SONARQUBE CPP PROJECT ANALYSIS

Step 1: Install Prequisites

1. sudo apt install openjdk-17-jdk –y
2. sudo apt install cppcheck
3. sudo apt install curl

Step 2: Install SonarQube community edition

‘’’

```
cd ~/Downloads

unzip sonarqube-9.9.8.100196.zip

sudo mv sonarqube-9.9.8.100196 /opt/sonarqube

sudo chown -R $USER:$USER /opt/sonarqube

cd /opt/sonarqube/bin/linux-x86-64

./sonar.sh start
```

‘’’

Step 3: Go to SonarQube server

1. http://127.0.0.1:9000
2. Login:
   Username- admin
   Password- admin
   (Change to new password when prompted)
3. Click on manually create project.,
   A. Give project name [eg., cpp-analysis] and fill other stuffs and click create.
   B. Click on the newly created project, and locate *locally analyse* section.
   Click on that, and give token name [eg., cpp-analysis] set the expiration date to never, and then click on generate token.
   C. Copy and keep the generated token somewhere safely, [this token will later be used in sonar-project.properties and makefile].

Step 4: create a sample cpp project

1. mkdir -p ~/cpp-analysis cd ~/cpp-analysis
2. **main.cpp**
   Content:
   ```
   #include <iostream>
   #include <vector>
   ```

```
class Person {
public:
    Person(const std::string& name, int age) : name(name), age(age) {}

    void printInfo() const {
        std::cout << "Name: " << name << ", Age: " << age << std::endl;
    }

private:
    std::string name;
    int age;
};

class Group {
public:
    void addPerson(const std::string& name, int age) {
        Person* p = new Person(name, age); // Memory leak if not deleted
        members.push_back(p);
    }

    void printGroupInfo() const {
        for (int i = 0; i <= members.size(); i++) { // Off-by-one error
            members[i]->printInfo();
        }
    }

    ~Group() {
        for (Person* p : members) {
            delete p; // Properly deleting allocated memory
        }
    }

private:
    std::vector<Person*> members; // Using raw pointers, can cause memory issues
};

int main() {
    Group group;
    group.addPerson("Alice", 30);
    group.addPerson("Bob", 25);

    // Logic error: group.printGroupInfo() not called
```

```
  return 0;
}
```

3. **sonar-project.properties**

   Content:

```
# Basic project information
sonar.projectKey=cpp-analysis
sonar.projectName=cpp-analysis
sonar.projectVersion=1.0
sonar.language=cpp
# Source file configuration
sonar.sources=.
# SonarQube server URL
sonar.host.url=http://127.0.0.1:9000
sonar.login=sqp_f488b71485b9e975180f1819d95d5bc84e2eb43d
# External issues report path (will be generated later)
sonar.externalIssuesReportPaths=issues-report.json
```

4. Run Cppcheck to Generate an XML Report:

   ‘’’

```
        cppcheck --enable=all --xml main.cpp 2> cppcheck-report.xml
```

   ‘’’

   Verify the XML Report:

   ‘’’

```
cat cppcheck-report.xml
```

   ‘’’

5. **convert_cppcheck_to_json.py**

   Content:

```
import xml.etree.ElementTree as ET
import json
import sys
if len(sys.argv) != 3:
print("Usage: python3 convert_cppcheck_to_json.py <input_xml> <output_json>")
sys.exit(1)
input_file = sys.argv[1]
output_file = sys.argv[2]

errors = []

try:
  tree = ET.parse(input_file)
  root = tree.getroot()
```

```
    for error in root.findall('./errors/error'):
        file = error.find('location').get('file') if error.find('location') is not None else None
        message = error.get('msg')
        severity = error.get('severity').upper()

        errors.append({
            "file": file,
            "message": message,
            "severity": severity
        })

    with open(output_file, 'w') as json_file:
        json.dump(errors, json_file, indent=4)

    print(f"JSON report saved to {output_file}")
except Exception as e:
    print(f"Error: {e}")
```

6. Convert the Cppcheck XML Report to JSON:
   ‘’’
   python3 convert_cppcheck_to_json.py cppcheck-report.xml issues-report.json
   ‘’’
   Verify the JSON Report:
   ‘’’
   cat issues-report.json
   ‘’’

Step 5: Install SonarScanner CLI

1. Go to this website SonarScanner and donwload the version suitable to your system.
2. cd ~/Downloads
3. unzip sonar-scanner-cli-6.2.1.4610-linux-x64.zip
4. sudo mv sonar-scanner-6.2.1.4610-linux-x64 /opt/sonar-scanner
5. cd ~
6. export PATH=$PATH:/opt/sonar-scanner/bin
7. echo 'export PATH=$PATH:/opt/sonar-scanner/bin' >> ~/.bashrc
   source ~/.bashrc
8. sonar-scanner –version

Step 6: Analyzing the cpp-analyse project folder

1. cd ~/cpp-analyse

2. sonar-scanner
3. After the successful execution of the above command, go to the sonarqube server and view the updated analysis report changes for the project, this indicates that the sever is working properly.
4. **Makefile**

   Content:

   ```
   CXX = g++
   CXXFLAGS = -Wall -Wextra -std=c++17
   SOURCES = $(wildcard *.cpp)
   TARGET = example
   ISSUES_REPORT = issues-report.json
   SONAR_HOST_URL = http://127.0.0.1:9000
   SONAR_PROJECT_KEY = cpp-analysis
   SONAR_LOGIN = sqp_f488b71485b9e975180f1819d95d5bc84e2eb43d

   .PHONY: all sonar fetch-issues clean

   all: build sonar fetch-issues

   build:
   $(CXX) $(CXXFLAGS) $(SOURCES) -o $(TARGET)

   sonar:
   @echo "Running SonarScanner..."
   @sonar-scanner -Dsonar.projectKey=$(SONAR_PROJECT_KEY) -Dsonar.sources=. -Dsonar.host.url=$(SONAR_HOST_URL) -Dsonar.login=$(SONAR_LOGIN)

   fetch-issues:
   @echo "Fetching issues from SonarQube server..."
   @curl -u $(SONAR_LOGIN): "http://127.0.0.1:9000/api/issues/search?componentKeys=$(SONAR_PROJECT_KEY)&ps=500" | jq '.issues[] | {file: .file, message: .message, severity: .severity}'

   clean:
   rm -f $(TARGET) $(ISSUES_REPORT)
   ```

5. Now execute this command:

   ‘’’

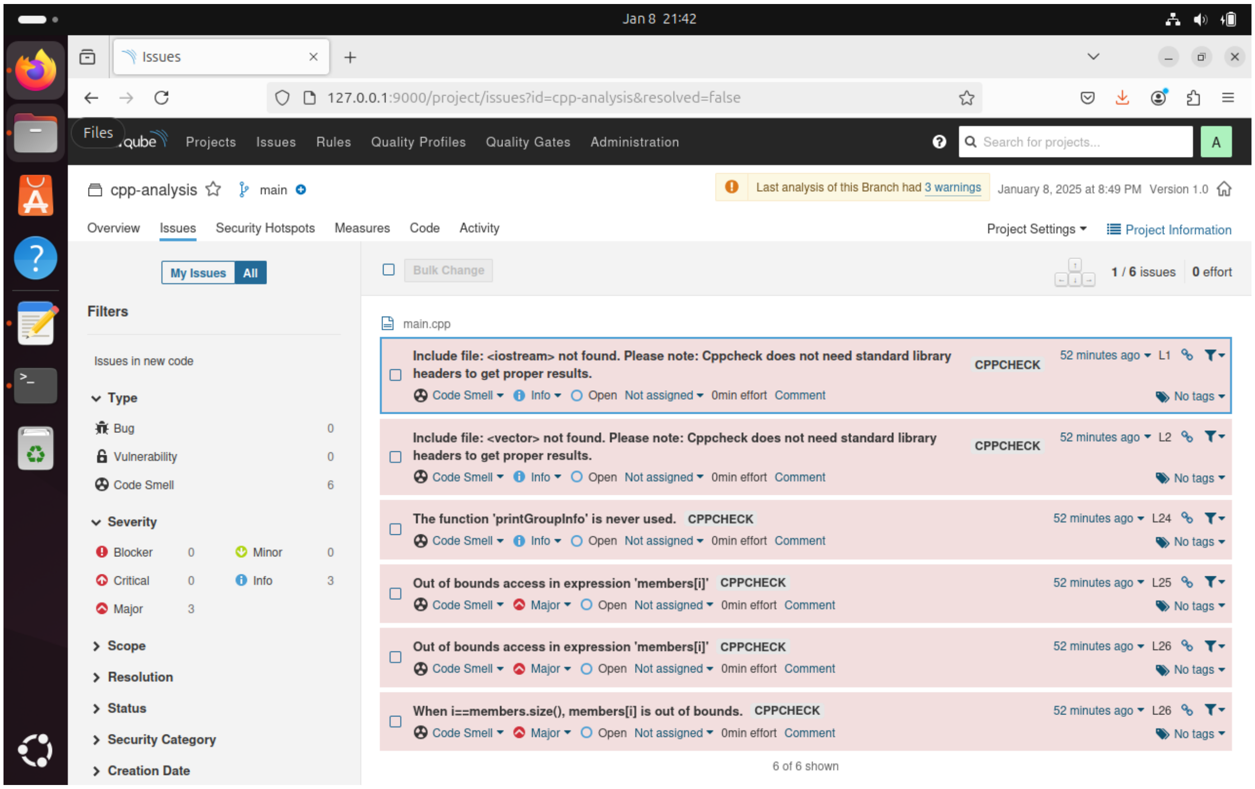
   make all

   ‘’’

   [you will see the issues of the cpp file in the terminal and in the server too!]

OUTPUTS:

1. SonarQube server analysis issue page:



Jan 8 21:42

Issues

127.0.0.1:9000/project/issues?id=cpp-analysis&resolved=false

Files qube Projects Issues Rules Quality Profiles Quality Gates Administration

Search for projects...

cpp-analysis ☆ main

Last analysis of this Branch had 3 warnings January 8, 2025 at 8:49 PM Version 1.0

Overview Issues Security Hotspots Measures Code Activity Project Settings Project Information

My Issues All

Filters

Issues in new code

Type

Bug	0
Vulnerability	0
Code Smell	6

Severity

Blocker	0	Minor	0
Critical	0	Info	3
Major	3		

Scope

Resolution

Status

Security Category

Creation Date

□ Bulk Change 1 / 6 issues 0 effort

main.cpp

□ Include file: <iostream> not found. Please note: Cppcheck does not need standard library headers to get proper results. CPPCHECK 52 minutes ago L1
Code Smell Info Open Not assigned 0min effort Comment No tags

□ Include file: <vector> not found. Please note: Cppcheck does not need standard library headers to get proper results. CPPCHECK 52 minutes ago L2
Code Smell Info Open Not assigned 0min effort Comment No tags

□ The function 'printGroupInfo' is never used. CPPCHECK 52 minutes ago L24
Code Smell Info Open Not assigned 0min effort Comment No tags

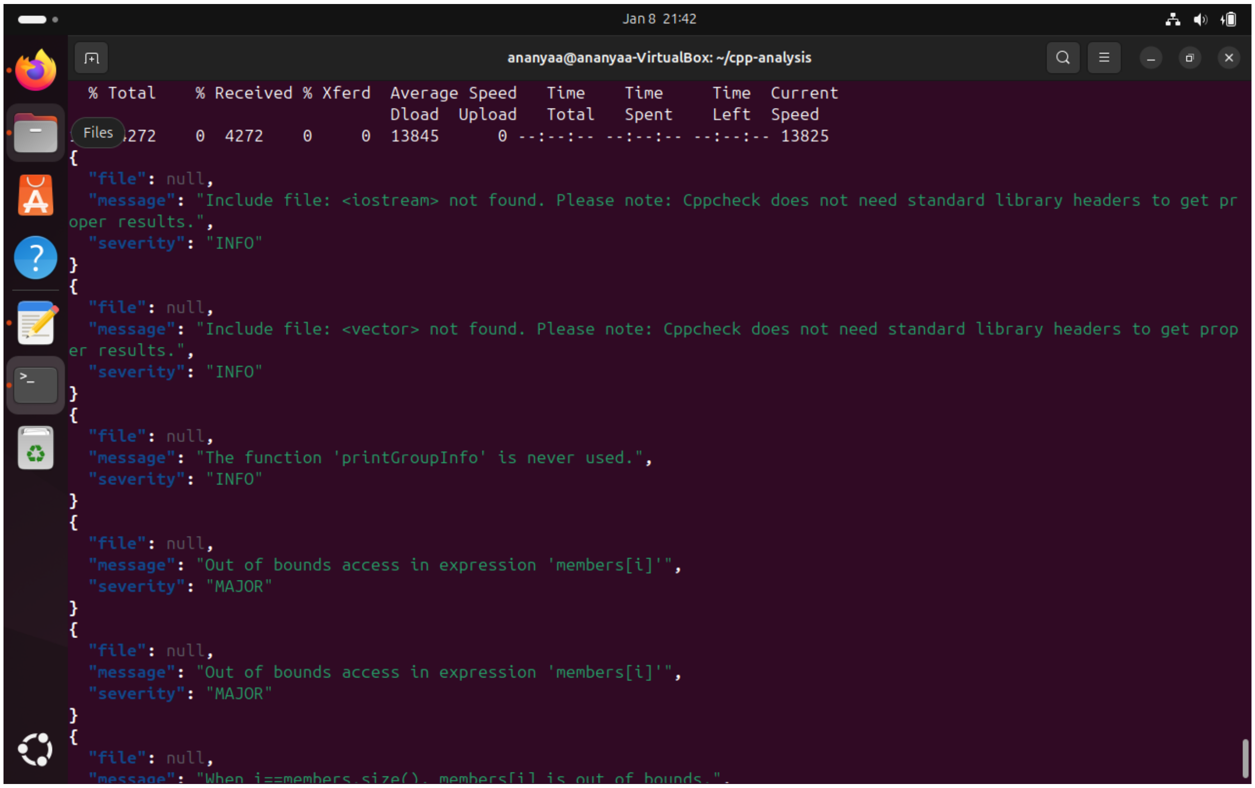
□ Out of bounds access in expression 'members[i]' CPPCHECK 52 minutes ago L25
Code Smell Major Open Not assigned 0min effort Comment No tags

□ Out of bounds access in expression 'members[i]' CPPCHECK 52 minutes ago L26
Code Smell Major Open Not assigned 0min effort Comment No tags

□ When i==members.size(), members[i] is out of bounds. CPPCHECK 52 minutes ago L26
Code Smell Major Open Not assigned 0min effort Comment No tags

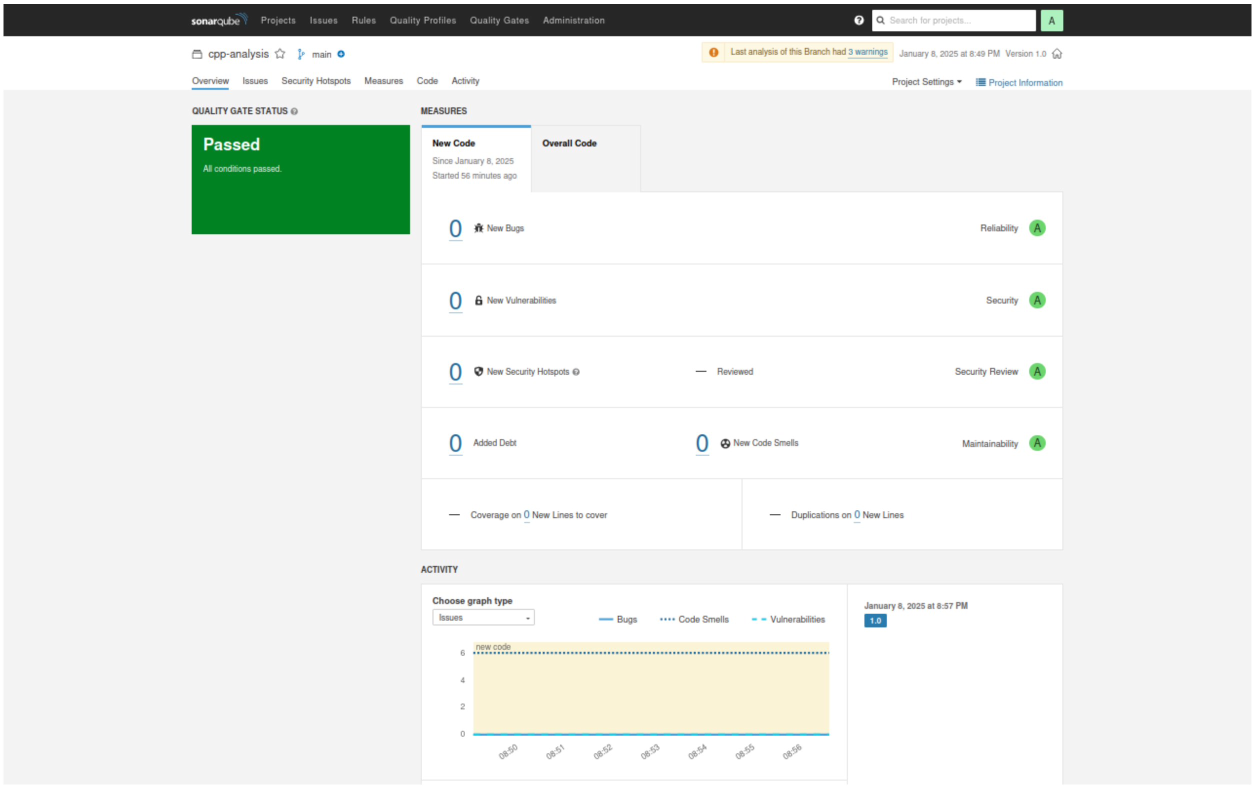
6 of 6 shown

2. Issues displayed in terminal:



```
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
  272    0  4272    0     0  13845      0 --:--:-- --:--:-- --:--:-- 13825
{
  "file": null,
  "message": "Include file: <iostream> not found. Please note: Cppcheck does not need standard library headers to get pr
oper results.",
  "severity": "INFO"
}
{
  "file": null,
  "message": "Include file: <vector> not found. Please note: Cppcheck does not need standard library headers to get prop
er results.",
  "severity": "INFO"
}
{
  "file": null,
  "message": "The function 'printGroupInfo' is never used.",
  "severity": "INFO"
}
{
  "file": null,
  "message": "Out of bounds access in expression 'members[i]'",
  "severity": "MAJOR"
}
{
  "file": null,
  "message": "Out of bounds access in expression 'members[i]'",
  "severity": "MAJOR"
}
{
  "file": null,
  "message": "When i==members.size(), members[i] is out of bounds.",
```

3. SonarQube server overview:



cpp-analysis main

Last analysis of this Branch had 3 warnings January 8, 2025 at 8:49 PM Version 1.0

QUALITY GATE STATUS

Passed

All conditions passed.

MEASURES

New Code

Since January 8, 2025

Started 56 minutes ago

Overall Code

0 New Bugs Reliability A

0 New Vulnerabilities Security A

0 New Security Hotspots — Reviewed Security Review A

0 Added Debt 0 New Code Smells Maintainability A

— Coverage on 0 New Lines to cover

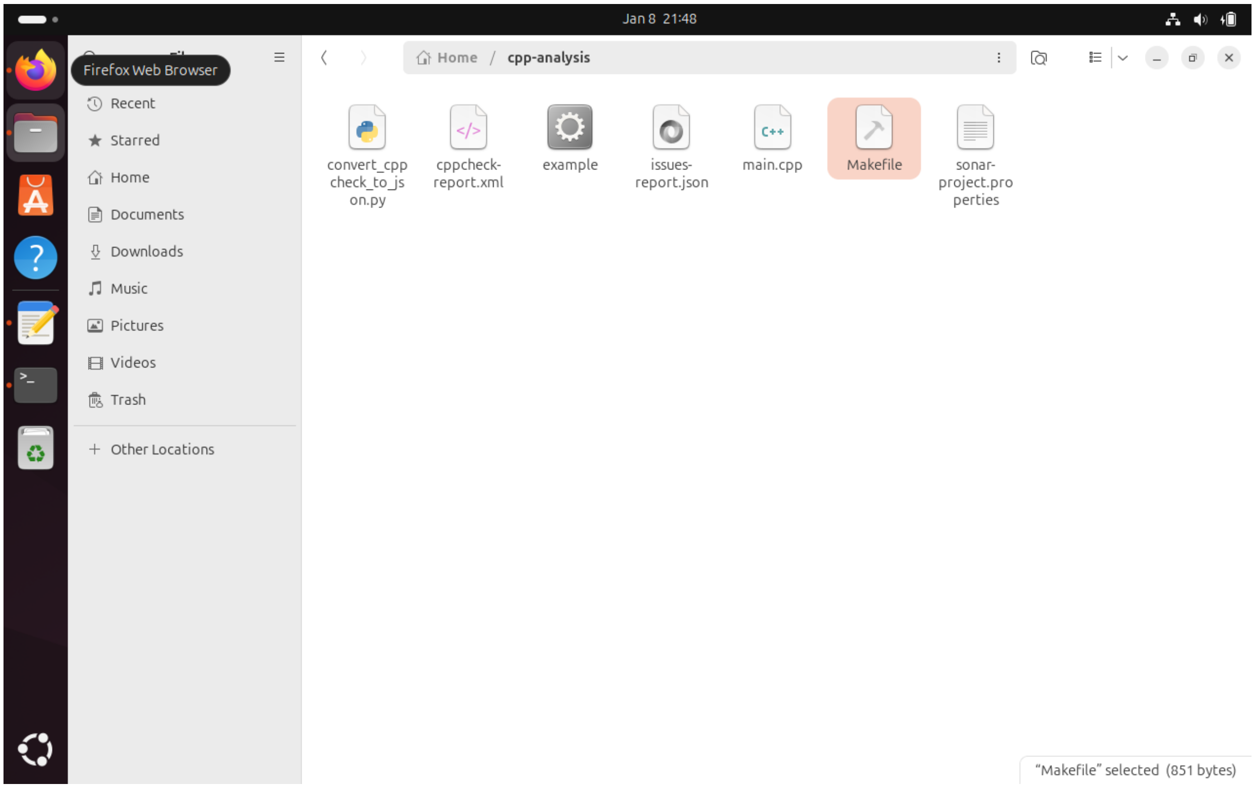
— Duplications on 0 New Lines

ACTIVITY

January 8, 2025 at 8:57 PM

1.0

4. Cpp-analysis project folder:



“Makefile” selected (851 bytes)