

The following table lists the IP addresses of the VMs installed with AlmaLinux 9 for the labs based on Git, GitHub, Jenkins, Maven, Tomcat, Apache Webserver, Ansible, Docker, and Docker Hub.

VM Name	IP Address
Developers	192.168.10.110
Jenkins	192.168.10.111
WebServer	192.168.10.112
Ansible	192.168.10.113
Docker	192.168.10.114
Jslave1	192.168.10.115

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Project 1

Setup CI/CD with GitHub, Jenkins, Apache Webserver to deploy an artifact (http-based website).

Step 1: Set up Jenkins

a. Install Java

```

root@jenkins:~# yum -y install java-11-openjdk

Last metadata expiration check: 6:31:03 ago on Sun 25 Aug 2024 02:57:22 PM +0545.
Dependencies resolved.

=====
 Package                        Arch      Version                               Repository    Size
=====
Installing:
 java-11-openjdk                x86_64    1:11.0.24.0.8-2.el9                 appstream    434 k
Installing dependencies:
 copy-jdk-configs               noarch    4.0-3.el9                           appstream    27 k
 java-11-openjdk-headless       x86_64    1:11.0.24.0.8-2.el9                 appstream    40 M
 javapackages-filessystem        noarch    6.0.0-4.el9                         appstream    10 k
 lksctp-tools                   x86_64    1.0.19-3.el9_4                      baseos       96 k
 lua                             x86_64    5.4.4-4.el9                         appstream    187 k
 lua-posix                      x86_64    35.0-8.el9                          appstream    131 k
 mkfontscale                    x86_64    1.2.1-3.el9                         appstream    31 k
 ttmkfdir                       x86_64    3.0.9-65.el9                       appstream    52 k
 tzdata-java                    noarch    2024a-1.el9                         appstream    148 k
 xorg-x11-fonts-Type1           noarch    7.5-33.el9                         appstream    499 k

Transaction Summary
=====
Install 11 Packages

```

- If you have an old version of JDK installed, configure the alternative Java version

```
[root@jenkins yum.repos.d]# alternatives --config java
There are 2 programs which provide 'java'.

  Selection    Command
-----
*+ 1          java-11-openjdk.x86_64 (/usr/lib/jvm/java-11-openjdk-11.0.24.0.8-2.el9.x86_64/bin/java)
  2          java-17-openjdk.x86_64 (/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64/bin/java)

Enter to keep the current selection[+], or type selection number: 2
```

- Select the appropriate Java version and verify:

```
root@jenkins:~  
[root@jenkins ~]# java --version  
openjdk 17.0.12 2024-07-16 LTS  
OpenJDK Runtime Environment (Red_Hat-17.0.12.0.7-1) (build 17.0.12+7-LTS)  
OpenJDK 64-Bit Server VM (Red_Hat-17.0.12.0.7-1) (build 17.0.12+7-LTS, mixed mod  
e, sharing)  
[root@jenkins ~]# |
```

- b. Set the JAVA_HOME environment variable:

```
root@jenkins:/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
[root@jenkins ~]# cd /usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64/
[root@jenkins java-17-openjdk-17.0.12.0.7-2.el9.x86_64]# pwd
/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
[root@jenkins java-17-openjdk-17.0.12.0.7-2.el9.x86_64]#
```

- o Copy the output path and add it to the .bash_profile:

```
# .bash_profile

# Get the aliases and functions
if [ -f ~/.bashrc ]; then
    . ~/.bashrc
fi
JAVA_HOME=/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
PATH=$PATH:$HOME/bin:$JAVA_HOME
# User specific environment and startup programs
~
```

- o Refresh the environment:

```
[root@jenkins yum.repos.d]# . /root/.bash_profile
[root@jenkins yum.repos.d]#
```

- c. Install Jenkins

```
root@jenkins:/etc/yum.repos.d
[root@jenkins /]# cd /etc/yum.repos.d/
[root@jenkins yum.repos.d]#
```

- o Browse the official Jenkins website for the genuine Jenkins repository URL and key.

```
[root@jenkins yum.repos.d]# wget https://pkg.jenkins.io/redhat-stable/jenkins.repo
--2024-08-25 22:07:45-- https://pkg.jenkins.io/redhat-stable/jenkins.repo
Resolving pkg.jenkins.io (pkg.jenkins.io)... 199.232.22.133, 2a04:4e42:42::645
Connecting to pkg.jenkins.io (pkg.jenkins.io)|199.232.22.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 85
Saving to: 'jenkins.repo'

jenkins.repo          100%[=====>]          85  --.-KB/s    in 0s
2024-08-25 22:07:45 (1.92 MB/s) - 'jenkins.repo' saved [85/85]

[root@jenkins yum.repos.d]# rpm --import https://pkg.jenkins.io/redhat/jenkins.io-2023.key
[root@jenkins yum.repos.d]# yum upgrade
Jenkins-stable                               16 kB/s | 29 kB    00:01
Dependencies resolved.
Nothing to do.
Complete!
```

```
[root@jenkins yum.repos.d]# yum install jenkins
Last metadata expiration check: 0:00:19 ago on Sun 25 Aug 2024 10:08:35 PM +0545.
Dependencies resolved.
=====
Package                Architecture      Version           Repository        Size
=====
Installing:
jenkins                 noarch            2.462.1-1.1      jenkins           89 M
Transaction Summary
=====
```

```
[root@jenkins yum.repos.d]# rpm -q jenkins
jenkins-2.462.1-1.1.noarch
```

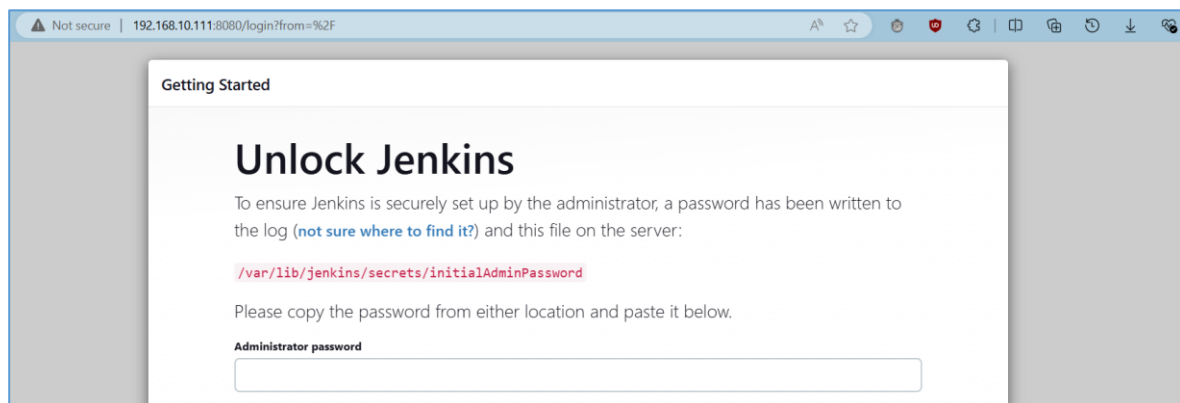
d. Start the Jenkins service:

```
root@jenkins:/etc/yum.repos.d
[root@jenkins yum.repos.d]# systemctl start jenkins
[root@jenkins yum.repos.d]# systemctl enable jenkins
Created symlink /etc/systemd/system/multi-user.target.wants/jenkins.service → /usr/lib/systemd/system/jenkins.service.
[root@jenkins yum.repos.d]# systemctl status jenkins
● jenkins.service - Jenkins Continuous Integration Server
   Loaded: loaded (/usr/lib/systemd/system/jenkins.service; enabled; preset: disabled)
   Active: active (running) since Sun 2024-08-25 22:13:44 +0545; 1min 5s ago
     Main PID: 2993 (java)
       Tasks: 52 (limit: 22830)
      Memory: 732.5M
         CPU: 1min 19.084s
        CGroup: /system.slice/jenkins.service
                └─2993 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: da5f15be07ca4ff88174ce5480527904
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: This may also be found at: /var/lib/jenkins/secrets/ini
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: *****
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: *****
Aug 25 22:13:44 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:44.908+0000 [id=47] INFO
Aug 25 22:13:44 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:44.949+0000 [id=26] INFO
Aug 25 22:13:44 jenkins.az.com systemd[1]: Started Jenkins Continuous Integration Server.
Aug 25 22:13:46 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:46.676+0000 [id=63] INFO
Aug 25 22:13:46 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:46.678+0000 [id=63] INFO
lines 1-20/20 (END)
```

e. Add the Jenkins port to the firewall for global access:

```
root@jenkins:/etc/yum.repos.d
[root@jenkins yum.repos.d]# firewall-cmd --permanent --add-port=8080/tcp
success
[root@jenkins yum.repos.d]# firewall-cmd --permanent --add-port=8080/udp
success
[root@jenkins yum.repos.d]# firewall-cmd --reload
success
[root@jenkins yum.repos.d]# firewall-cmd --list-all
public (active)
  target: default
icmp-block-inversion: no
interfaces: ens160
sources:
services: cockpit dhcpv6-client ssh
ports: 8080/tcp 8080/udp
protocols:
forward: yes
masquerade: no
forward-ports:
source-ports:
icmp-blocks:
rich rules:
[root@jenkins yum.repos.d]# |
```

f. Access the Jenkins dashboard:



- Follow the instructions to unlock Jenkins using the password provided in the specified location.

```
root@jenkins:/etc/yum.repos.d
[root@jenkins yum.repos.d]# vim /var/lib/jenkins/secrets/initialAdminPassword
[root@jenkins yum.repos.d]# |
```

- Install the suggested plugins.

Getting Started

<input checked="" type="checkbox"/> Folders	<input checked="" type="checkbox"/> OWASP Markup Formatter	<input type="checkbox"/> Build Timeout	<input type="checkbox"/> Credentials Binding	** Ionicons API
<input type="checkbox"/> Timestamper	<input type="checkbox"/> Workspace Cleanup	<input type="checkbox"/> Ant	<input type="checkbox"/> Gradle	Folders
<input type="checkbox"/> Pipeline	<input type="checkbox"/> GitHub Branch Source	<input type="checkbox"/> Pipeline: GitHub Groovy Libraries	<input type="checkbox"/> Pipeline Graph View	OWASP Markup Formatter
<input type="checkbox"/> Git	<input type="checkbox"/> SSH Build Agents	<input type="checkbox"/> Matrix Authorization Strategy	<input type="checkbox"/> PAM Authentication	
<input type="checkbox"/> LDAP	<input type="checkbox"/> Email Extension	<input type="checkbox"/> Mailer	<input type="checkbox"/> Dark Theme	

- Create the first admin user.
- Start using Jenkins!

The screenshot shows the Jenkins Dashboard. At the top, there's a header with the Jenkins logo, a search bar, and user information (Az Kifle). The main content area is divided into a left sidebar with navigation links (New Item, Build History, Manage Jenkins, My Views) and a main panel. The main panel has a 'Welcome to Jenkins!' message, a 'Start building your software project' section with a 'Create a job' button, and a 'Set up a distributed build' section with buttons for 'Set up an agent', 'Configure a cloud', and 'Learn more about distributed builds'. There are also status boxes for 'Build Queue' (No builds in the queue) and 'Build Executor Status' (2 idle).

Step 2: Git installation and configuration in Developer and Jenkins Machine

a. Installing Git in Developer Machine

```
root@developer:~  
[root@developer ~]# yum -y install git  
Last metadata expiration check: 0:22:22 ago on Sat 31 Aug 2024 12:33:00 PM +0545.  
Package git-2.43.5-1.el9_4.x86_64 is already installed.  
Dependencies resolved.  
Nothing to do.  
Complete!  
[root@developer ~]# git --version  
git version 2.43.5  
[root@developer ~]#
```

b. Configuring SSH Authentication with GitHub

- Generate an SSH key pair

```
[root@developer ~]# ssh-keygen  
Generating public/private rsa key pair.  
Enter file in which to save the key (/root/.ssh/id_rsa):  
/root/.ssh/id_rsa already exists.  
Overwrite (y/n)?  
[root@developer ~]#
```

- Navigate to the SSH directory and display the public key.

```
root@developer:~/.ssh  
[root@developer ~]# cd /root/.ssh/  
[root@developer .ssh]# cat id_rsa.pub  
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQGCUpRg5C1Xh05X90svD0PnxU4WeosxoWgHEAK9k/BvBFV7  
n  
Znp1C8/WEqj05ZAB5E/14NM7/8j3TE5K1314top210/nm023gr0wVjy3yvoq7/17/2qub0BmWEOAK1/Aty  
vSTP45YeuV6415e1e1uue06su2Btd87vup1ue674e0u0wDtkTPe8CWDF5ToekRvGlvJkRPyNiaTYGteA6T3
```

- Copy the displayed key and add it to GitHub:



- Test the SSH connection:

```
root@developer:/  
[root@developer /]# ssh -T git@github.com  
Hi kifleaz! You've successfully authenticated, but GitHub does not provide shell access.  
[root@developer /]#
```

Note: Follow the same process in Jenkins machine to configure Git.

Step 3: Set up Apache Webserver

a. Installing Apache Server and PHP

```
root@webserver:~  
[root@webserver ~]# yum -y install httpd php  
Last metadata expiration check: 0:02:17 ago on Wed 28 Aug 2024 12:26:40 PM +0545.  
Package httpd-2.4.57-11.el9_4.1.x86_64 is already installed.  
Package php-8.0.30-1.el9_2.x86_64 is already installed.  
Dependencies resolved.  
Nothing to do.  
complete!  
[root@webserver ~]#
```

b. Start and Enable the Apache service to Start on Boot.

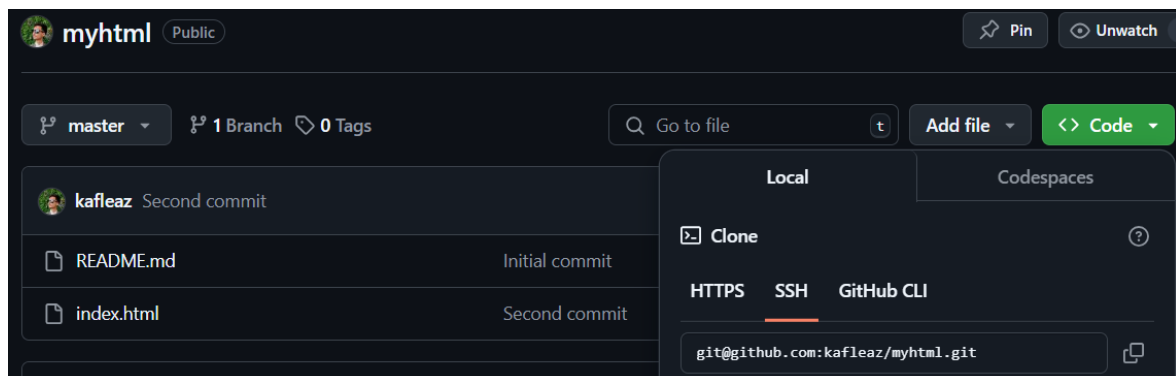
```
[root@webserver ~]# systemctl start httpd  
[root@webserver ~]# systemctl enable httpd
```

c. Configure Firewall to Allow HTTP Traffic:

```
[root@webserver ~]# systemctl start httpd  
[root@webserver ~]# systemctl enable httpd  
[root@webserver ~]# firewall-cmd --permanent --add-service=http  
Warning: ALREADY_ENABLED: http  
success  
[root@webserver ~]# firewall-cmd --reload  
success  
[root@webserver ~]#
```

Step 4: Creating a Local Git Repository

a. Create a new repository named "myhtml" in github and copy the URL.



b. Create a project workspace directory:

```
root@developer:~/project/githubtest  
[root@developer ~]# mkdir -p /root/project/githubtest  
[root@developer ~]# cd /root/project/githubtest/
```


- c. Initialize, Link and pull a Git repository:

```
MINGW64:/c/Users/user
[root@developer githubtest]# git init
Reinitialized existing Git repository in /root/project/githubtest/.git/
[root@developer githubtest]# git remote add origin git@github.com:kafleaz/myhtml.git
[root@developer githubtest]# git pull origin master
remote: Enumerating objects: 9, done.
remote: Counting objects: 100% (9/9), done.
remote: Compressing objects: 100% (6/6), done.
remote: Total 9 (delta 0), reused 6 (delta 0), pack-reused 0 (from 0)
Unpacking objects: 100% (9/9), 1.43 KiB | 122.00 KiB/s, done.
From github.com:kafleaz/myhtml
* branch          master      -> FETCH_HEAD
* [new branch]     master      -> origin/master
```

- d. Create a new file and add content.





```
[root@developer githubtest]# vi index.html
[root@developer githubtest]# git add .
[root@developer githubtest]# git commit -m "githubtest first commit"

[root@developer githubtest]# git push origin master
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 4 threads
Compressing objects: 100% (2/2), done.
Writing objects: 100% (3/3), 324 bytes | 324.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
To github.com:kafleaz/myhtml.git
   69e690c..d4237ab master -> master
[root@developer githubtest]# client_loop: send disconnect: Connection reset by peer
```

Step 5: jenkins configuration for "Github" and "publish over ssh"

- a. Install Required Plugins in Jenkins

- Navigate to Manage **Jenkins** > **Plugins** > **Available Plugins** > Search plugins
- Select it and click **Install without restart**.

Name ↓	Enabled
GitHub Integration Plugin 0.7.0 GitHub Integration Plugin for Jenkins	 
Publish Over SSH 1.25 Send build artifacts over SSH Report an issue with this plugin	 

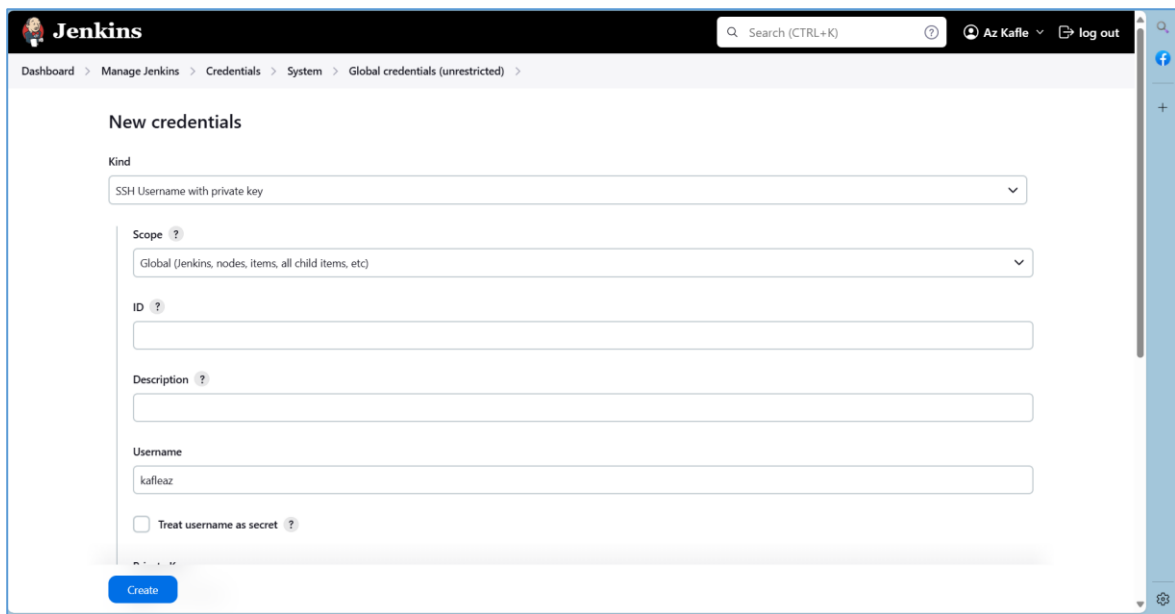
- b. jenkins and Github ssh authentication configuration

- o Display the private key

```
[root@jenkins /]# cd /root/.ssh/
[root@jenkins .ssh]# cat id_rsa
-----BEGIN OPENSSH PRIVATE KEY-----
b3BlbnNzaC1rZXktdjEAAAABG5vbmUAAAABbm9uZQAAAAAAAAABAAABlwAAAAadzC2gtcn
NhAAAAAwEAAQAAAYEAtibmt0A6pKvQ1B8TEan7f8L7KvVQUauCLBSt3TgTGLrJ1iwhhIU+
rQvLwnRA3Twvn8onL/MUIzSRJwHB+W80tmkxx7bbSKjFhOZkeXqx0lgRj91miuasvBaD62
```

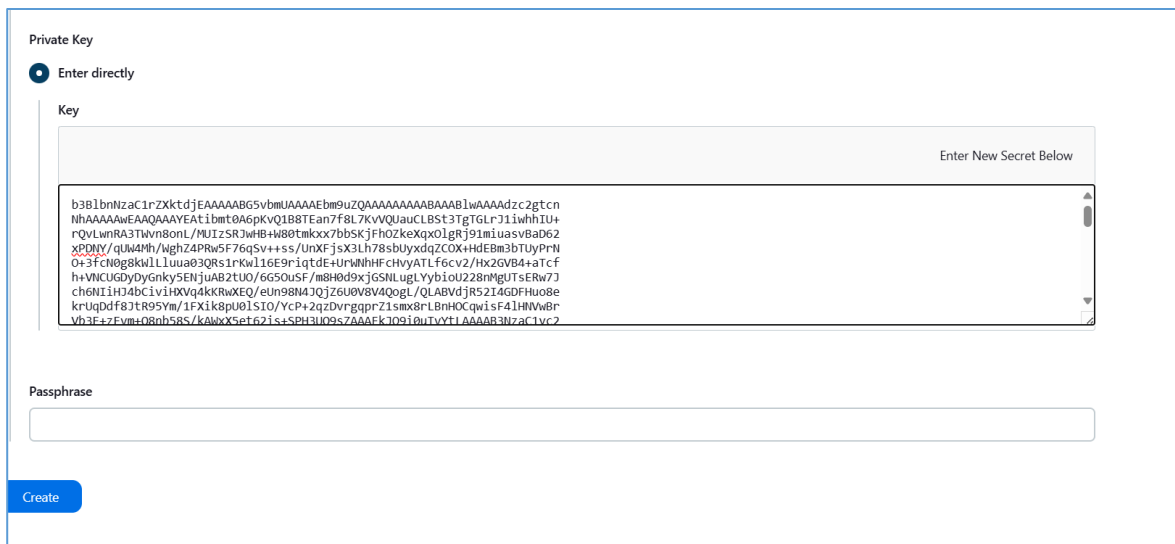
- o In Jenkins, navigate to Manage **Jenkins** > **Credentials** > **System** > **Global credentials**.
- o Click **Add Credentials**.

- Enter your **GitHub** username.



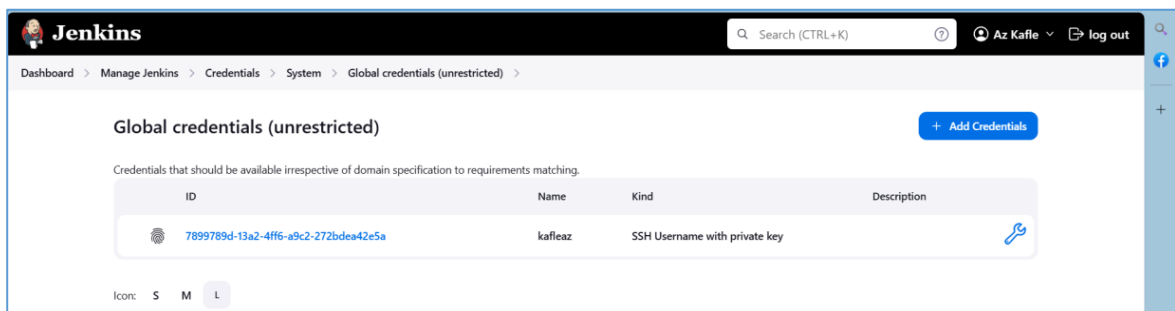
The screenshot shows the Jenkins 'New credentials' form. The 'Kind' dropdown is set to 'SSH Username with private key'. The 'Scope' dropdown is set to 'Global (Jenkins, nodes, items, all child items, etc)'. The 'ID' field is empty. The 'Description' field is empty. The 'Username' field contains 'kafleaz'. The 'Treat username as secret' checkbox is unchecked. A 'Create' button is at the bottom.

- Paste the copied private key.



The screenshot shows the 'Private Key' section of the Jenkins form. The 'Enter directly' radio button is selected. The 'Key' text area contains a long, multi-line base64-encoded string. The 'Passphrase' field is empty. A 'Create' button is at the bottom.

- Click **Create**.



The screenshot shows the Jenkins 'Global credentials (unrestricted)' page. It displays a table with one credential entry. The table has columns for ID, Name, Kind, and Description. The entry has ID '7899789d-13a2-4ff6-a9c2-272bdea42e5a', Name 'kafleaz', and Kind 'SSH Username with private key'. There is a 'Create' button at the top right.

ID	Name	Kind	Description
7899789d-13a2-4ff6-a9c2-272bdea42e5a	kafleaz	SSH Username with private key	

- a. In Jenkins, navigate to **Manage Jenkins > Configure system > System > Publish Over SSH > SSH Servers**

- SSH Servers

≡

SSH Server

✕

Name ?

WebServer

Hostname ?

192.168.10.112

Username ?

root

Remote Directory ?

☐ Avoid sending files that have not changed ?

Advanced ▾

Test Configuration

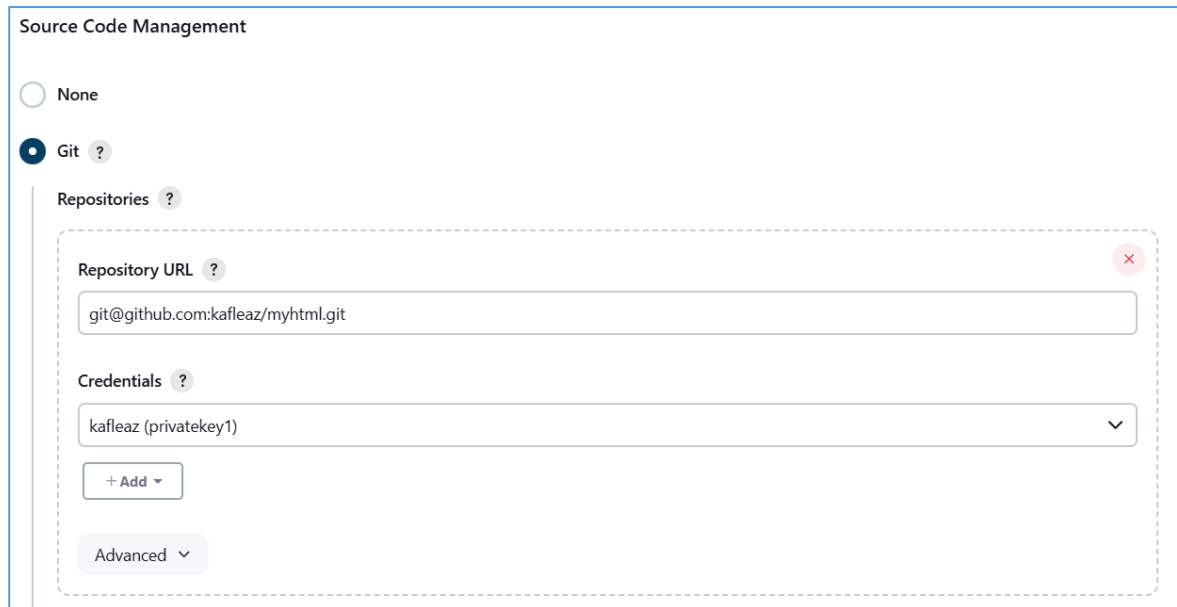
- Obtain the known host key of Jenkins machine

- Manually provided key

- **Save Configuration:**

Step 7: Createing a job in jenkins to pull index.html from github repo. and send it to the webserver into /var/www/html directory

- a. In Jenkins, navigate to **Jenkins Dashboard > New item > enter item name (Myhtml_p1) > Freestyle project > ok**
- o Select **Git**, add **repo url** and **credentials**.



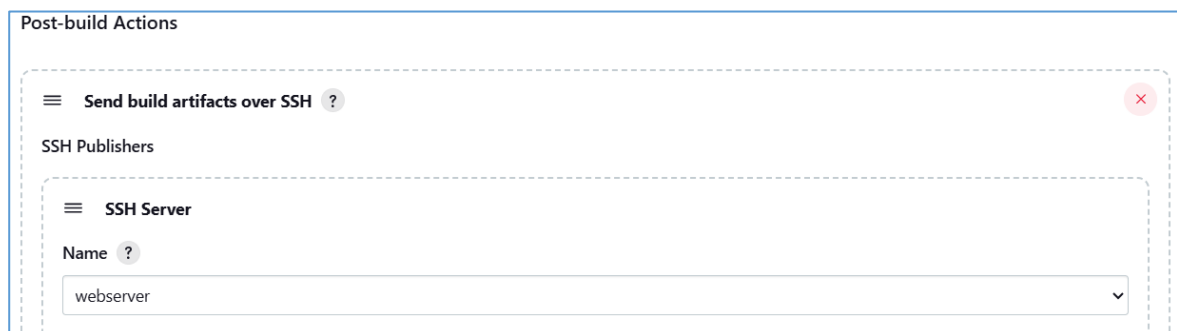
The screenshot shows the 'Source Code Management' section of the Jenkins configuration page. The 'Git' option is selected with a radio button. Below it, the 'Repositories' section is expanded, showing a 'Repository URL' field with the value 'git@github.com:kafleaz/myhtml.git' and a 'Credentials' dropdown menu with 'kafleaz (privatekey1)' selected. There are also '+ Add' and 'Advanced' buttons.

- o **Build Trigger > Poll SCM**



The screenshot shows the 'Build Trigger' section of the Jenkins configuration page. The 'Poll SCM' option is checked. Below it, the 'Schedule' field contains the text '* * * * *'. A note below the field states: 'No schedules so will only run due to SCM changes if triggered by a post-commit hook'. There is also an 'Ignore post-commit hooks' checkbox which is unchecked.

- o **post build Action > Send build artifact over ssh**



The screenshot shows the 'Post-build Actions' section of the Jenkins configuration page. The 'Send build artifacts over SSH' option is selected. Below it, the 'SSH Publishers' section is expanded, showing an 'SSH Server' dropdown menu with 'webserver' selected.

Transfers

Transfer Set

Source files ?

index.html

Remove prefix ?

Remote directory ?

//var/www/html

Exec command ?

All of the transfer fields (except for Exec timeout) support substitution of [Jenkins environment variables](#)

Advanced

Step 8: Test the Deployment

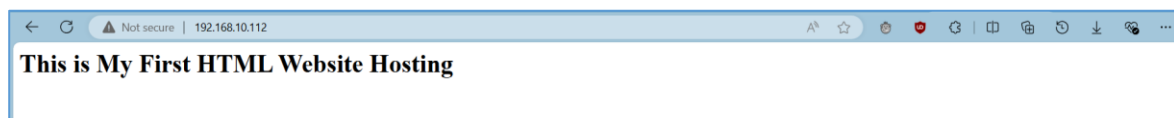
- Check Console Output:

```

Started by user Az Kafle
Running as SYSTEM
Building in workspace /var/lib/jenkins/workspace/Myhtml_p1
The recommended git tool is: NONE
using credential d5c8b220-5e76-406c-a00b-d317319da893
> git rev-parse --resolve-git-dir /var/lib/jenkins/workspace/Myhtml_p1/.git # timeout=10
Fetching changes from the remote Git repository
> git config remote.origin.url git@github.com:kafleaz/myhtml.git # timeout=10
Fetching upstream changes from git@github.com:kafleaz/myhtml.git
> git --version # timeout=10
> git --version # 'git version 2.43.5'
using GIT_SSH to set credentials privatekey1
[INFO] Currently running in a labeled security context
[INFO] Currently SELinux is 'enforcing' on the host
> /usr/bin/chcon --type=ssh_home_t /var/lib/jenkins/workspace/Myhtml_p1/tmp/jenkins-gitclient-ssh15146473077806405728.key
Verifying host key using manually-configured host key entries
> git fetch --tags --force --progress -- git@github.com:kafleaz/myhtml.git +refs/heads/*:refs/remotes/origin/* # timeout=10
> git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Checking out Revision d4237abd515ea0d687b191e5ffab19291fc654b4 (refs/remotes/origin/master)
> git config core.sparsecheckout # timeout=10
> git checkout -f d4237abd515ea0d687b191e5ffab19291fc654b4 # timeout=10
Commit message: "githubtest first commit"
> git rev-list --no-walk d4237abd515ea0d687b191e5ffab19291fc654b4 # timeout=10
SSH: Connecting from host [jenkins.az.com]
SSH: Connecting with configuration [webserver] ...
SSH: Disconnecting configuration [webserver] ...
SSH: Transferred 1 file(s)
Finished: SUCCESS

```

- Verify Deployment



Setup CI/CD with GitHub, Jenkins, Apache Webserver to deploy an artifact (PHP-based website).

Step 1: Set up Jenkins

a. Install Java

```

root@jenkins:~# yum -y install java-11-openjdk

Last metadata expiration check: 6:31:03 ago on Sun 25 Aug 2024 02:57:22 PM +0545.
Dependencies resolved.

=====
Package                                Arch      Version                               Repository    Size
=====
Installing:
java-11-openjdk                       x86_64    1:11.0.24.0.8-2.el9                 appstream    434 k
Installing dependencies:
copy-jdk-configs                      noarch    4.0-3.el9                           appstream    27 k
java-11-openjdk-headless              x86_64    1:11.0.24.0.8-2.el9                 appstream    40 M
javapackages-filesystem              noarch    6.0.0-4.el9                         appstream    10 k
lksctp-tools                          x86_64    1.0.19-3.el9_4                      baseos       96 k
lua                                    x86_64    5.4.4-4.el9                         appstream    187 k
lua-posix                             x86_64    35.0-8.el9                          appstream    131 k
mkfontscale                           x86_64    1.2.1-3.el9                         appstream    31 k
ttmkfdir                              x86_64    3.0.9-65.el9                        appstream    52 k
tzdata-java                           noarch    2024a-1.el9                         appstream    148 k
xorg-x11-fonts-Type1                  noarch    7.5-33.el9                          appstream    499 k

Transaction Summary
=====
Install 11 Packages

```

- If you have an old version of JDK installed, configure the alternative Java version

```
[root@jenkins yum.repos.d]# alternatives --config java
There are 2 programs which provide 'java'.

  Selection    Command
-----
*+ 1          java-11-openjdk.x86_64 (/usr/lib/jvm/java-11-openjdk-11.0.24.0.8-2.el9.x86_64/bin/java)
  2          java-17-openjdk.x86_64 (/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64/bin/java)

Enter to keep the current selection[+], or type selection number: 2
```

- Select the appropriate Java version and verify:

```
root@jenkins:~  
[root@jenkins ~]# java --version  
openjdk 17.0.12 2024-07-16 LTS  
OpenJDK Runtime Environment (Red_Hat-17.0.12.0.7-1) (build 17.0.12+7-LTS)  
OpenJDK 64-Bit Server VM (Red_Hat-17.0.12.0.7-1) (build 17.0.12+7-LTS, mixed mod  
e, sharing)  
[root@jenkins ~]# |
```

- Set the JAVA_HOME environment variable:

```
root@jenkins:/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
[root@jenkins ~]# cd /usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64/
[root@jenkins java-17-openjdk-17.0.12.0.7-2.el9.x86_64]# pwd
/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
[root@jenkins java-17-openjdk-17.0.12.0.7-2.el9.x86_64]#
```

- Copy the output path and add it to the .bash_profile:

```
# .bash_profile

# Get the aliases and functions
if [ -f ~/.bashrc ]; then
    . ~/.bashrc
fi
JAVA_HOME=/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
PATH=$PATH:$HOME/bin:$JAVA_HOME
# User specific environment and startup programs

~
```

- Refresh the environment:

```
[root@jenkins yum.repos.d]# . /root/.bash_profile
[root@jenkins yum.repos.d]#
```

b. Install Jenkins

```
root@jenkins:/etc/yum.repos.d
[root@jenkins /]# cd /etc/yum.repos.d/
[root@jenkins yum.repos.d]#
```

- Browse the official Jenkins website for the genuine Jenkins repository URL and key.

```
[root@jenkins yum.repos.d]# wget https://pkg.jenkins.io/redhat-stable/jenkins.repo
--2024-08-25 22:07:45-- https://pkg.jenkins.io/redhat-stable/jenkins.repo
Resolving pkg.jenkins.io (pkg.jenkins.io)... 199.232.22.133, 2a04:4e42:42::645
Connecting to pkg.jenkins.io (pkg.jenkins.io)|199.232.22.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 85
Saving to: 'jenkins.repo'

jenkins.repo          100%[=====>]          85  --.-KB/s    in 0s
2024-08-25 22:07:45 (1.92 MB/s) - 'jenkins.repo' saved [85/85]

[root@jenkins yum.repos.d]# rpm --import https://pkg.jenkins.io/redhat/jenkins.io-2023.key
[root@jenkins yum.repos.d]# yum upgrade
Jenkins-stable                               16 kB/s | 29 kB    00:01
Dependencies resolved.
Nothing to do.
Complete!
```

```
[root@jenkins yum.repos.d]# yum install jenkins
Last metadata expiration check: 0:00:19 ago on Sun 25 Aug 2024 10:08:35 PM +0545.
Dependencies resolved.
=====
Package                Architecture      Version           Repository        Size
=====
Installing:
jenkins                 noarch            2.462.1-1.1      jenkins           89 M
Transaction Summary
=====
```

```
[root@jenkins yum.repos.d]# rpm -q jenkins
jenkins-2.462.1-1.1.noarch
```

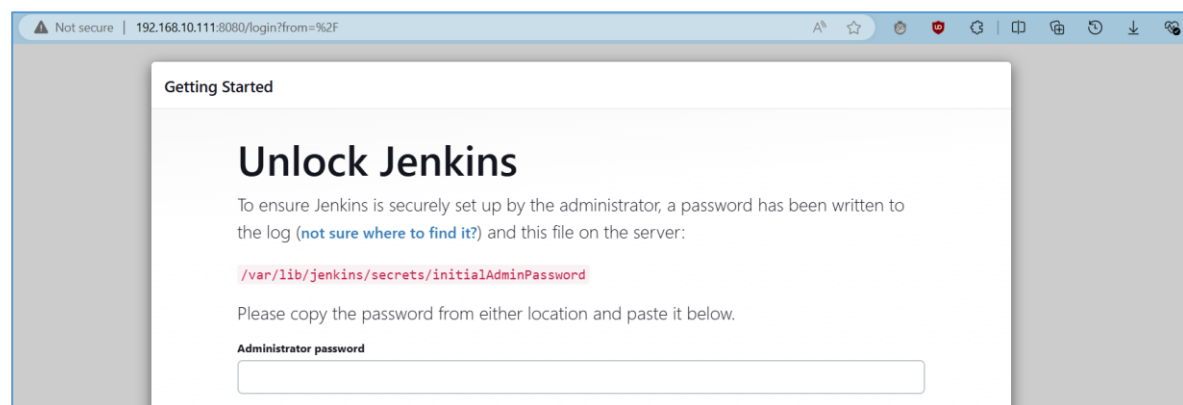
- Start the Jenkins service:

```
root@jenkins:/etc/yum.repos.d
[root@jenkins yum.repos.d]# systemctl start jenkins
[root@jenkins yum.repos.d]# systemctl enable jenkins
Created symlink /etc/systemd/system/multi-user.target.wants/jenkins.service → /usr/lib/systemd/system/jenkins.service.
[root@jenkins yum.repos.d]# systemctl status jenkins
● jenkins.service - Jenkins Continuous Integration Server
   Loaded: loaded (/usr/lib/systemd/system/jenkins.service; enabled; preset: disabled)
   Active: active (running) since Sun 2024-08-25 22:13:44 +0545; 1min 5s ago
     Main PID: 2993 (java)
        Tasks: 52 (limit: 22830)
       Memory: 732.5M
          CPU: 1min 19.084s
      CGroup: /system.slice/jenkins.service
              └─2993 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot=
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: da5f15be07ca4ff88174ce5480527904
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: This may also be found at: /var/lib/jenkins/secrets/ini
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: *****
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: *****
Aug 25 22:13:44 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:44.908+0000 [id=47] INFO
Aug 25 22:13:44 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:44.949+0000 [id=26] INFO
Aug 25 22:13:44 jenkins.az.com systemd[1]: Started Jenkins Continuous Integration Server.
Aug 25 22:13:46 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:46.676+0000 [id=63] INFO
Aug 25 22:13:46 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:46.678+0000 [id=63] INFO
lines 1-20/20 (END)
```

- Add the Jenkins port to the firewall for global access:

```
root@jenkins:/etc/yum.repos.d
[root@jenkins yum.repos.d]# firewall-cmd --permanent --add-port=8080/tcp
success
[root@jenkins yum.repos.d]# firewall-cmd --permanent --add-port=8080/udp
success
[root@jenkins yum.repos.d]# firewall-cmd --reload
success
[root@jenkins yum.repos.d]# firewall-cmd --list-all
public (active)
  target: default
icmp-block-inversion: no
  interfaces: ens160
  sources:
services: cockpit dhcpv6-client ssh
ports: 8080/tcp 8080/udp
protocols:
forward: yes
masquerade: no
forward-ports:
source-ports:
icmp-blocks:
rich rules:
[root@jenkins yum.repos.d]# |
```

- Access the Jenkins dashboard:



- Follow the instructions to unlock Jenkins using the password provided in the specified location.

```
root@jenkins:/etc/yum.repos.d
[root@jenkins yum.repos.d]# vim /var/lib/jenkins/secrets/initialAdminPassword
[root@jenkins yum.repos.d]# |
```

- Install the suggested plugins.

Getting Started

<input checked="" type="checkbox"/> Folders	<input checked="" type="checkbox"/> OWASP Markup Formatter	<input type="checkbox"/> Build Timeout	<input type="checkbox"/> Credentials Binding	** Ionicons API
<input type="checkbox"/> Timestamper	<input type="checkbox"/> Workspace Cleanup	<input type="checkbox"/> Ant	<input type="checkbox"/> Gradle	Folders
<input type="checkbox"/> Pipeline	<input type="checkbox"/> GitHub Branch Source	<input type="checkbox"/> Pipeline: GitHub Groovy Libraries	<input type="checkbox"/> Pipeline Graph View	OWASP Markup Formatter
<input type="checkbox"/> Git	<input type="checkbox"/> SSH Build Agents	<input type="checkbox"/> Matrix Authorization Strategy	<input type="checkbox"/> PAM Authentication	
<input type="checkbox"/> LDAP	<input type="checkbox"/> Email Extension	<input type="checkbox"/> Mailer	<input type="checkbox"/> Dark Theme	

- Create the first admin user.
- Start using Jenkins!

The screenshot shows the Jenkins Dashboard. At the top, there's a header with the Jenkins logo, a search bar, and user information (Az Kifle). The main content area is divided into a left sidebar with navigation links (New Item, Build History, Manage Jenkins, My Views) and a main panel. The main panel has a 'Welcome to Jenkins!' message, a 'Start building your software project' section with a 'Create a job' button, and a 'Set up a distributed build' section with buttons for 'Set up an agent', 'Configure a cloud', and 'Learn more about distributed builds'. There are also status boxes for 'Build Queue' (No builds in the queue) and 'Build Executor Status' (2 idle).

Step 2: Git installation and configuration in Developer and Jenkins Machine

a. Installing Git in Developer Machine

```
root@developer:~  
[root@developer ~]# yum -y install git  
Last metadata expiration check: 0:22:22 ago on Sat 31 Aug 2024 12:33:00 PM +0545.  
Package git-2.43.5-1.el9_4.x86_64 is already installed.  
Dependencies resolved.  
Nothing to do.  
Complete!  
[root@developer ~]# git --version  
git version 2.43.5  
[root@developer ~]#
```

b. Configuring SSH Authentication with GitHub

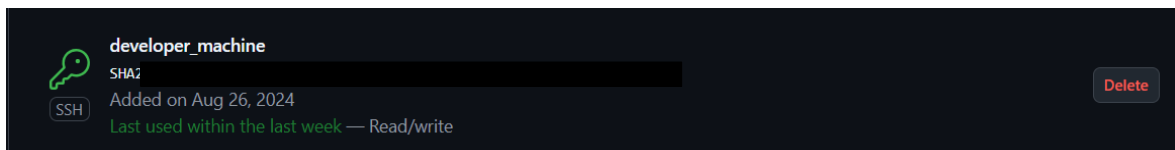
- Generate an SSH key pair

```
[root@developer ~]# ssh-keygen  
Generating public/private rsa key pair.  
Enter file in which to save the key (/root/.ssh/id_rsa):  
/root/.ssh/id_rsa already exists.  
Overwrite (y/n)?  
[root@developer ~]#
```

- Navigate to the SSH directory and display the public key.

```
root@developer:~/.ssh  
[root@developer ~]# cd /root/.ssh/  
[root@developer .ssh]# cat id_rsa.pub  
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQGCUpRg5C1Xh05X90svD0PnxU4WeosxoWgHEAK9k/BvBFV7  
n  
Znp1C8/WEqj05ZAB5E/14NM7/8j3TE5K1314top210/nm023gr0wVjy3yvoq7/17/2qu3GBmWEOAK1/Aty  
vSTP45YeuV6415e1e1uue06su2Btd87vup1ue674e0u0wDtkTPe8CWDF5ToekRvGlvJkRPyNiaTYGteA6T3
```

- Copy the displayed key and add it to GitHub:



- Test the SSH connection:

```
root@developer:/  
[root@developer /]# ssh -T git@github.com  
Hi kifleaz! You've successfully authenticated, but GitHub does not provide shell access.  
[root@developer /]#
```

Note: Follow the same process in Jenkins machine to configure Git.

Step 3: Set up Apache Webserver

a. Installing Apache Server and PHP

```
root@webserver:~  
[root@webserver ~]# yum -y install httpd php  
Last metadata expiration check: 0:02:17 ago on Wed 28 Aug 2024 12:26:40 PM +0545.  
Package httpd-2.4.57-11.el9_4.1.x86_64 is already installed.  
Package php-8.0.30-1.el9_2.x86_64 is already installed.  
Dependencies resolved.  
Nothing to do.  
complete!  
[root@webserver ~]#
```

b. Start and Enable the Apache service to Start on Boot.

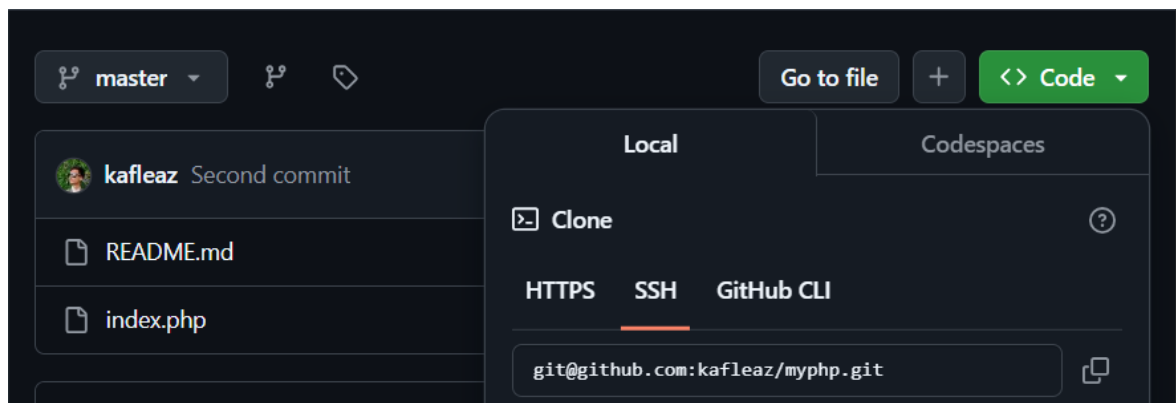
```
[root@webserver ~]# systemctl start httpd  
[root@webserver ~]# systemctl enable httpd
```

c. Configure Firewall to Allow HTTP Traffic:

```
[root@webserver ~]# systemctl start httpd  
[root@webserver ~]# systemctl enable httpd  
[root@webserver ~]# firewall-cmd --permanent --add-service=http  
Warning: ALREADY_ENABLED: http  
success  
[root@webserver ~]# firewall-cmd --reload  
success  
[root@webserver ~]#
```

Step 4: Creating a Local Git Repository

a. Create a new repository named "myphp" in github and copy the URL.



b. Create a project workspace directory:

```
[root@developer myphp]# mkdir -p /project/myphp  
[root@developer myphp]# cd /project/myphp/
```

c. Initialize, Link and pull a Git repository:

```
root@developer:/project/myphp
[root@developer myphp]# git init
Reinitialized existing Git repository in /project/myphp/.git/
[root@developer myphp]# git remote add origin git@github.com:kafleaz/myphp.git
[root@developer myphp]# git pull origin master
remote: Enumerating objects: 12, done.
remote: Counting objects: 100% (12/12), done.
remote: Compressing objects: 100% (10/10), done.
remote: Total 12 (delta 0), reused 9 (delta 0), pack-reused 0 (from 0)
Unpacking objects: 100% (12/12), 1.77 KiB | 78.00 KiB/s, done.
From github.com:kafleaz/myphp
* branch          master      -> FETCH_HEAD
* [new branch]     master      -> origin/master
```

d. Create a new file and add content.





```
[root@developer myphp]# vi index.php
[root@developer myphp]# git add .
[root@developer myphp]# git commit -m "myphp firstt commit"
[master 60b2008] myphp firstt commit
Committer: root <root@developer.az.com>
Your name and email address were configured automatically based

[root@developer myphp]# git push origin master
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 4 threads
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 331 bytes | 165.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
To github.com:kafleaz/myphp.git
   997a8ef..60b2008 master -> master
[root@developer myphp]#
```

Step 5: jenkins configuration for "Github" and "publish over ssh"

a. Install Required Plugins in Jenkins

- Navigate to Manage Jenkins > Plugins > Available Plugins > Search plugins
- Select it and click **Install without restart**.

Name ↓	Enabled
GitHub Integration Plugin 0.7.0 GitHub Integration Plugin for Jenkins	 
Publish Over SSH 1.25 Send build artifacts over SSH Report an issue with this plugin	 

b. jenkins and Github ssh authentication configuration

o Display the private key

```
[root@jenkins /]# cd /root/.ssh/
[root@jenkins .ssh]# cat id_rsa
-----BEGIN OPENSSH PRIVATE KEY-----
b3B1bnNzaC1rZXktdjEAAAABG5vbmUAAAEBm9uZQAAAAAAAAAABAAABlwAAAAadzC2gtcn
NhAAAAAwEAAQAAAYEAtibmt0A6pKvQ1B8TEan7f8L7KvVQUauCLBSt3TgTGLrJ1iwhhIU+
RqVlWnRA3TWvn8onL/MUIzSRJwHB+W80tmkxx7bbSKjFh0ZkeXqx0lgRj91miuasvBaD62
```

o In Jenkins, navigate to Manage Jenkins > Credentials > System > Global credentials.

- Click **Add Credentials**.
- Enter your **GitHub** username.

Jenkins Search (CTRL+K) Az Kafle log out

Dashboard > Manage Jenkins > Credentials > System > Global credentials (unrestricted)

New credentials

Kind: SSH Username with private key

Scope: Global (Jenkins, nodes, items, all child items, etc)

ID:

Description:

Username: kafleaz

☐ Treat username as secret

Create

- Paste the copied private key.

Private Key

☒ Enter directly

Key

Enter New Secret Below

```
b3B1bnHzaC1rZXktZjEAAAABG5vbmUAAAABm9uZQAAAAAAAAABAAABlWAAAAdzc2gtcn
NhAAAAAwEAAQAAAEAt1bmt0A6pKvQ1B8TEan7f8L7KvVQUauCLBSt3tGTLrJ1iwhIU+
rQvLwnRA3Tlwn8onL/MUIzSRJwHB+H80tmkcx7bsKjFhO2keXqxO1grj91miuasvBaD62
xPDjY/qUw4Mh/vghZ4PRw5F76qSv++ss/UnXFjsX3Lh78sbuYxdqZCOX+HdEBm3bTuyPrN
O+3fctN0g8kwll1uua03QRs1rKwL16E9riqtdE+UrWnhHFchvyATLf6cv2/Hx2GVb4+aTcf
h+VNCUGDyDyGnky5ENjuAB2tUO/6G5OuSF/m8H0d9xjGSNLuGLYyb1ouZ28nMgUTsERw7J
ch6NIiH4bCiviHXVq4kRwKEQ/eUn98NAJQJZ6U0V8V4QoGL/QLABVdjR52I4GDFHuo8e
krUqDdf8JtR95Ym/1FXik8pU0LSIO/YcP+2qzDvrgqprZ1smx8rLBnHOCqwisF4lHNVvBr
Vh3F+zFvm+D8nb5SRS/kAWvx5et621s+SPH3lUN9sZAABEKJ0910uTVVT1AABAB3MzaC1vc2
```

Passphrase

Create

- Click **Create**.

Jenkins Search (CTRL+K) Az Kafle log out

Dashboard > Manage Jenkins > Credentials > System > Global credentials (unrestricted)

+ Add Credentials

Global credentials (unrestricted)

Credentials that should be available irrespective of domain specification to requirements matching.

ID	Name	Kind	Description
7899789d-13a2-4ffe-a9c2-272bdea42e5a	kafleaz	SSH Username with private key	

Icon: S M L

- a. In Jenkins, navigate to **Manage Jenkins > Configure system > System > Publish Over SSH > SSH Servers**

- SSH Servers

SSH Server

Name ?

WebServer

Hostname ?

192.168.10.112

Username ?

root

Remote Directory ?

☐ Avoid sending files that have not changed ?

Advanced ▾

Test Configuration

- Obtain the known host key of Jenkins machine

```
[root@jenkins .ssh]# cat known_hosts
github.com ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQGCj7ndNxQowgcQnjshCLrqpPEiiphnt+VTTvD
219GKJl
```

- Host Key Verification Strategy ?

Manually provided keys

Approved Host Keys ?

1BxPktgB0Dax0r0ST59AKEZK77mWcOWD5ZAR0519QB51Z7HFDq+m0GgT1BFDK0M47mMn40M7IHi+7DdKDCjs50MtZfthU3B0FWz47NZqDf0uPvdIYQQL6dRjgRh3baPSAx0GI8Xu2hsjUtZcxShFiQB55ba1dCGbDrexQPblojhyJ5TbR5P5s7xMWMtl1/zQCc4UxX04jfdrmTzrmBUtTt89ISZTvm9mPuF5H6S1vaZ9FoHX1cGP2voguXhyrsq9sU=

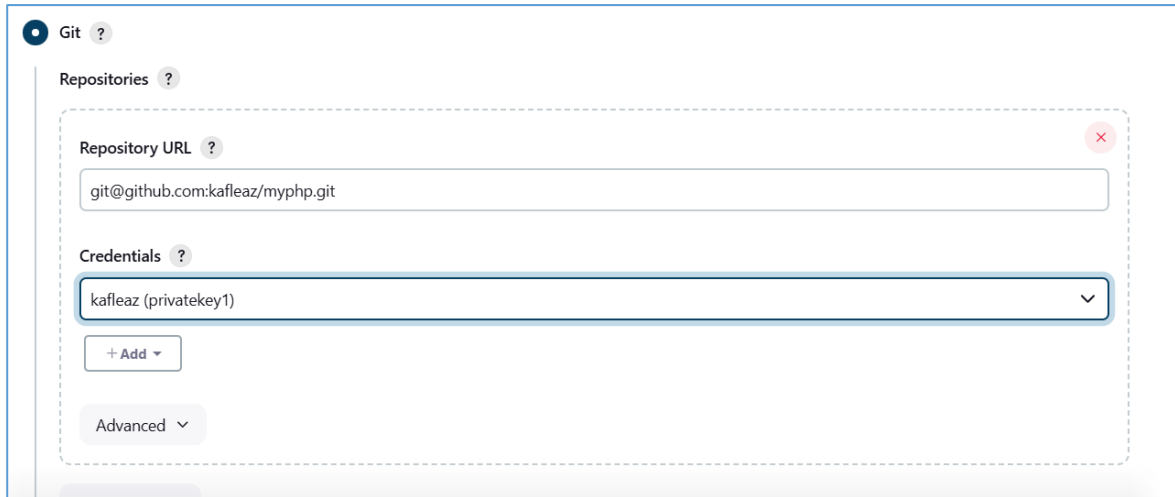
192.168.10.112 ecdsa-sha2-nistp256

AAAAE2VjZHNhLXNoYTItbmlzdHAyNTYAAAAIbmlzdHAyNTYAAABBBE2ZJHse+kKvfDFpYqsuZNMjUcgXwe12Og0M/RKRLVbuCw+/FW6hW7ilcWZHS9rCoBrX3zfAsKqTgaL5GL9/Zs=

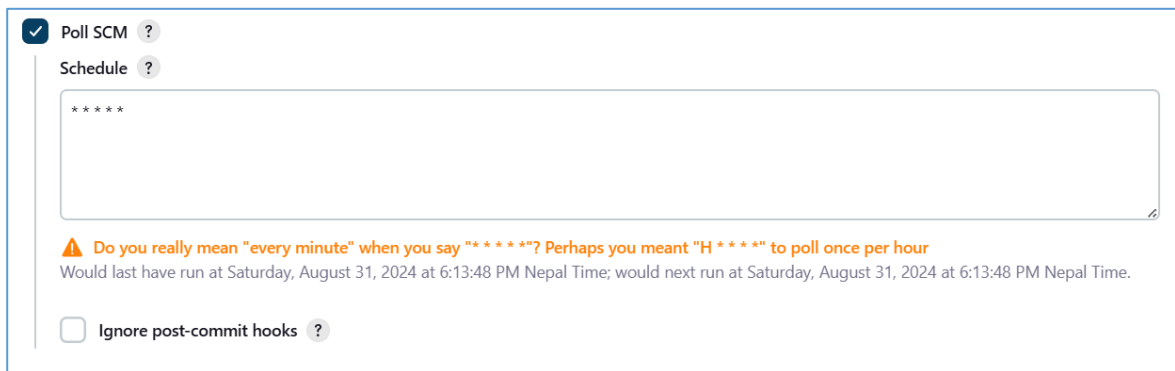
- 22

Step 7: Createing a job in jenkins to pull index.html from github repo. and send it to the webserver into /var/www/html directory

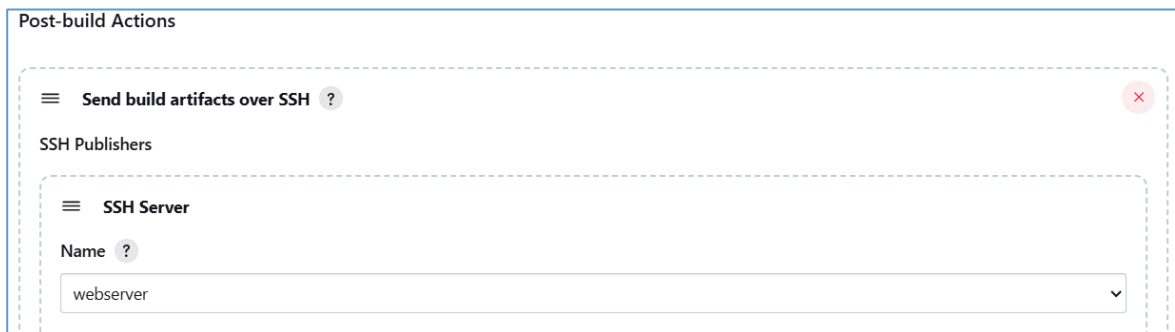
- a. In Jenkins, navigate to **Jenkins Dashboard > New item > enter item name (MyPhp_P2) > Freestyle project > ok**
- o Select **Git**, add **repo url** and **credentials**.



- o **Build Trigger > Poll SCM**



- o **post build Action > Send build artifact over ssh**



Transfers

Transfer Set

Source files ?

index.php

Remove prefix ?

Remote directory ?

//var/www/html

Exec command ?

All of the transfer fields (except for Exec timeout) support substitution of [Jenkins environment variables](#)

Advanced ▾

Step 8: Test the Deployment

- Remove index.html from /var/www/html/ from WebServer.

```
index.html
[root@webserver html]# rm -f index.html
[root@webserver html]# ls
```

- Check Console Output:

```
Started by user Az Kafle
Running as SYSTEM
Building in workspace /var/lib/jenkins/workspace/MyPhp_P2
The recommended git tool is: NONE
using credential d5c8b220-5e76-406c-a00b-d317319da893
> git rev-parse --resolve-git-dir /var/lib/jenkins/workspace/MyPhp_P2/.git # timeout=10
Fetching changes from the remote Git repository
> git config remote.origin.url git@github.com:kafleaz/myphp.git # timeout=10
Fetching upstream changes from git@github.com:kafleaz/myphp.git
> git --version # timeout=10
> git --version # 'git version 2.43.5'
using GIT_SSH to set credentials privatekey1
[INFO] Currently running in a labeled security context
[INFO] Currently SELinux is 'enforcing' on the host
> /usr/bin/chcon --type=ssh_home_t /var/lib/jenkins/workspace/MyPhp_P2/tmp/jenkins-gitclient-ssh14916015825130873086.key
Verifying host key using manually-configured host key entries
> git fetch --tags --force --progress -- git@github.com:kafleaz/myphp.git +refs/heads/*:refs/remotes/origin/* # timeout=10
> git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Checking out Revision 60b2008915ae3552c9233b54f6f0116cbcb11ea2 (refs/remotes/origin/master)
> git config core.sparsecheckout # timeout=10
> git checkout -f 60b2008915ae3552c9233b54f6f0116cbcb11ea2 # timeout=10
Commit message: "myphp first commit"
> git rev-list --no-walk 60b2008915ae3552c9233b54f6f0116cbcb11ea2 # timeout=10
SSH: Connecting from host [jenkins.az.com]
SSH: Connecting with configuration [webserver] ...
SSH: Disconnecting configuration [webserver] ...
SSH: Transferred 1 file(s)
Finished: SUCCESS
```

- Verify Deployment

← ↻ ⚠ Not secure | 192.168.10.112

This is my Php based Website hosting

Setup CI/CD with GitHub, Jenkins, Apache Webserver to deploy an artifact (Python based website).

Step 1: Set up Jenkins

a. Install Java

```

root@jenkins:~
[root@jenkins ~]# yum -y install java-11-openjdk

Last metadata expiration check: 6:31:03 ago on Sun 25 Aug 2024 02:57:22 PM +0545.
Dependencies resolved.

=====
 Package                                Arch      Version                               Repository    Size
=====
Installing:
 java-11-openjdk                        x86_64    1:11.0.24.0.8-2.el9                 appstream    434 k
Installing dependencies:
 copy-jdk-configs                      noarch   4.0-3.el9                           appstream    27 k
 java-11-openjdk-headless              x86_64   1:11.0.24.0.8-2.el9                 appstream    40 M
 javapackages-filesystem               noarch   6.0.0-4.el9                         appstream    10 k
 lksctp-tools                          x86_64   1.0.19-3.el9_4                      baseos       96 k
 lua                                    x86_64   5.4.4-4.el9                         appstream    187 k
 lua-posix                             x86_64   35.0-8.el9                          appstream    131 k
 mkfontscale                           x86_64   1.2.1-3.el9                         appstream    31 k
 ttmkfdir                              x86_64   3.0.9-65.el9                       appstream    52 k
 tzdata-java                           noarch   2024a-1.el9                        appstream    148 k
 xorg-x11-fonts-Type1                  noarch   7.5-33.el9                         appstream    499 k

Transaction Summary
=====
Install 11 Packages

```

- If you have an old version of JDK installed, configure the alternative Java version

```
[root@jenkins yum.repos.d]# alternatives --config java
There are 2 programs which provide 'java'.

  Selection    Command
-----
*+ 1          java-11-openjdk.x86_64 (/usr/lib/jvm/java-11-openjdk-11.0.24.0.8-2.el9.x86_64/bin/java)
  2          java-17-openjdk.x86_64 (/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64/bin/java)

Enter to keep the current selection[+], or type selection number: 2
```

- Select the appropriate Java version and verify:

```
root@jenkins:~  
[root@jenkins ~]# java --version  
openjdk 17.0.12 2024-07-16 LTS  
OpenJDK Runtime Environment (Red_Hat-17.0.12.0.7-1) (build 17.0.12+7-LTS)  
OpenJDK 64-Bit Server VM (Red_Hat-17.0.12.0.7-1) (build 17.0.12+7-LTS, mixed mode, sharing)  
[root@jenkins ~]# |
```

- Set the JAVA_HOME environment variable:

```
root@jenkins:/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
[root@jenkins ~]# cd /usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64/
[root@jenkins java-17-openjdk-17.0.12.0.7-2.el9.x86_64]# pwd
/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
[root@jenkins java-17-openjdk-17.0.12.0.7-2.el9.x86_64]#
```

- Copy the output path and add it to the .bash_profile:

```
# .bash_profile

# Get the aliases and functions
if [ -f ~/.bashrc ]; then
    . ~/.bashrc
fi
JAVA_HOME=/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
PATH=$PATH:$HOME/bin:$JAVA_HOME
# User specific environment and startup programs

~
```

- Refresh the environment:

```
[root@jenkins yum.repos.d]# . /root/.bash_profile
[root@jenkins yum.repos.d]#
```

- Install Jenkins

```
root@jenkins:/etc/yum.repos.d
[root@jenkins /]# cd /etc/yum.repos.d/
[root@jenkins yum.repos.d]#
```

- Browse the official Jenkins website for the genuine Jenkins repository URL and key.

```
[root@jenkins yum.repos.d]# wget https://pkg.jenkins.io/redhat-stable/jenkins.repo
--2024-08-25 22:07:45-- https://pkg.jenkins.io/redhat-stable/jenkins.repo
Resolving pkg.jenkins.io (pkg.jenkins.io)... 199.232.22.133, 2a04:4e42:42::645
Connecting to pkg.jenkins.io (pkg.jenkins.io)|199.232.22.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 85
Saving to: 'jenkins.repo'

jenkins.repo          100%[=====>]          85  --.-KB/s    in 0s
2024-08-25 22:07:45 (1.92 MB/s) - 'jenkins.repo' saved [85/85]

[root@jenkins yum.repos.d]# rpm --import https://pkg.jenkins.io/redhat/jenkins.io-2023.key
[root@jenkins yum.repos.d]# yum upgrade
Jenkins-stable                               16 kB/s | 29 kB    00:01
Dependencies resolved.
Nothing to do.
Complete!
```

```
[root@jenkins yum.repos.d]# yum install jenkins
Last metadata expiration check: 0:00:19 ago on Sun 25 Aug 2024 10:08:35 PM +0545.
Dependencies resolved.

=====
Package                Architecture      Version           Repository        Size
=====
Installing:
jenkins                 noarch            2.462.1-1.1      jenkins           89 M
Transaction Summary
=====
```

```
[root@jenkins yum.repos.d]# rpm -q jenkins
jenkins-2.462.1-1.1.noarch
```

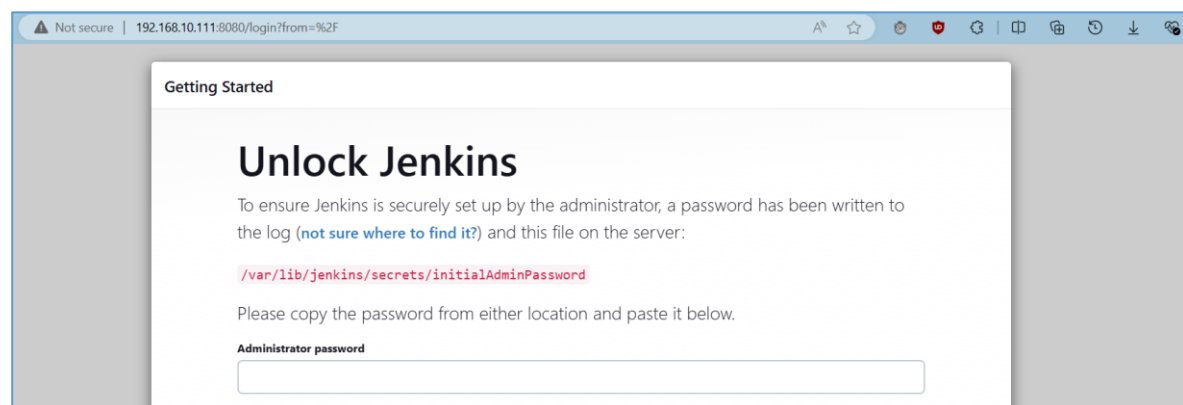
- Start the Jenkins service:

```
root@jenkins:/etc/yum.repos.d
[root@jenkins yum.repos.d]# systemctl start jenkins
[root@jenkins yum.repos.d]# systemctl enable jenkins
Created symlink /etc/systemd/system/multi-user.target.wants/jenkins.service → /usr/lib/systemd/system/jenkins.service.
[root@jenkins yum.repos.d]# systemctl status jenkins
● jenkins.service - Jenkins Continuous Integration Server
   Loaded: loaded (/usr/lib/systemd/system/jenkins.service; enabled; preset: disabled)
   Active: active (running) since Sun 2024-08-25 22:13:44 +0545; 1min 5s ago
     Main PID: 2993 (java)
        Tasks: 52 (limit: 22830)
       Memory: 732.5M
          CPU: 1min 19.084s
      CGroup: /system.slice/jenkins.service
              └─2993 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: da5f15be07ca4ff88174ce5480527904
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: This may also be found at: /var/lib/jenkins/secrets/ini
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: *****
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: *****
Aug 25 22:13:44 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:44.908+0000 [id=47] INFO
Aug 25 22:13:44 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:44.949+0000 [id=26] INFO
Aug 25 22:13:44 jenkins.az.com systemd[1]: Started Jenkins Continuous Integration Server.
Aug 25 22:13:46 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:46.676+0000 [id=63] INFO
Aug 25 22:13:46 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:46.678+0000 [id=63] INFO
lines 1-20/20 (END)
```

- b. Add the Jenkins port to the firewall for global access:

```
root@jenkins:/etc/yum.repos.d
[root@jenkins yum.repos.d]# firewall-cmd --permanent --add-port=8080/tcp
success
[root@jenkins yum.repos.d]# firewall-cmd --permanent --add-port=8080/udp
success
[root@jenkins yum.repos.d]# firewall-cmd --reload
success
[root@jenkins yum.repos.d]# firewall-cmd --list-all
public (active)
  target: default
icmp-block-inversion: no
interfaces: ens160
sources:
services: cockpit dhcpv6-client ssh
ports: 8080/tcp 8080/udp
protocols:
forward: yes
masquerade: no
forward-ports:
source-ports:
icmp-blocks:
rich rules:
```

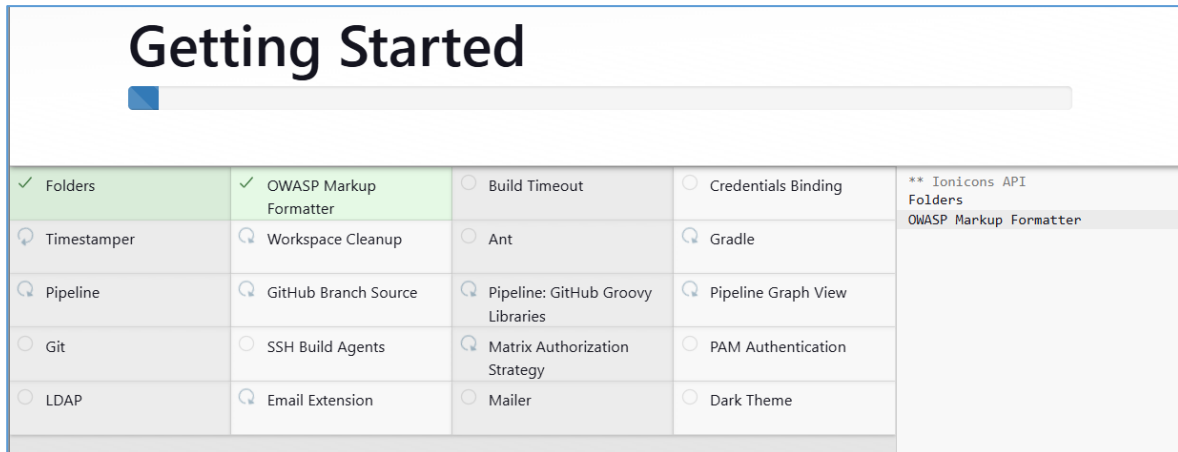
- c. Access the Jenkins dashboard:



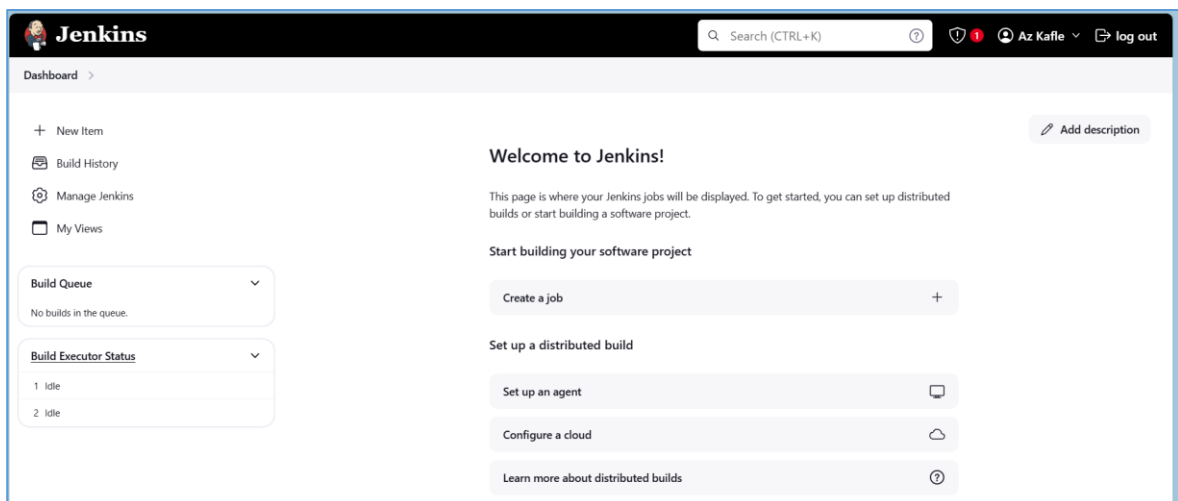
- Follow the instructions to unlock Jenkins using the password provided in the specified location.

```
root@jenkins:/etc/yum.repos.d
[root@jenkins yum.repos.d]# vim /var/lib/jenkins/secrets/initialAdminPassword
[root@jenkins yum.repos.d]# |
```

- Install the suggested plugins.



- Create the first admin user.
- Start using Jenkins!



Step 2: Git installation and configuration in Developer and Jenkins Machine

- Installing Git in Developer Machine

```
root@developer:~  
[root@developer ~]# yum -y install git  
Last metadata expiration check: 0:22:22 ago on Sat 31 Aug 2024 12:33:00 PM +0545.  
Package git-2.43.5-1.el9_4.x86_64 is already installed.  
Dependencies resolved.  
Nothing to do.  
Complete!  
[root@developer ~]# git --version  
git version 2.43.5  
[root@developer ~]#
```

b. Configuring SSH Authentication with GitHub

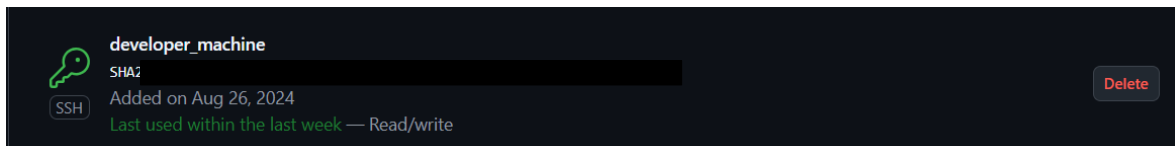
- o Generate an SSH key pair

```
[root@developer ~]# ssh-keygen  
Generating public/private rsa key pair.  
Enter file in which to save the key (/root/.ssh/id_rsa):  
/root/.ssh/id_rsa already exists.  
Overwrite (y/n)?  
[root@developer ~]#
```

- o Navigate to the SSH directory and display the public key.

```
root@developer:~/.ssh  
[root@developer ~]# cd /root/.ssh/  
[root@developer .ssh]# cat id_rsa.pub  
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQGCUpRg5C1Xh05X90svD0PnxU4WeosxoWgHEAK9k/BvBFV7  
n  
Znp1C3/WEqj05ZAB3E1/41N4/8j51E5K13147op210/nm023gr0wVjy3yvoq7/1/aq05GBmHwE0AK1/Aty  
kETD45YeuV641F61e1Hus0Gsu3Btd87vUP1ueG74e0UPwPtkTPePCWDFToKPrCkVd1kPXsNiaTYGtsA6T3
```

- o Copy the displayed key and add it to GitHub:



- o Test the SSH connection:

```
root@developer:/  
[root@developer /]# ssh -T git@github.com  
Hi kافلةaz! You've successfully authenticated, but GitHub does not provide shell access.  
[root@developer /]#
```

Note: Follow the same process in Jenkins machine to configure Git.

Step 3: Set up Apache Webserver

- a. Installing Apache Server and python packages

```
root@webserver:/  
[root@webserver /]# yum -y install httpd python3 python3-pip  
Last metadata expiration check: 2:07:43 ago on Sat 31 Aug 2024 04:35:51 PM +0545.  
Package httpd-2.4.57-11.el9_4.1.x86_64 is already installed.  
Package python3-3.9.18-3.el9_4.3.x86_64 is already installed.  
Dependencies resolved.  
=====
```

Package	Architecture	Version	Repository	Size
Installing: python3-pip	noarch	21.2.3-8.el9	appstream	1.7 M

```
=====
```

- b. Edit CGI scripts

```
root@webserver:/var/www/cgi-bin  
ScriptAlias /cgi-bin/ "/var/www/cgi-bin/"  
  
/IfModule>  
  
"/var/www/cgi-bin" should be changed to whatever your ScriptAliased  
CGI directory exists, if you have that configured.  
  
Directory "/var/www/cgi-bin">  
    AllowOverride None  
    options +ExecCGI  
    AddHandler cgi-script .cgi .pl .py  
    Options None  
    Require all granted  
/Directory>  
  
IfModule mime_module>  
    #  
    # TypesConfig points to the file containing the list of mappings from  
    # filename extension to MIME-type.  
    #  
    TypesConfig /etc/mime.types  
INSERT
```

- c. Start and Enable the Apache service to Start on Boot.

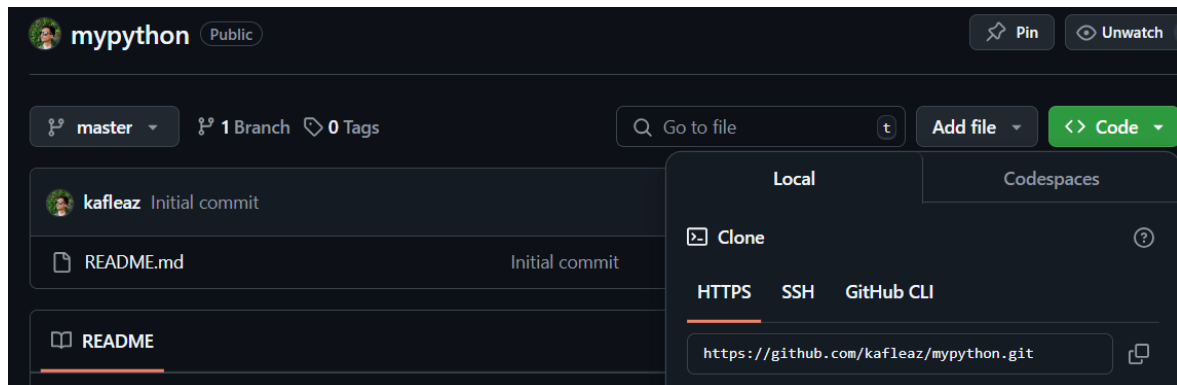
```
[root@webserver ~]# systemctl start httpd  
[root@webserver ~]# systemctl enable httpd
```

- d. Configure Firewall to Allow HTTP Traffic:

```
[root@webserver ~]# systemctl start httpd  
[root@webserver ~]# systemctl enable httpd  
[root@webserver ~]# firewall-cmd --permanent --add-service=http  
Warning: ALREADY_ENABLED: http  
success  
[root@webserver ~]# firewall-cmd --reload  
success  
[root@webserver ~]#
```

Step 4: Creating a Local Git Repository

- a. Create a new repository named "mypython" in github and copy the URL.



- b. Create a project workspace directory:

```
[root@developer /]# mkdir -p /project/mypython
[root@developer /]# cd /project/mypython
```

- c. Initialize, Link and pull a Git repository:

```
[root@developer project]# git init
Initialized empty Git repository in /project/.git/
[root@developer project]# git remote add origin git@github.com:kafleaz/mypython.git
[root@developer project]# git pull origin master
```

- d. Create a new file and add content.





```
[root@developer mypython]# git init
Initialized empty Git repository in /project/mypython/.git/
[root@developer mypython]# git remote add origin git@github.com:kafleaz/mypython.git
[root@developer mypython]# git pull origin master
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0 (from 0)
Unpacking objects: 100% (3/3), 859 bytes | 122.00 KiB/s, done.
From github.com:kafleaz/mypython
* branch      master      -> FETCH_HEAD
* [new branch] master      -> origin/master
```

```
[root@developer mypython]# vi hello.py
[root@developer mypython]# git add .
[root@developer mypython]# git commit -m "changed to hello.py"
On branch master
nothing to commit, working tree clean
[root@developer mypython]# git push origin master
Everything up-to-date
[root@developer mypython]#
```

Step 5: jenkins configuration for "Github" and "publish over ssh"

a. Install Required Plugins in Jenkins

- Navigate to Manage **Jenkins** > **Plugins** > **Available Plugins** > Search plugins
- Select it and click **Install without restart**.

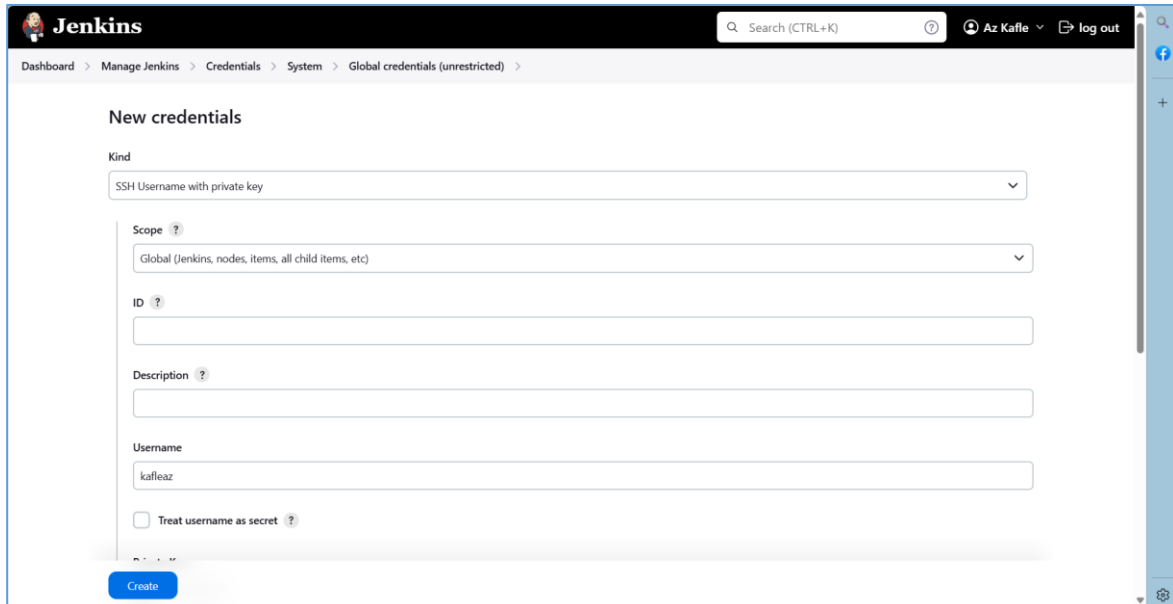
Name ↓	Enabled
GitHub Integration Plugin 0.7.0 GitHub Integration Plugin for Jenkins	 
Publish Over SSH 1.25 Send build artifacts over SSH Report an issue with this plugin	 

b. jenkins and Github ssh authentication configuration

- Display the private key

```
[root@jenkins /]# cd /root/.ssh/  
[root@jenkins .ssh]# cat id_rsa  
-----BEGIN OPENSSH PRIVATE KEY-----  
b3B1bnNzaC1rZXktdjEAAAABG5vbmUAAAABbm9uZQAAAAAAAAABAAABlwAAAAdzc2gtcn  
NhAAAAAwEAAQAAAYEAtibmt0A6pKvQ1B8TEan7f8L7KvVQUauCLBSt3TgTGLrJ1iwhhIU+  
rQvLwnRA3TWvn8onL/MUIzSRJwHB+W80tmkxx7bbSKjFh0ZkeXqx01gRj91miasvBaD6Z
```

- In Jenkins, navigate to **Manage Jenkins** > **Credentials** > **System** > **Global credentials**.
- Click **Add Credentials**.
- Enter your **GitHub username**.



- Paste the copied private key.

Private Key

Enter directly

Key

Enter New Secret Below

```

b3B1bnZaC1rZXktcjEAAAAAG5vbmUAAAAEbm9uZQAAAAAAAAABAAABlwAAAdzc2gtcn
NhAAAAAwEAAQAAAEAtibmt0A6pkvQ1B8TEan7f8L7KVVQUauCLBSt3TgTGLrJ1iwhhIU+
rQvLwnRA3Tlwn8onL/MUIzSRJwHb+W80tmkcc7bb5Kjfh0ZkeXqx01gRj91miuasvBaD62
xPDNIY/qUw4Mh/WghZ4PRw5F76qsv++ss/UnXFjsX3Lh78sbUyxdqZCOX+HdEBm3bTUyPrN
O+3fcl0g8kwlLluua03QRs1rKwL16E9rIgtde+UrWfHfCHvyATLf6cv2/Hx2GVb4+aTcf
h+VNCUGdyDyGky5EHjuAB2CU0/6G50UsF/m8H8D9xjGSNLugLYyb10Uz28nMgUtsERw7J
ch6NT1H34bCiviWxqdkKwXEQ/eun98M43QjZ6U0V8V4QogL/QLABvdJR521AGDFHuo8e
krUqDdf83TR9SYm/1FXik8pU0ISTO/YcP+2qZDvrgqprZ1smx8rLBnHOCqwisF41HNWw8r
Vh3E+zFvm+08nh58S/kAWxXsetf6Zis+SPH3U09s7AAAEKJ09i0uTVYTLAAAAB3Nzac1vr2

```

Passphrase

Create

○ Click **Create**.

Jenkins

Search (CTRL+K)

Az Kalle
log out

Dashboard > Manage Jenkins > Credentials > System > Global credentials (unrestricted) >

Global credentials (unrestricted)

Add Credentials

Credentials that should be available irrespective of domain specification to requirements matching.

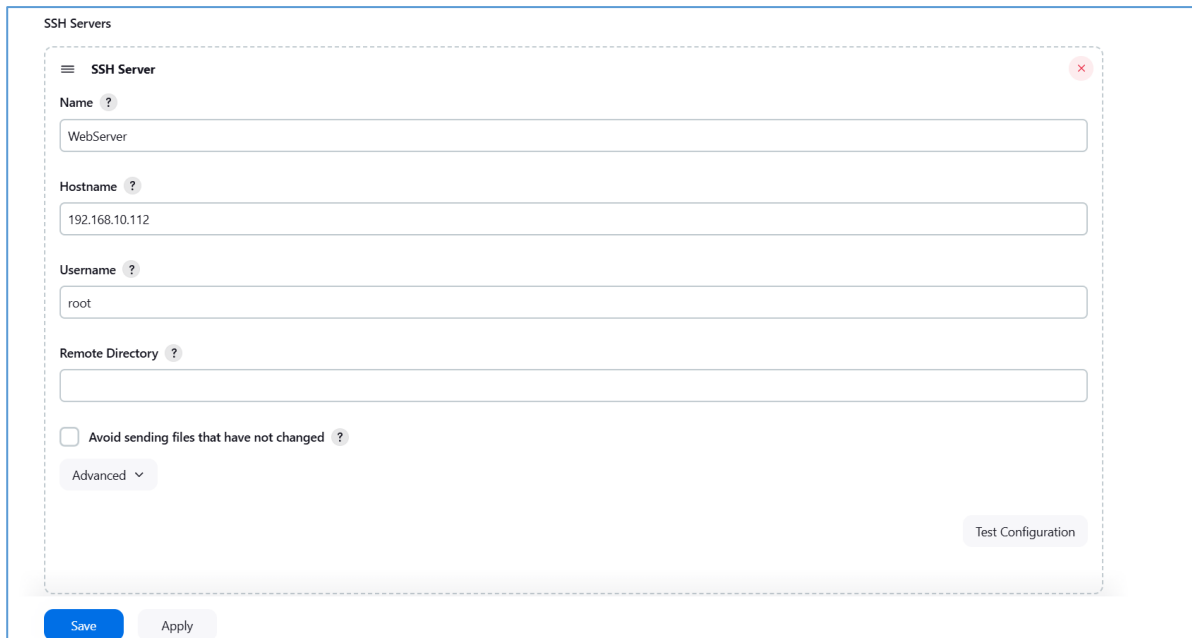
ID	Name	Kind	Description
7899789d-13a2-4ff6-a9c2-272bdea42e5a	kalleaz	SSH Username with private key	

Icon:

S
M
L

Step 6: Set IP address, username and password of webserver in jenkins for automated file transfer (publish over ssh)

- c. In Jenkins, navigate to **Manage Jenkins > Configure system > System > Publish Over SSH > SSH Servers**
- o Enter SSH Server Details

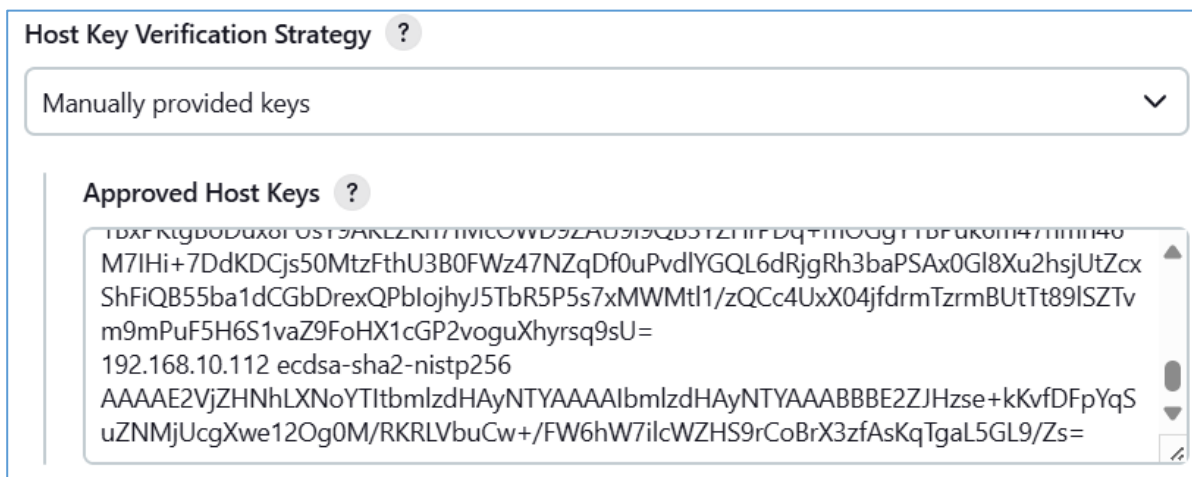


- d. In Jenkins, navigate to **Manage Jenkins > Security > Git Host Key Verification Configuration**

- o Obtain the known host key of Jenkins machine

```
[root@jenkins .ssh]# cat known_hosts
github.com s i0dh
219GKJl
github.com ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQGCj7ndNxQowgcQnJshcLrqPEiipht+VTTvD
56wUR0a1-nubv4t1-1muGh7p6-3yur7n-RK6-PRK6Uk-pk67-ntw8-Ttk17-66-9p/65663Wp/8c76u41
```

- o Manually provided key



- o **Save Configuration:**

Step 7: Createing a job in jenkins to pull index.html from github repo. and send it to the webserver into /var/www/html directory

- a. In Jenkins, navigate to **Jenkins Dashboard > New item > enter item name (mypython_P3) > Freestyle project > ok**
- o Select **Git**, add **repo url** and **credentials**.

The screenshot shows the 'Git' configuration section in Jenkins. It includes a 'Repository URL' field with the value 'git@github.com:kafleaz/mypython.git' and a 'Credentials' dropdown menu showing 'kafleaz (privatekey1)'. There is an '+ Add' button and an 'Advanced' dropdown menu.

- o **Build Trigger > Poll SCM**

The screenshot shows the 'Poll SCM' configuration section in Jenkins. It includes a 'Schedule' field with the value '**** *'. Below the field, there is a warning message: 'Do you really mean "every minute" when you say "**** *"? Perhaps you meant "H * * * *"' to poll once per hour. Below the warning, there is a checkbox labeled 'Ignore post-commit hooks'.

- o **post build Action > Send build artifact over ssh**

The screenshot shows the 'Post-build Actions' configuration section in Jenkins. It includes a 'Send build artifacts over SSH' section with a dropdown menu showing 'SSH Server'. Below the dropdown, there is a 'Name' field with the value 'webserver'.

Transfer Set

Source files ?

hello.py

Remove prefix ?

Remote directory ?

//var/www/cgi-bin

Exec command ?

cd /var/www/cgi-bin
chmod a+x hello.py

Step 8: Test the Deployment

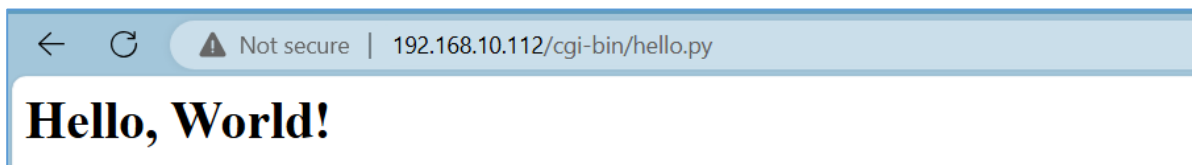
- verify if the script executable in WebServer.

```
[root@webserver cgi-bin]# ls -l
total 4
-rwxr-xr-x. 1 root root 245 Sep  8 22:42 hello.py
```

- Check Console Output in Jenkins:

```
Started by user Az Kafle
Running as SYSTEM
Building in workspace /var/lib/jenkins/workspace/mypython_P3
The recommended git tool is: NONE
using credential d5c8b220-5e76-406c-a00b-d317319da893
> git rev-parse --resolve-git-dir /var/lib/jenkins/workspace/mypython_P3/.git # timeout=10
Fetching changes from the remote Git repository
> git config remote.origin.url git@github.com:kafleaz/mypython.git # timeout=10
Fetching upstream changes from git@github.com:kafleaz/mypython.git
> git --version # timeout=10
> git --version # 'git version 2.43.5'
using GIT_SSH to set credentials privatekey1
[INFO] Currently running in a labeled security context
[INFO] Currently SELinux is 'enforcing' on the host
> /usr/bin/chcon --type=ssh_home_t /var/lib/jenkins/workspace/mypython_P3/tmp/jenkins-gitclient-ssh13614357653397722388.key
Verifying host key using manually-configured host key entries
> git fetch --tags --force --progress -- git@github.com:kafleaz/mypython.git +refs/heads/*:refs/remotes/origin/* # timeout=10
> git rev-parse refs/remotes/origin/master^{commit} # timeout=10
Checking out Revision e9141fe3b3aeac1d48f4ee77d02607cda1b03f8d (refs/remotes/origin/master)
> git config core.sparsecheckout # timeout=10
> git checkout -f e9141fe3b3aeac1d48f4ee77d02607cda1b03f8d # timeout=10
Commit message: "changed to hello.py"
> git rev-list --no-walk e9141fe3b3aeac1d48f4ee77d02607cda1b03f8d # timeout=10
SSH: Connecting from host [jenkins.az.com]
SSH: Connecting with configuration [webserver] ...
SSH: Disconnecting configuration [webserver] ...
SSH: Transferred 1 file(s)
Finished: SUCCESS
```

- Verify Deployment



Setup CI/CD with GitHub, Jenkins, Maven & Tomcat to deploy an artifact (Java web app).

Step 1: Set up Jenkins

a. Install Java

```

root@jenkins:~# yum -y install java-11-openjdk

Last metadata expiration check: 6:31:03 ago on Sun 25 Aug 2024 02:57:22 PM +0545.
Dependencies resolved.

=====
Package                               Arch      Version                               Repository    Size
=====
Installing:
java-11-openjdk                       x86_64    1:11.0.24.0.8-2.el9                 appstream    434 k
Installing dependencies:
copy-jdk-configs                      noarch    4.0-3.el9                           appstream    27 k
java-11-openjdk-headless              x86_64    1:11.0.24.0.8-2.el9                 appstream    40 M
javapackages-filessystem              noarch    6.0.0-4.el9                         appstream    10 k
lksctp-tools                          x86_64    1.0.19-3.el9_4                     baseos       96 k
lua                                    x86_64    5.4.4-4.el9                         appstream    187 k
lua-posix                             x86_64    35.0-8.el9                          appstream    131 k
mkfontscale                           x86_64    1.2.1-3.el9                         appstream    31 k
ttmkfdir                              x86_64    3.0.9-65.el9                       appstream    52 k
tzdata-java                           noarch    2024a-1.el9                         appstream    148 k
xorg-x11-fonts-Type1                  noarch    7.5-33.el9                          appstream    499 k

Transaction Summary
=====
Install 11 Packages

```

- If you have an old version of JDK installed, configure the alternative Java version

```
[root@jenkins yum.repos.d]# alternatives --config java
There are 2 programs which provide 'java'.

   Selection    Command
-----
*+ 1            java-11-openjdk.x86_64 (/usr/lib/jvm/java-11-openjdk-11.0.24.0.8-2.el9.x86_64/bin/java)
   2            java-17-openjdk.x86_64 (/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64/bin/java)

Enter to keep the current selection[+], or type selection number: 2
```

- Select the appropriate Java version and verify:

```
root@jenkins:~  
[root@jenkins ~]# java --version  
openjdk 17.0.12 2024-07-16 LTS  
OpenJDK Runtime Environment (Red_Hat-17.0.12.0.7-1) (build 17.0.12+7-LTS)  
OpenJDK 64-Bit Server VM (Red_Hat-17.0.12.0.7-1) (build 17.0.12+7-LTS, mixed mod  
e, sharing)  
[root@jenkins ~]# |
```

- Set the JAVA_HOME environment variable:

```
root@jenkins:/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
[root@jenkins ~]# cd /usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64/
[root@jenkins java-17-openjdk-17.0.12.0.7-2.el9.x86_64]# pwd
/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
[root@jenkins java-17-openjdk-17.0.12.0.7-2.el9.x86_64]#
```

- Copy the output path and add it to the .bash_profile:

```
# .bash_profile

# Get the aliases and functions
if [ -f ~/.bashrc ]; then
    . ~/.bashrc
fi
JAVA_HOME=/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
PATH=$PATH:$HOME/bin:$JAVA_HOME
# User specific environment and startup programs

~
```

- Refresh the environment:

```
[root@jenkins yum.repos.d]# . /root/.bash_profile
[root@jenkins yum.repos.d]#
```

b. Install Jenkins

```
root@jenkins:/etc/yum.repos.d
[root@jenkins /]# cd /etc/yum.repos.d/
[root@jenkins yum.repos.d]#
```

- Browse the official Jenkins website for the genuine Jenkins repository URL and key.

```
[root@jenkins yum.repos.d]# wget https://pkg.jenkins.io/redhat-stable/jenkins.repo
--2024-08-25 22:07:45-- https://pkg.jenkins.io/redhat-stable/jenkins.repo
Resolving pkg.jenkins.io (pkg.jenkins.io)... 199.232.22.133, 2a04:4e42:42::645
Connecting to pkg.jenkins.io (pkg.jenkins.io)|199.232.22.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 85
Saving to: 'jenkins.repo'

jenkins.repo          100%[=====>]          85  --.-KB/s    in 0s

2024-08-25 22:07:45 (1.92 MB/s) - 'jenkins.repo' saved [85/85]

[root@jenkins yum.repos.d]# rpm --import https://pkg.jenkins.io/redhat/jenkins.io-2023.key
[root@jenkins yum.repos.d]# yum upgrade
Jenkins-stable                               16 kB/s | 29 kB    00:01
Dependencies resolved.
Nothing to do.
Complete!
```

```
[root@jenkins yum.repos.d]# yum install jenkins
Last metadata expiration check: 0:00:19 ago on Sun 25 Aug 2024 10:08:35 PM +0545.
Dependencies resolved.

=====
Package                Architecture      Version           Repository        Size
=====
Installing:
jenkins                 noarch            2.462.1-1.1      jenkins           89 M
Transaction Summary
=====
```

```
[root@jenkins yum.repos.d]# rpm -q jenkins
jenkins-2.462.1-1.1.noarch
```

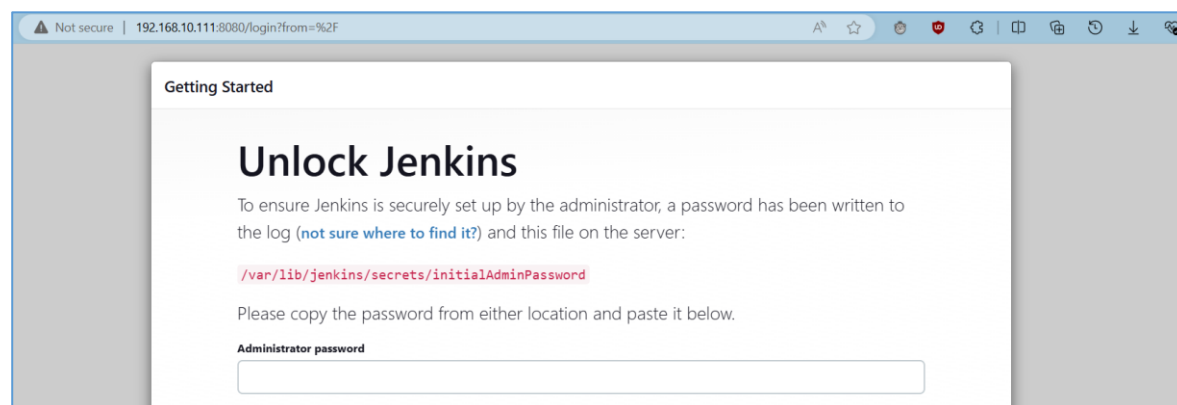
- Start the Jenkins service:

```
root@jenkins:/etc/yum.repos.d
[root@jenkins yum.repos.d]# systemctl start jenkins
[root@jenkins yum.repos.d]# systemctl enable jenkins
Created symlink /etc/systemd/system/multi-user.target.wants/jenkins.service → /usr/lib/systemd/system/jenkins.service.
[root@jenkins yum.repos.d]# systemctl status jenkins
● jenkins.service - Jenkins Continuous Integration Server
   Loaded: loaded (/usr/lib/systemd/system/jenkins.service; enabled; preset: disabled)
   Active: active (running) since Sun 2024-08-25 22:13:44 +0545; 1min 5s ago
     Main PID: 2993 (java)
       Tasks: 52 (limit: 22830)
      Memory: 732.5M
         CPU: 1min 19.084s
        CGroup: /system.slice/jenkins.service
                └─2993 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: da5f15be07ca4ff88174ce5480527904
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: This may also be found at: /var/lib/jenkins/secrets/ini
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: *****
Aug 25 22:13:30 jenkins.az.com jenkins[2993]: *****
Aug 25 22:13:44 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:44.908+0000 [id=47] INFO
Aug 25 22:13:44 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:44.949+0000 [id=26] INFO
Aug 25 22:13:44 jenkins.az.com systemd[1]: Started Jenkins Continuous Integration Server.
Aug 25 22:13:46 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:46.676+0000 [id=63] INFO
Aug 25 22:13:46 jenkins.az.com jenkins[2993]: 2024-08-25 16:28:46.678+0000 [id=63] INFO
lines 1-20/20 (END)
```

- c. Add the Jenkins port to the firewall for global access:

```
root@jenkins:/etc/yum.repos.d
[root@jenkins yum.repos.d]# firewall-cmd --permanent --add-port=8080/tcp
success
[root@jenkins yum.repos.d]# firewall-cmd --permanent --add-port=8080/udp
success
[root@jenkins yum.repos.d]# firewall-cmd --reload
success
[root@jenkins yum.repos.d]# firewall-cmd --list-all
public (active)
  target: default
icmp-block-inversion: no
  interfaces: ens160
  sources:
services: cockpit dhcpv6-client ssh
  ports: 8080/tcp 8080/udp
  protocols:
forward: yes
masquerade: no
forward-ports:
source-ports:
icmp-blocks:
rich rules:
[root@jenkins yum.repos.d]# |
```

- d. Access the Jenkins dashboard:



- Follow the instructions to unlock Jenkins using the password provided in the specified location.

```
root@jenkins:/etc/yum.repos.d
[root@jenkins yum.repos.d]# vim /var/lib/jenkins/secrets/initialAdminPassword
[root@jenkins yum.repos.d]# |
```

- Install the suggested plugins.

Getting Started

<input checked="" type="checkbox"/> Folders	<input checked="" type="checkbox"/> OWASP Markup Formatter	<input type="checkbox"/> Build Timeout	<input type="checkbox"/> Credentials Binding	** Ionicons API
<input type="checkbox"/> Timestamper	<input type="checkbox"/> Workspace Cleanup	<input type="checkbox"/> Ant	<input type="checkbox"/> Gradle	Folders
<input type="checkbox"/> Pipeline	<input type="checkbox"/> GitHub Branch Source	<input type="checkbox"/> Pipeline: GitHub Groovy Libraries	<input type="checkbox"/> Pipeline Graph View	OWASP Markup Formatter
<input type="checkbox"/> Git	<input type="checkbox"/> SSH Build Agents	<input type="checkbox"/> Matrix Authorization Strategy	<input type="checkbox"/> PAM Authentication	
<input type="checkbox"/> LDAP	<input type="checkbox"/> Email Extension	<input type="checkbox"/> Mailer	<input type="checkbox"/> Dark Theme	

- Create the first admin user.
- Start using Jenkins!

The screenshot shows the Jenkins Dashboard. At the top, there's a header with the Jenkins logo, a search bar, and user information (Az Kifle). The main content area is divided into a left sidebar with navigation links (New Item, Build History, Manage Jenkins, My Views) and a main panel. The main panel has a 'Welcome to Jenkins!' message, a 'Start building your software project' section with a 'Create a job' button, and a 'Set up a distributed build' section with buttons for 'Set up an agent', 'Configure a cloud', and 'Learn more about distributed builds'. There are also status boxes for 'Build Queue' (No builds in the queue) and 'Build Executor Status' (2 idle).

Step2: Setup Tomcat Server

a. Install java

```
root@webserver:~  
[root@webserver ~]# yum -y install java-17-openjdk  
AlmaLinux 9 - AppStream 1.8 kB/s | 4.2 kB 00:02  
AlmaLinux 9 - BaseOS 2.4 kB/s | 3.8 kB 00:01  
AlmaLinux 9 - CRB 2.7 kB/s | 4.2 kB 00:01  
AlmaLinux 9 - Extras 1.7 kB/s | 3.3 kB 00:01  
Dependencies resolved.  
=====
```

Package	Architecture	Version	Repository	Size
Installing:				
java-17-openjdk	x86_64	1:17.0.12.0.7-2.el9	appstream	429 k
Installing dependencies:				
copy-jdk-configs	noarch	4.0-3.el9	appstream	27 k
java-17-openjdk-headless	x86_64	1:17.0.12.0.7-2.el9	appstream	45 M
javapackages-filesystem	noarch	6.0.0-4.el9	appstream	10 k
lksctp-tools	x86_64	1.0.19-3.el9_4	baseos	96 k
lua	x86_64	5.4.4-4.el9	appstream	187 k
lua-posix	x86_64	35.0-8.el9	appstream	131 k

o Verify the installation:

```
complete.  
[root@webserver ~]# java -version  
openjdk version "17.0.12" 2024-07-16 LTS  
OpenJDK Runtime Environment (Red_Hat-17.0.12.0.7-1) (build 17.0.12+7-LTS)  
OpenJDK 64-Bit Server VM (Red_Hat-17.0.12.0.7-1) (build 17.0.12+7-LTS, mixed mode, sharing)  
[root@webserver ~]#
```

b. Set JAVA_HOME Variable Path

o Navigate to the Java installation directory:

```
root@webserver:/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64  
[root@webserver ~]# cd /usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64/  
[root@webserver java-17-openjdk-17.0.12.0.7-2.el9.x86_64]# pwd  
/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64  
[root@webserver java-17-openjdk-17.0.12.0.7-2.el9.x86_64]# |
```

o Edit the .bash_profile

```
root@webserver:/  
[root@webserver java-17-openjdk-17.0.12.0.7-2.el9.x86_64]# cd /  
[root@webserver /]# vi /root/.bash_profile
```

```
root@webserver:/  
# .bash_profile  
JAVA_HOME= /usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64  
PATH=$PATH:$HOME/bin:$JAVA_HOME  
  
# Get the aliases and functions  
if [ -f ~/.bashrc ]; then  
    . ~/.bashrc  
fi  
  
# User specific environment and startup programs  
~
```

o Refresh the profile:

```
[root@webserver /]# . /root/.bash_profile  
-bash: /usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64: Is a directory
```

c. Download and Extract Apache Tomcat

- Create a directory for Tomcat

```
root@webserver:/opt
[root@webserver ~]# cd /opt/
[root@webserver opt]# wget https://dlcdn.apache.org/tomcat/tomcat-11/v11.0.0-M24/bin/apache-tomcat-11.0.0-M24.tar.gz
--2024-09-02 08:21:52-- https://dlcdn.apache.org/tomcat/tomcat-11/v11.0.0-M24/bin/apache-tomcat-11.0.0-M24.tar.gz
Resolving dlcdn.apache.org (dlcdn.apache.org)... 151.101.2.132, 2a04:4e42::644
Connecting to dlcdn.apache.org (dlcdn.apache.org)|151.101.2.132|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 13055617 (12M) [application/x-gzip]
Saving to: 'apache-tomcat-11.0.0-M24.tar.gz'

apache-tomcat-11.0.0-M2 100%[=====] 12.45M 6.61MB/s in 1.9s
2024-09-02 08:21:54 (6.61 MB/s) - 'apache-tomcat-11.0.0-M24.tar.gz' saved [13055617/13055617]
```

- Extract the downloaded file

```
[root@webserver opt]# tar -zxvf apache-tomcat-11.0.0-M24.tar.gz
apache-tomcat-11.0.0-M24/conf/
apache-tomcat-11.0.0-M24/conf/catalina.properties
apache-tomcat-11.0.0-M24/conf/context.xml
```

- Create soft links for tomcat startup and shutdown scripts

```
root@webserver:/opt/apache-tomcat-11.0.0-M24/conf
[root@webserver opt]# cd apache-tomcat-11.0.0-M24/bin/
[root@webserver bin]# ln -s /opt/apache-tomcat-11.0.0-M24/bin/startup.sh /usr/local/bin/tomcatup
[root@webserver bin]# ln -s /opt/apache-tomcat-11.0.0-M24/bin/shutdown.sh /usr/local/bin/tomcatdown
[root@webserver bin]# |
```

d. Change Tomcat Server Port to 8090

- Navigate to the configuration directory

```
[root@webserver bin]# cd /opt/apache-tomcat-11.0.0-M24/conf/
[root@webserver conf]# ls
catalina.properties  jaspic-providers.xml  logging.properties  tomcat-users.xml  web.xml
context.xml          jaspic-providers.xsd  server.xml           tomcat-users.xsd
[root@webserver conf]# vi context.xml
[root@webserver conf]# cd /opt/apache-tomcat-11.0.0-M24/conf/
[root@webserver conf]# vi server.xml
```

- Edit server.xml (Change the connector port to 8090.)

```
root@webserver:/opt/apache-tomcat-11.0.0-M24/conf
-->
<Connector port="8090" protocol="HTTP/1.1"
           connectionTimeout="20000"
           redirectPort="8443" />
<!-- A "Connector" using the shared thread pool-->
<!--
<Connector executor="tomcatThreadPool"
           port="8080" protocol="HTTP/1.1"
           connectionTimeout="20000"
           redirectPort="8443" />
-->
```

- e. Allow Port 8090 in Firewall

```
root@webserver:/opt/apache-tomcat-11.0.0-M24/conf
[root@webserver conf]# firewall-cmd --permanent --add-port=8090/tcp
success
[root@webserver conf]# firewall-cmd --reload
success
[root@webserver conf]# firewall-cmd --list-all
public (active)
  target: default
  icmp-block-inversion: no
  interfaces: ens160
  sources:
  services: cockpit dhcpv6-client http ssh
  ports: 8090/tcp
  protocols:
  forward: yes
  masquerade: no
```

- f. Allow Remote Access to Tomcat Server

- o Edit context.xml for host-manager (Comment out the Valve section.)

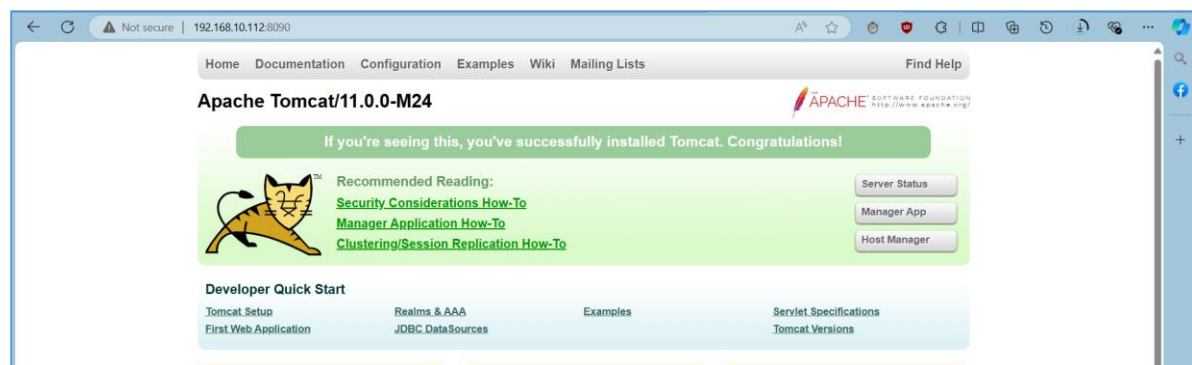
```
root@webserver:/opt/apache-tomcat-11.0.0-M24/webapps/host-manager/META-INF
[root@webserver /]# cd /opt/apache-tomcat-11.0.0-M24/webapps/host-manager/META-INF/
[root@webserver META-INF]# vi context.xml
-->
<Context antiResourceLocking="false" privileged="true" ignoreAnnotations="true">
  <CookieProcessor className="org.apache.tomcat.util.http.Rfc6265CookieProcessor"
    sameSiteCookies="strict" />
  <!-- Valve className="org.apache.catalina.valves.RemoteAddrValve"
    allow="127\.\d+\.\d+\.\d+|::1|0:0:0:0:0:0:0:1" / -->
  <Manager sessionAttributeValueClassNameFilter="java\.lang\.(?:Boolean|Integer|Long|Number|St
ring)|org\.apache\.catalina\.filters\.CsrfPreventionFilter\$LruCache(?:\$1)?|java\.util\.(?:Li
nked)?HashMap"/>
</Context>
```

- g. Test the Tomcat server in a browser

- o Start tomcat server

```
[root@webserver META-INF]# tomcatup
Using CATALINA_BASE:   /opt/apache-tomcat-11.0.0-M24
Using CATALINA_HOME:   /opt/apache-tomcat-11.0.0-M24
Using CATALINA_TMPDIR: /opt/apache-tomcat-11.0.0-M24/temp
Using JRE_HOME:        /usr
Using CLASSPATH:        /opt/apache-tomcat-11.0.0-M24/bin/bootstrap.jar:/opt/apache-tomcat-11.0
.0-M24/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.
```

- o URL: <http://192.168.100.153:8090>



h. Setup Credentials for Tomcat Manager

```
root@webserver:/opt/apache-tomcat-11.0.0-M24/conf
[root@webserver /]# cd /opt/apache-tomcat-11.0.0-M24/conf/
[root@webserver conf]# ls
Catalina      jaspic-providers.xml  server.xml      web.xml
catalina.properties  jaspic-providers.xsd  tomcat-users.xml
context.xml    logging.properties   tomcat-users.xsd
[root@webserver conf]# vi tomcat-users.xml

<role rolename="manager-gui"/>
<role rolename="manager-script"/>
<role rolename="manager-jmx"/>
<role rolename="manager-status"/>
<role rolename="admin-gui"/>
<role rolename="admin"/>
<role rolename="manager"/>
<role rolename="admin-script"/>

<user username="kafleaz" password="kafle126" roles="admin,admin-gui,admin-script,m
anager,manager-gui,manager-script,manager-jmx,manager-status"/>
<!-- user username="kafleaz" password="kafle126" roles="manager-gui"/ -->
<!-- user username="kafleaz" password="7878" roles="admin-gui"/ -->
/tomcat-users>
tomcat-users.xml" 68L, 3321B                                68,15      Bot
```

o Restart Tomcat

```
[root@webserver /]# tomcatdown
Using CATALINA_BASE:   /opt/apache-tomcat-11.0.0-M24
Using CATALINA_HOME:   /opt/apache-tomcat-11.0.0-M24
Using CATALINA_TMPDIR: /opt/apache-tomcat-11.0.0-M24/temp
Using JRE_HOME:        /usr
Using CLASSPATH:        /opt/apache-tomcat-11.0.0-M24/bin/bootstrap.jar:/opt/apache-
tomcat-11.0.0-M24/bin/tomcat-juli.jar

[root@webserver META-INF]# tomcatup
Using CATALINA_BASE:   /opt/apache-tomcat-11.0.0-M24
Using CATALINA_HOME:   /opt/apache-tomcat-11.0.0-M24
Using CATALINA_TMPDIR: /opt/apache-tomcat-11.0.0-M24/temp
Using JRE_HOME:        /usr
Using CLASSPATH:        /opt/apache-tomcat-11.0.0-M24/bin/bootstrap.jar:/opt/apache-tomcat-11.0
.0-M24/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.
```

Step3: Setup & Configure Maven

a. Install Maven

- Create a directory for Maven:

```
root@webserver:/opt
[root@webserver ~]# cd /opt/
```

- Download Maven binary

```
[root@webserver opt]# wget https://dlcdn.apache.org/maven/maven-3/3.9.9/binaries/apache-maven-3.9.9-bin.tar.gz
```

- Extract the downloaded file

```
[root@webserver opt]# ls
apache-maven-3.9.9-bin.tar.gz  apache-tomcat-11.0.0-M24
[root@webserver opt]# tar -zxvf apache-maven-3.9.9-bin.tar.gz
apache-maven-3.9.9/README.txt
apache-maven-3.9.9/LICENSE
apache-maven-3.9.9/NOTICE
apache-maven-3.9.9/lib/
```

b. Set M2 and M2_HOME Variable Path

- Navigate to the Maven directory

```
[root@webserver opt]# cd apache-maven-3.9.9/
[root@webserver apache-maven-3.9.9]# pwd
/opt/apache-maven-3.9.9
[root@webserver apache-maven-3.9.9]# vi /root/.bash_profile
```

- Edit the .bash_profile

```
# .bash_profile
JAVA_HOME= /usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64
PATH=$PATH:$HOME/bin:$JAVA_HOME

M2_HOME=/opt/apache-maven-3.9.9
M2=$M2_HOME/bin
PATH=$PATH:$HOME/bin:$JAVA_HOME:$M2
# Get the aliases and functions
```

- Refresh the profile

```
[root@webserver apache-maven-3.9.9]# . /root/.bash_profile
-bash: /usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64: Is a directory
```

- Verify Maven installation

```
[root@webserver apache-maven-3.9.9]# echo $M2
/opt/apache-maven-3.9.9/bin
[root@webserver apache-maven-3.9.9]# echo $M2_HOME
/opt/apache-maven-3.9.9
[root@webserver apache-maven-3.9.9]# mvn -version
Apache Maven 3.6.3 (Red Hat 3.6.3-15)
```

c. Create a Java-based Web Application Using Maven

- Create a directory for the Maven project and generate a web application project.

```
root@webserver:/opt/mymaven
[root@webserver /]# cd /opt/mymaven/
[root@webserver mymaven]# mvn archetype:generate -DgroupId=com.javaweb -DartifactId=
javaweb -DarchetypeArtifactId=maven-archetype-webapp -DinteractiveMode=false
[INFO] Scanning for projects...
[INFO]
[INFO] -----< org.apache.maven:standalone-pom >-----
```

- Navigate to the project directory

```
root@webserver:/opt/mymaven/javaweb
[root@webserver mymaven]# cd javaweb/
[root@webserver javaweb]# mvn compile
[INFO] Scanning for projects...
[INFO]
[INFO] -----< com.javaweb:javaweb >-----
[INFO] Building javaweb Maven Webapp 1.0-SNAPSHOT
[INFO] -----[ war ]-----
[INFO]
```

- Compile and package the application

```
[root@webserver javaweb]# mvn package
[INFO] Scanning for projects...
[INFO]
[INFO] -----< com.javaweb:javaweb >-----
[INFO] Building javaweb Maven Webapp 1.0-SNAPSHOT
[INFO] -----[ war ]-----
[INFO]
[INFO] --- maven-resources-plugin:2.6:resources (default-resources) @ javaweb ---
```

- Verify the generated .war file

```
[root@webserver javaweb]# cd target/
[root@webserver target]# ls
classes javaweb javaweb.war maven-archiver
[root@webserver target]#
```

Step 4: Setup Git

a. Installing Git in Developer Machine

```
root@developer:~
[root@developer ~]# yum -y install git
Last metadata expiration check: 0:22:22 ago on Sat 31 Aug 2024 12:33:00 PM +0545.
Package git-2.43.5-1.el9_4.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
[root@developer ~]# git --version
git version 2.43.5
[root@developer ~]#
```

b. Configuring SSH Authentication with GitHub

- Generate an SSH key pair

```
[root@developer ~]# ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa):
/root/.ssh/id_rsa already exists.
Overwrite (y/n)?
[root@developer ~]#
```

- Navigate to the SSH directory and display the public key.

```
root@developer:~/.ssh
[root@developer ~]# cd /root/.ssh/
[root@developer .ssh]# cat id_rsa.pub
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQGCUPRg5C1Xh05X90svD0PnxU4WeosxoWgHEAK9k/BvBFV7
n
z
eTP4iYeuV641Ee1e1HUs0Gcu3Ptd8ZvUP1uc674e0HDPkTPePCWDF5T0skPvClyJkPXnNiaTYCteA6T5
```

- Copy the displayed key and add it to GitHub:



- Test the SSH connection:

```
root@developer:/
[root@developer /]# ssh -T git@github.com
Hi kafeaz! You've successfully authenticated, but GitHub does not provide shell access.
[root@developer /]#
```

Step 4: Integrate GitHub, Maven, Tomcat Server with Jenkins

- Install Required Plugins in Jenkins for Github Maven, Tomcat Server Integration

- Navigate to **Manage Jenkins > Plugins > Available Plugins > Search plugins**
- Select it and click **Install without restart**.

Name ↓	Enabled
GitHub Integration Plugin 0.7.0 GitHub Integration Plugin for Jenkins	<input checked="" type="checkbox"/>
Maven Invoker plugin 2.5 This plugin will parse result files produced by the maven-invoker-plugin Report an issue with this plugin	<input checked="" type="checkbox"/>
Publish Over SSH 1.25 Send build artifacts over SSH Report an issue with this plugin	<input checked="" type="checkbox"/>

- jenkins and Github ssh authentication configuration

- Display the private key


```
[root@jenkins /]# cd /root/.ssh/
[root@jenkins .ssh]# cat id_rsa
-----BEGIN OPENSSH PRIVATE KEY-----
b3B1bnNzaC1rZXktdjEAAAABG5vbmUAAAABm9uZQAAAAAAAAABAAABlwAAAAdzc2gtcn
NhAAAAAwEAAQAAAEAtibmt0A6pkvQ1B8TEan7f8L7KvVQUauCLBSt3TgTGLrJ1iwhhIU+
rQvLwnRA3Twvn8onL/MUIzSRJwHB+W80tmkxx7bbSKjFhOZkeXqx0lgRj91miasvBaD62
```

- In Jenkins, navigate to **Manage Jenkins > Credentials > System > Global credentials**.
- Click **Add Credentials**.
- Enter your **GitHub username**.

Jenkins Search (CTRL+K) Az Kafele log out

Dashboard > Manage Jenkins > Credentials > System > Global credentials (unrestricted)

New credentials

Kind: SSH Username with private key

Scope: Global (Jenkins, nodes, items, all child items, etc)

ID:

Description:

Username: kafleaz

☐ Treat username as secret

Create

- Paste the copied private key.

Private Key

☒ Enter directly

Key

Enter New Secret Below

```
b3B1bnNzaC1rZXktdjEAAAABG5vbmUAAAABm9uZQAAAAAAAAABAAABlwAAAAdzc2gtcn
NhAAAAAwEAAQAAAEAtibmt0A6pkvQ1B8TEan7f8L7KvVQUauCLBSt3TgTGLrJ1iwhhIU+
rQvLwnRA3Twvn8onL/MUIzSRJwHB+W80tmkxx7bbSKjFhOZkeXqx0lgRj91miasvBaD62
xPDNY/qUw4Mh/vghZ4PRw5F76q5v++ss/UnXFjsX3Lh78sbUyxdqZCOX+HdEBm3bTuyPrN
O+3fCn0g8kwlLlUua03QRs1rKwL16E9riqtde+UrWlhHfCHvyATLf6cv2/Hx2GVb4+aTcf
h+VNCUGDyDyGnky5ENjuAB2TU0/6G5OuSF/m8H0d9xjGSNLugLYybioU228nMgUTsERw7J
ch6NI1H34BCiviHXVq4kRwXEQ/eUn98N4JQjZ6U0V8V4QogL/QLABVdjR52I4G0FHuo8e
krUqDd83tR95Ym/1FXik8pu0L510/YcP+2qZDvrgqprZ1smx8rLBnHOCqw1sF4lHNVwBr
Vh3E+7Fvml+08nb5RS/kawX5eT621s+SPH3UQ9s7BAAFK70910uTVYt1AAAAB3WzaC1vr2
```

- Click **Create**.

Jenkins Search (CTRL+K) Az Kafele log out

Dashboard > Manage Jenkins > Credentials > System > Global credentials (unrestricted)

[+ Add Credentials](#)

Credentials that should be available irrespective of domain specification to requirements matching.

ID	Name	Kind	Description
7899789d-13a2-4ff6-a9c2-272bde942e5a	kafleaz	SSH Username with private key	

Icon: S M L

- c. Specify java home and maven home (JAVA_HOME and M2_HOME) path in Jenkins.
- o Navigate to **Manage Jenkins > Tools > Add JDK**

JDK installations

JDK installations ^ Edited

Add JDK

JDK

Name

Java

JAVA_HOME

/usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64

! /usr/lib/jvm/java-17-openjdk-17.0.12.0.7-2.el9.x86_64 doesn't look like a JDK directory

☐ Install automatically ?

Add JDK

- o Navigate to **Manage Jenkins > Tools > Add Maven**

Maven installations

Maven installations ^ Edited

Add Maven

Maven

Name

Maven

MAVEN_HOME

/opt/apache-maven-3.9.9

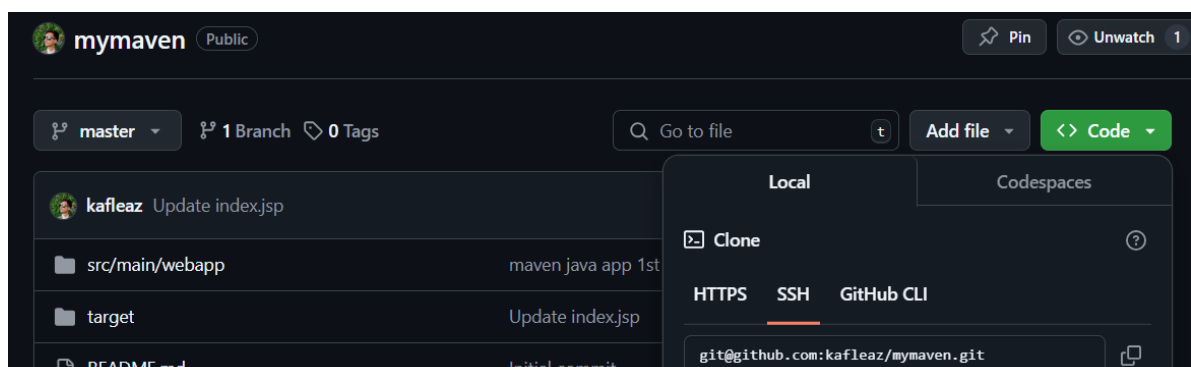
☐ Install automatically ?

Add Maven

- o **Apply > Save**

Step 5: Create CI and CD job to deploy an artifact (java web app)

- a. Create new repo in github



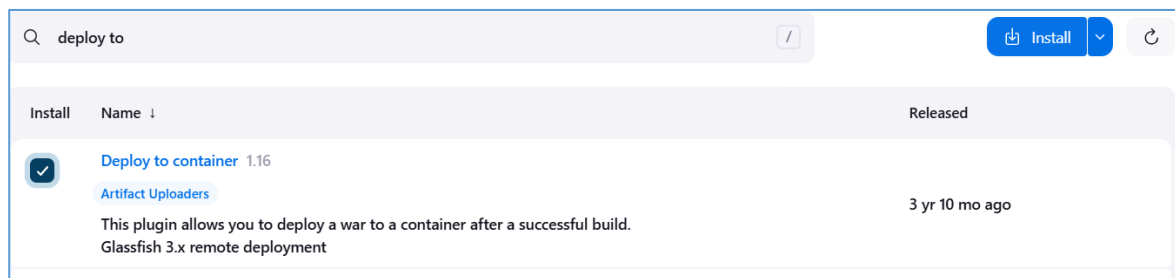
- b. Create folder for maven project

```
root@developer:/project/maven1
[root@developer ~]# cd /project/
[root@developer project]# mkdir maven1
[root@developer project]# cd maven1/
```

- c. Create local rep.

```
[root@developer maven1]# git init
Initialized empty Git repository in /project/maven1/.git/
[root@developer maven1]# git remote add origin git@github.com:kafleaz/mymaven.git
[root@developer maven1]# git pull origin master
remote: Enumerating objects: 31, done.
remote: Counting objects: 100% (31/31), done.
remote: Compressing objects: 100% (25/25), done.
remote: Total 31 (delta 3), reused 12 (delta 0), pack-reused 0 (from 0)
Unpacking objects: 100% (31/31), 6.40 KiB | 86.00 KiB/s, done.
From github.com:kafleaz/mymaven
* branch            master       -> FETCH_HEAD
* [new branch]      master       -> origin/master
[root@developer maven1]# git add .
[root@developer maven1]# git commit -m "maven java web app"
On branch master
nothing to commit, working tree clean
[root@developer maven1]# git push origin master
```

- d. Install "Deploy to container" plugin in the jenkins master
- Navigate to **Manage Jenkins > Plugins > Available Plugins > Search plugins**
 - Select it and click **Install without restart**.



- e. Start (sync) NTP server

```
root@jenkins:~
[root@jenkins ~]# systemctl start chronyd
[root@jenkins ~]# systemctl enable chronyd
[root@jenkins ~]# systemctl status chronyd
● chronyd.service - NTP client/server
   Loaded: loaded (/usr/lib/systemd/system/chronyd.service; enabled; preset: 
   Active: active (running) since Sat 2024-09-07 18:27:56 +0545; 4h 20min ago
   Docs: man:chronyd(8)
```

- f. Create a job such that the jenkins master pulls code from github repository which then asks to build (packages) and push the built artifact to the tomcat server.
- In Jenkins, navigate to **Jenkins Dashboard > New item > enter item name (mymaven_P5) > Freestyle project > ok**

- Select **Git**, add **repo url** and **credentials**.

Git ?

Repositories ?

Repository URL ?

git@github.com:kafleaz/mymaven.git

Credentials ?

kafleaz (privatekey1)

+ Add ▾

Advanced ▾

- **Build Trigger > Poll SCM**

☒ Poll SCM ?

Schedule ?

⚠ Do you really mean "every minute" when you say "*****"? Perhaps you meant "H *****" to poll once per hour

Would last have run at Saturday, September 7, 2024 at 10:51:12 PM Nepal Time; would next run at Saturday, September 7, 2024 at 10:51:12 PM Nepal Time.

☐ Ignore post-commit hooks ?

- **Build Steps > Add build step > invoke top-level Maven Targets**

Build Steps

≡ Invoke top-level Maven targets ?

Maven Version

Maven

Goals

package

Advanced ▾

- **Post-build Actions > Add post-build action > Deploy war/ear to a container**

Post-build Actions

≡ Deploy war/ear to a container

WAR/EAR files ?

target/*.war

- **Post-build actions > Add post-build action > Deploy war/ear to a container >Add container > Tomcat 9.x Remote > credentiaials > username >password >Apply > save**

The screenshot shows the 'Containers' configuration section in Jenkins. It features a 'Tomcat 9.x Remote' container configuration. Under the 'Credentials' section, there is a dropdown menu showing 'deployer/*****' and a '+ Add' button. Below this, the 'Tomcat URL' is set to 'http://192.168.10.112:8090'. An 'Advanced' dropdown is visible at the bottom left of the configuration area.

- **Apply > Save**

Step 5: Test The Deployment

- Check Console Output:

```
[INFO] Packaging webapp
[INFO] Assembling webapp [javaweb] in [/var/lib/jenkins/workspace/mymaven_p5/target/javaweb]
[INFO] Processing war project
[INFO] Copying webapp resources [/var/lib/jenkins/workspace/mymaven_p5/src/main/webapp]
[INFO] Building war: /var/lib/jenkins/workspace/mymaven_p5/target/javaweb.war
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 4.320 s
[INFO] Finished at: 2024-09-07T23:54:11+05:45
[INFO] -----
[DeployPublisher][INFO] Attempting to deploy 1 war file(s)
[DeployPublisher][INFO] Deploying /var/lib/jenkins/workspace/mymaven_p5/target/javaweb.war to container Tomcat 9.x Remote with context null
[DeployPublisher][INFO] [/var/lib/jenkins/workspace/mymaven_p5/target/javaweb.war] is not deployed. Doing a fresh deployment.
[DeployPublisher][INFO] Deploying [/var/lib/jenkins/workspace/mymaven_p5/target/javaweb.war]
Finished: SUCCESS
```

- Access the deployed web (Url: 192.168.10.112:8090/javaweb)

