Managing Complexity

Config As Code, Custom Ansible Modules, and You

Zach Marine, Squarespace

About me

- Software engineer
- 3.5 years at Squarespace
- Focus on data tooling and infrastructure

SQUARESPACE

- Platform for creating websites, domains, commerce stores, etc.
- “Squarespace makes beautiful products to help people with creative ideas succeed.”
- Millions of active subscriptions
- 650+ employees across New York, Portland, and Dublin

Agenda

1. Config As Code
2. Ansible
3. Testing

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Postgres Permissions

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2. Ansible
3. Testing

Our Example: Postgres Permissions

Behavior	Effect

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How can we make this better?

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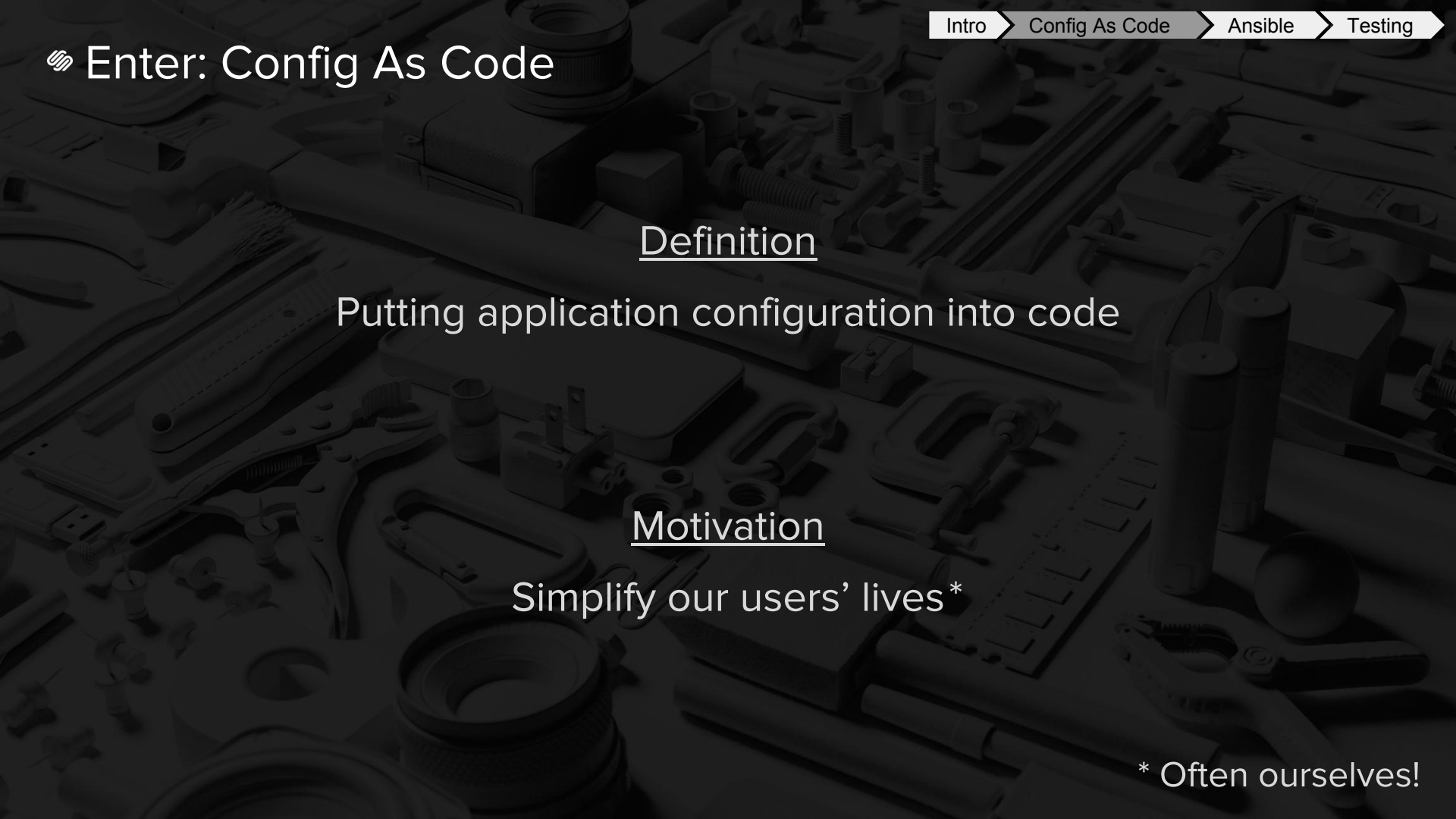
What is config as code?

Enter: Config As Code



Definition

Putting application configuration into code

Motivation

Simplify our users' lives*

* Often ourselves!

Config As Code: Best Practices

Before

```
CREATE ROLE "svc-mlcompute" LOGIN;

GRANT is_app TO "svc-mlcompute";

GRANT USAGE ON SCHEMA dmart TO "svc-mlcompute";
GRANT USAGE ON SCHEMA ods TO "svc-mlcompute";
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Config As Code: Best Practices

1. Simplify our users' lives by *using terminology they understand*.

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Database -> CONNECT

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Sequence -> SELECT

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Config As Code: Best Practices

Foreign Server -> USAGE

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Config As Code: Best Practices

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Foreign Server -> USAGE

Database -> CONNECT

Sequence -> SELECT

Large Object -> SELECT

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Config As Code: Best Practices

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Foreign Server -> USAGE

Sequence -> SELECT

Database -> CONNECT

Language -> USAGE

Large Object -> SELECT

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Config As Code: Best Practices

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Foreign Server -> READ

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Config As Code: Best Practices

2. Simplify our users' lives by *reusing techniques they're familiar with*.

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Config As Code: Best Practices

3. Simplify our users' lives by *abstracting away implementation details*.

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Config As Code: Best Practices

4. Simplify our users' lives by *removing boilerplate.*

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```

YAML (“Yet Another Markup Language”)

We chose to put our config into YAML

Benefits for our users:

- Familiar to many users
- Not a lot of boilerplate
  - Easy to read
  - Easy to write

Benefits for ourselves:

- Easy to parse in Python

```
- name: service_account1
  can_login: yes
  membership:
      - is_app
  privileges:
      read:
          schema:
              - metadata
          table:
              - metadata.oplog_tail_status

- name: person1
  can_login: yes
  has_personal_schema: yes
  membership:
      - analyst

- name: zmarine
  can_login: yes
  has_personal_schema: yes
  membership:
      - data-engineer
```

YAML ("Yet Another Markup Language")

```
(e) code In [1]  import yaml

                 with open('spec.yml', 'r') as f:
                     spec = yaml.load(f)

(e) code In [2]  from pprint import pprint

                 pprint(spec)
```

```
[{'can_login': True,
  'membership': ['is_app'],
  'name': 'service_account1',
  'privileges': {'read': {'schema': ['metadata'],
                          'table': ['metadata.oplog_tail_status']}}},
 {'can_login': True,
  'has_personal_schema': True,
  'membership': ['analyst'],
  'name': 'person1'},
 {'can_login': True,
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  'name': 'zmarine'}]
```

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Great! We've got our config into code.

...Now what?

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What is ansible?

What is Ansible?

Ansible described itself as:

> “A radically simple IT automation engine”

Often described as “infrastructure as code”

Similar tools:

- Chef
- Puppet
- SaltStack
- Terraform

Why Ansible?

- Currently the automation tool of choice at Squarespace
- Easy to write your own module
- Supports secure secret storage
- Modules typically support “check” mode
  (see what will change without actually doing it)

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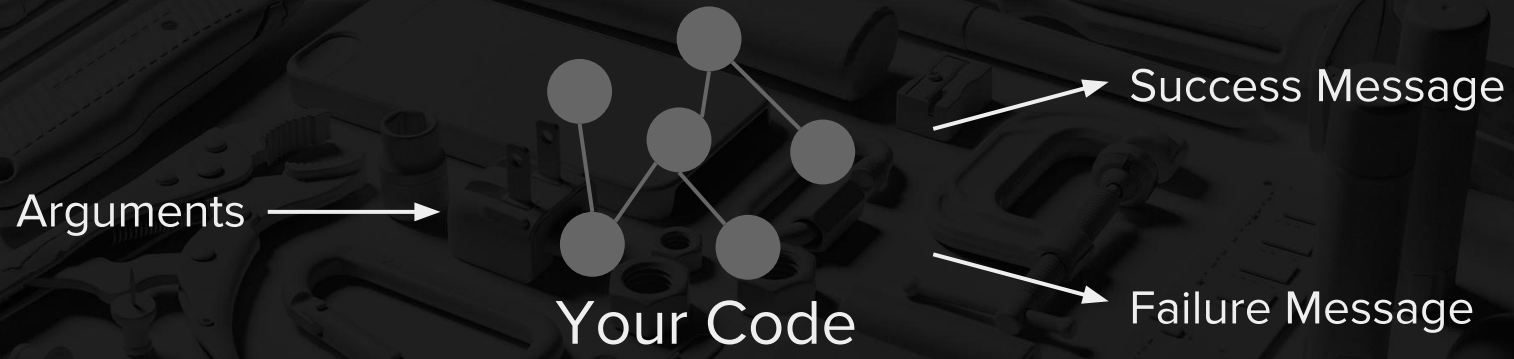
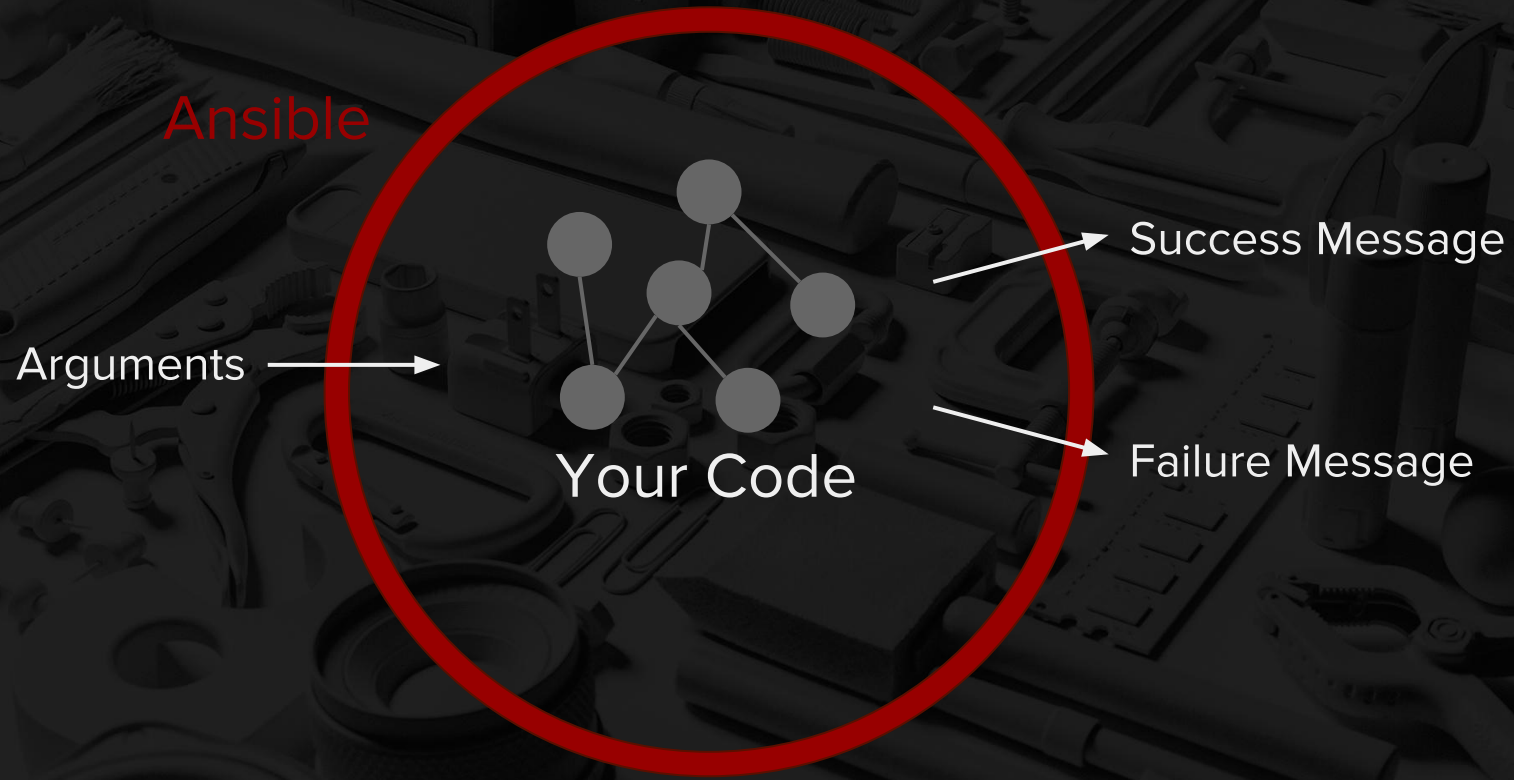
Ansible And Custom Modules



Ansible And Custom Modules



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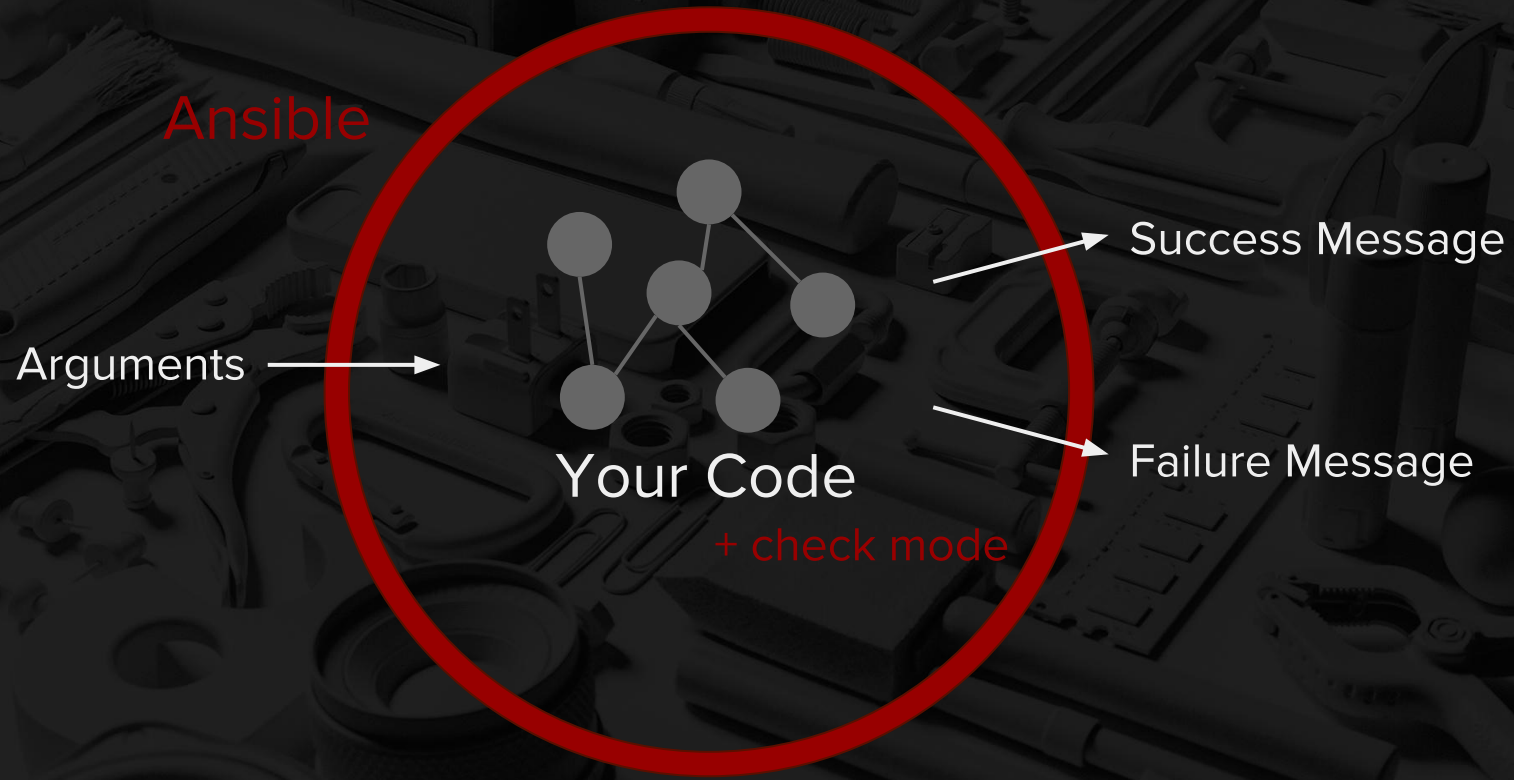

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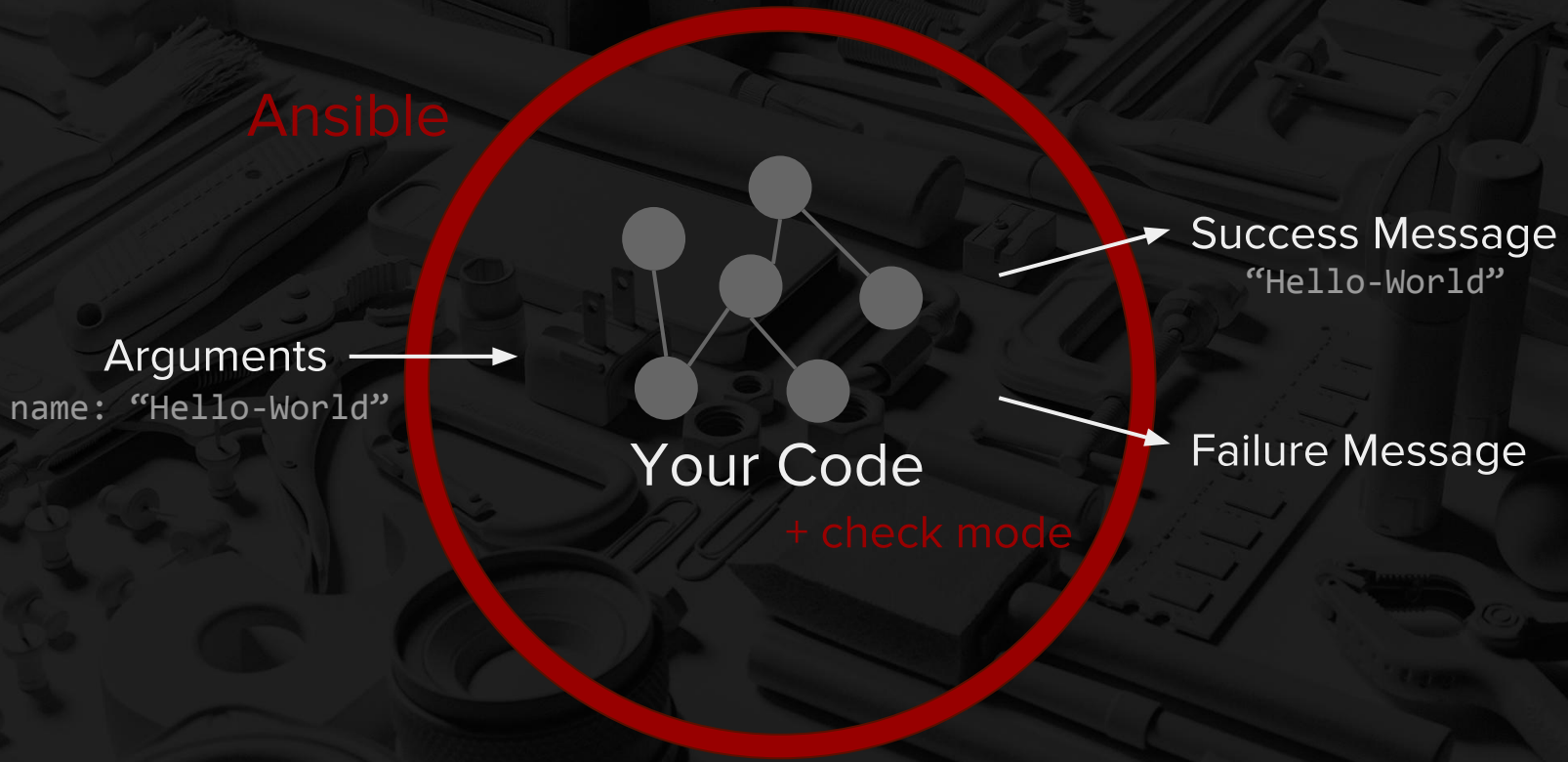
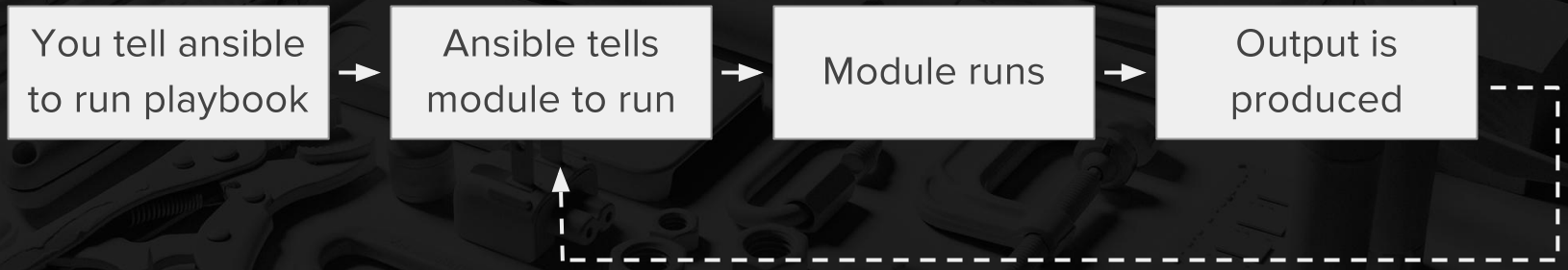


Ansible Execution



Ansible Execution


```
>>> pip install ansible
>>> export ANSIBLE_LIBRARY='.'
>>> ansible-playbook -v basic_playbook.yml
```

Ansible Execution

You tell ansible to run playbook → Ansible tells module to run → Module runs → Output is produced

./basic_playbook.yml

```
1 ---
2 - name: A basic playbook
3   hosts: localhost
4   tasks:
5     - name: Test that my module works
6       basic_module:
7         name: "Hello-World"
```

Servers to run against → line 3

Description of task → line 5

Module name → line 6

Module arguments → line 7

Ansible Execution

You tell ansible to run playbook → Ansible tells module to run → Module runs → Output is produced

./basic_module.py

```python
#!/usr/bin/python

from ansible.module_utils.basic import AnsibleModule


def setup_module():
    return AnsibleModule(
        argument_spec=dict(
            name=dict(required=True, type='str'),
        ),
        supports_check_mode=True
    )


def main():
    module = setup_module()
    module.exit_json(changed=True, msg=module.params['name'])


if __name__ == '__main__':
    main()

```

Ansible Execution

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Modules don't have to be Python!

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Ansible Execution

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Define expected arguments

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    main()

```

Provide info upon exit

Ansible Execution


```
PLAY [localhost] ***************************************************************

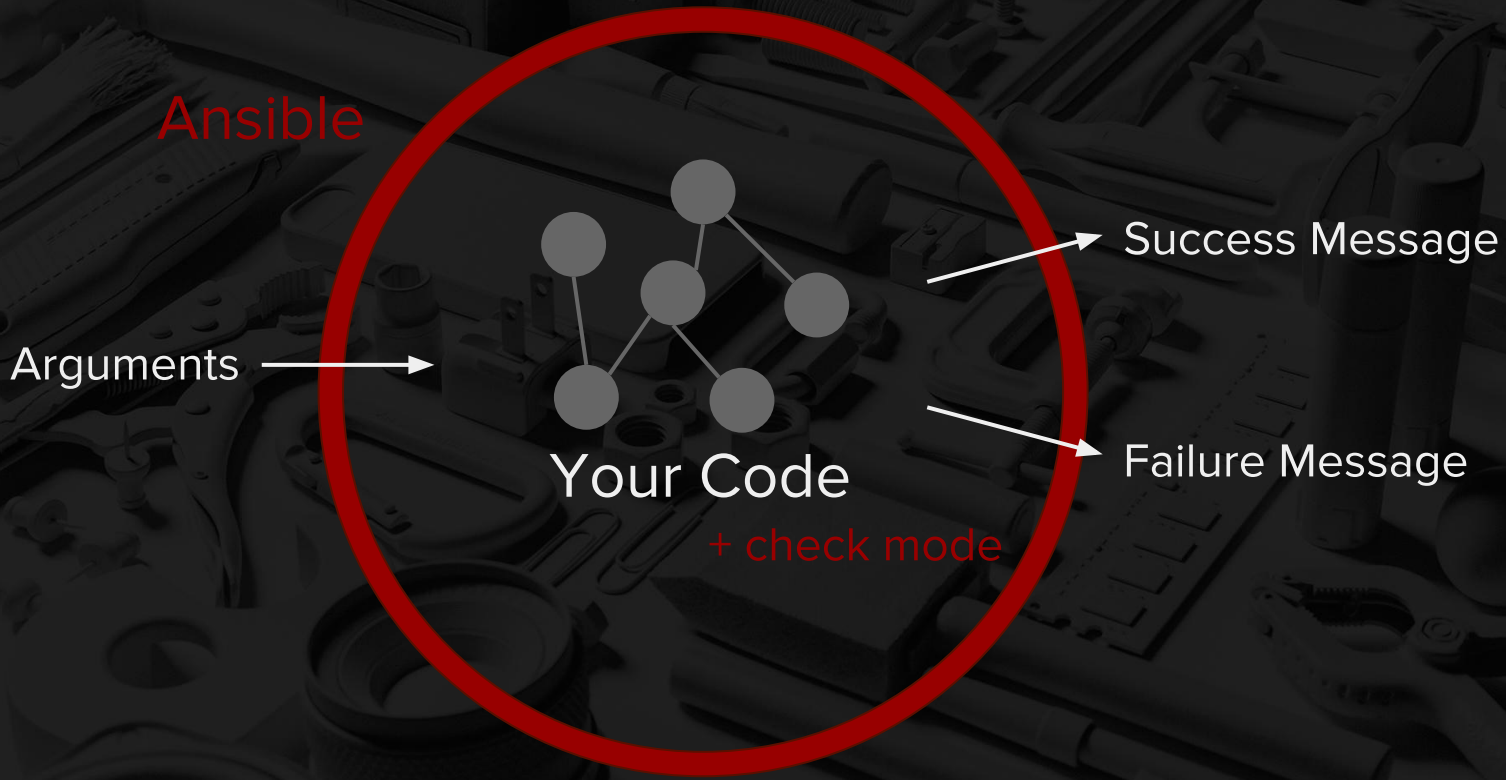
TASK [Gathering Facts] *********************************************************
ok: [localhost]

TASK [Test that my module works] ***********************************************
changed: [localhost] => {"changed": true, "failed": false, "msg": "Hello-World"}

PLAY RECAP *********************************************************************
localhost                  : ok=2    changed=1    unreachable=0    failed=0
```

Ansible Execution

You tell ansible to run playbook → Ansible tells module to run → Module runs → Output is produced



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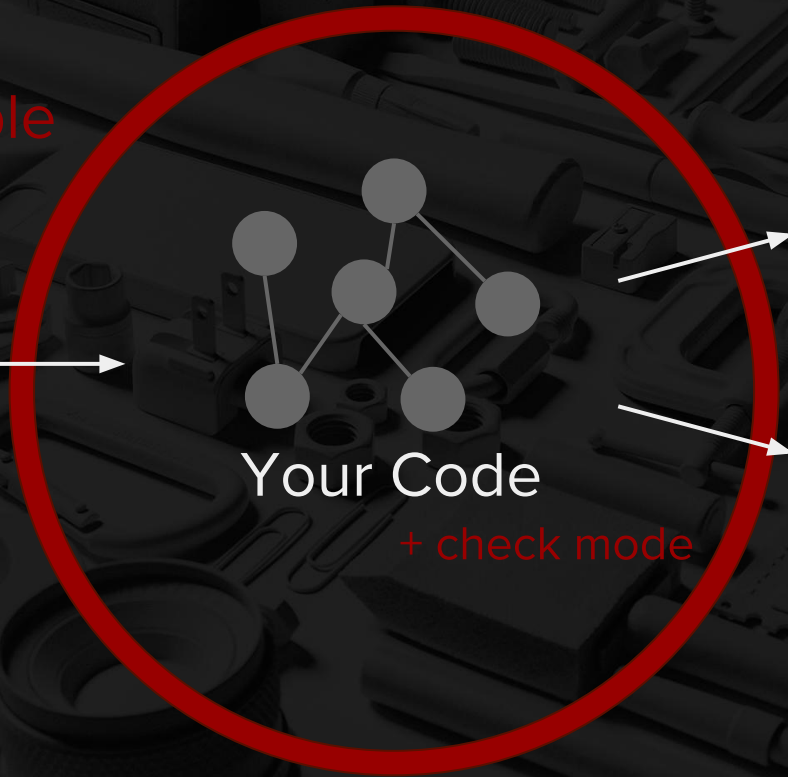

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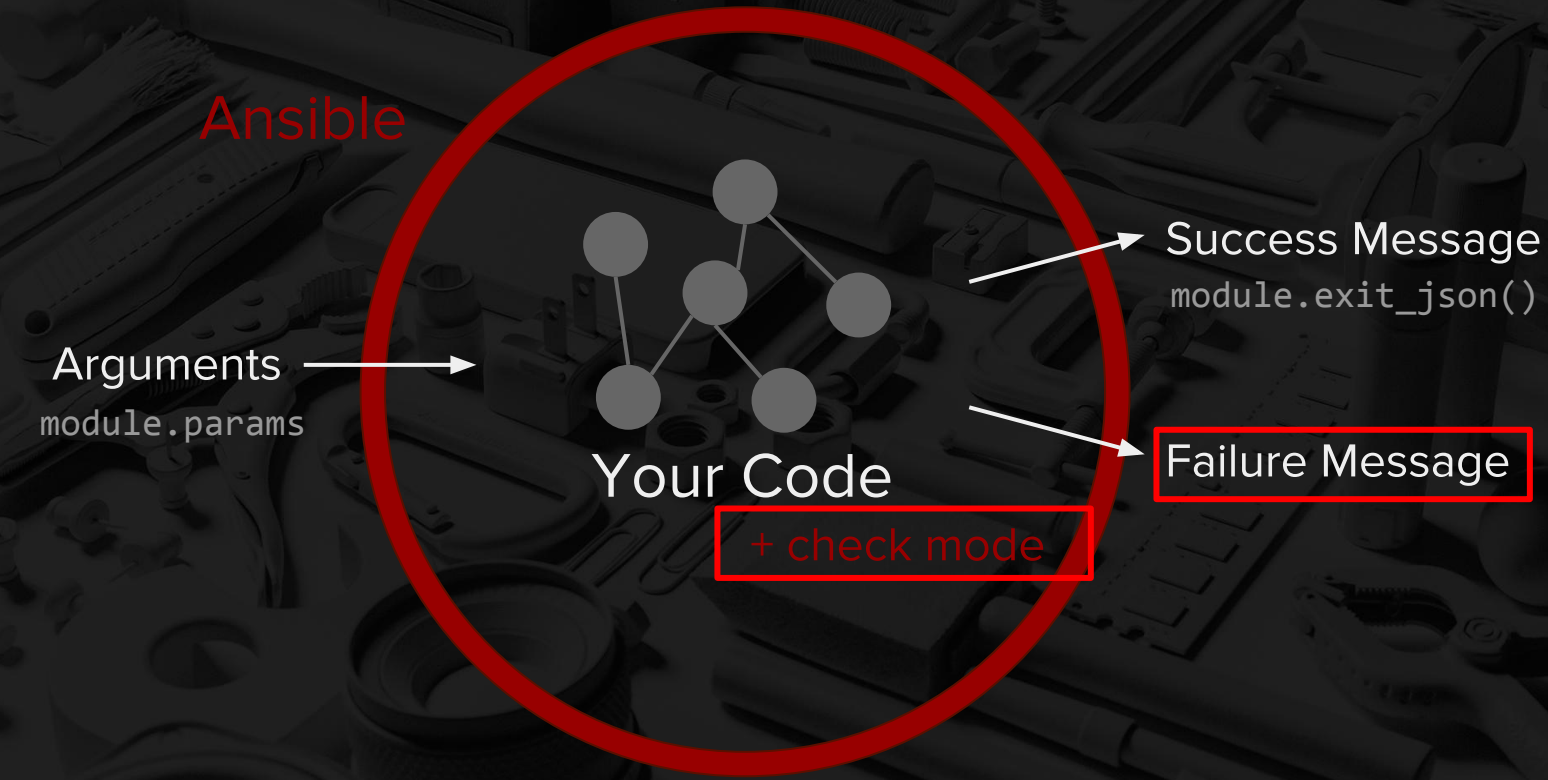

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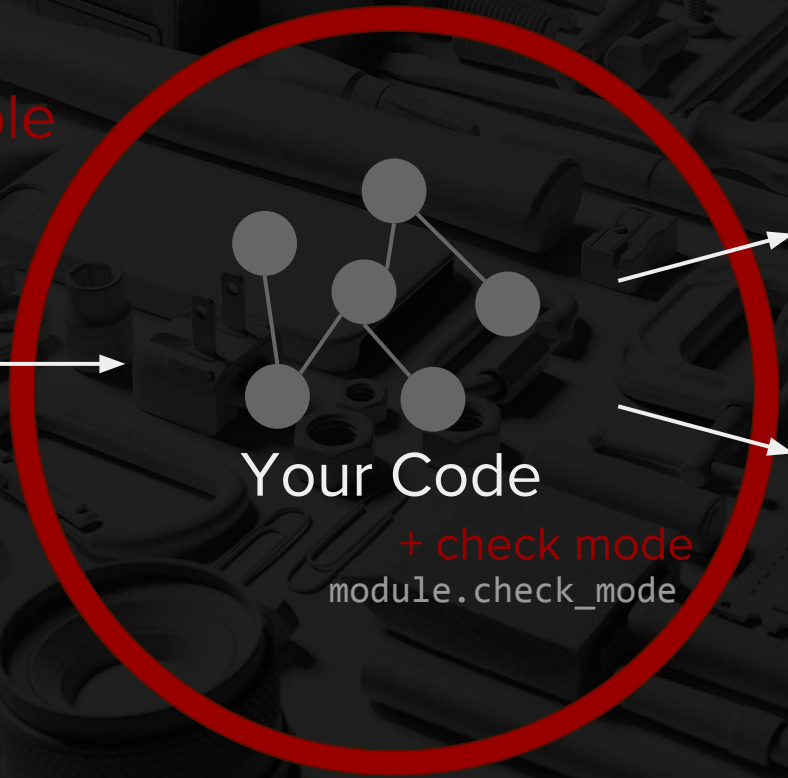

Ansible Execution: fail_json + check mode

```
14
15 def main():
16     module = setup_module()
17
18     if module.check_mode:
19         module.exit_json(changed=False, msg='This is check mode')
20
21     if module.params['name'] == 'Oscar':
22         module.fail_json(msg="Don't use the name 'Oscar'")
23
24     module.exit_json(changed=False, msg=module.params['name'])
25
```

```
>>> ansible-playbook -v basic_playbook.yml --check

PLAY [localhost] ***************************************************************

TASK [Gathering Facts] *********************************************************
ok: [localhost]

TASK [Test that my module works] ***********************************************
ok: [localhost] => {"changed": false, "failed": false, "msg": "This is check mode"}

PLAY RECAP *********************************************************************
localhost                  : ok=2    changed=0    unreachable=0    failed=0
```

Ansible Execution: fail_json + check mode

```
14
15 def main():
16     module = setup_module()
17
18     if module.check_mode:
19         module.exit_json(changed=False, msg='This is check mode')
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23
24     module.exit_json(changed=False, msg=module.params['name'])
25
```

```
>>> ansible-playbook -v basic_playbook.yml
```

```
PLAY [localhost] ***************************************************************

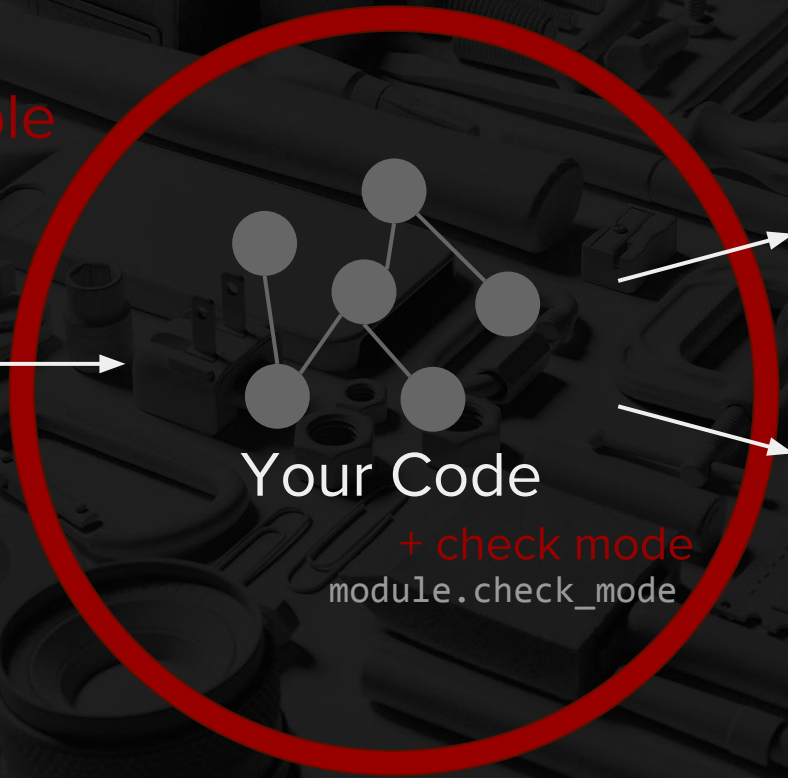
TASK [Gathering Facts] *********************************************************
ok: [localhost]

TASK [Test that my module works] ***********************************************
fatal: [localhost]: FAILED! => {"changed": false, "failed": true, "msg": "Don't use the name 'Oscar'"}

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

Ansible Execution

You tell ansible to run playbook → Ansible tells module to run → Module runs → Output is produced



Testing

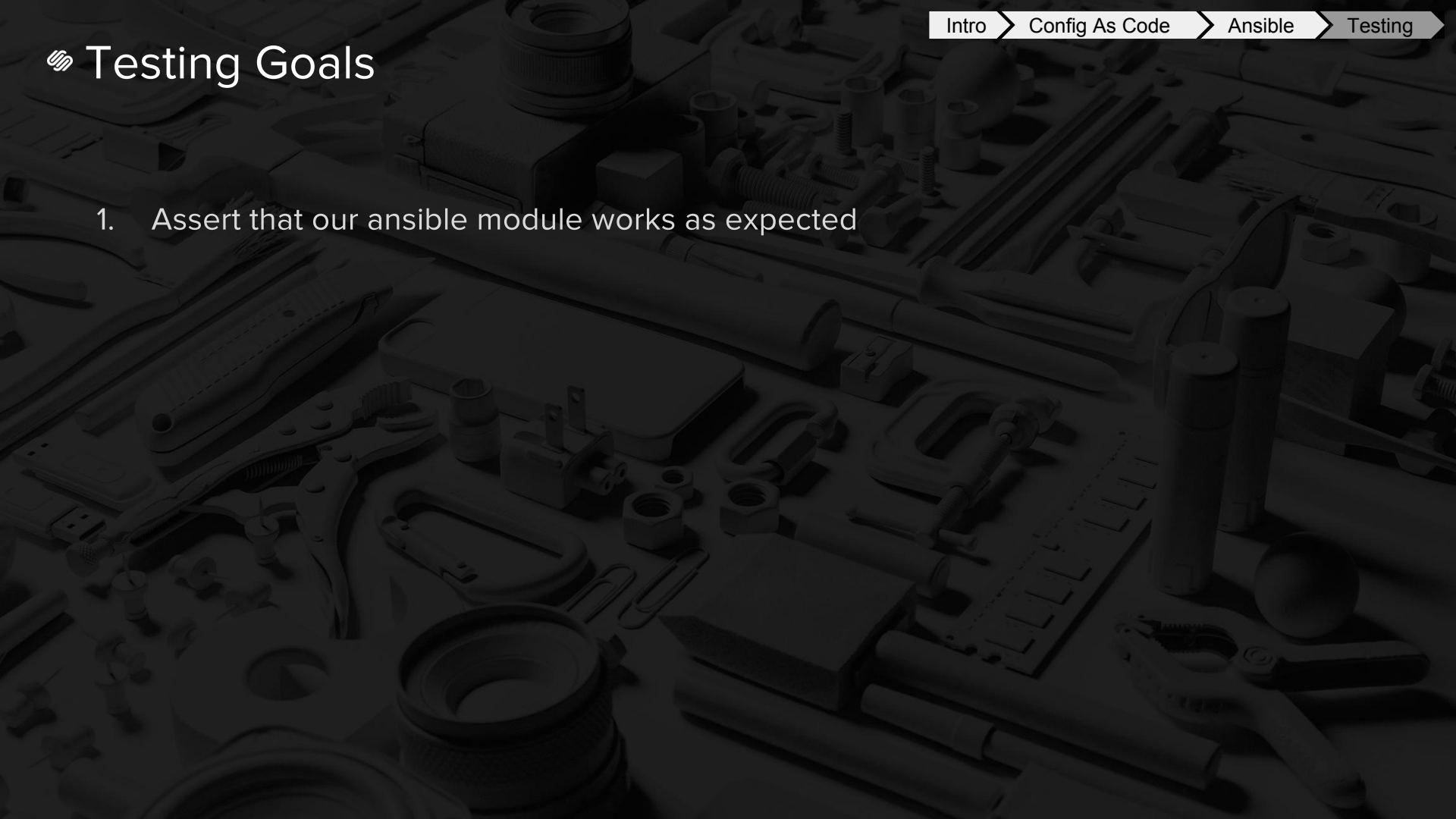
[x] Config as code

[x] Ansible

[?] Testing

Testing Goals

1. Assert that our ansible module works as expected



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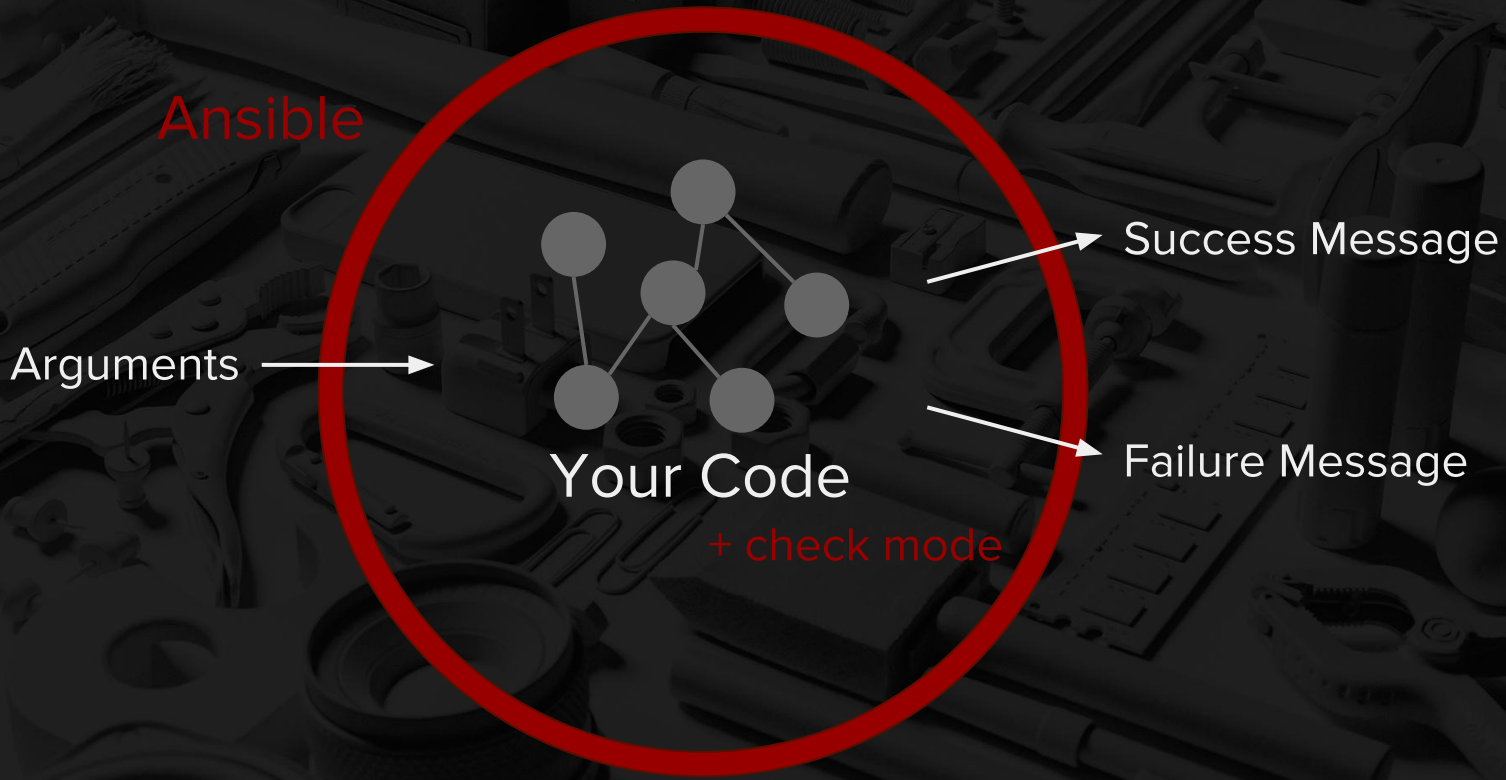

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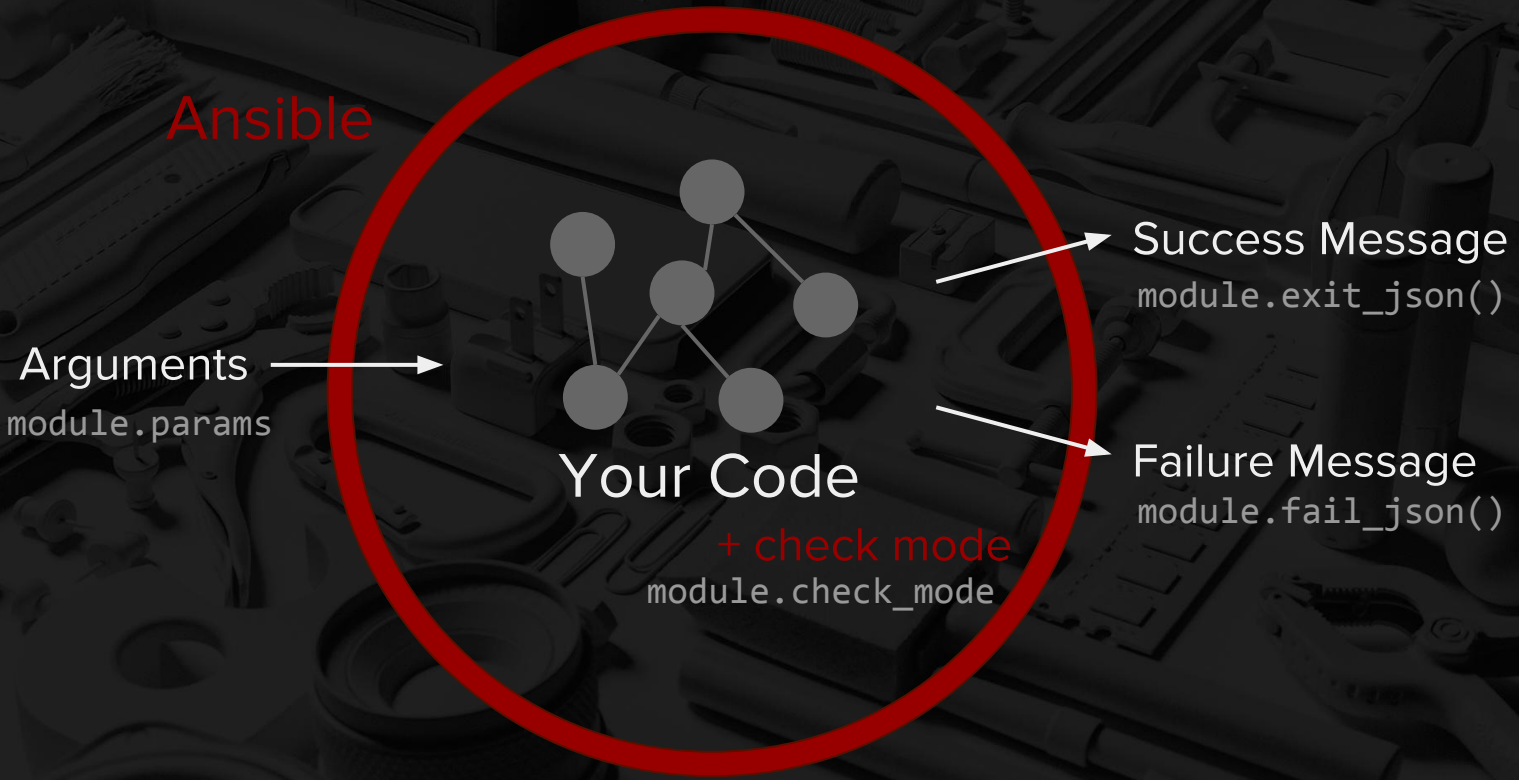

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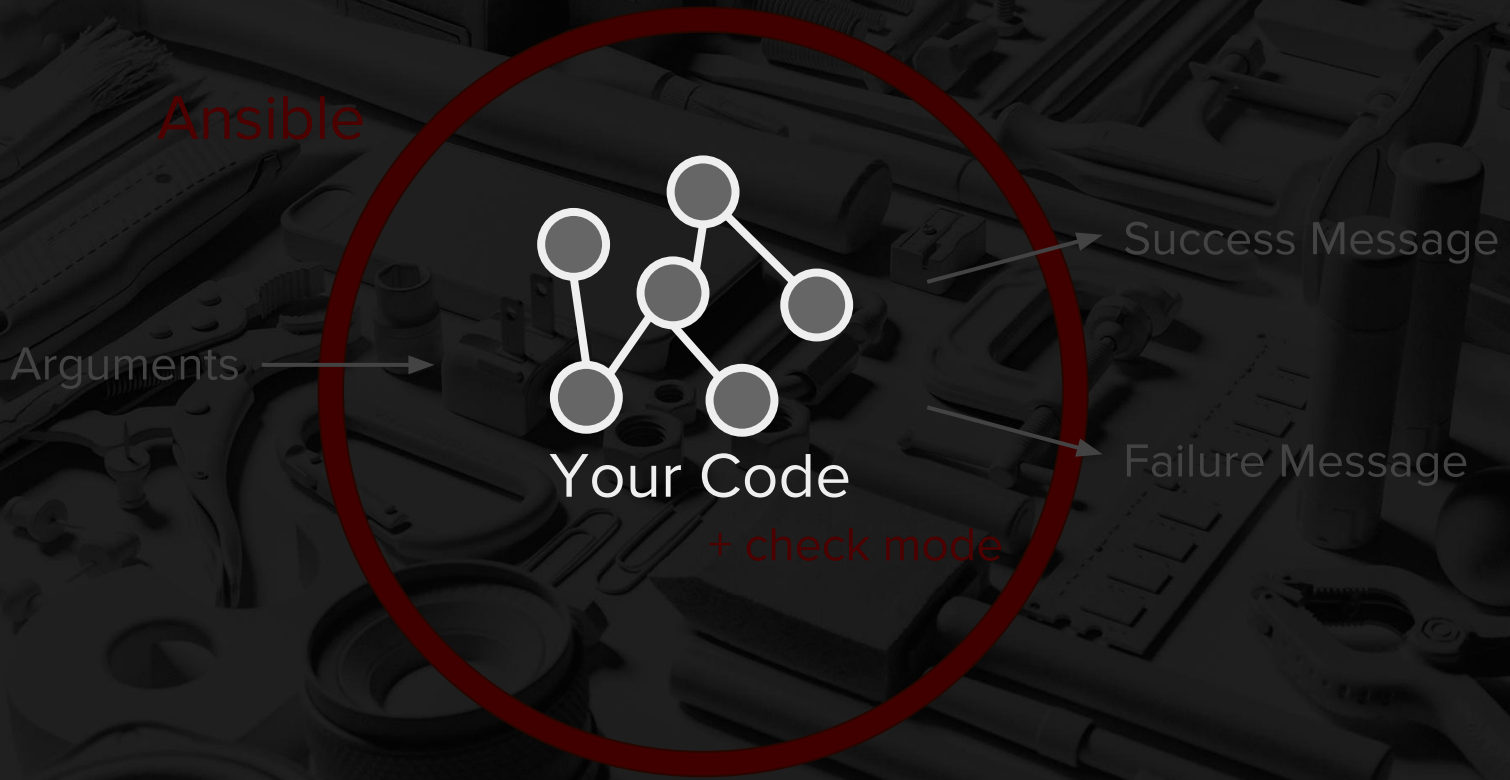

Testing Implementation

Mock fail_json to log its output: *

```
44 @pytest.fixture(scope='session')
45 def mockmodule():
46
47     class MockAnsibleModule(object):
48         def fail_json(self, msg):
49             logging.basicConfig()
50             logging.error(msg)
51
52     return MockAnsibleModule()
```

Use the ‘caplog’ fixture from the pytest-catchlog plugin:

```
16 def test_init_errors_on_single_quotes_in_name(caplog, mockmodule, cursor):
17     role = {'name': "bad'_name"}
18     _ = pgb._BaseConfigurer(mockmodule, cursor, role)
19     assert caplog.records[0].msg == 'Role "bad\'_name" contains an unsupported character: \' or "'
```

* Other mocked methods not shown

Testing Implementation

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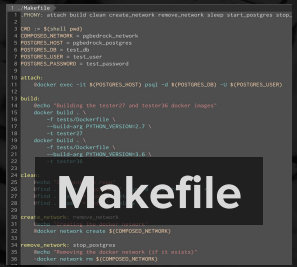

Testing Implementation

1. Assert that our ansible module works as expected
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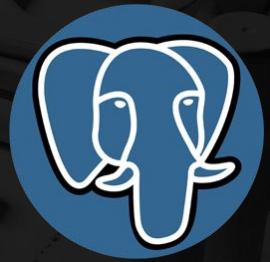
3. Make testing both Python 2 and Python 3 possible

Why don’t you just use tox??

Testing Implementation

1. Assert that our ansible module works as expected
2. Keep tests isolated from real systems
3. Make testing both Python 2 and Python 3 possible

#1) Spin up a new postgres database



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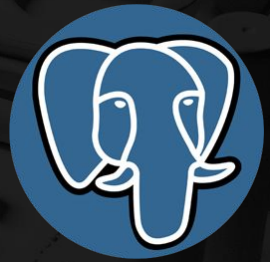

#2) Speed

Basic setup

```
>>> make build
>>> make test
```

Basic setup - make build

```
13 build:
14     @echo "Building the tester27 and tester36 docker images"
15     docker build . \
16         -f tests/Dockerfile \
17         --build-arg PYTHON_VERSION=2.7 \
18         -t tester27
19     docker build . \
20         -f tests/Dockerfile \
21         --build-arg PYTHON_VERSION=3.6 \
22         -t tester36
```

Basic setup - make build

```
1  ARG PYTHON_VERSION
2  FROM python:$PYTHON_VERSION
3
4  LABEL maintainer=zmarine@squarespace.com
5  VOLUME /opt
6  WORKDIR /opt
7
8  COPY requirements.txt /tmp
9  COPY tests/test-requirements.txt /tmp
10 RUN pip install --no-cache-dir -r /tmp/test-requirements.txt -r /tmp/requirements.txt
11
12 CMD ["python", "-m", "pytest", "/opt/tests"]
```

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Using Python 2 (or 3)

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Using Python 2 (or 3)

Install our requirements

And run pytest

Basic setup - make test

```
74 test: clean create_network start_postgres sleep test27 test36 stop_postgres
```

Additional Testing Nuances

- Want each test to be independent
- Tests require setup

Additional Testing Nuances

- Want each test to be independent → Roll back changes after each test
- Tests require setup → Use pytest fixtures for setup

Additional Testing Nuances

Yield fixtures separates test setup and test teardown:

```
29 @pytest.fixture(scope='function')
30 def cursor():
31     host = 'pgbedrock_postgres' if os.environ.get('WITHIN_DOCKER_FLAG') else 'localhost'
32     db_config = {'host': host,
33                  'port': 5432,
34                  'user': 'test_user',
35                  'password': 'test_password',
36                  'dbname': 'test_db'}
37     db_connection = psycopg2.connect(**db_config)
38     cursor = db_connection.cursor(cursor_factory=psycopg2.extras.DictCursor)
39     yield cursor
40     db_connection.rollback()
41     db_connection.close()
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Setup

Teardown

Agenda

1. Config As Code
2. Ansible
3. Testing

Questions?

Zach Marine, Squarespace


zmarine@squarespace.com
zcmarine
@zcmarine