IT Webinar Nasdaq Nordics

Equity Derivatives Trading Replatforming

October 22 2020
Agenda

• Introduction
  Pelle Fröling

• Equity Derivatives
  • Technical Impact
    Anders Bergström
  • Market Model and Data
    Joakim Fernlund/Lise Mejlholm
  • Onboarding
    Riitta Pesiö

• INETCash Equity
  Ronny Thellman

• Nasdaq Europe Connectivity Services
  Richard Gaudy
Introducing Nasdaq Financial Framework
Nasdaq Financial Framework - NFF

Resilience
- Distributed Architecture
- Improved market monitoring and support

Efficiency
- Aligning trading venues across continents and products
- Reducing and modernizing protocols
- Commonality between Cash Equities and Equity Derivatives

Agility
- Reduced time to market
- Lower cost of ownership

Nordic Derivatives Trading System
Current Landscape

**INET Nordic**

- Cash Equities Trading
- GUI – Nordic Workstation

**Protocols:**
- FIX (order entry, drop)
- OUCH (order entry)
- ITCH (Market Data)
- GCF (Market Data)
- Glimpse (Market Data)

**Genium INET℠**

- Equity Derivative Trading
- Fixed Income Trading
- Commodities Trading
- Clearing – Eq. Derivatives, Fixed Income & Commodities
- GUI – Trading Workstation
- All CCP Front-Ends & Surrounding Systems

**Protocols:**
- FIX (order entry, drop)
- OMnet (order entry, Market Data),
- ITCH (Market Data)
- GCF (Market Data)
- AMD (Market Data)
- Glimpse (Market Data)
Nordic Derivatives Trading System

**Future Platform**
- Same platform live in the US (Nasdaq BX Options)
- Based on INET technology leveraging the Nasdaq Financial Framework (NFF) program
- Protocols
  - Order Entry: OUCH, FIX
  - Market Data: ITCH, GCF, AMD, Glimpse

**Front-End GUI**
- Equity Derivatives and Cash Equities will migrate to a New GUI
  - Beginning with Cash Equities - EOY

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**Future Landscape**

**Nordic Derivatives Trading System**

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**Genium INET™**

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- FIX (order entry, drop)
- OMnet (order entry)
- AMD (Market Data)
- ITCH (Market Data)
- GCF (Market Data)

**INET Nordic**

**Protocols:**
- FIX (order entry, drop)
- OUCH (order entry)
- ITCH (Market Data)
- GCF (Market Data)
Protocols

• OUCH - with SoupBinTCP as transport layer
• FIX - 5.0 SP 2 new protocol specification
• ITCH - Multicast only, new protocol specification
• AMD - new protocol specification
• Glimpse - new protocol specification
Supporting documents

• Protocol specifications FIX, OUCH, ITCH, AMD, GLIMPSE
• Mapping table OMnet/FIX to OUCH/FIX
• Mapping table FIX/OUCH to ITCH/GCF
• Protocol Identifiers
New system set up between trading and clearing

Nordic Derivatives Trading System

- Trading engine
- Trade registration facility
- Market data feeds
- Order entry and drop copy ports
- Trading reference data

Genium INET℠

- All clearing activity
- Clearing reference data and reference data shared between clearing and trading
  - e.g. instrument data, participant data, etc.

Trading → Trades, Ref Data, Prices → Clearing
Impact on Genium INET Clearing

• Only clearing related functionality and information will continue to be available from Genium INET, and a separate connection to the new trading system may be required to obtain certain information today received over one connection.

• The new Nordic Derivatives Trading System will be separated from the Genium INET platform with as little impact on Genium INET Clearing as possible and with no mandatory changes planned.

• Nasdaq Clearing will remain on the existing Genium INET platform and the tools and support team will remain unchanged.

• The new Nordic Derivatives Trading System and the Genium INET platform will communicate via gateways.
Project Timeline

<table>
<thead>
<tr>
<th>Year</th>
<th>Month</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>Mar</td>
<td>Project buy-in, Announcement</td>
</tr>
<tr>
<td>2020</td>
<td>Apr</td>
<td>Tools and processes developed</td>
</tr>
<tr>
<td>2020</td>
<td>May</td>
<td>Infrastructure Connection testing</td>
</tr>
<tr>
<td>2020</td>
<td>Jun</td>
<td>Draft Protocol specifications / Market Model available</td>
</tr>
<tr>
<td>2020</td>
<td>Jul</td>
<td>Participant Briefings</td>
</tr>
<tr>
<td>2020</td>
<td>Aug</td>
<td>Complete trading functionality and final protocol and market model specs</td>
</tr>
<tr>
<td>2020</td>
<td>Sep</td>
<td>Complete end to end including Clearing Gateway</td>
</tr>
<tr>
<td>2020</td>
<td>Oct</td>
<td>Onboarding and development</td>
</tr>
<tr>
<td>2020</td>
<td>Nov</td>
<td>Preproduction environment</td>
</tr>
<tr>
<td>2020</td>
<td>Dec</td>
<td>Certification Period</td>
</tr>
<tr>
<td>2021</td>
<td>Jan</td>
<td>All Participants Certified</td>
</tr>
<tr>
<td>2021</td>
<td>Feb</td>
<td>Test system environment</td>
</tr>
<tr>
<td>2021</td>
<td>Mar</td>
<td>Go-Live End 2021</td>
</tr>
<tr>
<td>2021</td>
<td>Apr</td>
<td>Backup Period</td>
</tr>
<tr>
<td>2021</td>
<td>May</td>
<td>Backup Feb 2022</td>
</tr>
<tr>
<td>2021</td>
<td>Jun</td>
<td>Onboarding and development</td>
</tr>
<tr>
<td>2021</td>
<td>Jul</td>
<td>Transition Period</td>
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<tr>
<td>2021</td>
<td>Aug</td>
<td>Backup Period</td>
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<tr>
<td>2021</td>
<td>Sep</td>
<td>Backup Period</td>
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<tr>
<td>2021</td>
<td>Oct</td>
<td>Backup Period</td>
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<tr>
<td>2021</td>
<td>Nov</td>
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<tr>
<td>2021</td>
<td>Dec</td>
<td>Backup Period</td>
</tr>
<tr>
<td>2022</td>
<td>Jan</td>
<td>Backup Period</td>
</tr>
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<td>Feb</td>
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- Aug: Backup Period
- Sep: Backup Period
- Oct: Backup Period
- Nov: Backup Period
- Dec: Backup Period
- Jan: Backup Period
- Feb: Backup Period
Market Model & Business Functionality
Migration Overview

• The **existing scope of equity derivative instruments** traded on Nasdaq Stockholm will be maintained and the following market segments will be covered by the trading re-platform:
  • Swedish Equity Derivatives (SEED)
  • Danish Equity Derivatives (DKED)
  • Finnish Equity Derivatives (FIED)
  • Norwegian Equity Derivatives (NOED)
  • Pan-Nordic (VINX) Equity Derivatives (PNED)

• Existing **Market Participant (MPID) and Trader IDs** will be migrated to the **new trading system** and these same MPIDs will be reflected in the **clearing system**

• Overall the **market model for equity derivatives** will be maintained and a similar scope of business functionality will be offered as today

• A number of **new features** will be introduced, the behaviour of certain existing functionality will be **changed** and some underutilised or non-standard order types and validities will be **decommissioned** or replaced

• A draft version of the **market model document** describing the business functionality in detail together with a specification of **functional changes** will be available in late November 2020
Trading & Market Data Interfaces
## Trading Protocols Overview

<table>
<thead>
<tr>
<th>Functionality</th>
<th>OUCH</th>
<th>FIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Orders</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Market Making</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Quote Requests</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>User-Defined Combinations</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Flexible Instrument Request</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Off-Book Trade Reporting</td>
<td>-</td>
<td>✓*</td>
</tr>
<tr>
<td>Trade Cancels/Corrections</td>
<td>✓ (Orders/Quotes)</td>
<td>✓</td>
</tr>
<tr>
<td>Order Drop Copy</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Trade Drop Copy</td>
<td>✓ (Quote Fills)</td>
<td>✓</td>
</tr>
<tr>
<td>Self-Match Prevention</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Cancel on Disconnect</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Kill Switch Request</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>User-Defined Risk Settings (“PRM”)</td>
<td>✓</td>
<td>-</td>
</tr>
</tbody>
</table>

- **Order entry and market maker functionalities will be available on the same **new OUCH port**.
- **General order and trade reporting functionality continues to be supported with standard **FIX messaging**, via the same FIX session.
- **Separate FIX drop sessions will be used for order and/or trade copies based on flexible criteria.**

*Flexible OTC trades* may still be registered directly in the clearing system.
Market Data Feeds Overview

<table>
<thead>
<tr>
<th>Functionality</th>
<th>ITCH</th>
<th>AMD</th>
<th>GCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order &amp; Quote Level Data</td>
<td>✓</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Price Level Aggregated Data</td>
<td>-</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Net Order Imbalance Info</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Quote Requests</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Order Book Trades</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>(executions)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-Book Trades</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Trade Cancels/Corrections</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Trade Statistics, Settlement Prices &amp;OI</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Market Status</td>
<td>✓</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Instrument Ref Data</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Tick Size Tables</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Trading Ref Data</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

- **New ITCH feed**
  - Transaction data
  - Low latency
  - Off-book trades and trade cancels/corrections added enabling a complete trade feed

- **New Auxiliary Market Data Feed**
  - ITCH like format
  - Additional data which is not part of the ITCH feed (open interest, settlement prices etc)

- **Genium Consolidated Feed (GCF)**
  - Limited impact
  - New source
  - New message: Quote Request
  - External Test environment available at the latest in Q1 2021.

- **File Delivery Services (FDS)**
  - Limited impact
  - Same changes as for GCF
Important Considerations

• Today order management functionality and reference/market data are available on the same OMnet connection. A similar model will not be available after the trading re-platform.

• Today back office user types have access to market statistics calculated within the trading system via OMnet. Following the trading re-platform this information will no longer be available and need to be sourced from a separate market data service.

• Since trading and clearing systems are integrated, today trading user types can get information about post-trade allocations and trade give-ups carried out in the clearing system. This will not be possible following the trading re-platform, and a connection to the clearing system will be required to obtain such clearing trade information.

• Reference data on OMnet includes various market model parameters (order type rules, trading session lists, non-trading/half days, etc.). Following the trading re-platform and depending on the type of parameters, the information will be available in specifications or via GCF/FDS.

• Today MM obligations are available to market makers via OMnet reference data. This information will instead be provided via files following the re-platform.
Key Functional Changes
The Trading Day

- **Trading hours and holidays/half-days** concepts will be maintained based on country segment.

- Price/time and pro-rata **matching methods** will be maintained and assigned at a product level. There will be some changes to how implied and hidden reserve volumes are handled in the trade priority order:
  - **Implied orders** will trade after outright at the same price. Today implieds’ are ranked as normal orders.
  - If part of an aggressive order is not filled after trading displayed volume, **hidden reserve** at the best price will trade in time of entry order or on a pro-rata basis. Today the reserve orders trade as if they logically were refreshed on a round robin basis.

- Technically **index options** will only enter states of the trading session that are relevant as per their logical trading hours and no longer follow the related futures contracts through states where options trading is disabled (opening/closing auctions and extended hours sessions).

- The **trading phase and halt codes** identifying the active state on the ITCH feed will be changed compared to today. The new enumerations will be available in the protocol specification.
Orders & Quotes (1/2)

- **Reserve (iceberg) orders:**
  - New **refresh type** (partial or full execution) and **display method** (initial or random) attributes are introduced.
  - Every automatic refresh of display volume will generate a **new order ID on market data**. Today the same ID is kept.

- **Stop orders:**
  - **GTD/GTC** validities will be supported in addition to day, IOC and FOK validities.
  - Buy (sell) stop orders will trigger on **upwards (downwards) price movements** (both directions are possible today). It will no longer be possible to enter orders with a stop condition that is met already on arrival.

- There will be separate **mass-cancel messages** for orders and quotes. Today a mass-cancel option does not exist for FIX, and it is not possible to explicitly cancel quotes separately from orders on OMnet.

- **Quote protection** mechanism will have corresponding limits as today (cumulative quantity, delta) with additional vega measure \[ \left( \text{bought calls} + \text{bought puts} \right) - \left( \text{sold calls} + \text{sold puts} \right) \] introduced.

- **Self-match prevention** mechanism is extended to cover quotes. Today only single orders are covered.
Orders & Quotes (2/2)

- **On-Open/On-Close Order** handling will be simplified using standard time conditions, the activation and time validity will no longer be independent conditions.

- All **order expirations** will be notified on the trading protocols at the end of the relevant trading session. Today notifications are only sent for orders in Swedish index futures when expired before the post-trading session.

- **Market-to-limit orders** will be decommissioned due to limited use and partly overlapping functionality with normal market orders.

- Order validity **“good-for-session” is decommissioned.** Day orders entered before the post-trading session will automatically expire after the closing and on-open/on-close or IOC conditions can be used to limit an order’s participation to a certain auction period.
Pre- & Post-Trade Information

• **Futures Auctions:**
  - Pre-trade transparency will be harmonised with cash equities and limited to net order imbalance indicator (NOII) information sent in real-time. Market-by-level (5 prices) will no longer be disseminated.
  - ITCH messaging will be harmonised with cash equities, an order mass-delete message will disable market-by-order (instead of individual deletes) and a dedicated auction trade message will be sent when the book uncrosses.

• **Quotes** will be disseminated on ITCH with a new two-sided message covering both cancel + entry. This saves bandwidth compared to today where normal add/deletes messages are sent. The change means it will be possible to identify quotes separately from orders in order book viewers.

• **Trade cancels/corrections** will be notified on FIX using execution reports for order book trades and trade capture reports for off-book. Today trade capture reports are used for both.

• **Post-trade allocations and give-ups** continues to be processed and carried out in the clearing system. To receive information about trade changes in the clearing system, a clearing interface connection will be required.
Other Functionality

- **Pre-trade price controls** will have updated business logic for determining the reference price and acceptable price variations. Additionally a new **market order spread protection** feature will be introduced to reject market orders in case the BBO spread is too wide. Today the order is traded within the extended price band determined from an alternative reference price.

- **Order throttling functionality** will reject order entries in case the throttle limit is exceeded within the sliding time window, as opposed to queuing messages. Open orders/quotes will still be possible to cancel when limit has been exceeded.

- A **kill switch request** will be supported via the trading protocols, which if triggered will mass-cancel all open orders and quotes for a participant and prevent further entries until trading is re-enabled.

- **Pre-defined futures spreads** buying second month/selling first month (the current roll) will be available at all times for an index underlying. The third month/second month spread will no longer be listed.

- Scope of **user-defined combinations** is extended to support free-format strategies (e.g. 2:3 ratio) alongside current recognised strategies with standard definitions (price and time spread, straddles/strangles, etc.). The free-format strategies will no be covered by market maker obligations and will not support implied trading.

- **Implied orders** will be disseminated on the legs of two-legged combos when they are best price. Today implied depth beyond BBO is disseminated and implied orders are generated also for some three- and four-legged strategies.
Nordic Derivatives Trading System

Onboarding
## Onboarding activities

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct 2020</td>
<td>IP Prefix document and Connectivity Guideline for Test (NTF) published</td>
</tr>
<tr>
<td>Nov 2020</td>
<td>Member Administrators to assign project contact in the Member Portal</td>
</tr>
<tr>
<td>Dec 2020</td>
<td>Possible to order ports to Test (NTF)</td>
</tr>
<tr>
<td>March 2021</td>
<td>Test Environment (NTF) with full trading functionality available</td>
</tr>
<tr>
<td>H1/2021</td>
<td>IP Prefix document and Connectivity Guideline for Pre-Production/Production published</td>
</tr>
<tr>
<td>June-Sept 2021</td>
<td>Certification of ISV and client trading applications</td>
</tr>
<tr>
<td>Oct 2021</td>
<td>Market Wide Acceptance Test (MWAT) and Production verification</td>
</tr>
<tr>
<td>End of 2021</td>
<td>Launch of the new platform for Equity Derivatives Trading</td>
</tr>
</tbody>
</table>
Communication – Project webpage

Communication – IT-Notices

Communication – Member Portal Actions

Nasdaq Member Portal > My Required Actions: https://memberportal.nasdaq.com/
INET Nordic Future Enhancements

- NW 2.0 – Replacement of current Nordic Workstation
- PRM Account – Introducing PRM protocol
- MMF – MMO for Danish Investment Funds
- QTSP – New routing strategy
- Aggressive MMOs setting the price after pause
- Exchange Traded Notes & Exchange Traded Commodities (ETN & ETC)
Nordic Workstation 2.0 – Replacement of current Nordic Workstation - Why?

- Nordic Workstation is based on Flash programming language which will no longer be supported starting from 2021.
- Nasdaq is working with an external trading application vendor to build a second generation Nordic Workstation.
- It gives you enhanced usability with next generation trading and data visualization.
- Nordic workstation 2.0 is a web based application that allows seamless access and minimal infrastructure footprint on the client side.
Nordic Workstation 2.0 – Product Details

• Custom built front end supporting all available order/trading functionalities in INET Nordic through FIX.
• Web based customizable trading interface
• First line support and user management by Nasdaq Cash Equity Operations
• Option to use the application as PRM GUI
• Required MiFID II features included
Pricing & Agreement

Enhanced Front End application that you can use for primary trading or back-up:

- Same service fees as for current Workstation will apply
  - EUR 250/User account
  - No additional connectivity cost

- Your current client agreement rolls over to cover Nordic Workstation 2.0 (Terms and Conditions may be subject to minor changes).

Nordic Workstation 2.0 is therefore an upgraded version of your current set up, which is easy for you to deploy.
How do I get access to Nordic Workstation 2.0?

• Nordic Workstation 2.0 will be available in November
• Current Nordic Workstation Production User Accounts will be copied to NW 2.0. An e-mail will be sent to all users with all details.

• BETA testing of NW 2.0 is available in INET Test NTF.
• To request for, and removal of, beta user accounts, use the Member Portal form https://memberportal.nasdaq.com/client/#/requests/new/BETA-NordicWorkstation2
PRM Account – Introducing PRM protocol

• In addition to manage PRM settings via the Nordic Workstation 2.0 GUI, an API will be introduced to manage PRM settings on PRM Accounts

• The PRM Account protocol is based on SoupBinTCP (same as for OUCH)

• PRM Account requests will be available in Member Portal

• More information will be published separately
INET Production Site Failover Test on Nov 28

• All clients are invited to participate in a INET Nordic Production Site Failover Test on Saturday November 28, 10-13 CET.
• The intention is for clients to verify their site failover capabilities.
• Clients participating shall login to Site A, primary ports.
• Nasdaq will perform a site failover, when completed clients can verify that they have been able to login successfully to Site B, to their Secondary/Failover ports.
• Registration is open by sending a Verification and Report form according to IT-Notice 50/20. The form is attached to the IT-Notice.
• After the test, the same form shall be used to report clients result.
Communication and where to find more information


- INET Nordic Protocol Specifications:

- INET Nordic Environments (Production and NTF information, Conformance Testing):

- Nordic Workstation:

- Nasdaq Member Portal: [https://memberportal.nasdaq.com/](https://memberportal.nasdaq.com/)
Nasdaq Europe TMS
Co-location & Connectivity Services
Nasdaq POP aka Node

One single connection
One single connection to NODE provides you with unsurpassed access to our complete variety of asset classes and financial services from over 8 Exchanges and Clearing Houses operated by Nasdaq from Stockholm.

Available services

Access to over 8 Exchanges and Clearing Houses operated by Nasdaq from Stockholm.

Equinix LD4
Interxion Lon1
Equinix Frankfurt FR2
NEW Interxion Kista
Nasdaq Express Connect & RF aka Microwave

- RF Interxion Lon1 17,1ms RTT
  - 5Mb bandwidth service
  - Market Data service planned for 2021

- Nasdaq Express Connect Fiber service available 1Gb and 10Gb
  - Latency 19,8ms RTT
  - An improved latency sub 19,6ms RTT service to be offered by 1\textsuperscript{st} March 2021
European Market Connectivity Services - access to the Nasdaq European platforms

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