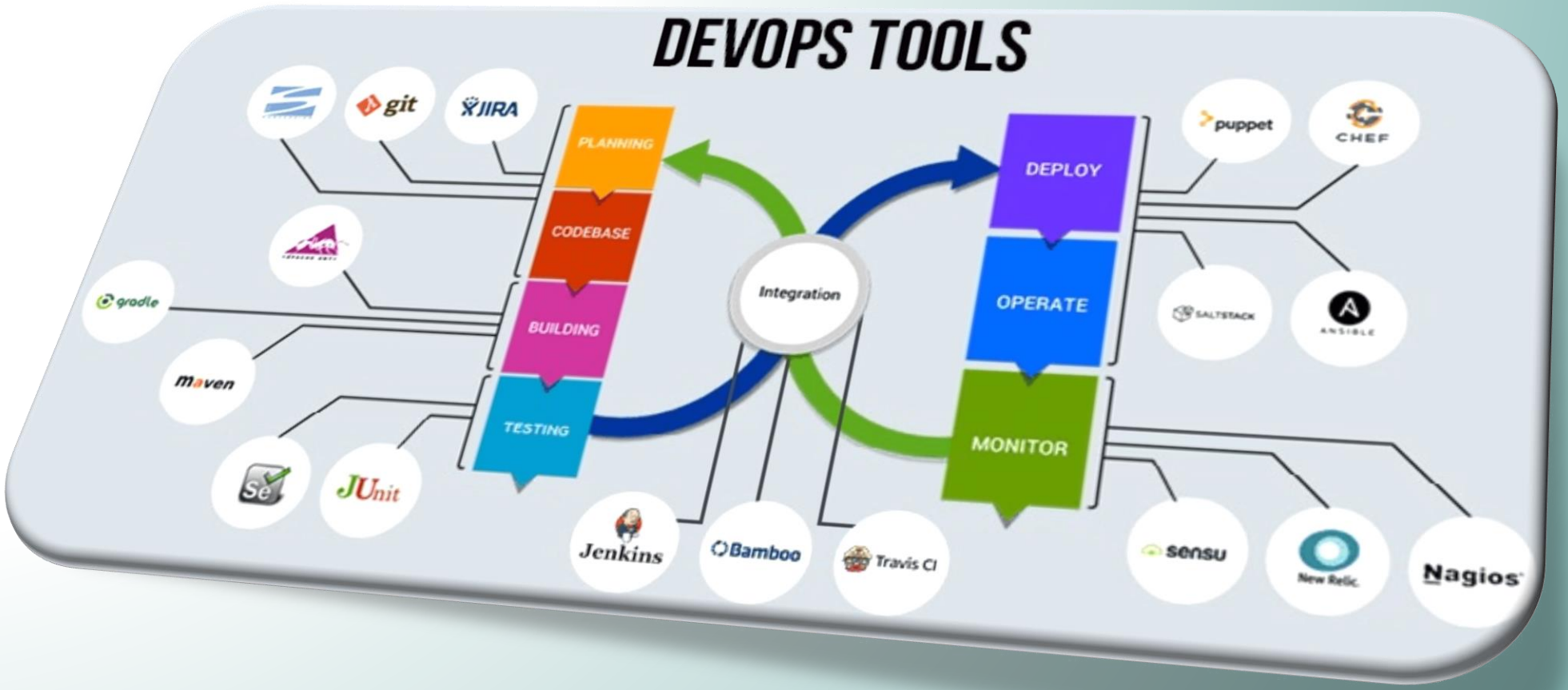
Configuration Management [Ansible]



AGENDA

- What is Ansible?
- How Ansible Work?
- Ansible Architecture
- Setting up Master Slave Using Ansible
- Ansible Playbook
- Ansible Roles
- Applying Configuration Using Ansible

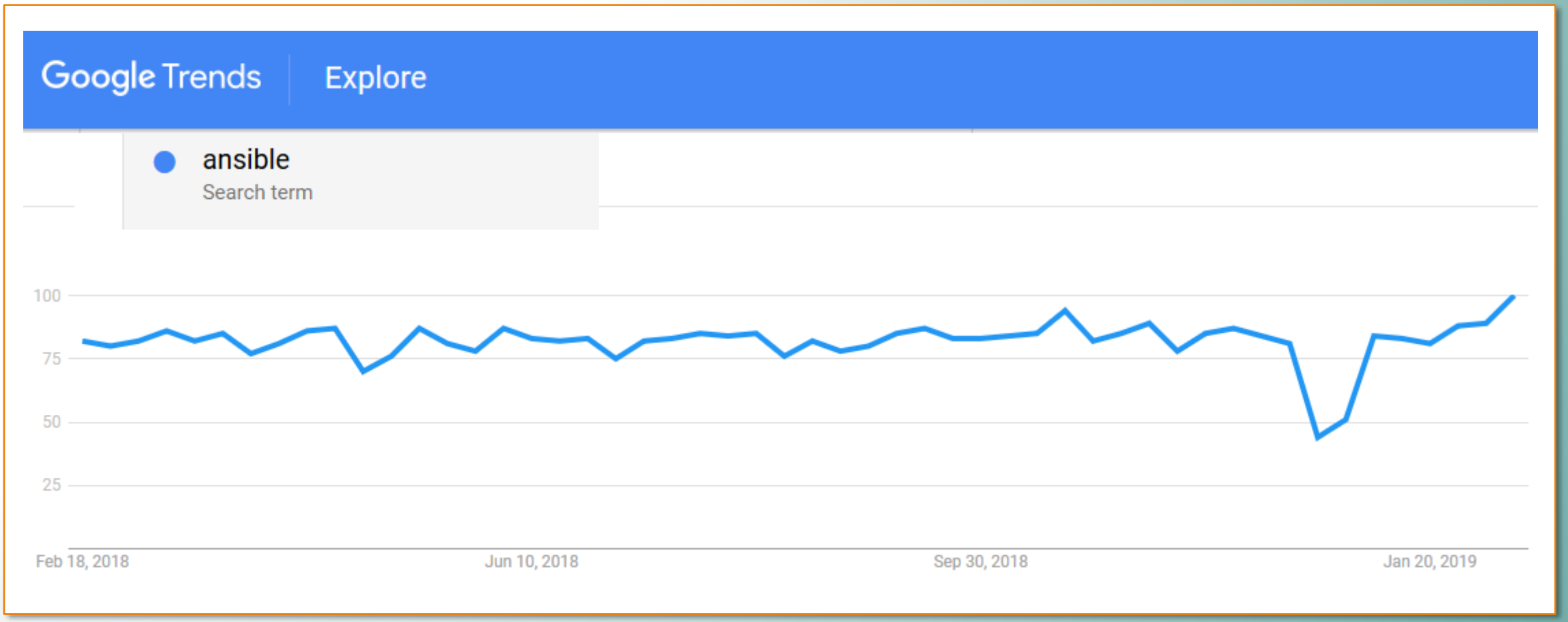
WHAT IS ANSIBLE?

WHAT IS ANSIBLE?

- Ansible is an open-source configuration management tool
- Used for configuration management
- Can solve wide range of automation challenges
- Written by Michael DeHaan
- Named after a fictional communication device, first used by Ursula K. LeGuin in her novel Rocannon's World in 1966
- In 2015 Red Hat acquired Ansible

WHY ANSIBLE?

WHY ANSIBLE?



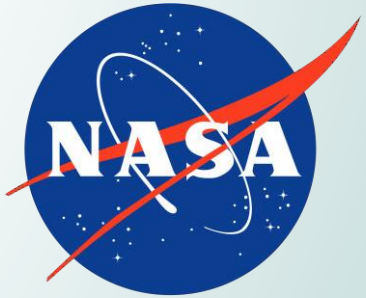
Google Trends Results for Ansible

ADVANTAGE OF ANSIBLE

- Easy to learn
- Written in Python
- Easy installation and configuration steps
- No need to install ansible on slave
- Highly scalable

POPULARITY OF ANSIBLE

Apple



NASA

Intel

Percussion

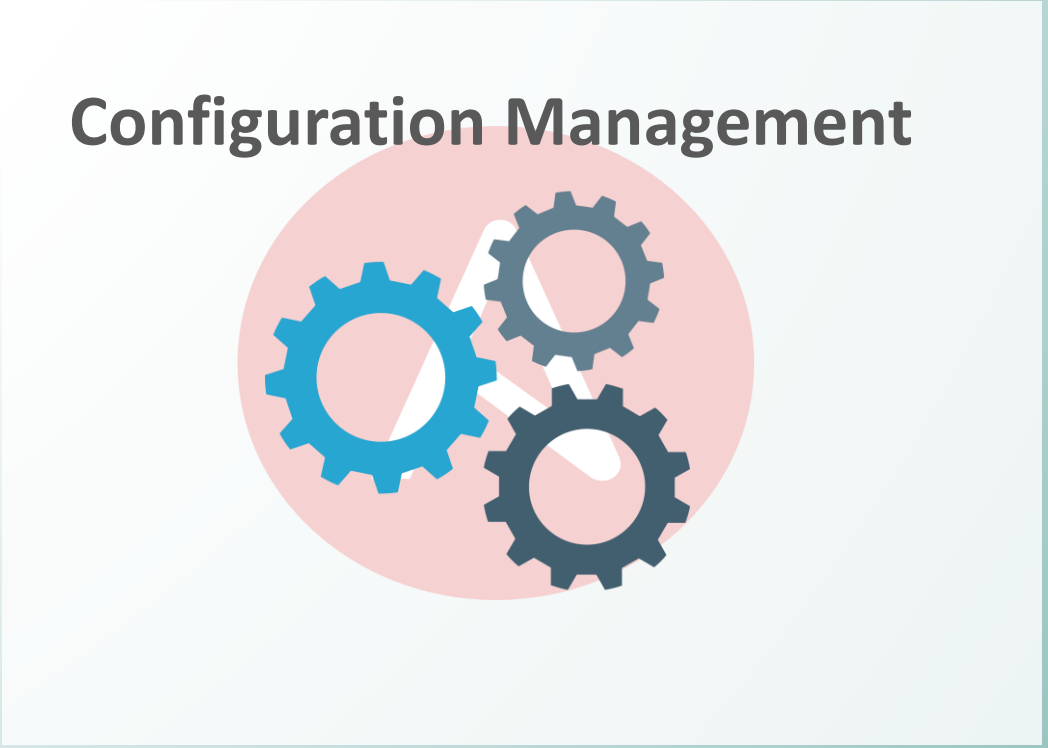
Cisco

Twitter

HOW DOES ANSIBLE WORK?

HOW DOES ANSIBLE WORK?

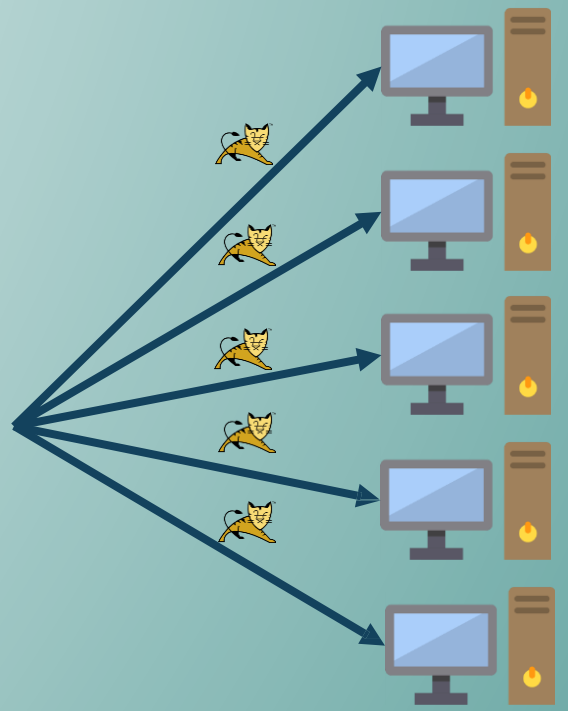
With the help of **Ansible Playbooks**,
which are written in a very simple language, **YAML**



PROBLEM STATEMENT

Say, Josh runs an enterprise, wants to install a new version of Apache Tomcat in all the systems

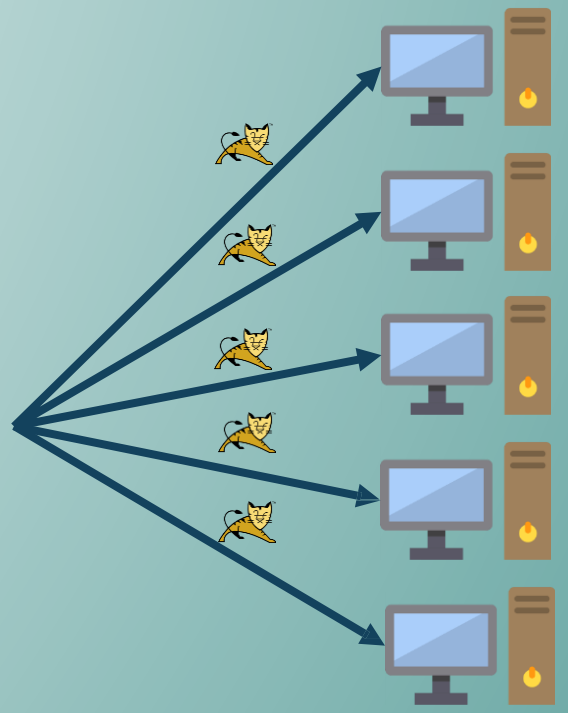
Configuration Management



PROBLEM STATEMENT-SOLUTION WITH ANSIBLE

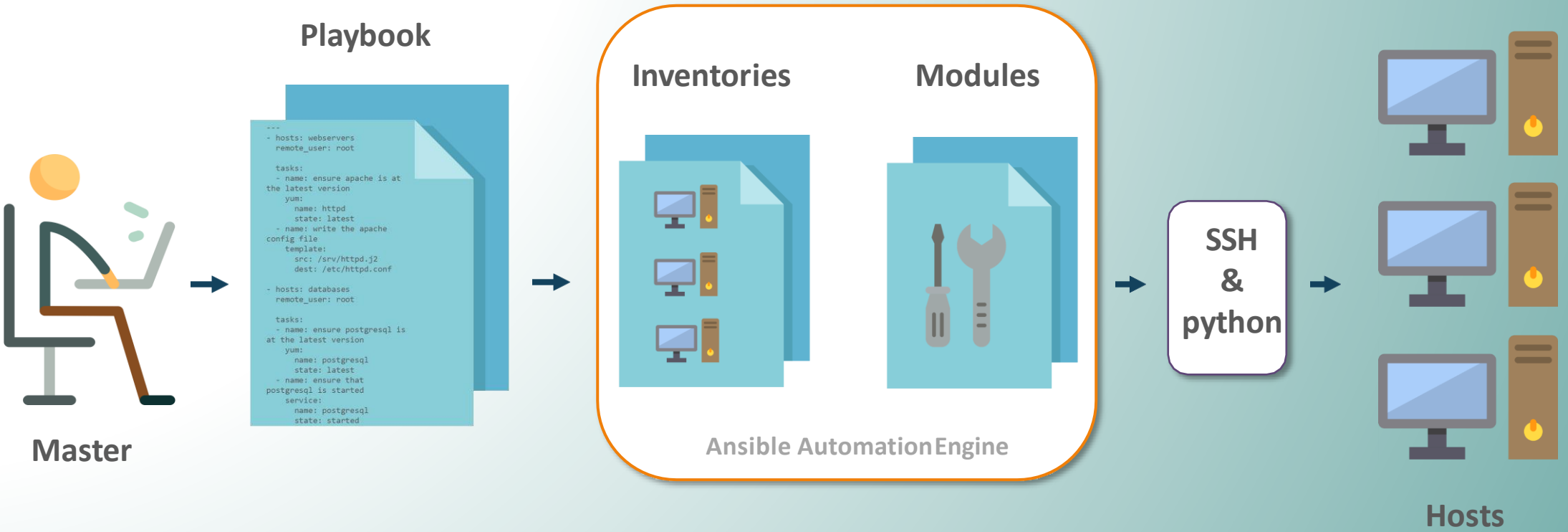
Instead of going to each system, manually updating, Josh can use Ansible to automate the installation using Ansible Playbooks

Configuration Management



ANSIBLE ARCHITECTURE

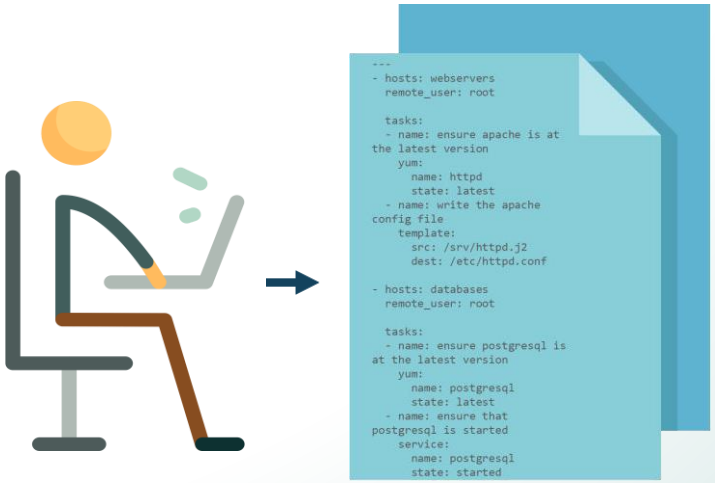
ANSIBLE ARCHITECTURE



Basic Ansible Architecture

ANSIBLE ARCHITECTURE- MASTER

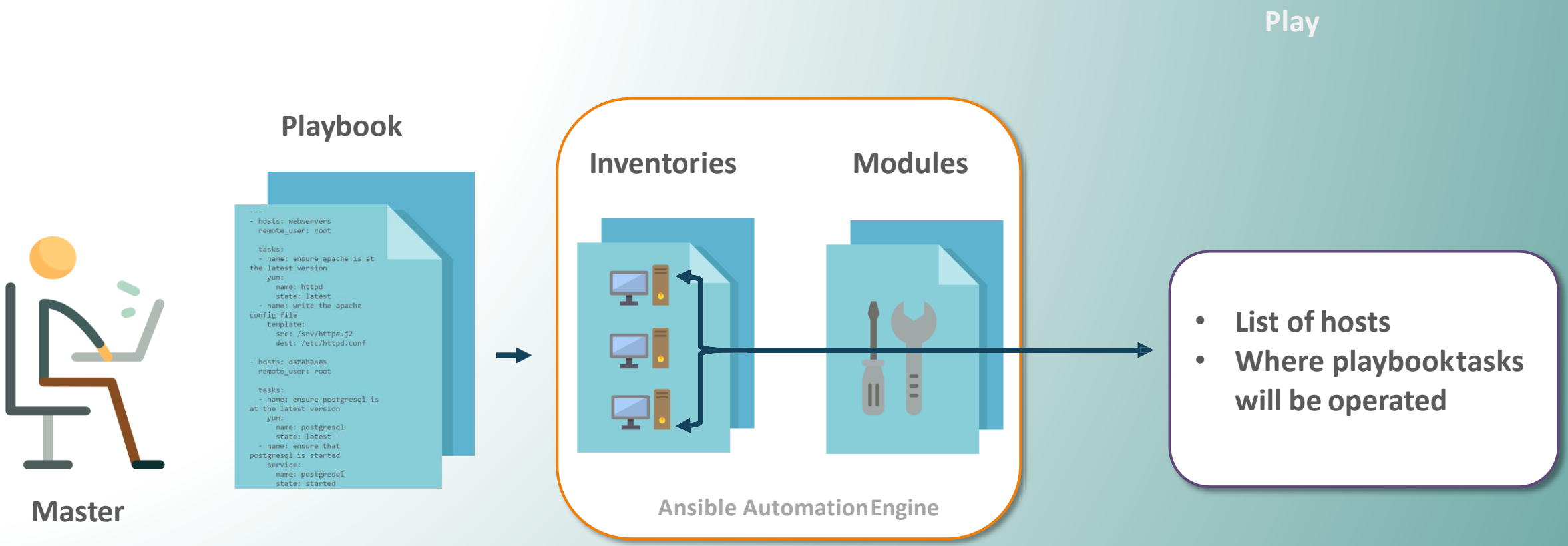
Playbook



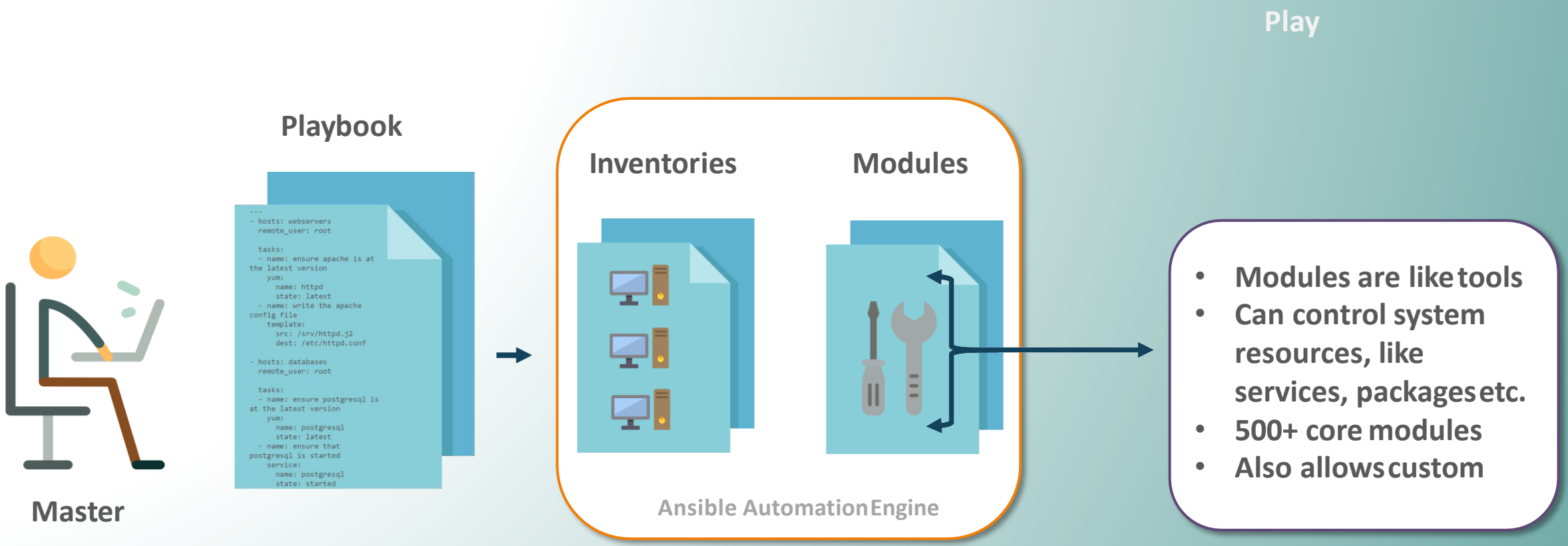
Master

- Describes the tasks to be executed
- Written in simple language
- Playbooks are like instruction manuals

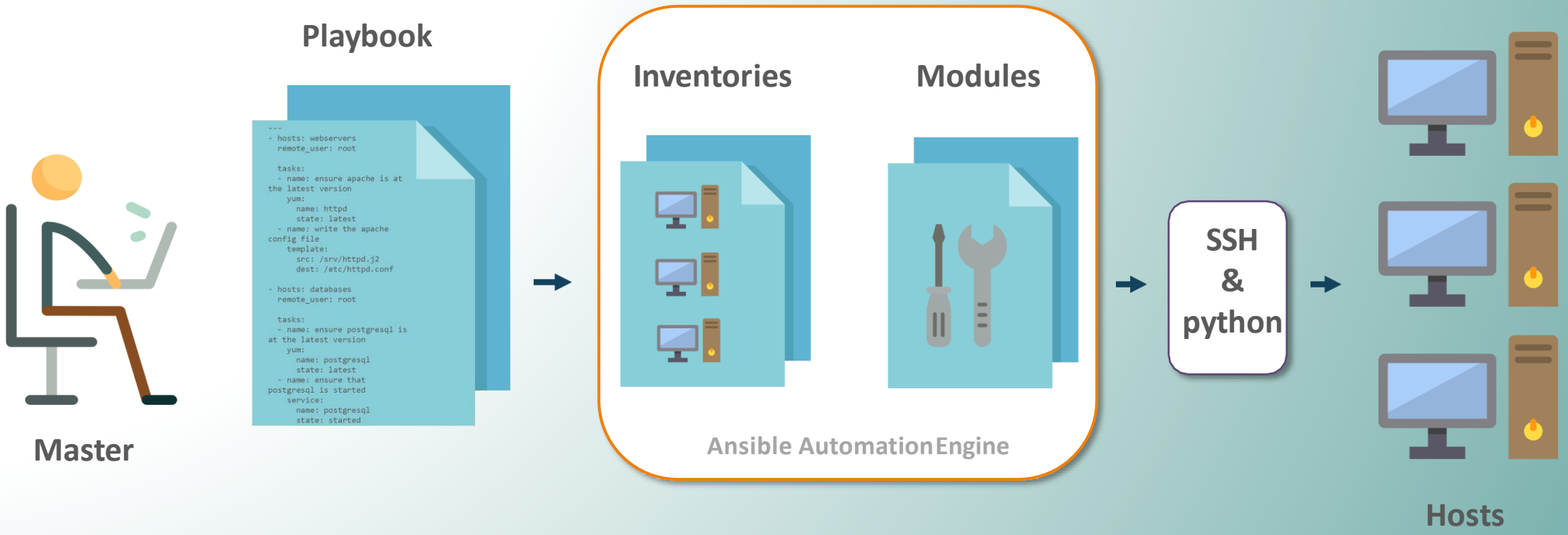
ANSIBLE ARCHITECTURE- INVENTORIES



ANSIBLE ARCHITECTURE- MODULES



ANSIBLE ARCHITECTURE- HOSTS



INSTALLING ANSIBLE

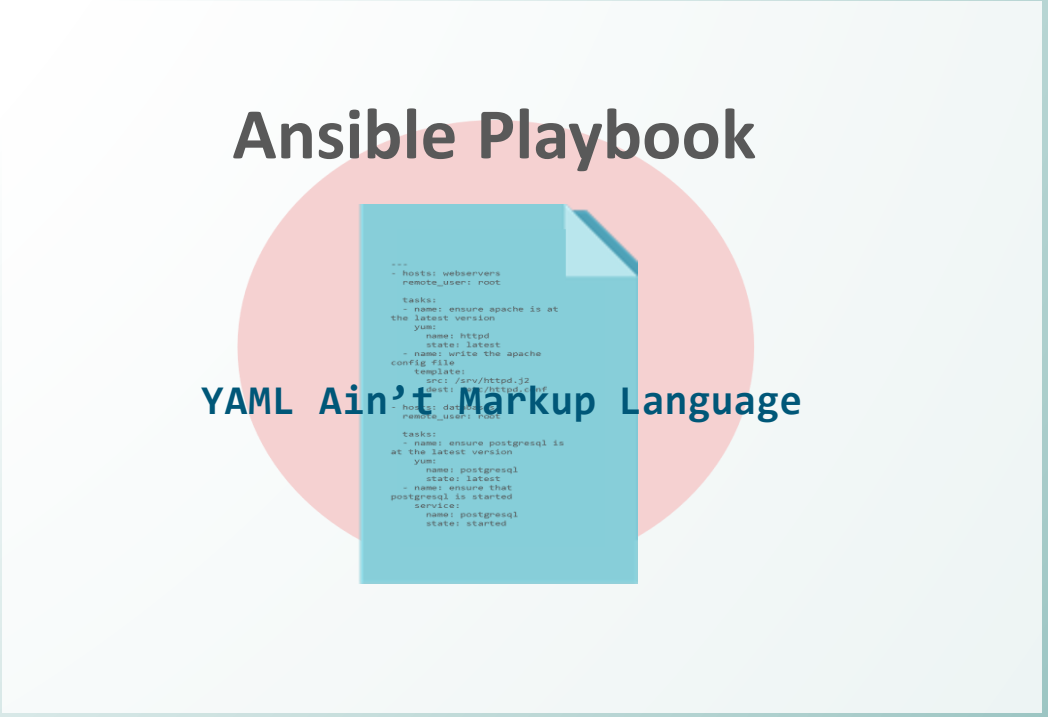
INSTALLING ANSIBLE

1. Install Ansible on Master
2. Configure SSH access to Ansible Host
3. Setting up Ansible Host and testing connection

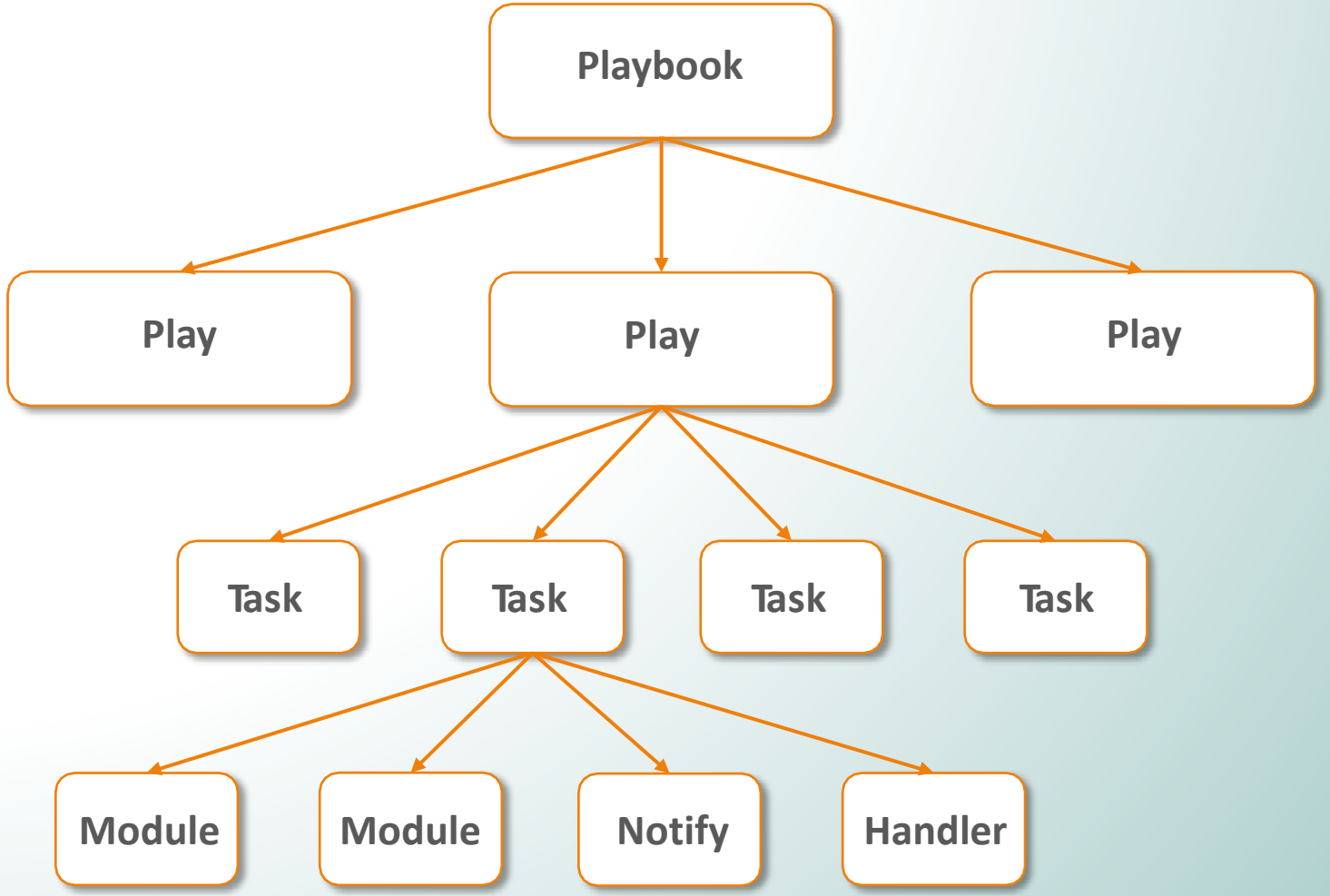
CREATING ANSIBLE PLAYBOOKS

WHAT IS ANSIBLE PLAYBOOK?

An organized unit of scripts
Defines work for a server configuration
Written in **YAML**



ANSIBLE PLAYBOOK STRUCTURE

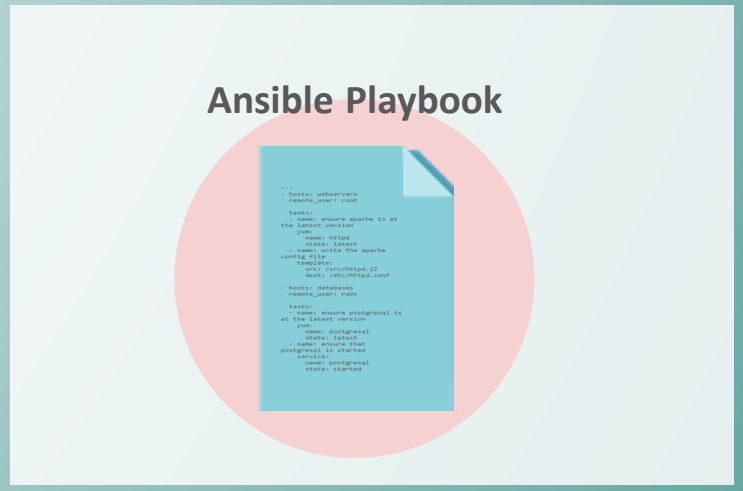


Playbook have number of **plays**

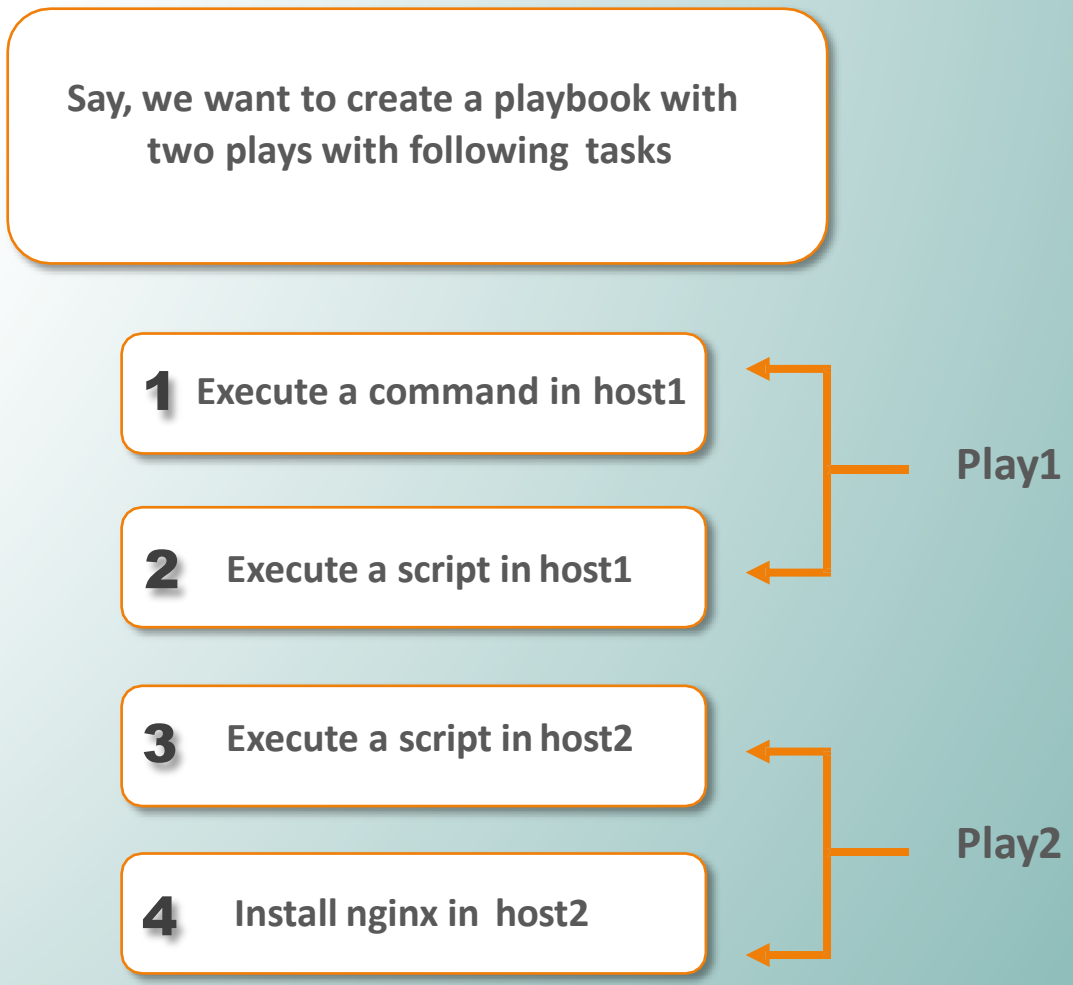
Play contains **tasks**

Tasks calls core or custom **modules**

Handler gets triggered from **notify** and executed at the end only once.



CREATING ANSIBLE PLAYBOOK-EXAMPLE



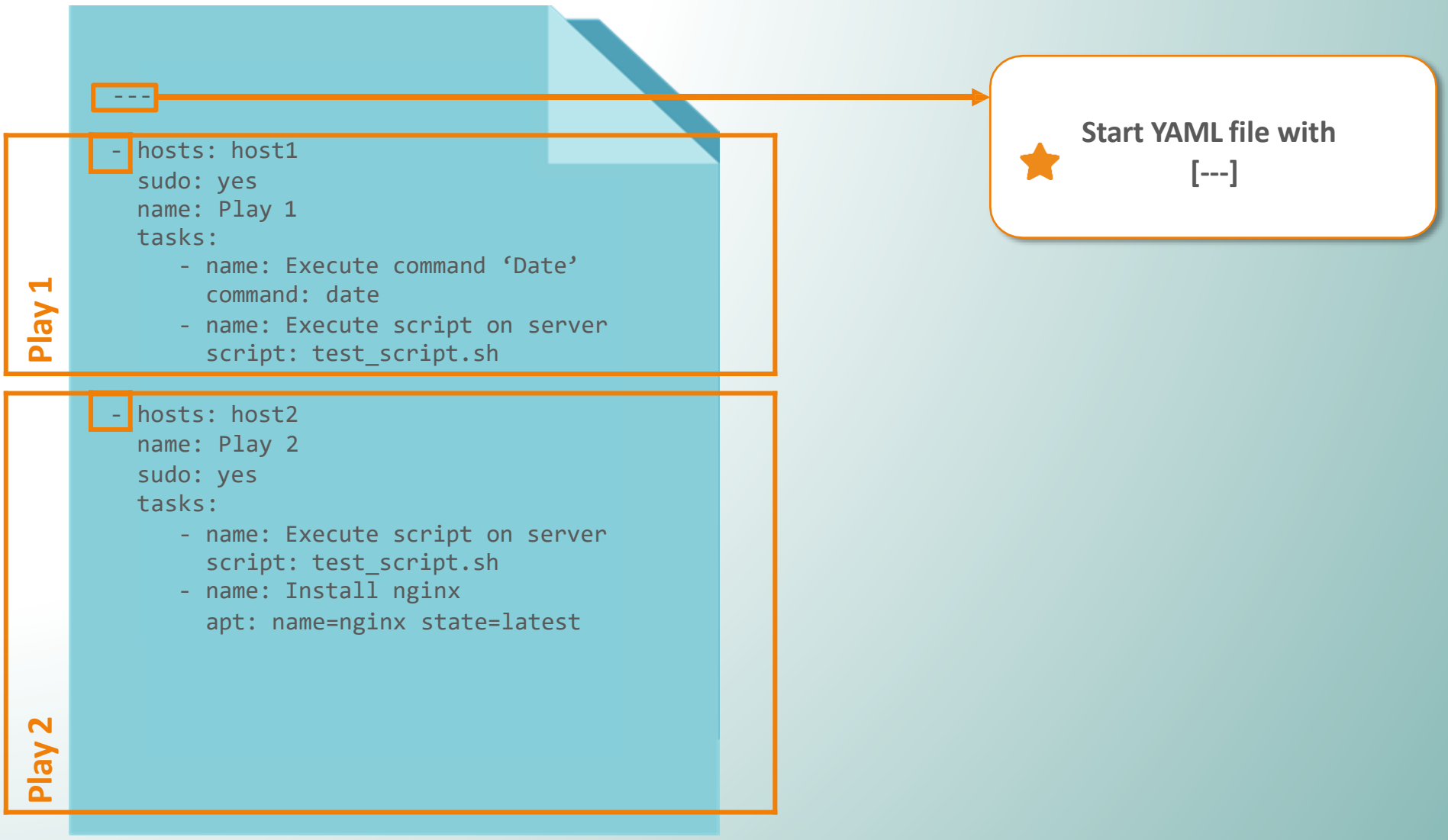
CREATING ANSIBLE PLAYBOOK-EXAMPLE

```
---

- hosts: host1
  sudo: yes
  name: Play 1
  tasks:
     - name: Execute command 'Date'
       command: date
     - name: Execute script on server
       script: test_script.sh


- hosts: host2
  name: Play 2
  sudo: yes
  tasks:
     - name: Execute script on server
       script: test_script.sh
     - name: Install nginx
       apt: name=nginx state=latest
```

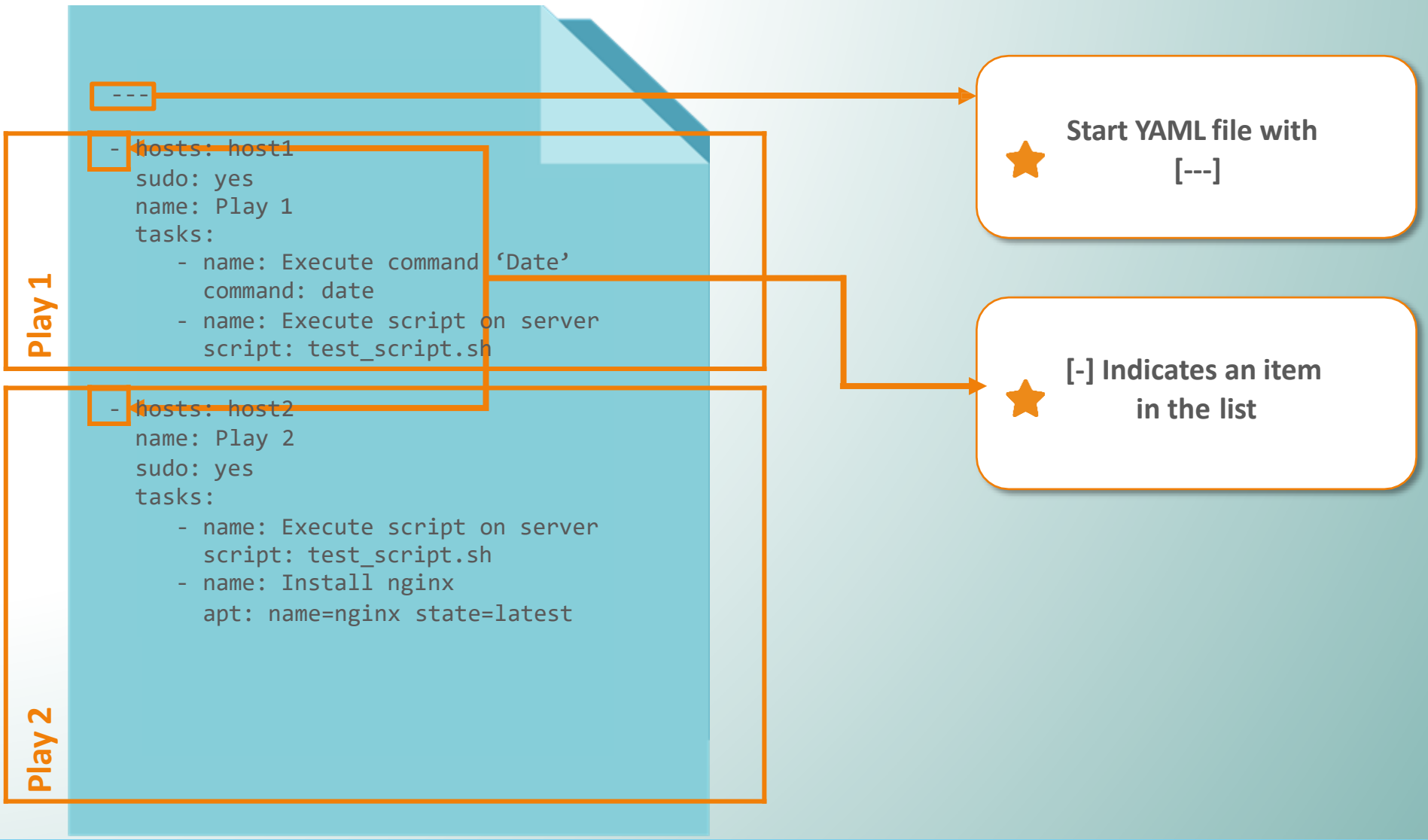
Say we want to create a playbook with two plays with following tasks

1. Execute a command in host1
2. Execute a script in host1
3. Execute a script in host2
4. Install nginx in host2

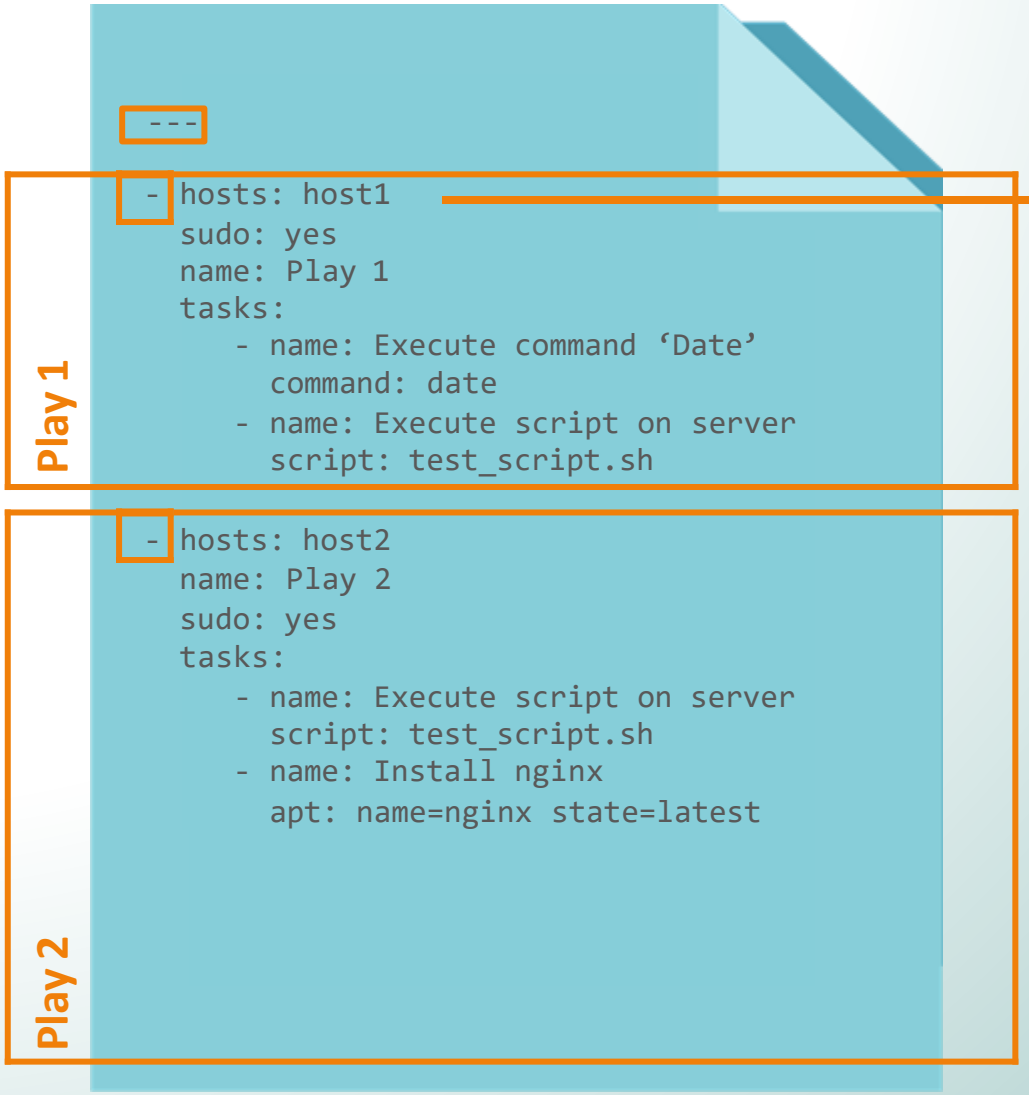
CREATING ANSIBLE PLAYBOOK-EXAMPLE



CREATING ANSIBLE PLAYBOOK-EXAMPLE

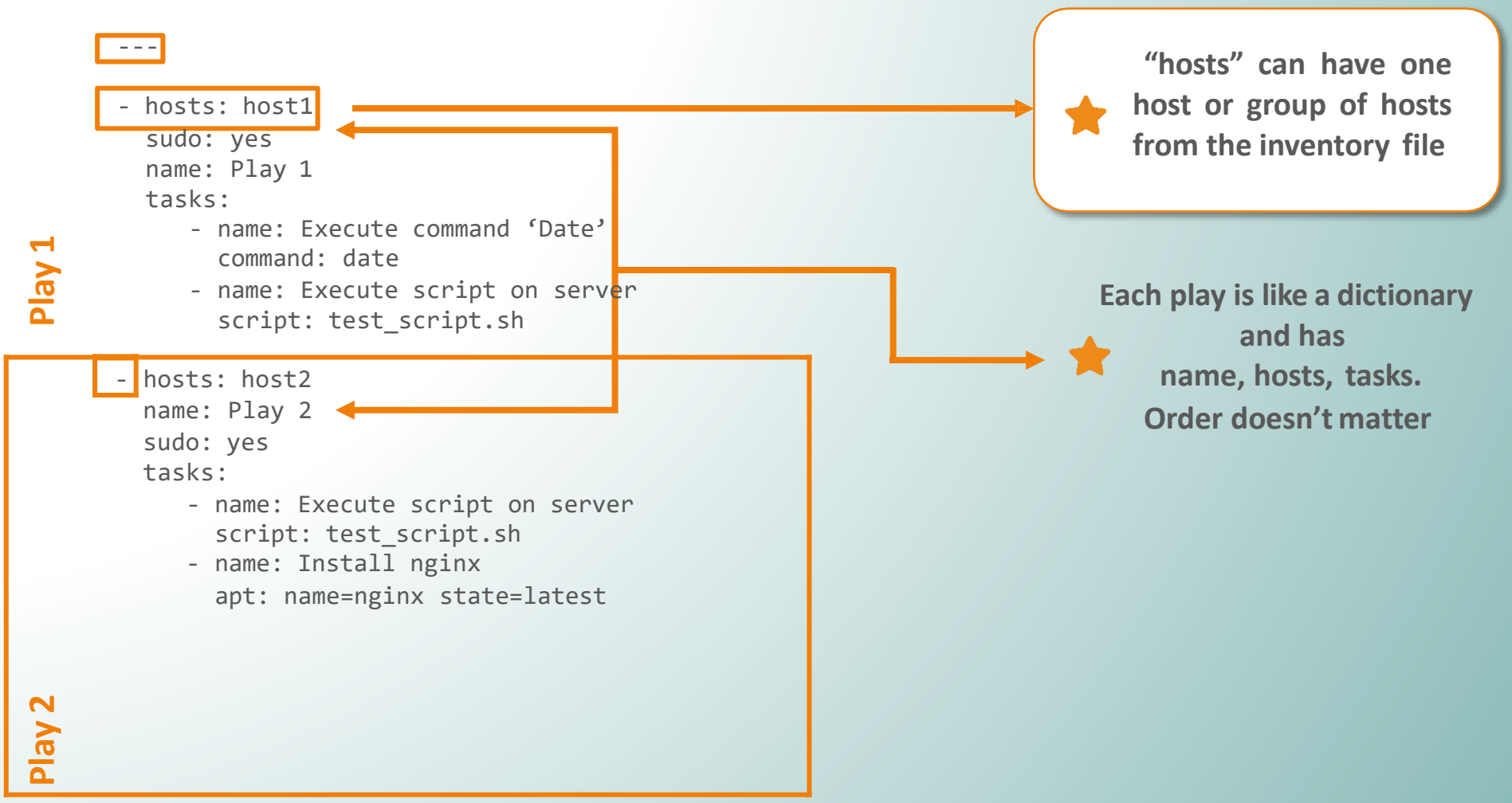


CREATING ANSIBLE PLAYBOOK-EXAMPLE

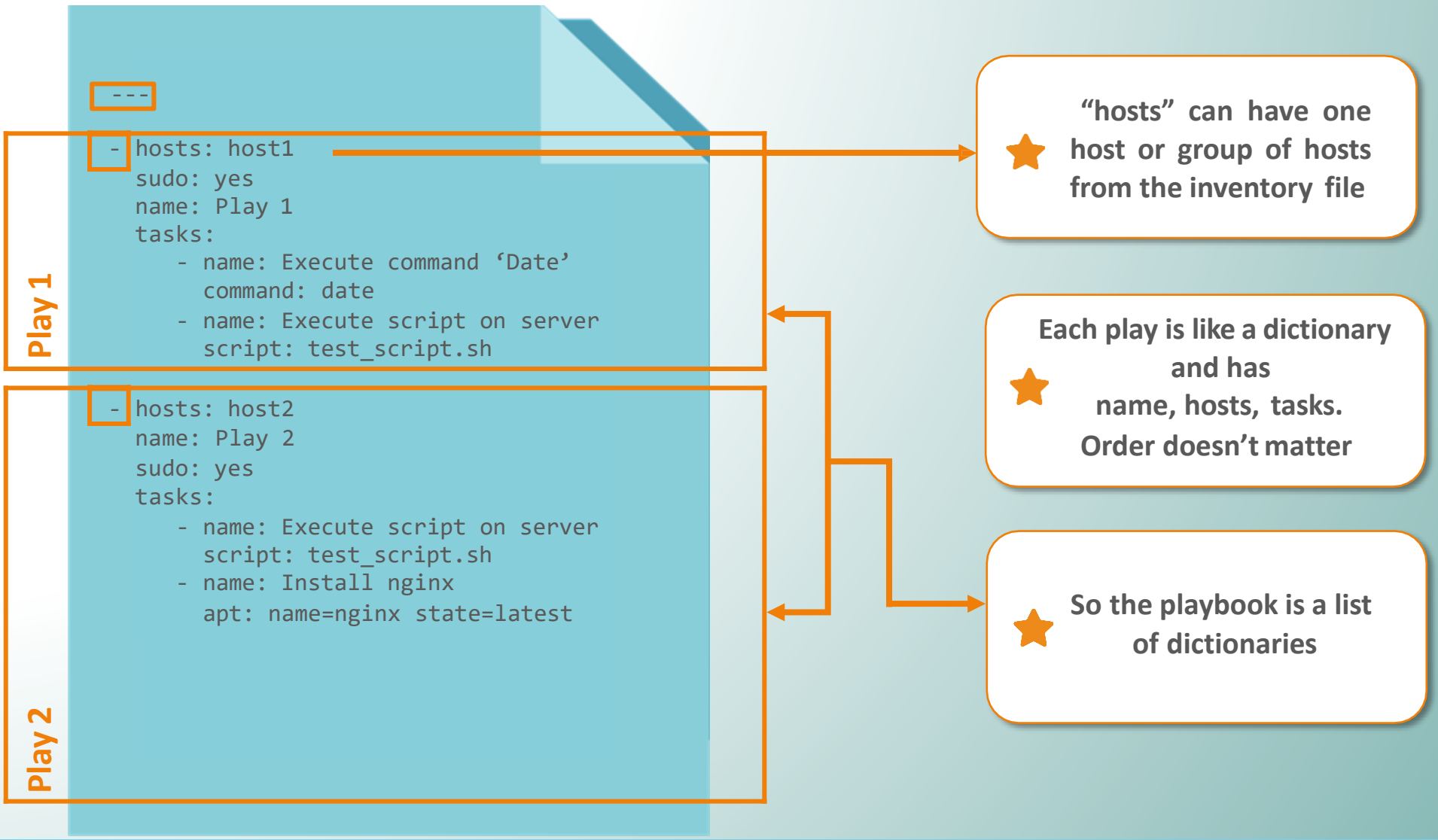


"hosts" can have one host or group of hosts from the inventory file /etc/ansible/hosts

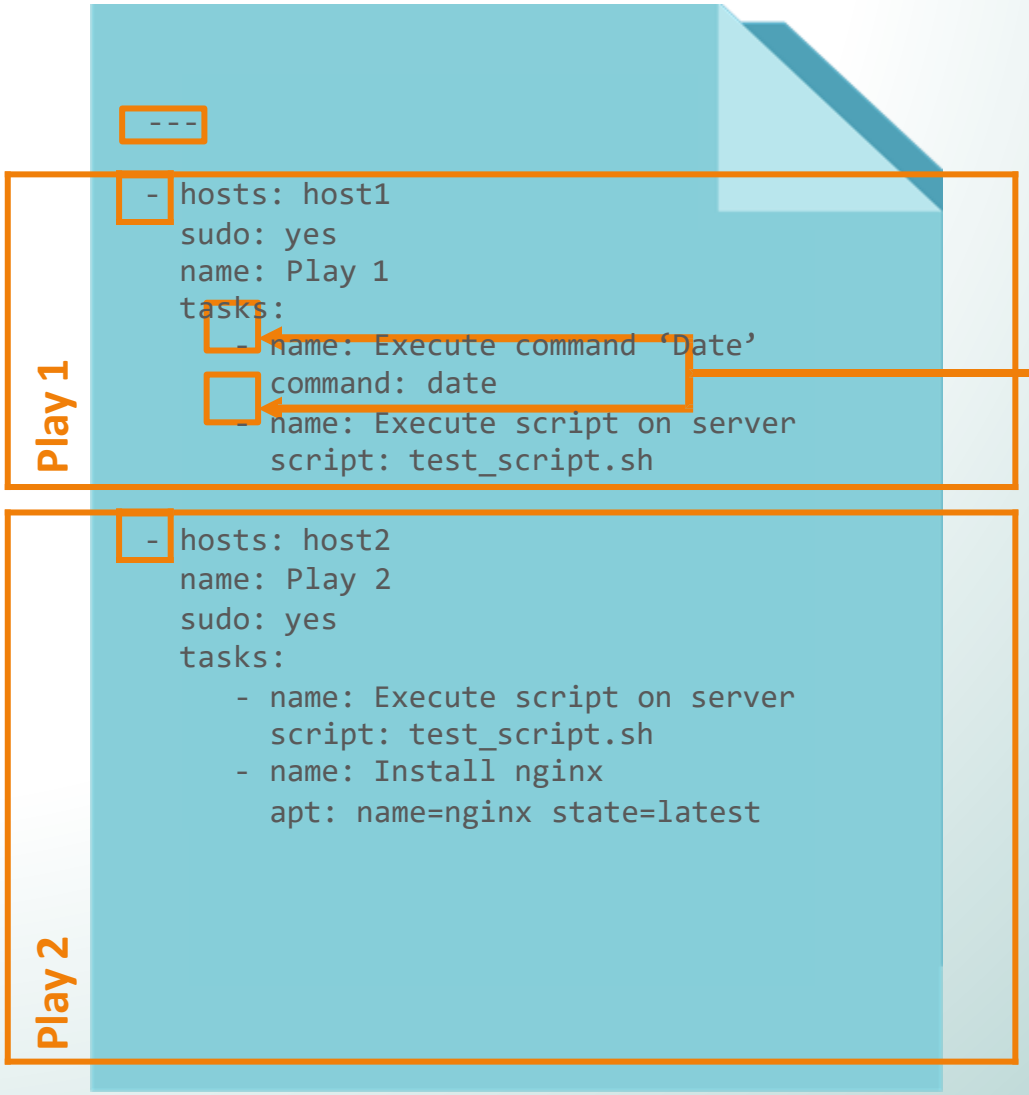
CREATING ANSIBLE PLAYBOOK-EXAMPLE



CREATING ANSIBLE PLAYBOOK-EXAMPLE



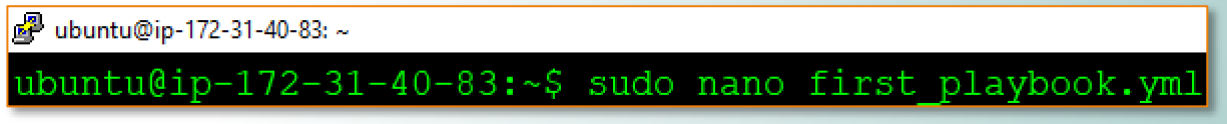
CREATING ANSIBLE PLAYBOOK-EXAMPLE

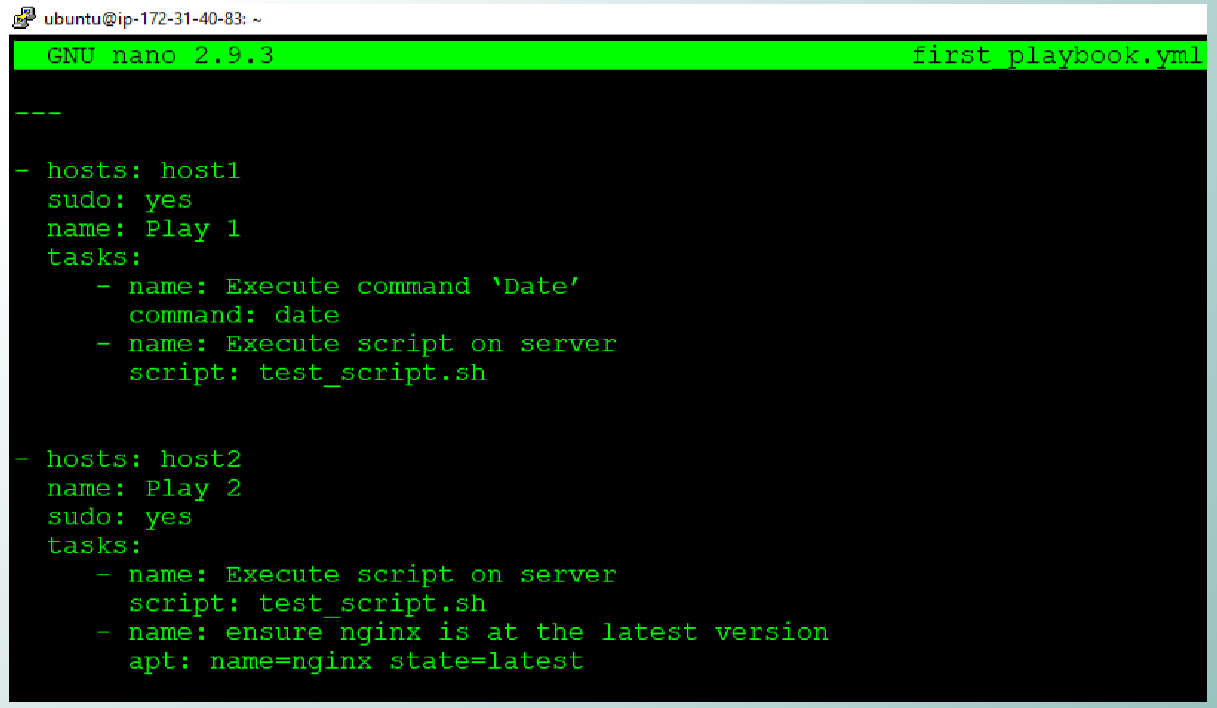


- Similarly tasks are nothing but lists Denoted by [-]
- For tasks ordered collection. Position of entry matters
- First entry gets performed first

CREATING ANSIBLE PLAYBOOK-EXAMPLE

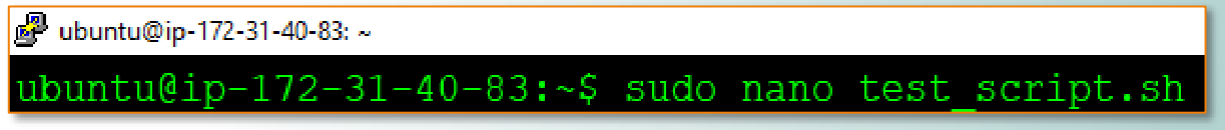
Create first_playbook.yml using
sudo nano <playbookname>

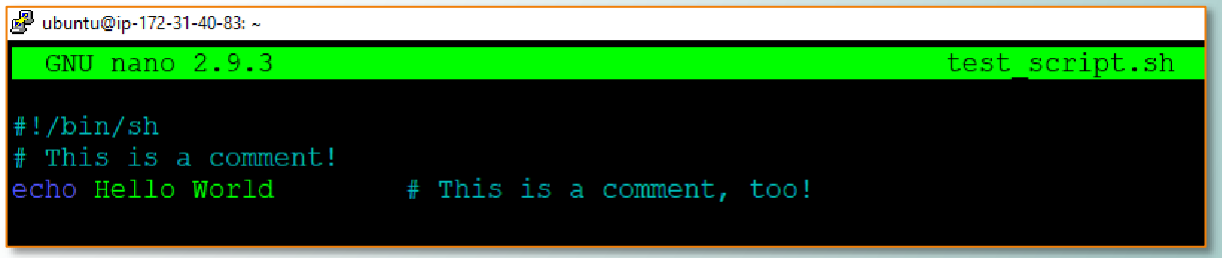




CREATING ANSIBLE PLAYBOOK-EXAMPLE

Create test_script.sh using
sudo nano <file_name>





CREATING ANSIBLE PLAYBOOK-EXAMPLE

Syntax-check and execute ansible playbook using *ansible-playbook <playbook> --syntax-check* and *ansible-playbook <playbook>*

```
ubuntu@ip-172-31-40-83: ~
ubuntu@ip-172-31-40-83:~$ ansible-playbook first_playbook.yml --syntax-check

playbook: first_playbook.yml
```

```
ubuntu@ip-172-31-40-83: ~
ubuntu@ip-172-31-40-83:~$ sudo ansible-playbook first_playbook.yml

PLAY [Play 1] ******************************************************

TASK [Gathering Facts] *********************************************
ok: [host1]

TASK [Execute command 'Date'] **************************************
changed: [host1]

TASK [Execute script on server] ************************************
changed: [host1]

PLAY [Play 2] ******************************************************

TASK [Gathering Facts] *********************************************
ok: [host1]
```

ANSIBLE ROLES

WHAT IS ANSIBLE ROLES?

An ansible role is group of tasks, files, and handlers stored in a standardized file structure.
Roles are small functionalities which can be used independently used but only within playbook

Ansible Playbook

Ansible playbook organizes tasks

Ansible Roles

Ansible roles organizes playbooks

WHY DO WE NEED ANSIBLE ROLES?

Roles simplifies writing complex playbooks

Roles allows you to reuse common configuration steps between different types of servers

Roles are flexible and can be easily modified

STRUCTURE OF ANSIBLE ROLE

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

Structure of an Ansible Role

Structure of an ansible role consists of below given components

Defaults: Store data about the role, also store default variables.

Files: Store files that needs to be pushed to the remote machine.

Handlers: Tasks that get triggered from some actions.

Meta: Information about author, supported platforms and dependencies.

STRUCTURE OF ANSIBLE ROLE

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

Structure of an Ansible Role

Structure of an ansible role consists of below given components:

Tasks: Contains the main list of tasks to be executed by the role

Templates: Contains templates which can be deployed via this role.

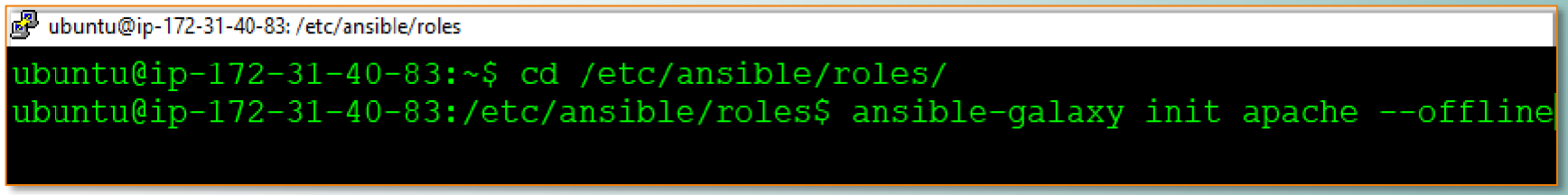
Handlers: Tasks that get triggered from some actions.

Vars: Stores variables with higher priority than default variables. Difficult to override.

CREATING AN ANSIBLE ROLE

1 Use the *ansible-galaxy init <role name> --offline* command to create one Ansible role

Remember that Ansible roles should be written inside */etc/ansible/roles/*



CREATING AN ANSIBLE ROLE

2 Install tree package using *sudo apt install tree*. Use tree command to view structure of the role

★ Use *tree <role name>* to see the role structure

```
ubuntu@ip-172-31-40-83: /etc/ansible/roles
ubuntu@ip-172-31-40-83:/etc/ansible/roles$ sudo apt install tree
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  tree
0 upgraded, 1 newly installed, 0 to remove and 154 not upgraded.
```

```
ubuntu@ip-172-31-40-83: /etc/ansible/roles
ubuntu@ip-172-31-40-83:/etc/ansible/roles$ tree apache
apache
├── README.md
├── defaults
│   └── main.yml
├── files
├── handlers
│   └── main.yml
├── meta
│   └── main.yml
├── tasks
│   └── main.yml
├── templates
├── tests
│   ├── inventory
│   └── test.yml
└── vars
    └── main.yml
```

CREATING AN ANSIBLE ROLE

3 Go inside task folder inside apache directory. Edit **main.yml** using *sudo nano main.yml*. Make changes as shown. Save and then exit.

Keeping install, configure and service files separately helps us reduce complexity.

```
ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/tasks
ubuntu@ip-172-31-40-83:/etc/ansible/roles/apache/tasks$ sudo nano main.yml
```

```
ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/tasks
  GNU nano 2.9.3                                          main.yml

---
# tasks file for apache
- include: install.yml
- include: configure.yml
- include: service.yml
```

CREATING AN ANSIBLE ROLE

4 Create **install.yml**, **configure.yml** and **service.yml** to include in the **main.yml**

★ To install apache2 in the remote machine

ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/tasks

```
ubuntu@ip-172-31-40-83:/etc/ansible/roles/apache/tasks$ sudo nano install.yml
```

ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/tasks

```
  GNU nano 2.9.3                                          install.yml

---
  - name: install apache2
    apt: name=apache2 update_cache=yes state=latest
```

CREATING AN ANSIBLE ROLE

4 Create **install.yml**, **configure.yml** and **service.yml** to include in the **main.yml**

To configure the apache2.conf file and to send copy.html file to the remote machine. Add notify too, based on which handlers will get triggered

ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/tasks

```
ubuntu@ip-172-31-40-83:/etc/ansible/roles/apache/tasks$ sudo nano configure.yml
```

ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/tasks

```
  GNU nano 2.9.3                                        configure.yml

---
#configure apache2.conf and send copy.html file
  - name: apache2.conf file
    copy: src=apache2.conf dest=/etc/apache2/
    notify:
     - restart apache2 service

  - name: send copy.html file
    copy: src=copy.html dest=/home/ubuntu/
```

CREATING AN ANSIBLE ROLE

4 Create **install.yml**, **configure.yml** and **service.yml** to include in the **main.yml**

To start apache2 service in the remote machine

ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/tasks

```
ubuntu@ip-172-31-40-83:/etc/ansible/roles/apache/tasks$ sudo nano service.yml
```

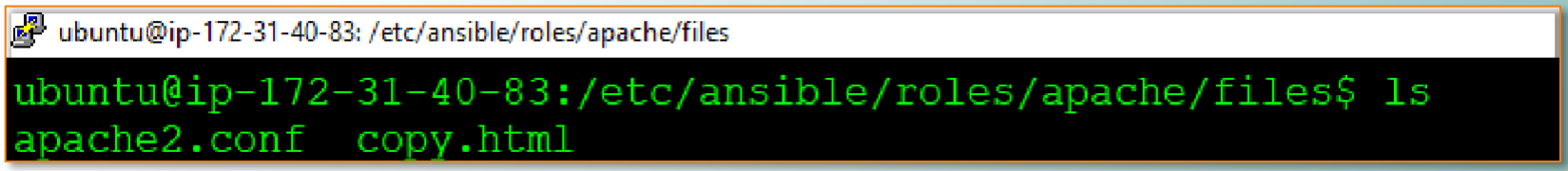
ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/tasks

```
  GNU nano 2.9.3                                          service.yml

---
  - name: starting apache2 service
    service: name=apache2 state=started
```

CREATING AN ANSIBLE ROLE

5 Now go inside files. Store the files that needs to be pushed to the remote machine

★ Copy the apache2.conf file and create one html file



CREATING AN ANSIBLE ROLE

6 Go inside handlers and add the action that needs to be performed after notify from configure.yml is executed.

★ Once the notify gets executed restart the apache2 service

ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/handlers

```
ubuntu@ip-172-31-40-83:/etc/ansible/roles/apache/handlers$ sudo nano main.yml
```

ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/handlers

```
  GNU nano 2.9.3                                          main.yml

---
# handlers file for apache
  - name: restart apache2 service
    service: name=apache2 state=restarted
```

CREATING AN ANSIBLE ROLE

Remember that notify name and handler name should match.

ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/tasks

```
  GNU nano 2.9.3                                    configure.yml

---
#configure apache2.conf and send copy.html file
  - name: apache2.conf file
    copy: src=apache2.conf dest=/etc/apache2/
    notify:
      - restart apache2 service

  - name: send copy.html file
    copy: src=copy.html dest=/home/ubuntu/
```

ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/handlers

```
  GNU nano 2.9.3                                      main.yml

---
# handlers file for apache
  - name: restart apache2 service
    service: name=apache2 state=restarted
```

CREATING AN ANSIBLE ROLE

7 Go inside meta and add information related to the role

★ Add author information, role descriptions, company information etc.

ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/meta

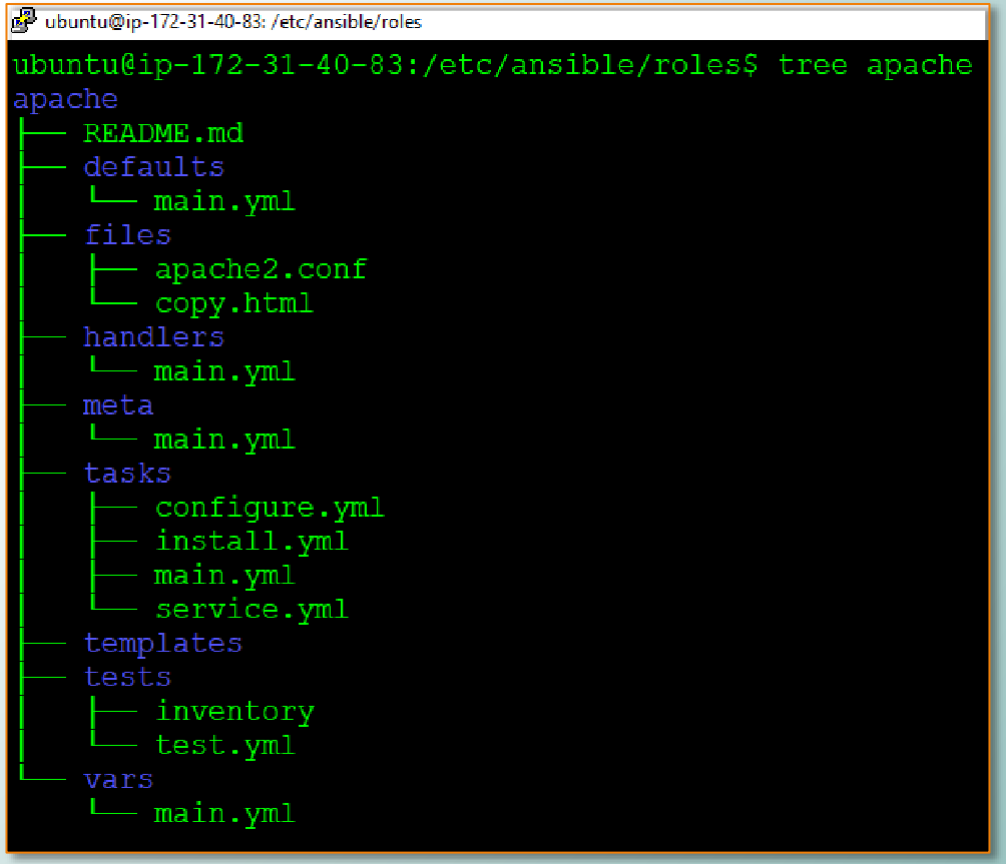
```
ubuntu@ip-172-31-40-83:/etc/ansible/roles/apache/meta$ sudo nano main.yml
```

ubuntu@ip-172-31-40-83: /etc/ansible/roles/apache/meta

```
  GNU nano 2.9.3                                          main.yml

galaxy_info:
  author: Intellipaat
  description: Simple apache role
  company: Intellipaat

  # If the issue tracker for your role is not on github, uncomment the
  # next line and provide a value
  # issue tracker url: http://example.com/issue/tracker
```

CREATING AN ANSIBLE ROLE

Structure of the role after adding all the required files



CREATING AN ANSIBLE ROLE

8 Go to the */etc/ansible/* and create one top level file where we can add hosts and roles to be executed

★ Execute *apache role* on the hosts that is under the group name *servers,* added in the inventory file */etc/ansible/hosts*

ubuntu@ip-172-31-40-83: /etc/ansible/roles

```
ubuntu@ip-172-31-40-83:/etc/ansible$ sudo nano site.yml
```

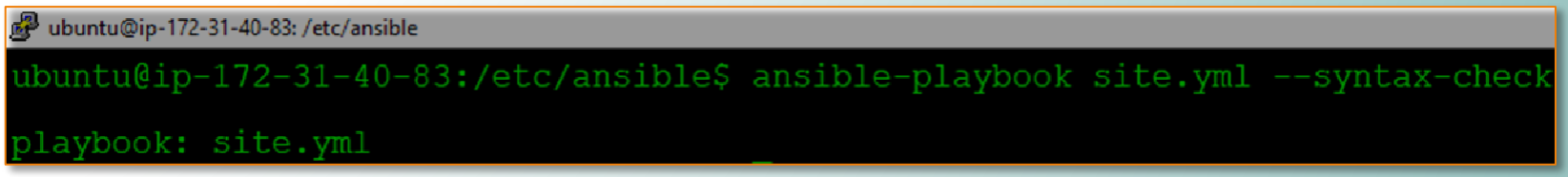
ubuntu@ip-172-31-40-83: /etc/ansible

```
  GNU nano 2.9.3                                          site.yml

---
  - hosts: servers
    roles:
      - apache
```

CREATING AN ANSIBLE ROLE

9 Before we execute our top level yml file we will check for syntax errors.

★ Use ansible-playbook <filename.yml> --syntax-check



CREATING AN ANSIBLE ROLE

10 Execute the top level yml file

★ Use ansible-playbook <filename.yml>

ubuntu@ip-172-31-40-83: /etc/ansible

```
ubuntu@ip-172-31-40-83:/etc/ansible$ ansible-playbook site.yml
```

```
PLAY [servers] ***************************************************************

TASK [Gathering Facts] *******************************************************
ok: [host1]
ok: [host2]

TASK [apache : install apache2] **********************************************
ok: [host1]
ok: [host2]

TASK [apache : apache2.conf file] ********************************************
ok: [host1]
ok: [host2]

TASK [apache : send copy.html file] ******************************************
ok: [host1]
ok: [host2]

TASK [apache : starting apache2 service] *************************************
ok: [host1]
ok: [host2]

PLAY RECAP *******************************************************************
host1                      : ok=5    changed=0    unreachable=0    failed=0
host2                      : ok=5    changed=0    unreachable=0    failed=0
```

USING ROLES IN PLAYBOOK

USING ROLES IN PLAYBOOK

- To use ansible roles along with other tasks in playbook Use *import_role* and *include_role.*

- Here we have created one playbook called *playbookrole.yml* to execute on *servers* along with two *debug* tasks before and after *apache* role.

ubuntu@ip-172-31-40-83: /etc/ansible

```
ubuntu@ip-172-31-40-83:/etc/ansible$ sudo nano playbookrole.yml
```

ubuntu@ip-172-31-40-83: /etc/ansible

```
  GNU nano 2.9.3                                  playbookrole.yml

---
  - hosts: servers
    sudo: yes
    tasks:
    - debug:
        msg: "before we run our role"
    - import_role:
        name: apache
    - include_role:
        name: apache
    - debug:
        msg: "after we ran our role"
```

USING ROLES IN PLAYBOOK

Check for syntax error and execute the playbook with roles.

```
ubuntu@ip-172-31-40-83: /etc/ansible
ubuntu@ip-172-31-40-83:/etc/ansible$ ansible-playbook playbookrole.yml --syntax-check

playbook: playbookrole.yml
```

```
ubuntu@ip-172-31-40-83: /etc/ansible
ubuntu@ip-172-31-40-83:/etc/ansible$ ansible-playbook playbookrole.yml
PLAY [servers] ***************************************************************

TASK [Gathering Facts] *******************************************************
ok: [host1]
ok: [host2]

TASK [debug] *****************************************************************
ok: [host1] => {
    "msg": "before we run our role"
}
ok: [host2] => {
    "msg": "before we run our role"
}

TASK [apache : install apache2] **********************************************
ok: [host1]
ok: [host2]

TASK [apache : apache2.conf file] ********************************************
ok: [host1]
ok: [host2]

TASK [apache : send copy.html file] ******************************************
ok: [host1]
ok: [host2]

TASK [apache : starting apache2 service] *************************************
ok: [host1]
ok: [host2]
```

Thank you