



London
Stock Exchange Group

Technical User Group

Monday 15 October 2018



Agenda

- Introduction
- London Stock Exchange Business Update
- London Stock Exchange Release 9.3
- Turquoise Update – Brexit and Hardware Refresh
- TRADEcho Update – Brexit and Release 11
- Borsa Italiana Update
- Oslo Børs Update
- Q&A



London Stock Exchange Business Update

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Head of Sales and Marketing
LSE Cash Secondary Markets and Turquoise

LSE Request for Quote



London
Stock Exchange

Auto-complete RFQ platform (Equities and ETFs) requiring no manual intervention





LSE Request for Quote

Auto-complete RFQ platform requiring no manual intervention

KEY POINTS

Fully automated process designed to fit within existing electronic workflow

Trades conducted on-exchange under the rules of the London Stock Exchange

Access to a broad and diverse universe of liquidity provision, offering aggregated within one platform

On book, on exchange activity with Central Counterparty (CCP) Clearing

Named and unnamed models available offering choice and control over counterparty selection

Functionality will be supported for all CCP-cleared order book Equities, Depositary Receipts and ETFs

Follows MiFID II pre-trade transparency rules

RFQ activity monitored by LSE Market Surveillance

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A Two-Way DR Programme

A summary of the London-Shanghai Stock Connect mechanism

Depository receipts (DRs) are securities certificates issued by depository banks to represent a company's publicly traded securities which can be listed and traded independently from the underlying shares.

	Traded on	Underlying Securities	Cleared & Settled at	DR Bank	Custodian
GDR (Global Depository Receipt)	LSE	A Shares already listed and traded on SSE	LCH, Euroclear Bank	Global bank	Member of ChinaClear
CDR (Chinese Depository Receipt)	SSE	Premium shares already listed and traded on LSE	ChinaClear	Chinese Commercial Bank	Member of EUI

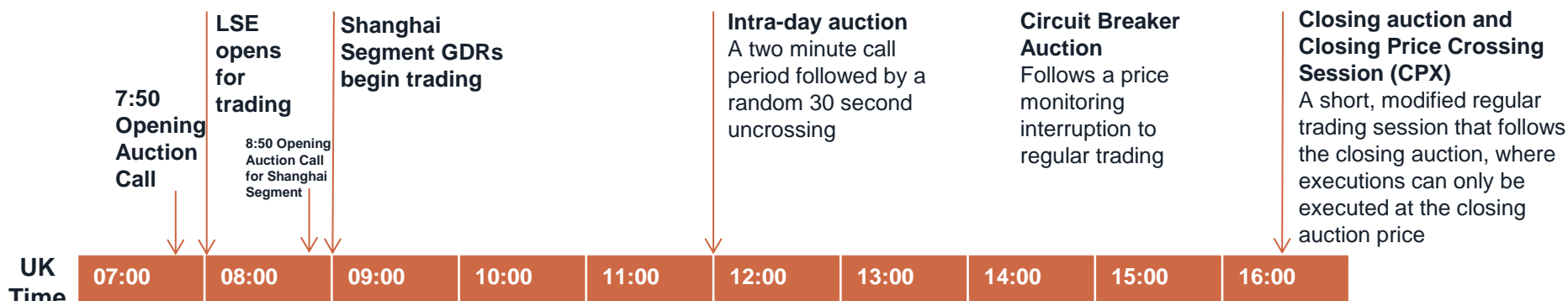
Trading GDRs on the Shanghai Segment



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Relevant trading rules on London Stock Exchange

- IOB has been extended to include IOBS (cleared segment) and IOBT (un-cleared segment): see **Millennium Exchange and TRADEcho Business Parameters** www.londonstockexchange.com/tradingservices
- test stocks available on Customer Development Service (CDS)
- *Rules of the London Stock Exchange* apply: www.londonstockexchange.com/traders-and-brokers/rules-regulations/core-rules/core-rules.htm
- Regular Trading Hours: 09:00 to 16:30, followed by closing auction
- Settlement on T+2, no pre-funding and no pre-delivery requirements
- Order book trading currency is USD (although RMB and GBP could be supported)
- Clearing through LCH and settlement in Euroclear Bank; CSDR rules apply
- All trading participants with access to LSE International Order Book trading will be able to access Shanghai Segment



*<https://www.londonstockexchange.com/traders-and-brokers/rules-regulations/rules-lse.pdf>



London Stock Exchange – Release 9.3

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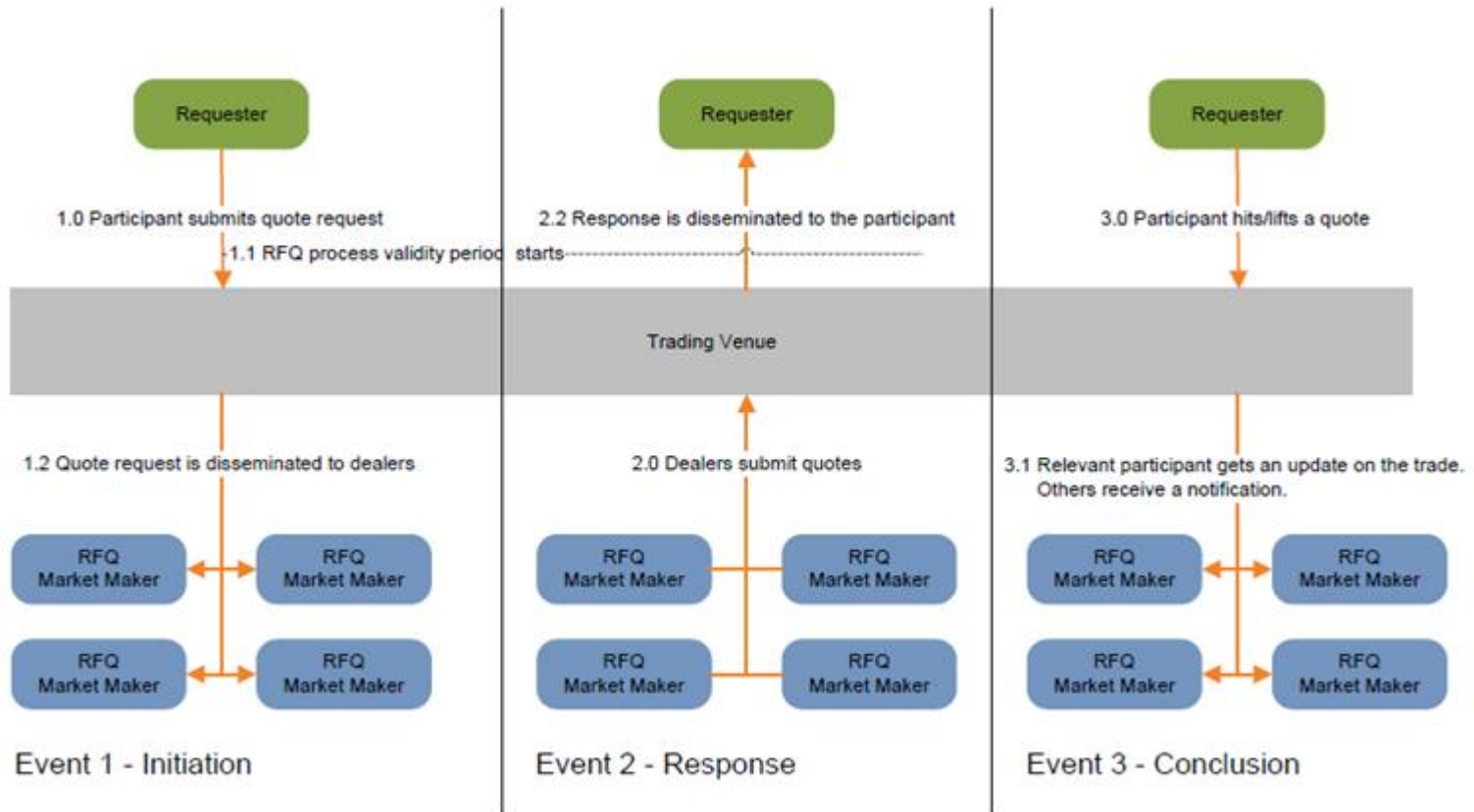
Release 9.3 - Overview

Summary of Changes

- Request For Quotes (RFQ) Enhancements
 - Introduction of RFQ for SETS cleared equities and Depositary Receipts in addition to Exchange Traded Funds and Exchange Traded Products
 - Enable pre-trade transparency for RFQ
 - Auto-Complete RFQ
- Real-Time Circuit Breaker Alerts via Drop Copy gateway
 - New message being introduced to drop copy gateway
- GTP – New Trade Summary Message
 - New message disseminated before any individual order book trade-related updates are published

Release 9.3 - RFQ - Current functionality

Current Manual RQF Model



Release 9.3 - RFQ – Enhancements 1/4

- Expand the instrument coverage
 - Introduction of RFQ for all CCP-cleared order book Equities and Depositary Receipts.
 - Trading services that will be enabled include SETS, ETFS - Euroclear Bank settlement, and International Order Book. The list of Trading Services and associated segments is provided in the updated Service & Technical Description - Request for Quote (RFQ) document.
- Enable pre-trade transparency for RFQ
 - Quotes will be published via market data when the trade is below the Large In Scale (LIS) threshold of the instrument MITCH - Add Order message Flag = 6 (Private RFQ).
 - GTP - Add Order Incremental with Order Book Type = 4.
 - RFQ Trades remain advertised via the MITCH Trade message and GTP Trade and MiFID II Trade messages.
- Vendors should ensure that RFQ quotes and trades are clearly distinguished from order book quotes and trades.

Release 9.3 - RFQ – Enhancements 2/4

Auto-Complete RFQ

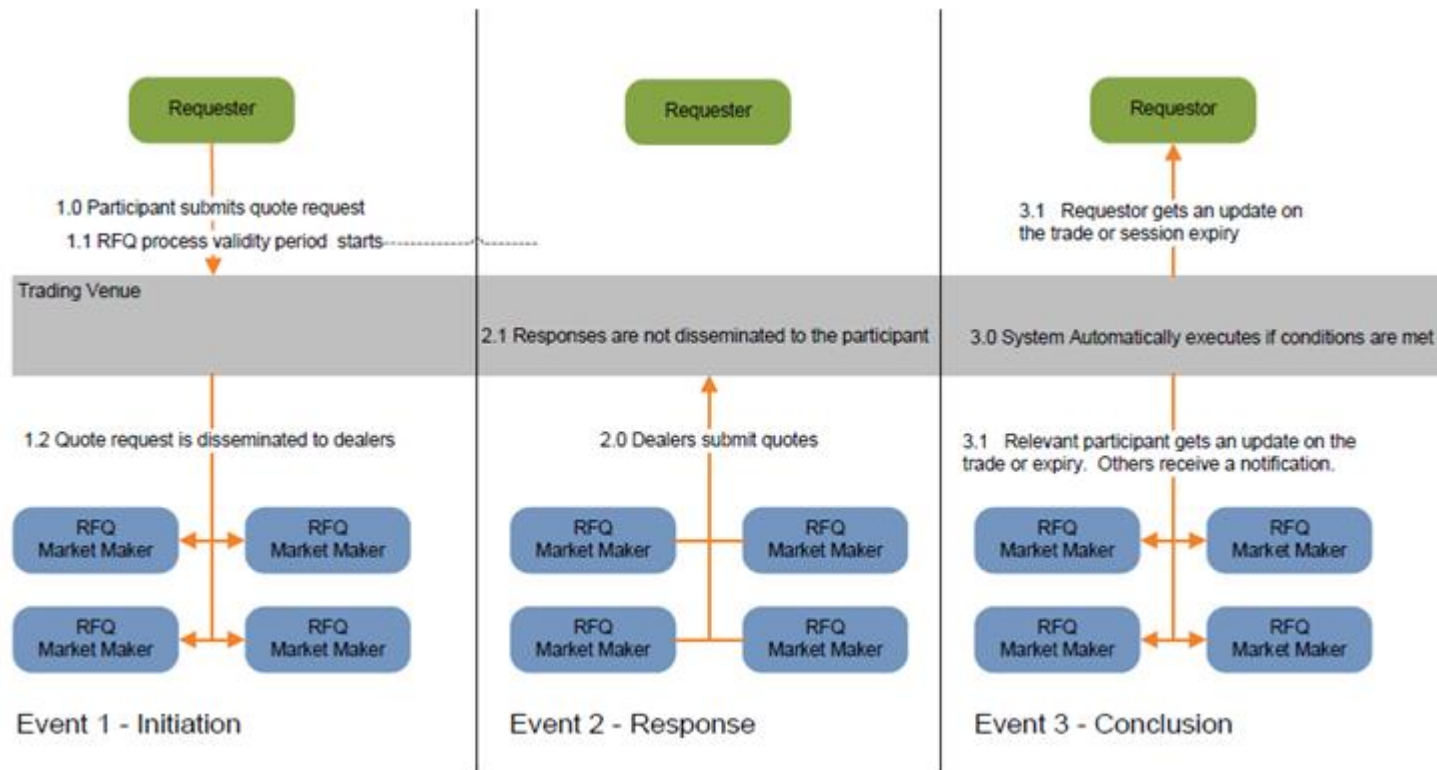
- The trading system can automatically execute a RFQ trade without the requester having to send a manual execution instruction
- Available for all instruments enabled for RFQ
- Requesters can choose to remain anonymous or named
- The RFQ can be sent to specific Market Makers or to all
- A minimum number of quotes can be specified in the request before the RFQ algorithm is triggered
- Requesters can also specify in the RFQ:
 - Expiry Time (milliseconds). If not specified, system default of 180 seconds will apply
 - Execution Delay (seconds). Minimum time before the system checks for received Quotes

Release 9.3 - RFQ – Enhancements 3/4

- RFQ Quotes will be prioritised on a Price-Time priority basis in the ‘RFQ trades’ book.
- All existing order book rules for maintaining and losing priority due to quote replacement will be applied to the ‘RFQ trades’ book.
- Once Execution Delay concludes, the system assesses:
 1. The requester’s stated minimum number of Quotes have been received.
 2. At least one of the Quotes received is marketable compared to the requester’s Limit Price.
 3. Random period will commence after which the Auto-Complete RFQ will execute against the best Quote.
 4. If the conditions change during the random period so that either (1) or (2) should not be met then the random period will cease and the system will wait until the conditions are again met within the expiry time.

Release 9.3 - RFQ – Enhancements 4/4

New Auto-Complete RFQ model





Release 9.3 - Drop Copy 'News' message 1/2

- 'News' message (35=B) being introduced to the Drop Copy gateway.
- The new message will only be sent to Drop Copy CompIDs that have been configured to receive it.
- A Drop Copy user configured will receive a 'News' message whenever the trading actions of a user being monitored trigger a circuit breaker.



Release 9.3 - Drop Copy 'News' message 2/2

The 'News' message disseminated will include the following information:

- The time the limit was breached
- Level of Urgency of the alert, always set as 'High Priority'
- Headline or subject of the alert as 'Circuit Breaker Breach'
- The Instrument ID
- The FIX compID or Native ID that breached the circuit breaker and associated Member ID
- Details of the breached:
 - "TRADING HALT: An order to [buy/sell] [Order Quantity] @ [Price] breached the outer CB limit (Ref. price = [Price], CB lower limit = [Price], CB upper limit = [Price]) [Order ID]"
 - A drop copy user configured to receive real time circuit breaker alerts will receive any missed alerts at the time of logging on.

Release 9.3 – GTP Trade Summary

- New GTP message on Level 2 Full Depth Incremental service line.
- Will be published to advertise both single and multi fill events and before any individual order book updates .
- Will only be disseminated during Regular Trading and the Closing Price Crossing Session (not applicable to Auction Trades).
- Will provide:
 - Total Executed Quantity
 - Total Hidden Executed Quantity
 - Far Price
 - Deleted Order Quantity due to self execution prevention

Release 9.3

- Release 9.3 production go-live **29 October 2018** *
- Recertification is required for any application change to support the new functionalities
- Updated technical documents and Service & Technical Description - Request for Quote (RFQ) document available at <https://www.londonstockexchange.com/products-and-services/technical-library/millennium-exchange-technical-specifications/millennium-exchange-technical-specifications.htm>
- Updated GTP documents available: www.londonstockexchange.com/products-and-services/millennium-exchange/documentation/documentation.htm
- Technical Account Management team: londonTAM@lseg.com / +44 (0)207 797 3939

*Subject to customer readiness and internal testing



Turquoise Updates

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Agenda

- Turquoise “Hard” Brexit Contingency Plan Update
- Turquoise Hardware Refresh



Turquoise “Hard” Brexit Contingency Plans

Turquoise “Hard” Brexit Contingency Plan

The information contained in the pack pertains to the contingency plans of Turquoise in the event of a “no deal” Brexit. In the event of other Brexit outcomes with a transition period, these plans are subject to change.

The plans are designed for a “no deal” Brexit at the end of March 2019, i.e. the UK becomes a third country and there are no transitional arrangements or equivalence agreements between the EU and the UK in place which facilitate cross-border services and related passporting.

Dates contained within this document are subject to regulatory approval and subject to the outcome of the UK-EU Brexit negotiations and any agreed transitional arrangements.

Turquoise

- Turquoise has established a company in Amsterdam to operate a MTF, Turquoise Global Holdings Europe B.V. (Turquoise Europe). This will operate in addition to Turquoise Global Holdings Limited (Turquoise UK).
- Turquoise Europe has submitted an investment firm application to the Autoriteit Financiële Markten (AFM) and is targeting approval in advance of the UK exit from the European Union being effective.
- Turquoise UK will continue to operate a MTF for trading in UK, US and Swiss securities.
- Turquoise Europe will operate a MTF for trading in all other European securities including Norway (subject to regulatory approval). All Turquoise members trading European securities will need to apply for membership of Turquoise Europe.

Turquoise – CDS

- Turquoise Customer Development Service (CDS) will be updated on 05 November 2018 with the Brexit configuration.
- Turquoise CDS environment will be closed on 01 – 02 November 2018 to perform upgrade activities.
- Existing CDS member id's and technical configuration will be configured for Turquoise UK and will only be permitted to enter orders in UK, US and Swiss securities.
- Customers can begin requesting new CDS technical set up for Turquoise Europe by contacting their Technical Account Manager.
- No new physical connectivity is required. Existing gateway IP addressing will remain the same.



Turquoise - Production

- Existing CompIDs and UserIDs will remain for firms trading UK, US and Swiss securities. Customers will only be permitted to submit orders in UK, US and Swiss securities using these ID's. Orders entered in other European securities via these existing CompIDs and UserIDs will be rejected.
- New CompIDs and UserIDs will be assigned to firms trading other European securities on Turquoise Europe. Customers will only be permitted to submit orders in these European securities through these ID's. Orders entered via these new UserIDs in UK or Swiss securities will be rejected.
- Logical connectivity charges will apply to both entities.
- Connectivity for both Turquoise UK and Turquoise Europe will remain in the existing data centres. No new physical connectivity is required. Existing gateway IP ranges will remain the same.

Interface Changes

- 4 new MIC codes will be added to the existing trading and market data messages for Turquoise Europe markets.
 - TQEX – Turquoise Europe, **Turquoise Lit™** (also TGHE NV's Operating MIC)
 - TQEM – Turquoise Europe, **Turquoise Plato™**
 - TQEA – Turquoise Europe, **Turquoise Lit Auctions™**
 - TQEB – Turquoise Europe, **Turquoise NYLON Cash Order Book™**
- Instrument Reference Data files will be updated to include the new MIC codes for Turquoise Europe markets.
- Market Data channels will remain the same. There is not expected to be any changes to commercial offerings.
- Vendors are requested to have separate identifiers for the different execution venues in line with the operation MIC.



Timeline – Hard Brexit Contingency Plan

The timeline below sets out the expected timeframes to support the launch of Turquoise Europe in a ‘no deal’ Brexit scenario (effective 29 March 2019).

Dates below are subject to regulatory approval and dependent on the outcome of Brexit negotiations and any agreed transitional agreements.

- October 2018 – Membership agreement available
- November 2018 – CDS available with new MIC codes for the new European entity
- From November 2018 – Certification and end to end testing
- TBC – Customer Dress Rehearsal and Go-Live dates

Membership Application

- Once membership agreements have been returned to the Membership Team, firms will be provided with access to the Turquoise Europe instance of Member Portal to complete onboarding information.
- Customers will need to contact their CCP (if self-clearing) or their General Clearing Member (if non-clearing member) to request a clearing configuration for Turquoise Europe markets.
- Customers can request new technical configuration through the Turquoise Europe instance of Member Portal.
- Existing Technical Configuration will be assigned to the Turquoise UK member; any changes to the existing configuration should be made through the Turquoise UK instance of the Member Portal.



Checklist – Hard Brexit Contingency Plan

- Submit Membership Application
- Complete on-boarding information in Member Portal
- Request technical enablement
- Request clearing set-up
- Complete Technical Testing and Customer Dress Rehearsal
- Upload short long code mappings in Member Portal



Turquoise - Hardware Refresh

Turquoise – Hardware Refresh

- Hardware across the Turquoise Millennium trading platform will be refreshed.
- No impact to customer software or network configuration.
- This will be a big bang approach, no parallel run.
- Customer connectivity testing window is planned for Saturday 24 November 2018.
- **Go-live planned for Monday 26 November 2018.**
- All dates are subject to completion of internal testing. Final dates will be confirmed in due course.



TRADEcho Updates

Paul Kennedy
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Client Technology Services London

Agenda

- TRADEcho “Hard” Brexit Contingency Plan Update
- TRADEcho Release 11 Update



TRADEcho Brexit Plans

TRADEcho “Hard” Brexit Contingency Plan

The information contained in the pack pertains to the contingency plans of TRADEcho in the event of a “no deal” Brexit. In the event of other Brexit outcomes with a transition period, these plans are subject to change.

The plans are designed for a “no deal” Brexit at the end of March 2019, i.e. the UK becomes a third country and there are no transitional arrangements or equivalence agreements between the EU and the UK in place which facilitate cross-border services and related passporting.

Dates contained within this document are subject to regulatory approval and subject to the outcome of the UK-EU Brexit negotiations and any agreed transitional arrangements.

TRADEcho Future State

- TRADEcho will continue to operate a UK trade reporting service for the combined EU27 & UK instrument universe.
- In addition, TRADEcho will establish a EU APA service in based Amsterdam; TRADEcho applied for approval for the service by the Autoriteit Financiële Markten (AFM).
- Customers will be granted access to the EU APA service in addition to the UK APA service under their current agreements.
- Customers will indicate which APA they are reporting to via the incoming message.
- SRR will remain as a single entity supporting both APAs but will introduce new rules to distinguish reporting obligations in the relevant jurisdiction of the submitter and its counterparty.
- London Stock Exchange will remain a UK Regulated Market, on Exchange trade reports will carry the relevant Regulated Market MIC (XLON) or MTF (XLOM or AIMX) as both venue or execution and venue of publication. They may only be submitted to the UK service.



Interface Changes

- New FIX tag “Target APA” will be introduced in the FIX trade report and SI Quote messages so customers can indicate the APA they want to report:
 - ECHO – TRADEcho UK APA
 - ECEU – TRADEcho EU APA
- **ECEU MIC code should not be used until EU APA goes live next year.**
- GTP messages will disseminate the relevant APA by disseminating the APA MIC code for Venue of Publication.
- No other major changes expected to the trading or market data interfaces.
- Vendors are requested to have a single identifier for both APA's.



Timeline – Hard Brexit Contingency Plan

The timeline below sets out the expected timeframes to support TRADEcho in a hard Brexit scenario (effective 29 March 2019).

Dates below are subject to regulatory approval and dependent on the outcome of Brexit negotiations and any agreed transitional agreements.

- January 2019 – CDS available
- January 2019 – March 2019 – Certification and customer testing
- TBC – Customer Dress Rehearsal and Go-Live dates



TRADEcho Release 11

TRADEcho Release 11 – Main Functional Changes

- Ability to send quotes as a package.
- Acceptance of non-equity trades with a negative monetary price.
- Ability to amend and cancel SRR Trade Reports via portal.
- Full list of changes and fixes being deployed in this release can be found in the Release Notes which will be available prior to CDS go-live.
- Technical specifications will be updated at the following link:
<https://www.londonstockexchange.com/products-and-services/technical-library/millennium-exchange-technical-specifications/millennium-exchange-technical-specifications.htm>

TRADEcho Release 11 - Timeline

The below dates are indicative dates for TRADEcho Release 11. Dates are subject to customer readiness and internal testing. Final confirmation of dates will be communicated in due course.

- Documentation expected to be available
- CDS deployment 9 November
- **Go-live date 3 December**



Borsa Italiana Update

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MIT Release 9.3 (1)

- New functionalities delivered with the new Release 9.3 are:
 - Trade Amendments (Price and/or Quantity), available for all Retained Trades until S-1 with the dissemination of ER and TCR messages
 - Auto RFQ - the *Requestor* will have the possibility to instruct the system to automatically execute (under a set of conditions defined by the Trader) a RFQ without sending the Quote Response message.
- Conformance Test is mandatory for all proprietary applications/ISVs that implemented RFQ submit (via both FIX and Native protocols).
- Self Certification Checklist is mandatory for the management of Trade Amendments (for all applications).

MIT Release 9.3 (2)

Key Dates

- Technical Specification -> published in July 2018
- CDS -> available since 12 September 2018
- Customer Dress Rehearsals -> Saturday 27 October 2018 (mandatory for all trading participants)
- Go-Live -> 12 November 2018 (TBC , subject to customers' readiness)

On Saturday 10 November a pre-go-live login session will be scheduled.

MIT, MITCH and GTP Update (1)

- During 2019, Hardware on which the MIT platform runs will be replaced for both Borsa Italiana and EuroTLX.
- No changes to Native and FIX Trading Protocol are planned to happen together with the Hardware Refresh.
- Customer Dress Rehearsals will be organized prior the go-live.
- One of the key objectives of the project are to provide customers with a significant improvement of performances and to support new services.

MIT, MITCH and GTP Update (2)

Together with the Hardware Refresh:

- The MITCH service will be decommissioned (Market Data for markets running on the MIT platform will be disseminated via the GTP and GTP Lite services only).
- FPGA will be introduced on GTP FDI channels for both Borsa Italiana and EuroTLX markets.
 - No protocol changes are planned to happen following the FPGA introduction.
 - Performances will significantly improve.
- C feed for GTP service will not be available anymore, only B feed will be available from the SDC in case of failover.

MIT, MITCH and GTP Update (3)

Platform Failover procedures change:

- Currently, the MIT platform runs in Active-Active mode (warm back-up): the Secondary Instance of the Matching Engine is always active and is aligned in real-time by the Primary one and in case of Failover/Disaster Recovery it does not need to be re-started.
- After the HW refresh, the MIT platform will run in Active-Passive mode (cold back-up): the Secondary Instance of the Matching Engine will not active and will need to be re-started in case of Failover/Disaster Recovery.
- Active-Passive mode is the standard for all other LSEG Venues (including IDEM) and performances will improve having a cold back-up failover (internal latency will decrease).

Other On-Going Projects (1)

- Together with the MIT 9.3 go-live, the new *preferred ccp* model will be made available for customers.
- In addition to CC&G (participation in CC&G will remain mandatory), a second Central Counter Party (EuroCCP) will be available for customers.
- This new model will be available for a subset of instruments traded on MTA, BitGEM and ETFPlus markets.
- Trades will only be guaranteed by the *preferred ccp* when both trading members have opted for the same *preferred ccp*, otherwise they will be guaranteed by CC&G.
- New CompIDs (dedicated and different from the existing ones) will be requested and assigned to the *preferred ccp* upon customers' request.

Other On-Going Projects (2)

- In January 2019 (TBC, subject to regulatory approval), tick size for bilateral negotiated transactions on Index Futures and Mini Futures will be reduced to 1 index point.
- No impacts on trading protocols are planned for the above change.
- Sponsored Access will be launched on Borsa Italiana markets in 2019 (further information and firm dates will be provided in due course).



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OSLO BØRS

OSLO STOCK EXCHANGE

Oslo Børs Update

Technical User Group

LONDON, 15 OCTOBER 2018

Millennium 9.3 Changes I

- Minimum Execution Size for Turquoise Lit Auctions™ on Oslo Børs
 - FIX Trading: NewOrder-Single, OrderCancel/Replace Request and ExecutionReport – MinQty(110) available for Turquoise Lit Auctions™ Orderbook (A).
 - Native Trading: ExecutionReport, NewOrder and OrderModificationRequest – Minimum Quantity available.
 - Drop Copy: ExecutionReport – MinQty(110) available for Turquoise Lit Auctions™ orders.
- Market Identification Code (MIC) on execution reports
 - FIX Trading: Execution Report and Execution Report-Quotes – Added LastMkt(30) as the MIC for execution.
 - Native Trading: Execution Report – Added Execution Venue as the MIC for execution.
 - Drop Copy: Execution Report – Added LastMkt(30).

Millennium 9.3 Changes II

- Trade Amendments (based on MiFID II, RTS1, Article 12-3)
 - Trade Amendments of reported trades can be initiated by contacting Oslo Børs Market Operations.
 1. Cancellation of previously published trade on T+0
 2. Insert of new trade with AMND flag and populated OrigTradeID
 3. Results of trade amendments are visible in:
 - Post Trade: TradeCaptureReport - New field OrigTradeID(1126) added.
 - FIX FAST: Market Data Incremental Refresh - MDEntryRefID(280) added. Contains the MDEntryID of the original trade.
 - MITCH: OffBookTrade, RecoveryTrade and EnhancedTrade - New field OrigTradeID added.
- Oslo Børs Millennium Reference data
 - Instrument File Record Layout – Added enum “ToTV”. Relates to all instrument types, but especially relevant for fixed income instruments.

Millennium 9.3 Changes III

- **Micro Auctions Uncross Algorithm – functional change**
 - No protocol changes
 - New uncross solution uses the same algorithm as regular trading/automatch as opposed to current reopening auction call algorithm today.
 - Orders can execute against more than one orderbook level, resulting in auction trades traded on different execution prices.
 - No order modifications, only cancellations during auction call.
- **Request for Quote (bonds)**
 - Changes to flow charts for RFQ messages, bonds only.

Oslo Børs Brexit update

- Remain physical location in Norway
- Remain hardware location in London - no changes to infrastructure
- ARM partnership for third country regulatory reporting (TRM)
- Prepare for continuation of UK memberships and onboarding of new members from European legal entities



Q & A