American Century Investments

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

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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

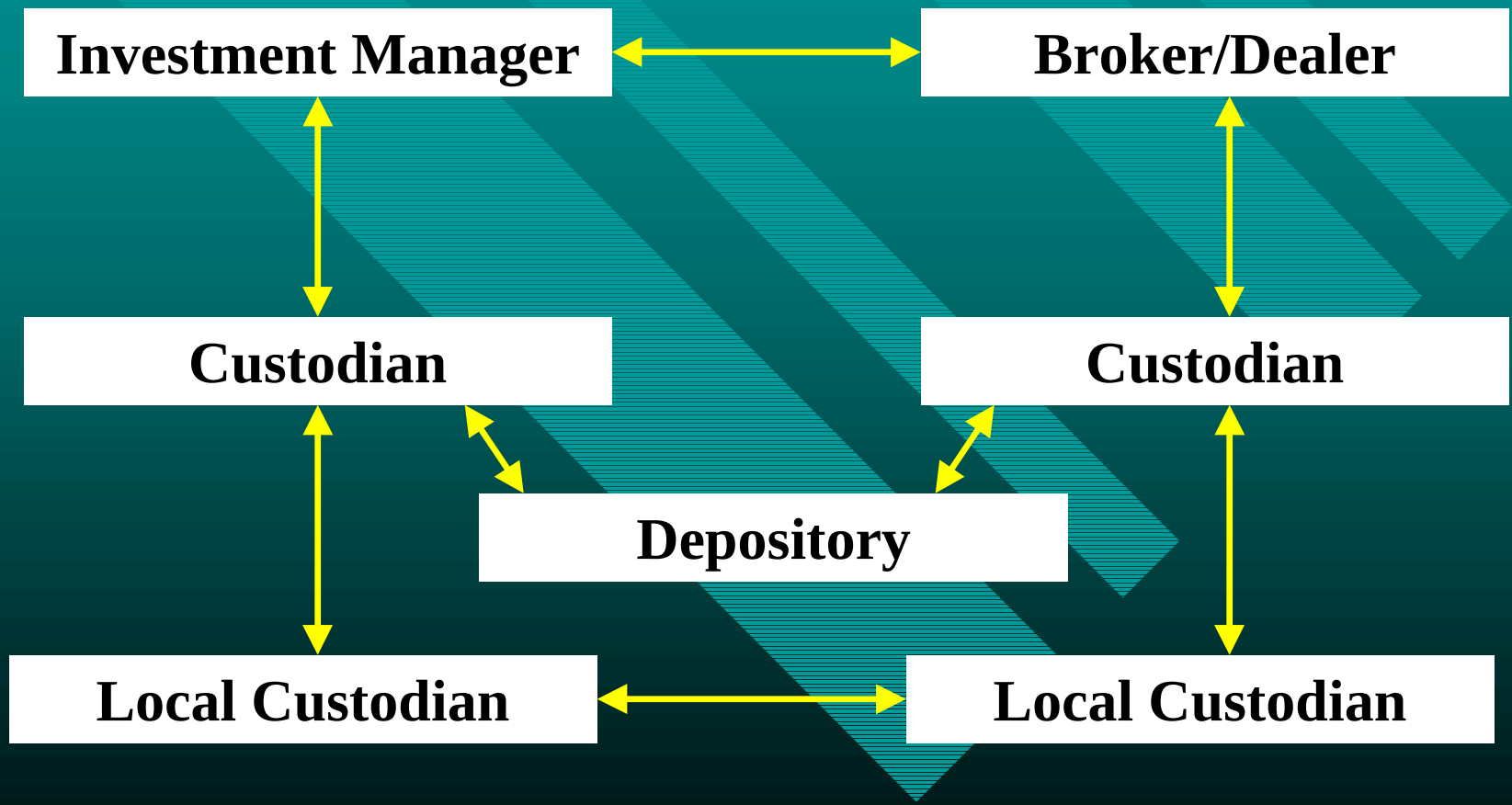
- Investment Manager
- Manages over $105 billion in assets
- Headquarters in Kansas City, Missouri
- Formerly named Twentieth Century and the Benham Group
- Live with FIX since April 1996

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
Custodian
Depository
Local Custodian
Local 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

Recent 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

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.

FIX Protocol Limited

Global Steering Committee

US | EUROPE | ... | TOKYO | Asia/ Pacific

Regional Steering Committees

SUPPORT

TECHNICAL COMMITTEE

IOI | Industry Standards | ... | Group 3

Business Working Groups

ECN/ Exchanges | FIXML | ... | Lists

Technical Working Groups

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

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

Asia Pacific Steering Committee

Institutions:

American Century

Cpaital 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:

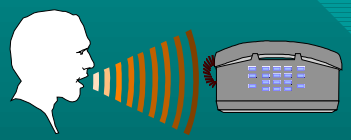
- **Mar 1999** Japanese FIX Committee Formalized
- **Apr 1999** Fix Protocol Ltd. Created
- **Jun 1999** Certification effort formalized w/PwC
- **Dec 1999** First Draft of Version 4.2 Published
- **Mar 2000** 4.2 Released
- **Mar 2000** Open/Vendor Forums in NY, London, and Tokyo
- **Mar 2000** Hong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

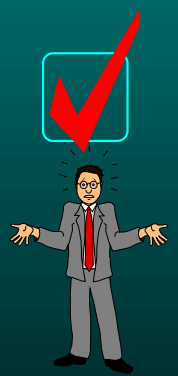
FIX Message Flow and Technical Overview

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

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

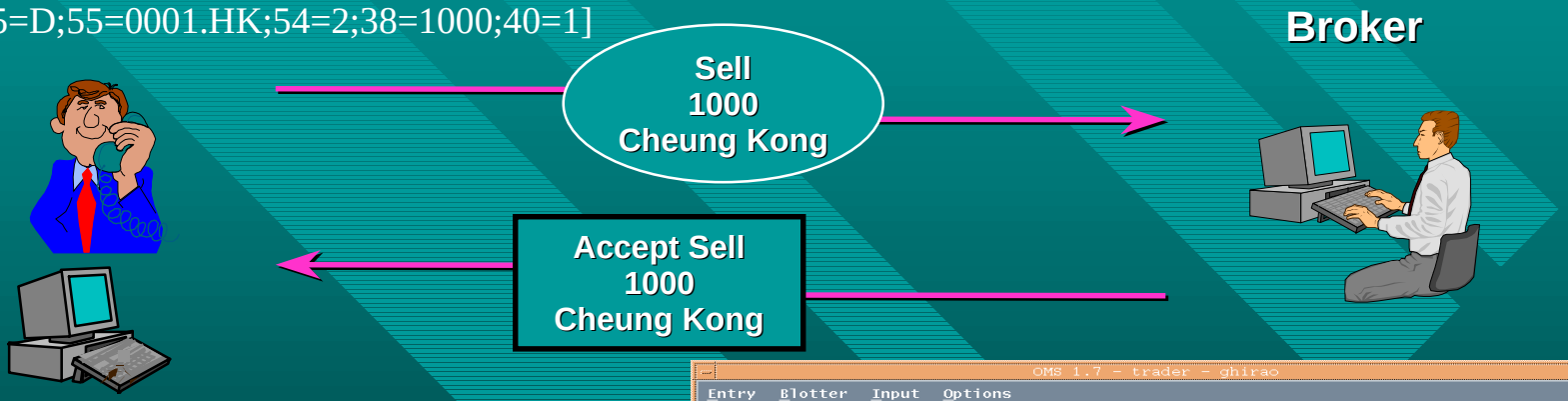
FIX Customer/Broker Example

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]



FIX Order Accept (Execution Report)

Symbol = 0001.HK

Side = Sell

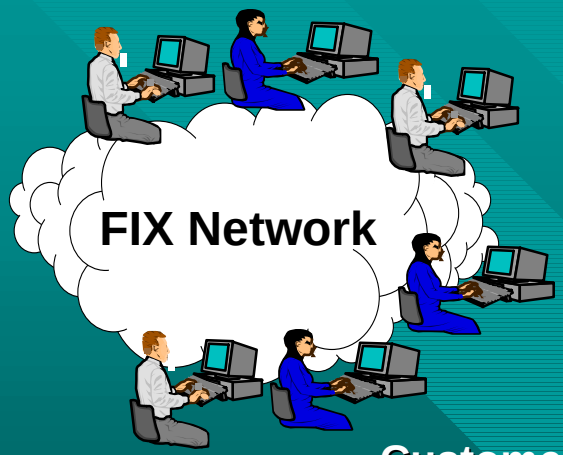
OrderQty = 1000, OrdType = Market

OrdStatus = New

[35=8;55=0001.HK;54=2;38=1000;40=1;39=0]

FIX Customer/Broker Example

Step 2 - Sending an IOI



Customers

Seller of 1000 Cheung Kong

Broker/ Position Trader

FIX IOI

Symbol = 0001.HK

Side = Sell

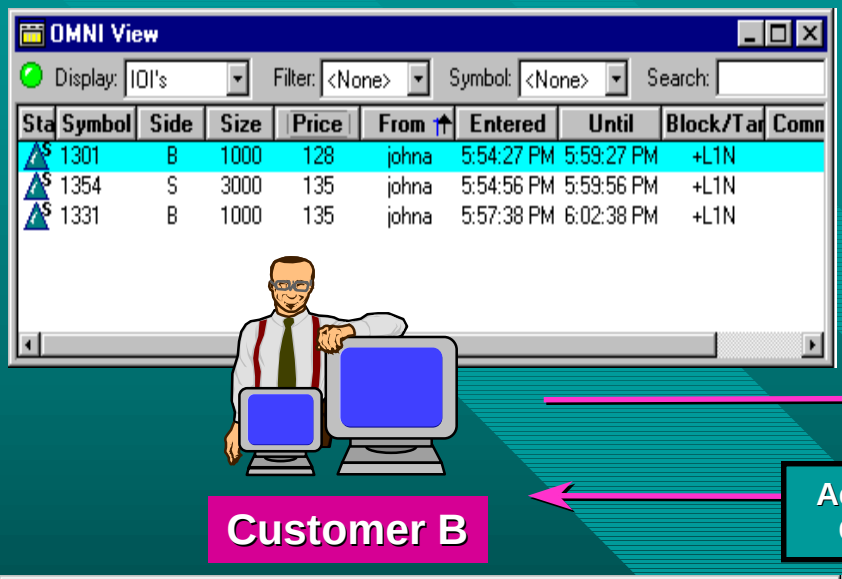
IOIShares = 1000

Price = 101

[35=6;55=0001.HK;54=2;27=1000;44=101]

FIX Customer/Broker Example

Step 3 - Filter IOIs, Cust B's Order



FIX Order

Symbol = 0001.HK

Side = Buy

OrderQty = 1000

OrdType = Market

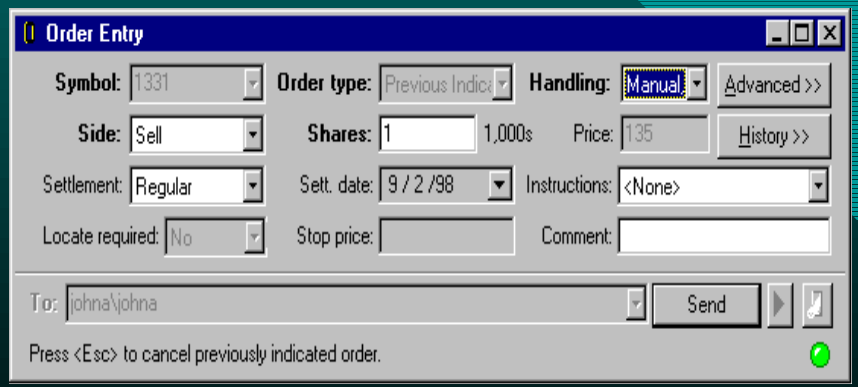
[35=D;55=0001.HK;54=1;38=1000;40=1]

Buy 1000 Cheung Kong

Accept Buy 1000 Cheung Kong

Customer B

Broker/ Sales Trader



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]

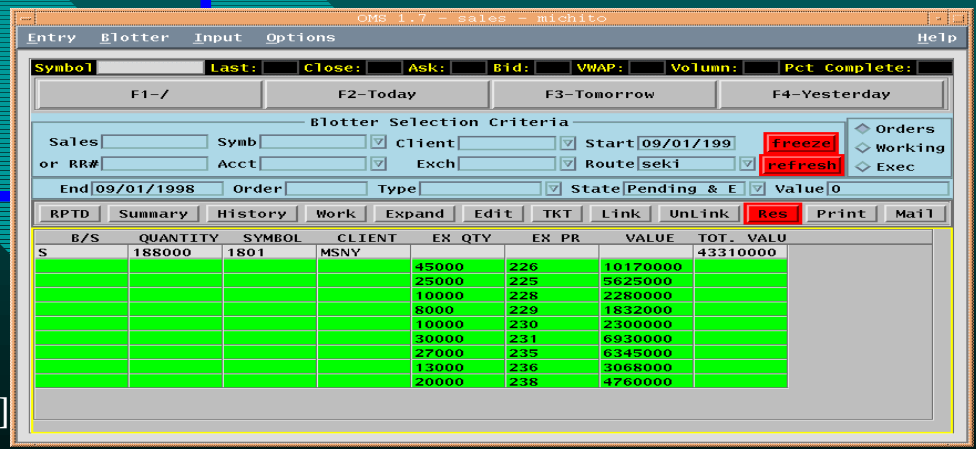
Customer B

Bought 1000 Cheung Kong

Broker Sales Trader

Sold 1000 Cheung Kong

Customer A



FIX Execution Report (Filled)

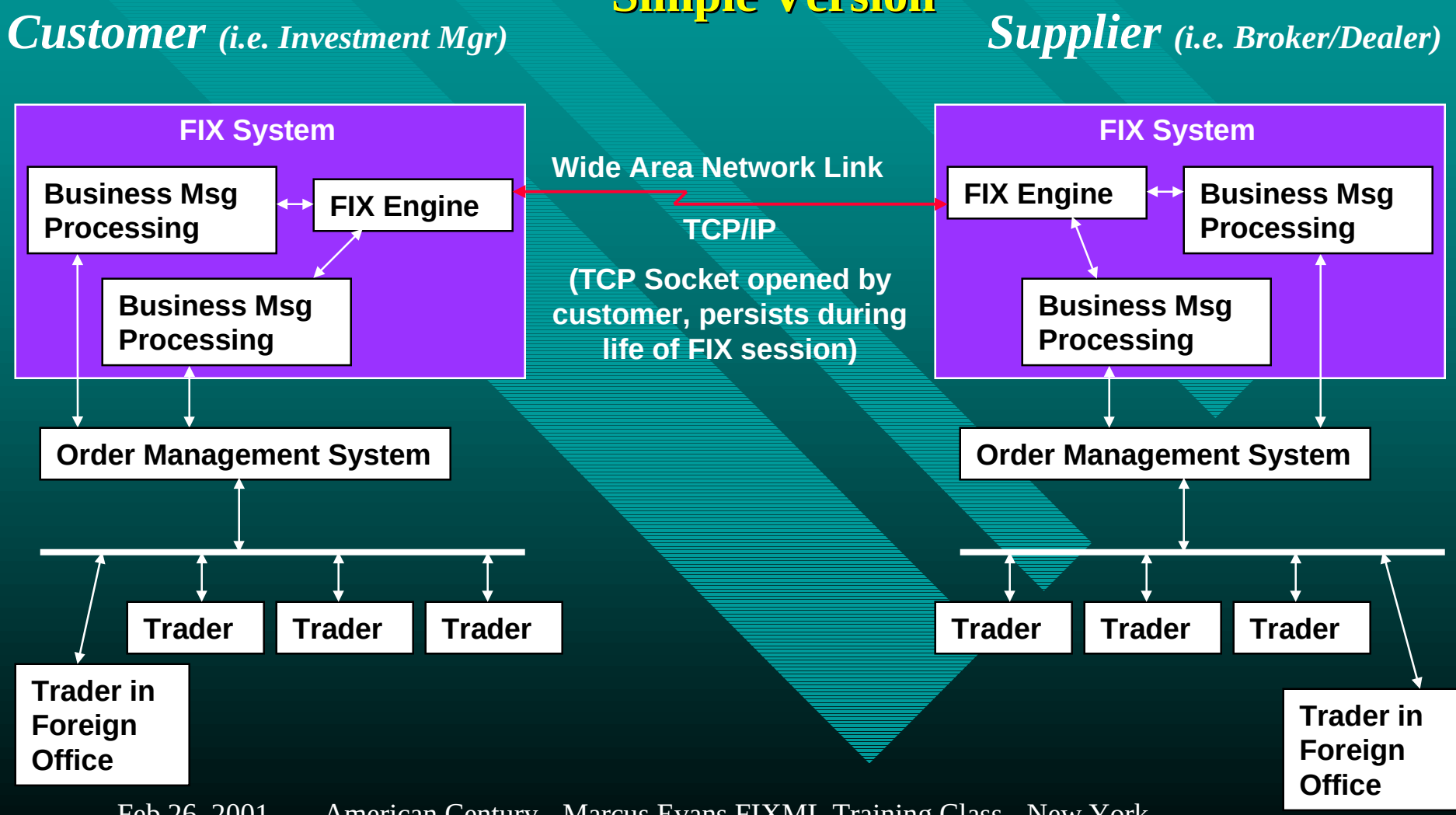
Symbol = 0001.HK, Side = Sell, OrderQty = 1000,

OrdStatus = Filled, LastShares=1000, LastPx=101

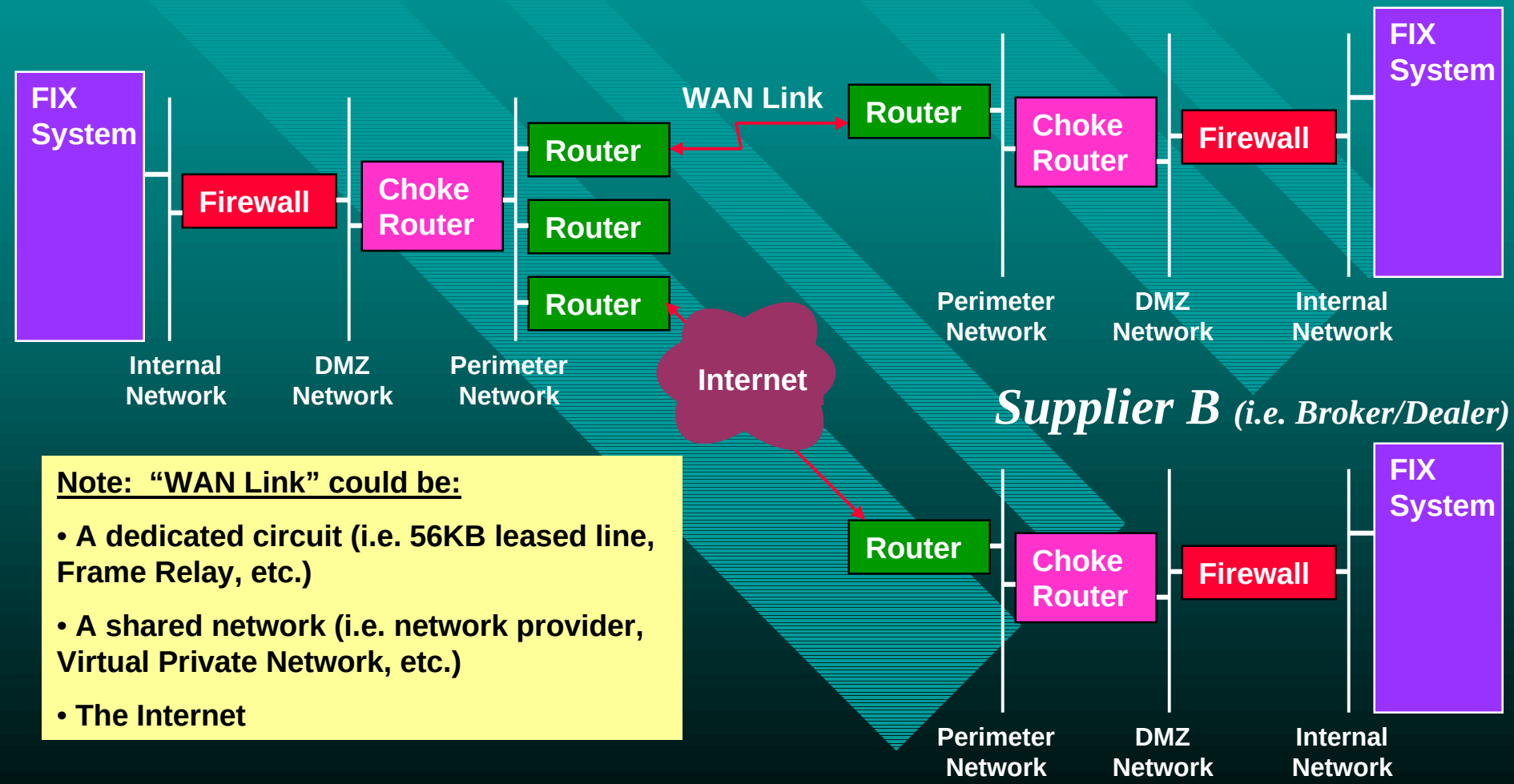
[35=8;55=0001.HK;54=2;38=1000;39=2;32=1000;31=101]

Typical FIX System Connectivity

Simple Version



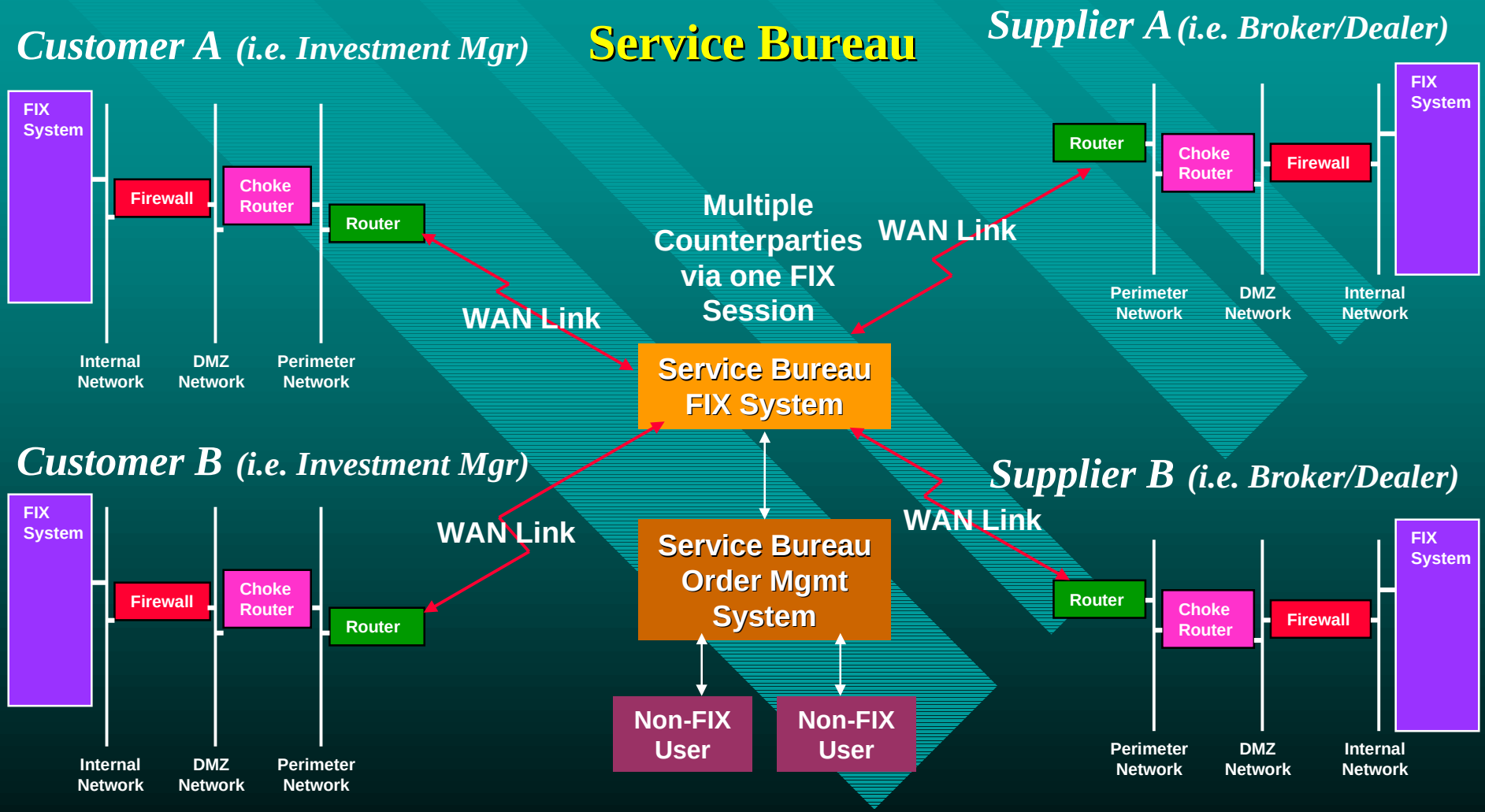
Typical FIX System Connectivity



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



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

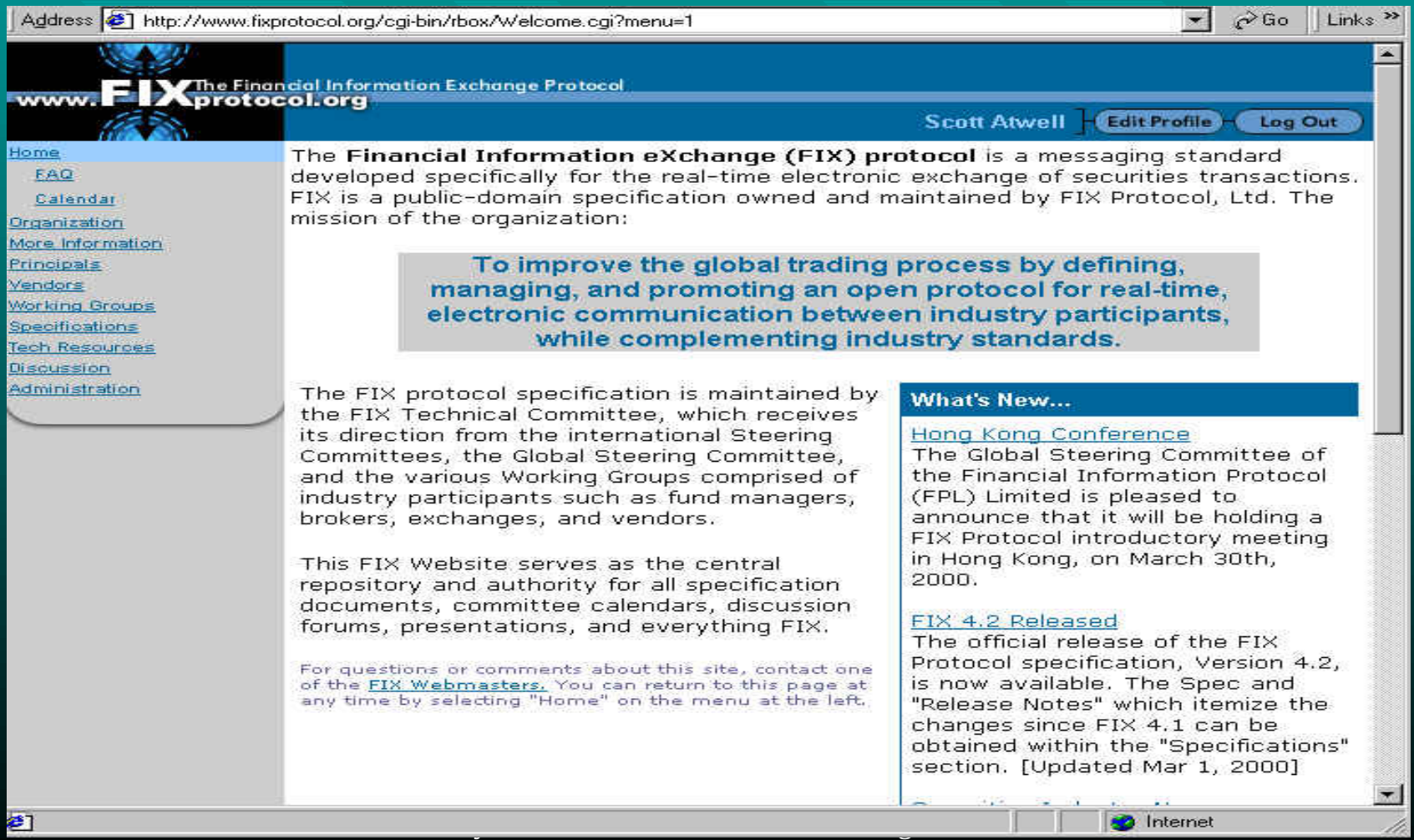
- Continuous functions
  - » Service inbound FIX messages
    - Decrypt, parse, and safe-store all messages
    - Respond to admin-level messages
    - Convert and forward business messages to “handler”
    - Validate seq num, send Resend Request if gap detected
  - » Service inbound requests from internal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

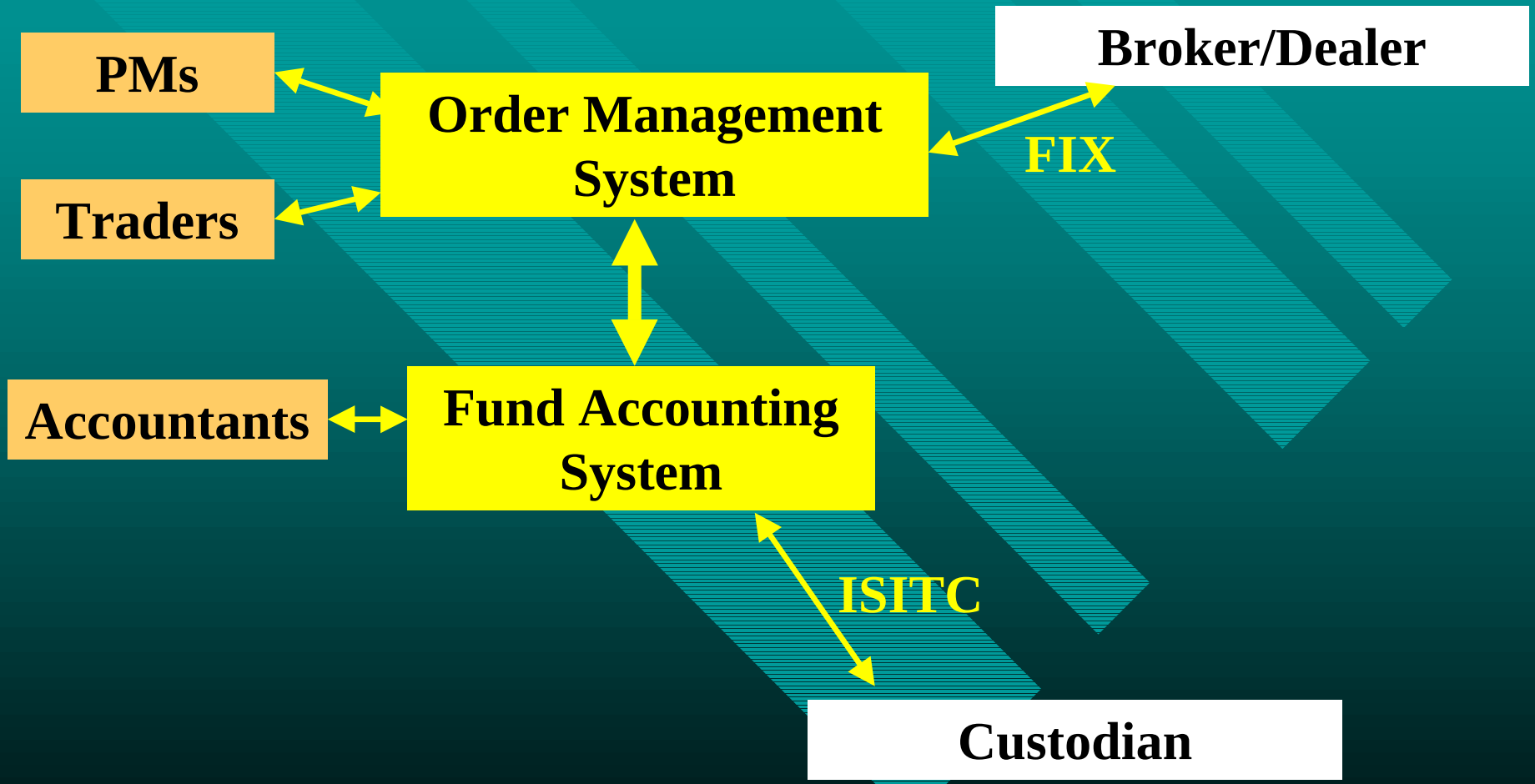
FIX Web-site

http://www.fixprotocol.org



Buyside Case Study: American Century Investments

American Century's STP Today



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

Introduced Feature	2.7	3.0	4.0	4.1
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

FIX 4.2 - Statistics

	FIX 3.0	*FIX 4.0*	*FIX 4.1*	*FIX 4.2*
Release Date	Sep 1995	Jan 1997	Apr 1998	Mar 2000
# Admin Msgs	7	7	7	7
# Business Msgs	17	20	21	39
# Fields	112	138	208	396
# Appendices	4	4	7	16
# pages in spec	57	69	106	265

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

FIX 4.2 - Session-level

- 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

Base	int, float, char, data
Intermediate	String, Boolean, UTCTimestamp, UTCTimeOnly, LocalMktDate, UTCDate, month-year, day-of-month, MultipleValueString
Business	Qty, Price, Amt, Currency, Exchange, PriceOffset

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

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

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

FIX 4.2 - Overall

#	New Appendices
H	Mass Quote Message Scenarios
I	Security Definition, Security Status, and Trading Session Message Scenarios
J	Example Usage of Encoded Fields for Japanese Language Support
K	Example Usage of Allocations
L	Pre-Trade Message Targeting/Routing
M	FIXML Support
N	Program/Basket/List Trading
O	Foreign Exchange Trading

FIX 4.2 - Orders/Execs

Orders and Executions

- Appendix D - Order State Change Matrices
- Pre-allocation on order
- Stale orders
- Good-Till (GT) and “ExecRestated”

FIX 4.2 - Orders/Execs

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 Replace (12)
  - Status (3)
  - Execution Cancel/Correct (3)
  - Cancel (3)
  - Unsolicited Reports (4)
  - GT Orders (4)
  - 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

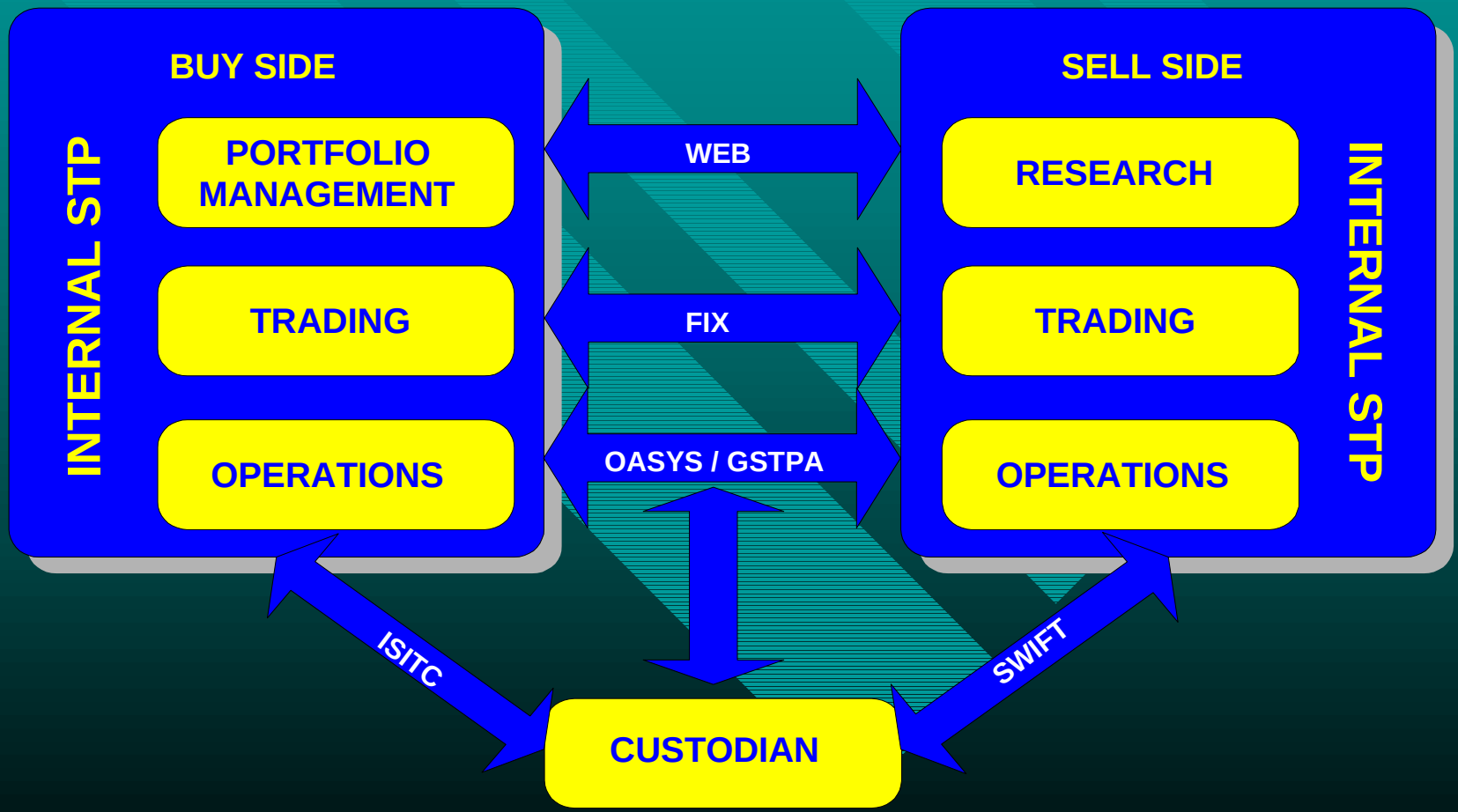
- Changes initiated via Working Groups, Website Discussion Postings, etc.
- Changes classified as either:
  - Clarifications: typographical and clarification of ambiguities [Errata]
  - Proposed Changes: new or changes to messages or fields [Specification]
- FIX Technical Committee approves Errata and 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



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

SWIFT	FPL	GSPTA
DTCC	ISITC	
ISITC-IOA	FpML	*and others*….

XML

Standards Development - Leveraging New Technology

- XML
- Business Modeling - UML

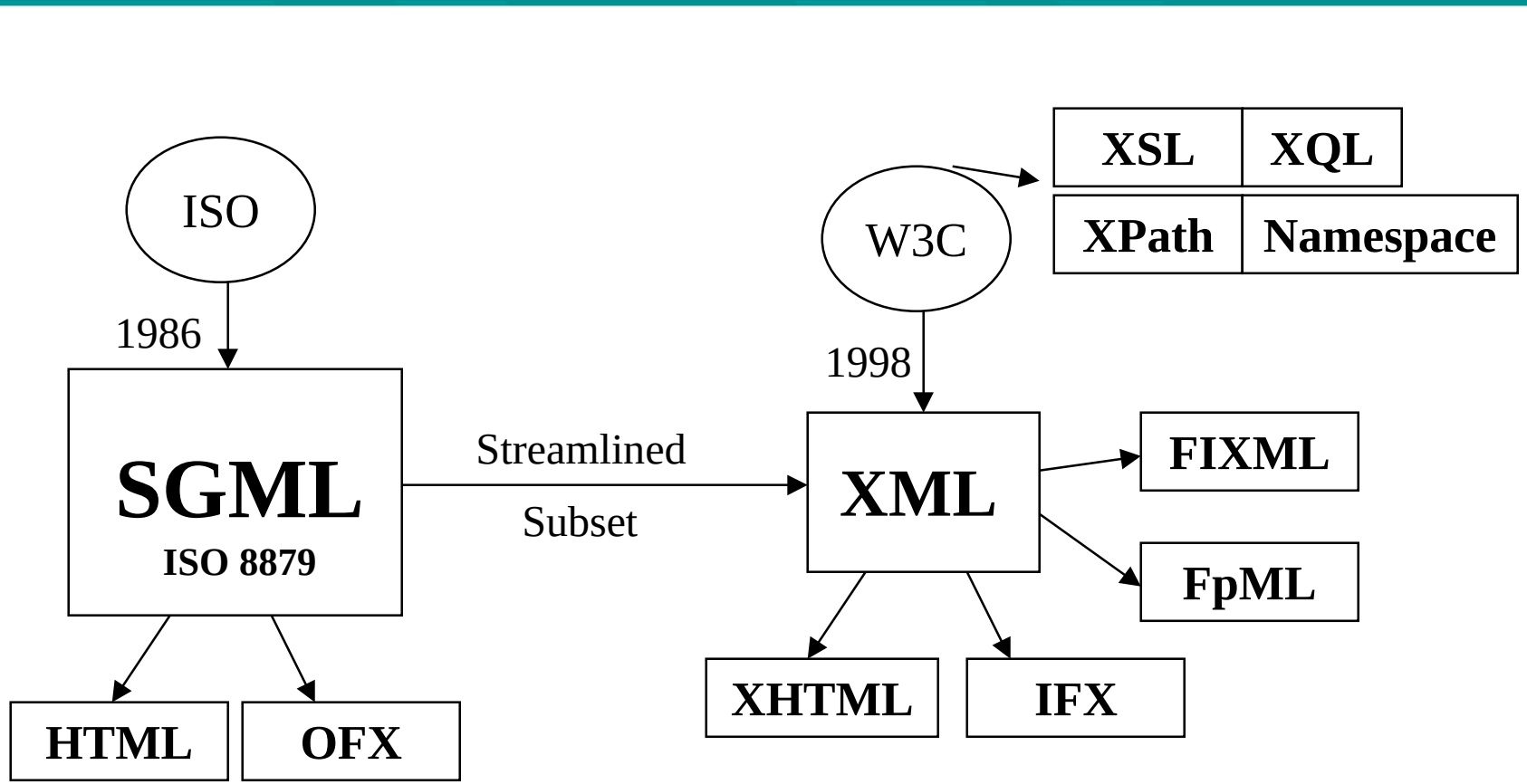
What is XML?

- 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
1986
SGML
ISO 8879
HTML
OFX
Streamlined
Subset
W3C
1998
XML
XSL
XQL
XPath
Namespace
FIXML
FpML
XHTML
IFX

XML Example

SALOMON SMITH BARNEY
A member of citigroup

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

<CurrentRank>3H</CurrentRank>

FUNDAMENTALS

Current Rank.....:3H Prior:No Change Price (11/16/99)....:$8.31
P/FFO Ratio 12/99...:4.4x Target Price..:$11.00 Prior:No Change
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%
Shrs & Units O/S(a).:10.5mil Convertible.....:No
Mkt. Capitalization.:87.3mil Hedge Clause(s).....:#
Comments.....:(a) Where applicable, includes operating partnership units.
Comments.....:
FFO = Funds from Operations, generally defined as net income according to GAAP before real estate depreciation, extraordinary items, and gains or losses f

<Yield>15.6</Yield>

tag data using XML syntax

XML Example Continued

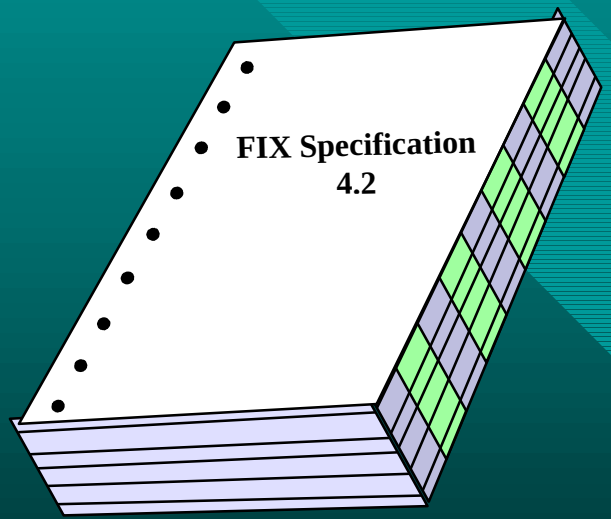
XML Document

Document:

```
<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



Human Readable

Format Structure Rules

FIXML.DTD

```
<!--
     Revision: 1.0.0
     Date:  15 Jan 1999
     FIX Protocol fixmlmain.dtd
     Copyright 1999 FIX Protocol

     This DTD defines the FIXML protocol.
-->
<!ELEMENT Indication (IOIid,
 IOITransType, Instrument, IOISide,
IOIShares, Price?, Currency?,
ValidUntilTime?,….
```

Computer Readable

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*

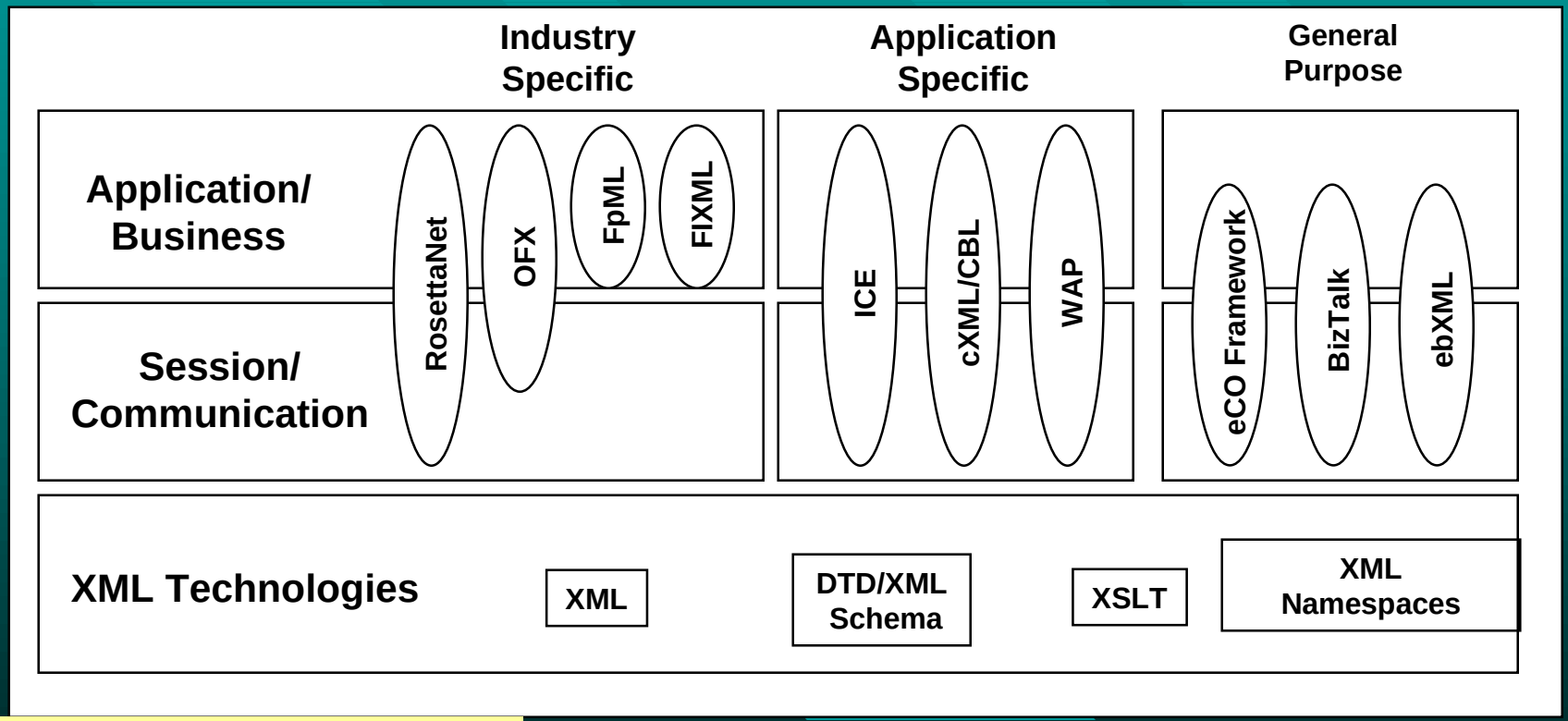
GedML - *Genealogical data*

WAP - *Wireless Application Protocol*

SAE J2008 - *Auto Industry*

ACCORD - *Insurance*

XML Standards Initiatives



Source: Giga Information Group/John Goeller

Legend:

RosettaNet is a global business consortium creating the electronic commerce framework to align processes in the IT supply chain
OFX is the joint intiative 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

FIXML: Example Syntax

8=*FIX.4.2*^9=*199*^35=*D*^34=*10*^49=*VENDOR*^115=*CUSTOMER*^144=*BOSTONEQ*^56=*BROKER*^57=*DOT*^143=*NY*^52=*20000907-09:25:58*^
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*^

Becomes…

8=*FIX.4.2*^9=*1043*^35=*D*^34=*10*^49=*VENDOR*^115=*CUSTOMER*^144=*BOSTONEQ*^56=*BROKER*^57=*DOT*^143=*NY*^52=*20000907-09:25:58*^
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>
     <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>
```

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