

T7 Release 5.0

Enhanced Trading Interface (ETI)

Manual

Simulation Version

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Enhanced Trading Interface (ETI)

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1. List of Abbreviations

Please find a list of all the abbreviations used in the document. The first time an abbreviation is introduced in the document it is written in brackets after the phrase.

| | |
|------------------|--------------------------------------------------------------------------------------|
| AAO | Any Auction Only (order) |
| Admin GUI | Graphical User Interface for Administration functions, for example, user maintenance |
| BOC | Book or Cancel (order) |
| CAO | Closing Auction Only (order) |
| EMDI | Enhanced Market Data Interface |
| EOBI | Enhanced Order Book Interface |
| ETI | Enhanced Trading Interface |
| FOK | Fill or Kill (order) |
| GTC | Good Till Cancel |
| GTD | Good Till Date |
| HF | High-frequency (session) |
| IOC | Immediate or Cancel (order) |
| LF | Low-frequency (session) |
| MDI | Market Data Interface |
| OAO | Opening Auction Only (orders) |
| OCO | One Cancels the Other (order) |
| RDF | Reference Data File |
| RDI | Reference Data Interface |
| TES | T7 Entry Service (derivatives markets only) |
| UDF | User-defined field that is not part of the official FIX Specification |

2. Introduction

T7 is the industry-leading, multi-asset trading platform of the Deutsche Börse Group, its affiliates and partners.

The system has best-in-class performance and is scalable to support markets of any size. It can be customized to support different types of markets.

The Enhanced Trading Interface (ETI) is the high performance interface designed for participants who require the highest throughput and the lowest latency for their transactions.

All application messages between the client and the ETI follow FIX V5.0 SP2 semantics including all officially approved extension packs.

A proprietary session layer and flat binary encoding is used in order to provide the best performance.

The ETI provides all trading functions of T7:

- Order handling
- Quote handling including quote activation and inactivation
- Execution notifications
- Market maker protection mechanisms (derivatives markets only)
- Creation of a strategy (derivatives markets only)
- Request for quote
- Cross request
- T7 Entry Service (derivatives markets only)
- Access to private reference data (e.g., list of own users/sessions, trade enrichment rules)

Additionally the ETI enables participants to subscribe to private trading data:

- Complete order history of all standard orders of any session belonging to the own business unit
- Trade notifications for all sessions of the business unit

The following trading support information may be subscribed by each session:

- General messages from market supervision (news)

Private risk control messages are automatically sent to each session of the corresponding trading and clearing business unit.

The ETI does not provide any market data, or administrative functions.

2.1 Purpose

The purpose of this document is to provide the documentation of the current version of the ETI interface to participants. It describes the main concepts.

Please refer to the related documents listed below for details on message formats, release scope, system overview and functional reference.

2.2 Related Documents

2.2.1 ETI Message References

There are two message reference manuals for the cash and derivatives markets, ETI Cash Message Reference and ETI Derivatives Message Reference, respectively. They provide all message formats available. Both documents are provided together with the ETI Manual.

2.2.2 Release Notes

There are separate release note documents for the cash and derivatives markets, namely Release Notes for Cash Markets and Release Notes for Derivatives Markets. They give an overview of the functional and technical enhancements and changes to be introduced. Both documents are already available.

2.2.3 Functional and Interface Overview

There is a single overview document which gives an overview of T7, irrespective of any cash markets or derivatives markets specifics. It describes the major functional and system features, and provides a high level description of the interface landscape. The document for T7 release will be available in April 2017. Please refer to the Communication Calendar for any updates.

2.2.4 Functional Reference

There is a single reference document which gives detailed insight into the functional concepts of T7, irrespective of any cash markets or derivatives markets specifics. The document for T7 Release 5.0 will be available in April 2017. Please refer to the Communication Calendar for any updates.

3. Technical Overview

The Enhanced Trading Interface (ETI) is the high performance trading interface designed for participants who require the highest throughput and the lowest latency. This transactional interface is provided in parallel to the FIX Gateway whose target groups are FIX 4.2 and FIX 4.4 customers.

The ETI has the following main characteristics:

3.1 Message Based

The ETI is an asynchronous, message-based interface. The connection between the participant and T7 is established via a TCP/IP connection.

3.2 Low Footprint

Integration of the ETI interface into the participant's existing IT infrastructure is simplified due to the following:

- No special hardware is required.
- No exchange software has to be installed.
- Free choice of operating system, programming language and compiler versions.

3.3 Standard

In order to ease the implementation effort for participants, the ETI uses best practice methods taken from the financial industry, namely the use of the FIX Protocol standard.

3.4 Session Oriented

The ETI is a session oriented interface.

Participant applications connect to the trading system by Application Gateways that host the client sessions. A session is established by opening a TCP/IP session to the gateway.

The exchange provides a unique session identifier that is used when logging on. A Session ID can only establish one session at any time. Each participant application requires its own session.

ETI based applications receive information on orders and quotes which were entered in their own session. Several trading groups and traders of the same business unit may share a single session.

3.5 Backward Compatibility

ETI offers its enhancements with new XML and C-header files for each release. Use of these files can be deferred until the next releases under certain circumstances, because ETI supports the concept of layout-level backward compatibility. That means, in case of an application that was built for one of the previous releases, ETI expects and sends the old layouts.

New or modified field contents (valid values and/or usage), however, are not suppressed. In certain cases, even layout-level backward compatibility cannot be offered. Enhancements introduced within the new release cannot be used by applications that make use of the backward compatibility facility. Please note that XML and C-header files of the previous releases will not be re-distributed.

Therefore an application using the ETI interface should be able to deal with:

- new valid values as field content,
- usage changes of message fields,
- new message layouts in a broadcast stream.

3.6 Subscription Mechanism

The ETI provides information across sessions via a subscription mechanism. This includes trade notifications, TES maintenance notifications, TES trade notifications (all at a business unit level), the complete order history of standard orders of another session (listener broadcast), and public news messages. TES is provided for derivatives markets only.

3.7 Full Control in Case of a Failover

A heartbeat mechanism between the participant's application and T7 supports the detection of malfunctions of the underlying trading session between the participant and the Exchange gateway.

ETI does not include any mechanism for automatic failover. Participant applications can implement a failover mechanism of their choice that supports their requirements. Please refer to chapter Failover for more information.

3.8 Architecture Throttle

The number of transaction requests transmitted to T7 per pre-defined time interval by each participant session is limited. This is to:

- prevent single participant sessions generating excessively high transaction rates, which might adversely affect exchange trading as a whole;
- guarantee fairness between participant sessions.

For more details, please refer to chapter Throughput Limits.

3.9 Session Login and User Login Throttle

The number of allowed session and user login requests transmitted to T7 per pre-defined time interval is limited. T7 will check both, the number of logins for a certain session and the number of logins for a certain user (via all sessions belonging to its business unit). For both, T7 will count the number of logins (per time interval). If that counter hits the limit, T7 will reject that login request and all the following ones (for either a certain session - session login, or a certain user - user login) within a "cooling" time interval. Then, T7 will re-set the related counter.

4. Service Description

4.1 FIX Semantics

All application messages between the participant and the ETI follow FIX V5.0 SP2 semantics including all officially approved extension packs.

Additionally user defined fields (UDF) and messages have been added to cover functional gaps in the FIX standard or to increase performance.

The following changes have been made for performance reasons:

- All rejections and errors on an application and session level are communicated via the FIX standard Reject (3) message.
- All parties are identified by individual UDFs instead of repeating groups. UDF tags and names were chosen in a way that supports automated translation to standard FIX repeating groups for parties.

The FIX messages are denoted in the following way:

- Message name (Message Type)

The FIX fields are denoted in the following way:

- Field name (FIX Tag)

FIX repeating groups and components are denoted in the following way:

- <Group name>

4.2 Party Identification

The **participant** is an entity accessing T7. The Eurex/Xetra concept of a member remains in place, and will be represented by a “participant” within the new system. When trades are sent to the clearing system, the participant will be replaced by its corresponding member-ID.

A participant may have several **business units** as independent entities taking part in trading at the exchange. Business units are identified by a business unit ID. A business unit belongs to a participant. The Enhanced Trading Interface deals only with the concept of a business unit.

A **user** is a person, such as a trader or an exchange market supervisor that interacts with T7. Users are identified by a user ID. A user belongs to one business unit. A user is a trader or administrator that logs on to the system to enter commands on the trading system.

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Users can be assigned to a specific **trader group**, along with the *head trader* and *supervisor roles*:

- A user with a user level of **head trader** may modify or cancel orders of any user belonging to the same trader group.
- A user with a user level of **supervisor** may modify or cancel orders of any user belonging to the same business unit.

All requests that are received by the Enhanced Trading Interface (ETI), with the exception of session related requests, must carry the ID of a user that enters the request.

The user of the business unit needs to be provided by the request submitter in the *SenderSubID (50)* of the request header. All orders and quotes must carry the identification of a physical person that is legally responsible for the order or quote.

The following party roles and attributes are used in ETI:

| Party/ Party Attributes | D* | C* | Description | Relevant FIX Field |
|----------------------------------------|----|----|------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Participant/ Participant Short Name | X | X | The participant is an entity accessing T7. | RootPartyExecutingFirm (22401) |
| Business Unit / Business Unit ID | X | X | Indicates the company or a part of a company that is set up as an independent entity taking part in trading at the exchange. | PartyIDExecutingUnit (20059), RootPartyIDExecutingUnit (20459), PartyDetailIDExecutingUnit (20259) |
| User/ User ID | X | X | A business unit can have multiple users. A user can be a trading user and/or an administrator. | Username (553), SenderSubID (50) |
| Owning User/ Owning User ID | X | X | User who owns the transaction. | PartyIDExecutingTrader (20012), RootPartyIDExecutingTrader (20412), TargetPartyIDExecutingTrader (20612), RequestingPartyIDExecutingTrader (20812), PartyDetailIDExecutingTrader (20212) |
| Owning User/ Owning User Short Name | X | X | User who owns the transaction. | RootPartyExecutingTrader (22412), PartyDetailExecutingTrader (22212) |

*D=Derivatives; C=Cash

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| Party/ Party Attributes | D | C* | Description | Relevant FIX Field |
|------------------------------------------------------|---|----|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Entering User/ Entering User ID | X | X | User who initiates/submits the order/quote transaction; could be the head trader or supervisor or a market supervision user. | PartyIDEnteringTrader (20036) |
| Entering Entity/ Entering Entity ID | X | X | Identifies the entity that entered the transaction; might be market supervision, the participant or the clearing member. | PartyIDEnteringFirm (20007) RequestingPartyIDEnteringFirm (20807) |
| Entering Entity/ Entering Entity Short Name | X | X | Identifies the entity that entered the transaction; might be market supervision, the participant or the clearing member. | RequestingPartyEnteringFirm (22807) |
| Trader Group/ Trader Group | X | X | Users can be assigned to a specific trader group. | TargetPartyIDDeskID (20676) PartyDetailIDDeskID (22276) |
| Session/ Session ID | X | X | Identification of the session. A session belongs to a business unit. | PartyIDSessionID (20055), TargetPartyIDSessionID (20655), RootPartyIDSessionID (20455) |
| Clearing Member/ Clearing Member Short Name | X | X | Clearing member identification. | RootPartyClearingFirm (22404), RequestingPartyClearingFirm (22804) |
| Clearing Business Unit/ Clearing Business Unit ID | X | X | Indicates the company or a part of a company that is set up as an independent entity taking part in clearing. | RootPartyIDClearingUnit (25026) |
| Counter Party /short name | - | X | Counter party for trades. | RootPartyContraFirm (22417) |
| Counter Party / Counter Party ID | - | X | Counter party for trades. | RootPartyIDContraUnit (25114) |

UDF tags for ETI parties consist of an offset and the standard “enum” value of *PartyRole* (452): e.g.,

- *PartyID* (448) has an offset of 20000
- *RootPartyID* (1117) has an offset of 20400
- *TargetPartyID* (1462) has an offset of 20600

UDF names for ETI parties consist of the standard FIX field name (*PartyID* (448), *RootPartyID* (1117), *TargetPartyID* (1462)) concatenated with the symbolic name of the standard “enum” value of *PartyRole* (452) as defined in the FIX Repository.

For example the ETI tag and field name for the user is *PartyIDExecutingTrader* (20036).

4.3 Security Identification

Each T7 product is processed on exactly one partition; a partition is a grouping of products. To optimize the routing to the corresponding partition, the product identifier needs to be provided in each order and quote transaction by the participant. The exceptions to this rule are Short Order Message Layouts, see chapter Short Order Message Layouts.

Both single and multi leg instruments are uniquely identified by the unique instrument identifier.

Additionally for multi leg instruments it is mandatory to specify the instrument type in all order requests.

Multi leg instruments are supported for derivatives markets only.

| Identifier | Description | Relevant FIX Tags |
|-----------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------|
| Product Identifier | The product identifier uniquely identifies a T7 product. | MarketSegmentID (1300) |
| Instrument Identifier | The instrument identifier uniquely identifies an instrument in the core system. | SecurityID (48), SimpleSecurityID (30048) ¹ |

¹ *SimpleSecurityID* (30048): Instrument identifier for simple instruments (derivatives markets only). Should be filled with the 4 least significant bytes of SecurityID (48) provided in Reference Data of **Eurex RDI** and **Eurex RDF**.

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| Identifier | Description | Relevant FIX Tags |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Instrument Type (derivatives markets only) | Required for complex instruments, valid values are: 1 = Simple Instrument 2 = Standard Option Strategy 3 = Non-Standard Option Strategy 4 = Options Volatility Strategy 5 = Futures Spread 6 = Inter Product Spread 7 = Standard Future Strategy 8 = Pack and Bundle 9 = Strip 10= Flexible Simple Instrument | ProductComplex (1227) |

4.4 Creation of a Strategy (derivatives markets only)

The Create Strategy message can be used to create a specified complex instrument on T7.

The T7 product identifier (*MarketSegmentID (1300)*), instrument type (*ProductComplex (1227)*) and the signature *<InstrmntLegGrp>* (description of the legs, their ratios and side) are mandatory attributes of the request.

Standard Options Strategies, Options Volatility Strategies, Standard Future Strategies, Pack and Bundle and Inter Product Spread require the entry of the strategy type (*SecuritySubtype (762)*). Please refer to functional product and instrument files on the Eurex website: www.eurexchange.com > Technology > Eurex Exchange's T7 > Documents.

If the complex instrument already exists or is created successfully, the Create Strategy Response message returns the complex instrument identifier (*SecurityID (48)*) and the signature of the complex instrument.

Note: The signature which is returned by the T7 architecture may differ from the signature which was sent in the Create Strategy message, e.g. in order to match a pre-defined strategy template. The same is true for instrument type (*ProductComplex (1227)*) and strategy type (*SecuritySubType (762)*).

Only after a specific complex instrument has been requested and created, is it possible to enter orders or quotes for this instrument.

Strategies which are created by users are always temporary and are cancelled during end of day processing if their order book is empty.

4.5 Creation of a Flexible Simple Instrument (derivatives markets only)

The Create Flexible Instrument request can be used to create a user defined flexible instrument.

Supported Flexible Instruments are:

- Simple instruments (Options and Futures)

If the Flexible Instrument already exists or is created successfully, the Create Flexible Instrument response message returns the flexible instrument identifier (*SecurityID (48)*) with the instrument type *ProductComplex(1227) = 10 (Flexible simple instrument)* and the signature of the Flexible Instrument.

Flexible simple instruments can be used only for TES trading.

4.6 Order Identifiers

Market Participants may choose one of the following **options for order identification**:

- Use a constant client order ID over the complete lifetime of an order.
- Standard FIX policy of client order ID chaining: client order ID must change on every modification and cancellation request.
- Use the exchange order ID.

Market participants may use the client order ID for order and order related message identification.

Modification and cancellation of an order is supported both via the client order ID and the exchange order ID.

Once an order has a client order ID, it must have a client order ID for the rest of its life cycle. Respectively an order without a client order ID cannot be modified to have a client order ID later on in its life cycle.

4.6.1 Client Order ID

The FIX standard field *CIOrdID (11)* is used for the client order ID.

Note: T7 will not enforce market participants to use a new *CIOrdID (11)* for application messages related to a resting order; i.e. the *CIOrdID (11)* may stay the same during the life cycle of an order.

The standard FIX policy regarding usage of client order IDs is additionally supported by ETI:

- When modifying or cancelling an order, a new *CIOrdID (11)* must be provided.
- The order to be modified or cancelled is identified with the *OrigCIOrdID (41)*. In this way the customer is able to find and track individual requests by their client order ID.

If a market participant changes the client order ID, the uniqueness of *CIOrdID (11)* is checked at entry time

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among currently live orders for the same instrument and session. Duplicate ClOrdID (11) values for the same session and instrument will be rejected with the exception of IOC or FOK Orders.

4.6.2 Exchange Order ID

The exchange order ID is assigned by the matching engine on order entry and remains unchanged for the entire life time of the order, for example, an order modify does not result in a change of the exchange order ID.

An exchange order ID is guaranteed to be unique among all orders of the same product.

The FIX standard field *OrderID* (37) is used for exchange order ID.

4.7 Order Handling

4.7.1 Order Types

The following order types are supported via the ETI interface:

| Order Type | D* | C* | Description | Relevant FIX Tags |
|---------------|----|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| Market | X | X | Market orders have no specific price limit. They will be matched to the best price available. | OrdType (40) = 1 |
| Limit | X | X | Limit orders include a specified price limit, and may not be executed at a price worse than that limit. | OrdType (40) = 2 Price (44) |
| Stop (Market) | X | X | Stop market orders create market orders when the specified trigger price is reached. Similar to market orders, stop orders are not visible in the order book for any market participant. | OrdType (40) = 3 StopPx (99) |

*D=Derivatives; C=Cash

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| Order Type | D | C* | Description | Relevant FIX Tags |
|-----------------------------|---|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Stop (Limit) | X | X | Stop limit orders create limit orders when the specified trigger price is reached. Similar to market orders, stop orders are not visible in the order book for any market participant. | OrdType (40) = 4 Price (44) StopPx (99) |
| One-cancels-the-other (OCO) | X | X | An order that combines the functionality of a limit order and a stop (market) order, expressed as a single order. Traders will specify a limit price and a trigger price as part of one order. | OrdType (40) = 2 Price (44) StopPx (99) |
| Closing auction only (CAO) | X | X | Closing auction only orders may be entered during the entire trading day, but are only active during the closing auction phase. | TradingSessionSubID (625) = 4 |
| Fill-or-kill (FOK) | - | X | A Market or Limit order, which is executed immediately and fully or not at all. If immediate and full execution is not possible, the order is cancelled without entry in the order book. | TimeInForce (59) = 4 |
| Iceberg | - | X | Limit Order that contains a peak quantity and an overall quantity. The peak quantity can be determined absolutely or randomly. Once the displayed quantity has been completely executed, a new peak is entered into the book. In auction trading, iceberg orders contribute with their overall volume. | DisplayQty (1138) DisplayLowQty (1085) DisplayHighQty (1086) |
| Trailing stop | - | X | A Trailing Stop order is a Stop order whose stop limit is adjusted in accordance with the development of the reference price. | PegOffsetValueAbs (25109) PegOffsetValuePct (25110) |

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| Order Type | D | C* | Description | Relevant FIX Tags |
|----------------------------|---|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Any auction only (AAO) | - | X | Any auction only orders may be entered during the entire trading day, but are only active during any auction phase. | TradingSessionSubID (625) = 8 |
| Opening auction only (OAO) | - | X | Opening auction only orders may be entered during the entire trading day, but are only active during the opening auction phase. | TradingSessionSubID (625) = 2 |
| Good-for-day (Day) | X | X | Day orders are deleted automatically in the next end-of-day processing. | TimeInForce (59) = 0 |
| Good-till-date (GTD) | X | X | Order carries a specified date on which the order is automatically cancelled. | TimeInForce (59) = 6 ExpireDate (432) |
| Good-till-cancelled (GTC) | X | X | Order remains valid until it is executed, or cancelled. | TimeInForce (59) = 1 |
| Immediate or Cancel (IOC) | X | X | An IOC order is to be filled immediately, either completely or to the extent possible; the portion that cannot be filled immediately is cancelled. | TimeInForce (59) = 3 |
| Book or Cancel (BOC) | X | X | An order, which is placed as resting liquidity in the order book to ensure passive execution. If immediate (and hence aggressive) execution is possible, the order is rejected without entry into the order book. | ExecInst (18) = 6 (encoded as bit map with third bit being set) |

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| Order Type | D | C* | Description | Relevant FIX Tags |
|----------------|---|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| Persistent | X | X | A persistent order is an order that is reinstated at the beginning of the Business Day (if valid for that Business Day) or after a Market Reset. | ExecInst (18) = H (encoded as bit map with first bit being set) |
| Non-persistent | X | X | Non-persistent orders are automatically cancelled at the end of the Business Day or after a Market reset. They are also cancelled in case of some system events (see Mass Cancellation Notification) and session connection problems or normal session logout. | ExecInst (18) = Q (encoded as bit map with second bit being set) |
| Standard | X | X | The complete order history can be recovered via retransmission requests. The order data is visible to all low-frequency sessions belonging to the same business unit. Standard orders can be persistent or non-persistent | ApplSeqIndicator (28703) = 1 (Recovery_Required) |
| Lean | X | X | For lean orders, the execution notifications can be recovered (via retransmission requests on the session data channel). All data on lean orders are visible only to the session that submitted the order. Lean orders are always non-persistent. | ApplSeqIndicator (28703) = 0 (No_Recovery_Required) |

4.7.2 Cancellation

The owner of an order is the entering business unit, session and user. On behalf cancellation via a different session of the same business unit is supported. Head traders of the same trader group and the supervisor of the business unit may cancel on behalf of the owning user.

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Cancelling an order will remove the remainder of a live order from the T7 architecture's order book.

The participant may either use the *OrigClOrdID (41)*, unique per instrument and the *TargetPartyIDSessionID(20655)* or the *OrderID (37)*, unique per product to identify the corresponding order to cancel. The ETI interface will respond with an *Execution Report (8)* or *Reject (3)* message for confirmation or rejection respectively.

4.7.3 Modification

An order may only be modified if the request comes from the same user, or a supervisor, or a head trader from the same trader group. Modification by another session of the same business unit is only supported for standard orders.

The participant may either use the *OrigClOrdID (41)* or the *OrderID (37)* to identify the corresponding order to modify. The ETI interface will respond with an *Execution Report (8)* or *Reject (3)* message for confirmation or rejection respectively.

The ownership of the modified order can be modified by the *OwnershipIndicator (28743)*. The Short Order Message Layout does not support the change ownership functionality.

| Ownership Indicator (28743) | Description | Relevant FIX Tags |
|--------------------------------------|--------------------------------------------------------------------------------------|--------------------------------|
| No change of ownership | No change of the order's ownership. The executing user is not changed | OwnershipIndicator (28743) = 0 |
| Change ownership to execution trader | The entering trader becomes the owner of the order, i.e. is now the executing trader | OwnershipIndicator (28743) = 1 |

Orders that have been completely filled cannot be modified.

The following order attributes cannot be modified:

- Security identification: *MarketSegmentID (1300)*, *SimpleSecurityID (30048)*, *SecurityID (48)*, *ProductComplex (1227)*
- *Side (54)*
- *TradingSessionSubID (625)*
- *ExecInst (18)*
- *ApplSeqIndicator (28703)*.

An order that is modified will lose its time priority, i.e. it will get a new priority timestamp, if

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- *Price (44)* is modified in any way, or
- *OrderQty (38)* is increased, or
- *OrdType (40)* is changed, or
- *ExecType (150)* is “L = Triggered by system”, or
- for cash markets only: *ExecRestatementReason (378)* is “155 = Order refreshed.

4.7.4 Total Order Quantity Modification

Participants need to specify the new total order quantity when modifying the field *OrderQty (38)*. This approach leads, from a participant’s point of view, to a clear and deterministic behaviour by specifying a total execution limit. The previously executed quantity of an order is maintained and is used to calculate the new open quantity. If this is zero or less then the order will be cancelled.

During the lifetime of an order, the total quantity of the order is always equal to the sum of the open order quantity and the accumulated traded quantity:

$$OrderQty (38) = CumQty (14) + LeavesQty (151)$$

After an order has been cancelled (*OrdStatus (39)* is “4 = Cancelled”), the total quantity of the order is equal to the sum of the cancelled order quantity and the accumulated traded quantity, while the open order quantity is zero.

$$OrderQty (38) = CumQty (14) + CxlQty (84)$$

4.7.5 Self-Match-Prevention (prevention of cross matches)

The T7 system offers a Self-Match-Prevention mechanism to avoid matching (crossing) of orders and/or quotes of one business unit having the same value in the field *MatchInstCrossID (28744)*.

For orders, any Self-Match-Prevention event involved in a transaction is reported in the order response and/or notification by the field *Crossed (28745)* set to “1 = Cross rejected”. In the case the order has not been deleted completely (*OrderStatus (39)* is not “4 = Cancelled”), the total order quantity of the order is reduced by the system and must be recalculated by the formulas given in chapter before.

For quotes, a Self-Match-Prevention event is reported in the Quote Execution Notification (10407) by the *QuoteEventReason (28733)* field set to “16 = Cross rejected”. If the Self-Match-Prevention event leads to a partial deletion of the quote (*QuoteEventType (28539)* set to “2 = Modified quote side”) the deleted quote quantity is given in *QuoteEventQty (28542)*.

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4.7.6 Order Mass Cancellation

Using the Order Mass Cancellation Request, a user can cancel all orders within a specified instrument, user or session scope. The instrument scope can be extended to an entire product. The session scope can be extended to all sessions of the submitting user or may reference a single but different session.

Additionally, users are able to delete multiple orders on the buy or sell side of an order book up or down to a particular price level. When using side and price as filter criteria, cancellation will be for a single instrument, and market orders would not get removed.

If the Order Mass Cancellation Request is rejected by the trading system, no orders have been deleted.

The following filter criteria can be specified:

| Filter Criteria: Target Parties | Description |
|-----------------------------------------|----------------------------------------------------------------------------------------------|
| TargetPartyIDExecutingTrader (20612) | Cancel all orders owned by a user ID. |
| TargetPartyIDSessionID (20655) | Cancel all orders of a session depending on the authorization of the user role. |
| Price(44) | Price to which limit orders are deleted (only in connection with the Side filter attribute) |
| Side(54) | Side for which limit orders are deleted (only in connection with the Price filter attribute) |

The user may filter on a specific owning session or the session scope can be extended to all sessions of the business unit.

A **head trader** may cancel all orders of any user belonging to the same trader group. Additionally the session may be used as filter criteria.

A **supervisor** may opt for the cancellation of all orders of any user, and any session of the business unit.

The omission of the filter criteria results in a mass cancellation request for all orders of the business unit in a product or instrument respectively.

Note: Mass cancellation confirmation is not provided on a single order or quote level. Using the filter 'Price'(44) and 'Side'(54), affects only limit orders (Stop or Market orders are not affected). The owning session will be informed about the scope of the cancellation by a summary record with an exception list. Please find more information regarding unsolicited mass order cancellation in chapter Mass Cancellation Notification.

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4.7.7 Account Structure

The field *TradingCapacity (1815)* must be provided for orders. It designates if the trader is acting in the capacity of an Agent, trading for its own account or acting as a market maker.

For quotes, the trader is implicitly always acting as a market maker.

| Business Type | D* | C* | Description | Relevant FIX Tags |
|---------------|----|----|-----------------------------------------------------|----------------------------|
| Agency | X | X | Market Participant is trading on behalf of clients. | TradingCapacity (1815) = 1 |
| Proprietary | X | X | Market Participant is trading for its own account. | TradingCapacity (1815) = 5 |
| Market Making | X | X | Market Participant is acting as a Market Maker. | TradingCapacity (1815) = 6 |

For derivatives markets:

The entry of a T7 account type and number is supported via the *Account (1)* field. It designates the account type and number to be used for the execution of that order when submitted to clearing. The field *Account (1)* needs to be provided only for orders.

Note, T7 will not evaluate the consistency between *TradingCapacity (1815)* and *Account (1)* for an order.

If the Clearing Account is missing or invalid, then it will be set by the clearing system according to the rules described in the T7 document “Functional and Interface Overview”, chapter “Clearing Account Rules”.

4.7.8 Short Order Message Layouts

ETI supports order message layouts with reduced message content for simple instruments: New Order Single (Sort Layout) and Replace Order Single (Short Layout).

The reduced payload of these messages, which is similar to quote messages, provides improved latency.

For short order message layouts the following order attributes are implicitly set:

- Lean
- Limit order
- Product Identifier

*D=Derivatives; C=Cash

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The usage of *TimeInForce* (59) in short order message layouts is limited to the following options:

- Good for Day
- Immediate or Cancel (IOC)
- Fill or Kill (FOK) for cash markets only

Note: Orders entered via New Order Single (Short Layout) may only be modified via Replace Order Single (Short Layout).

4.7.9 Order Status and Execution Reports

The *Execution Report* (8) message is used to communicate many different events. The type of event is specified in the *ExecType* (150) field and the *OrdStatus* (39) field is used to convey the current status of an order.

The T7 ETI will always send only one response message per request. Unsolicited events are communicated via notifications.

The following table shows different order scenarios and their usage of *OrdStatus* (39), *ExecType* (150) and *ExecRestatementReason* (378) in the *Execution Report* (8) sent by the ETI Interface:

| Scenario | D* | C* | OrdStatus(39) | ExecType (150) | ExecRestatement Reason (378) |
|--------------------------------------------------|----|----|--------------------|----------------|------------------------------|
| NEW ORDER | | | | | |
| Non IOC order added without execution | X | X | 0=New | 0=New | 101=Order added |
| Non IOC order added with partial execution | X | X | 1=Partially filled | F=Trade | 101=Order added |
| Order (IOC or non IOC) added with full execution | X | X | 2=Filled | F=Trade | 101=Order added |
| IOC order added without execution | X | X | 4=Cancelled | 4=Cancelled | 105=IOC order cancelled |
| FOK orders added without execution | - | X | 4=Cancelled | 4=Cancelled | 107=FOK order cancelled |

*D=Derivatives; C=Cash

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| Scenario | D | C* | OrdStatus(39) | ExecType (150) | ExecRestatement Reason (378) |
|------------------------------------------------------------------------------------------------|---|----|--------------------|----------------|----------------------------------------------------------|
| IOC order added with partial execution | X | X | 4=Cancelled | F=Trade | 105=IOC order cancelled |
| Attempt to add executable BOC order | X | X | 4=Cancelled | 4=Cancelled | 212=BOC order cancelled |
| Stop order added and triggered without execution | X | X | 0=New | L=Triggered | 101=Order added |
| Stop order added and triggered with partial execution | X | X | 1=Partially filled | F=Trade | 101=Order added |
| Stop order added and triggered with full execution | X | X | 2=Filled | F=Trade | 101=Order added |
| Closing/opening/any auction only order added outside of closing auction | X | X | 9=Suspended | 0=New | 101=Order added |
| Attempt to add (and trigger) executable (stop) order but deleted due to SMP | X | X | 4=Cancelled | 4=Cancelled | 101=Order added |
| (Stop) order added (and triggered) with partial execution and deletion of remainder due to SMP | X | X | 4=Cancelled | F=Trade | 101=Order added |
| REPLACE ORDER | | | | | |
| Unfilled order replaced (remaining non IOC) without execution | X | X | 0=New | 5=Replaced | 102=Order replaced 181=Ownership Changed ² |
| Unfilled order replaced (remaining non IOC) with partial execution | X | X | 1=Partially filled | F=Trade | 102=Order replaced 181=Ownership Changed ² |
| Partially filled order replaced without execution | X | X | 1=Partially filled | 5=Replaced | 102=Order replaced 181=Ownership Changed ² |

² In case of a modify order combined with an order ownership change

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| Scenario | D | C* | OrdStatus(39) | ExecType (150) | ExecRestatement Reason (378) |
|--------------------------------------------------------------|---|----|--------------------|----------------|---------------------------------------------------------------|
| Order quantity replaced at or below executed quantity | X | X | 2=Filled | 5=Replaced | 102=Order replaced 181=Ownership Changed ² |
| Order replaced (remaining non IOC) with partial execution | X | X | 1=Partially filled | F=Trade | 102=Order replaced 181=Ownership Changed ² |
| Order replaced (to IOC or non IOC) with full execution | X | X | 2=Filled | F=Trade | 102=Order replaced 181=Ownership Changed ² |
| Order replaced to IOC without execution | X | X | 4=Cancelled | 4=Cancelled | 105=IOC order cancelled 181=Ownership Changed ² |
| Order replaced to IOC with partial execution | X | X | 4=Cancelled | F=Trade | 105=IOC order cancelled 181=Ownership Changed ² |
| Order modified to FOK without execution or partial execution | - | X | 4=Cancelled | 4=Canceled | 107=FOK order cancelled 181=Ownership Changed ² |
| Stop order replaced and triggered without execution | X | X | 0=New | L=Triggered | 102=Order replaced 181=Ownership Changed ² |
| Stop order replaced and triggered with partial execution | X | X | 1=Partially filled | F=Trade | 102=Order replaced 181=Ownership Changed ² |
| Stop order replaced and triggered with full execution | X | X | 2=Filled | F=Trade | 102=Order replaced 181=Ownership Changed ² |

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| Scenario | D | C* | OrdStatus(39) | ExecType (150) | ExecRestatement Reason (378) |
|---------------------------------------------------------------------------------------------------|---|----|------------------|------------------|---------------------------------------------------------------|
| Closing/opening/any auction only order replaced outside of closing auction | X | X | 9=Suspended | 5=Replaced | 102=Order replaced 181=Ownership Changed ² |
| Attempt to modify (and trigger stop) order becoming executable and deleted due to SMP | X | X | 4=Cancelled | 4=Cancelled | 102=Order replaced 181=Ownership Changed ² |
| (Stop) order modified (and triggered) with partial execution and deletion of remainder due to SMP | X | X | 4=Cancelled | F=Trade | 102=Order replaced 181=Ownership Changed ² |
| Attempt to modify an order to BOC and becoming executable | X | X | 4=Cancelled | 4=Cancelled | 212=BOC order cancelled 181=Ownership Changed ² |
| CANCEL ORDER | | | | | |
| Order cancelled | X | X | 4=Cancelled | 4=Cancelled | 103=Order cancelled |
| Order cancellation deferred due to instrument freeze | X | X | 6=Pending Cancel | 6=Pending Cancel | 197=Order cancellation pending |
| Actual order cancellation after being initially deferred | X | X | 4=Cancelled | 4=Cancelled | 199=Pending cancellation executed |
| Closing auction only order deleted outside of closing auction | X | X | 9=Suspend | 4=Cancelled | 103=Order cancelled |
| Actual order deletion with partial execution after being initially deferred | X | X | 4=Cancelled | F=Trade | 199=Pending cancellation executed |
| BOC order cancelled because of instrument state change to auction | X | - | 4=Cancelled | 4=Cancelled | 122=Instrument State Change |
| Suspended/inactive order deletion without execution after being initially | X | X | 9=Suspend | 4=Cancelled | 199=Pending cancel executed |
| UNSOLICITED EVENT | | | | | |

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| Scenario | D | C* | OrdStatus(39) | ExecType (150) | ExecRestatement Reason (378) |
|-----------------------------------------------------------------------------------------------------------|---|----|--------------------|----------------|----------------------------------------------------------|
| <i>Other user:</i> Unfilled order replaced (remaining non IOC) without execution | X | X | 0=New | D=Restated | 102=Order replaced 181=Ownership Changed ² |
| <i>Other user:</i> Partially filled order replaced without execution | X | X | 1=Partially filled | D=Restated | 102=Order replaced 181=Ownership Changed ² |
| <i>Other user:</i> Order quantity replaced at or below executed quantity | X | X | 2=Filled | D=Restated | 102=Order replaced 181=Ownership Changed ² |
| <i>Other user:</i> Closing/opening/any auction only order replaced outside of closing/opening/any auction | X | X | 9=Suspended | D=Restated | 102=Order replaced 181=Ownership Changed ² |
| Partial execution of order resting on book | X | X | 1=Partially filled | F=Trade | 108=Book order executed |
| Full execution of order resting on book | X | X | 2=Filled | F=Trade | 108=Book order executed |
| Market order triggered and partially executed | X | X | 1=Partially filled | F=Trade | 135=Market order triggered |
| Market order triggered and fully executed | X | X | 2=Filled | F=Trade | 135=Market order triggered |
| Resting stop order triggered with partial execution | X | X | 1=Partially filled | F=Trade | 172=Stop order triggered |
| Resting stop order triggered with full execution | X | X | 2=Filled | F=Trade | 172=Stop order triggered |
| Resting OCO order triggered with partial execution | X | X | 1=Partially filled | F=Trade | 164=OCO order triggered |
| Resting OCO order triggered with full execution | X | X | 2=Filled | F=Trade | 164=OCO order triggered |
| Closing auction only order executed with partial execution | X | X | 9=Suspended | F=Trade | 150=CAO order inactivated |
| Opening auction only order executed with partial execution | - | X | 9=Suspended | F=Trade | 152=OAO order inactivated |

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| Scenario | D | C* | OrdStatus(39) | ExecType (150) | ExecRestatement Reason (378) |
|---------------------------------------------------------------------------------------------------|---|----|--------------------|----------------|------------------------------|
| Any auction only order executed with partial execution | - | X | 9=Suspended | F=Trade | 154=AAO order inactivated |
| Market order triggered with partial execution and complete deletion of remainder due to SMP | X | X | 4=Cancelled | F=Trade | 135=Market order triggered |
| Resting stop order triggered with partial execution and complete deletion of remainder due to SMP | X | X | 4=Cancelled | F=Trade | 172=Stop order triggered |
| Resting OCO order triggered with partial execution and complete deletion of remainder due to SMP | X | X | 4=Cancelled | F=Trade | 164=OCO order triggered |
| Resting Iceberg Order partially executed with refill | - | X | 1=Partially filled | F=Trade | 288=Order refreshed |
| Resting Iceberg Order fully executed | - | X | 2=Filled | F=Trade | 288=Order refreshed |
| Unfilled closing auction only order moved into closing auction | X | X | 0=New | D=Restated | 149=CAO order activated |
| Partially filled closing auction only order moved into closing auction | X | X | 1=Partially filled | D=Restated | 149=CAO order activated |
| Closing auction only order (unfilled or partially filled) moved out of closing auction | X | X | 9=Suspended | 9=Suspended | 150=CAO order inactivated |
| Unfilled opening auction only order moved into opening auction | - | X | 0=New | D=Restated | 151=OAO order activated |
| Partially filled opening auction only order moved into opening auction | - | X | 1=Partially filled | D=Restated | 151=OAO order activated |
| Opening auction only order (unfilled or partially filled) moved out of opening auction | - | X | 9=Suspended | 9=Suspended | 152=OAO order inactivated |

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| Scenario | D | C* | OrdStatus(39) | ExecType (150) | ExecRestatement Reason (378) |
|---------------------------------------------------------------------------------------------|---|----|--------------------|----------------|------------------------------|
| Unfilled any auction only order moved into any auction | - | X | 0=NEW | D=Restated | 153=AAO order activated |
| Partially filled any auction only order moved into any auction | - | X | 1=Partially filled | D=Restated | 153=AAO order activated |
| Any auction only order (unfilled or partially filled) moved out of any auction | - | X | 9=Suspended | 9=Suspended | 153=AAO order activated |
| Restatement of unfilled order | X | X | 0=New | D=Restated | 1=Order book restatement |
| Restatement of partially filled order | X | X | 1=Partially filled | D=Restated | 1=Order book restatement |
| Trailing Stop Order - Update Stop Price | - | X | 0=New | D=Restated | 213=Trailing Stop Update |
| Restatement of closing auction only order (unfilled or partially filled) | X | X | 9=Suspended | D=Restated | 1=Order book restatement |
| Complete deletion of order due to SMP without execution | X | X | 4=Cancelled | 4=Cancelled | 103=Order cancelled |
| <i>Restatement:</i> Partial deletion of unfilled order due to SMP without execution | X | X | 0=New | D=Restated | 1=Order book restatement |
| <i>Restatement:</i> Partial deletion of partially filled order due to SMP without execution | X | X | 1=Partially filled | D=Restated | 1=Order book restatement |
| <i>Restatement:</i> Trailing Stop Order – Update Stop Price | X | - | 0=New | D=Restated | 213=Trailing Stop Update |
| Resting stop order triggered without execution | X | X | 0=New | L=Triggered | 172=Stop order triggered |
| Resting OCO order triggered without execution | X | X | 0=New | L=Triggered | 164=OCO order triggered |
| Resting market order triggered without execution and complete deletion due to SMP | X | X | 4=Cancelled | 4=Cancelled | 135=Market order triggered |

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| Scenario | D | C* | OrdStatus(39) | ExecType (150) | ExecRestatement Reason (378) |
|---------------------------------------------------------------------------------|---|----|---------------|----------------|------------------------------|
| Resting stop order triggered without execution and complete deletion due to SMP | X | X | 4=Cancelled | 4=Cancelled | 172=Stop order triggered |
| Resting OCO order triggered without execution and complete deletion due to SMP | X | X | 4=Cancelled | 4=Cancelled | 164=OCO order triggered |

Note: For performance reasons ETI will use the standard FIX Reject (3) message for all rejections on application and session level.

4.7.10 Order Book Restatement

Order status inquiries are not supported by the ETI. Participants must maintain the state of orders based on the *Execution Report (8)* messages.

During the start-of-day phase and after a market reset event, all active orders of a session will be transmitted to the market participant via the respective session.

At first a Trading Session Event message is sent informing the participant about start-of-day or a market reset event per partition respectively, optionally followed by Extended Order Information messages for each restated order of the corresponding session and finally a Trading Session Event message is sent indicating the end of the restatement per product. Extended Order Information messages for restated order and end of the restatement message are only visible to LF sessions.

In case a session is cancelled by the member (disconnected from the ETI gateway) all open non-persistent orders and quotes which were entered via this session will be deleted and will not be restated.

Note: Order book restatement messages (and the Trading Session Event messages mentioned above) are recoverable. The owning session can request a retransmission in the event it was not logged on at the time. Order book restatement messages (including the Trading Session Event messages mentioned above) are also sent on the listener broadcast. These messages are only visible to LF sessions.

For cash markets only: during the order book restatement (as described above) there are *ExtendedDeletionReport (10128)* messages reporting “over night” deletion of orders. Please refer the Functional Reference documentation for the details.

4.8 Quote Handling

4.8.1 Quote Characteristics

A (double sided) quote establishes both a limit to buy and to sell within a single transaction. Quantities to buy

and to sell are independent of one another. The T7 architecture supports single-sided as well as double-sided quotes.

A quote is owned by the session. A session may have only one quote per instrument. Sessions belonging to the same business unit may have different quotes in the same instrument, but only one quote per session. Quotes of the same business unit might be executed against each other.

A user may overwrite, modify or cancel any quote of another user that is owned by the same session.

One session cannot enter or modify individual quotes of another session.

Sessions may cancel all quotes or inactivate and reactivate the quotes of another session belonging to the same business unit.

Quotes are non-persistent; they are automatically cancelled in case of:

- Exchange system failure (i.e. market reset)
- Session logs out
- Session loses the connection to the trading gateway
- Session logs in twice via a different connection
- Mass Cancellation events
- At the end of the business day.

4.8.2 Maintaining Quotes

Quotes are entered using the Mass Quote message. A Mass Quote request may contain several single-sided or double-sided quotes for different instruments of the same product.

There can only be one quote for an instrument in a Mass Quote message. Actions can be different for each side of a single instrument, for example in a double-sided quote; a trader can cancel one side and replace the other side.

The Client Order ID is not supported for quotes; instead the participant defines a mass quote identifier (*QuoteID (117)*) for each Mass Quote message. The mass quote identifier is provided in each Quote Execution Notification (*QuoteMsgID (1166)*) and Trade Notification (*CIOrdID (11)*).

T7 has two methods for updating quotes:

- Quote Entry
- Quote Modification

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Note: Quote Entry and Quote Modification cannot both be used within the same Mass Quote message.

The two types of quoting models are distinguished by the usage of different values in field *QuoteSizeType* (28723):

| Quoting Model | QuoteSizeType (28723) |
|--------------------|-----------------------|
| Quote Entry | 2 = Open Size |
| Quote Modification | 1 = Total Size |

Every **quote entry** simply overwrites an existing quote without considering an existing executed quantity. For each quote entry request, the user must specify the new price and the new quantity of the quote side. Under quote entry, there can only be one entry per instrument. If a two sided quote is entered then both sides must be in the same entry.

Accepted quotes are not confirmed in the Mass Quote Response unless additional information needs to be conveyed back to the submitter. The field *QuoteEntryStatus* (1167) identifies the status of quote entries of a Mass Quote that could not be processed as requested.

If an individual quote side of a double-sided quote in a mass quote request is rejected (for instance after the price reasonability check or the extended price range validation), then both sides of the quote for the instrument are not processed, and both sides of the current quote are cancelled; see Mass Quote Response message.

If however, the entire mass quote request is rejected, then any old quotes of the session remain unaffected; even if there had been new quotes for the corresponding instruments in the rejected mass quote request.

Participants may define via the T7 Admin GUI trade enrichment rules for text fields or fields required for quoting in partner exchange products (derivatives markets only) applied to trades resulting from quote executions.

Quote modification allows a trader to modify quotes with a total execution limit, similar to orders where the quantity specified by the trader is always a total order quantity. The previously executed quantity of a quote side is maintained and is used to calculate the new open quantity. If this is zero or less then the quote side will be cancelled. If the previous quote side is not found, for example as it has traded out, then the modification for that quote side is ignored.

The priority timestamp of a quote stored in the order book is preserved when the price is left unchanged and the open quote quantity is not strictly increased. Like for orders, when price and quantity are not modified, the priority timestamp is also preserved. In all other cases, the priority timestamp is refreshed.

To **cancel** a quote side, the quote quantity must be set to zero and the limit price field must be omitted. Only quotes entered via the same session can be cancelled with the *Mass Quote Request*.

Quote mass cancellation functionality is provided via Quote Mass Cancellation Request. With the help of this request it is possible to cancel all own quotes in a product as well as all quotes in a product of another session belonging to the same business unit. Please find more information regarding unsolicited mass

cancellation in chapter Mass Cancellation Notification.

4.8.3 Quote Activation/Inactivation

Quotes of a given session can be activated/inactivated on two different scopes:

- the product scope,
- the product and instrument type scope.

Quotes are inactivated by setting the status “quotes inactive” on the applied scope. In this case the system will hide all inactive quotes from trading. Quote activation is not meant to be used for liquidity taking trading strategies.

When “quotes inactive” is set for a session on a specific scope, none of the quotes of that session for that scope participate in matching nor will they be visible in the order book depth. The trader can continue to add, modify, and cancel individual quote sides for this session and scope, while all these quotes neither participate in matching nor are visible to the market.

The participant may set the status “quotes inactive/quotes active” for a session and scope using the Quote Activation Request and specifying *MassActionType (1373)*.

For derivatives markets only: please note that in case the Market Maker Protection mechanism is applied for the session, Quote Activation Requests can only be submitted on the scope of the applied Market Maker Protection parameters.

The status “quotes inactive/quotes active” is persisted for the current business day. After a system failover, all quotes are cancelled, but the latest status (quote active/quotes inactive) of a session and scope will remain in place after the failover. At the start of a new business day the default status for all sessions and scopes is “quotes active”.

Note: The processing of the Quote Activation Request (for activation) will be slowed down by the core system. As a consequence, the first-in/first-out principle for a certain instrument of a transaction set including a Quote Activation Request (for activation) is not guaranteed any more.

The processing of the Quote Activation Request (for inactivation) will not be slowed down.

4.8.4 Market Maker Protection - Derivatives Markets only

A market maker protection mechanism is provided to prevent too many simultaneous executions on quotes provided by a Market Maker.

Market maker protection parameters can be specified for a session on two different scopes:

- the product scope,

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- the product and instrument type scope.

Market maker protection parameters can be specified on either the product scope or the product and instrument type scope. Both scopes can not be used in parallel for one product on one session. Please note that for 'Inter Product Spreads' the Market Maker protection mechanism is not available.

The participant may use the Market Maker Parameter Definition request to define, overwrite or delete market maker protection parameters. To delete market maker protection parameters for a session and scope, all market maker protection parameters must be set to zero. The Inquire Market Maker Parameters request can be used to retrieve the recent market maker protection parameter for a session and product on all scopes.

The Market Maker Parameters are:

- ExposureDuration (1629): The time frame where the market maker protection parameters are counted (sliding time window).
- CumQty (14): Volume counter that counts the total number of traded contracts.
- PctCount (28615): The Percent counter sums up each trade as a percentage of the original volume. Delta (7966): The Delta counter holds for futures the difference of bought future contracts and sold future contracts. For options it is the the difference of (long calls + short puts) and (short calls + long puts).
- Vega (7968): The Vega counter (applicable for options only) holds the absolute number of purchased contracts minus sold contracts.

If a threshold is exceeded then:

- "quotes inactive" is set for the session and scope, i.e. quotes are inactivated on the respective scope,
- the threshold counter will be automatically reset on the respective scope,
- a Quote Activation Notification message (Session Data, retransmittable) for the scope of the threshold counter is sent to the respective session.

4.9 T7 Entry Service (TES) – derivatives markets only

T7 Entry Services (TES) enables Trading Participants to enter off-book transactions in standardised and tailor-made contracts.

The following TES activities are supported by the T7 interface:

- Enter a TES Trade
- Modify a TES Trade

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- Delete a TES Trade
- Approve a TES Trade
- Upload a TES Trade

T7 Entry Services on T7 will support the following TES trade types (*trdType(828)*):

- Block Trade Service.
- Exchange for Physicals (EFP) Fin which contains a cash reference to specific bonds.
- Exchange for Physicals (EFP) Index which contains a cash reference to an equity basket.
- Exchange for Swaps (EFS) which contains a cash reference to a swap contract.
- Vola Trade Service which contains a reference to an options off-book (Block TES Trade) trade. On-exchange options trades are not allowed to be used as reference for a Vola trade.
- Trade At Market (TAM) for off-book trades on Total Return Futures (TRF) with custom index value.

The TES Types defined above are independent from the instrument types and can be made available for a specific instrument type (*ProductComplex(1227)*).

A subscription to the TES Maintenance broadcast stream is needed for the implementation of TES.

4.10 Price Validity Checks

There are different price validations for orders and quotes, both considering the most recent best bid and best ask price.

4.10.1 Price Reasonability Check

When entering or replacing an order or quote, the user may opt for a check ensuring that the entered price does not differ significantly from the market. The field *PriceValidityCheckType (28710)* provides the following options:

- Valid value "0" = None
- Valid value "1" = Optional – derivatives markets only
- Valid value "2" = Mandatory

The "optional" differs from the "mandatory" Price Reasonability Check in the following way:

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If the best bid and best ask prices are not available or if their spread is not reasonable, an additional reference price (the last traded price or the theoretical price) is taken into account. If the additional reference price is also not available, the incoming order or quote is

- accepted without performing a price validation in case the submitting user chooses “**optional**”, or
- rejected in case the submitting user chooses “**mandatory**” .

4.10.2 Extended Price Range Validation

In case no Price Reasonability Check was performed, the Extended Price Validity Check is applied which ensures that no erroneous price crosses through the market.

For more details please refer to the document T7 Functional Reference.

4.11 Trade Notifications

4.11.1 Trade Characteristics

If subscribed to the Trade broadcast (see chapter Broadcast), a session will receive Trade Notification messages that confirm each trade for the entire business unit.

Notifications about trades are only provided on the T7 architecture via *Trade Capture Report (AE)* messages. Information provided via *Execution Reports (8, U8)* is indicative only and needs to be confirmed via a *Trade Capture Report (AE)*. For further details see chapter Preliminary Execution Report and Legally Binding Trade Notifications.

T7 will send out the Trade Notification message for each order and quote execution to the trading and clearing business units involved. The receiving clearing business unit may belong to a different participant.

Derivatives markets only: for trades in complex instruments, the Trade Notification message will be generated for each instrument leg executions.

4.11.2 Trade Report Types

The TradeReportType (856) indicates the type of the trade report type.

| Scenario | TradeReportType (856) | D* | C* |
|-------------|-----------------------|----|----|
| Final Trade | 0 = Trade | X | X |

*D=Derivatives; C=Cash

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| Scenario | TradeReportType (856) | D | C* |
|-----------------------------|-------------------------------|---|----|
| Preliminary Trade | 1 = Alleged | X | - |
| Approved TES Trade | 2 = Accept | X | - |
| Modified Trade | 5 = No/Was (Replaced) | X | - |
| Cancellation of a TES Trade | 6 = Trade Report Cancel | X | - |
| Trade Reversal | 7 = (Locked-In) Trade Break | X | X |
| Submitted TES Trade | 11= Alleged New | X | - |
| Modified TES Trade | 13= Alleged No/Was (Replaced) | X | - |

4.11.3 Trade Reconciliation

There are several identifiers that can be used to associate an *Execution Report (8)* or a *Quote Execution Report (U8)* with *Trade Capture Reports (AE)* and public trades on the market data interface. Please find an example message flow in the appendix Trade Reconciliation and Identifiers.

Every **match event** with one or more executions (**match steps**) in a simple or complex instrument results in only one *Execution Report (8)* or a *Quote Execution Report (U8)* message for each order or quote respectively. A Trade Notification will then be sent to confirm each trade at each price level. For complex instruments, there is a Trade Notification for each leg execution of the instrument.

Every match step occurring at the exchange has an identifier that is provided in the field *FillMatchID (28708)* in the *Execution Report (8)*, *QuoteEventMatchID (8714)* in the *Quote Execution Report (U8)* and *TrdMatchID (880)* in the Trade Notification. This identifier allows participants to link trade capture reports and the corresponding execution report.

The *TradeID (1003)* field in the Trade Notification in ETI uniquely identifies all order leg allocations referring to the same matching event, simple instrument and price.

For derivatives markets, the *TradeID (1003)* is equivalent to the trade identifier "TrdMatchID" in Eurex Clearing.

For cash markets, there is an additional private key field in the ETI Trade Notification, *SideTradeReportID (1005)*. It uniquely identifies all order allocations referring to the same matching event, instrument and price. The *SideTradeReportID (1005)* is equivalent to the trade identifier *TradeID* in CCP.

The field *SideTradeID (1506)*, which is unique for a product and business day, in the Trade Notification

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provides the private identifier of an order or quote match step, which can be reconciled with the corresponding *Execution Report (8)* for orders and *Execution Report (U8)* for quotes the following way:

- For order match events in simple instruments, the *Execution Report (8)* message provides the order execution ID on each price level, *FillExecID (1363)*.
- Derivatives markets only: for order match events in complex instruments the *Execution Report (8)* message provides the order execution ID on each price level and additionally the order leg execution ID, *LegExecID (28725)*.
- For quote match events in simple instruments the *Quote Execution Report (U8)* message provides the quote side execution ID on each price level, *QuoteEventExecID (28711)*.
- Derivatives markets only: for quote match events in complex instruments the *Quote Execution Report (U8)* message provides the quote side execution ID on each price level and additionally the quote side leg execution ID, *LegExecID (28725)*.

| Match Reporting | D* | C* | Execution Report (8), (U8) | Trade Notification |
|----------------------------------------------------------------------------|----|----|--------------------------------------------------|---------------------------------------|
| Trade event on instrument level: public trade volume reporting | X | X | FillMatchID (28708), QuoteEventMatchID (8714) | TrdMatchID (880) |
| Identifier for all leg allocations referring to the same simple instrument | X | X | | TradeID (1003), OrigTradeID (1126) |
| Order in simple instrument | X | X | FillExecID (1363) | SideTradeID (1506) |
| Order in complex instruments | X | - | LegExecID (28725) | SideTradeID (1506) |
| Quote in simple instrument | X | X | QuoteEventExecID (28711) | SideTradeID (1506) |
| Quote in complex instrument | X | - | LegExecID (28725) | SideTradeID (1506) |

* D=Derivatives; C= Cash

4.12 Cross Request

A cross trade is a trade where a participant trades against an own order in the order book. In a pre-arranged trade, orders from at least two members are executed against each other as previously negotiated.

Participants wanting to consciously enter cross and pre-arranged trades into T7, must precede them with the entry of a cross request.

A trader sends the Cross Request message which is then published via the market data interfaces to all other participants, to alert them of the intention to trade with an own order or to conduct a pre-arranged trade.

The cross request contains the security identification (product and instrument id combination) and the *OrderQty (38)*, which is mandatory for regulatory reasons. The quantity is valid for both sides of the cross request.

4.13 Request for Quote

The request for quote functionality is used by a trader to ask market makers to enter a quote in a specified instrument. This functionality is supported in the ETI by the Quote Request message. All requests for quote are published via the market data interfaces to all other participants.

Every Quote Request message contains the security identification (product and instrument id combination). *Side (54)* and *OrderQty (38)* are optional attributes.

A Quote Request message might be rejected with an error message indicating a previous request for quote has been already processed recently.

Note: Each request for quote is validated against the available quantities at the best price and the corresponding bid/ask spread in the market. A *Reject (3)* message might indicate that the bid/ask spread and the quantities in the market are currently sufficient.

4.14 Listener Broadcast

T7 offers 'drop copies' for standard orders (not for lean orders) to sessions within the same business unit. This service is provided on session level; for example each listener session may subscribe to listener broadcast data of one specified session or all sessions of a business unit. The parallel subscription to listener data of more than one session of a business unit is supported.

The listener broadcast provides information of the complete order history of standard orders of a session and can be retransmitted.

Complete order history means here: all changes to an order happening on the current business day.

Please note that the listener broadcast does not provide trade information.

4.15 News

The News message provides public information from the related market supervision.

This public stream provides a unique sequence number to support retransmission, i.e. news messages are recoverable. The retransmission protocol includes the access to historical news, i.e. there is no cut at the end of the business day.

4.16 Risk Control

ETI supports advanced risk protection services. There are the following message formats:

- Derivatives markets only: when a breach on a certain level of risk limits occurs, the participant will be informed via the Risk Notification message.
- Derivatives markets only: entitlement updates triggered from the Clearing system affecting the business unit are communicated via the Entitlement Notification message.
- Entitlement updates triggered within the Trading system (GUI) affecting the business unit or the trader are communicated via the Party Action Report message.
- Legal text messages in case of suspension from trading will be provided via the Legal Notification message.

This private stream is automatically sent to each session of the corresponding business unit and clearing unit, no subscription mechanism is supported.

Each Risk Control broadcast message provides a unique sequence number and can be retransmitted.

4.17 Service Availability

The Service Availability message provides information on the availability of all services on different partitions. Retransmission is not supported for this stream, i.e. service availability messages are not recoverable.

Subscription is handled via the Subscribe message. As filter criteria for subscription a single partition or all partitions may be specified. The Subscribe Response message confirms the subscription followed by Service Availability messages providing the current status of all services on all partitions. Any status change of a service would then be communicated via a new Service Availability message.

The following five services reside on a partition:

- *MatchingEngineStatus (25005)*: Order/Quote Management service - informs if trading is active for a grouping of T7 products.
- *TradeManagerStatus (25006)*: Trades service - informs about the availability of the retransmission service of trades for a grouping of T7 products.

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- *AppSeqStatus (28732)*: Retransmission of Order/Quote Events service - informs about the availability of the retransmission services for order and quote events (session data and listener data) for a grouping of T7 products.
- *TradeEntryServiceStatus (25048)* – derivatives markets only: T7 Entry Service informs if T7 Entry Service is active for a grouping of T7 products.
- *TradeEntryServiceRtmStatus (25050)* – derivatives markets only: informs about the availability of the retransmission service for T7 entry service data for a grouping of T7 products.

In addition to the (availability) status, the current business day of the related service is provided. The business day defines the visibility scope for retransmission data. Only data related to the current business day can be requested for retransmission.

The ETI Gateway rejects requests if their target service is not available on the respective partition. If a request has no target service, the request processing is independent of the published service states.

If a certain service on one or even on all partitions becomes unavailable, the system will

- NOT logout any user
- NOT logout any session
- NOT cancel any subscription
- NOT delete any orders (persistent or non-persistent) or quotes

4.18 Mass Cancellation Notification

An mass cancellation notification is not provided on a single order or quote level. The FIX message format *OrderMassActionReport (BZ)* message is used for responses and notifications. The owning session will be informed about the scope of the cancellation by a summary record. The summary record will also provide the entering parties involved and the reason for the mass cancellation.

Orders that couldn't be cancelled due to an incompatible instrument state are provided with their client order ID (*NotAffOrigClOrdID (1372)*) and Exchange Order ID (*NotAffectedOrderID (1371)*) in the `<NotAffectedOrdersGrp>`.

Instruments where quotes couldn't be cancelled due to an incompatible instrument state are provided with their Instrument ID (*NotAffectedSecurityID (28702)*) in the `<NotAffectedSecuritiesGrp>`.

4.19 Mass Cancellation Events

T7 informs additionally about events that implicitly led to the mass cancellation of orders or quotes via the

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Mass Cancellation Event message. Persistent and non-persistent orders are deleted for the following events depending on the value of *ExecInst (18)*: no value – no order cancellation, 1 – cancellation of persistent orders, 2 – cancellation of non-persistent orders, 3 - cancellation of both, non-persistent and persistent orders. Quotes are always deleted for all of the following events:

- product holiday
- product halt
- instrument suspension
- strategy cancellation (derivatives markets only)
- volatility interruption product level (derivatives markets only)
- volatility interruption – instrument level (derivatives markets only)
- product temporarily not trade-able
- instrument stop (cash markets only)

Derivatives markets only: there is no notification for the cancellation of orders and quotes during the end-of-day processing.

4.20 Trading Session Events

Trading session events triggered by the T7 architecture are communicated to **all** trading and listener sessions via the Trading Session Event message. It is part of the session data stream and the listener data stream, regardless if orders or quotes were entered for a product by the session.

Trading session events might imply mass cancellation events, where no explicit mass cancellation notifications are provided; for details see the following table:

| Trading Session Event | Level | Persistent Orders | Non-persistent Orders | Quotes |
|---------------------------------|-----------|-------------------|-----------------------|--------|
| Start of Service | Partition | No | Yes | Yes |
| Market Reset | Partition | No | Yes | Yes |
| End of Restatement ³ | Product | N/A | N/A | N/A |

³ Order Book Restatement is only provided for Low Frequency Sessions (LF), see chapter Session Concept.

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| Trading Session Event | Level | Persistent Orders | Non-persistent Orders | Quotes |
|-----------------------|-----------|-------------------|-----------------------|--------|
| End of Service | Partition | No | Yes | Yes |
| Service Resumed | Product | N/A | N/A | N/A |

For all Trading Session Event messages to be sent out on Partition level (see above) the field MarketSegmentId is not set.

4.21 Timestamps

All ETI timestamps will provide date and time, in UTC, represented as nanoseconds past the UNIX epoch (00:00:00 UTC on 1 January 1970).

ETI provides the following timestamp information:

| Timestamp | FIX field | Description |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transaction timestamp | ExecID (17), MassActionReportID (1369), QuoteResponseID (693), SecurityResponseID (322), MMPParameterReportID (28717) | Taken when a transaction is functionally processed and used as a unique message identifier per product for messages sent by ETI. ExecID (17) maps to MDEntryTime (273) in EMDI for order and quote events. |
| Entry timestamp | TrdRegTSEntryTime (21009) | Time of the creation of the order. It will be set when an order is received and processed by the Matching Engine. This timestamp is only provided for Standard Orders. |
| Priority timestamp | TrdRegTSTimePriority (21008) | Is initially set to the entry timestamp and then gets re-stamped when the order loses time priority, see chapter Modification. This timestamp is only provided for Standard Orders. |
| Creation timestamp | LastUpdateTime (779), OrigTime (42) | Creation Time of a strategy, respectively of market supervision News. |
| Gateway request in | RequestTime (5979) | Provides the time the T7 application has read an inbound message on a gateway from the TCP socket. |

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| Timestamp | FIX field | Description |
|-------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------|
| Gateway request out | RequestOut (7764) | Provides the time the T7 application has sent an outbound message from a gateway to the matching engine. |
| Gateway response in | ResponseIn(7765) | Provides the time the T7 application has received an inbound response message on a gateway from a matching engine. |
| Gateway response out | SendingTime (52) | Provides the time the T7 application has written an outbound message on a gateway to the TCP socket. |
| Matching engine in | TrdRegTSTimeIn (21002) | Provides the time the T7 application has received an inbound message on a matching engine. |
| Matching engine out | TrdRegTSTimeOut (21003) | Provides the time the T7 application has sent an outbound message from a matching engine. |
| Gateway notification in | NotificationIn(25043) | Provides the time the T7 application has received an inbound notification message on a gateway from a matching engine. |

5. Connectivity and Session Parameters

5.1 Session Concept

The ETI interface is a session oriented interface whereby the session is the basic scope of the interaction with the T7 architecture. Several users may share a single session, but every session may only be instantiated once. Each TCP/IP connection may only support one session instance.

The receiver of the direct response to a request sent to the gateway is always the submitting session. Additionally the session is informed about system events and all unsolicited messages referring to status changes of orders and quotes belonging to that session.

The ETI interface will supports three session types: low frequency sessions for regular trading, low frequency session for back office, and high frequency session.

The following table provides an overview on the functionality supported by the different session types:

| Functionality | D* | C* | Low Frequency Session (LF) – Regular Trading | Low Frequency Session (LF) – Back Office | High Frequency Session (HF) |
|------------------------------------------------------------|----|----|----------------------------------------------|------------------------------------------|-----------------------------|
| Standard Order | X | X | Yes | No | No |
| Lean Order | X | X | Yes | No | Yes |
| Persistent Order | X | X | Yes | No | No |
| Non-persistent Order | X | X | Yes | No | Yes |
| Order Book Restatement | X | X | Yes | Yes | No |
| Short Order Message Layouts | X | X | Yes | No | Yes |
| Quotes | X | X | Yes | No | Yes |
| Maintaining orders of another session (same business unit) | X | X | Yes | No | Yes ⁴ |

*D=Derivatives; C=Cash

⁴ Only Order Mass Cancellation and Cancel Order Single is supported via HF sessions.

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| Functionality | D | C* | Low Frequency Session (LF) – Regular Trading | Low Frequency Session (LF) – Back Office | High Frequency Session (HF) |
|-------------------------------------------------------------------------|---|----|----------------------------------------------|------------------------------------------|-----------------------------|
| Maintaining quotes of another session (same business unit) ⁵ | X | X | Yes | No | Yes |
| Listener Broadcast | X | X | Yes | Yes | No |
| Trade Broadcast | X | X | Yes | Yes | No |
| Trade Reversals | X | X | Yes ⁶ | Yes | No |
| News Broadcast | X | X | Yes | Yes | No |
| Risk Control Broadcast | X | X | Yes | Yes | Yes |
| TES Maintenance Broadcast | X | - | Yes | Yes | No |
| TES Trade Broadcast | X | - | Yes | Yes | No |
| Market Maker Parameter request for the own session | X | - | Yes | No | Yes |
| Market Maker Parameter request for another session | X | - | Yes | No | No |
| Service Availability Broadcast | X | X | Yes | Yes | Yes |
| Session List Inquire | X | X | Yes | Yes | No |
| User List Inquire | X | X | Yes | No | Yes |
| User Logon | X | X | Yes | No | Yes |
| Trade Enrichment List | X | X | Yes | Yes | Yes |
| Request for Quote | X | X | Yes | No | Yes |
| Cross Reques | X | X | Yes | No | Yes |
| TES trading | X | - | Yes | No | No |

⁵ Only QuoteActivation and Quote Mass Cancellation is supported via both, LF and HF session.

⁶ Trade Reversals are part of the Trade Broadcast.

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5.1.1 Low Frequency Session (LF) – Regular Trading

This session type supports the complete ETI functionality.

Modification for another session of the same business unit is only supported for standard orders.

A LF session may also be used to subscribe broadcast streams, for example: Listener broadcast, trade notifications.

5.1.2 Low Frequency Session (LF) – Back Office

This session type supports only a subset of the Regular Trading Low Frequency Sessions. Please refer to the table above for the details.

5.1.3 High Frequency Session (HF)

This session type is aimed at high frequency trading; only executions of orders and quotes and foreign events may be recovered.

The submission of standard orders is not supported by this session type.

The HF session type does not support the subscription of the broadcasts listener, trades, and news.

Mass cancellation and quote activation/inactivation for another session is supported.

5.2 Identification and Authentication

ETI has a three-step logon procedure, with a Connection Gateway Request message to retrieve the assigned application gateway from the connection gateway, followed by a Session Logon at the assigned gateway and followed by one or multiple User Logon messages.

5.2.1 IP Addresses and Ports

At first the participant must establish a TCP/IP session to the Connection Gateway — the IP/port numbers are provided by the exchange. Participants will be provided with two Connection Gateway addresses via the member portal. If the connection to the first Connection Gateway fails, participants should connect to the second Connection Gateway.

Once that connection is established, the participant sends a Connection Gateway Request message. The Connection Gateway will validate *PartyIDSessionID (20055)* and *Password (554)*, which are parameters provided by the exchange. The Connection Gateway cannot be used for any other purpose.

The Connection Gateway Response contains the IP/ports of the primary and secondary application gateway where the member application can establish an active ETI session. Once the Connection Gateway Response message is received, the Connection Gateway connection is closed.

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The participant must now try to connect to one of the provided application gateways within 120 seconds. If the connection is not made within this time, the slots are released and the participant must start again from scratch.

5.2.2 Session Authentication

After requesting the Application Gateway addresses and ports the participant must open a TCP/IP connection to the specified gateway. The Session Logon message must be the first message sent by the participant authenticating the ETI session.

The gateway will validate *PartyIDSessionID (20055)* and *Password (554)*, which are parameters provided by the exchange. A successful logon will initiate a T7 ETI session.

Note: The Session Logon message is not used to log on and authenticate a user on T7.

The following messages may be sent on a session without any authenticated trader:

- Session logon/logout
- Heartbeat messages
- Subscription and unsubscription of broadcasts
- Retransmission of recoverable data
- Trader authentication
- Session List inquire
- User List Inquire
- Trade Enrichment List Inquire

All other requests must be submitted with an authenticated trader name in the *SenderSubID (50)* of the message header.

5.2.3 User Authentication

The User Logon message identifies and authenticates a qualified user establishing access to the T7 architecture. A ETI session may be shared by several users belonging to the same business unit.

The participant must provide the binary **User ID** in the *Username (553)* field, and the corresponding password in the *Password (554)* field.

A successful user logon will grant the user access to the trading system. All further transactions that require a user scope from the session are validated in the gateway against an

authenticated User ID, i.e. *SenderSubID (50)* in the message header.

Users may logon to the T7 architecture via all sessions of their business unit.

Multiple User Logon messages for a user via the same session are rejected.

Note: ETI uses binary identifiers for users (User ID) and business units (Business Unit ID). A mapping to the current Member (Business Unit Short Name) and Trader ID (User Login Name) is available in the Admin GUI.

5.3 Failover

In the event of a network connection failure, active ETI sessions will be disconnected from the gateway. There will be no automatic session failover if a connection to the gateway is lost.

In the event of a ETI gateway failure, active sessions will be disconnected.

If the active ETI session is ever disconnected, for any reason, the participant application must reconnect to the Connection Gateway by resending the Gateway Request message, and then receives a new gateway assignment.

Please note, that quotes and non-persistent orders (both, lean and standard ones) are automatically deleted in such cases.

5.4 Throughput Limits

HF and LF sessions can differ in the number of requests per time interval allowed.

A participant application may send multiple messages without waiting for a response. However, the number of messages allowed within a given timeframe is limited by the use of throttles.

The limits are configured by the T7 architecture for each session type, and are provided to the participant application in the Session Logon Response message.

The limit parameters are upper limits and do not guarantee throughput rates. As loads fluctuate in the exchange system, actual throughput rates can vary.

The mechanism uses three components:

- Transaction limit
- Reject/disconnect limit
- Time interval

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5.4.1 Transaction Limit

The transaction limit is the maximum number of messages that a participant application may send within a configured time interval without getting rejected (sliding window approach).

If a participant application exceeds the threshold “number of transactions per time interval”, the exceeding request will be rejected and not queued. The unit of the time interval is milliseconds.

Required heartbeats do not count against the transaction limit.

For example, a transaction limit of 200 messages per second could be represented in the Logon (A) response message as:

- ThrottleNoMsgs (1613) = 200
- ThrottleTimeInterval (1614) = 1000

5.4.2 Reject/Disconnect Limit

The purpose of the Reject/Disconnect Limit is to protect the gateway from large amounts of invalid data. It defines the maximum number of sequential message rejects due to the violation of the transaction limit allowed by ETI.

Once an acknowledgement has been sent, the reject/disconnect limit counter is reset to zero.

If the participant application continues to send messages which are rejected for exceeding the transaction limit and the reject/disconnect limit is exceeded, ETI will disconnect the session.

For example, a disconnect limit of 500 rejects is represented in the Logon (A) response message as:

ThrottleRejectNoMsg (25002) = 500

5.5 Mass Cancellation on Disconnect

Quotes and non-persistent orders are automatically cancelled on session disconnect.

In case of a session loss or a session logout the following messages will be generated for all products where the Matching Engine cancelled non-persistent orders (either lean or standard orders) and/or quotes of the lost session:

- Order Mass Cancellation Notification (retransmittable, via listener broadcast and session data) for canceled non-persistent orders (*MassActionReason* (28721): 6 = “Session Loss”). Potentially followed-up by Cancel Order Notification messages for each order of <NotAffectedOrdersGrp> that could not be canceled due to an incompatible instrument state.
- Quote Mass Cancellation Notification (non-retransmittable, via session data) for canceled quotes (*MassActionReason* (28721): 6 = “Session Loss”). Potentially followed-up by Quote Execution Notification (retransmittable, via session data) messages for each quote on an instrument in <NotAffectedSecuritiesGrp> that could not be canceled due to an incompatible instrument state.

5.6 Mass Cancellation on Duplicate Session Login

Quotes and non-persistent orders of a session are automatically cancelled if the session tries to login again via a new connection to a gateway.

In such a scenario, the already logged in session stays logged in while the second session login (via a different connection) is rejected. The following messages will be generated for all products where the Matching Engine cancelled non-persistent orders (either lean or standard orders) and/or quotes of the session:

- Order Mass Cancellation Notification (retransmittable, via listener broadcast and session data) for canceled non-persistent orders (*MassActionReason (28721): 7="Duplicate Session Login"*). Potentially followed-up by Cancel Order Notification messages for each order of `<NotAffectedOrdersGrp>` that could not be canceled due to an incompatible instrument state.
- Quote Mass Cancellation Notification (non-retransmittable, via listener broadcast) for canceled quotes (*MassActionReason (28721): 7="Duplicate Session Login"*). Potentially followed-up by Quote Execution Notification (retransmittable, via session data) messages for each quote on an instrument in `<NotAffectedSecuritiesGrp>` that could not be canceled due to an incompatible instrument state.

6. Session Layer

The ETI interface uses a proprietary session layer. ETI follows FIX 5.0 semantics; however the message headers and trailers have been modified to improve efficiency.

Each message in ETI has a unique numeric *TemplateID* (28500) assigned to it in addition to the standard FIX *MsgType* (35) information provided in the header.

ETI will echo the participant's *MsgSeqNum* (34) of the request header in the corresponding response header.

6.1 Flat Binary Encoding

ETI messages have a defined order of fixed-length fields and arrays of fixed-length elements. ETI avoids string fields wherever possible.

The arrays (repeating groups) consist of a counter (FIX NoXXX fields, indicating the number of array elements) and their fixed-length elements. In general, repeating groups are at the end of the ETI messages.

Binary values are presented in little endian byte order.

The length of ETI messages (*BodyLen* (9)) sent by the ETI gateway is always set to a multiple of 8. If there is a variable size string at the end of a message, it is "filled up" with binary zeroes.

Padding bytes required for proper alignment do not need to be initialized.

6.2 Logon

The participant application needs to open a TCP/IP connection to T7 during start-up.

The first message to be sent on the connection must be the Session Logon message.

If the Session Logon message is not sent within a certain time interval, the connection will be closed by the T7 architecture.

If the session logon fails, no further logon attempts will be accepted on that TCP connection. The application must drop the TCP session and restart the logon to the Connection Gateway.

6.3 Logout

The participant may log out the session using the Session Logout message.

ETI will automatically drop a session if:

- The TCP/IP session is disconnected.

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- If three consecutive heartbeats are missed or on receipt of too many Heartbeats
- If throttle reject/disconnect limit is exceeded.
- In case of severe protocol errors.

After a successful session logout, the participant should shut down the connection and close the socket.

The system will perform a forced logout overnight after which time the participant may log back in.

6.4 Heartbeat

The *HeartBtInt (108)* must be specified by the participant in the Session Logon message. This parameter specifies the period in which ETI sends heartbeats to the participant and the interval ETI checks for request messages from the application.

The Heartbeat message should be sent by the participant if no other message has been processed during the defined *HeartBtInt (108)* interval. It is used by the ETI gateway to monitor the status of the communication link to the ETI client during periods of inactivity.

A heartbeat interval of zero indicates that ETI will not take any action for missed heartbeats. This setting can only be used on test systems.

The minimum value is 100 milliseconds in the production system. The upper limit is 60 seconds.

If the field is not supplied, then ETI will use a default value. The applied heartbeat interval is provided in the Session Logon Response.

Note: Heartbeats do not count against any of the throttle counters. Anyhow, a session sending too many heartbeats is disconnected by the system.

The Heartbeat Notification is sent by ETI based on the heartbeat interval, regardless if the participant application sends Heartbeat messages or not. It may be used by the ETI client to monitor the status of the communication link to the ETI gateway during periods of inactivity.

6.5 Reject

All rejections and errors on the application and session level are communicated via the FIX standard Reject (3) message; i.e. none of the fields in the request message other than *MsgSeqNum (34)* will be echoed.

6.6 Message Sequence Number

The *MsgSeqNum (34)* in the request header must increment with each message sent by the participant to the gateway, starting with the Session Logon message as sequence number 1.

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ETI will echo the participant's *MsgSeqNum* (34) of the request header in the corresponding response header.

In case of any unexpected sequence numbers, sequence number gaps, or duplicate sequence numbers, the request message will be rejected with a sequence number error, and the session will be disconnected.

Note: There is no recovery mechanism for message sequence numbers in ETI. All participant connections (including a reconnection after a disconnection) are considered "new," and all Session Logon requests are expected to contain the message sequence number 1.

6.7 Application Message Sequencing

6.7.1 Application Message Identifier

All recoverable session and listener data sent by ETI will provide an application message identifier, *AppMsgID* (28704), to uniquely identify order and quote related data sent by the gateway.

With the help of the application message identifier, the participant is able to ask for a retransmission of recoverable order/quote data.

The same application message identifier is also provided in the Listener Broadcast (standard order drop copy).

The *AppMsgID* (28704) has the following characteristics:

- It is unique per partition and business day.
- It is ascending during a business day until end-of-stream – per broadcast type (either, session or listen data) and scope (session). i.e., ordering (of *AppMsgID*) is not guaranteed across broadcast types and/or sessions.
- Gap detection is not possible.
- It does not start at any particular number.

Consists of 16 bytes, ordered with the highest significant byte first (as in big endian).

Memory comparison functions such as **memcmp()** can be used to compare two Application Message Identifiers:

- Two Application Message Identifiers *AppMsgID1* and *AppMsgID2* are equal, if the character array of size 16 of *AppMsgID1* and *AppMsgID2* are equal at all positions.
- The *AppMsgID1* is greater than *AppMsgID2*, if at the first differing position *i*, the corresponding character *AppMsgID1[i]* is greater than *AppMsgID2[i]*.
- The *AppMsgID1* is less than *AppMsgID2*, if at the first differing position *i*, the corresponding

character `AppMsgID1[i]` is less than `AppMsgID2[i]`.

6.7.2 Application Message Sequence Number

ETI will assign an application message sequence number, the *AppSeqNum (1181)*, to messages related to Trade Notification, News and Risk Control (Risk Notification and Entitlement Notification).

The *AppSeqNum (1181)* has the following characteristics:

- The first message will be the message sequence number 1.
- It is ascending during a business day until end-of-stream (Trade Notification).
- The message sequence will be gapless and allows gap detection.
- Trade notification: unique per business day, partition and business unit.
- News: unique per market.
- Risk Control: unique per business unit.

6.8 Session Data

Each session receives information on orders and quotes which were entered in their own session automatically without any subscription. The Session Data include Trading Session Event messages: start of service, market reset, end of restatement (for LF sessions only), and end of service.

For standard orders the complete order history may be recovered.

For lean orders and quotes only match events in the session scope may be recovered.

Session Data are recoverable, if and only if they have an *AppMsgId (28704)*.

The complete history for standard orders is distributed via the listener broadcast, too. In these cases, both messages for (session and listener data) will have the same *AppMsgId (28704)*.

Note: The retransmission message template used for order and quote events may differ from the session data response template. For more details, please refer to chapter Retransmit Response (Order/Quote Event).

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6.9 Broadcast

A broadcast is an application message that is available to multiple sessions, such as Trades or News messages.

Sessions may receive the following broadcast types:

| Broadcast | D* | C* | FIX Message Type | Application Identifier (1355) | Broadcast Message Identifier |
|-------------------------------------------------------------------------------------------------|----|----|---------------------------------------------------------------------------------------|-------------------------------|------------------------------|
| Listener: complete order history of standard orders of a session | X | X | Execution Report (8), Trading Session Status (h), Order Mass Action Report (BZ) | 5 | AppMsgID (28704) |
| Trades: Trade data on business unit level | X | X | Trade Capture Report (AE) | 1 | AppSeqNum (1181) |
| News: Public general messages from market supervision | X | X | News (B) | 2 | AppSeqNum (1181) |
| Risk Control: Private risk control messages | X | X | Party Risk Limits Update Report (CR), Party Entitlements Update Report (CZ) | 6 | AppSeqNum (1181) |
| Service Availability: Provides information on the availability of service on a partition | X | X | User Notification (CB) | 3 | N/A |

*D=Derivatives; C=Cash

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| Broadcast | D | C* | FIX Message Type | Application Identifier (1355) | Broadcast Message Identifier |
|------------------------------------------------------------------------------------------------------------------------------------------|---|----|---------------------------|-------------------------------|------------------------------|
| TES Maintenance: complete history of TES (enter, approve, modify, delete) excluding the TES trade data on business unit level. | X | - | Trade Capture Report (AE) | 7 | ApplSeqNum (1181) |
| TES Trade: TES trade data on business unit level | X | - | Trade Capture Report (AE) | 8 | ApplSeqNum (1181) |

After a session is established, it is not subscribed to any broadcast, but the risk control broadcast; nevertheless unsolicited session data is received.

For broadcast subscription, the Subscribe message is used. Per request only one broadcast type, via *RefAppID* (1355), may be subscribed. The response provides a unique subscription identifier in *AppSubID* (28727).

For broadcast unsubscription, the Unsubscribe message is used. Per request only one subscription, via *RefAppSubID* (28728), may be unsubscribed.

The following tables shows the results of different subscriptions:

| RefAppID (1355) | D* | C* | SubscriptionScope (25001) | Result |
|---------------------------------|----|----|---------------------------|----------------------------------------------------------------------------------|
| Trade (1) | X | X | 0xFFFFFFFF (no value) | All trade data for the own business unit. |
| News (2) | X | X | 0xFFFFFFFF (no value) | All public general messages from the market supervision of the specified market. |
| Service Availability (3) | X | X | Partition ID | Availability of the services provided by the specified partition. |

*D=Derivatives; C= Cash

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| RefAppID (1355) | D | C* | SubscriptionScope (25001) | Result |
|---------------------------------|---|----|---------------------------|--------------------------------------------------------------------------------------------------------|
| Service Availability (3) | X | X | 0xFFFFFFFF (no value) | Availability of the services provided by all known partitions. |
| Listener Data (5) | X | X | Session ID | Complete history of standard orders (of the current business day) submitted via the specified session. |
| Listener Data (5) | X | X | 0xFFFFFFFF (no value) | Complete history of standard orders (of the current business day) of the own business unit. |
| TES Maintenance (7) | X | - | 0xFFFFFFFF (no value) | Complete history of TES data (of the current business day) of the own business unit. |
| TES Trades (8) | X | - | 0xFFFFFFFF (no value) | All TES trade data of the own business unit. |

Note: Broadcasts may only be subscribed by LF sessions with the exception of service availability, which are available on HF and LF sessions. The receipt of the risk control broadcast is required by the regulator for all sessions; therefore no subscription is needed.

The FIX Application Sequencing concept⁷ is used for broadcasts on ETI:

- Each broadcast type is assigned a unique *AppID* (1180).
- Application-level messages are uniquely identified using a combination of *AppID* (1180) and *AppSeqNum* (1181) or *AppID* (1180) and *AppMsgID* (28704) respectively.

6.10 Recovery

6.10.1 Retransmission

Retransmission is supported for recoverable session data and the broadcast types listener, trades, news, and risk control.

Since application message identifiers and sequence numbers are unique per partition, the *PartitionID* (5948) is a mandatory parameter for all retransmission requests.

⁷ See FIX 5.0 SP2 Specification, Vol.1

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For retransmission, the Retransmit and Retransmit (Order/Quote Event) message respectively is used.

With a retransmission request, only data in the scope of one broadcast type and partition can be requested via *RefApplID (1355)* and *PartitionID (5948)*.

The FIX application level recovery concept can be used by the participant for selective recovery and late start restatements:

| Recoverable Data | D* | C* | Scope | Application Message Sequencing | Application Identifier RefApplID (1355) | Retransmission Sequencing |
|-----------------------------------------------|----|----|----------------------|--------------------------------|-----------------------------------------|--------------------------------------------|
| Recoverable session data | X | X | No value | ApplMsgID (28704) | 4 | ApplBegMsgID (28718), ApplEndMsgID (28719) |
| Listener broadcast (standard order drop copy) | X | X | session ⁸ | ApplMsgID (28704) | 5 | ApplBegMsgID (28718), ApplEndMsgID (28719) |
| Trades | X | X | N/a | ApplSeqNum (1181) | 1 | ApplBegSeqNum (1182), ApplEndSeqNum (1183) |
| News | X | X | N/a | ApplSeqNum (1181) | 2 | ApplBegSeqNum (1182), ApplEndSeqNum (1183) |
| Risk Control | X | X | N/a | ApplSeqNum (1181) | 6 | ApplBegSeqNum (1182), ApplEndSeqNum (1183) |
| TES Maintenance | X | - | N/a | ApplSeqNum (1181) | 7 | ApplBegSeqNum (1182), ApplEndSeqNum (1183) |
| TES Trade | X | - | N/a | ApplSeqNum (1181) | 8 | ApplBegSeqNum (1182), ApplEndSeqNum (1183) |

Optionally, the application message identifiers and respectively the application message sequence numbers provide the retransmission sequencing range. If no start value is specified, it is assumed to be "1". If ending range is absent, it is assumed to be infinity ("all available messages").

*D=Derivatives; C= Cash

⁸ Retransmission of listener broadcast data must be requested for each session separately. No session wildcard processing is supported for retransmission.

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The retransmission response will provide the range of recovered order and quote data in the fields *AppBegMsgID (28718)* and *AppEndMsgID (28719)* and for all other broadcasts respectively in the fields *AppBegSeqNum (1182)* and *AppEndSeqNum (1183)*.

This range may differ from the requested range, i.e. further retransmission requests may need to be submitted.

Please note, Risk Control and News messages are not deleted at the end of the trading day.

If you specify *AppBegSeqNum (1182)* with no value in your retransmit request, you may receive old Risk Control/News messages in your retransmit response, where the data relates to a trading day from the past.

Please check the value of the field

- *OrigTime (42)* in case of *News (TemplateID 10031)*,
- *TradeDate (75)* in case of *Entitlement Notification (10034)*, *Risk Notification (10033)* and *Party Action Report (10042)*.

This value indicates the date when either the respective risk data event has occurred or the respective news has been created and can therefore be used as a filter.

6.10.2 Preliminary Execution Report and Legally Binding Trade Notifications

All order and quote response information in ETI is sent out immediately after the order and quote has been processed by the core matching process.

All order and quote response information in ETI is preliminary; this includes *Execution Reports (8)* sent out for persistent and non-persistent orders as well as *Quote Execution Reports (U8)* sent out for quotes. This is also true for the standard order drop copy information published via the Listener broadcast.

Note: Market data on T7 is based on order and quote execution information. The MDI , EMDI and EOBI interfaces provide trade price messages on the basis of this preliminary information.

For these reasons, a participant application always needs to confirm the preliminary execution information with the corresponding legally binding Trade Notification message (*Trade Capture Report (AE)*).

In case of an exchange system failure, the participant is informed of a market reset event via the Trading Session Event message including the last persisted application message identifier. This message is followed by an order book restatement of all active orders.

In this event it is highly recommended to reconcile all *Execution Reports (8, U8)* with higher application message identifiers with the corresponding *Trade Capture Reports (AE)*. If there is no *Trade Capture Report (AE)* for a given *Execution Report (8)* or a *Quote Execution Report (U8)* then this *Execution Report (8)* or a *Quote Execution Report (U8)* has to be considered invalid and should be discarded. Please find detailed information regarding trade reconciliation in chapter Trade Reconciliation.

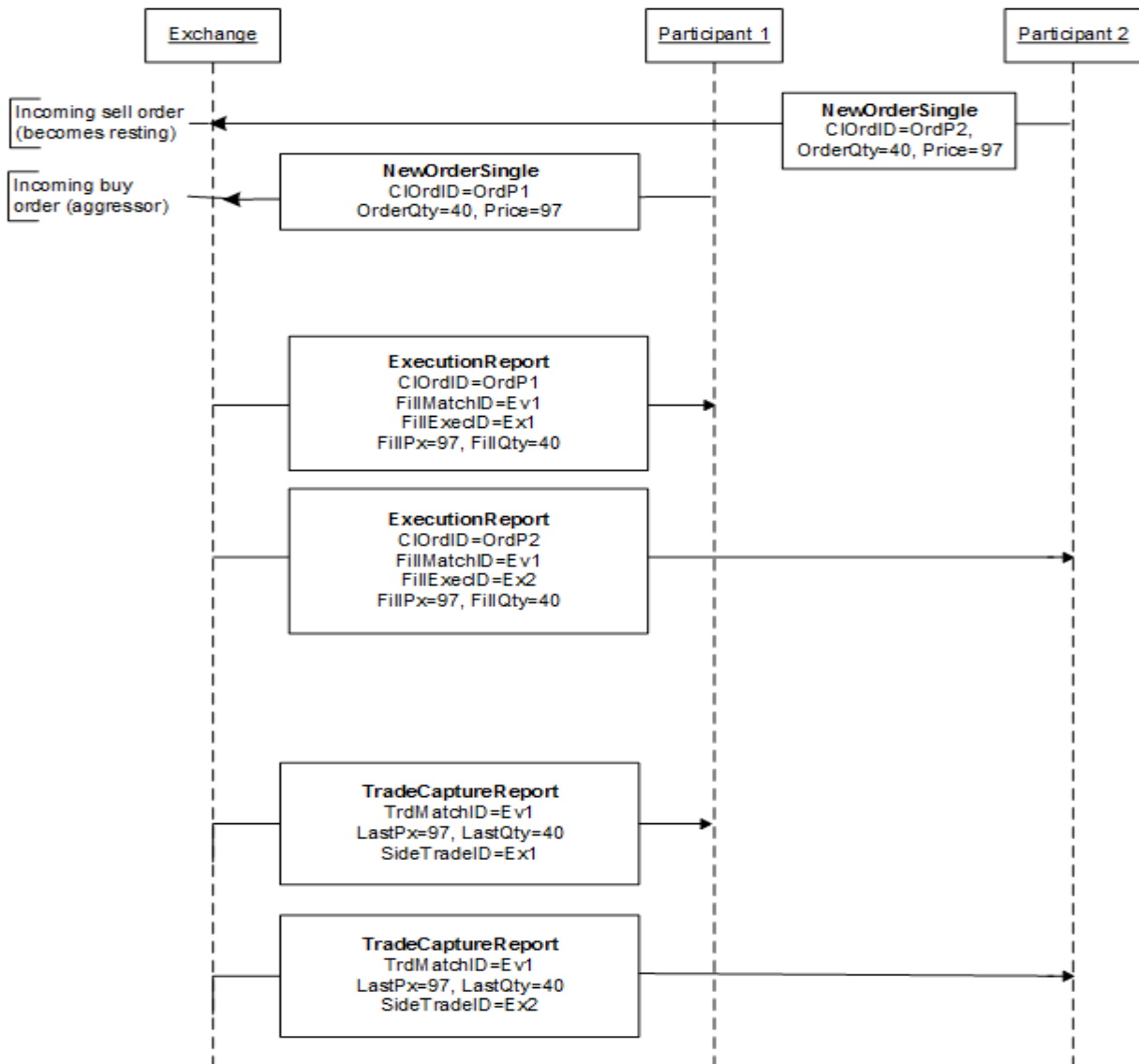
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7. Appendix

7.1 Trade Reconciliation and Identifiers

The following message flow shows a match event of an incoming aggressively matching order against one resting order in the book.

The focus of this message flow is to show, how trade reconciliation is based on the different execution and trade identifiers.



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7.2 Uniqueness of Identifiers

The following table documents the criteria required for uniqueness of IDs.

| Tag | Field Name | Description | Source | Rule | Uniqueness |
|-----------------------|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| 11 | ClOrdID | Client Order ID: Unique participant defined order request identifier. | P ⁹ | The uniqueness of ClOrdID (11) is checked at entry time among currently live orders for the same instrument and session. Duplicate ClOrdID (11) values for the same session and instrument will be rejected with the exception of Immediate or Cancel (IOC) Orders. | Session Instrument |
| 37 | OrderID | Exchange Order ID generated by the T7 System; it remains constant over the lifetime of an order. | E | An exchange order ID is guaranteed to be unique among all orders of the same product. | Product |
| 117 | QuoteID | Participant defined mass quote identifier. | P | The uniqueness of the mass quote identifier is not checked by the T7 system. | |
| 693 | Quote-ResponseID | Mass quote response identifier generated by the exchange. | E | Is unique per product. | Product |
| 17 | ExecID | Transaction timestamp. | E | Is unique per product. | Product |
| 34 | MsgSeqNum | Message sequence number used by the participant for requests sent to the gateway. | P | The MsgSeqNum (34) in the request header must increment with each message sent by the participant to the gateway, starting with the Session Logon message as sequence number 1. | Session |
| 28704 | ApplMsgID | Application Message Identifier. | E | Is unique per software release and partition. Any kind of "reset" will be announced via the related release notes. | Software Release Partition |
| 1181 | ApplSeqNum | Application Message Sequence Number. | E | Trade notification: unique per business day, partition and business unit. Starts every business day with 1. Please note: in rare cases sequence numbers might be sent twice. | Partition Business Unit |
| | | | | News: unique per market. | Market |
| | | | | Risk Control: unique per business unit. | Business Unit |
| 880 28708 8714 | TrdMatchID FillMatchID QuoteEventMatchID | Unique identifier for each price level (match step) of a match event; it is used for public trade reporting. | E | Is unique for the product and business day. | Business Day Product |
| 1363 28725 1506 | FillExecID LegExecID SideTradeID | Private identifier of an order match step event, which can be reconciled with the field SideTradeID (1506) in the Trade Notification. | E | Is unique for the product and business day. | Business Day Product |

⁹ P = Participant, E = Eurex

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| Tag | Field Name | Description | Source | Rule | Uniqueness |
|--------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------|-----------------------|
| 1003 1126 | TradeID OrigTradeID | The TradeID (1003) field in the Trade Notification in T7 ETI uniquely identifies all order leg allocations referring to the same matching event, simple instrument and price. The TradeID (1003) is equivalent to the trade identifier in Eurex Clearing. | E | Is unique per product and business day. | Business Day Product |
| 1005 | SideTradeRep ortID | Private unique identifier for each side of a trade (with or without a central counter party). | E | Is unique per product and business day. | Business Day, Product |
| 467 70 | IndividualAlloc ID AllocID | TES trade side ID | E | Is unique per product and business day. | Business Day Product |
| 2489 | PackageID | TES trade ID | E | Is unique per product and business day. | Business Day Product |

7.3 Quote Entry Status

The following table list the scenarios for the valid values of *QuoteEntryStatus* (1167):

| Scenario | Quote in Book | QuoteEntryStatus (1167) | BidCxlSize and/or SellCxlSize provided |
|------------------------------------------------|---------------|----------------------------------------|----------------------------------------|
| Incoming Quote with error | no | 5 = Rejected | no |
| Incoming Quote with error | yes | 6 = Removed quote in book and Rejected | yes |
| Incoming Quote during Freeze | | 10 = Pending | no |
| Incoming Quote during Freeze (already pending) | | 5 = Rejected | no |
| Modify/Delete Quote | no | 0 = Accepted with warning | 0 |
| Modify Quote (Qty <= executed Qty) | yes | 0 = Accepted with warning | yes (remaining Qty) |
| Incoming Quote side would lead to Crossing | yes | 0 = Accepted with warning | yes (quote side in book cancelled) |

8. Change Log

8.1 T7 Release 5.0 – Simulation Version:

- Restructuring of the document:
 - added cash markets specific parts
 - added chapter Related Documents
 - removed message references - see chapter ETI Message References
- Cash markets only: changed in chapter Mass Cancellation Events volatility interruption product/instrument level (derivatives markets only).
- Cash markets only: added refill of iceberg orders to the cases when modified orders will lose its time priority – see chapter Modification.
- Changed subscription scope in chapter Broadcast for *News* broadcast: only news for the market the subscribing session belongs are provided.
- new use cases in chapter Order Status and Execution Reports:
 - added cash markets only uses cases
 - added BOC order cancelled because of instrument state change to auction (cash markets only)
 - added Suspended/inactive order deletion without execution after being initially deferred
 - added Restatement: Trailing Stop Order – Update Stop Price
- Changed system behaviour:
 - Service Availability updates are only provided for the partitions belonging to the market the subscribing session is assigned to.
 - Listener Data/Session Data broadcast : “public events” (Market Reset, End of Restatement, End of Service, Service Resumed) are delivered only to sessions assigned to the respective markets – see chapter Trading Session Event in ETI Message References.
 - Trade Broadcast: Trade Notification Status messages indicating end of service are only delivered to sessions assigned to the corresponding market – see chapter Trade

Notification Status in ETI Message References.

- Retransmission requests are only accepted partitions/markets the requesting session is assigned to.
- Ordering of *AppMsgIDs* (message keys) not guaranteed across broadcast types (session vs. listener data) – see chapter Application Message Identifier.