



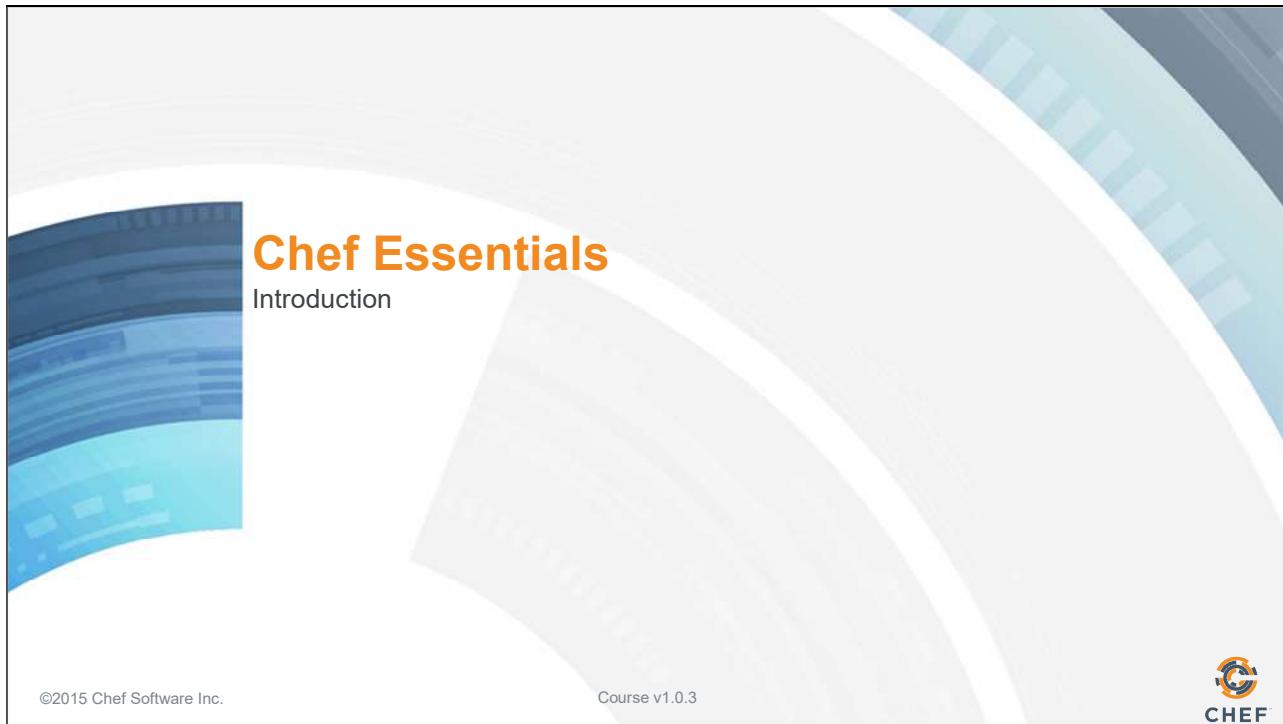
CHEFTM

Chef Training Services

Chef Essentials

Instructor Guide

1: Introduction



This Chef Essentials course provides a basic understanding of Chef's core components, basic architecture, commonly used tools, and basic troubleshooting methods.

This should provide you with enough knowledge to start using Chef to automate common infrastructure tasks and express solutions to common infrastructure problems.

Instructor Note: Be sure to read Appendix Z for training lab set up notes and additional instructor notes.

Slide 2

Introduce Yourselves

Name

Current job role

Previous job roles/background

Experience with Chef and/or config management

Favorite Text Editor



Expectations

You will leave this class with a basic understanding of Chef's core components, architecture, commonly used tools, and basic troubleshooting methods

You bring with you your own domain expertise and problems. Chef is a framework for solving those problems. Our job is to teach you how to express solutions to your problems with Chef.



Chef is not, in itself, a solution to your infrastructure problems. Chef is an automation framework. You bring the domain expertise about your own business and its problems. Chef provides a platform for modeling solutions to those problems. Our job in this class is to work together to teach you how to express solutions to your unique problems with Chef.

Together we get unicorns and rainbows, but we can't have one without the other.

Course Objectives

After completing this course, you should be able to:

- Use Chef Resources to define the state of your system
- Write and use Chef recipes and cookbooks
- Automate testing of cookbooks
- Manage multiple nodes with Chef Server
- Create Organizations
- Bootstrap nodes
- Assign Roles to nodes
- Deploy nodes to environments



Agenda

Day 1

- Getting a Workstation
- Using Resources
- Building Cookbooks
- Test Kitchen
- Details About a System
- Desired State and Data
- Local Workstation Installation

Day 2

- Connecting to Chef Server
- Community Cookbooks
- Managing Multiple Nodes
- Roles
- Search
- Environments



Slide 6

Chef

Chef can automate how you build, deploy, and manage your infrastructure.

Chef can integrate with cloud-based platforms such as Rackspace and Amazon Elastic Compute Cloud to automatically provision and configure new machines.



Chef can automate how you build, deploy, and manage your infrastructure. Your infrastructure becomes as versionable, testable, and repeatable as application code enabling you to automate the process of configuring, deploying and scaling servers and applications

Chef

Chef is a large set of tools that are able to be used on multiple platforms and in numerous configurations.

Learning Chef is like learning a language. You will reach fluency very fast but it will take practice until you become comfortable.

A great way to learn Chef is to use Chef



Chef is a large set of tools that are able to be used on multiple platforms and in numerous configurations. We will have time to only explore some of its most fundamental pieces.

Learning Chef is like learning a language. You will reach fluency very fast but it will take practice until you become comfortable.

Chef Fundamentals

Ask Me Anything: It is important that we answer your questions and set you on the path to find more.

Break It: If everything works the first time go back and make some changes. Break it!



Ask Me Anything: All of us are coming here with *unique* experiences and from *unique* teams that are using Chef in *unique* ways. It is important that we answer your questions and set you on the path to find more.

Break It: If everything works the first time go back and make some changes. Break it! It's rare that you have a safe space like this to explore. Sometimes it's more important to know what something looks like when it does not work than when it does work.

Chef Lab System Architecture

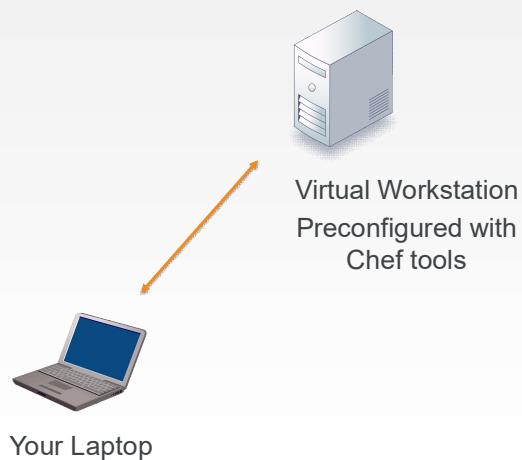
In this course you will use two different architectures:

1. Initially, you'll use a virtual workstation so you can start using Chef right away.
2. Later, you'll use a common production type of architecture that includes a Chef Server.



Chef Lab System Architecture

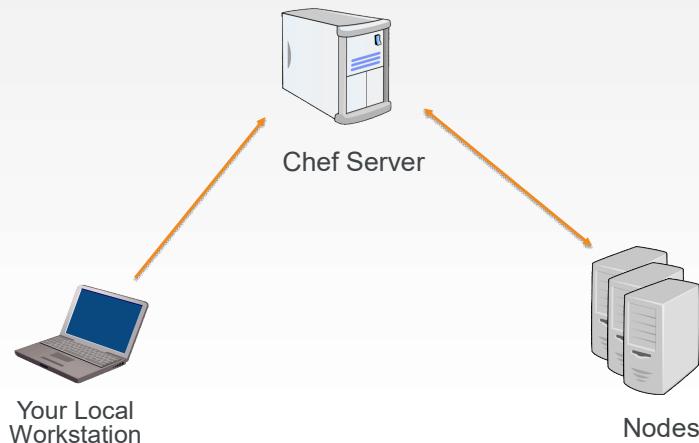
Architecture 1



This is the architecture you'll start using in a few minutes. To ensure the smoothest setup experience, you'll be using a virtual workstation with all the necessary tools installed so you can start using Chef right away.

Chef Lab System Architecture

Architecture 2



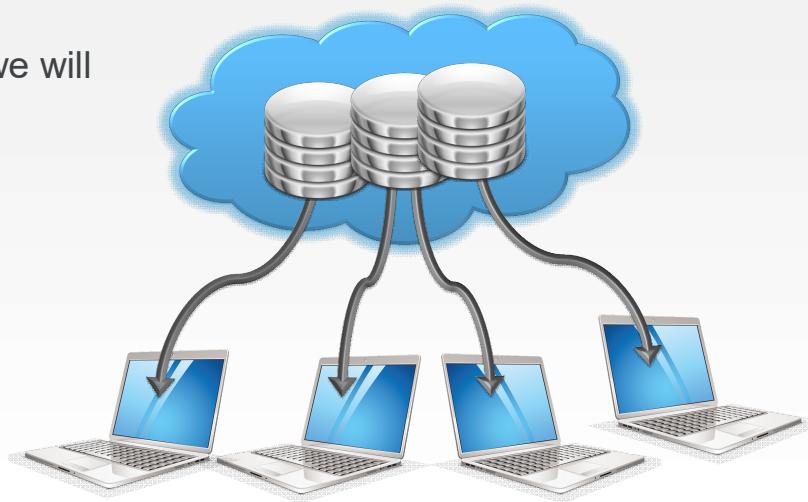
This is the architecture you'll be using later in this course. When using this architecture, the Chef tools will be installed on your laptop and you'll perform your configurations locally before pushing them to the Chef server and ultimately to the nodes you will be managing.

In this way, when you complete this course you will have a code repository on your laptop that can be used and modified to solve real business problems.

We'll discuss the items in this architecture in more detail later in this class.

Getting a Workstation

Around the end of Day 1, we will have an Install Fest.



Around the end of Day 1, we will have an Install Fest.

During that time we will install all the necessary tools on your workstation (your laptop) and troubleshoot any installation issues you may experience.

Configuring a Workstation

We need the following:

- Chef Development Kit (ChefDK)
- Editor
- git (optional)



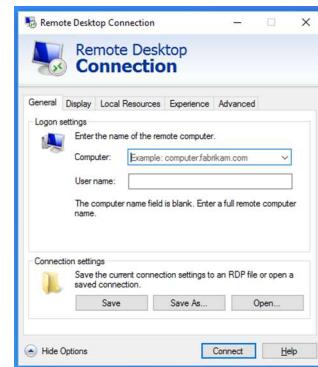
Hands-on Legend

- GE or Group Exercise: All participants and the instructor do this task together with the instructor often leading the way and explaining things as we proceed.
- Lab: You perform this task on your own.

In this course, various slides and pages will be tagged with either Group Exercise (or GE), or Lab. This slide defines those tags.

GE: Login to the Remote Workstation

Use the **address**, **user name**, and **password** to connect to the remote workstation.



In this course, various slides and pages will be tagged with either Group Exercise (or GE), or Lab. This slide defines those tags.

Slide 16



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2: Chef Resources

Chef Resources

Chef's Fundamental Building Blocks

©2015 Chef Software Inc.



Slide 2

Objectives



After completing this module, you should be able to:

- Use Chef to install packages on your virtual workstation
- Use the chef-apply command
- Create a basic Chef recipe file
- Define Chef Resources

Slide 3

Choose an Editor



You'll need to choose an editor to edit files:

emacs

nano

vi / vim

During this course we are going to need our workstations to have an editor installed. There are at least three command-line editors that we can choose from on the Linux workstation: Emacs, Nano, or Vim.

Linux Editor Reference



Tips for using these editors can be found below in your participant guide.

emacs

nano

vi / vim

Emacs: (Emacs is fairly straightforward for editing files.)

OPEN FILE \$ emacs FILENAME
WRITE FILE ctrl+x, ctrl+w
EXIT ctrl+x, ctrl+c

Nano: (Nano is usually touted as the easiest editor to get started with editing through the command-line.)

OPEN FILE \$ nano FILENAME
WRITE (When exiting) ctrl+x, y, ENTER
EXIT ctrl+x

VIM: (Vim, like vi, is more complex because of its different modes.)

OPEN FILE \$ vim FILENAME
START EDITING i
WRITE FILE ESC, :w
EXIT ESC, :q
EXIT (don't write) ESC, :q!

Slide 5

GE: How About Nano?



```
$ which nano
```

```
/usr/bin/which: no nano in  
(/usr/local/bin:/bin:/usr/bin:/usr/local/sbin:/usr/sbin:/sbin:/home/chef/bin)
```

Now that you've picked your editor, you need to find out if it is already installed.

Use the `which` command to ask the Operating System (OS) if it knows if there is an executable for our text editor in our path.

Is nano installed? No, it doesn't look like it.

Slide 6

GE: How About Vim?



\$ which vim

```
/usr/bin/which: no vim in  
(/usr/local/bin:/bin:/usr/bin:/usr/local/sbin:/usr/sbin:/sbin:/home/chef/bin)
```

Slide 7

GE: How About Emacs?



\$ which emacs

```
/usr/bin/which: no emacs in  
(/usr/local/bin:/bin:/usr/bin:/usr/local/sbin:/usr/sbin:/sbin:/home/chef/bin)
```

Is emacs installed? Seems like it isn't either.

It seems your workstation doesn't have any of the preferred command-line editors installed. So that means there is a little more configuration left for you to do.

Learning Chef



One of the best ways to learn a technology is to apply the technology in every situation that it can be applied.

A number of chef tools are installed on the system so lets put them to use.

But before you figure out the Linux distribution and start installing packages through the distribution's specific package manager, this seems like a perfect opportunity to experiment with how to solve configuration problems with Chef.

One of the best ways to learn a technology is to apply the technology in every situation that it can be applied. A number of chef tools are installed on the system so lets put them to use.

Slide 9

What is chef-apply?



chef-apply is a command-line application that allows us to work with resources and recipes files.

The first tool we will explore is `chef-apply`. It is a command-line application that allows us to work with resources and recipes files.

What Can chef-apply Do?



```
$ sudo chef-apply --help
```

```
Usage: chef-apply [RECIPE_FILE] [-e RECIPE_TEXT] [-s]
      --[no-]color           Use colored output, defaults to enabled
      -e, --execute RECIPE_TEXT Execute resources supplied in a string
      -j JSON_ATTRIBUTES,   Load attributes from a JSON file or URL
      --json-attributes
      -l, --log_level LEVEL Set the log level (debug, info, warn, error,
fatal)
      --minimal-chai        Only run the bare minimum ohai plugins chef
need ...
      -s, --stdin            Execute resources read from STDIN
      -v, --version          Show chef version
      -w, --why-run          Enable whyrun mode
      -h, --help              Show this message
```

Run the chef-apply application on the workstation with the "--help" flag to learn more about it.

Reading the output you may be left with more questions. Like what is recipe file? What is recipe text? What are resources?

Let us start answering those questions by looking at Chef's documentation.

Slide 11

DOCS

Resources



A resource is a statement of configuration policy.

It describes the desired state of an element of your infrastructure and the steps needed to bring that item to the desired state.

<https://docs.chef.io/resources.html>

First, let's look at Chef's documentation about resources. Visit the docs page on resources and read the first three paragraphs.

Afterwards, let us look at a few examples of resources.

Instructor Note: This may sound unusual to ask people to read the documentation site but it is important that they learn to refer to the documentation. This page is an important reference page.

Example: Package



```
package 'httpd'
```

The package named 'httpd' is installed.

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

Here is an example of the package resource. The package named 'httpd' is installed.

Instructor Note: The default action for the package resource is create. When you do not specify an action or attributes you can define it without the do and end block.

Example: Service



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

The service named 'ntp' is enabled (start on reboot) and started.

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

In this example, the service named 'ntp' is enabled and started.

Instructor Note: Service resources are often defined with two actions. The action method can only take one parameter so to provide two actions you need to specify the two actions within an Array.

Slide 14

Example: File



```
file '/etc/motd' do
  content 'This company is the property ...'
end
```

The file name '/etc/motd' is created with content 'This company is the property ...'

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

In this example, the file named '/etc/motd' is created with content "This company is the property...".

Instructor Note: The default action for the file resource is to create the file.

Example: File



```
file '/etc/php.ini.default' do
  action :delete
end
```

The file name '/etc/php.ini.default' is deleted.

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

In this example, the file named '/etc/php.ini.default' is deleted.

Instructor Note: A resource's default action is based on the principle of least surprise. So they are often creative actions towards the system. This is why the file resource specified here has the action specified. It is not the default action.

Using the -e Execute Option

```
$ sudo chef-apply --help
```

Usage: chef-apply [RECIPE_FILE] [-e RECIPE_TEXT] [-s]	
--[no-]color	Use colored output, defaults to enabled
-e, --execute RECIPE_TEXT	Execute resources supplied in a string
-j JSON_ATTRIBS,	Load attributes from a JSON file or URL
--json-attributes	
-l, --log_level LEVEL	Set the log level (debug, info, warn, error, fatal)
--minimal-chai	Only run the bare minimum ohai plugins chef need ...
-s, --stdin	Execute resources read from STDIN
-v, --version	Show chef version
-W, --why-run	Enable whyrun mode
-h, --help	Show this message



Let's return to the `chef-apply` command. It looks like you can supply a resource or resources, in a string or text, with the -e flag.

Editors are software and software is delivered to our system through packages. So it seems like you could use the package resource to install our preferred editor.

Group Exercise: Install nano, emacs or vim



```
$ sudo chef-apply -e "package 'nano'"
```

```
Recipe: (chef-apply cookbook)::(chef-apply recipe)
  * yum_package[nano] action install
    - install version 2.0.9-7.el6 of package nano
```

Install the editor package of your choice. In this example we are choosing to install the nano package which installs the nano editor.

You are invited to change the value here to install the editor of your choice.

Slide 18

Group Exercise: Did I Install My Editor?



```
$ which nano
```

```
/bin/nano
```

Verify that the editor is installed by again using the `which` command followed by either nano, emacs or vim.

The 'which' command reports where it was able to find the executable.

Slide 19

Group Exercise: Test and Repair



1. What would happen if you ran the installation command again?
2. What would happen if the package were to become uninstalled?

What would happen if you ran the installation command again? Before you execute the command think about what will happen. Think about what you would want to happen. Look at the output from the previous execution. Then take a guess. Write it down or type out what you think will happen. Then execute the command again.

What would happen if the package were to become uninstalled? What would the output be if you ran installation command again? Was there a situation where the package was already uninstalled and we executed this resource text?

Test and Repair



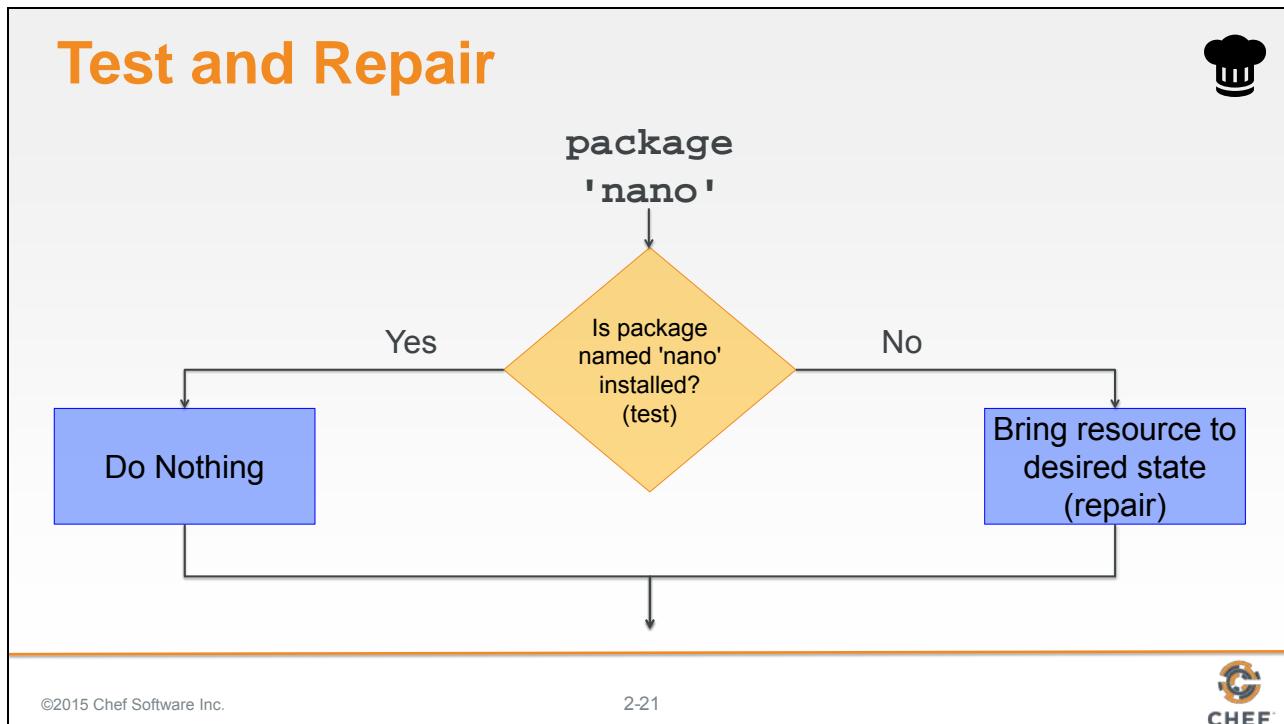
`chef-apply` takes action only when it needs to. Think of it as test and repair.

Chef looks at the current state of each resource and takes action only when that resource is out of policy.

Hopefully it is clear from running the `chef-apply` command a few times that the resource we defined only takes action when it needs to take action.

We call this test and repair. Test and repair means the resource first tested the system before it takes action.

Slide 21



If the package is already installed, then the resource does not need to take action.

If the package is not installed, then the resource NEEDS to take action to install that package.

Slide 22



Group Exercise: Hello, World?

I heard Chef is written in Ruby. If that's the case its required that we write a quick "Hello, world!" application.

Objective:

- Create a recipe file that defines the policy:
- The file named "hello.txt" is created with the content "Hello, world!".

Great! You installed an editor using `chef-apply` but we missed a very important step.

Chef is written in Ruby. Ruby is a programming language and it is required that the first program you write in a programming language is 'Hello World'.

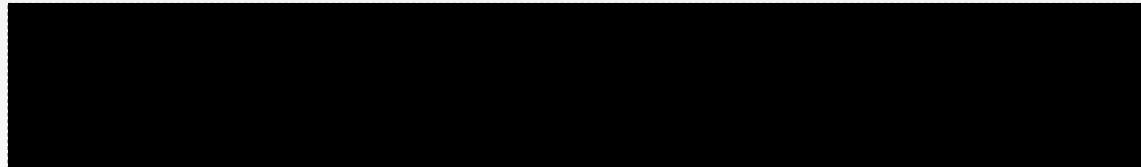
So let's walk through creating a recipe file that creates a file named 'hello.txt' with the contents 'Hello world!'.

Slide 23

GE: Create and Open a Recipe File



```
$ nano hello.rb
```



Using your editor open the file named 'hello.rb'. 'hello.rb' is a recipe file. It has the extension '.rb' because it is a ruby file.

Slide 24

GE: Create a Recipe File Named hello.rb

```
~/hello.rb  
file 'hello.txt' do  
  content 'Hello, world!'  
end
```

The file named 'hello.txt' is created with the content 'Hello, world!'

<https://docs.chef.io/resources.html>

- Add the resource definition displayed above. We are defining a resource with the type called 'file' and named 'hello.txt'. We also are stating what the contents of that file should contain 'Hello, World!'.
- Save the file and return to the terminal and the `chef-apply` command.

Instructor Note: The default action is to create the file.

Slide 25

GE: Can chef-apply Run a Recipe File?



```
$ sudo chef-apply --help
```

```
Usage: chef-apply [RECIPE_FILE] [-e RECIPE_TEXT] [-s]
      --[no-]color           Use colored output, defaults to enabled
      -e, --execute RECIPE_TEXT Execute resources supplied in a string
      -j JSON_ATTRIBS,       Load attributes from a JSON file or URL
      --json-attributes
      -l, --log_level LEVEL Set the log level (debug, info, warn, error,
fatal)
      --minimal-ohai         Only run the bare minimum ohai plugins chef
need ...
      -s, --stdin            Execute resources read from STDIN
      -v, --version          Show chef version
      -w, --why-run          Enable whyrun mode
      -h, --help              Show this message
```

If you were to use '--help' flag again, it looks like you can provide a recipe file directly to the `chef-apply` command.

GE: Apply a Recipe File



```
$ sudo chef-apply hello.rb
```

```
Recipe: (chef-apply cookbook):::(chef-apply recipe)
* file[hello.txt] action create
  - create new file hello.txt
  - update content in file hello.txt from none to 315f5b
    --- hello.txt      2015-09-14 22:38:29.386137524 +0000
    +++ ./hello.txt    2015-09-14 22:38:29.386137524 +0000
    @@ -1 +1,2 @@
    +Hello, world!
```



Type the specified command to apply the recipe file. You should see that a file named 'hello.txt' was created and the contents updated to include your 'Hello, World!' text.

Instructor Note: The output that shows the contents of the file have been modified is being displayed in a format similar to a git diff (<http://stackoverflow.com/questions/2529441/how-to-read-the-output-from-git-diff>).

Slide 27

GE: What Does hello.txt Say?



```
$ cat hello.txt
```

```
Hello, world!
```

Lets look at the contents of the 'hello.txt' file to prove that it was created and the contents of file is what we wrote in the recipe. The result of the command should show you the contents 'Hello, world!'.

Slide 28

GE: Test and Repair



What would happen if you ran the command again?

What happens when I run the command again?

Again, before you run the command -- think about it. What are your expectations now from the last time you ran it? What will the output look like?

Slide 29

GE: Test and Repair



What would happen if the file contents were modified?

Go ahead and modify the contents of 'hello.txt' with your text editor. Write the file and then think about what you expect to see in the output. Then run the chef-apply command again.

- Modify the contents of 'hello.txt'. Save the file with the new contents.
- Then think about what will happen if you applied this recipe file again.
- Then use `chef-apply` to apply the recipe file again.

Slide 30

Test and Repair



What would happen if the file were removed?

And, of course, what would happen if the file was removed?

At this point you hopefully you are starting to understand the concept of test and repair.

Slide 31

Test and Repair



What would happen if the file permissions (mode), owner, or group changed?

Have we defined a policy for these attributes?

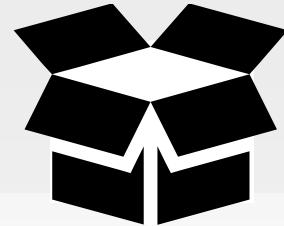
What would happen if the file permissions, owner or group of the file changed? In the resource that we defined have we specified the values that we desired in our policy.

Instructor Note: The learner is encouraged to change the file permissions, owner, and group here but it is not required. From the resource definition they have not set any of these attributes so Chef is relying on the default values provided by the file resource. This prepares them for the next exercise.

Slide 32

CONCEPT

Resource Definition



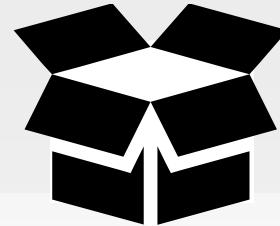
```
file 'hello.txt' do
  content 'Hello, world!'
end
```

The **TYPE** named **NAME** should be **ACTION'd** with **ATTRIBUTES**

Let's take a moment and talk about the structure of a resource definition. We'll break down the resource that we defined in our recipe file.

CONCEPT

Resource Definition



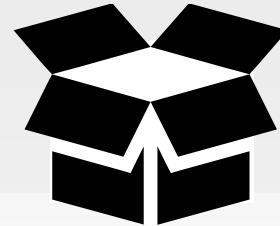
```
file 'hello.txt' do
  content 'Hello, world!'
end
```

The **TYPE** named **NAME** should be **ACTION'd** with **ATTRIBUTES**

The first element of the resource definition is the resource type. In this instance the type is 'file'. Earlier we used 'package'. We showed you an example of 'service'.

CONCEPT

Resource Definition



```
file 'hello.txt' do
  content 'Hello, world!'
end
```

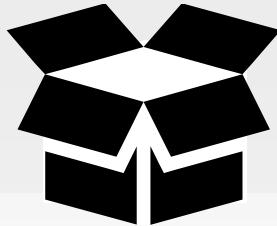
The **TYPE** named **NAME** should be **ACTION'd** with **ATTRIBUTES**

The second element is the name of the resource. This is also the first parameter being passed to the resource.

In this instance the resource name is also the relative file path to the file we want created. We could have specified a fully-qualified file path to ensure the file was written to the exact same location and not dependent on our current working directory.

CONCEPT

Resource Definition



```
file 'hello.txt' do
  content 'Hello, world!'
end
```

The **TYPE** named **NAME** should be **ACTION'd** with **ATTRIBUTES**

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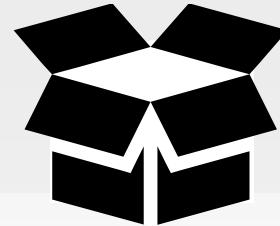
The `do` and `end` keywords here define the beginning of a ruby block. The ruby block and all the contents of it are the second attributes to our resource.

The contents of this block contains attributes (and other things) that help describe the state of the resource. In this instance, the source attribute here specifies the contents of the file.

Attributes are laid out with the name of the attributes followed by a space and then the value for the attribute.

CONCEPT

Resource Definition



```
file 'hello.txt' do
  content 'Hello, world!'
end
```



The **TYPE** named **NAME** should be **ACTION'd** with **ATTRIBUTES**

The interesting part is that there is no action defined. And if you think back to the previous examples that we showed you, not all of the resources have defined actions.

So what action is the resource taking? How do you know?



Lab: The file Resource

Read <https://docs.chef.io/resources.html>

Discover the file resource's:

- default action.
- default values for mode, owner, and group.

Update the file policy in "hello.rb" to:

The file named 'hello.txt' should be created with the content 'Hello, world!', mode '0644', owner is 'root', and group is 'root'.

Could you find that information in the documentation for the file resource?

- Read through the file Resource documentation.
- Find the list of actions and then see if you can find the default one.
- Find the list of attributes and find the default values for mode, owner, and group.

The reason for doing this is that we want you to return to the file resource in the the recipe file and add the action, if necessary, and attributes for mode, owner and group.

Instructor Note: Allow 10 minutes to complete this exercise.

Lab: The Updated file Resource



```
~/hello.rb
```

```
file 'hello.txt' do
  content 'Hello, world!'
  mode '0644'
  owner 'root'
  group 'root'
  action :create
end
```

The default action is to create (not necessary to define it).

The default mode is set by the POSIX Access Control Lists.

The default owner is the current user (could change).

The default group is the POSIX group (if available).

The file resources default action is to create the file. So if that is the policy we want our system to adhere to then we don't need to specify it. It doesn't hurt if you do, but you will often find when it comes to default values for actions we tend to save ourselves the keystrokes and forgo expressing them.

The file resource in the recipe may or may not need to specify the three attributes: mode; owner; and group.

The mode default value is "0644". That value could change depending on the Operating System we are currently running.

The default owner is the current user. That value could change depending on who applies this policy.

The default group is the POSIX group. In this instance this will be root. This could change depending on the system.

Slide 39

Questions



What questions can we answer for you?

Slide 40



Lab: Workstation Setup

Create a recipe file named "setup.rb" that defines the policy:

- The package named 'nano' is installed.
- The package named 'tree' is installed.
- The file named '/etc/motd' is created with the content 'Property of ...'.

Use chef-apply to apply the recipe file named "setup.rb"

Now that you've practiced:

- Installing an application with the package resource
- Creating a recipe file
- Creating a file with the file resource

Create a recipe that defines the following resource as its policy. When you are done defining the policy apply the policy to the system.

Instructor Note: Allow 15 minutes to complete this exercise.

Lab: Workstation Setup Recipe File



```
~/setup.rb
```

```
package 'nano'  
package 'vim'  
package 'emacs'  
  
package 'tree'  
  
file '/etc/motd' do  
  content 'Property of  
...'  
end
```

The package named 'nano' is installed.

The package named 'tree' is installed.

The file named '/etc/motd' is created with the content 'Property of ...'.

Here is a version of the recipe file that installs all the editors, our tree package, and creates the message-of -the-day file.

Slide 42

Lab: Apply the Setup Recipe



```
$ sudo chef-apply setup.rb
```

```
Recipe: (chef-apply cookbook)::(chef-apply recipe)
* apt_package[vim] action install (up to date)
* apt_package[tree] action install
  - install version 1.6.0-1 of package tree
* file[/etc/motd] action create
  - create new file /etc/motd
  - update content in file /etc/motd from none to d100eb
    --- /etc/motd 2015-05-11 23:17:00.869570000 +0000
    +++ /etc/.motd20150511-1762-trppul 2015-05-11 23:17:00.865570000 +0000
    @@ -1 +1,2 @@
    +Property of ...
```

This is how you apply the created recipe.

Slide 43

Let's Talk About Resources



Capture your answers because we're going to talk about them as a group.

Let's finish this Resources module with a discussion.

Write down or type out a few words for each of these questions. Talk about your answers with each other.

Remember that the answer "I don't know! That's why I'm here!" is a great answer.

Slide 44

Discussion



What is a resource?

What are some other possible examples of resources?

How did the example resources we wrote describe the desired state of an element of our infrastructure?

What does it mean for a resource to be a statement of configuration policy?

Answer these four questions:

- What is a resource?
- What are some other possible examples of resources?
- How did the examples resources we wrote describe the desired state of an element of our infrastructure?
- What does it mean for a resource to be a statement of configuration policy?

With your answers, turn to another person and alternate asking each other asking these questions and sharing your answers.

Slide 45

Q&A



What questions can we answer for you?

- chef-apply
- Resources
- Resource - default actions and default attributes
- Test and Repair

What questions can we answer for you?

About anything or specifically about:

- `chef-apply`
- resources
- a resources default action and default attributes
- Test and Repair

Slide 46



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3: Cookbooks



Objectives



After completing this module, you should be able to:

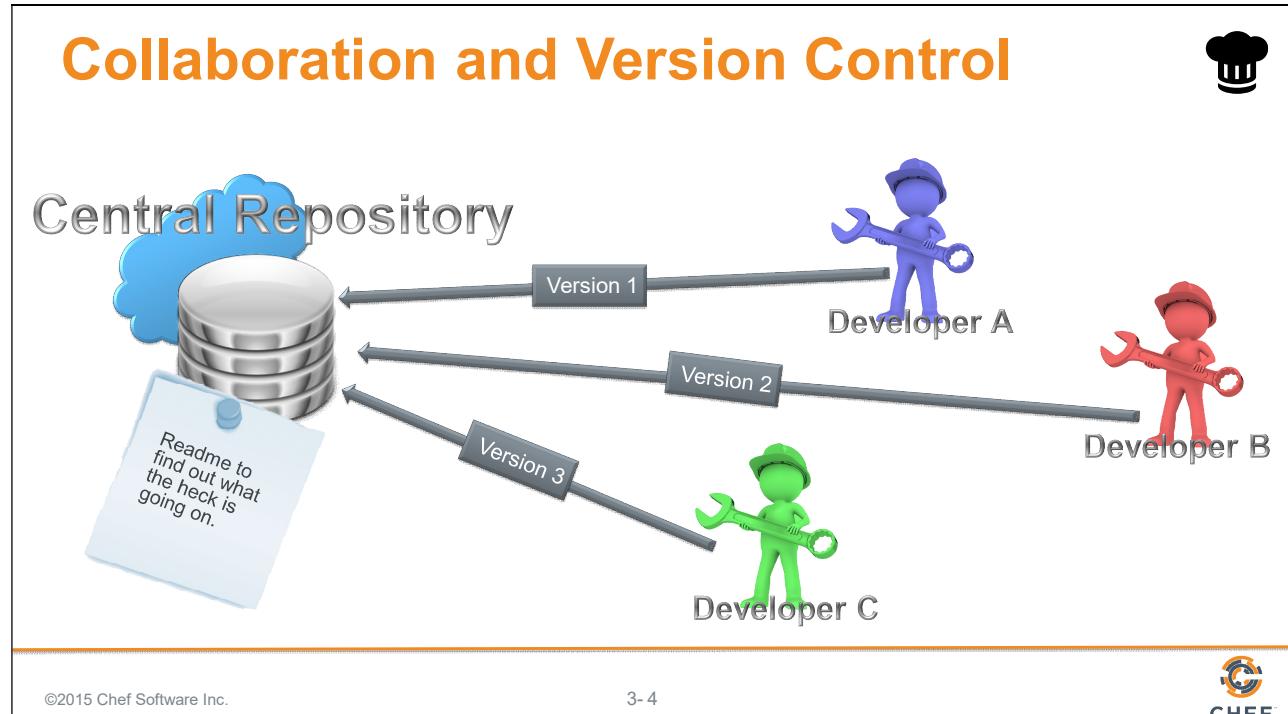
- Use version control
- Generate a Chef cookbook
- Define a Chef recipe that sets up a web server



Questions You May Have

1. Is there a way to package up recipes you create with a version number and a README?
2. If we have multiple versions - how might we better track these different changes and versions?
3. Thinking about the previous recipes, could we create a recipe to setup a web server?

1. Recipes on their own would be difficult to manage. Imagine handing a copy of a recipe that you develop to an individual. A few weeks later they come back to you and ask you why it no longer works. If you had made a number of changes since the last time you talked with them how do you know which version you gave them? Adding a version number and a README would allow you to better document the features of a particular recipe.
2. When developing recipes it is important to consider using a version control solution that allows us to track the changes that we make.
3. The recipe that you put together to disable UAC showed that Chef is powerful enough to manage the registry. Chef is powerful enough to install and configure a web server.



Before we answer that question, let's talk about collaboration. Usually, none of us work in a vacuum, and it's important that systems are in place to make collaboration easier. One such system is versioning. Versioning will make it easier to share the recipes that we create.

A versioning system should include:

A Central Repository into which all the developers publish their work.

Each revision should be stored as a new version.

For each change, a commit message should be added so that everyone knows what has or has not been changed

Versioning Pros and Cons

```
$ cp setup.rb setup.rb.bak  
or  
$ cp foo{,.`date +%Y%m%d%H%M`}   
or  
$ cp foo{,.`date +%Y%m%d%H%M` -`$USER`} 
```

Saving a copy of the original file as another filename.

Let's explore this first option of renaming the file by adding a quick extension, like in the first example shown here. In this way we can keep working on the original file as we add more features. As a group let's talk about the pros and cons of using this strategy.

So obviously a single backup won't do. We need backups more often as we are going to be iterating quickly.

We could use the current date and time down to the minute like in the second example. As a group let's talk about the pros and cons of using this strategy.

Would adding the user's name to the end of the file, like in the third example, solve the problems we are facing with other choices? Again what are the pros and cons of this new approach?

Git Version Control



git is a distributed revision control system with an emphasis on speed, data integrity, and support for distributed, non-linear workflows.

We will be using **git** throughout the rest of this course.



How about we use git?

What are the pros and cons of this approach?

For the rest of this course we will be using git. This may not be the version control software you use on your teams or within your organization and that is alright. Our use of git within this course is used solely to demonstrate the use of version control when developing Chef code. When you develop with Chef you are welcome to use the version control system of your choice.

Instructor Note: It is not important that the learners understand and learn all of git during this course. It is more important that the learners understand when and where to use version control to save their work. This is about training them on making changes, testing, and then committing their work. Version control is an instrumental piece of the workflow when you adopt Infrastructure as code. There are some benefits of learning and using git because Chef uses git and GitHub to do almost all development of Chef. The majority of the Chef community uses git and GitHub.



GE: Create a Cookbook

How are we going to manage this file? Does it need a README?

Objective:

- Use chef to generate a cookbook to store our disable-uac recipe.
- Add the "workstation" cookbook to version control.

The setup recipe now installs everything we currently need on our workstation.

But before throw this recipe file into a directory with our other scripts we should look at a concept in Chef called a cookbook.

What is a cookbook? How do we create one? Let's ask 'chef'.

CONCEPT

What is 'chef'?



An executable program that allows you generate cookbooks and cookbook components.

In this context, 'chef' is a command, not the company.

What's the best way to learn Chef? Use Chef. We want you to literally run 'chef'.

Slide 9

What can 'chef' do?

```
$ chef --help
```

```
Usage:
  chef -h/--help
  chef -v/--version
  chef command [arguments...] [options...]

Available Commands:
  exec      Runs the command in context of the embedded ruby
  gem       Runs the `gem` command in context of the embedded ruby
  generate   Generate a new app, cookbook, or component
  shell-init Initialize your shell to use ChefDK as your primary ruby
  install    Install cookbooks from a Policyfile and generate a locked cookbook
set
  update    Updates a Policyfile.lock.json with latest run_list and cookbooks
```



'chef' is a command-line application that does quite a few things. The most important thing to us right now is its ability to generate cookbooks and components.

Alright. So 'chef' can generate a cookbook. But what is the purpose of a cookbook? That sounds like we should read the documentation.

Cookbooks



A Chef cookbook is the fundamental unit of configuration and policy distribution.

Each cookbook defines a scenario, such as everything needed to install and configure MySQL, and then it contains all of the components that are required to support that scenario.

Read the first three paragraphs here: <http://docs.chef.io/cookbooks.html>



It's important that you learn to read the Chef documentation. Let's look up cookbooks in Chef's documentation. Visit the docs page on cookbooks and read the first three paragraphs.

A cookbook is a structure that contains recipes. It also contains a number of other things—but right now we are most interested in a finding a home for our recipes, giving them a version, and providing a README to help describe them.

What Can 'chef generate' Do?

```
$ chef generate --help
```

```
Usage: chef generate GENERATOR [options]
```

```
Available generators:
```

app	Generate an application repo
cookbook	Generate a single cookbook
recipe	Generate a new recipe
attribute	Generate an attributes file
template	Generate a file template
file	Generate a cookbook file
lwrp	Generate a lightweight resource/provider
repo	Generate a Chef policy repository
policyfile	Generate a Policyfile for use with the install/push commands (experimental)

Let's examine the 'chef generate' command. We can see that the command is capable of generating a large number of different things for us. It looks like if we want to generate a cookbook we're going to need to use 'chef generate cookbook'.

What Can 'chef generate cookbook' Do?

```
$ chef generate cookbook --help
```

Usage: chef generate cookbook NAME [options]

-C, --copyright COPYRIGHT	Name of the copyright holder - default...
-m, --email EMAIL	Email address of the author - defaults...
-a, --generator-arg KEY=VALUE	Use to set arbitrary attribute KEY to ...
-I, --license LICENSE	all_rights, httpd, mit, gplv2, gplv3 -
-g GENERATOR_COOKBOOK_PATH,	Use GENERATOR_COOKBOOK_PATH for the
--generator-cookbook	

Let's ask the 'chef generate cookbook' command for help to see how it is used.

To generate a cookbook, all we have to do is provide it with a name.

There are two hard things in Computer Science and one of those is giving something a name.

GE: Let's Create a Cookbook

```
$ chef generate cookbook workstation
Compiling Cookbooks...
Recipe: code_generator::cookbook
  * directory[C:/Users/Administrator/workstation] action create
    - create new directory C:/Users/Administrator/workstation
  * template[C:/Users/Administrator/workstation/metadata.rb] action
create_if_missing
    - create new file C:/Users/Administrator/workstation/metadata.rb
    - update content in file C:/Users/Administrator/workstation/metadata.rb
from none to 0a7e23
    (diff output suppressed by config)
  * template[C:/Users/Administrator/workstation/README.md] action
create_if_missing
    - create new file C:/Users/Administrator/workstation/README.md
```

We have you covered. Call the cookbook *workstation*. That's a generic enough name.

We want you to use 'chef generate' to generate a cookbook named *workstation*.

GE: The Cookbook Has a README

```
$ tree /f workstation
```

```
Folder PATH listing
Volume serial number is B04A-119C
C:\USERS\ADMINISTRATOR\WORKSTATION
|
|   .kitchen.yml
|   Berksfile
|   chefignore
|   metadata.rb
|   README.md
|
|   recipes
|       default.rb
|
|   spec
```

Aren't you curious what's inside it? Let's take a look with the help of the '`tree`' command. If we provide '`tree`' with a path we will see all the visible files in the specified directory.

So the chef cookbook generator created an outline of a cookbook with a number of default files and folders. The first one we'll focus on is the README.

CONCEPT

README.md



The description of the cookbook's features written in Markdown.

<http://daringfireball.net/projects/markdown/syntax>

All cookbooks that 'chef' will generate for you will include a default README file. The extension `.md` means that the file is a markdown file.

Markdown files are text documents that use various punctuation characters to provide formatting. They are meant to be easily readable by humans and can be easily be rendered as HTML or other formats by computers.

GE: The Cookbook Has Some Metadata



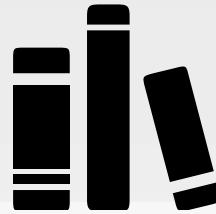
```
$ tree workstation
```

```
Folder PATH listing
Volume serial number is B04A-119C
C:\USERS\ADMINISTRATOR\WORKSTATION
|
|   .kitchen.yml
|   Berksfile
|   chefignore
|   metadata.rb
|   README.md
|
|   recipes
|       default.rb
|
|   spec
```

The cookbook also has a metadata file.

DOCS

metadata.rb



Every cookbook requires a small amount of metadata. Metadata is stored in a file called `metadata.rb` that lives at the top of each cookbook's directory.

http://docs.chef.io/config_rb_metadata.html

This is a ruby file that contains its own domain specific language (DSL) for describing the details about the cookbook.

GE: Let's Take a Look at the Metadata



```
$ gc workstation\metadata.rb
```

```
name          'workstation'
maintainer   'The Authors'
maintainer_email 'you@example.com'
license       'all_rights'
description   'Installs/Configures workstation'
long_description 'Installs/Configures workstation'
version       '0.1.0'
```

If you view the contents of your new cookbook's metadata, you'll see a number of details that help describe the cookbook:

The name of the cookbook, its maintainer, a way to reach them, how the cookbook is licensed, descriptions, and the cookbook's version number.

GE: The Cookbook Has a Folder for Recipes

```
$ tree workstation
└── Folder PATH listing
    Volume serial number is B04A-119C
    C:\USERS\ADMINISTRATOR\WORKSTATION
        ├── .kitchen.yml
        ├── Berksfile
        ├── chefignore
        ├── metadata.rb
        ├── README.md
        └── recipes
            └── default.rb
        └── spec
```



The cookbook also has a folder named *recipes*. This is where we store the recipes in our cookbook. You'll see that the generator created a default recipe in our cookbook. What does it do?

GE: The Cookbook Has a Default Recipe



```
$ gc workstation\recipes\default.rb
```

```
# Cookbook Name:: workstation
# Recipe:: default
#
# Copyright (c) 2015 The Authors, All Rights Reserved.
```

Looking at the contents of the default recipe you'll find it's empty except for some ruby comments.

A cookbook doesn't have to have a default recipe but most every cookbook has one. It's called *default* because when you think of a cookbook, it is probably the recipe that defines the most common configuration policy.

GE: Copy the Recipe into the Cookbook



```
$ mv disable-uac.rb workstation\recipes
```

From the Home directory, move your 'disable-uac.rb' recipe to the workstation cookbook and place it alongside our default recipe.



Group Exercise: Version Control

This is probably a good point to capture the initial state of our cookbook.

Objective:

- ✓ Use chef to generate a cookbook to store our disable-uac recipe.
- ❑ Add the "workstation" cookbook to version control.

Now that we have our cookbook with its README and version number, it's time to start tracking our changes with git.

GE: Move into the Cookbook Directory



```
$ cd workstation
```

Change into the workstation cookbook directory.

GE: Initialize the Directory as a git Repository



```
$ git init
```

```
Initialized empty Git repository in C:/Users/Administrator/workstation/.git/
```

We want git to start tracking the entire contents of this folder and any content in the subfolders. To do that with git, you need to execute the command 'git init' in the parent directory of the cookbook that you want to start tracking.

You will notice that git will say that the repository has been 'Reinitialized'. This is because the chef cookbook generator detected that we have git installed and automatically initialized the cookbook as a git repository.

CONCEPT

Staging Area



The staging area has a file, generally contained in your Git directory, that stores information about what will go into your next commit.

It's sometimes referred to as the "index", but it's also common to refer to it as the staging area.

<http://git-scm.com/book/en/v2/Getting-Started-Git-Basics>

You can think of the staging area as a box in which to put a bunch of items -- like a care package you would send to someone.

Staging files means to put them in the box, but don't close it up because you may add a few things, and don't close it up because you may replace or remove a few things. But put the items in the box because eventually we are going to close that box when it is ready to send it off.

GE: Use 'git add' to Stage Files to be Committed



```
$ git add .
```

Now we need to tell git which files it should start tracking in source control. In our case, we want to add all the files to the repository and we can do that by executing 'git add .' (dot).

This will place all the files into a staging area.

GE: Use 'git status' to View the Staged Files

```
$ git status
On branch master

Initial commit

Changes to be committed:
  (use "git rm --cached <file>..." to unstage)

    new file: .gitignore
    new file: .kitchen.yml
    new file: Berksfile
    new file: README.md
    new file: chefignore
    new file: metadata.rb
```

Let's see what changes we have placed in the staging area.

Thinking about our care package example, this is like looking inside the box and taking an inventory, allowing us to figure out if we need to move more things in or remove things we accidentally threw in there.

Running `git status` allows us to see in the box. Git reports back to us the changes that will be committed.

Instructor Note: Git helpfully tries to show you the command you can use to remove an item from that box. This is useful if you want to include all items excepts for one or simply manage everything before you commit.

GE: Use 'git commit' to Save the Staged Changes



```
$ git commit -m "Initial workstation cookbook"
```

```
*** Please tell me who you are.
```

```
Run
```

```
git config --global user.email "you@example.com"  
git config --global user.name "Your Name"
```

```
to set your account's default identity.
```

```
Omit --global to set the identity only in this repository.
```

```
fatal: empty ident name (for <Administrator@WIN-EALH2C3KQBA.(none)>) not  
allowed
```

If everything that is staged looks correct, then we are ready to commit the changes.

This is like saying we're ready to close the box up.

This is done in git with **git commit**. We can optionally provide a message on the command-line and that is done with the **-m** flag and then a string of text that describes that change.

When we attempt to commit our changes git presents us with an error that states that you need to setup a user name and email address.

GE: Use 'git commit' to Save the Staged Changes



```
$ git config --global user.email "you@example.com"
```

Set up your email you want to associate with your git commits.

GE: Use 'git commit' to Save the Staged Changes



```
$ git config --global user.name "Your Name"
```

Set up your user name you want to associate with your git commits.

GE: Use 'git commit' to Save the Staged Changes



```
$ git commit -m "Initial workstation cookbook"  
[master (root-commit) 1be94e8] Initial workstation cookbook  
11 files changed, 197 insertions(+)  
create mode 100644 .kitchen.yml  
create mode 100644 Berksfile  
create mode 100644 README.md  
create mode 100644 chefignore  
create mode 100644 metadata.rb  
create mode 100644 recipes/default.rb  
create mode 100644 recipes/disable-uac.rb  
create mode 100644 spec/spec_helper.rb  
create mode 100644 spec/unit/recipes/default_spec.rb  
create mode 100644 test/integration/default/serverspec/default_spec.rb  
create mode 100644 test/integration/helpers/serverspec/spec_helper.rb
```

If everything that is staged looks correct, then we are ready to commit the changes.

This is like saying we're ready to close the box up.

This is done in git with **git commit**. We can optionally provide a message on the command-line and that is done with the **-m** flag and then a string of text that describes that change.

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Git Version Control



If you use git versioning you should ultimately push the local git repository to a shared remote git repository.

In this way others could collaborate with you from a centralized location.

The screenshot shows a GitHub repository page for 'chef-training / chefdk-fundamentals-repo'. The branch is 'master'. A single commit by 'butlio' is shown, which removed the 'yum update' command. Below this commit, there is a list of files: recipes, spec, templates/default, test/integration/default/serverspec, .gitignore, and .kitchen.yml. Each file has a timestamp indicating it was last modified 9 days ago.

File	Description	Last Modified
recipes	Removed the 'yum update' it was causing problems	9 days ago
spec	ChefDK Fundamentals Course - Day 1 Repo	4 months ago
templates/default	ChefDK Fundamentals Course - Day 1 Repo	4 months ago
test/integration/default/serverspec	ChefDK Fundamentals Course - Day 1 Repo	4 months ago
.gitignore	ChefDK Fundamentals Course - Day 1 Repo	4 months ago
.kitchen.yml	ChefDK Fundamentals Course - Day 1 Repo	4 months ago

git tracks all our commits, all those closed up boxes, locally on the current system. If we wanted to share those commits with other individuals we would need to push those changes to a central repository where we could collaborate with other members of the team. GitHub is an example of a central git repository.

GE: Move out of the Workstation Cookbook



```
$ cd ~
```

Now that we are done adding our workstation cookbook to version control lets return to our home directory.



Lab: Setting up a Web Server

- Use `chef generate` to create a cookbook named "iis-demo".
- Write and apply a recipe named "`server.rb`" with the policy:
 - The `powershell_script` named 'Install IIS' is run with the code 'add-windowsfeature Web-Server'.
 - The `file` named 'c:\inetpub\wwwroot\Default.htm' is created with the content '<h1>Hello, world!</h1>'.
 - The `service` named 'w3svc' is started and enabled.
- Apply the recipe with `chef-apply` and verify the site is available by running `curl localhost`

Now. Here is your last challenge: Deploying a Web Server with Chef.

We need a cookbook named `iis-demo` that has a server recipe. Within that server recipe we need to use a `powershell_script` to install the IIS windows feature, write out an example HTML file, and then start and enable the `w3svc` service.

Then we should apply that recipe and make sure the site is up and running by running a command to visit that site.

Instructor Note: Allow 15 minutes to complete this exercise.

Lab: Create a Cookbook

```
$ chef generate cookbook iis-demo  
Compiling Cookbooks...  
Recipe: code_generator::cookbook  
  * directory[C:/Users/Administrator/iis-demo] action create  
    - create new directory C:/Users/Administrator/iis-demo  
  * template[C:/Users/Administrator/iis-demo/metadata.rb] action create_if_missing  
    - create new file C:/Users/Administrator/iis-demo/metadata.rb  
    - update content in file C:/Users/Administrator/iis-demo/metadata.rb from none to ce7d60  
      (diff output suppressed by config)  
  * template[C:/Users/Administrator/iis-demo/README.md] action create_if_missing  
    - create new file C:/Users/Administrator/iis-demo/README.md  
    - update content in file C:/Users/Administrator/iis-demo/README.md from none to 5c1920
```

From the Chef home directory, run the command 'chef generate cookbook iis-demo'. This will place the iis-demo cookbook alongside the workstation cookbook.

Lab: Create a Recipe

```
$ chef generate recipe iis-demo server
Compiling Cookbooks...
Recipe: code_generator::recipe
  * directory[./iis-demo/spec/unit/recipes] action create (up to date)
    * cookbook_file[./iis-demo/spec/spec_helper.rb] action create_if_missing (up to date)
      * template[./iis-demo/spec/unit/recipes/server_spec.rb] action create_if_missing
        - create new file ./iis-demo/spec/unit/recipes/server_spec.rb
        - update content in file ./iis-demo/spec/unit/recipes/server_spec.rb from none to 93f1e7
          (diff output suppressed by config)
      * template[./iis-demo/recipes/server.rb] action create
        - create new file ./iis-demo/recipes/server.rb
        - update content in file ./iis-demo/recipes/server.rb from none to f34166
```

From the Chef home directory, run the command 'chef generate cookbook iis-demo'. This will place the iis-demo cookbook alongside the workstation cookbook.

Lab: Create Server Recipe

```
~\iis-demo\recipes\server.rb

powershell_script 'Install IIS' do
  code 'add-windowsfeature Web-Server'
end

file 'c:\inetpub\wwwroot\Default.htm' do
  content '<h1>Hello, world!</h1>'
end

service 'w3svc' do
  action [:enable, :start]
end
```

The server recipe, found at `~/iis-demo/recipes/server.rb`, defines the policy:

Instructor Note: The service action defines two actions within a Ruby array. Ruby arrays are ordered, integer-indexed collections of any object. Each element in an array is associated with and referred to by an index.

Lab: Apply the Server Recipe

```
$ chef-apply iis-demo\recipes\server.rb
```

```
Recipe: (chef-apply cookbook)::(chef-apply recipe)
  * powershell_script[Install IIS] action run
    - execute "C:\Windows\system32\WindowsPowerShell\v1.0\powershell.exe" -NoLogo -NonInteractive -NoProfile -ExecutionPolicy Bypass -InputFormat None -File "C:/Users/ADMINI~1/AppData/Local/Temp/2/chef-script20151221-2240-1ch0aap.ps1"
      * file[c:\inetpub\wwwroot\Default.htm] action create
        - create new file c:\inetpub\wwwroot\Default.htm
        - update content in file c:\inetpub\wwwroot\Default.htm from none to ae4add
          --- c:\inetpub\wwwroot\Default.htm 2015-12-21 20:58:52.000000000 +0000
          +++ c:\inetpub\wwwroot\Default.htm20151221-2240-1ob1psg 2015-12-21 20:58:52.000000000 +0000
          @@ -1 +1,2 @@
          +<h1>Hello, world</h1>
    * windows_service[w3svc] action start (up to date)
```

When applying the recipe with '**chef-apply**', you need to specify the partial path to the recipe file within the `iis-demo` cookbook's recipe folder.

Lab: Verify That the Website is Available

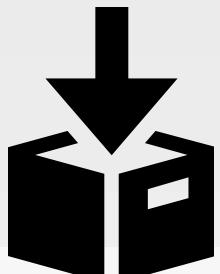
```
$ curl localhost
```

```
StatusCode      : 200
StatusDescription : OK
Content          : <h1>Hello, world</h1>
RawContent       : HTTP/1.1 200 OK
Accept-Ranges: bytes
Content-Length: 21
Content-Type: text/html
Date: Mon, 21 Dec 2015 20:59:13 GMT
ETag: "954c2066323cd11:0"
Last-Modified: Mon, 21 Dec 2015 20:58:52 GMT
Server...
```

So verify that the website is available and returns the content we expect to see.

COMMIT

GE: Commit Your Work



```
$ cd ~\iis-demo  
$ git init  
$ git add .  
$ git commit -m "Initial iis-demo Cookbook"
```

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Now, with everything working it is time to add the iis-demo cookbook to version control.

Move into the iis-demo directory.

Initialize the cookbook as a git repository.

Add all the files within the cookbook.

And commit all the files in the staging area.

Slide 41



Discussion

What file would you read first when examining a cookbook?

What other recipes might you include in the iis-demo or workstation cookbook?

Can resources accept multiple actions?

How often would commit changes with version control?

Answer these questions.

With your answers, turn to another person and alternate asking each other asking these questions and sharing your answers.

Slide 42



Q&A

What questions can we answer for you?

- Cookbooks
- Versions
- Version control

What questions can we help you answer?

General questions or more specifically about cookbooks, versioning and version control.

Slide 43



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4: Chef-Client



Objectives



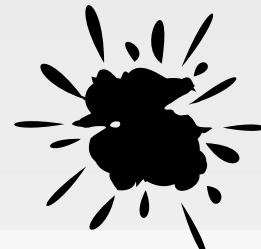
After completing this module, you should be able to use chef-client to:

- Locally apply a cookbook's recipe with chef-client.
- Locally apply multiple cookbooks' recipes with chef-client.
- Include a recipe from within another recipe.

In this module you will learn how to use the 'chef-client' command to apply recipes, and include a recipe within another recipe.

PROBLEM

chef-apply



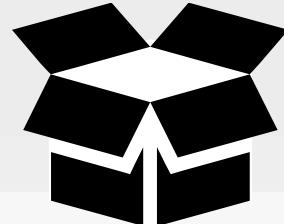
chef-apply is a great tool for applying resources (-e) and for individual recipes but it doesn't know how to apply a cookbook.

'chef-apply' is valuable tool for exploring resources within recipes without having to wrestle with all the folders and files associated with cookbooks. For the remainder of the modules we will not return to using 'chef-apply'. In the future you will most likely be using 'chef-client'. You may return to 'chef-apply' in your adventures when you find yourself wanting to test out an idea for a new recipe on a new platform or platform version. The speed of the tool is valuable.

Slide 4

CONCEPT

chef-client



chef-client is an agent that runs locally on every node that is under management by Chef.

When a chef-client is run, it will perform all of the steps that are required to bring the node into the expected state.

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

In the Chef Development Kit (ChefDK), we package another tool that is called 'chef-client'.

'chef-client' is a command-line application that can be used to apply a recipe or multiple recipes. It also has the ability to communicate with a Chef server – a concept we will talk about in another section. For now think of the Chef Server as a central, artifact repository where we will later store our cookbooks.

Demo: Using 'chef-client' to Locally Apply Recipes

```
$ chef-client --local-mode -r "recipe[workstation::disable-uac]"
```

Applying the following recipes locally:

The 'disable-uac' recipe from the 'workstation' cookbook

Here is an example of using 'chef-client' to locally apply the a run list of recipes. In this case we are applying one recipe and that is the disable-uac recipe within our workstation cookbook.

Instructor Note: These commands if executed by a learner at this point will not work. These are being displayed solely as demonstration.

Demo: Using 'chef-client' to Locally Apply Recipes

```
$ chef-client --local-mode -r "recipe[iis-demo::server]"
```

Applying the following recipes locally:

The 'server' recipe from the 'iis-demo' cookbook

Here is an example of using 'chef-client' to locally apply the server recipe within our iis-demo cookbook.

Demo: Using 'chef-client' to Locally Apply Recipes

```
$ chef-client --local-mode -r "recipe[workstation::disable-uac],recipe[iis-demo::server]"
```

Applying the following recipes locally:

- The 'disable-uac' recipe from the 'workstation' cookbook
- The 'server' recipe from the 'iis-demo' cookbook

Here is an example of using 'chef-client' to locally apply two recipes -- the disable-uac recipe from the workstation cookbook and the server recipe within our iis-demo cookbook.

It is important to note that when specifying a run list, recipes defined within it that are separated with a comma should NOT have a space after the comma or it will create an error.

CONCEPT

--local-mode



chef-client's default mode attempts to contact a Chef Server and ask it for the recipes to run for the given node.

We are overriding that behavior to have it work in a local mode.

Applying recipes with 'chef-client' is different than 'chef-apply' and that is because chef-client's default behavior is to communicate with a Chef server. So we use the '--local-mode' flag to ask 'chef-client' to look for the cookbooks locally.

CONCEPT

-r "recipe[COOKBOOK::RECIPE]"



In local mode, we need to provide a list of recipes to apply to the system. This is called a **run list**. A run list is an ordered collection of recipes to execute.

Each recipe in the run list must be addressed with the format `recipe[COOKBOOK::RECIPE]`.

When we apply a recipe with 'chef-client', we define a run list. This is an ordered list of recipes that we want to apply to the system. When you define a recipe from a cookbook on the run list, there is a particular convention:

`"recipe [COOKBOOK::RECIPE]"`

COOKBOOK means the name of the Cookbook.

RECIPE means the name of the Recipe without the Ruby file extension.

Group Exercise: Return Home First



```
$ cd ~
```

Before you start applying cookbooks through 'chef-client', make sure you are in your home directory.

GE: Apply the 'iis-demo::server' Recipe Locally



```
$ chef-client --local-mode -r "recipe[iis-demo::server]"  
[2015-09-15T14:52:45+00:00] WARN: No config file found or specified on command  
line, using command line options.  
[2015-09-15T14:52:45+00:00] WARN: No cookbooks directory found at or above  
current directory. Assuming /home/chef.  
Starting Chef Client, version 12.3.0  
resolving cookbooks for run list: ["iis-demo::server"]  
  
=====  
==  
Error Resolving Cookbooks for Run List:  
=====  
==
```

Try applying our server recipe from the iis-demo cookbook using `chef-client` in local mode.

Upon execution you unfortunately are presented with an error.

When executed we find that `chef-client` has an additional requirement. `chef-client` expects our cookbooks to be maintained in a directory named 'cookbooks'.

That seems simple enough to accommodate and a good way to start organizing the cookbooks that we are creating.

Instructor Note: This is supposed to fail. chef-client requires the cookbooks to be in a cookbooks directory. The second warning message tells the user of the application that it was unable to find a cookbooks directory.

Instructor Note: The other warning about 'No config file found or specified on command line, using command line options' is looking for a config file at a default location, which we have not created nor we will create one at this time. There is a flag '-c' that allows you to specify a configuration file as well. But again specifying the configuration file will be automatically when the instance is bootstrapped.

GE: Create Cookbooks Dir and Move the Cookbook

```
 $ mkdir cookbooks  
$ mv workstation cookbooks  
$ mv iis-demo cookbooks
```

Make a directory named 'cookbooks'. Then move the workstation cookbook and iis-demo cookbook into the cookbooks directory.

GE: Apply the Cookbook Recipe Locally



```
$ chef-client --local-mode -r "recipe[iis-demo::server]"  
[2015-12-22T19:56:55+00:00] WARN: No config file found or specified on command  
line, using command line options.  
Starting Chef Client, version 12.5.1  
resolving cookbooks for run list: ["iis-demo::server"]  
Synchronizing Cookbooks:  
  - iis-demo (0.1.0)  
Compiling Cookbooks...  
Converging 3 resources  
Recipe: iis-demo::server  
  * powershell_script[Install IIS] action run  
    - execute "C:\Windows\system32\WindowsPowerShell\v1.0\powershell.exe" -NoLogo  
-NonInteractive -NoProfile -ExecutionPolicy Bypass -InputFormat None -File
```

Let's try that again--this time with all of our cookbooks in the cookbooks directory like `chef-client` expects.

Try applying the iis-demo cookbook's recipe named server.

Instructor Note: The WARN messages were omitted from this output so you can see the converging resources.

GE: Apply the Cookbook Recipe Locally



```
$ chef-client --local-mode -r "recipe[workstation::disable-uac]"  
  
[2015-12-22T19:59:38+00:00] WARN: No config file found or specified on command  
line, using command line options.  
Starting Chef Client, version 12.5.1  
resolving cookbooks for run list: ["workstation::disable-uac"]  
Synchronizing Cookbooks:  
  - workstation (0.1.0)  
Compiling Cookbooks...  
Converging 2 resources  
Recipe: workstation::disable-uac  
  * registry_key[HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Policies\System]  
    action create (up to date)  
  * registry_key[HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Policies\System]  
    action create (up to date)
```

Try applying the workstation cookbook's recipe named 'disable-uac'.

GE: Apply Both Recipes Locally



```
$ chef-client --local-mode -r "recipe[iis-demo::server],recipe[workstation::disable-uac]"
```

```
[2015-12-22T20:04:38+00:00] WARN: No config file found or specified on command line, using command line options.  
Starting Chef Client, version 12.5.1  
resolving cookbooks for run list: ["iis-demo::server", "workstation::disable-uac"]  
Synchronizing Cookbooks:  
  - iis-demo (0.1.0)  
  - workstation (0.1.0)  
Compiling Cookbooks...  
Converging 5 resources  
Recipe: iis-demo::server
```

Try applying both recipes from both cookbooks again at one time.

Instructor Note: It is important to note that when specifying a run list, recipes defined within it that are separated with a comma should NOT have a space after the comma or it will create an error.

CONCEPT

-r "recipe[COOKBOOK(:default)]"



When you are referencing the default recipe within a cookbook you may optionally specify only the name of the cookbook.

chef-client understands that you mean to apply the default recipe from within that cookbook.

Actually, we didn't tell you everything about specifying the run list for the `chef-client` command.

When defining a recipe in the run list you may omit the name of the recipe, and only use the cookbook name, when that recipe's name is 'default'.

Similar to how resources have default actions and default attributes Chef uses the concept of providing sane defaults. This makes our faster when we understand the concepts.

A cookbook doesn't have to have a default recipe but most every cookbook has one. It's called default because when you think of a cookbook it is the recipe that defines the most common configuration policy.

When you think about the two cookbooks that we created -- the iis-demo cookbook with the server recipe and the workstation cookbook with the setup recipe -- it seems like those recipes would be good default recipes for their respective cookbooks.

DOCS

include_recipe



A recipe can include one (or more) recipes located in cookbooks by using the `include_recipe` method. When a recipe is included, the resources found in that recipe will be inserted (in the same exact order) at the point where the `include_recipe` keyword is located.

<https://docs.chef.io/recipes.html#include-recipes>

A simple solution would be to rename the setup recipe to the default recipe. However, a better practice would instead leave our recipes as they are and have the default recipe include the recipes with a method called `'include_recipe'`

This allows us to maintain all the current policies within its own recipe file and that way we can more easily switch our cookbooks default behavior, which can be useful when new requirements surface.

Demo: Including a Recipe

```
include_recipe 'workstation::disable-uac'
```

Include the 'disable-uac' recipe from the 'workstation' cookbook in this recipe

In this example we are including the 'workstation' cookbook's 'disable-uac' recipe.

Demo: Including a Recipe

```
include_recipe 'iis-demo::server'
```

Include the 'server' recipe from the 'iis-demo' cookbook in this recipe

In this example, we are including the 'iis-demo' cookbook's 'server' recipe.

GE: The Default Recipe Includes the Disable Recipe

```
~\cookbooks\workstation\recipes\default.rb

#
# Cookbook Name:: workstation
# Recipe:: default
#
# Copyright (c) 2015 The Authors, All Rights Reserved.

include_recipe 'workstation::disable-uac'
```

We are interested in having the default recipe for our workstation cookbook run the contents of the 'disable-uac' recipe.

Within the default recipe, define the `include_recipe` method and provide one parameter, which is the name of our recipe as it appears within a run list: `cookbook_name::recipe_name`.

GE: Apply the Cookbook's Default Recipe



```
$ chef-client --local-mode -r "recipe[workstation]"
```

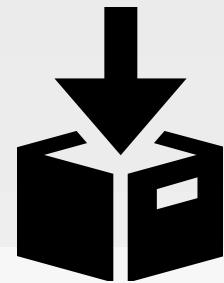
```
Starting Chef Client, version 12.5.1
resolving cookbooks for run list: ["workstation"]
Synchronizing Cookbooks:
  - workstation (0.1.0)
Compiling Cookbooks...
Converging 2 resources
Recipe: workstation::disable-uac
  * registry_key[HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Policies\System]
    action create (up to date)
      * registry_key[HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Policies\System]
        action create (up to date)

Running handlers:
```

Use 'chef-client' to locally apply the cookbook named workstation. This will load your workstation cookbook's default recipe, which in turn loads the workstation cookbook's 'disable-uac' recipe.

COMMIT

GE: Commit Your Work



```
$ cd ~\cookbooks\workstation  
$ git add .  
$ git commit -m "Default recipe includes the setup  
recipe"
```



With everything working it is time to commit the latest changes.

Lab

Lab: Update the iis-demo Cookbook



- ❑ Update the "iis-demo" cookbook's "default" recipe to:

Include the 'server' recipe from the 'iis-demo' cookbook

- ❑ Run chef-client and locally apply the run_list: "recipe[iis-demo]"
- ❑ Commit the changes with version control

In this lab you will update the iis-demo cookbook's default recipe to include the iis-demo cookbook's recipe named server.

Instructor Note: Allow 5 minutes to complete this exercise.

Lab: The Default Recipe Includes the iis-demo Recipe

```
~\cookbooks\iis-demo\recipes\default.rb

#
# Cookbook Name:: iis-demo
# Recipe:: default
#
# Copyright (c) 2015 The Authors, All Rights Reserved.

include_recipe 'iis-demo::server'
```

We are interested in having the default recipe for our iis-demo cookbook run the contents of the server recipe.

Within the default recipe, define the `include_recipe` method and provide one parameter, which is the name of our recipe as it appears within a run list: `cookbook_name::recipe_name`.

Lab: Applying the iis-demo Default Recipe



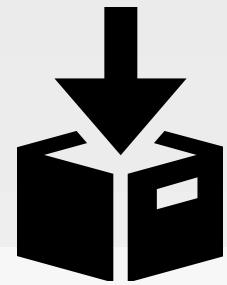
```
$ chef-client --local-mode -r "recipe[iis-demo]"
```

```
[2015-09-15T15:23:18+00:00] WARN: No config file found or specified on command line, using command line options.  
Starting Chef Client, version 12.3.0  
resolving cookbooks for run list: ["iis-demo"]  
Synchronizing Cookbooks:  
  - iis-demo  
Compiling Cookbooks...  
Converging 0 resources  
  
Running handlers:  
Running handlers complete  
Chef Client finished, 0/0 resources updated in 3.310768509 seconds
```

Use 'chef-client' to locally apply the cookbook named iis-demo. This will load your iis-demo cookbook's default recipe, which in turn loads the iis-demo cookbook's server recipe.

COMMIT

Lab: Commit Your Work



```
$ cd ~\cookbooks\iis-demo  
$ git add .  
$ git commit -m "Default recipe includes the server  
recipe"
```



With everything working it is time to commit the latest changes.

Discussion



Why would you want to apply more than one recipe at a time?

What are the benefits and drawbacks of using "include_recipe" within a recipe?

Do default values make it easier or harder to learn?

Answer these questions.

With your answers, turn to another person and alternate asking each other asking these questions and sharing your answers.

Slide 28

Q&A



What questions can we help you answer?

- chef-client
- local mode
- run list
- include_recipe

What questions can we help you answer?

Generally or specifically about chef-client, local mode, run lists, and include_recipe.

Slide 29



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5: Testing Cookbooks

Testing Cookbooks

Validating Our Recipes in Virtual Environments

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Objectives



After completing this module, you should be able to

- Use Test Kitchen to verify your recipes converge on a virtual instance
- Read the InSpec documentation
- Write and execute tests



Can We Test Cookbooks?

As we start to define our infrastructure as code we also need to start thinking about testing it.

Will the recipes that we created work on another system similar to this one? Will they work in production?

When we develop our automation we need to start thinking about verifying it. Because it is all too common a story of automation failing when it reaches production because it was never validated against anything other than "my machine".

So how could we solve a problem like this?

DISCUSSION



Mandating Testing

What steps would it take to test one of the cookbooks that we have created?

Write down or type out as many of the steps you can think of required to test one of the cookbooks.

When you are ready turn to another person and compare your lists. Create a complete list with all the steps that you have identified. Then as a group we will discuss all the steps necessary to test a cookbook.

Instructor Note: This exercise is useful in helping the learners visualize the each step of testing process and how Test Kitchen maps to each of those steps

Steps to Verify Cookbooks



- Create Virtual Machine
- Install Chef Tools
- Copy Cookbooks
- Run/Apply Cookbooks
- Verify Assumptions
- Destroy Virtual Machine

Here are the steps necessary to verify one of the cookbooks that you created.

Create a virtual machine or setup an instance that resembles your current production infrastructure

Install the necessary Chef tools

Copy the cookbooks to this new instance

Apply the cookbooks to the instance

Verify that the instance is the desired state by executing various commands

Clean up that instance by destroying it or rolling it back to a previous snapshot

Instructor Note: The class participant should be able to create a list of similar steps. The names and the detail may vary based on their experience or expertise. Instead of presenting this slide you may find it more engaging to invite the learners to share the list of steps that they created and create a list that represents the voice of the group. If you do, you may find it useful to hide this slide.

Testing Cookbooks



We can start by first mandating that all cookbooks are tested

How often should you test your cookbook?

How often do you think changes will occur?

What happens when the rate of cookbook changes exceed the time interval it takes to verify the cookbook?

So we can start by mandating that all cookbooks are tested.

But we need to consider how often we need to test a cookbook and how often changes to our cookbooks will occur.

And what would happen if the rate of rate of cookbook changes exceed the time interval it takes to verify the cookbook?

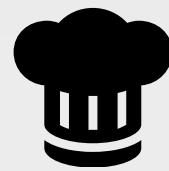


Code Testing

An automated way to ensure code accomplishes the intended goal and help the team understand its intent

Testing tools provide automated ways to ensure that the code we write accomplishes its intended goal. It also helps us understand the intent of our code by providing executable documentation. We add new cookbook features and write tests to preserve this functionality.

This provides us, or anyone else on the team, the ability to make new changes with a less likely chance of breaking something. Whether returning to the cookbook code tomorrow or in six months.



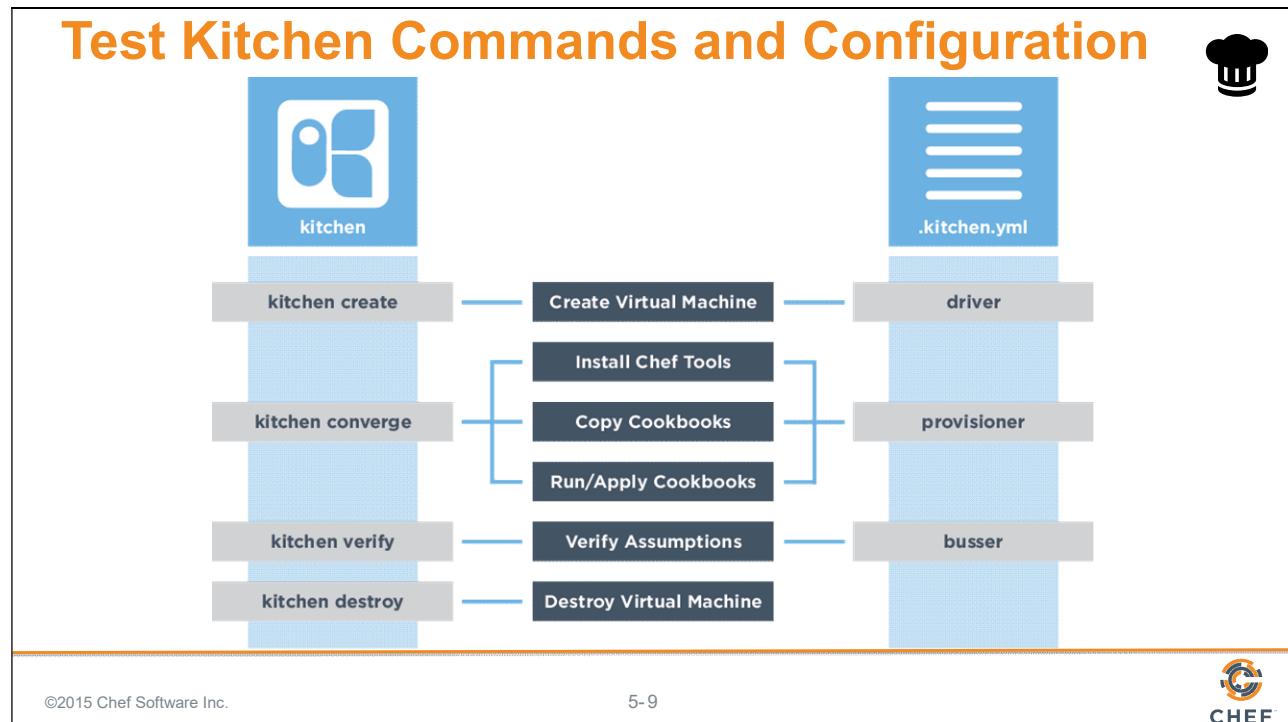
Test Configuration

What are we running in production? Maybe I could test the cookbook against a virtual machine.

Objective:

- Configure the "workstation" cookbook to test against a Windows 2012R2 platform
- Apply the "workstation" cookbook's default recipe to that virtual machine

Well if Chef is to replace our existing tools, it is going to need to provide a way to make testing the policies more delightful.



Test Kitchen allows us to create an instance solely for testing. On that created instance it will install Chef, converge a run list of recipes, verify that the instance is in the desired state, and then destroy the instance.

On the left are the `kitchen` commands that map to the stages of the testing lifecycle.

On the right are the `kitchen` configuration fields that map to the stages of the testing lifecycle.

These commands the configuration will be explained in more detail.

Instructor Note: If you created a custom list of steps with your learners use that custom list and overlay the following information over top of it.

What Can 'kitchen' Do?



```
$ kitchen --help
```

```
Commands:
  kitchen console                      # Kitchen Console!
  kitchen converge [INSTANCE|REGEXP|all] # Converge one or more instances
  kitchen create [INSTANCE|REGEXP|all]   # Create one or more instances
  kitchen destroy [INSTANCE|REGEXP|all]  # Destroy one or more instances
  ...
  kitchen help [COMMAND]                # Describe available commands or one specif...
  kitchen init                          # Adds some configuration to your cookbook...
  kitchen list [INSTANCE|REGEXP|all]    # Lists one or more instances
  kitchen setup [INSTANCE|REGEXP|all]   # Setup one or more instances
  kitchen test [INSTANCE|REGEXP|all]    # Test one or more instances
  kitchen verify [INSTANCE|REGEXP|all]  # Verify one or more instances
  kitchen version                      # Print Kitchen's version information
```

Kitchen is a command-line application that enables us to manage the testing lifecycle.

Similar to other tools within the ChefDK, we can ask for help to see the available commands.

The `init` command, by its name, seems like a good place to get started.

Slide 11

What Can 'kitchen init' Do?



```
$ kitchen help init
```

Usage:

```
kitchen init
-D, [--driver=one two three]                                # One or more Kitchen Driver gems ...
-P, [--provisioner=PROVISIONER]                               # Default: kitchen-vagrant
use                                                               # The default Kitchen Provisioner to
                                                               # Default: chef_solo
[--create-gemfile], [--no-create-gemfile] # Whether or not to create a Gemfi ...
```

Description:

```
Init will add Test Kitchen support to an existing project for convergence
integration testing. A default .kitchen.yml file (which is intended to be
customized) is created in the project's root directory and one or more gems will be
added to the project's Gemfile.
```

`kitchen help init` tells us that it will add Test Kitchen support to an existing project. It creates a .kitchen.yml file within the project's root directory.

There are a number of flags and other options but let's see if the cookbooks we created even needs us to initialize test kitchen.

Do We Have a .kitchen.yml?



```
$ tree /f cookbooks\workstation
```

```
Folder PATH listing
Volume serial number is B04A-119C
C:\USERS\ADMINISTRATOR\COOKBOOKS\WORKSTATION
|
|   .gitignore
|   .kitchen.yml
|   Berksfile
|   chefignore
|   metadata.rb
|   README.md
|
|---recipes
|     default.rb
|     disable-uac.rb
```

Using `tree` to look at the workstation cookbook, showing all hidden files and ignoring all git files, it looks like our cookbook already has a .kitchen.yml.

It was actually created alongside the other files when we ran the `chef generate cookbook` command when we originally created this cookbook.

Let's take a look at the contents of this file.

What is Inside .kitchen.yml?



```
$ gc cookbooks\iis-demo\.kitchen.yml
```

```
---
```

```
driver:
```

```
  name: vagrant
```

```
provisioner:
```

```
  name: chef_zero
```

```
# Uncomment the following verifier to leverage Inspec instead of Busser (the
```

```
# default verifier)
```

```
# verifier:
```

```
#   name: inspec
```

```
platforms:
```

The .kitchen.yml file defines a number of configuration entries that the kitchen command uses during execution.



.kitchen.yml

When chef generates a cookbook, a default .kitchen.yml is created. It contains kitchen configuration for the driver, provisioner, platform, and suites.

<http://kitchen.ci/docs/getting-started/creating-cookbook>

We don't need to run `kitchen init` because we already have a default kitchen file. We may still need to update it to accomplish our objectives so let's learn more about the various fields in the configuration file.

Demo: The kitchen Driver

```
~\cookbooks\workstation\.kitchen.yml
```

```
---
```

```
driver:
```

```
  name: vagrant
```



```
provisioner:
```

```
  name: chef_zero
```



```
# Uncomment the following verifier...
```

```
# default verifier)
```

```
# verifier:
```

```
#   name: inspec
```



```
# KITCHEN CONFIGURATION CONTINUES...
```

The driver is responsible for creating a machine that we'll use to test our cookbook.

The first key is driver, which has a single key-value pair that specifies the name of the driver Kitchen will use when executed.

The driver is responsible for creating the instance that we will use to test our cookbook. There are lots of different drivers available.

Instructor Note: Testing on this remote workstation requires that we use a completely different kitchen configuration file. This configuration file is generated for use on local machines which is not ideal when working on a virtual machine in the cloud.

Demo: The kitchen Provisioner

```
~\cookbooks\workstation\.kitchen.yml
```

```
---
```

```
driver:
```

```
  name: vagrant
```



```
provisioner:
```

```
  name: chef_zero
```



```
# Uncomment the following verifier...
```

```
# default verifier)
```

```
# verifier:
```

```
#   name: inspec
```



```
# KITCHEN CONFIGURATION CONTINUES...
```

This tells Test Kitchen how to run Chef, to apply the code in our cookbook to the machine under test.

The default and simplest approach is to use `chef_zero`.

The second key is `provisioner`, which also has a single key-value pair which is the name of the provisioner Kitchen will use when executed. This provisioner is responsible for how it applies code to the instance that the driver created. Here the default value is `chef_zero`.

Demo: The kitchen Platforms

```
~\cookbooks\workstation\.kitchen.yml
```

```
# TOP PART OF KITCHEN CONFIGURATION

platforms:
  - name: ubuntu-14.04
  - name: centos-7.1

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

This is a list of operation systems on which we want to run our code.

The third key is platforms, which contains a list of all the platforms that Kitchen will test against when executed. This should be a list of all the platforms that you want your cookbook to support.

None of these platforms are ones that we are interested in supporting. We can specify various different Operating Systems and Versions like Windows.

Demo: The kitchen Suites

```
~\cookbooks\workstation\.kitchen.yml
```

```
# TOP PART OF KITCHEN CONFIGURATION

platforms:
  - name: ubuntu-14.04
  - name: centos-7.1

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

This section defines what we want to test. It includes the Chef run-list of recipes that we want to test.

We define a single suite named "default".

The fourth key is suites, which contains a list of all the test suites that Kitchen will test against when executed. Each suite usually defines a unique combination of run lists that exercise all the recipes within a cookbook.

In this example, this suite is named 'default'.

Demo: The kitchen Suites

```
~\cookbooks\workstation\.kitchen.yml
```

```
# TOP PART OF KITCHEN CONFIGURATION

platforms:
  - name: ubuntu-14.04
  - name: centos-7.1

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

The suite named "default" defines a run_list.

Run the "workstation" cookbook's "default" recipe file.

This default suite will execute the run list containing: The workstation cookbook's default recipe.



Kitchen Test Matrix

Kitchen defines a list of instances, or test matrix, based on the platforms multiplied by the suites.

PLATFORMS x SUITES

Running kitchen list will show that matrix.

It is important to recognize that within the .kitchen.yml file we defined two fields that create a test matrix; The number of platforms we want to support multiplied by the number of test suites that we defined.

Example: View the Kitchen Test Matrix

```
$ kitchen list
```

Instance	Driver	Provisioner	Last Action
default-ubuntu-1204	Vagrant	ChefZero	<Not Created>
default-centos-65	Vagrant	ChefZero	<Not Created>

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

```
platforms:
  - name: ubuntu-12.04
  - name: centos-6.5
```

In this example, if we were to run this command on a local workstation, we can visualize this test matrix by running the command `kitchen list`.

In the output you can see that an instance is created in the list for every suite and every platform. In our current file we have one suite, named 'default', and two platforms. First the ubuntu 12.04 platform.

Instructor Note: This command will fail if ran on the workstations because the vagrant driver is still defined on the remote workstation. This is an example.

Example: View the Kitchen Test Matrix

```
$ kitchen list
```

Instance	Driver	Provisioner	Last Action
default-ubuntu-1204	Vagrant	ChefZero	<Not Created>
default-centos-65	Vagrant	ChefZero	<Not Created>

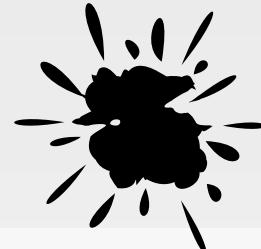
```
suites:
  - name: default
    run_list:
      - recipe[workstation::default]
    attributes:
      platforms:
        - name: ubuntu-12.04
        - name: centos-6.5
```

And the second centos 6.5 platform.

Instructor Note: This command will fail if run on the workstations because the vagrant driver is still defined on the remote workstation. This is an example.

PROBLEM

Virtualization



Vagrant is great for local development but when building cookbooks on a virtual machine in the cloud we will need to not use a local virtualization tool.

Instead, we will ask Amazon EC2 to provision nodes for us to test against.

Test Kitchen is tool that you will often use on your local workstation. That is why the default configuration file uses vagrant. Vagrant allows Test Kitchen to communicate with VirtualBox to provision test instance that you can easily spin up and tear down. However, VirtualBox does not work on virtual instances. We are currently using a virtual instance in the Amazon EC2 cloud. So instead we are going to configure Test Kitchen to provision virtual instances for us in the Amazon EC2 cloud.

We have provided a template file that has all the settings properly configured for our Training Amazon EC2 cloud. In the next series of steps we are going to copy that file into the cookbook and edit it with specific values.

GE: Replace the Kitchen Config



```
$ cp kitchen-template.yml cookbooks\workstation\.kitchen.yml
```

Copy the template kitchen configuration file from the home directory into the workstation cookbook directory. This will replace the existing kitchen configuration with the one set up to work within Amazon EC2.

GE: Add Your Name and Company

```
~\cookbooks\workstation\.kitchen.yml
---
driver:
  name: ec2
  # ... OTHER DRIVER DETAILS ...
  instance_type: m3.large
  tags:
    # Replace YOURNAME and YOURCOMPANY here
    Name: "Chef Training Node for YOURNAME, YOURCOMPANY"
    created-by: "test-kitchen"
    user: <%= ENV['USER'] %>
# ... REMAINDER OF THE CONFIGURATION FILE ...
```

Edit the file to insert your name and company information.

GE: Update to Test the Workstation Cookbook

```
~\cookbooks\workstation\.kitchen.yml
```

```
# ... TOP PART OF THE CONFIGURATION FILE ...

suites:
  - name: default
    run_list:
      # Replace with the name of the COOKBOOK
      - recipe[workstation::default]
    attributes:
```

Edit the file to define the correct test suite. In this instance we want to test the 'workstation' cookbook's 'default' recipe.

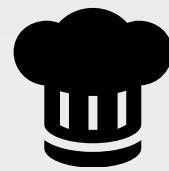
GE: Look at the Test Matrix



```
$ kitchen list
```

Instance	Driver	Provisioner	Verifier	Transport	Last Action
default-windows-2012r2	Ec2	ChefZero	Busser	Winrm	Converged

Run the `kitchen list` command to display our test matrix. You should see a single instance.



Test Configuration

What are we running in production? Maybe I could test the cookbook against a virtual machine.

Objective:

- Configure the "workstation" cookbook to test against a Windows 2012R2 platform
- Apply the "workstation" cookbook's default recipe to that virtual machine

Alright the 'workstation' cookbook configuration has been update properly and we verified that with `kitchen list` . Now to test our cookbook's recipe against that system we are going



The slide content is contained within a large rectangular frame. At the top right is a black icon of three nested boxes. Below it, the title "Kitchen Create" is displayed in a large orange font. Underneath the title is a horizontal sequence of three rounded rectangular buttons: the first is teal with "kitchen create", the second is dark grey with "kitchen converge", and the third is dark grey with "kitchen verify". A large grey arrow points from left to right beneath these buttons. Below the arrow is a command line entry: "\$ kitchen create [INSTANCE|REGEXP|all]". Underneath the command is the text "Create one or more instances." At the bottom left is the copyright notice "©2015 Chef Software Inc.", and at the bottom center is the page number "5-29". On the far right is the Chef logo, which consists of a stylized orange and blue "C" with the word "CHEF" in a sans-serif font below it.

```
$ kitchen create [INSTANCE|REGEXP|all]
```

Create one or more instances.

The first kitchen command is `kitchen create`.

To create an instance means to turn on virtual or cloud instances for the platforms specified in the kitchen configuration.

In our case, this command would use the ec2 driver to create a Windows 2012 R2 instance.

Instructor Note: The command does allow you to create specific instances by name or all instances that match a provided criteria.



Group Exercise: Kitchen Converge



```
$ kitchen converge [INSTANCE|REGEXP|all]
```

Create the instance (if necessary) and then apply the run list to one or more instances.

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Creating an image gives us a instance to test our cookbooks but it still would leave us with the work of installing chef and applying the cookbook defined in our .kitchen.yml run list.

So let's introduce you to the second kitchen command: 'kitchen converge'.

Converging an instance will create the instance if it has not already been created. Then it will install chef and apply that cookbook to that instance.

In our case, this command would take our image and install chef and apply the workstation cookbook's default recipe.

Instructor Note: It also, like the 'kitchen create' commands, defaults to all instances when executed without any parameters. And is capable of accepting parameters to converge a specific instance or all instances that match the provided criteria.

GE: Converge the Cookbook



```
$ kitchen converge
```

```
----> Starting Kitchen (v1.4.2)
----> Creating <default-windows-2012r2>...
      Instance <i-1be58ae2> requested.
      EC2 instance <i-1be58ae2> created.
      Waited 0/300s for instance <i-1be58ae2> to become ready.      Waited
5/300s for instance <i-1be58ae2> to become ready.
      ...
      Waited 280/300s for instance <i-1be58ae2> to become ready.
      EC2 instance <i-1be58ae2> ready.
      [WinRM] Established
      ...
```

Execute `kitchen converge` to validate that our workstation cookbook's default recipe is able to converge on the Windows 2012 instance.

Instructor Note: This process can easily take 5 minutes before the instance is ready and able to be converged.

GE: Converge the Cookbook



```
$ kitchen login
```

We can also login to the instance through the command `kitchen login`. This is useful to see the state of the system to ensure that UAC has been properly disabled.



Test Configuration

What are we running in production? Maybe I could test the cookbook against a virtual machine.

Objective:

- ✓ Configure the "workstation" cookbook to test against a Windows 2012R2 platform
- ✓ Apply the "workstation" cookbook's default recipe to that virtual machine

We successfully configured the workstation cookbook to use the Amazon EC2 driver and target a Windows 2012 R2 Instance.



Lab: Converge the Recipe for iis-demo

- Copy the template kitchen configuration into the 'iis-demo' cookbook
- Update the configuration to specify username and cookbook name
- Converge the 'iis-demo' cookbook

Do the same thing again for the 'iis-demo' cookbook. Update the .kitchen.yml file so that it converges the iis-demo cookbook's default recipe on a Windows 2012R2 instance through the EC2 driver.

Instructor Note: Allow 12 minutes to complete this exercise. Most of the time for this exercise is likely going to be spent waiting for the instance in Amazon EC2 to be ready.

Lab: Return the Home Directory

 \$ cd ~

First, return to the home directory.

Lab: Replace the Kitchen Config



```
$ cp kitchen-template.yml cookbooks\iis-demo\.kitchen.yml
```

Copy the template kitchen configuration file from the home directory into the 'iis-demo' cookbook directory. This will replace the existing kitchen configuration with the one set up to work within Amazon EC2.

Lab: Add Your Name and Company

```
~\cookbooks\iis-demo\.kitchen.yml
---
driver:
  name: ec2
  # ... OTHER DRIVER DETAILS ...
  instance_type: m3.large
  tags:
    # Replace YOURNAME and YOURCOMPANY here
    Name: "Chef Training Node for YOURNAME, YOURCOMPANY"
    created-by: "test-kitchen"
    user: <%= ENV['USER'] %>
# ... REMAINDER OF THE CONFIGURATION FILE ...
```

Edit the file to insert your name and company information.

Lab: Update to Test the 'iis-demo' Cookbook

```
~\cookbooks\iis-demo\.kitchen.yml
# ... TOP PART OF THE CONFIGURATION FILE ...

suites:
- name: default
  run_list:
    # Replace with the name of the COOKBOOK
    - recipe[iis-demo::default]
  attributes:
```

Edit the file to define the correct test suite. In this instance we want to test the 'workstation' cookbook's 'default' recipe.

Lab: Return Home and Move into the Cookbook

```
💻 $ cd cookbooks\iis-demo
```

Change into the 'iis-demo' cookbook folder.

Lab: Converge the Cookbook



```
$ kitchen converge
```

```
----> Starting Kitchen (v1.4.2)
----> Creating <default-windows-2012r2>...
      Instance <i-1be58ae2> requested.
      EC2 instance <i-1be58ae2> created.
      Waited 0/300s for instance <i-1be58ae2> to become ready.      Waited
      5/300s for instance <i-1be58ae2> to become ready.
      ...
      Waited 280/300s for instance <i-1be58ae2> to become ready.
      EC2 instance <i-1be58ae2> ready.
      [WinRM] Established
      ...
      ...
```

Execute `kitchen converge` to validate that our iis-demo cookbook's default recipe is able to converge on the Windows 2012 instance.



Lab: Converge the Recipe for iis-demo

- ✓ Copy the template kitchen configuration into the 'iis-demo' cookbook
- ✓ Update the configuration to specify username and cookbook name
- ✓ Converge the 'iis-demo' cookbook

Congratulations you successfully converged the 'iis-demo' cookbook on a test instance that you created in Amazon EC2.

DISCUSSION



Test Kitchen

What does this test when kitchen converges a recipe?

And what does it NOT test when kitchen converges a recipe?

So what does this test when kitchen converges a recipe?

What does it NOT test when kitchen converges a recipe?

Instructor Note: Converging the recipe is able to validate that our recipe is defined without error. However, converging a particular recipe does not validate that the intended goal of the recipe has been successfully executed.

DISCUSSION

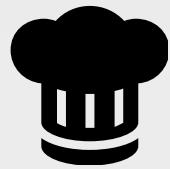


Test Kitchen

What is left to validate to ensure that the cookbook successfully applied the policy defined in the recipe?

What is left to validate to ensure that the cookbook successfully applied the policy defined in the recipe?

Instructor Note: Converging the instance ensured that the recipe was able to install a package, write out a file, and start and enable a service. But what it was unable to check to see if the system was configured correctly -- is our instance serving up our custom home page.



The First Test

Converging seems to validate that the recipe runs successfully. But does it assert what actually is installed?

Objective:

- Write a test that asserts that we have disabled UAC when the "workstation" cookbook's default recipe is applied
- Execute the test that we have written

There is no automation that automatically understands the intention defined in the recipes we create. To do that we will define our own automated test.

Let's explore testing by adding an expectation that will validate that UAC has been properly disabled on our test instance.

To do that we are going to need to learn a few more kitchen commands and a way to express our expectations in a language called InSpec.



InSpec

InSpec tests your servers' actual state by executing command locally, via SSH, via WinRM, via Docker API and so on against a test instance.

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

InSpec is one of many possible test frameworks that Test Kitchen supports. It is a popular choice for those doing Chef cookbook development because InSpec is written by Chef and is built on a Ruby testing framework named RSpec.

RSpec is similar to Chef - as it is a Domain Specific Language, or DSL, layered on top of Ruby. Where Chef gives us a DSL to describe the policy of our system, RSpec allows us to describe the expectations of tests that we define. InSpec adds a number of helpers to RSpec to make it easy to test the state of a system.

Example: Is the Registry Key Set Correctly?

```
system_policies = 'HKLM\Software\Microsoft\Windows\CurrentVersion\Policies\System'

describe registry_key('System Policies', system_policies) do
  its('EnableLUA') { should eq 0 }
end
```

I expect the 'System Policies' found at registry key 'HKLM\Software\Microsoft\Windows\CurrentVersion\Policies\System' to have the property 'EnableLUA' with the value 0.

https://docs.chef.io/inspec_reference.html#registry-key

Here is an InSpec example.

We define a local variable named 'system_policies' that will store the registry key that stores our particular key we want to verify.

We use RSpec's 'describe' to begin to illustrate the element of our system that we are testing.

InSpec provides a helper method named 'registry_key' that allows to provide two parameters. The first parameter is a common name for the registry key. The second is the registry key itself which can be found inside the variable that we have defined.

Within the describe block we define an its block where we are targeting the particular key we are interested in examining. We want to ensure that the 'EnableLUA' key has a value that is equal to zero.

GE: Return Home and Move into the Cookbook



```
$ cd ~\cookbooks\workstation
```

Rename ServerSpec Test Directories



```
$ mv test\integration\default\serverspec  
test\integration\default\inspec
```

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Chef Development Kit 0.10.0 assumes we want to use ServerSpec so it generated a number of folders with files in the test directory. ServerSpec is a similar verifier to InSpec

To use InSpec we will need to manually rename the folder from 'serverspec' to to be called 'inspec'.

Instructor Note: This may not be necessary in future versions of the ChefDK that automatically assume InSpec as the Test Kitchen verifier.



Where do Tests Live?

```
workstation/test/integration/default/inspec/default_spec.rb
```

Test Kitchen will look for tests to run under this directory. It allows you to put unit or other tests in test/unit, spec, acceptance, or wherever without mixing them up. This is configurable, if desired.

<http://kitchen.ci/docs/getting-started/writing-test>

Let's take a moment to describe the reason behind this long directory path. Within our cookbook we define a test directory and within that test directory we define another directory named 'integration'. This is the basic file path that Test Kitchen expects to find the specifications that we have defined.



Where do Tests Live?

`workstation/test/integration/default/inspec/default_spec.rb`

This corresponds exactly to the Suite name we set up in the .kitchen.yml file. If we had a suite called "server-only", then you would put tests for the server only suite under

<http://kitchen.ci/docs/getting-started/writing-test>

The next part the path, 'default', corresponds to the name of the test suite that is defined in the .kitchen.yml file. In our case the name of the suite is 'default' so when test kitchen performs a `kitchen verify` for the default suite it will look within the 'default' folder for the specifications to run.



Where do Tests Live?

```
workstation/test/integration/default/inspec/default_spec.rb
```

This tells Test Kitchen (and Busser) which Busser runner plugin needs to be installed on the remote instance.

<http://kitchen.ci/docs/getting-started/writing-test>

'inspec' is the kind of tests that we want to define. Test Kitchen supports a number of testing frameworks.



Where do Tests Live?

```
workstation/test/integration/default/inspec/default_spec.rb
```

All test files (or specs) are named after the recipe they test and end with the suffix "_spec.rb". A spec missing that will not be found when executing `kitchen verify`.

<http://kitchen.ci/docs/getting-started/writing-test>

The final part of the path is the specification file. This is a ruby file. The naming convention for this file is the recipe name with the appended suffix of _spec.rb. All specification files must end with _spec.rb.

Instructor Note: Without the '_spec.rb' extension RSpec will simply ignore that file.

GE: Replace the Existing Test File

```
~\cookbooks\workstation\test\integration\default\inspec\default_spec.rb

system_policies = 'HKLM\Software\Microsoft\Windows\CurrentVersion\Policies\System'

describe registry_key('System Policies', system_policies) do
  its('EnableLUA') { should eq 0 }
end
```

The content of the previous test file provided ServerSpec example. We need to replace the existing content with the above content.



The First Test

Converging seems to validate that the recipe runs successfully. But does it assert what actually is installed?

Objective:

- ✓ Write a test that asserts that we have disabled UAC when the "workstation" cookbook's default recipe is applied
- Execute the test that we have written

We have now defined our first test. Now it is time to execute that test against our test instance.



Kitchen Verify

kitchen
create kitchen
converge kitchen
verify

```
$ kitchen verify [INSTANCE|REGEXP|all]
```

Create, converge, and verify one or more instances.

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The third kitchen command is `kitchen verify`.

To verify an instance means to:

Create a virtual or cloud instances, if needed

Converge the instance, if needed

And then execute a collection of defined tests against the instance

In our case, our instance has already been created and converged so when we run `kitchen verify` it will execute the tests that we will later define.

Instructor Note: It works as the other commands do with regard to parameters and targeting instances.

Kitchen Destroy

```
$ kitchen destroy [INSTANCE|REGEXP|all]
```

Destroys one or more instances.

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The fourth kitchen command is 'kitchen destroy'.

Destroy is available at all stages and essentially cleans up the instance.

Instructor Note: It works as all the other commands do with regard to parameters and targeting instances.



The diagram illustrates the 'kitchen test' workflow. At the top right is a black Chef logo icon. Below it, the title 'Kitchen Test' is displayed in large orange text. Underneath the title is a horizontal sequence of five rounded rectangular boxes arranged in a flow. From left to right, the boxes are: red ('kitchen destroy'), teal ('kitchen create'), teal ('kitchen converge'), teal ('kitchen verify'), and red ('kitchen destroy'). A large grey arrow points from right to left, indicating the direction of the workflow. Below this sequence is a command line prompt: '\$ kitchen test [INSTANCE|REGEXP|all]'. Further down, a descriptive text states: 'Destroys (for clean-up), creates, converges, verifies and then destroys one or more instances.' At the bottom of the slide, there is copyright information: '©2015 Chef Software Inc.' on the left, '5-57' in the center, and the 'CHEF' logo with a circular icon on the right.

There is a single command that encapsulates the entire workflow - that is 'kitchen test'.

Kitchen test ensures that if the instance was in any state - created, converged, or verified - that it is immediately destroyed. This ensures a clean instance to perform all of the steps: create; converge; and verify. 'kitchen test' completes the entire execution by destroying the instance at the end.

Traditionally this all encompassing workflow is useful to ensure that we have a clean state when we start and we do not leave a mess behind us.

GE: Running the Test

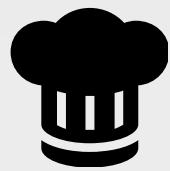


```
$ kitchen verify
```

```
-----> Starting Kitchen (v1.4.2)
-----> Verifying <default-windows-2012r2>...
.

Finished in 0.68749 seconds (files took 0.14062 seconds to load)
1 example, 0 failures

      Finished verifying <default-windows-2012r2> (0m0.73s).
-----> Kitchen is finished. (0m5.22s)
```



The First Test

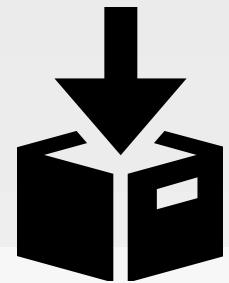
Converging seems to validate that the recipe runs successfully. But does it assert what actually is installed?

Objective:

- ✓ Write a test that asserts that we have disabled UAC when the "workstation" cookbook's default recipe is applied
- ✓ Execute the test that we have written

Congratulations you wrote and executed your first test.

GE: Commit Your Work



```
$ cd ~\cookbooks\workstation  
$ git add .  
$ git status  
$ git commit -m "Added first test for the default  
recipe"
```

With the first test completed. It is time to commit the changes to source control.

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Lab: Additional Test

- Add tests that validate that the registry key 'ConsentPromptBehaviorAdmin' has been set to the value to 0.
- Run kitchen verify to validate the test meets the expectations that you defined
- Commit your changes

As a lab exercise, we want you to define an additional test to verify that the remaining registry key has been set properly.

Instructor Note: Allow 8 minutes to complete this exercise.

GE: Replace the Existing Test File

```
~\cookbooks\workstation\test\integration\default\inspec\default_spec.rb

system_policies = 'HKLM\Software\Microsoft\Windows\CurrentVersion\Policies\System'

describe registry_key('System Policies', system_policies) do
  its('EnableLUA') { should eq 0 }
  its('ConsentPromptBehaviorAdmin') { should eq 0 }
end
```

The content of the previous test file provided ServerSpec example. We need to replace the existing content with the above content.

GE: Running the Test



```
$ kitchen verify
```

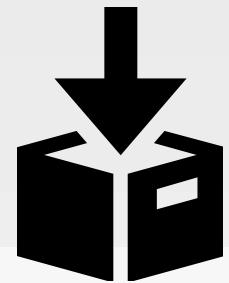
```
-----> Starting Kitchen (v1.4.2)
-----> Verifying <default-windows-2012r2>...
.

Finished in 0.68749 seconds (files took 0.14062 seconds to load)
2 example, 0 failures

      Finished verifying <default-windows-2012r2> (0m0.73s).
-----> Kitchen is finished. (0m5.22s)
```

Now verify our expectation using the `kitchen verify` command. If you have defined the test correctly and the system is in the desired state you should see a summary of the execution. Showing 1 example completed with 0 failures.

GE: Commit Your Work



```
$ cd ~\cookbooks\workstation  
$ git add .  
$ git status  
$ git commit -m "Added second test for the default  
recipe"
```

With the first test completed. It is time to commit the changes to source control.



Lab: Additional Test

- ✓ Add tests that validate that the registry key 'ConsentPromptBehaviorAdmin' has been set to the value to 0.
- ✓ Run kitchen verify to validate the test meets the expectations that you defined
- ✓ Commit your changes

As a lab exercise, we want you to define an additional test to verify that the remaining registry key has been set properly.

Instructor Note: Allow 8 minutes to complete this exercise.

Slide 66

DISCUSSION



Testing

What questions can we help you answer?

What questions can we help you answer?



Testing Our Webserver

I would love to know that the webserver is installed and running correctly.

Objective:

- Discuss and decide what should be tested with the iis-demo cookbook

Now let's turn our focus towards testing the iis-demo cookbook.

DISCUSSION



Testing

What are some things we could test to validate our web server has deployed correctly?

What manual tests do we use now to validate a working web server?

What are some things we could test to validate our web server has deployed correctly?

The iis-demo cookbook is similar to the workstation cookbook. It has a package and file which are things that we have already tested. The new thing is the service. We could review the InSpec documentation to find examples on how to test the service.

But does testing the package, file and service validate that iis-demo is hosting our static web page and returning the content to visitors of the instance?

What manual tests do we use now to validate a working web server?

After applying the recipes in the past we visited the site through a browser or verified the content through running the command 'curl localhost'.

Is that something that we could test as well? Does InSpec provide the way for us to execute a command and verify the results?



Testing Our Webserver

I would love to know that the webserver is installed and running correctly.

Objective:

- ✓ Discuss and decide what should be tested with the iis-demo cookbook

Now that we have decided on the important things to test for our webserver. It is not time to write those tests.



Lab: Testing iis-demo

- Create a test file for the "iis-demo" cookbook's default recipe
- Add tests that validate a working web server
 - https://docs.chef.io/inspec_reference.html#port
 - https://docs.chef.io/inspec_reference.html#command
- Run kitchen verify
- Commit your changes

So for this final exercise, you are going to create a test file for the iis-demo cookbook's default recipe.

That test will validate that you have a working web server. This means I want you to add the tests that you feel are necessary to verify that the system is installed and working correctly.

When you are done execute your tests with `kitchen verify` .

Instructor Note: Allow 15 minutes to complete this exercise.

Lab: Change in the 'iis-demo' Cookbook Dir



```
$ cd ~\cookbooks\iis-demo  
$ mv test\integration\default\serverspec  
test\integration\default\inspec
```

Move into the iis-demo cookbook. Rename the 'serverspec' directory to be called 'inspec'

Lab: What Does the Webserver Say?

```
~\cookbooks\iis-demo\test\integration\default\inspec\default_spec.rb
```

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

describe command('curl http://localhost') do
  its(:stdout) { should match /Hello, world!/ }
end
```

Port 80 should be listening.

The standard out from the command 'curl http://localhost' should match 'Hello, world!'

Here we chose to validate that port 80 should be listening for incoming connections.

And we also validated that the standard out from the command 'curl http://localhost' should match 'Hello, world!'.

Lab: Verify the Webserver is Working



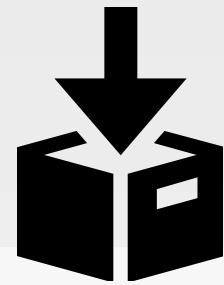
```
$ kitchen verify
```

```
-----> Starting Kitchen (v1.4.2)
-----> Verifying <default-windows-2012r2>...
.

Finished in 2.17 seconds (files took 1.41 seconds to load)
2 examples, 0 failures

      Finished verifying <default-windows-2012r2> (0m3.49s) .
-----> Kitchen is finished. (0m8.21s)
```

Lab: Commit Your Work



```
$ cd ~\cookbooks\iis-demo  
$ git add .  
$ git status  
$ git commit -m "Added tests for the default recipe"
```

Again, let's commit the work.

DISCUSSION



Discussion

Why do you have to run kitchen within the directory of the cookbook?

Where would you define additional platforms?

Why would you define a new test suite?

What are the limitations of using Test Kitchen to validate recipes?

Answer these questions.

With your answers, turn to another person and alternate asking each other asking these questions and sharing your answers.

DISCUSSION



Q&A

What questions can we help you answer?

- Test Kitchen
- kitchen commands
- kitchen configuration
- InSpec

What questions can we help you answer?

Generally or specifically about test kitchen, kitchen commands, kitchen configuration, InSpec.

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6: Details About the System

Details About the System

Finding and Displaying Information About Our System

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Objectives



After completing this module, you should be able to

- Capture details about a system
- Use the node object within a recipe
- Use Ruby's string interpolation
- Update the version of a cookbook

In this module you will learn how to capture details about a system, use the node object within a recipe, use Ruby's string interpolation, and update the version of a cookbook.



Managing a Large Number of Servers

Have you ever had to manage a large number of servers that were almost identical?

How about a large number of identical servers except that each one had to have host-specific information in a configuration file?

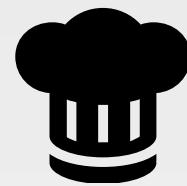
Have you ever had to manage a large number of servers that were almost identical?

How about a large number of identical servers except that each one had to have host-specific information in a configuration file?

The file needed to have the hostname or the IP address of the system.

Maybe you needed to allocate two-thirds of available system memory into HugePages for a database. Perhaps you needed to set your thread max to number of CPUs minus one.

The uniqueness of each system required you to define custom configuration files. Custom configurations that you need to manage by hand.



Details About the System

Displaying system details in the default web page definitely sounds useful.

Objective:

- Find out various details about the system
- Update the web page file contents, in the "iis-demo" cookbook, to include system details
- Use Test Kitchen to converge and verify the "iis-demo" cookbook
- Use chef-client to locally apply the "iis-demo" cookbook's default recipe

When deploying our IIS server it would be nice if the test page displayed some details about the system. Together, let's walk through finding out these details and then updating the content attribute of the file resource to include this new content.

Some Useful System Data

- IP Address
- hostname
- memory
- CPU - MHz

Thinking about some of the scenarios that we mentioned at the start of the session makes us think that it would be useful to capture:

The IP address, hostname, memory, and CPU megahertz of our current system.

We'll walk through capturing that information using various system commands starting with the IP address.

Instructor Note: The next series of steps often seem like an obvious mistake to the learners. It may be helpful to have the learners watch as you perform these steps and comment on the process.

GE: Finding the IP Address



```
$ ipconfig
```

```
Windows IP Configuration

Ethernet adapter Ethernet 2:

  Connection-specific DNS Suffix  . : ec2.internal
  Link-local IPv6 Address . . . . . : fe80::2da8:4ba7:45e2:e863%21
  IPv4 Address. . . . . : 172.31.21.21
  Subnet Mask . . . . . : 255.255.240.0
  Default Gateway . . . . . : 172.31.16.1
```

Running the `ipconfig` command will return to the IP Address of the system.

GE: Finding the Hostname



```
$ hostname
```

```
WIN-KRQSVD3RFM7
```

Running the `hostname` command will return to the hostname of the system.

GE: Finding the Total Memory



```
$ wmic ComputerSystem get TotalPhysicalMemory
```

```
TotalPhysicalMemory  
8052654080
```

Running the following command will return to the total physical memory of the system.

GE: Finding the CPU MHz



```
$ wmic cpu get name
```

```
Name  
Intel(R) Xeon(R) CPU E5-2666 v3 @ 2.90GHz
```

Running the following command will return to the cpu name which includes the clock speed of the CPU.



Details About the System

Displaying system details in the default web page definitely sounds useful.

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- Use Test Kitchen to converge and verify the "iis-demo" cookbook
- Use chef-client to locally apply the "iis-demo" cookbook's default recipe

Now that we have those values about the system it is time to update the server recipe to include these details in the test page that we deploy.

GE: Adding the CPU

~\cookbooks\iis-demo\recipe\server.rb

```
# ... POWERSHELL_SCRIPT RESOURCE ...

file 'c:\inetpub\wwwroot\Default.htm' do
  content '<h1>Hello, world!</h1>
<h2>ipaddress: 172.31.21.21</h2>
<h2>hostname: WIN-KRQSVD3RFM7</h2>
<h2>total memory: 8052654080</h2>
<h2>CPU Mhz: 2.90GHz</h2>'
end

# ... SERVICE RESOURCE ...
```

Edit the server recipe and update the content attribute of the file resource to include some new HTML that includes the fields that we are interested in seeing in our test page.

Notice that the first line of the content attribute is no longer terminated with a single-quote. The single-quote is moved until the very end of the content after the element that contains the CPU Mhz.

Instructor Note: Hard-coding these values is addressed later in discussion and updated to use real-time values in an exercise. This content is done in this manner so that learners are able to see the hard-coded values and replace them with the node attribute equivalents.



Details About the Node

Displaying system details in the default web page definitely sounds useful.

Objective:

- ✓ Find out various details about the system
- ✓ Update the web page file contents, in the "iis-demo" cookbook, to include system details
- ❑ Use Test Kitchen to converge and verify the "iis-demo" cookbook
- ❑ Use chef-client to locally apply the "iis-demo" cookbook's default recipe

The recipe has been updated. Now it is time to test the changes that we have made. We have not written any new tests but our existing tests will ensure that the functionality we have come to depend on will not be broken.



Introducing a Change

By creating a change we have introduced risk.

Lets run our cookbook tests before we apply the updated recipe.

Even though that seemed like a small change, it was a change. And with any changes there is a chance that we made a mistake or changed the behavior that was previously expected. If we decided to not run our tests we would be taking a risk when we attempted to apply it to our current system or if we were to give the cookbook to another individual.

This is an important practice to follow. After completing a change it is a good idea to execute the test suite.

Instructor Note: This is important to reinforce the workflow of working with recipes. Even though this seems like a small change it important to verify every change.

GE: Change into Our Cookbook

```
💻 $ cd ~\cookbooks\iis-demo
```

Remember, we are testing a specific cookbook with kitchen so we need to be within the directory of the cookbook. So change directory into the 'iis-demo' cookbook's directory.

GE: Converge and Verify the Test Instance



```
$ kitchen converge  
$ kitchen verify
```

```
...  
* file[c:\inetpub\wwwroot\Default.htm] action create  
      - update content in file c:\inetpub\wwwroot\Default.htm from 17d291 to  
f37fdd  
      --- c:\inetpub\wwwroot\Default.htm 2015-12-23 21:34:57.000000000 +0000  
      +++ c:\inetpub\wwwroot\Default.htm20151223-3788-i7kjq5 2015-12-23  
22:43:48.000000000 +0000  
      @@ -1,2 +1,6 @@  
      <h1>Hello, world!</h1>  
      +<h2>ipaddress: 172.31.21.21</h2>  
      +<h2>hostname: WIN-KRQSVD3RFM7</h2>  
      +<h2>total memory: 8052654080</h2>
```

Again we have not defined any new tests but the tests that we currently test that the recipe converges successfully and that the existing functionality is still present.

First run `kitchen converge` to apply the updated policy against the same test instance. Because we are not destroying the instance, when we converge it will act much faster as the resources will be updating the existing features, files, and services already in place.

Second run `kitchen verify` to ensure that the tests that we have defined previously will still pass.



Details About the System

Displaying system details in the default web page definitely sounds useful.

Objective:

- ✓ Find out various details about the system
- ✓ Update the web page file contents, in the "iis-demo" cookbook, to include system details
- ✓ Use Test Kitchen to converge and verify the "iis-demo" cookbook
- ❑ Use chef-client to locally apply the "iis-demo" cookbook's default recipe

When everything converges successfully and all the tests pass it is time to apply the cookbook locally to the system.

GE: Return Home and Apply iis-demo Cookbook



```
$ cd ~  
$ chef-client --local-mode -r "recipe[iis-demo]"
```

```
[2015-12-23T22:45:48+00:00] WARN: No config file found or specified on command  
line, using command line options.  
Starting Chef Client, version 12.5.1  
resolving cookbooks for run list: ["iis-demo"]  
Synchronizing Cookbooks:  
  - iis-demo (0.1.0)  
Compiling Cookbooks...  
Converging 3 resources  
Recipe: iis-demo::server  
  * powershell_script[Install IIS] action run  
    - execute "C:\Windows\system32\WindowsPowerShell\v1.0\powershell.exe" -NoLogo  
-NonInteractive -NoProfile -ExecutionPolicy Bypass -InputFormat None -File
```

If everything looks good, then we want to use `chef-client`. `chef-client` is not run on a specific cookbook--it is a tool that allows us to apply recipes for multiple cookbooks that are stored within a cookbooks directory.

1. So we need to return home to the parent directory of all our cookbooks.
2. Then use `chef-client` to locally apply the run list defined as: the 'iis-demo' cookbook's default recipe.

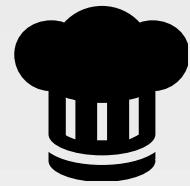
GE: Verify the Default Page Returns the Details



```
$ curl localhost
```

```
StatusCode      : 200
StatusDescription : OK
Content          : <h1>Hello, world!</h1>
                  <h2>ipaddress: 172.31.21.21</h2>
                  <h2>hostname: WIN-KRQSVD3RFM7</h2>
                  <h2>total memory: 8052654080</h2>
                  <h2>CPU Mhz: 2.90GHz</h2>
RawContent       : HTTP/1.1 200 OK
Accept-Ranges: bytes
Content-Length: 150
```

Verify that the Default page is returning the new updated content with the details about the system.



Details About the System

Displaying system details in the default web page definitely sounds useful.

Objective:

- ✓ Find out various details about the system
- ✓ Update the web page file contents, in the "iis-demo" cookbook, to include system details
- ✓ Use Test Kitchen to converge and verify the "iis-demo" cookbook
- ✓ Use chef-client to locally apply the "iis-demo" cookbook's default recipe

DISCUSSION

Capturing System Data



What are the limitations of the way we captured this data?

How accurate will our MOTD be when we deploy it on other systems?

Are these values we would want to capture in our tests?

Now that we've defined these values, lets reflect:

What are the limitations of the way we captured this data?

How accurate will our Default page be when we deploy it on other systems?

Are these values we would want to capture in our tests?



Hard Coded Values

The values that we have derived at this moment may not be the correct values when we deploy this recipe again even on the same system!

If you have worked with systems for a while, the general feeling is that hard-coding the values in our file resource's attribute probably is not sustainable because the results are tied specifically to this system at this moment in time.

DISCUSSION

Data In Real Time



How could we capture this data in real-time?

So how can we capture this data in real-time?

Capturing the data in real-time on each system is definitely possible. One way would be to execute each of these commands, parse the results, and then insert the dynamic values within the file resource's content attribute.

We could also figure out a way to run system commands within our recipes.

Before we start down this path, we'd like to introduce you to Ohai.

Instructor Note: There are many ways within Ruby to escape out and run a system command. Someone new to Chef and Ruby may reach for those and this section is important in showing that most of the work has already been done.

CONCEPT

Ohai!



Ohai is a tool that already captures all the data that we similarly demonstrated finding.

<http://docs.chef.io/ohai.html>

Ohai is a tool that detects and captures attributes about our system. Attributes like the ones we spent our time capturing already.

GE: Running Ohai!



```
$ ohai
```

```
{  
  "kernel": {  
    "name": "Linux",  
    "release": "2.6.32-431.1.2.0.1.el6.x86_64",  
    "version": "#1 SMP Fri Dec 13 13:06:13 UTC 2013",  
    "machine": "x86_64",  
    "os": "GNU/Linux",  
    "modules": {  
      "veth": {  
        "size": "5040",  
        "refcount": "0"  
      },  
      "ipt_addrtype": {  
        "size": "5040",  
        "refcount": "0"  
      }  
    },  
    "cpu": {  
      "cores": 4,  
      "model": "Intel(R) Core(TM) i7-4770K CPU @ 3.50GHz",  
      "speed": 3500,  
      "vendor": "GenuineIntel"  
    },  
    "mem": {  
      "free": 15360,  
      "total": 16384  
    },  
    "swap": {  
      "free": 0,  
      "total": 0  
    }  
  },  
  "os": {  
    "name": "Red Hat Enterprise Linux Server",  
    "version": "6.5",  
    "codename": "Santiago",  
    "arch": "x86_64",  
    "family": "Red Hat Enterprise Linux",  
    "major": 6,  
    "minor": 5,  
    "patch": 0,  
    "branch": "Stable",  
    "version_id": "6.5",  
    "id": "rhel",  
    "id_short": "rhel",  
    "pretty": "Red Hat Enterprise Linux Server 6.5 (Santiago)",  
    "full": "Red Hat Enterprise Linux Server release 6.5 (Santiago)"  
  },  
  "platform": {  
    "name": "rhel",  
    "version": "6.5",  
    "codename": "Santiago",  
    "arch": "x86_64",  
    "family": "Red Hat Enterprise Linux",  
    "major": 6,  
    "minor": 5,  
    "patch": 0,  
    "branch": "Stable",  
    "version_id": "6.5",  
    "id": "rhel",  
    "id_short": "rhel",  
    "pretty": "Red Hat Enterprise Linux Server 6.5 (Santiago)",  
    "full": "Red Hat Enterprise Linux Server release 6.5 (Santiago)"  
  },  
  "platform_family": "rhel",  
  "platform_version": "6.5",  
  "platform_codename": "Santiago",  
  "platform_arch": "x86_64",  
  "platform_branch": "Stable",  
  "platform_id": "rhel",  
  "platform_id_short": "rhel",  
  "platform_pretty": "Red Hat Enterprise Linux Server 6.5 (Santiago)",  
  "platform_full": "Red Hat Enterprise Linux Server release 6.5 (Santiago)"  
}
```

Ohai is also a command-line application that is part of the Chef Development Kit (ChefDK).

CONCEPT

All About The System



Ohai queries the operating system with a number of commands, similar to the ones demonstrated.

The data is presented in JSON (JavaScript Object Notation).

<http://docs.chef.io/ohai.html>

Ohai, the command-line application, will output all the system details represented in JavaScript Object Notation (JSON).

CONCEPT

ohai + chef-client = <3



chef-client and chef-apply automatically executes ohai and stores the data about the node in an object we can use within the recipes named node.

<http://docs.chef.io/ohai.html>

These values are available in our recipes because `chef-client` and `chef-apply` automatically execute Ohai. This information is stored within a variable we call 'the node object'

CONCEPT

The Node Object



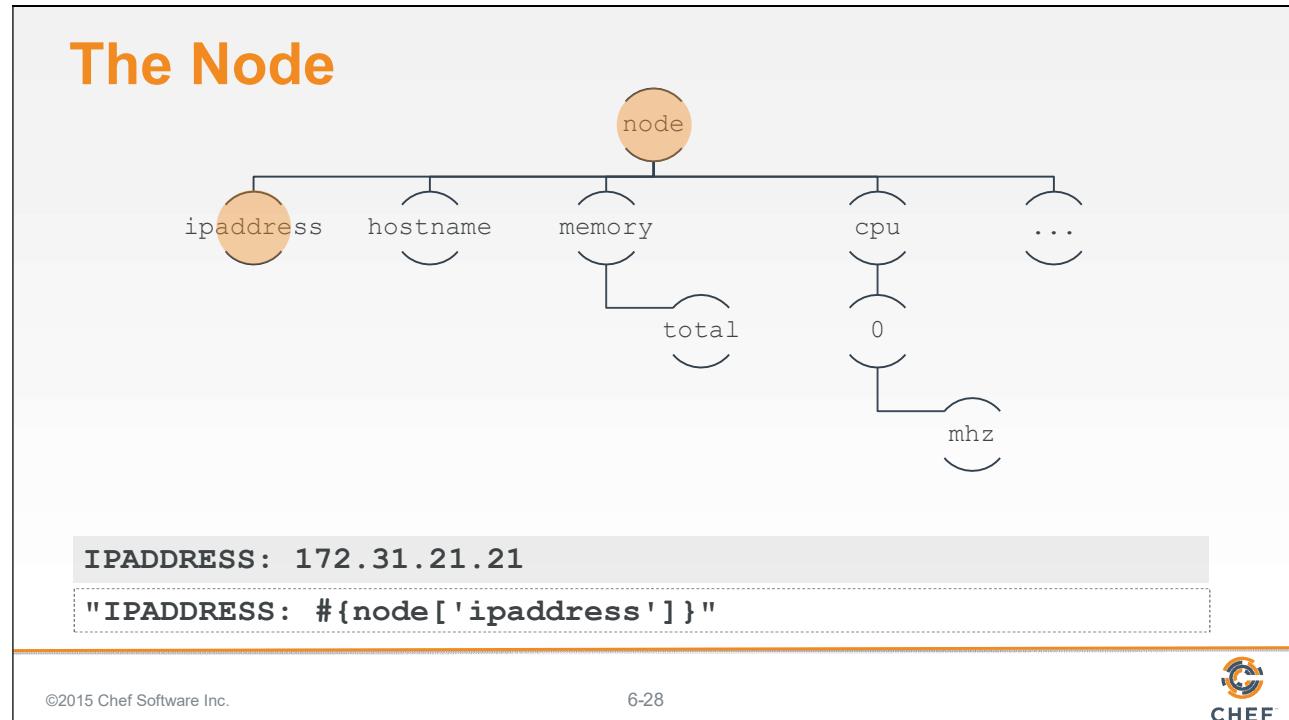
The node object is a representation of our system.
It stores all the attributes found about the system.

<http://docs.chef.io/nodes.html#attributes>

The node object is a representation of our system. It stores all these attributes found about the system. It is available within all the recipes that we write to assist us with solving the similar problems we outlined at the start.

An attribute is a specific detail about a node, such as an IP address, a host name, a list of loaded kernel modules, the version(s) of available programming languages that are available, and so on.

Let's look at using the node object to retrieve the ipaddress, hostname, total memory, and cpu megahertz.

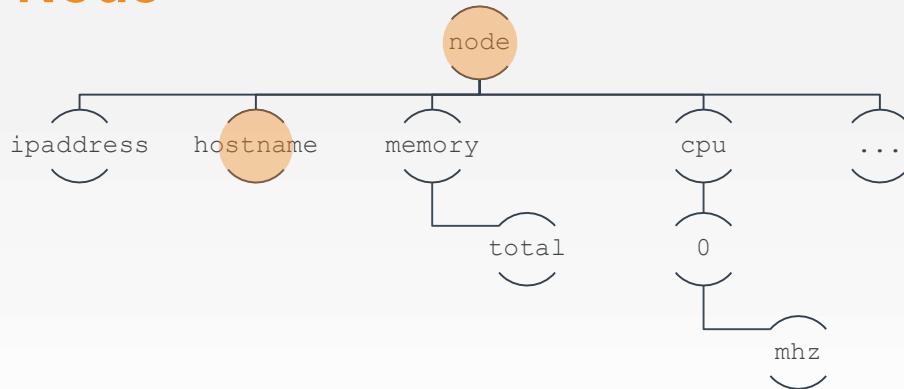


This is the visualization of the node attributes as a tree. That is done here to illustrate that the node maintains a tree of attributes that we can request from it.

The shaded text near the bottom of this slide is the hard-coded value we currently have in the file resource's content attribute.

At the very bottom is an example of how we could use the node's dynamic value within a string instead of the hard-coded one.

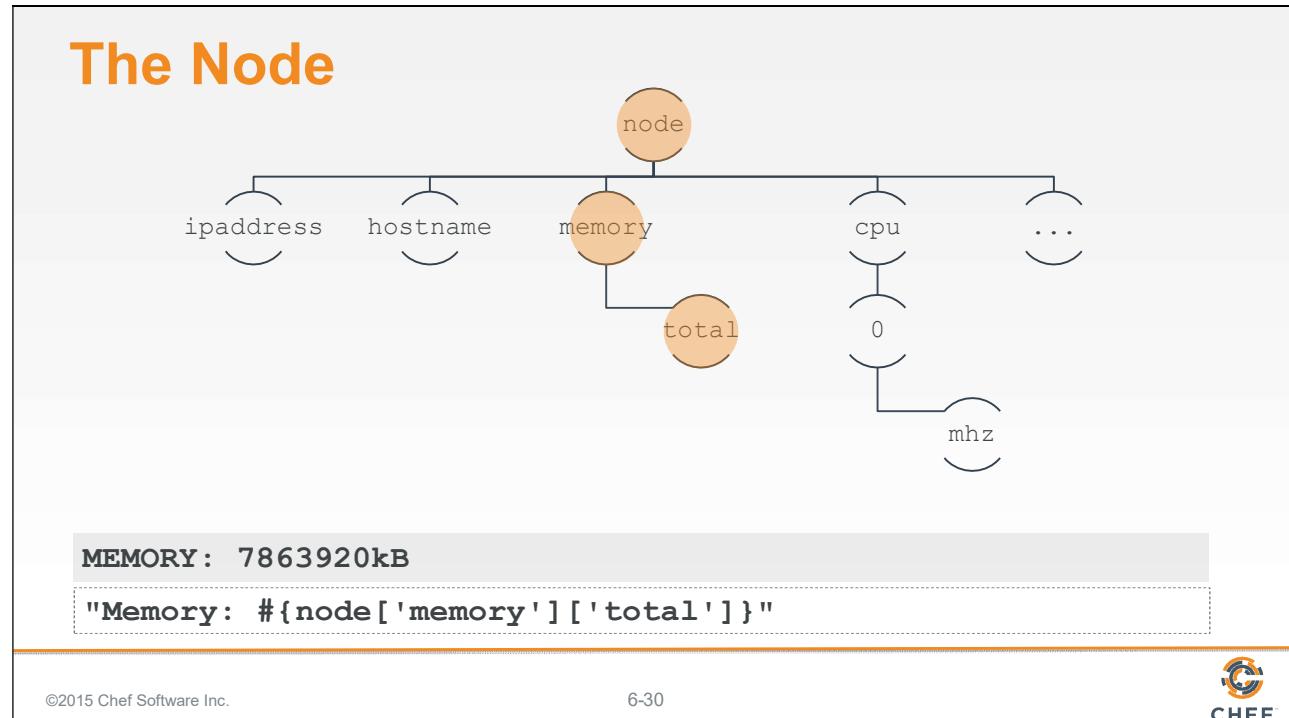
The Node



HOSTNAME: WIN-KRQSVD3RFM7

```
"HOSTNAME: #{node['hostname']}
```

The node maintains a hostname attribute. This is how we retrieve and display it.

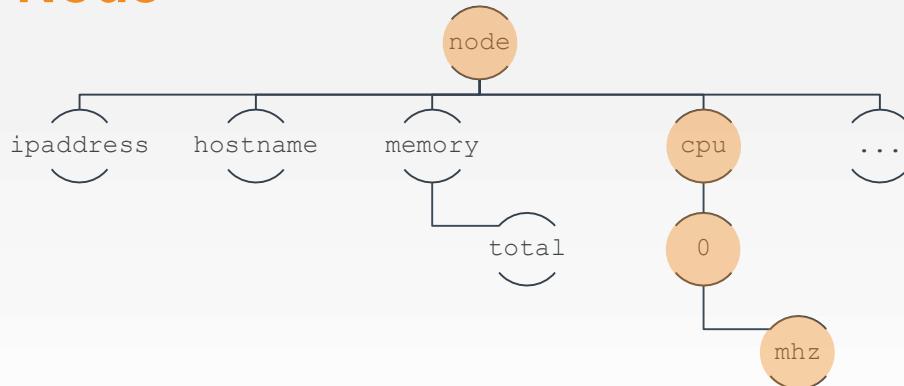


The node contains a top-level value `memory` which has a number of child elements. One of those child elements is the total amount of system memory.

Accessing the node information is different. We retrieve the first value `'memory'`, returning a subset of keys and values at that level, and then immediately select to return the total value.

Slide 31

The Node



CPU: 2900

```
"CPU: #{node['cpu']['0']['mhz']}
```

And finally, here we return the megahertz of the first CPU.

CONCEPT

String Interpolation



```
I have 4 apples
```

```
apple_count = 4  
puts "I have #{apple_count} apples"
```

http://en.wikipedia.org/wiki/String_interpolation#Ruby

In all of the previous examples we demonstrated retrieving the values and displaying them within a string using a ruby language convention called string interpolation.

CONCEPT

String Interpolation



I have 4 apples

```
apple_count = 4
puts "I have #{apple_count} apples"
```

http://en.wikipedia.org/wiki/String_interpolation#Ruby

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String interpolation is only possible with strings that start and end with double-quotes.

CONCEPT

String Interpolation



```
I have 4 apples
```

```
apple_count = 4  
puts "I have #{apple_count} apples"
```

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6-34

 CHEF

To escape out to display a ruby variable or ruby code you use the following sequence: number sign, left curly brace, the ruby variables or ruby code, and then a right curly brace.



Using Node Attributes

Hard-coding the values was a start. But a better approach would be to replace with the dynamic values found from Ohai.

Objective:

- Update the web page file contents, in the "iis-demo" cookbook, to include system details from node attributes.

So as a group let's return the recipe and update file resource to use the dynamic attributes found by Ohai.

GE: Using the Node's Attributes

~\cookbooks\iis-demo\recipe\server.rb

```
# ... POWERSHELL_SCRIPT RESOURCE ...

file 'c:\inetpub\wwwroot\Default.htm' do
  content "<h1>Hello, world!</h1>
<h2>ipaddress: #{node['ipaddress']}</h2>
<h2>hostname: #{node['hostname']}</h2>
<h2>total memory: #{node['memory']['total']}
```

Update the content attribute of the file resource to include the node details. Remember to include the details about the node in the content string we need to use string interpolation. String interpolation requires that the string be a double-quoted string. Ensure you change the single-quotes to double quotes. Then use `#{}` to escape out of the double-quoted string. Between the curly braces you can define the node object and specify which attribute you would like to display.



Using Node Attributes

That feels much better!

Objective:

- ✓ Update the web page file contents, in the "iis-demo" cookbook, to include system details from node attributes.



Lab: Verify the Changes

- Change directory into the "iis-demo" cookbook's directory
- Run kitchen test for the "iis-demo" cookbook
- Change directory into the home directory
- Run chef-client locally to verify the "iis-demo" cookbook's default recipe.

Again we have created a change.

1. Move into the workstation cookbook's directory.
2. Verify the changes we made to the workstation cookbook's default recipe with kitchen.
3. Return to the home directory.
4. Use 'chef-client' to locally apply the workstation cookbook's default recipe.

Instructor Note: Allow 8 minutes to complete this exercise.

Lab: Test the 'iis-demo' Cookbook

```
 $ cd ~\cookbooks\iis-demo  
$ kitchen converge  
$ kitchen verify  
----> Starting Kitchen (v1.4.2)  
----> Setting up <default-windows-2012r2>...  
      Finished setting up <default-windows-2012r2> (0m0.00s).  
----> Verifying <default-windows-2012r2>...  
..  
      Finished in 1.69 seconds (files took 1.01 seconds to load)  
2 examples, 0 failures  
  
      Finished verifying <default-windows-2012r2> (0m2.60s).  
----> Kitchen is finished. (0m7.44s)
```

Change into the 'iis-demo' cookbook's directory and then converge and verify the cookbook. This ensures that change we made was done without an error and did not break any of the existing functionality.

Lab: Apply the 'iis-demo' Cookbook's Default Recipe



```
$ cd ~  
$ chef-client --local-mode -r "recipe[iis-demo]"  
  
[2015-12-23T23:15:24+00:00] WARN: No config file found or specified on command  
line, using command line options.  
Starting Chef Client, version 12.5.1  
resolving cookbooks for run list: ["iis-demo"]  
Synchronizing Cookbooks:  
- iis-demo (0.1.0)  
Compiling Cookbooks...  
Converging 3 resources  
Recipe: iis-demo::server  
* powershell_script[Install IIS] action run  
- execute "C:\Windows\system32\WindowsPowerShell\v1.0\powershell.exe" -  
NoLogo -NonInteractive -NoProfile -ExecutionPolicy Bypass -InputFormat None -
```

If everything passes, change to the home directory and then run `chef-client` to apply the iis-demo cookbook locally to the system.



Change Means a New Version

Lets bump the version number and check in the code to source control.

Objective:

- Determine the new version number
- Update the version of the "iis-demo" cookbook
- Commit the changes to the "iis-demo" cookbook to version control

Whenever you make a change to the cookbook it is important to test it to verify that it works. It is also important to update the version of the cookbook to correspond with the change in the features provided by the cookbook.

Together, let's talk about version numbers, update the version number, and then commit the changes to version control.

CONCEPT

Cookbook Versions



A cookbook version represents a set of functionality that is different from the cookbook on which it is based.

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

A version may exist for many reasons, such as ensuring the correct use of a third-party component, updating a bug fix, or adding an improvement.

The first version of the cookbook displayed a simple hello message. Now the page displays the hello message with additional details about the system. The changes that we finished are new features of the cookbook.

CONCEPT

Semantic Versions



Given a version number **MAJOR.MINOR.PATCH**, increment the:

- **MAJOR** version when you make incompatible API changes
- **MINOR** version when you add functionality in a backwards-compatible manner
- **PATCH** version when you make backwards-compatible bug fixes

<http://semver.org>

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Cookbooks use semantic version. The version number helps represent the state or feature set of the cookbook. Semantic versioning allows us three fields to describe our changes: major; minor; and patch.

Major versions are often large rewrites or large changes that have the potential to not be backwards compatible with previous versions. This might mean adding support for a new platform or a fundamental change to what the cookbook accomplishes.

Minor versions represent smaller changes that are still compatible with previous versions. This could be new features that extend the existing functionality without breaking any of the existing features.

And finally Patch versions describe changes like bug fixes or minor adjustments to the existing documentation.

DISCUSSION

Major, Minor, or Patch?



What kind of changes did you make to the cookbook?

So what kind of changes did you make to the cookbook? How could we best represent that in an updated version?

Changing the contents of an existing resource--by adding the attributes of the node doesn't seem like a bug fix and it doesn't seem like a major rewrite. It is like a new set of features while remaining backwards compatible. That sounds like a Minor changes based on the definitions provided by the Semantic Versioning documentation.



Change Means a New Version

Lets bump the version number and check in the code to source control.

Objective:

- Determine the new version number
- Update the version of the "iis-demo" cookbook
- Commit the changes to the "iis-demo" cookbook to version control

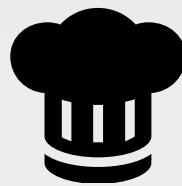
With the idea in mind that we want to update the minor version number we need to find that version number within the cookbook. When we do, we will "bump" the number - which means to increase the value by 1.

GE: Update the Cookbook Version

```
~\cookbooks\iis-demo\metadata.rb
```

```
name          'iis-demo'  
maintainer    'The Authors'  
maintainer_email 'you@example.com'  
license        'all_rights'  
description    'Installs/Configures iis-demo'  
long_description 'Installs/Configures iis-demo'  
version        '0.2.0'
```

Edit the "iis-demo" cookbook's metadata file. Find the line that specifies the version and increase the minor value by one.



Change Means a New Version

Lets bump the version number and check in the code to source control.

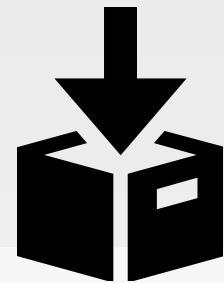
Objective:

- Determine the new version number
- Update the version of the "iis-demo" cookbook
- Commit the changes to the "iis-demo" cookbook to version control

Now the last thing is to save those changes in version control. This will allow us in the future to return to this version of the code if we need to reproduce issues when someone uses the cookbook.

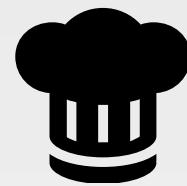
COMMIT

GE: Commit Your Work



```
$ cd ~\cookbooks\workstation  
$ git add .  
$ git status  
$ git commit -m "Version 0.2.0 - Added Node  
Details in MOTD"
```

The last thing to do is commit our changes to source control. Change into the directory, add all the changed files, and then commit them.



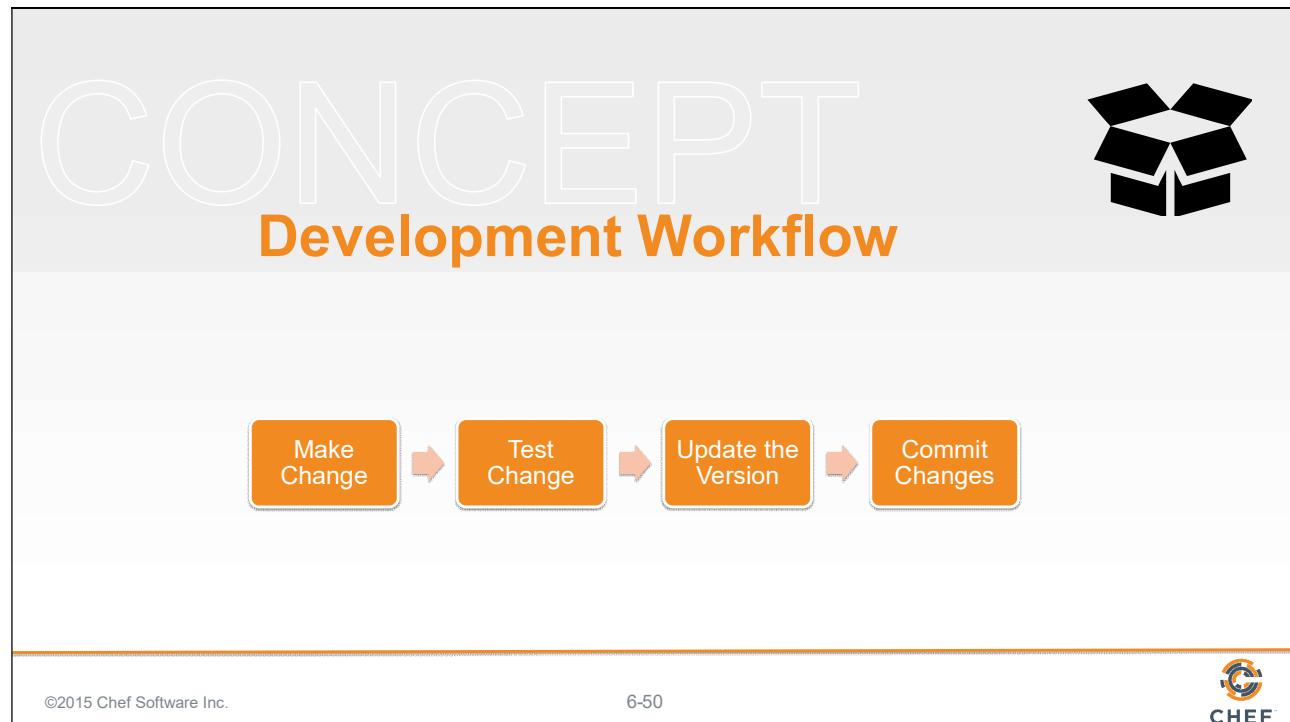
Change Means a New Version

Lets bump the version number and check in the code to source control.

Objective:

- ✓ Determine the new version number
- ✓ Update the version of the "iis-demo" cookbook
- ✓ Commit the changes to the "iis-demo" cookbook to version control

Now that you have bumped the version number and committed your work you now have experienced the entire workflow when working with a cookbook.



First you make the changes to the policies defined within your cookbook to meet the new requirements. Test the changes that you have by writing and executing the tests that are defined. When all the tests pass it is time to update the version of the cookbook. Then finally commit your changes. At this point you would then share those changes with your central source code repository and share the cookbook with your team.

It is important to note that some individuals like to write the tests before they make changes to the system. This is called Test-Driven Development (TDD). This often helps you when developing cookbooks to explicitly define the expectations of the code you are about to write. This workflow is often adopted after one becomes more comfortable with this first workflow.

DISCUSSION

Discussion



What is the major difference between a single-quoted string and a double-quoted string?

How are the details about the system available within a recipe?

How does the version number help convey information about the state of the cookbook?

Answer these questions.

With your answers, turn to another person and alternate asking each other asking these questions and sharing your answers.

DISCUSSION

Q&A



What questions can we help you answer?

- Ohai
- Node Object
- Node Attributes
- String Interpolation
- Semantic Versions

With that we have added all of the requested features.

What questions can we help you answer?

In general or about specifically about ohai, the node object, node attributes, string interpolation, or semantic versioning.

Slide 53



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7: Desired State and Data

Desired State and Data

Extracting the Content for Clarity

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Objectives



After completing this module, you should be able to

- Explain when to use a template resource
- Create a template file
- Use ERB tags to display node data in a template
- Define a template resource

In this module you will learn how to understand when to use a template resource, create a template file, use ERB tags to display node data in a template, define a template resource.

Slide 3



Cleaner Recipes

In the last section we updated our webserver cookbook to display information about our node.

We added this content to the file resource in the server recipe.

We were successful in displaying the details about the system instead of using hard-coded values. We added that content to the content attribute of the file resource that generates the Default page for the webserver.

Demo: The 'iis-demo' Server Recipe

~/cookbooks/iis-demo/recipes/server.rb

```
powershell_script "Install IIS" do
  code "add-windowsfeature Web-Server"
end

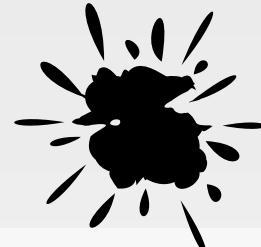
file 'c:\inetpub\wwwroot\Default.htm'
  content "<h1>Hello, world!</h1>
<h2>ipaddress: #{node['ipaddress']}</h2>
<h2>hostname: #{node['hostname']}</h2>
<h2>total memory: #{node['memory']['total']}
```

What if new changes are given to us for the website splash page?

For each new addition we would need to return to this recipe and carefully paste the contents of the new HTML into the string value of the content attribute.

Let's talk about some ways in which this method of keeping the content within the recipe will be problematic as we make more changes.

Double Quotes Close Double Quotes



Double quoted strings are terminated by double quotes.

```
"<h1 style="color: red;">Hello, World!</h1>"
```



There are some things that you need to be careful of when working with double-quoted strings in Ruby: double-quoted strings are terminated by double-quotes.

If any of the text that we paste into this content field has double quotes it is going to have to be escaped. This can possibly become a problem if we wanted to add some additional style or design to our splash page.

CONCEPT

Backslash



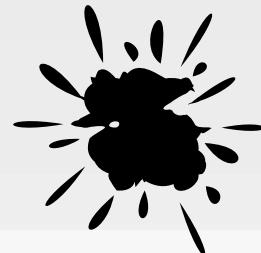
We can use double-quotes as long as we prefix them with a backslash.

```
"<h1 style=\"color: red;\">Hello, World!</h1>"
```



With Ruby strings you can use the backslash character as an escape character. In this case, if you wanted to have a double-quote inside a double-quoted string, you would need to place a backslash before the double-quote.

Here is the fixed version where all the double-quotes within the string are escaped to ensure that Ruby will read this as a single string of characters.



Backslash

Backslashes are reserved characters. So to use them you need to use a backslash.

`"Root Path: C:\\\"`



That also brings up an issue with the backslash character. This is particularly important on Windows where the file separator is often represented with a backslash character. You will need to keep an eye out for backslash characters because backslash characters are now the escape character in a double-quoted string.

If you want to literally represent a backslash you'll need to use two-backslashes.

CONCEPT

Backslash



Backslashes are reserved characters. So to use them you need to use a backslash.

Root Path: C:\\"

So every time text you use a double-quoted string, you will need to find and replace all backslashes with double-backslashes and then replace all double-quotes with backslash double-quotes.

Unexpected Formatting

```
file '/etc/motd' do
  content 'This is the first line of the file.
           This is the second line. If I try and line it up...
           '
  end
```

This is the first line of the file.

This is the second line. If I try and line
it up...

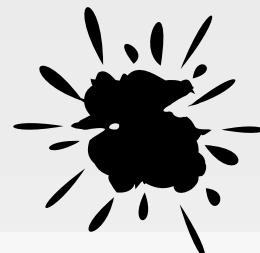
Don't even think about pasting ASCII ART in here!

It is important to note that the file content may have some important formatting that might be easily overlooked when working with the content in a recipe file.

Besides that, if the size of the string value of the content field grows, it will consume the recipe--making it difficult to understand what the desired state is and what the data is.

Instructor Note: The Message of the Day file is not a white-space important file. Other configuration files that could be managed with Chef may be white-space important.

Copy Paste



This process is definitely error prone. Especially because a human has to edit the file again before it is deployed.

So if you are copying and pasting large amounts of text content into a double-quoted string it will be important to check that every time.

This sounds like a bug waiting to happen.

Any process that requires you to manually copy and paste values and then remember to escape out characters in a particular order, is likely going to lead to issues later when you deploy this recipe to production.

CONCEPT

What We Need



We need the ability to store the data in another file, which is in the native format of the file we are writing out but that still allows us to insert ruby code...

...specifically, the node attributes we have defined.

It is better to store this data in another file. The file would be native to whatever format is required so it you wouldn't need to escape any common characters.

But you still need a way to insert node attributes. So you really need a native file format that allows us to escape out to ruby.

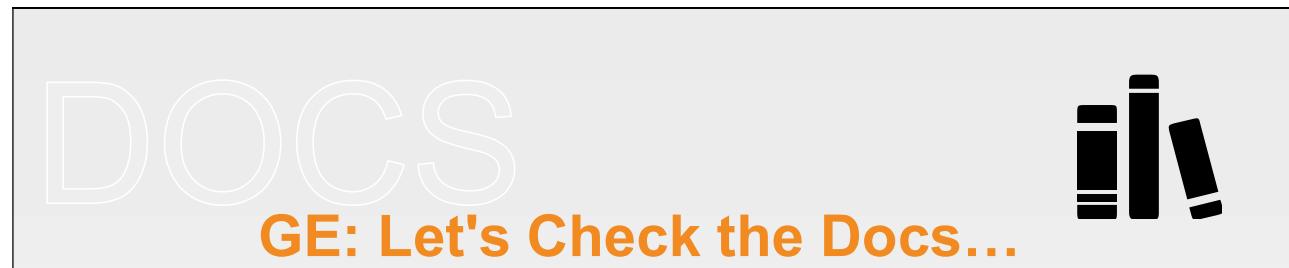


GE: Cleaner Recipes

Adding the node attributes to our recipes did make it harder to read.

Objective:

- Decide which resource will help us address this issue



DOCS

GE: Let's Check the Docs...

Use the file resource to manage files directly on a node.

Use the **cookbook_file** resource to copy a file from a cookbook's `/files` directory. Use the **template** resource to create a file based on a template in a cookbook's `/templates` directory. And use the **remote_file** resource to transfer a file to a node from a remote location.

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

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Let's start from what we know--the file resource. Open the documentation and see what it says and see if it gives us an clue to finding alternatives.

The file resource documentation suggests a couple of alternatives to using the file resource: `cookbook_file` resource; `template` resource; and `remote_file` resource.

Let's start with the `remote_file` resource.



GE: `remote_file`

Use the **remote_file** resource to transfer a file from a remote location using file specificity. This resource is similar to the file resource.

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

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Reading the documentation for `remote_file`, it seems that `remote_file` is similar to `file`. Except `remote_file` is used to specify a file at a remote location that is copied to a specified file path on the system.

So we could define our index file or message-of-the-day file on a remote system. But that does not allow us to insert attributes about the node we are currently on.



GE: **cookbook_file**



Use the **`cookbook_file`** resource to transfer files from a sub-directory of `COOKBOOK_NAME/files/` to a specified path located on a host that is running the chef-client.

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

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Reading the documentation for `cookbook_file`, after the boiler-plate resource definition, it sounds as though a cookbook file is capable of...

Demo: cookbook_file's Source Match Up

```
$ tree /f cookbooks\iis-demo\files\default
Folder PATH listing
Volume serial number is B04A-119C
C:\USERS\ADMINISTRATOR\COOKBOOKS\IIS-DEMO\FILES\DEFAULT
    Default.htm
No subfolders exist

cookbook_file 'c:\inetpub\wwwroot\Default.htm' do
  source 'Default.htm'
end
```

...allowing us to store a file within our cookbook and then have that file transferred to a specified file path on the system.

While it sounds like it allows us to write a file in its native format, it does not sound as though the ability exists to escape out to access the node object and dynamically populate data.



The slide features a large, stylized 'DOCS' logo in white on the left. To the right of the logo is a graphic of three books standing upright. Below the logo, the word 'Template' is written in orange. A text block follows, describing what a cookbook template is and how it's used. A URL is provided for further reading. The slide has a light gray background with a thin orange horizontal line separating the main content from the footer.

DOCS

Template

A cookbook template is an Embedded Ruby (ERB) template that is used to generate files ... Templates may contain Ruby expressions and statements and are a great way to...

Use the template resource to add cookbook templates to recipes; place the corresponding Embedded Ruby (ERB) template in a cookbook's /templates directory.

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

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Let's explore templates.

Reviewing the documentation, it seems as though it shares some similarities to the `cookbook_file` resource.

Demo: Template File's Source Matches Up

```
$ tree /f cookbooks\iis-demo\templates\default
Folder PATH listing
Volume serial number is B04A-119C
C:\USERS\ADMINISTRATOR\COOKBOOKS\IIS-DEMO\TEMPLATES\DEFAULT
    Default.htm.erb
```

```
No subfolders exist
```

```
template 'c:\inetpub\wwwroot\Default.htm' do
  source 'Default.htm.erb'
end
```

A template can be placed in a particular directory within the cookbook and it will be delivered to a specified file path on the system.

The biggest difference is that it says templates can contain ruby expressions and statements. This sounds like what we wanted: A native file format with the ability to insert information about our node.



To use a template, two things must happen:

1. A template resource must be added to a recipe
2. An Embedded Ruby (ERB) template must be added to a cookbook

https://docs.chef.io/resource_template.html#using-templates

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And if we look at the bottom section about "Using Templates", we'll see more information about what is required and how we can use them to escape out to execute ruby code.



GE: Cleaner iis-demo Recipe

Adding the node attributes to the index page did make it harder to read the recipe.

Objective:

- Create a template with chef generate
- Define the contents of the ERB template
- Change the file resource to the template resource in the 'iis-demo' cookbook

So our objective is clear. We need to use a template resource and create a template and then link them together.

Let's start by creating the actual template file and then we will update the recipe.

CONCEPT

What is chef?



An executable program that allows you generate cookbooks and cookbook components.

Remember that application Chef--the one that generated our cookbooks. Well it is able to generate cookbook components as well.

Templates and files (for cookbook_files) are a few of the other things it can generate for us.

GE: What Can chef Do?



```
$ chef --help
```

Usage:

```
chef -h/--help  
chef -v/--version  
chef command [arguments...] [options...]
```

Available Commands:

<code>exec</code>	Runs the command in context of the embedded ruby
<code>gem</code>	Runs the `gem` command in context of the embedded ruby
<code>generate</code>	Generate a new app, cookbook, or component
<code>shell-init</code>	Initialize your shell to use ChefDK as your primary ruby
<code>install</code>	Install cookbooks from a Policyfile and generate a locked
<code>cookbook set</code>	

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7-22



Let's use help to review the command again.

GE: What Can chef generate Do?



```
$ chef generate --help
```

```
Usage: chef generate GENERATOR [options]

Available generators:
  app           Generate an application repo
  cookbook      Generate a single cookbook
  recipe        Generate a new recipe
  attribute     Generate an attributes file
  template      Generate a file template
  file          Generate a cookbook file
  lwrp          Generate a lightweight resource/provider
  repo          Generate a Chef policy repository
  policyfile    Generate a Policyfile for use with the install/push commands
                 (experimental)
```

And let's ask for help about the 'generate' subcommand.

GE: What Can chef generate template Do?



```
$ chef generate template --help
```

```
Usage: chef generate template [path/to/cookbook] NAME [options]
      -C, --copyright COPYRIGHT           Name of the copyright holder - defaults
      to 'The Authors'
      -m, --email EMAIL                 Email address of the author - defaults to
      ...
      -a, --generator-arg KEY=VALUE    Use to set arbitrary attribute KEY to
      VALUE in the
      -I, --license LICENSE            all_rights, iis-demo2, mit, gplv2, gplv3
      - defaults to
      -s, --source SOURCE_FILE        Copy content from SOURCE_FILE
      -g GENERATOR_COOKBOOK_PATH,
      code_generator
      --generator-cookbook
```

Finally let's ask for help for generating templates.

The command requires two parameters--the path to where the cookbook is located and the name of the template to generate. There are some other additional options but these two seem like the most important.

GE: Use chef to Generate a Template



```
$ cd ~  
$ chef generate template cookbooks\iis-demo Default.htm
```

```
Compiling Cookbooks...  
Recipe: code_generator::template  
  * directory[cookbooks/iis-demo/templates/default] action create  
    - create new directory cookbooks/iis-demo/templates/default  
  * template[cookbooks/iis-demo/templates/default/ Default.htm.erb] action...  
    - create new file cookbooks/iis-demo/templates/default/Default.htm.erb  
    - update content in file cookbooks/iis-demo/templates/default/  
Default.htm.erb from none to e3b0c4  
  (diff output suppressed by config)
```

Use '**chef generate template**' to create a template in the iis-demo cookbook found in the cookbooks\iis-demo directory and the file we want to create is named Default.htm.

GE: Lets Look at the Template File



```
$ tree /f cookbooks\iis-demo\templates
```

```
cookbooks/iis-demo/templates/
└── default
    └── Default.htm.erb
```

```
1 directory, 1 file
```

That is the first step. Now that the template exists, we are ready to define the content within the template file.



Cleaner Recipes

Adding the node attributes to the default page did make it harder to read the recipe.

Objective:

- ✓ Create a template with chef generate
- ❑ Define the contents of the ERB template
- ❑ Change the file resource to the template resource in the 'iis-demo' cookbook

Now we need to understand what ERB means.

CONCEPT

ERB



An Embedded Ruby (ERB) template allows Ruby code to be embedded inside a text file within specially formatted tags.

Ruby code can be embedded using expressions and statements.

<https://docs.chef.io/templates.html#variables>

ERB template files are special files because they are the native file format we want to deploy but we are allowed to include special tags to execute ruby code to insert values or logically build the contents.

Text Within an ERB Template

```
<% if (50 + 50) == 100 %>
50 + 50 = <%= 50 + 50 %>
<% else %>
At some point all of MATH I learned in school changed.
<% end %>
```

Each ERB tag has a beginning tag and a matched ending tag.

Here is an example of a text file that has several ERB tags defined in it.

Text Within an ERB Template

```
<% if (50 + 50) == 100 %>
50 + 50 = <%= 50 + 50 %>
<% else %>
At some point all of MATH I learned in school changed.
<% end %>
```

Each ERB tag has a beginning tag and a matched ending tag.

Each ERB tag has a beginning tag and an ending tag.

Text Within an ERB Template

```
<% if (50 + 50) == 100 %>
50 + 50 = <%= 50 + 50 %>
<% else %>
At some point all of MATH I learned in school changed.
<% end %>
```

Each ERB tag has a beginning tag and a matched ending tag.

The beginning tag is a less-than sign followed by a percent sign. The closing tag is a percent sign followed by a greater-than sign.

Text Within an ERB Template

```
<% if (50 + 50) == 100 %>
50 + 50 = <%= 50 + 50 %>
<% else %>
At some point all of MATH I learned in school changed.
<% end %>
```

Executes the ruby code within the brackets and do not display the result.

These tags are used to execute ruby but the results are not displayed.

Text Within an ERB Template

```
<% if (50 + 50) == 100 %>
50 + 50 = <%= 50 + 50 %>
<% else %>
At some point all of MATH I learned in school changed.
<% end %>
```

Executes the ruby code within the brackets and display the results.

ERB supports additional tags, one of those is one that allows you to output some variable or some ruby code. Here the example is going to display that 50 plus 50 equals the result of ruby calculating 50 plus 50 and then displaying the result.

CONCEPT

The Angry Squid



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The starting tag is different. It has an equals sign. This means show the value stored in a variable or the result of some calculation.

We often refer to this opening tag that outputs the content as the Angry Squid. The less-than is its head, the percent sign as its eyes, and the equals sign its tentacles shooting away after blasting some ink.

GE: Move Our Source to the Template

```
~\cookbooks\iis-demo\templates\default\Default.htm.erb
```

```
<html>
  <body>
    <h1>Hello, world!</h1>
    <h2>ipaddress: #{node['ipaddress']}</h2>
    <h2>hostname: #{node['hostname']}</h2>
    <h2>total memory: #{node['memory']['total']}
```

With that in mind let's update the template with the current value of the file resource's content field.

Copying this literally into the file does not work because we no longer have the ability to use string interpolation within this html file. String interpolation only works within a ruby file between a double-quoted String.

GE: Replace String Interpolation with ERB

```
~\cookbooks\iis-demo\templates\default\Default.htm.erb
```

```
<html>
  <body>
    <h1>Hello, world!</h1>
    <h2>ipaddress: <%= node['ipaddress'] %></h2>
    <h2>hostname: <%= node['hostname'] %></h2>
    <h2>total memory: <%= node['memory']['total'] %></h2>
    <h2>CPU Mhz: <%= node['cpu'][0]['mhz'] %></h2>
  </body>
</html>
```

We are going to need to change string interpolation sequence with the ERB template syntax. And it seems for this content we want to display the output so we want to make sure that we are using ERB's angry squid opening tag.



Cleaner Recipes

Adding the node attributes to the default page did make it harder to read the recipe.

Objective:

- ✓ Create a template with chef generate
- ✓ Define the contents of the ERB template
- ❑ Change the file resource to the template resource in the 'iis-demo' cookbook

The template is created and the contents are correctly defined. It is time to update the recipe.

GE: Remove the Existing Content Attribute

```
~\cookbooks\iis-demo\recipes\server.rb

# ... POWERSHELL_SCRIPT RESOURCE ...

file 'c:\inetpub\wwwroot\Default.htm' do
  content "<h1>Hello, world!</h1>
<h2>ipaddress: #{node['ipaddress']}</h2>
<h2>hostname: #{node['hostname']}</h2>
<h2>total memory: #{node['memory']['total']}</h2>
<h2>CPU Mhz: #{node['cpu'][0]['mhz']}</h2>""
end

# ... SERVICE RESOURCE ...
```

Let's open the iis-demo cookbook's recipe named 'server'.

We will want to remove the content attribute from the file resource. Because that content is now in the template. But only if we use a template resource.

GE: Change the File Resource to a Template

```
~\cookbooks\iis-demo\recipes\server.rb
```

```
# ... POWERSHELL_SCRIPT RESOURCE ...

template 'c:\inetpub\wwwroot\Default.htm' do
  ...
end

# ... SERVICE RESOURCE ...
```

So it's time to change the file resource to a template resource so that it can use the template file that we have defined.

What to Specify as the Source?

```
~\cookbooks\iis-demo\recipes\server.rb
```

```
# ... POWERSHELL_SCRIPT RESOURCE ...

template 'c:\inetpub\wwwroot\Default.htm' do
  source "?????????????"
end

# ... SERVICE RESOURCE ...
```

Lastly we need to specify a source attribute which contains that path to the template we generated. This path is relative starting from within the cookbook's template directory.

GE: Viewing the Partial Path to the Template



```
$ tree /f cookbooks\iis-demo\templates\default
```

```
Folder PATH listing
Volume serial number is B04A-119C
C:\USERS\ADMINISTRATOR\COOKBOOKS\IIS-DEMO\TEMPLATES\DEFAULT
    Default.htm.erb

No subfolders exist
```

To visualize that with 'tree' we can run it with a path that places us right at the templates directory. So the results will be relative paths from the point specified.

And we see the filepath Default.htm.erb.

Instructor Note: The default folder denotes that we want to use this file for all platforms.

GE: Change the File Resource to a Template

```
~\cookbooks\iis-demo\recipes\server.rb
template '/var/www/html/index.html' do
  source 'Default.htm.erb'
end
```

Now we have the path to our template so we can update the template resource's source attribute value.



Cleaner Recipes

Adding the node attributes to the default page did make it harder to read the recipe.

Objective:

- ✓ Create a template with chef generate
- ✓ Define the contents of the ERB template
- ✓ Change the file resource to the template resource in the 'iis-demo' cookbook

We hopefully haven't changed the original goal of our recipe but we have made some changes.



Lab: Update the Version

- Use kitchen converge and kitchen verify on the "iis-demo" cookbook
- Use chef-client to apply the "iis-demo" cookbook's "default" recipe
- Update the "iis-demo" cookbook's version for this patch
- Commit the changes

In this lab, you will use 'kitchen' to verify the cookbook and use 'chef-client' to apply the cookbook. If everything is working then update the patch number and commit the changes to version control.

Instructor Note: Allow 8 minutes to complete this exercise.

Lab: Test the Cookbook

```
 $ cd ~\cookbooks\iis-demo  
$ kitchen converge  
$ kitchen verify  
  
-----> Starting Kitchen (v1.4.2)  
-----> Setting up <default-windows-2012r2>...  
      Finished setting up <default-windows-2012r2> (0m0.00s).  
-----> Verifying <default-windows-2012r2>...  
.  
  
Finished in 1.69 seconds (files took 1.01 seconds to load)  
2 examples, 0 failures  
  
Finished verifying <default-windows-2012r2> (0m2.60s).
```

Since kitchen is a cookbook testing tool, you need to move into the cookbook's directory.

Then run the 'kitchen converge' and 'kitchen verify' command, addressing any issues if they show up.

Lab: Change Directories and Apply the Cookbook



```
$ cd ~  
$ chef-client --local-mode -r "recipe[iis-demo]"  
  
[2015-09-16T14:18:05+00:00] WARN: No config file found or specified on command line,  
using command line options.  
Starting Chef Client, version 12.3.0  
resolving cookbooks for run list: ["iis-demo"]  
Synchronizing Cookbooks:  
- iis-demo  
Compiling Cookbooks...  
[2015-09-16T14:18:09+00:00] WARN: Cloning resource attributes for service[httpd]  
from prior resource (CHEF-3694)  
[2015-09-16T14:18:09+00:00] WARN: Previous service[httpd]: /root/.chef/local-mode-  
cache/cache/cookbooks/iis-demo/recipes/server.rb:8:in `from_file'  
[2015-09-16T14:18:09+00:00] WARN: Current service[httpd]: /root/.chef/local-mode-  
cache/ ...
```

When all the tests pass, return to the home directory, so you can execute 'chef-client'.

And then apply the iis-demo cookbook's default recipe to the local system.

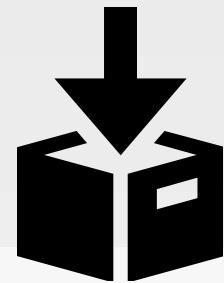
Lab: Update the Cookbook's Patch Number

```
~\cookbooks\iis-demo\metadata.rb
```

```
name          'iis-demo'  
maintainer    'The Authors'  
maintainer_email 'you@example.com'  
license        'all_rights'  
description    'Installs/Configures iis-demo'  
long_description 'Installs/Configures iis-demo'  
version        '0.2.1'
```

If everything converges correctly, update the version number. As mentioned previously, this is a patch fix.

Lab: Commit the Changes



```
$ cd ~\cookbooks\iis-demo  
$ git add .  
$ git status  
$ git commit -m "Changed file resource to template  
resource and defined a template"
```

Return to the cookbook directory and add all the changed files and commit them with a message.

Slide 49

DISCUSSION



Discussion

What is the benefit of using a template over defining the content within a recipe? What are the drawbacks?

What do each of the ERB tags accomplish?

Answer these questions.

With your answers, turn to another person and alternate asking each other these questions and sharing your answers.

DISCUSSION



Q&A

What questions can we help you answer?

- Resources (file, cookbook_file, template, and remote_file)
- Templates
- ERB

What questions can we help you answer?

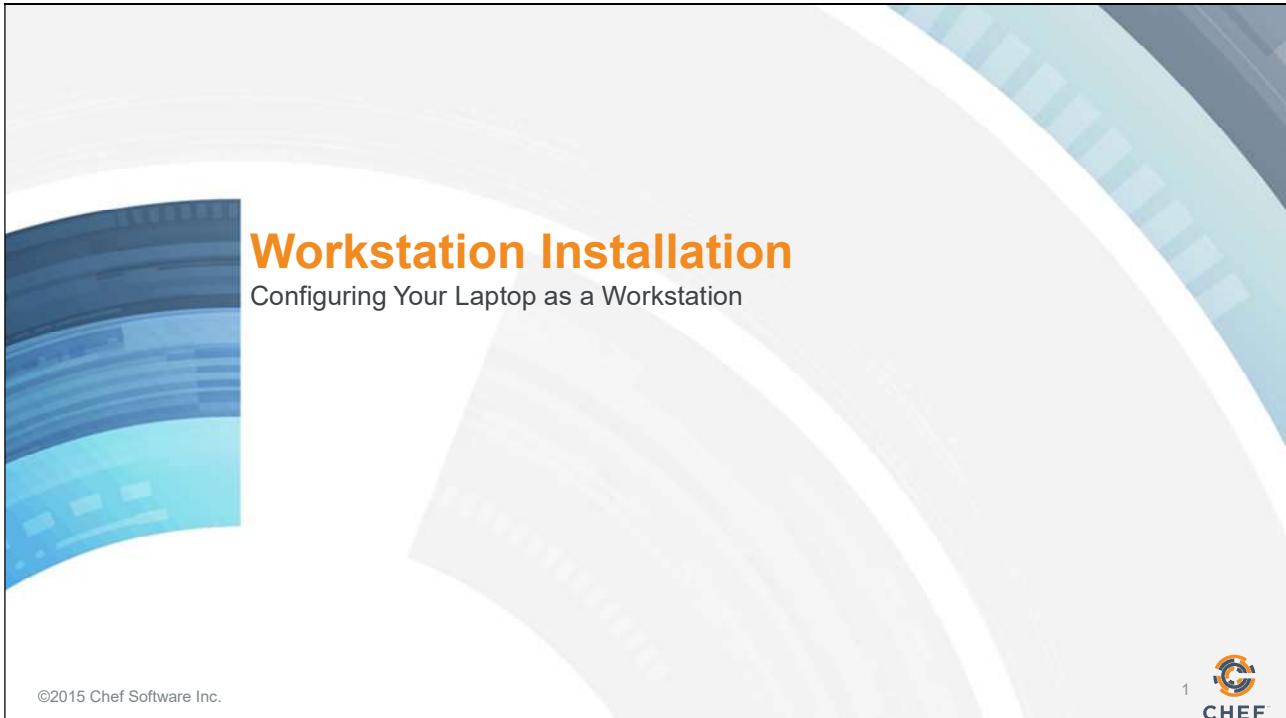
Generally or specifically about resources, templates, and ERB.

Slide 51



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8: Workstation Installation



Objectives



After completing this module, you should be able to

- Ensure that ChefDK is installed on your laptop
- Execute a series of commands to ensure everything is installed
- Download a repository of cookbooks
- Install a local editor like Atom

We have been doing a lot of great work with Chef on this remote workstation that we have provided for you.

In this section we will walk through the installation of the necessary tools and the commands to verify your installation.



Installing the ChefDK

Installing the tools on your system

Objective:

- Install the ChefDK
- Open a Terminal / Command Prompt
- Execute a series of commands to ensure everything is installed
- Download a repository of cookbooks
- Install git (optional)
- Install a text editor (optional)

To become a successful Chef developer, you will want to install Chef tools on your local workstation. These tools are available in the Chef Development Kit (ChefDK). After the installation is complete, we will verify that the various tools are working.

Then we will download a copy of the cookbooks that we created together.

After that you can optionally download a number of other tools that will help you in your journey using Chef. The first is git and the second is a text editor.

Let's get started.

Slide 4



ChefDK

The ChefDK contains tools like chef-apply, chef-client, and kitchen.

You can find the ChefDK to download at the website [downloads.chef.io](https://downloads.chef.io/chef-dk/). Be sure to download ChefDK version 0.8.1

<https://downloads.chef.io/chef-dk/>

Throughout this course we have been using a number of tools found within the ChefDK. The ChefDK contains tools like 'chef-apply', 'chef-client', and 'kitchen'. It also has a number of other great tools that we will use when connecting to a Chef Server, managing cookbook dependencies, or ensuring the quality of the cookbooks that we write.

You can download the ChefDK at <https://downloads.chef.io/chef-dk>.

Instructor Note: Prior to attending this course they may have received correspondence that informed them to setup the ChefDK on their systems. It is possible that they did not and this slides acts as a good reminder to ensure that they have the necessary tools before continuing on to the next section.



GE: Download the ChefDK

ChefDK is a tool chain built on top of the Ruby programming language.

The ChefDK installer does not install any particular graphical-user-interface—installs CLI instead

<https://downloads.chef.io/chef-dk/>

The ChefDK is a tool chain built on top of the Ruby programming language. To assist with making the tools more portable to all platforms we package Ruby and all these tools together in a single platform specific installation package.

The installer does not install any particular graphical user interface, GUI, but instead installs the command-line tools we have been using thus far.

You may have already downloaded the ChefDK previously in this course.



GE: Installing ChefDK

The omnibus installer is used to set up the Chef development kit on a workstation, including the chef-client itself, an embedded version of Ruby, RubyGems, OpenSSL, key-value stores, parsers, libraries, command line utilities, and community tools such as Kitchen, Berkshelf, and ChefSpec.

<https://downloads.chef.io/chef-dk/>

Instructor Note: They should install the ChefDK locally here.

Slide 7

GE: Installing ChefDK



The screenshot shows the 'Chef Development Kit v0.8.1 Setup' window. On the left is a dark blue panel featuring the 'CHEF DEVELOPMENT KIT' logo. The main panel displays the text: 'Welcome to the Chef Development Kit v0.8.1 Setup Wizard' and 'The Setup Wizard will install Chef Development Kit v0.8.1 on your computer. Click Next to continue or Cancel to exit the Setup Wizard.' At the bottom are three buttons: 'Back', 'Next >', and 'Cancel'. The 'Next >' button is highlighted with a cursor. In the top right corner of the slide frame is a small black chef's hat icon.

©2015 Chef Software Inc. 8- 7



Follow the ChefDK installation wizard's instructions. It could take over 10 minutes to install ChefDK.

ChefDk will be installed into an opscode folder on your laptop.



Lab: Run All These Commands

```
$ chef --version  
$ chef-client --version  
$ knife --version  
$ ohai --version  
$ berks --version  
$ kitchen --version  
$ foodcritic --version  
$ rubocop --version
```

Open a local command prompt or something like Windows Power Shell if you prefer and then run these commands.

Some of these commands, like 'chef', 'chef-client', 'ohai', and 'kitchen', are the ones that we have used on our remote workstation. Some of these commands you have not seen yet. Later in this course, we'll explore the commands 'knife' and 'berks'. Some of the remaining commands, like 'foodcritic' and 'rubocop', verify the quality of our cookbook code but will not be discussed in the next sections.

All of these commands have the ability to report their versions. This ensures that all the commands are installed properly on your execution path. If any of these commands fail to run this is the time to stop and troubleshoot them.

CONCEPT

git



Git was initially designed and developed by Linus Torvalds for Linux kernel development in 2005, and has since become the most widely adopted version control system for software development.

<http://git-scm.com/downloads>

We used git on the remote workstations. Chef and the Chef community uses git to manage the source code that we write. It is not required that you install git or use git when working with source code. However, we strongly recommend you use a version control tool and if you have not selected one then please install and use git. It's great once you get through the learning curve.

Instructor Note: It is not necessary that the learner install git. In some situations they may not be even allowed to install it. This again may be a good point to remind them that working with Chef and the Chef community they will likely come in contact with git again and so it is useful to have this tool to be able to participate in reading the source code and contributing fixes, changes, and features.

CONCEPT

Text Editors



When working with Chef you spend a large time editing files.

Whatever editor you use should optimize for this workflow.

As you have experienced during this introduction to working with Chef, a lot of what you are doing is writing source code in an editor. To work with Chef, you spend a large amount of time editing files, saving your work, and then opening more files. Whatever editor you use should optimize for this workflow.

A large number of basic editors that come standard on your operating system are capable of working with chef: notepad; textedit; kedit; etc. However, they are not always optimized for this workflow.

CONCEPT

ATOM Editor



Atom is modern, approachable, and hackable to the core. We can't wait to see what you build with it.

<https://atom.io>

The Atom editor tool can be customized to do anything, but can also be used productively on the first day without ever touching a config file. Atom is modern, approachable, and hackable to the core. We can't wait to see what you build with it.

You can download Atom at this time, if you don't already have it. You could also use Sublime Text if you already have it.

Slide 12



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9: The Chef Server



You accomplished a lot so far. You created two cookbooks; one to setup workstation and a second cookbook that set up a web server that delivered a "Hello, world!" message with some pertinent information about your system.

Objectives



After completing this module, you should be able to

- Connect your local workstation (laptop) to a Chef Server
- Upload cookbooks to a Chef Server
- Bootstrap a node
- Manage a node via a Chef Server



More Web Servers?

More easily manage multiple nodes

Objective:

- Create a Hosted Chef Account
- Upload your cookbooks to the Hosted Chef Server
- Add your old workstation as a managed node

Currently, your cookbook exists on one webserver. If you wanted to setup additional web servers to serve additional traffic for your soon-to-be highly successful website, what steps would you need to take to setup an identical system?

Managing an Additional System



To manage another system, you would need to:

1. Provision a new node within your company or appropriate cloud provider with the appropriate access to login to administrate the system.
2. Install the Chef tools.
3. Transfer the iis-demo cookbook.
4. Run chef-client on the new node to apply the iis-demo cookbook's default recipe.

As an exercise, roughly estimate the time it would take to accomplish this series of steps of preparing another node.

A new system would require us to provision a new node within your company or appropriate cloud provider with the appropriate access to login to administrate the system.

Install the Chef tools.

Transfer the iis-demo cookbook.

Run chef-client locally to apply the iis-demo cookbook's default recipe.

Instructor Note: This exercise is to show the value of using a Chef Server with regard to managing multiple systems. It can be done with the group, with individuals, or done in pairs.

Managing Additional Systems



Installing the Chef tools, transferring the iis-demo cookbook, and applying the run list is not terribly expensive.

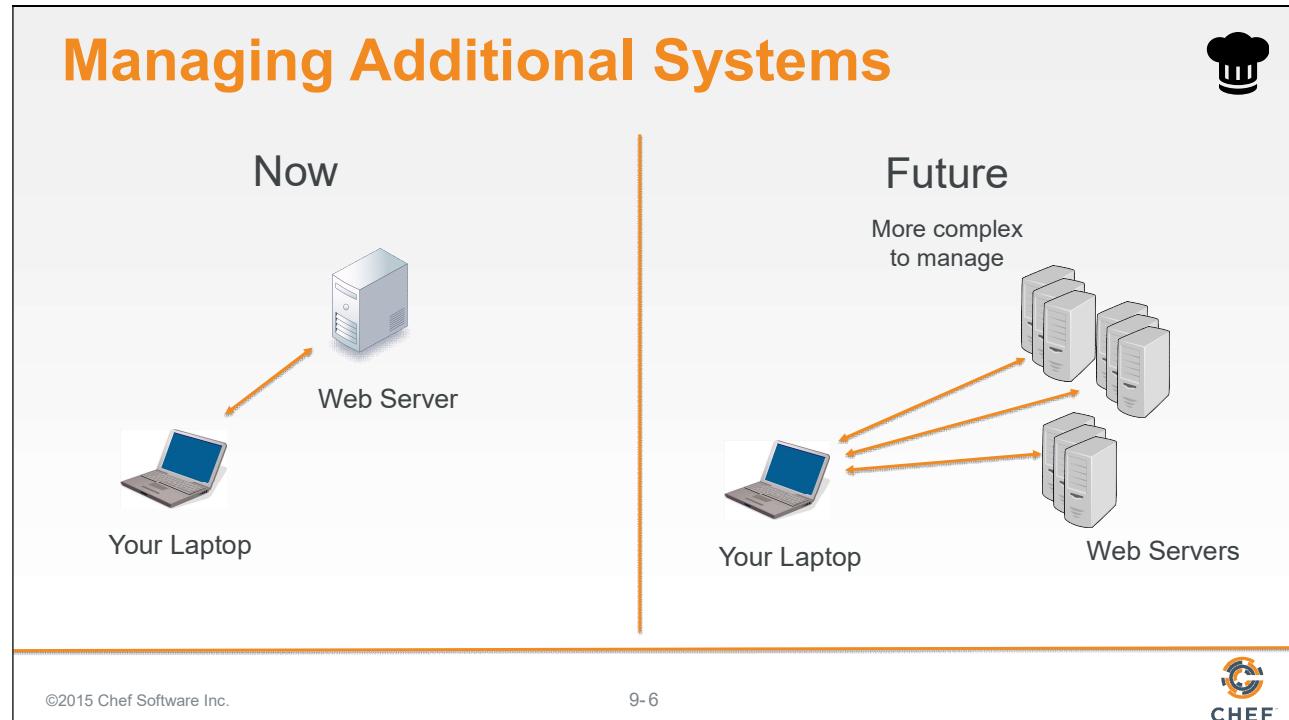
- Chef provides a one-line curl install.
- You could use **git** to clone the repository from a common **git** repository.
- Applying the run list.

The cost of installing the Chef tools, transferring the iis-demo cookbook, and applying the run list is not terribly expensive.

Chef provides a one-line curl install for the Chef Development Kit (ChefDK).

You could use git to clone the repository from a common git repository. Another option is to archive the cookbook and then using SCP to copy over the contents. A third might be to mount a file share. There are a myriad ways to transfer the cookbooks to the new instance.

Then applying the run list requires the execution of a command on that system.



So the overall time required to setup a new instance is not a massive time investment. This manual process will definitely take its toll when requirements demand you manage more than a few additional nodes.

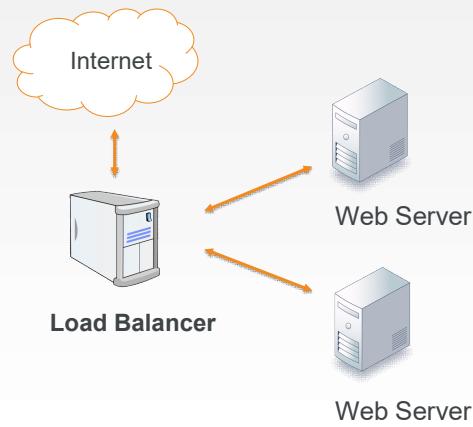
Some may think 10 minutes is not so bad. But what if there were 10 new nodes? 20 new nodes?

As the popularity of your site grows, one server will not be able to keep with all of the web requests. You will need to provision additional machines as demand increases.

Managing User Traffic



A load balancer can forward incoming user web requests to other nodes.



Let's change topics for a moment to managing user web traffic.

In addition to the complexities of configuring and managing multi-server infrastructure, such as web servers, you also need to develop a way to route incoming traffic to each of those web servers and other nodes.

There are many ways that you can route the traffic from one node to a group of similar nodes. This can be done with services by some of the major cloud providers or it can be done with another instance running as a load balancer.

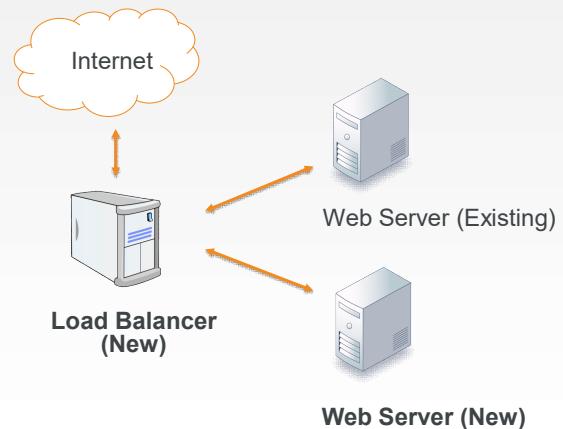
A load balancer allows us to receive incoming requests and forward those requests to other nodes. A load balancer allows us to receive incoming requests and forward those requests to other nodes.

Instructor Note: The preceding three slides covered the complexity of configuring and managing multi-server infrastructure. This slide and page is now talking about managing user **web traffic**, via a load balancer.

Managing User Traffic



Today you will set up a new load balancer that will direct web requests to similarly-configured nodes.



Today you are going to set up a load balancer that will direct web requests to similar configured nodes. Those nodes will be running your default web page that you deploy with the iis-demo cookbook's default recipe.

You have one system already configured as a web server. You will need to set up another web server.

You will also need to set up a node to act as the load balancer to both of these web servers.

Steps to Set up Load Balancer and Web Servers



Web Server

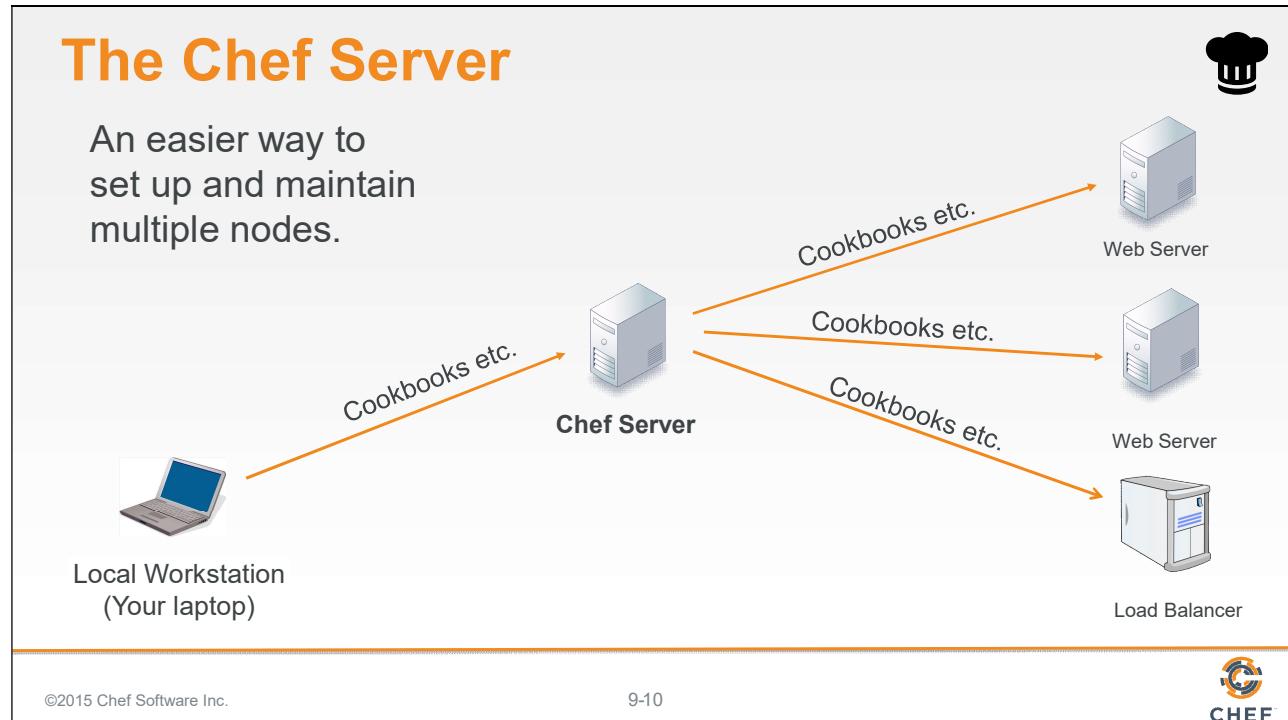
1. Provision the instance
2. Install Chef
3. Copy the Web Server cookbook
4. Apply the cookbook

Load Balancer

1. Create the load balancer cookbook
2. Provision the instance
3. Install Chef
4. Copy the load balancer cookbook
5. Apply the cookbook

Whether you tackle installing, configuring, or running a load balancer or re-create a second instance running the iis-demo cookbook's default recipe, you will need to solve the problem of how you can manage multiple systems. Each system would need to have Chef installed, the cookbooks copied onto each system, and a run list of the recipes to apply to each system.

Instructor Note: The left side is setting up a new web server that is like the one they created yesterday. The right is path the learner is following today.



One way to solve that problem is with a Chef Server.

The Chef Server is designed to help us manage multiple nodes in this situation.

The Chef Server acts as a hub for configuration data. The Chef server stores cookbooks, the policies that are applied to nodes, and metadata that describes each registered node that is being managed by 'chef-client'.

Nodes, such as web servers, load balancers, etc., use 'chef-client' to ask the Chef server for configuration details, such as recipes, templates, and file distributions. The chef-client then does as much of the configuration work as possible on the nodes themselves (and not on the Chef server). In a production environment, the 'chef-client' runs in an automated mode—it polls the Chef Server for updates at set intervals and then applies any configuration changes.

This scalable approach distributes the configuration effort throughout the organization.

Flavors of Chef Server



Open Source
Chef Server

Chef Server
(Support +
Premium
Features)

Multi-tenant
Hosted Chef Server

At the core we offer Chef Server as an open source project freely available for anyone to deploy. We offer support and additional premium features. Lastly, we have Hosted Chef Server, which is a multi-tenant Chef Server that you host as a service. This by far is the quickest way to get started with and is free as long as you remain under the reasonable node amount.



GE: Hosted Chef

More easily manage multiple nodes

Objective:

- Create a Hosted Chef Account
- Upload your cookbooks to the Hosted Chef Server
- Add your old workstation as a managed node

In the interest of getting things done with a relatively small node count, it seems like the Hosted Chef Server option is best.

GE: Signing Up for a Hosted Chef Account



Steps

1. Navigate to <https://manage.chef-demo.com>
2. From the resulting window, click **Get Chef**.

The screenshot shows a web browser displaying the Chef website. At the top, there's a navigation bar with links for COMMUNITY, BLOG, SUPPORT, ACCOUNT MANAGEMENT, CONSOLE, CHEF, DELIVERY, LEARN CHEF, and RESOURCES. To the right of these is a prominent orange 'GET CHEF' button with a hand cursor pointing at it. Below the navigation, the page title 'How Chef Works' is displayed above an illustration of a delivery truck and several cardboard boxes, one of which has arrows indicating movement. At the bottom of the page, there are links for INFRASTRUCTURE AS CODE, FEATURES, and PLANS.

To get started with Hosted Chef Server, visit the Chef website and sign up for a Hosted Chef Account.

Slide 14

GE: Signing Up for a Hosted Chef Account



Steps

3. From the resulting window, click the Hosted Chef **Sign Up** button.

New to Chef? Learn Chef makes it fast and easy. [Get Started](#)

Hosted Chef
Just upload your cookbooks to a highly available, highly scalable Chef server.
[Sign Up](#)

Chef Development Kit
Download and install the latest and greatest version of Chef DK onto your workstation.
[Download](#)

Run Your Own Chef Server
Choose to install Chef server on premises or spin it up quickly on AWS or Microsoft Azure.

Chef Server [Download](#) AWS Marketplace [Learn More](#) Azure Marketplace [Learn More](#)

GE: Signing Up for a Hosted Chef Account



Steps

4. Fill out the form as indicated in this image using your name and a valid email address and then click **Get Started**.

Note: You should write down your new user name and remember your password.

Start your free trial of hosted Chef

You're one step away from access to all the power and flexibility of Chef. Get ready to automate your infrastructure, accelerate your time to market, manage scale and complexity, and safeguard your systems. Just complete the form to get started.

Full Name	Jane Doe
Email	Jane@chef.io
Username	janedoe
Password
Company	Chef

I agree to the [Terms of Service](#) and the [Master License and Services Agreement](#).

Get Started

Already
Click he
Looking
Start with
Join the
Join our v

Instructor Note: Learners that already have an account will login instead of creating an account. The learner's account may be tied to a production organization. The learner can create a new organization with their existing account. If there are still concerns they can create a new login with a unique email address.

GE: Signing Up for a Hosted Chef Account



Steps

5. From the resulting page, click the **Create New Organization** button.

A screenshot of a web browser displaying the 'Welcome to CHEF MANAGE' page. The page has a dark header with the Chef logo and the word 'MANAGE'. Below the header, a message says 'Thank you for using Chef!' and 'You are not yet a member of any organizations, so please either create a new organization or accept a pending invitation.' A note below that says 'If you are trying to join a specific organization and don't have any invitations, get someone in the organization to send you an invitation, then hit the refresh button.' At the bottom left is a 'Sign Out' link, and at the bottom right is a 'Accept Invitations (0 pending)' button with a circular arrow icon. In the center, there is an orange 'Create New Organization' button with a white hand cursor icon pointing to it.

Instructor Note: Learners that already have an account will already have an organization. They are welcome to use that organization if it does not have any cookbooks or nodes from previous exercises or from their production systems. It is often easier to have them create a new organization for the purposes of this training. That can be done through the website.

GE: Signing Up for a Hosted Chef Account



Steps

6. Fill out the resulting Create Organization form and then click **Create Organization**.

The screenshot shows a modal dialog titled "Create Organization". It has two input fields: "Full Name (example: Chef, Inc.)" containing "Jane Organization" and "Short Name (example: chef)" containing "janeorg". At the bottom right are two buttons: "Cancel" and "Create Organization", with a mouse cursor hovering over the "Create Organization" button.

An organization is a structure within managed Chef that allows multiple companies or entities to exist on the same Chef Server without your paths ever crossing. You might think of it as like setting up a unique username for your organization.

All of the cookbooks, instances and other configuration details that you manage with Chef will be stored on the Chef Server for this particular organization. No other organization will have access to it.

GE: Signing Up for a Hosted Chef Account



Steps

7. From the resulting page, click your new organization to highlight it and then click **Starter Kit**.

CHEF MANAGE		Nodes	Reports
> Organizations		Showing All Organization	
Organization			
Create			sd-essentials
Reset Validation Key			
Generate Knife Config			
Invite User			
Leave Organization			
Starter Kit			

Instructor Note: By far the easiest way to get setup with Managed Chef Server is download the Starter Kit. The most important pieces of the starter kit are found in a hidden directory (".*chef*") which contains the organization key, user key, and organization configuration file.

GE: Signing Up for a Hosted Chef Account

The screenshot shows the Chef web interface. At the top right is a chef's hat icon. The main area has a heading 'Thank you for choosing CHEF'. Below it is a button labeled 'Download Starter Kit' with a hand cursor icon pointing at it. To the left is a sidebar with sections for 'Organizations' (Create, Reset Validation Key, Generate Knife Config, Invite User, Leave Organization, Starter Kit), 'Users', and 'Groups'. At the bottom is a confirmation dialog box titled 'Are you certain?' with the message 'Your user and organization keys will be reset. Are you sure you want to do this?'. It has 'Cancel' and 'Proceed' buttons, with 'Proceed' being highlighted with a mouse cursor icon.

Steps

8. From the resulting window, click the **Download Starter Kit** button.
9. Click the **Proceed** button when prompted.

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The starter kit will warn that it will reset your organization key and personal key. If this is a new account and new organization this reset is totally fine. If you already have an account or this is an existing organization please understand that you are destroying the existing keys that already exist on a workstation.

Instructor Note: If the learner already has an account and an organization tied to that account this will reset their personal key and organizational key. This means that the other chef repository that they were previously maintaining will no longer be able to communicate with the Chef Server.

GE: Signing Up for a Hosted Chef Account



Steps

10. Open the downloaded zip file and copy chef-repo folder that's contained in the zip file.
11. Paste the chef-repo folder to a location on your laptop, such as your home directory.

Name
<input type="text" value="chef-repo"/>

Note: Ensure that the path to the chef-repo does not have a space in it. Examples:

Mac: /home/username/chef-repo

Windows: C:\Users\username\chef-repo

Instructor Note: The reason that spaces are not suggested is that Ruby tools have a hard time with file paths that contain spaces.



GE: Download a Repository

A repository containing a similar copy of the work you did previously in this course can be downloaded from here:

<https://github.com/chef-training/chef-essentials-windows-repo>

The cookbooks that were created during the first modules can be found here. These are not the exact cookbooks that you created but ones that have been completed with additional comments and details added.

Instructor Note: A learner may want to use the exact copy of the cookbooks that they developed. You may need to coordinate with the learners on using git or other methods to retrieve those cookbooks from those remote workstations.

Slide 22

GE: Download the Repository

No description or website provided.

Branch: master • [New pull request](#)

2 commits 1 branch 0 releases 1 contributor

burtlo Added a README

Adding workstation and iis-demo cookbook 8 minutes ago

Adding workstation and iis-demo cookbook 8 minutes ago

README.md Added a README 2 minutes ago

README.md

<https://github.com/chef-training/chef-essentials-windows-repo/archive/master.zip>

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CHEF

You may clone the repository or download the zip file. Both of those links can be found in the bottom right.

GE: Paste the cookbooks Folder



Steps

- Open the downloaded chefdk-fundamentals-repo-master zip file and then copy **only** the **cookbooks** folder that's contained in the zip file.
- Replace the **cookbooks** folder that's in your chef-repo folder with the copied cookbooks folder.

Name	Type
.chef	File folder
cookbooks	File folder
README	MD File
Open	
Explore	
Cut	
Copy	
Delete	
Properties	



After you download and open the chef-essentials-windows-master archive, copy the included cookbooks folder and paste it into your chef-repo that you unzipped from the Start Kit. Let the new cookbooks folder (that you got from the chef-essentials-windows-master) overwrite the existing cookbooks folder that was in your chef-repo folder.

Important: If you had an existing chef-repo prior to class that you want to preserve, save a copy of your old cookbooks folder before pasting the new one into your chef-repo.

Instructor Note: The Starter Kit only contained a starter cookbook that has no value to the learner.

GE: Navigate to the chef-repo



```
$ cd ~\chef-repo
```

The starter kit contains the configuration to reach the Chef Server and your credentials to validate the communication between your workstation and the Chef Server.

To verify the connection with the Chef Server you will need to run commands within the repository you downloaded.

Open a terminal or command prompt and navigate to the chef-repo directory.

CONCEPT

knife



knife is a command-line tool that provides an interface between a local chef-repo and the Chef Server.

knife is a command-line tool that allows us to request and send information to the Chef Server.

knife

helps

users

manage:

- Nodes
- Cookbooks and recipes
- Roles
- and more

knife provides a number of sub-commands.

GE: knife --help



```
$ knife --help
```

```
Available subcommands: (for details, knife SUB-COMMAND --help)

** BOOTSTRAP COMMANDS **
knife bootstrap FQDN (options)
knife bootstrap windows ssh FQDN (options)
knife bootstrap windows winrm FQDN (options)

** CLIENT COMMANDS **
knife client bulk delete REGEX (options)
knife client create CLIENT (options)
knife client delete CLIENT (options)
knife client edit CLIENT (options)
```

You can look at all the commands with 'knife --help'.

This will display all the sub-commands available. In your case you want to verify that the client list contains a single entry so you need to look for help for the specific command 'knife client --help'.

GE: knife client --help



```
$ knife client --help
```

```
Available client subcommands: (for details, knife SUB-COMMAND --help)

** CLIENT COMMANDS **

knife client bulk delete REGEX (options)
knife client create CLIENT (options)
knife client delete CLIENT (options)
knife client edit CLIENT (options)
knife client list (options)
knife client reregister CLIENT (options)
knife client show CLIENT (options)
```

This will give us an even smaller subset of the commands related specifically to asking the Chef Server about client information. A general command is the list command which will output all the clients that the Chef Server currently maintains.

GE: knife client list



```
$ knife client list
```

```
ORGNAME-validator
```

For your Chef Server account there should be a single client that is the organization name: validator. This is a special key that has access to the Chef Server. The important thing is that the result does not contain an error with the configuration or authenticating with the Chef Server.

If you receive an error ensure that you:

typed the command correctly

executed the command within the chef repository

are connected to the internet and not blocking ssl connections from your own system's proxy servers or virtual private networks

have a .chef directory, within the chef repository, which contains the knife configuration file (knife.rb), personal key, and organizational key



Hosted Chef

More easily manage multiple nodes

Objective:

- ✓ Create a Hosted Chef Account
- ❑ Upload your cookbooks to the Hosted Chef Server
- ❑ Add your old workstation as a managed node

With all that complete, you are now able to communicate with the Chef Server. At this point we will refer to the system in front of you, with the chef repository, the configuration, and the keys installed as your workstation.

When working with Chef with a Chef Server, the workstation is the location where you will compose your cookbook code. When that code is complete, you will then upload it to the Chef Server.

GE: knife cookbook --help



```
$ knife cookbook --help
```

```
** COOKBOOK COMMANDS **  
knife cookbook bulk delete REGEX (options)  
knife cookbook create COOKBOOK (options)  
knife cookbook delete COOKBOOK VERSION (options)  
knife cookbook download COOKBOOK [VERSION] (options)  
knife cookbook list (options)  
knife cookbook metadata COOKBOOK (options)  
knife cookbook metadata from FILE (options)  
knife cookbook show COOKBOOK [VERSION] [PART] [FILENAME] (options)  
knife cookbook test [COOKBOOKS...] (options)  
knife cookbook upload [COOKBOOKS...] (options)
```

Similar to asking the Chef Server about the list of available clients, you can also ask for information about cookbooks. You can find all the commands related to the cookbooks subcommand by running `knife cookbook --help`.

Similar to the list of clients, you can examine a list of cookbooks.

GE: knife cookbook list



```
$ knife cookbook list
```

Running this command will return the cookbooks currently uploaded to the Chef Server. The empty response should come as no surprise.

You want to change that. So you are going to upload each of your cookbooks to the Chef Server.

GE: Change to the cookbooks/iis-demo Directory

```
💻 $ cd cookbooks\iis-demo
```

To upload a cookbook to the Chef Server you need to be within the directory of the cookbook. Let us start with the iis-demo cookbook. Change directory into the iis-demo cookbook directory which is within the cookbooks directory.

CONCEPT

Berkshelf



Berkshelf is a cookbook management tool that allows us to upload your cookbooks and all of its dependencies to the Chef Server.

berkshelf.com

To upload the cookbook you will need to use another tool called Berkshelf.

Berkshelf is a cookbook management tool that allows us to upload your cookbooks and all of its dependencies to the Chef Server. In this instance, your current cookbooks have no dependencies, but in the future when they do, Berkshelf will assist you in ensuring those are all uploaded.

GE: Run berks --help



```
$ berks --help
```

```
Commands:
  berks apply ENVIRONMENT      # Apply version locks from Berksfile.lock to a Chef
  environment
  berks contingent COOKBOOK    # List all cookbooks that depend on the given cookbook in
  your
  berks cookbook NAME [PATH]    # Create a skeleton for a new cookbook
  berks help [COMMAND]          # Describe available commands or one specific command
  berks info [COOKBOOK]          # Display name, author, copyright, and dependency information
  berks init [PATH]              # Initialize Berkshelf in the given directory
  berks install                 # Install the cookbooks specified in the Berksfile
  berks list                     # List cookbooks and their dependencies specified by your
  berks outdated [COOKBOOKS]     # List dependencies that have new versions available that
  berks package [PATH]            # Vendor and archive the dependencies of a Berksfile
  berks search NAME              # Search the remote source for cookbooks matching the partial
```

Berkshelf is a command-line tool that you can ask to see available the commands.

GE: Run berks install



```
$ berks install
```

```
Resolving cookbook dependencies...
Fetching 'iis-demo' from source at .
Fetching cookbook index from https://supermarket.chef.io...
Using iis-demo (0.2.1) from source at .
```

Berkshelf is used on a per-cookbook basis. As dependencies are often per cookbook you'll need to change into the directory of the cookbook.

You should install any dependencies that your cookbook might have. Again, in this instance there are no dependencies external to this cookbook but Berkshelf ensures that this is the case when it runs the 'berks install' command.

You'll see that it finds the current cookbook within your current directory, it contacts the Supermarket for any external dependencies, and then ...

GE: See the Berksfile.lock



```
$ dir
```

```
drwxr-xr-x 7 chef chef 4096 Aug 27 18:44 .
drwxr-xr-x 4 chef chef 4096 Aug 27 16:17 ..
drwxr-xr-x 8 chef chef 4096 Aug 27 16:07 .git
-rw-r--r-- 1 chef chef 126 Aug 27 15:46 .gitignore
drwxr-xr-x 3 chef chef 4096 Aug 27 18:45 .kitchen
-rw-r--r-- 1 chef chef 183 Aug 27 18:44 .kitchen.yml
-rw-r--r-- 1 chef chef 47 Aug 27 15:46 Berksfile
-rw----- 1 chef chef 77 Aug 27 18:45 Berksfile.lock
-rw-r--r-- 1 chef chef 54 Aug 27 15:46 README.md
-rw-r--r-- 1 chef chef 974 Aug 27 15:46 chefignore
-rw-r--r-- 1 chef chef 198 Aug 27 15:46 metadata.rb
drwxr-xr-x 2 chef chef 4096 Aug 27 16:34 recipes
```

...it completes by writing a Berksfile.lock to the file system.

The Berksfile.lock is a receipt of all the cookbooks and dependencies found at the exact moment that you ran 'berks install'.

GE: See the Contents of the Berksfile.lock



```
$ cat Berksfile.lock
```

```
DEPENDENCIES
  iis-demo
    path: .
    metadata: true

GRAPH
  iis-demo (0.2.1)
```

This lock file is useful to ensure that in the future you use the same dependencies when working with the cookbook.

GE: Upload the Cookbook to the Chef Server



```
$ berks upload
```

```
Uploaded iis-demo (0.2.1) to:  
'https://api.opscode.com:443/organizations/steveessentials2'
```

With the dependencies accounted for, it is time to upload the to the Chef Server. This is another sub-command that Berkshelf provides called 'upload'. Run the command to upload the iis-demo cookbook to the Chef Server.

GE: Display Cookbooks within Your Org



```
$ knife cookbook list
```

```
iis-demo      0.2.1
```

When that is complete you can return to the cookbook command that allows you to display the cookbooks within your organization by running this command. This will show you that the Chef Server has the iis-demo cookbook that you have uploaded.

Lab



Lab: Upload Cookbooks

- Upload your remaining cookbooks
- Verify that all cookbooks are uploaded

As a lab, upload the remaining cookbooks within the cookbooks directory. After you have done that verify that the cookbooks have been uploaded.

Instructor Note: Allow 5 minutes to complete this exercise.

Lab: cd and Run knife cookbook list



```
$ cd ~\chef-repo\cookbooks\workstation  
$ knife cookbook list
```

```
iis-demo      0.2.1
```

The one remaining cookbook is the workstation cookbook. Berkshelf is a cookbook management tool that examines the contents and dependencies of a single cookbook.

Change into the cookbooks directory.

Verify that the cookbook is not currently uploaded.

Lab: Install the Cookbook Dependencies



```
$ berks install
```

```
Resolving cookbook dependencies...
Fetching 'workstation' from source at .
Fetching cookbook index from https://supermarket.chef.io...
Using workstation (0.1.0) from source at .
```

Run "berks install" to install all the cookbook dependencies.

Lab: Upload the Cookbook to the Chef Server



```
$ berks upload
```

```
Uploaded workstation (0.1.0) to:  
'https://api.opscode.com:443/organizations/steveessentials2'
```

Run "berks upload" to upload the cookbook and all its dependencies to the Chef Server.

Lab: Is the workstation Cookbook Uploaded?



```
$ knife cookbook list
```

```
iis-demo      0.2.1
workstation    0.1.0
```

Lastly, run "knife cookbook list" to validate that the workstation cookbook is now uploaded to the Chef Server.



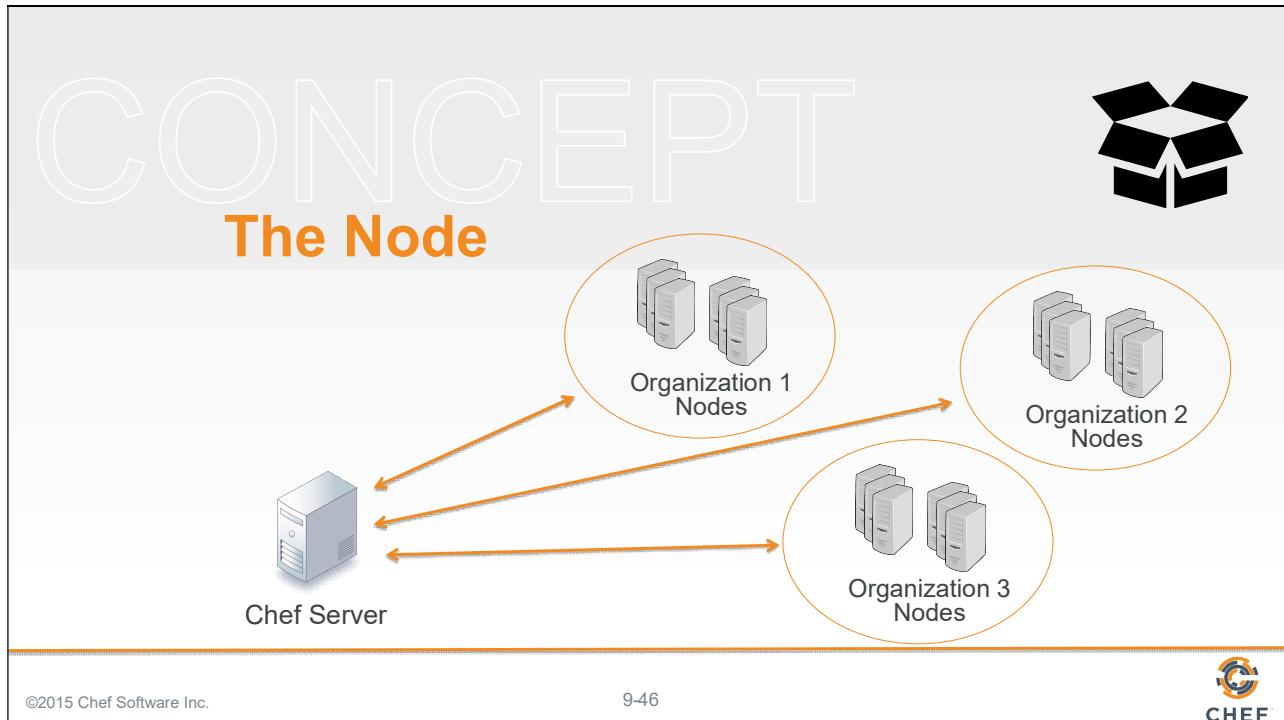
Hosted Chef

More easily manage multiple nodes

Objective:

- ✓ Create a Hosted Chef Account
- ✓ Upload your cookbooks to the Hosted Chef Server
- ❑ Add your old workstation as a managed node

You have one remaining objective and that is to add an instance as a node within your organization.



As you know by now, a node is a server that Chef is managing. A node could be a web server, an application server, a database server, a load balancer, and so on.

A node can only join one organization. To be a node means that it has Chef installed, has configuration files in place, and when you run the chef-client application with no parameters it will successfully contact the Chef Server and ask it for the run list that it should apply and the cookbooks required to execute that run list.

When a node is part of the organization you manage that information on the Chef Server as well. A Chef Server can manage multiple organizations. Managing that information in a Chef Server allows us to use for inventory, querying and searching.

GE: Change to the chef-repo



```
$ cd ~\chef-repo
```

Let's add the instance we used previously as a workstation now as a managed node. Return to the root of the chef repository.

GE: Run 'knife node --help'



```
$ knife node --help
```

```
** NODE COMMANDS **  
knife node bulk delete REGEX (options)  
knife node create NODE (options)  
knife node delete NODE (options)  
knife node edit NODE (options)  
knife node environment set NODE ENVIRONMENT  
knife node from file FILE (options)  
knife node list (options)  
knife node run_list add [NODE] [ENTRY[,ENTRY]] (options)  
knife node run_list remove [NODE] [ENTRY[,ENTRY]] (options)  
knife node run_list set NODE ENTRIES (options)  
knife node show NODE (options)
```

Verify that you have no existing nodes within your organization. You can use the 'knife node --help' command to see that you can ask for the list of all nodes within your organization with the list command.

GE: Run 'knife node list'



```
$ knife node list
```

Run "knife node list" to see that you have no nodes currently registered with your Chef Server. At this point the results should be blank.

GE: Run 'knife bootstrap –help'



```
$ knife bootstrap --help
```

```
knife bootstrap FQDN (options)
  --bootstrap-curl-options OPTIONS
    Add options to curl when install chef-client
  --bootstrap-install-command COMMANDS
    Custom command to install chef-client
  --bootstrap-no-proxy [NO_PROXY_URL|NO_PROXY_IP]
    Do not proxy locations for the node being
bootstrapped; this option is used internally by Opscode
  --bootstrap-proxy PROXY_URL  The proxy server for the node being
bootstrapped
  -t TEMPLATE,                      Bootstrap Chef using a built-in or custom
template. Set to the full path of an erb
template or use one of the built-in templates.
```

Knife provides a bootstrap subcommand that takes a number of options.

When you bootstrap an instance it is performing the following:

- * Installing chef tools if they are not already installed
- * Configuring Chef to communicate with the Chef Server
- * Running chef-client to apply a default run list

GE: Bootstrap Your Node



```
$ knife bootstrap windows winrm IP -x USER -P PWD -N node1
```

```
Creating new client for node1
Creating new node for node1
Connecting to ec2-54-175-46-24.compute-1.amazonaws.com
ec2-54-175-46-24.compute-1.amazonaws.com Starting first Chef Client run...
ec2-54-175-46-24.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-175-46-24.compute-1.amazonaws.com resolving cookbooks for run list: []
ec2-54-175-46-24.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-175-46-24.compute-1.amazonaws.com Compiling Cookbooks...
ec2-54-175-46-24.compute-1.amazonaws.com [2015-09-16T16:51:21+00:00] WARN: Node
node1 has an empty run list.
ec2-54-175-46-24.compute-1.amazonaws.com Converging 0 resources
ec2-54-175-46-24.compute-1.amazonaws.com
ec2-54-175-46-24.compute-1.amazonaws.com Running handlers:
```

To communicate with the remote instance you need to provide it the credentials to connect to the system. Use the user name with the '-x' flag and the password '-P' flag.

Include the '--sudo' flag because you are installing software and writing configuration to directories traditionally owned by the root user.

Name the node with the '-N' flag. This is optional but makes it easier for us to communicate. When we ask you to look at the details of node 1 or login to node 1, it will be easier to remember than the fully-qualified domain name.

When executing the command, the output will tell us what it installed and ran.

GE: Run 'knife node list' Again



```
$ knife node list
```

```
node1
```

When bootstrapping is done, you can see that your organization knows about the new node by again running the command "knife node list". You now see that you have a new node, node1, uploaded to the Chef Server.

GE: View More Information About Your Node



```
$ knife node show node1
```

```
Node Name: node1
Environment: _default
FQDN: ip-172-31-8-68.ec2.internal
IP: 54.175.46.24
Run List:
Roles:
Recipes:
Platform: centos 6.7
Tags:
```

You can see more information about a particular node with the command 'knife node show node1'. This will display a summary of the node information that the Chef Server stores.

GE: Add a Recipe to a Run List



```
$ knife node run_list add node1 "recipe[iis-demo]"
```

```
node1:  
  run_list: recipe[iis-demo]
```

node1 does not have a list of recipes that it applies to the system by default. You can make Chef Server tell node1 to apply a specific run-list the next time node 1 runs 'chef-client'.

You can do that through the 'knife node run_list add' command. In this example, you are adding to node1's run-list the iis-demo cookbook's default recipe.



Hosted Chef

More easily manage multiple nodes

Objective:

- ✓ Create a Hosted Chef Account
- ✓ Upload your cookbooks to the Hosted Chef Server
- ✓ Add your old workstation as a managed node

DISCUSSION



Discussion

What is the benefit of storing cookbooks in a central repository?

What is the primary tool for communicating with the Chef Server?

How did you add a node to your organization?

Answer these questions.

With your answers, turn to another person and alternate asking each other asking these questions and sharing your answers.

DISCUSSION



Q&A

What questions can you help you answer?

- Chef Server
- Managed Chef
- Berkshelf
- Bootstrapping Nodes

With all of the objectives complete you are finished with this section. What question can you answer for you?

Slide 58



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10: Community Cookbooks



Objectives

After completing this module, you should be able to

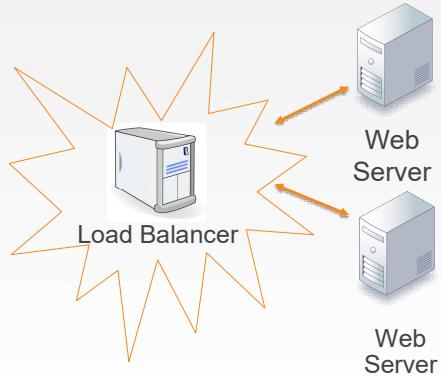
- Find cookbooks on the Chef Super Market
- Create a wrapper cookbook
- Replace the existing default values
- Upload a cookbook to Chef Server
- Bootstrap a new node that runs the cookbook

In this module you will learn how to find cookbooks on the Chef Super Market, create a wrapper cookbook, replace the existing default values, upload a cookbook to Chef Server, and bootstrap a new node that runs the cookbook

Load Balancer

Adding a load balancer will allow us to better grow our infrastructure.

Receives requests and relays them to other systems.



With a single web server running with our organization, it's now time to talk about the next goal to tackle. We need to setup a load balancer.

A load balancer is able to receive requests and relay them to other systems. In our case, we specifically want to use the load balancer to balance the entire traffic load between one or more systems.

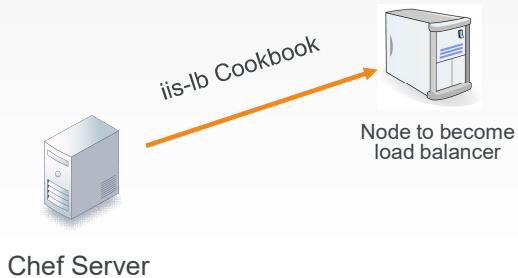
This means we will need to establish a new node within our organization, install the necessary software to make the node a load balancer, and configure it so that it will relay requests to our existing node running iis-demo and to future nodes.

Load Balancer

Work that needs to be accomplished to setup a load balancer within our infrastructure:

Write a `iis-lb` (load balancer) cookbook.

We will need to establish a new node within our organization to which we apply that cookbook.



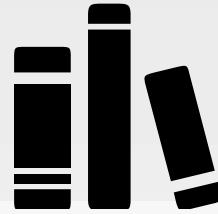
Similar to how we installed and configured `iis-demo` on our first node, we could do the same thing here with a load balancer. We could read documentation or find tutorials on how to implement IIS as a load balancer. They would likely have us install necessary applications, set the configuration for the applications, write out files, and start the service.

The `powershell_script` resource, `template` resource, `registry_key` resource, and `service` resource are the core of configuration management on Windows. Most every recipe you write will often use these fundamental resources. We could spend some time focused on composing the cookbook recipe and testing it on our platform with our custom configuration.

Community Cookbooks

Someone already wrote that cookbook?

Available through the community site called
Supermarket/



<https://supermarket.chef.io>

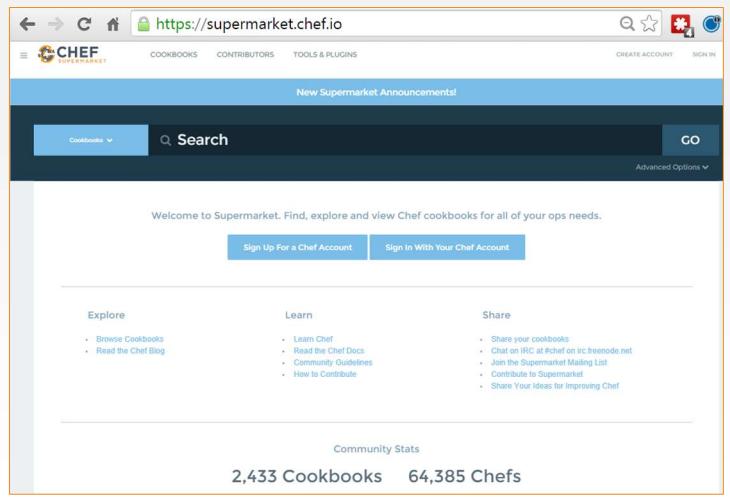
But what if we told you someone already wrote that cookbook?

Someone already has and that cookbook is available through the community site called Supermarket. Supermarket is a public repository of all the cookbooks shared by other developers, teams, and companies who want to share their knowledge and hard work with you to save you time.

Slide 6

Community Cookbooks

- Community cookbooks are managed by individuals.
- Chef does not verify or approve cookbooks in the Supermarket.
- Cookbooks may not work for various reasons.
- Still, there are real benefits to community cookbooks.



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An important thing to remember is that on the community site are cookbooks managed by individuals. Chef does not verify or approve the cookbooks found in the Supermarket. These cookbooks solved problems for the original authors and then they decided to share them. This means that the cookbooks you find in the Supermarket may not be built or designed for your platform. It may not take into special consideration your needs and requirements. It may no longer be actively maintained.

Even if the cookbook does not work as a whole, there is still value in reading and understanding the source code and extracting the pieces you need when creating your own. With all that said, there is a real benefit to the community site. When you find a cookbook that helps you deliver value quickly, it can be a tremendous boon to your productivity. This is what we are going to take advantage of with the iis-lb cookbook.



Load Balancer

Adding a load balancer will allow us to better grow our infrastructure.

Objective:

- Find or Create a Cookbook to Manage a load balancer
- Configure the load balancer to send traffic to the new node
- Upload cookbook to Chef Server
- Bootstrap a new node that runs the iis-lb (load balancer) cookbook

Let's find the iis-lb (load balancer) cookbook within the community site to learn more about it.

Slide 8

GE: Searching in the Supermarket

- From the <https://supermarket.chef.io> page, type **iis-lb** in the search field and then click the **GO** button.

The screenshot shows the Chef Supermarket homepage. At the top, there's a navigation bar with the Chef logo and a search bar containing the text "iis-lb". Below the search bar is a large blue button labeled "GO". Underneath the search bar, there's a message: "Welcome to Supermarket. Find, explore and view Chef cookbooks for all of your ops needs." Below this message are two buttons: "Sign Up For a Chef Account" and "Sign In With Your Chef Account". The bottom of the page features a copyright notice: "©2015 Chef Software Inc." and a page number: "10- 8". On the right side, there's a vertical scroll bar.

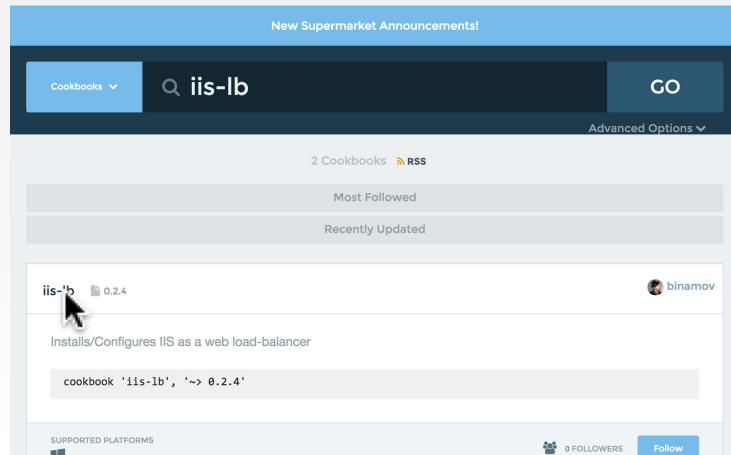
From the Supermarket main page type the search term "iis-lb" and the click the **GO** button.

Below the search term will show us all the matching cookbooks. The iis-lb cookbook is in that result set.

Slide 9

GE: Searching in the Supermarket

2. Click the resulting **iis-lb** link.



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Cookbooks usually map one-to-one to a piece of software and usually are named after the piece of software that they manage. Select the cookbook named iis-lb from the search results.

Slide 10

Supermarket Cookbooks

On the right-hand side we can see the individuals that maintain the cookbook...

The screenshot shows the Chef Supermarket interface. At the top, there's a navigation bar with links for COOKBOOKS, CONTRIBUTORS, and TOOLS & PLUGINS. Below that is a search bar with a 'GO' button and an 'Advanced Options' dropdown. A banner at the top says 'New Supermarket Announcements!'. The main content area displays the 'iis-lb' cookbook. It includes a brief description: 'Installs/Configures IIS as a web load-balancer', a version dropdown set to '0.2.4', and a link to the GitHub repository: 'cookbook/iis-lb', '→ 0.2.4'. Below this are tabs for README, Dependencies, Foodcritic, Code Issues, and Coverage Issues. To the right, there's a profile for 'binamov' (Bain Imray) with a 'Follow' button. Further down, it shows the last update was on December 31, 2015, and it supports Windows platforms. There are also sections for LICENSE and a 'Download Cookbook' button. The bottom right corner of the screenshot features the Chef logo.

On the left, we are presented with the various ways we can install the cookbook...

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10-10

At this point you are presented with information that describes the cookbook. Starting on the right-hand side we see the individuals that maintain the cookbook, a link to view the source details, last updated date, supported platforms, licensing, and a link to download the cookbook.

On the left, we are presented with the various ways we can install the cookbook, the README that describes information about the cookbook, any cookbooks that this cookbook may depend on, a history of the changes, and its food critic rating--which is a code evaluator for best practices

Supermarket Cookbooks

The area to focus most of your attention from the beginning is the README.

Reading and understanding the README at a glance is difficult. It is a skill that comes with time.

Usage

Specify your servers by setting the `node['iis-lb']['members']` attribute hash in a wrapper cookbook. Then include the `'iis-lb::default'` recipe. This creates the Server Farm and adds your servers to it. For example:

```
# contents of chef-repo/cookbooks/my-wrapper-cookbook/recipes/default.rb
node.default['iis-lb']['members'] = [
  {
    'address' => 'localhost',
    'weight' => 100,
    'port' => 4800,
    'ssl_port' => 4800
  },
  {
    'address' => '127.0.0.1',
    'weight' => 100,
    'port' => 4801,
    'ssl_port' => 4801
  }
]
```

The area to focus most of your attention from the beginning is the README. The README describes the various attributes that are defined within the cookbook and the purpose of the recipe. This is the same README file found in the cookbooks we currently have within our organization. This one, however, has had far more details added to give new users like us the ability to understand more quickly what the cookbook does and how it does it.

Reading and understanding the README at a glance is difficult. It is a skill that comes with time. For the iis-lb cookbook, there is an defined attribute that establishes the members that receive the proxy requests from the load balancer. This is available in a node attribute available through `node['iis-lb']['members']`.

Supermarket Cookbooks

These node attributes are different than the automatic ones defined by Ohai.

Attributes defined in a cookbook are not considered automatic.

Usage

Specify your servers by setting the `node['iis-lb']['members']` attribute hash in a wrapper cookbook. Then include the `'iis-lb::default'` recipe. This creates the Server Farm and adds your servers to it. For example:

```
# contents of chef-repo/cookbooks/my-wrapper-cookbook/recipes/default.rb
node.default['iis-lb']['members'] = [
  {
    'address' => 'localhost',
    'weight' => 100,
    'port' => 4000,
    'ssl_port' => 4000
  },
  {
    'address' => '127.0.0.1',
    'weight' => 100,
    'port' => 4001,
    'ssl_port' => 4001
  }
]
```

<https://docs.chef.io/attributes.html>

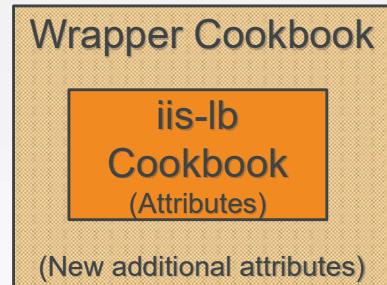
Prior to this point we have seen how node attributes are defined by Ohai but cookbooks also have this ability to define node attributes. These node attributes are different than the ones defined by Ohai as well. Ohai attributes are considered automatic attributes and generally inalienable characteristics about the node.

Attributes defined in a cookbook are not considered automatic. They are simply default values that we may change. There are many ways that we provide new default values for these. One way that we will learn is defining a wrapper cookbook.

Supermarket Cookbooks

A wrapper cookbook is a new cookbook that encapsulates the functionality of the original cookbook.

It defines new default values for the recipes.



<https://docs.chef.io/supermarket.html#wrapper-cookbooks>

<https://www.chef.io/blog/2013/12/03/doing-wrapper-cookbooks-right/>

A wrapper cookbook is a new cookbook that encapsulates the functionality of the original cookbook but allows us to define new default values for the recipes.

This is a common method for overriding cookbooks because it allows us to leave the original cookbook untouched. We simply provide new default values that we want and then include the recipes that we want to run.

Let's generate our wrapper cookbook named myiis-lb. Traditionally we would name the cookbook with a prefix of the name of our company and then follow it by the cookbook name 'company-cookbook'.

GE: CD and Generate the Cookbook



```
$ cd ~\chef-repo
$ chef generate cookbook cookbooks\myiis-lb

Compiling Cookbooks...
Recipe: code_generator::cookbook
  * directory[C:/Users/sdelfante/chef-repo/cookbooks/myiis-lb] action create
    - create new directory C:/Users/sdelfante/chef-repo/cookbooks/myiis-lb
  * template[C:/Users/sdelfante/chef-repo/cookbooks/myiis-lb/metadata.rb] action
create_if_missing
    - create new file C:/Users/sdelfante/chef-repo/cookbooks/myiis-lb/metadata.rb
    - update content in file C:/Users/sdelfante/chef-repo/cookbooks/myiis-
lb/metadata.rb from none to 899276
      (diff output suppressed by config)
  * template[C:/Users/sdelfante/chef-repo/cookbooks/myiis-lb/README.md] action
create_if_missing
```

Change to your chef-repo directory and then generate your new cookbook.

Instructor Note: The generate cookbook command needs the path in the name of the cookbook here to ensure that it generates the cookbook in the cookbooks directory. Without it the cookbook will be generated within the root of the chef repository. If that happens simply have the learner move the newly generated cookbook into the cookbooks directory.

GE: Create a Dependency in the Cookbook

```
~\chef-repo\cookbooks\myiis-lb\metadata.rb
```

```
name          'myiis-lb'
maintainer    'The Authors'
maintainer_email 'you@example.com'
license        'all_rights'
description    'Installs/Configures myiis-lb'
long_description 'Installs/Configures myiis-lb'
version        '0.1.0'

depends 'iis-lb'
```

Set up a dependency within your iis-lb cookbook. Establishing this dependency informs the Chef Server that whenever you deliver this cookbook to a node, you should also deliver with it the mentioned dependent cookbooks.

This is important because your cookbook is simply going to set up new default values and then execute the recipes defined in the original cookbook.



Load Balancer

Adding a load balancer will allow us to better grow our infrastructure.

Objective:

- ✓ Find or create a cookbook to manage a load balancer
- ❑ Configure the load balancer to send traffic to the new node
- ❑ Upload cookbook to Chef Server
- ❑ Bootstrap a new node that runs the iis-lb cookbook

Now that you have the dependency on the iis-lb cookbook in your wrapper cookbook, you need to learn what new default values you need to add to the recipe.

Supermarket Cookbooks

Currently, the iis-lb cookbook assumes that there are two different services running on the localhost at port 4000 and port 4001.

In a moment, you'll need to change that.

Usage

Specify your servers by setting the `node['iis-lb']['members']` attribute hash in a wrapper cookbook. Then include the `'iis-lb::default'` recipe. This creates the Server Farm and adds your servers to it. For example:

```
# contents of chef-repo/cookbooks/my-wrapper-cookbook/recipes/default.rb
node.default['iis-lb']['members'] = [
  {
    'address' => 'localhost',
    'weight' => 100,
    'port' => 4000,
    'ssl_port' => 4000
  },
  {
    'address' => '127.0.0.1',
    'weight' => 100,
    'port' => 4001,
    'ssl_port' => 4001
  }
]
```

<https://docs.chef.io/supermarket.html#wrapper-cookbooks>

Currently the iis-lb cookbook assumes that there are two different services running on the localhost at port 4000 and port 4001. The iis-lb process will relay messages to itself to those two ports.

That is not our configuration. First, we currently only have one system that we want to route traffic. Second, we want to have the traffic routed not to localhost but instead to our webserver, node1, which will have a completely different hostname and IP address.

GE: Capture Node's Public Host Name and IP



```
$ knife node show --help
```

```
knife node show NODE (options)
  -a ATTR1 [--attribute ATTR2] ,  Show one or more attributes
      --attribute
  -s, --server-url URL          Chef Server URL
      --chef-zero-host HOST       Host to start chef-zero on
      --chef-zero-port PORT      Port (or port range) to start chef-zero on.
Port ranges
  -k, --key KEY                 API Client Key
      --[no-]color              Use colored output, defaults to false on
Windows, true
  -c, --config CONFIG           The configuration file to use
      --defaults                Accept default values for all questions
  -d, --disable-editing         Do not open EDITOR, just accept the data as is
  -e, --editor EDITOR          Set the editor to use for interactive commands
```

This new default value for the iis-lb members needs to define the information about the webserver node, node1. So you need to capture the node's public host name and public IP address.

The 'knife node show' command will display information about the node. You can ask to see a specific attribute on a node with the -a flag or the --attribute flag.

GE: Capture Node's Public Host Name and IP



```
$ knife node show node1 -a ipaddress
```

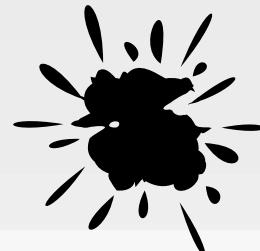
```
node1:  
  ipaddress: 172.31.8.68
```

You can display the IP address of node1 with the '-a' flag and specifying the attribute 'ipaddress'.

With cloud providers that generate machines for you often assign internal IP addresses, those values may not work properly.

Instructor Note: The IP addresses of the nodes that were used during the creation of this training were based on Amazon Web Services (AWS). The address reported by Ohai is often the private, internal address.

AWS VM Instances



The IP address and host name are unfortunately not how we can address these nodes within our recipes.

The reason you may need to ask the node for a different set of attributes is that we are using Amazon as a cloud provider for our instances. These instances are displaying the internal IP address when we ask for the ipaddress attribute.

Ohai collects attributes from the current cloud provider and makes them available in an attribute named 'cloud'. We can look at the cloud attribute on our first node and see that it returns for us information about the node.

GE: Capture Node's Public Host Name and IP



```
$ knife node show node1 -a cloud
```

```
node1:
  cloud:
    local_hostname: ip-172-31-8-68.ec2.internal
    local_ipv4:     172.31.8.68
    private_ips:   172.31.8.68
    provider:      ec2
    public_hostname: ec2-54-175-46-24.compute-1.amazonaws.com
    public_ips:    54.175.46.24
    public_ipv4:   54.175.46.24
```

If you use 'knife node show' to display the 'cloud' attribute for node1, you will see the local, private, and public connection information.

Capture and write down the public hostname and the public ipv4 address of node1. You will need this in the recipe you are going to write.

GE: Edit the myiis-lb Default Recipe

```
~\chef-repo\cookbooks\myiis-lb\recipes\default.rb
```

```
#  
# Cookbook Name:: myiis-lb  
# Recipe:: default  
#  
# Copyright (c) 2015 The Authors, All Rights  
Reserved.
```

```
include_recipe 'iis-lb::default'
```

First, within the myiis-lb cookbook you will use the include_recipe method to specify the fully-qualified name of the cookbook and recipe that you want to execute. In this case, when you run your wrapped cookbooks recipe, you'll want it to run the original cookbook's default recipe.

GE: Edit the myiis-lb Default Recipe

~\chef-repo\cookbooks\myiis-lb\recipes\default.rb

```
node.default['iis-lb']['members'] = [
  {
    'address' => 'localhost',
    'weight' => 100,
    'port' => 4000,
    'ssl_port' => 4000
  },
  {
    'address' => 'localhost',
    'weight' => 100,
    'port' => 4001,
    'ssl_port' => 4001
  }
]

include_recipe 'iis-lb::default'
```

Find the following example code within the README that the author has provided. This example code shows how to override the default values within a recipe. Copy and paste the example code into the default recipe above the include_recipe line.

More modifications are still necessary to override the original recipe and replace it with the values of the systems within our infrastructure.

GE: Edit the myiis-lb Default Recipe

~\chef-repo\cookbooks\myiis-lb\recipes\default.rb

```
node.default['iis-lb']['members'] = [
  {
    'address' => 'localhost',
    'weight' => 100,
    'port' => 4000,
    'ssl_port' => 4000
  },
  {
    'address' => 'ec2-52-8-71-11.us-west-1.compute.amazonaws.com',
    'weight' => 100,
    'port' => 80,
    'ssl_port' => 80
  }
]
include_recipe 'iis-lb::default'
```

Remove one of the entries within the members array (shown in red).

Then update the information for the remaining member to include the public ipaddress and hostname for node1 (shown in green).

NOTE: Your details will be different than the values that appear here. Use the `knife node show -a ec2` command to find the public hostname and address.

GE: Edit the myiis-lb Default Recipe

```
~\chef-repo\cookbooks\myiis-lb\recipes\default.rb
```

```
node.default['iis-lb']['members'] = [
  {
    'address' => 'ec2-52-8-71-11.us-west-1.compute.amazonaws.com',
    'weight' => 100,
    'port' => 80,
    'ssl_port' => 80
  }
]

include_recipe 'iis-lb::default'
```

The final recipe should appear like the following (with your custom values). Here we have a default recipe that first replaces the default values with only one default value which is your system.



Load Balancer

Adding a load balancer will allow us to better grow our infrastructure.

Objective:

- ✓ Find or create a cookbook to manage a load balancer
- ✓ Configure the load balancer to send traffic to the new node
- Upload cookbook to Chef Server
- Bootstrap a new node that runs the iis-lb cookbook

You have completed creating the wrapper cookbook. It is time to upload to the Chef Server.



Lab: Upload the Cookbook

- Upload the cookbook to the Chef Server

As a lab exercise, upload the cookbook to the Chef Server

Instructor Note: Allow 5 minutes to complete this exercise.

Lab: Change in the Cookbook Directory



```
$ cd ~\chef-repo\cookbooks\myiis-lb
```

Let's review that lab.

You change into the directory for the 'myiis-lb' cookbook.

Lab: Install Cookbook Dependencies



```
$ berks install
```

```
Resolving cookbook dependencies...
Fetching 'myiis-lb' from source at .
Fetching cookbook index from https://supermarket.chef.io...
Using chef_handler (1.2.0)
Installing iis (4.1.5)
Installing iis-lb (0.2.4)
Using myiis-lb (0.1.0) from source at .
Installing webpi (2.0.0)
Using windows (1.39.0)
```

We use the Berkshelf to upload our cookbooks. This is where Berkshelf really shines as a tool.

Run the command "berks install".

When you run this command for a cookbook that has a dependency, you'll see that Berkshelf will download the iis-lb cookbook and its dependencies as well. The iis-lb cookbook is dependent on the build-essential cookbook and the cpu cookbook. If any of those cookbooks had dependencies, berkshelf would find those and download them as well.

Instructor Note: Berkshelf downloads these cookbooks into a common directory within your home path. They are not added alongside your other cookbooks.

Lab: Upload the Cookbook to Chef Server



```
$ berks upload
```

```
Uploaded chef_handler (1.2.0) to: 'https://api.chef.io:443/organizations/bakh'  
Uploaded iis (4.1.5) to: 'https://api.chef.io:443/organizations/bakh'  
Uploaded iis-lb (0.1.9) to: 'https://api.chef.io:443/organizations/bakh'  
Uploaded myiis-lb (0.1.0) to: 'https://api.chef.io:443/organizations/bakh'  
Uploaded webpi (1.2.8) to: 'https://api.chef.io:443/organizations/bakh'  
Uploaded windows (1.39.0) to: 'https://api.chef.io:443/organizations/bakh'
```

After installing all the necessary dependent cookbooks, we used 'berks upload' to send the cookbook and all its dependencies to the Chef Server. This is again an easier method to manage dependencies instead of manually identifying the dependencies and then uploading each single cookbook at a time.

Lab: Verify the Cookbook Upload



```
$ knife cookbook list
```

iis-demo	0.2.1
iis-lb	1.6.6
myiis-lb	0.1.0
chef_handler	1.2.0
iis	4.1.5
webpi	1.2.8
windows	1.39.0
workstation	0.1.0

When that is complete you can verify that you've uploaded your cookbook and all of its dependencies.



Load Balancer

Adding a load balancer will allow us to better grow our infrastructure.

Objective:

- ✓ Find or create a cookbook to manage a load balancer
- ✓ Configure the load balancer to send traffic to the new node
- ✓ Upload cookbook to Chef Server
- ❑ Bootstrap a new node that runs the iis-lb cookbook

The myiis-lb cookbook's default recipe is ready to be assigned to a run list of a node. So we'll need another node. The new load balancer node.



Lab: Bootstrap a Load Balancer

- Bootstrap a new node
- Update the run list of the new node to include the wrapper proxy server cookbook
- RDP to that system and run chef-client
- Verify that traffic to the load balancer is relayed to the web server.

Bootstrap this node the same as you did before but this time define the run list to converge the myiis-lb's default recipe.

After setting that value, RDP into that node with the provided user name and password.

Then run 'sudo chef-client' to apply the recipes defined in this node's run list.

Then verify that your new node's default website is properly redirecting traffic to the original web node you previously set up.

Instructor Note: Allow 12 minutes to complete this exercise.

Lab: Bootstrap a New Node



```
$ knife bootstrap windows winrm FQDN2 -x USER -P PWD -N node2
```

```
Creating new client for node2
Creating new node for node2
Connecting to ec2-54-210-192-12.compute-1.amazonaws.com
ec2-54-210-192-12.compute-1.amazonaws.com Starting first Chef Client run...
ec2-54-210-192-12.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-192-12.compute-1.amazonaws.com resolving cookbooks for run list: []
ec2-54-210-192-12.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-210-192-12.compute-1.amazonaws.com Compiling Cookbooks...
ec2-54-210-192-12.compute-1.amazonaws.com [2015-09-16T17:13:10+00:00] WARN:
Node node2 has an empty run list.
ec2-54-210-192-12.compute-1.amazonaws.com Converging 0 resources
ec2-54-210-192-12.compute-1.amazonaws.com
ec2-54-210-192-12.compute-1.amazonaws.com Running handlers:
```

First you bootstrap a new node named node2.

Lab: Validate the New Node



```
$ knife node show node2
```

```
Node Name: node2
Environment: _default
FQDN: WIN-F9R1IJ8VE59
IP: 52.90.82.67
Run List:
Roles:
Recipes:
Platform: windows 6.3.9600
Tags:
```

After the node is bootstrapped, validate that it was added correctly to the organization.

Lab: Define the Run List



```
$ knife node run_list add node2 'recipe[myiis-lb]'
```

```
node2:  
  run_list: recipe[myiis-lb]
```

Define an initial run list for that node to converge the default recipe of the myiis-lb cookbook.

Lab: Validate the Run List

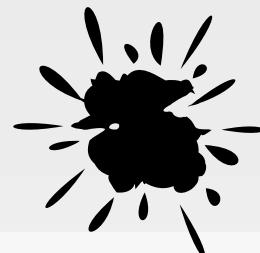


```
$ knife node show node2
```

```
Node Name: node2
Environment: _default
FQDN: WIN-F9R1IJ8VE59
IP: 52.90.82.67
Run List: recipe[myiis-lb]
Roles:
Recipes:
Platform: windows 6.3.9600
Tags:
```

Ensure the run list has been set correctly for node2.

RDP Woes



Logging into both systems is a pain. We can use another knife tool to allow us to send commands to all of our nodes.

We asked you to login to that remote node and run 'sudo chef-client' to apply the new run list defined for that node. This does in fact work but considering that we may need to execute this command for this node and many future nodes, it seems like a lot of windows and commands that we would need to execute.

GE: Using knife winrm



```
$ knife winrm --help
```

```
knife winrm QUERY COMMAND (options)
  -a, --attribute ATTR          The attribute to use for opening the connection -
  default is fqdn
  -f CA_TRUST_FILE,             The Certificate Authority (CA) trust file used for
  SSL transport
  --ca-trust-file
  -s, --server-url URL         Chef Server URL
  --chef-zero-host HOST         Host to start chef-zero on
  --chef-zero-port PORT         Port (or port range) to start chef-zero on.  Port
ranges like 1000,1010 or 8889-9999 will try all given ports until one works.
  -k, --key KEY                API Client Key
  --[no-]color                  Use colored output, defaults to enabled
  -c, --config CONFIG           The configuration file to use
  --defaults                    Accept default values for all questions
```

To make our lives easier, the 'knife' command provides a subcommand named winrm' that allows us to execute a command across multiple nodes that match a specified search query.

GE: Define the Run List



```
$ knife winrm *:* -x USERNAME -P PASSWORD -a ipaddress "chef-client"
```

```
ec2-54-175-46-24.compute-1.amazonaws.com  Starting Chef Client, version 12.3.0
ec2-54-210-192-12.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-175-46-24.compute-1.amazonaws.com  resolving cookbooks for run list: ["iis-demo"]
ec2-54-210-192-12.compute-1.amazonaws.com  resolving cookbooks for run list: ["myiis-lb"]
ec2-54-175-46-24.compute-1.amazonaws.com  Synchronizing Cookbooks:
ec2-54-175-46-24.compute-1.amazonaws.com    - iis-demo
ec2-54-175-46-24.compute-1.amazonaws.com  Compiling Cookbooks...
ec2-54-175-46-24.compute-1.amazonaws.com  Converging 3 resources
ec2-54-175-46-24.compute-1.amazonaws.com  Recipe: iis-demo::server
ec2-54-210-192-12.compute-1.amazonaws.com  Synchronizing Cookbooks:
ec2-54-210-192-12.compute-1.amazonaws.com    - build-essential
ec2-54-210-192-12.compute-1.amazonaws.com    - cpu
```

There are a lot of options for defining the search criteria that we will continue to explore. The most important criteria in this instance is star-colon-star. This means that we want to issue a command to all nodes.

So if you want to execute a "sudo chef-client" run for all of your nodes, you should write out this command.

You would need to provide the user name to log into the system, the password for that system, and then finally the command to execute.

In this way, you could easily ask your nodes to update from your current workstation as long as they all have the same login credentials. For more security, you should likely use keys and forego specifying a username and password.

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GE: Testing Your Websites

The screenshot shows a web browser window with the URL `ec2-52-91-186-11.compute-1.amazonaws.com` in the address bar. The page content displays the message **Hello, world!** followed by three system statistics: **ipaddress: 172.31.54.225**, **hostname: WIN-3VTFMHJB0T3**, and **total memory: 16776816kB**. A callout arrow points from the text "URL of load balancer." to the browser's address bar. Another callout arrow points from the text "Output from the web server." to the first statistic line.

URL of load balancer.

Output from the web server.

ipaddress: 172.31.54.225

hostname: WIN-3VTFMHJB0T3

total memory: 16776816kB

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 CHEF

Point a web browser to the URL or public IP address of your load balancer. It should display the web page of the web server node that the load balancer is configured to serve.



Load Balancer

Adding a load balancer will allow us to better grow our infrastructure.

Objective:

- ✓ Find or create a cookbook to manage a load balancer
- ✓ Configure the load balancer to send traffic to the new node
- ✓ Upload cookbook to Chef Server
- ✓ Bootstrap a new node that runs the iis-lb cookbook

With your node running the myiis-lb's cookbook's default recipe--relaying traffic to your first node running the iis-demo cookbook's default recipe--you have moved closer to creating the original topology we set out to define today.

DISCUSSION

Discussion



What are the benefits and drawbacks of the Chef Super Market?

Is your team able to leverage community cookbooks?
Is the team able to contribute to community cookbooks?

Why do you use a wrapper cookbook? When might you decide to not wrap the cookbook?

Answer these questions.

With your answers, turn to another person and alternate asking each other asking these questions and sharing your answers.

DISCUSSION

Q&A



What questions can we help you answer?

- Chef Super Market
- Wrapper Cookbooks
- Node Attributes
- knife winrm

What questions can we help you answer?

In general or about specifically about Chef Super Market, wrapper cookbooks, node attributes, the 'knife winrm' command.

Slide 45



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11: Managing Multiple Nodes

Managing Multiple Nodes

Create another web server and add it as a proxy member

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This section's goal is to have you bootstrap another node, this time a web server, and add it to the proxy members.

Objectives



After completing this module, you should be able to

- Bootstrap, update the run_list, and run chef-client on a node
- Append values to an attribute within a recipe
- Version a cookbook and upload it to the Chef Server

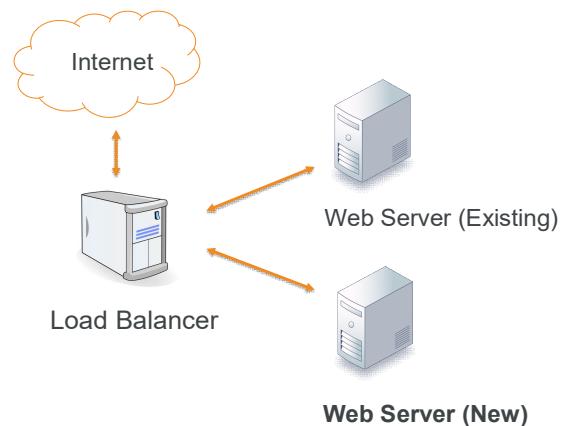
In this module you will learn how to bootstrap, update the run list, and run chef-client on a node. You will also learn how to update a default attribute within a recipe, version and upload a cookbook.

Managing User Traffic



You already configured the load balancer and one web server node.

In this module you'll add another node to the load balancer's list of web server's it is serving.



After completing this module, you will have configured three nodes:

- Node 1: A web server
- Node 2: The load balancer
- Node 3: Another web server

Slide 4



Lab: Another Web Node

- Bootstrap a new node
- Update the run list of the new node to include the web server cookbook
- Login to that system and run chef-client
- Verify that the node's web server is functional

Now it's time to create a third node. The third node will be the second web server node.

We will provide you with a new node for the following exercise.

Instructor Note: Allow 10 minutes to complete this exercise

Lab: Bootstrap the New Node



```
$ knife bootstrap windows winrm FQDN -x USER -P PWD -N node3
```

```
Connecting to ec2-54-210-86-164.compute-1.amazonaws.com
ec2-54-210-86-164.compute-1.amazonaws.com Starting first Chef Client run...
ec2-54-210-86-164.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-86-164.compute-1.amazonaws.com resolving cookbooks for run list: []
ec2-54-210-86-164.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-210-86-164.compute-1.amazonaws.com Compiling Cookbooks...
ec2-54-210-86-164.compute-1.amazonaws.com [2015-09-16T17:36:14+00:00] WARN: Node
node3 has an empty run list.
ec2-54-210-86-164.compute-1.amazonaws.com Converging 0 resources
ec2-54-210-86-164.compute-1.amazonaws.com
ec2-54-210-86-164.compute-1.amazonaws.com Running handlers:
ec2-54-210-86-164.compute-1.amazonaws.com Running handlers complete
ec2-54-210-86-164.compute-1.amazonaws.com Chef Client finished, 0/0 resources
updated in
```

Bootstrap the new node and name it node3.

Lab: Verify the New Node



```
$ knife node show node3
```

```
Node Name: node3
Environment: _default
FQDN: WIN-F9R1IJ8VE59
IP: 52.90.82.67
Run List:
Roles:
Recipes:
Platform: windows 6.3.9600
Tags:
```

Lab: Set the Run List



```
$ knife node run_list add node3 "recipe[iis-demo]"
```

```
node3:  
  run_list: recipe[iis-demo]
```

Set the run list for this node by running the iis-demo cookbook's default recipe.

Slide 8

Lab: Converge the Run List

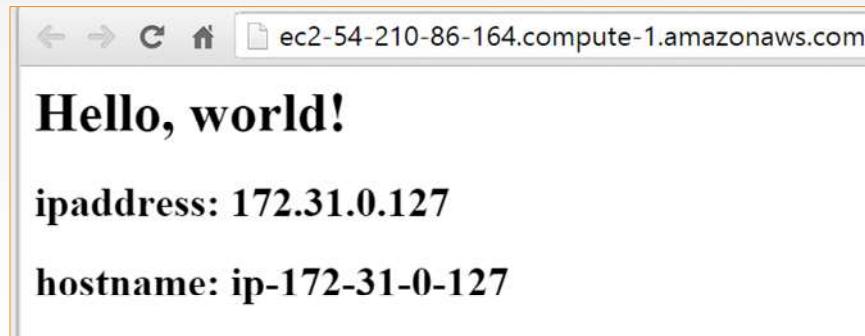


```
$ knife winrm *.* -x USERNAME -P PWD -a ipaddress "chef-client"
```

```
ec2-54-175-46-24.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-192-12.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-86-164.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-175-46-24.compute-1.amazonaws.com resolving cookbooks for run list: ["iis-demo"]
ec2-54-210-86-164.compute-1.amazonaws.com resolving cookbooks for run list: ["iis-demo"]
ec2-54-210-86-164.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-210-192-12.compute-1.amazonaws.com resolving cookbooks for run list: ["myiis-lb"]
ec2-54-175-46-24.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-175-46-24.compute-1.amazonaws.com      - iis-demo
ec2-54-175-46-24.compute-1.amazonaws.com Compiling Cookbooks...
ec2-54-175-46-24.compute-1.amazonaws.com Converging 3 resources
ec2-54-175-46-24.compute-1.amazonaws.com Recipe: iis-demo::server
```

Apply that run list by logging into that node and running chef-client or remotely administer the node with the 'knife winrm' command as shown here.

Verify that the New Node Serves the Page



Verify that the node serves up the default html page that contains the node's internal IP address and hostname.



Lab: Update the Load Balancer

- Update the wrapped proxy server cookbook to include the new web node as a member.
- Upload that cookbook to the Chef Server
- Login to that system and run chef-client
- Verify that the load balancer delivers traffic to both web server nodes.

Now that you have the third node, it is time to add that node to the member's list for the load balancer.

Instructor Note: Allow 15 minutes to complete this exercise

Lab: Capture Node's Public Host Name and IP



```
$ knife node show node3 -a cloud
```

```
node3:
  cloud:
    local_hostname: ip-172-31-8-64.ec2.internal
    local_ipv4:     172.31.8.64
    private_ips:   172.31.8.64
    provider:      ec2
    public_hostname: ec2-54-176-64-173.us-west-1.compute.amazonaws.com
    public_ips:    54.175.46.48
    public_ipv4:   54.175.46.48
```

If you use 'knife node show' to display the 'cloud' attribute for node3, you will see the local, private, and public connection information.

Capture and write down the public hostname and the public ipv4 address of node3. You will need this in the recipe you are going to write.

Lab: Add the Other Web Server to LB

```
~\chef-repo\cookbooks\myiis-lb\recipes\default.rb
```

```
node.default['iis-lb']['members'] = [
  {
    'address' => 'ec2-52-8-71-11.us-west-1.compute.amazonaws.com',
    'weight' => 100,
    'port' => 80,
    'ssl_port' => 80
  },
  {
    'address' => 'ec2-54-176-64-173.us-west-1.compute.amazonaws.com',
    'weight' => 100,
    'port' => 80,
    'ssl_port' => 80
  }
]

include_recipe 'iis-lb::default'
```

Add the second web server (node3) to the load balancer's (LB) members list. You may need to run 'knife node show node3 -a cloud' to get the hostname and ipaddress values.

Lab: Update the Version

```
~\chef-repo\cookbooks\myiis-lb\metadata.rb
```

```
name          'myiis-lb'
maintainer    'The Authors'
maintainer_email 'you@example.com'
license        'all_rights'
description    'Installs/Configures myiis-lb'
long_description 'Installs/Configures myiis-lb'
version        '0.2.0'

depends 'iis-lb'
```

Update the version number in myiis-lb cookbook's metadata.

Lab: Upload the Updated myiis-lb Cookbook



```
$ cd ~\chef-repo\cookbooks\myiis-lb  
$ berks install
```

```
Resolving cookbook dependencies...  
Fetching 'myiis-lb' from source at .  
Fetching cookbook index from https://supermarket.chef.io...  
Using build-essential (2.2.3)  
Using cpu (0.2.0)  
Using iis-lb (1.6.6)  
Using myiis-lb (0.2.0) from source at .
```

Change into the 'myiis-lb' cookbook directory and then run 'berks install' to install any dependencies for the 'myiis-lb' cookbook.

Instructor Note: Any time you change the version number of a cookbook Berkshelf requires you re-evaluate the dependencies even if they dependencies have not changed.

Lab: Upload the Cookbook to Chef Server



```
$ berks upload
```

```
Uploaded build-essential (2.2.3) to:  
'https://api.opscode.com:443/organizations/steveessentials2'  
Uploaded iis-lb (1.6.6) to: 'https://api.opscode.com:443/organizations/steveessentials2'  
Uploaded myiis-lb (0.2.0) to: 'https://api.opscode.com:443/organizations/steveessentials2'
```

Run 'berks upload' to upload the myiis-lb cookbook to Chef Server.

Lab: Converge the Node



```
$ knife winrm *:* -x USERNAME -P PWD -a ipaddress "chef-client"
```

```
ec2-54-210-192-12.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-175-46-24.compute-1.amazonaws.com  Starting Chef Client, version 12.3.0
ec2-54-210-86-164.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-192-12.compute-1.amazonaws.com resolving cookbooks for run list: ["myiis-lb"]
ec2-54-175-46-24.compute-1.amazonaws.com  resolving cookbooks for run list: ["iis-demo"]
ec2-54-175-46-24.compute-1.amazonaws.com  Synchronizing Cookbooks:
ec2-54-175-46-24.compute-1.amazonaws.com    - iis-demo
ec2-54-175-46-24.compute-1.amazonaws.com  Compiling Cookbooks...
ec2-54-210-192-12.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-175-46-24.compute-1.amazonaws.com  Converging 3 resources
ec2-54-175-46-24.compute-1.amazonaws.com  Recipe: iis-demo::server
ec2-54-210-192-12.compute-1.amazonaws.com    - build-essential
```

Converge the node by logging into that node and running 'chef-client' or remotely administer the node with the 'knife winrm' command as shown here.

Within the output you should see the iis-lb configuration file will update with a new entry that contains the information of the second member (node3).

Slide 17

Lab: Test the Load Balancer

The image shows three separate browser windows, each displaying a "Hello, world!" message along with system specifications. The top window is titled "ec2-52-91-186-11.compute-1.amazonaws.com" and shows the following information:

```
Hello, world!  
ipaddress: 172.31.54.225  
hostname: WIN-3VTFMHJB0T3  
total memory: 16776816kB  
CPU Mhz: 2400
```

The middle window is titled "ec2-52-90-104-159.compute-1.amazonaws.com" and shows the same information:

```
Hello, world!  
ipaddress: 172.31.54.225  
hostname: WIN-3VTFMHJB0T3  
total memory: 16776816kB  
CPU Mhz: 2400
```

The bottom-right window is titled "ec2-54-152-109-197.compute-1.amazonaws.com" and shows the same information:

```
Hello, world!  
ipaddress: 172.31.49.133  
hostname: WIN-3VTFMHJB0T3  
total memory: 16776816kB  
CPU Mhz: 2400
```

A blue arrow points from the top window down to the middle window, indicating a request being load balanced between the two servers.

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Point a web browser to the URL of your Proxy server and then click Refresh a few times. You should see each of your web server's HTML page as the Proxy server switches between each web server.

This is not a very scientific way of seeing that the proxy server is balancing requests between these two web nodes.

Slide 18

Lab: Test the Load Balancer

The image shows three separate terminal windows, each displaying system information for a different Amazon EC2 instance. The top window is titled 'ec2-52-91-186-11.compute-1.amazonaws.com' and shows the following output:

```
Hello, world!
ipaddress: 172.31.49.133
hostname: WIN-3VTFMHJB0T3
total memory: 16776816kB
CPU Mhz: 2400
```

The middle window is titled 'ec2-52-90-104-159.compute-1.amazonaws.com' and shows the following output:

```
Hello, world!
ipaddress: 172.31.54.225
hostname: WIN-3VTFMHJB0T3
total memory: 16776816kB
CPU Mhz: 2400
```

The bottom right window is titled 'ec2-54-152-109-197.compute-1.amazonaws.com' and shows the following output:

```
Hello, world!
ipaddress: 172.31.49.133
hostname: WIN-3VTFMHJB0T3
total memory: 16776816kB
CPU Mhz: 2400
```

A blue arrow points from the top window to the bottom right window, indicating a connection or relationship between them.

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 CHEF

DISCUSSION

Discussion



What is the process to setup a third web node?

What is the process for removing a web node?

What is the most manual part of the process?

Answer these questions.

With your answers, turn to another person and alternate asking each other asking these questions and sharing your answers.

Slide 20

DISCUSSION

Q&A



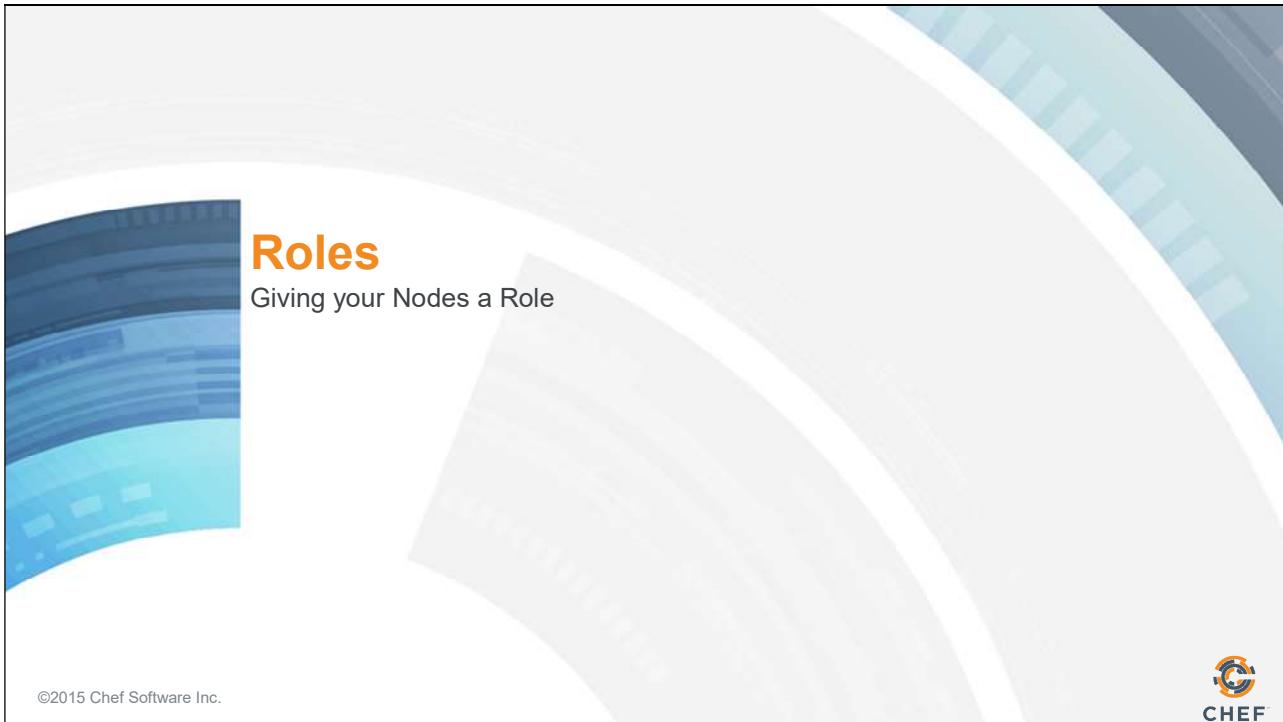
What questions can we help you answer?

Slide 21



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12: Roles



Objectives



After completing this module, you should be able to

- Assign roles to nodes so you can better describe them and configure them in a similar manner.

CONCEPT

Roles



A role describes a run list of recipes that are executed on the node.

A role may also define new defaults or overrides for existing cookbook attribute values.

Up until this point it has been a mouthful to describe the nodes within our organization. We have two nodes, node1 and node3, that have the iis-demo cookbook's default recipe in their run list. We have one node, node2, that has the myiis-lb cookbook's default recipe in its run list.

The Chef Server allows us to create and manage roles. A role describes a run list of recipes that are executed on the node. A role may also define new defaults or overrides for existing cookbook attribute values. Similar to what we accomplished with the wrapper cookbook.

A node may have zero or roles assigned to it.

CONCEPT

Roles



When you assign a role to a node you do so in its run list.

This allows you to configure many nodes in a similar fashion.

When you assign a role to a node you do so in its run list. This allows us to configure many nodes in a similar fashion because we no longer need to re-create a long run list for each node--we simply give it a role or all the roles it needs to accomplish its desired function.



GE: Roles for Everyone

We will give our nodes a role to better describe them and so we can configure them in a similar manner.

Objective:

- Give our load balancer node a "load_balancer" Role
- Give our web nodes a "web" Role

In this section you will create a `load_balancer` role and assign it to the run list of `node2`. You will also will create a `web` role and assign it to the run list of `node1` and `node3`.

This is particularly powerful because we will no longer have to manage each of these identical nodes individually, instead we can make changes to the role that they share and all of the nodes that have this role will update accordingly.

GE: What Can 'knife role' Do?



```
$ cd ~\chef-repo
$ knife role --help
** ROLE COMMANDS **
knife role bulk delete REGEX (options)
knife role create ROLE (options)
knife role delete ROLE (options)
knife role edit ROLE (options)
knife role env_run_list add [ROLE] [ENVIRONMENT] [ENTRY[,ENTRY]] (options)
knife role env_run_list clear [ROLE] [ENVIRONMENT]
knife role env_run_list remove [ROLE] [ENVIRONMENT] [ENTRIES]
knife role env_run_list replace [ROLE] [ENVIRONMENT] [OLD_ENTRY] [NEW_ENTRY]
knife role env_run_list set [ROLE] [ENVIRONMENT] [ENTRIES]
knife role from file FILE [FILE..] (options)
```

Return to the base of your Chef repository and then run 'knife role --help' to see the available commands. Similar to other commands, you can see that 'knife role' supports the ability to list currently-defined roles.

GE: Run 'knife role list'



```
$ knife role list
```

When you run 'knife role list' you can see from its lack of response that you have no roles defined.

GE: Create a Roles Directory



```
$ mkdir roles
```

Create a **roles** directory if necessary. If you are using the Chef Starter Kit this directory may already exist.

GE: Create the Load Balancer Role

```
□ ~\chef-repo\roles\load_balancer.rb
```

```
name 'load_balancer'  
description 'Load Balancer'  
run_list 'recipe[myiis-lb]'
```

Create a file named `load_balancer.rb`. This is a ruby file that contains specific methods that allow you to express details about the role. You'll see that the role has a name, a description, and run list.

The name of the role as a practice will share the name of the ruby file unless it cannot for some reason. The name of the role should clearly describe what it attempts accomplish.

The description of the role helps reinforce or clarify the intended purpose of the role. When selecting a role name that is not clear it is important that a helpful description is provided to help ensure everyone on the team understands its purpose.

The run list defines the list of recipes that give the role its purpose. Currently the `load_balancer` role defines a single recipe - the `myiis-lb` cookbook's default recipe.

GE: Upload the Role to the Chef Server



```
$ knife role from file load_balancer.rb
```

```
Updated Role load_balancer!
```

Now you need to upload it to the Chef Server. This is done through the command 'knife role from file load_balancer.rb'.

The knife tool understands that you are uploading a role file and will look within the roles folder to find a file named knife role from file load_balancer.rb.

GE: Validate Chef Server Received It



```
$ knife role list
```

```
load_balancer
```

With the role uploaded, it is time to validate that the Chef Server received it correctly. We can do that by again asking the Chef Server for a list of all the roles on the system.

GE: View Details of the Role



```
$ knife role show load_balancer
```

```
chef_type:          role
default_attributes:
description:        Load Balancer
env_run_lists:
json_class:         Chef::Role
name:               load_balancer
override_attributes:
run_list:
```

You can ask for more details about a specific role using the above command. In this example we are requesting specific details about the role named `load_balancer`.

GE: Run 'knife node --help'



```
$ knife node --help
```

```
** NODE COMMANDS **  
knife node bulk delete REGEX (options)  
knife node create NODE (options)  
knife node delete NODE (options)  
knife node edit NODE (options)  
knife node environment set NODE ENVIRONMENT  
knife node from file FILE (options)  
knife node list (options)  
knife node run_list add [NODE] [ENTRY[,ENTRY]] (options)  
knife node run_list remove [NODE] [ENTRY[,ENTRY]] (options)  
knife node run_list set NODE ENTRIES (options)  
knife node show NODE (options)
```

Run 'knife node --help' to see its options.

GE: Set the load_balancer Role to node2



```
$ knife node run_list set node2 "role[load_balancer]"
```

```
node2:  
  run_list: role[load_balancer]
```

The last step is to redefine the run list for node2. We want the run list to contain only the load_balancer role.

Previously, we used the command 'knife node run_list add' to append a new item to the existing run list. There is also a command that allows us to remove an item from the run list. There is a command that allows us to set the run list to a value provided. This will replace the existing run list with a new one that we provide.

GE: Verify the Run List



```
$ knife node show node2
```

```
Node Name: node2
Environment: _default
FQDN:      WIN-F9R1IJ8VE59
IP:        52.90.82.67
Run List:   role[load_balancer]
Roles:
Recipes:    myiis-lb, myiis-lb::default, iis-lb::default, iis-lb::lb, webpi::default,
webpi::install-msi, windows::default
Platform:   windows 6.3.9600
Tags:
```

After you update the run list, you can verify that the node has the correctly-defined run list by running 'knife node show node2'.

GE: Converge All the Load Balancer Nodes



```
$ knife winrm role:load_balancer -x USER -P PWD -a ipaddress "chef-client"

ec2-54-210-192-12.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-192-12.compute-1.amazonaws.com resolving cookbooks for run list: ["myiis-lb"]
ec2-54-210-192-12.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-210-192-12.compute-1.amazonaws.com   - build-essential
ec2-54-210-192-12.compute-1.amazonaws.com   - cpu
ec2-54-210-192-12.compute-1.amazonaws.com   - iis-lb
ec2-54-210-192-12.compute-1.amazonaws.com   - myiis-lb
ec2-54-210-192-12.compute-1.amazonaws.com Compiling Cookbooks...
ec2-54-210-192-12.compute-1.amazonaws.com Converging 9 resources
ec2-54-210-192-12.compute-1.amazonaws.com Recipe: iis-lb::install_package
ec2-54-210-192-12.compute-1.amazonaws.com   * yum_package[iis-lb] action install (up to date) ...
```

You can use 'knife winrm' to run 'sudo chef-client' on all the nodes again to ensure that nothing has changed.

In this instance we only interested in having node2 run the command so we can get a little more creative with the search criteria and find nodes with the role load_balancer. In this case there is only one result.

Within the results, nothing should change. Switching over to the role did not change the fundamental recipes that were applied to the node.



Roles for Everyone

We will give our nodes a role to better describe them and so we can configure them in a similar manner.

Objective:

- Give our load balancer node a "load_balancer" Role
- Give our web nodes a "web" Role

Now if you want to setup a new node in the future to act as a load balancer, you can now simply set the new node's run list to be the load_balancer role and it will have identical functionality with all the other nodes that define this role.



Lab: Define a Web Role

- Create a role named 'web' that has the run list 'recipe[iis-demo]'
- Set node1's run list to be "role[web]"
- Set node3's run list to be "role[web]"

In this lab, define a new role named 'web' that has the run list: including the iis-demo cookbook's default recipe.

When you're done defining the role, upload it to the Chef Server, and then set the run list on node1 and node3 to the role that you have defined.

And for good measure, though nothing should have changed, run 'sudo chef-client' on both node1 and node3 to ensure that no functionality has been lost.

Instructor Note: Allow 10 minutes to complete this exercise

Lab: Create the Web Role

```
□ ~\chef-repo\roles\web.rb
```

```
name 'web'
description 'Web Server'
run_list 'recipe[iis-demo]'
```

First we create a file named web.rb in the roles directory.

The name of the role is web. The description should be Web Server. The run list you define should contain the iis-demo cookbook's default recipe.

Lab: Upload the Role to the Chef Server



```
$ knife role from file web.rb
```

Updated Role web!

You need to share the role with the Chef Server so upload that file.

Use the command 'knife role from file web.rb'. 'knife' knows where to look for that role to upload it.

Lab: Verify the Role on the Chef Server



```
$ knife role list
```

```
load_balancer  
web
```

Verify that the role can be found on the Chef Server.

Lab: Verify Specific Information About the Role



```
$ knife role show web
```

```
chef_type:          role
default_attributes:
description:        Web Server
env_run_lists:
json_class:         Chef::Role
name:               web
override_attributes:
run_list:
```

Verify specific information about the role. Specifically, does it have the run list that we defined?

Lab: Set node1's Run List



```
$ knife node run_list set node1 "role[web]"
```

```
node1:  
  run_list: role[web]
```

Set node1's run list to be the web role.

Lab: Set node3's Run List



```
$ knife node run_list set node3 "role[web]"
```

```
node3:  
  run_list: role[web]
```

And we then set node3's run list to be the web role.

Lab: Converge All Web Nodes



```
$ knife winrm role:web -x USER -P PWD -a ipaddress "chef-client"
```

```
ec2-54-175-46-24.compute-1.amazonaws.com  Starting Chef Client, version 12.3.0
ec2-54-210-86-164.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-86-164.compute-1.amazonaws.com resolving cookbooks for run list: ["iis-d демо"]
ec2-54-175-46-24.compute-1.amazonaws.com  resolving cookbooks for run list: ["iis-d демо"]
ec2-54-210-86-164.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-210-86-164.compute-1.amazonaws.com    - iis-d демо
ec2-54-210-86-164.compute-1.amazonaws.com Compiling Cookbooks...
ec2-54-210-86-164.compute-1.amazonaws.com Converging 3 resources
ec2-54-210-86-164.compute-1.amazonaws.com Recipe: iis-d демо::server
ec2-54-175-46-24.compute-1.amazonaws.com  Synchronizing Cookbooks:
ec2-54-175-46-24.compute-1.amazonaws.com    - iis-d демо
```

To verify that everything is working the same as before, run 'knife winrm' for both of these nodes. In this instance the query syntax is going to find all nodes with the role set to web.



Roles for Everyone

We will give our nodes a role to better describe them and so we can configure them in a similar manner.

Objective:

- ✓ Give our load balancer node a "load_balancer" Role
- ✓ Give our web nodes a "web" Role

With that we now have made it far easier to talk about our nodes. We can more casually describe a node as a 'web' server node or a 'load_balancer' node.

In the future if we needed to ensure that these types of nodes needed to run additional recipes, we could return to the role file, update its run list, and then upload it to the Chef Server again.

DISCUSSION

Discussion



What are the benefits of using roles? What are the drawbacks?

Roles can contain roles. How many of these nested roles would make sense?

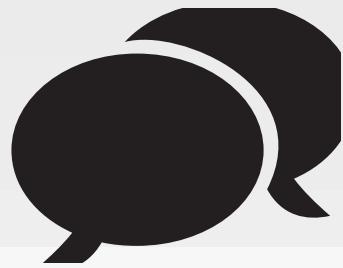
Answer these questions.

With your answers, turn to another person and alternate asking each other asking these questions and sharing your answers.

Slide 28

DISCUSSION

Q&A



What questions can we help you answer?

Slide 29



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13: Search

Search

Update a Cookbook to Dynamically Use Nodes with the Web Role

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Objectives



After completing this module, you should be able to

- Describe the query syntax used in search
- Build a search into your recipe code
- Create a Ruby Array and Ruby Hash
- Update the myiis-lb wrapper cookbook (for the load balancer) to dynamically use nodes with the web role

In this module you will learn how to describe the query syntax used in search, build a search into your recipe code, create a ruby array and ruby hash, and update the myiis-lb wrapper cookbook to dynamically use nodes with the web role

CONCEPT

Search



So far we have seen how Chef is able to manage the policy of the nodes.

We have two web servers and one load balancer.

So far we have seen how Chef is able to manage the policy of the nodes within our infrastructure.

We have two web servers and one load balancer. As more customers come to our website we can continue scale up to meet that demand.

CONCEPT

Search



To add new servers as load balancer members, we would need to bootstrap a new web server and then update our load balancer's myiis-lb cookbook recipe.

That seems inefficient to have to update a cookbook recipe.

To add new servers as load balancer members, we would need to bootstrap a new web server and then update our myiis-lb cookbook to include that new web server. But that seems dramatically inefficient to have to update a cookbook recipe.

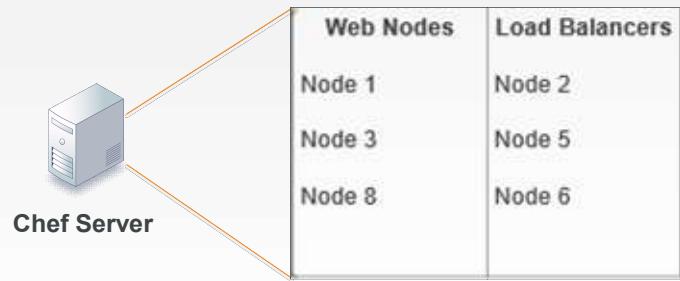
A more ideal solution would be for the recipe to instead discover all of the web servers within our organization and automatically add them list of available members for our load balancer.

The Chef Server and Search



Chef Server maintains a representation of all the nodes within our infrastructure that can be searched on.

Search is a service discovery tool that allows us to query the Chef Server.



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

https://docs.chef.io/chef_search.html#search-indexes

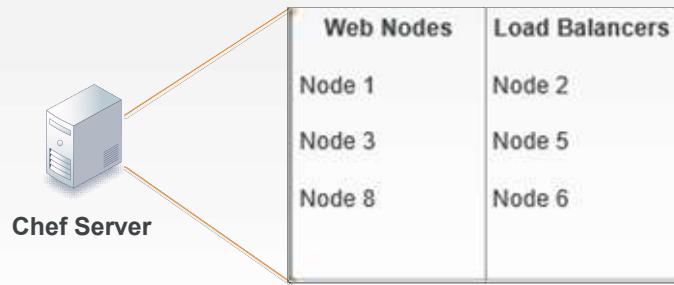
The Chef Server maintains a representation of all the nodes within an infrastructure and provides a way for us to discover these systems through Search.

Search is a service discovery tool that allows us to query the Chef Server across a few indexes. One such index is on our nodes.

The Chef Server and Search



We can ask the Chef Server to return all the nodes or a subset of nodes based on the query syntax that we provide it through `knife search` or within our recipes through `search`.



We can ask the Chef Server to return back to us all the nodes or a subset of nodes based on the query syntax that we provide it through the knife command `knife search` or within our recipes through the `search` method.

Search Criteria



The search criteria that we have been using up to this point is "`*.*`"

Querying and returning every node is not what we need to solve our current problem.



Scenario: We want only to return a subset of our nodes--only the nodes that are web servers.

We have been using a form of the search criteria already when we have employed the `'knife winrm'` command. The search criteria that we have been using up to this point is `"*.*"` which we explained matched every node within our infrastructure.

Querying and returning every node is not exactly what we need to solve our current problem. Scenario: We want only to return a subset of our nodes--only the nodes that are web servers.

Let's examine the search criteria more so we can understand how it works and how we can use it to find a subset of the nodes--only the nodes that are web servers.

Search Syntax



A search query is comprised of two parts: the key and the search pattern. A search query has the following syntax:

`key:search_pattern`

...where key is a field name that is found in the JSON description of an indexable object on the Chef server and search_pattern defines what will be searched for,

A search query is comprised of two parts: the key and the search pattern. A search query has the following syntax:

`key:search_pattern`

...where key is a field name that is found in the JSON description of an indexable object on the Chef server (a role, node, client, environment, or data bag) and search_pattern defines what will be searched for.

Search Syntax within a Recipe

```
all_web_nodes = search('node', 'role:web')
```

creates and names a variable

assigns the value of the
operation on the right
into the variable on the left

invokes the search method

the index or items to search

the search criteria - key:value

Search within a recipe is done through a `search` method that is available within the recipe.

The `search` method accepts two arguments. The first argument is a string or variable that contains the index or item to search on the Chef Server. These are: nodes; roles; and environments. The second argument is a string or variable that contains the search criteria to scope the results. This is using the notation 'key:value'.

The result of the search method is stored in a local variable that is named 'all_web_nodes'. Variables within Ruby are created immediately when you assign them.

Search Syntax within a Recipe

```
all_web_nodes = search('node', 'role:web')
```

Search the Chef Server for all node objects that have the role equal to 'web' and store the results into a local variable named "all_web_nodes".

This example syntax could be translated to mean: Search the Chef Server for all node objects that have the role equal to 'web' and store the results into a local variable named 'all_web_nodes'.

GE: Example Hard Coded Values in Recipe

```
~\chef-repo\cookbooks\myiis-lb\recipes\default.rb

node.default['iis-lb']['members'] = [
  {
    'address' => 'ec2-52-8-71-11.us-west-1.compute.amazonaws.com',
    'weight' => 100,
    'port' => 80,
    'ssl_port' => 80
  },
  {
    'address' => 'ec2-54-176-64-173.us-west-1.compute.amazonaws.com',
    'weight' => 100,
    'port' => 80,
    'ssl_port' => 80
  }
]
include_recipe 'iis-lb::default'
```

Previously, we had been hard coding the hostname and ipaddress values in our wrapped iis-lb recipe. We can request these values from the Chef Server through the `knife node show` command.

The hostname and ipaddress values are captured by Ohai and sent to the Chef Server. On the Chef Server we can query those values when we ask about specific attribute about the node.

We do that by providing the `-a` flag with the name of the attribute. Because the nodes that we manage are hosted in the cloud, these attributes are stored under a parent attribute named 'cloud'.



GE: Dynamic Web Load Balancer

Every time we create a web node we need to update our load balancer (myiis-lb) cookbook. That doesn't feel right!

Objective:

- Update the myiis-lb cookbook to dynamically use nodes with the web role

In this section we'll update the load balancer's myiis-lb cookbook to dynamically use nodes with the web role.

GE: Showing node1 Cloud Attributes



```
$ knife node show node1 -a cloud
```

```
node1:
  cloud:
    local_hostname: ip-10-198-51-26.us-west-1.compute.internal
    local_ipv4: 10.198.51.26
    private_ips: 10.198.51.26
    provider: ec2
    public_hostname: ec2-204-236-155-223.us-west-1.compute.amazonaws.com
    public_ips: 204.236.155.223
    public_ipv4: 204.236.155.223
```

Here we are asking for all the 'cloud' attributes for 'node1'.

GE: Showing node3 Cloud Attributes



```
$ knife node show node3 -a cloud
```

```
node3:
  cloud:
    local_hostname: ip-10-197-105-148.us-west-1.compute.internal
    local_ipv4: 10.197.105.148
    private_ips: 10.197.105.148
    provider: ec2
    public_hostname: ec2-54-176-64-173.us-west-1.compute.amazonaws.com
    public_ips: 54.176.64.173
    public_ipv4: 54.176.64.173
```

Here we are asking for all the 'cloud' attributes for 'node3'.

GE: Remove the Hard-coded Members

```
~\chef-repo\cookbooks\myiis-lb\recipes\default.rb
```

```
node.default['iis-lb']['members'] = [
  {
    'address' => 'ec2-52-8-71-11.us-west-1.compute.amazonaws.com',
    'weight' => 100,
    'port' => 80,
    'ssl_port' => 80
  },
  {
    'address' => 'ec2-54-176-64-173.us-west-1.compute.amazonaws.com',
    'weight' => 100,
    'port' => 80,
    'ssl_port' => 80
  }
]

include_recipe 'iis-lb::default'
```

Edit the 'myiis-lb' cookbook's default recipe and remove the current default recipe where you hard-coded the members.

GE: Use Search to Identify the Members

```
~\chef-repo\cookbooks\myiis-lb\recipes\default.rb  
all_web_nodes = search('node', 'role:web')  
  
include_recipe 'iis-lb::default'
```

Replace it with an updated recipe that searches for all nodes that have the 'web' role defined.

The search method's first parameter is asking the Chef Server to look at all the nodes within our organization.

The search method's second parameter is asking the Chef Server to only return the nodes that have been assigned the role web.

All of those nodes are stored in a local variable named `all_web_nodes`. This is an array of node objects. It may contain zero or more nodes that match the search criteria.

GE: Creating an Array to Store the Converted Members

```
~\chef-repo\cookbooks\myiis-lb\recipes\default.rb

all_web_nodes = search('node', 'role:web')

members = []

#TODO: Convert each web node into an array of
#hashes

node.default['iis-lb']['members'] = members

include_recipe 'iis-lb::default'
```

Unfortunately we cannot simply assign our array of web nodes into the iis-lb's members attributes because it needs a hash that contains the keys 'hostname', 'ipaddress', 'port', and 'ssl_port'.

We will need to convert each of the web node objects into a structure that the iis-lb member's attribute expects.

First we create an empty array and assign that empty array into a local variable named `members`. `members` is an array that we will populated with the hashes we will create later; until then we will write a TODO for us.

Then we will assign that array into the `node.default['iis-lb']['members']`.

GE: Populating the Members with Each New Member

```
~\chef-repo\cookbooks\myiis-lb\recipes\default.rb
all_web_nodes = search('node', 'role:web')

members = []

all_web_nodes.each do |web_node|
  member = {}
  # TODO: add populate the hash with hostname, ipaddress ...
  # TODO: add the hash to the new array of members
  members.push(member)
end

node.default['iis-lb']['members'] = members

include_recipe 'iis-lb::default'
```

So we need to loop through the array of all the web nodes stored in `all_web_nodes`. We do that through a method available on every array object named 'each'. With the each method a block of code is provided -- you see it here from the first 'do' right after the each to the 'end' later in the file.

A block of code is an operation that you want perform on every item in the array. In our case we want to take each of the node objects and convert them into a hash object.

So every member of the array is visited and every member of the array runs through the block of code.

GE: Populating the Hash with Node Details

```
~\chef-repo\cookbooks\myiis-lb\recipes\default.rb
all_web_nodes.each do |web_node|
  member = {
    'address' => web_node['cloud']['public_hostname'],
    'weight' => 100,
    'port' => 80,
    'ssl_port' => 80
  }
  members.push(member)
end
```

Between the pipes we see a local variable that we are defining that exists only in the block `web_node`. This local variable, `web_node`, is a name we came up with to refer to each node in our array of `all_web_nodes`.

Each web node in the array is sent through the block. When inside the block of code it is referred to as `web_node`.

Inside the block the first thing that is created is another local variable named `member` which is assigned a hash that contains the web_node's hostname and the web_node's ipaddress.

Then the local variable `member`, which contains that hash is pushed into the array of members. This adds the member to the end of the array.

When we are done looping through every web node the `members` array contains a list of all these hash objects.

GE: The Final Recipe

```
~\chef-repo\cookbooks\myiis-lb\recipes\default.rb

all_web_nodes = search('node', 'role:web')

members = []

all_web_nodes.each do |web_node|
  member = {
    'address' => web_node['cloud']['public_hostname'],
    'weight' => 100,
    'port' => 80,
    'ssl_port' => 80
  }
  members.push(member)
end

node.default['iis-lb']['members'] = members

include_recipe 'iis-lb::default'
```

This is the complete recipe source code.



Dynamic Web Load Balancer

Every time we create a web node we need to update our load balancer (myiis-lb) cookbook. That doesn't feel right!

Objective:

- ✓ Update the myiis-lb cookbook to dynamically use nodes with the web role

The default recipe of the myiis-lb recipe is now dynamic. Every time a load balancer checks in with the Chef Server, when you run `chef-client`, it will ask the Chef Server if there are any new nodes that are web servers.

As you add nodes, your load balancer will dynamically grow to accommodate them, returning them as node objects, which are then converted to hashes, and then assigned as members.

As you remove nodes, your load balancer will dynamically shrink to accommodate them, returning a smaller set of node objects, which are then converted to hashes, and then assigned as members.



Lab: Upload the Cookbook

- Update the major version of the myiis-lb cookbook
- Upload the cookbook
- Run chef-client on the load balancer node
- Verify that the load balancer node relays requests to both web nodes

As a lab exercise:

- * Update the major version of the cookbook
- * Update the cookbook to the Chef Server
- * Run `chef-client` on the load balancer node
- * Verify that the load balancer node still relays requests to both of our web servers

Instructor Note: Allow 8 minutes to complete this exercise.

Lab: Update the Version Number

```
~\chef-repo\cookbooks\myiis-lb\metadata.rb
```

```
name          'myiis-lb'
maintainer    'The Authors'
maintainer_email 'you@example.com'
license        'all_rights'
description    'Installs/Configures myiis-lb'
long_description 'Installs/Configures myiis-lb'
version        '1.0.0'

depends 'iis-lb'
```

First we update the version to the next major release. We set the version number to 1.0.0.

Lab: CD and Install Dependencies



```
$ cd ~\chef-repo\cookbooks\myiis-lb
```

```
$ berks install
```

```
Resolving cookbook dependencies...
Fetching 'myiis-lb' from source at .
Fetching cookbook index from https://supermarket.chef.io...
Using chef_handler (1.2.0)
Using iis (4.1.5)
Using iis-lb (0.1.9) from https://github.com/binamov/iis-lb.git (at master)
Using myiis-lb (1.0.0) from source at .
Using webpi (1.2.8)
Using windows (1.39.0)
```

Change into the cookbook's directory and then install any new dependencies that your cookbook may need at version 1.0.0.

We have no new dependencies but this is required by berkshelf whenever you update the version of the cookbook.

Lab: Upload the Cookbook



```
$ berks upload
```

```
Uploaded build-essential (2.2.3) to:  
'https://api.opscode.com:443/organizations/steveessentials2'  
Uploaded cpu (0.2.0) to:  
'https://api.opscode.com:443/organizations/steveessentials2'  
Uploaded iis-lb (1.6.6) to:  
'https://api.opscode.com:443/organizations/steveessentials2'  
Uploaded myiis-lb (1.0.0) to:  
'https://api.opscode.com:443/organizations/steveessentials2'  
PS C:\Users\sdelfante\chef-repo\cookbooks\myiis-lb>
```

Upload the cookbook using the `berks upload` command.

Instructor Note: During the course the learner may find they have a mistake with the cookbook and need to re-upload the cookbook. Berkshelf will 'freeze' the versions of the cookbooks that you upload. This is to prevent you from accidentally overriding cookbooks that you may have already created. It is a best practice to not re-upload a cookbook again with new changes if they share the same version. During this course, however, it is important that the version numbers be aligned to make future sections work correctly so it OK to do in the training environment. To re-upload a cookbook with Berkshelf replacing the existing cookbook can be done with `berks upload --force`

Lab: Run the 'knife winrm' Command



```
$ knife winrm role:load_balancer -x USER -P PWD -a
ipaddress "chef-client"

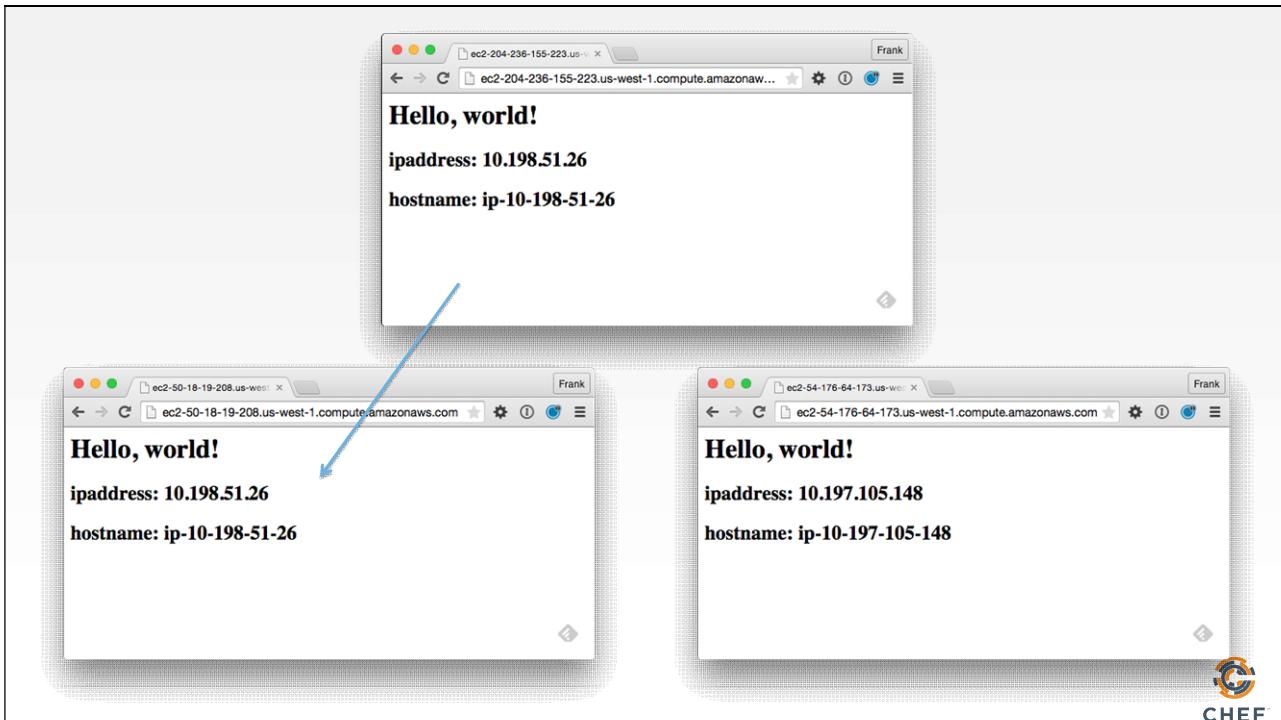
ec2-54-210-192-12.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-192-12.compute-1.amazonaws.com resolving cookbooks for run list:
["myiis-lb"]

ec2-54-210-192-12.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-210-192-12.compute-1.amazonaws.com   - build-essential
ec2-54-210-192-12.compute-1.amazonaws.com   - cpu
ec2-54-210-192-12.compute-1.amazonaws.com   - iis-lb
ec2-54-210-192-12.compute-1.amazonaws.com   - myiis-lb
ec2-54-210-192-12.compute-1.amazonaws.com Compiling Cookbooks...
ec2-54-210-192-12.compute-1.amazonaws.com Converging 9 resources
ec2-54-210-192-12.compute-1.amazonaws.com Recipe: iis-lb::install_package
ec2-54-210-192-12.compute-1.amazonaws.com   * yum_package[iis-lb] action
```

Use `knife winrm` and ask only the nodes with the role `load_balancer` to run `chef-client`. This is more efficient than targeting all of the nodes as we did before and more accurate than targeting the node2 "name:node2".

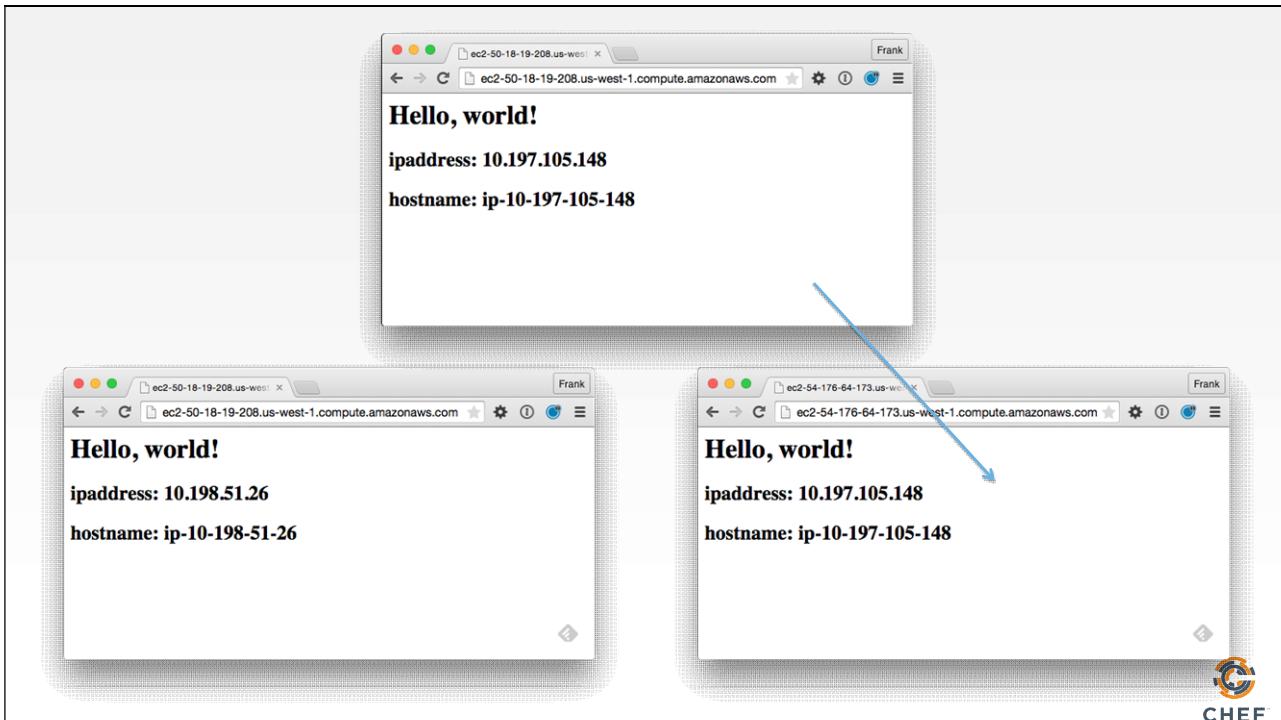
This ensures that all nodes that are also load balancers check in with the Chef Server--similar to how we are targeting only the web server nodes in the recipe.

Slide 27



Nothing should change externally. You may see some differences in the logs as the `load_balancer` configuration file might change the order of the two entries but the end results is that our load balancer node is still delivering traffic to our two web server nodes.

Slide 28



DISCUSSION

Discussion



What happens when new web nodes are added to the organization? Removed?

What happens if you were to terminate a web node instance without removing it from the Chef Server?

Answer these questions.

With your answers, turn to another person and alternate asking each other asking these questions and sharing your answers.

Slide 30

DISCUSSION

Q&A



What questions can we help you answer?

Slide 31



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14: Environments

Environments

Using Environments to Reflect Organization Patterns and Workflow

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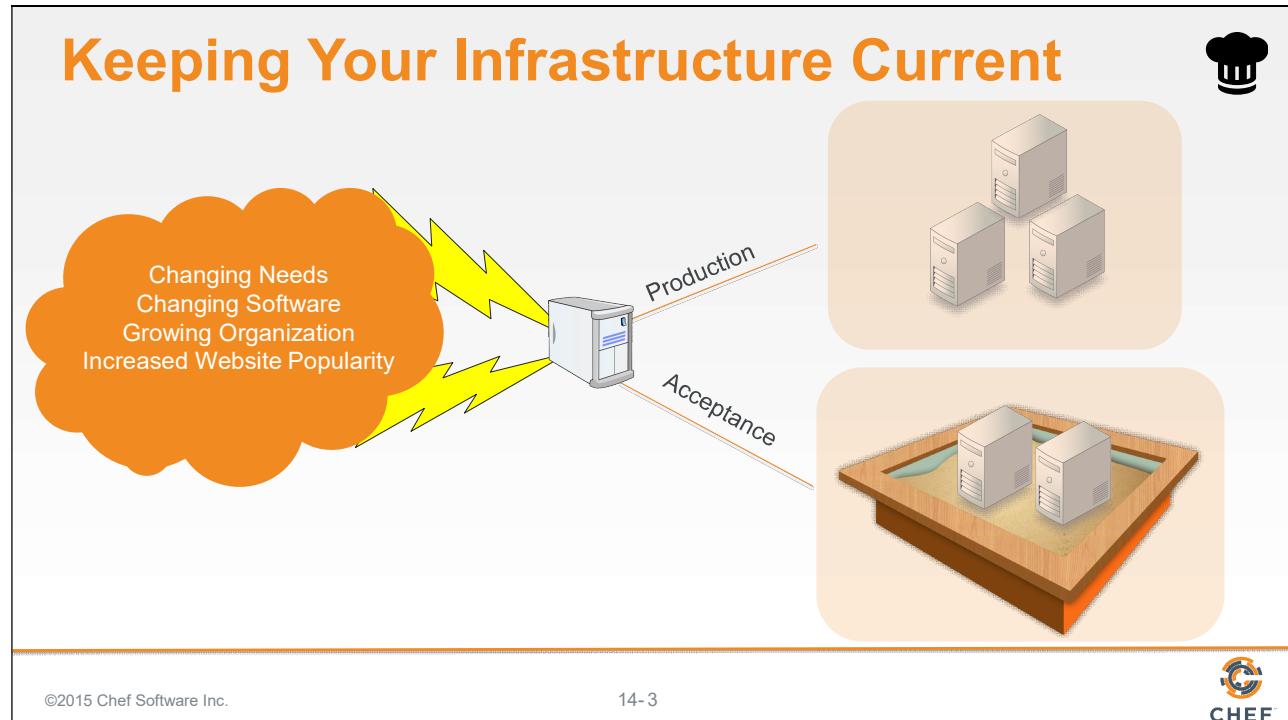
Slide 2

Objectives



After completing this module, you should be able to

- Create an environment
- Deploy a node to an environment
- Update a search query to be more exact



So, we have updated our load balancer's myiis-lb cookbook to dynamically search for and update nodes. Everything is as it should be.

But our system is like a living, breathing thing that must grow and be updated to fit our changing needs. We need to find a way to update and test new tools, features and settings without impacting our current production system.

Of course, we have local testing tools like Test Kitchen to help us verify that our individual cookbooks work before we upload them to the Chef Server. But, that is not always enough. We may want to build, test, and release new features to our cookbooks but we do not immediately want all of our nodes to immediately use them.

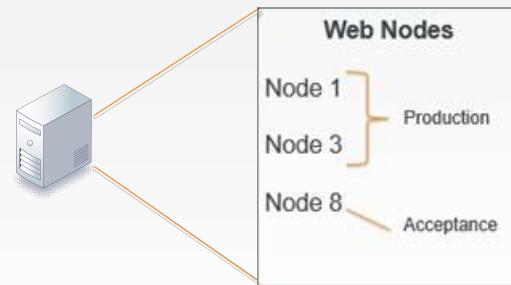
For example, what if we had a requirement to update our iis-demo cookbook with a new front page for our application? The release date of our new service with the sign up page does not go live for a week. So, we want to build, test, and upload that cookbook to the Chef Server without actually applying the cookbook until the release date. How would we accomplish that?

This is where environments are useful.

Environments



Environments can define different functions of nodes that live on the same system.



You likely are familiar with the concept of environments. An environment can best be defined as a logical separation of nodes that most often describe the life-cycle of an application.

Each environment signifies different behaviors and policies to which a node adheres for a given application or platform. For example, environments can be separated into 'acceptance' and 'production'.

"Acceptance" would be where we may make allowances for constant change and updates and for applications to be deployed with each release.

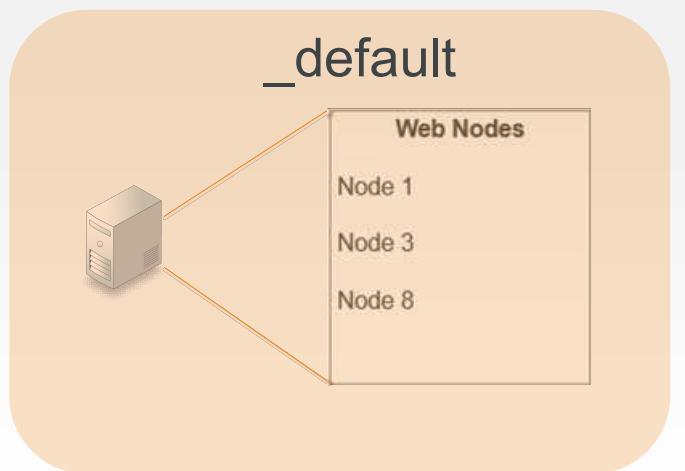
"Production" might be where we lock down our infrastructure and policies. Production would be what the outside world sees, and would remain unaffected by changes and upgrades until you specifically release them.

Chef also has a concept of an environment. A Chef environment allows us to define a list of policies that we will allow by defining a cookbook.

Environments



Every organization or infrastructure starts with the _default environment.



Chef also has a concept of an environment. Chef uses environments to map an organization's real-life workflow to what can be configured and managed using the Chef server.

Every organization begins with a single environment called the _default (underscore default) environment, which cannot be modified or deleted.

Therefore, you must create custom environments to define your organization's workflow.



GE: Production

Let's create a reliable environment for our nodes.

Objective:

- Deploy Our Site to Production

First, we need to create a Production environment. This is where we lock down our infrastructure and policies to a specific version of the myiis-lb cookbook.

GE: Using 'knife environment --help'



```
$ cd ~\chef-repo  
$ knife environment --help
```

```
** ENVIRONMENT COMMANDS **  
knife environment compare [ENVIRONMENT..] (options)  
knife environment create ENVIRONMENT (options)  
knife environment delete ENVIRONMENT (options)  
knife environment edit ENVIRONMENT (options)  
knife environment from file FILE [FILE..] (options)  
knife environment list (options)  
knife environment show ENVIRONMENT (options)
```

Because we still are communicating with the Chef server, let's ask Chef for help regarding available environment commands.

So change into chef-repo and then run 'knife environment --help'.

GE: View List of Defined Environments



```
$ knife environment list
```

```
_default
```

Remember, we use 'list' to view existing environments.

As previously stated, we see the `_default` environment has already been created.

GE: Viewing the `_default` Environment



```
$ knife environment show _default
```

```
chef_type:           environment
cookbook_versions:
default_attributes:
description:        The default Chef environment
json_class:         Chef::Environment
name:               _default
override_attributes:
```

GE: Searching All of Our Nodes



```
$ knife search node *:*
```

```
3 items found

Node Name:    node1
Environment:  _default
FQDN:        ip-172-31-8-68.ec2.internal
IP:          54.175.46.24
Run List:    role[web]
Roles:       web
Recipes:     iis-demo, iis-demo::default, iis-demo::server
Platform:    centos 6.7
Tags:
```

If we search our nodes, we see that all three nodes have been set to the `_default` environment. How do we change this?

GE: Create an environments Directory



```
$ mkdir environments
```

GE: Create the production.rb

```
~\chef-repo\environments\production.rb

name 'production'
description 'Where we run production code'

cookbook 'iis-demo', '= 0.2.1'
cookbook 'myiis-lb', '= 1.0.0'
```

Then we need to create a production.rb file. Like in the roles.rb files, we must provide a name and description.

Additionally, we need to define cookbook restrictions to lock down specific versions of both the iis-demo and myiis-lb cookbooks. By adding this information to production.rb, we are telling our nodes to use these specific versions of these specific cookbooks.

Obviously, what this means is that as we work on newer versions of these cookbooks, we won't break anything in the production environment.

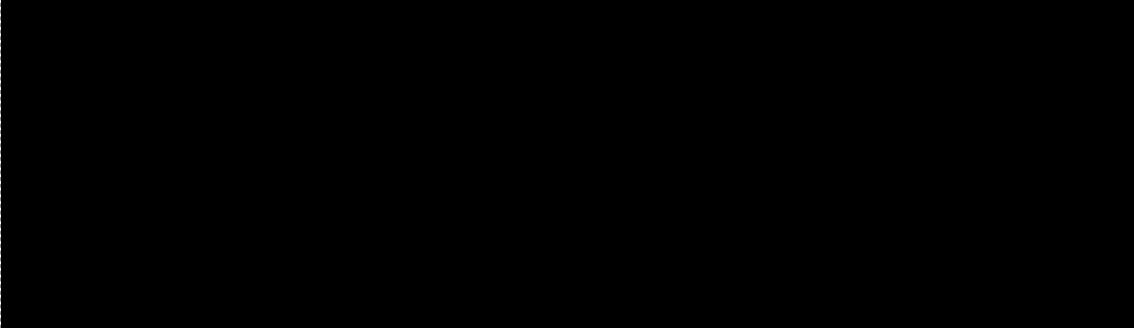
Okay, so now that we have captured our 'good' environment in this file, let's save it and upload it.

GE: Upload the production.rb File



```
$ knife environment from file production.rb
```

```
Updated Environment production
```

A large black rectangular box redacting the terminal output below the command.

Using the knife environment command, let's upload the production.rb file. This should be familiar because it is just like the command we used to upload roles.

GE: View the List of Environments



```
$ knife environment list
```

```
_default  
production
```

Okay, let's use our list command to make sure the file uploaded correctly.

GE: View the Production Environment



```
$ knife environment show production
```

```
chef_type:           environment
cookbook_versions:
  iis-demo:      = 0.2.1
  myiis-lb:     = 1.0.0
default_attributes:
description:        Where we run production code
json_class:         Chef::Environment
name:               production
override_attributes:
```

If we use the knife environment show command, we can see how the production.rb file looks.

Note the cookbook versions that we set are shown here.

GE: Viewing 'knife node --help'



```
$ knife node --help
```

```
** NODE COMMANDS **  
knife node bulk delete REGEX (options)  
knife node create NODE (options)  
knife node delete NODE (options)  
knife node edit NODE (options)  
knife node environment set NODE ENVIRONMENT  
knife node from file FILE (options)  
knife node list (options)  
knife node run_list add [NODE] [ENTRY[,ENTRY]] (options)  
knife node run_list remove [NODE] [ENTRY[,ENTRY]] (options)  
knife node run_list set NODE ENTRIES (options)  
knife node show NODE (options)
```

Now, we need to set the environments for our nodes. Let's ask Chef for help on that as well.

Let's use the knife node environment set command.

GE: Viewing 'knife node set --help'



```
$ knife node environment set --help
```

```
knife node environment set NODE ENVIRONMENT
  -s, --server-url URL          Chef Server URL
      --chef-zero-host HOST      Host to start chef-zero on
      --chef-zero-port PORT     Port (or port range) to start chef-zero on.
Port ranges like 1000,1010 or 8889-9999 will try all given ports until one works.
  -k, --key KEY                API Client Key
      --[no-]color              Use colored output, defaults to false on
Windows, true otherwise
  -c, --config CONFIG          The configuration file to use
      --defaults                Accept default values for all questions
  -d, --disable-editing        Do not open EDITOR, just accept the data as is
  -e, --editor EDITOR          Set the editor to use for interactive commands
```

But how does that command work, exactly?

It looks like we just add the environment name at the end of the command to set that environment on a node.

GE: Using 'knife environment set node1 production'



```
$ knife node environment set node1 production
```

```
node1:  
  chef_environment:
```

So, let's do that for node1.

The results don't really tell us much, so let's take a look at node1.

GE: Viewing node1's Attributes



```
$ knife node show node1
```

```
Node Name: node1
Environment: production
FQDN: ip-172-31-8-68.ec2.internal
IP: 54.175.46.24
Run List: role[web]
Roles: web
Recipes: iis-demo, iis-demo::default, iis-demo::server
Platform: centos 6.7
Tags:
```

Using knife node show, we can see node1's attributes. Note that it has indeed been set to the production environment.

Slide 20



Lab: Set More Nodes to Production

- Set node2's environment to production

Let's do the same thing for node2.

Instructor Note: Allow 2 minutes to complete this exercise.

Lab: Set node2's Environment to Production



```
$ knife node environment set node2 production
```

```
node2:  
  chef_environment:
```

Lab: Verify node2 is Set to Production



```
$ knife node show node2
```

```
Node Name:    node2
Environment:  production
FQDN:        ip-172-31-0-128.ec2.internal
IP:          54.210.192.12
Run List:    role[load_balancer]
Roles:       load_balancer
Recipes:     myiis-lb, myiis-lb::default, iis-lb::default, iis-lb::install_package
Platform:    centos 6.6
Tags:
```

And, it looks like node2 was successfully set to the production environment.

Slide 23



Production

Let's create a reliable environment for our nodes.

Objective:

- ✓ Deploy our site to Production



Lab: Acceptance Environment

- Create an environment named "acceptance" that has no cookbook restrictions.
- Move node3 into the acceptance environment
- Run chef-client on all the nodes

Now, let's create the environment we can use to change and update the cookbooks without affecting our production environment. A sandbox, if you will.

Let's call this our "Acceptance environment".

Instructor Note: Allow 10 minutes to complete this exercise.

Lab: Create a New Environment File

```
~\chef-repo\environments\acceptance.rb
```

```
name 'acceptance'  
description 'Where code and applications are  
tested'  
# No Cookbook Restrictions
```

First, let's create a new rb file in our chef-repo/environments directory. Let's name it acceptance.

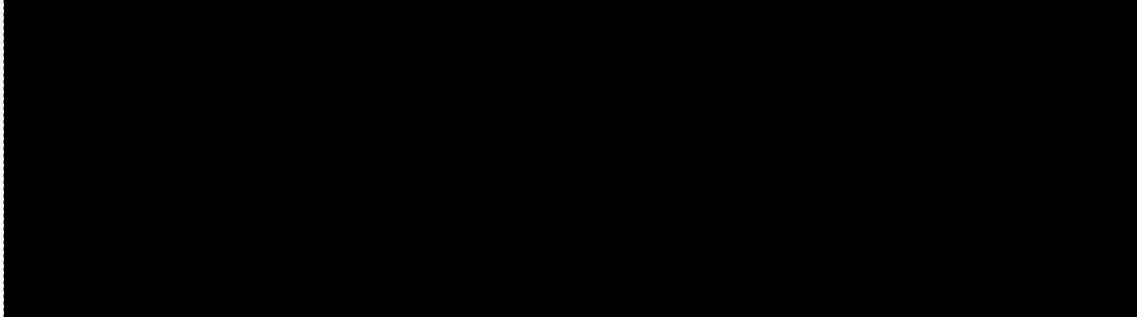
In the Acceptance environment, we don't want to lock-down the cookbook versions, so we are not going to place restrictions on the cookbooks.

Lab: Upload the .rb File



```
$ knife environment from file acceptance.rb
```

```
Updated Environment acceptance
```

A large black rectangular box redacting the terminal output below the command.

Let's upload that environment file to the Chef server.

Lab: Verify that the Environment was Set



```
$ knife environment list
```

```
_default  
production  
acceptance
```

And let's make sure that this environment file was added properly.

Lab: Verify the Contents of the Environment



```
$ knife environment show acceptance
```

```
chef_type:           environment
cookbook_versions:
default_attributes:
description:        Where code and applications are tested
json_class:         Chef::Environment
name:               acceptance
override_attributes:
```

And last, but not least, let's ask the Chef Server to show us the acceptance environment.

Lab: Set node 3 to the Acceptance Environment



```
$ knife node environment set node3 acceptance
```

```
node3:  
  chef_environment: acceptance
```

Lab: Verify that the Environment Was Set



```
$ knife node show node3
```

```
Node Name:    node3
Environment:  acceptance
FQDN:        ip-172-31-0-127.ec2.internal
IP:          54.210.86.164
Run List:    role[web]
Roles:       web
Recipes:     iis-demo, iis-demo::default, iis-demo::server
Platform:   centos 6.6
Tags:
```

And confirm that it has been set properly.

Lab: Converge All the Nodes



```
$ knife winrm *:* -x USER -P PWD -a ipaddress "chef-client"
```

```
ec2-54-175-46-24.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-86-164.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-192-12.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-86-164.compute-1.amazonaws.com resolving cookbooks for run list: ["iis-demo"]
ec2-54-210-192-12.compute-1.amazonaws.com resolving cookbooks for run list: ["myiis-lb"]
ec2-54-210-86-164.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-210-86-164.compute-1.amazonaws.com   - iis-demo
ec2-54-210-86-164.compute-1.amazonaws.com Compiling Cookbooks...
ec2-54-210-86-164.compute-1.amazonaws.com Converging 3 resources
ec2-54-210-86-164.compute-1.amazonaws.com Recipe: iis-demo::server
ec2-54-210-192-12.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-210-192-12.compute-1.amazonaws.com   - build-essential
```

Using the knife winrm let's run chef client on all the nodes.



Separating Environments

Objective:

- Use Search to separate out the environments
- Update myiis-lb cookbook's version number and upload it to Chef Server

Now that we have created our two environments and set each node to a specific environment, we need to separate the environments to ensure that the load balancer only communicates with the production nodes.

DISCUSSION



Expected Situation

What do we expect to happen when we set a web node to a specific environment?

So we set our web nodes to specific environments. As we manage our nodes, making changes to our cookbooks and recipes, what do you think is going to happen to Node1?

What about Node 3?

Setting the nodes is not enough. Chef does not automatically know to separate the environments. So, we have to tell it how to do that.

DISCUSSION



Balancing Nodes

Which cookbook handles balancing the requests between web nodes?

Which recipe within that cookbook sets up the request balancing between the two nodes?

How do we do that?

First, let's answer a couple of questions. As you think about the infrastructure we have created, which cookbook handles balance requests between nodes?

So if we want to make changes to that cookbook, which recipe would we change?

Answer 1: myiis-lb Answer 2: default.rb

DISCUSSION



Search Criteria

How are we currently searching for web nodes?

How can we further refine our search results?

In our last module, we talked about searching our nodes using Chef. Do you recall what we used to search for web nodes?

Answer: `all_web_nodes = search("node","role:web")`

So, considering our search syntax, how can we further refine that syntax to search for a specific web node by environment?

Let's take a look.

GE: Examine the Existing Search Criteria

~\chef-repo\cookbooks\myiis-lb\recipes\default.rb

```
#  
# Cookbook Name:: myiis-lb  
# Recipe:: default  
#  
# Copyright (c) 2015 The Authors, All Rights Reserved.  
  
all_web_nodes = search('node','role:web')  
  
members = []  
  
#...
```

Looking at the default.rb file in the load balancer's myiis-lb cookbook, we can review the original search syntax. If we want to search by environments, what would we need to add here?

GE: Modify the myiis-lb Default Recipe

~\chef-repo\cookbooks\myiis-lb\recipes\default.rb

```
#  
# Cookbook Name:: myiis-lb  
# Recipe:: default  
#  
# Copyright (c) 2015 The Authors, All Rights Reserved.  
  
all_web_nodes = search('node', "role:web AND chef_environment:#{{node.chef_environment}}")  
  
members = []  
  
#...
```

Search the Chef Server for all node objects that have the role equal to 'web' and also share the same environment as the current node applying this recipe. The nodes currently applying this recipe are the nodes with the role set to load_balancer.

Now that we've made our changes, let's save this file.



Separating Environments

Objective:

- Use Search to separate out the environments
- Update myiis-lb cookbook's version number and upload it to Chef Server

Now that we have created our two environments and set each node to a specific environment, we need to separate the environments to ensure that the load balancer only communicates with the production nodes.

Now it's time to update the version number of the cookbook and upload it to the Chef Server.

GE: Version the myiis-lb metadata.rb

```
~/chef-repo/cookbooks/myiis-lb/metadata.rb
```

```
name          'myiis-lb'  
maintainer    'The Authors'  
maintainer_email 'you@example.com'  
license        'all_rights'  
description    'Installs/Configures myiis-lb'  
long_description 'Installs/Configures myiis-lb'  
version        '1.0.1'  
  
depends 'iis-lb'
```

Before we upload the new myiis-lb cookbook to the server, we probably want to update the version number. What type of change have we made here?

Answer: Patch

Because we are performing a patch, let's set the version number to 1.0.1.

GE: Run 'berks install'



```
$ cd ~\cookbooks\myiis-lb  
$ berks install
```

```
Resolving cookbook dependencies...  
Fetching 'myiis-lb' from source at .  
Fetching cookbook index from https://supermarket.chef.io...  
Using build-essential (2.2.3)  
Installing iis-lb (1.6.6)  
Using cpu (0.2.0)  
Using myiis-lb (1.0.1) from source at .
```

We are going to need to use Berks to upload this cookbook because it has dependencies. So first we need to cd into the cookbook.

Then run 'berks install'.

GE: Run 'berks upload'



```
$ berks upload
```

```
Skipping build-essential (2.2.3) (frozen)
Skipping cpu (0.2.0) (frozen)
Skipping iis-lb (1.6.6) (frozen)
Uploaded myiis-lb (1.0.1) to:
'https://api.opscode.com:443/organizations/vogue'
```

And finally berks upload.



Separating Environments

Objective:

- ✓ Use Search to separate out the environments
- ✓ Update myiis-lb cookbook's version number and upload it to Chef Server

Now the load balancer will only find nodes that are web servers in the same environment as the load balancer. This is useful if we want to deploy a load balancer to the acceptance environment as it will only address requests to the nodes in that environment.

DISCUSSION



A Brief Recap

- We restricted the production environment to specific cookbook version.
- We created an acceptance environment with no cookbook restrictions.
- We set specific nodes to each of these environments.
- We updated the myiis-lb's default recipe to include environment search criteria.
- And we changed the version number in the myiis-lb metadata.rb file.

Before we run 'chef-client' to bring everything up to date, let's think about what we've done.

First, in the production environment, we restricted our cookbooks to a specific version.

Second, we created an acceptance environment with no cookbook restrictions.

Third, we set specific nodes to each of these environments.

Fourth, we updated the myiis-lb default.rb to include environment search criteria.

And lastly, we changed the version number in the myiis-lb metadata.rb file.

What problems do you think we may encounter, given all that we've done here?



Lab: Update Production

- ❑ Update the environment named production's cookbook constraint:

```
'myiis-lb' cookbook version equal to '1.0.1'
```

- ❑ Upload the Role to the Chef Server
- ❑ Converge all the nodes

Since we changed the version of the myiis-lbcookbook, we need to revise the production.rb file to incorporate the new version.

Lab: Update production.rb

```
~/chef-repo/environments/production.rb
```

```
name 'production'  
description 'Where we run production code'  
  
cookbook 'iis-demo', '= 0.2.1'  
cookbook 'myiis-lb', '= 1.0.1'
```

So let's go back into our production.rb and update it to include the new version number.

Lab: cd and Run 'knife environment...'



```
$ cd ~\chef-repo  
$ knife environment from file production.rb
```

```
Updated Environment production
```

Change directory to your chef-repo and then run 'knife environment from file production.rb'.

Lab: Verify the Version Number



```
$ knife environment show production
```

```
chef_type:           environment
cookbook_versions:
  iis-demo:      = 0.2.1
  myiis-lb:     = 1.0.1
default_attributes:
description:        Where we run production code
json_class:         Chef::Environment
name:               production
override_attributes:
```

And let's make sure that the production.rb on Chef server has the correct version of myiis-lb designated.

Lab: Converge All Nodes



```
$ knife winrm *:* -x USER -P PWD -a ipaddress "chef-client"
```

```
ec2-54-175-46-24.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-86-164.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-192-12.compute-1.amazonaws.com Starting Chef Client, version 12.3.0
ec2-54-210-86-164.compute-1.amazonaws.com resolving cookbooks for run list: ["iis-demos"]
ec2-54-210-192-12.compute-1.amazonaws.com resolving cookbooks for run list: ["myiis-lb"]
ec2-54-210-86-164.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-210-86-164.compute-1.amazonaws.com   - iis-demos
ec2-54-210-86-164.compute-1.amazonaws.com Compiling Cookbooks...
ec2-54-210-86-164.compute-1.amazonaws.com Converging 3 resources
ec2-54-210-86-164.compute-1.amazonaws.com Recipe: iis-demos::server
ec2-54-210-192-12.compute-1.amazonaws.com Synchronizing Cookbooks:
ec2-54-210-192-12.compute-1.amazonaws.com   - build-essential
```

And use 'chef-client' to converge all nodes.



Lab: Update Production

- ✓ Update the environment named production's cookbook constraint:

```
'myiis-lb' cookbook version equal to '1.0.1'
```

- ✓ Upload the Role to the Chef Server
- ✓ Converge all the nodes

Now the production load balancers in the production environment will use the latest version of the myiis-lb cookbook.

DISCUSSION



Discussion

What is the benefit of constraining cookbooks to a particular environment?

When defining search criteria what happens when you **AND** in a query?

What happens when you use an **OR** in a query?

Answer these questions.

With your answers, turn to another person and alternate asking each other asking these questions and sharing your answers.

Slide 51

DISCUSSION



Q&A

What questions can we help you answer?

Slide 52



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15: Further Resources

Further Resources

Other Places to Talk About, Practice, and Learn Chef

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Slide 2



Going Forward

There are many Chef resources available to you outside this class. During this module we will talk about just a few of those resources.

But...remember what we said at the beginning of this class:

The best way to learn Chef is to use Chef

Slide 3



Practice Chef

First, let's talk about stuff you can read to help you learn Chef.

Slide 4

**learnchef.com**

Interactive learning for those new to Chef.

Another great place to practice Chef is our awesome Learn Chef site. These interactive modules provide you with an opportunity to run through exercises similar to those we did in this class, and it is updated when new Chef features are introduced. This is one of the most robust self-guided tutorial sites out there.

Slide 5



Resources You Can Read

A lot of people in the Chef community have written about Chef.

Here are just a few of those resources.

Slide 6



Docs are available to you, 24 hours a day, 7 days a week.

Any question you have, you probably will find the answer for on our Docs site.

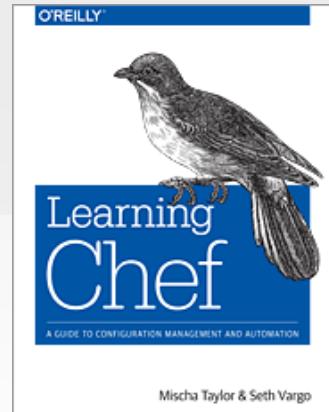
Remember, how often we referred to the Docs site throughout this workshop. That wasn't by accident. We wanted you to become comfortable with using our Docs site to resolve issues and learn about the many Chef tools out there.

Docs are there, available to you, 24 hours a day, 7 days a week. Any question you have, you probably will find the answer on our Docs site.

Slide 7

Learning Chef

A Guide to Configuration Management
and Automation

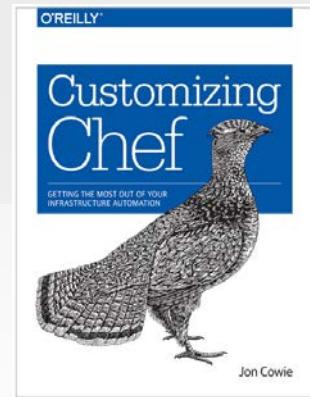


Some people who have used Chef for years have written some excellent books about Chef. Check out Mischa Taylor's and Seth Vargo's *Guide to Configuration Management and Automation*. You can find it on O'Reilly. It's a great book.

Slide 8

Customizing Chef

Getting the Most Out of Your
Infrastructure Automation



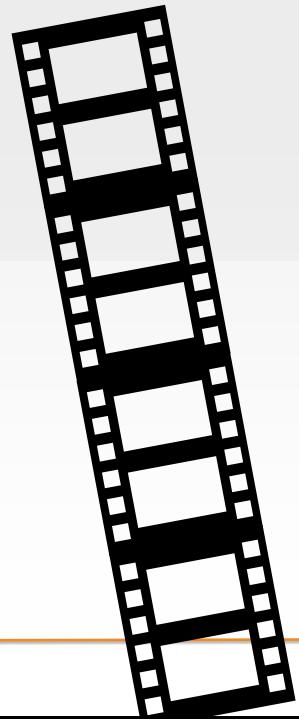
Additionally, you may want to read Jon Cowie's *Getting the Most Out of Your Infrastructure Automation*. It's also available on O'Reilly.

Slide 9

YouTube Channel

- ChefConf Talks
- Training Videos

<https://www.youtube.com/user/getchef/playlists>



We have uploaded a number of videos to the Chef YouTube channel, including training videos and talks from past Chef conferences.

Slide 10

theshipshow.com



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The Ship Show is a twice-monthly podcast, featuring discussion on everything from build engineering to DevOps to release management, plus interviews, new tools and techniques, and reviews.

Slide 11

foodfightshow.org



FOOD FIGHT

The Podcast where DevOps chefs do battle

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Food Fight is a bi-weekly podcast for the Chef community. We bring together the smartest people in the Chef community and the broader DevOps world to discuss the thorniest issues in system administration.

Slide 12



Chef Developers' IRC Meeting

<https://github.com/chef/chef-community-irc-meetings>

Join members of the Chef Community in a weekly meeting for Chef Developers where we'll discuss the future of the Chef project and other things pertinent to the community. The agenda and schedule can be found at this link.

Slide 13



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ChefConf is a gathering of hundreds of Chef community members. We get together to learn about the latest and greatest in the industry (both the hows and the whys), as well as exchange ideas, brainstorm solutions, and give hugs, which has become the calling card of the DevOps community, and the Chef community in particular.

ChefConf 2016 will be held in Austin, Texas during July.

Slide 14

Chef Community Summit - 2016 Dates to be Announced

<https://www.chef.io/summit/>

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CHEF

The Chef Community will gather for two days of open space sessions and brainstorm on Chef best practices.

The Chef Community Summit is a facilitated Open Space event. The participants of the summit propose topics, organize an agenda, and discuss and work on the ideas that are most important to the community.

Dates for the 2016 Summit will be announced in the spring of 2016.

Slide 15



CHEF™

Thank You!