Using Chef Roles to Define and Assign Configurations to Different Environments

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Description

This guide covers how to use **Chef Roles** to define configurations based on different environments. Roles in Chef provide an easy way to set configuration attributes for nodes, helping manage environments like **Development**, **Staging**, and **Production** with reusable configurations.

Problem Statement

When managing servers across different environments, it's essential to ensure that each environment is configured according to its specific requirements. Using Chef roles, we can define and group environment-specific settings and apply them to nodes easily.

Prerequisites

Completion of all previous lab guides (up to Lab Guide-02) is required before proceeding with Lab Guide-03.

Software Required

- **Chef Workstation**: To create and manage roles.
- **Chef Server**: To store and manage roles and node configurations.
- **Chef Node(s)**: Target machines where roles will be assigned.

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 Role

1. **Navigate to the Roles Directory**:
   - From your Chef Workstation, go to the `chef-repo/roles` directory:

```
cd ~/chef-repo/roles
```

2. **Create a Role File**:
   - Create a new file using VScode or any other IDE called `webserver_dev.json` for the Development environment role:
   - Command to create the file using code command:

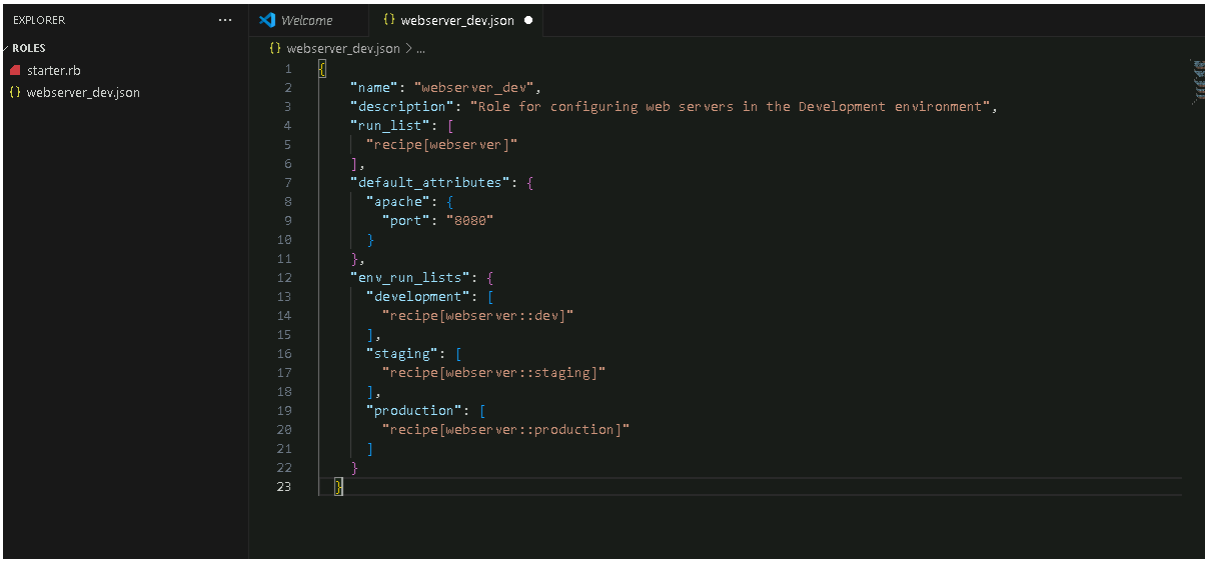
```
code webserver_dev.json
```

   - Add the following content to the `webserver_dev.json` file:

```
{
  "name": "webserver_dev",
  "description": "Role for configuring web servers in the Development
environment",
  "run_list": [
    "recipe[webserver]"
  ],
  "default_attributes": {
    "apache": {
      "port": "8080"
    }
  },
  "env_run_lists": {
    "development": [
      "recipe[webserver::dev]"
    ],
    "staging": [
      "recipe[webserver::staging]"
    ],
    "production": [
      "recipe[webserver::production]"
    ]
  }
}
```

   - This JSON file:

- Defines the `webserver_dev` role with a description.
- Specifies the `webserver` recipe in the run list.
- Sets environment-specific configurations in the `env_run_lists` section, specifying different recipes for each environment.



3. **Save the Role**.

Step-2: Define Configurations for Different Environments

1. **Create Environment Files**:

   - Create a folder called `environments` in the `chef-repo` directory and cd into it and create files for each environment, for example, `development.json` use code command to create the file:

     ```
     code development.json
     ```

   - Add the following content to the `development.json` file:

```
{
  "name": "development",
  "description": "Development environment configuration",
  "cookbook_versions": {
    "webserver": ">= 0.1.0"
  },
  "default_attributes": {
    "apache": {
      "port": "8080"
    }
  }
}
```

   - Make sure to change the `webserver version` as per your cookbook version.

2. **Upload the Environment Configuration**:
    - cd to environments folder.
    - Upload each environment file to the Chef Server:

```
knife environment from file development.json
```

Step-3: Create Environment-Specific Recipes

1. **Create `dev.rb` Recipe**:
    - Navigate to the `recipes` folder in the `webserver` cookbook:

```
cd ~/chef-repo/cookbooks/webserver/recipes
```

    - Create using `code dev.rb` command:

```
code dev.rb
```

    - Add the following content to the `dev.rb` recipe file:

```
# recipes/dev.rb

package 'apache2' do
  action :install
end

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

file '/var/www/html/index.html' do
  content '<h1>Welcome to Chef-managed Web Server!</h1>'
  action :create
end
```

    - This recipe creates an `index.html` file with a welcome message for the Development environment.

Step-4: Assign Roles to Nodes

> Note: cd to roles

1. **Assign a Role to a Node**:
   - cd to `roles` folder.
   - Use the `knife` command to assign the `webserver_dev` role to a specific node in the **Development** environment:

```
knife node run_list add <node_name> "role[webserver_dev]"
```

2. **Set the Environment for the Node**:
   - Run the command from `chef-repo` directory.
   - Assign the environment to the node to ensure it picks up environment-specific settings:

```
knife node environment set <node_name> development
```

3. **Run Chef Client on the Node**:
   - Login into the node, and run the Chef client to apply the assigned role and environment configurations:

```
sudo chef-client
```

```
vagrant@default-ubuntu-2004:~$ sudo chef-client
Chef Infra Client, version 18.5.0
Patents: https://www.chef.io/patents
Infra Phase starting
Resolving cookbooks for run list: ["webserver::dev"]
Synchronizing cookbooks:
  - webserver (0.1.0)
Installing cookbook gem dependencies:
Compiling cookbooks...
Loading Chef InSpec profile files:
Loading Chef InSpec input files:
Loading Chef InSpec waiver files:
Converging 3 resources
Recipe: webserver::dev
  * apt_package[apache2] action install (up to date)
  * service[apache2] action enable (up to date)
  * service[apache2] action start (up to date)
  * file[/var/www/html/index.html] action create (up to date)

Running handlers:
Running handlers complete
Infra Phase complete, 0/4 resources updated in 22 seconds
vagrant@default-ubuntu-2004:~$
```

- The node will configure itself according to the `webserver_dev` role and the `development` environment settings, including using port `8080` as defined.

References

- Chef Documentation: https://docs.chef.io/
- Managing Roles with Chef: https://docs.chef.io/roles/
- Environments in Chef: https://docs.chef.io/environments/