NuFTA Testing

Logic Package

FSM Part

200711472 진교선
200511349 장기웅
200511310 김진규
200711004 강정희

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Pairwise Test Case Generator

- ✓Pairwise Test
- ✓Pairwise Tools
- ✓Pros & Cons of Each Tools

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Tools

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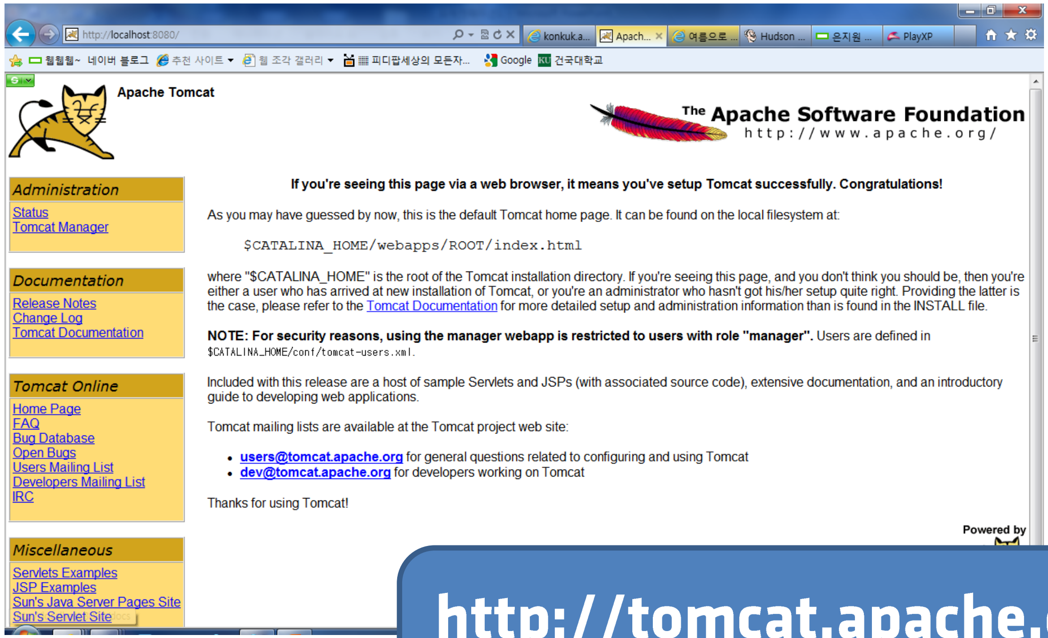
Environment For CTIP

OverView

- CI Server – Hudson
  - WAS : Tomcat 6.0
- CM Tool – VisualSVN(Subversion)
- Unit Testing Tool – Junit
- Build Automation Tool – Ant
- Requirement Management Tool - JFeature

Environment For CTIP

Apache Tomcat 6.0



Administration
Status
Tomcat Manager

Documentation
Release Notes
Change Log
Tomcat Documentation

Tomcat Online
Home Page
FAQ
Bug Database
Open Bugs
Users Mailing List
Developers Mailing List
IRC

Miscellaneous
Servlets Examples
JSP Examples
Sun's Java Server Pages Site
Sun's Servlet Site

If you're seeing this page via a web browser, it means you've setup Tomcat successfully. Congratulations!

As you may have guessed by now, this is the default Tomcat home page. It can be found on the local filesystem at:

```
$CATALINA_HOME/webapps/ROOT/index.html
```

where "$CATALINA_HOME" is the root of the Tomcat installation directory. If you're seeing this page, and you don't think you should be, then you're either a user who has arrived at new installation of Tomcat, or you're an administrator who hasn't got his/her setup quite right. Providing the latter is the case, please refer to the Tomcat Documentation for more detailed setup and administration information than is found in the INSTALL file.

NOTE: For security reasons, using the manager webapp is restricted to users with role "manager". Users are defined in `$CATALINA_HOME/conf/tomcat-users.xml`.

Included with this release are a host of sample Servlets and JSPs (with associated source code), extensive documentation, and an introductory guide to developing web applications.

Tomcat mailing lists are available at the Tomcat project web site:

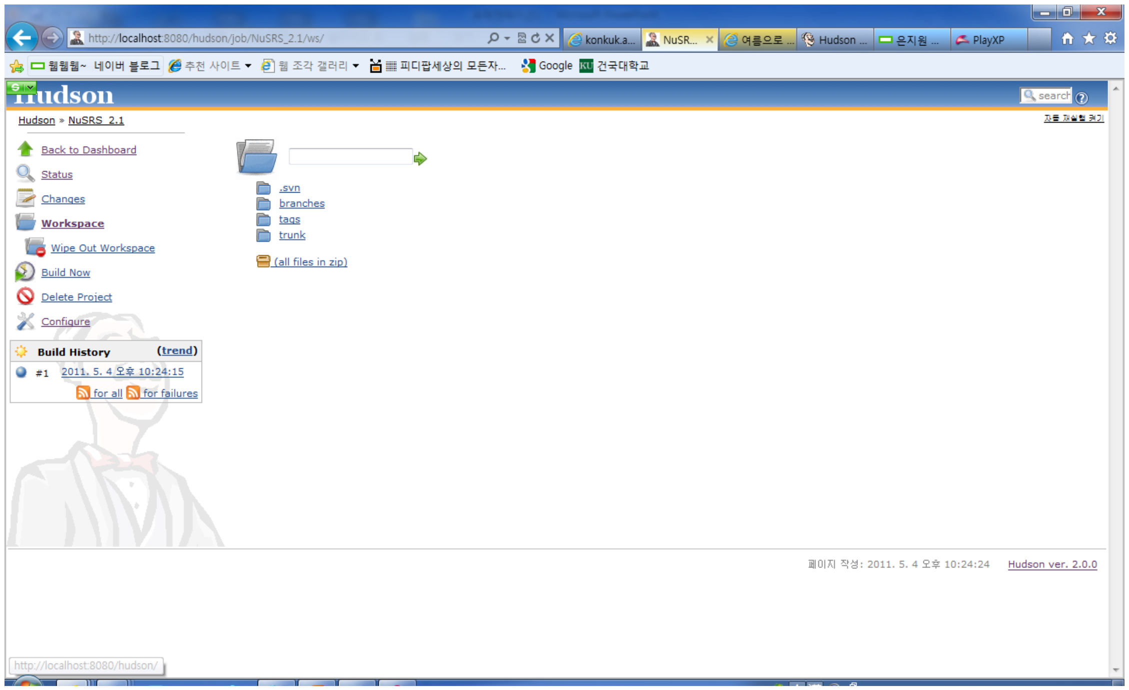
- **users@tomcat.apache.org** for general questions related to configuring and using Tomcat
- **dev@tomcat.apache.org** for developers working on Tomcat

Thanks for using Tomcat!

http://tomcat.apache.org/ 접속 & 다운로드

Environment For CTIP

Hudson



Hudson » NuSRS_2.1

Back to Dashboard
Status
Changes
Workspace
Wipe Out Workspace
Build Now
Delete Project
Configure

Build History (**trend**)
#1 2011. 5. 4 오후 10:24:15
for all for failures

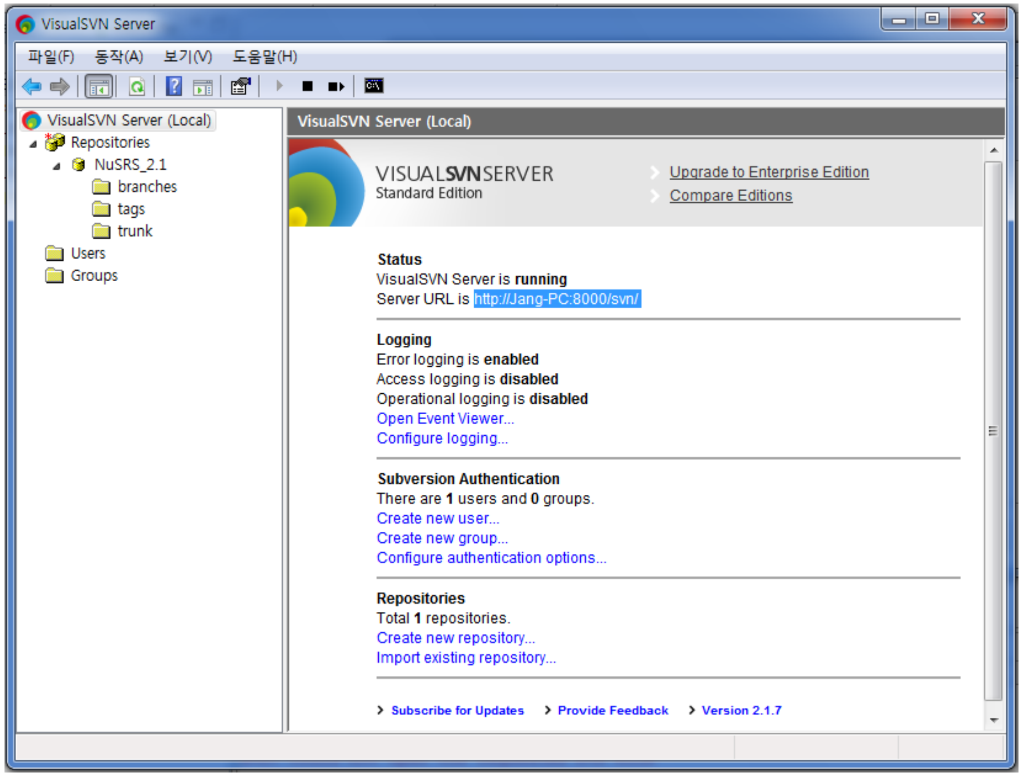
.svn
branches
tags
trunk

(all files in zip)

페이지 작성: 2011. 5. 4 오후 10:24:24 Hudson ver. 2.0.0

Environment For CTIP

VisualSVN



Status
VisualSVN Server is **running**
Server URL is http://Jang-PC:8000/svn/

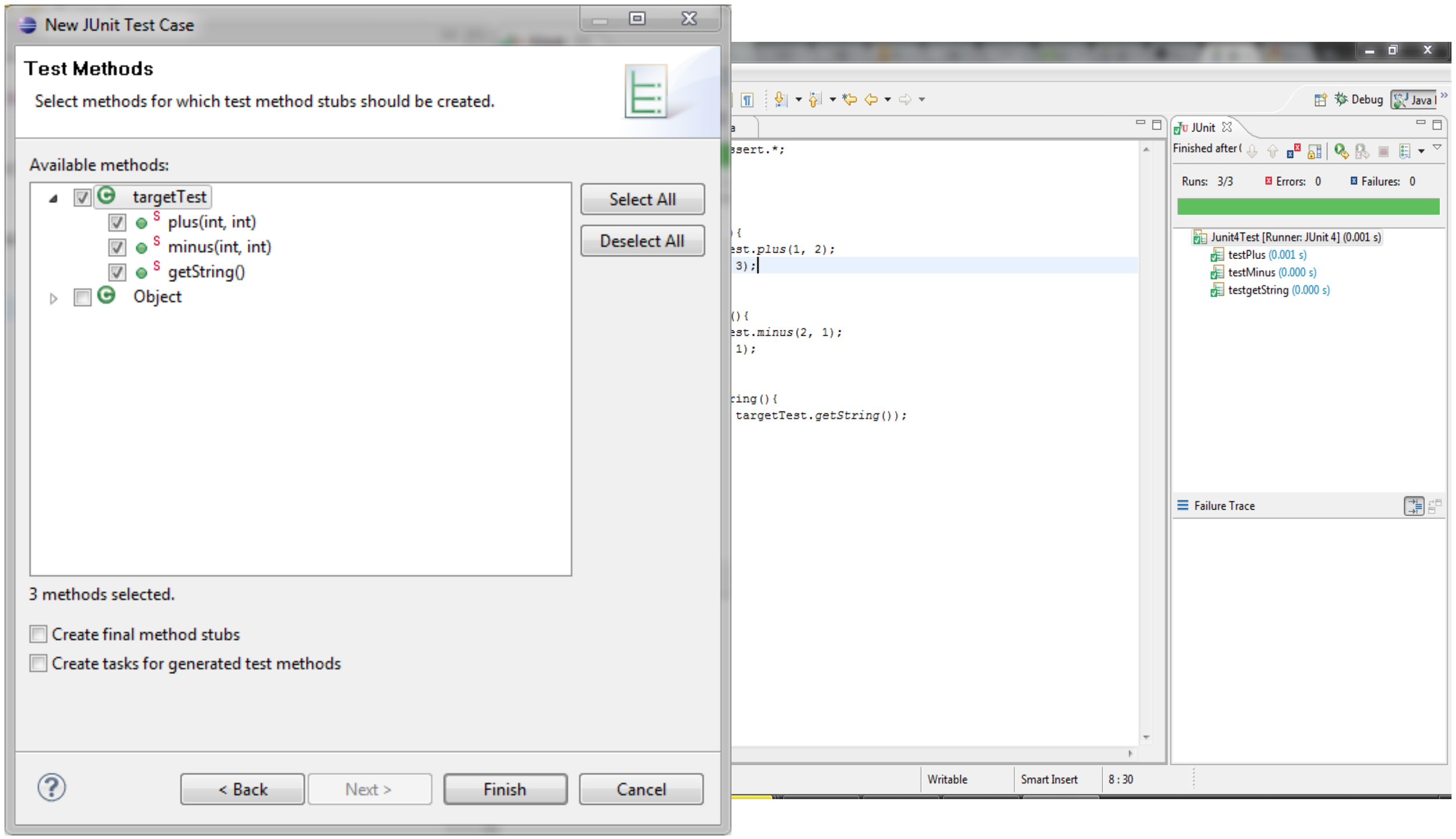
Logging
Error logging is **enabled**
Access logging is **disabled**
Operational logging is **disabled**
Open Event Viewer...
Configure logging...

Subversion Authentication
There are **1** users and **0** groups.
Create new user...
Create new group...
Configure authentication options...

Repositories
Total **1** repositories.
Create new repository...
Import existing repository...

Environment For CTIP

JUnit



New JUnit Test Case

Test Methods

Select methods for which test method stubs should be created.

Available methods:

- ☑ targetTest
  - ☑ plus(int, int)
  - ☑ minus(int, int)
  - ☑ getString()
- ☐ Object

3 methods selected.

☐ Create final method stubs

☐ Create tasks for generated test methods

```
ssert.*;

) {
est.plus(1, 2);
 3);

() {
est.minus(2, 1);
 1);

ring() {
 targetTest.getString());
```

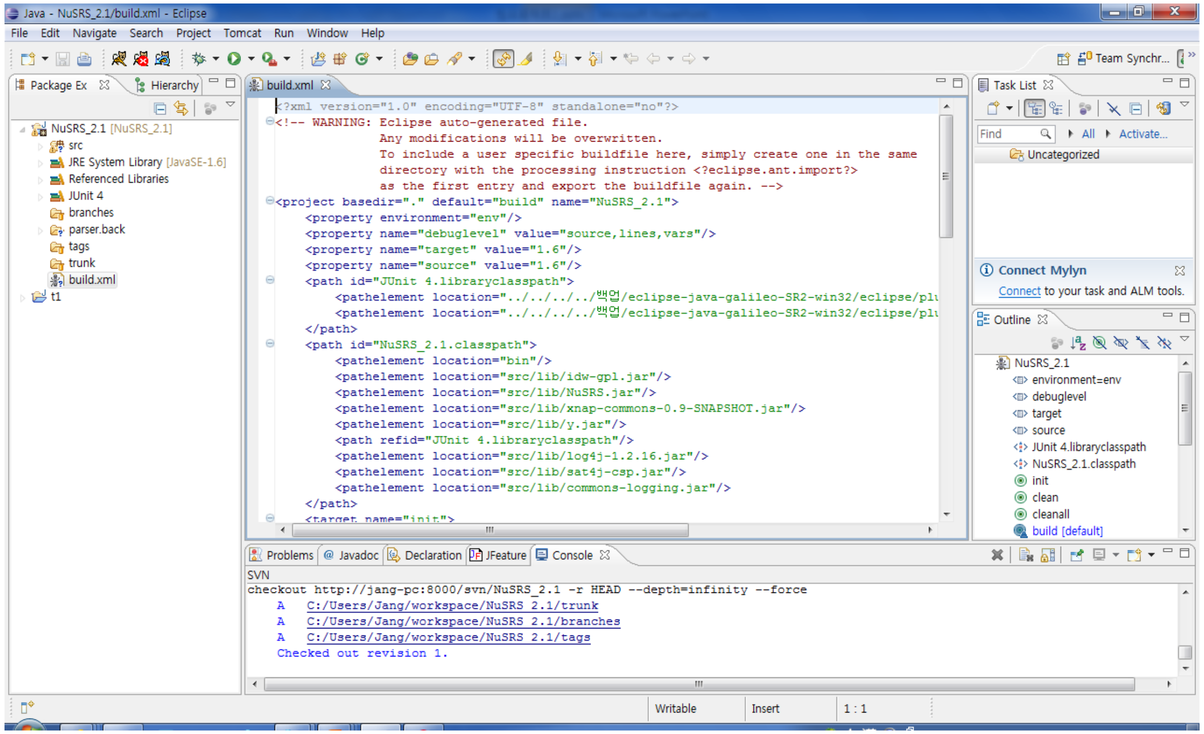
Finished after

Runs: 3/3 Errors: 0 Failures: 0

```
Junit4Test [Runner: JUnit 4] (0.001 s)
  testPlus (0.001 s)
  testMinus (0.000 s)
  testgetString (0.000 s)
```

Environment For CTIP

ANT Script



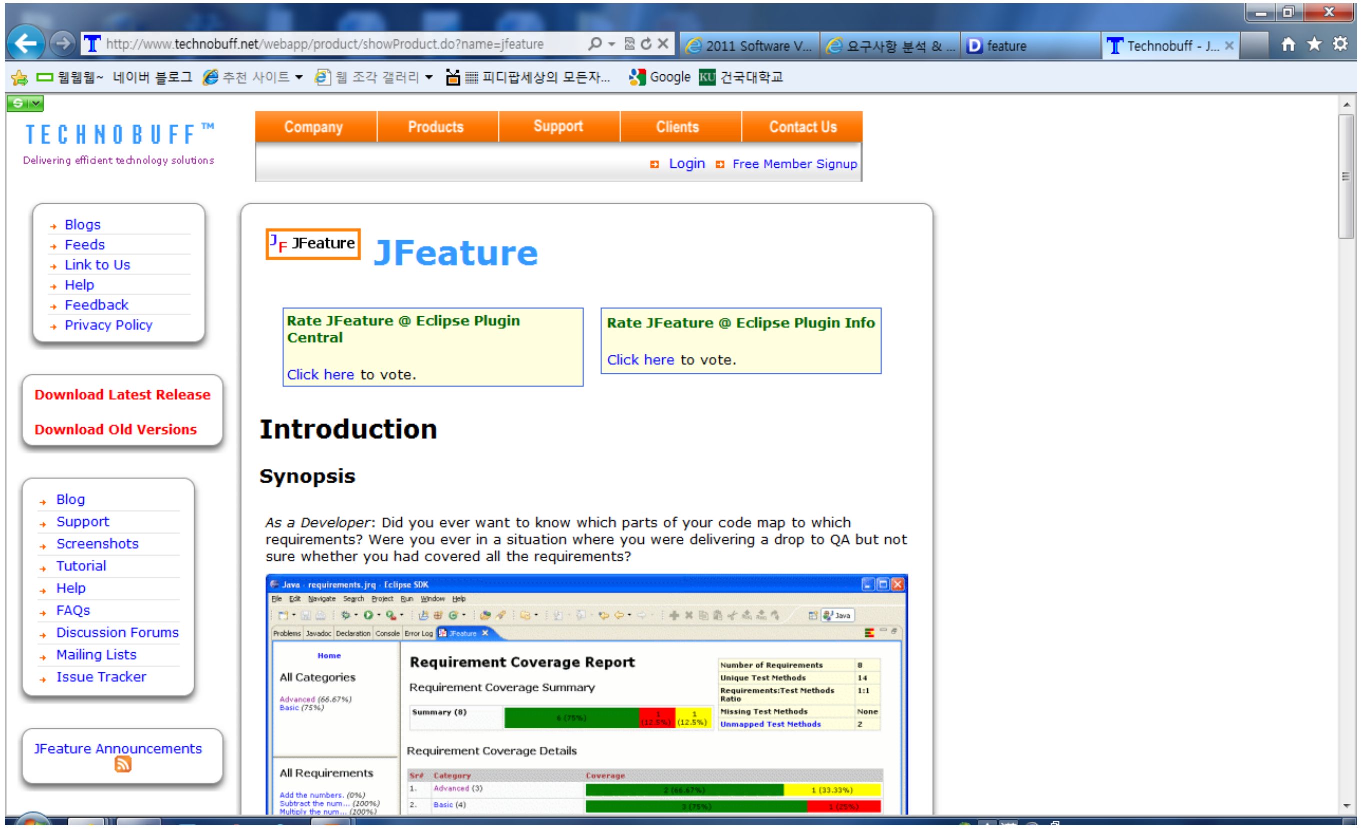
```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!-- WARNING: Eclipse auto-generated file.
              Any modifications will be overwritten.
              To include a user specific buildfile here, simply create one in the same
              directory with the processing instruction <?eclipse.ant.import?>
              as the first entry and export the buildfile again. -->
<project basedir="." default="build" name="NuSRS_2.1">
    <property environment="env"/>
    <property name="debuglevel" value="source,lines,vars"/>
    <property name="target" value="1.6"/>
    <property name="source" value="1.6"/>
    <path id="JUnit 4.libraryclasspath">
        <pathelement location="../../../../백업/eclipse-java-galileo-SR2-win32/eclipse/pl
        <pathelement location="../../../../백업/eclipse-java-galileo-SR2-win32/eclipse/pl
    </path>
    <path id="NuSRS_2.1.classpath">
        <pathelement location="bin"/>
        <pathelement location="src/lib/idw-gpl.jar"/>
        <pathelement location="src/lib/NuSRS.jar"/>
        <pathelement location="src/lib/xnap-commons-0.9-SNAPSHOT.jar"/>
        <pathelement location="src/lib/y.jar"/>
        <path refid="JUnit 4.libraryclasspath"/>
        <pathelement location="src/lib/log4j-1.2.16.jar"/>
        <pathelement location="src/lib/sat4j-csp.jar"/>
        <pathelement location="src/lib/commons-logging.jar"/>
    </path>
    <target name="init">
```

SVN

```
checkout http://jang-pc:8000/svn/NuSRS_2.1 -r HEAD --depth=infinity --force
    A   C:/Users/Jang/workspace/NuSRS_2.1/trunk
    A   C:/Users/Jang/workspace/NuSRS_2.1/branches
    A   C:/Users/Jang/workspace/NuSRS_2.1/tags
    Checked out revision 1.
```

Environment For CTIP

JFeature



http://www.technobuff.net/webapp/product/showProduct.do?name=jfeature

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- Discussion Forums
- Mailing Lists
- Issue Tracker

JFeature Announcements

JFeature

Rate JFeature @ Eclipse Plugin Central
Click here to vote.

Rate JFeature @ Eclipse Plugin Info
Click here to vote.

Introduction

Synopsis

As a Developer: Did you ever want to know which parts of your code map to which requirements? Were you ever in a situation where you were delivering a drop to QA but not sure whether you had covered all the requirements?

Java - requirements.jrq - Eclipse SDK

Home

All Categories

Advanced *(66.67%)*
Basic *(75%)*

All Requirements

Add the numbers. *(0%)*
Subtract the num... *(100%)*
Multiply the num... *(100%)*

Requirement Coverage Report

Requirement Coverage Summary

Summary (8)	6 (75%)	1 (12.5%)	1 (12.5%)

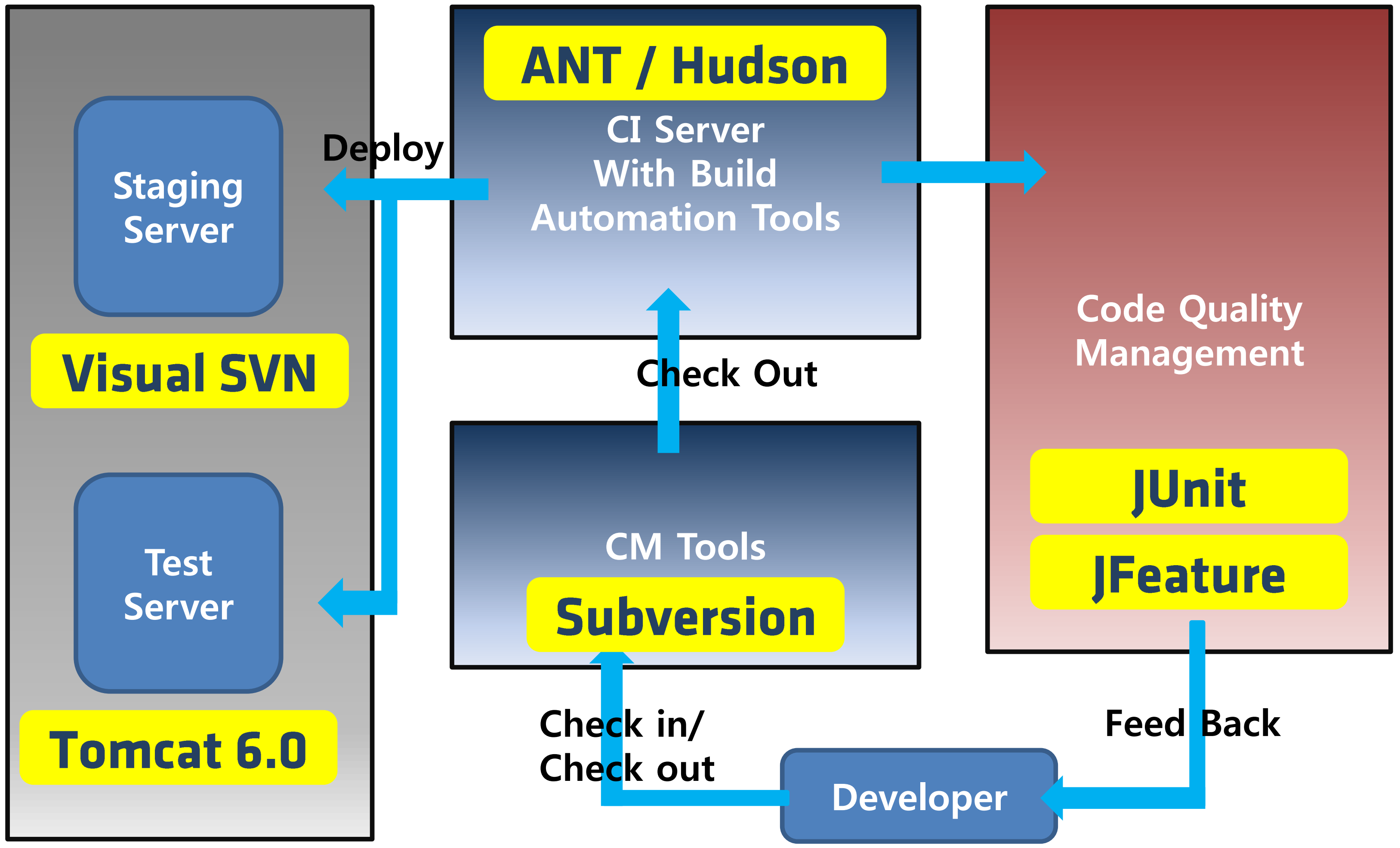
Number of Requirements	8
Unique Test Methods	14
Requirements:Test Methods Ratio	1:1
Missing Test Methods	None
Unmapped Test Methods	2

Requirement Coverage Details

Sr#	Category	Coverage	
1.	Advanced (3)	2 (66.67%)	1 (33.33%)
2.	Basic (4)	3 (75%)	1 (25%)

Environment For CTIP

Diagram For Our Environment



Pairwise Testing

AllPairs

PICT

Pairwise Combination Testing Tools – AllPairs/ PICT Selection

Pairwise Combination Testing

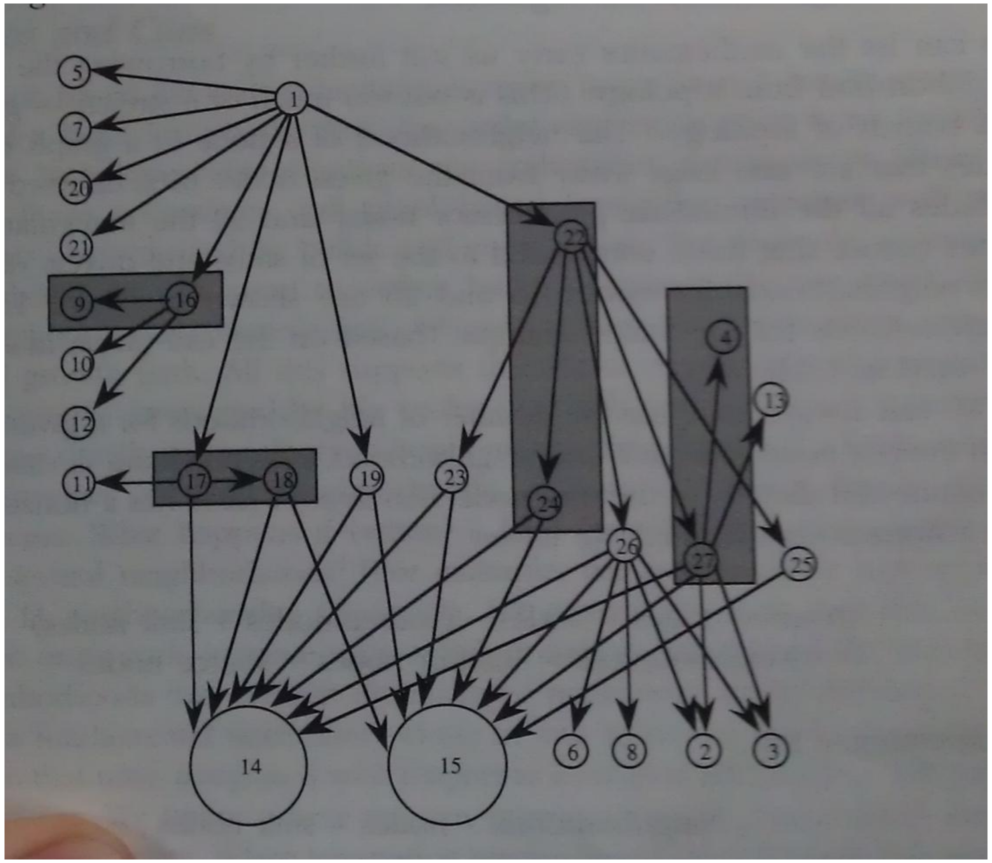
- **Category Partitioning Testing**
  - 직관적인 Constraint를 줄일 때 효과적인 테스트 방법
    - Constraint가 충분하지 않다면 관리 할 수 없을 정도로 많은 조합의 수가 있을 수 있다.

- **Pairwise Combination Testing**
  - 효율적으로 커버할 수 있는 모든 쌍을 생성
    - 대부분의 Failure가 2개 요소의 상호작용(Interaction of two factors)에 기인한다.

  - 모든 조합을 고려해 테스팅했을 때 발견할 수 있는 Failure를 모두 발견 할 수 있는 것은 아님.

Pairwise Combination Testing

- **Pairwise Combination Testing**



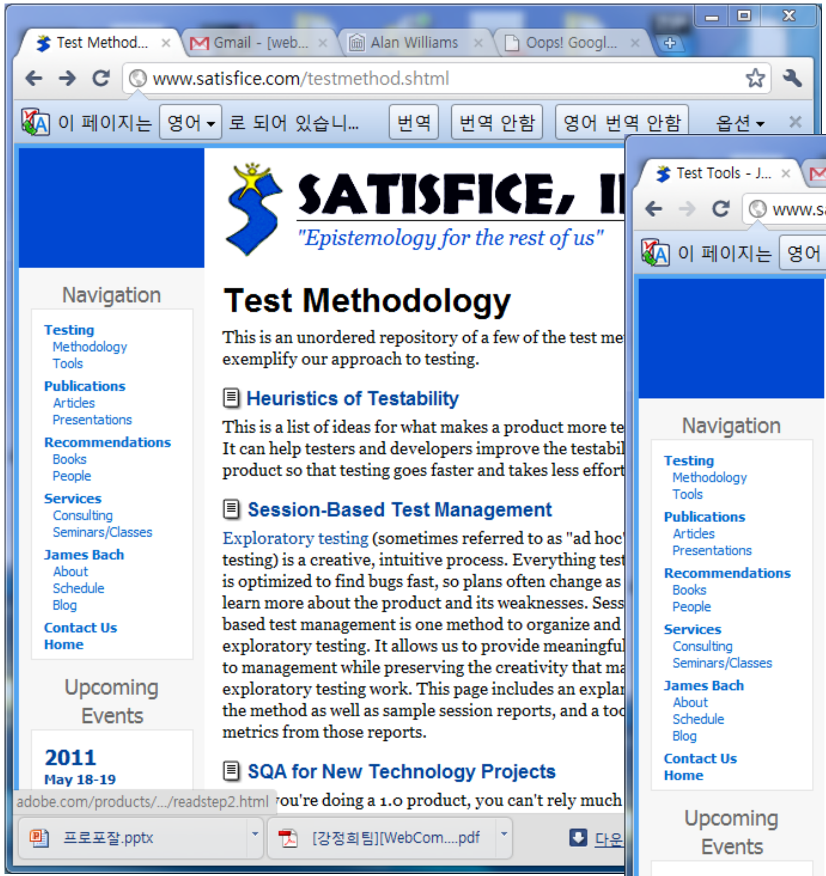
Pairwise Combination Testing

- Effectiveness of Pairwise
  - sured the coverage of combinatorial design test sets for 10 Unix commands: basename, cb, comm, crypt, sleep, sort, touch, tty, uniq, and wc. [...] The pairwise tests gave over 90 percent block coverage. [D. M. Cohen et al., 1996]
  - 10가지 unix 명령을 페어와이즈 만으로 90%의 블럭 커버리지를 준다면.. 사용해 볼 만한 가치가 있지 않은가??

Pairwise Tools - AllPairs

Download

www.pairwise.org -> available Tools -> 7. AllPairs



SATISFICE, I

"Epistemology for the rest of us"

Test Methodology

This is an unordered repository of a few of the test me
exemplify our approach to testing.

Heuristics of Testability

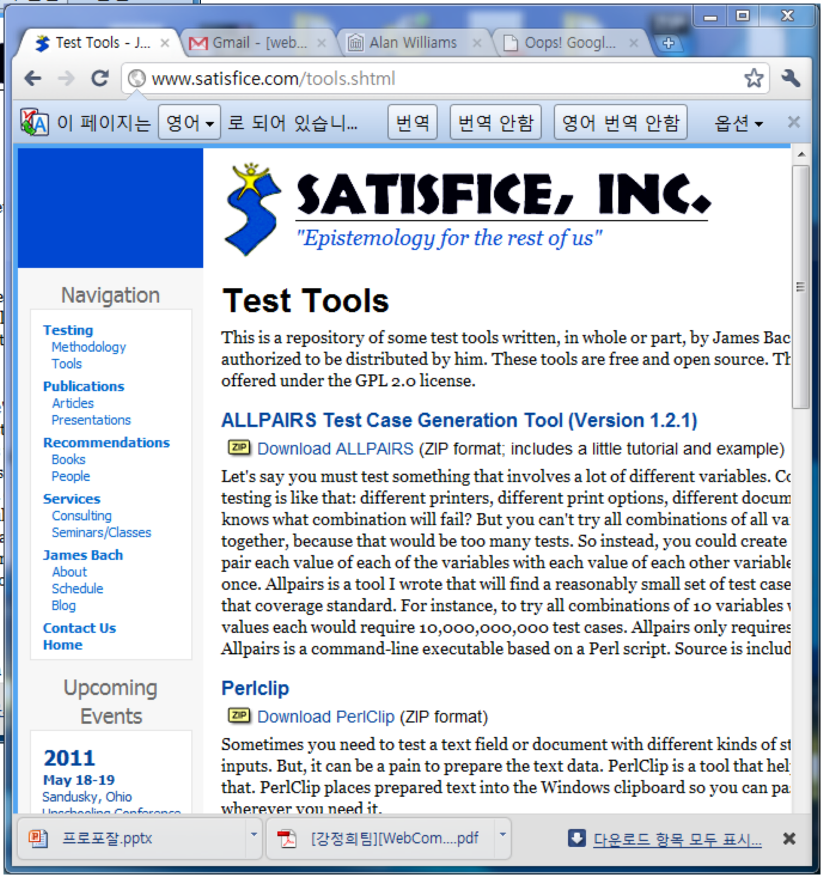
This is a list of ideas for what makes a product more te
It can help testers and developers improve the testabil
product so that testing goes faster and takes less effort

Session-Based Test Management

Exploratory testing (sometimes referred to as "ad hoc"
testing) is a creative, intuitive process. Everything test
is optimized to find bugs fast, so plans often change as
learn more about the product and its weaknesses. Sess
based test management is one method to organize and
exploratory testing. It allows us to provide meaningful
to management while preserving the creativity that ma
exploratory testing work. This page includes an explar
the method as well as sample session reports, and a too
metrics from those reports.

SQA for New Technology Projects

ou're doing a 1.0 product, you can't rely much



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Test Tools

This is a repository of some test tools written, in whole or part, by James Bac
authorized to be distributed by him. These tools are free and open source. Th
offered under the GPL 2.0 license.

ALLPAIRS Test Case Generation Tool (Version 1.2.1)

Download ALLPAIRS (ZIP format; includes a little tutorial and example)

Let's say you must test something that involves a lot of different variables. Co
testing is like that: different printers, different print options, different docum
knows what combination will fail? But you can't try all combinations of all va
together, because that would be too many tests. So instead, you could create
pair each value of each of the variables with each value of each other variable
once. Allpairs is a tool I wrote that will find a reasonably small set of test case
that coverage standard. For instance, to try all combinations of 10 variables v
values each would require 10,000,000,000 test cases. Allpairs only requires
Allpairs is a command-line executable based on a Perl script. Source is includ

Perlclip

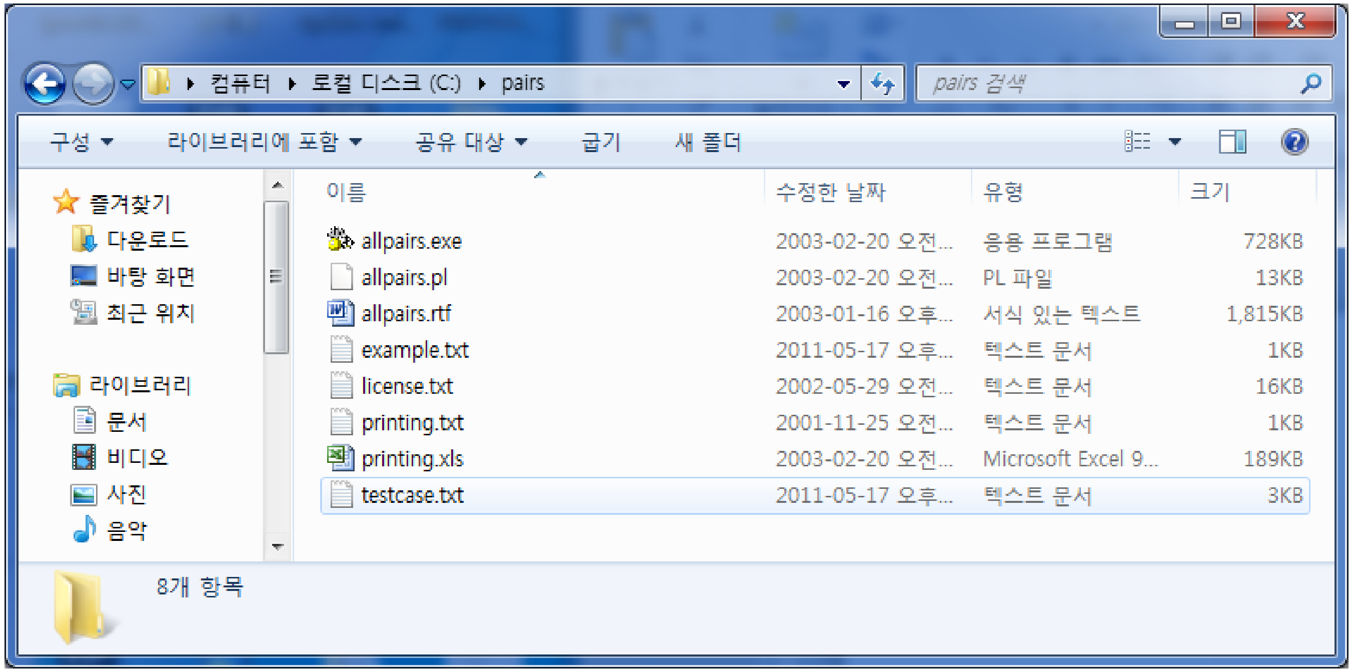
Download PerlClip (ZIP format)

Sometimes you need to test a text field or document with different kinds of st
inputs. But, it can be a pain to prepare the text data. PerlClip is a tool that hel
that. PerlClip places prepared text into the Windows clipboard so you can pa
wherever you need it.

Pairwise Tools - AllPairs

Install

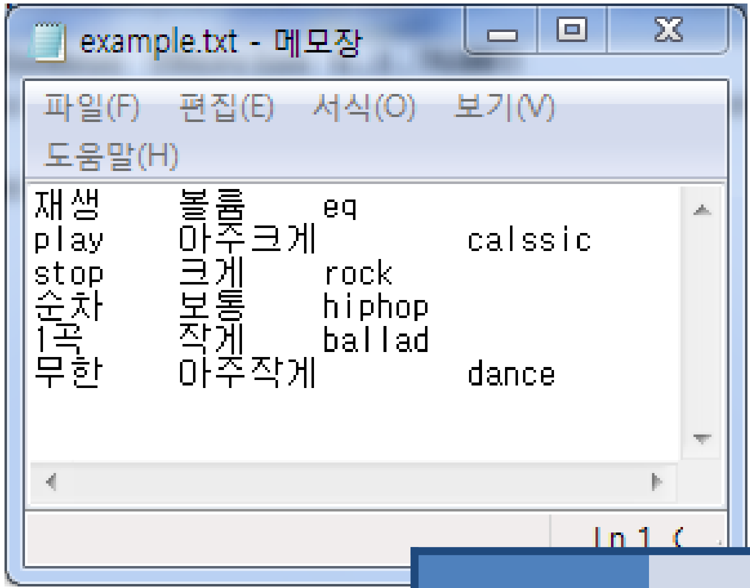
- Download Zip File
- Unzip to Any Folder



이름	수정한 날짜	유형	크기
allpairs.exe	2003-02-20 오전...	응용 프로그램	728KB
allpairs.pl	2003-02-20 오전...	PL 파일	13KB
allpairs.rtf	2003-01-16 오후...	서식 있는 텍스트	1,815KB
example.txt	2011-05-17 오후...	텍스트 문서	1KB
license.txt	2002-05-29 오전...	텍스트 문서	16KB
printing.txt	2001-11-25 오전...	텍스트 문서	1KB
printing.xls	2003-02-20 오전...	Microsoft Excel 9...	189KB
testcase.txt	2011-05-17 오후...	텍스트 문서	3KB

Pairwise Tools - AllPairs

Testcase Generate Example



```
재생	볼륨	eq
play	아주크게		calssic
stop	크게	rock
순차	보통	hiphop
1곡	작게	ballad
무한	아주작게		dance
```

- Music Player Example
- Each Category and Belonging Values Delimited by Tab

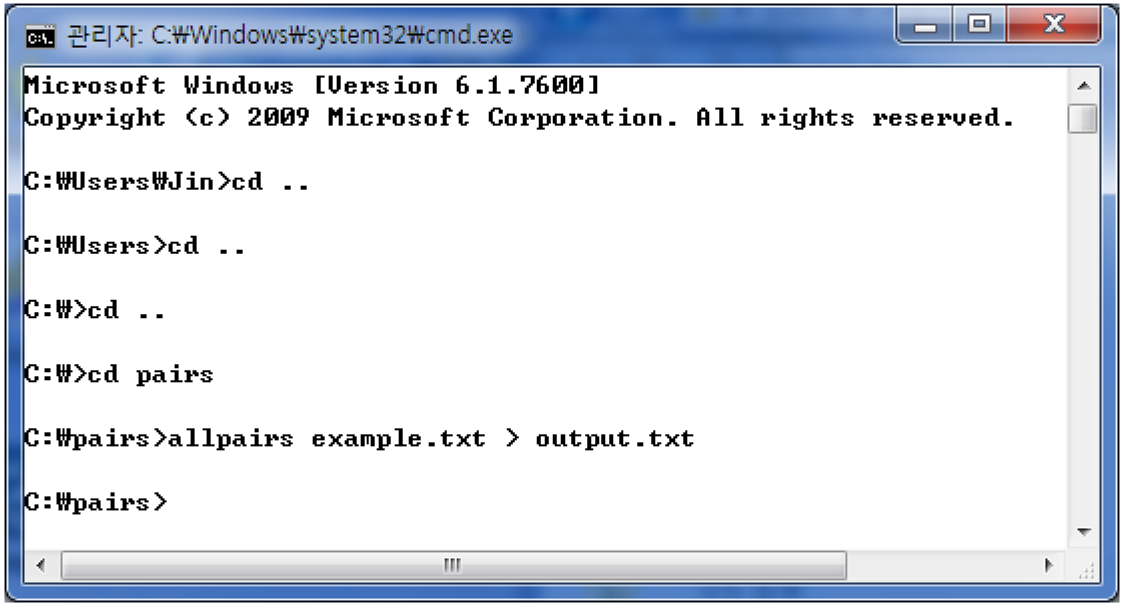
❖ Representative Values Table

재생	Play	Stop	순차	1곡	무한	
볼륨	아주크게	크게	보통	작게	아주작게	
EQ	classic	rock	hiphop	ballad	dance	

Pairwise Tools - AllPairs

Testcase Generate Example

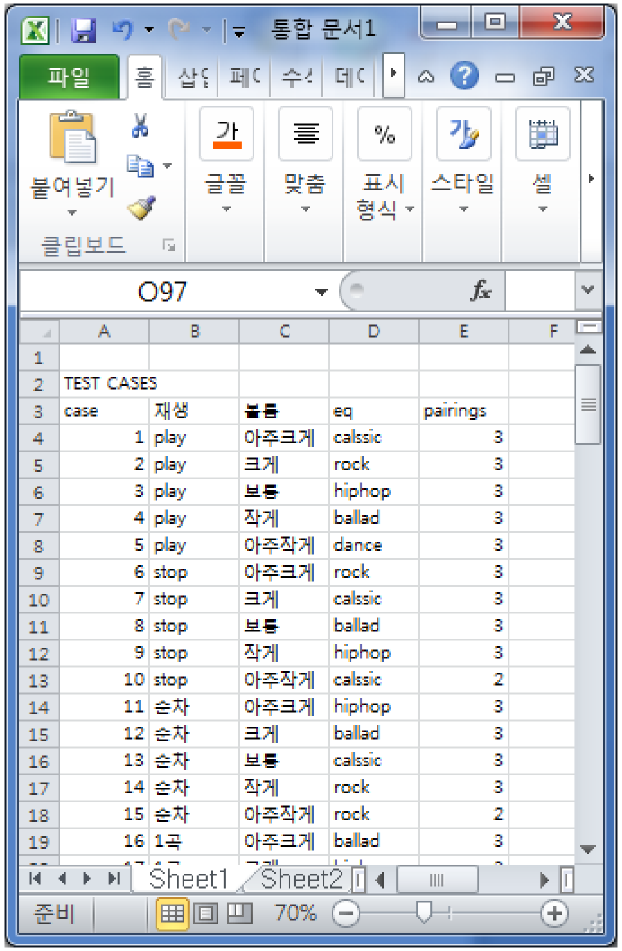
- allpairs “inputFile Name” > “outputFile Name”



```
Microsoft Windows [Version 6.1.7600]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:₩Users₩Jin>cd ..

C:₩Users>cd ..

C:₩>cd ..

C:₩>cd pairs

C:₩pairs>allpairs example.txt > output.txt

C:₩pairs>
```

Pairwise Tools - AllPairs

Testcase Generate Example



TEST CASES				
case	재생	볼륨	eq	pairings
1	play	아주크게	calssic	3
2	play	크게	rock	3
3	play	보통	hiphop	3
4	play	작게	ballad	3
5	play	아주작게	dance	3
6	stop	아주크게	rock	3
7	stop	크게	calssic	3
8	stop	보통	ballad	3
9	stop	작게	hiphop	3
10	stop	아주작게	calssic	2
11	순차	아주크게	hiphop	3
12	순차	크게	ballad	3
13	순차	보통	calssic	3
14	순차	작게	rock	3
15	순차	아주작게	rock	2
16	1곡	아주크게	ballad	3

- Generate 28 Test Case
- View Paring Details
- In Test Cases Table
  - "Pairings" : 독립적으로 묶인 Parameter 수

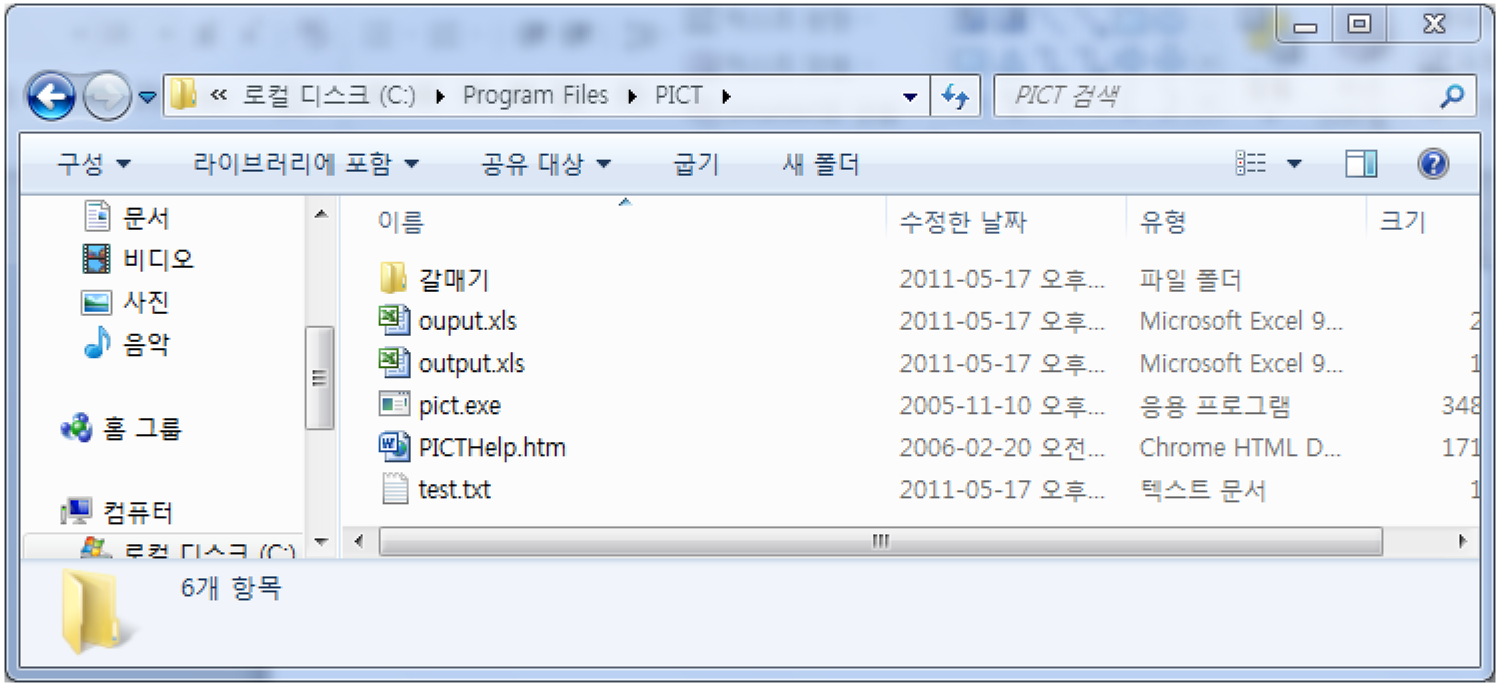
125 Test Case

To 28 Test Case

Pairwise Tools - PICT

Download & Install

- www.pairwise.org -> available Tools -> 20. PICT
- Download MSI File and Click Next

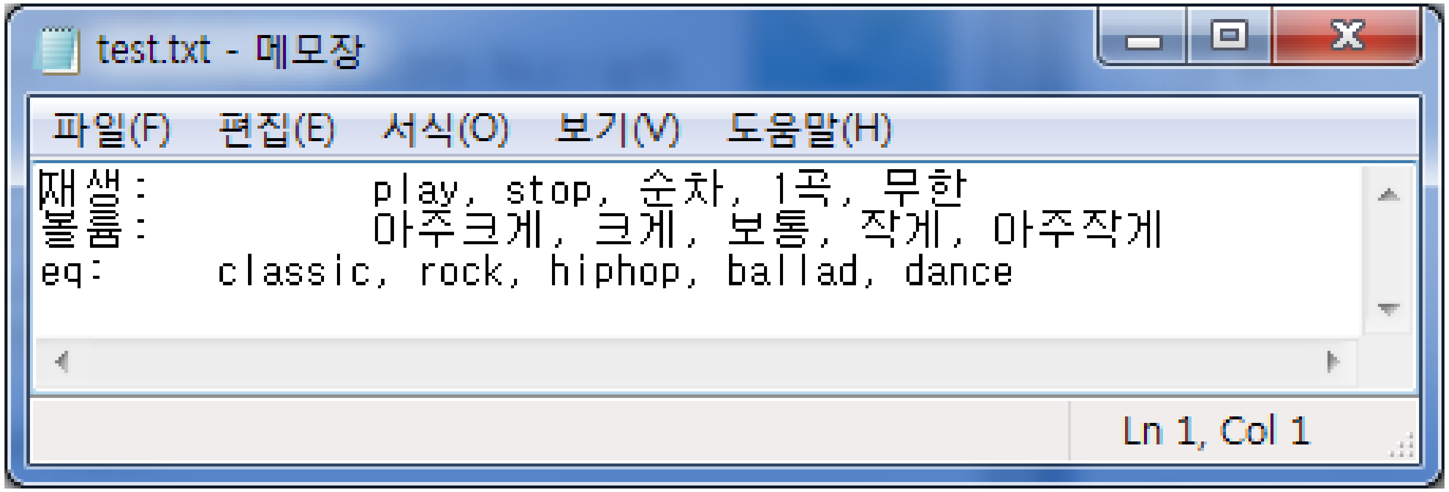


이름	수정한 날짜	유형	크기
갈매기	2011-05-17 오후...	파일 폴더	
ouput.xls	2011-05-17 오후...	Microsoft Excel 9...	2
output.xls	2011-05-17 오후...	Microsoft Excel 9...	1
pict.exe	2005-11-10 오후...	응용 프로그램	348
PICTHelp.htm	2006-02-20 오전...	Chrome HTML D...	171
test.txt	2011-05-17 오후...	텍스트 문서	1

Pairwise Tools - PICT

Testcase Generation Example

- Same Condition in AllPairs Testing
- Form
  - “CategoryName”:<-TAB->”Value”,”Value”,…….

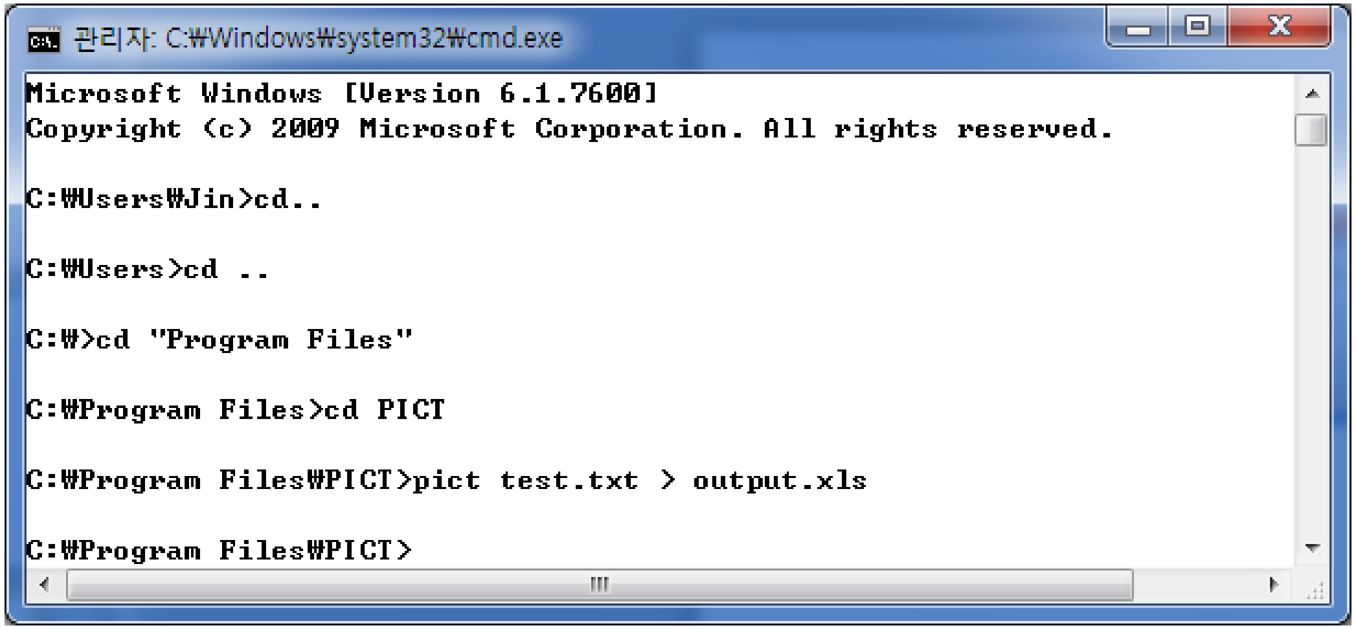


```
재생:		play, stop, 순차, 1곡, 무한
볼륨:		아주크게, 크게, 보통, 작게, 아주작게
eq:	classic, rock, hiphop, ballad, dance
```

Pairwise Tools - PICT

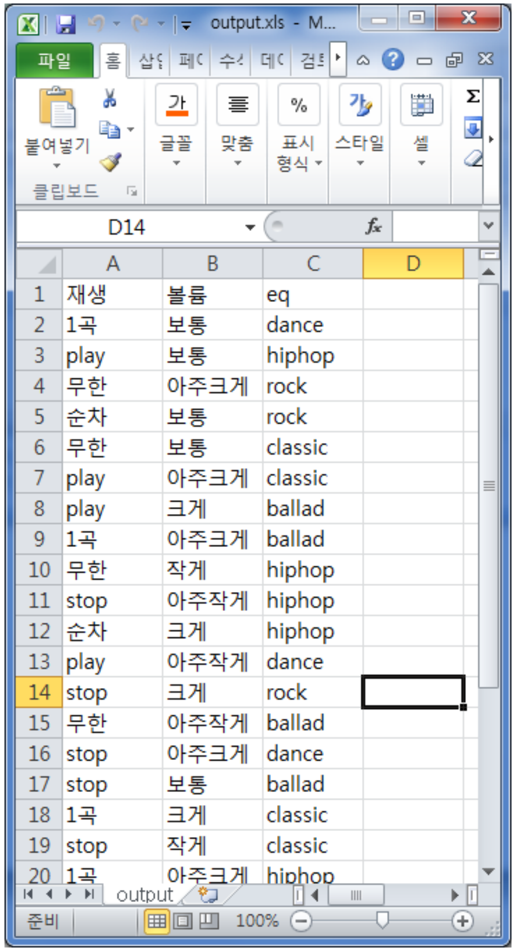
Testcase Generation Example

- pict “inputFile Name” > “outputFile Name”



```
Microsoft Windows [Version 6.1.7600]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:₩Users₩Jin>cd..

C:₩Users>cd ..

C:₩>cd "Program Files"

C:₩Program Files>cd PICT

C:₩Program Files₩PICT>pict test.txt > output.xls

C:₩Program Files₩PICT>
```

Pairwise Tools - PICT



D14

	A	B	C	D
1	재생	볼륨	eq	
2	1곡	보통	dance	
3	play	보통	hiphop	
4	무한	아주크게	rock	
5	순차	보통	rock	
6	무한	보통	classic	
7	play	아주크게	classic	
8	play	크게	ballad	
9	1곡	아주크게	ballad	
10	무한	작게	hiphop	
11	stop	아주작게	hiphop	
12	순차	크게	hiphop	
13	play	아주작게	dance	
14	stop	크게	rock	
15	무한	아주작게	ballad	
16	stop	아주크게	dance	
17	stop	보통	ballad	
18	1곡	크게	classic	
19	stop	작게	classic	
20	1곡	아주크게	hiphop	

- Generate 27 Test Case
- Just View Test Case

125 Test Case
To 27 Test Case

Pairwise Tools - Compare

AllPairs - Advantage

- Testcase 와 함께 Pairing Detail을 제시한다.
- 설치가 쉽다.(Unzip 만으로 원하는 경로에 설치)

AllPairs - Disadvantage

- 초기 Value Table을 작성하기 힘들다.
- Value의 수가 다를 때 Table을 만들기 힘들다.
- Excel Export를 지원하지만 Text Export가 더 정확한 결과를 제시한다.

Pairwise Tools - Compare

PICT - Advantage

- Value Table 작성이 쉽다.
- 각 Category에 Value 수가 다를 때 Test Case 생성이 쉽다.
- Excel Export를 지원한다.

PICT - Disadvantage

- 지정된 경로 이외에는 설치가 힘들다.
- ASCII 문자 이외에는 Value값 지정이 안된다.(공백으로 표시)

Pairwise Tools - Conclusion

We Choose AllPairs!!!

PICT가 좀 더 사용하기 편리하였다. 그렇지만 Testcase가 어떤 방식으로 생성 된 것인지 알 수 가 없는 단점이 있었다. 그러나 AllPairs는 Testcase의 생성 중간과정까지 보여주어 좀 더 신뢰성 있는 Generation 결과를 보여주었다. 또한 AllPairs는 ASCII코드에 없는 문자도 지원하여 기호가 Value로 들어가는 Logic Expression상황에 더 적합하였다.

편의성 $<$ 신뢰성

Logic Package

Analysis

Testing Process

Code Analysis

Testcase Generation

Test Result

Conclusion

Logic Package Analysis

Function of Each Class

- stringToLogic : 주어진 Expression을 Logic Member와 Tree Member로 분리
- makeFomula : 노드에 삽입될 Fomula를 만듬
- treeMember/logicMember/formulaMember
  : 조건식으로 부터 분리된 Fault Tree 구성 Member

➡ **StringToLogic Class 의 Method가 Logic Package의 핵심**

Logic Package Testcase Generation

Document Specified Requirement

- Used symbol : “|, &, +, -, =, !, <, >, <=, >=, :=, (,)”
- Divide with operator and definition of variable
- Expression must be identified that value is false or true
- If ‘(‘, ‘)’ is occurred in expression, identify value
- Expression is parsed to Logic structure

Logic Package Testcase Generation

Extracted Functional Specification

- String의 Symbol이 define된 Symbol
- String의 Statement가 Boolean value
- String에 '(', ')' 가 추가되었을 때 하나의 value로 인식

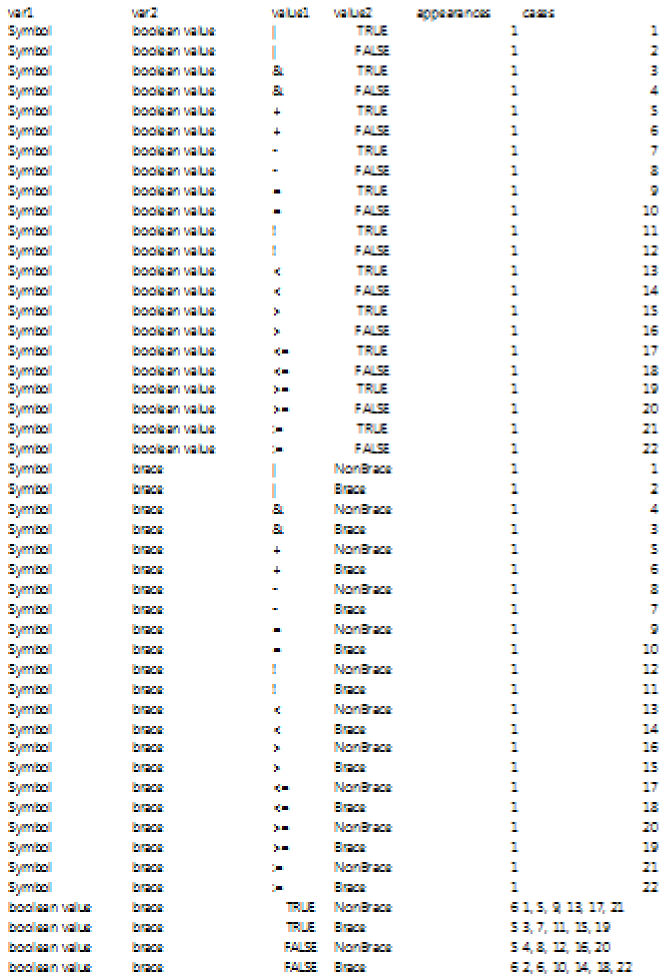
Logic Package Testcase Generation

Identify Representative Values

- String의 Symbol이 define된 Symbol
  - |, &, +, -, =, !, <, >, <=, >=, :=, (,)
- String의 Statement가 Boolean value
  - True, False
- String에 '(', ')' 가 추가되었을 때 하나의 value로 인식
  - Non Brace, Brace

Logic Package Testcase Generation

Generated TestPairs by AllPairs



var1	var2	value1	value2	appearances	cases
Symbol	boolean value	|	TRUE	1	1
Symbol	boolean value	|	FALSE	1	2
Symbol	boolean value	&	TRUE	1	3
Symbol	boolean value	&	FALSE	1	4
Symbol	boolean value	+	TRUE	1	5
Symbol	boolean value	+	FALSE	1	6
Symbol	boolean value	-	TRUE	1	7
Symbol	boolean value	-	FALSE	1	8
Symbol	boolean value	=	TRUE	1	9
Symbol	boolean value	=	FALSE	1	10
Symbol	boolean value	!	TRUE	1	11
Symbol	boolean value	!	FALSE	1	12
Symbol	boolean value	<	TRUE	1	13
Symbol	boolean value	<	FALSE	1	14
Symbol	boolean value	>	TRUE	1	15
Symbol	boolean value	>	FALSE	1	16
Symbol	boolean value	<=	TRUE	1	17
Symbol	boolean value	<=	FALSE	1	18
Symbol	boolean value	>=	TRUE	1	19
Symbol	boolean value	>=	FALSE	1	20
Symbol	boolean value	:=	TRUE	1	21
Symbol	boolean value	:=	FALSE	1	22
Symbol	brace	|	NonBrace	1	1
Symbol	brace	|	Brace	1	2
Symbol	brace	&	NonBrace	1	4
Symbol	brace	&	Brace	1	3
Symbol	brace	+	NonBrace	1	5
Symbol	brace	+	Brace	1	6
Symbol	brace	-	NonBrace	1	8
Symbol	brace	-	Brace	1	7
Symbol	brace	=	NonBrace	1	9
Symbol	brace	=	Brace	1	10
Symbol	brace	!	NonBrace	1	12
Symbol	brace	!	Brace	1	11
Symbol	brace	<	NonBrace	1	13
Symbol	brace	<	Brace	1	14
Symbol	brace	>	NonBrace	1	16
Symbol	brace	>	Brace	1	15
Symbol	brace	<=	NonBrace	1	17
Symbol	brace	<=	Brace	1	18
Symbol	brace	>=	NonBrace	1	20
Symbol	brace	>=	Brace	1	19
Symbol	brace	:=	NonBrace	1	21
Symbol	brace	:=	Brace	1	22
boolean value	brace	TRUE	NonBrace	6	1, 5, 9, 13, 17, 21
boolean value	brace	TRUE	Brace	5	3, 7, 11, 15, 19
boolean value	brace	FALSE	NonBrace	5	4, 8, 12, 16, 20
boolean value	brace	FALSE	Brace	6	2, 6, 10, 14, 18, 22

- 48 Pair Generated
- 48 Pair Generate

  22 Test Case

Logic Package Testcase Generation

Generated Testcase By AllPairs

case	Symbol	boolean value	brace	pairings
1	|	TRUE	NonBrace	3
2	|	FALSE	Brace	3
3	&	TRUE	Brace	3
4	&	FALSE	NonBrace	3
5	+	TRUE	NonBrace	2
6	+	FALSE	Brace	2
7	-	TRUE	Brace	2
8	-	FALSE	NonBrace	2
9	=	TRUE	NonBrace	2
10	=	FALSE	Brace	2
11	!	TRUE	Brace	2

Logic Package Testcase Generation

Generated Testcase By AllPairs

case	Symbol	boolean value	brace	pairings
12	!	FALSE	NonBrace	2
13	<	TRUE	NonBrace	2
14	<	FALSE	Brace	2
15	>	TRUE	Brace	2
16	>	FALSE	NonBrace	2
17	<=	TRUE	NonBrace	2
18	<=	FALSE	Brace	2
19	>=	TRUE	Brace	2
20	>=	FALSE	NonBrace	2
21	:=	TRUE	NonBrace	2
22	:=	FALSE	Brace	2

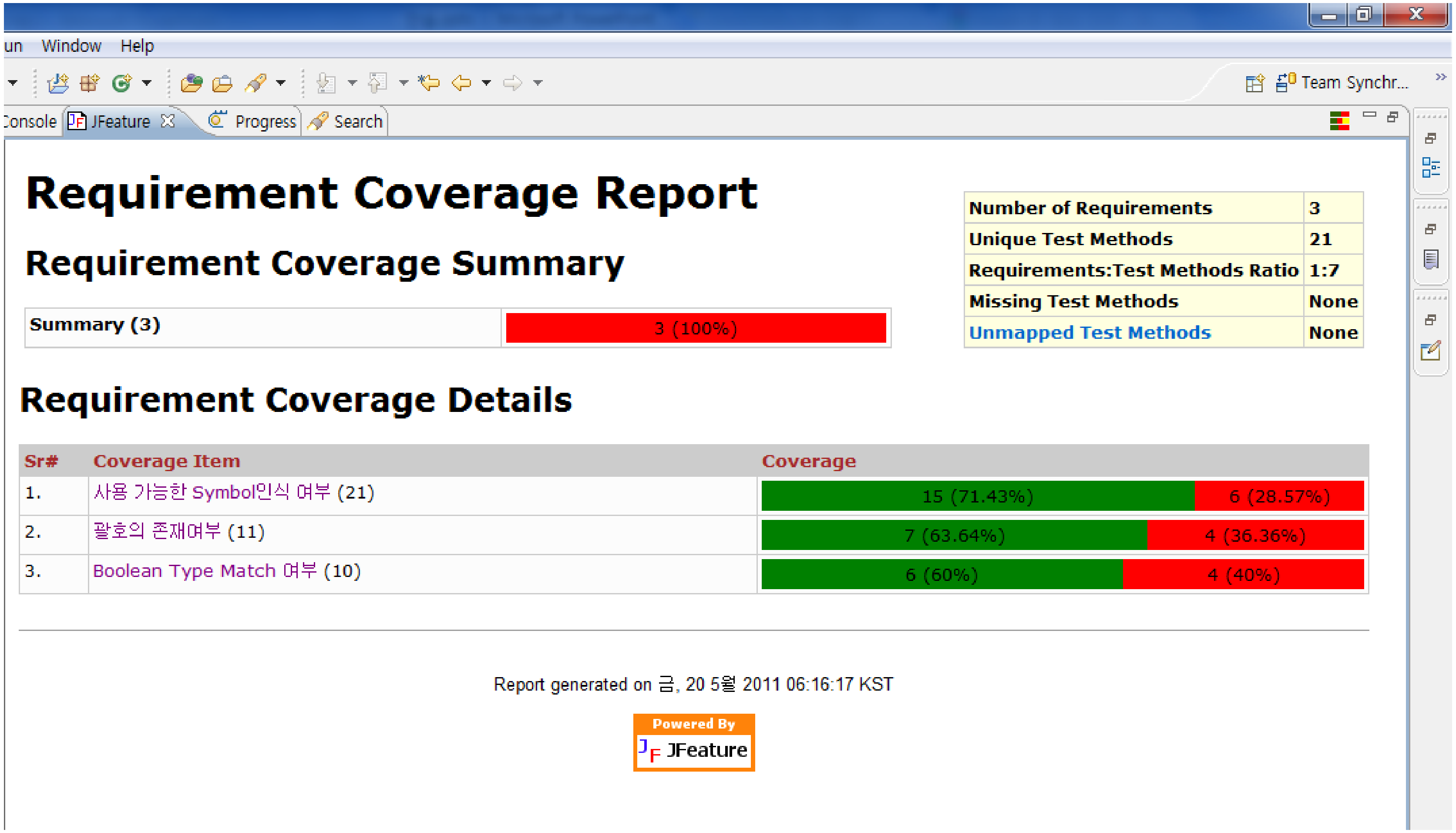
Logic Package Test Result

Jfeature Requirement Table

RQ_ID	Title	Priority	Must Have
RQ_1	사용 가능한 Symbol인식 여부	3	No
RQ_2	괄호의 존재여부	3	No
RQ_3	Boolean Type Match 여부	3	No

Logic Package Test Result

Jfeature Requirement Coverage



Requirement Coverage Report

Requirement Coverage Summary

Summary (3)	3 (100%)

Number of Requirements	**3**
Unique Test Methods	**21**
Requirements:Test Methods Ratio	**1:7**
Missing Test Methods	**None**
Unmapped Test Methods	**None**

Requirement Coverage Details

Sr#	Coverage Item	Coverage	
1.	사용 가능한 Symbol인식 여부 (21)	15 (71.43%)	6 (28.57%)
2.	괄호의 존재여부 (11)	7 (63.64%)	4 (36.36%)
3.	Boolean Type Match 여부 (10)	6 (60%)	4 (40%)

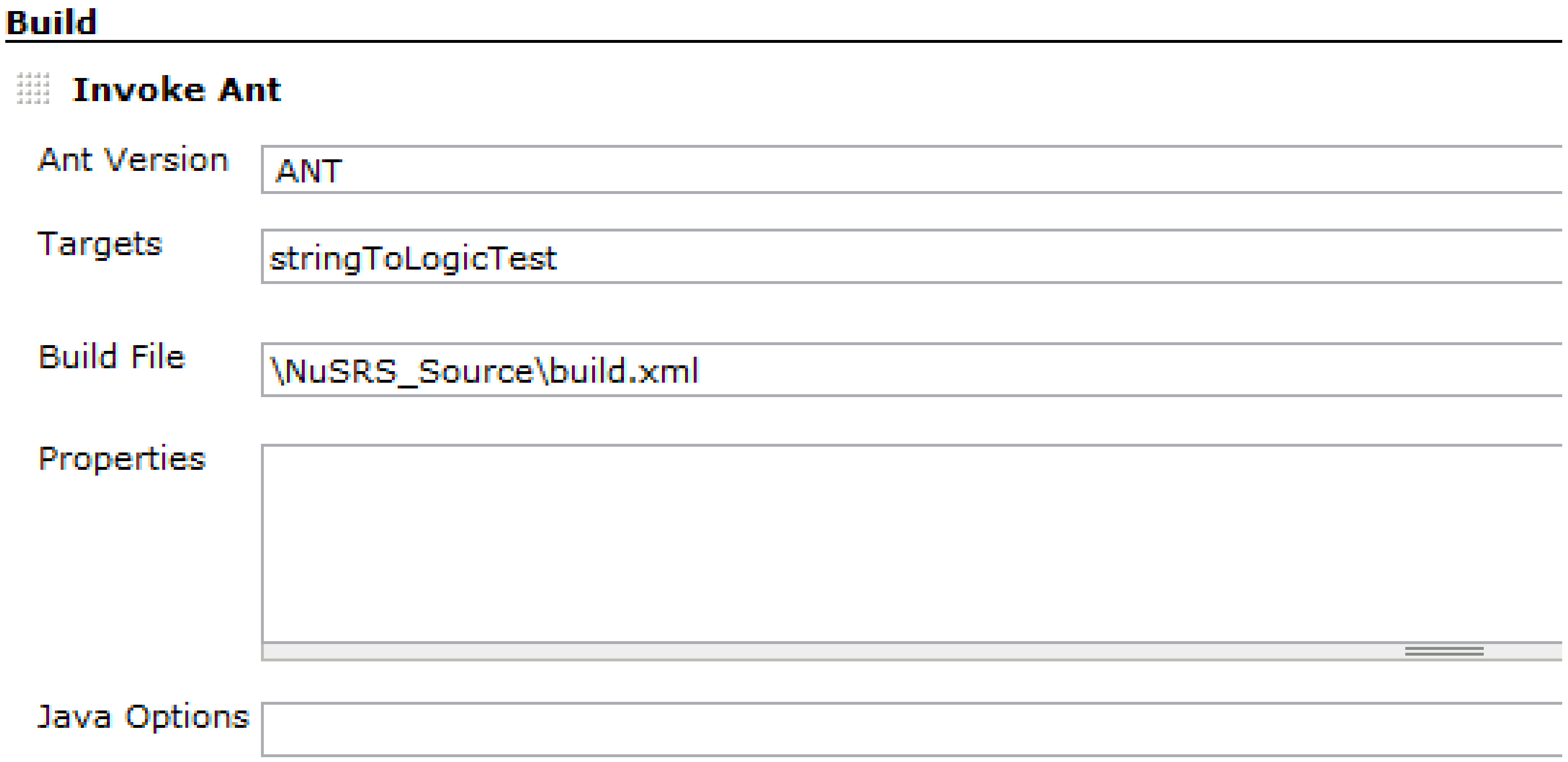
Report generated on 금, 20 5월 2011 06:16:17 KST

Powered By JFeature

Logic Package Test Result

Hudson Invoke Ant Setting

– Project -> Configure



Build

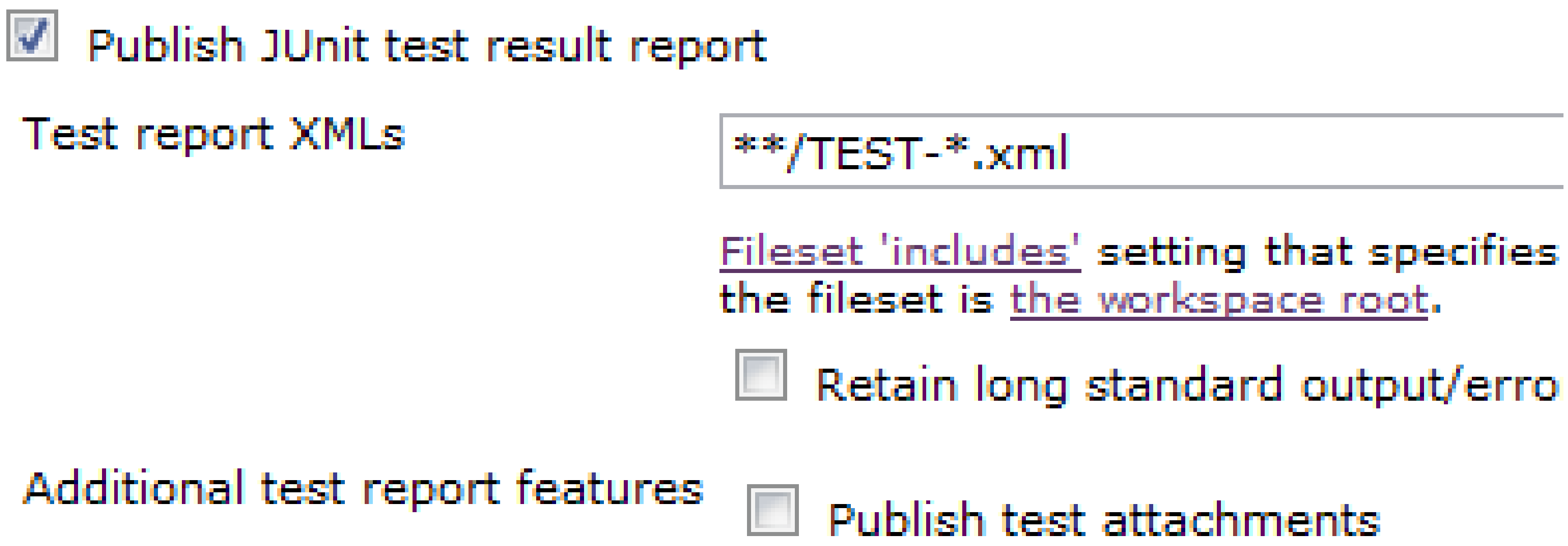
Invoke Ant

Ant Version	ANT
Targets	stringToLogicTest
Build File	\NuSRS_Source\build.xml
Properties	
Java Options	

Logic Package Test Result

Hudson Junit Report View Setting

- Project -> Configure



[✓] Publish JUnit test result report

Test report XMLs **/TEST-*.xml

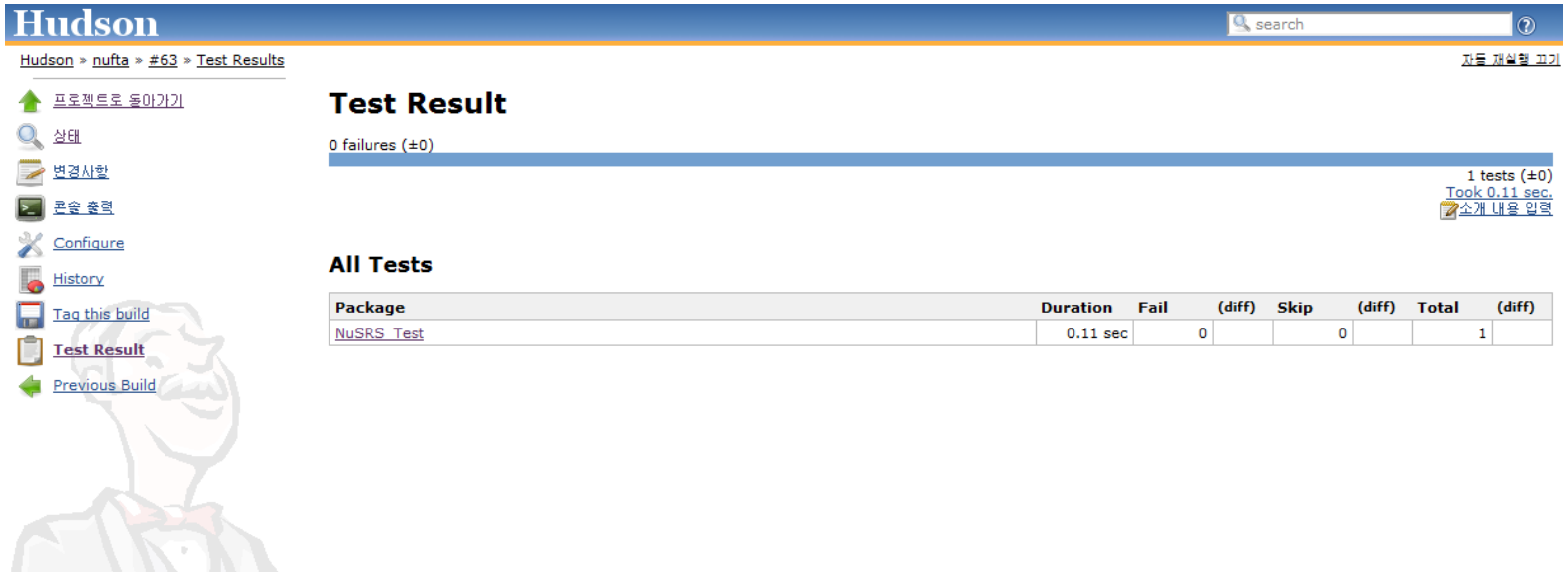
Fileset 'includes' setting that specifies
the fileset is the workspace root.

[ ] Retain long standard output/erro

Additional test report features [ ] Publish test attachments

Logic Package Test Result

Hudson Junit Report View Example



Hudson

search

Hudson » nufta » #63 » Test Results

자동 재실행 끄기

- 프로젝트로 돌아가기
- 상태
- 변경사항
- 콘솔 출력
- Configure
- History
- Tag this build
- **Test Result**
- Previous Build

Test Result

0 failures (±0)

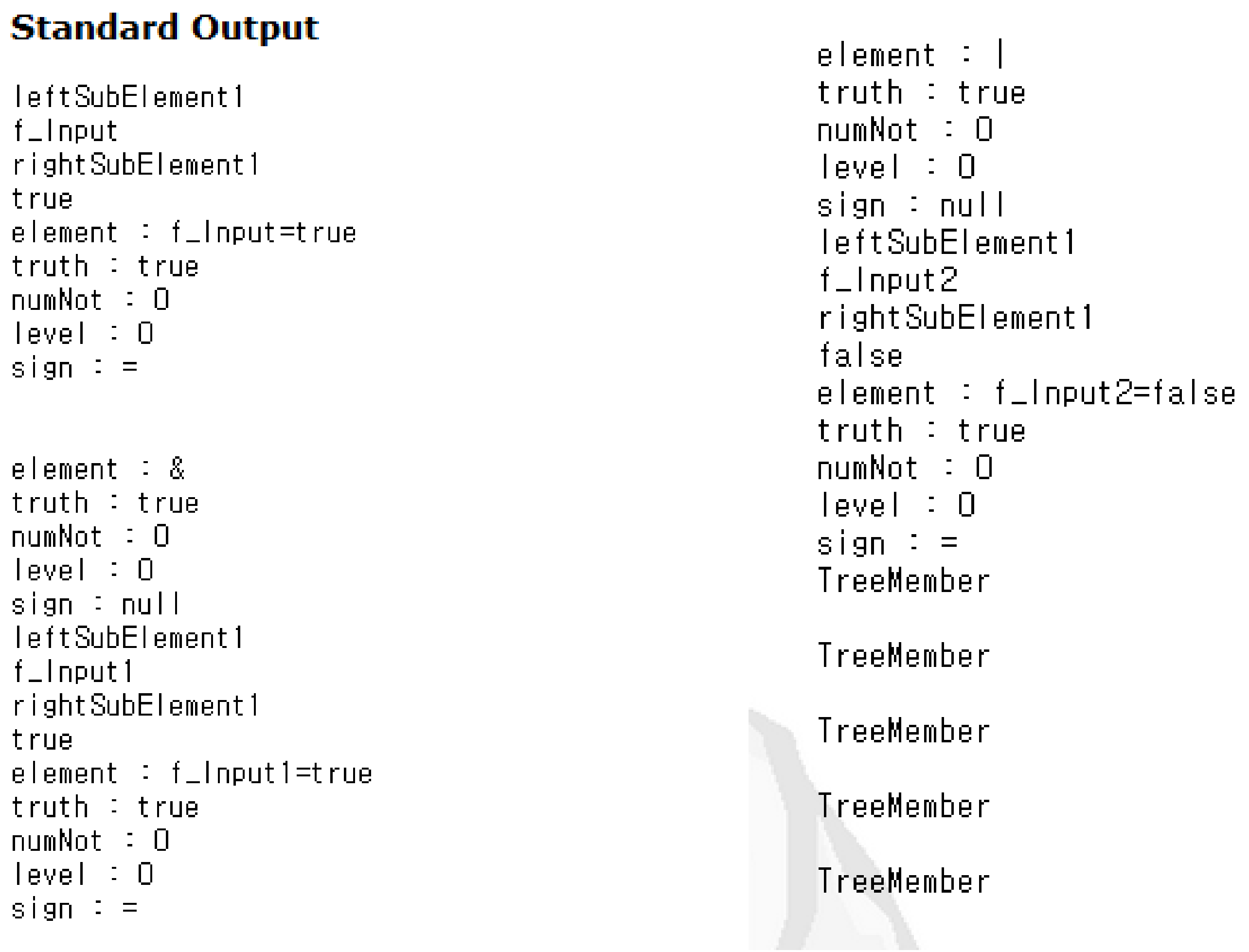
1 tests (±0)
Took 0.11 sec.
소개 내용 입력

All Tests

Package	Duration	Fail	(diff)	Skip	(diff)	Total	(diff)
NuSRS_Test	0.11 sec	0		0		1	

Logic Package Test Result

Hudson Junit Report View Example



Standard Output

```
leftSubElement1
f_Input
rightSubElement1
true
element : f_Input=true
truth : true
numNot : 0
level : 0
sign : =


element : &
truth : true
numNot : 0
level : 0
sign : null
leftSubElement1
f_Input1
rightSubElement1
true
element : f_Input1=true
truth : true
numNot : 0
level : 0
sign : =
element : |
truth : true
numNot : 0
level : 0
sign : null
leftSubElement1
f_Input2
rightSubElement1
false
element : f_Input2=false
truth : true
numNot : 0
level : 0
sign : =
TreeMember

TreeMember

TreeMember

TreeMember

TreeMember
```

Logic Package Test Result

Conclusion

- Analysis 단계에서 설정된 Specification이 필요함
- Pairwise Tool에 의해 추출해낸 Test Case도 Requirement Coverage가 생각보다 낮게 나옴
- SDT 속성 값에 대해 좀 더 심도 깊은 문서가 필요
- Test Case가 여러 개인 경우 Hudson에서 Target Test를 인식하지 못하는 문제가 발생

Logic Package Test Result

Conclusion

- 한글 인코딩이 간혹 깨져서 Ant bulid시 오류를 발생 시킴
- 불필요한 Package Import시 bulid path를 찾지 못해 오류를 발생 시키는 경우가 있었음
- SDT클래스를 Test Case에서 직접 Input으로 주지 못하였음. Class Instance 를 Test Case에서 직접 생성하지 못하는 문제가 있었음

FSM Part

Analysis

Testing Process

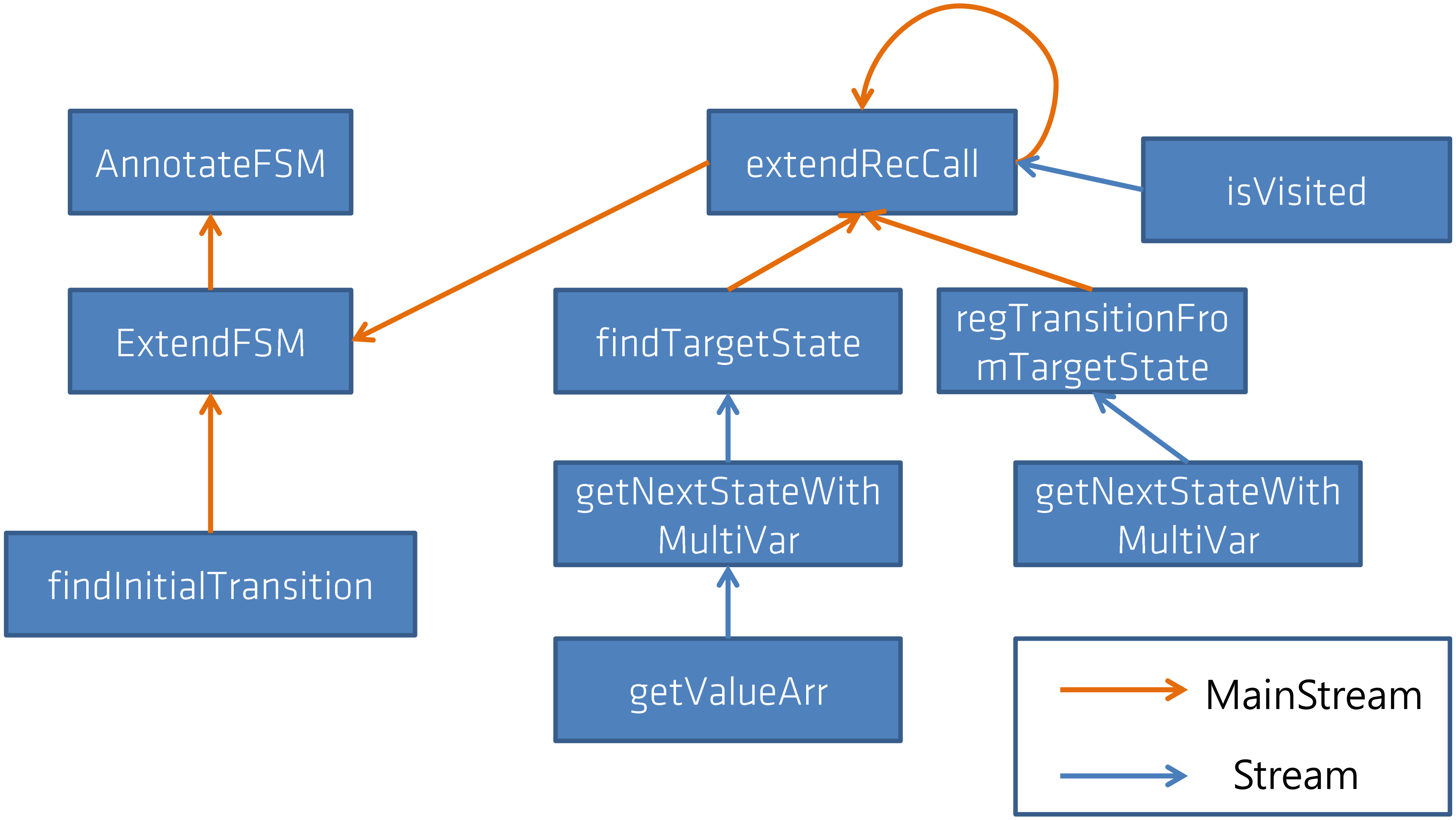
Analysis

Testcase Generation

Conclusion

Logic Package Analysis

FSMAnalyzer Call Graph



Logic Package Analysis

FSMAnalyzer Function

- annotateFSM : FSM을 annotate FSM으로 제작
- extendFSM : originalFSM 을 annotateFSM으로 재구성
- findInitialState : 최초 State를 찾아 extendFSM에 추가
- extendRecCall : Recursive Call을 이용하여 모든 Node를 돌아가며 Transition과 Node를 방문 annotate FSM을 구성하기 위한 Transition과 Node재구성

FSM을 재구성 하여
annotateFSM 으로 만든다!

FSM Parts Testcase Generation

Document Specified Requirement

- Initial Value of Initial state is 0.
- Value of state defined by ingoing transition
  - If assignment is none, value is that of previous state
- Value of state must restrict some range
- Name of Annotated state is consisted of name of original state and value

FSM Parts Testcase Generation

Document Specified Requirement

- Basically, annotated transition is between original one.
  - (S1) -> (S2), (S1, 1) -> (S2, 0)
  - Transitions can changed by output value of Annotated transition
    - (S1) -> (S2) : original transition, assignment : current output +1
    - Annotated transition : (S1, 0) -> (S2, 1), In (S1, 0), only (S2, 1) can available. (S2, 3), (S2, 4) is not available

FSM Parts Testcase Generation

Extracted Functional Specification

- Value 의 초기값은 0
- Value 의 값은 Transition에 의하여 결정
- Value 는 Range 안에 존재
- Annotated State 는 State 와 Value 로 구성

FSM Parts Testcase Generation

Extracted Functional Specification

- Annotated State 는 Original State 를 포함
- Original Transition 은 Annotated State 의 Value 를 바꿀 수 있다.
- Original Transition 의 Output의 값은 변하지 않음

FSM Parts Testcase Generation

Identify Representative Values

- Value 의 초기값은 0
  - 0 , Invalid
- Value 의 값은 Transition에 의하여 결정
  - Valid_exist_value, Invalid_exist_value, Non_exist_value
- Value 는 Range 안에 존재
  - Valid_range, Invalid_range
- Annotated State 는 State 와 Value 로 구성
  - Both_valid, State_valid, Value_Valid, Both_Invalid

FSM Parts Testcase Generation

Identify Representative Values

- Annotated State 는 Original State 를 포함
  - Include, Not_include
- Original Transition 은 Annotated State 의 Value 를 바꿀 수 있다.
  - Changed, Not_changed
- Original Transition 의 Output의 값은 변하지 않음
  - Changed, Not_changed

FSM Parts Testcase Generation

Generated TestPairs by AllPairs

PAIRING DETAILS

var1	var2	value1	value2	appearances	cases	
State&Value	Incoming value	Both_Valid	Valid_exist_value		1	1
State&Value	Incoming value	Both_Valid	Invalid_exist_value		1	2
State&Value	Incoming value	Both_Valid	Non_exist_value		1	9
State&Value	Incoming value	State_Valid	Valid_exist_value		1	3
State&Value	Incoming value	State_Valid	Invalid_exist_value		1	4
State&Value	Incoming value	State_Valid	Non_exist_value		1	10
State&Value	Incoming value	Value_Valid	Valid_exist_value		1	11
State&Value	Incoming value	Value_Valid	Invalid_exist_value		1	12
State&Value	Incoming value	Value_Valid	Non_exist_value		25, 6	
State&Value	Incoming value	Both_invalid	Valid_exist_value		1	7
State&Value	Incoming value	Both_invalid	Invalid_exist_value		1	8
State&Value	Incoming value	Both_invalid	Non_exist_value		1	13
State&Value	Initial value	Both_Valid		0	21, 9	
State&Value	Initial value	Both_Valid	Valid		1	2
State&Value	Initial value	State_Valid		0	1	4
State&Value	Initial value	State_Valid	Valid		23, 10	
State&Value	Initial value	Value_Valid		0	25, 12	
State&Value	Initial value	Value_Valid	Valid		26, 11	
State&Value	Initial value	Both_invalid		0	27, 13	
State&Value	Initial value	Both_invalid	Valid		1	8
State&Value	Ranged value	Both_Valid	Valid_range		21, 9	
State&Value	Ranged value	Both_Valid	Invalid_range		1	2
State&Value	Ranged value	State_Valid	Valid_range		1	3
State&Value	Ranged value	State_Valid	Invalid_range		24, 10	
State&Value	Ranged value	Value_Valid	Valid_range		25, 12	
State&Value	Ranged value	Value_Valid	Invalid_range		26, 11	
State&Value	Ranged value	Both_invalid	Valid_range		1	8
State&Value	Ranged value	Both_invalid	Invalid_range		27, 13	
State&Value	Original state	Both_Valid	Include		21, 9	
State&Value	Original state	Both_Valid	Not_include		1	2
State&Value	Original state	State_Valid	Include		1	4
State&Value	Original state	State_Valid	Not_include		23, 10	
State&Value	Original state	Value_Valid	Include		26, 11	
State&Value	Original state	Value_Valid	Not_include		25, 12	
State&Value	Original state	Both_invalid	Include		28, 13	
State&Value	Original state	Both_invalid	Not_include		1	7
State&Value	Output of Node	Both_Valid	Changed		1	1
State&Value	Output of Node	Both_Valid	Not_changed		22, 9	
State&Value	Output of Node	State_Valid	Changed		23, 10	
State&Value	Output of Node	State_Valid	Not_changed		1	4
State&Value	Output of Node	Value_Valid	Changed		26, 12	
State&Value	Output of Node	Value_Valid	Not_changed		25, 11	
State&Value	Output of Node	Both_invalid	Changed		28, 13	
State&Value	Output of Node	Both_invalid	Not_changed		1	7
State&Value	Output of transition	Both_Valid	Change		1	1
State&Value	Output of transition	Both_Valid	Not_change		22, 9	
State&Value	Output of transition	State_Valid	Change		24, 10	
State&Value	Output of transition	State_Valid	Not_change		1	3
State&Value	Output of transition	Value_Valid	Change		25, 11	
State&Value	Output of transition	Value_Valid	Not_change		26, 12	
State&Value	Output of transition	Both_invalid	Change		1	8
State&Value	Output of transition	Both_invalid	Not_change		27, 13	
Incoming value	Initial value	Valid_exist_value		0	21, 7	
Incoming value	Initial value	Valid_exist_value	Valid		23, 11	
Incoming value	Initial value	Invalid_exist_value		0	24, 12	
Incoming value	Initial value	Invalid_exist_value	Valid		22, 8	
Incoming value	Initial value	Non_exist_value		0	35, 9, 13	
Incoming value	Initial value	Non_exist_value	Valid		26, 10	
Incoming value	Ranged value	Valid_exist_value	Valid_range		21, 3	
Incoming value	Ranged value	Valid_exist_value	Invalid_range		27, 11	
Incoming value	Ranged value	Invalid_exist_value	Valid_range		28, 12	
Incoming value	Ranged value	Invalid_exist_value	Invalid_range		22, 4	
Incoming value	Ranged value	Non_exist_value	Valid_range		25, 9	
Incoming value	Ranged value	Non_exist_value	Invalid_range		36, 10, 13	
Incoming value	Original state	Valid_exist_value	Include		21, 11	
Incoming value	Original state	Valid_exist_value	Not_include		23, 7	
Incoming value	Original state	Invalid_exist_value	Include		24, 8	
Incoming value	Original state	Invalid_exist_value	Not_include		22, 12	
Incoming value	Original state	Non_exist_value	Include		36, 9, 13	
Incoming value	Original state	Non_exist_value	Not_include		25, 10	
Incoming value	Output of Node	Valid_exist_value	Changed		21, 3	
Incoming value	Output of Node	Valid_exist_value	Not_changed		27, 11	
Incoming value	Output of Node	Invalid_exist_value	Changed		28, 12	
Incoming value	Output of Node	Invalid_exist_value	Not_changed		22, 4	
Incoming value	Output of Node	Non_exist_value	Changed		36, 10, 13	
Incoming value	Output of Node	Non_exist_value	Not_changed		25, 9	
Incoming value	Output of transition	Valid_exist_value	Change		21, 11	
Incoming value	Output of transition	Valid_exist_value	Not_change		23, 7	
Incoming value	Output of transition	Invalid_exist_value	Change		24, 8	
Incoming value	Output of transition	Invalid_exist_value	Not_change		22, 12	
Incoming value	Output of transition	Non_exist_value	Change		25, 10	
Incoming value	Output of transition	Non_exist_value	Not_change		36, 9, 13	
Initial value	Ranged value		0 Valid_range		41, 5, 9, 12	
Initial value	Ranged value		0 Invalid_range		34, 7, 13	
Initial value	Ranged value	Valid	Valid_range		23, 8	
Initial value	Ranged value	Valid	Invalid_range		42, 6, 10, 11	
Initial value	Original state		0 Include		41, 4, 9, 13	
Initial value	Original state		0 Not_include		35, 7, 12	
Initial value	Original state	Valid	Include		36, 8, 11	
Initial value	Original state	Valid	Not_include		32, 3, 10	
Initial value	Output of Node		0 Changed		31, 12, 13	
Initial value	Output of Node		0 Not_changed		44, 5, 7, 9	
Initial value	Output of Node	Valid	Changed		43, 6, 8, 10	
Initial value	Output of Node	Valid	Not_changed		22, 11	
Initial value	Output of transition		0 Change		31, 4, 5	
Initial value	Output of transition		0 Not_change		47, 9, 12, 13	
Initial value	Output of transition	Valid	Change		38, 10, 11	
Initial value	Output of transition	Valid	Not_change		32, 3, 6	
Ranged value	Original state	Valid_range	Include		31, 8, 9	
Ranged value	Original state	Valid_range	Not_include		33, 5, 12	
Ranged value	Original state	Invalid_range	Include		44, 6, 11, 13	
Ranged value	Original state	Invalid_range	Not_include		32, 7, 10	
Ranged value	Output of Node	Valid_range	Changed		41, 3, 8, 12	
Ranged value	Output of Node	Valid_range	Not_changed		25, 9	
Ranged value	Output of Node	Invalid_range	Changed		36, 10, 13	
Ranged value	Output of Node	Invalid_range	Not_changed		42, 4, 7, 11	
Ranged value	Output of transition	Valid_range	Change		31, 5, 8	
Ranged value	Output of transition	Valid_range	Not_change		33, 9, 12	
Ranged value	Output of transition	Invalid_range	Change		34, 10, 11	
Ranged value	Output of transition	Invalid_range	Not_change		42, 6, 7, 13	
Original state	Output of Node	Include	Changed		41, 6, 8, 13	
Original state	Output of Node	Include	Not_changed		34, 9, 11	
Original state	Output of Node	Not_include	Changed		33, 10, 12	
Original state	Output of Node	Not_include	Not_changed		32, 5, 7	
Original state	Output of transition	Include	Change		41, 4, 8, 11	
Original state	Output of transition	Include	Not_change		36, 9, 13	
Original state	Output of transition	Not_include	Change		25, 10	
Original state	Output of transition	Not_include	Not_change		42, 3, 7, 12	
Output of Node	Output of transition	Changed	Change		31, 8, 10	
Output of Node	Output of transition	Changed	Not_change		43, 6, 12, 13	
Output of Node	Output of transition	Not_changed	Change		34, 5, 11	
Output of Node	Output of transition	Not_changed	Not_change		32, 7, 9	

- 124 Pair Generated
- 124 Pair Generate

13 Test Case

FSM Parts Testcase Generation

Generated Testcase By AllPairs

Case	Initial value	Incoming value	Ranged value	State&Value	Original state	Output of Node	Output of transition	pairings
1	0	Valid_exsist_value	Vaild_range	Both_Valid	Include	Changed	Change	21
2	Invalid	Invalid_exsist_value	Invalid_range	Both_Valid	Not_include	Not_changed	Not_change	21
3	Invalid	Valid_exsist_value	Vaild_range	State_Valid	Not_include	Changed	Not_change	15
4	0	Invalid_exsist_value	Invalid_range	State_Valid	Include	Not_changed	Change	15
5	0	Non_exsist_value	Vaild_range	Value_Valid	Not_include	Not_changed	Change	14
6	Invalid	Non_exsist_value	Invalid_range	Value_Valid	Include	Changed	Not_change	13

FSM Parts Testcase Generation

Generated Testcase By AllPairs

7	0	Valid_exsist_value	Invalid_range	Both_invalid	Not_include	Not_changed	Not_change	9
8	Invalid	Invalid_exsist_value	Vaild_range	Both_invalid	Include	Changed	Change	9
9	~0	Non_exsist_value	~Vaild_range	Both_Valid	~Include	~Not_changed	~Not_change	1
10	~Invalid	Non_exsist_value	~Invalid_range	State_Valid	~Not_include	~Changed	~Change	1
11	~Invalid	Valid_exsist_value	~Invalid_range	Value_Valid	~Include	~Not_changed	~Change	1
12	~0	Invalid_exsist_value	~Vaild_range	Value_Valid	~Not_include	~Changed	~Not_change	1
13	~0	Non_exsist_value	~Invalid_range	Both_invalid	~Include	~Changed	~Not_change	1

Logic Package Test Result

Conclusion

- Logic Package와 같은 문제 발생
- Logic Package의 경우 String 만으로 어느 정도 Testing이 가능하였으나, FSM Part의 경우 초기 Input 값 자체가 Nuspec Class 자체 이므로 Testcase Code 작성에 실패
- FSM의 Input 특성에 대한 Specification이 필요
- Annotated FSM의 Class Instance를 Testcase에서 생성하기 어려움. Input을 주더라도 Output을 확인 하기가 어려움

Refference

- Practical Subversion 2nd Edittion /Daniel Berlin and Garrett Rooney/ apress
- 자바 프로젝트 필수 유틸리티 Ant, TeamCity, Subversion,Trac/ 민진우, 이인선/ 한빛미디어
- 자바 프로젝트 필수 유틸리티 Maven, TeamCity, Subversion,Trac/ 박재성/ 한빛미디어
- 자바의 또 다른 멋진 도구 Ant / 에릭해쳐,스티브라우란 공저/심우곤송인철 공역 인포북
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