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## CI/CD Deployment Using Ansible CM Tool

### 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:

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

#### 1. Install Jenkins

```
raghulcsanjaym@raghulcsanjaym:~/Desktop/ChefPuppetAnsible/Ansible$  
raghulcsanjaym@raghulcsanjaym:~/Desktop/ChefPuppetAnsible/Ansible$ wget -q -O - https://pkg.jenkins.io/debian-stable/jenkins.io.key | sudo apt-key add -  
OK  
raghulcsanjaym@raghulcsanjaym:~/Desktop/ChefPuppetAnsible/Ansible$  
raghulcsanjaym@raghulcsanjaym:~/Desktop/ChefPuppetAnsible/Ansible$ sudo sh -c 'echo deb http://pkg.jenkins.io/debian-stable binary/ > /etc/apt/sources.list.d/jenkins.list'  
raghulcsanjaym@raghulcsanjaym:~/Desktop/ChefPuppetAnsible/Ansible$  
raghulcsanjaym@raghulcsanjaym:~/Desktop/ChefPuppetAnsible/Ansible$  
raghulcsanjaym@raghulcsanjaym:~/Desktop/ChefPuppetAnsible/Ansible$ sudo apt update  
Hit:1 http://azure.archive.ubuntu.com/ubuntu xenial InRelease  
Get:2 http://azure.archive.ubuntu.com/ubuntu xenial-updates InRelease [109 kB]  
Get:3 http://azure.archive.ubuntu.com/ubuntu xenial-backports InRelease [107 kB]  
Get:4 http://dl.google.com/linux/chrome/deb stable InRelease [1,811 B]  
Hit:5 http://repo.zabbix.com/zabbix/3.2/ubuntu xenial InRelease  
Get:7 http://security.ubuntu.com/ubuntu xenial-security InRelease [109 kB]  
Hit:8 http://ppa.launchpad.net/ansible/ansible/ubuntu xenial InRelease  
Get:9 http://apt.puppetlabs.com bionic InRelease [143 kB]  
Hit:10 http://ppa.launchpad.net/certbot/certbot/ubuntu xenial InRelease
```

```
raghulcsanjaym@raghulcsanjaym:~/Desktop/ChefPuppetAnsible/Ansible$  
raghulcsanjaym@raghulcsanjaym:~/Desktop/ChefPuppetAnsible/Ansible$ sudo apt install jenkins  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following packages were automatically installed and are no longer required:  
  liblua5.2-0 libreadline7 libssl1.0.2 libtcl8.6 vim-gui-common  
Use 'sudo apt autoremove' to remove them.  
The following additional packages will be installed:  
  daemon  
The following NEW packages will be installed:  
  daemon jenkins  
0 upgraded, 2 newly installed, 0 to remove and 318 not upgraded.  
Need to get 69.8 MB of archives.  
After this operation, 72.6 MB of additional disk space will be used.  
Do you want to continue? [Y/n] Y
```

## 1.1 Check service status –

```
raghulcsanjaygm@raghulcsanjaygm:~/Desktop/ChefPuppetAnsible/Ansibles$ sudo systemctl status jenkins
● jenkins.service - LSB: Start Jenkins at boot time
   Loaded: loaded (/etc/init.d/jenkins; bad; vendor preset: enabled)
   Active: active (exited) since Sat 2021-08-28 19:21:24 UTC; 2min 25s ago
     Docs: man:systemd-sysv-generator(8)

Aug 28 19:21:22 raghulcsanjaygm systemd[1]: Starting LSB: Start Jenkins at boot time...
Aug 28 19:21:22 raghulcsanjaygm jenkins[1465]: Correct java version found
Aug 28 19:21:22 raghulcsanjaygm jenkins[1465]: * Starting Jenkins Automation Server jenkins
Aug 28 19:21:22 raghulcsanjaygm su[1526]: Successful su for jenkins by root
Aug 28 19:21:22 raghulcsanjaygm su[1526]: + ??? root:jenkins
Aug 28 19:21:22 raghulcsanjaygm su[1526]: pam_unix(su:session): session opened for user jenkins by (uid=0)
Aug 28 19:21:24 raghulcsanjaygm jenkins[1465]: ...done.
Aug 28 19:21:24 raghulcsanjaygm systemd[1]: Started LSB: Start Jenkins at boot time.
raghulcsanjaygm@raghulcsanjaygm:~/Desktop/ChefPuppetAnsible/Ansibles$
```

## 1.2 Setup Jenkins for first use post installation –

Getting Started

### Unlock Jenkins

To ensure Jenkins is securely set up by the administrator, a password has been written to the log ([not sure where to find it?](#)) and this file on the server:

```
/var/lib/jenkins/secrets/initialAdminPassword
```

Please copy the password from either location and paste it below.

Administrator password

Continue

## 1.3 Install suggested plugins

Getting Started

### Getting Started

✓ Folders	✓ OWASP Markup	✓ Build Timeout	✓ Credentials Binding	** SSH server
⚙ Timestamper	⚙ Workspace Cleanup	⚙ Ant	⚙ Gradle	** Trilead API
⚙ Pipeline	⚙ GitHub Branch Source	⚙ Pipeline: GitHub Groovy Libraries	⚙ Pipeline: Stage View	** OWASP Markup Formatter
⚙ Git	⚙ SSH Build Agents	⚙ Matrix Authorization Strategy	⚙ PAM Authentication	** Structs
⚙ LDAP	⚙ Email Extension	⚙ Mailer		** Pipeline: Step API
				** Token Macro
				Build Timeout
				** Credentials
				** Plain Credentials

\*\* - required dependency

Jenkins 2.303.1

## 1.4 Manage Jenkins – Manage Plugins

### Manage Jenkins

Building on the controller node can be a security issue. You should set up distributed builds. See [the documentation](#).

[Set up agent](#)[Set up cloud](#)[Dismiss](#)

Java 11 is the recommended version to run Jenkins on; please consider upgrading.

[More Info](#)[Dismiss](#)

### System Configuration



#### Configure System

Configure global settings and paths.



#### Global Tool Configuration

Configure tools, their locations and automatic installers.



#### Manage Plugins

Add, remove, disable or enable plugins that can extend the functionality of Jenkins.



#### Manage Nodes and Clouds

Add, remove, control and monitor the various nodes that Jenkins runs jobs on.

## 2. Install Ansible Plugin

Search:

Updates: **Available** | Installed | Advanced

Install	Name	Version	Released
<input type="checkbox"/>	<b>Ansible</b> Build Tools   Deployment   DevOps   External Site/Tool Integrations   pipeline Invoke <b>Ansible</b> Ad-Hoc commands and playbooks.	1.1	10 mo ago
<input type="checkbox"/>	<b>Ansible Tower</b> This plugin connects Jenkins with Ansible Tower	0.16.0	1 yr 2 mo ago

[Install without restart](#) [Download now and install after restart](#) Update information obtained: 8 min 47 sec ago [Check now](#)

### 2.1 Install ansible on localhost and apache2 on remote server.

```
sudo apt install ansible
```

```
sudo apt install apache2
```

### 2.2 Configure /etc/ansible/hosts

```
jenkins@ip-172-31-4-62:~$  
jenkins@ip-172-31-4-62:~$ sudo tail /etc/ansible/hosts  
# Here's another example of host ranges, this time there are no  
# leading 0s:  
  
#db-[99:101]-node.example.com  
  
[local]  
localhost  
  
[remote]  
ec2-3-235-121-213.compute-1.amazonaws.com  
jenkins@ip-172-31-4-62:~$
```

### 2.3 Setup password-less connectivity for Jenkins user.

```
ssh-keygen
```

```
ssh-copy-id -i /root/.ssh/id_rsa.pub jenkins@ip-172-31-10-19
```

## 2.4 Add below in /etc/sudoers for Jenkins user to avoid password prompt while using sudo –

```
jenkins ALL=(ALL) NOPASSWD:ALL
```

## 2.5 Perform ping test for remote –

```
jenkins@ip-172-31-4-62:~$
jenkins@ip-172-31-4-62:~$ ansible remote -m ping
ec2-3-235-121-213.compute-1.amazonaws.com | SUCCESS => {
  "ansible_facts": {
    "discovered_interpreter_python": "/usr/bin/python"
  },
  "changed": false,
  "ping": "pong"
}
jenkins@ip-172-31-4-62:~$
jenkins@ip-172-31-4-62:~$
```

## 2.6 Run a sample job on remote server –

```
jenkins@ip-172-31-4-62:~$
jenkins@ip-172-31-4-62:~$ ansible remote -m file -a 'name=/tmp/file.txt state=touch'
ec2-3-235-121-213.compute-1.amazonaws.com | CHANGED => {
  "ansible_facts": {
    "discovered_interpreter_python": "/usr/bin/python"
  },
  "changed": true,
  "dest": "/tmp/file.txt",
  "gid": 1001,
  "group": "jenkins",
  "mode": "0664",
  "owner": "jenkins",
  "size": 0,
  "state": "file",
  "uid": 1001
}
jenkins@ip-172-31-4-62:~$
```

## 3. Write maven\_build.yaml to perform build action –

```
- name: Performing git pull and maven build
  hosts: local
  tasks:
    - name: clean old repository if exists.
      file: name=/home/jenkins/maven state=absent

    - name: check out the repository
      command: git clone https://github.com/sanjayraghuwanshi/simple-java-maven-app.git /home/jenkins/maven

    - name: run maven build
      command: mvn -f /home/jenkins/maven/pom.xml clean package

- name: Performing deployment and apache restart
  hosts: remote
  become: yes
  become_method: sudo

  tasks:
    - name: apache2 stop
      service: name=apache2 state=stopped

    - name: create a directory for deployment
      file: name=/var/www/html/deployment state=directory

    - name: Copy build to remote
      copy:
        src: /home/jenkins/maven/target/my-app-1.0-SNAPSHOT.jar
        dest: /var/www/html/deployment

    - name: apache2 start
      service: name=apache2 state=started
```

### 3.1 Run maven build and check the status on remote –

```
jenkins@ip-172-31-4-62:/home/jenkins$
jenkins@ip-172-31-4-62:/home/jenkins$ ansible-playbook maven_build.yml

PLAY [Performing git pull and maven build] *****
TASK [Gathering Facts] *****
ok: [localhost]
TASK [clean old repository if exists.] *****
changed: [localhost]
TASK [check out the repository] *****
changed: [localhost]
TASK [run maven build] *****
changed: [localhost]
PLAY [Performing deployment and apache restart] *****
TASK [Gathering Facts] *****
ok: [ec2-3-235-121-213.compute-1.amazonaws.com]
TASK [apache2 stop] *****
changed: [ec2-3-235-121-213.compute-1.amazonaws.com]
TASK [create a directory for deployment] *****
changed: [ec2-3-235-121-213.compute-1.amazonaws.com]
TASK [Copy build to remote] *****
changed: [ec2-3-235-121-213.compute-1.amazonaws.com]
TASK [apache2 start] *****
changed: [ec2-3-235-121-213.compute-1.amazonaws.com]
PLAY RECAP *****
ec2-3-235-121-213.compute-1.amazonaws.com : ok=5 changed=4 unreachable=0 failed=0 skipped=0 rescued=0 ignored=0
localhost : ok=4 changed=3 unreachable=0 failed=0 skipped=0 rescued=0 ignored=0

jenkins@ip-172-31-4-62:/home/jenkins$
```

### 3.2 Add ansible tool in the Jenkins global tools configuration –

#### Ansible

Ansible installations

Add Ansible

Ansible

Name

ansible

Path to ansible executables directory

/usr/bin/

☐ Install automatically

?

Delete Ansible

?

Add Ansible

List of Ansible installations on this system

### 3.3 Write a pipeline to execute ansible playbook with the help of pipeline syntax –

#### Pipeline

Definition

Pipeline script

Script

```
1 pipeline{
2   agent any
3   stages{
4     stage('run playbook'){
5       steps {
6         ansiblePlaybook become: true, installation: 'ansible', inventory: '/etc/ansible/hosts', playbook: '/home/jenkins/maven_build.yml'
7       }
8     }
9   }
10 }
```

☒ Use Groovy Sandbox

?


Pipeline Syntax

```

pipeline{
    agent any
    stages{
        stage('run playbook'){
            steps {
                ansiblePlaybook become: true, installation: 'ansible', inventory:
                '/etc/ansible/hosts', playbook: '/home/jenkins/maven_build.yml'
            }
        }
    }
}

```

#### 4. Executed Ansible playbook via Jenkins –


**Jenkins**

Dashboard > ansible\_demo > #7

- Back to Project
- Status
- Changes
- Console Output**
- View as plain text
- Edit Build Information
- Thread Dump
- Pause/resume
- Replay
- Pipeline Steps
- Workspaces
- Previous Build

### Console Output

Started by user admin

Running in Durability level: MAX\_SURVIVABILITY

[Pipeline] Start of Pipeline

[Pipeline] node

Running on Jenkins in /var/lib/jenkins/workspace/ansible\_demo

[Pipeline] {

[Pipeline] stage

[Pipeline] { (run playbook)

[Pipeline] ansiblePlaybook

[ansible\_demo] \$ /usr/bin/ansible-playbook /home/jenkins/maven\_build.yml -i /etc/ansible/hosts -b --become-user root

PLAY [Performing git pull and maven build] \*\*\*\*\*

TASK [Gathering Facts] \*\*\*\*\*

ok: [localhost]

TASK [clean old repository if exists.] \*\*\*\*\*

changed: [localhost]

TASK [check out the repository] \*\*\*\*\*

changed: [localhost]

TASK [run maven build] \*\*\*\*\*

changed: [localhost]

PLAY [Performing deployment and apache restart] \*\*\*\*\*

TASK [Gathering Facts] \*\*\*\*\*

ok: [ec2-3-235-121-213.compute-1.amazonaws.com]

TASK [apache2 stop] \*\*\*\*\*

changed: [ec2-3-235-121-213.compute-1.amazonaws.com]

TASK [create a directory for deployment] \*\*\*\*\*

changed: [ec2-3-235-121-213.compute-1.amazonaws.com]

TASK [Copy build to remote] \*\*\*\*\*

changed: [ec2-3-235-121-213.compute-1.amazonaws.com]

TASK [apache2 start] \*\*\*\*\*

changed: [ec2-3-235-121-213.compute-1.amazonaws.com]

PLAY RECAP \*\*\*\*\*

Host	ok	changed	unreachable	failed	skipped	rescued	ignored
ec2-3-235-121-213.compute-1.amazonaws.com	5	4	0	0	0	0	0
localhost	4	3	0	0	0	0	0

[Pipeline] }

[Pipeline] // stage

[Pipeline] }

[Pipeline] // node

[Pipeline] End of Pipeline

Finished: SUCCESS

#### 4.1 Check if file deployed on remote server –



The screenshot shows a web browser window with the address bar displaying `ec2-3-235-121-213.compute-1.amazonaws.com:8090/deployment/`. The page title is "Index of /deployment". Below the title, there is a table with the following columns: Name, Last modified, Size, and Description. The table contains two entries: a "Parent Directory" link with a folder icon and a dash in the description, and a file named "my-app-1.0-SNAPSHOT.jar" with a file icon, a last modified date of "2021-08-29 08:05", and a size of "2.7K". Below the table, the text "Apache/2.4.41 (Ubuntu) Server at ec2-3-235-121-213.compute-1.amazonaws.com Port 8090" is displayed.

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
<a href="#">Parent Directory</a>			-
<a href="#">my-app-1.0-SNAPSHOT.jar</a>	2021-08-29 08:05	2.7K	

Apache/2.4.41 (Ubuntu) Server at ec2-3-235-121-213.compute-1.amazonaws.com Port 8090

```
jenkins@ip-172-31-10-19:/var/www/html$  
jenkins@ip-172-31-10-19:/var/www/html$ ls -ltrh deployment/  
total 4.0K  
-rw-r--r-- 1 root root 2.7K Aug 29 08:05 my-app-1.0-SNAPSHOT.jar  
jenkins@ip-172-31-10-19:/var/www/html$  
jenkins@ip-172-31-10-19:/var/www/html$  
jenkins@ip-172-31-10-19:/var/www/html$  
jenkins@ip-172-31-10-19:/var/www/html$
```

**Status - build deployed successfully.**

Thanks.

Sanjay Raghuwanshi