Examining the FIX Technical Committee’s FIX 4.3 Protocol

Scott Atwell
American Century Investments
Co-chair FIX Technical Committee

September 12, 2001

American Century

- Investment Manager
- Manages over $95 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 FIX Technical Committee since 1997
- Member of FIX Global Steering Committee
- Member of FIX U.S. Steering Committee since 1995
- GSTPA technical subcommittee member
- Developed American Century's FIX engine and interface to Order Mgmt System
- Responsible for American Century's Order Mgmt System

Agenda

- FIX feature history and statistics by version
- Restructured specification
- FIXML
- Overall changes
- FIX Session Protocol (Vol 2)
- Pre-trade messaging (Vol 3)
- Orders and Execution messaging (Vol 4)
- Post-Trade messaging (Vol 5)
- Data Dictionary (Vol 6)
- Products (Vol 7)

FIX Feature History

Introduced Feature	2.7	3.0	4.0	4.1	4.2
Initial FIX Session-level	X				
IOI/Advertisements	X				
Orders/Execution Reports	X				
Clarification of 2.7 Ambiguities *(e.g. Timezone for times, PGP-DES-MD5, etc)*		X			
Robust Session-level enhancements *(e.g. Seq Reset-GapFill, OnBehalfOf/DeliverTo, etc)*			X		
Quotes, DK Trade, US Allocations			X		
Minor 4.0 Session-level ehancements *(e.g.ResetSeqNumFlag, alphanumeric ID fields, etc)*				X	
ExecType added to Exec Rpt *(vs. dual use of OrdStatus value)*				X	
Cross-border Allocations (MiscFees)				X	
Foreign Exchange Trading				X	
XmlData, Pre-alloc on order, Good-Till *(Order State Change Matrices expanded from 10 to 37)*					X
Japanese mkt support, EncodedText					X
Exchange-related *(Market Data, Mass Quote, Security Def/Status etc)*					X
Program/List Trading *(Two bidding models, List staging and submission)*					X

FIX 4.3 - Statistics

	FIX 2.7	FIX 3.0	FIX 4.0	FIX 4.1	FIX 4.2	FIX 4.3
Release Date	Jul 1994	Sep 1995	Jan 1996	Apr 1998	Mar 2000	Aug 2001
# Volumes	1	1	1	1	1	7
# Admin Msgs	7	7	7	7	7	7
# Business Msgs	17	17	20	21	39	61
# Fields	103	112	138	208	396	641
# Appendices	2	4	4	7	16	> 25
# pages in spec	52	57	69	106	265	745

Restructured the specification

Into seven volumes vs. a single document:

- Volume 1 - INTRODUCTION
  - Introduction, FIX Protocol Syntax,
  - Common Components of App Msgs, Common App Msgs, Glossary
- Volume 2 - FIX SESSION PROTOCOL
- Volume 3 - FIX APP MSGS: PRE-TRADE
  - Indication, Event Communication, Quotation,
  - Market Data, Security & Trading Session Definition/Status
- Volume 4 - FIX APP MSGS: ORDERS & EXECUTIONS (TRADE)
  - Single/General Order Handling, Cross Orders,
  - Multileg Orders (Swaps, Option Strategies, etc),
  - List/Program/Basket Trading

Restructured the specification (cont)

Into seven volumes vs. a single document:

- Volume 5 - FIX APP MSGS: POST-TRADE
  - Allocation and Ready-To-Book, Settlement Instructions,
  - Trade Capture ("Streetside") Reporting, Registration Instructions
- Volume 6 - FIX DATA DICTIONARY
  - Field Definitions, Appendices
- Volume 7 - FIX USAGE BY PRODUCT
  - Collective Investment Vehicles (CIV)
  - Derivatives (Futures and Options)
  - Equities
  - Fixed Income
  - Foreign Exchange

FIX Protocol dual syntax and XML support

The FIX Protocol has two syntaxes:

- “Tag=Value”
  - 75=20010618
- FIXML
  - <TradeDate>20010618</TradeDate>
- FIX 4.3 defines messages in both syntaxes
  - Note: XML DTDs also exist for 4.1 and 4.2

FIXML - Goals

FIXML is the XML vocabulary based upon the FIX Protocol

- 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 apps
- Position FIX for greater interoperability with other industry standards

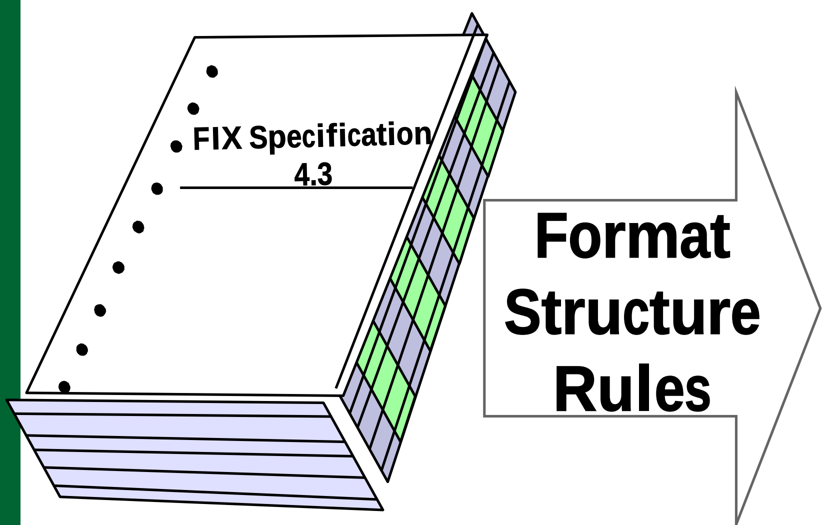
FIXML - Implementation considerations

Leverage existing FIX and provide smooth transition

- Easy migration for existing FIX engines
  - "Embedded FIXML"
- Backward-compatibility
  - optional XmlData field (tag 212) can co-exist with "standard" "Tag=Value" data
- FIX Session Protocol transport layer remains intact
  - core FIX engine is not affected
- Added XmlDataLen & XmlData (tags 212 & 213) to 4.2

How are XML Grammars defined?

DTD - Document Type Definition



Human Readable

FIXML.DTD

```
<!ENTITY % OrderCustom "">
<!ENTITY % OrderContent "ClOrdID, SecondaryClOrdID?,
ClOrdLinkID?, PartiesList?, TradeOriginationDate?, Account?,
AccountType?, DayBookingInst?, BookingUnit?, PreallocMethod?,
OrdAllocGroupList?, Settlement?, CashMargin?, HandInst, ExecInstList?,
MinQty?, MaxFloor?, ExDestination?, TrdSessionList?, ProcessCode?,
Instrument, PrevClosePx?, Side, LocateReqd?, TransactTime,
StipulationsList?, QuantityType?, OrderQtyData, OrdType, PriceType?,
Price?, StopPx?, SpreadOrBenchmarkCurveData?, YieldData?, Currency?,
ComplianceID?, SolicitedFlag?, IOI_ID?, QuoteID?, OrderDuration?,
EffectiveTime?, GTBookingInst?, CommissionData?, OrderCapacity?,
OrderRestrictions?, CustOrderCapacity?, ForexReqOrder?, Text?,
EncodedTextGroup?, FutSettDate2?, OrderQty2?, PositionEffect?,
CoveredOrUncovered?,  MaxShow?, PegDifference?, DiscretionInst?,
DiscretionOffset?, CancellationRights?, MoneyLaunderingStatus?,
RegistID?, Designation?, AccruedInterestRate?, AccruedInterestAmt?,
NetMoney? %OrderCustom;" >
<!ELEMENT Order (%OrderContent;)>
<!ATTLIST Order FIXTag   CDATA  #FIXED '35'
  DataType CDATA  #FIXED 'String'
  Value    CDATA  #FIXED 'D' >
```

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

FIXML - DTD design decisions

DTD design rules

- 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 (e.g. traditional FIX tag number)

FIXML: Example Syntax

8=*FIX.4.3*^9=*199*^35=*D*^34=*10*^49=*VENDOR*^115=*CUSTOMER*^144=*BOSTON EQ*^56=*BROKER*^57=*DOT*^143=*NY*^52=*20010907-09:25:58*^
11=**ORD_1**^21=**2**^110=**1000**^55=**EK**^22=**1**^
48=**277461109**^54=**1**^60=**20010907-09:25:56**^38=**5000**^40=**2**^44=**62.5**^15=**USD**
^528=**A**^
10=*165*^

Becomes…

8=*FIX.4.3*^9=*1043*^35=*D*^34=*10*^49=*VENDOR*^115=*CUSTOMER*^144=*BOSTON EQ*^56=*BROKER*^57=*DOT*^143=*NY*^52=*20010907-09:25:58*^
212=**937**^213=**<FIXML><FIXMLMessage> …omitted …</FIXMLMessage></FIXML>**^
10=*038*^

```
<FIXML><FIXMLMessage>
<Header>
  … omitted …
</Header>
<ApplicationMessage>
 <Order>
  <ClOrdID>ORD_1</ClOrdID>
  <HandInst Value="2" />
  <MinQty>1000</MinQty>
  <Instrument>
   <Symbol>EK</Symbol>
   <SecurityIDSource Value="1"/>
   <SecurityID>277461109</SecurityID>
  </Instrument>
  <Side Value="1" />
  <TransactTime>20010907-09:25:56</TransactTime>
  <OrderQtyData>
   <OrderQty>5000</OrderQty>
  </OrderQtyData>
  <OrdType Value="2"/>
  <Price>62.5</Price>
  <Currency Value="USD" />
  <OrderCapacity Value="A" />
 <Order>
</ApplicationMessage>
</FIXMLMessage></FIXML>
```

FIX Protocol Dual Syntax: “Tag=Value”

“Traditional FIX”

- Widely accepted and in use today--bottom line is it works…
- Works well with FIX Session protocol for real-time, transactional
- Compact in size
- “58” is the same in English, French, Japanese, Italian, etc.
- Difficult to represent repeating groups and nested sets of the same type of data
- Not self-describing (must cross-reference)
- Not well-suited for web server-based implementation

FIX Protocol Dual Syntax: FIXML

An XML-based (DTD) representation of the FIX Protocol

- XML DTDs defined post-release for FIX 4.1/4.2, and on release 4.3
- XML is the accepted standard syntax across industries
  - Wide array of XML tools and technology expertise
  - Focus of media and attention
- Better positioned for interoperability with other XML-based stds
- Supports repeating groups and nested sets of same data well
- Self-describing & Verbose (FIXML messages at least 6X larger)
- Well-suited for use with either FIX Session Protocol or web server-based transport technology
- FIXML is not widely adopted--yet...

FIX Protocol XML Support: FIXML in FIX 4.3

FIX 4.3's FIXML focus

- FIXML DTD support now at new version's release vs. delayed
- FIX 4.3 spec was reorganized to reflect dual syntax
- FIXML DTD is part of the specification download
- FIXML definitions appear after each FIX message in the spec (Vol 3, 4, and 5)
- Field Reference was expanded to include a FIXML representation of each field (Vol 6)

FIX Protocol XML Support: Future Direction

The FIX Protocol's XML support will continue to evolve

- FIX will also be defined according to W3C's "XML Schema"
- Continue the liaison and interoperability work with ISO 15022 XML and other standards
- Continue engaging XML experts in FIX Protocol XML development
- Expect some XML usage via both FIX Session Protocol and web server-based technology (e.g. HTTP, SOAP, etc.)
- Expect new products (e.g. CIV and Fixed Income) to push XML syntax more than entrenched equities has

“Component blocks”

Replaced common sets of data within application messages

- <Instrument> represents Symbol, SymbolSfx, SecurityID, SecurityIDSource, …. EncodedSecurityDesc
- Others:
  - <UndrInstrument>
  - <InstrumentLeg>
  - <CommissionData>
  - <Parties>
  - <NestedParties>
  - <SpreadOrBenchmark>
  - <Stipulations>
  - <YieldData>

Parties

Added a flexible repeating group of Party identification

<Parties>				
Tag	*Field Name*		*Req'd*	*Comments*
453	NoPartyIDs		N	Repeating group below should contain unique combinations of PartyID, PartyIDSource, and PartyRole
→	448	***PartyID***	N	Used to identify source of PartyID. Required if PartyIDSource is specified. Required if NoPartyIDs > 0.
→	447	***PartyIDSource***	N	Used to identify class source of PartyID value (e.g. BIC). Required if PartyID is specified. Required if NoPartyIDs > 0.
→	452	***PartyRole***	N	Identifies the type of PartyID (e.g. Executing Broker). Required if NoPartyIDs > 0. 1 = Executing Firm (formerly FIX 4.2 ExecBroker) 2 = Broker of Credit (formerly FIX 4.2 BrokerOfCredit) 3 = Client ID (formerly FIX 4.2 ClientID) 4 = Clearing Firm (formerly FIX 4.2 ClearingFirm) 5 = Investor ID 6 = Introducing Firm 7 = Entering Firm 8 = Locate/Lending Firm (for short-sales) 9 = Fund manager Client ID (for CIV) 10 = Settlement Location (formerly FIX 4.2 SettlLocation) 11 = Order Origination Trader (associated with Order Origination Firm – e.g. trader who initiates/submits the order) 12 = Executing Trader (associated with Executing Firm - actually executes) 13 = Order Origination Firm (e.g. buyside firm) 14 = Giveup Clearing Firm (firm to which trade is given up) 15 = Correspondant Clearing Firm 16 = Executing System 17 = Contra Firm 18 = Contra Clearing Firm 19 = Sponsoring Firm 20 = Underlying Contra Firm
→	523	***PartySubID***	N	Sub-identifier (e.g. Clearing Acct for PartyID=Clearing Firm) if applicable
</Parties>				

"Deprecated" Features

Phased-out. A new, supported approach established. Feature will be removed in next version.

- Appendix 6-E
  - Benchmark - now BenchmarkCurveCurrency, BenchmarkCurveName, BenchmarkCurvePoint
  - "MarketOnClose", "OnClose", and "LimitOnClose" OrdTypes are now new TimeInForce of "At the Close" like existing TIF "At the Opening"
  - Rule80A - combined use of new OrderCapacity and OrderRestriction
  - OnBehalfOfSendingTime - now use HopSendingTime
  - "Forex-Market", "Forex-Limit", and "Forex-Previously Quoted" OrdType values - now use Product="Currency" and OrdType="Market", "Limit", or "Previously Quoted"

“Removed” Features

Removed and replaced by a new, supported approach

- Appendix 6-F
  - ExecTransType field - merged values into ExecType
  - MaturityDay field - new full date field MaturityDate
    - (still have MaturityMonthYear for standardized derivatives)
  - ExecBroker, BrokerOfCredit, ClientID, ClearingFirm, ClearingAccount fields - now part of <Parties> component block
  - “FUT” and “OPT” SecurityType values, “Long” and “Short” OptAttribute values, and PutOrCall field are now represented as CFICode
  - CustomerOrFirm field - now via OrderCapacity
  - “Preliminary”, “Calculated”, and “Calculated without Preliminary” AllocTransType values are now AllocType values

Support of Other Standards

Appendix 6-B - FIX Fields Based Upon Other Standards

- ***(new to 4.3) Market Identifier Code (MIC) - ISO 10383:1992***
  - vs. Reuters exchange suffix
  - examples: “XNYS” vs. “N”, “XLON” vs. “L”, “XHKG” vs. “HK”
- ***(new to 4.3) Classification of Financial Instruments (CFI code) - ISO 10962:1997***
  - vs. ISITC-based SecurityType (for all but Fixed Income)
- Bank Identification Code (BIC) - ISO 9362:1994
- Country codes - ISO 3166-1:1997
- Currency codes - ISO 4217:1995
- ISIN security identification - ISO 6166:1994

Volume 1 - Introduction

Glossary

- Glossary definitions added for values for the following fields:
  - ExecInst
  - PartyRole
  - OrdType
  - OrdStatus
  - IOIQualifier
  - PriceType

Volume 2 - FIX Session Protocol

- Added “Transmitting FIXML or other XML-based content” section
- Added a new repeating group to Standard Header: Hops
  - Documents route/hops taken for audit trail, does not specify routing
  - NoHops, HopCompID, HopSendingTime, HopRefID
- Added new fields to Logon:
  - Test Message Indicator, Userid, and Password
- Added “FIX Session using a Multicast Transport” appendix
- Added “FIX Session-level Test Cases and Expected Behavior”
  - Also available under “Organization”, “Tech Committee” for ver 4.x

Volume 3 - Pre-Trade

Category: Indication

- Minor changes only

Category: Event Communication

- Minor changes only

Category: Quotation

- QuoteType supports 3 Quoting models:
  - Indicative, Tradeable, and Restricted Tradeable
  - Documentation improved, messages no longer overloaded
  - Added RFQ Request, Quote Status Repot, and Quote Request Reject new messages
  - Examples provided

Volume 3 - Pre-Trade

Category: Security and Trading Session Definition/Status

- Security Def Req/Security Def restricted to definition of single and multi-leg securities (<UndrInstrument> now <InstrumentLeg>)
- 3 new pairs of messages
  - Security Type Request and Security Type
  - Security List Request and Security List
  - Derivative Security List Request and Derivative Security List

Volume 4 - Orders and Executions (Trade)

Category: Single/General Order Handling

- Merged ExecTransType into ExecType and updated Matrices
  - Added “Trade Cancel”, “Trade Correct”, “Order Status” as ExecType
  - Replaced ExecType “Partial Fill” and “Fill” with new ExecType “Trade”
- Added “Example Usage of PartyRole=‘Investor ID’” for Korea, Taiwan, China, etc
- Added “Price Condition” Matrices for Japanese and Euronext
- Added new messages “Order Mass Cancel Request”, “Order Mass Cancel Report”, and “Mass Order Status Request”
- Order Cancel/Replace now lists what cannot vs. can change
- Added optional Leg repeating group to Execution Report

Volume 4 - Orders and Executions (Trade) (cont)

Category: Cross Orders

- Added three new messages: "New Order - Cross", "Cross Order Cancel/Replace Request", and "Cross Order Cancel Request”
- Defined four classifications/models of cross order handling with message flow examples

Category: Multileg Orders (Swaps, Option Strategies, etc)

- Added two new messages: "New Order - Multileg" and "Multileg Order Cancel/Replace”

Category: List/Program/Basket Trading

- Minor changes only

Volume 5 - Post-Trade

Category: Allocation and Ready-to-Book

- Added AllocType field, removed three AllocTransType values
- Added BookingRefID and documented Ready-to-Book functionality
- Added LegalConfirm field
- Added “Two party” and “Three party” “Step-outs and Directed Commissions” sections

Category: Settlement Instructions

- Minor changes only

Volume 5 - Post-Trade

Category: Trade Capture (Streetside) Reporting

- Added two new messages: “Trade Capture Report” and “Trade Capture Report Request”
  - Supports matched and unmatched trades between counterparties for SIA T+1 Streetside Processing Committee Technical Working Group (TWG) and other post-execution market-side requirements

Category: Registration Instructions

- Added two new messages: “Registration Instructions” and “Registration Instructions Response” for CIV

Volume 6 - Data Dictionary

Field Reference

- Added 245 new fields (641 vs. 396 total)
- Added 22 new MsgTypes (61 vs. 39 total)
- New column contains FIXML documentation for each field

Appendices

- Many FIX 4.2 appendices moved to pertinent volume
- Several new appendices added

Product-specific changes: CIV

Mutual Funds, Unit Trusts, Managed Investments, Open Ended Investment Companies (OEICs), Undertaking for Collective Investment in Transferable Securities (UCITs), etc

- Added Registration Instructions-related messages to Volume 5
- “Broker” references include “intermediary” or “fund manager”
- <OrderQtyData> supports percentage and rounding rules
- ExecValuationPoint, ExecPriceType, ExecPriceAdjustment, etc.
- Added 3 new “Exchange/switch CIV order” ListType values
- Added 50+ new fields (most for Registration Instructions)
- Vol 7 documentation provided by CIV Working Group

Product-specific changes: Derivatives

Futures and Options

- “Market If Touched (MIT)” as OrdType
- Multileg Orders - made up of multiple securities: “legs”
  - Swaps, Option Strategies, Futures Spreads, etc.
- Security Type, Security List, and Derivative Security List messages
- Quote message enhancements: Tradable quote model
- Vol 7 documentation provided by Futures & Options Working Group

Product-specific changes: Fixed Income

Corporate, Government, Loan, Money Market, Mortgage, and Municipal products

- Component blocks: <SpreadOrBenchmark>, <Stipulations>, <YieldData>
  - Benchmark field now: BenchmarkCurveCurrency, Name, and Point
- PriceType: “discount: % points below par”, “premium: % points over par”, “basis points relative to benchmark”
- No new messages, added 25+ fields most to <Instrument>
  - CouponPaymentDate, IssueDate, RepoCollateralSecurityType, RepurchaseTerm, RepurchaseRate, Factor, CountryOfIssue, StateOrProvinceOfIssue, LocaleOfIssue, and RedemptionDate
  - Product (e.g. Government) and SecurityType (e.g. US Treasury)
- Fixed Income WG ongoing work with Bond Market Association (BMA)

Product-specific changes: Foreign Exchange

Foreign Exchange (Currency)

- Moved FIX 4.2's "Appendix O - Foreign Exchange Trading" contents to "Volume 7 - Product: Foreign Exchange"
- Added Price2 to New Order - Single and LastForwardPoints2 to Execution Report for F/X Swaps

FIX 4.3 Changes Summary

Significant set of enhancements

- Restructured spec into 7 volumes according to Trade Life Cycle
  – FIXML support within spec
  – Component blocks: <Instrument>, <Parties>, etc.
  – Support of ISO stds: MIC for exchange & CFICode for sec type
- New messages:
  – RFQ Req, Quote Status Report, Quote Req Reject.
  – Sec Type, Sec List, Derivative SecList pairs.
  – Order Mass Cancel. Mass Status Req. Cross & Multi-leg orders.
  – Trade Capture ("Streetside") Report. Registration Instructions.
- New products: Collective Invest Vehicles (CIV), Fixed Income
  – existing: Derivatives, Equities, Foreign Exchange