Automation with Ansible and Containers

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What is Ansible

- Automation language
- Automation engine

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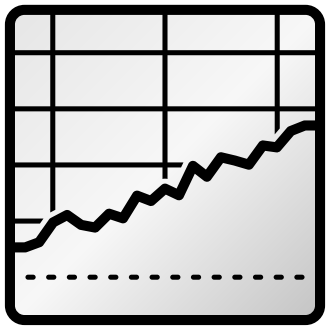
- Simple: install, configure, understand
- Agentless, uses SSH*
- Extensible
- Open Source
- Written in Python!
- Great community -- 2,588 contributors

What can we do with Ansible

- Configuration Management
- Application Deployments
- Provisioning
- Orchestration
- Continuous Delivery

My story with Ansible

- openshift-ansible
- Ansible from a programmer's perspective
- Learning curve
- Beyond the basics



The basics

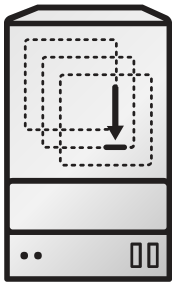
- Inventory
- Task
- Play
- Playbook

The basics

An inventory typically lists remote hosts, either bare metal or VMs.

Testing is hard, make it less painful.

Ansible ♥ Containers!



Inventory

```
[masters]
master-container

[nodes]
node-container-1
node-container-2

[etcd]
[lb]
[nfs]

[OSEv3:children]
masters
nodes
etcd
lb
nfs

[OSEv3:vars]
deployment_type=origin
ansible_connection=docker
```

Playbooks

- YAML files describing desired state

```
---
- name: Launch containers
  hosts: localhost
  connection: local
  become: no
  gather_facts: no
  tasks:
  - name: Ensure containers are running
    docker_container:
      name: "{{item}}"
      image: centos:7
      command: sleep infinity
      state: started
    with_items:
    - master-container
    - node-container-1
    - node-container-2
```

Running the playbook

```
$ ansible-playbook -i hosts playbooks/start-containers.yml

PLAY [Launch containers] ***************************************************

TASK [Ensure containers are running] ***************************************
changed: [localhost] => (item=master-container)
changed: [localhost] => (item=node-container-1)
changed: [localhost] => (item=node-container-2)

PLAY RECAP *****************************************************************
localhost                  : ok=1    changed=1    unreachable=0    failed=0
```

Removing containers

```
---
- name: Cleanup containers
  hosts: localhost
  connection: local
  become: no
  gather_facts: no
  tasks:
  - name: Ensure containers are removed
    docker_container:
      name: "{{item}}"
      state: absent
    with_items:
    - master-container
    - node-container-1
    - node-container-2
```

Removing containers

```
$ ansible-playbook -i hosts playbooks/remove-containers.yml

PLAY [Cleanup containers] ******************************************************

TASK [Ensure containers are removed] *******************************************
changed: [localhost] => (item=master-container)
changed: [localhost] => (item=node-container-1)
changed: [localhost] => (item=node-container-2)

PLAY RECAP *********************************************************************
localhost                  : ok=1    changed=1    unreachable=0    failed=0
```

More concepts

- Modules
- Roles
- Ansible Galaxy

Ansible ships with more than 700 modules.

Roles is a standard way to organize playbooks.

Galaxy is a free site for finding, downloading, and sharing community developed roles.

Ansible Modules ♥ Python!

```
# ansible/modules/core/system/ping.py
from ansible.module_utils.basic import AnsibleModule

def main():
    module = AnsibleModule(
        argument_spec=dict(
            data=dict(required=False, default=None),
        ),
        supports_check_mode=True
    )
    result = dict(ping='pong')
    if module.params['data']:
        if module.params['data'] == 'crash':
            raise Exception("boom")
        result['ping'] = module.params['data']
    module.exit_json(**result)

if __name__ == '__main__':
    main()
```

Modules

Modules are copied to the target hosts, then executed in the targets.

```
$ ansible -i hosts all -m ping -a data=pyconsk
master-container | SUCCESS => {
    "changed": false,
    "ping": "pyconsk"
}
node-container-1 | SUCCESS => {
    "changed": false,
    "ping": "pyconsk"
}
node-container-2 | SUCCESS => {
    "changed": false,
    "ping": "pyconsk"
}
```

```
$ ansible -i hosts masters -m command -a 'rm -rf /'
master-container | FAILED | rc=1 >>
rm: it is dangerous to operate recursively on '/'
rm: use --no-preserve-root to override this failsafe
```

To infinity... and beyond!

Plugins

www.ansible.com/blog/how-to-extend-ansible-through-plugins

- Action
- Callback
- Connection
- Others...

Action Plugins

```
# ansible/plugins/action/fail.py
from ansible.plugins.action import ActionBase

class ActionModule(ActionBase):
    ''' Fail with custom message '''

    TRANSFERS_FILES = False

    def run(self, tmp=None, task_vars=None):
        if task_vars is None:
            task_vars = dict()

        result = super(ActionModule, self).run(tmp, task_vars)

        msg = 'Failed as requested from task'
        if self._task.args and 'msg' in self._task.args:
            msg = self._task.args.get('msg')

        result['failed'] = True
        result['msg'] = msg
        return result
```

Action Plugins

Run on the control machine, giving great control over how to run modules.

```
$ ansible -i hosts nodes -m fail
node-container-1 | FAILED! => {
    "changed": false,
    "failed": true,
    "msg": "Failed as requested from task"
}
node-container-2 | FAILED! => {
    "changed": false,
    "failed": true,
    "msg": "Failed as requested from task"
}
```

Callback Plugins

```
# ansible/plugins/callback/timer.py
from datetime import datetime
from ansible.plugins.callback import CallbackBase

class CallbackModule(CallbackBase):
    """This callback module tells you how long your plays ran for."""
    CALLBACK_VERSION = 2.0
    CALLBACK_TYPE = 'aggregate'
    CALLBACK_NAME = 'timer'
    CALLBACK_NEEDS_WHITELIST = True

    def __init__(self):
        super(CallbackModule, self).__init__()
        self.start_time = datetime.now()

    def v2_playbook_on_stats(self, stats):
        end_time = datetime.now()
        runtime = end_time - self.start_time
        self._display.display("Playbook run took %s days, %s hours, %s minutes, %s seconds" % \
            (self.days_hours_minutes_seconds(runtime)))
```

Callback Plugins

React to events which occur during the execution of playbooks.
Use it to customize output.

```
$ ANSIBLE_CALLBACK_WHITELIST=timer ansible-playbook -i hosts playbooks/start-containers.yml

PLAY [Launch containers] *******************************************************

TASK [Ensure containers are running] *******************************************
ok: [localhost] => (item=master-container)
ok: [localhost] => (item=node-container-1)
ok: [localhost] => (item=node-container-2)

PLAY RECAP *********************************************************************
localhost                  : ok=1    changed=0    unreachable=0    failed=0

Playbook run took 0 days, 0 hours, 0 minutes, 1 seconds
```

Conclusion

- It's 2017, go learn Ansible!
- Automate
- Programming the infrastructure
- Testing is hard, but don't give up
- Python is a fundamental tool in your toolbox

Red Hat Czech

- Brno - the biggest engineering hub globally
- 1100 employees (including 85 interns) in 3 buildings
- Software Development, QE, Technical Writing, Technical Support, BI
- Small engineering office in Prague

We're hiring!

- Python is one of the most used programming language
- Open positions in RHEL Platform Team, QE, Release Engineering, Containers, DevOps (both Development and SysAdmin), OpenStack

Thank you

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