Ansible Playbooks

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Playbook Introduction

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YAML

A Playbook is typically a YAML file

Slide Deck

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A book with plays

Each play consists of tasks

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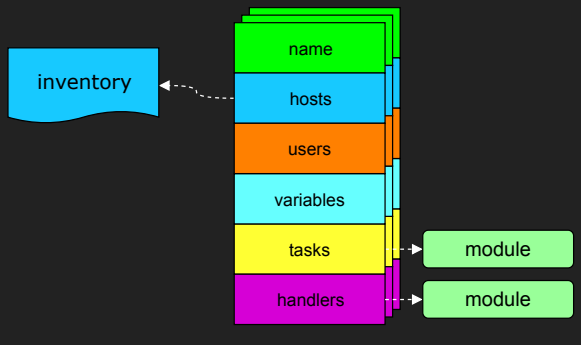
Play structure



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Breakdown of sections

Example

```yaml
---
- name: Configure Apache httpd
  hosts: tv-series-web-servers
  become: true
  tasks:
  - name: ensure https is at the latest version
    package:
      name: httpd
      state: present
  …
  - name: ensure apache is running
    service:
      name: httpd
      state: started
```


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Multiple plays

```
---
- name: Configure Apache httpd
  hosts: tv-series-web-servers
  become: true
  tasks:
    ...
- name: Configure Postgres
  hosts: tv-series-db-servers
  become: true
  become_user: postgres
  tasks:
    ...
```


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Hosts

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Example

```
---
- hosts: db-servers
  ...
```

Will be ordered by *inventory*

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Setting ordering

```
---
- hosts: db-servers
  order:
  ...
```

`inventory`, `reverse_inventory`, `sorted`, `reverse_sorted`, `shuffle`

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Gathering facts

```
---
- hosts: db-servers
  gather_facts: false
  ...
```

By default `true/yes`

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Tasks

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A play contains one or more tasks

a named call to a module with arguments

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Task list

- in order
- one-at-a-time for all machines
- then proceed to next task

This behaviour can be changed through strategies (explained later)

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Failures

machines with failed tasks are taken out of rotation

Errors can be managed (explained later)

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Example

```
tasks:
  - name: Ensure docker is installed
    package:
      name: {{docker_package_name}}
  - name: make sure docker is restarted and enabled
    service:
      name: docker
      state: restarted
      enabled: true
```


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Modules overview

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Categories

- Cloud modules
- Clustering modules
- Commands modules
- Crypto modules
- Database modules
- Files modules
- Identity modules
- Inventory modules
- Messaging modules
- Monitoring modules
- Net Tools modules
- Network modules
- Notification modules
- Packaging modules
- Remote Management modules
- Source Control modules
- Storage modules
- System modules
- Utilities modules
- Web Infrastructure modules
- Windows modules

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Getting help on a module

ansible-doc

```
$ ansible-doc …
```


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command

```
- name: Ensure the database is initialised
  command: "/usr/bin/initdb -u scott -encoding UTF-8 -n recipesdb"
  args:
    chdir: /var/db/
    creates: /var/db/recipesdb # to make this task idempotent
```

Uses *free form* syntax for the command (and hence the `args`)

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shell

runs in a shell (`/bin/sh`)

```
- name: Ensure security tokens are removed
  shell: "$HOME/cleanup.sh"
  args:
    removes: /etc/credentials/
```

Also uses *freeform*

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Installing software

calls yum, dnf, apt, …

```
- name: Ensure docker is installed
  package:
    name: {{docker_package_name}}
    state: present # (set to absent to uninstall)
```

Also available: apt, yum, yumdnf …

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Installing software

using a list

```
- name: Ensure docker is installed
  package:
    name:
      - docker
      - docker-compose
    state: present
```


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service module

```
- name: make sure docker is running and enabled
  service:
    name: docker
    state: started
    enabled: true
```

Uses **`ansible_service_mgr`** fact (systemd, systemctl, service, …)

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Non OS package modules

- bower
- bundler
- composer
- cpanm
- easy_install
- gems
- maven_artifact
- npm/yarn
- pear
- pip

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File modules overview

- archive
- blockinfile
- copy
- fetch
- file
- find
- ini_file
- lineinfile
- patch
- replacein
- stat
- synchronize
- tempfile
- template
- unarchive
- xml
- ...

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Copy files/directories

```yaml
- name: ensure index page is there
  copy:
    src: resources/index.html
    dest: /var/www/html
    owner: www
    group: www
    mode: 0644
```


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Ensuring lines in files

```yaml
tasks:
- lineinfile:
    path: /etc/httpd/conf/httpd.conf
    regexp: '^#Listen '
    line: 'Listen 8080'
- lineinfile:
    path: /etc/sudoers
    state: absent
    regexp: '^%wheel
```


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Block in files

```yaml
- name: Ensure proxy set for npm
  blockinfile:
    path: "{{ ansible_env.HOME }}/.npmrc"
    block: |
      proxy={{proxy_address}}
      https-proxy={{proxy_address}}
    marker: '# {mark} proxy settings'
    create: yes
    insertbefore: BOF
```

Often in conjunction with yaml literal style multi-line scalar (|)

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Creating users/groups

```yaml
tasks:
  - name: Ensure the jboss group exists
    group:
      name: postgres
      state: present
  - name: Ensure jboss user is available
    user:
      name: jboss
      group: jboss
      home: /opt/jboss/
      password: $6$7S8WGecOpqPvO22p$yxwVjGZpAk8G4xQ6DWDtSaevEc4luXQcBhlIZ8YuW.qewY8yXkmuNG.u3ZU3taccKDOHKQLj2hiibdaq7Yj1
      append: true
```

Password needs to be salted (see next slide)

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Password hasing

```
$ mkpasswd --method=sha-512
Password:
$6$78BWGecUgqFvOS2$p7yxwVjGZpAk8G6rQ6DNDtSsmvKr4luXQrBh1Z18YuW.qxw7ZyXkmoNG.u3ZU3tzccKDDHKQLj2hiibdaqJYj1
```

or use python (example is python3)

```
$ $ python -c 'import crypt,getpass; \
           print(crypt.crypt(getpass.getpass(), \
              crypt.mksalt(crypt.METHOD_SHA512)))'
```

For python make sure **passlib** is installed

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Identity & Privilege escalation

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overview

key	description
remote_user	SSH user
become	set to `yes` to escalate privilege
become_user	which user to *become* (root)
become_method	`su`, `sudo`, `pbrun`, …
become_flags	parameters to the `become_method`

might be used in conjunction with **`--ask-become-pass`**

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example

```
---
- hosts: webservers
  remote_user: admin
  become: yes
  become_user: www
```


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can also be set on tasks

```
---
- hosts: webservers
  tasks:
    - service:
        name: nginx
        state: started
      become: yes
      become_method: sudo
```


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defaults are set using `ansible.cfg`

ini	env	default
become	ANSIBLE_BECOME	false
become_ask_pass,	ANSIBLE_BECOME_ASK_PASS	false
become_flags	ANSIBLE_BECOME_FLAGS	''
become_method	ANSIBLE_BECOME_METHOD	sudo
become_user	ANSIBLE_BECOME_USER	root

`[privilege_escalation]` section

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Command Line Options

- --ask-become-pass,-K
- --become,-b
- --become-method=
- --become-user=

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Variables & Facts in Playbooks

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Variables in Playbook

example (recap)

```
---
- hosts: all
  user: vagrant
  vars:
    host: proxy01.example.com
    port_no: 8443
    proxy_address: http://{{host}}:{{port_no}}
  tasks:
  - name: Ensure proxy set in .npmrc
    blockinfile:
      path: "/home/vagrant/.npmrc"
      block: |
        proxy={{proxy_address}}
        https-proxy={{proxy_address}}
        …
```


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External File

```
hosts: …
vars_files:
  - vars/myvars.yaml
```

vars/myvars.yaml:

```
host: proxy01.example.com
port_no: 8443
proxy_address: http://{{host}}:{{port_no}}
```


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Command Line

-e/--extra-vars

```
- hosts: ""{{ env }}"

  …
```


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Command Line

-e/--extra-vars

```
- hosts: ""{{ env }}"

  …
```

```
$ ansible-playbook -e "env=localhost" playbook.yml
```


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Command Line

-e/--extra-vars

```
- hosts: ""{{ env }}"
  vars:
    port_no: 8443
  …
```

```
$ ansible-playbook -e "env=localhost" playbook.yml
```

Can also use yaml/json

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Command Line

-e/--extra-vars

```
- hosts: ""{{ env }}"
  vars:
    port_no: 8443
  …
```

```
$ ansible-playbook -e "env=localhost" playbook.yml

$ ansible-playbook -e "env=localhost"
                   -e "port_no=8080" playbook.yml
```

Can also use yaml/json

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Command Line

-e/--extra-vars

```
- hosts: ""{{ env }}"
  vars:
    port_no: 8443
  …
```

```
$ ansible-playbook -e "env=localhost" playbook.yml

$ ansible-playbook -e "env=localhost"
                   -e "port_no=8080" playbook.yml

$ ansible-playbook -e "-e "{'env':'test-machines'}"" playbook.yml
```

Can also use yaml/json

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Command Line

-e/--extra-vars

```
- hosts: ""{{ env }}"
  vars:
    port_no: 8443
  …
```

```
$ ansible-playbook -e "env=localhost" playbook.yml

$ ansible-playbook -e "env=localhost"
                   -e "port_no=8080" playbook.yml

$ ansible-playbook -e "-e "{'env':'test-machines'}"" playbook.yml

$ ansible-playbook -e "@my-vars.json" playbook.yml
```

Can also use yaml/json

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Prompting

```
- hosts:  localhost
  vars:
    proxy: http://{{username}}:{{password}}@{{host}}:{{port_no}}
    …
  vars_prompt:
  - name: username
    prompt: "proxy username"
    private: no
  - name: password
    prompt: "proxy password"
    private: yes
```


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Register Variables

```
tasks:
- command: /usr/sbin/ip route list 10.0.2.0/24
  register: routeValue
- debug:
    var: routeValue
```


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Setting facts using set_fact

```
tasks:
  - command: whoami
    register: woami_result
  - set_fact:
      user: "{{woami_result.stdout}}"
```


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set_fact using Jinja2 functions

```
tasks:
  - command: /usr/sbin/ip route list 10.0.2.0/24
    register: route_result
  - set_fact:
      route_ip: "{{route_result.stdout.split()[8]}}"
```


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Troubleshooting

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Check syntax

--syntax-check

```
$ ansible-playbook --syntax-check test.yml
```


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Check mode

-C/--check

```
$ ansible-playbook --check mybook.yml
```

Like a *dry-mode*

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Diff

(together with check-mode)

```
$ ansible-playbook --check --diff mybook.yml
...
```


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DIFF
(together with check-mode)

```
$ ansible-playbook --check --diff mybook.yml
...
TASK [Configure the server] ***********************************
--- before: /etc/nginx/conf.d/server.conf (content)
+++ after: /etc/nginx/conf.d/server.conf (content)
@@ -0,0 +1,6 @@
+# BEGIN ANSIBLE MANAGED BLOCK
+server {
+       listen 80;
+       location / {
+       }
+  }
+# END ANSIBLE MANAGED BLOCK
```


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verbose mode

```
$ ansible-playbook  my-book.yaml  --verbose
```

-v/--verbose, -vvv, -vvvv

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debug module

```
- tasks:
  - name: Initialise the database
    shell: initdb
    register: result
  - debug:
      var: result
      verbosity: 3  # for -vvv, 0 by default
```

Or use `msg` with Jinja2 templates

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stepping
one-step-at-a-time

```
$ ansible-playbook mybook.yaml --step
PLAY [mybook] task: TASK: Gathering Facts
  (N)o/(y)es/(c)ontinue:
```

At the same time open a ssh connection to investigate

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stepping
one-step-at-a-time

```
$ ansible-playbook mybook.yaml --step
PLAY [mybook] task: TASK: Gathering Facts
  (N)o/(y)es/(c)ontinue: y
```

At the same time open a ssh connection to investigate

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stepping
one-step-at-a-time

```
$ ansible-playbook mybook.yaml --step
PLAY [mybook] task: TASK: Gathering Facts
  (N)o/(y)es/(c)ontinue: y
ok: [db-servers]
Perform task: TASK: Ensure database is installed
(N)o/(y)es/(c)ontinue: |
```

At the same time open a ssh connection to investigate

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Make error messages easier to read

```
ANSIBLE_STDOUT_CALLBACK=yaml  ansible-playbook mybook.yaml
```

Can also be set in `ansible.cfg` (`stdout_callback`)

More on this later

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Lab 3

Playbooks

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Handlers

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Problem

- certain tasks require an action afterwards
- tasks are idempotent
- so how do we know if we need to perform the action?
- what if many tasks require the same action (e.g., reload a service?)

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Handlers

- Called zero or one time
- only when notified one or more times
- at the end of the block
- in the order they are defined

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Defining Handlers

```
tasks:
...
handlers:
- name: restart redis service
  service:
    name: redis
    state: restarted
- name: restart docker service
  service:
    name: docker
    state: restarted
```


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Triggering Handlers by their *name*

```
tasks:
   - name: configure redis authentication
     ...
     notify: restart redis service
   - name: enable redis store
     ...
     notify: restart redis service
handlers:
...
```


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Triggering Handlers using *listen*

```
tasks:
  - name: configure redis authentication
    ...
    notify: RESTART_REDIS
handlers:
  - name: restart redis service
    service:
      name: redis
      state: restarted
    listen: RESTART_REDIS
```

Decouples from handler's name

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Triggering multiple handlers;

```
tasks:
  - name: configure redis authentication
    ...
    notify: RESTART_REDIS
handlers:
  - name: restart redis service
    ...
    listen: RESTART_REDIS
  - name: restart redis proxy
    ...
    listen: RESTART_REDIS
```


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Triggering all handlers before block-end using a *meta* statement

```
tasks:
   - name: ...
     ...
   - name: ...
     ...
   - meta: flush_handlers
```

Triggers all notified handlers inside block so far

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Lab 4

Handlers

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Done!

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