Callisto
Acceptance Test Plan
Version 1.0.1

Project team
J.N. Adegeest | 0841357
G. Foks | 0847293
S.J. den Hertog | 0853459
K.R. Klaren | 0812587
S. Lovett | 0927993
K. Man | 0929573
K. Nassar | 0926380
B. Raducanu | 0870280
T. van Schijndel | 0857767
J.W. Sleijster | 0856823

Project managers
M. Brunings
L.D. Stooker

Project supervisor
N. Zannone

Customer
M.A. Weffers-Albu
Abstract

This document describes the acceptance test plan for The Callisto plug-in. Callisto is a plug-in for Jupyter which enables analysis of data from the MIMIC-III database [1]. In this document the acceptance test plan for the Callisto project is laid out. All the individual tests specified in the test case specifications which are also mentioned inside the test procedure, have to pass the acceptance test. If one fails, the overall acceptance test also failed. This document complies with the ESA software standard.
Contents

1 Introduction 8
   1.1 Purpose .......................................................... 8
   1.2 Overview ......................................................... 8
   1.3 Definitions and abbreviations ................................. 9
      1.3.1 Definitions ................................................ 9
      1.3.2 Abbreviations .............................................. 10
   1.4 List of references .............................................. 10

2 Introduction 11
   2.1 Test items ....................................................... 11
   2.2 Features to be tested .......................................... 11
   2.3 Test deliverables ............................................... 11
   2.4 Testing tasks .................................................. 11
   2.5 Environmental needs ......................................... 12
   2.6 Test case pass/fail criteria .................................. 12

3 Test case specifications 13
   3.1 Clinical Data Investigations and Insights .................. 13
      3.1.1 ATA1 - Logging into JupyterHub ...................... 13
      3.1.2 ATA2 - Creating an arbitrary number of graphs .... 13
      3.1.3 ATA3 - Create a graph using the MIMIC-III database 14
      3.1.4 ATA4 - The user is able to remove graphs .......... 14
      3.1.5 ATA5 - Creating a graph title ......................... 14
      3.1.6 ATA6 - Creating a graph description ................. 15
      3.1.7 ATA7 - Creating notes under a graph ............... 15
      3.1.8 ATA8 - Deleting notes under a graph ............... 15
      3.1.9 ATA9 - Saving the document ......................... 16
      3.1.10 ATA10 - Creating a line graph ...................... 16
      3.1.11 ATA11 - Creating a scatter plots graph ........... 16
      3.1.12 ATA12 - Creating a bar charts graph .............. 16
      3.1.13 ATA13 - Creating a pie charts graph .............. 17
      3.1.14 ATA14 - Creating a 3D line chart graph .......... 17
      3.1.15 ATA15 - Creating a 3D scatter plot graph ......... 17
      3.1.16 ATA16 - Changing the color of the graph ......... 18
      3.1.17 ATA17 - Changing the type of marker ............. 18
      3.1.18 ATA18 - Creating a graph with the number of patients with a certain number of (re)admissions .......... 18
3.1.19 ATA19 - Creating a graph with the number of patient deaths for patients who were admitted a certain number of days ago ........................................ 19
3.1.20 ATA20 - Creating a graph with the number of patients deaths for patients who were admitted a certain number of months ago .............. 19
3.1.21 ATA21 - Creating a graph with the number of days since the last (re)admission for the top 6 disease classes with the number of patients that died within that time ................................................................. 19
3.1.22 ATA22 - Creating a graph with the length of stay for the top 6 disease classes within a certain age group .............................................. 20
3.1.23 ATA23 - Creating a graph of the average ICU length of stay for the top 6 disease classes within a certain age group. ....................... 20
3.1.24 ATA24 - Creating a graph with the top 6 disease classes in each age group with the average number of patient transfers from the ICU. .......... 21
3.1.25 ATA25 - Creating a graph with the top 6 disease classes in each age group with the average number of patient transfers to the ICU. .......... 21
3.1.26 ATA26 - Filter the graph data on diagnosis ........................................ 21
3.1.27 ATA27 - Filter the graph data on age .................................................. 22
3.1.28 ATA28 - Filter the graph data on gender ............................................. 22
3.1.29 ATA29 - Filter the graph data on ethnicity .......................................... 23
3.1.30 ATA30 - Filter the graph data on treatment ........................................ 23
3.1.31 ATA31 - Correlation analysis on age versus length of stay ................... 23
3.1.32 ATA32 - Correlation analysis on age versus ICU length of stay .......... 24
3.1.33 ATA33 - Correlation analysis on length of stay versus transitions .......... 24
3.1.34 ATA34 - Opening up a root terminal .................................................. 24
3.1.35 ATA35 - Creating a new user account ............................................... 25
3.1.36 ATA36 - Removing a user account .................................................... 25
3.1.37 ATA37 - Creating or changing a password for the user ....................... 25
3.1.38 ATA38 - Creating a new preset. ......................................................... 26
3.1.39 ATA39 - Editing an existing preset. ................................................... 27
3.1.40 ATA40 - Removing a predetermined combination. ............................. 28

3.2 Automatic Report Generation ................................................................. 29
3.2.1 ATB1 - Download the Jupyter project, with all the MIMIC-III graphs, as a Microsoft Word compatible (.docx) file. ......................... 29
3.2.2 ATB2 - select which graphs will be downloaded as a Microsoft Word compatible (.docx) file. .................................................. 29
3.2.3 ATB3 - Notes are only exported if the graph it is considered part of, is exported too .................................................. 30

4 Test procedures ........................................................................................................ 32
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test reports</td>
<td>36</td>
</tr>
<tr>
<td>Requirements Traceability Matrix</td>
<td>37</td>
</tr>
<tr>
<td>6.1 URF to ATP</td>
<td>37</td>
</tr>
<tr>
<td>6.2 ATP to URD</td>
<td>38</td>
</tr>
<tr>
<td>Appendix - SQL Query</td>
<td>39</td>
</tr>
<tr>
<td>Appendix - Demo preset</td>
<td>40</td>
</tr>
</tbody>
</table>
DOCUMENT STATUS SHEET

GENERAL

Document title: Acceptance Test Plan v1.0.1
Identification: ATP/1.0.1
Authors: K.W. Man, J.W. Sleijster, J.N. Adegeest
Document status: Final version

DOCUMENT HISTORY

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Author(s)</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0.1</td>
<td>18-10-2016</td>
<td>K.W. Man</td>
<td>Initial document structure</td>
</tr>
<tr>
<td>0.0.2</td>
<td>24-10-2016</td>
<td>J.W. Sleijster J.N. Adegeest K.W. Man</td>
<td>Implemented acceptance tests</td>
</tr>
<tr>
<td>0.0.3</td>
<td>27-10-2016</td>
<td>J.W. Sleijster J.N. Adegeest</td>
<td>Modified acceptance tests</td>
</tr>
<tr>
<td>1.0.0</td>
<td>31-10-2016</td>
<td>J.W. Sleijster</td>
<td>Removed ToDos</td>
</tr>
<tr>
<td>1.0.1</td>
<td>31-10-2016</td>
<td>J.W. Sleijster</td>
<td>Changed small errors</td>
</tr>
<tr>
<td>1.0.2</td>
<td>31-10-2016</td>
<td>J.W. Sleijster</td>
<td>Changed the name of a preset</td>
</tr>
<tr>
<td>Section</td>
<td>Reason</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>--------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1.1</td>
<td>Changed the name of the preset for ATA-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1.38</td>
<td>Elaborated more on how to open a new notebook and creating a new callisto cell.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1.39</td>
<td>Elaborated more on how to open a new notebook and creating a new callisto cell.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1.40</td>
<td>Elaborated more on how to open a new notebook and creating a new callisto cell.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2.1</td>
<td>Added requirement to save.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2.2</td>
<td>Added requirement to save.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2.3</td>
<td>Added requirement to save.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Added a required tilda to a command.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Changed the name of a preset.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1 INTRODUCTION

1.1 PURPOSE

The Acceptance Test Plan document serves as a guidance through the acceptance test. All tests are defined in this document are to verify the requirements defined in the URD. The customer needs to approve this document before the tests are to be executed. Afterwards, the tests are to be executed the test results are to be reported in this document.

1.2 OVERVIEW

In chapter 2 is mentioned what is to be tested and how it is going to be tested and when the test will pass or fail. In chapter 3, for each defined test is described what requirement(s) is to be tested and how that is done. Chapter 4 describes the procedure of running all tests. In chapter 5, all the results of the tests are reported.
### 1.3 DEFINITIONS AND ABBREVIATIONS

#### 1.3.1 DEFINITIONS

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Callisto Cell</td>
<td>A Jupyter cell which contains the graphical user interface for the creation of the graph and the graph itself. Furthermore it contains options for exporting to Microsoft Word and MATLAB.</td>
</tr>
<tr>
<td>Disease class</td>
<td>All diseases which would be in the same category, is called a disease class.</td>
</tr>
<tr>
<td>Jupyter Notebook</td>
<td>A web application that allows the creation of live code, visualisations and text.</td>
</tr>
<tr>
<td>Jupyter Project</td>
<td>A document in the Jupyter Notebook which can contain a set of cells.</td>
</tr>
<tr>
<td>JupyterHub</td>
<td>An application which enables an instance of Jupyter Notebook for every user which logs in.</td>
</tr>
<tr>
<td>MATLAB</td>
<td>A multi-paradigm computing environment for numerical data.</td>
</tr>
<tr>
<td>MIMIC Graph</td>
<td>A graph created with the data of the MIMIC-III database.</td>
</tr>
<tr>
<td>Philips</td>
<td>A company focused on improving people’s lifestyle with meaningful innovations in healthcare, consumers lifestyles and lighting.</td>
</tr>
<tr>
<td>Python</td>
<td>Python is a widely used high-level, general-purpose, interpreted, dynamic programming language.</td>
</tr>
<tr>
<td>Top 6 disease classes</td>
<td>Cardiovascular disease, chronic lung disease, chronic kidney disease, cancer, diabetes, injuries.</td>
</tr>
</tbody>
</table>
1.3.2 ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESA</td>
<td>European Space Agency</td>
</tr>
<tr>
<td>GUI</td>
<td>Graphical User Interface</td>
</tr>
<tr>
<td>MIT</td>
<td>Massachusetts Institute of Technology</td>
</tr>
<tr>
<td>TU/e</td>
<td>Eindhoven University of Technology</td>
</tr>
<tr>
<td>URD</td>
<td>User Requirements Document</td>
</tr>
<tr>
<td>SRD</td>
<td>Software Requirements Document</td>
</tr>
<tr>
<td>ADD</td>
<td>Architecture Design Document</td>
</tr>
<tr>
<td>ATP</td>
<td>Acceptance Test Plan</td>
</tr>
<tr>
<td>AT</td>
<td>Acceptance Test</td>
</tr>
<tr>
<td>SVVP</td>
<td>Software Verification and Validation Plan</td>
</tr>
<tr>
<td>ICU</td>
<td>Intensive Care Unit</td>
</tr>
</tbody>
</table>

1.4 LIST OF REFERENCES


2 INTRODUCTION

2.1 TEST ITEMS

The software package to be tested is the Callisto application. All the requirements which were specified in consultation with the client, M.A. Weffers-Albu, will be tested. These requirements are described in the URD[2].

2.2 FEATURES TO BE TESTED

All the features are defined in the URD[2] with priorities. All the requirements with priority must have are required to pass. All the other requirements with priorities should have could have or won't have, will only be tested if they are implemented and if implemented, they should also pass the tests. All the other requirements that are not implemented and thus not tested will be marked in the tracing table as NI.

2.3 TEST DELIVERABLES

The following document must be delivered before the testing can start:

- URD[2]
- ATP (this document, chapter 1 till 4)
- Input data
- The Callisto plugin

After the completion of all the tests, the following documents must be delivered:

- ATP (this document, chapter 5)
- AT output data
- Problem reports (if any)

2.4 TESTING TASKS

Before any testing can take place, the following tasks have to be done:

- Designing the acceptance tests
- Linking all test cases to the user requirements in the URD[2] and/or use cases
- Creation of the AT input data
Ensuring all the environmental needs for the AT are satisfied

When all these tasks are satisfied, an AT can be performed following the procedures described in chapter 4.

2.5 ENVIRONMENTAL NEEDS

Before the AT can be performed, the following resources need to be set up:

- A desktop computer which has Chrome version 54 installed and is able to run the Jupyter Notebook with the Callisto plugin. Chrome is not logged in into Jupyterhub.

- A desktop computer with the ssh client, putty, on it.

- A server with Jupyter Notebook installed with our extensions installed and enabled. (With latest commit: 179bb24fbf79d153812858126127a91431da3319)[6]

- A server running JupyterHub. (With latest commit: 33a59c835262faacbf303273a4a442d7bf26a255)[5]

- A Debian server (v8.3) running PostgreSQL with the MIMIC-III database loaded[1]

2.6 TEST CASE PASS/FAIL CRITERIA

Every individual test has to describe what should criteria should be met to pass the test. The overall AT pass can only be achieved by passing each individual test described in chapter 3.
3 TEST CASE SPECIFICATIONS

In this section all the acceptance tests that need to be run in order to accept the Callisto project are described. All these tests can be executed separately as long as the pre-condition is met. However, to have an efficient acceptance test run, an efficient ordering is given in chapter 4. The make every acceptance test traceable, every acceptance test is provided with a unique identifier.

Note: Due to the requirement of having a MIT certificate before being allowed to access the database, any passwords are hidden in this document. All passwords are only available upon request.

3.1 CLINICAL DATA INVESTIGATIONS AND INSIGHTS

3.1.1 ATA1 - LOGGING INTO JUPYTERHUB

Precondition JupyterHubs interface to login is open.

Functional Requirements URF-48

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Enter as username “testplan”.</td>
<td></td>
</tr>
<tr>
<td>2. Enter as password Available upon request.</td>
<td></td>
</tr>
<tr>
<td>3. Click on the button “Sign In”.</td>
<td>4. Your Jupyter Notebook workspace will be opened.</td>
</tr>
</tbody>
</table>

3.1.2 ATA2 - CREATING AN ARBITRARY NUMBER OF GRAPHS

Precondition The user is logged in and opened a Jupyter project.

Functional Requirements URF-1, URF-20, URF-21

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Repeat step 1 to 4 for 5 times.</td>
<td></td>
</tr>
<tr>
<td>1. Create a new cell in the menu by ”Insert -&gt; Insert Cell Below”.</td>
<td></td>
</tr>
<tr>
<td>2. For the cell type selector in the menu, select ”Callisto”.</td>
<td></td>
</tr>
<tr>
<td>3. Select preset ‘Number months v. Readmissions within X months’.</td>
<td></td>
</tr>
<tr>
<td>4. Click on the ”Make graph” button.</td>
<td>5. A graph is created.</td>
</tr>
</tbody>
</table>
### 3.1.3 ATA3 - CREATE A GRAPH USING THE MIMIC-III DATABASE

**Precondition** At least one Callisto cell still exists and is selected.

**Functional Requirements** URF-2

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Select the 'Number of patient deaths per disease class' preset.</td>
<td>3. A graph is created.</td>
</tr>
<tr>
<td>2. Click on the “Make graph” button.</td>
<td></td>
</tr>
<tr>
<td>4. Go to the website '<a href="https://querybuilder-lcp.mit.edu/dashboard.cgi">https://querybuilder-lcp.mit.edu/dashboard.cgi</a>'.</td>
<td></td>
</tr>
<tr>
<td>5. Login with your user credentials.</td>
<td></td>
</tr>
<tr>
<td>6. Enter the query attached at Appendix A.</td>
<td></td>
</tr>
<tr>
<td>7. Click the &quot;Execute Query&quot; button.</td>
<td>8. The results of the query will be given.</td>
</tr>
<tr>
<td>9. Verify that the results of the query are compliant with the graph.</td>
<td></td>
</tr>
</tbody>
</table>

### 3.1.4 ATA4 - THE USER IS ABLE TO REMOVE GRAPHS

**Precondition** At least one Callisto cell still exists and is selected.

**Functional Requirements** URF-3

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In the menu go to &quot;Edit -&gt; Delete Cells&quot;.</td>
<td>2. The cell is deleted.</td>
</tr>
</tbody>
</table>

### 3.1.5 ATA5 - CREATING A GRAPH TITLE

**Precondition** At least one Callisto cell with a preset selected still exists and is selected.

**Functional Requirements** URF-4, URF-5

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Use the textfield next to &quot;Title&quot; and enter &quot;That Title&quot;.</td>
<td>3. A graph is created with the title on the top of the graph.</td>
</tr>
<tr>
<td>2. Click on the &quot;Make graph&quot; button.</td>
<td></td>
</tr>
</tbody>
</table>
3.1.6 ATA6 - CREATING A GRAPH DESCRIPTION

Precondition At least one Callisto cell with a preset selected still exists and is selected.

Functional Requirements URF-6, URF-7

Input Specifications
1. Use the textfield next to "Description" and enter "That Description".
2. Click on the "Make graph" button.

Output specifications
3. A graph is created with the description on the bottom of the graph.

3.1.7 ATA7 - CREATING NOTES UNDER A GRAPH

Precondition At least one Callisto cell still exists and is selected.

Functional Requirements URF-8, URF-9

Input Specifications
1. Click in the menu on "Insert -> Insert cell below".
2. In the cell type selector in the menu, select "Markdown".
3. Write "This is a note" in the newly appeared text box.
4. Press "Ctrl" and "Enter" at the same time.

Output specifications
5. A box is created with the note.

3.1.8 ATA8 - DELETING NOTES UNDER A GRAPH

Precondition A note under the a Callisto cell have been created and is selected.

Functional Requirements URF-10

Input Specifications
1. Click on "Edit".
2. Select "Delete cells".

Output specifications
3. The text box with notes is deleted.
3.1.9 **ATA9 - SAVING THE DOCUMENT**

**Precondition** At least one Callisto cell still exists.

**Functional Requirements** URF-11

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Click on &quot;File&quot;.</td>
<td>3. The document has been saved.</td>
</tr>
<tr>
<td>2. Select &quot;Save and Checkpoint&quot;.</td>
<td></td>
</tr>
<tr>
<td>4. Press &quot;F5&quot; on the keyboard.</td>
<td>5. The page will be reloaded with the same contents.</td>
</tr>
</tbody>
</table>

3.1.10 **ATA10 - CREATING A LINE GRAPH**

**Precondition** At least one Callisto cell still exists and is selected.

**Functional Requirements** URF-12

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Select the &quot;Number months v. Readmissions within X month&quot; preset.</td>
<td>4. A line chart graph is created.</td>
</tr>
<tr>
<td>2. Select &quot;Line 2d&quot; as graph type option.</td>
<td></td>
</tr>
<tr>
<td>3. Click on the &quot;Make graph&quot; button.</td>
<td></td>
</tr>
</tbody>
</table>

3.1.11 **ATA11 - CREATING A SCATTER PLOTS GRAPH**

**Precondition** A Callisto cell with the preset "Number months v. Readmissions within X months" and as graph type 'Line 2d' is created and selected.

**Functional Requirements** URF-13, URF-17

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Select &quot;Scatter 2d&quot; as graph type option.</td>
<td>3. A scatter plot is created.</td>
</tr>
<tr>
<td>2. Click on the &quot;Make graph&quot; button.</td>
<td></td>
</tr>
</tbody>
</table>

3.1.12 **ATA12 - CREATING A BAR CHARTS GRAPH**

**Precondition** A Callisto cell with the preset "Number months v. Readmissions within X months" and as graph type 'Scatter 2d' is created and selected.
**Functional Requirements** URF-14, URF-17

### Input Specifications

1. Select "Bar 2d" as graph type option.
2. Click on the "Make graph" button.

### Output specifications

3. A bar chart graph is created.

**3.1.13 ATA13 - CREATING A PIE CHARTS GRAPH**

**Precondition** A Callisto cell with the preset "Number months v. Readmissions within X months" and as graph type 'Bar 2d' is created and selected.

**Functional Requirements** URF-15, URF-17, URF-23

### Input Specifications

1. Select the "Disease Classes v. Patients with majority of readmissions due to the same disease class" preset.
2. Select "Pie 2d" as graph type option.
3. Click on the "Make graph" button.

### Output specifications

4. A pie chart graph is created.

**3.1.14 ATA14 - CREATING A 3D LINE CHART GRAPH**

**Precondition** A Callisto cell with a preset is created and selected.

**Functional Requirements** URF-16, URF-24

### Input Specifications

1. Select the "Number of (re)admissions v. Disease Classes v. Patients with readmissions due to the same disease class" preset
2. Select "Line 3d" as graph type option.
3. Click on the "Make graph" button.

### Output specifications

4. A 3D line chart graph is created.

**3.1.15 ATA15 - CREATING A 3D SCATTER PLOT GRAPH**

**Precondition** A Callisto cell with the preset "Number of (re)admissions v. Disease Classes v. Patients with readmissions due to the same disease class" and as graph type "Line 3d" is created and selected.

**Functional Requirements** URF-16, URF-17
### Input Specifications
1. Select "Scatter 3d" as graph type option.
2. Click on the "Make graph" button.

### Output specifications
3. A 3D scatter plot is created.

#### 3.1.16 ATA16 - CHANGING THE COLOR OF THE GRAPH

**Precondition** A Callisto cell with the preset "Number months v. Readmissions within X months" and as graph type "Scatter 2d" is created and selected.

**Functional Requirements** URF-18

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In the selector of &quot;Color&quot; select a green color.</td>
<td>3. A 2D scatter graph with green dots is created.</td>
</tr>
<tr>
<td>2. Click on the &quot;Make graph&quot; button.</td>
<td></td>
</tr>
</tbody>
</table>

#### 3.1.17 ATA17 - CHANGING THE TYPE OF MARKER

**Precondition** A Callisto cell with the preset "Number months v. Readmissions within X months" and as graph type "Scatter 2d" is created and selected.

**Functional Requirements** URF-19

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In the selector of &quot;Type of marker&quot; select &quot;X&quot;.</td>
<td>3. A 2D scatter graph with X as markers is created.</td>
</tr>
<tr>
<td>2. Click on the &quot;Make graph&quot; button.</td>
<td></td>
</tr>
</tbody>
</table>

#### 3.1.18 ATA18 - CREATING A GRAPH WITH THE NUMBER OF PATIENTS WITH A CERTAIN NUMBER OF (RE)ADMISSIONS

**Precondition** At least one Callisto cell still exists and is selected.

**Functional Requirements** URF-20, URF-22

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Select the preset &quot;Number of (re)admissions v. Number of patients with X (re)admissions&quot;.</td>
<td>3.</td>
</tr>
<tr>
<td>2. Click on &quot;Make graph&quot;.</td>
<td></td>
</tr>
</tbody>
</table>
November 11, 2016

3. A graph with the amount of (re)admissions on the X-axis and the number of patients with X (re)admissions on the Y-axis is created.

3.1.19 ATAV - CREATING A GRAPH WITH THE NUMBER OF PATIENT DEATHS FOR PATIENTS WHO WERE ADMITTED A CERTAIN NUMBER OF DAYS AGO

Precondition At least one Callisto cell still exists and is selected.
Functional Requirements URF-20, URF-25, URF-34

Input Specifications
1. Select the preset "Number of patients admitted X days ago v. Number of patient deaths".
2. Click on "Make graph".

Output specifications
3. A graph with the number of days from admission until death on the X-axis and the number of patient deaths on the Y-axis has been created.

3.1.20 ATA20 - CREATING A GRAPH WITH THE NUMBER OF PATIENTS DEATHS FOR PATIENTS WHO WERE ADMITTED A CERTAIN NUMBER OF MONTHS AGO

Precondition At least one Callisto cell still exists and is selected.
Functional Requirements URF-20, URF-26, URF-34

Input Specifications
1. Select the preset "Number of (re)admissions v. Number of patient deaths after X admissions".
2. Click on "Make graph".

Output specifications
3. A graph with the number of patient deaths for X (re)admissions on the X-Axis and the number of (re)admissions on the Y-Axis has been created.

3.1.21 ATA21 - CREATING A GRAPH WITH THE NUMBER OF DAYS SINCE THE LAST (RE)ADMISSION FOR THE TOP 6 DISEASE CLASSES WITH THE NUMBER OF PATIENTS THAT DIED WITHIN THAT TIME

Precondition At least one Callisto cell still exists and is selected.
Functional Requirements URF-20, URF-27, URF-34
### 3.1.22 ATA22 - CREATING A GRAPH WITH THE LENGTH OF STAY FOR THE TOP 6 DISEASE CLASSES WITHIN A CERTAIN AGE GROUP

**Precondition** At least one Callisto cell still exists and is selected.

**Functional Requirements** URF-20, URF-29, URF-34

**Input Specifications**
1. Select the preset “Age group v. Disease Class v. Average Length of Stay”.
2. Click on the “Make graph” button.

**Output specifications**
3. A graph with the top 6 disease classes on the X-axis, the age group on the Y-Axis and the length of stay in the ICU on the Z-axis has been created.

### 3.1.23 ATA23 - CREATING A GRAPH OF THE AVERAGE ICU LENGTH OF STAY FOR THE TOP 6 DISEASE CLASSES WITHIN A CERTAIN AGE GROUP

**Precondition** At least one Callisto cell still exists and is selected.

**Functional Requirements** URF-20, URF-30, URF-34

**Input Specifications**
1. Select the preset “Age group v. Disease Class v. Average ICU Length of Stay”.
2. Click on the “Make graph” button.

**Output specifications**
3. A graph with the top 6 disease classes on the X-axis, the age group on the Y-Axis and the length of stay in the ICU on the Z-axis has been created.
3.1.24  ATA24 - CREATING A GRAPH WITH THE TOP 6 DISEASE CLASSES IN EACH AGE GROUP WITH THE AVERAGE NUMBER OF PATIENT TRANSFERS FROM THE ICU.

**Precondition** At least one Callisto cell still exists and is selected.

**Functional Requirements** URF-20, URF-31, URF-34

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
</table>
| 1. Select the preset "Age group v. Disease Class v. Average transfers from ICU".  
2. Click on the "Make graph" button. | 3. A graph with the top 6 disease classes on the X-axis, the age group on the Y-Axis and the average number of patient transfers from the ICU on the Z-axis has been created. |

3.1.25  ATA25 - CREATING A GRAPH WITH THE TOP 6 DISEASE CLASSES IN EACH AGE GROUP WITH THE AVERAGE NUMBER OF PATIENT TRANSFERS TO THE ICU.

**Precondition** At least one Callisto cell still exists and is selected.

**Functional Requirements** URF-20, URF-32, URF-34

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
</table>
| 1. Select the preset "Age group v. Disease Class v. Average transfers to ICU".  
2. Click on the "Make graph" button. | 3. A graph with the top 6 disease classes on the X-axis, the age group on the Y-Axis and the average number of patient transfers to the ICU on the Z-axis has been created. |

3.1.26  ATA26 - FILTER THE GRAPH DATA ON DIAGNOSIS

**Precondition** A Callisto cell with the preset "Number months v. Readmissions within X months" and no filters created is already present and selected.

**Functional Requirements** URF-35

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
</table>
| 1. Click on the "Add filter" button.  
2. Choose "Diagnosis" in the option box that has appeared. |  |
3. Choose the diagnosis “Diabetes” in the newly appeared option box.
4. Click on the “Make graph” button.

5. The results is a graph filtered by the chosen diagnosis class.

3.1.27  ATA27 - FILTER THE GRAPH DATA ON AGE

Precondition A Callisto cell with the preset "Number months v. Readmissions within X months" and no filters created is already present and selected.

Functional Requirements URF-36

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Click on the “Add filter” button.</td>
<td>5. The results is a graph filtered by the chosen age range.</td>
</tr>
<tr>
<td>2. Choose &quot;Age&quot; in the option box that has appeared.</td>
<td></td>
</tr>
<tr>
<td>3. Use the newly appeared text fields or sliders to filter on age from 20 to 40.</td>
<td></td>
</tr>
<tr>
<td>4. Click on the &quot;Make graph&quot; button.</td>
<td></td>
</tr>
</tbody>
</table>

3.1.28  ATA28 - FILTER THE GRAPH DATA ON GENDER

Precondition A Callisto cell with the preset "Number months v. Readmissions within X months" and the age filter "20 to 40" is present and selected.

Functional Requirements URF-37, URF-40

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Click on the “Add filter” button.</td>
<td>5. The results is a graph filtered based on the chosen gender and the age range.</td>
</tr>
<tr>
<td>2. Choose &quot;Gender&quot; in the option box that has appeared.</td>
<td></td>
</tr>
<tr>
<td>3. Use the newly appeared option box to select &quot;Male&quot;.</td>
<td></td>
</tr>
<tr>
<td>4. Click on the &quot;Make graph&quot; button.</td>
<td></td>
</tr>
</tbody>
</table>
3.1.29 ATA29 - FILTER THE GRAPH DATA ON ETHNICITY

**Precondition** A Callisto cell with the preset "Number months v. Readmissions within X months" and no filter created is already present and selected.

**Functional Requirements** URF-38

**Input Specifications**

1. Click on the "Add filter" button.
2. Choose "Ethnicity" in the option box that has appeared.
3. Use the newly appeared option box to select the ethnicity.
4. Click on the "Make graph" button.

**Output specifications**

5. The results is a graph filtered by the chosen ethnicity.

3.1.30 ATA30 - FILTER THE GRAPH DATA ON TREATMENT

**Precondition** A Callisto cell with the preset "Number months v. Readmissions within X months" and no filters created is already present and selected.

**Functional Requirements** URF-39

**Input Specifications**

1. Click on the "Add filter" button.
2. Choose "Treatment" in the option box that has appeared.
3. Use the newly appeared option box to select the treatment.
4. Click on the "Make graph" button.

**Output specifications**

5. The results is a graph filtered by the chosen filter.

3.1.31 ATA31 - CORRELATION ANALYSIS ON AGE VERSUS LENGTH OF STAY

**Precondition** At least one Callisto cell still exists and is selected.

**Functional Requirements** URF-43

**Input Specifications**

1. Select the "Correlation analysis on age versus length of stay" preset.

**Output specifications**
2. Click on the "Make graph" button.

3. A correlation analysis is created for this preset.

3.1.32 ATA32 - CORRELATION ANALYSIS ON AGE VERSUS ICU LENGTH OF STAY

Precondition At least one Callisto cell still exists and is selected.
Functional Requirements URF-44

Input Specifications
1. Select the "Correlation analysis on age versus ICU length of stay" preset.
2. Click on the "Make graph" button.

Output specifications
3. A correlation analysis is created for this preset.

3.1.33 ATA33 - CORRELATION ANALYSIS ON LENGTH OF STAY VERSUS TRANSITIONS

Precondition At least one Callisto cell still exists and is selected.
Functional Requirements URF-45

Input Specifications
1. Select the "Correlation analysis on length of stay versus number of transitions" preset.
2. Click on the "Make graph" button.

Output specifications
3. A correlation analysis is created for this preset.

3.1.34 ATA34 - OPENING UP A ROOT TERMINAL

Precondition An admin is logged into JupyterHub and has his workspace open.
Functional Requirements URF-49, URF-50, URF-51, URF-52

Input Specifications
1. Open up the Terminal by New -> Terminal.
2. Enter the command "sudo su".
3. Enter the password Available upon request.

Output specifications
4. The terminal will switch the user to a root user.
3.1.35  ATA35 - CREATING A NEW USER ACCOUNT

**Precondition** A root terminal is already open

**Functional Requirements** URF-49

---

**Input Specifications**  
1. The user enters the command "useradd -m newuser".

**Output specifications**  
2. The user is added.

---

3.1.36  ATA36 - REMOVING A USER ACCOUNT

**Precondition** A root terminal is already open.

**Functional Requirements** URF-50

---

**Input Specifications**  
1. The user enters the command "deluser newuser".
2. If: error code 8 is returned
   - Find the process number that the user is still using in the error message.
   - Enter the command "kill processid".
   - Run the command "deluser newuser".

**Output specifications**  
3. The user is removed.

---

3.1.37  ATA37 - CREATING OR CHANGING A PASSWORD FOR THE USER

**Precondition** A root terminal is already open.

**Functional Requirements** URF-51, URF-52

---

**Input Specifications**  
1. Enter the command "passwd newuser".
2. Enter the new password, newpass, for this user.
3. Enter the new password, newpass, for this user.
4. Log out by pressing logout in the top right corner by clicking on "Logout".
6. Enter as username newuser and as password wrongpass
7. Click on the button "Sign In".
8. You will get an error message that the password is incorrect.
9. Enter as username newuser and as password newpass
10. Click on the button "Sign In".
11. You will now be logged in with the new account.

3.1.38  ATA38 - CREATING A NEW PRESET.

Precondition The user has admin rights. The terminal is still open and selected.

Functional Requirements URF-54

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Enter the command &quot;cd ~/Callisto/src/callisto/config/presets&quot;.</td>
<td></td>
</tr>
<tr>
<td>2. Enter the command &quot;nano demo_preset.py&quot;.</td>
<td></td>
</tr>
<tr>
<td>3. Copy the contents of Appendix B.</td>
<td></td>
</tr>
<tr>
<td>4. Paste the contents of Appendix B. into the terminal.</td>
<td></td>
</tr>
<tr>
<td>5. Press &quot;Ctrl+x&quot; followed by &quot;Y&quot; and &quot;Enter&quot;.</td>
<td></td>
</tr>
<tr>
<td>6. Run the following command &quot;cd ~/&quot;.</td>
<td></td>
</tr>
<tr>
<td>7. Run the following command &quot;/root/runc&quot;.</td>
<td></td>
</tr>
<tr>
<td>8. Open up JupyterHub in Chrome by entering the address &quot;<a href="https://calisto.win.tue.nl">https://calisto.win.tue.nl</a>&quot;.</td>
<td></td>
</tr>
<tr>
<td>9. If: only one button is present. Click on &quot;Start My Server&quot;.</td>
<td></td>
</tr>
<tr>
<td>10. Open up a new Jupyter Notebook by clicking on &quot;New -&gt; Python 3&quot;.</td>
<td></td>
</tr>
<tr>
<td>11. Create a Callisto cell by inserting a new cell below and selecting &quot;Callisto&quot; from the cell type selector.</td>
<td></td>
</tr>
<tr>
<td>12. Open up the preset dropdown menu.</td>
<td></td>
</tr>
<tr>
<td>13. The preset dropdown will contain an &quot;This is a illustrative query&quot; option.</td>
<td></td>
</tr>
</tbody>
</table>
14. Select the preset "This is a illustrative query".
15. Select the graph style "2D line".
16. Click "Make graph".
17. A graph with number of patients vs. age is rendered.

3.1.39  ATA39 - EDITING AN EXISTING PRESET.

Precondition  The user has admin rights. There exists at least one preset. The terminal is still open and selected.

Functional Requirements  URF-55

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Enter the command &quot;cd ~/Callisto/src/callisto/config/presets&quot;.</td>
<td></td>
</tr>
<tr>
<td>2. Enter the command &quot;nano corr_anal_age_v_los.py&quot; in a text editor.</td>
<td></td>
</tr>
<tr>
<td>3. Replace &quot;Correlation analysis on age versus length of stay&quot; on line 3 with &quot;Test editing preset&quot;</td>
<td></td>
</tr>
<tr>
<td>4. Close by pressing &quot;Ctrl+x&quot; followed by &quot;Y&quot; and &quot;Enter&quot;.</td>
<td></td>
</tr>
<tr>
<td>5. Enter the command &quot;cd ~/.&quot;.</td>
<td></td>
</tr>
<tr>
<td>6. Enter the command &quot;/root/runc&quot;.</td>
<td></td>
</tr>
<tr>
<td>7. Open up JupyterHub in Chrome by entering the address &quot;<a href="https://calisto.win.tue.nl">https://calisto.win.tue.nl</a>&quot;.</td>
<td></td>
</tr>
<tr>
<td>8. If: only one button is present.</td>
<td></td>
</tr>
<tr>
<td>Click on &quot;Start My Server&quot;.</td>
<td></td>
</tr>
<tr>
<td>9. Open up a new Jupyter Notebook by clicking on &quot;New -&gt; Python 3&quot;.</td>
<td></td>
</tr>
<tr>
<td>10. Create a Callisto cell by inserting a new cell below and selecting &quot;Callisto&quot; from the cell type selector.</td>
<td></td>
</tr>
<tr>
<td>11. Open up the preset dropdown menu.</td>
<td></td>
</tr>
<tr>
<td>12. The preset dropdown will contain an &quot;Test editing preset&quot; option instead of &quot;Correlation analysis on age versus length of stay&quot;.</td>
<td></td>
</tr>
</tbody>
</table>
3.1.40 ATA40 - REMOVING A PREDETERMINED COMBINATION.

**Precondition** The user has admin rights. There exists at least one predetermined combination. The terminal is still open and selected.

**Functional Requirements** URF-56

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Press &quot;Ctrl+C&quot; on the keyboard to kill the Jupyterhub process.</td>
<td></td>
</tr>
<tr>
<td>2. Enter the command &quot;cd ~/Callisto/src/callisto/config/presets&quot;.</td>
<td></td>
</tr>
<tr>
<td>3. Enter the command &quot;rm demo_preset.py&quot;.</td>
<td></td>
</tr>
<tr>
<td>4. Enter the command &quot;cd ~/&quot;.</td>
<td></td>
</tr>
<tr>
<td>5. Enter the command &quot;/root/runc&quot;.</td>
<td></td>
</tr>
<tr>
<td>6. Open up JupyterHub in Chrome by entering the address &quot;<a href="https://calisto.win.tue.nl">https://calisto.win.tue.nl</a>&quot;.</td>
<td></td>
</tr>
<tr>
<td>7. If: only one button is present. Click on &quot;Start My Server&quot;.</td>
<td>11. The preset dropdown will no longer contain a &quot;This is an illustrative query&quot; option.</td>
</tr>
<tr>
<td>8. Open up a new Jupyter Notebook by clicking on &quot;New -&gt; Python 3&quot;.</td>
<td></td>
</tr>
<tr>
<td>9. Create a Callisto cell by inserting a new cell below and selecting &quot;Callisto&quot; from the cell type selector.</td>
<td></td>
</tr>
<tr>
<td>10. Open up the preset dropdown menu.</td>
<td></td>
</tr>
</tbody>
</table>
3.2 AUTOMATIC REPORT GENERATION

3.2.1 ATB1 - DOWNLOAD THE JUPYTER PROJECT, WITH ALL THE MIMIC-III GRAPHS, AS A MICROSOFT WORD COMPATIBLE (.DOCX) FILE.

Precondition There exist two Callisto cells. One contains a 2D pie chart and the other contains a 2D scatter graph.

Functional Requirements URF-57

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Save the file by clicking on &quot;File -&gt; Save and Checkpoint&quot;.</td>
<td>2. The file is saved.</td>
</tr>
<tr>
<td>3. Select 'File' from the top menu.</td>
<td></td>
</tr>
<tr>
<td>4. Select the 'Download as' option.</td>
<td></td>
</tr>
<tr>
<td>5. Select the 'Word doc (.docx)' option.</td>
<td>6. A .docx file is downloaded which contains the created graphs.</td>
</tr>
</tbody>
</table>

3.2.2 ATB2 - SELECT WHICH GRAPHS WILL BE DOWNLOADED AS A MICROSOFT WORD COMPATIBLE (.DOCX) FILE.

Precondition There exist two Callisto cells. One contains a 2D pie chart and the other contains a 2D scatter graph.

Functional Requirements URF-58

<table>
<thead>
<tr>
<th>Input Specifications</th>
<th>Output specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Deselect the export checkmark for the scatter 2d graph.</td>
<td>2. The scatter 2d graph export checkmark gets deselected.</td>
</tr>
<tr>
<td>3. Save the file by clicking on &quot;File -&gt; Save and Checkpoint&quot;.</td>
<td>4. The file is saved.</td>
</tr>
<tr>
<td>5. Select 'File' from the top menu.</td>
<td></td>
</tr>
<tr>
<td>6. Select the 'Download as' option.</td>
<td></td>
</tr>
<tr>
<td>7. Select the 'Word doc (.docx)' option.</td>
<td>8. A .docx file is downloaded which contains only the pie 2d graph.</td>
</tr>
</tbody>
</table>
3.2.3 ATB3 - NOTES ARE ONLY EXPORTED IF THE GRAPH IT IS CONSIDERED PART OF, IS EXPORTED TOO

Precondition There exist two Callisto cells. One contains a 2D pie chart and the other contains a 2D scatter graph.

Functional Requirements URF-59

Input Specifications
1. Select the Callisto cell which contains the 2D pie chart graph.
2. Select 'Insert' from the top menu.
3. Select the 'Insert Cell Below' option.
4. A new cell is created below the selected Callisto cell.
5. Select the newly created cell.
6. Type "This will be displayed" in the selected cell.
7. Press "Ctrl" and "Enter" at the same time.
8. A box is created with the note.
9. Select the Callisto cell which contains the 2D scatter chart graph.
10. Select 'Insert' from the top menu.
11. Select the 'Insert Cell Below' option.
12. A new cell is created below the selected Callisto cell.
13. Select the newly created cell.
14. Type "This will not be displayed" in the selected cell.
15. Press "Ctrl" and "Enter" at the same time.
16. A box is created with the note.
17. Deselect the export checkmark for the scatter 2d graph.
18. The scatter 2d graph export checkmark gets deselected.
19. Save the file by clicking on "File -> Save and Checkpoint".
20. The file is saved.
21. Select 'File' from the top menu.
22. Select the 'Download as' option.
23. Select the 'Word doc (.docx)' option.

24. A .docx file is downloaded which contains only the 2D pie chart and the text "This will be displayed".
4 TEST PROCEDURES

Before we start the testing procedure make sure all the testing tasks are complete as specified in chapter 2.4 and all the environmental needs are satisfied as specified in chapter 2.5. Each time a command is entered into the terminal, the enter button needs to be pressed. Perform the tasks in the order of the following list:

1. Open up putty.
2. Enter as Host Name "calisto.win.tue.nl" followed by pressing "Enter" on the keyboard.
3. Enter the useraccount testplan.
4. Enter the password available upon request.
5. Open up as root terminal with the command "sudo su".
6. If requested enter the password of the testplan account.
7. Enter the command "cd ~/".
8. Enter the command "/root/runc" to start the server.
9. Continue with the rest and leave the terminal open.
10. Open up JupyterHub in Chrome by entering the address "https://calisto.win.tue.nl".
11. Execute ATA1
12. Execute ATA34
13. Execute ATA35
14. Execute ATA37
15. Log out by pressing logout in the top right corner by clicking on "Logout".
16. Login with the useraccount testplan again.
17. Open up a root terminal again. (ATA34)
18. Execute ATA36.
19. Leave the terminal by clicking on the "Control Panel".
20. If: you only get the option to "Stop My Server" or "My Server" Click on "My Server".
21. Open up a new Jupyter Notebook by clicking on "New -> Python 3".

22. Execute ATA2

23. Execute ATA3

24. Execute ATA4

25. Delete 3 of the 5 graphs.

26. Execute ATA5

27. Execute ATA6

28. Execute ATA7

29. Execute ATA8

30. Execute ATA9

31. Select any Callisto cell

32. Execute ATA10

33. Execute ATA11

34. Execute ATA16

35. Execute ATA17

36. Execute ATA12

37. Execute ATA13

38. Execute ATA14

39. Execute ATA15

40. Execute ATA18

41. Execute ATA19

42. Execute ATA20

43. Execute ATA21

44. Execute ATA22

45. Execute ATA23

46. Execute ATA24
47. Execute ATA25
48. Select "Number months v. Readmissions within X months" as preset.
49. Click on the "Make graph" button.
50. Execute ATA26
51. Delete the "Diagnosis" filter by clicking on the x on the right of the filter.
52. Execute ATA27
53. Execute ATA28
54. Delete the "Age" and the "Gender" filter by clicking on the x on the right of the filters.
55. Execute ATA29
56. Delete the "Ethnicity" filter by clicking on the x on the right of the filter.
57. Execute ATA30
58. Delete the "Threatment" filter by clicking on the x on the right of the filter.
59. Execute ATA31
60. Execute ATA32
61. Execute ATA33
62. Open up the putty windows again.
63. Press "Ctrl+C" on the keyboard to kill the Jupyterhub process.
64. Execute ATA38
65. Open up the putty windows again.
66. Press "Ctrl+C" on the keyboard to kill the Jupyterhub process.
67. Execute ATA39
68. Open up the putty windows again.
69. Press "Ctrl+C" on the keyboard to kill the Jupyterhub process.
70. Execute ATA40
71. Remove all Callisto cells
72. Create a new Cell. Make it a Callisto cell. Select the preset "Number months v. Readmissions within X months". Select as graph type "Scatter 2d". Click on the "Make graph" button.

73. Create a new Cell. Make it a Callisto cell. Select the preset "Number of patient deaths per disease class". Select as graph type "Pie 2d". Click on the "Make graph" button.

74. Execute ATB1
75. Execute ATB2
76. Execute ATB3
5 TEST REPORTS

All the results and the report of this acceptance test will be in the STD[4].
### 6 REQUIREMENTS TRACEABILITY MATRIX

In this section the URFs are linked to the ATs and the ATs are linked to the URFs. URFs that are not implemented are categorized by **NI** (Not Implemented).

#### 6.1 URF TO ATP

<table>
<thead>
<tr>
<th>URF</th>
<th>ATP</th>
<th>URD</th>
<th>ATP</th>
<th>URD</th>
<th>ATP</th>
</tr>
</thead>
<tbody>
<tr>
<td>URF-1</td>
<td>ATA2</td>
<td>URF-21</td>
<td>ATA2</td>
<td>URF-41</td>
<td>NI</td>
</tr>
<tr>
<td>URF-2</td>
<td>ATA2</td>
<td>URF-22</td>
<td>ATA18</td>
<td>URF-42</td>
<td>NI</td>
</tr>
<tr>
<td>URF-3</td>
<td>ATA3</td>
<td>URF-23</td>
<td>ATA13</td>
<td>URF-43</td>
<td>ATA31</td>
</tr>
<tr>
<td>URF-4</td>
<td>ATA5</td>
<td>URF-24</td>
<td>ATA14</td>
<td>URF-44</td>
<td>ATA32</td>
</tr>
<tr>
<td>URF-5</td>
<td>ATA5</td>
<td>URF-25</td>
<td>ATA19</td>
<td>URF-45</td>
<td>ATA33</td>
</tr>
<tr>
<td>URF-6</td>
<td>ATA6</td>
<td>URF-26</td>
<td>ATA20</td>
<td>URF-46</td>
<td>NI</td>
</tr>
<tr>
<td>URF-7</td>
<td>ATA6</td>
<td>URF-27</td>
<td>ATA21</td>
<td>URF-47</td>
<td>NI</td>
</tr>
<tr>
<td>URF-8</td>
<td>ATA7</td>
<td>URF-28</td>
<td>NI</td>
<td>URF-48</td>
<td>ATA1</td>
</tr>
<tr>
<td>URF-9</td>
<td>ATA7</td>
<td>URF-29</td>
<td>ATA22</td>
<td>URF-49</td>
<td>ATA34,ATA35</td>
</tr>
<tr>
<td>URF-10</td>
<td>ATA8</td>
<td>URF-30</td>
<td>ATA23</td>
<td>URF-50</td>
<td>ATA34,ATA36</td>
</tr>
<tr>
<td>URF-11</td>
<td>ATA9</td>
<td>URF-31</td>
<td>ATA24</td>
<td>URF-51</td>
<td>ATA34,ATA37</td>
</tr>
<tr>
<td>URF-12</td>
<td>ATA10</td>
<td>URF-32</td>
<td>ATA25</td>
<td>URF-52</td>
<td>ATA34,ATA37</td>
</tr>
<tr>
<td>URF-13</td>
<td>ATA11</td>
<td>URF-33</td>
<td>NI</td>
<td>URF-54</td>
<td>ATA38</td>
</tr>
<tr>
<td>URF-14</td>
<td>ATA12</td>
<td>URF-34</td>
<td>ATA19,ATA20,</td>
<td>URF-55</td>
<td>ATA39</td>
</tr>
<tr>
<td>URF-15</td>
<td>ATA13</td>
<td>URF-35</td>
<td>ATA21,ATA22,</td>
<td>URF-56</td>
<td>ATA40</td>
</tr>
<tr>
<td>URF-16</td>
<td>ATA14,ATA15</td>
<td>URF-36</td>
<td>ATA23,ATA24,</td>
<td>URF-57</td>
<td>ATB1</td>
</tr>
<tr>
<td>URF-17</td>
<td>ATA11,ATA12,</td>
<td>URF-37</td>
<td>ATA25</td>
<td>URF-58</td>
<td>ATB2</td>
</tr>
<tr>
<td></td>
<td>ATA13,ATA15</td>
<td>URF-38</td>
<td>ATA26</td>
<td>URF-59</td>
<td>ATB3</td>
</tr>
<tr>
<td>URF-18</td>
<td>ATA16</td>
<td>URF-39</td>
<td>ATA27</td>
<td>URF-60</td>
<td>NI</td>
</tr>
<tr>
<td>URF-19</td>
<td>ATA17</td>
<td>URF-40</td>
<td>ATA28</td>
<td>URF-61</td>
<td>NI</td>
</tr>
<tr>
<td>URF-20</td>
<td>ATA2,ATA18,</td>
<td>URF-41</td>
<td>ATA29</td>
<td>URF-62</td>
<td>NI</td>
</tr>
<tr>
<td></td>
<td>ATA19,ATA20,</td>
<td>URF-42</td>
<td>ATA30</td>
<td>URF-63</td>
<td>NI</td>
</tr>
<tr>
<td></td>
<td>ATA21,ATA22,</td>
<td>URF-43</td>
<td>ATA31</td>
<td>URF-64</td>
<td>NI</td>
</tr>
<tr>
<td></td>
<td>ATA23,ATA24,</td>
<td>URF-44</td>
<td>ATA32</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ATA25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 6.2 ATP TO URD

<table>
<thead>
<tr>
<th>ATP</th>
<th>URD</th>
<th>ATP</th>
<th>URD</th>
<th>ATP</th>
<th>URD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATA1</td>
<td>URF-48</td>
<td>ATA16</td>
<td>URF-18</td>
<td>ATA27</td>
<td>URF-36</td>
</tr>
<tr>
<td>ATA2</td>
<td>URF-1, URF-20,</td>
<td>ATA17</td>
<td>URF-19</td>
<td>ATA28</td>
<td>URF-37, URF-40</td>
</tr>
<tr>
<td></td>
<td>URF-21</td>
<td>ATA18</td>
<td>URF-20, URF-22</td>
<td>ATA29</td>
<td>URF-38</td>
</tr>
<tr>
<td>ATA3</td>
<td>URF-2</td>
<td>ATA19</td>
<td>URF-20, URF-25,</td>
<td>ATA30</td>
<td>URF-39</td>
</tr>
<tr>
<td>ATA4</td>
<td>URF-3</td>
<td></td>
<td>URF-34</td>
<td>ATA31</td>
<td>URF-43</td>
</tr>
<tr>
<td>ATA5</td>
<td>URF-4, URF-5</td>
<td>ATA20</td>
<td>URF-20, URF-26,</td>
<td>ATA32</td>
<td>URF-44</td>
</tr>
<tr>
<td>ATA6</td>
<td>URF-6, URF-7</td>
<td></td>
<td>URF-34</td>
<td>ATA33</td>
<td>URF-45</td>
</tr>
<tr>
<td>ATA7</td>
<td>URF-8, URF-9</td>
<td>ATA21</td>
<td>URF-20, URF-27,</td>
<td>ATA34</td>
<td>URF-49, URF-50,</td>
</tr>
<tr>
<td>ATA8</td>
<td>URF-10</td>
<td></td>
<td>URF-34</td>
<td></td>
<td>URF-51, URF-52</td>
</tr>
<tr>
<td>ATA9</td>
<td>URF-11</td>
<td>ATA22</td>
<td>URF-20, URF-29,</td>
<td>ATA35</td>
<td>URF-49</td>
</tr>
<tr>
<td>ATA10</td>
<td>URF-12</td>
<td></td>
<td>URF-34</td>
<td>ATA36</td>
<td>URF-50</td>
</tr>
<tr>
<td>ATA11</td>
<td>URF-13, URF-17</td>
<td>ATA23</td>
<td>URF-20, URF-30,</td>
<td>ATA37</td>
<td>URF-51, URF-52</td>
</tr>
<tr>
<td>ATA12</td>
<td>URF-14, URF-17</td>
<td></td>
<td>URF-34</td>
<td>ATA38</td>
<td>URF-54</td>
</tr>
<tr>
<td>ATA13</td>
<td>URF-15, URF-17,</td>
<td>ATA24</td>
<td>URF-20, URF-31,</td>
<td>ATA39</td>
<td>URF-55</td>
</tr>
<tr>
<td></td>
<td>URF-23</td>
<td></td>
<td>URF-34</td>
<td>ATA40</td>
<td>URF-56</td>
</tr>
<tr>
<td>ATA14</td>
<td>URF-16, URF-24</td>
<td>ATA25</td>
<td>URF-20, URF-32,</td>
<td>ATB1</td>
<td>URF-57</td>
</tr>
<tr>
<td>ATA15</td>
<td>URF-16, URF-17,</td>
<td>ATA26</td>
<td>URF-34</td>
<td>ATB2</td>
<td>URF-58</td>
</tr>
<tr>
<td></td>
<td>URF-24</td>
<td></td>
<td>URF-35</td>
<td>ATB3</td>
<td>URF-59</td>
</tr>
</tbody>
</table>
A  APPENDIX - SQL QUERY

Attached in this Appendix one can find the SQL Query used for creating the data to compare with the created graph inside Callisto.

WITH diagnosis_class AS (  
SELECT *,  
CASE  
WHEN SUBSTR(icd9_code, 1, 3)::Integer between 140 and 239  
then 'Neoplasms Inc. Cancer'  
WHEN SUBSTR(icd9_code, 1, 3)::Integer between 390 and 439  
then 'Heart Disease'  
WHEN SUBSTR(icd9_code, 1, 3)::Integer between 460 and 519  
then 'Respiratory System'  
WHEN SUBSTR(icd9_code, 1, 3)::Integer between 580 and 589  
then 'Kidney Disease'  
WHEN SUBSTR(icd9_code, 1, 3)::Integer between 800 and 999  
then 'Injury And Poisoning'  
WHEN SUBSTR(icd9_code, 1, 3)::Integer = 250  
then 'Diabetes'  
ELSE 'Other'  
END AS diagnosis_class  
FROM DIAGNOSES_ICD  
WHERE icd9_code not like 'V%%'  
AND icd9_code not like 'E%%'  
)  
SELECT d.diagnosis_class AS X, COUNT(*) AS Y  
FROM admissions a  
INNER JOIN diagnosis_class d on a.hadm_id = d.hadm_id  
WHERE a.hospital_expire_flag = 1  
GROUP by d.diagnosis_class
options = {
    'name': 'This is an illustrative query',
    'builtin_filters': [],
    'blacklist_filters': ['', ''],
    'graph_types': ['line2d'],
    'axis_labels': ['X', 'Y'],
}

sql = ""
SELECT age AS X, COUNT(*) AS Y
FROM (SELECT admissions.hadm_id,
      (EXTRACT(YEAR FROM AGE(admissions.admittime, patients.DOB))::Integer)
      AS age FROM admissions INNER JOIN patients USING (subject_id)) AS ages
WHERE ages.hadm_id IN
  {filtered_subjects}
GROUP BY age
""

def make_query(builtin_filter_variables, filtered_subjects):
    return sql.format(
        filtered_subjects=filtered_subjects
    )