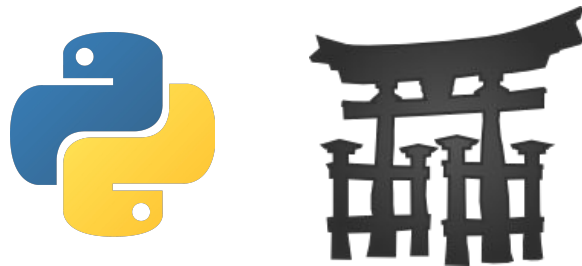
Networks will still exist, and the world will still need people who know physical networks!

Ansible makes network management easier but it's a *framework* for building your automation.

Remember when we said Ansible was easy to learn? It's as easy as you need it to be!

It needs to be built by the people who know it best.

YAML, Jinja, and Python...oh my!



Yes!

Here's a Playbook to login and do `show run`:

```
---
- hosts: all
  connection: network_cli
  remote_user: admin
  tasks:
    - name: show run
      ios_command:
        commands:
          - show running-config
```

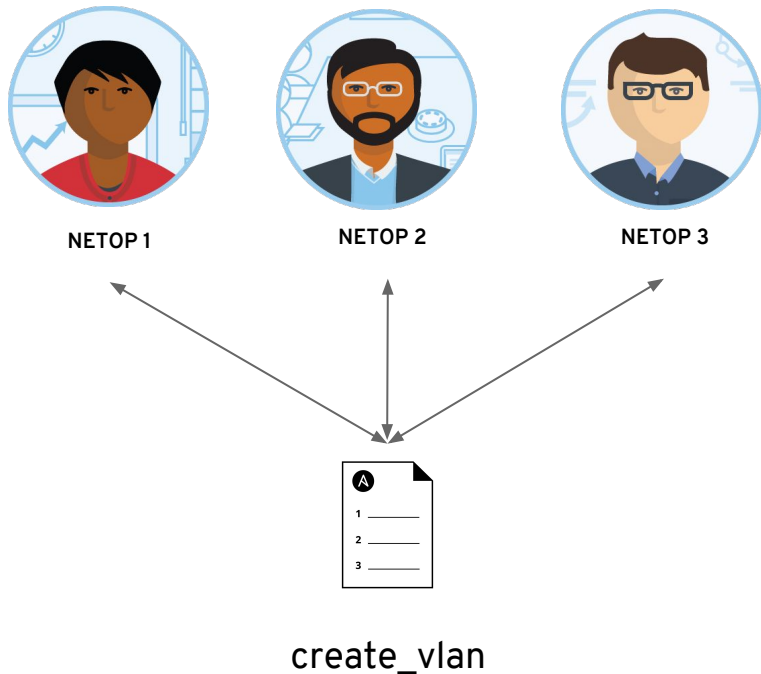
Yes (Again)!

Here's a Playbook to perform a backup:

```
---
- hosts: rtr1
  connection: network_cli
  remote_user: admin

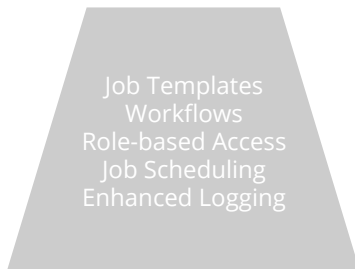
  tasks:
    - name: Backup Configuration
      ios_config:
        backup: yes
```

PROBLEM: Everyone is writing the same playbooks in a vacuum, per platform



SOLUTION: Ansible Roles

- Opinionated, task-focused solutions
- Developed, tested, distributed, and supported
- Integration with DCI and Agile development models



**API AND GUI-BASED FOR
LARGE TEAMS OF
NETWORK OPERATORS**



**CLI-BASED FOR
INDIVIDUALS,
DEVELOPERS, AND
SMALL TEAMS**

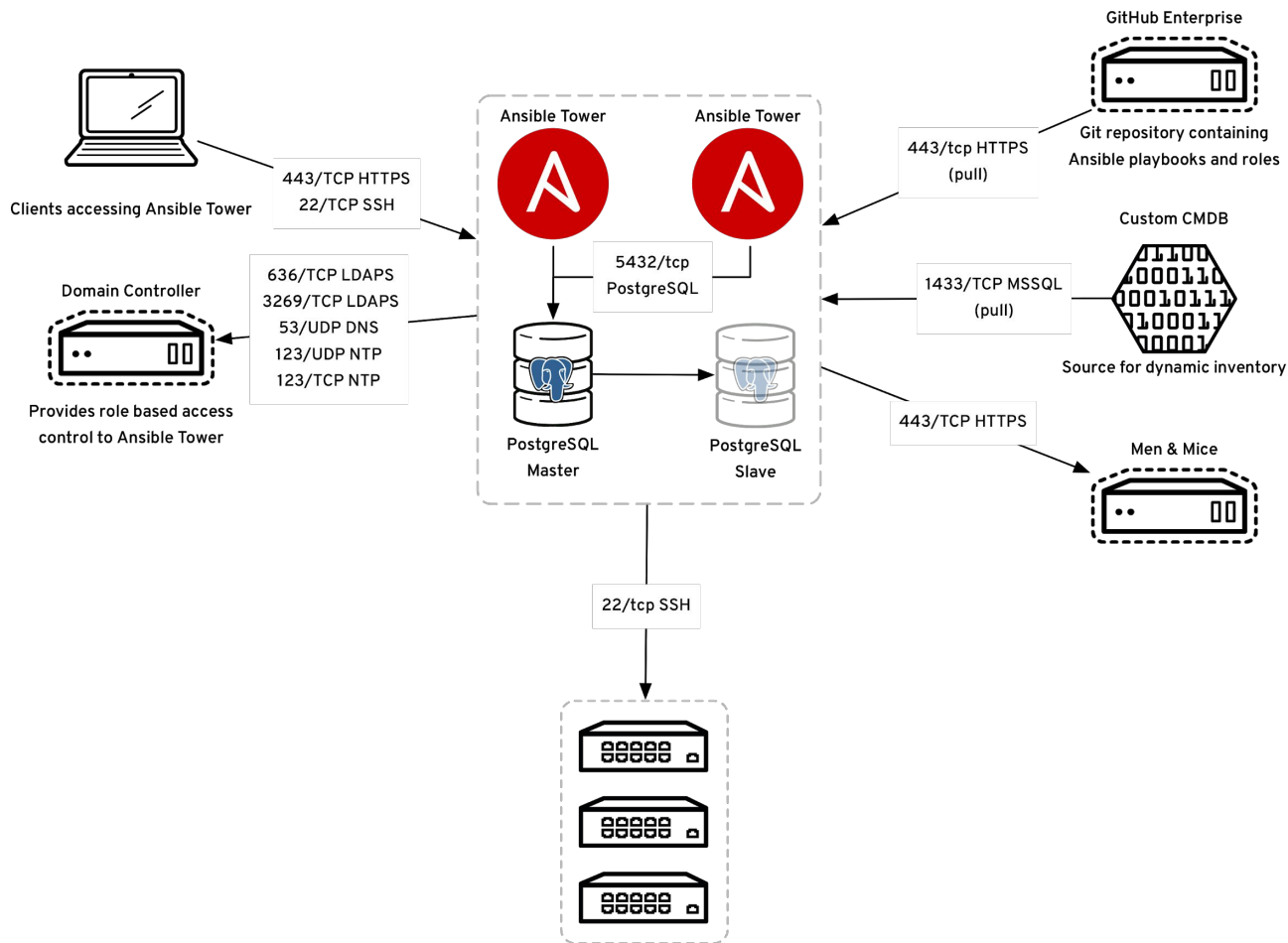
Our Project

Automate manageability use cases for multiple vendors with a wide range of versions:

- Cisco (Switching, Routing, Wireless)
 - IOS
 - IOS XR
 - IOS XE
 - NX-OS
 - AireOS
- Arista EOS (Switching, Routing)
- Aruba (Wireless)
- F5 BIG-IP (Load Balancing)
- Fortinet FortiManager (Firewall)

Configuration management that map to specific tasks for network operations:

1. Device facts and configs
2. SNMP polls/traps
3. NTP
4. Local passwords
5. Syslog
6. AAA
7. ACLs
8. Interfaces
9. Address / Address Groups



Repo breakdown

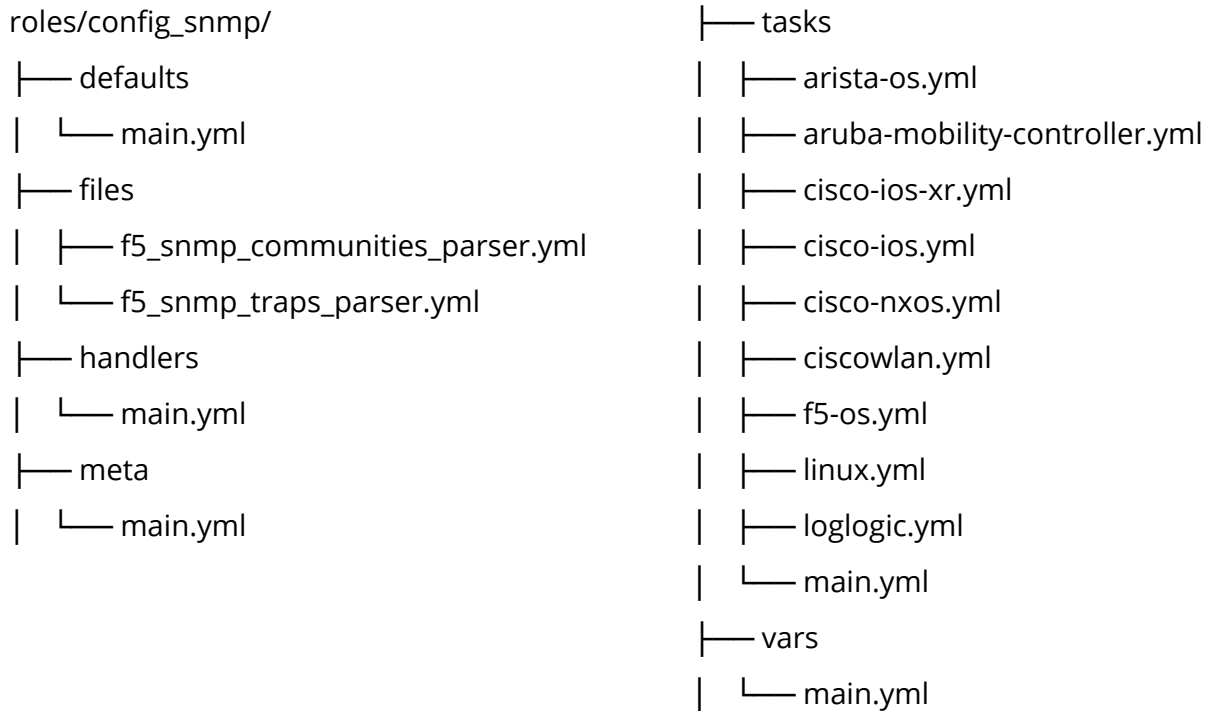
Main repo

- └─ action_plugins
- └─ filter_plugins
- └─ group_vars
- └─ inventory
- └─ library
- └─ lookup_plugins
- └─ module_utils
- └─ parsers
- └─ roles
- └─ simple_tasks
- └─ terminal_plugins
- └─ top_level_playbooks.yml

Some of the roles

- └─ adhoc
- └─ config_aaa
- └─ config_acl
- └─ config_localpw
- └─ config_ntp
- └─ config_snmp
- └─ config_syslog
- └─ deploy_psk
- └─ get_wireless_baseline
- └─ network-cli
- └─ network-engine
- └─ network_facts

Role breakdown



tasks/main.yml

```
- name: include device specific tasks
  include_tasks: "{{ device_os }}.yml"
```

tasks/cisco-ios.yml

```
# Add a line if the host is a 6500
- name: Add config line for 6500's
  set_fact:
    snmp_lines: "{{ snmp_lines }}" + [ 'snmp-server ifindex persist' ]
  when: model_number[0:2] | version_compare('65', 'eq')

- name: Apply snmp-server config lines
  ios_config:
    provider: "{{ cli }}"
    running_config: "{{ config }}"
    lines: "{{ snmp_lines }}"
    parents: "{{ snmp_parents | default(omit) }}"
    save: yes
  register: snmp_lines_applied
```

Networking at Scale

Scaling Ansible and Tower

In scaling Ansible to manage *any* amount of network devices, these are the key factors that affect job performance:

- Config size -- raw text output from ``show run`` for each device
- Device performance -- how long it takes to login, send commands, and get output
- Inventory sizes and devices families, e.g., IOS, NX, XR, EOS, etc...
- Frequency and extent of scheduling device changes
- Use or availability of Ansible network facts

Sizing inventories and jobs

- Linear gain when adding CPUs
(everything runs locally)
- Bigger isn't always better:
 - More small Tower hosts
 - Create small inventories and use job limits
 - Use lots of small jobs
- Use facts and fact caching

OPTIONS

- ☐ Enable Privilege Escalation ?
- ☐ Allow Provisioning Callbacks ?
- ☐ Enable Concurrent Jobs ?
- ☒ Use Fact Cache ?

A TOWER PROJECTS INVENTORIES TEMPLATES

TEMPLATES / Demo Job Template

Demo Job Template

DETAILS PERMISSIONS NOTIFICATIONS COMPLETED

*NAME

Demo Job Template

*INVENTORY ? ☐ PROMPT ON LA

Q Demo Inventory

*CREDENTIAL ? ☐ PROMPT ON LA

Q MACHINE: Demo Credential

*VERBOSITY ? ☐ PROMPT ON LA

0 (Normal)

SKIP TAGS ? ☐ PROMPT ON LA

OPTIONS

- ☐ Enable Privilege Escalation ?
- ☐ Allow Provisioning Callbacks ?
- ☐ Enable Concurrent Jobs ?
- ☒ Use Fact Cache ?

Single job: 500 hosts, 100 forks

Fact Collection (no changes):

IOS	4:08
XR	4:25
NX	15:35
EOS	8:09

All: 2:03:15

Local Passwords:

IOS	5:25
XR	6:23
NX	19:44
EOS	12:01

All: 2:45:12

SNMP Community Strings:

IOS	8:34
XR	10:12
NX	25:51
EOS	18:01

All: 3:34:32

The Open Source Way

All development has been contributed back to the community

- Aruba and AireOS
 - Command and config modules
 - Terminal and action plugins
- New save option
- CLI transport for F5's bigip_command
- Minor fixes
 - Connection setup
 - Documentation
 - Multiple changes in ansible-network repos

Challenges

- Limited hardware
- Variability of device versions
- Training and focus
- Scaling Ansible/Tower
- Snowflake devices
- Defining source of truth

Lessons Learned

- Effectively scaling Ansible/Tower
- Writing efficient roles and playbooks
- Implementing creative device logic
- Use facts and caching
- Job auto-sharding

Where to get started with Ansible Networking

Overview

ansible.com/overview/networking

Ansible Docs - Networking

docs.ansible.com/ansible/latest/network/index.html

Ansible Linklight

github.com/network-automation/linklight

IRC freenode #ansible-network



THANK YOU



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