CTIP 환경 구축

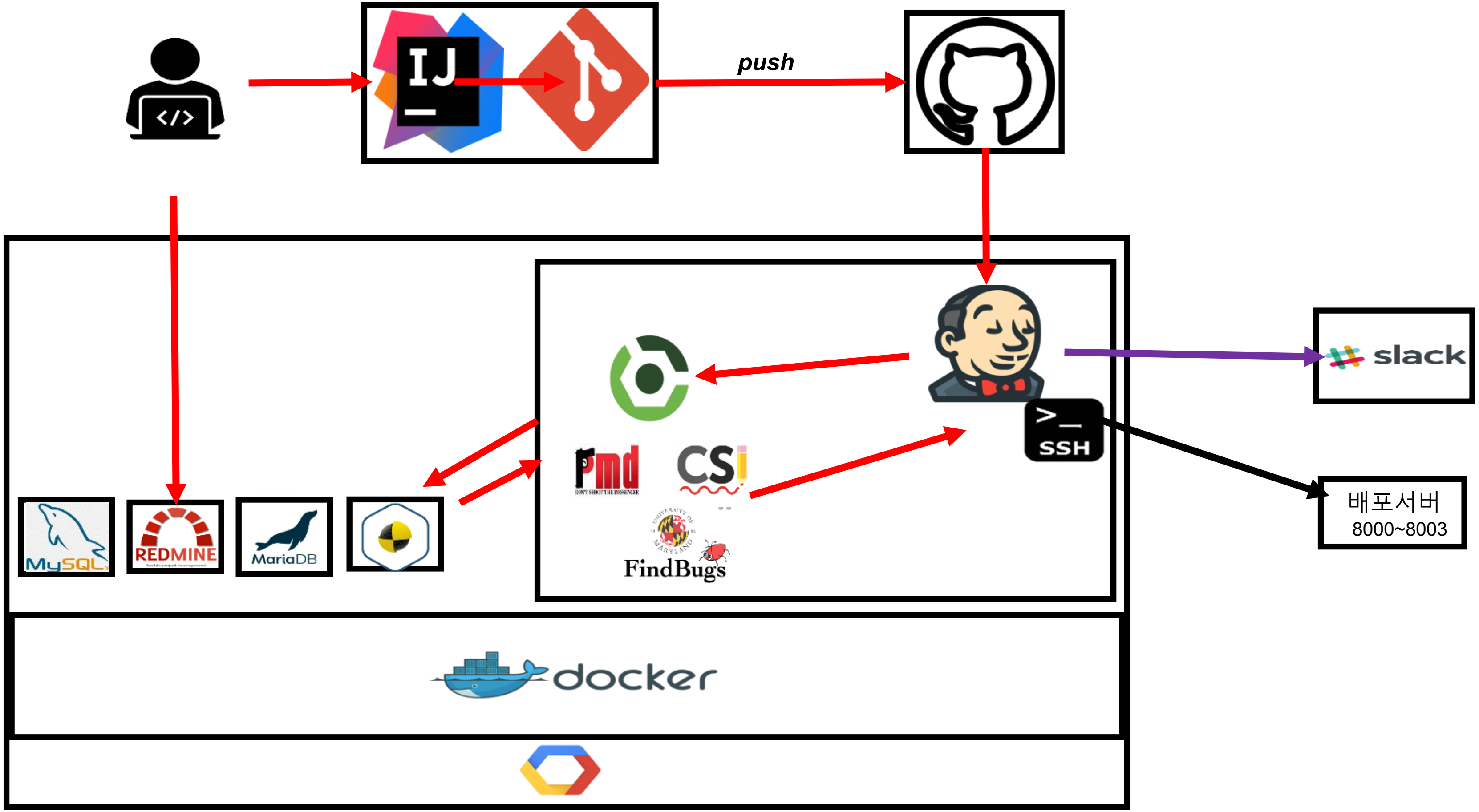
3조
소 경현
이 정우
주 재빈

INDEX

1. Service Architecture
2. Instance Management Tool
3. Static Analysis
4. Test Case Generation

Service Outlines

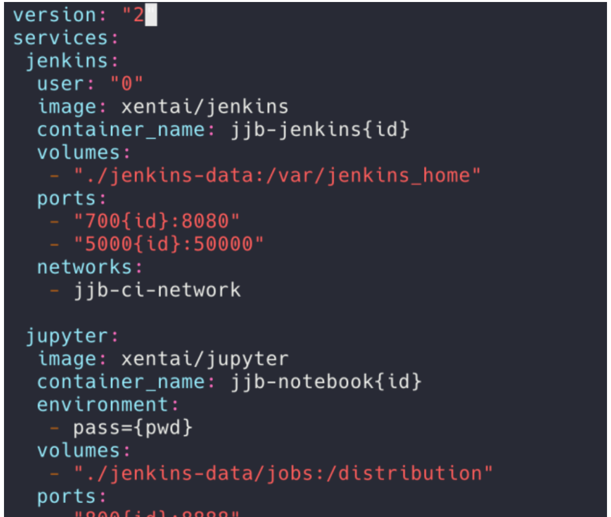
Service Architecture



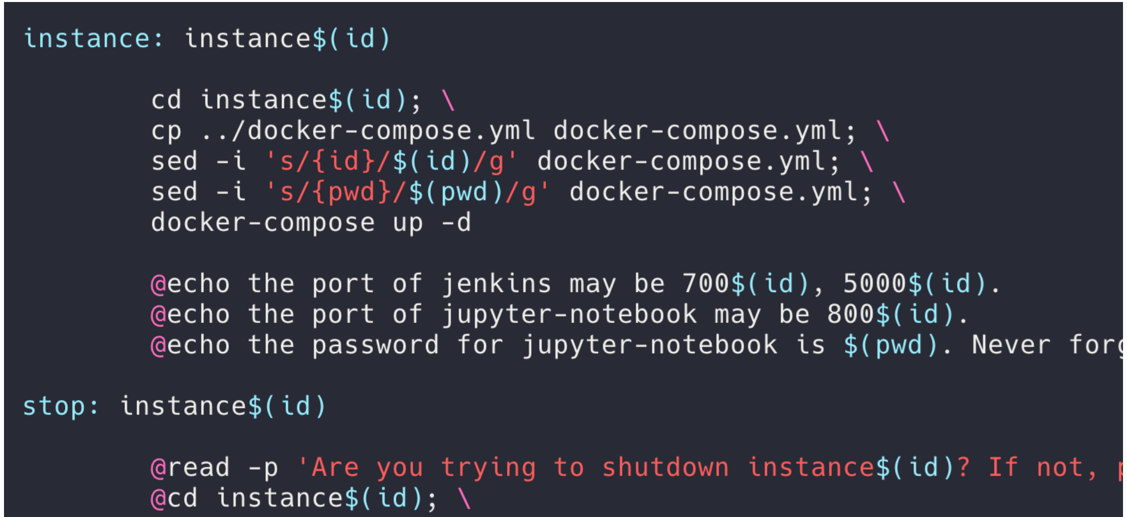
Instance Management Tool

docker-compose + Makefile

- 젠킨스와 배포서버의 컨테이너 생성에 소요되는 작업을 배치화 하려 함
- docker-compose 파일과 Makefile, 플레이스 홀더 치환으로 구현가능
  - **인스턴스 생성** make instance id=[0-9] pwd=.*
  - **인스턴스 정지** make stop id=[0-9]
  - **인스턴스 제거** make rm id=[0-9]
  - **인스턴스 마이그레이션** make migrate from=[0-9] to=[0-9]



```
version: "2
services:
 jenkins:
  user: "0"
  image: xentai/jenkins
  container_name: jjb-jenkins{id}
  volumes:
   - "./jenkins-data:/var/jenkins_home"
  ports:
   - "700{id}:8080"
   - "5000{id}:50000"
  networks:
   - jjb-ci-network

 jupyter:
  image: xentai/jupyter
  container_name: jjb-notebook{id}
  environment:
   - pass={pwd}
  volumes:
   - "./jenkins-data/jobs:/distribution"
  ports:
   - "800{id}:8888"
```



```
instance: instance$(id)

        cd instance$(id); \
        cp ../docker-compose.yml docker-compose.yml; \
        sed -i 's/{id}/$(id)/g' docker-compose.yml; \
        sed -i 's/{pwd}/$(pwd)/g' docker-compose.yml; \
        docker-compose up -d

        @echo the port of jenkins may be 700$(id), 5000$(id).
        @echo the port of jupyter-notebook may be 800$(id).
        @echo the password for jupyter-notebook is $(pwd). Never forg

stop: instance$(id)

        @read -p 'Are you trying to shutdown instance$(id)? If not,
        @cd instance$(id); \
```

Static Analysis Tools

Static Analysis Tools

Checkstyle :

- 코딩 스타일 규칙을 정의하여 체크해줌. 프로그램 유지 및 보수에 용이.

PMD(Programming Mistake Detector) :

- 문법적으로 오류 가능성이 높은 항목들을 체크

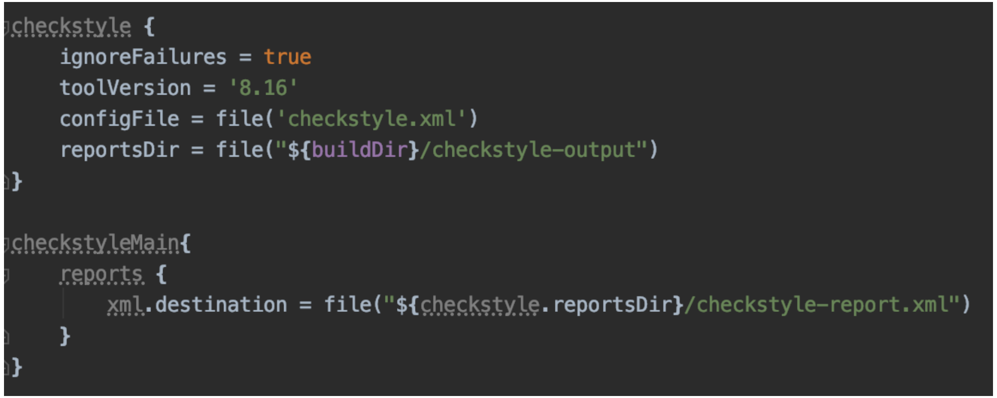
Findbugs :

- 기본적으로 발생할 수 있는 결함을 확인하고 Report.
- 소스코드가 아닌 바이트코드를 이용하여 잠재적 결함 체크.

Static Analysis Tools : 1.Checkstyle

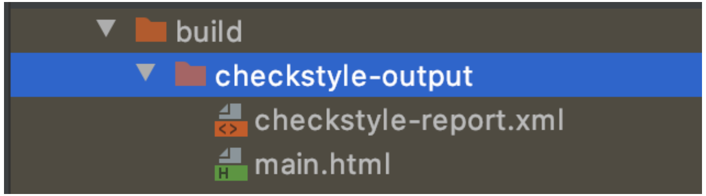
- 코딩 규약을 설정(checkstyle.xml)하고, 이 규약에 벗어난 오류들을 잡아준다.
- 코딩 규약은 보통 Google에서 사용하는 .xml파일을 이용한다.

build.gradle



```
checkstyle {
    ignoreFailures = true
    toolVersion = '8.16'
    configFile = file('checkstyle.xml')
    reportsDir = file("${buildDir}/checkstyle-output")
}

checkstyleMain{
    reports {
        xml.destination = file("${checkstyle.reportsDir}/checkstyle-report.xml")
    }
}
```

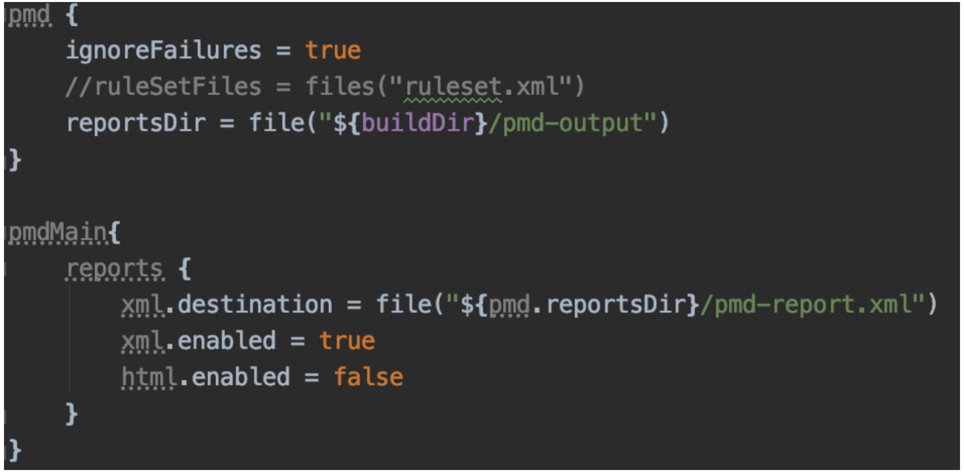
build후에 확인



Static Analysis Tools : 2.PMD

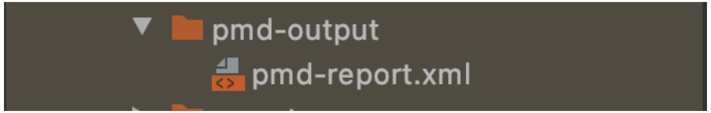
- 소스코드를 분석하여 오류가 날 만한 부분들을 Check.
- ruleSet을 지정하여 customizing 할 수 있다.

build.gradle



```
pmd {
    ignoreFailures = true
    //ruleSetFiles = files("ruleset.xml")
    reportsDir = file("${buildDir}/pmd-output")
}

pmdMain{
    reports {
        xml.destination = file("${pmd.reportsDir}/pmd-report.xml")
        xml.enabled = true
        html.enabled = false
    }
}
```

build후에 확인

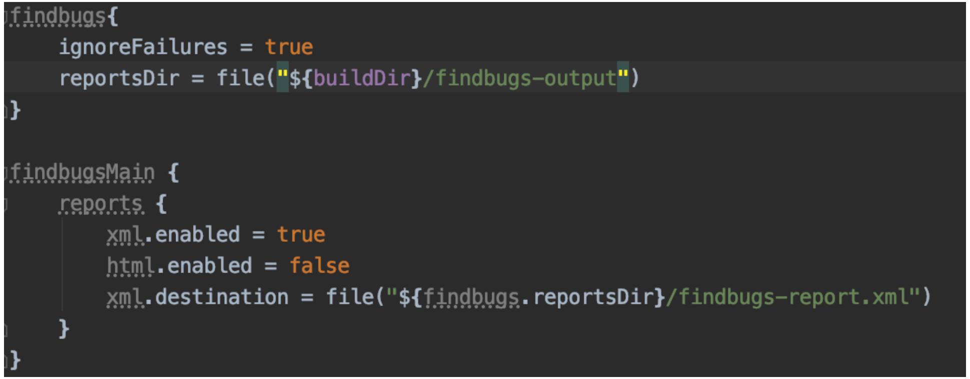


```
▼ pmd-output
    pmd-report.xml
```

Static Analysis Tools : 3.Findbugs

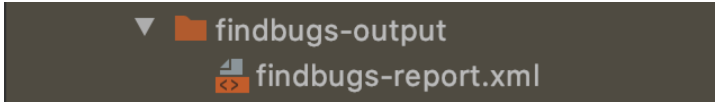
- 바이트코드를 사용하여 결함 체크, 결함 체크의 정확도가 가장 높다.
- sourceSets 로 체크할 sourceSet을 지정하여 실행할 수 있다.
- excludeFilter로 customizing이 가능하다.

build.gradle



```
findbugs{
    ignoreFailures = true
    reportsDir = file("${buildDir}/findbugs-output")
}

findbugsMain {
    reports {
        xml.enabled = true
        html.enabled = false
        xml.destination = file("${findbugs.reportsDir}/findbugs-report.xml")
    }
}
```

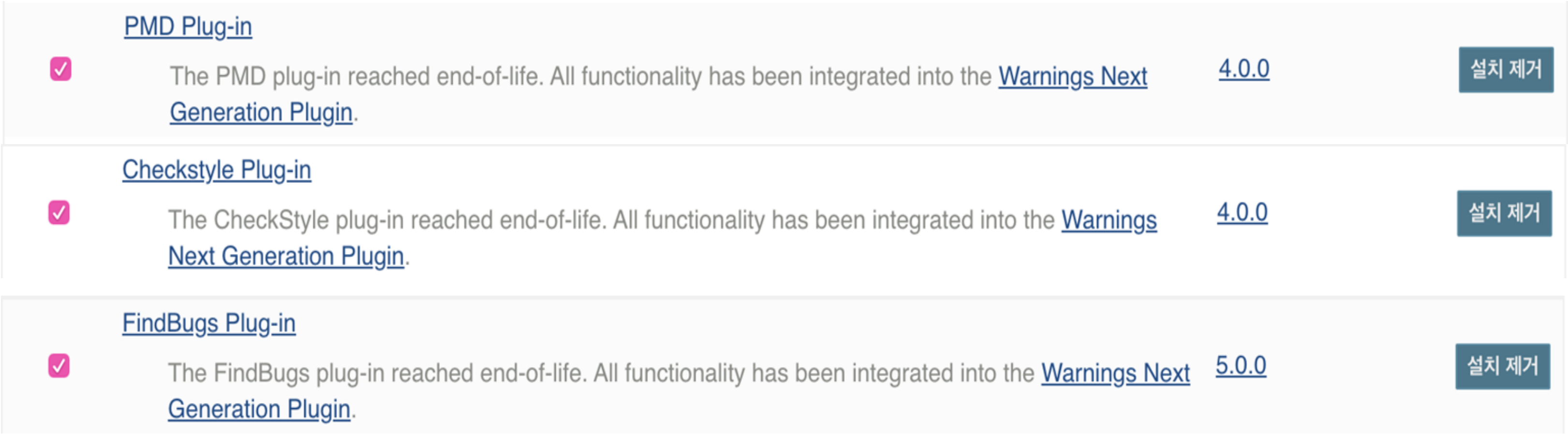
build후에 확인



```
▼ findbugs-output
     findbugs-report.xml
```

Applying Static Analysis Tools to Jenkins

- Jenkins 관리 -> Plugin 관리 -> 다음 Plugin 설치



☑ PMD Plug-in

The PMD plug-in reached end-of-life. All functionality has been integrated into the Warnings Next Generation Plugin.

4.0.0

☑ Checkstyle Plug-in

The CheckStyle plug-in reached end-of-life. All functionality has been integrated into the Warnings Next Generation Plugin.

4.0.0

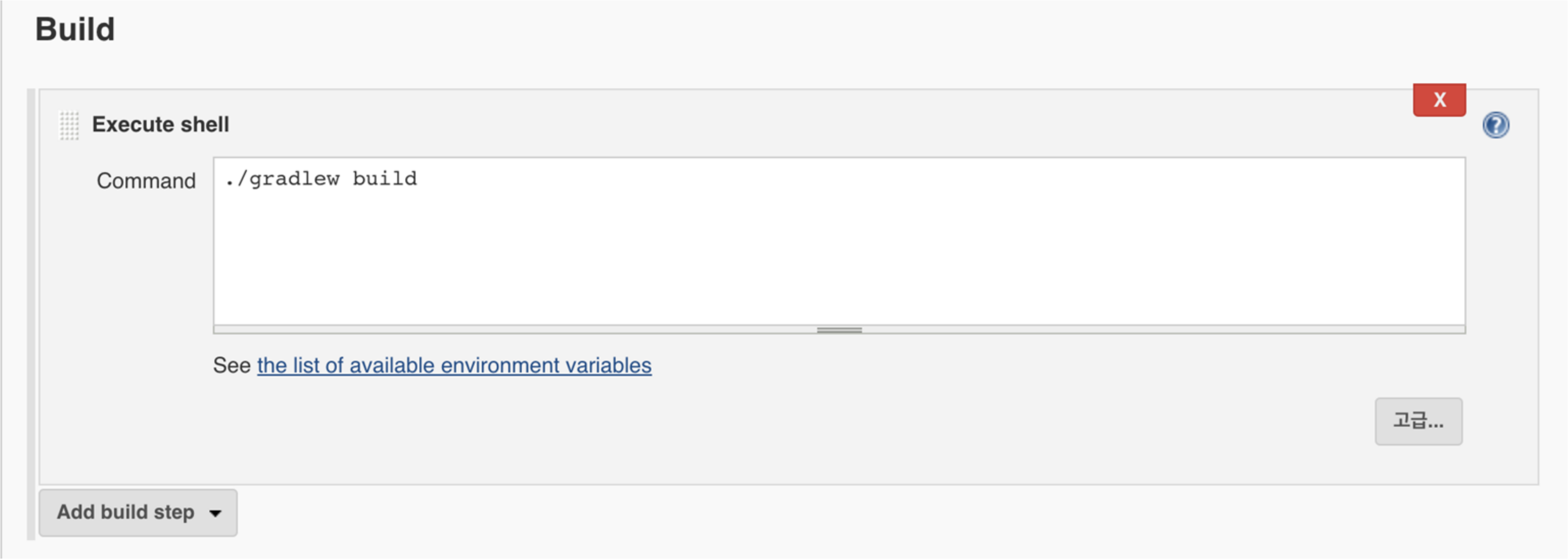
☑ FindBugs Plug-in

The FindBugs plug-in reached end-of-life. All functionality has been integrated into the Warnings Next Generation Plugin.

5.0.0

Applying Static Analysis Tools to Jenkins

- 자신의 Project -> 구성 -> Build



Build

Execute shell

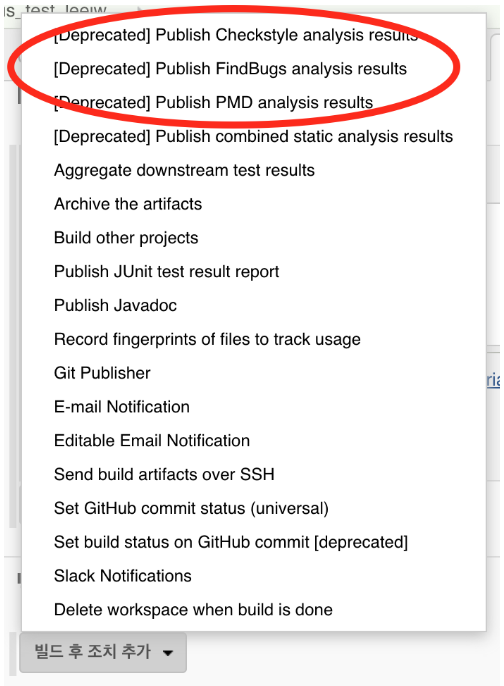
Command

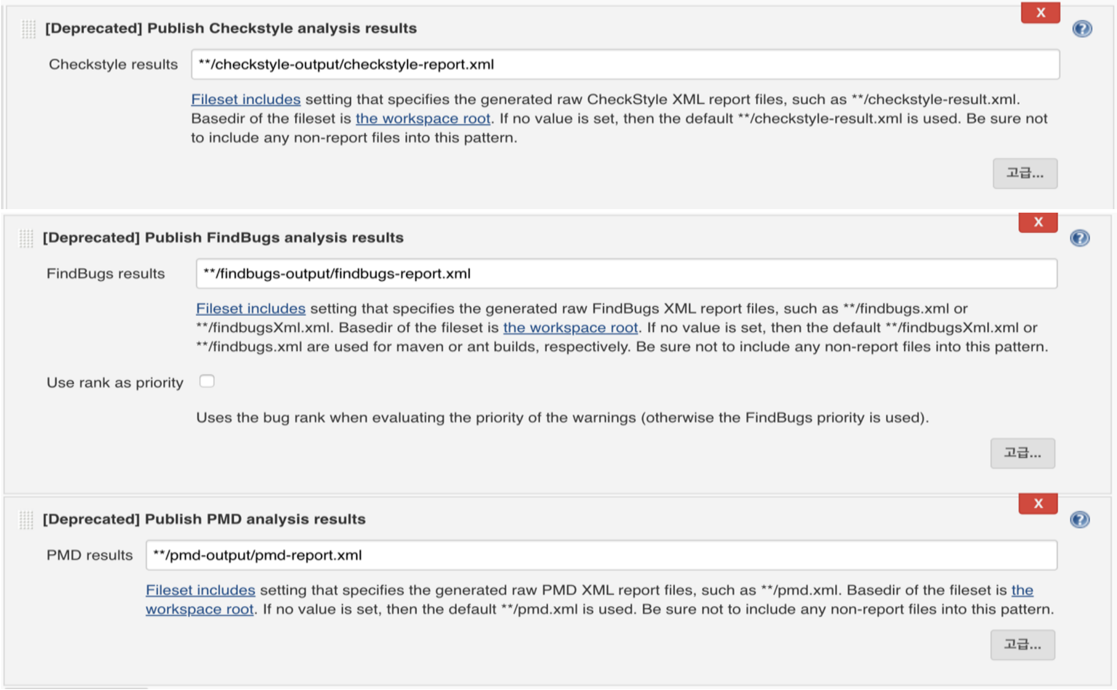
```
./gradlew build
```

See the list of available environment variables

Applying Static Analysis Tools to Jenkins

- 자신의 Project -> 구성 -> 빌드 후 조치


[Deprecated] Publish Checkstyle analysis results
[Deprecated] Publish FindBugs analysis results
[Deprecated] Publish PMD analysis results
[Deprecated] Publish combined static analysis results
Aggregate downstream test results
Archive the artifacts
Build other projects
Publish JUnit test result report
Publish Javadoc
Record fingerprints of files to track usage
Git Publisher
E-mail Notification
Editable Email Notification
Send build artifacts over SSH
Set GitHub commit status (universal)
Set build status on GitHub commit [deprecated]
Slack Notifications
Delete workspace when build is done
빌드 후 조치 추가



[Deprecated] Publish Checkstyle analysis results

Checkstyle results: **/checkstyle-output/checkstyle-report.xml

Fileset includes setting that specifies the generated raw CheckStyle XML report files, such as **/checkstyle-result.xml. Basedir of the fileset is the workspace root. If no value is set, then the default **/checkstyle-result.xml is used. Be sure not to include any non-report files into this pattern.

[Deprecated] Publish FindBugs analysis results

FindBugs results: **/findbugs-output/findbugs-report.xml

Fileset includes setting that specifies the generated raw FindBugs XML report files, such as **/findbugs.xml or **/findbugsXml.xml. Basedir of the fileset is the workspace root. If no value is set, then the default **/findbugsXml.xml or **/findbugs.xml are used for maven or ant builds, respectively. Be sure not to include any non-report files into this pattern.

Use rank as priority □

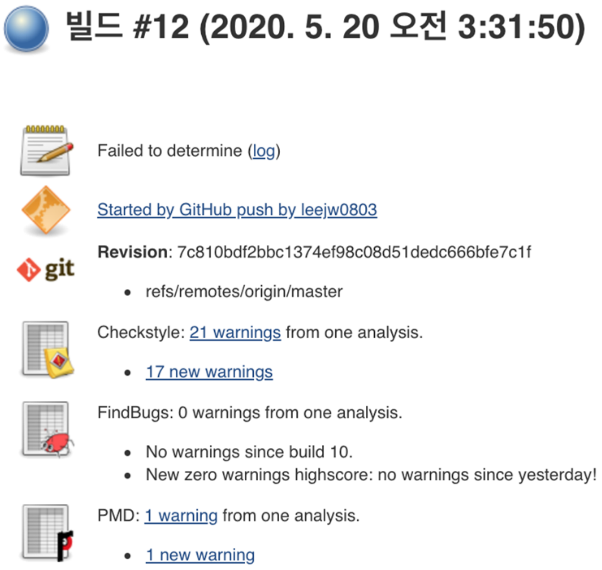
Uses the bug rank when evaluating the priority of the warnings (otherwise the FindBugs priority is used).

[Deprecated] Publish PMD analysis results

PMD results: **/pmd-output/pmd-report.xml

Fileset includes setting that specifies the generated raw PMD XML report files, such as **/pmd.xml. Basedir of the fileset is the workspace root. If no value is set, then the default **/pmd.xml is used. Be sure not to include any non-report files into this pattern.

Build Example



빌드 #12 (2020. 5. 20 오전 3:31:50)

Failed to determine (log)

Started by GitHub push by leejw0803

Revision: 7c810bdf2bbc1374ef98c08d51dedc666bfe7c1f

- refs/remotes/origin/master

Checkstyle: 21 warnings from one analysis.

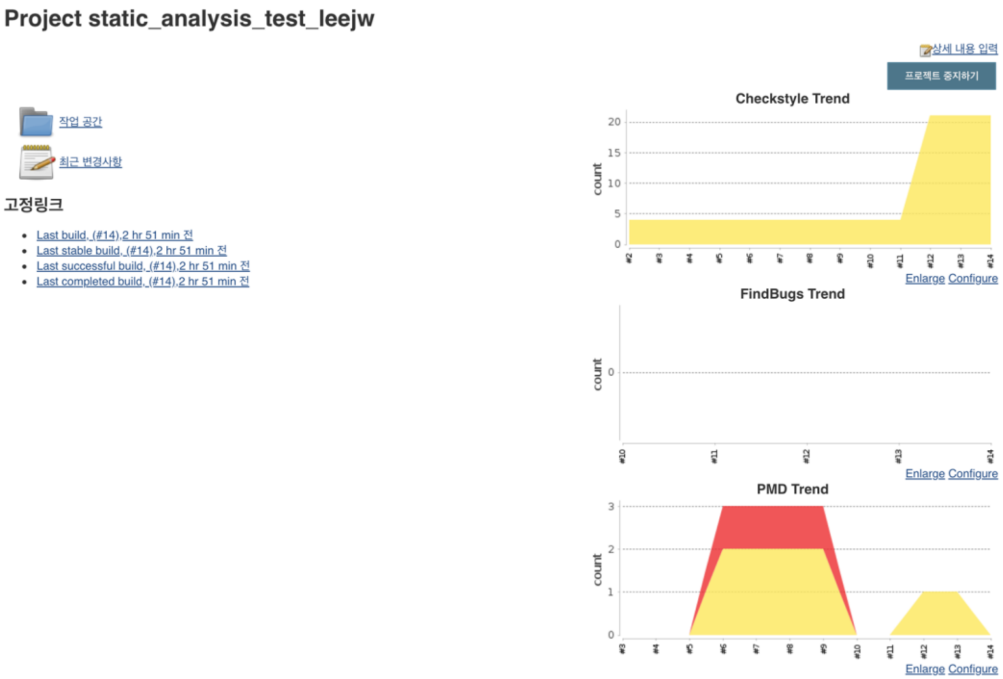
- 17 new warnings

FindBugs: 0 warnings from one analysis.

- No warnings since build 10.
- New zero warnings highscore: no warnings since yesterday!

PMD: 1 warning from one analysis.

- 1 new warning



Project static_analysis_test_leejw

고정링크

- Last build, (#14),2 hr 51 min 전
- Last stable build, (#14),2 hr 51 min 전
- Last successful build, (#14),2 hr 51 min 전
- Last completed build, (#14),2 hr 51 min 전

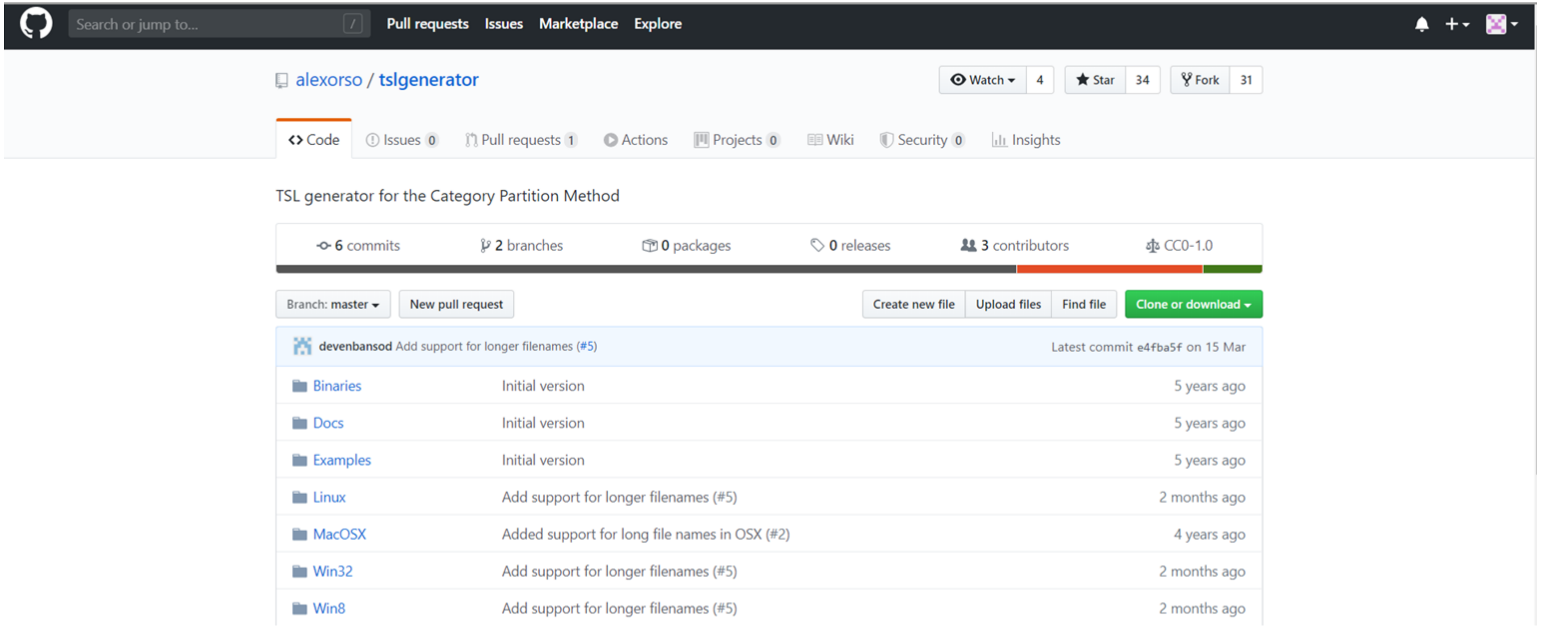
Test Case Generation

1. TSL generator
2. PICT

TSL generator

Category Partitioning을 위한 test case 자동생성 프로그램

URL : https://github.com/alexorso/tslgenerator

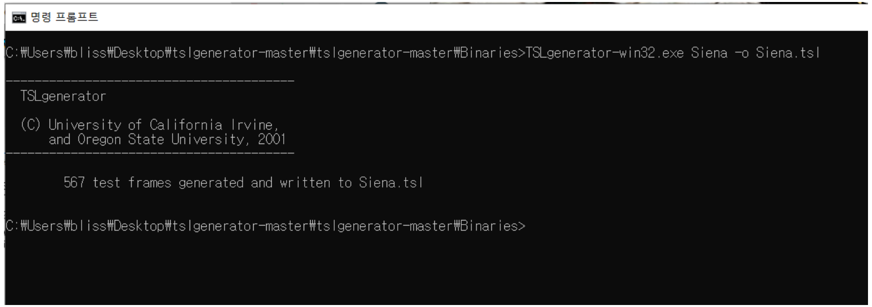


TSL generator for the Category Partition Method

devenbansod Add support for longer filenames (#5) Latest commit e4fba5f on 15 Mar

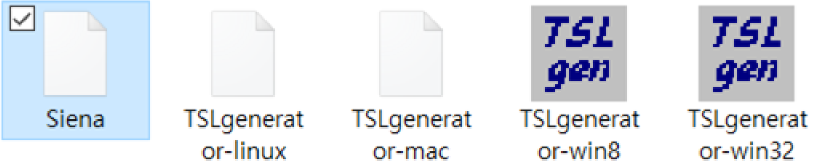
Binaries	Initial version	5 years ago
Docs	Initial version	5 years ago
Examples	Initial version	5 years ago
Linux	Add support for longer filenames (#5)	2 months ago
MacOSX	Added support for long file names in OSX (#2)	4 years ago
Win32	Add support for longer filenames (#5)	2 months ago
Win8	Add support for longer filenames (#5)	2 months ago

Generating .tsl File

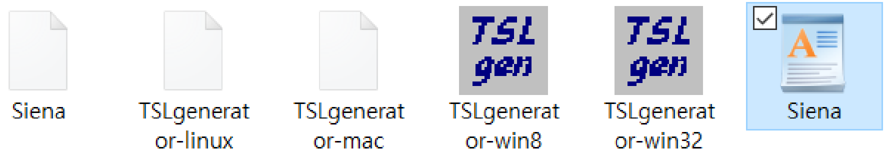


```
C:₩Users₩bliss₩Desktop₩tslgenerator-master₩tslgenerator-master₩Binaries>TSLgenerator-win32.exe Siena -o Siena.tsl

________________________________________
  TSLgenerator

  (C) University of California Irvine,
      and Oregon State University, 2001
________________________________________

        567 test frames generated and written to Siena.tsl

C:₩Users₩bliss₩Desktop₩tslgenerator-master₩tslgenerator-master₩Binaries>
```

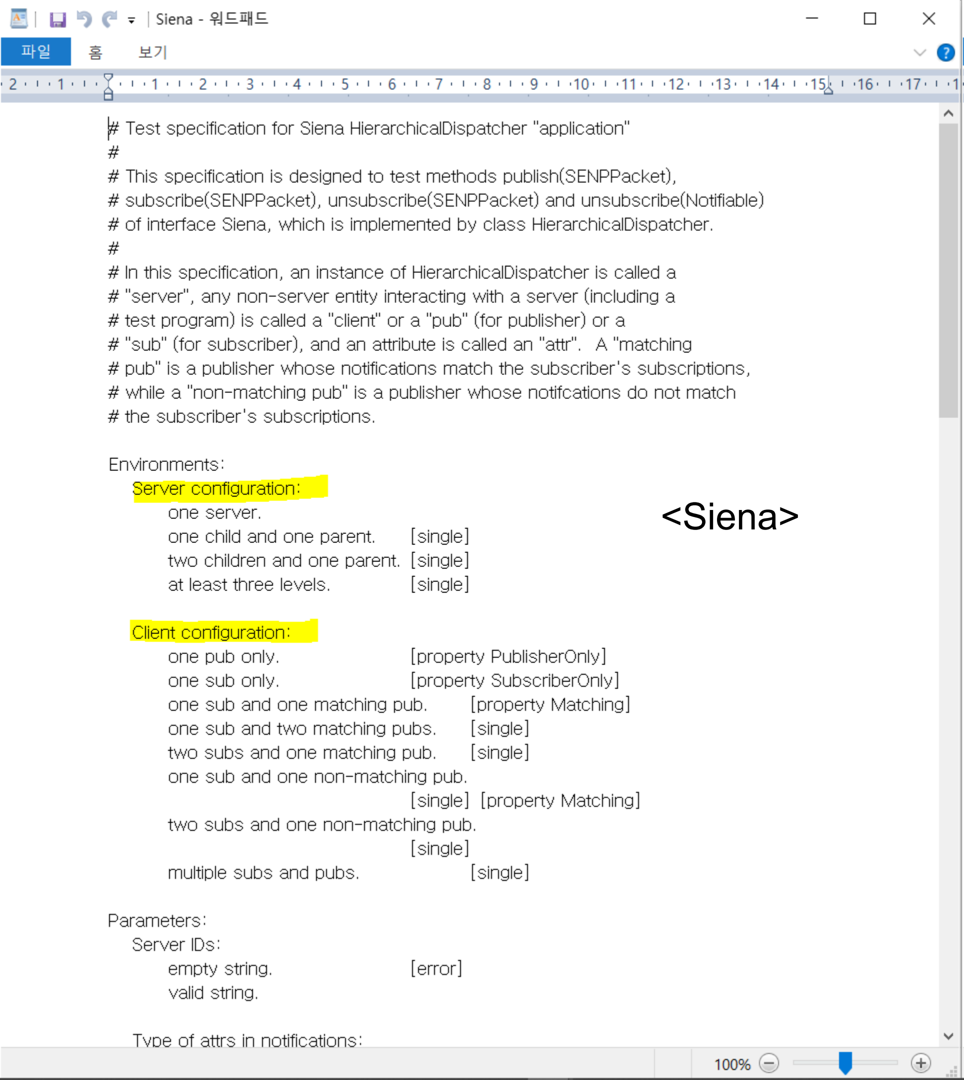
명령어 : TSLgenerator-win32.exe Siena -o Siena.tsl



- TSL generator 설치 시 제공되는 Siena 파일을 사용
- category와 representative value가 담긴 파일을 [Binaries] 폴더로 이동

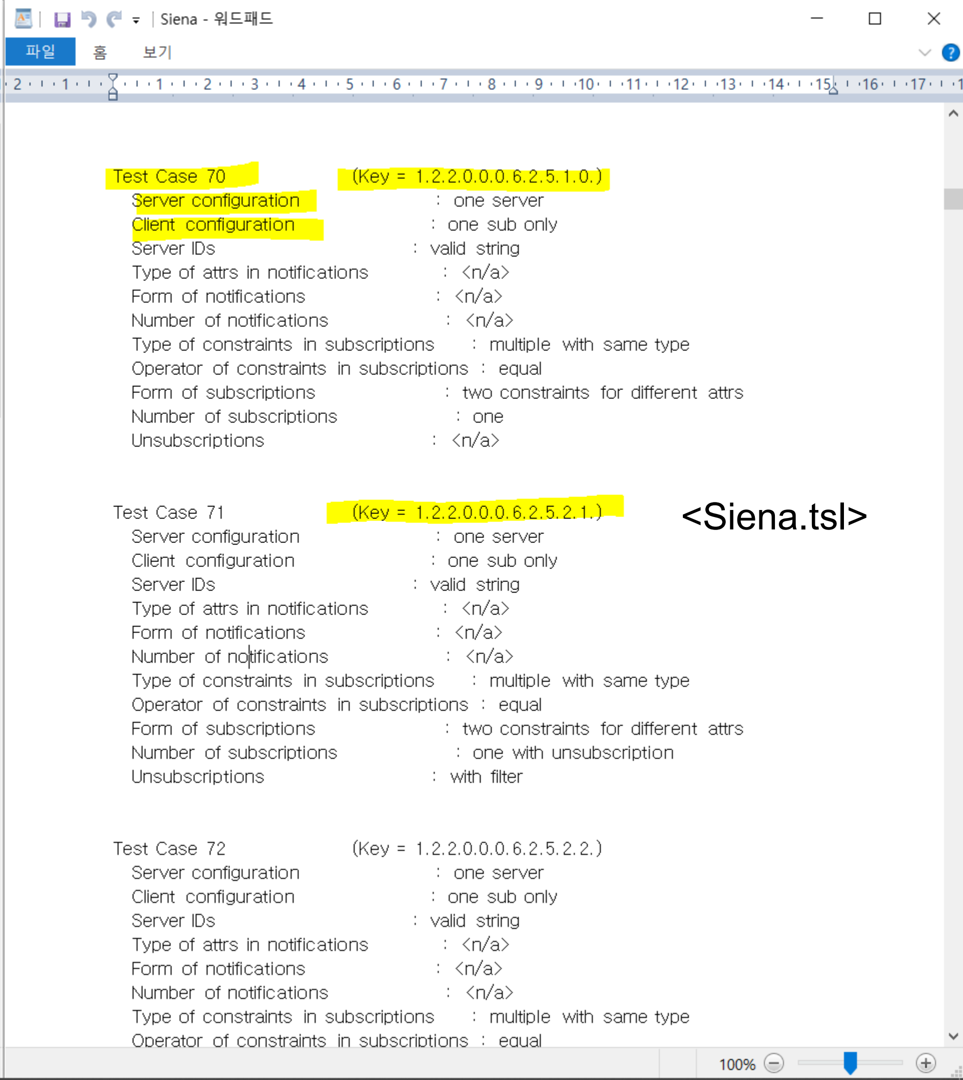


Siena.tsl 파일 생성



<Siena>

```
# Test specification for Siena HierarchicalDispatcher "application"
#
# This specification is designed to test methods publish(SENPPacket),
# subscribe(SENPPacket), unsubscribe(SENPPacket) and unsubscribe(Notifiable)
# of interface Siena, which is implemented by class HierarchicalDispatcher.
#
# In this specification, an instance of HierarchicalDispatcher is called a
# "server", any non-server entity interacting with a server (including a
# test program) is called a "client" or a "pub" (for publisher) or a
# "sub" (for subscriber), and an attribute is called an "attr".   A "matching
# pub" is a publisher whose notifications match the subscriber's subscriptions,
# while a "non-matching pub" is a publisher whose notifcations do not match
# the subscriber's subscriptions.

Environments:
    Server configuration:
        one server.
        one child and one parent.    [single]
        two children and one parent. [single]
        at least three levels.       [single]

    Client configuration:
        one pub only.                [property PublisherOnly]
        one sub only.                [property SubscriberOnly]
        one sub and one matching pub.       [property Matching]
        one sub and two matching pubs.      [single]
        two subs and one matching pub.      [single]
        one sub and one non-matching pub.
                                     [single]  [property Matching]
        two subs and one non-matching pub.
                                     [single]
        multiple subs and pubs.             [single]

Parameters:
    Server IDs:
        empty string.                [error]
        valid string.

    Type of attrs in notifications:
```

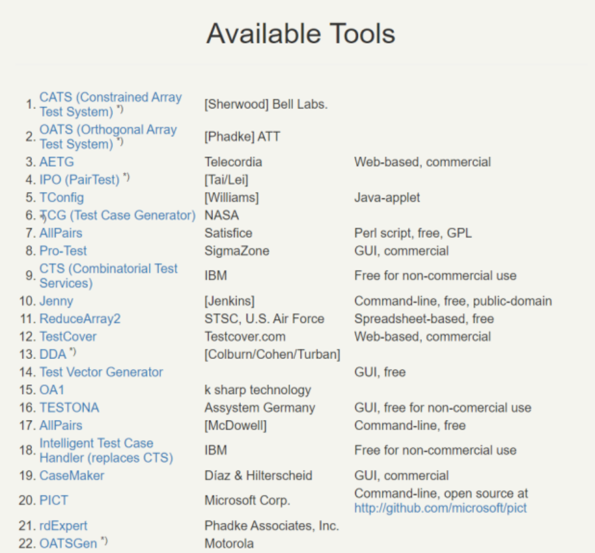


<Siena.tsl>

```
Test Case 70            (Key = 1.2.2.0.0.0.6.2.5.1.0.)
   Server configuration                       :  one server
   Client configuration                       :  one sub only
   Server IDs                              :  valid string
   Type of attrs in notifications              :  <n/a>
   Form of notifications                      :  <n/a>
   Number of notifications                     :  <n/a>
   Type of constraints in subscriptions        :  multiple with same type
   Operator of constraints in subscriptions  :  equal
   Form of subscriptions                       :  two constraints for different attrs
   Number of subscriptions                      :  one
   Unsubscriptions                            :  <n/a>


Test Case 71            (Key = 1.2.2.0.0.0.6.2.5.2.1.)
   Server configuration                       :  one server
   Client configuration                       :  one sub only
   Server IDs                              :  valid string
   Type of attrs in notifications              :  <n/a>
   Form of notifications                      :  <n/a>
   Number of notifications                     :  <n/a>
   Type of constraints in subscriptions        :  multiple with same type
   Operator of constraints in subscriptions  :  equal
   Form of subscriptions                       :  two constraints for different attrs
   Number of subscriptions                      :  one with unsubscription
   Unsubscriptions                            :  with filter


Test Case 72            (Key = 1.2.2.0.0.0.6.2.5.2.2.)
   Server configuration                       :  one server
   Client configuration                       :  one sub only
   Server IDs                              :  valid string
   Type of attrs in notifications              :  <n/a>
   Form of notifications                      :  <n/a>
   Number of notifications                     :  <n/a>
   Type of constraints in subscriptions        :  multiple with same type
   Operator of constraints in subscriptions  :  equal
```

PICT

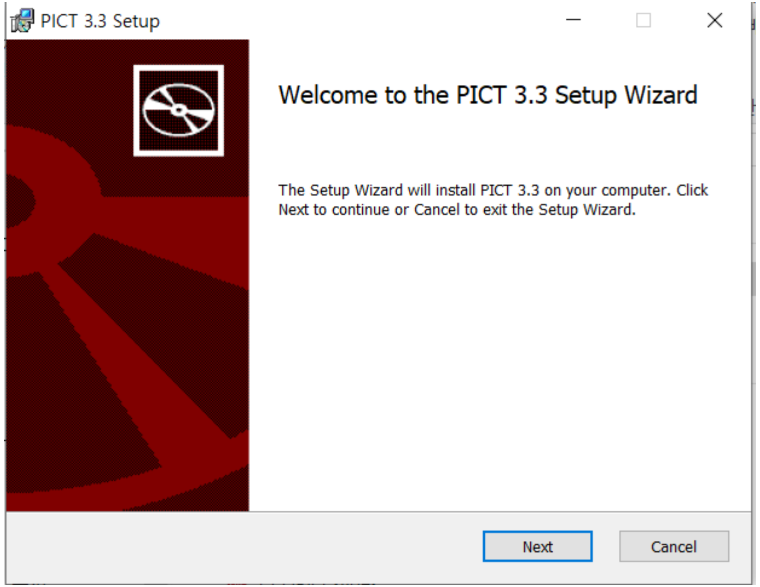
- Pairwise Independent Combinatorial Testing tool
- 모든 가능한 입력값들의 조합을 테스트하지 않고 대신 모든 짝(pair)들의 조합을 생성
- option을 설정하지 않으면 default 2-way pairwise testing을 진행한다.
- input file 생성시 적절한 문법 사용해 효율적인 test case 생성 가능
- URL : http://www.pairwise.org/tools.asp 에서 20. PICT 선택



Available Tools

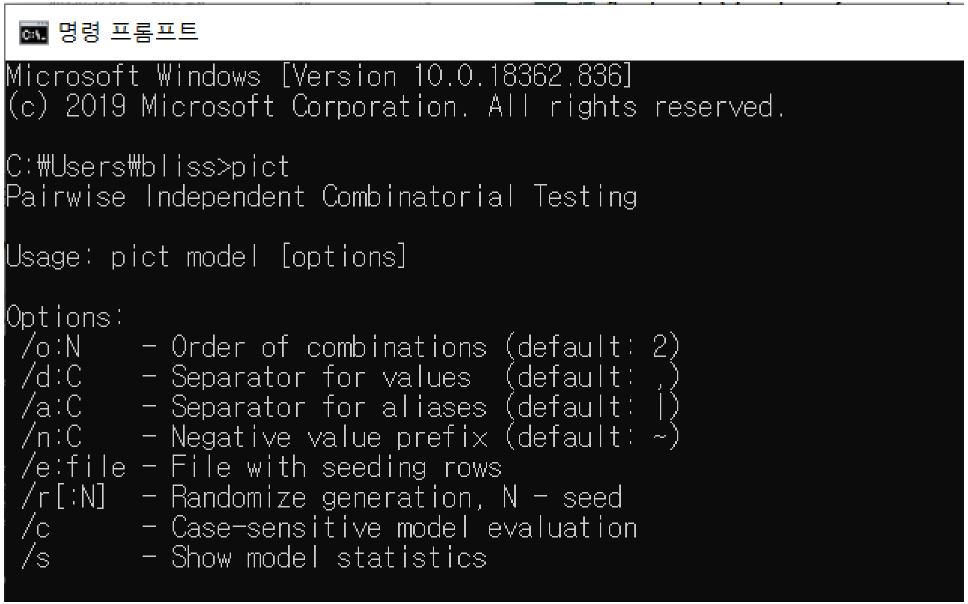
1. CATS (Constrained Array Test System) *)	[Sherwood] Bell Labs.	
2. OATS (Orthogonal Array Test System) *)	[Phadke] ATT	
3. AETG	Telecordia	Web-based, commercial
4. IPO (PairTest) *)	[Tai/Lei]	
5. TConfig	[Williams]	Java-applet
6. *)TCG (Test Case Generator)	NASA	
7. AllPairs	Satisfice	Perl script, free, GPL
8. Pro-Test	SigmaZone	GUI, commercial
9. CTS (Combinatorial Test Services)	IBM	Free for non-commercial use
10. Jenny	[Jenkins]	Command-line, free, public-domain
11. ReduceArray2	STSC, U.S. Air Force	Spreadsheet-based, free
12. TestCover	Testcover.com	Web-based, commercial
13. DDA *)	[Colburn/Cohen/Turban]	
14. Test Vector Generator		GUI, free
15. OA1	k sharp technology	
16. TESTONA	Assystem Germany	GUI, free for non-comercial use
17. AllPairs	[McDowell]	Command-line, free
18. Intelligent Test Case Handler (replaces CTS)	IBM	Free for non-commercial use
19. CaseMaker	Díaz & Hilterscheid	GUI, commercial
20. PICT	Microsoft Corp.	Command-line, open source at http://github.com/microsoft/pict
21. rdExpert	Phadke Associates, Inc.	
22. OATSGen *)	Motorola	

PICT Installation



Welcome to the PICT 3.3 Setup Wizard

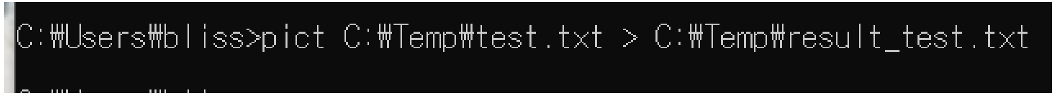
The Setup Wizard will install PICT 3.3 on your computer. Click Next to continue or Cancel to exit the Setup Wizard.



```
Microsoft Windows [Version 10.0.18362.836]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Users\bliss>pict
Pairwise Independent Combinatorial Testing

Usage: pict model [options]

Options:
 /o:N    - Order of combinations (default: 2)
 /d:C    - Separator for values  (default: ,)
 /a:C    - Separator for aliases (default: |)
 /n:C    - Negative value prefix (default: ~)
 /e:file - File with seeding rows
 /r[:N]  - Randomize generation, N - seed
 /c      - Case-sensitive model evaluation
 /s      - Show model statistics
```

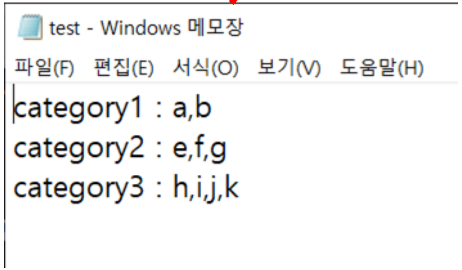
정상 설치시 pict 명령어 입력화면

PICT Installation

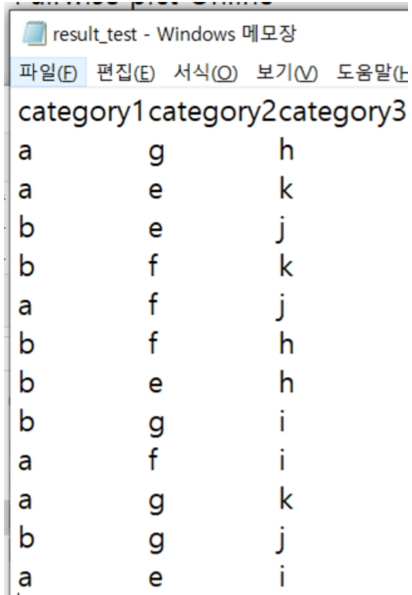


```
C:₩Users₩bliss>pict C:₩Temp₩test.txt > C:₩Temp₩result_test.txt
```

- 명령어 형식 : pict 조건입력파일.txt > 출력파일.txt
- 환경변수 설정시 파일의 경로를 적어주지않고도 출력파일을 생성할 수 있다.
- 옵션 미설정시 2-way pairwise testing진행 (default : 2) 적용



```
category1 : a,b
category2 : e,f,g
category3 : h,i,j,k
```


result_test - Windows 메모장
파일(F) 편집(E) 서식(O) 보기(V) 도움말(H

```
category1category2category3
a	g	h
a	e	k
b	e	j
b	f	k
a	f	j
b	f	h
b	e	h
b	g	i
a	f	i
a	g	k
b	g	j
a	e	i
```