



DEUTSCHE BÖRSE
GROUP

Deutsche Börse Cash Market Migration of Trading Venue Börse Frankfurt (including Börse Frankfurt Zertifikate) (XFRA)

April 2020



Agenda

Introduction & Cornerstones

Functional Aspects

Technical Aspects

Migration Approach

Connectivity

Services, Support & Further Information

1

Migration of Börse Frankfurt

Introduction &
Cornerstones




Agenda Introduction & Cornerstones

History

Scope

Simulation and Production Launch Schedule

A Brief History of the Architecture



| | | |
|---|--|-------------|
| Börse Frankfurt on T7 | Migration of Börse Frankfurt to the T7 system. The migration includes instruments of both Börse Frankfurt and Börse Frankfurt Zertifikate. After the migration all legacy interfaces of the Xetra system including the MISS Infrastructure will be decommissioned. | 2020 |
| Xetra on T7 | Introduction of T7 for the Cash Market - Xetra's new trading architecture as a next generation Cash Market trading system | 2017 |
| Continued Xetra Interface Strategy | Start decommissioning of legacy interfaces and MISS infrastructure | 2013 |
| Launch of T7 | Introduction of T7 - Eurex Exchange's new trading architecture | 2012 |
| Xetra Release 10.0 | Introduction of socket based interfaces <ul style="list-style-type: none"> - Enhanced Broadcast Solution - Enhanced Transaction Solution | 2009 |
| Launch of Xetra | Launch of an electronic trading system for the Cash Market | 1997 |

Börse Frankfurt goes T7

With the migration of Börse Frankfurt to T7 technology Deutsche Börse takes the next step to a common platform for the trading of securities and derivatives on a truly state-of-the-art multi exchange trading system.

1

Multi exchange trading system

Xetra®, Börse Frankfurt and Eurex® run on a common technology. Trading participants benefit from synergies resulting from the alignment and a harmonised interface landscape and releases

2

Multiple asset classes

Via T7 access to a large variety of asset classes like equities, ETFs, bonds, funds, structured products as well as futures and options is provided

3

State-of-the-art technology

T7 is a powerful state-of-the-art trading platform. Cutting-edge technology delivers ultra-low latency, robustness and safe handling of very high throughput

Scope of Migration

With the migration of Börse Frankfurt (MIC: XFRA) to the T7 system the continuous auction market model for equities, ETFs, ETPs, bonds, funds and structured products is migrated with the following scope*:

Instrument scope and market models

| | |
|-----------------------|---|
| Asset Classes | ~ 12,000 Equities, ~33,500 Bonds, ~1,600 ETFs & ETPs, ~ 3,100 Mutual Funds and ~ 1,2 mio. Structured Products |
| Trading Models | Continuous Auction (Specialist Model), TES OTC |

Order types, transparency, trading times and clearing & settlement

| | |
|----------------------------------|--|
| Order Types and Quotes | Market Orders, Limit Orders, Stop Limit Orders, Stop Market Orders, Trailing Stop Orders, One-Cancels-the-Other Orders, Specialist Quotes, Quote Requests |
| Transparency | Same level of transparency as today. |
| Trading Times | 08:00 to 20:00 for Börse Frankfurt (Equities, ETFs, ETPs and Mutual Funds) 08:00 to 17:30 for Börse Frankfurt (Bonds) 08:00 to 22:00 for Börse Frankfurt Zertifikate |
| Clearing & Settlement | Same offering for clearing & settlement as today (CCP or non-CCP with bilateral aggregation and settlement internalization) |

Connectivity, market data and execution reports

| | |
|----------------------------------|--|
| Connectivity | ETI (Enhanced Trading Interface), FIX and GUI |
| Market Data Dissemination | Netted market data, un-netted market data**, Instrument and market state changes |
| Member Confirmation | Order Confirmation, Order Execution Confirmation, Trade Confirmation |

* Out of scope are the order type "Order-on-Event" and Order-Level-Netting

**available in co-locations only

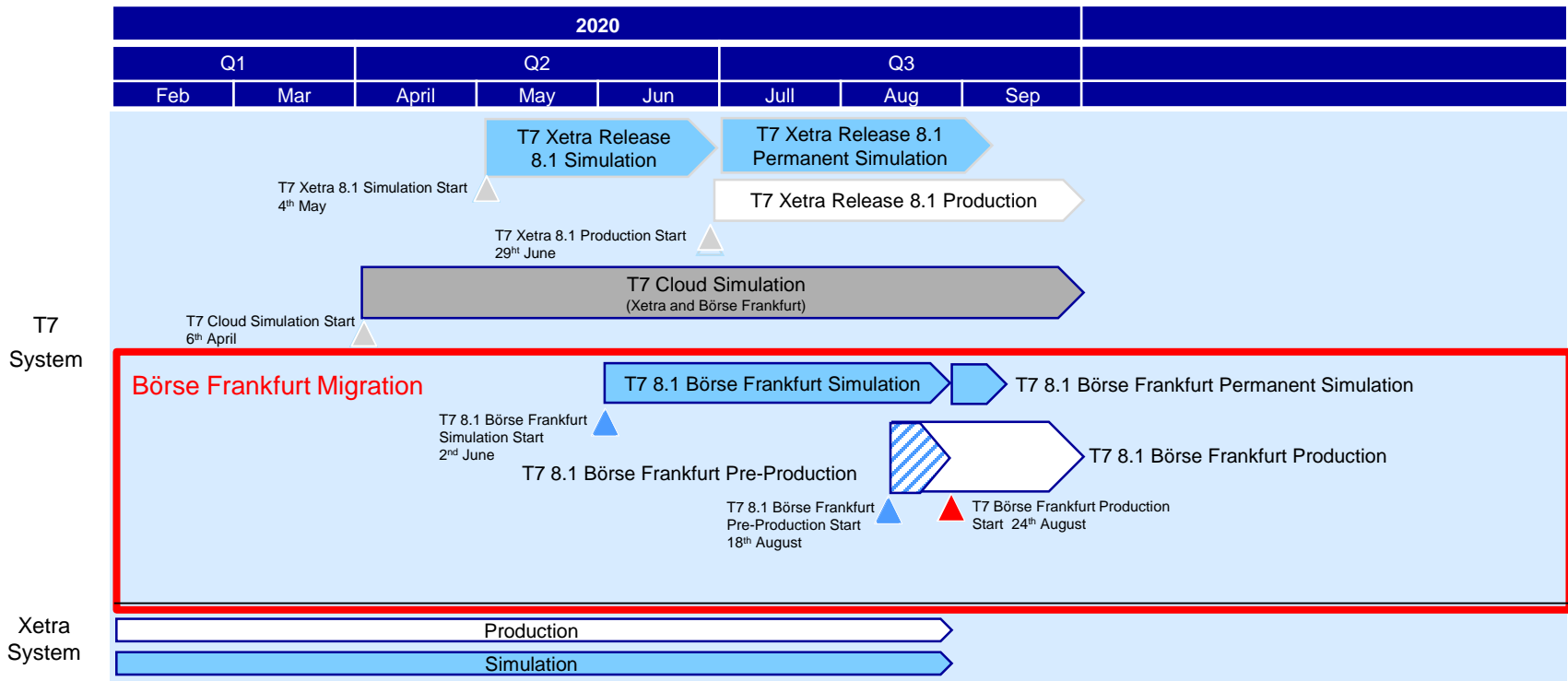
Simulation and Production Introduction Schedule

Migration of the trading venue Börse Frankfurt will take place on 24 August 2020 based on the functionality implemented with T7 Release 8.1, which will be launched on 29 June 2020.

Cloud Simulation – started on 6 April 2020.

Simulation with an integrated environment – will start on the 2nd June 2020 on the simulation environment for Börse Frankfurt.

Product migration – will be done on 24 August 2020 as ‘big bang’.



2

Migration of Börse Frankfurt

Functional Aspects



Agenda Functional Aspects

Market Structure

Participant / Business Unit / User

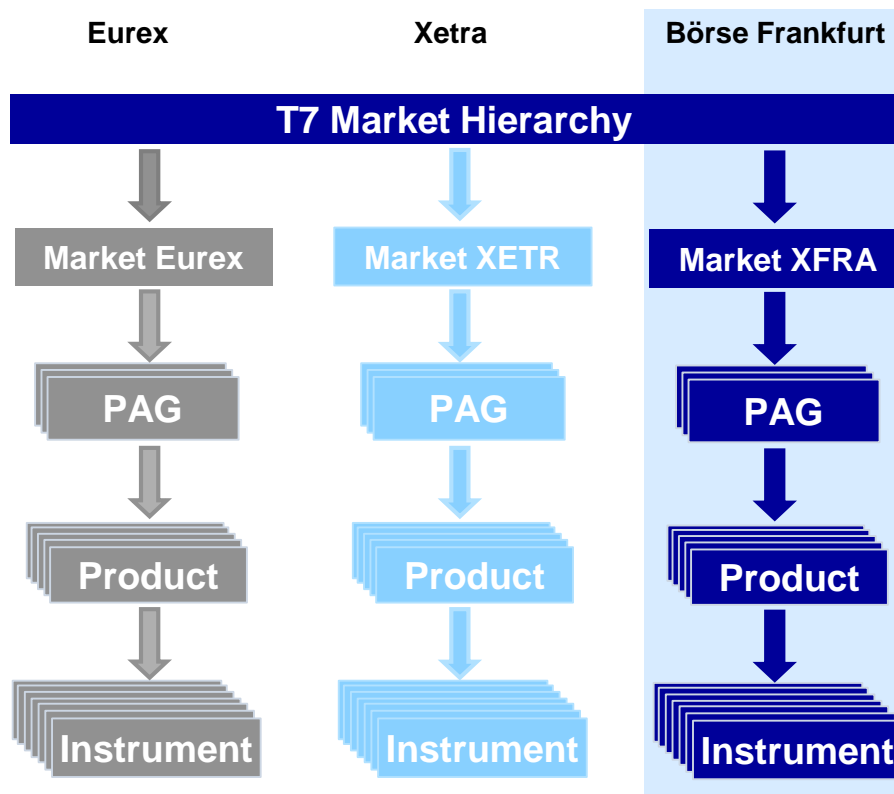
General Entitlement Concept

Market Model “Continuous Auction with Specialist”

Major Functional Changes

Market Structure

- Both trading venues Xetra and Börse Frankfurt will be set up as different markets in separate environments
- Each market will be identified by a unique MIC



Product Assignment Group (PAG)

- Products are grouped into PAGs
- PAGs govern entitlement in T7. In Börse Frankfurt, all users will be entitled to trade all instruments
- PAG hierarchy is maintained by the exchange

Products

- Börse Frankfurt: Instruments are grouped per asset class
- Börse Frankfurt Zertifikate: Instruments are grouped per issuer
- Products of the same group are traded in the same way

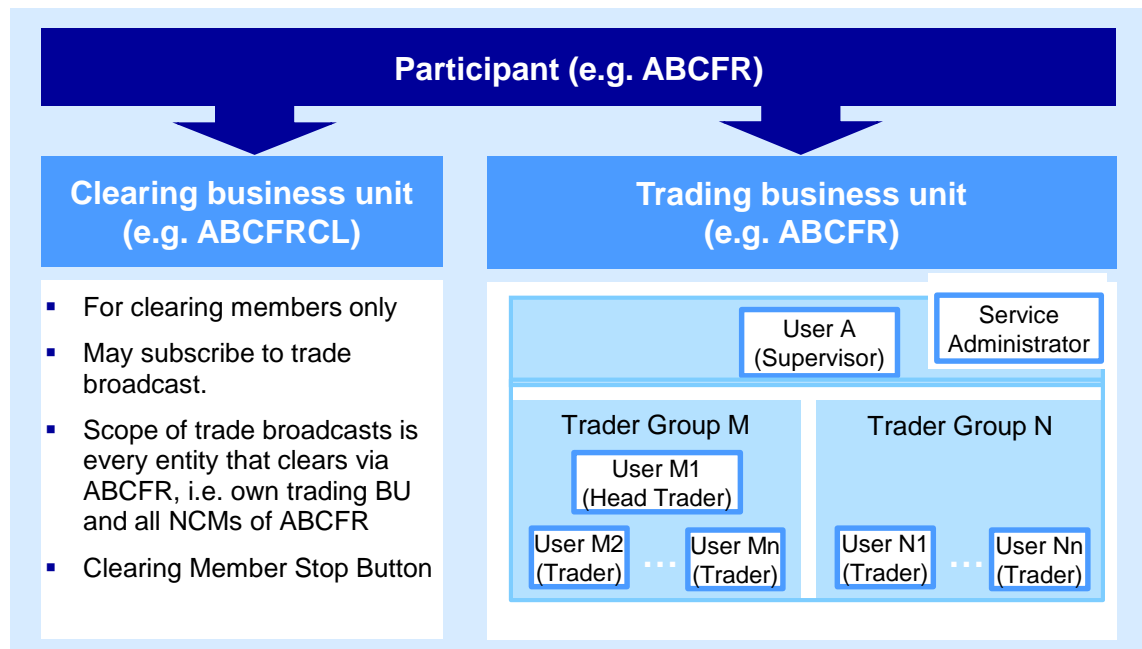
Instrument

- Tradeable entities
- An order refers to buying/selling specified quantities of an instrument
- Instruments are set up by the exchange

Participant, Business Unit, User – Three Level Hierarchy

Clear concept of rights & product assignments and user hierarchy:

- **Participant:** Trading participant, clearing member or service provider
- **Business Unit:** By default, trading members will only get a trading BU; clearing members will only get a clearing BU; members both clearing & trading will get a trading BU and a clearing BU. The IDs of the participant and the business units are equal to the member ID in the Xetra system today
- **User:** A Business Unit can have multiple users, which can be traders or service administrators. A user belongs to exactly one business unit



- Entitlement on participant level is maintained by Market Operations
- Entitlement on user level is maintained by service administrator(s) of the Participant

Participant, Business Unit, User – User Levels and User Roles

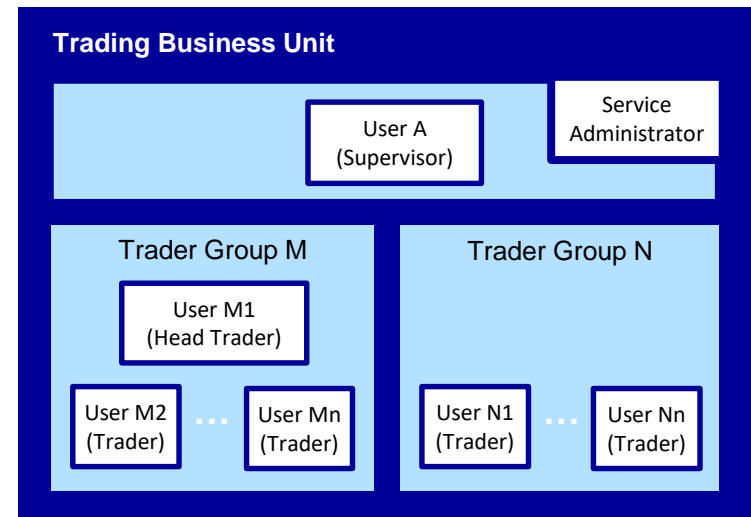
A user can be a person that interacts with the trading system (e.g. trader or administrator) or a machine (e.g. Order routing system)

The new system supports trader groups and a hierarchy of three user levels:

- **Traders** can maintain own orders only
- **Head Traders** can maintain own orders and can modify and delete the orders of traders in their trader group
- **Supervisors** can maintain own orders and can delete orders of all traders / trader groups. It is also possible to modify standard orders via other low frequency sessions or the Trader GUI

User functions depend on roles:

- Trader,
- Specialist,
- Service administrator,
- T7 entry service (TES) trader,
- TES broker,...



Quotes can only be entered using ETI sessions, the context to modify or delete a quote is therefore defined by the session used to enter a quote.

Emergency actions like „delete all“ are determined by the user level and user role.

General Entitlement Concept – Responsibilities in Context of the Migration

Deutsche Börse AG

- Migration of the Xetra environment to the T7 platform
- Migration of reference data, including instruments as well as members
- Migration of the entitlement:
 - Assignment of all product groups to participants
 - Assignment of roles to users in regard to their former RAL setup

Participants

- Assessment and maintenance of the user and entitlement configuration
- Assignment of new roles to users
- Set-up of clearing business unit users
- Passwords for all users have to be changed

General Entitlement Concept - Mapping of RALs to Roles

- Xetra: RALs entitle user to execute specific operations
- T7: the equivalent to RALs are resources. Resources are bundled in pre-defined roles
- Users will be assigned pre-defined roles in T7 equivalent to their RAL entitlement in the Xetra trading system*

In the first example the user will be assigned the Cash Trader role since he is entitled to *Enter Orders*

The Trader role also includes other resources, e.g. display of orders and trades, statistics

The screenshot shows the 'Authorizations' tab in the Xetra system. A table lists resources with their codes, names, and access status. Resource 7, 'Xetra Enter Order', is highlighted with a blue box. A blue arrow points from this resource to the 'Cash Trader' role (102) on the right. The role's permissions list includes: Add Order, Modify Order, Delete Order, Delete all orders, Cross Trade, Quote Request, Add Short Order, Modify Short Order, and Allow Cross Prevention.

| ResCode | ResName | Access |
|---------|-------------------------|-------------------------------------|
| 1 | Xetra Inquire User List | <input checked="" type="checkbox"/> |
| 2 | Xetra Inquire User | <input checked="" type="checkbox"/> |
| 3 | Xetra Add User | <input checked="" type="checkbox"/> |
| 4 | Xetra Modify User | <input checked="" type="checkbox"/> |
| 5 | Xetra Delete User | <input checked="" type="checkbox"/> |
| 6 | Xetra Inquire Order | <input checked="" type="checkbox"/> |
| 7 | Xetra Enter Order | <input checked="" type="checkbox"/> |
| 8 | Xetra Modify Order | <input checked="" type="checkbox"/> |
| 9 | Xetra Delete Order | <input checked="" type="checkbox"/> |
| 10 | Xetra Inquire Quote | <input type="checkbox"/> |
| 11 | Xetra Enter Quote | <input type="checkbox"/> |
| 12 | Xetra Delete Quote | <input type="checkbox"/> |

In the second example the user will be assigned the *Cash Service Administrator* role since he is entitled to *Add Users*

The *Cash Service Administrator* role also includes the modification of users, maintenance of their entitlement, etc:

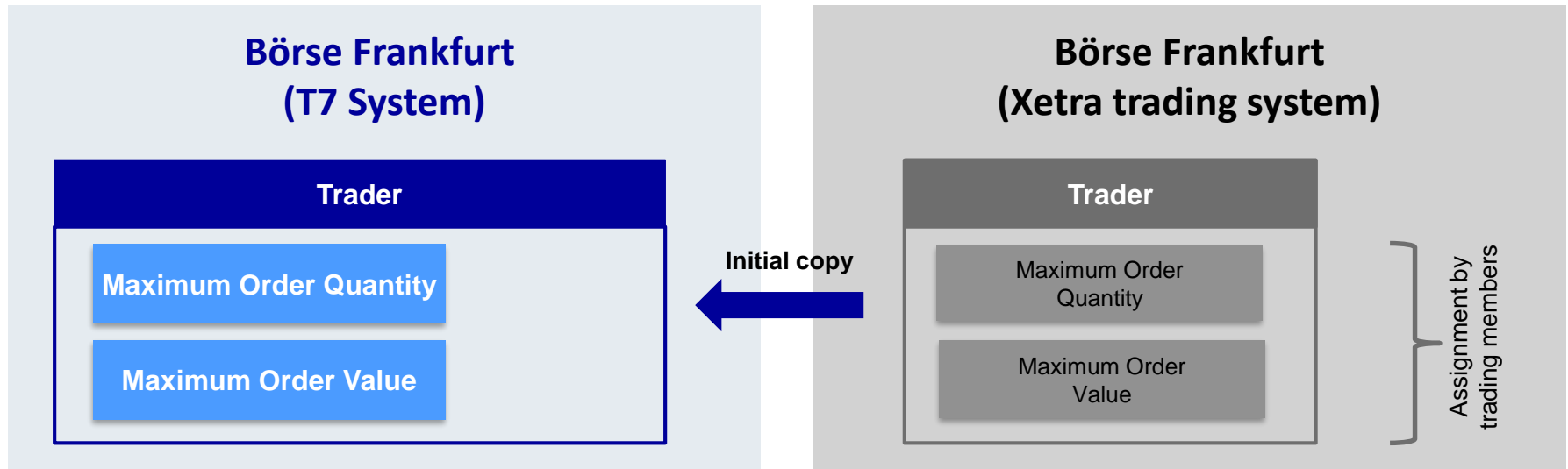
The screenshot shows the 'Authorizations' tab in the Xetra system. A table lists resources with their codes, names, and access status. Resource 3, 'Xetra Add User', is highlighted with a blue box. A blue arrow points from this resource to the 'Cash Service Administrator' role (101) on the right. The role's permissions list includes: User Maintenance View, STOP View, Sessions View, and Bandwidth Monitor.

| ResCode | ResName | Access |
|---------|-------------------------|-------------------------------------|
| 1 | Xetra Inquire User List | <input checked="" type="checkbox"/> |
| 2 | Xetra Inquire User | <input checked="" type="checkbox"/> |
| 3 | Xetra Add User | <input checked="" type="checkbox"/> |
| 4 | Xetra Modify User | <input checked="" type="checkbox"/> |
| 5 | Xetra Delete User | <input checked="" type="checkbox"/> |
| 6 | Xetra Inquire Order | <input type="checkbox"/> |
| 7 | Xetra Enter Order | <input type="checkbox"/> |
| 8 | Xetra Modify Order | <input type="checkbox"/> |
| 9 | Xetra Delete Order | <input type="checkbox"/> |
| 10 | Xetra Inquire Quote | <input type="checkbox"/> |
| 11 | Xetra Enter Quote | <input type="checkbox"/> |
| 12 | Xetra Delete Quote | <input type="checkbox"/> |

* More information is available in the *T7 Participant and User Maintenance Manual – Xetra*.

General Entitlement Concept – Trading Limits

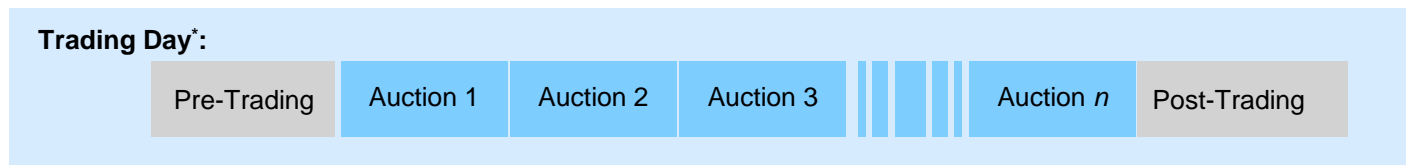
- Maximum Order Value and Maximum Order Quantity will be migrated from the Xetra system to T7 for all users of the trading venue Börse Frankfurt
- Maintenance on user level in T7 is possible as in the Xetra system
- Maximum Order Values and Maximum Order Quantities will be applicable for all products of Börse Frankfurt and Börse Frankfurt Zertifikate



Continuous Auction with Specialist

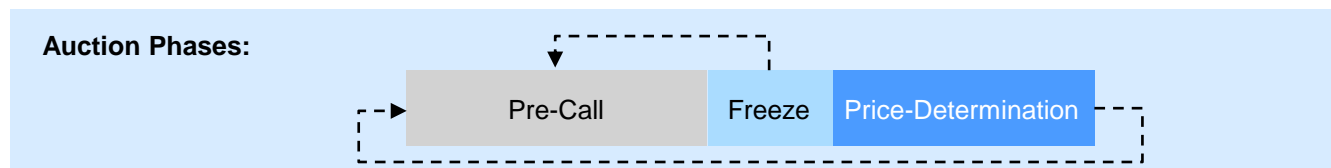
Trading Day

- Continuous Auction with 1 to n auctions, where the number of auctions depends on trading activity in the respective instrument.
- Closed order book, solely Specialist's standard quote is published by trading system and via CEF (BFZ: only via CEF)



Auctions

- During Pre-Call all trading participants can add, modify and delete orders
- Order book freeze initiated by Specialist as soon as limit control system indicates an executable order book situation. Order submissions, modifications and deletions are entered in a locked stock during freeze and are processed after the order book is unfrozen (directly or after price determination)
- Specialist is able to add, modify and delete orders and quotes on own account or orders on behalf of other trading participants during freeze
- Price determination according to modified principle of most executable volume which is triggered by a matching quote entered by the Specialist



* The exact timing of the different trading phases depends on the specific asset classes. The schedule is planned to match the existing setup.

Single and Special Auction

Single Auction

- Only one price determination is allowed. An indicator on instrument level is available to identify these instruments



- Specialist will take care of one price determination per business day



- Price distribution via market data interfaces as auction price

Special Auction

- For federal bonds and subscription rights a „Special Auction“ price determination is supported. Identification is possible on instrument level
- For these instruments the new trading restriction „Special Auction“ can be entered



- The Specialist can initiate a special auction price determination
- All orders with and without trading restriction „SA“ are included in Special Auction price determination



- Price distribution via market data interfaces as auction price and indicator „Special Auction“

Orders - Attributes

- For the trading venue Börse Frankfurt orders can only be entered as persistent standard orders
- Entry of non-persistent standard orders or lean orders is **not** possible
- Only quotes will be handled like non-persistent lean orders

Standard

- The complete order history can be recovered via retransmission requests. This order data is visible to all low frequency sessions belonging to the same business unit (via subscription to the listener data broadcast)
- Should be used for low frequency sessions



Persistent

- Orders will be reinstated at the start of the next business day depending on their order validity, or after a failure of the trading system

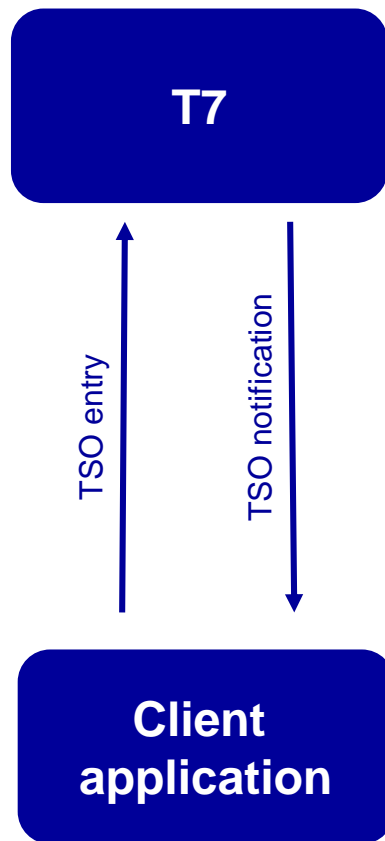
Orders - Profiles

For the trading venues Börse Frankfurt the following order types are supported:

| Order Profile | Order Profile Attributes | | | | | | | | | | | | | | | |
|-----------------------------|-------------------------------------|------|---------|-----|-----|-----|-----|-----|----|-----|-------------------------|--------|------------------------|-----|-----|-------------|
| | Internal Order Types & Restrictions | | | | | | | | | | Allowed Price Condition | | Allowed Order Validity | | | |
| | Regular | Stop | Iceberg | TSO | OCO | AOO | OAO | CAO | SA | BOC | Limit | Market | IOC | FOK | Day | GTD/ GTC |
| Limit Order | ✓ | | | | | | | | | ✓ | ✓ | | | | ✓ | ✓ |
| Market Order | ✓ | | | | | | | | | ✓ | | ✓ | | | ✓ | ✓ |
| Auction Only Order | | | | | | | | | | | | | | | | |
| Opening Auction Order | | | | | | | | | | | | | | | | |
| Closing Auction Order | | | | | | | | | | | | | | | | |
| Book-Or-Cancel Order | | | | | | | | | | | | | | | | |
| Stop Order | | ✓ | | | | | | | | | ✓ | ✓ | | | ✓ | ✓ |
| One-Cancels-the-Other Order | | | | | ✓ | | | | | | ✓ | | | | ✓ | ✓ |
| Iceberg Order | | | | | | | | | | | | | | | | |
| Trailing Stop Order | | ✓ | | ✓ | | | | | | | | ✓ | | | ✓ | ✓ |

Major Functional Changes - Trailing Stop Order Handling in T7

- Trailing stop orders will be monitored directly in T7 & specialist systems
- Triggering of trailing stop orders will be based on matching quotes as for regular stop orders
- Trailing stop price updates will be broadcast to entering business unit and Specialist (push instead of pull)

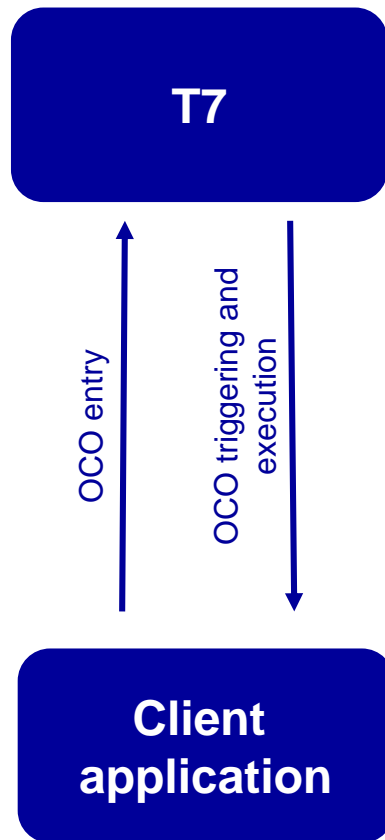


TSO updates and trigger handling

- TSO updates are performed based on Specialist's standard quote and matching quote:
 - For buy TSO, if $\text{ask quote price} + \text{delta} < \text{trailing stop limit}$, then update is applied as $\text{trailing stop limit} = \text{ask quote price} + \text{delta}$
 - For sell TSO, if $\text{buy quote price} - \text{delta} > \text{trailing stop limit}$, then update is applied as $\text{trailing stop limit} = \text{bid quote price} - \text{delta}$
- TSO updates will be provided to client applications and Specialist in defined netting intervals
- After a stop limit update was broadcast, further stop limit updates for the same TSO within the netting interval will not be published directly
- Additionally, Specialist will receive TSO updates
 - When the Auction phase is switched to Freeze
 - When the TSO is triggerable by the Specialist's standard quote
- TSO will participate in price determination as a market order when its current trigger limit is triggerable by Specialist's matching quote
- Untriggered TSO are not modifiable by the Specialist

Major Functional Changes - One-Cancels-Other Order Handling in T7

- One-cancels-Other orders will be monitored directly in T7 & specialist systems
- Triggering of stop orders uniformly based on matching quotes

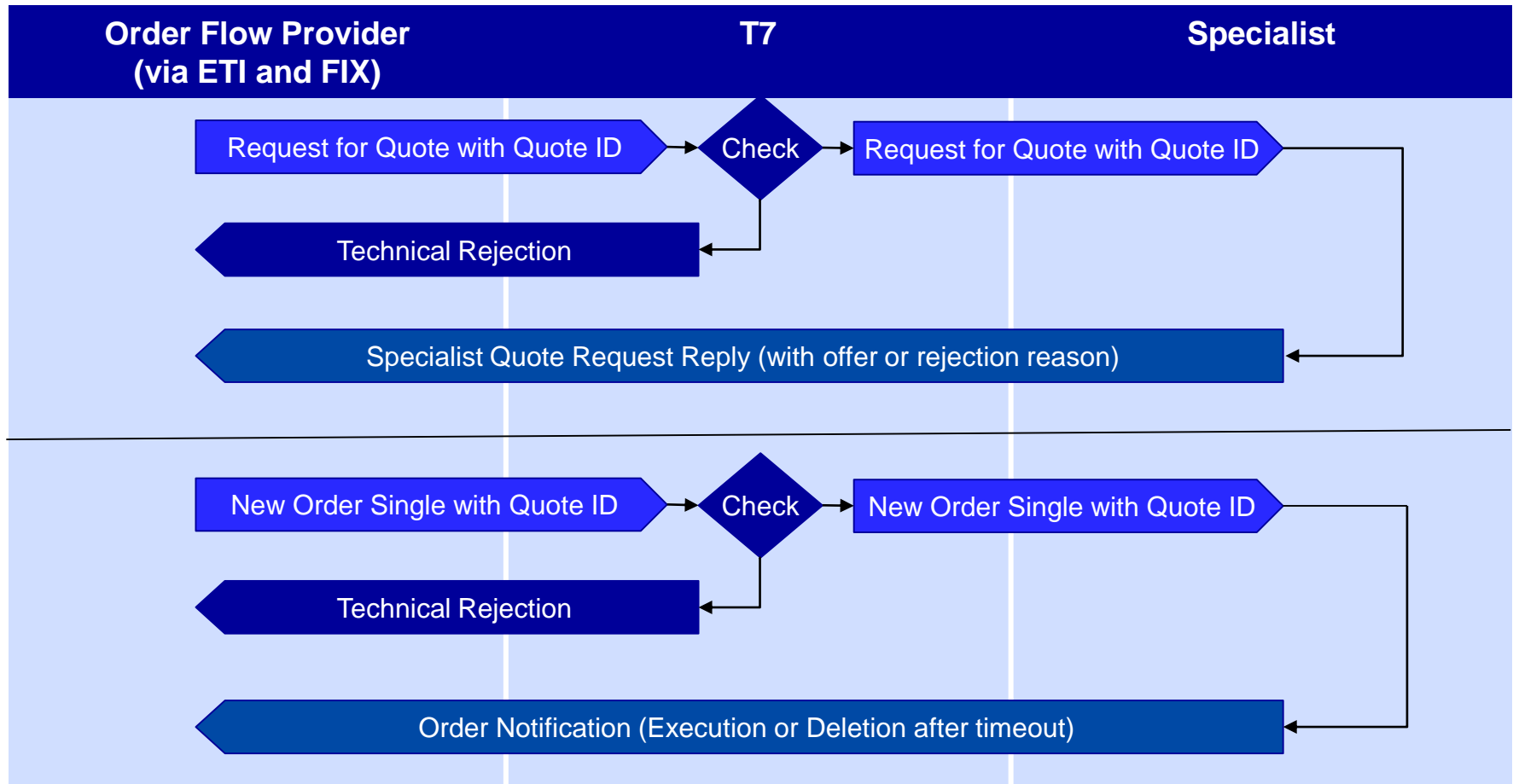


OCO Order handling in T7

- OCO order will be triggered by Specialist's matching quote
- Upon price determination after freeze phase
 - If the stop limit of the OCO order is triggerable against the matching quote, it will participate as a market order during price determination / price calculation,
 - Otherwise it will participate with its limit part
- Price collar checks will apply on the limit and stop price against the last price
- Untriggered OCO orders are not modifiable by the Specialist

Major Functional Changes - Quote Request Solution (QRS)

- Quote request functionality for retail customers will be extended to all asset classes
- The QRS Workflow resembles the workflow currently implemented in the Xetra trading system

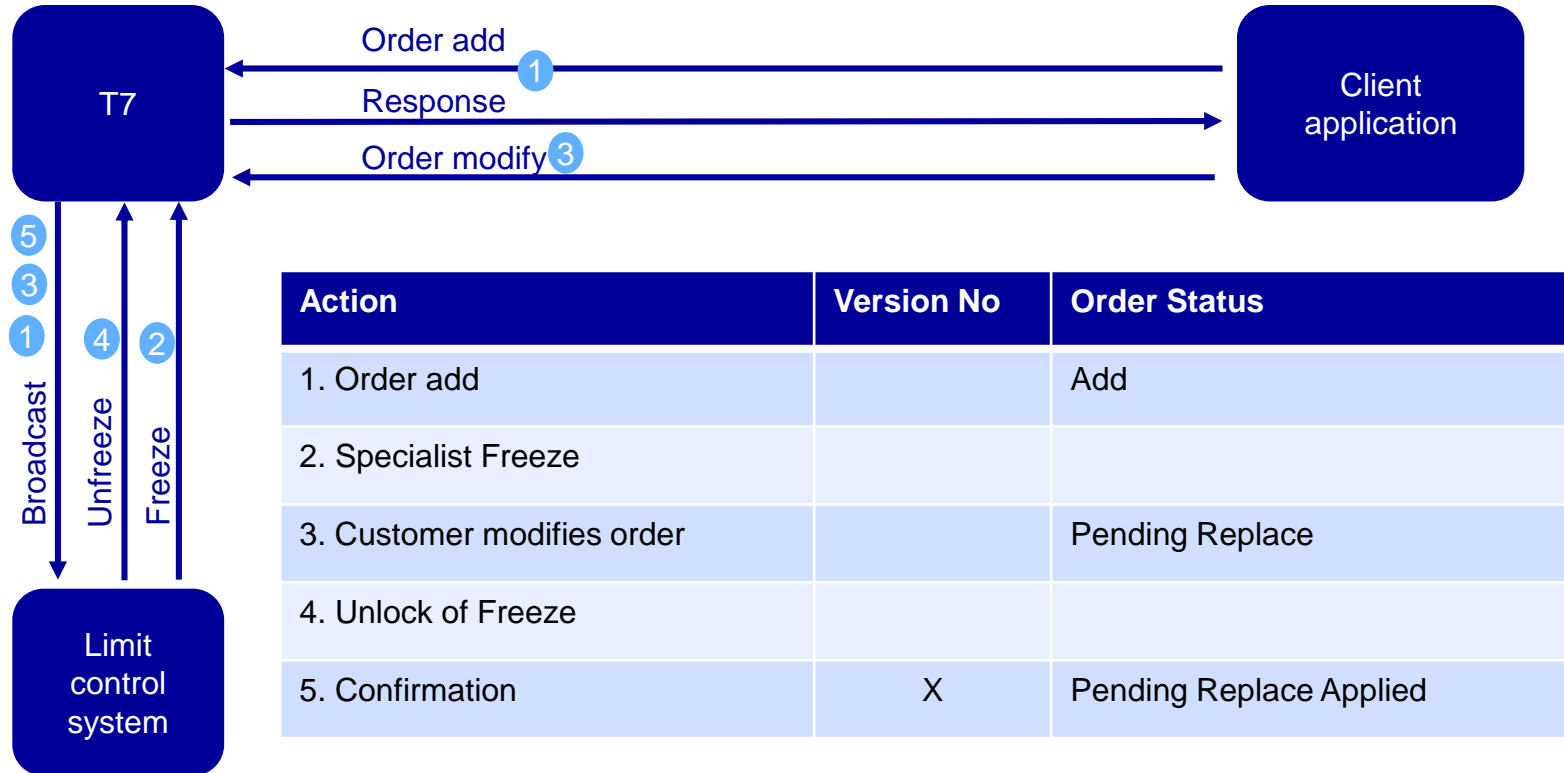


Please note: the quote request solution without quoteID is also available as on the Xetra system.

Major Functional Changes - Locked Stock (LS) Scenarios – Xetra Trading System vs. T7

| Action | Xetra trading system | T7 |
|--|---|--|
| 1. Orderbook freeze by Specialist | <ul style="list-style-type: none"> Order transactions are buffered in locked stock and marked as ‚pending‘ Provision of a new order number for each pending transaction Pending transactions are netted resulting in only one overall pending order action | <ul style="list-style-type: none"> Order transactions are buffered in locked stock and marked as ‚pending‘ No new order number will be provided for pending transactions 1-n pending transactions are stored individually |
| 2. Execution | <ul style="list-style-type: none"> Partial/full execution applies on the active order | <ul style="list-style-type: none"> Partial/full execution applies on the active order |
| 3. LS resolution after Freeze if order still exist (pending transactions can be applied) | <ul style="list-style-type: none"> One broadcast for the netted pending transaction Linkage via OrderNoLinked | <ul style="list-style-type: none"> One broadcast for each pending transaction Order number will remain unchanged Order version number will be increased in case priority has been changed by applied pending modify |
| 4. LS resolution after Freeze if orders was matched/ deleted (pending transactions cannot be applied) | <ul style="list-style-type: none"> Final cancellation message for the netted pending transaction | <ul style="list-style-type: none"> Last broadcast message (from 2 or 3) will contain „pendingsCancelled“ to indicate that pending transaction(s) have been cancelled |

Major Functional Changes - Locked Stock Scenario in T7 Börse Frankfurt - Example



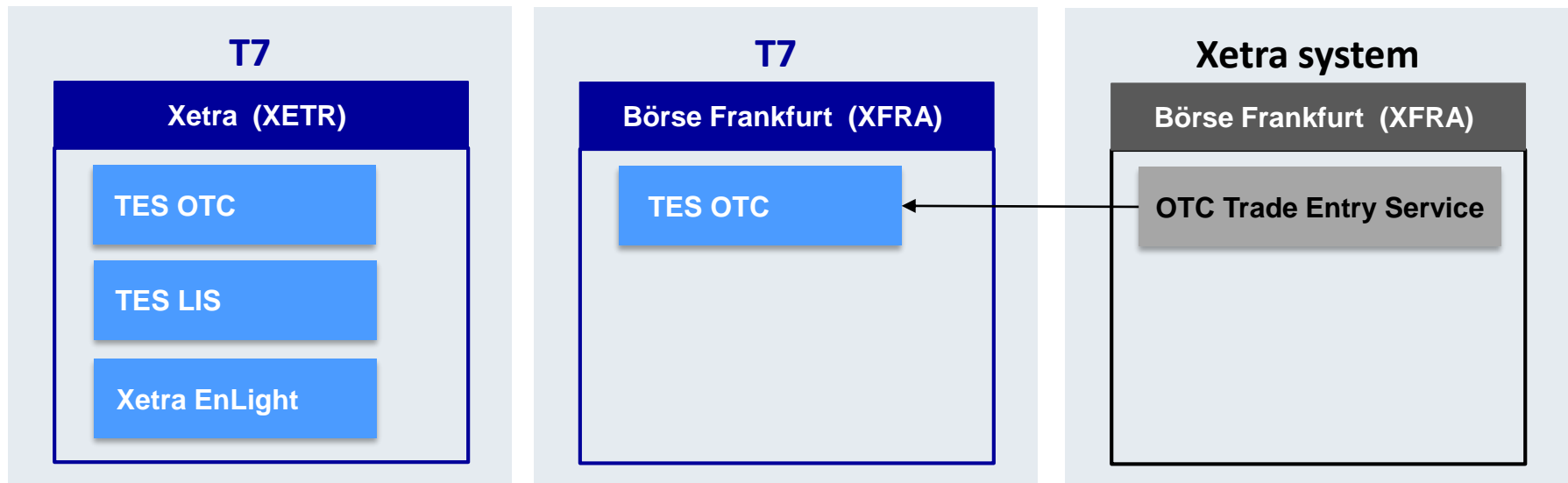
- Pending message will be sent to customer and Specialist
- After unfreeze pending replace request will be resolved with an increased version number. Respective message will be sent to customer and Specialist

Major Functional Changes - Quoting Periods

- Quoting Periods define the periods in which a quote can be submitted in T7
- A Starting and an Ending Time are set on instrument level in case Quoting Periods are defined for an instrument
- In case PWT quotes, standard quotes or matching quotes are submitted outside of defined Quoting Periods, the entry is rejected
- Quoting Periods are included in the T7 reference data
- All Single Auction instruments will have a Quoting Period from 11 a.m. to 1 p.m. during which one price determination either via matching quote or PWT is allowed
- Börse Frankfurt Zertifikate: Issuer defined Quoting Periods in eListing are inserted into T7

Major Functional Changes - OTC and T7 Entry Service (TES)

- Currently on Börse Frankfurt the OTC Trade Entry Service is offered. Trades that are bilaterally agreed outside the trading system can be entered for settlement
- With the migration of Börse Frankfurt to T7 the TES OTC functionality is offered, which allows members to enter bilaterally agreed trades that have been agreed outside the trading system
- In addition to the TES OTC functionality the TES type TES LIS is offered on the trading venue Xetra on T7. With TES LIS a functionality for on-exchange off-order book transactions for large in scale sizes is provided
- On T7 Xetra EnLight is offered for the trading venue Xetra. With this functionality on-exchange off-order book transaction for large in scale sizes can be conducted on T7



Major Functional Changes - TVTIC Generation

TVTIC - Trading Venue Transaction Identification Code

The TVTIC availability and generation in T7 differ from Xetra:

- In ETI, *RegulatoryTradeID* (Tag 1903) contains TVTIC information in Trade Notification and TES Trade Broadcast
- In FIX-Gateway, the TVTIC is delivered in the component *<RegulatoryTradeIDGrp>* contained in User/TradeCaptureReport (UAE/AE)
- In Report TC810 T7 Daily Trade Confirmation, tvtic contains the TVTIC information

TVTIC Creation Rule:

→ Envir_Flag (1) + SecurityID (20) + MDEntryTime (20) + DealType (1) + MatchStepID (10)

Envir Flag (1):

To be set to 1 for transactions in T7 system.

SecurityID (20):

Field length is fix 20 digits. The part on the leading zeros needs to be provided to reach the fixed length

- RDF, MDI, ETI: SecurityID (Tag 48)
- FGW: SecurityAltID (Tag 455)

TranTime (20):

Field length is fix 20 digits. The part on the leading zeros needs to be provided to reach the fixed length.

- ETI: Trade Notification TransactTime Stamp (Tag 60)
- MDI: MDEntryTime (Tag 273)
- FGW in Execution and Trade Capture Report UTransactTime (Tag 30060)

DealType (1):

- Valid Value "0" for on-book
- Valid Value "1" for off-book

MatchStepID (10):

Field length is 10.

For on-book:

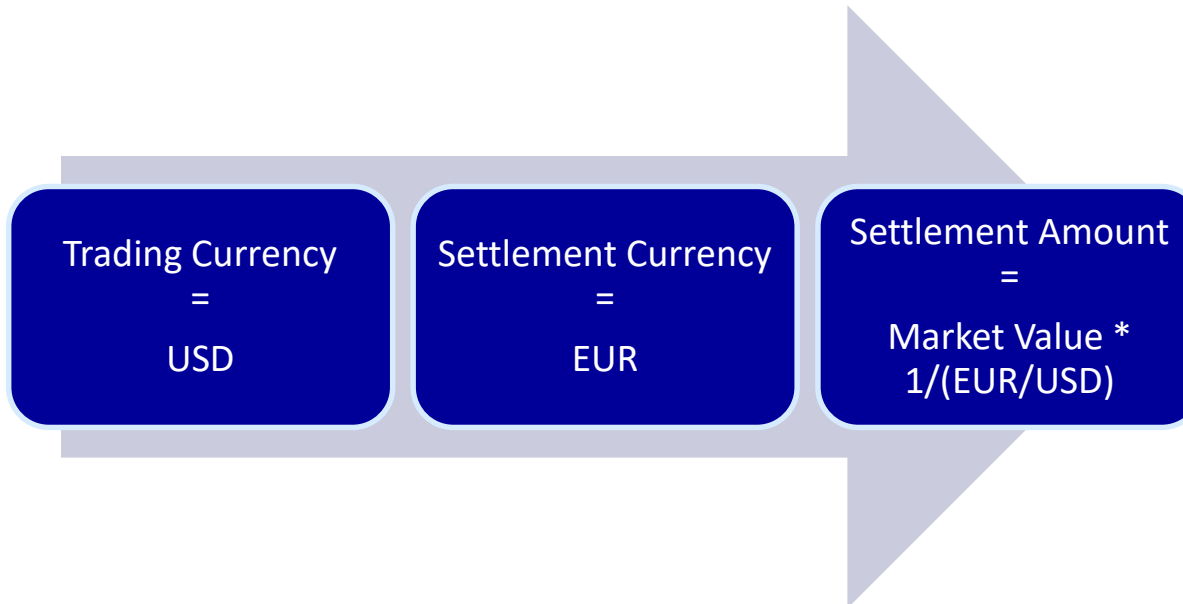
- ETI: TradeMatchID (tag 880)
- MDI: MDEntryID (tag 278)
- FGW: TradeMatchID (tag 880)

For off-book:

- ETI and FGW: packageID (tag 2489)
- MDI: MDEntryID (tag 278)

Further Functional Change: Exchange Currency Rate Handling

- The exchange rate is defined as a conversion factor, converting the market value given in instrument trading currency into the settlement amount given in settlement currency. The conversion factor must be entered as Trading Currency to Settlement Currency (e.g. USDEUR or 1/EURUSD).



Note: For the entry of a user defined exchange rate upon a TES trade and Matching Quote entry, the respective conversion factor needs to be entered. In case no conversion factor is entered by the Specialist trader, the system uses the ECB exchange rate of the day before as conversion factor.

Further Functional Changes Compared to Börse Frankfurt on the Xetra trading system

Order Quantity Modification

- Order quantity can be modified after order entry
- Increasing quantity will change the order version number (priority change)
- Order quantity modification in Continuous Auction will be allowed for non-Specialist traders as well
- Untriggered TSO/OCO are not modifiable by the Specialist

Single Sided Quotes

- The entry of single sided quotes upon entry of standard quotes is supported. As the entry of standard quotes overwrites the existing quote on session level, a single sided quote entry after a double sided quote entry will lead to deletion of the respective missing opposite quote side accordingly.

Instrument Reference Data

- **Warrants** can be listed with Unit of Quotation *Unit* or *Percent*
- Percentage-listed structured instruments will be grouped under 'WAR' instead of 'BON' (currently ~ 90.000 instruments)
- **Bonds** can be listed with Unit of Quotation *Unit* or *Percent*
- Unit quoted bonds will be grouped under 'BON' instead of 'EQU'

Settlement

- Settlement internalisation and bilateral aggregation are possible on settlement account level
- It will be possible, to restrict user access rights to trading of CCP instruments only

3

Migration of Börse Frankfurt

Technical Aspects



Agenda Technical Aspects

Technical Characteristics

Member Interfaces

- GUI

- ETI

- FIX

- MDI

- EOBI

Reference Data

Reports and Files

Major Technical Changes

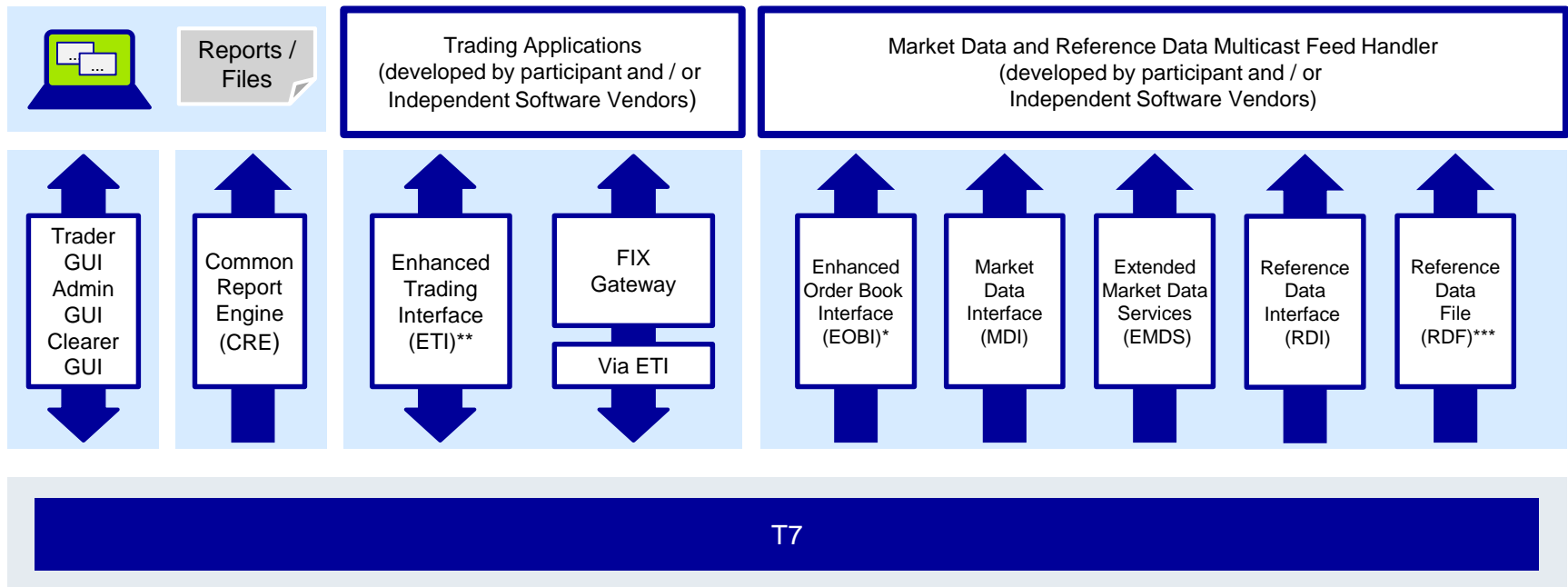
Overview of T7 – Technical Characteristics

- Common system for all DBAG cash and derivatives markets
- Trading platform based on Linux with various system components; no VMS-system
 - Partitions concept for better scalability, throughput and separation of failure domains
 - Direct messaging concept for high throughput (no message broker)
- New external interfaces for exchange participants
 - New message based interfaces for trading and market/reference data
 - New GUIs for trading and administration
 - No MISS / VALUES API
- Reports provided exclusively via the CRE
- Multi market capability
 - Used for Eurex Exchange, Cash Market and partner exchanges and European Energy Exchange (EEX)
- Platform inherent functional changes*
 - New hierarchy of participants and business units and the addition of the Supervisor role
 - New entitlement concept with pre-defined roles replacing the current concept of RALs

*For more details please refer to the *T7 Final Release Notes for the Trading Venues Xetra and Börse Frankfurt*.

Overview of T7- Interface Landscape

- Each trading venue will have its own dedicated Trader GUI, Admin & Clearer GUI. Separate logins are required for Xetra and Börse Frankfurt
- Distribution of reports via Common Report Engine
- New trading interfaces - Enhanced Trading Interface and FIX Gateway (via ETI)
- New market data interfaces for netted and un-netted* market data. Reference data available via interface and file



• available in co-locations only

** including Specialist functionality

*** in addition there will also be an internet download

Member Interfaces – High Level Summary

| | Exchange GUIs | | | Market Data | | | Reference Data | | | Trading Interfaces | |
|---------------------------------------|---------------|--------|---------|------------------|---------------|---------------|----------------|----------|-----|--------------------|-----|
| | | | | Interfaces | | | | | | | |
| | Admin | Trader | Clearer | EOBI | MDI | EMDS | RDF/RDI | Web Page | CRE | ETI | FIX |
| | GUI | GUI | GUI | | | | | | | | |
| Order Transactions | | ✓ | | | | | | | | ✓ | ✓ |
| Quote Transactions | | | | | | | | | | ✓ | |
| Private Order / Execution Information | | ✓ | | | | | | | | ✓ | ✓ |
| Private Trade Information | | ✓ | ✓ | | | | | | | ✓ | ✓ |
| Market Data | | ✓ | | ✓ (un-netted) | ✓ (netted) | ✓ (Trades) | | ✓ | | | |
| User Administration | ✓ | | ✓ | | | | | | | | |
| Instrument Reference Data | | | | | | | ✓ | | ✓ | | |
| Reports | | | | | | | | | ✓ | | |
| Clearing Member Stop/Release NCM | | | ✓ | | | | | | | | |
| Specialist Functionality | | | | | | | | | | ✓ | |

Exchange GUIs

- One for core trading and one to maintain user master data

Enhanced Order Book Interface (EOBI)

- Provides order-by-order public market data

Market Data Interface (MDI)

- Provides netted price level aggregated public market data for low-bandwidth connected customers

EMDS (Extended Market Data Services)

- Provides a real time and replay dissemination of all on-exchange trade prices

Common Report Engine (CRE)

- Provides public reference data as a file download (RDF)
- Provides reports and files

Enhanced Trading Interface (ETI)

- Performs order routing via TCP/IP socket interface
- Native interface which uses FIX 5.0 syntax but partly varying semantics
- Contains relevant functionality for Specialists

FIX Gateway

- Provides order routing and order trade info access for FIX 4.2 and FIX 4.4 customers order routing devices
i.e. it can host trading and/or back office sessions

Member GUIs

Trader GUI

For on-exchange trading:

- Latest and statistical Market information (e.g. Market prices with Market depth, Time & Sales data)
- Trading Support (e.g. Order add/modify/delete)
- Private trading information for orders (including Order History for the current business day) and trades
- T7 Entry Service
- News Board
- Highly customisable (e.g. configurable views, instrument profiles, alert notifications, filtering)
- All views automatically updated
- Modern look and easy to use
- No software installation required for GUI updates
- Internet or leased line connection

Limitations:

- Entry and display of quotes not supported
- QRS functionality not supported

Admin GUI

For administrative functions:

- User setup and maintenance
- Assignment of user entitlements
- Maximum order value and quantity
- Basic risk protection services (“Stop Button”)
- Sessions view and bandwidth monitor

Clearer GUI

For back office and clearing risk functions:

- Trades of Clearing Members NCMs
- Clearing Member: Stop/Release NCM
- Clearing user setup

Member GUIs – Technical Aspects

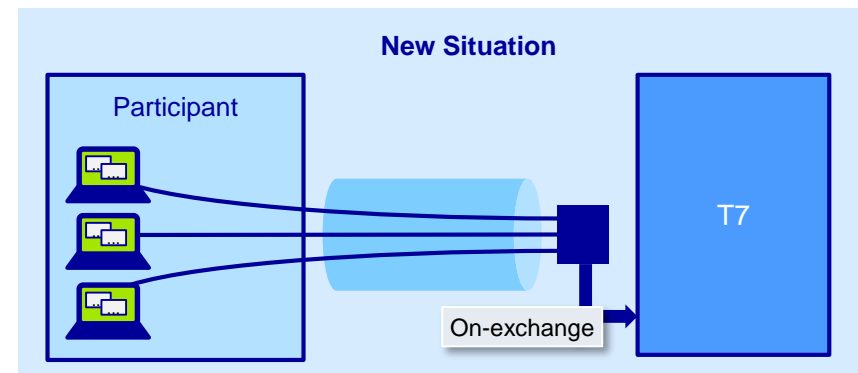
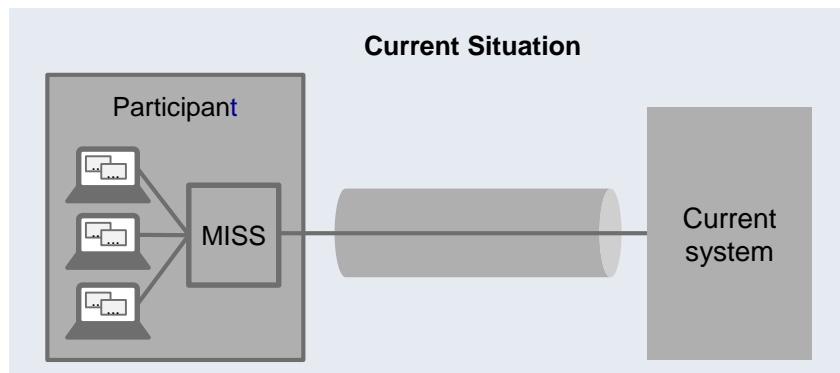
Java-based GUI solution:

- Deutsche Börse offers a customized seamless solution to start and automatically receive updates of the T7 GUIs named *T7 GUI Launcher* independently of Oracle's Java SE Java Web Start mechanism for Windows
- Deutsche Börse offers a Java SE 8 Runtime Environment without additional Java license charges to be used exclusively with the T7 GUI application
- Once the T7 GUI Launcher is installed on the workplace of a T7 GUI user, T7 GUIs
 - start via the T7 GUI Launcher
 - will operate exclusively using the Deutsche Börse-packaged JRE version

DBAG recommends to use this GUI launch mechanism. The also existing GUI Landing Pages will be decommissioned in due time

Connectivity:

- No MISS used as concentrator for market data provided to the GUIs, thus bandwidth requirements increase with the number of open screens
- Access via leased lines and internet possible



Enhanced Trading Interface (ETI) – Technical Features

| | |
|---|--|
| Message based | <p>T7 ETI is an asynchronous, message-based interface. Connection between participant and T7 backend established via TCP/IP session</p> <ul style="list-style-type: none">▪ Low footprint: no special hardware required; no exchange software to be installed; free choice of operating system, programming language and compiler versions▪ Adoption of standards: messages follow semantics of FIX standard V5.0 SP2 (including officially approved extension packs)▪ Performance oriented: proprietary session layer and flat binary encoding (defined order of fixed-length fields and arrays of fixed-length elements) |
| Session oriented | <p>T7 ETI based applications receive information on orders/quotes and their executions which were entered in their own session</p> |
| Subscription mechanism | <p>T7 ETI provides information across sessions via a subscription mechanism for broadcast streams (including new specialist stream)</p> |
| Throughput limits / throttle | <p>The number of transaction requests transmitted to T7 per time interval by each participant session is limited</p> |
| Full control in case of a failover | <p>Participant applications will be required to take full control of failover. Heartbeats can be used to support detection of malfunctions between the client application (trading session) and the gateway</p> |

Enhanced Trading Interface (ETI) – High Level Concepts

General concepts

- Order/Quote/Execution messages do not completely echo the data of the original order
- No state recovery (inquiry) is supported
- All order events are recoverable for standard (non-lean) orders
- Execution notifications and unsolicited events are recoverable
- A listener broadcast contains order events for standard (non-lean) orders

Session oriented interface

- Responds to each request on the same session after the request was submitted
- Sends unsolicited messages when changes / executions to any order / quote received

Ownership of orders & quotes

- Orders are owned by the user within a session
- Quotes are owned by the session

Enables subscription to trading in broadcast form

- Drop copy of order events
- Trade confirmation at a business unit level

Provides all the trading functions

- Order handling
- Quote handling
- Quote Request Solution
- Execution notifications
- TES OTC
- Specialist functionality

Provides trading support information

- News messages from market supervision
- Private risk control messages

Enhanced Trading Interface (ETI) – Session Concept

Two session types are supported for Börse Frankfurt:

Low Frequency (LF):

- Intended for participant applications that rely on the complete recoverable order history
- May also be used for the receipt of broadcasts

Back Office (LF):

- Intended for settlement and clearing business units plus back office departments of trading members
- Drop copy functionality available as part of risk processing

| Functionality | Low Frequency Session | Back Office Session |
|---|---------------------------|---------------------|
| Standard Order (non-lean) | Yes | No |
| Persistent Order | Yes | No |
| Quotes (non-persistent) | Yes | No |
| <u>Update</u> : Modification “on behalf” functionality* | Yes (for standard orders) | No |
| Delete “on behalf” functionality* | Yes | No |
| Listener Broadcast (order history) | Yes | Yes |
| Trade Broadcast | Yes | Yes |
| News Broadcast | Yes | Yes |
| Service Availability Broadcast | Yes | Yes |
| Order Validity Types | GTD, GTC, GFD | n/a |

* Please note, “On-behalf” means on behalf of another session. “Delete” includes also the de-activation and re-activation functions for quotes.

Enhanced Trading Interface (ETI) – Order / Quote Response

Order / quote response information (execution report) is sent out immediately after the order or quote has been processed by the T7 matcher

Order / quote response information is preliminary

- Order / quote response execution information is always preliminary. Only the corresponding Trade Capture Report (sent via Trades broadcast) is legally binding
- Market data is based on order execution information.* Market data interfaces provide trade price messages on the basis of preliminary information

Limited order and quote response

- Order / quote responses are only sent within the initiating session
- Execution reports do not contain all data of an order / quote (e.g. no quantity, price, etc.). Participants' applications are required to maintain the state of orders / quotes
- Listener broadcast contains all order parameters (different layout compared to direct response)

* Dependent on order book transparency

Enhanced Trading Interface (ETI) – Order Book Restatement

No order status inquiries

- Order status inquiries are not supported by the ETI
- Participants must maintain the state of orders based on the Execution reports
- For lost order information, participants must rely on retransmission recovery and the order book restatement

Order book restatement

- Sent at start-of-day and in case of an exchange system failure, i.e. a market reset
- Order book restatement messages provide execution reports for each restated order
- Restatement messages are only sent for persistent orders. There is no restatement for quotes, as no quotes exist at start-of-day or they are deleted in case of a market reset
- Order book restatement messages are also sent on the listener broadcast
- Order book restatement is available in the Specialist Specific information

Retransmission request of restatement messages

- Order book restatement messages are recoverable*
- The owning session can request a retransmission if it was not logged on at the time

* Retransmission requests are also supported for broadcasts (Listener, Trades, News and Risk Control).

Enhanced Trading Interface (ETI) – Failover Concepts

Two groups of ETI gateways.

- Both groups of gateways are built redundantly
- Two lines highly recommended to ensure access in case of a line failure

Network failover.

- ETI sessions will be disconnected from the gateway
- No automatic session failover if a connection to the gateway is lost
- Application requires failover mechanism to re-establish an ETI session connection to an alternative gateway

Application failover.

- Active sessions will be disconnected upon gateway failure
- Application can re-establish ETI session connection to one gateway

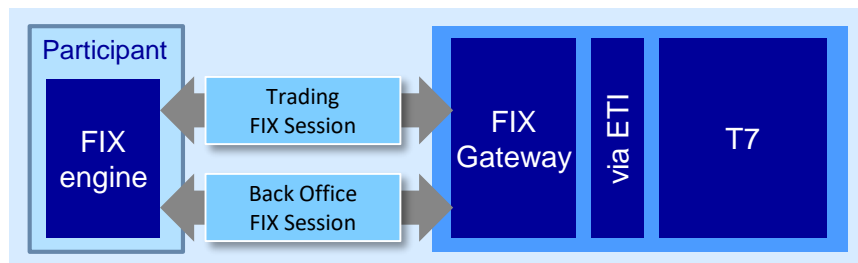
FIX Gateway – Interface Characteristics and FIX Sessions

Characteristics

Standard session-based FIX interface supporting FIX versions 4.2 and 4.4

Provides trading functionality for on-exchange trading and TES on T7 Xetra and Börse Frankfurt

- Does not support quoting functionality
- Does not provide market / reference data
- Provides enhanced information on mass cancellation events (e.g. in case of a market reset)



*All responses are optimistic. Only trade capture reports are legally binding.

FIX session concept

FIX sessions are identified by SenderCompID and password

For Börse Frankfurt, dedicated sessions are required

Trading FIX session:

- Used for order management
- A session only receives information for all of its own orders and their executions*
- One session can be shared by several traders

Back Office session:

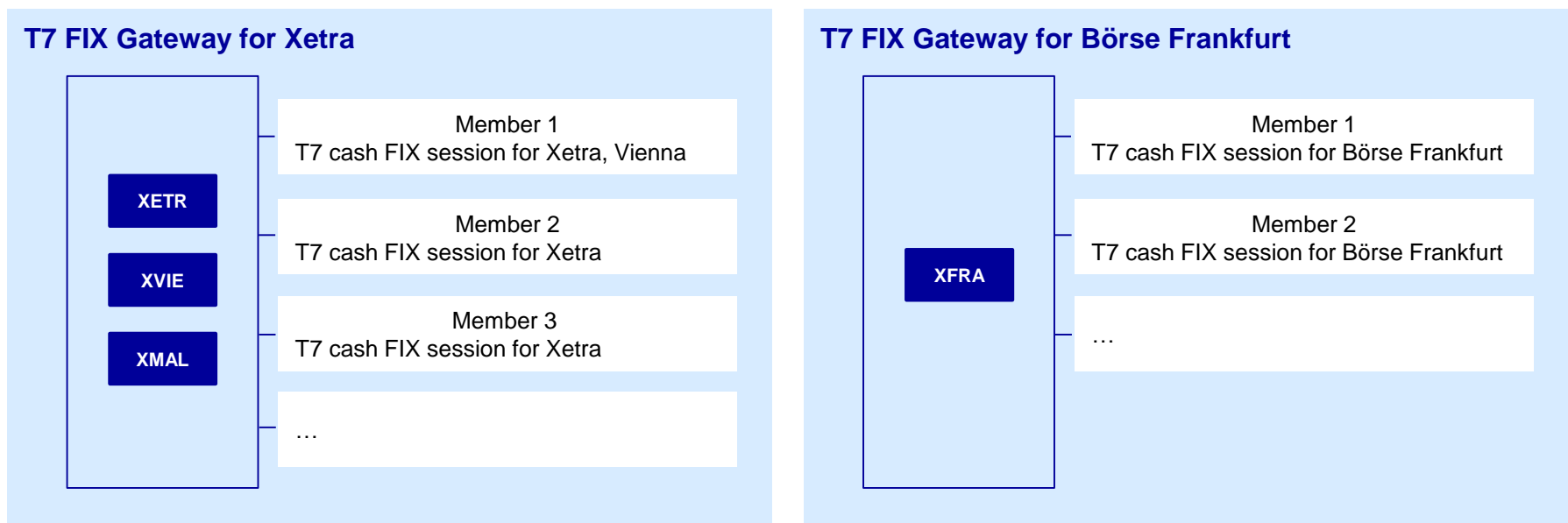
- Used for trade capture at a business unit level
- Optional drop-copy functionality for standard orders

FIX Gateway - Xetra FIX Gateway vs T7 Cash FIX Gateway

| | FIX-Gateway (Xetra trading system) | FIX-Gateway (T7 trading system) |
|---|---|--|
| FIX Message flows and message formats | Message Flows based on ETS interface | Message flows similar to Xetra FIX-Gateway. Messages formats will be different, adapted to the ETI interface and the T7 functionality. |
| Supported FIX-Versions | FIX 4.2 and FIX 4.4 | FIX 4.2 and FIX 4.4 |
| Instrument Identification | ISIN, Isix | ISIN, SecurityID |
| Back Office Session functionality | Functionality on Member Level <ul style="list-style-type: none"> Trade Confirmations Drop-copy for persistent orders (optional - activation via Xetra Member Section) | Functionality on Business Unit Level <ul style="list-style-type: none"> Trade Confirmations Drop-copy for standard orders (optional - activation via Xetra Member Section) |
| Trading Session functionality | <ul style="list-style-type: none"> Order Handling Quote Request Solution OTC Trading functionality (Xetra Trade Entry) | <ul style="list-style-type: none"> Order Handling Quote Request Solution TES OTC Risk Control Events |
| Initial order transfer / order book replay | Optional Can be deactivated via Xetra Member Section | Mandatory Cannot be deactivated |
| Supported Order Attributes | Persistent, Non-persistent | Only Standard orders (no support for lean orders) Persistent, Non-persistent (not for Börse Frankfurt) |
| Support for all Order Types, Price Conditions, Validity- and Execution-Restrictions implemented in Backend | ✓ | ✓ |

FIX Gateway – Separate Gateways for Xetra and Börse Frankfurt

- New T7[®] FIX Gateway for cash markets will replace the existing Xetra[®] FIX Gateway for the trading venue Börse Frankfurt (XFRA) after migration. The existing Xetra FIX Gateway will be switched off
- No common FIX sessions for the FIX Gateway for Xetra on T7 (XETR) and Börse Frankfurt on T7 (XFRA)
- Additional FIX sessions will be required for accessing Börse Frankfurt. These can be ordered via the Xetra Member Section



Configuration after migration

New Market Data Interfaces for Börse Frankfurt – Introduction

Multicast-based public market data interfaces.

Market Data Interface (MDI)

- Provides, netted, price level aggregated market data on-exchange market data*
- Order book depth of 10*
- Snapshots and incremental market data messages delivered via one channel (in-band)

Enhanced Order Book Interface (EOBI)

- Provides un-netted, order by order (including quotes)*
- No depth limitation*
- The side, price, priority timestamp and displayed quantity of each visible order and quote*
- Trade prices and traded quantity for each executed on-exchange trade
- Product state and Instrument state information
- Full order book depth *

Extended Market Data Services (EMDS)

- Provides a real time and replay dissemination of all on-exchange trade prices
- Provides a replay service which allows users to recover from data loss for on-exchange trades

* Dependent on order book transparency settings

Market Data Interfaces - Characteristics

Comprise all services that provide public information

- Public order book information – netted and un-netted
- Market statistics and state
- Order book depth – either price level aggregated, order-by-order, or nothing (dependent on order book transparency settings)
- Trade information
- Instrument state

| | Market Data Interface (MDI) | Enhanced Order Book Interface (EOBI) | Extended Market Data Interface (EMDS) |
|-----------------|-------------------------------|---|---------------------------------------|
| Data Type | Netted | Un-netted | Un-netted |
| Connection Type | Low bandwidth | High bandwidth (only in co-location) | Low bandwidth |
| Encoding | FAST encoded FAST compression | Fixed length binary no data compression | FAST encoded FAST compression |
| Recovery | In-band | Out-of-band | Replay Service |

Market Data Interfaces – Major Differences

| Characteristic | T7 EOB1 | T7 MDI | T7 EMDS |
|--|---|---|---|
| Netting interval / market depth | <ul style="list-style-type: none"> Provides un-netted, entire visible order book information for all instruments * | <ul style="list-style-type: none"> Configurable netting interval in milliseconds | <ul style="list-style-type: none"> Provides un-netted ,entire on-exchange trades for all instruments |
| Snapshot processing | <ul style="list-style-type: none"> Snapshot messages required for recovery only Snapshot and incremental messages must be synchronized during recovery | <ul style="list-style-type: none"> No synchronisation of messages required as in-band delivery is used but snapshot messages must be processed | <ul style="list-style-type: none"> N/A |
| Snapshot / incremental sequence numbers | <ul style="list-style-type: none"> Individual sequence number range per instrument | <ul style="list-style-type: none"> One sequence number range per instrument | <ul style="list-style-type: none"> No snapshots, but individual sequence number range per instrument |
| Trade volume reporting | <ul style="list-style-type: none"> It can be calculated by using incrementals. Snapshot messages contain trade statistics / volume information for recovery | <ul style="list-style-type: none"> Statistical information (daily high / low and total traded quantity) and last trade per netting interval information only * | <ul style="list-style-type: none"> Each on-exchange trade reported separately |
| Packet header | <ul style="list-style-type: none"> No explicit performance indicator. It can be calculated by using Matching Engine-In and packet header timestamp | <ul style="list-style-type: none"> No performance indicator | <ul style="list-style-type: none"> No performance indicator |
| Functional heartbeat | <ul style="list-style-type: none"> Functional heartbeat message on a product / instrument level + the last valid MsgSeqNum | <ul style="list-style-type: none"> Snapshot messages act as functional heartbeat messages | <ul style="list-style-type: none"> Functional heartbeat contains + the last valid MsgSeqNum |
| Technical heartbeat | <ul style="list-style-type: none"> Technical heartbeats (FAST reset messages) sent periodically on all multicast / port combinations to verify technical connection | | |

* Dependent on order book transparency settings

Reference Data

Depending on the content, the reference data is provided as files via the

- Common Report Engine,
- Member Section, and
- Xetra.com

| Reference Data | Availability | | |
|--|-----------------|----------------|---------------|
| | CRE Public Area | Member Section | Xetra Website |
| Static Files (common for BF and BFZ) | X | X | X |
| RDF listing all instruments | X | X | |
| All Tradeable Instruments File listing all instruments | X | | X |
| RDF listing only instruments of Börse Frankfurt | X | X | |
| All Tradeable Instruments File listing only instruments of Börse Frankfurt | X | | X |
| RDF listing only instruments of BFZ | X | X | |
| All Tradeable Instruments File listing only instruments of BFZ | X | | X |
| RDF listing only instruments of BFZ assigned to Specialist BALFR | X | | |
| All Tradeable Instruments File listing only instruments of BFZ assigned to Specialist BALFR | X | | |
| RDF listing only instruments of BFZ assigned to Specialist ICFFR | X | | |
| All Tradeable Instruments File listing only instruments of BFZ assigned to Specialist ICFFR | X | | |

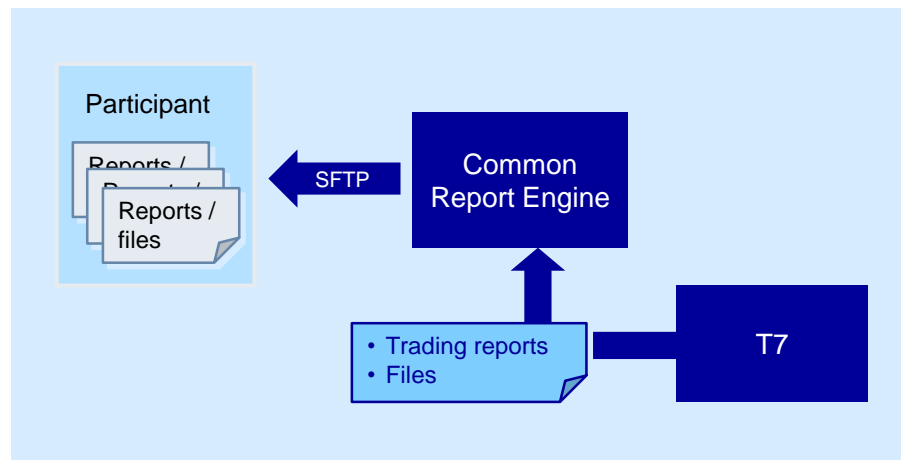
In addition, reference data is offered via the Reference Data Interface (RDI). Due to the high number of instruments, it is recommended to use the file-based reference data solution

Reports and Files - Common Report Engine

The Common Report Engine (CRE) and internet downloads via both the public and member sections are the sources of reports and files from T7

Reports on T7 are provided by the Common Report Engine analogue to the reports of the Xetra trading system:

- Enhanced structure of report provision
- Reports produced in XML but the layouts will change
- Trading reports for instruments traded on Börse Frankfurt by T7
- Clearing reports for products on new and current system from the clearing system
- Both T7 & Xetra system deliver mostly the same reports, but key will change (format as for Xetra on T7)



T7: Trade- vs. Deal-Logic

Trade-Logic

(currently applied in the Xetra trading system)

- In the Xetra trading system **trades** can be generated in CCP eligible instruments as well as non-CCP eligible instruments
- In non-CCP eligible instruments, participants need to receive all executions and the according counterparty information

Deal-Logic

(currently applied in the T7 trading system)

- In T7 all match steps on **one price level** will be combined under one **deal**
- All orders that are executed in this match step will be included in this deal
- Technically the orders are netted on price level, i.e. the originator of the incoming order does not see how many executions he has. He only sees that his order is fully executed. He does not need to know the amount of executions nor the real counterparties since all trades will be executed against the CCP

- In CCP instruments, so-called deal logic is applied. In deal logic, exactly one trade broadcast correlates to one order execution broadcast, independent on the number of counter orders / counterparties
- In non-CCP instruments the so-called trade logic will be applied. In trade logic, the number of trade broadcasts for each individual order confirmation corresponds to the number of counterparties, as for each counterparty individual trade broadcast pairs will be generated (existing logic in the Xetra trading system)

T7: Trade- vs. Deal-Logic

Example: Handling of half trades in Auctions

Handling of half-trades – Auction Example

Buy Orders

(B) 30@17,00

(C) 50@17,00

(D) 20@16,50

Sell Orders

(A) 100@16,50

Match: 100@16,50

Trade-Logic

3 Trades & 6 Half Trades

30 @ 16,50€

A sell 30

B buy 30

50 @ 16,50€

A sell 50

C buy 50

20 @ 16,50€

A sell 20

D buy 20

4 Order Execution Reports / 6 Trade Capture Reports*

Member A 1 OER (100) / 3 TCR – 30/50/20@16,50 ⚠

Member B 1 OER / 1 TCR – 30@16,50

Member C 1 OER / 1 TCR – 50@16,50

Member D 1 OER / 1 TCR – 20@16,50

Deal-Logic

1 Trade & 4 Half Trades

100 @ 16,50€

A sell 100

B buy 30

C buy 50

D buy 20

4 Order Execution Reports / 4 Trade Capture Reports

Member A 1 OER / 1 TCR – 100@16,50 ⚠

Member B 1 OER / 1 TCR – 30@16,50

Member C 1 OER / 1 TCR – 50@16,50

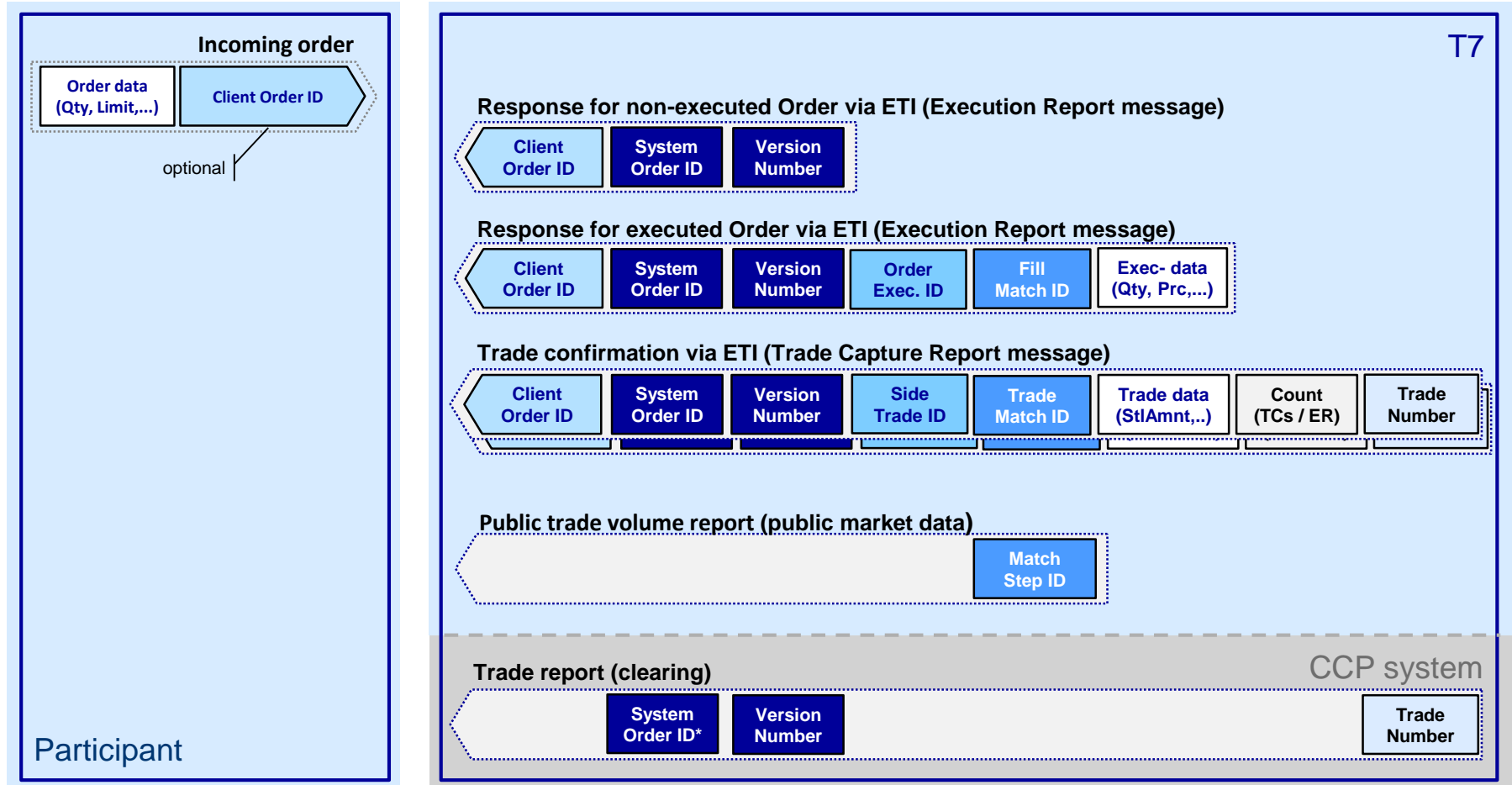
Member D 1 OER / 1 TCR – 20@16,50

- Independent from the Trade- or Deal-logic, the number of Order Execution Reports stays the same
- In general Deal-logic is more efficient regarding generation of Trade Capture Reports due to **aggregation by time and price**

* Order level netting is not considered since it is not supported on T7

TCR = Trade Capture Report; OER = Order Execution Report

Major Technical Changes - Tracing of Orders and Trades



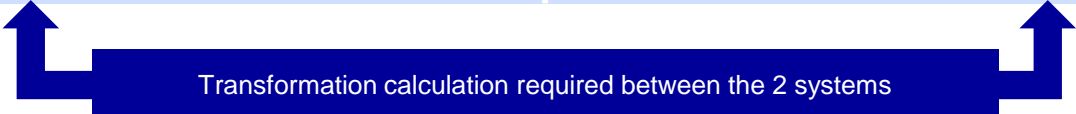
*Same content information reflected by the same colour and position of the respective boxes

Comparison of order execution ID in private order broadcast to Side Trade ID in private trade broadcast allows mapping of related order and trade broadcast information

Major Technical Changes - System Order ID & Trade Number

System Order IDs

| CCP or Customer system | T 7 |
|--|---|
| System Order Number (as Xetra) <ul style="list-style-type: none"> Max 13 digits | System Order ID <ul style="list-style-type: none"> Assigned by the trading system <ul style="list-style-type: none"> Based on elapsed time (nsec) since 1/1/1970 The order ID is unique per exchange (MIC) and product. An order consists of the order number plus version number. The order number of an order will stay the same during the entire lifetime of the order, the version number is changed each time the order gets a new time priority. Length greater than System Order Number (Xetra today) Max 20 digits (8 byte integer) |


 Transformation calculation required between the 2 systems

Trade Numbers

T7 uses Trade number as unique identifier of a trade

- The Trade number is unique in the context of the exchange (MIC) plus the product per day (In contrast to the Xetra System the trade number on T7 Börse Frankfurt is not unique per MIC)
- The format of the Trade number is 7 digits what is identical to the Xetra trading system
- T7 Börse Frankfurt Trade number could equal a Trade number issued by T7 Xetra for the same ISIN

4

Migration of Börse Frankfurt

Migration Approach



Agenda Migration Approach

Simulation

Production

Simulation Approach

The Simulation of the trading venue Börse Frankfurt on the T7 system will be as production like as possible

- **The following environments can be used with different focus:**

- T7 Cloud Simulation: Adaption of interfaces to new T7 Release 8.1 software at an early stage
- T7 Börse Frankfurt Simulation Environment: Testing of new functionality including the downstream systems that allow to test the whole chain including settlement. At production launch the environment will be used as permanent simulation environment

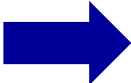
- **Instruments:**

- The Simulation Environment will include most of the instruments of Börse Frankfurt and a representative set of structured products of Börse Frankfurt Zertifikate AG.
- A test with a large number of instruments was already possible on the Pre-Production environment until Februar 2020 and will not be offered during the simulation anymore.

The set up of the Simulation Environment with all necessary downstream interfaces shall ensure a smooth migration with a big bang on 24 August 2020

T7 Börse Frankfurt Production – Member and User Setup

- Currently the T7 Börse Frankfurt Production environment contains the refreshed user data based on the refresh that took place in March 2020 after the Pre-Production. The
- **Cut-off date** for the member and user data for Börse Frankfurt on the Xetra Trading system will be August 7th, 2020. In case, user data are changed on the Xetra Trading system for Börse Frankfurt production after this date, these changes will have to be performed in the T7 Börse Frankfurt Production environment manually by the member. These changes can be performed between August 18th, 2020 and August 24th, 2020.
- **Passwords** will be migrated from the Börse Frankfurt Xetra production. Upon initial GUI login, a user will be requested to insert a new password. If a user password has already been changed in the Pre-Production for the first planned migration date in March 2020 this password will still be valid for the Production on August 24th, 2020
- The refresh on T7 Börse Frankfurt on August 7th, 2020 will be performed for the Business Unit Entitlements. The following roles on Business Unit level will be updated according to the RAL setup in the Börse Frankfurt production on the Xetra system:
 - CASH TRADER
 - TES TRADER
 - TES BROKER
 - CASH SPECIALIST
- User data will be refreshed. **User names, technical IDs and passwords will not be changed**
- Other than in the Xetra system, **Bilateral Aggregation** can be defined on settlement account level in T7. With initial setup, all settlement accounts in T7 Börse Frankfurt Pre-Production will be set for Bilateral Aggregation when the respective flag is set on account-level in the Xetra system

 **Passwords for all users** regardless of later on accessed interface **will have to be changed by accessing any T7 GUI once**. Ensure to enter the old password in **CAPITAL LETTERS** during initial login and adhere to the new password rules of T7

5

Migration of Börse Frankfurt

Connectivity



Agenda Connectivity

Connectivity - Concept

Bandwidth Requirements

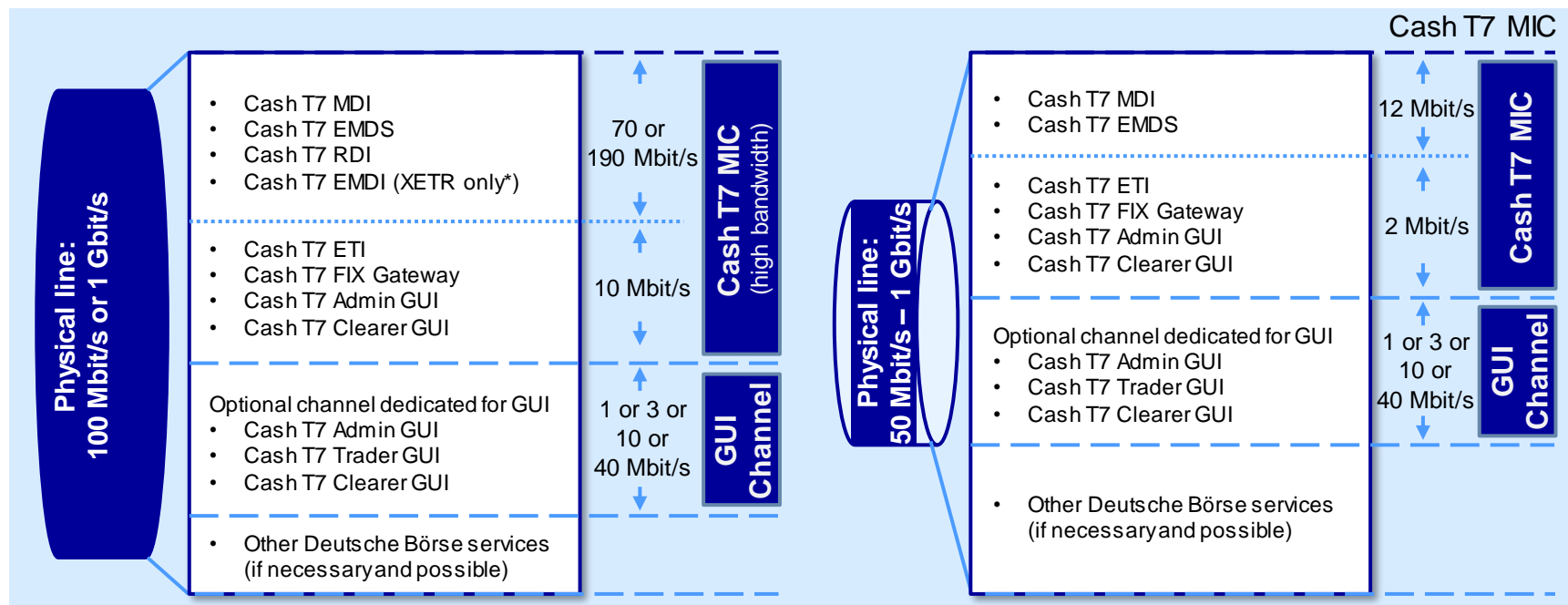
Bandwidth and Fees

Session Offering

Joint Connectivity-Concept for Xetra and Börse Frankfurt

The existing Cash T7 Multi Interface Channel (MIC) concept will be applied and utilized:

- Joint usage possible for Xetra and Börse Frankfurt for all MIC sizes (14, 80 or 200 Mbit/s)
- 10 Gbit/s connectivity in co-location to remain segregated by market / reference data versus transactions, joint usage for Xetra and Börse Frankfurt also possible
- GUI channel of 1 Mbit/s, 3 Mbit/s, 10 Mbit/s or 40 Mbit/s in addition to MIC
Dedicated GUI channel of 7 Mbit/s or 40 Mbit/s without MIC possible



All Simulation market data interfaces are accessible via each Cash T7 MIC independent of bandwidth.

*EMDI is not offered for Börse Frankfurt.

Connectivity – Bandwidth Requirement

- The netted Market Data Interface for Börse Frankfurt requires additional bandwidth. In this context, all Xetra Multi-Interface Channels (MIC) with the entry bandwidth of 7 Mbit/s have been increased to 14 Mbit/s. The price of the entry bandwidth remains unchanged.
- For Cash T7 MICs with higher bandwidth (80 Mbit/s or 200 Mbit/s) no change is required. However, members which want to receive Xetra **and** Börse Frankfurt market data on the 80 Mbit/s MIC should keep in mind that the migration of Börse Frankfurt to T7 will result in an increase of market data traffic.
- A joint usage of the market data channels (of a 14, 80 or 200 Mbit/s Multi-Interface Channel or a 10 Gbit/s connection) allows the subscription to the offered Börse Frankfurt feeds, based on the connection type specified in the Network Access Guide. (EMDI is not offered by Börse Frankfurt).
- Unnetted market data for Börse Frankfurt will only be offered as EOBI feed in co-location via 10 Gbit/s connections. The 10 Gbit/s connectivity in co-location will remain segregated by market/reference data versus transactions. Joint usage for Xetra and Börse Frankfurt is also possible.
- T7 GUI access will be provided via the native internet (certificate based) or via dedicated GUI Channels on leased lines (existing Xetra GUI channels can be utilized).

Please note:

Members and service providers who want to receive Börse Frankfurt T7 market data will be required to add the respective multicast ranges to their configuration

Connectivity – Bandwidth and Fees

<https://www.xetra.com/xetra-en/trading/trading-fees-and-charges>

| Fee per connection | Bandwidth | Leased line Co-Location (Equinix) | Leased line Tier A ¹ | Leased line Tier B ² | Leased line Tier C ³ | Internet via VPN (iAccess) |
|---|------------|-----------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------|
| Cash T7 MIC | 14 Mbit/s | 1,500 | 1,500 | 1500 | 1500 | 750 |
| | 80 Mbit/s | 3,000 | 4,200 | R ⁴ | R ⁴ | - |
| | 200 Mbit/s | 4,000 | 5,400 | R ⁴ | R ⁴ | - |
| Cash T7 Market Data ² Co-Lo 2.0 | 10 Gbit/s | 5,000 | - | - | - | - |
| Cash T7 EOBI Co-Lo 2.0 | 10 Gbit/s | 6,000 | - | - | - | - |
| Cash T7 EOBI and Market Data Co-Lo 2.0 | 10 Gbit/s | 7,000 | - | - | - | - |
| Cash T7 GUI-Channel (in combination with MIC) | 1 Mbit/s | 40 | 60 | 100 | 110 | - |
| | 3 Mbit/s | 110 | 170 | 300 | 340 | - |
| | 10 Mbit/s | 380 | 600 | 1,000 | 1,100 | - |
| | 40 Mbit/s | 1,500 | 2,300 | R ⁴ | R ⁴ | - |
| Dedicated Cash T7 GUI-Channel (without MIC) | 7 Mbit/s | - | 1,500 | 1,500 | 1,500 | - |
| | 40 Mbit/s | - | 2,300 | R ⁴ | R ⁴ | - |
| Cash T7 GUI via internet (certificate) | n/a | | | | 500 ⁵ | |

¹ Metro areas of Amsterdam, Frankfurt, London, Milan, Paris and Zurich.

² Austria, France, Germany, Netherlands, Switzerland and UK.

³ Belgium, Denmark, Finland, Ireland, Italy, Luxembourg, Portugal, Spain and Sweden.

⁴ R: High-bandwidth MIC (80 Mbit/s, 200 Mbit/s) and Cash T7 GUI Channel in other locations available upon request (connection fee will be at least Tier A).

⁵ Cash T7 GUI via internet is free of charge for participants with a MIC, a GUI-Channel, a 10 Gbit/s connection in Co-Location or if a connection via a Multi-Member-Service Provider is used.

⁶ Cash T7 Market Data includes EMDI (XETR only), MDI, RDI and EMDS. All Simulation market data interfaces are accessible via each Cash T7 MIC independent of bandwidth.

Connectivity – Session Offering

- For Börse Frankfurt access is only possible via FIX sessions and/or Low Frequency ETI sessions. Those sessions are available as
 - ETI Full Sessions (150 transactions/second),
 - ETI Light Sessions (50 transactions/second),
 - FIX trading Sessions and
 - ETI/FIX Back Office Sessions.

Please note:

If sessions that were used for testing in Pre-Production until February 28th, 2020 have not yet decommissioned and shall not be used in Production, members have to decommission those sessions prior to production launch on August 24th, 2020. On production launch on August 24th, 2020 only sessions should be used that are needed in T7 Börse Frankfurt production.

6

Migration of Börse Frankfurt

Services, support and further information



Agenda Sevices, support and further information

Implementation and communication schedule

Further information

Support contacts

Implementation and Communication Schedule

| T7 Release 8.1 | Derivatives | Cash Markets | Combined | Q1 / 2020 | | | Q2 / 2020 | | | Q3 / 2020 | | | Q4 / 2020 | | |
|---|-------------|--------------|----------|-----------|-----|-----|-----------|-----|-----|-----------|-----|-----|-----------|-----|-----|
| | | | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| T7 Release Note 8.1 - Release Notes | x | x | | ◆ | | | ● | | | | | | | | |
| T7 Functional Reference | | | x | | | | ● | | | | | | | | |
| T7 Functional and Interface Overview | | | x | | | | ● | | | | | | | | |
| T7 Participant Simulation Guide | | | x | | | | ● | | | | | | | | |
| T7 Cross System Traceability | | | x | | | | ● | | | | | | | | |
| T7 Incident Handling Guide | | | x | | | | ● | | | | | | | | |
| T7 Participant and User Maintenance Manual | x | x | | | | | ● | | | | | | | | |
| Contract Notes Description | | x | | | | | ● | | | | | | | | |
| T7 Known Limitations | | | x | | | | ■ | ● | | | | | | | |
| T7 Trader, Admin and Clearer GUI – User Manual | x | x | | | | | ■ | ● | | | | | | | |
| T7 Trader, Admin and Clearer GUI – Installation Manual | | | x | | | | ■ | ● | | | | | | | |
| T7 Enhanced Trading Interface – Manual incl. Repository and Header files | | | x | | ◆ | | ■ | ● | | | | | | | |
| T7 Enhanced Trading Interface – XML Representation | | | x | | ◆ | | ■ | ● | | | | | | | |
| T7 FIX Gateway – FIX 4.2 and 4.4 Manual incl. Fiximate and Repository | | | x | | ◆ | | ■ | ● | | | | | | | |
| T7 Market, - Enhanced Order Book- and Reference Data Interfaces Manual incl. Fast Message Template, Repository & FIXML Schema Files | | | x | | ◆ | | ■ | ● | | | | | | | |
| T7 Extended Market Data Services – Manual incl. Fast Message Template and Underlying Ticker Data | | | x | | | | ■ | ● | | | | | | | |
| Cash Market Instrument Reference Data Guide | | x | | | | | ● | | | | | | | | |
| T7 XML Report Reference Manual | | | x | | | | ■ | ● | | | | | | | |
| Common Report Engine User Guide | | | x | | | | ● | | | | | | | | |
| N7 Network Access Guide | | | x | | | | ● | | | | | | | | |
| Exchange Rules & Regulations | | x | | | | | | ● | | | | | | | |
| Market Model Continuous Trading in connection with Auctions | | x | | | | | ● | | | | | | | | |
| Market Model Continuous Auction | | x | | | | | ● | | | | | | | | |

Implementation and Migration – High Level Checklist (1/2)

All Trading Participants

HIGH LEVEL CHECKLIST FOR IMPLEMENTATION AND MIGRATION

| | |
|--|---|
| Modification of software applications for trading | Decide on applications/files to be used: *(new) trading interfaces (ETI and FIX Gateway), *(new) market data interfaces (MDI for netted data and EOBI for unnetted data, but only in co-location 2.0) *(new) Reference Data File (RDF) on Common Report Engine or public website/member section, *(new) Instrument Reference Data on public website |
| | Verify with your Independent Software Provider (ISV), if applicable |
| | Coordinate software rollout and implementation timeline with your software provider ISV, if applicable |
| | Disable / migrate TSO-Limit-Interface (from pull to push) |
| Connectivity | Order connectivity and sessions (FIX Gateway and/or ETI sessions) for T7 |
| | *sessions for Prod - ETI and FIX |
| | *sessions for Simu |
| Simulation preparation | Ensure access to the new T7 Admin GUI - necessary for user maintenance |
| | Establish connection to T7 Cloud Simulation for early development |
| | Test your applications using the new interface in Simulation environment |
| | Validate the processing of reports and reference data from the Common Report Engine |
| | Test product migration / rollout behaviour |
| | Test handling of changed locked stock messaging |
| | Settlement internalisation and bilateral aggregation |
| | Test handling of deal-logic (CCP) instruments and trade-logic (Non-CCP) |
| | Test the processing of the chain from trading to settlement |
| | Confirm successful migration of user accounts |
| Production launch preparation | Enter orders in simulation - via ETI, FIX, GUI |
| | Prepare for the product migration / rollout period |
| | Change user passwords - if you have not already changed it in Pre-Production during the first planned migration date |
| Readiness check | Assess your readiness & send Readiness Statement |

Implementation and Migration – High Level Checklist (2/2)

Specialists, Issuers, Cash Clearers and Settlements Institutes

| ADDITIONAL CHECKLIST FOR SPECIALISTS | |
|--|--|
| Modification of software applications for trading | Decide whether to use (F)XML reflat file or CSV file |
| | Decide whether to load all tradable instruments or just the own subset (for structured products) |
| Connectivity | ETI mandatory for Specialists |
| Simulation preparation | Implement and test intensively new RFQ for all asset classes |
| | Special focus on limit control in specialist's LCS for TSO and OCO |
| | Settlement internalisation and bilateral aggregation |
| | |
| ADDITIONAL CHECKLIST FOR ISSUERS (STRUCTURED PRODUCTS) | |
| Connectivity | Decide whether to indicate knock-out-events via email/eListing or via FIX (new) |
| Simulation preparation | Ensure Quote-Provider-ID (QPR) setup is correct |
| | Ensure trader linked to QPR id is admitted to the same BU and has sufficient rights & limits |
| | Ensure that issuer can provide MIFID II shortcodes to specialist and takes care of the shortcode- / longcode-mapping |
| | Check if all quoting periods in T7 reldata are correct |
| | |
| CHECKLIST FOR CASH CLEARERS & SETTLEMENT INSTITUTES | |
| Modification of software applications for trading | Decide on applications/files to be used: *(new) trading interfaces (ETI and FIX Gateway), *(new) Reference Data File (RDF) on Common Report Engine or public website/member section, *(new) Instrument Reference Data on public website (depending on set up) |
| | Verify with your Independent Software Provider (ISV), if applicable |
| | Coordinate software rollout and implementation timeline with your software provider ISV, if applicable |
| Connectivity | Order connectivity and sessions (FIX Gateway and/or ETI sessions) for T7 |
| | *sessions for Pre-Prod - ETI and FIX |
| | *sessions for Simu |
| Simulation preparation | Ensure access to the new T7 Clearer GUI |
| | Test your applications using the new interface in Simu environment |
| | Set-up clearing business unit users |
| | Change user passwords |
| | Validate the processing of reports and reference data from the Common Report Engine |
| | Settlement internalisation and bilaterale aggregation |
| Production launch preparation | Check if you receive trade confirmation from Simulation |
| | Prepare for the product migration / rollout period |

Improved communication

Dedicated area for the Börse Frankfurt Migration

essentials you need to know (i.e. Checklists, Presentations) that can be found under

xetra.com > Technology > T7 trading architecture > Publications

Market Readiness Newsflashes

to always keep you up to date and inform you about required tasks and updates

The screenshot shows the Xetra website interface. At the top, there is a navigation bar with links for 'Cash Market', 'Börse Frankfurt', 'Contact', 'Member Section', 'Rules & Regulations', and 'Sprachversion'. Below this, a secondary navigation bar includes 'Instruments', 'Trading', 'Clearing & Settlement', 'Technology' (highlighted), and 'Newsroom'. The main content area displays a breadcrumb trail: 'Xetra > Technology > T7 trading architecture > Publications'. On the left, a sidebar menu lists 'Technology' with a sub-menu for 'T7 trading architecture' containing 'Access', 'Interfaces', 'Publications', 'Videos', 'System documentation', 'Cloud Simulation', 'T7 GUI Launcher', 'Xetra trading architecture', 'Vendors', and 'Trading tools'. The main content area features a 'Share' button and a large heading 'T7 Publications'. Underneath, there are two sub-sections: 'Börse Frankfurt Migration' and 'Börse Frankfurt Migration Newsflashes'. The 'Börse Frankfurt Migration' section contains two items: 'Migration of Trading Venue Börse Frankfurt (including Börse Frankfurt Zertifikate) (Download, PDF, 13.96 MB)' and 'Migration checklist (Download, PDF, 58.16 kB)'. The 'Börse Frankfurt Migration Newsflashes' section is currently empty.

The screenshot shows the Xetra website interface, specifically the 'T7 Publications' page. The top navigation bar is identical to the previous screenshot. The secondary navigation bar includes 'Instruments', 'Trading', 'Clearing & Settlement', 'Technology' (highlighted), and 'Newsroom'. The breadcrumb trail is 'Xetra > Technology > T7 trading architecture > Publications'. The main content area features a 'Share' button and a large heading 'T7 Publications'. Below the heading, there are two sub-sections: 'Börse Frankfurt Migration' and 'Börse Frankfurt Migration Newsflashes'. The 'Börse Frankfurt Migration' section contains two items: 'Migration of Trading Venue Börse Frankfurt (including Börse Frankfurt Zertifikate) (Download, PDF, 13.96 MB)' and 'Migration checklist (Download, PDF, 58.16 kB)'. The 'Börse Frankfurt Migration Newsflashes' section contains three items: 'Cash Market Readiness Newsflash | Updates regarding the migration of Börse Frankfurt including Börse Frankfurt Zertifikate to T7', 'Cash Market Readiness Newsflash | Börse Frankfurt including Börse Frankfurt Zertifikate Pre-Production Emergency Focus Day: Simulation of a delayed system startup for the T7 Börse Frankfurt Pre-Production environment', and 'Cash Market Readiness Newsflash | Migration of Börse Frankfurt and Börse Frankfurt Zertifikate to T7: Update of the N7 Network Access Guide and information regarding Börse Frankfurt Simulation'.

Further Information - The Xetra Website

For general information reg. Börse Frankfurt Migration visit the Xetra website at <https://www.xetra.com/xetra-en/technology/t7/publications>

The T7 Release system documentation is available under

<http://www.xetra.com/xetra-en/technology/t7/system-documentation/release8>

<https://www.xetra.com/xetra-en/technology/t7/system-documentation/release81/Release-8.1-1698746?frag=1698768>

Implementation News can be found under

<https://www.xetra.com/xetra-en/technology/implementation-news>

The relevant Migration-related Circulars and Newsflashes can be found under

<https://www.xetra.com/xetra-en/newsroom/circulars/xetra-circulars>

To ensure an efficient communication, Trading Participants, Clearing Members, Service Providers and ISVs are kindly asked to verify their registered release contacts, that are stored in the members only area <https://member.deutsche-boerse.com/irj/portal>

If you require help to do this, please contact our Member Section Team via telephone

+49 69 211 17888 or member.section@deutsche-boerse.com

Support contacts

Your Key Account Manager

Please contact your dedicated key account manager directly. If you need the contact details, please ask via client.services@deutsche-boerse.com

Technical Support

cts@deutsche-boerse.com
or your dedicated Technical Account Manager

ISV Relations

Steven Will, steven.will@deutsche-boerse.com, +49 69 211 14130

Pre-production/
Simulation support

Cash Market Operations
frankfurt.trading@deutsche-boerse.com
+49 69 211 11050

Change Log

The following changes have been made in this version:

- Slide 7: Schedule updated
- Slide 28: Exchange Currency Rate Handling added
- Slide 29: Single Sided Quotes added
- Slide 54: More precise definition of difference of the trade number uniqueness
- Slide 57: Simulation approach updated
- Slide 58: Production – Member and User Setup updated
- Slide 64: Connectivity – Session Offering updated
- Slide 67: Communication Calendar 8.1 added
- Slides 68 – 71: Checklist and Information updated

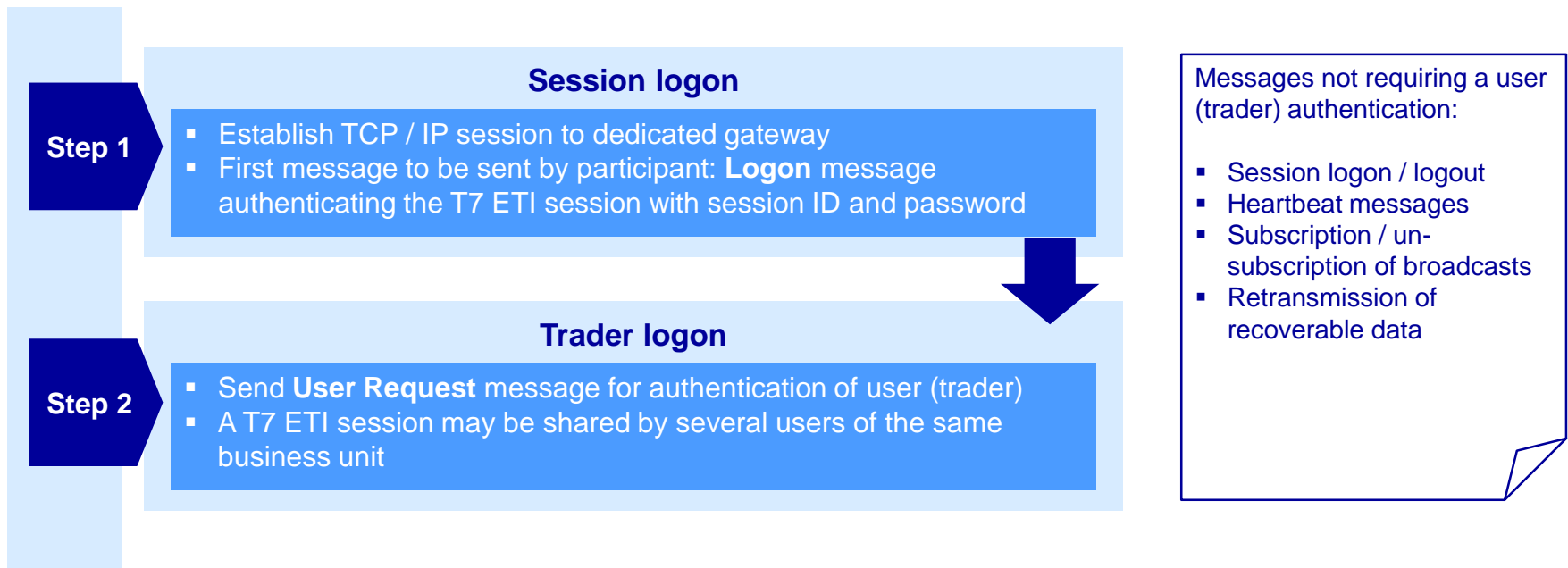
Back up

Recommended Reading Material

- Communication Calendar
- Cash Market Functional and Technical Release Notes Release 8.0 and 8.1
- Functional and Interface Overview
- Functional Reference
- T7 Cash Markets – Participant and User Maintenance Manual
- T7 Cash Markets Trader, Admin and Clearer GUI Manual
- T7 Enhanced Trading Interface Manual
- T7 Market and Reference Data Interfaces Manual
- T7 Extended Market Data Service Manual
- T7 Report Reference Manual
- T7 Market Model Continuous Auction
- Simulation Guide
- Circulars
- Implementation News
- News Flashes

Enhanced Trading Interface (ETI) – Session Concept

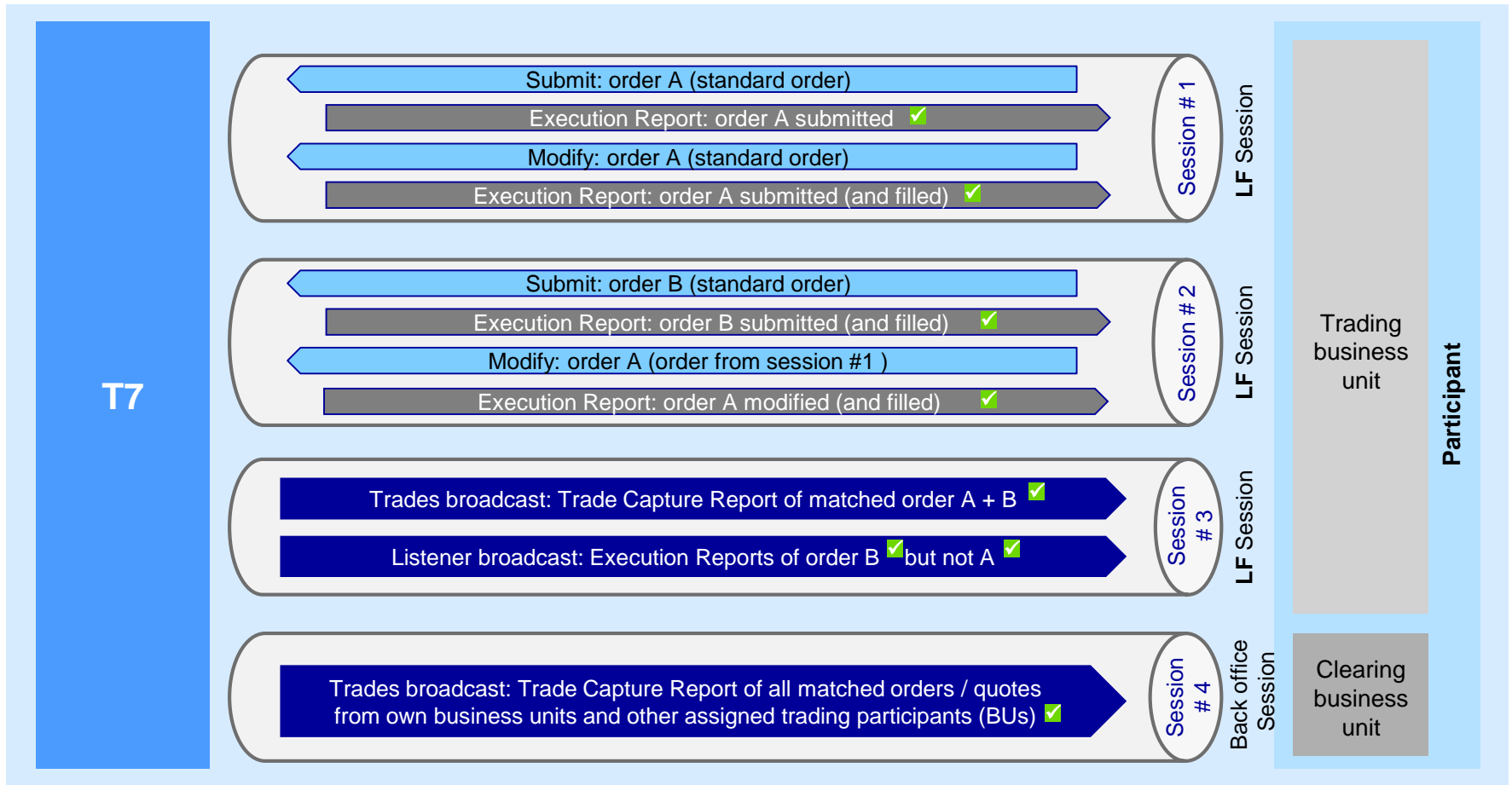
Two step logon procedure



Note: There are separate technical infrastructures for T7 gateways with different IP address ranges / ports compared to the current Enhanced Transaction Solution infrastructure.

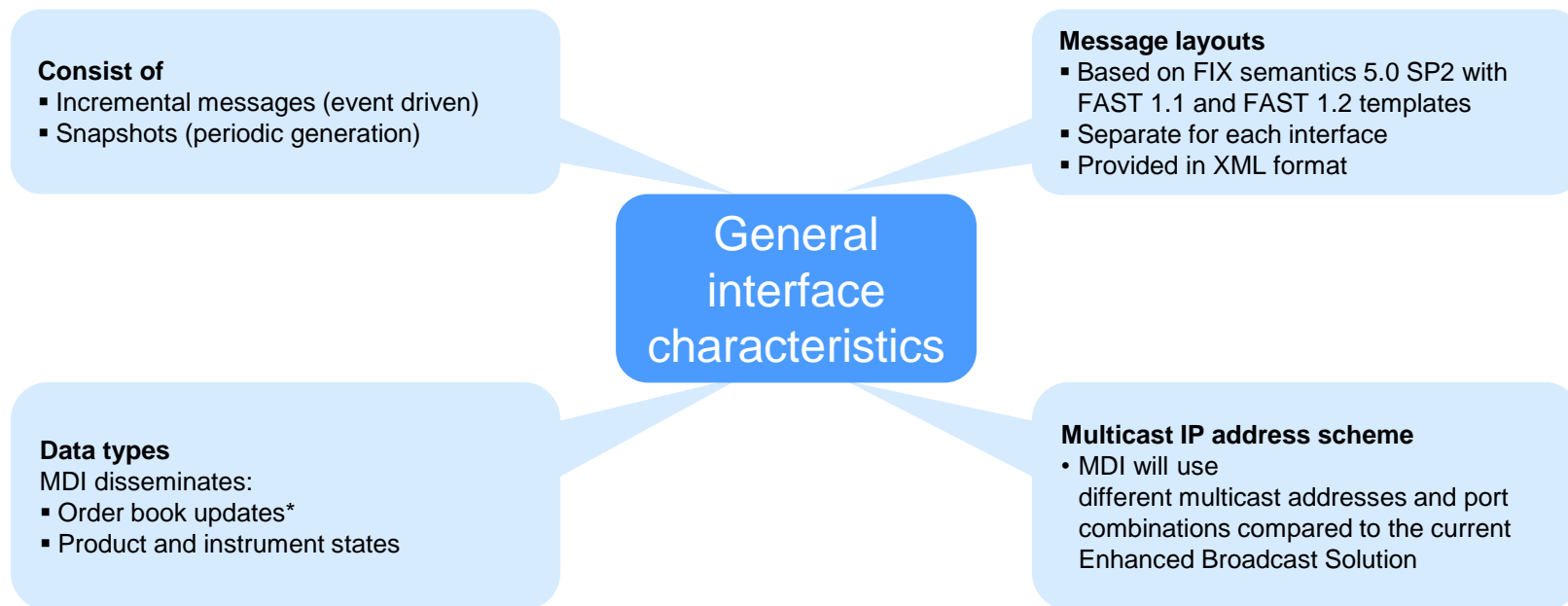
Enhanced Trading Interface (ETI) – Session Concept

Example for Usage of Standard Order Types



T7

MDI - Market Data Interface

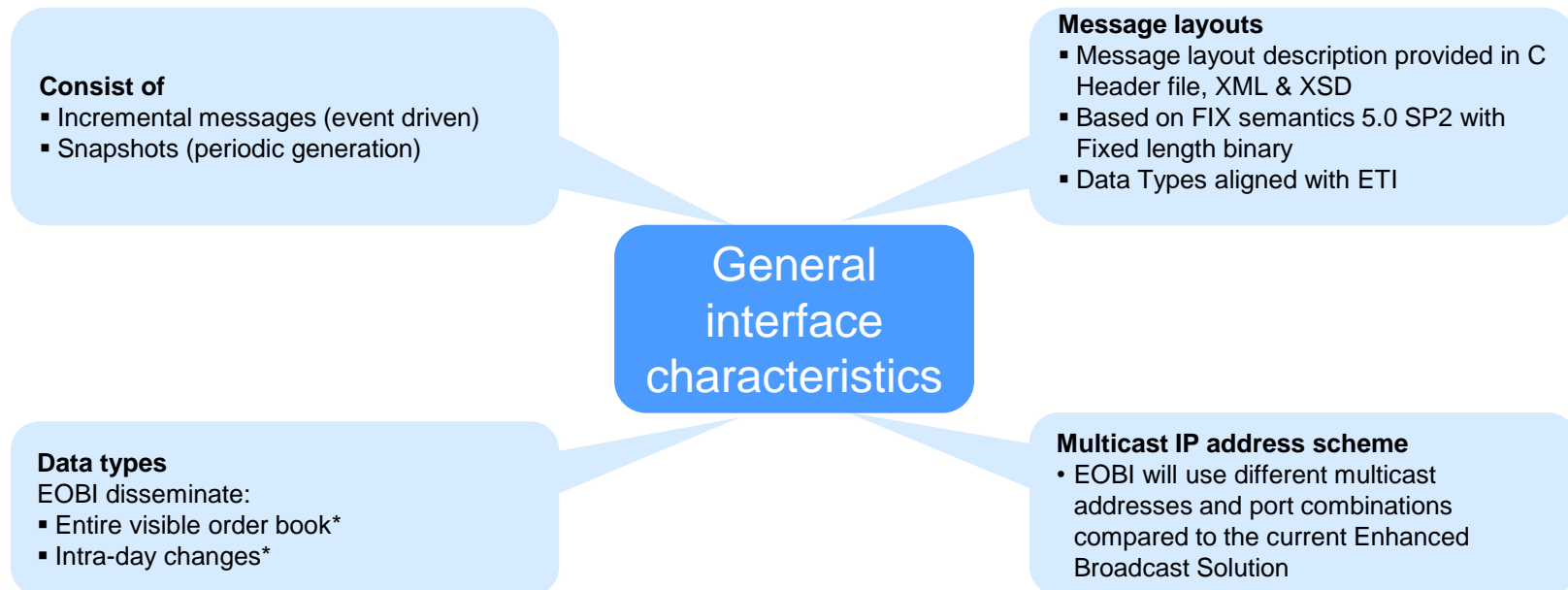


A and B Stream

- All feeds sent on two multicast addresses via different channels, so called service A and B; both services identical in terms of packet contents, sequence numbers and package sequence
- Depending on the partition, market data will either originate first either on the A-Stream (even partitions) or the B-Stream (odd partitions), therefore both streams should be subscribed simultaneously
- Packet Header contains a sender ID, which together with a sequence number, is unique (for a given multicast address and port combination) allowing detection of duplicates and missing packets

* Dependent on order book transparency settings

EOBI - Order By Order Market Data Interfaces



A and B Stream

- All feeds sent on two multicast addresses via different channels, so called service A and B; both services identical in terms of packet contents, sequence numbers and package sequence
- In-band and out-of-band approaches to synchronise incrementals and snapshots:
 - In-band: packet sequence number is incremented for both.
 - Out-of-band: packet sequence number is incremented individually.

* Dependent on order book transparency settings



Imprint

The following names and designations are registered trademarks of Deutsche Börse AG:

Buxl[®], C7[®], CEF[®], Classic All Share[®], DAX[®], DAXglobal[®], DAXplus[®], DBIX Deutsche Börse India Index[®], DivDAX[®], Eurex[®], Eurex Bonds[®], Eurex Repo[®], F7[®], FWB[®], GC Pooling[®], GEX[®], M7[®], MDAX[®], N7[®], RDAX[®], REX[®], RX REIT Index[®], SDAX[®], StatistiX[®], T7[®], TecDAX[®], Technology All Share[®], VDAX[®], Xetra[®], Xetra-Gold[®]

CFF[®] and Vestima[®] are registered trademarks of Clearstream International S.A.

EURO STOXX[®], EURO STOXX 50[®], iSTOXX[®], STOXX[®], STOXX[®] Asia Total Market, STOXX[®] Europe 50, STOXX[®] Europe 600, STOXX[®] Global 1800, STOXX[®] USA 900 and VSTOXX[®] are registered trademarks of STOXX Ltd. The STOXX indices, the data included therein and the trademarks used in the index names are the intellectual property of STOXX Ltd., Zurich, Switzerland and / or its licensors which is used by Eurex Frankfurt AG under licence. Eurex's derivatives based on the STOXX indices are in no way sponsored, endorsed, sold or promoted by STOXX and its licensors and neither STOXX nor its licensors shall have any liability with respect thereto.

360T[®] is a registered trademark of 360 Treasury Systems AG.

TRADEGATE[®] is a registered trademark of Tradegate AG.

KOSPI is a registered trademark of Korea Exchange, Inc.

TAIEX is a registered trademark of Taiwan Stock Exchange Corporation.