QualiMaster

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QualiMaster

A configurable real-time Data Processing Infrastructure mastering autonomous Quality Adaptation

Grant Agreement No. 619525

Deliverable D6.2

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Topics marked in blue are added in this version of the deliverable. Modifications in other topics are also marked blue.

Executive summary

This deliverable reports the results of technical testing of the Qualimaster components IConf (QualiMaster infrastructure configuration tool, tool for the configuration and derivation of the QualiMaster infrastructure, in particular the pipelines), Stakeholder design environment (tool for composing stakeholder applications) and the Stakeholder applications (tools used by the end user to analyze systemic risk in the financial markets).

We present the plans for testing the tools based on technical evaluations as well as expert evaluations, technical use cases and their results in terms of acceptation or failure.

In the first version of the deliverable, we missed the expert evaluation plan and results. This second version now includes the missing parts.

The results of technical testing show, that the software components IConf (for pipeline configurations) and Qualimaster Stakeholder applications are in a good shape.

Most requirements are implemented and will be further sharpened through the expert evaluations.

1 Introduction

This report contains the detailed evaluation strategy, the results from the first technical evaluation, including scalability and robustness tests under real-world settings as well as recommendations for improvements and optimizations for the third year of the project.

The objective of the testing is to provide adequate coverage metrics, requirements validation, and system quality data such that sufficient data is provided for those making the decision to release. The tests referenced herein are written to validate use cases and requirements (both functional and non-functional) using Manual Testing.

Several functionalities of the QualiMaster platform have been tested, including application functionalities, view management, several menu functionalities, interfaces functionalities, type configuration, machine configuration, reconfigurable hardware, algorithm configuration, pipeline configuration, infrastructure configuration.

The deliverable includes the tests for the system performance in general, for the pipeline configuration, for the design environment and for stakeholder applications.

By end of November 2015, some of the results of pipeline calculations based on social media data and the historical batch processing of financial and social media data were not yet fully integrated into the Qualimaster infrastructure. As these are important features of QualiMaster from a stakeholders/ experts view, we decided to delay the expert evaluation and to skip the part on expert evaluations for the first version of this deliverable. This second version contains the expert's evaluation results based on risk analysis of both financial and social media data.

1.1 Requirements Status

The following tables list the current state of requirement implementations.

Table 1: IConf (QualiMaster infrastructure configuration tool, tool for the configuration and derivation of the QualiMaster infrastructure, in particular the pipelines)

Identifier	Name	Realization state
UC-PD1	Define new pipeline	full support
UC-PD2	Modify pipeline definition	full support
UC-PD3	Delete pipeline definition	full support
UC-AM1	Define quality parameters of processing elements	in progress
UC-AM2	Define pipeline quality characteristics	in progress
UC-AM3	Define reactive adaptation rules	in progress (full support via rt-VIL editor)
UC-AM4	Define proactive adaptation rules	in progress (full support via rt-VIL editor)
UC-AM5	Monitor execution of adaptation rules	in progress (display of execution state)
UC-AM6	Change adaptation settings	in progress
UC-PA1	Define platform quality parameters	in progress
UC-PA2	Modify platform quality parameters	in progress
UC-PA3	Add data processing algorithm	full support
UC-PA4	Modify data processing algorithm	full support
UC-PA5	Add Hardware-based Data Processing algorithm	full support
UC-PA6	Modify Hardware-based Data progressing algorithm	full support
UC-PA7	Configure Pipeline Sources and Sinks	full support
UC-PA8	Start Pipeline	basic support

UC-PA9	Stop Pipeline	basic support
UC-PA10	Configure QualiMaster Platform for Software-based Execution	full support
UC-PA11	Configure QualiMaster Platform for Hardware-based Execution	full support
UC-PA12	Start QualiMaster Platform	no support planned, realization via command line
UC-PA13	Stop QualiMaster Platform	not started
UC-PA14	Instantiate Platform	full support
UC-PA15	Monitor Execution	basic support

The table above indicates the actual realization state of the requirements for QM-IConf listed in D1.2. We categorize the realization state in terms of four categories, namely:

- Full support: The realization is done and considered to be production ready. Improvements may happen due to the identification of improvements.
- In progress: The realization is actually in progress, but already left the basic state.
- Basic support: There is a basic, potentially limited support. The realization is in progress.
- Not started: The realization of this use case has not started so far.
- No support planned: There is a use case indicated in D1.2, but the use case indicates that no specific tool support is required.

In total, the consortium collected 24 use cases for QM-IConf, out of which 11 have been fully realized, 8 are categorized as in progress of realization (mostly adaptation-related use cases as the user-supporting implementation in QM-IConf will be done after the respective implementation / evaluation in the platform), 3 use cases are marked as basic support and will be turned into full implementation in the next few months, 1 use case was not started so far (as the command line way of stopping the platform is sufficient for now), and 1 use case indicates that no support by QM-IConf is needed.

Stakeholder design environment (tool for composing stakeholder applications)

Initially, there were no use cases for the design environment defined, as the expected outcomes from Qualimaster are the Stakeholder applications themselves. But due to the multiple requirements of stakeholders regarding visualization of systemic risk and the need of flexibility in presentation of systemic risk, the design environment was built, which allows creating and re-organizing stakeholder applications through an administrative user.

Table 2: Stakeholder applications (tools used by the end user to analyze systemic risk in the financial markets)

Identifier	Name	Realization state
UC-TOPS1	Application Trading of predictive signals against existing portfolio	full support
UC-PCASR1	Application portfolio correlation against systemic risk	full support
UC-LM1	General Systemic Risk Assessment for Markets	in progress
UC-LM2	Specific Systemic Risk Assessment for Individual Market Players	in progress
UC-ERIB1	Checking co-dependencies against existing portfolio members	full support
UC-ERIB2	Check co-dependencies against all markets	full support

UC-RM	Regulatory Monitoring	full support

The table above indicates the actual realization state of the requirements for Stakeholder applications listed in D1.2. We categorize the realization state in terms of four categories, namely:

- Full support: The realization is done and considered to be production ready. Improvements may happen due to the identification of improvements.
- In progress: The realization is actually in progress, but already left the basic state.
- Basic support: There is a basic, potentially limited support. The realization is in progress.
- Not started: The realization of this use case has not started so far.
- No support planned: There is a use case indicated in D1.2, but the use case indicates that no specific tool support is required.

In total, the consortium collected 7 use cases for Stakeholder applications, out of which 5 have been fully realized and 2 are categorized as in progress of realization (full realization depends on the support of processing historical batch processing of data in the pipelines).

2   Evaluation strategy

2.1 *Plan for the technical evaluation*

2.1.1   Test plan

TEST OBJECTIVES

The objective of the testing is to provide adequate coverage metrics, requirements validation, and system quality data such that sufficient data is provided for those making the decision to release.

EXTENT OF TESTING

The testing referenced herein is written to validate use cases and requirements (both functional and non-functional) using Manual Testing. Test cases will be developed based on the requirements mentioned, test cases will be executed across Windows Operating system, bugs will be captured in Spreadsheet and finally test report will be prepared to summarize the overall testing status. Figure 1 describes the relationships between test documentations.
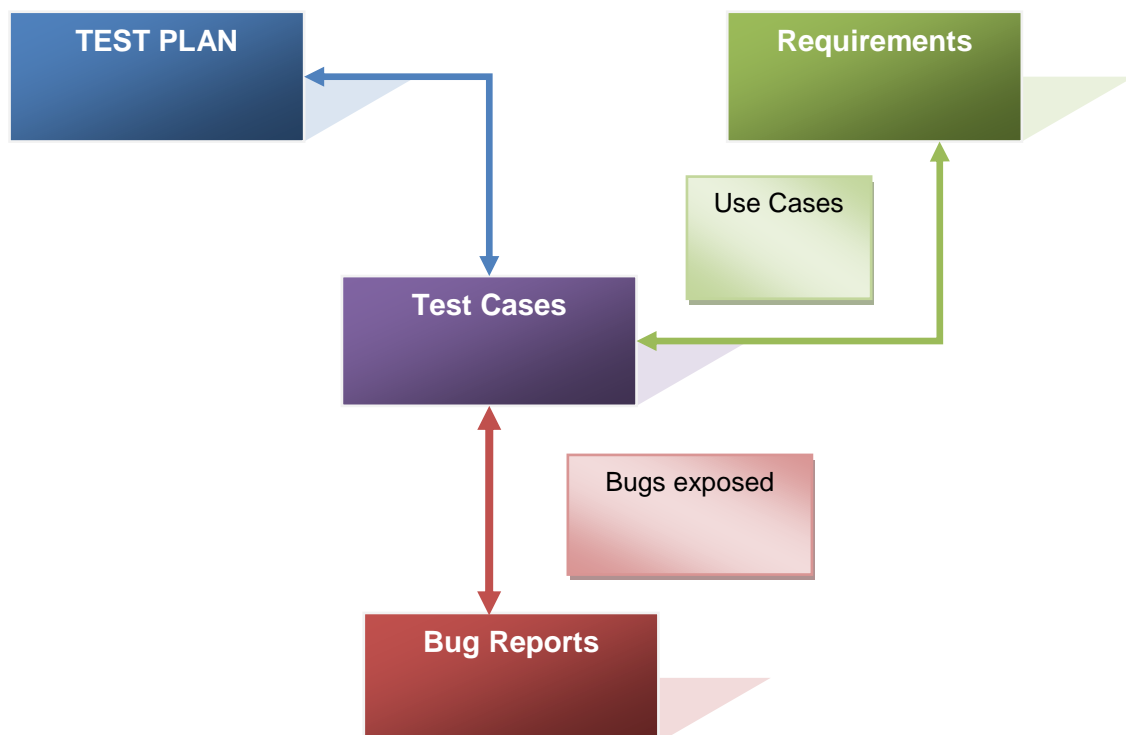

Figure 1. Relationship of documentations

TEST STRATEGY

TEST ASSUMPTIONS

- Exploratory Testing would be carried out initially for 2-3 days after the software is installed in the System to gain knowledge on the application.

- All the defects would come along with proper screenshot/video required.

- The Test Team assumes all necessary inputs required during Test design and execution will be provided.

- Test case design activities will be performed by QA Team.

- Test environment and preparation activities will be owned by QA Team.

- The defects will be tracked through Excel/BTS only. After bug fixes, new build of the software will be provided to the QA Team.

- Project Manager/BUSINESS ANALYST will review and sign-off all test deliverables.

- The project will provide test planning, test design and test execution support.

- Test team will manage the testing effort with close coordination with Project PM/BUSINESS ANALYST.

- Project team has the knowledge and experience necessary, or has received adequate training in the system, the project and the testing processes.

TEST PRINCIPLES

- Testing will be focused on meeting the business objectives, cost efficiency, and quality.

- Testing processes will be well defined, yet flexible, with the ability to change as needed.

- Testing activities will be built from scratch.

- Testing will be a repeatable, quantifiable, and measurable activity.

- Testing will be divided into distinct phases, each with clearly defined objectives and goals.

SCOPE AND LEVELS OF TESTING

- **EXPLORATORY**

- o **PURPOSE:** The purpose of this test is to make sure critical defects are removed before the next levels of testing can start.

- o **METHOD:** This exploratory testing is carried out in the application without any test cases and documentation.

- o **TIMING:** At the beginning of each cycle.

- **FUNCTIONAL TEST**
  - o **PURPOSE:** Functional testing will be performed to check the functions of application. The functional testing is carried out by feeding the input and validates the output from the application.

  - o **METHOD:** The test will be performed according to functional test cases developed by the QA team.

  - o **TIMING:** After exploratory test is completed.

TEST ACCEPTANCE CRITERIA

- Approved functional specification document, use case documents must be available prior to start of test design phase.

- Test cases approved and signed-off prior to start of test execution.

- Test environment with application installed, configured and ready to use state.

TEST DELIVERABLES

- The following artifacts will be delivered by the QA team

- Test Plan

- Test Cases

- Bug Reports

- Test Summary Report

TEST EFFORT ESTIMATE

Estimate effort for IQonf test

QA ACTIVITIES	EFFORT (DAYS)

Test Plan	1
Exploratory Testing	3
Test Cases Development	30
Test Cases Execution	10
Bug Reporting	5
Defect Retesting	3
Test Summary Report	2

Estimate effort for application design environment test and Stakeholder applications

QA ACTIVITIES	EFFORT (DAYS)
Test Plan	0.5
Exploratory Testing	1
Test Cases Development	10
Test Cases Execution	5
Bug Reporting	2
Defect Retesting	1
Test Summary Report	1

TEST EXECUTION STRATEGY
ENTRY AND EXIT CRITERIA

- The entry criteria refer to the desirable conditions in order to start test execution; only the migration of the code and fixes need to be assessed at the end of each cycle.
- The exit criteria are the desirable conditions that need to be met in order proceed with the implementation.
- Entry and exit criteria are flexible benchmarks. If they are not met, the test team will assess the risk, identify mitigation actions and provide a recommendation. All this is input to the project manager for a final "go-no go" decision.
- Entry criteria to start the execution phase of the test: the activities listed in the Test Planning section of the schedule are 100% completed.
- Entry criteria to start each cycle: the activities listed in the Test Execution section of the schedule are 100% completed at each cycle.

EXIT CRITERIA	TEST TEAM	TECHNICAL TEAM	NOTES

100% Test cases executed	✓	✓	Completed
No open Critical and High severity defects	✓	✓	Completed
90% of Medium severity defects have been closed	✓	✓	Completed
All remaining defects are either cancelled or documented as Change Requests for a future release	✓	✓	Completed
All expected and actual results are captured and documented with the test cases	✓	✓	Completed
All defects logged in BTS	✓	✓	Completed
Test Closure Report completed and signed off	✓	✓	Completed

TEST CYCLES

- There will be two cycles for functional testing. First cycle will execute all the test cases. Second cycle will execute the failed test cases to ensure the bugs are corrected.
- The objective of the first cycle is to identify any blocking, critical defects, and most of the high defects.
- Test Automation scripts will be executed towards the last phase of the test

DEFECTS MANAGEMENT

Figure 2 describes the life cycle of bugs

- QA Team will report bugs in the Excel/BTS and assign them to the respective people for resolution.
- Product Owner / Development Team Lead / Business Analyst will assess the bugs and decide which one to fix in what order.
- After the bugs are fixed, QA Team will again retest the bugs and mark them Resolved (If found fixed after the retest) / In Progress (If found not fixed after the retest). In Progress bugs will again go through the Development process and QA process until it is resolved.
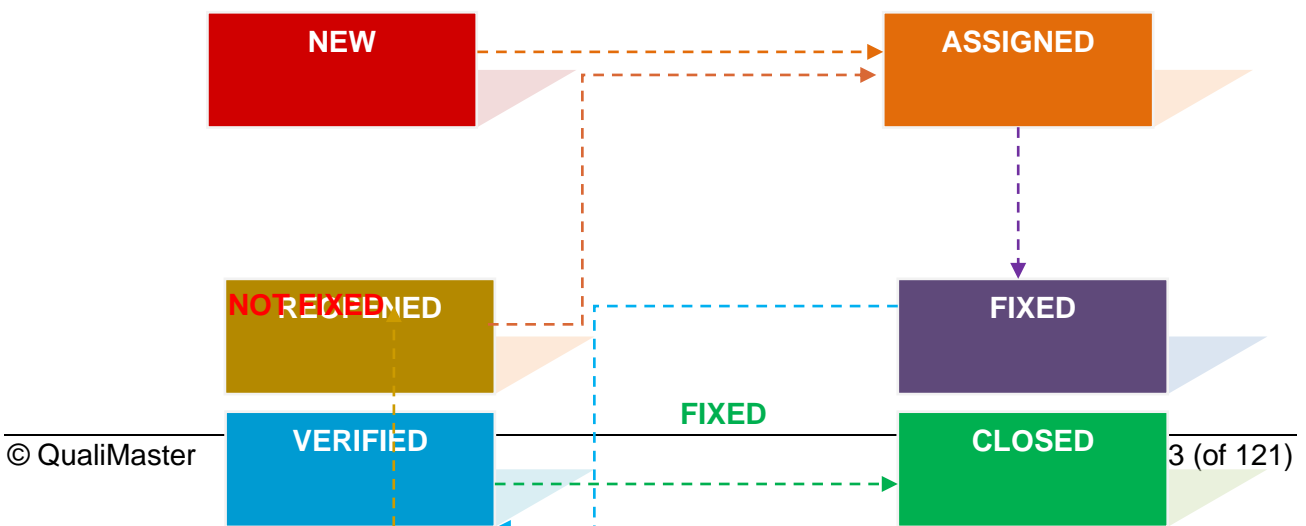
Figure 2. Bug Life Cycle

- **Critical** – Issue is a business blocker for one or more users and requires immediate attention (System down, user unable to proceed with the subsequent actions).
- **High** – Issue is significantly impacting one or more users ability to work but does not prevent them from completing their job (Isolated I/O error , Incorrect data)
- **Medium** – Issue is impacting one or more users but does not prevent them from completing their job (Performance issues, Incorrect Validation, Incorrect Data Format)
- **Low** – Issue does not have significant impact on the user and does not prevent them from completing their job (Incorrect message)

TOOLS
Tools for IQonf test

BUG TRACKING SYSTEM

A) Open Source Solutions

- BugZilla

- Mantis

- Trac

- Redmine

B) Paid Solutions

- JIRA

- Pivotal Tracker

Tools for application design environment test and Stakeholder applications

BUG TRACKING SYSTEM

Microsoft Excel

TEST CASES MANAGEMENT

Microsoft Excel

TEST ENVIRONMENT
OPERATING SYSTEM
- Windows 8 for IQonf test
- Windows 7 for application design environment test and Stakeholder applications

QA TEAM

QA Team will include 1 Manual QA. Contact details are given below:

QA PERSON	ROLE
Stefan Burkard	Software QA Engineer

2.2 Plan for the expert evaluation

A first expert evaluation was processed in cooperation with an external partner of the Qualimaster consortium, the Szczecin University of Technology. The dean of the university, Prof., DSc, PhD Antoni Wilinski, which is an expert of Machine Learning, Data mining, Databases, Prediction from time series and Financial trading system development, processes the evaluations together with his PhD students from the faculty of Computer Science and Information Technology. The testers were asked to first follow predefined scenarios, which not only follow a typical workflow, but also allow the testers to learn the handling of the applications and then follow their own, intuitive storylines. In order to refine the QualiMaster application features and handling, a questionnaire has been prepared (see section 4) in the scope of WP6. The aim of the questionnaire has been to collect inputs from the experts of financial markets and risk assessment. The experts can rank their impressions and add comments and expert suggestions.

2.2.1 Design environment scenarios

Scenario1: Modify an existing design for a stakeholder application

Step no	Description
1	Login to the Design Environment by selecting the Qualimaster icon on the Desktop of you Windows computer *User: administrator* *Pass: password*
2	Select the menu **Configuration**, choose **Open Configuration**
3	Select the configuration **QM** and click on **Open**

4	On the Tab **Data**, click on **Connect** to connect to the data server
5	When you see **QM SERVER:Connection success** in the text field at the button of the tab, click on **Get MP list** to receive the list of available market players.
6	As soon, as the list **Available MP** is filled, you are ready to modify the configuration
7	Select the tab **Visualisation**
8	On the right part of this window, select the first tab **Classic correlation table**
9	Make a single left click on the table image. You see the small selection boxes at the edges of the image
10	Move the mouse over the box at the lower right corner
11	When the mouse icon changes, click and hold left and move the mouse. This will resize the image
12	Make it 2 times bigger in both X and Y dimension. Then leave the mouse button
13	Click right on the image
14	Choose **Select data set**
15	A new window opens **Market player selector**. On the left side, you can select market players and add them to this visualisation. On the right side, you see the already selected MPs.
16	Click on the left side on the **+** symbol of the node **Forex**. This opens this list
17	Double click on some (around 5) items in this list. They will be added to **Selected pairs**. To remove an item from selection, double click on it in **Selected pairs**
18	Finish this by selecting **OK**
19	Select the menu **Configuration** and click **Save Configuration**
20	Click **Save**. You are asked, if the existing configuration should be replaced. Select **Yes**
21	On the tab Visualisation, the button **Compile** is now enabled. Click it to open the stakeholder application with your modification included.
22	In the new window, select the menu View, then Classic correlation table. A new window opens, showing your modified visualisation.
23	Close the window **Application**, close the window **Qualimaster Design Environment**

Scenario2: Create a new stakeholder application

Step no	Description
1	Login to the Design Environment by selecting the Qualimaster icon on the Desktop of you Windows computer

	User: administrator *Pass: password*
2	On the tab **Data**, click on **Add new stream** to define a data source for the new configuration
3	The available fields are prefilled for the currently used server. So you don't have to enter anything. Make shure, that **Stream is active** is checked, then click **OK**
4	Click on **Connect** to connect to the data server
5	When you see **QM SERVER:Connection success** in the text field at the button of the tab, click on **Get MP list** to receive the list of available market players.
6	As soon, as the list **Available MP** is filled, you are ready to create the configuration
7	Select the Tab **Process**, then click on **Add function**
8	Enter a name for the new function, lets say **Test function**
9	An editor tab is created, which allows you to enter **Basic** code to manipulate the data from the data source.

10	Enter this code:
	
	If Inputstream.Value > -0.5 And InputStream.Value < 0.5 Then
	    InputStream.Value = 0
	End If
	
	The incoming data has currently a range from -1 to 1. This line of code removes all values smaller then 0.5

11	As last and most important step, visualisations are added. Select the tab **Visualisations**
12	On the left side, you see the currently available visualisation types. On the right side, you see the empty sheet Main.
13	Take the black **chart** visualisation type from the left side and place it via drag and drop on the right sheet. Now resize it to nearly fit the sheet.
14	Click right on the visualisation and choose Select data set
15	A new window opens **Market player selector**. On the left side, you can select market players and add them to this visualisation. On the right side, you see the already selected MPs.
16	Click on the left side on the **+** symbol of the node **Eurex**. This opens this list
17	Double click on **DAX-Future** and on **BUND-Future**. Now close the window by selecting **OK**
18	Click on **Add more sheets** on the tab **Visualisation**
19	Enter a name for a second sheet, lets say **Circle**

20	A second empty sheet is created. Now place the **D3** visualisation type (the orange/ white one) on the sheet and resize it to nearly fit the sheet.
21	Click right on it, choose **Select data set**.
22	Click on the left side on the **+** symbol of the node **Forex.** Add 10 or more items to Selected pairs.
23	Close the window by clicking **OK**
24	Again right click on the visualisation type, select **Set processing code**
25	A new window is opened. From the dropdownbox **Select diagram**, choose **Circle**. Confirm the selection by clicking **OK**
26	Now we add a third and last sheet. Click on **Add more sheets**, enter the name **Combi**.
27	Take the **Chart** visualisation type, place it on the empty sheet and resize it, that it nearly fits the upper half of the sheet.
28	Take the **List** visualisation type and place it below the **Chart**. Resize it, that it fits nearly the left half of the remaining space
29	Take a second **List** visualisation type, place it next to the first one and resize it to fit the remaining space. This may look lie this:
30	Right click on the **Chart** visualisation type, choose **Select data set**. From the **Forex** node, select **EUR/GBP, EUR/JPY** and **EUR/USD**. Confirm with **OK**.
31	Right click on the first **List** visualisation type, choose **Select data set**.
32	Select **DAX** from the node **Dt.Börse Indices** first.
33	Now select 10 items from the node **Xetra** and confirm with **OK**
34	Right click on the second **List** visualisation type, choose **Select data set**.
35	Select **Dow E-mini** from the node **CBOT mini** first.
36	Now select 10 or more items from the node **NASDAQ** and confirm with **OK**
37	Select the menu **Configuration**, then **Save Configuration**.
38	Enter the name **Test** and click on **Save**
39	The new configuration is created and saved now. To check it out, press the **Compile** button on the tab **Visualisation**.
40	A new window opens. Select the menu **View**, then **Main**. Repeat with **Circle** and **Combi**.
41	Close the window **Application**, close the window **Qualimaster Design Environment**

2.2.2 Runtime environment scenarios

Scenario 1: Modify an existing setup in the stakeholder application

Step no	Description
1	Login to the Runtime Environment by selecting the Qualimaster icon on the Desktop of you Windows computer *User: user1* *Pass: password*
2	Select the menu **File**,choose **Open Setup**.
3	Select the setup **Default**, click **Open**.
4	Right click on the window **Basic chart**, select **Properties**
5	Click on the tab **Colors**.
6	Click on **Background**, select white color, confirm with **OK**
7	Click on **Foreground**, select black color, confirm with **OK**
8	Click on **Grid**, select light gray, confirm with **OK**
9	Click on **Series**, select dark blue, confirm with **OK**
10	Right click on one of the **Classic correlation table** windows, select **Properties**
11	Click on the small button right from **Back color**, select light yellow color, confirm with **OK**
12	Change **Header height** from 20 to 40
13	Disable **Dependency coloring**
14	Confirm with **OK**
15	Right click on the window **Parallel chart**, select **Properties**
16	On the tab **Symbol**, navigate to the node **Forex**, open its list by clicking on **+**
17	Add one market player
18	Confirm with **OK**
19	Select menu **File**, choose **Save Setup**
20	Click **Save** and confirm replacing.

Scenario 2: Create a new setup in the stakeholder application

Step no	Description
1	If you are already logged in to the Runtime environment then

	Select menu **File**, choose **New Setup** Otherwise, login to the Runtime Environment by selecting the Qualimaster icon on the Desktop of you Windows computer *User: user1* *Pass: password*
2	Select menu **View**, choose **Basic chart**
3	Right click on the window **Basic chart**, select **Properties**
4	Change any properties and/ or market players. Confirm with **OK**
5	Place and resize the window for your needs.
6	Repeat steps 2 to 5 for any other menu item in the menu **View**
7	Resize the main window **Application** for our needs
8	Select the menu **File**, choose **Save Setup**
9	Save the new setup with a name of your choice.

3 Technical evaluation results

3.1 QualiMaster system performance

This section presents the performance results of the proposed QualiMaster platform when the Hayashi-Yoshida correlation algorithm is computed on streaming data. Two different performance evaluation scenarios took place. First, we evaluated the performance for the reconfigurable part and the Storm-based parts of the platform, separately. Next, the performance evaluation of the "hybrid" solution took place.

3.1.1 Evaluation Data sets

We evaluated the performance of the QualiMaster system on various scenarios. To capture different test cases, we used real data sets from the financial domain as well as synthetic data sets. The following paragraphs provide their detailed description while Tables 3 and 4 summarize their main characteristics.

(I) Real life data sets

This data is provided by SPRING through a custom API. SPRING gets the data from established financial data providers. In particular, we have two data sets: SRD-A that contains the data of 03/18/2014 and SRD-B that contains the data of 07/08/2015. As shown by the overview in Table 3, SRD-A has 125 marker players and 29.2 (average) transactions per second, whereas SRD-B has 2830 market players and 422.7 (average) transactions per second.

Table 3: Real life datasets

Dataset	Market players	Total seconds	Avg. transactions per second
SRD-A (03/18/2014)	125	86400	29.2
SRD-B (07/08/2015)	2830	85960	422.7

(II) Synthetic Financial Data Sets

We also created synthetic data sets in order to investigate the infrastructure's behavior on more complex situations and on various characteristics. Thus, we used a data simulator provided by SPRING. This simulator allows to create data sets with custom market player numbers, data rate (ticks per second), data length and specific behavior of the market player's data in terms of correlation of the market players.

Using the simulator, we created three collections that contain data sets with different characteristics. In particularly, we varied the following characteristics: (a) the number of market players that provide stock information; (b) the number of ticks provided by all market players within a second; and (c) the overall comparisons that the correlation algorithms need to compute. Table 4 provides an overview of the created collections. As shown, the first collection, named Increasing-MP&TS, contains data sets with an increasing number of market players and ticks per second (and thus also correlations). In the second collection, named Increasing-MP, we fixed the number of ticks per second and modified only the number of players. The overall number of correlations that must be computed is increasing along with the number of players. In the third collection, named Increasing-TS, we fixed the number of market players and varied the ticks per second. In this collection the number of correlations is the same for all data sets since the correlations depend only on the number of market players.

Table 4: Synthetic datasets

(a) Increasing Market Players and Transactions

Dataset	Market players	Avg. transactions per second
I-ALL-A	100	100
I-ALL-B	250	250
I-ALL-C	500	500
I-ALL-D	750	750
I-ALL-E	1000	1000

(b) Increasing Market Players

Dataset	Market players	Avg. transactions per second
I-MP-A	250	250
I-MP-B	500	250
I-MP-C	750	250
I-MP-D	1000	250

(c) Increasing Transactions

Dataset	Market players	Avg. transactions per second
I-TS-A	750	250
I-TS-B	750	500
I-TS-C	750	750

3.1.2 Performance Analysis

This section shows the performance analysis of the implemented systems. The high level goal of the priority pipeline is to compute and generate the correlations between the market players using the transactions of the incoming data stream. The pipeline must return the new correlations every second, i.e., every second the pipeline returns correlations based on the updated ticks it has received. As all the tests follow the streaming formulation, the size of the processing time window is irrelevant to the performance of the implemented systems, thus we used time window size with 60 seconds and advance 1 sec, which is the smallest possible advance time.

We used various evaluation scenarios: i) we measured the performance of the standalone hardware-based implementation for the Hayashi-Yoshida correlation algorithm, ii) we evaluated the performance of the Storm-based implementation in standalone mode and iii) we evaluated the performance of the proposed-"hybrid" QualiMaster platform for various datasets as presented above.

(I) Standalone FPGA-based implementation tests

During these tests, one Storm-based cluster node was used for sending the transactions of the stock markets' correlation and receiving the correlation results from the MPC-C server (reconfigurable platform). The correlation calculation took place on the reconfigurable part of the FPGA-based platform. Table 5 presents the execution time, i.e., the processing and the I/O time, for the reconfigurable part of the hybrid platform for various input size datasets. It is obvious that reconfigurable system using a single FPGA device and a single cluster node for I/O issues can compute in real-time the correlation metric for all the pairs of up to 5000 stock markets, i.e., each clock tick is 1 second, thus if the processing and I/O time is less than 1 second, then the processing can take place in real time.

Table 5: Processing time per "tick" for the proposed system when only the reconfigurable platform is utilized

#Stock Markets	Processing Time for Hybrid Platform ("tick" = 1 second)
40	0.002 sec/"tick"
100	0.005 sec/"tick"
500	0.017 sec/"tick"
1000	0.049 sec/"tick"
5000	0.869 sec/"tick"

(II) Standalone Storm-based distributed implementation tests

Next, we present the performance results for the standalone implementation of the distributed Storm-based implementation. We measured the performance of the system for various input datasets and different cluster configurations. Table 6 summarizes the results. As the table indicates, the Storm-based solution can compute the correlation up to 1000 stock markets when a cluster with 24 high-end nodes is used.

Table 6: Real-time correlation computation using the Storm framework

#Stock Markets	Storm-based Platform
40	1 Cluster Node
100	1 Cluster Node
500	7 Cluster Nodes
1000	24 Cluster Nodes

(III) "Hybrid" solution implementation tests

The hybrid solution is a combination of the reconfigurable hardware with the Storm framework. Taking into account the above results, a "hybrid" platform covers all the needs for the various input datasets. In more details, the FPGA-based part of the platform was responsible for the correlation computation of the frequently transacted stock markets, while the Storm-based part was responsible for preprocessing data, streaming transactions and receiving the results and, last, the calculation of the correlation for the low frequency stock markets. As referred above, we tested the QualiMaster infrastructure using various datasets.

- **Real life data sets**

First, we evaluated the priority pipeline over the real data from the financial domain. The QualiMaster infrastructure is able to compute the correlations for both data sets, i.e., SRD-A and SRD-B. One issue we detected is that the SRD-B data set has a large number of market players for some hours. For instance, we see 1684 market players' transactions in about 10 minutes, which means that we generate 1.4 Million correlations. Although the QualiMaster infrastructure can calculate these correlations, the network does not have the capability to transfer them within the required time. More specifically, our network at the Technical University of Crete has bandwidth up to 100 Mbps, which is about 12.5 MBs per second. If each tuple that describes a correlation result is about 15 Bytes, then we need at least a transfer rate about 20 MBs per second in order to send all the results to the sink. Thus, despite the fact that the processing of this real life dataset can be easily achieved by the proposed QualiMaster platform, the transfer rate for the existing infrastructure restricts the capabilities of the system. In future, we aim at increasing the transfer rates in our network for achieving even higher throughput rates.

- **Synthetic data sets**

Next, we used the synthetic datasets for evaluating the performance of the QualiMaster infrastructure.
First, we measured the system's performance using the data sets from the increasing market player collection. We evaluated both software and hardware parts of the system in standalone mode using the same datasets. Table 7 summarizes the results. As shown, in this evaluation we used 4 data sets with an average of 250 ticks per seconds and an increasing number of market players. The correlations that are required to be computed and returned per second span from 31125 to 499500. Both implementations are able to return all these correlations.

Table 7: The results of the priority pipeline when computing the correlations over the data sets of the increasing market players' collection using SW and HW implementations.

Market players	Transactions per second	No of correlations	Processing with SW	Processing with HW
250	250	31125	X	X
500	250	124750	X	X
750	250	280875	X	X
1000	250	499500	X	X

The second evaluation was over the data sets of the "increasing transactions" collection. The market players were 750 in all data sets but the average ticks per seconds were increasing from 250 until 750. Note that since the number of correlations depends on the number of market players, which was the same in the data sets, the correlations that are required to be computed and returned per second were 280875 in all cases. As shown in Table 8 the SW and the HW implementations are able to return all these correlations.

Table 8: The results of the priority pipeline when computing the correlations over the data sets of the "increasing transactions" collection using SW and HW implementations.

Market players	Transactions per second	No of correlations	Processing with SW	Processing with HW
250	250	31125	X	X
500	250	124750	X	X
750	250	280875	X	X
1000	250	499500	X	X

Last, in the third evaluation we used the increasing market players and transactions collection. This collection has an increasing number of players, spanning from 100 to 1000, and increasing number of ticks per second, going from 100 to 1000. Given the increase in the number of the market players, we also see an increase in the number of correlations. As shown in Table 9, the hardware-based implementation computes the correlations for all these data sets. However, we see that SW does not reach this goal. More specifically, we see that the 20% of the required 499500 correlations are not delivered within the first second, but in the next second. This extremely small delay will be propagated to the consequent seconds (in case the same ticks per second rate continues), contributing to a non-acceptable delay for the end-user.

Table 9: The results of the priority pipeline when computing the correlations over the data sets of the increasing market players and transactions collection using SW and HW implementations.

Market players	Transactions per second	No of correlations	Processing with SW	Processing with HW
100	100	4950	X	X
250	250	31125	X	X
500	500	124750	X	X
750	750	280875	X	X
1000	1000	499500		X

According to the above QualiMaster platform performance evaluation, given the QualiMaster infrastructure, we can easily see a possible switching from the SW to the HW implementation, when the number of market players is somewhere between 800 and 1000. Thus, end-users keep receiving all required correlations within the defined time frame (i.e., within one second).

3.2 Pipeline configuration QM-IQonf

The following tests of the IConf tool are based on the demo version of the tool, that is public available. This version is without a connection to the repository, but with model reset. In agreement with WP4/WP5, the functionalities of configuration of adaption, monitoring and runtime monitoring are not part of the tests.

Test Case ID: TC_QM_001

Module: Splash

Summary: Verify **QualiMasterApplication.exe** is opening or not.

Test Steps:

1) **Download application from:** https://projects.sse.uni-hildesheim.de/qm/confApp/demo/QMConfigApp-win32-0.8.0-DEMO.zip

2) Go to download directory and unzip the **QMConfigApp-win32-0.8.0-DEMO.zip.**

3) Execute the start program by double clicking on **QualiMasterApplication.exe**.

Workflow Diagram (Explaining test steps):

Figure 3. *Splash screen of the QM Application*
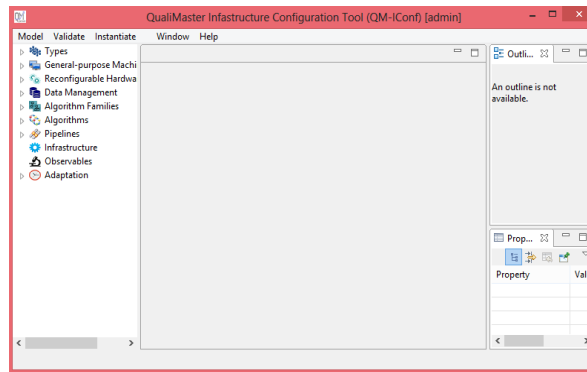
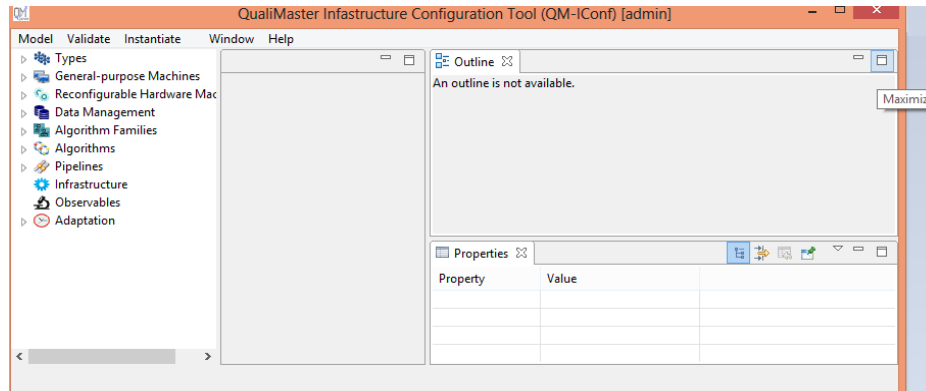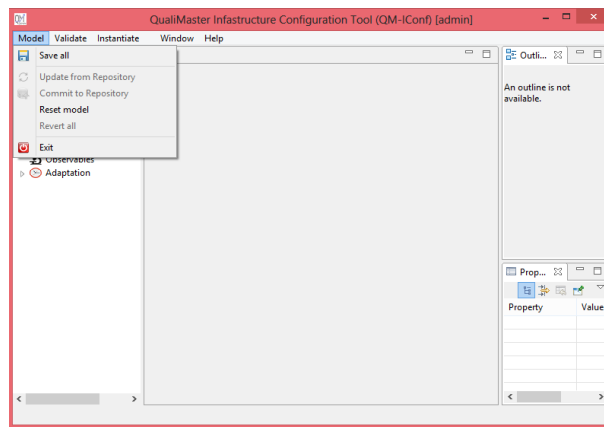Figure 4. QM Application main Window

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome: Application should be launched successfully and Main window of QM-IConf contains, menu (top), configuration options tree (left), editor area (center), detailed views (right), and status bar (bottom).

Execution Status: Pass

Test Case ID: TC_QM_002
Module: View Management
Summary: Verify the View management functionality of configuration tree section of the application.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Now resize the configuration tree section towards right to left and left to right.

3) Decrease the width of Configuration tree window so that some of the tree/subtree names are not fully visible.

4) Mouse hover on the tree/subtree name.
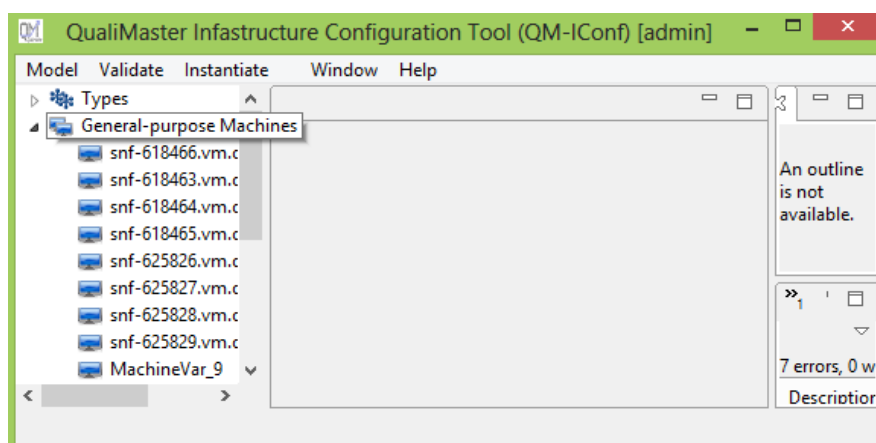
Figure 5. View management of configuration tree section.

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome: When user decreases the width of Configuration tree window so that some of the tree/subtree name are not fully visible and then mouse hover on the tree/subtree name (whose names are not fully visible) should show the complete name.

Execution Status: Pass

Test Case ID: TC_QM_003
Module: View Management
Summary: Verify the View management functionality of Editor Section of the application.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Now resize the Editor section towards right to left and left to right.

3) Click on Minimize and Maximize/Restore option from the Editor section.
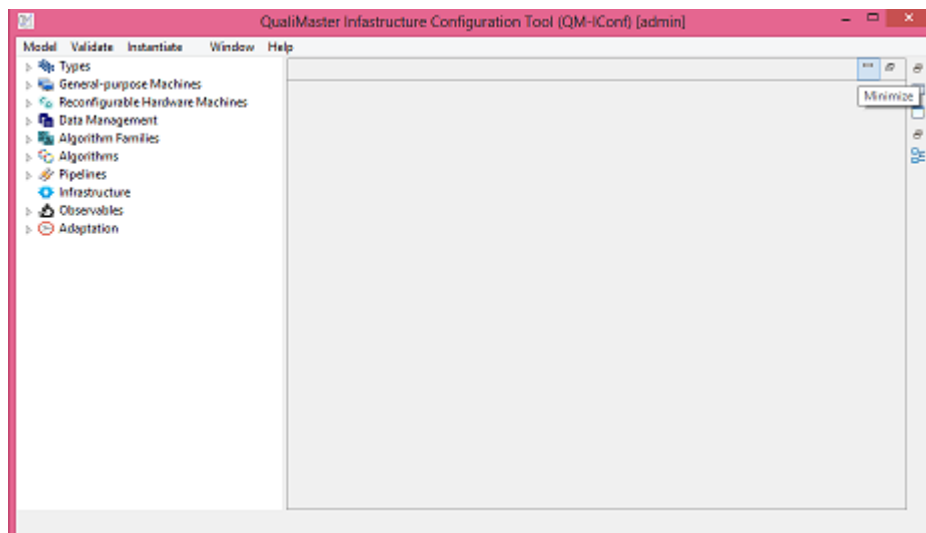
Figure 6. Minimize View of Editor section.

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome: When user increase/decreases the width of Editor Section the editor window should be resized. Clicking on Minimization, the editor section should be minimized and user can restore the previous view clicking on Restore option present in the extreme right portion of the application after minimization. After click on Maximize option editor section should be enlarged and user can restore the previous view clicking on Restore option present in the Editor section itself.

Execution Status: Pass

Test Case ID: TC_QM_004
Module: View Management
Summary: Verify the View management functionality of Detailed View Section of the application.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Now resize the Detailed View section towards right to left and left to right.

3) Click on Minimize and Maximize/Restore option from the Detailed View section.

Figure 7. Maximize View of Detailed view section

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome: When user increase/decreases the width of Detailed View Section the Detailed View section should be resized. Clicking on Minimization, the Detailed View section should be minimized and Status bar section gets maximized to the location of detailed view section. User can restore the previous view clicking on Restore option present in the extreme right portion of the application after minimization. After click on Maximize option Detailed view section gets maximized to the Status bar section. User can restore the previous view clicking on Restore option present in the right side options.

Execution Status: Pass

Test Case ID: TC_QM_005
Module: Top menu bar
Summary: Verify the functionality of **Save all, Reset Model** and **Exit** options from **Model** Menu.

Test Steps:

4) Execute the start program double clicking on **QualiMasterApplication.exe**.

5) Click on **Model** menu from the application window.

6) Now click on **Save all** option.

7) Click on **Reset Model**.

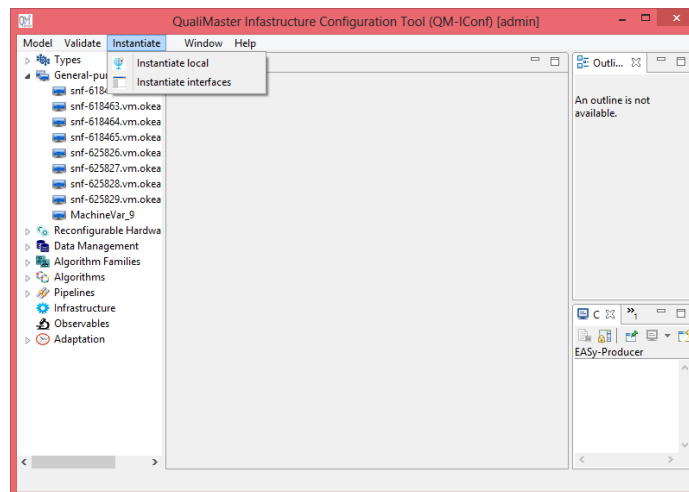8) Click on **Exit** option.
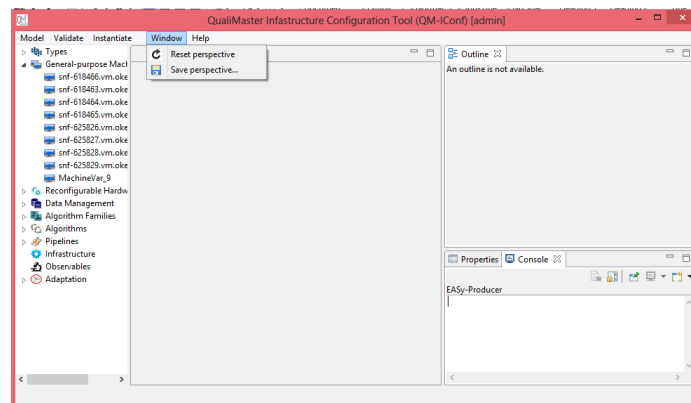
Workflow Diagram (Explaining test steps):

Figure 8. Application window with Model menu

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

1) After clicking on **Model** menu bar, it should show the **Save all, Update from Repository, Commit to Repository, Reset Model, Revert all** and **Exit** options. After all the options appear, clicking on **Model** menu or outside of the Model menu should close out the options.

2) After clicking on **Save all** option all the data should be saved.

3) Clicking on **Reset Model,** application should get closed and open with default settings.

4) Clicking on **Exit** option should close the application.

Execution Status: Pass

Test Case ID: TC_QM_006
Module: Top menu bar
Summary: Verify the functionality of **Validate All** option from **Validate** Menu.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Click on **Validate** menu from the application window.

3) Now click on **Validate All** option.

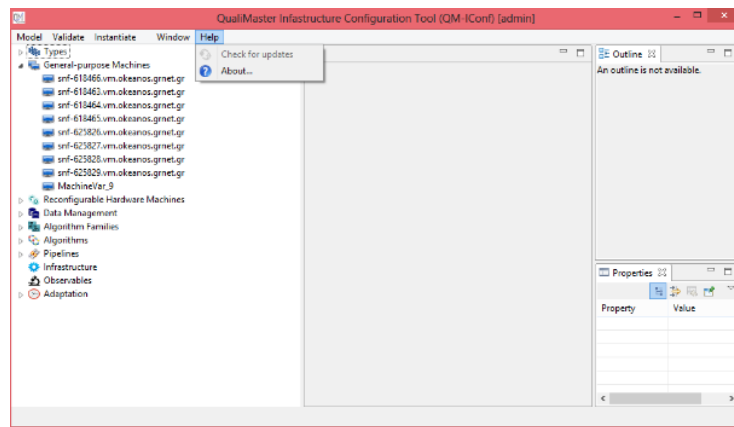**Workflow Diagram (Explaining test steps):**
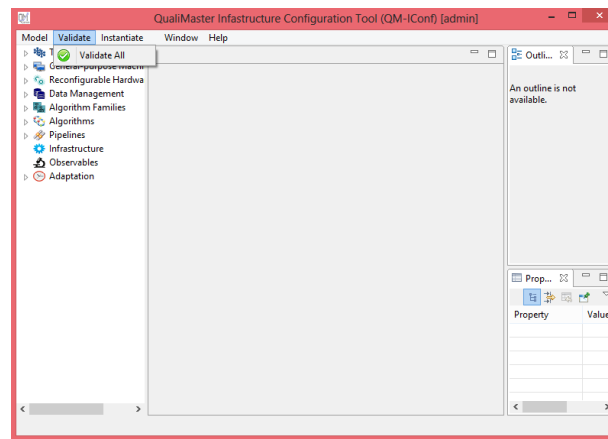
Figure 9. Application window with Validate menu

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

1) After clicking on **Validate menu, Validate All** option should be opened. After all the options appear, clicking on **Validate** menu or outside of the **Validate** menu should close out the options.

2) Clicking on **Validate All,** Validation successful message should be shown and clicking on **OK** button validation should be applied successfully.

Execution Status: Pass

Test Case ID: TC_QM_007
Module: Top menu bar
Summary: Verify the functionality of **Instantiate local** and **Instantiate interfaces** options from **Instantiate** Menu.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Click on **Instantiate** menu from the application window.

3) Now click on **Instantiate local** and **Instantiate interfaces** options one after another.

Workflow Diagram (Explaining test steps):

Figure 10. Application window with Instantiate menu

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

1) After clicking on **Instantiate** menu**, Instantiate local** and **Instantiate interfaces** options should be shown. After all the options appear, clicking on **Instantiate** menu or outside of the **Instantiate** menu should close out the options.

2) Clicking on **Instantiate local,**

3) Clicking on **Instantiate interfaces,**

Execution Status: Pass

Test Case ID: TC_QM_008
Module: Top menu bar
Summary: Verify the functionality of **Reset Perspective** and **Save Perspective** options from **Window** Menu.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Click on **Window** menu from the application window.

3) Now click on **Reset Perspective** and **Save Perspective** options one after another.

Workflow Diagram (Explaining test steps):

Figure 11. Application window with Window menu

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

1) After clicking on **Window** menu**, Reset Perspective** and **Save Perspective** options should be shown. After all the options appear, clicking on **Window** menu or outside of the **Window** menu should close out the options.

2) Clicking on **Reset Perspective** option**, Reset Perspective** pop up should get opened and clicking on **Yes** button should save the default perspective and clicking on **No** button current perspective remains the same.

3) Clicking on **Save Perspective**, current customized perspective can be saved. While saving of perspective with same name, an **Overwrite Perspective** pop up should open. Clicking on **Yes** button present under **Overwrite Perspective** pop up, user can overwrite the existing perspective and clicking on **No** button pop-up should get closed and user can change the existing perspective name. Clicking on **Cancel** button pop-up should get closed.

Execution Status: Pass

Test Case ID: TC_QM_009
Module: Top menu bar
Summary: Verify the functionality of **Check for updates** and **About** options from **Help** Menu bar

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Click on **Help** menu from the application window.

3) Now click on **About** option.

Workflow Diagram (Explaining test steps):

Figure 12. Application window with Help menu

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

1) After clicking on **Help** menu**, Check for updates** and **About** options should be shown. After all the options appear, clicking on **Help** menu or outside of the **Help** menu should close out the options.

2) Clicking on **About** menu **About QM-IConf** popup opens with proper information. Clicking on qualimaster.eu link present in the popup window, respective page should open up in the browser. If user clicks on OK button from **About QM-IConf** pop up, pop up window should get closed**.**

Execution Status: Pass

Test Case ID: TC_QM_010
Module: Type Configuration tree
Summary: Verify if all the Types configuration sub-tree can be shown

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Open **Types** configuration option by clicking on triangle from the left side of the application window.

3) Double click on **Types** tree itself.
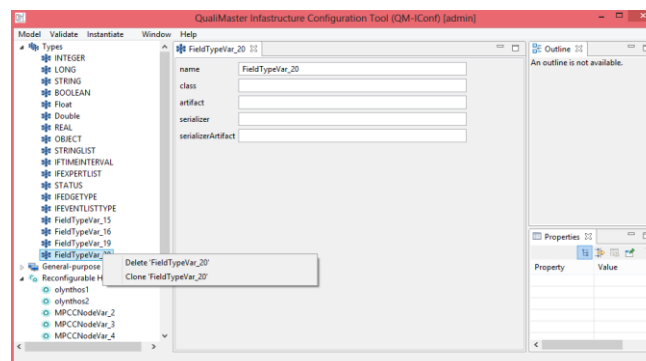
Workflow Diagram (Explaining test steps):
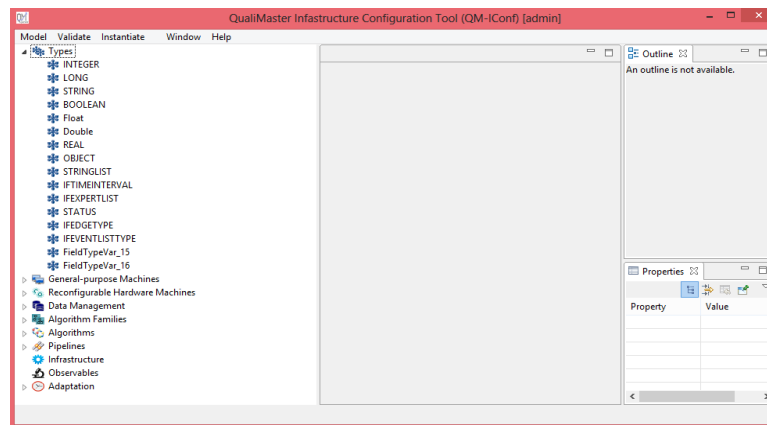
Figure 13. Types Configuration options tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After clicking on triangle of the Type configuration options tree on the left side, all the sub tree of **Type** should be shown. Double clicking on **Types** tree itself, tree configurations should be shown in the Editor section

Execution Status: Fail

Bug ID:BR_QM_001

Test Case ID: TC_QM_011
Module: Type Configuration tree
Summary: Verify scrollbar appears in Configuration tree, Editor, Detailed views and Status bar section for **Types** tree.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Double click on Types tree itself.

3) Open **Types** configuration option by clicking on triangle from the left side of the application window.

4) Double click on Subtree under **Types** tree.

5) Now resize the application window towards top to bottom and bottom to top.

6) Now resize the application window towards right to left and left to right.

Workflow Diagram (Explaining test steps):
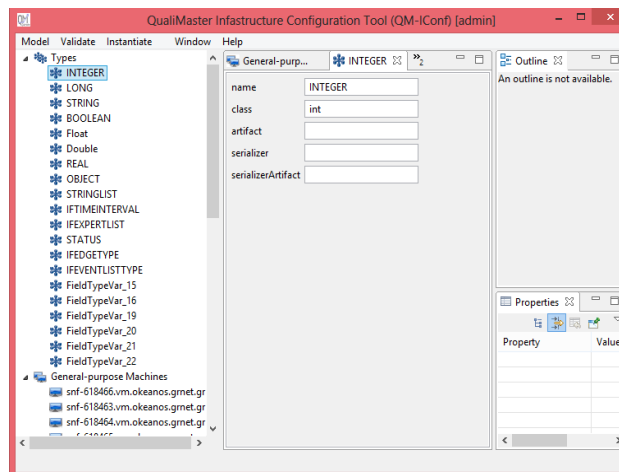
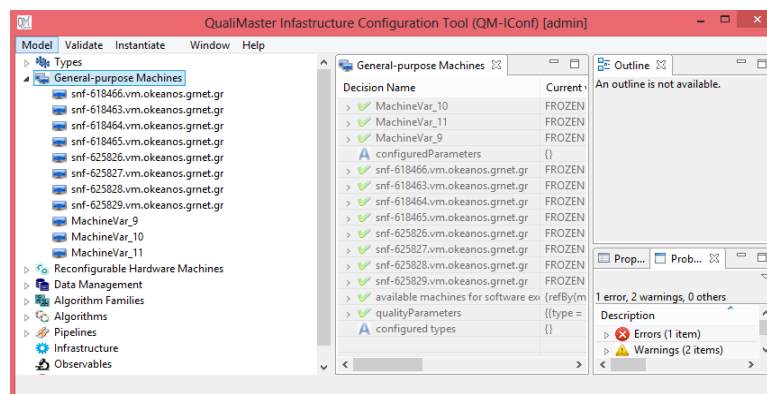Figure 14. Scrollbar functionality for Types Configuration options tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After resizing the application window, Horizontal and vertical scrollbar should be found for all segments.

Execution Status: Fail

Bug ID:BR_QM_002

Test Case ID: TC_QM_012
Module: Type Configuration tree

Summary: Verify if user can add a new Type.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add field types to **Type** by right click on the Types configuration tree and click on **AddFieldTypeto'Types'**.

Workflow Diagram (Explaining test steps):
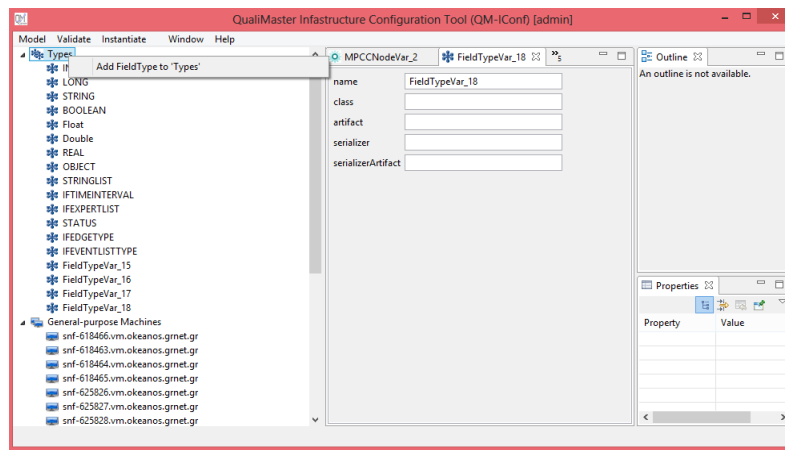
Figure 15. Adding a Type Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on AddFieldtypeto'Types' user should be able to add a new Type and this type should be visible in Editor Section.

Execution Status: Pass

Test Case ID: TC_QM_013
Module: Type Configuration tree
Summary: Verify if user can Delete/Clone the created Type.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add field types to **Type** by right click on the Types configuration tree.

3) Right click on created type and select Delete/ Clone option.

Workflow Diagram (Explaining test steps):

Figure 16. Delete/Clone a Type Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on **Delete** option created Type should be deleted and after clicking on **Clone** option created Type should be cloned with new name.

Execution Status: Pass

Test Case ID: TC_QM_014
Module: General-purpose Machines Configuration tree
Summary: Verify if all the General-purpose Machines configuration sub-tree can be shown

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Open **General-purpose Machines** configuration option by clicking on triangle from the left side of the application window.

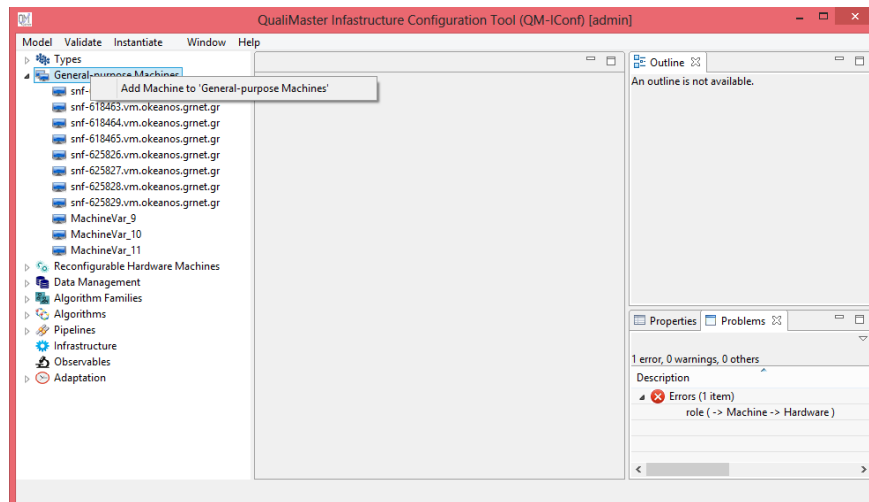3) Double click on **General-purpose Machines** configuration tree itself.

Workflow Diagram (Explaining test steps):

Figure 17. General-purpose Machines Configuration options tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on triangle of the General-purpose Machines configuration tree on the left side**,** all the sub tree of General-purpose Machines should be shown. Double clicking on **General-purpose Machines** tree itself, tree configurations should be shown in the Editor section.

Execution Status: Pass

Test Case ID: TC_QM_015
Module: General-purpose Machines Configuration tree.

Summary: Verify scrollbar appears in Configuration tree, Editor, Detailed views and Status bar section for **General-purpose Machines** tree.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Double click on **General-purpose Machines** tree itself.

3) Open **General-purpose Machines** configuration option by clicking on triangle from the left side of the application window.

4) Double click on Subtree under **General-purpose Machines** tree.

5) Now resize the application window towards top to bottom and bottom to top.

6) Now resize the application window towards right to left and left to right.

Workflow Diagram (Explaining test steps):
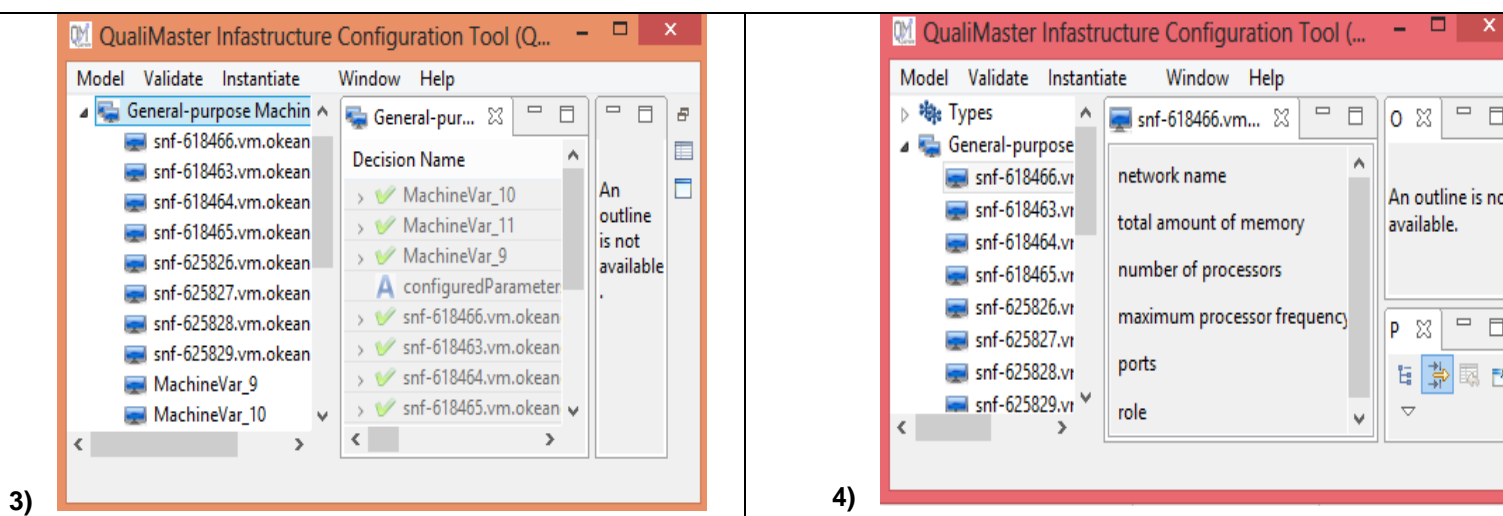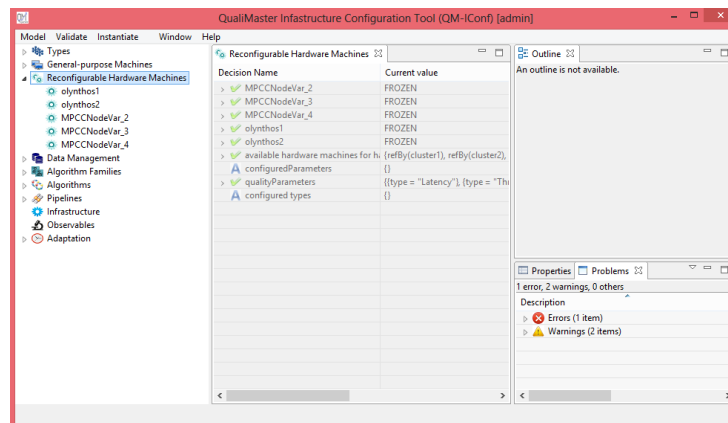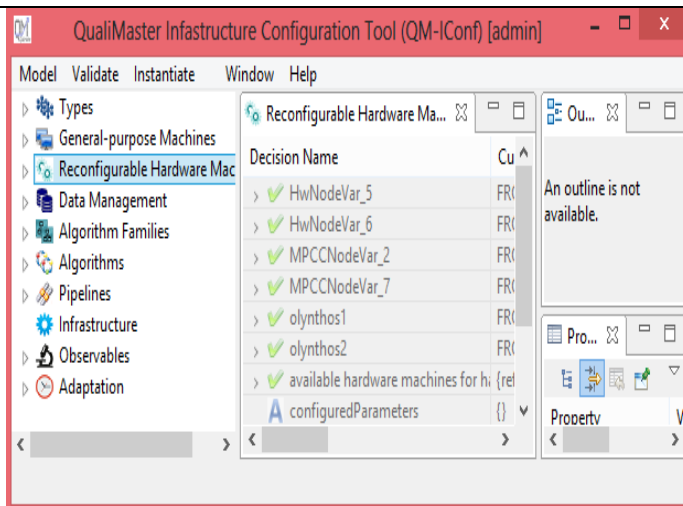

Figure 18. Scrollbar functionality for General-purpose Machines Configuration options tree/subtree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After resizing the application window, Horizontal and vertical scrollbar should be found for all segments.

Execution Status: Fail

Bug ID: BR_QM_002, BR_QM_003.

Test Case ID: TC_QM_016
Module: General-purpose Machines Configuration tree
Summary: Verify if user can add a new sub-tree for General-purpose Machines.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add a **Machine** by right click on **General-purpose Machines tree** and click on the **Add Machine to 'General-purpose Machines'** configuration tree.

Workflow Diagram (Explaining test steps):

Figure 19. Adding a General-purpose Machines Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After clicking on **Add Machine to 'General-purpose Machines',** user should be able to add a new machine and this created machine should be visible in Editor Section.

Execution Status: Pass

Test Case ID: TC_QM_017

Module: General-purpose Machines Configuration tree
Summary: Verify if user can Delete/Clone the created General-purpose Machines.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add a **Machine** by right click on **General-purpose Machines tree** and click on the '**Add Machine to General-purpose Machines**' configuration tree.

3) Right click on created Machine and select Delete/ Clone option.

Workflow Diagram (Explaining test steps):
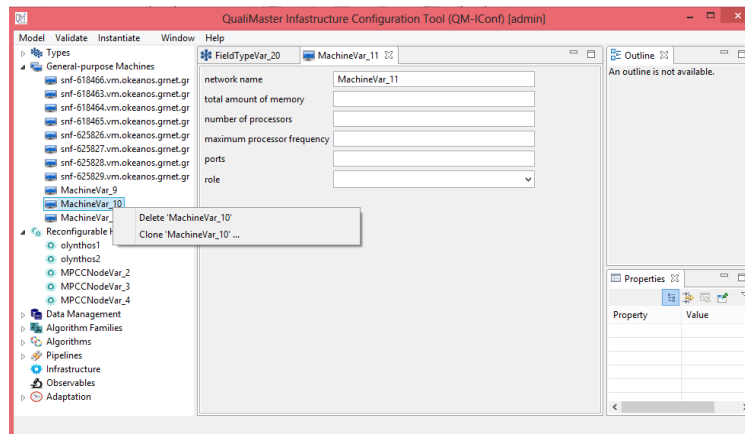
Figure 20. Delete/Clone of a Machine Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After clicking on **Delete** option created Machine should be deleted and after clicking on **Clone** option created Machine should be cloned with new name.

Execution Status: Pass

Test Case ID: TC_QM_018
Module: Reconfigurable Hardware Machines Configuration tree
Summary: Verify if all the Reconfigurable Hardware Machines configuration sub-tree can be shown

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Open **Reconfigurable Hardware Machines** configuration option by clicking on triangle from the left side of the application window.

3) Double click on **Reconfigurable Hardware Machines** tree itself.

Workflow Diagram (Explaining test steps):

Figure 21. General-purpose Machines Configuration options tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After clicking on triangle of the **Reconfigurable Hardware Machines** configuration tree on the left side**,** all the sub tree of **Reconfigurable Hardware Machines** should be shown. Double clicking on **Reconfigurable Hardware Machines** tree itself, tree configurations should be shown in the Editor section.

Execution Status: Pass

Test Case ID: TC_QM_019
Module: Reconfigurable Hardware Machines Configuration tree.
Summary: Verify scrollbar appears in Configuration tree, Editor, Detailed views and Status bar section for **Reconfigurable Hardware Machines** tree.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Double click on **Reconfigurable Hardware Machines** tree itself.

3) Open **Reconfigurable Hardware Machines** configuration option by clicking on triangle from the left side of the application window.

4) Double click on Subtree under **Reconfigurable Hardware Machines** tree.

5) Now resize the application window towards top to bottom and bottom to top.

6) Now resize the application window towards right to left and left to right.

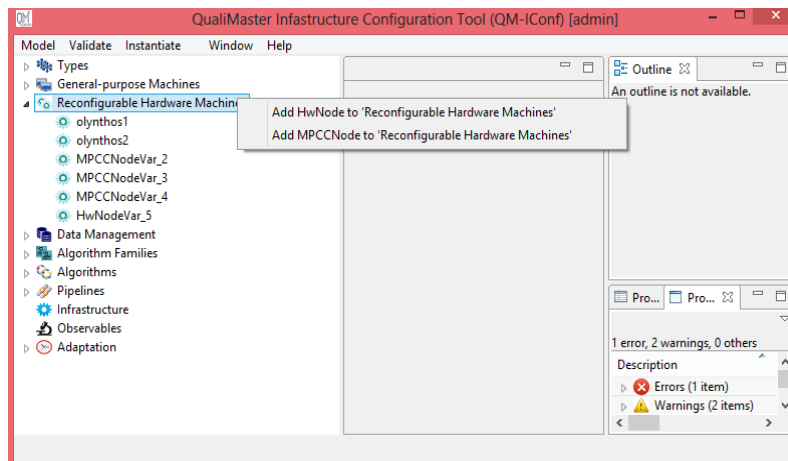**Workflow Diagram (Explaining test steps):**
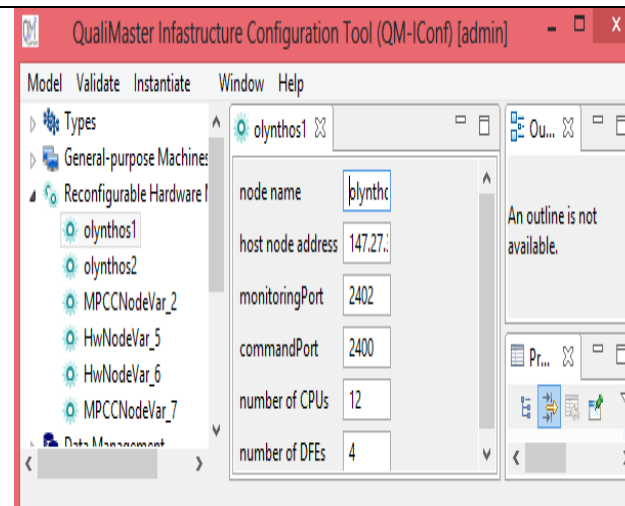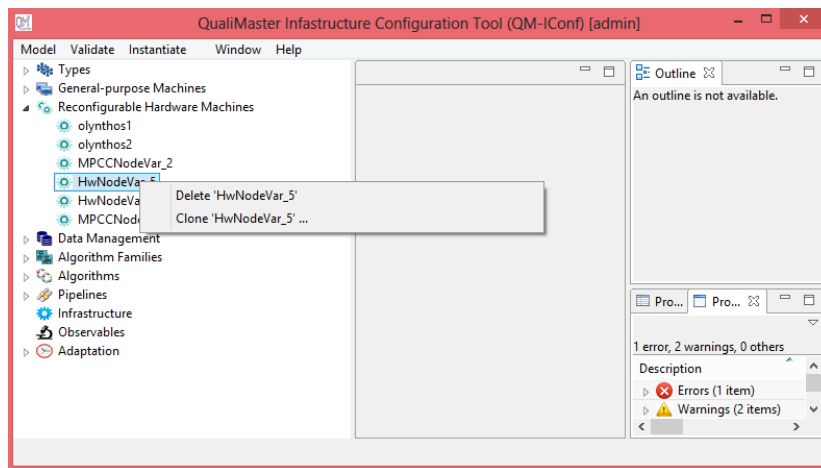
Figure 22: Scrollbar functionality for Reconfigurable Hardware Machines Configuration tree/subtree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After resizing the application window, Horizontal and vertical scrollbar should be found for all segments.

Execution Status: Fail

Bug ID: BR_QM_002, BR_QM_003.

Test Case ID: TC_QM_020
Module: Reconfigurable Hardware Machines Configuration tree
Summary: Verify if user can add a new sub-tree for **Reconfigurable Hardware Machines**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add an **HwNodeMachine** by right click on **Reconfigurable Hardware Machines** and click on the **Add HwNode to 'Reconfigurable Hardware Machines'** configuration tree.

3) Add an **MPCCNode Machine** by right click on **Reconfigurable Hardware Machines** and click on the **Add MPCCNode to 'Reconfigurable Hardware Machines'** configuration tree.

Workflow Diagram (Explaining test steps):

Figure 23. Adding a Reconfigurable Hardware Machines Configuration tree
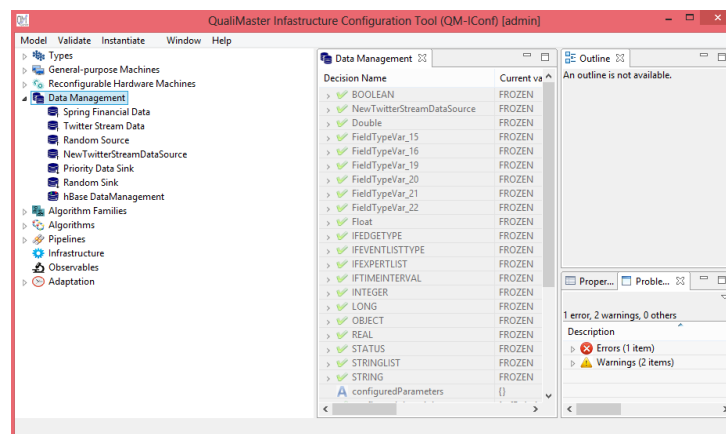
Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

1) After clicking on **Add HwNode to Reconfigurable Hardware Machines,** user should be able to add a new machine and this created machine should be visible in Editor Section.

2) After clicking on **Add MPCCNode to Reconfigurable Hardware Machines,** user should be able to add a new machine and this created machine should be visible in Editor Section.

Execution Status: Pass

Test Case ID: TC_QM_021

Module: Reconfigurable Hardware Machines Configuration tree.
Summary: Verify if user can Delete/Clone the created **Reconfigurable Hardware Machines**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add an **HwNode, MPCCNode** by right click on **Reconfigurable Hardware Machines** configuration tree.

3) Right click on created **HwNode** and **MPCCNode** Machine and select Delete/ Clone option.

Workflow Diagram (Explaining test steps):

Figure 24. Delete/Clone of a Machine Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After clicking on **Delete** option, created **HwNode** and **MPCCNode** Machine should be deleted and after clicking on **Clone** option, created Machine should be cloned with new name.

Execution Status: Pass

Test Case ID: TC_QM_022
Module: Data Management Configuration tree
Summary: Verify if all the Data Management sub-tree can be shown.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Open **Data Management** configuration option by clicking on triangle from the left side of the application window.

3) Double click on **Data Management** tree itself.

Workflow Diagram (Explaining test steps):

Figure 25. Data Management Configuration options tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After clicking on triangle of the **Data Management** configuration tree on the left side**,** all the sub tree of **Data Management** should be shown. Double clicking on **Data Management** tree itself, tree configurations should be shown in the Editor section.

Execution Status: Pass

Test Case ID: TC_QM_023
Module: Data Management Configuration tree.
Summary: Verify scrollbar appears in Configuration tree, Editor, Detailed views and Status bar section for **Data Management** tree.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Double click on **Data Management** tree itself.

3) Open **Data Management** configuration option by clicking on triangle from the left side of the application window.

4) Double click on Subtree under **Data Management** tree.

5) Now resize the application window towards top to bottom and bottom to top.

6) Now resize the application window towards right to left and left to right.

Workflow Diagram (Explaining test steps):
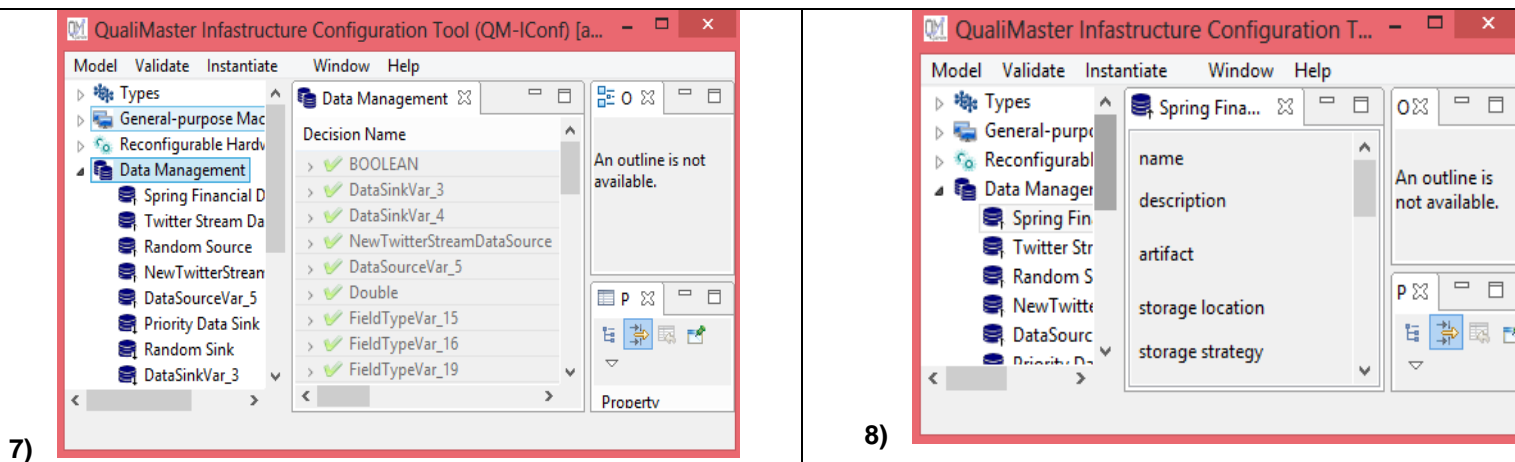
Figure 26: Scrollbar functionality for Data ManagementConfiguration tree/subtree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After resizing the application window, Horizontal and vertical scrollbar should be found for all segments.

Execution Status: Fail

Bug ID:BR_QM_002, BR_QM_003.

Test Case ID: TC_QM_024
Module: Data Management Configuration tree
Summary: Verify if user can add a new sub-tree for **Data Management**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add a **Data Source** by right click on **Data Management** and click on the **Add Data Source to 'Data Management'** configuration tree.

3) Add a **Data Sink** by right click on **Data Management** and click on the **Add Data Sink to 'Data Management'** configuration tree.

4) Add a **Persistent Data Element** by right click on **Data Management** and click on the **Add Persistent Data Element to 'Data Management'** configuration tree.
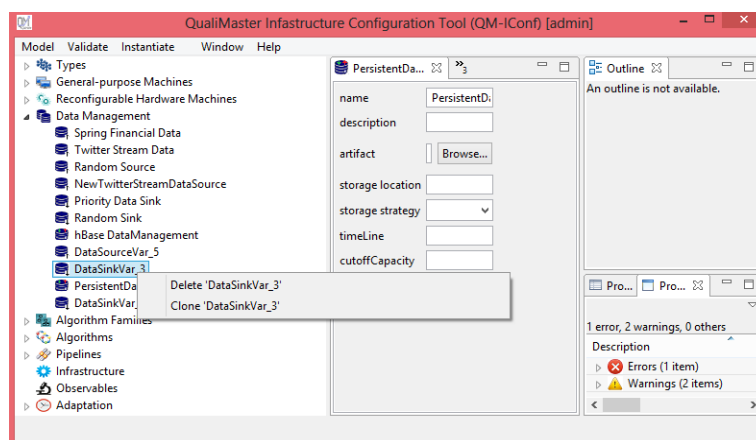
Workflow Diagram (Explaining test steps):
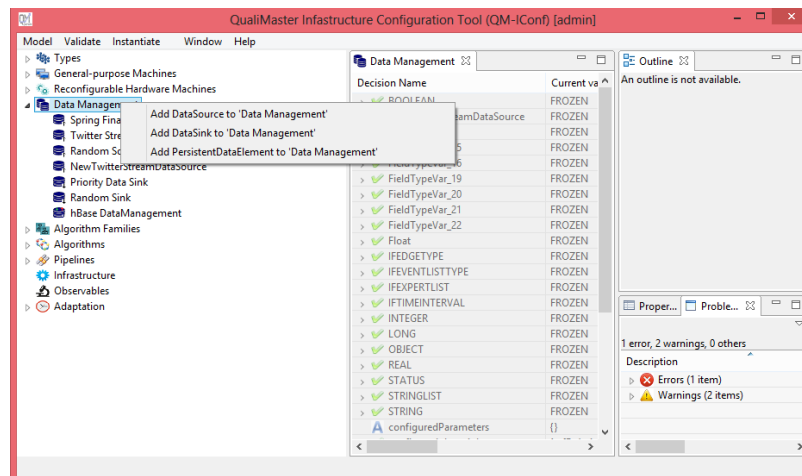
Figure 27. Adding a Data Management Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

1) After clicking on **Add Data Source to 'Data Management',** user should be able to add a new **Data Source** and this created **Data Source** should be visible in Editor Section.

2) After clicking on **Add Data Sink to 'Data Management',** user should be able to add a new **Data Sink** and this created **Data Sink** should be visible in Editor Section.

3) After clicking on **Add Persistent DataElement to 'Data Management',** user should be able to add a new **Data Element** and this created **Data Element** should be visible in Editor Section.

Execution Status: Pass

Test Case ID: TC_QM_025

Module: Data Management Configuration tree.
Summary: Verify if user can Delete/Clone the created **Data Management**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add a **Data Source, Data Sink and Data Element** by right click on **Data Management** configuration tree.

3) Right click on created **Data Source, Data Sink** and **Data Element** one after another and select Delete/ Clone option.

Workflow Diagram (Explaining test steps):

Figure 28. Delete/Clone of a Data Management Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on **Delete** option, created **Data Source, Data Sink** and **Data Element** data management should be deleted and after clicking on **Clone** option, created data management should be cloned with new name.

Execution Status: Pass

Test Case ID: TC_QM_026
Module: Algorithm Families Configuration tree
Summary: Verify if all the **Algorithm Families** sub-tree can be shown.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Open **Algorithm Families** configuration option by clicking on triangle from the left side of the application window.

3) Double click on **Algorithm Families** tree itself.

Workflow Diagram (Explaining test steps):
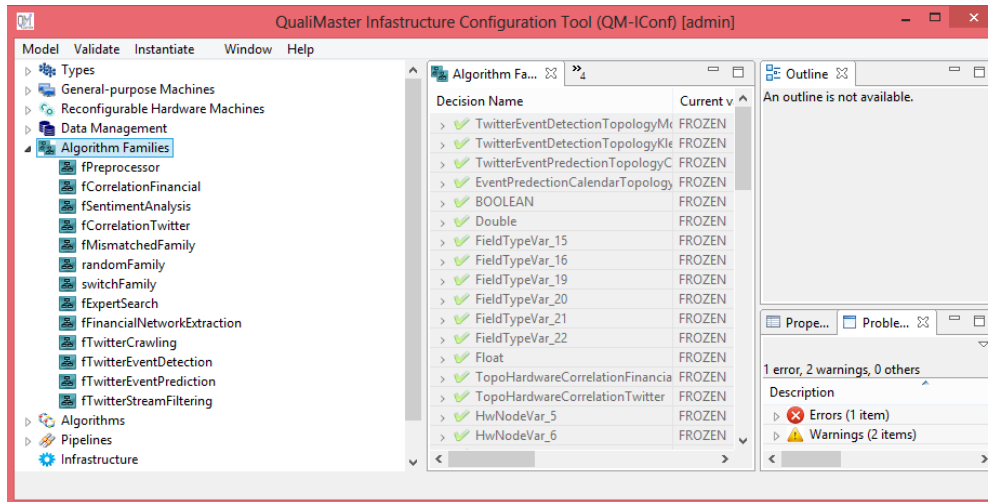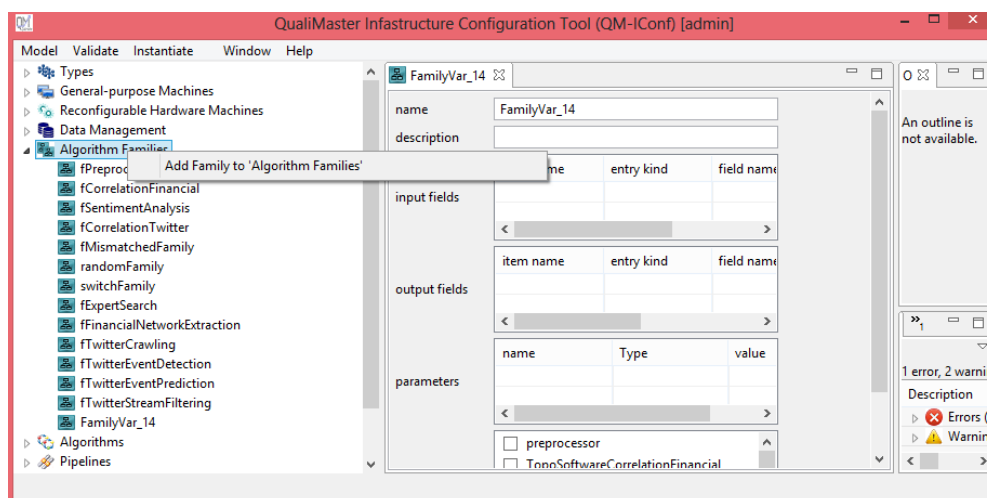

Figure 29: Algorithm Families Configuration options tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on triangle of the **Algorithm Families** configuration tree on the left side**,** all the sub tree of **Algorithm Families** should be shown. Double clicking on **Algorithm Families** tree itself, tree configurations should be shown in the Editor section.

Execution Status: Pass

Test Case ID: TC_QM_027
Module: Algorithm Families Configuration tree.
Summary: Verify scrollbar appears in Configuration tree, Editor, Detailed views and Status bar section for **Algorithm Families** tree.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Double click on **Algorithm Families** tree itself.

3) Open **Algorithm Families** configuration option by clicking on triangle from the left side of the application window.

4) Double click on Subtree under **Algorithm Families** tree.

5) Now resize the application window towards top to bottom and bottom to top.

6) Now resize the application window towards right to left and left to right.

Workflow Diagram (Explaining test steps):
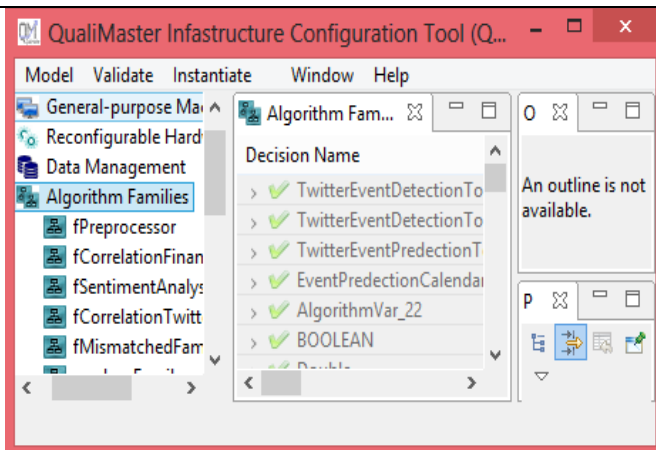
9)   10)
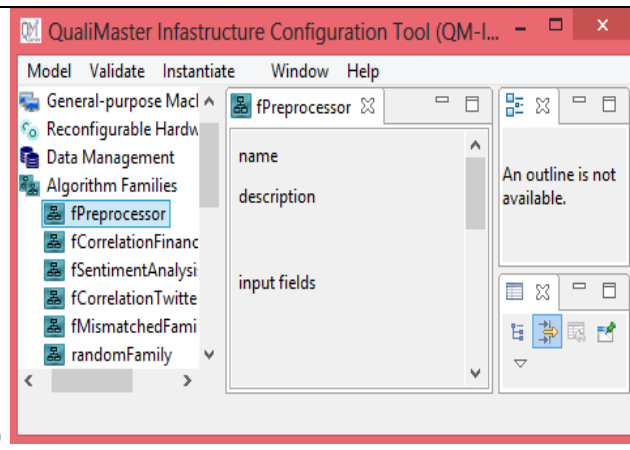
Figure 30: Scrollbar functionality for Algorithm Families Configuration tree/subtree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After resizing the application window, Horizontal and vertical scrollbar should be found for all segments.

Execution Status: Fail

Bug ID: BR_QM_002, BR_QM_003.

Test Case ID: TC_QM_028
Module: Algorithm Families Configuration tree
Summary: Verify if user can add a new sub-tree for **Algorithm Families**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add a **Family** by right click on **Algorithm Families** and click on the **Add Family to 'Algorithm Families'** configuration tree.
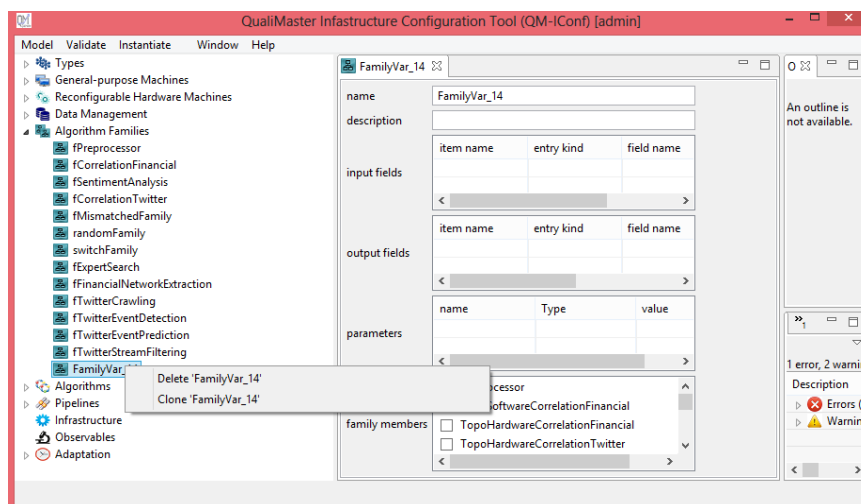
Workflow Diagram (Explaining test steps):

Figure 31: Adding an Algorithm Family Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on **Add Family to 'Algorithm Families',** user should be able to add a new **Algorithm Family** and this created Family should be visible in Editor Section.

Execution Status: Pass

Test Case ID: TC_QM_029
Module: Algorithm Families Configuration tree.
Summary: Verify if user can Delete/Clone the created **Algorithm Families**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add a **Family** by right click on **Algorithm Families** configuration tree.

3) Right click on created **Family** and select Delete/ Clone option.

Workflow Diagram (Explaining test steps):

Figure 32: Delete/Clone of an Algorithm Family Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on **Delete** option, created **Algorithm Family** should be deleted and after clicking on **Clone** option, created Family should be cloned with new name.

Execution Status: Pass

Test Case ID: TC_QM_030
Module: Algorithm Configuration tree
Summary: Verify if all the **Algorithms** sub-tree can be shown.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Open **Algorithms** configuration option by clicking on triangle from the left side of the application window.

3) Double click on **Algorithms** tree itself.
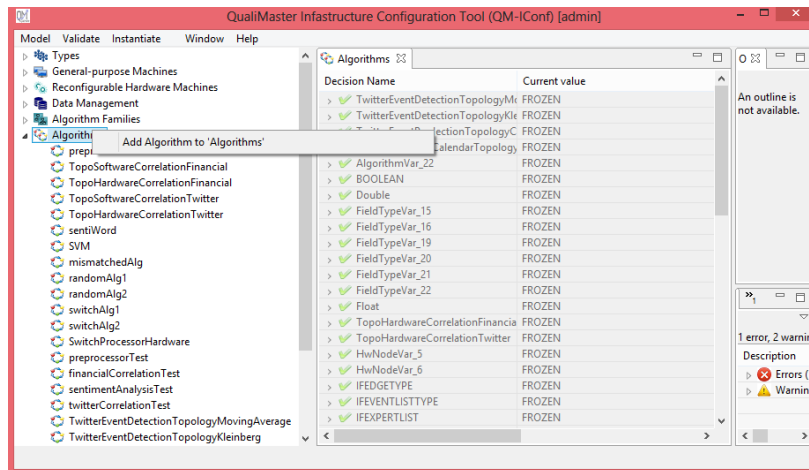
Workflow Diagram (Explaining test steps):

Figure 33: Algorithms Configuration options tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on triangle of the **Algorithms** configuration tree on the left side**,** all the sub tree of **Algorithms** should be shown. Double clicking on **Algorithms** tree itself, tree configurations should be shown in the Editor section.

Execution Status: Pass

Test Case ID: TC_QM_031
Module: Algorithm Configuration tree.
Summary: Verify scrollbar appears in Configuration tree, Editor, Detailed views and Status bar section for **Algorithm** tree.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Double click on **Algorithm** tree itself.

3) Open **Algorithm** configuration option by clicking on triangle from the left side of the application window.

4) Double click on Subtree under **Algorithm** tree.

5) Now resize the application window towards top to bottom and bottom to top.

6) Now resize the application window towards right to left and left to right.
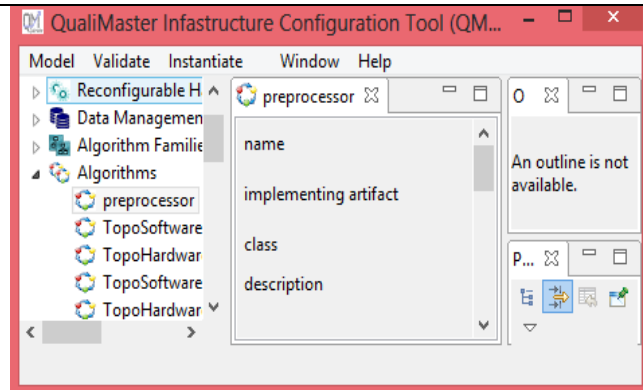
Workflow Diagram (Explaining test steps):
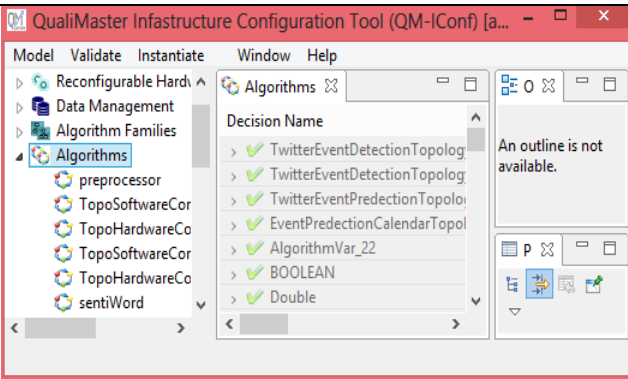
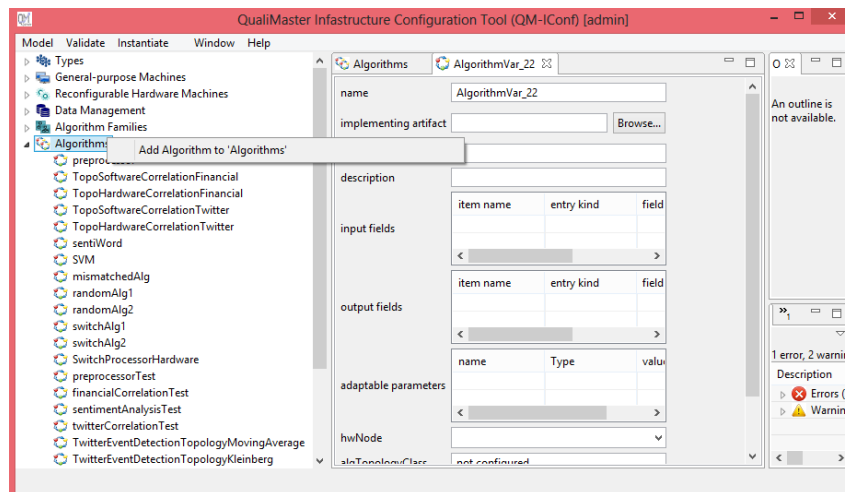Figure 34: Scrollbar functionality for Algorithm Configuration tree/subtree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After resizing the application window, Horizontal and vertical scrollbar should be found for all segments.

Execution Status: Fail

Bug ID: BR_QM_002, BR_QM_003.

Test Case ID: TC_QM_032
Module: Algorithms Configuration tree
Summary: Verify if user can add a new sub-tree for **Algorithms**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add an **Algorithm** by right click on **Algorithms** and click on the **Add Algorithm to 'Algorithms'** configuration tree.

Workflow Diagram (Explaining test steps):
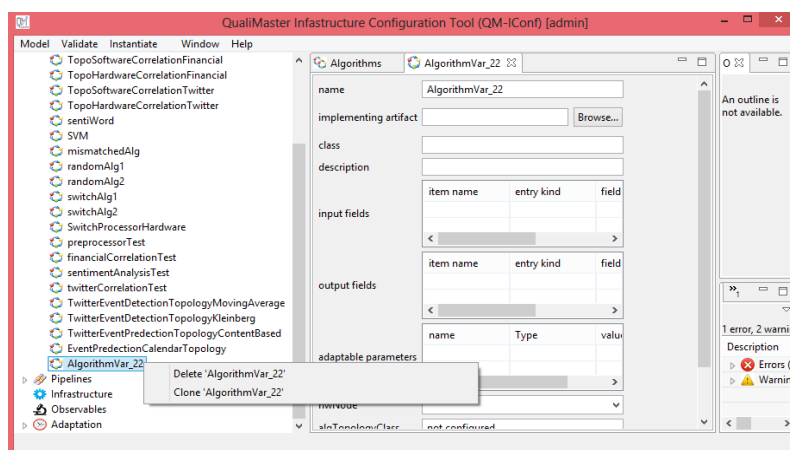
Figure 35: Adding an Algorithm Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on **Add Algorithm to 'Algorithms',** user should be able to add a new **Algorithm** and this created Family should be visible in Editor Section.

Execution Status: Pass

Test Case ID: TC_QM_033

Module: Algorithms Configuration tree.
Summary: Verify if user can Delete/Clone the created **Algorithms**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add an **Algorithm** by right click on **Algorithms** configuration tree.

3) Right click on created **Algorithm** and select Delete/ Clone option.

Workflow Diagram (Explaining test steps):

Figure 36: Delete/Clone of an Algorithms Configuration tree
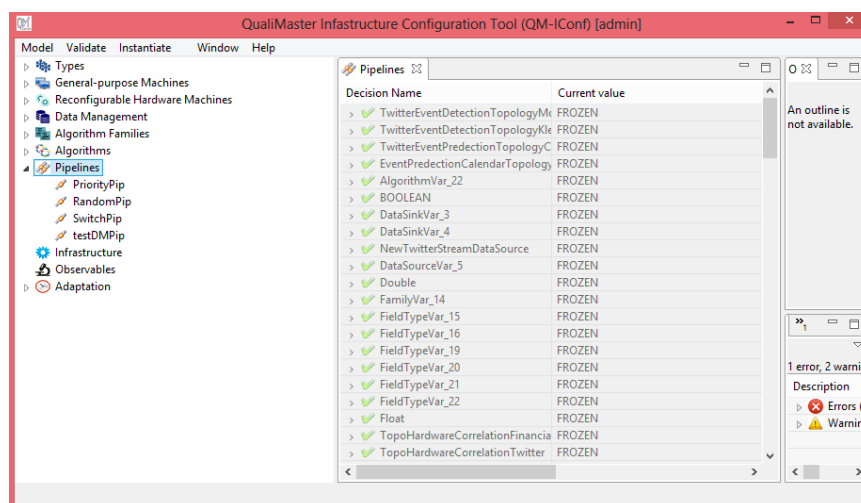
Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on **Delete** option, created **Algorithm** should be deleted and after clicking on **Clone** option, created Algorithm should be cloned with new name.

Execution Status: Pass

Test Case ID: TC_QM_034
Module: Pipelines Configuration tree
Summary: Verify if all the **Pipelines** sub-tree can be shown.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Open **Pipelines** configuration option by clicking on triangle from the left side of the application window.

3) Double click on **Pipelines** tree itself.

Workflow Diagram (Explaining test steps):

Figure 37: PipelinesConfiguration options tree

Test Environment: Windows 8, 64-bit Operating System,x64-based processor.

Expected Outcome:

After clicking on triangle of the **Pipelines** configuration tree on the left side, all the sub tree of **Pipelines** should be shown. Double clicking on **Pipelines** tree itself, tree configurations should be shown in the Editor section.

Execution Status: Pass

**Test Case ID:** TC_QM_035
Module: Pipelines Configuration tree.
Summary: Verify scrollbar appears in Configuration tree, Editor, Detailed views and Status bar section for **Pipelines** tree.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Double click on **Pipelines** tree itself.

3) Open **Pipelines** configuration option by clicking on triangle from the left side of the application window.

4) Double click on Subtree under **Pipelines** tree.

5) Now resize the application window towards top to bottom and bottom to top.

6) Now resize the application window towards right to left and left to right.

Workflow Diagram (Explaining test steps):
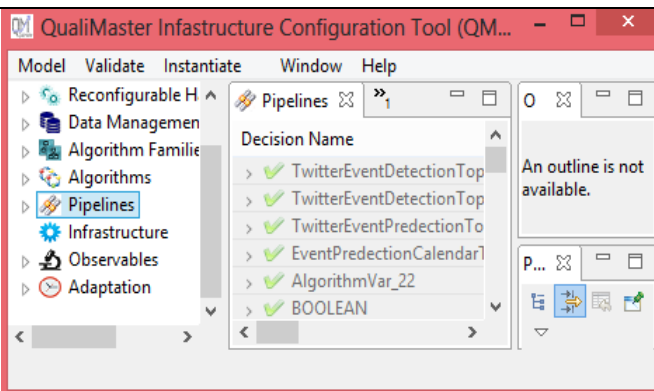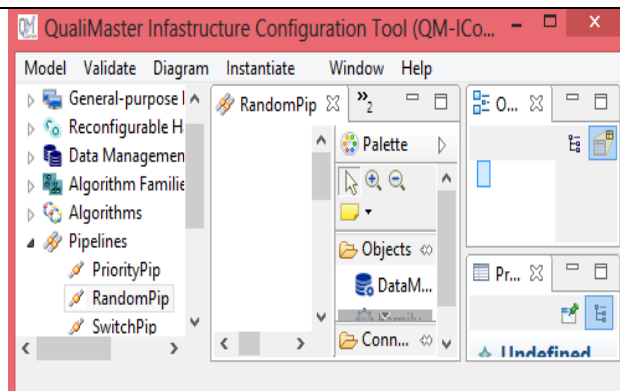
Figure 38: Scrollbar functionality for Pipelines Configuration tree/subtree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After resizing the application window, Horizontal and vertical scrollbar should be found for all segments.

Execution Status: Fail

Bug ID: BR_QM_003.

Test Case ID: TC_QM_036
Module: Pipelines Configuration tree
Summary: Verify if user can add a new sub-tree for **Pipelines**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add a Pipeline by right click on **Pipelines** and click on the **Add Pipeline to 'Pipelines'** configuration tree.
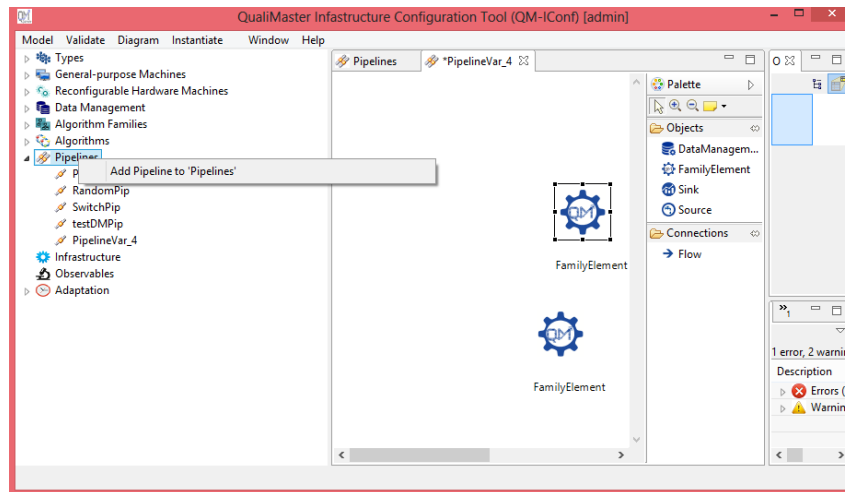
Workflow Diagram (Explaining test steps):

Figure 39: Adding a Pipeline Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on **Add Pipeline to 'Pipelines',** user should be able to add a new **Pipeline** and this created Pipeline should be visible in Editor Section.

Execution Status: Pass

Test Case ID: TC_QM_037

Module: Pipelines Configuration tree.
Summary: Verify functionality of Deploy, Start, Stop and Delete functionality of the created **Pipeline**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add a **Pipeline** by right click on **Pipelines** configuration tree.

3) Right click on created **Pipeline** and select Deploy, Start, Stop and Delete option one by one.

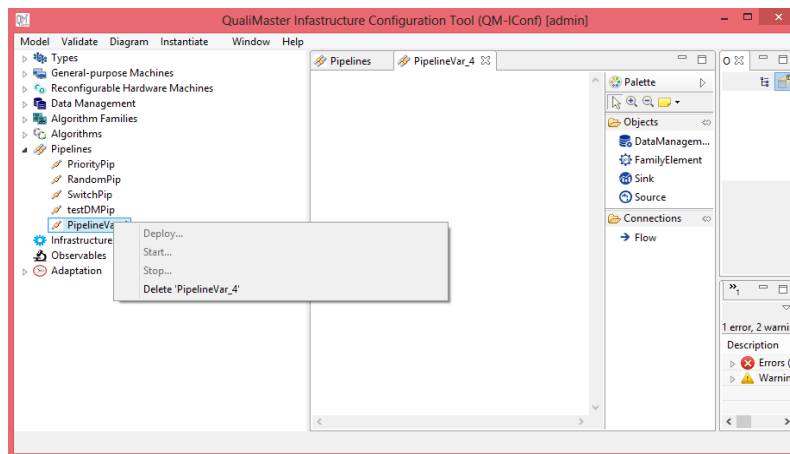**Workflow Diagram (Explaining test steps):**

Figure 40: Deploy, Start, Stop and Delete of a Pipeline Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on **Deploy, Start, Stop** and **Delete** option, created **Pipeline** should **Deploy, Start, Stop** and **Delete** accordingly.

Execution Status: Pass

Test Case ID: TC_QM_038
Module: Infrastructure Configuration tree
Summary: Verify if Infrastructure Configuration tree can be edited.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Double click on **Infrastructure** tree itself.
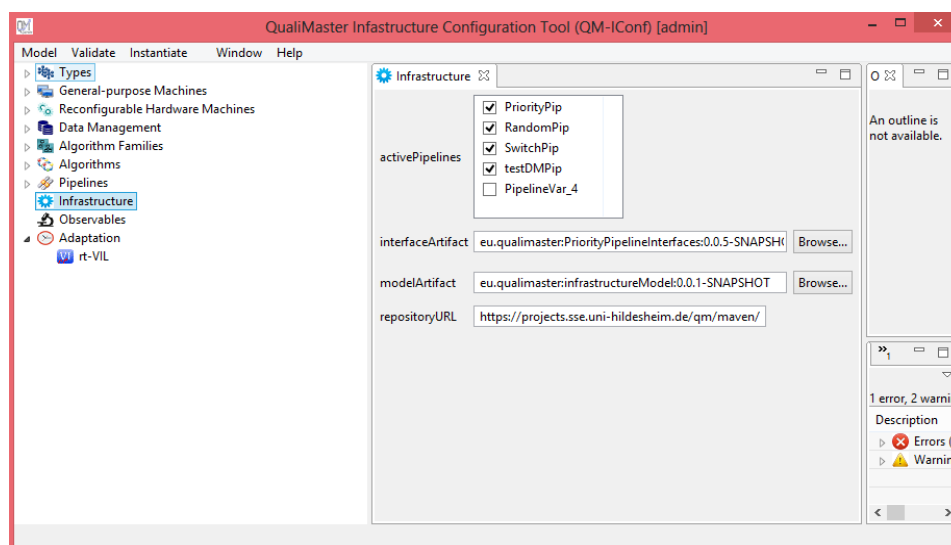
Workflow Diagram (Explaining test steps):

Figure 41: Infrastructure Configuration options tree

Test Environment: Windows 8, 64-bit Operating System,x64-based processor.

Expected Outcome:

Double clicking on **Infrastructure** tree itself, tree configurations should be shown in the Editor section.

Execution Status: Pass

Note: The following test cases (TC_QM_39 – TC_QM_47) indicate a "Fail" status, which is due to the fact, that these functions are mostly not implemented in the demo version of IConf. Nevertheless, they have been processed as part as a complete test cycle.

Test Case ID: TC_QM_039
Module: Infrastructure Configuration tree.
Summary: Verify scrollbar appears in Configuration tree, Editor, Detailed views and Status bar section for **Pipelines** tree.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Double click on **Infrastructure** tree itself.

3) Now resize the application window towards top to bottom and bottom to top.

4) Now resize the application window towards right to left and left to right.

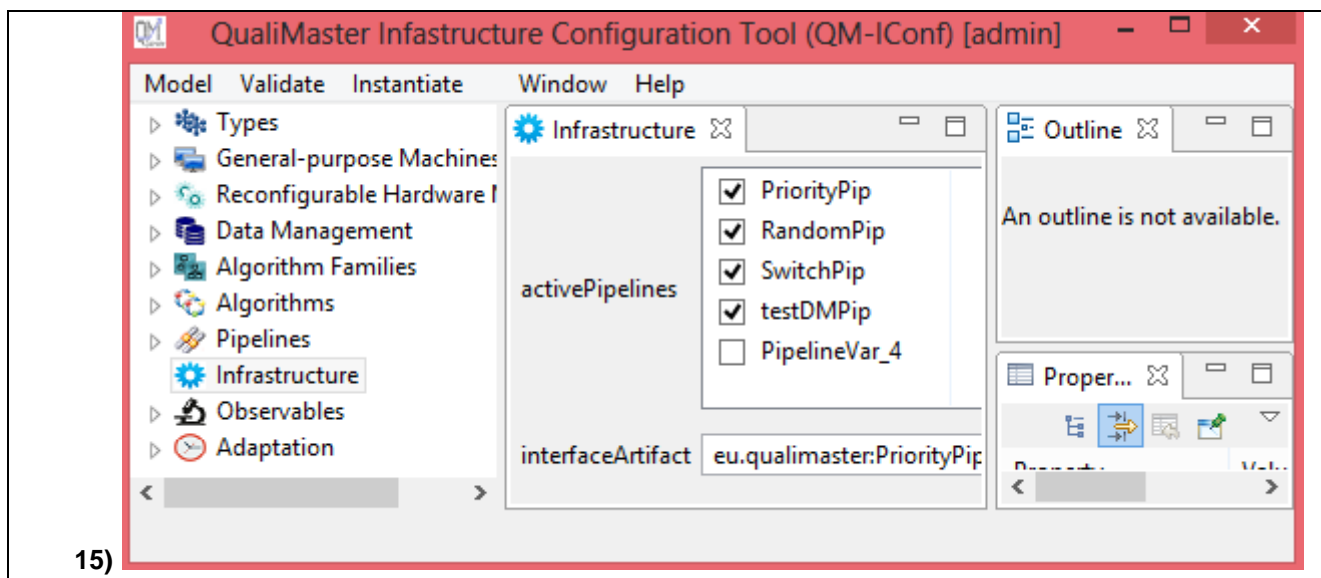**Workflow Diagram (Explaining test steps):**

Figure 42: Scrollbar functionality for Infrastructure Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

After resizing the application window, Horizontal and vertical scrollbar should be found for all segments.

Execution Status: (Fail)

Bug ID: BR_QM_004.

Test Case ID: TC_QM_040
Module: Observables Configuration tree
Summary: Verify if **Observables** Configuration tree can be edited.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Double click on **Observables** tree itself.

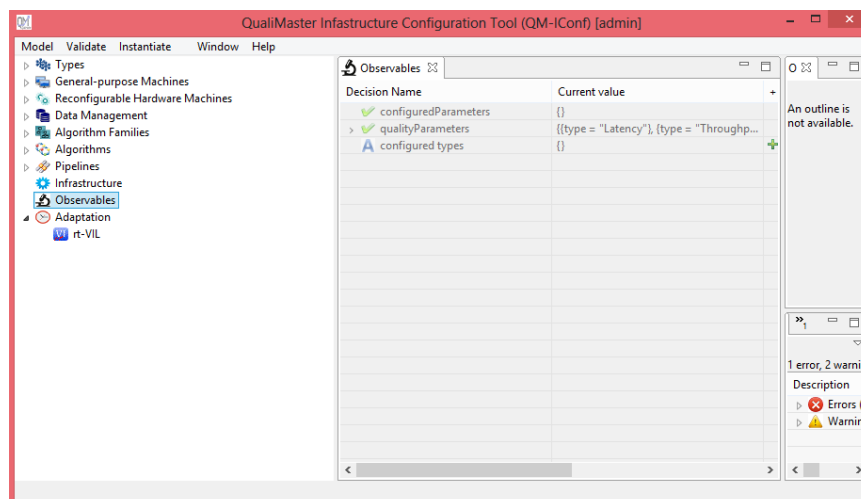**Workflow Diagram (Explaining test steps):**

Figure 43: Observables Configuration options tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

Double clicking on **Observables** tree itself, tree configurations should be shown in the Editor section.

Execution Status: Pass

Test Case ID: TC_QM_041
Module: Observables Configuration tree
Summary: Verify if user can add a new Configured Quality Parameter for **Observables**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add a Configured Quality Parameter by right click on **Observables** and click on the **Add Configured Quality Parameter to 'Observables'** configuration tree.

3) Double click on created **Observables** sub tree to open in **Editor** Section.

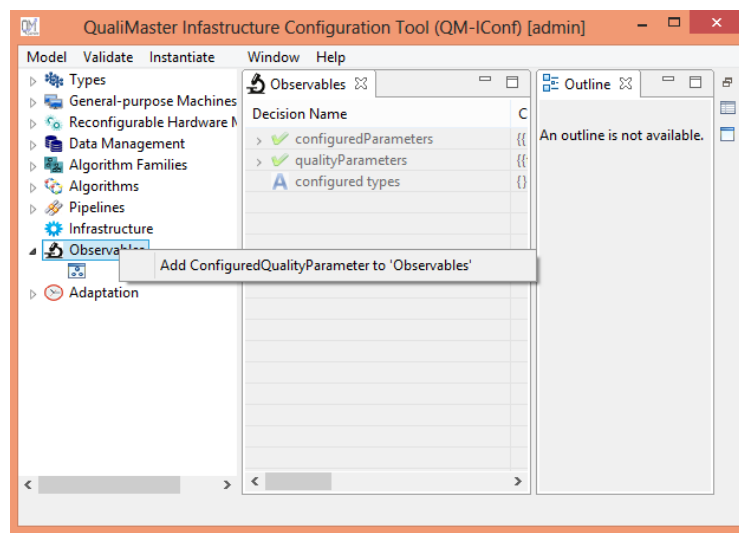**Workflow Diagram (Explaining test steps):**

Figure 44: Adding a Observables Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on **Add Configured Quality Parameter to 'Observables',** user should be able to add a new **Configured Quality Parameter** and this created Quality Parameter should be visible in Editor Section. Double clicking on created subtree, it should be opened in Editor Section.

Execution Status: (Fail)

Bug ID: BR_QM_005, BR_QM_007

Test Case ID: TC_QM_042
Module: Observables Configuration tree.
Summary: Verify if user can Delete the created **Configured Quality Parameter**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add a **Configured Quality Parameter** by right click on **Observables** configuration tree.

3) Right click on created **Observables** and select Delete option.
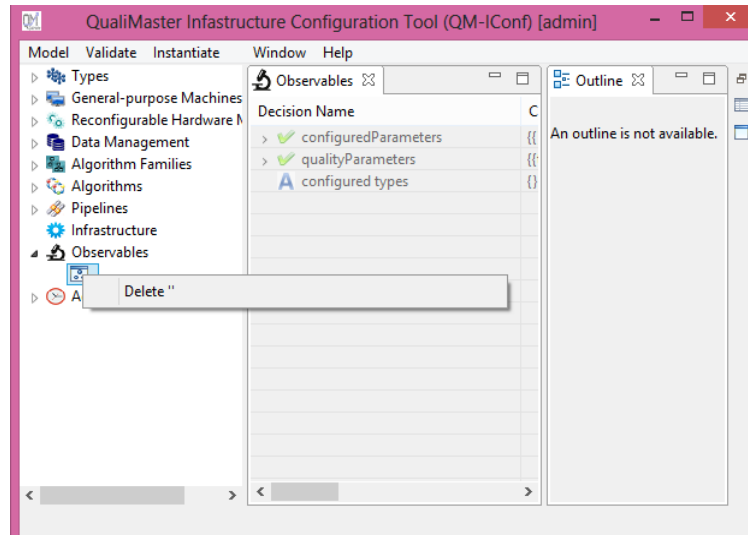
Workflow Diagram (Explaining test steps):

Figure 45: Delete of a created Observables Configuration sub tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on **Delete** option, created **Configured Quality Parameter** should be deleted.

Execution Status: (Fail)

Bug ID: BR_QM_006

**Test Case ID:** TC_QM_043
Module: Observables Configuration tree.
Summary: Verify scrollbar appears in Configuration tree, Editor, Detailed views and Status bar section for **Pipelines** tree.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Double click on **Observables** tree itself.

3) Open **Observables** configuration option by clicking on triangle from the left side of the application window.

4) Double click on Subtree under **Observables** tree.

5) Now resize the application window towards top to bottom and bottom to top.

6) Now resize the application window towards right to left and left to right.
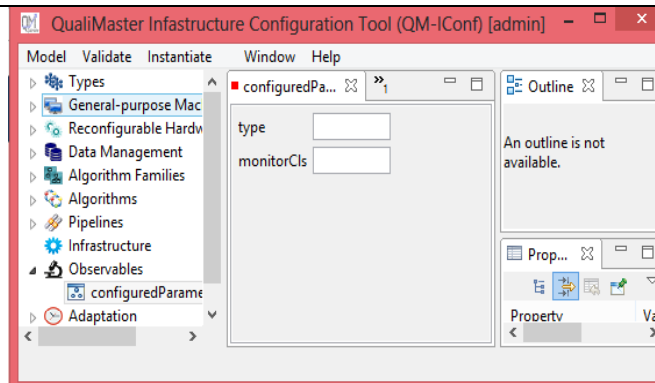
Workflow Diagram (Explaining test steps):
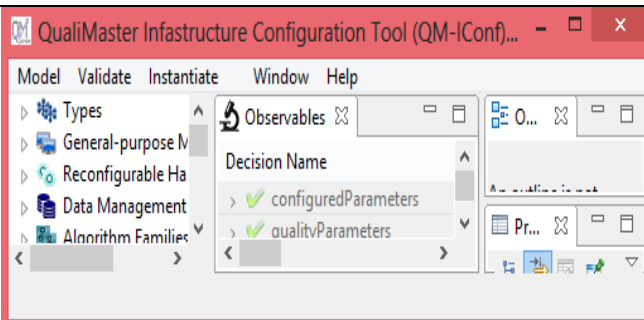
Figure 46: Scrollbar functionality for Observables Configuration tree/subtree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After resizing the application window, Horizontal and vertical scrollbar should be found for all segments.

Execution Status: (Fail)

Bug ID: BR_QM_002, BR_QM_003.

Test Case ID: TC_QM_044
Module: Adaptation Configuration tree
Summary: Verify if all the **Adaptation** sub-tree can be shown.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Open **Adaptation** configuration option by clicking on triangle from the left side of the application window.

3) Double click on **Adaptation** tree itself.
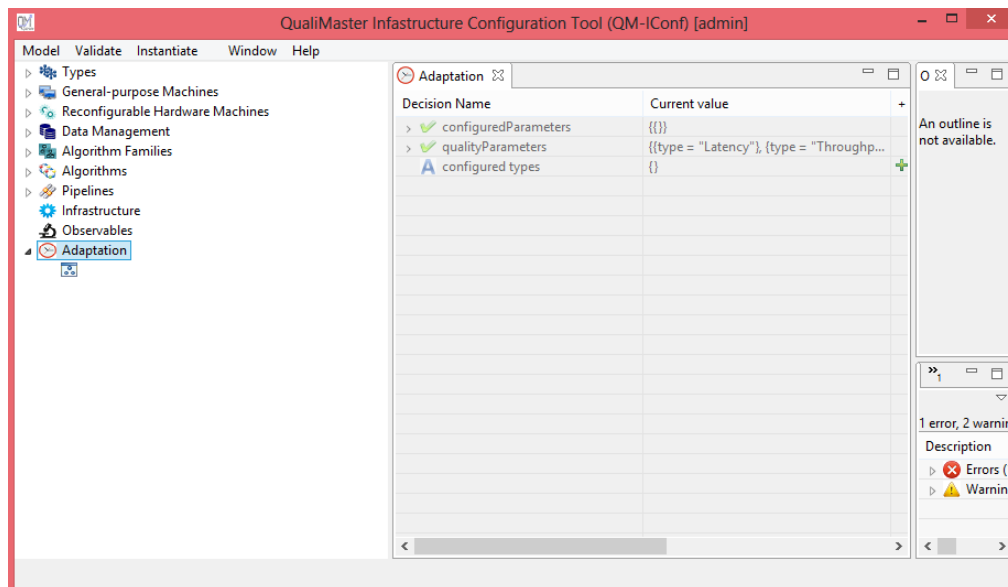
Workflow Diagram (Explaining test steps):

Figure 47: AdaptationConfiguration options tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on triangle of the **Adaptation** configuration tree on the left side, all the sub tree of **Adaptation** should be shown. Double clicking on **Adaptation** tree itself, tree configurations should be shown in the Editor section.

Execution Status: Pass

**Test Case ID:** TC_QM_045
Module: Adaptation Configuration tree.
Summary: Verify scrollbar appears in Configuration tree, Editor, Detailed views and Status bar section for **Adaptation** tree.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Double click on **Adaptation** tree itself.

3) Open **Adaptation** configuration option by clicking on triangle from the left side of the application window.

4) Double click on Subtree under **Adaptation** tree.

5) Now resize the application window towards top to bottom and bottom to top.

6) Now resize the application window towards right to left and left to right.

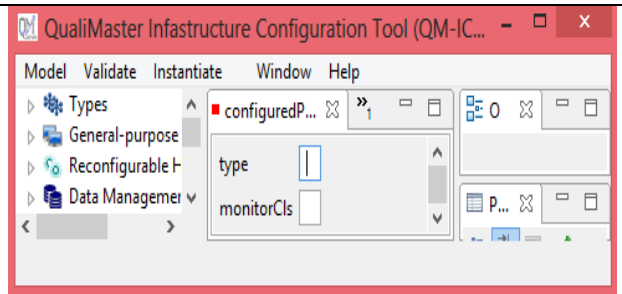**Workflow Diagram (Explaining test steps):**
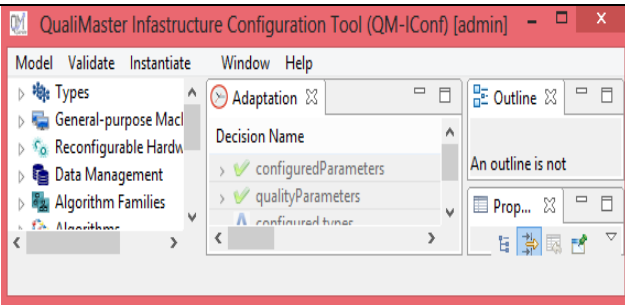
Figure 48: Scrollbar functionality for Adaptation Configuration tree/subtree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After resizing the application window, Horizontal and vertical scrollbar should be found for all segments.

Execution Status: (Fail)

Bug ID: BR_QM_002, BR_QM_003.

Test Case ID: TC_QM_046
Module: Adaptation Configuration tree
Summary: Verify if user can add a new Configured Quality Parameter for **Adaptation**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add a Configured Quality Parameter by right click on **Adaptation** and click on the **Add Configured Quality Parameter to 'Adaptation'** configuration tree.

3) Double click on created **Adaptation** configuration tree.

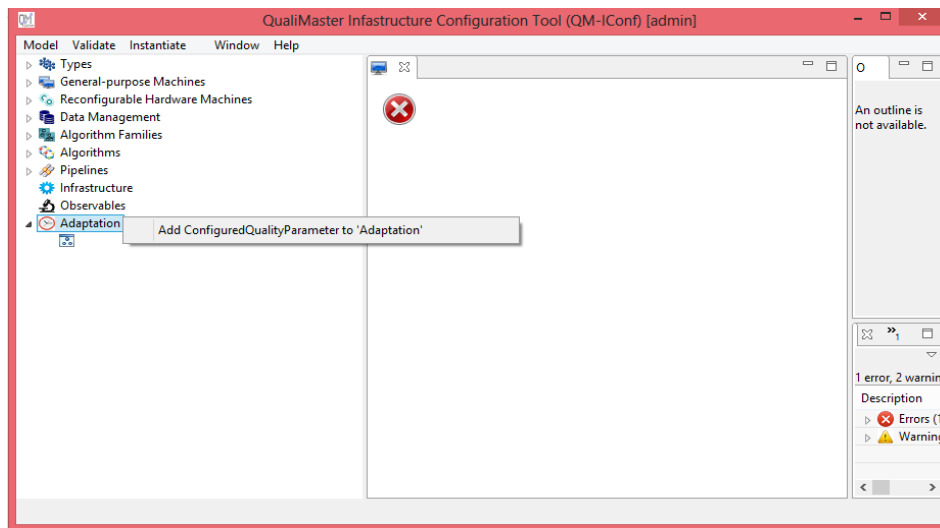**Workflow Diagram (Explaining test steps):**

Figure 49: Adding a Configured Quality Parameter Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on **Add Configured Quality Parameter to 'Adaptation',** user should be able to add a new **Configured Quality Parameter** and this created Quality Parameter should be visible in Editor Section. After double click on created **Adaptation** subtree it should open in the **Editor** tab.

Execution Status: (Fail)

Bug ID: BR_QM_008, BR_QM_010,

Test Case ID: TC_QM_047

Module: Adaptation Configuration tree.
Summary: Verify if user can Delete the created **Configured Quality Parameter**.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Add a **Configured Quality Parameter** by right click on **Adaptation** configuration tree.

3) Right click on created **Adaptation** and select Delete option.

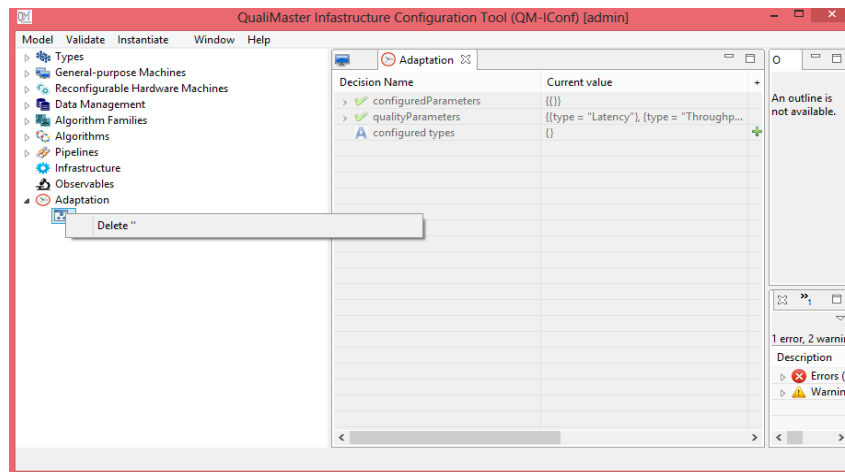**Workflow Diagram (Explaining test steps):**

Figure 50: Delete of a created Adaptation Configuration tree

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

After clicking on **Delete** option, created **Configured Quality Parameter** should be deleted.

Execution Status: (Fail)
Bug ID: BR_QM_009

Test Case ID: TC_QM_048
Module: Type Sub-tree item.
Summary: Verify new Type sub tree item can be added.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Right click on **Types** configuration tree and click on **Add Field Type to 'Types'**.

3) Fill in data for **name**, **class**, **artifact**, **serializer**, **serializer Artifact** fields and save the info using CTRL+S.
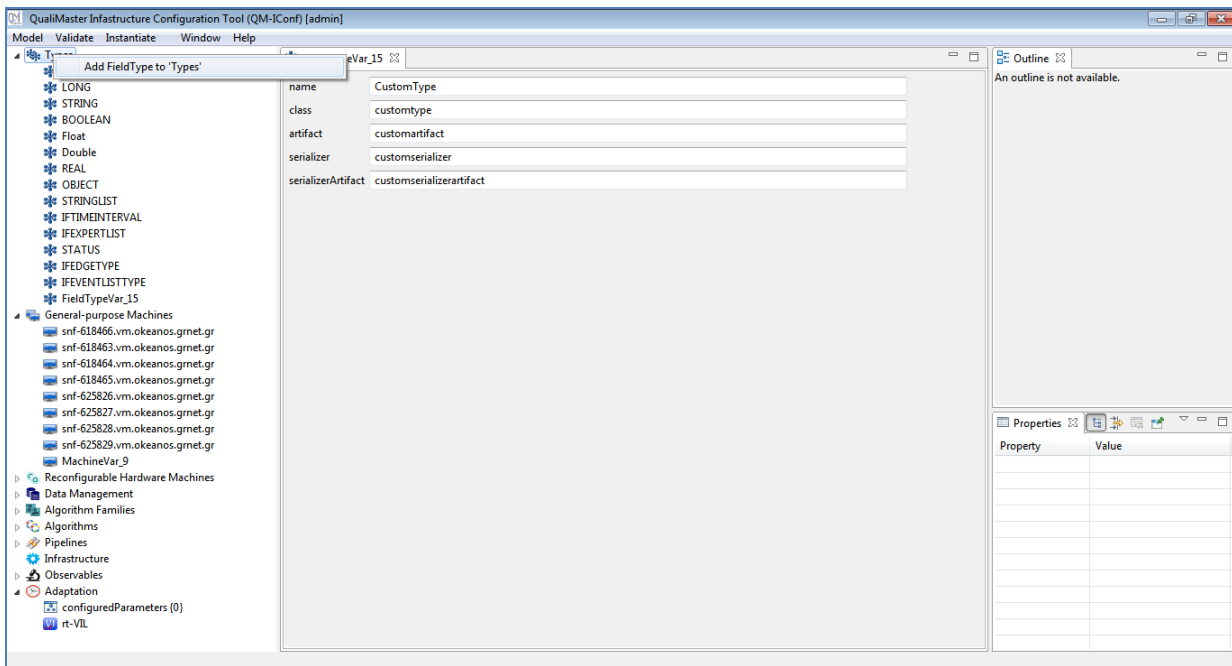
Workflow Diagram (Explaining test steps):

Figure 51: Create new Types

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

New Type sub-tree item should get created.

Execution Status: Pass

Test Case ID: TC_QM_049
Module: Type Sub-tree item.
Summary: Verify existing Type sub tree item can be edited.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Expand **Types** configuration tree and double-click on an existing Types sub-tree item.

3) Edit data for **name/class/artifact/serializer/serializerArtifact** field(s) and save the info using CTRL+S.
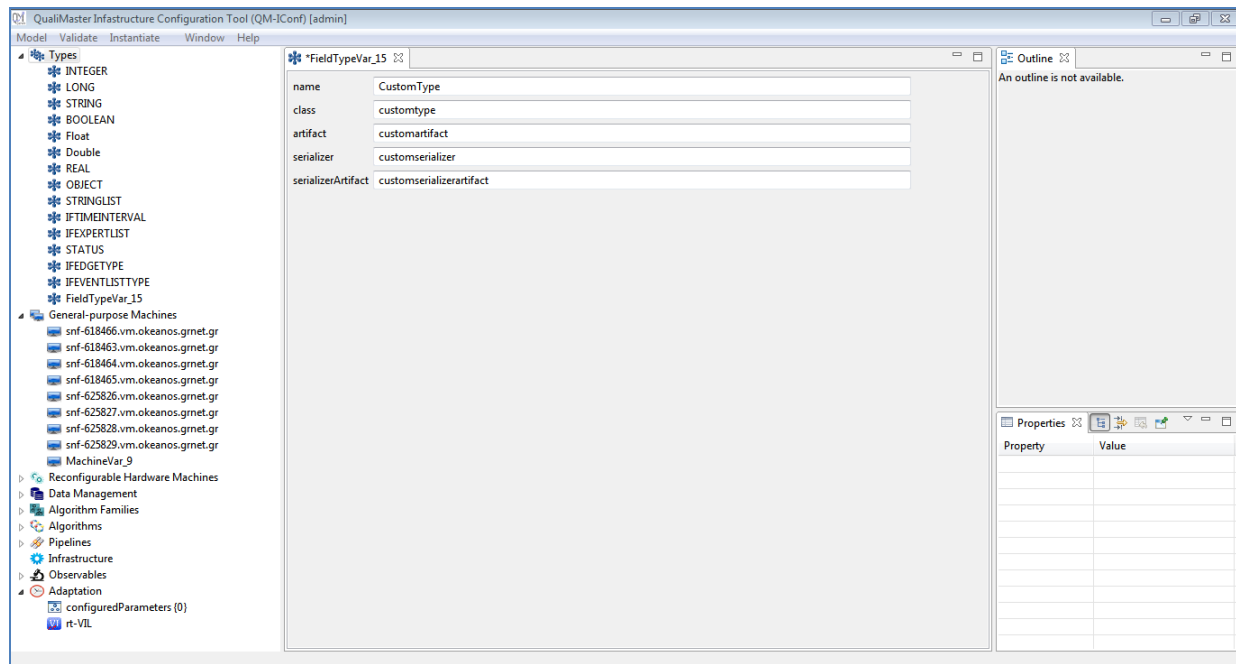
Workflow Diagram (Explaining test steps):

Figure 52: Edit existing Type

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

Edited data should get saved for the Type sub-tree item.

Execution Status: Pass

Test Case ID: TC_QM_050
Module: General-purpose Machines sub-tree item.
Summary: Verify new General-purpose Machines sub tree item can be added.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Right click on **General-purpose Machines** configuration tree and click on **Add Machine to 'General-purpose Machines'**.

3) Fill in data for **network name**, **total amount of memory**, **number of processors**, **maximum processor frequency**, **ports, role** fields and save the info using CTRL+S.
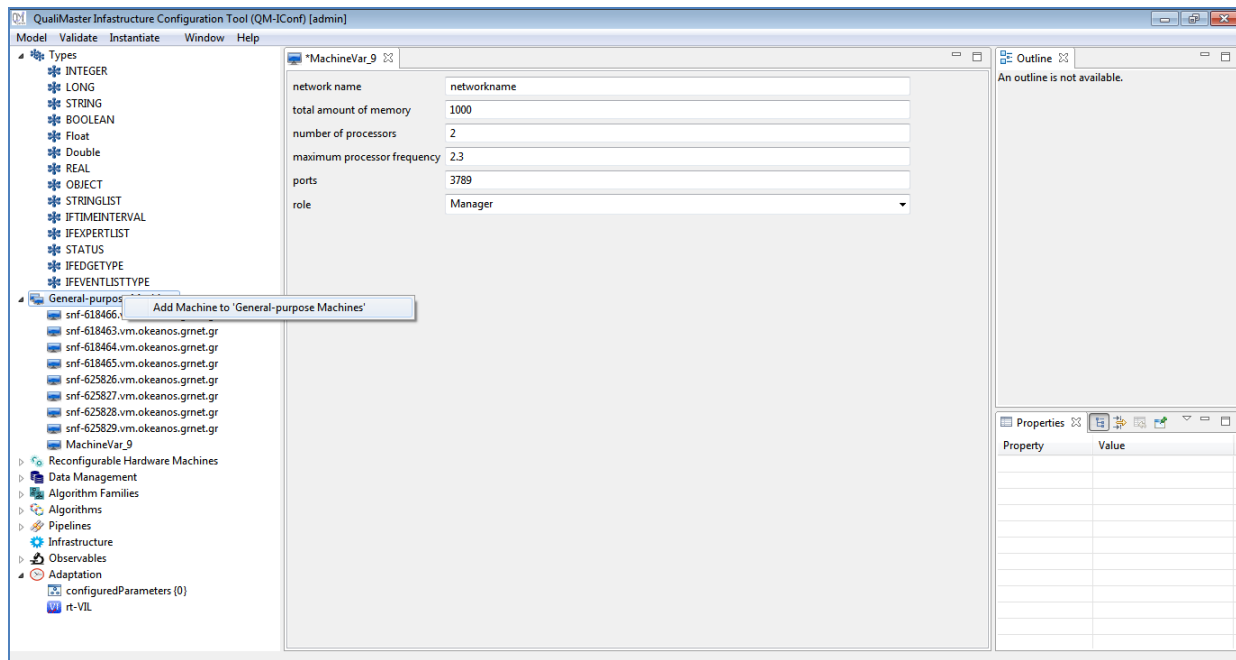
Workflow Diagram (Explaining test steps):

Figure 53: Create new General-purpose Machine

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

New General-purpose Machine sub-tree item should get created.

Execution Status: Pass

Test Case ID: TC_QM_051
Module: General-purpose Machines sub-tree item.
Summary: Verify existing **General-purpose Machines** sub tree item can be edited.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Expand **General-purpose Machines** configuration tree and double-click on an existing **General-purpose Machines** sub-tree item.

3) Edit data for **name network name/total amount of memory/number of processors/maximum processor frequency/ports/role** field(s) and save the info using CTRL+S.

Workflow Diagram (Explaining test steps):

Figure 54: Edit existing General-purpose Machine

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

Edited data should get saved for the **General-purpose Machines** sub-tree item.

Execution Status: Pass

Test Case ID: TC_QM_052
Module: Reconfigurable Hardware Machines sub-tree item.
Summary: Verify new HwNode to **Reconfigurable Hardware Machines** sub tree item can be added.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Right click on **Reconfigurable Hardware Machines** configuration tree and click on **Add HwNode to 'Reconfigurable Hardware Machines**.

3) Fill in data for **node name** field and save the info using CTRL+S.

Workflow Diagram (Explaining test steps):
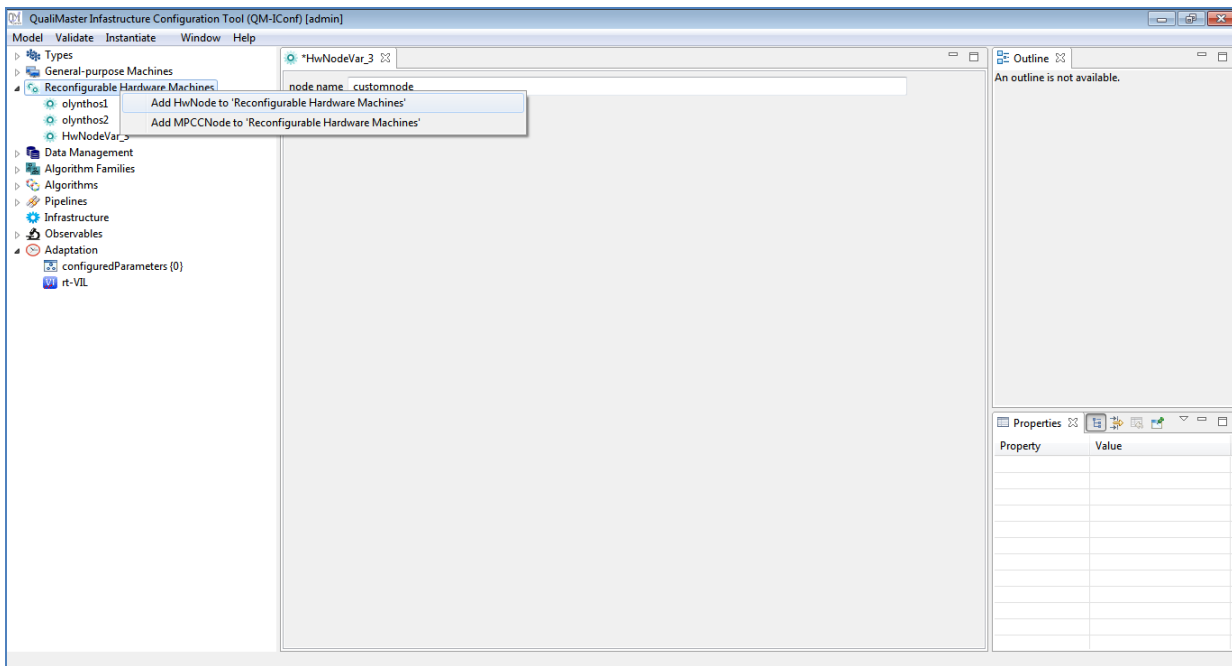
Figure 55: Create new HwNode to Reconfigurable Hardware Machine
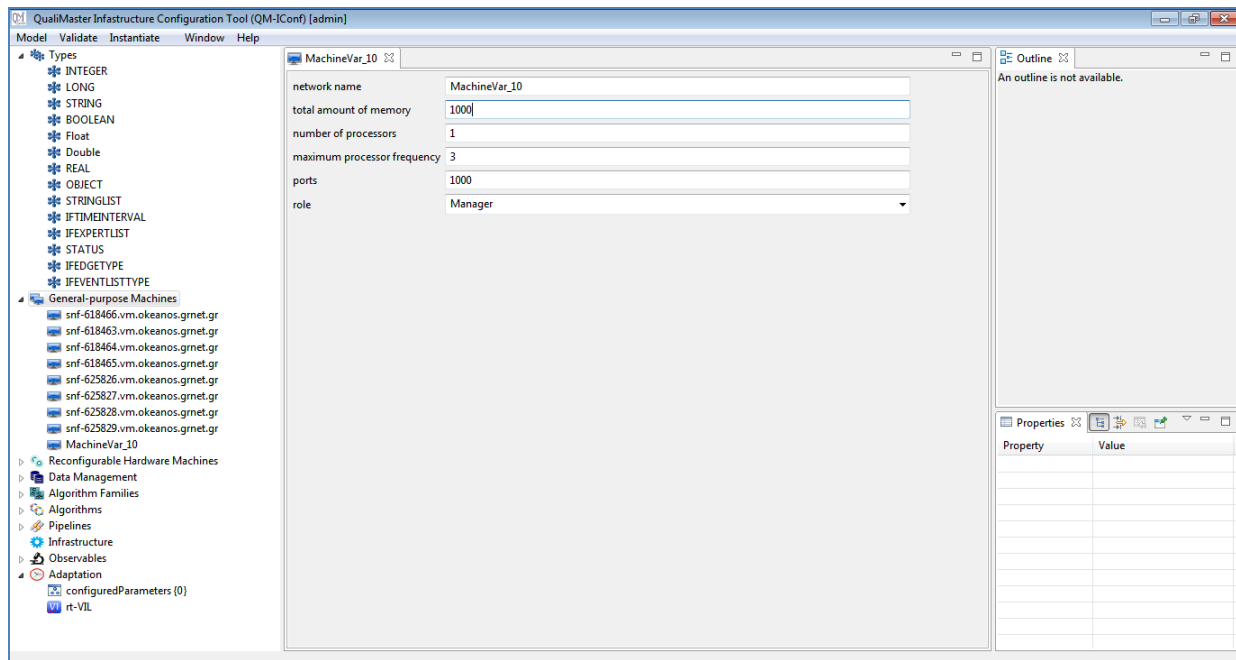
Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

New HwNode to **Reconfigurable Hardware Machines** sub-tree item should get created.

Execution Status: Pass

Test Case ID: TC_QM_053
Module: Reconfigurable Hardware Machines sub-tree item.
Summary: Verify existing HwNode to **Reconfigurable Hardware Machines** sub tree item can be edited.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Expand **Reconfigurable Hardware Machines** configuration tree and double-click on an existing HwNode to **Reconfigurable Hardware Machines** sub-tree item.

3) Edit data for **node name** field and save the info using CTRL+S.

Workflow Diagram (Explaining test steps):

Figure 56: Edit existing HwNode to Reconfigurable Hardware Machine

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

Edited data should get saved for the **General *HwNode to Reconfigurable Hardware Machine*** sub-tree item.

Execution Status: Pass

Test Case ID: TC_QM_054
Module: Reconfigurable Hardware Machines sub-tree item.
Summary: Verify new MPCCNode to **Reconfigurable Hardware Machines** sub tree item can be added.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Right click on **Reconfigurable Hardware Machines** configuration tree and click on **Add MPCCNode to 'Reconfigurable Hardware Machines**.

3) Fill in data for **node name, host node address, monitoringPort, commandPort, number of CPUs, number of DEFs** field(s) and save the info using CTRL+S.

Workflow Diagram (Explaining test steps):
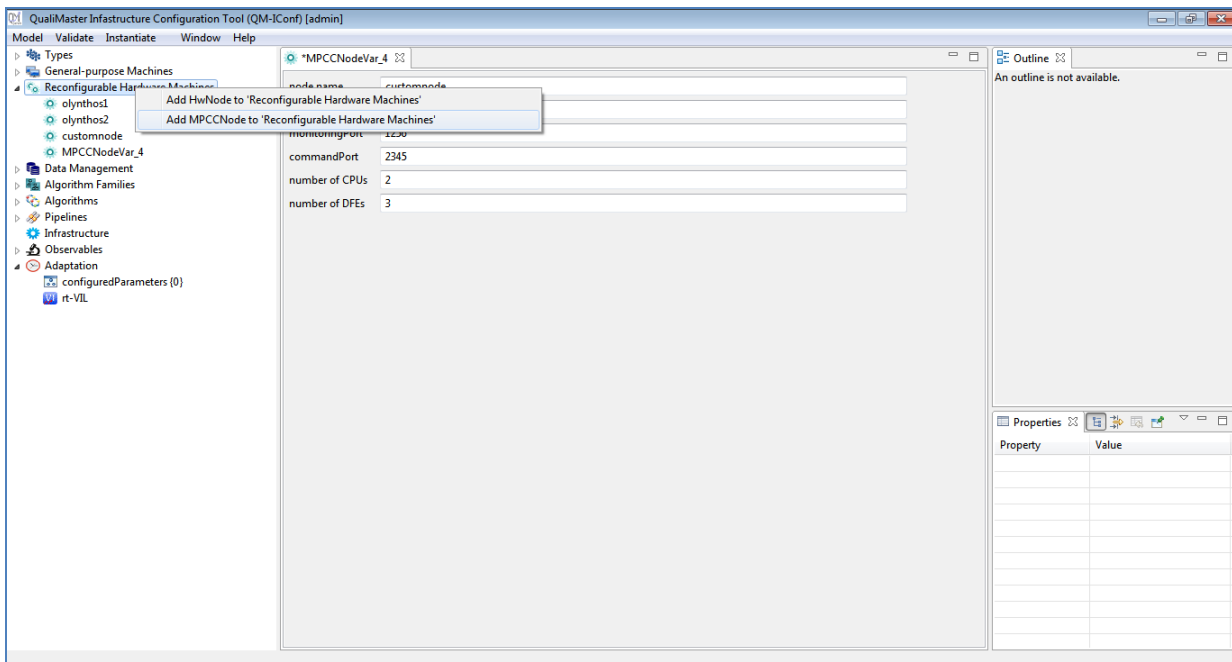

Figure 57: Create new MPCCNode to Reconfigurable Hardware Machine

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

New MPCCNode to **Reconfigurable Hardware Machines** sub-tree item should get created.

Execution Status: Pass

Test Case ID: TC_QM_055
Module: Reconfigurable Hardware Machines sub-tree item.
Summary: Verify existing MPCCNode to **Reconfigurable Hardware Machines** sub tree item can be edited.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Expand **Reconfigurable Hardware Machines** configuration tree and double-click on an existing MPCCNode to **Reconfigurable Hardware Machines** sub-tree item.

3) Edit data for **node name/host node address / monitoringPort / commandPort / number of CPUs / number of DEFs** field(s) and save the info using CTRL+S.

Workflow Diagram (Explaining test steps):
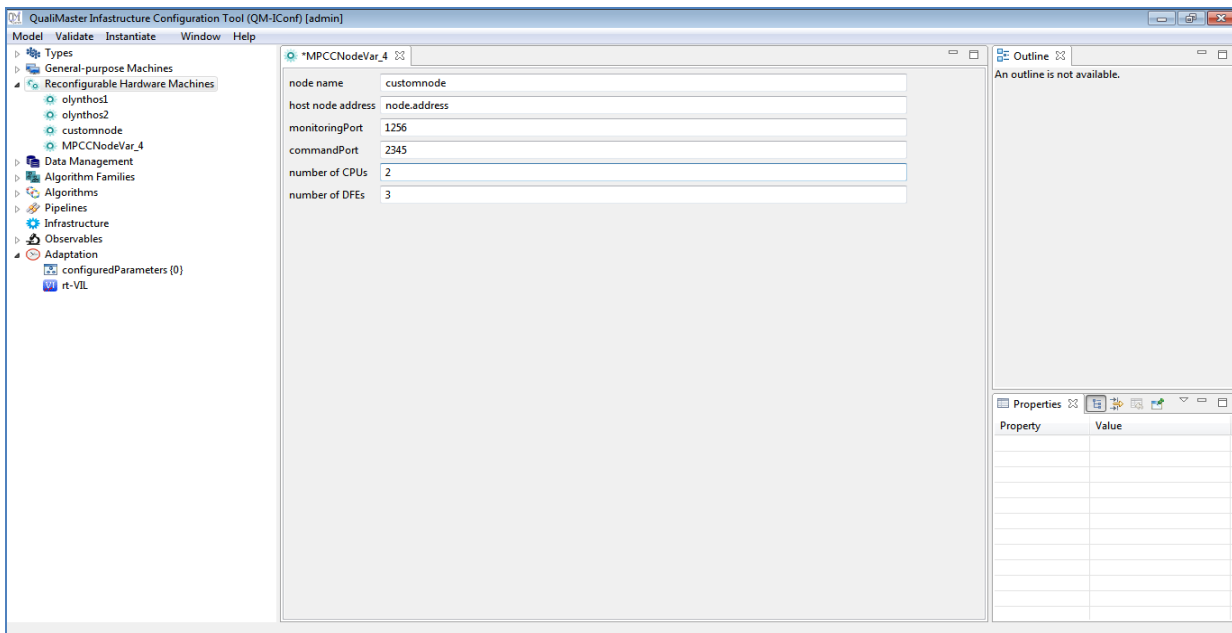

Figure 58: Edit existing MPCCNode to Reconfigurable Hardware Machine

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

Edited data should get saved for the **MPCCNode to Reconfigurable Hardware Machine** sub-tree item.

Execution Status: Pass

Test Case ID: TC_QM_056
Module: Data Management sub-tree item.
Summary: Verify new Data Source to **Data Management** sub tree item can be added.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Right click on **Data Management** configuration tree and click on **Add Data Source to 'Data Management'**.

3) Fill in data for **name, description,** browse **artifact,** fill in **storage location,** select **storage strategy,** fill in **timeLine, cutoffCapacity, physical data source** field(s). Add a new data item to **input fields**. To add, right-click on anywhere on the right-side input segment for **input fields** and click on **Add a new data item**. Add a new parameter to **parameters**. To add, right-click on anywhere on the right-side input segment for **parameters** and click on **Add a new parameter**. Input source CIs. Add a new constraint to **constraints**. To add, right-click on anywhere on the right-side input segment for **constraints** and click on **Add constraint**.
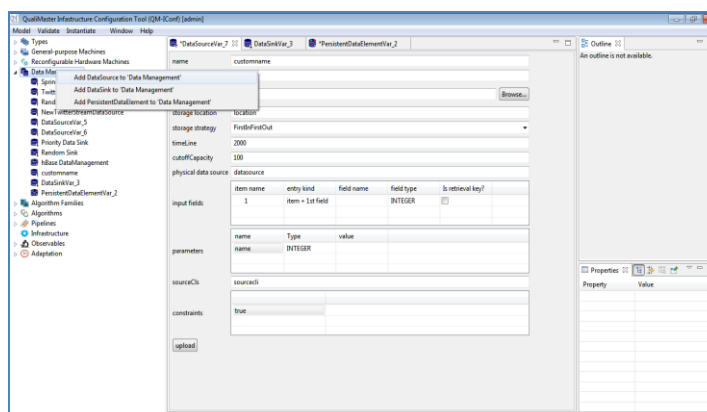
4) Save the info using CTRL+S.

Workflow Diagram (Explaining test steps):

Figure 59: Create new Data Source to Data Management

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

New Data Source to **Data Management** sub-tree item should get created.

Execution Status: Fail

Bug ID: BR_QM_011

Test Case ID: TC_QM_057
Module: Data Management sub-tree item.
Summary: Verify existing Data Source to **Data Management** sub tree item can be edited.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Expand **Data Management** configuration tree and double-click on an existing Data Source to **Data Management** sub-tree item.

3) Edit data for **name/description/artifact/storage location/storage strategy/timeline/cutoffCapacity/physical data source/ input fields/parameters/ sourceCls/constraints** field(s) and save the info using CTRL+S.
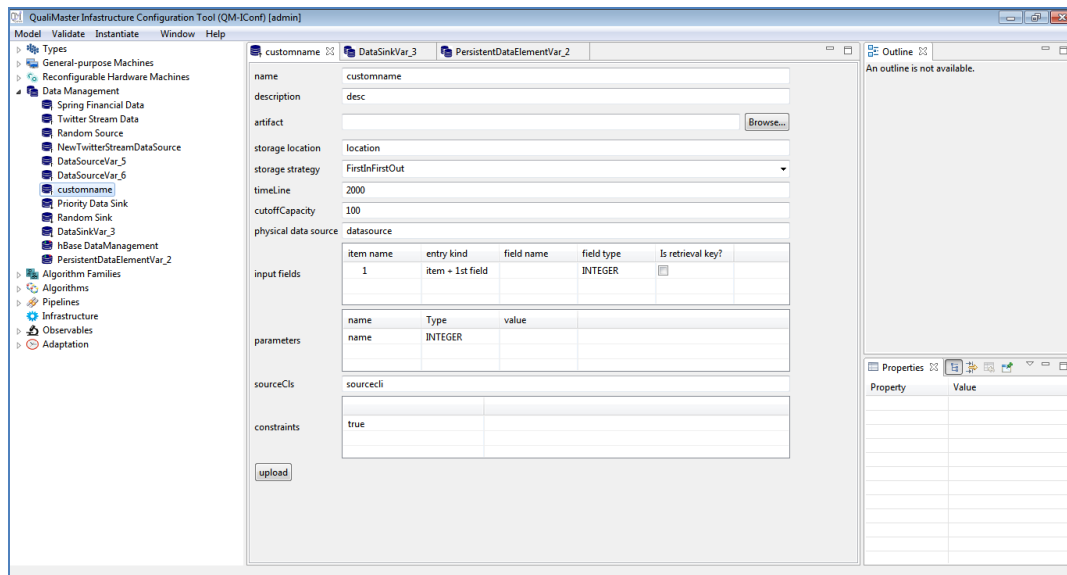
Workflow Diagram (Explaining test steps):

Figure 60: Edit existing Data Source to Data Management

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

Edited data should get saved for the ***Data Source to Data Management*** sub-tree item.

Execution Status: Fail
Bug ID: BR_QM_011

Test Case ID: TC_QM_058
Module: Data Management sub-tree item.
Summary: Verify new Data Sink to **Data Management** sub tree item can be added.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Right click on **Data Management** configuration tree and click on **Add Data Sink to 'Data Management'**.

3) Fill in data for **name, description,** browse **artifact,** fill in **storage location,** select **storage strategy,** fill in **timeLine, cutoffCapacity** field(s). Add a new data item to **output fields**. To add, right-click on anywhere on the right-side input segment for **output fields** and click on **Add a new data item**. Add a new parameter to **parameters**. To add, right-click on anywhere on the right-side input segment for **parameters** and click on **Add a new parameter**. Input source CIs. Add a new constraint to **constraints**. To add, right-click on anywhere on the right-side input segment for **constraints** and click on **Add constraint**.

4) Save the info using CTRL+S.
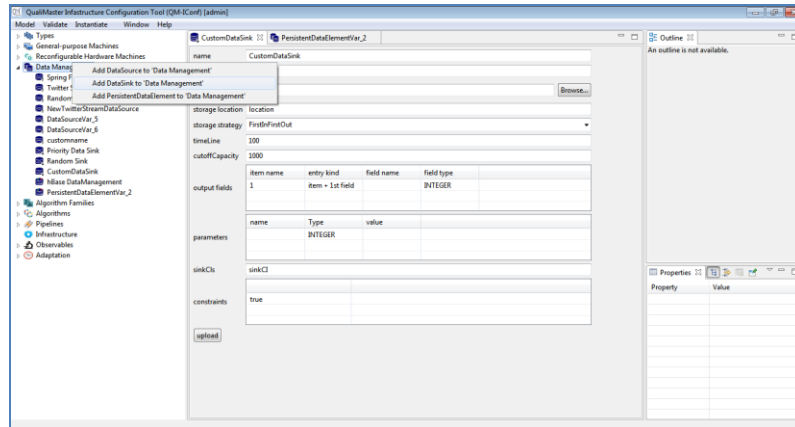
Workflow Diagram (Explaining test steps):

Figure 61: Create new Data Sink to Data Management

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome:

New Data Sink to **Data Management** sub-tree item should get created.

Execution Status: Fail

Bug ID: BR_QM_012

Test Case ID: TC_QM_059
Module: Data Management sub-tree item.
Summary: Verify existing Data Sink to **Data Management** sub tree item can be edited.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Expand **Data Management** configuration tree and double-click on an existing Data Sink to **Data Management** sub-tree item.

3) Edit data for **name/description/artifact/storage location/storage strategy/timeline/cutoffCapacity/output fields/parameters/ sourceCls/constraints** field(s) and save the info using CTRL+S.
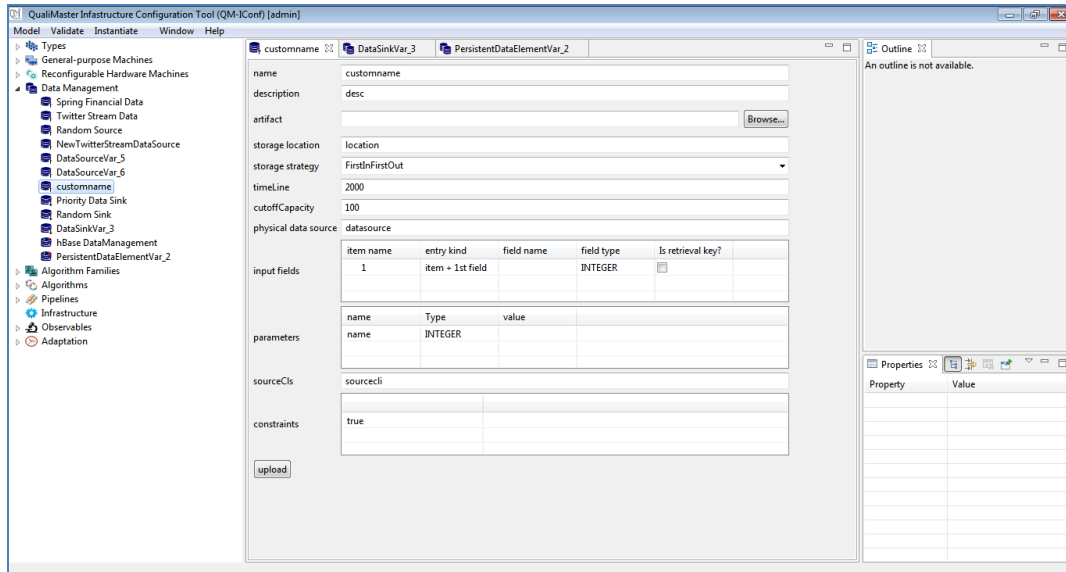
Workflow Diagram (Explaining test steps):

Figure 62: Edit existing Data Sink to Data Management

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

Edited data should get saved for the ***DataSink to Data Management*** sub-tree item.

Execution Status: Fail
Bug ID: BR_QM_012

Test Case ID: TC_QM_060
Module: Data Management sub-tree item.
Summary: Verify new PersistentDataElement to **Data Management sub** tree item can be added.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Right click on **Data Management** configuration tree and click on **Add PersistentDataElement to 'Data Management'**.

3) Fill in data for **name, description,** browse **artifact,** fill in **storage location,** select **storage strategy,** and fill in timeLine, cutoffCapacity field.

4) Save the info using CTRL+S.

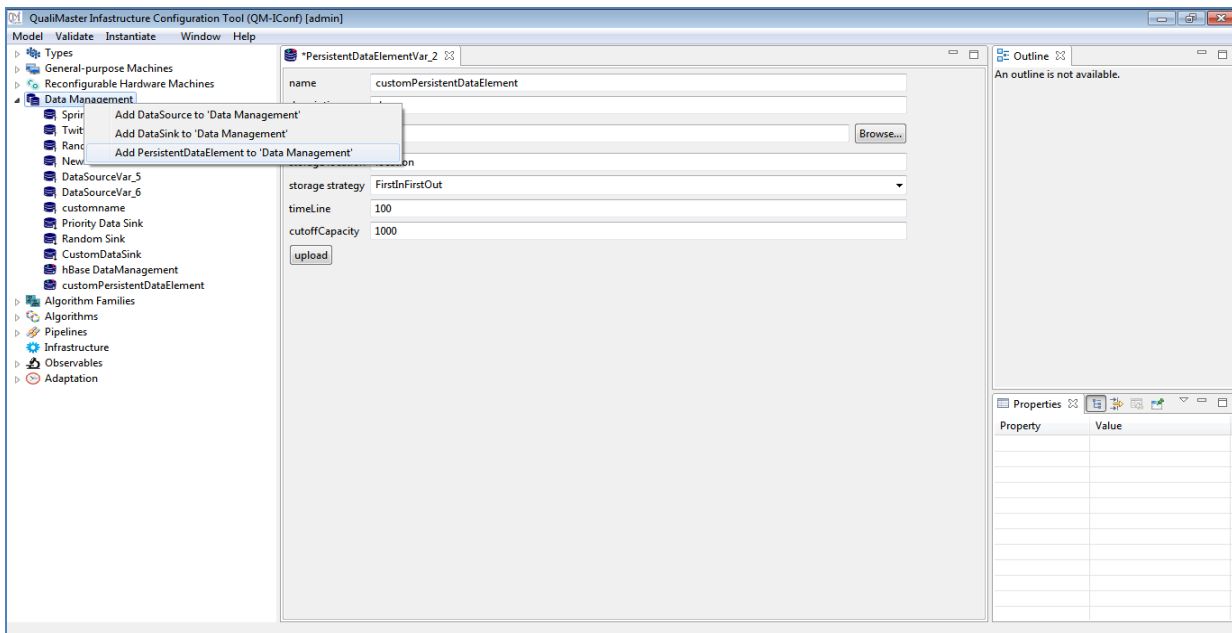**Workflow Diagram (Explaining test steps):**

Figure 63: Create new Persistent Data Element to Data Management

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome: New **Persistent Data Element** to **Data Management** sub-tree item should get created.

Execution Status: Fail

Bug ID: BR_QM_013

Test Case ID: TC_QM_061
Module: Data Management sub-tree item.
Summary: Verify existing Persistent Data Element to **Data Management** sub tree item can be edited.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Expand **Data Management** configuration tree and double-click on an existing Persistent Data Element to **Data Management** sub-tree item.

3) Edit data for **name/description/artifact/storage location/storage strategy/timeline/cutoffCapacity** field(s) and save the info using CTRL+S.
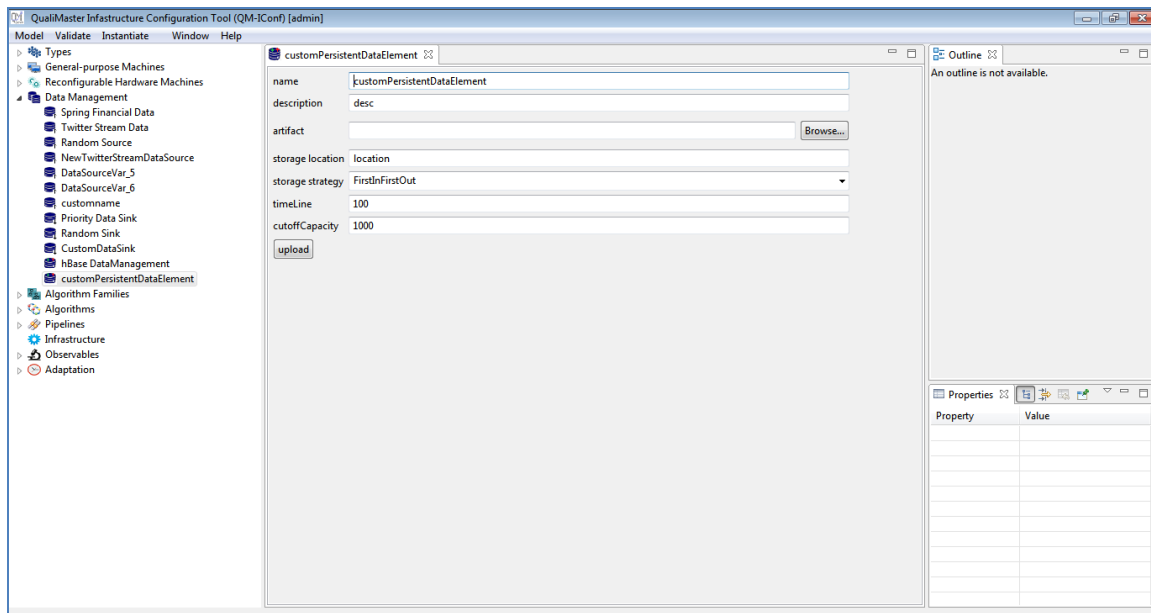
Workflow Diagram (Explaining test steps):

Figure 64: Edit existing Persistent Data Element to Data Management

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

Edited data should get saved for the **Persistent Data Element *to Data Management*** sub-tree item.

Execution Status: Fail

Bug ID: BR_QM_013

Test Case ID: TC_QM_062
Module: Algorithm Families sub-tree item.
Summary: Verify new Family to **Algorithm Families** Sub tree item can be added.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Right click on **Algorithm Families** configuration tree and click on **Add Family to 'Algorithm Families'**.

3) Fill in data for **name, description** field(s). Add a new data item to **input** and **output fields**. To add, right-click on anywhere on the right-side input segment for **input** and **output fields** and click on **Add a new data item**. Add a new parameter to **parameters**. To add, right-click on anywhere on the right-side input segment for **parameters** and click on **Add a new parameter**. Choose option from the list present in **family members.**

4) Save the info using CTRL+S.

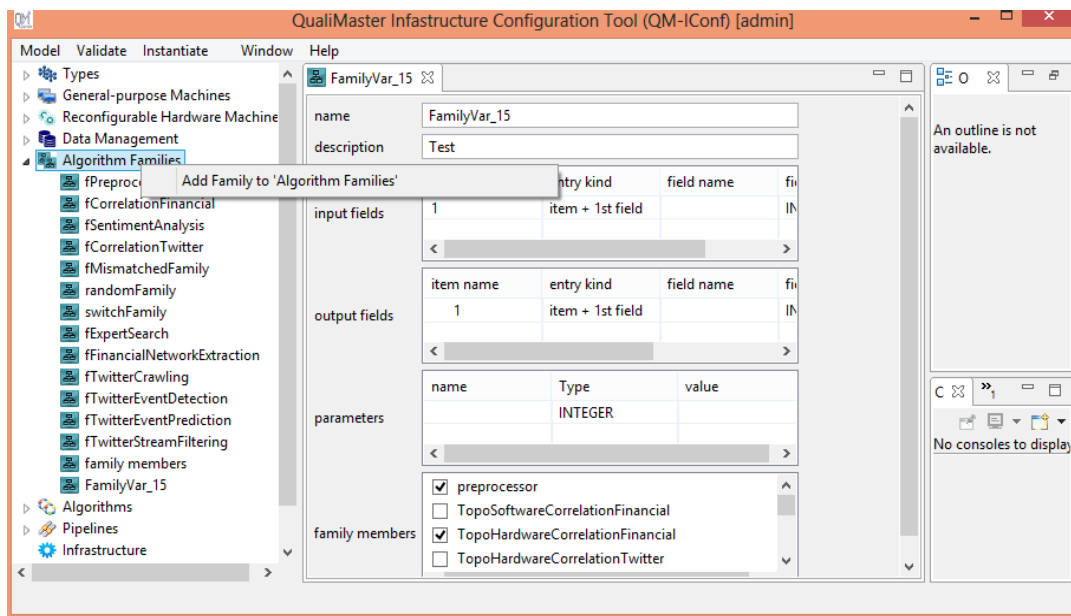**Workflow Diagram (Explaining test steps):**

Figure 65: Create new Family to Algorithm Families

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome: New **Family** to **Algorithm Families** sub-tree item should get created.

Execution Status: Pass

Test Case ID: TC_QM_063
Module: Algorithm Families sub-tree item.
Summary: Verify new Family to **Algorithm Families** Sub tree item can be edited.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Expand **Algorithm Families** configuration tree and double-click on an existing Family to **Algorithm Families** sub-tree item.

3) Edit data for **name/description/input field/output fields/parameters/ family members** field(s) and save the info using CTRL+S.
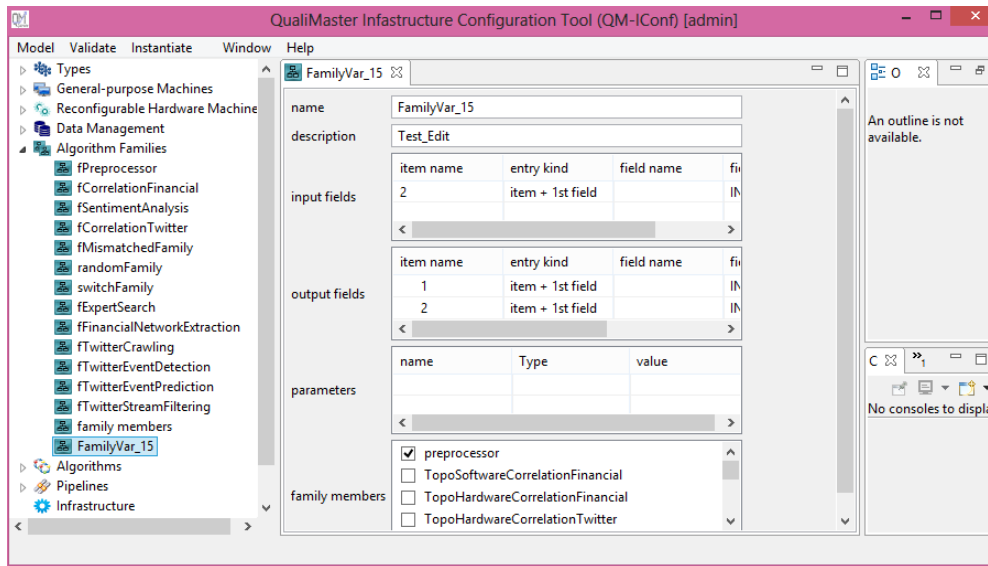
Workflow Diagram (Explaining test steps):

Figure 66: Edit existing family to Algorithm Families

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

Edited data should get saved for the **Family *to Algorithm Families*** sub-tree item.

Execution Status: Fail

Bug ID: BR_QM_014

Test Case ID: TC_QM_064
Module: Algorithms sub-tree item.
Summary: Verify new Algorithm to **Algorithms** Sub tree item can be added.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Right click on **Algorithms** configuration tree and click on **Add Algorithm to 'Algorithms'**.

3) Fill in data for **name** field. Browse for implementation artifacts. Put data for class and Description field. Add a new data item to **input** and **output fields**. To add, right-click on anywhere on the right-side input segment for **input** and **output fields** and click on **Add a new data item**. Add a new parameter to Adaptable **parameters**. To add, right-click on anywhere on the right-side input segment for **parameters** and click on **Add a new parameter**. Set hwNode and algTopologyClass. Choose option from the list present in **Successor.**

4) Save the info using CTRL+S.

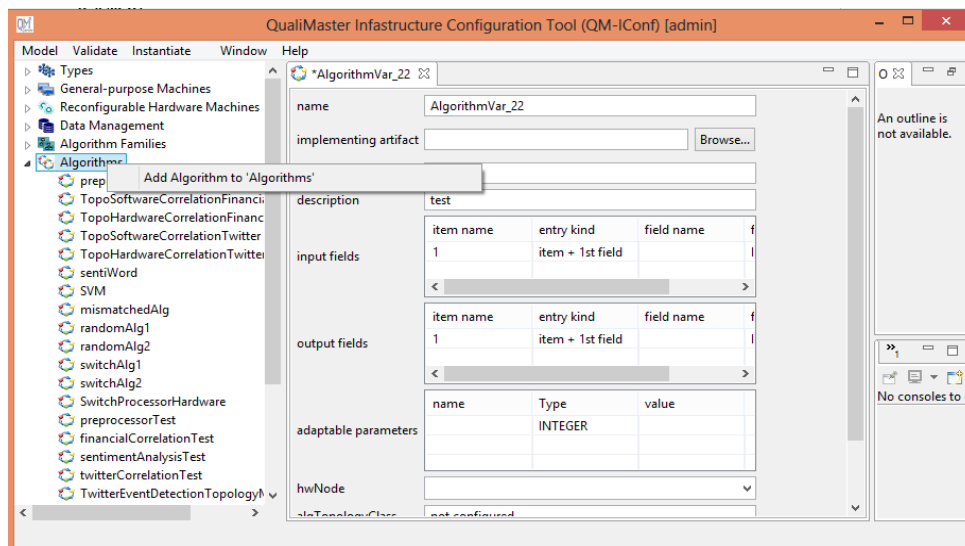**Workflow Diagram (Explaining test steps):**

Figure 67: Create new Algorithm to Algorithms

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.

Expected Outcome: New **Family** to **Algorithm Families** sub-tree item should get created.

Execution Status: Fail

Bug ID: BR_QM_015

Test Case ID: TC_QM_065
Module: Algorithms sub-tree item.
Summary: Verify new Algorithm to **Algorithms** Sub tree item can be edited.

Test Steps:

1) Execute the start program double clicking on **QualiMasterApplication.exe**.

2) Expand **Algorithm** configuration tree and double-click on an existing Family to **Algorithms** sub-tree item.

3) Edit data for **name/ implementation artifacts/Class/description/input field/output fields/adaptable parameters/hwNode/algTopologyClass/ Successor** field(s) and save the info using CTRL+S.

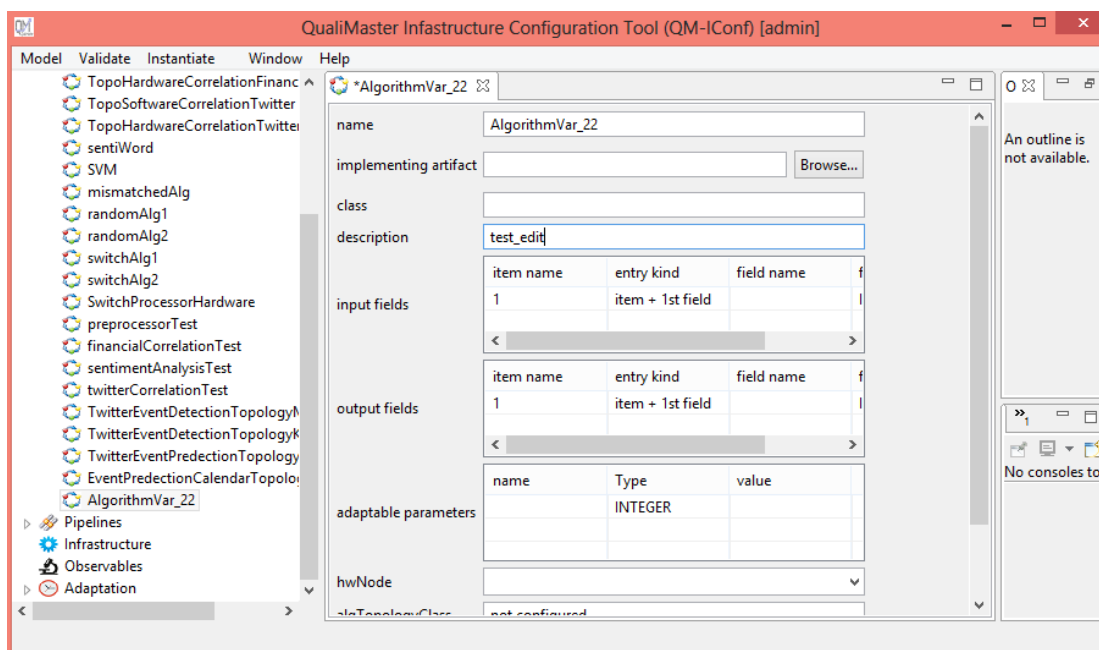**Workflow Diagram (Explaining test steps):**

Figure 68: Edit existing family to Algorithms

Test Environment: Windows 8, 64-bit Operating System, x64-based processor.
Expected Outcome:

Edited data should get saved for the ***Algorithm to Algorithms*** sub-tree item.

Execution Status: Fail
Bug ID: BR_QM_015

SUMMARY OF TESTS (make this headline more prominent)

OVERALL TESTING

• **Total Incidents: 15** (I would change this part of the text below from bolt to normal fonts.)

• **Open or Unresolved incidents: 15**

• **Resolved: 0**

• **Major priority Issues: 6**

MAJOR PRIORITY ISSUES

There are 6 major issues found during the course of our testing process. Here is the list:

- **Open Issues (Bug IDs): BR_QM_001, BR_QM_011, BR_QM_012, BR_QM_013, BR_QM_014, BR_QM_015** (change from bolt to normal fonts)
  (add a text-description of all bug-ID-codes here)

- **Resolved Issues (Bug IDs) : None**

There are 6 major priority open issues that need to be fixed. <mark>(Name these 6 issues here in the text end describe them for a non-expert (reviewer).)</mark>
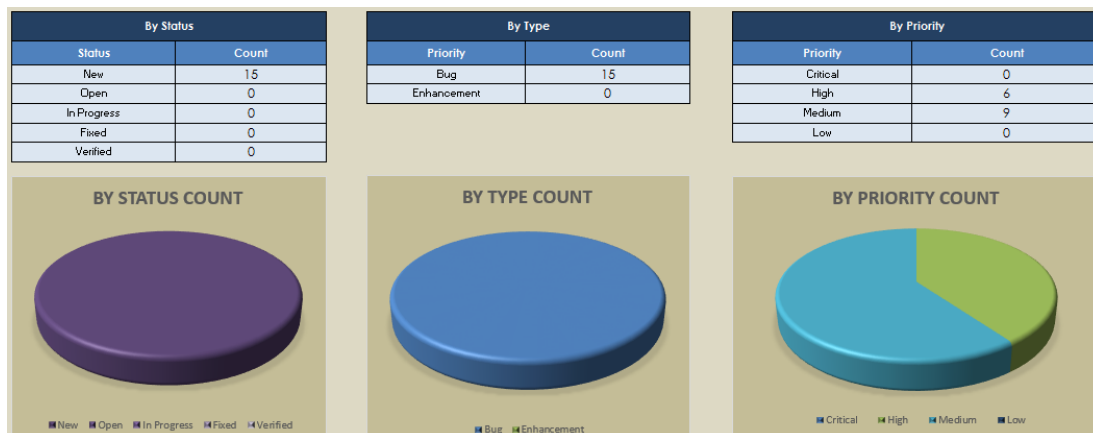
By Status			By Type			By Priority	
Status	Count		Priority	Count		Priority	Count
New	15		Bug	15		Critical	0
Open	0		Enhancement	0		High	6
In Progress	0					Medium	9
Fixed	0					Low	0
Verified	0						

Figure 69. Pipeline configuration testing summary <mark>(add short description/keywords of the three images here)</mark>

3.3 Design environment

As the design environment is a new software development and as it is in an on-going process of development, many test cases didn't get a complete 'Pass'. This is mainly based on the facts, that
- The installation procedure of the design environment does not yet cover different installation languages
- Avoiding wrong usage of the software is only partially implemented
- User management functionalities are only temporarily implemented on the client side. These functions will move to the server side during the next development steps

Test Case ID: TC_QMA_001
Module: Installation
Summary: Verify installation of **QMApplicationsSetup.exe**.

Test Steps:

1) **Download QMApplicationsSetup.exe application.**
2) Go to download directory and execute the program by double clicking on **QMApplicationsSetup.exe** and Select **Yes** option to install the application. Otherwise choose **No** option.
3) Choose English/ German as application Language.
4) Click on **Next/Cancel** button from the Language Selection Widget.
5) Click on **Browse, Back, Next** and **Cancel** button from **Destination Folder** widget.
6) Click on **Back, Next** and **Cancel** button from **Ready to Install the Program** widget.
7) Click on **Cross sign** or **Cancel button** from S**etup Status** widget.
8) Click on **Cross sign** or **Finish** button from **Installation Complete** widget.

Workflow Diagram (Explaining test steps):
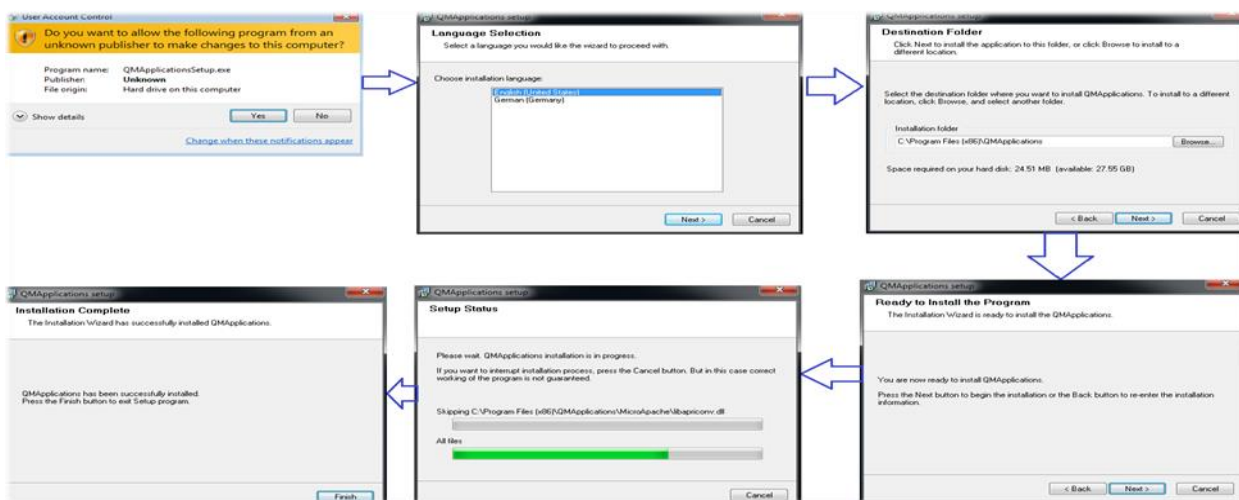

Figure 70. installation steps of QMApplicationsSetup application

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

1) Application should be downloaded successfully and should be visible in the proper directory.
2) Double clicking on **QMApplicationsSetup.exe** User Account control Popup opens choosing **Yes** option user should be able to see the Language selection option of the application. Choosing **No** option user can exit from the popup.
3) Application Language should be as per user sets the application language during installation.
4) Clicking on **Next** button from **Language Selection** Widget user can proceed to the application installation. Choosing **Cross** sign present in the top-right corner or **Cancel** button, abort warning popup shows. In abort warning popup clicking on **Yes** button, **Installation Aborted** popup shows. Clicking on **Ok** button or pressing **Cross** sign user can abort the installation process. Choosing **No** option user button abort warning popup disappears and user stays at **Language Selection** widget.
5) Clicking on **Browse** button from **Destination Folder** widget user can set the destination location of their choice from the local PC storage during installation of the application. Clicking on **Back,** user can back to the previous widget. Clicking on **Next** button, user can proceed the installation procedure of the application and if the specified folder exists a pop up shows. Clicking on **Yes** it overwrites the file otherwise it stays at the same widget. Clicking on **Cross** sign present in the top-right corner or **Cancel** button, abort warning popup shows**.** In abort warning popup clicking on **Yes** button, **Installation Aborted** popup shows. Clicking on **Ok** button or pressing **Cross** sign user can abort the installation process. Choosing **No** option user button abort warning popup disappears and user stays at **Destination Folder** widget.

6) Clicking on **Back from Ready to Install the Program,** user can back to the previous widget. Clicking on **Next** button, user can proceed the installation procedure and sees the S**etup Status** progression. Clicking on **Cross** sign present in the top-right corner or **Cancel** button, user can abort the installation procedure.

7) Click on **Cross sign** or **Cancel button** from S**etup Status** widget, **Installation Complete** Widget opens.

8) Clicking on **Cross sign** or **Finish** button from **Installation Complete** widget, application should be installed successfully.

Execution Status: Fail

Bug Id: BR_QMA_01, BR_QMA_02, BR_QMA_03 and BR_QMA_04

Module: Log in
Summary: Verify Log in Functionality of **QMApplicationsSetup.exe**.

Test Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.
2) Put proper username and password in Username and Password field then Click on **Login** button to log in to the application. Otherwise click on **Cancel** button

Workflow Diagram (Explaining test steps):

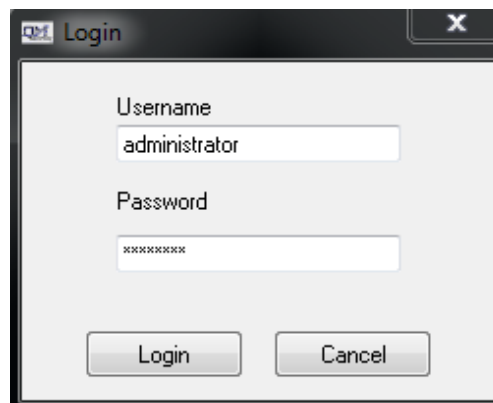Figure 71. : Log in authentication of QMApplicationsSetup application

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

1) Put valid username and password then clicking on **Login** button user can successfully log in to the application. Putting invalid username and password then clicking on **Login** button user should not be able to successfully log in to the application.

2) Click on **Cross** sign present on the top-right corner of the **Login** widget or clicking on **Cancel** button, user should not be able to log in to the application. Login widget get closed.

Execution Status: Fail

Bug Id: BR_QMA_05

Test Case ID: TC_QMA_003
Module: View Management
Summary: Verify the View management functionality of **QMApplicationsSetup application**

Test Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.
2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.
3) Now resize the application main window towards right to left and left to right or up and down.

Workflow Diagram (Explaining test steps):

Figure 72. View management of QMApplicationsSetup application

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

Application should be launched successfully and Main window of **QMApplicationsSetup** contains **Data, Process and Visualization** tab. On top of the application window there is Configuration option present. Application window size should be decreased to a fixed dimension.

Execution Status: Pass

Test Case ID: TC_QMA_004

Module: Configuration Management

Summary: Verify the Configuration functionality of QMApplicationsSetup application

Test Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.

2) Put valid username and password in Username and Password field then Click on Login button to log in to the application.

3) Now click on Configuration option present on the application main window.

4) Click on New Configuration, Open Configuration, Save Configuration and Exit option one after another.
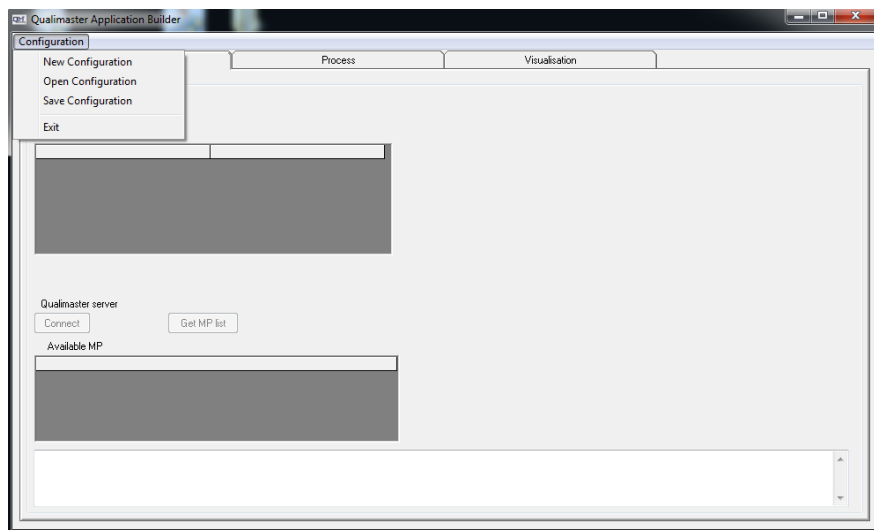
Workflow Diagram (Explaining test steps):

Figure 73. Configuration of QMApplicationsSetup application

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

1) Clicking on **Configuration,** user should be able to see **New Configuration, Open Configuration, Save Configuration** and **Exit** option.

2) Choosing **New Configuration,** user can create a new configuration. Clicking on **Open Configuration,** user can open previously saved configuration. Selecting **Save Configuration,** user can save the current configuration. Clicking on **Exit** option application should be closed.

Execution Status: Fail

Bug Id: BR_QMA_06

Test Case ID: TC_QMA_005

Module: Data Tab

Summary: Verify the Data Tab functionality of **QMApplicationsSetup application**

Test Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.
2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.
3) Now click on **Data** tab option present on the application main window.
4) Then Click on **Add new Stream** button to create a new data stream. To create new data stream put data in **Realtime server IP, Port, Register command, Register response, Unregister command, Unregister response, Request list command, Request list response** and other require data in **Stream details** window**.**
5) Put check for **Stream is active** checkbox and click on **OK** or **Cancel** button.
6) After creating a data stream double click on created **data stream** to edit it.
7) Click on **Connect** button under **Qualimaster server** keeping at least one Stream active.
8) After connection set up click on **Get MP list** button.
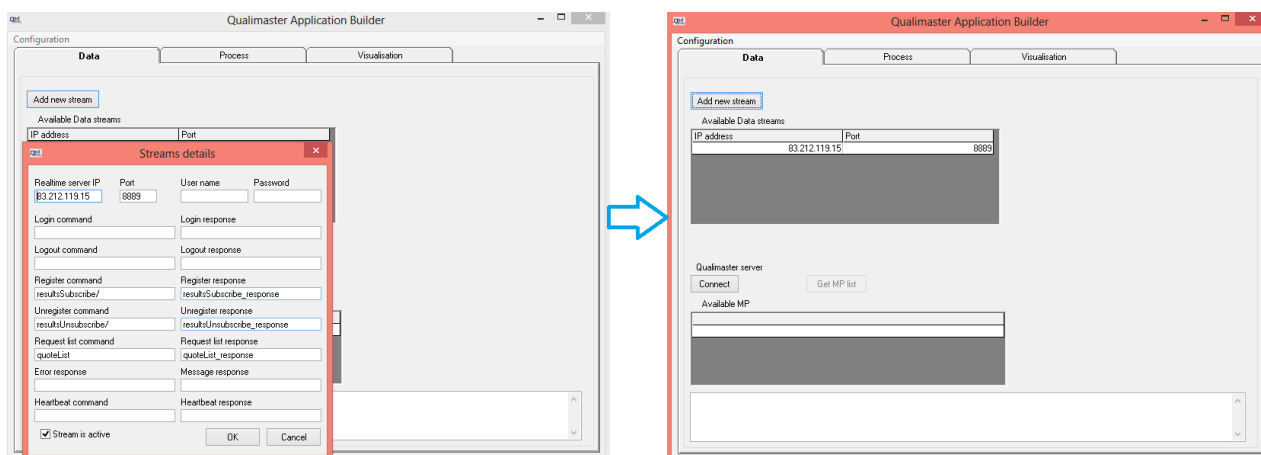
Workflow Diagram (Explaining test steps):

Figure 74: Adding a new stream from Data tab of QMApplicationsSetup application

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

1) Clicking on **Add new Stream** button, **Stream details** window should open with proper UI. Putting proper data in **Stream details** window and click on **OK** button user should be able to create a new Data Stream. Otherwise, Clicking on Cross sign or **Cancel** button, **Stream details** window should get closed.

2) If user don't check on **Stream is active** checkbox of any created data stream, The **Connect** and **Get MP list** button should not work.

3) Double click on created data stream, the created **Stream details** window opens and user should be able to edit the previous data stream. User should not be able to active two data stream at same time an alert should come for this.

4) Clicking on **Connect** button there should be a message **QM SERVER:Connection success** in the bottom **Status area.**

5) After connection set up click on **Get MP list** button, it should show all available list of MP in the under **Available MP** section. User should be able to scroll up and down to see all the present MP list.

Execution Status: Fail

Bug Id: BR_QMA_07, BR_QMA_08, BR_QMA_09, BR_QMA_10

Test Case ID: TC_QMA_006

Module: Process Tab

Summary: Verify the Process Tab functionality of **QMApplicationsSetup application**

Test Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.

2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.

3) Now click on **Process** tab option present on the application main window.

4) Now click on **Add function** button to add new function. Then put name of the function in the **Function name** window and click on **OK** button otherwise click on **cross** or **Cancel** button.

5) Try to create two functions with same name.

6) Click on **Delete function** button to delete created function.
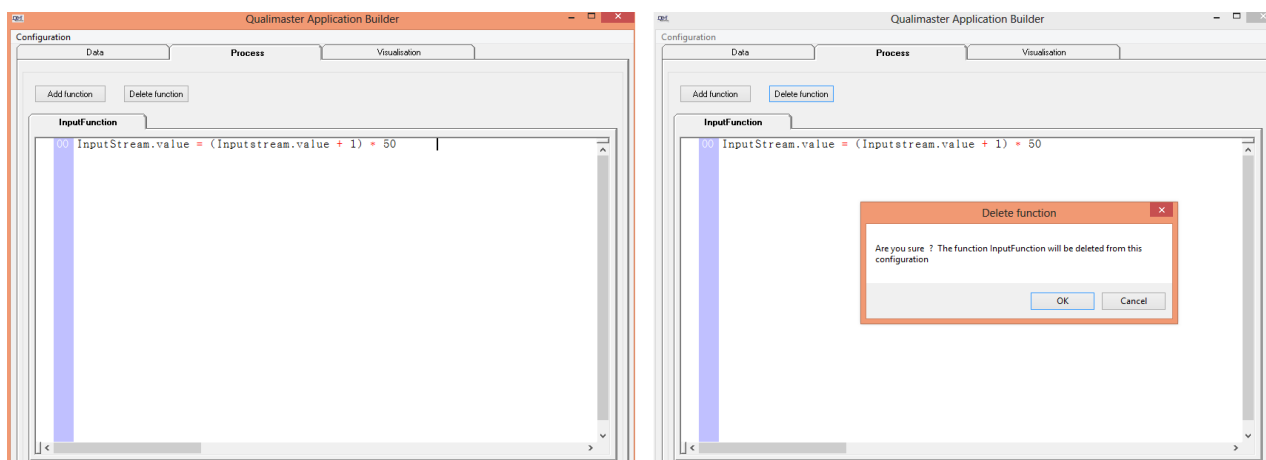
Workflow Diagram (Explaining test steps):

Figure 75. Addition and Deletion of a Function of QMApplicationsSetup application

Expected Outcome:

1) Clicking on **Add function** button, **Function name** window should be opened. Then after putting function name click on **OK** button, user should be able to create a new function. Otherwise, click on **cross** or **Cancel** button, **Function name** window should get closed.

2) User should not be able to create two functions with same name. If user want to add function with same name a pop up should be opened. Clicking on **OK or Cross** sign **popup** should get closed.

3) Clicking on **Delete function** button to user should be able to delete created function.

Execution Status: Fail

Bug Id: BR_QMA_11, BR_QMA_12, BR_QMA_13

Test Case ID: TC_QMA_007

Module: Visualisation Tab

Summary: Verify the Visualisation Tab functionality of **QMApplicationsSetup application**

Test Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.
2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.
3) Now click on **Visualisation** tab option present on the application main window.
4) Now click on **Add more sheets** button to add new sheet. Then put name for the new sheets in the **Sheet Name** window and click on **OK** button otherwise click on **cross** or **Cancel** button.
5) Try to create two sheets with same name.
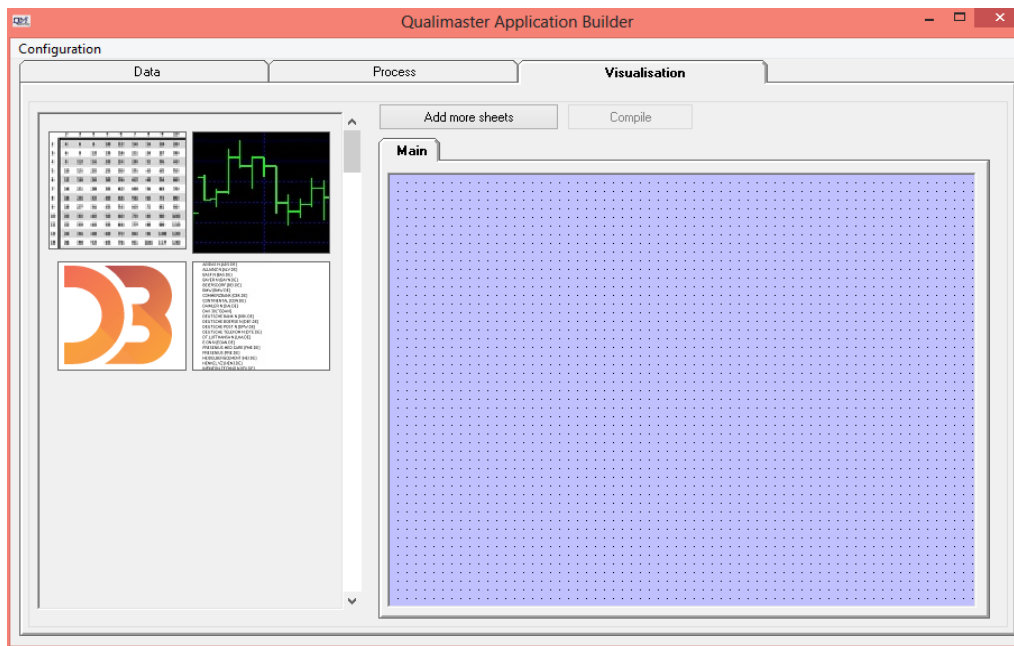
Workflow Diagram (Explaining test steps):

Figure 76. Function of Visualisation tab of QMApplicationsSetup application

Expected Outcome:

1) Clicking on **Visualisation** tab, this should be open with proper UI with four visualisations like **Grid, Chart, D3 control** and **List control.** Click on **Add more sheets** button, **Sheet name** window should be opened. Then after putting sheet name click on **OK** button, user should be able to create a new sheet. Otherwise, click on **cross** or **Cancel** button, **sheet name** window should get closed.

2) Users should not be able to create two sheets with same name. If users want to add function with same name a pop up should be opened. Clicking on **OK or Cross** sign **popup** should get closed.

3) There should be an option to delete created sheet.

Execution Status: Fail

Bug Id: BR_QMA_14, BR_QMA_15, BR_QMA_16

Module: Visualisation Tab

Summary: Verify the functionality of Grid option under Visualisation Tab of **QMApplicationsSetup application**

Test Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.

2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.

3) Go to **Data** tab and add new data stream and keep the stream active by checking the **Stream is Active** check box.

4) Connect to the **Qualimaster server** and **get MP list.**

5) Now click on **Visualisation** tab option present on the application main window.

6) Drag on drop the Grid control from left side menu to right section.
7) Right click on Grid and choose **Select data set** option.
8) Now add 5 to 10 market players from Select Pair(s) section.
9) Save the configuration and press **Compile** button to see the result.
10) To delete the visualisation right click on sheet and select **Delete object** option.
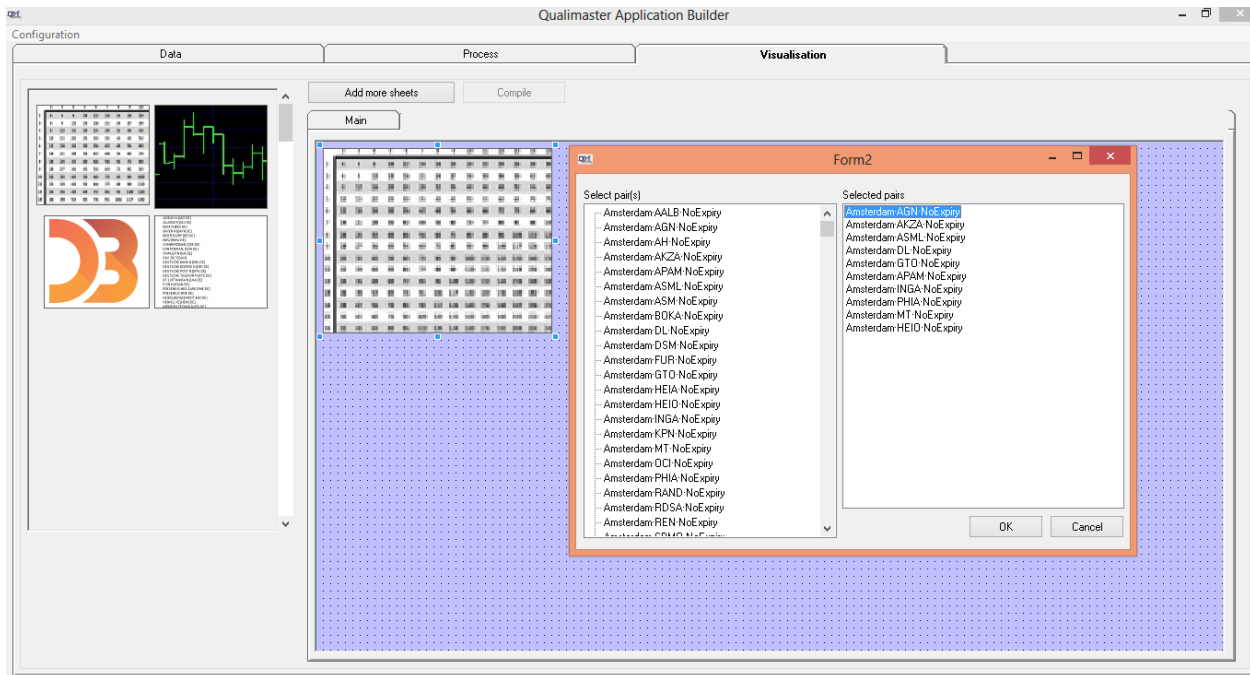
Workflow Diagram (Explaining test steps):

Figure 77. Function of Grid option under Visualisation tab of QMApplicationsSetup application

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

1) Selecting **Grid** visualisation**. Grid sheet** should be opened with proper UI. It Shows a correlation table for the selected market player pairs
2) User should be able to Save the configuration of the **Grid visualisation.**
3) After saving the configurations, user should be able to Compile the created **Grid visualisation.**
4) Selecting **Delete object** option, user should be able to delete the created chart.

Execution Status: Fail

Bug Id: BR_QMA_17, BR_QMA_18

Module: Visualisation Tab

Summary: Verify functionality of Chart option under Visualisation Tab of **QMApplicationsSetup application**

Test Steps:

1. Open the application double clicking on the "QM Applications" shortcut from the desktop.
2. Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.
3. Go to **Data** tab and add new data stream and keep the stream active by checking the **Stream is Active** check box.
4. Connect to the **Qualimaster server** and **get MP list.**
5. Now click on **Visualisation** tab option present on the application main window.
6. Drag on drop the Chart control from left side menu to right section.
7. Right click on Chart and choose **Select data set** option.
8. Now add 2 market players from Select Pair(s) section.
9. Save the configuration and press **Compile** button to see the result.
10. To delete the visualisation right click on sheet and select Delete object option.

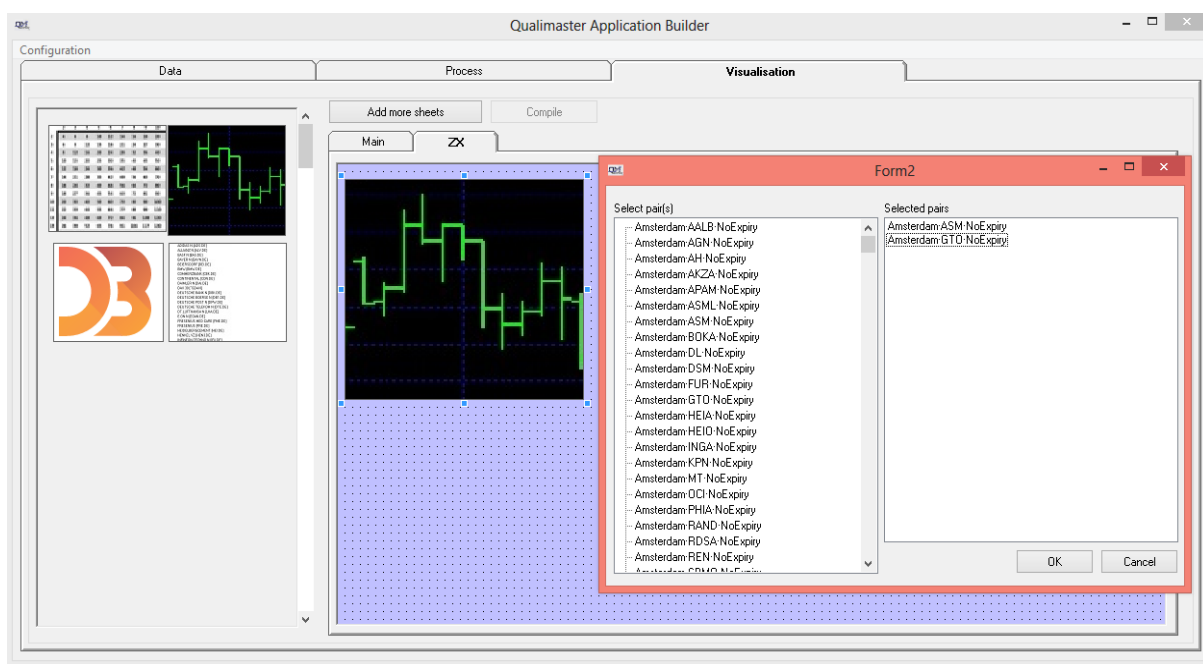**Workflow Diagram (Explaining test steps):**

Figure 78. Function of chart option under Visualisation tab of QMApplicationsSetup application

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

1. Selecting **Chart** visualisation**. Chart sheet** should be opened with proper UI. It shows a financial style chart of the selected market player pairs.
2. User should be able to Save the configuration of the **Chart visualisation**.
3. After saving the configurations, user should be able to Compile the created **Chart visualisation.**
4. Selecting **Delete object** option, user should be able to delete the created chart.

Execution Status: Fail

Bug Id: BR_QMA_18

Module: Visualisation Tab

Summary: Verify functionality of D3 control option under Visualisation Tab of **QMApplicationsSetup application**

Test Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.
2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.
3) Go to **Data** tab and add new data stream and keep the stream active by checking the **Stream is Active** check box.
4) Connect to the **Qualimaster server** and **get MP list.**
5) Now click on **Visualisation** tab option present on the application main window.
6) Drag on drop the D3 control from left side menu to right section.
7) Right click on D3 control and choose **Select data set** option.
8) Now add 2 market players from Select Pair(s) section.
9) Then click on **Set processing code** option. Now choose diagram from Select Diagram dropdown list. To create new diagram click on **Add New Diagram files** button and click on **OK** button**.**
10) Save the configuration and press **Compile** button to see the result.
11) To delete the visualisation right click on sheet and select Delete object option.
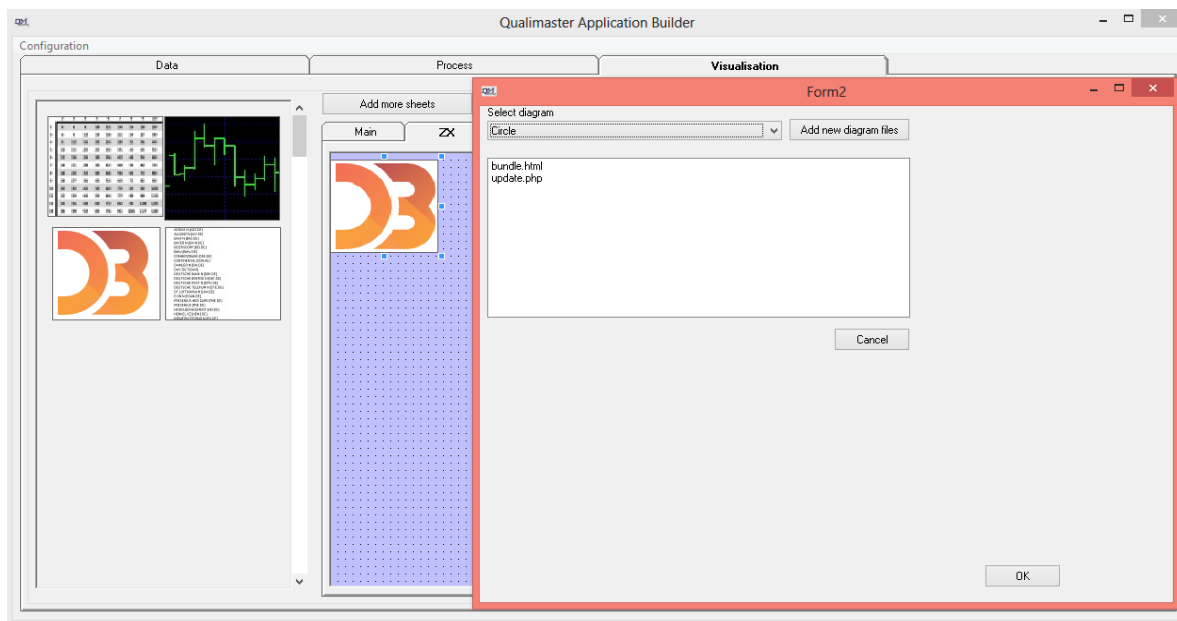
Workflow Diagram (Explaining test steps):

Figure 79. Function of D3 control option under Visualisation tab of QMApplicationsSetup application

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

1) Selecting **D3 control** visualisation**. D3 control** should be opened with proper UI. It shows a flexible control with its own scripting.
2) User should be able to Save the configuration of the **D3 control** visualisation.
3) After saving the configurations, user should be able to Compile the created **D3 control** visualisation.
4) Selecting **Delete object** option, user should be able to delete the created chart.

Execution Status: Fail

Bug Id: BR_QMA_18, BR_QMA_19

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

5) Selecting **D3 control** visualisation**. D3 control** should be opened with proper UI. It shows a flexible control with its own scripting.
6) User should be able to Save the configuration of the **D3 control** visualisation.
7) After saving the configurations, user should be able to Compile the created **D3 control** visualisation.
8) Selecting **Delete object** option, user should be able to delete the created chart.

Execution Status: Fail

Bug Id: BR_QMA_18, BR_QMA_19

Module: Visualisation Tab

Summary: Verify functionality of List control option under Visualisation Tab of **QMApplicationsSetup application**

Test Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.
2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.
3) Go to **Data** tab and add new data stream and keep the stream active by checking the **Stream is Active** check box.
4) Connect to the **Qualimaster server** and **get MP list.**
5) Now click on **Visualisation** tab option present on the application main window.
6) Drag on drop the List control from left side menu to right section.
7) Right click on List control and choose **Select data set** option.
8) Now add 2 market players from Select Pair(s) section.
9) Save the configuration and press **Compile** button to see the result.
10) To delete the visualisation right click on sheet and select **Delete object** option.

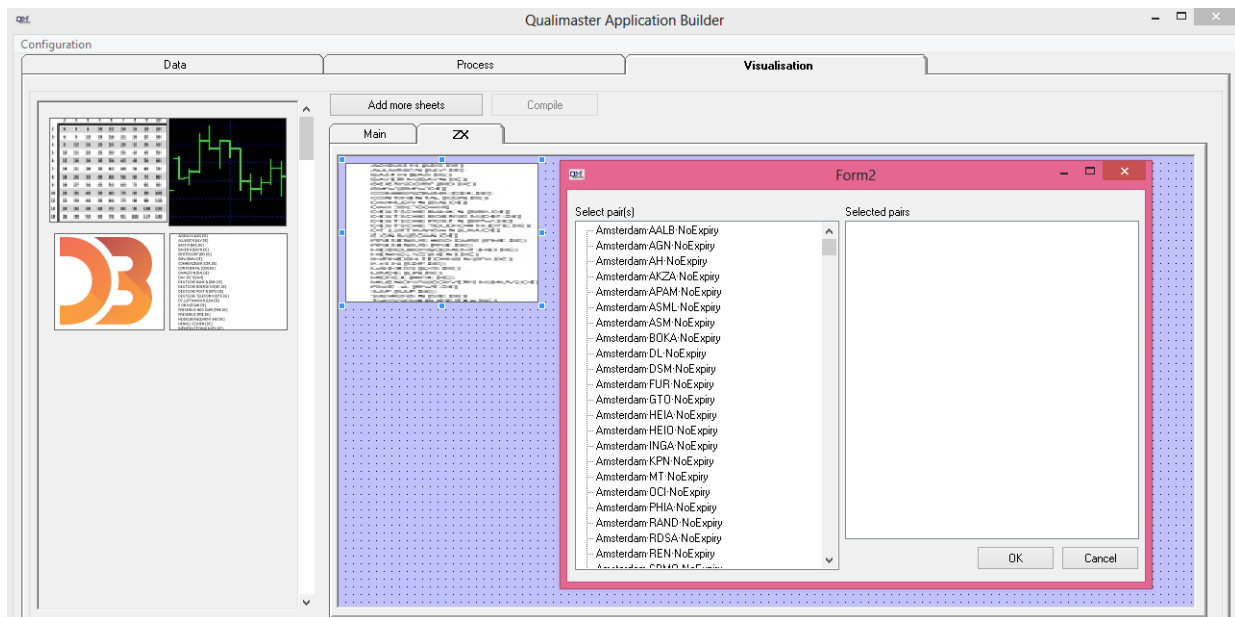**Workflow Diagram (Explaining test steps):**

Figure 80. Function of List control option under Visualisation tab of QMApplicationsSetup application

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

1) Selecting **List control** visualisation**. List control** should be opened with proper UI. It shows a list of market player pairs.
2) User should be able to Save the configuration of the **List control** visualisation.
3) After saving the configurations, user should be able to Compile the created **List control** visualisation.
4) Selecting **Delete object** option, user should be able to delete the created chart.

Execution Status: Fail

Bug Id: BR_QMA_17, BR_QMA_18

3.4 *Stakeholder applications*

Test Case ID: TC_QMS_001
Module: Installation
Summary: Verify installation of **QMApplicationsSetup.exe**.

Test Steps:

1) **Download QMApplicationsSetup.exe application.**
2) Go to download directory and execute the program by double clicking on **QMApplicationsSetup.exe** and Select **Yes** option to install the application. Otherwise choose **No** option.
3) Choose English as application Language.
4) Click on **Next/Cancel** button from the Language Selection Widget.
5) Click on **Browse, Back, Next** and **Cancel** button from **Destination Folder** widget.

6) Click on **Back, Next** and **Cancel** button from **Ready to Install the Program** widget.
7) Click on **Cross sign** or **Cancel button** from S**etup Status** widget.
8) Click on **Cross sign** or **Finish** button from **Installation Complete** widget.
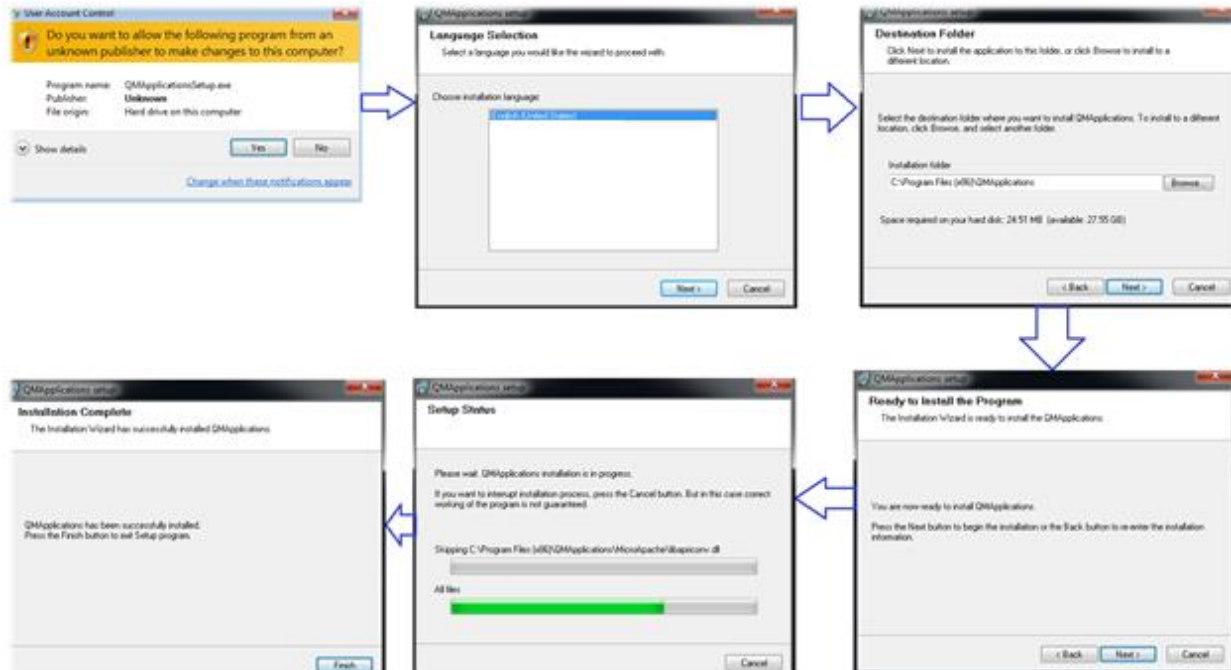
Workflow Diagram (Explaining test steps):

Figure 81. Installation steps of QMApplicationsSetup application

Expected Outcome:

1) Application should be downloaded successfully and should be visible in the proper directory.
2) Double clicking on **QMApplicationsSetup.exe** User Account control Popup opens choosing **Yes** option user should be able to see the Language selection option of the application. Choosing **No** option user can exit from the popup.
3) Application Language should be as per user sets the application language during installation.
4) Clicking on **Next** button from **Language Selection** Widget user can proceed to the application installation. Choosing **Cross** sign present in the top-right corner or **Cancel** button, abort warning popup shows. In abort warning popup clicking on **Yes** button, **Installation Aborted** popup shows. Clicking on **Ok** button or pressing **Cross** sign user can abort the installation process. Choosing **No** option user button abort warning popup disappears and user stays at **Language Selection** widget.
5) Clicking on **Browse** button from **Destination Folder** widget user can set the destination location of their choice from the local PC storage during installation of the application. Clicking on **Back,** user can back to the previous widget. Clicking on **Next** button, user can proceed the installation procedure of the application and if the specified folder exists a pop up shows. Clicking on **Yes** it overwrites the file otherwise it stays at the

same widget. Clicking on **Cross** sign present in the top-right corner or **Cancel** button, abort warning popup shows**.** In abort warning popup clicking on **Yes** button, **Installation Aborted** popup shows. Clicking on **Ok** button or pressing **Cross** sign user can abort the installation process. Choosing **No** option user button abort warning popup disappears and user stays at **Destination Folder** widget.

6) Clicking on **Back from Ready to Install the Program,** user can back to the previous widget. Clicking on **Next** button, user can proceed the installation procedure and sees the S**etup Status** progression. Clicking on **Cross** sign present in the top-right corner or **Cancel** button, user can abort the installation procedure.

7) Click on **Cross sign** or **Cancel button** from S**etup Status** widget, **Installation Complete** Widget opens.

8) Clicking on **Cross sign** or **Finish** button from **Installation Complete** widget, application should be installed successfully.

Execution Status: Pass

Test Case ID: TC_QMS_002
Module: Log in
Summary: Verify Log in Functionality of **QMApplicationsSetup (stakeholder application)**.

Test   **Steps:**

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.
2) Put proper username and password in Username and Password field then Click on **Login** button to log in to the application. Otherwise click on **Cancel** button

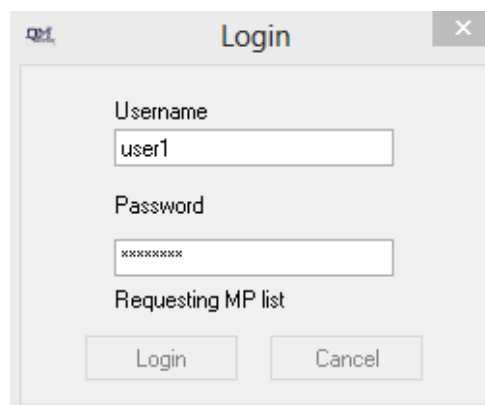**Workflow Diagram (Explaining test steps):**

Figure 82. Log in authentication of QMApplicationsSetup (stakeholder application).

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

1) Put valid username and password then clicking on **Login** button user can successfully log in to the application. Putting invalid username and password then clicking on **Login** button user should not be able to successfully log in to the application and there should be Requesting MP list text.

2) Click on **Cross** sign present on the top-right corner of the **Login** widget or clicking on **Cancel** button, user should not be able to log in to the application. Login widget get closed.

Execution Status: Pass

Test Case ID: TC_QMS_003
Module: View Management
Summary: Verify the View management functionality of **QMApplicationsSetup (stakeholder application)**

Test Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.
2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.
3) Now resize the application main window towards right to left and left to right or up and down.
4) Click on Minimize, Maximize and Cross option present on the top-right corner of the application window.

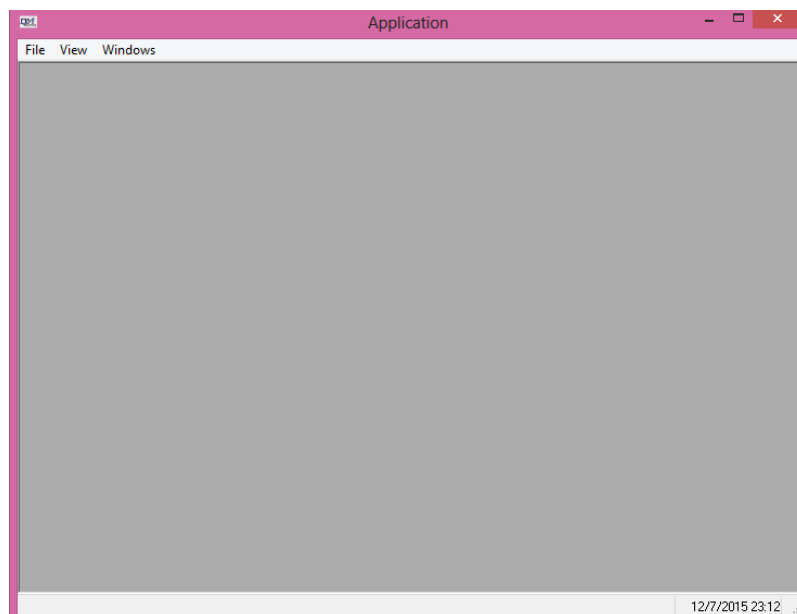**Workflow Diagram (Explaining test steps):**

Figure 83. View management of QMApplicationsSetup (stakeholder application)

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

Application should be launched successfully and Main window of the application contains **File, View** and **Windows** menu. On bottom-right corner user should be able to see the current Date and Time. Clicking on Minimize, Maximize and Cross option application window should get minimized/maximized or closed.

Execution Status: Pass

Test Case ID: TC_QMS_004
Module: File option
Summary: Verify the functionality of **File** option of **QMApplicationsSetup(stakeholder application)**
Test   **Steps:**

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.
2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.
3) Now click on **File** option present on the application main window.
4) Click on **New Setup, Open Setup, Save Setup** and **Exit application** option one after another.
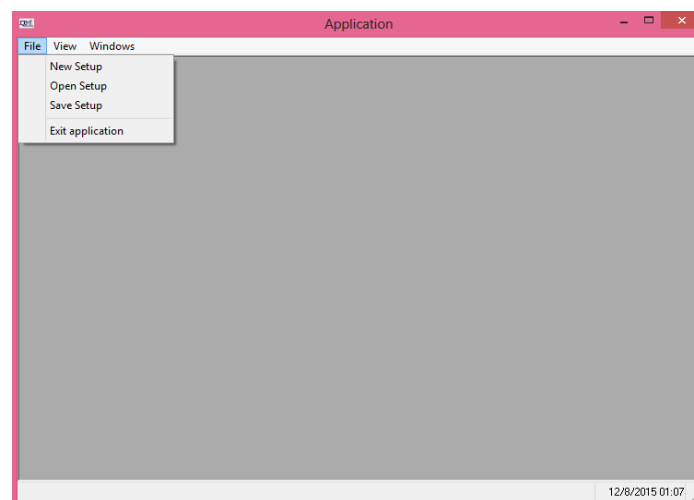

Workflow Diagram (Explaining test steps):

Figure 84. File option of QMApplicationsSetup(stakeholder application).

Test Environment: Windows 7, 64-bit Operating System, x64-based processor.

Expected Outcome:

Clicking on File menu user should be able to see **New Setup, Open Setup, Save Setup** and **Exit application** options. Clicking on **New Setup, Open Setup, Save Setup** and **Exit application** options user should be able to create/save new File setup, Clicking on Save setup option users should be able to Save the created File. Clicking on Exit application option application should get closed.

Execution Status: Fail

Bug Id: BR_QMAS_01

Test Case ID: TC_QMS_005
Module: File option
Summary: Verify the functionality of **View** option of **QMApplicationsSetup(stakeholder application)**

Test   **Steps:**

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.
2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.
3) Now click on **View** option present on the application main window.
4) Click on **Main, Chart, Circle, MultiChart, Multidata** and **List** options one after another and set property right click on the selected sheet.

Workflow Diagram (Explaining test steps):

Figure 85. View option of QMApplicationsSetup (stakeholder application).

Expected Outcome:

1) Clicking on **View** menu user should be able to see **Main, Chart, Circle, MultiChart, Multidata** and **List** options. Clicking on **Main, Chart, Circle, MultiChart, Multidata** and **List** options user should be able to create **Main, Chart, Circle, MultiChart, Multidata** and **List** type of view.
2) User should be able to set properties of the sheet after selecting a sheet and change it's property via right click on the sheet. The selected sheets and their properties can be saved as a setup. Clicking on Multi data sheet it should be opened in IE browser.

Execution Status: Pass

Test Case ID: TC_QMS_006

Module: File option

Summary: Verify the Properties of **Main** sheet under **View** option of **QMApplicationsSetup (stakeholder application)**

Test Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.
5) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.
6) Now click on **View** option present on the application main window.
7) Click on **Main** option then right on the sheet or click on Properties option.
8) From Grid properties window, put Grid Caption, set fore/back color, Grid lines Header, market players etc.
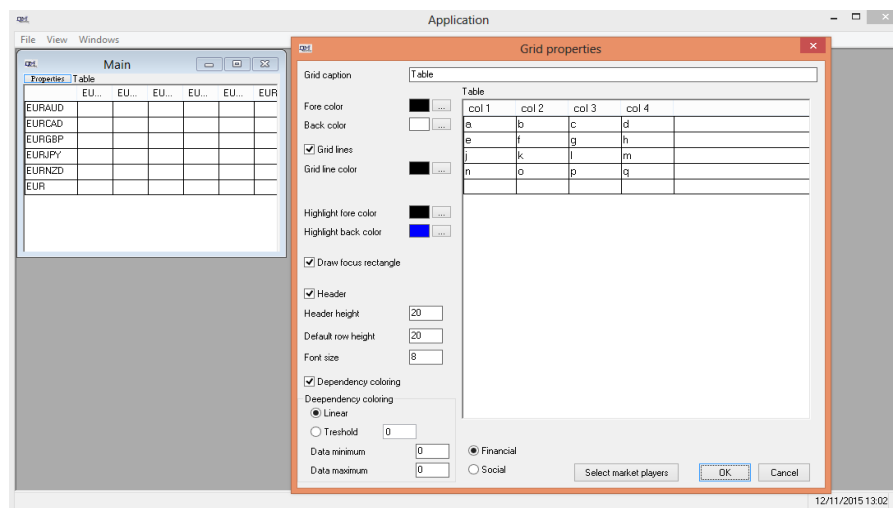
Workflow Diagram (Explaining test steps):

Figure 86. Mail sheet under View option of QMApplicationsSetup (stakeholder application).

Expected Outcome:

Clicking on Main option under **View** menu user should be able to see the **Main** sheet. Then click on Properties option or right click on the sheet user should see Grid properties window. User can add a Grid caption. User can set Fore/back color from the Fore Color and Back color option. Putting check on Grid lines table line can be shown. Putting check on Header option, column name should be shown. User can also select market players from **Select market players** button. Now clicking on **OK** button setting should be saved.

Execution Status: Pass

Test Case ID: TC_QMS_007

Module: File option

Summary: Verify the Properties of **Chart** sheet under **View** option of **QMApplicationsSetup (stakeholder application)**

Test **Steps:**

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.

2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.

3) Now click on **View** option present on the application main window.

4) Click on **Chart** option then right click on the sheet or click on Properties option.

5) From Chart properties window, put Chart Caption, Select market player pair(s) and other settings from Symbol tab. In Chart type tab set chart type and settings. Set various color and scaling settings from **Colors** and **Settings** tab.
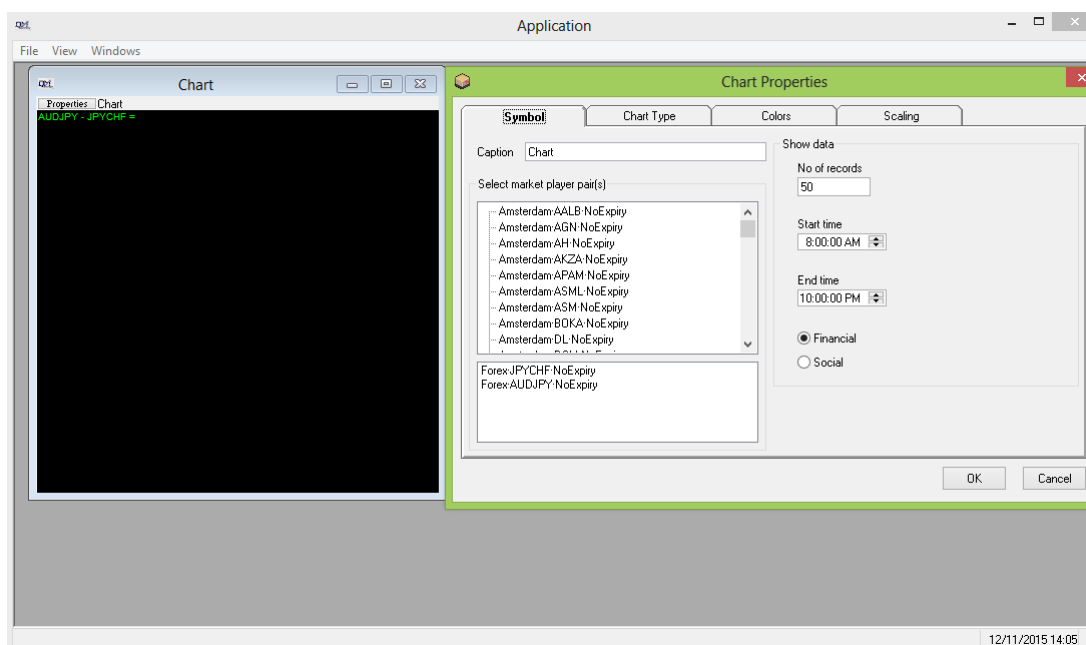
Then click on OK button.

Workflow Diagram (Explaining test steps):

Figure 87. Chart sheet under View option of QMApplicationsSetup (stakeholder application).

Expected Outcome:

From Chart properties window, user can set various properties from **Symbol, Chart type, Colors** and **Scaling** tab. Clicking OK button new properties should be saved.

Execution Status: Pass

Test Case ID: TC_QMS_008

Module: File option

Summary: Verify the Properties of **Circle** sheet under **View** option of **QMApplicationsSetup** (stakeholder application)

Test   **Steps:**

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.

2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.

3) Now click on **View** option present on the application main window.

4) Click on **Circle** option then click on **Properties** option from the sheet.

5) From Circle properties window, put Caption, Select market players and other settings then click on OK button.
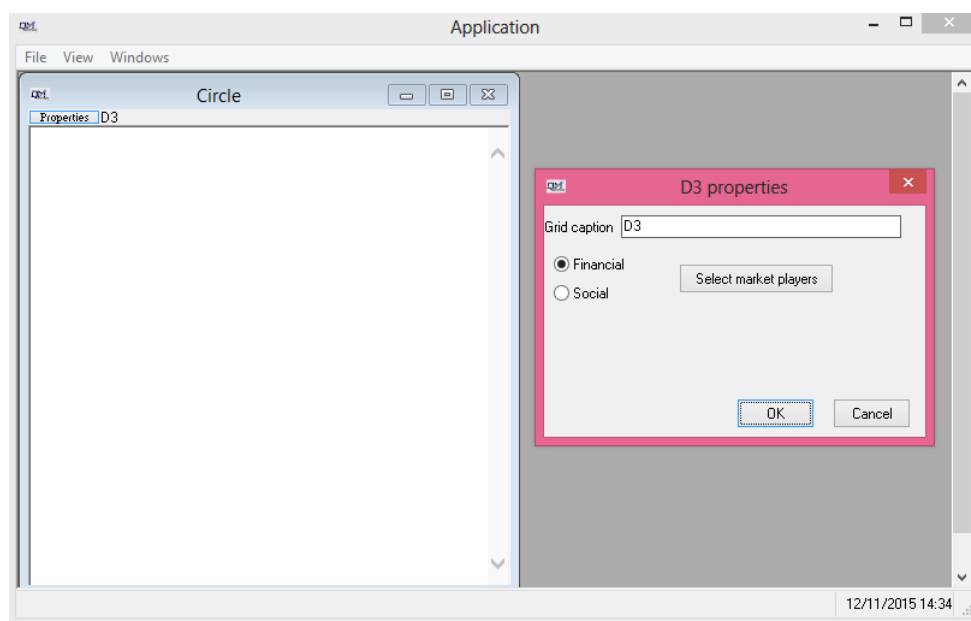
Workflow Diagram (Explaining test steps):

Figure 88. Circle sheet under View option of QMApplicationsSetup (stakeholder application)

Expected Outcome:

From Circle properties window, user should be able to set the circle properties.

Execution Status: Pass

Test Case ID: TC_QMS_010

Module: File option

Summary: Verify the Properties of **MultiChart** sheet under **View** option of **QMApplicationsSetup (stakeholder application)**

Test   **Steps:**

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.

2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.

3) Now click on **View** option present on the application main window.

4) Click on **MultiChart** option then click on **Properties** option from the sheet or right click on the sheet or click on Properties option.

5) From Chart properties window, put Chart Caption, Select market player pair(s) and other settings from Symbol tab. In Chart type tab set chart type and settings. Set various color and scaling settings from **Colors** and **Settings** tab.
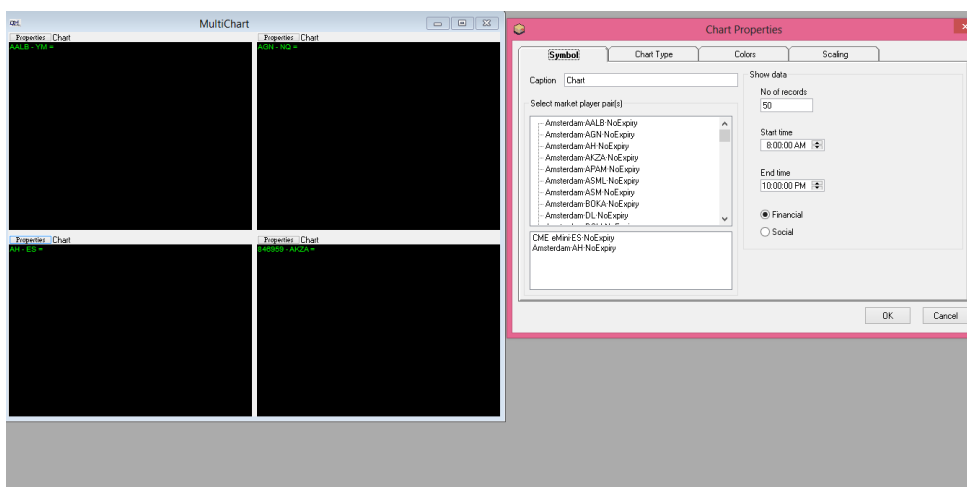
Workflow Diagram (Explaining test steps):

Figure 89. Multichart sheet under View option of QMApplicationsSetup (stakeholder application).

Expected Outcome:

From Chart properties window, user can set various properties from **Symbol, Chart type, Colors** and **Scaling** tab.

Execution Status: Pass

Test Case ID: TC_QMS_011

Module: File option

Summary: Verify the Properties of **Multidata** sheet under **View** option of **QMApplicationsSetup (stakeholder application)**

Test   **Steps:**

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.

2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.

3) Now click on **View** option present on the application main window.

4) Click on **Multidata** option then click on **Properties** option from the sheet or right click on the sheet or click on Properties option.

5) From the properties window, set properties from various data sheets from Chart, Circle and Main type sheets and click on OK button.
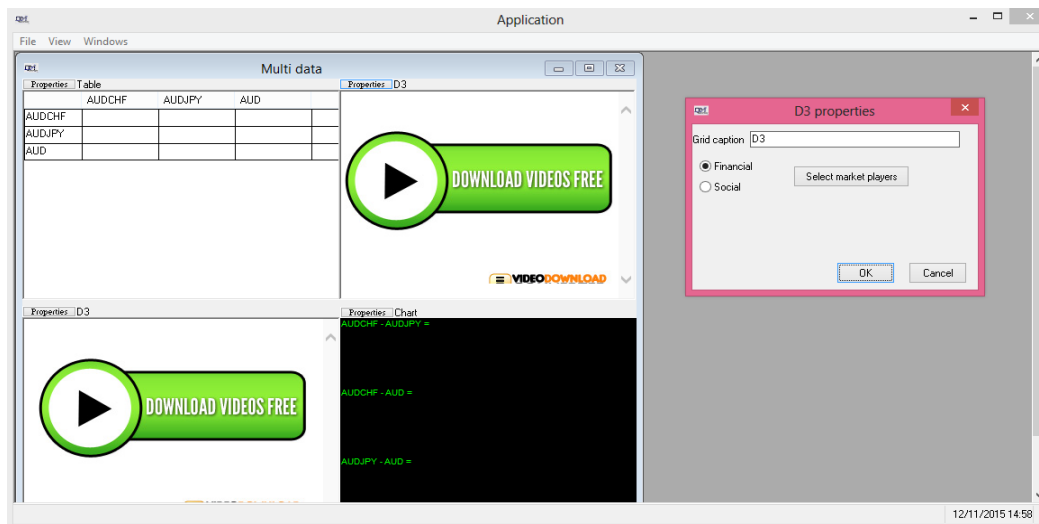
Workflow Diagram (Explaining test steps):

Figure 90. Multidata sheet under View option of QMApplicationsSetup (stakeholder application)

From Chart properties window, user can set properties from various data sheets from Chart, Circle and Main type sheets.

Execution Status: Pass

Test Case ID: TC_QMS_012

Module: File option

Summary: Verify the Properties of **List** sheet under **View** option of **QMApplicationsSetup (stakeholder application)**

Test   Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.

2) Put valid username and password in **Username** and **Password** field then Click on **Login** button to log in to the application.

3) Now click on **View** option present on the application main window.

4) Click on **List** option then click on **Properties** option from the sheet or right click on the sheet or click on Properties option.

5) From List properties window, put Grid Caption, set fore/back color, Grid lines Header, market players etc. and click on OK button.
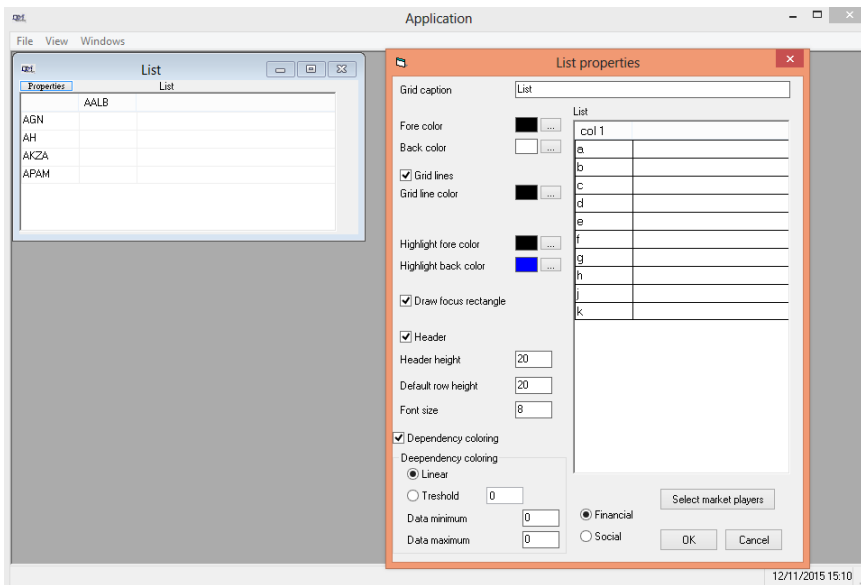
Workflow Diagram (Explaining test steps):

Figure 91. List sheet under View option of QMApplicationsSetup (stakeholder application).

Expected Outcome:

Clicking on List option under **View** menu user should be able to see the **List** sheet. Then click on Properties option or right click on the sheet user should see List properties window. User can add a Grid caption. User can set Fore/back color from the Fore Color and Back color option. Putting check on Grid lines table line can be shown. Putting check on Header option, column name should be shown. User can also select market players from **Select market players** button. Now clicking on **OK** button setting should be saved.

Execution Status: Pass

Test Case ID: TC_QMS_013

Module: Window option

Summary: Verify the functionality of Window option of QMApplicationsSetup(stakeholder application)

Test   Steps:

1) Open the application double clicking on the "QM Applications" shortcut from the desktop.

2) Put valid username and password in Username and Password field then Click on Login button to log in to the application.

3) Now click on Window option present on the application main window.

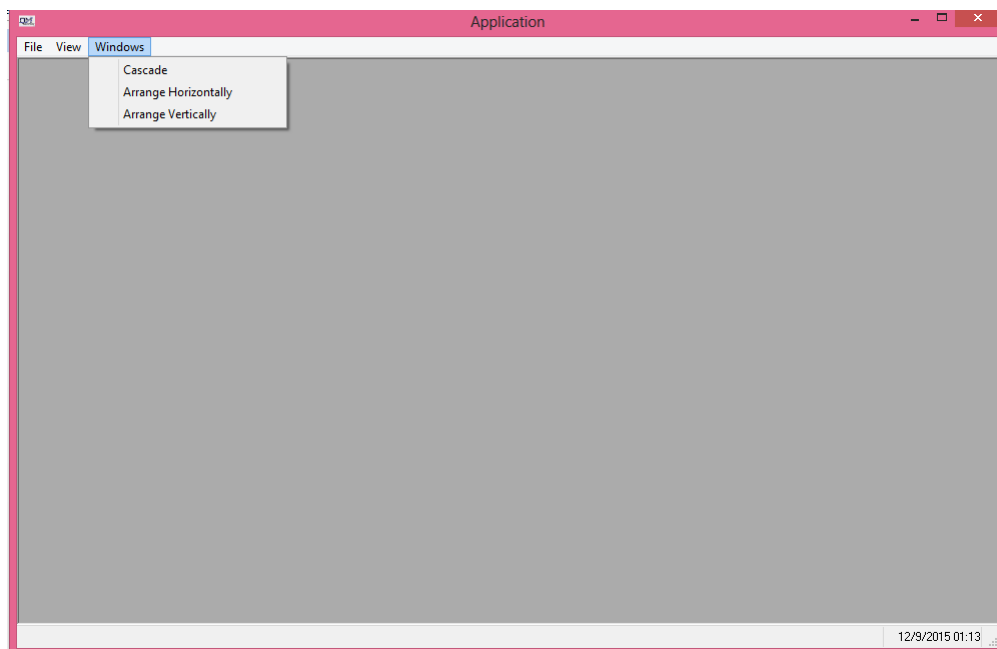4) Click on Cascade, Arrange Horizontally and Arrange Horizontally options one after another.

Workflow Diagram (Explaining test steps):

Figure 92. Window option of QMApplicationsSetup(stakeholder application).

Expected Outcome:

Clicking on **Window** menu, user should be able to see **Cascade, Arrange Horizontally** and **Arrange Vertically** options. Clicking on **Cascade,** all the created sheet displaying in a progressive order so that all the title bars appear on screen at one time. Click on **Arrange Horizontally,** all the sheet should be visible horizontally. Click on **Arrange Vertically,** all the sheet should be visible vertically.

Execution Status: Pass

4   Expert evaluation results

The expert evaluation results are now integrated in this second version of this deliverable provided at mid of February. A questionnaire was used to measure the results and impressions from the expert evaluators. The experts have knowledge in applications and mechanisms of the financial domain. They have no knowledge in the areas of Qualimaster system pipelines, so system performance and pipeline configuration exprt evaluations are not part of this evaluation. These expert evaluations will be processed by members of the Qualimaster consortium and will be part of D6.4. So the questionnaire focuses on the stakeholder applications, which consist of the Design environment and the Runtime environment.

This questionnaire is structured into

- Demographic / Subject Questions
- Design environment questions
- Runtime environment questions

The goal of the questionnaire is mainly to get suggestions and comments from the experts. That because, we left many space for individual remarks.

The results of the expert evaluations are based on 12 questionnaires, processed by the University Szczecin University of Technology.

4.1 Demographic / Subject

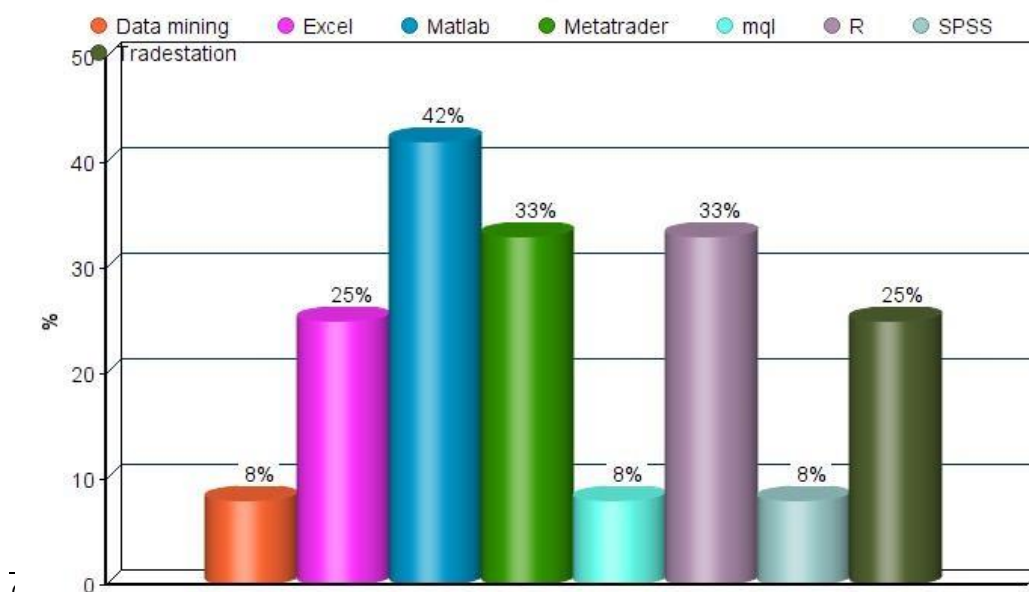### 4.1.1 What is your job title/ occupation/ academic grade?

Engineer	PhD	Professor	Student
17 %	50 %	8 %	25 %
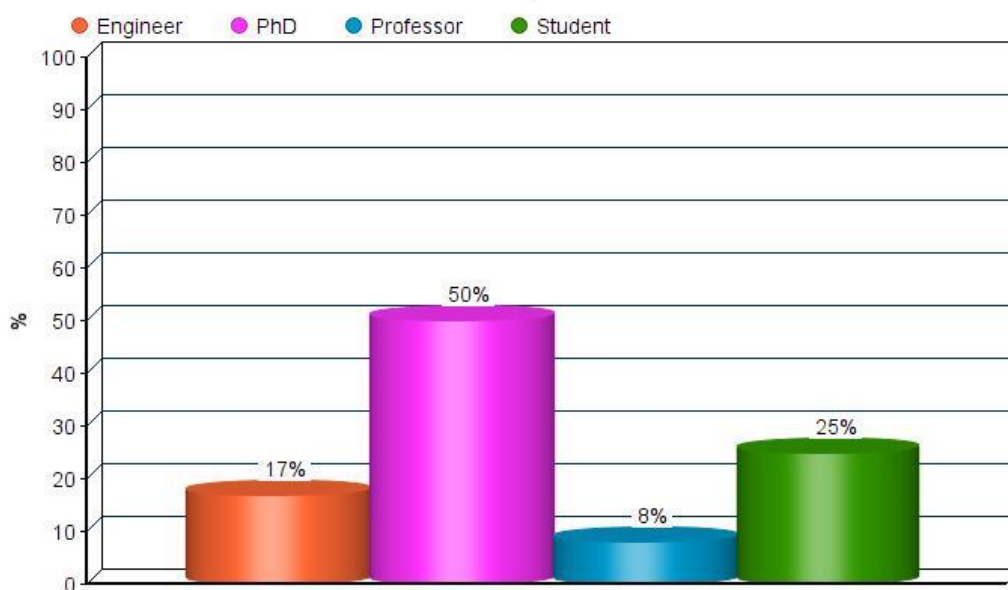
4.1.2 What kind of systems are you working on?

Data mining	Excel	Matlab	Metatrader	mql	R	SPSS	Tradestation
8 %	25 %	42 %	33 %	8 %	33 %	8 %	25 %

(Several experts are working with more than one system)

4.1.3   How much experience do you have with risk management?

< 1 year	1-3 years	3-5 years	5-10 years	>10 years
0 %	25 %	17 %	33 %	25 %
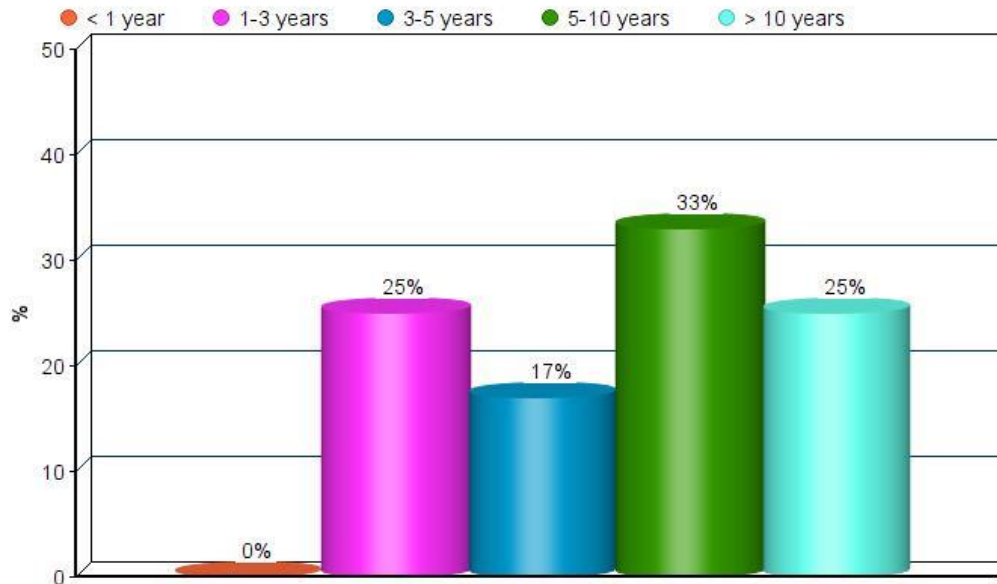
4.1.4   How much experience do you have in applying risk analysis applications?

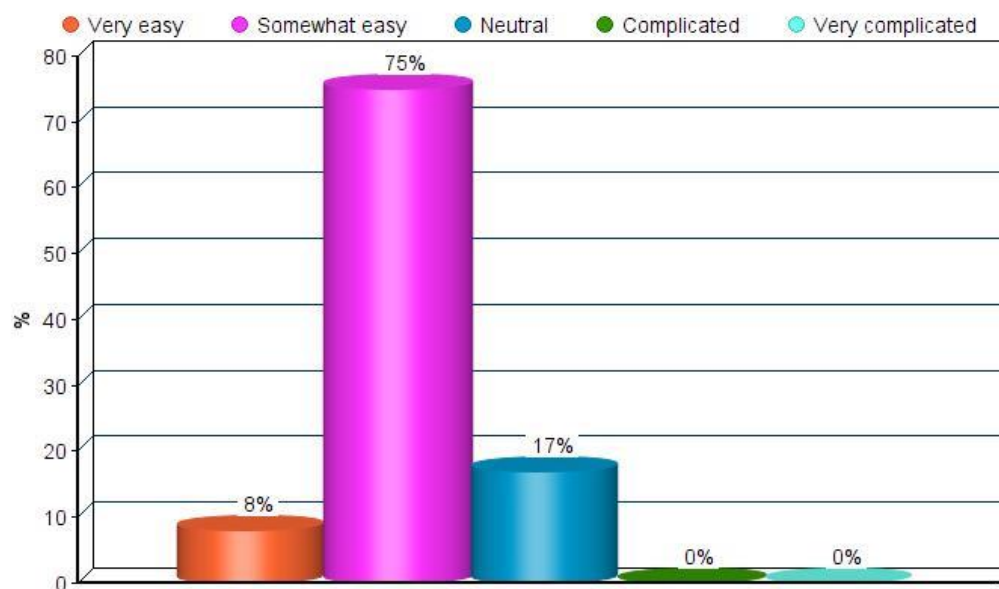| < 1 year	1-3 years	3-5 years	5-10 years	>10 years
8 %	25 %	42 %	0 %	25 %
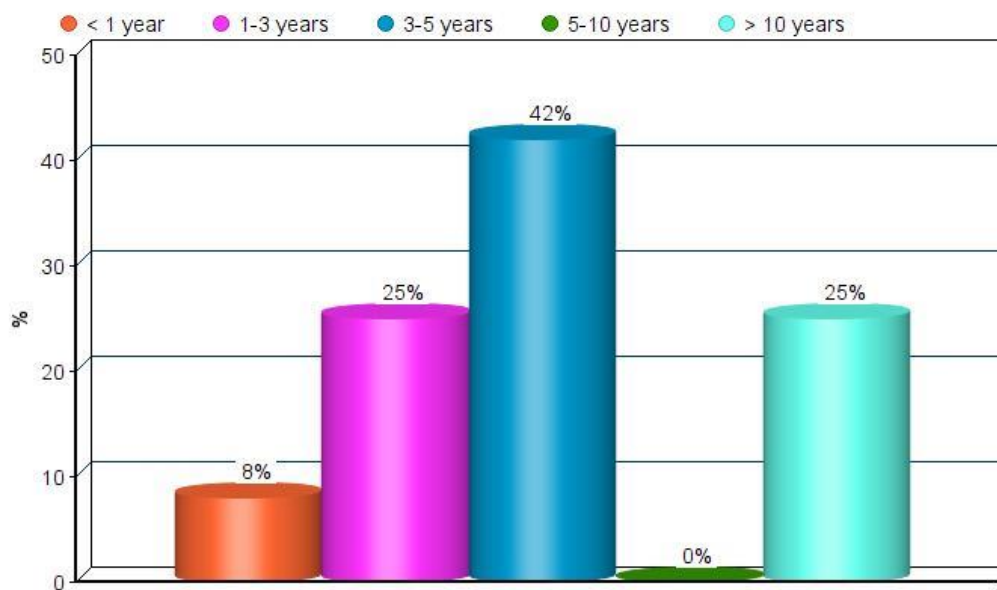
4.2 Design environment

4.2.1 Handling of the platform

| Very easy	Somewhat easy	Neutral	Complicated	Very complicated
8 %	75 %	17 %	0 %	0 %

Comments:

- The platform has old-fashion design of GUI, it's not a problem for me personally, but i think you should consider small improvements
- I mentioned in my correspondence that I had some problems with understanding functionalities

4.2.2 Data sources

| Very useful	Somewhat useful	Neutral	Not at all useful	Not applicable
8 %	59 %	33 %	0 %	0 %
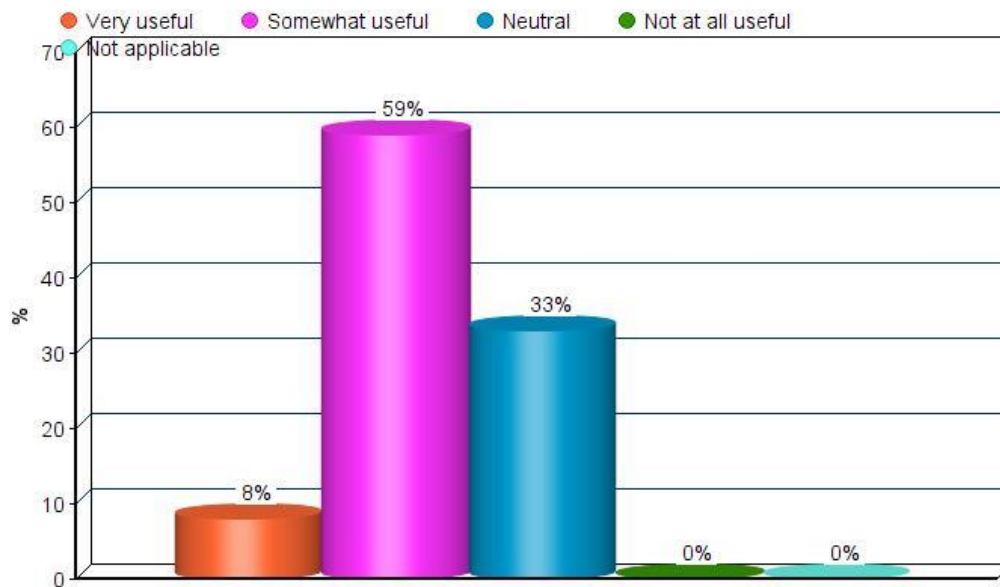
Comments:

- How do I know, if a certain new datasource fits the purpose of the Qualimaster application?
- It will be useful only when one could configure format of this data sources
- You could add a dropdown menue with existing and pre-configured datasources to choose from

4.2.3 Functions

| Very useful	Somewhat useful	Neutral	Not at all useful	Not applicable
17 %	33 %	42 %	8 %	0 %
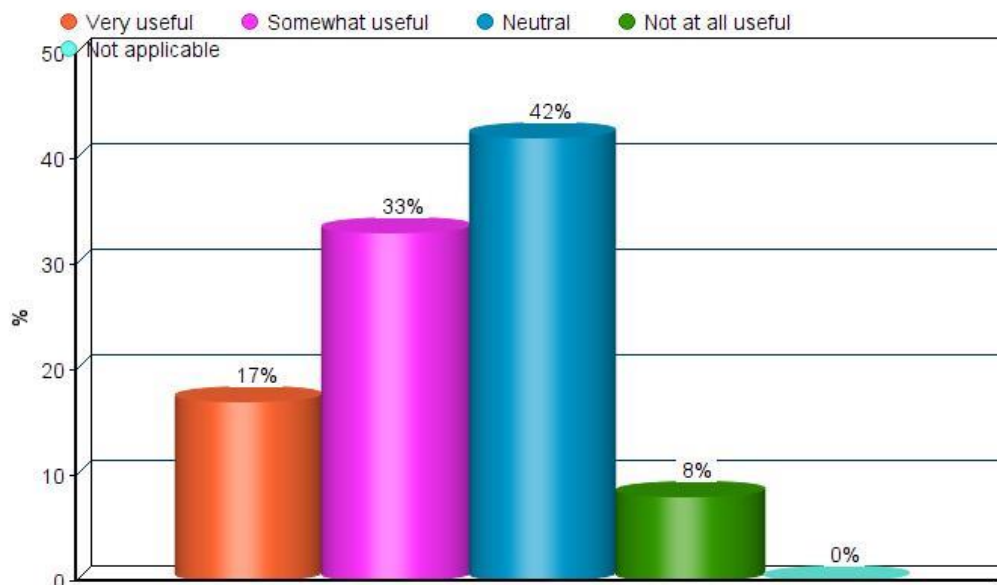
Comments:

- Add more examples for scripts and explain them

- As mentioned above, this is one of most critical elements of any good data analysis software

- Maybe this function would better be placed on sheet level. This would allow different functions for each sheet. Some preconfigured scripts would help using this feature

- The first step seems to be easy but I have not further experience yet

- Preprocessing should allow to be different for different charts

4.2.4 Visualisations

Very useful	Somewhat useful	Neutral	Not at all useful	Not applicable
67 %	33 %	0 %	0 %	0 %
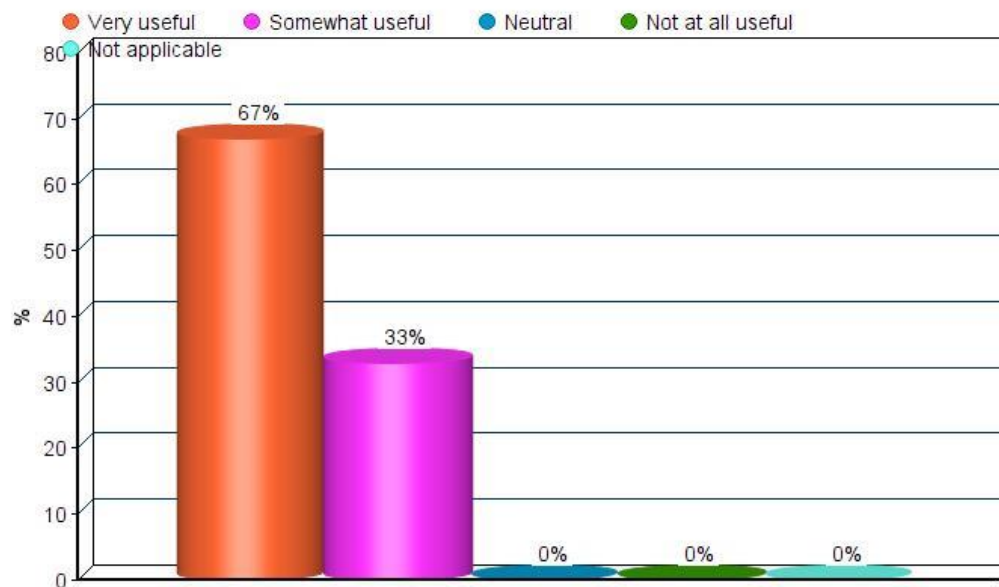
Comments:

- The drag and drop function is not very user friendly as it is. The elements should be bigger, when drawn into the main window

- There should be templates, which can be filled with custom functions

- This is really a big advantage

- It's only my opinion as advanced computer user and experienced programmer: this kind of applications (1. easy to use. 2. very customizable and programmable) are hard to develop. If I could give you advice: try to split it in two applications (1. User part, 2. Configuration and programming) or at least define boundaries between this two parts.

- It would be useful to have a preview for the D3 visualisations

4.2.5 General comments

A help section would be helpful

- It is very interesting step into social trading. I see some prospective ideas how to use this data – with regression approach, clusterization, rough sets theory, particle swarm optimization etc.

- You should develop a description of the application

4.3 Runtime environment

4.3.1 Handling of the platform

| Very easy	Somewhat easy	Neutral	Complicated	Very complicated
25 %	67 %	8 %	0 %	0 %
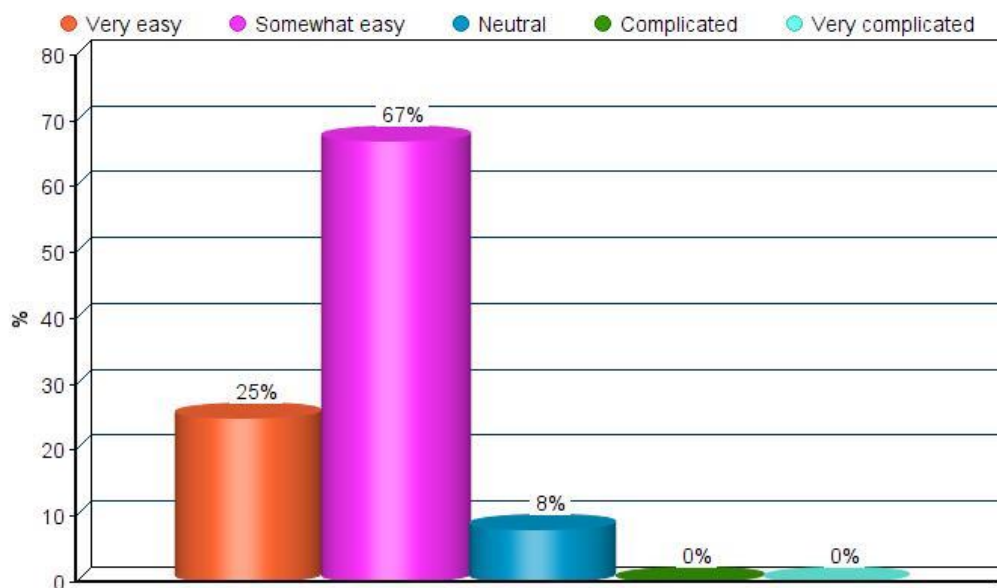
Comments:

- The runtime environment shows a somehow basic user interface. I would find it helpful to have more options for navigation: There could e.g. be an upper navigation bar, where the most important functions are available as buttons
- The loading time of some functions like "carousel" in the runtime environment was rather long in my tests. This might be improved
- Show a status bar, when single functions under "view" are in the process of loading
- At times, I am kicked out of the connection of the application and have to re-login
- Quickly understandable handling
- Only some of your examples works after compilation. Some of stakeholder scenarios didn't display data (as expected).
- Easy handling
- It is good, that the platform is so flexible and that I can build workspaces that fit my specific marketplayers

4.3.2 Using existing setups

| Very useful	Somewhat useful	Neutral	Not at all useful	Not applicable
58 %	42 %	0 %	0 %	0 %
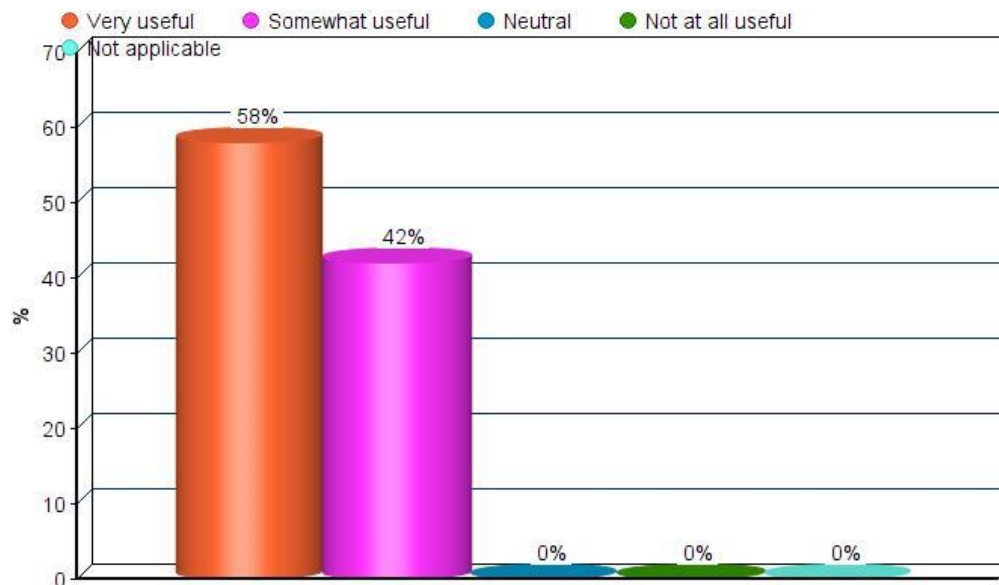
Comments:

- Can the single windows of the existing setups be put in an automatic order? Like cascading them or ordering horizontally?

- Existing setups, which are already in the platform, are very useful to get a first impression of the functionalities without first having to design an own workspace.Also existing setups, that I build as a user, are useful

- In order to avoid to be too bulky at first, there could be some additional existing setups with a more limited number of windows or functions

- It could be useful to have some templates here with locked design, where I could put in my custom charts and functions. Such a locked design would give a fixed grid, which avoids that my design shifts involuntarily when I work

4.3.3 Create new setups

| Very useful	Somewhat useful	Neutral	Not at all useful	Not applicable
17 %	67 %	17 %	0 %	0 %
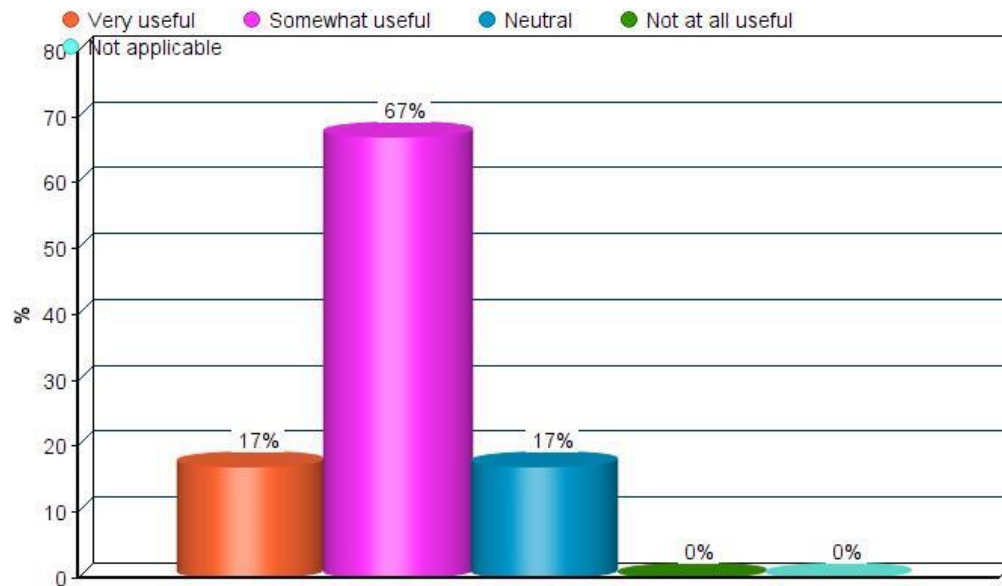
Comments:

- Add a help section, where the single visualizations and their purpose is explained

- It would be an idea to add an additional feature here: Add an additional (redundant) bar, which allows to add visualisations through buttons (with thumbnails of the visualizations on them). This bar may be attached to the left side or it might be like a popup

- Can I auto-link a visualization to a list of marketplayers? The visualization would change every time, when I change the marketplayers in the list

4.3.4 Changing visualization properties

Very useful	Somewhat useful	Neutral	Not at all useful	Not applicable
25 %	67 %	8%	0 %	0 %
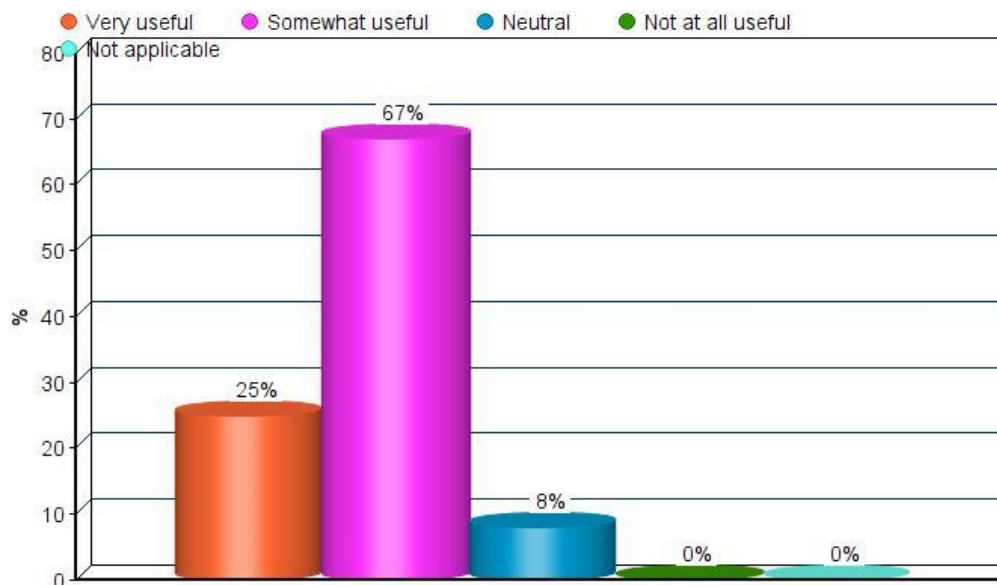
Comments:

- Overall very useful. The selection of marketplayers from the correlation table should also be possible by typing in the name of the marketplayer – not only from the dropdown menue

4.3.5 General comments

- How can the application be linked to external trading platforms? Can portfolios or market player lists from these trading platforms be imported for analysis in the QualiMaster platform?

- Are you planning an alarm feature, which indicates "high risk" when predefined conditions are met? This might also be combined with an inverse alarm that says "normal risk" or "low risk" again after a period of "high risk" which was indicated before

- How can the analysis and visualizations be automatically connected to the stocks in my portfolio or the stocks of a specific sector? Is there something like an easy-connect function?

- My personal opinion: it's very powerful tool (only had 2 days) but has many places to improvement (simplest example: no search box in dataset selector).

- Add alternative navigation functions

- Initial loading time of some visualizations could be improved

- Do you plan to add suggestions for reducing risk – such as suggestions to sell some stocks from my portfolio and add others. Or the suggestion to reduce the exposure to the market by selling e.g. half of my portfolio and keeping 50% cash?

5 Conclusions and Outlook

The technical based tests showed, that the Qualimaster pipeline configuration software (IConf) is in a stable and well- developed shape. It is expected, that only one additional test iteration is needed.

The design environment and the runtime environment of the stakeholder applications need at least two more iterations. There are several upcoming enhancements and changes, for example

1 Fully implementation of the communication protocol between the stakeholder applications and the pipeline infrastructure

2 Integration of social media related data

3 Historical data processing

4 Feature enhancements based on experts evaluations (Table 10)

These enhancements and changes require ongoing technical test iterations. If possible,1, 2, and 3 will be implemented in parallel, followed by a test iteration, afterwards 4 will be implemented followed by a final test iteration.

The expert evaluations showed, that the acceptance of the overall handling and workflow is satisfying. Beside that, from the questions, comments and suggestions there are several improvements, that were identified.

They can be categorized into the topics mentioned in Table 10.

Table 10: Identified improvements from the expert evaluation

Topic	Issues
Documentation/ help	Add common help section
	Add script help
	Add visualization help
Improvement of GUI	Add toolbars
	Add status panel
	Allow automatic window sizing
Add pre-configurations	For data sets
	For scripts
	For setups
Improve functionalities	Add market player search function
	Improve performance
	More involvement of social data
Add features	Data import
	Data export
	Alarm feature

These topics build the roadmap for the further development and will be implemented at least until the end of the project, but most of them will be ready for a second iteration of expert evaluation.