

**< CONTINUOUS INTEGRATION USING JENKINS,
NEXUS, SONARQUBE & SLACK >**

IMPLEMENTATION PLAN

VERSION 1.0 | 23/05/2022 – 25/05/2022

Purpose

This section, describe the Continuous Integration Using Jenkins, Nexus, Sonarqube & Slack.

Project Scenario

- Agile SDLC.
- Developer makes regular code changes.
- These commits need to be regularly Build and Tested.
- Build and Release Team will do this job.
- Or Developer job to merge and integrate code.

Problem Statement

- In Agile SDLC, there will be frequent code changes.
- Not so frequently code will be tested, which accumulates bugs and error in the code.
- Developer need to rework to fix these bugs and errors.
- Manual Build & release process.
- Inter Team Dependencies.

Solution

- Build & test for every commit.
- Automated process.
- Notify for every build status.
- Fix code if bugs or error found instantly rather than waiting.

Tools

- Jenkins – Continuous Integration Server
- GIT – Version Control System
- Maven – Build Tool
- CheckStyle – Code Analysis Tool
- Slack – Notification
- Nexus – Artifact/Software Repository
- Sonarqube – Code Analysis Server
- AWS – EC2 Resource

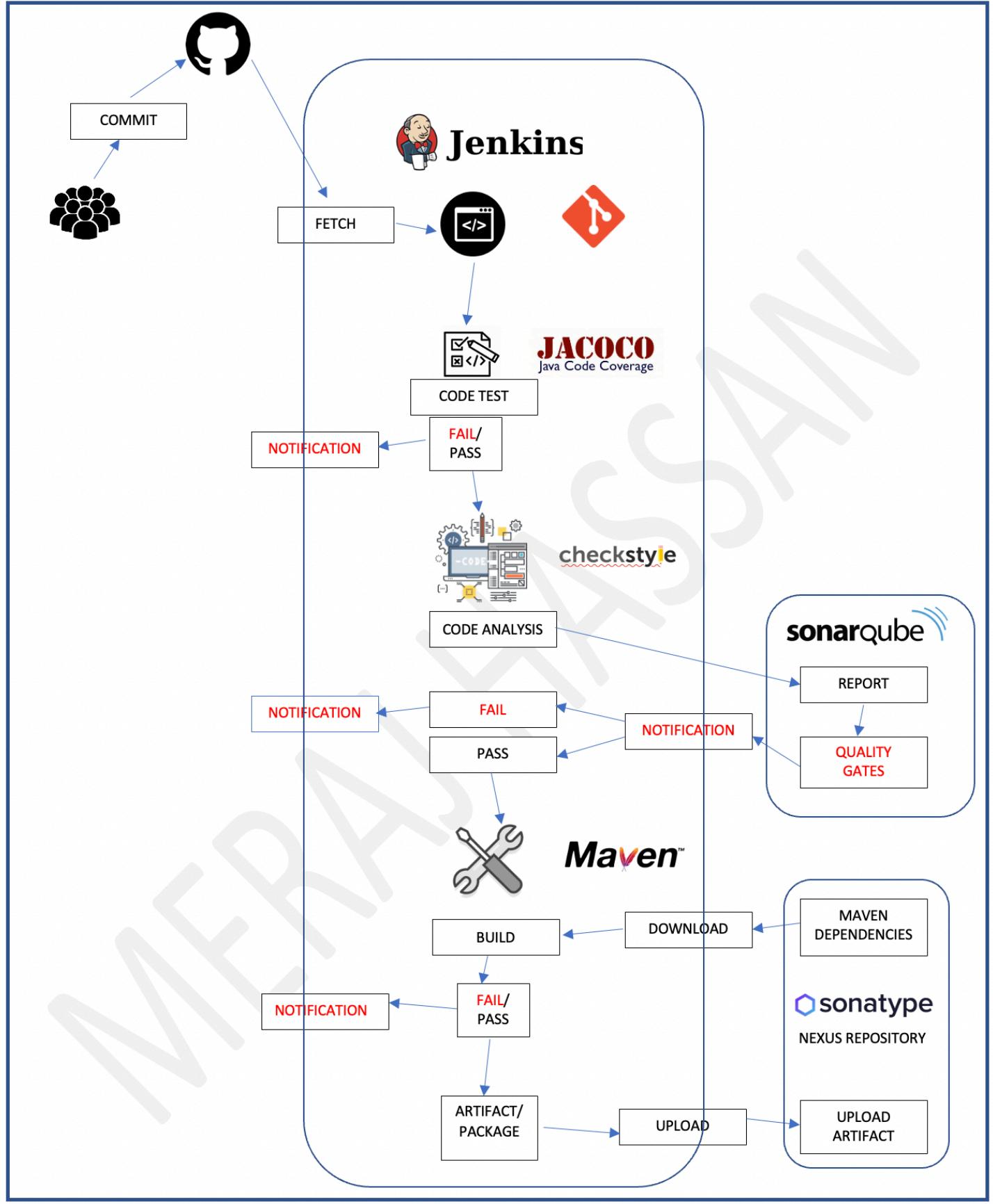
Objective

- Fault Isolation.
- Short MTTR
- Fast turnaround on feature changes
- Less disruptive

Architecture of AWS Services

- EC2 Instances

Architecture Continuous Integration Pipeline



Flow of Execution

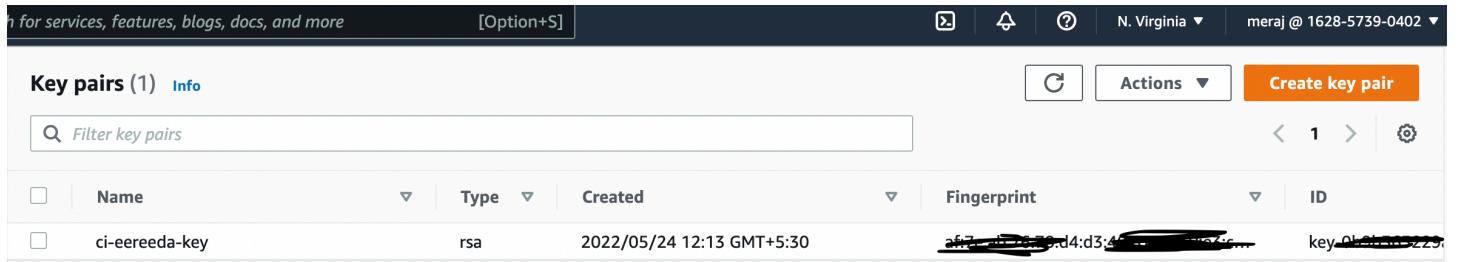
- *Login to AWS Account*
- *Create Login Key*
- *Create Security Group*
 - *Jenkins*
 - *Nexus*
 - *Sonar*
- *Create EC2 instance with user data*
 - *Jenkins*
 - *Sonarqube*
 - *Nexus*
- *Jenkins post installation*
- *Nexus repository setup*
 - *3 Repos*
- *Sonarqube Post Installation*
- *Jenkins Steps*
 - *Build Job*
 - *Setup Slack Notification*
 - *Checkstyle code analysis job*
 - *Setup Sonar integration*
 - *Sonar Code analysis job*
 - *Artifact upload job*
- *Connect all job together with BuildPipeline*
- *Set automatic build trigger*
- *Test with intellij*
- *Clean-up*

Prerequisite

1. *AWS Account*
2. *GITHUB Account*
3. *IntelliJ*

1. Security Group & Keypairs

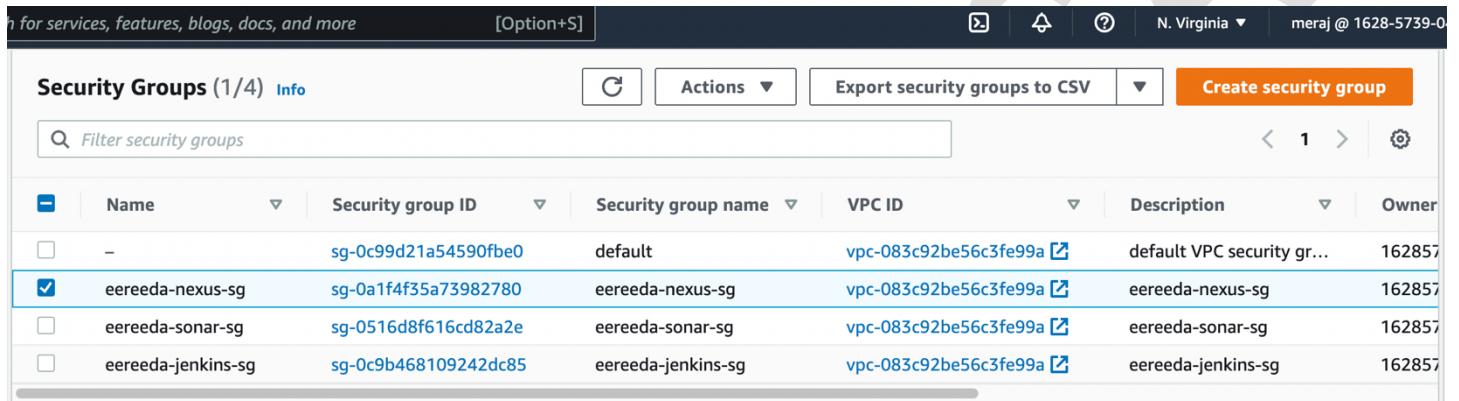
a. KeyPairs



A screenshot of the AWS Lambda console showing the 'Key pairs' list. The table has columns: Name, Type, Created, Fingerprint, and ID. One row is visible: 'ci-eereeda-key' (rsa, 2022/05/24 12:13 GMT+5:30, fingerprint, key_ID).

	Name	Type	Created	Fingerprint	ID
<input type="checkbox"/>	ci-eereeda-key	rsa	2022/05/24 12:13 GMT+5:30	[REDACTED]	key_ID[REDACTED]

b. Security Group



A screenshot of the AWS Lambda console showing the 'Security Groups' list. The table has columns: Name, Security group ID, Security group name, VPC ID, Description, and Owner. One row is checked: 'eereeda-nexus-sg' (sg-0a1f4f35a73982780, default, vpc-083c92be56c3fe99a, eereeda-nexus-sg, 162857).

	Name	Security group ID	Security group name	VPC ID	Description	Owner
<input type="checkbox"/>	-	sg-0c99d21a54590fbe0	default	vpc-083c92be56c3fe99a	default VPC security gr...	162857
<input checked="" type="checkbox"/>	eereeda-nexus-sg	sg-0a1f4f35a73982780	eereeda-nexus-sg	vpc-083c92be56c3fe99a	eereeda-nexus-sg	162857
<input type="checkbox"/>	eereeda-sonar-sg	sg-0516d8f616cd82a2e	eereeda-sonar-sg	vpc-083c92be56c3fe99a	eereeda-sonar-sg	162857
<input type="checkbox"/>	eereeda-jenkins-sg	sg-0c9b468109242dc85	eereeda-jenkins-sg	vpc-083c92be56c3fe99a	eereeda-jenkins-sg	162857

User Data Script

```
$ git clone https://github.com/merajafnan/DevOps_Projects.git  
$ git checkout CI-Jenkins  
$ cd userdata  
$ ls
```



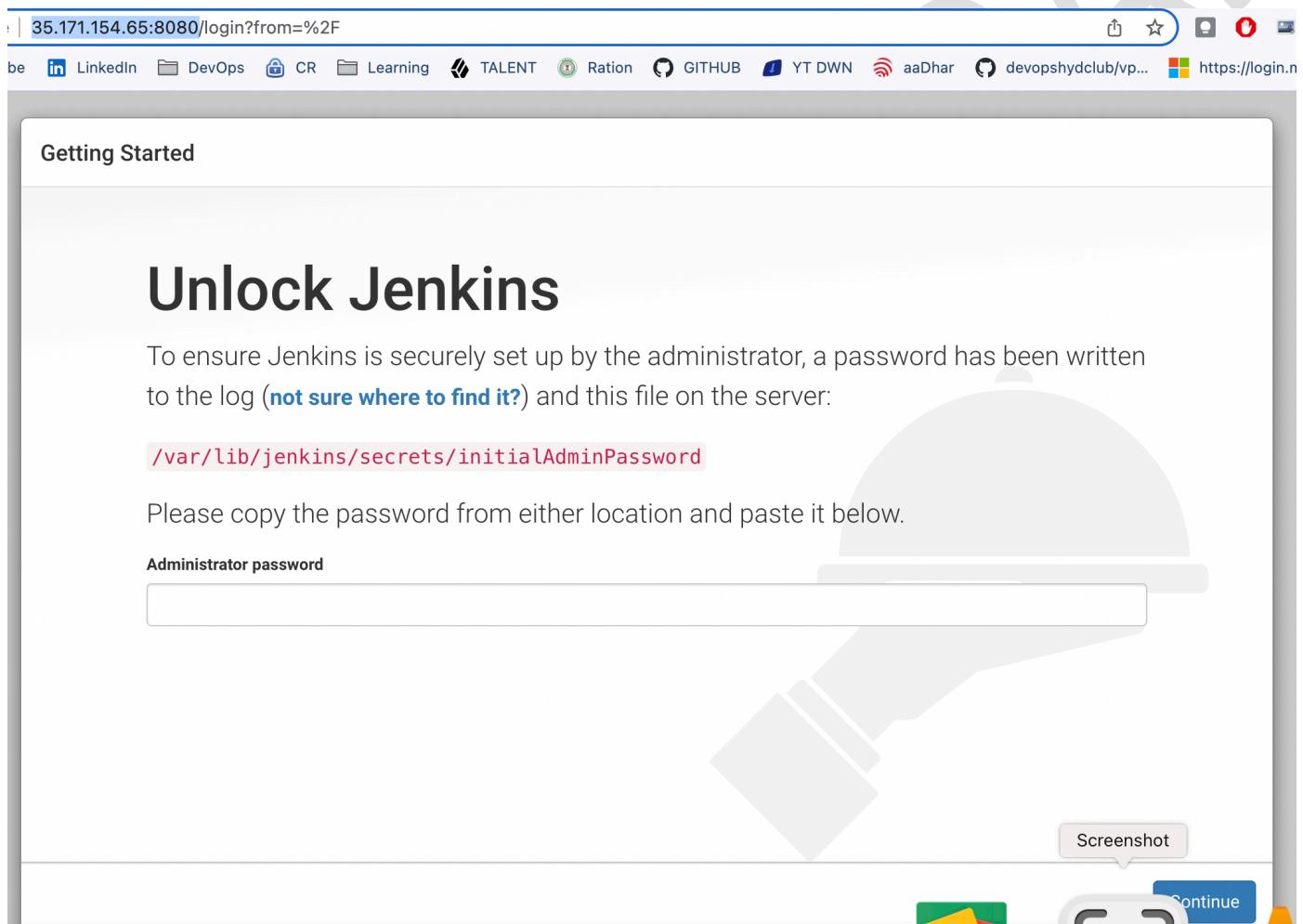
A screenshot of a terminal window titled 'DevOps_Projects -- zsh -- 80x24'. The command 'ls userdata' is run, showing files: jenkins-setup.sh, nexus-setup.sh, sonar-analysis-properties, and sonar-setup.sh.

```
merajhassan@MERAJs-MacBook-Air DevOps_Projects % ls userdata  
jenkins-setup.sh  
nexus-setup.sh  
sonar-analysis-properties  
sonar-setup.sh
```

2. Setup Jenkins, Nexus & SonarQube Server

Instances (1/3) Info							
	Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
<input type="checkbox"/>	Nexus-Server	i-01982dc566661f662	Running  	t2.medium	Initializing 	No alarms 	us-east-1d
<input checked="" type="checkbox"/>	Jenkins-Server	i-0dde0e3c038db66f3	Running  	t2.small	2/2 checks passed 	No alarms 	us-east-1d
<input type="checkbox"/>	SonarQube-Se...	i-0f350bfa8ac3a3267	Running  	t2.medium	Initializing 	No alarms 	us-east-1d

Check Jenkins is working - <http://35.171.154.65:8080/>



35.171.154.65:8080/login?from=%2F

be LinkedIn DevOps CR Learning TALENT Ration GITHUB YT DWN aaDhar devopshyclub/vp... https://login.n

Getting Started

Unlock Jenkins

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

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

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

Administrator password

Screenshot Continue

```
$ ssh -i "ci-eereeda-key.pem" ubuntu@ec2-35-171-154-65.compute-1.amazonaws.com
$ sudo -i
# cat /var/lib/jenkins/secrets/initialAdminPassword
```

The screenshot shows the Jenkins dashboard at <http://35.171.154.65:8080>. The left sidebar contains links for 'New Item', 'People', 'Build History', 'Manage Jenkins', 'My Views', and 'New View'. The main content area features a 'Welcome to Jenkins!' heading and a 'Start building your software project' section with a 'Create a job' button.

Check Nexus is working - <http://54.165.249.37:8081/>

The screenshot shows the Sonatype Nexus Repository Manager at <http://54.165.249.37:8081>. The left sidebar has 'Welcome', 'Search', and 'Browse' options. The main content includes a 'Welcome' message, a 'Read More...' button, a 'Get Started' section, a 'Configuration' section, and a 'Repository Formats' section. A 'Sign In' dialog box is overlaid on the page, containing instructions about the admin password location and two input fields for 'Username' and 'Password'.

```
$ ssh -i "ci-eereeda-key.pem" centos@ec2-54-165-249-37.compute-1.amazonaws.com
$ sudo -i
$ cat /opt/nexus/sonatype-work/nexus3/admin.password
```

The screenshot shows the Sonatype Nexus Repository Manager at <http://54.165.249.37:8081>. The left sidebar includes 'Upload' as well as 'Welcome', 'Search', and 'Browse'. The main content features a warning message about the log4j vulnerability and its mitigation, followed by a 'Enable Capability' button.

Settings > Repositories > Create Repository

Maven hosted – Upload our artifact

Maven hosted – Maven Build tool will download dependencies from here
[<https://repo1.maven.org/maven2/>]

Maven group – Group both repository together

The screenshot shows the Artifactory Manager interface with the 'Repositories' screen selected. The top navigation bar includes 'Manager', a cube icon, a gear icon (highlighted in green), a search bar, and user information for 'admin'. Below the header, there's a 'Create repository' button and a 'Filter' dropdown. The main area lists three repositories:

Name ↑	Type	Format	Status	URL	Health check	IQ Policy Vi...
eereeda-central	proxy	maven2	Online - Ready to Connect	<button>copy</button>	Analyze	
eereeda-maven-group	group	maven2	Online	<button>copy</button>		
eereeda-release	hosted	maven2	Online	<button>copy</button>		

3. Build and Nexus Integration Job

Build

Invoke top-level Maven targets X

Goals

install -DskipTests ▼

POM ?

Properties ?

```
SNAP-REPO=eereeda-snapshot  
NEXUS-USER=admin  
NEXUS-PASS=admin123  
RELEASE-REPO=eereeda-release  
CENTRAL-REPO=eereeda-central  
NEXUS-GRP-REPO=eereeda-maven-group  
NEXUSIP=172.31.87.153  
NEXUSPORT=8081
```

Git ?

Repositories ?

Repository URL ?

https://github.com/merajafnan/DevOps_Projects.git

Credentials ?

- none - ▼

Add ▼

Advanced...

Add Repository

Branches to build ?

Branch Specifier (blank for 'any') X

[*/CI-Jenkins](#)

Screenshot

S	W	Name ↓	Last Success	Last Failure	Last Duration
✓	⌚	Build	58 sec #6	21 min #1	8.5 sec

4. Slack Integration

The screenshot shows the Slack web interface. On the left, the sidebar includes a search bar, a user profile for 'eereeda', and a list of channels. The '# devops' channel is selected, indicated by a blue background. A promotional message from India for a 60% discount on a paid subscription is visible in the channel. At the bottom of the channel view, there is a 'Today' button.

Create bot in - api.slack.com

Scope – Chat:write

Install to workspace

Add bot to slack - @jenkins in slack and press enter

This screenshot shows the message input field in Slack. It displays a message from 'meraj afnan' at 14:23 stating that they joined the workspace along with Jenkins. Below the message input field, there are various rich text and emoji icons available for message formatting.

Manage Jenkins > Plugins > Available > Slack Notification > Install without restart

Manage Jenkins > Manage Credentials > Jenkins > Global Credential > Add Credential > Kind > Secret Text

This screenshot shows the Jenkins 'Manage Credentials' screen. A new global credential is being added, specifically a 'Secret Text' type. The configuration fields include 'Kind' set to 'Secret text', 'Scope' set to 'Global (Jenkins, nodes, items, all child items, etc.)', 'Secret' containing a redacted value, 'ID' set to 'slack', and 'Description' set to 'slack-token'. The 'Secret' field is highlighted with a blue border.

Manage Jenkins > Configure System > Slack > Custom slack app bot user >save

Post-build Actions

Slack Notifications

- Notify Build Start
- Notify Success
- Notify Aborted
- Notify Not Built
- Notify Unstable
- Notify Regression
- Notify Every Failure
- Notify Back To Normal
- Notify First Failure Only

Archive the artifact > build
Check Slack Notification

Today ▾



meraj afnan 14:23

joined #eereeda-jenkins along with Jenkins.



Jenkins APP 14:44

Slack/Jenkins plugin: you're all set on <http://35.171.154.65:8080/>

Build - #7 Started by user admin ([Open](#))

Build - #7 Success after 8.4 sec ([Open](#))

 Try me!

5. Test, Code Analysis, SonarQube Integration

New Item > Test > Copy from build Job

Build

Invoke top-level Maven targets

Goals

test

S	W	Name ↓	Last Success	Last Failure	Last Duration
✓	⌚	Build	29 min #7	1 hr 40 min #1	8.4 sec
✓	☁️	Test	1 min 1 sec #4	19 min #2	20 sec

Build > configure > Post Build job > Test,
New Item > Integration Test > Copy from Test Job
Test > configure > Post Build job > Integration Test,

Invoke top-level Maven targets

Goals

verify -DskipUnitTests

Advanced...

eereeda-jenkins ▾

+ Add a bookmark

Test - #3 Started by user admin (Open)

Test - #3 Still Failing after 11 sec (Open)

Jenkins APP 15:15

Test - #4 Started by user admin (Open)

Test - #4 Success after 20 sec (Open)

Jenkins APP 15:22

Integration Test - #1 Started by user admin (Open)

Integration Test - #1 Success after 28 sec (Open)

Try me!

Manage Jenkins > Plugins > Available > Warnings Next Generation & Violations > Install without restart

Install	Name ↓	Released
<input checked="" type="checkbox"/>	Warnings Next Generation 9.12.0	1 mo 9 days ago
<input checked="" type="checkbox"/>	Violations 0.7.11	9 yr 8 mo ago
	.NET Development Maven Build Reports	
	This plugin does reports on checkstyle, csslint, pmd, cpd, fxcop, pylint, jcReport, findbugs, and perlcritic violations.	
	This plugin is deprecated. In general, this means that it is either obsolete, no longer being developed, or may no longer work. Learn more.	

New Item > Code Analysis > Copy from Build Job



S	W	Name ↓	Last Success	Last Failure	Last Duration	# Issues
<input checked="" type="checkbox"/>		Build	43 min #7	1 hr 54 min #1	8.4 sec	
<input checked="" type="checkbox"/>		Code-Analysis	56 sec #1	N/A	21 sec	
<input checked="" type="checkbox"/>		Integration Test	8 min 39 sec #1	N/A	28 sec	
<input checked="" type="checkbox"/>		Test	14 min #4	33 min #2	20 sec	

Invoke top-level Maven targets X

?

Goals

checkstyle:checkstyle ▼

```
[ [1;33mWARNING [m] For more information see: https://maven.apache.org/plugins/maven-checkstyle-plugin/examples/upgrading-checkstyle.html
[ [1;33mWARNING [m] File encoding has not been set, using platform encoding UTF-8, i.e. build is platform dependent!
[ [1;34mINFO [m] There are 96 errors reported by Checkstyle 8.29 with sun_checks.xml ruleset.
[ [1;33mWARNING [m] Unable to locate Source XRef to link to - DISABLED
[ [1;34mINFO [m] [1m----- [m
[ [1;34mINFO [m] [1;32mBUILD SUCCESS [m
[ [1;34mINFO [m] [1m----- [m
[ [1;34mINFO [m] Total time: 14.329 s
[ [1;34mINFO [m] Finished at: 2022-05-24T10:00:04Z
[ [1;34mINFO [m] [1m----- [m
[Slack Notifications] will send OnSuccessNotification because build matches and user preferences allow it
Finished: SUCCESS Screenshot
```

> 50 error build becomes unstable

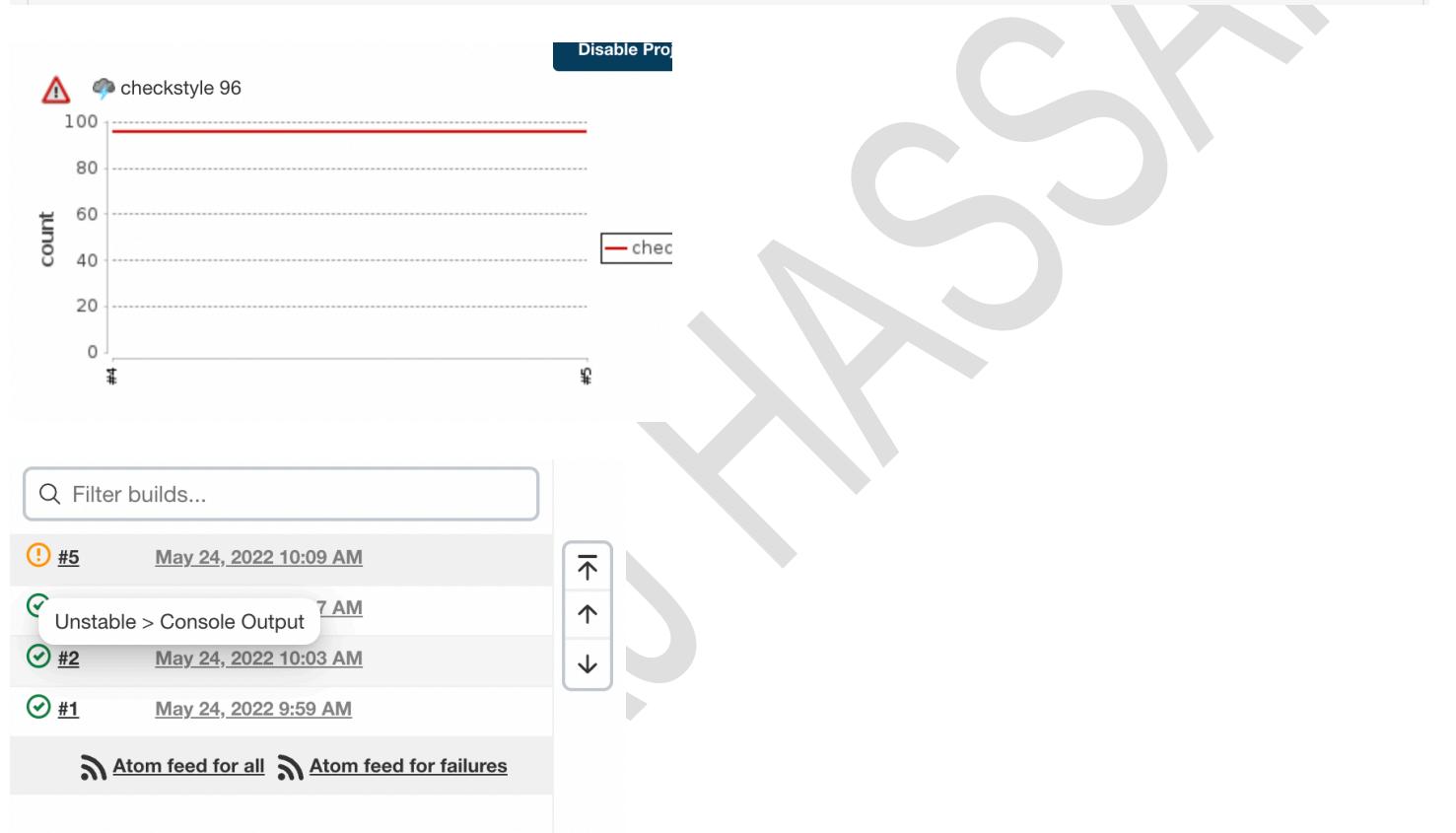
Post-build Actions

Report Violations X

XML filename pattern

checkstyle

10 50 50 target/checkstyle-result.xml



6. SonarQube Setup

My account > security > Generate Tokens > (sonartoken) > Generate
Manage Jenkins > Plugins > Available > SonarQube Scanner & Sonar Quality Gate > Install without restart
Manage Jenkins > Global Tool Configuration > SonarQube Scanner > Install
Manage Jenkins > Configure System > SonarQube servers > Enable injection of SonarQube
New Item > SonarScanner-CodeAnalysis > Copy from Build Job

SonarQube servers

- Environment variables Enable injection of SonarQube server configuration as build environment variables
If checked, job administrators will be able to inject a SonarQube server configuration as environment variables in the build.

SonarQube installations

Name

sonar-eereeda

Server URL

http://172.31.81.27

Default is http://localhost:9000

Server authentication token

sonartoken ▾

Add ▾

SonarQube authentication token. Mandatory when anonymous access is disabled.

Quality Gates - Sonarqube

Name ?

sonar-eereeda

Make sure the name is unique value

SonarQube Server URL ?

http://172.31.81.27

Default value is 'http://localhost:9000'

SonarQube account token ?

c1fe5b6a072548bb871237e0018bc43

Use token instead of user and password

Build Environment

- Delete workspace before build starts
- Use secret text(s) or file(s) ?
- Abort the build if it's stuck
- Add timestamps to the Console Output
- Inspect build log for published Gradle build scans
- Prepare SonarQube Scanner environment ?

Server authentication token

- none -

SonarQube authentication token. Mandatory when anonymous access is disabled. Will default to the one defined in the SonarQube installation.

Invoke top-level Maven targets

?

Goals

clean install sonar:sonar

POM ?

Properties ?

```
SNAP-REPO=eereeda-snapshot  
NEXUS-USER=admin  
NEXUS-PASS=admin123  
RELEASE-REPO=eereeda-release  
CENTRAL-REPO=eereeda-central  
NEXUS-GRP-REPO=eereeda-maven-group  
NEXUSIP=172.31.87.153  
NEXUSPORT=8081
```

Last analysis: May 25, 2022, 11:11 AM

32 C
 Bugs

1 D
 Vulnerabilities

0.0% E
 Hotspots Reviewed

18 A
 Code Smells

 31.3%
Coverage

 13.6%
Duplications

1.6k S
JSP, Java, ...

7. Quality Gates

Quality Gates > {eereeda-QualityGates} > Create > Bugs > {>15} > Create Project > {eereeda-jenkins} > Quality Gates > {eereeda-QualityGates}

Post-build Actions

Quality Gates Sonarqube Plugin X

Project Key ?

com.visualpathit:vprofile

Job status when analysis fails ?

UNSTABLE

SonarScanner-CodeAnalysis - #7 Started by user admin ([Open](#)) New

SonarScanner-CodeAnalysis - #7 Unstable after 51 sec ([Open](#))

B I ⌂ ⌁ ⌃ ⌄ ⌅ ⌆ ⌈ ⌉ ⌋ ⌑ ⌔

Send a message to #eereeda-jenkins

```
[1;34mINFO [m] [1;32mBUILD SUCCESS [m
[1;34mINFO [m] [1m-----
[1;34mINFO [m] Total time: 29.074 s
[1;34mINFO [m] Finished at: 2022-05-25T06:08:25Z
[1;34mINFO [m] [1m-----
Has build PENDING with id: AYD51Kr7mjUGxOCySdfm - waiting 10000 to execute next check. DEBUG:27
Status => SUCCESS
PostBuild-Step: Quality Gates plugin build passed: FALSE
Build step 'Quality Gates Sonarqube Plugin' changed build result to UNSTABLE
[Slack Notifications] found #6 as previous completed, non-aborted build
[Slack Notifications] will send OnUnstableNotification because build matches and user preferences allow it
Finished: UNSTABLE
```

8. Nexus Repository Integration

Manage Jenkins > Plugins > Available > Nexus Artifact Uploader & Copy Artifact & ZenTimestamp > Install without restart

New Item > Deploy-to-Nexus > Copy from Build Job

Change date pattern for the BUILD_TIMESTAMP (build timestamp) variable ?

Date and Time Pattern ?

yy-MM-dd-HH-mm

Copy artifacts from another project

X

Project name ?

Build

Which build ?

Latest successful build

Stable build only

Artifacts to copy ?

**/*.war

Nexus artifact uploader

X

Nexus Details

Nexus Version

NEXUS3

Protocol

HTTP

Nexus URL ?

172.31.87.153:8081

Credentials

admin/******** (nexusserverlogin)

GroupId

Version

Repository ?

Artifacts

Artifact X

ArtifactId

Browse / **eereeda-release**

[Upload component](#) [HTML View](#)

- QA
 - 22-05-25-06-25
 - eereeda-22-05-25-06-33
 - V3
 - V4
 - eereeda-22-05-25-06-33-V4.war
 - eereeda-22-05-25-06-33-V4.war.md5
 - eereeda-22-05-25-06-33-V4.war.sha1

QA/eereeda-22-05-25-06-33 Delete folder

MEPAS

9. Validate Pipeline & Summarize

Manage Jenkins > Plugins > Available > Build Pipeline > Install without restart

The screenshot shows the Jenkins interface for the 'Integration Test' project. The left sidebar has a 'Console Output' section selected. The main content area is titled 'Console Output' with a green checkmark icon. It displays the build log for build number 2, which was started by upstream project 'Test' build 5. The log shows the command to resolve the git repository and the configuration for fetching upstream changes from GitHub.

```
Started by upstream project "Test" build number 5
originally caused by:
Started by upstream project "Build" build number 8
originally caused by:
Started by user admin
Running as SYSTEM
Building in workspace /var/lib/jenkins/workspace/Integration Test
The recommended git tool is: NONE
No credentials specified
> git rev-parse --resolve-git-dir /var/lib/jenkins/workspace/Integration Test/.git # timeout=10
Fetching changes from the remote Git repository
> git config remote.origin.url https://github.com/merajafnan/DevOps_Projects.git # timeout=10
Fetching upstream changes from https://github.com/merajafnan/DevOps_Projects.git
```

The screenshot shows the Jenkins interface for the 'Build Pipeline' project. The pipeline consists of seven stages: Pipeline #8, #8 Build, #5 Test, #2 Integration Test, #6 Code-Analysis, #9 SonarScanner-CodeAnalysis, and Deploy-to-Nexus. Stage #9 is currently running. The stages are represented by cards with icons for each step and a progress bar for the analysis stage.

The screenshot shows the Jenkins interface for the 'Build Pipeline' project. The pipeline stages are identical to the previous screenshot. In this run, stage #9 SonarScanner-CodeAnalysis failed, indicated by a red status icon and a red progress bar. The other stages completed successfully.

10. Slack Notification

eereeda-jenkins ▾

+ Add a bookmark

Jenkins APP 12:13

Build - #8 Started by user admin ([Open](#))

Build - #8 Success after 17 sec ([Open](#))

Test - #5 Started by upstream project "Build" build number 8 ([Open](#))

Test - #5 Success after 47 sec ([Open](#))

Integration Test - #2 Started by upstream project "Test" build number 5 ([Open](#))

Integration Test - #2 Success after 49 sec ([Open](#))

Code-Analysis - #6 Started by upstream project "Integration Test" build number 2 ([Open](#))

Code-Analysis - #6 Success after 16 sec ([Open](#))

SonarScanner-CodeAnalysis - #9 Started by upstream project "Code-Analysis" build number 6 ([Open](#))

SonarScanner-CodeAnalysis - #9 Success after 1 min 21 sec ([Open](#))

Deploy-to-Nexus - #5 Started by upstream project "SonarScanner-CodeAnalysis" build number 9 ([Open](#))

Deploy-to-Nexus - #5 Success after 1.2 sec ([Open](#))

↑ 21 new messages ×

Pol SCM for Automatically start pipeline when there is a code change

Build Triggers

- Trigger builds remotely (e.g., from scripts) ?
- Build after other projects are built ?
- Build periodically ?
- GitHub hook trigger for GITScm polling ?
- Poll SCM ?

Schedule ?

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

Would last have run at Wednesday, May 25, 2022 6:53:02 AM UTC; would next run at Wednesday, May 25, 2022 6:53:02 AM UTC.

This field follows the syntax of cron (with minor differences). Specifically, each line consists of 5 fields separated by TAB or whitespace:
MINUTE HOUR DOM MONTH DOW

11. References

The following table summarizes the documents referenced in this plan.

DOCUMENT NAME	INSTRUCTOR	LOCATION
DevOps Beginners to Advanced	Imran Teli	https://www.udemy.com/course/decodingdevops/learn/lecture/28273912?start=0#overview

MEERAUHASSAN