INSPEC

BY CHEF™

Compliance Automation with InSpec

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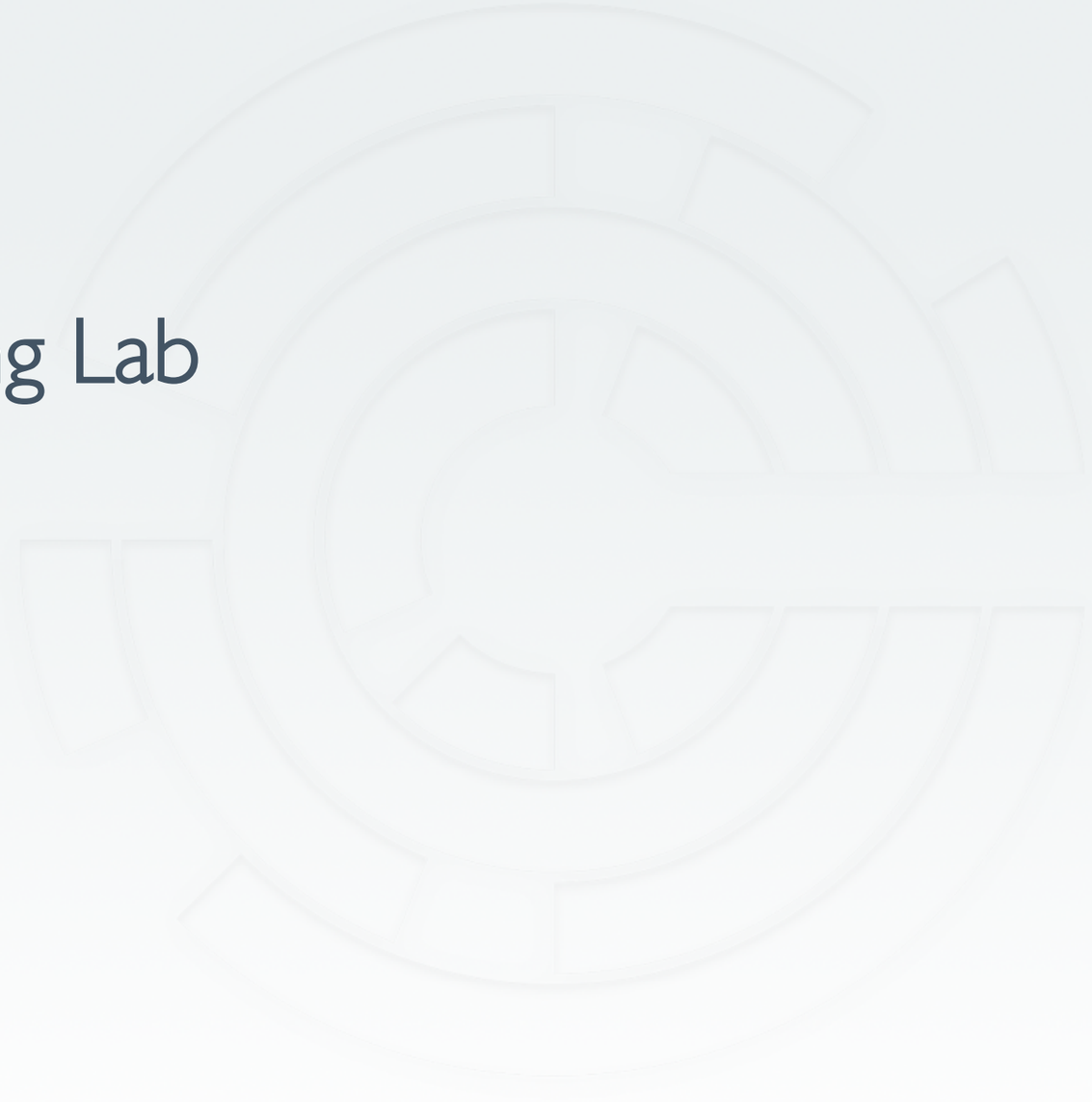
CHEF™

Learning Lab



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Join Slack Team & Channel

- http://community-slack.chef.io
- #CHANNEL-NAME

#CHANNEL-NAME

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Find your IP Address

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Login to remote workstation

```
$ ssh chef@IP_ADDRESS
```

```
The authenticity of host '52.54.113.210 (52.54.113.210)' can't be
established.
ECDSA key fingerprint is
SHA256:zAtoeO29XbhRNvwg542cuh4qsKCEaX8hNIlEOCbgd3I.
Are you sure you want to continue connecting (yes/no)?
```

Login to remote workstation

```
$ ssh chef@IP_ADDRESS
```

```
The authenticity of host '52.54.113.210 (52.54.113.210)' can't be
established.
ECDSA key fingerprint is
SHA256:zAtoeO29XbhRNvwg542cuh4qsKCEaX8hNIlEOCbgd3I.
Are you sure you want to continue connecting (yes/no)? yes
```

Login to remote workstation

```
$ ssh chef@IP_ADDRESS
```

```
The authenticity of host '52.54.113.210 (52.54.113.210)' can't be
established.
ECDSA key fingerprint is
SHA256:zAtoeO29XbhRNvwg542cuh4qsKCEaX8hNIlEOCbgd3I.
Are you sure you want to continue connecting (yes/no)? Yes
Warning: Permanently added '52.54.113.210' (ECDSA) to the list of known
hosts.
chef@52.54.113.210's password:
```

Login to remote workstation

```
$ ssh chef@IP_ADDRESS
```

```
The authenticity of host '52.54.113.210 (52.54.113.210)' can't be
established.
ECDSA key fingerprint is
SHA256:zAtoeO29XbhRNvwg542cuh4qsKCEaX8hNIlEOCbgd3I.
Are you sure you want to continue connecting (yes/no)? Yes
Warning: Permanently added '52.54.113.210' (ECDSA) to the list of known
hosts.
chef@52.54.113.210's password: chef
```

Touch a file with your name

```
$ touch firstname-lastname
```

List your home directory

```
$ sleep 60 && ls -t
```

```
firstname-lastname  cookbooks       Berksfile    profiles
nodes               Berksfile.lock  config.json
```

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Verify the installation

```
$ which inspec
```

```
/opt/chefdk/bin/inspec
```

Verify the installation

```
$ inspec version
```

```
1.11.0

Your version of InSpec is out of date! The latest version is 1.15.0.
```

Verify the installation

```
$ which chef
```

```
/opt/chefdk/bin/chef
```

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Verify the installation

```
$ chef --version
```

```
Chef Development Kit Version: 1.2.22
chef-client version: 12.18.31
delivery version: master (0b746cafed65a9ea1a79de3cc546e7922de9187c)
berks version: 2017-03-02T09:46:48.762338 20503]
2017-03-02T09:46:48.762505 20503] 2017-03-02T09:46:48.762618 20503]
2017-03-02T09:46:48.762722 20503] 2017-03-02T09:46:48.791141 20503]
2017-03-02T09:46:48.791248 20503] 5.6.0
kitchen version: 1.15.0
```

Chef DK - The Chef Development Kit

. Definitive tooling for local development of Chef code & Infrastructure as Code development

FAST INEXPENSIVE TESTING

Foodcritic

Test Your "Chef Style"

- Validate your Chef code against Chef best practices
- Extend with rules to enforce organizational Chef development best practices
- Enforce compliance & security practices

CookStyle

Validate your Ruby

- Validate your Chef code against Ruby best practices
- Identify potential Ruby errors
  Unclosed strings, etc.
- Identify style/convention that helps write better code
  Single quotes vs. double quotes

ChefSpec

Simulate Chef

- Validate your Chef code will run
- Testing for more Chef advanced use cases
- Useful for regression testing

DEEP INTEGRATION TESTING

Test Kitchen

Let's do this (almost) for real

- Executes your Chef code on an instance or container
- Integrates with Cloud and Virtualization providers
- Validate your Chef code locally before sharing
- Speed development of Chef Cookbooks

InSpec

Verify automation results & ensure compliance

- Assert the intention of your Chef code
- Verify on live systems that your Chef code produced the correct result
- Confirm your Chef code didn't not produce compliance drift

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Join Slack Team & Channel

- http://community-slack.chef.io
- #CHANNEL-NAME

#CHANNEL-NAME

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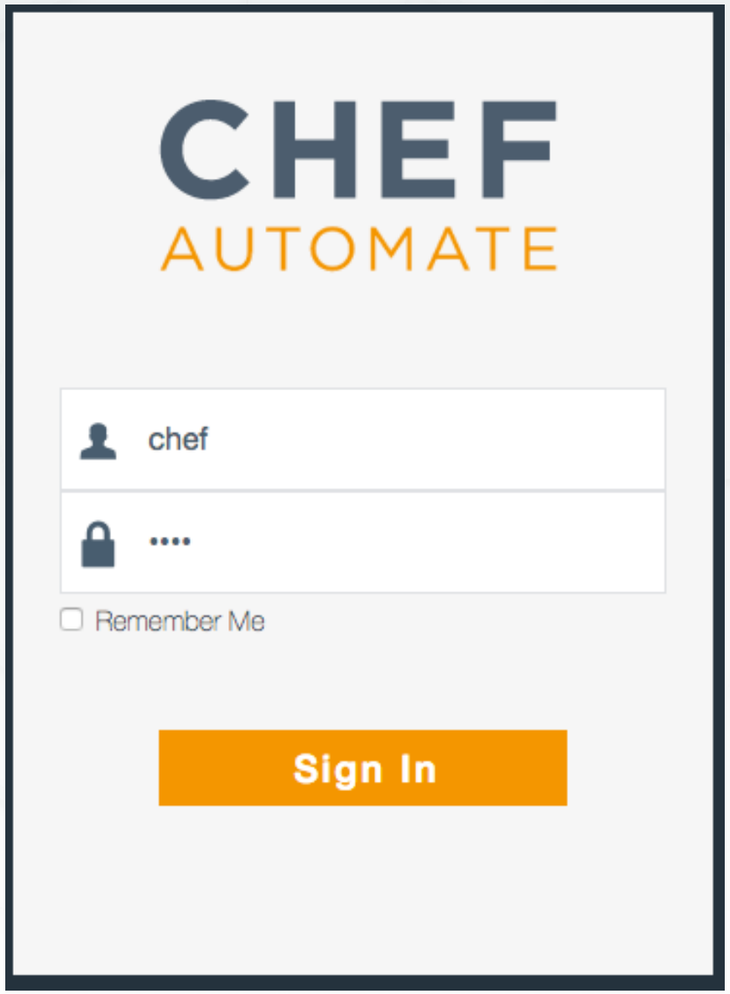
Continuous Compliance

Chef Automate and InSpec Profiles

Login to Chef Automate

- https://informatica-compliance-workshop.chefdemo.net
- Uses a self-signed certificate in this lab

- Username: `chef`
- Password: `chef`



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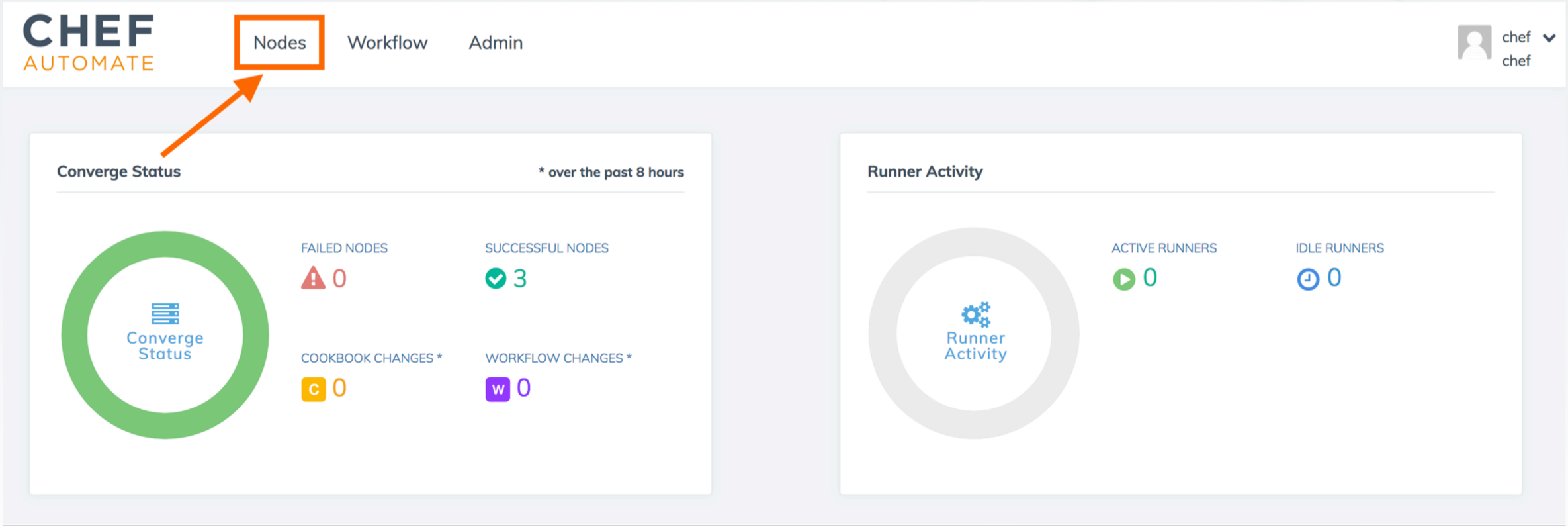
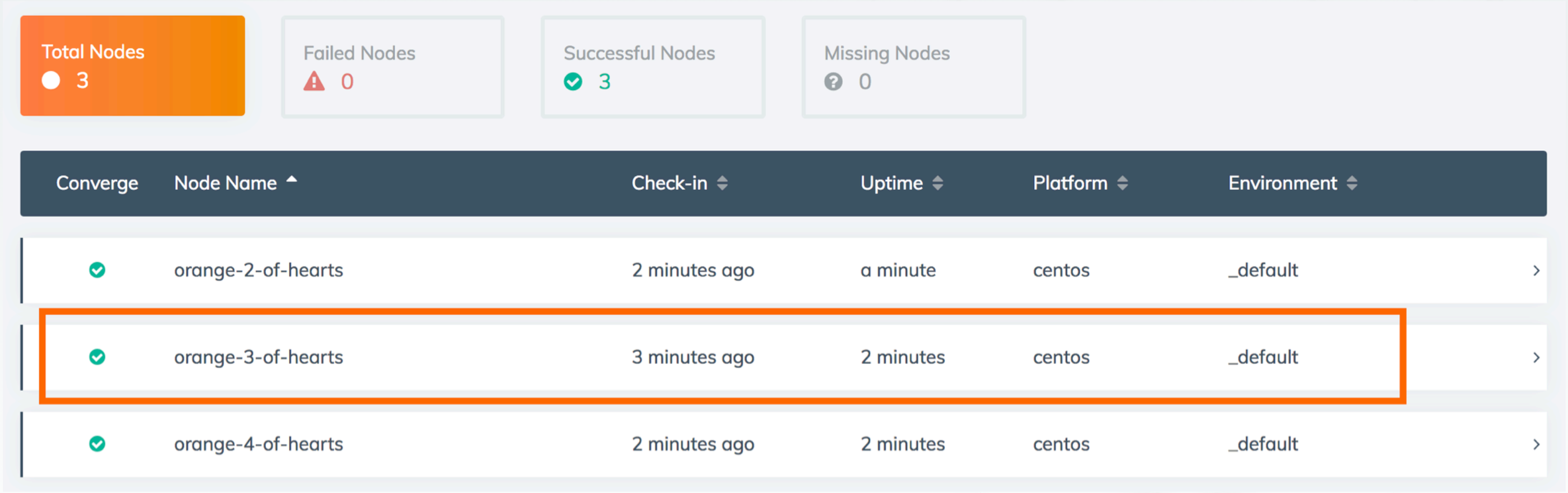
Browse to your node



Browse to your node



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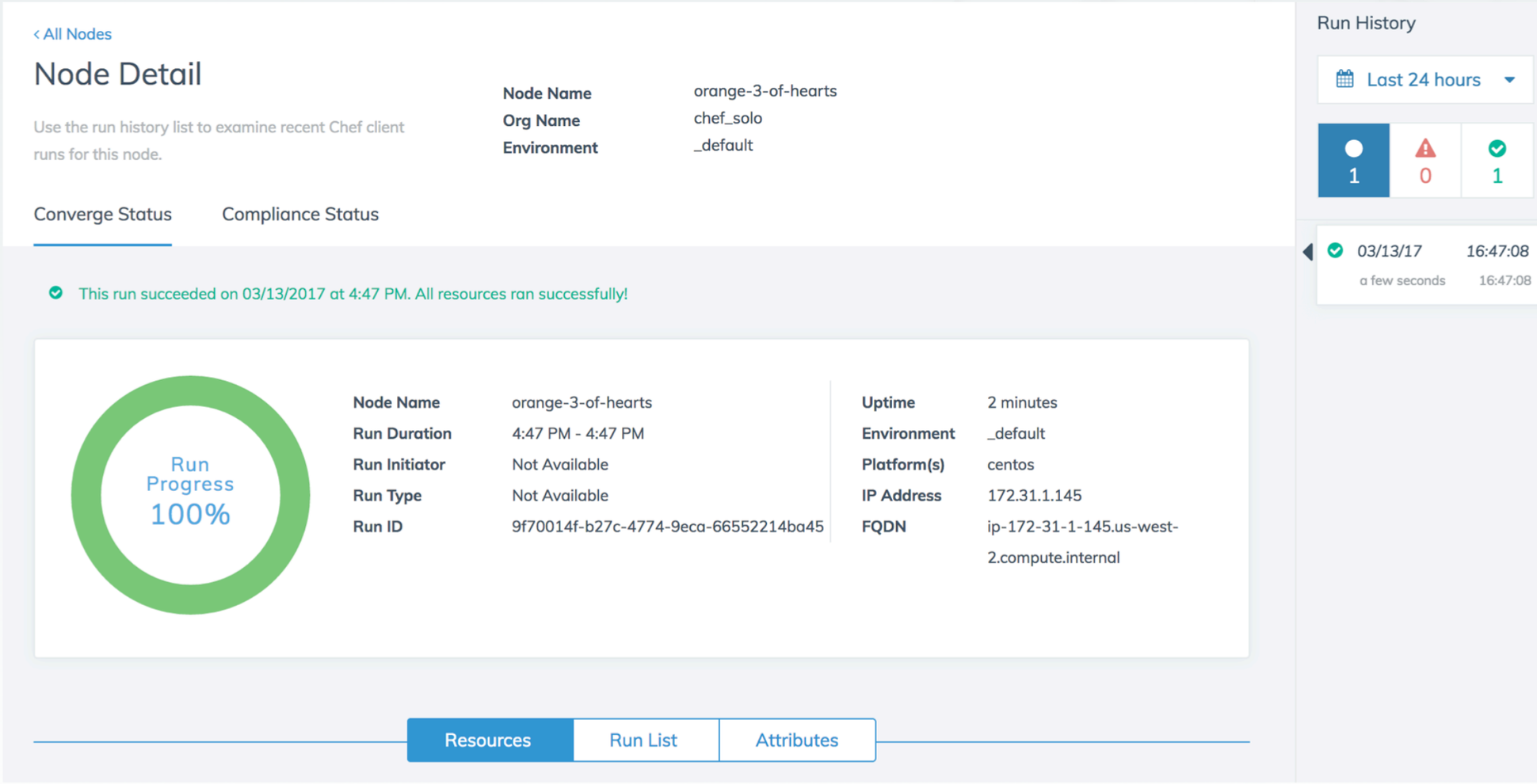
View details of your node



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View details of your node

Node Name	orange-3-of-hearts	**Uptime**	2 minutes
Run Duration	4:47 PM - 4:47 PM	**Environment**	_default
Run Initiator	Not Available	**Platform(s)**	centos
Run Type	Not Available	**IP Address**	172.31.1.145
Run ID	9f70014f-b27c-4774-9eca-66552214ba45	**FQDN**	ip-172-31-1-145.us-west-2.compute.internal

Resources | **Run List** | Attributes

Roles	Cookbooks	Recipes	Failed	Succeeded
0	0	0	0	0

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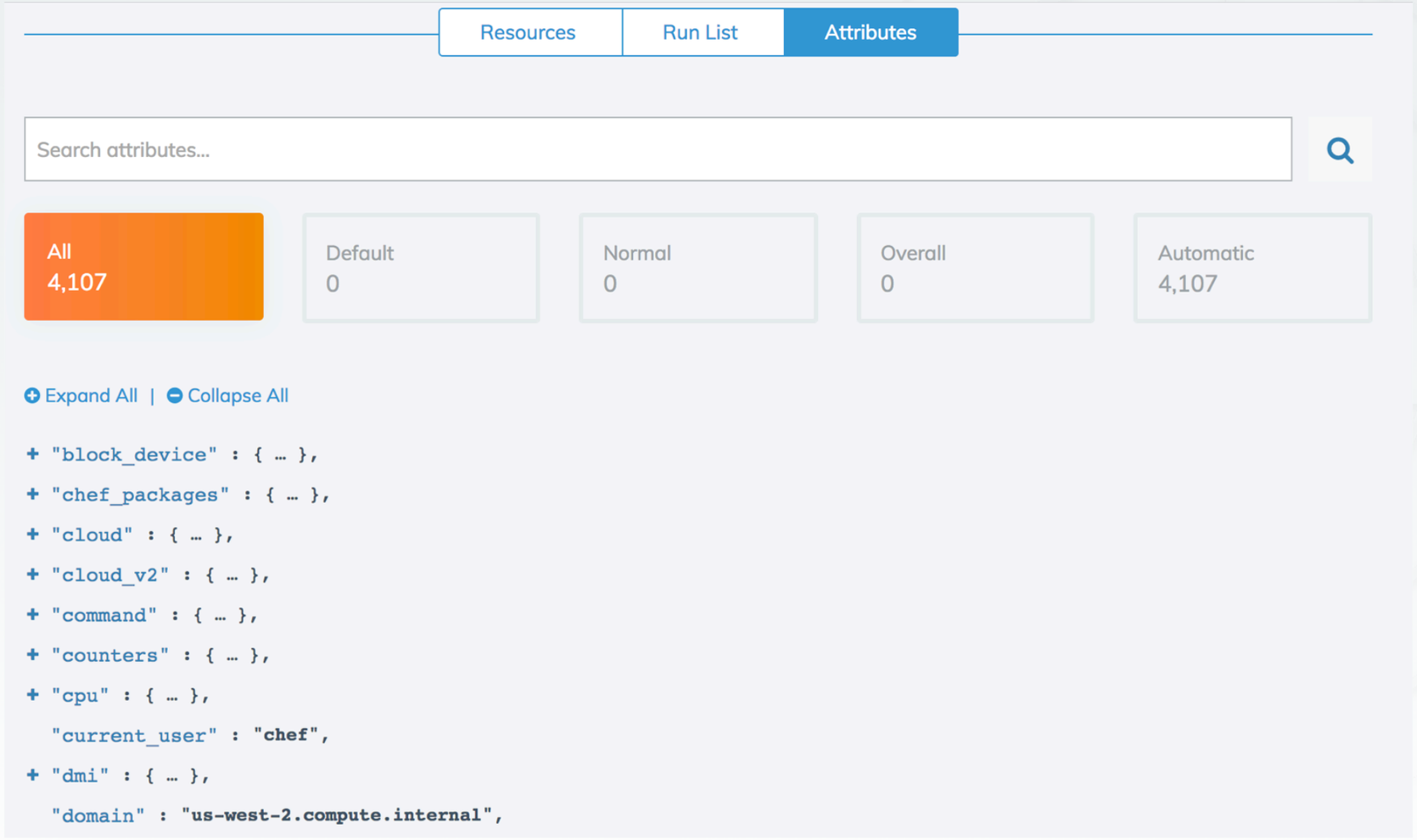
View details of your node



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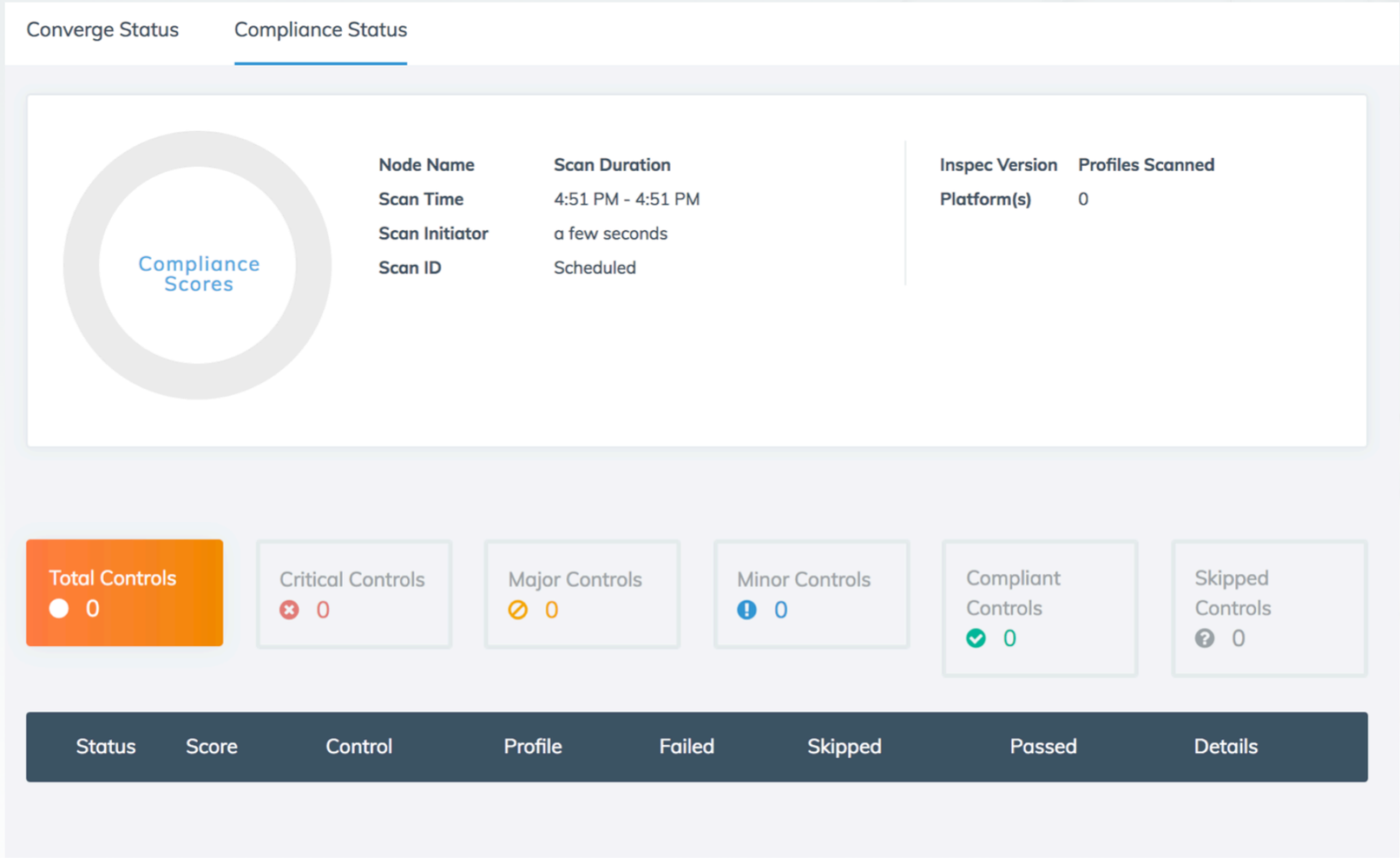
View details of your node



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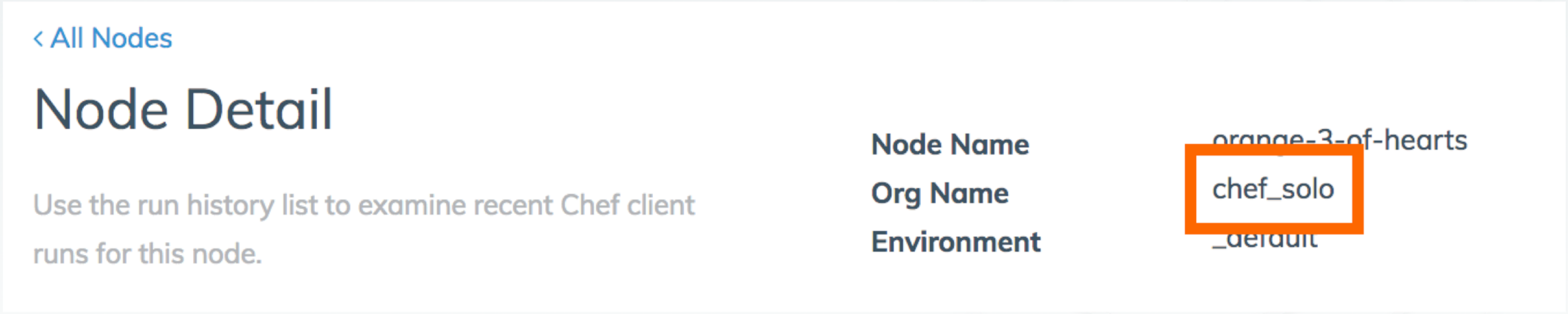
The node uses chef solo



Chef Automate – Node View

- View aggregate status of your infrastructure
  - Overall & trend views of converge status
  - Overall & trend views of compliance status
  - Filter & search options
- View details of any node
  - Status of converged resources
  - Run List applied to the node
  - Attributes of the node

Chef Solo

Executes chef-client without relying on a Chef server to provide configuration policies (cookbooks, environments, etc.)

https://docs.chef.io/chef_solo.html

Chef Solo

- Local directory for configuration policy
  - Or a URL from which a `.tar.gz` file can be downloaded
- Node objects stored as a local JSON file
- Attribute data stored in a JSON file
  - Local or remote
- Does not pull from a Chef Server
- Can be configured to send data to a Chef Server

Chef Client – Local Mode

Local mode is a way to run the chef-client against the chef-repo on a local machine as if it were running against the Chef server.

https://docs.chef.io/ctl_chef_client.html#run-in-local-mode

Go home

```
$ cd ~
```

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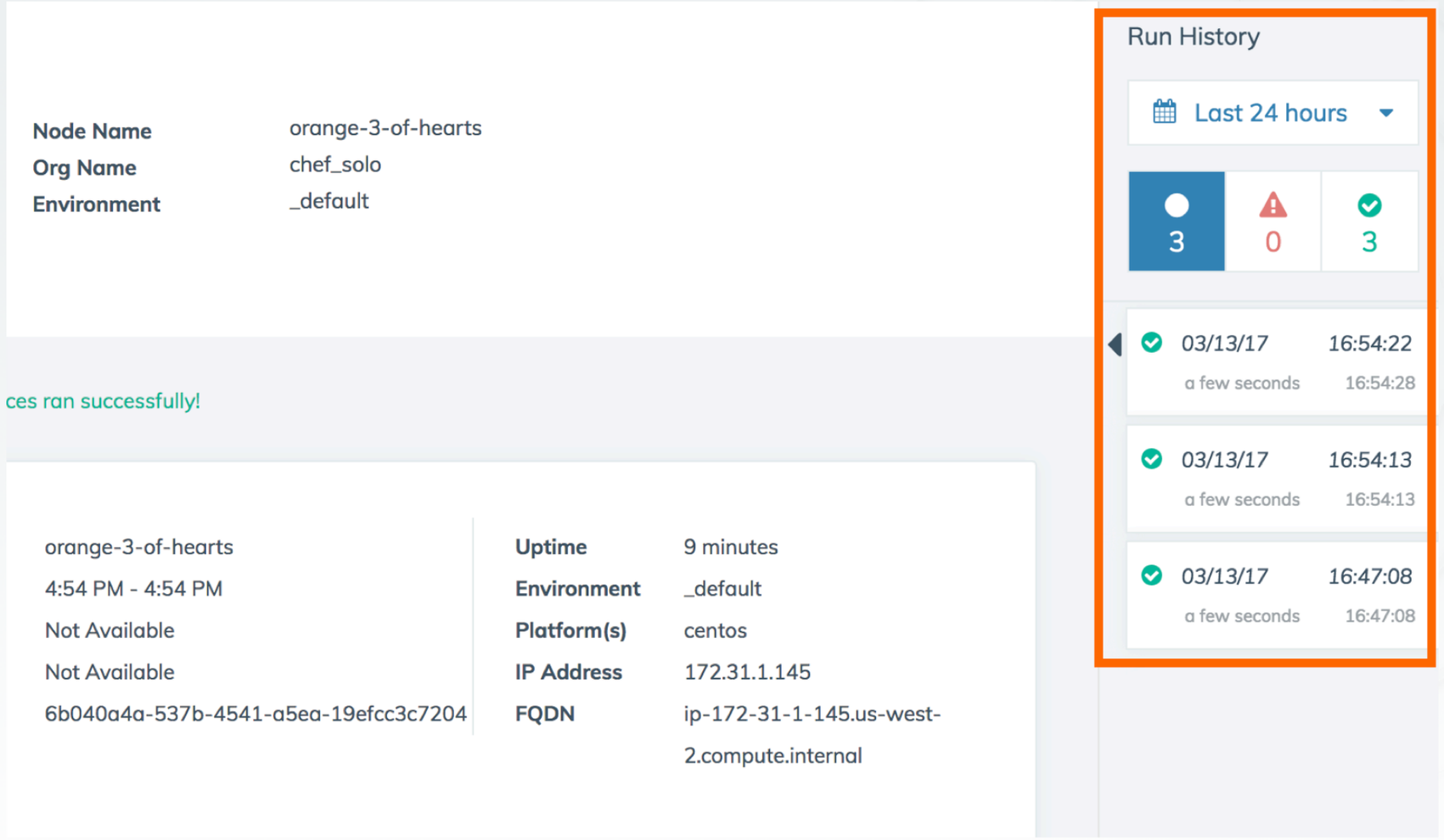
Run chef-client in local mode

```
$ sudo run_chef
```

```
[2017-03-10T14:05:49+00:00] INFO: Forking chef instance to converge...
Starting Chef Client, version 12.18.31
...
Converging 0 resources
[2017-03-10T14:05:51+00:00] INFO: Chef Run complete in 0.19413018 seconds

Running handlers:
[2017-03-10T14:05:51+00:00] INFO: Running report handlers
Running handlers complete
[2017-03-10T14:05:51+00:00] INFO: Report handlers complete
Chef Client finished, 0/0 resources updated in 01 seconds
```

Check the converge status in Automate



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Run with additional parameters

```
$ sudo run_chef "recipe[audit::default]"
[2017-03-10T14:10:34+00:00] INFO: Forking chef instance to converge...
Starting Chef Client, version 12.18.31
[2017-03-10T14:10:34+00:00] INFO: *** Chef 12.18.31 ***
...
[2017-03-10T14:10:40+00:00] INFO: Chef Run complete in 4.10402964 seconds

Running handlers:
[2017-03-10T14:10:40+00:00] INFO: Running report handlers
[2017-03-10T14:10:40+00:00] WARN: Format is json
[2017-03-10T14:10:40+00:00] INFO: Initialize InSpec
[2017-03-10T14:10:40+00:00] INFO: Running tests from: [{:name=>"ssh", :path=>"/home/chef/profiles/ssh"}]
[2017-03-10T14:10:40+00:00] INFO: Reporting to chef-visibility
...
Running handlers complete
[2017-03-10T14:10:40+00:00] INFO: Report handlers complete
Chef Client finished, 1/2 resources updated in 06 seconds
```

Check the converge status in Automate

Node Name	orange-3-of-hearts	**Uptime**	9 minutes
Run Duration	4:54 PM - 4:54 PM	**Environment**	_default
Run Initiator	Not Available	**Platform(s)**	centos
Run Type	Not Available	**IP Address**	172.31.1.145
Run ID	6b040a4a-537b-4541-a5ea-19efcc3c7204	**FQDN**	ip-172-31-1-145.us-west-2.compute.internal

Resources | Run List | Attributes

Total Resources	Failed	Successful	Unchanged	Unprocessed
2	0	1	1	0

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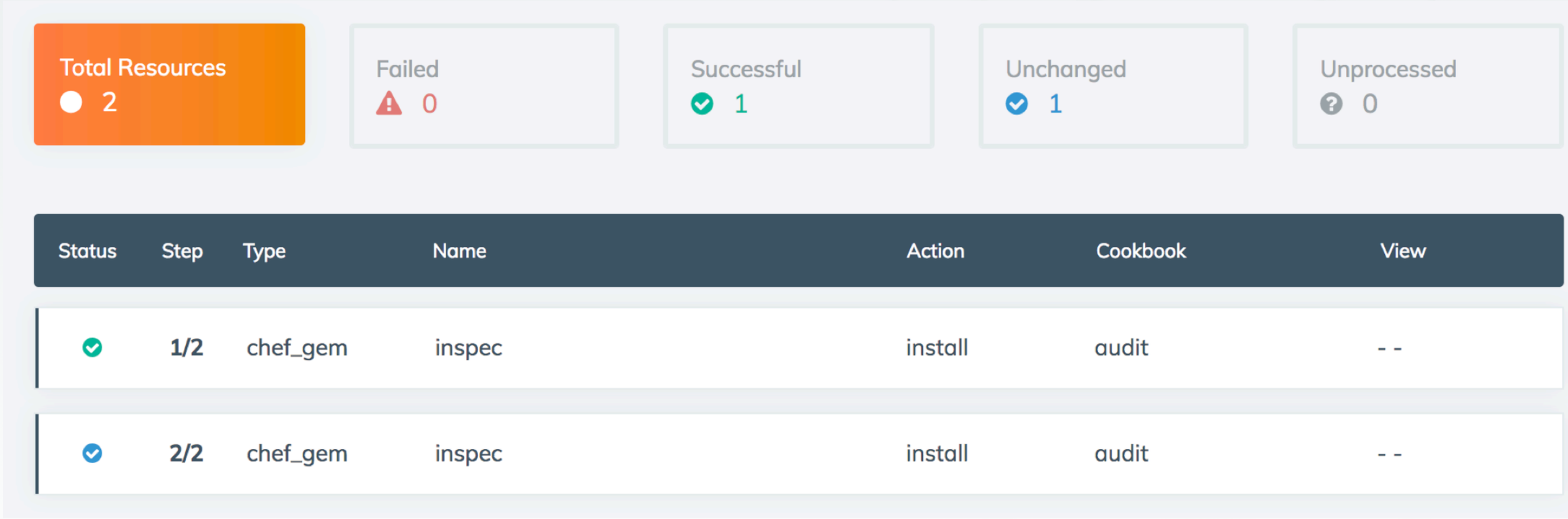
Check the converge status in Automate



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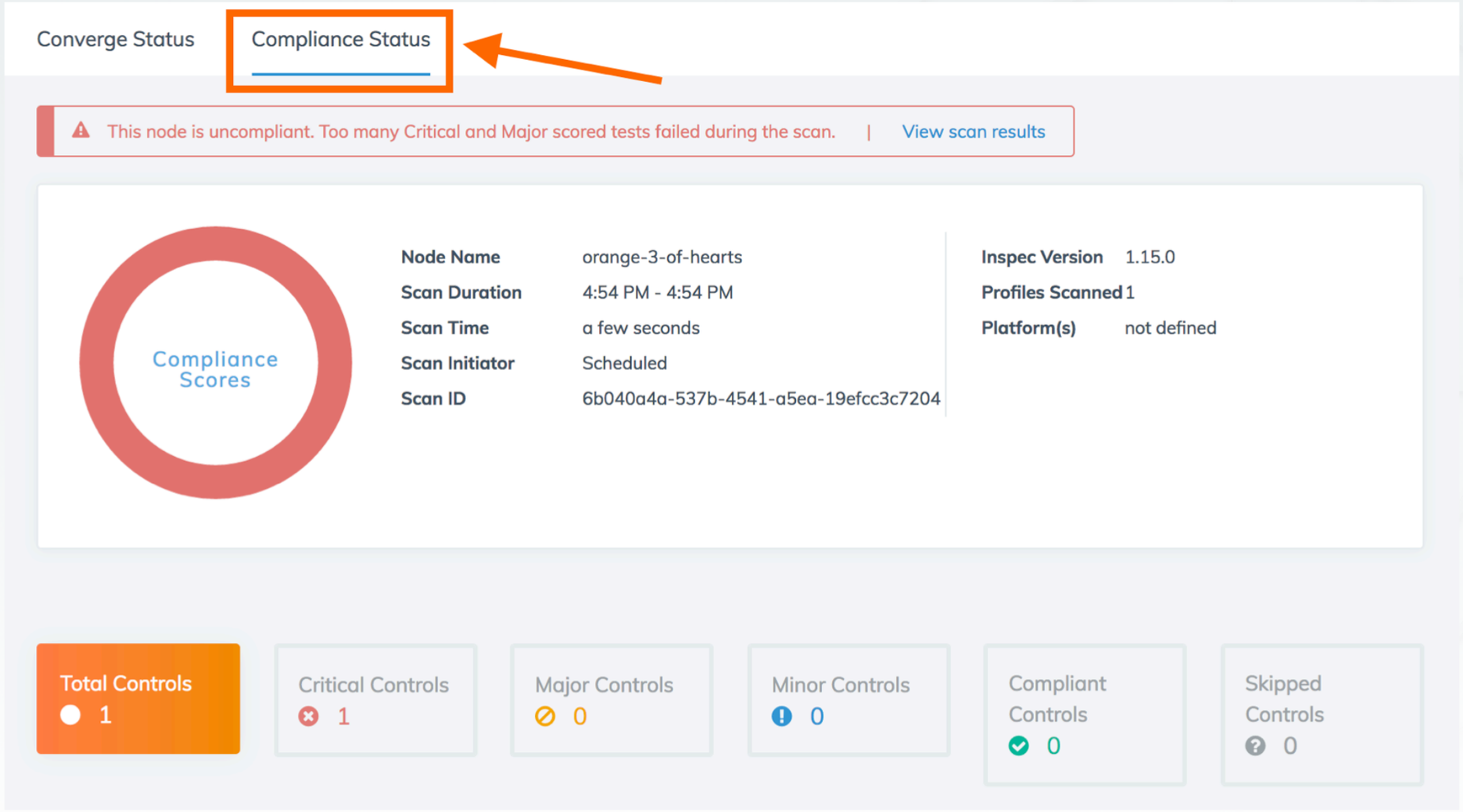
Check the compliance status in Automate



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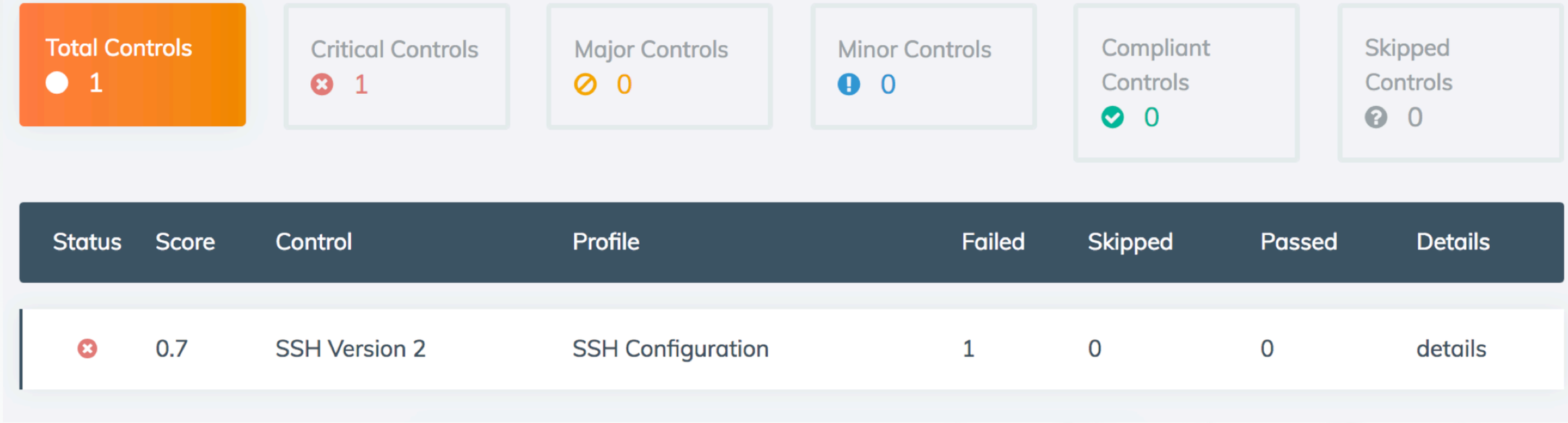
Check the compliance status in Automate



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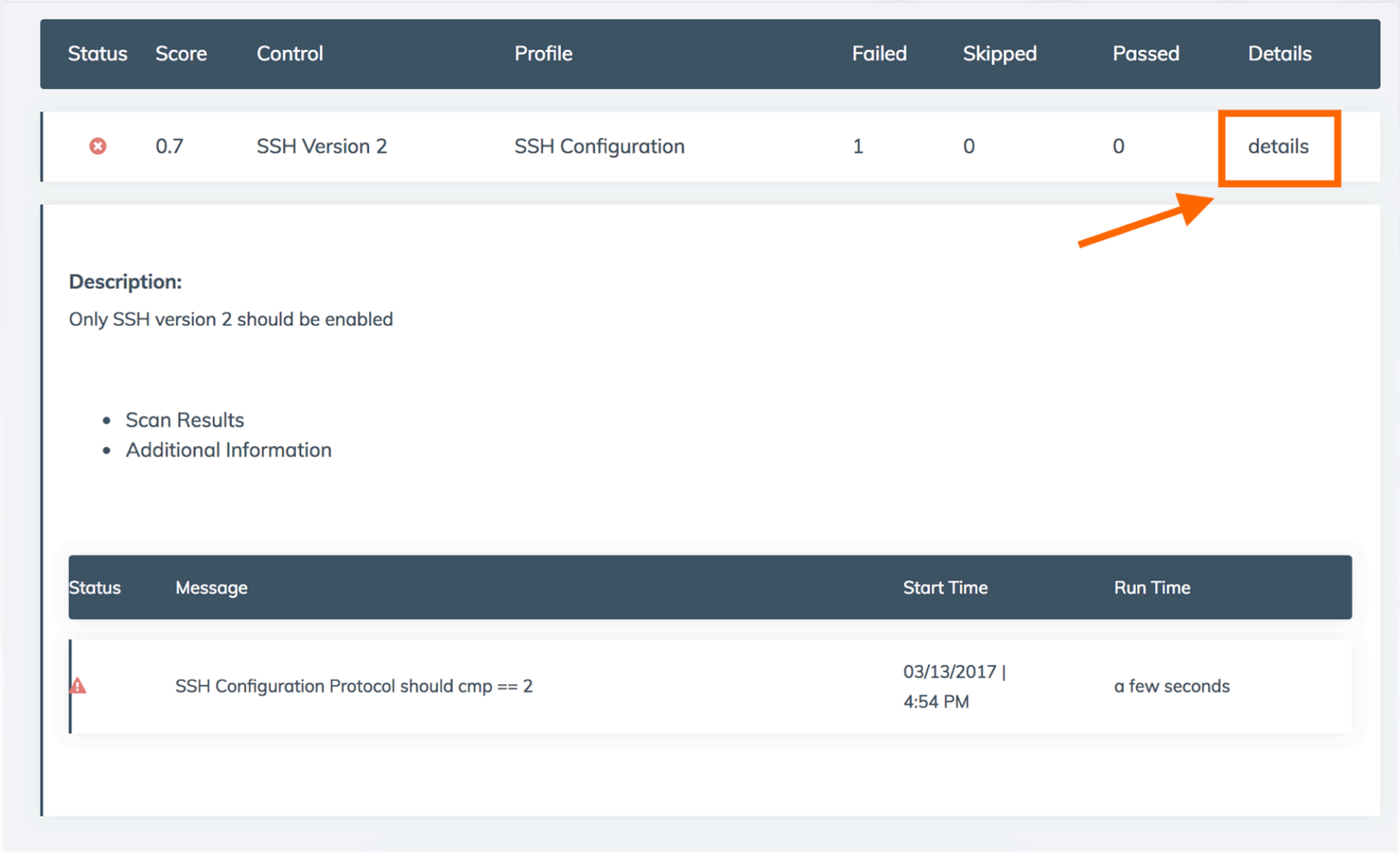
View details of the failing control



Status	Score	Control	Profile	Failed	Skipped	Passed	Details
⊗	0.7	SSH Version 2	SSH Configuration	1	0	0	details

Description:

Only SSH version 2 should be enabled

- Scan Results
- Additional Information

Status	Message	Start Time	Run Time
⚠	SSH Configuration Protocol should cmp == 2	03/13/2017 | 4:54 PM	a few seconds

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View details of the failing control

- Scan Results
- Additional Information

Control:

```
control 'sshd-1.0' do
  impact 0.7
  title 'SSH Version 2'
  desc 'Only SSH version 2 should be enabled'
  describe sshd_config do
    its('Protocol') { should cmp 2 }
  end
end
```

Tags:

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Review the set-up

tying it all together

Go home

```
$ cd ~
```

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List contents

```
$ ls
```

```
Berksfile        config.json  firstname-lastname  profiles
Berksfile.lock   cookbooks    nodes
```

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List cookbooks

```
$ ls cookbooks
```

```
audit  compat_resource
```

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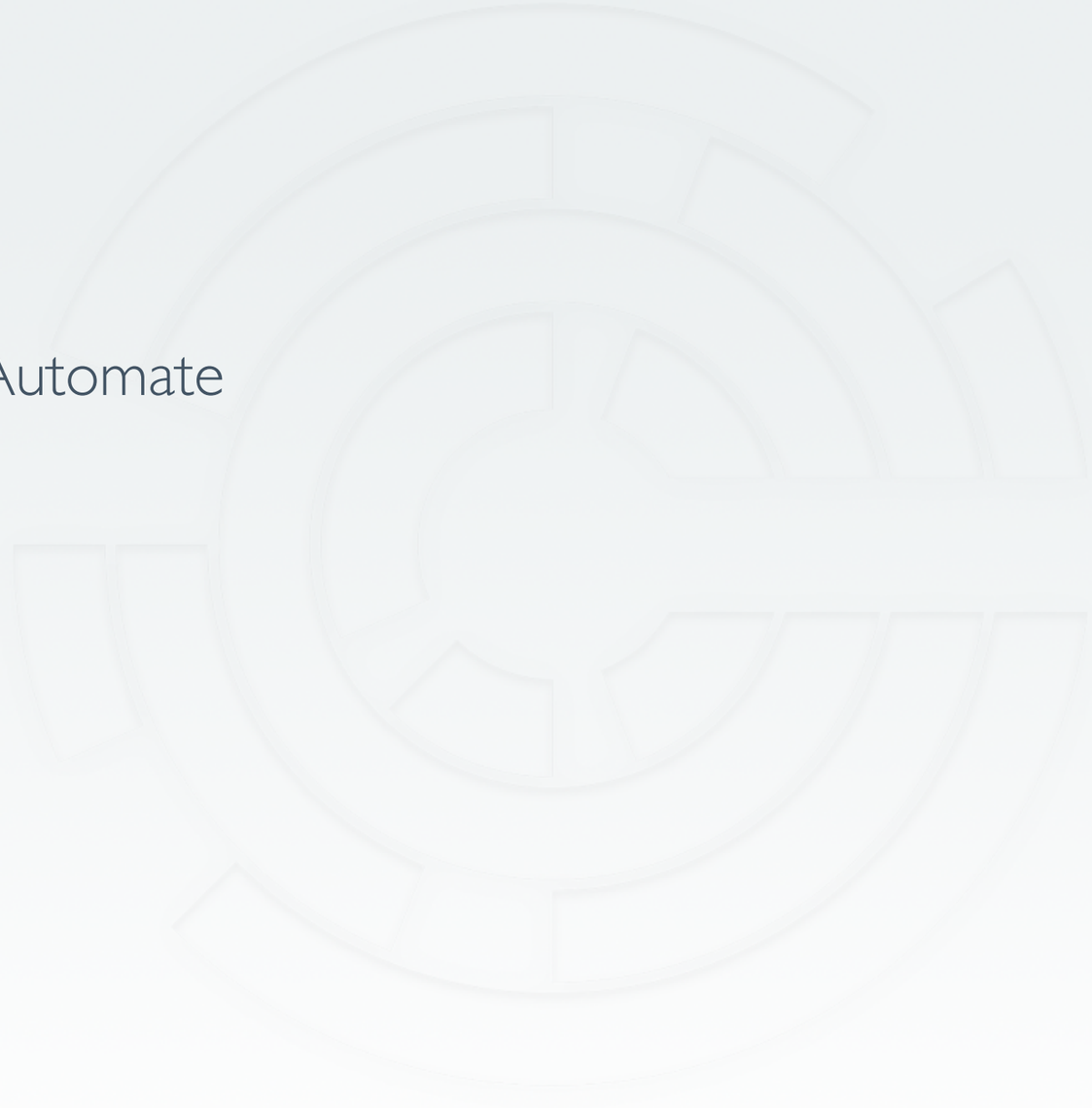
Audit Cookbook

- Install InSpec
- Run InSpec profiles
- Report results to Chef Compliance or Chef Automate



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Compat Resource Cookbook

- Adds functionality introduced in the latest chef-client releases to any chef-client from 12.1 onwards.
- Includes
  - Custom Resource functionality
  - notification improvements
  - new resources added to core chef
- Allows for these new resources in cookbooks without requiring the very latest Chef client release.

config.json

```
$ cat config.json
```

```
{
  "audit": {
    "collector": "chef-visibility",
    "inspec_version": "1.15.0",
    "profiles": [
      {
        "name": "ssh",
        "path": "/home/chef/profiles/ssh"
      }
    ]
  }
}
```

Local Profiles

```
$ tree profiles
```

```
profiles/
└── ssh
    ├── controls
    │   └── ssh.rb
    ├── inspec.lock
    └── inspec.yml

2 directories, 3 files
```

Run Locally with InSpec

```
$ inspec exec profiles/ssh
```

```
Profile: SSH Configuration (ssh)
Version: 0.1.0
Target:  local://

  ×  sshd-1.0: SSH Version 2 (
     expected: 2
          got:

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

     expected: 2
          got:

     (compared using `cmp` matcher)


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

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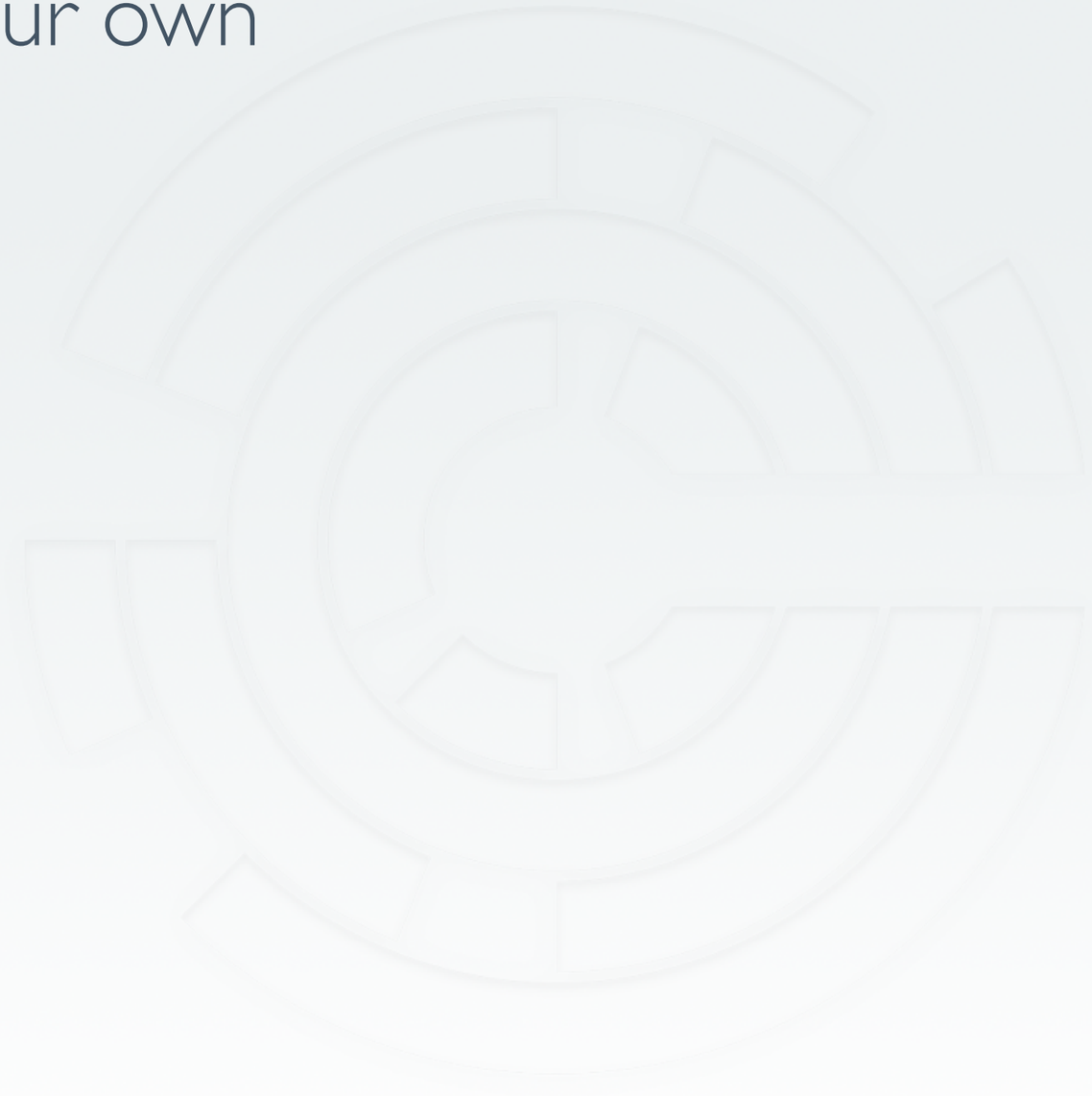
Next Steps

- Remediate the failing control
- Run the audit cookbook to verify the remediation
- View the compliant node in Automate

Remediate the Failing Control

Fix your ssh configuration on your own

- Write a cookbook to manage SSH
- Manually update the SSH configuration



Verify Compliance Status in Automate

Converge Status | Compliance Status

This node is compliant. View scan results

Node Name	orange-3-of-hearts
Scan Duration	5:03 PM - 5:03 PM
Scan Time	a few seconds
Scan Initiator	Scheduled
Scan ID	6076b098-e02c-4b6e-8731-8c63217e8733

Inspec Version	1.15.0
Profiles Scanned	1
Platform(s)	not defined

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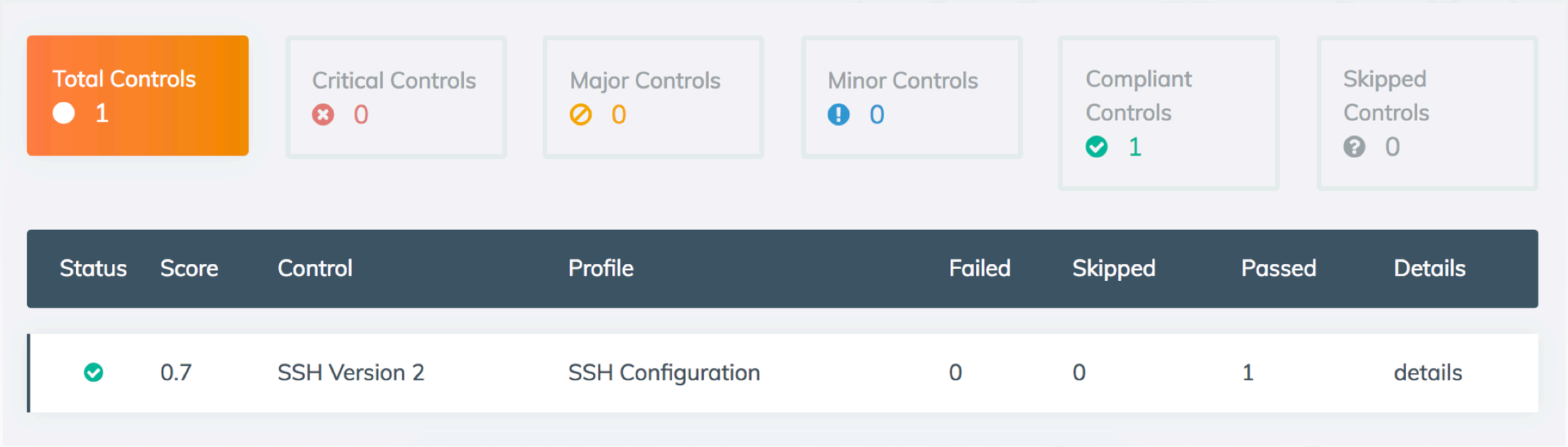
Verify Compliance Status in Automate



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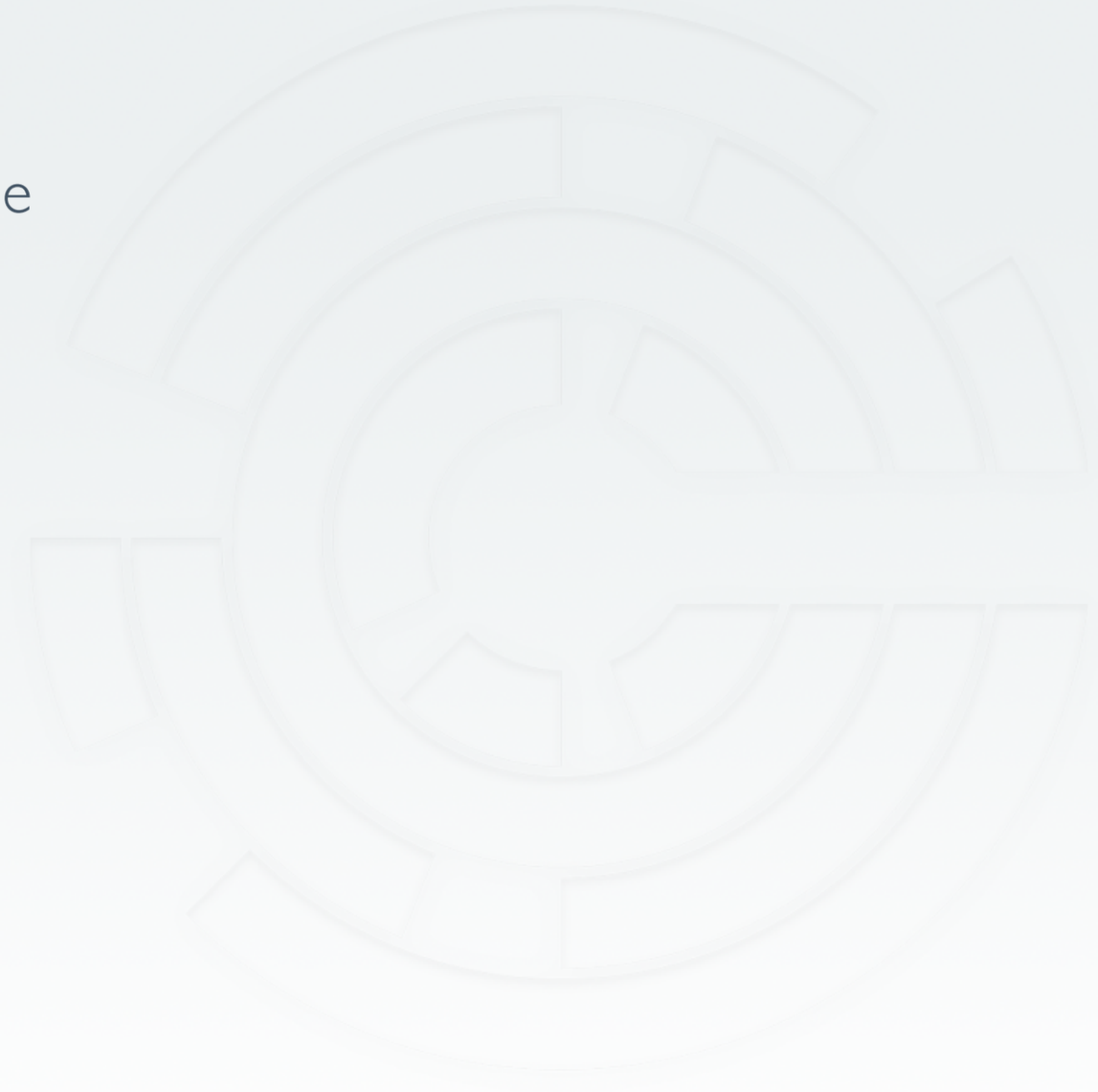
Remediate Failing SSH Control

Simple SSH Cookbook

- A server recipe to manage the sshd_config file
- Local test environment configured



Move to the cookbooks directory

```
$ cd ~/cookbooks
```

Generate an ssh cookbook

```
$ chef generate cookbook ssh
```

```
Generating cookbook ssh
- 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 ssh` 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
```

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Add a server recipe to the ssh cookbook

```
$ chef generate recipe ssh server
```

```
Recipe: code_generator::recipe
  * directory[./ssh/spec/unit/recipes] action create (up to date)
  * cookbook_file[./ssh/spec/spec_helper.rb] action create_if_missing (up to date)
  * template[./ssh/spec/unit/recipes/server_spec.rb] action create_if_missing
    - create new file ./ssh/spec/unit/recipes/server_spec.rb
    - update content in file ./ssh/spec/unit/recipes/server_spec.rb from none to d14960
    (diff output suppressed by config)
  * directory[./ssh/test/smoke/default] action create (up to date)
  * template[./ssh/test/smoke/default/server.rb] action create_if_missing
    - create new file ./ssh/test/smoke/default/server.rb
    - update content in file ./ssh/test/smoke/default/server.rb from none to aa8bba
    (diff output suppressed by config)
  * template[./ssh/recipes/server.rb] action create
    - create new file ./ssh/recipes/server.rb
    - update content in file ./ssh/recipes/server.rb from none to 18f24e
    (diff output suppressed by config)
```

Add a template to the cookbook

```
$ chef generate template ssh sshd_config -s /etc/ssh/sshd_config
```

```
Recipe: code_generator::template
  * directory[./ssh/templates/default] action create
    - create new directory ./ssh/templates/default
  * file[./ssh/templates/sshd_config.erb] action create
    - create new file ./ssh/templates/sshd_config.erb
    - update content in file ./ssh/templates/sshd_config.erb from none to
a16b11
    (diff output suppressed by config)
```

Server Recipe

~/cookbooks/ssh/recipes/server.rb

```
template '/etc/ssh/sshd_config' do
  source 'sshd_config.erb'
  owner 'root'
  group 'root'
  mode '0600'
end
```

Remember…

- Infrastructure policies need testing
  - ↳ Linting
  - ↳ Static Analysis
  - ↳ Unit Testing
  - ↳ Integration Testing
  - ↳ Compliance Testing

"Infrastructure as Code" should be tested like ANY other codebase.

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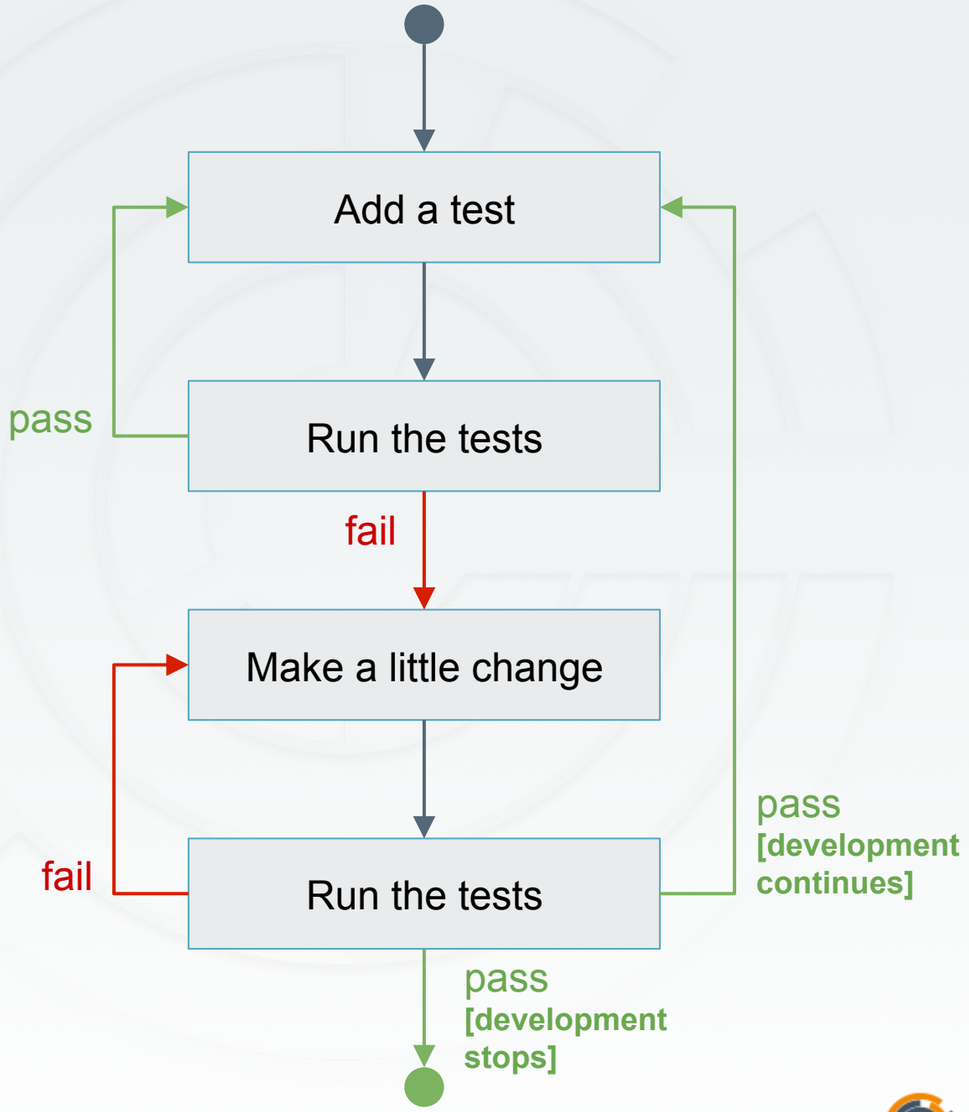
Test-driven Development

- 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



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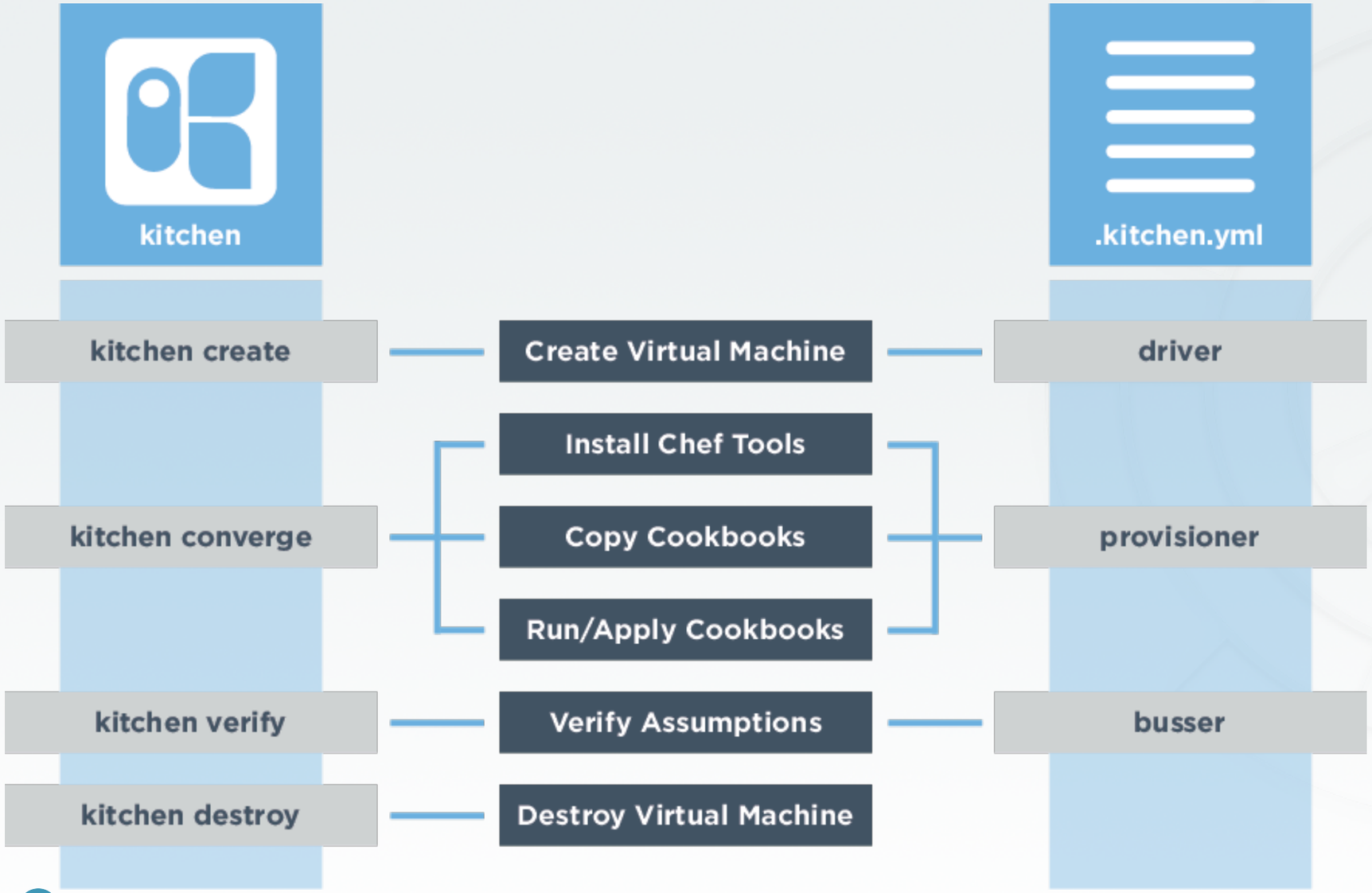
Testing the change



amazon web services

Microsoft Azure

vmware

openstack™

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Test Kitchen Configuration (1 of 3)

~/cookbooks/ssh/.kitchen.yml

```
---
driver:
-   name: vagrant
+   name: docker


...
```

Test Kitchen Configuration (2 of 3)

~/cookbooks/ssh/.kitchen.yml

```
...

platforms:
-   - name: ubuntu-16.04
-   - name: centos-7.2
+   - name: centos-7.3

...
```

Test Kitchen Configuration (3 of 3)

~/cookbooks/ssh/.kitchen.yml

```
suites:
-   - name: default
+   - name: server
      run_list:
-       - recipe[ssh::default]
+       - recipe[ssh::server]
      verifier:
        inspec_tests:
-         - test/smoke/default
+         - /home/chef/profiles/ssh
      attributes:
```

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Move to the cookbook's directory

```
$ cd ~/cookbooks/ssh
```

List the kitchens

```
$ kitchen list
```

```
Instance          Driver   Provisioner   Verifier   Transport   Last Action    Last Error
server-centos-73  Docker   ChefZero      Inspec     Ssh         <Not Created>  <None>
```

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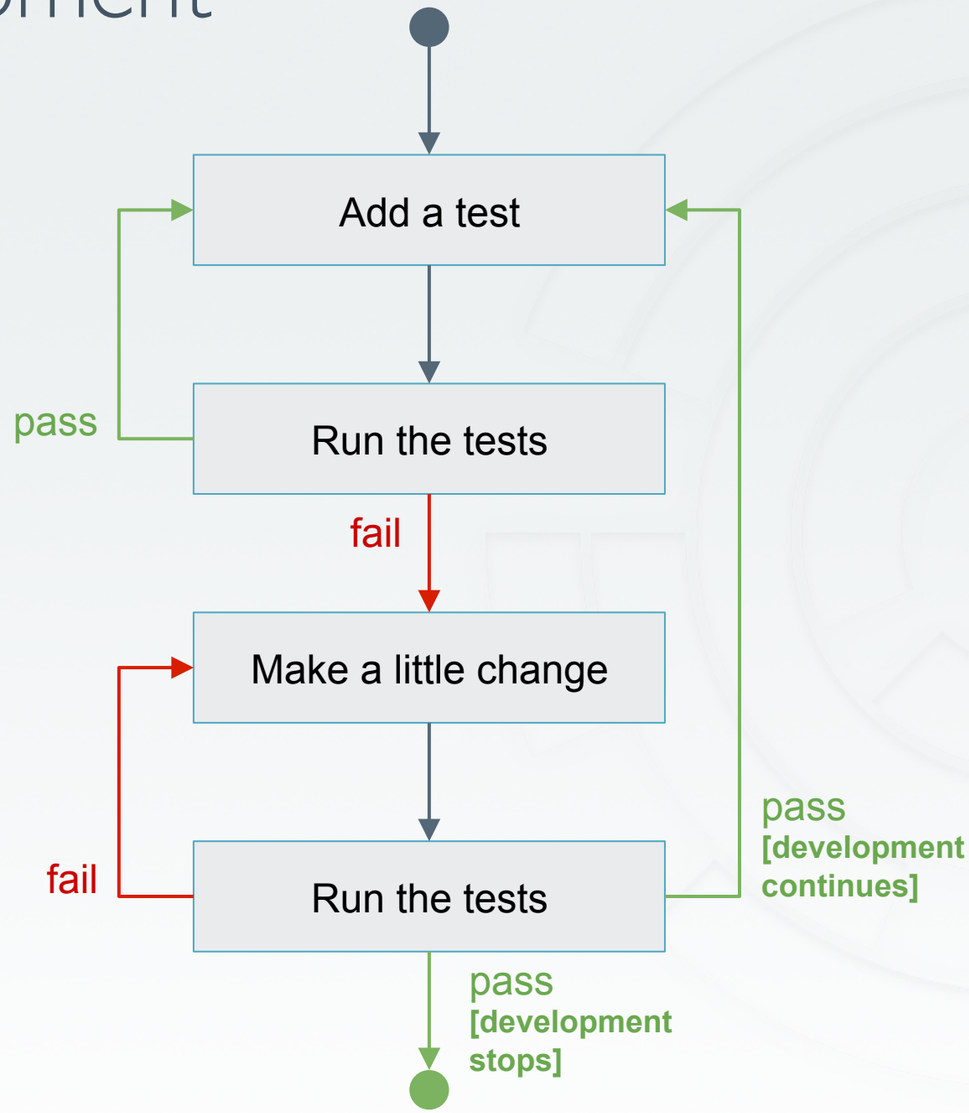
Converge

```
$ kitchen converge
```

```
-----> Starting Kitchen (v1.15.0)
...
-----> Creating <server-centos-73>...
       Sending build context to Docker daemon 227.8 kB
       Sending build context to Docker daemon
       Step 0 : FROM centos:centos7
...
Running handlers:
[2017-03-12T02:26:16+00:00] INFO: Running report handlers
Running handlers complete
[2017-03-12T02:26:16+00:00] INFO: Report handlers complete
Chef Client finished, 1/1 resources updated in 01 seconds
Finished converging <server-centos-73> (0m23.54s).
-----> Kitchen is finished. (1m0.39s)
```

Test-driven Development



Verify the Kitchen

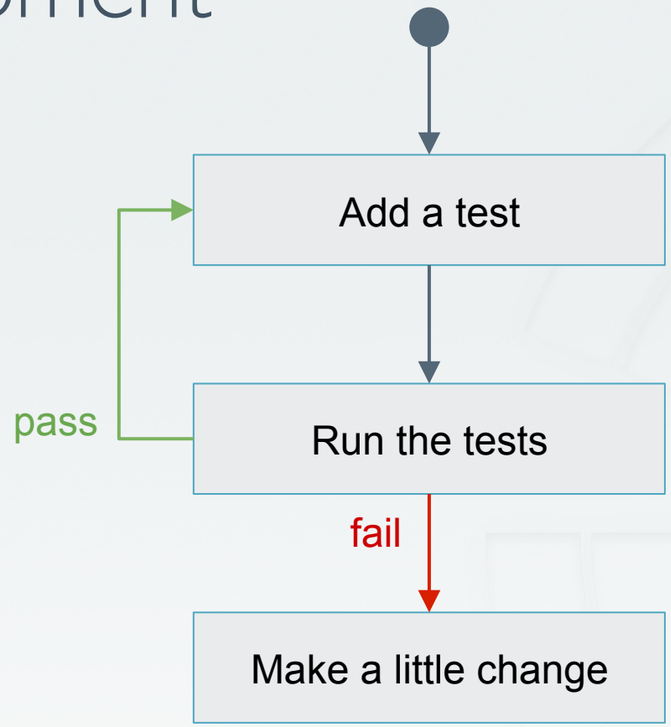
```
$ kitchen verify
```

```
-----> Verifying <server-centos-73>...
       Loaded

Target:  ssh://kitchen@localhost:32771

  ×  sshd-1.0: SSH Version 2 (
     expected: 2
          got:

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

     expected: 2
          got:

     (compared using `cmp` matcher)


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

INSPEC

CHEF

Test-driven Development



Edit the SSH Configuration Template

~/cookbooks/ssh/templates/sshd_config.erb

```
#ListenAddress 0.0.0.0
#ListenAddress ::

# The default requires explicit activation of protocol 1
-#Protocol 2
+Protocol 2

# HostKey for protocol version 1
```

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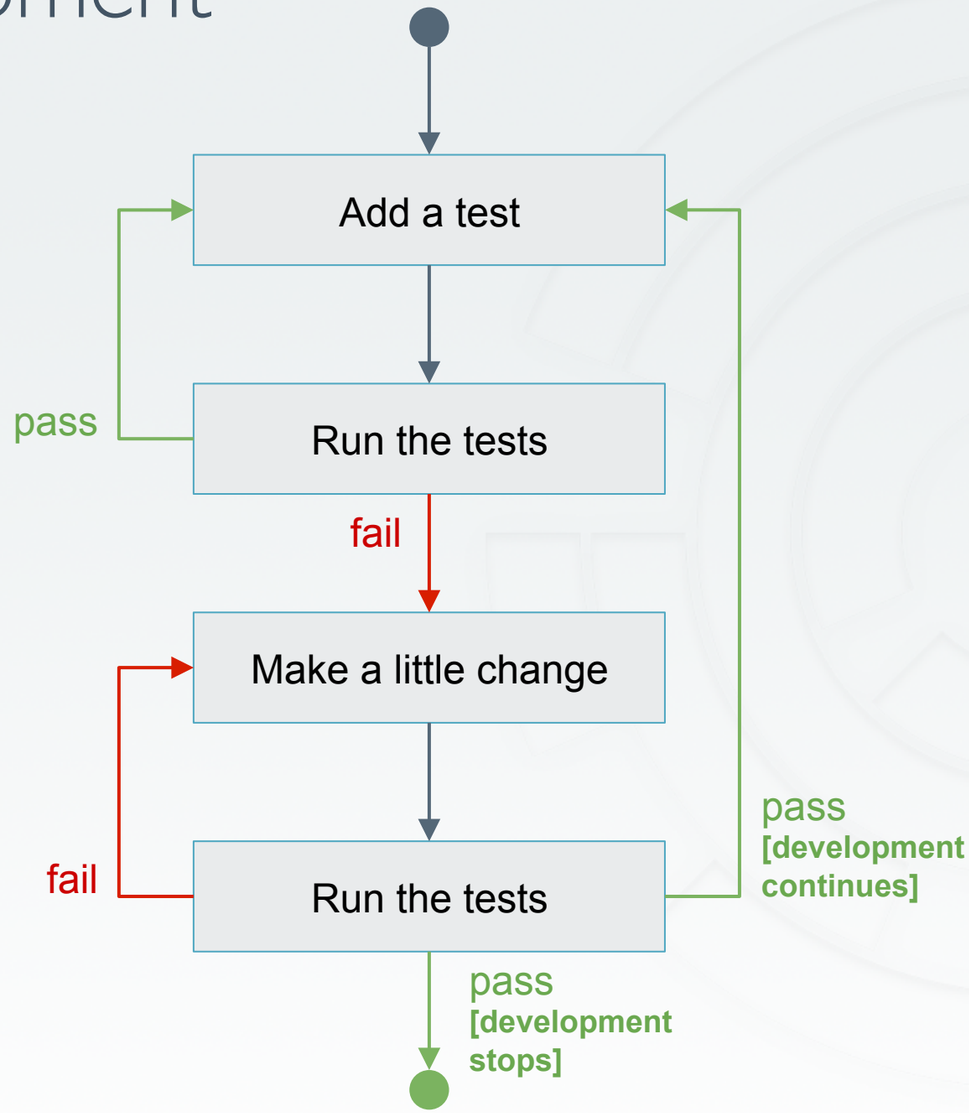
Test-driven Development



Converge

```
$ kitchen converge
```

```
-----> Starting Kitchen (v1.15.0)
...
-----> Converging <server-centos-73>...
...
# The default requires explicit activation of protocol 1
-#Protocol 2
+Protocol 2

# HostKey for protocol version 1
...
Running handlers:
[2017-03-12T02:32:32+00:00] INFO: Running report handlers
Running handlers complete
[2017-03-12T02:32:32+00:00] INFO: Report handlers complete
Chef Client finished, 1/1 resources updated in 01 seconds
Finished converging <server-centos-73> (0m16.32s).
-----> Kitchen is finished. (0m17.34s)
```

Verify the Kitchen

```
$ kitchen verify
```

```
-----> Starting Kitchen (v1.15.0)
...
-----> Verifying <server-centos-73>...
       Loaded

Target:  ssh://kitchen@localhost:32771

  ✔  sshd-1.0: SSH Version 2
     ✔  SSH Configuration Protocol should cmp == 2

Profile Summary: 1 successful, 0 failures, 0 skipped
Test Summary: 1 successful, 0 failures, 0 skipped
       Finished verifying <server-centos-73> (0m0.22s).
-----> Kitchen is finished. (0m1.27s)
```

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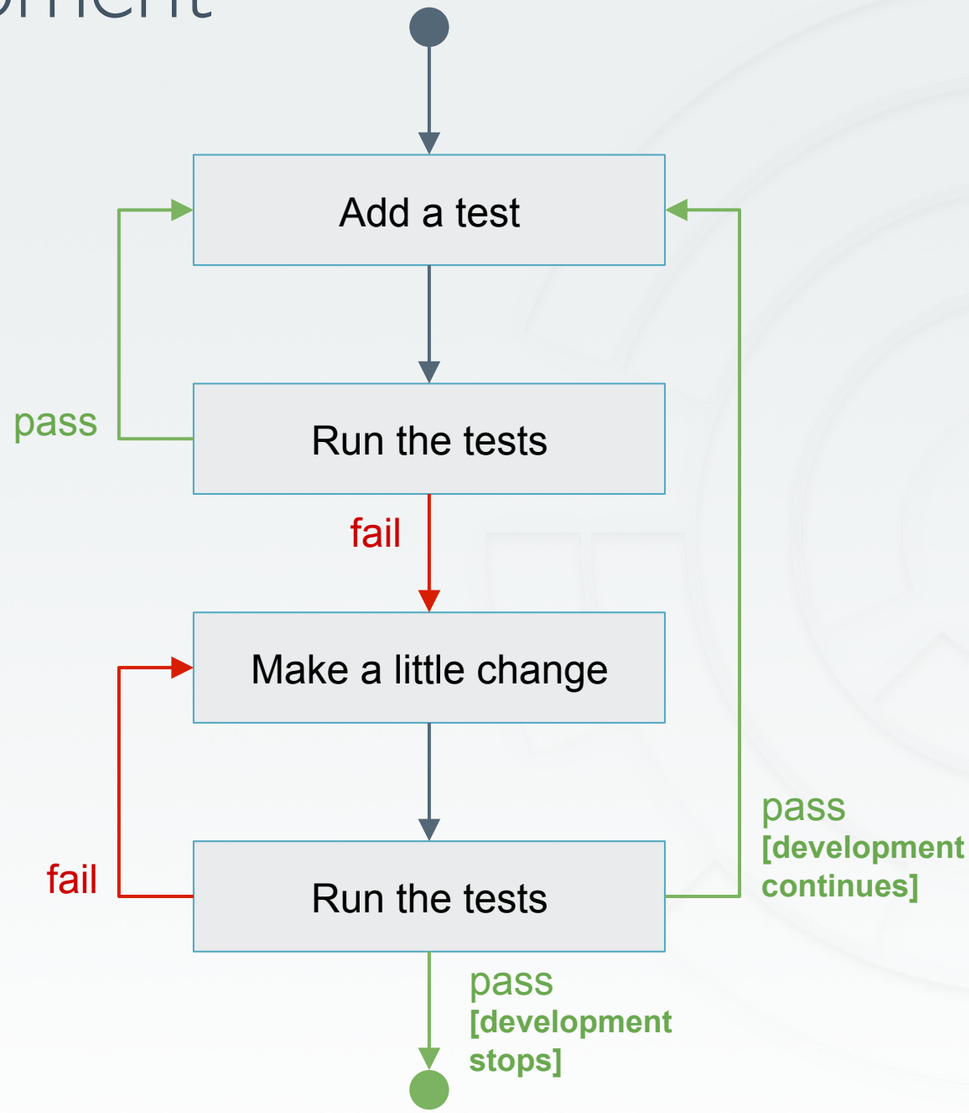
Test-driven Development



Test the Kitchen (1 of 2)

```
$ kitchen test
```

```
-----> Starting Kitchen (v1.15.0)
...
-----> Cleaning up any prior instances of <server-centos-73>
-----> Destroying <server-centos-73>...
...
-----> Testing <server-centos-73>
-----> Creating <server-centos-73>...
...
-----> Creating <server-centos-73>...
...
       Finished creating <server-centos-73> (0m0.60s).
-----> Converging <server-centos-73>...
...
```

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Test the Kitchen (2 of 2)

```
$ kitchen test
```

```
-----> Installing Chef Omnibus (install only if missing)
...
-----> Setting up <server-centos-73>...
       Finished setting up <server-centos-73> (0m0.00s).
-----> Verifying <server-centos-73>...
...
Profile Summary: 1 successful, 0 failures, 0 skipped
Test Summary: 1 successful, 0 failures, 0 skipped
       Finished verifying <server-centos-73> (0m0.51s).
-----> Destroying <server-centos-73>...
...
-----> Kitchen is finished. (0m25.18s)
```

What's next?

- Test-driven development cycle is complete
- Deploy the change

Remediate with Chef

```
$ sudo run_chef "recipe[ssh::server],recipe[audit::default]"
```

```
[2017-03-10T16:48:02+00:00] INFO: Forking chef instance to converge...
Starting Chef Client, version 12.18.31
...
Synchronizing Cookbooks:
  - ssh (0.1.0)
  - audit (2.4.0)
  - compat_resource (12.16.3)
...
    -#Protocol 2
    +Protocol 2
...
[2017-03-10T16:48:05+00:00] INFO: Chef Run complete in 1.248588588 seconds

Running handlers:
...
[2017-03-10T16:48:05+00:00] INFO: Report handlers complete
Chef Client finished, 1/3 resources updated in 03 seconds
```

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Verify Converge Status in Automate

Total Resources	Failed	Successful	Unchanged	Unprocessed
3	0	1	2	0

Status	Step	Type	Name	Action	Cookbook	View
✓	1/3	chef_gem	inspec	install	audit	- -
✓	2/3	template	/etc/ssh/sshd_config	create	ssh	- -

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Verify Compliance Status in Automate

Converge Status | Compliance Status

This node is compliant. View scan results

Node Name	orange-3-of-hearts
Scan Duration	5:03 PM - 5:03 PM
Scan Time	a few seconds
Scan Initiator	Scheduled
Scan ID	6076b098-e02c-4b6e-8731-8c63217e8733

Inspec Version	1.15.0
Profiles Scanned	1
Platform(s)	not defined

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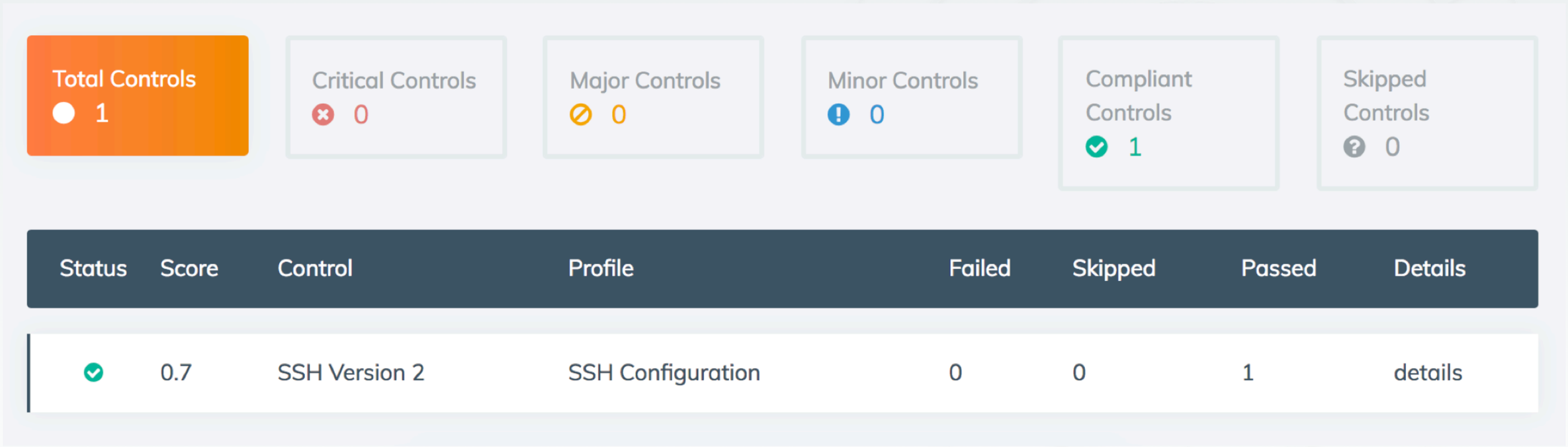
Verify Compliance Status in Automate



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More hands-on Exercises

Still have time to play around?

Server SSH Key

- Write a control that:
  - Tests for the existence of `/etc/ssh/ssh_host_rsa_key`
  - Tests that `/etc/ssh/ssh_host_rsa_key` contains "`BEGIN RSA PRIVATE KEY`"
- Check out the docs on http://inspec.io for what InSpec resource you can use

Ensure SSH root login is disabled

- The PermitRootLogin parameter specifies if the root user can log in using ssh(1). The default is no.

- Disallowing root logins over SSH requires system admins to authenticate using their own individual account, then escalating to root via sudo or su. This in turn limits opportunity for non-repudiation and provides a clear audit trail in the event of a security incident

- Add a control to `~/profiles/ssh/controls/ssh.rb`

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

    Or look at the ssh-hardening cookbook

Build additional CIS controls

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

Static Analysis

- Ensure cookbooks pass chefstyle
- Ensure cookbooks pass foodcritic

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Unit Testing

- Add unit testing to the cookbooks

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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

DAY 1 // MAY 22

- ★ Workshops & Chef Training
- ★ DevOps Leadership Summit
- ★ Community Summit
- ★ Partner Summit
- ★ Welcome Reception
- ★ Customer Dinner
- ★ Analyst Day

DAY 2 // MAY 23

- ★ Keynotes
- ★ Technical Sessions
- ★ Happy Hour
- ★ Game Night
- ★ Executive Dinner

DAY 3 // MAY 24

- ★ Keynotes
- ★ Technical Sessions
- ★ Awesome Chef Awards
- ★ Community Celebration

DAY 4 // MAY 25

- ★ Hackday

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