

Case Study

14. Continuous Integration with Simple Code Analysis

- **Concepts Used:** Jenkins, AWS Cloud9, and SonarQube.
- **Problem Statement:** "Set up a Jenkins pipeline using AWS Cloud9 to perform a simple code analysis on a JavaScript file using SonarQube."
- **Tasks:**
 - Create a Jenkins job using AWS Cloud9.
 - Configure the job to integrate with SonarQube for basic code analysis.
 - Run the Jenkins job with a JavaScript file and review the analysis report.

1. Introduction:

Case Study Overview : This case study focuses on implementing a continuous integration (CI) pipeline using Jenkins and SonarQube on an Amazon EC2 instance. Due to access issues with AWS Cloud9, we opted to set up the entire development environment directly on an EC2 instance. The goal is to automate the code analysis process for JavaScript files, enabling developers to identify potential issues early in the development cycle. Continuous integration enhances software quality by ensuring that changes to the codebase are tested and integrated regularly.

Key Features and application:

Automation of Code Quality Checks: Jenkins automatically triggers builds and runs SonarQube checks every time new code is committed, ensuring real-time analysis without manual intervention.

Integration of Tools: GitHub, Jenkins, and SonarQube work together, streamlining the development and review process by continuously inspecting code quality.

Practical Use: This setup is particularly beneficial in agile environments, where rapid development cycles are needed, ensuring code quality remains high without slowing down the release process.

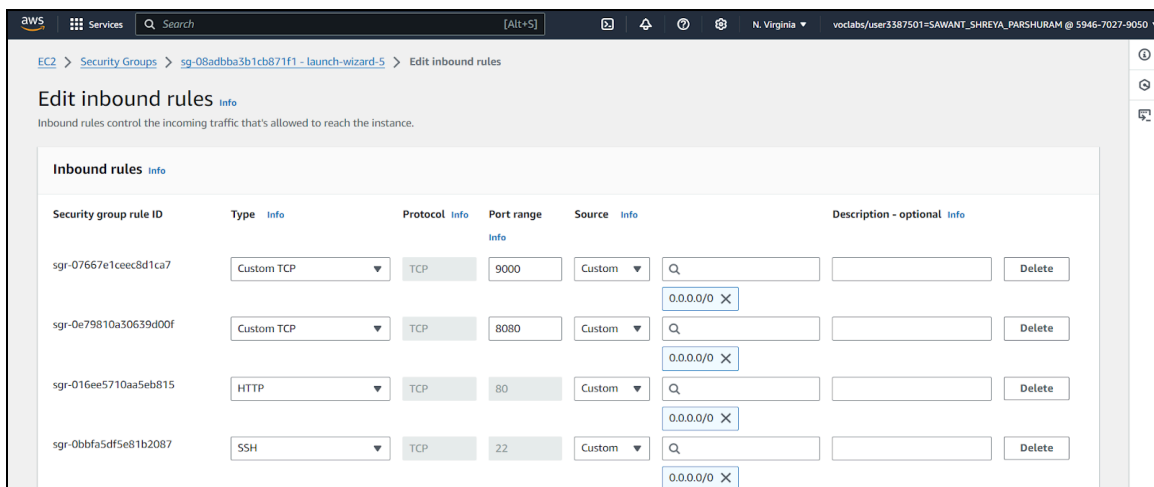
Third-Year Project Integration (Optional):

1. If your third-year project involves **CI/CD pipelines**, this case study demonstrates the importance of **automating builds and code analysis** using cloud-based tools like AWS and Jenkins.
2. If your project is focused on **software quality** or **security**, you can apply similar SonarQube integration to automatically detect vulnerabilities in real time.
3. For projects involving **cloud infrastructure** or **DevOps practices**, the setup in this case study showcases how to leverage cloud services (AWS EC2, Cloud9) for scalable and reliable software development.

2. Step-by-Step Explanation

Allow the following inbound rules on EC2 instance of Jenkins and SonarQube:

- HTTP(port 80): For accessing Jenkins and SonarQube.
- SSH(port22): For secure shell access and SonarQube.
- CustomTCP(port 8080): For accessing Jenkins.
- CustomTCP(port 9000): For accessing sonarqube.



Initial Setup and Configuration 1. Launch a t2.medium EC2 instance with Ubuntu.

2. SSH into the instance using a terminal with the command

Instances (6) Info								
Last updated less than a minute ago			Refresh	Connect	Instance state ▾	Actions ▾	Launch instances ▾	
<input type="text" value="Find Instance by attribute or tag (case-sensitive)"/>			All states ▾		< 1 > Settings			
<input type="checkbox"/>	Name ↗	Instance ID	Instance state ↕	Instance type ↕	Status check	Alarm status	Availability Zone ↕	Public IP
<input type="checkbox"/>	jenkins	i-0e3685cd2f7f65fe0	Running ↗ ↗	t2.micro	2/2 checks passed	View alarms +	us-east-1a	ec2-3-81
<input type="checkbox"/>	sonarqube	i-09943604011ada036	Running ↗ ↗	t2.micro	2/2 checks passed	View alarms +	us-east-1a	ec2-54-

[EC2](#) > [Instances](#) > [i-0e3685cd2f7f65fe0](#) > [Connect to instance](#)

Connect to instance [Info](#)

Connect to your instance i-0e3685cd2f7f65fe0 (jenkins) using any of these options

EC2 Instance Connect

Session Manager

SSH client

EC2 serial console

Instance ID

i-0e3685cd2f7f65fe0 (jenkins)

1. Open an SSH client.

2. Locate your private key file. The key used to launch this instance is my_key_pair.pem

3. Run this command, if necessary, to ensure your key is not publicly viewable.

`chmod 400 "my_key_pair.pem"`

4. Connect to your instance using its Public DNS:

`ec2-3-88-195-101.compute-1.amazonaws.com`

Command copied

`ssh -i "my_key_pair.pem" ubuntu@ec2-3-88-195-101.compute-1.amazonaws.com`

Note: In most cases, the guessed username is correct. However, read your AMI usage instructions to check if the AMI owner has changed the default AMI username.

Step 2: Install Jenkins on EC2 (Ubuntu)

- `ssh -i path/to/your-key.pem ubuntu`
- `sudo apt update`

```
ubuntu@ip-172-31-93-45:~$ sudo apt update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Packages [15.0 MB]
Get:5 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe Translation-en [5982 kB]
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Components [3871 kB]
Get:7 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 c-n-f Metadata [301 kB]
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 Packages [269 kB]
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse Translation-en [118 kB]
Get:11 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 Components [35.0 kB]
Get:12 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 c-n-f Metadata [8328 B]
Get:13 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [599 kB]
Get:14 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main Translation-en [146 kB]
Get:15 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [114 kB]
Get:16 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 c-n-f Metadata [10.3 kB]
Get:17 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [707 kB]
Get:18 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe Translation-en [210 kB]
Get:19 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [305 kB]
Get:20 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 c-n-f Metadata [19.8 kB]
Get:21 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [388 kB]
Get:22 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted Translation-en [74.8 kB]
Get:23 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:24 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Packages [14.7 kB]
Get:25 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse Translation-en [3820 B]
Get:26 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:27 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 c-n-f Metadata [552 B]
Get:28 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [208 B]
```

- `sudo apt install fontconfig openjdk-17-jre`

```
ubuntu@ip-172-31-93-45:~$ sudo apt install fontconfig openjdk-17-jre
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  adwaita-icon-theme alsa-topology-conf alsa-ucm-conf at-spi2-common
  at-spi2-core ca-certificates-java dconf-gsettings-backend dconf-service
  fontconfig-config fonts-dejavu-core fonts-dejavu-extra fonts-dejavu-mono
  gsettings-desktop-schemas gtk-update-icon-cache hicolor-icon-theme
  humanity-icon-theme java-common libasound2-data libasound2t64
  libatk-bridge2.0-0t64 libatk-wrapper-java libatk-wrapper-java-jni
  libatk1.0-0t64 libatspi2.0-0t64 libavahi-client3 libavahi-common-data
  libavahi-common3 libcairo-gobject2 libcairo2 libcups2t64 libdatriel
  libdconf1 libdeflate0 libdrm-amdgpu1 libdrm-intel1 libdrm-nouveau2
  libdrm-radeon1 libfontconfig1 libgail-common libgail18t64
  libgdk-pixbuf2.0-0 libgdk-pixbuf2.0-bin libgdk-pixbuf2.0-common libgif7
  libgl1 libgl1-amdgl-dri libgl1-mesa-dri libglapi-mesa libglvnd0
  libglx-mesa0 libglx0 libgraphite2-3 libgtk2.0-0t64 libgtk2.0-bin
  libgtk2.0-common libharfbuzz0b libice6 libjpeg0 libjpeg-turbo8 libjpeg8
  liblcms2-2 liblerc4 libllvml17t64 libpango-1.0-0 libpangocairo-1.0-0
  libpangoft2-1.0-0 libpciaccess0 libpcsclite1 libpixmap-1-0 librsvg2-2
  librsvg2-common libsharpuyuv0 libsm6 libthai-data libthai0 libtiff6
  libvulkan1 libwayland-client0 libwebp7 libx11-xcb1 libxaw7 libxcb-dri2-0
  libxcb-dri3-0 libxcb-glx0 libxcb-present0 libxcb-randr0 libxcb-render0
  libxcb-shape0 libxcb-shm0 libxcb-sync1 libxcb-xfixes0 libxcompositel
  libxcursor1 libxdamage1 libxfixes3 libxft2 libxi6 libxinerama1
  libxkbfile1 libxmu6 libxpm4 libxrandr2 libxrender1 libxshmfence1
  libxt6t64 libxtst6 libxv1 libxxf86dga1 libxxf86vm1 mesa-vulkan-drivers
  openjdk-17-jre-headless session-migration ubuntu-mono x11-common
  x11-utils
Suggested packages:
  default-jre alsa-utils libasound2-plugins cups-common gvfs
  liblcms2-utils pcsd librsvg2-bin libnss-mdns fonts-ipafont-gothic
  fonts-ipafont-mincho fonts-wqy-microhei | fonts-wqy-zenhei fonts-indic
  mesa-utils
Recommended packages:
  luit
The following NEW packages will be installed:
  adwaita-icon-theme alsa-topology-conf alsa-ucm-conf at-spi2-common
  at-spi2-core ca-certificates-java dconf-gsettings-backend dconf-service
```

Add the Jenkins repository

- `sudo wget -O /usr/share/keyrings/jenkins-keyring.asc \`
`https://pkg.jenkins.io/debian/jenkins.io-2023.key`
- `echo "deb [signed-by=/usr/share/keyrings/jenkins-keyring.asc]" \`
`https://pkg.jenkins.io/debian binary/ | sudo tee \ /etc/apt/sources.list.d/jenkins.list >`
`/dev/null`

```
ubuntu@ip-172-31-93-45:~$ sudo wget -O /usr/share/keyrings/jenkins-keyring.a
sc https://pkg.jenkins.io/debian/jenkins.io-2023.key
echo "deb [signed-by=/usr/share/keyrings/jenkins-keyring.asc] https://pkg.je
nkins.io/debian binary/" | sudo tee /etc/apt/sources.list.d/jenkins.list > /
dev/null
--2024-10-24 09:50:37-- https://pkg.jenkins.io/debian/jenkins.io-2023.key
Resolving pkg.jenkins.io (pkg.jenkins.io)... 146.75.30.133, 2a04:4e42:78::64
5
Connecting to pkg.jenkins.io (pkg.jenkins.io)|146.75.30.133|:443... connecte
d.
HTTP request sent, awaiting response... 200 OK
Length: 3175 (3.1K) [application/pgp-keys]
Saving to: '/usr/share/keyrings/jenkins-keyring.asc'

/usr/share/keyring 100%[=====>] 3.10K --.-KB/s in 0s

2024-10-24 09:50:38 (54.4 MB/s) - '/usr/share/keyrings/jenkins-keyring.asc'
saved [3175/3175]
```

- `sudo apt-get update`

```
ubuntu@ip-172-31-93-45:~$ sudo apt-get update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease
Ign:4 https://pkg.jenkins.io/debian binary/ InRelease
Get:5 https://pkg.jenkins.io/debian binary/ Release [2044 B]
Get:6 https://pkg.jenkins.io/debian binary/ Release.gpg [833 B]
Get:7 https://pkg.jenkins.io/debian binary/ Packages [65.4 kB]
Hit:8 http://security.ubuntu.com/ubuntu noble-security InRelease
Fetched 68.3 kB in 1s (55.3 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-93-45:~$ |
```

- sudo apt-get install jenkins

```
ubuntu@ip-172-31-93-45:~$ sudo apt-get update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease
Ign:4 https://pkg.jenkins.io/debian binary/ InRelease
Get:5 https://pkg.jenkins.io/debian binary/ Release [2044 B]
Get:6 https://pkg.jenkins.io/debian binary/ Release.gpg [833 B]
Get:7 https://pkg.jenkins.io/debian binary/ Packages [65.4 kB]
Hit:8 http://security.ubuntu.com/ubuntu noble-security InRelease
Fetched 68.3 kB in 1s (55.3 kB/s)
Reading package lists... Done
ubuntu@ip-172-31-93-45:~$ |
```

- sudo systemctl start jenkins

```
ubuntu@ip-172-31-93-45:~$ sudo apt-get install jenkins
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  net-tools
The following NEW packages will be installed:
  jenkins net-tools
0 upgraded, 2 newly installed, 0 to remove and 27 not upgraded.
Need to get 94.4 MB of archives.
After this operation, 96.9 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 net-to
ols amd64 2.10-0.1ubuntu4 [204 kB]
Get:2 https://pkg.jenkins.io/debian binary/ jenkins 2.482 [94.2 MB]
Fetched 94.4 MB in 2s (39.0 MB/s)
Selecting previously unselected package net-tools.
(Reading database ... 82524 files and directories currently installed.)
Preparing to unpack .../net-tools_2.10-0.1ubuntu4_amd64.deb ...
Unpacking net-tools (2.10-0.1ubuntu4) ...
Selecting previously unselected package jenkins.
Preparing to unpack .../archives/jenkins_2.482_all.deb ...
Unpacking jenkins (2.482) ...
Setting up net-tools (2.10-0.1ubuntu4) ...
Setting up jenkins (2.482) ...
Created symlink /etc/systemd/system/multi-user.target.wants/jenkins.service
→ /usr/lib/systemd/system/jenkins.service.
Processing triggers for man-db (2.12.0-4build2) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.
No services need to be restarted.
No containers need to be restarted.
No user sessions are running outdated binaries.
```

- sudo systemctl enable jenkins • sudo systemctl status jenkins

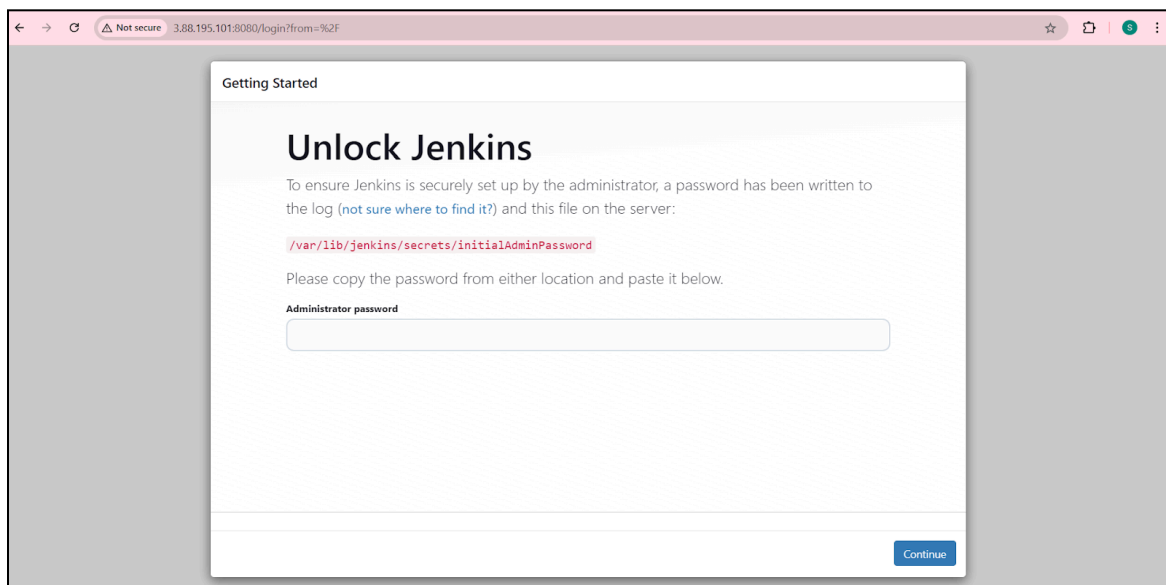
Shreya Sawant

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```
ubuntu@ip-172-31-93-45:~$ sudo systemctl start jenkins
ubuntu@ip-172-31-93-45:~$ sudo systemctl enable jenkins
Synchronizing state of jenkins.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable jenkins
ubuntu@ip-172-31-93-45:~$ sudo systemctl status jenkins
● jenkins.service - Jenkins Continuous Integration Server
   Loaded: loaded (/usr/lib/systemd/system/jenkins.service; enabled; preset)
   Active: active (running) since Thu 2024-10-24 09:52:59 UTC; 1min 28s ago
   Main PID: 4090 (java)
    Tasks: 38 (limit: 1130)
   Memory: 294.6M (peak: 372.9M)
      CPU: 15.203s
   CGroup: /system.slice/jenkins.service
           └─4090 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/

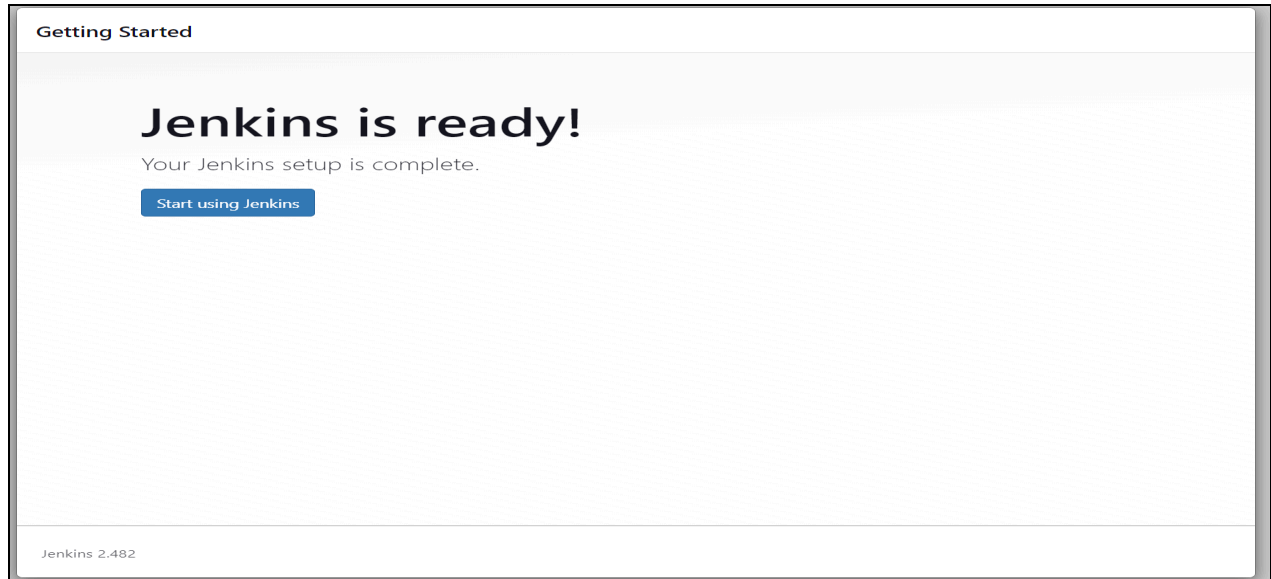
Oct 24 09:52:54 ip-172-31-93-45 jenkins[4090]: ec7b262b26cd45aeac086bce0218
Oct 24 09:52:54 ip-172-31-93-45 jenkins[4090]: This may also be found at: />
Oct 24 09:52:54 ip-172-31-93-45 jenkins[4090]: *****
Oct 24 09:52:54 ip-172-31-93-45 jenkins[4090]: *****
Oct 24 09:52:54 ip-172-31-93-45 jenkins[4090]: *****
Oct 24 09:52:59 ip-172-31-93-45 jenkins[4090]: 2024-10-24 09:52:59.890+0000
Oct 24 09:52:59 ip-172-31-93-45 jenkins[4090]: 2024-10-24 09:52:59.925+0000
Oct 24 09:52:59 ip-172-31-93-45 systemd[1]: Started jenkins.service - Jenki>
Oct 24 09:53:00 ip-172-31-93-45 jenkins[4090]: 2024-10-24 09:53:00.071+0000
Oct 24 09:53:00 ip-172-31-93-45 jenkins[4090]: 2024-10-24 09:53:00.072+0000
lines 1-20/20 (END)
```

Open a browser and navigate to <http://:8080>.

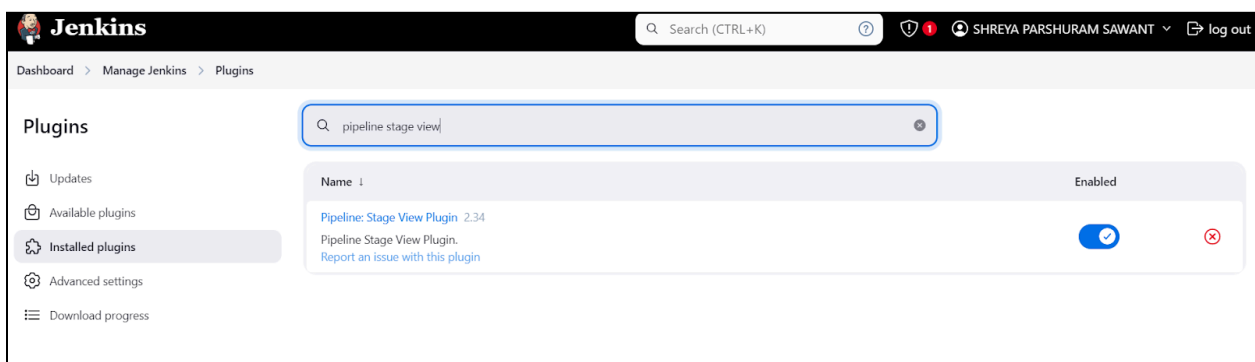
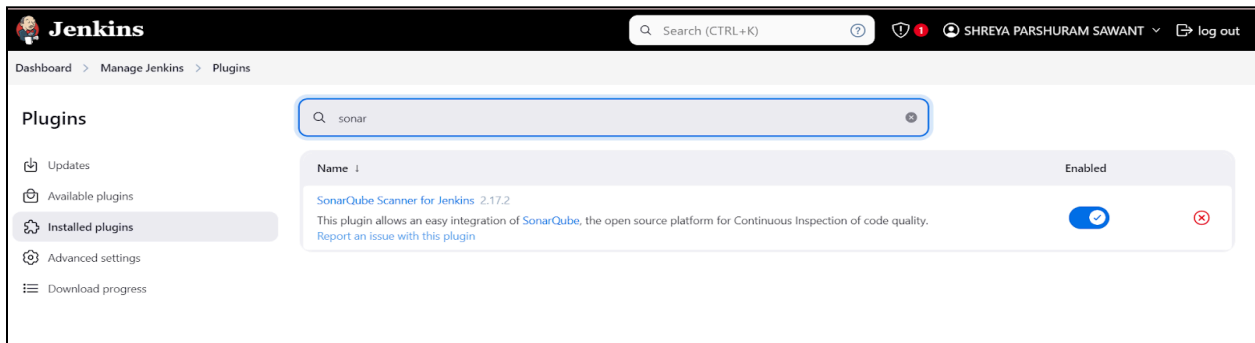


- `sudo cat /var/lib/jenkins/secrets/initialAdminPassword`

```
ubuntu@ip-172-31-93-45:~$ sudo cat /var/lib/jenkins/secrets/initialAdminPas
sword
ec7b262b26cd45aeac086bce0218cbd7
ubuntu@ip-172-31-93-45:~$ |
```



1. Install SonarQube Scanner Plugin in Jenkins:



Step 3: Install Sonarqube in new EC2 (Ubuntu)

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```
C:\Users\sawan>cd downloads

C:\Users\sawan\Downloads>ssh -i "my_key_pair.pem" ubuntu@ec2-54-197-22-197.compute-1.amazonaws.com
The authenticity of host 'ec2-54-197-22-197.compute-1.amazonaws.com (54.197.22.197)' can't be established.
ED25519 key fingerprint is SHA256:R7GwZgYj/tXiTjNZYaWhhw+9VE5KvyCRHMIzez832H4.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? y
Please type 'yes', 'no' or the fingerprint: yes
Warning: Permanently added 'ec2-54-197-22-197.compute-1.amazonaws.com' (ED25519) to the list of known hosts
Welcome to Ubuntu 24.04.1 LTS (GNU/Linux 6.8.0-1016-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro

System information as of Thu Oct 24 10:28:09 UTC 2024

System load:  0.08          Processes:           103
Usage of /:   23.0% of 6.71GB    Users logged in:    0
Memory usage: 20%          IPv4 address for enX0: 172.31.83.122
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
```

```
ubuntu@ip-172-31-83-122:~$ sudo apt update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease [18.0 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease [18.0 kB]
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Packages [91.9 MB]
Get:5 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe Translation amd64 [60.9 kB]
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Comp [60.9 kB]
Get:7 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 c-n-f [60.9 kB]
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 Packages [60.9 kB]
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse Translation amd64 [60.9 kB]
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 Comp [60.9 kB]
Get:11 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 c-n-f [60.9 kB]
Get:12 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [91.9 MB]
Get:13 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main Translation amd64 [60.9 kB]
Get:14 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 Comp [60.9 kB]
Get:15 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 c-n-f [60.9 kB]
Get:16 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [91.9 MB]
Get:17 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe Translation amd64 [60.9 kB]
Get:18 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Comp [60.9 kB]
Get:19 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 c-n-f [60.9 kB]
Get:20 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [91.9 MB]
Get:21 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted Translation amd64 [60.9 kB]
Get:22 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Comp [60.9 kB]
Get:23 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Packages [91.9 MB]
Get:24 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse Translation amd64 [60.9 kB]
Get:25 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Comp [60.9 kB]
Get:26 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 c-n-f [60.9 kB]
Get:27 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/main amd64 Packages [91.9 MB]
Get:28 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/main Translation amd64 [60.9 kB]
Get:29 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Packages [91.9 MB]
Get:30 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/universe Translation amd64 [60.9 kB]
Get:31 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Comp [60.9 kB]
Get:32 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/universe amd64 c-n-f [60.9 kB]
Get:33 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Packages [91.9 MB]
Get:34 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/restricted Translation amd64 [60.9 kB]
Get:35 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Comp [60.9 kB]
Get:36 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Packages [91.9 MB]
```

2. Install OpenJDK 11- install java development kit 11 or higher version as now

udo apt install-y openjdk-11-jdk


```

ubuntu@ip-172-31-83-122:~$ sudo apt install -y openjdk-11-jdk
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  alsa-topology-conf alsa-ucm-conf at-spi2-common at-spi2-core
  ca-certificates-java dconf-gsettings-backend dconf-service
  fontconfig-config fonts-dejavu-core fonts-dejavu-extra fonts-dejavu-mono
  gsettings-desktop-schemas java-common libasound2-data libasound2t64
  libatk-bridge2.0-0t64 libatk-wrapper-java libatk-wrapper-java-jni
  libatk1.0-0t64 libatspi2.0-0t64 libavahi-client3 libavahi-common-data
  libavahi-common3 libcups2t64 libdconf1 libdrm-amdgpu1 libdrm-intel1
  libdrm-nouveau2 libdrm-radeon1 libfontconfig1 libgif7 libgl1
  libgl1-amd-glx libgl1-mesa-dri libglapi-mesa libglvnd0 libglx-mesa0
  libglx0 libgraphite2-3 libharfbuzz0b libice-dev libice6 libjpeg-turbo8
  libjpeg8 liblcms2-2 libllvm17t64 libpciaccess0 libpcsclite1
  libpthread-stubs0-dev libsm-dev libsm6 libvulkan1 libwayland-client0
  libx11-dev libx11-xcb1 libxau-dev libxaw7 libxcb-dri2-0 libxcb-dri3-0
  libxcb-glx0 libxcb-present0 libxcb-randr0 libxcb-shape0 libxcb-shm0
  libxcb-sync1 libxcb-xf86vm0 libxcb1-dev libxcomposite1 libxdmcp-dev
  libxfixes3 libxft2 libxi6 libxinerama1 libxkbfile1 libxmu6 libxpm4
  libxrandr2 libxrender1 libxshmfence1 libxt-dev libxt6t64 libxtst6 libxv1
  libxxf86dga1 libxxf86vm1 mesa-vulkan-drivers openjdk-11-jdk-headless
  openjdk-11-jre openjdk-11-jre-headless session-migration x11-common
  x11-utils x11proto-dev xorg-sgml-doctools xtrans-dev
Suggested packages:
  default-jre alsa-utils libasound2-plugins cups-common libice-doc
  liblcms2-utils pcsd libsm-doc libx11-doc libxcb-doc libxt-doc
  openjdk-11-demo openjdk-11-source visualvm libnss-mdns
  fonts-ipafont-gothic fonts-ipafont-mincho fonts-wqy-microhei
  | fonts-wqy-zenhei fonts-indic mesa-utils
Recommended packages:
  luit
The following NEW packages will be installed:
  alsa-topology-conf alsa-ucm-conf at-spi2-common at-spi2-core
  ca-certificates-java dconf-gsettings-backend dconf-service
  fontconfig-config fonts-dejavu-core fonts-dejavu-extra fonts-dejavu-mono
  gsettings-desktop-schemas java-common libasound2-data libasound2t64
  libatk-bridge2.0-0t64 libatk-wrapper-java libatk-wrapper-java-jni

```

3. Install and Configure PostgreSQL

```

ubuntu@ip-172-31-83-122:~$ sudo apt install -y postgresql postgresql-contrib
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libcommon-sense-perl libjson-perl libjson-xs-perl libpq5
  libtypes-serialiser-perl postgresql-16 postgresql-client-16
  postgresql-client-common postgresql-common ssl-cert
Suggested packages:
  postgresql-doc postgresql-doc-16
The following NEW packages will be installed:
  libcommon-sense-perl libjson-perl libjson-xs-perl libpq5
  libtypes-serialiser-perl postgresql postgresql-16 postgresql-client-16
  postgresql-client-common postgresql-common postgresql-contrib ssl-cert
0 upgraded, 12 newly installed, 0 to remove and 27 not upgraded.
Need to get 17.3 MB of archives.
After this operation, 50.8 MB of additional disk space will be used.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libjson-p
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 p
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 ssl-cert
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 p
Get:5 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libcommor
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libtypes-
Get:7 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libjson-
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 l
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 p
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64
Get:11 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64
Get:12 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64
Fetched 17.3 MB in 0s (68.8 MB/s)
Preconfiguring packages ...
Selecting previously unselected package libjson-perl.
(Reading database ... 70476 files and directories currently installed.)

```

- `sudo sh-c 'echo "deb http://apt.postgresql.org/pub/repos/apt/ `lsb_release -cs`-pgdg main" >> /etc/apt/sources.list.d/pgdg.list'` Add PostgreSQL signing key.
- `wget-q`

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<https://www.postgresql.org/media/keys/ACCC4CF8.asc-O-> | sudo apt-key add Install PostgreSQL.

```
ubuntu@ip-172-31-83-122:~$ sudo systemctl enable postgresql
Synchronizing state of postgresql.service with SysV service script with /usr/l
Executing: /usr/lib/systemd/systemd-sysv-install enable postgresql
ubuntu@ip-172-31-83-122:~$ sudo systemctl start postgresql
ubuntu@ip-172-31-83-122:~$ sudo passwd postgres
New password:
Retype new password:
passwd: password updated successfully
ubuntu@ip-172-31-83-122:~$ su- postgres
Command 'su-' not found, did you mean:
  command 'sum' from deb coreutils (9.4-2ubuntu2)
  command 'sup' from deb sup (20100519-3)
  command 'sur' from deb subtle (0.11.3224-xi-2.2build5)
  command 'sul' from deb hxttools (20231101-1)
  command 'su' from deb util-linux (2.39.3-9ubuntu6.1)
Try: sudo apt install <deb name>
```

- sudo apt install-y postgresql postgresql-contrib

Enable DB server to start automatically on reboot. • su- postgres

```
ubuntu@ip-172-31-83-122:~$ su - postgres
Password:
postgres@ip-172-31-83-122:~$ createuser shreya
postgres@ip-172-31-83-122:~$ psql
psql (16.4 (Ubuntu 16.4-0ubuntu0.24.04.2))
Type "help" for help.

postgres=#
postgres=# help
You are using psql, the command-line interface to PostgreSQL.
Type:  \copyright for distribution terms
       \h for help with SQL commands
       \? for help with psql commands
       \g or terminate with semicolon to execute query
       \q to quit
postgres=# \q
postgres@ip-172-31-83-122:~$ createuser shreya
createuser: error: creation of new role failed: ERROR:  role "shreya" already
postgres@ip-172-31-83-122:~$ psql
psql (16.4 (Ubuntu 16.4-0ubuntu0.24.04.2))
Type "help" for help.

postgres=# ALTER USER sonar WITH ENCRYPTED PASSWORD 'shreya444';
CREATE DATABASE sonarqube OWNER sonar;
GRANT ALL PRIVILEGES ON DATABASE sonarqube TO sonar;
ERROR:  role "sonar" does not exist
ERROR:  role "sonar" does not exist
ERROR:  database "sonarqube" does not exist
postgres=# ALTER USER shreya WITH ENCRYPTED PASSWORD 'shreya444';
CREATE DATABASE sonarqube OWNER shreya;
GRANT ALL PRIVILEGES ON DATABASE sonarqube TO shreya;
ALTER ROLE
CREATE DATABASE
GRANT
postgres=# \q
postgres@ip-172-31-83-122:~$ exit
logout
```

```
ubuntu@ip-172-31-83-122:~$ sudo wget https://binaries.sonarsource.com/Distribution/sonarqube/sonarqube-9.0.1.46107.zip
--2024-10-24 10:49:35-- https://binaries.sonarsource.com/Distribution/sonarqube/sonarqube-9.0.1.46107.zip
Resolving binaries.sonarsource.com (binaries.sonarsource.com)... 99.84.191.87, 99.84.191.71, 99.84.191.75, ...
Connecting to binaries.sonarsource.com (binaries.sonarsource.com)|99.84.191.87|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 290201762 (277M) [application/zip]
Saving to: 'sonarqube-9.0.1.46107.zip'

sonarqube-9.0.1.46 100%[=====>] 276.76M  114MB/s   in 2.4s

2024-10-24 10:49:38 (114 MB/s) - 'sonarqube-9.0.1.46107.zip' saved [290201762/290201762]
```

```
ubuntu@ip-172-31-83-122:~$ sudo unzip sonarqube-9.0.1.46107.zip
Archive:  sonarqube-9.0.1.46107.zip
  creating: sonarqube-9.0.1.46107/
  creating: sonarqube-9.0.1.46107/bin/
  creating: sonarqube-9.0.1.46107/bin/jsr-license/
  inflating: sonarqube-9.0.1.46107/bin/jsr-license/LICENSE.txt
  creating: sonarqube-9.0.1.46107/bin/windows-x86-64/
  inflating: sonarqube-9.0.1.46107/bin/windows-x86-64/StopNTService.bat
  creating: sonarqube-9.0.1.46107/bin/windows-x86-64/lib/
  inflating: sonarqube-9.0.1.46107/bin/windows-x86-64/lib/wrapper.dll
  inflating: sonarqube-9.0.1.46107/bin/windows-x86-64/StartSonar.bat
  inflating: sonarqube-9.0.1.46107/bin/windows-x86-64/wrapper.exe
  inflating: sonarqube-9.0.1.46107/bin/windows-x86-64/StartNTService.bat
  creating: sonarqube-9.0.1.46107/bin/macosx-universal-64/
  creating: sonarqube-9.0.1.46107/bin/macosx-universal-64/lib/
  inflating: sonarqube-9.0.1.46107/bin/macosx-universal-64/lib/libwrapper.jn
  inflating: sonarqube-9.0.1.46107/bin/macosx-universal-64/wrapper
  inflating: sonarqube-9.0.1.46107/bin/macosx-universal-64/sonar.sh
  creating: sonarqube-9.0.1.46107/bin/linux-x86-64/
  creating: sonarqube-9.0.1.46107/bin/linux-x86-64/lib/
  inflating: sonarqube-9.0.1.46107/bin/linux-x86-64/lib/libwrapper.so
  inflating: sonarqube-9.0.1.46107/bin/linux-x86-64/wrapper
  inflating: sonarqube-9.0.1.46107/bin/linux-x86-64/sonar.sh
  creating: sonarqube-9.0.1.46107/extensions/
  creating: sonarqube-9.0.1.46107/extensions/jdbc-driver/
  creating: sonarqube-9.0.1.46107/extensions/jdbc-driver/oracle/
  inflating: sonarqube-9.0.1.46107/extensions/jdbc-driver/oracle/README.txt

  creating: sonarqube-9.0.1.46107/extensions/plugins/
  inflating: sonarqube-9.0.1.46107/extensions/plugins/README.txt
  inflating: sonarqube-9.0.1.46107/COPYING
  creating: sonarqube-9.0.1.46107/logs/
  inflating: sonarqube-9.0.1.46107/logs/README.txt
  creating: sonarqube-9.0.1.46107/temp/
  inflating: sonarqube-9.0.1.46107/temp/README.txt
  creating: sonarqube-9.0.1.46107/data/
```

```

sonarqube
GNU nano 7.2 /opt/sonarqube/conf/sonar.properties *
# Property values can:
# - be overridden by environment variables. The name of the corresponding e
#   upper-cased name of the property where all the dot ('.') and dash ('-')
#   underscores ('_'). For example, to override 'sonar.web.systemPasscode'
# - be encrypted. See https://redirect.sonarsource.com/doc/settings-encrypt
#-----
# DATABASE
#
# IMPORTANT:
# - The embedded H2 database is used by default. It is recommended for test
#   production use. Supported databases are Oracle, PostgreSQL and Microsof
# - Changes to database connection URL (sonar.jdbc.url) can affect SonarSou
# User credentials.
# Permissions to create tables, indices and triggers must be granted to JDB
# The schema must be created first.
sonar.jdbc.username=sonar
sonar.jdbc.password=my_strong_password
sonar.jdbc.url=jdbc:postgresql://localhost:5432/sonarqube
#----- Embedded Database (default)
# H2 embedded database server listening port, defaults to 9092
#sonar.embeddedDatabase.port=9092

#----- Oracle 12c/18c/19c
# The Oracle JDBC driver must be copied into the directory extensions/jdbc-
# Only the thin client is supported, and we recommend using the latest Orac
# https://jira.sonarsource.com/browse/SONAR-9758 for more details.
# If you need to set the schema, please refer to http://jira.sonarsource.co
#sonar.jdbc.url=jdbc:oracle:thin:@localhost:1521/XE

#----- PostgreSQL 9.6 or greater
# By default the schema named "public" is used. It can be overridden with t
^G Help      ^O Write Out  ^W Where Is   ^K Cut        ^T Execute
^X Exit      ^R Read File  ^\ Replace    ^U Paste      ^J Justify

```

```

GNU nano 7.2
[Unit]
Description=SonarQube service
After=network.target

[Service]
Type=forking
ExecStart=/opt/sonarqube/bin/linux-x86-64/sonar.sh start
ExecStop=/opt/sonarqube/bin/linux-x86-64/sonar.sh stop
User=shreya
Group=sonar
Restart=always

[Install]
WantedBy=multi-user.target

```

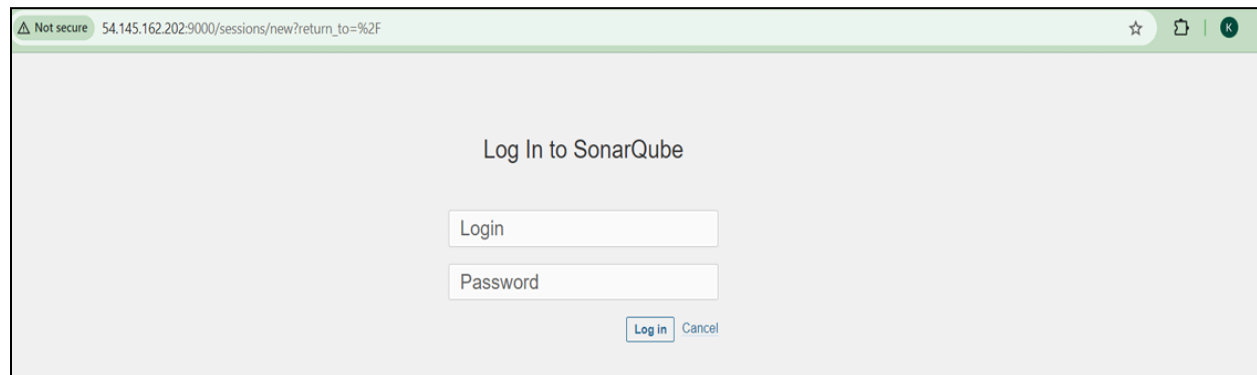
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```
ubuntu@ip-172-31-44-178:~$ sudo systemctl daemon-reload
sudo systemctl restart sonar
sudo systemctl status sonar
● sonar.service - SonarQube service
   Loaded: loaded (/etc/systemd/system/sonar.service; enabled; preset: en>
   Active: active (running) since Thu 2024-10-24 13:40:51 UTC; 30ms ago
   Main PID: 15640 (sonar.sh)
     Tasks: 4 (limit: 1130)
    Memory: 512.0K (peak: 872.0K)
       CPU: 10ms
    CGroup: /system.slice/sonar.service
            └─15640 /bin/sh /opt/sonarqube/bin/linux-x86-64/sonar.sh start
              └─15660 /bin/sh /opt/sonarqube/bin/linux-x86-64/sonar.sh start
                └─15662 sed -e "s;;; ;g"

Oct 24 13:40:51 ip-172-31-44-178 systemd[1]: Started sonar.service - SonarQ>
lines 1-13/13 (END)
```

Open a browser and navigate to <http://<IP ADDRESS>:9000>.



Log In to SonarQube

Login

Password

Log In Cancel

Integrate Jenkins with SonarQube 1. Generate authentication token: Generate a token in SonarQube by going to My Account → Security → Generate Tokens.

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There's a new version of SonarQube available. Upgrade to the latest active version to access new updates and features. [Learn More](#)

sonarqube Projects Issues Rules Quality Profiles Quality Gates Administration More Q

A Administrator

Profile Security Notifications Projects

Security

If you want to enforce security by not providing credentials of a real SonarQube user to run your code scan or to invoke web services, you can provide a User Token as a replacement of the user login. This will increase the security of your installation by not letting your analysis user's password going through your network.

Generate Tokens

Name **Type** **Expires in**

✔ New token "token" has been created. Make sure you copy it now, you won't be able to see it again!

`sqa_ddb37530e18947b4657de7c32a2148dde2a6a8ec`

Name	Type	Project	Last use	Created	Expiration
token	Global		Never	October 21, 2024	November 20, 2024

[Revoke](#)

Create Pipeline project

Select an item type

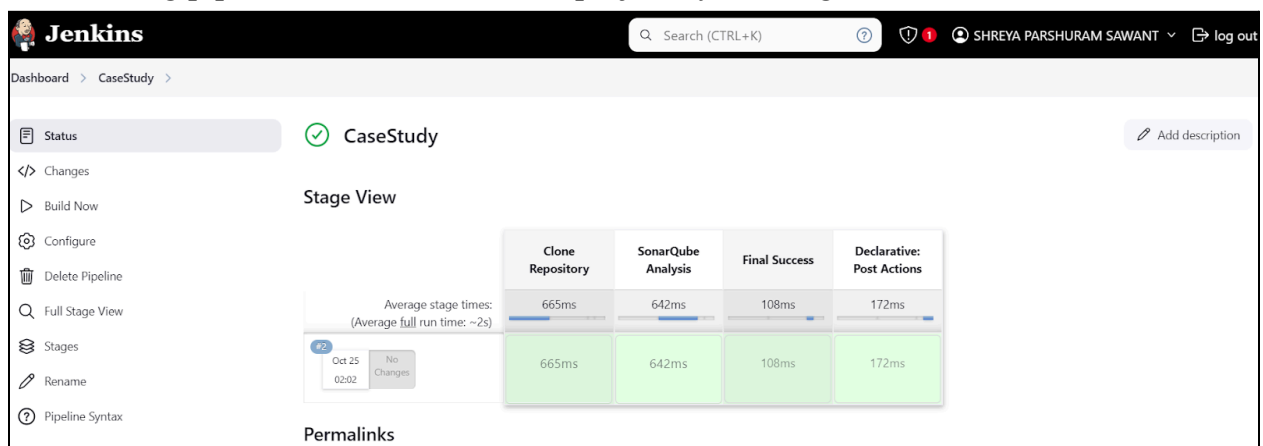
- Freestyle project**
Classic, general-purpose job type that checks out from up to one SCM, executes build steps serially, followed by post-build steps like archiving artifacts and sending email notifications.
- Pipeline**
Orchestrates long-running activities that can span multiple build agents. Suitable for building pipelines (formerly known as workflows) and/or organizing complex activities that do not easily fit in free-style job type.
- Multi-configuration project**
Suitable for projects that need a large number of different configurations, such as testing on multiple environments, platform-specific builds, etc.
- Folder**
Creates a container that stores nested items in it. Useful for grouping things together. Unlike view, which is just a filter, a folder creates a separate namespace, so you can have multiple things of the same name as long as they are in different

For Continuous Integration: 1) Configure GitHub Webhook: a) Goto your GitHub repository. → Navigate to Settings > Webhooks → Click Add webhook

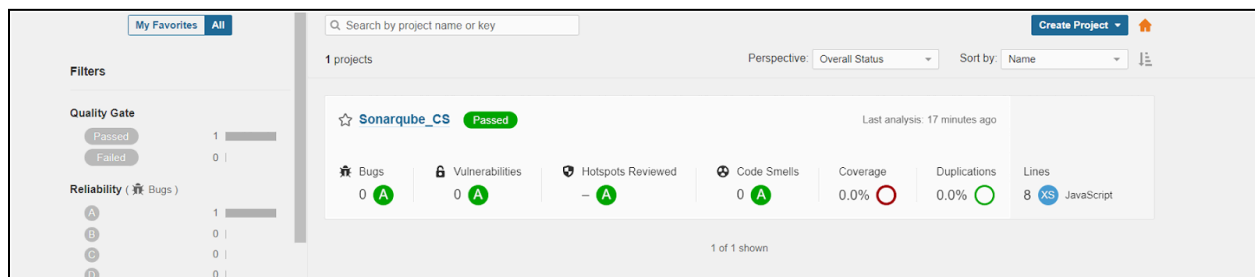
The screenshot shows the GitHub repository settings for 'case_study' under the 'Webhooks' tab. The left sidebar contains a navigation menu with options like General, Access, Collaborators, Moderation options, Code and automation, Rules, Actions, Webhooks (selected), Environments, Codespaces, Pages, Security, Code security, Deploy keys, and Secrets and variables. The main content area is titled 'Webhooks / Add webhook'. It includes a description of webhooks, a 'Payload URL' field with the value 'https://example.com/postreceive', a 'Content type' dropdown set to 'application/x-www-form-urlencoded', a 'Secret' field, and an 'SSL verification' section with 'Enable SSL verification' selected. At the bottom, there is a section for 'Which events would you like to trigger this webhook?' with a radio button for 'Just the push event'.

The screenshot shows the GitHub repository settings for 'Ad.CaseStudy' under the 'Webhooks' tab. The left sidebar is similar to the previous screenshot. The main content area is titled 'Webhooks' and shows a confirmation message: 'Okay, that hook was successfully created. We sent a ping payload to test it out! Read more about it at https://docs.github.com/webhooks/#ping-event.' Below this, there is a table with one row showing a webhook with the URL 'http://34.227.9.231:8080/github-w...' and a status of '(push)'. The table has 'Edit' and 'Delete' buttons. An 'Add webhook' button is also present.

After adding pipeline : Save it and Build project by clicking Build Now



Then check sonarqube-



Conclusion

This case study showcases the implementation of a Continuous Integration (CI) pipeline using Jenkins, SonarQube, and AWS Cloud9, which automates code quality checks and enhances the development workflow. The integration of Jenkins with SonarQube provides real-time feedback on code vulnerabilities, bugs, and improvements, ensuring cleaner and more secure code. By utilizing AWS EC2 for hosting and GitHub for version control, this setup offers flexibility and scalability for modern software development.

Automating code analysis reduces manual effort, allowing developers to focus more on innovation rather than routine checks. This approach fits well with agile methodologies, where rapid iteration and continuous improvement are key. Early detection of issues ensures that the software maintains high standards of quality, security, and performance throughout its lifecycle.

In summary, the tools and methods used here offer an efficient solution for teams to streamline development, improve code quality, and boost productivity in a cloud-based environment.