EURONEXT

Document title

OPTIQ DERIVATIVES THROTTLING CONFORMANCE TEST SCRIPT

Document type or subject

Throttling Conformance test

Version number	Date
Revision Number: 1.0	7 Oct 2019

Number of pages	Author
14	Euronext

PREFACE

PURPOSE

The purpose of this document is to provide customers with a description of how Throttling tests works on Optiq in preparation for the go-live of Euronext Derivatives markets on Optiq platform.

TARGET AUDIENCE

This document is relevant to Trading Members on Optiq Derivatives.

WHAT'S NEW?

The following lists only the most recent modification made to this revision/version. For the Document History table, see the Appendix.

REVISION NO./ VERSION NO.	DATE	AUTHOR	CHANGE DESCRIPTION
1.0	7 Oct 2019	Euronext	Second release – fully replacing previous version of the document

ASSOCIATED DOCUMENTS

The following lists the associated technical documents, which either should be read in conjunction with this document or which provide other relevant information for the user:

■ Technical specifications (Phase 3: Cash OEG / ME & MDG)

- Euronext Derivatives Markets – Optiq Kinematics Specifications
- Euronext Markets – Optiq OEG Client Specifications – SBE Interface
- Euronext Markets – Optiq OEG Client Specifications – FIX 5.0 Interface
- Euronext Derivatives – How the Market Works
- Euronext Markets – OEG Connectivity Specifications

CONTACT

Please find below the Optiq Support Desk contact details, which has been established to ensure customer readiness by:

- sending information to customers related to Optiq
- answering customers' questions related to Optiq
- assisting customers in their testing and validation on the EUA environment
- providing follow-up on customer conformance testing
- assessing customers' state of readiness with regards to technical changes

Optiq Support Desk

Tel: +33 1 70 48 25 55

Email: optiq@euronext.com

SCOPE OF OPTIQ SEGMENTS

The following table provides a list of Optiq Segments and associated tags to which the test script in this document apply to.

Optiq Segment	Tag
Equity Derivatives	EQD
Index Derivatives	IDD
Financial Derivatives	FID
Commodities	CMO

CONTENTS

1.   BEFORE TESTING THROTTLING

Description of the Mechanism:

Details description of the Throttling mechanism used by Optiq is provided as a dedicated section of the *Euronext Markets - OEG Connectivity Specifications* document. Customers should review the document and prepare for passing the throttling tests using the description of the mechanism, and the guidelines for handling of the various cases when their messages are throttled.

Technical Constraints of the Tests:

1) The Throttling conformance script is meant to provide the customer an understanding on how tests of Throttling on Optiq are to be conducted for the Derivatives segments.

   The script contains scenarios to test the two Throttling method – Queuing and Rejection. Customers can choose one of the two methods in their Logon (100) / Logon (A) message.

   It is important that each scenario is only tested a few seconds. The Throttling test involves a large number of messages and bandwidth. In order to reduce impact on the overall Next EUA (p-EUA) platform and other testing activities, customers are reminded to keep their testing short. Each scenario should take no longer than a couple of seconds to perform.

2) When logging into Optiq clients may choose to reject or queue messages that are over their connection throughput limit. The method of handling of the messages over the limit (rejection of queueing) can be modified on each logon. Clients are encouraged to pass tests for both methods of handling of the throttled messages, but are required to pass the tests for at least one of the methods.

2.   THROTTLING CONFORMANCE TEST SCENARIOS

2.1.1   Throttling Queuing: Without Rejection

REQUIRED SBE MESSAGES	Logon (100); New Order(01); Ack (03)
REQUIRED FIX MESSAGES	Logon (A); NewOrderSingle (D); ExecutionReport (8)
MANDATORY	Yes

Objective:

This cycle tests customer's ability to identify and manage the messages that were held in the throttling queue when they choose to Queue messages. The queueing of messages occurs when clients send within 1 second more messages than the maximum throughput of messages assigned to their logical access.

In this case, the corresponding outbound messages (an acknowledgement) contains a field *Ack Qualifiers / AckQualifiers* (21014), with the second position set to 1, to indicate that message was queued.

SBE

Instruction for SBE (Without reject message):
- Customer submits a valid and correctly formatted **Logon** (100) message with Queueing Indicator set to 1.
- Customer waits a minimum of 1 second, to ensure their connection has the full allocated capacity of messages.
- Customer submits within 1 second:
   Either:
   o a burst of **New Order** (01) messages that is between 2 and 3 times the throughput of their Logical Access, OR
   o a linear injection of messages that in sum corresponds to between 2 and 3 times the throughput allocated to their Logical access.

Success Criteria for SBE (Without reject message):
- Optiq system will successfully queue some of the messages.
- Customer confirms:
   o the receipt and correct interpretation of the **Ack** (03) messages,
   o processing of the field *Ack Qualifiers* with second position (bit #1) set to 1 = "Yes" for the message being held in the queue due to throttling
- Customer confirms <u>no</u> **Technical Reject** (108) message was received.

FIX

Instruction for FIX Scenario (Without reject message):
- Customer submits a valid and correctly formatted **Logon** (A) message with *QueueingIndicator* (21020) set to 1

Revision Number: 1.0

- Customer waits a minimum of 1 second, to ensure their connection has the full allocated capacity of messages.
- Customer submits within 1 second
    Either:
    - a burst of **NewOrderSingle** (D) messages that is between 2 and 3 times the throughput of their Logical Access, OR
    - a linear injection of messages that in sum corresponds to between 2 and 3 times the throughput allocated to their Logical access.

Success Criteria for FIX (Without reject message):
- Optiq system will successfully queue some of the messages.
- Customer confirms:
    - the receipt and correct interpretation of the **ExecutionReport** (8) messages,
    - processing of the field *AckQualifiers* (21014) with the position equivalent to Queue Indicator set to 1 = "Yes" for the messages being held in the queue due to throttling.
- Customer confirms no **Reject** (3) message was received.

How to avoid this type of throttling:
To ensure that messages are not queued by the Exchange clients should:
- take the Ack qualifier into consideration in their system, and if required send fewer messages or at a lower rate, to reduce possibility of the messages being throttled,
- assess the speed and/or number of messages being sent by their system and either
    - reduce the frequency of sending to be in line with their replenish time, or
    - reduce the number of messages sent to be in line with the rate and associated throttling limits set for their logical access

2.1.2 Throttling Queuing: Rejection due to Full Queue

REQUIRED SBE MESSAGES	Logon (100); New Order (01) or Quote (08); Technical Reject (108)
REQUIRED FIX MESSAGES	Logon (A); NewOrderSingle (D); Reject (3)
MANDATORY	Yes

Objective:
This cycle tests customer's ability to identify and manage the rejection messages when they choose to queue messages and the queue is full.

In this case, customer's connection receives a rejection indicating that their throttled messages were rejected because their throttling queue is full (flagged as follows):

SBE			FIX		
Message	**Feld**	**Value**	**Message**	**Feld**	**Value**
Technical Reject (108)	Error Code	2087 = Throttling queue full	Reject (3)	SessionRejectReason (373)	25 = Throttling queue full

To provide an indication of which message is rejected due to OEG throttling, the following fields are provided in the rejection messages:

■ SBE**: TechnicalReject** (108) message contains the following fields for this purpose:

Field	Short Description
Rejected Client Message Sequence Number	Indicates the Client Message Sequence Number of the rejected message
Rejected Message	Provides the Type of message rejected, by indicating its Template ID
Error Code	Indicates the type of OEG throttling rejection that occurred

■ FIX: **Reject (3)** message contains the following fields for this purpose:

Tag	Field	Short Description
45	RefSeqNum	Indicates the reference sequence number of the rejected message
372	RefMsgType	Provides the Type of message rejected, by indicating its MsgType (35)
373	SessionRejectReason	Indicates the type of OEG throttling rejection that occurred

SBE

Instruction for SBE (With rejection message):
- Customer submits a valid and correctly formatted **Logon** (100) message with *Queueing Indicator* set to 1.
- Customer submits within 1 second
  Either:
    - a burst of more than **four times** the throughput of messages assigned to that their Logical access, OR
    - a linear injection of messages that in sum corresponds to more than **four times** the throughput allocated to their Logical access.

Success Criteria for SBE (With rejection message):
- Optiq system will successfully queue the maximum number of messages the Logical Access is set up to.
- Customer confirm the receipt and correct interpretation of the **Ack** (03) messages
- Customer confirm the receipt and correct interpretation of the **Technical Reject** (108) message with field *Error Code* = 2087 (Throttling Queue full) for any messages rejected above their queue size.

FIX

Instruction for FIX Scenario (With rejection message):
- Customer submits a valid and correctly formatted **Logon (A)** message with *QueueingIndicator* (21020) = 1
- Customer submits within 1 second
  Either:
    - a burst of more than **four times** the throughput of messages assigned to that their Logical access, OR

     o   a linear injection of messages that in sum corresponds to more than **four times** the throughput allocated to their Logical access.

Success Criteria for FIX (With rejection message):

- Optiq system will successfully queue the maximum number of messages the Logical Access is set up to.
- Customer confirm the receipt and correct interpretation of the **ExecutionReport** (8) messages
- Customer confirm the receipt and correct interpretation of the **Reject (3)** message with field *SessionRejectReason* (373) = 25 (Throttling Queue full).

How to avoid this type of throttling:

The message rejected is not processed by the Exchange. To avoid this clients should:

- take this rejection into consideration in their system, and if required resend the same message that was throttled to the exchange,
- wait for a minimum of 1 replenish time period[1] before sending any further messages,
- assess the speed and/or number of messages being sent by their system and either
  - reduce the frequency of sending to be in line with their replenish time, or
  - reduce the number of messages sent to be in line with the rate and associated throttling limits set for their logical access

2.1.3 Throttling Rejection: Limit Breach

REQUIRED SBE MESSAGES	**Logon (100), New Order (01) or Quote (08); Reject (108)**
REQUIRED FIX MESSAGES	**Logon; NewOrderSingle (D); Reject (3)**
MANDATORY	**Yes**

Objective:

This cycle tests Client's ability to identify and manage the rejection messages when they choose to reject messages over the throttling limit.

Client receives a rejection indicating that their throttled messages were rejected because they have exceeded their rate (flagged as follows):

SBE			FIX		
Message	**Feld**	**Value**	**Message**	**Feld**	**Value**
Technical Reject (108)	Error Code	2085 = Rate exceeded	Reject (3)	SessionRejectReason (373)	26 = Throttling Rate exceeded

---

[1] Concept is explained in the section dedicated to throttling in the OEG Connectivity Specifications document.

To provide an indication of which message is rejected due to OEG throttling, the following fields are provided in the rejection messages:

■ SBE**: TechnicalReject** (108) message contains the following fields for this purpose:

Field	Short Description
Rejected Client Message Sequence Number	Indicates the Client Message Sequence Number of the rejected message
Rejected Message	Provides the Type of message rejected, by indicating its Template ID
Error Code	Indicates the type of OEG throttling rejection that occurred

■ FIX: **Reject (3)** message contains the following fields for this purpose:

Tag	Field	Short Description
45	RefSeqNum	Indicates the reference sequence number of the rejected message
372	RefMsgType	Provides the Type of message rejected, by indicating its MsgType (35)
373	SessionRejectReason	Indicates the type of OEG throttling rejection that occurred

SBE

Instruction for SBE (with Technical Reject message) :
- Customer submits a valid and correctly formatted **Logon** (100) message with field *Queueing Indicator* set to 0.
- Customer submits within 1 second **more than twice** the throughput of their Logical Access.

Success Criteria for SBE (with Technical Reject message) :
- Customer confirm the receipt and correct interpretation of the **Ack** (03) messages,
- Customer confirms the receipt and correct interpretation of the **Technical Reject** (108) message with field *Error Code* = 2085 (Rate exceeded).

FIX

Instruction for FIX Scenario (With Reject message):
- Customer submits a valid and correctly formatted **Logon** (A) message with *QueueingIndicator* (21020) set to 0.
- Customer submits within 1 second **more than twice** the throughput of their Logical Access.

Success Criteria for FIX (With Reject message):
- Customer confirm the receipt and correct interpretation of the **ExecutionReport** (8) messages,
- Customer confirm the receipt and correct interpretation of the **Reject** (3) message with *SessionRejectReason* (373) = 26 (Throttling Rate exceeded).

How to avoid this type of throttling:
The message rejected is not processed by the Exchange. To avoid this clients should:
- take this rejection into consideration in their system, and if required resend the same message that was throttled to the exchange,

- wait for a minimum of 1 replenish time period[2] before sending any further messages,
- assess the speed and/or number of messages being sent by their system and either
  - reduce the frequency of sending to be in line with their replenish time, or
  - reduce the number of messages sent to be in line with the rate and associated throttling limits set for their logical access

2.1.4 Sending New Messages After Rejection due to Throttling (FIX only)

REQUIRED SBE MESSAGES	N/A
REQUIRED FIX MESSAGES	ResendRequest (2); NewOrderSingle (D); SequenceReset (4)
MANDATORY	Yes, for FIX protocol only

Objective:

This cycle tests Client's ability to identify and manage Gap in sequence of message due to rejection of throttled messages.

Any messages rejected due to throttling are not read by the OEG.

The sequence number of rejected messages is not taken into consideration by the OEG.

In this case, for clients that use FIX protocol, a gap in the sequence number will occur. When sending messages after being rejected, the OEG will detect a gap, and will initiate the standard FIX protocol mechanism for reset of sequence / gap fill.

Instruction (Sequence of steps in the test):

- Customer submits a valid and correctly formatted **Logon** (A) message with *QueueingIndicator* (21020) set to 0.
- Customer submits within 1 second **more than twice** the throughput of their Logical Access.
  - Some of these messages may already be rejected.
  - Even without any other actions, clients may already receive a ResendRequest (2) from the OEG at this moment.
- If no ResendRequest (2) is received from the OEG, customer:
  - Waits a minimum of 1 second
  - Then, sends a new message that follows the sequence numbering as if no rejections were sent to provoke a Resend request
- When the ResendRequest (2) is sent by the OEG customer submits
  Either,
  - Resent the missing messages with the appropriate sequence number and GapFill flag, OR

---

[2] Concept is explained in the section dedicated to throttling in the OEG Connectivity Specifications document.

- o Sends a valid and correctly formatted **SequenceReset** (4) message followed by a new message that is submitted after the rejections. This is the Final successful message of the test.

Expected result:

- Customer confirms the receipt and correct interpretation of the **ExecutionReport** (8) messages, for the messages before the rejection.
- Customer confirms the receipt and correct interpretation of the **Reject** (3) message with *SessionRejectReason* (373) = 26 (Throttling Rate exceeded).
- Customer confirms the receipt and correct interpretation of the **ResendRequest** (2).
- Client confirms the receipt of an **ExecutionReport** (8) for the Final Successful message of the test.

3.   SUPPORT

A Support Desk dedicated to the Optiq programme was launched in June 2016, and will be available to customers for the duration of the Optiq implementation programme. It has been set up to answer customers' queries related to the Optiq programme, to send information to customers related to Optiq, to assist customers in their testing and validation on the EUA environment, and to provide follow-up on client conformance testing.

The Optiq Support Desk has been set up to ensure customer readiness and will be the primary point of contact for clients throughout the migration. The scope of the Support Desk will include:

- Answering customer queries about the Optiq programme, such as technical and functional questions, clarifications on the specifications and documentation, questions relative to the migration and associated dates, and questions regarding connectivity.

- Sending information about Optiq to customers, such as the monthly newsletters, regular technical notes, programme Info Flashes and updates to the dedicated Optiq web page.

- Assisting customers in their testing and validation on EUA environment by generating test orders, trades and market data, matching client orders upon request, and facilitating testing on the platform by creating Production-like conditions.

- Coordination and follow-up on customer conformance testing by ensuring that clients have made the required developments for the new Optiq platform and providing support during the conformance testing periods.

SUPPORT DESK INFORMATION

Contact details: Optiq Support Desk

Tel: +33 1 70 48 25 55

Email**: optiq@euronext.com**

Opening hours: Monday – Friday: 09:00 to 18:00 CET

                             Revision Number: 1.0

APPENDIX A: REVISION HISTORY

SUMMARY OF CHANGES

Version	Change Description
1.0	First release

DOCUMENT HISTORY

REVISION NO.	DATE	AUTHOR	CHANGE DESCRIPTION
1.0	7 October 2019	Euronext (Optiq Desk)	First release of the document