T7 Release 5.0

Release Notes for Xetra

Version	V1.2
Date	28th April 2017

Content

1. Definitions and Abbreviations

The following are the definitions and abbreviations used in the release notes:

BU	Business Unit
CRE	Common Report Engine
EMDI	Enhanced Market Data Interface
EOBI	Enhanced Order Book Interface
ETI	Enhanced Trading Interface
FIX	Financial Information eXchange (Protocol)
FWB	Frankfurter Wertpapier Börse
MDI	Market Data Interface
RDF	Reference Data File
RDI	Reference Data Interface
T7	Cash and Derivatives trading system developed by Deutsche Börse Group
Xetra EMDS	Xetra Extended Market Data Service
Xetra (system)	Existing Xetra trading system
Xetra (trading venue)	Trading venue with Market Identifier Code "XETR"

2. Introduction

To improve and extend its exchange infrastructure, Deutsche Börse is planning to migrate its cash market trading (Xetra) to the T7 architecture already used by the Derivatives Markets (Eurex, EEX).

The migration of the whole cash market functionality will be executed in two steps. Step 1 concentrates on the migration of the trading venue Xetra (XETR) and its functionality while the trading venue Börse Frankfurt (XFRA) will be part of step 2.

Step 1 of the migration will be the main part of T7 Release 5.0, which also includes new features for Eurex and EEX markets. The launch of Release 5.0 will follow a staggered approach.

The table below gives an overview of the introduction schedule of Release 5.0:

Exchange	Task	Start Date	End Date
All	Release 5.0 installation in Production	16.06.2017	17.06.2017
Xetra	Load member and user data	17.06.2017	17.06.2017
Eurex, EEX	Connection Test	17.06.2017	17.06.2017
Eurex, EEX	Launch of R5.0	19.06.2017	19.06.2017
Xetra	Load product, instrument & member session data	19.06.2017	19.06.2017
Xetra	Connection Test & User Maintenance	20.06.2017	23.06.2017
Xetra	Start trading in ETCs	26.06.2017	26.06.2017
Xetra	Start trading full instrument scope	03.07.2017	03.07.2017

Table 1: T7 Release 5.0 introduction schedule

Trading participants will have the opportunity to perform comprehensive testing of their trading applications before going live. On T7 the simulation for the trading venue Xetra will be provided in two phases. The first phase starts on 06.03.2017 with the Cloud Simulation. The Cloud Simulation provides the opportunity to test the T7 member interfaces without any unintended interaction of other trading participants or vendors. Test scenarios can be created based on the needs of the trading participants. As of 18.04.2017, the second phase starts in an integrated environment, which allows trading participants to test the whole process chain. Additionally Deutsche Börse AG will provide dedicated test scenarios.

2.1 Migration Strategy for Step 1 of the Cash Market Migration

One major goal of the migration is to allow the frictionless continuation of trading on customer´s side. Therefore, it is planned to migrate the functional scope as well as all necessary data as identical as possible from the Xetra system to T7.

The first step of the migration encompasses all CCP-eligible instruments of the trading venue Xetra (XETR), which are traded in trading model Continuous Trading with Auctions. From a trading model perspective, One Auction will also be available after the migration to the T7 architecture. Furthermore, the Auction Price without Turnover functionality will be supported.

This instrument scope includes equities, ETFs, ETCs and ETNs as well as Money Market Funds. Trading in these instruments will be activated on two different dates. First the ETCs are launched followed by the remaining instruments one week later.
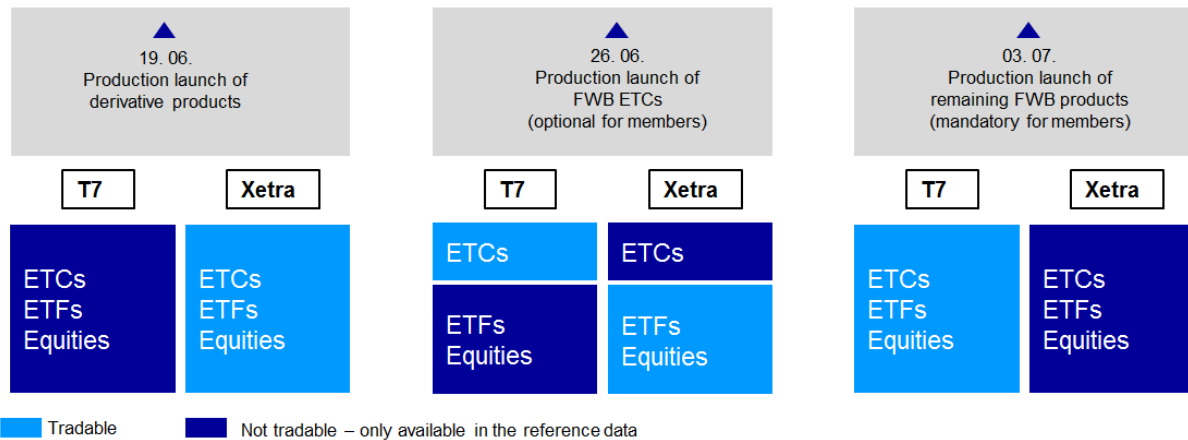
Figure 1: Staggered Production Launch

After production launch of the derivatives markets on 19.06.2016, all instruments of the trading venue Xetra (XETR) will be available in the reference data of T7 and the trading system Xetra on 20.06.2016. The trading of all instruments is only possible on the Xetra system. Instruments traded on T7 can be identified in the T7 reference data interfaces RDF, RDI and the ASCII file (webpage). There will be no changes in the trading behaviour for all members.

As of 26.06.2017, ETCs of the trading venue Xetra (XETR) can only be traded on T7. All other instruments are available for trading on the Xetra system. In the T7 reference data ETCs are marked as traded on T7 in RDI, RDF and the ASCII file (Value 1 = Active in the Market Segment Status). All other instruments are still marked as traded on the Xetra system (Value 10 = Published in the Market Segment Status). On the Xetra system ETCs are available in the reference data but are set to trading phase "HALT".

As of 03.07.2017, all instruments of the trading venue Xetra (XETR) can only be traded on T7. The instruments are marked in the T7 reference data RDI, RDF and the asci file accordingly as traded on T7.

Time schedules belonging to the trading models in use today will be migrated as they are, i.e. functional phases like start of trading, auctions, etc. will take place at the same time but may have different names.

Product Assignment Groups in T7 will replace the concept of instrument groups in the trading system Xetra for the purpose of trader assignment. Each instrument group available at the time of the migration in Xetra will be reflected by one Product Assignment Group with same name and instrument content.

Member and user IDs will be migrated with analogous access rights, settings and instrument assignments as they are setup in the Xetra system at end of day on 02.07.2017.

For every active member ID in the Xetra system at least one business unit will be generated in T7. For every Non-Clearing Member a trading business unit will be setup with a business unit ID which will be the same as their member ID in Xetra today. For members which are only offering clearing and/or settlement services a clearing business unit will be setup with an ID created from their Xetra member ID and adding "CL" as additional characters at the end. Members acting as trading member and as clearing member or settlement institute will receive both types of business units. For more details on the concept of participants, business units and users, please refer to chapter 3.2.

The T7 business unit and user roles as well as settings are derived from the RALs and settings of the members and users in the trading system Xetra within the migration according to the following rules:

Business Unit	
T7 Role/Setting	**Xetra RAL/Setting**
Cash Service Administrator	-none- (always assign)
Emergency Trading Stop	-none- (always assign to Trading Business Unit)
Trade Enrichment Rule	-none- (always assign to Trading Business Unit)
Trade Enrichment Rule View	-none- (always assign to Trading Business Unit)
CM Backoffice View	-none- (always assign to Clearing Business Unit)
Cash Trader	RAL (7) Enter Order
Cash Market Maker	RAL (11) Enter Quote
Trading View	-none- (always assign to Trading Business Unit)
Cash User Data View	-none- (always assign)
Emergency Mass Deletion	-none- (always assign to Trading Business Unit)
SMP Prevention[1]	Self Match Prevention not enabled
Clearing Member Stop	RAL (102) Modify CM Stop/Release

Table 2: Role/setting mapping from trading system Xetra to T7 for Business Units

User	
T7 Role/Setting	**Xetra RAL/Setting**
Cash Service Administrator	RAL (3) Add User
Cash Trader	RAL (7) Enter Order
Cash Market Maker	RAL (11) Enter Quote
Trading View	RAL (20) Inquire Trade and without RAL (7) Enter Order
Cash User Data View	RAL (1) Inquire User List and without RAL (3) Add User
Emergency Mass Deletion	RAL (29) Delete All Orders and Quotes
Clearing Member Stop	RAL (102) Modify CM Stop/Release
CM Backoffice View	-none- (always assign to user of Clearing Business Unit)

Table 3: Role/setting mapping from trading system Xetra to T7 for User

Users which have not logged in and have not changed their password after the introduction of Xetra Release 12.0 in 2011 are not migrated at all.

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[1] The role "SMP Prevention" disables the possibility to use Self Match Prevention which is usually enabled for all business units. The role can be assigned and hence SMP switched off for members on request..

For users which will be migrated from Xetra to T7, their passwords will be migrated as well for the first login but set to be expired. I.e. the users need to change their password during the first login. In this context it is highly recommended to all users, including technical users and order routing machines, to change the initial password prior to the first trading day. The change of passwords can only be performed via the GUI.

Senior traders will be migrated to be "Head Traders" in T7 while Non-Senior traders will be setup as "Traders" in T7. More information on users levels can be found in chapter 3.2.3.

Trading accounts "Agent", "Proprietary" and "Designated Sponsor" will be migrated as well and assigned as Trading Capcities "Agent", "Proprietary" and "Market Maker". The Maximum Order Value and the Default Settlement Information setup for a user will be migrated to T7 analogously while Maximum Order Values higher than 9,999,999,999.99999999 will be capped to this value.

Session IDs will neither be migrated to T7 nor can they be used to login into the trading system Xetra and T7 in parallel. In order to connect to the T7 system, it will be necessary for participants to order new T7-specific sessions for the interfaces. This applies to the Enhanced Trading Interface as well as FIX Gateway. Details regarding the session concept and session types can be found in chapter 4.1.1. Sessions can already be ordered for Simulation and starting on 08.05.2017 for Production as well.

Orders available in the trading system Xetra with validity equal to or longer than 26.06.2017 for ETCs and 03.07.2017 for all other instruments in scope of the migration, will not be transferred automatically to the T7 system. These orders will be deleted during their last batch run in Xetra with deletion reason "suspend" and a deletion time stamp "23:59:58". Members can therefore easily identify these orders and re-enter them into the T7 system.

Trade Entry Service as well as MiFID I Trade Reporting for Frankfurter Wertpapier Börse (FWB) which was offered via trading venue Xetra (XETR) will initially not be offered on T7. In order to continue to offer Xetra customers both functionalities, MiFID I Trade Reporting will be possible on Xetra for the trading venue Börse Frankfurt (XFRA) where Trade Entry for settlement is already available. The same functional as well as instrumental scope as today will be supported, i.e. besides the trading venue there is no change for members. With this approach it is avoided that customers have to process the same ISIN with the same Market Identification Code ("XETR") but for two technical environments, i.e. the Xetra system and T7. The migration of the MiFID I Trade Reporting to the trading venue Börse Frankfurt (XFRA) was already done with effective date 03.04.2017.

2.2 Further reading

The following documents will be published for T7 Release 5.0. Preliminary versions (identified by ◆) were published mainly in **December 2016.** Prior to the start of simulation, simulation versions (identified by ■) were provided in **February, March and April 2017**. Final versions (identified by ●) will then be distributed in prior to Production Launch in **April and May 2017.**

Please note that dates are preliminary and subject to change.

T7 Release 5.0	Eurex	Xetra	Combined	Q3 2016			Q4 2016			Q1 2017			Q2 2017		
				Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Release Notes															
T7 Release 5.0, Release Notes	X	X					◆						●		
Simulation															
Participant Simulation Guide	X	X										●			
Overview and Functionality															
T7 Functional and Interface Overview			X										●		
T7 Funtional Reference			X										●		
Participant and User Maintenance Manual	X	X											●		
Market Model Xetra		X										●			
GUI Solutions															
Trader, Admin and Clearer GUI - Manual	X	X											■	●	
T7 Trader, Admin and Clearer GUI - Installation Manual			X										■	●	
Trading Interfaces															
Xetra Enhanced Trading Interface - An Introduction		X				●									
Xetra FIX Gateway - An Introduction		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						◆		■		●		
Market and Reference Data Interfaces															
Xetra Enhanced Market Data Feed Interface, Market Data Feed Interface, Reference Data Interface – An Introduction		X				●									
T7 Market-, Enhanced Order Book- and Reference Data Interfaces, Manual incl. Fast Message Template and Repository			X						◆		■		●		
Reference Data File – FIXML Schema Files	X	X							◆		■		●		
Xetra Instrument Reference Data Guide		X											●		
T7 Extended Market Data Services – Manual incl. Fast Message Template and Underlying Ticker Data			X						◆		■		●		
T7 Multicast-Addresses			X									●			
Reports															
XML Reports - Reference Manual	X	X							◆			■	●		
Common Report Engine User Guide			X										●		
Network Access															
Exchange and Settlement Network Access			X												●
Rules & Regulations															
Xetra Rules & Regulations		X											●		
Connectivity Pricing															
Information on Connectivity Pricing Concept		X		●											
Price List		X											●		

Table 4: Communication Calendar T7 Release 5.0

Xetra only documents as well as documents which are planned as combined for Xetra and Eurex will be available on the Xetra website www.xetra.com.

2.3 Contacts

For any questions you may have, please contact Group Client Services & Administration at tel. +49-(0) 69-2 11-1 16 40. Alternatively, please contact your Technical Key Account Manager using your VIP number or via e-mail to cts@xetra.com.

3. Functional Aspects of the Cash Market Migration

This chapter outlines the general functional concepts on instruments, participants and users as well as how trading is organized on the T7 trading platform.

3.1 Instrument Concept

Generally in T7, each market has the following structure: "Product Assignment Groups", "Products" and "Instruments".

Instruments are the tradable entities, i.e. an order always refers to buying or selling a specified quantity of a certain instrument.

Instruments of the same type can be grouped together to form Products. However, every tradable instrument must belong to a product.

Instruments of the same product are traded in the same way, i.e. trading parameters and trading schedules are defined for products rather than for individual instruments.

The product itself is always associated to a product assignment group which is used for entitlement.
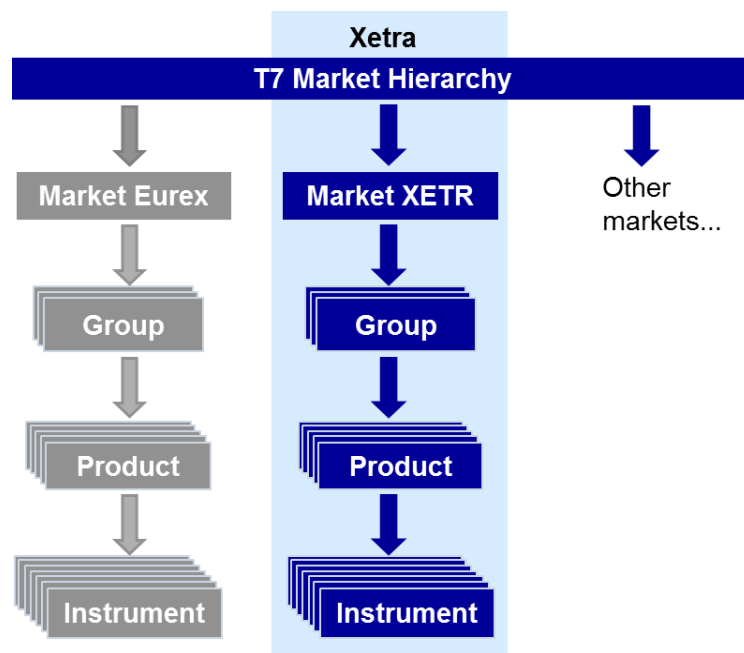
Figure 2: Market Structure on T7

With the migration of the cash market, Xetra will follow the T7 concept of products and instruments. However at present, it is planned to set up a 1:1 relation of product to instrument for all equities whereas a grouping of instruments into products for some ETCs and some ETFs is planned to allow the usage of mass quoting functionality. The mentioned ETCs are those on precious metals and on oil & gas as well as ETFs having the DAX or the EuroStoXX as an underlying. The remaining ETFs, ETCs and ETNs will have an instrument to product assignment of 1:1 as for the equities. The exact distribution of instruments to products will be published at a later point in time.

The assignment of product to product assignment group will correspond to the existing allocation of instrument to Instrument Group on Xetra.

3.2 Participant & User Concept

The member structure in T7 consists of three different levels: The participant which represents the legal firm, the business unit which always belongs to a participant and finally the user, always belonging to a dedicated business unit. Technically also the session needs to be discussed. The session also belongs to the business unit but has no hierarchical relation to the user.
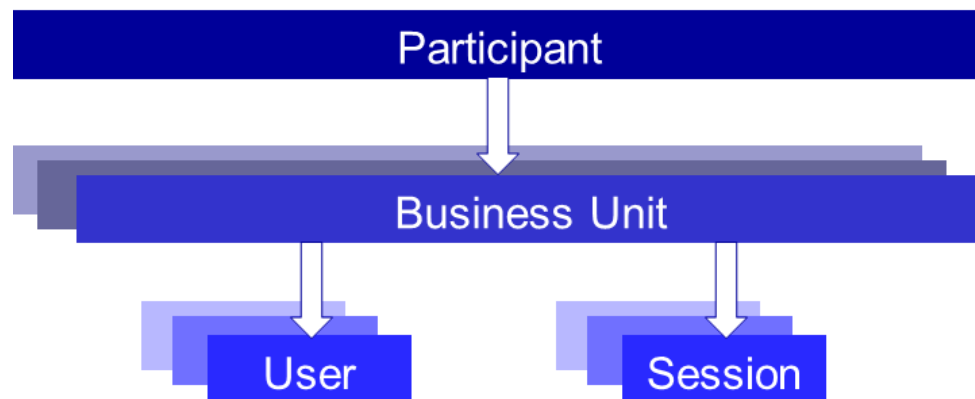
Figure 3: Participant hierarchy in T7

More details will be provided in the document "Participant and User Maintenance Manual", planned for April 2017.

3.2.1 Participant

The Participant is the highest level entity in the member structure of T7. It is the member legal firm.

3.2.2 Business Unit

Within a participant different units may exist that act independently from each other. These are so called Business Units (BU).

- Trading Business Unit

  A trading BU is necessary in order to participate in trading and will be available for every trading member firm. Necessary rights for trading will be assigned by the exchange.

- Clearing Business Unit

  A Clearing Member has a specific Clearing BU that receives trade confirmations for the trades of the own trading BUs, as well as for the trades of the trading BUs of related NCMs. Additionally the Clearing Member Stop Functionality can be granted by the exchange to the Clearing BU.

By default, trading members will only get a trading BU while clearing members will only get a clearing BU. Members who provide trading as well as clearing services will get both, a trading and a clearing BU.

A business unit is represented by a business unit name which will be mapped from the member ID in Xetra (system), e.g. ABCFR in case of a trading business unit. For clearing business units "CL" is appended to this ID, i.e. to ABCFRCL to be able to distinguish both IDs easily.

Figure 4: Business Units in T7

3.2.3 Users

Users are always assigned to a BU. Users can be created and assigned to the trading or the clearing BU. It is not possible to assign the same user to multiple business units. Since trading and clearing business units generally fulfil different tasks, the entitlement will deviate also.

Users in trading BUs can be grouped to user groups in order to reflect different departments or trading desks. The system supports a hierarchy of three user levels within a user group: Trader, head trader and supervisor. The user levels for trading users define a clear context for order maintenance:

- Trader
  Users can maintain own orders only.
- Head Trader
  Users can maintain own orders as well as orders of all other traders within the same user group.
- Supervisor
  Users can maintain own orders as well as orders of all other traders in all user groups.[2]

Single on-behalf transactions are supported for standard orders only while mass deletion also includes lean orders.

Since clearing BUs are not able to trade, the user group functionality is irrelevant in terms of order maintenance. However, users will need to be assigned to a user group upon creation.

3.2.4 Password rules

User password requirements for T7 are:

- minimum of 8 and a maximum of 16 characters
- valid characters: [a-z, A-Z, 0-9] and special characters: ['+', '-', '@', '!', '_', '$', '%', '&', '/', '=', '*','#']
- minimum 1 uppercase letter and minimum 1 lowercase letter
- minimum 1 special character
- maximum number of repeated characters allowed is 6
- a password history is maintained to prevent the last 10 passwords from being re-used.

User passwords do not automatically expire. Users are able to change their passwords themselves. Passwords can only be changed using the GUI. Passwords generated during setup of new users and passwords generated during password reset by Service Administrator will automatically expire after first login. The user is then forced to create a new password. Participants are responsible for the regular refresh of user passwords, according to their own security guidelines.

3.2.5 Sessions

Sessions are permanently registered connection channels to T7. A session is set up for and belongs to exactly one BU. In order to send requests to the trading system, a user must use a session that is connected to T7 and that

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[2] Only users of Clearing Business Units will be setup as "Supervisor". No user of a Trading Business Unit will get this user level assigned automatically.

belongs to the same BU as the user. Besides that, there is no further relationship between users and sessions, i.e. a user does not belong to a specific session and a session does not belong to a specific user.

The session concept provides different session types matching the different needs of participants. Participants migrating to the T7 platform will have to order new sessions for the Enhanced Trading Interface as well as for FIX Gateway. For more details regarding the session types, please check chapter 4.1.1.

3.2.6   Entitlement

The entitlement in T7 consists of a concept of roles in combination with product assignment groups. T7 includes a set of pre-defined user roles, configured and maintained by the exchange. User roles offer participants a simplified approach to administration: Sets of resources (e.g. enter order request) are combined to define a logical user role (e.g. Cash Trader). The roles are assigned to the business units by the exchange. From here, the participant can propagate the entitlement to his users. The roles which can be assigned to a user are always a subset of the roles of the business unit. The user maintenance can be done by a user having the Cash Service Administrator role assigned. The roles available in T7 that can be assigned to users of trading or clearing business units are:

Name	Description
Cash Service Administrator	The Cash Service Administrator is allowed to set up new users, maintain their entitlement as well as delete users. This role is relevant for the trading as well as for the clearing business unit.
Cash Trader	The Cash Trader role allows the user to participate in trading, e.g. to enter orders. This role is relevant for the trading business unit only.
Cash Market Maker	The Cash Market Maker role allows the user to, e.g. enter quotes. This role is relevant for the trading business unit only.
Cash User Data View	The Cash User Data View role allows the user to view the user data information of himself and other users. This role is relevant for the trading as well as clearing business unit.
Trading View	The Trading View role allows a user to view the trades. This role is relevant for the trading business unit only.
Trade Enrichment Rule	The Trade Enrichment Rule role enables a user to predefine texts that are filled in the respective free text fields of lean orders. This role is relevant for the trading business unit only.
Trade Enrichment Rule View	With the Trade Enrichment Rule View role a user is allowed to view predefined texts for lean orders. This role is relevant for the trading business unit only.
Emergency Mass Deletion	The Emergency Mass Deletion role allows a user to delete all open orders and quotes. This role is relevant for the trading business unit only.
Emergency Trading Stop	The Emergency Trading Stop role allows a user to halt the entire trading participant in case of emergency. All open orders and quotes will be deleted and additionally it will not be possible to enter new orders and quotes. This role is relevant for the trading business unit only.
Clearing Member Stop	The Clearing Member Stop role allows a user of a clearing member to stop one or many of his related trading participants. This role is relevant for the clearing business unit only.
CM Backoffice View	The CM Backoffice View role allows a user to inquire all trades of all of his related trading participants. This role is relevant for the clearing business unit only.

Users can also be assigned multiple roles at once. The roles Cash Service Administrator, Cash User Data View, Emergency Mass Deletion, Emergency Trading Stop, Clearing Member Stop and CM Back Office View are valid market-wide. Other roles have to be granted subject to a product assignment group what means that the same user can act with different roles in different product assignment groups (See for example TRA056 in picture below).
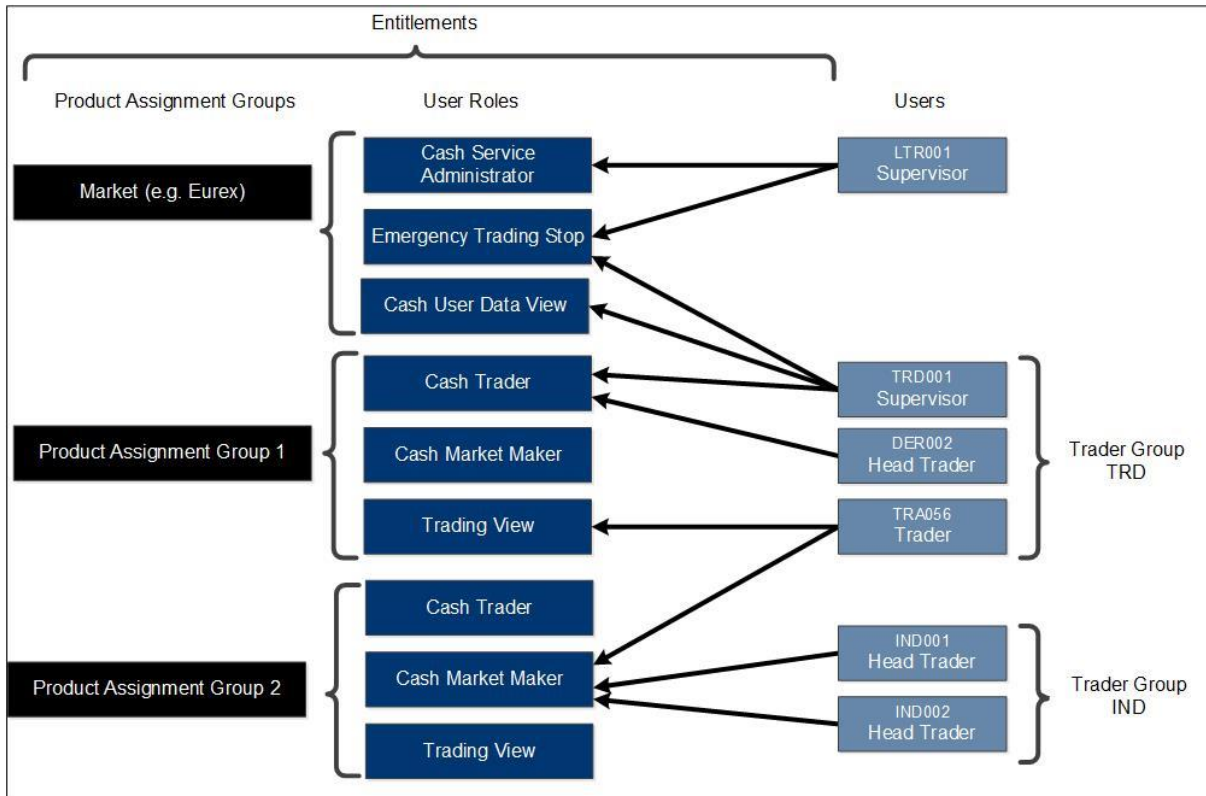
Figure 5: User Entitlement Overview

Beside the entitlement that needs to be done on user level at least two more settings need to be configured for users of trading business units: the Maximum Order Value and the Trading Capacities a trader is allowed to use.

Maximum Order Volume

The Maximum Order Volume is defined per user and is an optional parameter determining the maximum value of an order that a trader is allowed to enter. The value of the order is calculated as quantity times price for buy limit orders and as quantity times last traded price for market orders and sell limit orders. The Maximum Order Volume is stored in exchange currency, i.e. in case of orders in a foreign currency instrument, the respective exchange rate needs to be taken into account.

Trading Capacities

Whenever a user enters an order, the order will have to be entered for a certain trading capacity. Three different trading capacities will be supported on T7:

A – Agent Account
P – Proprietary
M – Market Maker

The different trading capacities can be granted or revoked from a user independently of each other.

3.3 Market Model

The trading models "Continuous Trading with Auctions", "One Auction" and "IPO Auction" will be available in T7 for the trading venue Xetra and will be outlined in this chapter. Furthermore, the concept of Auction Price without Turnover is part of T7 and is briefly highlighted as well.

More details are provided in the document "Market Model Xetra" which has been published in April 2017.

3.3.1 Trading States

Trading states give a structure to the business day. They control what activities are available to traders and what functions T7 will perform during each period.

Generally T7 supports product states and instrument states. While product states give a structure to the business day and control general access to the system, instrument states control order and quote maintenance and execution, and they also control the availability of public market data.

A product has a trading state, but also every instrument has its own individual trading state. However, the trading state of the instrument is related to the state of the product. Some product states map exactly to one instrument state and in some cases an instrument can have different states within one product state.

Usually, all instruments of a product have the same trading state that depends first of all on the trading state of the product. Nevertheless, under special circumstances, an individual instrument's state may differ from the states of the other instruments of the product.

With step one of the cash market migration, the Xetra trading models Continuous Trading with Auctions and One Auction will be supported on the T7 platform. The following chapters describe the trading states for both trading models in detail.

3.3.1.1 Continuous Trading with Auctions Trading Model

The following diagram shows the sequence of product states and the related instrument states for trading model Continuous Trading with Auctions:
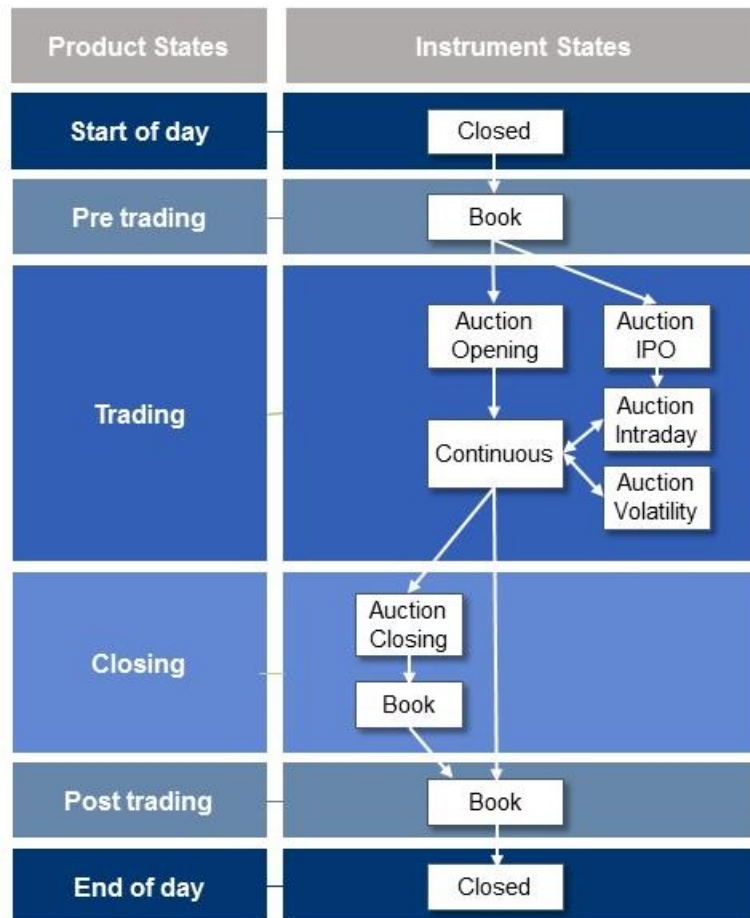
Figure 6: Product and Instrument States in Continuous Trading with Auctions trading model

Start of Day

The product state Start of Day represents the time before activity starts. Members have no access to the order book in this product state.

All instruments are in the instrument state Closed. During this state no access to the order book is available and no public market data is published by the exchange.

The Start of Day phase is followed by the Pre-Trading phase.

Pre-Trading

The product state Pre-Trading occurs before trading starts. It is typically a time where traders may maintain their orders prior to the start of trading. No matching occurs in this phase.

Instruments are in the instrument state Book. In the instrument state Book no public market data is published by the exchange.

With the end of Pre-Trading the trading phase starts.

Trading

The product state Trading represents the trading phase. The standard procedure for the product state Trading is that after an opening auction call phase, the instruments are in the trading phase Continuous, possibly interrupted by volatility auctions or intraday auctions.

For each instrument the phase Trading begins with the auction call phase. This state represents the auction call phase of all types of auctions, i.e. Opening Auction, Intraday Auction, Closing Auction, Volatility Auction or IPO Auction.

In the instrument state Auction order and quote maintenance is possible. Within this state only top of book market data is published by the exchange, i.e. either the best buy and sell prices or the potential auction price.

At the end of an auction instrument state, an order book uncrossing may occur, potentially resulting in an auction matching.

After the opening auction the instrument state switches to Continuous. The instrument state Continuous is the state where continuous matching of orders and quotes take place. During this state the order book is open, i.e. price and quantity information is published by the exchange.

Order and quote maintenance is possible while the instrument state is Continuous.

The instrument state Continuous can be interrupted by auction call phases. This can happen when a scheduled auction phase starts or when a volatility interruption is triggered.

Auction call phases based on a volatility interruption are characterized by a special volatility indicator, which will be published to the market. A volatility interruption can also be triggered at the end of an auction call phase. In this case the auction call phase will be prolonged and the volatility indicator is published. Any volatility auction might be followed by an extended volatility interruption in case the potential price deviation is too high. During such (extended) volatility interruption phases the same level of order and quote maintenance, execution and availability of public market data is given as for any other auction call phase. Extended volatility interruptions are usualy followed by a freeze phase if the potential price deviation persists. During the freeze phase no order maintenance activity is possible.

The product state Trading ends with the start of the scheduled Closing Auction.

Closing

The product state Closing is the phase between Trading and Post-Trading. It covers the time between the end of continuous trading and the end of the closing auction.

The product state Closing ends automatically when there is no more running auction in any of the product's instruments. The end of the product state Closing marks the moment when trades can no longer occur for the affected product for the rest of the day.

Instruments switch to the state Auction when Closing begins. At the end of this closing auction the order book will be uncrossed with the result of a price determination or – if configured for the respective instrument – of an auction price without turnover. Afterwards the instrument state changes to Book. In both phases order and quote maintenance is supported.

During the instrument state Auction only top of book market data or a potential auction price is published. In the Book phase the order book is completely closed.

At the end of the Closing Auction a volatility interruption is as well possible as described for auctions in product state Trading above.

Post-Trading

The product state Post-Trading terminates the trading session of a business day. It is typically a time where traders can maintain their orders in preparation of the next trading day. No matching occurs in this phase.

Instruments are in the instrument state Book. No market data is distributed.

End of Day

The product state End of Day represents the time that is reserved for the end-of-day processing and housekeeping measures by the exchange. Members have no access to the order book in this product state.

All instruments are in the instrument state Closed. No market data will be published during this state.

3.3.1.2 One Auction Trading Model

In the trading model One Auction the sequence of product states is quite similar to the sequence for the trading model Continuous Trading with Auctions, i.e. the trading day starts with the product state "Start of Day" followed by the "Pre-Trading", "Trading" and "Post-Trading" state and ends with the product state "End of Day".
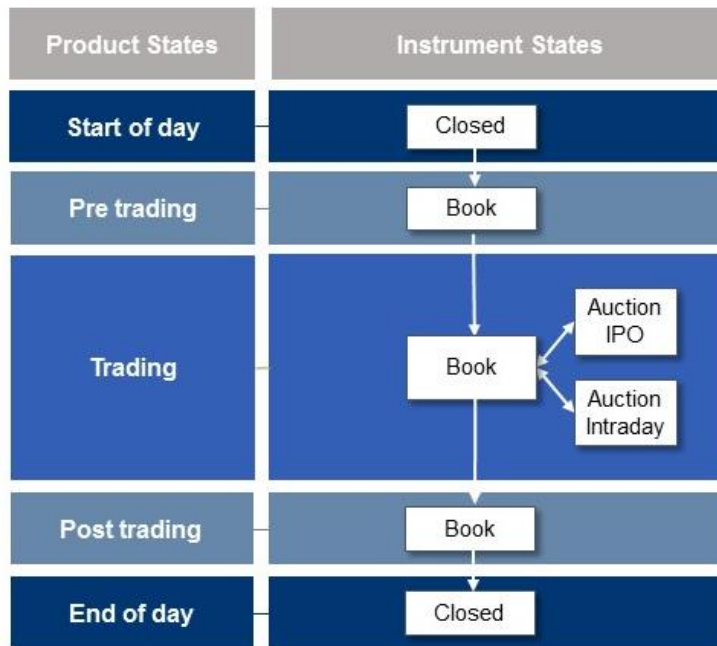

Figure 7: Product and Instrument States in One Auction trading model

The trading states of the One Auction trading model mainly differ in the instrument states from the Continuous Trading with Auctions trading model, i.e. with the start of the product state "Trading" the instrument state is Book until the scheduled intraday auction call phase is triggered.

In the instrument state Auction orders and quotes can be maintained. During this state only top of book market data is published by the exchange, i.e. either the best buy and sell prices or the potential auction price.

No trading occurs until the end of the auction call phase when an order book uncrossing may occur, resulting in an auction matching or in an extension of the auction call phase due to a volatility interruption potentially followed by an extended volatility interruption and a freeze phase. In all cases the market will be informed by the exchange.

After the instrument state Auction the instrument state is Book, order and quote maintenance is possible but no market data is disseminated.

Since the One Auction trading model consists of one intraday auction only the trading phase will be terminated by the scheduled start of the product state "Post-Trading". The instruments remain unchanged in Book.

The trading day ends with the product state End of Day. Members have no access to the order book in this product state.

All instruments are in the instrument state Closed. Customers cannot access the order book and no market data will be published during this state.

3.3.1.3 IPO Auction within Trading Models

An IPO auction is used for the inclusion of an instrument in the secondary market and is a special version of an auction. Like in an auction, orders and quotes can be entered, modified and deleted.

In contrast to the standard auction Market Supervision is able to enter a matching range on behalf of the lead bank during the IPO auction call phase. The price determination is restricted to this price range.

Market participants will only be informed about the price range. Market data will not be published at any time of the IPO auction phase.

Before the IPO auction is manually terminated, Market Supervision is setting the instrument state from Auction to Freeze in order to control the order book situation.

During this state, any activity that changes the order book is not possible.

After the IPO auction is terminated by Market Supervision the auction price determination takes place. The IPO auction is directly followed by an intraday auction call phase; except for trading model One Auction.

3.3.1.4 Extraordinary Trading States

Holiday

The product state Holiday applies to products that are not open for trading on that day, even though the exchange is open. Members have no access to the order book for a product that is in the product state Holiday.

All instruments are in the instrument state Closed.

Halt

Market Supervision may halt the market if it judges that market conditions or technical conditions impair the integrity of the market. In such a case, a product will be set to the product state Halt. In the product state Halt, no matching occurs and order book access is restricted.

When a product is set to Halt all non-persistent orders/quotes are getting deleted by T7 and all instruments are set to the instrument state Restricted.

Restricted

The instrument state Restricted is a state where traders are only allowed to delete their orders. During this state no order and quote maintenance is possible and no market data is published by the exchange.

In the instrument state Restricted no matching occurs.

T7 does not support the presence of non-persistent orders/quotes in the order book during the instrument state Restricted. Therefore, all non-persistent orders/quotes of an instrument are automatically deleted by T7, when the instrument enters the state Restricted.

Suspend

Suspend is a special instrument state qualifier (not an instrument state) in T7. It is only available for a specific instrument and can be set any time independently of the product state.

When the instrument state qualifier is set to "Suspend" by Market Supervision, the instrument state is changed to Restricted and all orders and quotes in the order book will be deleted. In case the order book is not empty, a broadcast message of type "Instrument Suspension" is sent to all sessions indicating that orders and quotes have been deleted.

3.3.2 Matching Rules

Generally the best priced orders in the book are traded first. When there are multiple orders at the best price, the quantity of an incoming order is allocated to the oldest book order first. If there is any remainder then it is moved to the next oldest order, until the quantity of the incoming order is exhausted or all orders at the best price have been executed. This price-time-priority matching rule is used in continuous trading as well as in auctions.

While in continuous trading the limit of the sitting order or the reference price in case of sitting market order determines the price of the match, in auctions the price determination follows the principle of the highest executable volume at the lowest surplus.

For IPO auctions the modified principle of highest executable volume at the lowest surplus is used, i.e. the optimum must lie within the IPO matching range entered by Market Supervision on-behalf of the lead bank.

For the Closing Auction in Continuous Trading with Auctions additionally it is possible to enable the determination of an Auction Price without Turnover. If it is enabled and no price determination in the Closing Auction is possible but on both sides of the order book limit orders or quotes are available, the midpoint of the best bid and best ask limit will be determined as price without turnover as long as it lies within the volatility ranges or even outside the volatility ranges if a licensed Designated Sponsor Quote is present in the order book.

3.3.3 Safeguards

3.3.3.1 Volatility Interruptions

During continuous trading and auction call phases, the potential trade price is validated against the fixed and floating volatility boundaries. If a potential trade price lies outside the fixed or floating volatility boundaries then a volatility interruption is triggered and the volatility indicator is published. Please note that in auction call phases, the volatility interruption is only triggered at the end of an auction call phase.

If, at the end of a volatility interruption, the potential price lies outside the extended range, which is broader than the floating price range, the volatility interruption will be extended until it is terminated manually. This extension of the volatility auction call phase will be marked with a special indicator. This indicator is published by the exchange to inform the market about an extended volatility interruption.

3.3.3.2 Self-Match Prevention (SMP)

Self-match prevention is an optional functionality which allows a business unit to prevent that certain own orders of the same instrument match against each other. This functionality can be used by filling in the numeric CrossID in the respective order or quote message. The CrossID will be checked on a business unit level. Its setup and usage lies within a business unit's responsibility.

SMP is offered via all trading interfaces (ETI, FIX Gateway) including the Trader GUI. It is supported for all order types (except iceberg orders and orders with order validity "FOK") and quotes.

SMP is performed during the instrument state Continuous only and works as follows:

When an incoming order or quote and a book order (or quote side) would match against each other, T7 checks whether they are owned by the same business unit and whether they carry the same user supplied CrossID. If this is the case, the match between the two orders is prevented and the quantity which would have matched is cancelled from the open order quantity, for both the incoming order and the book order. Afterwards, the incoming order is allowed to match further only on the same price level in case of sufficient quantity. After matching completed on that price level, any remaining open quantity left for the incoming order is deleted. In case there is quantity left from the book order after its reduction because of SMP, this quantity remains in the book.

3.4 Orders

T7 will offer a variety of different order types to fulfil customer needs and expectations.

All orders entered are anonymous. The trading members do not receive any information as to which member has entered an order into the order book.

The allowed combination of order types, restrictions, price conditions and validities is defined by an order profile which in turn is then assigned to products and their instruments.

All orders can be entered as persistent or non-persistent and can be defined to be visible only within the entering session (lean order) or also for other sessions of the same business unit (standard order).

Orders can be entered, modified and deleted. But while the priority of an order might change, the 20 digit system order ID assigned by T7 upon entry stays the same over the whole lifecycle. The system order ID is based on the elapsed nanoseconds since Jan 1st 1970 and does not change over the whole lifecycle of the order. The system order ID is unique per product, i.e. T7 may assign the same system order ID to orders belonging to different

products. Please note in this context the same security set up in different markets are separate products. Every order gets assigned a version number (starting with 0) which increases in case of a user driven order modification with a priority change, i.e. in case of

- Change of limit
- Increasing the quantity
- Enlarging the validity

Priority changes triggered by system functionality will not lead to a new version number of the order, i.e.

- Refill of Iceberg Peak
- Activating an Opening, Closing or Auction only order at start of the auction
- Triggering of stop order or trailing stop order

Functionally the latest status of an order can be identified by the system order ID and the version number, whereas the system order ID is the unique identifier to refer to an order.

3.4.1   Order Types

The following order types are supported for trading venue Xetra on T7:

Limit Order	The Limit Order can be used by a trader to ensure that the order does not get executed at a price worse than the defined limit.
Market Order	The Market Order is an order without any limit. Market orders are matched against the best available order(s) in the order book.
Stop Order	A Stop Order is an initially inactive Market or Limit Order, i.e. an order not available in the order book and not included in the public market data.
	As soon as the market reaches the price defined by the stop limit of the order the trigger condition is met and the Stop Order is converted to an active Market or Limit Order, and if possible, matched according to the rules for incoming Market or Limit Orders respectively.
	A Stop Buy Order has to be placed at a stop price above the current best bid limit in the order book, and a Stop Sell Order at a stop price below the current best sell limit.
One-Cancels-the-Other Order	An One-Cancels-the-Other (OCO) order is an order that combines the behaviour of a limit order with that of a stop market order.
	An OCO order has both a limit price and a stop price. On entry, it first behaves exactly like a Limit Order and can match accordingly. Once the trigger condition is fulfilled, the OCO order behaves like a triggered Stop Market Order, i.e. it gets a new priority timestamp and is converted to an incoming Market Order. The limit price does not apply anymore. Though the name One-Cancels-the-Other may suggest otherwise, T7 treats an OCO order as one single order, and not as two orders that are linked. This is also reflected by an OCO order having only one System Order ID that does not change throughout its life time, and specifically not when the OCO order is triggered.
	An OCO order that already fulfils its trigger condition on entry is rejected by the system.
Iceberg Order	Iceberg Orders are orders with quantities only partially visible in the order book.
	An Iceberg Order is characterized by its overall quantity as well as, the peak quantity which defines the visible part of the order and can only be entered

with a limit. The quantity which is used to refill the peak in the order book after it was fully matched can be configured to be random. In auctions the Iceberg Order takes part with its full quantity.

The Iceberg Order necessarily has to meet a certain size given by the "Minimum Iceberg Volume" and its peak has to be at least the "Minimum Peak Volume". Both values are amounts defined in the trading currency of the instrument.

Trailing Stop Order

Trailing Stop Orders (TSO) behave like Stop Orders but having an absolute or relative distance between the stop limit and the current reference price (trailing amount). TSOs can be entered only as "Market".

The stop limit of a Sell (Buy) TSO adjusts automatically according to the trailing amount as long as the reference price rises (falls), the trailing stop limit rises (falls) by the trailing amount. If the reference price falls (rises), the trailing stop limit remains the same. When the trailing stop limit is reached or fallen below (exceeded) the Sell (Buy) TSO is triggered.

Customers are informed about adjusted stop limits via broadcast within a certain time interval.

The execution of Market or Limit Orders can be limited by using one of the following restrictions:

Auction Only

If this restriction is set, the order can only get executed during a scheduled auction phase but not during continuous trading or an (extended) volatility interruption.

When the instrument enters the auction state Auction Only orders become automatically active, and they receive a new priority timestamp. In case there are several Auction Only orders they will get activated according to their entry time. The Auction Only orders participate then in the auction as any other order. Unexecuted Auction Only orders get deactivated after the auction is terminated and stay inactive until the next scheduled auction within their validity.

Opening Auction

This restriction works the same as Auction Only but restricts an order to participate only during the opening auction.

Closing Auction

This restriction works the same as Auction Only but restricts an order to participate only during the closing auction.

Book-Or-Cancel

Orders using the restriction Book-or-Cancel (BOC) are never matched on entry. BOC orders which could be partially or fully executed upon entry are immediately deleted without execution. BOC orders that are not executable on entry are accepted and written to the order book.

BOC orders must have a limit price. The matching will take place during continuous trading only. As soon as a scheduled or volatility auction is triggered, BOC orders are deleted.

Modifications of restrictions are generally not supported. If a trader wants to change a restriction it is necessary to delete and re-enter the order with the modified parameters.

Regarding the validity of orders T7 supports the following possibilities for Xetra:

Good-for-Day Orders entered "Good-for-Day" (GFD) will be deleted at the end of the trading day they were entered on.

Good-till-Date A certain date can be defined until which the order is valid. The order is then deleted automatically during the end of day processing of their last validity day.

Good-till-Cancelled Orders can be defined to be available in the system until they are deleted by the user. For this purpose the validity "Good-till-Cancelled" (GTC) is used.

Immediate-or-Cancel For orders entered as "Immediate-or-Cancel" (IOC), the quantity that cannot be executed immediately upon entry is deleted.

Fill-or-Kill For "Fill-or-Kill" (FOK) orders the full execution is checked and either the total quantity is matched upon order entry or nothing is executed at all and the whole order is cancelled.

Order types, restrictions, price conditions and validity constraints in their supported combinations are reflected in order profiles which can be assigned to products and used for trading via all interfaces (ETI, FIX and GUI). The assigned order profiles are available in the reference data provided by the exchange.

The following table gives an overview on the order profiles used for the trading venue Xetra on T7:

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

Table 5: Order Profile Overview

3.4.2   Further Order Attributes

All orders defined by the respective order profiles described above can be entered either as persistent or as non-persistent. Furthermore orders can be distinguished regarding their visibility only for the entering session or for all sessions of the same business unit (lean vs. standard orders). These attributes can be combined in the following way:
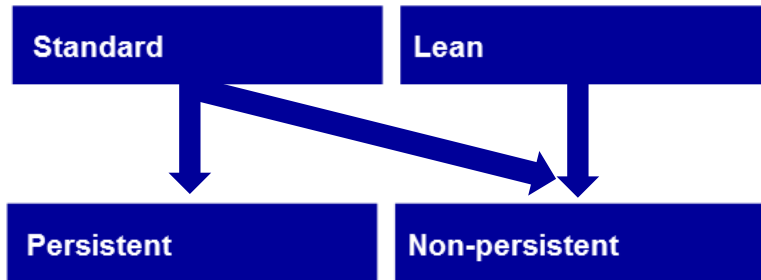

Figure 8: Combination Possibilities for Persistency and Visibility of Orders

3.4.2.1   Order Persistency

An order entered as persistent will be reinstated at the start of the next business day depending on their order validity or after a failure of the trading system. Non-persistent orders will be deleted in case of session loss, during market resets or trading halt as well as by the end of a business day. The validity for non-persistent orders is therefore limited to Good-For-Day. In case of a deletion due to session loss, market reset or trading halt only a summary information is sent to sessions that supplied non-persistent orders (or quotes).

3.4.2.2   Standard vs. Lean Orders

For standard orders, the complete order history of the current trading day can be recovered via retransmission requests. This order data is visible to all low frequency sessions belonging to the same business unit (including the Trader GUI) via subscription to the listener data broadcast (drop copy). Standard orders can be persistent or non-persistent and can only be used within low frequency sessions. For standard orders single on-behalf transactions are supported even via other sessions depending on the user rights while mass deletion also includes lean orders.

In case an order is defined as lean order, only the execution notifications and unsolicited events can be recovered via retransmission request. All data on lean orders are visible only to the session that submitted the order. Lean orders are always non-persistent and can be used via low or high frequency sessions.
A short order layout is available to reduce latency which only supports limit orders. The usage of the short order layout is limited to the validity constraints "Good for Day", "Immediate or Cancel" and "Fill or Kill".

3.4.3   Order Book Restatement

Order status inquiries are not supported by the Enhanced Trading Interface (ETI). Participants must maintain the state of orders based on the execution report 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 Status Event* message is sent to all sessions informing the participant about start-of-day or a market reset event per partition, optionally followed by *Extended Order Information* messages for each restated order of the corresponding session and finally a *Trading Session Event* message is sent, again to all sessions, indicating the end of the restatement per instrument. *Extended Order Information* messages for restated order and end of the restatement message are only visible to low-frequency sessions.

It is not possible to unsubscribe the order book restatement.

3.5 Quotes

A quote is the simultaneous entry of a limited buy and a sell order. Quotes can only be entered via the Enhanced Trading Interface (ETI) and are always of validity "Good-for-Day". Quantities to buy and to sell are independent of one another. T7 supports one-sided as well as double-sided quotes for the trading venue XETR. Even though they are defined for performance measurement reasons, no "Minimum Quantity" or "Maximum Spread" will be checked upon entry.

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.

Based on the entitlement, a user may overwrite, modify or cancel any quote of another user that is owned by the same session.

Users of one session cannot enter or modify individual quotes of other sessions even though they might have been entered by the same user.

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

Quotes are always non-persistent and thus are automatically cancelled in case of:
- Session logs out
- Session loses the connection to the trading gateway
- Session logs in second time via a different connection
- Mass Cancellation events
- At the end of the business day
- Exchange system failure (i.e. market reset, trading halt).

3.5.1 Mass Quote

Quotes are entered using the *Mass Quote* message in the Enhanced Trading Interface (ETI). A Mass Quote request may contain several single-sided or double-sided quotes for different instruments of the same product. Except for some ETFs and ETCs T7 generally uses a product-instrument relation of 1:1. For the respective ETFs and ETCs the *Mass Quote* message can contain several quotes but only one per instrument. In the other products one Mass Quote message needs to be used for every product or instrument respectively.

T7 provides two methods for updating quotes

- Quote Entry
- Quote Modification

Whereby Quote Entry and Quote Modification cannot be used within the same Mass Quote message.

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. In one request an instrument can only be referred once, i.e. if a two sided quote is entered then both sides must be in the same entry and not separated for buy and sell.

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 used to calculate the new open quantity. If this is zero or negative the respective quote side will be cancelled. If the previous quote side is not found, for example as it has traded out, then the modification for this quote side is ignored.

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.

3.5.2 Quote Activation/Inactivation

Quotes are inactivated by setting the status "quotes inactive" on the applied scope. In this case the system will hide these quotes from trading. 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 are 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 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' scopes is "quotes active".

3.6 Mass Cancellations

In the T7 system either functional or technical reasons may occur that lead to a mass cancellation of orders triggered by a user, market operations or the system. Such a mass action may impact several products/instruments at once and could lead to only non-persistent orders to be deleted or persistent orders as well. However, mass cancellation messages are send per product to the respective sessions indicating that all affected orders are deleted. No single order deletion message will be send. However, with regards to "Deleted persistent Orders", the system order number as well as the client order ID will be listed in the message.

A mass cancellation message on product level could include additional information if the cancellation refers only to a certain instrument within the product e.g. in case of Instrument Suspension or maybe to a dedicated session or a user of the business unit, e.g. in case of Mass Cancellation by Trader.

For mass cancellations not only affecting one instrument it might happen that an instrument's trading phase does not allow deletion of orders. This is the case especially in an IPO Freeze phase or during the Freeze of an Extended Volatility Interruption. In such a situation the respective orders cannot be deleted directly but the deletion is pending until the respective phase gets released. Within the mass cancellation message the member is informed about all orders with "Pending Deletion" by enumeration of the system order numbers and client order IDs.

If there is a pending delete for a persistent order, the respective order ID(s) will only be part of the "Pending Deletion" list but not part of the "Deleted persistent Orders".

As soon as the IPO or Extended Vola Freeze is resolved an order marked for pending deletion might get executed or (the remaining quantity) is deleted before the next incoming order book transaction is processed. For this final deletion a single order message is formatted. The following table gives an overview on possible scenarios:

Event	Delete Persistent Orders as well (Y / N)	Pending Delete possible (Y / N)
Instrument Suspension	Y	N
Instrument Stop	N	N
Product temporarily not tradeable (Slow Partition)	N	N
Product State Halt	N	N
Mass Delete by Market Operation	Y	Y
Clearing Member Stop	Y	Y
Session Disconnect (Loss, Logout or Duplicate Login)	N	Y
Mass Cancellation by Trader	Y	Y
Emergency Mass Delete by Trader	Y	Y
Trader/Business Unit Stop	Y	Y

Table 6: Mass Cancellation Scenarios

Quotes are deleted as well together with non-persistent orders in the scenarios above. Additionally, only quotes are deleted in case the Product State is switched to "Holiday".

For quotes no list with single IDs in case of pending deletion exists but the instruments where the deletion could not be executed finally are given in the message which is send to the respective session. This is due to the fact that only one quote per session can exist for an instrument. As soon as the pending deletion is processed finally a single quote deletion is formatted.

Further details on the respective implementation can be found in "T7 Enhanced Trading Interface – Manual" and "T7 Enhanced Trading Interface – Cash Message Reference" or "T7 FIX Gateway – FIX 4.2 and 4.4 Manual" respectively.

3.7   Executions, Trades and Order Referencing

When an order is executed, the trader is informed via an order execution confirmation. To generate the legally binding trade confirmation, which is as well sent to the respective sessions, the execution data needs to be enriched with trade details and the counterparty specific information.

In case of CCP eligible instruments, the counterparty of a trade is always the CCP. The counterparty specific information that needs to be added is hence always the same even if the execution was done against several orders on the other side of the book. As consequence, all executions of an order in one matching transaction, i.e. at the same price and at the same time, are aggregated in one trade confirmation in T7. This trade confirmation then maps exactly to one order execution confirmation.

Example 1: Execution in Continuous Trading

Buy	Limit	Sell
30 (entered by member B)	17,00	
50 (entered by member C)		
20 (entered by member B)	16,50	

Now when member A enters a sell order 100@16,50€ the order gets executed immediately and member A receives two trade confirmations, one for the execution of 80 shares at 17,00 € and one for 20 shares at 16,50 €. Member B receives two trade confirmations one for 30@17,00€ and another for 20@16,50€ and member C will get one trade confirmation for the execution of 50@17,00€.

Example 2: Execution in Auction

Buy	Limit	Sell
30 (entered by member B)	17,00	
50 (entered by member C)		
20 (entered by member B)	16,50	(entered by member A) 100

When the auction is terminated all available orders are executed at 16,50€ and member A receives one trade confirmation for the execution of 100@16,50€. Member B receives two trade confirmations one for 30@16,50€ and another for 20@16,50€. Member C will get one trade confirmation for the execution of 50@16,50€.

All order executions of one matching transaction and the respective trade confirmations get assigned one ID which allows the respective owning members to identify their match/trade in the public market data. The "Fill Match ID" in the order execution confirmation, the "Trade Match ID" of the trade confirmation and the "Match Step ID" in the public trade volume report in the market data are identical and can be used to link the messages together.

Furthermore each execution/trade gets assigned a private unique ID which can be used to directly map the execution confirmation ("Order Execution ID") and trade confirmation ("Side Trade ID") to each other. For the identification in the clearing and settlement process the T7 system assigns a unique trade identifier ("Trade Number") to each trade confirmation.

However, all IDs are only unique in the context of a market, i.e. MIC, and a product. Throughout a trading day same IDs can occur multiple times, i.e. in one market and different products in the same product traded in different markets.
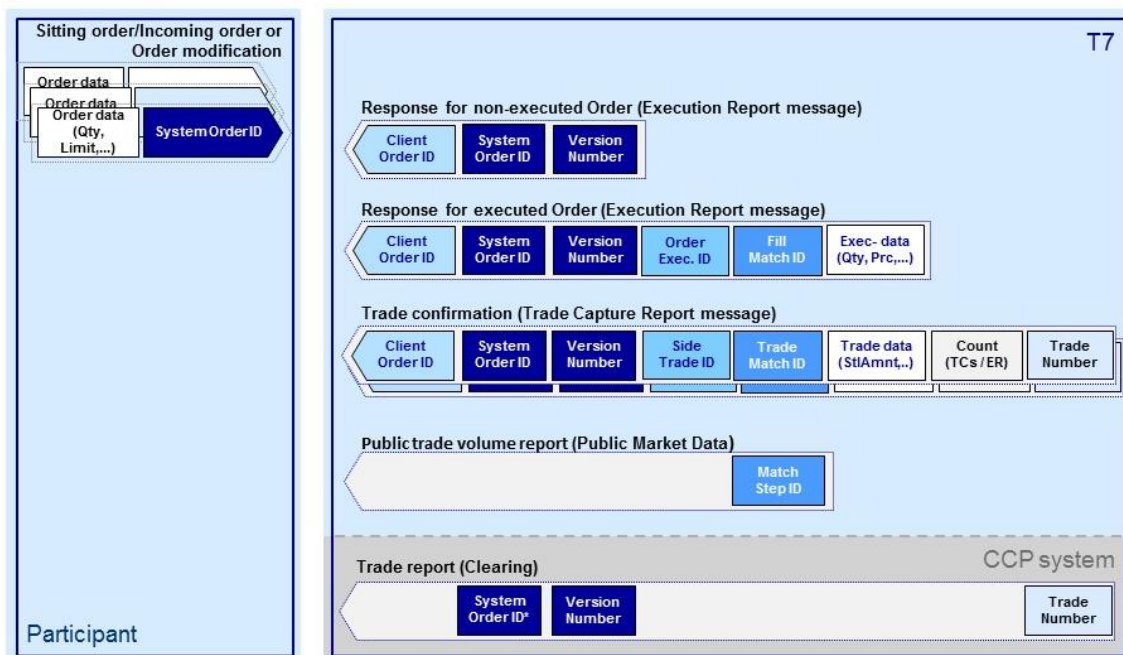

Figure 9: Schematic Overview of Message Flow in case of Matching and Order-Trade-Referencing (same colours represent same content)

The system order ID is forwarded for clearing and settlement as well but needs to be converted since the field length in the clearing and settlement systems is limited to 13 alphanumerical. The conversion is done by using the Horner scheme to recalculate the system order ID, which is expressed as decimal number (i.e. basis of 10), to the basis of 36.

Whenever a trade is generated and a trade confirmation is sent to the involved participants, it contains an indicator which declares whether the executed order added or removed liquidity. Valid values are "passive", "aggressive" or "none".

Member A in example 1 above enters a sell order which gets executed immediately against the sitting orders of member B and C who will receive a trade confirmation with an aggressor indicator set as "passive" because their orders were resting, i.e. added liquidity to the order book. Member A will receive a trade confirmation with the indicator set as "aggressive", i.e. it removed liquidity from the order book.

Order executions in an auction or a volatility interruption will be followed by trade confirmations with the indicator set to "none". I.e. in example 2 above members A, B and C will receive such a trade confirmation.

3.8 End of Day Processing

3.8.1 Order Deletions

Beside the expiration of an order there might be further reasons which make a deletion of orders necessary in an instrument before the start of the next business day.

For every persistent order not valid anymore on the next business day an order deletion message is sent to the customer during end-of-day processing. A deletion reason gives information why the deletion became necessary.

For non-persistent orders no order deletion during end-of-day is sent since non-persistent orders are only valid on the day of their entry and no explicit deletion information is necessary.

All persistent orders for which no order deletion message is received are then transmitted within the order book restatement at the start of the next business day (see above).

In case of extraordinary circumstances which do not allow to execute the respective order deletions at the end of a trading day, the deletion messages will be sent at the start of the next business day.

3.8.2 End of Day Service Message

As soon as no trading is possible anymore, i.e. when all products of a partition are moved to end-of-day, a special message is send via trade notification stream indicating that no more trade data will be send for this business day.

Afterwards when all order deletions have been processed and when the last product on a partition changes its state to post-end of day, the partition is shut down. In this situation an end of day service message is send for the respective partition via order notification stream to the customer. As soon this end of service message for the last partition is received members can disconnect without loosing information.

3.9 Reports

The activities of the customers are reflected in different reports available on T7. Reports can only be received via the Common Report Engine (CRE) and are always transferred automatically to the member's CRE account.

Following reports are supported for the Cash Market. More details can be found in "XML Reports - Reference Manual" (Simulation version in March 2017, final version to be published in May 2017).

Report Name	Report Description
CB Transactions and Fees Reports	
CB042 Fee Per Executed Order	This daily report lists each transaction per order ID, the fee of each executed order and the order volume. It is summed by instrument and account type.
CB050 Fee Overall Summary	This daily report shows the current and previous day's fees in the billing currency sorted by trading currency. In addition, it shows the fees produced currently, in the previous month and all together during the year.
CB060 Fee Statement	This monthly report is produced at the end of the month and gives an overview on the current month's fees, order volume and order quantity
CB062 Designated Sponsor Refund	This report lists the monthly Designated Sponsor refund per order. The totals are sorted by instrument, market group and participant.
CB068 Transaction Overview	This daily report is divided into three parts: The first part of the report contains a participant specific summary of generated transactions per transaction group and instrument. The second part of the report shows the number of transactions per transaction group for every session of the participant. The third part of the report shows the number of transactions per transaction group sorted by the participant's user.
CB080 Monthly Fee and Rebate Statement	This monthly report provides at the end of the month an overview of all monthly fees and rebates/refunds for Cash Market for reconciling Xetra invoice.
RD Trading RDS Reports	
RD110 User Profile Maintenance	This daily report provides an overview of all changes made to the general attributes of a user and to his entitlement profile, i.e. deletions, additions, modifications.
RD115 User Profile Status	This daily report provides an overview of all current user entitlement profiles for a participant. It includes profiles maintainable by exchange participants and those maintainable only by Market Supervision. In addition, the report provides information on several users attributes like level or status. If a resource is missing in the list, the user is not entitled to use the resource.
RD130 Trade Enrichment Rule Maintenance	This daily report provides an overview of all changes made to trade enrichment rules during the business day (deletions, additions, modifications).
RD135 Trade Enrichment Rule Status	This daily report provides an overview of all current trade enrichment rules. The report is split per market participant, business unit and rule and is sorted by rule.

TC Trading Order and Quote Maintenance	
TC230 Cross and Quote Requests Report	This daily report list, for each market participant and for each exchange, all Cross Trade Announcement and Request For Quote requests entered during the day. Reports are grouped per Business Unit, Trader and Request Type and sorted per Product, Instrument Type, Instrument ID and Request Time.
TC540 Daily Order Maintenance	This daily report list, for each market participant and for each exchange,all orders regularly entered, traded, changed or deleted during the day. The report is split per business unit, session and trader and sorted per product, instrument type, instrument and time.
TC550 Open Order Detail	For each market participant and for each exchange, this daily report lists all orders remaining in the order book at the end of the day.
TC810 Daily Trade Confirmation	This daily report contains an inventory of all trades matched by a market participant during a trading day. Identified by their deal item, trades are arranged by market participant, trader, product, instrument and clearing account.
TC 812 Daily Prevented Self-Matches	This daily report contains the prevented self matches during a trading day. The prevented self matches is identified by their transaction times. They are arranged by market participant, trader, product, simple instrument and sorted by transaction time.
TC910 Daily Match Step Activity	This daily report lists for each product and each instrument all match steps created during the day and provides the corresponding trade volume reporting. For each match step, the report gives the trade type, the trade price, the executed quantity and the number of traded buy and sell orders. It gives also for each match step the accumulated trade quantity per instrument since the start of day and the relative higher and lower trade prices at the trade time.
TD Trading Volume and Performance	
TD930 Daily Trade Statistics	This report contains the daily information on prices and trade volumes for all instruments.
TL Usage Fees	
TL001 System Transaction Overview	This daily report provides each participant with the details about his numbers of orders and quotes at the respective day. Furthermore, it provides all information on a possibly charged system transaction fee.
TL100 Order to Trade Ratio	This report provides each member with his month to date OTR's and the total volume of binding orders and quotes which had been added, modified, deleted and executed in the order book since the beginning of a month until the respective day.

TL900 Message Rate Report	This daily report contains the message rates under Directive 2014/65/EU Article 40(c). The report contains daily, month-to-date and yearly message rates per ISIN as well as daily, month-to-date and yearly message rates on a total of all traded ISINs. Seconds the ISIN was available for trading and the messages are given on a single ISIN basis. For calculation purposes messages include: order and quote insertions, modifications, deletions. This report contains "financial instruments for which there is a liquid market" and market making and proprietary messages only.
TT Trading Security	
TT133 Trading Risk Event Report	This daily report provides an overview of all trading risk actions triggered on T7 during the trading day. i.e. stop/release trading occurrences on user and business unit level. This report does not contain Clearing Member Stop events.
TT135 Risks Event Report	This daily report lists details concerning occurred Clearing Member Stop events. It shows the time of an event, S for stop/R for release action, the initiating member or the on behalf member of the event

Table 7: Reports

4. Technical Aspects

In this section the major technical aspects of the Cash Market Migration which are going to be launched with T7 Release 5.0 are briefly discussed. The Interfaces offered by the exchange, data to be sent and received as well as the GUIs are highlighted.

The following picture gives an overview about the interface landscape of T7.
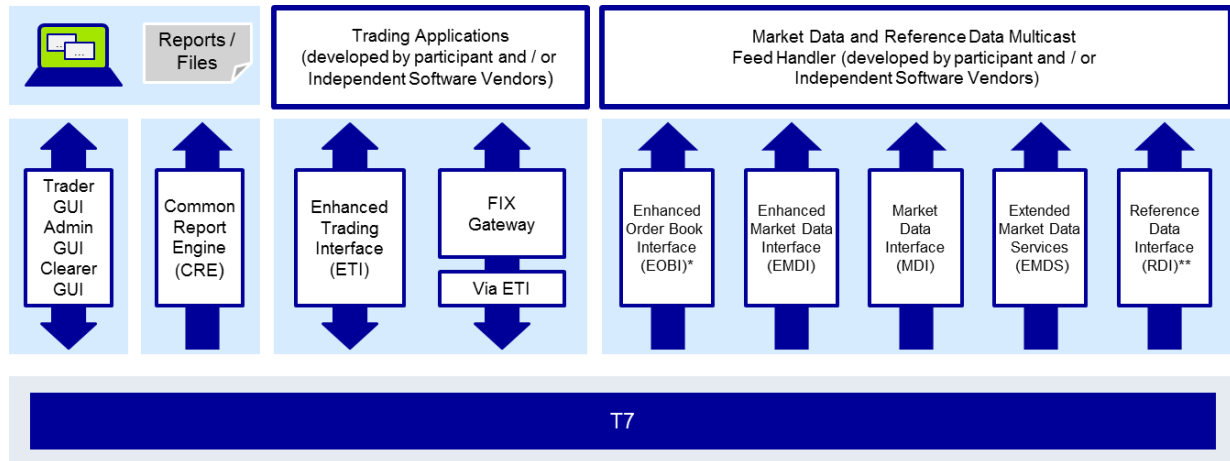

Figure 10: T7 Interface Landscape

*   available in co-locations only
**   In addition to the multicast based solution there will also be a file based solution for reference data via the
         Common Report Engine (CRE) and an internet download

4.1 Enhanced Trading Interface

The T7 Enhanced Transaction Interface (ETI) is an asynchronous, message based interface using TCP/IP sessions. No special hardware, operating system, programming language or compiler version is required on customer side and no exchange delivered software needs to be installed.

The Enhanced Trading Interface (ETI) is a high performance interface designed for participants who require the highest throughput and the lowest latency for their transactions. A proprietary session layer and flat binary encoding is used in order to provide the best performance.

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

A dedicated request scope to address the cash market functionalities will be available. Although all information in ETI is session oriented, a subscription mechanism to receive broadcast streams across sessions is provided.

Further details on the Enhanced Trading Interface can be found in the document "Xetra Enhanced Trading Interface - An Introduction" already available or in the "T7 Enhanced Trading Interface – Manual" (preliminary version in December 2016 and final version to be published in May 2017).

4.1.1 Session Concept

ETI 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.

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

Low Frequency Session (LF) – Regular Trading

This session type supports the complete ETI functionality. It is specially aimed at participant applications that rely on the complete order history to be recoverable. Although the submission of, for example, non-persistent and lean orders or quotes is supported, 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.

Low Frequency Session (LF) – Back Office

This session type supports only a subset of the Regular Trading Low Frequency Sessions. In particular it does not support order management functions. Please refer to the table below for the details.

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.

4.1.2 Functional Scope

The Enhanced Trading Interface provides a dedicated request scope for Xetra (trading venue) and the whole cash market functionality.

Due to the character of high and low frequency sessions, not all functional scope is offered via both session types. The following table provides an overview on the T7 functionality supported by the different session types:

Functionality	Low Frequency Session (LF) - Regular Trading	Low Frequency Session (LF) – Back Office	High Frequency Session (HF)
Standard Order	✔		
Lean Order	✔		✔
Persistent Order	✔		
Non-persistent Order	✔		✔
Order Book Restatement	✔	✔	
Short Order Message Layouts	✔		✔
Quotes	✔		✔
Maintaining orders of another session (same BU)	✔		✔
Maintaining quotes of another session (same BU)	✔		✔
Listener Broadcast	✔	✔	
Trade Broadcast	✔	✔	
Trade Reversals	✔	✔	

Functionality	Low Frequency Session (LF) - Regular Trading	Low Frequency Session (LF) – Back Office	High Frequency Session (HF)
News Broadcast	✔	✔	
Risk control broadcast	✔	✔	✔
Service Availability Broadcast	✔	✔	✔
Session List Inquire	✔	✔	
User List Inquire	✔		✔

Table 8: Functionality per Session Type

4.2 FIX Gateway

The FIX Gateway will be enhanced to support also the cash market functionality in T7. The interface is intended for participants that require a standard FIX connection to the exchange and is a point-to-point service based on the technology and industry standards TCP/IP, FIX and FIX Session.

The T7 FIX Gateway supports version 4.2 and version 4.4 of the FIX protocol.

For further information please refer to the already available document "Xetra FIX Gateway – An Introduction" or to the document "T7 FIX Gateway - FIX 4.2 and 4.4 Manual" (preliminary version in December 2016, final version to be published in May 2017).

4.2.1 Main Concepts

The FIX Gateway uses the Enhanced Trading Interface to connect to the exchange. In general, the before mentioned concepts valid in ETI are also reflected in FIX Gateway including especially the order book restatement which cannot be unsubscribed.

From a session concept perspective FIX uses only low frequency session connections. Separated sessions for trading and back office are required.

The request scope of the FIX Gateway is common for derivatives and cash markets, i.e. in general the same requests need to be used by the customers. However, it might be possible that the requests need to be filled differently depending on the market type the user wants to address.

4.2.2 Functional Scope

FIX Gateway offers the complete functional scope of the ETI except for Quote handling. While it is possible to send a quote request, FIX Gateway does not provide the functionality to send or maintain quotes.

The FIX Gateway provides the following functions for T7 via a respective trading session:

- Order management incl. Execution notifications
- Cross request
- Quote request
- Risk control events

Additionally the FIX Gateway enables participants to subscribe to private trading data in broadcast form via back office session:

- Trade notifications at a business unit level
- Drop Copy for standard (not lean) orders at business unit level

4.3 GUIs

T7 offers a java-based GUI solution. No front front-end software needs to be installed, only the supported Java version is required locally. Front-end updates will be downloaded automatically. Installation of exchange delivered software kits will not be necessary.

No MISS infrastructure is necessary, clients will directly connect to Deutsche Börse server. As a consequence bandwidth requirements increase with the number of open screens.
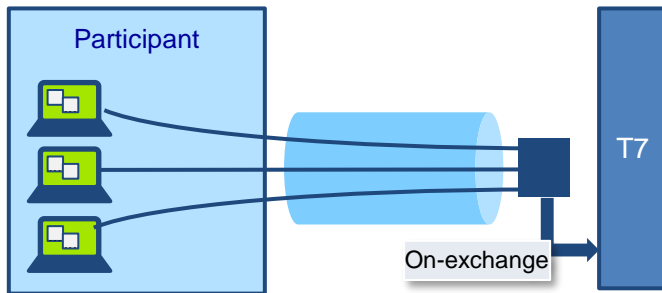

Figure 11: GUI Connection Scheme

T7 provides different GUIs subject to the activities and operations a user wants to execute: an Admin GUI, a Trader GUI and a Clearer GUI.

Each of the different GUIs supports different operations and functionalities, which can be taken from the below overview table:

	Exchange GUIs		
	Trader GUI	Admin GUI	Clearer GUI
Order Transactions	✔		
Private Order / execution info	✔		
Private Trade info	✔		✔
Market Data	✔		
User Administration		✔	✔
Clearing Member Stop/Release			✔

Table 9: Supported Functionality per GUI

More details about the GUIs will be provided in the "Trader, Clearer and Admin GUI – Manual" which will be published in May 2017.

4.3.1 Trader GUI

The Trader GUI provides the functionalities relevant for all trading related activities. This includes add, modify and delete of orders, on-behalf deletion of a single standard order, deletion of all orders, as well as the activation and deactivation of quotes. The entry of quotes is not supported via GUI. Cross requests can be submitted and private trading information for orders including the order history and trades will be given.

Latest and statistical market information can be retrieved, e.g. market prices with market depth and time and sales data and a Newsboard window to display system generated or Market Supervision news is provided.

The GUI is highly customisable in terms of configurable views, instrument profiles or alert notifications.

Historic trade information is not available.

The start page of the Trading GUI will look like on the picture below. The screenshot shows the 'Welcome View' and the main menu. From this mask it will be possible to navigate directly to each of the different submenus.
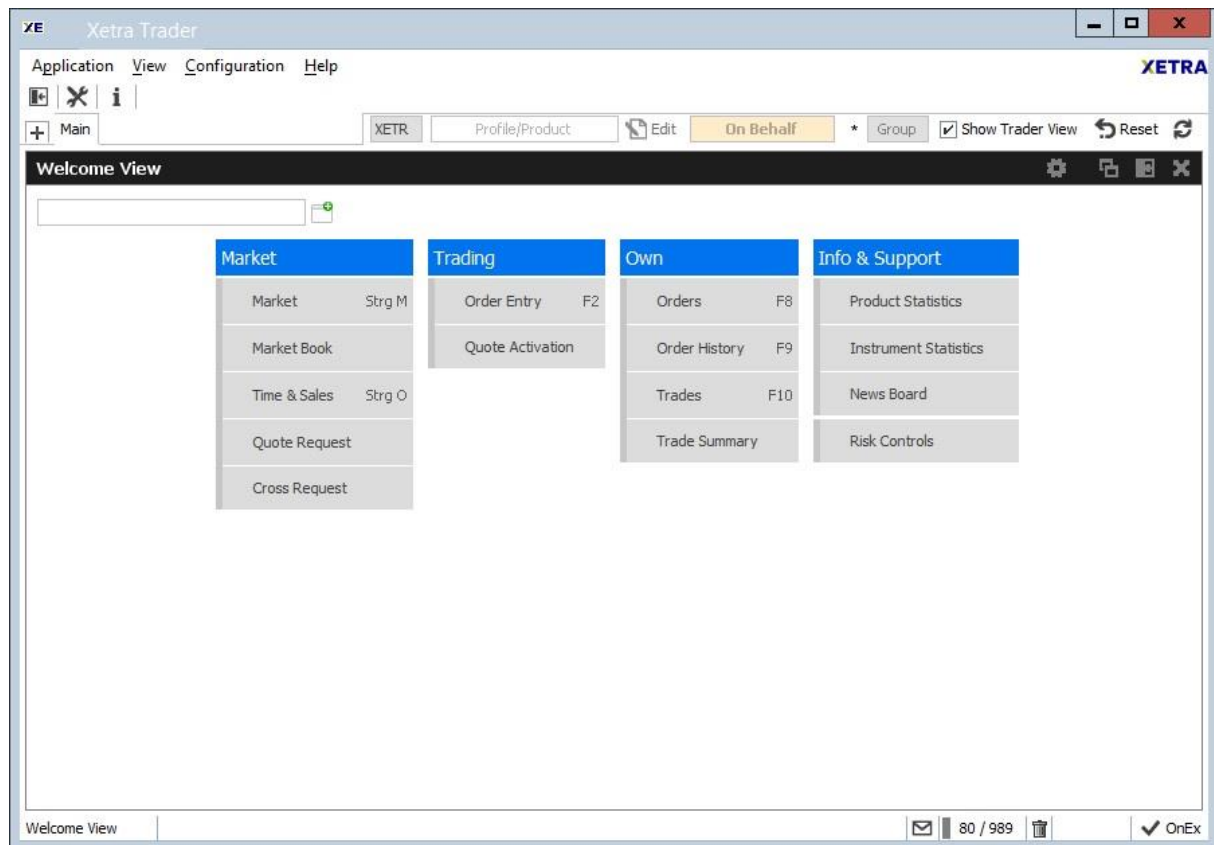

Figure 12: Welcome View of the Xetra Trader GUI

4.3.2 Admin GUI

The Admin GUI provides administrative functions and thus is mainly tailored for the service administrator. In the Admin GUI the setup and the maintenance of users can be done. This includes all relevant user information, e.g. the user name as well as the entitlement. Risk parameters like the maximum order volume can be set in the Admin GUI as well. The sessions view and the bandwidth monitor are also provided. In addition a new functionality is introduced to the cash market called Emergency Trading Stop. This functionality can be triggered via a stop button in the GUI which leads to an emergency deletion of all open orders and quotes as well as a temporary halt of the entire trading business unit. No further orders and quotes can be entered while the trading business unit is halted.
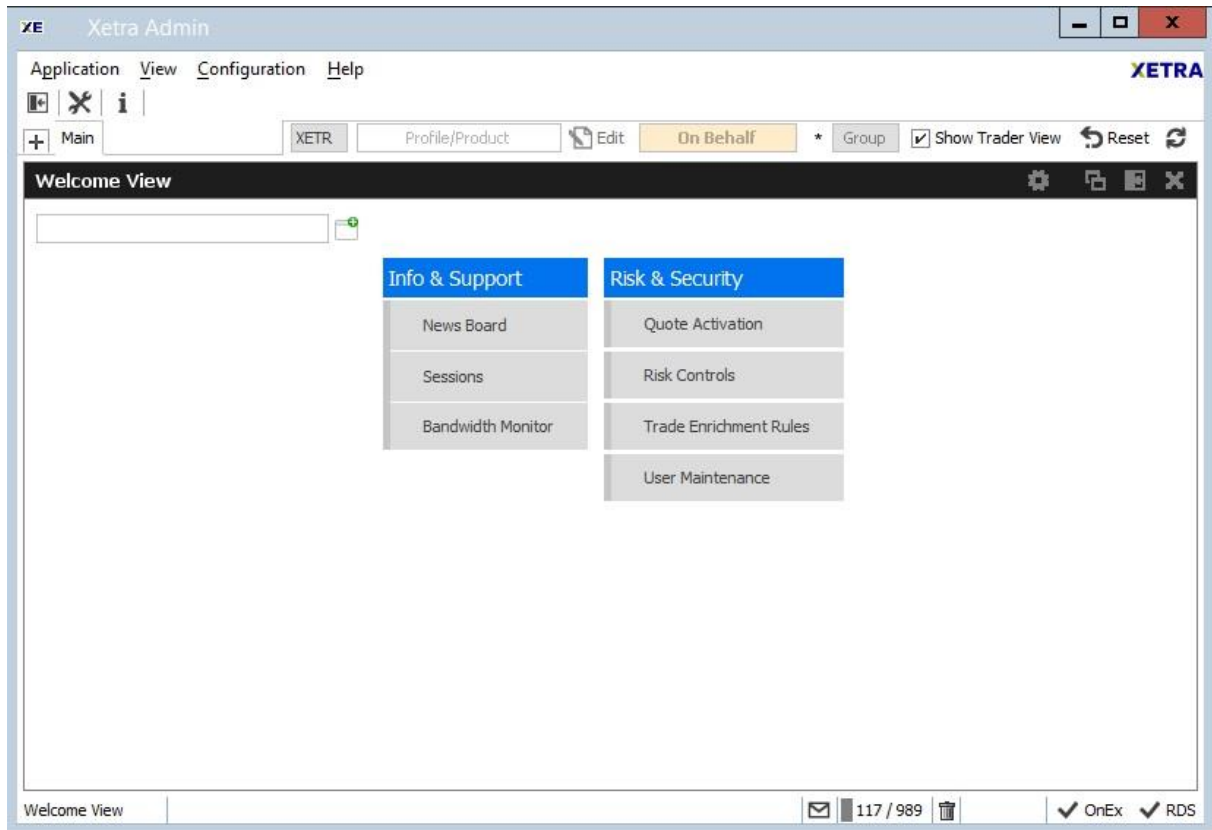
Figure 13: Welcome View of the Xetra Admin GUI

4.3.3 Clearer GUI

The Clearer GUI is designed for the back office departments and the clearing risk functions. For clearing members it will be possible to view trades of their related trading participants. The clearing member stop functionality will be implemented in the Clearer GUI also. The clearing member stop button allows a clearer to halt one or many of his related trading participants, causing all open orders and quotes to be deleted and the according participant to be halted.

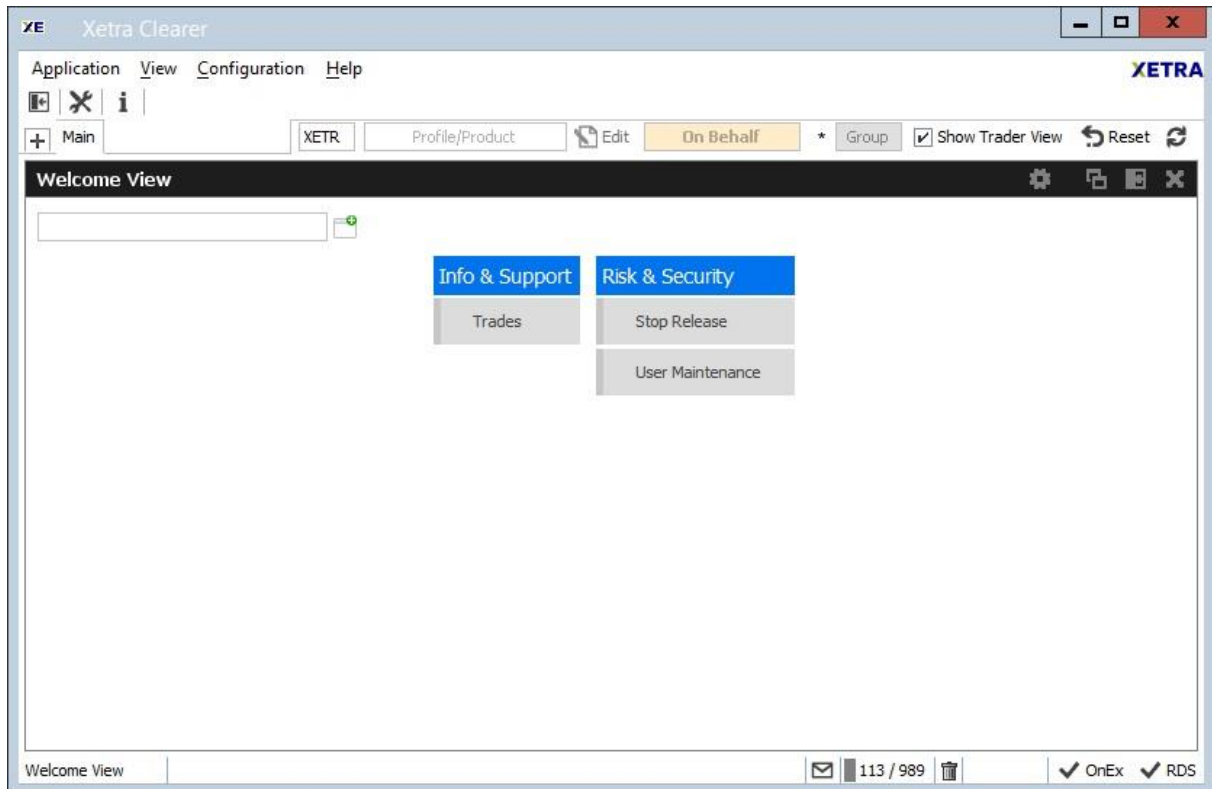Finally administration functionality for clearing users is provided.

Figure 14: Welcome View of the Xetra Clearer GUI

4.4 Market Data

Xetra offers public market data via four interfaces as part of the T7 architecture. All interfaces distribute information via UDP multicast; following FIX 5.0 SP2 semantics and are FAST 1.2 encoded (except EOBI). If any messages are lost, complete recovery is possible because every message is published on two identical services (A and B) with different multicast addresses (live-live principle). In the unlikely case of a message-loss on both services, participants can take advantage of the respective snapshot message and rebuild the order book.

The Market Data Interfaces are:

- **Market Data Interface (MDI)**: This interface provides netted price level aggregated market data.
- **Enhanced Market Data Interface (EMDI)**: This interface provides un-netted price level aggregated market data.
- **Enhanced Order Book Interface (EOBI):** This interface provides the entire visible order book, by publishing information on each individual order and quote.
- **Extended Market Data Services (EMDS):** This interface provides real time and replay dissemination of all on-exchange trade prices.

More details about the market data interfaces are provided in the already available document "Market and Reference Data Interfaces – An Introduction", as well as in "T7 Market-, Enhanced Order Book- and Reference Data Interfaces Manual", "Reference Data File – FIXML Schema Files" and "T7 Extended Market Data Services – Manual" which were published as Simulation version in February 2017.

4.4.1 Market Data Interface

The Market Data Interface (MDI) for netted price-level aggregated market data, introduced with Xetra Release 12.0, also exists on the T7 trading platform. It provides netted price level aggregated exchange market data with a market depth of 10. Updates of the order book are sent at regular intervals; they are not provided for every order book change and are sent significantly less frequently than the EOBI or EMDI.

Along with the order book updates, the following market data is disseminated via this interface:

- Product state and instrument state information
- Cross requests
- Trades

Trades are not reported individually, but statistical information (daily high/low price, last trade price and quantity) is provided instead.

The Market Data Interface consists of incremental messages (event driven) and snapshots (periodic generated) which will be delivered via one channel (in-band).

4.4.2 Enhanced Market Data Interface

The Enhanced Market Data Interface (EMDI) is the sole source for un-netted price-level aggregated market data. The interface replaces the current Enhanced Broadcast Solution. The EMDI interface disseminates the same market data as the MDI. However, the updates of the order book are sent for all order book changes up to a market depth of 10 and all trades are reported individually.

The un-netted market data is partitioned over several channels; each channel provides information about a group of products. As the market becomes busier, the number of messages (and therefore bandwidth usage) increases.

Snapshots and incremental market data messages delivered via separate channels (out-of-band)

4.4.3 Enhanced Order Book Interface

The Enhanced Order Book Interface (EOBI) is a market data interface exclusive to the T7 trading platform and provides un-netted Order-by-order public market data (including quotes). The EOBI interface provides fixed-length binary messages with no data compression. It is only available in co-location and needs to be ordered explicitly by the customer.

Most of the functional concepts used are similar to those of EMDI, however the EOBI provides greater transparency, together with a high throughput at minimal latency. The following information is provided on the EOBI:

- Order book information, disseminated without any 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
- Cross requests

4.4.4 Extended Market Data Services

The Extended Market Data Services (EMDS) is an additional market data interface providing a real time and replay dissemination of all on-exchange trade prices. The replay service allows participants to recover from any data loss for on-exchange trades.

EMDS also includes ticker information about the indices calculated and disseminated by Deutsche Börse.

4.5 Reference Data

The Reference data is provided via the

- Reference Data Interface (RDI),
- Common Report Engine (CRE),
- Member Section and
- public webpages.

The Reference Data Interface (RDI) distributes data over a number of IP multicast addresses via high bandwidth connections. All feeds follow FIX 5.0 SP2 semantics and are sent with FAST encoding.

Information is provided as regular snapshots containing reference data as of the beginning of the day. For intra-day recovery purposes the snapshots are repeated during the day. It uses the same technical means as the market data interfaces.

Via the Common Report Engine the Reference Data is provided in file form as compressed Reference Data File (RDF) in FIXML-layout.

For customers using the Member Section a link will be established in the Member Section which redirects the member to the file available on the CRE.

Reference Data provided via CRE, RDI, member section and public webpages include only instrument related information. In addition to those files, the information about trading schedules, order profiles and descriptions of market segment and market segment supplements will be provided in zipped file on the public webpages. Members have to process these files in parallel to the Reference Data received via RDI, CRE, Member Section and the public webpages. These static files will only change rarely. Changes will be communicated in advance with sufficient lead time.

More details about the distribution of reference data can be found in the already available document "Market and Reference Data Interfaces – An Introduction", the "T7 Market-, Enhanced Order Book- and Reference Data Interfaces Manual" (preliminary version was published in December 2016, final version will be available in May 2017) as well as the "Xetra Instrument Reference Data Guide" published in April 2017.

Change log

No	Chapter, page	Date	Change
V0.1	General	16.03.2017	Initial Version
V1.0	General	27.03.2017	Incorporated internal review commnets
V1.1	General	24.04.2017	Incorporated additional comments & customer telco results.
V1.2	General	28.04.2017	Create final version for publication