BISTECH PHASE 2P+

(FIXED INCOME MARKET)

FIX CERTIFICATION PROGRAM

SIMULATOR APPLICATION

USERS MANUAL

September 2018, Version 1.1

DOCUMENT HISTORY

Date	Version	Description
September 2017	1.0	Initial version
March 2018	1.1	Logs updated

CONTENTS

LIST OF FIGURES

© 2018 Borsa İstanbul A.Ş.

LIST OF TABLES

1. INTRODUCTION

1.1 PURPOSE OF DOCUMENT

This document aims to give information about simulator application which is prepared for our members and software companies who intend to submit orders via FIX protocol in Phase 2P (Fixed Income Market) BISTECH Trading System. By simulator application, companies can test their BISTECH Phase 2P FIX software and get ready for the certification program.

1.2 TARGET SEGMENT

This document is prepared for our members and software companies who develop software to submit orders via BISTECH FIX API and want to complete the certification program in order to be able to use their software.

2. GENERAL PROCESS

Phase 2P (Fixed Income Market) BISTECH FIX Certification Program simulator application is developed for members and software companies to test the certification steps, which are specified in certification program guide, before they make an appointment for the certification program. BISTECH FIX Certification Program simulator application will help to complete the certification program successfully.

The aim of the simulator is to provide the companies to check if they send the expected messages in the certification program steps or not. In simulator, a member or software company may send a message for each step specified in the certification program. The sent messages and the expected (reference) messages are compared and a result table is shown on the screen. Companies can see the differences in their software according to the table and make the necessary changes before they make an appointment for the certification program. The member or software company is ready for the certification program, when all steps are passed successfully.

2.1 Installing and Running

Phase 2P BISTECH FIX simulator is a web application and has user interface that can be accessed from a web browser. The simulator application is depended on Java Runtime Environment (JRE) and no additional setup is required. You have to install JRE to run the simulator.

The simulator can run on both Linux and Windows operating systems for both "Order Entry" and "Reference Data" steps in certification scenarios.

The simulator application supports 2 partition structures in certification program. You can run the simulator for different partitions by start-up parameters. These parameters: "part1", "part2" and "rds" for order entry first partition, order entry second partition and reference data partition respectively.

Due to the Tailor-made series creation step in the order entry certification, the simulator application will ask for the dates to be entered in the "part2" section. T + 2 and T + 5 dates for the certification steps will be these numbers.

Excluding control of the ClOrdID, QuoteID and TradeReportID is determined by a start-up parameter. By setting this parameter as "Y", ClOrdID, QuoteID and TradeReportID are not included in controlled fields of a selected message in Simulator application. So that users will be able to perform test with

Simulator Application without having to send the ClOrdID, QuoteId and TradeReportID fields as given in the Certification Document.

After you start the simulator, you can select the certification scenario in the related partition from its web browser interface. The simulator uses predefined FIX and http ports for different partitions. Therefore, you can run the simulator for different partitions at the same time. Table 1 shows connection information.

Table 1: BISTECH FIX Simulator Connection Information

	FIX IP Address	FIX Port	URL
Order Entry (partition 1)	127.0.0.1	16061	http://localhost:8061/
Order Entry (partition 2)	127.0.0.1	16062	http://localhost:8062/
Reference Data (reference data)	127.0.0.1	16063	http://localhost:8063/

The steps below should be followed to run the application:

- Windows: Double click on run.bat file runs the application.
- Linux: run.sh script file is run on shell for the application.
- You can set parameters from startup console menu of the application. An example of setting parameters is given below:

```
*******************************
Scenario List:
1. Order Entry Partition1
2. Order Entry Partition2
3. Reference Data
Select Scenario: 2
Please enter T+2 date (ddMMyyyy): 25092017
Please enter T+5 date (ddMMyyyy): 28092017
Allow free "ClOrdID, QuoteID, TradeReportID, SecurityReqID" (Y/N): Y
*******************************
```

- When the application runs, the logs about loading the scenario steps are shown on console.
- You can access user interface on a browser by using links given in connection information table.
- You should select the certification scenario.
- You can connect to the FIX server by using connection information (Table 1) for the corresponding partition.
- Companies can use any Username, SenderCompID, and SenderSubID. Reference logs are created for BIABC user but these fields (Username, SenderCompID, and SenderSubID) will be ignored during the log comparison.

- Logon mechanism is detailed on <u>2.3.2 Logon Structure</u> section.

The sent and received messages can be traced on the browser screen.

2.2 Technical Requirements

Java (JRE) version 1.7.0_55 and above is required for simulator to run. The application does not require any additional setup.

The browsers specified below can be used for web interface;

- Google Chrome: 42.0.2311.152 and above (recommended)
- Internet Explorer: 10.0.9200.16521 and above
- Mozilla Firefox: 37.0 and above

2.3 Process

2.3.1 Test Steps (Session Requests / Application Requests)

All steps in BISTECH FIX API Order Entry Certification Program document appear in two sections; "Session Messages" which consists of the steps in Section 1: Connectivity Tests; "Application Messages" which consist of all remaining steps in the BISTECH FIX API Order Entry Certification Program document. BISTECH FIX API Reference Data Certification Program document appear in single section named as "RDS Request". All steps in BISTECH FIX API Certification Program document is listed with the same order in the application. Corresponding steps of certification in the simulator is given at **Error! Reference source not found.** Companies can test all the steps sequentially or in any order. It is recommended to follow the sequence of the scenario steps which are related with the following step in the simulator application.

After you start the simulator application, you should select a scenario from "Scenario" drop down list on web interface and press "Set Scenario" button to load selected scenario steps.

The application does not work as trading engine. It contains the reference logs of certification tests to help companies to test if they send the correct certification messages. The messages sent by the companies are compared to the expected messages. If the sent message is correct, the expected response messages are sent to the company by simulator. If the content of the sent message does not match the reference message, Reject (35=3) message is sent in response even if the message is meaningful in trading system. Briefly, when a company tests a step, the message will be rejected as long as the sent message does not contain the expected data.

While the messages are compared to the reference logs, the application ignores the fields that can change according to the user, message or time (SenderCompID, MsgSeqNum, SendingTime etc.). The ignored fields are specified internally in the application. Companies should pass all steps successfully to be able to complete the certification program successfully.

IMPORTANT: Some fields that may change during certification are ignored by simulator when comparing the messages. But the reference logs used in comparison are static and they are not changed according to the messages sent by the user. That may cause simulator to send different values than the member has sent. For example, in order entry certification program order modification step, reference logs are generated by modifying the field only mentioned in the related step, and sending unchanged fields with original values. In that case, even if a member modifies a different field than the field modified in reference log, this field change cannot be seen in simulator responses. Members will not experience such a case during certification process, the responses to member messages will contain complete and correct data.

2.3.2 Logon Structure

When a Logon message is sent, if one of the Logon steps in "Session Messages" section is selected, the sent message is compared to the selected step. As it is required to log on before sending a message, you can connect to the system by setting password to "MMM" on any step different from Logon step in simulator. After connection is established you can send selected steps' messages.

2.3.3 Test Results (Request History)

The messages in "Session Messages" and "Application Messages" sections are the messages expected from the companies during the certification program respectively. All steps in the sections should contain the same contents specified in BISTECH FIX API Member Software Certification Program. When companies select a step and send the corresponding message in certification program, simulator shows the result in "Request History" section after comparing the sent message and the reference log. If the sent message contains correct data, the selected step turns to green and the next step is selected automatically. If the sent message is not correct, the selected step turns to red. "Request History" section contains the details of the sent message (SERVER RECEIVED), the comparison results (COMPARE RESULT) and the response messages sent by the simulator (SERVER RESPONSE).

Figure 2: Message Flow and Comparison

Same step can be tested more than once. Each trial is shown on Request History section sequentially. When a step is passed, current step turns to green and the next step is selected automatically. Therefore, each step in the certification program can be prepared correctly and sent automatically during the certification. When a step fails, the same step is repeated unless the user chooses another step. In Request List section, the selected step is shown with a blue frame. The example below shows that the first step in BISTECH FIX API Certification Program which is in "Order Entry and Functions" section is selected to be tested.

Figure 3: The Selected Step in Scenario List

2.3.4   Sent / Received Messages (Server Received / Server Response)

In Request History section, the details of sent/received messages and comparison results can be seen by clicking the corresponding line.

Figure 4: Details of Sent / Received Messages

Tag	TagName	Value	ValueName
8	BeginString	FIXT.1.1	
9	BodyLength	147	
34	MsgSeqNum	7	
35	MsgType	D	NewOrderSingle
49	SenderCompID	BIACA	
50	SenderSubID	FE001	
52	SendingTime	20150518-08:04:23.849	
56	TargetCompID	BI_TEST	
1	Account	123	
11	ClOrdID	10	
38	OrderQty	200	
40	OrdType	2	Limit
44	Price	6.2	
54	Side	1	Buy
55	Symbol	ADANA.E	
59	TimeInForce	0	Day

2.3.5 Comparison Results (Compare Result)

In Request History section, the details of COMPARE RESULT line contain the comparison of the sent message and the expected message field by field. If the comparison successes, the COMPARE RESULT line turns to green, otherwise it turns to red.

Figure 5: Failed Comparison

COMPARE RESULT 8=FIXT.1.1 9=113 35=A 34=1 49=BIXXX 50=FE001 52=20150408-08:51:08.434 56=BI_TEST 98=0 108=300 141=Y 553=P.

Figure 6: Passed Comparison

COMPARE RESULT 8=FIXT.1.1 9=148 35=D 34=17 49=BIXXX 50=FE001 52=20150416-14:10:28.275 56=BI_TEST 1=123 11=10 60=20150416-14:10:28.250 528=A 10=127

Since the responses of the simulator are sent according to the reference log file, the responses for a step will be the same as long as the sent message is valid. If a sent message is valid, the responses in the log file are sent back. If it is invalid, a Reject (35=3) message with description "UnExpectedMessage" is sent.

Figure 7: Reject Message for an Invalid Comparison Result

```
8=FIXT.1.1 9=94 35=3 34=7 49=BI_TEST 52=20150518-08:07:42.168 56=BIACA 45=8 58=UnExpectedMessage 372=F 37
```

If a user does not send the messages in given order, since the responses are sent according to the certification scenario, user may receive order information which is not transmitted. For example, if an order matches a previous order according to the scenario and a user skips the first order and sends the second order, the trade information of both orders will be sent according to the reference log. Therefore, if a client uses simulator with a connection to its order management system, it is recommended to follow the sequence of the scenario steps.

Figure 8: Simulator Interface

In the figure above, it is denoted that after 25. step (NewOrderSingle), the user skips following steps and continues with 29. step. As 25, 39, and 43. steps are invalid, they turn to red. The remaining steps are green due to successfully completion.

Figure 9: Comparison Detail

Tag	TagName	ReceivedValue	ReceivedValueName	ExpectedValue	ExpectedValueName	Status
8	BeginString	FIXT.1.1		FIXT.1.1		OK
9	BodyLength	131		131		OK
34	MsgSeqNum	38		53		IGN
35	MsgType	c	SecurityDefinitionRequest	c	SecurityDefinitionRequest	OK
49	SenderCompID	BIIYM		BIXXX		IGN
50	SenderSubID	FX051		FX051		OK
52	SendingTime	20160530-13:32:07.430		20160520-13:57:45.766		IGN
56	TargetCompID	BI		BI		OK
55	Symbol	O_XU030E1216C100.000		O_XU030E1216C100.000		OK
202	StrikePrice	81		81		OK
320	SecurityReqID	10		10		OK
321	SecurityRequestType	1	ReqSecIDPRov	1	ReqSecIDPRov	OK
864	NoEvents	1		1		OK
865	EventType	102	EndDate	102	EndDate	OK
866	EventDate	20160526		20160530		ERR
10	CheckSum	056		042		IGN

By clicking "COMPARE RESULT" button in Request History section, the detailed comparison result of sent message and reference log is displayed.

The comparison results are explained below:

- Green field: Sent and expected fields are matched. (Status = OK)

- Red field: Sent and expected fields are not matched. (Status = ERR)

- Yellow field: Unexpected field is sent or a field recommended (not mandatory) is not sent. (Status = WRN)

- _MISSING_: This field is expected but it is not sent by the user.

- _NOT EXPECTED_: This field is not expected but it is sent by the user.

While comparing messages, the fields which cannot have the same values with reference logs are taken into IGN (ignore) state in order not to take into comparison. These rows will remain uncolored.

When receiving more fields than expected fields, if these fields are not in IGN list, the comparison result will be "Warning (WRN)" and colored by yellow. WRN state is not a bottleneck to pass the related step but it is advised to check the correctness. The correctness of excessive fields which are

in IGN list also has to be checked. If these fields are sent wrong in production environment, this can cause an error during certification.

Figure 10: _MISSING_ ve _NOT EXPECTED_ Fields

Tag	TagName	ReceivedValue	ReceivedValueName	ExpectedValue	ExpectedValueName	Status
8	BeginString	FIXT.1.1		FIXT.1.1		OK
9	BodyLength	137		147		IGN
34	MsgSeqNum	10		32		IGN
35	MsgType	D	NewOrderSingle	F	OrderCancelRequest	ERR
49	SenderCompID	BIACA		BIXXX		IGN
50	SenderSubID	FE001		FE001		OK
52	SendingTime	20150519-13:14:39.548		20150416-14:13:13.843		IGN
56	TargetCompID	BI_TEST		BI_TEST		OK
11	ClOrdID	2		160		ERR
38	OrderQty	5		90		ERR
40	OrdType	2	Limit	__NOT_EXPECTED__		IGN
44	Price	5		__NOT_EXPECTED__		IGN
54	Side	1	Buy	1	Buy	OK
55	Symbol	GARAN.E		ADANA.E		ERR
59	TimeInForce	0	Day	__NOT_EXPECTED__		IGN
60	TransactTime	20150519-13:14:39.548		20150416-14:13:13.842		IGN
528	OrderCapacity	A	Agency	__NOT_EXPECTED__		IGN
10	CheckSum	116		140		IGN

The difference in the ignored fields does not affect the comparison result. Therefore, a user is able to send the ignored fields which are not mandatory. But these unexpected fields should not affect the scenario. For example, in an OrderCancelReplaceRequest message, quantity field can be sent for a scenario although the quantity does not change. The sent quantity should be the same with the original quantity. If the quantity is changed, certification will fail since the scenario will change during the certification, while simulator passes the step since it ignores the unexpected fields. Therefore, it is recommended to check the red (ERR) and yellow (WRN) fields in COMPARE RESULT section even if the message passes the comparison successfully. All fields should be valid for FIX protocol to be able to pass the certification, even if they are ignored or not.

2.3.6 Reseting Test Steps (Reset Steps)

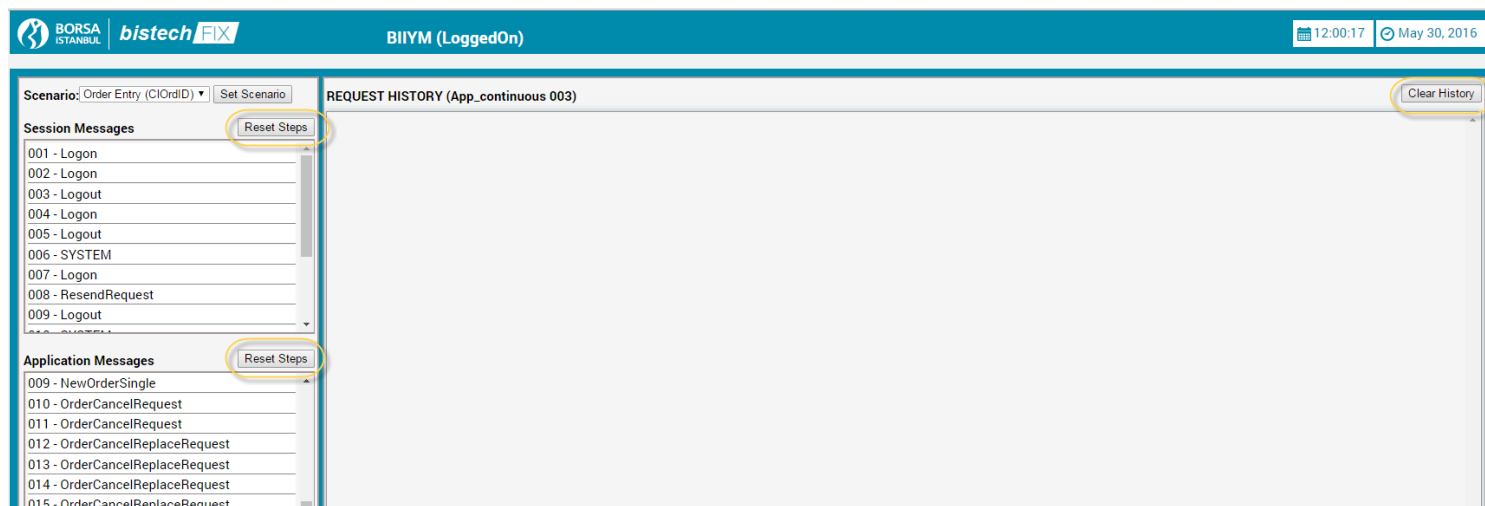There is a "Reset Steps" button over "Session Request", "Opening Session" and "Continuous Auction" sections. Clicking this button clears all trials in all steps for the corresponding section.

2.3.7 Clearing Test Results (Clear History)

To clear the trials of a selected step, "Clear History" button over "Request History" section can be clicked. "Clear History" button clears only the trials belong to the selected step.

Figure 11: Clearing the Tested Steps

2.3.8   Footer Tab

The footer tab shows the step flow followed during the tests.

Figure 12: Followed Test Steps

3. RESULT

BISTECH FIX Simulator is developed for the companies to prepare for certification process. Therefore, when all steps are green in simulator application, which mean all steps are passed, you can make an appointment for certification program by sending a message titled "BISTECH FIX Certification Test Date Request" to the e-mail address bistechsupport_autoticket@borsaistanbul.com.

4. CORRESPONDING STEPS OF CERTIFICATION PROGRAM IN SIMULATOR

Each step in simulator application corresponds to a step in scenario program. This section of documents explains which step in simulator corresponding to which step of certification program.

Matching Engine or Fix server side operations are represented as "SYSTEM" events in the simulator application. If the simulator passed to a SYSTEM step, it does not automatically run SYSTEM events. SYSTEM button must be clicked manually to run these kinds of steps.

In certification program users send more than one messages in some steps. On the other hand each message corresponds to a separate step in the simulator application. Message fields in a simulator step should be sent according to the scenario in certification documents' step.

NOTE: One of OrderID or OrigClOrdID tags can be used for order cancel and order amendment steps. Therefore, those two fields are ignored (IGN) in OrderCancelRequest and OrderCancelReplaceRequest messages. The responsibility of submitting correct values for those fields belong to our members and members should send correct values in order to pass certification tests.

4.1   Connectivity Tests

Messages in the "Session Messages" section of the simulator application and their corresponding messages in the certification documents are given in Table 2.

Table 2: Partition 2 Session Messages

	Simulator Step	Certification Program	
Session Messages	01 - Logon	1. Step – Password change Logon	**Connectivity Tests**
	02 - Logon	1. Step - Password change Logon	
	03 - Logout	2. Step - Logout	
	04 - Logon	3. Step - Sequence Reset Logon	
	05 - NewOrderSingle	4. Step – Sending Resend Request	
	06 - NewOrderSingle	4. Step - Sending Resend Request	
	07 - NewOrderSingle	4. Step - Sending Resend Request	
	08 - Logout	4. Step - Sending Resend Request	
	09 – SYSTEM*	4. Step - Sending Resend Request system step	
	10 - Logon	4. Step - Sending Resend Request	
	11 - ResendRequest	4. Step - Sending Resend Request	
	12 - Logout	5. Step - Logout	
	13 – SYSTEM**	6. Step - Resend Request Reply - System Step	
	14 - Logon	6. Step - Resend Request Reply	
	15 - SequenceReset	6. Step - Resend Request Reply	
	16 - NewOrderSingle	6. Step - Resend Request Reply	
	17 - NewOrderSingle	6. Step - Resend Request Reply	
	18 - NewOrderSingle	6. Step - Resend Request Reply	
	19 - SequenceReset	6. Step - Resend Request Reply	
	20 - Logout	7. Step - Logout	

* 09 – System step: The simulator application prepares internal states to make the company send Resend Request message after the following Logon message of the company. You must manually click the SYSTEM button, since this step does not run automatically.

** 13 – System step: The simulator application prepares internal states to send Resend Request to the company after the following Logon message.

4.2 Order Entry Certification Levels

There is one simulator for all certification levels. You can test only the steps that are required for the certification level which you want to get and skip the remaining steps. The detailed information about certification levels and corresponding steps can be found in Certification Program document.

4.2.1 Order Entry Base Level Messages

For order entry base level certification, there are messages for both first and the second partition. These messages of the simulator application and their corresponding messages in the certification documents are given in Table 3 and Table 4 respectively.

Table 3: Partition 1 Base Level

	Simulator Step	Certification Program	
Application Messages	01 - NewOrderSingle	8. Step - ClOrdID=220	Base Level

Table 4: Partition 2 Base Level

	Simulator Step	Certification Program	
Application Messages	01 - NewOrderSingle	1. Step - ClOrdID=10	Base Level
	02 - NewOrderSingle	1. Step - ClOrdID=20	
	03 - NewOrderSingle	1. Step - ClOrdID=30	
	04 - NewOrderSingle	1. Step - ClOrdID=40	
	05 - NewOrderSingle	1. Step - ClOrdID=50	
	06 - NewOrderSingle	1. Step - ClOrdID=60	
	07 - NewOrderSingle	1. Step - ClOrdID=70	
	08 - NewOrderSingle	1. Step - ClOrdID=80	
	09 - NewOrderSingle	1. Step - ClOrdID=90	
	10 - OrderCancelRequest	2. Step - ClOrdID=100	
	11 - OrderCancelRequest	2. Step - ClOrdID=110	
	12 - OrderCancelReplaceRequest	3. Step - ClOrdID=120	
	13 - OrderCancelReplaceRequest	3. Step - ClOrdID=130	
	14 - NewOrderSingle	4. Step - ClOrdID=140	
	15 - OrderCancelReplaceRequest	5. Step - ClOrdID=150	
	16 - NewOrderSingle	6. Step - ClOrdID=160	
	17 - NewOrderSingle	6. Step - ClOrdID=170	
	18 - OrderCancelRequest	6. Step - ClOrdID=180	

19 - NewOrderSingle	7. Step - ClOrdID=190
20 - OrderCancelReplaceRequest	7. Step - ClOrdID=200
21 - OrderCancelReplaceRequest	7. Step - ClOrdID=210
22 - NewOrderSingle	9. Step - ClOrdID=230
23 - NewOrderSingle	9. Step - ClOrdID=240
24 - OrderCancelReplaceRequest	10. Step - ClOrdID=250
25 - NewOrderSingle	11. Step - ClOrdID=260
26 - NewOrderSingle	12. Step - ClOrdID=270
27 - NewOrderSingle	13. Step - ClOrdID=280
28 - NewOrderSingle	13. Step - ClOrdID=290

4.2.2   Order Entry Advanced Level Messages

For order entry advanced level certification, there are messages the second partition. These messages of the simulator application and their corresponding messages in the certification documents are given in Table 5 and Table 6 respectively.

Table 5: Partition 2 Advanced Level

	Simulator Step	Certification Program	
Application Messages	29 - TradeCaptureReport	14. Step -TradeReportID=1010	**Medium Level**
	30 - SYSTEM*	15. Step – System Step for new TradeReport Submission	
	31 - TradeCaptureReport	16. Step -TradeReportID=1020	
	32 - TradeCaptureReport	17. Step -TradeReportID=1030	
	33 - SYSTEM*	18. Step - System Step for new TradeReport Submission	
	34 - TradeCaptureReport	18. Step -TradeReportID=1040	
	35 - SYSTEM*	19. Step - System Step for new TradeReport Submission	
	36 - SYSTEM*	19. Step – System Step for cancellation of the TradeReport	
	37 - TradeCaptureReport	20. Step -TradeReportID=1050	
	38 - SYSTEM*	21. Step - System Step for new TradeReport Submission	
	39 - TradeCaptureReport	21. Step -TradeReportID=1060	
	40 - TradeCaptureReport	21. Step -TradeReportID=1070	
	41 - SecurityDefinitionRequest	22. Step - Tailor Made Instrument Generation	
	42 - NewOrderSingle	22. Step - ClOrdID=540	
	43 - NewOrderSingle	22. Step - ClOrdID=550	
	44 - SecurityDefinitionRequest	23. Step - Tailor Made Instrument	

		Generation
	45 - NewOrderSingle	23. Step - ClOrdID=560
	46 - NewOrderSingle	23. Step - ClOrdID=570

4.2.3 Order Entry Market Making Messages

For order entry market making certification, messages are only sent to the second partition. These messages of the simulator application and their corresponding messages in the certification documents are given in Table 6.

Table 6: Partition 2 Market Making

	Simulator Step	Certification Program	
	01 - MassQuote	1. Step - QuoteID=5000	
	02 - MassQuote	2. Step - QuoteID=5010	
	03 - NewOrderSingle	3. Step - ClOrdID=5020	
	04 - MassQuote	4. Step - QuoteID=5030	
	05 - MassQuote	5. Step - QuoteID=5040	
Application Messages	06 - MassQuote	6. Step - QuoteID=5050	Market Making
	07 - MassQuote	7. Step - QuoteID=5060	
	08 - MassQuote	8. Step - QuoteID=5070	
	09 - MassQuote	9. Step - QuoteID=5080	
	10 - MassQuote	10. Step - QuoteID=5090	
	11 - MassQuote	11. Step - QuoteID=5100	
	12 - MassQuote	12. Step - QuoteID=5110	
	13 - MassQuote	13. Step - QuoteID=5120	

4.3 Closing the System

Only system steps exist in closing the system tests. Those steps are run for end of day and next day operations. These messages of the simulator application and their corresponding messages in the certification documents are given in Table 7.

Table 7: Partition 2 Closing the System

	Simulator Step	Certification Program	
Application Messages	47 - SYSTEM*	System step for end of day operations	Closing the System

* 47 – System step: The simulator application simulates finishing the process of previous steps and operating end of day process. This step assumes all previous messages are sent successfully and messages that have to be sent in end of day session are sent, like cancelation of expired orders.

4.4   Reference Data Messages

Base and Advanced level reference messages of the simulator application and their corresponding messages in the certification documents are given in Table 8 respectively.

Table 8: Reference Data

	Simulator Step	Certification Step	
RDS Request	01 - Logon	1. Step - Logon	**Reference Data**
	02 - ApplicationMessageRequest	3. Step - ApplicationMessageRequest	
	03 - SecurityDefinitionRequest	4. Step - SecurityDefinitionRequest	
	04 - SecurityDefinitionRequest	4. Step - SecurityDefinitionRequest	
	05 - SecurityStatusRequest	5. Step - SecurityStatusRequest	
	06 - SecurityStatusRequest	5. Step - SecurityStatusRequest	
	07 - PriceReferenceRequest	6. Step - PriceReferenceRequest	
	08 - PriceReferenceRequest	6. Step - PriceReferenceRequest	
	09 - ApplicationMessageRequest	7. Step – Resend ApplicationMessageRequest	