

# SOFTWARE VERIFICATION

정적 분석 & 시스템테스트 도구

TEAM 1

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**Summary**



# Static Analysis

# 1. Static Analysis

- 정적 분석은 프로그램을 실행하지 않고 컴퓨터 소프트웨어를 분석하는 것이다. 프로그램에 내재한 논리적 오류는 보통 프로그램을 실행하지 않으면 찾기가 힘들지만, 정적 분석은 실행하지 않은 상태에서 프로그램의 오류를 찾을 수 있다.



# 1. Static Analysis

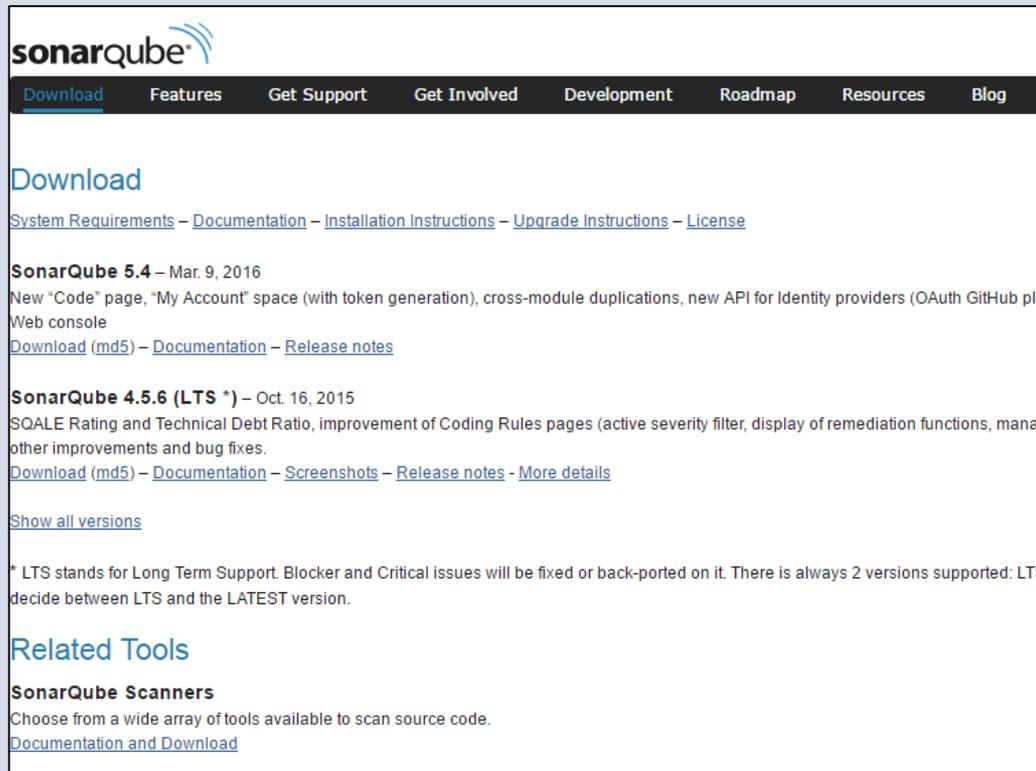
## Sonarqube

- Source Code Static Analysis Tool 중에 하나
- 소스코드의 지속적인 품질 관리를 위한 도구
- JAVA 기반의 소스코드 정적 분석 도구
- 특징
  - 여러 분석 툴을 통합하여 여러 항목들을 한 번에 검색 가능
  - 웹 페이지에서 분석 결과들을 한 눈에 보기 쉬움
  - Plug-in을 이용하여 다양한 기능 제공

# 1. Static Analysis

## Sonarqube

- <http://www.sonarqube.org/downloads/>에서 다운로드 가능
- Plug-in도 다운로드 가능

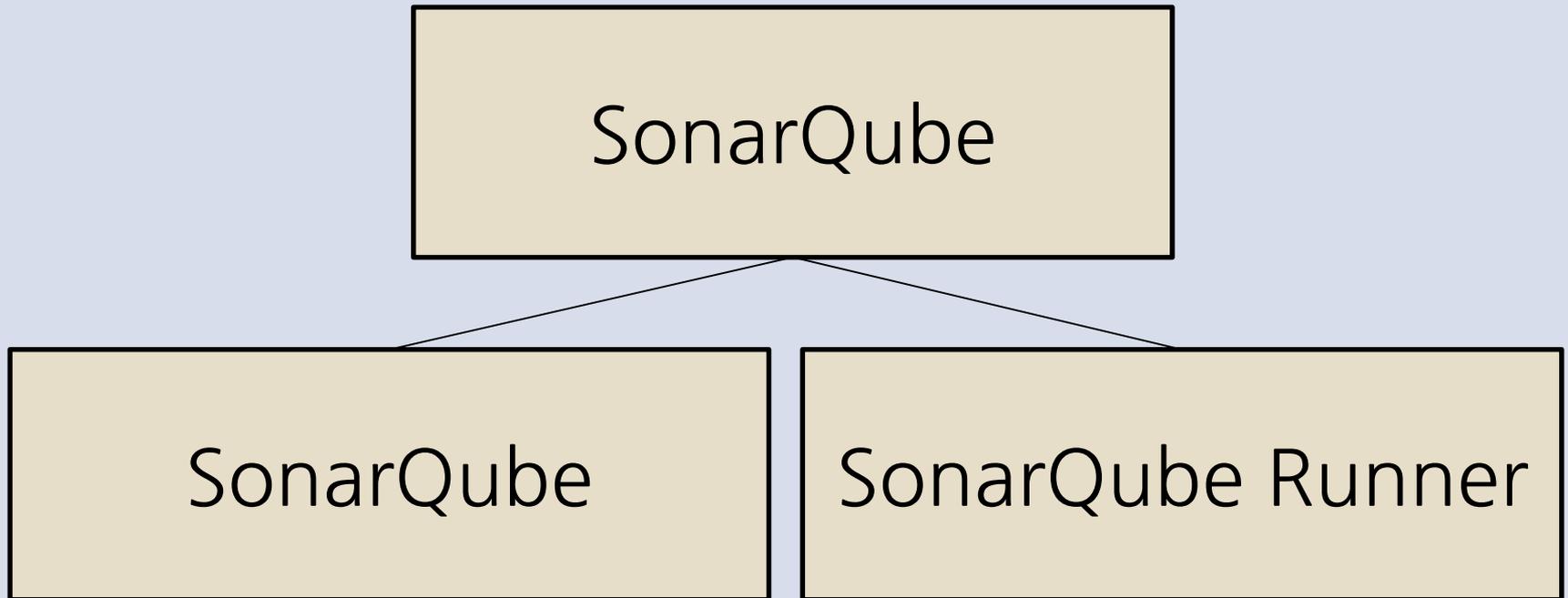


The screenshot displays the SonarQube website's download page. At the top, the SonarQube logo is visible, followed by a navigation menu with links for Download, Features, Get Support, Get Involved, Development, Roadmap, Resources, and Blog. The main heading is "Download", with sub-links for System Requirements, Documentation, Installation Instructions, Upgrade Instructions, and License. Two release announcements are shown: "SonarQube 5.4" (dated Mar. 9, 2016) and "SonarQube 4.5.6 (LTS \*)" (dated Oct. 16, 2015). Each announcement includes a brief description of new features and links to download, documentation, and release notes. A "Show all versions" link is also present. A note explains that LTS stands for Long Term Support and that there are always two versions supported: LTS and the LATEST version. The page concludes with a "Related Tools" section titled "SonarQube Scanners", which offers a wide array of tools for scanning source code and provides a link to "Documentation and Download".

# 1. Static Analysis

## Sonarqube

- SonarQube는 크게 SonarQube와 SonarQube Runner로 분류
- 단순히 결과를 보여주는 것과 대상 소스를 분석하는 명령어가 있는 것으로 분류



# 1. Static Analysis

## Sonarqube

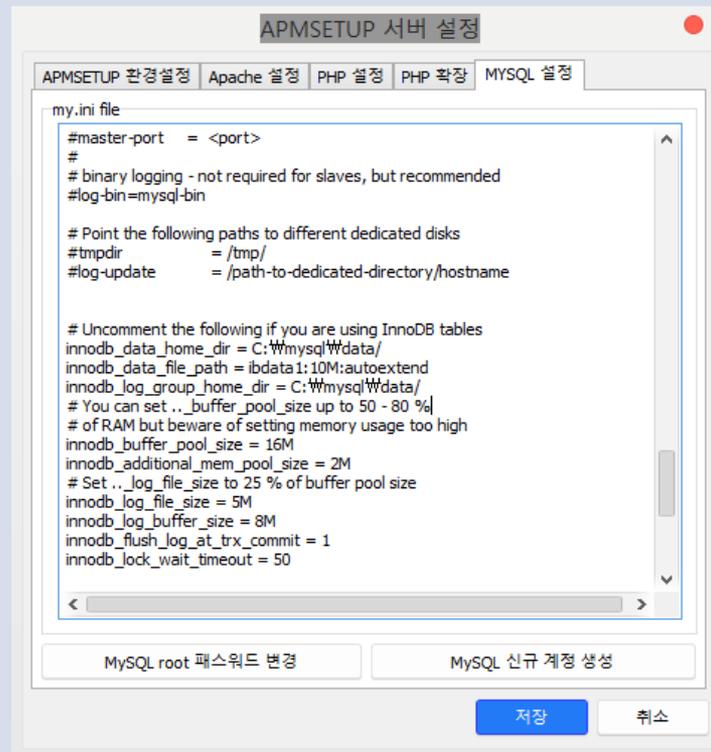
- 배포처에서 Download 받은 파일의 압축을 해제하면 아래와 같은 파일들이 존재

| 이름         | 수정한 날짜           | 유형    | 크기  |
|------------|------------------|-------|-----|
| bin        | 2016-03-28 오후... | 파일 폴더 |     |
| conf       | 2016-03-28 오후... | 파일 폴더 |     |
| data       | 2016-03-28 오후... | 파일 폴더 |     |
| extensions | 2016-03-28 오후... | 파일 폴더 |     |
| lib        | 2016-03-28 오후... | 파일 폴더 |     |
| logs       | 2016-03-28 오후... | 파일 폴더 |     |
| temp       | 2016-03-28 오후... | 파일 폴더 |     |
| web        | 2016-03-28 오후... | 파일 폴더 |     |
| COPYING    | 2016-03-08 오후... | 파일    | 8KB |

# 1. Static Analysis

## Sonarqube

- MySQL Database Server에 데이터를 저장하기 위해 위와 같이 옵션을 변경



# 1. Static Analysis

## Sonarqube

- MySQL Database Server에 아래와 같이 sonar라는 이름의 Database를 생성

```
C:\Windows\System32>mysql -u root -p
Enter password: *****
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 2
Server version: 5.1.41-community MySQL Community Server (GPL)

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> create database
  -> sonar;
Query OK, 1 row affected (0.00 sec)

mysql> .
```

# 1. Static Analysis

## Sonarqube

- MySQL Database Server에 아래와 같이 sonar라는 이름의 사용자를 생성

```
mysql> create user 'sonar';  
Query OK, 0 rows affected (0.00 sec)
```

- MySQL Database Server에 아래와 같이 sonar라는 이름의 Database에 sonar라는 이름의 사용자에게 모든 권한 부여

```
mysql> grant all privileges on `sonar_%`.* to sonar@localhost identified by 'password' with grant option;  
Query OK, 0 rows affected (0.00 sec)
```

# 1. Static Analysis

## Sonarqube

- 이후 sonarqube 압축해제 폴더/bin/운영체제 버전 /StartSonarqube.bat을 실행

```
C:\Users\Chester\Downloads\sonarqube-5.4\sonarqube-5.4\bin\windows-x86-64>StartSonar.bat
wrapper      --> Wrapper Started as Console
wrapper      |-----|
wrapper      |-----| Launching a JVM...
jvm 1        |-----| Error occurred during initialization of VM
jvm 1        |-----| GC triggered before VM initialization completed. Try increasing NewSize, current value 1536K.
wrapper      |-----| JVM exited while loading the application.
wrapper      |-----| JVM Restarts disabled. Shutting down.
wrapper      |-----| <-- Wrapper Stopped
계속하려면 아무 키나 누르십시오 . . .
```

# 1. Static Analysis

## Sonarqube

- Memory 부족으로 인한 오류가 발생 시,  
sonarqube 압축해제 폴더/conf/wrapper.conf을 워드패드 등으로  
열어서 다음과 같이 수정

```
wrapper.java.additional.1=-Djava.awt.headless=true  
wrapper.java.mainclass=org.tanukisoftware.wrapper.WrapperSimple  
App  
wrapper.java.classpath.1=../../lib/jsw/*.jar  
wrapper.java.classpath.2=../../lib/*.jar  
wrapper.java.library.path.1=./lib  
wrapper.app.parameter.1=org.sonar.application.App  
wrapper.java.initmemory=32  
wrapper.java.maxmemory=64
```

# 1. Static Analysis

## Sonarqube

- 정상적으로 실행되면 아래와 같은 화면을 볼 수 있다.

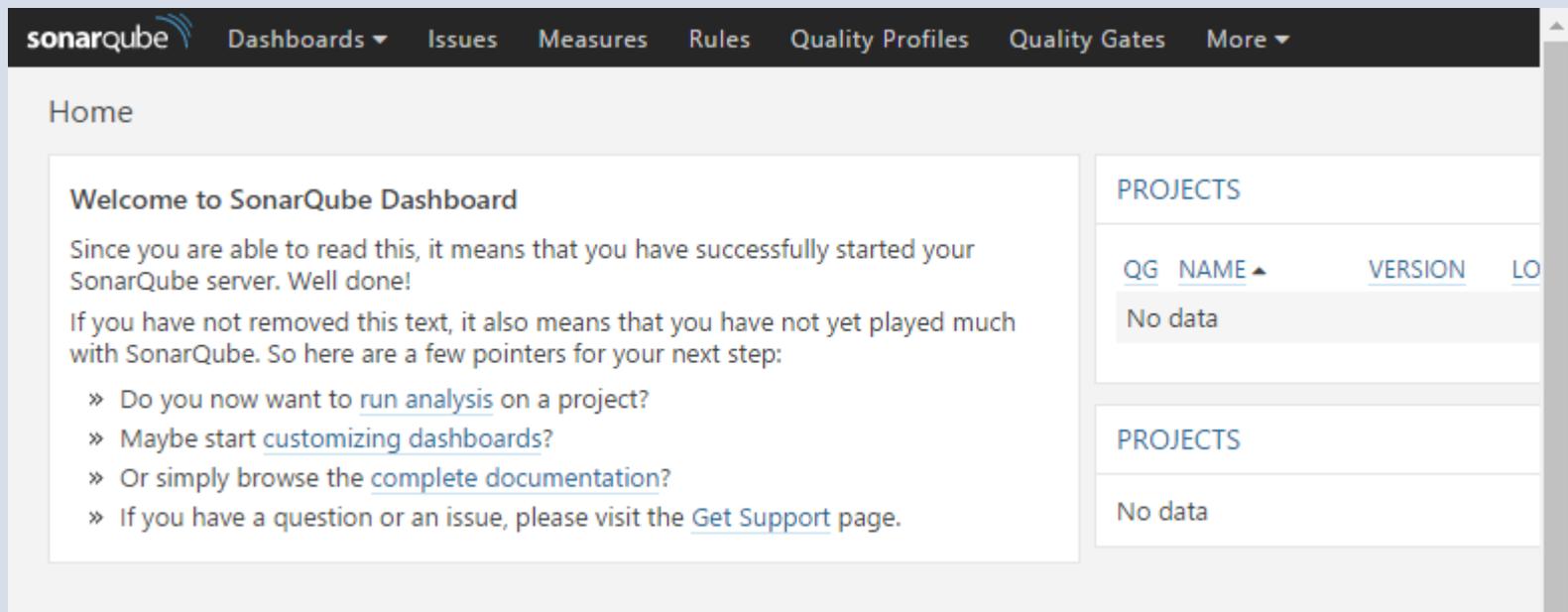
```
SonarQube
C:\Users\Chester\Downloads\sonarqube-5.4\sonarqube-5.4\bin\windows-x86-64>StartSonar.bat
wrapper --> Wrapper Started as Console
wrapper Launching a JVM...
jvm 1 Error occurred during initialization of VM
jvm 1 GC triggered before VM initialization completed. Try increasing NewSize, current value 1536K.
wrapper JVM exited while loading the application.
wrapper JVM Restarts disabled. Shutting down.
wrapper <-- Wrapper Stopped
계속하려면 아무 키나 누르십시오 . . .

C:\Users\Chester\Downloads\sonarqube-5.4\sonarqube-5.4\bin\windows-x86-64>StartSonar.bat
wrapper --> Wrapper Started as Console
wrapper Launching a JVM...
jvm 1 Wrapper (Version 3.2.3) http://wrapper.tanukisoftware.org
jvm 1 Copyright 1999-2006 Tanuki Software, Inc. All Rights Reserved.
jvm 1
jvm 1 2016.03.28 21:22:15 INFO app[o.s.a.AppFileSystem] Cleaning or creating temp directory C:\Users\Chester\Downloads\
sonarqube-5.4\sonarqube-5.4\temp
jvm 1 | 2016.03.28 21:22:15 INFO app[o.s.p.m.JavaProcessLauncher] Launch process[search]: C:\Program Files\Java\jre1.8.0_
73\bin\java -Djava.awt.headless=true -Xmx1G -Xms256m -Xss256k -Djava.net.preferIPv4Stack=true -XX:+UseParNewGC -XX:+UseConcMa
rkSweepGC -XX:CMSInitiatingOccupancyFraction=75 -XX:+UseCMSInitiatingOccupancyOnly -XX:+HeapDumpOnOutOfMemoryError -Djava.io.
tmpdir=C:\Users\Chester\Downloads\sonarqube-5.4\sonarqube-5.4\temp -cp ./lib/common/*;./lib/search/* org.sonar.search.SearchS
erver C:\Users\Chester\AppData\Local\Temp\sq-process1912721620328340888properties
jvm 1 | 2016.03.28 21:22:22 INFO app[o.s.p.m.Monitor] Process[search] is up
jvm 1 | 2016.03.28 21:22:22 INFO app[o.s.p.m.JavaProcessLauncher] Launch process[web]: C:\Program Files\Java\jre1.8.0_73\
bin\java -Djava.awt.headless=true -Dfile.encoding=UTF-8 -Djruby.management.enabled=false -Djruby.compile.invokedynamic=false
-Xmx768m -Xms256m -XX:MaxPermSize=160m -XX:+HeapDumpOnOutOfMemoryError -Djava.net.preferIPv4Stack=true -Djava.io.tmpdir=C:\Us
ers\Chester\Downloads\sonarqube-5.4\sonarqube-5.4\temp -cp ./lib/common/*;./lib/server/*;C:\Users\Chester\Downloads\sonarqube
-5.4\sonarqube-5.4\lib\jdbc\h2\h2-1.3.176.jar org.sonar.server.app.WebServer C:\Users\Chester\AppData\Local\Temp\sq-process97
0956414984983594properties
```

# 1. Static Analysis

## Sonarqube

- 웹 브라우저를 통해 <http://localhost:9000>을 입력하면 Dashboard를 볼 수 있다.



The screenshot shows the SonarQube web interface. At the top is a navigation bar with the SonarQube logo and menu items: Dashboards, Issues, Measures, Rules, Quality Profiles, Quality Gates, and More. Below the navigation bar, the page title is "Home".

The main content area is divided into two columns. The left column contains a "Welcome to SonarQube Dashboard" message. It states: "Since you are able to read this, it means that you have successfully started your SonarQube server. Well done!" and "If you have not removed this text, it also means that you have not yet played much with SonarQube. So here are a few pointers for your next step:". Below this are four bullet points with links: "Do you now want to [run analysis](#) on a project?", "Maybe start [customizing dashboards](#)?", "Or simply browse the [complete documentation](#)?", and "If you have a question or an issue, please visit the [Get Support](#) page."

The right column contains two "PROJECTS" sections. Each section has a table header with columns: QG, NAME, VERSION, and LO. The first table shows "No data". The second table also shows "No data".

# 1. Static Analysis

## Sonarqube

- Eclipse의 plug-in 형태로 제공  
본 환경에서는 Eclipse의 plug-in을 설치하여 사용

### SonarQube 3.5.0

This plugin is deprecated and is replaced by SonarLint  
(<https://marketplace.eclipse.org/content/sonarlint>). [more info](#)



by [SonarSource](#), LGPL

★ 90



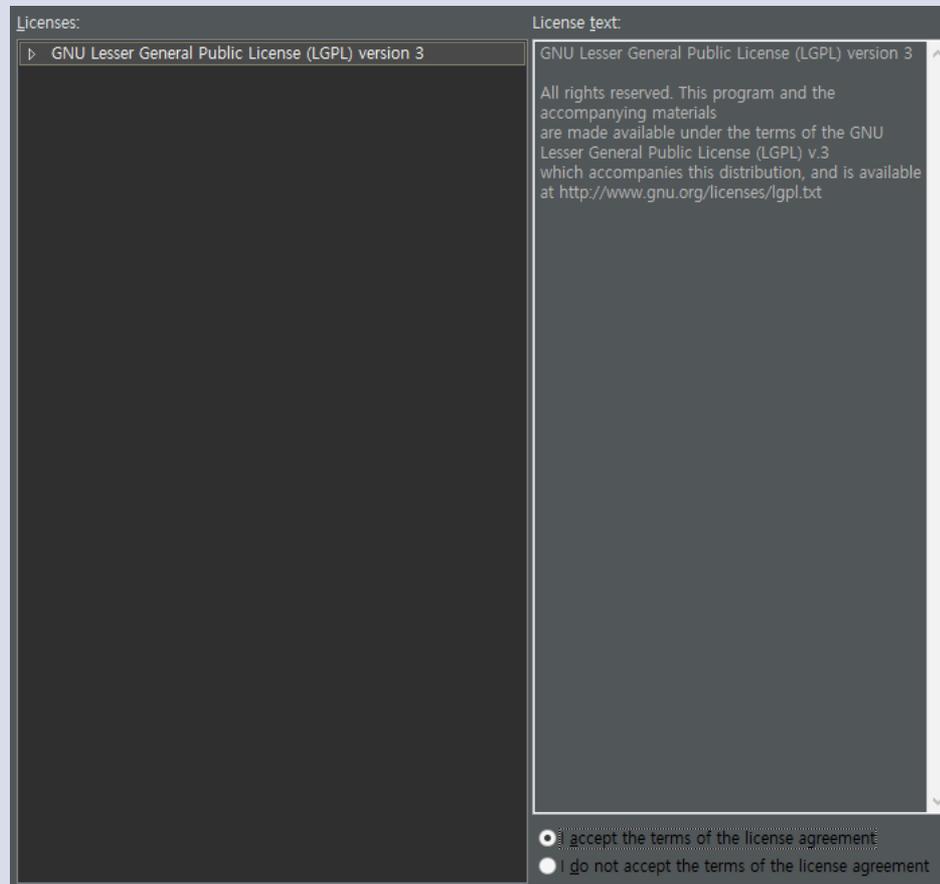
Installs: 133K (2,902 last month)

Install

# 1. Static Analysis

## Sonarqube

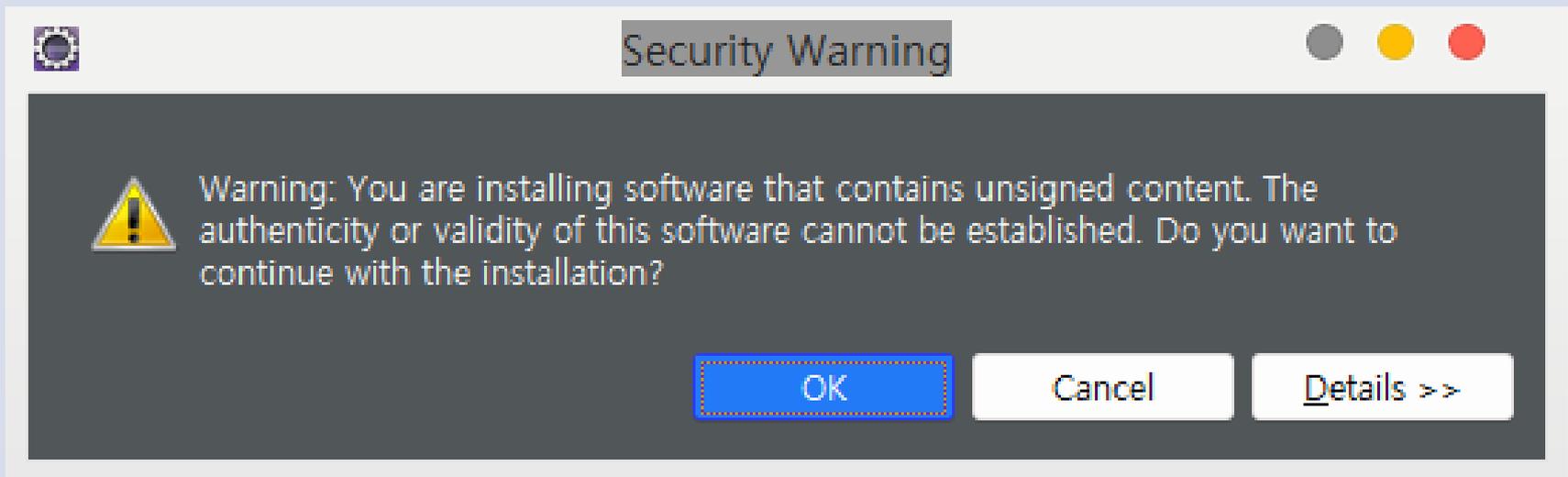
- License 동의 후 Finish 클릭



# 1. Static Analysis

## Sonarqube

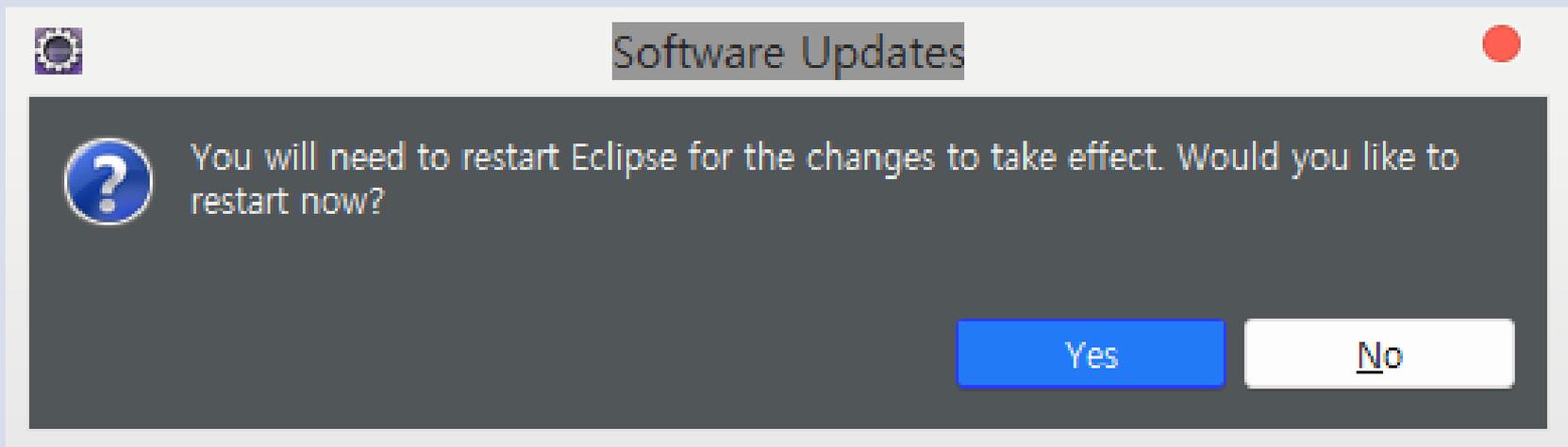
- 지금 설치하는 plug-in이 믿을만한 소프트웨어인지 판단을 위한 Warning이므로 OK를 클릭 후 설치를 계속 진행



# 1. Static Analysis

## Sonarqube

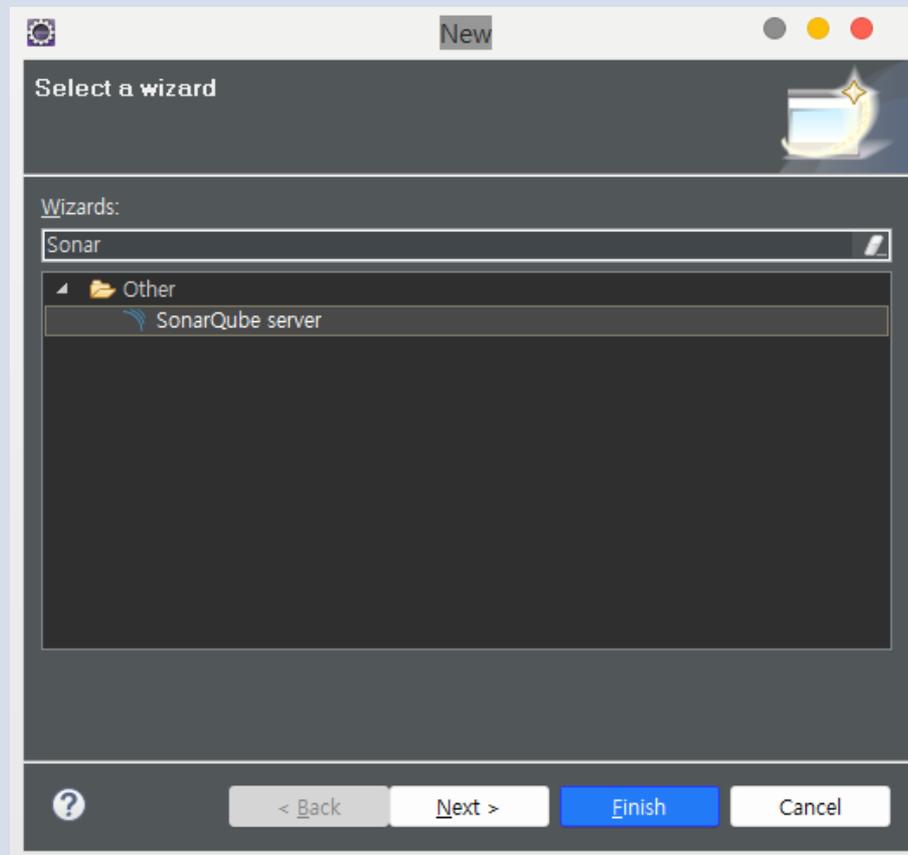
- 설치가 끝나면 Eclipse의 재실행 필요



# 1. Static Analysis

## Sonarqube

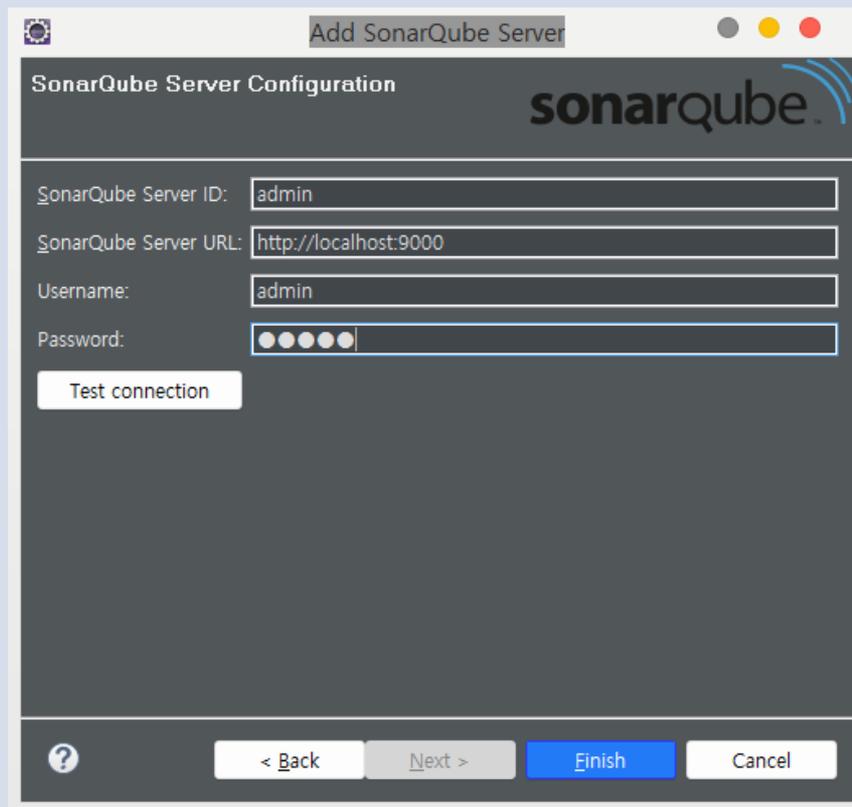
- New – others에서 SonarQube를 입력, SonarQube server를 선택



# 1. Static Analysis

## Sonarqube

- Server의 Setting대로 접속하면 연동을 마칩

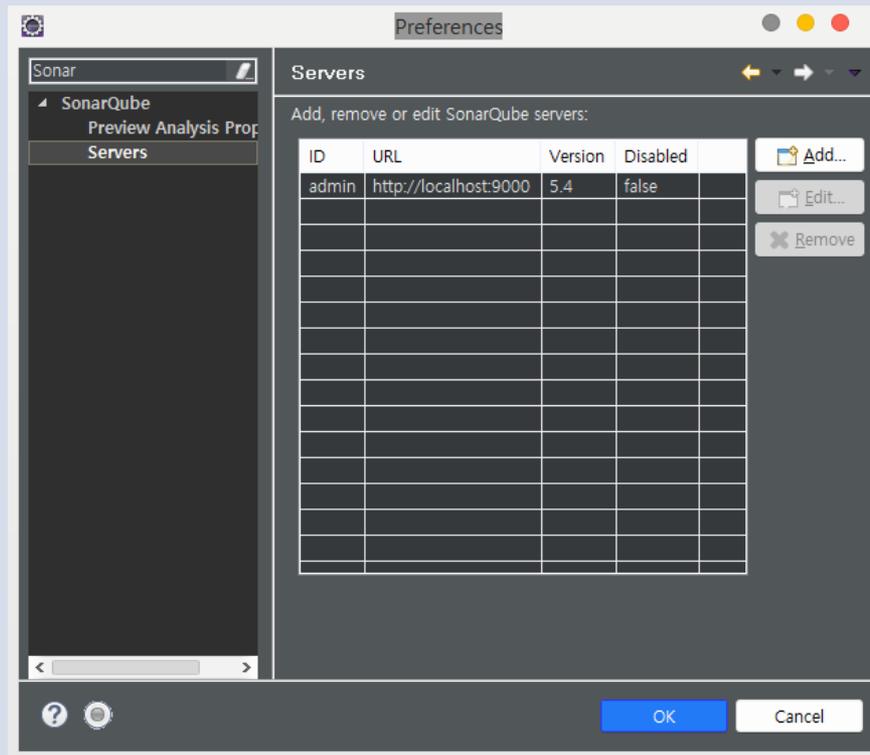


The image shows a screenshot of the 'Add SonarQube Server' dialog box. The dialog has a title bar with a gear icon and the text 'Add SonarQube Server'. The main content area is titled 'SonarQube Server Configuration' and features the SonarQube logo. It contains four input fields: 'SonarQube Server ID' with the value 'admin', 'SonarQube Server URL' with the value 'http://localhost:9000', 'Username' with the value 'admin', and 'Password' with five masked characters. Below these fields is a 'Test connection' button. At the bottom of the dialog, there is a navigation bar with a help icon, a '< Back' button, a 'Next >' button, a blue 'Finish' button, and a 'Cancel' button.

# 1. Static Analysis

## Sonarqube

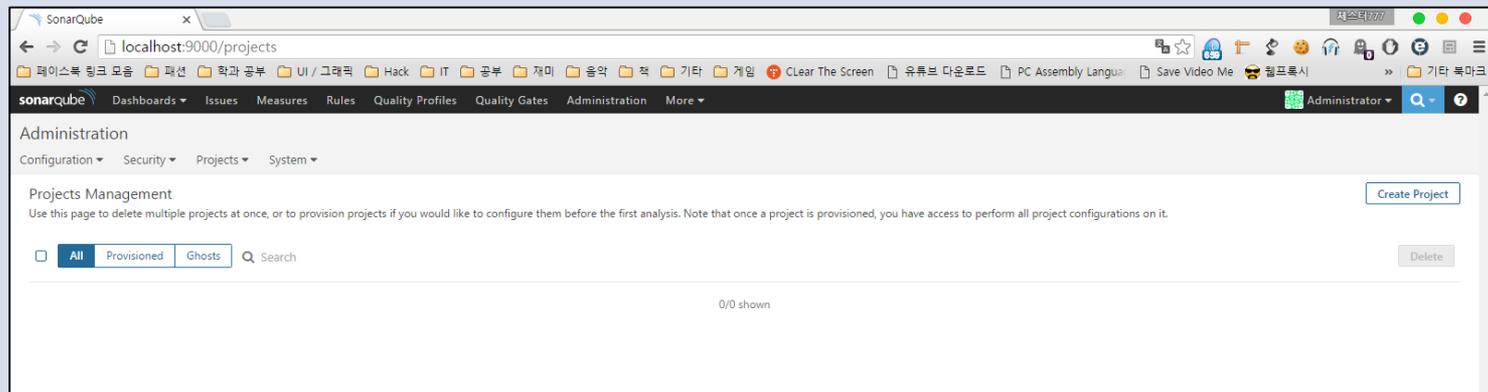
- 등록된 서버는 여기서 확인 할 수 있다.



# 1. Static Analysis

## Sonarqube

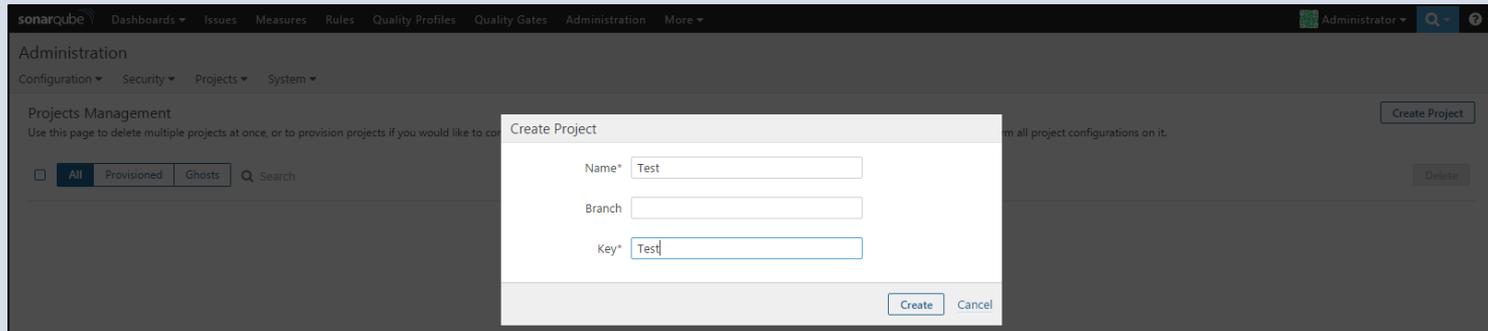
- 이후 Sonarqube 서버와 Eclipse를 연동하기 위해 Sonarqube에서 프로젝트를 생성



# 1. Static Analysis

## Sonarqube

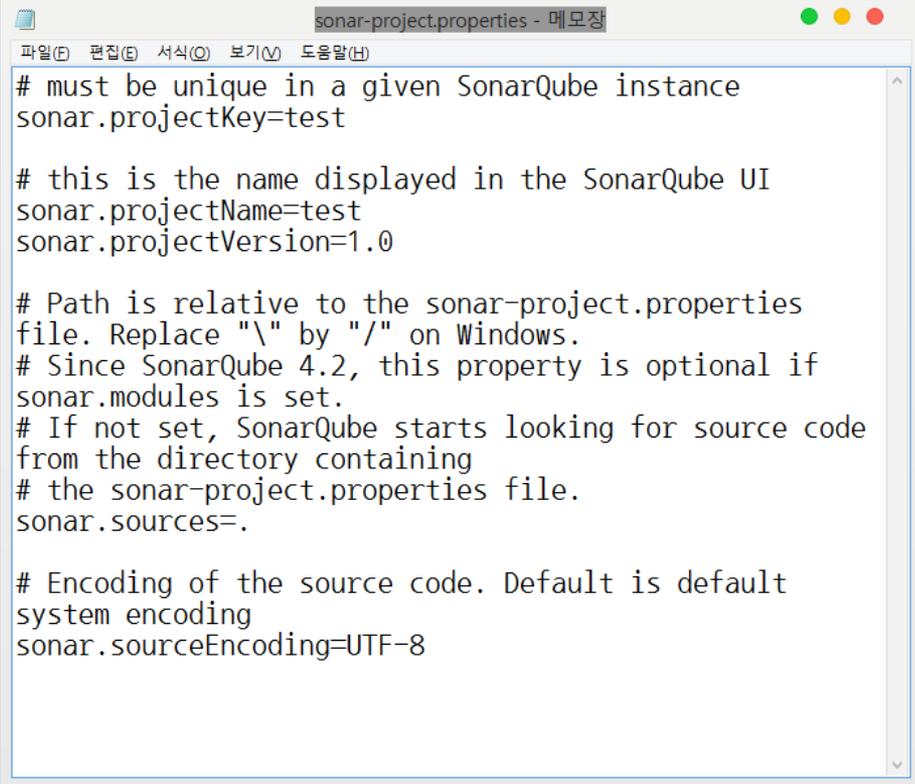
- Login(admin/admin) 후,  
Administration – Project – Management –Create



# 1. Static Analysis

## Sonarqube

- 정적 테스트를 진행하고자 하는 프로젝트의 루트폴더로 이동  
파일명이 sonar-project.properties인 파일을 생성하고 아래의 내용을 입력



```
sonar-project.properties - 메모장
파일(F) 편집(E) 서식(O) 보기(V) 도움말(H)
# must be unique in a given SonarQube instance
sonar.projectKey=test

# this is the name displayed in the SonarQube UI
sonar.projectName=test
sonar.projectVersion=1.0

# Path is relative to the sonar-project.properties
file. Replace "\" by "/" on Windows.
# Since SonarQube 4.2, this property is optional if
sonar.modules is set.
# If not set, SonarQube starts looking for source code
from the directory containing
# the sonar-project.properties file.
sonar.sources=.

# Encoding of the source code. Default is default
system encoding
sonar.sourceEncoding=UTF-8
```

# 1. Static Analysis

## Sonarqube

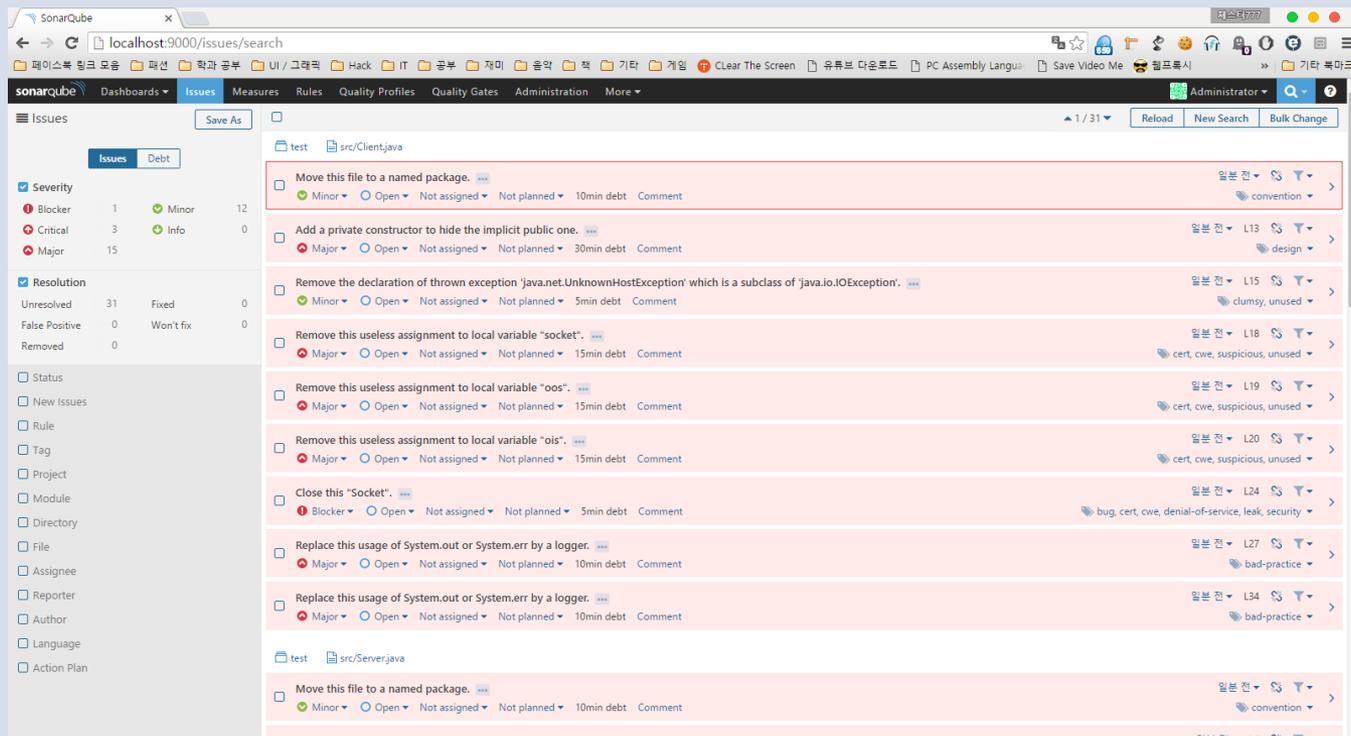
- 프로젝트 Root Directory에서 sonar-runner를 실행

```
C:\Windows\system32\cmd.exe
C:\Users\Chester\SourceCode\Java\Eclipse Workspace\Multi_Client_Test>sonar-runner
C:\Users\Chester\Downloads\sonar-runner-dist-2.4
SonarQube Runner 2.4
Java 1.8.0_77 Oracle Corporation (64-bit)
Windows 8.1 6.3 amd64
INFO: Runner configuration file: C:\Users\Chester\Downloads\sonar-runner-dist-2.4\conf\sonar-runner.properties
INFO: Project configuration file: C:\Users\Chester\SourceCode\Java\Eclipse Workspace\Multi_Client_Test\sonar-project.properties
INFO: Default locale: "ko_KR", source code encoding: "UTF-8"
INFO: Work directory: C:\Users\Chester\SourceCode\Java\Eclipse Workspace\Multi_Client_Test\.\sonar
INFO: SonarQube Server 5.4
20:08:45.600 INFO - Load global repositories
20:08:47.354 INFO - Load global repositories (done) | time=1748ms
20:08:47.451 INFO - User cache: C:\Users\Chester\.sonar\cache
20:08:48.176 INFO - Load plugins index
20:08:48.211 INFO - Load plugins index (done) | time=35ms
20:08:50.480 INFO - Process project properties
20:08:51.027 INFO - Load project repositories
20:08:51.108 INFO - Load project repositories (done) | time=81ms
20:08:51.145 INFO - Apply project exclusions
20:08:51.262 INFO - Load quality profiles
20:08:51.722 INFO - Load quality profiles (done) | time=459ms
20:08:51.752 INFO - Load active rules
20:08:57.364 INFO - Load active rules (done) | time=5612ms
20:08:57.401 WARN - SCM provider autodetection failed. No SCM provider claims to support this project. Please use sonar.scm.provider to define SCM of your project.
20:08:57.402 INFO - Publish mode
20:08:57.408 INFO - ----- Scan test
20:08:57.880 INFO - Load server rules
20:08:58.752 INFO - Load server rules (done) | time=872ms
20:08:59.079 INFO - Base dir: C:\Users\Chester\SourceCode\Java\Eclipse Workspace\Multi_Client_Test
20:08:59.081 INFO - Working dir: C:\Users\Chester\SourceCode\Java\Eclipse Workspace\Multi_Client_Test\.\sonar
20:08:59.089 INFO - Source paths: .
20:08:59.090 INFO - Source encoding: UTF-8, default locale: ko_KR
20:08:59.092 INFO - Index files
20:08:59.197 WARN - Invalid character encountered in file C:\Users\Chester\SourceCode\Java\Eclipse Workspace\Multi_Client_Test\src\ServerThread.java at line 8 for encoding UTF-8. Please fix file content or configure the encoding to be used using property 'sonar.sourceEncoding'.
20:08:59.246 INFO - 4 files indexed
```

# 1. Static Analysis

## Sonarqube

- 마지막으로 결과를 서버에서 확인 가능



The screenshot displays the SonarQube web interface in a browser window. The address bar shows the URL `localhost:9000/issues/search`. The interface includes a navigation menu with options like 'Issues', 'Measures', 'Rules', 'Quality Profiles', 'Quality Gates', 'Administration', and 'More'. The 'Issues' section is active, showing a summary of issues by severity and resolution status. The main content area lists several issues with details such as severity, status, and debt.

| Severity | Count | Info  | Count |
|----------|-------|-------|-------|
| Blocker  | 1     | Minor | 12    |
| Critical | 3     | Info  | 0     |
| Major    | 15    |       |       |

| Resolution     | Count | Fixed     | Count |
|----------------|-------|-----------|-------|
| Unresolved     | 31    | Fixed     | 0     |
| False Positive | 0     | Won't fix | 0     |
| Removed        | 0     |           |       |

| Issue Description  | Severity | Status | Not assigned | Not planned | Debt       |
|--|----------|--------|--------------|-------------|------------|
| Move this file to a named package.   | Minor    | Open   | Not assigned | Not planned | 10min debt |
| Add a private constructor to hide the implicit public one.   | Major    | Open   | Not assigned | Not planned | 30min debt |
| Remove the declaration of thrown exception 'java.net.UnknownHostException' which is a subclass of 'java.io.IOException'. | Minor    | Open   | Not assigned | Not planned | 5min debt  |
| Remove this useless assignment to local variable 'socket'.   | Major    | Open   | Not assigned | Not planned | 15min debt |
| Remove this useless assignment to local variable 'oos'.  | Major    | Open   | Not assigned | Not planned | 15min debt |
| Remove this useless assignment to local variable 'ois'.  | Major    | Open   | Not assigned | Not planned | 15min debt |
| Close this 'Socket'.   | Blocker  | Open   | Not assigned | Not planned | 5min debt  |
| Replace this usage of System.out or System.err by a logger.  | Major    | Open   | Not assigned | Not planned | 10min debt |
| Replace this usage of System.out or System.err by a logger.  | Major    | Open   | Not assigned | Not planned | 10min debt |
| Move this file to a named package.   | Minor    | Open   | Not assigned | Not planned | 10min debt |



2

## **System Analysis Tool**

## 2. System Analysis Tool

- 시스템 분석은 어떤 업무를 컴퓨터를 써서 시스템화하려고 할 경우에 먼저 그 업무를 분석하고, 업무의 흐름을 조사하며, 어떤 정보가 언제 발생하고 어떤 정보를 필요로 하는가 등을 파악해서 시스템을 위한 준비다.

## 2. System Analysis Tool

### Testlink

- 테스트 케이스가 어떻게 요구 사항에 맵핑이 되는지, 테스트 케이스의 시나리오가 어떻게 되고 요구 되는 결과는 어떻게 되는지, 테스트 결과는 어떻게 되는지, 그리고 Version 별 릴리즈에 따른 테스트 계획과 결과는 어떻게 되는지를 관리한다.
- 오픈 소스 도구 중에서 널리 사용되며, Learning Curve가 낮은 도구 중 하나이다.



## 2. System Analysis Tool

### Testlink

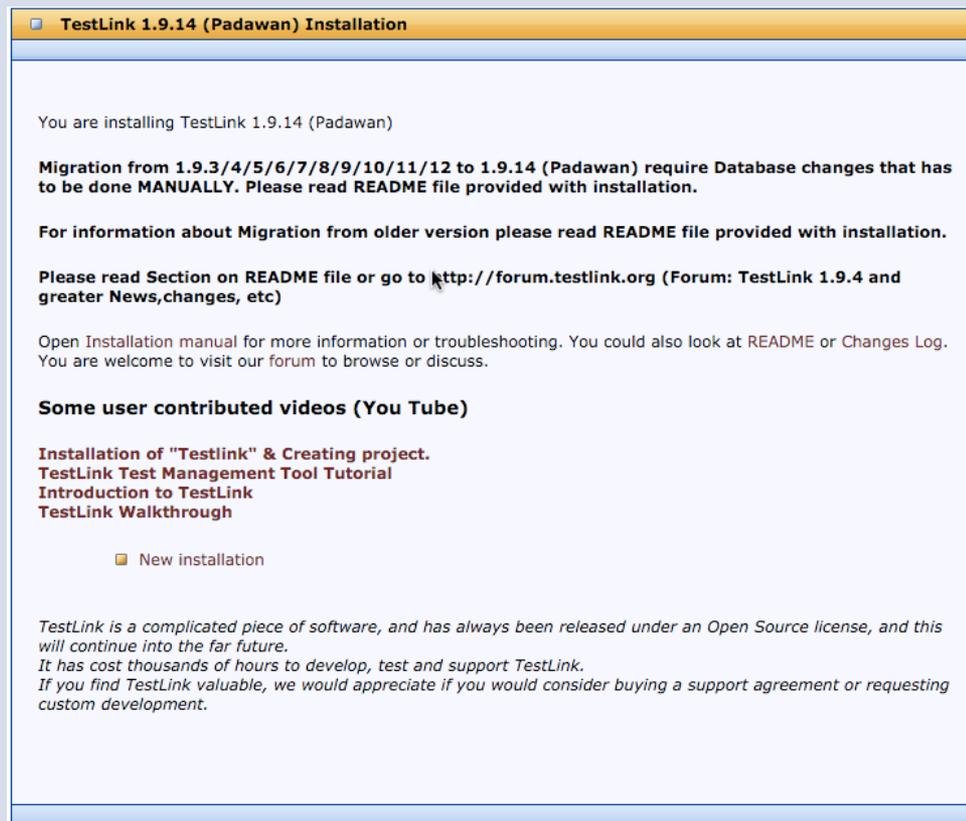
- Testlink 다운로드  
<http://teamst.org> → 최신의 testlink 파일 download
- 사전에 APM 설치가 필요



## 2. System Analysis Tool

### Testlink

- 설치파일을 실행시킨 뒤 초기 화면



## 2. System Analysis Tool

### Testlink

- 라이선스 동의 후 Continue 선택

**TestLink** is developed and shared under GPL license. You are welcome to share your changes with community. Please, confirm your understanding below.

***The GNU General Public License is a Free Software license.***

*Like any Free Software license, it grants to you the four following freedoms:*

- *The freedom to run the program for any purpose.*
- *The freedom to study how the program works and adapt it to your needs.*
- *The freedom to redistribute copies so you can help your neighbor.*
- *The freedom to improve the program and release your improvements to the public, so that the whole community benefits.*

*You may exercise the freedoms specified here provided that you comply with the express conditions of this license. The principal conditions are:*

- *You must conspicuously and appropriately publish on each copy distributed an appropriate copyright notice and disclaimer of warranty and keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of the GNU General Public License along with the Program. Any translation of the GNU General Public*

I agree to the terms set out in this license.

Continue

## 2. System Analysis Tool

### Testlink

- Testlink를 설치 뒤 Continue 선택

```
Read/write permissions
For security reasons we suggest that directories tagged with [S] on following messages, will be made
UNREACHABLE from browser.
Give a look to README file, section 'Installation & SECURITY' to understand how to change the
defaults.
Checking if /var/www/testlink/gui/templates_c directory exists OK
Checking if /var/www/testlink/gui/templates_c directory is writable (by user used to run webserver
process) OK
Checking if /var/testlink/logs/ directory exists [S] OK
Checking if /var/testlink/logs/ directory is writable (by user used to run webserver process) OK
Checking if /var/testlink/upload_area/ directory exists [S] OK
Checking if /var/testlink/upload_area/ directory is writable (by user used to run webserver process) OK

Your system is prepared for TestLink configuration (no fatal problem found). 
```

## 2. System Analysis Tool

### Testlink

- Database 접근을 위한 아이디와 비밀번호 입력

Set an existing database user with administrative rights (root):

**Database admin login**

**Database admin password**

*This user requires permission to create databases and users on the Database Server.  
These values are used only for this installation procedures, and is not saved.*

Define database User for Testlink access:

**TestLink DB login**

**TestLink DB password**

*This user will have permission only to work on TestLink database and will be stored in TestLink configuration.  
All TestLink requests to the Database will be done with this user.*

After successful installation You will have the following login for TestLink Administrator:  
login name: admin  
password : admin

## 2. System Analysis Tool

### Testlink

- Database 접근을 위한 아이디와 비밀번호 입력

TestLink setup will now attempt to setup the database:

**Creating connection to Database Server:OK!**

Database testlink does not exist.

Will attempt to create:

**Creating database `testlink` :OK!**

**Creating Testlink DB user `jinh574` :OK! ( ok - new user)**

Processing:sql/mysql/testlink\_create\_tables.sql

OK!

Writing configuration file:**Failed!**

TestLink couldn't write the config file. Please copy the following into the `../config_db.inc.php` file:

```
<?php
// Automatically Generated by TestLink Installer - Tue, 12 Apr 16 17:52:59
+0900
define('DB_TYPE', 'mysql');
define('DB_USER', 'jinh574');
define('DB_PASS', 'dhapr12');
define('DB_HOST', 'localhost');
define('DB_NAME', 'testlink');
define('DB_TABLE_PREFIX', '');
```

Once that's been done, you can log into TestLink by pointing your browser at your TestLink site.

## 2. System Analysis Tool

### Testlink

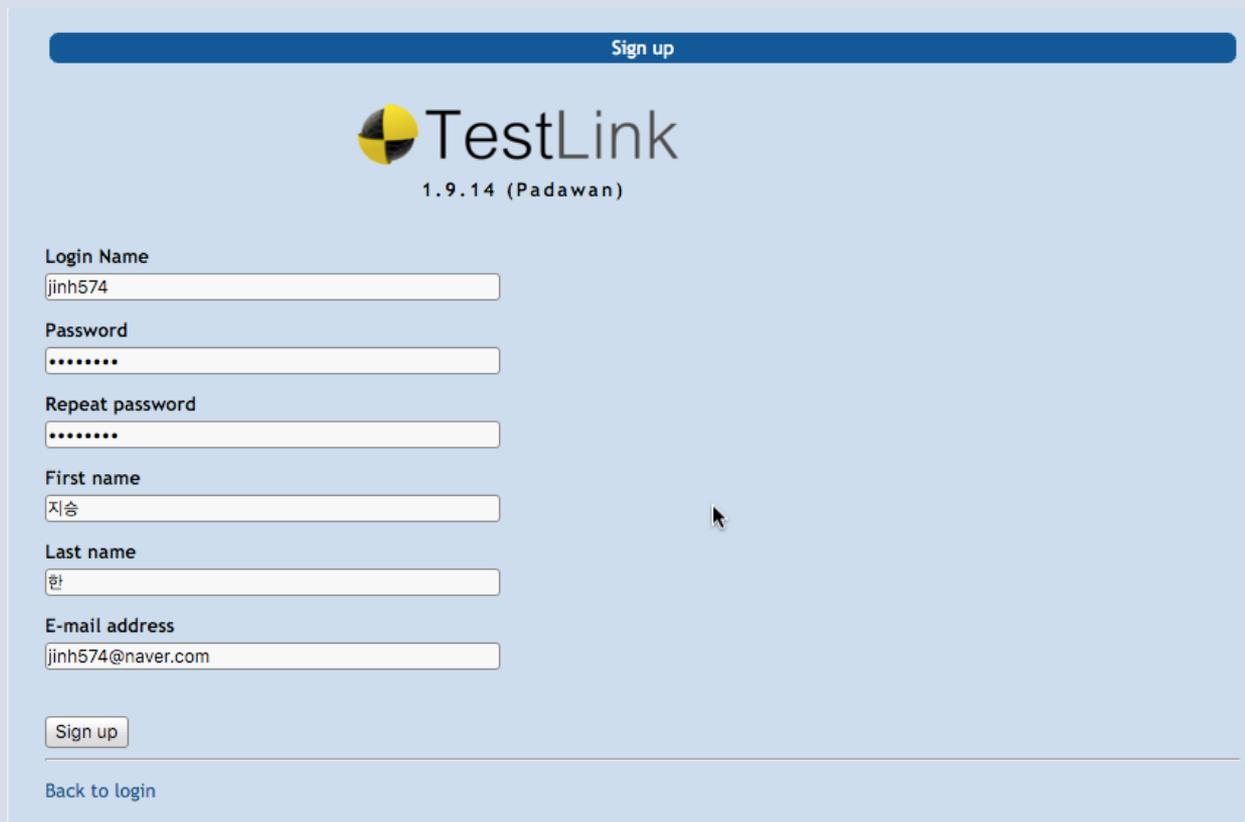
- Database 환경 설정 값 수정

```
<?php
// Automatically Generated by TestLink Installer - Tue, 12 Apr 16 17:57:35 +0900
define('DB_TYPE', 'mysql');
define('DB_USER', 'jinh574');
define('DB_PASS', 'dhaprk12');
define('DB_HOST', 'localhost');
define('DB_NAME', 'testlink');
define('DB_TABLE_PREFIX', '');
```

## 2. System Analysis Tool

### Testlink

- Testlink 가입 화면



Sign up

 TestLink  
1.9.14 (Padawan)

Login Name

Password

Repeat password

First name

Last name

E-mail address

[Back to login](#)

## 2. System Analysis Tool

### Testlink

- Testlink 와 Redmine 연동

|                              |  |
|------------------------------|--|
| <b>Issue Tracker</b>         | <input type="text" value="JS-redmine"/>  |
| <b>Type</b>                  | redmine (Interface: rest) <a href="#">Show configuration example</a>   |
| <b>Configuration</b>         | <pre>&lt;issuetracker&gt; &lt;urlbase&gt;http://localhost/redmine/&lt;/urlbase&gt; &lt;urlview&gt;http://localhost/issues/&lt;/urlview&gt; &lt;/issuetracker&gt;</pre> |
| <b>Configuration example</b> |  |

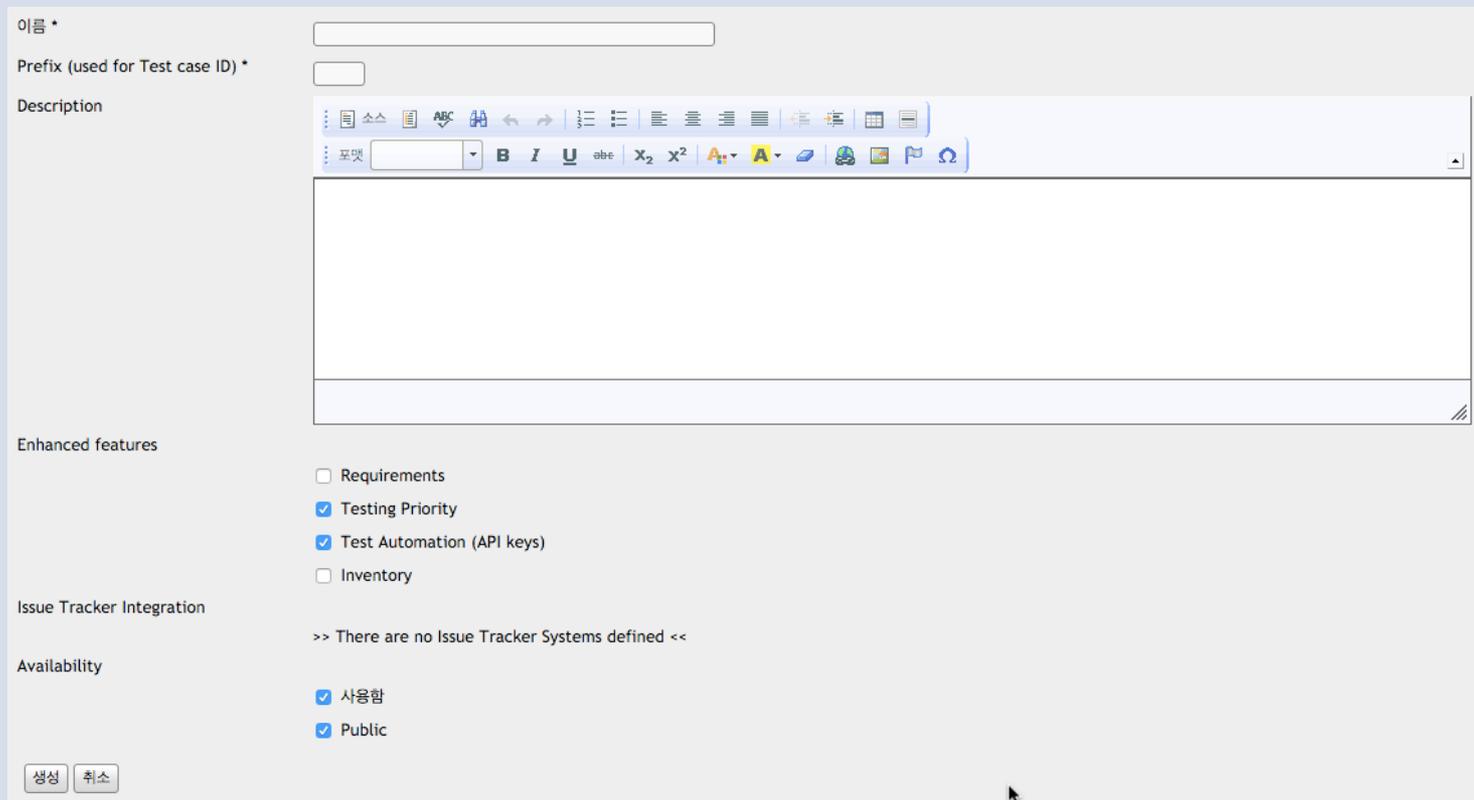
저장

취소

## 2. System Analysis Tool

### Testlink

- Testlink 프로젝트 생성



The screenshot shows the Testlink project creation interface. It includes the following sections:

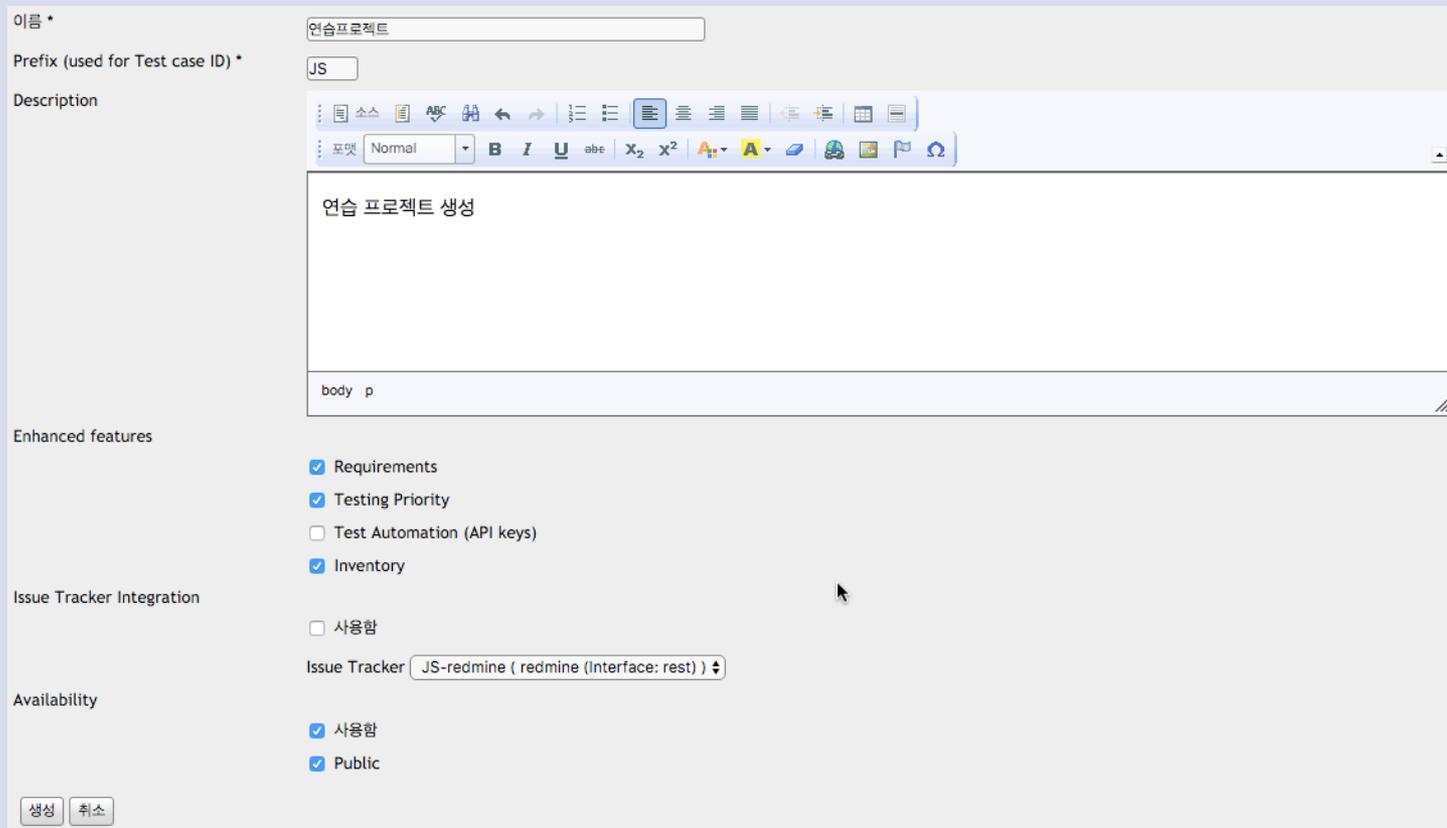
- 이름 \***: A text input field for the project name.
- Prefix (used for Test case ID) \***: A text input field for the prefix.
- Description**: A rich text editor with a toolbar containing icons for bold, italic, underline, text color, background color, link, unlink, and other formatting options.
- Enhanced features**: A list of checkboxes for additional features:
  - Requirements
  - Testing Priority
  - Test Automation (API keys)
  - Inventory
- Issue Tracker Integration**: A message that reads ">> There are no Issue Tracker Systems defined <<".
- Availability**: A list of checkboxes for project availability:
  - 사용함
  - Public

At the bottom left, there are two buttons: "생성" (Create) and "취소" (Cancel).

## 2. System Analysis Tool

### Testlink

- Testlink 프로젝트 이름, 설명, 추가 항목, 이슈 트래커 등 추가 가능



The screenshot shows the Testlink project configuration form. The form is divided into several sections:

- 이름 \***: Name field containing "연습프로젝트".
- Prefix (used for Test case ID) \***: Prefix field containing "JS".
- Description**: A rich text editor with a toolbar. The content is "연습 프로젝트 생성". Below the editor, the HTML code "body p" is visible.
- Enhanced features**: A list of checkboxes:
  - Requirements
  - Testing Priority
  - Test Automation (API keys)
  - Inventory
- Issue Tracker Integration**:
  - 사용함
  - Issue Tracker**: A dropdown menu showing "JS-redmine ( redmine (Interface: rest) )".
- Availability**:
  - 사용함
  - Public

At the bottom left, there are two buttons: "생성" (Create) and "취소" (Cancel).

## 2. System Analysis Tool

### Testlink

- Testlink 요구 명세서

The screenshot displays the Testlink web interface for managing requirements. The left sidebar is titled '네비게이터 - 요구사항 명세' and contains several sections:

- Settings:** Includes a checkbox for '트리 자동 업데이트' (Tree auto-update), which is currently checked.
- Filters:** A section for filtering requirements with the following fields:
  - Document ID:
  - 제목:
  - 상태: [모두] (dropdown)
  - Requirement Type: [모두] (dropdown)
  - Req. Spec. Type: [모두] (dropdown)
  - Expected no. of testcases:
  - Has relation of type: [모두] (dropdown)
  - TC ID: JS-
- Buttons: '적용' (Apply), 'Reset Filters', and '상세한 필터' (Detailed filters).
- Tree controls: 'Expand tree' and 'Collapse tree' buttons.
- Folder list: '연습프로젝트 (0)' (Practice project (0)).

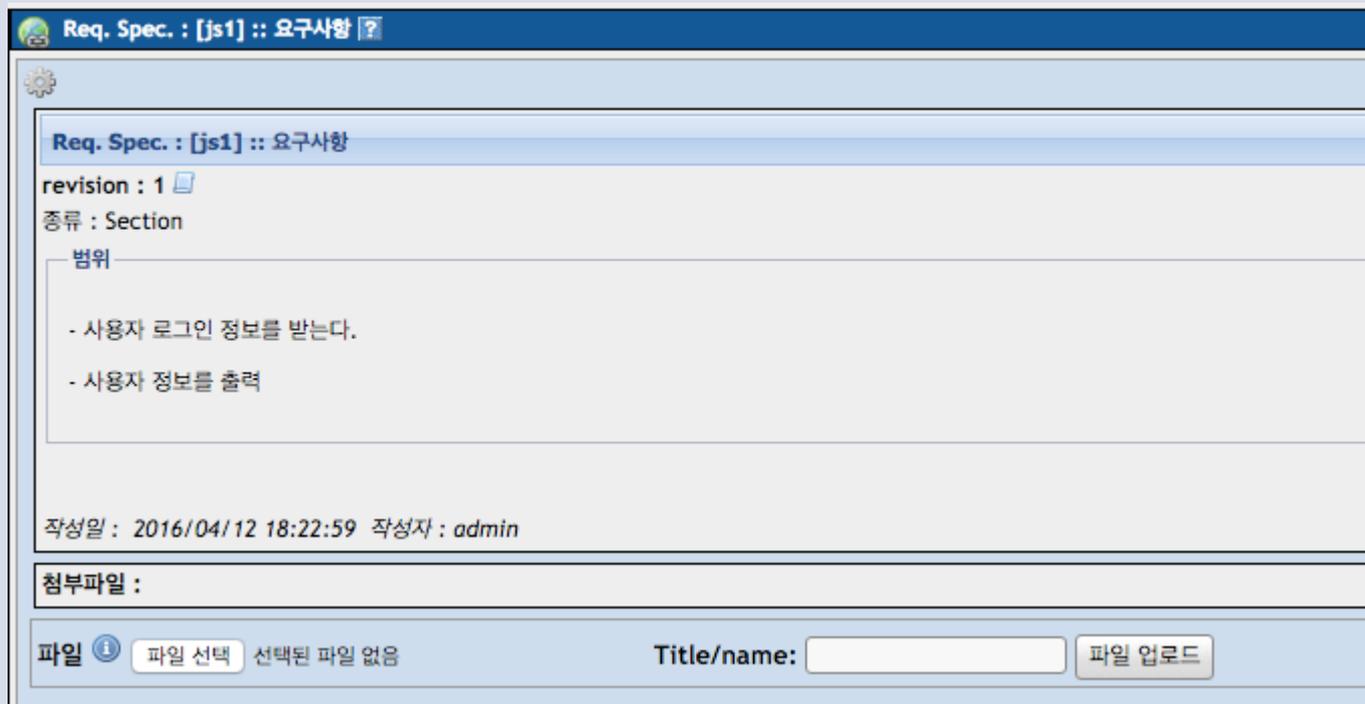
The main content area is titled '테스트 프로젝트 : 연습프로젝트 : 요구사항 명세' and features three buttons at the top: '새 요구사항 명세' (New requirement specification), 'Export All Requirement Specifications', and '가져오기' (Import).



## 2. System Analysis Tool

### Testlink

- Testlink 요구사항 operation 추가 후 모습



The screenshot displays the Testlink web interface for editing a requirement specification. The browser title bar shows "Req. Spec. : [js1] :: 요구사항?". The main content area is titled "Req. Spec. : [js1] :: 요구사항" and includes the following details:

- revision : 1
- 종류 : Section
- 범위
- 사용자 로그인 정보를 받는다.
- 사용자 정보를 출력

At the bottom of the form, it shows the creation date and author: "작성일 : 2016/04/12 18:22:59 작성자 : admin". Below this is a section for attachments labeled "첨부파일 :". At the very bottom, there is a file upload area with a "파일" button, a "파일 선택" button, the text "선택된 파일 없음", a "Title/name:" input field, and a "파일 업로드" button.

## 2. System Analysis Tool

### Testlink

- Testlink Test suite 만들기

테스트 스위트 : 사용자 로그인 정보 받기

Test Suite Operations + [edit] [delete] [duplicate] [copy] [paste] [refresh] [undo] [redo]

Test Case Operations + [edit] [delete] [duplicate] [copy] [paste] [refresh] [undo] [redo]

테스트 스위트 : 사용자 로그인 정보 받기

상세정보

로그인정보 받는 테스트

키워드 : 없음

첨부파일 :

파일 ⓘ 파일 선택 선택된 파일 없음 Title/name:  파일 업로드

## 2. System Analysis Tool

### Testlink

- Testlink Test case 만들기

테스트 케이스

JS-1:사용자 정보

버전 1  

요약

이름 받기

Preconditions

| # | Step actions          | 예상결과              |   |   |
|---|-----------------------|-------------------|---|---|
| 1 | 이름을 받는다               | 스tring 변수 생성 및 저장 |    |    |
| 2 | 스tring 변수에 값이 갺참은지 확인 | 스tring 값인지 확인     |  |  |

Create step   Resequence Steps

## 2. System Analysis Tool

### Testlink

- Testlink Test Plan 생성

테스트 계획 관리 - 테스트 프로젝트 연습프로젝트

테스트 계획편집 - 테스트 계획 ⓘ

|         |   |
|---------|---|
| 이름      | 테스트 계획  |
| 설명      | <p>소스 ABC ↩ ↲ ↳ ↴ ↵ ↶ ↷ ↸ ↹ ↺ ↻ ↼ ↽ ↾ ↿ ↺ ↻ ↼ ↽ ↾ ↿</p> <p>포맷 <input type="text"/> <b>B</b> <i>I</i> <u>U</u> abc <math>x_2</math> <math>x^2</math> A: A ↵ ↶ ↷ ↸ ↹ ↺ ↻ ↼ ↽ ↾ ↿ ↺ ↻ ↼ ↽ ↾ ↿</p> <p>테스트 플랜 선택</p> |
| 사용함     | <input checked="" type="checkbox"/>   |
| Public  | <input type="checkbox"/>  |
| API Key | 4a367b0147235b6c1b5820537eadcf2e61a7f2c2422c8ac8d50e83d6beeaed15  |

## 2. System Analysis Tool

### Testlink

- Testlink Test Plan 빌드 설정

빌드 관리 - 테스트 계획 : 테스트 계획

#### 새 빌드 생성

|              |  |
|--------------|--|
| 이름           | 로그인관련 테스트  |
| 설명           | <div style="border: 1px solid #ccc; padding: 5px;"><p>소스</p><p>포맷 Normal</p><p>B I U abc x<sub>2</sub> x<sup>2</sup> A<sub>1</sub> A</p><p>body p</p></div>                                  |
| 사용함          | <input checked="" type="checkbox"/>  |
| 진행           | <input checked="" type="checkbox"/>  |
| Release date | <input type="text"/>   |

빌드는 이름으로 구별합니다. 각각의 빌드는 선택된 테스트 계획에 연결 되어 있습니다.  
설명란에는 다음과 같은 것을 기재합니다 : 결과물 목록, 수정사항 또는 기능들, 승인서, 상태, 등.  
빌드는 두 가지 속성을 가지고 있습니다 :  
사용함 / 사용안함 - 빌드를 사용할 수 있는지 여부를 나타냅니다. 사용안함으로 설정한 빌드는 실행과 보고서에서 나타나지 않습니다.  
진행 / 완료 - 진행 상태인 빌드에서만 테스트 결과를 변경할 수 있습니다.

## 2. System Analysis Tool

### Testlink

- Testlink Test 지정

테스트 계획 : 테스트 계획 - 테스트 계획에 테스트 케이스 추가/삭제

Assign to user on add  on build   테스터에게 메일로 알려 주기

Check/uncheck all Test cases for

---

사용자 로그인 정보 받기

| 테스트 케이스   | 버전 | 중요도 |       |                          |            |
|---|----|-----|-------|--------------------------|------------|
| <input checked="" type="checkbox"/> JS-1 : 사용자 정보 | 1  | 보통  | 10000 | <input type="checkbox"/> | 2016/04/12 |

## 2. System Analysis Tool

### Testlink

- Testlink Test 실행

The screenshot displays the Testlink interface for a test execution. At the top, there's a blue header with the text '테스트 결과 : 빌드 로그인관련 테스트'. Below this, there are several navigation buttons: '인쇄', '모든 실행결과들 보기', and 'XML 결과 가져오기'. The main content area is divided into sections: '테스트 계획 테스트 계획', '빌드 로그인관련 테스트', and '테스트 스위트 : 사용자 로그인 정보 받기/'. A section titled '마지막 실행 (모든 빌드)' shows a black bar with the text '실행안함'. Below this, it says '아직 테스트 안함'. A blue bar indicates '테스트 케이스 JS-1 :: 버전: 1 :: 사용자 정보' and '테스터 : admin'. The main execution details are shown in a yellow-bordered box with a '요약' section. It includes a table with columns: '#', 'Step actions', '예상결과', 'Execution notes', and 'Result'. The table has one row with the following data: '# 1', 'Step actions 이름 받는다', '예상결과 스트링 변수 생성 및 저장', 'Execution notes' (empty), and 'Result' (dropdown menu). At the bottom, there's a '파일' section with a button '파일 선택' and the text '선택된 파일 없음'.

테스트 결과 : 빌드 로그인관련 테스트

인쇄 모든 실행결과들 보기 XML 결과 가져오기

테스트 계획 테스트 계획

빌드 로그인관련 테스트

테스트 스위트 : 사용자 로그인 정보 받기/

마지막 실행 (모든 빌드)

실행안함

아직 테스트 안함

테스트 케이스 JS-1 :: 버전: 1 :: 사용자 정보

테스터 : admin

요약

이름 받기

Preconditions

| # | Step actions | 예상결과           | Execution notes | Result |
|---|--------------|----------------|-----------------|--------|
| 1 | 이름 받는다       | 스트링 변수 생성 및 저장 |                 |        |

파일 파일 선택 선택된 파일 없음



**3 CTIP**

# 3. CTIP

- Jenkins 대쉬 보드

The screenshot shows the Jenkins dashboard interface. At the top, there is a search bar and user information. The main content area displays a table of build statistics for a public Jenkins server. The table has columns for build status (S), workspace (W), name, last success, last failure, and last build time. Two builds are listed: 'Android Build' and 'iOS Build'. Below the table, there are links for '아이콘: S M L' and 'Legend' with RSS feeds for '모두', '실패', and '최근 빌드'. On the left side, there is a sidebar with navigation options like '새로운 Item', '사람', '빌드 기록', 'Jenkins 관리', 'Credentials', and 'My Views'. Below these are sections for '빌드 대기 목록' (empty) and '빌드 실행 상태' (showing 'master' and 'Android Build Slave' with 2 pending builds each, and 'iOS Build Slave' with 0 pending builds).

| S | W | Name ↓                        | 최근 성공                         | 최근 실패                         | 최근 소요 시간 |  |
|---|---|-------------------------------|-------------------------------|-------------------------------|----------|--|
|   |   | <a href="#">Android Build</a> | 21 days - <a href="#">#44</a> | 26 days - <a href="#">#41</a> | 52 sec   |  |
|   |   | <a href="#">iOS Build</a>     | 26 days - <a href="#">#45</a> | 26 days - <a href="#">#44</a> | 36 sec   |  |

# 3. CTIP

- Jenkins와 Jdk, Git, Gradle 연동

**JDK**

JDK installations

JDK Name:

JAVA\_HOME:

Install automatically

[Delete JDK](#)

[Add JDK](#)

List of JDK installations on this system

---

**Git**

Git installations

Git Name:

Path to Git executable:

Install automatically

[Delete Git](#)

[Add Git](#)

description

---

**Gradle**

Gradle installations

Gradle name:

GRADLE\_HOME:

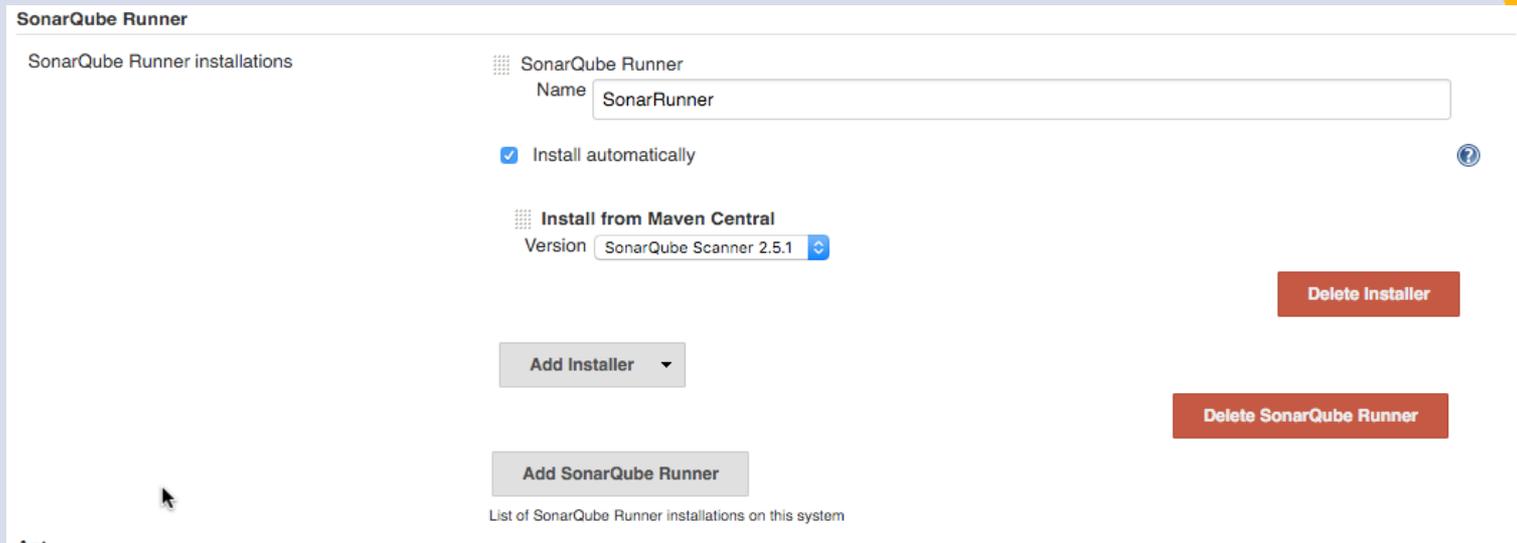
Install automatically

[Delete Gradle](#)

[저장](#) [적용](#)

## 3. CTIP

- Jenkins와 sonarqube runner 연동



The screenshot shows the 'SonarQube Runner' configuration page in Jenkins. The page title is 'SonarQube Runner'. Under the heading 'SonarQube Runner installations', there is a list of installed runners. One runner is shown with the name 'SonarRunner'. The 'Install automatically' checkbox is checked. Below this, there is a section for 'Install from Maven Central' with the version 'SonarQube Scanner 2.5.1'. At the bottom of the configuration area, there are three buttons: 'Add Installer', 'Add SonarQube Runner', and 'Delete SonarQube Runner'. On the right side, there are two red buttons: 'Delete Installer' and 'Delete SonarQube Runner'. The text 'List of SonarQube Runner installations on this system' is visible at the bottom of the configuration area.

## 3. CTIP

- Jenkins와 sonarqube 연동

**SonarQube**

Environment variables

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

SonarQube installations

Name

Server URL   
Default is http://localhost:9000

SonarQube account login   
SonarQube account used to perform analysis. Mandatory when anonymous access is disabled.

SonarQube account password   
SonarQube account used to perform analysis. Mandatory when anonymous access is disabled.

Disable   
Check to quickly disable SonarQube on all jobs.

List of SonarQube installations

# 3. CTIP

- Jenkins와 E-mail과 Slack 연동

**E-mail로 알려줌**

|  |  |   |
|--|--|---|
| SMTP 서버  | <input type="text" value="smtp.naver.com"/>    | ? |
| Default user e-mail suffix   | <input type="text"/>                           | ? |
| <input checked="" type="checkbox"/> Use SMTP Authentication        |  | ? |
| 사용자명   | <input type="text" value="jinh574"/>           |   |
| 비밀번호   | <input type="password" value="....."/>         |   |
| SSL 사용   | <input checked="" type="checkbox"/>            | ? |
| SMTP Port  | <input type="text" value="465"/>               | ? |
| Reply-To Address   | <input type="text" value="jinh574@naver.com"/> |   |
| Charset  | <input type="text" value="UTF-8"/>             |   |
| <input type="checkbox"/> Test configuration by sending test e-mail |  |   |

**Global Slack Notifier Settings**

|                   |   |   |
|-------------------|---|---|
| Team Subdomain    | <input type="text" value="starnight"/>                  | ? |
| Integration Token | <input type="text" value="OLlrRLFIPGjswxVc57cR9I7A"/>   | ? |
| Channel           | <input type="text"/>                                    | ? |
| Build Server URL  | <input type="text" value="http://203.252.160.1:8080/"/> | ? |

## 3. CTIP

- Jenkins와 Gitlab 연동

**Gitlab**

Gitlab host URL

API Token

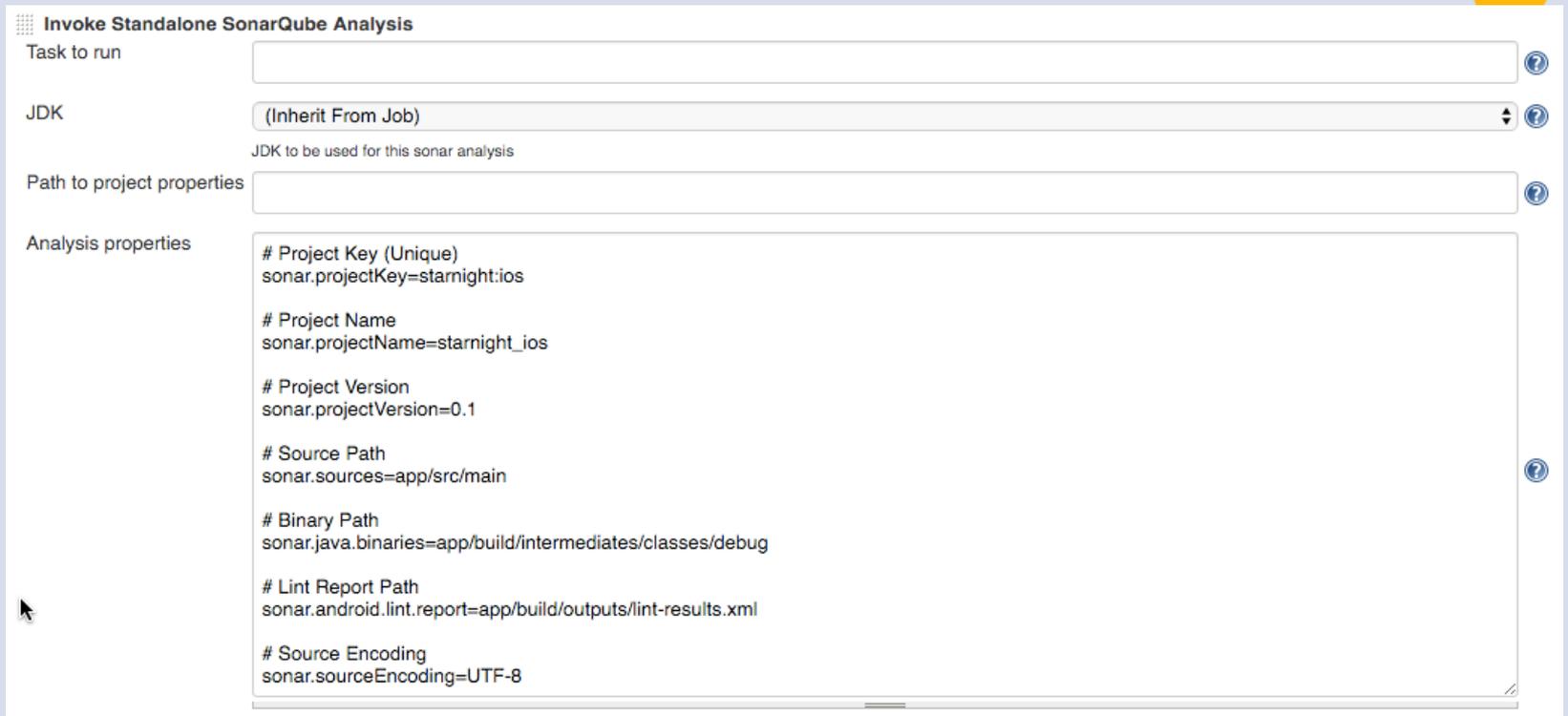
The complete URL to the Gitlab server (i.e. http://gitlab)

Ignore SSL Certificate Errors

API Token for accessing Gitlab

# 3. CTIP

- Sonarqube Runner Build 환경 설정



**Invoke Standalone SonarQube Analysis**

Task to run

JDK

JDK to be used for this sonar analysis

Path to project properties

Analysis properties

```
# Project Key (Unique)
sonar.projectKey=starnight:ios

# Project Name
sonar.projectName=starnight_ios

# Project Version
sonar.projectVersion=0.1

# Source Path
sonar.sources=app/src/main

# Binary Path
sonar.java.binaries=app/build/intermediates/classes/debug

# Lint Report Path
sonar.android.lint.report=app/build/outputs/lint-results.xml

# Source Encoding
sonar.sourceEncoding=UTF-8
```

## 3. CTIP

- Redmine 환경 설정

**Redmine**

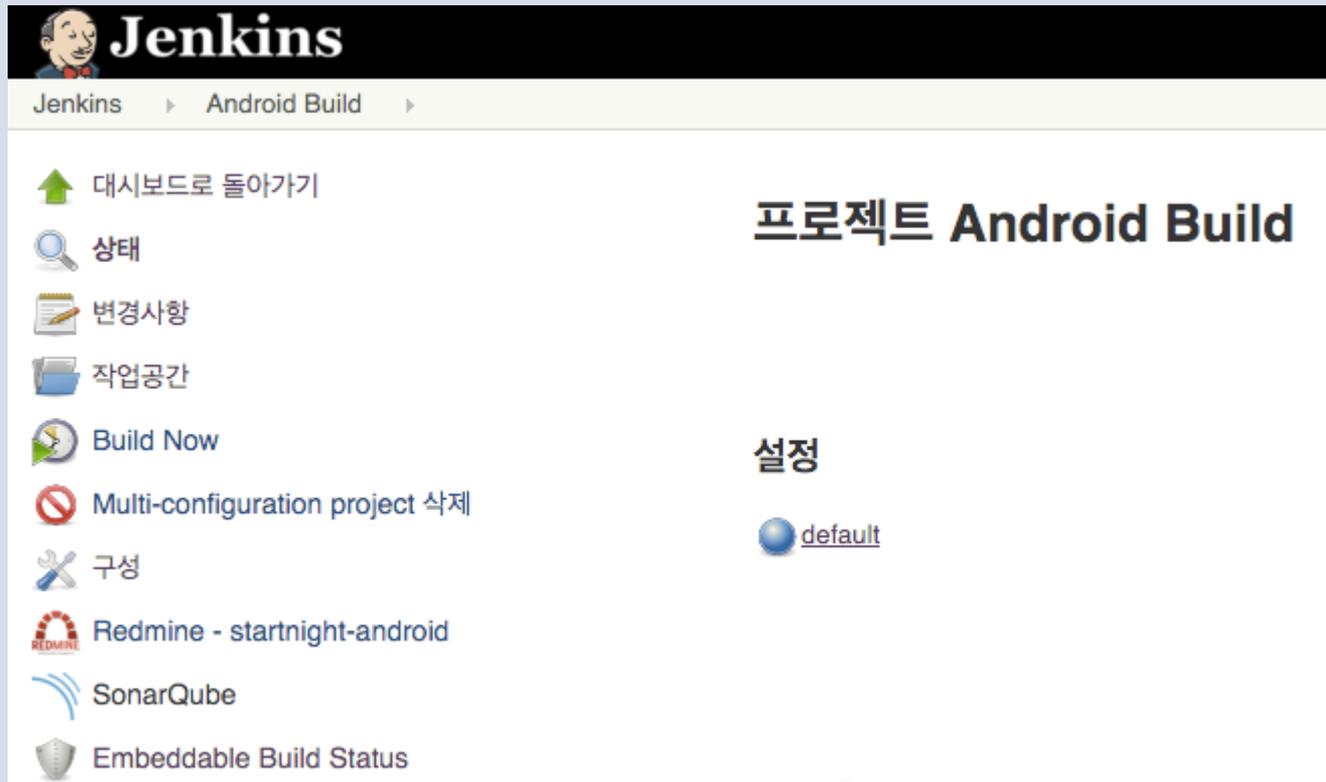
Redmine websites

|                |  |
|----------------|--|
| Name           | <input type="text" value="redmine"/>               |
| Base url       | <input type="text" value="http://localhost:8000"/> |
| Version number | <input type="text" value="3.2.1"/>                 |



## 3. CTIP

- 프로젝트와 Redmine, Sonarqube 연결



**Jenkins**

Jenkins > Android Build >

↑ 대시보드로 돌아가기

🔍 상태

📝 변경사항

📁 작업공간

🔄 Build Now

🚫 Multi-configuration project 삭제

🔧 구성

🔗 Redmine - startnight-android

📶 SonarQube

🛡️ Embeddable Build Status

### 프로젝트 Android Build

설정

🔵 default



# 4 Summary

## 4. Summary

### Environment

|            | Name      | Version |
|------------|-----------|---------|
| 운영체제       | Ubuntu    | 12.14   |
| 자바         | Jdk       | 1.8     |
| 개발도구       | Eclipse   | Mars    |
| 유닛 테스트 도구  | JUnit     | 4.12    |
| 빌드 도구      | Gradle    | 2.1     |
| 빌드 서버      | Window    | 7       |
| 버전 관리      | Git       | 2.7.2   |
| 이슈 트래커     | Redmine   | 3.2.1   |
| 정적 분석 도구   | Sonarqube | 3.5     |
| 시스템 테스트 도구 | Testlink  | 2.9.14  |



THANK YOU

정적 분석 & 시스템테스트 도구

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