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IBM SOA Summit

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# SOA and Enterprise Information Consistency

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IBM Software Group

# Agenda

- SOA and Enterprise Architecture
- SOA and the Information Perspective
- The key role of Data Models
- Information as a Service
- Information Services Implementation Patterns
- Conclusion

# The problem is to align Business and IT
## to address Key Challenges IT Executives are facing today

Move to architectures capable of business agility and game changing business models

Integrate core processes with agents and producers through Web and B2B channels

Reduce cycle times, operating expenses, and leverage BPO

Comply with national or international regulations and Industry Standa

•Close to 80% of organizations currently implementing SOA components aim to "**Create Efficiencies across Business Processes**" and "**Improve Access to Corporate Information**" (Yankee Group CIO Survey 2004)

# Enterprise Architecture
## embraces both Business and IT Architectures

Strategy

Business Opportunity

Business Strategy

Information Technology Strategy

Technology Availability

Enterprise wide focus

Planning

Enterprise Architecture

Business Architecture

IT Architecture

Business Map

Application Map

***Enterprise Architecture***
*"the city plan"*

***Domain Architectures***
*"regions of the city plan"*

Project focus

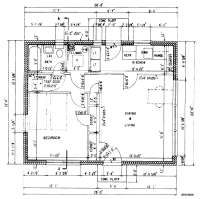
Design and Delivery

Business Operating Environment and IT Infrastructure

Infrastructure Map

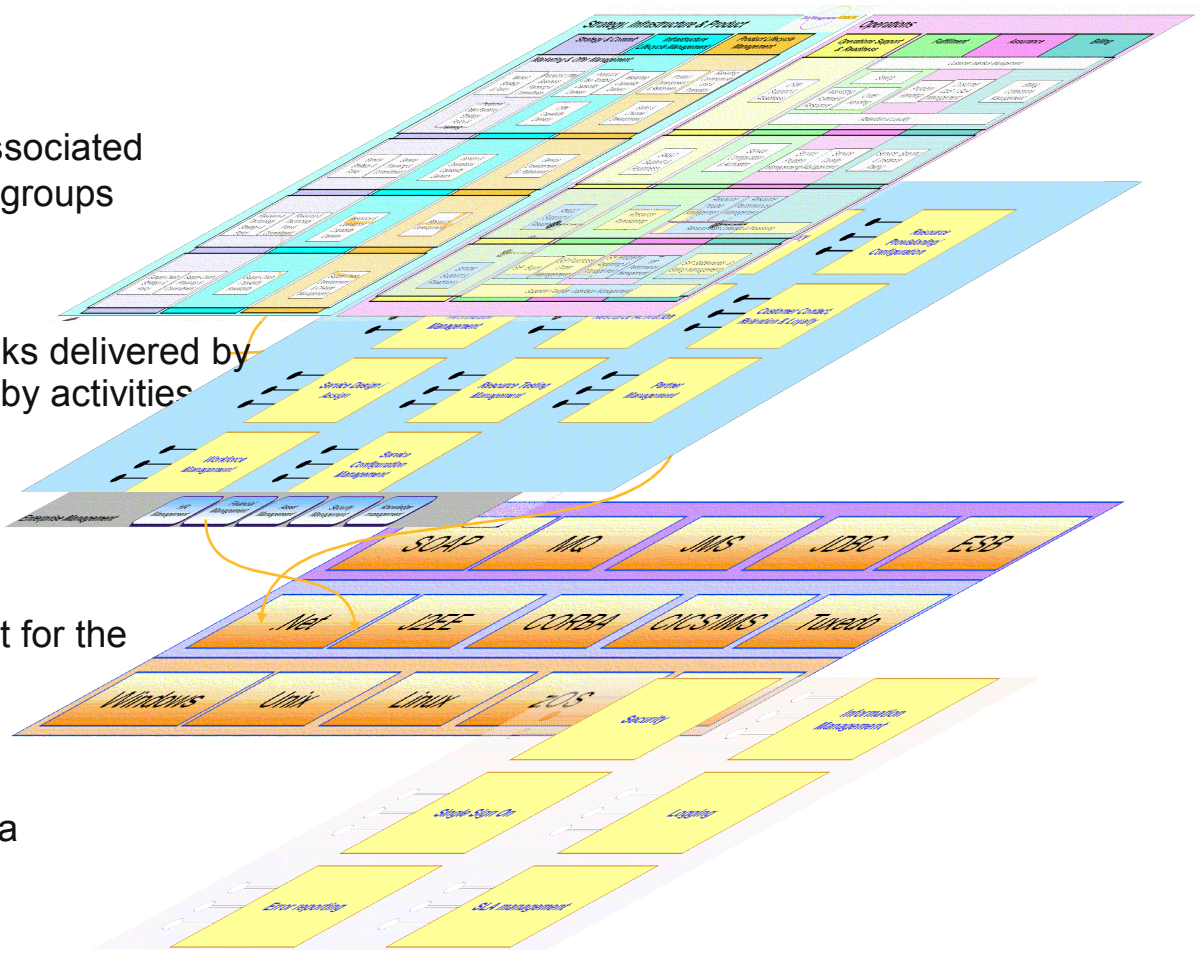
***Solution Architecture***
- *functional aspects*
- *operational aspects*

*"the infrastructure and Single building design"*



# SOA approach
## extends an EA initiative to introduce flexibility

- Business Map
  - Business components collect associated business activities within activity groups
- Business Services
- Application Map
  - Expose repeatable business tasks delivered by business components
  - Deliver business tasks required by activities
- Infrastructure Map
  - Enable the physical environment for the applications
- Technical services
  - Factorize Infrastructure and Data



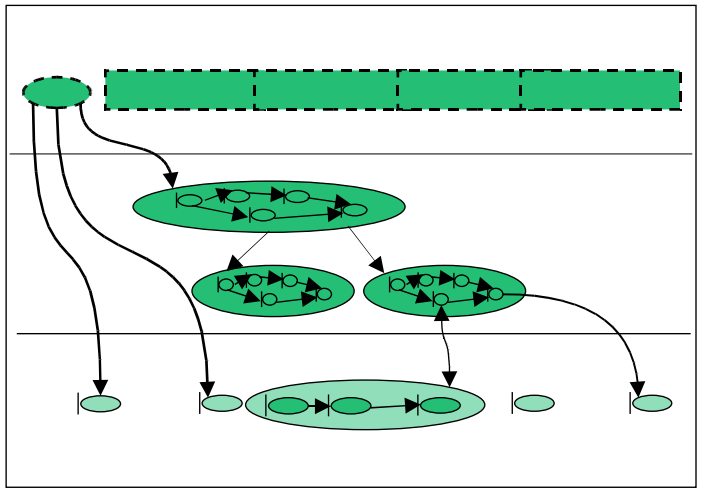


SOA aims to define “IT expansion joints”

# The SOA Top-Down Approach

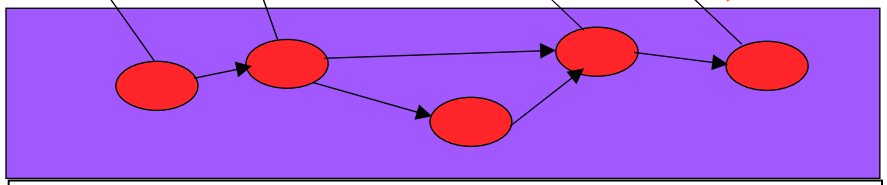
## Component Business Model

| | Manage Customers | Merchandising | Store/Channel Operations | Supply Chain & Distribution | Finance Administration | Business Administration |
|---|---|---|---|---|---|---|
| Strategy | Channel, Category Strategy and Planning | | Store/Channel Objectives & Strategy Planning | Supply Chain Strategy and Planning | Financial Management and Planning | Corp. Planning |
| | Customer Relationship Planning and Strategies | Product Planning, Development & Pricing Strategies | Store/Channel Labor Strategy | | | Alliance Management |
| | | | | | | Line of Business Planning |
| Tactics | Customer Insights | Vendor Relationship Strategies | Store/Channel Design and Layout | Distribution Oversight | Market Risk Management | Business Perf. Mgmt. |
| | Assessing Customer Satisfaction | Matching Supply and Demand | Inventory Planning | Outbound Logistics | | External Market Assessment |
| | Event, Promotion Strategy and Planning | Assortment and Space Planning Management and Execution | | | | Organization and Process Design |
| | | | | | Corporate Finance and Controls | Legal and Regulatory |
| Execution | Order Management | Vendor and Product Performance Execution and Management | Store Operations Management | Distribution Center | | Indirect Procurement |
| | Customer Account Servicing | Item Management | Store/Off-site Services Execution | Transportation Resources | Treasury | Real Estate, Facilities and Equipment |
| | | | | | Operations Back Office Financial | HR Administration |
| | Customer Directory | Product Directory | Inventory, Product Tracking and Tracing | | Accounting and GL | Develop and Operate IT Systems |



Supports

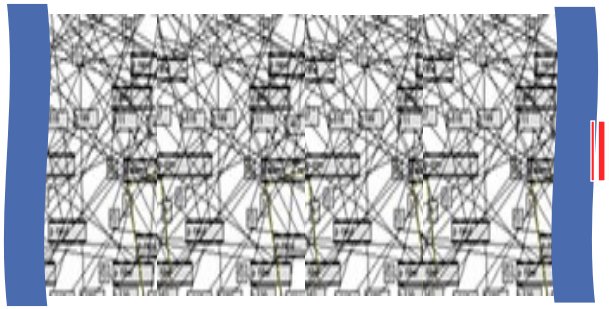
Supports



Composed Business process

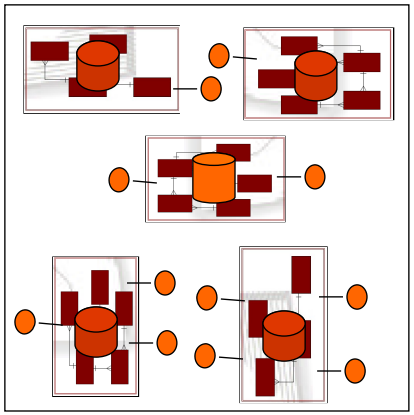
- Business Focus
- Process
- People
- Technology
- Information?

# A Brief History of Architecture Models
## in regard to Information Analysis



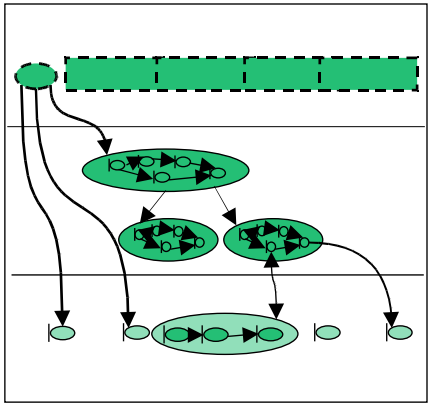
Enterprise Data Models

- **Enterprise wide, centralized Data Modeling**
- **Monolithic Data Models. Centralized Data stores were the ideal**
- **Outcomes were too complex to be useful. Generally ignored by other groups in the company**



Component Based Development

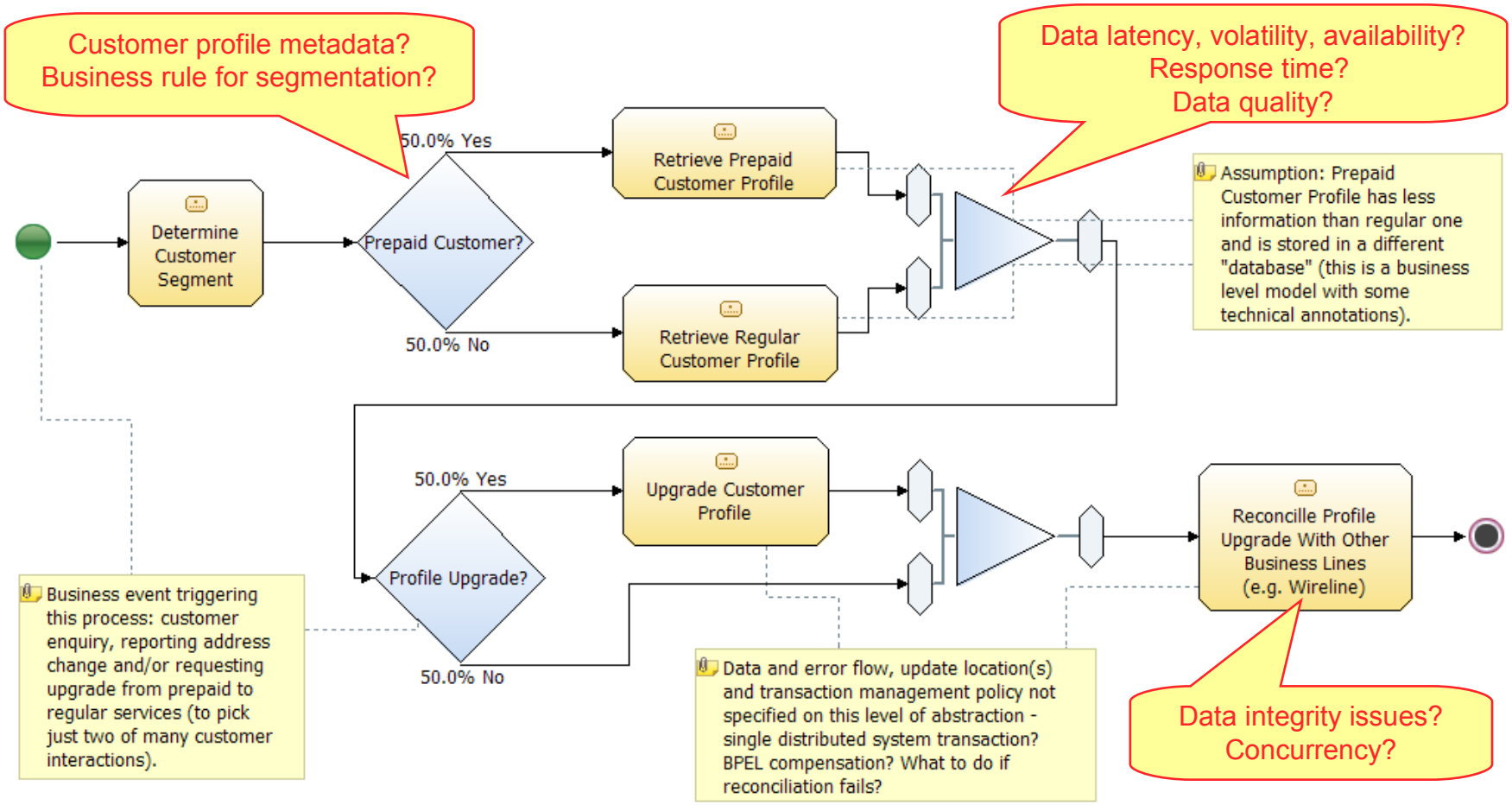
- Data Models partitioned
- Interfaces encapsulated the Data stores
- The perspective is still inside-out. It was a Producer perspective ("Build, they'll come").



Service Orientation

- Focus is on the Consumer perspective. Relatively little attention to Data Models or Data stores – which are more of an implementation concern.
- The outside-in consumer perspective makes it well-suited for business focused methods such as the CBM
- From the implementation perspective, not much different from the CBD.

# Example: Wireless Telco Operator Upgrading Customer Profile



# The Information-specific issues to address

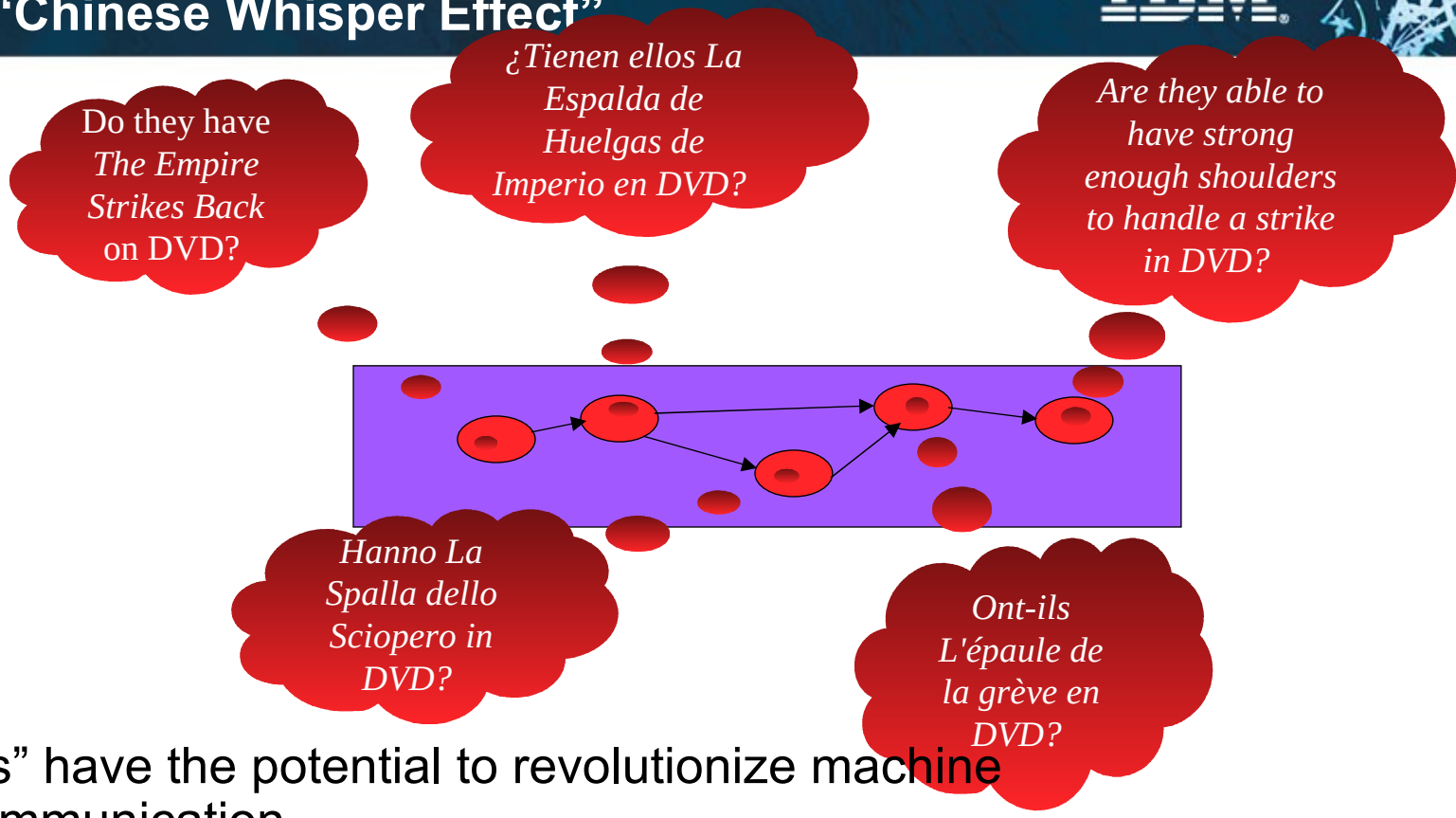
- **Semantic Interoperability**
  - The very premise of the composition of services into business processes depends on a semantic hand-shake between the composed Services.
  - You could not compose if you don't understand the meaning of the data involved.

- **Information ownership**
  - Lack of a clear understanding of Data ownership can result in several "system of record" problems later on.
  - This is the major cause of Data Quality issues in future.
  - E.g. Which Business Component (by extension, which System or Service Provider) owns the Customer Profile data?

- **Information Complexity, Accessibility & Quality**
  - These are major concerns to SOA.
  - A business perspective is needed to establish the quality of data source within an organization.
  - A Priori Data Quality Management is key.

- **Quality of Service**
  - Data ownership, quality greatly impact the speed and volume of data flows.
  - This, in turn, will impact the performance of an SOA solution.
  - Performance is a premier business concern.

# Semantic Interoperability
## avoiding the "Chinese Whisper Effect"




- "Web Services" have the potential to revolutionize machine to machine communication
- But…there is a real problem
  - to work together, systems need to share the same "world view" – common data models, data dictionaries, a common understanding of meaning

# Models and Ontologies ….

- Need to share common understanding of the structure of information ***within*** organizations…
  - Siloed applications, multiple Software Editors, mergers and acquisition …
- …as it is ***between*** organizations beyond the boundaries of the enterprise

- **Models** are critical for applications that need to search across or merge information from diverse communities
  - Models provide industry or domain specific, shared business vocabulary
  - Modeling of information structures, quality of service, manageability

- An **Ontology** is an explicit description of a domain and the constituent relationships:
  - Concepts
  - Properties and attributes of concepts
  - Constraints on properties and attributes
  - Individuals (often, but not always; a.k.a. Instances)

- It combines semantic data model and dictionary to facilitate interoperability

# Integrated Metadata Enables Shared Understanding

Data Administrators

Implementers

Architects

Subject Matter Experts, Data Stewards

Data Analysts

**Development**

Database application and transformation development

**Data Modeling**

Metadata and data-driven data modeling and management

**Data Stewardship**

Business definition & ontology mapped to physical data

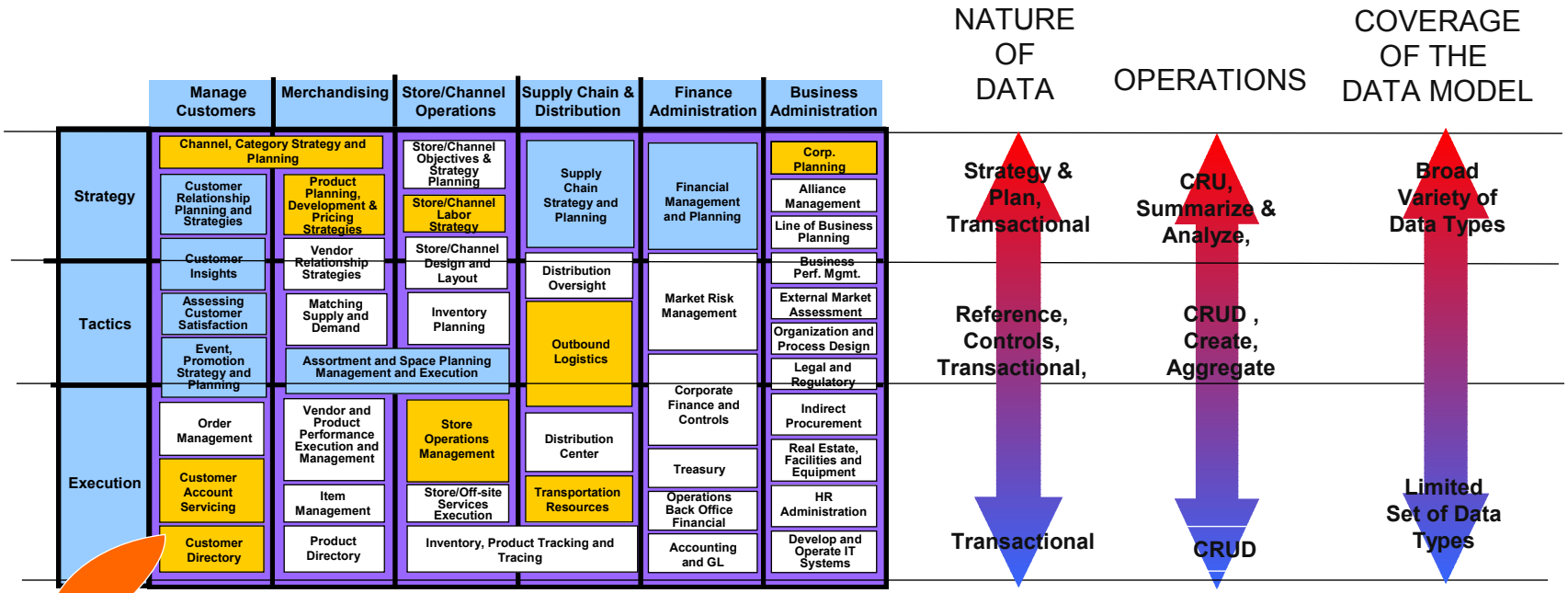
**Source System Analysis**

Data-driven analysis, reporting, monitoring, data rule & integration specification

**Metadata Server**

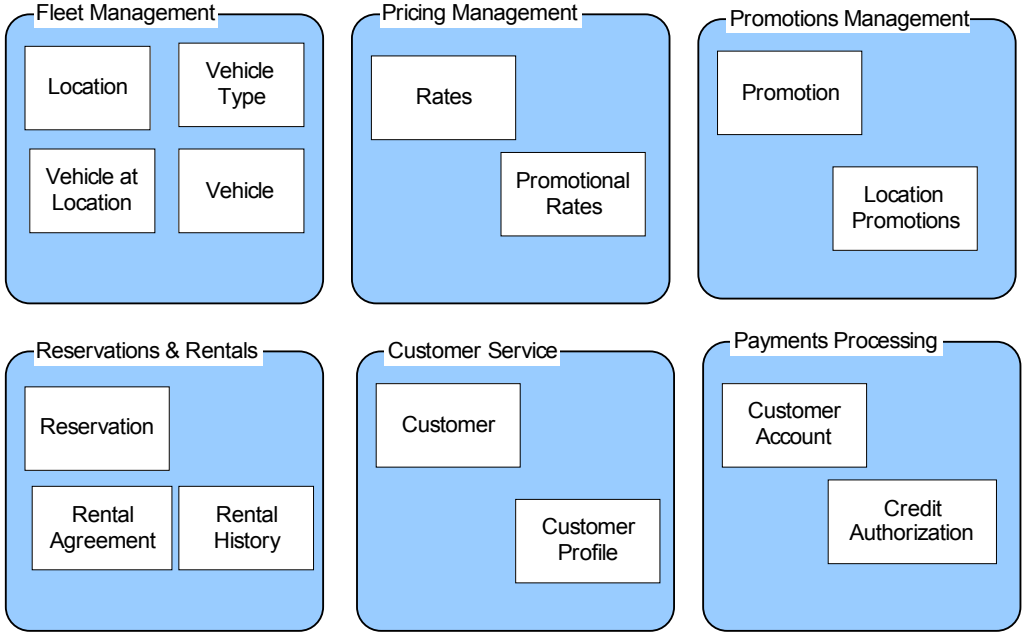
- ***Simplify integration***
- ***Facilitate change management & reuse***
- ***Increase compliance to standards***
- ***Increase trust and confidence in information***

# Information Ownership

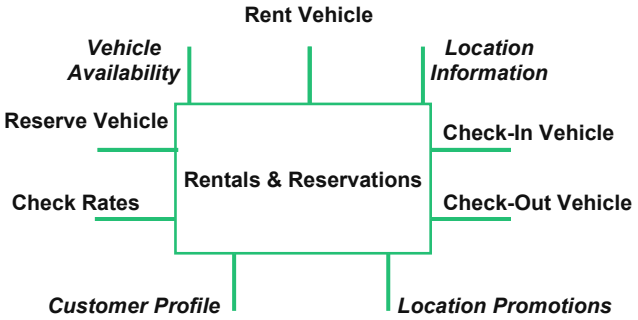



The Business Components tend to be a set of activities that are most similar in the way they use Data

# SOA Methodology should help to determine Information Owners and Interface Message Structures

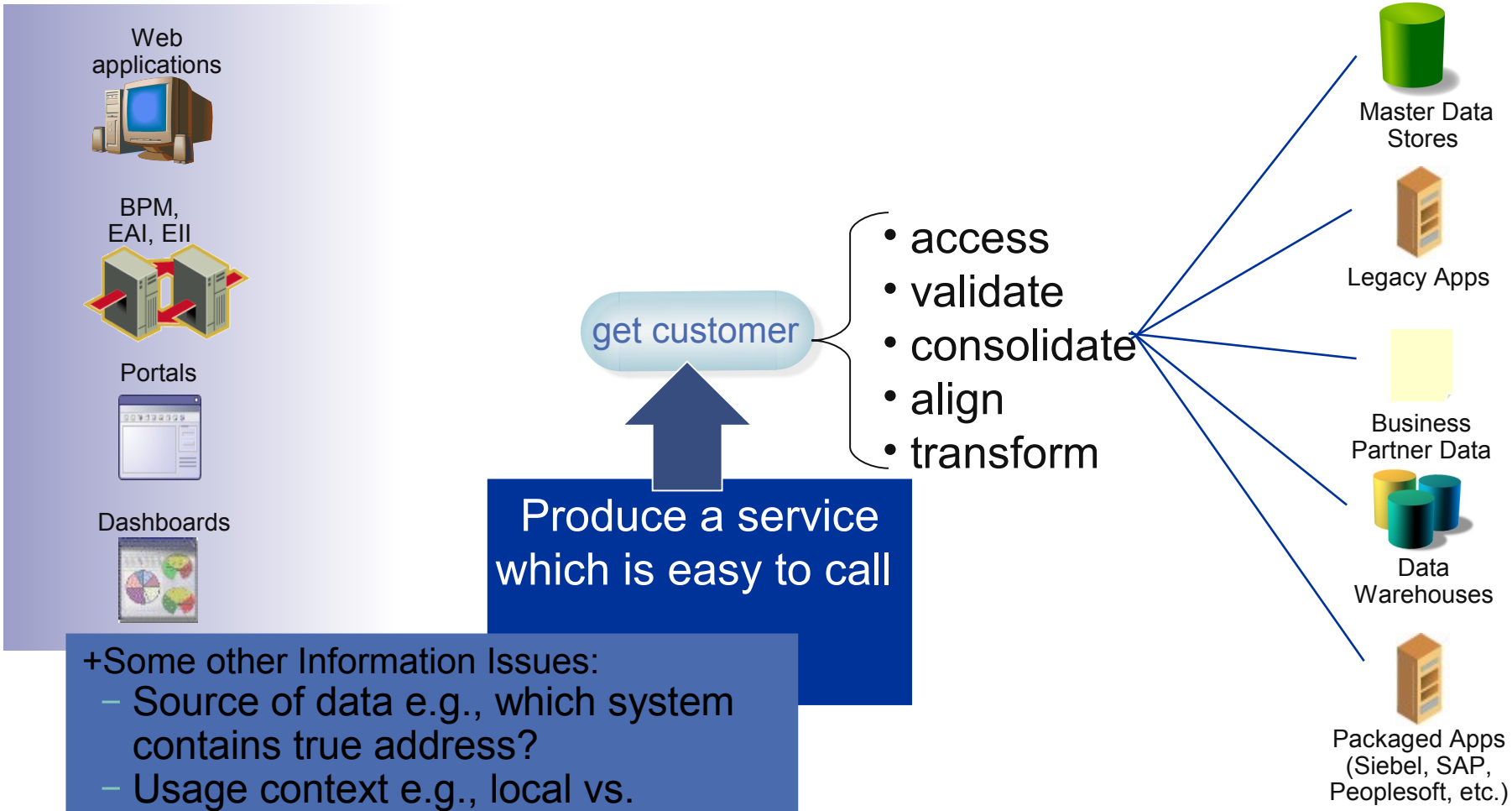



FOCUS ON THE INFORMATION INVOLVED IN THE INTERFACES




EXAMPLE

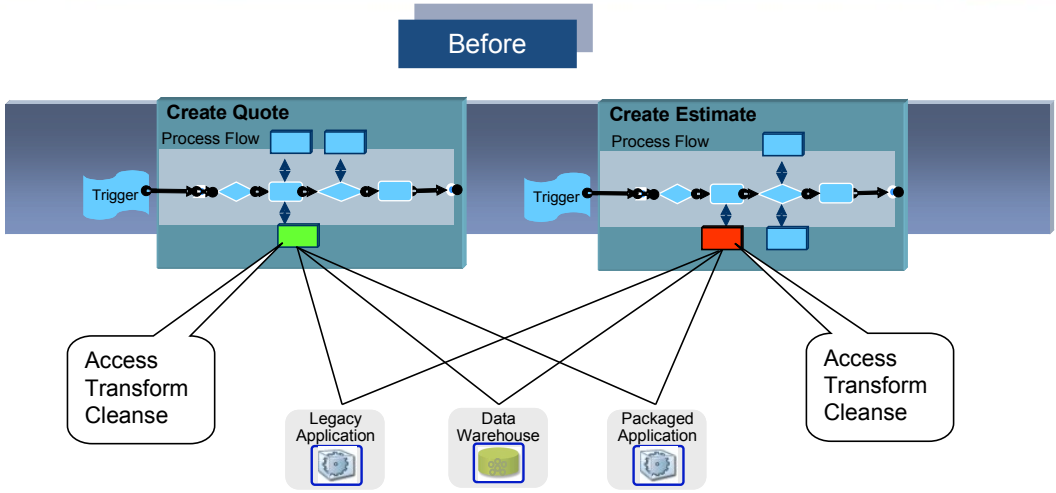
# How to Manage
## Information Complexity, Accessibility & Quality?



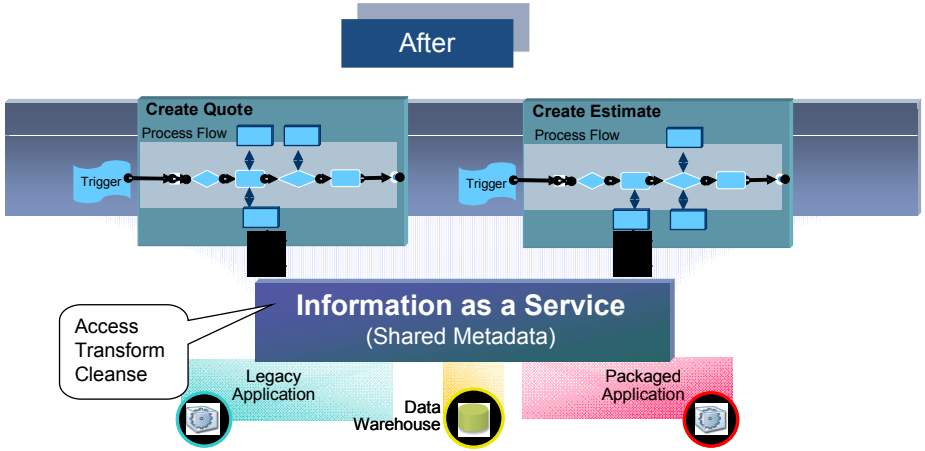

+Some other Information Issues:
- Source of data e.g., which system contains true address?
- Usage context e.g., local vs. international addresses
- Structure of service response
- Governance issues
- Business rules

# Information as a Service Concept

- **An integrated view of information**
  - Single view of the truth for all channels
  - Services to understand, cleanse and federate data across heterogeneous platforms
  - Leverages understanding of metadata relationships




- **Deploys SOA Information Services**
  - Applies consistent rules to data
  - Enriches data for calling process and applications
  - Flexibility to change information sources and formats
  - Centralized control and maintenance



# Examples of Information Services

## Information Integration Services

**Data Validation Services**
Validate records against defined business rules

**Data Cleansing Services**
Cleanse & match inbound records to existing data

**Data Transformation Services**
Transform and align data from different sources

**Partner Data Integration Services**
Electronic integration with partners
*SWIFT, EDI, HIPAA*

**Operational Data Services**
Unified access to data in files, databases, and applications

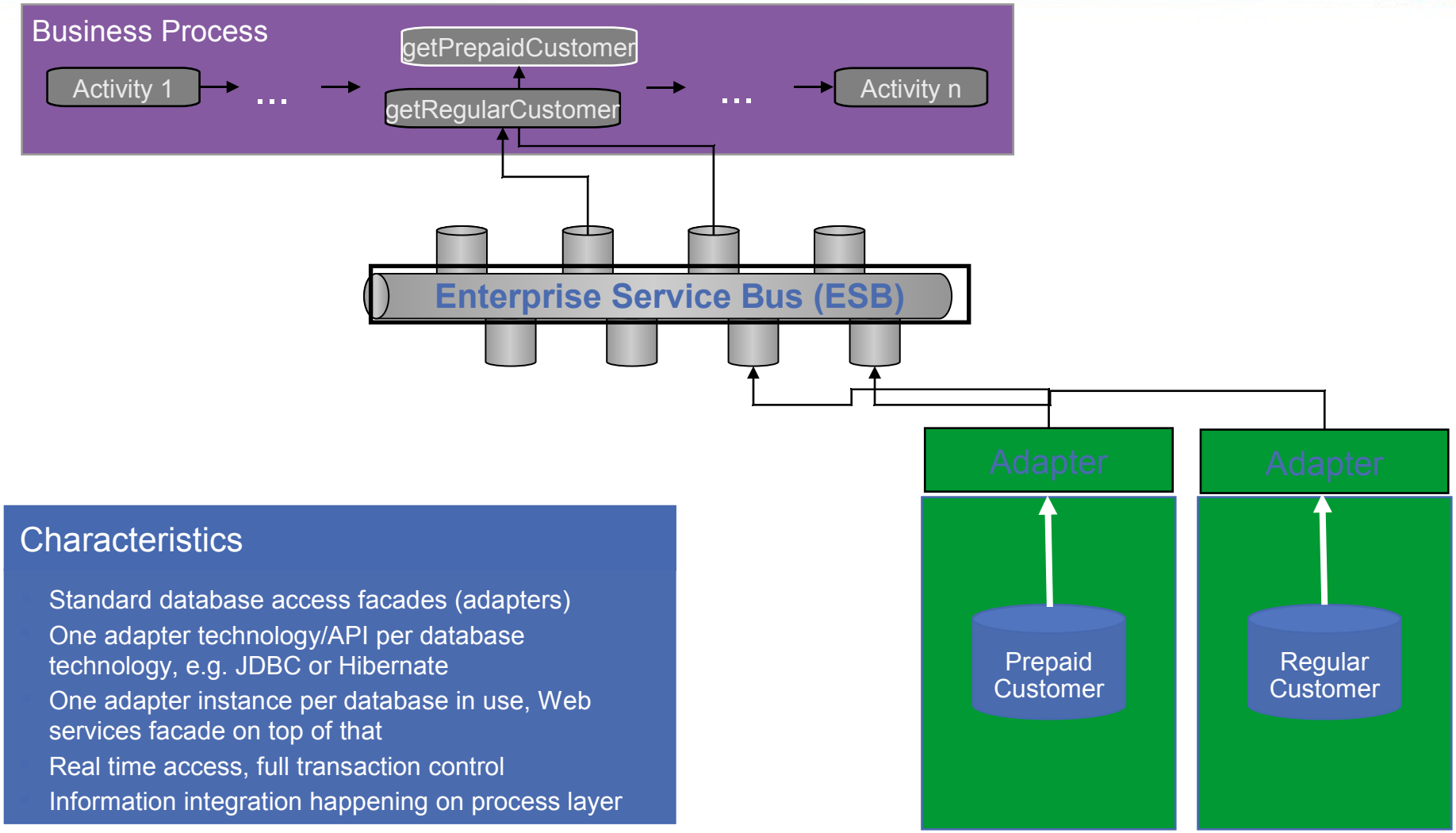
**Analytical Data Services**
Access to analytical data for closed-loop processes

**Unstructured Data Services**
Access to unstructured information alongside structured data

**Master Data Services**
Access to and integration of master data

## Information Access Services

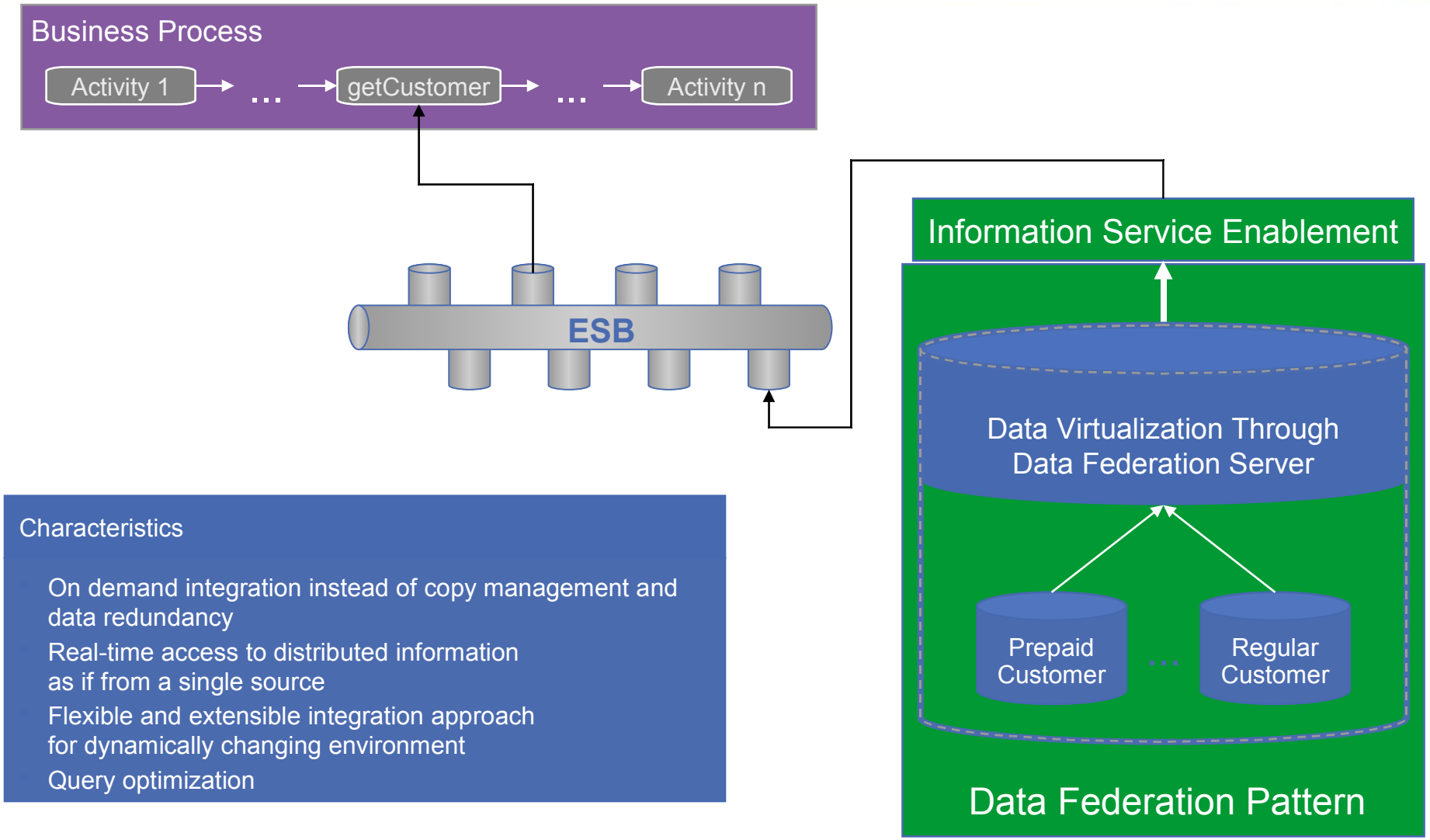
# Select the Right Pattern
## to provide the relevant Quality of Service




### Characteristics

- Standard database access facades (adapters)
- One adapter technology/API per database technology, e.g. JDBC or Hibernate
- One adapter instance per database in use, Web services facade on top of that
- Real time access, full transaction control
- Information integration happening on process layer

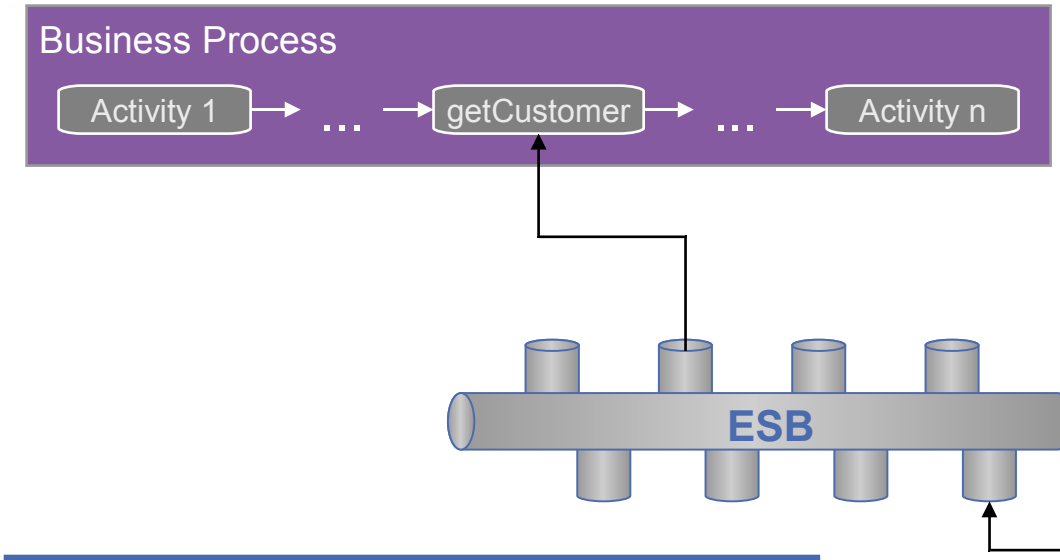
# Select the Right Pattern
## to provide the relevant Quality of Service

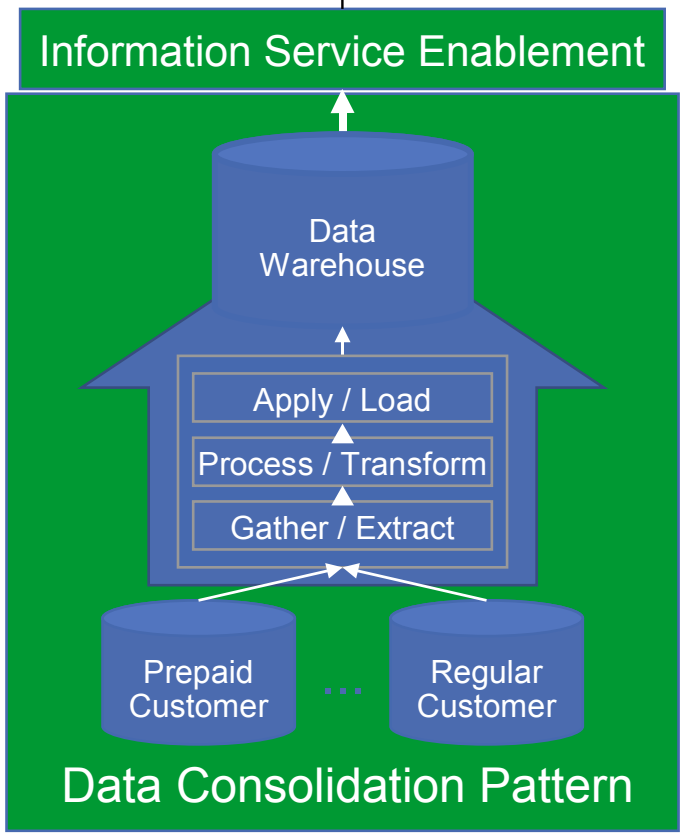



Characteristics

- On demand integration instead of copy management and data redundancy
- Real-time access to distributed information as if from a single source
- Flexible and extensible integration approach for dynamically changing environment
- Query optimization

# Select the Right Pattern
## to provide the relevant Quality of Service

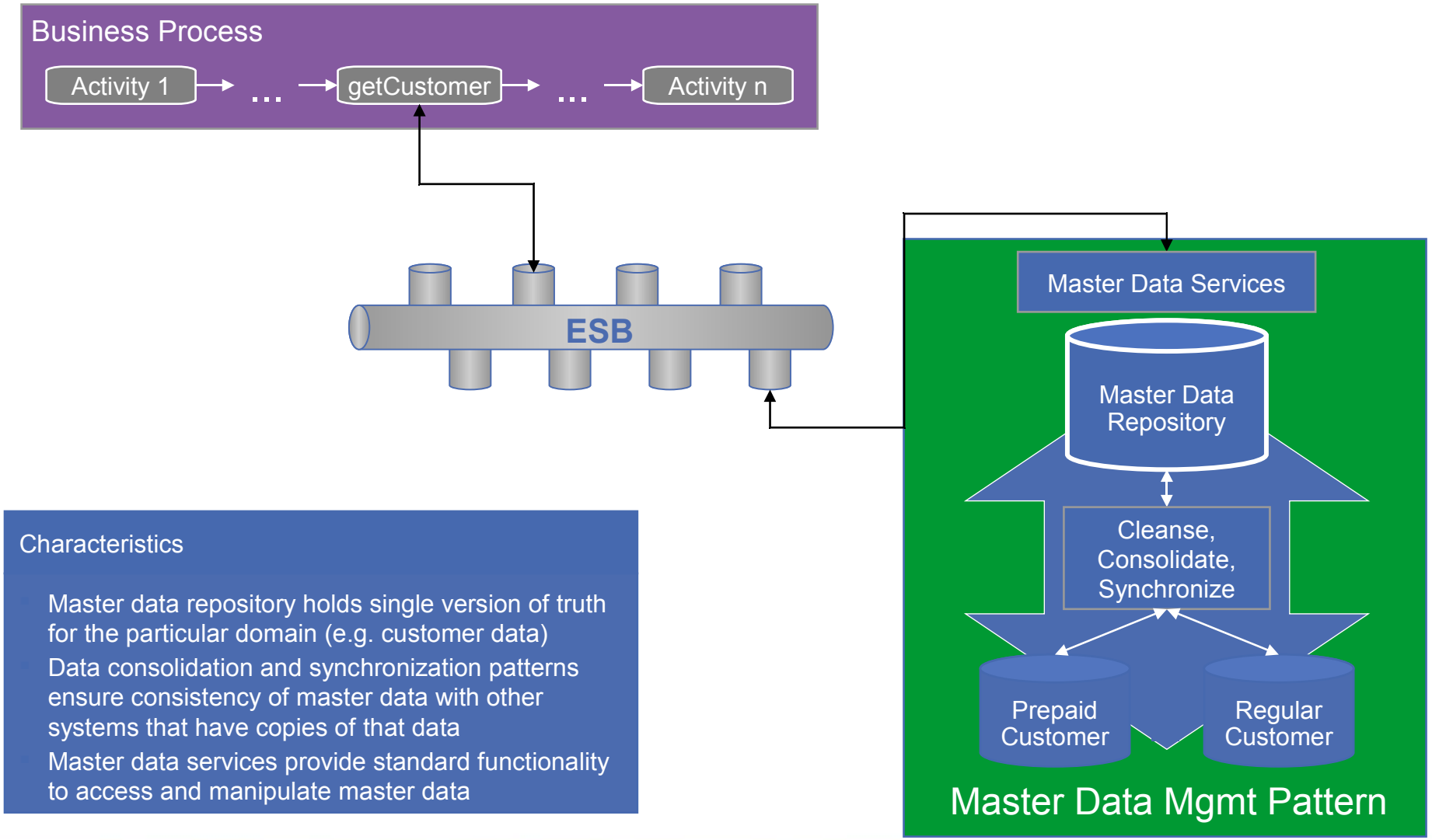



Characteristics

- Complex transformations
- High data volume (billions of records)
- Performance and scalability of target access more important than data currency in target
- De-coupled model: minimal impact on source systems due to target access
- Target may collect historical snapshots of integrated information
- Access to distributed information as if from a single source

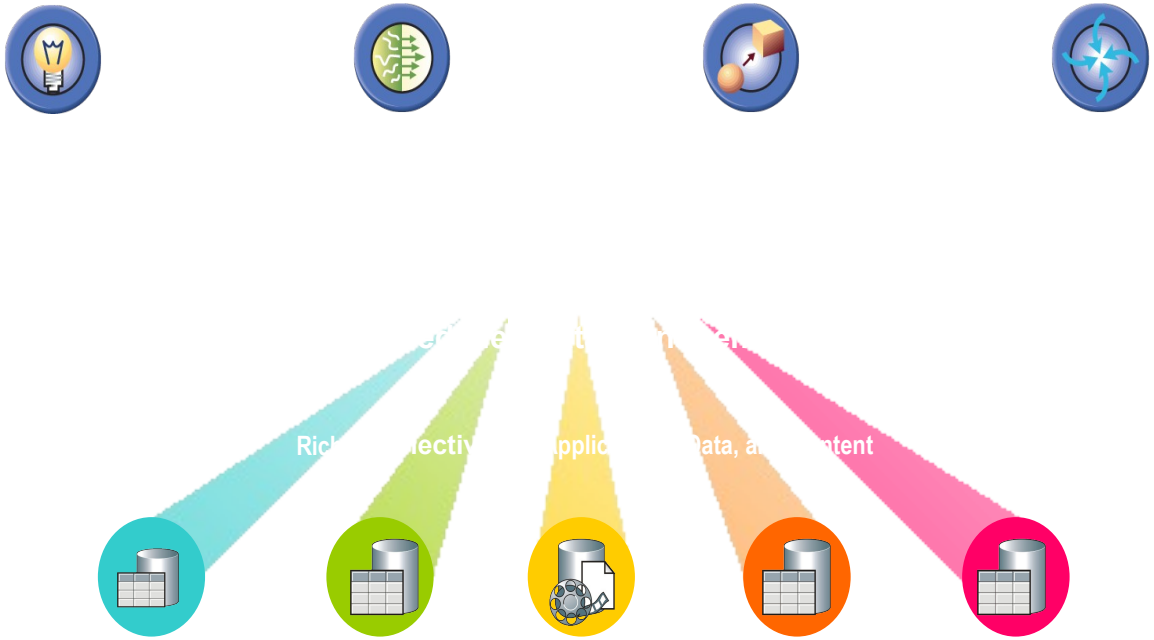
# Select the Right Pattern
## to provide the relevant Quality of Service



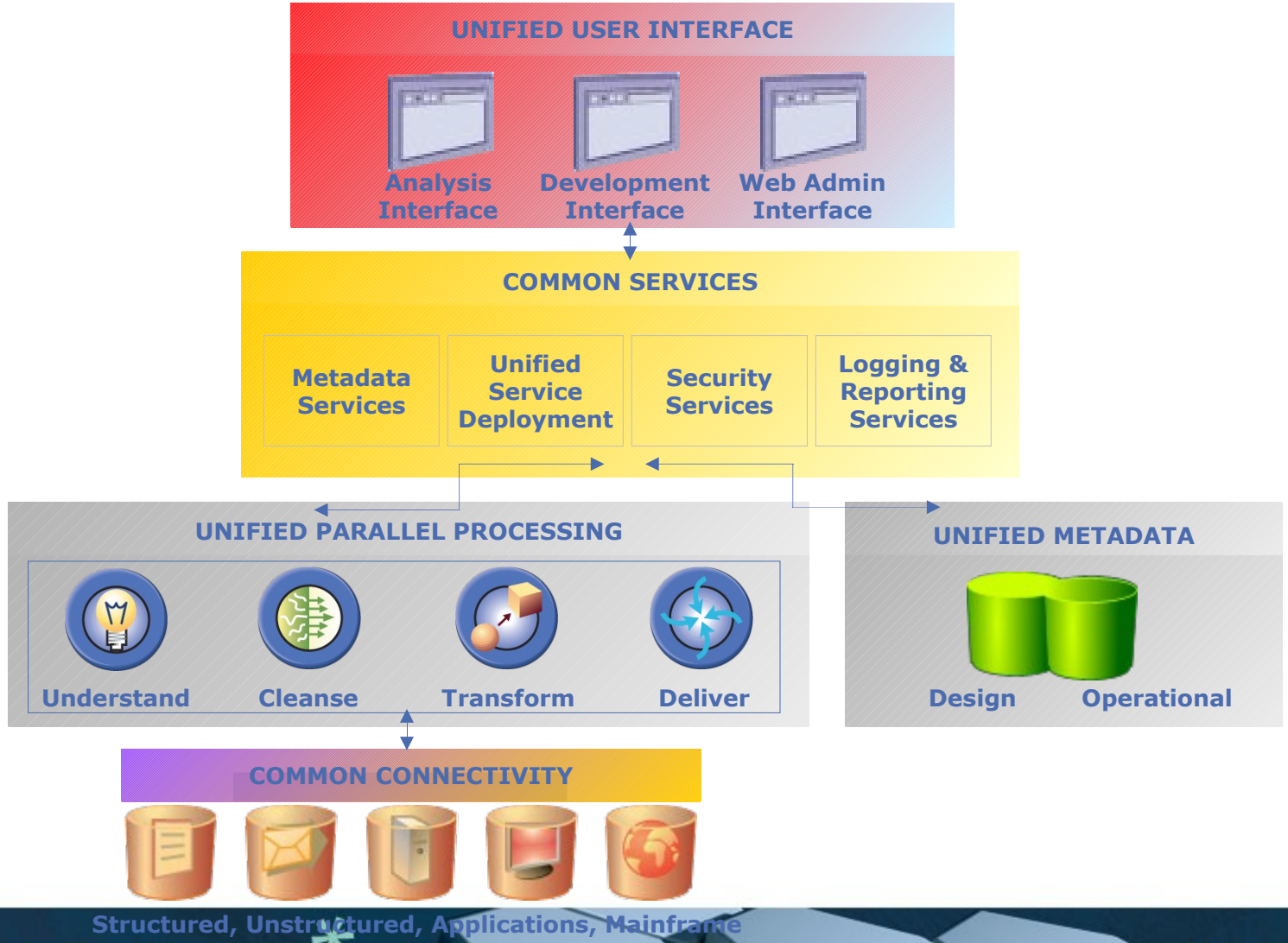

Characteristics

- Master data repository holds single version of truth for the particular domain (e.g. customer data)
- Data consolidation and synchronization patterns ensure consistency of master data with other systems that have copies of that data
- Master data services provide standard functionality to access and manipulate master data

# IBM Information Server
## To implement Information Virtualisation Services



# IBM Information Server Architecture



# What is Master Data?

- **The facts describing the core business entities: customers, suppliers, partners, products, materials, bill of materials, chart of accounts, location and employees**
  - The high value information an organization uses repeatedly across many business processes
  - Generally used across multiple LOB
  - The data is decisive (currency, quality) for these business processes, and often a prerequisite for service-orientation
- **Master Data is critical because it provides the *business context* by providing concrete data models and processes for a particular domain**
- **Master Data is not limited to a particular usage pattern**
- **… And Master Data is typically scattered within heterogeneous application silos across the enterprise**
  - Numerous applications / many subsidiaries / various LOBs
  - Inhibitor of a full scope enterprise transformation

# Master Data Management
## *Core Capabilities*

- **Multi-Style**
  - Collaborative MDM
    - Authoring, workflow, check in/out services to support collaboration on master data creation, management and quality control
  - Operational MDM
    - Business services to ingest master data from range of sources, manage it and fulfill all consumer uses of master data
    - Over 500 Business Services
    - Act as “System of Record”
  - Analytic MDM
    - Identity resolution & relationship discovery
    - Master data simplifies input to analytical environments (DWs) and improves quality (MDM is source)
    - Enterprise reporting and analytics
    - Industry-specific data warehouses
- **Multi-Domain**
  - Support for Customer, Product, Account, Location, Supplier ….
- **Enterprise business processes - SOA industry models**
    - Integrate master data with data consumers (business applications)

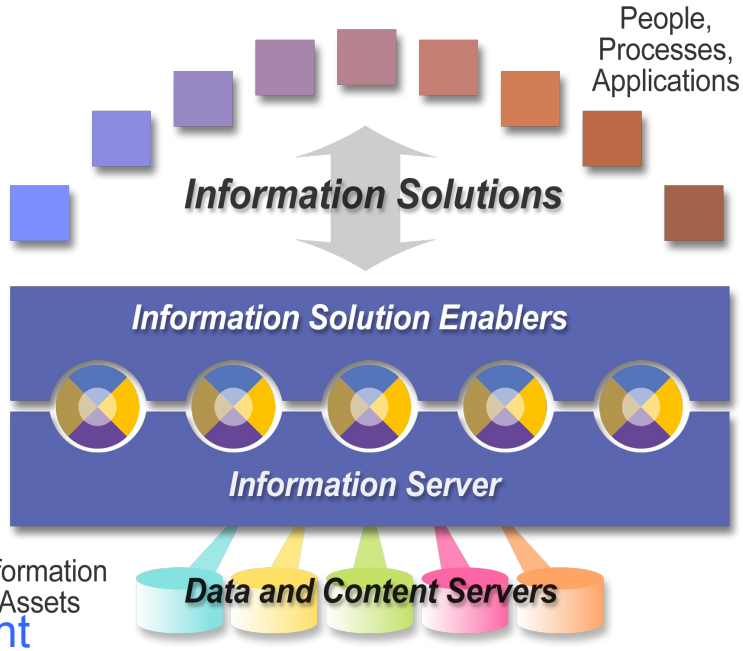
- Data Quality Management
  - Duplicate record processing
  - Data validation, cleansing & standardization

- Event Management
  - Event detection & management
  - Notification to business processes and systems

- Data Lifecycle Management
  - Data Governance
  - Data access management
  - Auditing, enterprise rules and policies

# Conclusion: some answers …

- **Semantic Interoperability**
  - Leveraging sophisticated and extensive industry models
  - Introducing semantic reconciliation
- **Information ownership**
  - Evolution of SOA methodologies to integrate Information perspective
- **Information Complexity, Accessibility & Quality**
  - Information as a Service concept
  - Information Server Middleware to virtualize Information
  - Comprehensive multi-forms Master Data Services
- **Quality of Service**
  - SOMA Service realization to determine the relevant pattern
  - Information Server Middleware to supports various Information Integration patterns




Thank
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# Ontology Standards

- **RDF (Resource Description Framework)**
  - "The Resource Description Framework (RDF) is a general-purpose language for representing information in the Web"
- **OWL (Web Ontology Language)**
  - "OWL facilitates greater machine interpretability of Web content than that supported by XML, RDF, and RDF Schema (RDF-S) by providing additional vocabulary along with a formal semantics"
- **Others:**
  - SWRL (Semantic Web Rule Language), SPARQL, RDQL (RDF Data Query Language)