Introduction to Testing Chef

Cookbook development workflow

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v0.1.3

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CHEF

Resources

Fundamental building blocks

Resources

- Piece of the system and its desired state

Resources - Package

Package that should be installed

```
package "mysql-server" do
  action :install
end
```

Resources - Service

Service that should be running and restarted on reboot

```
service "iptables" do
  action [ :start, :enable ]
end
```

Resources - Service

File that should be generated

```
file "/etc/motd" do
  content "Property of Chef Software"
end
```

Resources - Cron

Cron job that should be configured

```
cron "restart webserver" do
  hour '2'
  minute '0'
  command 'service httpd restart'
end
```

Resources - User

User that should be managed

```
user "nginx" do
  comment "Nginx user <nginx@example.com>"
  uid 500
  gid 500
  supports :manage_home => true
end
```

Resources - DSC

DSC resource that should be run

```
dsc_script 'emacs' do
  code <<-EOH
  Environment 'texteditor'
  {
    Name = 'EDITOR'
    Value = 'c:\\emacs\\bin\\emacs.exe'
  }
  EOH
end
```

Resources – Registry Key

Registry key that should be created

```
registry_key "HKEY_LOCAL_MACHINE\
\SOFTWARE\\Microsoft\\Windows\
\CurrentVersion\\Policies\\System"
do
  values [{
    :name => "EnableLUA",
    :type => :dword,
    :data => 0
    }]
  action :create
end
```

Test and Repair

Resources follow a test and repair model

```
package "vim"
```

Test and Repair

Resources follow a **test** and repair model

```
package "vim"
```

Test Is vim installed?

Test and Repair

Resources follow a **test** and repair model

```
package "vim"
```

Test Is vim installed?

Yes

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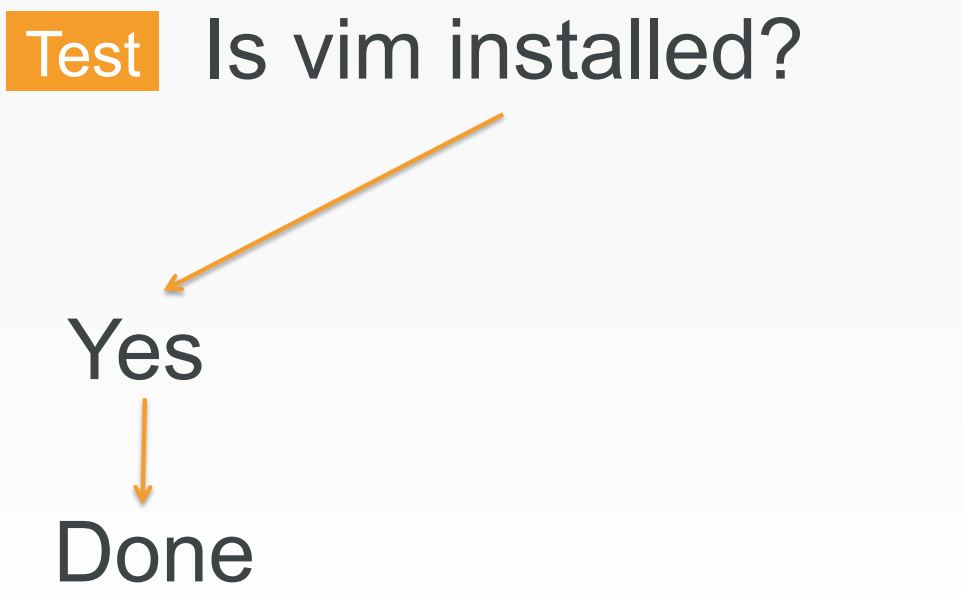
Test and Repair

Resources follow a **test** and repair model

```
package "vim"
```



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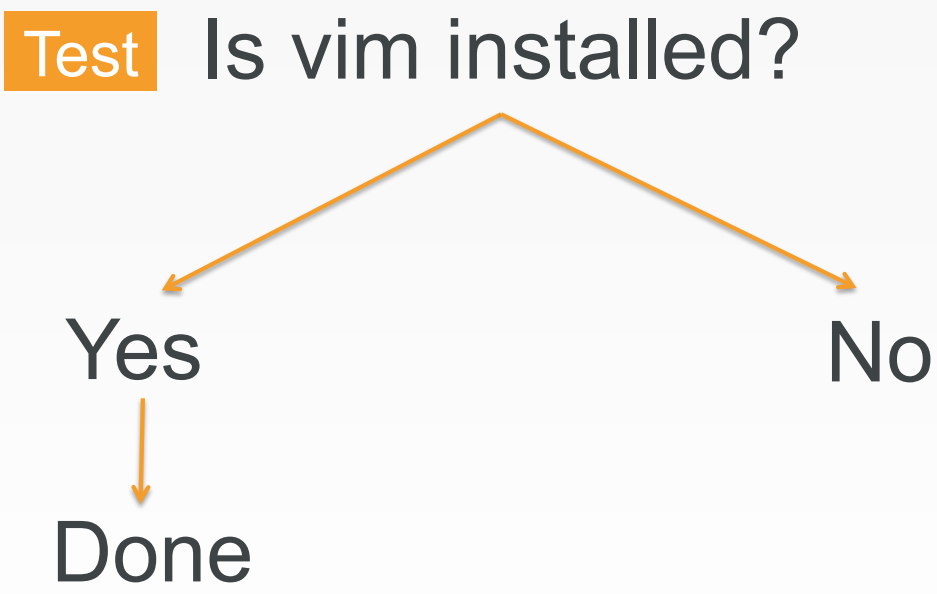
Test and Repair

Resources follow a **test** and repair model

```
package "vim"
```

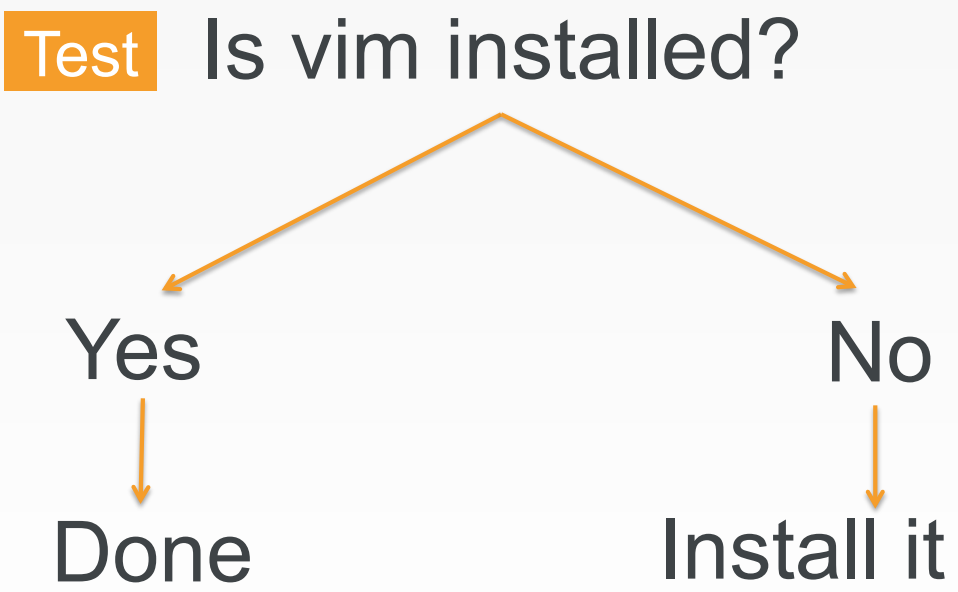


CHEF

Test and Repair

Resources follow a **test** and repair model

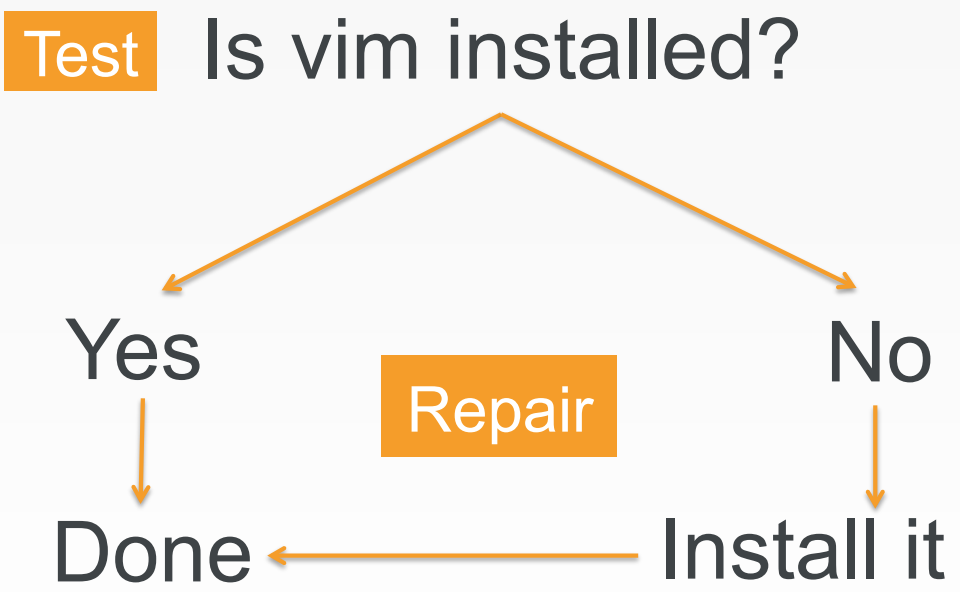
```
package "vim"
```



Test and Repair

Resources follow a **test** and **repair** model

```
package "vim"
```



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Resources – Test and Repair

- Resources follow a test and repair model

- Resource currently in the desired state? (test)
  - Yes – Do nothing
  - No – Bring the resource into the desired state (repair)

Resources

- package
- template
- service
- directory
- user
- group
- dsc_script
- registry_key
- powershell_script
- cron
- mount
- route
- …and more!

Testing Chef Cookbooks

v0.1.3

CHEF

Our process

- Write policy
- Apply policy
- Verify policy

- Not bad for the simple case, will quickly get untenable

Faster Feedback

- Speed-up the feedback loops with automated testing.
- Have confidence in your changes before you run them in production

The pedantries of testing

- Unit testing
- Integration testing
- Acceptance testing
- Functional testing
- Regression testing
- Smoke testing
- Load testing

Chef Testing

- Did chef-client complete successfully?
- Did the recipe put the node in the desired state?
- Are the resources properly defined?
- Does the code follow our style guide?

Test-driving infrastructure

- We are going to use a relatively simple scenario
- We are going to explore many facets of testing
- We are going to follow a test-first, test-driven model

Our Scenario

- We want a custom home page available on the web.

Create an apache cookbook

```
$ chef generate cookbook apache
```

```
Compiling Cookbooks...
Recipe: code_generator::cookbook
  * directory[/home/chef/chef-repo/cookbooks/apache] action create
    - create new directory /home/chef/chef-repo/cookbooks/apache
    - restore selinux security context
  * template[/home/chef/chef-repo/cookbooks/apache/metadata.rb] action create_if_missing
    - create new file /home/chef/chef-repo/cookbooks/apache/metadata.rb
    - update content in file /home/chef/chef-repo/cookbooks/apache/metadata.rb from none to 4c0e2d
    (diff output suppressed by config)
    - restore selinux security context
  * template[/home/chef/chef-repo/cookbooks/apache/README.md] action create_if_missing
    - create new file /home/chef/chef-repo/cookbooks/apache/README.md
    - update content in file /home/chef/chef-repo/cookbooks/apache/README.md from none to 5c3d3a
    (diff output suppressed by config)
    - restore selinux security context
  * cookbook_file[/home/chef/chef-repo/cookbooks/apache/chefignore] action create
 …
```

Create an apache cookbook

```
$ cd apache
```

Chef client success status

- Requirements to verify chef-client success:
  - A target server running the same OS as production

Chef client success status

- Requirements to verify chef-client success:
  - A target server running the same OS as production
  - A chef-client with access to the cookbook

Test Kitchen

- Test harness to execute code on one or more platforms
- Driver plugins to allow your code to run on various cloud and virtualization providers
- Includes support for many testing frameworks
- Included with ChefDK

Test Matrix

- Two operating systems

ubuntu-12.04
centos-6.4

Test Matrix

- Two operating systems
- One recipe

	default
ubuntu-12.04	apache::default
centos-6.4	apache::default

Test Matrix

- Two operating systems
- Two recipes

	default	ssl
ubuntu-12.04	apache::default	apache::ssl
centos-6.4	apache::default	apache::ssl

Test Matrix

- Three operating systems
- Two recipes

	default	ssl
ubuntu-12.04	apache::default	apache::ssl
centos-6.4	apache::default	apache::ssl
ubuntu-14.04	apache::default	apache::ssl

Configuring the Kitchen

OPEN IN EDITOR: apache/.kitchen.yml

```
---
driver:
  name: vagrant

provisioner:
  name: chef_zero

platforms:
  - name: ubuntu-12.04
  - name: centos-6.4

suites:
  - name: default
    run_list:
      - recipe[apache::default]
    attributes:
```

SAVE FILE!

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.kitchen.yml

- driver - virtualization or cloud provider

```
---
driver:
  name: vagrant

provisioner:
  name: chef_zero

platforms:
  - name: ubuntu-12.04
  - name: centos-6.4

suites:
  - name: default
    run_list:
      - recipe[apache::default]
    attributes:
```

.kitchen.yml

- provisioner - application to configure the node

```
---
driver:
  name: vagrant

provisioner:
  name: chef_zero

platforms:
  - name: ubuntu-12.04
  - name: centos-6.4

suites:
  - name: default
    run_list:
      - recipe[apache::default]
    attributes:
```

.kitchen.yml

- platforms - target operating systems

```
---
driver:
  name: vagrant

provisioner:
  name: chef_zero

platforms:
  - name: ubuntu-12.04
  - name: centos-6.4

suites:
  - name: default
    run_list:
      - recipe[apache::default]
    attributes:
```

.kitchen.yml

- suites - target configurations

```
---
driver:
  name: vagrant

provisioner:
  name: chef_zero

platforms:
  - name: ubuntu-12.04
  - name: centos-6.4

suites:
  - name: default
    run_list:
      - recipe[apache::default]
    attributes:
```

.kitchen.yml

	default
ubuntu-12.04	apache::default
centos-6.4	apache::default

```
---
driver:
  name: vagrant

provisioner:
  name: chef_zero

platforms:
  - name: ubuntu-12.04
  - name: centos-6.4


suites:
  - name: default
    run_list:
      - recipe[apache::default]
```

.kitchen.yml

	default	ssl
ubuntu-12.04	apache::default	apache::ssl
centos-6.4	apache::default	apache::ssl

```
---
driver:
  name: vagrant

provisioner:
  name: chef_zero

platforms:
  - name: ubuntu-12.04
  - name: centos-6.4

suites:
  - name: default
    run_list:
      - recipe[apache::default]
  - name: ssl
    run_list:
      - recipe[apache::ssl]
```

.kitchen.yml

	default	ssl
ubuntu-12.04	apache::default	apache::ssl
centos-6.4	apache::default	apache::ssl
ubuntu-14.04	apache::default	apache::ssl

```
---
driver:
  name: vagrant

provisioner:
  name: chef_zero

platforms:
  - name: ubuntu-12.04
  - name: centos-6.4
  - name: ubuntu-14.04

suites:
  - name: default
    run_list:
      - recipe[apache::default]
  - name: ssl
    run_list:
      - recipe[apache::ssl]
```

.kitchen.yml

- The configuration file for your Test Kitchen
- driver – virtualization or cloud provider
- provisioner – application to configure the node
- platforms – target operating systems
- suites – target configurations

Move to the apache cookbook directory

```
$ cd ~/chef-repo/cookbooks/apache
```

List the Test Kitchens

```
$ kitchen list
```

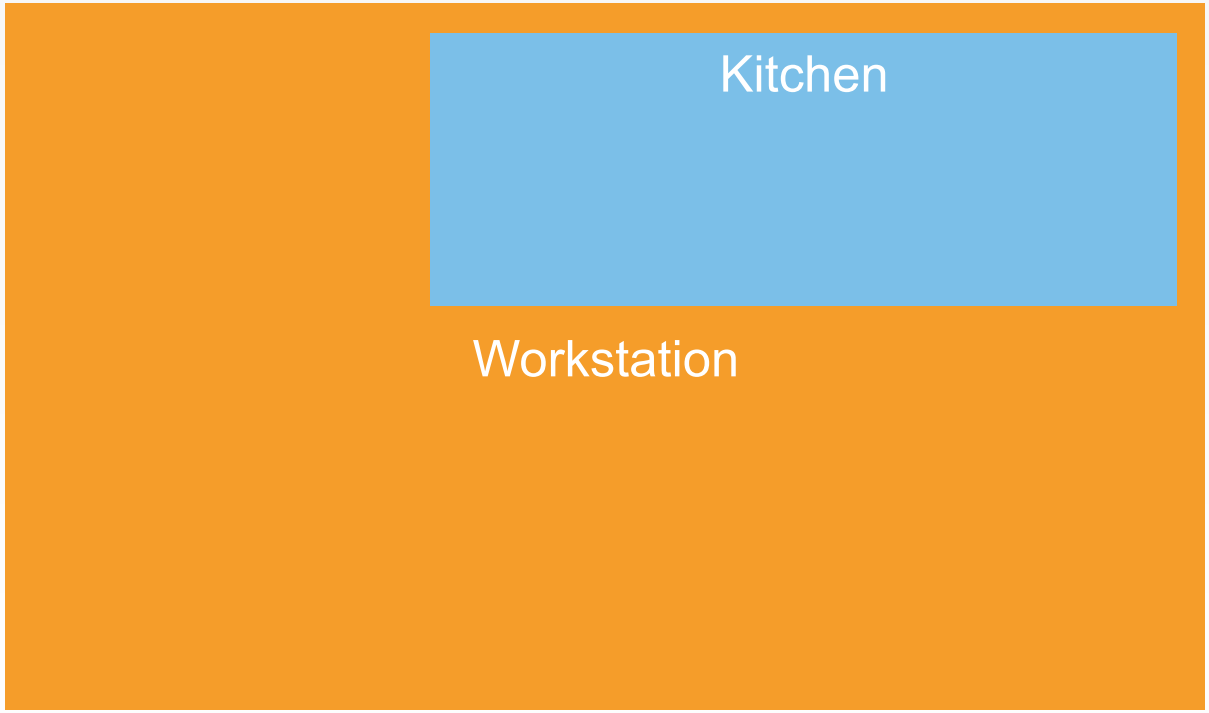
```
Instance             Driver   Provisioner  Last Action
default-centos-65    Docker   ChefZero     <Not Created>
```

Create the kitchen

```
$ kitchen create
```

```
-----> Starting Kitchen (v1.2.1)
-----> Creating <default-centos-64>...
       Step 0 : FROM centos:centos6
        ---> 68eb857ffb51
       Step 1 : RUN yum clean all
        ---> Running in cdf3952a3f18
       Loaded plugins: fastestmirror
       Cleaning repos: base extras libselinux updates
       Cleaning up Everything
        ---> b1cccd25ce55
       Removing intermediate container cdf3952a3f18
       Step 2 : RUN yum install -y sudo openssh-server openssh-clients which curl
        ---> Running in 9db69ace459d
       Loaded plugins: fastestmirror
```

Kitchen created

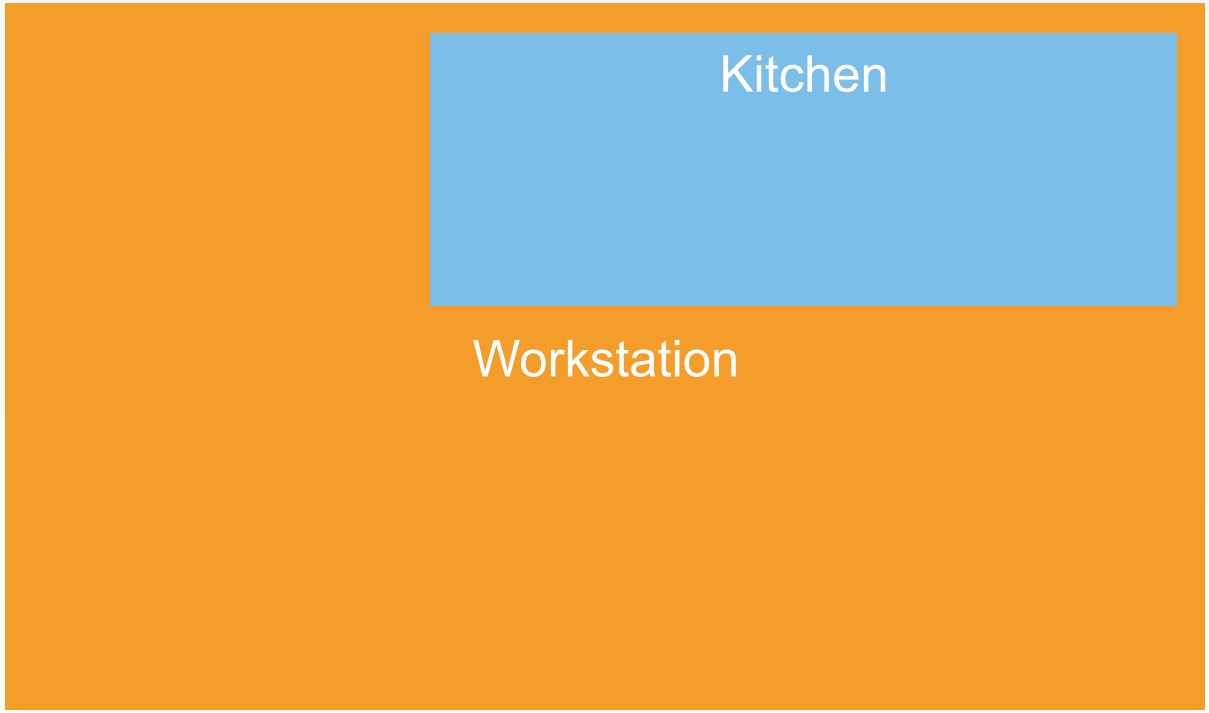


Login to the kitchen

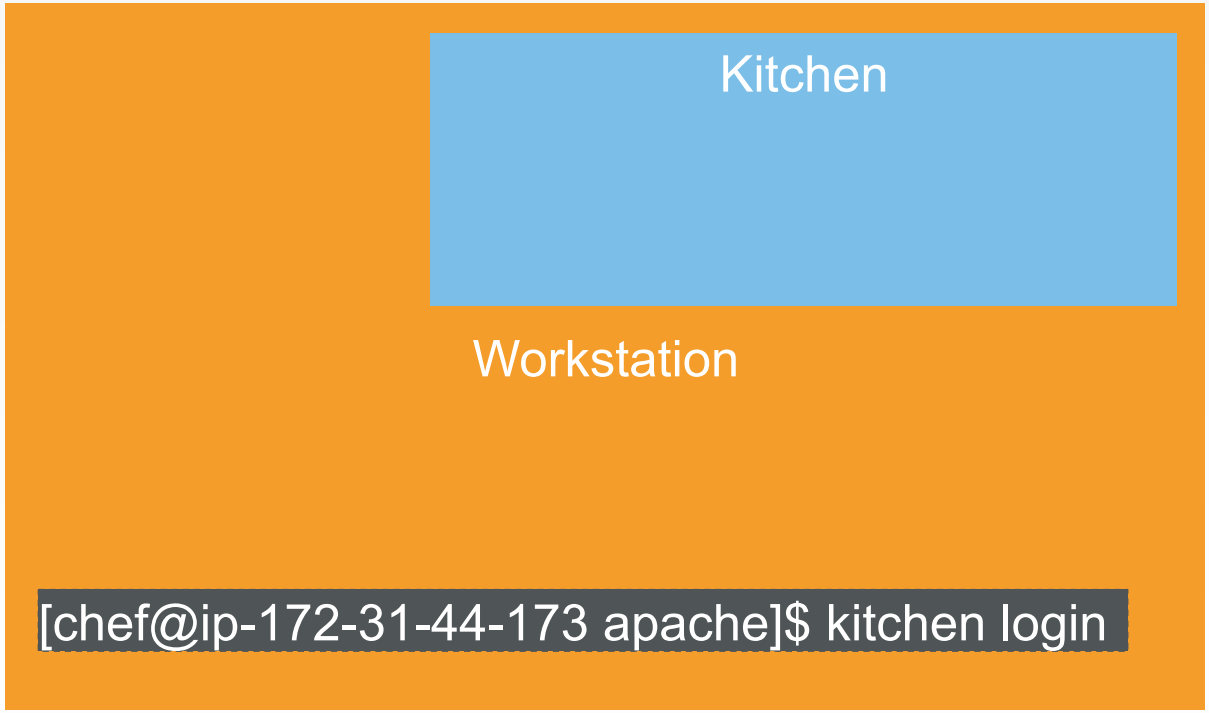
```
$ kitchen login
```

```
kitchen@localhost's password:
```

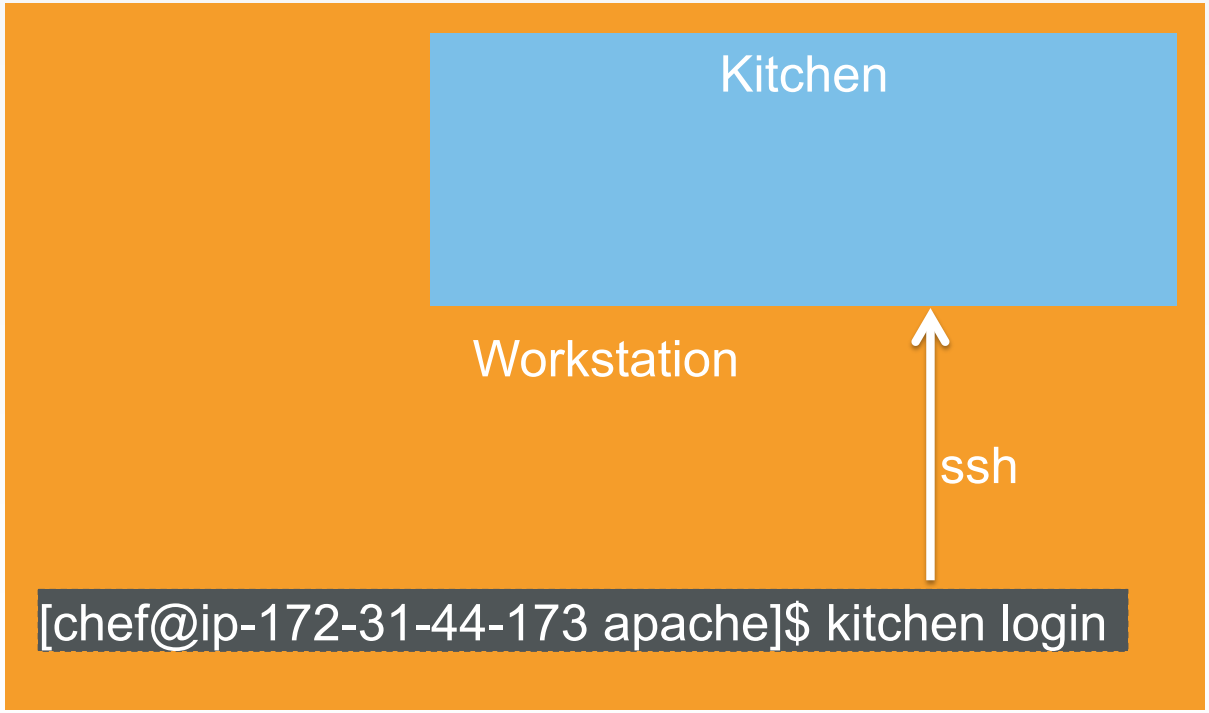
Kitchen login



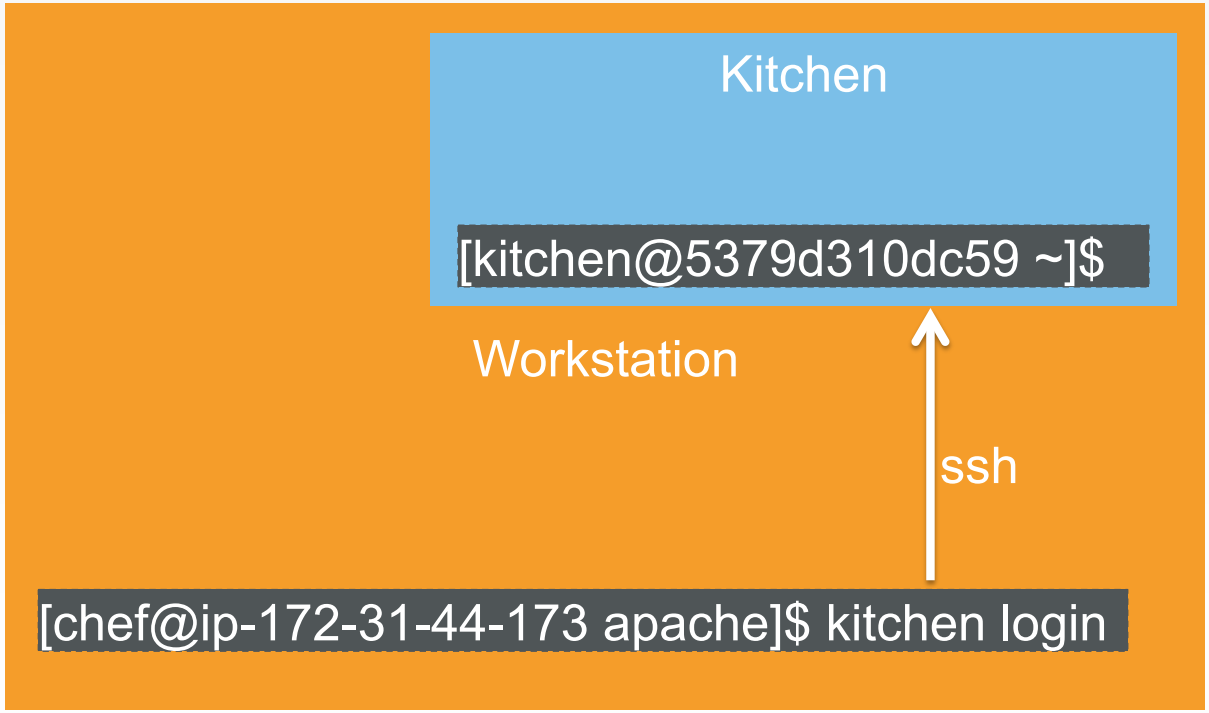
Kitchen login



Kitchen login



Kitchen login



Chef client success status

- Requirements to verify chef-client success:
  - A target server running the same OS as production
  - A chef-client with access to the cookbook

Go to the right place

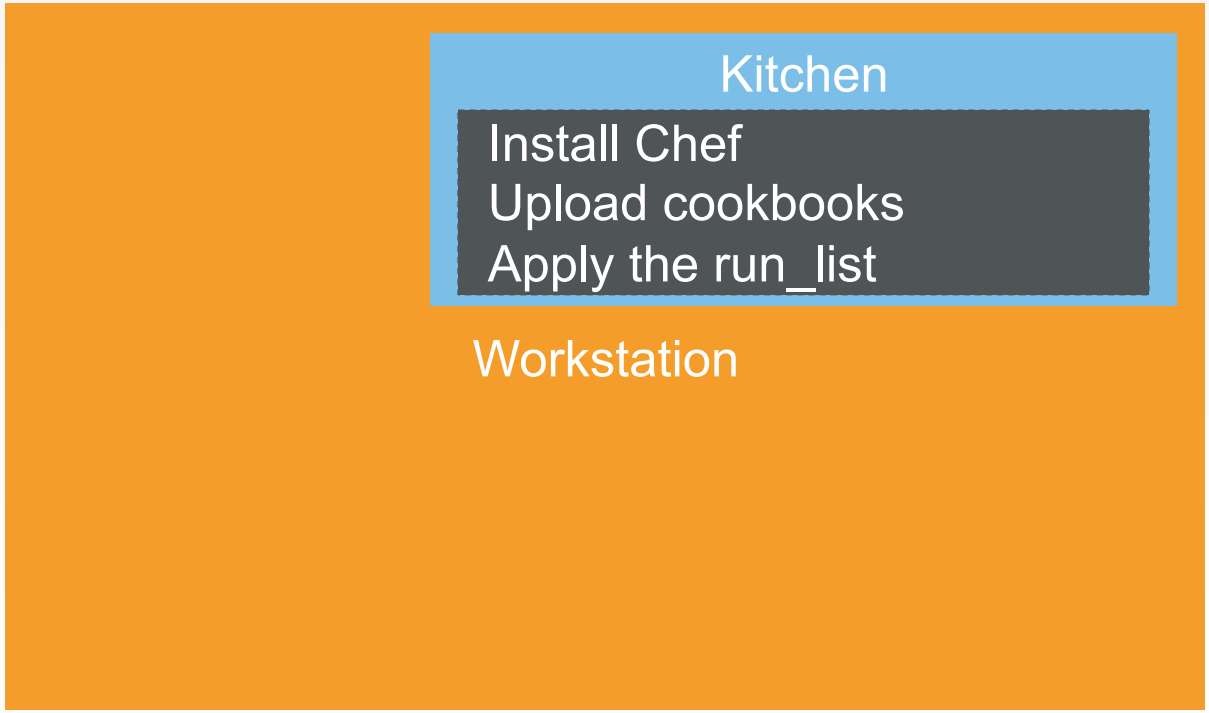
```
$ cd ~/chef-repo/cookbooks/apache
```

Apply our policy

```
$ kitchen converge
```

```
-----> Starting Kitchen (v1.2.1)
-----> Converging <default-centos-64>...
       Preparing files for transfer
       Resolving cookbook dependencies with Berkshelf 3.1.5...
       Removing non-cookbook files before transfer
-----> Installing Chef Omnibus (true)
       downloading https://www.getchef.com/chef/install.sh
         to file /tmp/install.sh
       trying curl...
```

Kitchen converge



Chef Testing

- Did chef-client complete successfully?
- Did the recipe put the node in the desired state?
- Are the resources properly defined?
- Does the code following our style guide?

Chef Testing

- ✓ Did chef-client complete successfully?
- Did the recipe put the node in the desired state?
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Verifying node state

Serverspec

CHEF

Chef Testing

- ✓ Did chef-client complete successfully?
- Did the recipe put the node in the desired state?
- Are the resources properly defined?
- Does the code following our style guide?

Manually inspect the test node

```
$ kitchen login
```

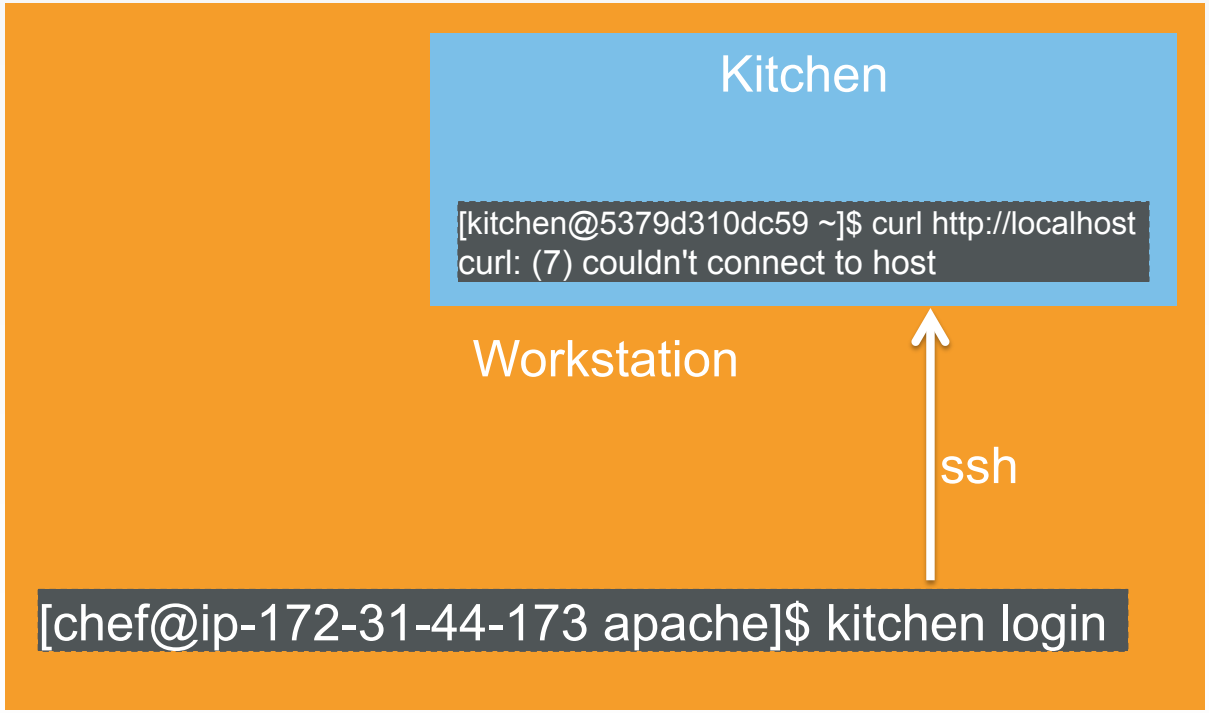
```
kitchen@localhost's password:
```

Manually inspect the test node

```
$ curl http://localhost
```

```
curl: (7) couldn't connect to host
```

Kitchen login



Serverspec

- Write tests to verify your servers
- Not dependent on Chef
- Defines many resource types
  - package, service, user, etc.
- Works well with Test Kitchen
- http://serverspec.org/

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Move to the proper directory

```
$ cd ~/chef-repo/cookbooks/apache
```

Default location for tests

- Test Kitchen will look in the `test/integration` directory for test-related files

Suite subdirectory

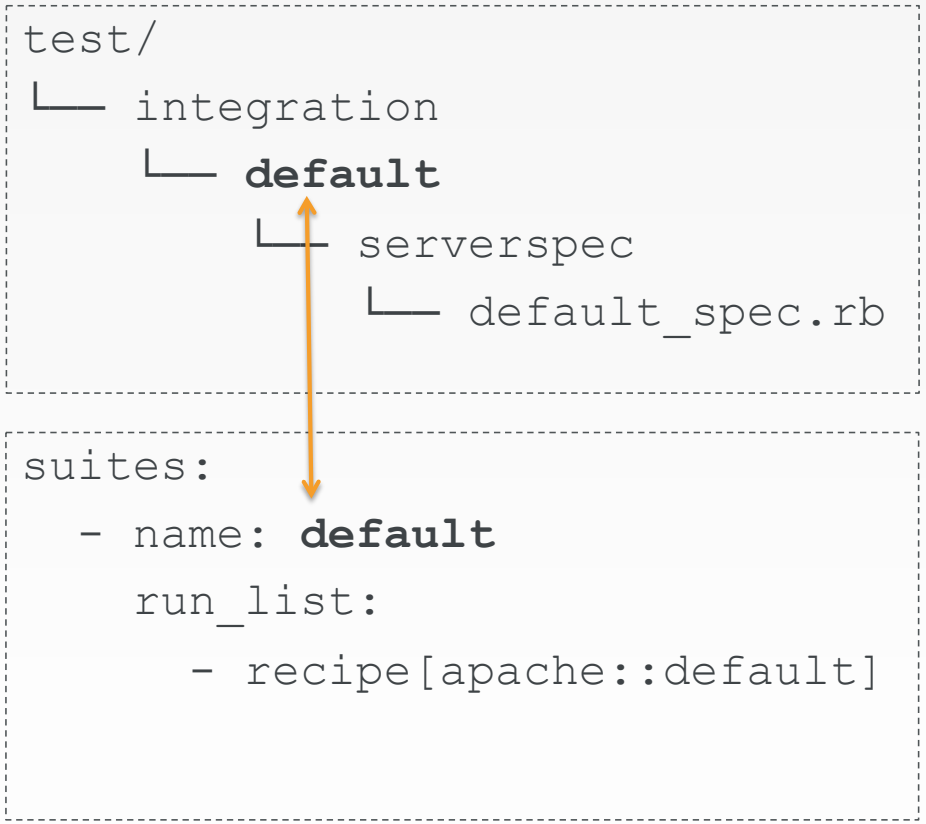
- The next level subdirectory will match the suite name.

```
test/
└── integration
    └── default
        └── serverspec
            └── default_spec.rb
```

```
suites:
  - name: default
    run_list:
      - recipe[apache::default]
```

Suite subdirectory

- The next level subdirectory will match the suite name.



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Busser subdirectory

- Test Kitchen utilizes **bussers** to manage test plugins.
- We'll be using the serverspec plugin

```
test/
└── integration
    └── default
        └── serverspec
            └── default_spec.rb
```

```
suites:
  - name: default
    run_list:
      - recipe[apache::default]
```

CHEF

Write a Serverspec test

OPEN IN EDITOR: test/integration/default/serverspec/default_spec.rb

```
require 'serverspec'
set :backend, :exec

describe 'apache' do

end
```

SAVE FILE!

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Generic Expectation Form

```
describe "<subject>" do
  it "<description>" do
    expect(thing).to eq result
  end
end
```

Awesome Expectations

OPEN IN EDITOR: test/integration/default/serverspec/default_spec.rb

```
require 'serverspec'
set :backend, :exec

describe "apache" do
  it "is awesome" do
    expect(true).to eq true
  end
end
```

SAVE FILE!

CHEF

Run the serverspec test

```
$ kitchen verify
```

```
-----> Running serverspec test suite
       /opt/chef/embedded/bin/ruby -I/tmp/busser/suites/serverspec -I/tmp/
busser/gems/gems/rspec-support-3.1.2/lib:/tmp/busser/gems/gems/rspec-
core-3.1.7/lib /opt/chef/embedded/bin/rspec --pattern /tmp/busser/suites/
serverspec/\*\*/\*_spec.rb --color --format documentation --default-path /
tmp/busser/suites/serverspec

       apache
         is awesome

       Finished in 0.02823 seconds (files took 0.99875 seconds to load)
       1 example, 0 failures
       Finished verifying <default-centos-64> (0m5.03s).
```

How would you test our criteria?

- We want a custom home page available on the web.

What is success?

- Package is installed?
- Page is displayed?
- What else?

Verify package is installed

OPEN IN EDITOR: test/integration/default/serverspec/default_spec.rb

```
require 'serverspec'
set :backend, :exec

describe "apache" do
  it "is awesome" do
    expect(true).to eq true
  end

  it "is installed" do
    expect(package("httpd")).to be_installed
  end
end
```

SAVE FILE!

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Exercise the test

```
$ kitchen verify
```

```
 apache
         is awesome
         is installed (FAILED - 1)

       Failures:

         1) apache is installed
            Failure/Error: expect(package("httpd")).to
be_installed
              expected Package "httpd" to be installed
              /bin/sh -c rpm\ -q\ httpd
              package httpd is not installed
```

Test is failing, make it pass

- Test-driven development involves
  - Write a test to verify something is working
  - Watch the test fail
  - Write just enough code to make the test pass
  - Repeat

Update our cookbook

OPEN IN EDITOR: ~/chef-reop/cookbooks/apache/recipes/default.rb

```
package "httpd"
```

SAVE FILE!

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Converge the node again

```
$ kitchen converge
```

```
-----> Converging <default-centos-64>...
       Preparing files for transfer
       Resolving cookbook dependencies with Berkshelf 3.1.5...
       Removing non-cookbook files before transfer
       Transfering files to <default-centos-64>
       [2014-11-10T09:20:26+00:00] INFO: Starting chef-zero on host localhost, port 8889
with repository at repository at /tmp/kitchen
         One version per cookbook

       [2014-11-10T09:20:26+00:00] INFO: Forking chef instance to converge...
       Starting Chef Client, version 11.16.4
       [2014-11-10T09:20:27+00:00] INFO: *** Chef 11.16.4 ***
       [2014-11-10T09:20:27+00:00] INFO: Chef-client pid: 571
 ...
```

Exercise the test

```
$ kitchen verify
```

```
 apache
         is awesome
         is installed

       Finished in 0.48165 seconds (files took 1.05
seconds to load)
       2 examples, 0 failures
       Finished verifying <default-centos-64>
(0m5.64s).
-----> Kitchen is finished. (0m11.84s)
```

What else will you test?

- Is the service running?
- Is the port accessible?
- Is the expected content being served?

- Make sure everything works from a fresh kitchen, too!

Extend the Serverspec test

OPEN IN EDITOR: test/integration/default/serverspec/default_spec.rb

```
describe 'apache' do
  it "is installed" do
    expect(package 'httpd').to be_installed
  end

  it "is running" do
    expect(service 'httpd').to be_running
  end

  it "is listening on port 80" do
    expect(port 80).to be_listening
  end

  it "displays a custom home page" do
    expect(command("curl localhost").stdout).to match /hello/
  end
end
```

SAVE FILE!

CHEF

Verify the kitchen

```
$ kitchen verify
```

```
apache
        is installed
        is running
        is listening on port 80
        displays a custom home page

      Finished in 0.3968 seconds
      4 examples, 0 failures
      Finished verifying <default-centos-64> (0m4.25s).
```

Kitchen Workflow

- `kitchen create`
- `kitchen converge`
- `kitchen verify`
- `kitchen destroy`

- All at once with `kitchen test`

Chef Testing

- ✓ Did chef-client complete successfully?
- ✓ Did the recipe put the node in the desired state?
- Are the resources properly defined?
- Does the code following our style guide?

Even Faster Feedback

ChefSpec

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Chef Testing

- ✓ Did chef-client complete successfully?
- ✓ Did the recipe put the node in the desired state?
- Are the resources properly defined?
- Does the code following our style guide?

This is too slow!

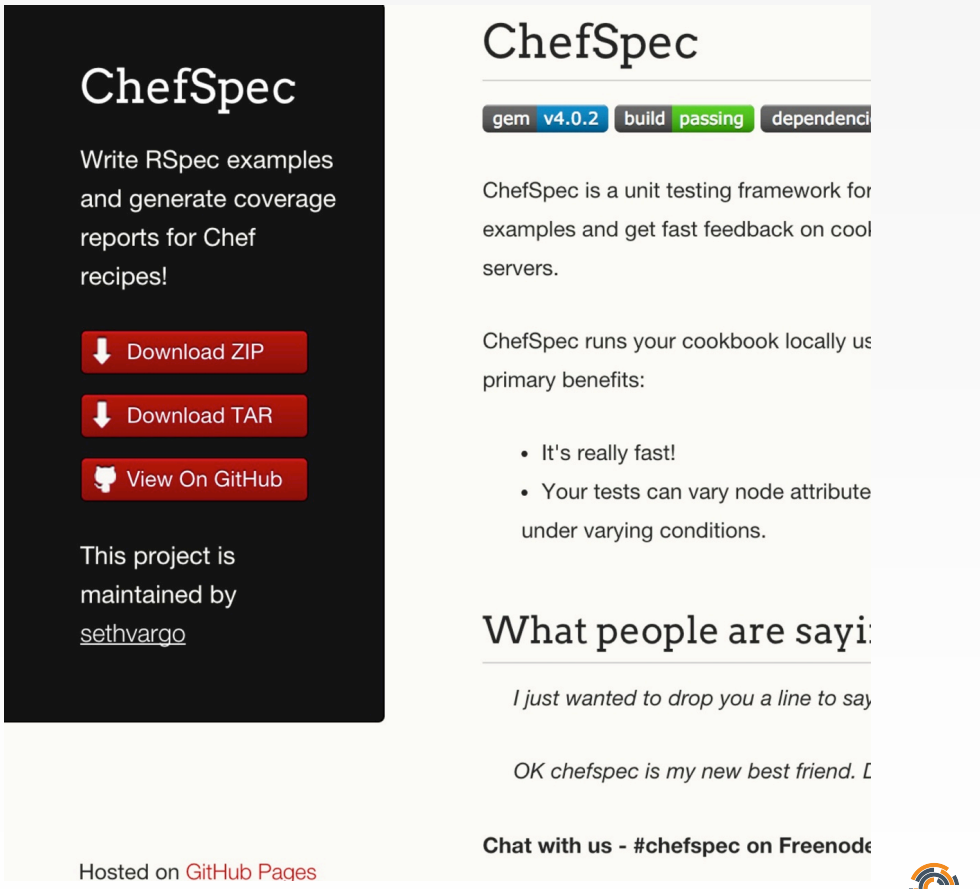
- To test our code, we need to spin up a test kitchen, converge a node, execute some tests.
- Our simple test case takes about 2 minutes to fully execute.

Properly configured resources

- We need a way to verify that the resources in our recipes are properly configured
- We want to get faster feedback

ChefSpec

- Test before you converge
- Get feedback on cookbook changes without the need for target servers



http://sethvargo.github.io/chefspec/

Write a ChefSpec test

OPEN IN EDITOR: spec/unit/default.rb

```
require 'chefspec'

describe 'apache::default' do
  let(:chef_run) do
    ChefSpec::Runner.new.converge(described_recipe)
  end

  it 'installs apache' do
    expect(chef_run).to install_package('httpd')
  end
end
```

SAVE FILE!

CHEF

Run the ChefSpec tests

```
$ rspec spec/unit/*.rb
```

```
.

Finished in 0.00865 seconds (files took 5.5 seconds to load)
1 example, 0 failures
```

Chef Testing

- ✓ Did chef-client complete successfully?
- ✓ Did the recipe put the node in the desired state?
- ✓ Are the resources properly defined?
- Does the code following our style guide?

Clean code

Follow best practices, avoid mistakes

CHEF

Foodcritic

- Check cookbooks for common problems
- Style, correctness, deprecations, etc.
- Included with ChefDK

http://www.foodcritic.io/

Change our recipe

OPEN IN EDITOR: recipes/default.rb

```
package_name = "httpd"

package "#{package_name}"

service "httpd" do
  action :start
end

template "/var/www/html/index.html" do
  source "index.html.erb"
end
```

SAVE FILE!

CHEF

Run Foodcritic

```
$ foodcritic .
```

```
FC002: Avoid string interpolation
where not required: ./recipes/
default.rb:7
```

Chef Testing

- ✓ Did chef-client complete successfully?
- ✓ Did the recipe put the node in the desired state?
- ✓ Are the resources properly defined?
- ✓ Does the code following our style guide?