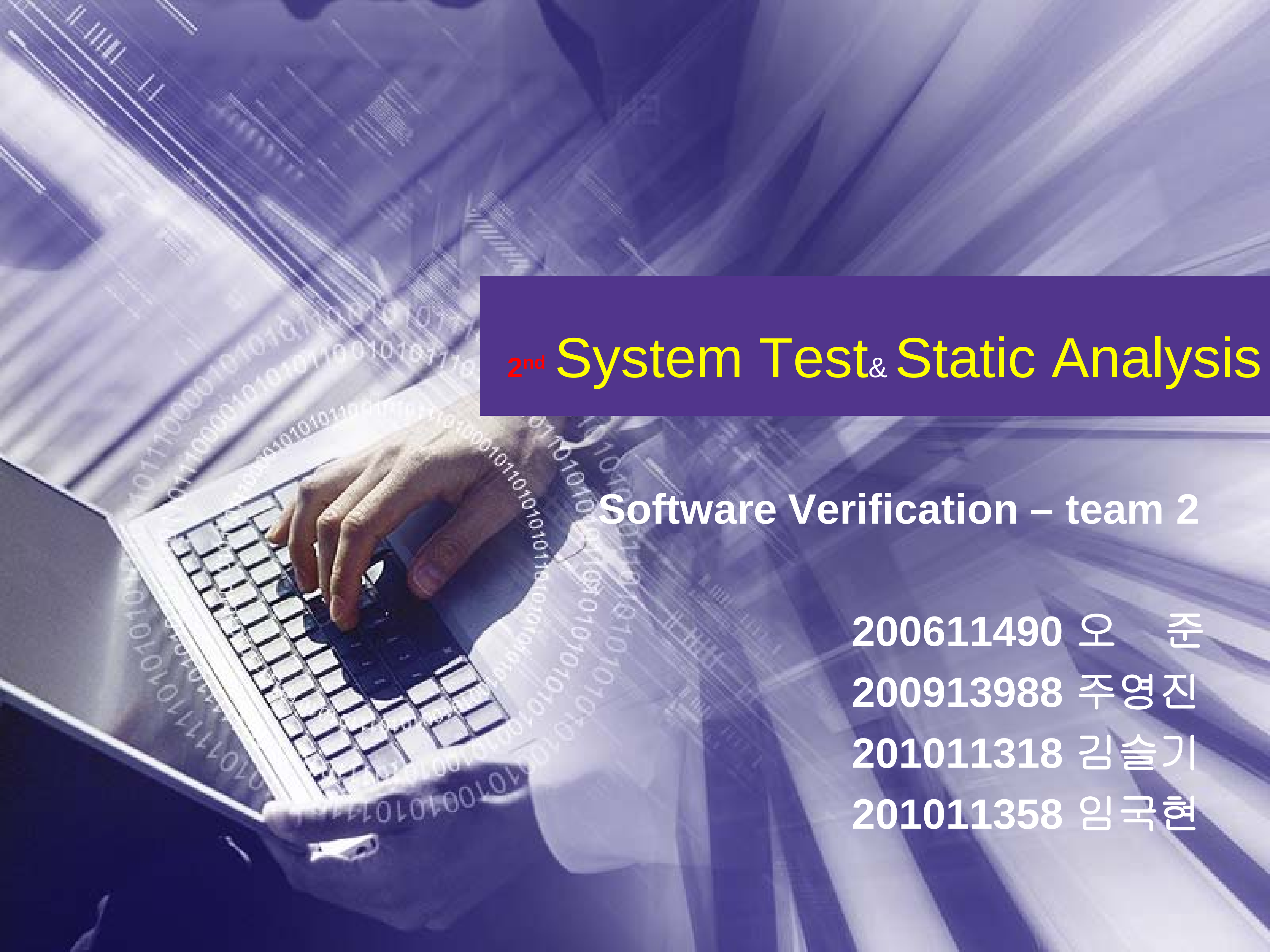

# 2nd System Test& Static Analysis

**Software Verification – team 2**

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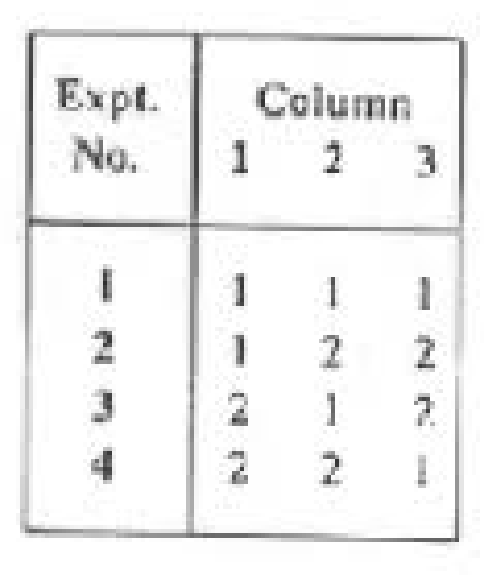
# Index

- 1. System test – Pairwise testing
- 2. Code Coverage – Clover
- 3. Static Analysis  by Sonar
- 4. Tools

# 1.Pairwise Testing

# Pairwise Testing?



| Expt. No. | Column | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| 1 | 1 | 1 | 1 |
| 2 | 1 | 2 | 2 |
| 3 | 2 | 1 | 2 |
| 4 | 2 | 2 | 1 |

- Black-Box Testing의 한 종류로 Parameter 값들의 개별 조합만을 고려하여 Test Case를 만든다.

- 각 Parameter값들의 모든 조합을 Test Case로 만드는 것 보다 적은 수의 Test Case를 만들어 테스트 할 수 있는 장점이 있다.

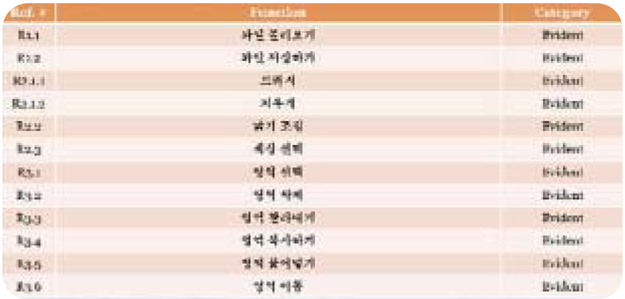
# AllPairs

http://www.satisfice.com/testmethod.shtml

- Pairwise Testing Tool로 Pairwise 조합을 생성해주는 도구이다.
- AllPairs는 James bach가 만든 도구로써 사용자가 파라미터의 값들을 입력으로 주면 각 파라미터 값들의 Pairwise 조합을 출력한다.
- Parameter 들이 가질 수 있는 값들을 같은 간격으로 입력해주어야 한다.

# Pairwise Test

- 시스템 요구사항을 기반으로 테스트 가능한 기능 단위

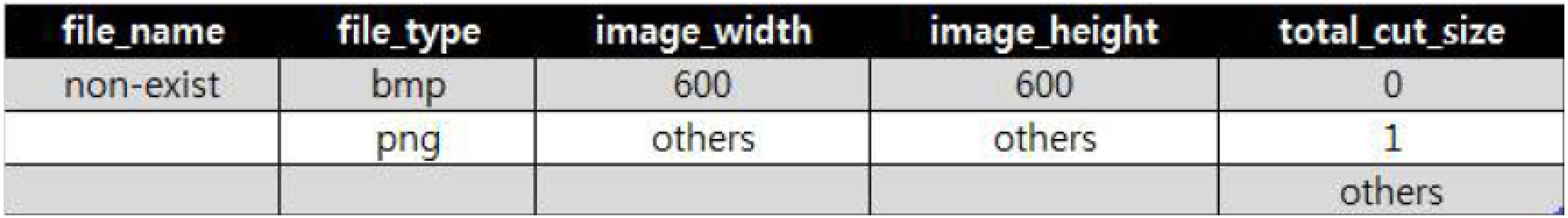


| Ref. # | Function | Category |
|---|---|---|
| R1.1 | 파일 불러오기 | Evident |
| R1.2 | 파일 저장하기 | Evident |
| R2.1.1 | 브러시 | Evident |
| R2.1.2 | 지우개 | Evident |
| R2.2 | 굵기 조절 | Evident |
| R2.3 | 색상 선택 | Evident |
| R3.1 | 영역 선택 | Evident |
| R3.2 | 영역 삭제 | Evident |
| R3.3 | 영역 잘라내기 | Evident |
| R3.4 | 영역 복사하기 | Evident |
| R3.5 | 영역 붙여넣기 | Evident |
| R3.6 | 영역 이동 | Evident |

| |
|---|
| 파일 저장하기 |
| 파일 불러오기 |
| 브러시 |
| 지우개 |
| 굵기 조절 |
| 색상 선택 |
| 영역 선택하기 |
| 영역 복사하기 |
| 영역 삭제하기 |
| 영역 잘라내기 |
| 영역 붙여넣기 |
| 컷 추가하기 |
| 컷 삭제하기 |
| 컷 전환하기 |
| 컷 크기조절하기 |
| 컷 합치기 |

# Pairwise Test

- 파일 저장하기 Parameter Values

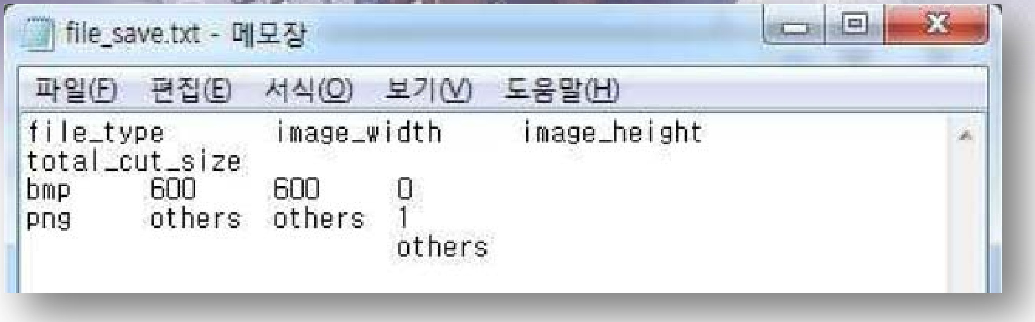


| file_name | file_type | image_width | image_height | total_cut_size |
|---|---|---|---|---|
| non-exist | bmp | 600 | 600 | 0 |
| | png | others | others | 1 |
| | | | | others |

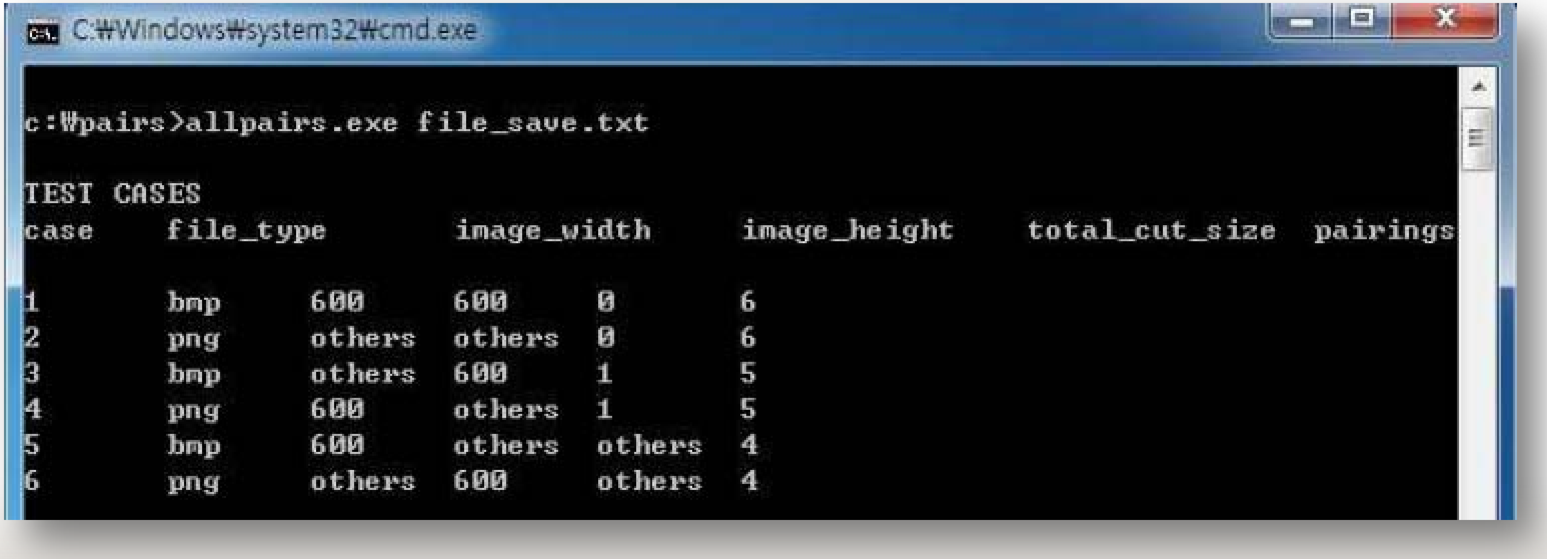
//Error Constraints 적용

# Pairwise Test

- Allpairs 사용



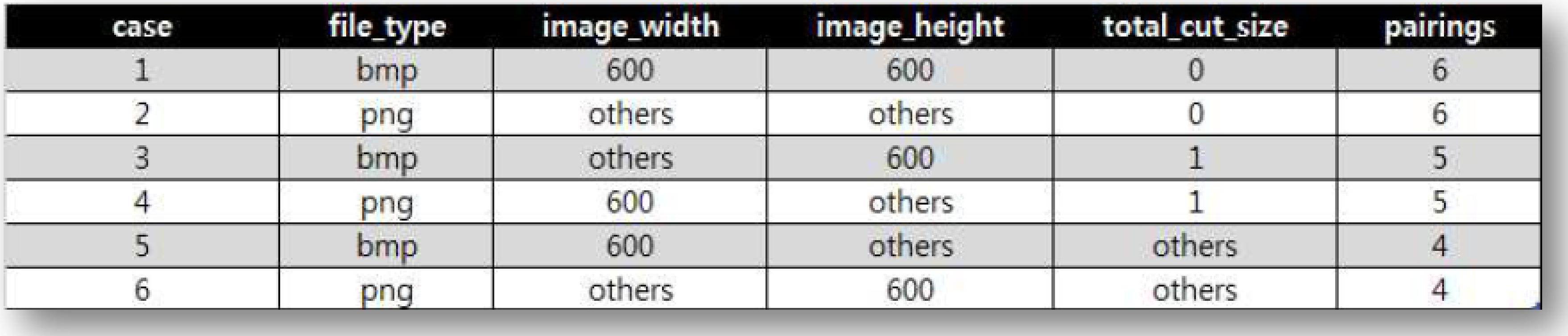
```
file_type       image_width     image_height
total_cut_size
bmp     600     600     0
png     others  others  1
                        others
```



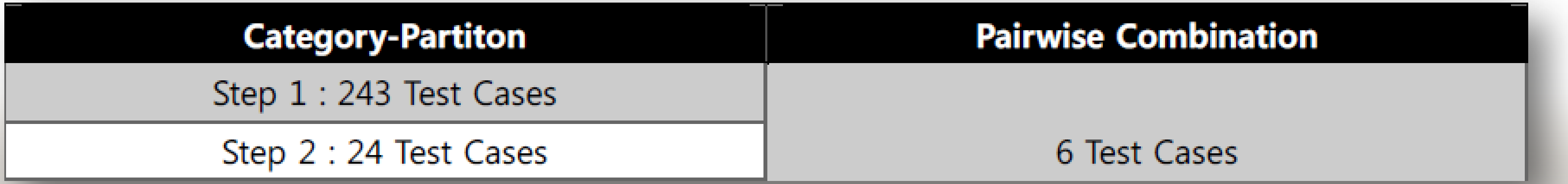
```
c:₩pairs>allpairs.exe file_save.txt

TEST CASES
case    file_type       image_width     image_height    total_cut_size  pairings

1       bmp     600     600     0       6
2       png     others  others  0       6
3       bmp     others  600     1       5
4       png     600     others  1       5
5       bmp     600     others  others  4
6       png     others  600     others  4
```

# Pairwise Test

- 파일 저장하기 Pairwise Combination



| case | file_type | image_width | image_height | total_cut_size | pairings |
|---|---|---|---|---|---|
| 1 | bmp | 600 | 600 | 0 | 6 |
| 2 | png | others | others | 0 | 6 |
| 3 | bmp | others | 600 | 1 | 5 |
| 4 | png | 600 | others | 1 | 5 |
| 5 | bmp | 600 | others | others | 4 |
| 6 | png | others | 600 | others | 4 |



| Category-Partiton | Pairwise Combination |
|---|---|
| Step 1 : 243 Test Cases | 6 Test Cases |
| Step 2 : 24 Test Cases | |

# Pairwise Test

- 파일 불러오기

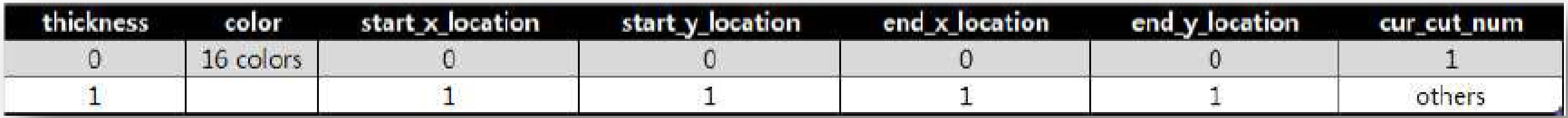
| file_name | file_type | image_width | image_height | total_cut_size |
|---|---|---|---|---|
| exist | bmp | 600 | 600 | 0 |
|  | png | others | others | 1 |
|  |  |  |  | others |

| case | file_type | image_width | image_height | total_cut_size | pairings |
|---|---|---|---|---|---|
| 1 | bmp | 600 | 600 | 0 | 6 |
| 2 | png | others | others | 0 | 6 |
| 3 | bmp | others | 600 | 1 | 5 |
| 4 | png | 600 | others | 1 | 5 |
| 5 | bmp | 600 | others | others | 4 |
| 6 | png | others | 600 | others | 4 |

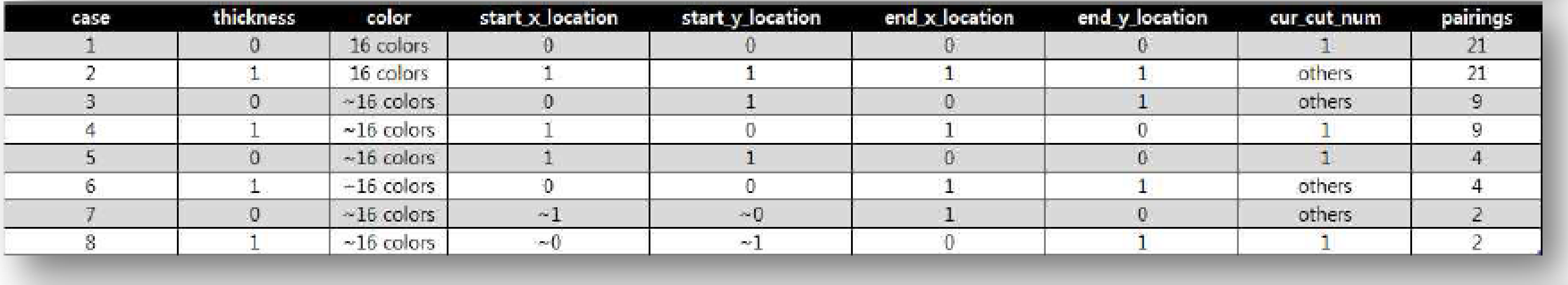
| Category-Partiton | Pairwise Combination |
|---|---|
| Step 1 : 243 Test Cases | 6 Test Cases |
| Step 2 : 24 Test Cases |  |

# Pairwise Test

- 브러시



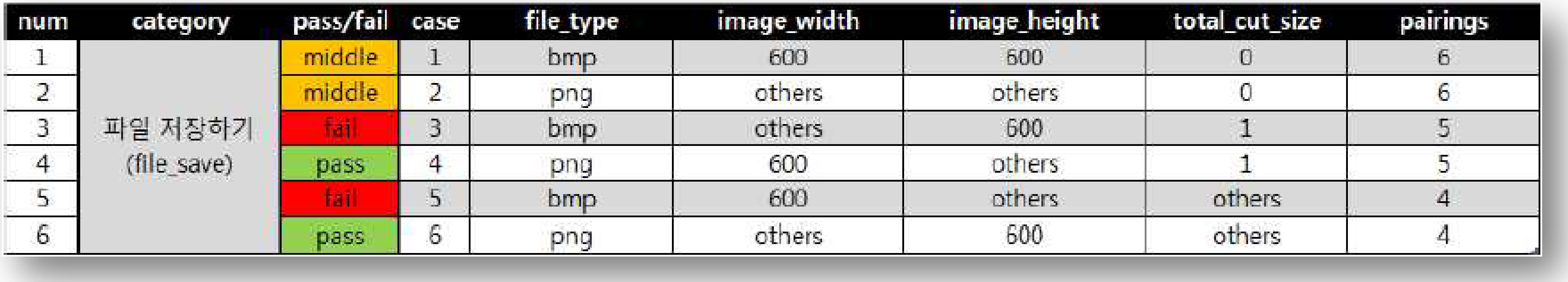
| thickness | color | start_x_location | start_y_location | end_x_location | end_y_location | cur_cut_num |
|---|---|---|---|---|---|---|
| 0 | 16 colors | 0 | 0 | 0 | 0 | 1 |
| 1 |  | 1 | 1 | 1 | 1 | others |



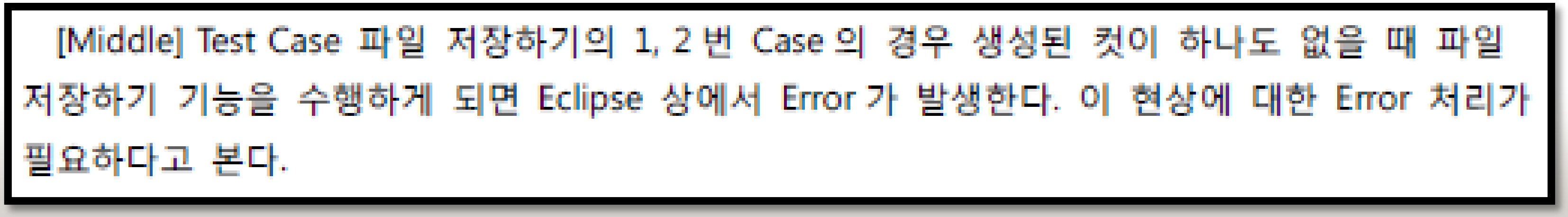
| case | thickness | color | start_x_location | start_y_location | end_x_location | end_y_location | cur_cut_num | pairings |
|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 16 colors | 0 | 0 | 0 | 0 | 1 | 21 |
| 2 | 1 | 16 colors | 1 | 1 | 1 | 1 | others | 21 |
| 3 | 0 | ~16 colors | 0 | 1 | 0 | 1 | others | 9 |
| 4 | 1 | ~16 colors | 1 | 0 | 1 | 0 | 1 | 9 |
| 5 | 0 | ~16 colors | 1 | 1 | 0 | 0 | 1 | 4 |
| 6 | 1 | ~16 colors | 0 | 0 | 1 | 1 | others | 4 |
| 7 | 0 | ~16 colors | ~1 | ~0 | 1 | 0 | others | 2 |
| 8 | 1 | ~16 colors | ~0 | ~1 | 0 | 1 | 1 | 2 |

| Category-Partiton | Pairwise Combination |
|---|---|
| Step 1 : 1,458 Test Cases | 8 Test Cases |
| Step 2 : 64 Test Cases |  |

# Result

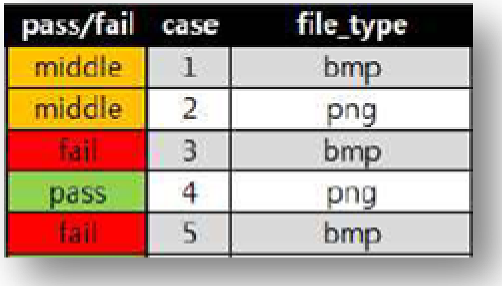


| num | category | pass/fail | case | file_type | image_width | image_height | total_cut_size | pairings |
|---|---|---|---|---|---|---|---|---|
| 1 | 파일 저장하기<br>(file_save) | middle | 1 | bmp | 600 | 600 | 0 | 6 |
| 2 | | middle | 2 | png | others | others | 0 | 6 |
| 3 | | fail | 3 | bmp | others | 600 | 1 | 5 |
| 4 | | pass | 4 | png | 600 | others | 1 | 5 |
| 5 | | fail | 5 | bmp | 600 | others | others | 4 |
| 6 | | pass | 6 | png | others | 600 | others | 4 |

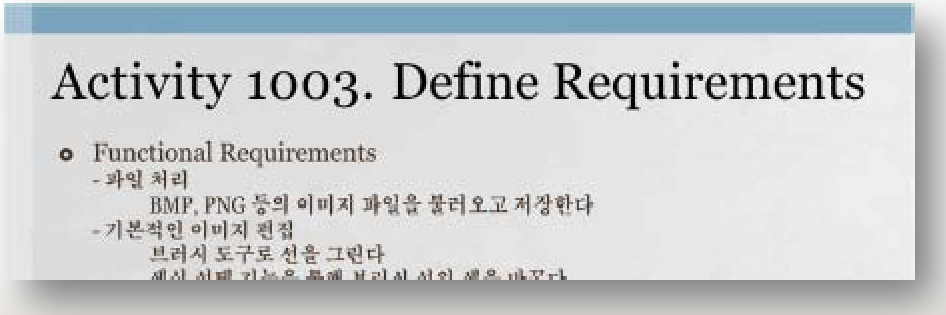


[Middle] Test Case 파일 저장하기의 1, 2 번 Case 의 경우 생성된 컷이 하나도 없을 때 파일 저장하기 기능을 수행하게 되면 Eclipse 상에서 Error 가 발생한다. 이 현상에 대한 Error 처리가 필요하다고 본다.

# Result

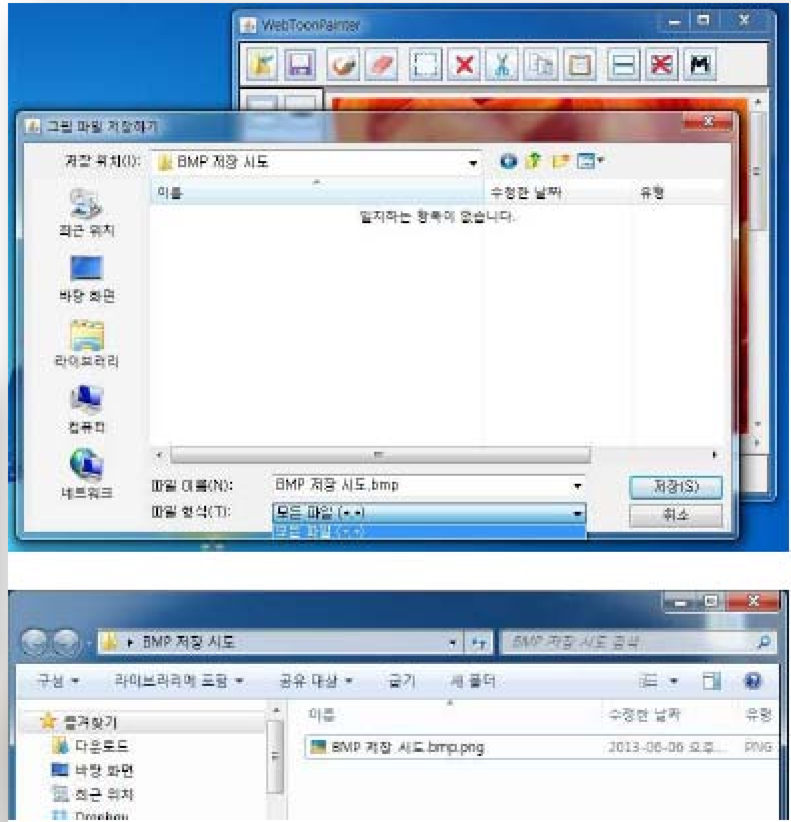


| pass/fail | case | file_type |
|---|---|---|
| middle | 1 | bmp |
| middle | 2 | png |
| fail | 3 | bmp |
| pass | 4 | png |
| fail | 5 | bmp |



## Activity 1003. Define Requirements

- Functional Requirements
  - 파일 처리
    BMP, PNG 등의 이미지 파일을 불러오고 저장한다
  - 기본적인 이미지 편집
    브러시 도구로 선을 그린다
    색상 선택 기능을 통해 브러시 선의 색을 바꾼다



저장 위치(I): BMP 저장 시도

일치하는 항목이 없습니다.

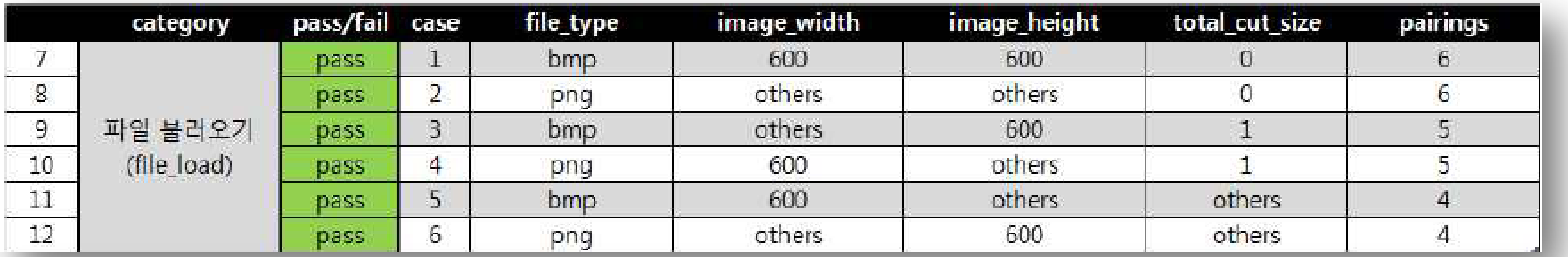
파일 이름(N): BMP 저장 시도.bmp

파일 형식(T): 모든 파일 (*.*)

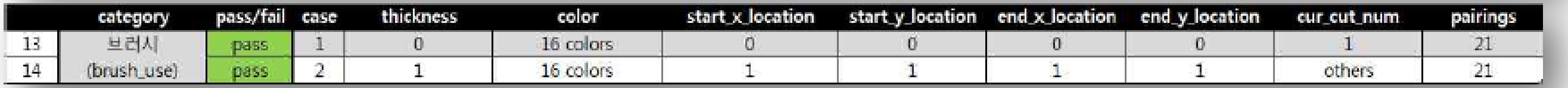
▸ BMP 저장 시도

| 이름 | 수정한 날짜 | 유형 |
|---|---|---|
| BMP 저장 시도.bmp.png | 2013-06-06 오후... | PNG |

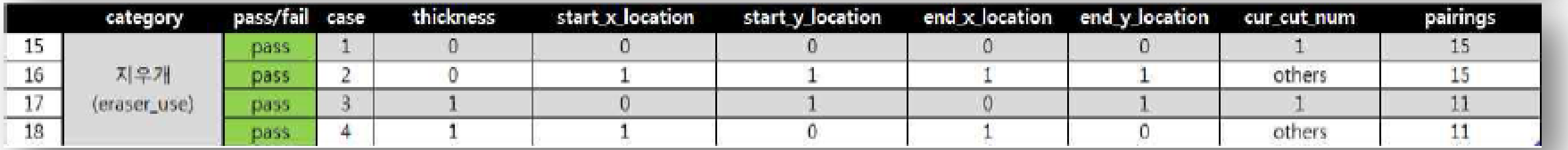
# Result



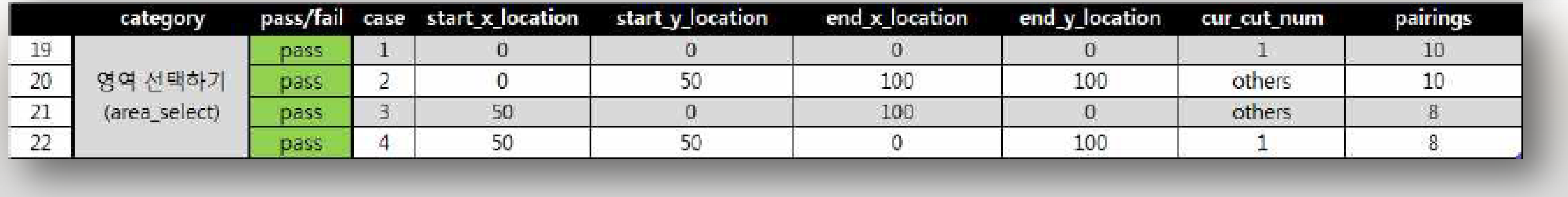
| | category | pass/fail | case | file_type | image_width | image_height | total_cut_size | pairings |
|---|---|---|---|---|---|---|---|---|
| 7 | 파일 불러오기<br>(file_load) | pass | 1 | bmp | 600 | 600 | 0 | 6 |
| 8 | | pass | 2 | png | others | others | 0 | 6 |
| 9 | | pass | 3 | bmp | others | 600 | 1 | 5 |
| 10 | | pass | 4 | png | 600 | others | 1 | 5 |
| 11 | | pass | 5 | bmp | 600 | others | others | 4 |
| 12 | | pass | 6 | png | others | 600 | others | 4 |



| | category | pass/fail | case | thickness | color | start_x_location | start_y_location | end_x_location | end_y_location | cur_cut_num | pairings |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 브러시<br>(brush_use) | pass | 1 | 0 | 16 colors | 0 | 0 | 0 | 0 | 1 | 21 |
| 14 | | pass | 2 | 1 | 16 colors | 1 | 1 | 1 | 1 | others | 21 |

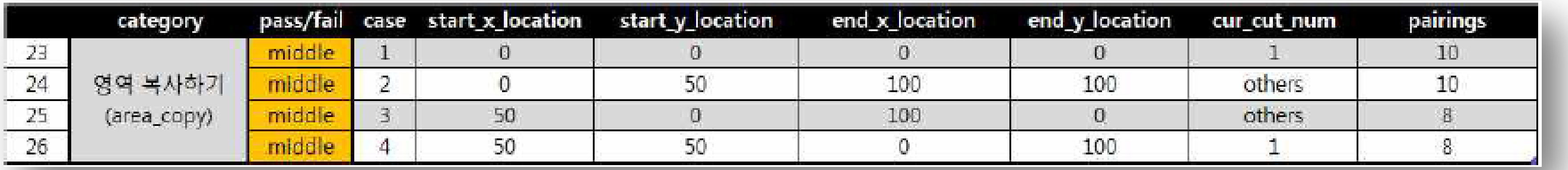


| | category | pass/fail | case | thickness | start_x_location | start_y_location | end_x_location | end_y_location | cur_cut_num | pairings |
|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 지우개<br>(eraser_use) | pass | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 15 |
| 16 | | pass | 2 | 0 | 1 | 1 | 1 | 1 | others | 15 |
| 17 | | pass | 3 | 1 | 0 | 1 | 0 | 1 | 1 | 11 |
| 18 | | pass | 4 | 1 | 1 | 0 | 1 | 0 | others | 11 |

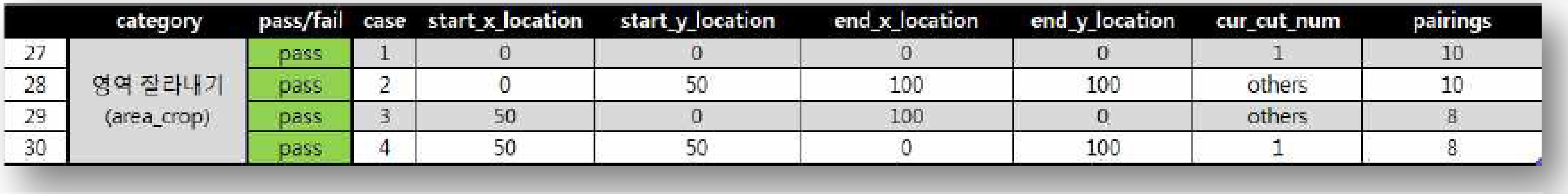


| | category | pass/fail | case | start_x_location | start_y_location | end_x_location | end_y_location | cur_cut_num | pairings |
|---|---|---|---|---|---|---|---|---|---|
| 19 | 영역 선택하기<br>(area_select) | pass | 1 | 0 | 0 | 0 | 0 | 1 | 10 |
| 20 | | pass | 2 | 0 | 50 | 100 | 100 | others | 10 |
| 21 | | pass | 3 | 50 | 0 | 100 | 0 | others | 8 |
| 22 | | pass | 4 | 50 | 50 | 0 | 100 | 1 | 8 |

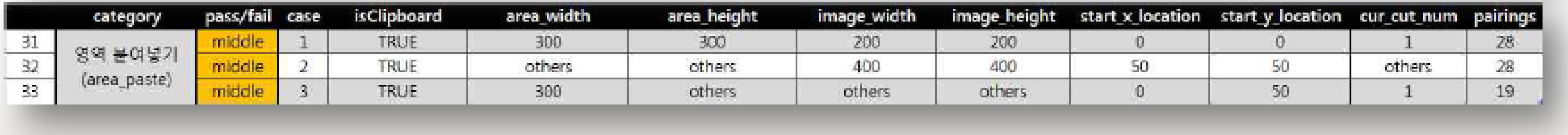
# Result



| | category | pass/fail | case | start_x_location | start_y_location | end_x_location | end_y_location | cur_cut_num | pairings |
|---|---|---|---|---|---|---|---|---|---|
| 23 | 영역 복사하기<br>(area_copy) | middle | 1 | 0 | 0 | 0 | 0 | 1 | 10 |
| 24 | | middle | 2 | 0 | 50 | 100 | 100 | others | 10 |
| 25 | | middle | 3 | 50 | 0 | 100 | 0 | others | 8 |
| 26 | | middle | 4 | 50 | 50 | 0 | 100 | 1 | 8 |

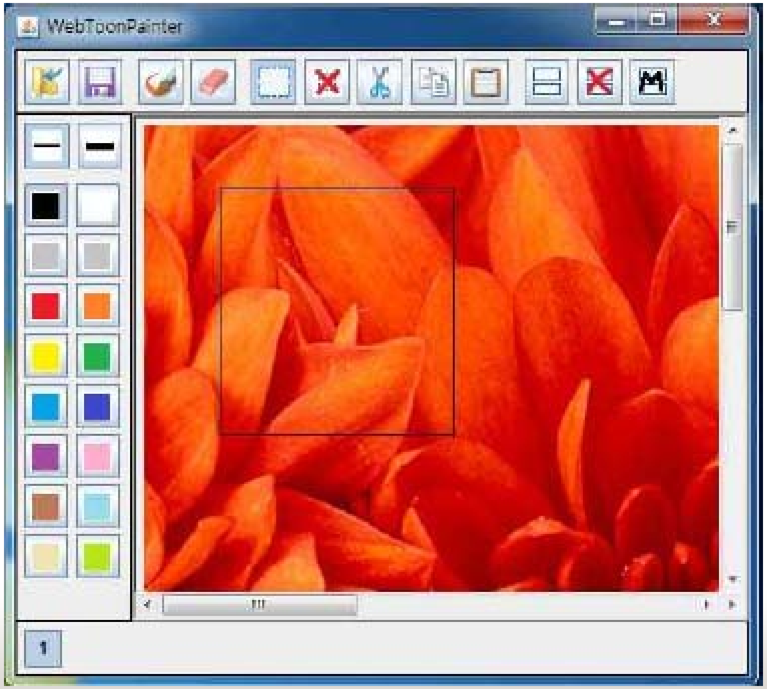


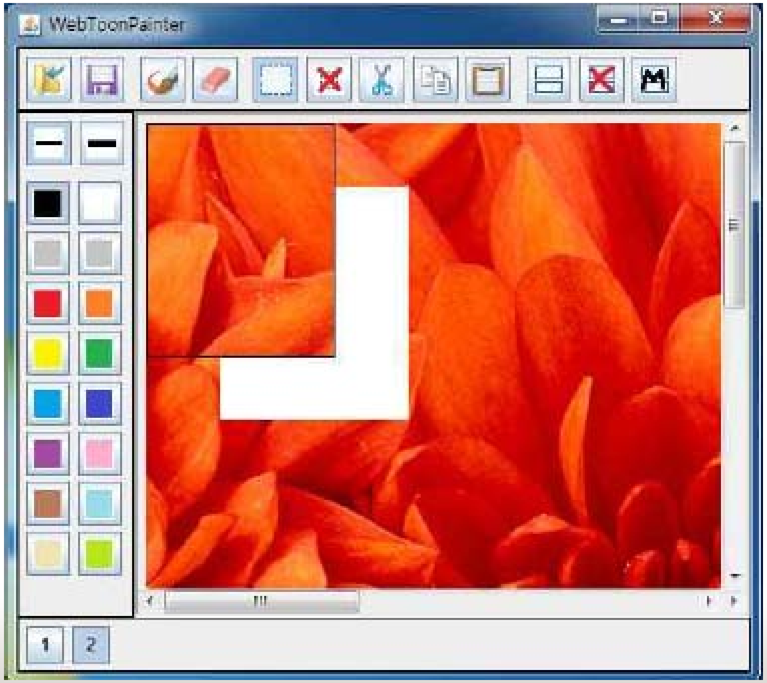
| | category | pass/fail | case | start_x_location | start_y_location | end_x_location | end_y_location | cur_cut_num | pairings |
|---|---|---|---|---|---|---|---|---|---|
| 27 | 영역 잘라내기<br>(area_crop) | pass | 1 | 0 | 0 | 0 | 0 | 1 | 10 |
| 28 | | pass | 2 | 0 | 50 | 100 | 100 | others | 10 |
| 29 | | pass | 3 | 50 | 0 | 100 | 0 | others | 8 |
| 30 | | pass | 4 | 50 | 50 | 0 | 100 | 1 | 8 |



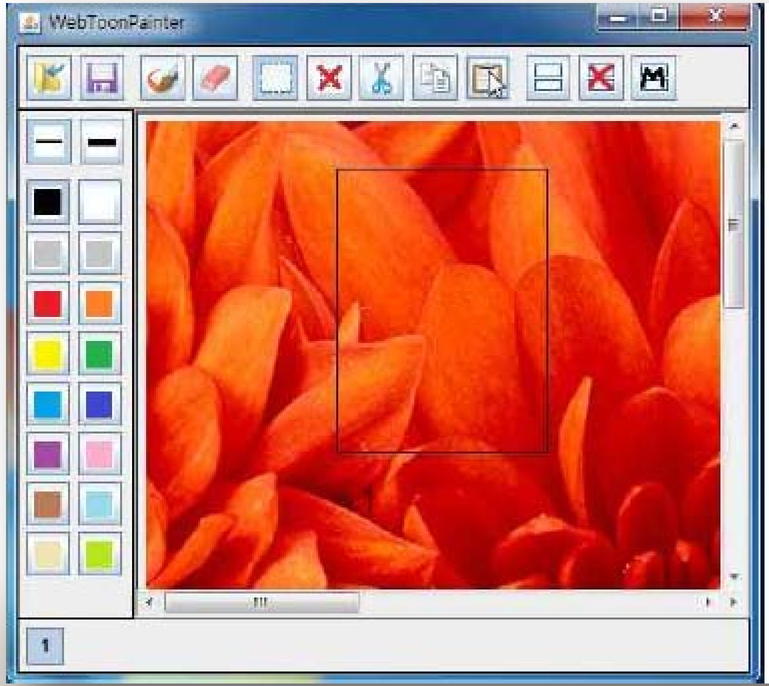
| | category | pass/fail | case | isClipboard | area_width | area_height | image_width | image_height | start_x_location | start_y_location | cur_cut_num | pairings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 영역 붙여넣기<br>(area_paste) | middle | 1 | TRUE | 300 | 300 | 200 | 200 | 0 | 0 | 1 | 28 |
| 32 | | middle | 2 | TRUE | others | others | 400 | 400 | 50 | 50 | others | 28 |
| 33 | | middle | 3 | TRUE | 300 | others | others | others | 0 | 50 | 1 | 19 |

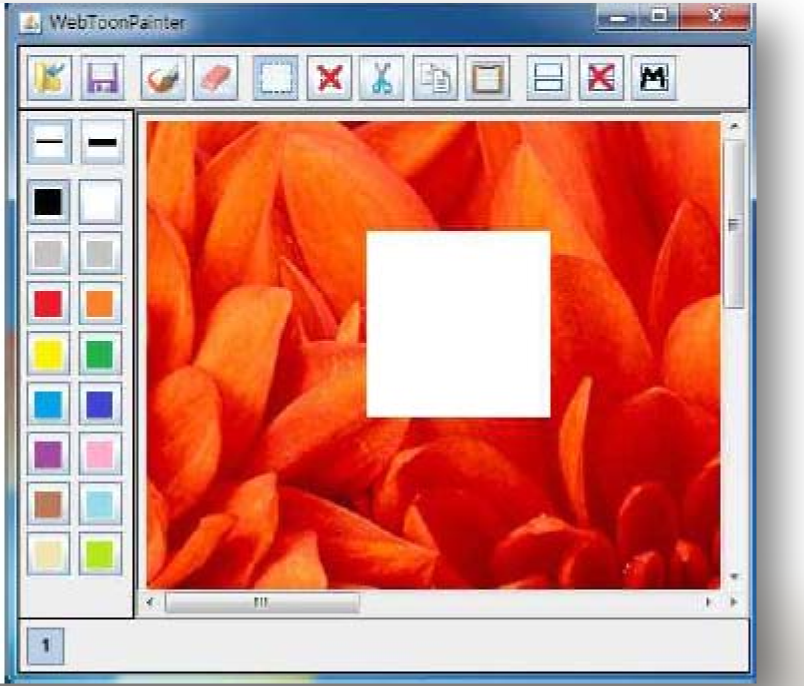
# Result





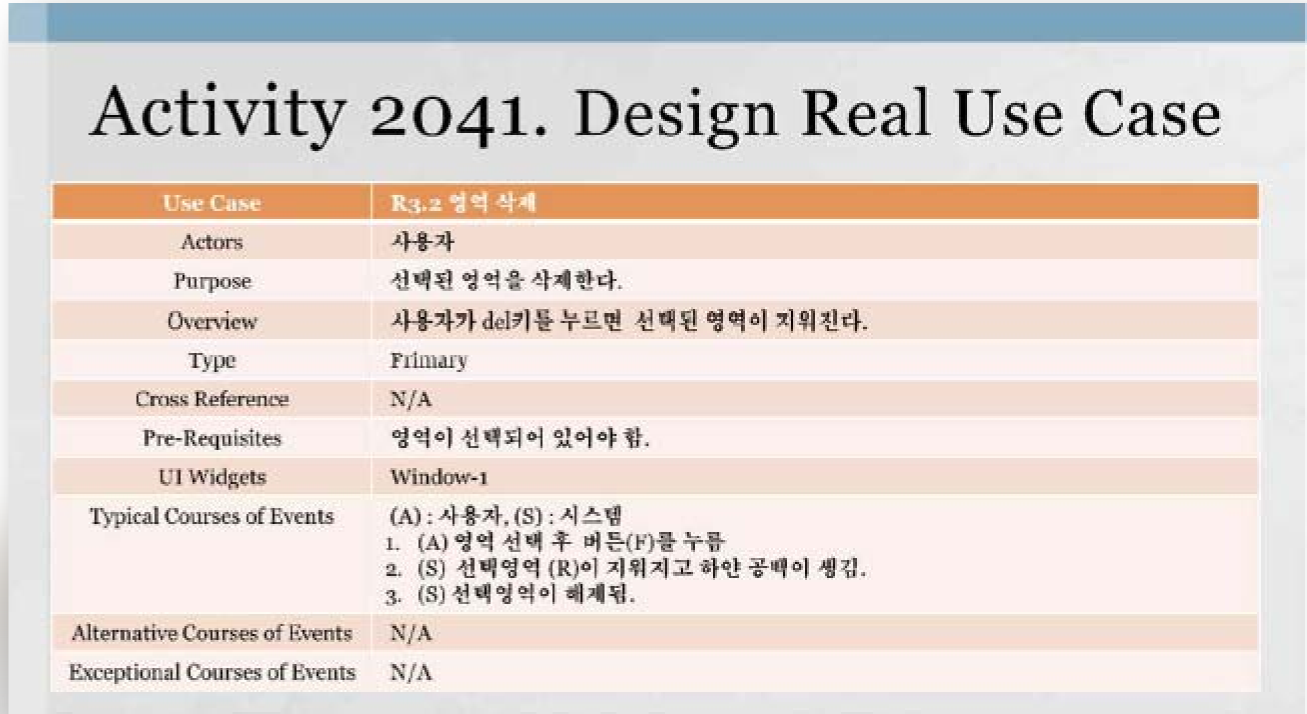
# Result





# Result

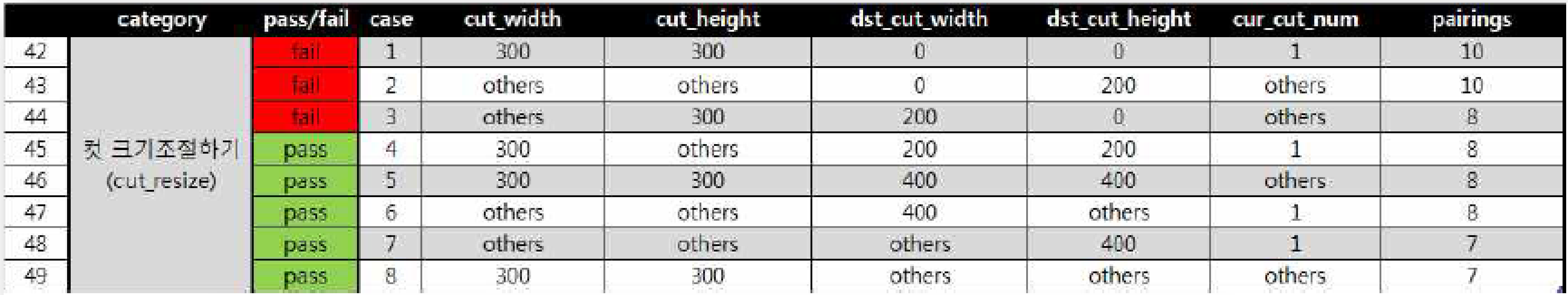
- 영역 삭제하기



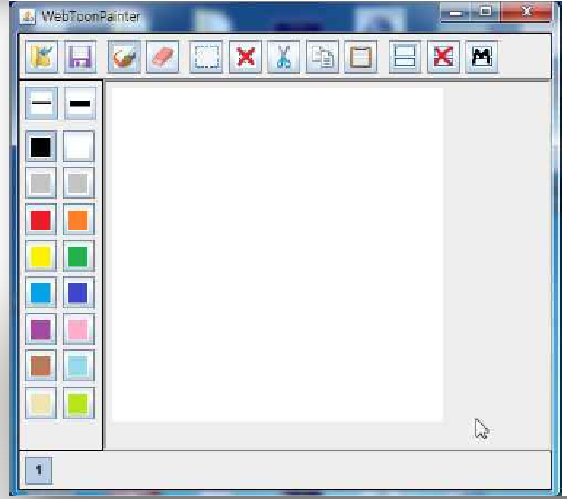
## Activity 2041. Design Real Use Case

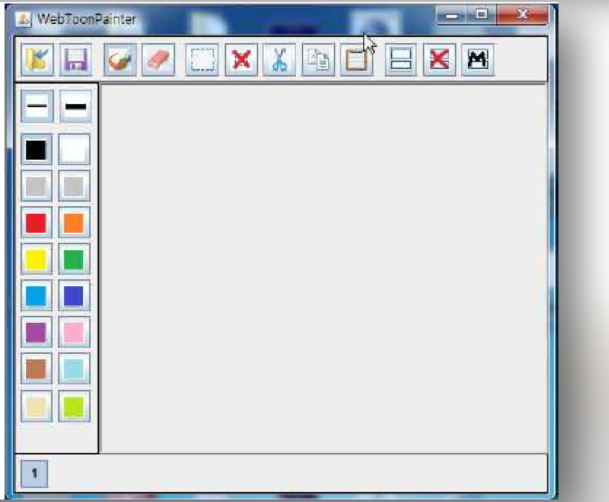
| Use Case | R3.2 영역 삭제 |
|---|---|
| Actors | 사용자 |
| Purpose | 선택된 영역을 삭제한다. |
| Overview | 사용자가 del키를 누르면  선택된 영역이 지워진다. |
| Type | Frimary |
| Cross Reference | N/A |
| Pre-Requisites | 영역이 선택되어 있어야 함. |
| UI Widgets | Window-1 |
| Typical Courses of Events | (A) : 사용자, (S) : 시스템<br>1. (A) 영역 선택 후 버튼(F)를 누름<br>2. (S) 선택영역 (R)이 지워지고 하얀 공백이 생김.<br>3. (S) 선택영역이 해제됨. |
| Alternative Courses of Events | N/A |
| Exceptional Courses of Events | N/A |

# Pairwise Test



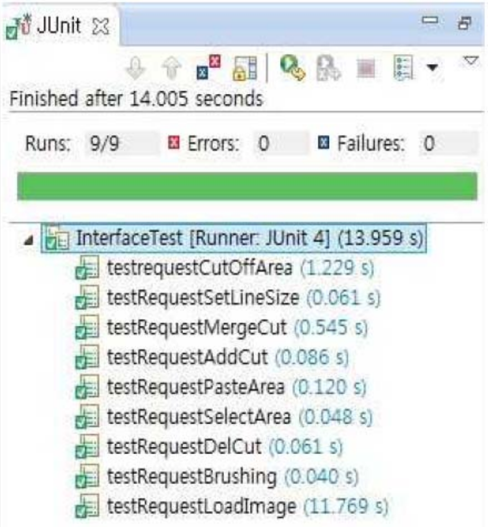
| | category | pass/fail | case | cut_width | cut_height | dst_cut_width | dst_cut_height | cur_cut_num | pairings |
|---|---|---|---|---|---|---|---|---|---|
| 42 | 컷 크기조절하기<br>(cut_resize) | fail | 1 | 300 | 300 | 0 | 0 | 1 | 10 |
| 43 | | fail | 2 | others | others | 0 | 200 | others | 10 |
| 44 | | fail | 3 | others | 300 | 200 | 0 | others | 8 |
| 45 | | pass | 4 | 300 | others | 200 | 200 | 1 | 8 |
| 46 | | pass | 5 | 300 | 300 | 400 | 400 | others | 8 |
| 47 | | pass | 6 | others | others | 400 | others | 1 | 8 |
| 48 | | pass | 7 | others | others | others | 400 | 1 | 7 |
| 49 | | pass | 8 | 300 | 300 | others | others | others | 7 |



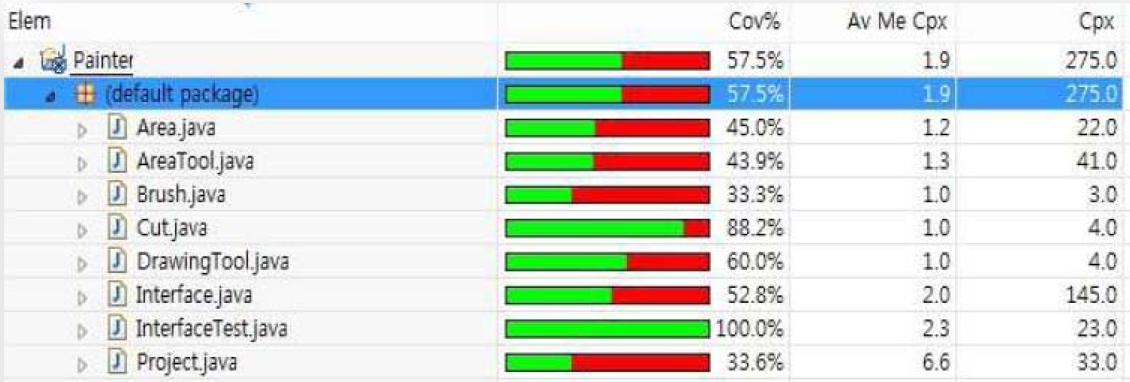


# 2. Clover

# Result

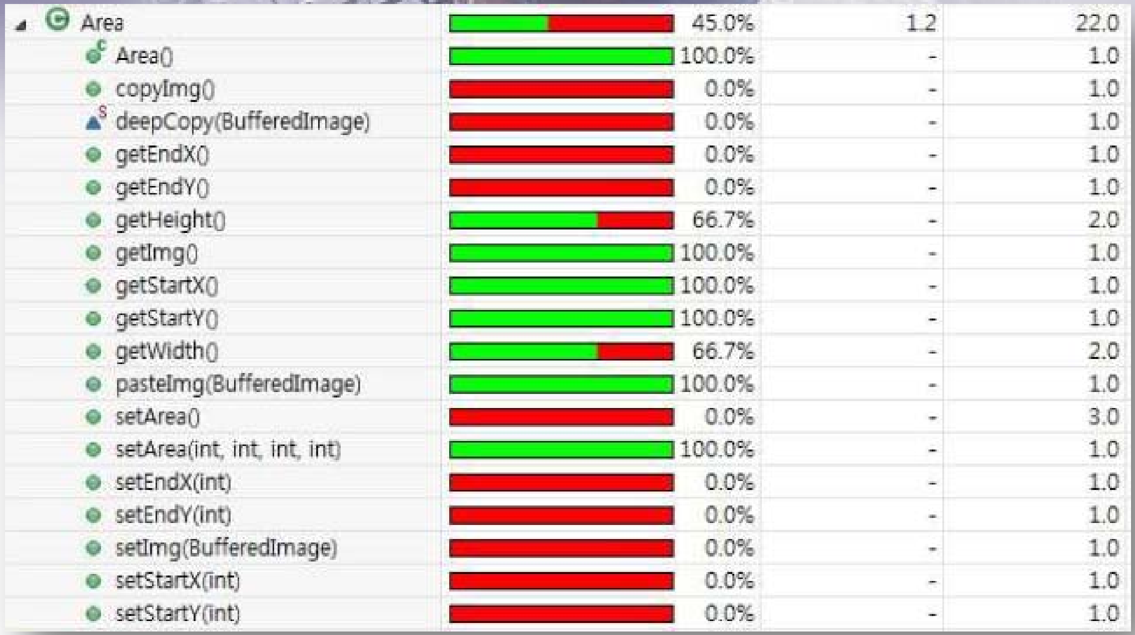


```
Finished after 14.005 seconds

Runs: 9/9    Errors: 0    Failures: 0

InterfaceTest [Runner: JUnit 4] (13.959 s)
    testrequestCutOffArea (1.229 s)
    testRequestSetLineSize (0.061 s)
    testRequestMergeCut (0.545 s)
    testRequestAddCut (0.086 s)
    testRequestPasteArea (0.120 s)
    testRequestSelectArea (0.048 s)
    testRequestDelCut (0.061 s)
    testRequestBrushing (0.040 s)
    testRequestLoadImage (11.769 s)
```



| Elem | | Cov% | Av Me Cpx | Cpx |
|---|---|---|---|---|
| Painter | | 57.5% | 1.9 | 275.0 |
| (default package) | | 57.5% | 1.9 | 275.0 |
| Area.java | | 45.0% | 1.2 | 22.0 |
| AreaTool.java | | 43.9% | 1.3 | 41.0 |
| Brush.java | | 33.3% | 1.0 | 3.0 |
| Cut.java | | 88.2% | 1.0 | 4.0 |
| DrawingTool.java | | 60.0% | 1.0 | 4.0 |
| Interface.java | | 52.8% | 2.0 | 145.0 |
| InterfaceTest.java | | 100.0% | 2.3 | 23.0 |
| Project.java | | 33.6% | 6.6 | 33.0 |

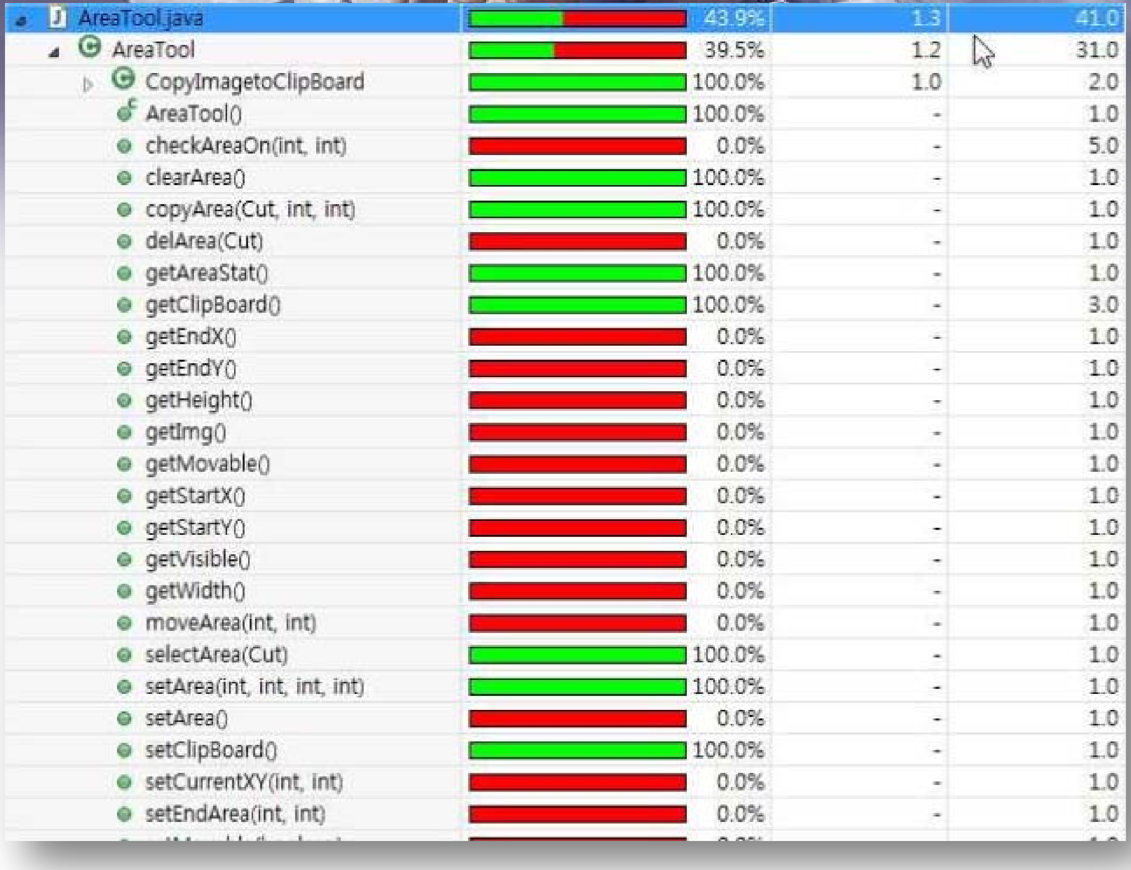
Code Coverage 를 측정하는 도구인 'Clover'를 통해 'SMA Team 2'가 수행한 Test Case 의 결과에 대한 Coverage 를 분석해보았다.



| | | | |
|---|---|---|---|
| Area | 45.0% | 1.2 | 22.0 |
| Area() | 100.0% | - | 1.0 |
| copyImg() | 0.0% | - | 1.0 |
| deepCopy(BufferedImage) | 0.0% | - | 1.0 |
| getEndX() | 0.0% | - | 1.0 |
| getEndY() | 0.0% | - | 1.0 |
| getHeight() | 66.7% | - | 2.0 |
| getImg() | 100.0% | - | 1.0 |
| getStartX() | 100.0% | - | 1.0 |
| getStartY() | 100.0% | - | 1.0 |
| getWidth() | 66.7% | - | 2.0 |
| pasteImg(BufferedImage) | 100.0% | - | 1.0 |
| setArea() | 0.0% | - | 3.0 |
| setArea(int, int, int, int) | 100.0% | - | 1.0 |
| setEndX(int) | 0.0% | - | 1.0 |
| setEndY(int) | 0.0% | - | 1.0 |
| setImg(BufferedImage) | 0.0% | - | 1.0 |
| setStartX(int) | 0.0% | - | 1.0 |
| setStartY(int) | 0.0% | - | 1.0 |

# Analysis

Area Class 의 경우, 전체 Method 18 개 중 Coverage 비율이 60% 이상인 Method 는 8 개였고, Statement Coverage 는 전체 54 개 중 26 개였다. 그 중 분기문에 해당하는 Branch 는 8 개였는데 Cover 된 분기문은 getHeight()함수와 getWidth()함수에서 단 2 개에 불과했다. 따라서, Statement Coverage 는 48%, Branch Coverage 는 25%였다.

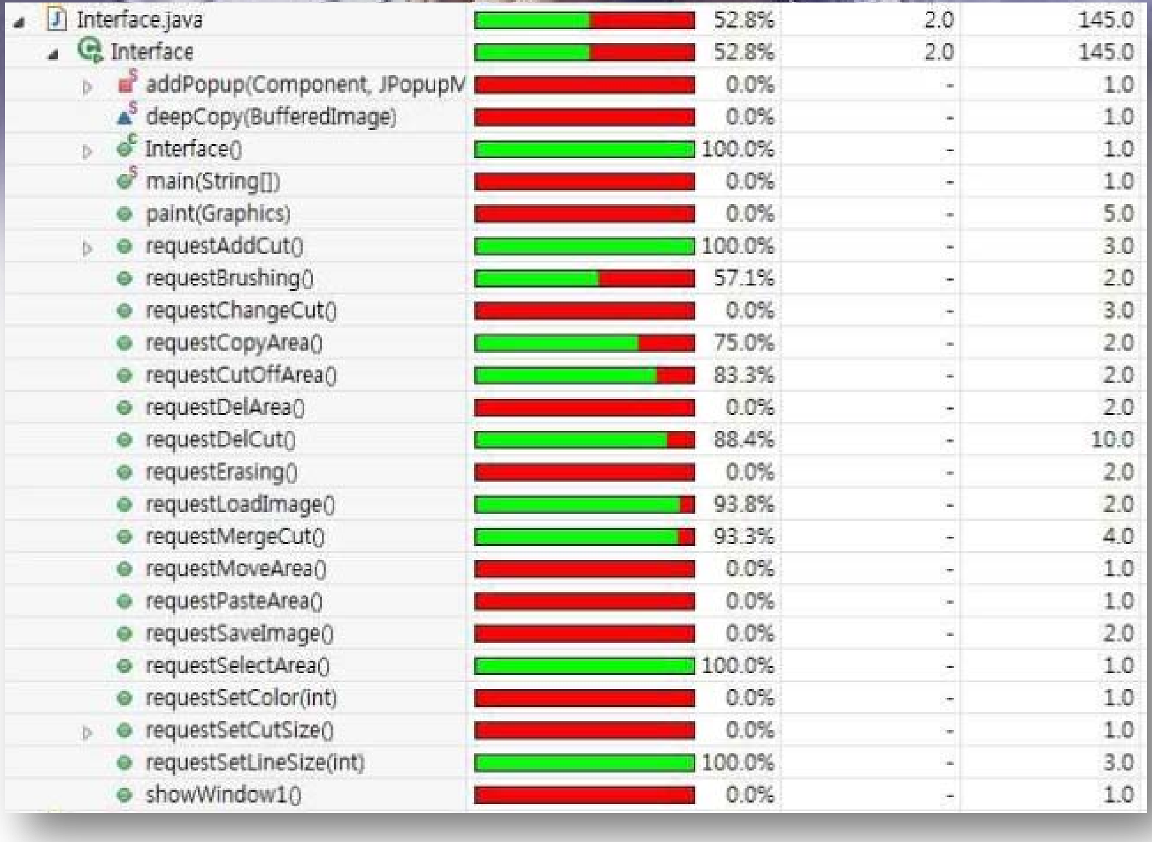


| | | | | |
|---|---|---|---|---|
| AreaTool.java | 🟩🟥 | 43.9% | 1.3 | 41.0 |
| AreaTool | 🟩🟥 | 39.5% | 1.2 | 31.0 |
| CopyImagetoClipBoard | 🟩 | 100.0% | 1.0 | 2.0 |
| AreaTool() | 🟩 | 100.0% | - | 1.0 |
| checkAreaOn(int, int) | 🟥 | 0.0% | - | 5.0 |
| clearArea() | 🟩 | 100.0% | - | 1.0 |
| copyArea(Cut, int, int) | 🟩 | 100.0% | - | 1.0 |
| delArea(Cut) | 🟥 | 0.0% | - | 1.0 |
| getAreaStat() | 🟩 | 100.0% | - | 1.0 |
| getClipBoard() | 🟩 | 100.0% | - | 3.0 |
| getEndX() | 🟥 | 0.0% | - | 1.0 |
| getEndY() | 🟥 | 0.0% | - | 1.0 |
| getHeight() | 🟥 | 0.0% | - | 1.0 |
| getImg() | 🟥 | 0.0% | - | 1.0 |
| getMovable() | 🟥 | 0.0% | - | 1.0 |
| getStartX() | 🟥 | 0.0% | - | 1.0 |
| getStartY() | 🟥 | 0.0% | - | 1.0 |
| getVisible() | 🟥 | 0.0% | - | 1.0 |
| getWidth() | 🟥 | 0.0% | - | 1.0 |
| moveArea(int, int) | 🟥 | 0.0% | - | 1.0 |
| selectArea(Cut) | 🟩 | 100.0% | - | 1.0 |
| setArea(int, int, int, int) | 🟩 | 100.0% | - | 1.0 |
| setArea() | 🟥 | 0.0% | - | 1.0 |
| setClipBoard() | 🟩 | 100.0% | - | 1.0 |
| setCurrentXY(int, int) | 🟥 | 0.0% | - | 1.0 |
| setEndArea(int, int) | 🟥 | 0.0% | - | 1.0 |

# Analysis

해당 클래스도 Area Class 와 마찬가지로 Test 되지 않은 대부분의 Code 가 Setter, Getter Method 였지만, checkAreaOn()과 moveArea() method 의 경우, 주요 기능의 핵심 method 이므로 해당 method 에 대한 Unit Test Case 가 필요할 것으로 보인다.

# Analysis



| | | | |
|---|---|---|---|
| Interface.java | 52.8% | 2.0 | 145.0 |
| Interface | 52.8% | 2.0 | 145.0 |
| addPopup(Component, JPopupM | 0.0% | - | 1.0 |
| deepCopy(BufferedImage) | 0.0% | - | 1.0 |
| Interface() | 100.0% | - | 1.0 |
| main(String[]) | 0.0% | - | 1.0 |
| paint(Graphics) | 0.0% | - | 5.0 |
| requestAddCut() | 100.0% | - | 3.0 |
| requestBrushing() | 57.1% | - | 2.0 |
| requestChangeCut() | 0.0% | - | 3.0 |
| requestCopyArea() | 75.0% | - | 2.0 |
| requestCutOffArea() | 83.3% | - | 2.0 |
| requestDelArea() | 0.0% | - | 2.0 |
| requestDelCut() | 88.4% | - | 10.0 |
| requestErasing() | 0.0% | - | 2.0 |
| requestLoadImage() | 93.8% | - | 2.0 |
| requestMergeCut() | 93.3% | - | 4.0 |
| requestMoveArea() | 0.0% | - | 1.0 |
| requestPasteArea() | 0.0% | - | 1.0 |
| requestSaveImage() | 0.0% | - | 2.0 |
| requestSelectArea() | 100.0% | - | 1.0 |
| requestSetColor(int) | 0.0% | - | 1.0 |
| requestSetCutSize() | 0.0% | - | 1.0 |
| requestSetLineSize(int) | 100.0% | - | 3.0 |
| showWindow1() | 0.0% | - | 1.0 |

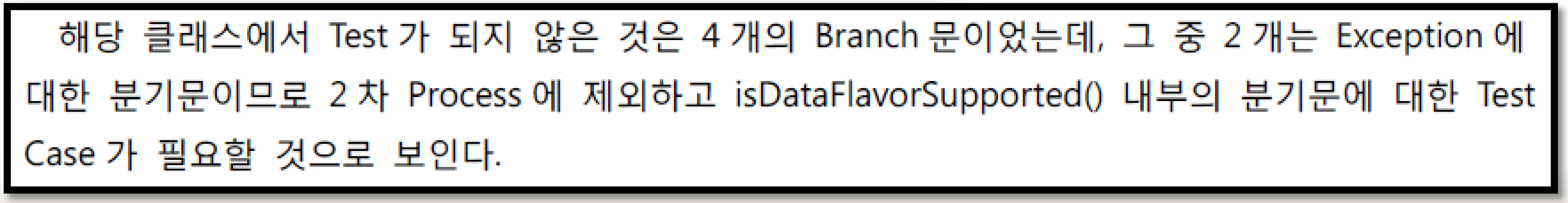
requestSetColor(), requestDelArea()…) paint()에 대한 Unit Test 가 아예 이루어지지 않았다.

# Analysis

AreaTool.CopyImagetoClipBoard

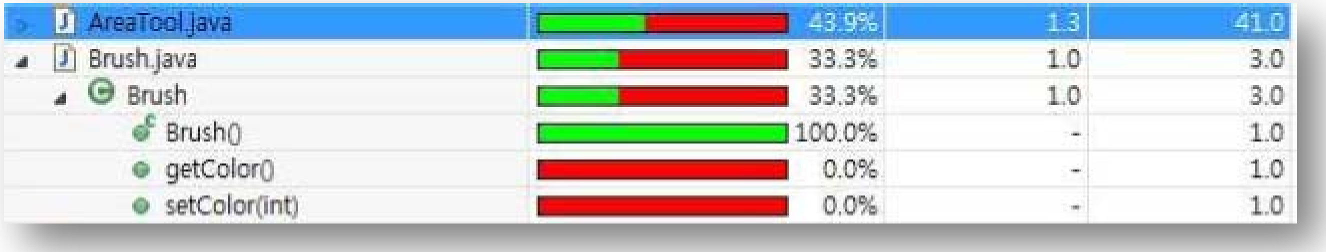
해당 클래스는 Code Coverage 는 100%였다.

AreaTool.CopyImagetoClipBoard.TransferableImage

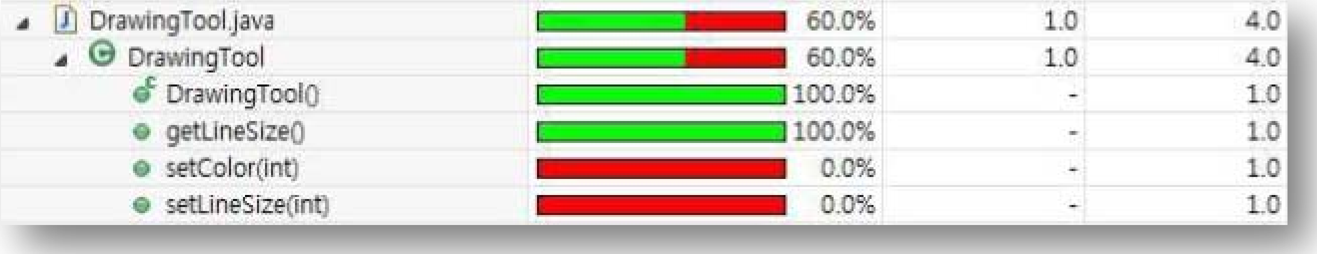


해당 클래스에서 Test 가 되지 않은 것은 4 개의 Branch 문이었는데, 그 중 2 개는 Exception 에 대한 분기문이므로 2 차 Process 에 제외하고 isDataFlavorSupported() 내부의 분기문에 대한 Test Case 가 필요할 것으로 보인다.

# Analysis



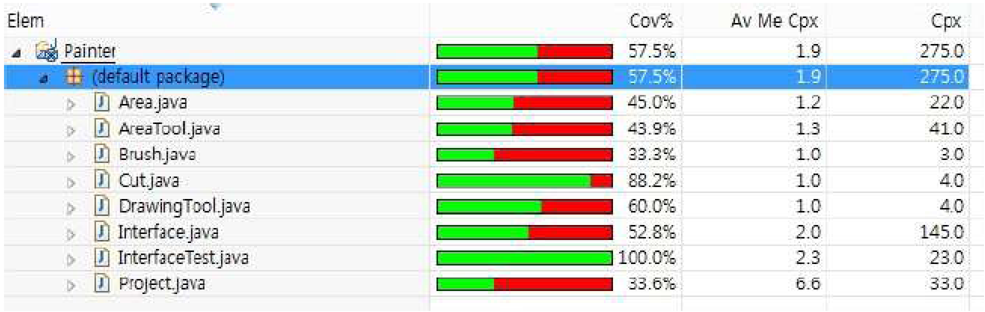
| | | | |
|---|---|---|---|
| AreaTool.java | 43.9% | 1.3 | 41.0 |
| Brush.java | 33.3% | 1.0 | 3.0 |
| Brush | 33.3% | 1.0 | 3.0 |
| Brush() | 100.0% | - | 1.0 |
| getColor() | 0.0% | - | 1.0 |
| setColor(int) | 0.0% | - | 1.0 |



| | | | |
|---|---|---|---|
| DrawingTool.java | 60.0% | 1.0 | 4.0 |
| DrawingTool | 60.0% | 1.0 | 4.0 |
| DrawingTool() | 100.0% | - | 1.0 |
| getLineSize() | 100.0% | - | 1.0 |
| setColor(int) | 0.0% | - | 1.0 |
| setLineSize(int) | 0.0% | - | 1.0 |

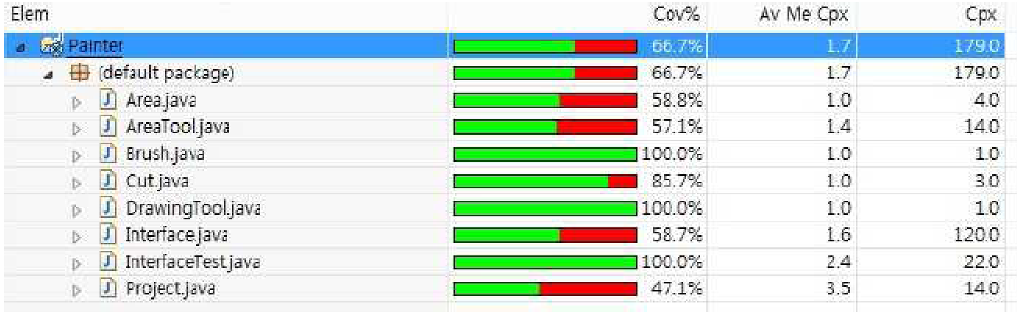
# Conclusion

## Before



| Elem | Cov% | Av Me Cpx | Cpx |
|---|---|---|---|
| Painter | 57.5% | 1.9 | 275.0 |
| (default package) | 57.5% | 1.9 | 275.0 |
| Area.java | 45.0% | 1.2 | 22.0 |
| AreaTool.java | 43.9% | 1.3 | 41.0 |
| Brush.java | 33.3% | 1.0 | 3.0 |
| Cut.java | 88.2% | 1.0 | 4.0 |
| DrawingTool.java | 60.0% | 1.0 | 4.0 |
| Interface.java | 52.8% | 2.0 | 145.0 |
| InterfaceTest.java | 100.0% | 2.3 | 23.0 |
| Project.java | 33.6% | 6.6 | 33.0 |

## After



| Elem | Cov% | Av Me Cpx | Cpx |
|---|---|---|---|
| Painter | 66.7% | 1.7 | 179.0 |
| (default package) | 66.7% | 1.7 | 179.0 |
| Area.java | 58.8% | 1.0 | 4.0 |
| AreaTool.java | 57.1% | 1.4 | 14.0 |
| Brush.java | 100.0% | 1.0 | 1.0 |
| Cut.java | 85.7% | 1.0 | 3.0 |
| DrawingTool.java | 100.0% | 1.0 | 1.0 |
| Interface.java | 58.7% | 1.6 | 120.0 |
| InterfaceTest.java | 100.0% | 2.4 | 22.0 |
| Project.java | 47.1% | 3.5 | 14.0 |

# 3.Sonar

# Sonar란?

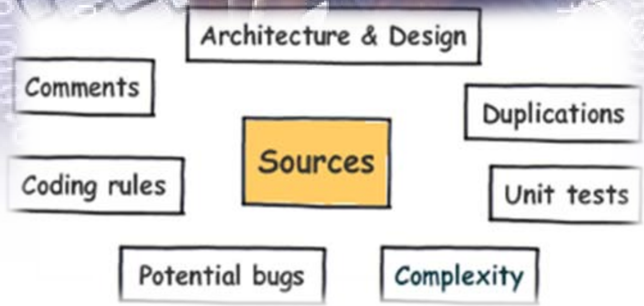
- 정적 분석 도구

- 소스코드 전반에 대한 전반적인 품질을 확보할 수 있도록 제공하는 통합 플랫폼

  - Client / Server 구조
  - 다양한 언어 지원
  - Plugin으로 다양한 도구와 유연한 통합
  - 웹기반 애플리케이션으로 결과를 서버에 통합 관리 수월

# 정적분석

- 프로그램을 실행하지 않고  소스코드의 의미를 분석하여 소프트웨어의 잠대된 결함이나 오류를 검출할 수 있으며 인스펙션, 워크쓰루와 같은 수동적인 방법과 정적분석 도구를 활용하는 방법이 있음.
- 정적분석 공개 SW 도구
  - **PMD**
    - 자바 프로그램 언어에 대한 소스 코드 검사 도구
  - **Sonar**
    - 다양한 언어 소스코드 분석 도구. 플로그인을 추가하여 통합 분석 가능
  - **CheckStyle**
    - 자바 프로그램에 대한 코딩 표준 준수 여부 검사 도구
  - **FindBugs**
    - 자바 프로그램 언어에 대한 소스 코드 오류 분석 도구



# 검사 유형

- **코드 유형**
  - 규칙준수
    - 언어별 코딩표준 및 주석 규칙 준수 여부 검사
  - 중복코드
    - 중복으로 사용된 소스코드가 있는지 검사
  - 복잡성
    - 분기문 등의 복잡도를 측정
- **결함 유형**
  - **Memory leak**
    - 코드 내에서 메모리가 헤제 되지 않고 계속 점유되는 문제
  - **Buffer Overflow/Overrun**
    - 코드 내에서 메모리를 다루는 중 오류
  - **NullPointerException**
    - 코드 내에서 잘못된 객체를 사용하려고 할 때 발생

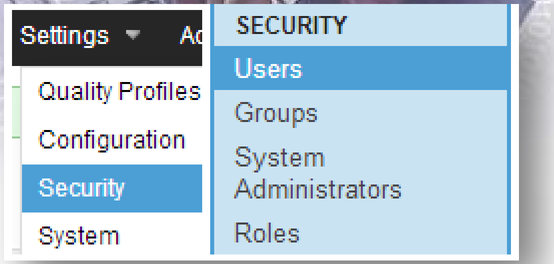
# Sonar 설치

Java

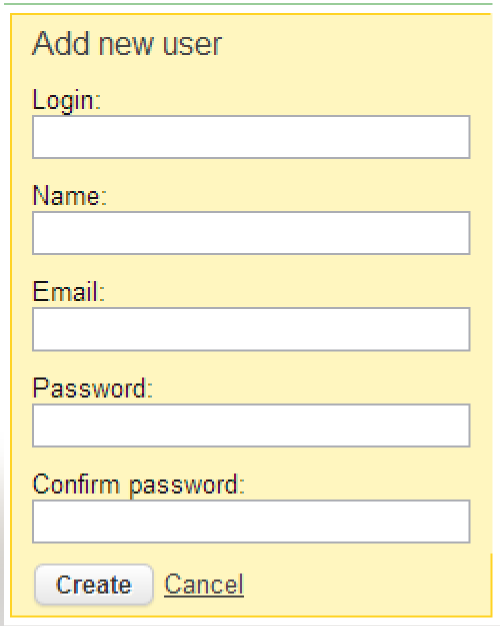
sonar

eclipse plugins

# Sonar Conf



- 기본관리자계정 : admin/admin



Add new user

Login:

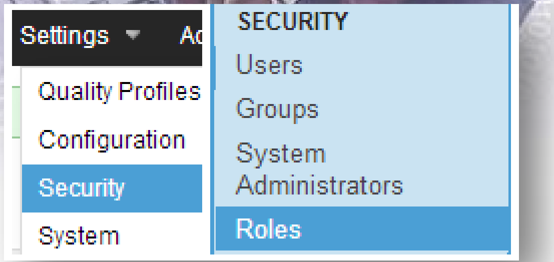
Name:

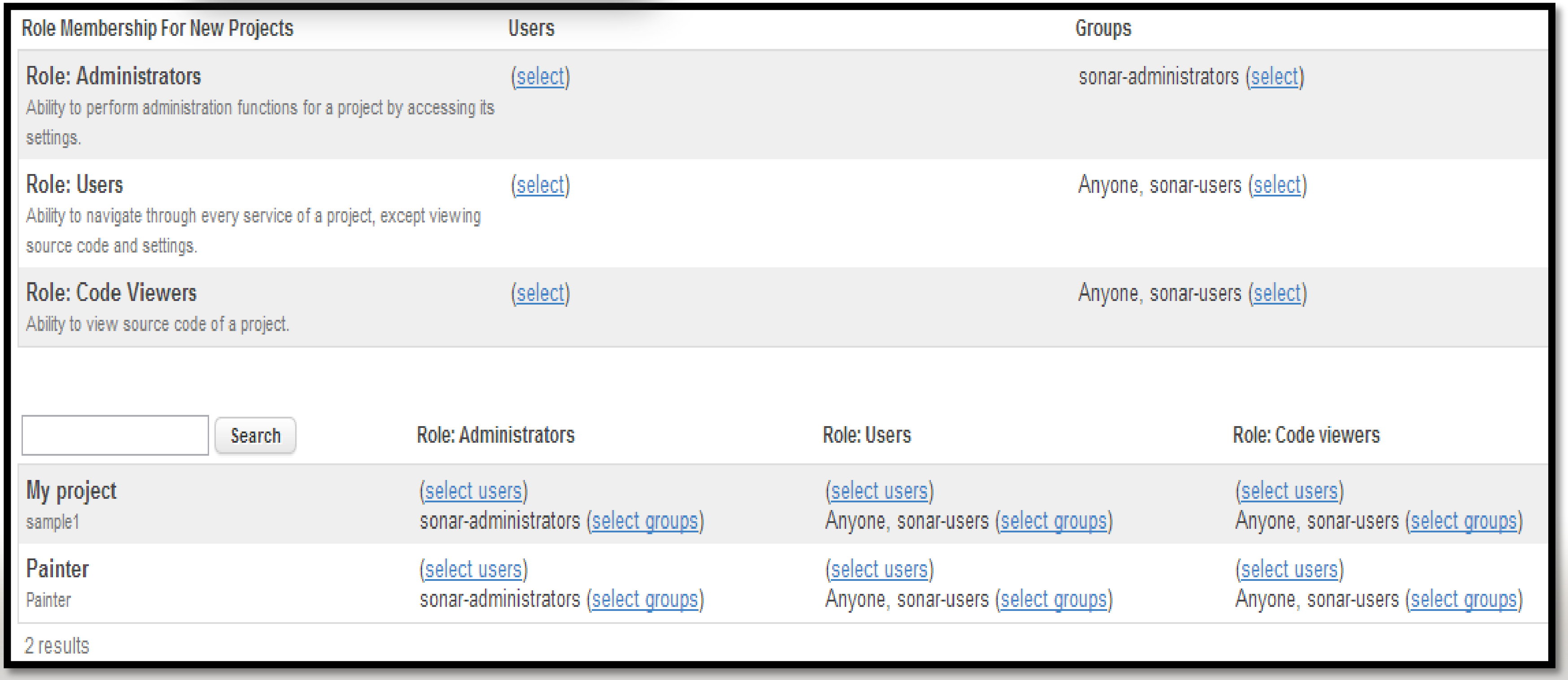
Email:

Password:

Confirm password:

# Sonar Conf





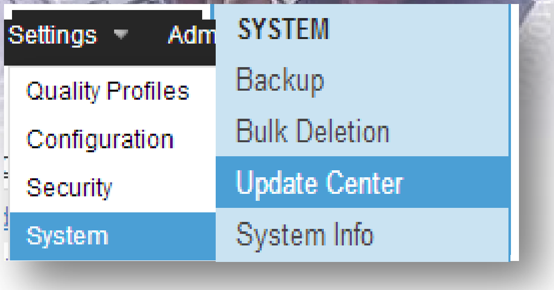
| Role Membership For New Projects | Users | Groups |
|---|---|---|
| **Role: Administrators**<br>Ability to perform administration functions for a project by accessing its settings. | (select) | sonar-administrators (select) |
| **Role: Users**<br>Ability to navigate through every service of a project, except viewing source code and settings. | (select) | Anyone, sonar-users (select) |
| **Role: Code Viewers**<br>Ability to view source code of a project. | (select) | Anyone, sonar-users (select) |

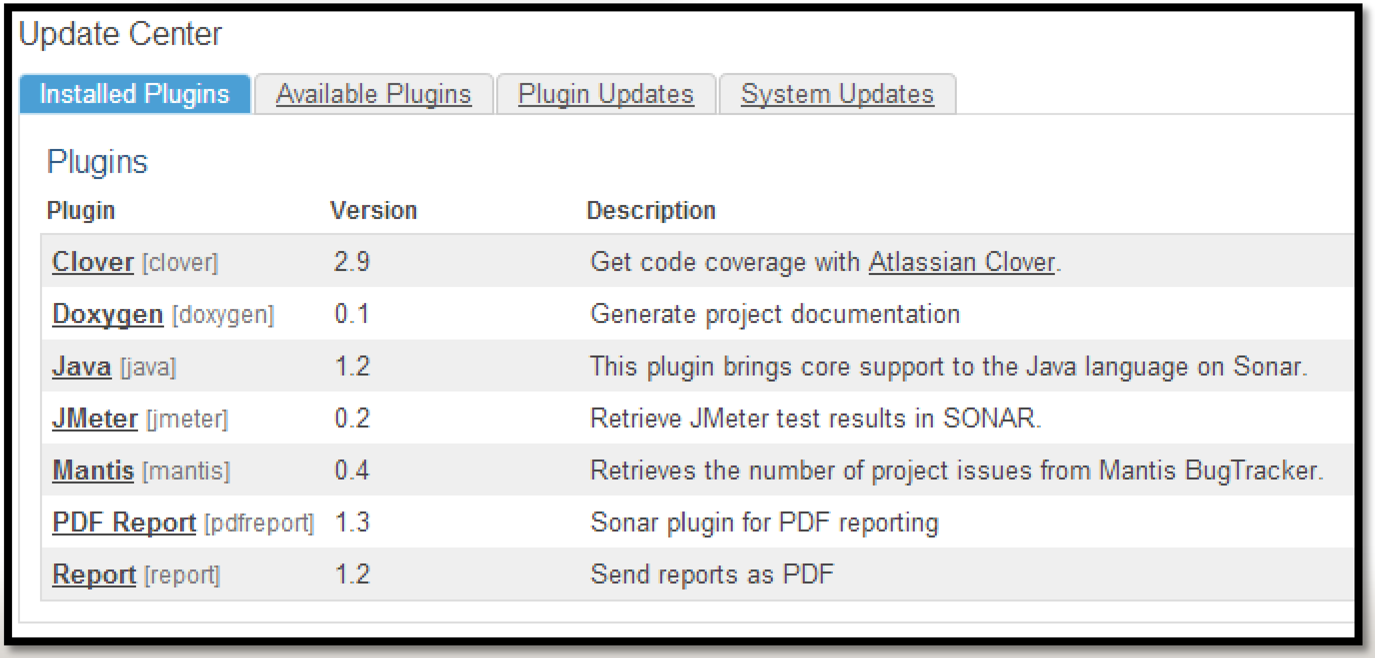
Search

|  | Role: Administrators | Role: Users | Role: Code viewers |
|---|---|---|---|
| **My project**<br>sample1 | (select users)<br>sonar-administrators (select groups) | (select users)<br>Anyone, sonar-users (select groups) | (select users)<br>Anyone, sonar-users (select groups) |
| **Painter**<br>Painter | (select users)<br>sonar-administrators (select groups) | (select users)<br>Anyone, sonar-users (select groups) | (select users)<br>Anyone, sonar-users (select groups) |

2 results

# Sonar Conf

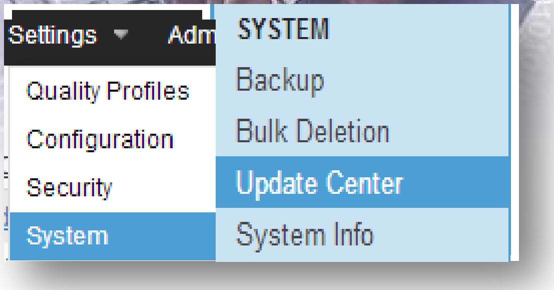


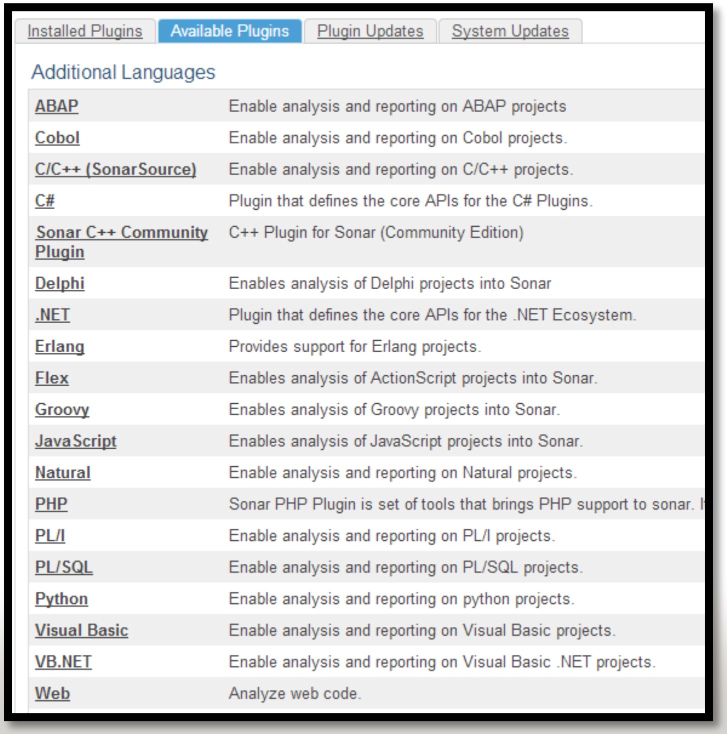


Plugins

| Plugin | Version | Description |
|---|---|---|
| Clover [clover] | 2.9 | Get code coverage with Atlassian Clover. |
| Doxygen [doxygen] | 0.1 | Generate project documentation |
| Java [java] | 1.2 | This plugin brings core support to the Java language on Sonar. |
| JMeter [jmeter] | 0.2 | Retrieve JMeter test results in SONAR. |
| Mantis [mantis] | 0.4 | Retrieves the number of project issues from Mantis BugTracker. |
| PDF Report [pdfreport] | 1.3 | Sonar plugin for PDF reporting |
| Report [report] | 1.2 | Send reports as PDF |

# Sonar Conf



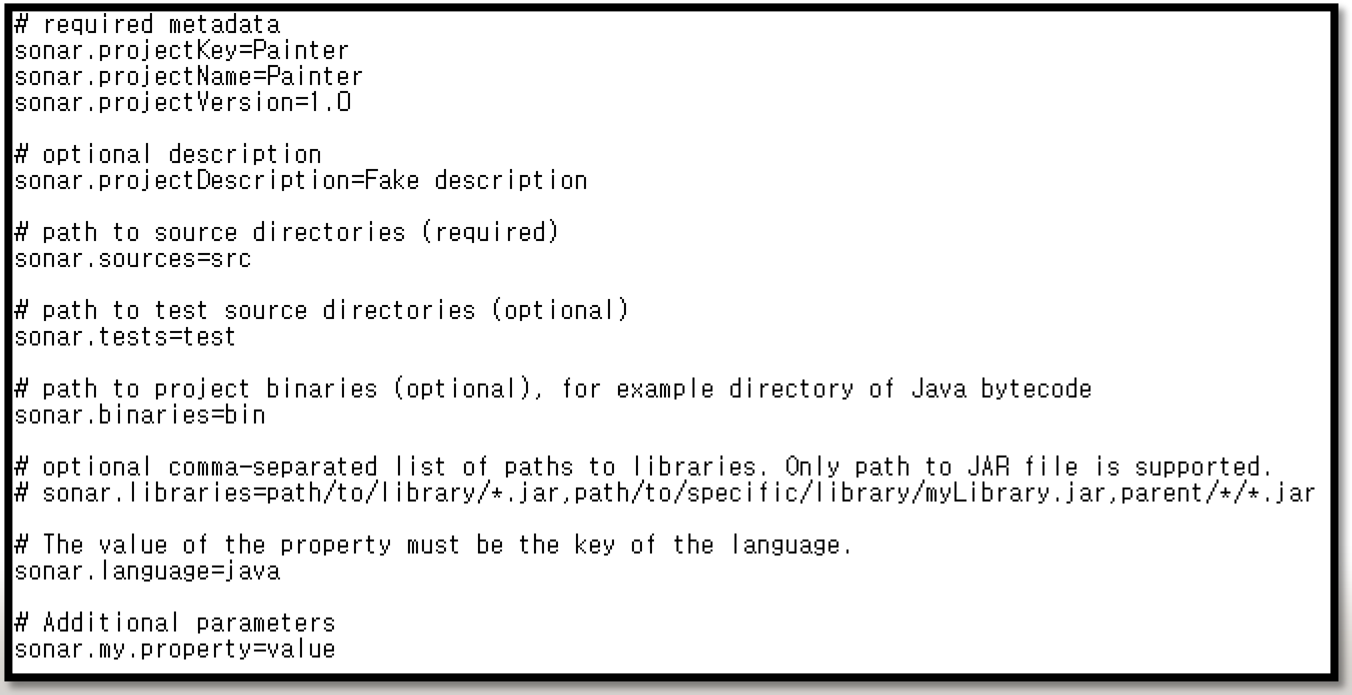


Additional Languages

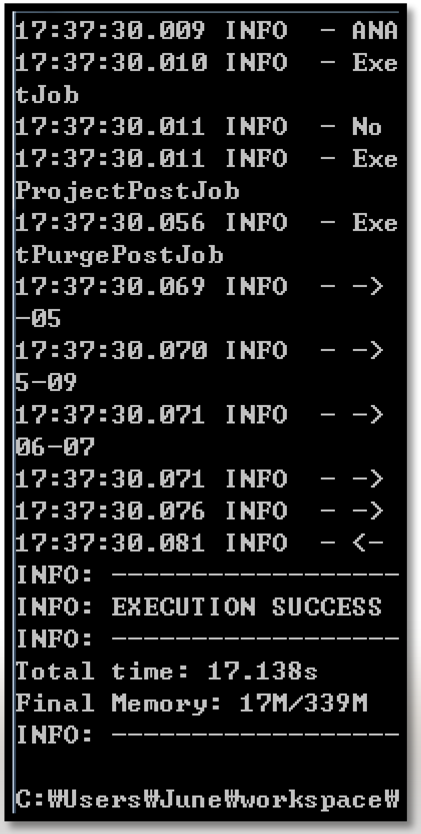
| | |
|---|---|
| ABAP | Enable analysis and reporting on ABAP projects |
| Cobol | Enable analysis and reporting on Cobol projects. |
| C/C++ (SonarSource) | Enable analysis and reporting on C/C++ projects. |
| C# | Plugin that defines the core APIs for the C# Plugins. |
| Sonar C++ Community Plugin | C++ Plugin for Sonar (Community Edition) |
| Delphi | Enables analysis of Delphi projects into Sonar |
| .NET | Plugin that defines the core APIs for the .NET Ecosystem. |
| Erlang | Provides support for Erlang projects. |
| Flex | Enables analysis of ActionScript projects into Sonar. |
| Groovy | Enables analysis of Groovy projects into Sonar. |
| JavaScript | Enables analysis of JavaScript projects into Sonar. |
| Natural | Enable analysis and reporting on Natural projects. |
| PHP | Sonar PHP Plugin is set of tools that brings PHP support to sonar. |
| PL/I | Enable analysis and reporting on PL/I projects. |
| PL/SQL | Enable analysis and reporting on PL/SQL projects. |
| Python | Enable analysis and reporting on python projects. |
| Visual Basic | Enable analysis and reporting on Visual Basic projects. |
| VB.NET | Enable analysis and reporting on Visual Basic .NET projects. |
| Web | Analyze web code. |

# Sonar Conf

- Sonar클라이언트설치경로\conf\sonar-runner.properties



```
# required metadata
sonar.projectKey=Painter
sonar.projectName=Painter
sonar.projectVersion=1.0

# optional description
sonar.projectDescription=Fake description

# path to source directories (required)
sonar.sources=src

# path to test source directories (optional)
sonar.tests=test

# path to project binaries (optional), for example directory of Java bytecode
sonar.binaries=bin

# optional comma-separated list of paths to libraries. Only path to JAR file is supported.
# sonar.libraries=path/to/library/*.jar,path/to/specific/library/myLibrary.jar,parent/*/*.jar

# The value of the property must be the key of the language.
sonar.language=java

# Additional parameters
sonar.my.property=value
```

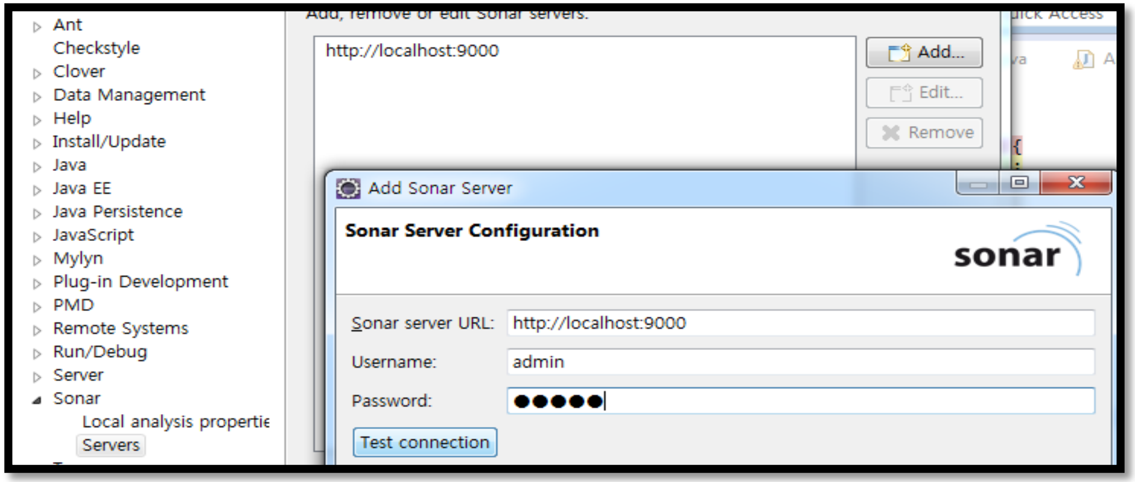


```
17:37:30.009 INFO  - ANA
17:37:30.010 INFO  - Exe
tJob
17:37:30.011 INFO  - No
17:37:30.011 INFO  - Exe
ProjectPostJob
17:37:30.056 INFO  - Exe
tPurgePostJob
17:37:30.069 INFO  - ->
-05
17:37:30.070 INFO  - ->
5-09
17:37:30.071 INFO  - ->
06-07
17:37:30.071 INFO  - ->
17:37:30.076 INFO  - ->
17:37:30.081 INFO  - <-
INFO: ------------------
INFO: EXECUTION SUCCESS
INFO: ------------------
Total time: 17.138s
Final Memory: 17M/339M
INFO: ------------------

C:₩Users₩June₩workspace₩
```

//Sonar-runner 환경 변수 설정 하면 편함.

# Sonar Conf

- Eclipse - Window - preferences



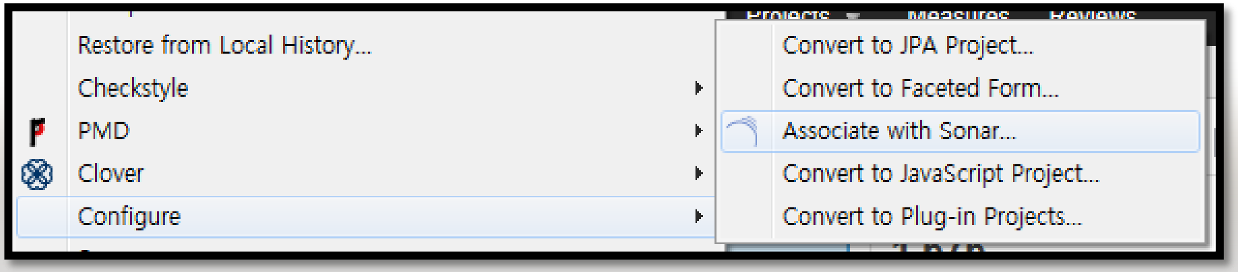
http://localhost:9000

Sonar Server Configuration

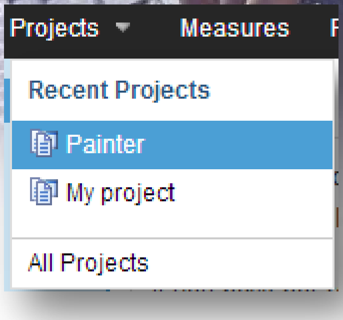
Sonar server URL: http://localhost:9000

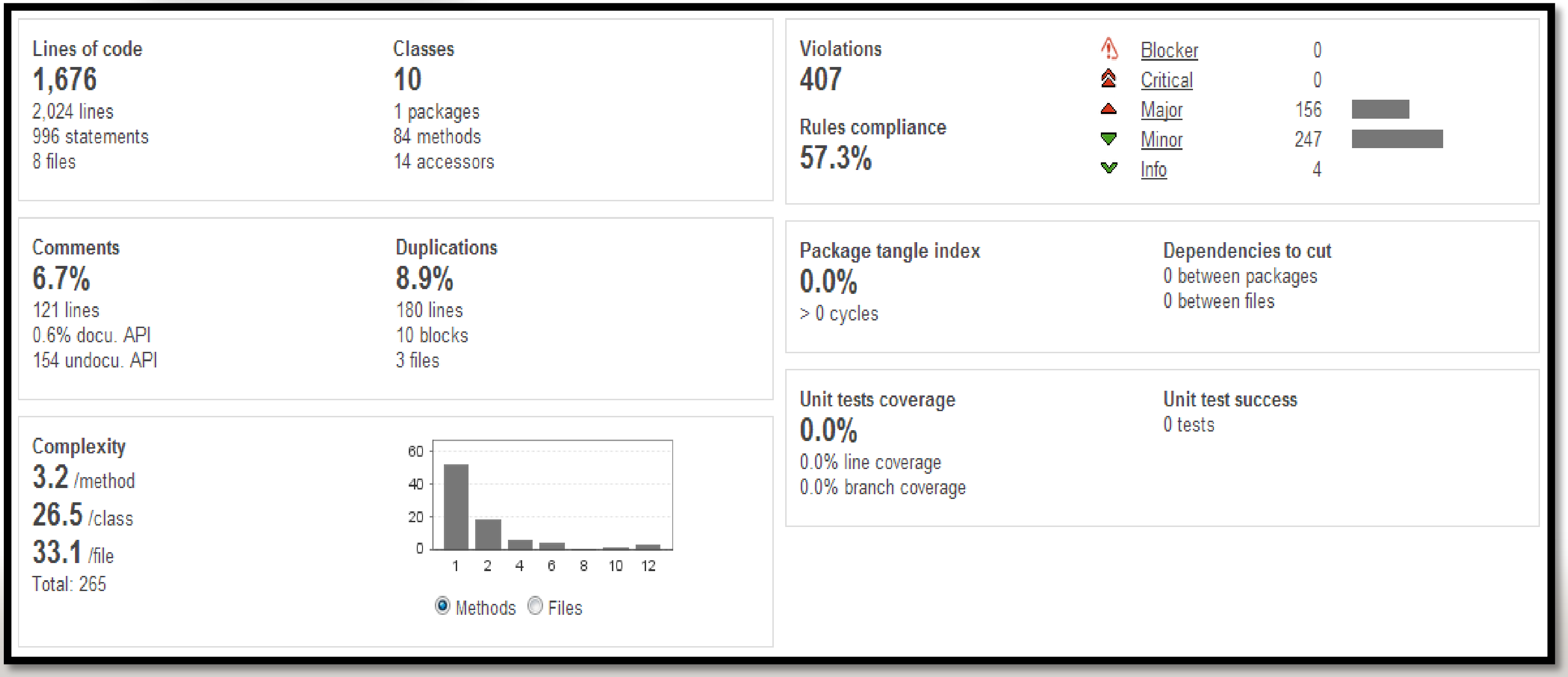
Username: admin

Password: ●●●●●


Restore from Local History...
Checkstyle
PMD
Clover
Configure
Convert to JPA Project...
Convert to Faceted Form...
Associate with Sonar...
Convert to JavaScript Project...
Convert to Plug-in Projects...

# Sonar Result





Lines of code
**1,676**
2,024 lines
996 statements
8 files

Classes
**10**
1 packages
84 methods
14 accessors

Violations
**407**

Rules compliance
**57.3%**

| | |
|---|---|
| Blocker | 0 |
| Critical | 0 |
| Major | 156 |
| Minor | 247 |
| Info | 4 |

Comments
**6.7%**
121 lines
0.6% docu. API
154 undocu. API

Duplications
**8.9%**
180 lines
10 blocks
3 files

Package tangle index
**0.0%**
> 0 cycles

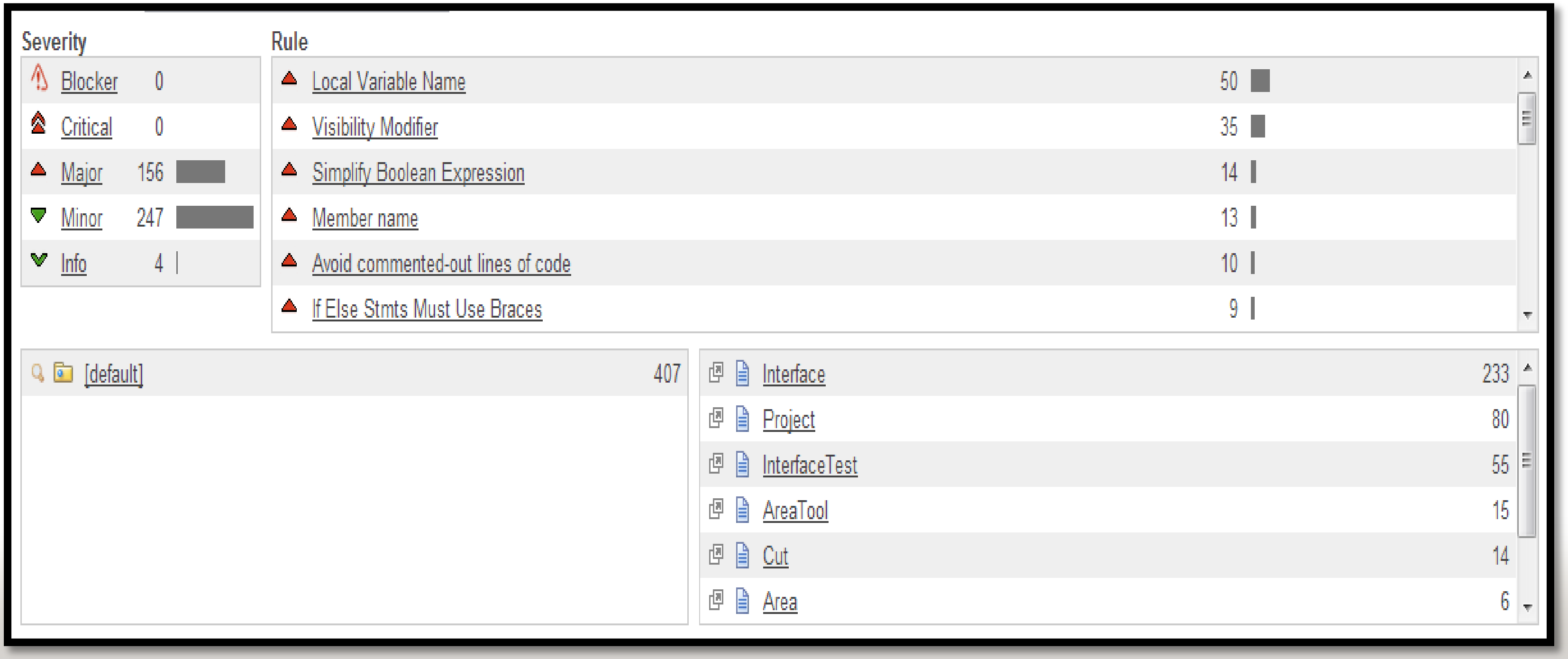
Dependencies to cut
0 between packages
0 between files

Complexity
**3.2** /method
**26.5** /class
**33.1** /file
Total: 265

Unit tests coverage
**0.0%**
0.0% line coverage
0.0% branch coverage

Unit test success
0 tests

# Sonar Result



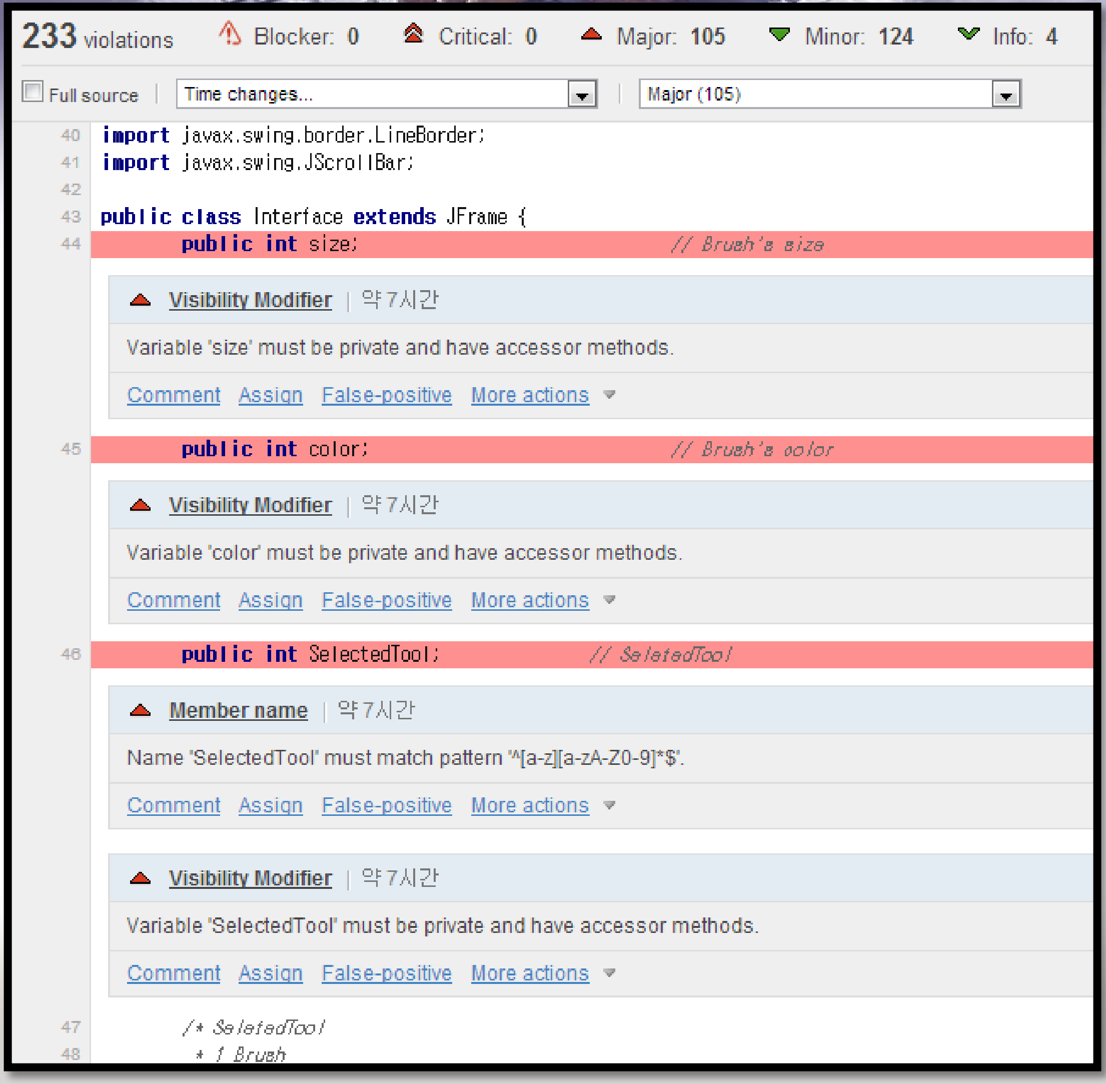
| Severity | | |
|---|---|---|
| Blocker | 0 | |
| Critical | 0 | |
| Major | 156 | ▬ |
| Minor | 247 | ▬ |
| Info | 4 | \| |

| Rule | | |
|---|---|---|
| Local Variable Name | 50 | ▬ |
| Visibility Modifier | 35 | ▬ |
| Simplify Boolean Expression | 14 | \| |
| Member name | 13 | \| |
| Avoid commented-out lines of code | 10 | \| |
| If Else Stmts Must Use Braces | 9 | \| |

| | |
|---|---|
| [default] | 407 |

| | |
|---|---|
| Interface | 233 |
| Project | 80 |
| InterfaceTest | 55 |
| AreaTool | 15 |
| Cut | 14 |
| Area | 6 |

# Sonar Result



233 violations | Blocker: 0 | Critical: 0 | Major: 105 | Minor: 124 | Info: 4

□ Full source | Time changes... | Major (105)

```
import javax.swing.border.LineBorder;
import javax.swing.JScrollBar;

public class Interface extends JFrame {
	public int size;		// Brush's size
```

Visibility Modifier | 약 7시간

Variable 'size' must be private and have accessor methods.

Comment Assign False-positive More actions

```
	public int color;		// Brush's color
```

Visibility Modifier | 약 7시간

Variable 'color' must be private and have accessor methods.

Comment Assign False-positive More actions

```
	public int SelectedTool;		// SeletedTool
```

Member name | 약 7시간

Name 'SelectedTool' must match pattern '^[a-z][a-zA-Z0-9]*$'.

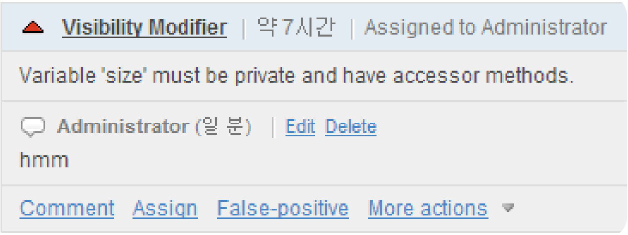
Comment Assign False-positive More actions

Visibility Modifier | 약 7시간

Variable 'SelectedTool' must be private and have accessor methods.

Comment Assign False-positive More actions

```
	/* SeletedTool
	 * 1 Brush
```



Visibility Modifier | 약 7시간 | Assigned to Administrator

Variable 'size' must be private and have accessor methods.

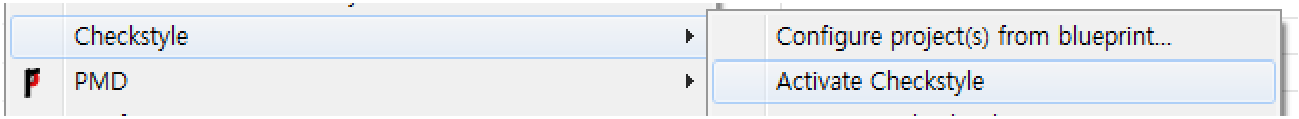
Administrator (일 분) | Edit Delete

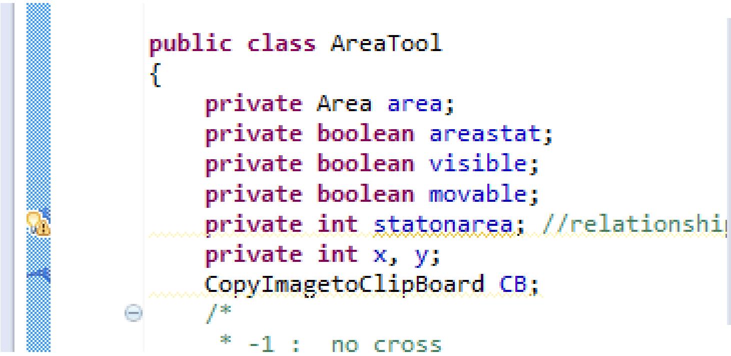
hmm

Comment Assign False-positive More actions

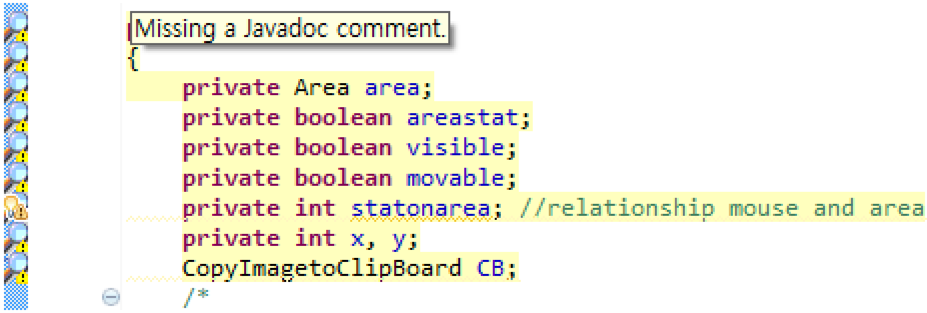
# 4. Tools

# Checkstyle





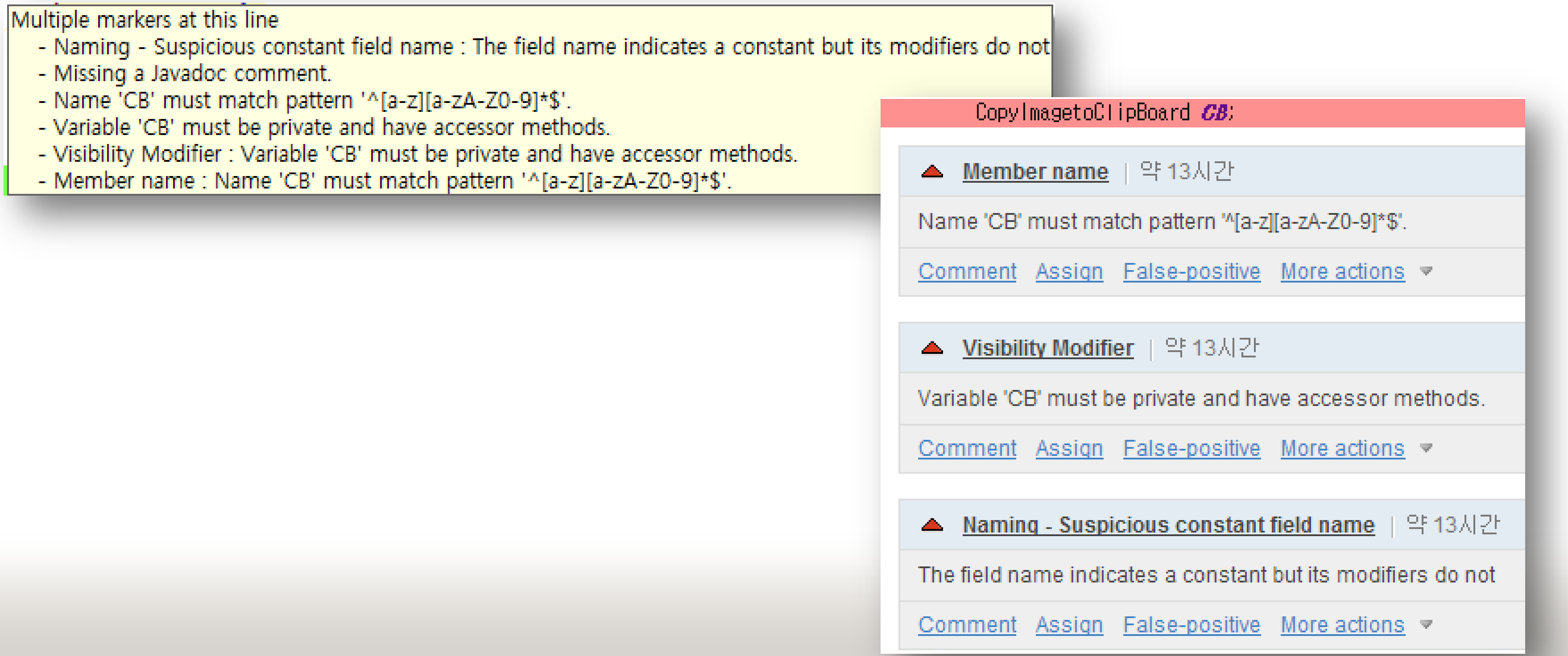
```
public class AreaTool
{
    private Area area;
    private boolean areastat;
    private boolean visible;
    private boolean movable;
    private int statonarea; //relationshi
    private int x, y;
    CopyImagetoClipBoard CB;
    /*
     * -1 :  no cross
```



Missing a Javadoc comment.

```
{
    private Area area;
    private boolean areastat;
    private boolean visible;
    private boolean movable;
    private int statonarea; //relationship mouse and area
    private int x, y;
    CopyImagetoClipBoard CB;
    /*
```

# Checkstyle



```
Multiple markers at this line
   - Naming - Suspicious constant field name : The field name indicates a constant but its modifiers do not
   - Missing a Javadoc comment.
   - Name 'CB' must match pattern '^[a-z][a-zA-Z0-9]*$'.
   - Variable 'CB' must be private and have accessor methods.
   - Visibility Modifier : Variable 'CB' must be private and have accessor methods.
   - Member name : Name 'CB' must match pattern '^[a-z][a-zA-Z0-9]*$'.
```

```
CopyImagetoClipBoard CB;
```

**Member name** | 약 13시간

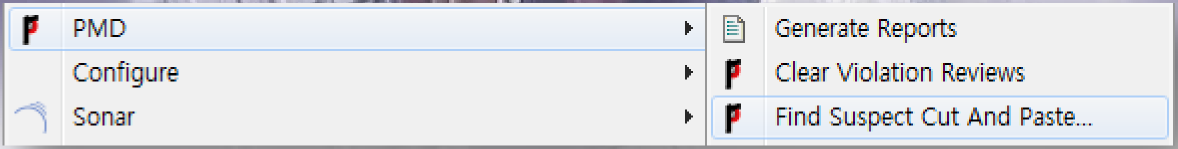
Name 'CB' must match pattern '^[a-z][a-zA-Z0-9]*$'.

**Visibility Modifier** | 약 13시간

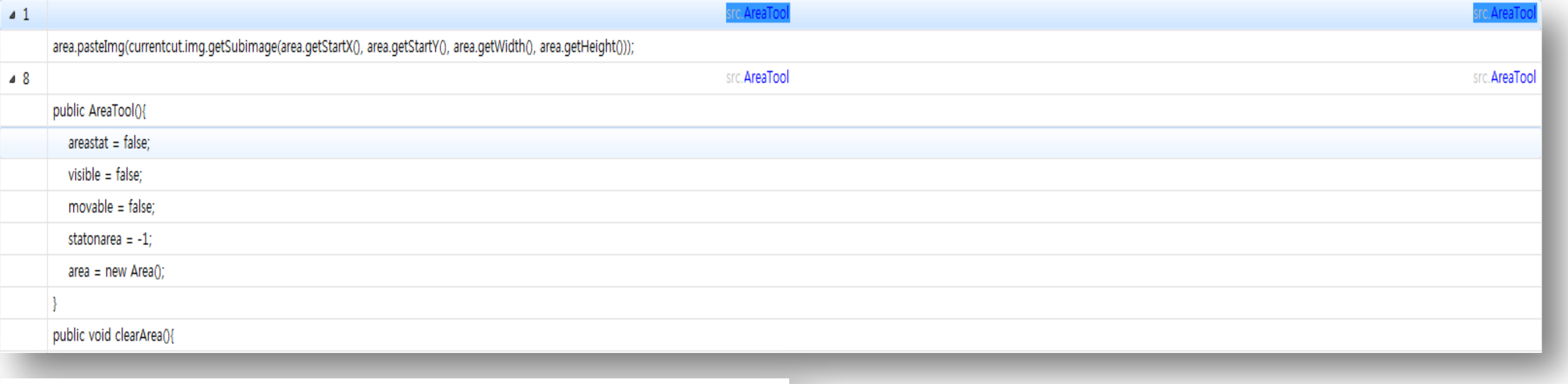
Variable 'CB' must be private and have accessor methods.

**Naming - Suspicious constant field name** | 약 13시간

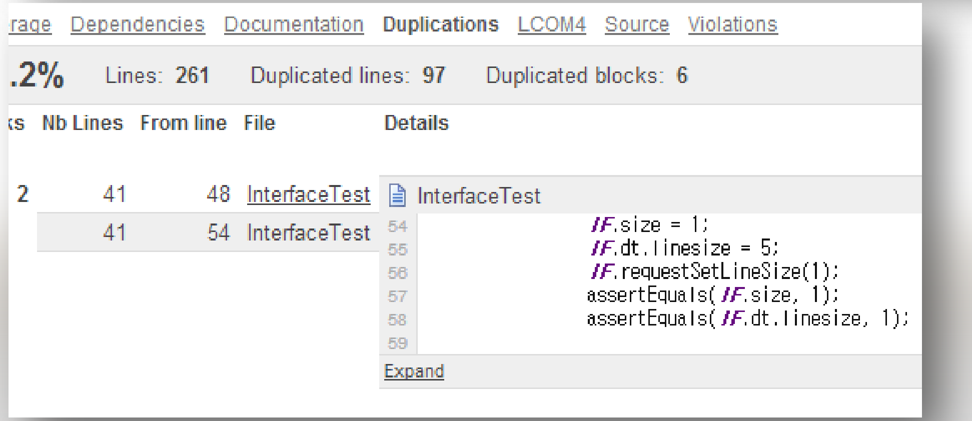
The field name indicates a constant but its modifiers do not



# PMD



```
1                         src.AreaTool                         src.AreaTool
area.pasteImg(currentcut.img.getSubimage(area.getStartX(), area.getStartY(), area.getWidth(), area.getHeight()));
8                         src.AreaTool                         src.AreaTool
public AreaTool(){
  areastat = false;
  visible = false;
  movable = false;
  statonarea = -1;
  area = new Area();
}
public void clearArea(){
```



rage Dependencies Documentation **Duplications** LCOM4 Source Violations

.2% Lines: 261 Duplicated lines: 97 Duplicated blocks: 6

| ks | Nb Lines | From line | File |
|---|---|---|---|
| 2 | 41 | 48 | InterfaceTest |
| | 41 | 54 | InterfaceTest |

Details

InterfaceTest

```
            IF.size = 1;
            IF.dt.linesize = 5;
            IF.requestSetLineSize(1);
           assertEquals( IF.size, 1);
           assertEquals( IF.dt.linesize, 1);
```

Expand

# The End