“Priority” Category Partitioning Testing Tool

OOPT stage 2050 & 2060

Construct & Testing

Project Team

T4

201311265 김상원

201210194 김정환

201311269 김제헌

201311297 이상명

Date

2017-05-24

목차

[2050 Construct 3](#_Toc483350216)

[Activity 2051. Implement Class & Methods Definitions 3](#_Toc483350217)

[Activity 2052. Implement Windows 19](#_Toc483350218)

[Activity 2055. Write Unit Test Code 22](#_Toc483350219)

[2060 Test 22](#_Toc483350220)

[Activity 2061. Unit Testing 22](#_Toc483350221)

[Activity 2063. System Testing 22](#_Toc483350222)

[Activity 2067. Testing Traceability Analysis 22](#_Toc483350223)

# 2050 Construct

# Activity 2051. Implement Class & Methods Definitions

|  |  |
| --- | --- |
| **Type** | Class |
| **Name** | MainSystem |
| **Purpose** | 전반적인 프로그램의 수행을 제어하는 클래스 |
| **Overview (Class)** | Specification, FileManager를 가지고 GUI를 호출한다 |
| **Cross Reference** | ALL |
| **Input (Method)** | - |
| **Output (Method)** | - |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Class |
| **Name** | FileManager |
| **Purpose** | File과 관련된 모든 Event를 담당하는 클래스 |
| **Overview (Class)** | 새로운 파일 생성, 기존 파일 읽기, 파일 저장, 최근파일목록 갱신 등의 기능을 수행한다. |
| **Cross Reference** | R.1.1, R.1.2, R.1.3, R.13 |
| **Input (Method)** | - |
| **Output (Method)** | - |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | newSpecipication() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | String newFileName |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | loadSpecification() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | String filePath |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | saveSpecification() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | void |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | updateRecentList() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | String filePath |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | getPath() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | void |
| **Output (Method)** | String |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Class |
| **Name** | Specification |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | - |
| **Output (Method)** | - |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | generateTestCases() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | void |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | export2excel() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | void |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | getCategory() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | categoryIndex |
| **Output (Method)** | Category |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | setCategory() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer categoryIndex, String categoryName |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | addCategory() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | String categoryName |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | delCategory() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer categoryIndex |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | void updateData() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Void |
| **Output (Method)** | void |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Class |
| **Name** | Category |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | - |
| **Output (Method)** | - |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | setCategoryName() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | String categoryName |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | getCategoryName() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | void |
| **Output (Method)** | String |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | getRepresentativeValue() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer representativeIndex |
| **Output (Method)** | RepresentativeValue |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | setRepresentativeValue() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer representativeValueIndex, String representativeValueName |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | addRepresentativeValue() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | String representativeValueName |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | delRepresentativeValue() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer representativeValueIndex |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Class |
| **Name** | RepresentativeValue |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | - |
| **Output (Method)** | - |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | getNumberOfPropertyConstraints() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Void |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | getNumberOfIfPropertyConstraints() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Void |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | setRepresentativeValueName() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | String representativeValueName |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | getRepresentativeValueName() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Void |
| **Output (Method)** | String |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | setProperty() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer propertyIndex, String propertyName |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | addProperty() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | String propertyName |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | delProperty() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer propertyIndex |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | setIfProperty() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer ifPropertyIndex, String ifPropertyName |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | addIfProperty() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | String ifPropertyName |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | deIfProperty() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer ifPropertyIndex |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | setSingleError() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer singleError |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | setPriorityRank() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer priorityRank |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | getProperty() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer propertyIndex |
| **Output (Method)** | Property |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | getIfProperty() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Integer ifPropertyIndex |
| **Output (Method)** | Property |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | getSingleError() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Void |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | getPriorityRank() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | Void |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Class |
| **Name** | Property |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | - |
| **Output (Method)** | - |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | getName() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | void |
| **Output (Method)** | String |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

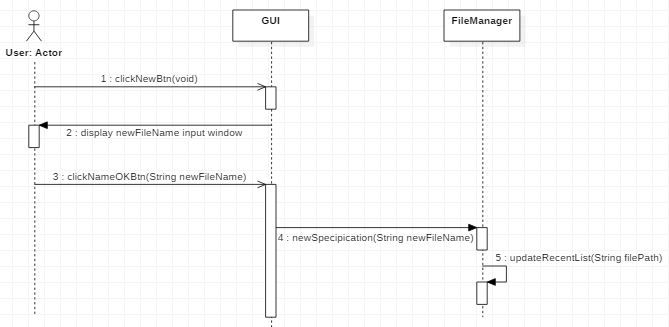
|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | setName() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | String name |
| **Output (Method)** | Integer |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | addName() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | String valueName |
| **Output (Method)** | void |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

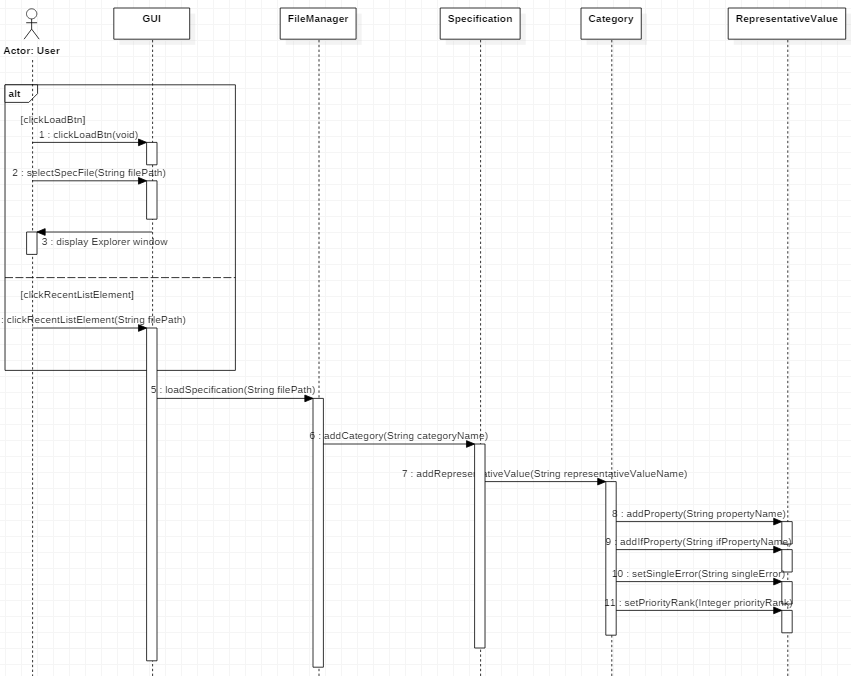
|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | isOnly() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | void |
| **Output (Method)** | Boolean |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

|  |  |
| --- | --- |
| **Type** | Method |
| **Name** | delName() |
| **Purpose** |  |
| **Overview (Class)** |  |
| **Cross Reference** |  |
| **Input (Method)** | String valueName |
| **Output (Method)** | void |
| **Abstract Operation(Method)** | - |
| **Exceptional Courses of Events** | N/A |

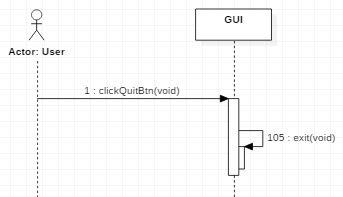
# Activity 2052. Implement Windows



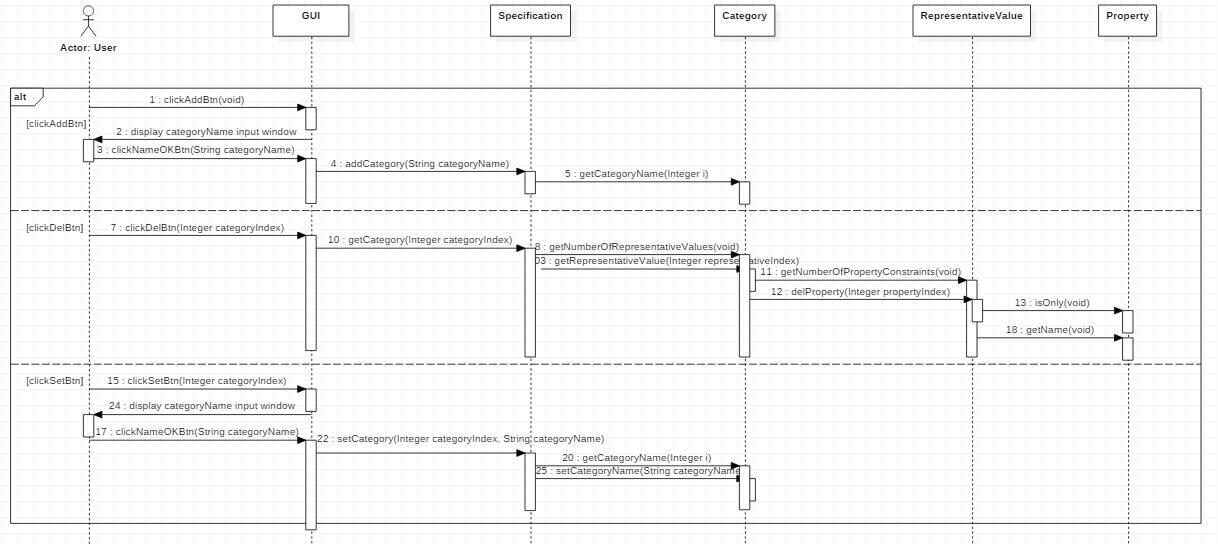
|  |  |
| --- | --- |
| **Name** | newSpecification |
| **Responsibilities** | GUI에서 ‘새로 만들기’버튼을 클릭하고, 새로 만들 Specification파일 이름을 입력 받는다. |
| **Type** | GUI |
| **Cross Reference** | R1.1 |
| **Notes** | 저장할 파일 이름을 입력 받는 화면이 출력된다. 추후 사용자로부터 입력 받은 이름으로 새로운 specification파일을 생성한다. 최근 파일 항목에 반영한다. |
| **Pre-Conditions** | N/A |
| **Post-Conditions** | Specification파일을 작성하기 위한 화면으로 넘어간다. |



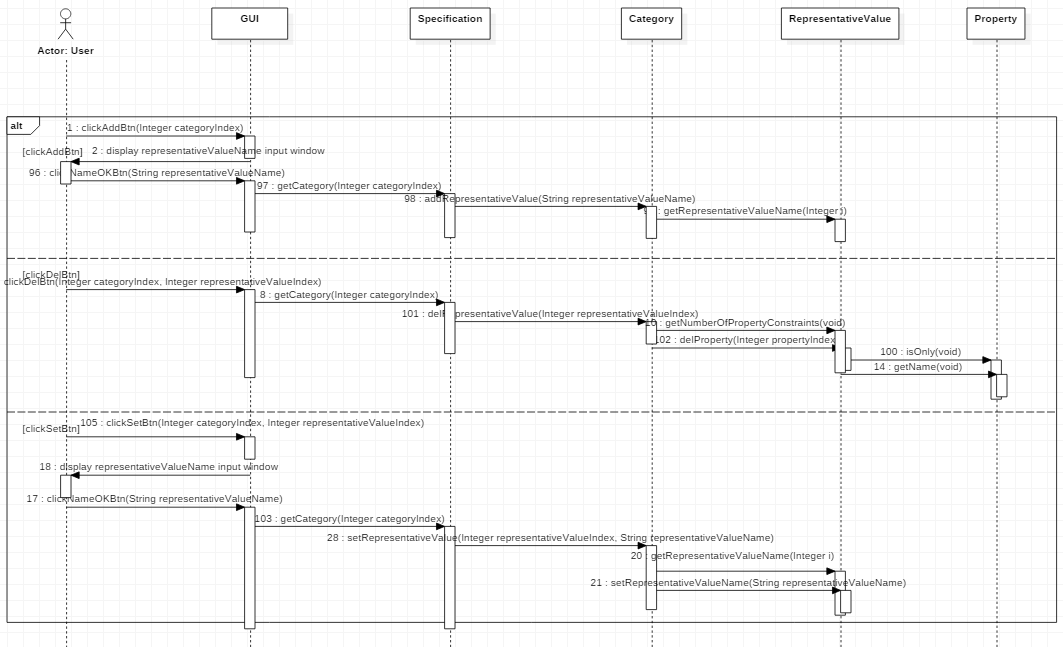
|  |  |
| --- | --- |
| **Name** | loadSpecification |
| **Responsibilities** | GUI에서 ‘불러오기’버튼을 클릭하거나, 최근 파일 목록 중 하나를 클릭한다. |
| **Type** | GUI |
| **Cross Reference** | R1.2 |
| **Notes** | 기존에 작성한 Specification파일을 불러온다. 최근 파일 항목에 반영한다. |
| **Pre-Conditions** | 불러올 Specification파일 또는 recent file list에 specification  파일이 있어야 한다. |
| **Post-Conditions** | Specification파일을 작성하기 위한 화면으로 넘어간다. |



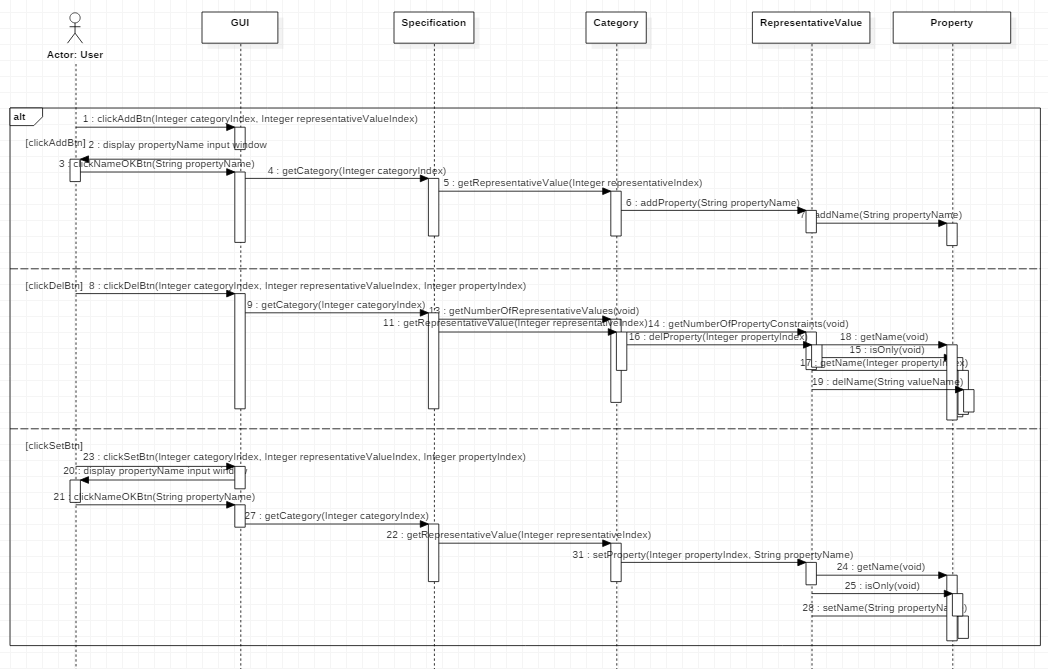
|  |  |
| --- | --- |
| **Name** | shutdownProgram |
| **Responsibilities** | GUI에서 ‘종료하기’ 버튼을 클릭한다. |
| **Type** | GUI |
| **Cross Reference** | R1.3 |
| **Notes** | 프로그램을 종료한다. |
| **Pre-Conditions** | N/A |
| **Post-Conditions** | N/A |



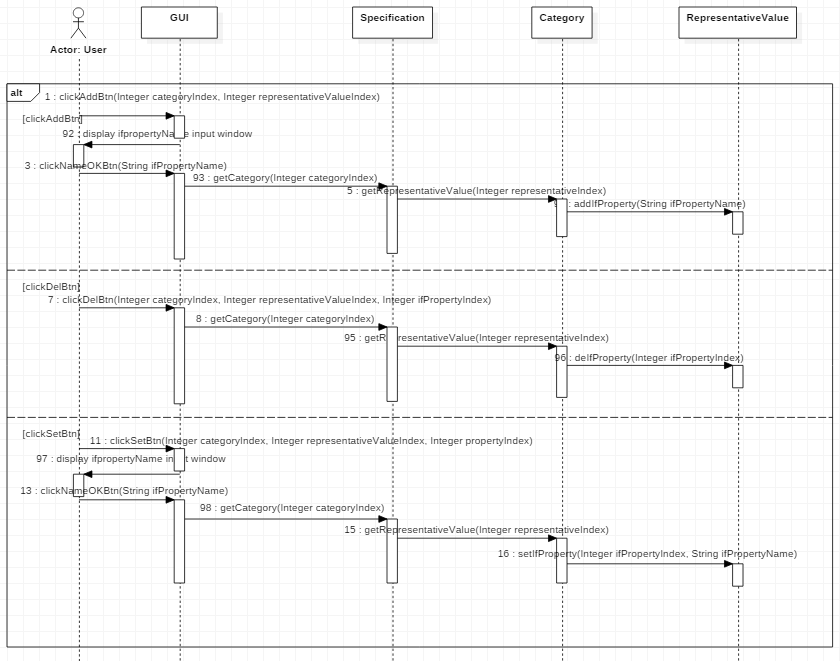
|  |  |
| --- | --- |
| **Name** | setCategory |
| **Responsibilities** | GUI에서 category에 대해 ‘추가’, 또는 ‘수정’, ‘삭제’버튼을 클릭한다. |
| **Type** | GUI |
| **Cross Reference** | R2.1 |
| **Notes** | 새로운 category를 추가 또는 이미 작성된 category를 수정하거나 지운다. |
| **Pre-Conditions** | ‘수정’, ‘삭제’버튼이 작동하기 위해서는 이미 추가된 category가 있어야 한다. |
| **Post-Conditions** | 클릭한 버튼의 결과가 Specification 및 화면에 반영된다. |



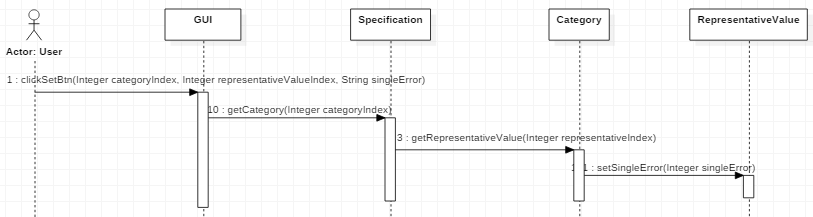
|  |  |
| --- | --- |
| **Name** | setRepresentativeValue |
| **Responsibilities** | GUI에서 representativeValue에 대해 ‘추가’, 또는 ‘수정’, ‘삭제’버튼을 클릭한다. |
| **Type** | GUI |
| **Cross Reference** | R2.2 |
| **Notes** | 새로운 representativeValue를 추가 또는 이미 작성된 representativeValue를 수정하거나 지운다. |
| **Pre-Conditions** | ‘수정’, ‘삭제’버튼이 작동하기 위해서는 이미 추가된 representativeValue가 있어야 한다. |
| **Post-Conditions** | 클릭한 버튼의 결과가 Specification 및 화면에 반영된다. |



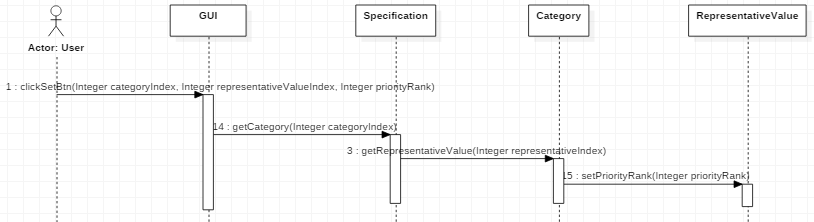
|  |  |
| --- | --- |
| **Name** | setProperty |
| **Responsibilities** | GUI에서 property에 대해 ‘추가’, 또는 ‘수정’, ‘삭제’버튼을 클릭한다. |
| **Type** | GUI |
| **Cross Reference** | R2.3 |
| **Notes** | 새로운 property를 추가 또는 이미 작성된 property를 수정하거나 지운다. |
| **Pre-Conditions** | ‘수정’, ‘삭제’버튼이 작동하기 위해서는 이미 추가된 property가 있어야 한다. |
| **Post-Conditions** | 클릭한 버튼의 결과가 Specification 및 화면에 반영된다. |



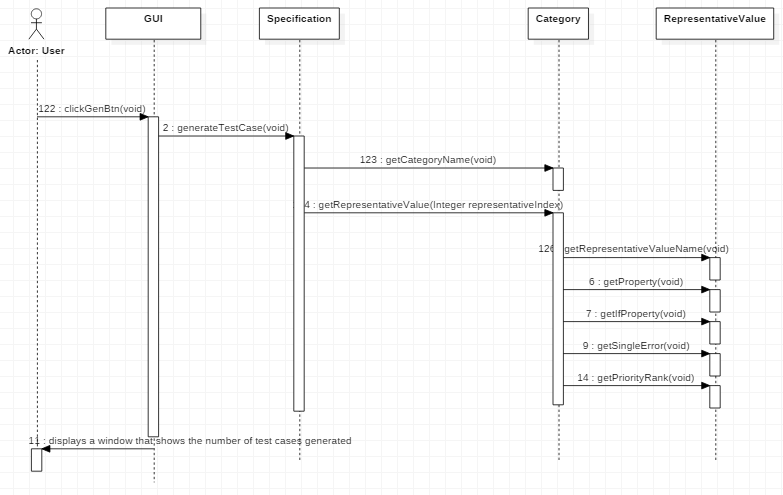
|  |  |
| --- | --- |
| **Name** | setIfProperty |
| **Responsibilities** | GUI에서 if-property에 대해 ‘추가’, 또는 ‘수정’, ‘삭제’버튼을 클릭한다. |
| **Type** | GUI |
| **Cross Reference** | R2.4 |
| **Notes** | 새로운 if-property를 추가 또는 이미 작성된 if-property를 수정하거나 지운다. |
| **Pre-Conditions** | ‘수정’, ‘삭제’버튼이 작동하기 위해서는 이미 추가된 if-property가 있어야 한다. |
| **Post-Conditions** | 클릭한 버튼의 결과가 Specification 및 화면에 반영된다. |



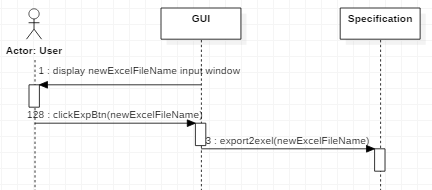
|  |  |
| --- | --- |
| **Name** | setSingleError |
| **Responsibilities** | GUI에서 single 또는 error constraint에 대해서 클릭한다. |
| **Type** | GUI |
| **Cross Reference** | R2.5 |
| **Notes** | 선택 받은 single 또는 error constraint 중 하나를 부여한다. [선택을 안 할 수도 있음] |
| **Pre-Conditions** | N/A |
| **Post-Conditions** | 클릭한 버튼의 결과가 Specification 및 화면에 반영된다. |



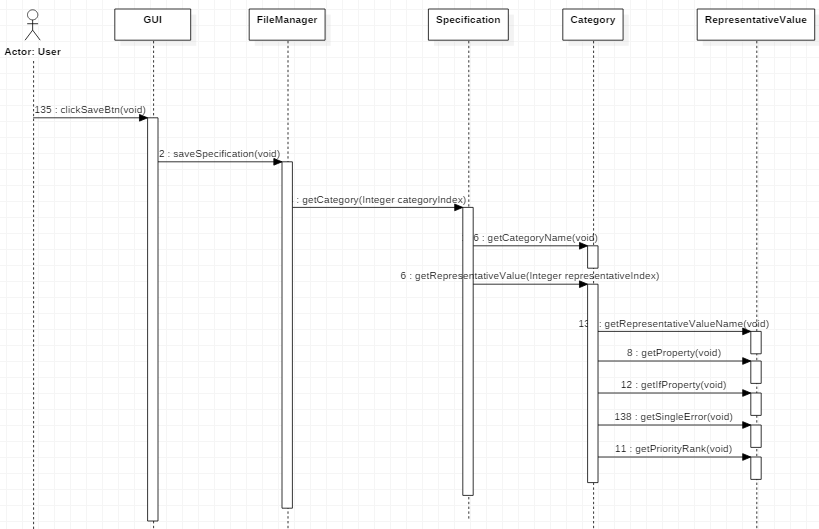
|  |  |
| --- | --- |
| **Name** | setPriorityRank |
| **Responsibilities** | GUI에서 priority에 대해 총 1~5점 중 하나를 클릭한다. |
| **Type** | GUI |
| **Cross Reference** | R2.6 |
| **Notes** | priority(중요도)를 선택 받은 1~5점 중 하나로 부여한다. |
| **Pre-Conditions** | N/A |
| **Post-Conditions** | 클릭한 버튼의 결과가 Specification 및 화면에 반영된다. |



|  |  |
| --- | --- |
| **Name** | generateTestCases |
| **Responsibilities** | GUI에서 ‘Test case 생성 후 엑셀로 저장하기’ 버튼을 클릭한다. |
| **Type** | GUI |
| **Cross Reference** | R3 |
| **Notes** | 입력된 Specification을 통해 test case를 만들고 그 총 개수를 화면을 통해 사용자에게 알려준다. |
| **Pre-Conditions** | 입력된 Specification이 test case를 만들기 위한 충분한 값이 입력되어야 한다. |
| **Post-Conditions** | test case를 만들고 그 총 개수를 화면을 통해 사용자에게 알려준다. |



|  |  |
| --- | --- |
| **Name** | export2excel |
| **Responsibilities** | GUI에서 생성할 Test case 엑셀파일의 이름을 입력 받는다. |
| **Type** | GUI |
| **Cross Reference** | R4 |
| **Notes** | Test case generate이 끝난 후, 생성할 엑셀파일의 이름을 받는다. 이후 생성된 test cases를 Priority순으로 정렬한 후, 입력 받은 이름의 엑셀 파일에 저장한다. |
| **Pre-Conditions** | 입력된 Specification이 test case를 만들기 위한 충분한 값이 입력되어서, Generate test cases가 실행되어야 한다. |
| **Post-Conditions** | 생성된 Test case를 입력 받은 이름의 엑셀 파일에 저장한다. |



|  |  |
| --- | --- |
| **Name** | saveSpecification |
| **Responsibilities** | GUI에서 ‘저장하기’ 버튼을 클릭한다. |
| **Type** | GUI |
| **Cross Reference** | R5 |
| **Notes** | specification입력 중간저장 버튼을 누르면, 현재까지의 작업 상태를 저장한다. |
| **Pre-Conditions** | N/A |
| **Post-Conditions** | 현재까지의 작업 상태를 specification 파일로 저장한다. |

# Activity 2055. Write Unit Test Code

# 2060 Test

# Activity 2061. Unit Testing

# Activity 2063. System Testing

# Activity 2067. Testing Traceability Analysis