ANSIBLE

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ANSIBLE BEST PRACTICES: THE ESSENTIALS

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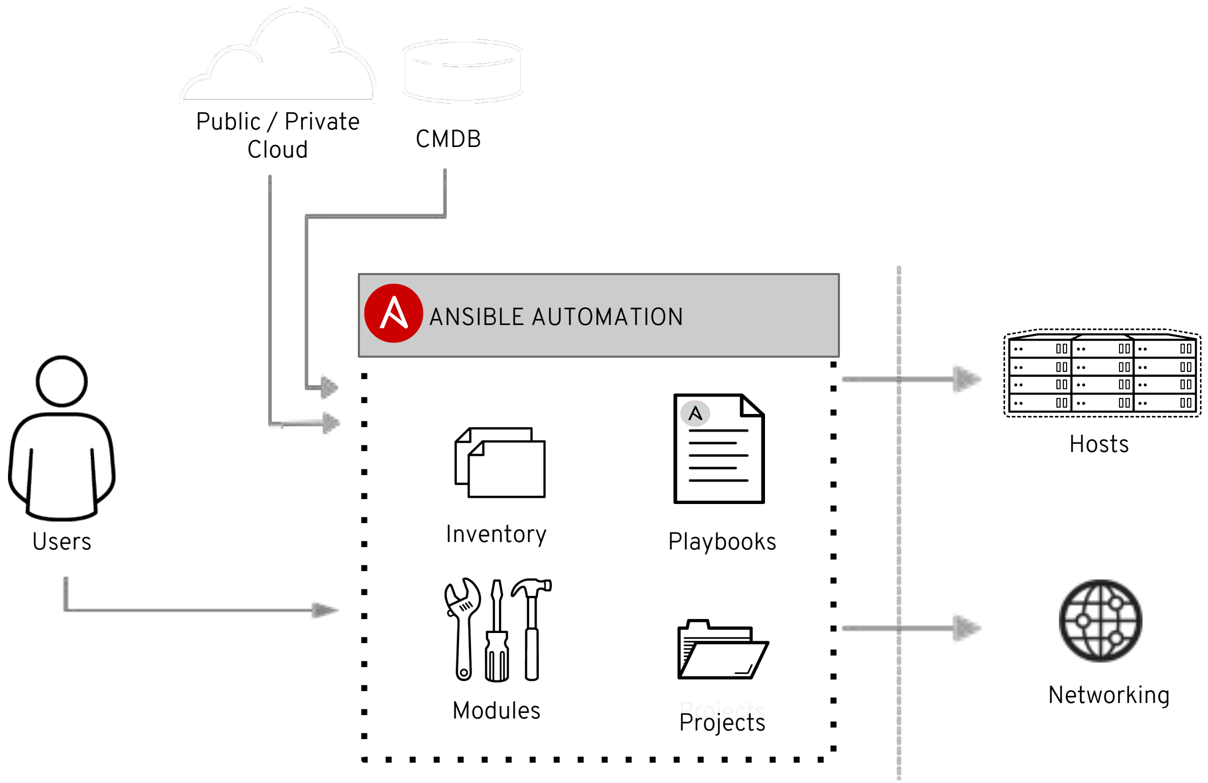
HOW DOES IT WORK?



THE ANSIBLE WAY

Principal 1 - COMPLEXITY KILLS PRODUCTIVITY

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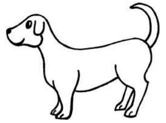
Now

We need to automate



No problem. I'm Phil. I'll have this automated in a bit.

5 years later

Heey… Do you know what

```
^(?:(?:(?:0?[13578]|1[02])(\/|-|\.)31)\1|(?:(?:0?[
13-9]|1[0-2])(\/|-|\.)(?:29|30)\2))(?:(?:1[6-9]|[2-
9]\d)?\d{2})$|^(?:0?2(\/|-|\.)29\3(?:(?:(?:1[6-9]|[
2-9]\d)?(?:0[48]|[2468][048]|[13579][26])|(?:(?:
16|[2468][048]|[3579][26])00))))$|^(?:(?:0?[1-9
])|(?:1[0-2]))(\/|-|\.)(?:0?[1-9]|1\d|2[0-8])\4(?:(?:
1[6-9]|[2-9]\d)?\d{2})$
```

...does?

Phil wrote that, good luck, he got killed in the great dog-regexp war of 2019.

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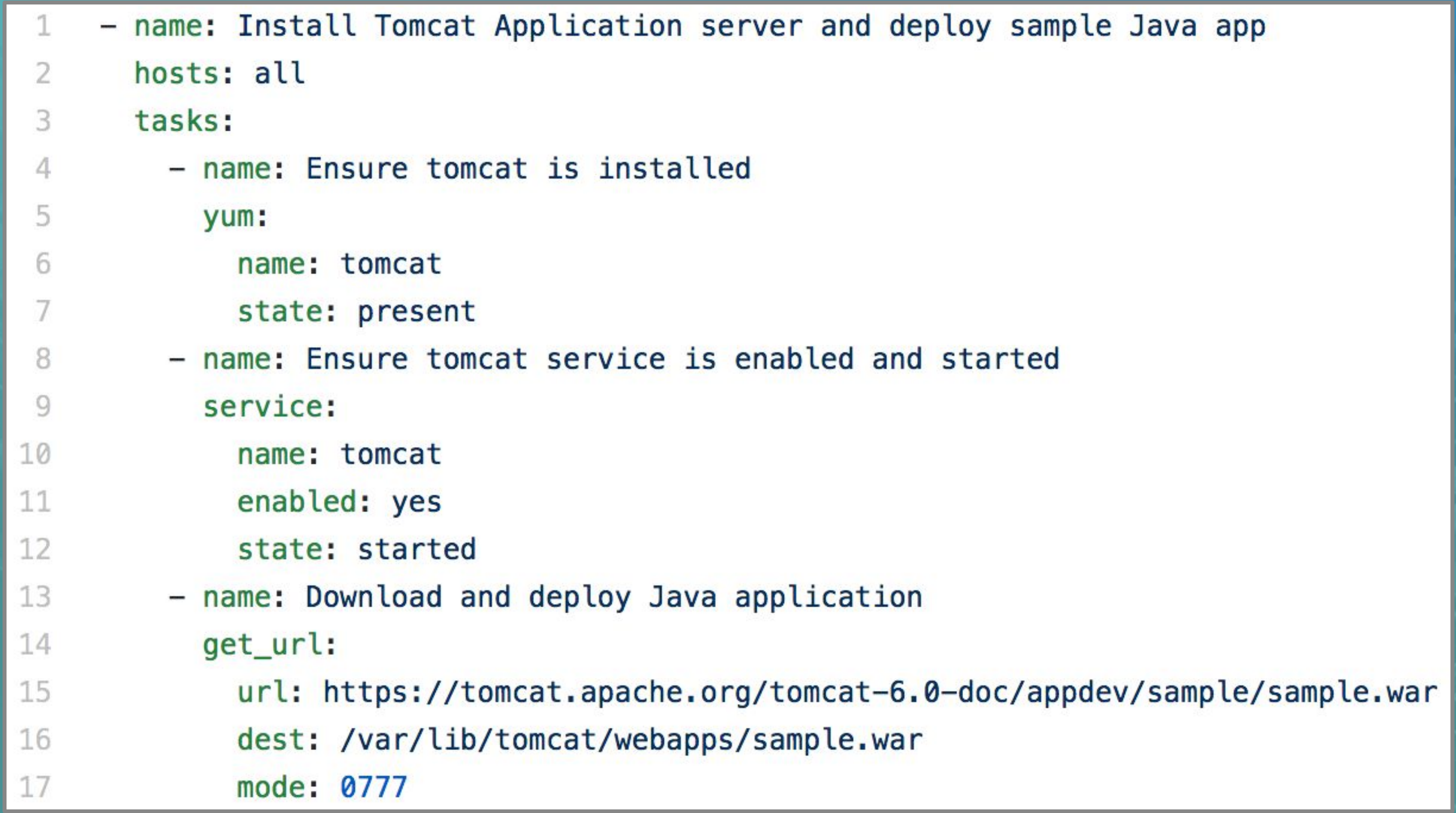
Principal 2 - OPTIMIZE FOR READABILITY



```yaml
- name: Install Tomcat Application server and deploy sample Java app
  hosts: all
  tasks:
    - name: Ensure tomcat is installed
      yum:
        name: tomcat
        state: present
    - name: Ensure tomcat service is enabled and started
      service:
        name: tomcat
        enabled: yes
        state: started
    - name: Download and deploy Java application
      get_url:
        url: https://tomcat.apache.org/tomcat-6.0-doc/appdev/sample/sample.war
        dest: /var/lib/tomcat/webapps/sample.war
        mode: 0777
```

Principal 3 - THINK DECLARATIVELY

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Ansible is a desired state engine by design. If you're trying to "write code" in your plays and roles, you're setting yourself up for failure. Our YAML-based playbooks were never meant to be for programming.

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WORKFLOW

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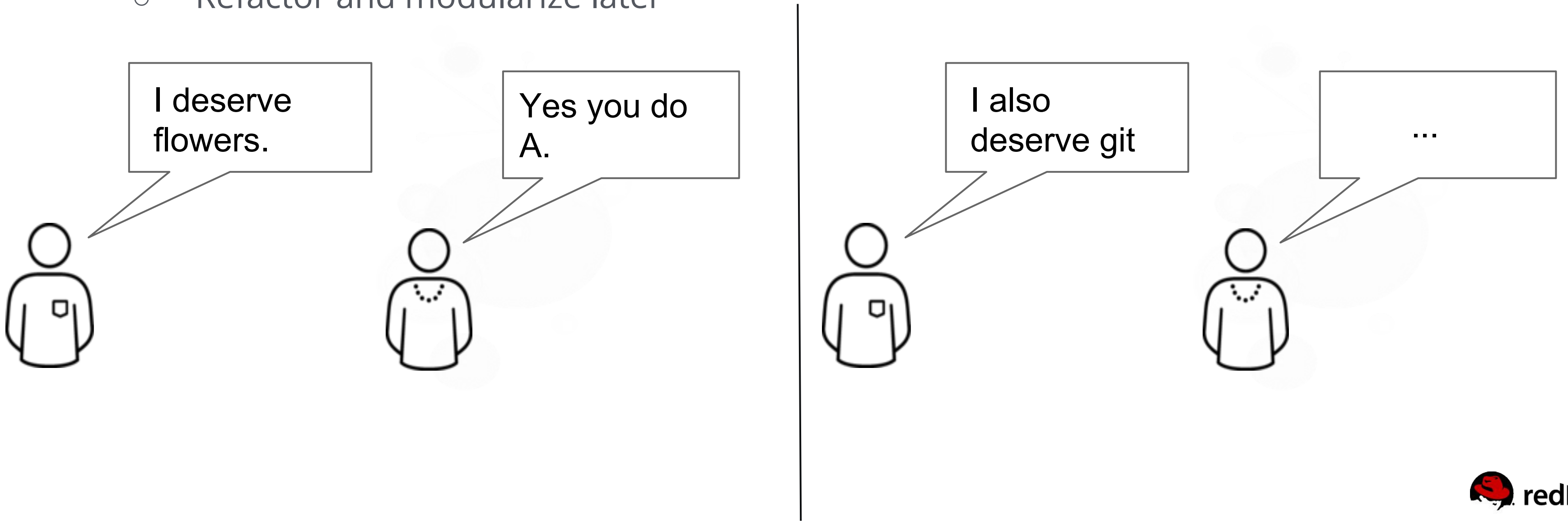
Treat your Ansible content like code

- Version control your Ansible content
- Start as simple as possible and iterate
  - Start with a basic playbook and static inventory
  - Refactor and modularize later



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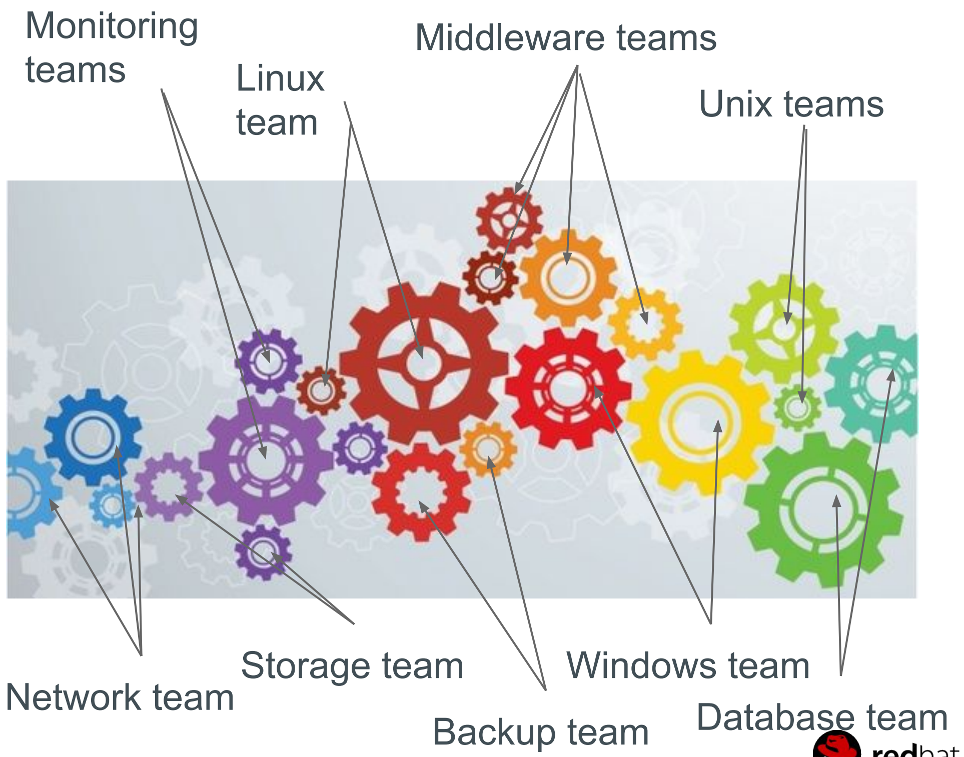
WORKFLOW

ANSIBLE

Treat your Ansible content like code

1. **Ansible** doesn’t require version control
2. **When** you scale out your Ansible usage (aka. automate all things) you’ll have many different teams collaborating
3. **Version control** was invented to solve common collaboration challenges
4. **Git** has earned its worldwide popularity the hard way and is in the core of many of the world’s most popular collaboration services and products



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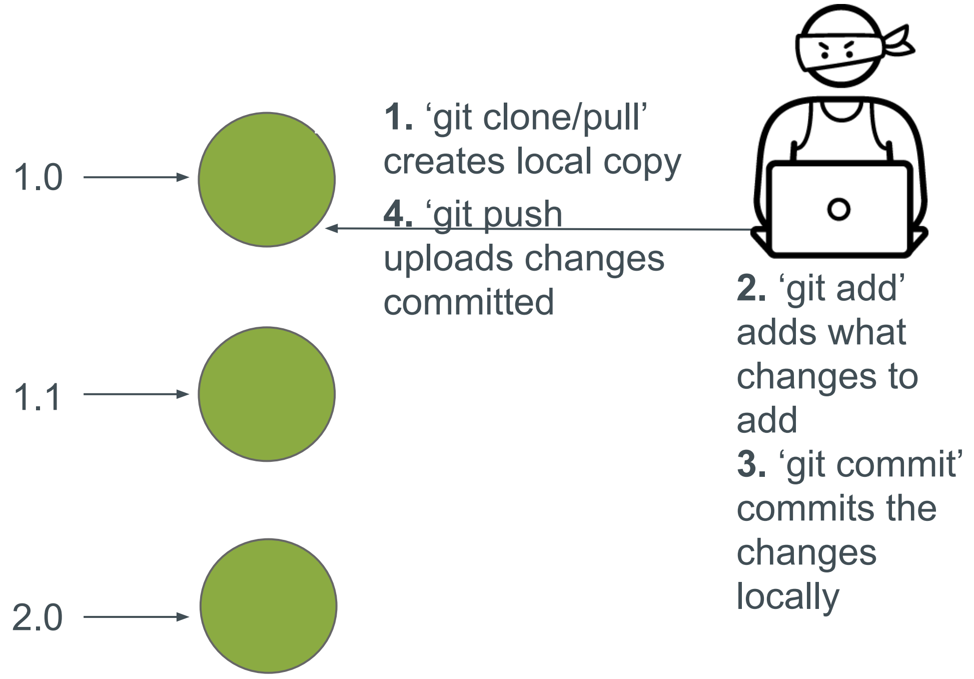
WORKFLOW

ANSIBLE

Example: Version control

1. **A** git repository stores files
2. **Access** controls are specific to repositories
3. **All** changes to all files are tracked
4. **When** you want to make a change to a file you first make a local copy of the repository which is stored on your computer, you then change the file locally, commit the change locally and then go ahead and tell git to copy this local change to the repository.


1.0
1.1
2.0
1. 'git clone/pull' creates local copy
4. 'git push uploads changes committed
2. 'git add' adds what changes to add
3. 'git commit' commits the changes locally

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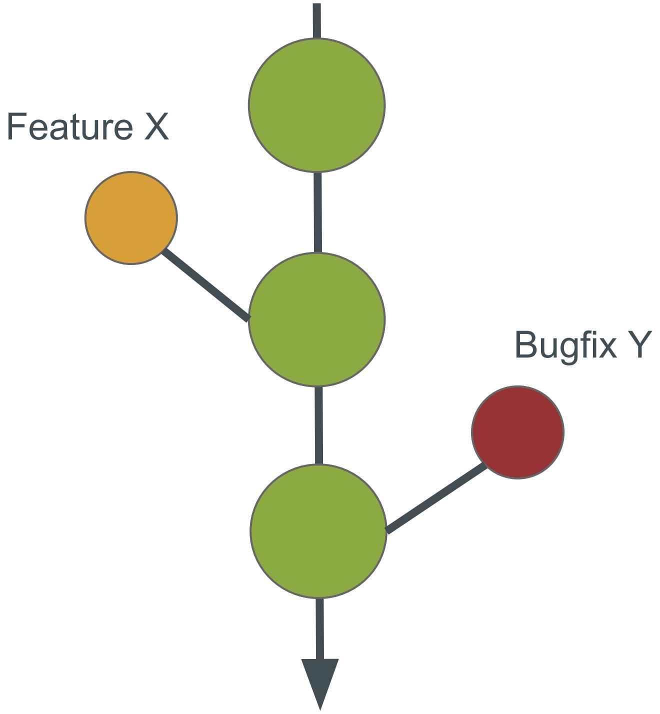
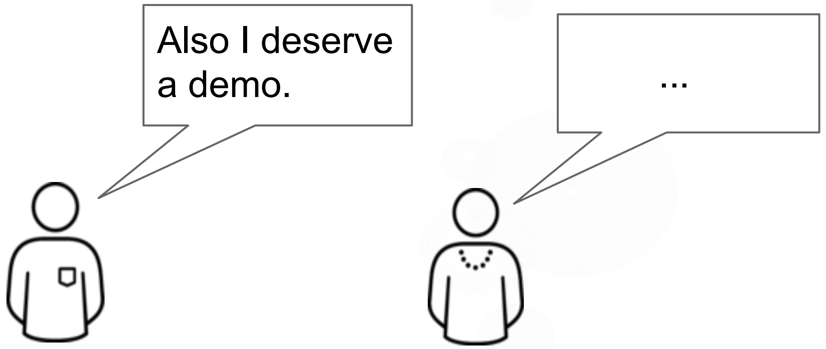
Example: GitHub workflow

1. **Does not** require GitHub, the workflow model is just called that
2. **A** very simple workflow
3. **Master** branch is always possible to release
4. **Branches** are where you develop and test new features and bugfixes.
5. **Yes,** I wrote test. If you do not test your Ansible code you cannot keep the master branch releasable and this all fails.

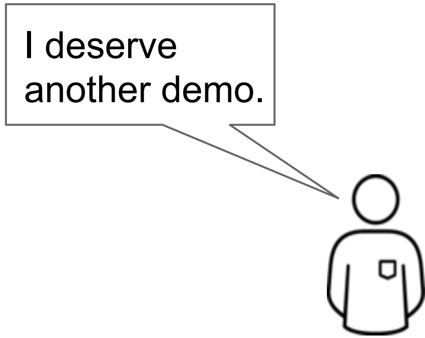


Treat your Ansible content like code



Do It with Style

- Create a style guide for developers
- Consistency in:
  - Tagging
  - Whitespace
  - Naming of Tasks, Plays, Variables, and Roles
  - Directory Layouts
- Enforce the style
- Check out ansible-lint



Implement a test framework for playbooks

A basic framework for Ansible testing is:

- Verify correct syntax with
  a. ansible-playbook --syntax-check your-playbook.yml
- Verify style for bad practices and behaviour that could potentially be improved
  a. ansible-lint your-playbook.yml
- Run your playbook or role and ensure it completes without failures.
- Run your playbook or role again and ensure that no changes are reported, this ensures playbook idempotency, a key feature of Ansible.
- Query your application's API or do another external test of it's functionality.
- Implement your testing framework into a CI/CD pipeline for your playbooks

Read more
https://github.com/mglantz/ansible-roadshow/tree/master/labs/lab-9

PROJECT LAYOUTS: BASIC

```
basic-project
├── inventory
│   ├── group_vars
│   │   └── web.yml
│   ├── host_vars
│   │   └── db1.yml
│   └── hosts
└── site.yml
```

PROJECT LAYOUTS: ORGANIZATIONAL ROLES

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```
myapp
├── roles
│   ├── myapp
│   │   ├── tasks
│   │   │   └── main.yml
│   │   └── ...
│   ├── nginx
│   │   └── ...
│   └── proxy
│       └── ...
└── site.yml
```

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PROJECT LAYOUTS: SHARED ROLES

```
myapp
├── config.yml
├── provision.yml
├── roles
│   └── requirements.yml
└── site.yml
```

INVENTORY

Give inventory nodes human-meaningful

EXHIBIT A

```
10.1.2.75
10.1.5.45
10.1.4.5
10.1.0.40

w14301.example.com
w17802.example.com
w19203.example.com
w19304.example.com
```

EXHIBIT B

```
db1  ansible_host=10.1.2.75
db2  ansible_host=10.1.5.45
db3  ansible_host=10.1.4.5
db4  ansible_host=10.1.0.40

web1 ansible_host=w14301.example.com
web2 ansible_host=w17802.example.com
web3 ansible_host=w19203.example.com
web4 ansible_host=w19203.example.com
```

INVENTORY

Group hosts for easier inventory selection and less conditional tasks -- the more groups the better.

WHAT

```
[db]
db[1:4]

[web]
web[1:4]
```

```
db1 = db, east, dev
```

WHERE

```
[east]
db1
web1
db3
web3

[west]
db2
web2
db4
web4
```

WHEN

```
[dev]
db1
web1

[test]
db3
web3

[prod]
db2
web2
db4
web4
```

INVENTORY

Use a single source of truth if you have it -- even if you have multiple sources, Ansible can unify them.

- Stay in sync automatically
- Reduce human error

VARIABLES

The world is flat - Proper variable naming can make plays more readable and avoid variable name conflicts

- Use descriptive, unique human-meaningful variable names
- Prefix role variables with its “owner” such as a role name or package

```
apache_max_keepalive: 25
apache_port: 80
tomcat_port: 8080
```

SEPARATE LOGIC FROM VARIABLES

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```
- name: Clone student lesson app for a user
  host: nodes
  tasks:
    - name: Create ssh dir
      file:
        state: directory
        path: /home/{{ username }}/.ssh

    - name: Set Deployment Key
      copy:
        src: files/deploy_key
        dest: /home/{{ username }}/.ssh/id_rsa

    - name: Clone repo
      git:
        accept_hostkey: yes
        clone: yes
        dest: /home/{{ username }}/exampleapp
        key_file: /home/{{ username }}/.ssh/id_rsa
        repo: git@github.com:example/apprepo.git
```

EXHIBIT A

- Embedded parameter values and repetitive home directory value pattern in multiple places
- Works but could be more clearer and setup to be more flexible and maintainable

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SEPARATE LOGIC FROM VARIABLES

```
- name: Clone student lesson app for a user
  host: nodes
  vars:
    user_home_dir: /home/{{ username }}
    user_ssh_dir: "{{ user_home_dir }}/.ssh"
    deploy_key: "{{ user_ssh_dir }}/id_rsa"
    app_dir: "{{ user_home_dir }}/exampleapp"
  tasks:
    - name: Create ssh dir
      file:
        state: directory
        path: "{{ user_ssh_dir }}"

    - name: Set Deployment Key
      copy:
        src: files/deploy_key
        dest: "{{ deploy_key }}"

    - name: Clone repo
      git:
        dest: "{{ app_dir }}"
        key_file: "{{ deploy_key }}"
        repo: git@github.com:example/exampleapp.git
        accept_hostkey: yes
        clone: yes
```

EXHIBIT B

- Parameters values are set thru values away from the task and can be overridden.
- Human meaningful variables “document” what’s getting plugged into a task parameter
- More easily refactored into a role

PLAYS & TASKS

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Use native YAML syntax to maximize the readability of your plays

- Vertical reading is easier
- Supports complex parameter values
- Works better with editor syntax highlighting in editors

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USE NATIVE YAML SYNTAX

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NO!

```
- name: install telegraf
  yum: name=telegraf-{{ telegraf_version }} state=present update_cache=yes disab
  notify: restart telegraf

- name: configure telegraf
  template: src=telegraf.conf.j2 dest=/etc/telegraf/telegraf.conf

- name: start telegraf
  service: name=telegraf state=started enabled=yes
```

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USE NATIVE YAML SYNTAX

Better, but no

```
- name: install telegraf
  yum: >
      name=telegraf-{{ telegraf_version }}
      state=present
      update_cache=yes
      disable_gpg_check=yes
      enablerepo=telegraf
  notify: restart telegraf

- name: configure telegraf
  template: src=telegraf.conf.j2 dest=/etc/telegraf/telegraf.conf

- name: start telegraf
  service: name=telegraf state=started enabled=yes
```

USE NATIVE YAML SYNTAX

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Yes!

```yaml
- name: install telegraf
  yum:
    name: telegraf-{{ telegraf_version }}
    state: present
    update_cache: yes
    disable_gpg_check: yes
    enablerepo: telegraf
  notify: restart telegraf

- name: configure telegraf
  template:
    src: telegraf.conf.j2
    dest: /etc/telegraf/telegraf.conf
  notify: restart telegraf

- name: start telegraf
  service:
    name: telegraf
    state: started
    enabled: yes
```

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PLAYS & TASKS

ANSIBLE

Names improve readability and user feedback

- Give all your playbooks, tasks and blocks brief, reasonably unique and human-meaningful names

PLAYS & TASKS

EXHIBIT A

```
- hosts: web
  tasks:
  - yum:
      name: httpd
      state: latest


  - service:
      name: httpd
      state: started
      enabled: yes
```

```
PLAY [web]
********************************

TASK [setup]
********************************
ok: [web1]

TASK [yum]
********************************
ok: [web1]

TASK [service]
********************************
ok: [web1]
```

PLAYS & TASKS

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EXHIBIT B

```
- hosts: web
  name: install and start apache
  tasks:
    - name: install apache packages
      yum:
        name: httpd
        state: latest

    - name: start apache service
      service:
        name: httpd
        state: started
        enabled: yes
```

```
PLAY [install and start apache]
********************************

TASK [setup]
********************************
ok: [web1]

TASK [install apache packages]
********************************
ok: [web1]

TASK [start apache service]
********************************
ok: [web1]
```

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PLAYS & TASKS

Focus avoids complexity

- Keep plays and playbooks focused. Multiple simple ones are better than having a huge single playbook full of conditionals
- Follow Linux principle of do one thing, and one thing well

Clean up your debugging tasks

- Make them optional with the verbosity parameter so they're only displayed when they are wanted.

```
- debug:
    msg: "This always displays"

- debug:
    msg: "This only displays with ansible-playbook -vv+"
    verbosity: 2
```

PLAYS & TASKS

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Don’t just start services -- use smoke tests

```
- name: check for proper response
  uri:
    url: http://localhost/myapp
    return_content: yes
  register: result
  until: '"Hello World" in result.content'
  retries: 10
  delay: 1
```

Use command modules sparingly

- Use the run `command` modules like *`shell`* and *`command`* as a last resort
- The *`command`* module is generally safer
- The *`shell`* module should only be used for I/O redirect

Always seek out a module first

NO!

```
- name: add user
  command: useradd appuser

- name: install apache
  command: yum -y install httpd

- name: start apache
  shell: |
    systemctl start httpd && systemctl enable httpd
```

Yes :-)

```
- name: add user
  user:
    name: appuser
    state: present

- name: install apache
  yum:
    name: httpd
    state: latest

- name: start apache
  service:
    name: httpd
    state: started
    enabled: yes
```

Still using command modules a lot?

```
- hosts: all
  vars:
    cert_store: /etc/mycerts
    cert_name: my cert
  tasks:
  - name: check cert
    shell: certify --list --name={{ cert_name }} --cert_store={{ cert_store }} | grep "{{ cert_name }}"
    register: output

  - name: create cert
    command: certify --create --user=chris --name={{ cert_name }} --cert_store={{ cert_store }}
    when: output.stdout.find(cert_name)" != -1
    register: output

  - name: sign cert
    command: certify --sign  --name={{ cert_name }} --cert_store={{ cert_store }}
    when: output.stdout.find("created")" != -1
```

Develop your own module

```
- hosts: all
  vars:
    cert_store: /etc/mycerts
    cert_name: my cert
  tasks:
    - name: create and sign cert
      certify:
        state: present
        sign: yes
        user: chris
        name: "{{ cert_name }}"
        cert_store: "{{ cert_store }}"
```

- Understandable by non-technical people
- CRUD (Create, read, update and delete)

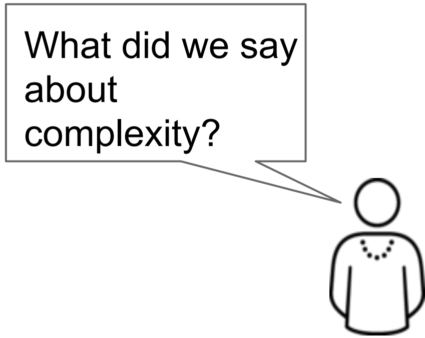
Separate provisioning from deployment and configuration tasks

```
acme_corp/
├── configure.yml
├── provision.yml
└── site.yml

$ cat site.yml
---
- import_playbook: provision.yml
- import_playbook: configure.yml
```

Jinja2 is powerful but you needn't use all of it

- Templates should be simple:
  - Variable substitution
  - Conditionals
  - Simple control structures/iterations
  - Design your templates for your use case, not the world's
- Things to avoid:
  - Anything that can be done directly in Ansible
  - Managing variables in a template
  - Extensive and intricate conditionals
  - Conditional logic based on embedded hostnames
  - Complex nested iterations



TEMPLATES

Careful when mixing manual and automated configuration
(Or even different automation frameworks...)

- Label template output files as being generated by Ansible

```
{{ ansible_managed | comment }}
```

Keep in mind

- Like playbooks -- keep roles purpose and function focused
- Use a `roles/` subdirectory for roles developed for organizational clarity in a single project
- Follow the Ansible Galaxy pattern for roles that are to be shared beyond a single project
- Limit role dependencies

ROLES

Tricks and tips

- Use `ansible-galaxy init` to start your roles...
- ...then remove unneeded directories and stub files
- Use `ansible-galaxy` to install your roles -- even private ones
- Use a roles files (i.e. `requirements.yml`) to manifest any external roles your project is using
- Always peg a role to a specific version such as a tag or commit

Command line tools have their limitations

- Coordination across a distributed teams & organization…
- Controlling access to credentials…
- Track, audit and report automation and management activity…
- Provide self-service or delegation…
- Integrate automation with enterprise systems…

ANSIBLE TOWER by Red Hat®

Complexity kills productivity

Optimize for readability

Think declaratively

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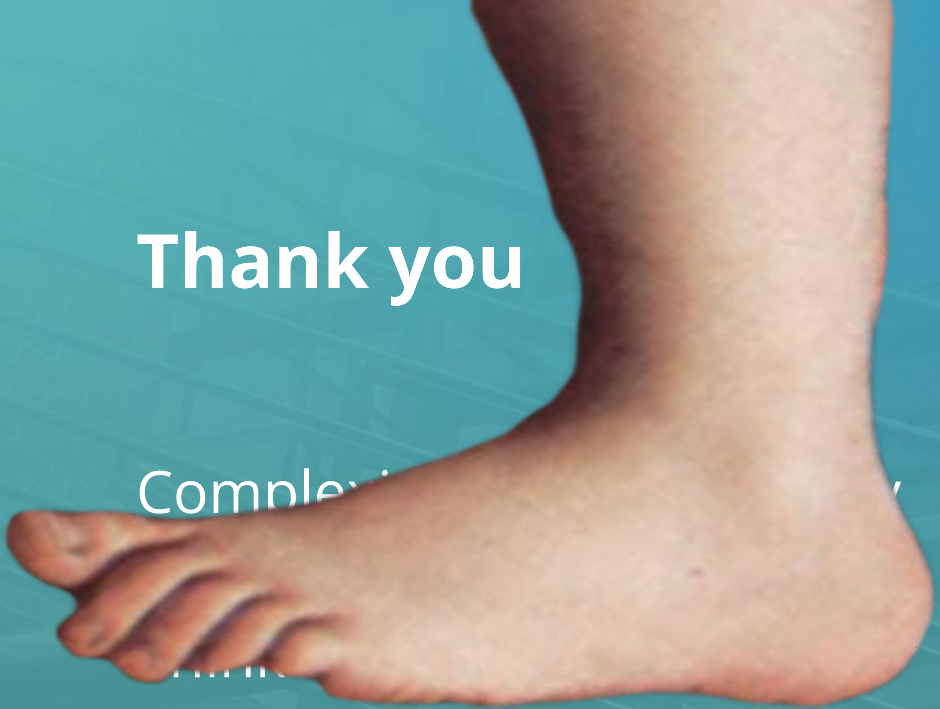
Thank you

Complex



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