

18/03/2019 Playbooks Advanced

PLAYBOOKS ADVANCED

- Ansible Introduction
- Ansible Concepts
- Ansible Playbooks
- Plugins & Dynamic inventories
- ➔ Playbooks Advanced
- Ansible Roles
- AWX / Ansible Tower Overview

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VAULTS

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ENCRYPT SENSITIVE DATA

encrypted variables

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ENCRYPTED VAR FILES

- group & host vars
- var files
- files passed as arguments (e.g, `-e @myvars.json`)

Can also inline encrypted data without a file

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USES SEPARATE TOOL

ansible-vault

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EXAMPLE

creating a FILE

```
$ ansible-vault create secrets.yaml
New Vault password:
Confirm New Vault password:
[WARNING]: does not exist, creating...
```

set `$EDITOR` to launch an editor different from vi

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commands

Command	Description
create	create a new vault
edit	change contents
view	view contents (decrypted)
encrypt/decrypt	encrypt/decrypt file
encrypt_string	encrypt string (to embed in yaml)
rekey	change the vault's password

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using

(example uses var_files)

```
- hosts: ...
  var_files:
    vars/secrets.yaml
  tasks:
    - name: Ensure mysql user is available
      mysql_user:
        name: bob
        password: "{{mysql_pwd}}"
        priv: '*.*:ALL'
        state: present
```

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PROVIDING THE VAULT PASSWORD(S) PROMPT

```
$ ansible-playbook mysql-db.yaml ----vault-id @prompt
```

—ask-vault-pass/—vault-password-file are deprecated

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PROVIDING THE VAULT PASSWORD(S) PASSWORD FILE

```
$ ansible-playbook mysql-db.yaml ----vault-id=prod-passwords
```

can also be an executable script

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STRUCTURING

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IMPORT & INCLUDE

- static `import_...`
- dynamic `include_...`

`import` (for both tasks/playbooks) has been deprecated

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DIFFERENCES

STATIC

parse time

- can't use inventory vars for filename
- not for loops

DYNAMIC

EXECUTION TIME

- great for loops
- can't use `start-at-tasks`
- can't trigger a included handler

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use-cases

- loops (explained later)
- Making plays DRY
- Having a master/main playbook
- Managing large playbooks

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EXAMPLE

```
tasks:
  - import_tasks: tasks/install_apache.yaml
  - import_tasks: tasks/remove_defaults.yaml
  - include_tasks: tasks/setup_{(ansible_os_family | lower)}.yaml
```

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CAN PASS VARIABLES

```
task:
  - import_tasks: includes/remove_defaults.yaml
    vars:
      include_modules: false
```

for both imports and includes

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MAIN YAML

```
---
- import_playbook: redis.yaml
- import_playbook: auth-server.yaml
- import_playbook: tvseries-db.yaml
- import_playbook: tvseries-api.yaml
- import_playbook: frontend.yaml
- import_playbook: load-balancer.yaml
```

used in "standard" directory structures

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DIRECTORY STRUCTURE

EXAMPLE 1

```
├── production
├── staging
├── group_vars
│   ├── nginx.yaml
│   └── postgres-servers.yaml
├── host_vars
│   └── proxy.example.com
├── main.yaml
├── databases.yaml
└── webservers.yaml
```

```
# inventory
# inventory
# variables for server groups

# variables for specific hosts
# main playbook (with import_playbook)
# playbook for databases
# playbook for web servers
```

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ANOTHER STRUCTURE

```
inventories
├── production
│   ├── group_vars
│   │   ├── nginx.yaml
│   │   └── postgres-servers.yaml
│   ├── host_vars
│   │   └── proxy.example.com
│   └── hosts
├── staging
│   ├── group_vars
│   │   ├── nginx.yaml
│   │   └── postgres-servers.yaml
│   ├── host_vars
│   │   └── proxy.test.com
│   └── hosts
├── databases.yaml
├── main.yaml
└── webservers.yaml
```

(when host/group vars differ a lot)

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JINJA2

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<http://jinja.pocoo.org/>

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JINJA2

TEMPLATING LANGUAGE FOR PYTHON

Based on [django](#)

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USAGE WITHIN ANSIBLE

- value expressions
- looping expressions
- conditional expressions
- templating

evaluation occurs on the control machine

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SIMPLE EXAMPLES

```
- name: Jinja
  hosts: localhost
  vars:
    x: 10
  tasks:
    - name: values
      debug:
        msg: "x: {{x}}"
    - name: conditional
      debug:
        msg: "x< 100: {{x<100}}"
```

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ACCESSING DICTIONARIES

DOTS or array-LIKE

```
- debug:
  msg: "{{hostvars['n1'].ansible_eth1.ipv4.address}}"
- debug:
  msg: "{{hostvars['n1']['ansible_eth1']['ipv4']['address']}}"
```

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SYNTAX BY example

CONDITIONS

```
{% if x < 10 %}
  x is less than 10 {{ x }}
{% else %}
  x is too high
{% endif %}
```

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SYNTAX BY example

LOOPS

```
<Proxy balancer://myset>
{% for host in groups[ tvwebservers ] %}
  BalancerMember
  {{ hostvars[host]['ansible_eth1']['ipv4']['address'] }}
{% endfor %}
ProxySet lbmethod=bytraffic
</Proxy>
```

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FILTERS

TO *MODIFY* value of a variable

```
$ ansible localhost -e "v=hello" -m debug -a "msg={{ v|upper }}"
```

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FILTERS

TO *MODIFY* value of a variable

```
$ ansible localhost -e "v=hello" -m debug -a "msg={{ v|upper }}"
$ ansible localhost -e "{x: [12,21,3]}" -m debug \
  -a "msg={{ x | min }}"
```

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FILTERS

TO *MODIFY* value of a variable

```
$ ansible localhost -e "v=hello" -m debug -a "msg={{ v|upper }}"
$ ansible localhost -e "{x: [12,21,3]}" -m debug \
  -a "msg={{ x | min }}"
$ ansible localhost -m debug -a "msg={{ foobar|default(10) }}"
```

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FILTERS overview

- Formatting Data
- mandatory
- Defaulting
- Omitting Parameters
- List
- Set Theory
- Dict Filter
- subelements
- Random Number
- Shuffle
- Math
- JSON Query
- IP address filter
- Network CLI
- Network XML
- Hashing filters
- Combining
- Extracting
- Comment
- URL Split
- Regular Expressions
- Combinations
- Debugging
- Other

See also jinja2 built-in filters

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LOOKUPS

PLUGIN TO access OUTSIDE DATA

USES PLUGINS

On the control node

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KEY LOOKUP PLUGINS

- config
- csvfile
- dict
- env
- etcd
- file
- fileglob
- filetree
- first_found
- flattened
- ini
- inventory_hostnames
- items
- k8s
- lines
- mongoddb
- redis/redis_kv
- lastpass/onepassword/passwordstore
- pipe
- sequence
- template
- url

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LOOKUP EXAMPLE

```

- name: Jinja
  hosts: localhost
  vars:
    hosts: "{{lookup('file','/etc/hosts')}}"
  tasks:
    - name: lookup value
      debug:
        msg: "hosts: {{hosts}}"

```

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LOOPS

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TRADITIONAL LOOPS

```

- name: Ensure proxy set in .bashrc
  lineinfile:
    path: "{{ ansible_env.HOME }}/.bashrc"
    line: export {{item}}={{proxy_address}}
    insertbefore: EOF
    create: yes
  with_list:
    - http_proxy
    - HTTP_PROXY
    - https_proxy
    - HTTPS_PROXY
    ...
    - SOCKS_PROXY

```

6.2

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REPLACED BY new >2.5 loop

```
- name: Ensure proxy set in .bashrc
  lineinfile:
    path: "{{ ansible_env.HOME }}/.bashrc"
    line: export {{ item }}={{ proxy_addresses }}
    insertbefore: EOF
    create: yes
  loop:
    - http_proxy
    - HTTP_PROXY
    ...
    - SOCKS_PROXY
```

Let's have a look at both

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ROAD TO TRADITIONAL LOOPS

consider

```
vars:
  lines: "{{lookup('lines','cat /etc/hosts', wantlist=true)}}"
tasks:
  - name: lookup lines
    debug:
      msg: "1st line: {{lines | first}}"
```

(wantlist ensures the lines are returned as a list)

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ROAD TO TRADITIONAL LOOPS

LOOPING

```
- name: loop over
  debug:
    msg: "item: {{item}}"
  with_lines: cat /etc/hosts
```

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TRADITIONAL LOOPS

Are really LOOKUPS

- with_items (lookup/flatten)
- with_lines (lookup/lines)
- with_fileglob (lookup/fileglob)
- with_... (lookup/...)

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ROAD TO CONTEMPORARY LOOPS

query ALWAYS returns a LIST

```
# recall
vars:
  lines: "{{lookup('lines','cat /etc/hosts', wantlist=true)}}"
  qlines: "{{query('lines','cat /etc/hosts')}}"
```

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new >2.5 LOOPS

loop WITH query

```
- name: new loop over
  debug:
    msg: "{{item}}"
  loop: "{{query('lines', 'cat /etc/hosts')}}"
```

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LOOPING OVER MULTIPLE TASKS

```
# conf-reverse-proxy.yaml
- task: Ensure {{item}} Cluster is defined
  template:

- task: Ensure {{item}} Virtual Host is defined
  template:
  ...

tasks:
- include_tasks: includes/conf-reverse-proxy.yaml
  loop:
  - {worker: tvweb,  serverName: "www.tvweb.org"}
  - {worker: tvapi,  serverName: "api.tvweb.org"}
```

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Renaming LOOPING variable

```
- set_fact:
  host: "{{ item }}"
- task: Ensure {{host}} Cluster is defined
  template:

- task: Ensure {{host}} Virtual Host is defined
  template:
  ...
```

Especially helpful when using loops inside the includes tasks

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conditional

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when

run TASK(S) under a
CONDITION
BASED ON VARIABLES/FACTS

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when example

```
tasks:
- name: Ensure a reboot takes place (Debian only)
  command: /sbin/shutdown -t now
  when: ansible_distribution == "Debian"
```

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using and/or

```
tasks:
- name: Reboot CentOS 6 or when forced has been set
  command: ...
  when: (ansible_distribution == "CentOS" and
        ansible_distribution_major_version == "6")
        or (force_reboot)
```

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USING a LIST

(LOGICAL and)

```
tasks:
  - name: Create directories for CentOS 7
    file:
      ...
    when:
      - ansible_distribution == "CentOS"
      - ansible_distribution_major_version == "7"
```

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Running a task only

when another task ran

```
tasks:
  - name: Ensure Proxy has been set for the docker daemon
    blockinfile:
      path: /etc/systemd/system/docker.service.d/proxy.conf
      ...
  - name: reload the daemon
    systemd:
      name: docker
      daemon_reload: true
```

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Running a task only

when another task ran

```
tasks:
  - name: Ensure Proxy has been set for the docker daemon
    blockinfile:
      path: /etc/systemd/system/docker.service.d/proxy.conf
      ...
    register: docker_conf
  - name: reload the daemon
    systemd:
      name: docker
      daemon_reload: true
    when: docker_conf | changed
```

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Error HANDLING

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DEFAULT BEHAVIOUR

```
...
TASK [Ensure SSL certificate from twitter.com ...] *****
changed: [10.20.1.3]
changed: [10.20.1.2]
Fatal: [10.20.1.4]: FAILED! => {"changed": false, "cmd": "...", ... }

TASK [Ensure Trust store is ... ] *****
changed: [10.20.1.3]
changed: [10.20.1.2]

PLAY RECAP *****
10.20.1.2      : ok=4    changed=3    unreachable=0    failed=0
10.20.1.3      : ok=4    changed=3    unreachable=0    failed=0
10.20.1.4      : ok=2    changed=1    unreachable=0    failed=1
```

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DEFAULT BEHAVIOUR

- machine with error is taken out of rotation
- if all machines have failed, the play stops
- handlers are *not* invoked on the failt host
- same applies to *unreachable* hosts

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Error by default is non-zero return code

this behaviour can be tuned

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ABORT THE WHOLE PLAY

```
- hosts: rest_servers
  any_errors_fatal: true
  tasks:
    - name: ...
      ...
```

Or use `max_fail_percentage`

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FORCING HANDLERS

```
- hosts: rest_servers
  force_handlers: true
  tasks:
    - name: ...
      ...
```

Can also be specified in `ansible.cfg` or using `—force-handlers`

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IGNORING FAILURES

```
- name: Ensure database is Initialised
  command: sqltool {{sql_file}}
  ignore_errors: yes
- name: Ensure database is configured
  ...
```

This ignores errors from the task's result only

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IGNORING errors

```
...
TASK [Ensure database is Initialised] *****
changed: [10.20.1.3]
changed: [10.20.1.2]
fatal: [10.20.1.4]: FAILED! => {"changed": false, "cmd": "...", ... }
...ignoring

TASK [Ensure database is configured ] *****
changed: [10.20.1.3]
changed: [10.20.1.2]
changed: [10.20.1.4]

PLAY RECAP *****
10.20.1.2      : ok=4    changed=3    unreachable=0    failed=0
10.20.1.3      : ok=4    changed=3    unreachable=0    failed=0
10.20.1.4      : ok=4    changed=2    unreachable=0    failed=0
```

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DEALING WITH zero-return code errors

USING `failed_when`

```
- name: JunOS Commands
  junos_command:
    commands:
      - show version
  ...
  register: results
  failed_when: '"[12.3R12.4]" in results.stdout[0]'
```

From 

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BLOCKS

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LOGICAL GROUP OF TASKS

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use cases

- common/shared configuration
- conditional blocks
- error-handling

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EXAMPLE

```
tasks:
  - name: Install Apache
    block:
      - yum:
          name: httpd
          state: installed
      - template:
          src: templates/src.j2
          dest: /etc/foo.conf
      - service:
          name: bar
          state: started
          enabled: True
    when: ansible_distribution == 'CentOS'
    become: true
    become_user: root
```

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rescue/always

```
tasks:
  - name: Take VM out of the load balancer
  - name: Create a VM snapshot before the app upgrade
  - block:
      - name: Upgrade the application
      - name: Run smoke tests
    rescue:
      - name: Revert a VM to the snapshot after a failed upgrade
    always:
      - name: Re-add webserver to the loadbalancer
      - name: Remove a VM snapshot
```

Similar to try-catch-finally in programming

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LAB 7

COMPLEX PLAYBOOKS

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STRATEGIES

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overview

- linear (default)
- free
- serial

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Linear

(5 machines, parallelism 3, tasks 2)

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Free

(5 machines, parallelism 3, tasks 2)

10.4

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EXAMPLE

```
- hosts: all
  strategy: free
  tasks:
    - name: First nap
      command: sleep {{wait}}
    - name: Second nap
      command: sleep 6s
    - name: done
      debug:
        msg: done {{ansible_hostname}}
```

See [~/course/ansible/demos/playbooks/strategies.yaml](#)

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BATCH

(5 machines, batch: 2, parallelism 3, tasks 3)

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BATCH EXAMPLE

```
- name: Rolling update of the rest back-end
hosts: rest-servers
serial: 3
tasks:
  - name: Ensure latest version is Available
    git:
      repo: 'https://gitlab.example.com/tvapp/backend.git'
      dest: /var/app/
      depth: 1
    ...
```

Great for *rolling updates*

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BATCH VALUES

- fixed number: 3
- percentage: 33%
- List (fixed and/or percentages):

```
serial:
  - 1 # 1st batch size
  - 3 # 2nd batch size
  - 20% # batch size for remaining hosts
```

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TASK DELEGATION

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DeLEGate

RUN TASK ON HOST

Inventory variables are kept

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EXAMPLE

(CONTEXT: ROLLINT UPDATE)

```
- hosts: webservers
serial: 1
tasks:
  - name: disable nagios alerts for this host webserver service
    nagios: 'action=disable_alerts host={{inventory_hostname}} ...'
    delegate_to: nagios.example.com

  - name: disable the server in haproxy
    haproxy: 'state=disabled host={{inventory_hostname}} ...'
    delegate_to: lb.example.com
```

[View Example](#)

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TAGS

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ONLY run SPECIFIC PART OF a PLAYBOOK

SPECIFIC *TAGGED* TASKS

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TAGGING TASKS

```
tasks:
  - package:
    - nginx
    - mysql
    tags:
    - installation
  - pip:
    name: docker-py
    tags:
    - installation
  - template:
    src: templates/nginx.j2
    dest: /etc/nginx/nginx.conf
    tags:
    - configuration
```

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INCLUDING TAGGED TASKS

```
$ ansible-playbook -tags "configuration" provision.yml
```

can be comma-separated list of tags

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EXCLUDING TAGGED TAGS

```
$ ansible-playbook -skip-tags "installation" provision.yml
```

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LISTING ALL TAGS

```
ansible-playbook mybook.yaml --list-tags
```

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LISTING ALL TAGS

```
ansible-playbook mybook.yaml --list-tags
playbook: mybook.yaml

play #1 (all): all TAGS: []
TASK TAGS: [security, content]
```

12.6

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THE **always** TAG

WILL always run (except WHEN SKIPPING)

```
tasks:
  - name: Configure nginx
    ...
    tags:
      - always
```

12. 7

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THE **never** TAG

WILL never run (except WHEN INCLUDING)

```
tasks:
  - name: Configure nginx
    ...
    tags:
      - never
```

12. 8

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RUNNING ONLY UNTAGGED

```
$ ansible-playbook -tags untagged provision.yml
```

12. 9

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TAGGING all TASKS in a PLAY

```
- hosts: front-end
  tags:
    - content
```

12. 10

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TAGGING IMPORTED TASKS/ROLES

```
- import_tasks: database-tasks.yml
  tags:
    - config
```

for dynamic (`include_...` the tags apply to the tag intself)

12. 11

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LAB 8

Delegation & more

13

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done!

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