Enterprise IT Architectures
SOA Part 1

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Agenda

I. SOA Introduction

II. Move from C/S to SOA

III. Exercise: Integration Architecture for FACT

IV. SOA Reference Architecture & SOA Entry Points

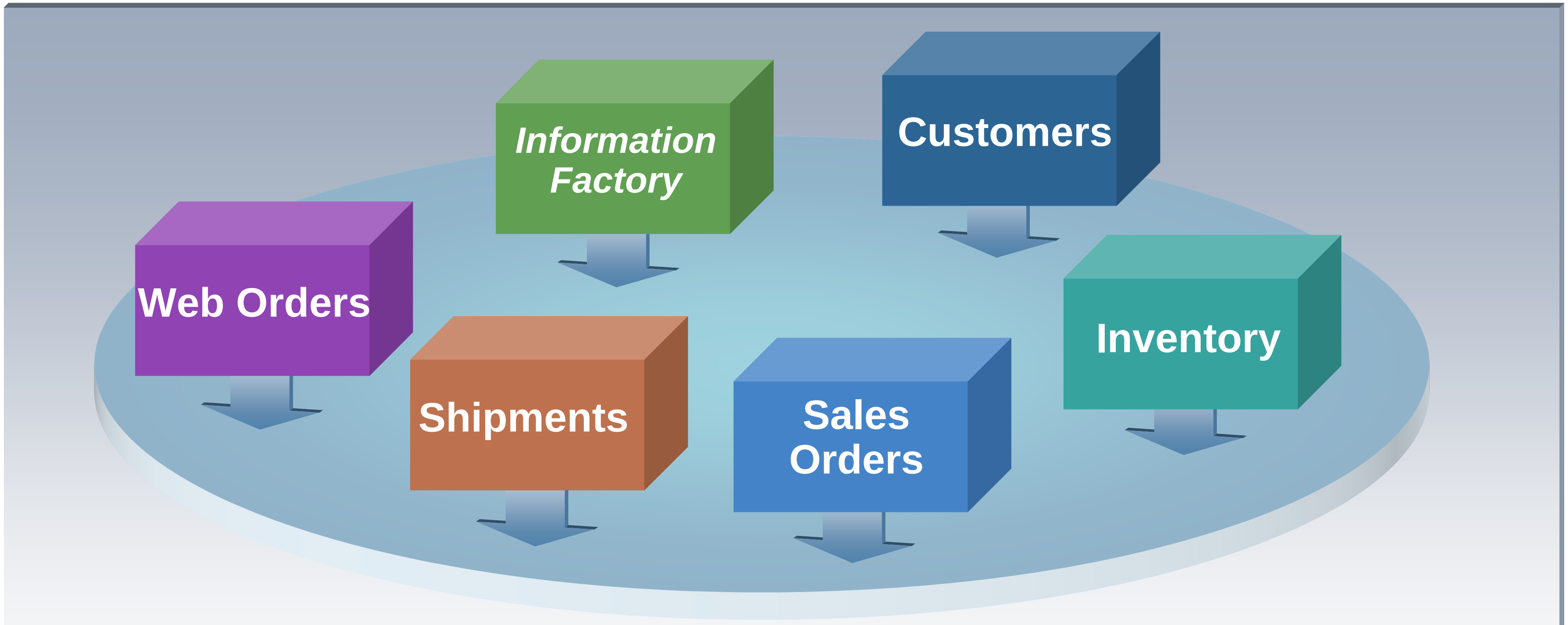
I. SOA Introduction

Why SOA (Service Oriented Architecture)

- Business is constantly changing (no longer stable)
- IT is required to be more flexible
- Monolithic applications can’t be reused (historical limitations of current IT)
- SOA ties together changing Business Models and supporting IT Architecture
- SOA separates concerns, locations
- SOA follows essential principles: loosely coupled, federated, contract based
- SOA provides integration and supports business processes

Service Oriented Architecture

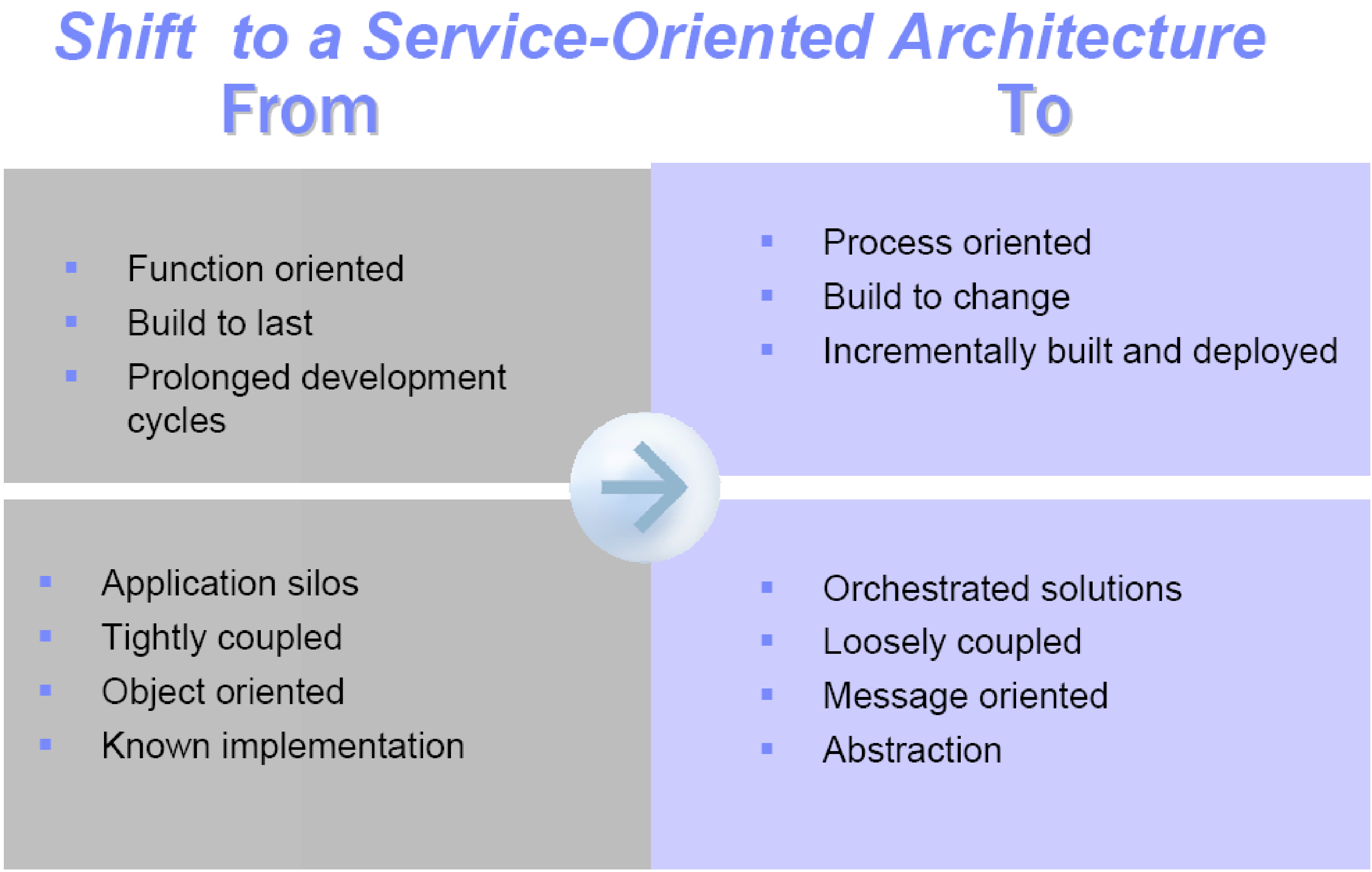
Moves IT Logic Out of Services



Services defined as units of business logic separated from…

- Flow of control and routing
- Data transformation and protocol transformation

SOA addressing IT as well as Business – common shift



Shift to a Service-Oriented Architecture

From

- Function oriented
- Build to last
- Prolonged development cycles

- Application silos
- Tightly coupled
- Object oriented
- Known implementation

To

- Process oriented
- Build to change
- Incrementally built and deployed

- Orchestrated solutions
- Loosely coupled
- Message oriented
- Abstraction

What is SOA

- SOA is an architectural style or approach whose goal is to achieve loose coupling among interacting software agents
- All functions (that need to be used by more than one system) are defined as "services“
- Service providers agree to a defined, implementation-independent interface with service clients
- Services oriented architecture is the policies, practices and frameworks
  - that enable application functionality and IT services to be
  - provided and requested as a set of services
  - using a standards based form of interface.

SOA Principles

Componentized

Standardized services interfaces for applications and resources

Interoperable

Easy information exchange between applications and/or resources

Modular

Mix and match, add or remove, business processes and infrastructure

Scaleable

Start with what you have and add additional resources as needed

SOA is different things to different people

A set of services that a business wants to expose to customers and clients

an <u>architectural style</u> which requires a service provider, requestor and a service description.

a <u>set of architectural principles and patterns</u> which address characteristics such as *modularity, encapsulation, loose coupling, separation of concerns, reuse, composable and single implementation*.

A <u>programming model</u> complete with standards, tools, methods and technologies such as web services.

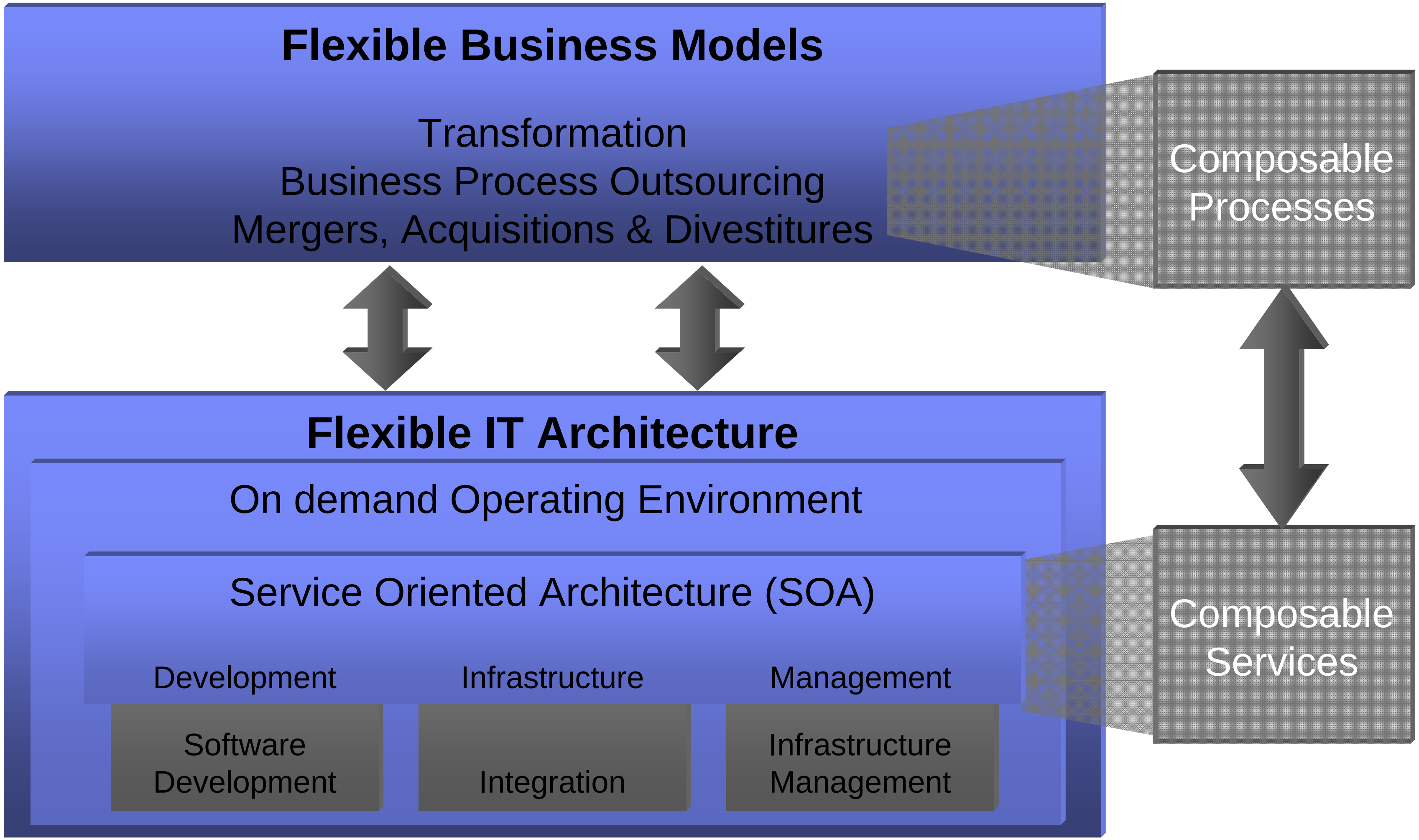
Roles

Business

Architecture

Implementation

Greater flexibility from business models and supporting IT architecture



II. From C/S to SOA

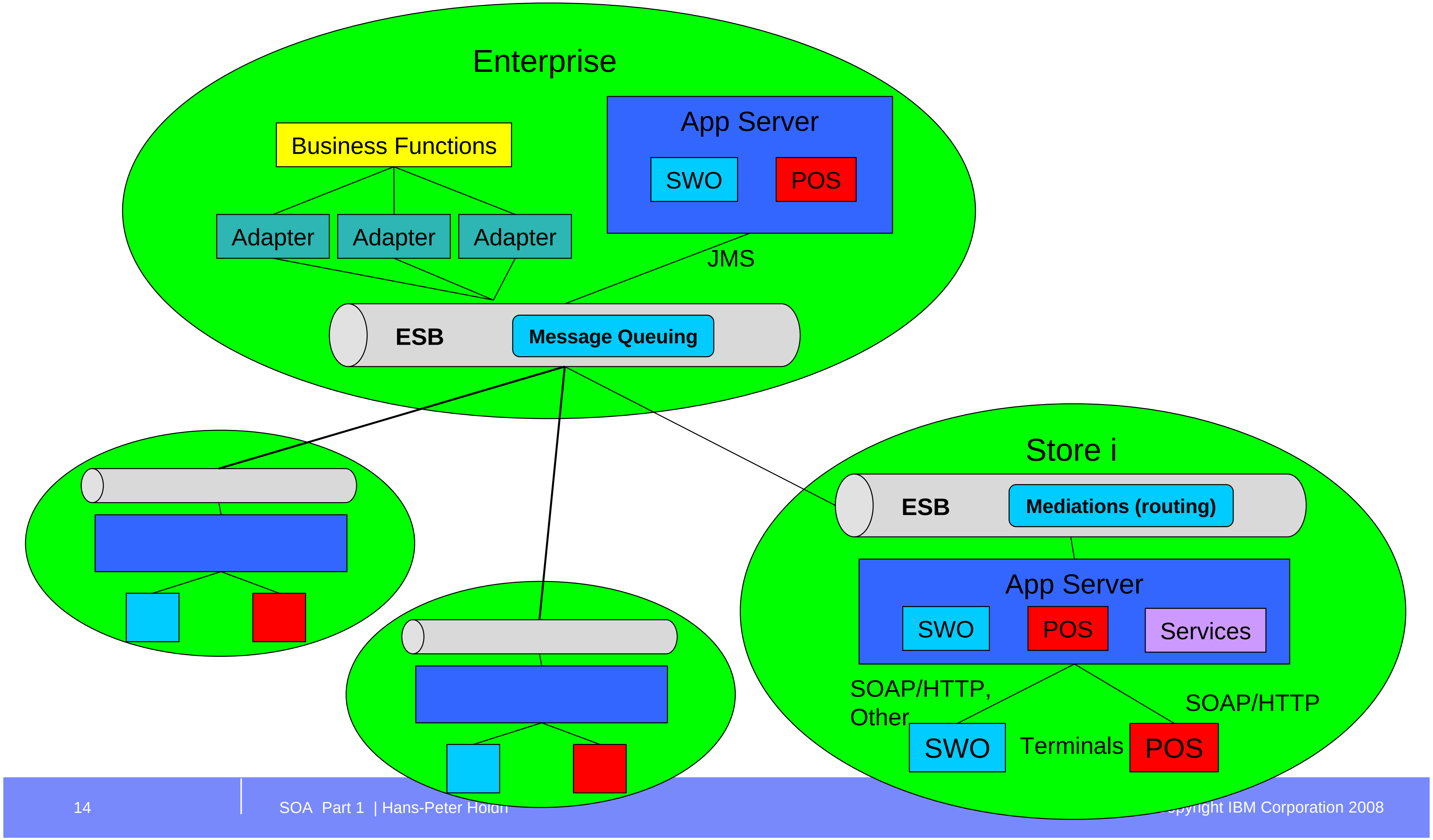
Elements for a successful End-to-End Implementation

- Success with SOA Requires a Core Infrastructure
- The SOA reference architecture is a way of looking at the set of services that go into building an SOA.
- The backbone of the reference architecture is the ESB (Enterprise Service Bus), which facilitates communication between services.
- The reference architecture is a great tool for laying out roadmaps for pursuing SOA.

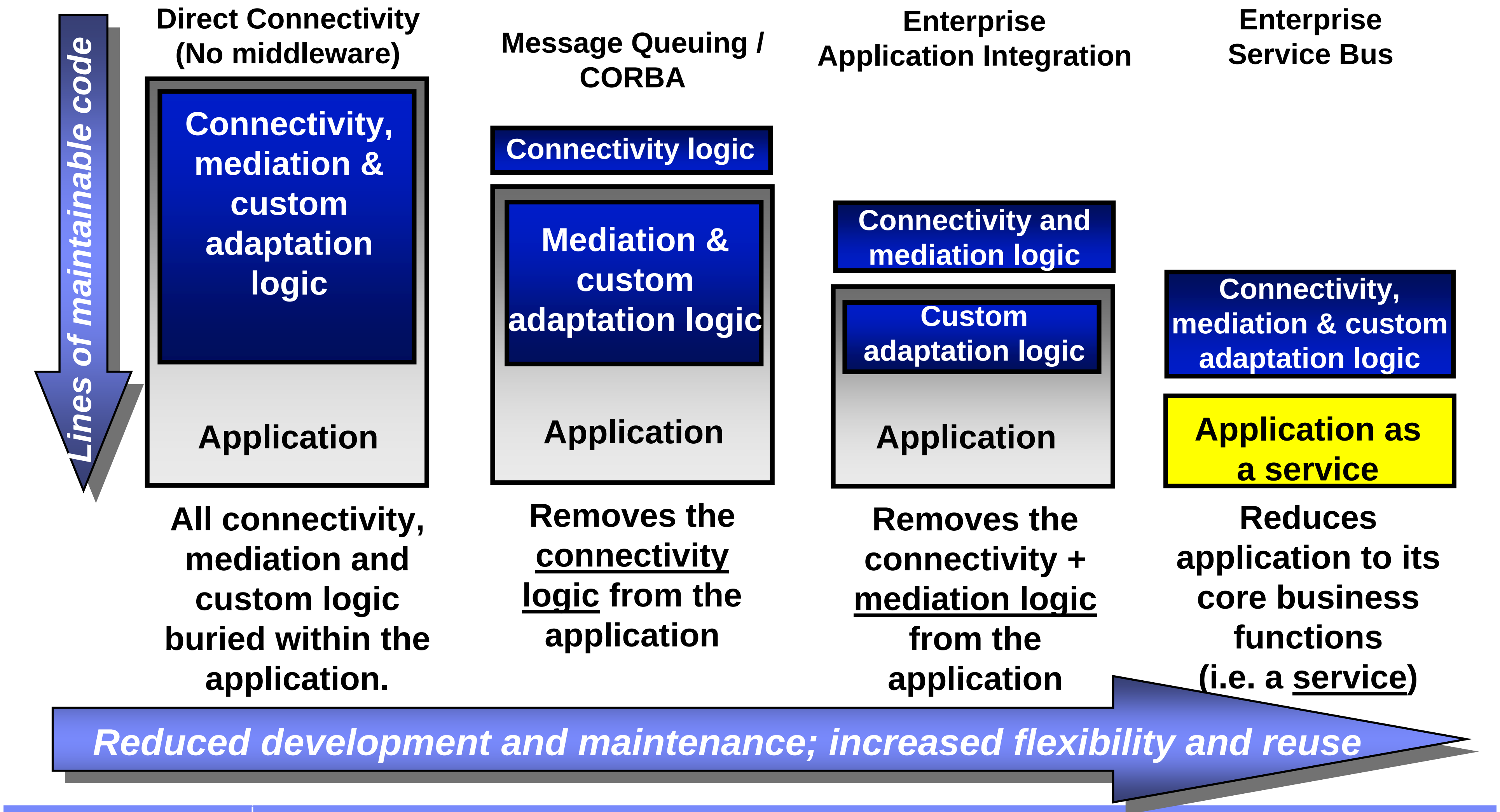
ESB (Enterprise Service Bus)

- An Enterprise Service Bus (ESB) is an architectural pattern defining a flexible connectivity infrastructure for integrating applications and services.
- The architecture pattern is a guiding principle to enable the integration and federation of multiple service bus instantiations.
- An ESB performs:
  - Routing messages between services
  - Converting transport protocols between requestor and service – managing multiple protocols
  - Transforming message content between requestor and service
  - Handling business events from disparate sources

ESB Pattern in Action – Retail Scenario



ESB is the next stage in the technology evolution


Lines of maintainable code
Direct Connectivity (No middleware)
Connectivity, mediation & custom adaptation logic
Application
Message Queuing / CORBA
Connectivity logic
Mediation & custom adaptation logic
Application
Enterprise Application Integration
Connectivity and mediation logic
Custom adaptation logic
Application
Enterprise Service Bus
Connectivity, mediation & custom adaptation logic
Application as a service

All connectivity, mediation and custom logic buried within the application.

Removes the <u>connectivity logic</u> from the application

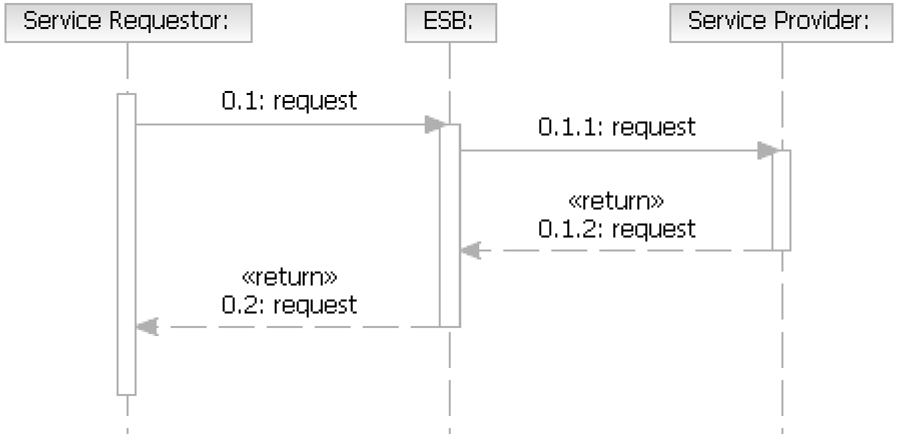
Removes the connectivity + <u>mediation logic</u> from the application

Reduces application to its core business functions (i.e. a <u>service</u>)

Reduced development and maintenance; increased flexibility and reuse

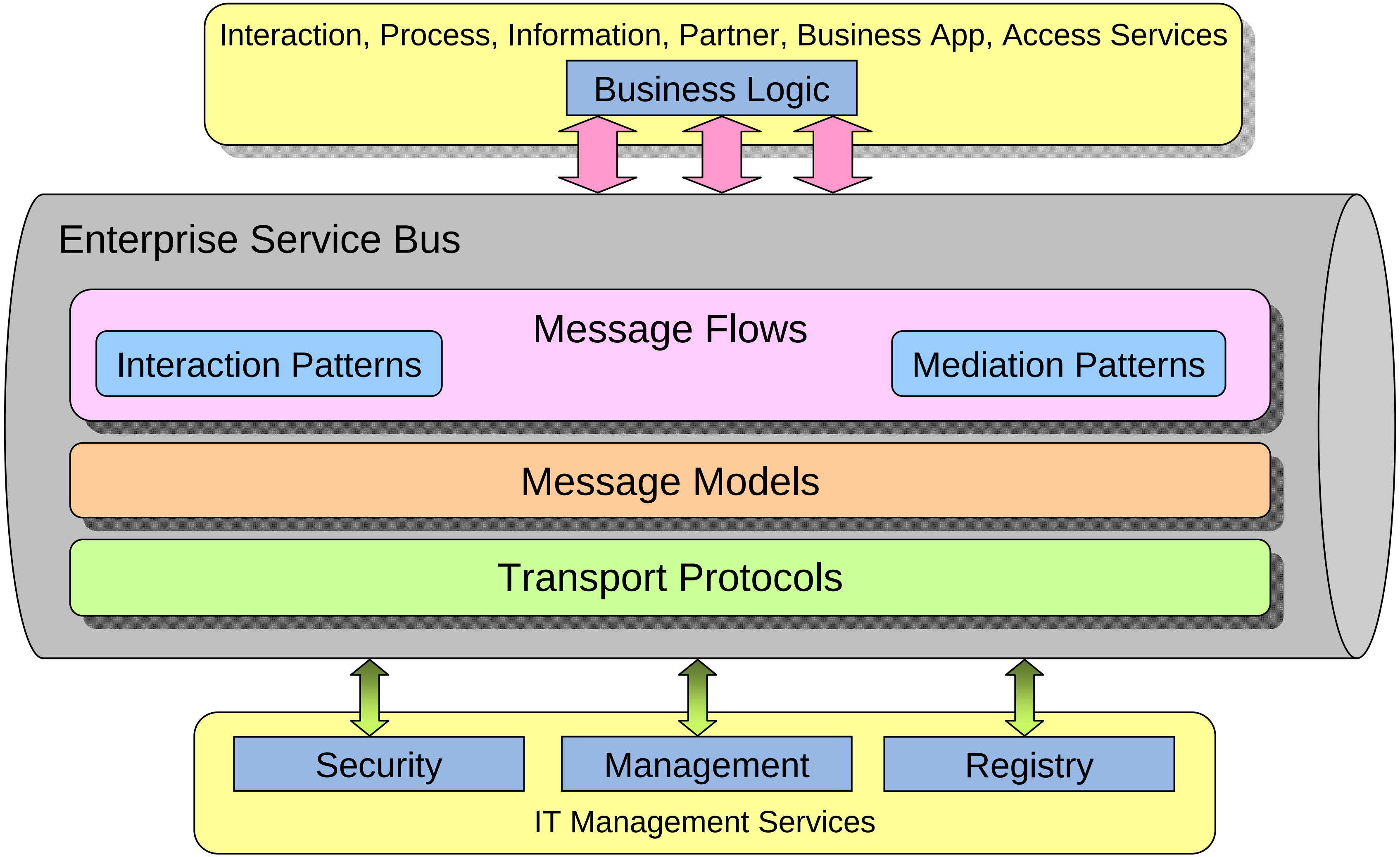
ESB Core Principle – Service Virtualization

- ESB acts as an intermediary (proxy) between requestor and provider

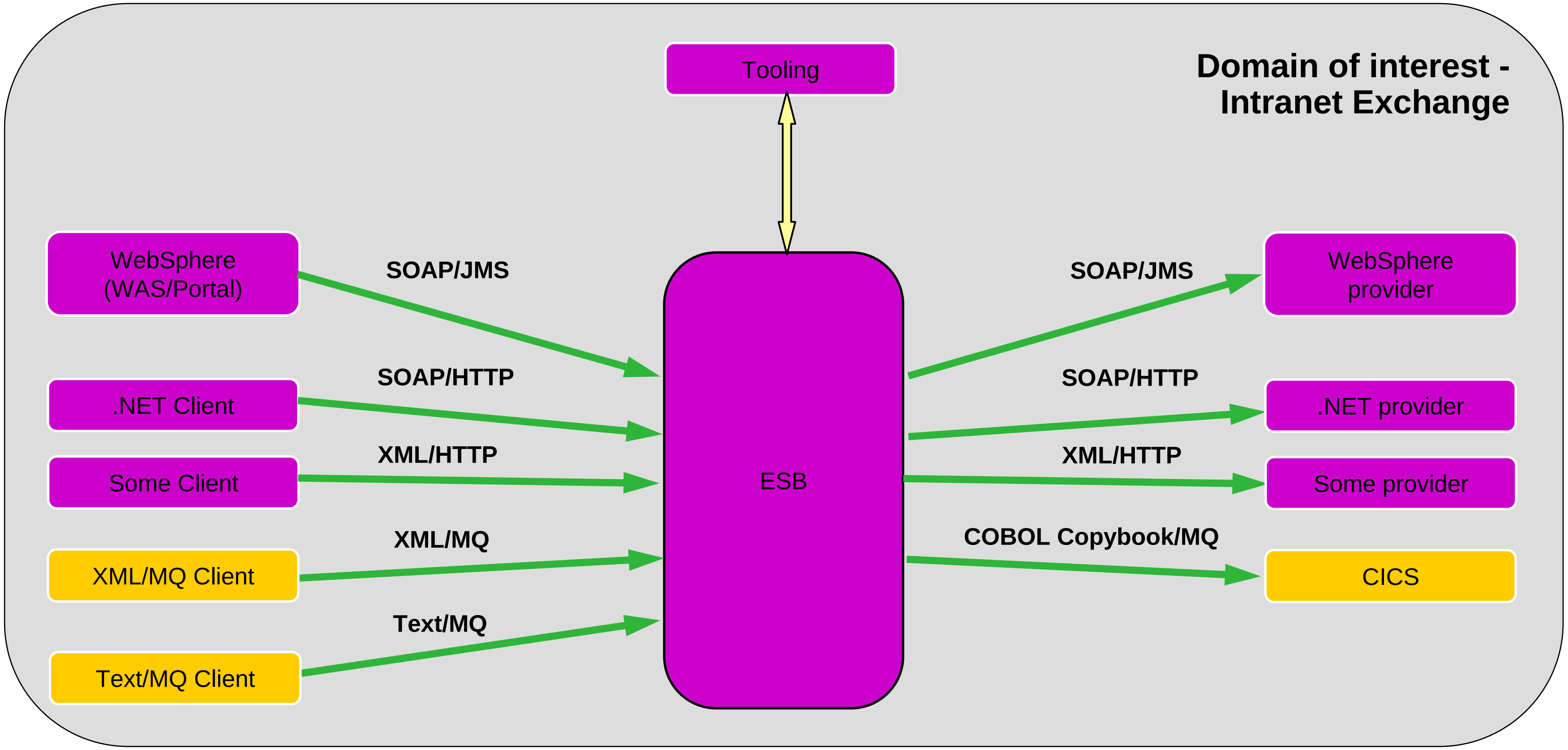


- ESB provides *service virtualization* of
  - *Location and identity*
  - *Interaction protocol*
  - *Interface*
- Interactions are *decoupled*, supporting *separation of concerns*

Expanded View of the Enterprise Service Bus

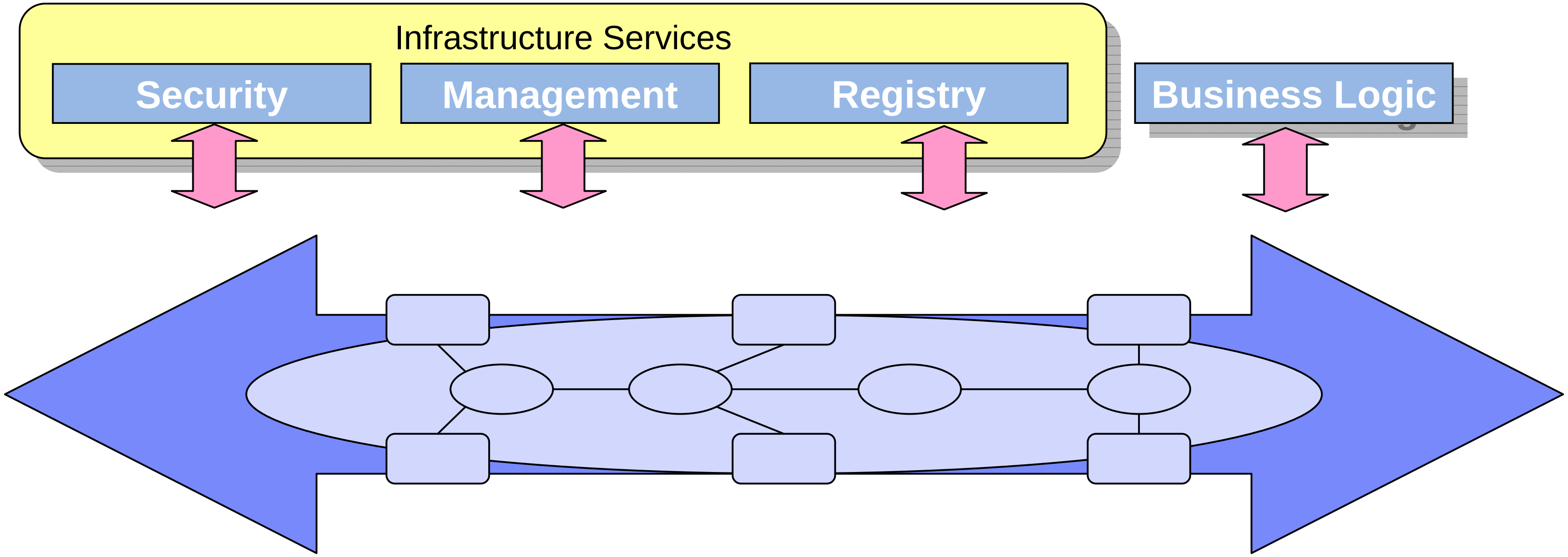


Case: Multi-protocol Exchange – Intermediary decoupling heterogeneous consumers and suppliers

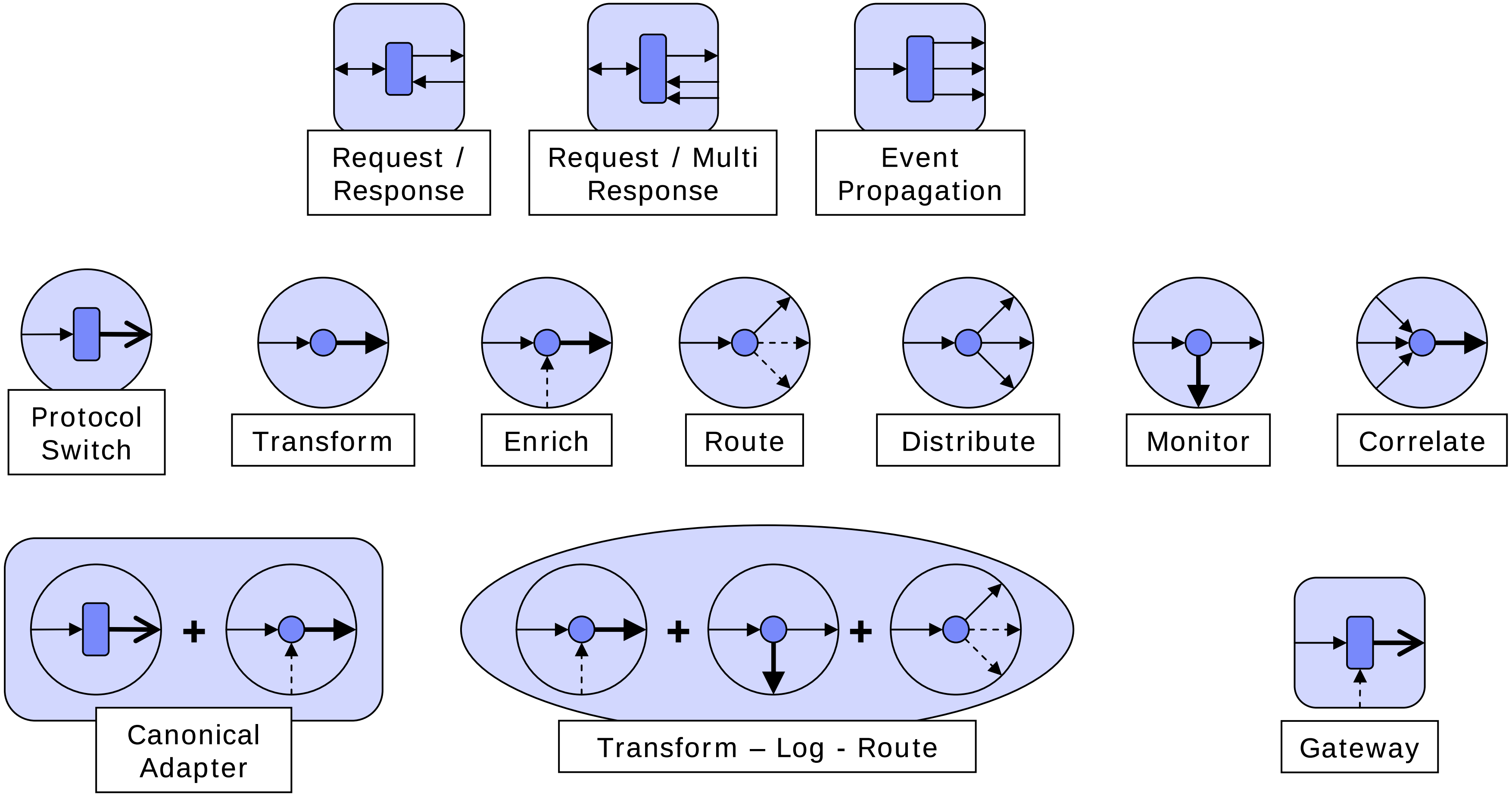


What is NOT in the Enterprise Service Bus?

- In the ESB – capability necessary to support service virtualization
- Not in the ESB – everything else!
  - But things not in the ESB may use or be used by the ESB



Mediation Patterns



Request / Response

Request / Multi Response

Event Propagation

Protocol Switch

Transform

Enrich

Route

Distribute

Monitor

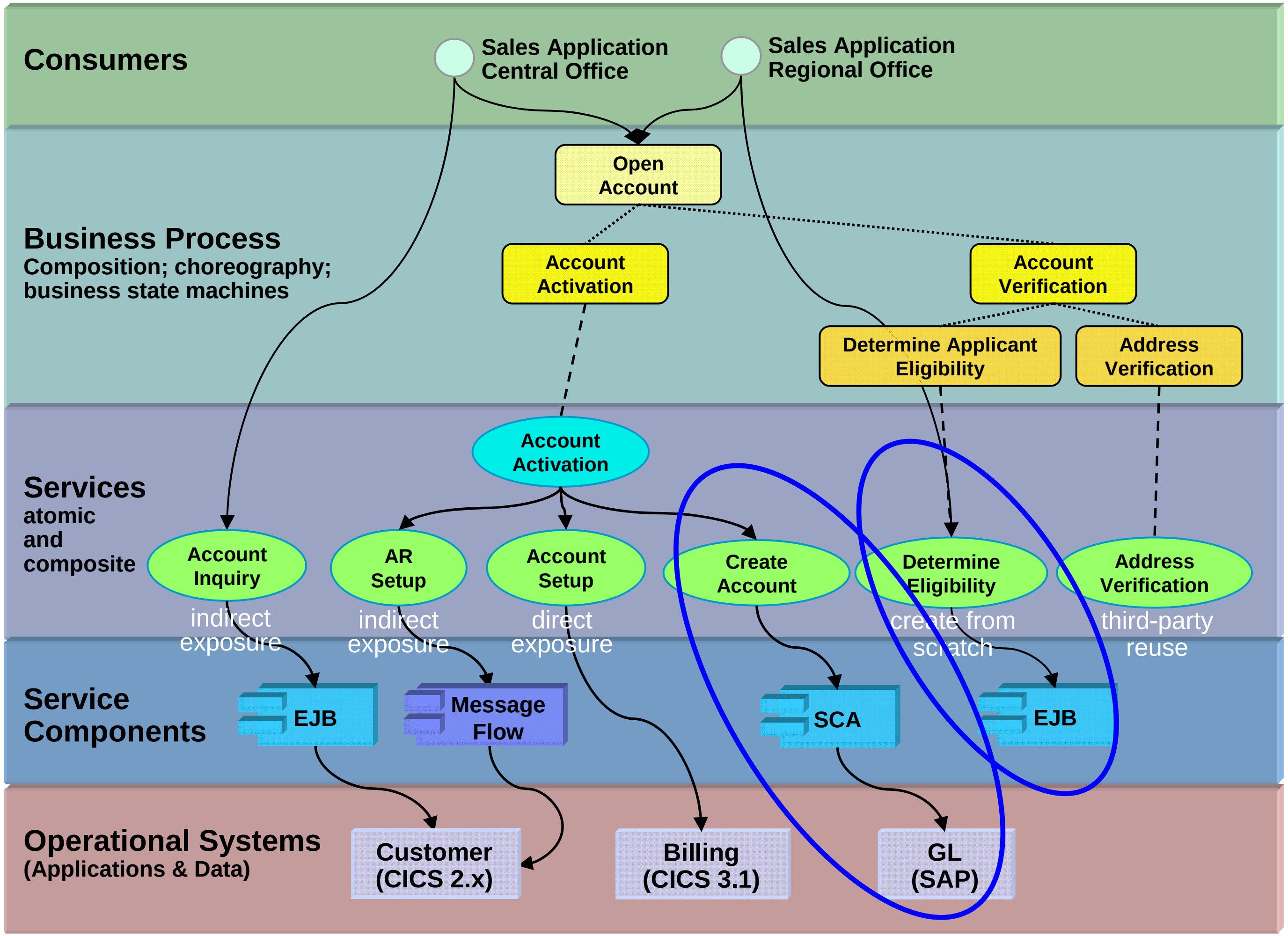
Correlate

Canonical Adapter

Transform – Log - Route

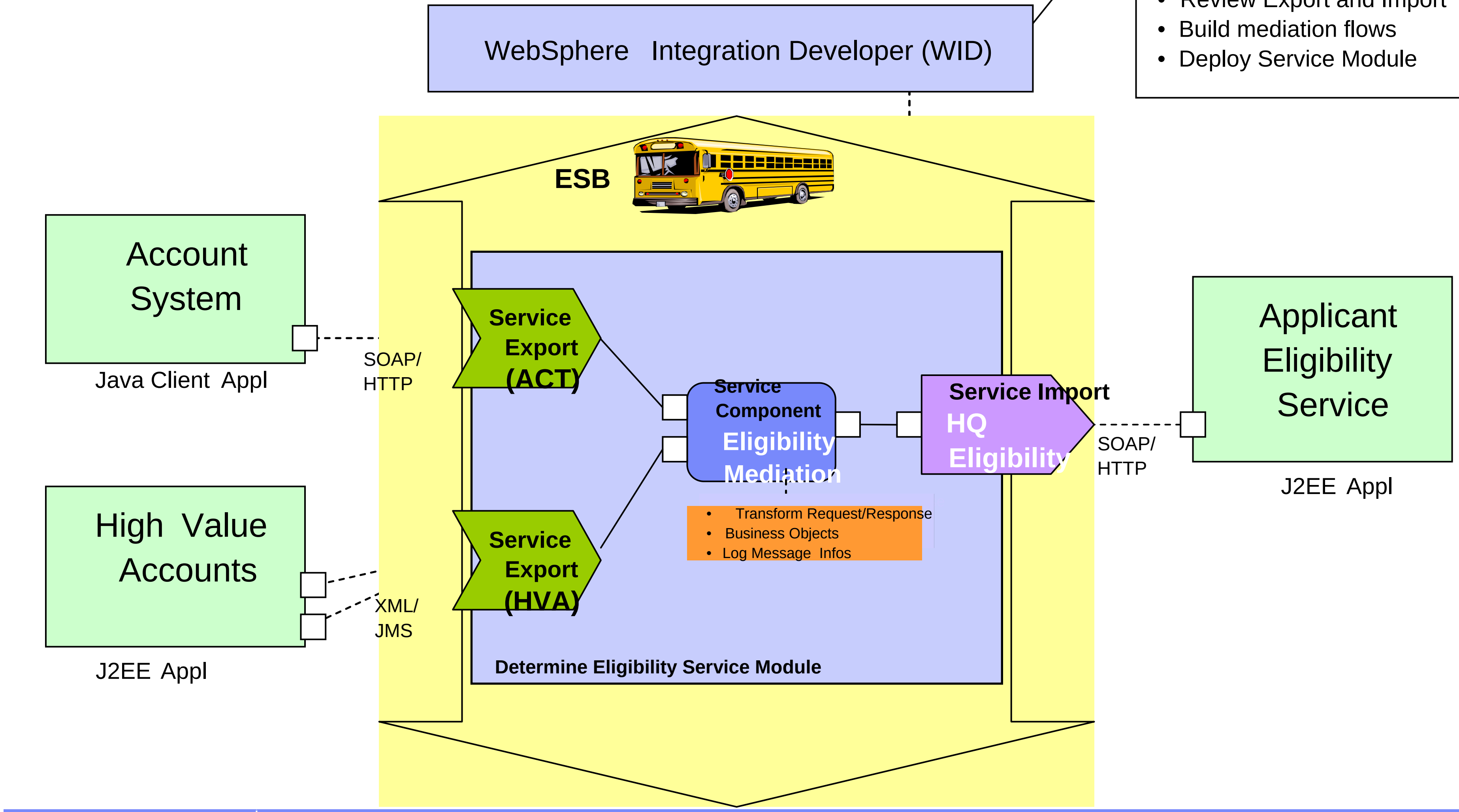
Gateway

Example JK Enterprise – a virtual company with an „Open Account Process“



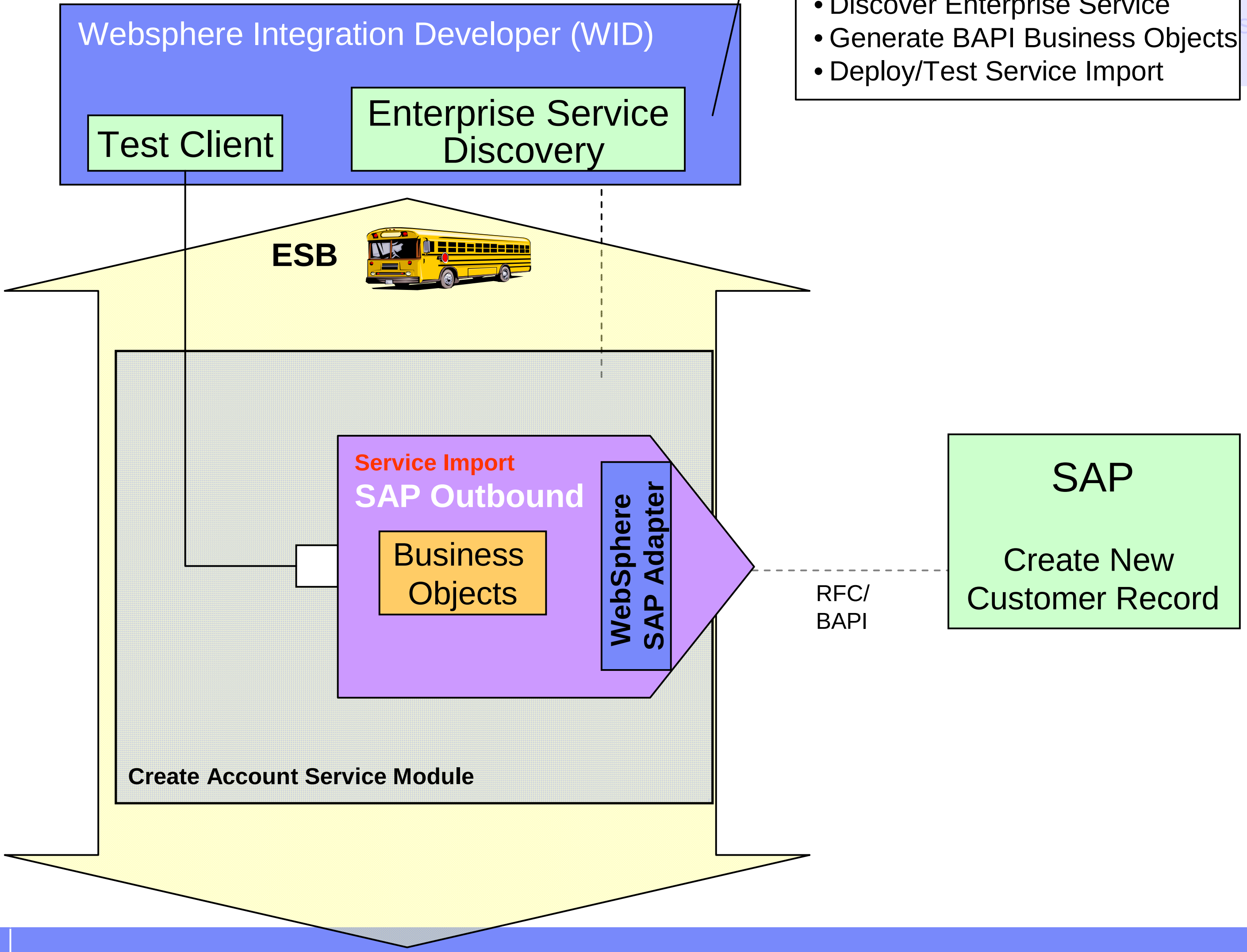
Example A: Multiple Channel Access to Backend Service

- Review Export and Import
- Build mediation flows
- Deploy Service Module



Example B: Create SAP Service

- Deploy Adapter
- Discover Enterprise Service
- Generate BAPI Business Objects
- Deploy/Test Service Import

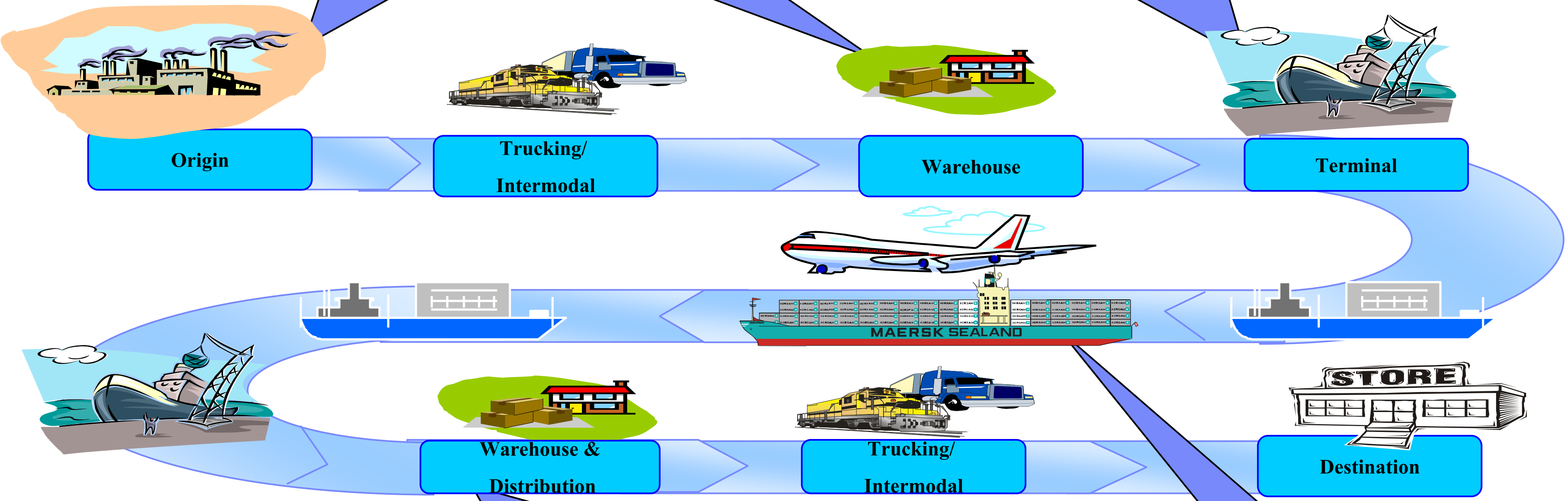

Websphere Integration Developer (WID)
Test Client
Enterprise Service Discovery
ESB
Service Import
SAP Outbound
Business Objects
WebSphere SAP Adapter
Create Account Service Module
RFC/ BAPI
SAP
Create New Customer Record

III. Exercise
Integration Architecture for FACT

Financial Accounting for Container Business

- Financial Accounting performed by SAP
- Long lasting Business Processes – from taking the order to delivery at destination
- Global IT environment (140 countries)
- Integration of approx. 40 operational applications

Container Business Value Chain



- Purchase Order Management

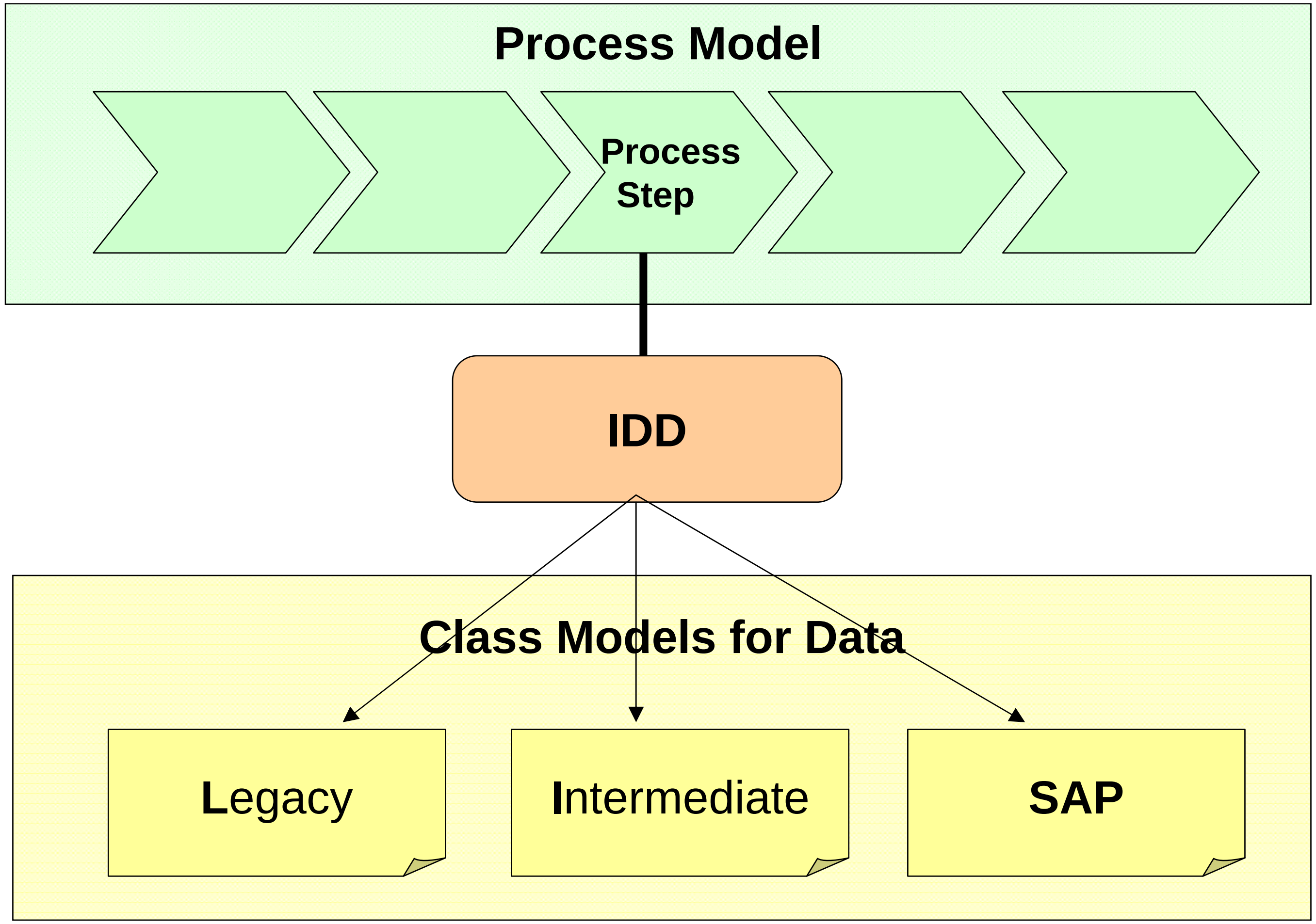
- Consolidation
- Labeling, Scanning

- M&R (Container, Vessel)
- Equipment Leasing

- Depot Management
- Deconsolidation, Re-label

- Crewing
- Ship Owning

Process Model describing IDD (Interface Detailed Definitions)



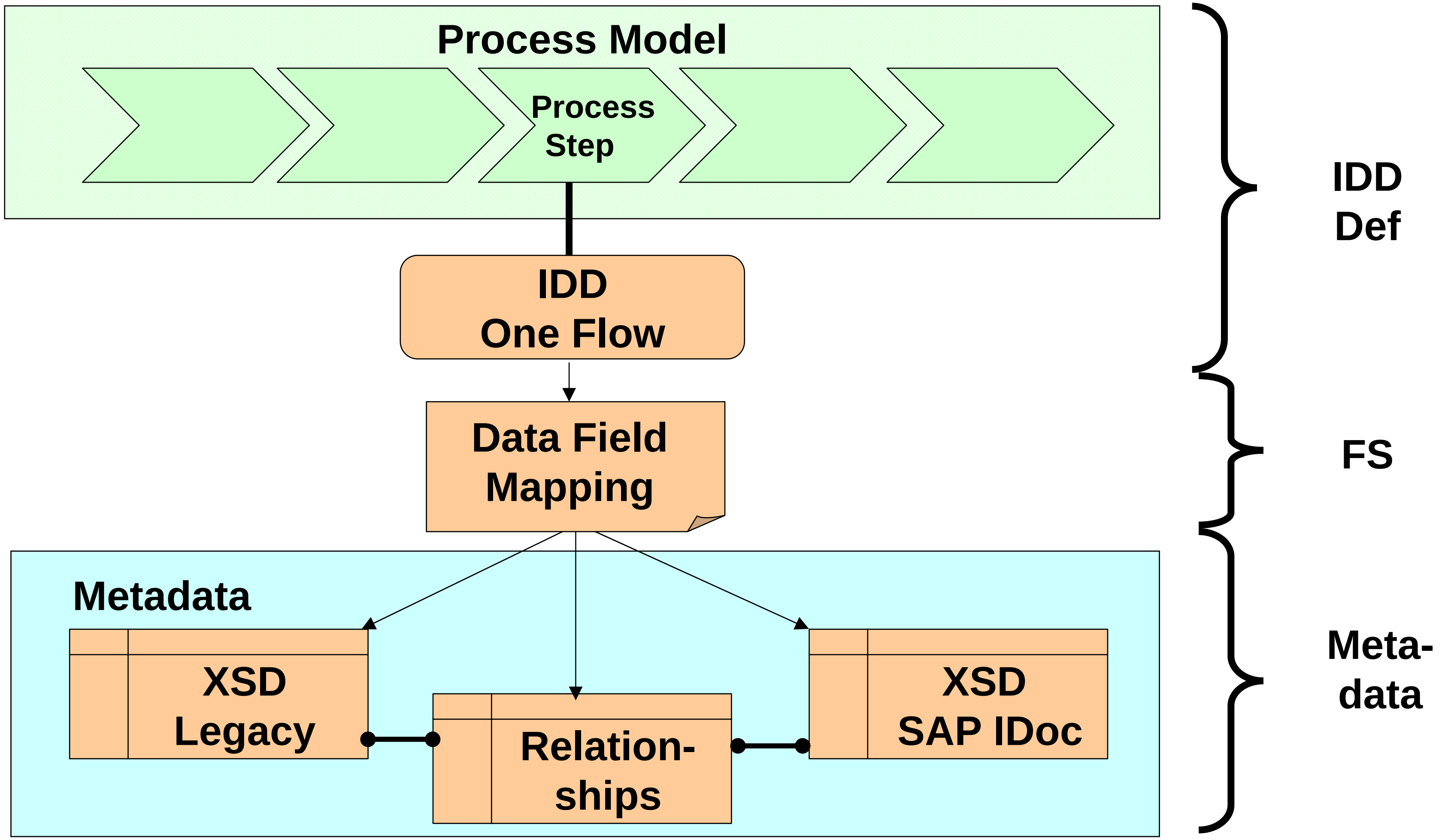
Overview

- IDD (Interface Detailed Definition) related to a step in the Business Process – may include multiple information flows

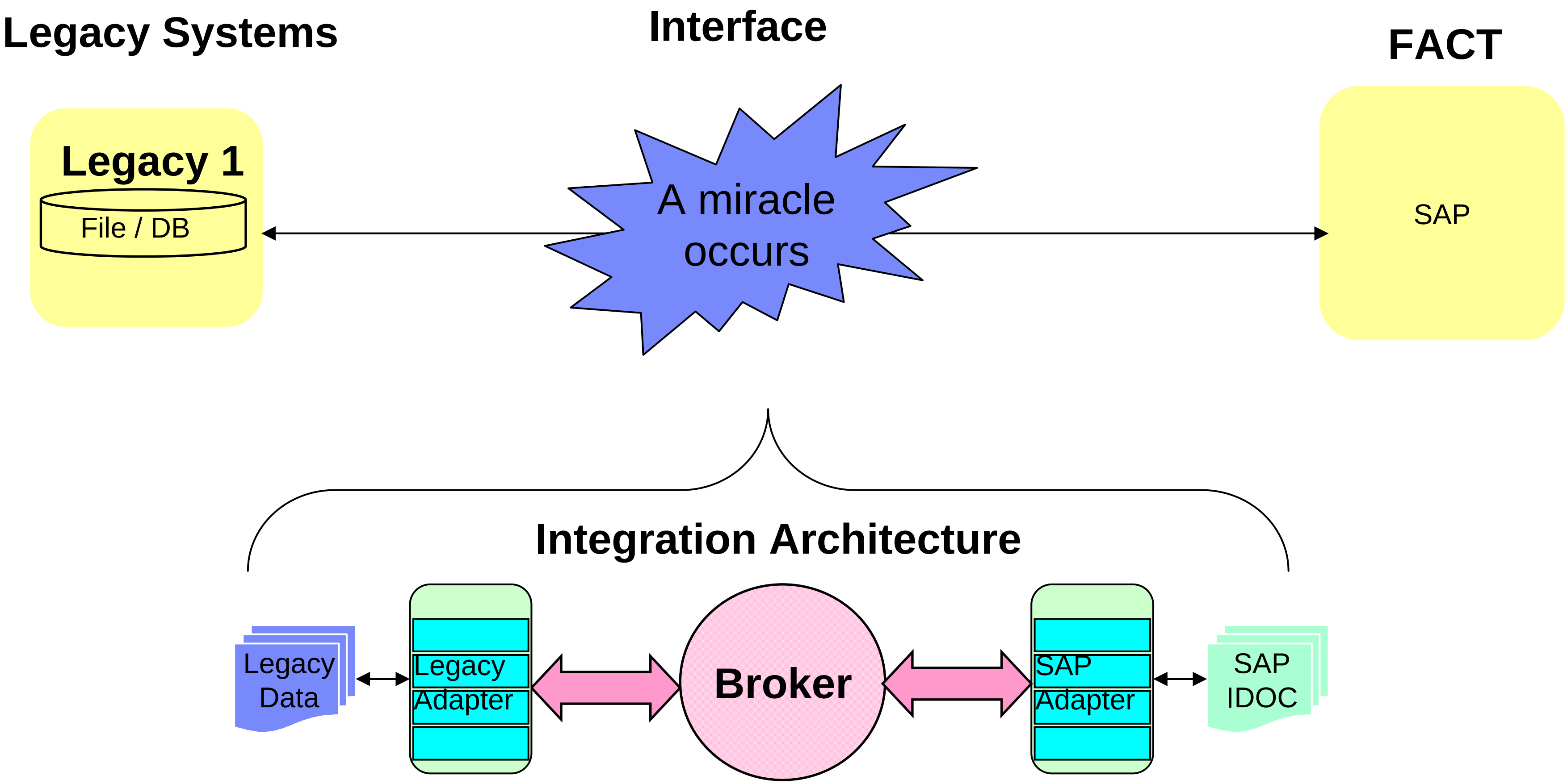
- FS (Functional Specification)
  - *Functional Specification* (FS) defines data (SAP and Legacy) from Business Perspective, including some transformations
  - Data Structure include IDoc / BAPI as well as Legacy interface data structure to be used and or customized

- TS (Technical Specification)
  - *Technical Specifications* (TS) (Overview, SAP, Legacy, Broker) include AND *data models* and XSD (XML Schema Definition) for XML of SAP IDocs, XML of Legacy Application Interfaces, Transformations

Deliverables of Data Structures for an IDD



Integration Architecture is about breaking “Interfaces” into smaller chunks

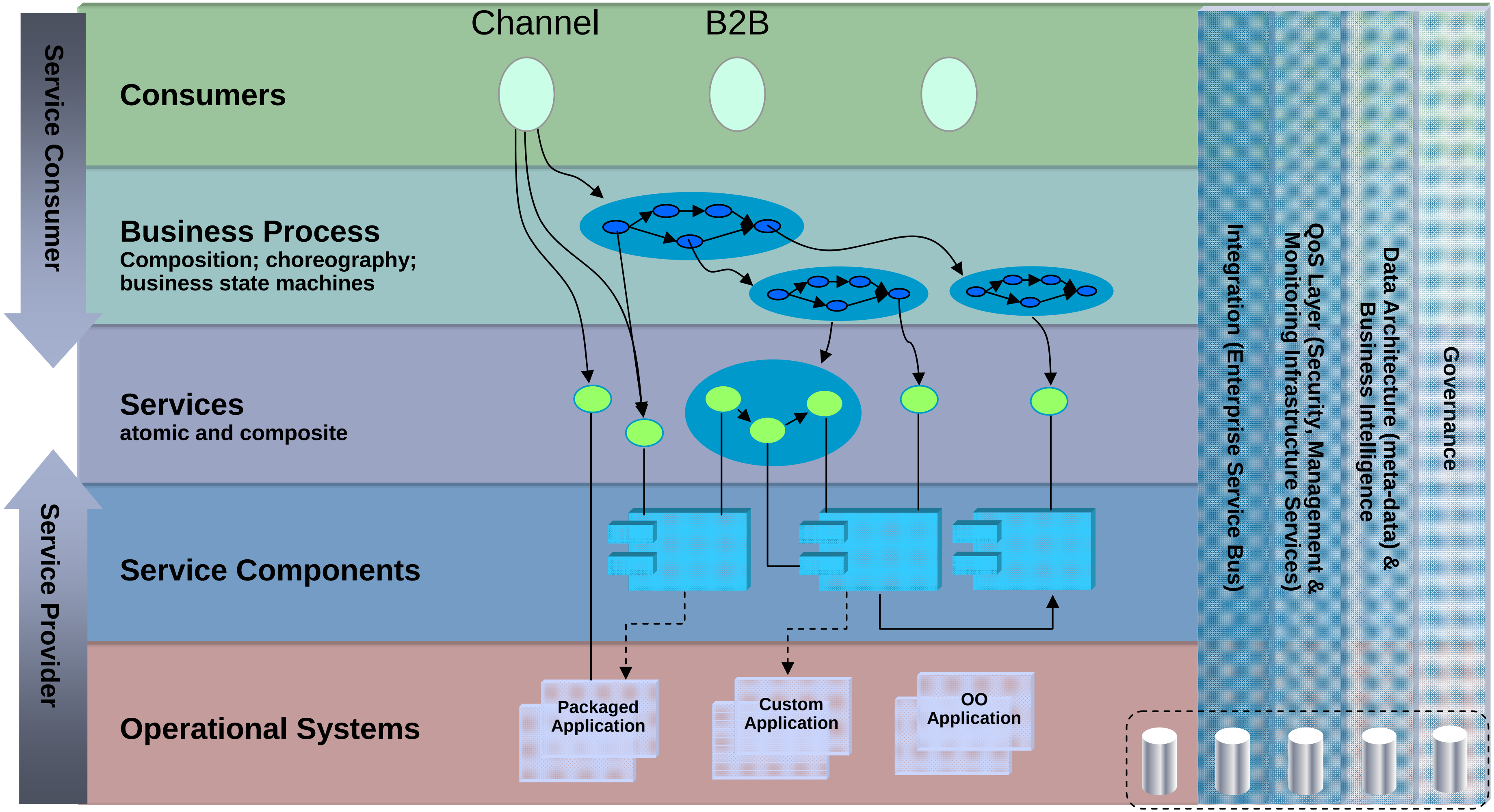


Exercise

- Apply SOA Principles to the described environment
- Define SOA Infrastructure

IV. SOA Reference Architecture & SOA Entry Points

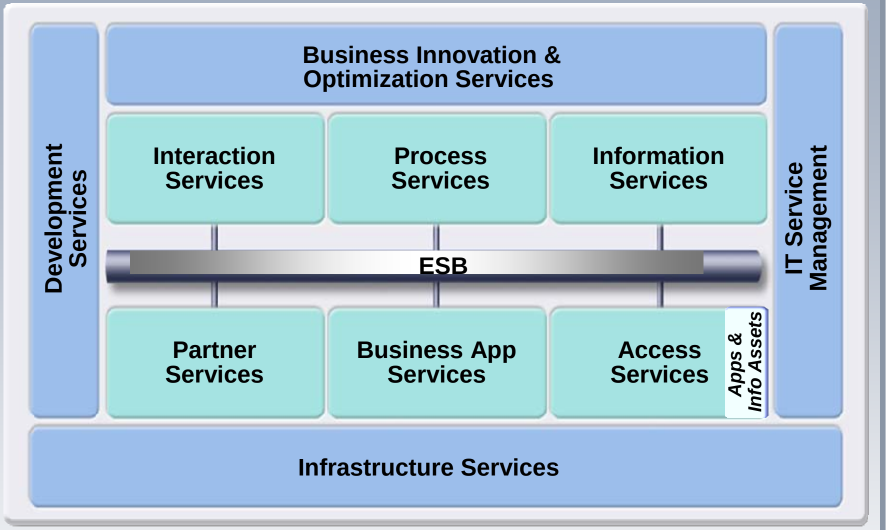
Moving to Services-Oriented Solutions – Layered Architecture View


Service Consumer
Service Provider
Channel
B2B
Consumers
Business Process
Composition; choreography; business state machines
Services
atomic and composite
Service Components
Operational Systems
Packaged Application
Custom Application
OO Application
Integration (Enterprise Service Bus)
QoS Layer (Security, Management & Monitoring Infrastructure Services)
Data Architecture (meta-data) & Business Intelligence
Governance

The SOA Reference Architecture and its Key Principles

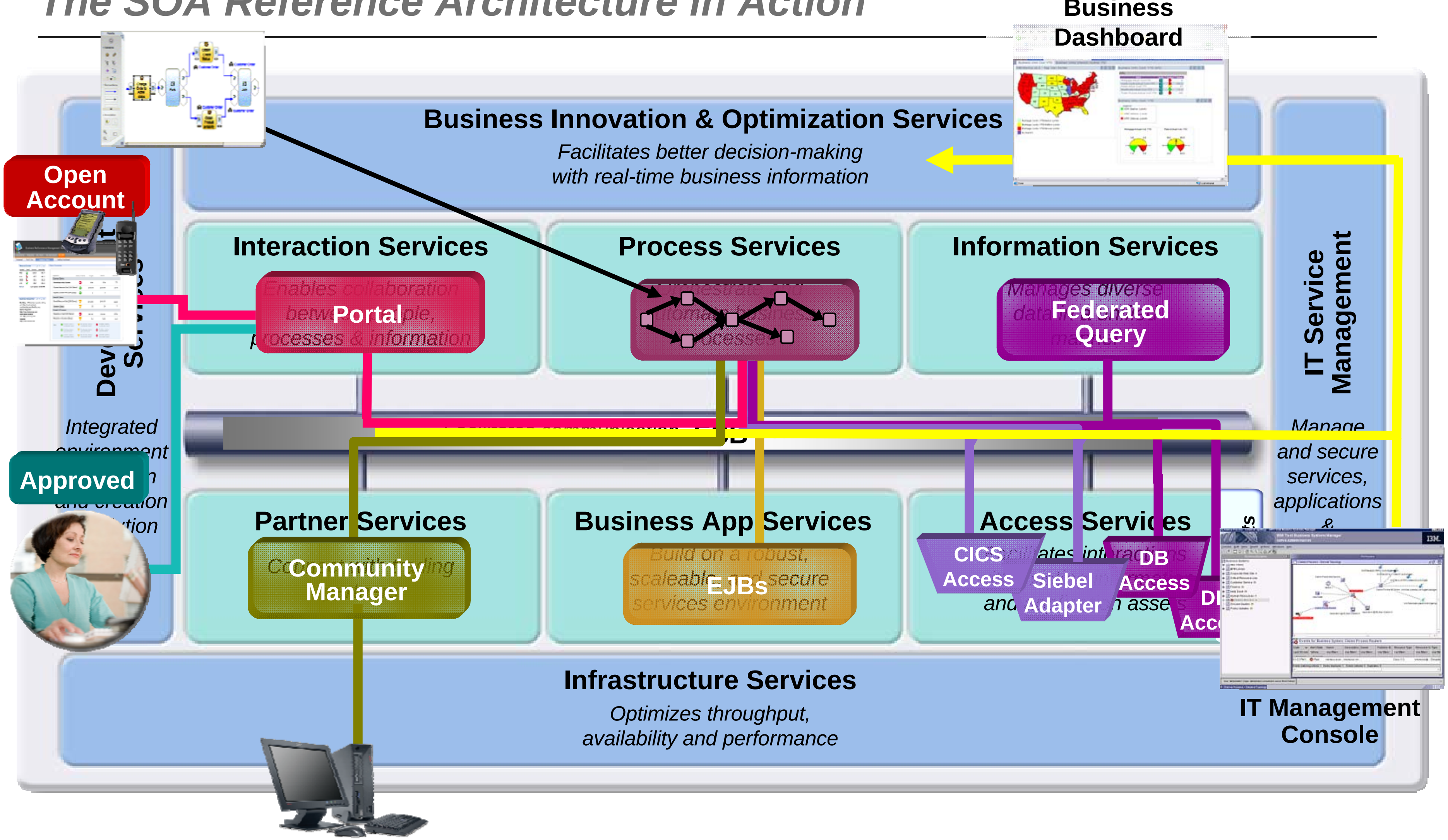
Providing IT Flexibility to Meet the Demands of Business

- Linkage between business and IT through support of the entire SOA Lifecycle
- Connectivity and Service Isolation through the Enterprise Service Bus
- Separation of Concerns/Modularity for incremental adoption
- Component-based Programming and Solution Development
- Business and IT Monitoring and Management
- Open Standards

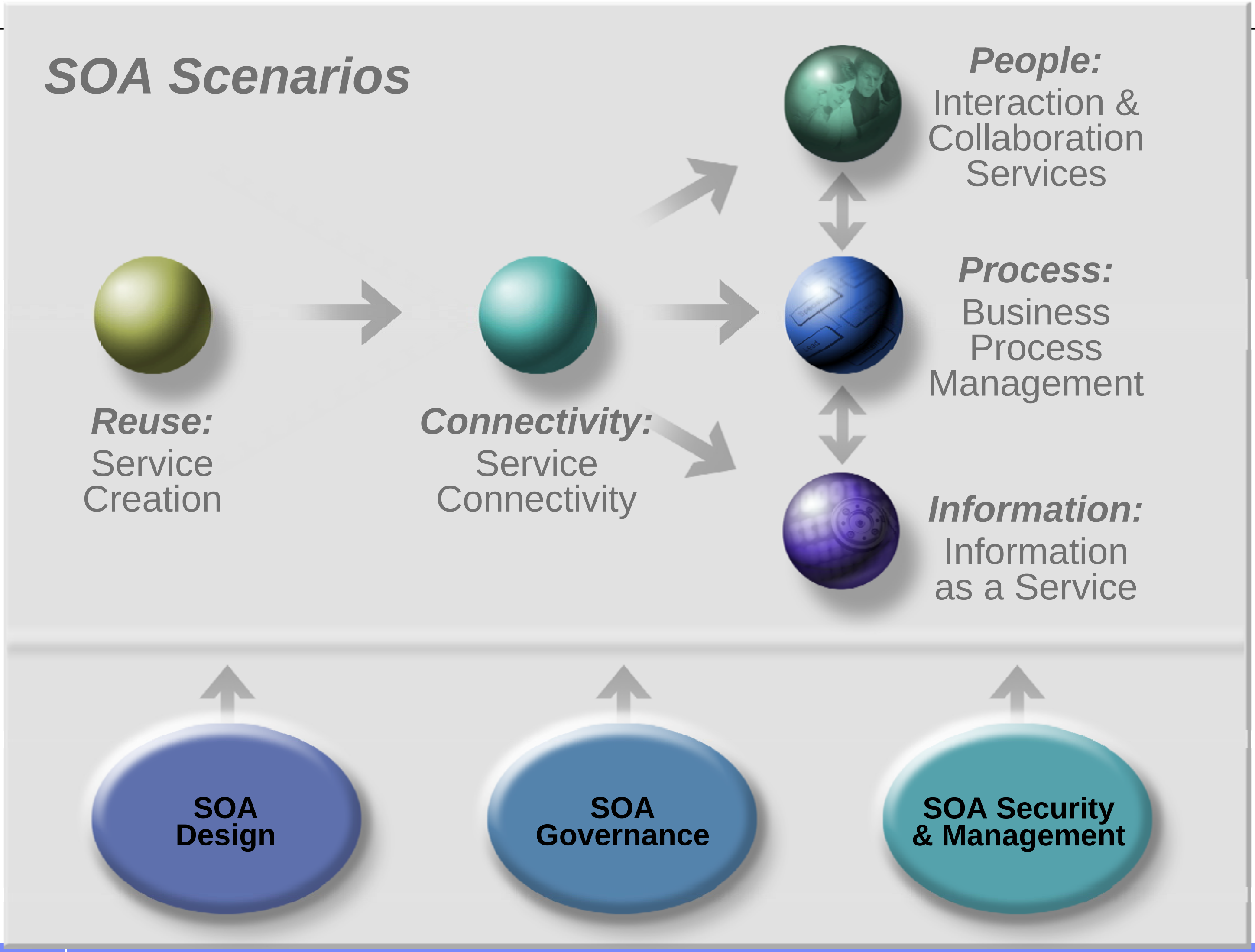


Separation of Concerns

The SOA Reference Architecture in Action



SOA Scenarios



SOA Scenarios
Reuse: Service Creation
Connectivity: Service Connectivity
People: Interaction & Collaboration Services
Process: Business Process Management
Information: Information as a Service
SOA Design
SOA Governance
SOA Security & Management

SOA Entry Points are Both Business Centric and IT Focused

People

Deliver role-based interaction and collaboration through services

Process

Achieve business process innovation through treating tasks as modular services

Information

Provide trusted information in business context by treating it as a service

Reuse

Service-enable existing assets and fill portfolio gaps with new reusable services

Connectivity

Connect systems, users, and business channels based on open standards

People: Interaction & Collaboration Services / Interaction Services in SOA Reference Architecture

- People are the drivers of the business – they **interact** with reusable business services using the right information at the right time!

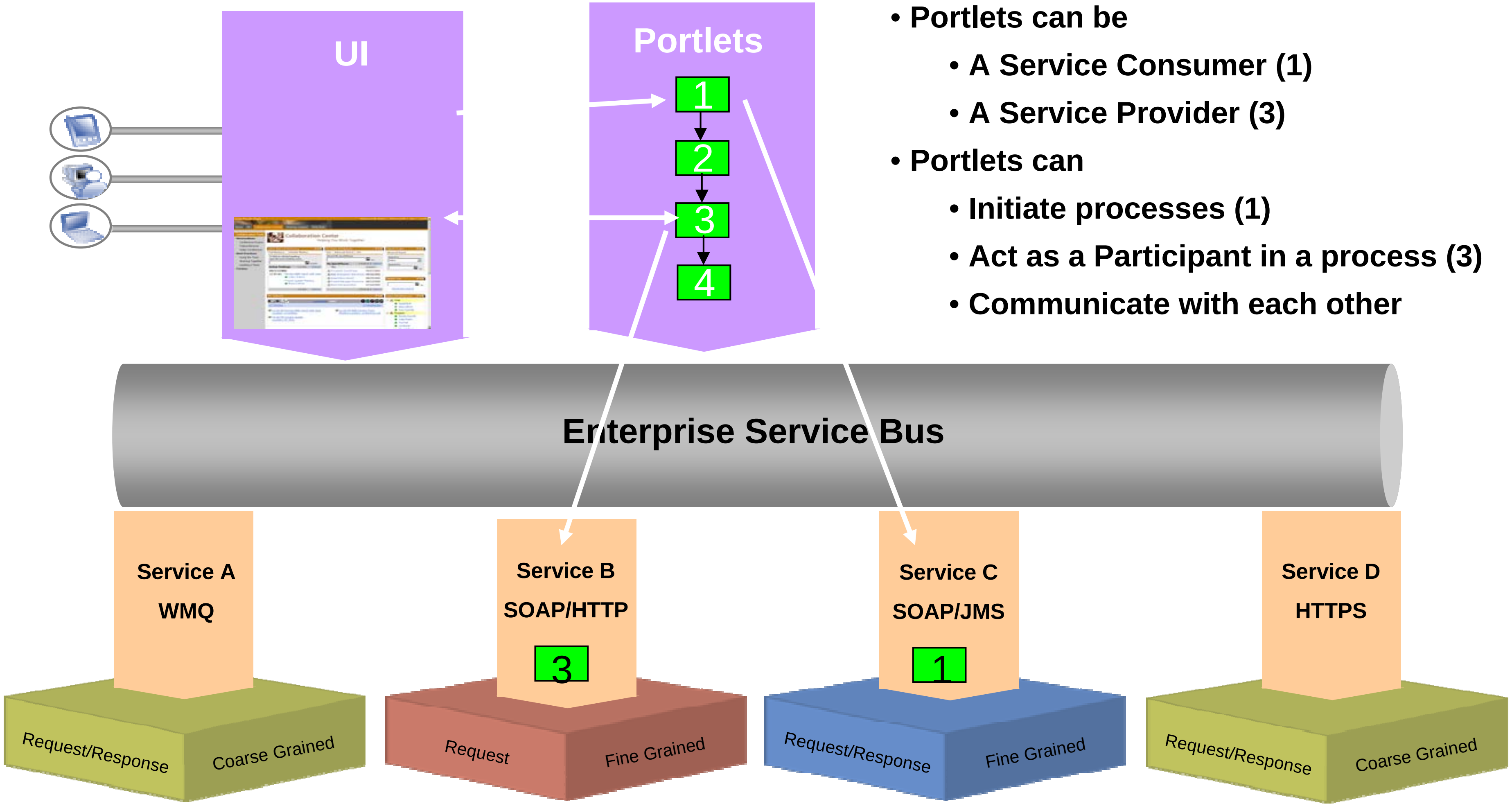
- Starting point for SOA - enabling people to interact with **application and information "services"** supporting **business processes**.

- Provided by Portals using **Portlets**, relying on security for the managing user access

- Based on Web Servers, new is the use of **AJAX**

- Link with **Web 2.0**

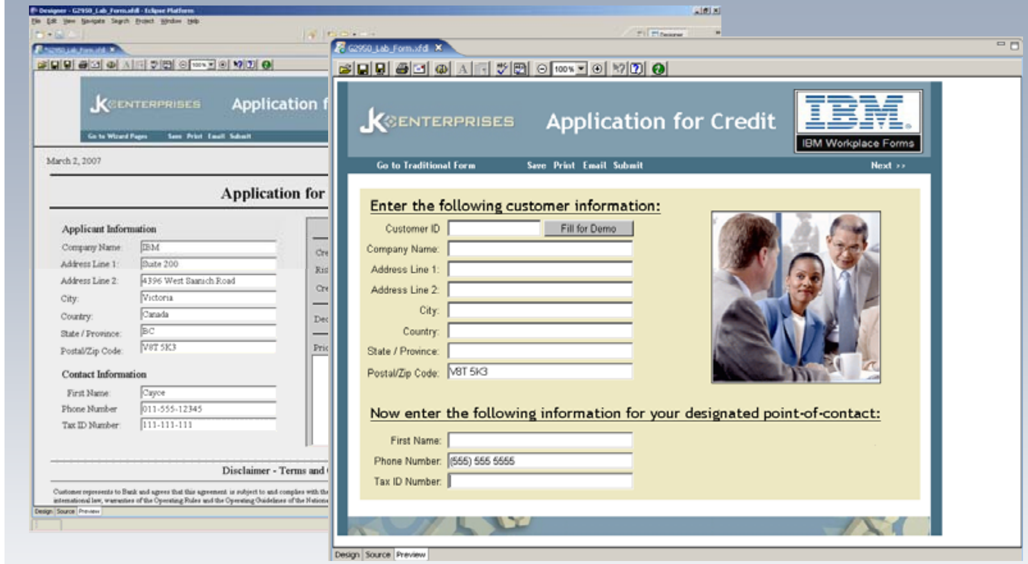
What is an Interaction Service?



- Portlets can be
  - A Service Consumer (1)
  - A Service Provider (3)
- Portlets can
  - Initiate processes (1)
  - Act as a Participant in a process (3)
  - Communicate with each other

The Portal Framework Provides Service Aggregation

Building User Interaction Services



March 2, 2007

Application for

Applicant Information

Company Name:	IBM
Address Line 1:	Suite 200
Address Line 2:	4396 West Saanich Road
City:	Victoria
Country:	Canada
State / Province:	BC
Postal/Zip Code:	V8T 5K3

Contact Information

First Name:	Cayce
Phone Number:	011-555-12345
Tax ID Number:	111-111-111

Disclaimer - Terms and

Customer represents to Bank and agrees that this agreement is subject to and complies with the international law, warranties of the Operating Rules and the Operating Guidelines of the Nationa

Application for Credit

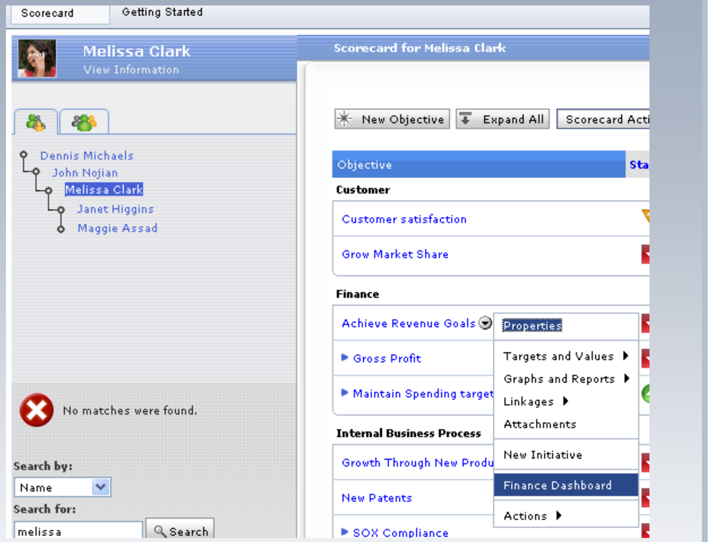
Enter the following customer information:

Customer ID	
Company Name:	
Address Line 1:	
Address Line 2:	
City:	
Country:	
State / Province:	
Postal/Zip Code:	V8T 5K3

Now enter the following information for your designated point-of-contact:

First Name:	
Phone Number:	(555) 555 5555
Tax ID Number:	

Developing and Deploying the “New Account” Application



Melissa Clark

Scorecard for Melissa Clark

Dennis Michaels
John Nojian
Melissa Clark
Janet Higgins
Maggie Assad

No matches were found.

Search by: Name

Search for: melissa

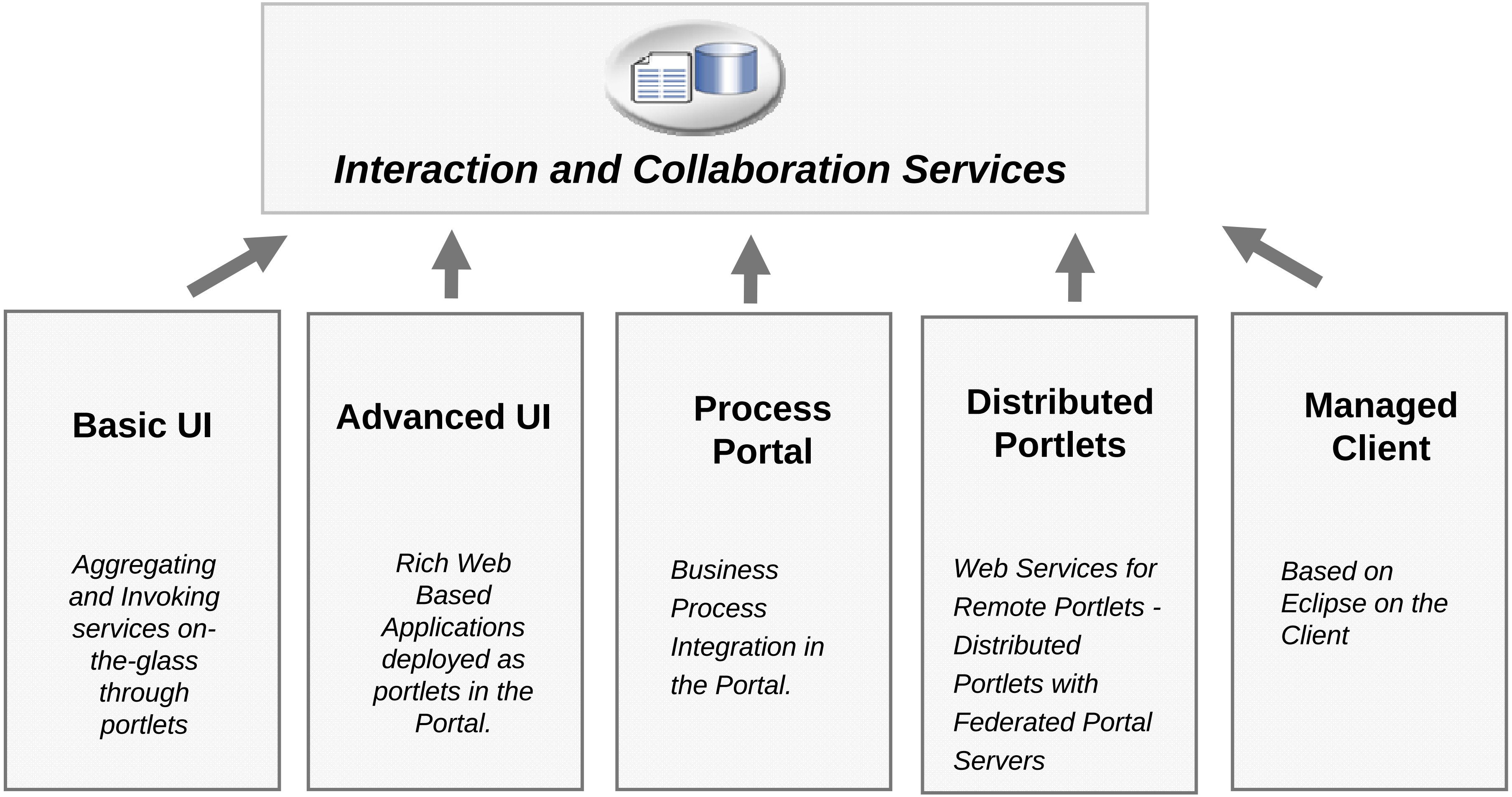
Customer
- Customer satisfaction
- Grow Market Share

Finance
- Achieve Revenue Goals
- Gross Profit
- Maintain Spending target

Internal Business Process
- Growth Through New Produ
- New Patents
- SOX Compliance

Building Role-Specific Portlets and Dashboards

SOA Interaction and Collaboration Realizations



Interaction and Collaboration Services

Basic UI

Aggregating and Invoking services on-the-glass through portlets

Advanced UI

Rich Web Based Applications deployed as portlets in the Portal.

Process Portal

Business Process Integration in the Portal.

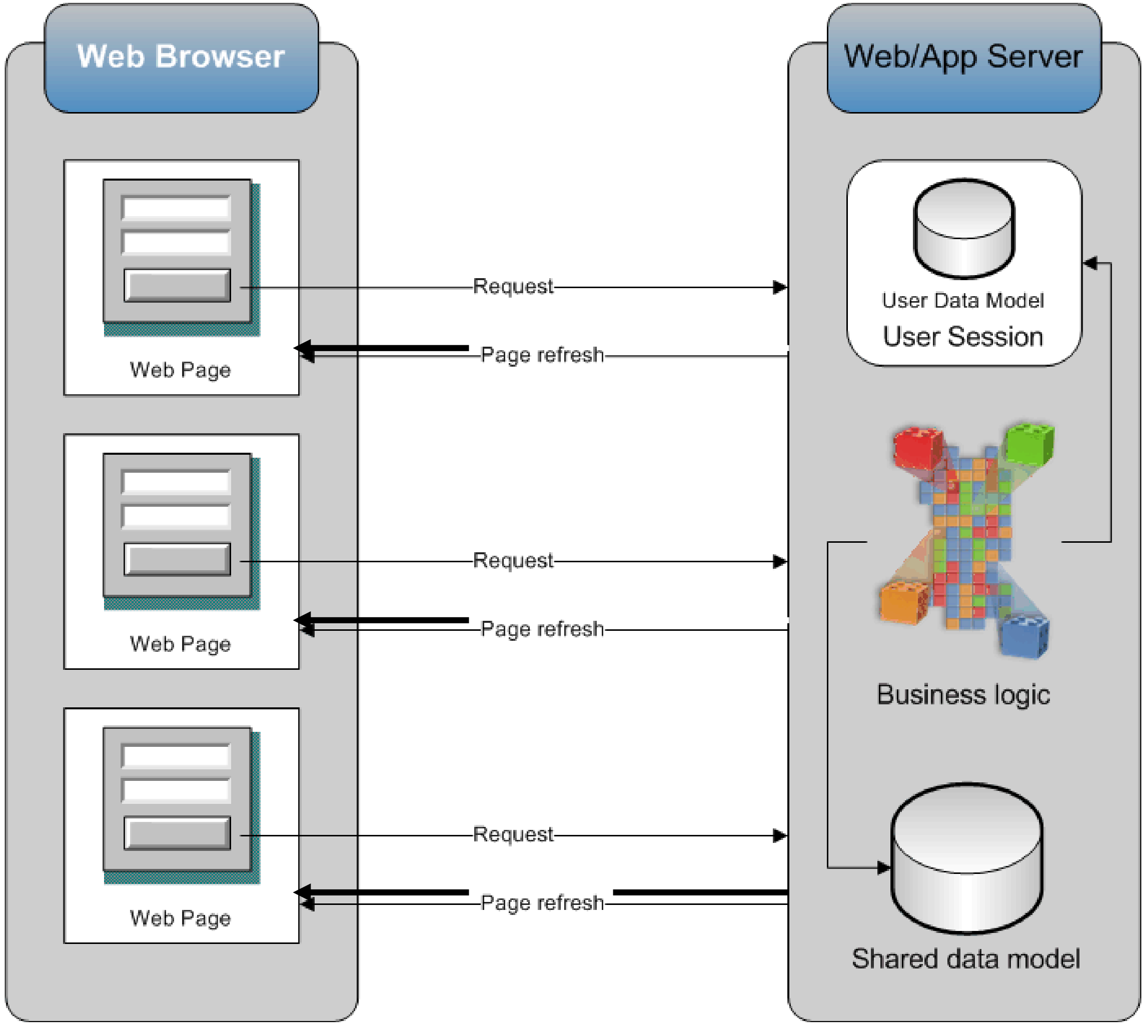
Distributed Portlets

Web Services for Remote Portlets - Distributed Portlets with Federated Portal Servers

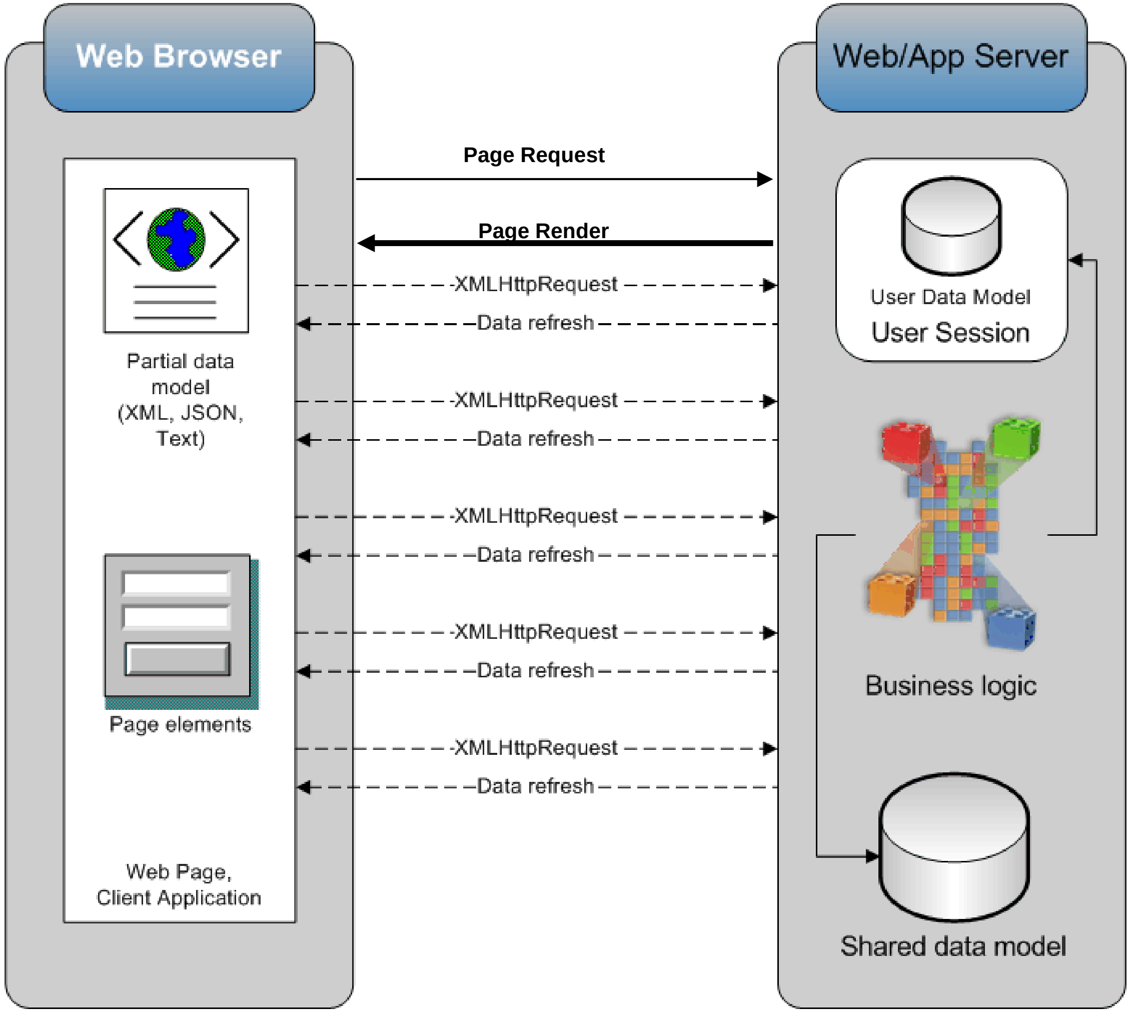
Managed Client

Based on Eclipse on the Client

Traditional Interaction: Interrupted interaction with request driven processing with static page refresh



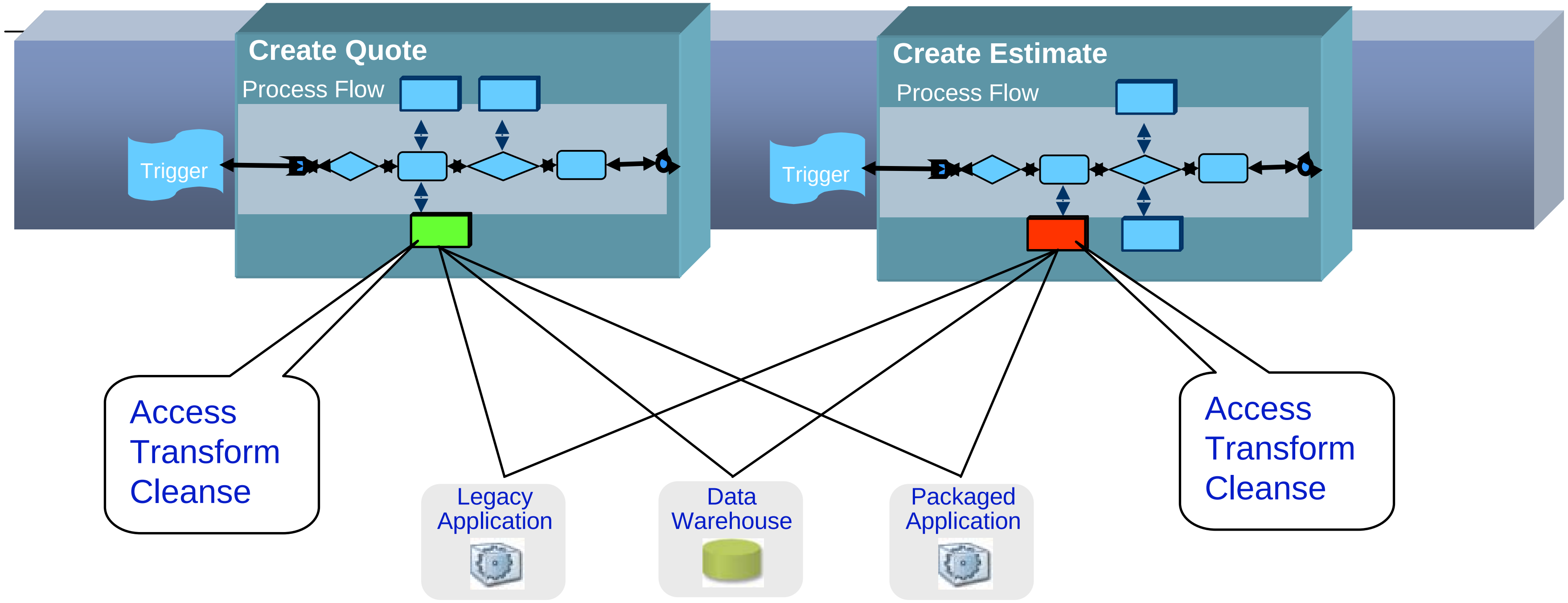
AJAX Web Interaction: Continuous user interaction with event driven processing and dynamic content refresh



Information: Information as a Service / Information Services in SOA Reference Architecture

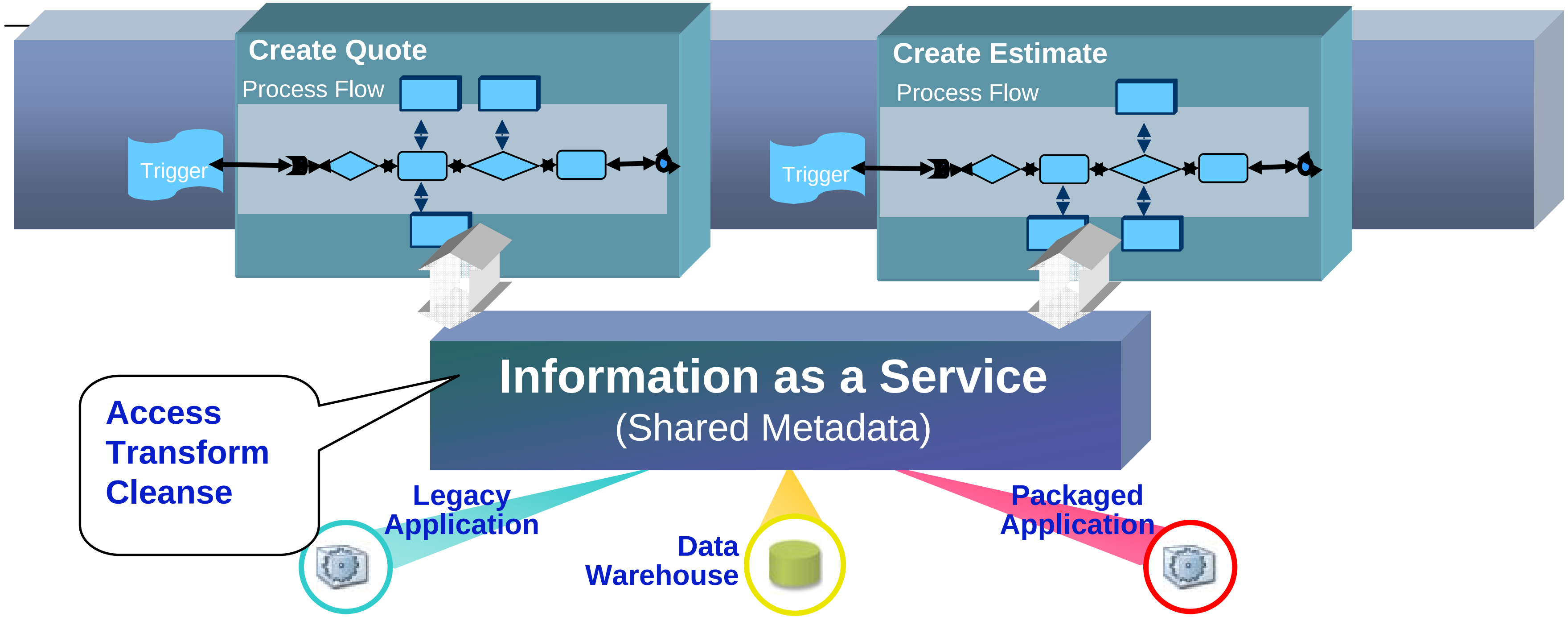
- Delivering actionable information to people and processes
- Connect, enhance and deliver in-context information across diverse operating systems, applications and legacy systems through reusable services
- The Information Services enables consistent views and maintenance of data and content, providing a “single view of the truth” to people and processes

Information: Tight coupling causes inconsistent results



- Inconsistent “view” of the data
- Inconsistency in sources and how data is derived
- Inconsistent rules applied to data
- Multiple points of maintenance
- No flexibility to change information sources and formats

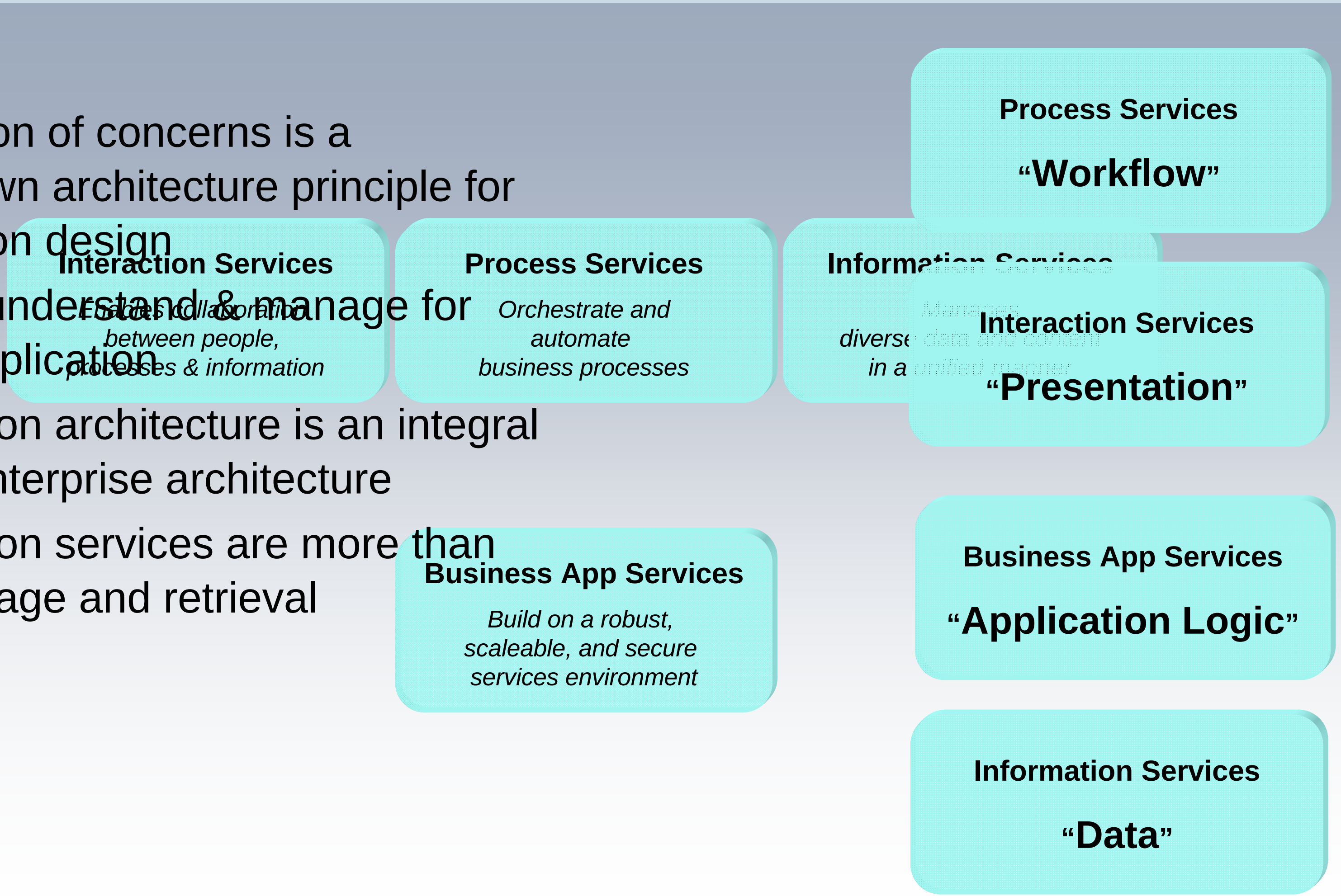
Information as a Service (IaaS) as Solution



- Consistent packaging of data
- Leverages understanding of metadata relationships
- Applies consistent rules to data
- Centralized control and maintenance
- Flexibility to add and change information sources and formats

Separation of Concerns exists Even Before SOA…

- Separation of concerns is a well-known architecture principle for application design
- Easy to understand & manage for single application
- Information architecture is an integral part of enterprise architecture
- Information services are more than data storage and retrieval



Interaction Services

Enables collaboration between people, processes & information

Process Services

Orchestrate and automate business processes

Information Services

Manages diverse data and content in a unified manner

Business App Services

Build on a robust, scaleable, and secure services environment

Process Services

“Workflow”

Interaction Services

“Presentation”

Business App Services

“Application Logic”

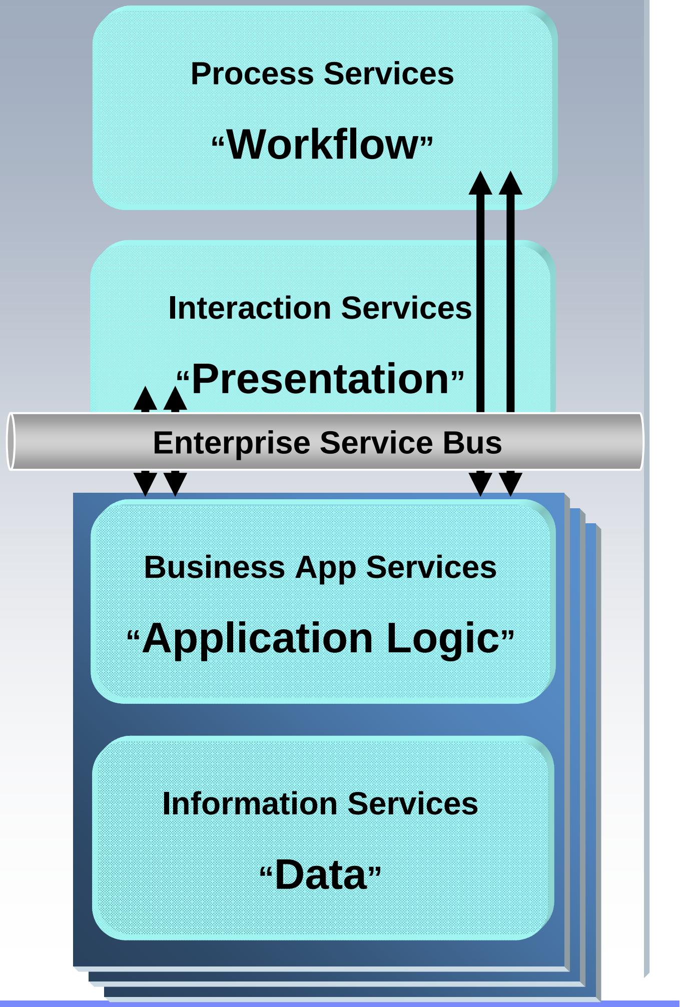
Information Services

“Data”

Separations of Concerns Focussing on Exposing Application Services

- Exposing application logic as services is straight-forward and enabled by tooling
- The integration of services focuses on mediation (brokering) and orchestration (workflow) of application logic

- **As a result, data is tightly coupled with the corresponding application logic**



Information as a Service

Critical business initiatives depend on Information

Key Issues

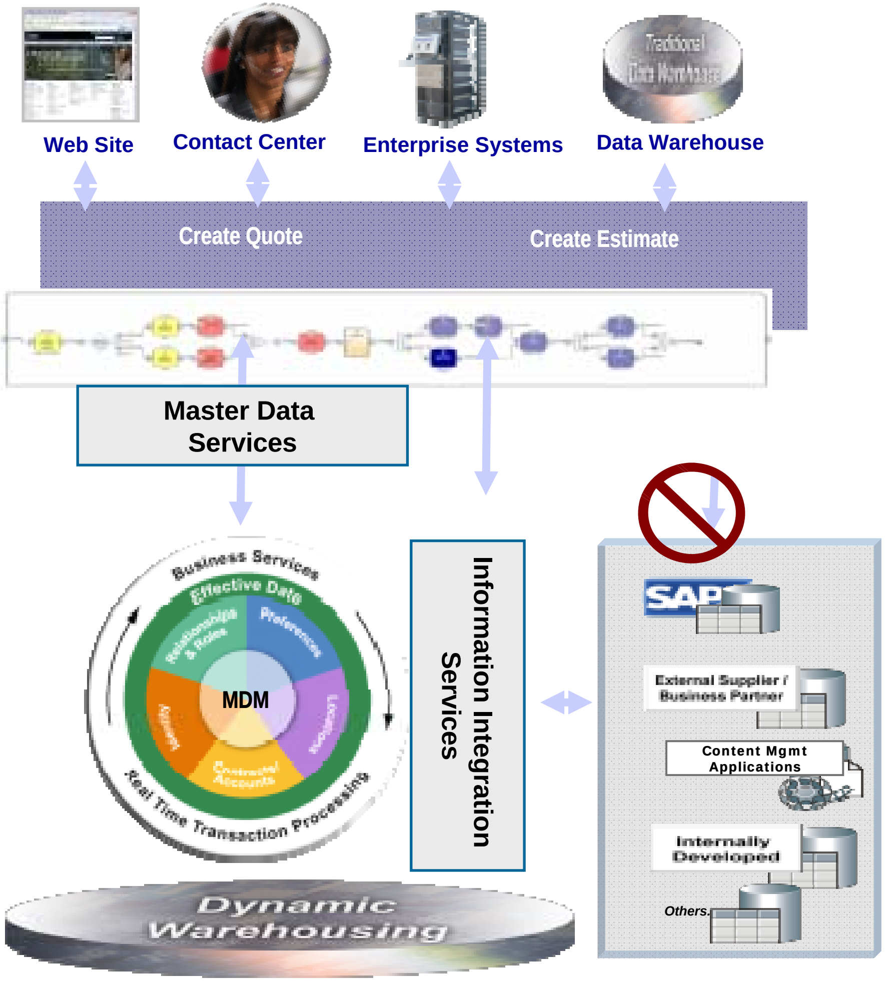
- Separation of Information & Process
- In-context delivery

Enablers

- Information Infrastructure
- Metadata Management

Hot Topics

- Dynamic Warehousing
- Analytic Services
- Models and Metadata



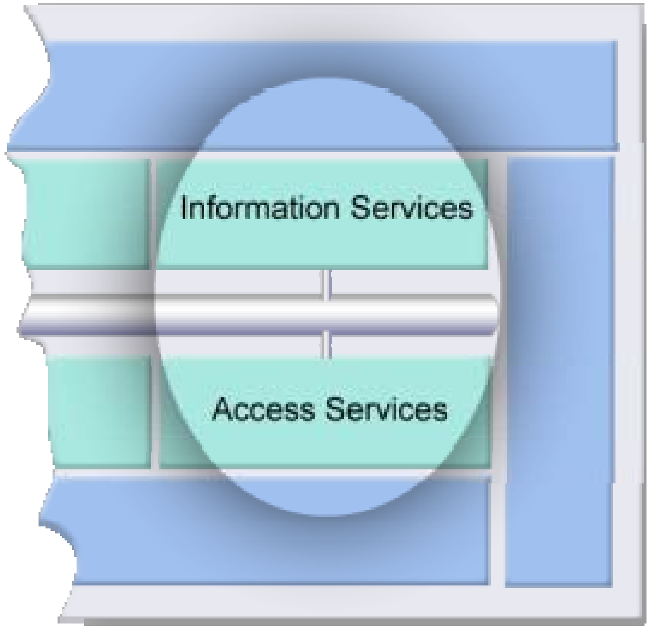
Classifying Information Services patterns
Identifying usage patterns to focus the business case

Data Complexity, & Accessibility

Deliver trusted information as a service

Multiple Versions of the Truth

Build master data services for product and customer info



An enterprise-wide information management strategy increases the chance of success for service oriented architecture efforts by at least 70%...

Gartner, February 2006

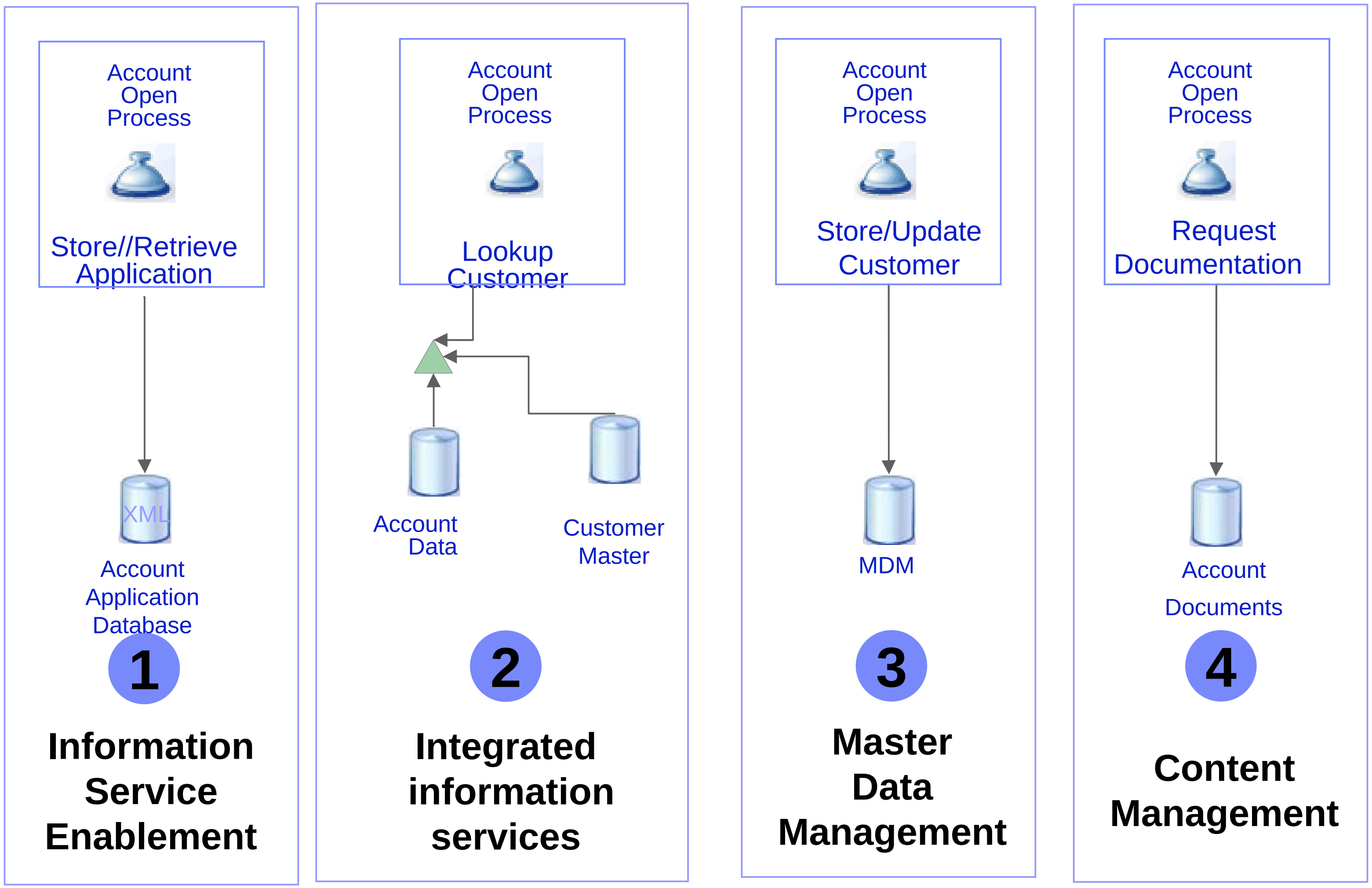
Enterprise Content Management

Build services to integrate content into processes

Real time access to analytical information

Deliver analytical services for structured an unstructured data

IAAS Patterns in JK Enterprises

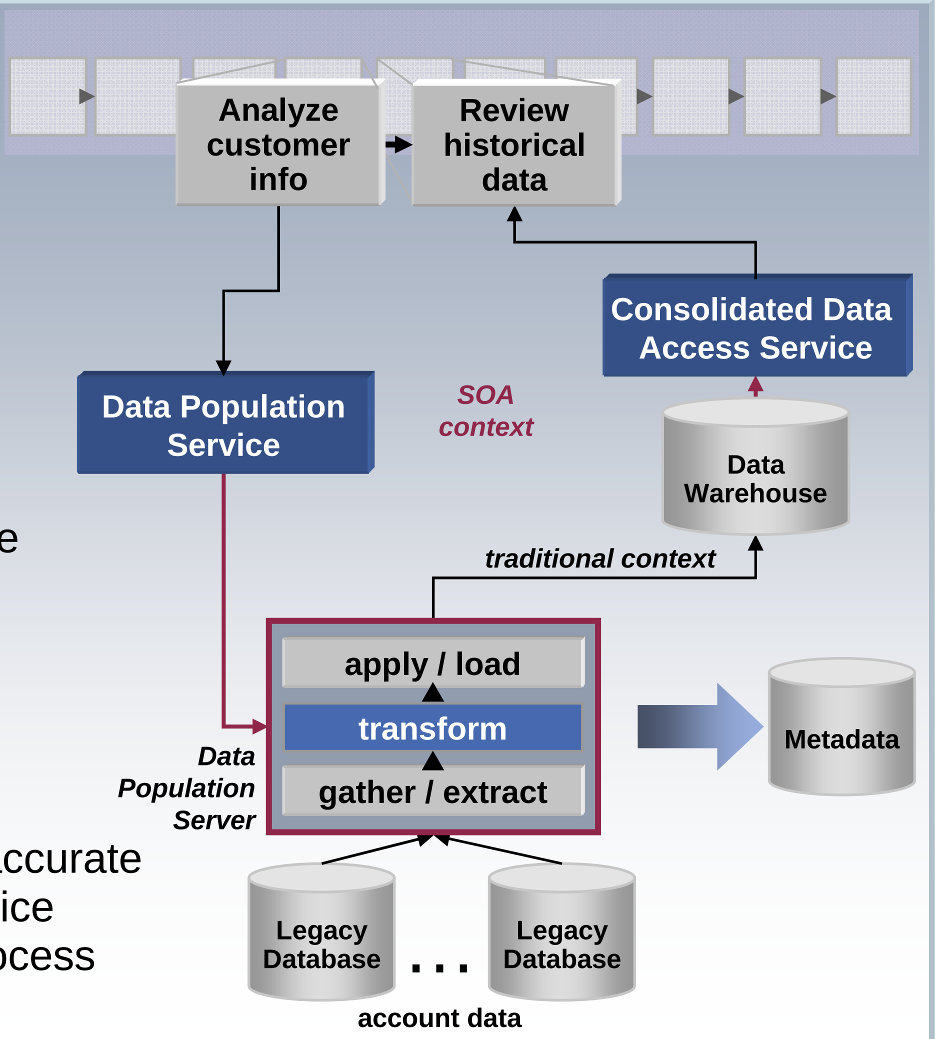


IaaS Example – Transform Your Data
Create Trusted Information from Disparate Sources

- **As-Is Environment**
  - Data resides in disparate sources
  - Manual & redundant integration of data by multiple consumers results in high costs and inconsistent/inaccurate data
  - Slow response time due to large data volume and complex transformations

- **Solution Characteristics**
  - Apply transformations on extracted source data; copy into consolidated target and expose consolidated data as services
  - Invoke population from business process

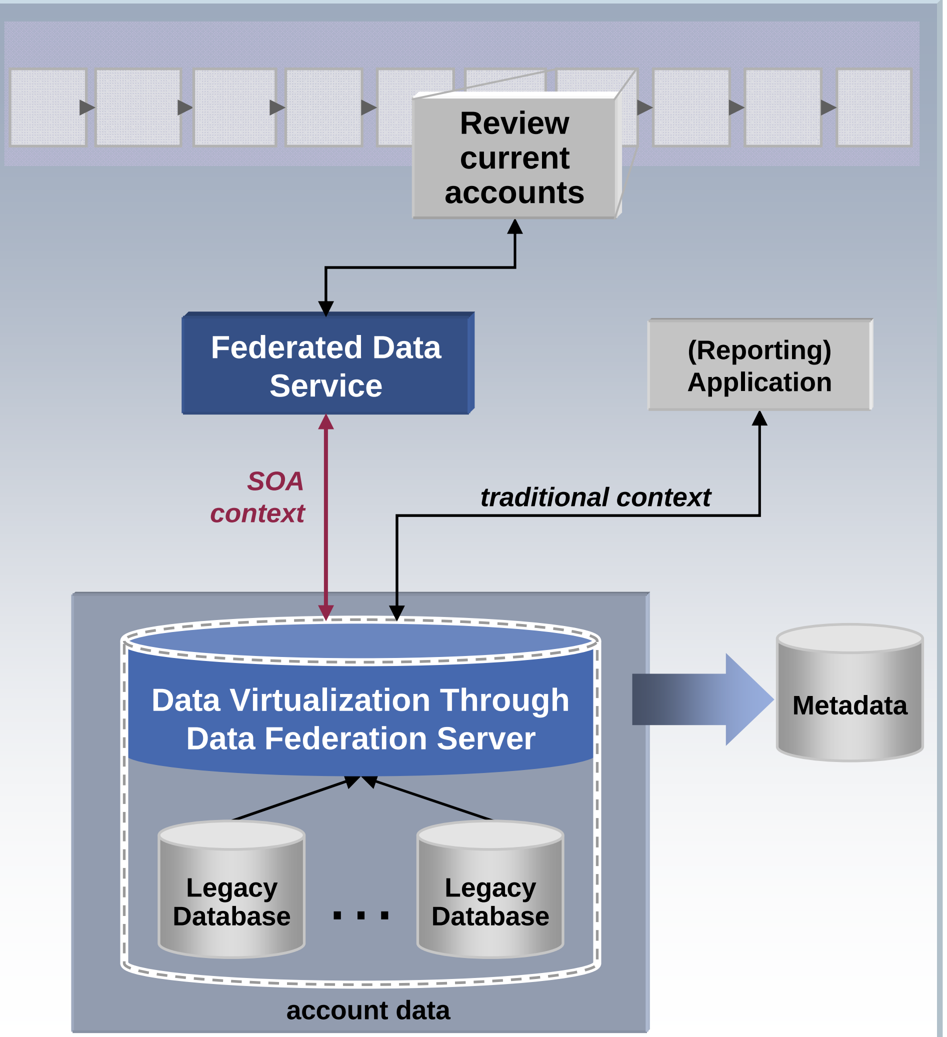
- **Results**
  - Multiple consumers can access trusted, accurate and integrated information through a service
  - Data availability aligned with business process



IaaS Example – Deliver Your Data

Virtualized Through Services

- **As-Is Environment**
  - Data resides in disparate sources
  - Manual & redundant integration of data by multiple consumers results in high costs and inconsistent/inaccurate data
  - Slow response time due to inefficient real-time access
- **Solution Characteristics**
  - On demand integration instead of redundant data
  - Transparent & optimized access to distributed, heterogeneous sources
- **Results**
  - Real-time access to distributed information, fast response time
  - Scalable approach for adding more data sources



Closing Remark