FIX and High Performance Trading Technology

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Setting the scene...

• Why talk about FIX and High Performance?
• Is FIX more than just an interface?
• How has FIX been deployed in the past?
• What is needed to take FIX to the next level?
Performance is impacted by...

- Network Infrastructure
- Hardware
- Software
- Databases
- Interfaces
  - Encoding / Syntax
  - Alignment of interfaces and applications
  - Semantic verbosity of interfaces
**FIX Application and Transport Layer**

- **FIX semantics layer (application)** consists of one or more concepts for each business functionality.
- **FIX syntax layer** offers ASCII, XML and binary representations of the FIX semantics.
- **FAST** is currently the only binary representation offered by FIX.
- **FIX session layer** allows FIX and non-FIX transports as of FIX 5.0.
- **TCP/IP** is used for transactions, multicast only for market data.

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Diagram:

- **FIX Semantic**
  - Concept
  - Concept
  - Concept
  - Concept

- **FIX Syntax**
  - FIXatdl
  - Tag=Value
  - FIXML
  - FAST
  - FIX over FAST

- **[FIX] Session**
  - FIXT
  - AMQP
  - Commercial Product
  - Proprietary Implementation

- **Network**
  - TCP/IP
  - Multicast
  - ...

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Structural Changes with FIX 5.0

FIX 5.0 Unlocks the Application Layer From the Session Layer

FIX 4.0, 4.1, 4.2, 4.3, 4.4

- FIX Application Layer
- FIX Session Layer

FIX 5.0

- FIX Application Layer
- FIX Session Layer

Application Versioning

Transport Independence
Encoding / Syntax

• FIXatdl
  – <Strategy name="Tazer1" uiRep="Tazer" wireValue="Tazer" version="1" fixMsgType="D" providerID="ABC">...

• FIX tag=value
  – 8=FIX.4.2^9=92^35=A^49=BOFASEC0^...

• FIXML
  – <IOI IOIID="4711" TransTyp="N" Side="2" Qty="200"...>

• FAST
  – FAST Templates describe message layouts
  – 81 84 41 4C CC 01 EA 91 82 E0 B1 FF 99 E0 B0

Increase of wire level legibility decreases performance!
Alignment of Interfaces and Applications

• Data Types
  – ASCII versus binary
  – MultipleCharValue, MultipleStringValue

• Entity Identification
  – IDs for Order, quotes, trades may be assigned by sender or receiver

• Transaction Models
  – 1:n translation (replication)
  – n:1 translation (bundling)

• Recovery Models
  – FIX Session Layer
  – FIX Application Sequencing
Semantic Verbosity of Interfaces

• Mandatory versus optional fields
  – AvgPx is optional as of FIX 5.0
  – Order Cancel Request requires not only an order identifier and an instrument but also the side and order quantity

• Explicit versus implicit information
  – Single Execution Report for IOC/FOK orders
  – FIX 5.0 SP1 Specification Volume 7: Exchanges and Markets

• Message bundling
  – Multiple fills of the same order in a single Execution Report (SP1)
  – Mass action messages that can be optimized by receiver

• Echo of input from requests
  – Order submitter does not need attributes that do not change
FIX Order State Changes

- **New**
  - Accept order with immediate partial fill
  - Accept order with immediate expiry (FOK, IOC)
  - (Reject of acc’d order) Expiry
  - Partial Execution
  - “Overnight” store (GT orders)

- **Rejected**
  - Reject on entry

- **Suspended**
  - Partial Execution
  - Reinstatement

- **Partially Filled**
  - Start of Day Activation (GT orders)
  - “Overnight” store (GT orders)
  - Partial Execution or reinstatement

- **Filled**
  - Full Execution
  - Start of Day Activation (GT orders)

- **Canceled**
  - Ended due to corporate action
  - Cancel from Book

- **Expired**
  - Full Execution
  - Expire

- **Done for Day**
  - Accept order with immediate partial fill
  - Accept order with immediate complete fill
  - Cancel from Book

- **Overnight” store** (GT orders)
Deutsche Börse Interfaces using FIX

- **International Securities Exchange (ISE)**
  - FIX 5.0 SP2 over Binary for Trading and Market Making
  - FIX 5.0 SP2 over FAST 1.2 for Reference and Market Data
  - FIX 4.2, 4.3, 4.4 over FIX Engine for Order Routing

- **Eurex**
  - FIXML 5.0 SP2 over AMQP for real-time Risk Management
  - FIXML 5.0 SP2 over AMQP for Clearing & OTC Trade Entry

- **Eurex and Xetra**
  - FIX 4.2, FIX 4.4 over FIX Engine for Order Routing
  - FIX 5.0 SP2 over FAST 1.2 for netted Market Data
Conclusion

• FIX is a universal language for the financial industry, not just a technology.
• FIX can be used for many different interface types in combination with the appropriate transport.
• High performance can be achieved with FIX by integrating FIX semantics into the core system and using a binary transport.
• Gateways conveying FIX messages between internal and external applications can then be designed to be stateless.
Questions?