

# Creating and Using Chef Cookbooks for Complex Configurations

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## Description

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Chef **Cookbooks** are collections of recipes and configurations used to manage infrastructure and application setups across multiple environments. This guide details the process of creating a cookbook, defining complex configurations using recipes and attributes, and deploying it on Chef-managed nodes.

## Problem Statement

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When managing complex environments with multiple configuration requirements, it's essential to use **cookbooks** to organize reusable, modular recipes. By leveraging Chef cookbooks, you can:

- **Centralize configuration management** for various environments.
- **Reuse and version configurations** to avoid redundant coding.
- **Parameterize configurations** to handle varying requirements across different nodes.

## Prerequisites

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### Software Required

- **Chef Workstation:** To create and manage cookbooks.
- **Chef Server:** To store and distribute cookbooks to nodes.
- **Chef Node:** To apply and execute cookbooks.

### Hardware Requirement

- **Chef Workstation:** 2 GB RAM, 2 CPU cores
- **Chef Server:** 4 GB RAM, 2 CPU cores
- **Chef Node(s):** 2 GB RAM, 1 CPU core

# Implementation Steps

## Step-1: Create a Chef Cookbook

1. Generate a Cookbook:

- From your Chef Workstation, use the `chef generate cookbook` command to create a new cookbook.

```
chef generate cookbook my_webserver
```

```
C:\Users\Administrator\Downloads\chef-starter\chef-repo\cookbooks\my_webserver>chef generate cookbook my_webserver
Generating cookbook my_webserver
- Ensuring correct cookbook content

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

There are several commands you can run to get started locally developing and testing your cookbook.

Why not start by writing an InSpec test? Tests for the default recipe are stored at:
test/integration/default/default_test.rb

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

C:\Users\Administrator\Downloads\chef-starter\chef-repo\cookbooks\my_webserver>
```





- This command creates a folder named `my_webserver` with default files and folders, including recipes, attributes, libraries, and tests.

2. Navigate to the Cookbook Directory:

```
cd my_webserver
```

3. Organize the Folder Structure:

- Use the `recipes` directory for configuration tasks, `attributes` for parameter values, and `templates` for any dynamic files you need for configuration.

 attributes	12-11-2024 10:11	File folder
 compliance	12-11-2024 10:10	File folder
 recipes	12-11-2024 10:10	File folder
 templates	12-11-2024 10:11	File folder

## Step-2: Define Recipes for Complex Configurations

1. Create a Recipe to Install Web Server:

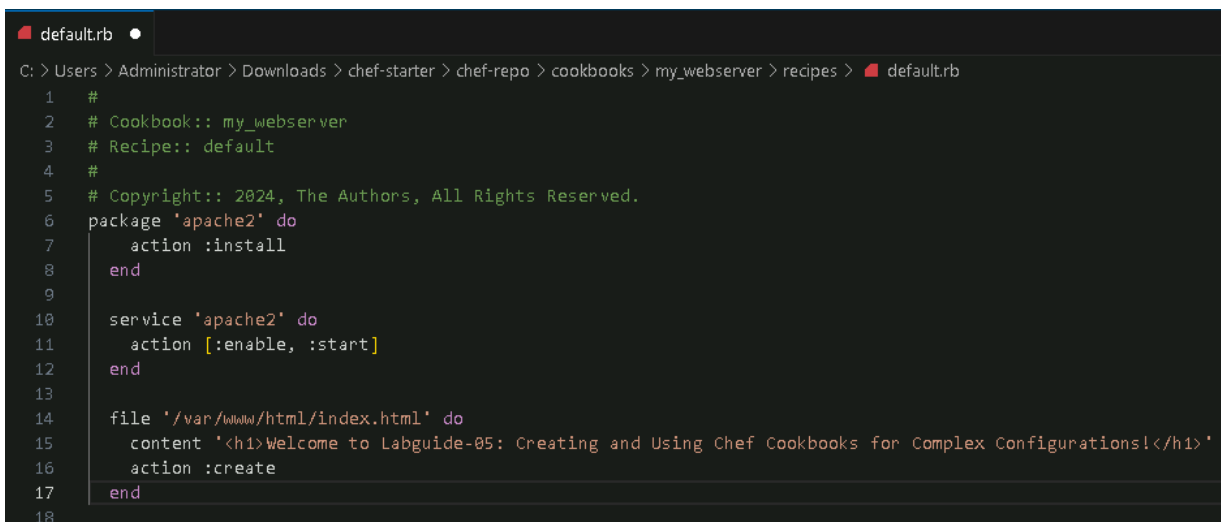
- Add a recipe to install and configure a web server in `recipes/default.rb`:

```
# recipes/default.rb
package 'apache2' do
  action :install
end

service 'apache2' do
  action [:enable, :start]
end

# Use a template for ports configuration, passing the port attribute
template '/etc/apache2/ports.conf' do
  source 'ports.conf.erb' # Make sure this file exists in your templates
  folder
  variables(port: node['my_webserver']['port'])
end

file '/var/www/html/index.html' do
  content '<h1>Welcome to my Chef-configured web server!</h1>'
  action :create
end
```

A screenshot of a code editor window titled 'default.rb'. The editor shows the content of the file, which is a Chef recipe for installing and configuring Apache2. The code is color-coded: comments are grey, package and service names are green, and actions are blue. The file path in the breadcrumb is 'C:\> Users > Administrator > Downloads > chef-starter > chef-repo > cookbooks > my\_webserver > recipes > default.rb'.

```
1 #
2 # Cookbook:: my_webserver
3 # Recipe:: default
4 #
5 # Copyright:: 2024, The Authors, All Rights Reserved.
6 package 'apache2' do
7   action :install
8 end
9
10 service 'apache2' do
11   action [:enable, :start]
12 end
13
14 file '/var/www/html/index.html' do
15   content '<h1>Welcome to Labguide-05: Creating and Using Chef Cookbooks for Complex Configurations!</h1>'
16   action :create
17 end
18
```

## Step-3: Use Attributes to Parameterize Configurations

### 1. Define Attributes:

- Attributes are the key components for dynamically configuring cookbooks. Attributes enable the authors to make the cookbook configurable. By overriding default values set in cookbooks, the user can inject their own values.
- Set default values for parameters in the `attributes/default.rb` file. For example, to define the web server's port:

```
default['my_webserver']['port'] = 80
```

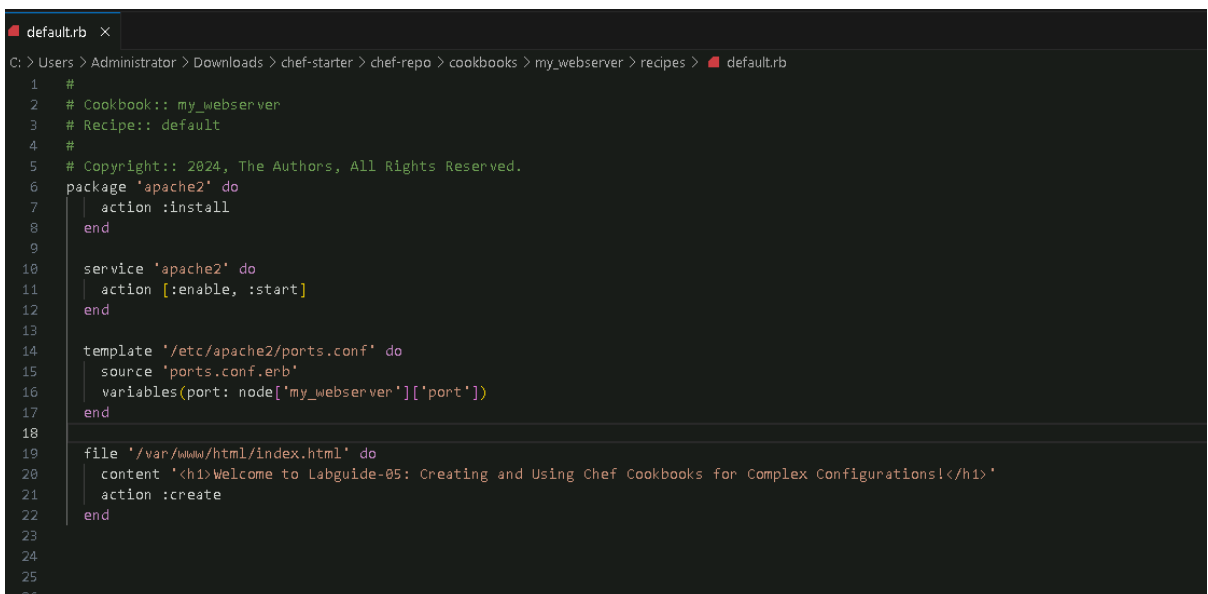


```
default.rb x
default.rb
1 default['my_webserver']['port'] = 80
2
```

## 2. Use Attributes in Recipes:

- Reference these attributes in your recipes to parameterize configurations:

```
template '/etc/apache2/ports.conf' do
  source 'ports.conf.erb'
  variables(port: node['my_webserver']['port'])
end
```



```
default.rb x
C:\> Users > Administrator > Downloads > chef-starter > chef-repo > cookbooks > my_webserver > recipes > default.rb
1 #
2 # Cookbook:: my_webserver
3 # Recipe:: default
4 #
5 # Copyright:: 2024, The Authors, All Rights Reserved.
6 package 'apache2' do
7   action :install
8 end
9
10 service 'apache2' do
11   action [:enable, :start]
12 end
13
14 template '/etc/apache2/ports.conf' do
15   source 'ports.conf.erb'
16   variables(port: node['my_webserver']['port'])
17 end
18
19 file '/var/www/html/index.html' do
20   content '<h1>Welcome to Labguide-05: Creating and Using Chef Cookbooks for Complex Configurations!</h1>'
21   action :create
22 end
23
24
25
26
```

## 3. Override Attributes for Different Environments:

- In production or other environments, you can override attributes by setting values in environment-specific files or roles, allowing you to manage configurations across environments.

## Step-4: Test and Deploy the Cookbook

### 1. Upload the Cookbook to Chef Server:

- Use **knife** to upload the cookbook to the Chef Server:

## knife cookbook upload my\_webserver

```
C:\Users\Administrator\Downloads\chef-starter\chef-repo\cookbooks>knife cookbook upload my_webserver
INFO: Using configuration from C:/Users/Administrator/Downloads/chef-starter/chef-repo/.chef/config.rb
Uploading my_webserver [0.1.0]
INFO: Validating ruby files
INFO: Validating templates
INFO: Syntax OK
INFO: Saving my_webserver
INFO: Uploading files
INFO: Uploading C:/Users/Administrator/AppData/Local/Temp/d20241112-3324-3g5bgn/my_webserver/README.md (checksum hex = 4866f7ed74c36a8c6c764b34d45698dd) to https://host
ed-chef-production-cookbooks.s3-external-1.amazonaws.com:443/organization-205d51beaa25de254812efc9396014fb/checksum-4866f7ed74c36a8c6c764b34d45698dd?X-Amz-Algorithm=AWS
4-HMAC-SHA256&X-Amz-Credential=AKIA5K3LHHXZDSX75XAF%2F20241112%2Fus-east-1%2F%3%2Faws4_request&X-Amz-Date=20241112T063549Z&X-Amz-Expires=900&X-Amz-SignedHeaders=content
-md5%3Bcontent-type%3Bhost&X-Amz-Signature=092ccc598ffda35b0eed6d7efa604fd5168d83f66ee9de494ec7452ad22d45bb
INFO: Uploading C:/Users/Administrator/AppData/Local/Temp/d20241112-3324-3g5bgn/my_webserver/CHANGELOG.md (checksum hex = 7aa119099d56a2f6f9251226bb9226b3) to https://h
osted-chef-production-cookbooks.s3-external-1.amazonaws.com:443/organization-205d51beaa25de254812efc9396014fb/checksum-7aa119099d56a2f6f9251226bb9226b3?X-Amz-Algorithm=
AWS4-HMAC-SHA256&X-Amz-Credential=AKIA5K3LHHXZDSX75XAF%2F20241112%2Fus-east-1%2F%3%2Faws4_request&X-Amz-Date=20241112T063549Z&X-Amz-Expires=900&X-Amz-SignedHeaders=cont
ent-md5%3Bcontent-type%3Bhost&X-Amz-Signature=962b8fba914de466a5bafb2025f8b31c45e9aed0b030789593223cf352ec0d2
INFO: Uploading C:/Users/Administrator/AppData/Local/Temp/d20241112-3324-3g5bgn/my_webserver/metadata.json (checksum hex = 7e63f611fc809b82f24eafc169a23279) to https://h
osted-chef-production-cookbooks.s3-external-1.amazonaws.com:443/organization-205d51beaa25de254812efc9396014fb/checksum-7e63f611fc809b82f24eafc169a23279?X-Amz-Algorithm=
AWS4-HMAC-SHA256&X-Amz-Credential=AKIA5K3LHHXZDSX75XAF%2F20241112%2Fus-east-1%2F%3%2Faws4_request&X-Amz-Date=20241112T063549Z&X-Amz-Expires=900&X-Amz-SignedHeaders=cont
ent-md5%3Bcontent-type%3Bhost&X-Amz-Signature=7f19dbd468c850ac8185fe787a32cf7d7cfd333b46d4b5fb3fba7903e7ac13518
INFO: Uploading C:/Users/Administrator/AppData/Local/Temp/d20241112-3324-3g5bgn/my_webserver/attributes/default.rb (checksum hex = 995faa5a6eaa825c249b000e2fe9fc1c) to h
ttps://hosted-chef-production-cookbooks.s3-external-1.amazonaws.com:443/organization-205d51beaa25de254812efc9396014fb/checksum-995faa5a6eaa825c249b000e2fe9fc1c?X-Amz-A
lgorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIA5K3LHHXZDSX75XAF%2F20241112%2Fus-east-1%2F%3%2Faws4_request&X-Amz-Date=20241112T063549Z&X-Amz-Expires=900&X-Amz-SignedHea
ders=content-md5%3Bcontent-type%3Bhost&X-Amz-Signature=31d763ae1224165745972ee3b33e7ca8a8d39e83a596049c9a95f8ddc8285e72
INFO: Uploading C:/Users/Administrator/AppData/Local/Temp/d20241112-3324-3g5bgn/my_webserver/metadata.rb (checksum hex = ac198aae1ceabc5d256935337206663) to https://h
osted-chef-production-cookbooks.s3-external-1.amazonaws.com:443/organization-205d51beaa25de254812efc9396014fb/checksum-ac198aae1ceabc5d256935337206663?X-Amz-Algorithm=
AWS4-HMAC-SHA256&X-Amz-Credential=AKIA5K3LHHXZDSX75XAF%2F20241112%2Fus-east-1%2F%3%2Faws4_request&X-Amz-Date=20241112T063549Z&X-Amz-Expires=900&X-Amz-SignedHeaders=cont
ent-md5%3Bcontent-type%3Bhost&X-Amz-Signature=c3f420234871a2e01c4d092139dbba2e0b15133b69aba979264d1e838e99
INFO: Uploading C:/Users/Administrator/AppData/Local/Temp/d20241112-3324-3g5bgn/my_webserver/templates/ports.conf.erb (checksum hex = e3ca71df5a05cc25fb8a33944a53951f) to
https://hosted-chef-production-cookbooks.s3-external-1.amazonaws.com:443/organization-205d51beaa25de254812efc9396014fb/checksum-e3ca71df5a05cc25fb8a33944a53951f?X-Am
z-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIA5K3LHHXZDSX75XAF%2F20241112%2Fus-east-1%2F%3%2Faws4_request&X-Amz-Date=20241112T063549Z&X-Amz-Expires=900&X-Amz-Signed
Headers=content-md5%3Bcontent-type%3Bhost&X-Amz-Signature=0e191834631e8cc19d6d581a3482e6f7e30cbe9883c216857e6806b3181b3a3
INFO: Uploading C:/Users/Administrator/AppData/Local/Temp/d20241112-3324-3g5bgn/my_webserver/recipes/default.rb (checksum hex = ea186eac69c037678ef1c005ec84f4ab) to htt
ps://hosted-chef-production-cookbooks.s3-external-1.amazonaws.com:443/organization-205d51beaa25de254812efc9396014fb/checksum-ea186eac69c037678ef1c005ec84f4ab?X-Amz-Algo
rithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIA5K3LHHXZDSX75XAF%2F20241112%2Fus-east-1%2F%3%2Faws4_request&X-Amz-Date=20241112T063549Z&X-Amz-Expires=900&X-Amz-SignedHeader
s=content-md5%3Bcontent-type%3Bhost&X-Amz-Signature=209123f0ab5e7397c68f9b50ba2906f768190c2d1b44929d45768e2ea8d377ea
INFO: Upload complete!
Uploaded 1 cookbook.
```

## 2. Run the Cookbook on a Node:

- Add the cookbook to a node's **run list** to apply it:

```
knife node run_list add NODE_NAME 'recipe[my_webserver]'
```

```
C:\Users\Administrator\Downloads\chef-starter\chef-repo\cookbooks>knife node run_list add chef-node 'recipe[my_webserver]'
INFO: Using configuration from C:/Users/Administrator/Downloads/chef-starter/chef-repo/.chef/config.rb
chef-node:
  run_list: recipe[my_webserver]
C:\Users\Administrator\Downloads\chef-starter\chef-repo\cookbooks>
```

## 3. Verify the Configuration:

- Log into the Chef Node to ensure that the configurations have been applied and that the services (like Apache) are running with the expected settings.

```
sudo chef-client
```

```
Recipe: my_webserver::default
* apt_package[apache2] action install (up to date)
* service[apache2] action enable (up to date)
* service[apache2] action start (up to date)
* template[/etc/apache2/ports.conf] action create
  - update content in file /etc/apache2/ports.conf from 9d2d53 to 6d242e
  --- /etc/apache2/ports.conf 2023-12-04 18:57:15.000000000 +0000
  +++ /etc/apache2/.chef-ports20241112-1106-bkicff.conf      2024-11-12 06:40:05.613290746 +0000
  @@ -1,16 +1,4 @@
  -# If you just change the port or add more ports here, you will likely also
  -# have to change the VirtualHost statement in
  -# /etc/apache2/sites-enabled/000-default.conf
  +# cookbooks/my_cookbook/templates/default/ports.conf.erb

  Listen 80
  -
  -<IfModule ssl_module>
  -  Listen 443
  -</IfModule>
  -
  -<IfModule mod_gnutls.c>
  -  Listen 443
  -</IfModule>
  -
  -# vim: syntax=apache ts=4 sw=4 sts=4 sr noet
* file[/var/www/html/index.html] action create
  - update content in file /var/www/html/index.html from 3bd214 to 7238d6
  --- /var/www/html/index.html      2024-11-08 08:58:37.198948688 +0000
  +++ /var/www/html/.chef-index20241112-1106-2prswg.html      2024-11-12 06:40:05.741354746 +0000
  @@ -1 +1 @@
  -<h1>Hello, Apache is configured by Chef!</h1>
  +<h1>Welcome to Labguide-05: Creating and Using Chef Cookbooks for Complex Configurations!</h1>

Running handlers:
Running handlers complete
Infra Phase complete, 2/5 resources updated in 26 seconds
vagrant@default-ubuntu-2004:~$
```

- In order to verify the configurations running on port:80, run the following command

```
curl localhost:80
```

```
vagrant@default-ubuntu-2004:~$ curl localhost:80
<h1>Welcome to Labguide-05: Creating and Using Chef Cookbooks for Complex Configurations!</h1>vagrant@default-ubuntu-2004:~$ _
```

## References

- Chef Documentation: <https://docs.chef.io/>
- Creating Chef Cookbooks: <https://docs.chef.io/cookbooks/>
- Using Attributes in Chef: <https://docs.chef.io/attributes/>