

Introduction to InSpec



CHEF™

Nathen – Start the recording!

Agenda

Orientation to the learning environment

Introduction to InSpec

The InSpec Command Line Interface (CLI)

Integration testing with InSpec

Additional Resources and Support

Objectives

Execute an InSpec test on a local machine

Execute an InSpec test on a remote machine

Generate an InSpec profile

Add InSpec-based integration test to a Chef cookbook

Run InSpec-based integrations tests during Chef cookbook development

List additional resources and places to look for support with InSpec

Learning Environment

Let's have a look around

Sign-up to Strigo & Join the classroom ?

 Connect with Google

Or sign-up using your email

Email

Password

Name

Sign-up

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The information you provide will not be used for commercial purposes
and will not be sold, rented, leased or forwarded to any third party.

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[About this workshop](#)

[About the instructor](#)

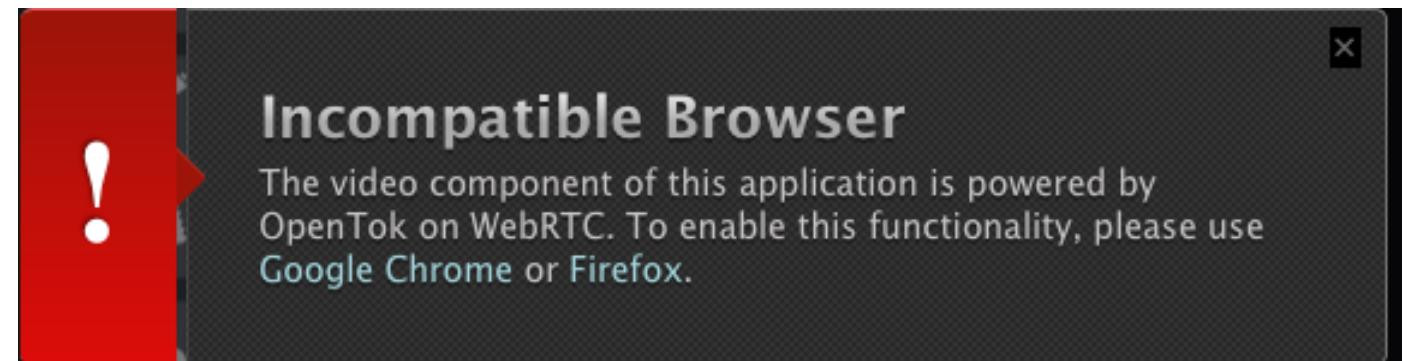
N

Hello, Nathen, you're all set!

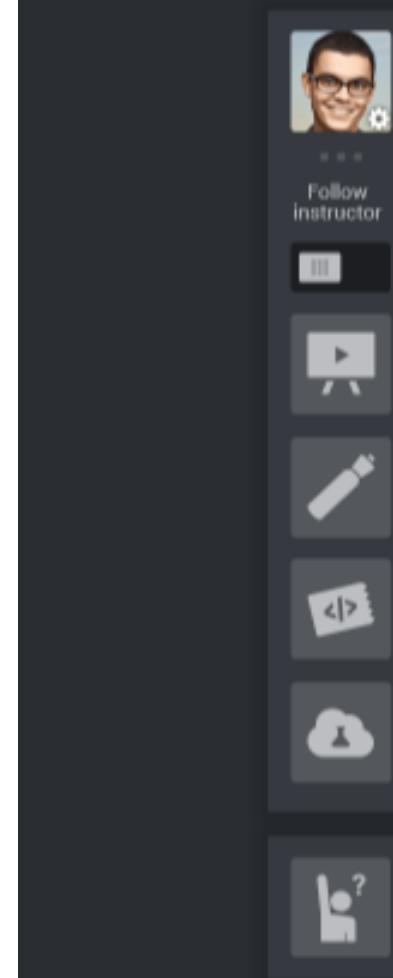
To enter the classroom please insert the 4 digit token
provided by the instructor and click the button

TOKEN

Enter the classroom



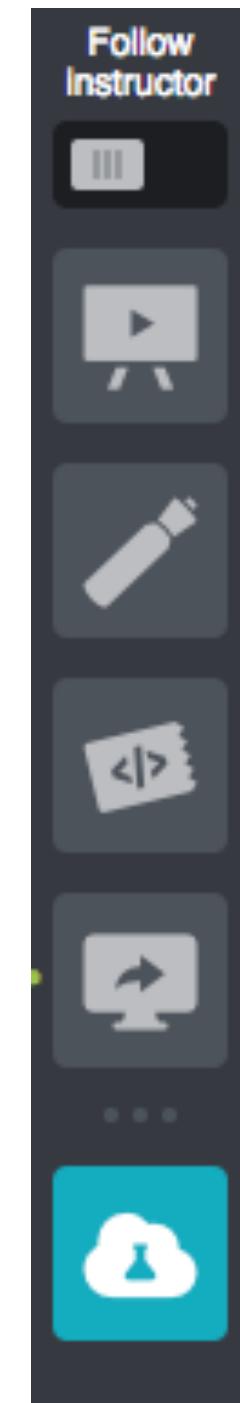
For any technical difficulties please approach the instructor



* The follow toggle is used to switch between following the instructor and freely navigating through the classroom

Means you are following the instructor

Means you are navigating on your own



Toggle following instructor

The presentation

A whiteboard

Code snippets

View the instructor's screen

Your Lab

My Lab (ready)
ec2-35-157-78-2...

Terminal

ec2-user@ip-... +

```
[ec2-user@ip-172-31-23-226 ~]$ touch firstname_lastname  
[ec2-user@ip-172-31-23-226 ~]$
```

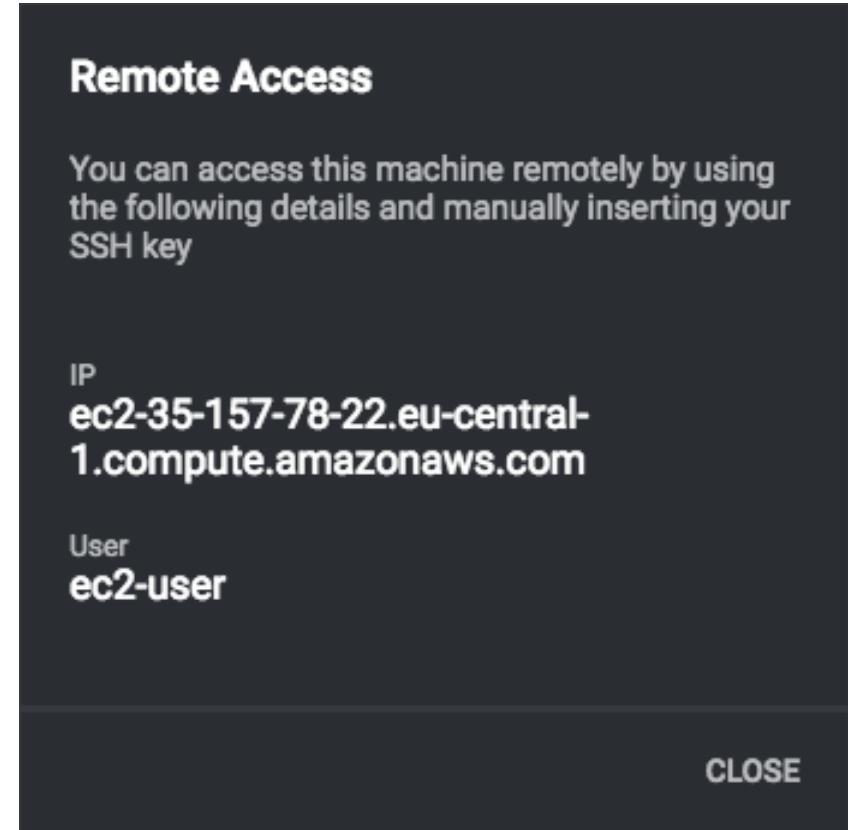
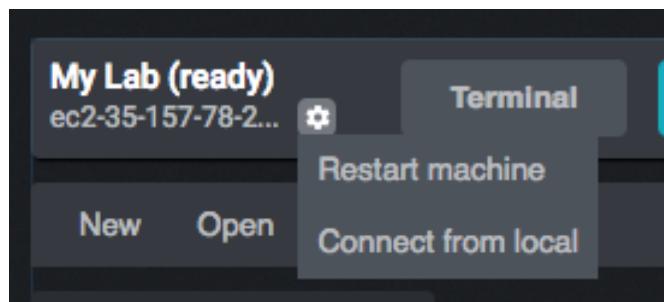
My Lab (ready)
ec2-35-157-78-2...

Terminal

New Open Save Save as

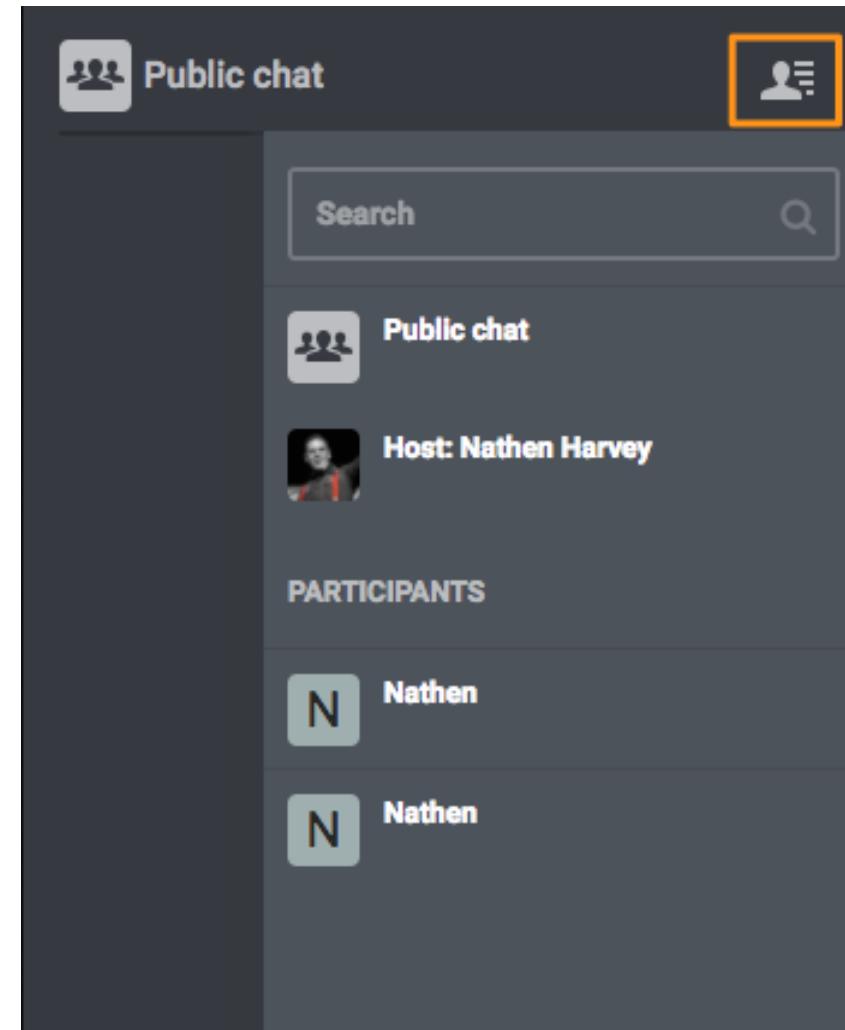
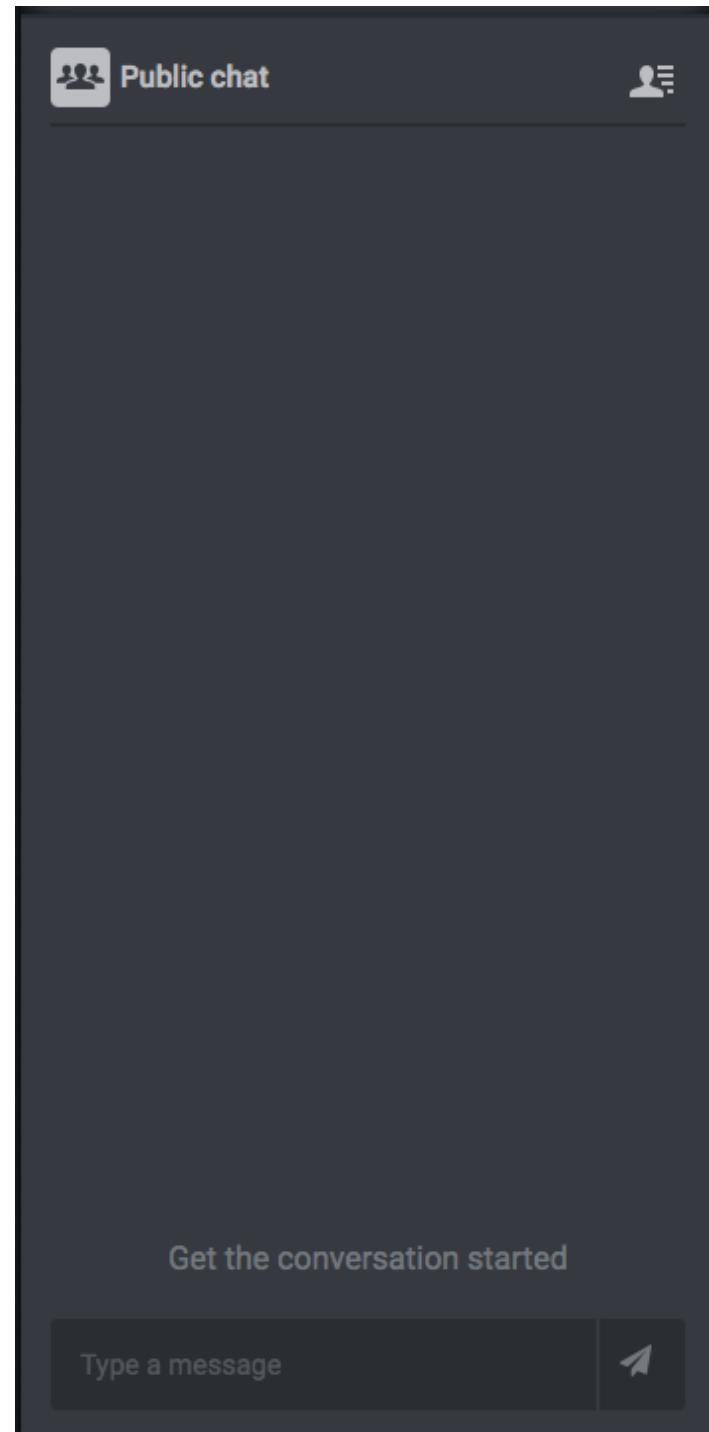
firstname.lastname.txt

```
1 hello!
```



Login Directly

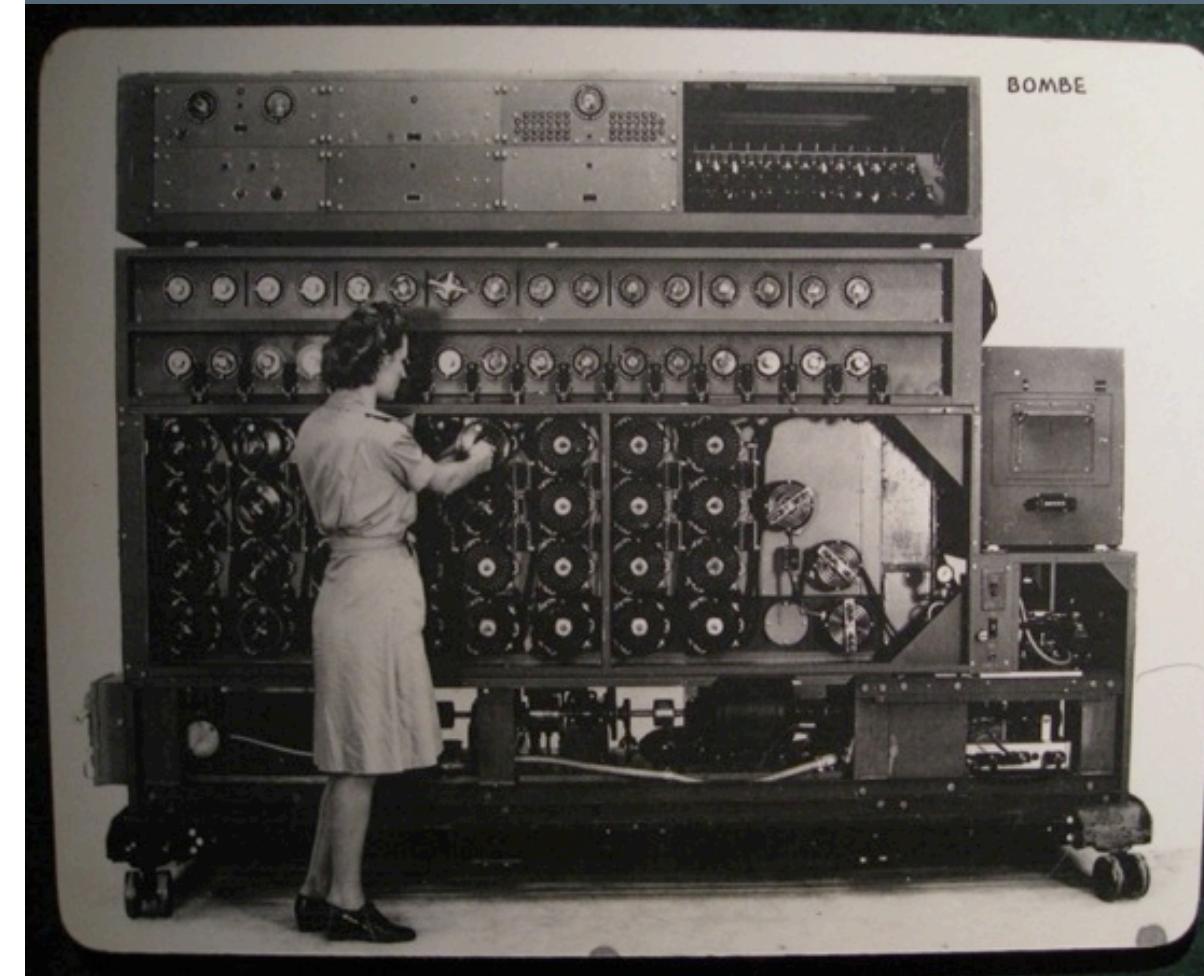
Login: chef
Password: chef



Infrastructure as Code

Infrastructure as Code

- Programmatically provision and configure components
- Treat like any other code base
- Reconstruct business from code repository, data backup, and compute resources



Infrastructure as Code

BUILD

- Develop reusable Cookbooks
- Expose tunable settings
- Test locally to reduce risk, and ensure compliance

DEPLOY

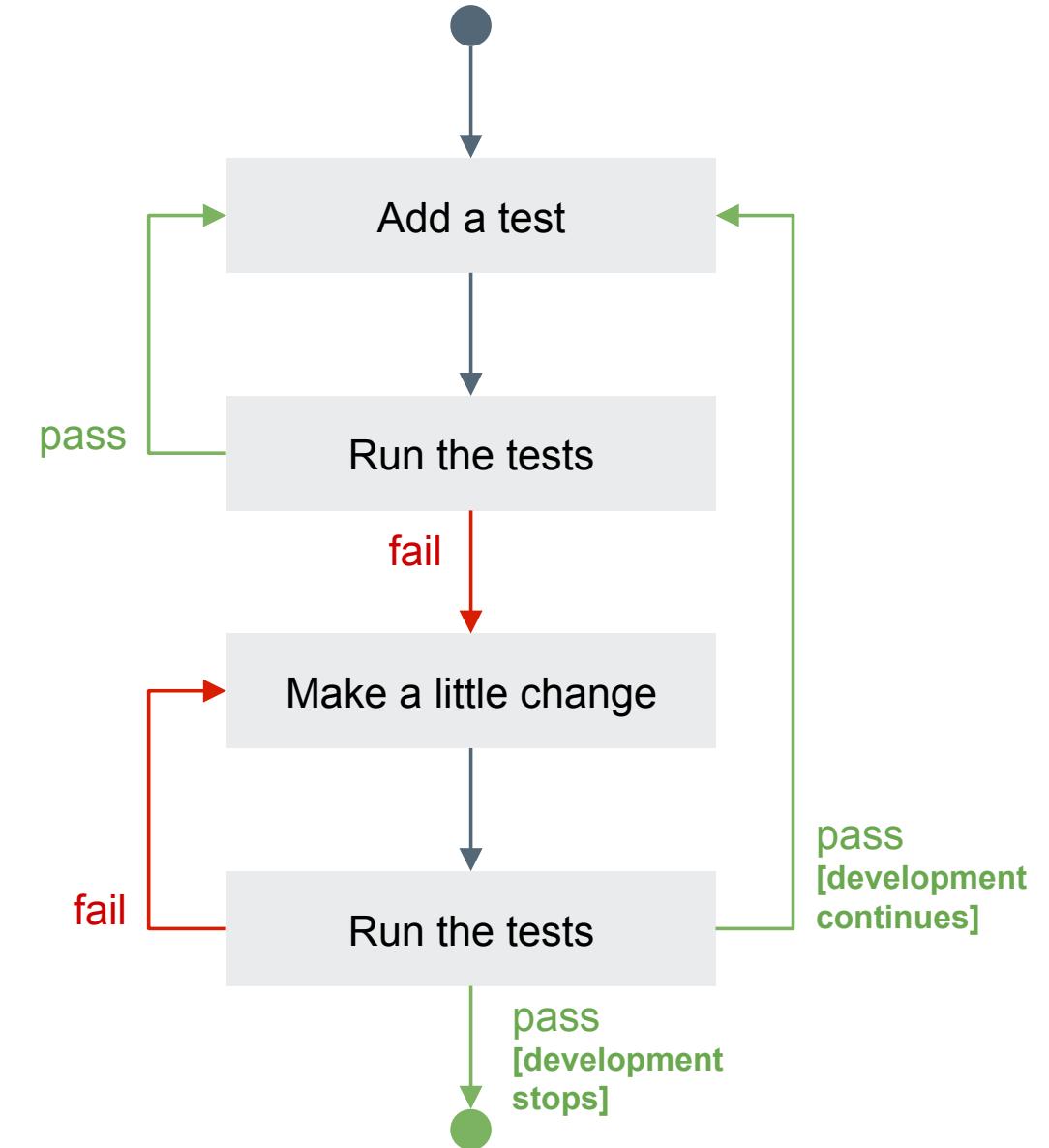
- Commit to Source Code
- Automated Testing through Continuous Integration
- Automatically promote across environments

MANAGE

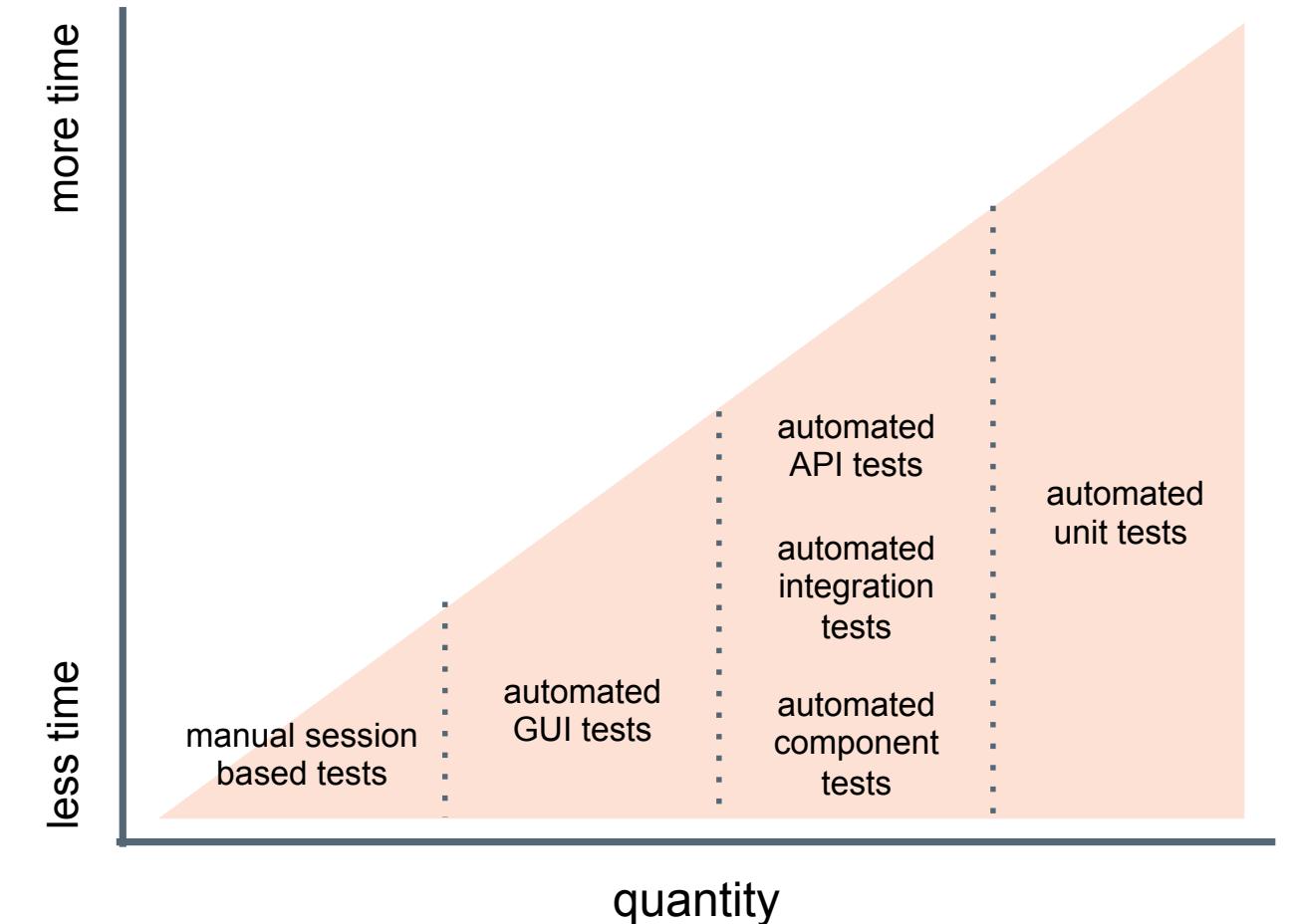
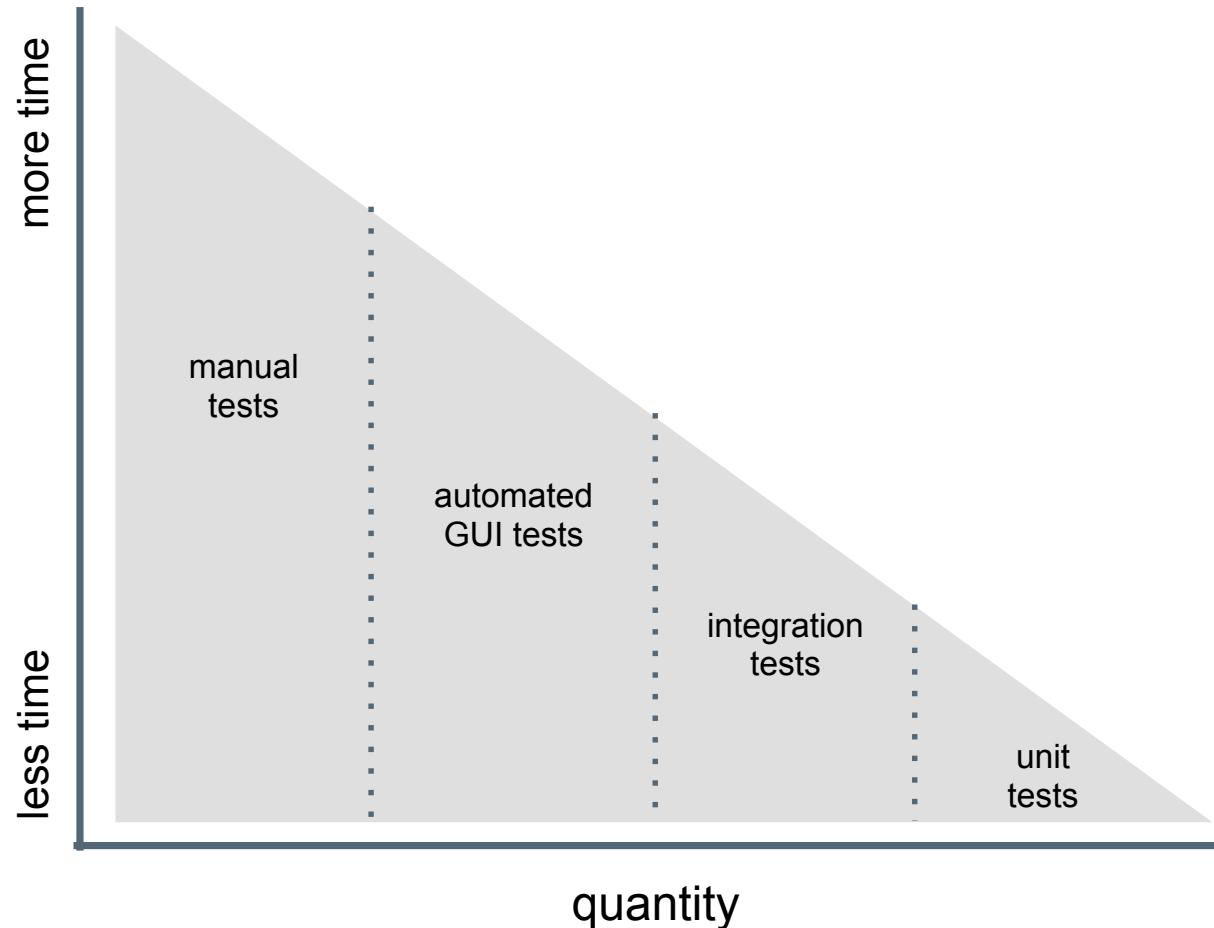
- Easily deploy new configurations in a matter of minutes.
- Continuously verify and repair misconfigured systems

Test-Driven Development

- Write a unit test, watch it fail
- Write some code
- Write and run more unit tests
- Run some integration/acceptance tests
- Code review
- Delivery pipeline to production
- Lowered chance of production failure



Software Testing and Why it Matters



Testing builds safety through feedback loops

Inexpensive experiments to provide validation

Reduces risk

Optimize Testing: Do more of the inexpensive testing first!

Remember...

Infrastructure policies need testing

- ↳ Linting
- ↳ Static Analysis
- ↳ Unit Testing
- ↳ Integration Testing
- ↳ Compliance Testing



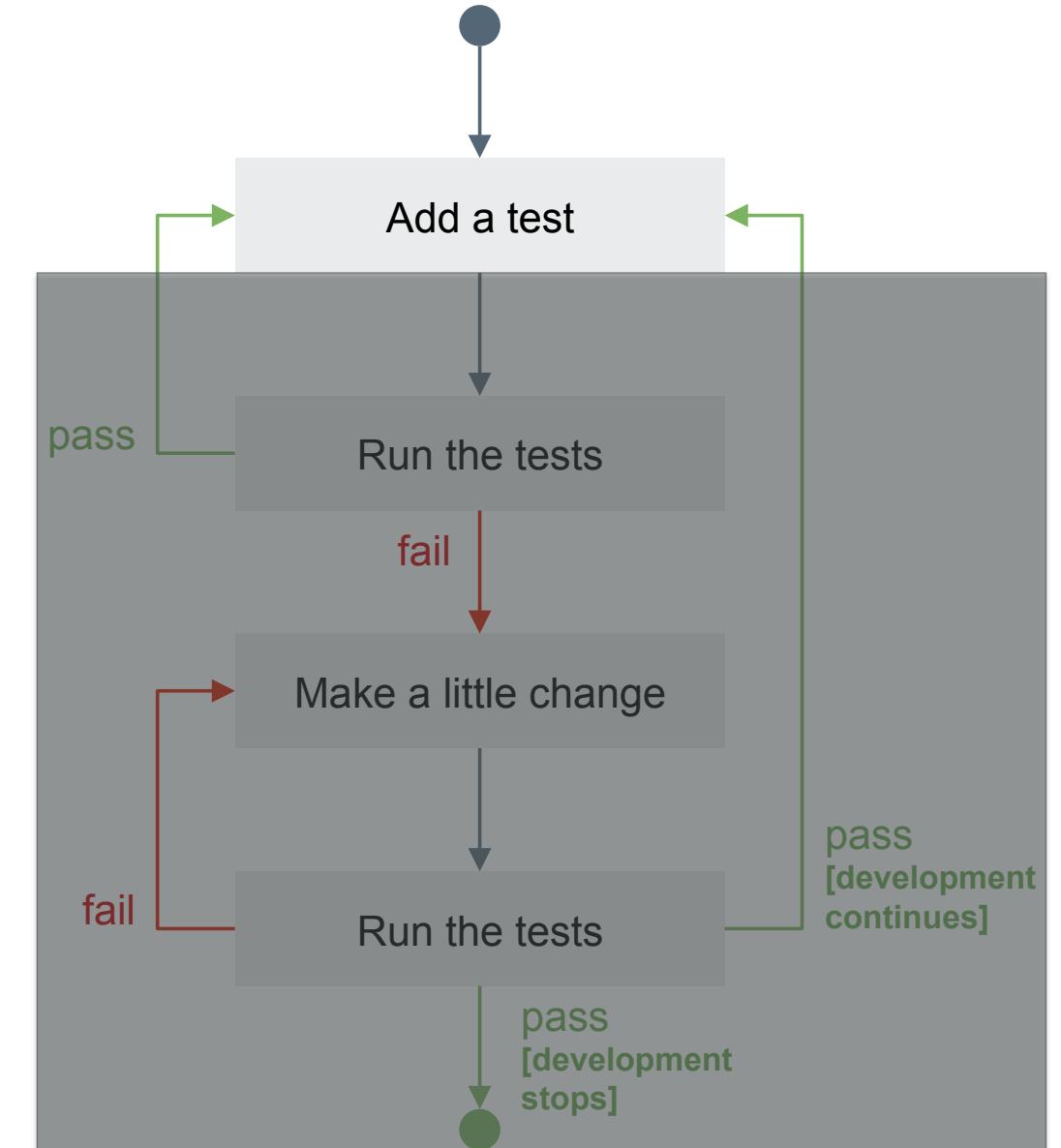
**“Infrastructure
as Code”**
should be
tested like ANY
other
codebase.

Integration Testing – Add tests

```
describe package 'httpd' do
  it { should be_installed }
end

describe service 'httpd' do
  it { should be_running }
  it { should be_enabled }
end

describe port(80) do
  it { should be_listening }
end
```



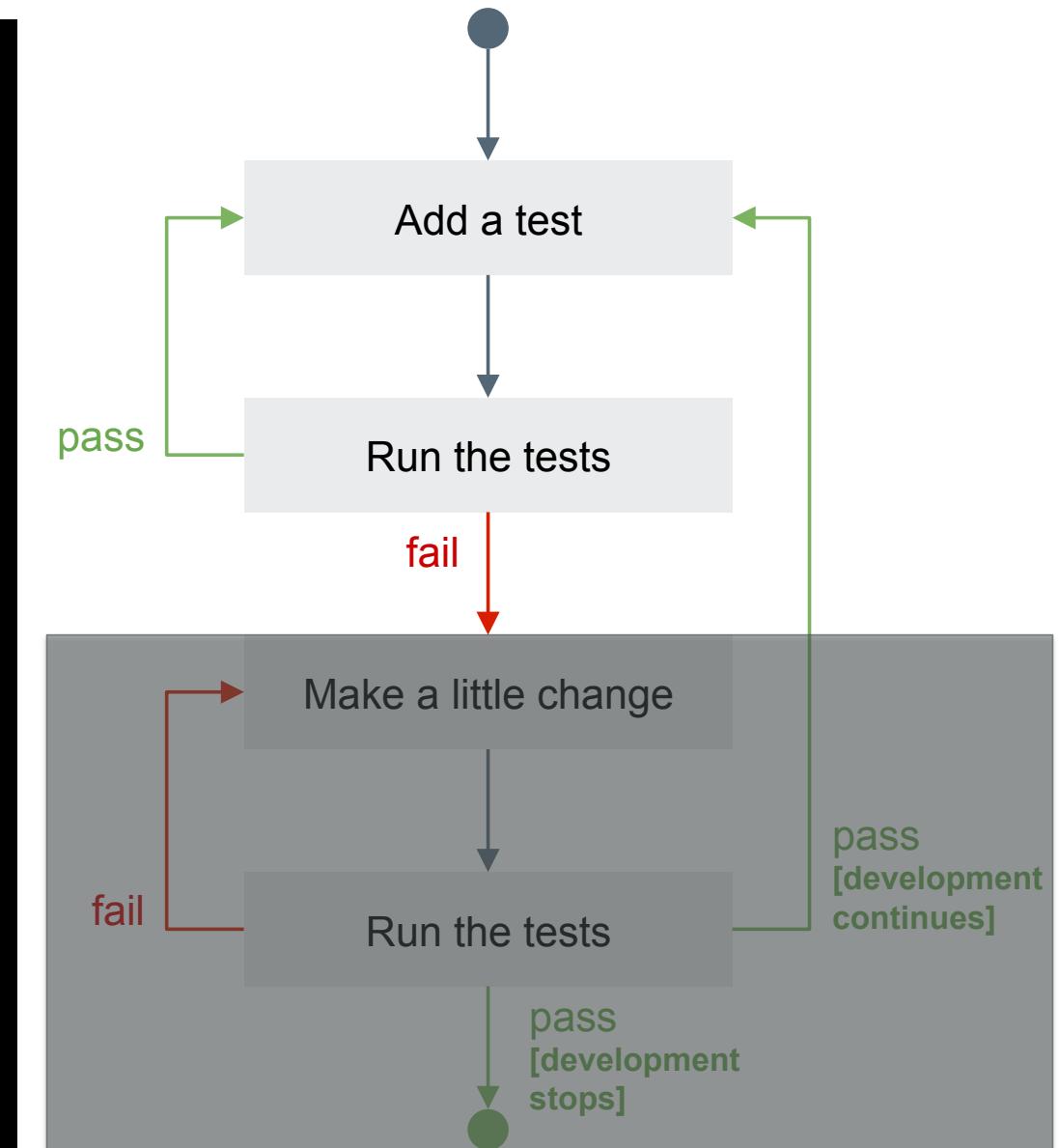
Integration Testing - Run the tests

```
-----> Verifying <default-centos-72>...
Loaded

Target: ssh://vagrant@127.0.0.1:2222

System Package
  ø httpd should be installed
    expected that `System Package httpd` is installed
Service httpd
  ø should be running
    expected that `Service httpd` is running
  ø should be enabled
    expected that `Service httpd` is enabled
Port 80
  ø should be listening
    expected `Port 80.listening?` to return true, got false

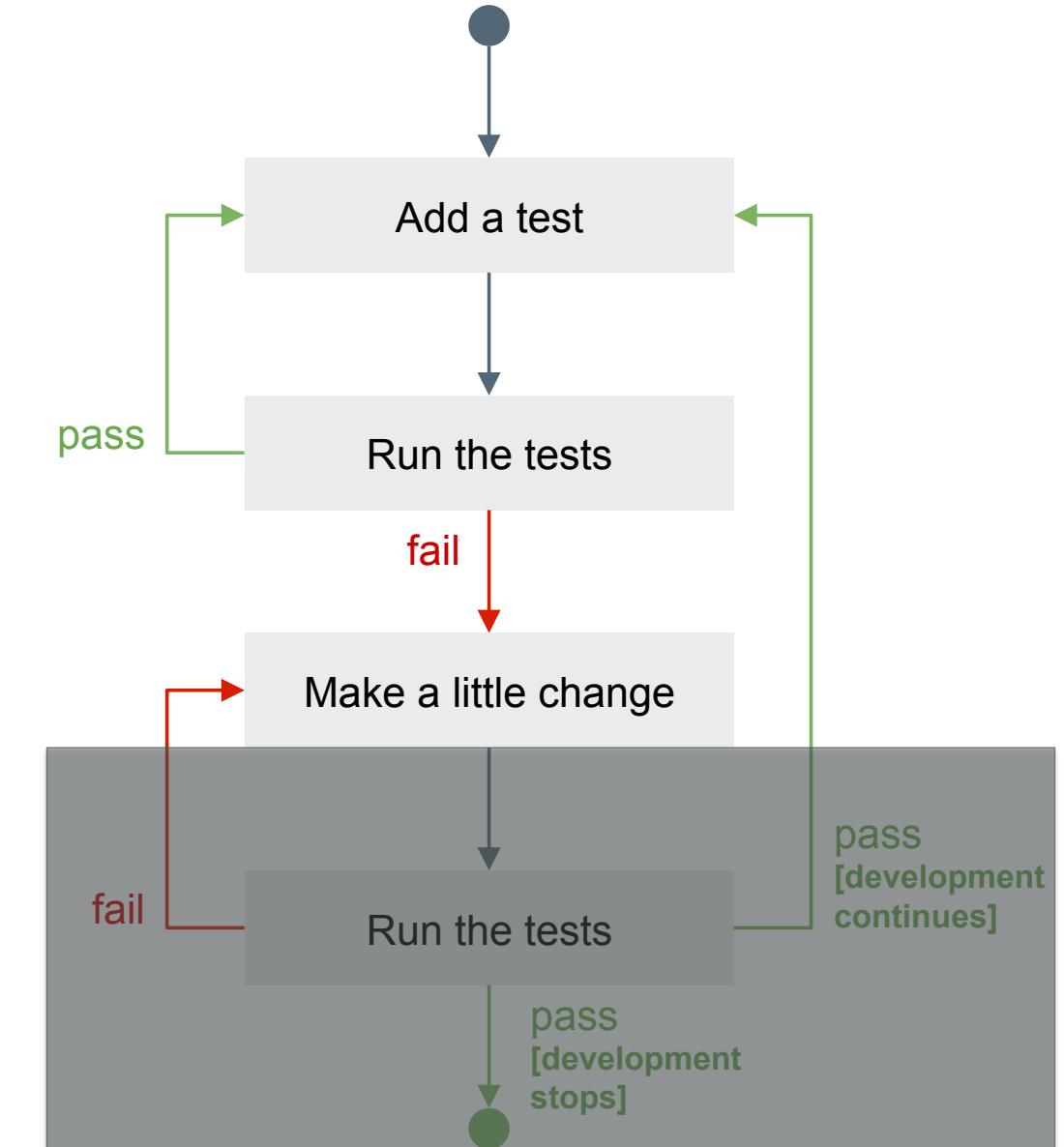
Test Summary: 0 successful, 4 failures, 0 skipped
```



Integration Testing – Make a change

```
package 'httpd' do
  action :install
end

service 'httpd' do
  action [ :start, :enable ]
end
```



Integration Testing – Apply the change

```
Synchronizing Cookbooks:
```

- httpd (0.1.0)

```
Installing Cookbook Gems:
```

```
Compiling Cookbooks...
```

```
Converging 2 resources
```

```
Recipe: httpd::default
```

- * yum_package[httpd] action install
 - install version 2.4.6-45.el7.centos of package httpd
- * service[httpd] action start
 - start service service[httpd]
- * service[httpd] action enable
 - enable service service[httpd]

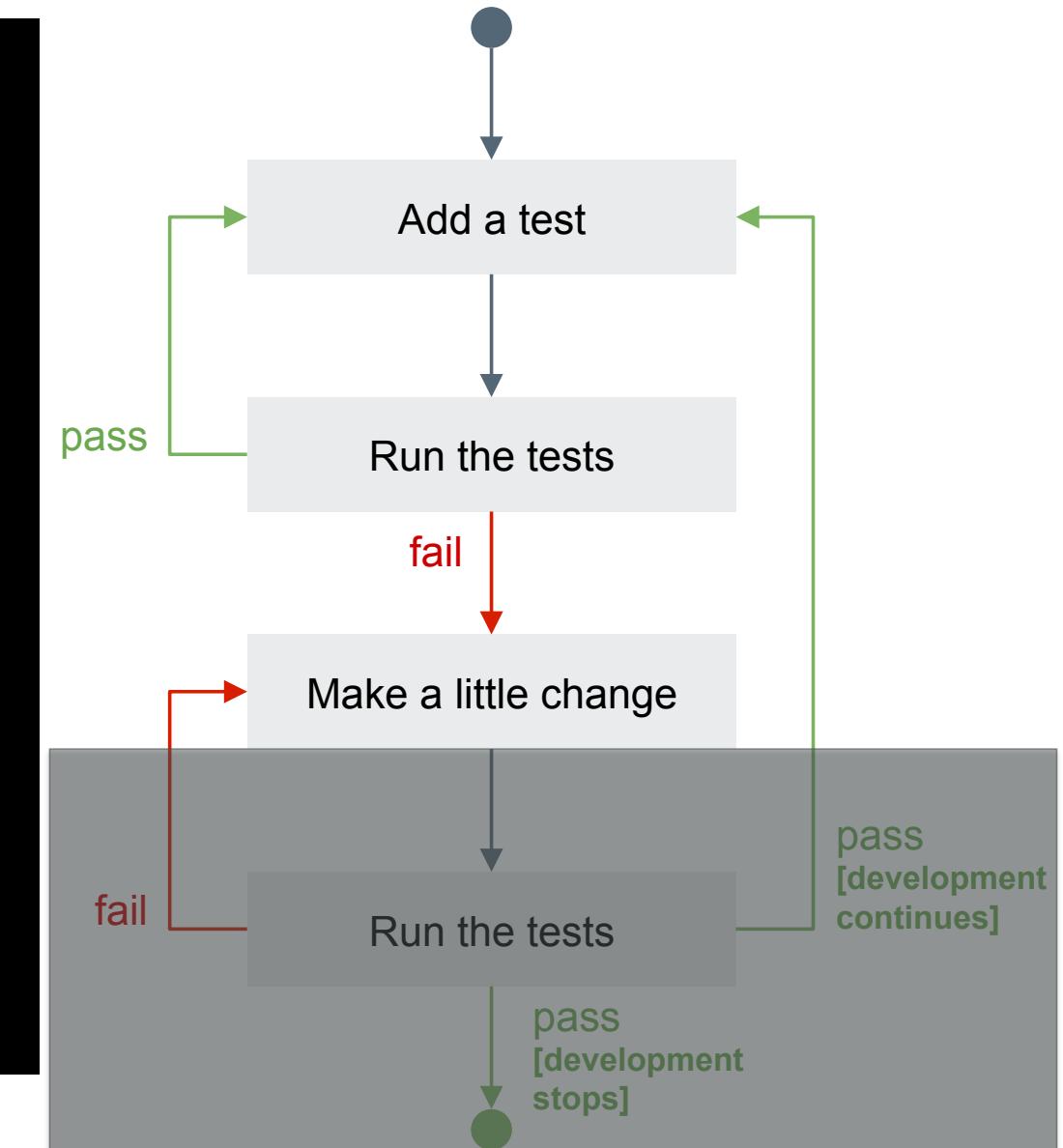
```
Running handlers:
```

```
Running handlers complete
```

```
Chef Client finished, 3/3 resources updated in 10 seconds
```

```
Finished converging <default-centos-72> (0m15.73s).
```

```
-----> Kitchen is finished. (0m18.13s)
```



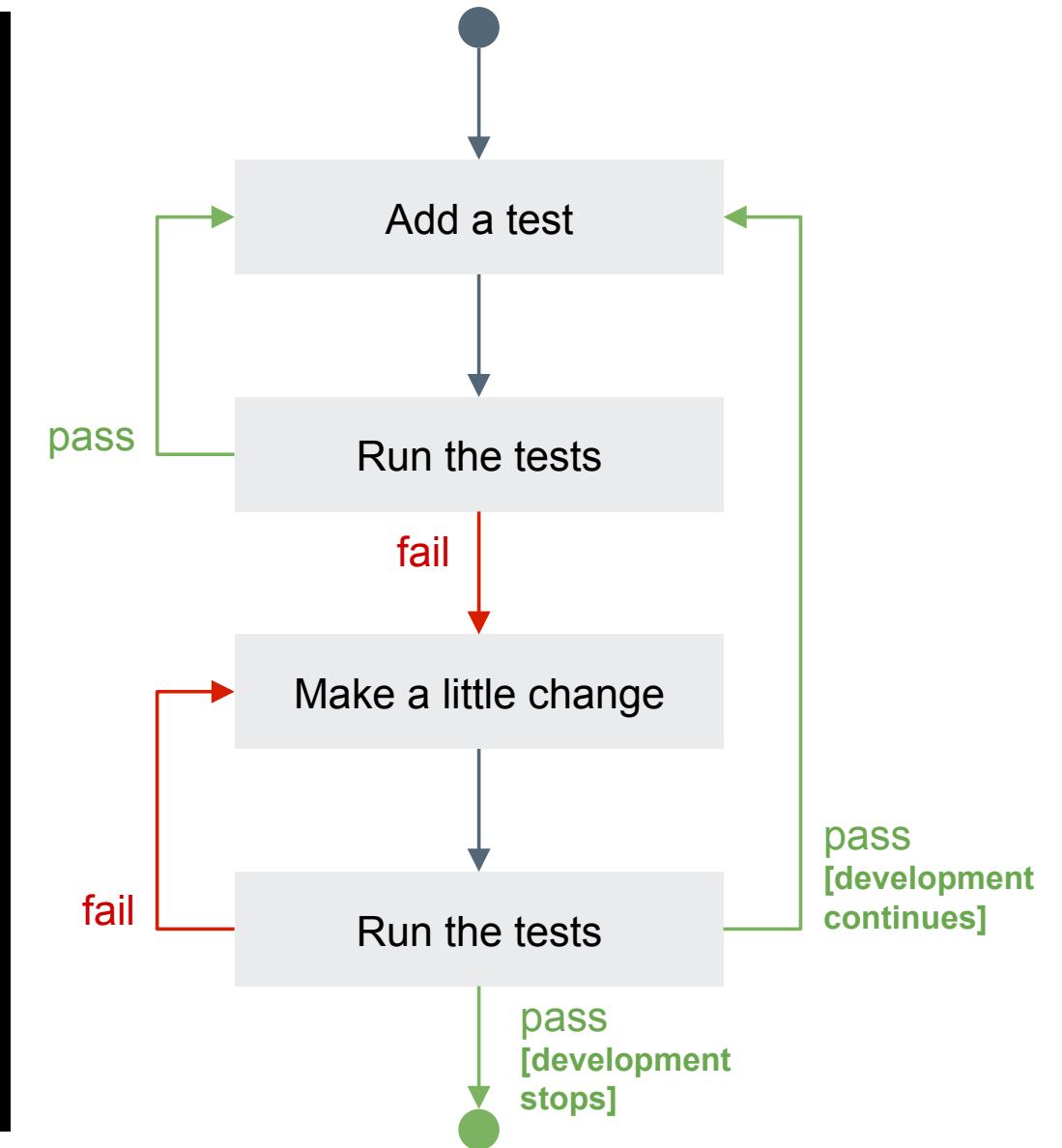
Integration Testing – Run the tests

```
-----> Verifying <default-centos-72>...
Loaded

Target: ssh://vagrant@127.0.0.1:2222

System Package
  ✓ httpd should be installed
Service httpd
  ✓ should be running
  ✓ should be enabled
Port 80
  ✓ should be listening

Test Summary: 4 successful, 0 failures, 0 skipped
Finished verifying <default-centos-72> (0m0.91s).
```



InSpec

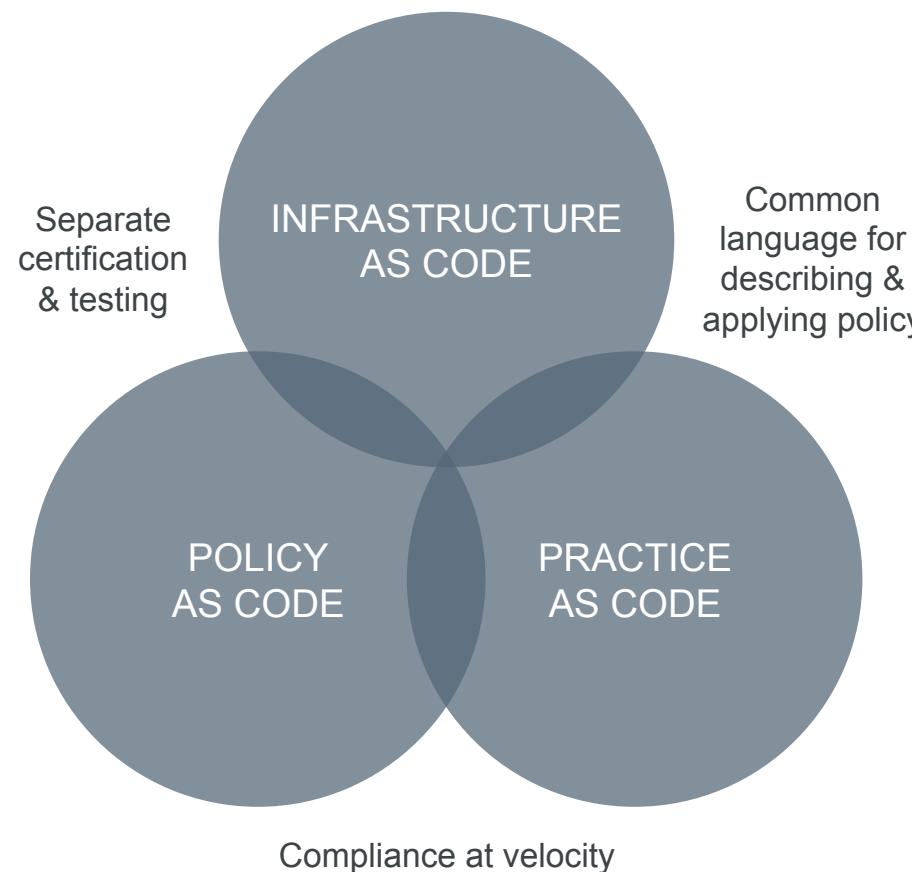
Compliance as Code



InSpec is compliance as code – a human-readable language for automating the continuous testing and compliance auditing of your entire infrastructure.

Compliance as Code

ACCELERATED CYCLE



ROLE OF THE COMPLIANCE OFFICER



One language, One workflow

SSH Control

SSH supports two different protocol versions. The original version, SSHv1, was subject to a number of security issues. Please use SSHv2 instead to avoid these.

Mapping Compliance Document to InSpec

6.2.1 Set SSH Protocol to 2 (Scored)

Profile Applicability:

- Level 1

Description:

SSH supports two different and incompatible protocols: SSH1 and SSH2. SSH1 was the original protocol and was subject to security issues. SSH2 is more advanced and secure.

Rationale:

SSH v1 suffers from insecurities that do not affect SSH v2.

Audit:

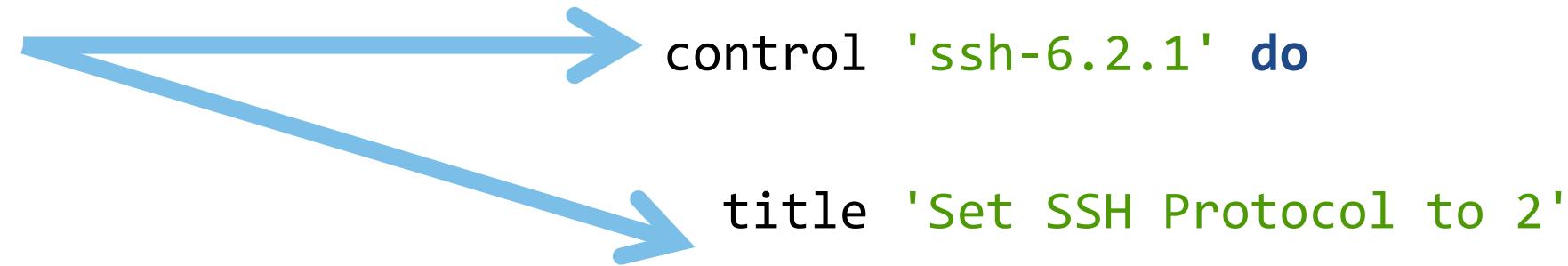
To verify the correct SSH setting, run the following command and verify that the output is as shown:

```
# grep "Protocol" /etc/ssh/sshd_config
Protocol 2
```

Remediation:

Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
Protocol 2
```



end

Mapping Compliance Document to InSpec

6.2.1 Set SSH Protocol to 2 (Scored)

Profile Applicability:

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Description:

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Audit:

To verify the correct SSH setting, run the following command and verify that the output is as shown:

```
# grep "Protocol" /etc/ssh/sshd_config
Protocol 2
```

Remediation:

Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
Protocol 2
```

```
control 'ssh-6.2.1' do
```

```
title 'Set SSH Protocol to 2'
```

```
desc "
```

```
SSH supports two different ...
```

```
"
```



```
end
```

Mapping Compliance Document to InSpec

6.2.1 Set SSH Protocol to 2 (Scored)

Profile Applicability:

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Description:

SSH supports two different and incompatible protocols: SSH1 and SSH2. SSH1 was the original protocol and was subject to security issues. SSH2 is more advanced and secure.

Rationale:

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Audit:

To verify the correct SSH setting, run the following command and verify that the output is as shown:

```
# grep '^Protocol' /etc/ssh/sshd_config
Protocol 2
```

Remediation:

Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
Protocol 2
```

```
control 'ssh-6.2.1' do
```

```
title 'Set SSH Protocol to 2'
```

```
desc "
```

```
SSH supports two different ...
```

```
"
```

```
describe sshd_config do
```

```
  its('Protocol') { should cmp('2') }
```

```
end
```

```
end
```

Mapping Compliance Document to InSpec

6.2.1 Set SSH Protocol to 2 (Scored)

Profile Applicability:

- Level 1

Description:

SSH supports two different and incompatible protocols: SSH1 and SSH2. SSH1 was the original protocol and was subject to security issues. SSH2 is more advanced and secure.

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SSH v1 suffers from insecurities that do not affect SSH v2.

Audit:

To verify the correct SSH setting, run the following command and verify that the output is as shown:

```
# grep '^Protocol' /etc/ssh/sshd_config
Protocol 2
```

Remediation:

Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
Protocol 2
```

```
control 'ssh-6.2.1' do
```

```
  impact 1.0
```

```
  title 'Set SSH Protocol to 2'
```

```
  desc "
```

SSH supports two different ...

```
"
```

```
describe sshd_config do
```

```
  its('Protocol') { should cmp('2') }
```

```
end
```

```
end
```

Differences in verifying compliance policy

DOCUMENTATION

SSH supports two different protocol versions. The original version, SSHv1, was subject to a number of security issues. Please use SSHv2 instead to avoid these.

SCRIPTING TOOLS

```
> grep "Protocol" /etc/ssh/  
sshd_config | sed 's/Protocol //'  
2
```

COMPLIANCE LANGUAGE

```
control 'ssh-1234' do  
  impact 1.0  
  title 'Server: Set protocol version to SSHv2'  
  desc "  
    Set the SSH protocol version to 2. Don't use legacy  
    insecure SSHv1 connections anymore...  
  "
```

COMPLIANCE LANGUAGE

```
describe sshd_config do  
  its('Protocol') { should eq 2 }  
end
```

InSpec

ONE LANGUAGE



Oracle Solaris 11



InSpec for Windows

```
control 'windows-base-201' do
  impact 1.0
  title 'Strong Windows NTLMv2 Authentication Enabled; Weak LM
         Disabled'
  desc '
    @link: http://support.microsoft.com/en-us/kb/823659
  '

  describe registry_key
    ('HKLM\System\CurrentControlSet\Control\Lsa') do
      it { should exist }
      its('LmCompatibilityLevel') { should eq 4 }
    end
  end
end
```

InSpec

ONE LANGUAGE



- Baremetal
- VMs
- Containers



Oracle Solaris 11



Different ways to run InSpec

Test your machine locally

```
> inspec exec test.rb
```

Test a machine remotely via SSH

```
> inspec exec test.rb -i identity.key -t ssh://root@172.17.0.1
```

Test a machine remotely via WinRM

```
> inspec exec test.rb -t winrm://Admin@192.168.1.2 --password super
```

Test Docker Container

```
> inspec exec test.rb -t docker://5cc8837bb6a8
```

No ruby/agent on the node

No ruby/agent on the node

no SSH/agent in the container

InSpec

ONE LANGUAGE



Oracle Solaris 11



- Baremetal
- VMs
- Containers
- Databases
- API endpoints
(e.g. cloud)

Database Testing

```
describe mysql_session.query("SELECT user,host FROM mysql.user WHERE host = '%'")  
do  
  its(:stdout) { should be empty }  
end
```

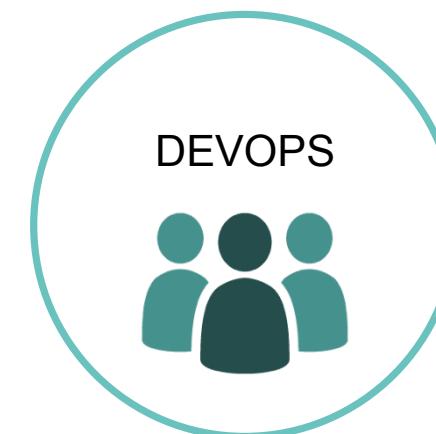
Cloud Provider Testing

```
security_groups.each do |security_group|  
  describe security_group do  
    it { should_not  
      have_inbound_rule().with_source('0.0.0.0/0')  
    }  
  end  
end
```

InSpec

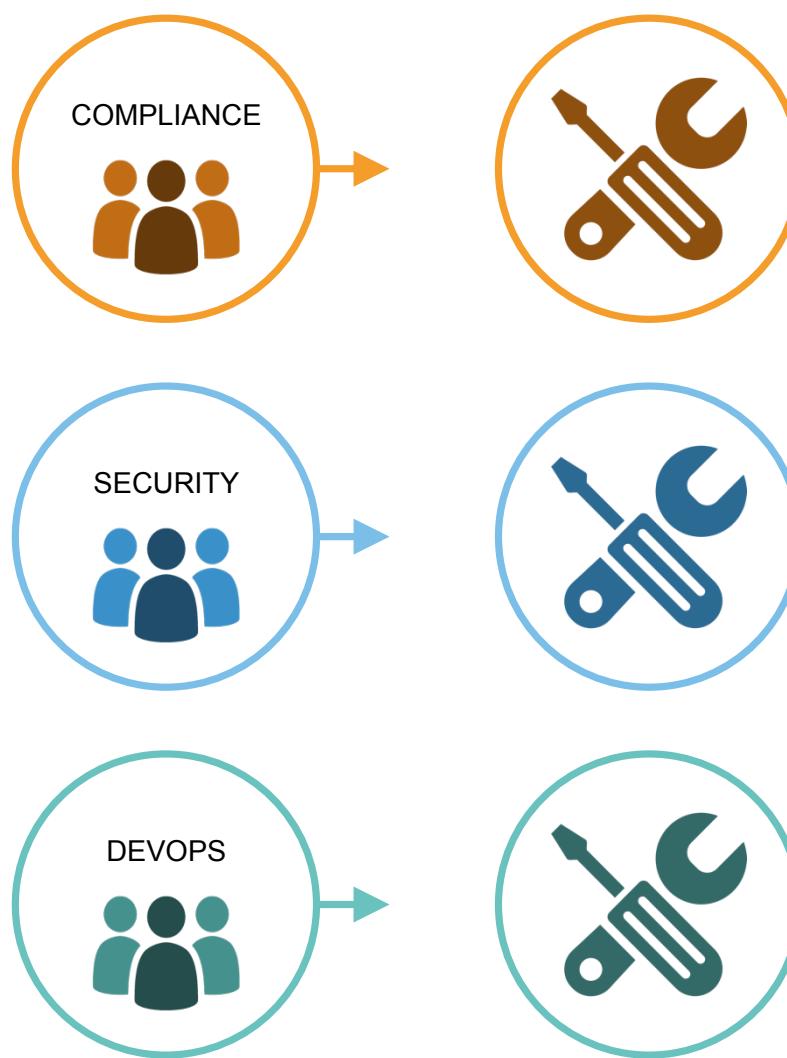
ONE WORKFLOW

Security meets operations



InSpec

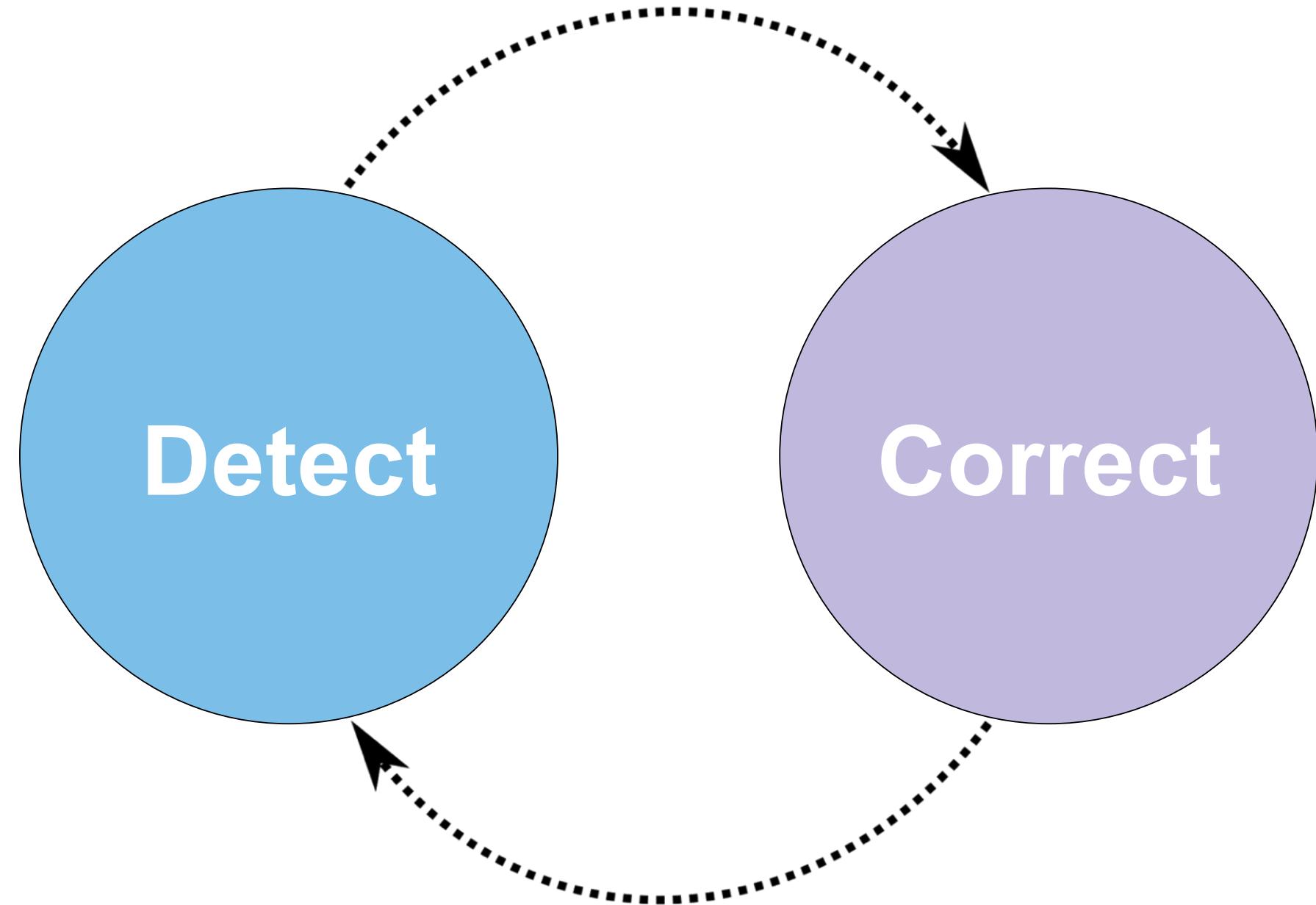
Each team uses separate tools



Unified language



Continuous Workflow



InSpec

Turn security and compliance into code

- Translate **compliance** into Code
- **Clearly** express statements of policy
- Move risk to build/test from **runtime**
- Find issues **early**
- Write code **quickly**
- Run code **anywhere**
- **Inspect** machines, data, and APIs



PART OF A PROCESS OF CONTINUOUS COMPLIANCE



A SIMPLE EXAMPLE OF AN INSPEC CIS RULE

```
control 'cis-1.4.1' do
  title '1.4.1 Enable SELinux in /etc/grub.conf'
  desc '
    Do not disable SELinux and
    enforcing in your GRUB configuration. These are important
    security features that prevent attackers from escalating their
    access to your systems. For reference see ...
  '
  impact 1.0
  expect(grub_conf.param 'selinux').to_not_eq '0'
  expect(grub_conf.param 'enforcing').to_not_eq '0'
end
```

InSpec CLI

Command Line Interface

Objectives

Create and execute a simple compliance check

LAB



Ensure SSH Protocol is set to 2

- Review the Center for Internet Security control
- Create an InSpec profile to verify the control
- Execute the InSpec profile to determine current system state

Compliance Mandate

5.2.2 Ensure SSH Protocol is set to 2 (Scored)

Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

Description:

SSH supports two different and incompatible protocols: SSH1 and SSH2. SSH1 was the original protocol and was subject to security issues. SSH2 is more advanced and secure.

Rationale:

SSH v1 suffers from insecurities that do not affect SSH v2.

Audit:

Run the following command and verify that output matches:

```
# grep "Protocol" /etc/ssh/sshd_config
Protocol 2
```

Remediation:

Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
Protocol 2
```

Run InSpec



\$ inspec

Commands:

```
inspec archive PATH          # archive a profile to tar.gz (default) or zip
inspec artifact SUBCOMMAND ... # Sign, verify and install artifacts
inspec check PATH            # verify all tests at the specified PATH
inspec compliance SUBCOMMAND ... # Chef Compliance commands
inspec detect                 # detect the target OS
inspec env                    # Output shell-appropriate completion configuration
inspec exec PATHS             # run all test files at the specified PATH.
inspec help [COMMAND]         # Describe available commands or one specific command
inspec init TEMPLATE ...      # Scaffolds a new project
inspec json PATH              # read all tests in PATH and generate a JSON summary
inspec shell                  # open an interactive debugging shell
inspec supermarket SUBCOMMAND ... # Supermarket commands
inspec vendor PATH             # Download all dependencies and generate a lockfile in a `vendor` directory
inspec version                # prints the version of this tool
```

Options:

```
l, [--log-level=LOG_LEVEL]    # Set the log level: info (default), debug, warn, error
[--log-location=LOG_LOCATION] # Location to send diagnostic log messages to. (default: STDOUT or STDERR)
[--diagnose], [--no-diagnose] # Show diagnostics (versions, configurations)
```

DISCUSSION



Questions

What version of InSpec is installed?

What type(s) of projects with inspec init generate?

Build scaffold for an ssh profile



```
$ inspec init profile ssh
```

Create new profile at /home/ec2-user/ssh

- * Create file README.md
- * Create directory controls
- * Create file controls/example.rb
- * Create file inspec.yml
- * Create directory libraries

Open the example control



/home/ec2-user/ssh/controls/example.rb

```
# encoding: utf-8
# copyright: 2015, The Authors
# license: All rights reserved

title 'sample section'

# you can also use plain tests
describe file('/tmp') do
  it { should be_directory }
end

# you add controls here
control 'tmp-1.0' do
  impact 0.7
  title 'Create /tmp directory'
  desc 'An optional description...'
  describe file('/tmp') do
    it { should be_directory }
  end
end
```

Execute the example control



```
$ inspec exec ssh
```

```
Profile: InSpec Profile (ssh)
```

```
Version: 0.1.0
```

```
Target: local://
```

- ✓ tmp-1.0: Create /tmp directory
 - ✓ File /tmp should be directory

```
File /tmp
```

- ✓ should be directory

```
Profile Summary: 1 successful, 0 failures, 0 skipped
```

```
Test Summary: 2 successful, 0 failures, 0 skipped
```

Rename the example control



```
$ mv ~/ssh/controls/example.rb ~/ssh/controls/server.rb
```

Rewrite the control

/home/ec2-user/ssh/controls/example.rb

```
# 5.2.2 Ensure SSH Protocol is set to 2
#
# grep "Protocol" /etc/ssh/sshd_config
# Protocol 2
#
describe file('/etc/ssh/sshd_config') do
  its('content') { should match /^Protocol 2/ }
end
```

Execute the control



```
$ inspec exec ssh
```

```
Profile: InSpec Profile (ssh)
Version: 0.1.0
Target: local://

File /etc/ssh/sshd_config
  ↗ content should match /^Protocol 2/
    expected "# This config file was generated by Chef\n\n# $OpenBSD: sshd_config,v 1.93 2014/01/10
05:59:19...XMODIFIERS\n\n# override default of no subsystems\nSubsystem sftp /usr/libexec.openssh/sftp-server" to match /
^Protocol 2/
  Diff:
    @@ -1,2 +1,78 @@
    -/^Protocol 2/
    +# This config file was generated by Chef
  ...
  +Subsystem sftp /usr/libexec.openssh/sftp-server

Test Summary: 0 successful, 1 failures, 0 skipped
```

DISCUSSION

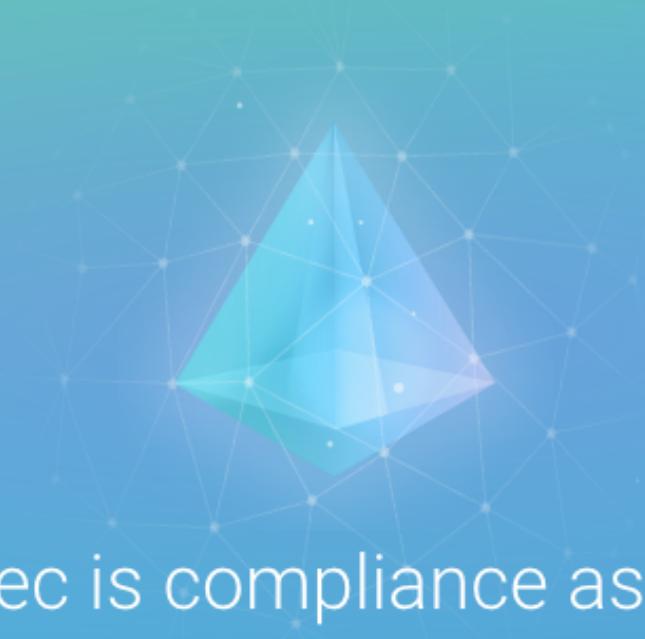


Wait a minute...

Where did its('content') come from?

What other file attributes can we write tests for?

Where does one go to find out more information about these resources?

[Tutorials](#) [Docs](#) [Community](#) [Github](#)[Try the Demo](#)[Download](#)

InSpec is compliance as code



Automated testing, codified

InSpec is an open-source testing framework for infrastructure with a human-readable language for specifying compliance, security and other policy requirements. Easily integrate automated tests that check for adherence to policy into any stage of your deployment pipeline.



Tutorials

Docs

Community



Try the Demo

Download

Search Documentation



GETTING STARTED

- [Overview](#)
- [Get InSpec](#)
- [Tutorials](#)
- [InSpec and friends](#)

REFERENCE

- [inspec execute](#)
- [Profiles](#)
- [Resources](#)
- [Matchers](#)
- [InSpec DSL](#)
- [Resource DSL](#)
- [kitchen-inspec](#)
- [inspec shell](#)
- [Ruby DSL](#)

InSpec Documentation

Welcome to the InSpec documentation! This is a reference guide for all available features and options.

In the navigation, you will see 2 sections. The first provides a few links to get started and context around InSpec. The second section contains references to all elements of InSpec: The DSL, CLI, profiles, resources, and matchers.

Are you new to InSpec?

If you're just getting started and want a quick introduction, then we recommend you start with the following items in the order listed.





GETTING STARTED

[Overview](#)
[Get InSpec](#)
[Tutorials](#)
[InSpec and friends](#)

REFERENCE

[inspec executable](#)
[Profiles](#)
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[Matchers](#)
[InSpec DSL](#)
[Resource DSL](#)
[kitchen-inspec](#)
[inspec shell](#)
[Ruby usage](#)
[Migration from Serverspec](#)

InSpec Resources Reference

The following InSpec audit resources are available:

apache_conf
apt
audit_policy
auditd_conf
auditd_rules
bash
bond
bridge
bsd_service
command
csv
directory
etc_group
etc_password
etc_shadow
file
gem
group
grub_conf
host

file

Use the `file` InSpec audit resource to test all system file types, including files, directories, symbolic links, named pipes, sockets, character devices, block devices, and doors.

Syntax

A `file` resource block declares the location of the file type to be tested, what type that file should be (if required), and then one (or more) matchers:

```
describe file('path') do
  it { should MATCHER 'value' }
end
```

where

`('path')` is the name of the file and/or the path to the file

`MATCHER` is a valid matcher for this resource

`'value'` is the value to be tested

Matchers

This InSpec audit resource has the following matchers:

be

Use the `be` matcher to use a comparison operator—`=` (equal to), `>` (greater than), `<` (less than), `>=` (greater than or equal to), and `<=` (less than or equal to)—to compare two values:

`its('value') { should be >= value }`, `its('value') { should be < value }`, and so on.

be block device

File Resource

```
describe file('path') do
  it { should MATCHER 'value' }
end
```

Use the file resource to test all system file types, including files, directories, symbolic links, named pipes, sockets, character devices, block devices, and doors.

Test if a file exists

```
describe file('/tmp') do
  it { should exist }
end
```

Test if a path is a directory

```
describe file('/tmp') do
  its('type') { should eq :directory }
  it { should be_directory }
end
```

Content Matcher

```
describe file('/etc/ssh/sshd_config') do
  its('content') { should match /^Protocol 2/ }
end
```

The content matcher tests if contents in the file match the value specified in a regular expression. The values of the content matcher are arbitrary and depend on the file type being tested and also the type of information that is expected to be in that file

LAB



Ensure SSH Protocol is set to 2

- ✓ Review the Center for Internet Security control
- ✓ Create an InSpec profile to verify the control
- ✓ Execute the InSpec profile to determine current system state

PROBLEM



There are some problems!

Location of the SSH server configuration is hard-coded
Regular expressions are difficult

LAB

Refactor our control



- Use a different resource

DISCUSSION



Which resource

Is there a better resource that we could use?
What might a refactored test look like?

Refactored Control

/home/ssh/controls/server.rb

```
describe sshd_config do
  its('Protocol') { should cmp 2 }
end
```

Resource: sshd_config

```
describe sshd_config('path') do
  its('name') { should include('foo') }
end
```

where

`name` is a configuration setting in `sshd_config`

`('path')` is the non-default /path/to/sshd_config

`{ should include('foo') }` tests the value of name as read from `sshd_config` versus the value declared in the test

Use the `sshd_config` resource to test configuration data for the OpenSSH daemon located at `/etc/ssh/sshd_config` on Linux and Unix platforms.

Execute the control



```
$ inspec exec ssh
```

```
SSH Configuration
```

```
∅ Protocol should cmp == 2
```

```
expected: 2
```

```
got:
```

```
(compared using `cmp` matcher)
```

```
Test Summary: 0 successful, 1 failures, 0 skipped
```

LAB



Refactor our control

- ✓ Use a different resource

LAB



Execute profile on a remote machine

- ❑ Execute your ssh profile against the instructor's machine

Different ways to run InSpec

Test your machine locally

```
> inspec exec test.rb
```

Test a machine remotely via SSH

```
> inspec exec test.rb -i identity.key -t ssh://root@172.17.0.1
```

Test a machine remotely via WinRM

```
> inspec exec test.rb -t winrm://Admin@192.168.1.2 --password super
```

Test Docker Container

```
> inspec exec test.rb -t docker://5cc8837bb6a8
```

No ruby/agent on the node

No ruby/agent on the node

no SSH/agent in the container

Execute the control



```
$ inspec exec ssh -t ssh://ec2-35-156-226-39.eu-central-1.compute.amazonaws.com --user=chef --password=chef
```

SSH Configuration

∅ Protocol should cmp == 2

expected: 2

got:

(compared using `cmp` matcher)

Test Summary: 0 successful, 1 failures, 0 skipped

LAB



Execute profile on a remote machine

- ✓ Execute your ssh profile against the instructor's machine

LAB



Enrich our profile

- Add additional metadata to our control

Compliance Mandate

5.2.2 Ensure SSH Protocol is set to 2 (Scored)

Profile Applicability:

- Level 1 - Server
- Level 1 - Workstation

Description:

SSH supports two different and incompatible protocols: SSH1 and SSH2. SSH1 was the original protocol and was subject to security issues. SSH2 is more advanced and secure.

Rationale:

SSH v1 suffers from insecurities that do not affect SSH v2.

Audit:

Run the following command and verify that output matches:

```
# grep "Protocol" /etc/ssh/sshd_config
Protocol 2
```

Remediation:

Edit the `/etc/ssh/sshd_config` file to set the parameter as follows:

```
Protocol 2
```

Server Control

/home/ssh/controls/server.rb

```
describe sshd_config do
  its('Protocol') { should cmp 2 }
end
```

Enriched Server Control



/home/ssh/controls/server.rb

```
control '5.2.2' do
  impact 1.0

  title 'Ensure SSH Protocol is set to 2'

  desc <<-EOF
    SSH supports two different and incompatible protocols: SSH1 and SSH2.
    SSH1 was the original protocol and was subject to security issues.
    SSH2 is more advanced and secure.

    SSH v1 suffers from insecurities that do not affect SSH v2.
  EOF

  tag 'ssh', 'sshd', 'server', 'workstation'

  ref 'SSH Protocol', url: 'https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/7/html/System_Administrators_Guide...'

  describe sshd_config do
    its('Protocol') { should cmp 2 }
  end
end
```



GETTING STARTED

[Overview](#)
[Get InSpec](#)
[Tutorials](#)
[InSpec and friends](#)

REFERENCE

[inspec executable](#)
[Profiles](#)
[Resources](#)
[Matchers](#)
[InSpec DSL](#)
[Resource DSL](#)
[kitchen-inspec](#)
[inspec shell](#)
[Ruby usage](#)
[Migration from Serverspec](#)

Additional metadata for controls

The following example illustrates various ways to add tags and references to `control`

```
control 'ssh-1' do
  impact 1.0

  title 'Allow only SSH Protocol 2'
  desc 'Only SSH protocol version 2 connections should be permitted.
        The default setting in /etc/ssh/sshd_config is correct, and can be
        verified by ensuring that the following line appears: Protocol 2'

  tag 'production','development'
  tag 'ssh','sshd','openssh-server'

  tag cce: 'CCE-27072-8'
  tag disa: 'RHEL-06-000227'

  tag remediation: 'stig_rhel6/recipes/sshd-config.rb'
  tag remediation: 'https://supermarket.chef.io/cookbooks/ssh-hardening'

  ref 'NSA-RH6-STIG - Section 3.5.2.1', url: 'https://www.nsa.gov/ia/_files/os/re
  ref 'http://people.redhat.com/swells/scap-security-guide/RHEL/6/output/ssg-cent

  describe ssh_config do
    its ('Protocol') { should eq '2'}
  end
end
```

Compliance Profile Severity Mapping

The table below shows the current mapping of Compliance Profile **impact** numbering to severity.

```
Set the SSH protocol version to 2. Don't use legacy insecure S
control 'ssh-4' do
  impact 1.0
  title 'Client: Set SSH protocol version to 2'
  desc "
    Set the SSH protocol version to 2. Don't use legacy
    insecure SSHv1 connections anymore.
  "
  describe ssh_config do
    its('Protocol') { should eq('2') }
  end
end
```

Impact Numbering	Severity Designation
0.7 - 1.0	Critical Issues
0.4 - <0.7	Major Issues
0 - <0.4	Minor Issues

Critical Issues	■
Critical Issues	■
Critical Issues	■
Major Issues	■
Major Issues	■
Major Issues	■
Minor Issues	■
Minor Issues	■

<https://nvd.nist.gov/cvss.cfm>

Execute the control



```
$ inspec exec ssh
```

```
x 5.2.2: Ensure SSH Protocol is set to 2 (
  expected: 2
    got:

  (compared using `cmp` matcher)
)
x SSH Configuration Protocol should cmp == 2

  expected: 2
    got:

  (compared using `cmp` matcher)
```

LAB



Enrich our profile

- ✓ Add additional metadata to our control

Objectives

- ✓ Execute an InSpec test on a local machine
- ✓ Execute an InSpec test on a remote machine
- ✓ Generate an InSpec profile

Add InSpec-based integration test to a Chef cookbook

Run InSpec-based integrations tests during Chef cookbook development

List additional resources and places to look for support with InSpec

InSpec for Integration Testing

LAB



Simple Web Server Cookbook

- The Apache web server should be running
- The Apache web server should be listening on the default port
- The Apache web server should be configured to start on boot

Create a directory for cookbooks



```
$ mkdir -p ~/cookbooks
```

Move into the directory for cookbooks



```
$ cd ~/cookbooks
```

Generate an apache cookbook



```
$ chef generate cookbook apache
```

```
Generating cookbook apache
- Ensuring correct cookbook file content
- Committing cookbook files to git
- Ensuring delivery configuration
- Ensuring correct delivery build cookbook content
- Adding delivery configuration to feature branch
- Adding build cookbook to feature branch
- Merging delivery content feature branch to master
```

Your cookbook is ready. Type `cd apache` to enter it.

There are several commands you can run to get started locally developing and testing your cookbook.
Type `delivery local --help` to see a full list.

Why not start by writing a test? Tests for the default recipe are stored at:

test/smoke/default/default_test.rb

If you'd prefer to dive right in, the default recipe can be found at:

recipes/default.rb

Move into the apache cookbook's directory



```
$ cd ~/cookbooks/apache
```

```
Generating cookbook apache
- Ensuring correct cookbook file content
- Committing cookbook files to git
- Ensuring delivery configuration
- Ensuring correct delivery build cookbook content
- Adding delivery configuration to feature branch
- Adding build cookbook to feature branch
- Merging delivery content feature branch to master
```

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If you'd prefer to dive right in, the default recipe can be found at:

recipes/default.rb

Remember...

Infrastructure policies need testing

- ↳ Linting
- ↳ Static Analysis
- ↳ Unit Testing
- ↳ Integration Testing
- ↳ Compliance Testing



**“Infrastructure
as Code”**
should be
tested like ANY
other
codebase.

Remember...

Infrastructure policies need testing

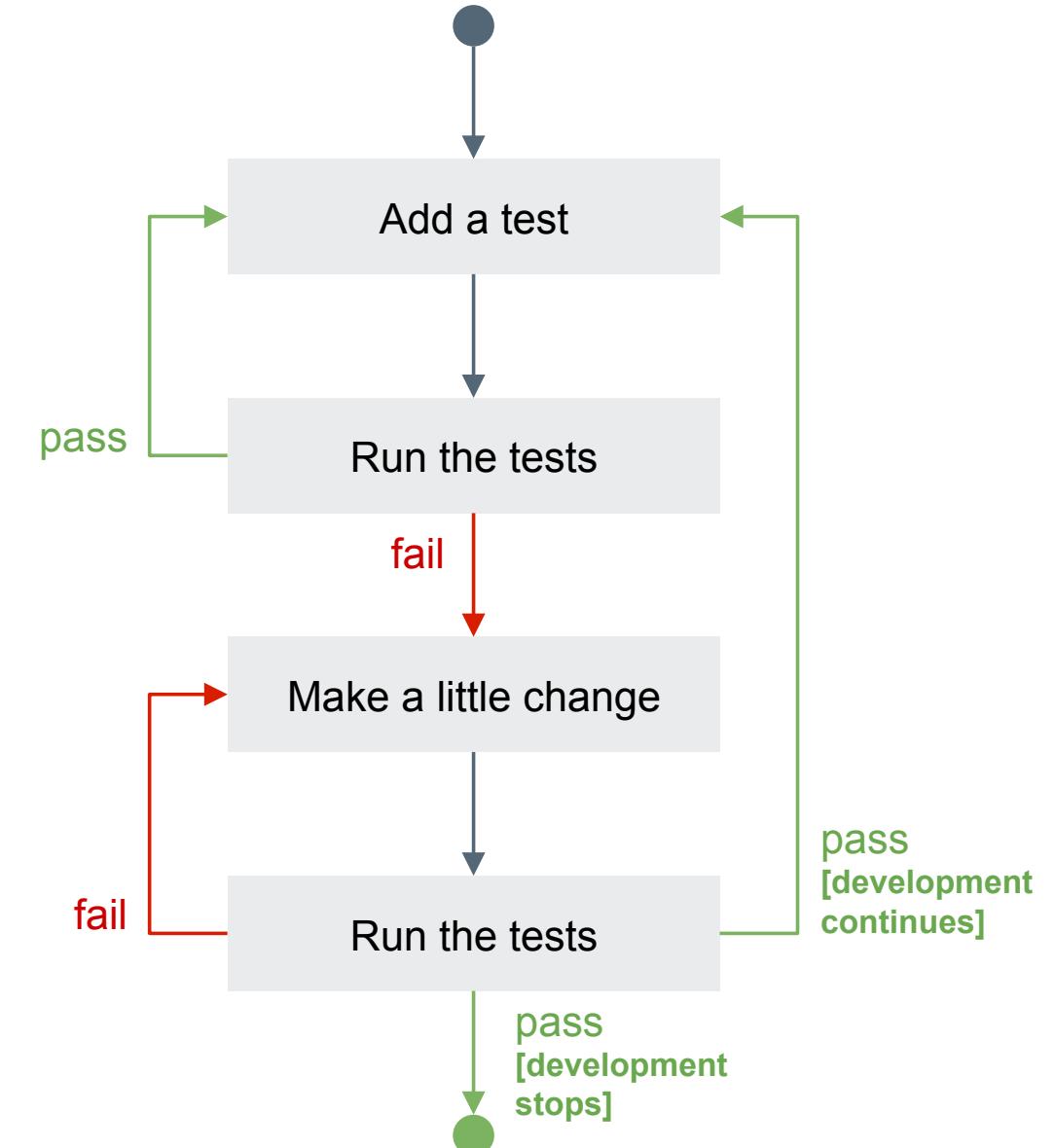
- ↳ Linting
- ↳ Static Analysis
- ↳ Unit Testing
- ↳ Integration Testing
- ↳ Compliance Testing



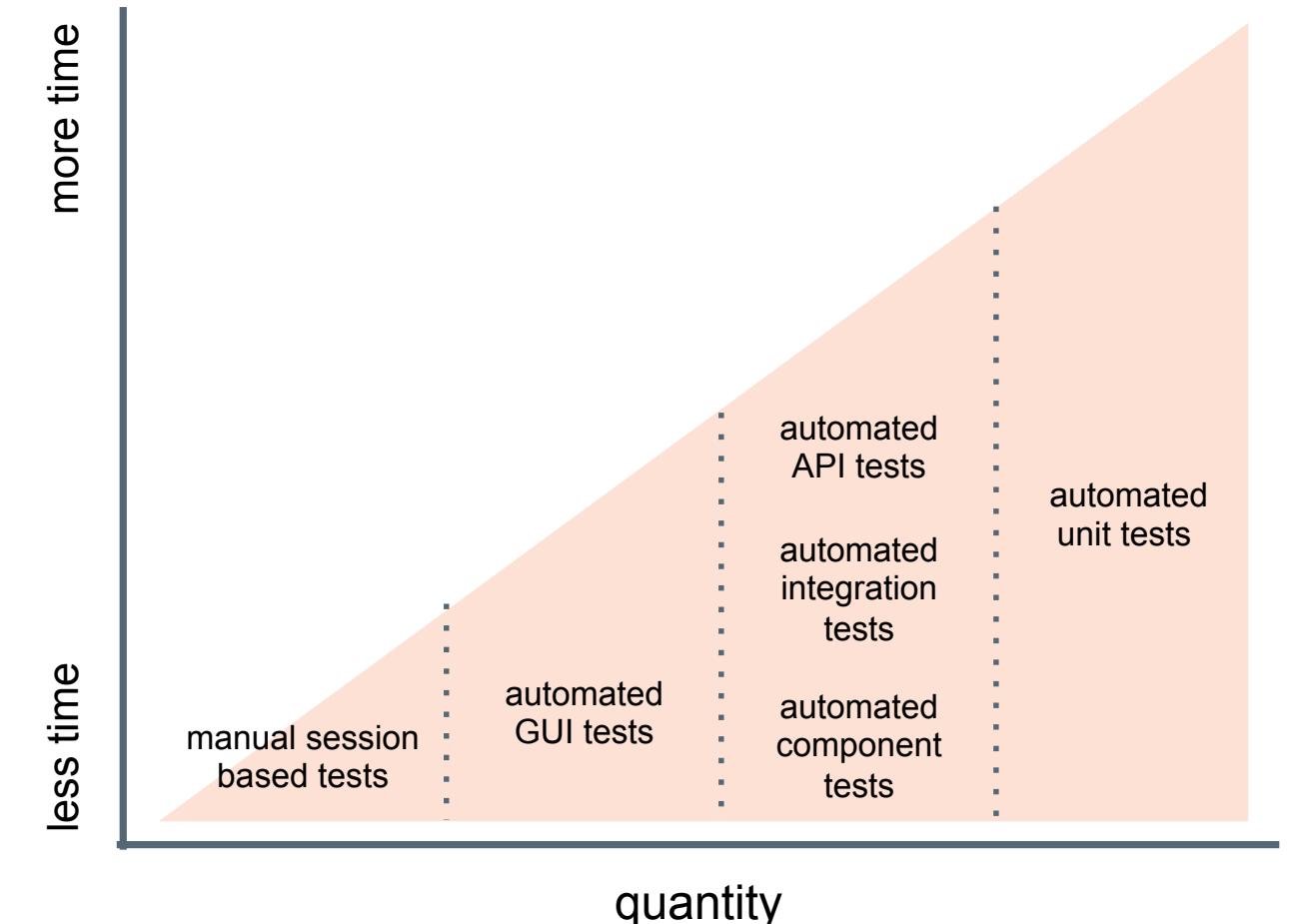
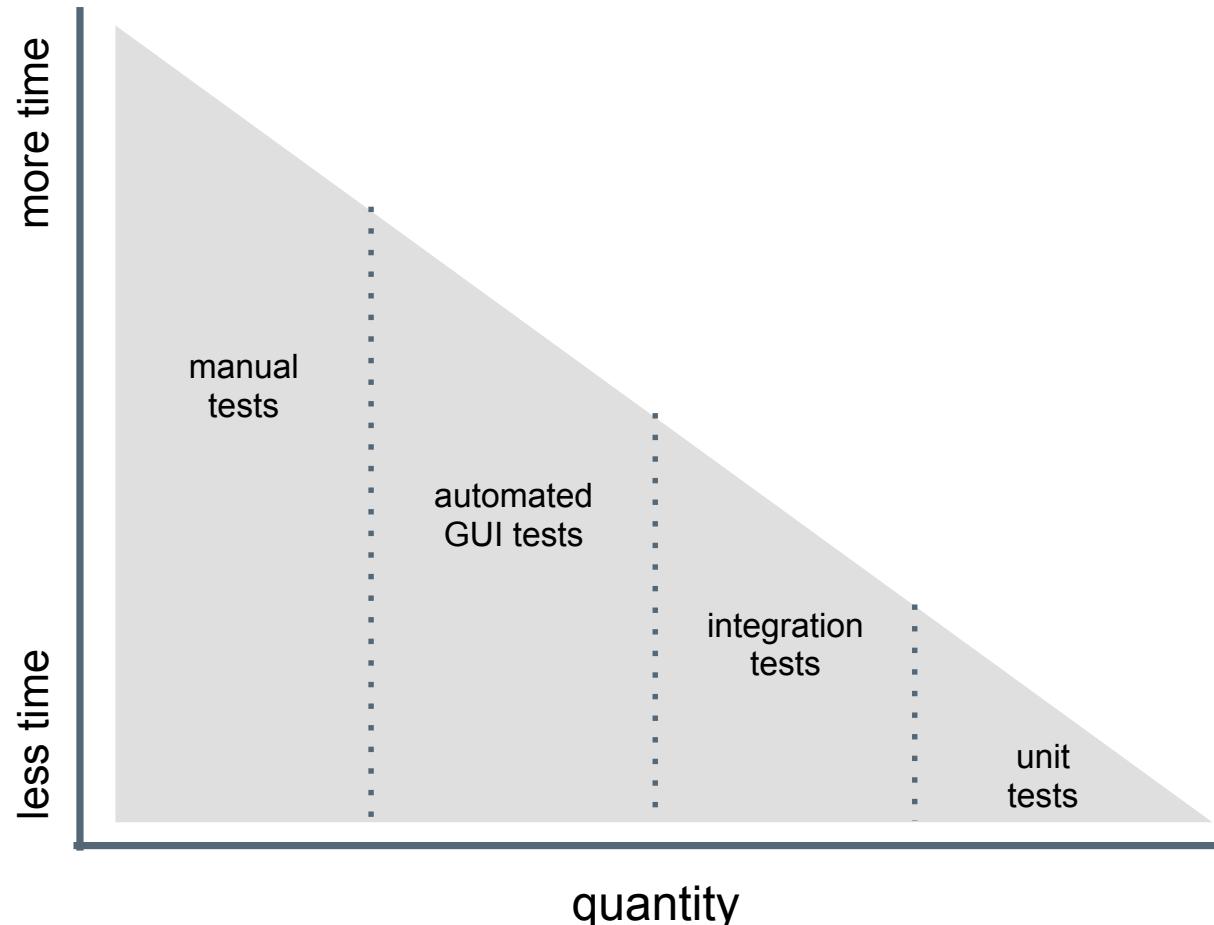
**“Infrastructure
as Code”**
should be
tested like ANY
other
codebase.

Test-Driven Development

- Write a test, watch it fail
- Write some code
- Write and run more tests
- Code review
- Delivery pipeline to production
- Lowered chance of production failure



Software Testing and Why it Matters



Testing builds safety through feedback loops

Inexpensive experiments to provide validation

Reduces risk

Optimize Testing: Do more of the inexpensive testing first!

What can delivery local do?



```
$ delivery local --help
```

delivery-local

Run Delivery phases on your local workstation.

USAGE:

```
  delivery local [FLAGS] <phase>
```

FLAGS:

-h, --help	Prints help information
--no-spinner	Disable the spinner
--non-interactive	Disable cli interactions
-v, --version	Prints version information

ARGS:

```
  <phase>    Delivery phase to execute [values: unit, lint, syntax, provision, deploy, smoke, cleanup]
```

Test Kitchen

kitchen list
kitchen create
kitchen converge
kitchen verify
kitchen destroy
kitchen test
kitchen login

Delivery

[No matching delivery command]

delivery local provision
delivery local deploy
delivery local smoke
delivery local cleanup

[No matching delivery command]

[No matching delivery command]

~/cookbooks/apache/.delivery/project.toml

Update the Kitchen Configuration

```
~/cookbooks/apache/.kitchen.yml
```

```
---
```

```
driver:
```

```
  name: vagrant
```

```
  name: docker
```

```
  use_sudo: false
```

Update the Kitchen Configuration

```
└── ~/cookbooks/apache/.kitchen.yml
```

```
platforms:  
  - name: ubuntu-16.04  
  - name: centos-7.2  
  - name: centos-6.8
```

Final .kitchen.yml

~/cookbooks/apache/.kitchen.yml

```
---
driver:
  name: docker
  use_sudo: false

provisioner:
  name: chef_zero
  # You may wish to disable always updating cookbooks in CI or other testing environments.
  # For example:
  #   always_update_cookbooks: <%= !ENV['CI'] %>
  always_update_cookbooks: true

verifier:
  name: inspec

platforms:
  - name: centos-6.8

suites:
  - name: default
    run_list:
      - recipe[apache::default]
    verifier:
      inspec_tests:
        - test/smoke/default
    attributes:
```

List Kitchen Instances



```
$ kitchen list
```

Instance	Driver	Provisioner	Verifier	Transport	Last Action	Last Error
default-centos-68	Docker	ChefZero	Inspec	Ssh	<Not Created>	<None>

Run the integration tests



```
$ delivery local smoke
```

```
Chef Delivery
Running Smoke Phase
----> Starting Kitchen (v1.14.2)
----> Creating <default-centos-68>...
      Sending build context to Docker daemon 193.5 kB
      Step 1 : FROM centos:centos7
      ...
----> Verifying <default-centos-68>...
      Loaded

Target: ssh://kitchen@localhost:32768

User root
  ✓ should exist
  ⚡ This is an example test, replace with your own test.

Port 80
  ✓ should not be listening
  ⚡ This is an example test, replace with your own test.

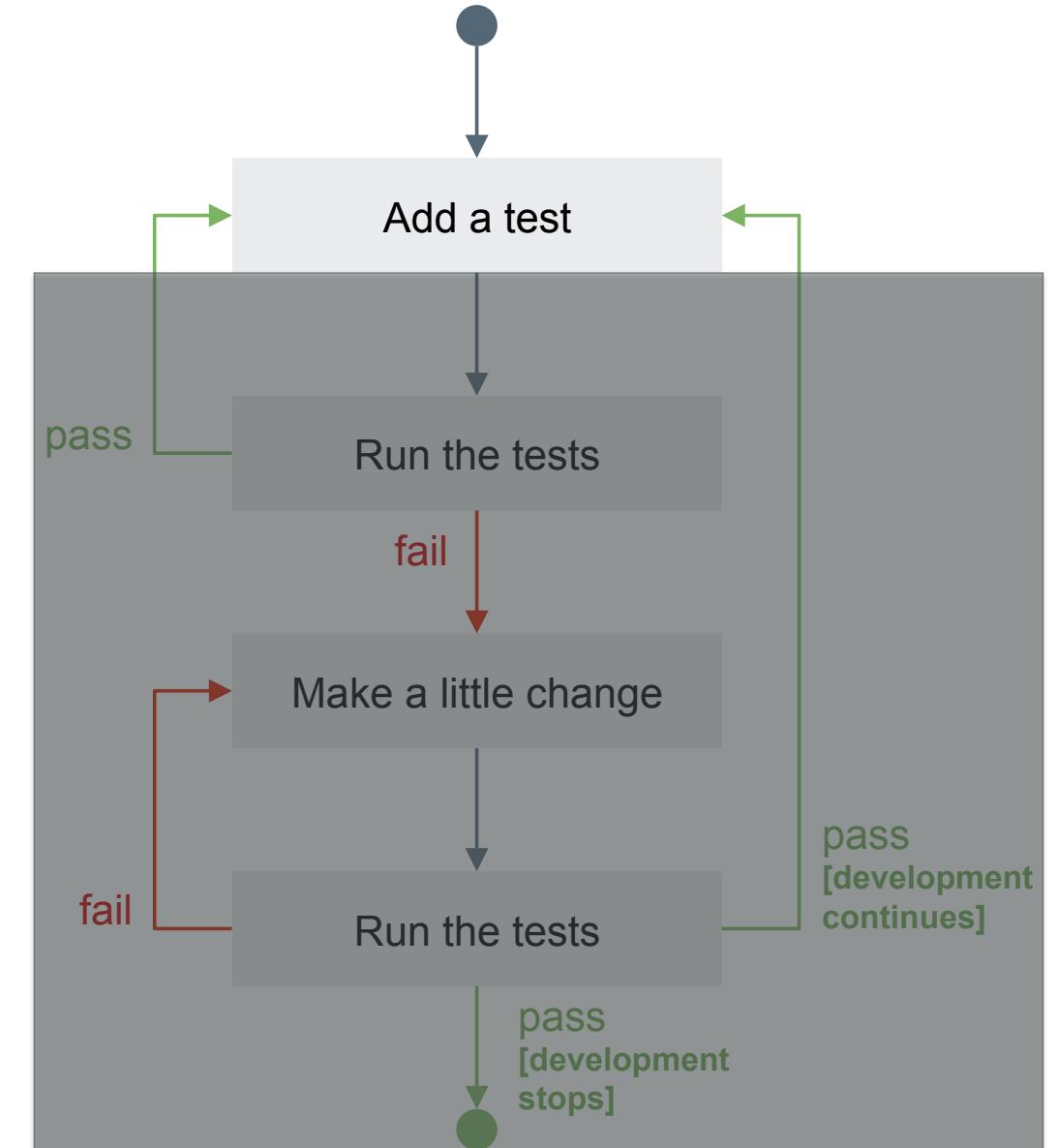
Test Summary: 2 successful, 0 failures, 2 skipped
  Finished verifying <default-centos-68> (0m0.45s).
----> Kitchen is finished. (1m4.44s)
```

Integration Testing – Add tests

```
describe package 'httpd' do
  it { should be_installed }
end

describe service 'httpd' do
  it { should be_running }
  it { should be_enabled }
end

describe port(80) do
  it { should be_listening }
end
```



Resource: package

```
describe package('name') do
  it { should be_installed }
end
```

where

('name') must specify the name of a package, such as 'nginx'
be_installed is a valid matcher for this resource

Use the package resource to test if the named package and/or package version is installed on the system.

Resource: service

```
describe service('service_name') do
  it { should be_installed }
  it { should be_enabled }
  it { should be_running }
end
```

Use the service resource to test if the named service is installed, running and/or enabled.

Resource: port

```
describe port(514) do
  it { should be_listening }
end
```

Use the port InSpec audit resource to test basic port properties, such as port, process, if it's listening.

Run the Integration Test



```
$ delivery local smoke
```

```
System Package
```

```
  Ø httpd should be installed
```

```
    expected that `System Package httpd` is installed
```

```
Service httpd
```

```
  Ø should be running
```

```
    expected that `Service httpd` is running
```

```
  Ø should be enabled
```

```
    expected that `Service httpd` is enabled
```

```
Port 80
```

```
  Ø should be listening
```

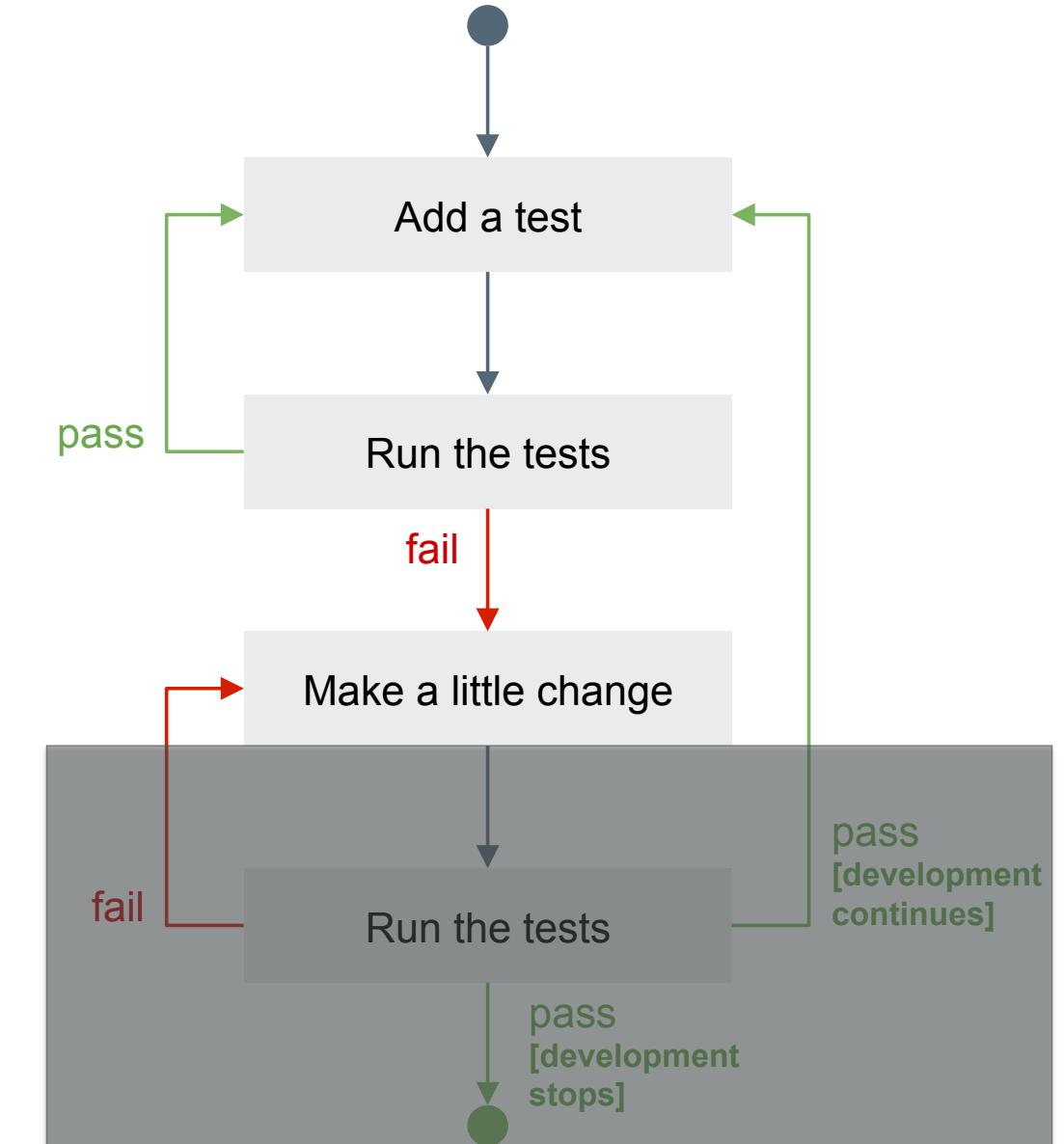
```
    expected `Port 80.listening?` to return true, got false
```

```
Test Summary: 0 successful, 4 failures, 0 skipped
```

Integration Testing – Make a change

```
package 'httpd' do
  action :install
end

service 'httpd' do
  action [ :start, :enable ]
end
```



Apply the change



```
$ delivery local deploy
```

```
Chef Delivery
Running Deploy Phase
----> Starting Kitchen (v1.14.2)
----> Converging <default-centos-68>...
    Preparing files for transfer
    Preparing dna.json
    Resolving cookbook dependencies with Berkshelf 5.2.0...
...
Recipe: apache::default
  * yum_package[httpd] action install
    - install version 2.2.15-56.el6.centos.3 of package httpd
  * service[httpd] action start
    - start service service[httpd]
  * service[httpd] action enable
    - enable service service[httpd]

Running handlers:
Running handlers complete
Chef Client finished, 3/3 resources updated in 06 seconds
Finished converging <default-centos-68> (0m11.54s).
----> Kitchen is finished. (0m12.42s)
```

Run the Integration Test



```
$ delivery local smoke
```

```
System Package
```

- ✓ httpd should be installed

```
Service httpd
```

- ✓ should be running
- ✓ should be enabled

```
Port 80
```

- ✓ should be listening

```
Test Summary: 4 successful, 0 failures, 0 skipped
```

```
Finished verifying <default-centos-68> (0m0.58s).
```

```
-----> Kitchen is finished. (0m1.46s)
```

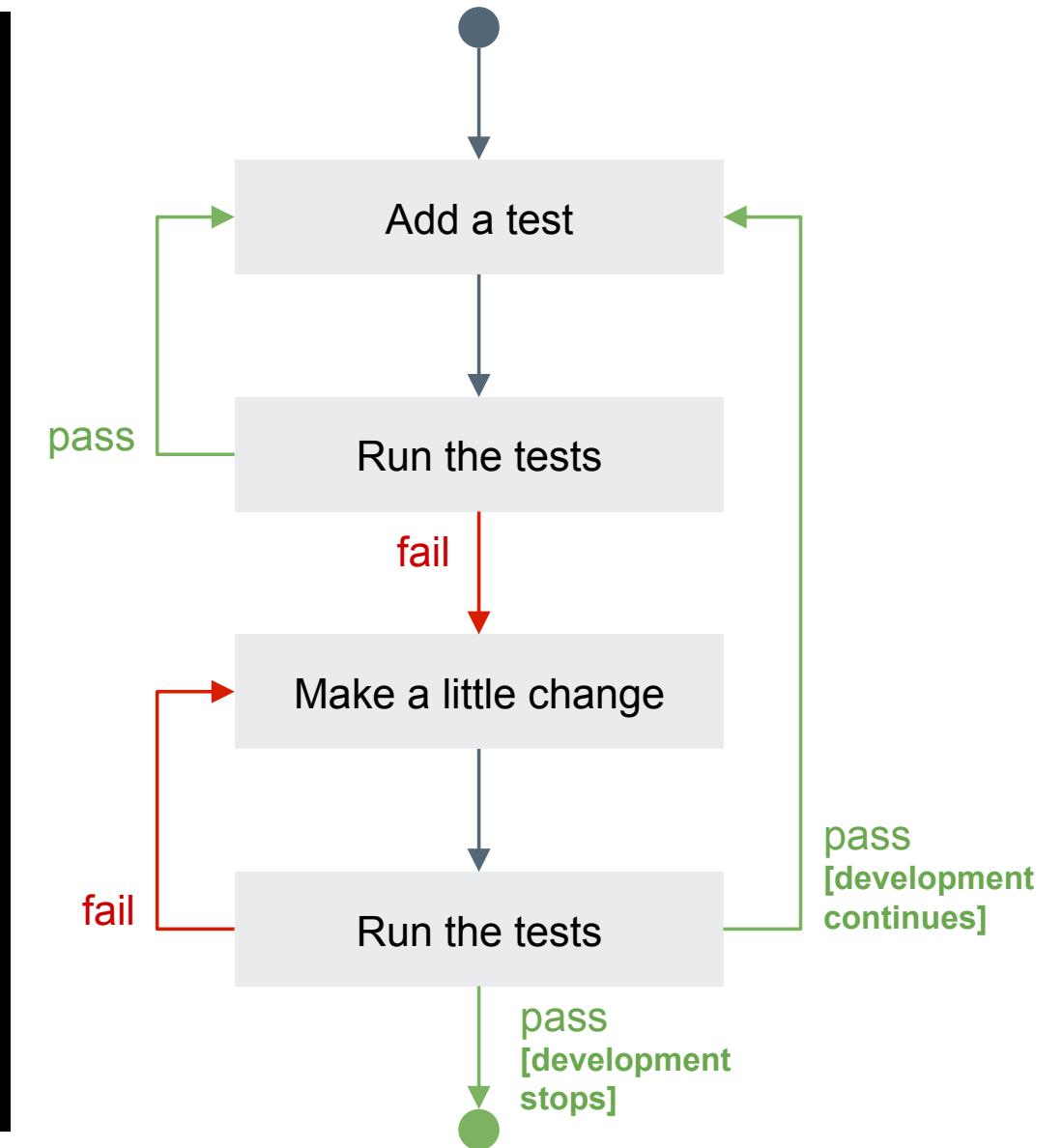
Integration Testing – Run the tests

```
-----> Verifying <default-centos-72>...
Loaded

Target: ssh://vagrant@127.0.0.1:2222

System Package
  ✓ httpd should be installed
Service httpd
  ✓ should be running
  ✓ should be enabled
Port 80
  ✓ should be listening

Test Summary: 4 successful, 0 failures, 0 skipped
Finished verifying <default-centos-72> (0m0.91s).
```



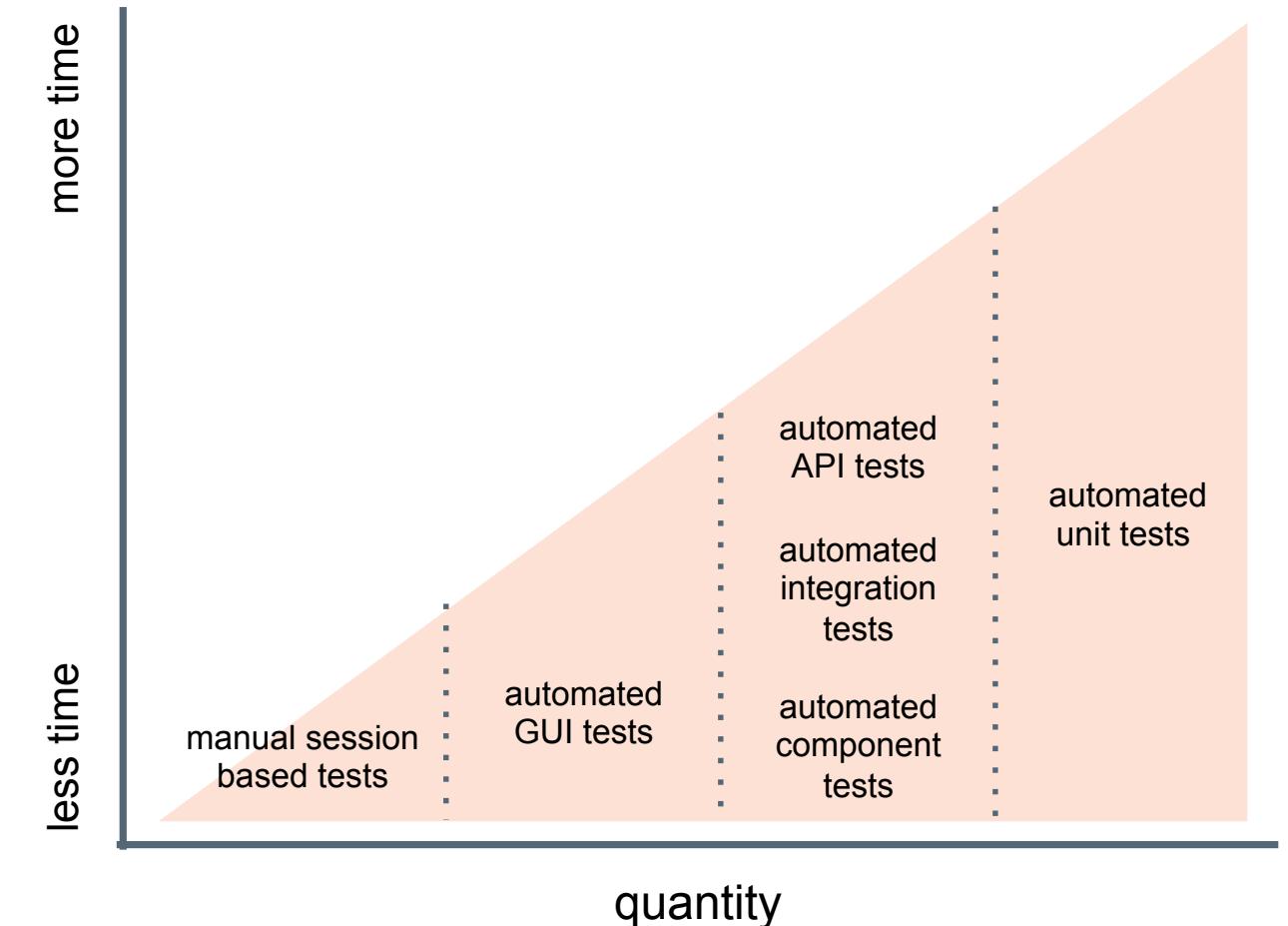
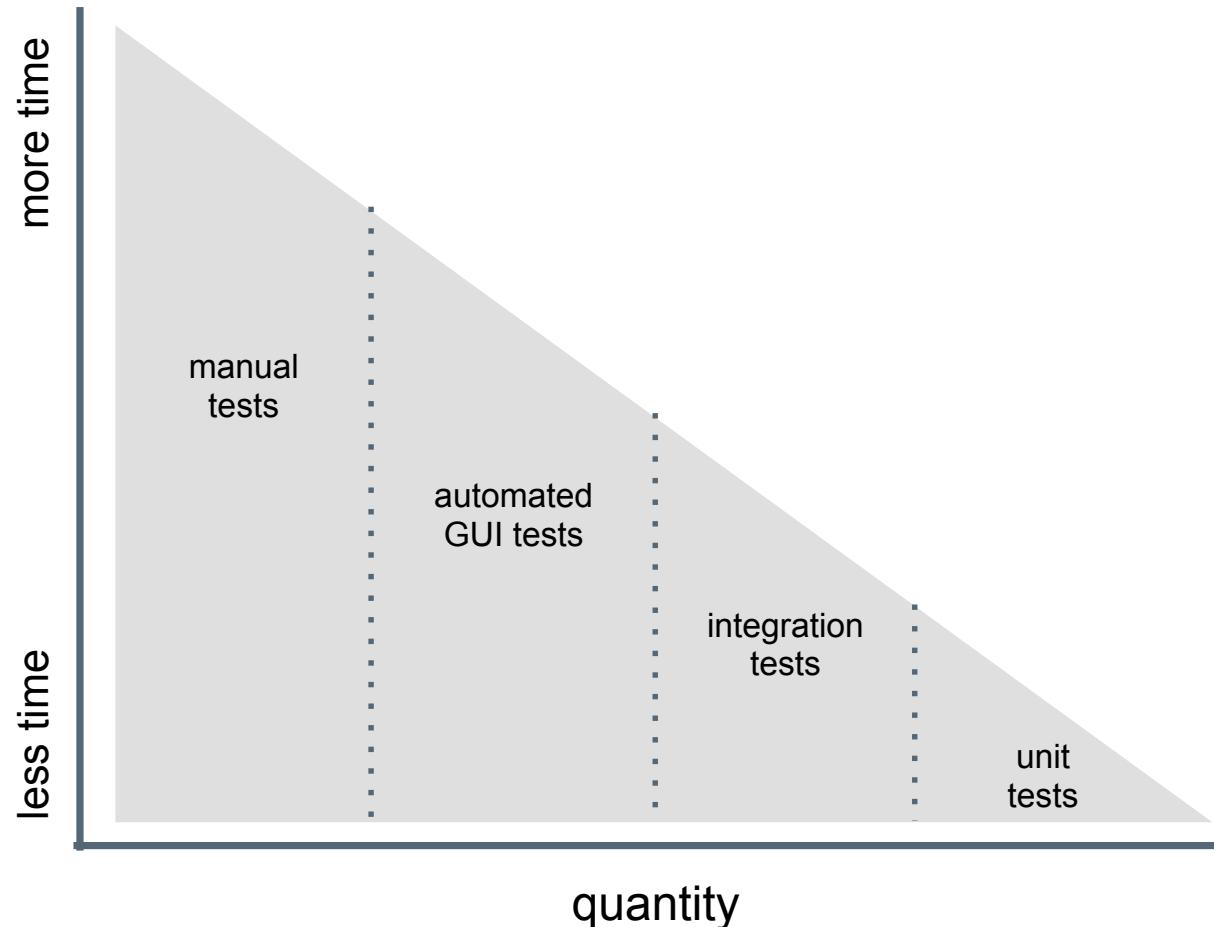
LAB



Simple Web Server Cookbook

- ✓ The Apache web server should be running
- ✓ The Apache web server should be listening on the default port
- ✓ The Apache web server should be configured to start on boot

Software Testing and Why it Matters



Testing builds safety through feedback loops

Inexpensive experiments to provide validation

Reduces risk

Optimize Testing: Do more of the inexpensive testing first!

DISCUSSION



Additional Testing

What command would you use to complete lint testing?

What command would you use to complete syntax testing?

What command would you run to complete unit tests?

What additional kitchen-related commands should we run?

How would you InSpec exec your tests over the docker protocol?

Objectives

- ✓ Execute an InSpec test on a local machine
- ✓ Execute an InSpec test on a remote machine
- ✓ Generate an InSpec profile
- ✓ Add InSpec-based integration test to a Chef cookbook
- ✓ Run InSpec-based integrations tests during Chef cookbook development

List additional resources and places to look for support with InSpec

Further Resources

Where to go for additional help

Community Resources

InSpec Website, includes tutorials and docs - <http://inspec.io/>

#inspec channel of the Chef Community Slack - <http://community-slack.chef.io/>

InSpec category of the Chef Mailing List - <https://discourse.chef.io/c/inspec>

Compliance Profiles on the Supermarket - https://supermarket.chef.io/tools?type=compliance_profile

Open Source Project - <https://github.com/chef/inspec>

Objectives

- ✓ Execute an InSpec test on a local machine
- ✓ Execute an InSpec test on a remote machine
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- ✓ Add InSpec-based integration test to a Chef cookbook
- ✓ Run InSpec-based integrations tests during Chef cookbook development
- ✓ List additional resources and places to look for support with InSpec

More hands-on Exercises

Still have time to play around?

LAB



Remediate ssh Protocol

- Write a cookbook to manage ssh
- Verify the Protocol is set appropriately
- Apply the recipe to your local machine with `chef-client --local` (if you dare!)
- Verify your colleague's work

LAB



Build additional CIS controls

- <https://github.com/chef-training/workshops/tree/master/InSpec>

LAB



Supermarket Profiles

- List profiles available on the Supermarket
- View information about the dev-sec/ssh-baseline profile
- Execute the dev-sec/ssh-baseline profile from the Supermarket
- Write a cookbook to remediate failing controls from dev-sec/ssh-baseline

LAB



Unit Testing

- Add unit testing to our apache cookbook
- Create a cookbook to remediate the failing ssh controls; include unit tests

Introduction to InSpec



CHEF™