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.

Importance of Continuous Integration

Continuous Integration streamlines the development process by encouraging developers to commit their changes regularly. The advantages of CI include:

- **Early Detection of Errors:** Frequent integration leads to early detection of bugs, reducing the cost and effort needed for fixes.
- **Improved Software Quality:** Automated testing and code analysis contribute to higher code quality and maintainability.
- **Faster Feedback Loop:** Developers receive immediate feedback on their code, enabling quicker iterations and adjustments.
- **Enhanced Collaboration:** CI fosters better communication among team members by ensuring that everyone is working with the latest code.

2 . Key Feature and Application

The primary feature of this case study is the integration of Jenkins with SonarQube for automated code analysis. By utilizing this CI pipeline, developers can receive immediate feedback on code quality, security vulnerabilities, and code smells. This practical application helps teams maintain high code standards and facilitates quicker identification and resolution of issues, ultimately improving overall project delivery.

Automated Quality Checks: SonarQube analyzes the codebase and reports on issues such as bugs, vulnerabilities, and code smells, providing developers with actionable insights.

Customizable Quality Gates: Teams can define quality gates that must be met before code changes can be merged, ensuring adherence to coding standards.

Visual Reports: SonarQube offers dashboards that visualize code quality metrics, making it easier for teams to monitor and improve their codebase over time.

3 . Third-Year Project Integration

This case study can be linked to third-year project by incorporating automated code analysis into your existing development practices. By adopting CI/CD principles, we can improve the maintainability and reliability of your project, ultimately aligning it with industry standards.

To incorporate this case study into your third-year project's workflow:

1. **Set Up Jenkins and SonarQube:** On an EC2 instance or local environment, set up Jenkins and SonarQube as demonstrated in your case study.
2. **GitHub Integration:** Configure Jenkins to monitor your project's GitHub repository. Each time a new feature or bug fix is pushed, the CI pipeline will automatically trigger.
3. **Code Analysis as a Standard Practice:** Enforce regular code reviews with SonarQube analysis before merging any code changes into the main project branch.
4. **Documentation:** Document this integration in your project report, emphasizing the improvements in code quality, reduced manual testing, and faster feedback cycles.

4 . Tools Used

SAST Overview

SAST (Static Application Security Testing) is a method of security testing that analyzes the source code of an application to identify vulnerabilities and security issues without executing the program. It involves examining the code, configurations, and dependencies early in the development process to detect issues like SQL injection, cross-site scripting (XSS), buffer overflows, and insecure coding practices.

- **Early Detection:** SAST identifies vulnerabilities before the code is compiled or executed, allowing developers to fix issues earlier in the development lifecycle.
- **White-box Testing:** It has full access to the application's source code and inspects it for security flaws.
- **Automated Analysis:** Tools scan the codebase, providing detailed reports on potential issues such as security vulnerabilities, coding errors, and adherence to best practices.

SAST is commonly integrated into CI/CD pipelines to ensure continuous security checks and improve code quality.

Jenkins Overview

Jenkins is an open-source automation server widely used for Continuous Integration and Continuous Delivery (CI/CD). It provides a framework for building, testing, and deploying applications. Some key features of Jenkins include:

- **Extensibility:** Jenkins supports a wide range of plugins, allowing it to integrate with various tools and technologies.
- **Distributed Builds:** Jenkins can distribute build tasks across multiple machines, improving performance and scalability.
- **User-Friendly Interface:** Its web-based interface makes it easy for users to configure jobs, monitor builds, and view results.

SonarQube Overview

SonarQube is an open-source platform for continuous inspection of code quality. It performs automatic reviews of code to detect bugs, code smells, and security vulnerabilities. Key aspects of SonarQube include:

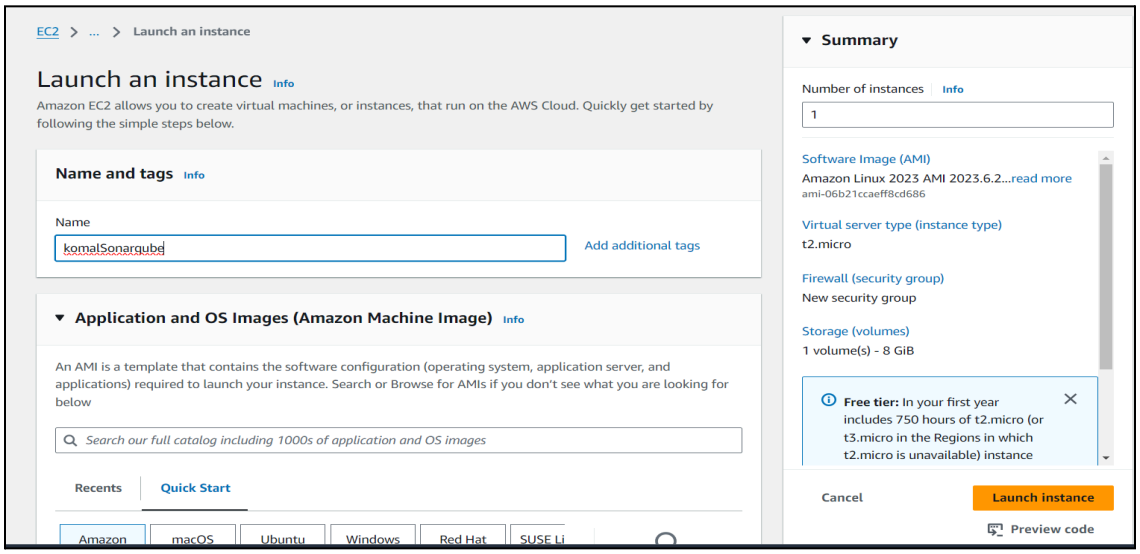
- **Multi-Language Support:** SonarQube supports multiple programming languages, making it versatile for diverse projects.
- **Quality Gates:** Teams can define quality gates that evaluate the code based on metrics like code coverage, duplications, and maintainability.
- **Integration Capabilities:** SonarQube can be easily integrated with CI tools like Jenkins to automate code analysis during the build process.

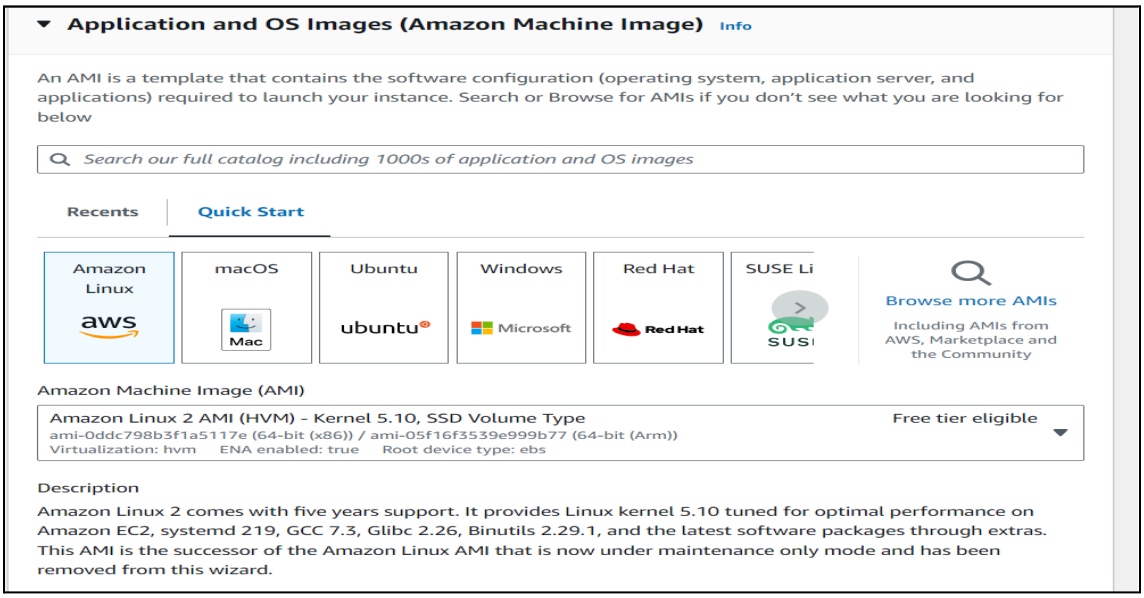
Step-by-step Explanation

Step 1: Initial Setup and Configuration

1. **Set Up EC2 Instances for jenkins and sonarqube:**
   - Launch a new EC2 instance using Amazon Linux 2.
   - Ensure the instance has the necessary security groups to allow inbound traffic on relevant ports (e.g., 8080 for Jenkins, 9000 for SonarQube).

EC2 instance for Sonarqube with configuration :
(Os image : Amazon linux 2, Instance type : T2.small, Allow SSH traffic from : My ip , also select or create key-pair)





Instance type Info | Get advice

Instance type

t2.small
Family: t2 1 vCPU 2 GiB Memory Current generation: true
On-Demand Windows base pricing: 0.032 USD per Hour
On-Demand Linux base pricing: 0.023 USD per Hour
On-Demand RHEL base pricing: 0.0376 USD per Hour
On-Demand SUSE base pricing: 0.053 USD per Hour

All generations

Compare instance types

Additional costs apply for AMIs with pre-installed software

Key pair (login) Info

You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.

Key pair name - *required*

sonar-key

Create new key pair

Network Info

vpc-014f21aed2a85fb2e

Subnet Info

No preference (Default subnet in any availability zone)

Auto-assign public IP Info

Enable

Additional charges apply when outside of free tier allowance

Firewall (security groups) Info

A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.

Create security group | Select existing security group

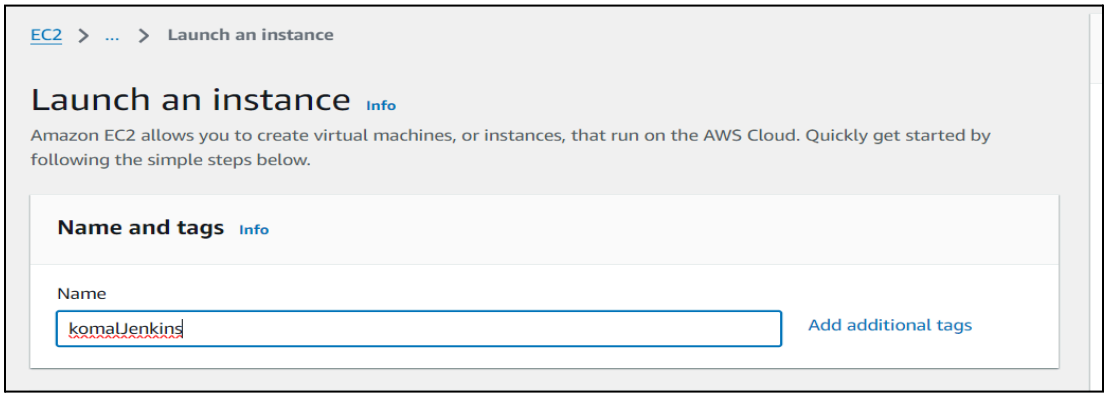
We'll create a new security group called '**launch-wizard-2**' with the following rules:

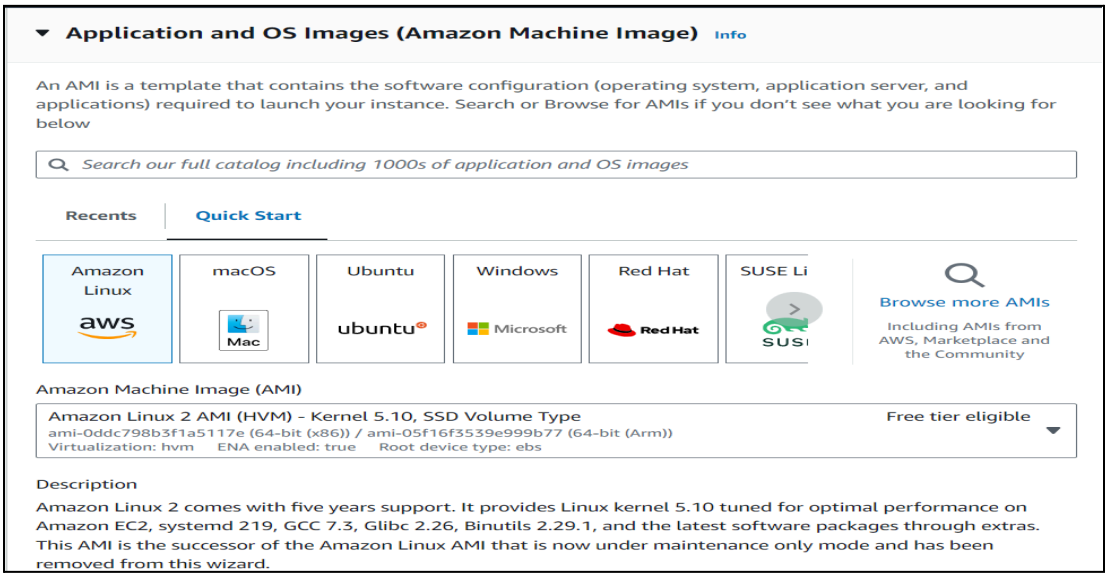
- [x] Allow SSH traffic from
  Helps you connect to your instance
  My IP
  152.58.51.21/32
- [ ] Allow HTTPS traffic from the internet
  To set up an endpoint, for example when creating a web server
- [ ] Allow HTTP traffic from the internet
  To set up an endpoint, for example when creating a web server

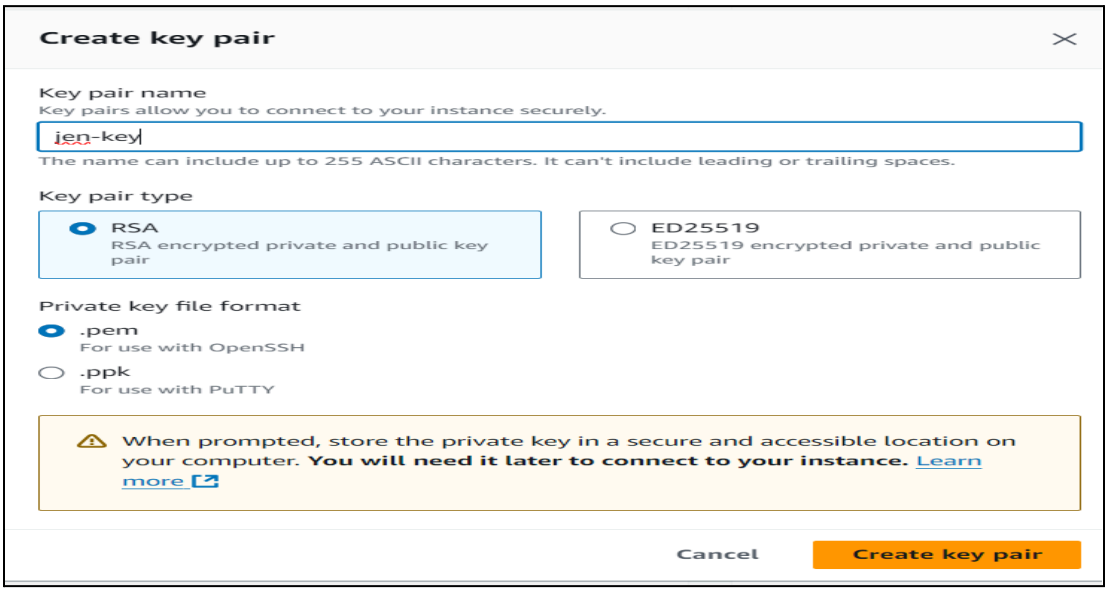
EC2 > ... > Launch an instance

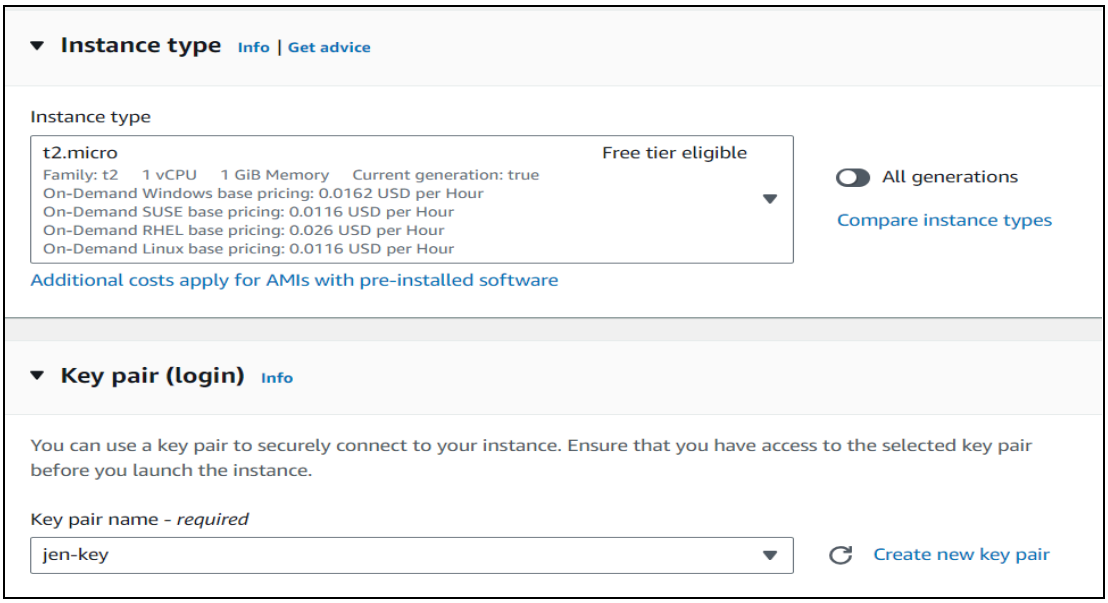
Success
Successfully initiated launch of instance (i-06bc7734629d9416a)

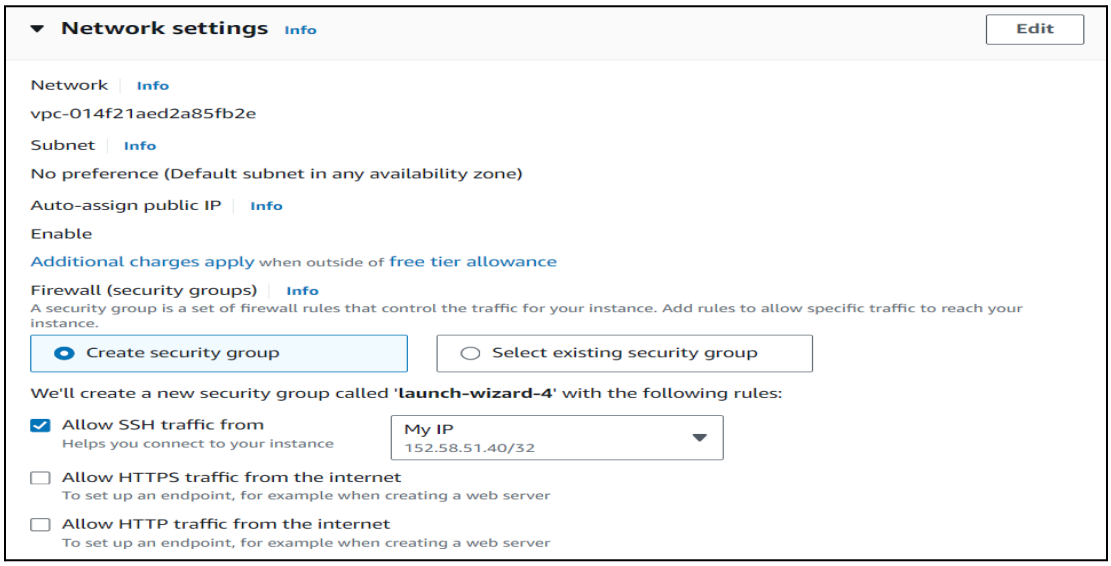
EC2 instance for Jenkins with configuration :
(os type : Amazon linux 2, Instance type : T2.micro, Allow SSH traffic from : My ip)

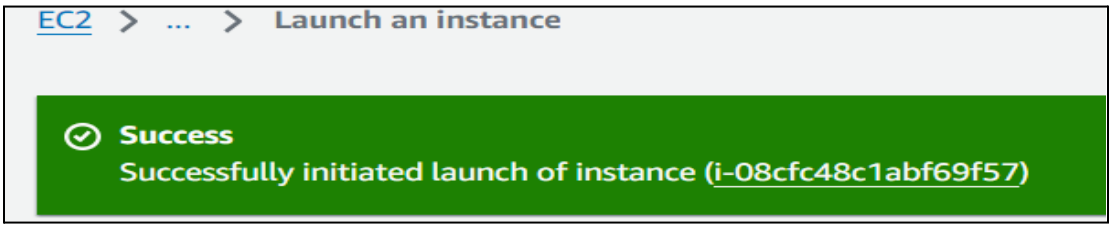


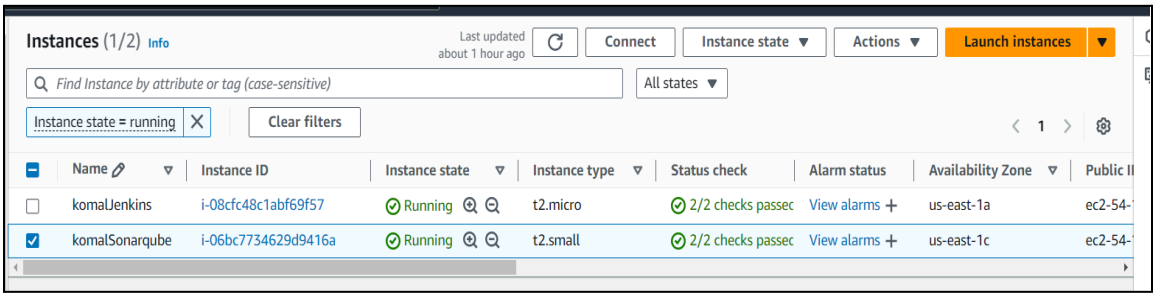




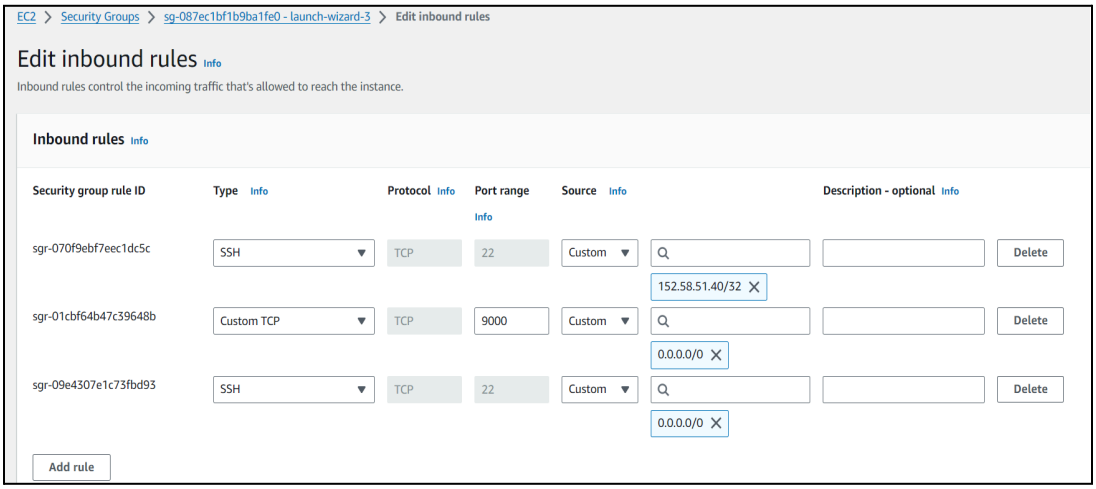

Instance type Info | Get advice
Instance type
t2.micro
Free tier eligible
Family: t2 1 vCPU 1 GiB Memory Current generation: true
On-Demand Windows base pricing: 0.0162 USD per Hour
On-Demand SUSE base pricing: 0.0116 USD per Hour
On-Demand RHEL base pricing: 0.026 USD per Hour
On-Demand Linux base pricing: 0.0116 USD per Hour
All generations
Compare instance types
Additional costs apply for AMIs with pre-installed software
Key pair (login) Info
You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.
Key pair name - required
jen-key
Create new key pair


Network settings Info
Edit
Network Info
vpc-014f21aed2a85fb2e
Subnet Info
No preference (Default subnet in any availability zone)
Auto-assign public IP Info
Enable
Additional charges apply when outside of free tier allowance
Firewall (security groups) Info
A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.
Create security group
Select existing security group
We'll create a new security group called 'launch-wizard-4' with the following rules:
Allow SSH traffic from
Helps you connect to your instance
My IP
152.58.51.40/32
Allow HTTPS traffic from the internet
To set up an endpoint, for example when creating a web server
Allow HTTP traffic from the internet
To set up an endpoint, for example when creating a web server

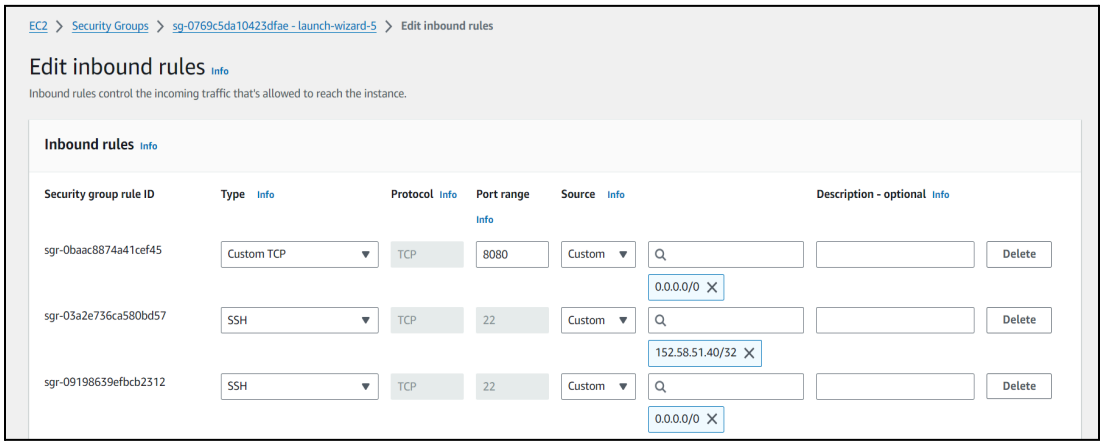

EC2 > ... > Launch an instance
Success
Successfully initiated launch of instance (i-08cfc48c1abf69f57)


Instances (1/2) Info
Last updated about 1 hour ago
Connect
Instance state
Actions
Launch instances
Find Instance by attribute or tag (case-sensitive)
All states
Instance state = running
Clear filters
Name
Instance ID
Instance state
Instance type
Status check
Alarm status
Availability Zone
komalJenkins i-08cfc48c1abf69f57 Running t2.micro 2/2 checks passed View alarms us-east-1a
komalSonarqube i-06bc7734629d9416a Running t2.small 2/2 checks passed View alarms us-east-1c

Security Inbound rules for Sonarqube



Security Inbound rules for Jenkins

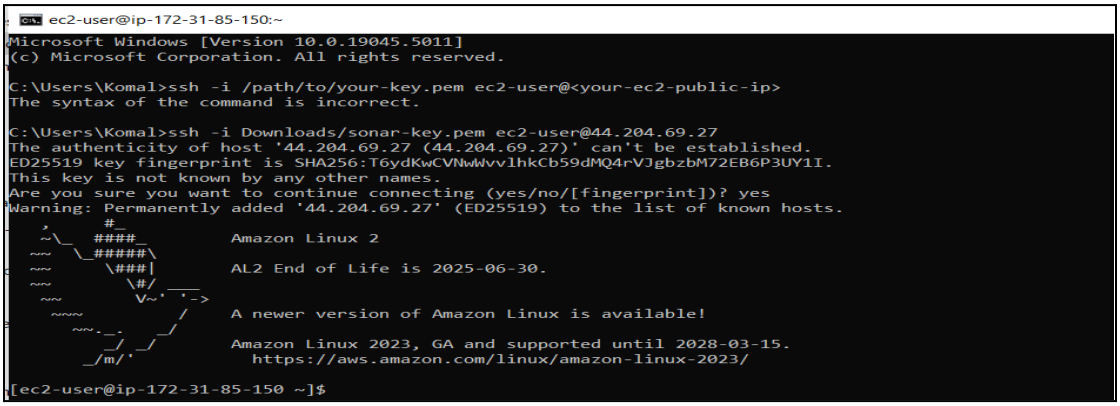


Now connect both the machines to cmd through ssh

ssh -i /path/to/your-key.pem ec2-user@<your-ec2-public-ip>

Install SonarQube:

- Set up SonarQube on the same or another EC2 instance or run it in a Docker container. Ensure it's accessible from your Jenkins instance.



Switch to root user

```
[ec2-user@ip-172-31-85-150 ~]$ sudo su -
[root@ip-172-31-85-150 ~]#
```

Java installation : (Install java from amazon-linux-extras as we have Amazon Linux 2)

```
[root@ip-172-31-85-150 ~]# amazon-linux-extras install java-openjdk11
Topic java-openjdk11 has end-of-support date of 2024-09-30
Installing java-11-openjdk
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
Cleaning repos: amzn2-core amzn2extra-docker amzn2extra-java-openjdk11 amzn2extra-kernel-5.10
17 metadata files removed
6 sqlite files removed
0 metadata files removed
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core                                                              | 3.6 kB  00:00:00
amzn2extra-docker                                                       | 2.9 kB  00:00:00
amzn2extra-java-openjdk11                                               | 3.0 kB  00:00:00
amzn2extra-kernel-5.10                                                  | 3.0 kB  00:00:00
(1/9): amzn2-core/2/x86_64/group_gz                                     | 2.7 kB  00:00:00
(2/9): amzn2-core/2/x86_64/updateinfo                                   | 983 kB  00:00:00
(3/9): amzn2extra-docker/2/x86_64/updateinfo                            |  20 kB  00:00:00
(4/9): amzn2extra-java-openjdk11/2/x86_64/primary_db                    | 174 kB  00:00:00
(5/9): amzn2extra-java-openjdk11/2/x86_64/updateinfo                    | 8.0 kB  00:00:00
(6/9): amzn2extra-docker/2/x86_64/primary_db                            | 114 kB  00:00:00
(7/9): amzn2extra-kernel-5.10/2/x86_64/updateinfo                       |  91 kB  00:00:00
(8/9): amzn2extra-kernel-5.10/2/x86_64/primary_db                       |  31 MB  00:00:00
(9/9): amzn2-core/2/x86_64/primary_db                                   |  71 MB  00:00:01
```

```
root@ip-172-31-85-150:~
 40  mock                      available    [ =stable ]
 43  livepatch                 available    [ =stable ]
 45  haproxy2                  available    [ =stable ]
 46  collectd                  available    [ =stable ]
 47  aws-nitro-enclaves-cli    available    [ =stable ]
 48  R4                        available    [ =stable ]
 _   kernel-5.4                available    [ =stable ]
 50  selinux-ng                available    [ =stable ]
 52  tomcat9                   available    [ =stable ]
 53  unbound1.13               available    [ =stable ]
 54 †mariadb10.5               available    [ =stable ]
 55  kernel-5.10=latest        enabled      [ =stable ]
 56  redis6                    available    [ =stable ]
 58 †postgresql12              available    [ =stable ]
 59 †postgresql13              available    [ =stable ]
 60  mock2                     available    [ =stable ]
 61  dnsmasq2.85               available    [ =stable ]
 62  kernel-5.15               available    [ =stable ]
 63 †postgresql14              available    [ =stable ]
 64  firefox                   available    [ =stable ]
 65  lustre                    available    [ =stable ]
 66 †php8.1                    available    [ =stable ]
 67  awscli1                   available    [ =stable ]
 68 †php8.2                    available    [ =stable ]
 69  dnsmasq                   available    [ =stable ]
 70  unbound1.17               available    [ =stable ]
 72  collectd-python3          available    [ =stable ]
* Extra topic has reached end of support.
† Note on end-of-support. Use 'info' subcommand.
[root@ip-172-31-85-150 ~]#
```

```
[root@ip-172-31-85-150 ~]# java --version
openjdk 11.0.23 2024-04-16 LTS
OpenJDK Runtime Environment (Red_Hat-11.0.23.0.9-2.amzn2.0.1) (build 11.0.23+9-LTS)
OpenJDK 64-Bit Server VM (Red_Hat-11.0.23.0.9-2.amzn2.0.1) (build 11.0.23+9-LTS, mixed mode, sharing)
[root@ip-172-31-85-150 ~]#
```

Sonarqube installation

wget https://binaries.sonarsource.com/Distribution/sonarqube/sonarqube-8.9.2.46101.zip

```
[root@ip-172-31-85-150 opt]# wget https://binaries.sonarsource.com/Distribution/sonarqube/sonarqube-8.9.2.46101.zip
--2024-10-23 13:16:01--  https://binaries.sonarsource.com/Distribution/sonarqube/sonarqube-8.9.2.46101.zip
Resolving binaries.sonarsource.com (binaries.sonarsource.com)... 99.84.191.71, 99.84.191.87, 99.84.191.75, ...
Connecting to binaries.sonarsource.com (binaries.sonarsource.com)|99.84.191.71|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 276400757 (264M) [application/zip]
Saving to: ‘sonarqube-8.9.2.46101.zip’

100%[===================================================================================================================================================>] 276,400,757 26.4MB/s   in 9.4s

2024-10-23 13:16:11 (28.0 MB/s) - ‘sonarqube-8.9.2.46101.zip’ saved [276400757/276400757]

[root@ip-172-31-85-150 opt]#
```

```
[root@ip-172-31-85-150 opt]# ls -l
total 269928
drwxr-xr-x 4 root root        33 Oct 14 20:16 aws
-rw-r--r-- 1 root root       697 Jul 16 12:41 index.html?prefix=Distribution%2Fsonarqube%2Fsonarqube-8.9.2.46101.zip
drwxr-xr-x 2 root root         6 Aug 16  2018 rh
-rw-r--r-- 1 root root 276400757 Feb 16  2022 sonarqube-8.9.2.46101.zip
[root@ip-172-31-85-150 opt]#
```

Unzip the zip file

```
[root@ip-172-31-85-150 opt]# unzip sonarqube-8.9.2.46101.zip
Archive:  sonarqube-8.9.2.46101.zip
   creating: sonarqube-8.9.2.46101/
   creating: sonarqube-8.9.2.46101/bin/
   creating: sonarqube-8.9.2.46101/bin/jsw-license/
  inflating: sonarqube-8.9.2.46101/bin/jsw-license/LICENSE.txt
   creating: sonarqube-8.9.2.46101/bin/windows-x86-64/
  inflating: sonarqube-8.9.2.46101/bin/windows-x86-64/StopNTService.bat
   creating: sonarqube-8.9.2.46101/bin/windows-x86-64/lib/
  inflating: sonarqube-8.9.2.46101/bin/windows-x86-64/lib/wrapper.dll
  inflating: sonarqube-8.9.2.46101/bin/windows-x86-64/StartSonar.bat
  inflating: sonarqube-8.9.2.46101/bin/windows-x86-64/wrapper.exe
  inflating: sonarqube-8.9.2.46101/bin/windows-x86-64/StartNTService.bat
   creating: sonarqube-8.9.2.46101/bin/macosx-universal-64/
   creating: sonarqube-8.9.2.46101/bin/macosx-universal-64/lib/
  inflating: sonarqube-8.9.2.46101/bin/macosx-universal-64/lib/libwrapper.jnilib
  inflating: sonarqube-8.9.2.46101/bin/macosx-universal-64/wrapper
  inflating: sonarqube-8.9.2.46101/bin/macosx-universal-64/sonar.sh
   creating: sonarqube-8.9.2.46101/bin/linux-x86-64/
   creating: sonarqube-8.9.2.46101/bin/linux-x86-64/lib/
  inflating: sonarqube-8.9.2.46101/bin/linux-x86-64/lib/libwrapper.so
  inflating: sonarqube-8.9.2.46101/bin/linux-x86-64/wrapper
  inflating: sonarqube-8.9.2.46101/bin/linux-x86-64/sonar.sh
   creating: sonarqube-8.9.2.46101/extensions/
   creating: sonarqube-8.9.2.46101/extensions/jdbc-driver/
   creating: sonarqube-8.9.2.46101/extensions/jdbc-driver/oracle/
  inflating: sonarqube-8.9.2.46101/extensions/jdbc-driver/oracle/README.txt
   creating: sonarqube-8.9.2.46101/extensions/plugins/
  inflating: sonarqube-8.9.2.46101/extensions/plugins/README.txt
  inflating: sonarqube-8.9.2.46101/COPYING
   creating: sonarqube-8.9.2.46101/logs/
  inflating: sonarqube-8.9.2.46101/logs/README.txt
   creating: sonarqube-8.9.2.46101/temp/
  inflating: sonarqube-8.9.2.46101/temp/README.txt
   creating: sonarqube-8.9.2.46101/elasticsearch/
  inflating: sonarqube-8.9.2.46101/elasticsearch/README.asciidoc
   creating: sonarqube-8.9.2.46101/elasticsearch/bin/
```

Delete the zip package for no conflict.

```
[root@ip-172-31-85-150 opt]# ls -l
total 269928
drwxr-xr-x  4 root root        33 Oct 14 20:16 aws
-rw-r--r--  1 root root       697 Jul 16 12:41 index.html?prefix=Distribution%2Fsonarqube%2Fsonarqube-8.9.2.46101.zip
drwxr-xr-x  2 root root         6 Aug 16  2018 rh
drwxr-xr-x 11 root root       141 Jul 27  2021 sonarqube-8.9.2.46101
-rw-r--r--  1 root root 276400757 Feb 16  2022 sonarqube-8.9.2.46101.zip
[root@ip-172-31-85-150 opt]# rm -f index.html?prefix=Distribution%2Fsonarqube%2Fsonarqube-8.9.2.46101.zip
[root@ip-172-31-85-150 opt]# rm -f sonarqube-8.9.2.46101.zip
[root@ip-172-31-85-150 opt]# ls -l
total 0
drwxr-xr-x  4 root root  33 Oct 14 20:16 aws
drwxr-xr-x  2 root root   6 Aug 16  2018 rh
drwxr-xr-x 11 root root 141 Jul 27  2021 sonarqube-8.9.2.46101
[root@ip-172-31-85-150 opt]#
```

Creating user for sonarqube

Creating user sonaradmin / Password Sonar@2024qube

```
[root@ip-172-31-85-150 opt]# useradd sonaradmin
[root@ip-172-31-85-150 opt]# passwd sonaradmin
Changing password for user sonaradmin.
New password:
Retype new password:
passwd: all authentication tokens updated successfully.
[root@ip-172-31-85-150 opt]#
```

Adding user to wheelgroup for permissions

```
[root@ip-172-31-85-150 opt]# visudo
[root@ip-172-31-85-150 opt]#
```

```
## Allows members of the 'sys' group to run networking, software,
## service management apps and more.
# %sys ALL = NETWORKING, SOFTWARE, SERVICES, STORAGE, DELEGATING, PROCESSES, LOCATE, DRIVERS

## Allows people in group wheel to run all commands
%wheel  ALL=(ALL)       ALL
sonaradmin ALL=(ALL)       ALL

## Same thing without a password
# %wheel        ALL=(ALL)       NOPASSWD: ALL
sonaradmin      ALL=(ALL)       NOPASSWD: ALL
## Allows members of the users group to mount and unmount the
## cdrom as root
# %users  ALL=/sbin/mount /mnt/cdrom, /sbin/umount /mnt/cdrom
```

Now start the sonarqube

So to start the sonarqube application we need to switch to sonaradmin user and for sonaradmin to get access of sonarqube repository we need to provide access to sonaradmin user as well as group through the root user.

user:groupname

chown -R sonaradmin:sonaradmin sonarqube-8.9.2

```
[root@ip-172-31-85-150 linux-x86-64]# cd /opt
[root@ip-172-31-85-150 opt]# chown -R sonaradmin:sonaradmin sonarqube-8.9.2.46101
[root@ip-172-31-85-150 opt]#
```

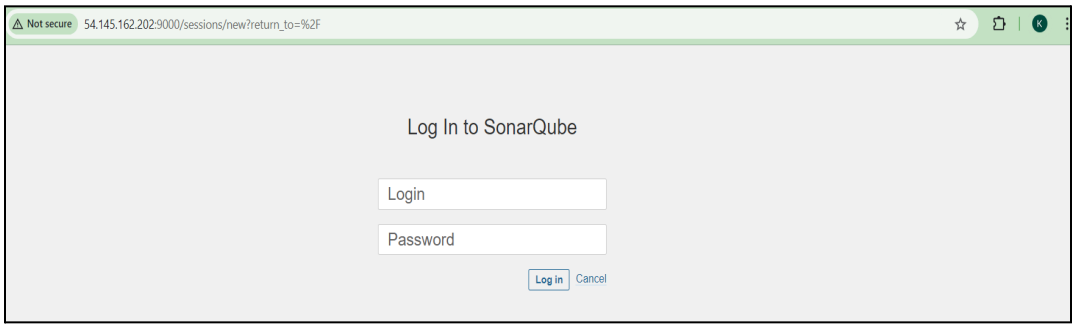
Now switch to sonaradmin user

```
[root@ip-172-31-85-150 opt]# sudo su - sonaradmin
Last login: Wed Oct 23 14:20:39 UTC 2024 on pts/0
[sonaradmin@ip-172-31-85-150 ~]$
```

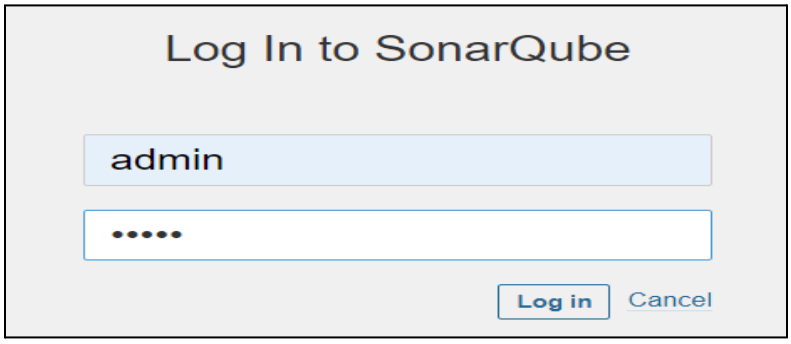
Start the sonarqube

```
[sonaradmin@ip-172-31-85-150 ~]$ cd /opt
[sonaradmin@ip-172-31-85-150 opt]$ ls -l
total 0
drwxr-xr-x  4 root        root         33 Oct 14 20:16 aws
drwxr-xr-x  2 root        root          6 Aug 16  2018 rh
drwxr-xr-x 11 sonaradmin sonaradmin 141 Jul 27  2021 sonarqube-8.9.2.46101
[sonaradmin@ip-172-31-85-150 opt]$ cd sonarqube-8.9.2.46101/
[sonaradmin@ip-172-31-85-150 sonarqube-8.9.2.46101]$ ls -l
total 12
drwxr-xr-x 6 sonaradmin sonaradmin   94 Jul 27  2021 bin
drwxr-xr-x 2 sonaradmin sonaradmin   50 Jul 27  2021 conf
-rw-r--r-- 1 sonaradmin sonaradmin 7651 Jul 27  2021 COPYING
drwxr-xr-x 2 sonaradmin sonaradmin   24 Jul 27  2021 data
drwxr-xr-x 7 sonaradmin sonaradmin  132 Jul 27  2021 elasticsearch
drwxr-xr-x 4 sonaradmin sonaradmin   40 Jul 27  2021 extensions
drwxr-xr-x 6 sonaradmin sonaradmin  143 Jul 27  2021 lib
drwxr-xr-x 2 sonaradmin sonaradmin   64 Oct 23 14:15 logs
drwxr-xr-x 3 sonaradmin sonaradmin   38 Oct 23 14:15 temp
drwxr-xr-x 6 sonaradmin sonaradmin 4096 Jul 27  2021 web
[sonaradmin@ip-172-31-85-150 sonarqube-8.9.2.46101]$ cd bin/
[sonaradmin@ip-172-31-85-150 bin]$ ls -l
total 0
drwxr-xr-x 2 sonaradmin sonaradmin  25 Jul 27  2021 jsw-license
drwxr-xr-x 3 sonaradmin sonaradmin  48 Oct 23 14:15 linux-x86-64
drwxr-xr-x 3 sonaradmin sonaradmin  48 Jul 27  2021 macosx-universal-64
drwxr-xr-x 3 sonaradmin sonaradmin 109 Jul 27  2021 windows-x86-64
[sonaradmin@ip-172-31-85-150 bin]$ cd linux-x86-64/
[sonaradmin@ip-172-31-85-150 linux-x86-64]$ ls -l
total 132
drwxr-xr-x 2 sonaradmin sonaradmin     27 Jul 27  2021 lib
-rwxr-xr-x 1 sonaradmin sonaradmin  16393 Jul 27  2021 sonar.sh
-rwxr-xr-x 1 sonaradmin sonaradmin 111027 Jul 27  2021 wrapper
[sonaradmin@ip-172-31-85-150 linux-x86-64]$
```

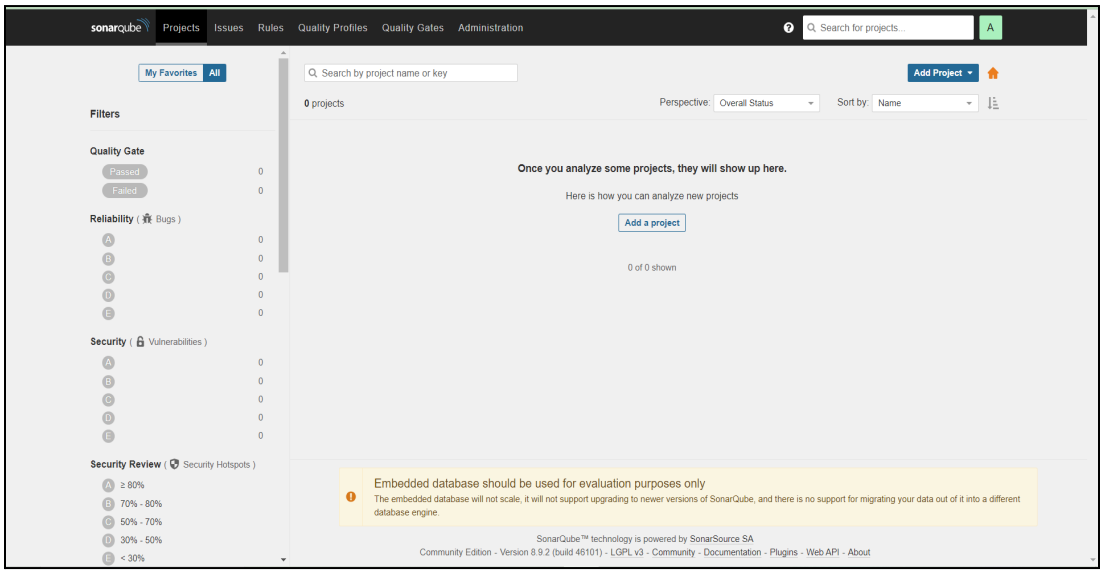
```
[sonaradmin@ip-172-31-85-150 linux-x86-64]$ ls -l
total 132
drwxr-xr-x 2 sonaradmin sonaradmin     27 Jul 27  2021 lib
-rwxr-xr-x 1 sonaradmin sonaradmin  16393 Jul 27  2021 sonar.sh
-rwxr-xr-x 1 sonaradmin sonaradmin 111027 Jul 27  2021 wrapper
[sonaradmin@ip-172-31-85-150 linux-x86-64]$ ./sonar.sh start
Starting SonarQube...
Started SonarQube.
[sonaradmin@ip-172-31-85-150 linux-x86-64]$ ./sonar.sh status
SonarQube is running (18612).
[sonaradmin@ip-172-31-85-150 linux-x86-64]$
```



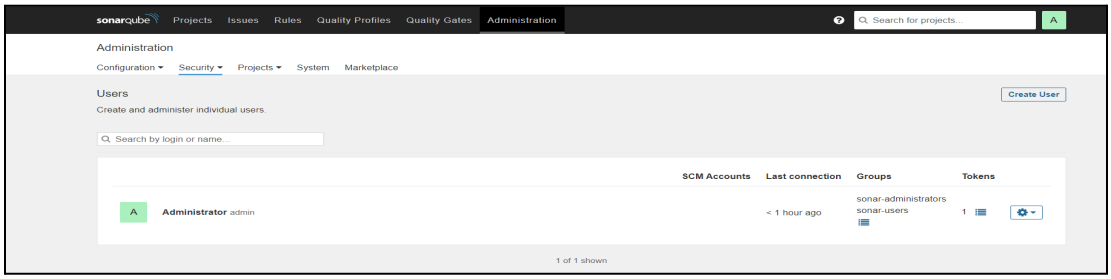
Login with username : admin password : admin

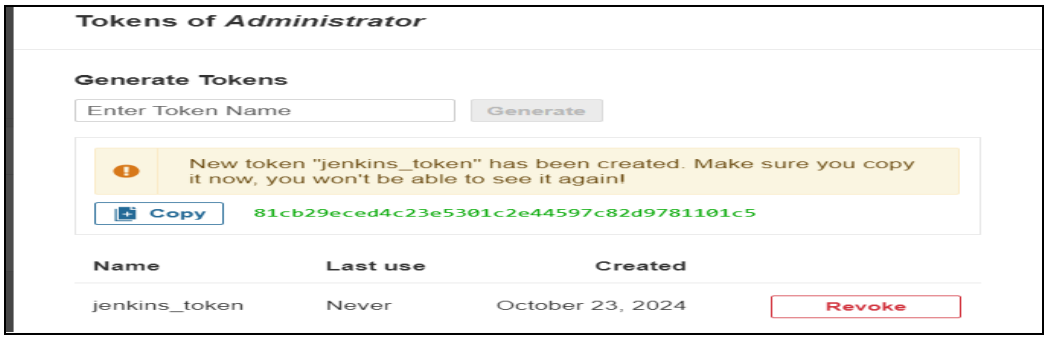


Update password



Create authentication key for jenkins in sonarqube
administration>security>users>tokens>add a token





81cb29eced4c23e5301c2e44597c82d9781101c5

Jenkins installation on another ec2 instance

Connect the ec2 instance

```
C:\Users\Komal>ssh -i Downloads/jen-key.pem ec2-user@54.145.106.192
```

```
C:\Users\Komal>ssh -i Downloads/jen-key.pem ec2-user@54.145.106.192
The authenticity of host '54.145.106.192 (54.145.106.192)' can't be established.
ED25519 key fingerprint is SHA256:L1NyVOSmf8yyiI4QzR1HBLCTKdaQbkdIdeL2MN8dydU.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '54.145.106.192' (ED25519) to the list of known hosts.
       __|  __|_  )
       _| (     /   Amazon Linux 2
      ___|\___|___|
https://aws.amazon.com/linux/amazon-linux-2023/
[ec2-user@ip-172-31-44-105 ~]$
```

```
[ec2-user@ip-172-31-44-105 ~]$ sudo su -
[root@ip-172-31-44-105 ~]#
```

Java installation

Openjdk11 package available in amazon-linux-extras repository

```
[root@ip-172-31-44-105 ~]# amazon-linux-extras install java-openjdk11
Topic java-openjdk11 has end-of-support date of 2024-09-30
Installing java-11-openjdk
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
Cleaning repos: amzn2-core amzn2extra-docker amzn2extra-java-openjdk11 amzn2extra-kernel-5.10
17 metadata files removed
6 sqlite files removed
0 metadata files removed
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core
amzn2extra-docker
amzn2extra-java-openjdk11
amzn2extra-kernel-5.10
(1/9): amzn2-core/2/x86_64/group_gz
(2/9): amzn2-core/2/x86_64/updateinfo
(3/9): amzn2extra-java-openjdk11/2/x86_64/primary_db
(4/9): amzn2extra-kernel-5.10/2/x86_64/updateinfo
(5/9): amzn2extra-docker/2/x86_64/updateinfo
(6/9): amzn2extra-java-openjdk11/2/x86_64/updateinfo
(7/9): amzn2extra-docker/2/x86_64/primary_db
(8/9): amzn2extra-kernel-5.10/2/x86_64/primary_db
(9/9): amzn2-core/2/x86_64/primary_db
```

```
[root@ip-172-31-44-105 ~]# java --version
openjdk 11.0.23 2024-04-16 LTS
OpenJDK Runtime Environment (Red_Hat-11.0.23.0.9-2.amzn2.0.1) (build 11.0.23+9-LTS)
OpenJDK 64-Bit Server VM (Red_Hat-11.0.23.0.9-2.amzn2.0.1) (build 11.0.23+9-LTS, mixed mode, sharing)
[root@ip-172-31-44-105 ~]#
```

Jenkins Installation

wget -O /etc/yum.repos.d/jenkins.repo https://pkg.jenkins.io/redhat-stable/jenkins.repo

Downloading jenkins repo

```
[root@ip-172-31-44-105 ~]# wget -O /etc/yum.repos.d/jenkins.repo https://pkg.jenkins.io/redhat-stable/jenkins.repo
--2024-10-23 15:12:55--  https://pkg.jenkins.io/redhat-stable/jenkins.repo
Resolving pkg.jenkins.io (pkg.jenkins.io)... 146.75.38.133, 2a04:4e42:78::645
Connecting to pkg.jenkins.io (pkg.jenkins.io)|146.75.38.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 85
Saving to: '/etc/yum.repos.d/jenkins.repo'

100%[===========================================================================================================

2024-10-23 15:12:55 (9.41 MB/s) - '/etc/yum.repos.d/jenkins.repo' saved [85/85]

[root@ip-172-31-44-105 ~]#
```

Download key for authentication

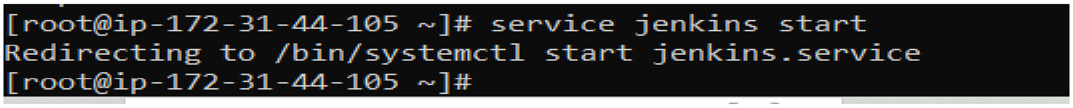
rpm --import https://pkg.jenkins.io/redhat-stable/jenkins.io-2023.key

```
[root@ip-172-31-44-105 ~]# rpm --import https://pkg.jenkins.io/redhat-stable/jenkins.io-2023.key
```

Now install jenkins

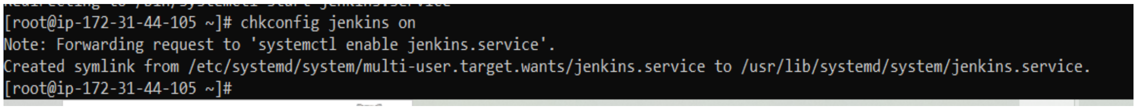
```
[root@ip-172-31-44-105 ~]# yum install jenkins -y
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core                                                                                         | 3.6 kB  00:00:00
jenkins                                                                                            | 2.9 kB  00:00:00
jenkins/primary_db                                                                                 |  51 kB  00:00:00
Resolving Dependencies
--> Running transaction check
---> Package jenkins.noarch 0:2.462.3-1.1 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

==========================================================================================================================
 Package                      Arch                      Version                      Repository                      Size
==========================================================================================================================
Installing:
 jenkins                      noarch                    2.462.3-1.1                  jenkins                         89 M

Transaction Summary
==========================================================================================================================
Install  1 Package

Total download size: 89 M
Installed size: 89 M
Downloading packages:
jenkins-2.462.3-1.1.noarch.rpm                                                                     |  89 MB  00:00:06
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
  Installing : jenkins-2.462.3-1.1.noarch                                                                             1/1
  Verifying  : jenkins-2.462.3-1.1.noarch                                                                             1/1

Installed:
  jenkins.noarch 0:2.462.3-1.1

Complete!
[root@ip-172-31-44-105 ~]#
```

Start jenkins

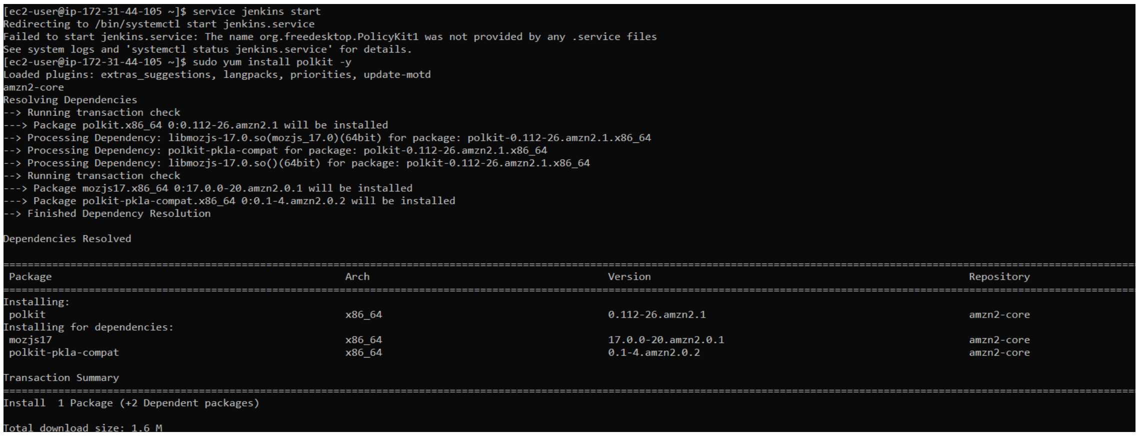


```
[root@ip-172-31-44-105 ~]# service jenkins start
Redirecting to /bin/systemctl start jenkins.service
[root@ip-172-31-44-105 ~]#
```

Setup jenkins to automatically start at boot | Chkconfig jenkins on

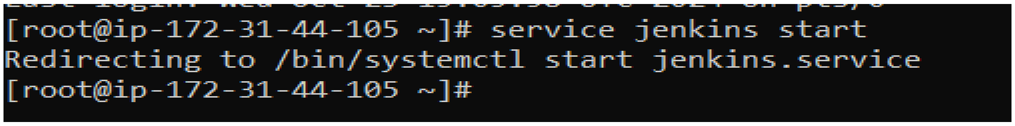


```
[root@ip-172-31-44-105 ~]# chkconfig jenkins on
Note: Forwarding request to 'systemctl enable jenkins.service'.
Created symlink from /etc/systemd/system/multi-user.target.wants/jenkins.service to /usr/lib/systemd/system/jenkins.service.
[root@ip-172-31-44-105 ~]#
```



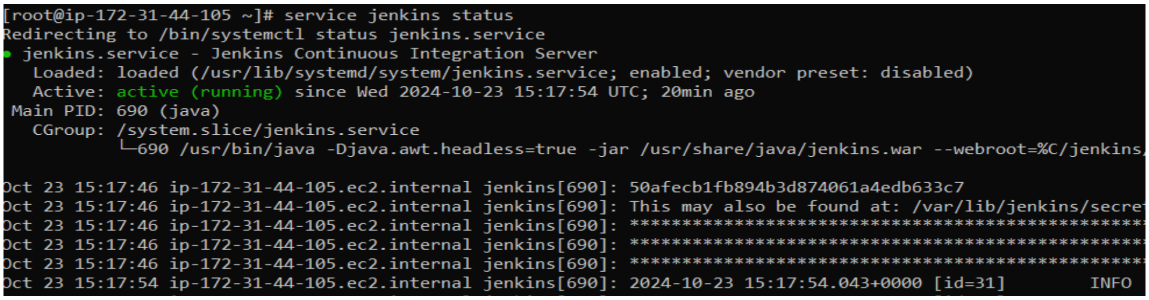
```
[ec2-user@ip-172-31-44-105 ~]$ service jenkins start
Redirecting to /bin/systemctl start jenkins.service
Failed to start jenkins.service: The name org.freedesktop.PolicyKit1 was not provided by any .service files
See system logs and 'systemctl status jenkins.service' for details.
[ec2-user@ip-172-31-44-105 ~]$ sudo yum install polkit -y
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core
Resolving Dependencies
--> Running transaction check
---> Package polkit.x86_64 0:0.112-26.amzn2.1 will be installed
--> Processing Dependency: libmozjs-17.0.so(mozjs_17.0)(64bit) for package: polkit-0.112-26.amzn2.1.x86_64
--> Processing Dependency: polkit-pkla-compat for package: polkit-0.112-26.amzn2.1.x86_64
--> Processing Dependency: libmozjs-17.0.so()(64bit) for package: polkit-0.112-26.amzn2.1.x86_64
--> Running transaction check
---> Package mozjs17.x86_64 0:17.0.0-20.amzn2.0.1 will be installed
---> Package polkit-pkla-compat.x86_64 0:0.1-4.amzn2.0.2 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

==============================================================================================================================
 Package                          Arch                      Version                                Repository
==============================================================================================================================
Installing:
 polkit                           x86_64                    0.112-26.amzn2.1                       amzn2-core
Installing for dependencies:
 mozjs17                          x86_64                    17.0.0-20.amzn2.0.1                    amzn2-core
 polkit-pkla-compat               x86_64                    0.1-4.amzn2.0.2                        amzn2-core

Transaction Summary
==============================================================================================================================
Install  1 Package (+2 Dependent packages)

Total download size: 1.6 M
```

Start the jenkins

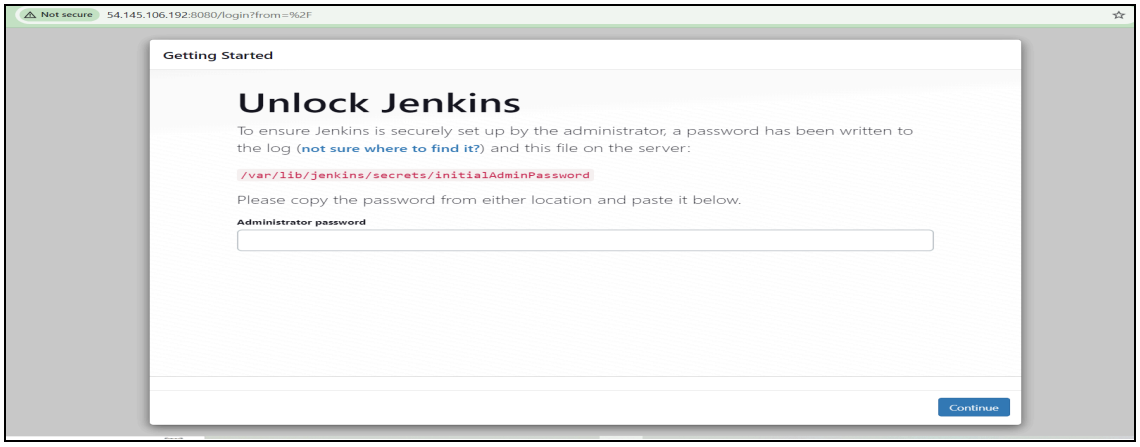


```
[root@ip-172-31-44-105 ~]# service jenkins start
Redirecting to /bin/systemctl start jenkins.service
[root@ip-172-31-44-105 ~]#
```

Check status

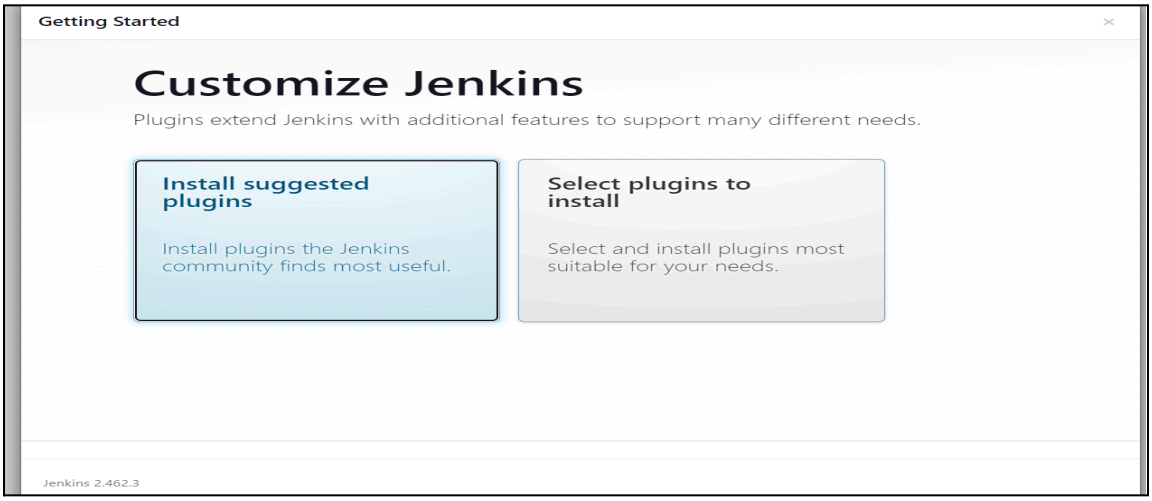


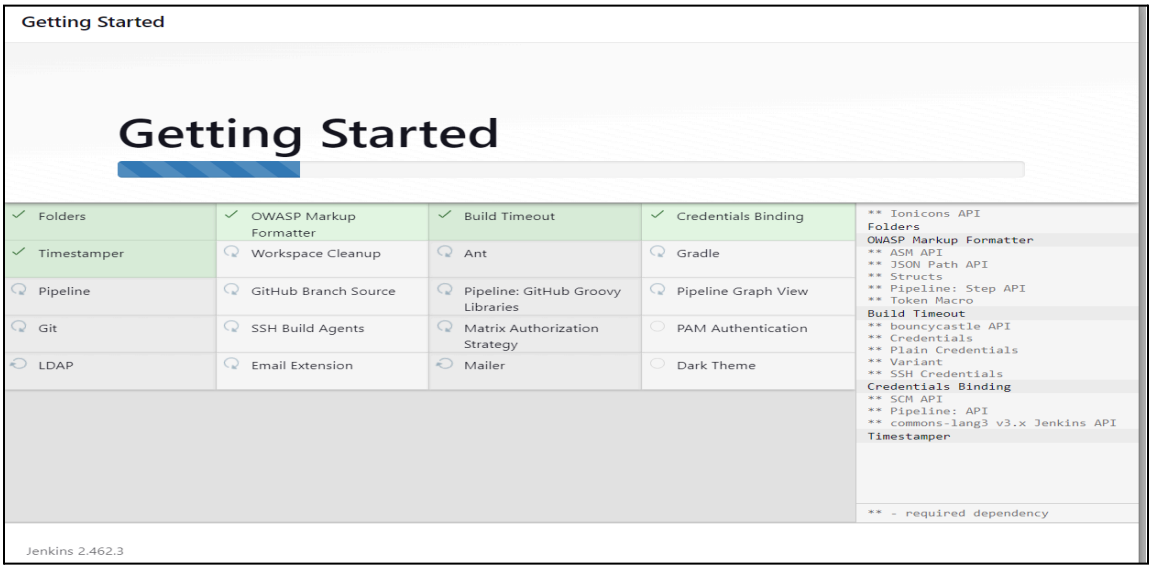
```
[root@ip-172-31-44-105 ~]# service jenkins status
Redirecting to /bin/systemctl status jenkins.service
● jenkins.service - Jenkins Continuous Integration Server
   Loaded: loaded (/usr/lib/systemd/system/jenkins.service; enabled; vendor preset: disabled)
   Active: active (running) since Wed 2024-10-23 15:17:54 UTC; 20min ago
 Main PID: 690 (java)
   CGroup: /system.slice/jenkins.service
           └─690 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot=%C/jenkins

Oct 23 15:17:46 ip-172-31-44-105.ec2.internal jenkins[690]: 50afecb1fb894b3d874061a4edb633c7
Oct 23 15:17:46 ip-172-31-44-105.ec2.internal jenkins[690]: This may also be found at: /var/lib/jenkins/secre
Oct 23 15:17:46 ip-172-31-44-105.ec2.internal jenkins[690]: ***********************************************
Oct 23 15:17:46 ip-172-31-44-105.ec2.internal jenkins[690]: ***********************************************
Oct 23 15:17:46 ip-172-31-44-105.ec2.internal jenkins[690]: ***********************************************
Oct 23 15:17:54 ip-172-31-44-105.ec2.internal jenkins[690]: 2024-10-23 15:17:54.043+0000 [id=31]       INFO
```



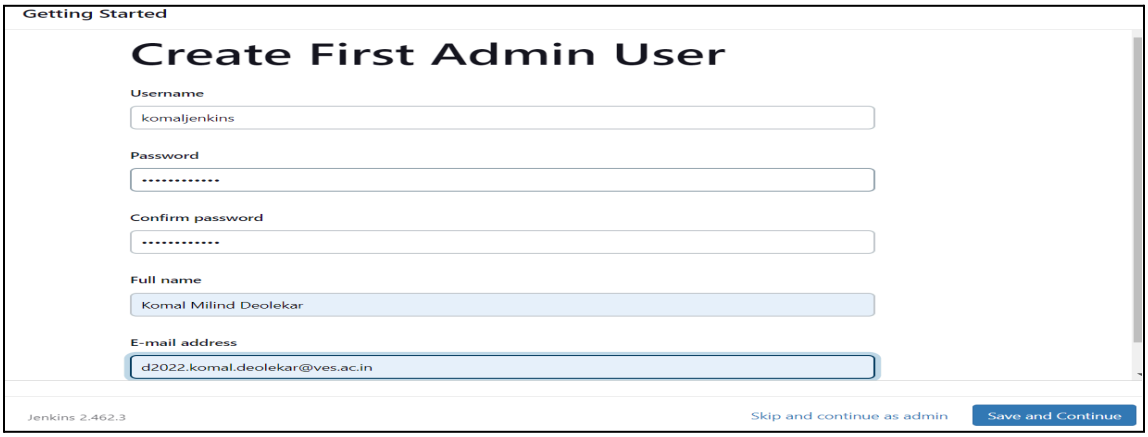
Get the password

```
[root@ip-172-31-44-105 ~]# cat /var/lib/jenkins/secrets/initialAdminPassword
50afecb1fb894b3d874061a4edb633c7
[root@ip-172-31-44-105 ~]#
```

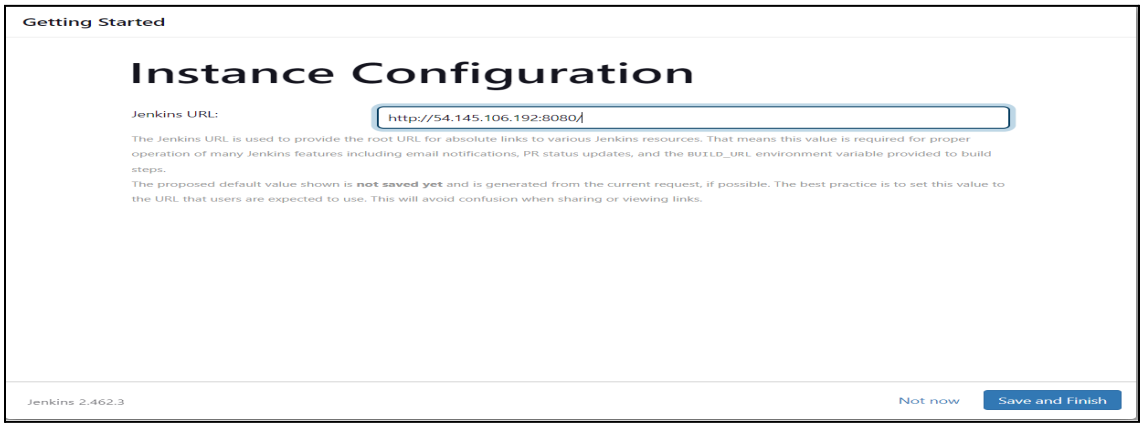


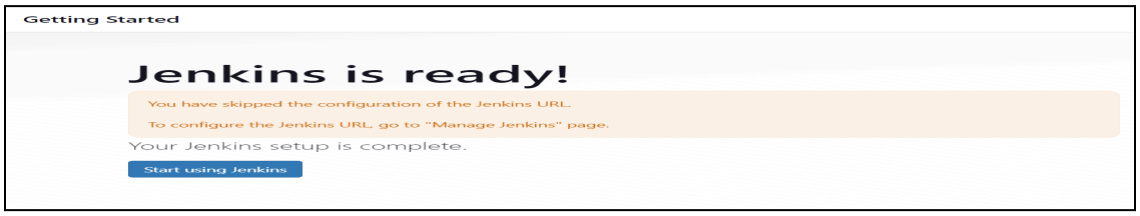


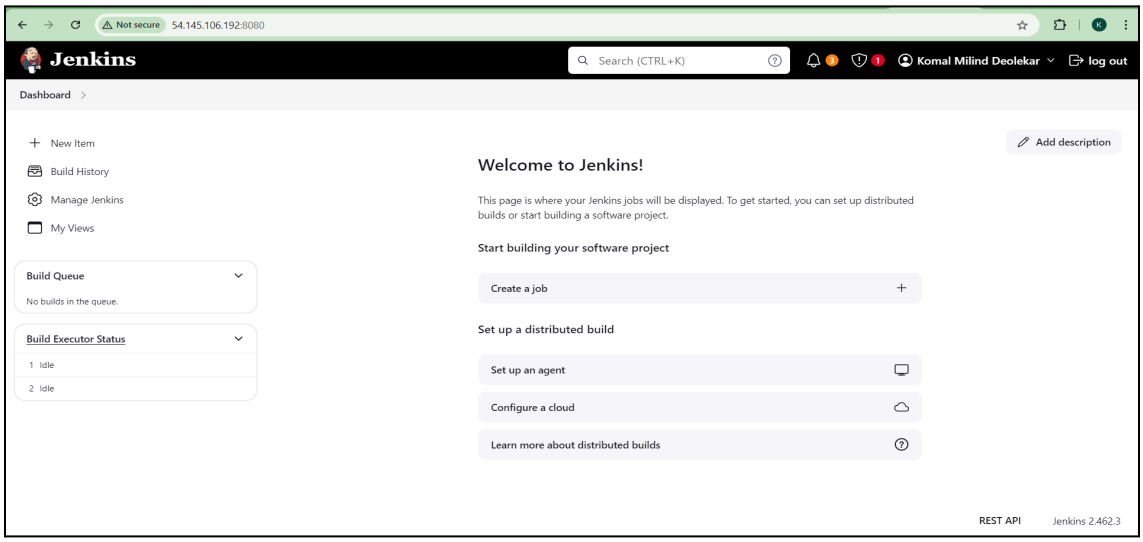
Update default profile



Skip this because we are working on ec2 so ip address can change.







Git installation

```
[root@ip-172-31-44-105 ~]# yum install git -y
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core
Resolving Dependencies
--> Running transaction check
---> Package git.x86_64 0:2.40.1-1.amzn2.0.3 will be installed
--> Processing Dependency: git-core = 2.40.1-1.amzn2.0.3 for package: git-2.40.1-1.amzn2.0.3.x86_64
--> Processing Dependency: git-core-doc = 2.40.1-1.amzn2.0.3 for package: git-2.40.1-1.amzn2.0.3.x86_64
--> Processing Dependency: perl-Git = 2.40.1-1.amzn2.0.3 for package: git-2.40.1-1.amzn2.0.3.x86_64
--> Processing Dependency: perl(Git) for package: git-2.40.1-1.amzn2.0.3.x86_64
--> Processing Dependency: perl(Term::ReadKey) for package: git-2.40.1-1.amzn2.0.3.x86_64
--> Running transaction check
---> Package git-core.x86_64 0:2.40.1-1.amzn2.0.3 will be installed
---> Package git-core-doc.noarch 0:2.40.1-1.amzn2.0.3 will be installed
---> Package perl-Git.noarch 0:2.40.1-1.amzn2.0.3 will be installed
--> Processing Dependency: perl(Error) for package: perl-Git-2.40.1-1.amzn2.0.3.noarch
---> Package perl-TermReadKey.x86_64 0:2.30-20.amzn2.0.2 will be installed
--> Running transaction check
---> Package perl-Error.noarch 1:0.17020-2.amzn2 will be installed
--> Finished Dependency Resolution

Dependencies Resolved
```

Add path for java in bash_profile file

```
[root@ip-172-31-44-105 /]# cd ~
[root@ip-172-31-44-105 ~]# vi .bash_profile
[root@ip-172-31-44-105 ~]#
```

```
root@ip-172-31-44-105:~
# .bash_profile

# Get the aliases and functions
if [ -f ~/.bashrc ]; then
        . ~/.bashrc
fi

# User specific environment and startup programs
JAVA_HOME=/usr/lib/jvm/java-11-openjdk-11.0.23.0.9-2.amzn2.0.1.x86_64/bin/java

M2_HOME=/opt/apache-maven-3.8.8
M2=$M2_HOME/bin
PATH=$PATH:$JAVA_HOME:$M2_HOME:$M2:$HOME/bin


#PATH=$PATH:$HOME/bin

export PATH
~
```

For changes to update source the file

```
[root@ip-172-31-44-105 ~]# source .bash_profile
[root@ip-172-31-44-105 ~]#
```

```
[root@ip-172-31-44-105 ~]# echo $PATH
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/root/bin:/usr/lib/jvm/java-11-openjdk-11.0.23.0.9-2.amzn2.0.1.x86_64/bin/java:/opt/apache-maven-3.8.8:/opt/apache-maven-3.8.8/bin:/root/bin
[root@ip-172-31-44-105 ~]#
```

<u>Nodejs installation</u>

```
[root@ip-172-31-44-105 ~]# sudo yum install -y gcc-c++ make
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core
Package 1:make-3.82-24.amzn2.x86_64 already installed and latest version
Resolving Dependencies
--> Running transaction check
---> Package gcc-c++.x86_64 0:7.3.1-17.amzn2 will be installed
--> Processing Dependency: gcc(x86-64) = 7.3.1-17.amzn2 for package: gcc-c++-7.3.1-17.amzn2.x86_64
--> Processing Dependency: libmpc.so.3()(64bit) for package: gcc-c++-7.3.1-17.amzn2.x86_64
--> Processing Dependency: libmpfr.so.4()(64bit) for package: gcc-c++-7.3.1-17.amzn2.x86_64
--> Running transaction check
---> Package gcc.x86_64 0:7.3.1-17.amzn2 will be installed
--> Processing Dependency: cpp = 7.3.1-17.amzn2 for package: gcc-7.3.1-17.amzn2.x86_64
--> Processing Dependency: glibc-devel >= 2.2.90-12 for package: gcc-7.3.1-17.amzn2.x86_64
--> Processing Dependency: libatomic >= 7.3.1-17.amzn2 for package: gcc-7.3.1-17.amzn2.x86_64
--> Processing Dependency: libcilkrts >= 7.3.1-17.amzn2 for package: gcc-7.3.1-17.amzn2.x86_64
--> Processing Dependency: libitm >= 7.3.1-17.amzn2 for package: gcc-7.3.1-17.amzn2.x86_64
--> Processing Dependency: libmpx >= 7.3.1-17.amzn2 for package: gcc-7.3.1-17.amzn2.x86_64
--> Processing Dependency: libquadmath >= 7.3.1-17.amzn2 for package: gcc-7.3.1-17.amzn2.x86_64
--> Processing Dependency: libsanitizer >= 7.3.1-17.amzn2 for package: gcc-7.3.1-17.amzn2.x86_64
---> Package libmpc.x86_64 0:1.0.1-3.amzn2.0.2 will be installed
---> Package mpfr.x86_64 0:3.1.1-4.amzn2.0.2 will be installed
```

curl -o- https://raw.githubusercontent.com/nvm-sh/nvm/v0.34.0/install.sh | bash

```
[ec2-user@ip-172-31-44-105 ~]$ curl -o- https://raw.githubusercontent.com/nvm-sh/nvm/v0.34.0/install.sh | bash
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 13226  100 13226    0     0   532k      0 --:--:-- --:--:-- --:--:--  538k
=> nvm is already installed in /home/ec2-user/.nvm, trying to update using git
=> => Compressing and cleaning up git repository

=> nvm source string already in /home/ec2-user/.bashrc
=> bash_completion source string already in /home/ec2-user/.bashrc
=> Close and reopen your terminal to start using nvm or run the following to use it now:

export NVM_DIR="$HOME/.nvm"
[ -s "$NVM_DIR/nvm.sh" ] && \. "$NVM_DIR/nvm.sh"  # This loads nvm
[ -s "$NVM_DIR/bash_completion" ] && \. "$NVM_DIR/bash_completion"  # This loads nvm bash_completion
[ec2-user@ip-172-31-44-105 ~]$ curl -o- https://raw.githubusercontent.com/nvm-sh/nvm/v0.34.0/install.sh | bash
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 13226  100 13226    0     0   601k      0 --:--:-- --:--:-- --:--:--  615k
=> nvm is already installed in /home/ec2-user/.nvm, trying to update using git
=> => Compressing and cleaning up git repository

=> nvm source string already in /home/ec2-user/.bashrc
=> bash_completion source string already in /home/ec2-user/.bashrc
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export NVM_DIR="$HOME/.nvm"
[ -s "$NVM_DIR/nvm.sh" ] && \. "$NVM_DIR/nvm.sh"  # This loads nvm
[ -s "$NVM_DIR/bash_completion" ] && \. "$NVM_DIR/bash_completion"  # This loads nvm bash_completion
[ec2-user@ip-172-31-44-105 ~]$ . ~/.nvm/nvm.sh
[ec2-user@ip-172-31-44-105 ~]$ nvm install node
Downloading and installing node v23.0.0...
Downloading https://nodejs.org/dist/v23.0.0/node-v23.0.0-linux-x64.tar.xz...
#################################################################################################################
Computing checksum with sha256sum
Checksums matched!
node: /lib64/libm.so.6: version `GLIBC_2.27' not found (required by node)
node: /lib64/libc.so.6: version `GLIBC_2.27' not found (required by node)
node: /lib64/libc.so.6: version `GLIBC_2.28' not found (required by node)
nvm is not compatible with the npm config "prefix" option: currently set to ""
Run `nvm use --delete-prefix v23.0.0` to unset it.
[ec2-user@ip-172-31-44-105 ~]$
```

. ~/.nvm/nvm.sh

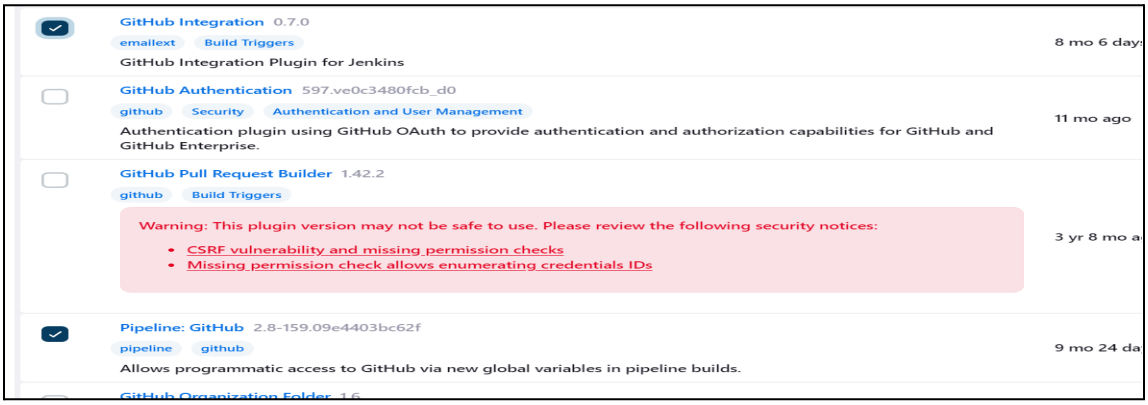
Nvm install 16

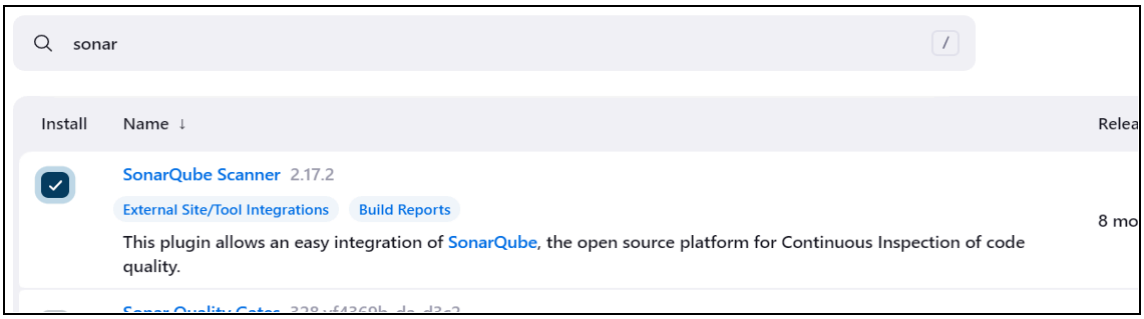
```
[ec2-user@ip-172-31-44-105 ~]$ nvm install 16
Downloading and installing node v16.20.2...
Downloading https://nodejs.org/dist/v16.20.2/node-v16.20.2-linux-x64.tar.xz...
#################################################################################################################
Computing checksum with sha256sum
Checksums matched!
Now using node v16.20.2 (npm v8.19.4)
Creating default alias: default -> 16 (-> v16.20.2)
[ec2-user@ip-172-31-44-105 ~]$
```

```
[ec2-user@ip-172-31-44-105 ~]$ nvm use 16
Now using node v16.20.2 (npm v8.19.4)
[ec2-user@ip-172-31-44-105 ~]$
```

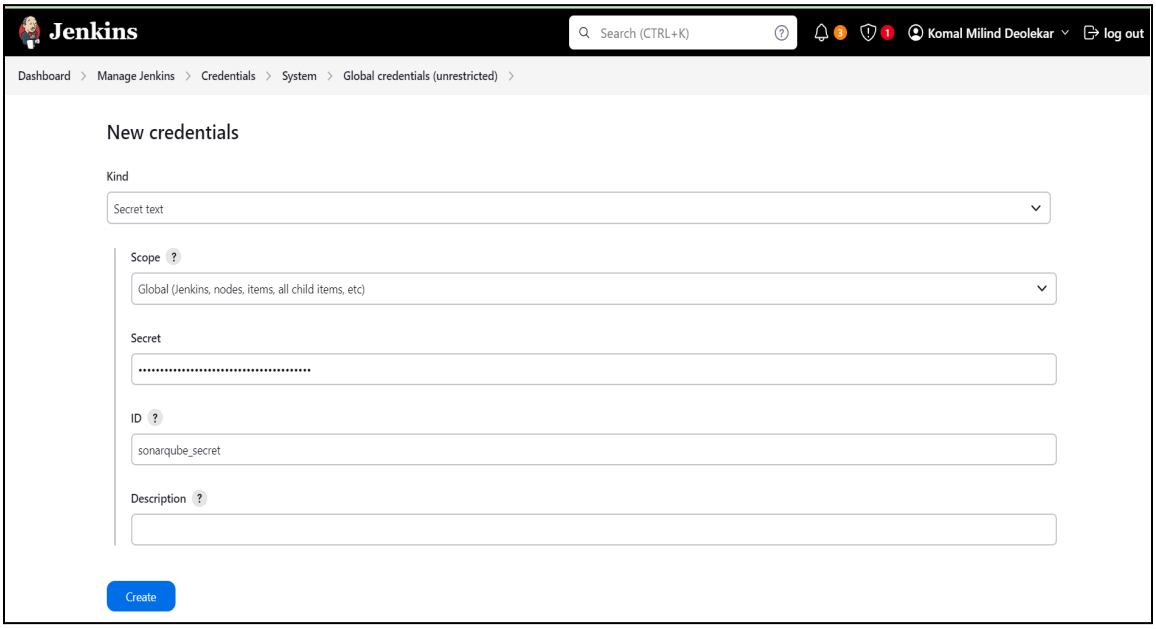
```
[ec2-user@ip-172-31-44-105 ~]$ node -v
v16.20.2
[ec2-user@ip-172-31-44-105 ~]$ npm -v
8.19.4
```

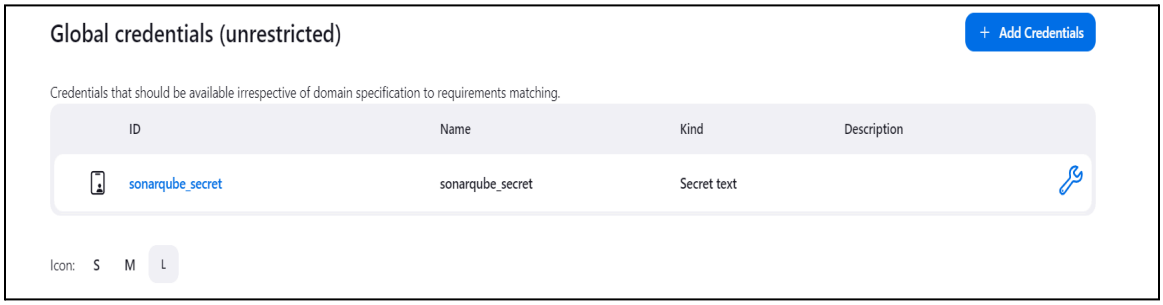
Install plugins on jenkins



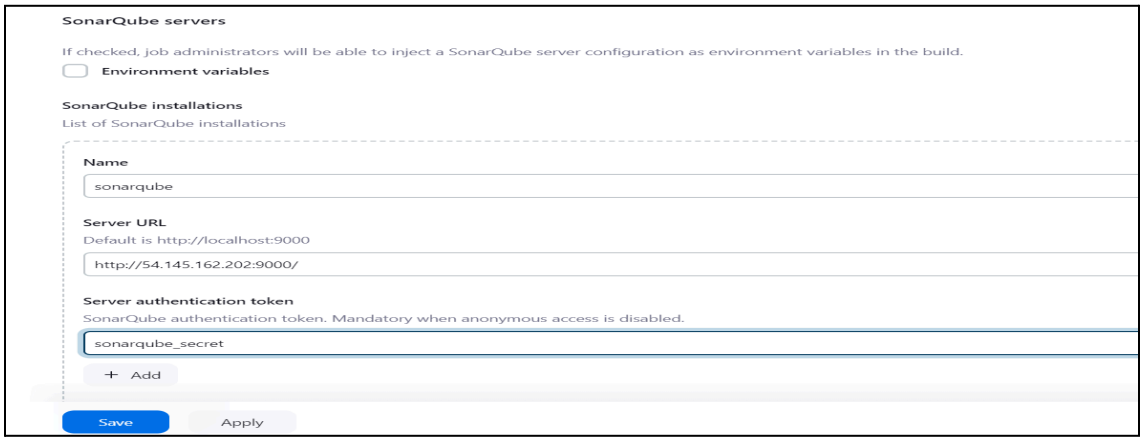


Adding sonarqube token in jenkins



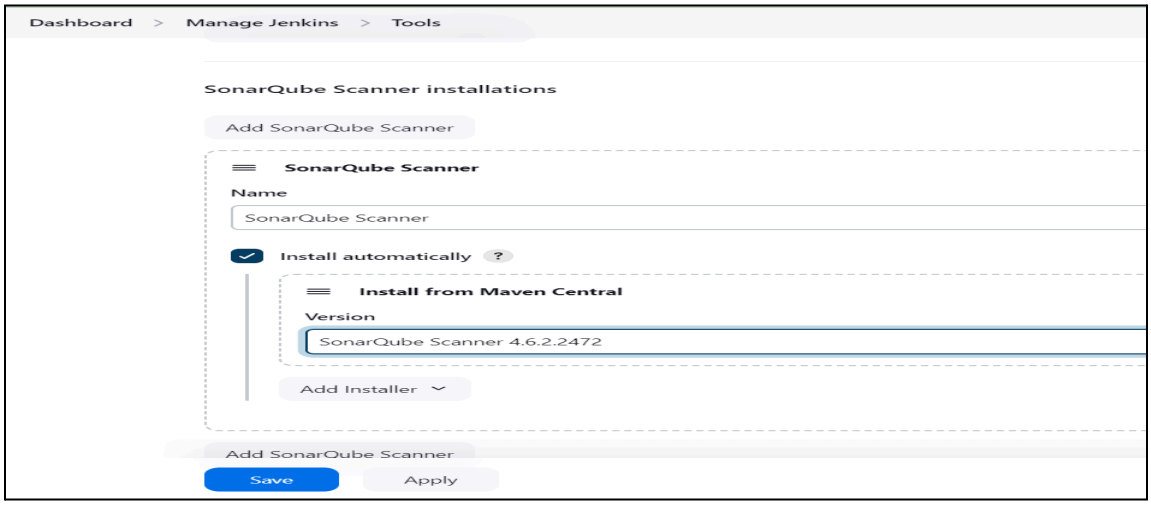


Setting sonarqube in jenkins (manage jenkins > system)



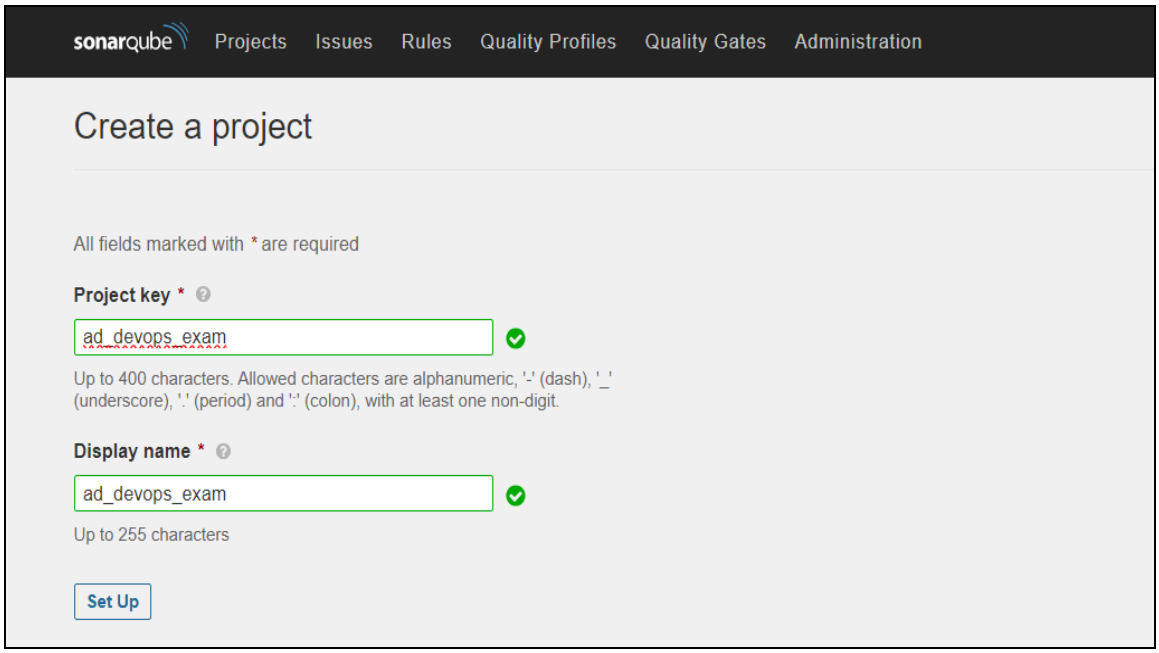
Setting up nodejs in jenkins

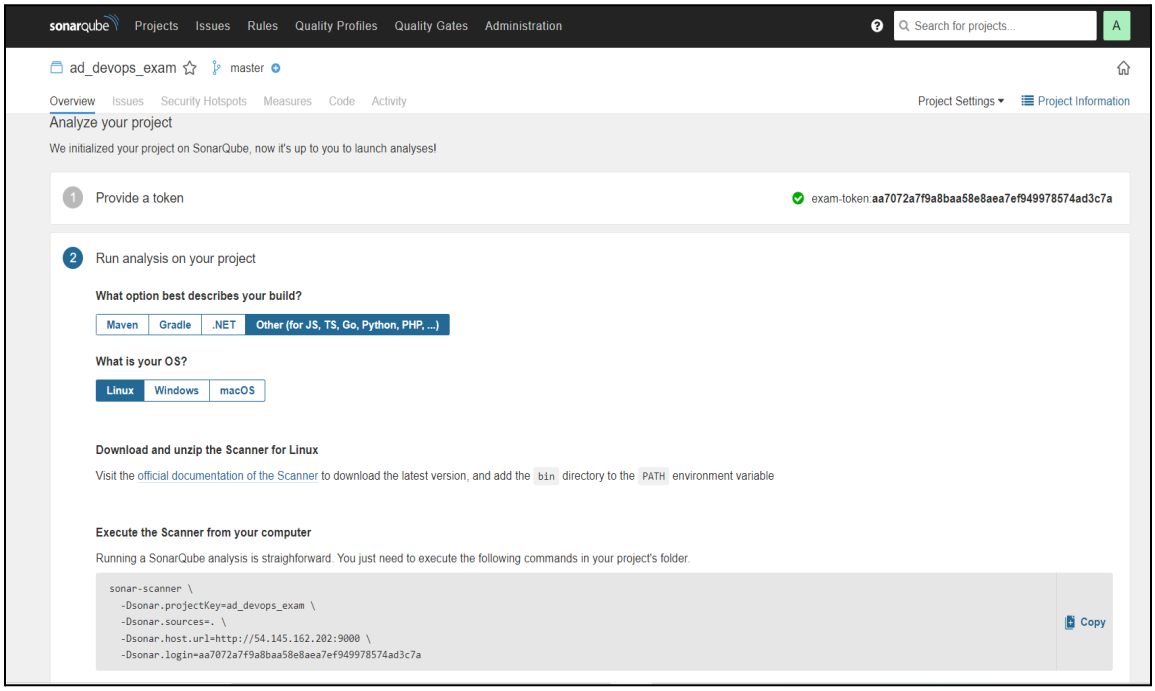
Setting sonarqube scanner (manage jenkins > tools)



Step 2: Create project in SonarQube

1. **Create a New Project:**
    a. Provide name.
    b. Generate token then continue and then select fields according to you project configuration it will provide you the script.

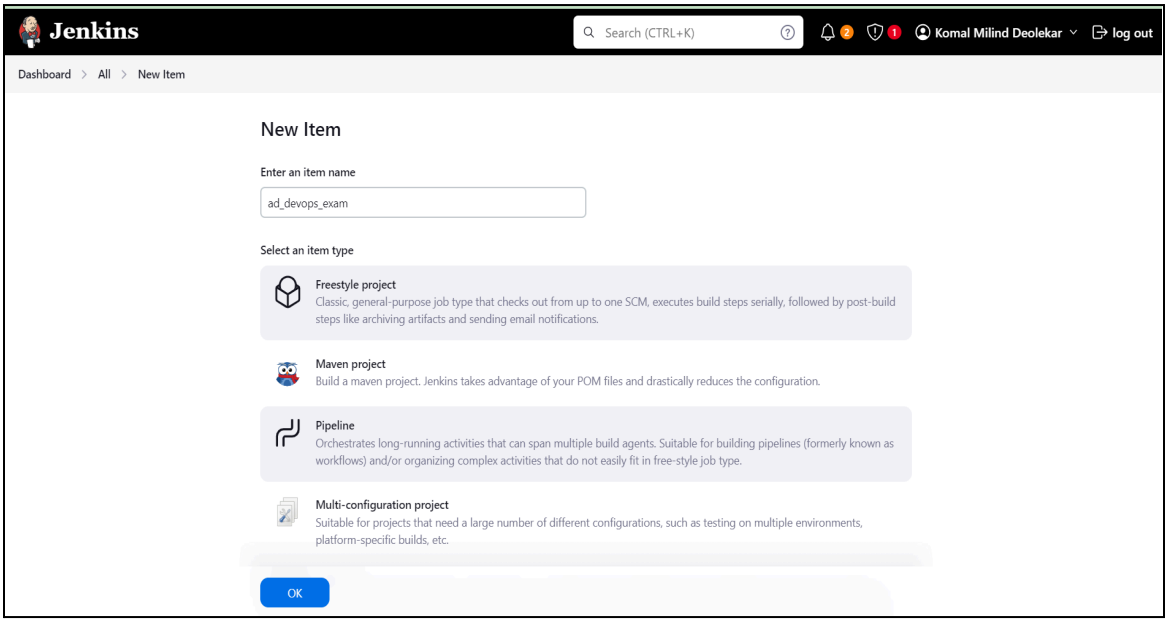




Step 3: Configure Jenkins Job

1. **Create a New Jenkins Job:**
    a. Click on "New Item" in Jenkins.
    b. Choose "Pipeline" and name it (e.g., "JavaScript Code Analysis").
2. **Configure Source Code Management:**
    a. In the job configuration, set up the source code management to pull from your Git repository.
3. **Add Build Steps:**
    a. Add a build step to execute a shell command to run the SonarQube scanner. Make sure to configure the SonarQube parameters.
4. **Configure Post-Build Actions:**
    a. Under post-build actions, add "SonarQube" and specify the project key.

Create a job and select pipeline and in pipeline script write the script



Script :

```
pipeline {
   agent any
   tools {
      nodejs 'node'  // Ensure Node.js is installed in Jenkins
   }
   stages {
      stage('Checkout') {
         steps {
            cleanWs()
            git branch: 'main', url: 'https://github.com/KomalDeolekar0607/ad_dev_test.git'
```

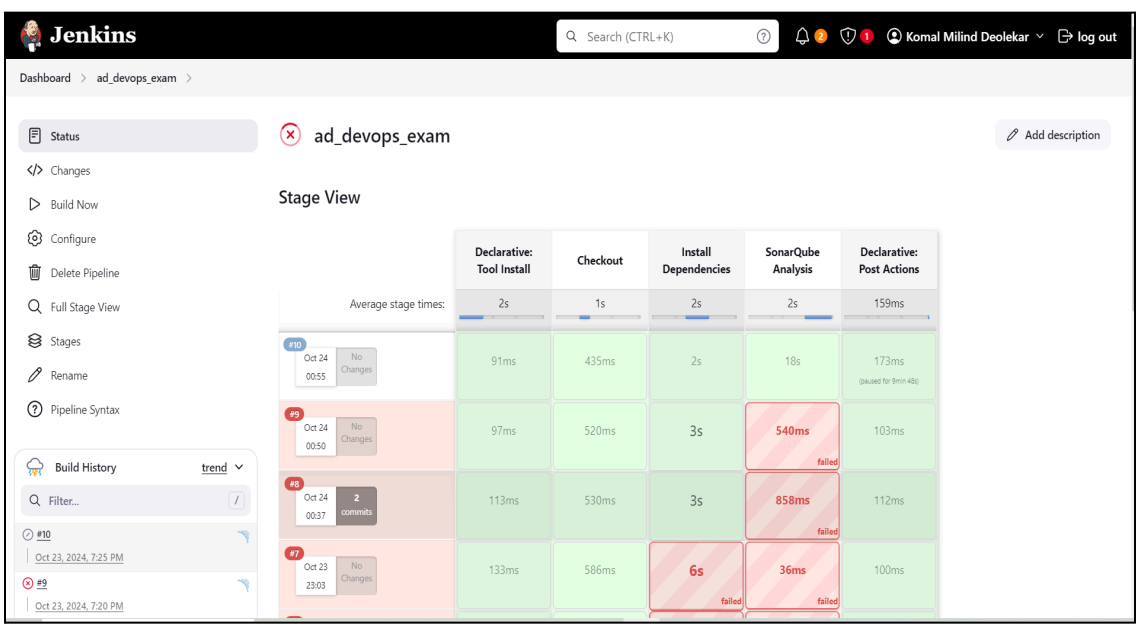
```
            }
        }
        stage('Install Dependencies') {
            steps {
                // Install nvm
                    sh '''
                    curl -o- https://raw.githubusercontent.com/nvm-sh/nvm/v0.39.5/install.sh | bash
                    source ~/.nvm/nvm.sh
                    nvm install 16 # Install the desired Node.js version
                    nvm use 16
                    npm install
                    '''
            }
        }
        stage('SonarQube Analysis') {
            steps {
                // SonarQube Scanner command
                withSonarQubeEnv('sonarqube') {
                    sh '''
                        /opt/sonar-scanner/bin/sonar-scanner \
                          -Dsonar.projectKey=new_test_projecr \
                          -Dsonar.sources=. \
                          -Dsonar.host.url=http://54.145.162.202:9000 \
                          -Dsonar.login=0ba67fecb520ea316d4b1625ef11d71a04d198e4
                    '''
                }
            }
        }
    }
    post {
        always {
            // Check SonarQube Quality Gate result
            script {
                def qg = waitForQualityGate()
                if (qg.status != 'OK') {
                    error "Pipeline failed due to quality gate failure: ${qg.status}"
                }
            }
        }
    }
}
```

Pipeline script

Script ?

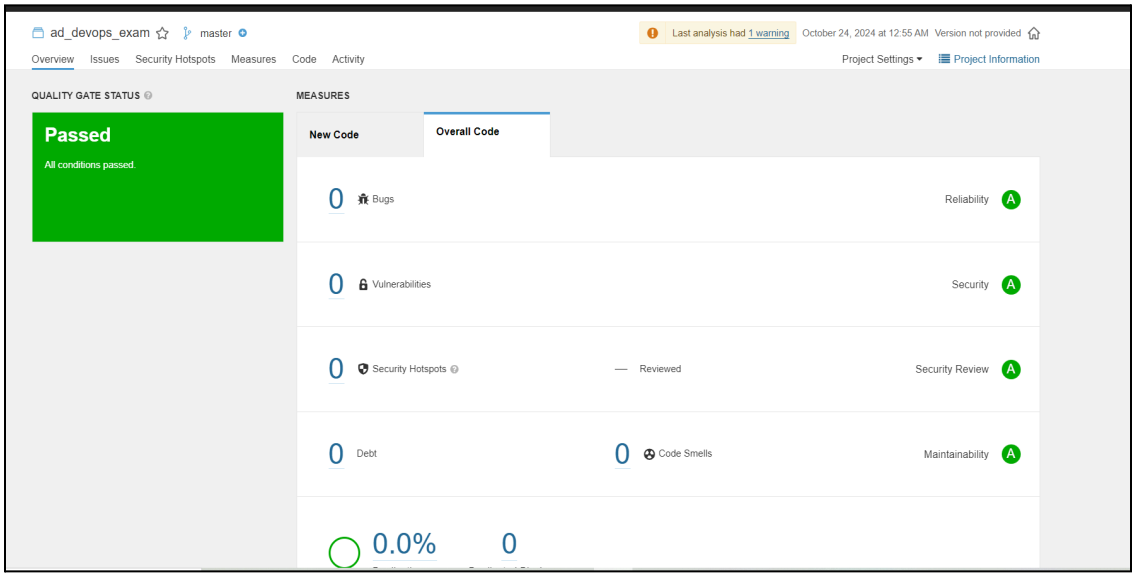
```
pipeline {
    agent any
    tools {
        nodejs 'node'  // Ensure Node.js is installed in Jenkins
    }
    stages {
        stage('Checkout') {
            steps {
                cleanWs()
                git branch: 'main', url: 'https://github.com/KomalDeolekar0607/ad_dev_test.git'
            }
        }
        stage('Install Dependencies') {
            steps {
                // Install nvm
                    sh '''
                    curl -o- https://raw.githubusercontent.com/nvm-sh/nvm/v0.39.5/install.sh | bash
                    source ~/.nvm/nvm.sh
                    nvm install 16 # Install the desired Node.js version
                    nvm use 16
                    npm install
                    '''
            }
        }
        stage('SonarQube Analysis') {
            steps {
                // SonarQube Scanner command
                withSonarQubeEnv('sonarqube') {
                    sh '''
                        /opt/sonar-scanner/bin/sonar-scanner \
                          -Dsonar.projectKey=new_test_projecr \
                          -Dsonar.sources=. \
                          -Dsonar.host.url=http://54.145.162.202:9000 \
                          -Dsonar.login=0ba67fecb520ea316d4b1625ef11d71a04d198e4
                    '''
                }
            }
        }
    }
    post {
        always {
            // Check SonarQube Quality Gate result
            script {
                def qg = waitForQualityGate()
                if (qg.status != 'OK') {
                    error "Pipeline failed due to quality gate failure: ${qg.status}"
                }
            }
        }
    }
}
```

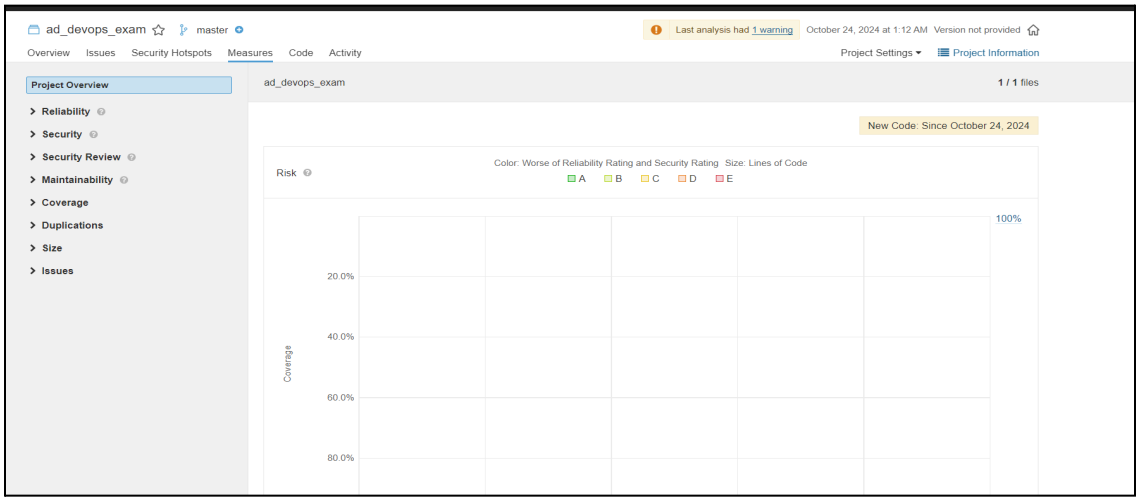
Now build the job.

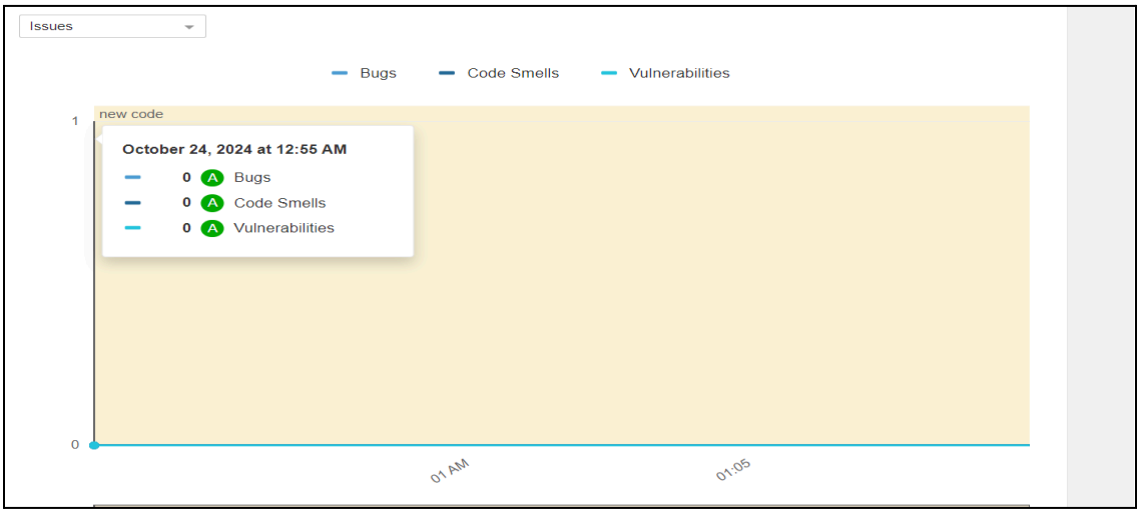


Sonarqube dashboard

Now you can analyze the project in sonarqube







5. Conclusion

The successful integration of Jenkins and SonarQube within an EC2 instance demonstrates the effectiveness of automating code quality checks through Continuous Integration. By following the outlined steps, I set up a Jenkins pipeline that automatically performed static code analysis on a JavaScript file, using SonarQube to evaluate the code's quality.

In the final analysis, the SonarQube report indicated 0 bugs, and all metrics—such as security vulnerabilities, code smells, and maintainability—were rated as optimal (green). This result validates the correctness of the code in the provided repository and highlights the importance of maintaining high-quality standards through continuous code inspection.

The green indicators signify that the project adheres to good coding practices, has minimal technical debt, and is free from critical issues, which is crucial for long-term project sustainability. This case study not only illustrates the practical use of CI/CD tools but also emphasizes the value of automated tools like SonarQube in ensuring the reliability and maintainability of software projects over time.

Going forward, this CI pipeline can be extended and adapted for larger projects, incorporating additional tests and checks to further enhance the development process.