Fixed Income Trading Platform Architecture

Khader Vali Shaik

Note: Design of hypothetical system for educational purpose
Architecture Diagram

FI Trading Platform Architecture (high level)

Services:
- Order Management System
- Connectivity Gateways
- Analytics & Pricing Engines
- Market Data Access Components

Liquidation Sources:
- Exchanges
- Dealer Networks
- Others

Front Office Trading Desks
- Traders

Middle Office

Copyright 2010 Khader Shaik (www.kwali.com)
Technical Requirements of Trading Platform

- Performance
- Scalability
- Fault Tolerance
- Reliability/Stability
- Security
- Modular (options to use selected components)
- Open Architecture (support for extensions)
  - Open APIs
  - Easy Integration
Functional Requirements of Trading System

• Trade Capture
• Market Access (D2D, D2C, Market Data)
• Pricing
• Risk & Portfolio Analytics
• Position Management (Blotter)
• Easy Integration with middle and backoffice systems
Popular FI Products

- Government Bonds
- Strips
- Corporate Bonds
- Floaters
- Inflation Linked Bonds
- Multi-step bonds
- Futures
- Bond Options
- Futures Options
- Swaptions
- Caps and Floors
- Emerging Markets etc
Front End

• Users
  – Traders
  – Risk Management Group
  – Operations
  – Support

• Applications
  – Trade Capture
  – Quote Entry
  – Risk Analytics
  – Operations etc.

• Technologies
  – Excel + Vendor Libraries
  – C++
  – Java
  – C# (latest development)

• Platforms
  – Windows
  – Unix (X-Windows)
Application Servers

• Application Servers
  – Pricing Engine, Risk/Analytics Engine, Position Management, Market Data Server etc

• Technologies
  – High Performance Architecture
  – Java (Core Java)
  – C++/C#
  – Communication Software (TIBCO EMS, SOAP etc)
  – Vendor APIs (if any vendor products used)
Database

- Popular Database Servers
  - Sybase
  - Oracle
  - MS SQL Server etc
Multi-tier Architecture

- Communication Protocols
  - Synchronous – TCP/IP etc
  - Asynchronous
    - Messaging
- Messaging
  - Publish/Subscribe
  - Point-to-point
  - MQ, Tibco and vendor products
- Java – JMS, RMI, Sockets, WebServices etc
- .Net – Remoting, WebServices etc
Design Considerations

• Scalable and Powerful platform
• Processing Power – complex calculations
  – Pricing
  – Analytics
  – Risk Calculations
  – P&L Calculations etc
Backoffice

• Usually different from Trading Systems
• Settlement
• Accounting & Finance
• Regulations/Compliance
  – Usually External Service Providers
• Custodian Houses
• Many vendor software products available
Technology Team

• Front-end Developers
  – GUI developers with reasonable understanding of the products, fundamentals of Fixed Income mathematics

• Pricing Engine
  – Back-end developers
  – Core language expertise (VBA, Java, C++, multi-threading, data structures, performance etc)
  – In-depth knowledge of Product Evaluation methods
  – Financial Mathematics/Mathematics educational background
  – Ph.D, MS in Math and Finance, or some certifications in finance etc.
Technology Team cont..

• Risk Engine
  – Complex APIs and Application Server
  – Advanced Math Degree
  – Advanced Finance Education, Ph.D, CFA etc
  – Usually available in the form of APIs or Vendor product

• Other Technical Skill
  – Platform skill – Unix scripting, architecture, performance etc
Technology Team cont..

• QA / Testing
  – Good understanding of Markets and Products
  – Excel/VBA
  – Good understanding of Trading
  – Knowledge of Risk Measures etc

• Support Team
  – Provide day to day system support
  – Troubleshooting
  – Platform Knowledge (Unix scripting, excel, VBA etc)
  – Good business knowledge
  – Good Communication Skills etc.
Quant

• Quantitative Analysts – Financial Engineers
• Role
  – Developing Pricing Models, Risk Models, Trading Strategies, etc
  – Assisting Traders in Trading Strategy development and testing
  – Build and Perform Regression tests, Stress tests etc
Vendor Trading Platforms

• Popular FI Trading Systems
  – Bloomberg Professional
  – Reuters Trading for Fixed Income
  – Thomson TradeWeb and many more

• Key Features
  – Provide most of the basic features
  – Connectivity with Liquidity Sources
  – Algorithms of Analytics
  – Risk Measures
  – Support of complex products
  – STP (Straight Through processing) support etc
Bloomberg/Reuters Trading Systems

• Full Service Trading Platforms
  – Trade Entry
  – Market Data
  – Risk and Portfolio Analytics etc

• Connectivity
  – Liquidation Sources (ECNs etc)
  – Other Broker/Dealers (Dealer-to-Dealer D2D)
  – Large Clients (Dealer-to-Client D2C)
Thank You
Khader Vali Shaik

khaderv@yahoo.com
http://www.ksvali.com