Setting Up SonarQube for Static Analysis of Test Automation Code

QAOps Implementation

VIRNECT QA Team

Sungtae Kim

I. Project Overview

Purpose

- Enhance quality through test automation implementation.
- Improve development efficiency by integrating CI/CD and Agile processes.
- Systematically manage tests and code based on backlog management.
- Strengthen collaboration between development and QA teams.

Goals

- Conduct static analysis of automated test code using SonarQube.
- Improve code quality by detecting code smells, bugs, and security vulnerabilities early.
- Integrate SonarQube into the Jenkins pipeline for continuous inspection.
- Visualize and track code quality metrics over time for test scripts.
- Facilitate collaboration by sharing analysis results through GitHub and Slack.

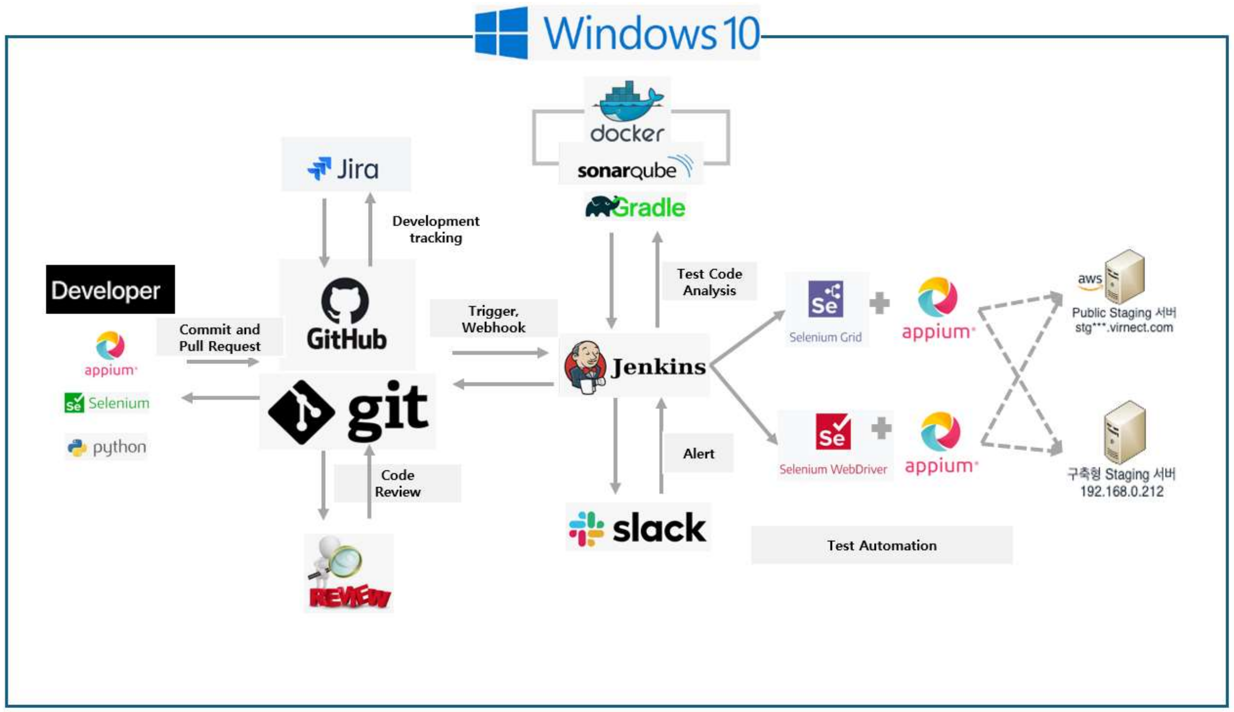
I. Project Overview

Schedule

No.	Schedule	Category	Key Tasks	Responsible Person		Remarks
1	Monday, March 24, 2025	Setup	• Installed SonarQube and PostgreSQL using docker-compose. • Verified that the SonarQube container runs properly and is accessible via http://localhost:9000. • Configured basic settings (admin login, project setup). • Connected a local project to SonarQube using the SonarScanner CLI.	VIRNECT Co., Ltd. | QA Team	Kim Sung-tae, Senior Engineer	
2	Tuesday, March 25, 2025	Study and Setup	• Tested a basic static analysis run and reviewed the code smells, bugs, and vulnerabilities detected. • Explored key dashboards such as: ➢ Overview, Issues, Code, and Measures tabs • Integrate SonarQube analysis into a CI/CD pipeline (Jenkins). • Customize quality gates and coding rules. • Share reports automatically via Slack or GitHub Pull Requests.	VIRNECT Co., Ltd. | QA Team	Kim Sung-tae, Senior Engineer	

I. Project Overview

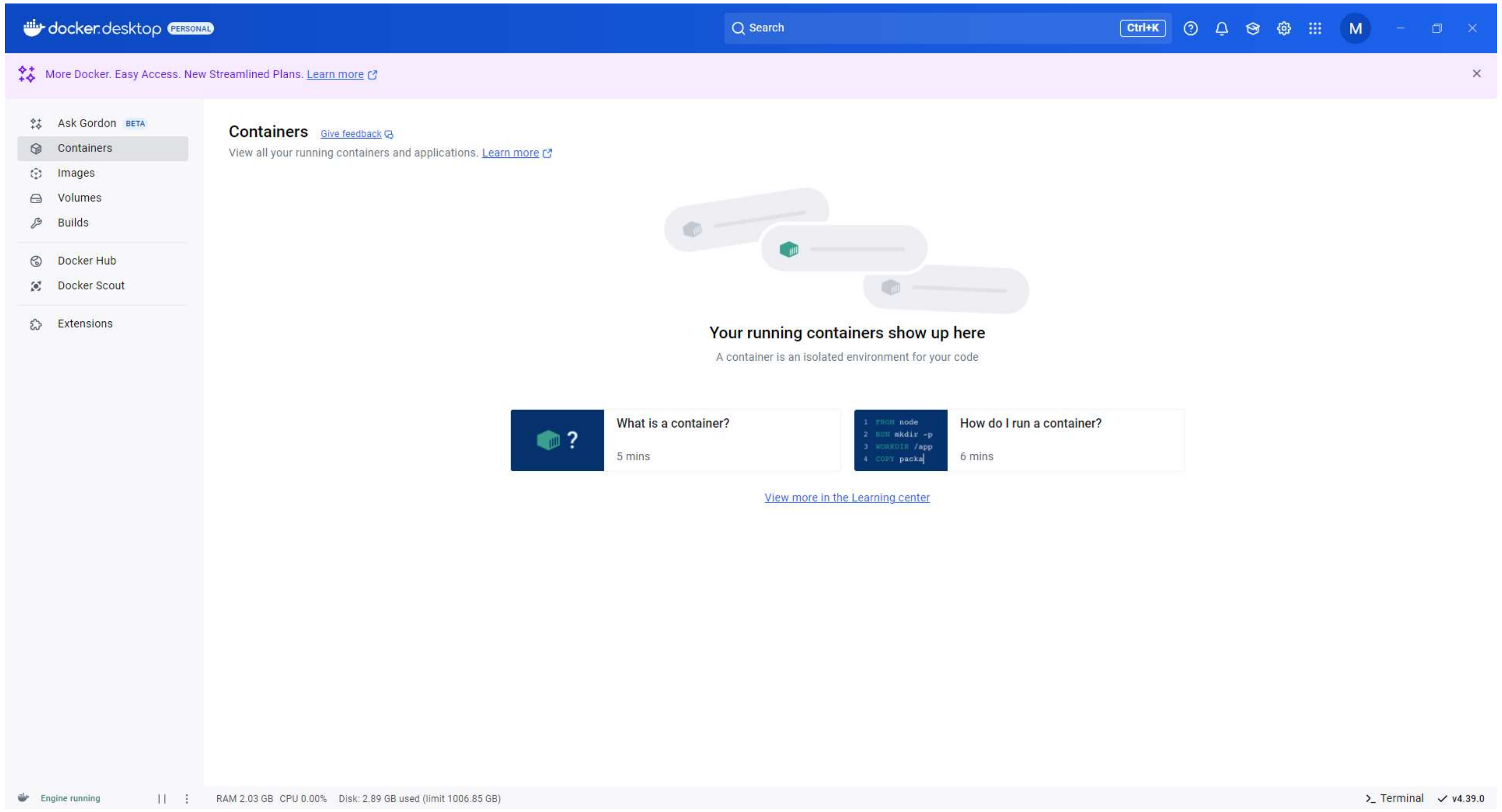
CI/CD Pipeline Architecture in a Team Environment (Windows 10)



VIRNECT

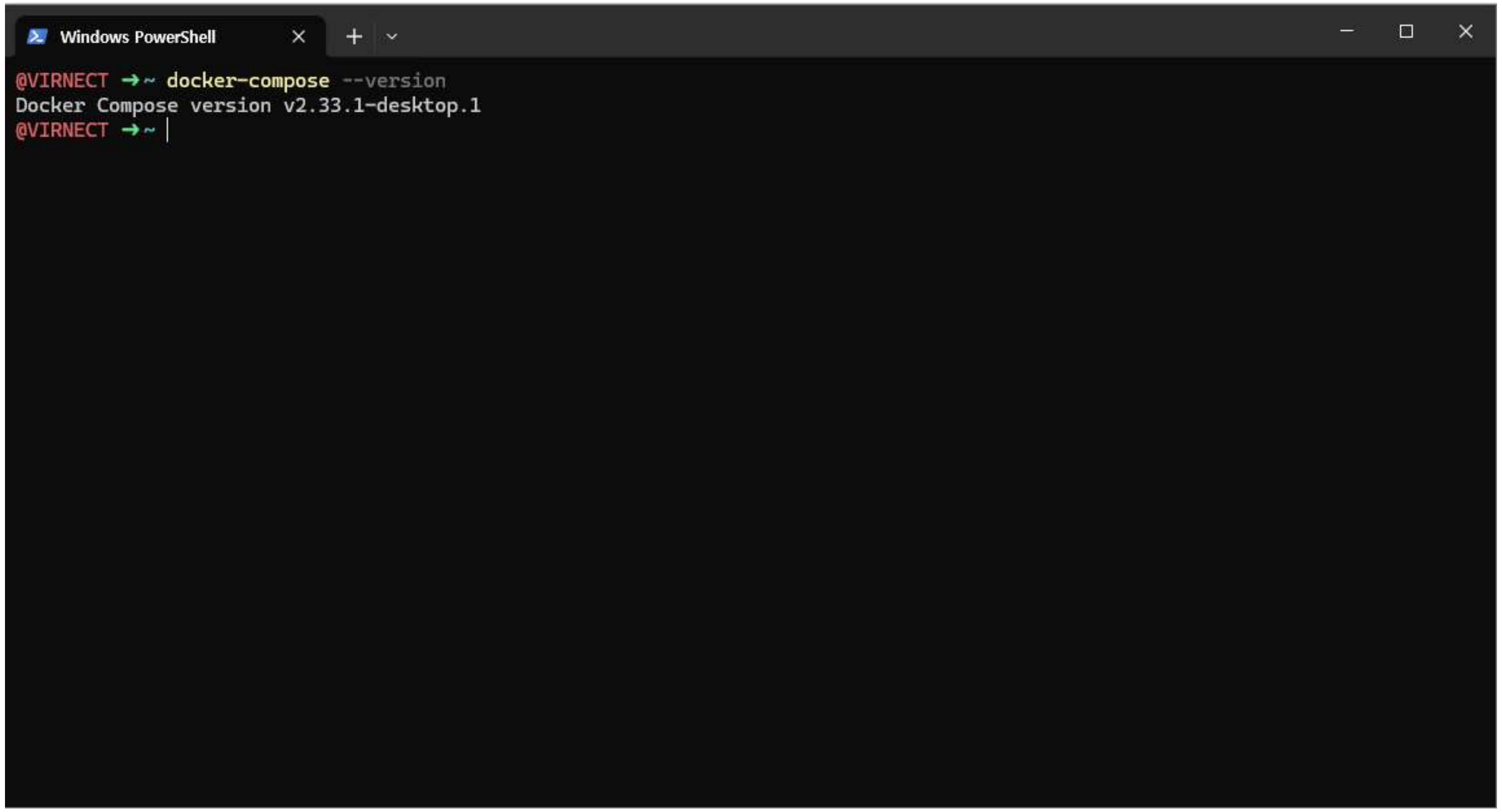
I. Project Overview

1. Install and prepare Docker on Windows


docker desktop PERSONAL
Search
Ctrl+K
M
More Docker. Easy Access. New Streamlined Plans. Learn more
Ask Gordon BETA
Containers
Images
Volumes
Builds
Docker Hub
Docker Scout
Extensions
Containers
Give feedback
View all your running containers and applications. Learn more
Your running containers show up here
A container is an isolated environment for your code
What is a container?
5 mins
How do I run a container?
6 mins
View more in the Learning center
Engine running
RAM 2.03 GB CPU 0.00% Disk: 2.89 GB used (limit 1006.85 GB)
Terminal
v4.39.0

I. Project Overview

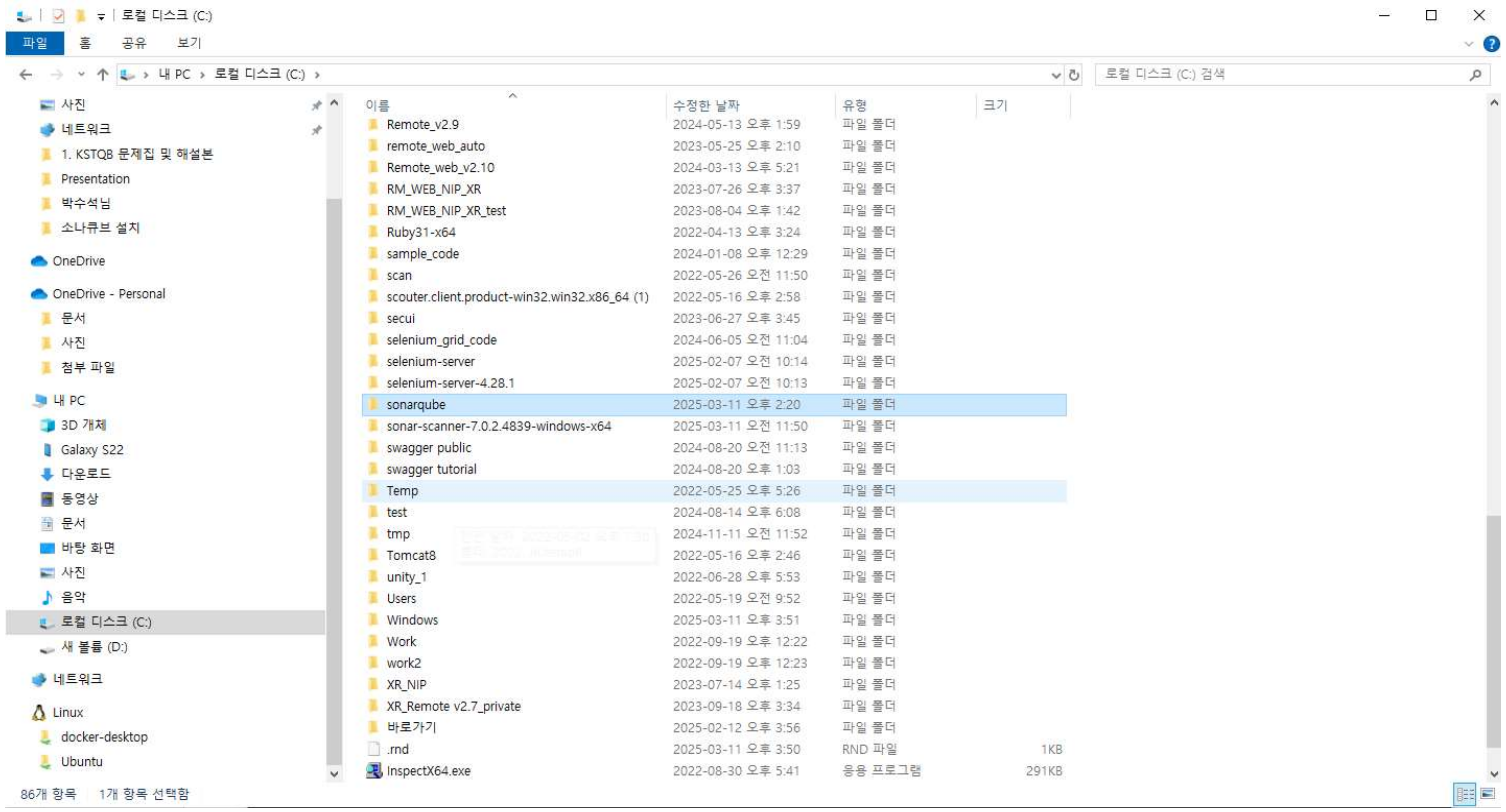
2. Check if Docker Compose is installed on Windows



```
@VIRNECT ➜~ docker-compose --version
Docker Compose version v2.33.1-desktop.1
@VIRNECT ➜~ |
```

I. Project Overview

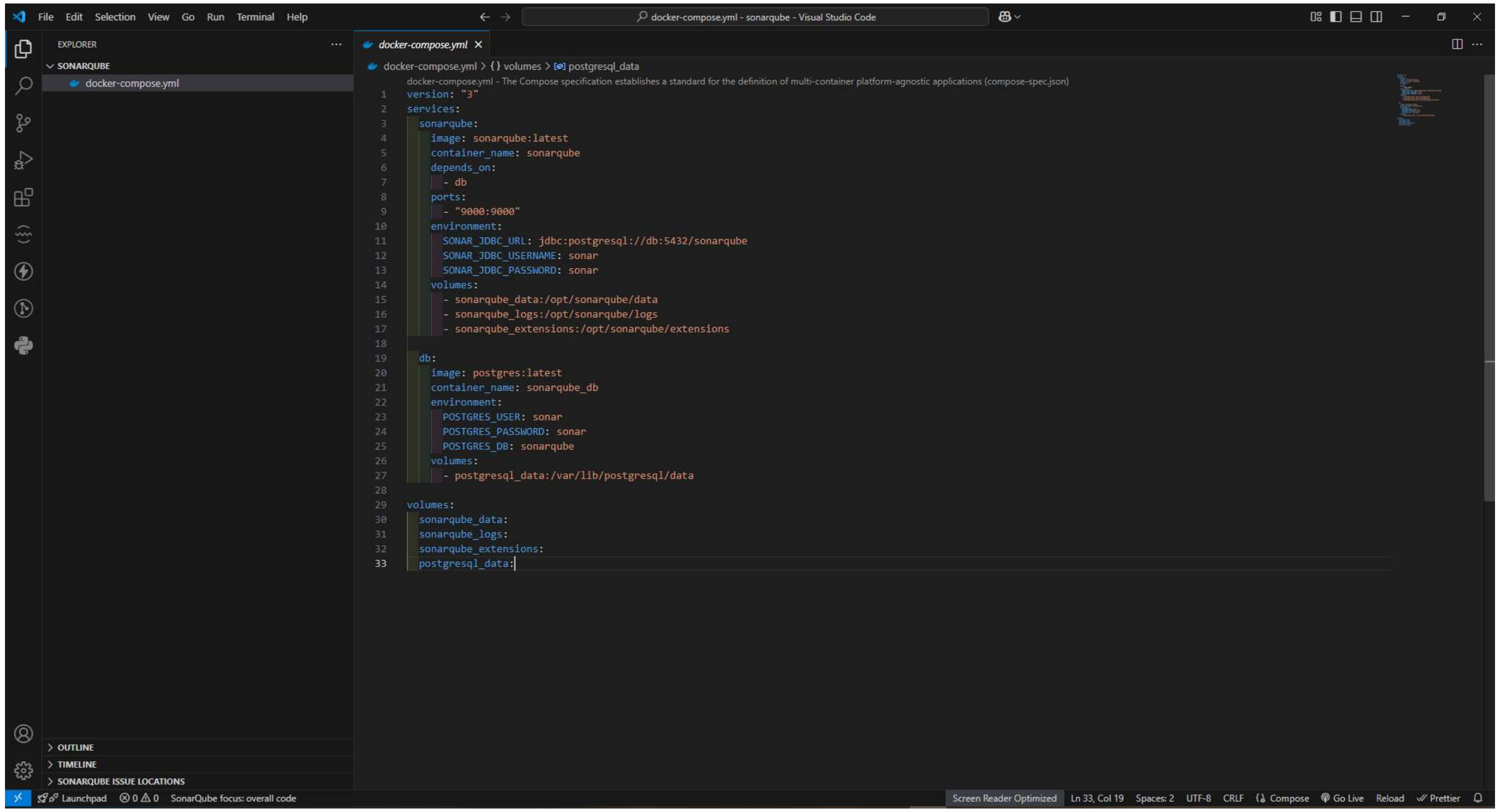
3. Create a SonarQube folder on the local laptop



이름	수정한 날짜	유형	크기
Remote_v2.9	2024-05-13 오후 1:59	파일 폴더	
remote_web_auto	2023-05-25 오후 2:10	파일 폴더	
Remote_web_v2.10	2024-03-13 오후 5:21	파일 폴더	
RM_WEB_NIP_XR	2023-07-26 오후 3:37	파일 폴더	
RM_WEB_NIP_XR_test	2023-08-04 오후 1:42	파일 폴더	
Ruby31-x64	2022-04-13 오후 3:24	파일 폴더	
sample_code	2024-01-08 오후 12:29	파일 폴더	
scan	2022-05-26 오전 11:50	파일 폴더	
scouter.client.product-win32.win32.x86_64 (1)	2022-05-16 오후 2:58	파일 폴더	
secui	2023-06-27 오후 3:45	파일 폴더	
selenium_grid_code	2024-06-05 오전 11:04	파일 폴더	
selenium-server	2025-02-07 오전 10:14	파일 폴더	
selenium-server-4.28.1	2025-02-07 오전 10:13	파일 폴더	
sonarqube	2025-03-11 오후 2:20	파일 폴더	
sonar-scanner-7.0.2.4839-windows-x64	2025-03-11 오전 11:50	파일 폴더	
swagger public	2024-08-20 오전 11:13	파일 폴더	
swagger tutorial	2024-08-20 오후 1:03	파일 폴더	
Temp	2022-05-25 오후 5:26	파일 폴더	
test	2024-08-14 오후 6:08	파일 폴더	
tmp	2024-11-11 오전 11:52	파일 폴더	
Tomcat8	2022-05-16 오후 2:46	파일 폴더	
unity_1	2022-06-28 오후 5:53	파일 폴더	
Users	2022-05-19 오전 9:52	파일 폴더	
Windows	2025-03-11 오후 3:51	파일 폴더	
Work	2022-09-19 오후 12:22	파일 폴더	
work2	2022-09-19 오후 12:23	파일 폴더	
XR_NIP	2023-07-14 오후 1:25	파일 폴더	
XR_Remote v2.7_private	2023-09-18 오후 3:34	파일 폴더	
바로가기	2025-02-12 오후 3:56	파일 폴더	
.rnd	2025-03-11 오후 3:50	RND 파일	1KB
InspectX64.exe	2022-08-30 오후 5:41	응용 프로그램	291KB

I. Project Overview

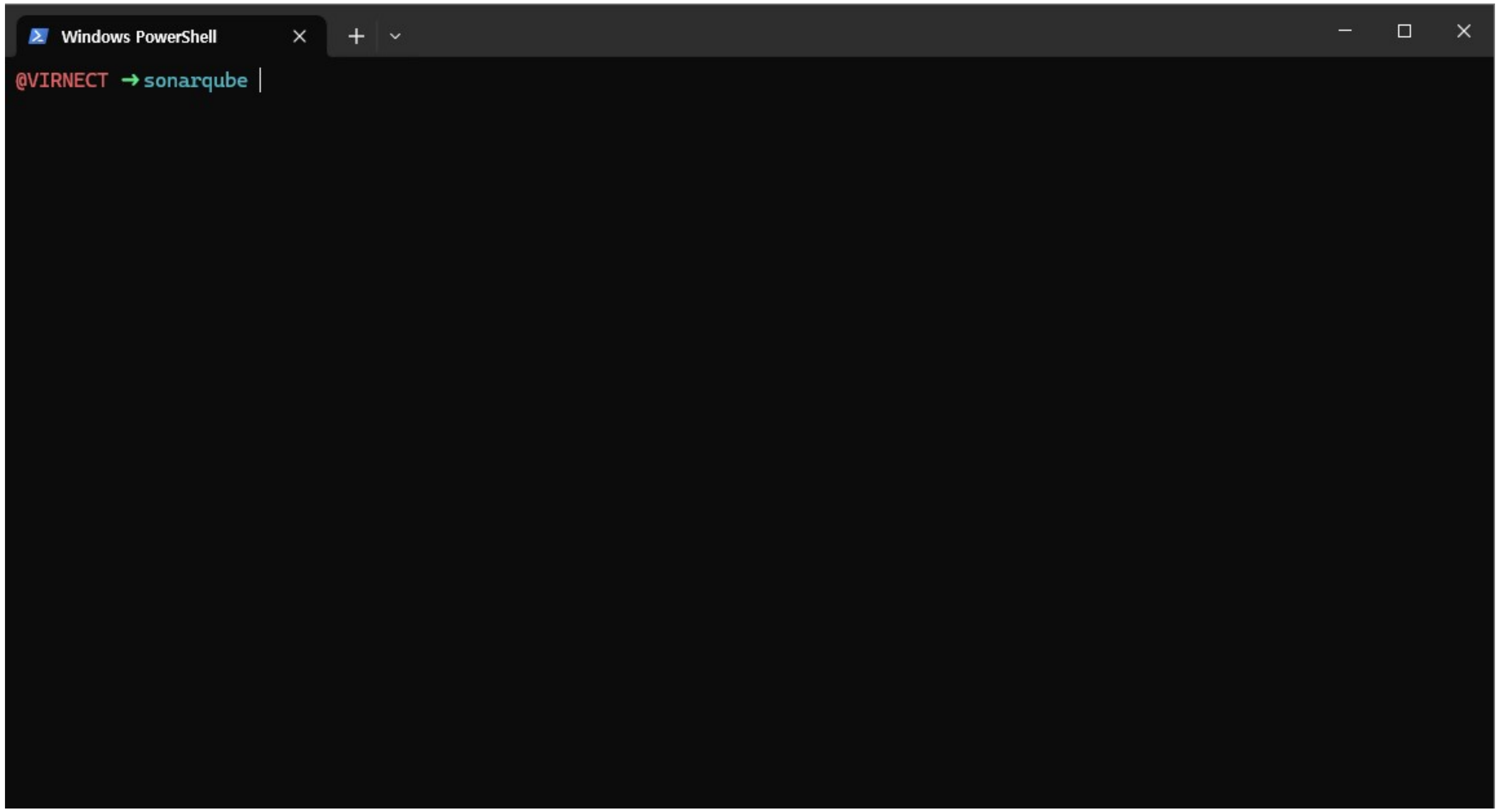
4. Write a Docker Compose file for installing SonarQube


docker-compose.yml - sonarqube - Visual Studio Code
EXPLORER
SONARQUBE
docker-compose.yml
docker-compose.yml > {} volumes > postgresql_data
docker-compose.yml - The Compose specification establishes a standard for the definition of multi-container platform-agnostic applications (compose-spec.json)
OUTLINE
TIMELINE
SONARQUBE ISSUE LOCATIONS
Launchpad
SonarQube focus: overall code
Screen Reader Optimized
Ln 33, Col 19
Spaces: 2
UTF-8
CRLF
Compose
Go Live
Reload
Prettier

```yaml
version: "3"
services:
  sonarqube:
    image: sonarqube:latest
    container_name: sonarqube
    depends_on:
      - db
    ports:
      - "9000:9000"
    environment:
      SONAR_JDBC_URL: jdbc:postgresql://db:5432/sonarqube
      SONAR_JDBC_USERNAME: sonar
      SONAR_JDBC_PASSWORD: sonar
    volumes:
      - sonarqube_data:/opt/sonarqube/data
      - sonarqube_logs:/opt/sonarqube/logs
      - sonarqube_extensions:/opt/sonarqube/extensions

  db:
    image: postgres:latest
    container_name: sonarqube_db
    environment:
      POSTGRES_USER: sonar
      POSTGRES_PASSWORD: sonar
      POSTGRES_DB: sonarqube
    volumes:
      - postgresql_data:/var/lib/postgresql/data

volumes:
  sonarqube_data:
  sonarqube_logs:
  sonarqube_extensions:
  postgresql_data:
```

I. Project Overview

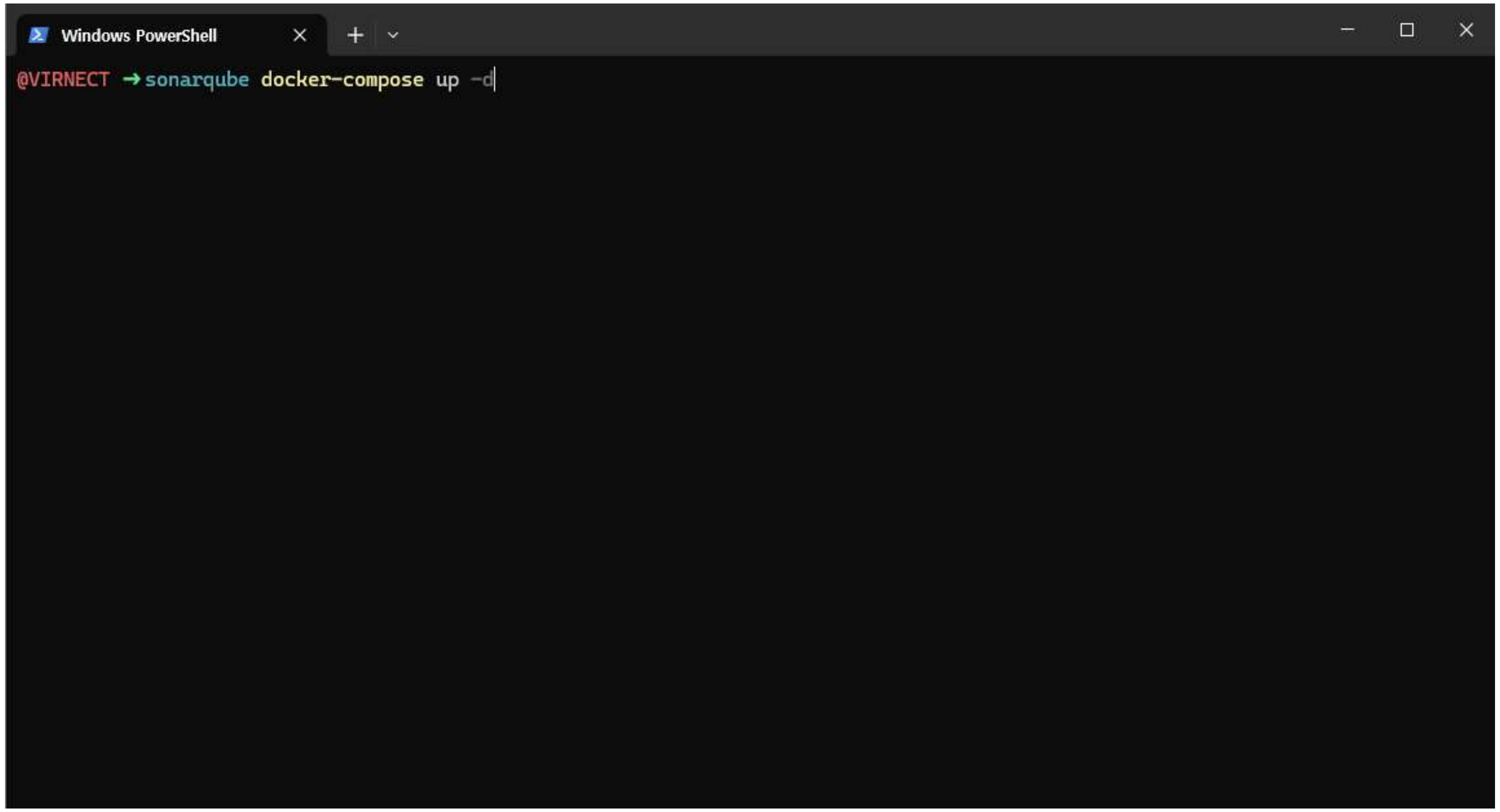
5. Run the Docker Compose file



```
@VIRNECT ➜ sonarqube
```

I. Project Overview

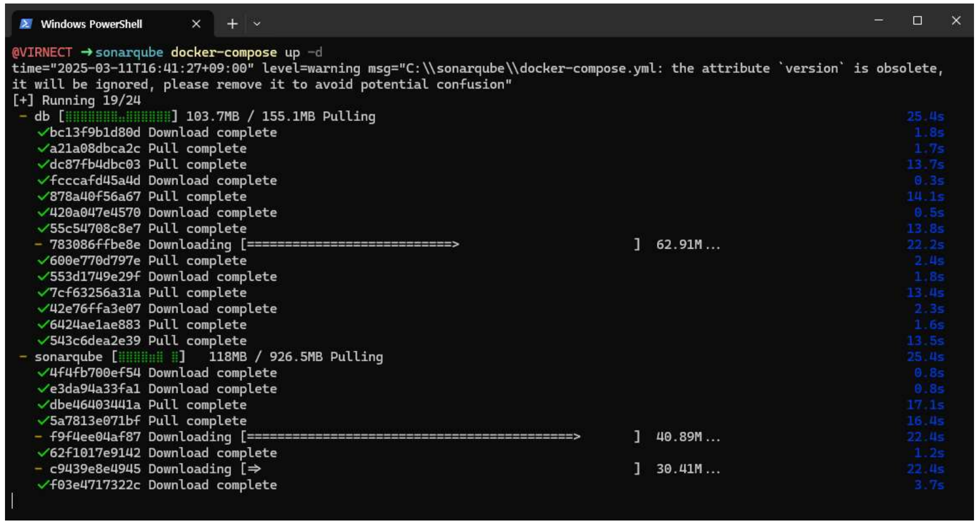
5. Run the Docker Compose file



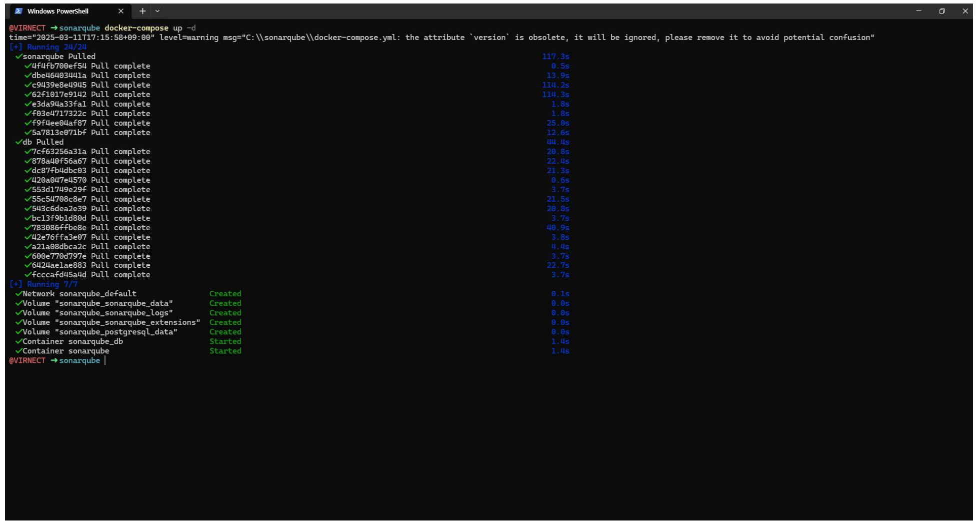
```
@VIRNECT ➜sonarqube docker-compose up -d
```

I. Project Overview

6. Download SonarQube by executing the Docker Compose file



```
@VIRNECT ➜sonarqube docker-compose up -d
time="2025-03-11T16:41:27+09:00" level=warning msg="C:\\sonarqube\\docker-compose.yml: the attribute `version` is obsolete,
it will be ignored, please remove it to avoid potential confusion"
[+] Running 19/24
 - db [⣿⣿⣿⣿⣿⣿⣿⣿⣀⣿⣿⣿⣿⣿⣿⣿] 103.7MB / 155.1MB Pulling                                                      25.4s
   ✓bc13f9b1d80d Download complete                                                                           1.8s
   ✓a21a08dbca2c Pull complete                                                                               1.7s
   ✓dc87fb4dbc03 Pull complete                                                                              13.7s
   ✓fcccafd45a4d Download complete                                                                           0.3s
   ✓878a40f56a67 Pull complete                                                                              14.1s
   ✓420a047e4570 Download complete                                                                           0.5s
   ✓55c54708c8e7 Pull complete                                                                              13.8s
   - 783086ffbe8e Downloading [============================>                        ]  62.91M...            22.2s
   ✓600e770d797e Pull complete                                                                               2.4s
   ✓553d1749e29f Download complete                                                                           1.8s
   ✓7cf63256a31a Pull complete                                                                              13.4s
   ✓42e76ffa3e07 Download complete                                                                           2.3s
   ✓6424ae1ae883 Pull complete                                                                               1.6s
   ✓543c6dea2e39 Pull complete                                                                              13.5s
 - sonarqube [⣿⣿⣿⣿⣿⣿⣿ ⣿]   118MB / 926.5MB Pulling                                                            25.4s
   ✓4f4fb700ef54 Download complete                                                                           0.8s
   ✓e3da94a33fa1 Download complete                                                                           0.8s
   ✓dbe46403441a Pull complete                                                                              17.1s
   ✓5a7813e071bf Pull complete                                                                              16.4s
   - f9f4ee04af87 Downloading [============================================>        ]  40.89M...            22.4s
   ✓62f1017e9142 Download complete                                                                           1.2s
   - c9439e8e4945 Downloading [=>                                                   ]  30.41M...            22.4s
   ✓f03e4717322c Download complete                                                                           3.7s
|
```

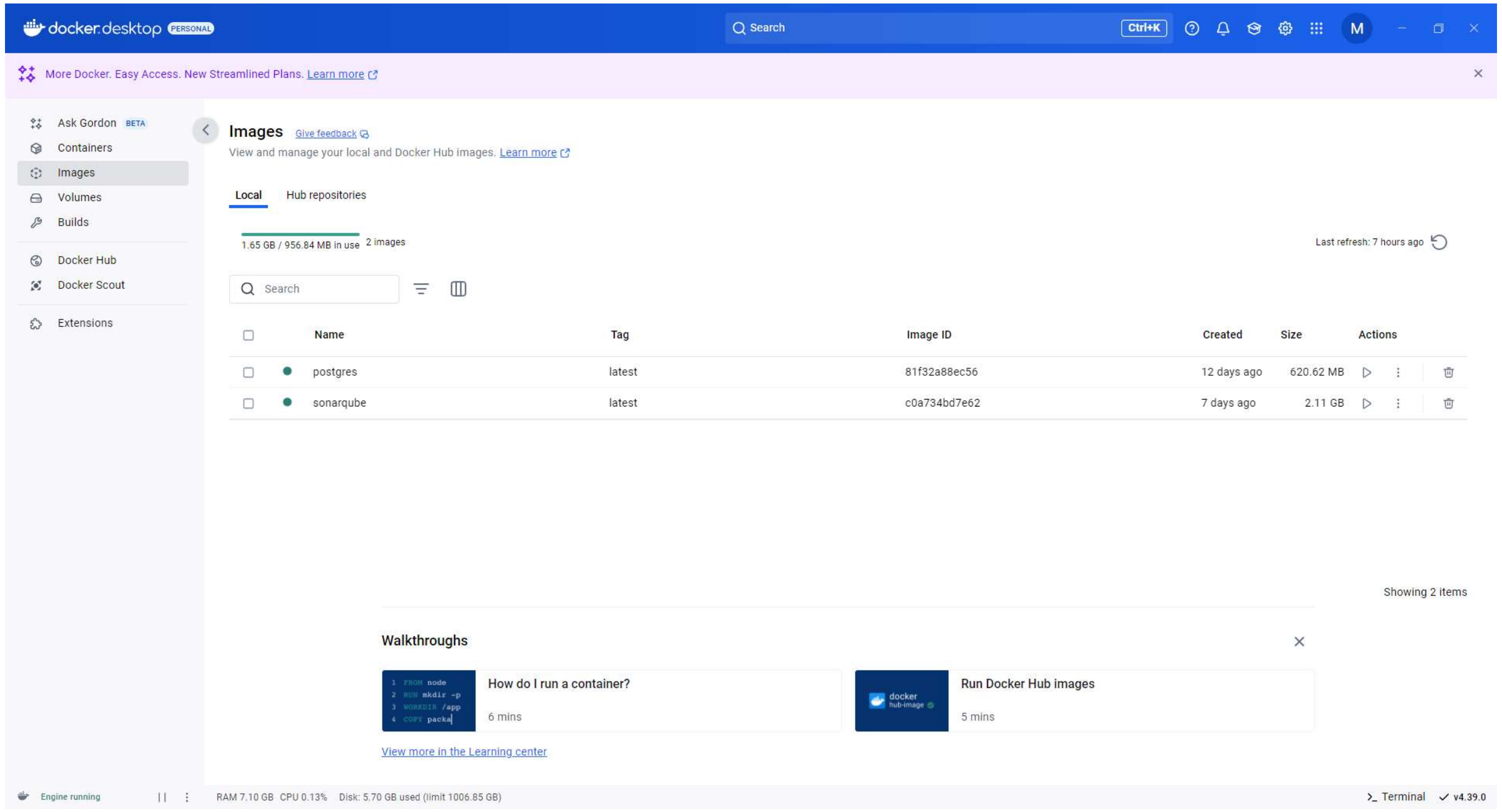


```
@VIRNECT ➜sonarqube docker-compose up -d
time="2025-03-11T17:15:58+09:00" level=warning msg="C:\\sonarqube\\docker-compose.yml: the attribute `version` is obsolete, it will be ignored, please remove it to avoid potential confusion"
[+] Running 24/24
 ✓sonarqube Pulled                                                                          117.3s
   ✓4f4fb700ef54 Pull complete                                                                0.5s
   ✓dbe46403441a Pull complete                                                               13.9s
   ✓c9439e8e4945 Pull complete                                                              114.2s
   ✓62f1017e9142 Pull complete                                                              114.3s
   ✓e3da94a33fa1 Pull complete                                                                1.8s
   ✓f03e4717322c Pull complete                                                                1.8s
   ✓f9f4ee04af87 Pull complete                                                               25.0s
   ✓5a7813e071bf Pull complete                                                               12.6s
 ✓db Pulled                                                                                  44.4s
   ✓7cf63256a31a Pull complete                                                               20.8s
   ✓878a40f56a67 Pull complete                                                               22.4s
   ✓dc87fb4dbc03 Pull complete                                                               21.3s
   ✓420a047e4570 Pull complete                                                                0.6s
   ✓553d1749e29f Pull complete                                                                3.7s
   ✓55c54708c8e7 Pull complete                                                               21.5s
   ✓543c6dea2e39 Pull complete                                                               20.8s
   ✓bc13f9b1d80d Pull complete                                                                3.7s
   ✓783086ffbe8e Pull complete                                                               40.9s
   ✓42e76ffa3e07 Pull complete                                                                3.8s
   ✓a21a08dbca2c Pull complete                                                                4.4s
   ✓600e770d797e Pull complete                                                                3.7s
   ✓6424ae1ae883 Pull complete                                                               22.7s
   ✓fcccafd45a4d Pull complete                                                                3.7s
[+] Running 7/7
 ✓Network sonarqube_default                    Created                                        0.1s
 ✓Volume "sonarqube_sonarqube_data"            Created                                        0.0s
 ✓Volume "sonarqube_sonarqube_logs"            Created                                        0.0s
 ✓Volume "sonarqube_sonarqube_extensions"      Created                                        0.0s
 ✓Volume "sonarqube_postgresql_data"           Created                                        0.0s
 ✓Container sonarqube_db                       Started                                        1.4s
 ✓Container sonarqube                          Started                                        1.4s
@VIRNECT ➜sonarqube |
```

VIRNECT

I. Project Overview

7. Verify that SonarQube is installed in Docker



Images Give feedback

View and manage your local and Docker Hub images. Learn more

Local | Hub repositories

1.65 GB / 956.84 MB in use 2 images

Last refresh: 7 hours ago

Name	Tag	Image ID	Created	Size	Actions
postgres	latest	81f32a88ec56	12 days ago	620.62 MB	
sonarqube	latest	c0a734bd7e62	7 days ago	2.11 GB	

Showing 2 items

Walkthroughs

How do I run a container? 6 mins

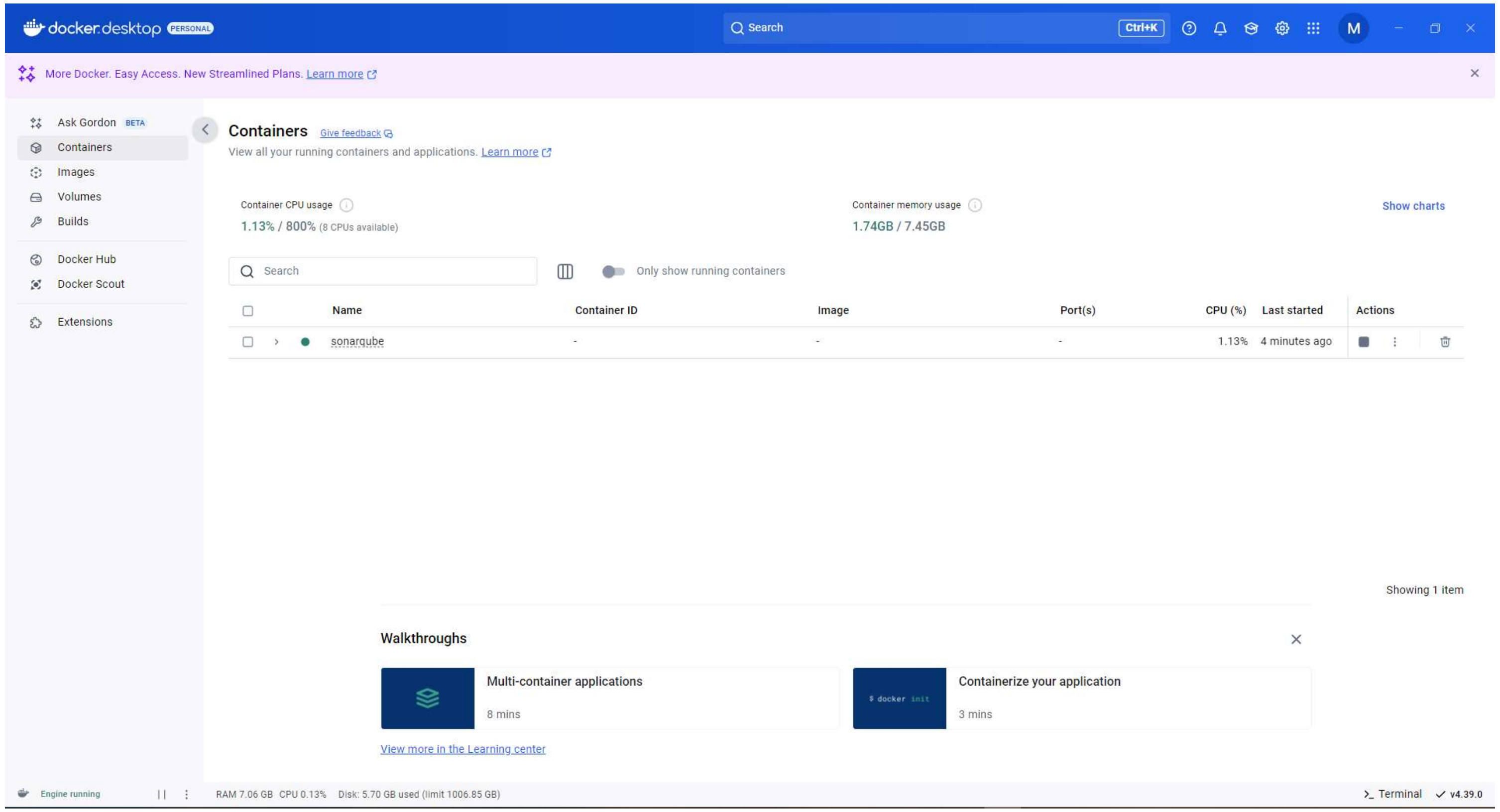
Run Docker Hub images 5 mins

View more in the Learning center

Engine running RAM 7.10 GB CPU 0.13% Disk: 5.70 GB used (limit 1006.85 GB) Terminal v4.39.0

I. Project Overview

7. Verify that SonarQube is installed in Docker


docker desktop PERSONAL
Search Ctrl+K
M
More Docker. Easy Access. New Streamlined Plans. Learn more
Ask Gordon BETA
Containers
Images
Volumes
Builds
Docker Hub
Docker Scout
Extensions

Containers Give feedback

View all your running containers and applications. Learn more

Container CPU usage 1.13% / 800% (8 CPUs available)

Container memory usage 1.74GB / 7.45GB

Show charts

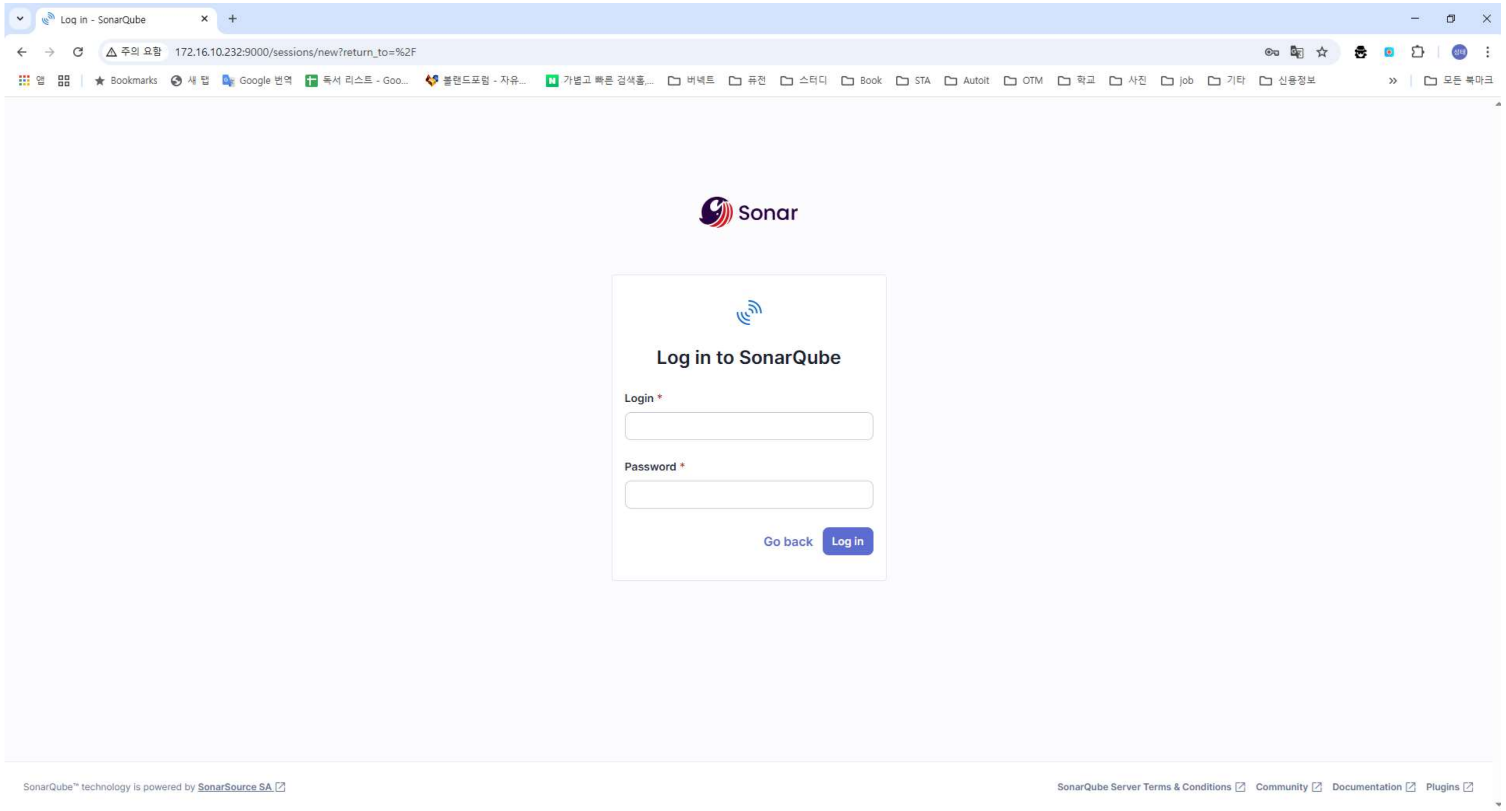
Search | Only show running containers

Name	Container ID	Image	Port(s)	CPU (%)	Last started	Actions
sonarqube	-	-	-	1.13%	4 minutes ago	

Showing 1 item

Walkthroughs
Multi-container applications
8 mins
Containerize your application
3 mins
$ docker init
View more in the Learning center
Engine running
RAM 7.06 GB CPU 0.13% Disk: 5.70 GB used (limit 1006.85 GB)
>_ Terminal
v4.39.0

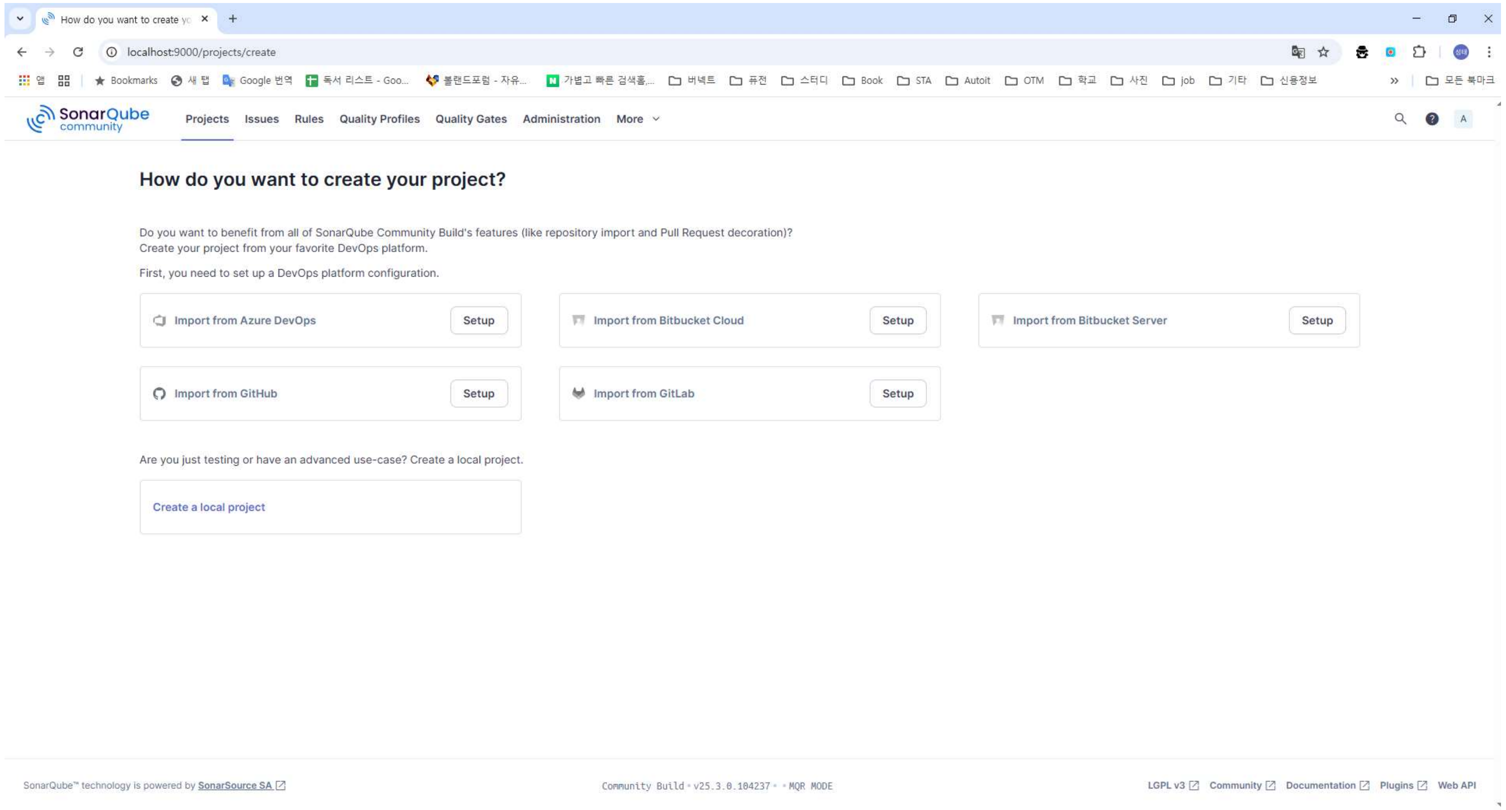
8. Launch SonarQube


Log in - SonarQube
172.16.10.232:9000/sessions/new?return_to=%2F
Sonar
Log in to SonarQube
Login *
Password *
Go back
Log in
SonarQube™ technology is powered by SonarSource SA
SonarQube Server Terms & Conditions
Community
Documentation
Plugins

I. Project Overview

VIRNECT

9. Log in to SonarQube



How do you want to create your project?

Do you want to benefit from all of SonarQube Community Build's features (like repository import and Pull Request decoration)?
Create your project from your favorite DevOps platform.

First, you need to set up a DevOps platform configuration.

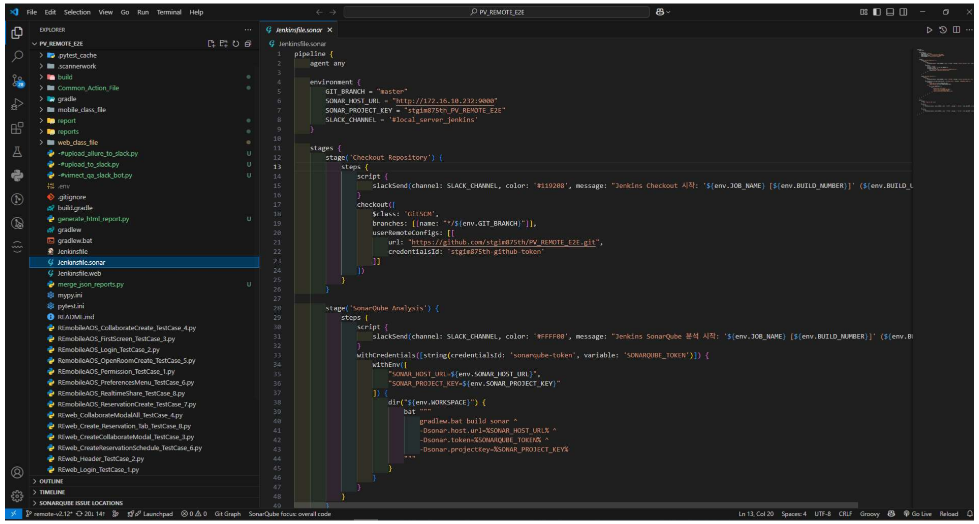
Are you just testing or have an advanced use-case? Create a local project.

SonarQube™ technology is powered by SonarSource SA

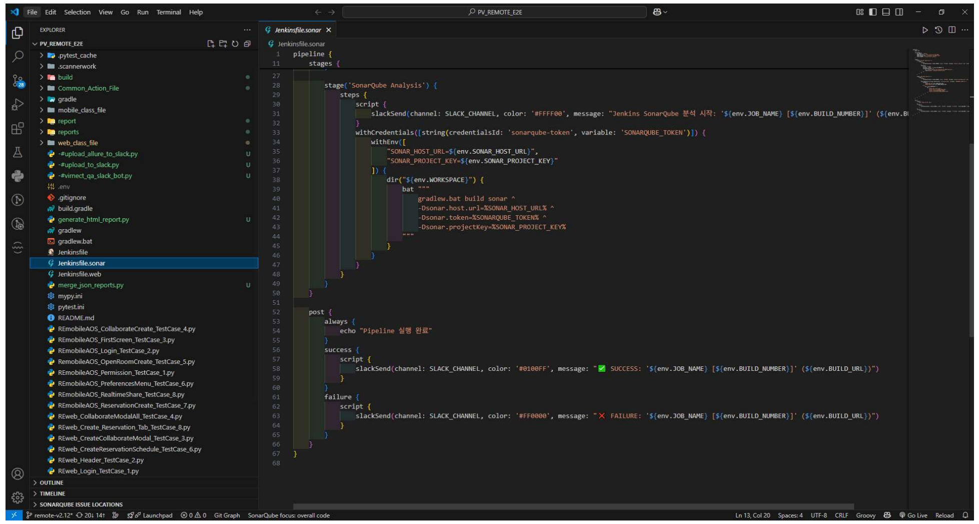
Community Build - v25.3.0.104237 - MQR MODE

I. Project Overview

10. Create a SonarQube pipeline in Jenkins



```
pipeline {
    agent any

    environment {
        GIT_BRANCH = "master"
        SONAR_HOST_URL = "http://172.16.10.232:9000"
        SONAR_PROJECT_KEY = "stgim875th_PV_REMOTE_E2E"
        SLACK_CHANNEL = '#local_server_jenkins'
    }

    stages {
        stage('Checkout Repository') {
            steps {
                script {
                    slackSend(channel: SLACK_CHANNEL, color: '#119208', message: "Jenkins Checkout 시작: '${env.JOB_NAME} [${env.BUILD_NUMBER}]' (${env.BUILD_U
                }
                checkout([
                    $class: 'GitSCM',
                    branches: [[name: "*/${env.GIT_BRANCH}"]],
                    userRemoteConfigs: [[
                        url: "https://github.com/stgim875th/PV_REMOTE_E2E.git",
                        credentialsId: 'stgim875th-github-token'
                    ]]
                ])
            }
        }

        stage('SonarQube Analysis') {
            steps {
                script {
                    slackSend(channel: SLACK_CHANNEL, color: '#FFFF00', message: "Jenkins SonarQube 분석 시작: '${env.JOB_NAME} [${env.BUILD_NUMBER}]' (${env.BU
                }
                withCredentials([string(credentialsId: 'sonarqube-token', variable: 'SONARQUBE_TOKEN')]) {
                    withEnv([
                        "SONAR_HOST_URL=${env.SONAR_HOST_URL}",
                        "SONAR_PROJECT_KEY=${env.SONAR_PROJECT_KEY}"
                    ]) {
                        dir("${env.WORKSPACE}") {
                            bat """
                                gradlew.bat build sonar ^
                                -Dsonar.host.url=%SONAR_HOST_URL% ^
                                -Dsonar.token=%SONARQUBE_TOKEN% ^
                                -Dsonar.projectKey=%SONAR_PROJECT_KEY%
                            """
                        }
                    }
                }
            }
        }
    }
```

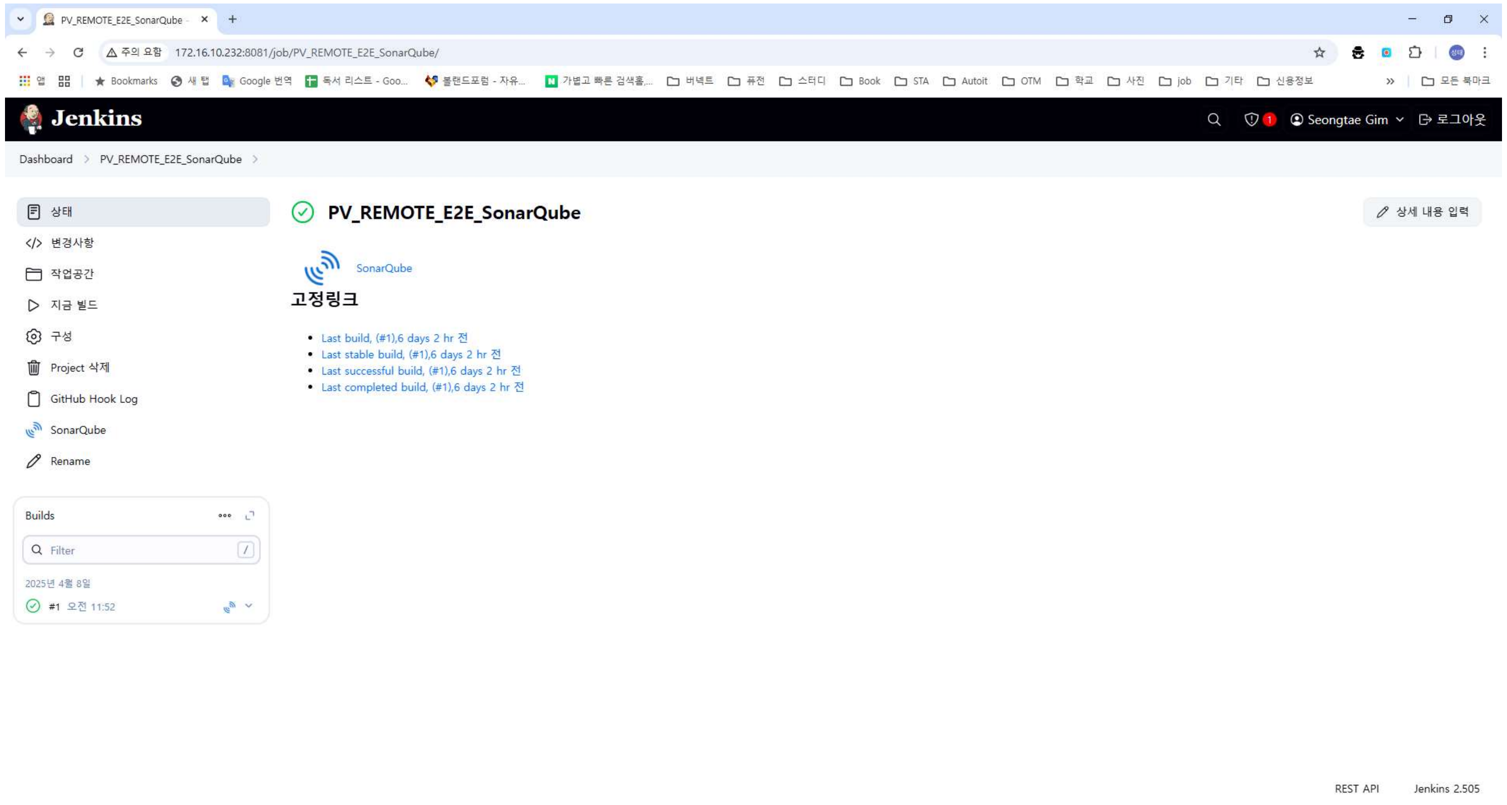


```
pipeline {
    stages {

        stage('SonarQube Analysis') {
            steps {
                script {
                    slackSend(channel: SLACK_CHANNEL, color: '#FFFF00', message: "Jenkins SonarQube 분석 시작: '${env.JOB_NAME} [${env.BUILD_NUMBER}]' (${env.BU
                }
                withCredentials([string(credentialsId: 'sonarqube-token', variable: 'SONARQUBE_TOKEN')]) {
                    withEnv([
                        "SONAR_HOST_URL=${env.SONAR_HOST_URL}",
                        "SONAR_PROJECT_KEY=${env.SONAR_PROJECT_KEY}"
                    ]) {
                        dir("${env.WORKSPACE}") {
                            bat """
                                gradlew.bat build sonar ^
                                -Dsonar.host.url=%SONAR_HOST_URL% ^
                                -Dsonar.token=%SONARQUBE_TOKEN% ^
                                -Dsonar.projectKey=%SONAR_PROJECT_KEY%
                            """
                        }
                    }
                }
            }
        }
    }

    post {
        always {
            echo "Pipeline 실행 완료"
        }
        success {
            script {
                slackSend(channel: SLACK_CHANNEL, color: '#0100FF', message: "✅ SUCCESS: '${env.JOB_NAME} [${env.BUILD_NUMBER}]' (${env.BUILD_URL})")
            }
        }
        failure {
            script {
                slackSend(channel: SLACK_CHANNEL, color: '#FF0000', message: "❌ FAILURE: '${env.JOB_NAME} [${env.BUILD_NUMBER}]' (${env.BUILD_URL})")
            }
        }
    }
}
```

I. Project Overview

VIRNECT

11. Run SonarQube from Jenkins


PV_REMOTE_E2E_SonarQube

172.16.10.232:8081/job/PV_REMOTE_E2E_SonarQube/

Dashboard > PV_REMOTE_E2E_SonarQube >

PV_REMOTE_E2E_SonarQube

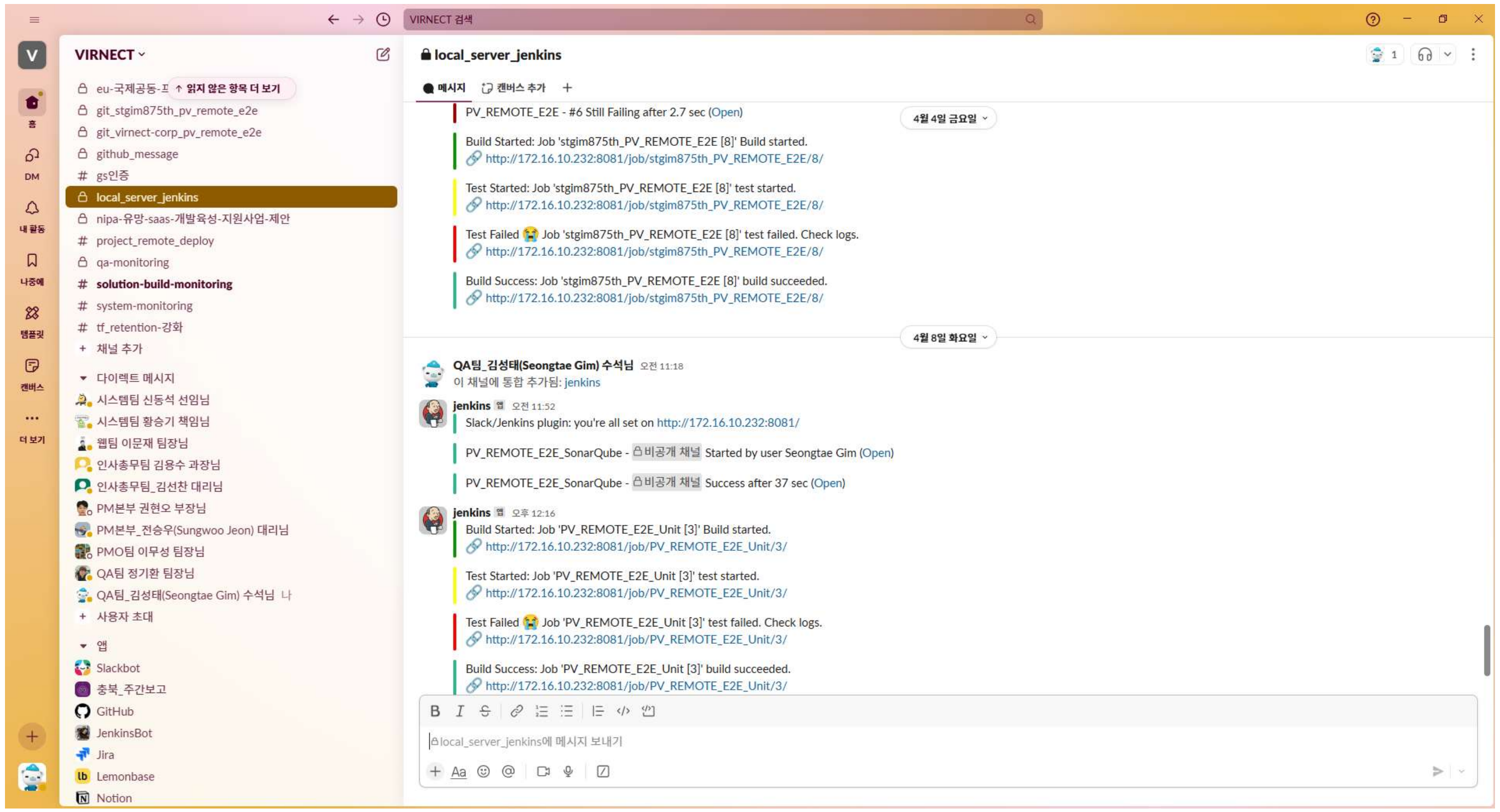
SonarQube

고정링크

- Last build, (#1),6 days 2 hr 전
- Last stable build, (#1),6 days 2 hr 전
- Last successful build, (#1),6 days 2 hr 전
- Last completed build, (#1),6 days 2 hr 전

VIRNECT

12. Integrate Jenkins with Slack



PV_REMOTE_E2E - #6 Still Failing after 2.7 sec (Open)

Build Started: Job 'stgim875th_PV_REMOTE_E2E [8]' Build started.
http://172.16.10.232:8081/job/stgim875th_PV_REMOTE_E2E/8/

Test Started: Job 'stgim875th_PV_REMOTE_E2E [8]' test started.
http://172.16.10.232:8081/job/stgim875th_PV_REMOTE_E2E/8/

Test Failed 😭 Job 'stgim875th_PV_REMOTE_E2E [8]' test failed. Check logs.
http://172.16.10.232:8081/job/stgim875th_PV_REMOTE_E2E/8/

Build Success: Job 'stgim875th_PV_REMOTE_E2E [8]' build succeeded.
http://172.16.10.232:8081/job/stgim875th_PV_REMOTE_E2E/8/

QA팀_김성태(Seongtae Gim) 수석님 오전 11:18
이 채널에 통합 추가됨: jenkins

jenkins 앱 오전 11:52
Slack/Jenkins plugin: you're all set on http://172.16.10.232:8081/

PV_REMOTE_E2E_SonarQube - 비공개 채널 Started by user Seongtae Gim (Open)

PV_REMOTE_E2E_SonarQube - 비공개 채널 Success after 37 sec (Open)

jenkins 앱 오후 12:16
Build Started: Job 'PV_REMOTE_E2E_Unit [3]' Build started.
http://172.16.10.232:8081/job/PV_REMOTE_E2E_Unit/3/

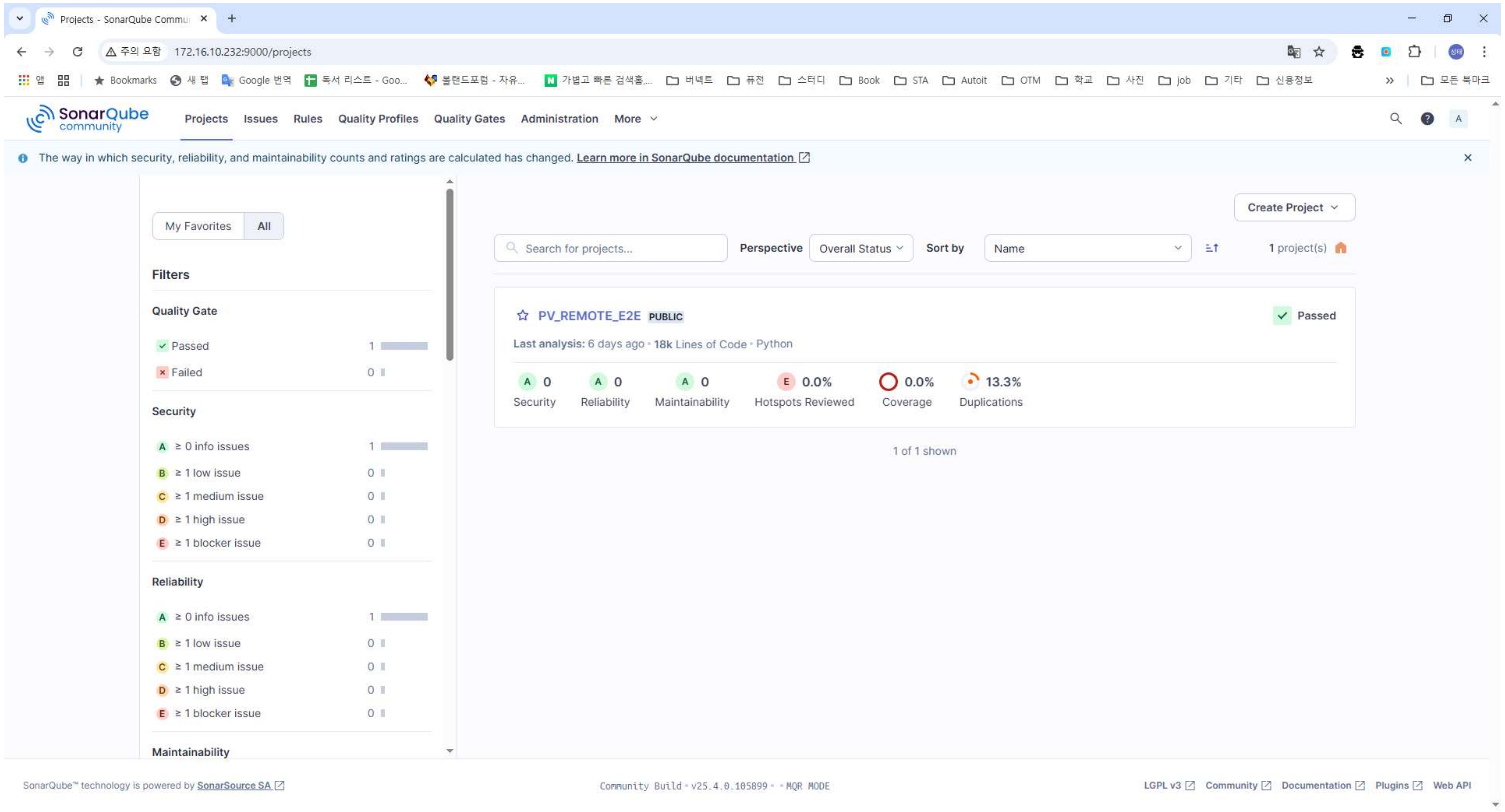
Test Started: Job 'PV_REMOTE_E2E_Unit [3]' test started.
http://172.16.10.232:8081/job/PV_REMOTE_E2E_Unit/3/

Test Failed 😭 Job 'PV_REMOTE_E2E_Unit [3]' test failed. Check logs.
http://172.16.10.232:8081/job/PV_REMOTE_E2E_Unit/3/

Build Success: Job 'PV_REMOTE_E2E_Unit [3]' build succeeded.
http://172.16.10.232:8081/job/PV_REMOTE_E2E_Unit/3/

I. Project Overview

13. Perform static analysis on "test code" using SonarQube



Projects - SonarQube Commu

172.16.10.232:9000/projects

SonarQube community — Projects · Issues · Rules · Quality Profiles · Quality Gates · Administration · More

The way in which security, reliability, and maintainability counts and ratings are calculated has changed. Learn more in SonarQube documentation

My Favorites | All

Filters

Quality Gate

✓ Passed	1
× Failed	0

Security

A ≥ 0 info issues	1
B ≥ 1 low issue	0
C ≥ 1 medium issue	0
D ≥ 1 high issue	0
E ≥ 1 blocker issue	0

Reliability

A ≥ 0 info issues	1
B ≥ 1 low issue	0
C ≥ 1 medium issue	0
D ≥ 1 high issue	0
E ≥ 1 blocker issue	0

Maintainability

Create Project

Search for projects... Perspective: Overall Status · Sort by: Name · 1 project(s)

PV_REMOTE_E2E PUBLIC — ✓ Passed

Last analysis: 6 days ago · 18k Lines of Code · Python

Security	Reliability	Maintainability	Hotspots Reviewed	Coverage	Duplications
A 0	A 0	A 0	E 0.0%	0.0%	13.3%

1 of 1 shown

SonarQube™ technology is powered by SonarSource SA · Community Build · v25.4.0.105899 · MQR MODE · LGPL v3 · Community · Documentation · Plugins · Web API

2. Project Results

- Installed and configured SonarQube using Docker and Docker Compose on Windows
- Connected SonarQube with Jenkins for continuous static code analysis
- Performed static analysis on test automation code using SonarScanner CLI
- Set up quality gates and code review processes to enforce coding standards
- Visualized code smells, bugs, and security hotspots through SonarQube dashboards
- Automated code quality reporting and shared results via Slack integration
- Improved test script maintainability and reduced technical debt through early detection of issues