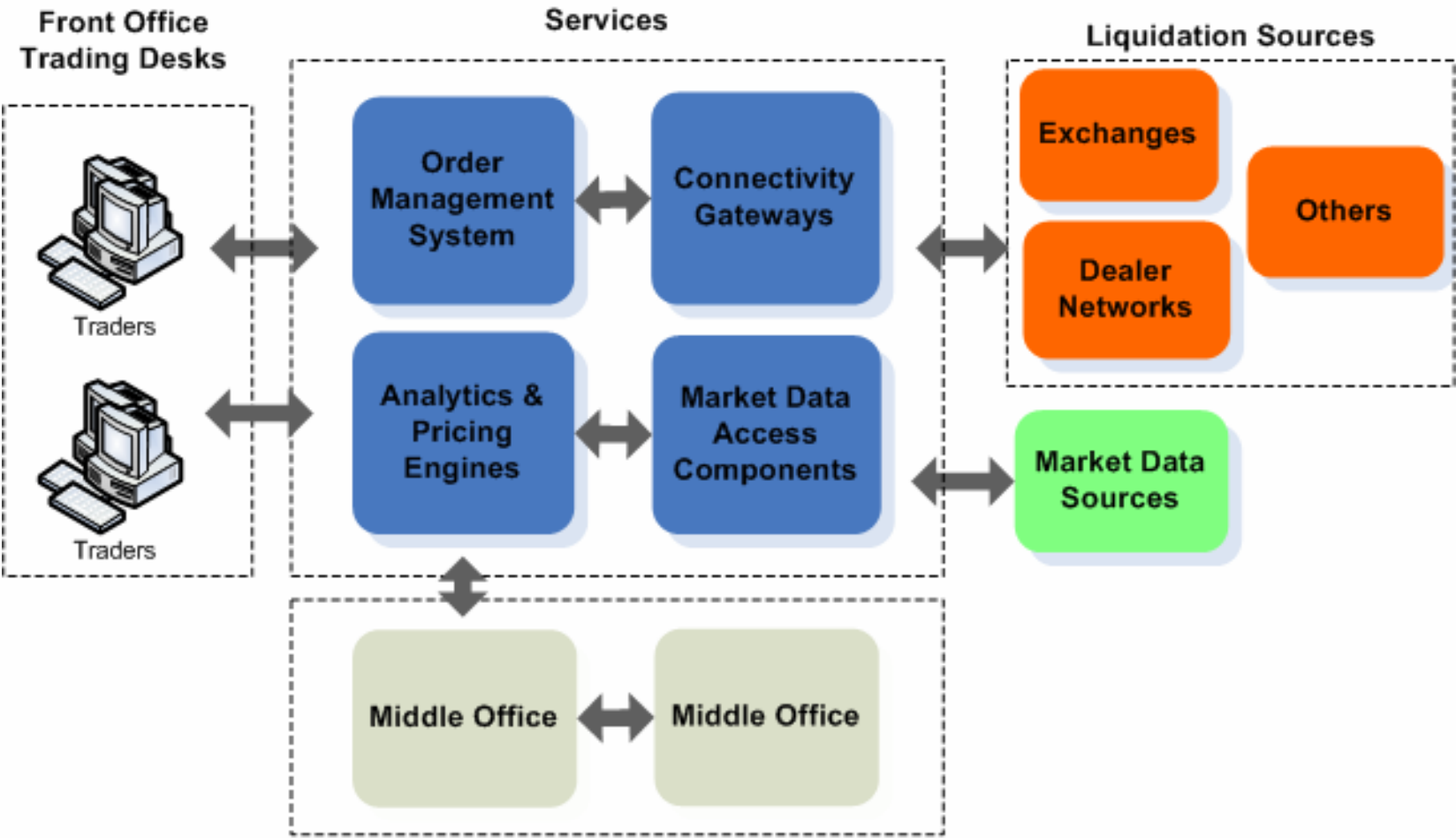# Fixed Income Trading Platform Architecture

Khader Vali Shaik

Note: Design of hypothetical system for educational purpose

Architecture Diagram

FI Trading Platform Architecture (high level)

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