

Software Verification

Introduction to

Sonarqube, Testlink , PMD , Checkstyle, Findbug

^{POWERED BY} 201210908 윤성일 201311265 김상원 201214150 정성철







정적 테스트

정적 테스트?

실제 실행 없이 컴퓨터 소프트웨어를 분석

대부분의 경우에 분석은 소스코드 버전 중 하나의 형태로 수행

Static WhiteBox Test

프로그램을 실행하지 않고 소프트웨어의 설계, 코드나 구조 등에서\버그를 찾을 수 있는 방법

코드 검토 체크리스트를 사전에 정해놓고 검사

Static BlakBox Test

프로그램의 소스코드를 파악할 수도 없고, 실행시키지도 않는 상태에서 수행하는 검사

프로그램 명세서에 대한 테스트

Software Verification 소프트웨어 검증

김 상 원 정 성 철 윤 성 일

KU 건국대학교







Sonarqube









Sonarqube

Sonarqube 설치

압축을 해제한 폴더 sonarqube-x.x.x/bin폴더에서 맞는 운영체제의 폴더로 진입



김 상 원 정 성 철 윤 성 일



Sonarqube

Sonarqube 설치

명령어입력시 소나큐브 시작(Linux 기준)

🛞 😑 🤀 🛛 sangwon-ssvm@ubuntu: ~/sonarqube-6.7.3/bin/linux-x86-64

sangwon-ssvm@ubuntu:~/sonarqube-6.7.3/bin/linux-x86-64\$./sonar.sh
Usage: ./sonar.sh { console | start | stop | restart | status | dump }
sangwon-ssvm@ubuntu:~/sonarqube-6.7.3/bin/linux-x86-64\$./sonar.sh start
Starting SonarQube...
Started SonarQube.
sangwon-ssvm@ubuntu:~/sonarqube-6.7.3/bin/linux-x86-64\$

설정 정보는 sonarqube-x.x.x/conf

Software Verification 소프트웨어 검증

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Sonarqube

Maven 연동

Sonarqube 접속(기본 접속 주소 <u>http://localhost:9000)</u>

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| sonarqube | Projects Issu | ues Rules Qu | uality Profiles Q | uality Gates | | | Q S | earch for projects, sub-proje | cts and files | ? Login |
| Continu | JOUS COde | e Quality | | | | | | O Projects Analyzed | 0 Xi Bugs 0 û Vuln 0 & Code | s erabilities e Smells |
| | | | | | | | | | | |
| Multi-Lang 20+ program | Juage ming languages a | tre supported by | SonarQube than | ks to our in-house | code analyzers, i | ncluding: | laur Carint | Transford | Objective O | VA. |
| Multi-Lang 20+ program Java VB.NET | guage iming languages a <u>C/C++</u> <u>PL/SQL</u> | rre supported by C# T-SQL | SonarQube thanl COBOL Flex | ks to our in-house ABAP Python | code analyzers, i HTML Groovy | ncluding: RPG PHP | JavaScript Swift | TypeScript Visual Basic | Objective C PL/I | XML |

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Sonarqube

Maven 연동



김 상 원 정 성 철 윤 성 일



Sonarqube



플러그인 관리메뉴 🛞 🖨 🤀 Manage Jenkins [Jenkins] - Mozilla Firefox 📟 SonarQube를 Jenkins에 🗙 🧕 Manage Jenkins [Jenkin 🗙 🕂 ← → ⊂ ŵ ... ♥ ☆ ± III\ ⊡ ≡ Iocalhost:8080/manage 🚱 Jenkins 🔍 sear ? Kimsangwon | log out Jenkins ENABLE AUTO REFRESH 쯜 New Item **Manage Jenkins** Reople Pauld History Configure System 🎡 Manage Jenkins Configure global settings and paths. 🍓 My Views **Configure Global Security A** Credentials Secure Jenkins; define who is allowed to access/use the system. 💼 New View **Configure Credentials Build Queue** -Configure the credential providers and types No builds in the queue. Global Tool Configuration _ 1 Configure tools, their locations and automatic installers. **Build Executor Status** 1 Idle Reload Configuration from Disk 2 Idle Discard all the loaded data in memory and reload everything from file system. Useful when you modified config files directly on disk. Manage Plugins Add, remove, disable or enable plugins that can extend the functionality of Jenkins. A There are updates available Manage Plugins System Information Displays various environmental information to assist trouble-shooting. 27 localhost:8080/pluginManager





Sonarqube



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| | <u>CodeSonar</u> | | | | 2.0.6 |
| | SonarQube Scan | ner | | | 2.7.1 |
| | Sonargraph Integ | ration | | | 2.1.2 |

김 상 원 정 성 철 윤 성 일



Sonarqube

Jenkins 연동

| General Source Code Management Build Environment Build Post-build Actions Use secret text(s) or file(s) @ Abort the build if it's stuck @ Add timestamps to the Console Output @ With Ant @ Execute SonarCube Scanner @ Execute SonarCube Scanner @ Invoke Gradle script | Jenkins Lest General Source Code Management Build Environment Build Post-build Actions Delete workspace before ound starts Image: Source Code Management Build Environment Build Post-build Actions Use secret text(s) or file(s) Image: Source Code Management Build Environment Build Environment Abort the build if it's stuck Image: Source Code Management Image: Source Code Management Image: Source Code Management Abort the build if it's stuck Image: Source Code Management Image: Source Code Management Image: Source Code Management Add timestamps to the Console Output Image: Source Code Management Image: Source Code Management Image: Source Code Management With Ant Image: Source Code Management Image: Source Code Management Image: Source Code Management Image: Source Code Management Invoke Ant Image: Source Code Management Image: Source Code Management Image: Source Code Management Image: Source Code Management Invoke Ant Image: Source Code Management Image: Source Code Management Image: Source Code Management Image: Source Code Management Source Code Management Image: Source Code Management Image: Source Code Management Image: Source Code Management <th>Initial V test V General Source Code Management Build Triggers Build Environment Build Post-build Actions Delete workspace berore Duild stants Use secret text(s) or file(s) Abort the build if it's stuck Add timestamps to the Console Output With Ant Execute SonarCube Scanner Execute SonarCube Scanner Execute Stall Invoke Ant I</th> <th>ethnins / test / General Source Code Management Build Triggers Build Environment Build Post-build Actions General Source Code Management Build Triggers Build Environment Build Post-build Actions Use secret text(s) or file(s) Abort the build if it's stuck Add timestamps to the Console Output Execute SonarQube Scanner Execute SonarQube Scanner Execute shell Invoke Gradie script Invoke Gradie script Invoke Gordie script Invoke Gordie script Invoke Gordie Scanner tor MSBuild - End Analysis SonarQube Scanner tor MSBuild - End Analysis Add build step</th> <th>General Source Code Management Build Triggers Build Environment Build Post-build Actions</th> <th>enkins / lest /</th> <th></th> <th></th> <th></th> <th></th> | Initial V test V General Source Code Management Build Triggers Build Environment Build Post-build Actions Delete workspace berore Duild stants Use secret text(s) or file(s) Abort the build if it's stuck Add timestamps to the Console Output With Ant Execute SonarCube Scanner Execute SonarCube Scanner Execute Stall Invoke Ant I | ethnins / test / General Source Code Management Build Triggers Build Environment Build Post-build Actions General Source Code Management Build Triggers Build Environment Build Post-build Actions Use secret text(s) or file(s) Abort the build if it's stuck Add timestamps to the Console Output Execute SonarQube Scanner Execute SonarQube Scanner Execute shell Invoke Gradie script Invoke Gradie script Invoke Gordie script Invoke Gordie script Invoke Gordie Scanner tor MSBuild - End Analysis SonarQube Scanner tor MSBuild - End Analysis Add build step | General Source Code Management Build Triggers Build Environment Build Post-build Actions | enkins / lest / | | | | |
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Sonarqube



| - | |
|----------------------------|---|
| Task to run | |
| JDK | (Inherit From Job) |
| | JDK to be used for this SonarQube analysis |
| Path to project properties | |
| Analysis properties | sonar.projectKey=myproject sonar.projectName=my project name sonar.projectVersion=1.0.0 |
| | sonar.sources=src/main/java sonar.java.binaries=target/classes |
| | sonar.language=java sonar.sourceEncoding=UTF-8 |
| Additional arguments | |
| WAL Onlines | |





Sonarqube





김 상 원 정 성 철 윤 성 일



PMD&Checkstyle&Findbugs

PMD

- 작성한 코드에 대한 위반사항(위반되는 코딩 스타일, 불필요한 코드)를 찾음
- 위반사항을 명시한 report파일(pmd.xml, cpd.xml file)에 대한 수정이 쉬움
- 한 번의 클릭으로 수많은 규칙에 대한 수정이 가능

Checkstyle

- •여러사람과 작업시 손쉽게 코딩 스타일을 맞출 수 있음
- •표준코딩스타일을 손쉽게 프로젝트에 적용

Findbugs

- 프로그램 버그 찾기
- 컴파일 된 바이트 코드 검색
- 각 버그에 대한 수정 안내서 제공

Software Verification 소프트웨어 검증

KU 건국대학교



Sonarqube

설치

Sonarqube 에서 PMD,Checkstyle,Findbugs 플러그인 설치

| sonarqube 때시보드▼ 미슈 측정지표 코딩규적 | 풍질프로파일 품질계이트 완경설정 대보기▼ |
|---|---|
| 환경설정 프로젝트 설정 ★ 시큐리티 ★ Projects ★ 시스템 ★ | |
| 업 데 이 트 센 터 물러그만을 설치하고 삭제합니다. 페이지 내의 시스템 업데이트 탭에 | 서 소나큐브 업그레이드 버전들 다운토드 할 수 있습니다. |
| Installed Updates Only Available System Upgrades | Q Search |
| C# Languages Enables scanning of C# source files | 4.4 installed Updates: Support Visual Studio 2015 Update 2, integration test code coverage and xUnit reports import and speed-up the processing of code coverage reports |
| Checkstyle Etternal Analyses Analyze Java code with Checkstyle. | 2.4 installed |
| Findbugs External Analysers Analyze Java code with Findbugs 3.0.1. | 3.3 installed |
| Korean Pack Localization Language pack for Korean | 1.2.0 installed |
| PMD <u>Estensi Analyzen</u> Analyze Java code with <u>PMD</u> . | 2.5 installed |
| SVN Interation | 1.2 installed |

김 상 원 정 성 철 윤 성 일



Sonarqube



| sonarqube | 대시보드▼ 이슈 | 측정 지표 코딩 규칙 | 풍질 프로파일 | 풍질 게이트 | 환경설정 | 더보기 ▼ |
|----------------------------|---|--------------------------------------|-----------|--------|------|-------|
| 소나큐브 (이 메시지) 다음을 참고 | 대시보드에 오신 것을 여러분이 읽을 수 있 1하여 이후 작업을 진행 | · 환영합니다 다면, 소나큐브 서버가 정상 해하십시오: | 적으로 동작한 것 | 입니다!! | | |
| | | | | | | |





Sonarqube

실행예시

품질 프로파일 에 Coding Rule 활성화

| #시보드▼ 이슈 측점지표 | ····································· | 🔛 Administrator * 🛛 🔍 💷 😌 |
|----------------------------|---|---|
| 사용자 규칙 성성 | | ▲1/271▼ 리프트 신규 검색 대규모 변경 |
| | Temay operator with a boolean literal can be simplified with a boolean expression | lina T· 문성파 |
| | Excessive Method Length | DEFRECATED Java 🗣 size 🝸 📲 🖽 👔 |
| 271 | Clone Throws Clone Not Supported Exception | DEPRECATED Java T - British |
| | Proper Logger | DEPECATED ima T · BEER |
| 15 | Replace Enumeration With Iterator | DEPRECATED Java T · 문장되 |
| 7 | Add Empty String | DEFRECATED June T · BOSH |
| 4 | Non Case Label In Switch Statement | DERECATED Java T * BESR |
| 3 | Avoid unnecessary comparisons in boolean expressions | DEPRECATED Java T * BIGH |
| 2 | Empty Finalizer | DEPRECATED Into T * (THE D |
| 1 | Do Not Extend Java Lang Error | DEPRECATED Java T * Tatal |
| | Guard Debug Logging | inte 🕈 🔹 |
| | Check ResultSet | ina T• Bitte |
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| pt active Mactive | Missing Static Method In Non-Instantiatable Class | ina T• Bak |
| | Avoid Using Octal Values | DEPASCATED Java T · Briter |
| | | |





Sonarqube

실행예시

| tort | | | | | | | | | | |
|--|---|---|--------------------------------------|--|--------------------------|-----------------------------------|----------------------------|------------------|---------------------------|---------------------------------|
| Technical De | bt Coverage | Duplications | Structure | 대시보드 🚽 | Code 0 | 이슈 환경 | 경설정 🚽 | | | |
| Quality Gate | Passed | | | | | 환 중 | 경 설정 질 프로파일(C | uality Profile | 25) | |
| lechnical Deb | t 더보기> | | | | | 8 0. | 칠 게이트(Qua istom Measure | lity Gate) Is | | |
| | - 3 | 시간 | | | | 액 | 션 플랜 hks | | | |
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| onar qube | 대시보드 | ▼ 이슈 | 측정 지표 | 코딩 규칙 | 품질 | 프로파일 | 품질 기 | 이트 | 환경설정 | 더보기 - |
| onarqube | 대시보드 | ▼ 이슈 - | 측정 지표 | 코딩 규칙 | 품질 | 프로파일 | : 품질기 | 이트 | 환경설정 | 더보기 🔻 |
| onarqube | 데시보드 al Debt Co | ▼ 이슈 · | 측정 지표 uplication | 코딩규칙 s Structur | 품질 re 대사 | 프로파일 | 품질 기 Code | 이트 | 환경설정 | 더보기 🕶 |
| onarqube 수 급 test * Technic 품질 프로 이프로젝트이 | 대시보드 al Debt Co 파일(Quali 에 적용할 품질 | ▼ 이슈 · overage D ty Profiles) 프로파일을 언 | 측정 지표 uplication i어 별로 선 | 코딩 규칙 s Structur 택하십시오(5 | 풍질 : re 대사 루 개 이상: | 프로파일 시보드 - 이 프로그 | 품질 기 Code 래밍 언어트 | 이트 이슈 리구성된 | 환경설정 환경설정 프로젝트인 (| 더보기 ▼ ▼ 경우에만 복 |
| onarqube | 대시보드 al Debt Co 파일(Quali 네 적용할 풍질 QUALITY PRO | ▼ 이슈 · overage D ty Profiles) 프로파일을 언 FILE | 측정 지표 uplication I어 별로 선 | 코딩 규칙 s Structur 택하십시오(위 | 품질 · re 대사 루 개 이상: | 프로파일 시보드 - 이 프로그 | 문 풍질 7 Code 래밍 언어트 | 이트 이슈 리구성된 | 환경설정 환경설정 프로젝트인 (| 더보기 - - 경우에만 복 |
| onarqube | 대시보드 al Debt Co 파일(Quali 에 적용할 풍질 QUALITY PRO 기본 값 | ▼ 이슈 Doverage D ty Profiles) 프로파일을 언 FILE ▼ Updat | 측정 지표 uplication I어 별로 선 | 코딩 규칙 s Structur 택하십시오(위 | 품질 : re 대사 루 개 이상: | 프로파일 시보드 ▾ 이 프로그 | 문질 7 Code 래밍 언어로 | 이트 이슈 리구성된 | 환경설정 환경설정 (프로젝트인 (| 더보기 ▼ ▼ 경우에만 목 |
| onarqube | 대시보드 al Debt Co 파일(Quali 에 적용할 품질 QUALITY PRO 기본 값 Test | ▼ 이슈 · overage D ty Profiles) 프로파일을 언 FILE ▼ Updat | 측정 지표 uplication !어 별로 선 te | 코딩 규칙 s Structur 택하십시오(위 Update | 품질 re 대서 루개 이상: | 프로파일 시보드 ▾ | 품질 기 Code 래밍 언어로 | 이슈 이슈 리구성된 | 환경설정 환경설정 프로젝트인 경 | 더보기 ▼ ▼ 경우에만 특 |

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시스템 테스트

시스템 테스트?

- 전체적으로 통합된 애플리케이션들을 테스팅

- 수행시간, 파일저장 및 처리 능력, 최대 부하, 복구 및 재시동 능력, 수작업 절차 등을 점검

-시스템의 실제 동작과 원래 의도했던 요구사항과는 차이가 없는지 등을 판단

-시스템 테스팅은 사용자 관점에서 소프트웨어 외부 동작들(external workings)을 수반

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TestLink? • Web 환경의 인터페이스(사용자는 인스톨 없이 어디서든지 접근가능) •테스트의 우선순위 부여 기능 및 사용자의 활동영역 정의(리더, 테스터) •다양한 종류의 DB를 지원(MySQL, PostgreSQL, MS-SQL 등) • 트리구조를 이용한 테스트 케이스 작성기능 • 다양한 형식의 보고서 제공(HTML, MS-Word, MS-Excel) 및 E-mail에 직접보고서를보낼 수 있는 기능 제공

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Software Verification 소프트웨어 검증

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설치

Testlink 에서 사용할 계정 생성

| 🐓 Setup | | | | × |
|------------------------------|------------------|--------|-------|---|
| Create Admin account | | | - | - |
| Bitnami TestLink Stack admir | user creation | | | |
| Your real name | thinkpad | | | |
| Email Address | user@example.com | | | |
| Login | user | | | |
| Password | | | | |
| Please confirm your passwo | d | | | |
| installBuilder | | | | |
| Installbuilder | < Back | Next > | Cance | : |





KU 건국대학교 Колкик илич



상 원

성 철 성 일

KU 건국대학교

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Test Specification

- Test Spec은 테스트를 진행하고자 하는 테스트 케이스들의 집합
- Test Suite Test Case로 분류
- Test Suite은 대분류 Teste Suite의 소분류를 Test Case

Test Plan

- 실제 진행하는 테스트를 의미
- 테스트 대상 시스템의 특정 버전을 테스트 하기 위해서 Test Spec내의 Test Suite/Case의 모음
- Test Plan에 Test Case를 맵핑시 엔지니어 선택 가능



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Test Execution

- 테스트 결과 Pass/Fail 여부를 체크
- 실패한케이스일경우에는재테스트

Test Report

- 테스트실패,성공여부, 주요 Test Category (TestSuite)별성공실패여부등을리포팅





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Bitnami Testlink Stack Manager를 실행 Go to Application 을 클릭



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| | 3 | iest Projet |
|---|---|----------------------|
| System | | |
| Define Custom Fields | | Test Plan |
| Issue Tracker Management | | Test Plan Management |
| Test Project | | |
| Test Project Management Assign User Roles Assign Custom Fields Keyword Management Platform Management | | |
| Test Specification | | |
| Test Specification Test Cases created per User | | |
| | | |
| | | |





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정보 입력후 Test Project 생성

| • • | |
|-------------------------------------|--|
| reate from existing Test roject? | No |
| lame * | |
| refix (used for Test case ID) * | |
| roject description | Image: Source Image: |
| | Format • B $I \ \underline{\cup} \ \underline{S} \ \underline{X}_2 \ \underline{X}^2 \ \overline{\Box}_3 \ \boldsymbol{\textcircled{B}} \ \overline{P} \ \Omega$ |
| | |
| | |
| | |
| | |
| | |
| | |
| nhanced features | |
| | Enable Requirements feature |
| | ☑ Enable Testing Priority |
| | □ Enable Test Automation (API keys) |
| | Fnable Inventory |

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| 🕮 and 🥝 💙 🚩 (VSV- | Test Project (|
|---|----------------------|
| System | |
| Define Custom Fields | Test Plan |
| Issue Tracker Management | Test Plan Management |
| Test Project | |
| Test Project Management | |
| Assign Custom Fields | |
| Keyword Management | |
| Protorni management | |
| | |
| Test Specification | |
| Test Specification Test Cases created per User | |
| | |
| | |
| | |
| | |





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| 정보 입력후 Test Suite / Test | case 생성 |
|--------------------------|---------|
|--------------------------|---------|

| Test Case Operation | s 😳 🗖 😫 💐 🗐 🎤 | | |
|------------------------|---------------|-------------|-------|
| Test Suite : test plan | | | |
| | | | |
| Keywords : | None | | |
| Attached files : | | | |
| File | 찾아보기 | Title/name: | Uploa |
| | | | |





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| 🗠 ::::: 🚳 💘 💉 VSV 👒 | lest Project (V&Vsoft |
|---|--|
| | |
| System Define Custom Fields Issue Tracker Management | Test Plan Test Plan Management |
| Test Project | |
| Test Project Management Assign User Roles Assign Custom Fields Keyword Management Platform Management | |
| Test Specification | |
| Test Specification Test Cases created per User | |
| | |
| | |





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| Test Plan Management - Test Project software | verification |
|--|--|
| Name | |
| Description | |
| | Format - B $I \ \underline{\cup} \ \mathbf{S} \ \mathbf{X}_2 \ \mathbf{X}^1 \ \overline{\mathbf{Q}} \ \mathbf{B} \ \overline{\mathbf{P}} \ \Omega$ |
| | |
| | |
| | |
| | |
| | |
| | A |
| Create from existing Test Plan? | No |
| Active | |
| Public | |

| SOFTWARE DEVELOP ENVIRON | Testlink 실행 예시 |
|--------------------------------|--|
| | Test Case 활성화 Assign to 탭을 클릭 Test 진행 엔지니어 선택후 저장 TestLink 1.9.16 (Moka pot) Test Project V&V software verification ~ Test Project V&V software verification ~ Assigning Test Case execution tasks for build ver 1.0 in test plan test for testing Check/uncheck all Test cases Bulk user assignment Do Bave Control Contr |
| 김 상 원 정 성 척 | test plan Image: Case [Version] Priority Assigned to Assign to Image: Case [Version] Medium Image: Case [Version] Medium Image: Case [Version] Medium Image: Case [Version] Medium |

Software Verification 소프트웨어 검증

KONKUT



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Redmine 연동

Redmine API 접근키입력 Redmine 메인과 일감의 URL 입력 project 명에는 이슈를 받을 Redmine Project 명을 입력 프로젝트 바로가기 lssue Tracker Manage 편집 🌵 Issue Tracker software verification 🔀 메일주소 🦻 비밀변호 바꾸기 🛛 내 계정 redmine (Interface: rest) Y Show configuration example Type 메일알림 로그인: thinkpad Configuration (issuetracker) 등록: 2018/04/15 23:14 <apikey>1a55a13bbefc627b2f59afbbf887d35c97c8af7b</apikey> Veren <uribase>http://localhost/redmine</uribase> 내가 지켜보거나 속해있는 사항만 盲 나의 계정 삭제 <uriview>http://localhost/redmine/issues/</uriview> ****** <projectidentifier>werification-validation</projectidentifier> ☑ 내가 만든 변경사항들에 대해서는 알림을 받지 않습니다. Atom 접근키 (/issuetracker) 피드 접근 키가 약 19시간 이전에 생성되었습니다. (3 설정 기화) ********* 메일 주소 숨기기 📝 API 접근키 시간대 보기 댓글 정렬 시간 순으로 정렬 API 접근키가 약 19시간 전에 생성되었습니다. (초기 화) 저장하지 않은 페이지를 빠져나 📝 갈 때 나에게 알림 Font used for text areas Default font N Configuration example Used on Test Project software verification

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| | | or ecoung | | | | | | | | |
|---------------------------------------|-----------------------|--|---|----------------------------------|----------------------|----------|-------------|--------|---|---|
| i드 ver | 1.0 | | | | | | | | | |
| 스트스 | 위트 : te | st plan/ | | | | | | | | |
| | | ar plant | | | | | | | | |
| 바거 실험 | 행한 결 | 과들 - 빌드 : ver 1. | 0 | | | | | | | |
| | | | | | | | | | | |
| 불짜 | | 담당자 | 상태 | Exec (min) | 버전 | H | 너그 관리 | | | |
| 2018 | /04/14 1 | 8:46:20 | thinkpad | 실패 | | 1 | Ø | 1 | 1 | |
| 빌드 | Test | 관련 버그 | | | * | | | | | |
| | Case | | | | | | | | | |
| | and the second second | 6 : [신규] : /software | verification/test plan/V&V-1:0 | ependablity - Execu | ted ON (ISO FORMAT): | 2018-04- | 14 18:46:20 | 0 | | _ |
| ver 1.0 | | ver 1.0 7 : [신규] : /software verification | | ependablity - Execu | ted ON (ISO FORMAT): | 2018-04- | 14 18:46:20 | 0 | | |
| ver 1.0 ver 1.0 | | 7 : [신규] : /software | verification/test plan/vuv-11 | | | 2018-04- | 14 18:46:20 | 0 | | |
| ver 1.0 ver 1.0 ver 1.0 | | 7 : [신규] : /software 8 : [신규] : /software | verification/test plan/V&V-1:0 | ependablity - Execu | ted ON (ISO FORMAT): | 2010-04- | | | | - |
| ver 1.0 ver 1.0 ver 1.0 2018 | /04/14 1 | 7 : [신규] : /software 8 : [신규] : /software 8:38:02 | verification/test plan/V&V-1:D thinkpad |)ependablity - Execu 실패 | ted ON (ISO FORMAT): | 1 | Ø | 當 | 1 | |
| ver 1.0 ver 1.0 ver 1.0 2018 | /04/14 1 | 7 : [신규] : /software 8 : [신규] : /software 8:38:02 9:46:35 | verification/test plan/V&V-1: thinkpad thinkpad | Dependablity - Execu 실패 실패 | ted ON (ISO FORMAT): | 1 | | 8 8 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | |

|스트 케이스 V&V-1 :: 버전: 1 :: Dependablity 눼스터 : thinkpad



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SOFTWARE

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THANK YOU

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