

Feesual CPT Tool

T6, T7 Static Analysis

TEAM 8

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 - 2.1 Level 1: PMD
 - 2.2 Level 2: Eclipse Metrics Plugin
 - 2.3 Level 3: FindBugs

T6 - PMD

Element	# Violations	# Violations/KLOC	# Violations/Method	Project
WIN2	20	50.5	1.43	T6_source
Window2.java	9	37.7	1.80	T6_source
VariableNamingConventions	7	29.3	1.40	T6_source
MethodNamingConventions	2	8.4	0.40	T6_source
Filter.java	8	92.0	1.33	T6_source
ConstructorCallsOverridableMethod	3	34.5	0.50	T6_source
VariableNamingConventions	4	46.0	0.67	T6_source
MethodNamingConventions	1	11.5	0.17	T6_source
CaseComponentSet.java	3	42.9	1.00	T6_source
VariableNamingConventions	2	28.6	0.67	T6_source
MethodNamingConventions	1	14.3	0.33	T6_source
Element	# Violations	# Violations/KLOC	# Violations/Method	Project
WIN1	10	16.3	0.77	T6_source
Window1.java	6	16.1	2.00	T6_source
VariableNamingConventions	6	16.1	2.00	T6_source
CstComponentSet.java	2	17.9	0.40	T6_source
VariableNamingConventions	1	8.9	0.20	T6_source
MethodNamingConventions	1	8.9	0.20	T6_source
ComponentSet.java	2	15.6	0.40	T6_source
VariableNamingConventions	2	15.6	0.40	T6_source
Element	# Violations	# Violations/KLOC	# Violations/Method	Project
TEST	17	114.1	1.00	T6_source
Task_test.java	6	125.0	1.00	T6_source
MethodNamingConventions	6	125.0	1.00	T6_source
RepValue_test.java	5	96.2	1.00	T6_source
MethodNamingConventions	5	96.2	1.00	T6_source
Property_testTest.java	3	120.0	1.00	T6_source
MethodNamingConventions	3	120.0	1.00	T6_source
Category_test.java	3	125.0	1.00	T6_source
MethodNamingConventions	3	125.0	1.00	T6_source

Element	# Violations	# Violations/KLOC	# Violations/Method	Project
EXTRA	9	20.3	0.36	T6_source
WinHelp.java	2	19.2	1.00	T6_source
VariableNamingConventions	1	9.6	0.50	T6_source
AvoidLosingExceptionInformation	1	9.6	0.50	T6_source
Window3.java	5	74.6	1.67	T6_source
VariableNamingConventions	5	74.6	1.67	T6_source
Bonus.java	2	16.7	0.33	T6_source
VariableNamingConventions	2	16.7	0.33	T6_source
Element	# Violations	# Violations/KLOC	# Violations/Method	Project
CPT	43	42.0	0.39	T6_source
Task.java	28	49.5	0.57	T6_source
AvoidLosingExceptionInformation	2	3.5	0.04	T6_source
SystemPrintln	6	10.6	0.12	T6_source
VariableNamingConventions	2	3.5	0.04	T6_source
MethodNamingConventions	18	31.8	0.37	T6_source
Result.java	2	64.5	0.40	T6_source
ProperCloneImplementation	1	32.3	0.20	T6_source
MethodNamingConventions	1	32.3	0.20	T6_source
RepValue.java	5	31.4	0.26	T6_source
MethodNamingConventions	5	31.4	0.26	T6_source
Property.java	3	41.1	0.30	T6_source
MethodNamingConventions	3	41.1	0.30	T6_source
Constraints.java	2	28.2	0.33	T6_source
MethodNamingConventions	2	28.2	0.33	T6_source
Category.java	3	68.2	0.27	T6_source
MethodNamingConventions	3	68.2	0.27	T6_source

T6 - PMD

VariableNamingConventions - 32개

MethodNamingConventions - 54개

ConstructorCallsOverridableMethod - 3개

AvoidLosingExceptionInformation - 3개

SystemPrintln - 6개

ProperCloneImplementation - 1개

Error - 99개

T6 - PMD

VariableNamingConventions

```
30     private JButton b_workitem;
31     private JPanel f_rv_Panel;
32
33     ...
```

MethodNamingConventions

```
194     public void set_property(){
195         // 이거 그 filter property 배치하는 함수
196         // 여기서 이름 설정하는 것만 property list 받아서 설정하면 됨
197     }
```

T6 - PMD

ConstructorCallsOverridableMethod

```
56         this.selected = selected;  
57         GUIinit(master, name);  
58         this.pindex = pindex;  
59         this.type = "Property";  
60     }
```

AvoidLosingExceptionInformation

```
135         }catch(IOException ie)  
136         {  
137             ie.getMessage();  
138         }  
139     }
```

T6 - PMD

SystemPrintln

```
435     {  
436         System.out.println("work");  
437     }
```

ProperCloneImplementation

```
48     public Result clone()  
49     {
```

T6 - PMD

13	es.WFQ Filter	es.WFQ CatComponent
15	es.WFQ Filter	es.WFQ Component
11	es.WFQ Window2	es.WFQ Windc
13	es.WFQ Window2	es.WFQ Windc
12	es.EXTRA Bonus	es.EXTRA Bo
13	es.TEST Task_test	es.TEST Task_J
12	es.EXTRA Window3	es.EXTRA Wind
13	es.WFQ Window2	es.WFQ Windc
13	es.WFQ Window2	es.WFQ Windc
13	es.WFQ Window2	es.WFQ Windc
13	es.EXTRA Bonus	es.EXTRA Bo
15	es.EXTRA Bonus	es.EXTRA Bo
11	es.EXTRA ArcDesign	es.EXTRA ArcDes
11	es.WFQ Window1	es.WFQ Windc
15	es.WFQ Window2	es.WFQ Windc
13	es.EXTRA Bonus	es.EXTRA Bo
11	es.EXTRA Bonus	es.EXTRA Bo
11	es.EXTRA Bonus	es.EXTRA Bo
16	es.CFT Task	es.CFT
16	es.TEST Task_test	es.TEST Task_J
15	es.TEST Task_test	es.TEST Task_J
15	es.TEST RegValue_test	es.TEST RegValue_J
19	es.CFT Task	es.CFT
14	es.WFQ Window1	es.WFQ Windc
12	es.EXTRA Bonus	es.EXTRA Bo
15	es.TEST RegValue_test	es.TEST RegValue_J
15	es.TEST Property_testTest	es.TEST Property_testJ
12	es.EXTRA Bonus	es.EXTRA Bo
13	es.EXTRA Bonus	es.EXTRA Bo
12	es.EXTRA Bonus	es.EXTRA Bo
11	es.WFQ Window1	es.WFQ Windc
11	es.WFQ Window1	es.WFQ Windc
17	es.CFT Task	es.CFT
14	es.TEST Category_test	es.TEST Category_J

T6 - PMD

```
1 Found a 27 line (81 tokens) duplication in the following files:
2 Starting at line 76 of C:\Users\sunggeun\workspace\T6_source\src\CPT\Property.java
3 Starting at line 174 of C:\Users\sunggeun\workspace\T6_source\src\CPT\RepValue.java
4
5 public CPT.RepValue getConst(int cstindex, String type)
6 {
7     switch(type)
8     {
9         case "Property":
10            return cstPropList.get(cstindex);
11        case "IFProperty":
12            return cstIfPropList.get(cstindex);
13        default:
14            return null;
15    }
16 }
17
18 public int getCstSize(String type)
19 {
20     switch(type)
21     {
22        case "Property":
23            return cstPropList.size();
24        case "IFProperty":
25            return cstIfPropList.size();
26        default:
27            return -1;
28    }
29 }
30
31 public ArrayList<RepValue> getCstList(String type)
--
```

T6 - Eclipse Metrics Plugin

눈여겨 봐야할 **Metrics** 항목의 의미

- **McCabe Cyclomatic Complexity**: 프로그램 복잡도를 나타내는 **software** 단위. 높으면 높을수록 복잡하다.
- **Number of Parameters**: 매개변수의 수
- **Nested Block Depth**: 중첩된 { }의 개수

눈여겨 봐야할 수치 의미

Total: 합계 / **Mean**: 평균 / **Std. Dev.**: 표준편차 / **Maximum**: 최대값

T6 - Eclipse Metrics Plugin

Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum	Method
▼ McCabe Cyclomatic Complexity (avg/max per method)	3.073	3.819		23	/T6_source/src/CPT/Task.java	load_work
▶ CPT	2.844	3.577		23	/T6_source/src/CPT/Task.java	load_work
▶ WIN1	7.692	7.342		21	/T6_source/src/WIN1/ComponentSet.java	actionPerformed
▶ EXTRA	2.52	2.352		10	/T6_source/src/EXTRA/ArcDesign.java	update
▶ WIN2	2.786	1.473		6	/T6_source/src/WIN2/Window2.java	updatePanel
▶ TEST	2.059	1.162		4	/T6_source/src/TEST/Category_test.java	testModify_rep_value
▼ Number of Parameters (avg/max per method)	1.051	1.474		12	/T6_source/src/EXTRA/ArcDesign.java	ArcDesign
▶ EXTRA	1.32	2.362		12	/T6_source/src/EXTRA/ArcDesign.java	ArcDesign
▶ CPT	0.862	1.053		6	/T6_source/src/CPT/Task.java	modify_const
▶ WIN1	2.154	1.46		5	/T6_source/src/WIN1/ComponentSet.java	ComponentSet
▶ WIN2	2.286	1.623		5	/T6_source/src/WIN2/CaseComponent...	CaseComponentSet
▶ TEST	0	0		0	/T6_source/src/TEST/Category_test.java	testNew_rep_value
▼ Nested Block Depth (avg/max per method)	1.517	1.023		6	/T6_source/src/CPT/Task.java	workContainValue
▶ CPT	1.495	1.146		6	/T6_source/src/CPT/Task.java	workContainValue
▶ EXTRA	1.56	0.941		4	/T6_source/src/EXTRA/WinHelp.java	actionPerformed
▶ WIN1	1.769	0.973		4	/T6_source/src/WIN1/ComponentSet.java	actionPerformed
▶ TEST	1.353	0.478		2	/T6_source/src/TEST/Category_test.java	testNew_rep_value
▶ WIN2	1.571	0.495		2	/T6_source/src/WIN2/CaseComponent...	PutPanel
▶ Afferent Coupling (avg/max per packageFragment)		5	5.55	15	/T6_source/src/CPT	
▶ Efferent Coupling (avg/max per packageFragment)		4.4	1.497	7	/T6_source/src/CPT	
▶ Instability (avg/max per packageFragment)		0.617	0.243	1	/T6_source/src/TEST	
▶ Abstractness (avg/max per packageFragment)		0.029	0.057	0.143	/T6_source/src/EXTRA	
▶ Normalized Distance (avg/max per packageFragment)		0.354	0.225	0.682	/T6_source/src/CPT	
▶ Depth of Inheritance Tree (avg/max per type)		2.083	1.913	6	/T6_source/src/CPT/MainFrame.java	
▶ Weighted methods per Class (avg/max per type)	547	22.792	32.811	168	/T6_source/src/CPT/Task.java	
▶ Number of Children (avg/max per type)	2	0.083	0.4	2	/T6_source/src/EXTRA/Caller.java	
▶ Number of Overridden Methods (avg/max per type)	3	0.125	0.439	2	/T6_source/src/EXTRA/Bonus.java	
▶ Lack of Cohesion of Methods (avg/max per type)		0.362	0.275	0.865	/T6_source/src/CPT/Task.java	
▶ Number of Attributes (avg/max per type)	147	6.125	6.153	26	/T6_source/src/WIN1/Window1.java	
▶ Number of Static Attributes (avg/max per type)	6	0.25	0.878	4	/T6_source/src/EXTRA/Icon.java	
▶ Number of Methods (avg/max per type)	175	7.292	9.467	49	/T6_source/src/CPT/Task.java	
▶ Number of Static Methods (avg/max per type)	3	0.125	0.439	2	/T6_source/src/EXTRA/Icon.java	
▶ Specialization Index (avg/max per type)		0.05	0.202	1	/T6_source/src/EXTRA/Bonus.java	
▶ Number of Classes (avg/max per packageFragment)	24	4.8	1.833	7	/T6_source/src/CPT	
▶ Number of Interfaces (avg/max per packageFragment)	1	0.2	0.4	1	/T6_source/src/EXTRA	
▶ Number of Packages	5					
▶ Total Lines of Code	3111					
▶ Method Lines of Code (avg/max per method)	2207	12.399	21.39	178	/T6_source/src/WIN1/Window1.java	Window1

<전체 프로젝트>

T6 - Eclipse Metrics Plugin

Metric	Total	Mean	Std. Dev.	Maximum	Resource causing	Maximum	Method
▼ McCabe Cyclomatic Complexity (avg/max per method)		2.844	3.577	23	/T6_source/src/CPT/Task.java		load_work
▼ Task.java		3.429	4.371	23	/T6_source/src/CPT/Task.java		load_work
▼ Task		3.429	4.371	23	/T6_source/src/CPT/Task.java		load_work
load_work	23						
modify_const	18						
save_work	10						
wrapValue	9						
workContainValue	9						
sort	9						
calculate	9						
remove_rep_value	5						
isContains	5						

Metric	Total	Mean	Std. Dev.	Maximum	Resource causing	Maximum	Method
▼ McCabe Cyclomatic Complexity (avg/max per method)		2.844	3.577	23	/T6_source/src/CPT/Task.java		load_work
► Task.java		3.429	4.371	23	/T6_source/src/CPT/Task.java		load_work
▼ RepValue.java		2.947	3.692	17	/T6_source/src/CPT/RepValue.java		isCompatible
▼ RepValue		2.947	3.692	17	/T6_source/src/CPT/RepValue.java		isCompatible
isCompatible	17						
remove_const	7						
add_const	4						
remove_const	4						

Metric	Total	Mean	Std. Dev.	Maximum	Resource causing	Maximum	Method
► McCabe Cyclomatic Complexity (avg/max per method)		2.844	3.577	23	/T6_source/src/CPT/Task.java		load_work
▼ Number of Parameters (avg/max per method)		0.862	1.053	6	/T6_source/src/CPT/Task.java		modify_const
▼ Task.java		1.041	1.277	6	/T6_source/src/CPT/Task.java		modify_const
▼ Task		1.041	1.277	6	/T6_source/src/CPT/Task.java		modify_const
modify_const	6						
remove_const	4						
check_filter	4						
modify_rep_value	3						
remove_const	3						
modify_rep_value	2						

Metric	Total	Mean	Std. Dev.	Maximum	Resource causing	Maximum	Method
► McCabe Cyclomatic Complexity (avg/max per method)		2.844	3.577	23	/T6_source/src/CPT/Task.java		load_work
► Number of Parameters (avg/max per method)		0.862	1.053	6	/T6_source/src/CPT/Task.java		modify_const
▼ Nested Block Depth (avg/max per method)		1.495	1.146	6	/T6_source/src/CPT/Task.java		workContainValue
▼ Task.java		1.898	1.515	6	/T6_source/src/CPT/Task.java		workContainValue
▼ Task		1.898	1.515	6	/T6_source/src/CPT/Task.java		workContainValue
workContainValue	6						
sort	6						
load_work	6						
wrapValue	5						
save_work	5						
remove_rep_value	4						

<package CPT>

T6 - Eclipse Metrics Plugin

Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum	Method
▶ McCabe Cyclomatic Complexity (avg/max per method)		2.52	2.352	10	/T6_source/src/EXTRA/ArcDesign.java	update
▼ Number of Parameters (avg/max per method)		1.32	2.362	12	/T6_source/src/EXTRA/ArcDesign.java	ArcDesign
▼ ArcDesign.java		4.333	5.437	12	/T6_source/src/EXTRA/ArcDesign.java	ArcDesign
▼ ArcDesign		4.333	5.437	12	/T6_source/src/EXTRA/ArcDesign.java	ArcDesign
ArcDesign	12					
paint	1					
update	0					
▶ Icon.java		2	2	4	/T6_source/src/EXTRA/Icon.java	makeColorRGBA
▶ FileSelector.java		0.571	0.728	2	/T6_source/src/EXTRA/FileSelector.java	FileSelector
▶ Window3.java		1.667	0.471	2	/T6_source/src/EXTRA/Window3.java	Window3

<package EXTRA>

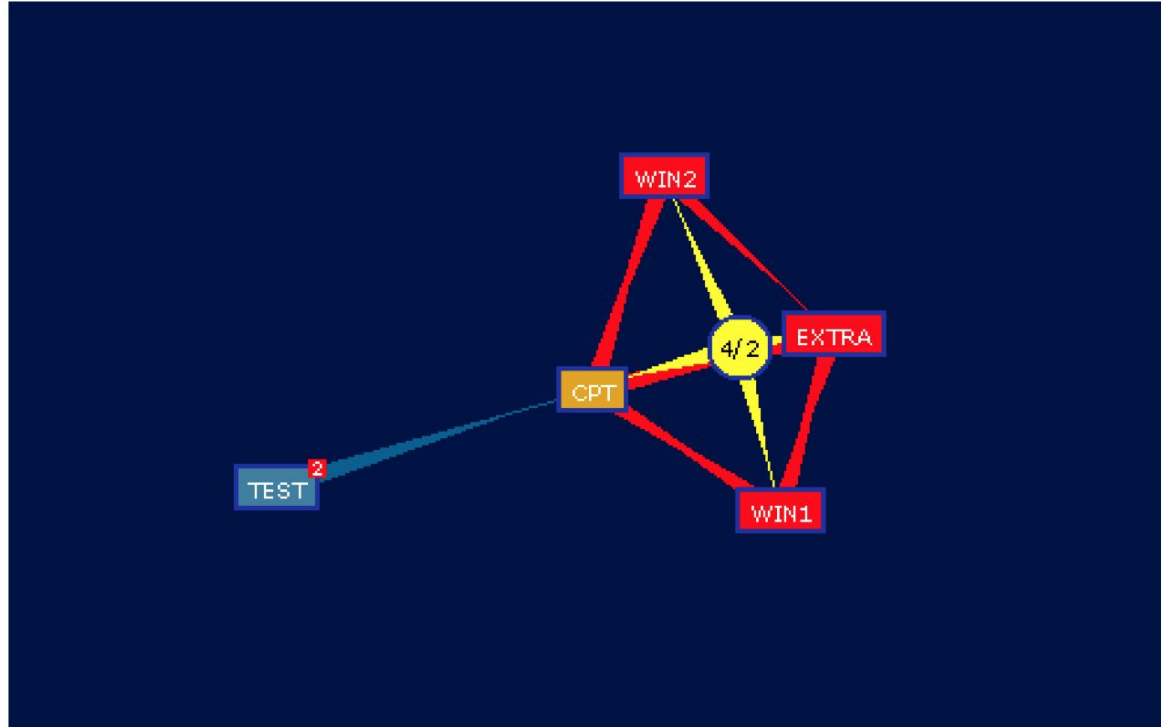
T6 - Eclipse Metrics Plugin

Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum	Method
▼ McCabe Cyclomatic Complexity (avg/max per method)		7.692	7.342	21	/T6_source/src/WIN1/ComponentSet.java	actionPerformed
▼ ComponentSet.java		6.8	7.521	21	/T6_source/src/WIN1/ComponentSet.java	actionPerformed
▼ ComponentSet		6.8	7.521	21	/T6_source/src/WIN1/ComponentSet.java	actionPerformed
actionPerformed	21					
yes	8					
ComponentSet	2					
putPanel	2					
no	1					
▼ Window1.java		12.333	8.055	19	/T6_source/src/WIN1/Window1.java	updatePanel
▼ Window1		12.333	8.055	19	/T6_source/src/WIN1/Window1.java	updatePanel
updatePanel	19					
actionPerformed	17					
Window1	1					
▼ CstComponentSet.java		5.8	5.231	16	/T6_source/src/WIN1/CstComponentS...	actionPerformed
▼ CstComponentSet		5.8	5.231	16	/T6_source/src/WIN1/CstComponentS...	actionPerformed
actionPerformed	16					
CstComponentSet	4					
CstComponentSet	4					
putPanel	4					
GUinit	1					
▶ Number of Parameters (avg/max per method)		2.154	1.46	5	/T6_source/src/WIN1/ComponentSet.java	ComponentSet
▶ Nested Block Depth (avg/max per method)		1.769	0.973	4	/T6_source/src/WIN1/ComponentSet.java	actionPerformed
Afferent Coupling	?					

<package WIN1 >

T6 - Eclipse Metrics Plugin

- ▼ T6_source (7)
 - ▼ src (7)
 - ▶ CPT (4)
 - ▶ EXTRA (3)
 - ▶ TEST
 - ▶ WIN1
 - ▶ WIN2



<Dependency Graph>

T6 - FindBugs

FindBugs : *Defect detection tool (결함 감지 도구)*

- ▼ 📁 CPT (7)
 - ▼ 🚨 Scary (2)
 - ▼ 🚨 High confidence (2)
 - ▼ 🚨 Null pointer dereference in method on exception path (2)
 - 🚨 Null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Scary(7), High confidence]
 - 🚨 Null pointer dereference of put in CPT.Task.save_work() on exception path [Scary(7), High confidence]
 - ▼ 🚨 Troubling (4)
 - ▼ 🚨 High confidence (1)
 - ▼ 🚨 Class defines clone() but doesn't implement Cloneable (1)
 - 🚨 CPT.Result defines clone() but doesn't implement Cloneable [Troubling(14), High confidence]
 - ▼ 🚨 Normal confidence (3)
 - ▼ 🚨 Check for oddness that won't work for negative numbers (1)
 - 🚨 Check for oddness that won't work for negative numbers in new EXTRA.Bonus(Task) [Troubling(13), Normal confidence]
 - ▼ 🚨 Possible null pointer dereference in method on exception path (2)
 - 🚨 Possible null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Troubling(11), Normal confidence]
 - 🚨 Possible null pointer dereference of put in CPT.Task.save_work() on exception path [Troubling(11), Normal confidence]
 - ▼ 🚨 Of Concern (1)
 - ▼ 🚨 High confidence (1)
 - ▼ 🚨 Dead store to local variable (1)
 - 🚨 Dead store to tempRepvList in CPT.Task.sort() [Of Concern(15), High confidence]

T6 - FindBugs (Scary)

The image shows a screenshot of an IDE with two windows. The left window is the Bug Explorer, and the right window is the code editor.

Bug Explorer:

- ▼ CPT (7)
 - ▼ Scary (2)
 - High confidence (2)
 - Null pointer dereference in method on exception path (2)
 - Null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Scary(7), High confidence]
 - Null pointer dereference of put in CPT.Task.save_work() on exception path [Scary(7), High confidence]
 - ▼ Troubling (4)
 - High confidence (1)
 - Class defines clone() but doesn't implement Cloneable (1)
 - CPT.Result defines clone() but doesn't implement Cloneable [Troubling(14), High confidence]
 - Normal confidence (3)
 - Check for oddness that won't work for negative numbers (1)
 - Check for oddness that won't work for negative numbers in new EXTRA.Bonus(Task) [Troubling(13), Normal confidence]
 - Possible null pointer dereference in method on exception path (2)
 - Possible null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Troubling(11), Normal confidence]
 - Possible null pointer dereference of put in CPT.Task.save_work() on exception path [Troubling(11), Normal confidence]
 - ▼ Of Concern (1)
 - High confidence (1)
 - Dead store to local variable (1)
 - Dead store to tempRepvList in CPT.Task.sort() [Of Concern(15), High confidence]

- ▼ SMA2017_FeesualCPT (1)

Code Editor:

```
121  
122     if(fp != null)  
123     {  
124         try  
125         {  
126  
127             in = new Scanner(fp);  
128  
129             textArea.setText("");  
130             while(in.hasNext())  
131             {  
132                 textArea.append(in.nextLine() + "\n");  
133             }  
134  
135         }catch(IOException ie)  
136         {  
137             ie.getMessage();  
138         }  
139         finally  
140         {  
141             in.close();  
142         }  
143     }  
144 }  
145 }  
146 }
```

T6 - FindBugs (Scary)

The image shows an IDE interface with two main panels. The left panel is the 'Bug Explorer' window, which displays a tree view of detected bugs. The right panel is the code editor, showing the source code for 'TestCaseTest.java'.

Bug Explorer:

- CPT (7)
 - Scary (2)
 - High confidence (2)
 - Null pointer dereference in method on exception path (2)
 - Null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Scary(7), High confidence]
 - Null pointer dereference of put in CPT.Task.save_work() on exception path [Scary(7), High confidence]
 - Troubling (4)
 - High confidence (1)
 - Class defines clone() but doesn't implement Cloneable (1)
 - CPT.Result defines clone() but doesn't implement Cloneable [Troubling(14), High confidence]
 - Normal confidence (3)
 - Check for oddness that won't work for negative numbers (1)
 - Check for oddness that won't work for negative numbers in new EXTRA.Bonus(Task) [Troubling(13), Normal confidence]
 - Possible null pointer dereference in method on exception path (2)
 - Possible null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Troubling(11), Normal confidence]
 - Possible null pointer dereference of put in CPT.Task.save_work() on exception path [Troubling(11), Normal confidence]
 - Of Concern (1)
 - High confidence (1)
 - Dead store to local variable (1)
 - Dead store to tempRepvList in CPT.Task.sort() [Of Concern(15), High confidence]
- SMA2017_FeesualCPT (1)

```
560     }
561     }
562     }catch(IOException ie)
563     {
564         ie.getMessage();
565     }
566     finally
567     {
568         put.close();
569     }
570 }
571
572 public void load_work()
573 {
574
575     cgrList.clear();
576     proplList.clear();
577     constraints.clear();
578     cindex = -1;
579     rindex = -1;
580     pindex = -1;
581
582     try
583     {
584         File fp = new File(fp.parse());
```

T6 - FindBugs (Troubling)

The image shows an IDE window with two panes. The left pane displays the Bug Explorer, and the right pane displays the source code for TestCaseTest.java.

Bug Explorer:

- ▼ CPT (7)
 - ▼ Scary (2)
 - ▼ High confidence (2)
 - ▼ Null pointer dereference in method on exception path (2)
 - Null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Scary(7), High confidence]
 - Null pointer dereference of put in CPT.Task.save_work() on exception path [Scary(7), High confidence]
 - ▼ Troubling (4)
 - ▼ High confidence (1)
 - ▼ Class defines clone() but doesn't implement Cloneable (1)
 - CPT.Result defines clone() but doesn't implement Cloneable [Troubling(14), High confidence]**
 - ▼ Normal confidence (3)
 - ▼ Check for oddness that won't work for negative numbers (1)
 - Check for oddness that won't work for negative numbers in new EXTRA.Bonus(Task) [Troubling(13), Normal confidence]
 - ▼ Possible null pointer dereference in method on exception path (2)
 - Possible null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Troubling(11), Normal confidence]
 - Possible null pointer dereference of put in CPT.Task.save_work() on exception path [Troubling(11), Normal confidence]
 - ▼ Of Concern (1)
 - ▼ High confidence (1)
 - ▼ Dead store to local variable (1)
 - Dead store to tempRepvList in CPT.Task.sort() [Of Concern(15), High confidence]
- ▶ SMA2017_FeesualCPT (1)

```
35
36
37 // GUI
38 this.caseFlag = !caseFlag;
39 }
40
41 // encapsulation
42
43
44 public boolean getCaseFlag()
45 {
46     return caseFlag;
47 }
48
49 public Result clone()
50 {
51     Result cResult = new Result();
52     cResult.combList = (ArrayList<RepValue>)this.combList.clone();
53     cResult.combListProp = (ArrayList<Property>)this.combListProp.clone();
54     return cResult;
55 }
```

T6 - FindBugs (Troubling)

Bug Explorer

- ▼ CPT (7)
 - ▼ Scary (2)
 - ▼ High confidence (2)
 - ▼ Null pointer dereference in method on exception path (2)
 - Null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Scary(7), High confidence]
 - Null pointer dereference of put in CPT.Task.save_work() on exception path [Scary(7), High confidence]
 - ▼ Troubling (4)
 - ▼ High confidence (1)
 - ▼ Class defines clone() but doesn't implement Cloneable (1)
 - CPT.Result defines clone() but doesn't implement Cloneable [Troubling(14), High confidence]
 - ▼ Normal confidence (3)
 - ▼ Check for oddness that won't work for negative numbers (1)
 - Check for oddness that won't work for negative numbers in new EXTRA.Bonus(Task) [Troubling(13), Normal confidence]
 - ▼ Possible null pointer dereference in method on exception path (2)
 - Possible null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Troubling(11), Normal confidence]
 - Possible null pointer dereference of put in CPT.Task.save_work() on exception path [Troubling(11), Normal confidence]
 - ▼ Of Concern (1)
 - ▼ High confidence (1)
 - ▼ Dead store to local variable (1)
 - Dead store to tempRepvList in CPT.Task.sort() [Of Concern(15), High confidence]
 - ▶ SMA2017_FeesualCPT (1)

```
29 public Bonus(Task T)
30 {
31     this.T = T;
32     thread = new Thread(this);
33     delay =18;
34
35     ad2 = new ArrayList<ArcDesign>();
36
37     for(int i=0;i<8;i++)
38     {
39         if(i%2 ==1)
40         {
41             ad2.add(new ArcDesign(247,217,115,18,4,0,0,false,45*i,45*i));
42             ad2.add(new ArcDesign(247,217,95,3,4,0,0,false,45*i,45*i));
43         }
44         else
45         {
46             ad2.add(new ArcDesign(247,217,115,18,4,0,0,false,45*i,45*i));
47             ad2.add(new ArcDesign(247,217,95,3,4,0,0,false,45*i,45*i));
48         }
49     }
50     //
51     ad2.add(new ArcDesign(247,217,143,2,4,0,1,true,240,110,110,110));
52     ad2.add(new ArcDesign(247,217,143,2,4,0,1,true,150,30,30,30));
```

T6 - FindBugs (Troubling)

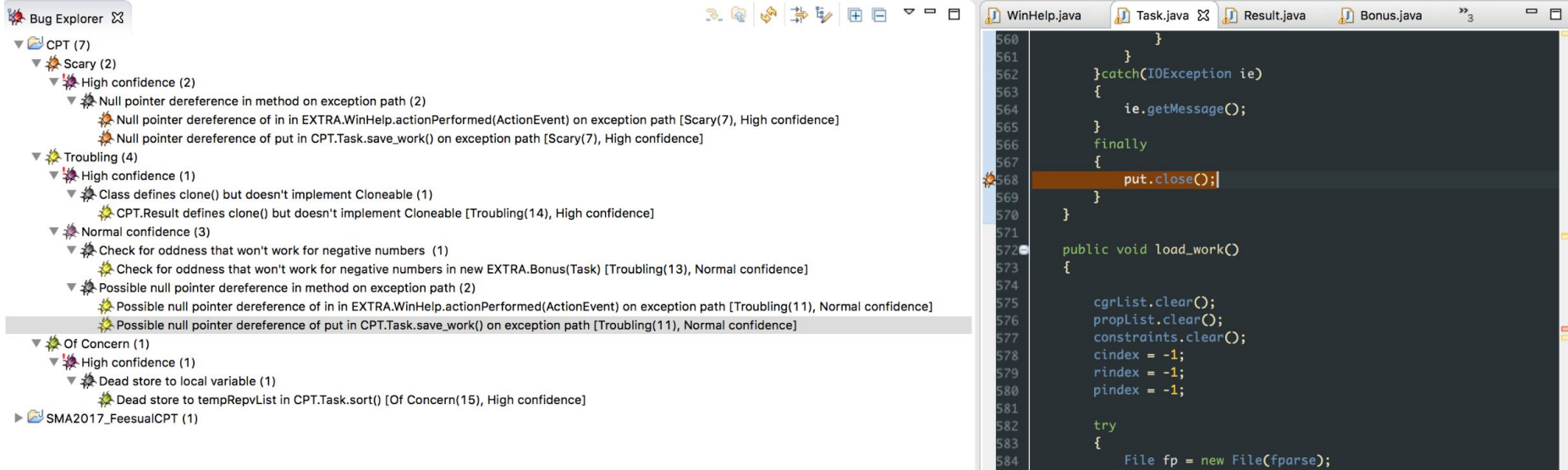
The image shows a screenshot of an IDE with two main windows: Bug Explorer and a code editor.

Bug Explorer:

- CPT (7)
 - Scary (2)
 - High confidence (2)
 - Null pointer dereference in method on exception path (2)
 - Null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Scary(7), High confidence]
 - Null pointer dereference of put in CPT.Task.save_work() on exception path [Scary(7), High confidence]
 - Troubling (4)
 - High confidence (1)
 - Class defines clone() but doesn't implement Cloneable (1)
 - CPT.Result defines clone() but doesn't implement Cloneable [Troubling(14), High confidence]
 - Normal confidence (3)
 - Check for oddness that won't work for negative numbers (1)
 - Check for oddness that won't work for negative numbers in new EXTRA.Bonus(Task) [Troubling(13), Normal confidence]
 - Possible null pointer dereference in method on exception path (2)
 - Possible null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Troubling(11), Normal confidence]**
 - Possible null pointer dereference of put in CPT.Task.save_work() on exception path [Troubling(11), Normal confidence]
 - Of Concern (1)
 - High confidence (1)
 - Dead store to local variable (1)
 - Dead store to tempRepvList in CPT.Task.sort() [Of Concern(15), High confidence]
- SMA2017_FeesualCPT (1)

```
121     if(fp != null)
122     {
123         try
124         {
125             {
126                 in = new Scanner(fp);
127             }
128         }
129         textArea.setText("");
130         while(in.hasNext())
131         {
132             textArea.append(in.nextLine() + "\n");
133         }
134     }
135     }catch(IOException ie)
136     {
137         ie.getMessage();
138     }
139     finally
140     {
141         in.close();
142     }
143 }
144 }
145 }
146 }
```

T6 - FindBugs (Troubling)



The image displays a screenshot of an IDE interface. On the left, the 'Bug Explorer' window shows a tree view of FindBugs results. The 'Troubling (4)' category is expanded, showing several bugs. The bug 'Possible null pointer dereference of put in CPT.Task.save_work() on exception path [Troubling(11), Normal confidence]' is highlighted. On the right, the 'WinHelp.java' file is open, showing a code snippet with a highlighted line: `put.close();` at line 568. The code snippet is as follows:

```
560     }
561     }
562     }catch(IOException ie)
563     {
564         ie.getMessage();
565     }
566     finally
567     {
568         put.close();
569     }
570 }
571
572 public void load_work()
573 {
574
575     cgrList.clear();
576     proplis.clear();
577     constraints.clear();
578     cindex = -1;
579     rindex = -1;
580     pindex = -1;
581
582     try
583     {
584         File fp = new File(fparse);
```


T6 - FindBugs (Of Concern)

The image shows a screenshot of an IDE interface. On the left, the 'Bug Explorer' pane displays a tree view of FindBugs results for the project 'CPT'. The results are categorized by confidence and type:

- CPT (7)
 - Scary (2)
 - High confidence (2)
 - Null pointer dereference in method on exception path (2)
 - Null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Scary(7), High confidence]
 - Null pointer dereference of put in CPT.Task.save_work() on exception path [Scary(7), High confidence]
- Troubling (4)
 - High confidence (1)
 - Class defines clone() but doesn't implement Cloneable (1)
 - CPT.Result defines clone() but doesn't implement Cloneable [Troubling(14), High confidence]
 - Normal confidence (3)
 - Check for oddness that won't work for negative numbers (1)
 - Check for oddness that won't work for negative numbers in new EXTRA.Bonus(Task) [Troubling(13), Normal confidence]
 - Possible null pointer dereference in method on exception path (2)
 - Possible null pointer dereference of in in EXTRA.WinHelp.actionPerformed(ActionEvent) on exception path [Troubling(11), Normal confidence]
 - Possible null pointer dereference of put in CPT.Task.save_work() on exception path [Troubling(11), Normal confidence]
- Of Concern (1)
 - High confidence (1)
 - Dead store to local variable (1)
 - Dead store to tempRepvList in CPT.Task.sort() [Of Concern(15), High confidence]

- SMA2017_FeesualCPT (1)

On the right, the 'WinHelp.java' editor shows the following code snippet:

```
381 public ArrayList<CPT.Category> sort(){
382
383     resultList.clear();
384     resultList_filtered.clear();
385
386     ArrayList<CPT.Property> temporaryPropertyList = new ArrayList<CPT.Property>();
387     ArrayList<CPT.Category> tempCategoryList = new ArrayList<CPT.Category>();
388     ArrayList<CPT.RepValue> tempRepvList = new ArrayList<CPT.RepValue>();
389
390     tempCategoryList = (ArrayList<CPT.Category>) result.clone();
391
392     boolean inOrder;
393     CPT.Category tmpCategory;
394
395     for(int i = 0; i<tempCategoryList.size();i++){
396         tmpCategory = tempCategoryList.get(i);
397         inOrder = true;
398
399         for(CPT.RepValue tmp : tmpCategory.getRpvList()){
400             /* If-property RepValue If-property Category Property
401              *
402              */
403             if(!tmp.getCstIfPropList().isEmpty()){
404                 if(!temporaryPropertyList.containsAll(tmp.getCstIfPropList())){
405                     inOrder = false;
```

T7 - PMD

Element	# Violations	# Violations/KLOC	# Violations/Method	Project
Package	359	164.2	5.61	SoftwareMo...
UI.java	26	178.1	13.00	SoftwareMo...
ConstructorCallsOverridableMethod	3	20.5	1.50	SoftwareMo...
SystemPrintln	2	13.7	1.00	SoftwareMo...
VariableNamingConventions	21	143.8	10.50	SoftwareMo...
Test.java	62	76.5	6.20	SoftwareMo...
ConstructorCallsOverridableMethod	1	1.2	0.10	SoftwareMo...
SystemPrintln	5	6.2	0.50	SoftwareMo...
VariableNamingConventions	48	59.3	4.80	SoftwareMo...
MethodNamingConventions	8	9.9	0.80	SoftwareMo...
Test.java	62	76.5	6.20	SoftwareMo...
ConstructorCallsOverridableMethod	1	1.2	0.10	SoftwareMo...
SystemPrintln	5	6.2	0.50	SoftwareMo...
VariableNamingConventions	48	59.3	4.80	SoftwareMo...
MethodNamingConventions	8	9.9	0.80	SoftwareMo...
TC.java	12	226.4	6.00	SoftwareMo...
SystemPrintln	4	75.5	2.00	SoftwareMo...
VariableNamingConventions	6	113.2	3.00	SoftwareMo...
MethodNamingConventions	2	37.7	1.00	SoftwareMo...
RV.java	37	698.1	3.70	SoftwareMo...
VariableNamingConventions	26	490.6	2.60	SoftwareMo...
MethodNamingConventions	11	207.5	1.10	SoftwareMo...
Output_Manager.java	15	625.0	3.75	SoftwareMo...
VariableNamingConventions	8	333.3	2.00	SoftwareMo...
MethodNamingConventions	6	250.0	1.50	SoftwareMo...
SystemPrintln	1	41.7	0.25	SoftwareMo...
Input_Manager.java	99	811.5	5.50	SoftwareMo...
SystemPrintln	2	16.4	0.11	SoftwareMo...
VariableNamingConventions	65	532.8	3.61	SoftwareMo...
MethodNamingConventions	32	262.3	1.78	SoftwareMo...
Category.java	18	600.0	3.00	SoftwareMo...
VariableNamingConventions	14	466.7	2.33	SoftwareMo...
MethodNamingConventions	4	133.3	0.67	SoftwareMo...
Calculate.java	28	202.9	14.00	SoftwareMo...
SystemPrintln	4	29.0	2.00	SoftwareMo...
VariableNamingConventions	22	159.4	11.00	SoftwareMo...
MethodNamingConventions	2	14.5	1.00	SoftwareMo...

T7 - PMD

VariableNamingConventions - 258개

MethodNamingConventions - 73개

ConstructorCallsOverridableMethod - 5개

SystemPrintln - 23개

Error - 359개

T7 - PMD

VariableNamingConventions

```
27 private JTextField categorytextField;  
28 private JTextField CategorytextField;  
29 private JTextField RVtextField;  
30
```

T7 - PMD

Spa.	Source				
> 2		es.Package Test			es.Package Te
> 2		es.Package Test			es.Package Te
> 6		es.Package Input_ManagerTest		es.Package Input_ManagerTe	
> 6		es.Package UR			es.Package Te
> 3		es.Package UR			es.Package Te
> 9		es.Package TC			es.Package T
> 4		es.Package UR			es.Package Te
> 4		es.Package UR			es.Package Te
> 6		es.Package Input_ManagerTest		es.Package Input_ManagerTe	
> 11		es.Package Test			es.Package Te
> 7		es.Package UR			es.Package Te
> 6		es.Package UR			es.Package Te
> 9		es.Package Input_ManagerTest		es.Package Input_ManagerTe	
> 11		es.Package UR			es.Package Te
> 8		es.Package Input_ManagerTest		es.Package Input_ManagerTest	es.Package Input_ManagerTe
> 10		es.Package Test		es.Package Test	es.Package Te
> 12		es.Package Test		es.Package Test	es.Package Te
> 7		es.Package Input_ManagerTest	es.Package Input_ManagerTest	es.Package Input_ManagerTest	es.Package Input_ManagerTe
> 7		es.Package Input_ManagerTest	es.Package Input_ManagerTest	es.Package Input_ManagerTest	es.Package Input_ManagerTe
> 3			es.Package UR		es.Package Te
> 9			es.Package TC		es.Package T
> 4			es.Package UR		es.Package Te
> 4			es.Package UR		es.Package Te
> 6		es.Package Input_ManagerTest		es.Package Input_ManagerTe	
> 11		es.Package Test			es.Package Te
> 7		es.Package UR			es.Package Te
> 6		es.Package UR			es.Package Te
> 9		es.Package Input_ManagerTest		es.Package Input_ManagerTe	
> 11		es.Package UR			es.Package Te
> 8		es.Package Input_ManagerTest		es.Package Input_ManagerTest	es.Package Input_ManagerTe
> 10		es.Package Test		es.Package Test	es.Package Te
> 12		es.Package Test		es.Package Test	es.Package Te
> 7		es.Package Input_ManagerTest	es.Package Input_ManagerTest	es.Package Input_ManagerTest	es.Package Input_ManagerTe
> 7		es.Package Input_ManagerTest	es.Package Input_ManagerTest	es.Package Input_ManagerTest	es.Package Input_ManagerTe

T7 - PMD

```
246 -----
247 Found a 7 line (29 tokens) duplication in the following files:
248 Starting at line 61 of C:\Users\sunggeun\workspace\T7_source\SoftwareModeling\src\unit\test\Input_ManagerTest.java
249 Starting at line 86 of C:\Users\sunggeun\workspace\T7_source\SoftwareModeling\src\unit\test\Input_ManagerTest.java
250 Starting at line 139 of C:\Users\sunggeun\workspace\T7_source\SoftwareModeling\src\unit\test\Input_ManagerTest.java
251 Starting at line 304 of C:\Users\sunggeun\workspace\T7_source\SoftwareModeling\src\unit\test\Input_ManagerTest.java
252 Starting at line 323 of C:\Users\sunggeun\workspace\T7_source\SoftwareModeling\src\unit\test\Input_ManagerTest.java
253
254     public void testAdd_RV() {
255         Input_Manager im = new Input_Manager();
256
257         im.Add_Category();
258         im.Add_RV(0);
259         im.Add_RV(0);
260         im.Add_RV(0);
261 -----
```

T7 - Eclipse Metrics Plugin

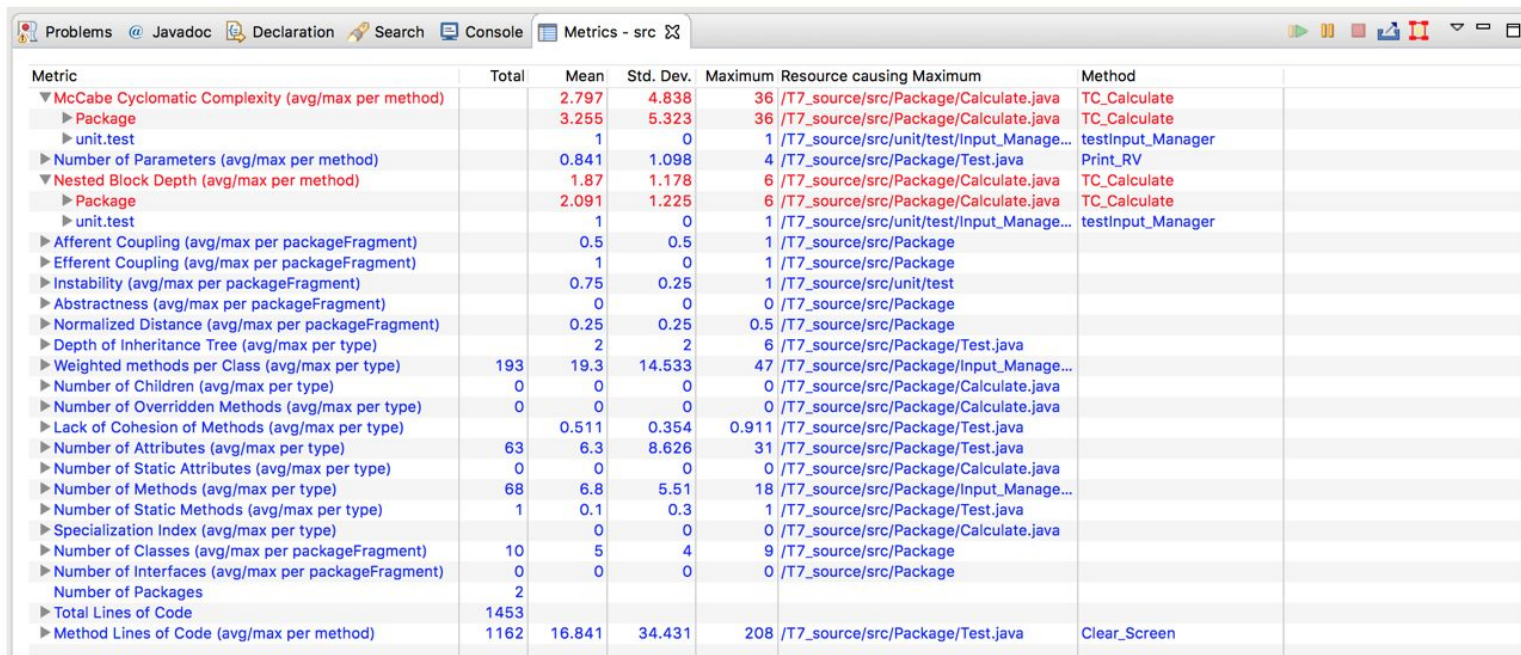
눈여겨 봐야할 **Metrics** 항목의 의미

- **McCabe Cyclomatic Complexity**: 프로그램 복잡도를 나타내는 **software** 단위. 높으면 높을수록 복잡하다.
- **Nested Block Depth**: 중첩된 { }의 개수

눈여겨 봐야할 수치의 의미

Total: 합계 / **Mean**: 평균 / **Std. Dev.**: 표준편차 / **Maximum**: 최대값

T7 - Eclipse Metrics Plugin



Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum	Method
▼ McCabe Cyclomatic Complexity (avg/max per method)		2.797	4.838	36	/T7_source/src/Package/Calculate.java	TC_Calculate
▶ Package		3.255	5.323	36	/T7_source/src/Package/Calculate.java	TC_Calculate
▶ unit.test		1	0	1	/T7_source/src/unit/test/Input_Manage...	testInput_Manager
▶ Number of Parameters (avg/max per method)		0.841	1.098	4	/T7_source/src/Package/Test.java	Print_RV
▼ Nested Block Depth (avg/max per method)		1.87	1.178	6	/T7_source/src/Package/Calculate.java	TC_Calculate
▶ Package		2.091	1.225	6	/T7_source/src/Package/Calculate.java	TC_Calculate
▶ unit.test		1	0	1	/T7_source/src/unit/test/Input_Manage...	testInput_Manager
▶ Afferent Coupling (avg/max per packageFragment)		0.5	0.5	1	/T7_source/src/Package	
▶ Efferent Coupling (avg/max per packageFragment)		1	0	1	/T7_source/src/Package	
▶ Instability (avg/max per packageFragment)		0.75	0.25	1	/T7_source/src/unit/test	
▶ Abstractness (avg/max per packageFragment)		0	0	0	/T7_source/src/Package	
▶ Normalized Distance (avg/max per packageFragment)		0.25	0.25	0.5	/T7_source/src/Package	
▶ Depth of Inheritance Tree (avg/max per type)		2	2	6	/T7_source/src/Package/Test.java	
▶ Weighted methods per Class (avg/max per type)	193	19.3	14.533	47	/T7_source/src/Package/Input_Manage...	
▶ Number of Children (avg/max per type)	0	0	0	0	/T7_source/src/Package/Calculate.java	
▶ Number of Overridden Methods (avg/max per type)	0	0	0	0	/T7_source/src/Package/Calculate.java	
▶ Lack of Cohesion of Methods (avg/max per type)		0.511	0.354	0.911	/T7_source/src/Package/Test.java	
▶ Number of Attributes (avg/max per type)	63	6.3	8.626	31	/T7_source/src/Package/Test.java	
▶ Number of Static Attributes (avg/max per type)	0	0	0	0	/T7_source/src/Package/Calculate.java	
▶ Number of Methods (avg/max per type)	68	6.8	5.51	18	/T7_source/src/Package/Input_Manage...	
▶ Number of Static Methods (avg/max per type)	1	0.1	0.3	1	/T7_source/src/Package/Test.java	
▶ Specialization Index (avg/max per type)		0	0	0	/T7_source/src/Package/Calculate.java	
▶ Number of Classes (avg/max per packageFragment)	10	5	4	9	/T7_source/src/Package	
▶ Number of Interfaces (avg/max per packageFragment)	0	0	0	0	/T7_source/src/Package	
▶ Number of Packages	2					
▶ Total Lines of Code	1453					
▶ Method Lines of Code (avg/max per method)	1162	16.841	34.431	208	/T7_source/src/Package/Test.java	Clear_Screen

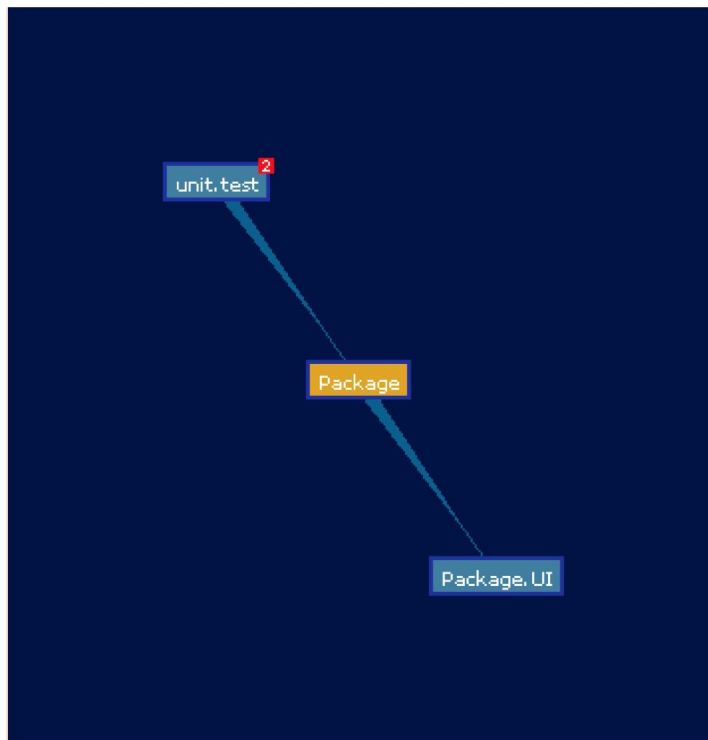
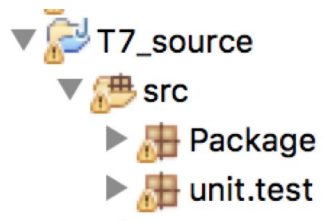
<전체 프로젝트>

T7 - Eclipse Metrics Plugin

Metric	Total	Mean	Std. Dev.	Maximum	Resource causing Maximum	Method
▼ McCabe Cyclomatic Complexity (avg/max per method)		3.255	5.323	36	/T7_source/src/Package/Calculate.java	TC_Calculate
▼ Calculate.java		18.5	17.5	36	/T7_source/src/Package/Calculate.java	TC_Calculate
▼ Calculate		18.5	17.5	36	/T7_source/src/Package/Calculate.java	TC_Calculate
TC_Calculate	36					
Calculate	1					
▼ TC.java		10.5	9.5	20	/T7_source/src/Package/TC.java	If_Property_Check
▼ TC		10.5	9.5	20	/T7_source/src/Package/TC.java	If_Property_Check
If_Property_Check	20					
TC	1					
▶ Test.java		3.2	2.182	8	/T7_source/src/Package/Test.java	Print_Output_Screen
▶ Input_Manager.java		2.611	1.948	8	/T7_source/src/Package/Input_Manage...	Add_Constraint
▶ RV.java		2.1	1.044	4	/T7_source/src/Package/RV.java	setSingle_Error
▶ Output_Manager.java		1.75	1.299	4	/T7_source/src/Package/Output_Man...	Output_File
▶ Category.java		1.667	0.943	3	/T7_source/src/Package/Category.java	Search_RV
▶ UI.java		1.333	0.471	4	/T7_source/src/Package/UI.java	actionPerformed
▶ Number of Parameters (avg/max per method)		1.055	1.135	4	/T7_source/src/Package/Test.java	Print_RV
▶ Nested Block Depth (avg/max per method)		2.091	1.225	6	/T7_source/src/Package/Calculate.java	TC_Calculate
▼ Calculate.java		3.5	2.5	6	/T7_source/src/Package/Calculate.java	TC_Calculate
▼ Calculate		3.5	2.5	6	/T7_source/src/Package/Calculate.java	TC_Calculate
TC_Calculate	6					
Calculate	1					
▼ TC.java		3.5	2.5	6	/T7_source/src/Package/TC.java	If_Property_Check
▼ TC		3.5	2.5	6	/T7_source/src/Package/TC.java	If_Property_Check
If_Property_Check	6					
TC	1					
▶ Test.java		2.6	0.917	4	/T7_source/src/Package/Test.java	Clear_Screen
▶ Input_Manager.java		2	0.943	4	/T7_source/src/Package/Input_Manage...	Add_Constraint
▶ Output_Manager.java		1.75	1.299	4	/T7_source/src/Package/Output_Man...	Output_File
▶ Category.java		1.667	0.943	3	/T7_source/src/Package/Category.java	Search_RV
▶ RV.java		1.8	0.748	3	/T7_source/src/Package/RV.java	Delete_Property
▶ UI.java		1.333	0.471	2	/T7_source/src/Package/UI.java	actionPerformed
▶ Afferent Coupling	1					
▶ Efferent Coupling	1					
▶ Instability	0.5					
▶ Abstractness	0					
▶ Normalized Distance	0.5					
▶ Depth of Inheritance Tree (avg/max per type)		2.111	2.079	6	/T7_source/src/Package/Test.java	
▶ Weighted methods per Class (avg/max per type)	179	19.889	15.206	47	/T7_source/src/Package/Input_Manage...	
▶ Number of Children (avg/max per type)	0	0	0	0	/T7_source/src/Package/Calculate.java	
▶ Number of Overridden Methods (avg/max per type)	0	0	0	0	/T7_source/src/Package/Calculate.java	
▶ Lack of Cohesion of Methods (avg/max per type)		0.567	0.327	0.911	/T7_source/src/Package/Test.java	
▶ Number of Attributes (avg/max per type)	63	7	8.819	31	/T7_source/src/Package/Test.java	
▶ Number of Static Attributes (avg/max per type)	0	0	0	0	/T7_source/src/Package/Calculate.java	

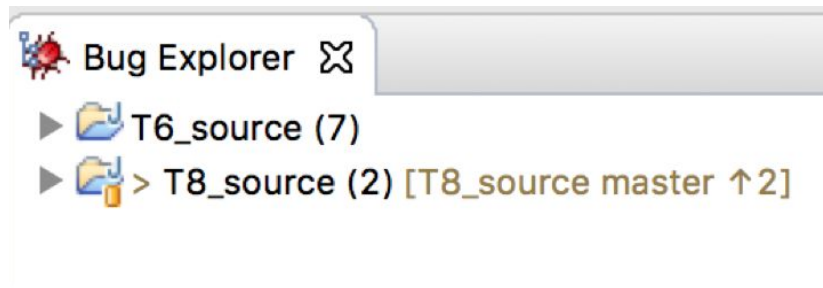
<package Package>

T7 - Eclipse Metrics Plugin



<Dependency Graph>

T7 - FindBugs



결함이 감지되지 않았다.