

TIMESTAMPS

TECHNICAL NOTE



Scope and audience: This document provides additional information related to time stamps for Optiq OEG.



ASSOCIATED DOCUMENTS

The following associated documents should either be read in conjunction with this document, or provide the relevant information for the user (including the description of the fields and messages named in this document), they could be found on our **website**:

- Euronext Cash Markets - Optiq OEG Client Specifications - SBE Binary Interface
 - Euronext Cash Markets - Optiq OEG Client Specifications - FIX 5.0 Interface
 - Euronext Cash Markets – Optiq Kinematics Specifications
 - Euronext Cash Markets – Optiq & TCS Error List
 - SBE XML message templates
 - Euronext Cash and Derivatives Markets – Optiq MDG Client Specifications
 - Euronext Cash and Derivatives Markets – Optiq File Specifications
-

1. TIME & TIME STAMPS IN OPTIQ

1.1 INTRODUCTION

To better track and illustrate superior performance of Optiq, private and public messages contains a number of Timestamp fields. This document highlights details of these fields, and provides guidance on how clients may better track latency of private and public messages, and may assist clients in identifying missed opportunities.

For readability purposes the examples, formulas and majority of descriptions use references to the SBE messages, fields and formats only.

1.2 GLOSSARY

This section provides some high level definitions of commonly used terms in this document. Please note that some of these terms are described in more details in the dedicated sections within this document or in the associated Optiq specifications documents.

- **Timestamps** - a device (a representation) for recording the time of day, and in some cases date, on which an event has occurred, or messages are received or sent out. Technical format of the timestamp used in various field may represent this value differently, and is specified for each field associated with timestamps in the message specifications.
- **Timescale** - the span of time within which events occur, in comparison to any broader period of time. Timescale is used to identify granularity of the time protocol used for synchronization between computer networked systems, and definition of timestamps.
- **Softstamps** - are timestamps captured in the application software.
- **Accuracy** - Precision, or exactness, of a measurement, indicating the ability of the system to match the actual value of the quantity being measured.
- **Precision Time Protocol (PTP)** - is a protocol (documented by IEEE in 1588) used to synchronize clocks in the computing infrastructure, using computer network. PTP is used in mission critical applications as it has higher level of granularity (as compared to NTP) and has built in provisions to eliminate network and equipment jitter. PTP timescale is defined in seconds and nanoseconds, with common assumption that the POSIX timescale with origin 1 January 1970 is used. Normally PTP accuracy of synchronized clocks is in the order of 100 ns.
- **Network Time Protocol (NTP)** - is a networking protocol (documented in RFC 5905) used to synchronize clocks in the computing infrastructure. NTP does not require hardware provision to provide timestamps, and is normally used for coarse level granularity, for application level synchronization. The NTP timescale is defined in seconds and fraction with origin 1 January 1900. The accuracy of NTP typically range from a few microseconds to tens of milliseconds in widely dispersed Internet networks.

1.3 TIMESTAMP FIELDS IN OPTIQ

Inbound and outbound messages in private and public data in Optiq carry several timestamps. Some of these are provided by the clients, and some are internal values provided by Optiq to allow the clients to monitor the processing time of the system at different levels.

The following diagram and table represents the different timestamps provided in the outbound messages:

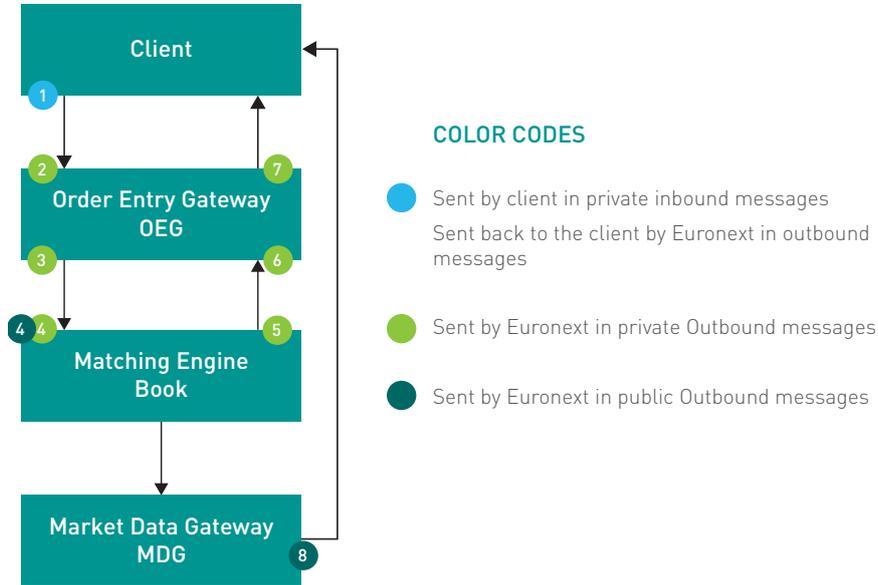


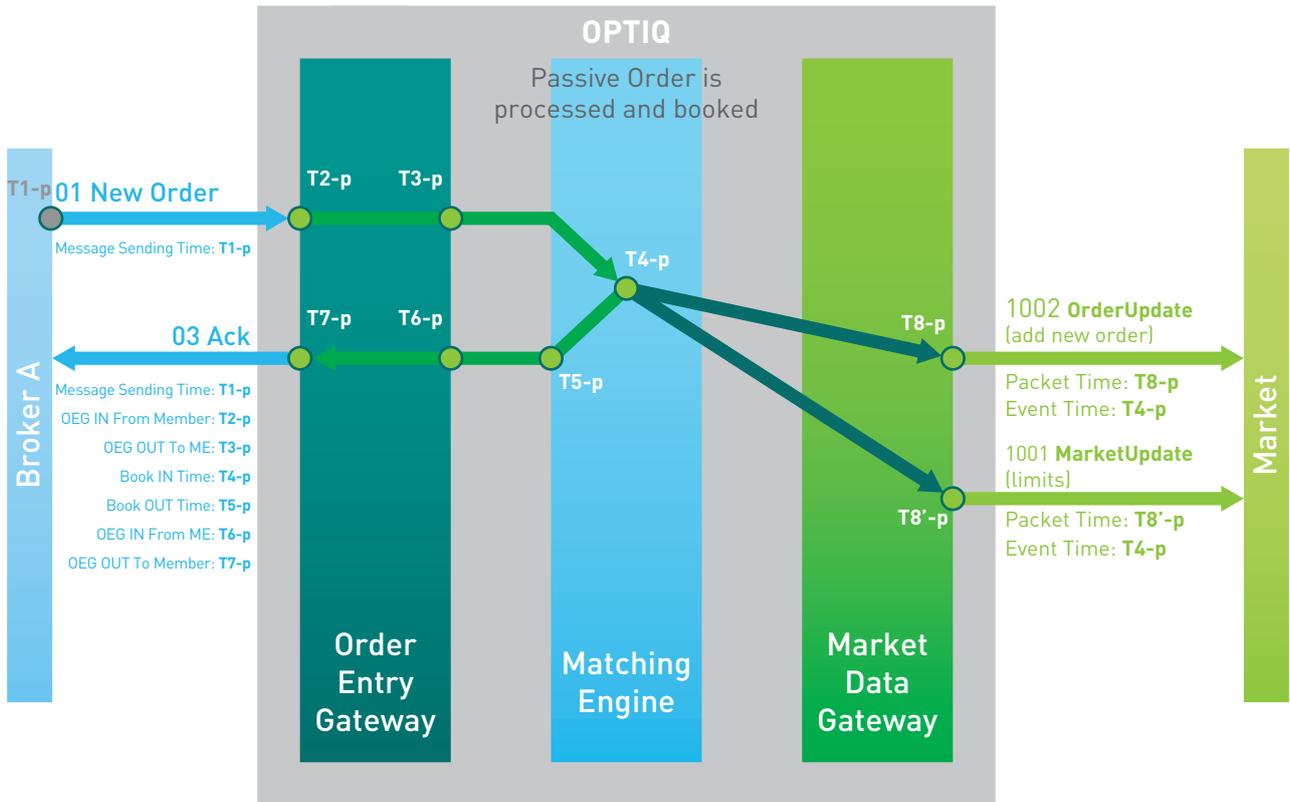
Table below provides a summary of timestamps used in Optiq, their identifiers and mapping to SBE and FIX fields used in various messages. These are the identifiers used throughout this document for descriptions, explanations and calculations associated to the time stamps.

Timestamp Identifier	Feed Type	SBE Field name	FIX Field	FIX Tag	Notes
T1	Private	<i>Message Sending Time</i>	<i>Sending Time</i>	52	Present only in inbound messages from Client
			<i>Client Message Sending Time</i>	21005	Present only in outbound messages. Populated with the same value provided by the client in the field <i>Sending Time</i> in the inbound messages
T2	Private	<i>OEG IN From Member</i>	<i>OEG IN From Member</i>	5979	
T3	Private	<i>OEG Out To ME</i>	<i>OEG Out To ME</i>	7764	
T4	Private	<i>Book IN Time</i>	<i>Book IN Time</i>	21002	Maps to <i>Event Time</i> field in public [MDG] messages
	Private	<i>Trade Time</i>	<i>Transact Time</i>	60	For aggressive orders that are matched immediately, this value is same as <i>Book In Time</i>
	Public [MDG]	<i>Event Time [MDG]</i>	N/A	N/A	Maps to <i>Book In Time</i> in private messages
T5	Private	<i>Book OUT Time</i>	<i>Book OUT Time</i>	21003	
T6	Private	<i>OEG IN From ME</i>	<i>OEG IN From ME</i>	7765	
T7	Private	<i>OEG OUT To Member</i>	<i>Sending Time</i>	52	Provided only in outbound messages
T8	Public [MDG]	<i>Packet Time [MDG]</i>	<i>PacketTime</i>	N/A	

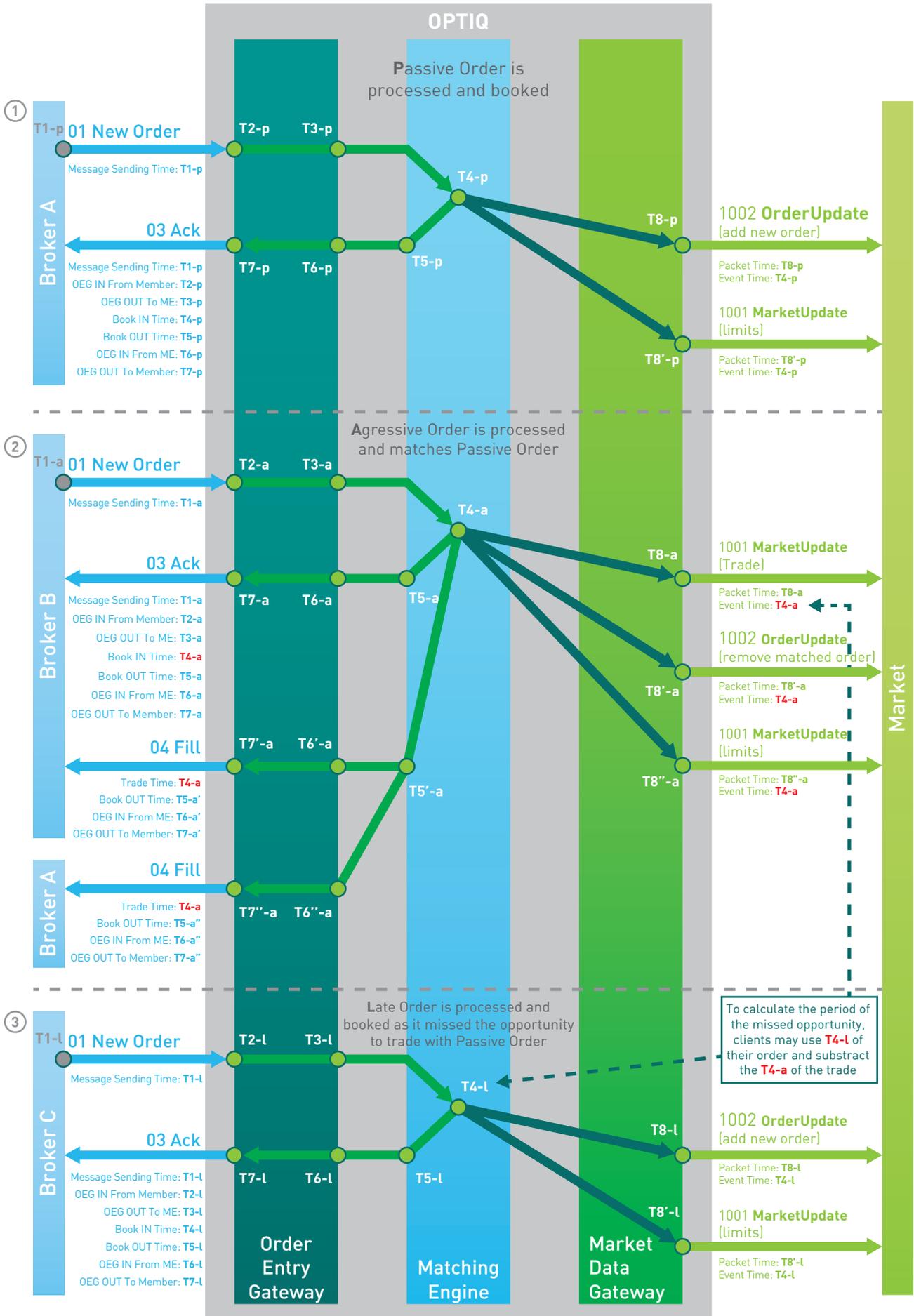
1.4 TIMESTAMP KINEMATICS

Diagrams below provide kinematics of timestamp use in Optiq, and correspond to the various cases described in this document.

Single Order Entry Into Book



Match of Two Orders, Followed by Entry of a "Missed Opportunity" Order



1.5 HOW OPTIQ TIMESTAMPS ARE SET

With delivery for the Cash markets full trading chain, including OEG, ME and MDG Optiq uses PTP to be in line with the MiFID II requirements.

Optiq timestamps are softstamps gathered at the moment individual components of the system receive or process the message. Optiq uses network adapters with integrated PTP hardware clock, which is used to synchronize the system clock. This solution results in very low jitter, with typical standard deviation for the offset-from-master-clock is in the range of 10 nanoseconds.

Table below identifies when the value of the timestamp is assigned, as indicated by the fields in the private SBE messages, and if applicable, their mapping to the timestamp fields in the public MDG messages.

Timestamp Identifier	When is the timestamp taken	Software or Hardware	Matching Timestamp in MDG Public messages
T1	Provided by client, and taken by the system as provided upon entry	Depends on the setup of clients' system	Available in Private messages only
T2	Assigned by the OEG after decoding the inbound message	Software	Available in Private messages only
T3	Assigned by the OEG when sending the inbound message to the matching engine	Software	Available in Private messages only
T4	Assigned by the ME when processing the inbound message from the OEG, and published in MDG	Software	Matches <i>Event Time</i> field in the following MDG public feed messages: <ul style="list-style-type: none"> • 1001 – Market update, when sent for a trade • 1002 – Order Update • 1004 – Full Trade Information
	For aggressive orders that are matched immediately, this value is same as <i>Book In Time</i>		Available in Private messages only For aggressive orders that are matched immediately, this value is equivalent to <i>Book In Time</i> (T4-a (ggressive order))
T5	Assigned by the ME when sending the outbound message to the OEG	Software	Available in Private messages only
T6	Assigned by the OEG just after receiving the outbound message from the ME	Software	Available in Private messages only
T7	Assigned by the OEG before sending the outbound message to the client	Software	Available in Private messages only
T8	Assigned by MDG on sending of the package	Software	Available in Private messages only

1.6 OBTAINING BEST PERFORMANCE / LATENCY

Use the “Shortest” path

In order to benefit from the best response times the clients should send messages directly to the partition on which the instrument is located. To identify on which partition each instrument is located, clients must use, and update on a daily basis, their referential data by downloading the **CashStandingData** (9007) files or using the **StandingData** (1007) real-time market data messages, where details of the *Partition ID* assigned to each instrument are provided.

1.7 GUIDELINES ON USING TIMESTAMPS

Notes for Use of Data

- References in the guidelines below use the Timestamp identifiers. Clients using FIX protocol must take into consideration that the same Timestamp identifier may be provided via different tags in inbound and outbound messages
- In case client disconnection, business continuity events, or any other cases where client may request retransmission of their messages, calculation of latency should not utilize such timestamp data as it won't be accurate or realistic. In most such cases clients using FIX protocol may identify such messages by value "Y" being set in field *PossDupFlag* (tag: 43)

Guidelines

- Calculate private message round trip time within Optiq

$$\textit{Roundtrip Time of Private Messages with Optiq} = T7 - T2$$

where:

- **T7** = *OEG OUT To Member* in the in **Ack** (03) (FIX 8) message
- **T2** = *OEG IN From Member* set by the exchange on receipt of in the incoming **New Order** (01) (FIX D) message received from the client
- Calculate private message round trip time from within Clients' system

$$\textit{Roundtrip Time of Private Messages from & to Client' system} = T8 - T1$$

where:

- **T8** = Time when client records receipt of the **Ack** (03) (FIX 8) message
- **T1** = *Message Sending Time* in the incoming **New Order** (01) (FIX D) message received from the client
- Identify time by which an aggressive order missed execution when the trade didn't occur as the result of the Uncrossing

$$\textit{Time by which Order Missed Opportunity} = T4-a - T4-l$$

where:

- **T4-a (aggressive order)** = *Event Time* of the Public (MDG) **MarketUpdate** (1001) message of the match, corresponding to the *BookInTime* of the aggressive order that triggered the match. In case the trade didn't occur as a result of the Uncrossing - the field *Event Time* for the trade in MDG messages is equivalent to the *BookInTime* field in the private messages of the associated successful aggressive order, that was executed immediately upon entry
- **T4-l (late order)** = *BookInTime* of the client's submitted aggressive order which missed the match

Please note: When the trade occurred as the result of the Uncrossing value in the field *Event Time* in Public (MDG) **MarketUpdate** (1001) message corresponds to the time of the Uncrossing and isn't subject to calculation of the time by which aggressive order missed execution.

Trades that occurred during Uncrossing can be identified in MDG as those sent after a **MarketStatusChange** (1005) message with the field *Book State* set to 4 = Uncrossing, and before another **MarketStatusChange** (1005) message with the field *Book State* set to any other value.

Customer focus

The migration onto the new Optiq platform has been designed with customers in mind. Technical relationship managers from the Euronext Client Readiness team will be available to meet with clients to review the technical specifications, facilitate impact assessment, hold development workshops, and provide regular updates on the migration timeline and status.

CONTACT DETAILS

For any questions about this document please contact Euronext Optiq Support Desk or the Customer Technical Support Group (CTSG)

Optiq Support Desk

Tel: +33 (1) 70 48 25 55

optiq@euronext.com

CTSG

Tel: +33 (0)1 8514 8588

CTSG@euronext.com

Disclaimers

This document contains information which is confidential and of value to Euronext. The information and materials contained in this document are provided 'as is' and Euronext does not warrant the accuracy, adequacy or completeness and expressly disclaims liability for any errors or omissions or changes enabled to be made for any reason included correction, update and upgrade purpose. This document contains links to certain Internet Websites developed, sponsored or maintained by third parties unaffiliated with Euronext. The content you view therein is not provided or controlled by Euronext. Euronext is not responsible for that content, nor has it developed, checked for accuracy or otherwise reviewed the content or privacy policy of any such third party Website. This document is not intended to impose any legal obligation on Euronext. This document and any contents thereof, as well as any prior or subsequent information exchanged with Euronext in relation to the subject matter of this document, are confidential and are for the sole attention of the intended recipient. Except as described below, all proprietary rights and interest in or connected with this publication shall vest in Euronext. No part of it may be redistributed or reproduced without the prior written permission of Euronext. Portions of this publication may contain materials or information copyrighted, trademarked or otherwise owned by a third party. No permission to use these third party materials should be inferred from this publication. Implementation of the project may be subject to regulatory approval. Euronext refers to Euronext N.V. and its affiliates. Information regarding trademarks and intellectual property rights of Euronext is located at www.euronext.com/terms-use.