New York Stock Exchange
Achieving the Promise of SOA

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Agenda

- The New York Stock Exchange
- Enterprise Architecture Program
- NYSE Enterprise Architecture
- Business Agility

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New York Stock Exchange

- World's Largest Exchange by Market Cap
  - $21.4 Trillion
- Listed Companies
  - 2,773 (Common and Preferred)
  - 3,615 (All)
- 341 Member Firms / 1366 Trading Licenses
- Average Daily Volume: 1.6 billion shares

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NYSE: Major Changes

- Hybrid Market
  - New Trading Venue
  - Enables Customer Choice
- Merger with Archipelago
  - High Performance Execution
  - Platform for New Trading Products

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NYSE Non-Trading Domains

- Regulatory & Compliance
- Global Corporate Client Group
- Competitive Positions Group
- Market Data Products
- Research
- Corporate: Finance, Legal, HR

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Enterprise Drivers

- Improve Information Quality
- Business Agility
- Operational Efficiencies
- Reduced Costs

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Current Environment Challenges

- Complexities involving data & technologies
- Performance issues as volumes continue to grow
- Increasing Time-to-Market & Costs
- Lack of transparency of information and business rules

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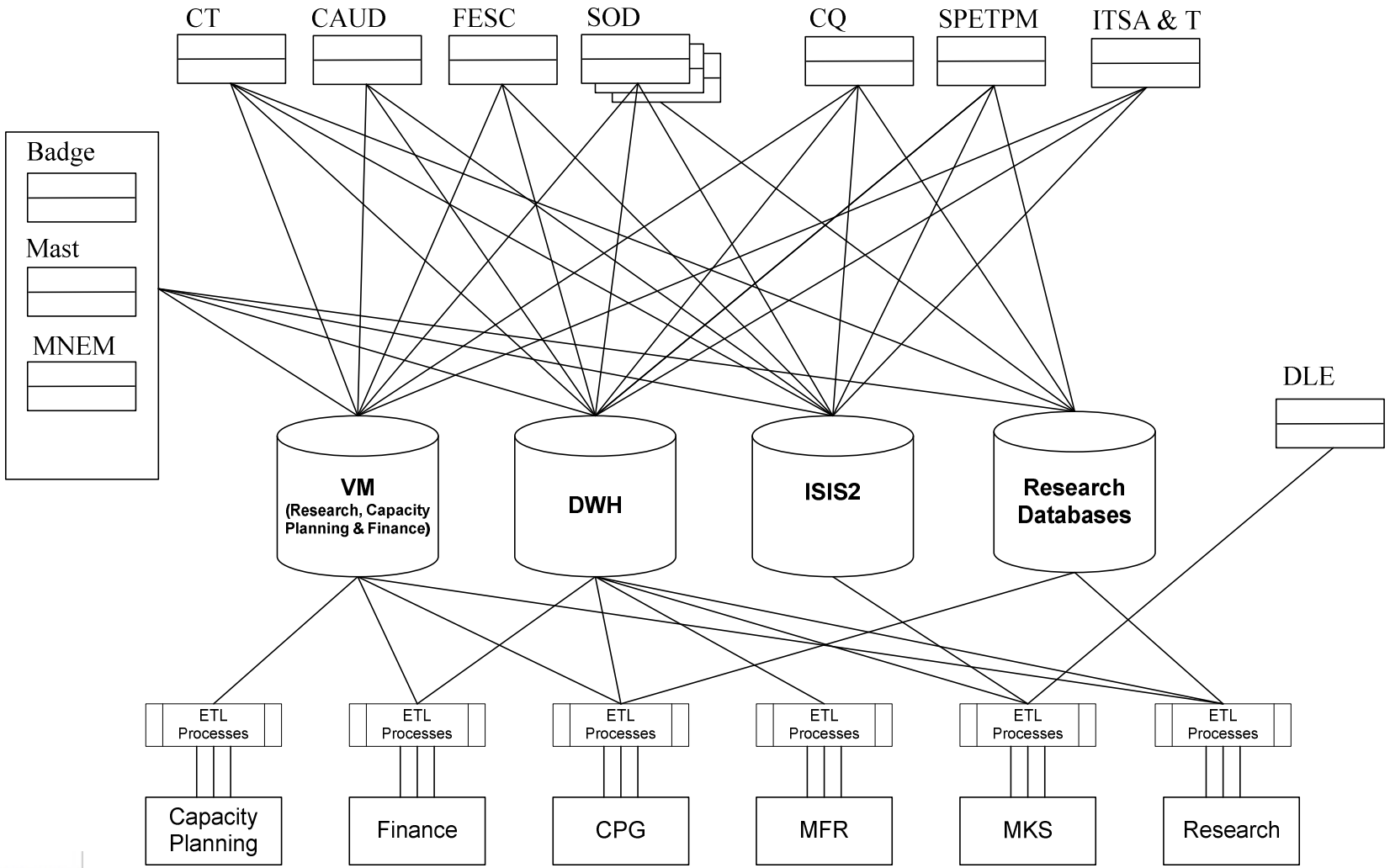
Current Environment

Current Data Sources & Stores



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Enterprise Architecture Strategy

- Business Optimization:
  - provide an environment which supports the business by engineering the enterprise
  - organizing information and functions as business services
- Architecture Governance
  - Implementation & Enforcement of Enterprise Technology Standards

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Project vs. Enterprise Level SOA

Enterprise-level **SOA** requires more preparation and coordination with:

- a formal approach to service portfolio planning
- platform planning
- governance

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Guiding Principles

- Loose Coupling
- Vendor & Technology Independence through Open Standards
- Utility Based Computing
- Consistency in Data, Processes & Technology
- Performance
- Flexibility

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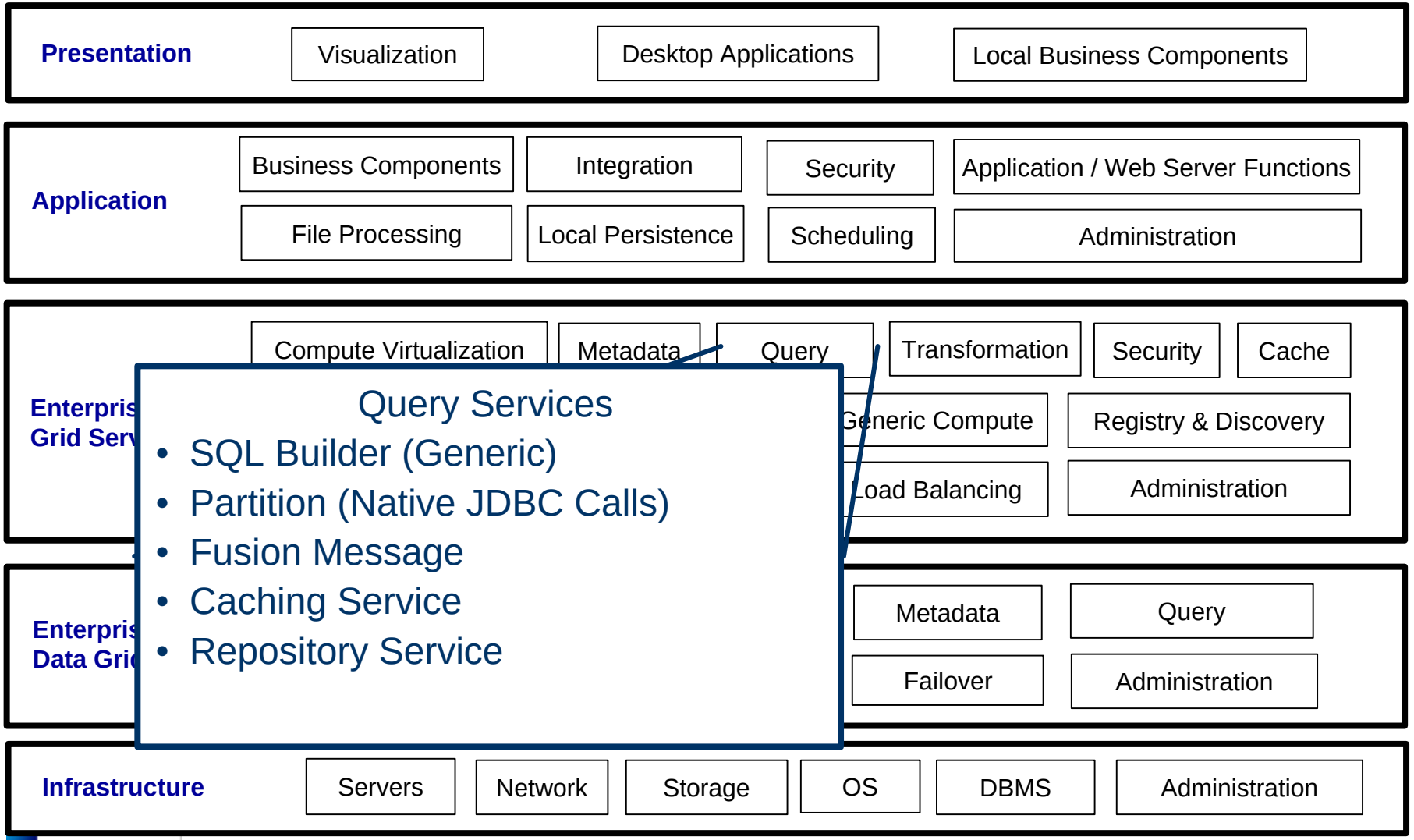
NYSE EA Services Reference Model



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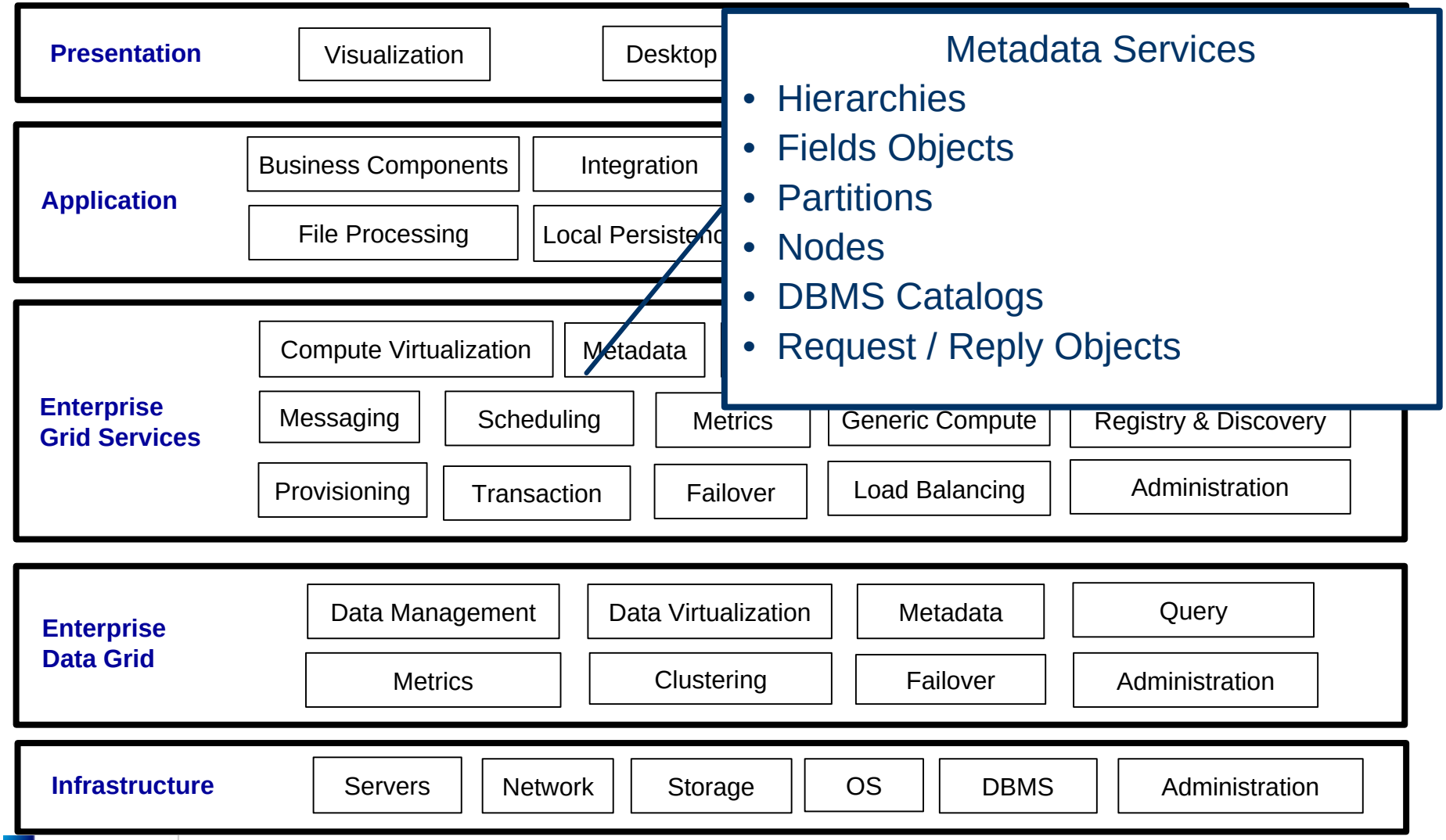
NYSE EA Services Reference Model



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Corporate Information Factory

- High Performance Computing and Data Warehouse Environment
- Lightweight, Grid Service Oriented Architecture
- Reusable Frameworks and Common Services
- Model Driven, Pattern Based Architecture

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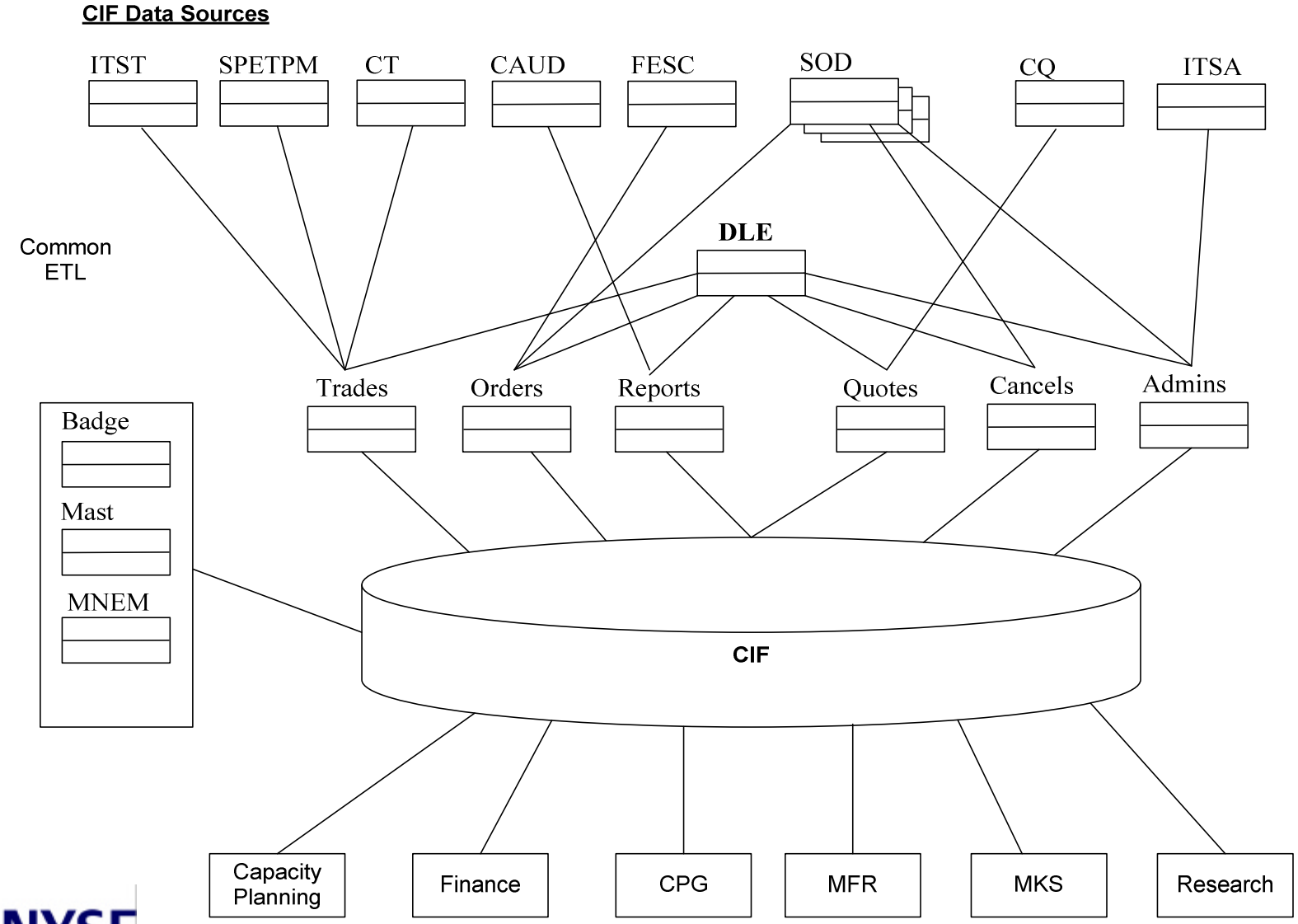
CIF Data Sources and Uses



NYSE Enterprise SOA Solution

- Complexities involving data & technologies
  - Establish an enterprise data warehouse (models & dictionary)
  - Establish & enforce enterprise technology standards
- Performance issues as volumes continue to grow
  - Horizontal scaling & parallelism
- Increasing Time-to-Market & Costs
  - Reusable services and Run-time assembly
  - Engineer & deploy low-cost commoditized components
- Transparency of information and business rules
  - Expose data & business rules through models & metamodels

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Grid Service Oriented Architecture

- Economies of Scale & Performance through Distribution
- Computer Resource Virtualization (“Grid Computing”)
- Master-Worker Pattern offers simple and elegant solution
- Request / Responses are Service Oriented using layered architecture
- Distribute Cache across “Grid”
- Heterogeneous software and hardware cooperate as one virtual “system”

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CIF Architecture Features

- Computer Resource Virtualization
- Federated Database for Trading, Market and Surveillance Source Data
- Metadata Repository
  - "*The Enterprise Data Dictionary*"
- Data Access Middleware
  - Metadata driven / Services Oriented
- Parallel Data Transformation & Load Engine
  - Grid Enabled

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Metadata Repository

- Logical views of distributed data (“Model”)
- Model data dictionary
  - (entities, attributes, fields, nodes, partitions)
- Hierarchical entity join relationships
- Data navigation hierarchies and business segmentation
- Logical data partitions
- Linkages to shared-nothing and/or federated databases
- User security and entitlements
- Data sources and providers

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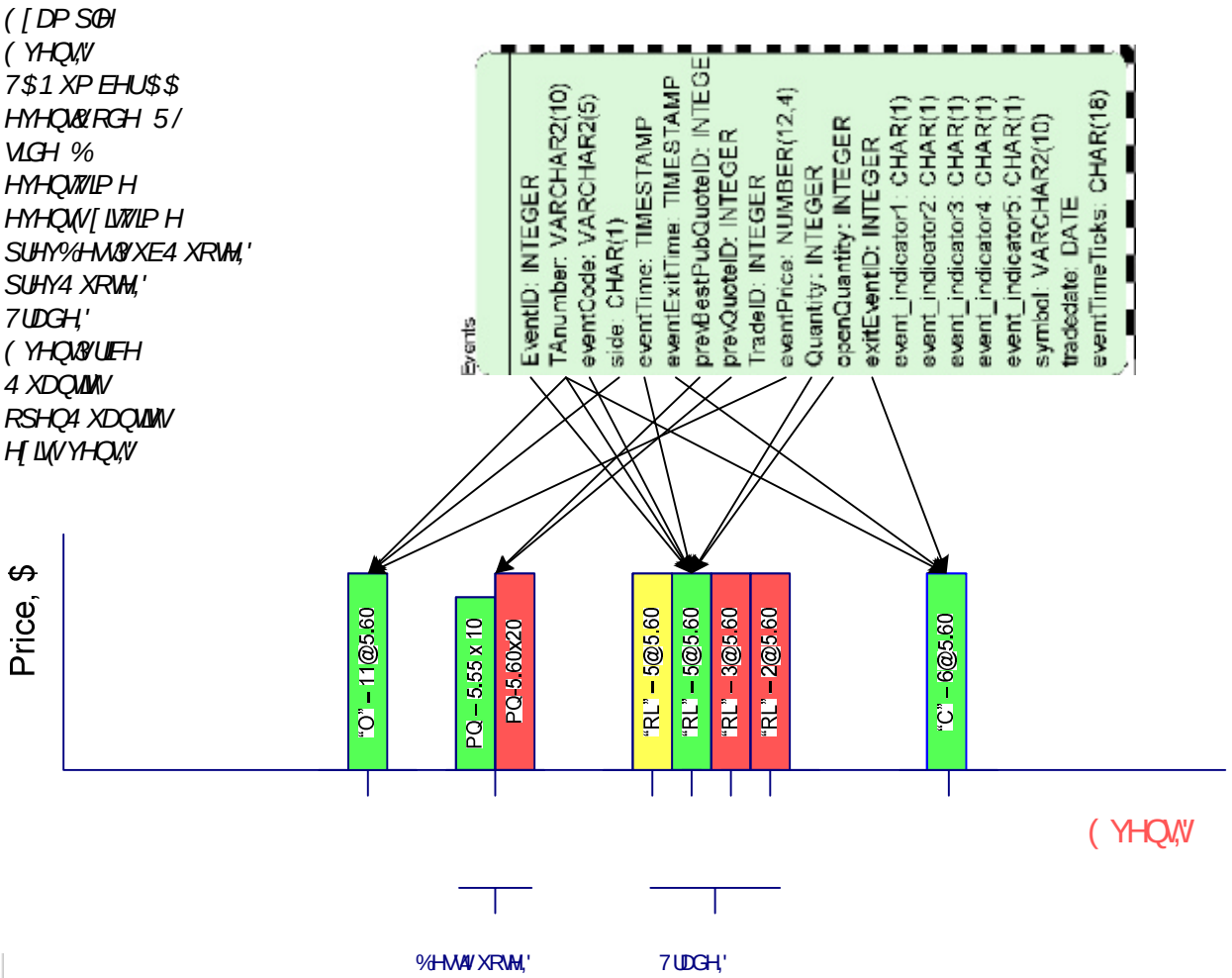
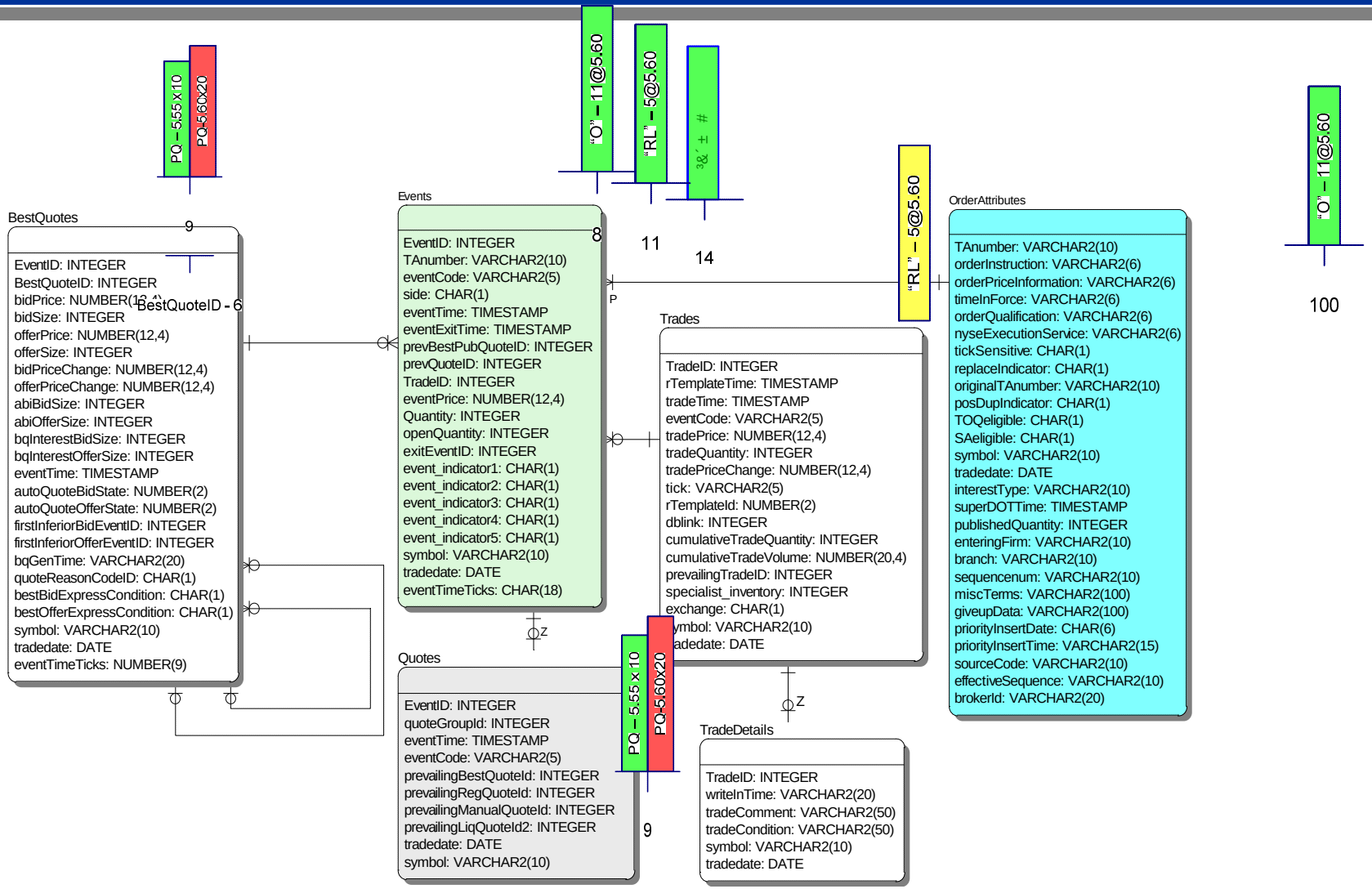
Architecture Methodology

It starts with Business Activity and Data Architecture

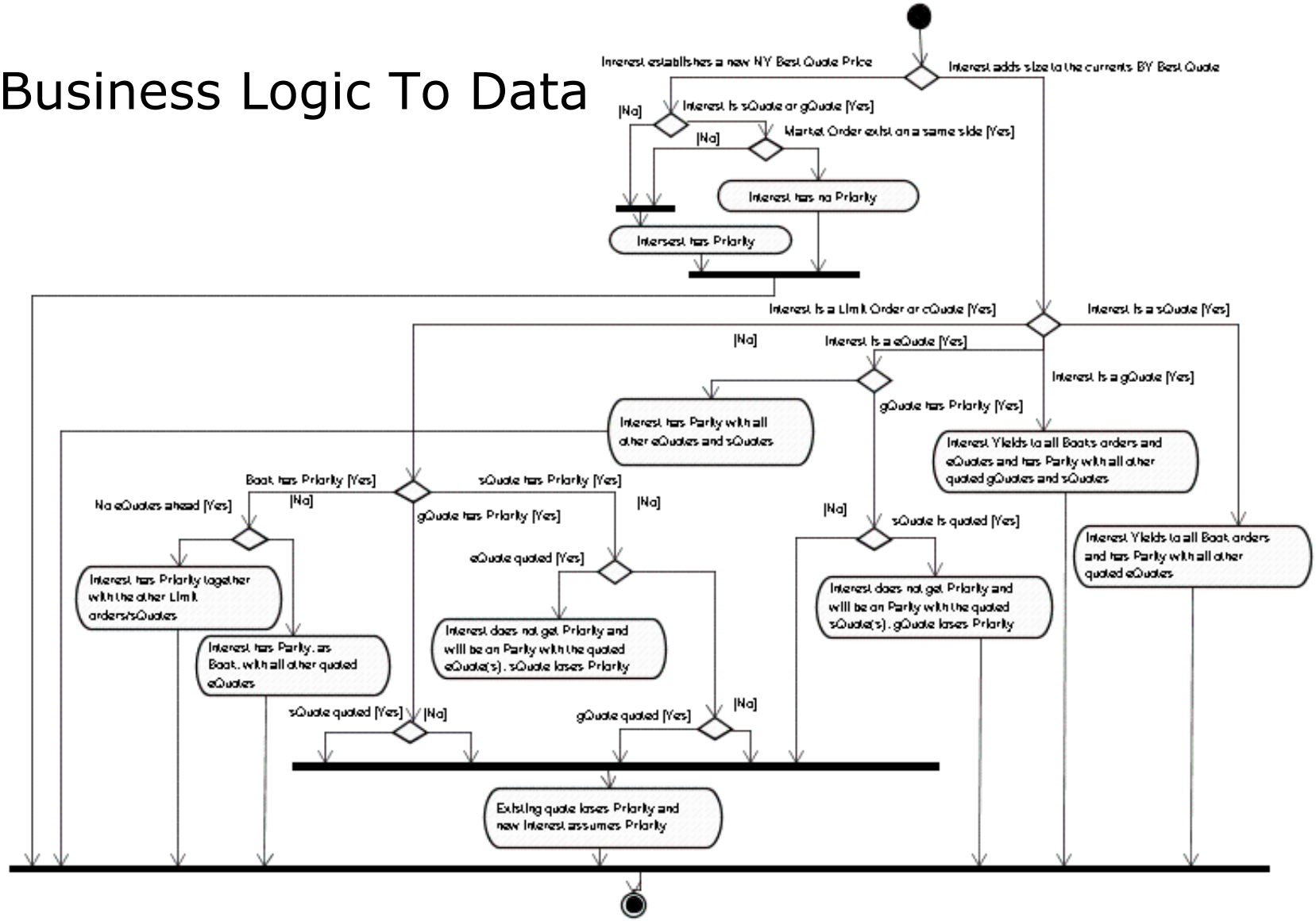


Architecture Methodology



Architecture Methodology

Map Business Logic To Data



Metadata Repository : Model-Driven Architecture

- A tool for integrating logical data models, DBMS systems, component services, security and business vocabulary
- Streamlines and centralizes metadata management, administration and deployment.
- Provides a Hierarchical business structure
  - structured data (relational)
  - unstructured data (documents, files, objects in cache)
  - Virtual Databases can be built rapidly, by logically linking these entities.
- Supports every type of data architecture; Federated Databases, Parallel and MPP Databases, Hierarchical Databases, ROLAP Databases

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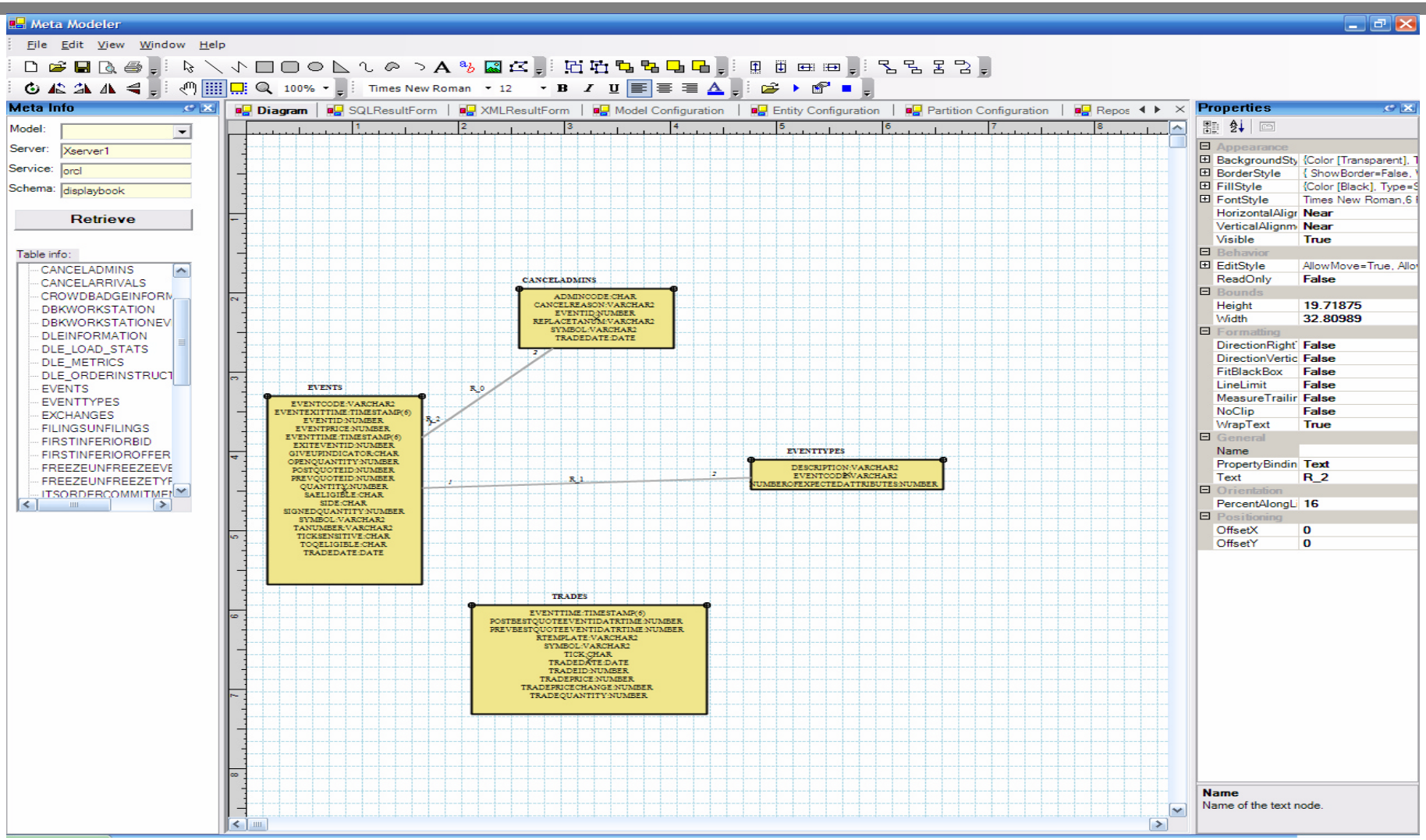
Metadata Repository



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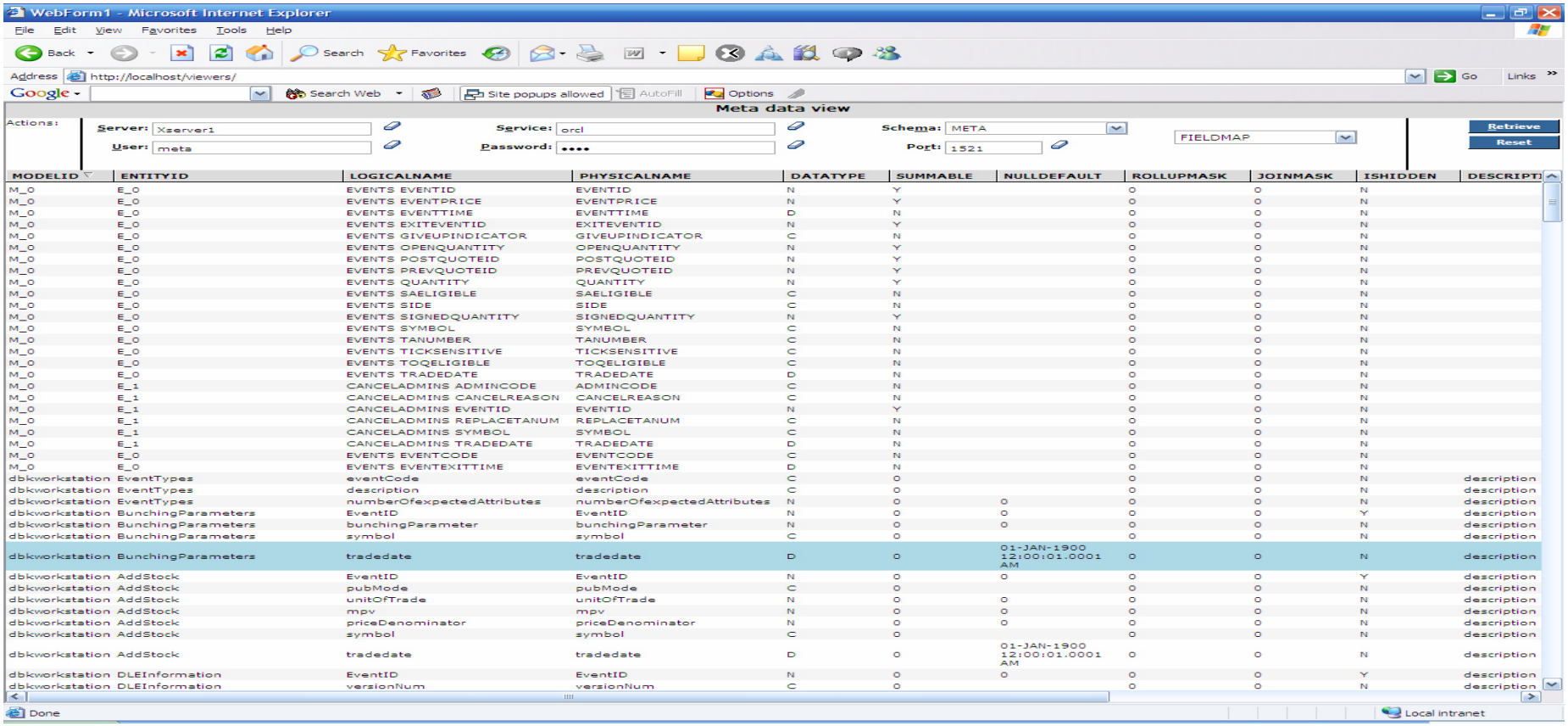
Metadata Repository Management

- Both thick and thin clients can access the metadata repository using common and simple interfaces (API)



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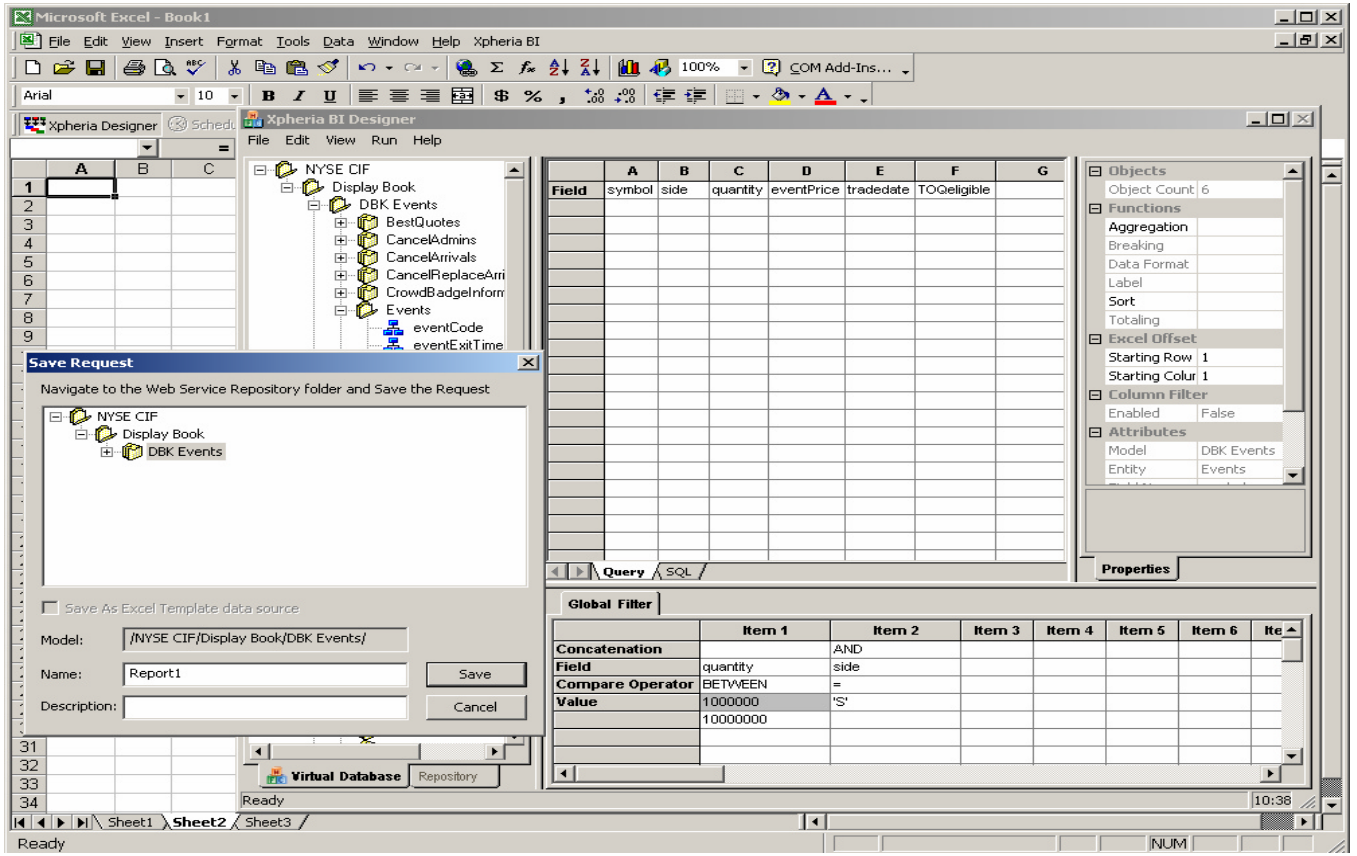
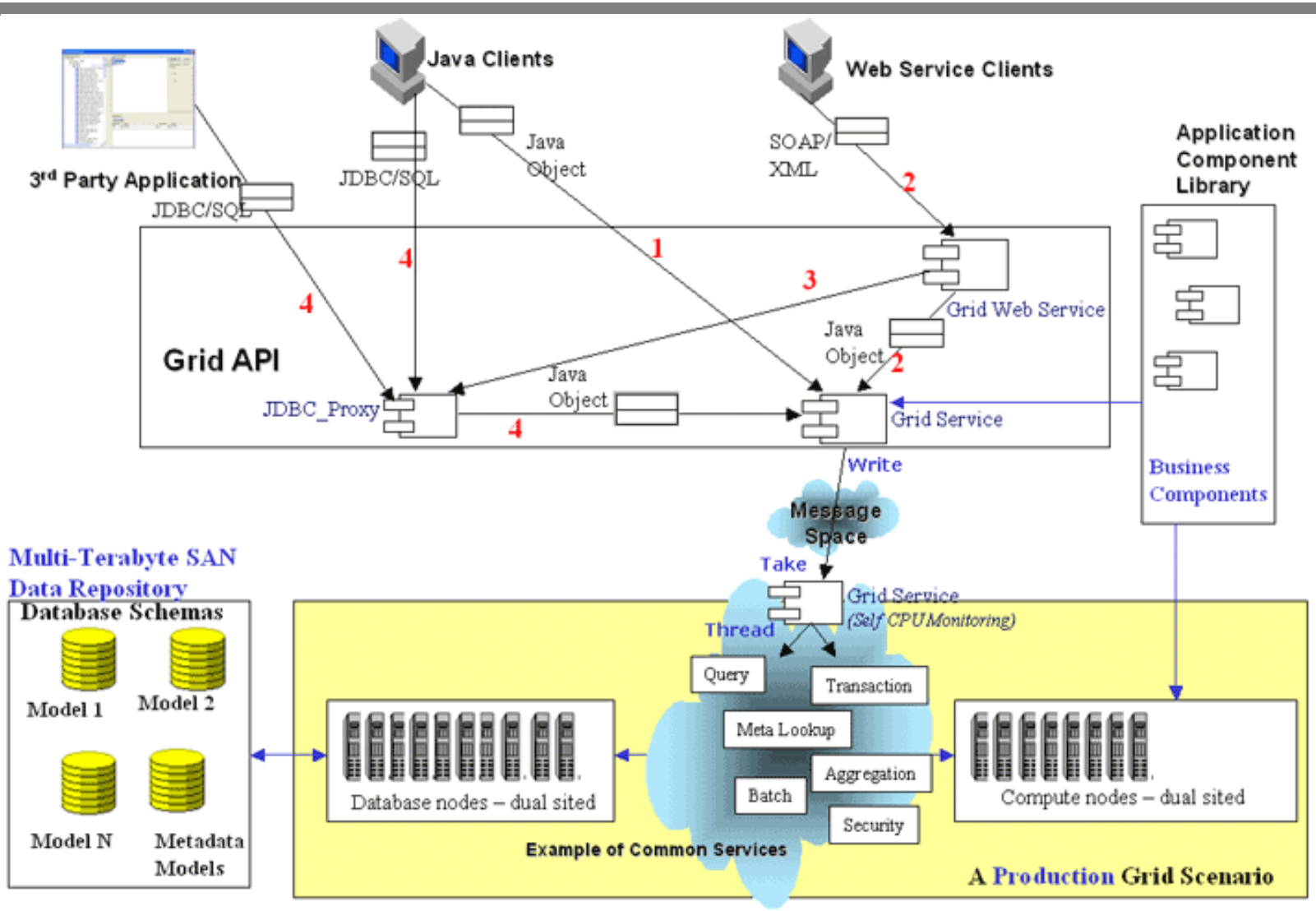
Grid Query

- Excel Add-in Query tool provides ad-hoc reporting capabilities to distributed data that is defined in the CIF metadata repository



Service Oriented Grid Topology



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Results to Date

- Data Quality & Integrity
- Time-to-Market Improvements
- Data, Services & Infrastructure Reuse
- Cost Savings

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Key Strategy Points

- Business pain drives SOA investments
  - Select areas the business cares about
  - Must deliver quick business value (“trader’s mindset”)
- Evolutionary approach with a long-term vision
  - Cannot approach SOA as a conversion project
  - SOA is an approach, not the solution
  - Keep reinforcing “the vision”
  - Implement using a just-in-time approach

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Critical Success Factors

- Partnership with Business Sponsors
  - Shared vision & Internal dialogue
  - Supporting development of business architectures
- Technology management leadership
  - Support of vision
  - Focus on high-impact areas
- Identify and Select appropriate services
  - Right definition and use of services
  - Developing modeling and design skills

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Q&A

Thank You !

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