Project 1: CI/CD Deployment Using Ansible CM Tool

Caltech | *Center for Technology & Management Education* | Simpl¡Learn
Post Graduate Program in DevOps
PG DO - Configuration Management with Ansible and Terraform

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DESCRIPTION

You are a DevOps engineer at XYZ Ltd. Your company is working on a Java application and wants to automate WAR file artifact deployment so that they don't have to perform WAR deployment on Tomcat/Jetty web containers. Automate Ansible integration with Jenkins CI server so that we can run and execute playbooks to deploy custom WAR files to a web container and then perform restart for the web container.

Steps to perform

Summary

- Configure Jenkins server as Ansible provisioning machine.
- Install Ansible plugins in Jenkins CI server.
- Prepare Ansible playbook to run Maven build on Jenkins CI server.
- Prepare Ansible playbook to execute deployment steps on the remote web container with restart of the web container post deployment.

Execution log

- ## Configure Jenkins server as Ansible provisioning machine in Ubuntu Server 20.04

1. Check ***Java*** is installed on the Jenkins host, if it is not present, install it.

```
# Verify Java is installed
java -version

# Install OpenJdk-8 [Ubuntu]
sudo apt-get install openjdk-8-jdk
sudo apt-get install openjdk-8-jre
```

Log files:

- 01 How to install OpenJDK 8 on Ubuntu Server 20.04.3
- Terminal log file

2. Verify whether ***Git*** is installed, in case it is not, then proceed to install it.

```
# Verify Git is Installed
git --version

# Install Git
sudo apt-get update
sudo apt install git-all
```

Log files:

- 02 How to install Git on Ubuntu Server 20.04.3
- Terminal log file

3. In case ***Maven*** is not installed in your system, you can install it using the commands:

```
# Verify Apache Maven is installed
mvn -v

# Install Apache Maven
sudo apt-get update
sudo apt-get install maven
```

Log files:

- 03 How to install Maven on Ubuntu Server 20.04.3
- Maven installation log file

4. If ***Jenkins*** is not installed in your host, install it using the commands below:

4.1 Verify whether Jenkins is installed

```
# 1. Verify whether Jenkins is installed
ls -l /usr/share/jenkins
```

4.2 Download the Jenkins GPG Key

```
wget -q -O - https://pkg.jenkins.io/debian-stable/jenkins.io.key | sudo
apt-key add -
```

4.3 Install the Debian package repository address to the server's source list

```
sudo sh -c 'echo deb http://pkg.jenkins.io/debian-stable binary/ >
/etc/apt/sources.list.d/jenkins.list'
```

4.4 Install Jenkins

```
sudo apt update
sudo apt install jenkins
```

4.5 Start Jenkins Service

```
sudo systemctl start jenkins
```

4.6 Verify Jenkins service has been started

```
systemctl status jenkins
```

4.7 Enable Jenkins on system boot

```
sudo systemctl enable jenkins
```

4.8 If the firewall is inactive, the command below enables it keeping OpnSSH port open

```
sudo ufw allow OpenSSH
sudo ufw enable
```

4.9 Open port 8080, used by Jenkins

```
sudo ufw allow 8080
```

Log files:

- 04 How to install Jenkins Ubuntu Server 20.04.3
- Jenkins installation log file

5. Ensure ***Node.js*** and ***npm*** are installed on the host, you can install it by using the commands:

5.1 For *Node.js* installation

```
# Verify Node.js is installed
node -v  # or node --version

# Install Node.js
sudo apt-get update
sudo apt-get install nodejs
```

Log files:

- 05 How to install Node.js on Ubuntu Server 20.04.3
- Node.js installation log

5.2 For *npm* installation

```
# Check npm is installed
npm --version

# Install npm
sudo apt-get update
sudo apt-get install npm
```

Log files:

- 06 How to install npm on Ubuntu Server 20.04.3
- npm installation log

6. Install Ansible

```
# Verify Ansible is installed
ansible --version

# Install Ansible
sudo apt install ansible
```

Log files: - 07 How to install Ansible on Ubuntu Server 20.04.3 - Terminal log about Ansible installation

- ## Install Ansible plugins in Jenkins CI server

1. Open you Jenkins instance http://localhost:8080
2. Login with the ***Admin*** user credentials.
3. Go to ***Manage Jenkins > Plugins*** menu.
4. Click on the ***Available*** tab and search for *ansible*.
5. Hit the ***Install without restart*** button.

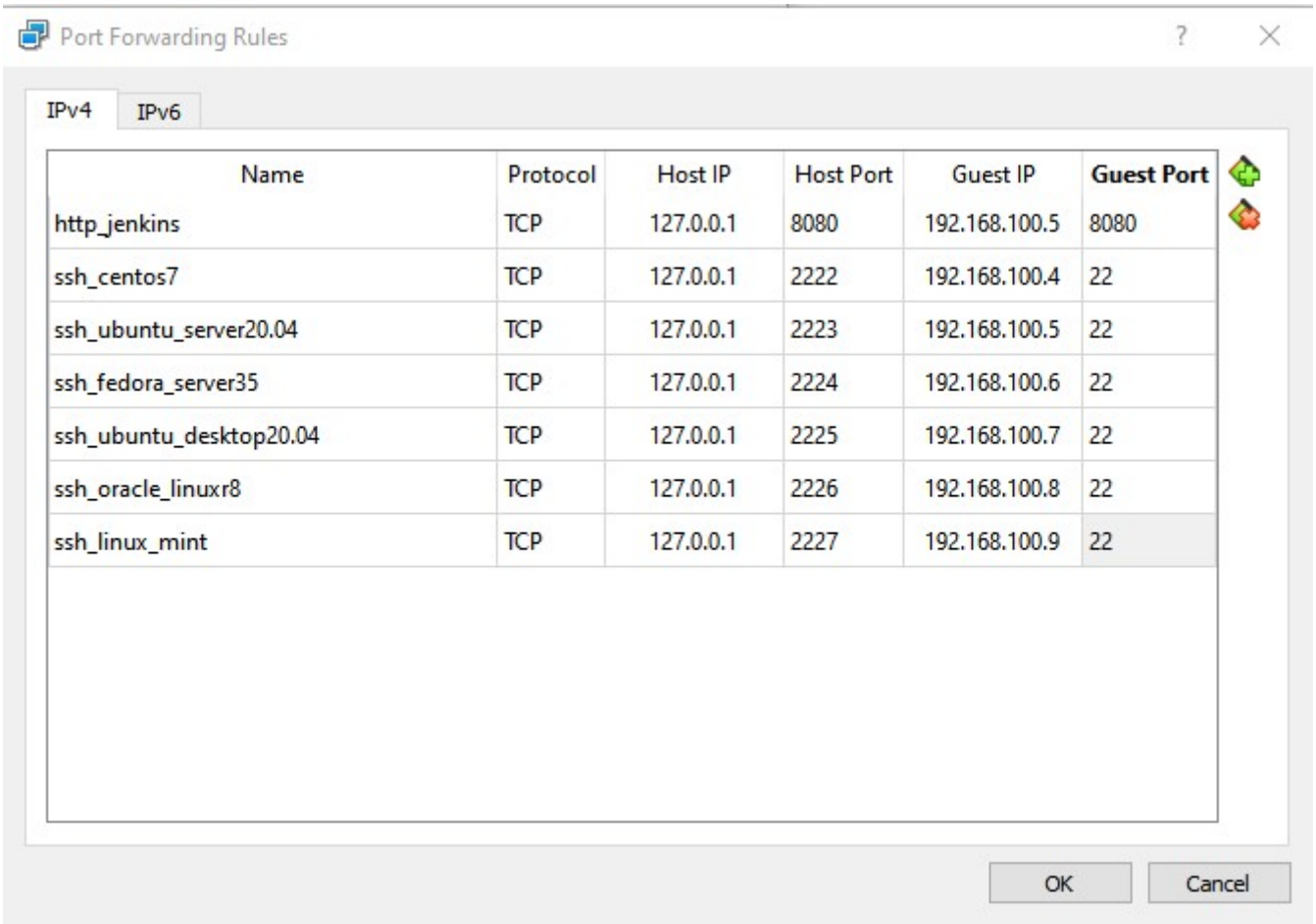
Log files: - 08 How to install Ansible plugin on Jenkins 2.332.2 - Terminal log about Ansible installation

- ## Create a virtual network having at least one master server and a couple of slaves

Using any Virtualization tool, create some Virtual Machines with the OS of your preference. *The Virtual Machines were created with VirtualBox, and the operating systems are described below:*

Machine Role	**Operating System**	**VM IP Address**	**VM Port**	**Host IP Address**	**Host port**	**Function**
Master	Ubuntu Server 20.04.3	192.168.100.5	2223	127.0.0.1	22	ssh
Master	Ubuntu Server 20.04.3	192.168.100.5	8080	127.0.0.1	8080	http_jenkins
Remote	CentOs Server 7	192.168.100.4	2222	127.0.0.1	22	ssh
Remote	CentOs Server 7	192.168.100.4	8080	127.0.0.1	8088	http_tomcat
Remote	Fedora Server 35	192.168.100.6	2222	127.0.0.1	22	ssh

i.e.



- ## Configure Ansible Inventory, Master and Slave Hosts Connection

1. Create a new user

```
NEW_USER=devops
sudo useradd -m -s /bin/bash $NEW_USER
sudo passwd $NEW_USER

# Grant sudo rights to the new user
sudo usermod -aG sudo $NEW_USER

sudo su - $NEW_USER
```

2. Create the SSH keys for your host

```
ssh-keygen -t rsa

# Hit ENTER to accept the default options
# input the passphrase if needed
```

3. Copy the ssh key to the destination hosts

```
# Repeat this step for each slave machine
ssh-copy-id 192.168.100.4 ;

# Notice the IP address could change depending on the network
```

4. Configure the Ansible Inventory

```
sudo vi /etc/ansible/hosts

# Input the host list, i.e.
[webserver]
192.168.100.4

[dbserver]
192.168.100.6
```

5. Test the connection

```
ansible all -m ping
ansible all -m command -a 'uptime'
```

Log files:

- 09 How to configure Ansible Inventory, Master and Slave hosts connection
- Ansible configuration log

- Prepare Ansible playbook to run Maven build on Jenkins CI server
- Prepare Ansible playbook to execute deployment steps on the remote web container with restart of the web container post deployment

  In this section, there were two main tasks:

  - Install and setup Apache Tomcat in the Web Server
  - Integrate Ansible and Maven with Jenkins jobs and pipe lines.

  The videos and scripts followd in the next section describe in detail how the integration was accomplished.

Videos

- 01 How to install OpenJDK 8 on Ubuntu Server 20.04.3
- 02 How to install Git on Ubuntu Server 20.04.3
- 03 How to install Maven on Ubuntu Server 20.04.3
- 04 How to install Jenkins Ubuntu Server 20.04.3
- 05 How to install Node.js on Ubuntu Server 20.04.3
- 06 How to install npm on Ubuntu Server 20.04.3
- 07 How to install Ansible on Ubuntu Server 20.04.3
- 08 How to install Ansible plugin on Jenkins 2.332.2
- 09 How to configure Ansible Inventory, Master and Slave hosts connection
- 10 How to manage Apache Tomcat Service from an Ansible playbook executed by a Jenkins pipeline
- 11 How to Integrate Maven with Jenkins to deploy WAR/WEAR applications
- 12 Example about a Jenkins build to Deploy an application to Apache Tomcat
- Adding SSH credentials on Jenkins
- Creating a new view on Jenkins
- Running a playbook test on Jenkins

Scripts

- Install Apache Tomcat playbook
- Manage Apache tomcat Service
- Manage Apache tomcat Service Piepeline
- Deploy sample app
- Deploy sample app pipeline

References

- How To Install Jenkins on Ubuntu 20.04