



소프트웨어 검증 #3

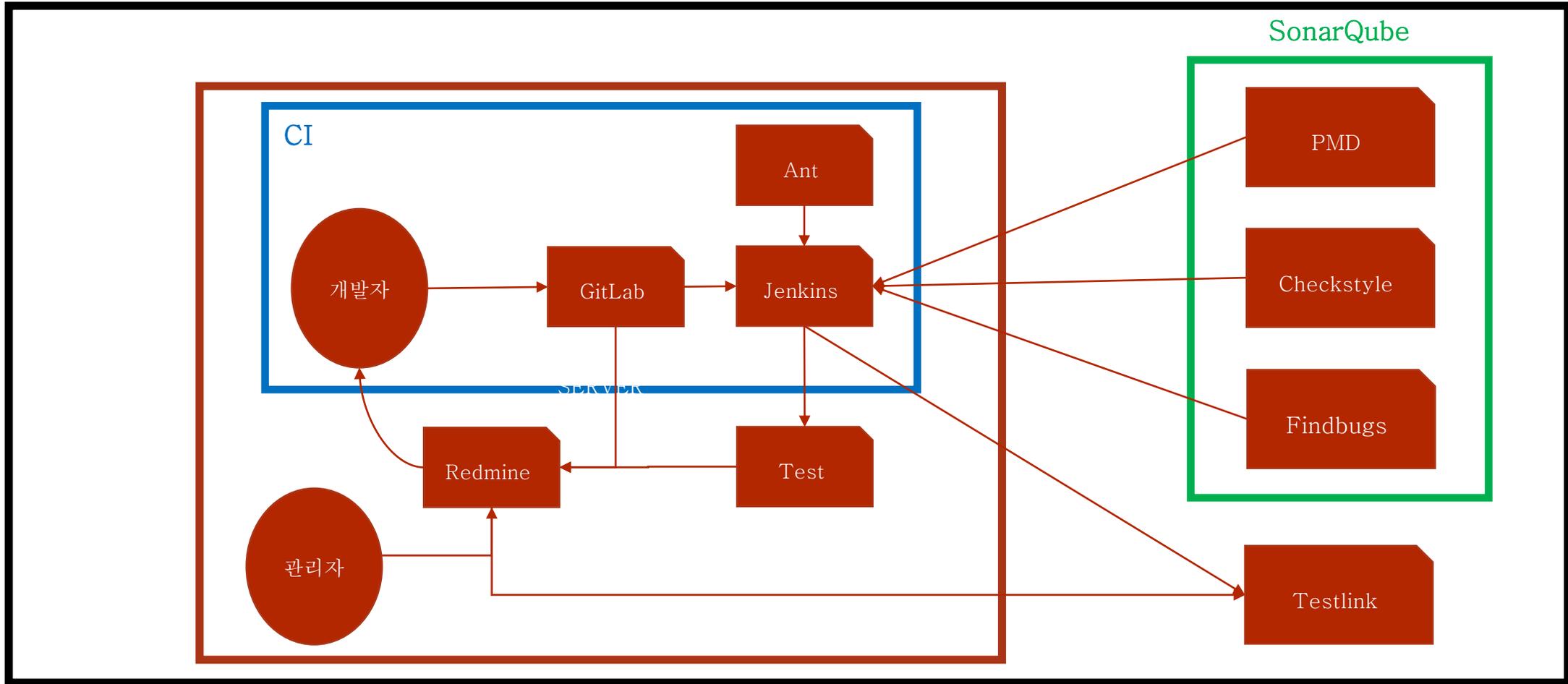
201111353 박수민

201111371 원정일

201111386 조경래

CTIP 환경

CTIP



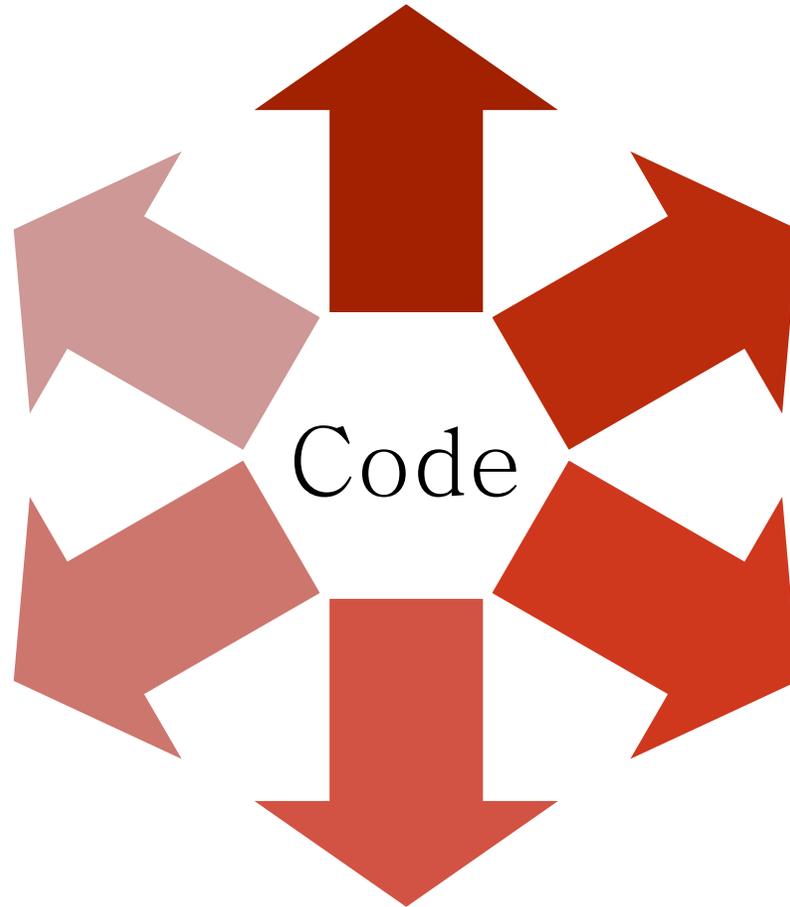




Static program analysis

정적 분석

Static program analysis



Testing tool

SonarQube SonarQube 5.1

PMD PMD for Eclipse 4

Checkstyle Checkstyle 5.6

FindBugs FindBugs 3.0.1

TestLink TestLink 1.9.14



SonarQube

Static Test

SonarQube

Main Dashboard

Time changes... ▾

Lines Of Code 70	Files 4	Functions 11
Java	Directories 1	Lines 98
	Classes 4	Statements 18
	Accessors 0	

SQALE Rating A	Technical Debt Ratio 4.0%
--------------------------	--

Debt 1h 25min	Issues 11	Blocker 0
		Critical 0
		Major 6
		Minor 5
		Info 0

Duplications
[0.0%](#)

Lines 0	Blocks 0	Files 0
----------------------------	-----------------------------	----------------------------

Directory Tangle Index 0.0%	Dependencies To Cut
	Between Directories 0
	Between Files 0
Cycles >0	

Complexity
[11](#)

/Function 1.0	/Class 2.8	/File 2.8
----------------------------------	-------------------------------	------------------------------

● Functions ● Files

Events [All](#) ▾

2016/04/12	Version	1.0
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testant [testant](#)

Profiles: [Sonar way](#) (Java)

SonarQube : SQL 설정

```
root@ciserver:~# mysql -u root -p
[Enter password:
[Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 37
Server version: 5.5.47-0ubuntu0.14.04.1 (Ubuntu)

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affiliates. Other names may be trademarks of their respective
owners.

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

mysql>
[mysql>
[mysql>
[mysql>
[mysql> CREATE DATABASE sonar CHARACTER SET utf8 COLLATE utf8_general_ci;
[Query OK, 1 row affected (0.00 sec)

mysql> CREATE USER 'sonar' IDENTIFIED BY 'sonar';
[Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL ON sonar.* TO 'sonar'@'%' IDENTIFIED BY 'sonar';
[Query OK, 0 rows affected (0.00 sec)

mysql> GRANT ALL ON sonar.* TO 'sonar'@'localhost' IDENTIFIED BY 'sonar';
[Query OK, 0 rows affected (0.00 sec)

mysql> FLUSH PRIVILEGES;
[Query OK, 0 rows affected (0.00 sec)
```

SonarQube : 설치

```
root@ciserver:~# wget http://dist.sonar.codehaus.org/sonarqube-5.1.zip
--2016-04-11 23:10:36-- http://dist.sonar.codehaus.org/sonarqube-5.1.zip
Resolving dist.sonar.codehaus.org (dist.sonar.codehaus.org)... 52.5.67.234
Connecting to dist.sonar.codehaus.org (dist.sonar.codehaus.org)|52.5.67.234|:80... connected.
HTTP request sent, awaiting response... 302 Found
Location: http://downloads.sonarsource.com/sonarqube/sonarqube-5.1.zip [following]
--2016-04-11 23:10:36-- http://downloads.sonarsource.com/sonarqube/sonarqube-5.1.zip
Resolving downloads.sonarsource.com (downloads.sonarsource.com)... 75.101.133.159
Connecting to downloads.sonarsource.com (downloads.sonarsource.com)|75.101.133.159|:80... connected.
HTTP request sent, awaiting response... 200 OK
```

```
$ wget http://dist.sonar.codehaus.org/sonarqube-5.1.zip
```

```
$ unzip sonarqube-5.1.zip
```

```
root@ciserver:~# unzip sonarqube-5.1.zip
Archive: sonarqube-5.1.zip
  creating: sonarqube-5.1/
  creating: sonarqube-5.1/conf/
 inflating: sonarqube-5.1/conf/sonar.properties
 inflating: sonarqube-5.1/conf/wrapper.conf
  creating: sonarqube-5.1/bin/
  creating: sonarqube-5.1/bin/windows-x86-64/
```

SonarQube : 설치

```
$ sudo mv sonarqube-5.1 /opt/sonar
```

```
$ wget  
http://repo1.maven.org/maven2/org/codehaus/sonar/runner  
/sonar-runner-dist/2.4/sonar-runner-dist-2.4.zip
```

```
$ unzip sonar-runner-dist-2.4.zip
```

```
sudo mv sonar-runner-2.4 /opt/sonar-runner
```

SonarQube : 설정

```
$ sudo vi /opt/sonar/conf/sonar.properties
```

```
#-----  
# DATABASE  
#  
# IMPORTANT: the embedded H2 database is used by default. It is recommended for tests but not for  
# production use. Supported databases are MySQL, Oracle, PostgreSQL and Microsoft SQLServer.  
  
# User credentials.  
# Permissions to create tables, indices and  
# The schema must be created first.  
sonar.jdbc.username=sonar  
sonar.jdbc.password=sonar  
  
#----- MySQL 5.x  
# Only InnoDB storage engine is supported (not myISAM).  
# Only the bundled driver is supported.  
sonar.jdbc.url=jdbc:mysql://localhost:3306/sonar?useUnicode=true&characterEncoding=utf8&rewriteBatchedStatements=true  
&useConfigs=maxPerformance
```

SonarQube : 설정

```
# Binding IP address. For servers with more than one IP address, this property specifies which  
# address will be used for listening on the specified ports.  
# By default, ports will be used on all IP addresses associated with the server.  
#sonar.web.host=0.0.0.0
```

```
# Binding IP address. For servers with more than one IP address, this property specifies which  
# address will be used for listening on the specified ports.  
# By default, ports will be used on all IP addresses associated with the server.  
#sonar.web.host=0.0.0.0
```

```
# Web context. When set, it must start with forward slash (for example /sonarqube).  
# The default value is root context (empty value).  
sonar.web.context=/sonar
```

```
# TCP port for incoming HTTP connections. Disabled when value is -1.  
sonar.web.port=9000
```

SonarQube : 설정

```
root@ciserver: /opt/sonar#  
[root@ciserver:/opt/sonar# ls  
bin conf COPYING data extensions lib logs temp web  
[root@ciserver:/opt/sonar# cp bin/linux-x86-64/sonar.sh /etc/init.d/sonar  
[root@ciserver:/opt/sonar#
```

```
[root@ciserver:/etc/init.d# ls  
acpid          dbus           killprocs     pppd-dns     resolvconf   skeleton      umountnfs.sh  
apache2        dns-clean     kmod          procs        rsync         sonar         umountroot  
apparmor       friendly-recovery mysql         rc           rsyslog      ssh          unattended-upgrades  
appport        grub-common  networking    rc.local     screen-cleanup sudo         urandom  
atd            halt          noms_nsight   rcS          sendmail     tomcat7      x11-common  
console-setup irqbalance   ondemand     README       sendsigs     udev        xe-linux-distribution  
cron           jenkins      postfix       reboot       single       umountfs  
root@ciserver:/etc/init.d# vi sonar
```

SonarQube : 설정

```
#  
# Copyright (c) 1999, 2006 Tanuki Software Inc.  
#  
# Java Service Wrapper sh script. Suitable for starting and stopping  
# wrapped Java applications on UNIX platforms.  
#  
SONAR_HOME=/opt/sonar  
PLATFORM=linux-x86-64  
_  
  
# Wrapper  
WRAPPER_CMD="${SONAR_HOME}/bin/${PLATFORM}/wrapper"  
WRAPPER_CONF="${SONAR_HOME}/conf/wrapper.conf"  
  
# Priority at which to run the wrapper. See "man nice" for valid priorities.  
# nice is only used if a priority is specified.  
PRIORITY=  
  
# Location of the pid file.  
PIDDIR="/var/run"
```

SonarQube : 설정

```
$ sudo vi /opt/sonar-runner/conf/sonar-runner.properties
```

```
#Configure here general information about the environment, such as SonarQube DB
details for example
#No information about specific project should appear here

#----- Default SonarQube server
sonar.host.url=http://125.209.199.219:9000/sonar
#----- PostgreSQL
#sonar.jdbc.url=jdbc:postgresql://localhost/sonar

#----- MySQL
sonar.jdbc.url=jdbc:mysql://localhost:3306/sonar?useUnicode=true&characterEncoding=utf8

#----- Oracle
#sonar.jdbc.url=jdbc:oracle:thin:@localhost/XE

#----- Microsoft SQLServer
#sonar.jdbc.url=jdbc:jtds:sqlserver://localhost/sonar;SelectMethod=Cursor

#----- Global database settings
sonar.jdbc.username=sonar
sonar.jdbc.password=sonar

#----- Default source code encoding
#sonar.sourceEncoding=UTF-8

#----- Security (when 'sonar.forceAuthentication' is set to 'true')
#sonar.login=admin
#sonar.password=admin
```

SonarQube : 설정

```
[root@ciserver:~# update-rc.d -f sonar remove
  Removing any system startup links for /etc/init.d/sonar ...
[root@ciserver:~# chmod 755 /etc/init.d/sonar
[root@ciserver:~# update-rc.d -f sonar defaults
update-rc.d: warning: /etc/init.d/sonar missing LSB information
update-rc.d: see <http://wiki.debian.org/LSBInitScripts>
Adding system startup for /etc/init.d/sonar ...
/etc/rc0.d/K20sonar -> ../init.d/sonar
/etc/rc1.d/K20sonar -> ../init.d/sonar
/etc/rc6.d/K20sonar -> ../init.d/sonar
/etc/rc2.d/S20sonar -> ../init.d/sonar
/etc/rc3.d/S20sonar -> ../init.d/sonar
/etc/rc4.d/S20sonar -> ../init.d/sonar
/etc/rc5.d/S20sonar -> ../init.d/sonar
...
```

SonarQube : 설정

```
$ sudo sonar start
```

```
[root@ciserver:~# /etc/init.d/sonar start  
Starting SonarQube...  
Started SonarQube.
```

```
$ sudo ufw allow 9000
```

```
[root@ciserver:~# ufw allow 9000/tcp  
Rule added  
Rule added (v6)
```

SonarQube : 실행

The screenshot shows the SonarQube web interface in a browser window. The browser's address bar displays the URL `125.209.199.219:9000/sonar/`. The page title is "Home".

Welcome to SonarQube Dashboard
Since you are able to read this, it means that you have successfully started your SonarQube server. Well done!
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:

- » Do you now want to [run analysis](#) on a project?
- » Maybe start [customizing dashboards](#)?
- » Or simply browse the [complete documentation](#)?
- » If you have a question or an issue, please visit the [Get Support](#) page.

PROJECTS

QG	NAME ▲	VERSION	LOC	TECHNICAL DEBT	LAST ANALYSIS
No data					

PROJECTS

No data					
---------	--	--	--	--	--

SonarQube : 연동

sonar-project.properties

```
sonar.projectKey=ctip_test_project

sonar.projectName=ctip_test_project
sonar.projectVersion=1.0

# Comma-separated paths to directories with sources (required)
sonar.sources=src

# Language
sonar.language=java

sonar.sourceEncoding=UTF-8
```

SonarQube : 연동

build.xml

```
<project basedir="." default="build" name="testant" xmlns:sonar="antlib:org.sonar.ant">
  <property environment="env"/>
  <property name="ECLIPSE_HOME" value="/usr/share/java/" />
  <property name="junit.output.dir" value="junit"/>
  <property name="debuglevel" value="source,lines,vars"/>
  <property name="target" value="1.8"/>
  <property name="source" value="1.8"/>

  <property name="sonar.host.url" value="http://125.209.199.219:9000/sonar"/>
  <!-- Define the SonarQube project properties -->
  <property name="sonar.projectKey" value="ctip_test_project" />
  <property name="sonar.projectName" value="ctip_test_project" />
  <property name="sonar.projectVersion" value="1.0" />
  <property name="sonar.language" value="java" />
  <property name="sonar.sources" value="src" />
  <property name="sonar.binaries" value="bin" />
  <property name="sonar.sourceEncoding" value="UTF-8" />

  <property name="sonar.jdbc.url" value="jdbc:mysql://localhost:3306/sonar?useUnicode=true&characterEncoding=utf8"/>
  <property name="sonar.jdbc.driverClassName" value="com.mysql.jdbc.Driver"/>
  <property name="sonar.jdbc.username" value="sonar"/>
  <property name="sonar.jdbc.password" value="sonar"/>
  <property name="sonar.sourceEncoding" value="UTF-8"/>

  <target name="sonar">
    <taskdef uri="antlib:org.sonar.ant" resource="org/sonar/ant/antlib.xml">
      <!-- Update the following line, or put the "sonarqube-ant-task-*.jar" file in your "$HOME/.ant/lib" folder -->
      <classpath path="/usr/share/ant/lib/sonarqube-ant-task-2.4.jar" />
    </taskdef>

    <sonar:sonar />
    <!-- Execute the SonarQube analysis -->
  </target>
```

SonarQube : 연동

[SonarQube Plugin](#) [2.3](#)
This plugin allows an easy integration of [SonarQube](#), the open source platform for Continuous Inspection of code quality.

SonarQube Runner

SonarQube Runner installations

☰ SonarQube Runner	
Name	<input type="text" value="sonar_runner"/>
SONAR_RUNNER_HOME	<input type="text" value="/opt/sonar-runner"/>
<input type="checkbox"/> Install automatically	

[?](#) [Delete SonarQube Runner](#)

[Add SonarQube Runner](#)

List of SonarQube Runner installations on this system

☰ Invoke Standalone SonarQube Analysis

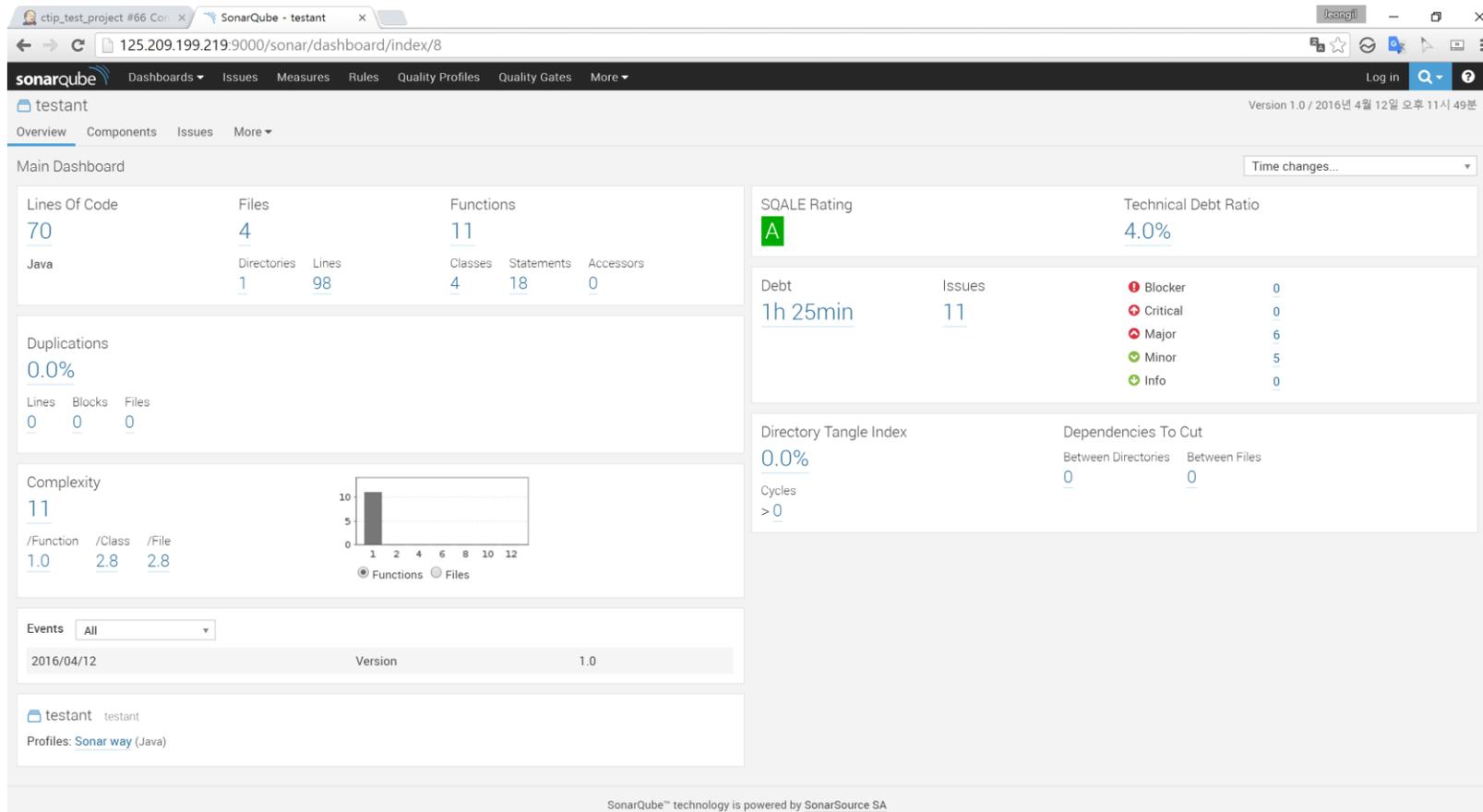
Task to run	<input type="text"/>	?
JDK	<input type="text" value="jdk8"/>	?
JDK to be used for this sonar analysis		
Path to project properties	<input type="text"/>	?
Analysis properties	<input type="text"/>	?
Additional arguments	<input type="text"/>	?
JVM Options	<input type="text"/>	?

[삭제](#)

SonarQube : 연동



SonarQube : 연동 결과



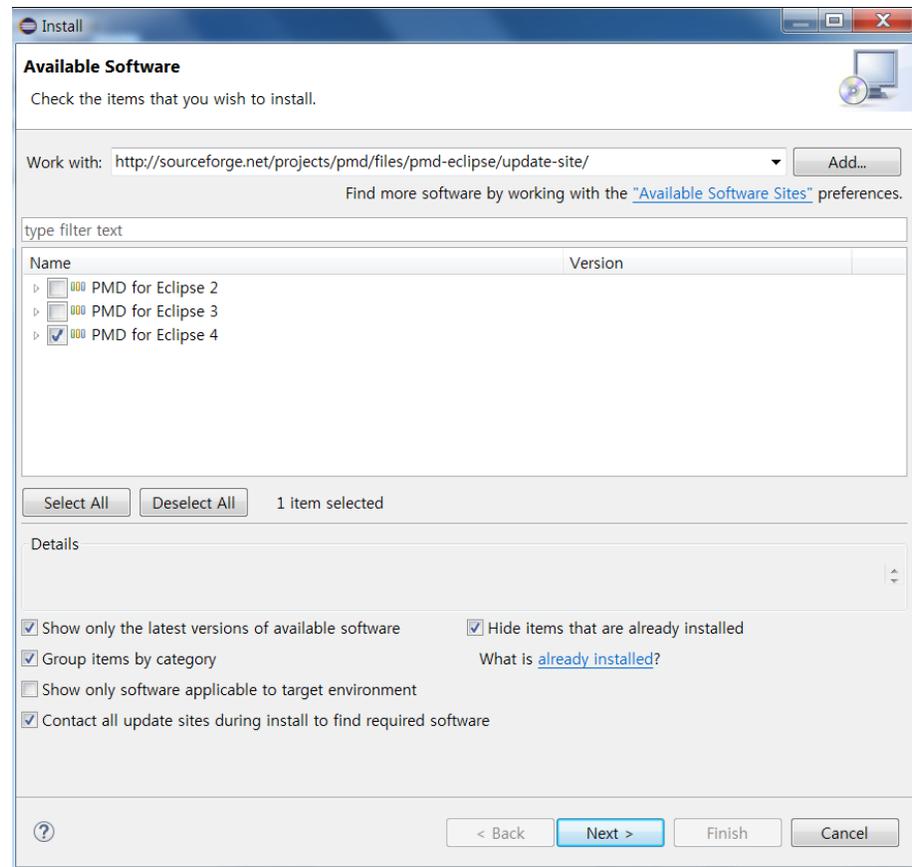


PMD

PMD

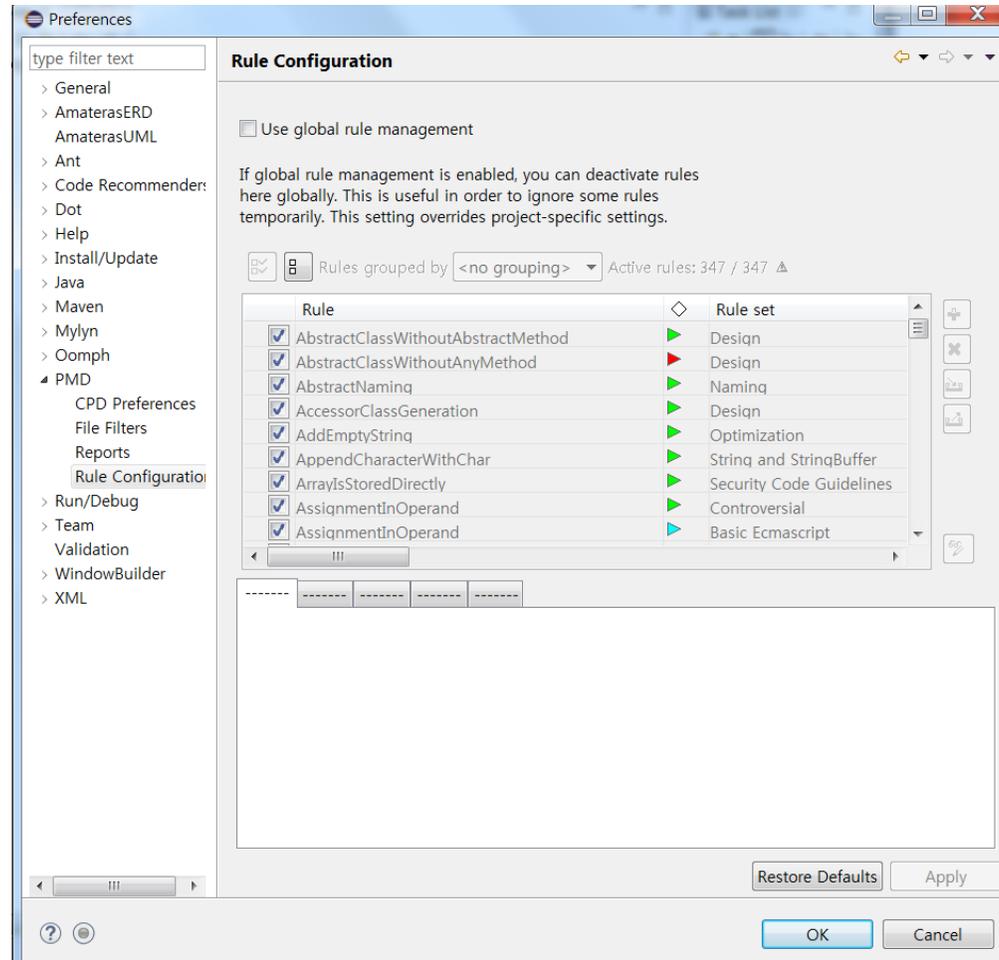
- PMD는 미사용 변수, 비어있는 코드 블록, 불필요한 오브젝트 생성과 같은 Defect을 유발할 수 있는 코드를 검사한다.
- PMD는 주로 Java에서 많이 사용하나, 이외에도 Javascript, PLSQL, Apache Velocity, XML, XSL과 같은 다양한 언어를 지원한다.

PMD : 사용

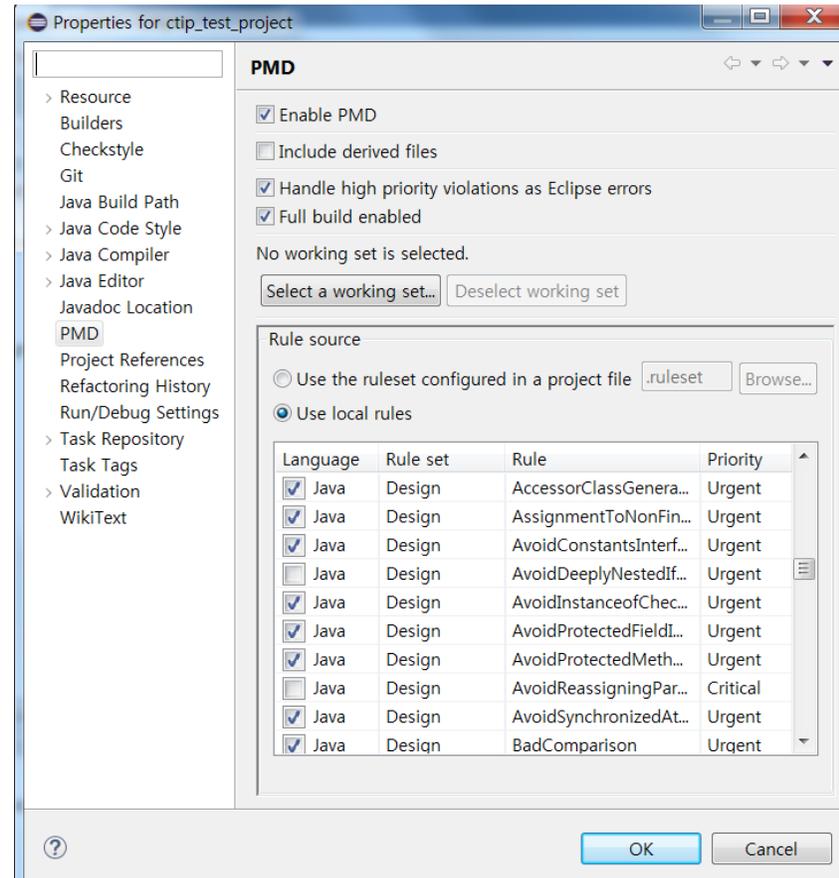


<http://sourceforge.net/projects/pmd/files/pmd-eclipse/update-site/>

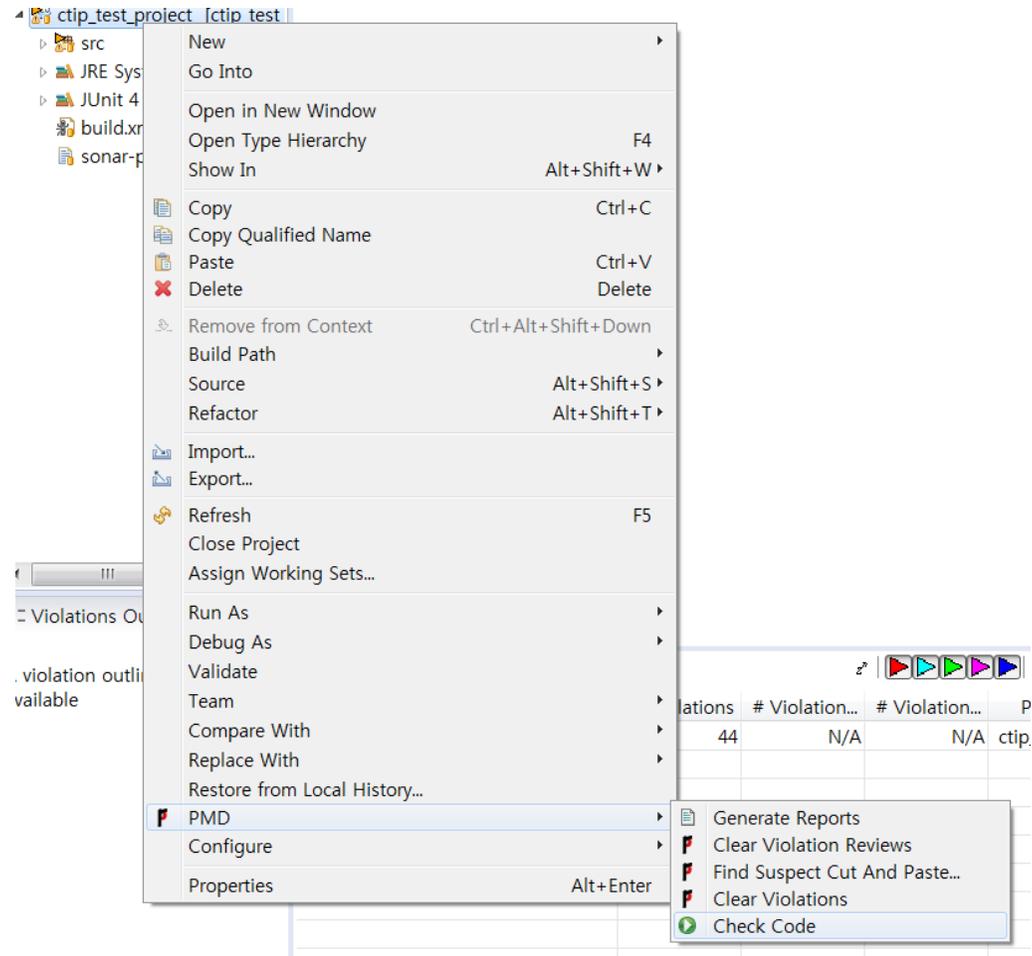
PMD : 사용



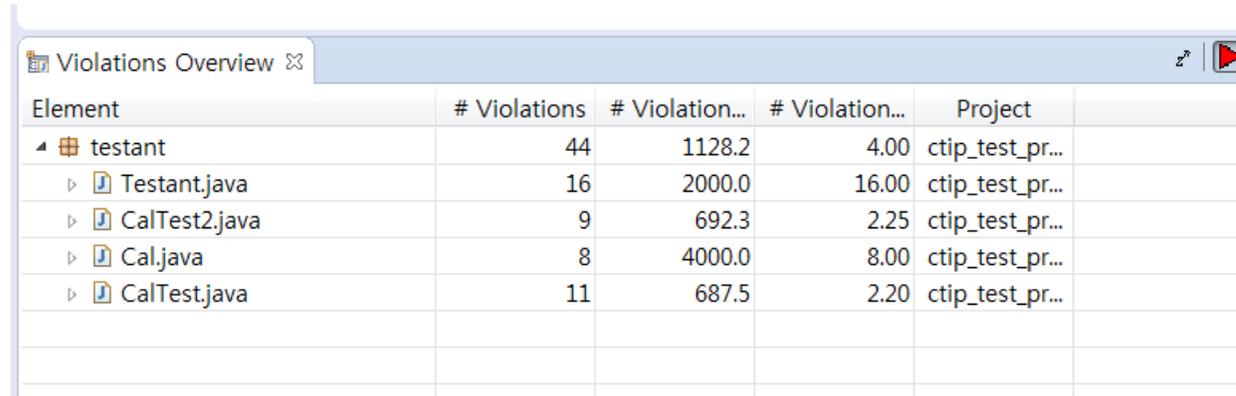
PMD : 사용



PMD : 사용



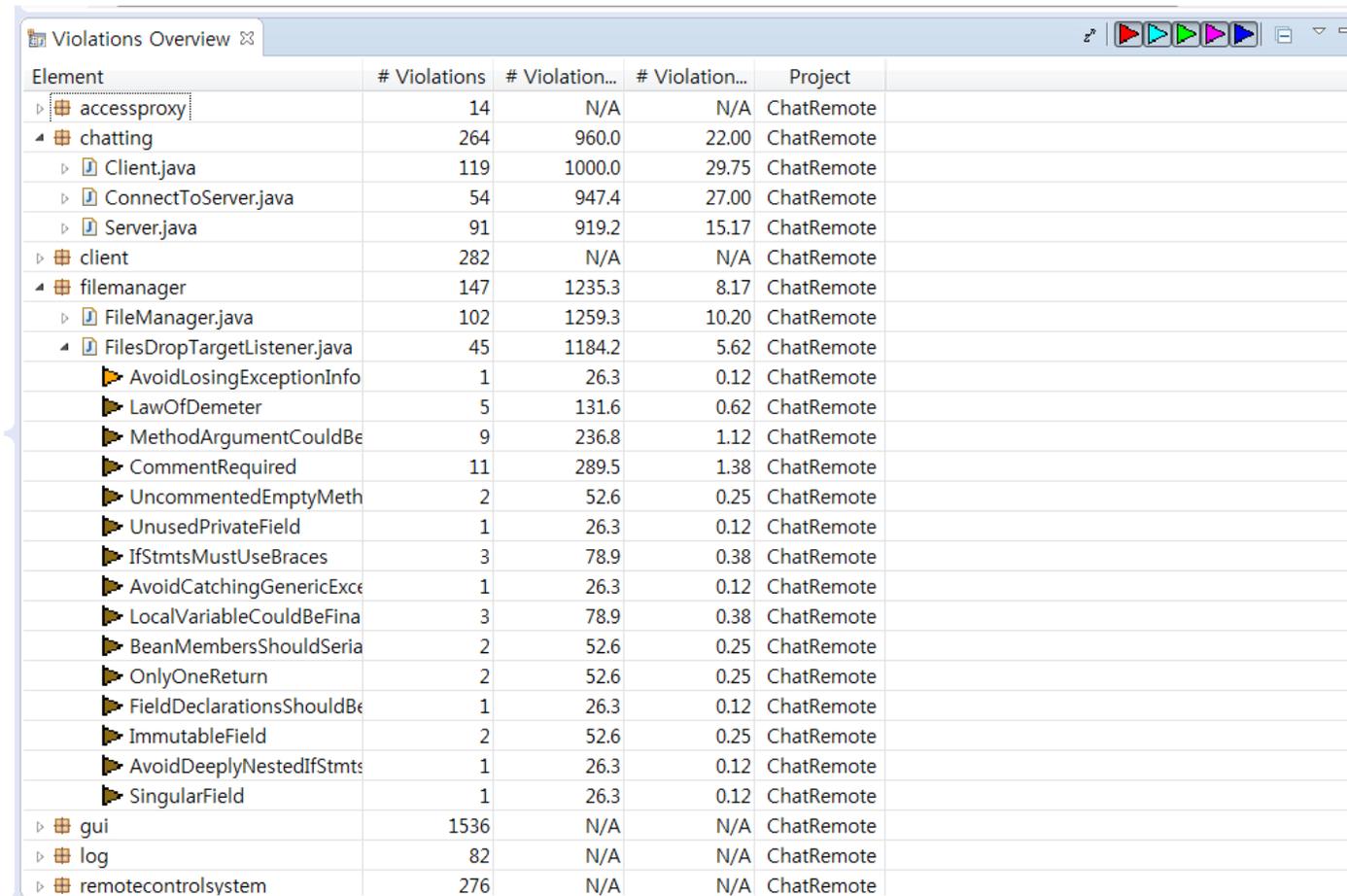
PMD : 사용



The screenshot shows the 'Violations Overview' window in PMD. The window title is 'Violations Overview' with a close button. The table below lists the violations for the project 'testant'.

Element	# Violations	# Violation...	# Violation...	Project
testant	44	1128.2	4.00	ctip_test_pr...
Testant.java	16	2000.0	16.00	ctip_test_pr...
CalTest2.java	9	692.3	2.25	ctip_test_pr...
Cal.java	8	4000.0	8.00	ctip_test_pr...
CalTest.java	11	687.5	2.20	ctip_test_pr...

PMD : 결과



The screenshot shows the 'Violations Overview' window in PMD. The table lists various code elements and their associated violation counts and metrics. The 'Element' column shows a hierarchical structure of folders and files. The '# Violations' column shows the total number of violations for each element. The '# Violation...' columns show additional metrics, likely related to the severity or type of violations. The 'Project' column indicates that all violations are from the 'ChatRemote' project.

Element	# Violations	# Violation...	# Violation...	Project
accessproxy	14	N/A	N/A	ChatRemote
chatting	264	960.0	22.00	ChatRemote
Client.java	119	1000.0	29.75	ChatRemote
ConnectToServer.java	54	947.4	27.00	ChatRemote
Server.java	91	919.2	15.17	ChatRemote
client	282	N/A	N/A	ChatRemote
filemanager	147	1235.3	8.17	ChatRemote
FileManager.java	102	1259.3	10.20	ChatRemote
FilesDropTargetListener.java	45	1184.2	5.62	ChatRemote
AvoidLosingExceptionInfo	1	26.3	0.12	ChatRemote
LawOfDemeter	5	131.6	0.62	ChatRemote
MethodArgumentCouldBe	9	236.8	1.12	ChatRemote
CommentRequired	11	289.5	1.38	ChatRemote
UncommentedEmptyMeth	2	52.6	0.25	ChatRemote
UnusedPrivateField	1	26.3	0.12	ChatRemote
IfStmtsMustUseBraces	3	78.9	0.38	ChatRemote
AvoidCatchingGenericExce	1	26.3	0.12	ChatRemote
LocalVariableCouldBeFina	3	78.9	0.38	ChatRemote
BeanMembersShouldSeria	2	52.6	0.25	ChatRemote
OnlyOneReturn	2	52.6	0.25	ChatRemote
FieldDeclarationsShouldBe	1	26.3	0.12	ChatRemote
ImmutableField	2	52.6	0.25	ChatRemote
AvoidDeeplyNestedIfStmts	1	26.3	0.12	ChatRemote
SingularField	1	26.3	0.12	ChatRemote
gui	1536	N/A	N/A	ChatRemote
log	82	N/A	N/A	ChatRemote
remotecontrolsystem	276	N/A	N/A	ChatRemote

PMD : 결과

Package Explorer

- ChatRemote (19)
 - src (19)
 - JRE System Library [JavaSE-1.8]
 - reports
 - pmd-report.txt
 - server.log
 - viewer.log
- ctip_test_project [ctip_test_project master]

build.xml pmd-report.txt FilesDropTargetListener.java pmd-report.txt

```
1 src/accessproxy/AccessProxy.java:6: Each class should declare at least one constructor
2 src/accessproxy/AccessProxy.java:6: headerCommentRequirement Required
3 src/accessproxy/AccessProxy.java:9: Parameter 'password' is not assigned and could be declared final
4 src/accessproxy/AccessProxy.java:9: Parameter 'username' is not assigned and could be declared final
5 src/accessproxy/AccessProxy.java:9: publicMethodCommentRequirement Required
6 src/accessproxy/AccessProxy.java:11: Found 'DD'-anomaly for variable 'flag' (lines '11'-'14').
7 src/accessproxy/AccessProxy.java:13: Avoid using if statements without curly braces
8 src/accessproxy/AccessProxy.java:13: Potential violation of Law of Demeter (static property access)
9 src/accessproxy/AccessProxy.java:13: Potential violation of Law of Demeter (static property access)
10 src/accessproxy/AccessProxy.java:18: Avoid variables with short names like au
11 src/accessproxy/AccessProxy.java:18: Local variable 'au' could be declared final
12 src/accessproxy/Authenticator.java:6: Each class should declare at least one constructor
13 src/accessproxy/Authenticator.java:6: headerCommentRequirement Required
14 src/accessproxy/Authenticator.java:8: publicMethodCommentRequirement Required
15 src/chatting/Client.java:13: headerCommentRequirement Required
16 src/chatting/Client.java:15: Found non-transient, non-static member. Please mark as transient or provide accessors.
17 src/chatting/Client.java:15: Private field 'messagefield' could be made final; it is only initialized in the declaration or cons
18 src/chatting/Client.java:15: fieldCommentRequirement Required
19 src/chatting/Client.java:16: Found non-transient, non-static member. Please mark as transient or provide accessors.
20 src/chatting/Client.java:16: Private field 'chatArea' could be made final; it is only initialized in the declaration or cons
21 src/chatting/Client.java:16: fieldCommentRequirement Required
22 src/chatting/Client.java:17: Found non-transient, non-static member. Please mark as transient or provide accessors.
23 src/chatting/Client.java:17: Private field 'userList' could be made final; it is only initialized in the declaration or cons
24 src/chatting/Client.java:17: fieldCommentRequirement Required
25 src/chatting/Client.java:18: Found non-transient, non-static member. Please mark as transient or provide accessors.
26 src/chatting/Client.java:18: Private field 'scrollPane' could be made final; it is only initialized in the declaration or col
27 src/chatting/Client.java:18: fieldCommentRequirement Required
28 src/chatting/Client.java:19: Found non-transient, non-static member. Please mark as transient or provide accessors.
29 src/chatting/Client.java:19: Perhaps 'socket' could be replaced by a local variable.
30 src/chatting/Client.java:19: fieldCommentRequirement Required
31 src/chatting/Client.java:20: Avoid variables with short names like br
32 src/chatting/Client.java:20: Found non-transient, non-static member. Please mark as transient or provide accessors.
33 src/chatting/Client.java:20: Perhaps 'br' could be replaced by a local variable.
34 src/chatting/Client.java:20: fieldCommentRequirement Required
35 src/chatting/Client.java:21: Avoid variables with short names like bw
36 src/chatting/Client.java:21: Found non-transient, non-static member. Please mark as transient or provide accessors.
```

Violations Outline

A violation outline is not available

PMD : Jenkins 통합

```
<taskdef name="pmd" classname="net.sourceforge.pmd.ant.PMDTask" classpathref="pmd.classpath"/>
<target name="pmd">

<!-- <pmd rulesetfiles="${pmd.home}/rulesets.xml" > -->
    <!-- <auxClasspath path="${basedir}/lib/Regex.jar" /> -->
    <!-- <sourcePath path="${basedir}/src/" /> -->
    <pmd rulesetfiles="java-imports">
        <formatter type="xml" toFile="${basedir}/pmd-result.xml"></formatter>
        <fileset dir="src" includes="**/*.java"></fileset>
    </pmd>
</target>
```

PMD : Jenkins 통합

The screenshot displays the Jenkins web interface for a project named 'ctip_test_project'. The main content area is divided into several sections:

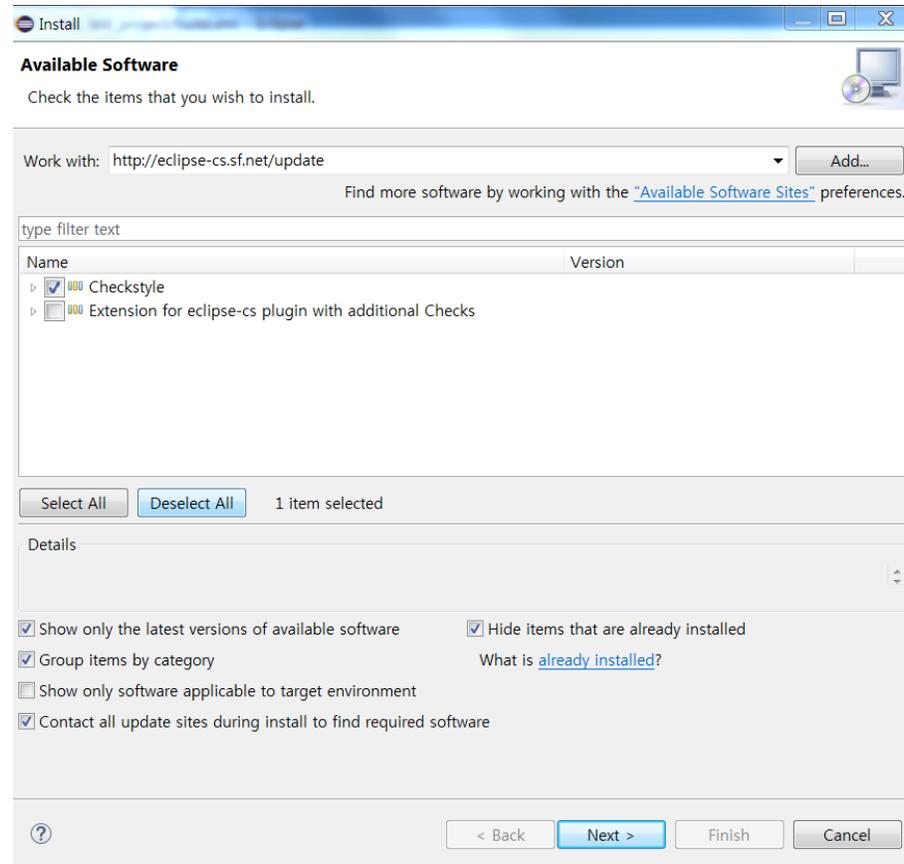
- Build History:** A table listing recent builds with columns for build number, time, and status. The most recent build is #248, which is successful and completed at 2016. 4. 15 오전 5:28.
- 고정링크 (Fixed Links):** A section providing quick access to various build-related links, such as 'Last build', 'Last stable build', 'Last successful build', 'Last failed build', 'Last unstable build', 'Last unsuccessful build', and 'Last completed build'.
- Trend Charts:** Three charts showing the count of issues over time:
 - checkstyle-trend:** Shows a sharp increase in the count of Checkstyle warnings starting around build #220, reaching a count of approximately 70 by build #241.
 - FindBugs Trend:** Shows a sharp increase in the count of FindBugs warnings starting around build #240, reaching a count of 2 by build #248.
 - PMD Trend:** Shows a sharp increase in the count of PMD warnings starting around build #240, reaching a count of 1 by build #248.
- 테스트 결과 현황 (Test Results Status):** A partially visible bar chart at the bottom showing the status of test results, with a count of 10 for the most recent build.

Checkstyle

Checkstyle

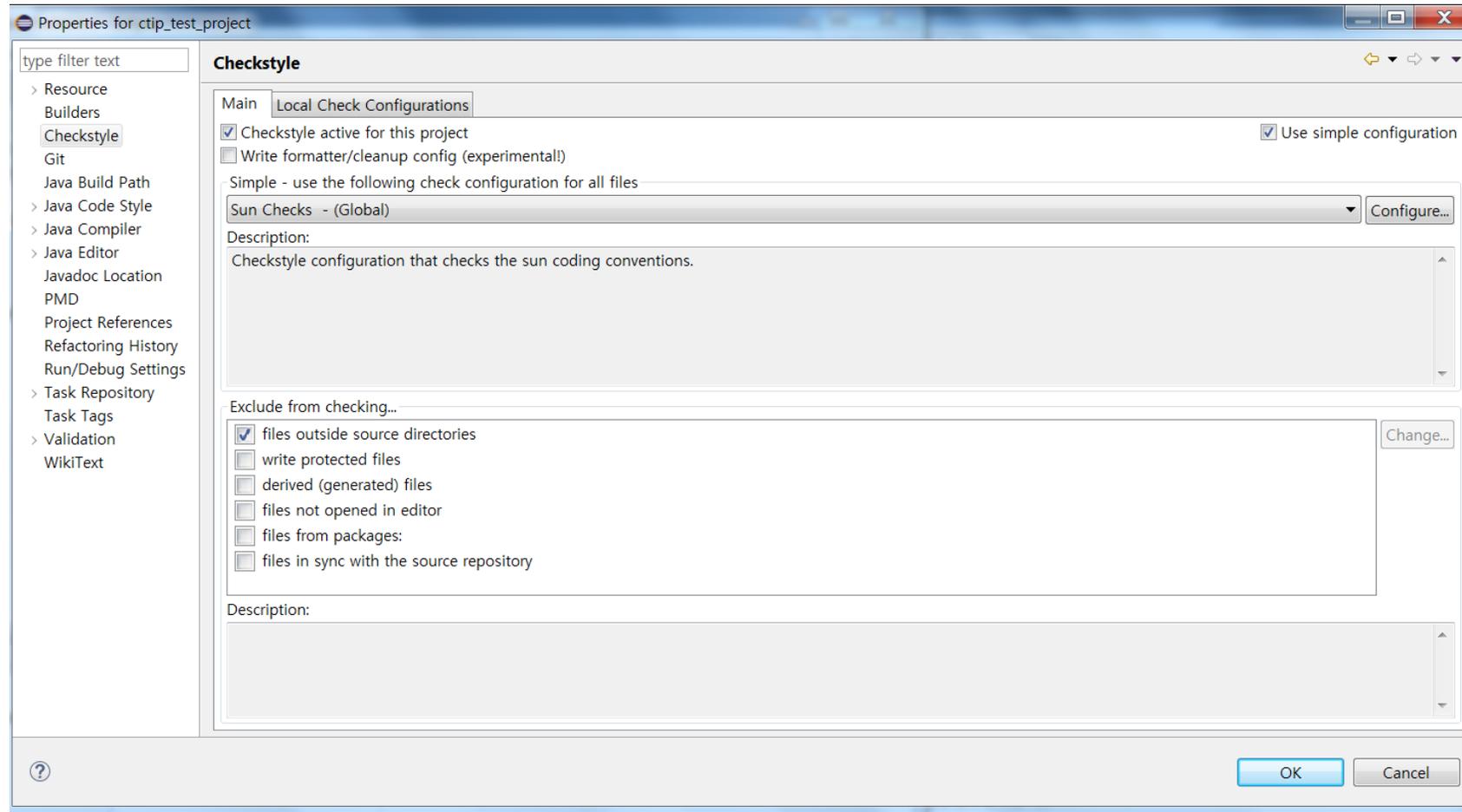
- CheckStyle은 개발된 코드가 얼마나 코딩 룰을 잘 따르고 있는지 분석해주는 정적 분석 도구이다.
- 기본적으로 내장된 코딩 룰은 Google's Style과 Unix Style이다.
- 추가적으로, 조직만의 코딩 룰을 정의하고 작성된 코드들이 이를 잘 따르고 있는지 점검할 수 있다.

Checkstyle : 사용



<http://eclipse-cs.sf.net/update>

Checkstyle : 사용



Checkstyle : 사용

The screenshot shows an IDE context menu with the 'Checkstyle' option selected. The menu items include: New, Go Into, Open in New Window, Open Type Hierarchy (F4), Show In (Alt+Shift+W), Copy (Ctrl+C), Copy Qualified Name, Paste (Ctrl+V), Delete, Remove from Context (Ctrl+Alt+Shift+Down), Build Path, Source (Alt+Shift+S), Refactor (Alt+Shift+T), Import..., Export..., Refresh (F5), Close Project, Assign Working Sets..., Run As, Debug As, Validate, Team, Compare With, Replace With, Restore from Local History..., Checkstyle (selected), PMD, Configure, and Properties (Alt+Enter). The 'Checkstyle' submenu is open, showing: Configure project(s) from blueprint..., Activate Checkstyle, Deactivate Checkstyle, Check Code with Checkstyle (selected), and Clear Checkstyle violations.

```
name="sonar.host.url" value="http://125.20
the SonarQube project properties -->
name="sonar.projectKey" value="ctip_test_p
name="sonar.projectName" value="ctip_test_
name="sonar.projectVersion" value="1.0" />
name="sonar.language" value="java" />
name="sonar.sources" value="src" />
name="sonar.binaries" value="bin" />
name="sonar.sourceEncoding" value="UTF-8"

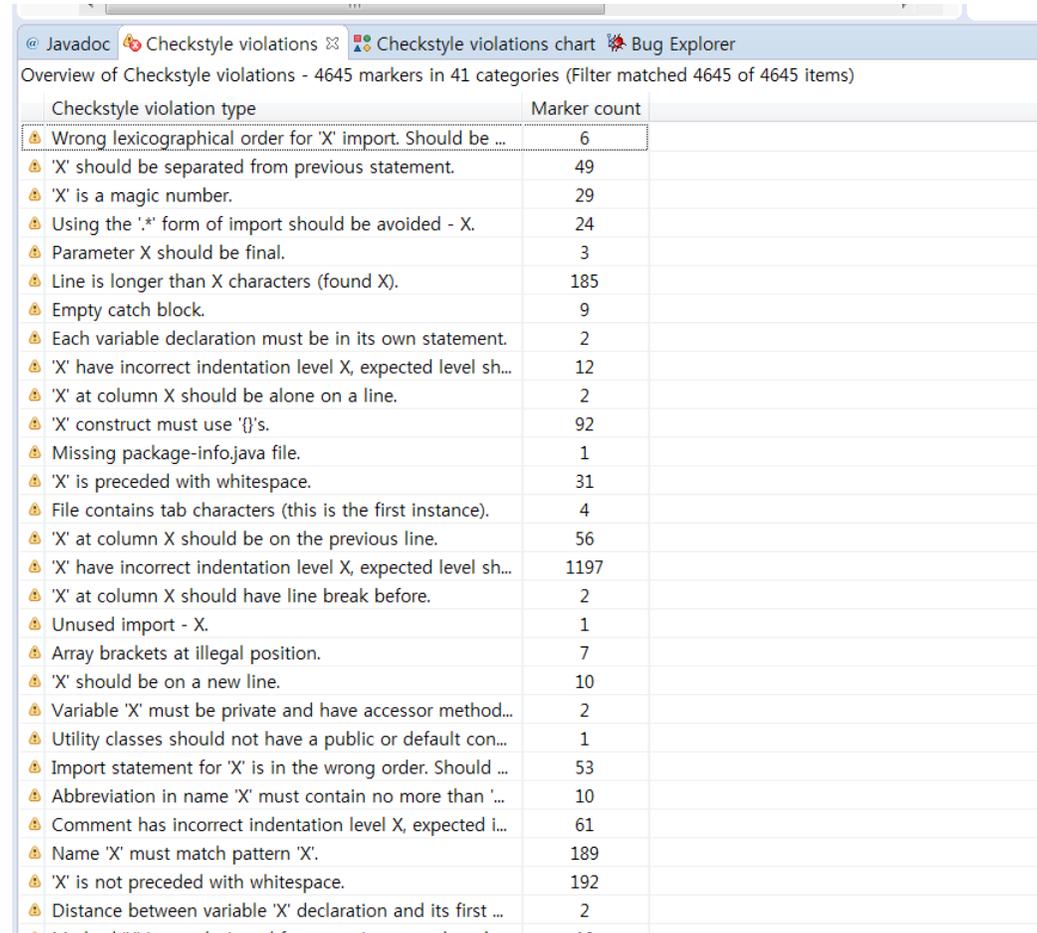
name="sonar.jdbc.url" value="jdbc:mysql://
name="sonar.jdbc.driverClassName" value="c
name="sonar.jdbc.username" value="sonar"/>
name="sonar.jdbc.password" value="sonar"/>
name="sonar.sourceEncoding" value="UTF-8"/

Unit 4.libraryclasspath">
element location="${ECLIPSE_HOME}junit4-4.1
element location="${ECLIPSE_HOME}hamcrest-c

stant.classpath">
element location="bin"/>
```

	# Violations	# Violation...	# Violation...
	60	N/A	N/A

Checkstyle : 결과



Overview of Checkstyle violations - 4645 markers in 41 categories (Filter matched 4645 of 4645 items)

Checkstyle violation type	Marker count
Wrong lexicographical order for 'X' import. Should be ...	6
'X' should be separated from previous statement.	49
'X' is a magic number.	29
Using the '*' form of import should be avoided - X.	24
Parameter X should be final.	3
Line is longer than X characters (found X).	185
Empty catch block.	9
Each variable declaration must be in its own statement.	2
'X' have incorrect indentation level X, expected level sh...	12
'X' at column X should be alone on a line.	2
'X' construct must use '{}'.s.	92
Missing package-info.java file.	1
'X' is preceded with whitespace.	31
File contains tab characters (this is the first instance).	4
'X' at column X should be on the previous line.	56
'X' have incorrect indentation level X, expected level sh...	1197
'X' at column X should have line break before.	2
Unused import - X.	1
Array brackets at illegal position.	7
'X' should be on a new line.	10
Variable 'X' must be private and have accessor method...	2
Utility classes should not have a public or default con...	1
Import statement for 'X' is in the wrong order. Should ...	53
Abbreviation in name 'X' must contain no more than '...	10
Comment has incorrect indentation level X, expected i...	61
Name 'X' must match pattern 'X'.	189
'X' is not preceded with whitespace.	192
Distance between variable 'X' declaration and its first ...	2

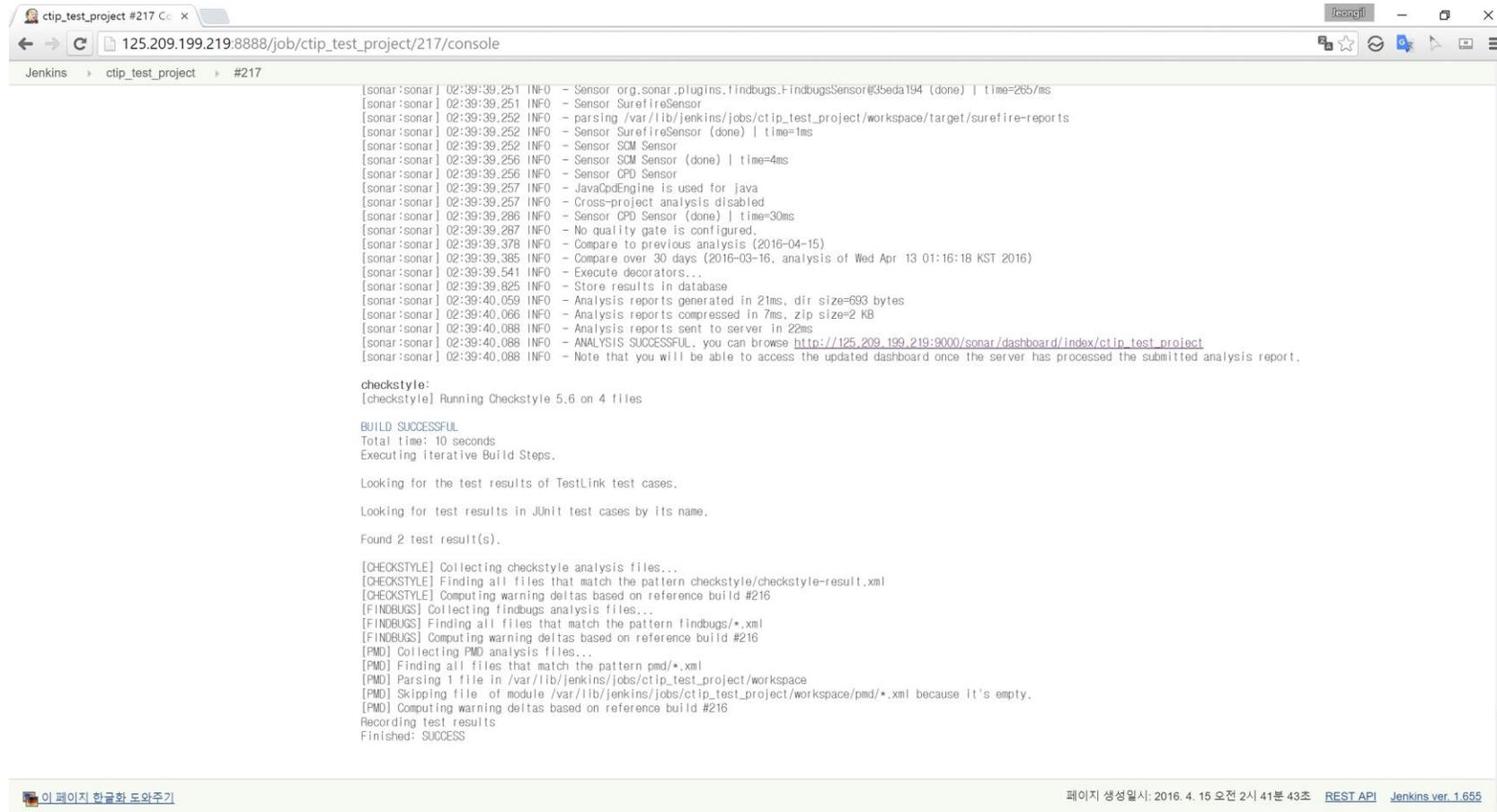
Checkstyle : Jenkins 통합

```
<property name="checkstyle.home" value="/usr/share/java"/>
<property name="findbugs.home" value="/usr/share/findbugs-3.0.1"/>
```

```
<target name="checkstyle">
  <taskdef resource="checkstyletask.properties" classpath="/usr/share/java/checkstyle-5.6.jar" />

  <!-- <available file = "${checkstyle.home}/checkstyle-5.6.jar" property="checkstyle.available" /> -->
  <!-- <fail unless="checkstyle.available" message="Error: CHECKSTYLE_HOME not set or checkstyle-5.6.jar not found." /> -->
  <checkstyle config="/usr/share/checkstyle/sun_checks.xml" failureProperty="checkstyle.failure" failOnViolation = "false">
    <!-- <formatter type="xml" tofile="${report.checkstyle.dor}/checkstyle_report.xml" /> -->
    <formatter type="xml" tofile="${basedir}/checkstyle-result.xml"></formatter>
    <fileset dir="src" includes="**/*.java"></fileset>
  </checkstyle>
</target>
```

Checkstyle : Jenkins 통합



```
ctip_test_project #217 Console
125.209.199.219:8888/job/ctip_test_project/217/console
Jenkins > ctip_test_project > #217

[sonar:sonar] 02:39:39.251 INFO - Sensor org.sonar.plugins.findbugs.FindbugsSensor@25eda194 (done) | time=265ms
[sonar:sonar] 02:39:39.251 INFO - Sensor SurefireSensor
[sonar:sonar] 02:39:39.252 INFO - parsing /var/lib/jenkins/jobs/ctip_test_project/workspace/target/surefire-reports
[sonar:sonar] 02:39:39.252 INFO - Sensor SurefireSensor (done) | time=1ms
[sonar:sonar] 02:39:39.252 INFO - Sensor SCM Sensor
[sonar:sonar] 02:39:39.256 INFO - Sensor SCM Sensor (done) | time=4ms
[sonar:sonar] 02:39:39.256 INFO - Sensor CPD Sensor
[sonar:sonar] 02:39:39.257 INFO - JavaCpdEngine is used for java
[sonar:sonar] 02:39:39.257 INFO - Cross-project analysis disabled
[sonar:sonar] 02:39:39.286 INFO - Sensor CPD Sensor (done) | time=30ms
[sonar:sonar] 02:39:39.287 INFO - No quality gate is configured.
[sonar:sonar] 02:39:39.378 INFO - Compare to previous analysis (2016-04-15)
[sonar:sonar] 02:39:39.385 INFO - Compare over 30 days (2016-03-16, analysis of Wed Apr 13 01:16:18 KST 2016)
[sonar:sonar] 02:39:39.541 INFO - Execute decorators...
[sonar:sonar] 02:39:39.825 INFO - Store results in database
[sonar:sonar] 02:39:40.059 INFO - Analysis reports generated in 21ms, dir size=693 bytes
[sonar:sonar] 02:39:40.066 INFO - Analysis reports compressed in 7ms, zip size=2 KB
[sonar:sonar] 02:39:40.088 INFO - Analysis reports sent to server in 22ms
[sonar:sonar] 02:39:40.088 INFO - ANALYSIS SUCCESSFUL, you can browse http://125.209.199.219:9000/sonar/dashboard/index/ctip_test_project
[sonar:sonar] 02:39:40.088 INFO - Note that you will be able to access the updated dashboard once the server has processed the submitted analysis report.

checkstyle:
[checkstyle] Running Checkstyle 5.6 on 4 files

BUILD SUCCESSFUL
Total time: 10 seconds
Executing iterative Build Steps.

Looking for the test results of TestLink test cases.

Looking for test results in JUnit test cases by its name.

Found 2 test result(s).

[CHECKSTYLE] Collecting checkstyle analysis files...
[CHECKSTYLE] Finding all files that match the pattern checkstyle/checkstyle-result.xml
[CHECKSTYLE] Computing warning deltas based on reference build #216
[FINDBUGS] Collecting findbugs analysis files...
[FINDBUGS] Finding all files that match the pattern findbugs/*.xml
[FINDBUGS] Computing warning deltas based on reference build #216
[PMDD] Collecting PMDD analysis files...
[PMDD] Finding all files that match the pattern pmd/*.xml
[PMDD] Parsing 1 file in /var/lib/jenkins/jobs/ctip_test_project/workspace
[PMDD] Skipping file of module /var/lib/jenkins/jobs/ctip_test_project/workspace/pmd/*.xml because it's empty.
[PMDD] Computing warning deltas based on reference build #216
Recording test results
Finished: SUCCESS

이 페이지 한글화 도와주기
페이지 생성일시: 2016. 4. 15 오전 2시 41분 43초 REST API Jenkins ver. 1.655
```

Checkstyle : Jenkins 통합

The screenshot shows the Jenkins web interface for a workspace named 'Workspace of ctip_test_project on master'. The main content area displays a file tree of build artifacts. A red box highlights three files: 'build.xml' (4.88 KB), 'checkstyle-result.xml' (13.36 KB), and 'sonar-project.properties' (239 B). The 'Build History' sidebar on the left shows a list of recent builds, with build #215 being the most recent and failed.

File Name	Size
build.xml	4.88 KB
checkstyle-result.xml	13.36 KB
sonar-project.properties	239 B

Checkstyle : Jenkins 통합

The screenshot shows the Jenkins web interface for the project 'ctip_test_project'. The main content area is divided into several sections:

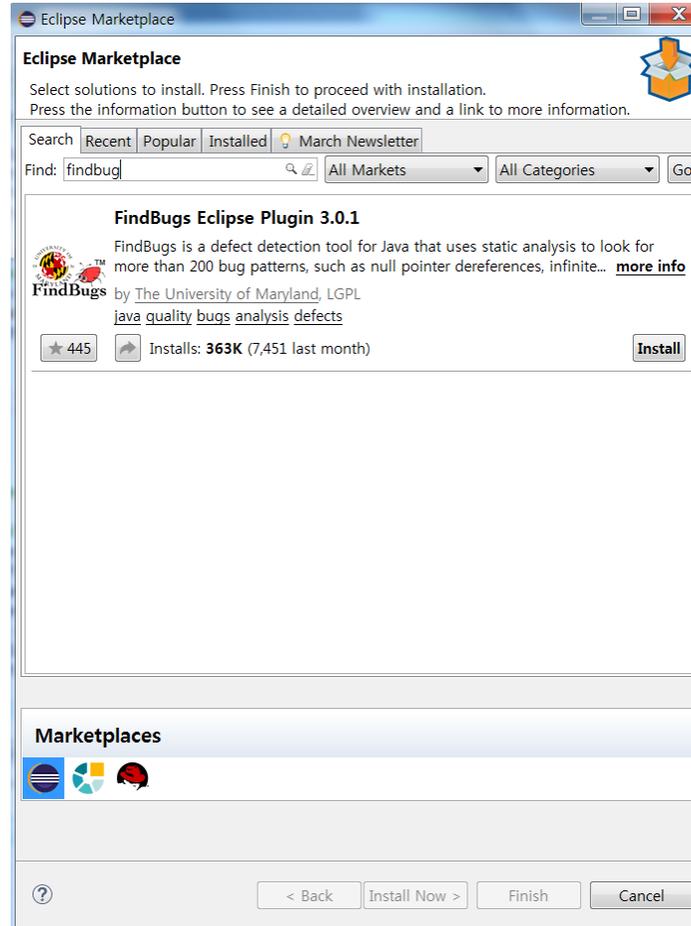
- Project Overview:** Displays 'Project ctip_test_project' with various utility icons like '대시보드로 돌아가기', '상태', '변경사항', '작업공간', 'Build Now', 'Project 삭제', '구성', 'Redmine - ctip_test_project', 'SonarQube', 'TestLink results', and 'Checkstyle Warnings'.
- Build History:** A table listing recent builds with columns for build number, date, and time. The most recent build is #221, which is successful.
- Project Actions:** Includes 'SonarQube', '작업공간', '최근 변경사항', and '가장 최근 테스트 결과 (실패가 없습니다)'. There is also a '고정링크' (Fixed Link) section with a list of build links.
- Checkstyle Trend:** A bar chart showing the 'TestLink Tests Count' for builds #148 to #221. The count is 0 for builds #148-#168, 1 for #169-#184, 2 for #185-#221. The legend indicates: Blocked (yellow), Failed (red), Not Run (grey), Passed (blue).
- FindBugs Trend:** A bar chart showing the 'count' of FindBugs for builds #205 to #221. The count is 0 for builds #205-#219, and 70 for build #220.

FindBugs

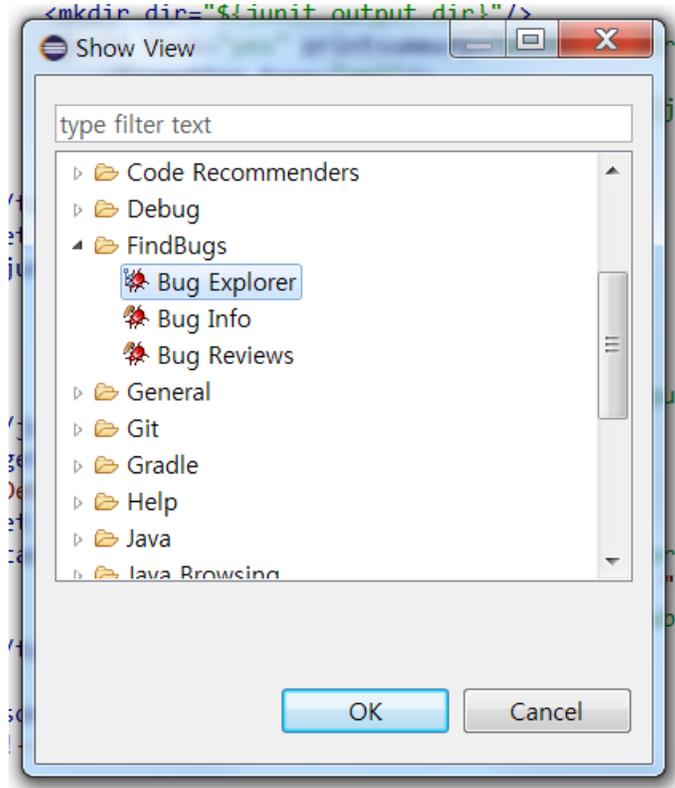
FindBugs

- FindBugs 또한 대표적인 Java의 정적 분석 도구이다.
- GNU 라이선스로 미국의 Maryland 대학에서 개발하였다.
- FindBugs는 Java 프로그램에서 100여 개의 잠재적인 에러 타입을 찾아주며, 이 잠재적인 에러는 scariest, scary, troubling, concern으로 구분하여 점수(rank)가 배정된다.

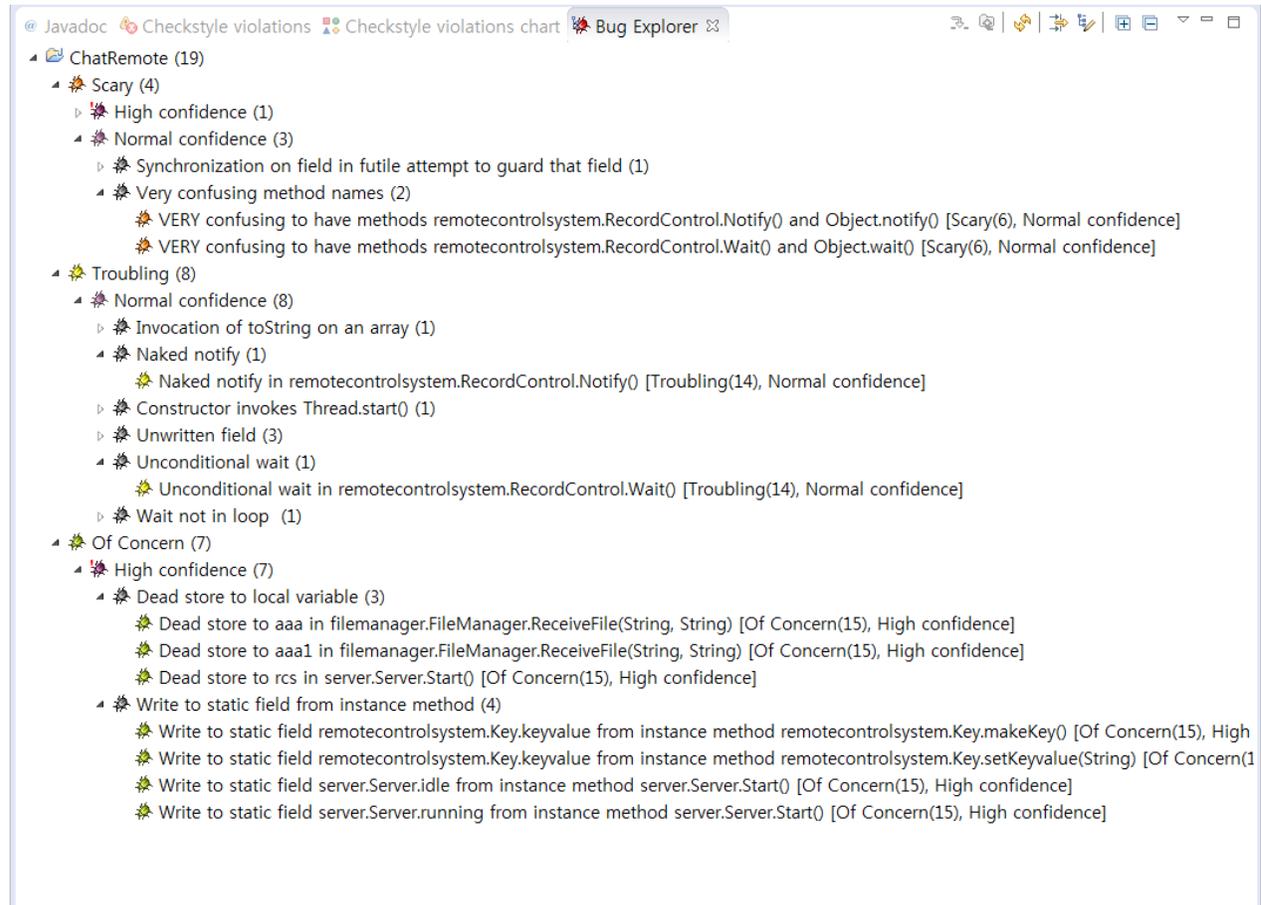
FindBugs : 사용



FindBugs : 사용



FindBugs : 결과



FindBugs : Jenkins 통합

```
<property name="checkstyle.home" value="/usr/share/java"/>
<property name="findbugs.home" value="/usr/share/findbugs-3.0.1"/>

<!-- findbugs -->
<path id="findbugs.classpath">
  <pathelement location="${build}"/>
  <fileset dir="${findbugs.home}/lib/">
    <include name="*.jar"/>
  </fileset>
</path>

<taskdef name="findbugs" classname="edu.umd.cs.findbugs.anttask.FindBugsTask" classpathref="findbugs.classpath"/>
<target name="findbugs" description="Run code analysis over code to check for problems.">

  <findbugs home="${findbugs.home}" output="xml" outputFile="${basedir}/findbugs-result.xml" >
    <!-- <auxClasspath path="${basedir}/lib/Regex.jar" /> -->
    <!-- <sourcePath path="${basedir}/src/" /> -->
    <sourcePath path="src" />
    <class location="bin" />
  </findbugs>
</target>
```

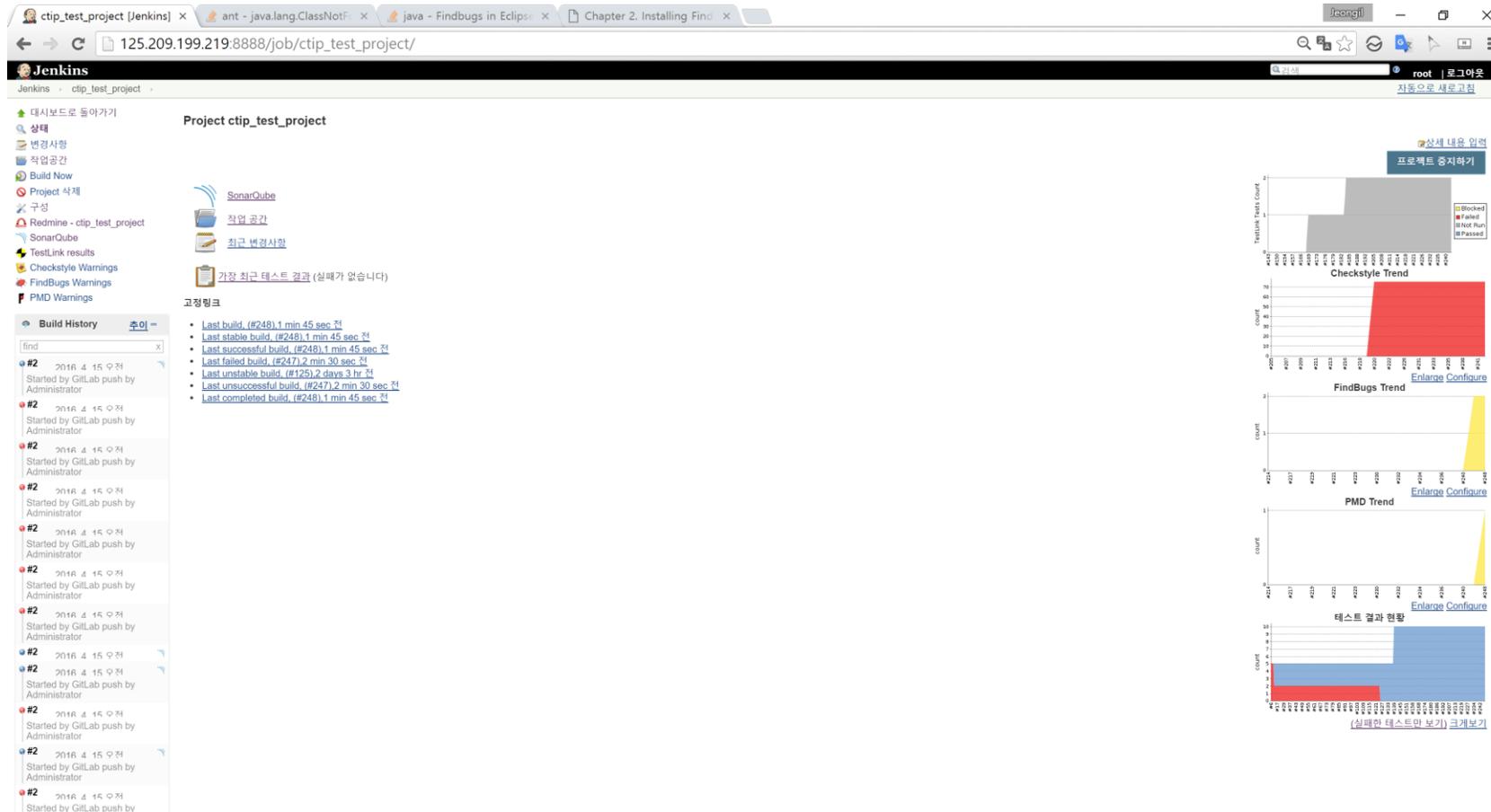
FindBugs : Jenkins 통합

The screenshot shows the Jenkins web interface for the project 'ctip_test_project'. The page includes a navigation sidebar on the left with options like '대시보드로 돌아가기', '상태', '변경사항', '작업공간', 'Build Now', 'Project 삭제', '구성', 'Redmine - ctip_test_project', 'SonarQube', 'TestLink results', 'Checkstyle Warnings', and 'FindBugs Warnings'. The main content area is titled 'Project ctip_test_project' and features several sections:

- SonarQube**: A link to the SonarQube analysis tool.
- 작업 공간**: A link to the workspace.
- 최근 변경사항**: A link to recent changes.
- 가장 최근 테스트 결과 (실패가 없습니다)**: A link to the latest test results, indicating no failures.
- 고정링크**: A section with links to various build types:
 - Last build, (#241), 49 sec 전
 - Last stable build, (#241), 49 sec 전
 - Last successful build, (#241), 49 sec 전
 - Last failed build, (#239), 3 min 30 sec 전
 - Last unstable build, (#125), 2 days 2 hr 전
 - Last unsuccessful build, (#239), 3 min 30 sec 전
 - Last completed build, (#241), 49 sec 전
- Build History**: A table listing recent builds with columns for build number, date, and time.

Build Number	Date	Time
#241	2016. 4. 15	오전 4:35
#240	2016. 4. 15	오전 4:33
#239	2016. 4. 15	오전 4:32
#238	2016. 4. 15	오전 4:29
#237	2016. 4. 15	오전 4:28
#236	2016. 4. 15	오전 4:22
#235	2016. 4. 15	오전 4:20
- TestLink Tests Count**: A bar chart showing the count of tests across various build numbers. The y-axis is 'TestLink Tests Count' (0 to 2). The x-axis shows build numbers from #148 to #240. The chart shows a step-like increase in test counts.
- Checkstyle Trend**: A bar chart showing the count of Checkstyle warnings. The y-axis is 'count' (0 to 70). The x-axis shows build numbers from #205 to #241. The chart shows a sharp increase in warnings starting around build #220.
- FindBugs Trend**: A bar chart showing the count of FindBugs warnings. The y-axis is 'count' (0 to 2). The x-axis shows build numbers from #214 to #241. The chart shows a single spike in warnings at build #241.

Jenkins 통합 화면

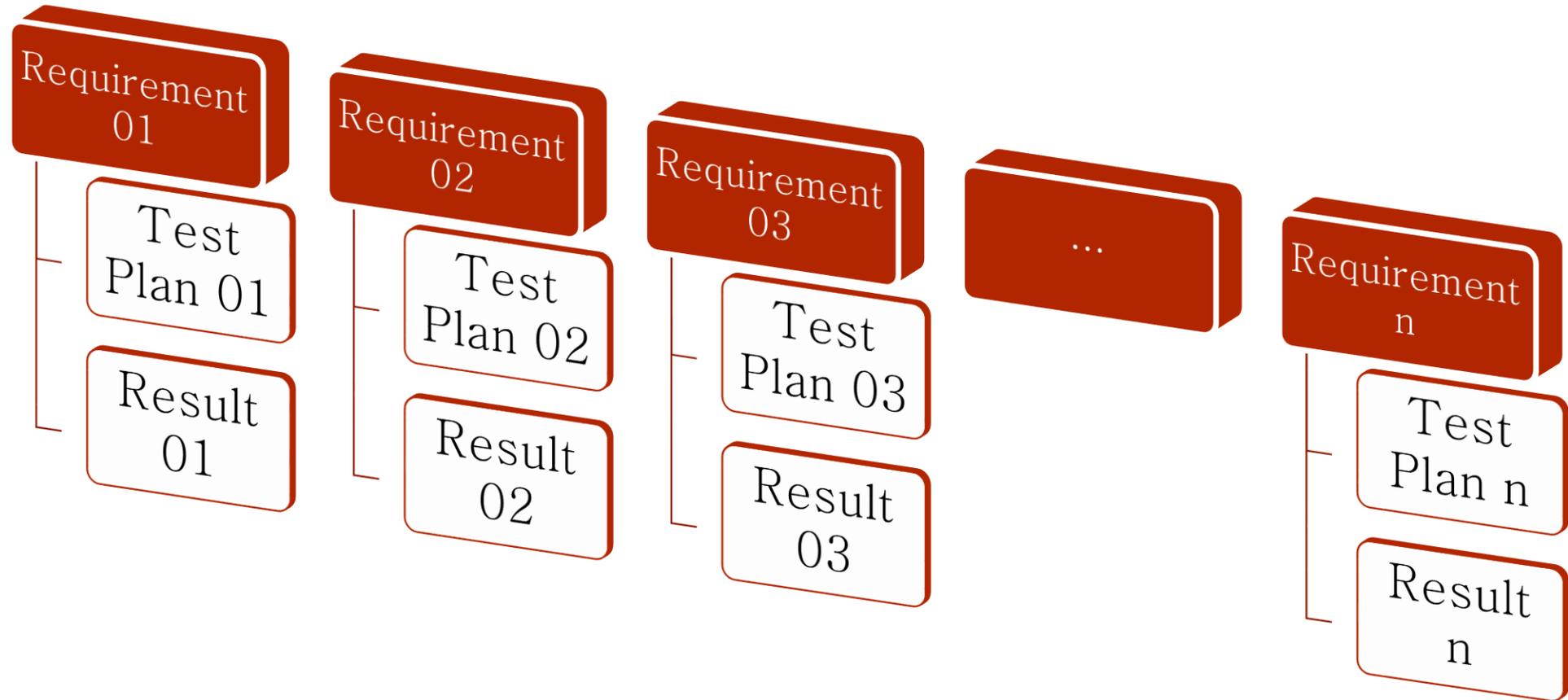




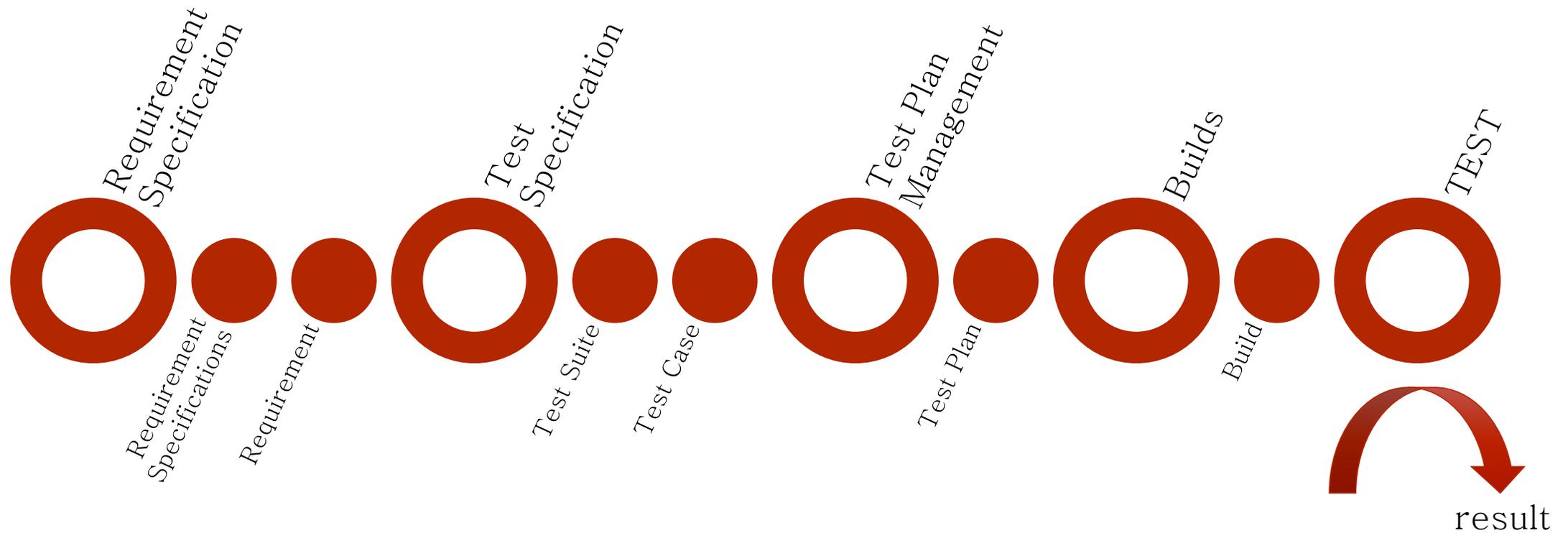
TestLink

System test

TestLink



TestLink : Process



TestLink : 설치

```
[root@ciserver:~# apt-get install libapache2-mod-auth-mysql
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  libapache2-mod-auth-mysql
0 upgraded, 1 newly installed, 0 to remove and 4 not upgraded.
Need to get 20.9 kB of archives.
After this operation, 104 kB of additional disk space will be used.
Get:1 http://kr.archive.ubuntu.com/ubuntu/trusty/main libapache2-mod-auth-mysql
amd64 4.3.9-13.1ubuntu3 [20.9 kB]
Fetched 20.9 kB in 0s (322 kB/s)
Selecting previously unselected package libapache2-mod-auth-mysql.
(Reading database ... 166776 files and directories currently installed.)
Preparing to unpack .../libapache2-mod-auth-mysql_4.3.9-13.1ubuntu3_amd64.deb ..
.
Unpacking libapache2-mod-auth-mysql (4.3.9-13.1ubuntu3) ...
Setting up libapache2-mod-auth-mysql (4.3.9-13.1ubuntu3) ...
```

TestLink : 설치

```
[root@ciserver:~# apt-get install php5-common php5 libapache2-mod-php5
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following extra packages will be installed:
  php5-cli php5-json php5-readline
Suggested packages:
  php-pear php5-user-cache
The following NEW packages will be installed:
  libapache2-mod-php5 php5 php5-cli php5-common php5-json php5-readline
0 upgraded, 6 newly installed, 0 to remove and 4 not upgraded.
Need to get 4,866 kB of archives.
```

```
[root@ciserver:~# apt-get install php5-mysql
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  php5-mysql
0 upgraded, 1 newly installed, 0 to remove and 4 not upgraded.
Need to get 62.9 kB of archives.
After this operation, 297 kB of additional disk space will be used.
Get:1 http://security.ubuntu.com/ubuntu/trusty-security/main php5-mysql amd64 5.9+dfsg-1ubuntu4.14 [62.9 kB]
```

TestLink : 설정

```
[root@ciserver:~# /etc/init.d/mysql restart
* Stopping MySQL database server mysqld           [ OK ]
* Starting MySQL database server mysqld           [ OK ]
* Checking for tables which need an upgrade, are corrupt or were
not closed cleanly.
[root@ciserver:~#
[root@ciserver:~#
[root@ciserver:~#
[root@ciserver:~# /etc/init.d/apache2 restart
* Restarting web server apache2
AH00558: apache2: Could not reliably determine the server's fully qualified domain
name, using 127.0.0.1. Set the 'ServerName' directive globally to suppress this message
[ OK ]
```

TestLink : 설정

```
[root@ciserver:~# wget http://iweb.dl.sourceforge.net/project/testlink/TestLink%201.9/TestLink%201.9.14/testlink-1.9.14.tar.gz
--2016-04-11 23:56:57-- http://iweb.dl.sourceforge.net/project/testlink/TestLink%201.9/TestLink%201.9.14/testlink-1.9.14.tar.gz
Resolving iweb.dl.sourceforge.net (iweb.dl.sourceforge.net)... 70.38.0.134, 2607:f748:10:12::5f:2
Connecting to iweb.dl.sourceforge.net (iweb.dl.sourceforge.net)|70.38.0.134|:80.
```

```
[root@ciserver:~# tar xvfz testlink-1.9.14.tar.gz
./testlink-1.9.14/BUYING_SUPPORT.TXT
./testlink-1.9.14/CHANGELOG
./testlink-1.9.14/CODE_REUSE
./testlink-1.9.14/LICENSE
./testlink-1.9.14/README
./testlink-1.9.14/cfg/
./testlink-1.9.14/cfg/.htaccess
./testlink-1.9.14/cfg/const.inc.php
```

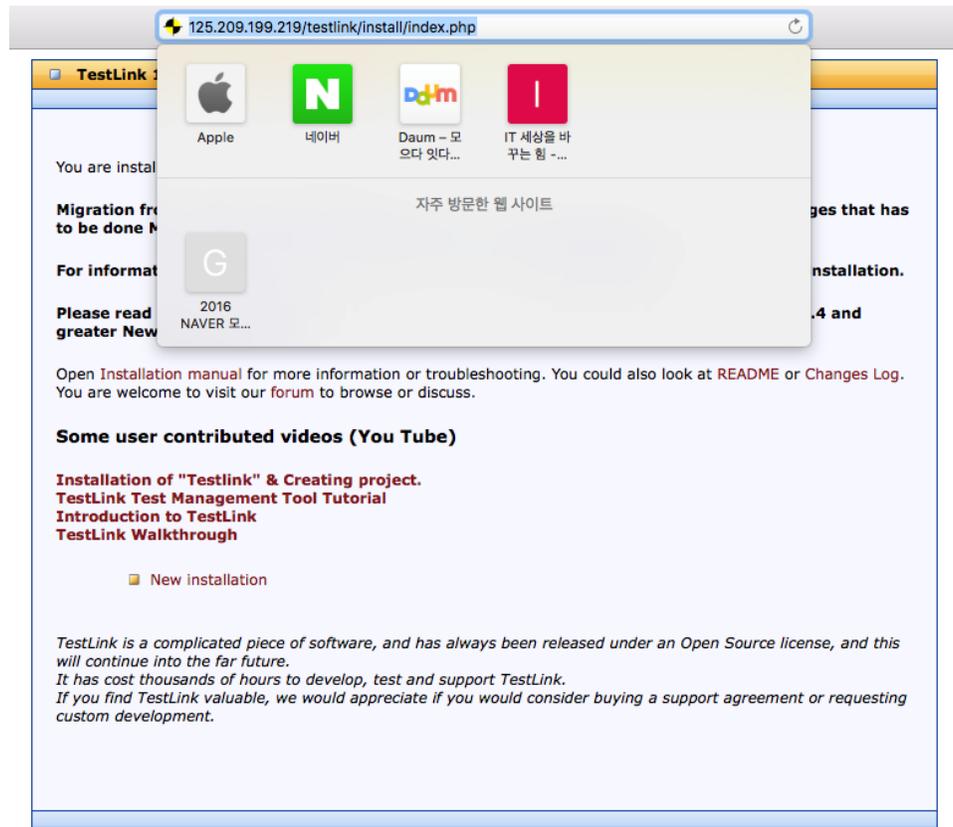
TestLink : 설정

```
[root@ciserver:~# cp -a testlink-1.9.14 /var/www/html/testlink
[root@ciserver:~# cd /var/www/html/testlink/
[root@ciserver:/var/www/html/testlink# chmod 777 -R
chmod: missing operand after '777'
Try 'chmod --help' for more information.
[root@ciserver:/var/www/html/testlink# chmod 777 . -R
[root@ciserver:/var/www/html/testlink# ls
BUYING_SUPPORT.TXT      locale          LICENSE         lostPassword.php
C12                     error.php      linkto.php     ltx.php
CHANGELOG               firstlogin.php lnln.php       README
CODE_REUSE              install        locale         third_party
config.inc.php          index.php     login.php      upload_area
custom                  install
custom_config.inc.php.example lib            logs
root@ciserver:/var/www/html/testlink#
```

TestLink : 설정

```
❯  
❯ # mkdir /var/testlink/  
❯ # mkdir /var/testlink/logs  
❯ # chmod 777 /var/testlink/logs  
❯ # mkdir /var/testlink/upload_area/  
❯ # chmod 777 /var/testlink/upload_area/  
❯ #
```

TestLink : 초기 SQL 설정



TestLink : 초기 SQL 설정

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

Continue

Database Configuration

Define your database to store TestLink data:

Database Type

MySQL (5.0.3 and later)

Database host

localhost

*Note: In the case that you DB connection doesn't use **STANDARD PORT** for , you need to add **:port_number**, at the end Database host parameter. Example: you use MySQL running on port 6606, on server matrix then Database host will be matrix:6606*

Enter the name of the TestLink database . The installer will attempt to create it if not exists.

Database name

testlink

*Disallowed characters in Database Name:
The database name can contains any character that is allowed in a directory name, except '/', '\', or '.'*

TestLink : 초기 SQL 설정

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.

TestLink : 초기 SQL 설정

```
TestLink 1.9.14 (Padawan) TestLink 1.9.14 (Padawan) - New installation

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 `testlink` :OK! ( ok - new user)
Processing:sql/mysql/testlink_create_tables.sql
OK!
Writing configuration file:OK!

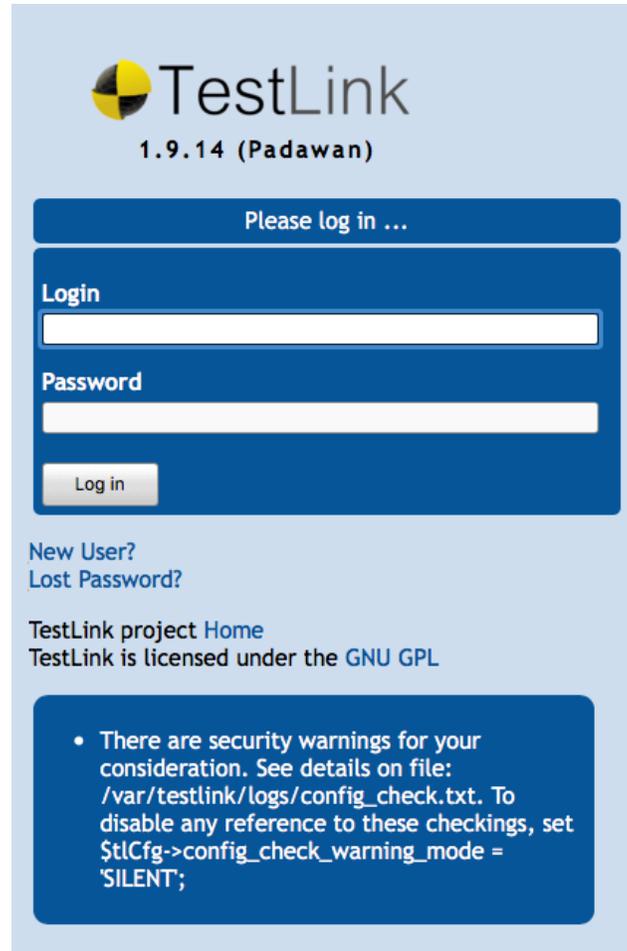
YOUR ATTENTION PLEASE:
To have a fully functional installation You need to configure mail server settings, following this steps



- copy from config.inc.php, [SMTP] Section into custom_config.inc.php.
- complete correct data regarding email addresses and mail server.

Installation was successful!
You can now log in to Testlink (using login name:admin / password:admin - Please Click Me!).
```

TestLink : 실행



 TestLink
1.9.14 (Padawan)

Please log in ...

Login

Password

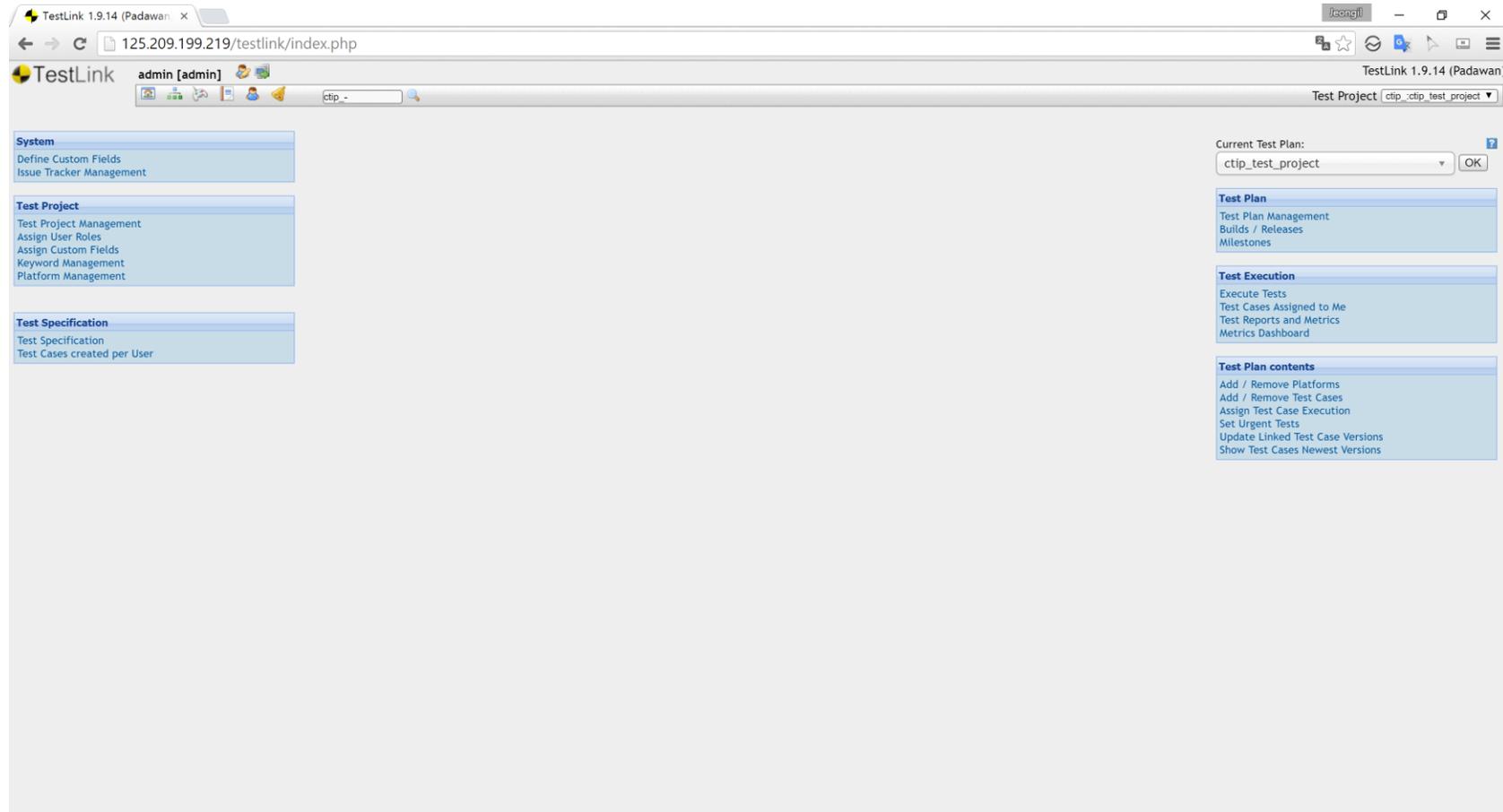
Log in

[New User?](#)
[Lost Password?](#)

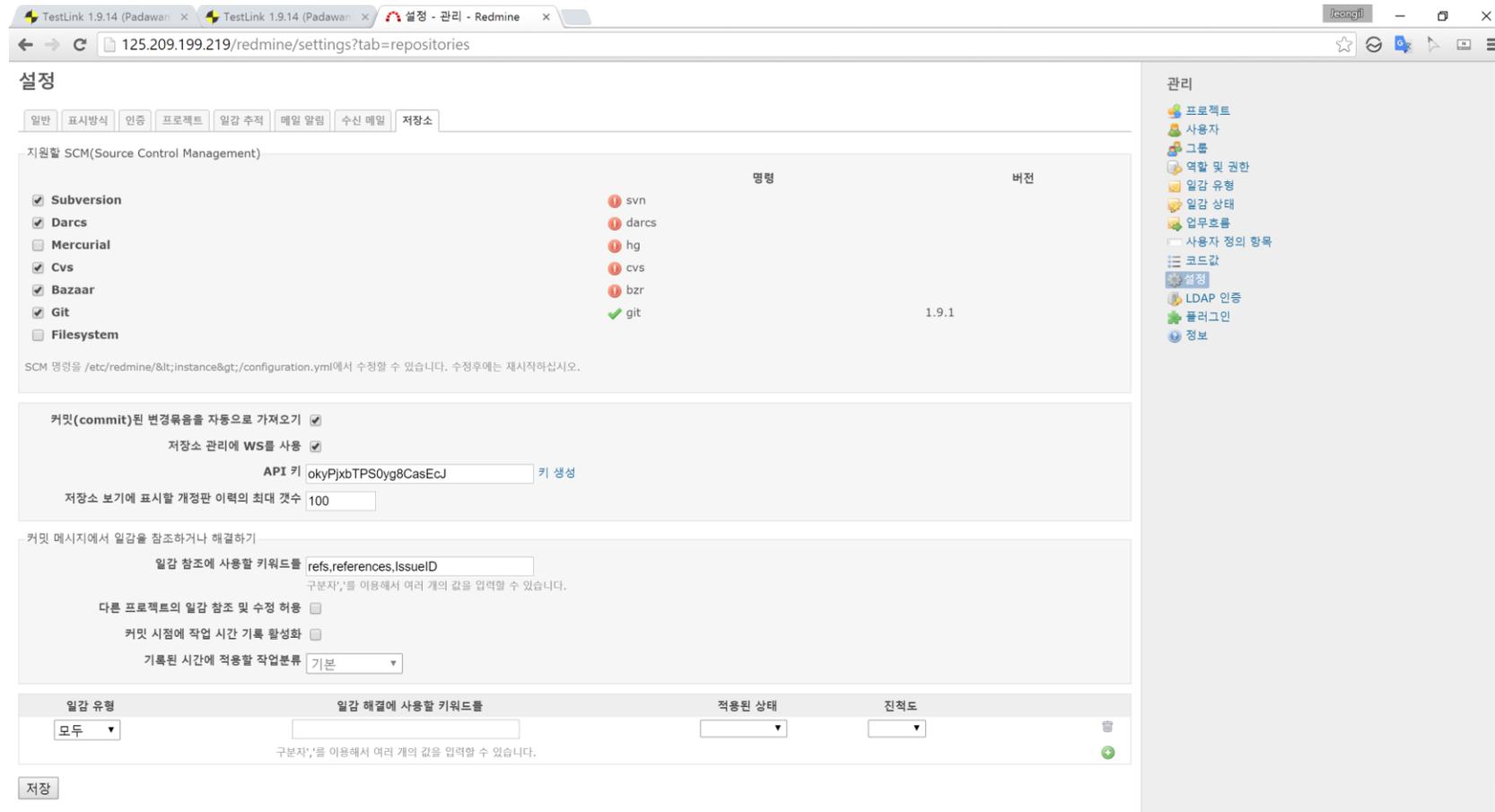
[TestLink project Home](#)
TestLink is licensed under the [GNU GPL](#)

- There are security warnings for your consideration. See details on file: `/var/testlink/logs/config_check.txt`. To disable any reference to these checkings, set `$tlCfg->config_check_warning_mode = 'SILENT';`

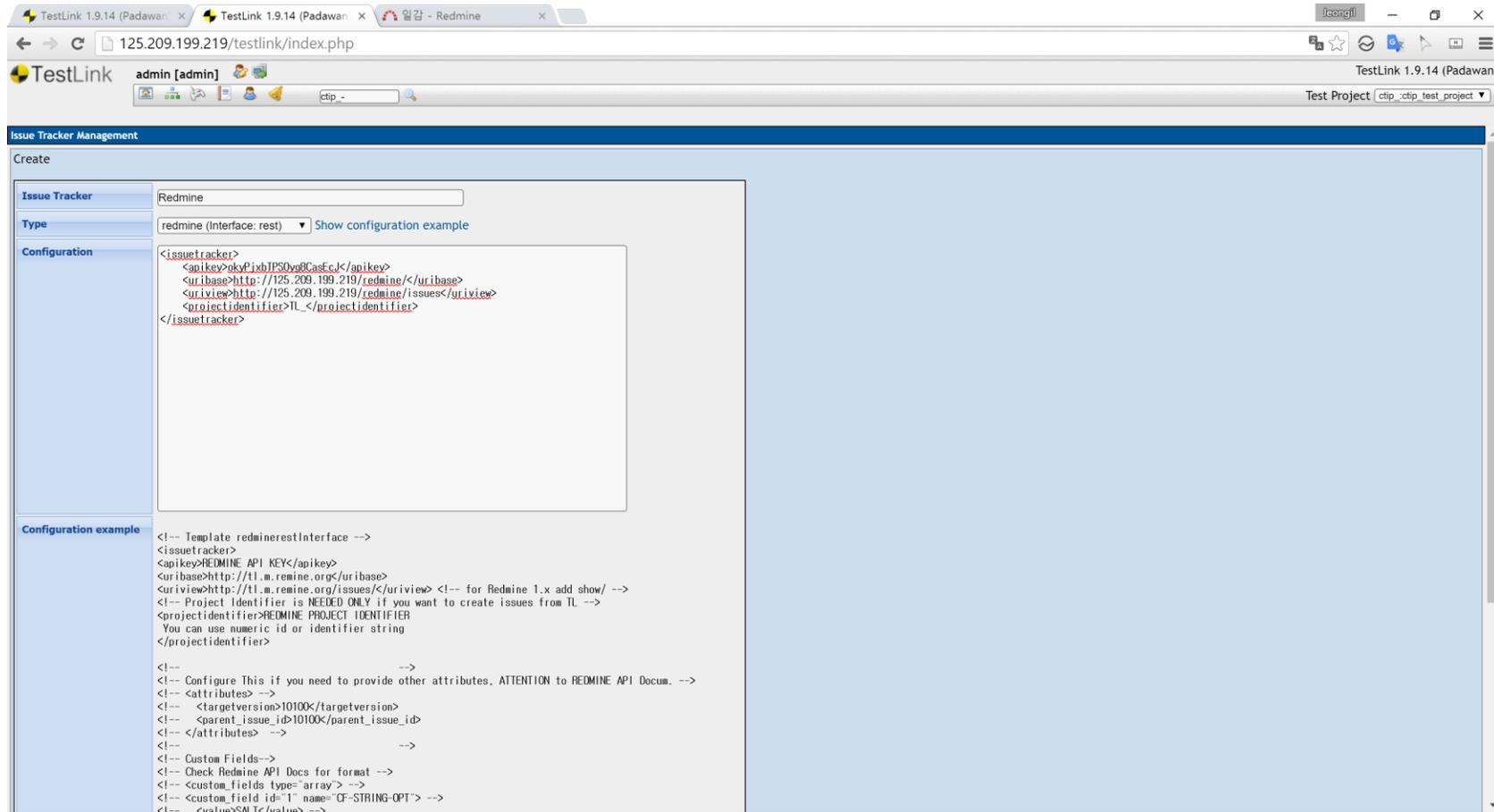
TestLink : 실행



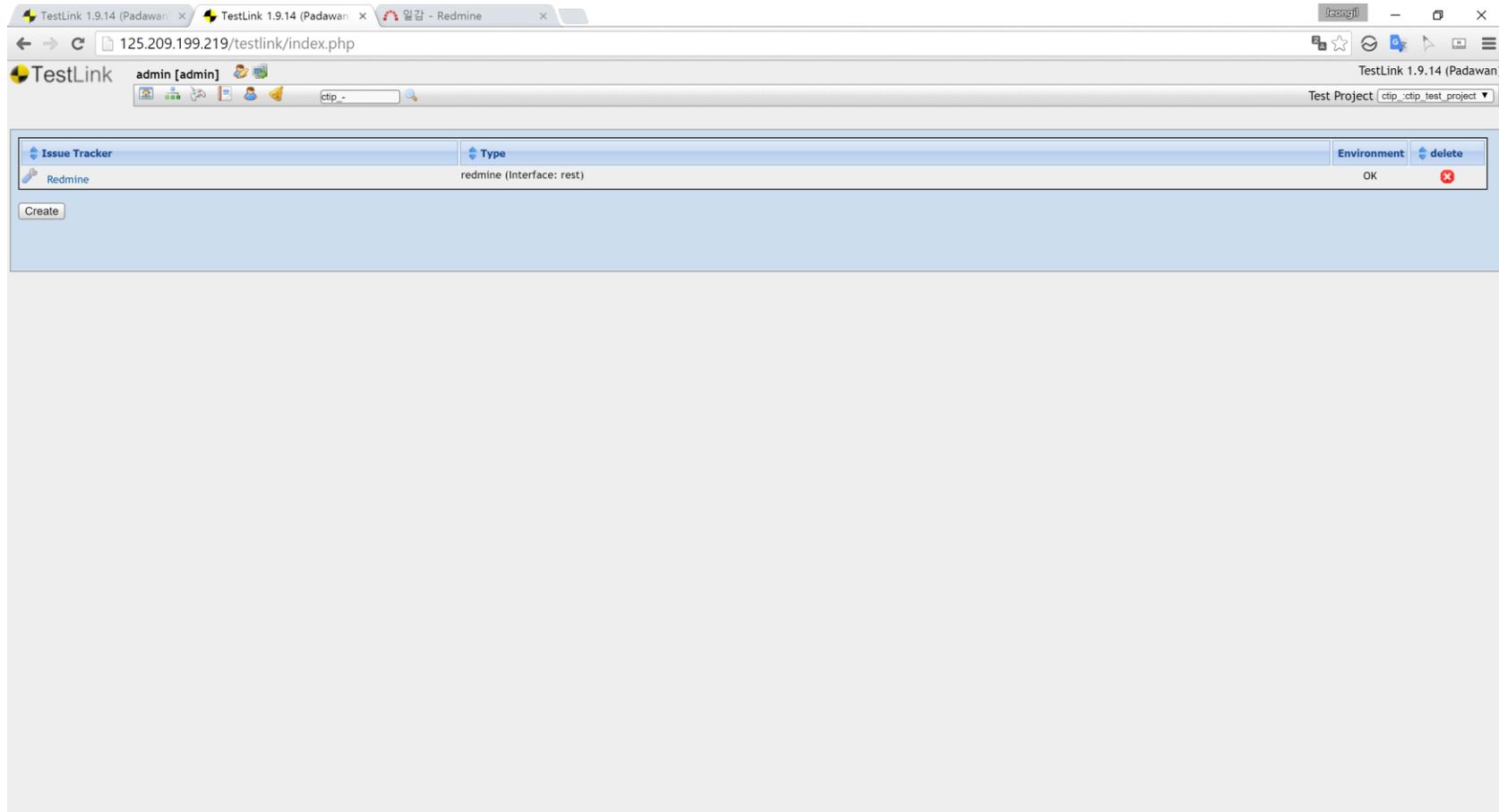
TestLink : Redmine 연동



TestLink : Redmine 연동



TestLink : Redmine 연동



TestLink : Jenkins 연동

API interface
Personal API access key = a4203abc679368a6a34a†
[Generate a new key](#)

TestLink
TestLink Installation

Name

URL ⓘ

Developer Key

[고급...](#)
[삭제](#)

[추가](#)

List of TestLink installations in this system

TestLink : Jenkins 연동

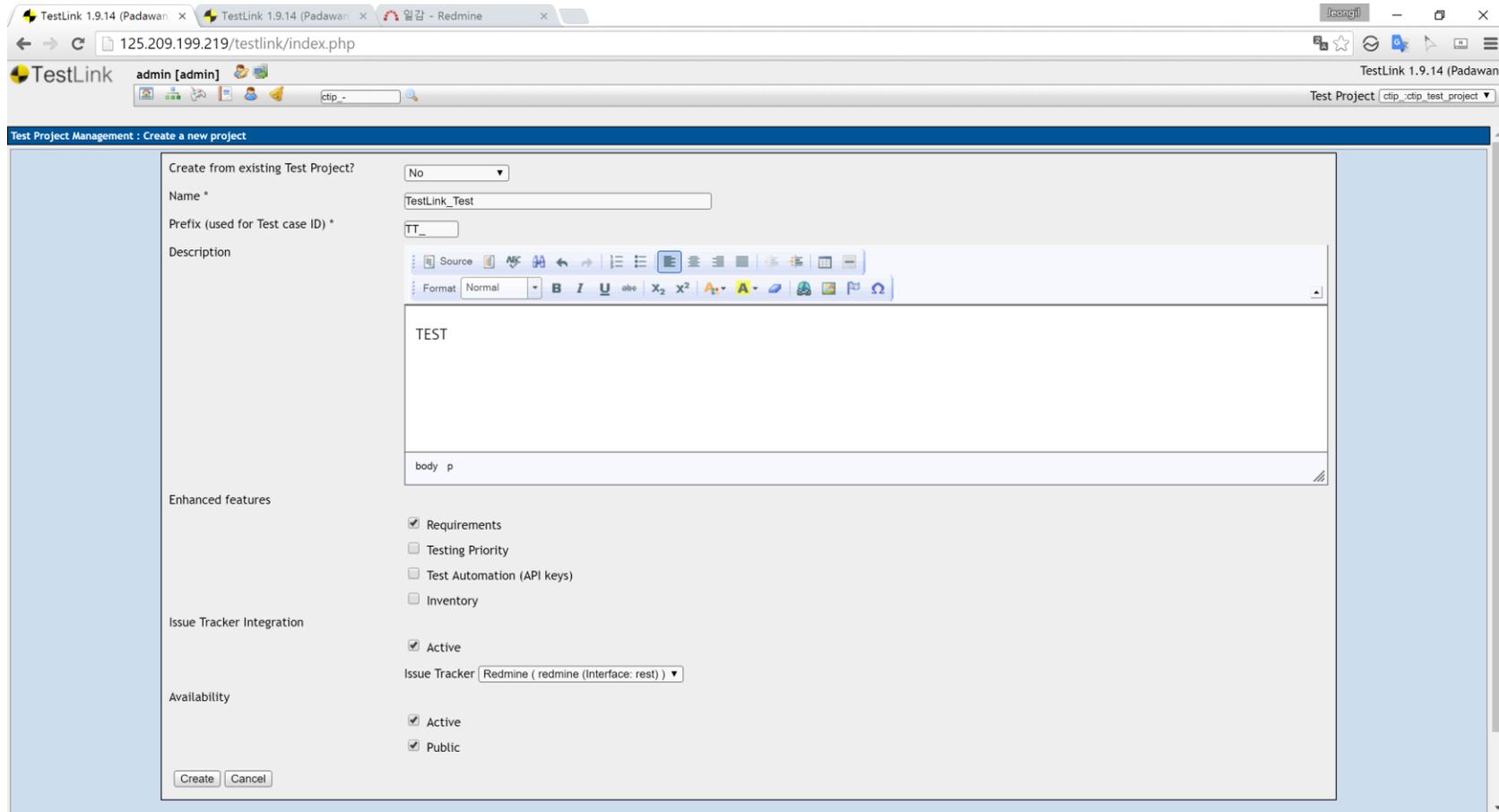
The screenshot displays the Jenkins interface for the 'ctip_test_project'. On the left, a sidebar contains navigation options like '대시보드로 돌아가기', '상태', '변경사항', '작업공간', 'Build Now', 'Project 삭제', '구성', 'Redmine - ctip_test_project', 'SonarQube', and 'TestLink results'. The main area shows the 'Project ctip_test_project' with options for 'SonarQube', '작업공간', '최근 변경사항', and '가장 최근 테스트 결과 (실패가 없습니다)'. Below this is a '고정링크' section with a list of build links.

On the right, there are two charts. The top chart, '테스트 결과 현황', is a stacked bar chart showing the count of tests across various build numbers (#148 to #192). The legend indicates: Blocked (yellow), Failed (red), Not Run (grey), and Passed (blue). The bottom chart, 'TestLink Tests Count', is a line chart showing the count of tests for each build number.

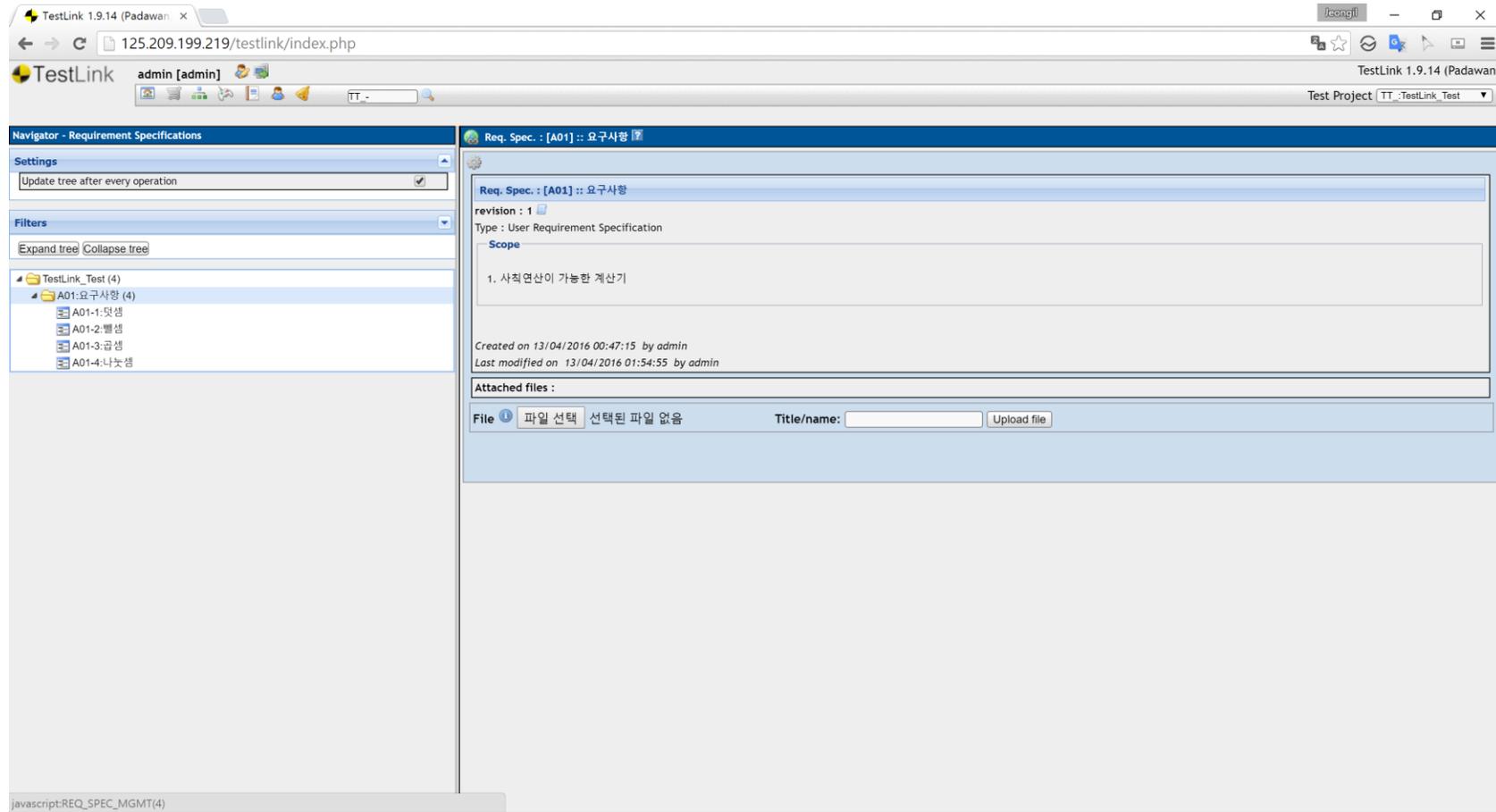
고정링크

- [Last build, \(#192\), 4 min 27 sec 전](#)
- [Last stable build, \(#192\), 4 min 27 sec 전](#)
- [Last successful build, \(#192\), 4 min 27 sec 전](#)
- [Last failed build, \(#191\), 5 min 16 sec 전](#)
- [Last unstable build, \(#125\), 1 day 22 hr 전](#)
- [Last unsuccessful build, \(#191\), 5 min 16 sec 전](#)
- [Last completed build, \(#192\), 4 min 27 sec 전](#)

TestLink : 프로젝트 생성



TestLink : 요구사항 작성



TestLink : Test suite & case

Project

Test suite 01

Test case 1-01

Test case 1-02

Test case 1-03

Test suite 02

Test case 2-01

Test case 2-02

TestLink : Test suite & case 작성

The screenshot displays the TestLink 1.9.14 web interface. The browser address bar shows the URL `125.209.199.219/testlink/index.php`. The user is logged in as 'admin [admin]'. The page title is 'Test Case' and the test project is 'TT_-TestLink_Test'.

The interface is divided into two main sections: 'Navigator - Test Specification' on the left and 'Test Case' on the right.

Navigator - Test Specification:

- Settings:** 'Update tree after every operation' is checked.
- Filters:** 'Expand tree' and 'Collapse tree' buttons are visible.
- Tree Structure:**
 - TestLink_Test (2)
 - 덧셈 (2)
 - TT_-2-SUM
 - TT_-3-SUM2

Test Case (TT_-2:SUM):

- Version 1:** Summary, Preconditions, Step actions, and Expected Results are visible.
- Summary:** 20이 출력
- Preconditions:** 10, 10을 입력
- Step actions and Expected Results Table:**

#	Step actions	Expected Results	
1	인자로 10, 10을 입력	10, 10의 합인 정수 20이 생성	✖ +
2	두 인자의 합이 반환	20 리턴	✖ +

Buttons: Create step, Resequence Steps

Status: Draft | Estimated exec. (min): | Save

Keywords: None

Requirements: None

Relations:

New relation: This test case related to PREFIX-ID Add

Test Plan usage:

Version	Test Plan
1	SUM TEST 01

Attached files:

TestLink : Test plan 작성

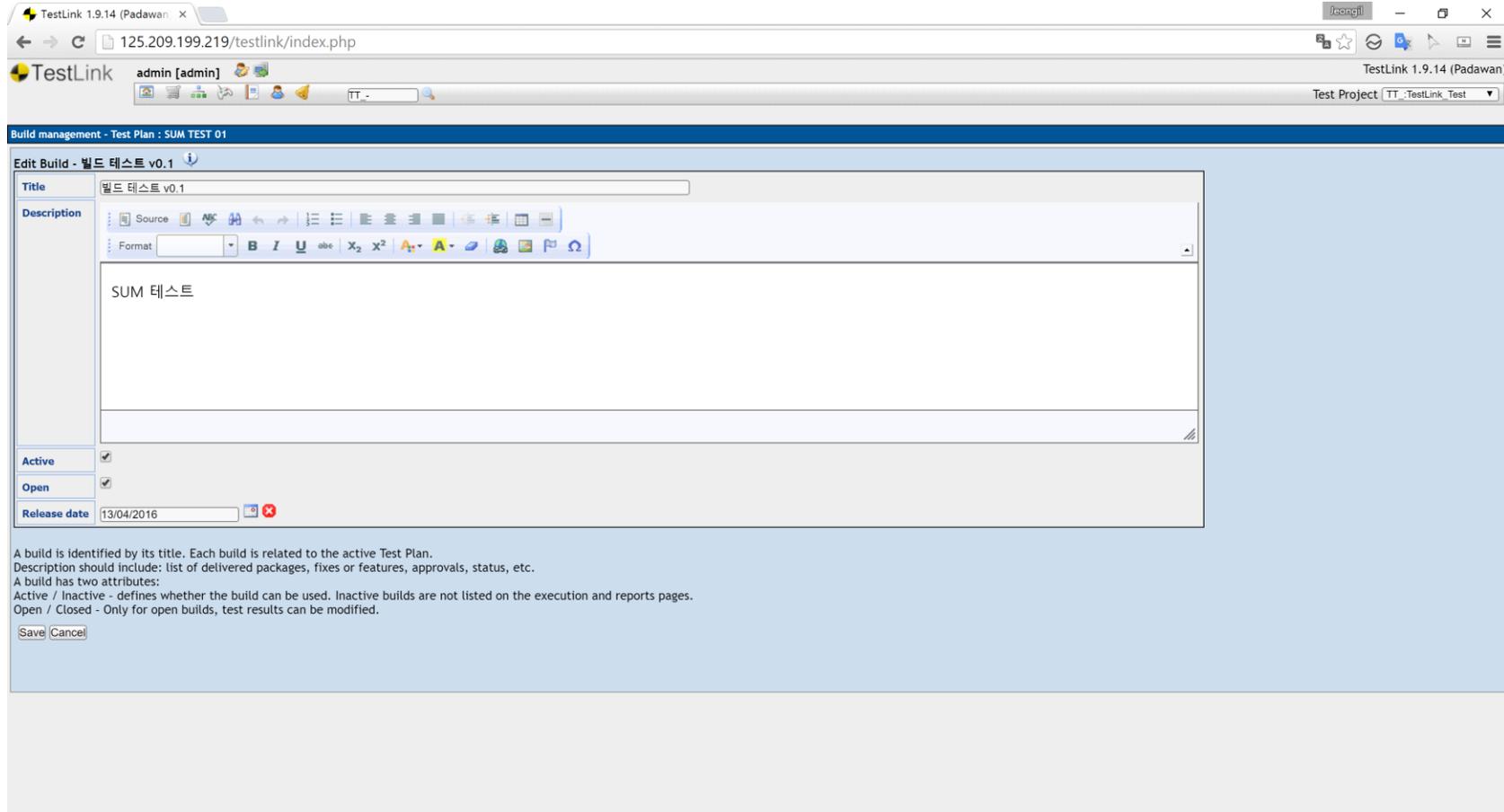
The screenshot displays the TestLink 1.9.14 web interface. The browser address bar shows the URL `125.209.199.219/testlink/index.php`. The user is logged in as 'admin [admin]'. The page title is 'Test Plan Management - Test Project TestLink_Test'. The main content area is titled 'Edit Test Plan - SUM TEST 01'. It features a form with the following fields:

- Name:** SUM TEST 01
- Description:** A rich text editor containing the text 'SUM test'.
- Active:**
- Public:**
- API Key:** 469c906eb2bc2635f5a483e01426964febb72a38256bdc8577e9eddf962a82d

Below the form are 'Update' and 'Cancel' buttons. An 'Attached files' section is visible with a file selection interface showing '파일 선택' and '선택된 파일 없음'. At the bottom, there is a help text block:

Test plans should encompass a (set of) clearly defined tasks with a timeframe and content. They can be created for everything from simple change requests to new product versions. It is recommended that the description field be used to document links to project plans and related documentation, lists of features to be tested, risks, etc. You can create a new test plan from an existing one. The items that are copied include: builds, test cases, priorities, milestones, and user roles. Test plans can be deactivated (i.e., editing and changing of results change are not allowed). Deactivated test plans are visible only via 'Reporting' and this page.

TestLink : Build 작성



TestLink : Test plan에 case 연결

The screenshot shows the TestLink 1.9.14 interface. The browser address bar indicates the URL is 125.209.199.219/testlink/index.php?caller=login. The user is logged in as 'admin [admin]'. The current test plan is 'SUM TEST 01'. The interface is titled 'Test Plan : SUM TEST 01 - Add/Remove Test Cases to/from Test Plan'. Below the title, there are options to assign the test cases to a user, specify the build version (currently '빌드 테스트 v0.1'), and a checkbox for 'Send mail notification to tester'. There are also buttons for 'adding', 'removal', 'Add / Remove selected', and 'Save order'. The main content area displays a table of test cases under the heading '덧셈'.

Test Case	Version	ID	Date
TT_-2 : SUM	1	10000	13/04/2016
TT_-3 : SUM2	1	10010	13/04/2016

TestLink : Test (1)

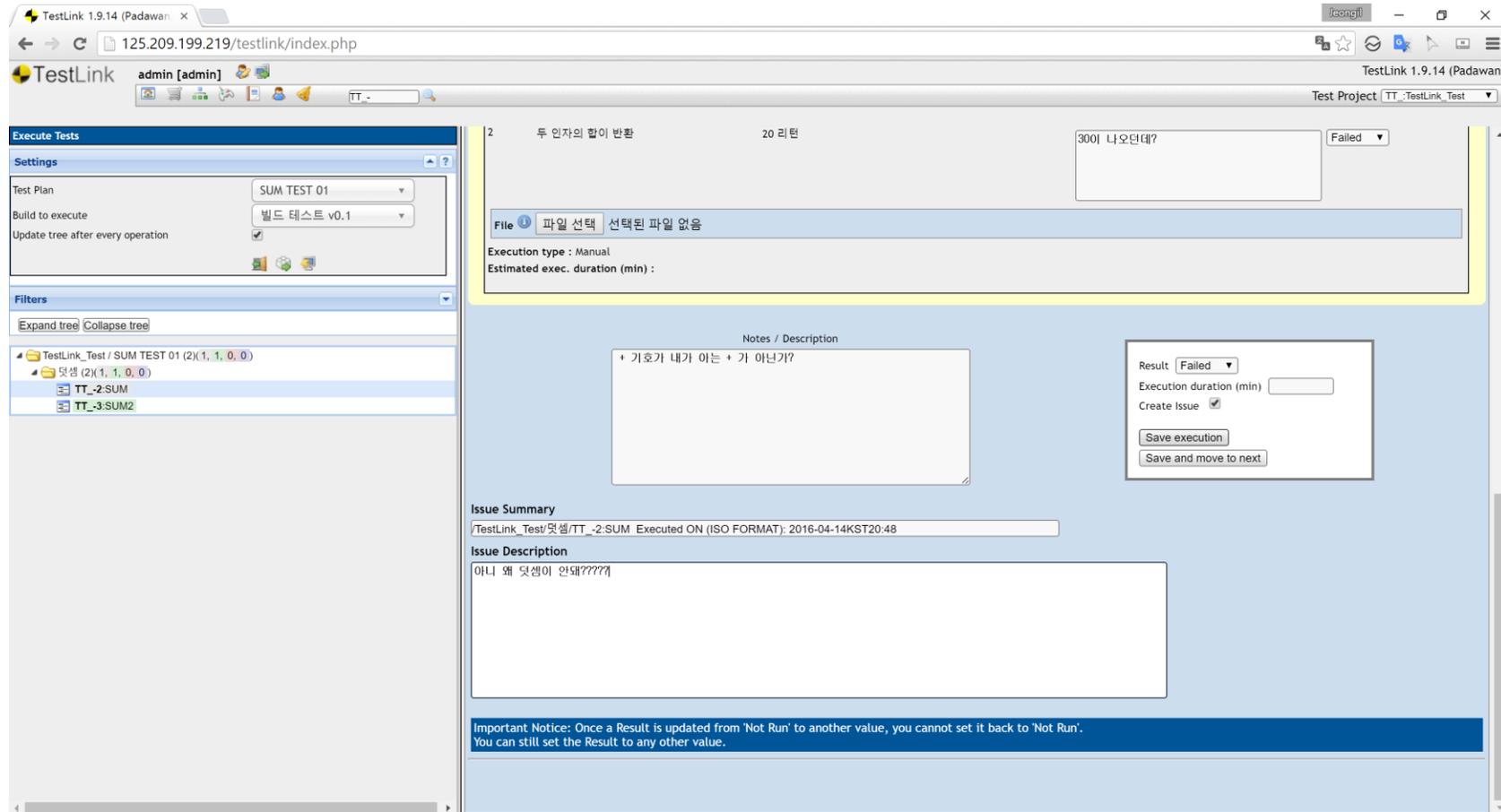
The screenshot displays the TestLink 1.9.14 web interface. The browser address bar shows the URL 125.209.199.219/testlink/index.php. The user is logged in as 'admin [admin]'. The current test project is 'TT_-TestLink_Test'. The interface is divided into several sections:

- Execute Tests:** Contains settings for the test plan (SUM TEST 01), build to execute (빌드 테스트 v0.1), and a checkbox for 'Update tree after every operation' which is checked.
- Filters:** Shows a tree view of test cases under 'TestLink_Test / SUM TEST 01 (2)(1, 1, 0, 0)'. The selected test case is 'TT_-2::SUM'.
- Latest execution (any build):** Shows 'Not Run' and 'Not Tested Yet'.
- Test Case TT_-2 :: Version : 1 :: SUM:** Assigned to 'admin'. It includes a 'Summary' section with '20이 출력' and a 'Preconditions' section with '10, 10을 입력'.
- Execution Results Table:** A table with columns: #, Step actions, Expected Results, Execution notes, and Result.

#	Step actions	Expected Results	Execution notes	Result
1	인자로 10, 10을 입력	10, 10의 합인 정수 20이 생성	10 10 잘 들어감	Passed
2	두 인자의 합이 반환	20 리턴	30이 나오던데?	Failed

At the bottom of the table, there are 'File' upload sections for each step, both showing '파일 선택' and '선택된 파일 없음'. Below the table, it indicates 'Execution type : Manual' and 'Estimated exec. duration (min) :'. The footer of the interface shows 'Notes / Description'.

TestLink : Test (2)



TestLink : Test result (Fail)

The screenshot displays the TestLink 1.9.14 (Padawan) web interface. The browser address bar shows the URL 125.209.199.219/testlink/index.php. The user is logged in as 'admin [admin]'. The interface is divided into several sections:

- Execute Tests:** Contains settings for the test plan (SUM TEST 01) and build (빌드 테스트 v0.1).
- Filters:** Shows a tree view of test cases, including 'TT_2::SUM' and 'TT_3::SUM2'.
- Test Results on Build 빌드 테스트 v0.1:** The main area showing the test execution history. It includes a table with the following data:

Date	Tested by	Status	Exec (min)	Version	BUG management	Run mode
14/04/2016 20:51:09	admin	Failed		1		
- Test Case TT_2 :: Version : 1 :: SUM:** Shows details for the failed test case, including a summary and preconditions.

TestLink : Test report

125.209.199.219/testlink/lib/execute/execPrint.php?id=9 - Chrome

125.209.199.219/testlink/lib/execute/execPrint.php?id=9

Test Case TT_-2: SUM [Version : 1]

Author: admin - 13/04/2016 02:01:39

Summary:
20이 출력

Preconditions:
10, 10을 입력

#:	Step actions:	Expected Results:	Execution notes:	Execution Status:
1	인자로 10, 10을 입력	10, 10의 합인 정수 20이 생성	10 10 잘 들어감	Passed
2	두 인자의 합이 반환	20 리턴	30이 나오던데?	Failed

Execution type: Manual

Estimated exec. duration (min):

Importance: Medium

Requirements None

Keywords: None

Execution Details

Tester admin

Execution Result: **Failed**

Execution Mode: **Manual**

Execution duration (min):

Execution notes + 기호가 내가 아는 + 가 아닌가?

Direct Link:<http://125.209.199.219/testlink/Inl.php?type=exec&id=9>

TestLink : Test result (Pass)

The screenshot displays the TestLink 1.9.14 web interface. The main content area shows the test results for 'SUM TEST 01' on build '빌드 테스트 v0.1'. The status is 'Passed'. The interface includes a left sidebar with 'Execute Tests' and 'Filters' sections, and a right sidebar with 'Test Results on Build 빌드 테스트 v0.1' and 'Test Case TT_-2 :: Version : 1 :: SUM' sections.

Test Results on Build 빌드 테스트 v0.1

Print Show complete execution history Import Results (XML)

Test Plan SUM TEST 01

SUM test

Build 빌드 테스트 v0.1

SUM 테스트

Test Suite : 덧셈/

Details

덧셈이 제대로 작동하는지 확인함.

Latest execution (any build)

Date : 14/04/2016 21:04:15 - Tested by : admin - Build : 빌드 테스트 v0.1 - Status : Passed

Latest execution (current build) - Build : 빌드 테스트 v0.1

Date	Build	Tested by	Status	Exec (min)	Version	BUG management	Run mode
14/04/2016 21:04:15	빌드 테스트 v0.1	admin	Passed		1		

Test Case TT_-2 :: Version : 1 :: SUM

Assigned to : admin

Summary

20이 출력

 End

Thank you!