Configuration Manual

MSc Research Project
Masters in Cybersecurity

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MSc Project Submission Sheet

School of Computing

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Configuration Manual

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1 Integration Instructions

Step 1: Ensure Correct File Placement

1. **Directory Structure**:

Ensure the directory contains both the `VulnerabilityAssessmentTool.java` file and the `consolidated_vulnerability_scanner.py` file. The structure should look like this.

```
├─── VulnerabilityAssessmentTool.java

├─── VulnerabilityAssessmentTool.class

└─── consolidated_vulnerability_scanner.py
```

Step 2: Modify Java Code for Python Script Execution

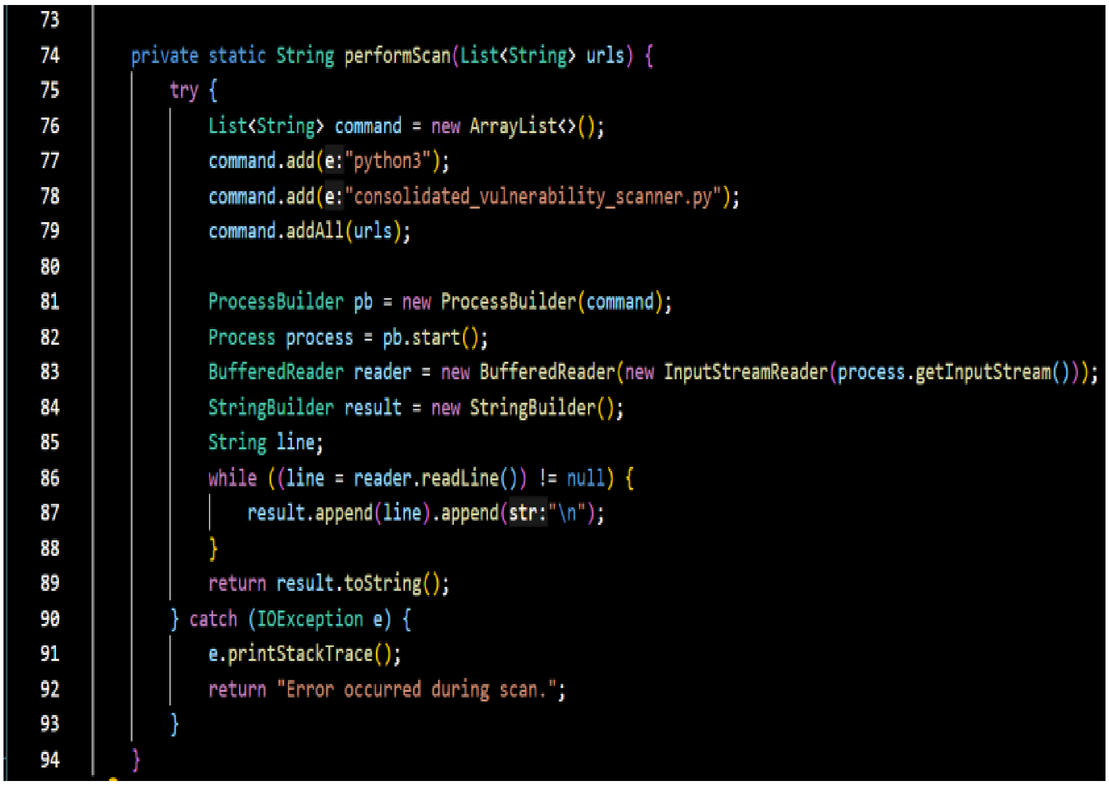
1. **Update Python Script Path in Java Code**:
   - Open the `VulnerabilityAssessmentTool.java` file in a text editor or an IDE.

Locate the `performScan` method. Ensure that the path to the Python script is correctly specified if the script is not in the same directory. Update the command list as needed:

```
private static String performScan(List<String> urls) {

         try {

             List<String> command = new ArrayList<>();

             command. Add("python3");

             command.add("path/to/consolidated_vulnerability_scanner.py"); // Update this path if necessary

             command.addAll(urls);


             ProcessBuilder pb = new ProcessBuilder(command);
```

```
                Process process = pb.start();
                BufferedReader reader = new BufferedReader(new
InputStreamReader(process.getInputStream()));
                StringBuilder result = new StringBuilder();
                String line;
                while ((line = reader.readLine()) != null) {
                    result.append(line).append("\n");
                }
                return result.toString();
            } catch (IOException e) {
                e.printStackTrace();
                return "Error occurred during scan.";
            }
        }
```

- Save the changes to `VulnerabilityAssessmentTool.java`.



```
    private static String performScan(List<String> urls) {
        try {
            List<String> command = new ArrayList<>();
            command.add(e:"python3");
            command.add(e:"consolidated_vulnerability_scanner.py");
            command.addAll(urls);

            ProcessBuilder pb = new ProcessBuilder(command);
            Process process = pb.start();
            BufferedReader reader = new BufferedReader(new InputStreamReader(process.getInputStream()));
            StringBuilder result = new StringBuilder();
            String line;
            while ((line = reader.readLine()) != null) {
                result.append(line).append(str:"\n");
            }
            return result.toString();
        } catch (IOException e) {
            e.printStackTrace();
            return "Error occurred during scan.";
        }
    }
```

Step 3: Compile and Run the Java Application

1. **Compile the Java Code**:
   - Open a terminal and navigate to the directory containing your Java file.

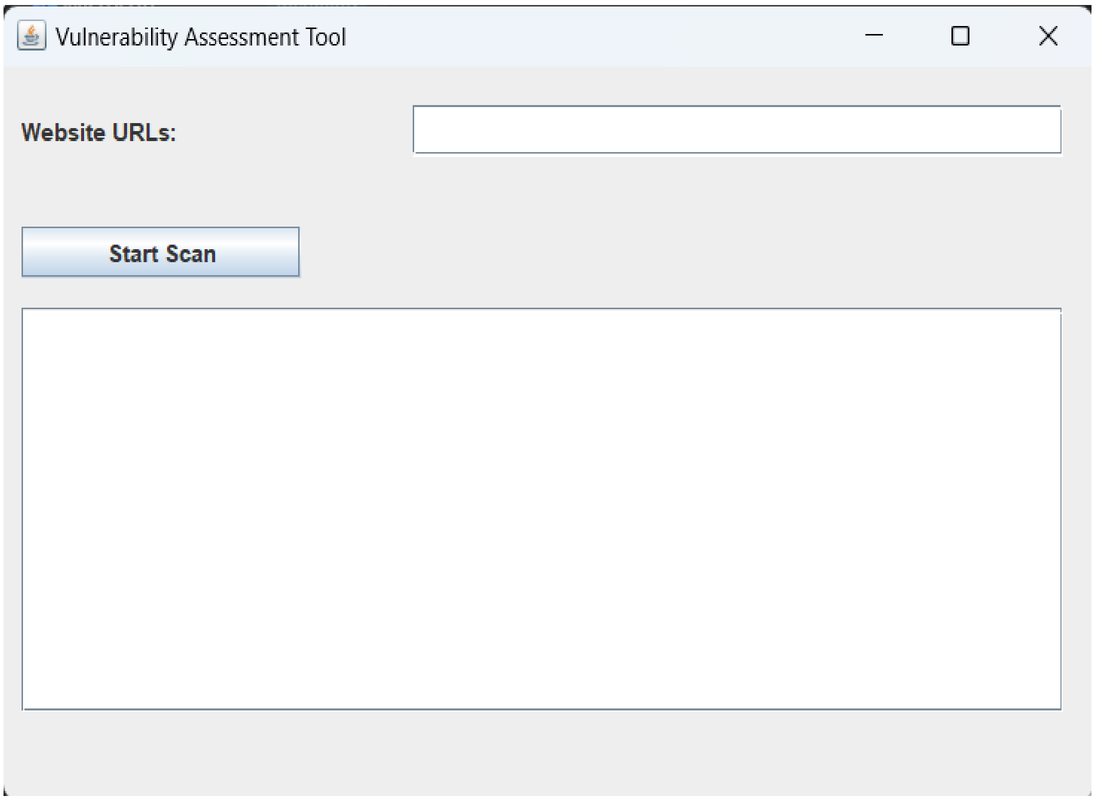
   Compile the Java code using the following command:

```
javac VulnerabilityAssessmentTool.java
```

2. **Run the Java Application**:

   Execute the Java application:

```
java VulnerabilityAssessmentTool
```

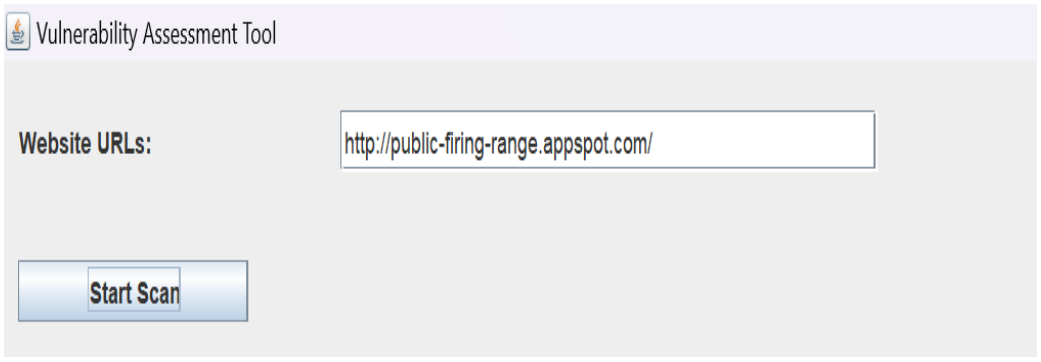


Step 4: Execute Vulnerability Scans Using the Integrated Tool

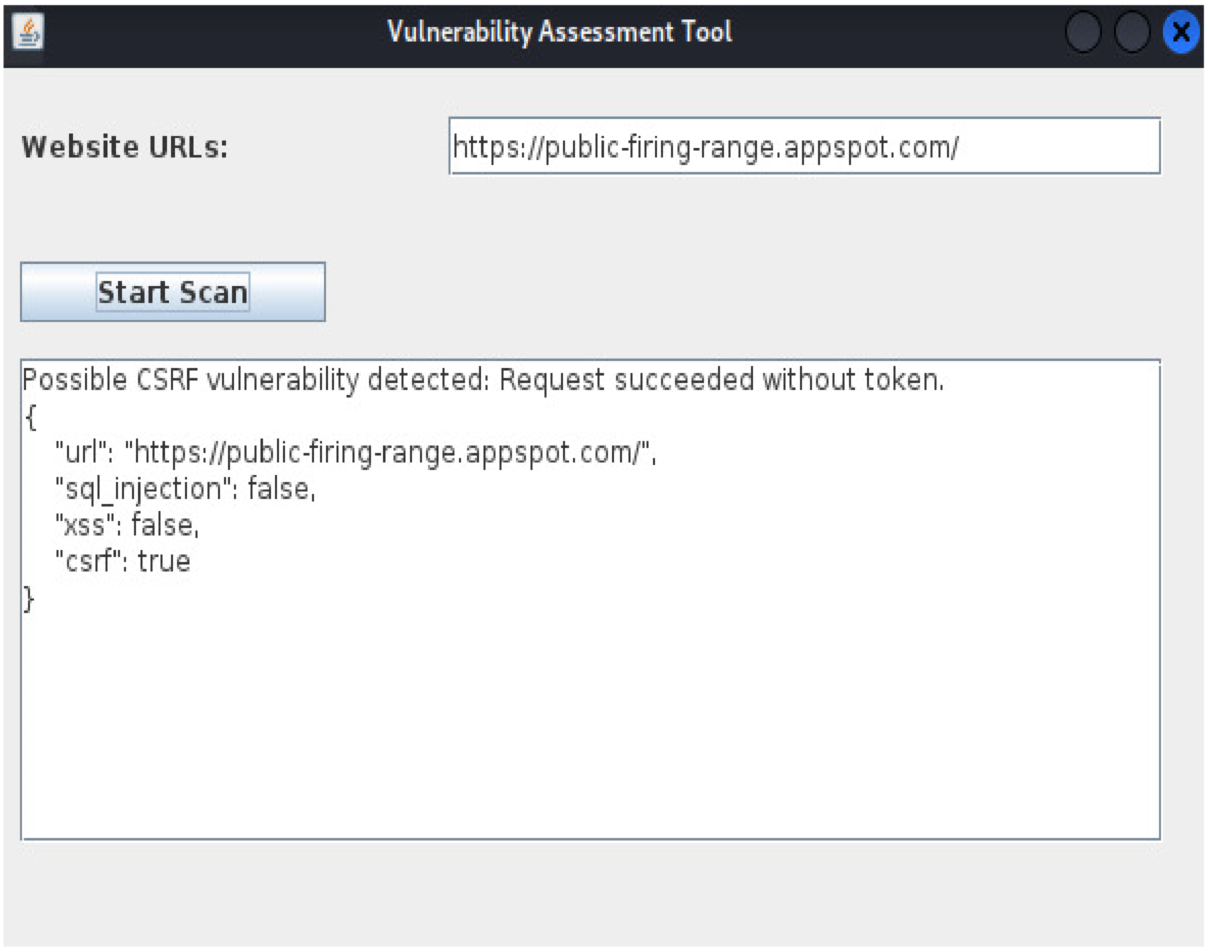
1. **Launch the Java Application**:
   - After running the `VulnerabilityAssessmentTool` class, a GUI window will appear.
2. **Input URLs**:

   In the text field labeled "Website URLs:", enter the URLs you want to scan, separated by commas. For example:

```
http://example.com, https://anotherexample.com
```

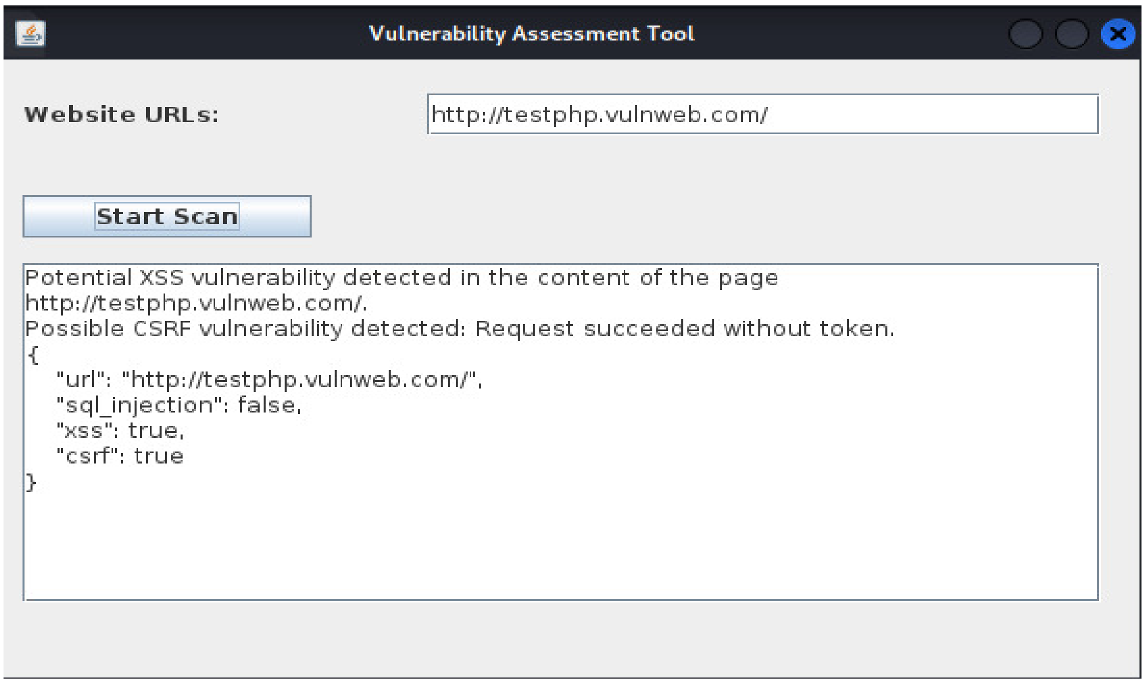

Vulnerability Assessment Tool
Website URLs:
http://public-firing-range.appspot.com/
Start Scan

3. **Start the Scan**:
    - Click the "Start Scan" button. The application will validate the URLs and, if they are valid, pass them to the Python script for scanning.
4. **View the Results**:
    - The scan results will be displayed in the text area within the GUI. A detailed report will also be saved in a file named `report. Json` in the current working directory.


Vulnerability Assessment Tool
Website URLs:
https://public-firing-range.appspot.com/
Start Scan

```
Possible CSRF vulnerability detected: Request succeeded without token.
{
   "url": "https://public-firing-range.appspot.com/",
   "sql_injection": false,
   "xss": false,
   "csrf": true
}
```

Another example:



```
Potential XSS vulnerability detected in the content of the page
http://testphp.vulnweb.com/.
Possible CSRF vulnerability detected: Request succeeded without token.
{
   "url": "http://testphp.vulnweb.com/",
   "sql_injection": false,
   "xss": true,
   "csrf": true
}
```

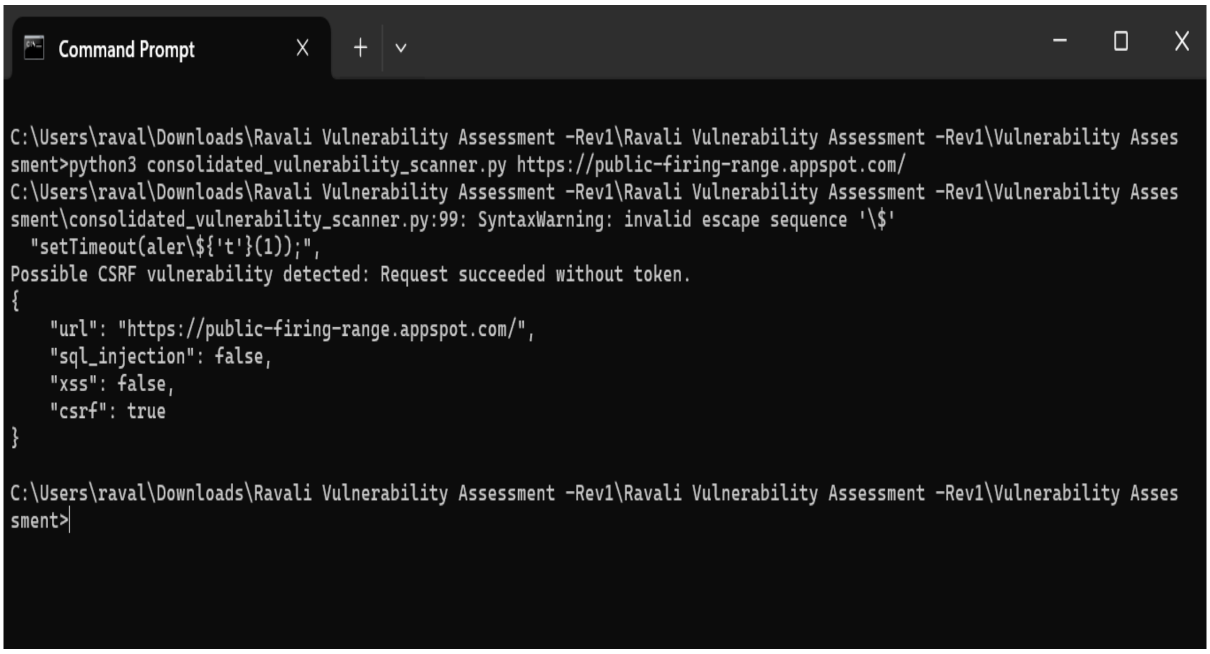
Step 5: Verify Python Script Execution

1. **Check Python Script Execution**:

   Ensure the Python script is executable by running it directly from the terminal:

```
python3 path/to/consolidated_vulnerability_scanner.py
http://example.com
```

   - This should return results like those displayed in the Java application's text area.



```
C:\Users\raval\Downloads\Ravali Vulnerability Assessment -Rev1\Ravali Vulnerability Assessment -Rev1\Vulnerability Asses
sment>python3 consolidated_vulnerability_scanner.py https://public-firing-range.appspot.com/
C:\Users\raval\Downloads\Ravali Vulnerability Assessment -Rev1\Ravali Vulnerability Assessment -Rev1\Vulnerability Asses
sment\consolidated_vulnerability_scanner.py:99: SyntaxWarning: invalid escape sequence '\$'
  "setTimeout(aler\${'t'}(1));",
Possible CSRF vulnerability detected: Request succeeded without token.
{
    "url": "https://public-firing-range.appspot.com/",
    "sql_injection": false,
    "xss": false,
    "csrf": true
}

C:\Users\raval\Downloads\Ravali Vulnerability Assessment -Rev1\Ravali Vulnerability Assessment -Rev1\Vulnerability Asses
sment>
```

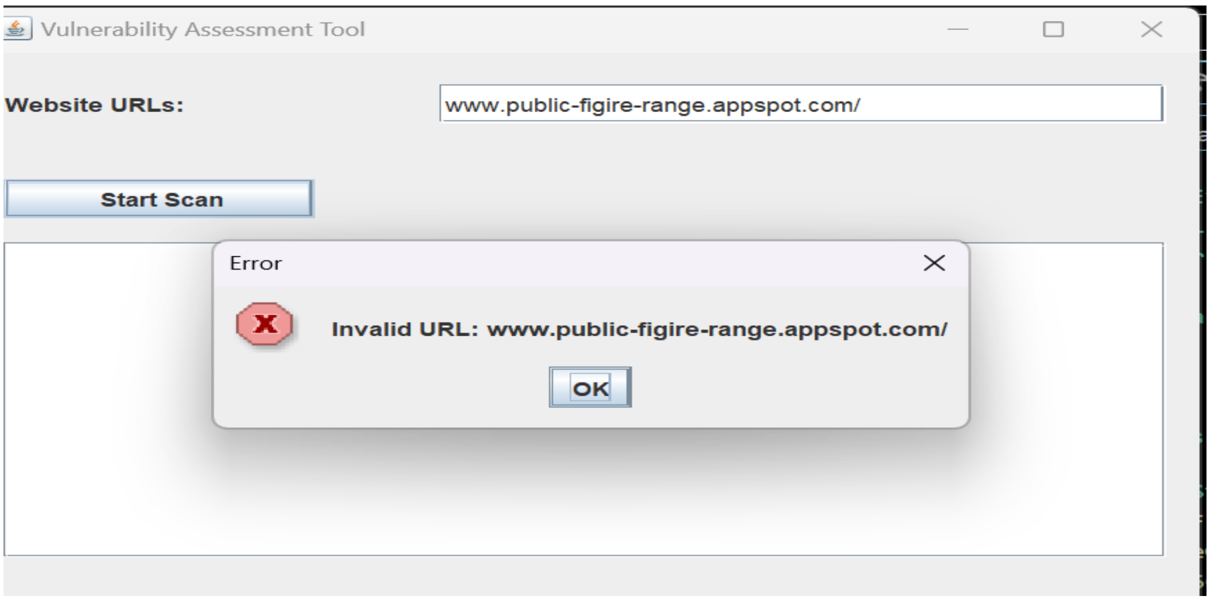
Step 6: Handle Common Issues

1. **Java Application Fails to Start**:
   - Ensure the JDK is correctly installed and the `JAVA_HOME` environment variable is set.
   - Verify the Java code is compiled without errors.
2. **Python Script Errors**:
   - Check that all required Python libraries (`requests`, `beautifulsoup4`, `json`, `re`) are installed.

Ensure the Python script has execution permissions:

```
chmod +x path/to/consolidated_vulnerability_scanner.py
```

3. **Invalid URLs**:
   - The application checks for valid URL formats. Ensure URLs are prefixed with `http://` or `https://`.


Vulnerability Assessment Tool

Website URLs: www.public-figire-range.appspot.com/

Start Scan

Error

Invalid URL: www.public-figire-range.appspot.com/

OK

By following these steps, the Java frontend will integrate with the Python backend, enabling vulnerability scans to be executed from the graphical interface.

2 Usage Guide

Launching the Application

1. **Run the Compiled Java Application**:
   - Open a terminal and navigate to the directory containing the compiled Java class file (`VulnerabilityAssessmentTool.class`).

Execute the Java application:

```
java VulnerabilityAssessmentTool
```

    - A graphical user interface (GUI) window titled "Vulnerability Assessment Tool" will appear.

Input URLs

1. **Enter URLs for Scanning**:
    - In the text field labeled **"Website URLs:"**, enter one or more URLs you wish to scan for vulnerabilities.

Ensure that the URLs are separated by commas if you enter multiple URLs. For example: `http://example.com, https://anotherexample.com`

- URLs must start with `http://` or `https://` to be considered valid.

Starting the Scan

1. **Initiate the Vulnerability Scan**:
    - After entering the URLs, click the **"Start Scan"** button below the text field.
    - The application will validate each URL. If a URL is invalid, an error message will be displayed indicating which URL is incorrect.

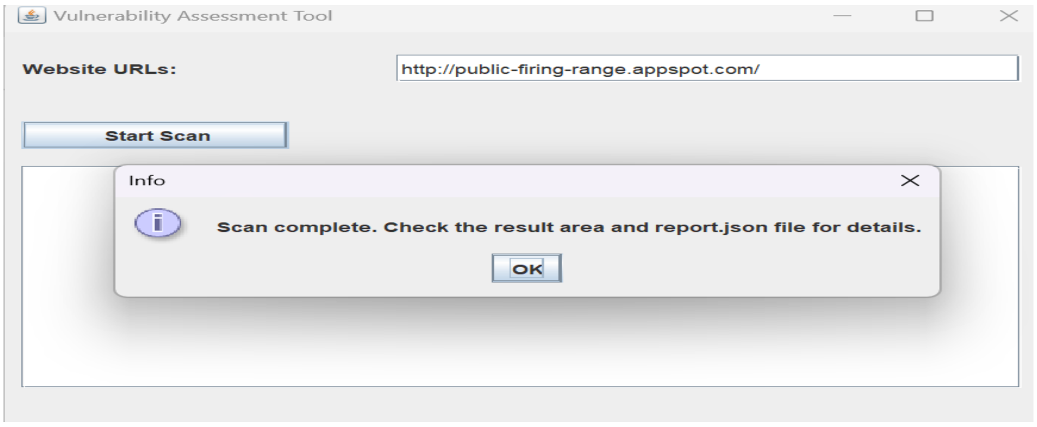
2. **Scan Execution**:
    - The Java application will call the Python script (`consolidated_vulnerability_scanner.py`) for valid URLs to perform the vulnerability scan.
    - A loading message or indicator may be displayed while the scan progresses.

Viewing the Results

1. **Results Display**:
    - Once the scan is complete, the results will be displayed in the text area within the GUI.
    - The text area provides a scrollable view to see the complete output of the scan.

2. **Interpreting the Results**:
    - The results will indicate whether vulnerabilities such as SQL injection, Cross-Site Scripting (XSS), or Cross-Site Request Forgery (CSRF) were detected for each URL.
    - Each detected vulnerability will be listed with details, including the payload that triggered the detection.

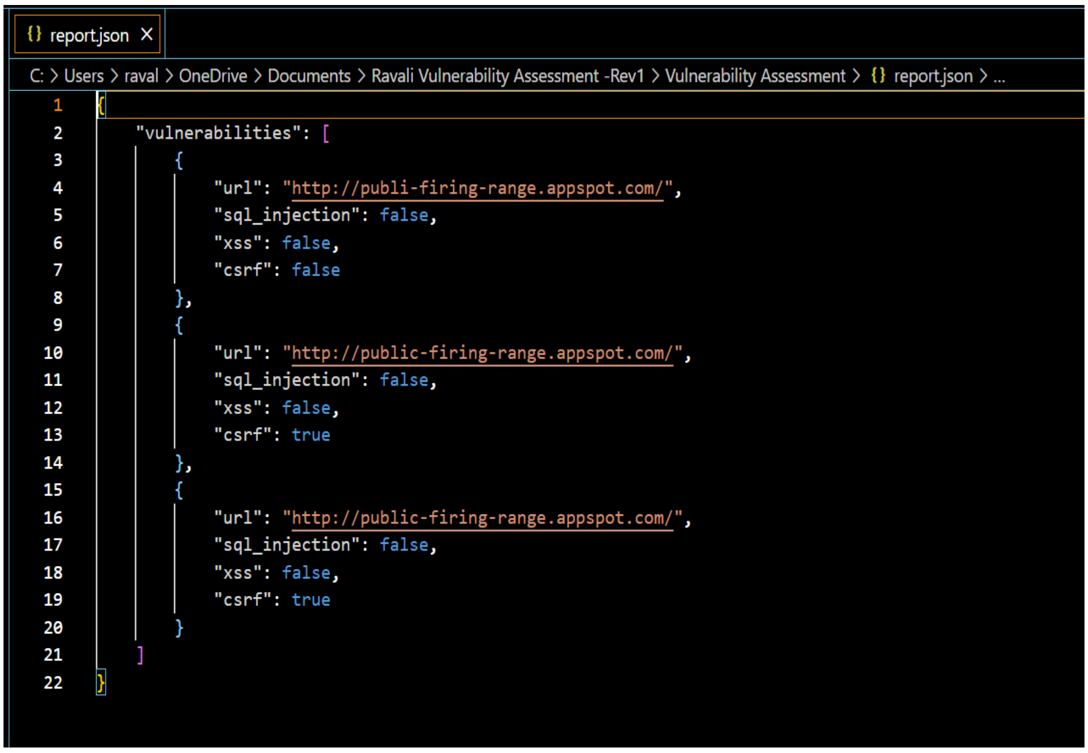
3. **Information Popup**:
    - A message box will appear informing you that the scan is complete and instructing you to check the result area and `report.json` file for detailed information.


Vulnerability Assessment Tool
Website URLs:
http://public-firing-range.appspot.com/
Start Scan
Info
OK

Scan complete. Check the result area and report.json file for details.

4. **Detailed Report**

1. **Accessing the Report**:
   - A detailed scan results report is saved in a file named `report.json` in the current working directory.
   - Open this file with any text editor or JSON viewer to see a structured and detailed account of the vulnerabilities detected.
2. **Understanding the Report Format**:
   - The `report.json` file contains an array of objects, each representing the scan results for a specific URL.
   - Each object includes the URL, and boolean flags indicating the presence of vulnerabilities (`sql_injection`, `xss`, `csrf`), and any error messages for invalid URLs.


{} report.json
C: > Users > raval > OneDrive > Documents > Ravali Vulnerability Assessment -Rev1 > Vulnerability Assessment > {} report.json > ...

```
{
    "vulnerabilities": [
        {
            "url": "http://publi-firing-range.appspot.com/",
            "sql_injection": false,
            "xss": false,
            "csrf": false
        },
        {
            "url": "http://public-firing-range.appspot.com/",
            "sql_injection": false,
            "xss": false,
            "csrf": true
        },
        {
            "url": "http://public-firing-range.appspot.com/",
            "sql_injection": false,
            "xss": false,
            "csrf": true
        }
    ]
}
```

3.**Common Issues and Troubleshooting**

1. **Java Application Fails to Start**:
   - Ensure the JDK is correctly installed and the `JAVA_HOME` environment variable is set.
   - Verify the Java code is compiled without errors.
2. **Python Script Errors**:
   - Check that all required Python libraries (`requests`, `beautifulsoup4`, `json`, `re`) are installed.

Ensure the Python script has execution permissions:

```
chmod +x path/to/consolidated_vulnerability_scanner.py
```

3. **Invalid URLs**:
   - Ensure URLs are correctly formatted and prefixed with `http://` or `https://`.

3 Troubleshooting

Java Application Issues

1. **Java Application Fails to Start**:
   - **Error Message**: `java.lang.NoClassDefFoundError`
     - **Solution**: Ensure the JDK is correctly installed and the `JAVA_HOME` environment variable is set.
     - **Steps**:
   - Check the JDK installation:
     ```
     java -version
     ```
   - Set the `JAVA_HOME` environment variable:
     ```
     export JAVA_HOME=/path/to/jdk

     export PATH=$JAVA_HOME/bin:$PATH
     ```
   - **Error Message**: `ClassNotFoundException`
     - **Solution**: Ensure the Java class file is in the correct directory and compiled without errors.
     - **Steps**:
   - Compile the Java code:
     ```
     javac VulnerabilityAssessmentTool.java
     ```
   - Run the Java application:
     ```
     java VulnerabilityAssessmentTool
     ```

Python Script Issues

1. **Python Script Execution Errors**:
   - **Error Message**: `ImportError: No module named 'requests'`
     - **Solution**: Install the required Python libraries.
     - **Steps**:

- Install the necessary libraries:
  `pip3 install requests beautifulsoup4`

- **Error Message**: `Permission denied`
  - **Solution**: Ensure the Python script has execution permissions.
  - **Steps**:
- Set the execute permission for the Python script:
  ```
  chmod +x
  path/to/consolidated_vulnerability_scanner.py
  ```

Invalid URLs

1. **Error Message**: `Invalid URL`
   - **Solution**: Ensure URLs are correctly formatted and prefixed with `http://` or `https://`.
   - **Steps**:
   - Verify the URL format before entering it into the application. URLs should be in the format:
     `http://example.com`
   - `https://anotherexample.com`

General Application Issues

1. **Scan Fails to Start**:
   - **Issue**: No output or response when clicking "Start Scan".
     - **Solution**: Ensure the paths to the Python script and other resources are correctly specified in the Java code.
     - **Steps**:
   - Verify and update the path to the Python script in the `performScan` method:
     ```
     command.add("path/to/consolidated_vulnerability_scan
     ner.py"); // Update this path if necessary
     ```
2. **Java Application Freezes or Crashes**:

Issue: The application becomes unresponsive during scanning.

- **Solution**: Ensure the system has sufficient resources and the scanned URLs do not cause the Python script to hang.
- **Steps**:
  - Monitor system resources and terminate any processes consuming excessive CPU or memory.
  - Test with a single, known-good URL to verify basic functionality.

3. **Unexpected Output or Incomplete Results**:

Issue: Scan results are not as expected or incomplete.

- **Solution**: Check for errors in the Python script output and ensure all necessary libraries and dependencies are installed correctly.

- **Steps**: Run the Python script directly with a test URL to identify any issues: `python3path/to/consolidated_vulnerability_scanner.py http://example.com`

Detailed Logging

1. **Enable Detailed Logging**:

Issue: Difficulty diagnosing problems without detailed logs.

- **Solution**: Add logging to Java and Python code to capture detailed execution information.
- **Steps**:
    - Add logging statements in the Java code to capture key events and errors.
    - Modify the Python script to log detailed information about the scanning process and any encountered issues.

References

[1] Oracle Corporation. (n.d.). *ProcessBuilder (Java Platform SE 11)*. Oracle. Retrieved August 12, 2024, from https://docs.oracle.com/en/java/javase/11/docs/api/java.base/java/lang/ProcessBuilder.html

[2] Baeldung, E. (2019). *Execute Python scripts from Java*. Baeldung. Retrieved August 12, 2024, from https://www.baeldung.com/run-shell-command-in-java

[3] GeeksforGeeks. (n.d.). *Java-Python Integration: How to Run Python Code in Java*. GeeksforGeeks. Retrieved August 12, 2024, from https://www.geeksforgeeks.org/different-ways-to-execute-python-code-in-java/

[4] Luv2code Blog. (2019). *Running shell commands in Java using ProcessBuilder*. Luv2code. Retrieved August 12, 2024, from https://www.luv2code.com/2019/10/10/running-shell-commands-in-java-using-processbuilder/