Simply Ansible

> Getting started with Ansible best practices

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`new Ansible()`

> Ansible is an IT automation tool. It can configure systems, deploy software, and orchestrate more advanced IT tasks such as continuous deployments or zero downtime rolling updates.

Ansible basics

- Ansible uses YAML for pretty much everything
    - Except for the occasional INI format
- Templates are written in Jinja2 template language
    - Can show up in `.yml` files. Much fun!
- Requires Python 2.x, on both control machine and managed nodes
    - No agent required on managed nodes
    - Modules may require certain libraries/apps to be installed

Using Ansible

`ansible` - ad hoc commands

Handy, but use sparingly. Changes to systems should be done through playbooks.

```
$ ansible all \
>   --module-name command \
>   --args "uname -a"
services | SUCCESS | rc=0 >>
Linux services 3.2.0-107-virtual #148-Ubuntu SMP Mon Jul

mariadb | SUCCESS | rc=0 >>
Linux mariadb 3.2.0-107-virtual #148-Ubuntu SMP Mon Jul 1

pdns | SUCCESS | rc=0 >>
Linux pdns 3.10.0-327.22.2.el7.x86_64 #1 SMP Thu Jun 23 1
```

`ansible-playbook` - what you really want

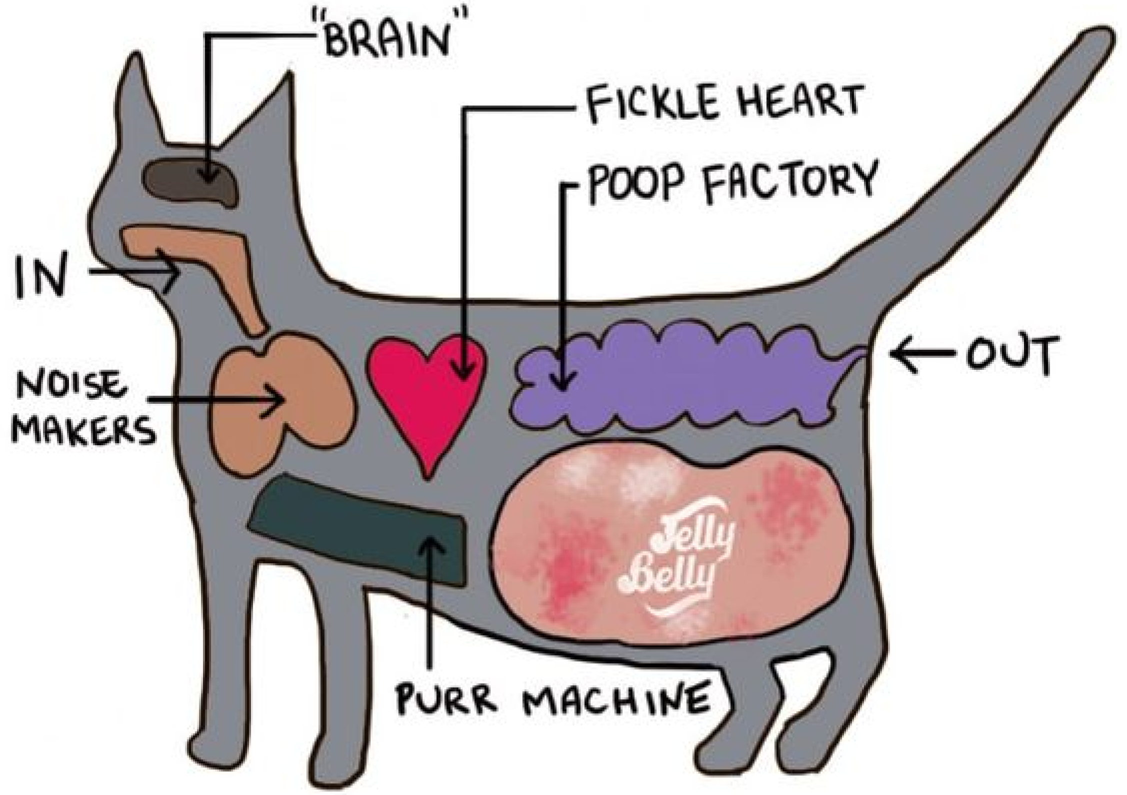
The `ansible-playbook` command executes the tasks specified in the playbook, in order, against the managed hosts.

```
$ ansible-playbook site.yml
PLAY [Do the thing] *************************************

TASK [setup] ********************************************
ok: [mariadb]
ok: [services]
ok: [pdns]

TASK [The thing] ****************************************
ok: [mariadb]
ok: [services]
skipped: [pdns]
```

Anatomy of an Ansible project



Inventory

The list of managed hosts

Can be static (in a `.ini` file) or dynamic (results of a `.py` inventory script).

```ini
# ./inventory/vagrant.ini
[services]
services ansible_host=192.168.98.100

[mariadb]
mariadb ansible_host=192.168.98.200
```

Variables

- Values that may vary per system
    - About a zillion different places to specify vars
    - Please don't use *all* of them

```
# ./group_vars/all/main.yml
---
# default to direct mail delivery.
# if you have a relay, set it here.
smtp_relay_host: ''

# Use for NODE_ENV, RAILS_ENV, RACK_ENV, etc.
app_env: development
```

Secret Variables: Ansible Vault

The `ansible-vault` command can be used to manage encrypted files. Put any secrets for a given environment in a `vault.yml` file in that environment's `group_vars`.

```
# create a vault
$ ansible-vault create group_vars/${ENV}/vault.yml
# edit a vault
$ ansible-vault edit group_vars/${ENV}/vault.yml
```

Playbook

A playbook is a list of plays, which are executed sequentially, in order.

```yaml
# ./site.yml
---
- name: Some play
  hosts: some-hosts
  roles:
   - some-role

- name: Some other play
  # ...
```

Play

A play is a list of roles, which are executed sequentially, in order.

```
- name: Some play
  hosts: some-hosts
  roles:
    - some-role
    - some-other-role
```

Role

A role is a list of tasks, which are executed sequentially, in order.

Plus some other stuff.

```
site.yml
roles/
   some-role/
     tasks/
       main.yml # tasks go in here
     vars/
       main.yml # role-specific vars go in here
     handlers/
       main.yml # tasks that are triggered optionally
                #   i.e. service restarts
     files/
       ...      # content for copy/script tasks
     templates/
       ...      # content for template tasks
                #   always append .j2 to filenames
```

Parameterized Role

A role may be parameterized, meaning that it expects certain variables to be set.

```
- role: rvm_io.rvm1-ruby
  rvm1_autolib_mode: 4 # automatically install deps
  rvm1_rubies: ['ruby-2.3.1', 'ruby-2.2.5']
```

Sharing roles

- Common roles can be shared via Ansible galaxy or git repo
- BUT... they tend to be very small, poorly versioned, and so poorly maintained, this is rarely useful
    - Don't use a role unless it has tagged versions
    - AND it looks like someone loves and cares for it
    - Otherwise, learn what you can from it and write your own

Task

A task specifies a module and the parameters to invoke it with. The task is executed in parallel on every matching host for that play.

```
- name: perform an action
  # args can be name=value
  action: some_param=some-value

- name: perform another action
  # or args can be an object
  action:
    some_param: some-value
```

Block

A block can all you to more easily apply settings to a group of tasks. Also adds `rescue` blocks for error handling. New in Ansible 2.x.

```
- when: some_var == 'some-val'
  block:
   - name: conditionally do a thing
     action: some_param=some-value
   - name: conditionally do another thing
     another_action: some_param=some-value
```

Template

You can use Jinja2 syntax in `.j2` template files, or in task definitions.

```
- name: perform an action
  action: some_param='{{ some_var }}'
  #                  ^              ^
  #                  in YAML, quotes are
  #                  usually necessary to
  #                  avoid yaml/j2 confusion
```

Tags and limits

Tags specify which tasks to run. Limits specifies which hosts to run those tasks on.

```
# run entire playbook on single machine
$ ansible-playbook site.yml --limit some-new-machine

# run everything tagged with sontaran on all machines
$ ansible-playbook site.yml --tags sontaran

# run sil and ood on the webservers not in San Diego
$ ansible-playbook site.yml --tags sil,ood \
>   --limit webservers:!san-diego
```

PROTIPS

Put tasks in roles, not the playbook

While you can list tasks directly in a play, you're usually better off putting the task off in a role.

```
# ./site.yml
- name: Some play
  hosts: some-hosts
  pre_tasks:        # meh
   - name: some pre_task
  roles:
   - some-role
  tasks:            # really?
   - name: some task
  post_tasks:       # PLEASE STOP!
   - name: some post_task
```

Really, keep tasks in roles

Besides, content from Ansible Galaxy can only be brought in as a role, so trying to sort that into existing `{pre,post}_tasks` is a pain.

```
- name: Some play
  hosts: some-hosts
  pre_tasks:
   # but what if I wanted to call a galaxy role
   # before this?
   - name: some pre_task
  post_tasks:
   - name: some post_task
   # or maybe a role after this?
```

Keep roles small and single purpose

If the playbook is your 'program', then roles are your 'functions'.

- For example, `pip` , `firewall` , `nodejs` , `timezone` , `auton`
- Not things like `common` , `general` , `misc` , ...
- Keep them small; most will fit on the screen

Bending the rule: `debug-tools`

I usually have a rule with a bunch of one-line installers for things that are generally useful for debugging. But if you can't install it with a single `apt`, `pip`, `npm`, `gem`, etc., then it gets its own role.

```yaml
# ./roles/debug-tools/tasks/main.yml
- when: ansible_distribution == 'Ubuntu'
  name: apt-get install <cool-stuff>
  apt: name={{ item }}
  with_items:
    - curl
    - htop
    - iotop
    - jq
    # ...
```

Avoid repeating roles...

Here both `foo` and `bar` need `zygon`. Since plays are sequential, `zygon` will be installed in sequence. Can really slow down the playbook.

```
- hosts: foo
  roles:
   - zygon # Bad!
   - foo

- hosts: bar
  roles:
   - zygon # Bad!
   - bar
```

i.e., consolidate roles to get parallelism

Since the `zygon` role is in a single play, it will execute in parallel on both `foo` and `bar`. You can't always do this, but when you can, it helps tremendously.

```
- hosts: foo,bar # both foo and bar groups
  roles:
   - zygon    # installs in parallel
              # across foo & bar nodes

- hosts: foo
  roles:
   - foo

- hosts: bar
  roles:
   - bar
```

Tag each role with the role's name

By keeping tag names consistent with role names, it's easier to keep track of what tags you have.

```
# ./roles/zygon/tasks/main.yml
---
- tags: zygon
  block: # Ansible 2.x syntax
   - name: First zygon invasion
     # ...
```

Since roles are small and single purpose, you're usually debugging individual roles.

```
$ ansible-playbook site.yml --tags zygon
```

Role tagging in Ansible 1.9

Before Ansible 2.x, the best way to tag an entire role was to put the tag in the playbook. Either way is fine.

```
roles:
 - { role: zygon, tags: zygon } # Ansible 1.9 syntax
```

Don't put tons of tags on a task

If you find yourself putting lots of tags on a task, you're probably doing it wrong. A tag should be there for a reason.

```
tags:
 - provision # okay, but every task in the
             #   playbook is for provisioning
 - bamboo    # and everything is for bamboo
 - bamboo-agent
             # what are you doing?
 - bamboo-agent-ubuntu
             # wait...
 - bamboo-agent-ubuntu-precise
             # MAKE IT STOP
 - bamboo-agent-ubuntu-precise-provision
             # *sigh*
```

Put variable definitions in the right spot

```
site.yml          # in the occasional vars block
                  # for parameterized roles
group_vars/
  all/
    main.yml      #   default values
    ...           #   can break into multiple files
  staging/        # Have a group for each environment
    main.yml      #   override defaults for env
    vault.yml     #   safe place for secrets
roles/
   kandy-man/
     vars/
       main.yml # specific vars for the role
                  # version numbers, SHA hashes, etc.
```

Vaults: too many vaults will kill you

- We tried having single-var per vault
    - PRO: Avoids merge conflicts w/ vaults
    - CON: No one follows the rules
        - Vars end up in random vaults
        - Or var was renamed and vault wasn't
        - Grep is either powerless, or really slow
- Use ansible-vault-tools and as few vaults as possible
    - Single vault per `group_vars`
    - `ansible-vault-merge` - magical vault merging
    - `ansible-vault-textconv` - magical vault diffing
        - And `git grep --textconv` can search in vaults!

!!!ENCRYPT YOUR VAULT PASSWORD!!!

The `ansible-vault-tools` project also provides `gpg-vault-password-file`, which can use your PGP key to encrypt your vault password.

- You do have a PGP key, right?
- And it's encrypted with a passphrase?
- And you use gpg-agent so you don't go insane typing the passphrase all the time?

Put common settings in `ansible.cfg`

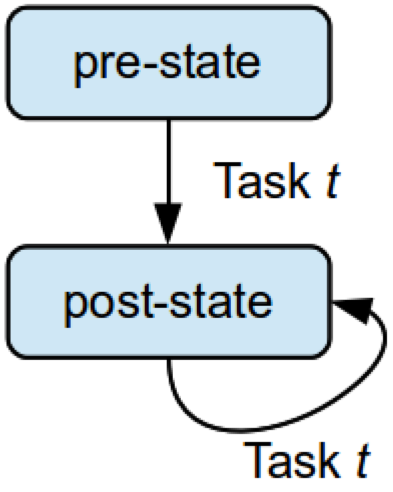
Defaults should be what's best for the humans that run the playbooks by hand the most (probably devs).

```
# ./ansible.cfg
[defaults]
# Why is the default not smart?
gathering = smart
# Default for most common params devs would use
inventory = ./inventory/vagrant.ini
# Consistent configuration for vault passwords
vault_password_file = $HOME/.ansible/some_project_vault

[privilege_escalation]
# Nearly everything requires sudo, so default to it
become = True

[ssh_connection]
# Speeds things up, but requires disabling
# requiretty in /etc/sudoers
pipelining = True
```

Make sure roles are idempotent



> The concept that change commands should only be applied when they need to be applied, and that it is better to describe the desired state of a system than the process of how to get to that state.

-- Ansible Glossary

Handlers are not idempotent!

...but often necessary. Just be aware of this when a playbook fails.

```
# ./site.yml
- # ...
  roles: [ master, cyberman ]

# ./roles/master/tasks/main.yml
- cp: src=missy.conf dest=/etc/master/
  notify: restart master
  # ^^ schedules restart of master if file is copied

# ./roles/cyberman/tasks/main.yml
- fail: msg="***HEAD EXPLODES***"
  # ^^ causes play to fail before restart master
  # even if you fix and re-run, file already copied
  # so it won't notify on re-run
```

Use a wrapper script so everyone runs the playbook consistently

- Setup virtualenv so everyone runs the same version
- Add some common/useful options (`-v` , `--diff`)
- Add domain specific options, useful for your team
    - `--env` to specify environment
    - `--service` to deploy a specific service
    - `--` to break for `ansible-playbook` options

```
$ ./deploy.sh --env staging -- --tags cyberman --check
+ exec ansible-playbook -v --diff \
+   --inventory-file ./inventory/staging.ini \
+   --tags cyberman \
+   --check \
+   -- site.yml
Using /Users/dlee/prj/doctor/ansible.cfg as config file

PLAY [pre-roles] ****************************************
```

Don't make a role portable until you have to

> There is no such thing as portable code. Only code that's been ported.

Avoid supporting multiple platforms as much as you can. It's better to standardize on a distro/version.

That said,

- You usually end up with one weird thing that needs to be on another distro
- Or you'll have a transition time as you upgrade major versions
- Don't port everything; only port what you need; one thing at a time.

Logic goes in roles; not in playbooks

Ansible allows you to split logic between playbooks and roles, but that just makes it harder to figure out what's going on.

```
# ./site.yml
- # ...
  roles:
   - role: epel
     when: ansible_distribution == 'CentOS' # bad

# ./roles/epel/tasks/main.yml
- when: ansible_distribution == 'CentOS' # Good!
  block:
   - name: yum install epel-...
```

Test your playbooks

- A `make test` target is always useful
- `ansible-playbook --syntax-check` finds syntax errors
- `ansible-lint` finds common errors

```
test: virtualenv galaxy
	@$(MAKE) check-env # errors if we're
	                   # not in virtualenv
	ansible-playbook site.yml --syntax-check
	ansible-lint --exclude build/ site.yml
.PHONY: test
```

Questions

Thanks!