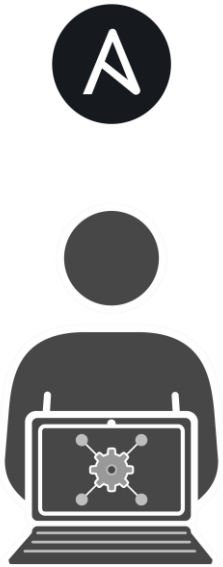
Seshagiri Sriram

Getting started with Ansible

Why do you need Ansible?



Automation happens when one person meets a problem they never want to solve again

Why Ansible?

Simple

Human readable automation

No special coding skills needed

Tasks executed in order

Usable by every team

Get productive quickly

Powerful

App deployment

Configuration management

Workflow orchestration

Network automation

Orchestrate the app lifecycle

Agentless

Agentless architecture

Uses OpenSSH & WinRM

No agents to exploit or update

Get started immediately

More efficient & more secure

What can I do using Ansible?

Automate the deployment and management of your entire IT footprint.

Do this...

- Orchestration
- Configuration Management
- Application Deployment
- Provisioning
- Continuous Delivery
- Security and Compliance

On these...

- Firewalls
- Load Balancers
- Applications
- Containers
- Clouds
- Servers
- Infrastructure
- Storage
- Network Devices

And more...

Red Hat Ansible Automation Platform

Network | Lines of business | Security |  | Operations | Infrastructure | Developers

Engage — **Ansible Hosted Services:** Engage users with an automation focused experience

Scale — **Ansible Tower:** Operate & control at scale

Create — **Ansible Engine:** Universal language of automation

Fueled by an open source community

Ansible automates technologies you use

Time to automate is measured in minutes

Cloud

AWS
Azure
Digital Ocean
Google
OpenStack
Rackspace
+more

Operating Systems

RHEL
Linux
Windows
+more

Virt & Container

Docker
VMware
RHV
OpenStack
OpenShift
+more

Storage

Netapp
Red Hat Storage
Infinidat
+more

Windows

ACLs
Files
Packages
IIS
Regedits
Shares
Services
Configs
Users
Domains
+more

Network

A10
Arista
Aruba
Cumulus
Bigswitch
Cisco
Dell
Extreme
F5
Lenovo
MikroTik
Juniper
OpenSwitch
+more

Security

Checkpoint
Cisco
CyberArk
F5
Fortinet
Juniper
IBM
Palo Alto
Snort
+more

Monitoring

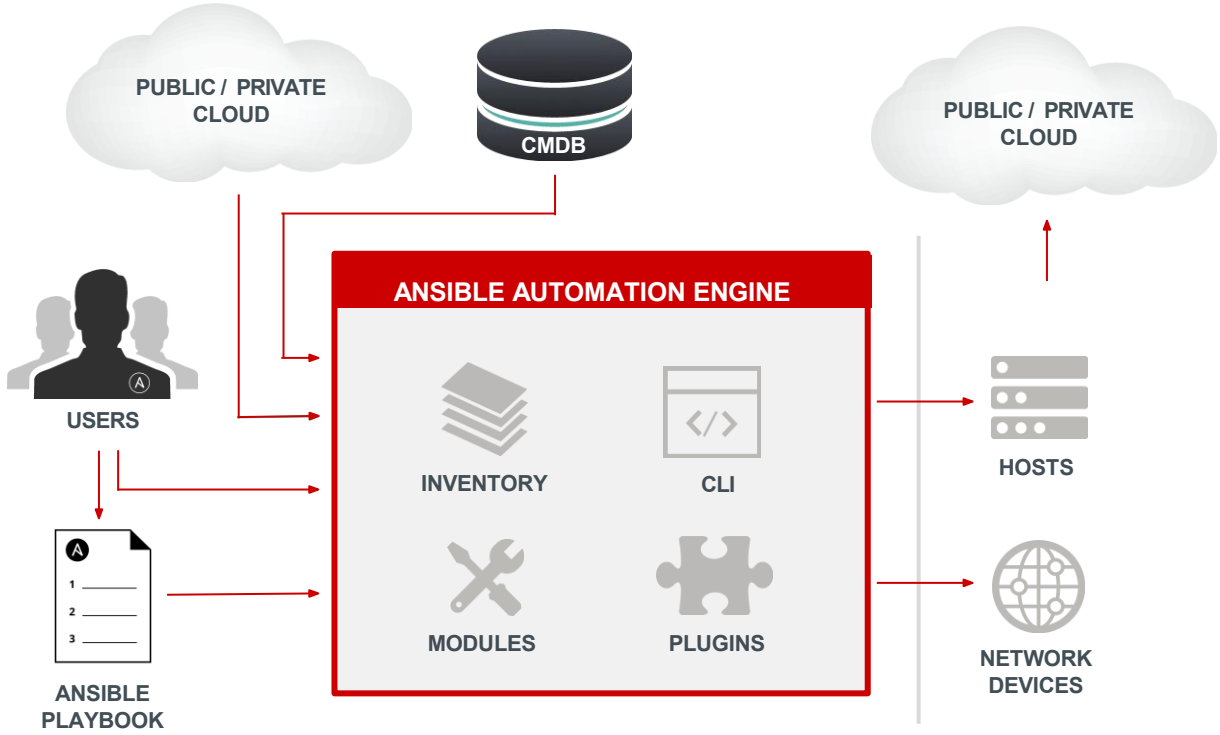
Dynatrace
Datadog
LogicMonitor
New Relic
Sensu
+more

Devops

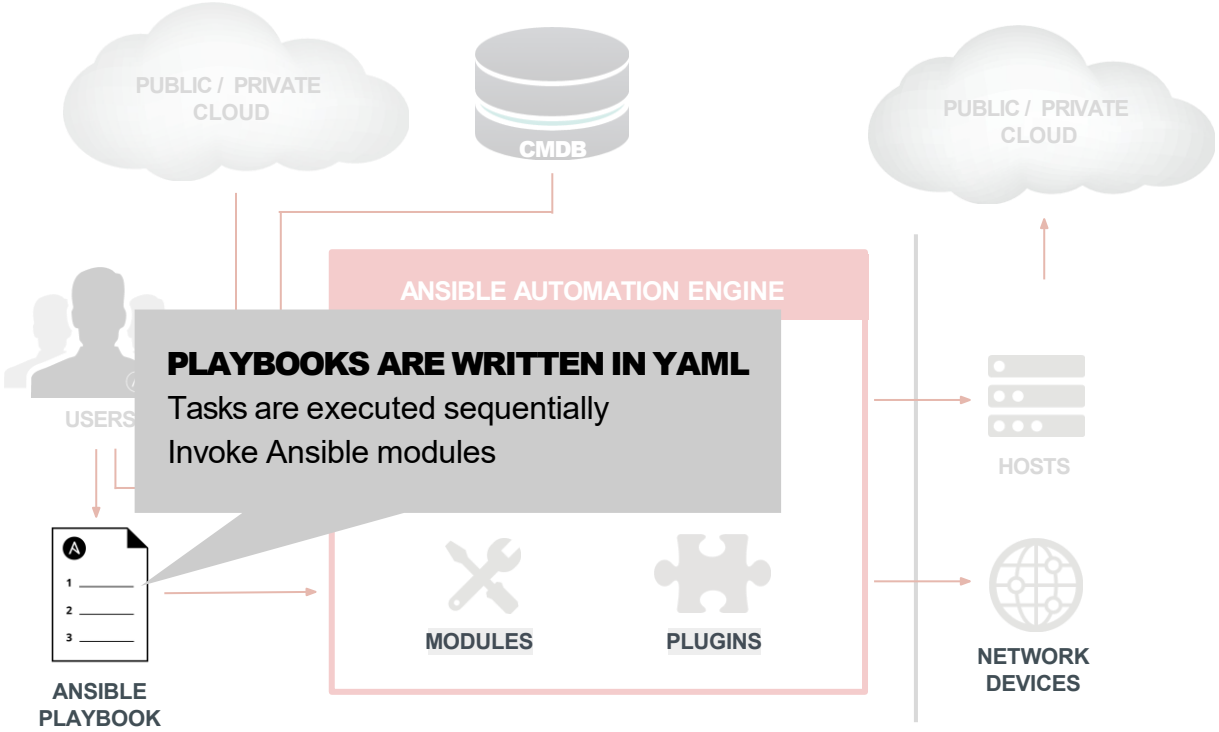
Jira
GitHub
Vagrant
Jenkins
Slack
+more

The Ansible Engine

The core Engine

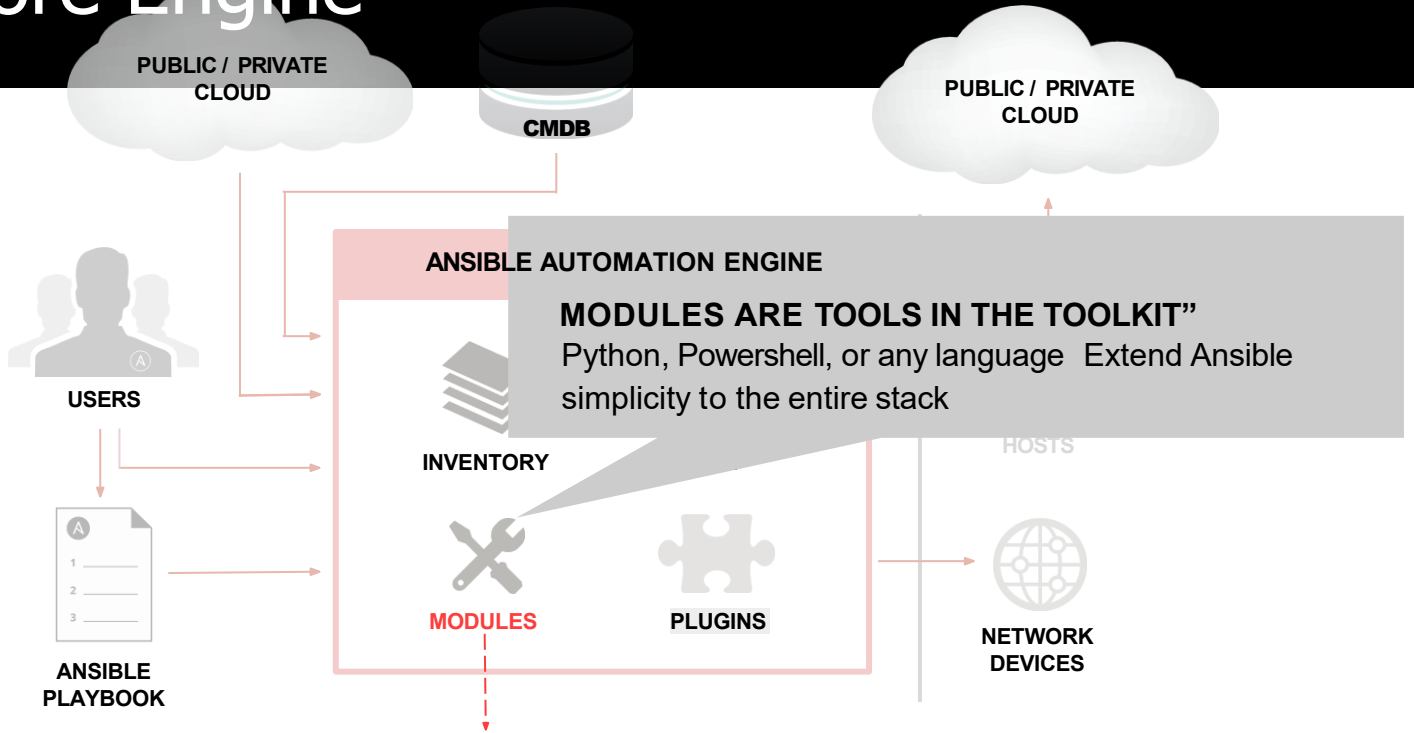


The Core Engine



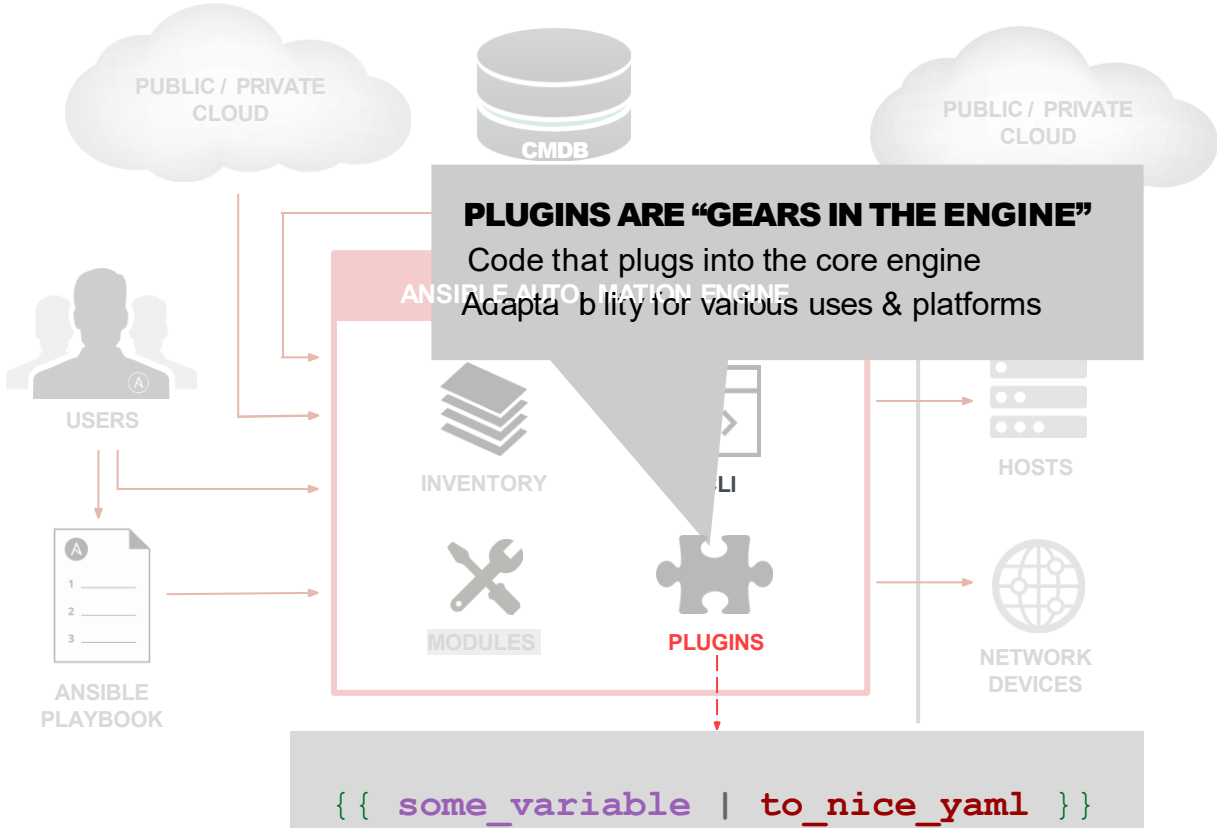
```yaml
---
- name: install and start apache
  hosts: web
  become: yes

  tasks:
    - name: httpd package is present
      yum:
        name: httpd
        state: latest

    - name: latest index.html file is present
      template:
        src: files/index.html
        dest: /var/www/html/

    - name: httpd is started
      service:
        name: httpd
        state: started
```

The Core Engine

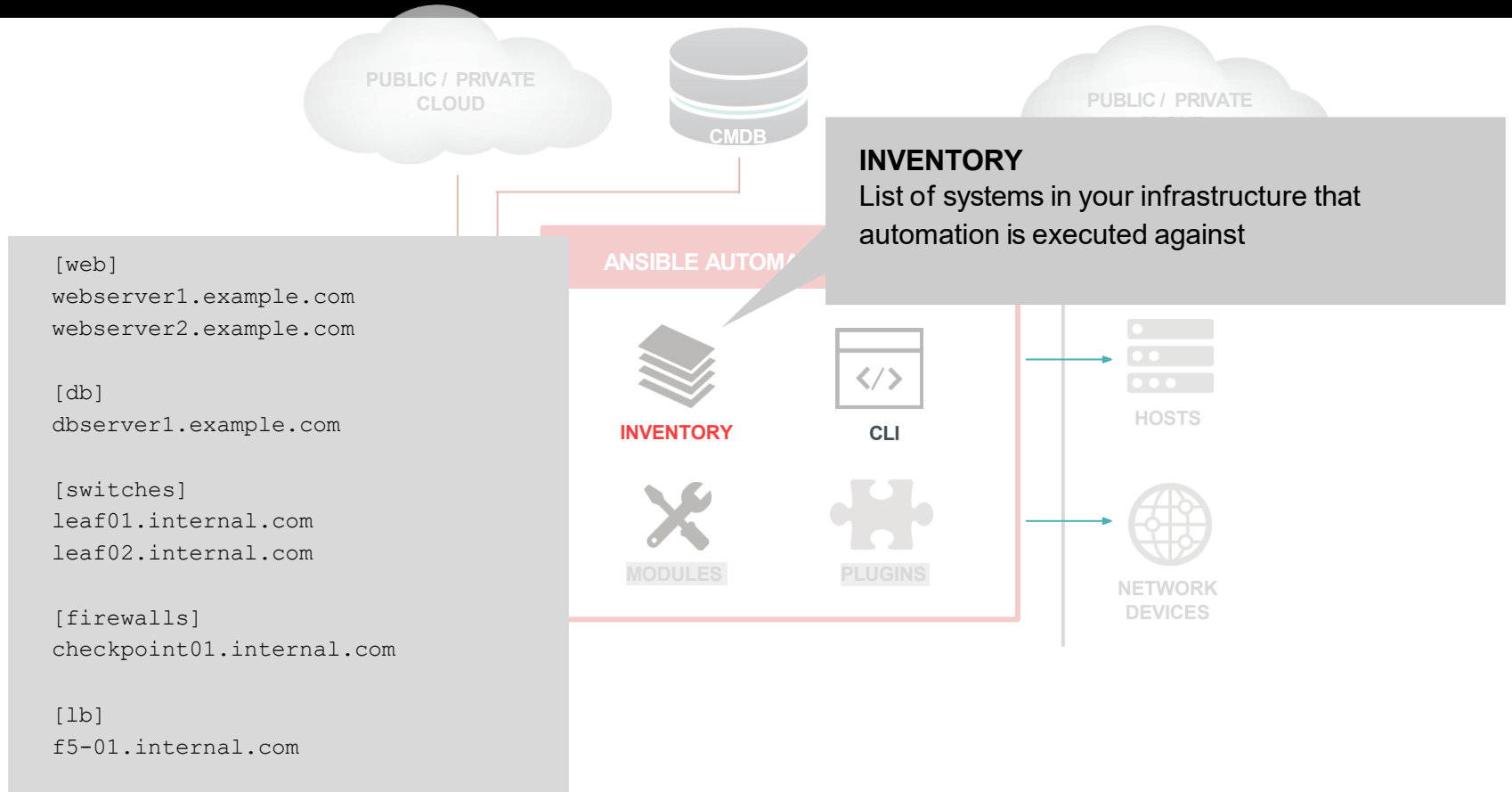



```
- name: latest index.html file is present
  template:
    src: files/index.html
    dest: /var/www/html/
```

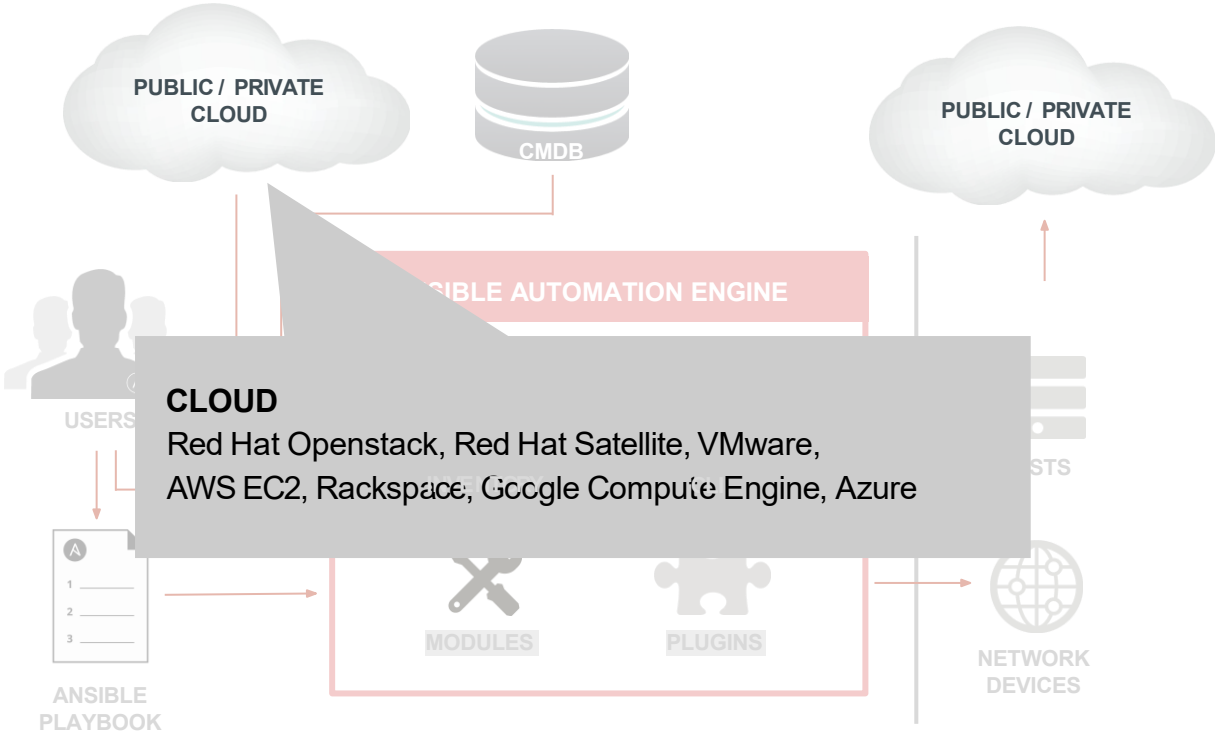
The Core Engine



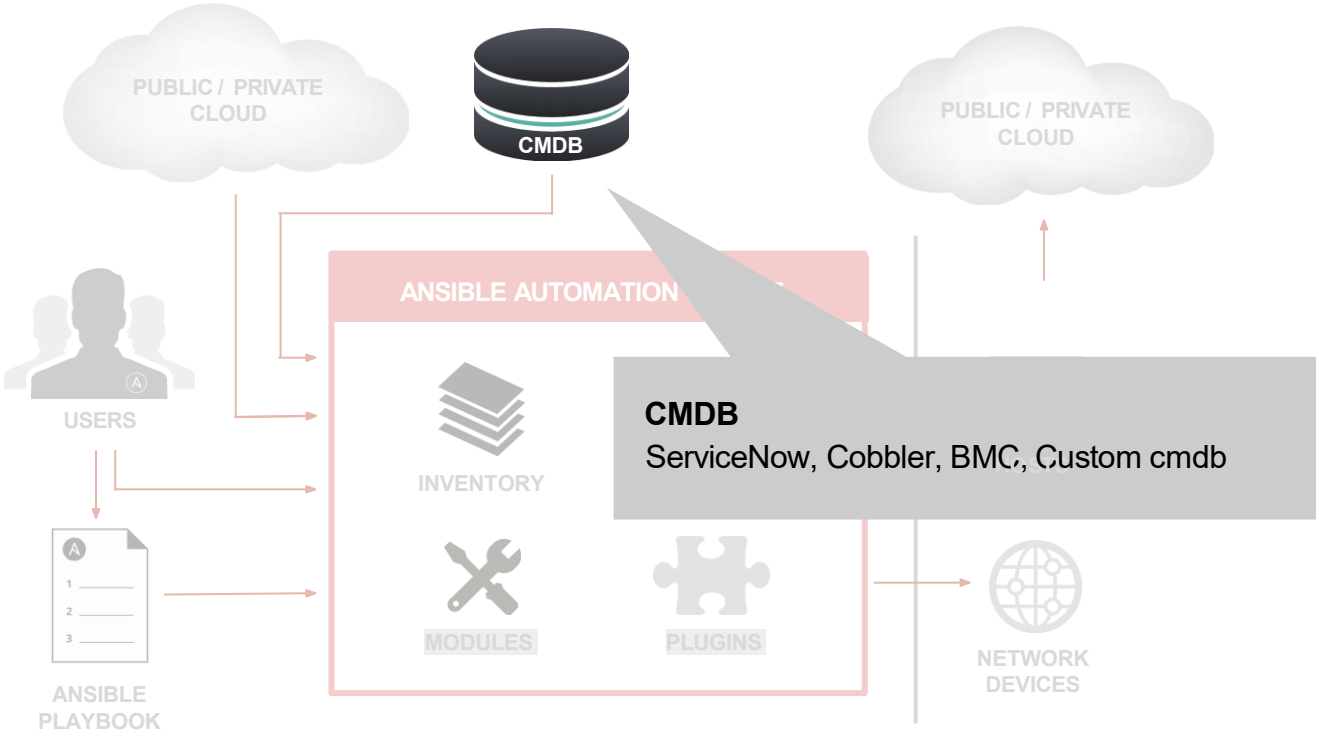
The Core Engine



The Core Engine

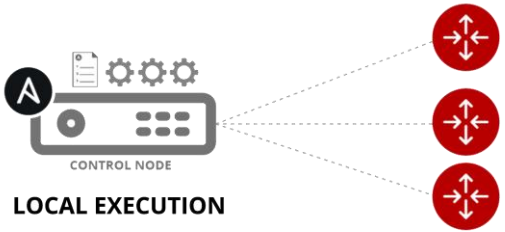


The Core Engine



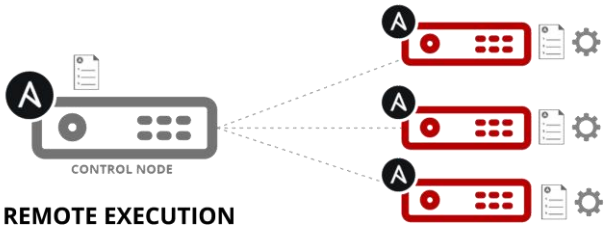
How Ansible Automation works

Module code is executed locally on the control node



NETWORKING DEVICES

Module code is copied to the managed node, executed, then removed



LINUX/WINDOWS HOSTS

Inventory

- Ansible works against multiple systems in an inventory
- Inventory is usually file based
- Can have multiple groups
- Can have variables for each group or even host

Understanding Inventory - Basic

```
# Static inventory example:
[myservers]
10.42.0.2
10.42.0.6
10.42.0.7
10.42.0.8
10.42.0.100
host.example.com
```

Understanding Inventory - Basic

```
[app1srv]
appserver01 ansible_host=10.42.0.2
appserver02 ansible_host=10.42.0.3

[web]
node-[1:30] ansible_host=10.42.0.[31:60]

[web:vars]
apache_listen_port=8080
apache_root_path=/var/www/mywebdocs/

[all:vars]
ansible_user=kev
ansible_ssh_private_key_file=/home/kev/.ssh/id_rsa
```

Understanding Inventory - Variables

```
[app1srv]
appserver01 ansible_host=10.42.0.2
appserver02 ansible_host=10.42.0.3

[web]
node-[1:30] ansible_host=10.42.0.[31:60]

[web:vars]
apache_listen_port=8080
apache_root_path=/var/www/mywebdocs/

[all:vars]
ansible_user=ender
ansible_ssh_private_key_file=/home/ender/.ssh/id_rsa
```

Understanding Inventory - Groups

```
[nashville]
bnaapp01
bnaapp02

[atlanta]
atlapp03
atlapp04

[south:children]
atlanta
nashville
hsvapp05
```

Configuration File

- Basic configuration for Ansible
- Can be in multiple locations, with different precedence
- Here: `.ansible.cfg` in the home directory
- Configures where to find the inventory

The Ansible Configuration

Configuration files will be searched for in the following order:

- ANSIBLE_CONFIG (environment variable if set)
- ansible.cfg (in the current directory)
- ~/.ansible.cfg (in the home directory)
- /etc/ansible/ansible.cfg (installed as Ansible default)

First Ad-Hoc Command: ping

- Single Ansible command to perform a task quickly directly on command line
- Most basic operation that can be performed
- Here: an example Ansible ping - not to be confused with ICMP

```
$ ansible all -m ping
```

First Ad-Hoc Command: ping

```
# Check connections (submarine ping, not ICMP)
[user@ansible] $ ansible all -m ping

web1 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python":
"/usr/bin/python"
    },
    "changed": false,
    "ping": "pong"
}
```

The Ansible Command

Some basics to keep you from getting stuck
--help (Display some basic and extensive options)

```
  [user@ansible ~]$ ansible --help

Usage: ansible <host-pattern> [options]

Define and run a single task 'playbook' against a set of hosts

Options:
  -a MODULE_ARGS, --args=MODULE_ARGS
  module arguments
  --ask-vault-pass      ask for vault password
  -B SECONDS, --background=SECONDS
<<<snippet, output removed for brevity>>>
```

Ad-Hoc Commands

Here are some common options you might use:

`-m MODULE_NAME, --module-name=MODULE_NAME`
Module name to execute the ad-hoc command

`-a MODULE_ARGS, --args=MODULE_ARGS`
Module arguments for the ad-hoc command

`-b, --become`
Run ad-hoc command with elevated rights such as sudo, the default method

`-e EXTRA_VARS, --extra-vars=EXTRA_VARS`
Set additional variables as key=value or YAML/JSON

Ad-Hoc Commands

```
# Check connections to all (submarine ping, not ICMP)
[user@ansible] $ ansible all -m ping

# Run a command on all the hosts in the web group
[user@ansible] $ ansible web -m command -a "uptime"

# Collect and display known facts for server “web1”
[user@ansible] $ ansible web1 -m setup
```

Playbooks

An Ansible Playbook

A play

```
---
- name: install and start apache
  hosts: web
  become: yes
 tasks:
   - name: httpd package is present
     yum:
       name: httpd
       state: latest

   - name: latest index.html file is present
     template:
       src: files/index.html
       dest: /var/www/html/

   - name: httpd is started
     service:
       name: httpd
       state: started
```

An Ansible Playbook

A task

```
---
- name: install and start apache
  hosts: web
  become: yes

  tasks:
    - name: httpd package is present
      yum:
        name: httpd
        state: latest

    - name: latest index.html file is present
      template:
        src: files/index.html
        dest: /var/www/html/

    - name: httpd is started
      service:
        name: httpd
        state: started
```

An Ansible Playbook

module

```
---
- name: install and start apache
  hosts: web
  become: yes

  tasks:
    - name: httpd package is present
      yum:
        name: httpd
        state: latest

    - name: latest index.html file is present
      template:
        src: files/index.html
        dest: /var/www/html/

    - name: httpd is started
      service:
        name: httpd
        state: started
```

Running an Ansible Playbook

```
A task executed as expected, no change was made.

A task executed as expected, making a change

A task failed to execute successfully
```

Running an Ansible Playbook

```
[user@ansible] $ ansible-playbook apache.yml

PLAY [webservers] ***************************************************************************

TASK [Gathering Facts] **********************************************************************
ok: [web2]
ok: [web1]
ok: [web3]

TASK [Ensure httpd package is present] ******************************************************
changed: [web2]
changed: [web1]
changed: [web3]

TASK [Ensure latest index.html file is present] *********************************************
changed: [web2]
changed: [web1]
changed: [web3]

TASK [Restart httpd] ************************************************************************
changed: [web2]
changed: [web1]
changed: [web3]

PLAY RECAP **********************************************************************************
web2                       : ok=1    changed=3  unreachable=0   failed=0
web1                       : ok=1    changed=3  unreachable=0   failed=0
web3                       : ok=1    changed=3  unreachable=0   failed=0
```

Other Concepts

Variables

Group Variables

Idempotency

An Ansible Playbook Variable Example

```
---
- name: variable playbook test
  hosts: localhost

  vars:
    var_one: awesome
    var_two: ansible is
    var_three: "{{ var_two }} {{ var_one }}"

  tasks:

    - name: print out var_three
      debug:
        msg: "{{var_three}}"
```

ansible is awesome

Facts

- Just like variables, really...
- ...but: coming from the host itself!
- Check them out with the setup module

```
    "ansible_facts": {
        "ansible_default_ipv4": {
            "address": "10.41.17.37",
            "macaddress": "00:69:08:3b:a9:16",
            "interface": "eth0",
...
```

Gather facts on target machine

```
$ ansible localhost -m setup
localhost | SUCCESS => {
    "ansible_facts": {
        "ansible_all_ipv4_addresses": [
            "192.168.122.1",
            "172.21.208.111"
        ],
        "ansible_all_ipv6_addresses": [
            "fe80::8f31:b68d:f487:2775"
        ],
```

Ansible Variables and Facts

```
  "ansible_facts": {
      "ansible_default_ipv4": {
          "address": "10.41.17.37",
          "macaddress": "00:69:08:3b:a9:16",
          "interface": "eth0",
...
```

A variable, defined in our playbook

```
  vars:
    mynewip: 10.7.62.39
```

This is a template file for **ifcfg-eth0**, using a mix of discovered facts and variables to write the static file.

```
DEVICE="{{ ansible_default_ipv4.interface }}"
ONBOOT=yes
HWADDR={{ ansible_default_ipv4.macaddress }}
TYPE=Ethernet
BOOTPROTO=static
IPADDR={{ mynewip }}
```

Variable Precedence

Ansible can work with metadata from various sources as variables. Different sources will be overridden in an order of precedence.

1. extra vars ***(Highest - will override anything else)***
2. task vars (overridden only for the task)
3. block vars (overridden only for tasks in block)
4. role and include vars
5. play vars_files
6. play vars_prompt
7. play vars
8. set_facts
9. registered vars
10. host facts
11. playbook host_vars
12. playbook group_vars
13. inventory host_vars
14. inventory group_vars
15. inventory vars
16. role defaults ***(Lowest - will be overridden by anything else listed here)***

Ansible Inventory - Managing Variables In Files

```
[user@ansible ~]$ tree /somedir

/somedir
├── group_vars
│   └── app1srv
│   └── db
│   └── web
├── inventory
└── host_vars
    └ app01
    └ app02
    └ app03
```

Ansible Inventory - Managing Variables In Files

```
[user@ansible ~]$ tree
/somedir

/somedir
├── group_vars
│   ├── app1srv
│   ├── db
│   └── web
├── inventory
└── host_vars
    ├── app01
    ├── app02
    └── app03
```

```
[user@ansible ~]$ cat /somedir/inventory

    [web]
    node-[1:30] ansible_host=10.42.0.[31:60]

    [appxsrv]
    app01
    app02
    app03
```

```
[user@ansible ~]$ cat /somedir/group_vars/web

    apache_listen_port: 8080
    apache_root_path: /var/www/mywebdocs/

[user@ansible ~]$ cat /somedir/host_vars/app01

    owner_name: Chris P. Bacon
    owner_contact: 'cbacon@mydomain.tld'
    server_purpose: Application X
```

Conditionals via VARS

```
vars:
   my_mood: happy

tasks:
- name: conditional task, based on my_mood var
  debug:
    msg: "Come talk to me.  I am {{ my_mood }}!"
  when: my_mood == "happy"
```

Conditionals with variables

```
vars:
   my_mood: happy

tasks:
- name: conditional task, based on my_mood var
  debug:
    msg: "Come talk to me.  I am {{ my_mood }}!"
  when: my_mood == "happy"
```

Alternatively

```
    debug:
       msg: "Feel free to interact.                I am
    {{ my_mood }}" when: my_mood != "grumpy"
```

Conditionals with facts

```
tasks:
- name: Install apache
  apt:
    name: apache2
    state: latest
  when: ansible_distribution == 'Debian' or ansible_distribution == 'Ubuntu'

- name: Install httpd
  yum:
    name: httpd
    state: latest
  when: ansible_distribution == 'RedHat'
```

Using Previous Task Results

This is NOT a handler task, but has similar function

```
- name: Ensure httpd package is present
  yum:
    name: httpd
    state: latest
  register: http_results

- name: Restart httpd
  service:
    name: httpd
    state: restart
  when: httpd_results.changed
```

Handler Tasks

A handler task is run when a referring task result shows a change

```
tasks:
- name: Ensure httpd package is present
  yum:
    name: httpd
    state: latest
  notify: restart_httpd

handlers:
- name: restart_httpd
  service:
    name: httpd
    state: restart
```

Handler Tasks

```
tasks:
- name: Ensure httpd package is present
  yum:
    name: httpd
    state: latest


- name: Standardized index.html file
  copy:
    content: "This is my index.html file for {{ ansible_host }}"
    dest: /var/www/html/index.html
  notify: restart_httpd
```

If **either** task notifies a **changed** result, the handler will be notified **ONCE**.

```
TASK [Ensure httpd package is present] ***********************************************
ok: [web2]
ok: [web1]

TASK [Standardized index.html file] **************************************************
changed: [web2]
changed: [web1]

NOTIFIED: [restart_httpd] ************************************************************
changed: [web2]
changed: [web1]
```

unchanged

changed

handler runs once

Handler Tasks

```
tasks:
- name: Ensure httpd package is present
  yum:
    name: httpd
    state: latest


- name: Standardized index.html file
  copy:
    content: "This is my index.html file for {{ ansible_host }}"
    dest: /var/www/html/index.html
  notify: restart_httpd
```

If **either** task notifies a **changed** result, the handler will be notified **ONCE**.

```
TASK [Ensure httpd package is present] ******************************************************
changed: [web2]
changed: [web1]

TASK [Standardized index.html file] *********************************************************
changed: [web2]
changed: [web1]

NOTIFIED: [restart_httpd] *******************************************************************
changed: [web2]
changed: [web1]
```

changed

changed

handler runs once

Handler Tasks

```
tasks:
- name: Ensure httpd package is present
  yum:
    name: httpd
    state: latest


- name: Standardized index.html file
  copy:
    content: "This is my index.html file for {{ ansible_host }}"
    dest: /var/www/html/index.html
  notify: restart_httpd
```

If **neither** task notifies a **changed** result, the handler will **not be** notified.

```
TASK [Ensure httpd package is present] ************************************************
ok: [web2]
ok: [web1]

TASK [Standardized index.html file] ***************************************************
ok: [web2]
ok: [web1]

PLAY RECAP ****************************************************************************
web2       : ok=2   changed=0    unreachable=0   failed=0   skipped=0   rescued=0 ignored=0
web1       : ok=2   changed=0    unreachable=0   failed=0   skipped=0   rescued=0 ignored=0
```

Variables & Loops

Great opportunity to use a loop

```
---
- name: Ensure users
  hosts: node1
  become: yes

  tasks:
    - name: Ensure user is present
      user:
        name: dev_user
        state: present

    - name: Ensure user is present
      user:
        name: qa_user
        state: present

    - name: Ensure user is present
      user:
        name: prod_user
        state: present
```

Variables & Loops

Using loops to simplify tasks

```
---
- name: Ensure users
  hosts:node1
  become:yes

  tasks:
    - name: Ensure users are present
      user:
        name: "{{item}}"
        state:present
      loop:
         - dev_user
         - qa_user
         - prod_user
```

Variables & Templates

Using a system fact or declared variable to write a file

```
- name: Ensure apache is installed and started
  hosts: web
  become: yes
  vars:
    http_port: 80
    http_docroot: /var/www/mysite.com

  tasks:
    - name: Verify correct config file is present
      template:
        src: templates/httpd.conf.j2
        dest: /etc/httpd/conf/httpd.conf
```

Variables & Templates

Using a system fact or declared variable to write a file

```
- name: Ensure apache is installed and started
  hosts: web
  become: yes
```

```
  tasks:
    - name: Verify correct config file is present
      template:
        src: templates/httpd.conf.j2
        dest: /etc/httpd/conf/httpd.conf
```

```
## Excerpt from httpd.conf.j2

# Change this to Listen on specific IP addresses as shown below to
# prevent Apache from glomming onto all bound IP addresses.
#
# Listen 80   ## original line
Listen {{ http_port }}

# DocumentRoot: The directory out of which you will serve your
# documents.
# DocumentRoot "/var/www/html"
DocumentRoot {{ http_docroot }}
```

Roles

- Roles: Think Ansible packages
- Roles provide Ansible with a way to load tasks, handlers, and variables from separate files.
- Roles group content, allowing easy sharing of code with others
- Roles make larger projects more manageable
- Roles can be developed in parallel by different administrators

Better start using roles now!

Role structure

- Defaults: default variables with lowest precedence (e.g. port)
- Handlers: contains all handlers
- Meta: role metadata including dependencies to other roles
- Tasks: plays or tasks
  Tip: It's common to include tasks in main.yml with "when" (e.g. OS == xyz)
- Templates: templates to deploy
- Tests: place for playbook tests
- Vars: variables (e.g. override port)

```
user/
├── defaults
│   └── main.yml
├── handlers
│   └── main.yml
├── meta
│   └── main.yml
├── README.md
├── tasks
│   └── main.yml
├── templates
├── tests
│   ├── inventory
│   └── test.yml
└── vars
    └── main.yml
```


v1 - Set config file to use on boot
1. Write multiple configuration files
• For each environment/region
2. Inspect metadata on boot and use the matching config file
v1 - Set config file to use on boot
1. Write multiple configuration files
• For each environment/region
2. Inspect metadata on boot and use the matching config file
Ansible Galaxy
Sharing Content
Community
Roles, and more

What is Ansible Tower?

Ansible Tower is a UI and RESTful API allowing you to scale IT automation, manage complex deployments and speed productivity.

- Role-based access control
- Deploy entire applications with push-button deployment access
- All automations are centrally logged
- Powerful workflows match your IT processes

Red Hat Ansible Tower

Push button

An intuitive user interface experience makes it easy for novice users to execute playbooks you allow them access to.

RESTful API

With an API first mentality every feature and function of Tower can be API driven. Allow seamless integration with other tools like ServiceNow and Infoblox.

RBAC

Allow restricting playbook access to authorized users. One team can use playbooks in check mode (read-only) while others have full administrative abilities.

Enterprise integrations

Integrate with enterprise authentication like TACACS+, RADIUS, Azure AD. Setup token authentication with OAuth 2. Setup notifications with PagerDuty, Slack and Twilio.

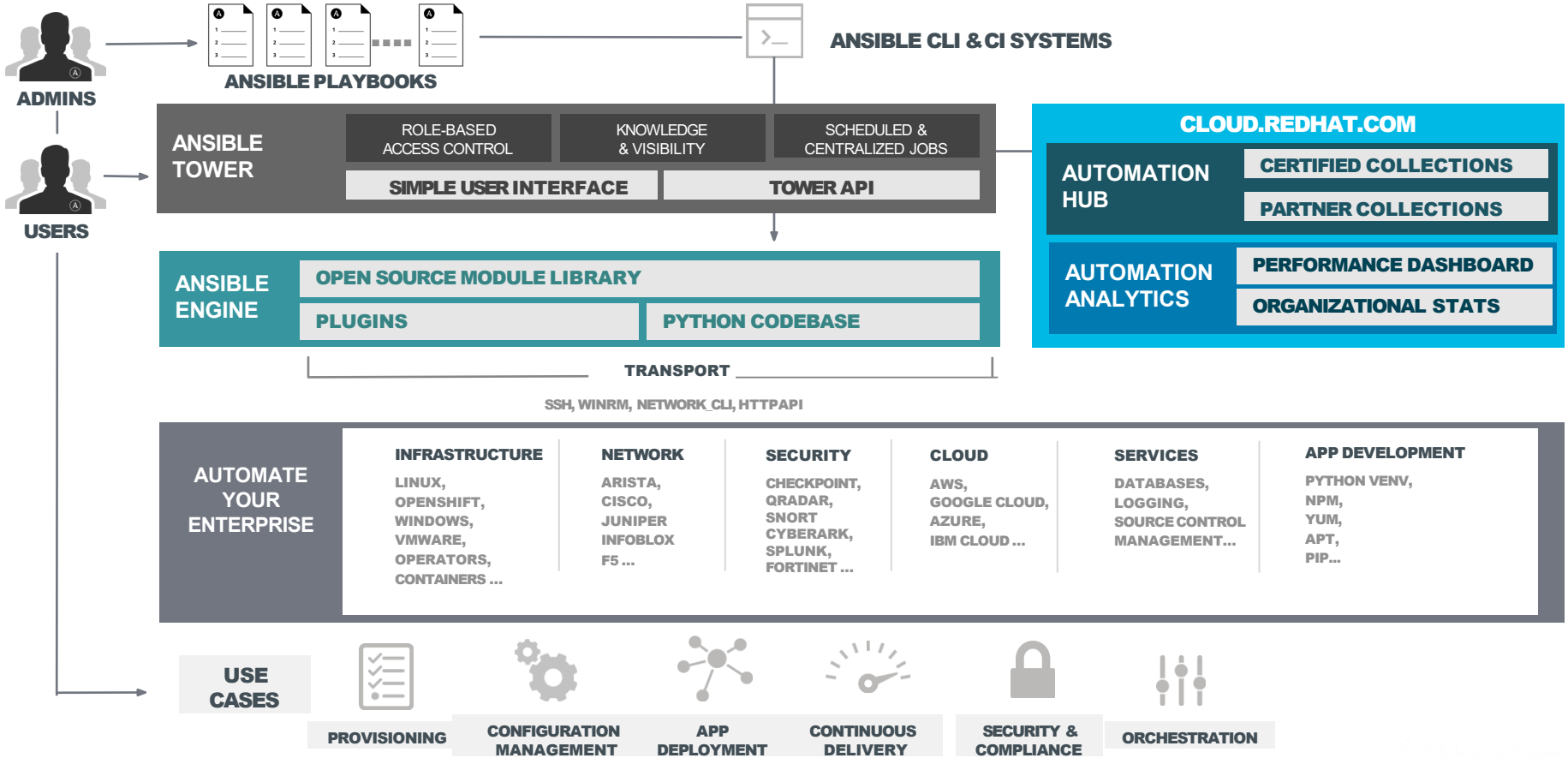
Centralized logging

All automation activity is securely logged. Who ran it, how they customized it, what it did, where it happened - all securely stored and viewable later, or exported through Ansible Tower's API.

Workflows

Ansible Tower's multi-playbook workflows chain any number of playbooks, regardless of whether they use different inventories, run as different users, run at once or utilize different credentials.

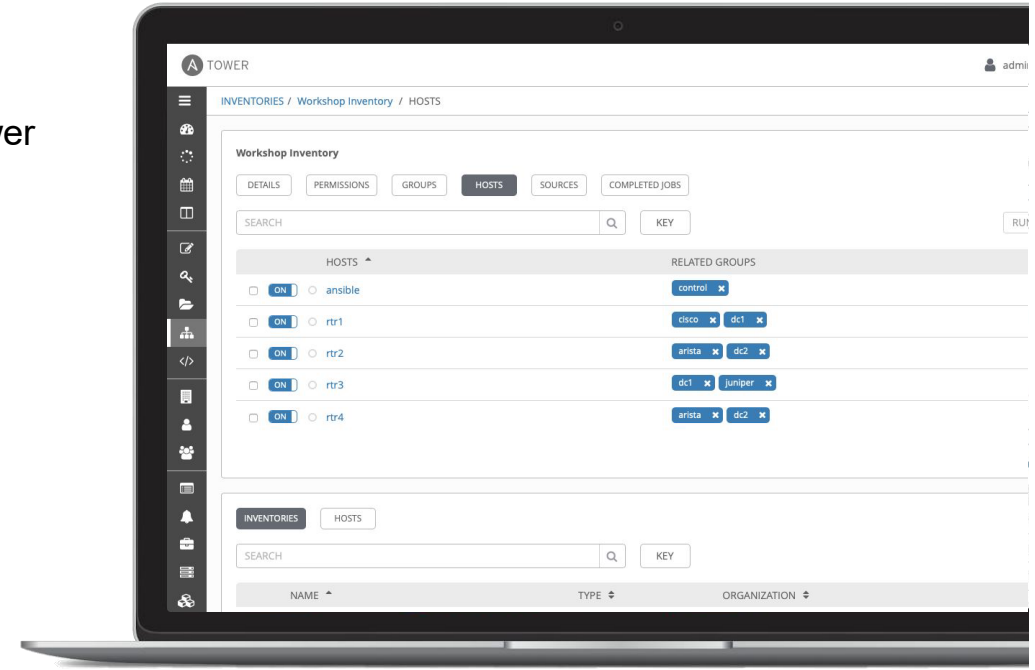
Ansible Automation Platform



Inventory

Inventory is a collection of hosts (nodes) with associated data and groupings that Ansible Tower can connect to and manage.

- Hosts (nodes)
- Groups
- Inventory-specific data (variables)
- Static or dynamic sources

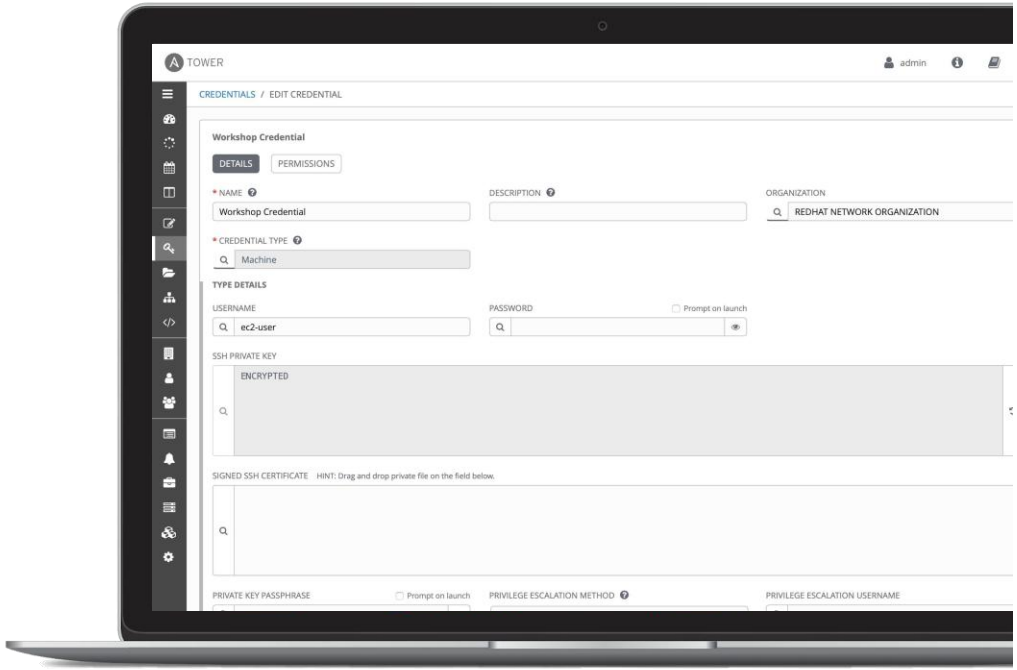


Credentials

Credentials are utilized by Ansible Tower for authentication with various external resources:

- Connecting to remote machines to run jobs
- Syncing with inventory sources
- Importing project content from version control systems
- Connecting to and managing network devices

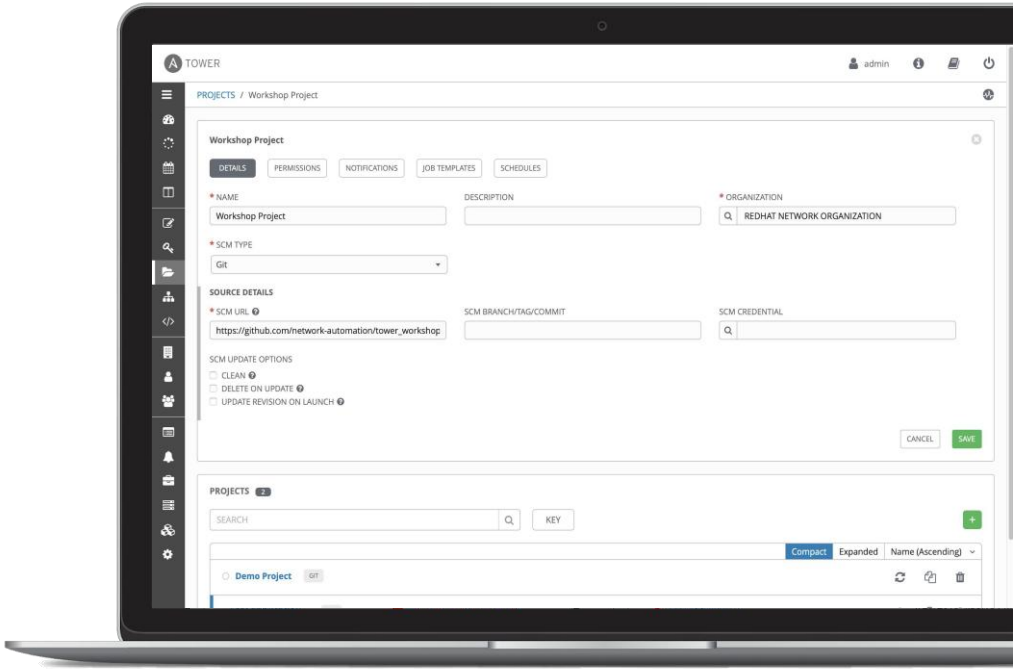
Centralized management of various credentials allows end users to leverage a secret without ever exposing that secret to them.



Project

A project is a logical collection of Ansible Playbooks, represented in Ansible Tower.

You can manage Ansible Playbooks and playbook directories by placing them in a source code management system supported by Ansible Tower, including Git, Subversion, and Mercurial.



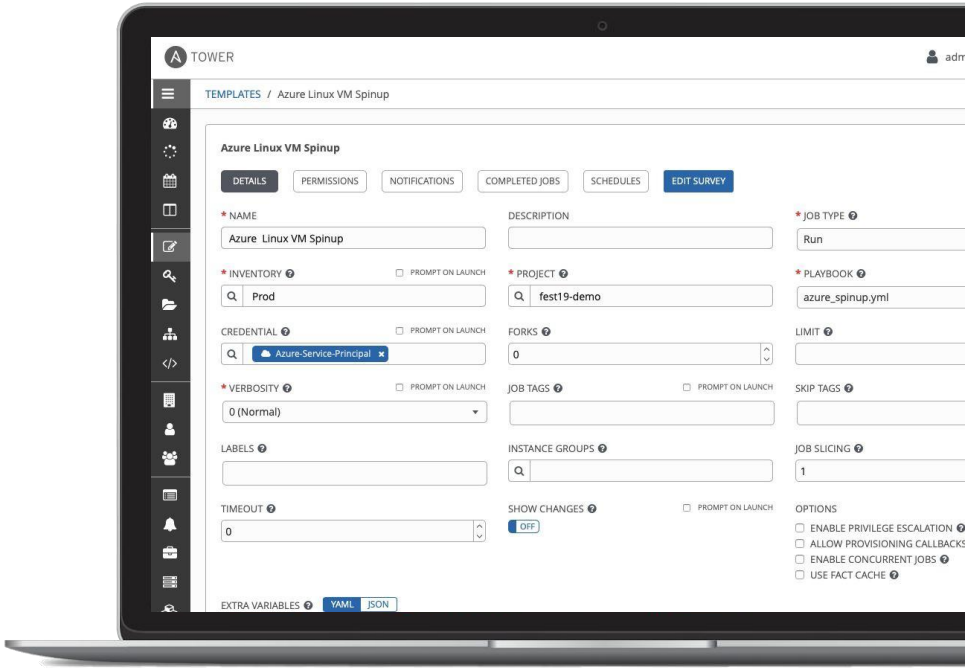
Job Templates

Everything in Ansible Tower revolves around the concept of a **Job Template**. Job Templates allow Ansible Playbooks to be controlled, delegated and scaled for an organization.

Job templates also encourage the reuse of Ansible Playbook content and collaboration between teams.

A **Job Template** requires:

- An **Inventory** to run the job against
- A **Credential** to login to devices.
- A **Project** which contains Ansible Playbooks

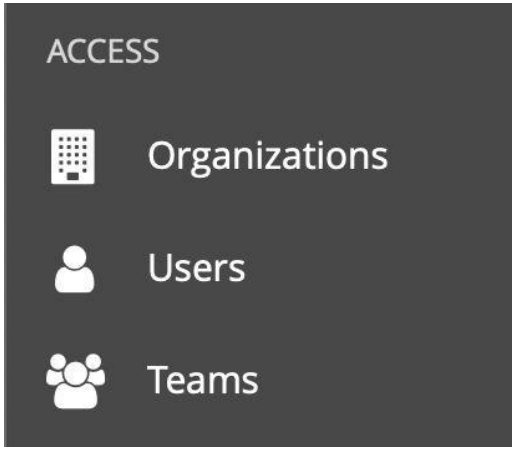


Role Based Access Control (RBAC)

Role-Based Access Controls (RBAC) are built into Ansible Tower and allow administrators to delegate access to inventories, organizations, and more. These controls allow Ansible Tower to help you increase security and streamline management of your Ansible automation.

User Management

- An **organization** is a logical collection of users, teams, projects, inventories and more. All entities belong to an organization.
- A **user** is an account to access Ansible Tower and its services given the permissions granted to it.
- **Teams** provide a means to implement role-based access control schemes and delegate responsibilities across organizations.



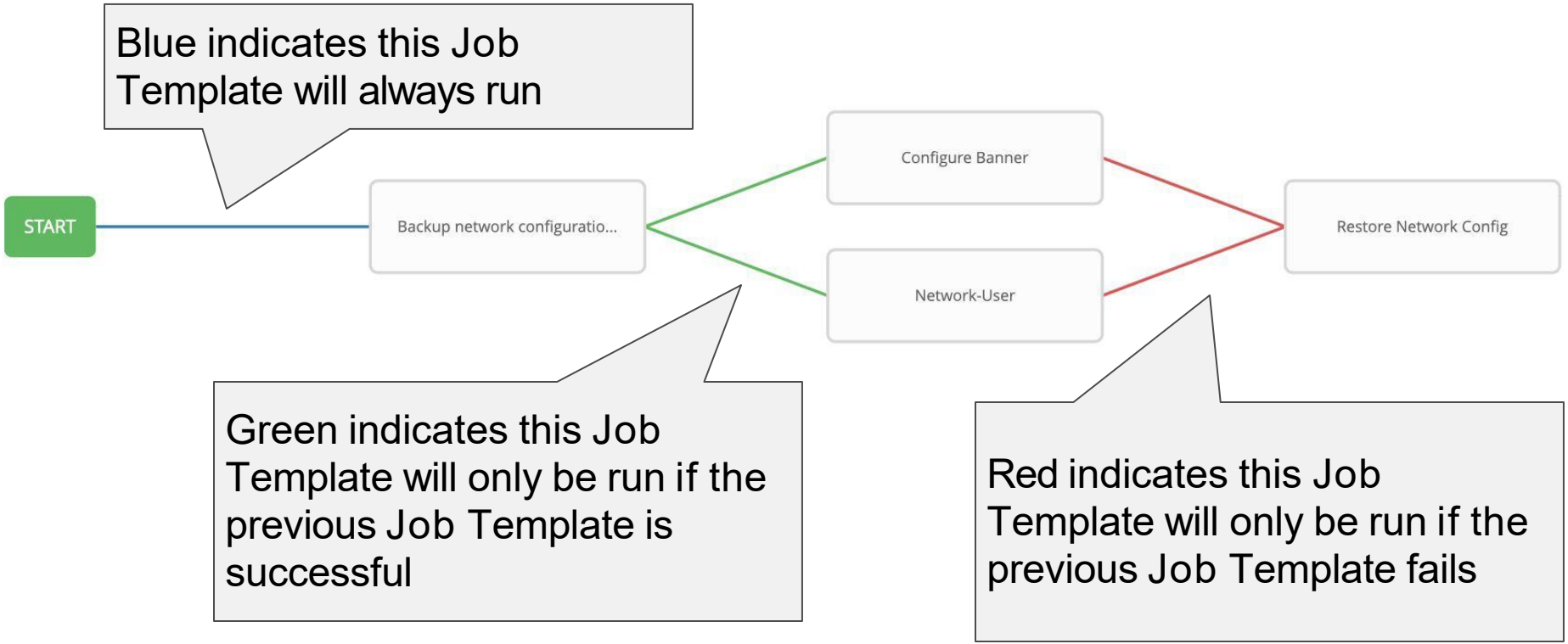
Other Ansible Tower Features

Organizations

Teams

Workflows – Create and Visualize

Visualizing a Workflow



Next Steps

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Thank You