American Century Investments

FIXML: Advancing FIX standards and developing implementation plans powering financial communications

Scott Atwell
scott_atwell@americancentury.com

Feb 26, 2001   American Century - Marcus Evans FIXML Training Class - New York
Agenda

- Institutional communication categories
- FIX today & industry trends
- FIX organization
- FIX message flow and technical overview
- Buyside case study: American Century
- FIX 4.2 overview
- Industry Standards
- XML
- FIXML
American Century

- Investment Manager
- Manages over $105 billion in assets
- Headquarters in Kansas City, Missouri
- Formerly named Twentieth Century and the Benham Group
- Live with FIX since April 1996
Speaker’s Background

- Co-chair of the FIX Technical Committee
- Member of FIX Global Steering Committee
- Member of FIX US Steering Committee since 1995
- GSTPA technical subcommittee member
- Developed American Century’s FIX engine and interface to Order Mgmt System
- AC has been live with FIX since April 1996
Institutional Trading
Communication Categories
Who?

Investment Manager

Broker/Dealer

Custodian

Depository

Local Custodian

Local Custodian

Custodian
What?

- Broker Research: Research Reports
- Pre-Trade: IOIs, Advertisements, News
- Trade: Orders, Confirmations, Fills
- Post-Trade: Allocations, Settlement Inst
- Clearing/Settlement: Backoffices to custodians
When?

- Broker Research: Research Reports
  - as written/available
- Pre-Trade: IOIs, Advertisements, News
  - real-time
- Trade: Orders, Confirmations, Fills
  - real-time
- Post-Trade: Allocations, Settlement Inst
  - end of trading day
- Clearing/Settlement: Backoffices to custodians
  - end of day (typically batch-driven)
How?

- Broker Research: Research Reports
  - paper, web-sites, vendor systems, (future) RIXML
- Pre-Trade: IOIs, Advertisements, News
  - phone calls, FIX, vendor systems, fax
- Trade: Orders, Confirmations, Fills
  - phone calls, FIX, vendor systems
- Post-Trade: Allocations, Settlement Inst
  - vendor systems, fax, FIX, (future) GSTPA
- Clearing/Settlement: Backoffices to custodians
  - vendor systems, fax, ISITC, SWIFT (ISO 15022)
Why?

- **Standard data formats**
  - Allow systems to scale and process data from many counterparties w/o incremental effort

- **Standard real-time session-level transport**
  - Allow systems to scale and communicate with many counterparties w/o incremental effort

- **Combination**
  - Enables automated processing into/out of OMS and Settlement systems--focus on exceptions
  - Commoditization, vendor solutions available
American Century’s STP Today

- Use broker web sites and vendor systems to access broker research
  - Member of the RIXML initiative
- Use FIX for all pre-trade, trade, and post-trade communication with brokers in real-time
- Use ISITC for batch-driven communication with custodians
- GSTPA member firm
FIX Today and Industry Trends related to FIX
FIX Today

- A standard messaging protocol to communicate trading information electronically between buy-side institutions, brokers, and markets.
- A flexible means of handling many types of financial instruments and transactions - global in nature.
- Platform independent, so it works on many types of computers and communications systems.
- The FIX website is the central point of reference and communication for all things FIX:
  - www.fixprotocol.org
Recently Survey - Spring, 1999

Enterprise Technology Corporation (ETC) surveyed nearly 900 senior executives from several hundred buy-side and sell-side firms on their current utilization as well as future plans for deployment of equity trading technology.

Key Findings

- 82% of firms, buy-side and sell-side, execute at least some of their trades via ECNs/ATSs.
- 78% of brokers and 59% of buy-side institutions utilize order routing networks for some of their orders/executions.
- 31% of the surveyed institutions use FIX:
  - 82% of brokers use FIX.
  - 77% of buy-side firms not using FIX plan to use it in 2000.
Why FIX usage is increasing?

Technical Reasons

- Delivers information in real-time
- Provides platform and vendor independence
- Eliminates proprietary interfaces and coding of multiple message formats which reduces amount of time to connect
- Guarantees order message delivery
- Supports data security (encryption)
- Supports multiple currencies and instrument types
- Allows for cost-effective connectivity
Why FIX usage is increasing?

Business Reasons

- Accommodates higher volumes
- Widely adopted
- Prepares firms for shortened settlement cycles
- Enables front to back STP
- Promotes liquidity through IOIs
- Responds quickly to industry changes
- Leverages the active participation of industry experts via working groups
Industry Trends

Obvious Conclusions

– Electronic Connectivity is a no longer a luxury - It is mandatory to remain competitive.

– This is being forced by the growing demands of STP, increasing trade volumes, search for liquidity, and other industry changes.

– FIX is the defacto standard for trade communication.

– FIX is now a commodity - there is a proliferation of FIX enabled products in the marketplace.
FIX Organization
The FIX Protocol is directed by FIX Protocol, Ltd (FPL).

The Global Committee oversees all regional committees, authorizes budgets and expenditures, and prioritizes objectives.

The Technical Committee maintains the FIX Technical Specification.

The Regional committees provide business direction.

Working groups provide the business and technical expertise for ongoing development and initiatives.
Mission Statement

To improve the global trading process by defining, managing, and promoting an open protocol for real-time, electronic communication between industry participants, while complementing industry standards.
Global Steering Committee

Regional Steering Committees

Business Working Groups

Technical Working Groups

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US Steering Committee

Institutions:
Alliance Capital
American Century
Credit Suisse Asset Management
Fidelity Mgmt & Research
Putnam
State Street Global Advisors
The Capital Group

Brokers:
Credit Suisse First Boston
Fidelity Capital Markets
Goldman Sachs
Merrill Lynch
Morgan Stanley Dean Witter
Salomon Smith Barney
UBS Warburg

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European Steering Committee

**Institutions:**
- Alliance Capital
- AXA Sun Life
- Dresdner RCM
- Fidelity International
- Foreign & Colonial Mgmt.
- Invesco
- Mercury Asset Mgmt
- Prudential Portfolio Mgrs
- Robert Fleming
- Royal Sun Alliance

**Brokers:**
- Credit Suisse First Boston
- Deutsche Bank
- Goldman Sachs
- HSBC
- Instinet
- Lehman Brothers
- Merrill Lynch International
- Salomon Smith Barney
- UBS Warburg
Japanese Steering Committee

Institutions:
Barclays Capital
Chumitsui Trust and Banking
Daiwa Bank
DLIBJ Asset Management
Mitsubishi Trust and Banking
Mitsui Trust and Banking
Nikko Asset Management
Nippon Life Insurance Company
Nomura Asset Management
Sumitomo Trust and Banking

Brokers:
Daiwa Securities
Goldman Sachs
Lehman Brothers
Merrill Lynch
Morgan Stanley
Nikko Salomon Smith Barney
Nomura Securities
UBS Warburg

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# Asia Pacific Steering Committee

## Institutions:
- American Century
- Capital Research
- Dresdner RCM
- Fidelity Investments HK
- Janus
- Jardine Fleming Asset Mgmt

## Brokers:
- Deutsche Securities
- Goldman Sachs
- ING-Baring
- Morgan Stanley Dean Witter
- Salomon Smith Barney
- UBS Warburg
Technical Committee

American Century
Credit Suisse Asset Mgmt
Credit Suisse First Boston
Fidelity Capital Markets
Fidelity Investments
Goldman Sachs
Instinet
LaSalle Technology/CBOE

Merrill Lynch
Morgan Stanley, DW&D
Putnam Investments
Salomon Smith Barney
State Street Global Advisors
Townsend Analytics, Ltd.
UBS Warburg
The History of FIX

Key Dates:

- Dec 1993  Fidelity-Salomon Pilot
- Jun 1994  FIX Committee formed
- Jan 1995  NY FIX General Conference / FIX 2.7 Released
- Mar 1995  First Technical Committee Meeting
- Sep 1995  FIX 3.0 Released
- Jun 1996  London FIX General Conference
- Jan 1997  FIX 4.0 Released
- Apr 1998  FIX 4.1 Released
- Jun 1998  FIX Committee Structure Formalized
- Oct 1998  Tokyo FIX Introduction
The History of FIX

Key Dates:

- Mar 1999    Japanese FIX Committee Formalized
- Apr 1999    Fix Protocol Ltd. Created
- Jun 1999    Certification effort formalized w/PwC
- Dec 1999    First Draft of Version 4.2 Published
- Mar 2000    4.2 Released
- Mar 2000    Open/Vendor Forums in NY, London, and Tokyo
- Mar 2000    Hong Kong FIX General Conference
- Aug 2000    Asia Pac FIX Committee Formalized
FIX Message Flow and Technical Overview
FIX Order Flow

Investment Manager  Broker/Dealer

- IOIs & Advertisements
- Order Via Phone Call
- OR  Order Via FIX
- Order Confirm
- Don’t Know Trade
- Execution Rpt (Partials)
Fix Post-Trade Flow:

Investment Manager

Broker/Dealer

Allocation (Breakdowns)

AllocationAck (Received)

AllocationAck (Accept/Reject)

Settlement Instructions

Settlement Instructions

Settlement Instructions may be standing, exchanged during or after allocation process, or one firm can send instructions for both sides for the other firm to match.

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FIX Session Level Messages

- Logon - handshake to authenticate counterparty

- Resend Requests - used to request missed messages after detecting a message gap

- Heartbeats/Test Requests - keep alive packets used to detect problems during slow message traffic periods
FIX Application Messages

- **Institution Originated**
  - Quote Requests
  - Orders, Modifications, Cancels
  - Allocations
  - Email
  - List Orders/Program/Basket Trading
  - Market Data Request, Security Definition
  - Request, Security Status Request, Trading
  - Session Status Request, etc.
FIX Application Messages

- Broker Originated
  - Indications of Interest, News, Email
  - Post Trade Advertisements
  - Quotes
  - Order Acknowledgments, Change
    Acknowledgments (cancels, modifications)
  - Partial Fills, Fills, Done For Days
  - Market Data, Security Definition, Security Status, Trading Session Status, Mass Quote, etc
**FIX Customer/Broker Example**

**Step 1 - Customer A’s Order**

**FIX Order**
Symbol = 0001.HK, Side = Sell, OrderQty = 1000, OrdType = Market
[35=D;55=0001.HK;54=2;38=1000;40=1]

**Customer A**

**FIX Order Accept (Execution Report)**
Symbol = 0001.HK
Side = Sell
OrderQty = 1000, OrdType = Market
OrdStatus = New
[35=8;55=0001.HK;54=2;38=1000;40=1;39=0]
FIX Customer/Broker Example
Step 2 - Sending an IOI

FIX IOI
Symbol = 0001.HK
Side = Sell
IOIShares = 1000
Price = 101
[35=6;55=0001.HK;54=2;27=1000;44=101]

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**FIX Customer/Broker Example**

**Step 3 - Filter IOIs, Cust B’s Order**

**FIX Order**
Symbol = 0001.HK  
Side = Buy  
OrderQty = 1000  
OrdType = Market  

```
[35=D;55=0001.HK;54=1;38=1000;40=1]
```

**Customer B**
Accept Buy 1000 Cheung Kong

**Broker/Sales Trader**

**Buy 1000 Cheung Kong**

**FIX Order Accept (Execution Report)**
Symbol = 0001.HK  
Side = Buy  
OrderQty = 1000, OrdType = Market  
OrdStatus = New  

```
[35=8;55=0001.HK;54=1;38=1000;40=1;39=0]
```
FIX Customer/Broker Example
Step 4 - Traded, Execution Rpts

FIX Execution Report (Filled)
Symbol = 0001.HK, Side = Buy, OrderQty = 1000,
OrdStatus = Filled, LastShares=1000, LastPx=101
[35=8;55=0001.HK;54=1;38=1000;39=2;32=1000;31=101]

Bought 1000 Cheung Kong

Broker Sales Trader

Sold 1000 Cheung Kong

Customer A

Customer B

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Typical FIX System Connectivity

Simple Version

**Customer (i.e. Investment Mgr)**

- FIX System
  - Business Msg Processing
  - FIX Engine
  - Order Management System
  - Trader
  - Trader in Foreign Office

**Supplier (i.e. Broker/Dealer)**

- FIX System
  - FIX Engine
  - Business Msg Processing
  - Order Management System
  - Trader
  - Trader in Foreign Office

- Wide Area Network Link (TCP Socket opened by customer, persists during life of FIX session)
- TCP/IP
Typical FIX System Connectivity

**Customer** (i.e. Investment Mgr) **Point-to-Point** **Supplier A** (i.e. Broker/Dealer)

Note: “WAN Link” could be:
- A dedicated circuit (i.e. 56KB leased line, Frame Relay, etc.)
- A shared network (i.e. network provider, Virtual Private Network, etc.)
- The Internet
Typical FIX System Connectivity

**Customer A** (i.e. Investment Mgr)  **Service Bureau**  **Supplier A** (i.e. Broker/Dealer)

- **Customer A** (i.e. Investment Mgr)
  - FIX System
  - Firewall
  - Choke Router
  - Router
  - Internal Network
  - DMZ Network
  - Perimeter Network

- **Service Bureau**
  - FIX System
  - Multiple Counterparties via one FIX Session
  - Service Bureau Order Mgmt System
  - WAN Link

- **Supplier A** (i.e. Broker/Dealer)
  - FIX System
  - Firewall
  - Choke Router
  - Router
  - Internal Network
  - DMZ Network
  - Perimeter Network

---

**Customer B** (i.e. Investment Mgr)

- **Customer B** (i.e. Investment Mgr)
  - FIX System
  - Firewall
  - Choke Router
  - Router
  - Internal Network
  - DMZ Network
  - Perimeter Network

- **Service Bureau**
  - FIX System
  - Service Bureau Order Mgmt System
  - Non-FIX User
  - Non-FIX User
  - WAN Link

- **Supplier B** (i.e. Broker/Dealer)
  - FIX System
  - Firewall
  - Choke Router
  - Router
  - Internal Network
  - DMZ Network
  - Perimeter Network

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FIX via Service Bureau

- Advantages
  - Fewer FIX connections and sessions to manage

- Disadvantages
  - More eggs in one basket
  - Service bureau “knows” your trading data
  - Difficult to know if and which counterparties are connected to service bureau
FIX Connectivity - Key Points

- Use of private network, shared network (VPN), or Internet look identical to a FIX engine
- Similar network infrastructure and design
  - i.e. Same desire and need for firewalls
- Similar security (authentication/encryption) concerns
  - Unwise to send highly sensitive data unencrypted via private network or shared network
Summary of Networking Options

- Internet - Ubiquitous, lowest cost, varying latency, varying reliability

- Leased Line - more reliable, stable, expensive, costly scalability

- Virtual Private Networks (VPN) - hybrid option allows for scalability, lower costs; several exist, not yet interconnected
**FIX Engine key functions**

- **Session initiation**
  - Get configuration details from session control DB (I.e. IP address, port, CompIDs, etc)
  - Determine last inbound/outbound sequence numbers or set to 1 if first session of the day
  - Connect to internal business message “handlers”
  - Connect to FIX session counterparty
  - Generate random encryption key
  - Send Logon and perform Logon handshake
**FIX Engine key functions**

– Continuous functions

» Service inbound FIX messages
  - Decrypt, parse, and safe-store all messages
  - Respond to admin-level messages
  - Convert and forward business messages to “handler”
  - Validate seq num, send Resend Request if gap detected

» Service inbound requests from internal “handlers”
  - Construct as FIX message, encrypt, safe-store, and send over FIX session to counterparty

» Admin functions
  - Send Heartbeats, Test Requests, system status
  - Logout at session “end” time
How do I get started?

- FIX website is primary source of information
  - Specification document is available for free
  - Discussion forums allow for Q&A
  - Vendors section contains FIX vendors
  - Principals section identifies other buy and sellside firms

- Investigate vendor offerings

- Work with existing FIX user base
FIX Web-site
http://www.fixprotocol.org
Buyside Case Study: American Century Investments
American Century’s STP Today

- PMs
- Traders
- Accountants
- Order Management System
- Fund Accounting System
- Broker/Dealer
  - FIX
- Custodian
  - ISITC
American Century’s Order Mgmt System

- Proprietary Order/Trade and Settlement systems with direct linkage (round trip)

- Mainframe
  - Languages: COBOL, CSP
  - DB2, CICS, MVS Batch

- Distributed
  - FIX: C++, mainframe DB2 access
  - Next Generation OMS: 100% Java, RMI, DB2, TIBCO Rendezvous, Market Data
Our Middleware Technology

- Standard business protocols: FIX, ISITC
- Standard “base” technology: TCP/IP, etc.
- Standard encryption technology: i.e. PGP
- Pub/Sub: TIBCO Rendezvous
- Java RMI and JDBC
- Custom TCP socket-based communications
Our FIX Implementation

- **FIX System**
  - Developed our own as an interface to our proprietary Order Management System

- **Connectivity (some have multiple sessions)**
  - Large portion (over 25) via the Internet
  - Less than 6 via private circuits
  - More than 30 via shared private networks
    - TNS - over 15
    - Bridge GFI net - over 10
    - NYFIX - over 5
  - Over 30 via Bloomberg session (primarily Int’l)
FIX Activity: 1/1/2000 - 12/31/2000

- Processed 6 million IOIs  (2.5 million from ECNs)
  - peak day over 58,000
- Processed 1.6 million ExecutionRpts
  - peak day over 22,500
  - 99% of total domestic and int’l equity trading
    » 99% of all domestic, 96% of all international trading
- Sent 5,600 FIX Orders
  - currently 32% domestic, 35% int’l orders sent via FIX
  - peak day 475
- Sent 50,000 Allocation messages  (63% of U.S.)
  - peak day over 860
Benefits of Automation

- **Productivity**
  - Handle more trades with fewer personnel
  - Process and prioritize information
  - Manage global “book” around the globe

- **Error Reduction**
  - Reduce errors overall and detect them earlier

- **Risk Reduction**
  - Reduce settlement cycle & likelihood of errors
FIX 4.2 Overview
# FIX Feature History

<table>
<thead>
<tr>
<th>Introduced Feature</th>
<th>2.7</th>
<th>3.0</th>
<th>4.0</th>
<th>4.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial FIX Session-level</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IOI/Advertisements</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orders/Execution Reports</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarification of 2.7 Ambiguities</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>(e.g. Timezone for times, PGP-DES-MD5, etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robust Session-level enhancements</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>(e.g. Seq Reset-GapFill, OnBehalfOf/DeliverTo, etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quotes, DK Trade, US Allocations</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Minor 4.0 Session-level enhancements</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(e.g. ResetSeqNumFlag, alphanumeric ID fields, etc)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ExecType added to Exec Rpt</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>(vs. dual use of OrdStatus value)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross-border Allocations (MiscFees)</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Foreign Exchange Trading</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
## FIX 4.2 - Statistics

<table>
<thead>
<tr>
<th></th>
<th>FIX 3.0</th>
<th>FIX 4.0</th>
<th>FIX 4.1</th>
<th>FIX 4.2</th>
</tr>
</thead>
<tbody>
<tr>
<td># Admin Msgs</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td># Business Msgs</td>
<td>17</td>
<td>20</td>
<td>21</td>
<td>39</td>
</tr>
<tr>
<td># Fields</td>
<td>112</td>
<td>138</td>
<td>208</td>
<td>396</td>
</tr>
<tr>
<td># Appendices</td>
<td>4</td>
<td>4</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td># pages in spec</td>
<td>57</td>
<td>69</td>
<td>106</td>
<td>265</td>
</tr>
</tbody>
</table>
FIX 4.2 - Summary

- Session-level and Overall
- Orders and Executions
  - Appendix D - Order State Change Matrices
  - Pre-allocation on order
  - Good-Till (GT) and “ExecRestated”
- Exchange-related Enhancements
  - Market Data
  - Mass Quoting
  - Security Definition and Status
  - Trading Session Status
  - Discretionary Pricing, Multiple/Extended Trading Sessions
- Program/List Trading
  - Two bidding models, List staging and submission
• Data Types:
  • Sub-second timestamps (either milliseconds or whole seconds)
  • Differentiated “char” vs. “String”
  • Quantity fields based upon “float” vs. “integer” to support non-equities
  • “Sub-classed” data types for fields

<table>
<thead>
<tr>
<th>Base</th>
<th>int, float, char, data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate</td>
<td>String, Boolean, UTCTimestamp, UTCTimeOnly, LocalMktDate, UTCDate, month-year, day-of-month, MultipleValueString</td>
</tr>
<tr>
<td>Business</td>
<td>Qty, Price, Amt, Currency, Exchange, PriceOffset</td>
</tr>
</tbody>
</table>
**FIX 4.2 - Session-level**

- **Removed max value from MsgSeqNum & BodyLength**
  - `MsgSeqNum = 0` represents Infinity, recommended for ResendRequests

- **New, optional fields in standard header**
  - `XmlDataLen`, `XmlData`, `MessageEncoding`, `LastMsgSeqNumProcessed`, `OnBehalfOfSendingTime`

- **Repeating groups easier to read and identify in spec**
## FIX 4.2 - Int’l Support

“Encoded” text Fields for Japanese character sets

<table>
<thead>
<tr>
<th>Tag</th>
<th>Field Name</th>
<th>Value</th>
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<tbody>
<tr>
<td></td>
<td>…Other Standard Header fields</td>
<td></td>
</tr>
<tr>
<td>347</td>
<td>MessageEncoding</td>
<td>Shift_JIS</td>
</tr>
<tr>
<td></td>
<td>…Other Standard Header fields</td>
<td></td>
</tr>
<tr>
<td></td>
<td>…Other Message Body fields</td>
<td></td>
</tr>
<tr>
<td>106</td>
<td>Issuer</td>
<td>HITACHI</td>
</tr>
<tr>
<td>350</td>
<td>EncodedIssuerLen</td>
<td>10</td>
</tr>
<tr>
<td>351</td>
<td>EncodedIssuer</td>
<td>日立製作所</td>
</tr>
<tr>
<td></td>
<td>…Other Message Body fields</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Text</td>
<td>This is a test</td>
</tr>
<tr>
<td>356</td>
<td>EncodedTextLen</td>
<td>17</td>
</tr>
<tr>
<td>357</td>
<td>EncodedText</td>
<td>これはテストです。</td>
</tr>
</tbody>
</table>

Issuer, SecurityDesc, ListExecInst, Text, Subject, Headline, AllocText, Underlying Issuer, UnderlyingSecurityDesc (Appendix J)
FIX 4.2 - Overall

- **Better support for non-Equities**
  - Support for complex, multi-legged instruments (e.g. option strategies)

- Fixed Income IOIs: High Yield and High Grade corporate bonds
  - New Symbology block fields: CouponRate & ContractMultiplier
  - New IOI fields: SpreadToBenchmark & Benchmark

- Enhanced/clarified foreign exchange trading
  - Appendix O
# New Appendices

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>H</td>
<td>Mass Quote Message Scenarios</td>
</tr>
<tr>
<td>I</td>
<td>Security Definition, Security Status, and Trading Session Message Scenarios</td>
</tr>
<tr>
<td>J</td>
<td>Example Usage of Encoded Fields for Japanese Language Support</td>
</tr>
<tr>
<td>K</td>
<td>Example Usage of Allocations</td>
</tr>
<tr>
<td>L</td>
<td>Pre-Trade Message Targeting/Routing</td>
</tr>
<tr>
<td>M</td>
<td>FIXML Support</td>
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<tr>
<td>N</td>
<td>Program/Basket/List Trading</td>
</tr>
<tr>
<td>O</td>
<td>Foreign Exchange Trading</td>
</tr>
</tbody>
</table>
Orders and Executions

- Appendix D - Order State Change Matrices
- Pre-allocation on order
- Stale orders
- Good-Till (GT) and “ExecRestated”
Appendix D – What’s been done?

• More user-friendly
  • Reformatted
  • Extra Columns (ExecTransType, OrderQty, CumQty…)
• Up from 10 in FIX Version 4.1 to 37 in Version 4.2
• Matrices grouped into function:
  • Vanilla (2) Cancel (3)
  • Cancel Replace (12) Unsolicited Reports (4)
  • Status (3) GT Orders (4)
  • Execution Cancel/Correct (3) Rejects, Resends, TIF, Stopped (6)
• Focussed on key order states
• Input from Web site Q&A, Japan + new areas (GT orders)
**FIX 4.2 - Exchange-related**

**Exchange-related Enhancements**
- Mass Quoting
- Security Definition and Status
- Trading Session Status
- Discretionary Pricing, Multiple/Extended Trading Sessions
- Improved Support for Extended hours and 24-hour trading.
- Market Data

**Exchange/ECN Working Group:**
Move FIX beyond the initial use for ECN/exchanges as an order/execution protocol to a complete interface for electronic trading.
Maintenance of the FIX Protocol

- Changes initiated via Working Groups, Website Discussion Postings, etc.

- Changes classified as either:
  - Clarifications: typographical and clarification of ambiguities [Errata]
  - Proposed Changes: new or changes to messages or fields [Specification]

- FIX Technical Committee approves Errata and Spec

- Typically new version once/year with public review
  - 15 week process after 1st draft release
  - Two drafts with 6 week comment period each
Industry Standards
Industry Standards

- As technology has become embedded in core industry processes, connectivity standards have flourished.

- Industry standards address different aspects and products of the trading lifecycle.

- Straight Through Processing requires seamless integration between systems.
Industry Standards

**INTERNAL STP**

**BUY SIDE**
- PORTFOLIO MANAGEMENT
- TRADING
- OPERATIONS

**SELL SIDE**
- RESEARCH
- TRADING
- OPERATIONS

- **WEB**
- **FIX**
- **OASYS / GSTPA**
- **ISITC**
- **SWIFT**

**CUSTODIAN**
**Industry Standards**

FPL is now working with other standards bodies:
- Leverage existing standards.
- Ensure interoperability and avoid redundancy.
- Converge towards Straight Through Processing goals.

Confirms the industry investment in FIX and future of FIX/FIXML as a global standard.

Maintaining relationships with organizations/standards groups

<table>
<thead>
<tr>
<th>SWIFT</th>
<th>FPL</th>
<th>GSPTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTCC</td>
<td>ISITC</td>
<td></td>
</tr>
<tr>
<td>ISITC-IOA</td>
<td>FpML</td>
<td>and others….</td>
</tr>
</tbody>
</table>
XML
Standards Development - Leveraging New Technology

- XML
- Business Modeling - UML
What is XML?

- Extensible Markup Language
- Metalanguage -- a language for describing other languages
  - Syntax for documents and messages
  - Self-Describing Format
  - Abbreviated version of SGML, Standard Generalized Markup Language (SGML-ISO 8879)
  - Project of the World Wide Web Consortium (W3C)
XML Standards Bearers

- W3C - World Wide Web Consortium
  (www.w3.org)
- OASIS  (www.oasis-open.org)
- Various Vertical Consortia
XML’s Roots

ISO 8879

ISO

SGML

HTML

OFX

XML

XSL

XQL

XPath

Namespace

FIXML

FpML

W3C

1998

Streamlined Subset

1986

XPath

Namespace

XHTML

IFX

FIXML Training Class - New York

Feb 26, 2001

American Century - Marcus Evans
KRT: 3Q well below est's; FFO should recover by end 1Q; Keep 3H

<Analyst>John Smith</Analyst>

Analyst: John Smith
Date: 11/17/1999
Industry: Real Estate Investment Trusts
Company: Kranzco Realty Trust

FUNDAMENTALS
Current Rank: 3H
Prior: No Change
Price (11/16/99): $8.31
P/FFO Ratio 12/99: 4.4x
Target Price: $11.00
P/FFO Ratio 12/00: 4.0x
Proj. 5yr FFO Grth: 4.0%
Return on Eqty 98: N/A%
Book Value/Shr: N/A
Debt-to-Total Cap: 66.6%
Dividend (99): $1.30
Yield: 15.6%

(a) Where applicable, includes operating partnership units.

FFO = Funds from Operations, generally defined as net income according to GAAP before real estate depreciation, extraordinary items, and gains or losses.
XML Document

Document:

```xml
<ResearchReport type="equity">
  <Title>KRT: 3Q well below est's; FFO should... </Title>
  <Analyst>John Smith</Analyst>
  <Date>06/05/2000</Date>
  <Company>Kranzco Realty Trust</Company>
  <Industry>Real Estate Investment Trust</Industry>
  <CurrentRank>3H</CurrentRank>
  <Yield>15.6</Yield>
</ResearchReport>
```
How are XML Grammars defined?

**DTD - Document Type Definition**

FIXML.DTD

```
<!ELEMENT Indication (IOIid, IOITransType, Instrument, IOISide, IOIShares, Price?, Currency?, ValidUntilTime?,....)
```

A DTD is a file (or several files used together) which contains a formal definition of a particular type of document.
How is XML Being Used?

- Application Integration
- Improving Internet Searching
- B2B - Business to Business
- Putting Legacy Data on the Web
- Standards
  - Evolving Existing Standards - FIX, SWIFT
  - New Standards Development
    - Industry Consortium - FpML
    - Vendor based - FinXML, NTM
XML Efforts in Other Industries

Over a 140 different proposed applications and industry initiatives

- HL7 - Healthcare
- XML/EDI - X12 & EDIFACT
- OTP - Internet Commerce
- Chemical Markup Language
- HRMML - Human Resource
- GedML - Genealogical data
- WAP - Wireless Application Protocol
- SAE J2008 - Auto Industry
- ACCORD - Insurance
RosettaNet is a global business consortium creating the electronic commerce framework to align processes in the IT supply chain.

OFX is the joint initiative of Microsoft, Intuit, and CheckFree to develop an open specification for the online transfer of financial data.

ICE manages and automates establishment of syndication relationships, data transfer, and results analysis.

The Common Business Library (CBL) is being developed by Veo Systems, Inc. as a set of building blocks with common semantics and syntax to ensure interoperability among XML applications.

Wireless Application Protocol (WAP) is a result of continuous work to define an industry wide standard for developing applications over wireless communication networks.

eCO is an industry consortium which is developing a common framework for interoperability among XML-based application standards and key electronic commerce environments.

BizTalk, a Microsoft-based initiative, is an XML framework for application integration and electronic commerce.

ebXML is an international effort established by UN/CEFACT and OASIS to initiate a worldwide project to standardize XML business specifications.
1999: The Year of the Financial Markup Language

- FIXML (1/99)
- Microsoft DNAfs (4/99)
- FpML (6/99)
- FinXML (6/99)
- NTM (6/99)
- MDml (6/99)
- SWIFT (9/99)
- GSTPA (9/99)
FIXML
FIX and XML: FIXML

FIXML is the XML vocabulary based on the FIX Protocol

Goals

• Utilize existing systems and processes
• Protect investment in traditional FIX
• Provide migration path to next generation FIX systems
• Impose little or no impact on existing business applications
• Position FIX for greater interoperability with other industry standards
FIXML: Implementation Issues

• Easy migration for existing FIX engines
  ➢ “Embedded FIXML”

• Backward-compatibility
  ➢ optional field can co-exist with “standard”
  ➢ tag=value data
  ➢ XML attributes represent existing FIX tags

• Session Layer remains intact
  ➢ core engine is not affected
FIXML and FIX 4.2

- Added two new tags
  - XmlDataLen - 212
  - XmlData -213

- Enables existing FIX engines to support FIXML

- Supports pilot applications
The image contains a FIXML ( FIX Message Language) example syntax with some omitted and omitted elements. The example shows how a FIXML message can be structured with various tags and values. The message structure is as follows:

```
<FIXML><FIXMLMessage>
  <Header>
    ... omitted ...
  </Header>
  <ApplicationMessage>
    <Order>
      <ClOrdID>ORD_1</ClOrdID>
      <HandInst Value="2" />
      <MinQty>1000</MinQty>
      <Instrument>
        <Symbol>EK</Symbol>
        <IDSource>1</IDSource>
        <SecurityID>277461109</SecurityID>
      </Instrument>
      <Side Value="1" />
      <TransactTime>20000907-09:25:56</TransactTime>
      <OrderQuantity>
        <OrderQty>5000</OrderQty>
      </OrderQuantity>
      <OrderType>
        <LimitOrder Value="2">
          <Price>62.5</Price>
        </LimitOrder>
      </OrderType>
      <Currency Value="USD" />
      <Rule80A Value="A" />
    </Order>
  </ApplicationMessage>
</FIXMLMessage></FIXML>
```

The example syntax is shown with some values replaced by caret (^) symbols to indicate where values are supposed to be inserted. The Becomes section illustrates how the example can be transformed into a complete FIXML message with all the necessary values inserted. The transformation looks like:

```
8=FIX.4.2^9=199^35=D^34=10^49=VENDO
R^115=CUSTOMER^144=BOSTON
EQ^56=BROKER^57=DOT^143=NY^52=20
000907-09:25:58^11=ORD_1^21=2^110=1000^55=EK^22=1^48=277461109^54=1^60=20000907-
09:25:56^38=5000^40=2^44=62.5^15=USD
^47=A^10=165^8
```

TheFIXML: Example Syntax FIXML: Example Syntax Becomes… Becomes…
FIXML DTD Design Decisions

- **Evolutionary**
  - Mirror the functionality of the existing FIX specification
  - Add structure without overly impacting the protocol’s flexibility

- **Simple**
  - Easy to process

- **Convergence**
  - Assist convergence by providing reference information
Current and Future FIX Initiatives

- Work closely with GSTPA, SWIFT and other standards bodies
- Leverage and release work from Certification effort to benefit of FIX Community
- Release version 4.3 (likely mid-year 2001)
- Active Working Groups:
  - Derivatives, Fixed Income, Common Investment Vehicles (Mutual Funds), Encryption, FIXML, etc.
- Continue to:
  - Evolve FIX to meet industry needs
  - Promote FIX globally
Summary

- Institutional communication categories
- FIX today & industry trends
- FIX organization
- FIX message flow and technical overview
- Buyside case study: American Century
- FIX 4.2 overview
- Industry Standards
- XML
- FIXML