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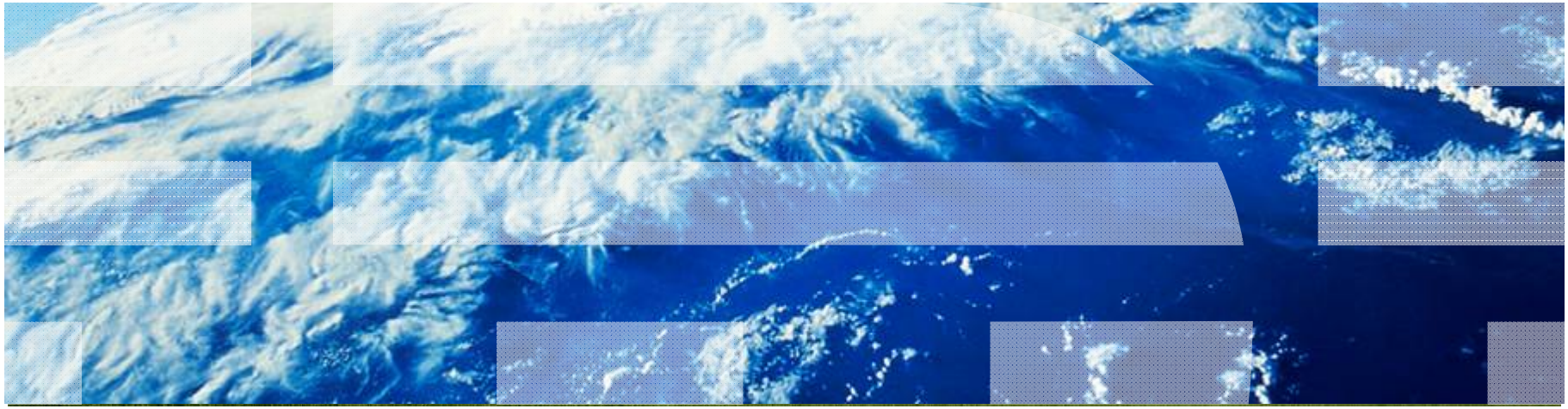
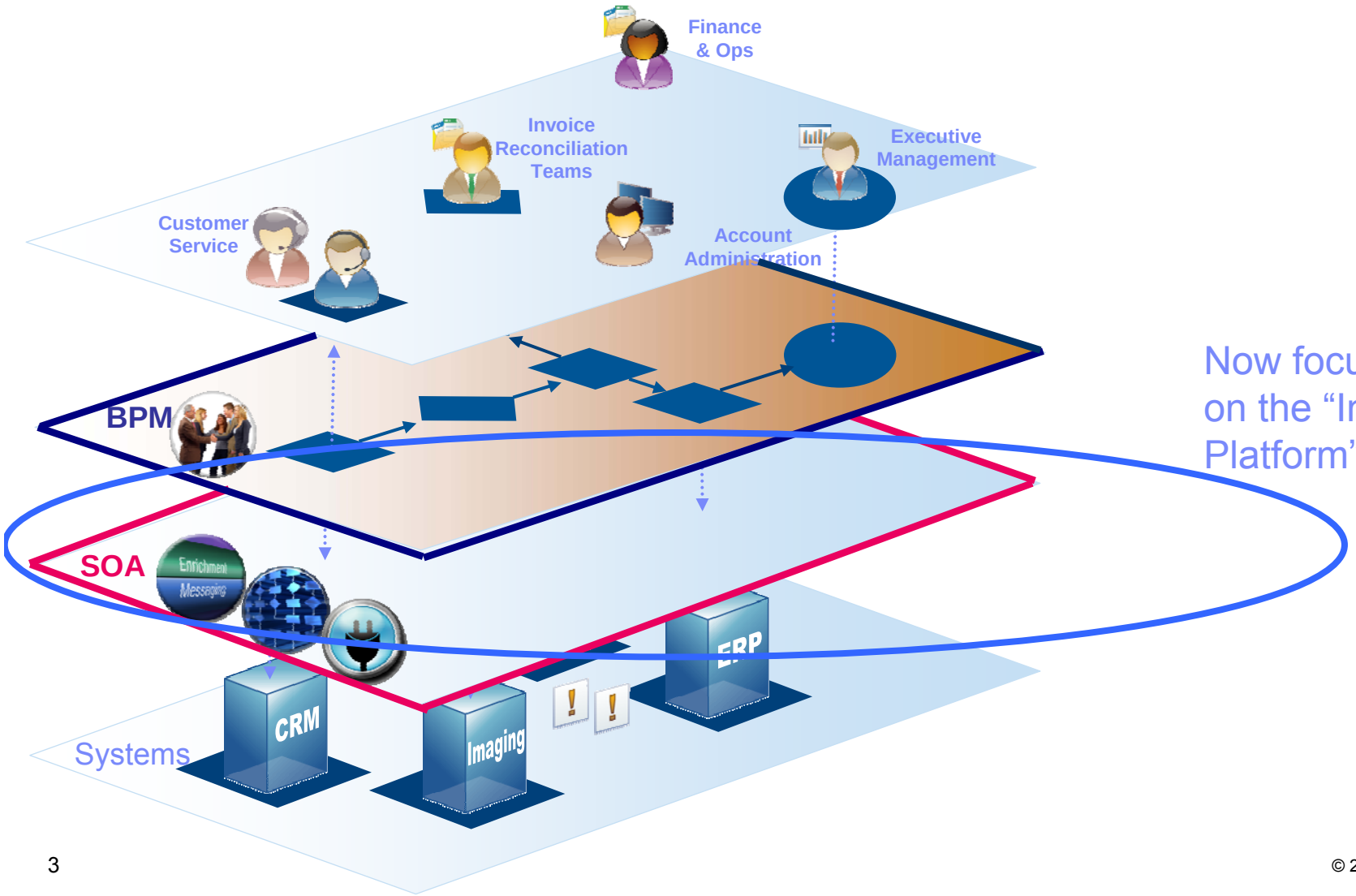
# *Enterprise IT Architectures*

# SOA (Service Oriented Architecture)



# SOA Introduction

# Positioning of SOA



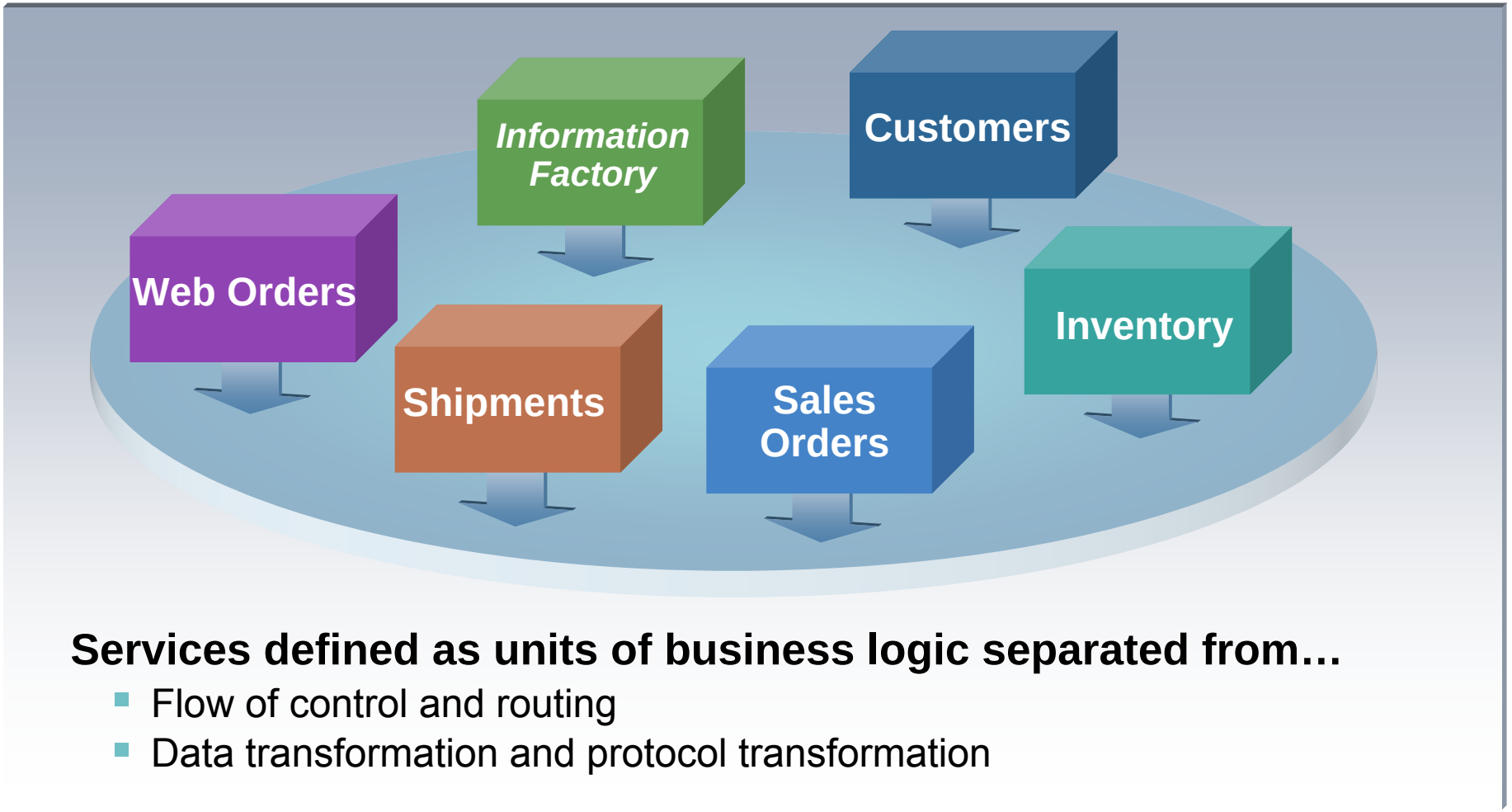

Now focusing on the "Integration Platform"

# 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.**

# Service Oriented Architecture

## *Moves IT Logic Out of Services*

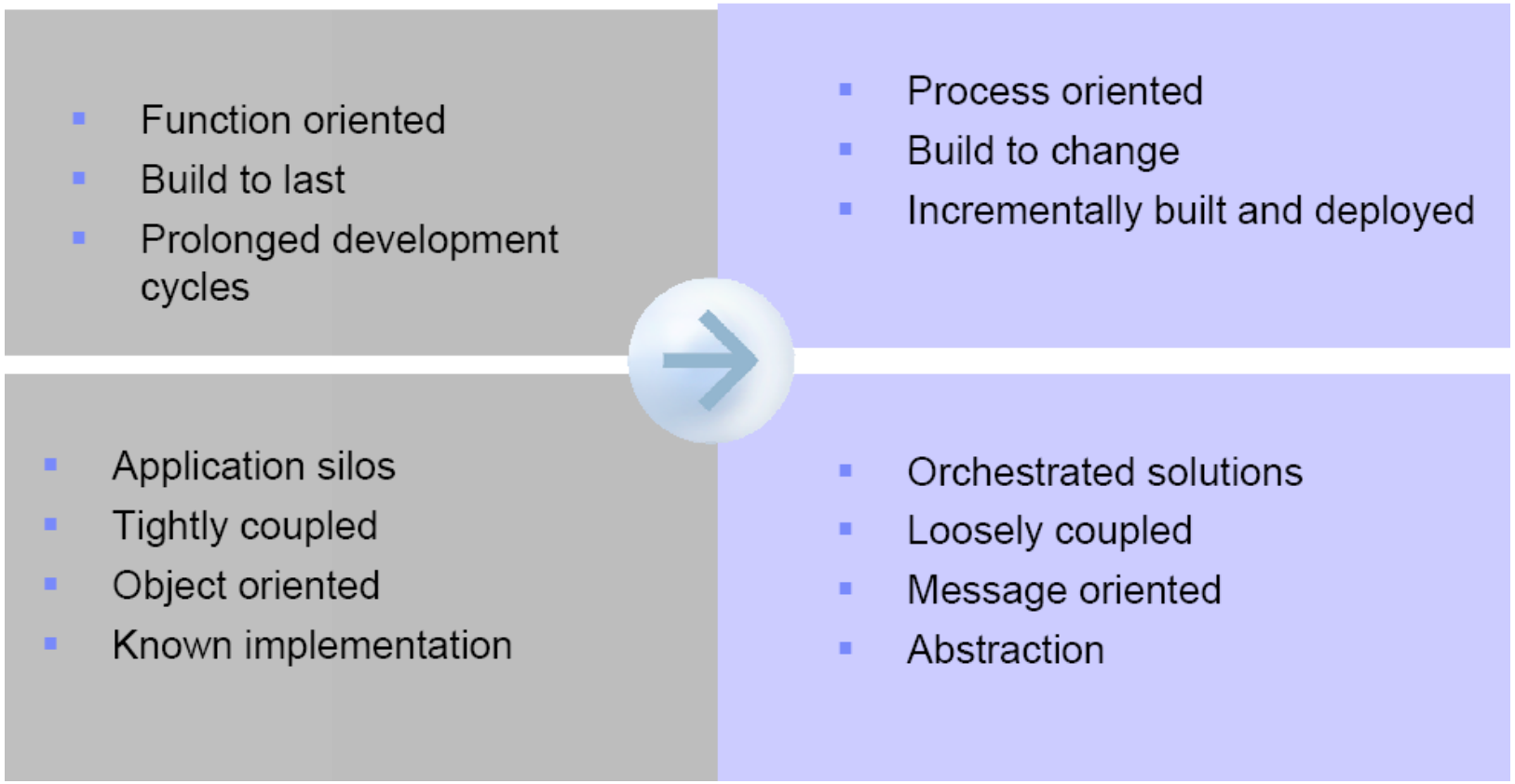



**Services defined as units of business logic separated from…**

- 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*



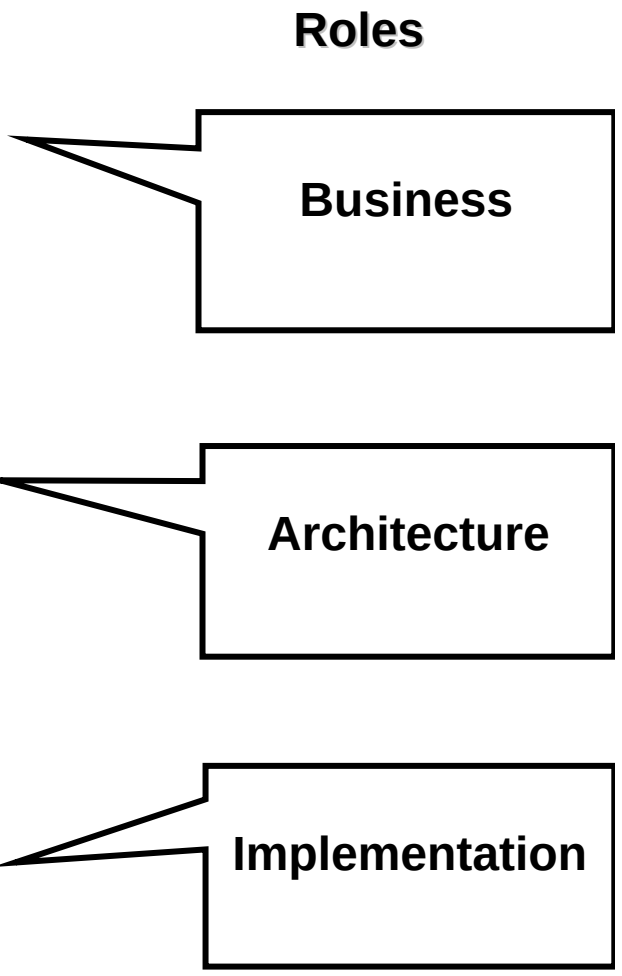
# SOA is different things to different people

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

an architectural style which requires a service provider, requestor and a service description.

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

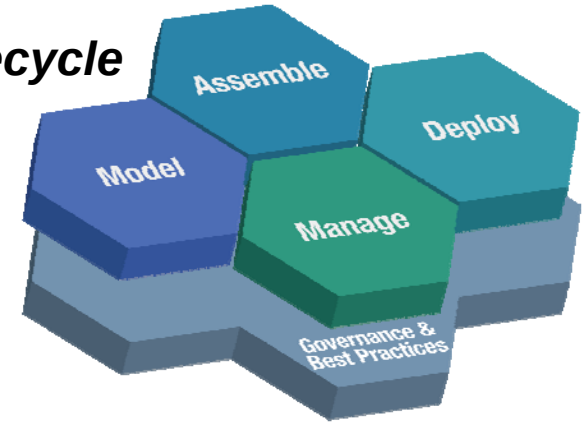
A programming model complete with standards, tools, methods and technologies such as web services.



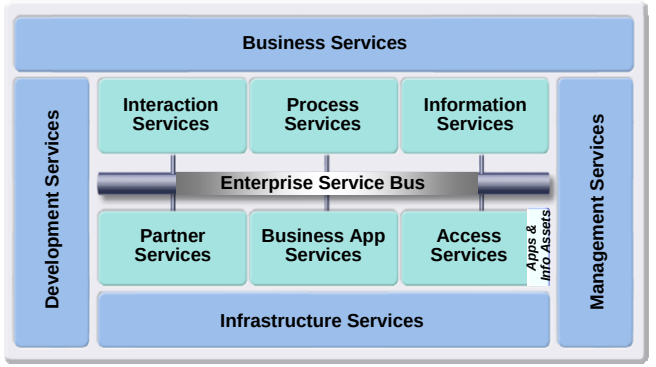
# SOA Key Concepts

# Key Models and Methods for SOA – Enabling greater flexibility in Enterprise IT Architectures

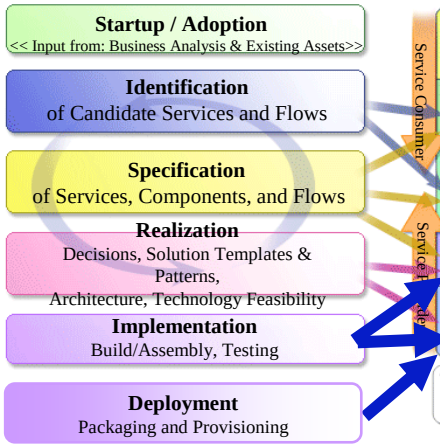
## SOA Lifecycle



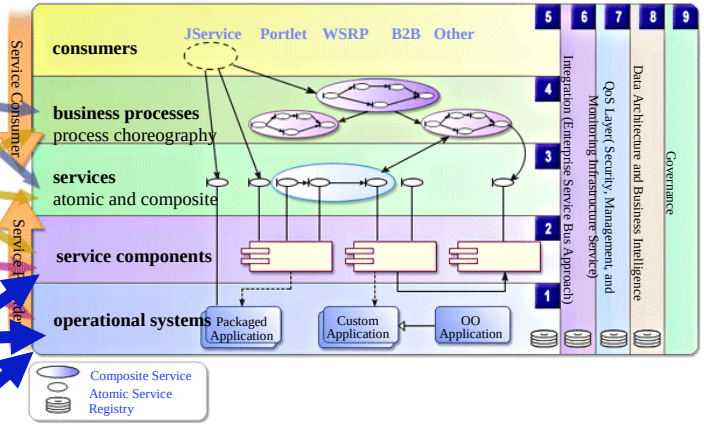

## SOA Reference Architecture




## The SOMA Method: Service-Oriented Modeling and Architecture

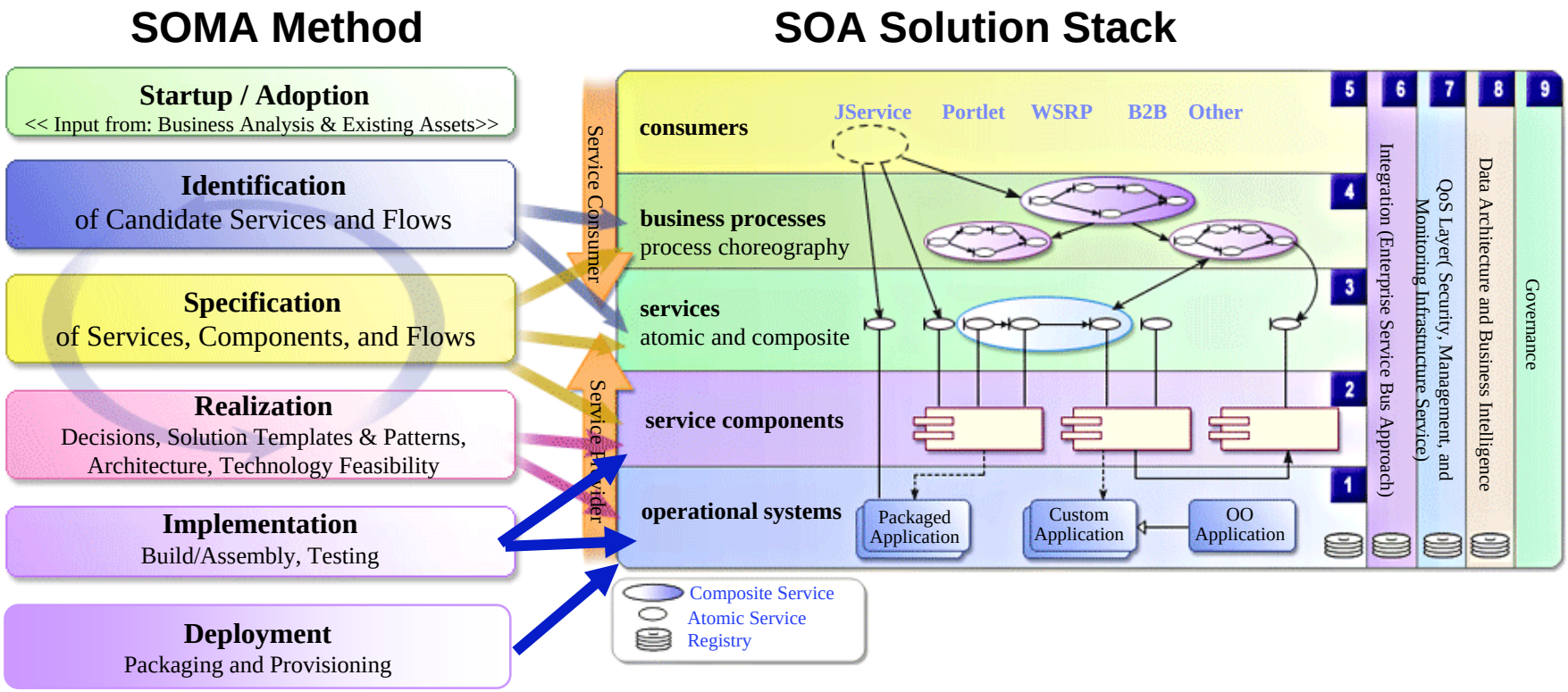



## The SOA Solution Stack: Layered solution view

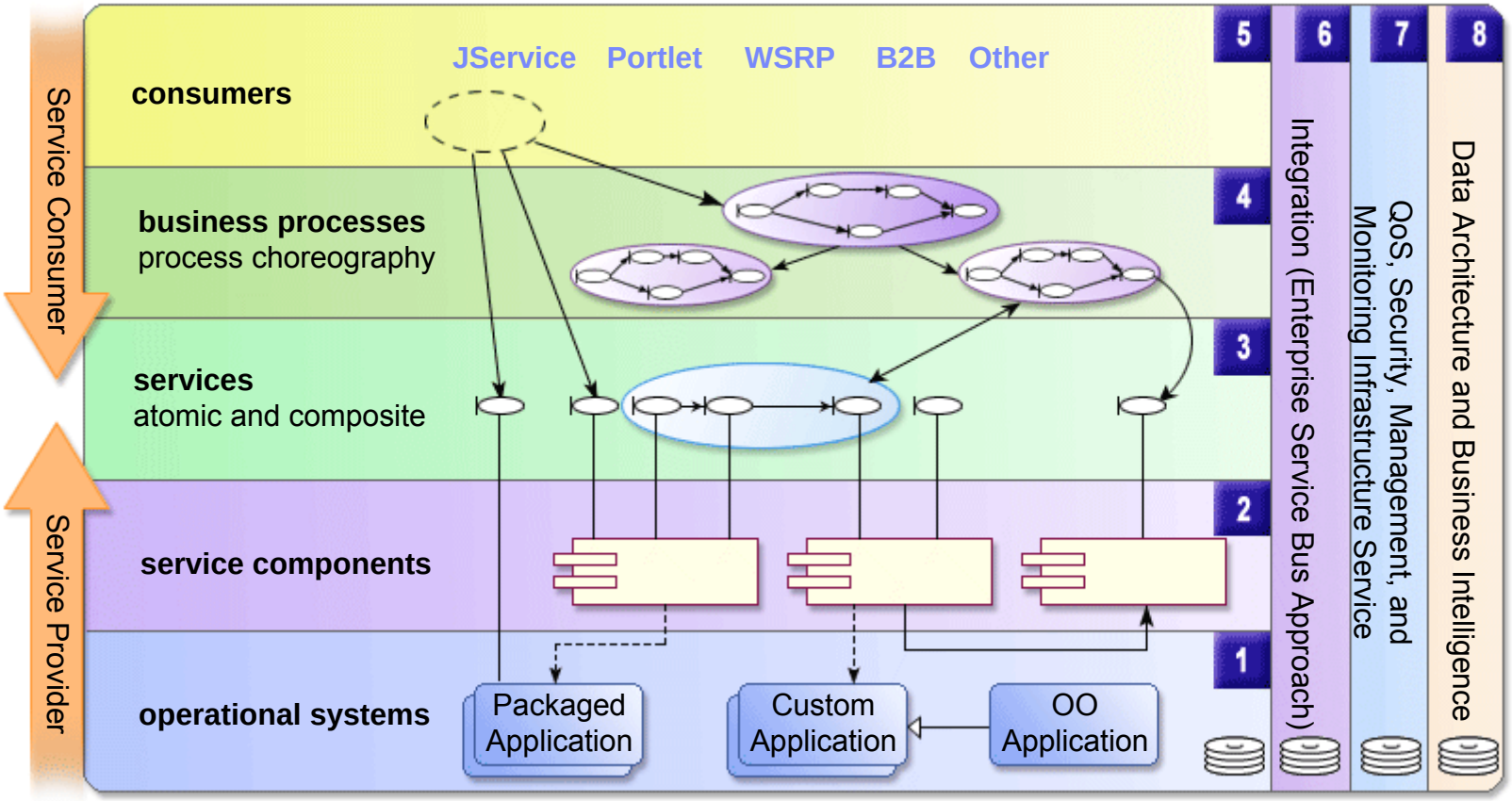


# SOMA (Service Oriented Modeling and Architecture) provides SOA Methodology

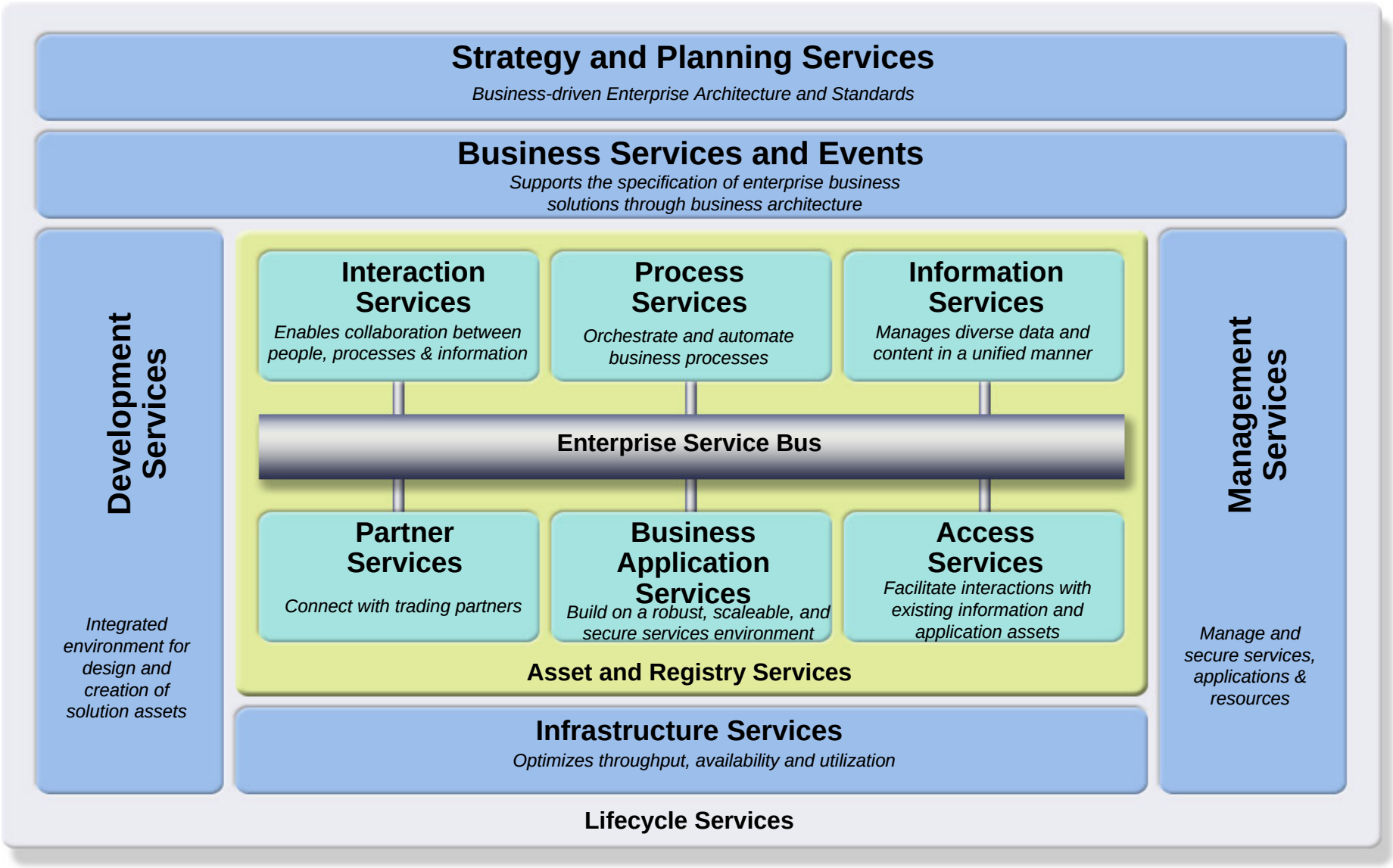
SOMA is about identification, specification, realization, implementation, and deployment of services, components and flows



# SOA Layered View (Solution Stack)



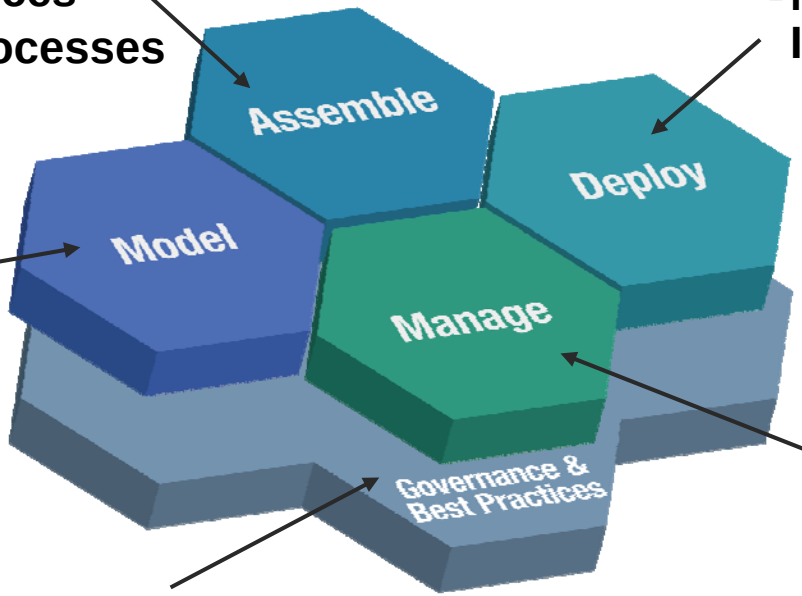
# IBM SOA Foundation Reference Model



# The SOA Lifecycle (to be addressed in detail in Governance)

- Discover Services
- Construct & Test Services / UIs
- Compose Services
- Orchestrate Processes

- Integrate People
- Integrate Processes
- Manage and integrate Information



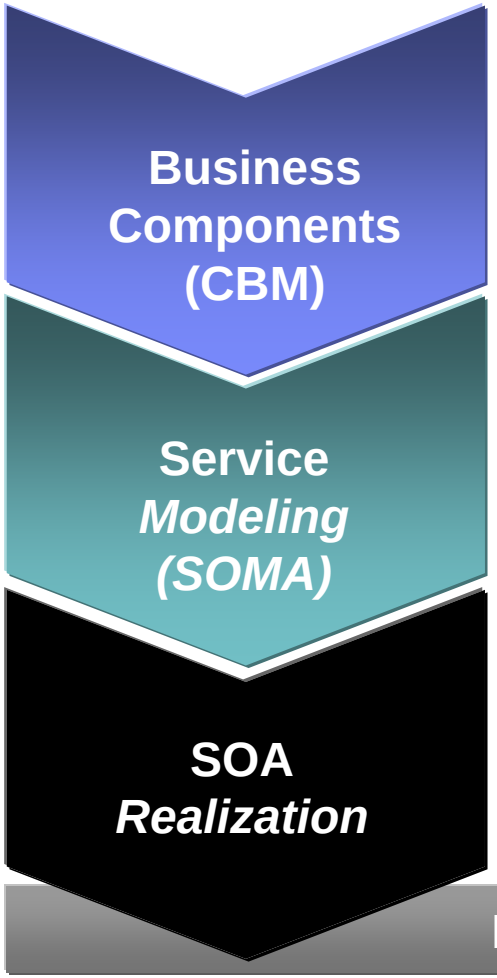

- Gather & Model Requirements
- Model & Simulate
- Model SW Architecture

- Financial Transparency
- Business/IT Alignment
- Process Control

- Manage Applications & Services
- Manage Identity & Compliance
- Monitor Business Metrics

# Identification and Specification of Services (SOMA)

# Top-Down (Ideal) Approach for SOA Start with Business Design




## *Step 1: Break down your business into components*

- **Decide what is strategically important, and what is just operations in the value chain domains**
- **Analyze the different KPIs attached to these components**
- **Prioritize and scope your transformation projects**

## *Step 2: Define a Service Model*

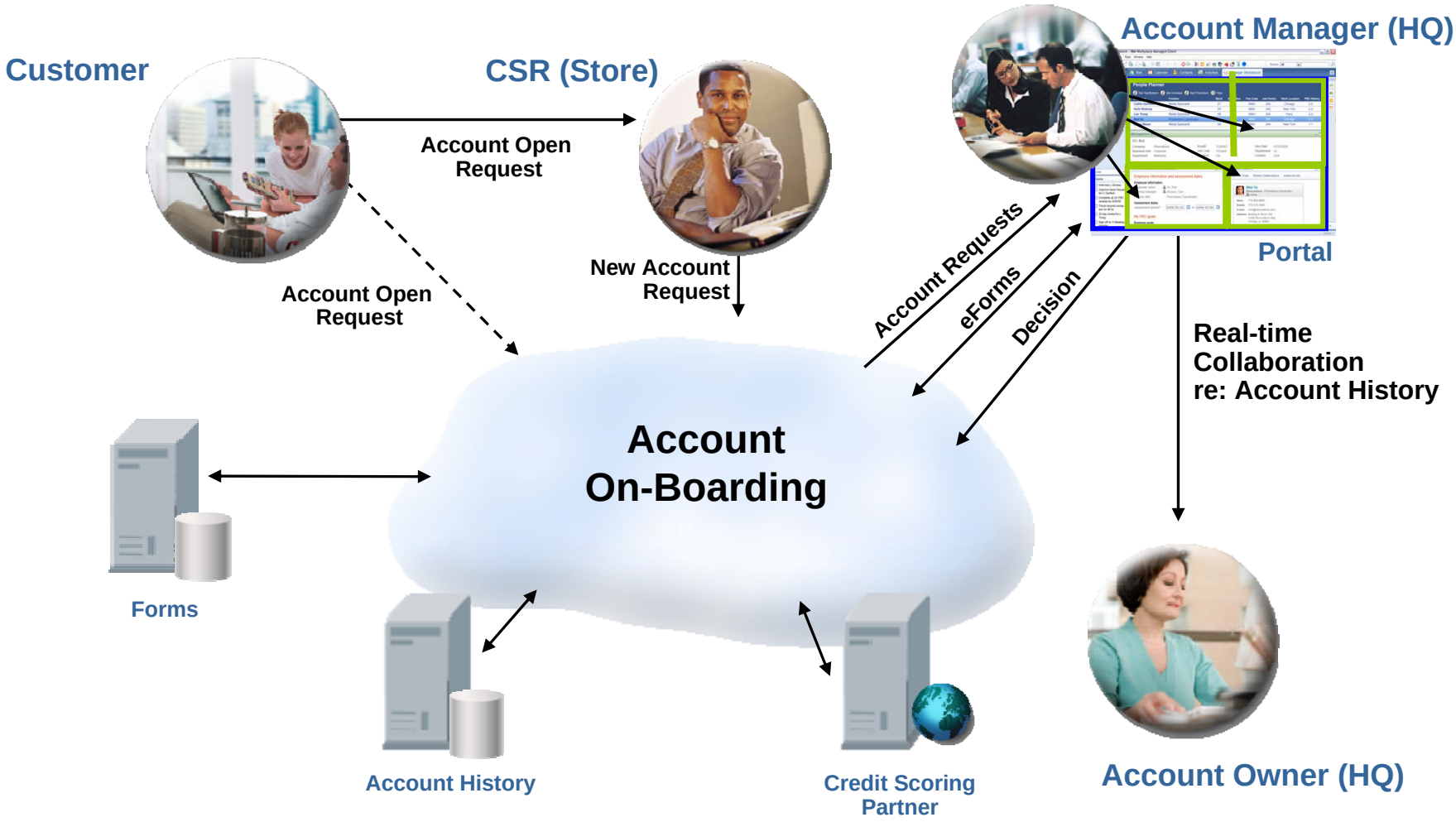
- **Identify your services based on your business components**
- **Specify the services and components accordingly**
- ***Make SOA realization decisions based on architectural decisions***

## *Step 3: Implement a Service Model*

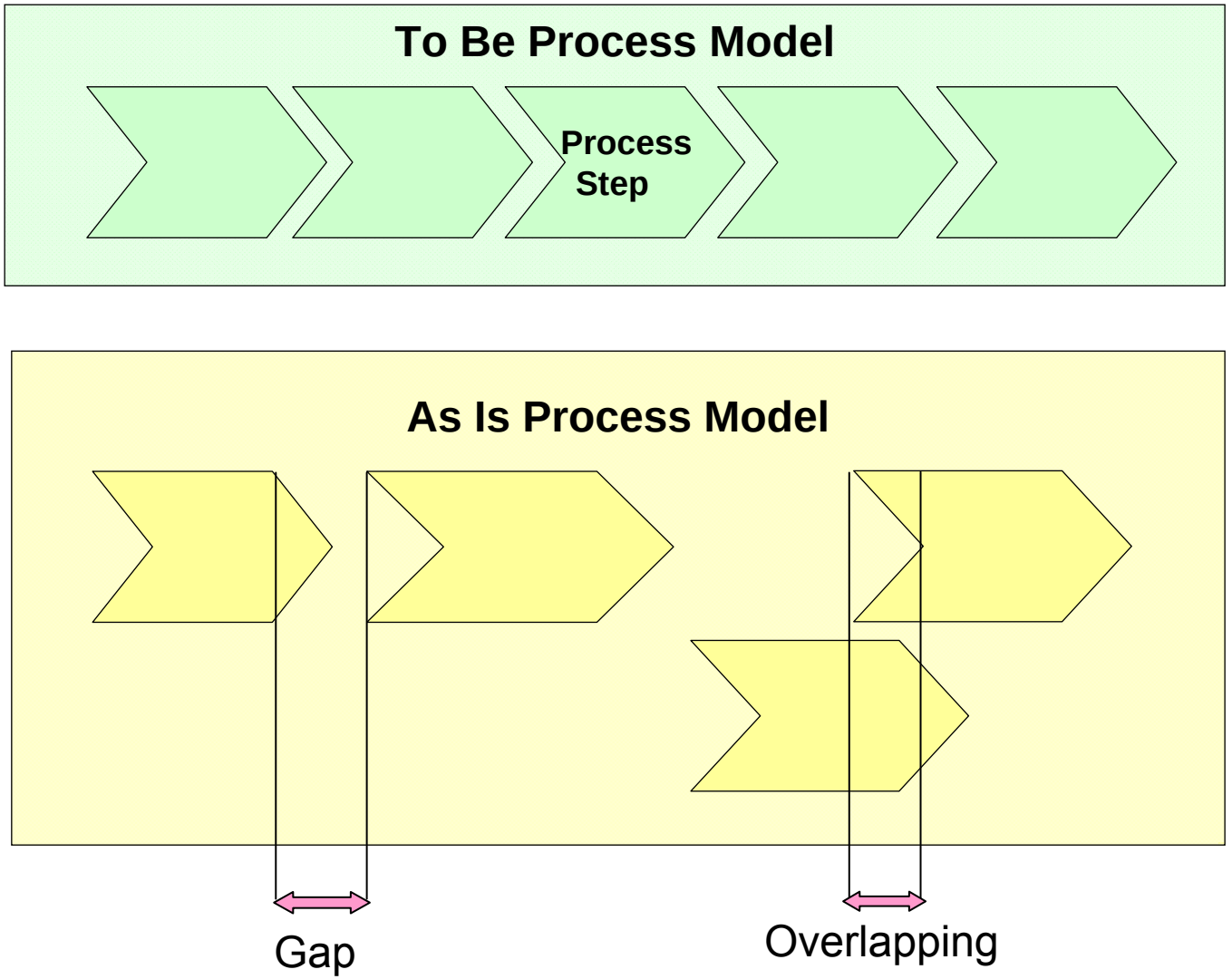
- **Develop a service-oriented architecture to support the Componentized Business**
- **Implement service based scoping policy for projects**
- **Implement appropriate governance mechanism**

**Business-Aligned IT Architecture**

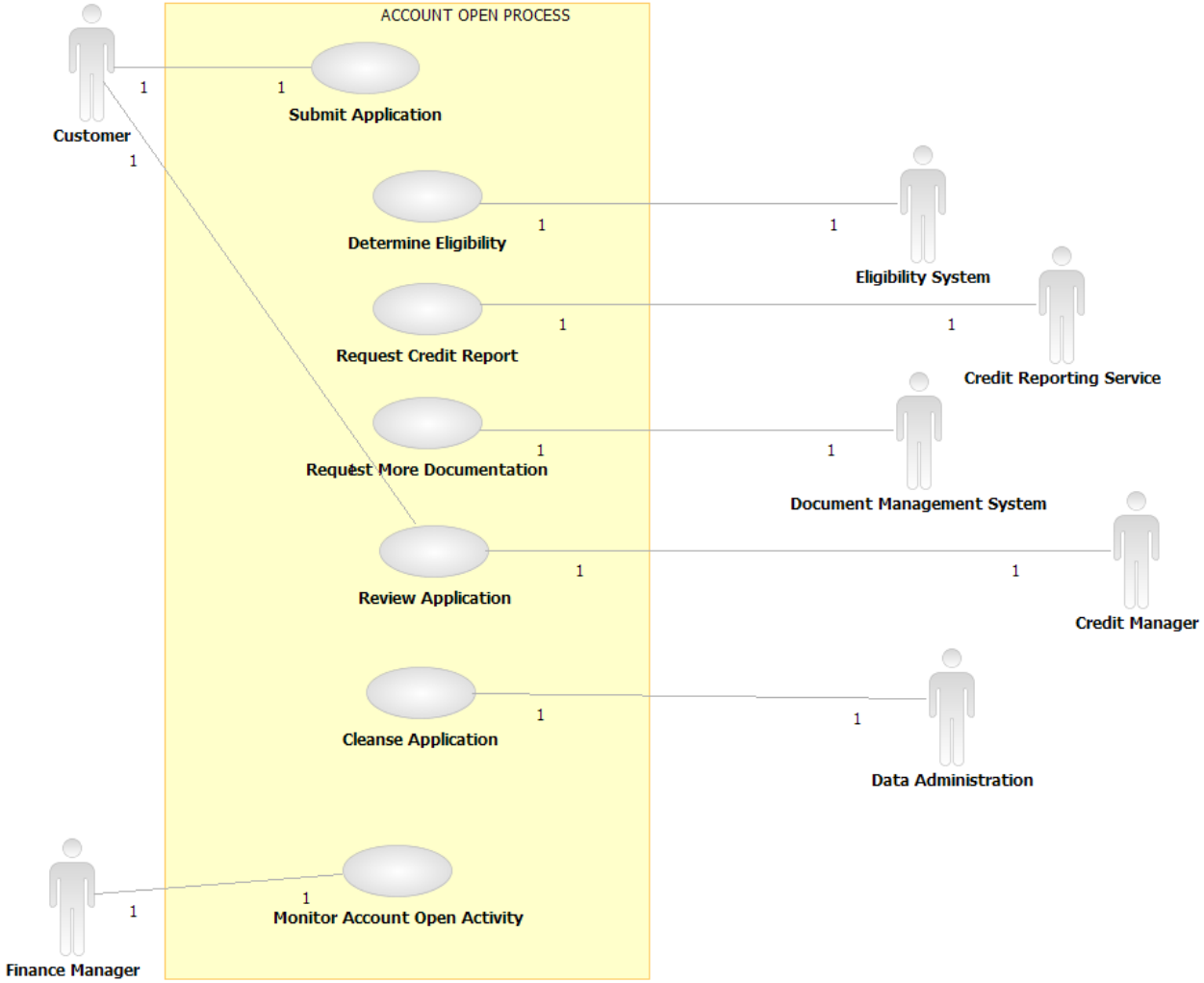
# *Example*: Business Context Diagram for Business Process "Open Account" (Solution Viewpoint)



# Business Process Reality and Plans – Streamline Business Process – Derive Requirements



# *Example*: Use Case for JKE's "Open Account"

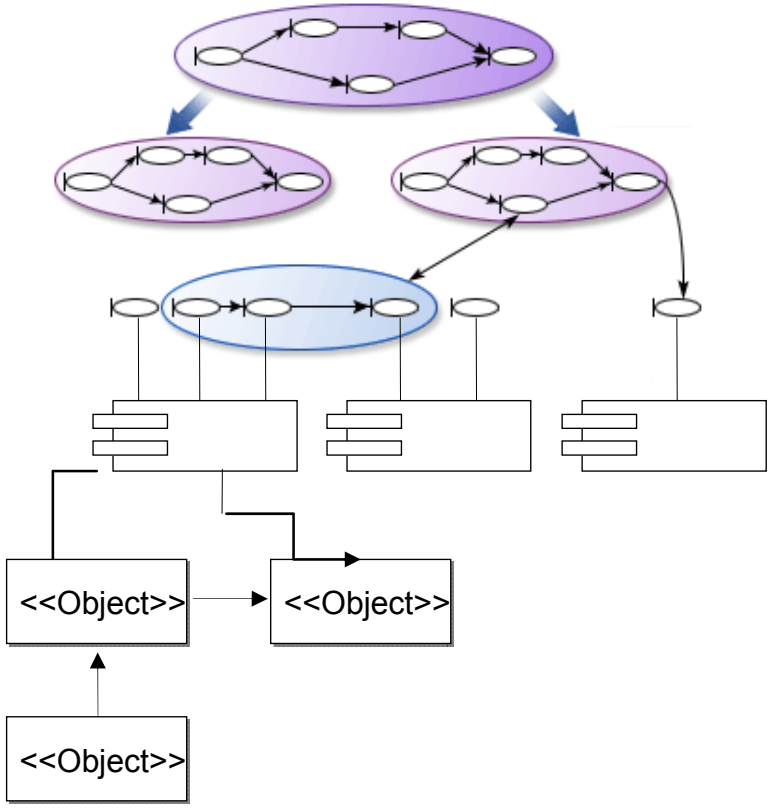


# SOA Modeling Constructs

**Business Processes**
**(Flows)**

**Services**
**Atomic and Composite**

**Service Components**

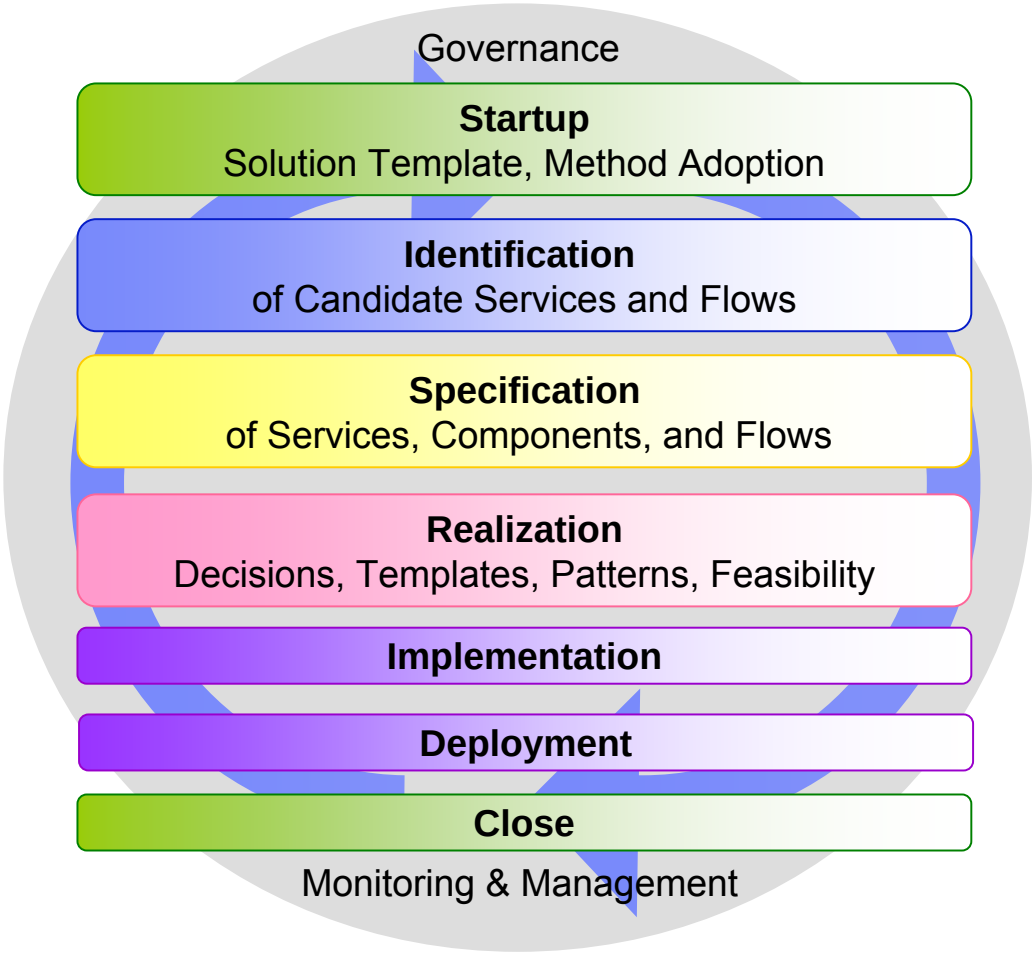



SOMA was created to specifically address modeling of all three constructs.

# Introducing SOMA (Service Oriented Modeling and Architecture)

- SOMA is a business-driven modeling and design method
- SOMA provides in-depth guidance on how to move from the business models to the IT models required by SOA
- SOMA adds new service-oriented aspects and techniques in intelligent ways to enable an SOA with services directly traceable to business goals and requirements

# At the heart of SOMA is identification, specification, realization and implementation of services, components and flows




- **Design is separated in Identification and Specification**
- **Realization are mainly decisions on how to implement, buy, or use existing assets**
- **Implementation and Deployment as "classical" Software Engineering**

# SOMA defines What we do and How we do it

**What we do ?**

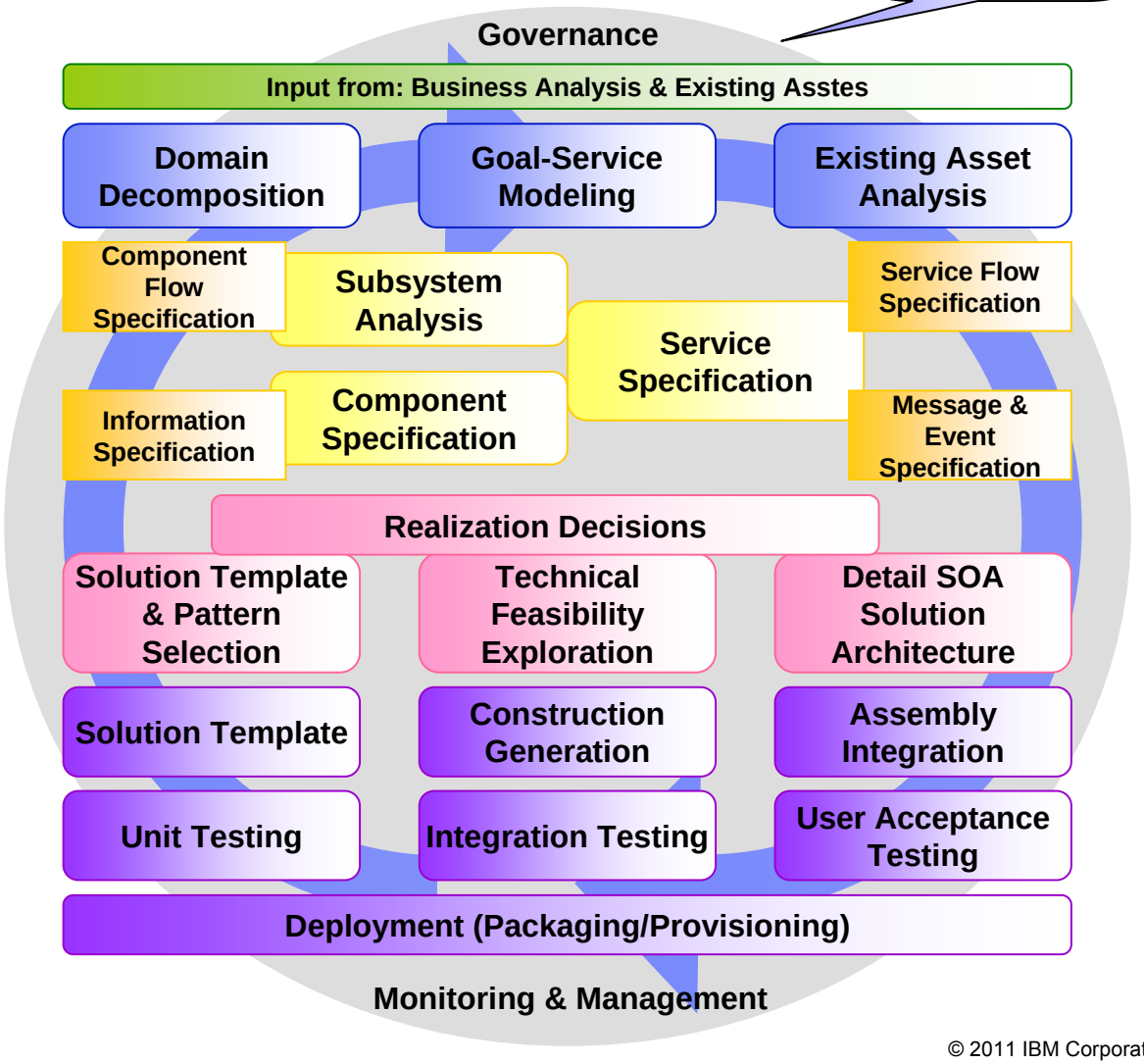
**Identification**
of candidate services and flows, leverageable existing assets

**Specification**
of services to be exposed, flows, and components (for realization of functionality)

**Realization**
captures realization decisions, selects solution templates, details SOA Solution Ref. Arch.

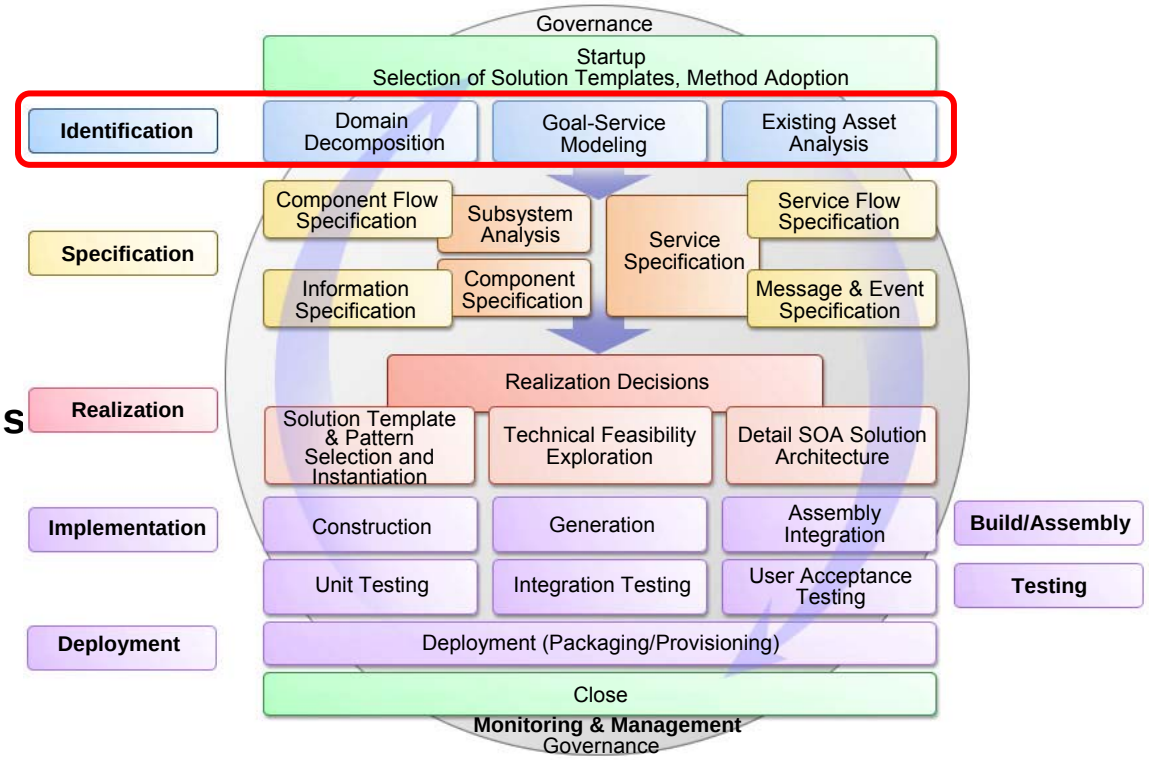
**Implementation**
incl. construction/ generation, assembly, testing, deployment, monitoring and management

**How we do it?**



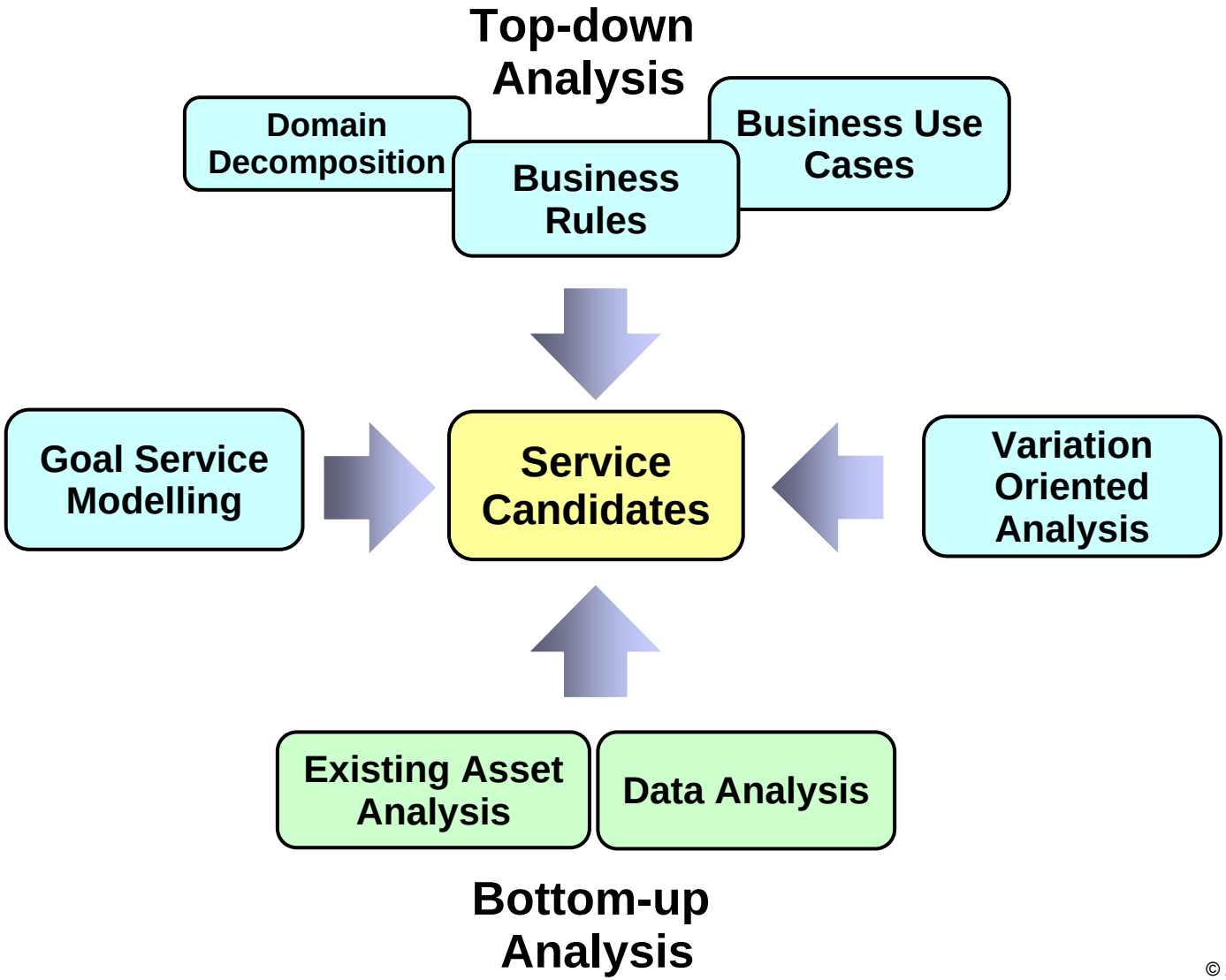
# Identifies Services

- **Domain Decomposition (Top-down Analysis)**
  - **Process Decomposition**
  - **Functional Area Analysis**
  - **Information Analysis, Modeling, and Planning**
  - **Rule and Policy Analysis**
  - **Variation-Oriented Analysis**
- **Existing Asset Analysis (Bottom-up Analysis)**
- **Goal-Service Modeling**
- **Additionally, Service Refactoring and Rationalization**
  - **Service Litmus Tests**
  - **Exposure Decisions, including Exposure Scope**

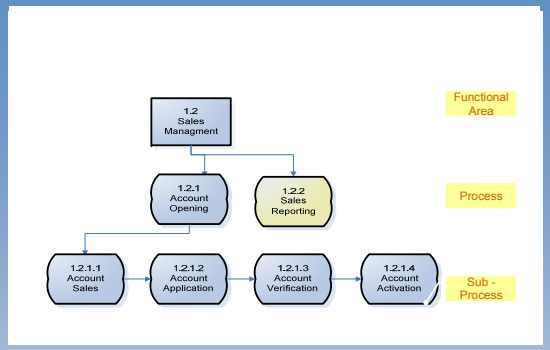



Id Services, Components, and Flows

# Service Identification Through 3 main Complimentary Techniques

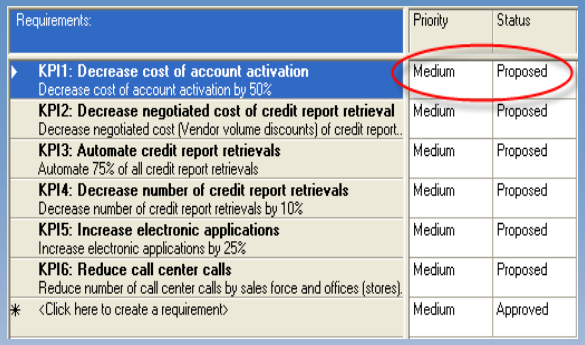


# Service Design via SOMA – Service Identification




## *Domain Decomposition*

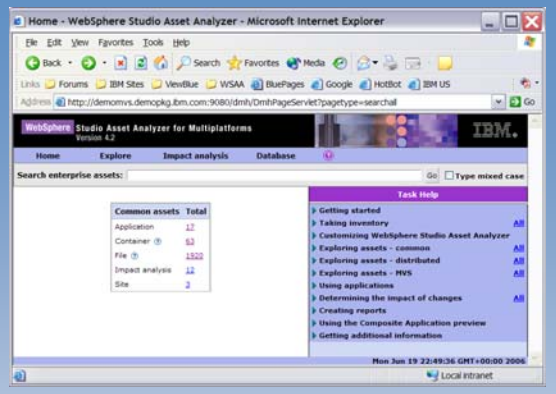
- **Techniques:**
  - **Process Modeling Tools**
  - **Design of KPIs/Metrics**
- **Services Identified**
  - **Open Account**
  - **Account Activation**
  - **Account Verification**



| Requirements: | Priority | Status |
|---|---|---|
| **KPI1: Decrease cost of account activation** Decrease cost of account activation by 50% | Medium | Proposed |
| **KPI2: Decrease negotiated cost of credit report retrieval** Decrease negotiated cost (Vendor volume discounts) of credit report.. | Medium | Proposed |
| **KPI3: Automate credit report retrievals** Automate 75% of all credit report retrievals | Medium | Proposed |
| **KPI4: Decrease number of credit report retrievals** Decrease number of credit report retrievals by 10% | Medium | Proposed |
| **KPI5: Increase electronic applications** Increase electronic applications by 25% | Medium | Proposed |
| **KPI6: Reduce call center calls** Reduce number of call center calls by sales force and offices (stores). | Medium | Proposed |
| <Click here to create a requirement> | Medium | Approved |

## *Goal Service Modeling*

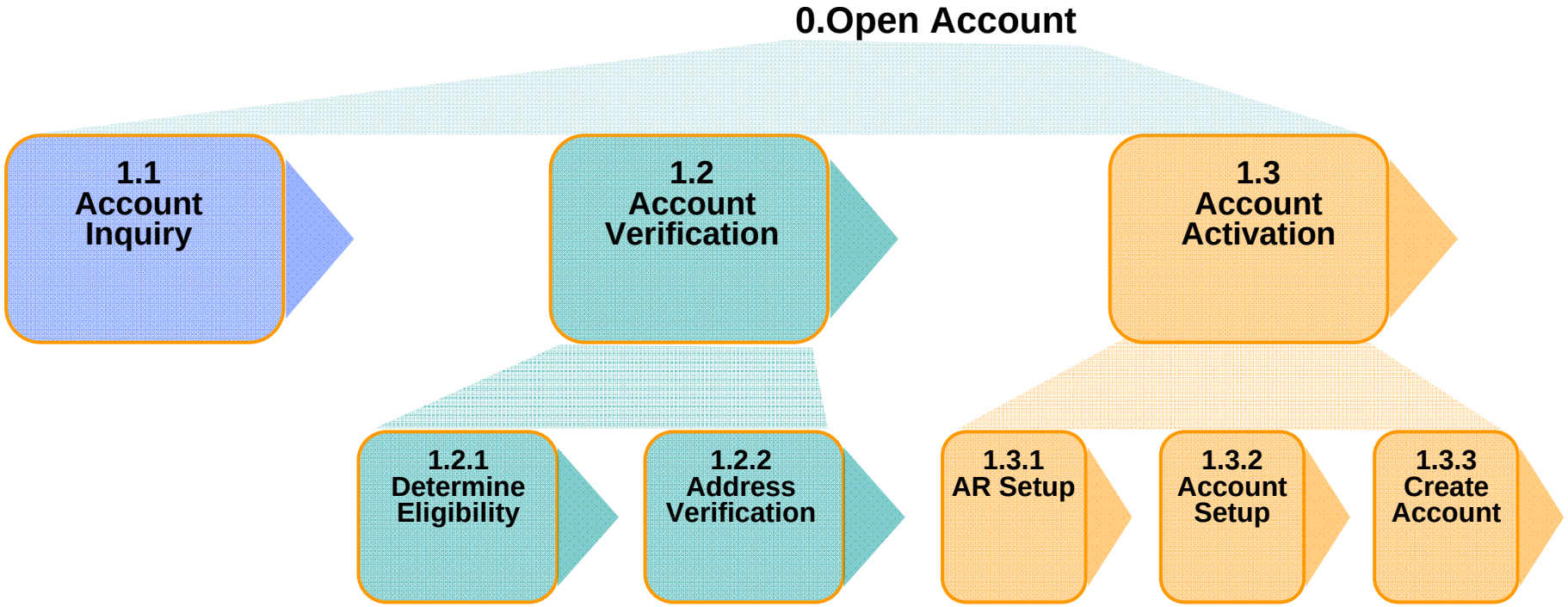
- **Techniques**
  - **Requirements Planning Tools**
  - **Design of KPIs/Metrics**
- **Services Identified**
  - **Determine Applicant Eligibility**
  - **Address Verification**




## *Existing Asset Analysis*

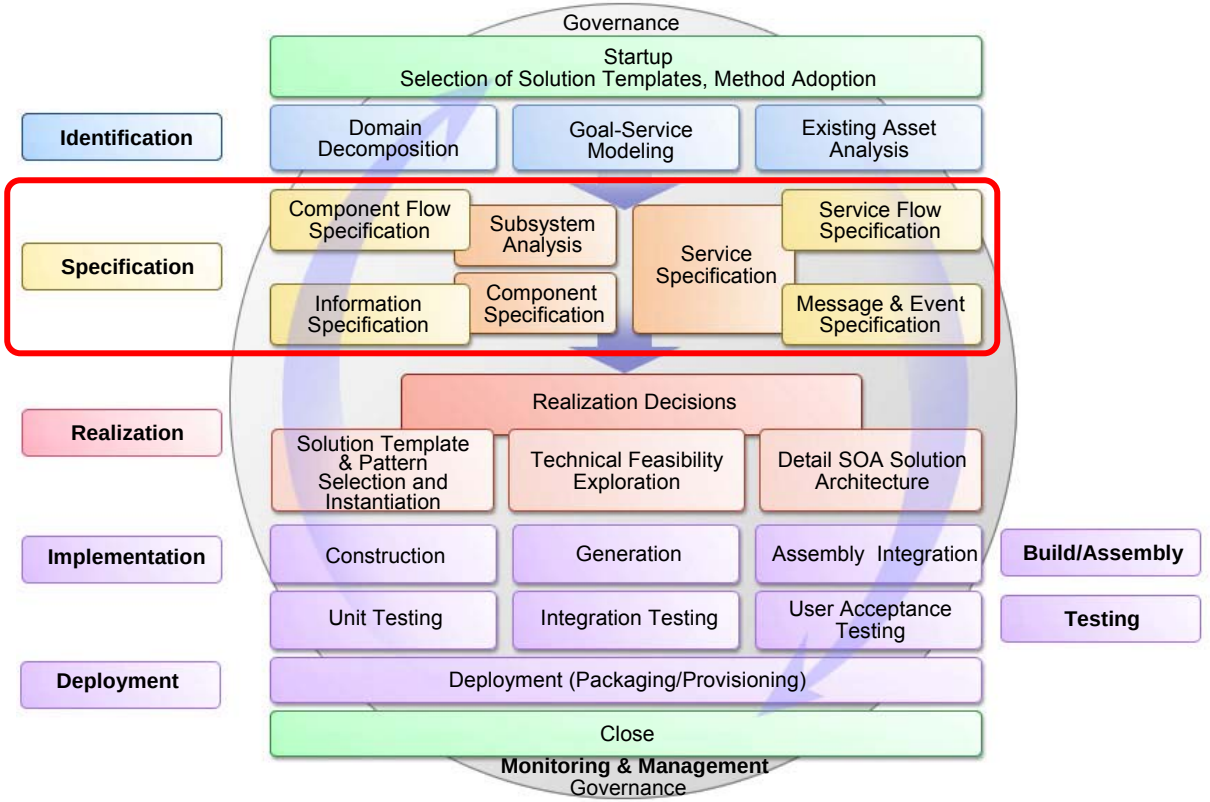
- **Techniques**
  - **Asset Analysis Tools**
  - **Interviews/Documentation**
- **Services Identified**
  - **Account Inquiry (CICS 2.2)**
  - **AR Setup (CICS 2.2)**
  - **Account Setup (CICS 3.1)**
  - **Create Account (SAP)**

# *Example*: Domain Decomposition – Business Process Modeling for JKE's "Open Account"



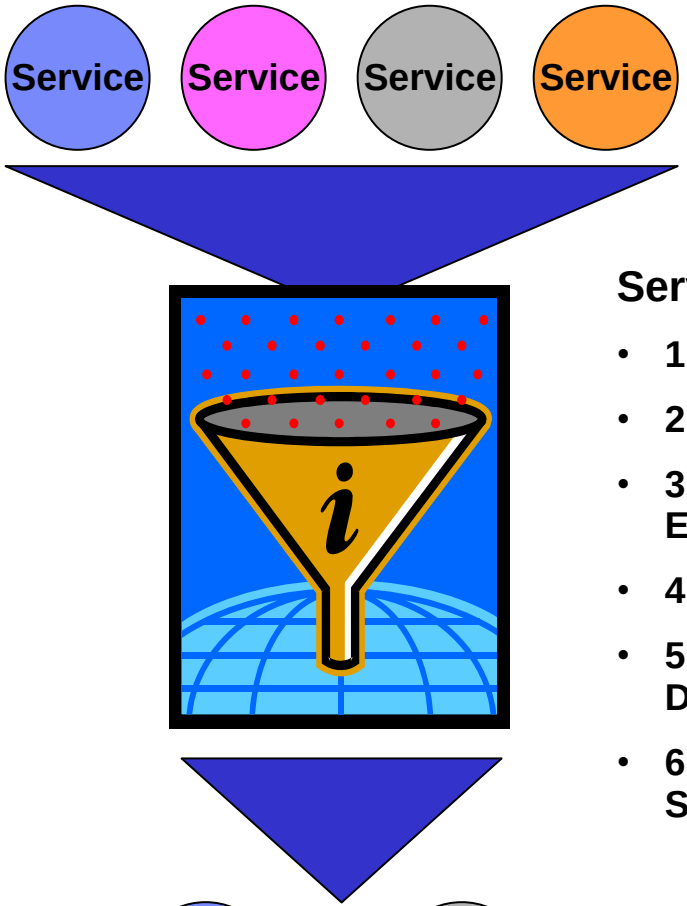
# SOMA Specification uses comprehensive techniques to specify Services, Flows, and Service Components that Realize Services

- **Information Specification**
  - Data Model, Message Model, Business Glossary
- **Existing Asset Analysis – Fine Grained**
  - Determine the technical viability of existing applications and approaches to realize services
- **Service Specification**
  - Elaborates the Service Model, for example, service dependencies, service composition and flow, rules and policies, event specification, service operation, service message specification, QoS requirements, design decisions, and so on
- **Subsystem Analysis**
  - Partitions subsystems into service components that will be responsible for service realization
- **Component Specification**
  - Details component modeling, flow, information architecture, messages



# Service Litmus Tests Are Gating Criteria Used to Determine If a Candidate Service Should Be Exposed

**Candidate Services**

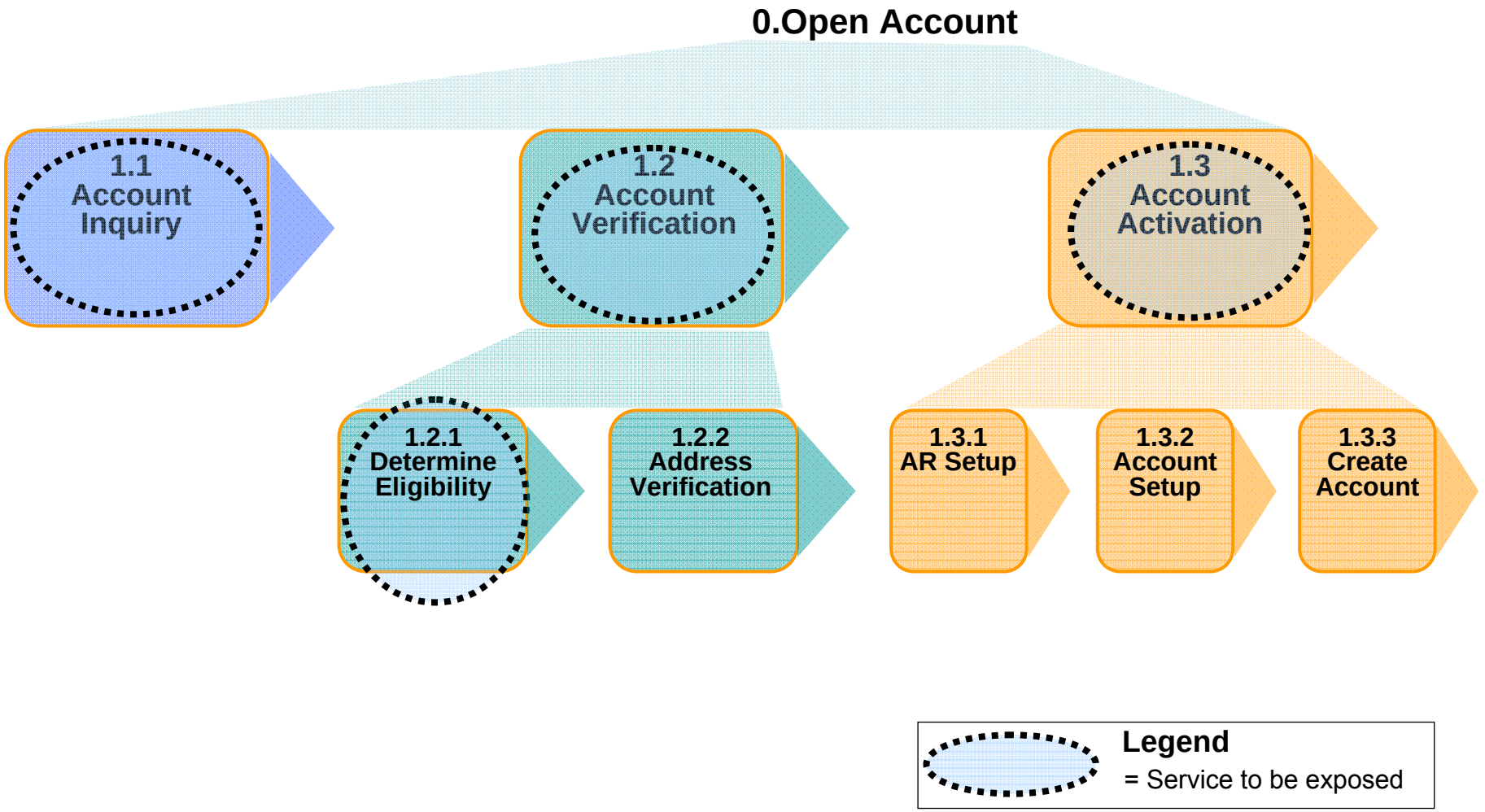


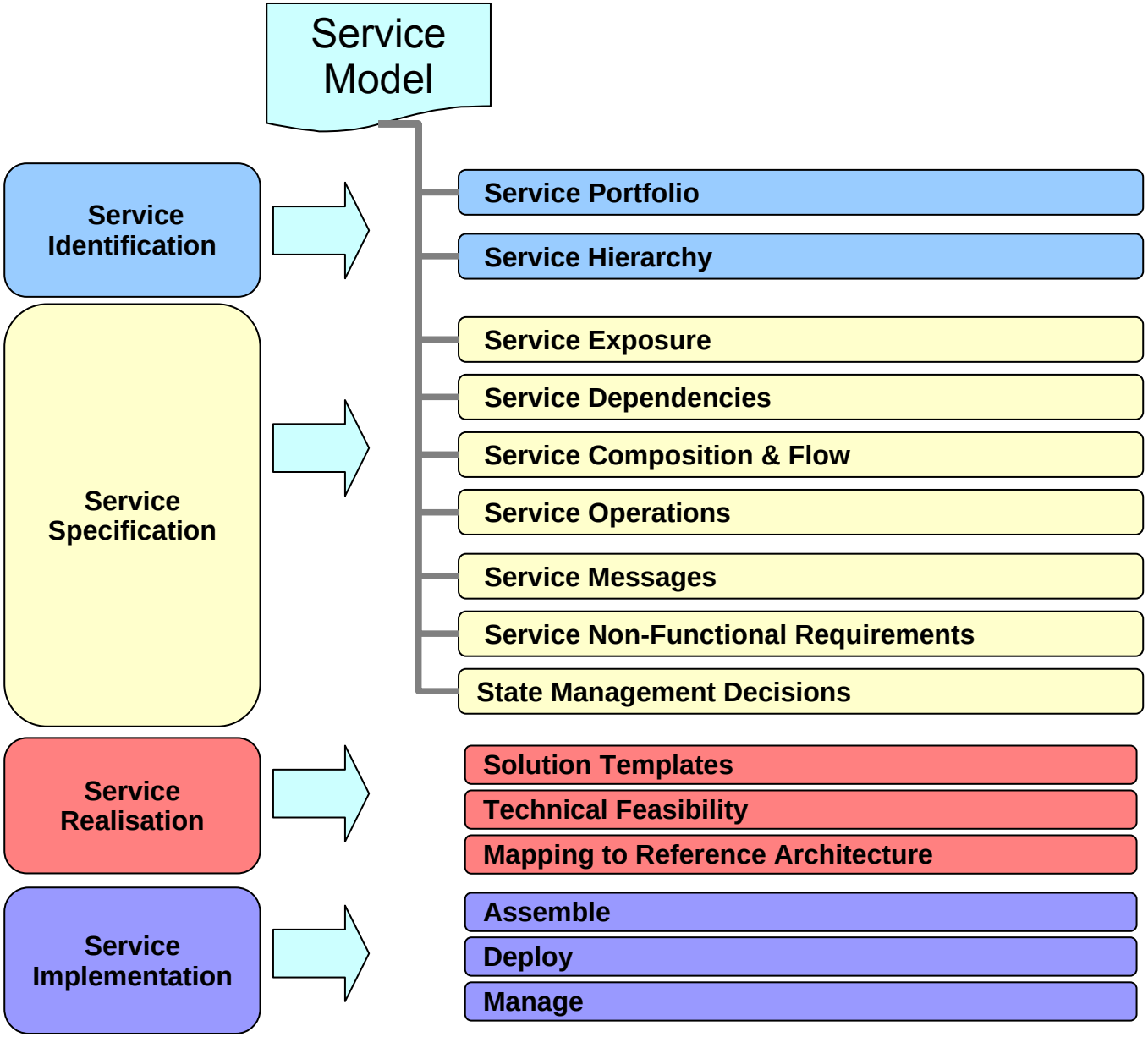

**Exposed Services**

## Service Litmus Tests

- 1. Business Alignment
- 2. Composability
- 3. Consolidation (Redundancy Elimination)
- 4. Technical Feasibility
- 5. [Externalized Service Description]
- 6. Project Defined/Customer Specific SLTs

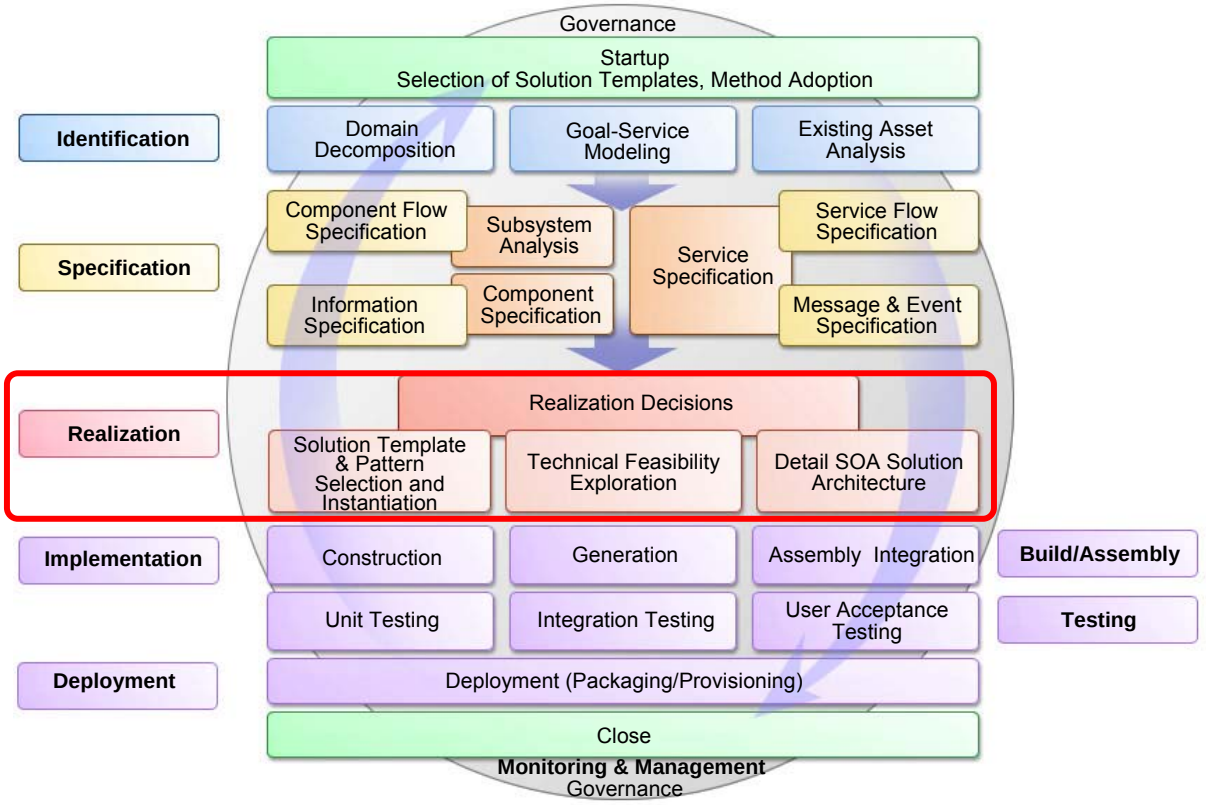
# *Example*: JK Enterprises Service Exposure Decisions





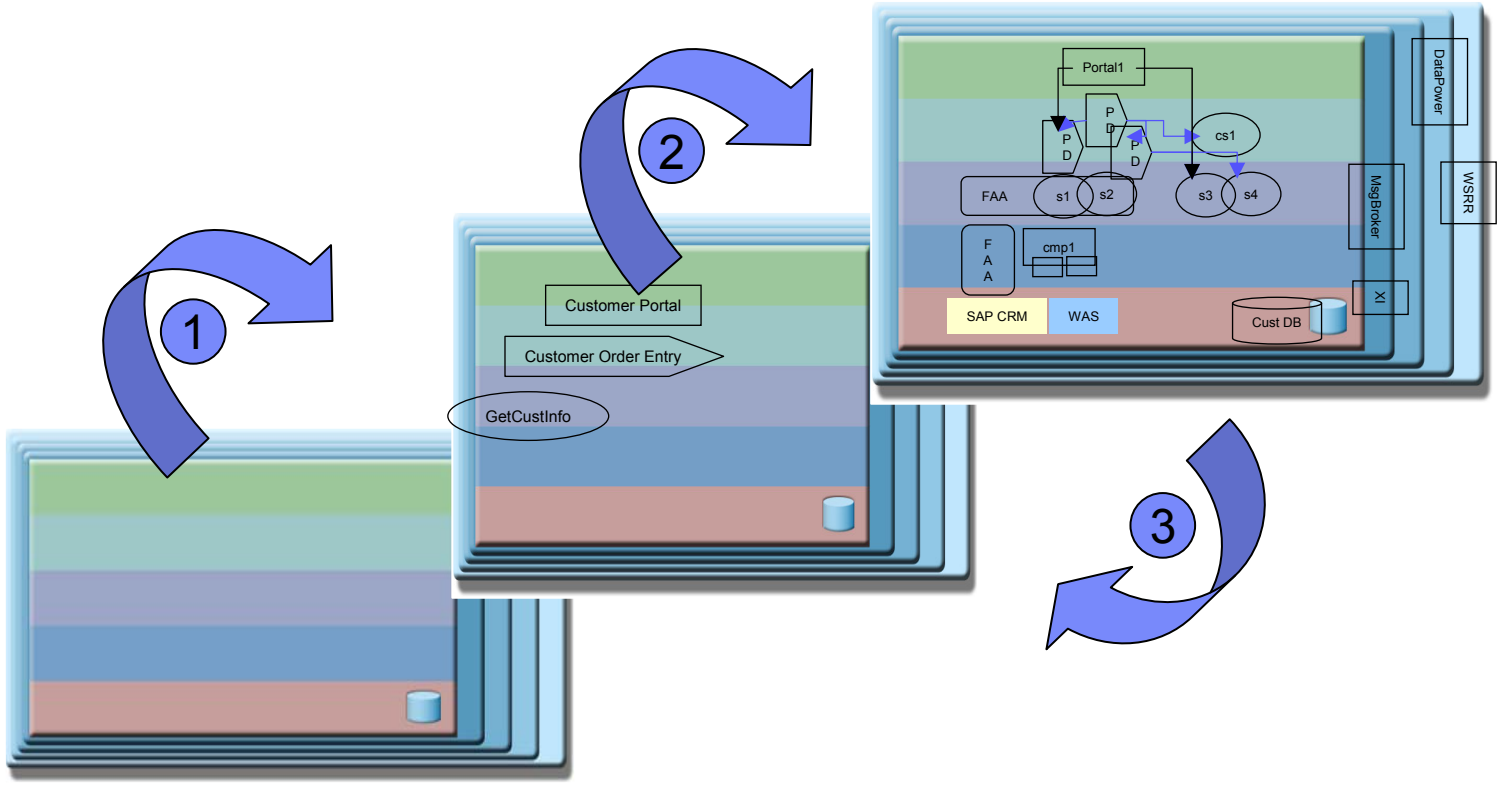
# SOMA Realization (Includes SOA Solution Stack Instantiation)

- **Select and instantiate Solution Templates and Patterns**
- **Technical Feasibility Exploration**
  - **Examine approaches to handle client requirements**
  - **Examine legacy application specific considerations**
- **Detail SOA Solution Stack**
- **Realization Decisions**
  - **Consider alternatives**
  - **Select the alternative**
  - **Provide justification**



# Iterative SOA Solution Design Process

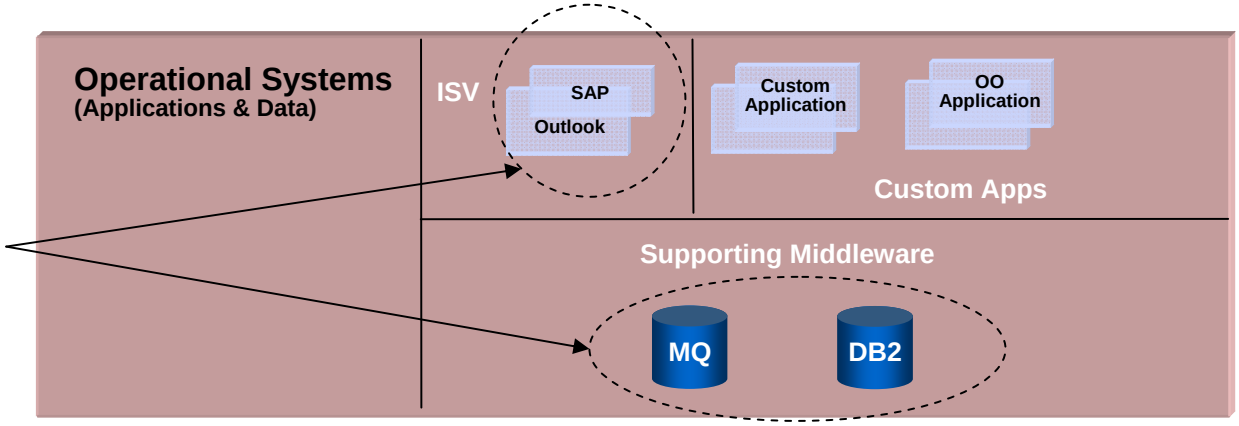
**As SOMA is applied during an engagement, we incrementally populate an architectural overview ("dashboard view") of the SOA Solution**



# SOA Layered View Details

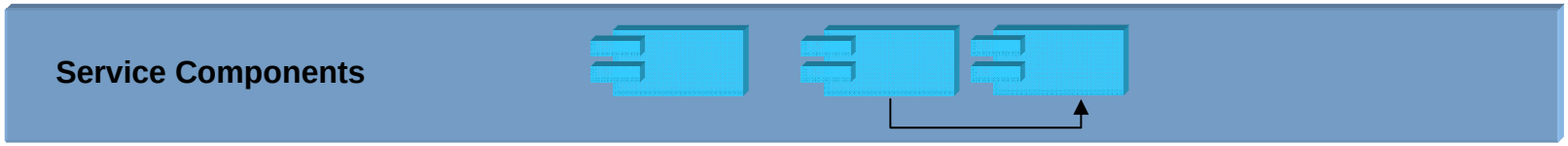
# Layer 1: Operational Systems (Leverage Existing Investment)

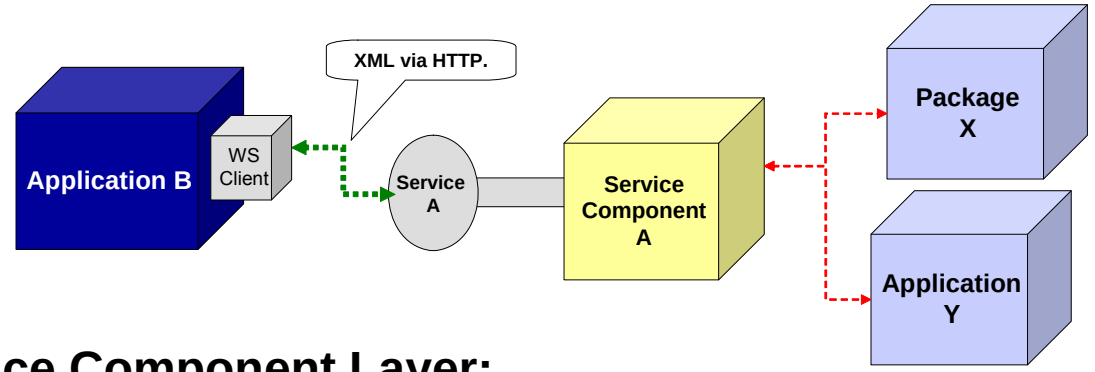
Examples for illustration: specifics are not in the scope of the reference model.




- Recognizes the value of existing IT investment
  - Use of existing "legacy" applications (e.g. COBOL application) and / or packages (e.g. SAP)
- Some SOA Related Activities:
  - Asset Inventory
  - Refactor existing applications to unlock business value

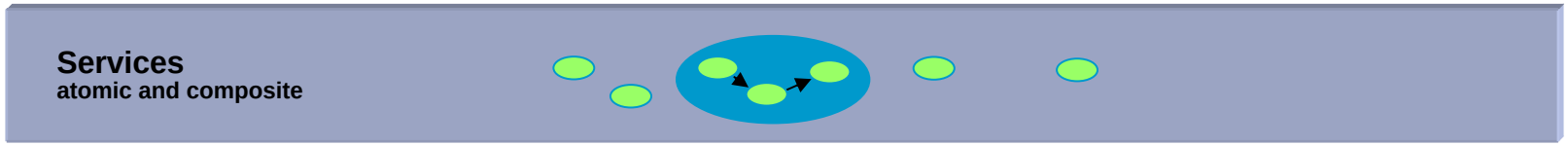
# Layer 2: Service Components



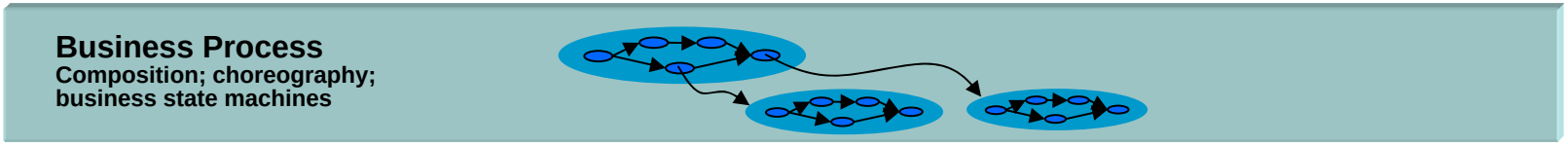

- **The Service Component Layer:**
  - **Enables IT flexibility by strengthening the decoupling in the system. Decoupling is achieved by hiding volatile implementation details from consumers.**
  - **Often employs container based technologies like EJBs**
- **Each Service Component:**
  - **Provides an enforcement point for service realization**
  - **Offers a facade behind which IT is free to do what they want/need to do**

# Layer 3: Services (Decouple Business and IT)



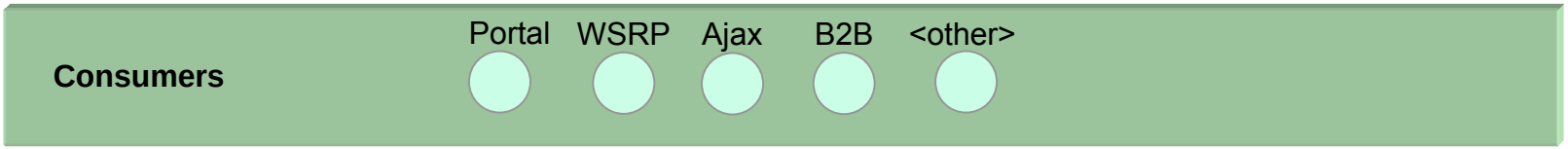

- **The Services Layer forms the basis for the decoupling of Business and IT.**
  - **Captures the functional contract (incl. QoS – Quality of Service) for each standalone *business* function or each task in a business process**
- **The assumption is that (within an SOA) IT responsibility is to realize/manage service implementations that faithfully conform to the set of services in the service model.**
- **This layer contains all the *exposed services* in the SOA**
- **Each service is a contract between the consumer(s) and the provider(s)**

# Layer 4: Business Processes (Business process alignment of IT)



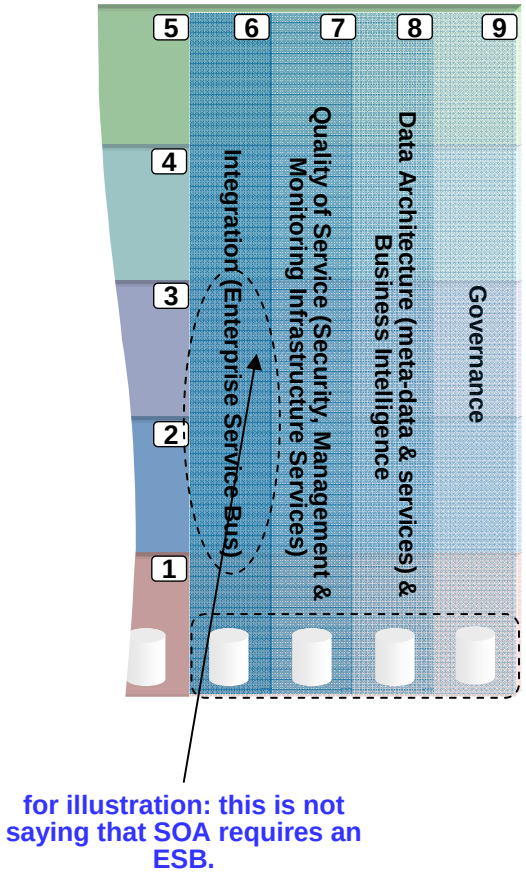

- This layer contains operational IT artifacts that implement business processes as a choreography of services
- The set of services that are composed is restricted to those services that are defined in Layer 3
- The choice of technology depends on a set of realization decisions that must be made when establishing a physical Reference Model for a given SOA

# Layer 5: The Consumer Layer (Channel independent access to business processes )



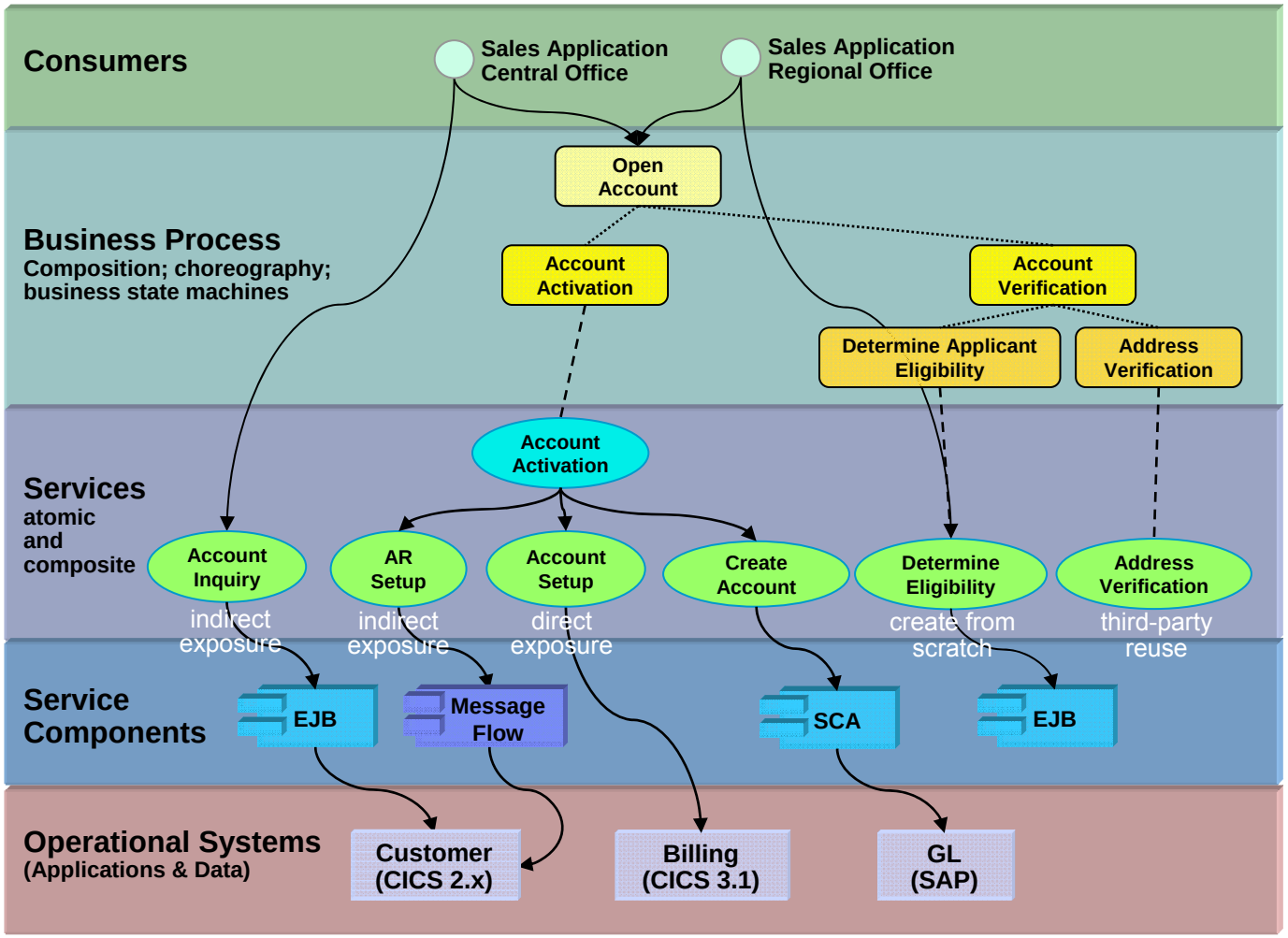

- **This layer exists to recognize that the technology chosen to expose Business Processes/Services must permit access from a wide set of interaction *channels*.**
- **It is important to populate this layer with the set of *channels* types that are required in a solution.**

# Cross-cutting concerns/capabilities

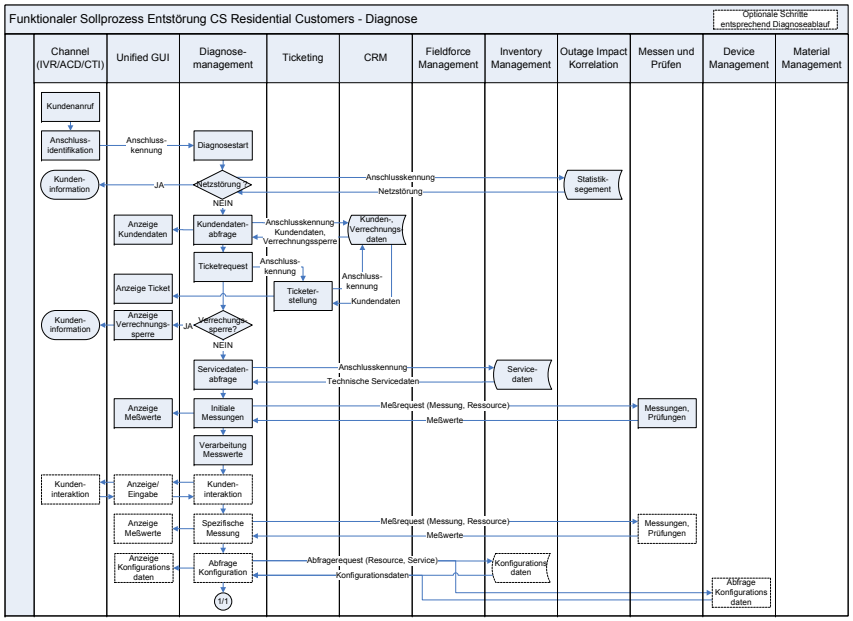


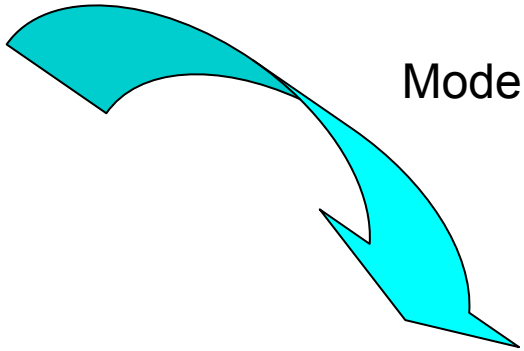

- Several concerns are not restricted to a single layer in the Reference Model, these concerns are captured in 'Layers' 6-9
- These are not really layers but treating them as such gives us the ability focus discussions/decisions, for example "What is found where Governance intersects Services? i.e. what are the Governance concerns specific to Services?"
- Clearly there is interaction among these 'layers' also. For example, it is likely that most data architectures will be subject to governance

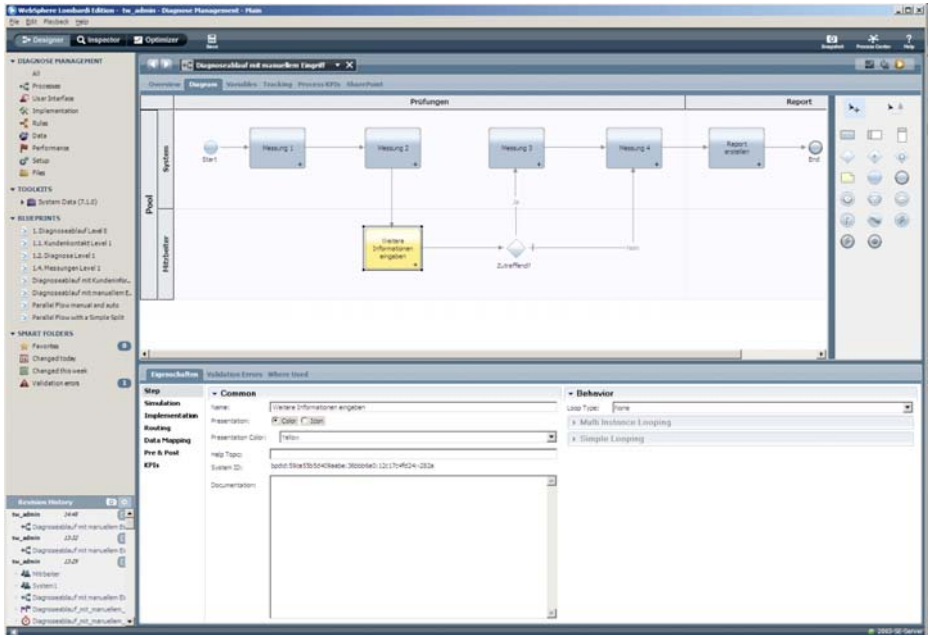
# Example JK Enterprise – a virtual company with an „Open Account Process“



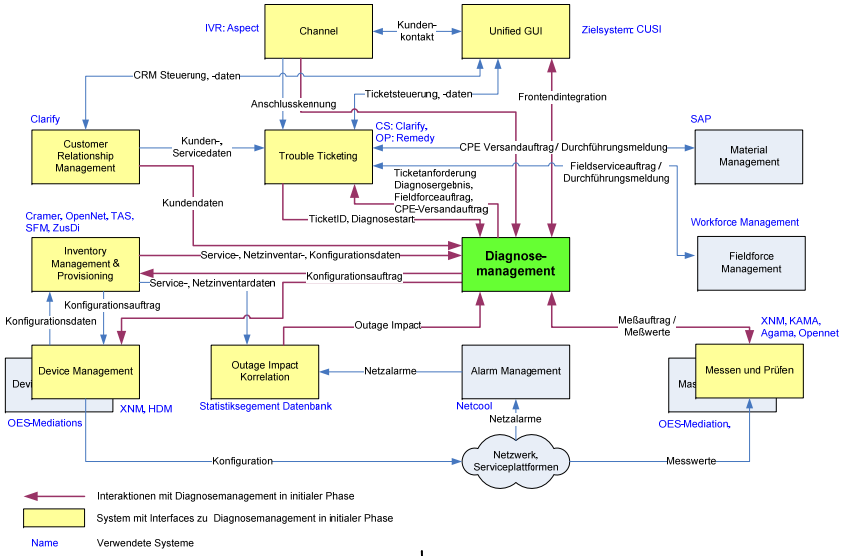
# Designing BPM / SOA Application: Process Modeling



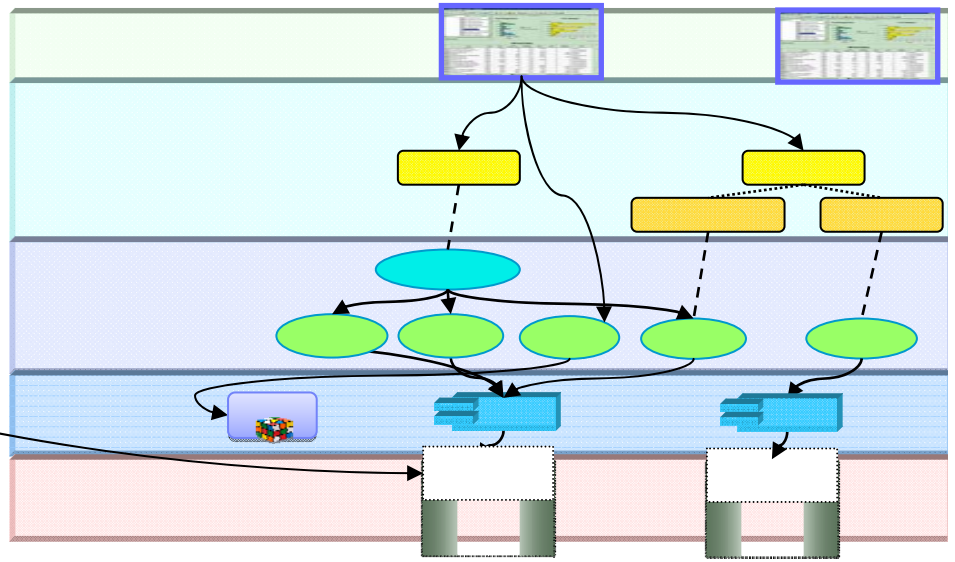



# Designing BPM / SOA Application: Layered View




Architecture

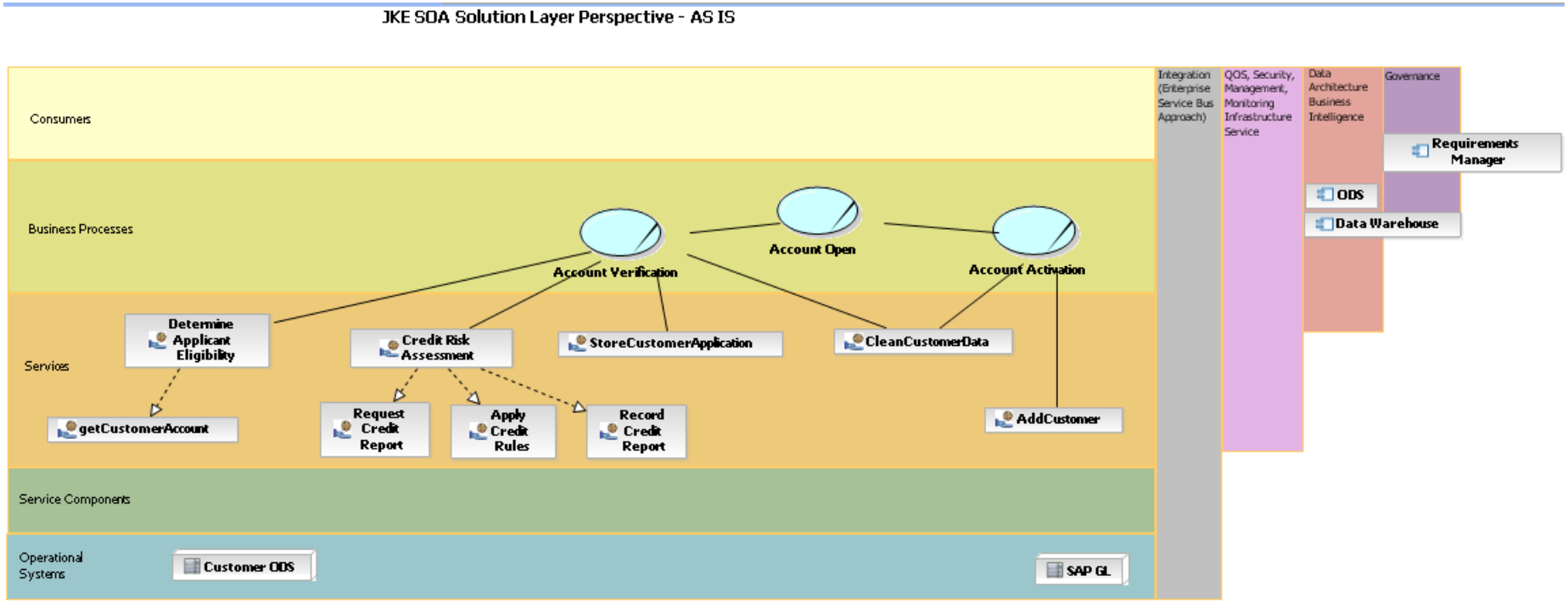


Integration of “Legacy”

# Home Work: Exercise Layered View

- Usually a diagram (or set) which is used as a basis for discussion and explanation.
- Assume you will create many iterations of this document.
- Should contain processes, services, components, and operational systems

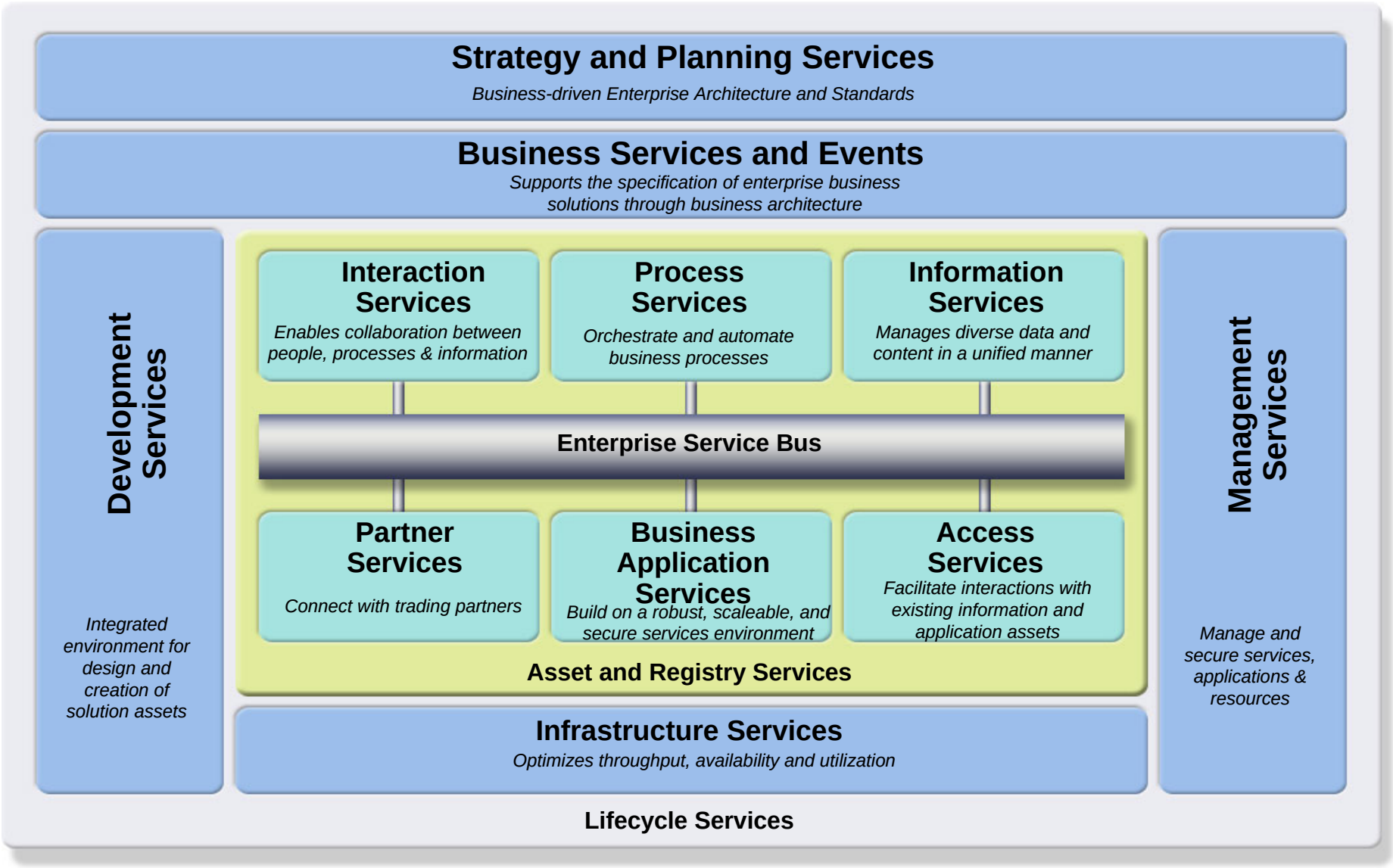
# Exercise – SOA Solution Layer Perspective – Add Missing Components




- Among the missing artifacts from this diagram, the Service Components (service realization)
- Also missing are To-Be supporting operational systems

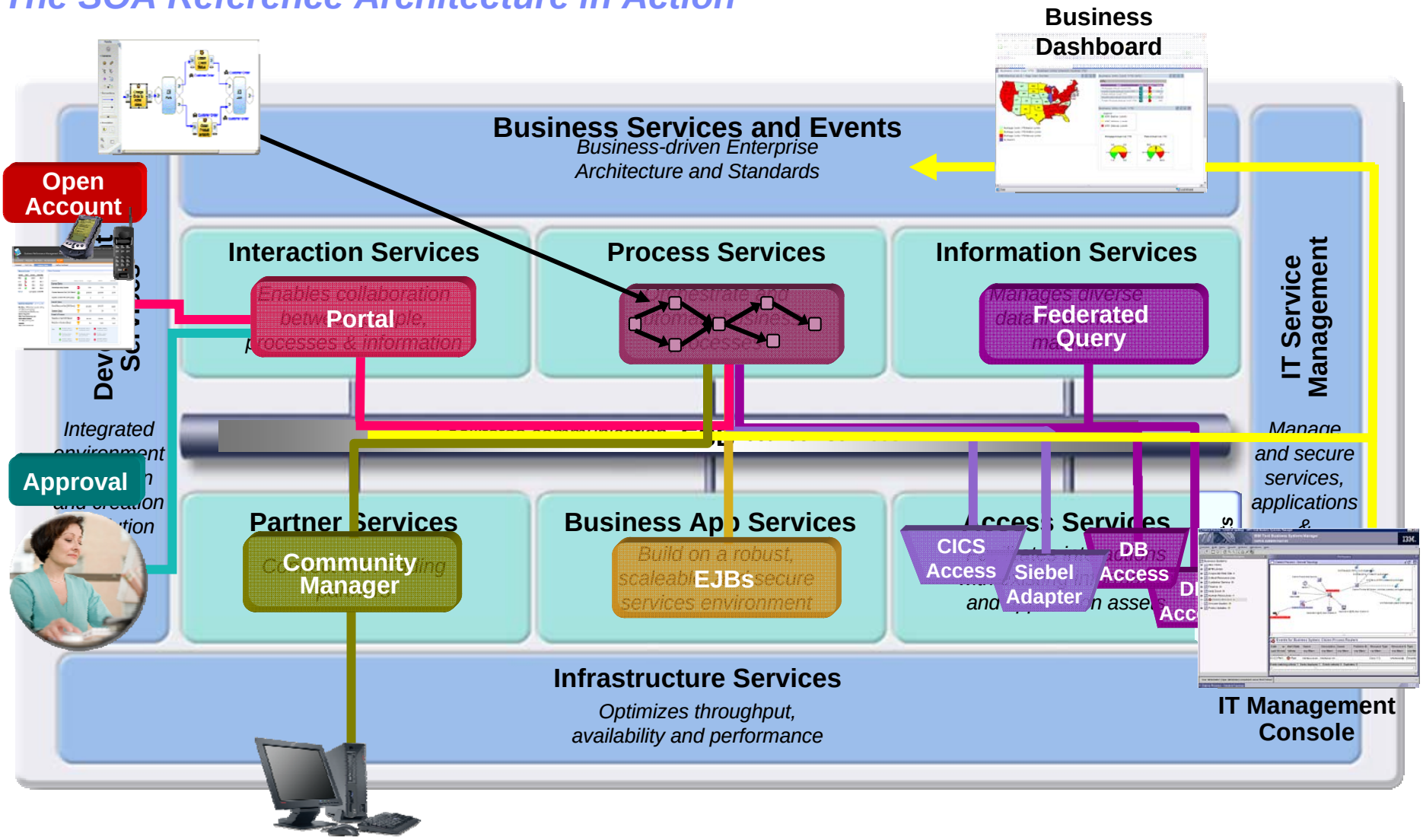
# SOA Reference Model

# IBM SOA Foundation Reference Model



# Separation of Concerns: Example "Open Account" Process

## *The SOA Reference Architecture in Action*



# ESB (Enterprise Service Bus)

# ESB (Enterprise Service Bus) – Definition and Purpose

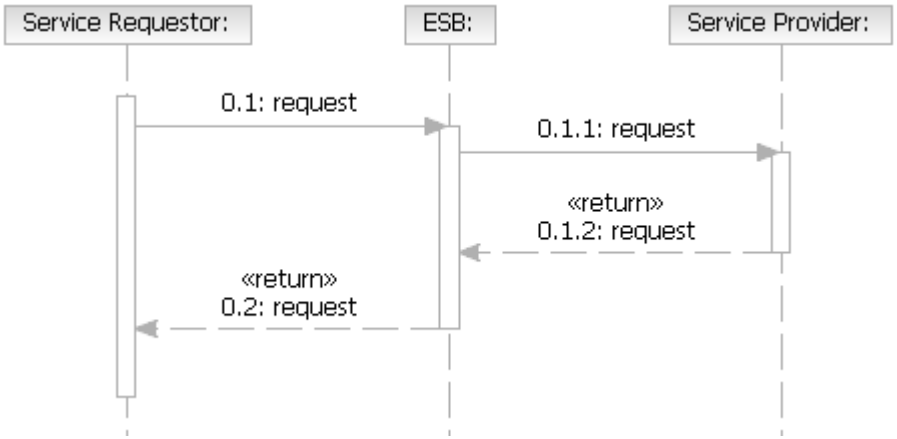
- An Enterprise Service Bus (ESB) is an architectural pattern defining a flexible connectivity infrastructure for integrating applications and services.

- 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

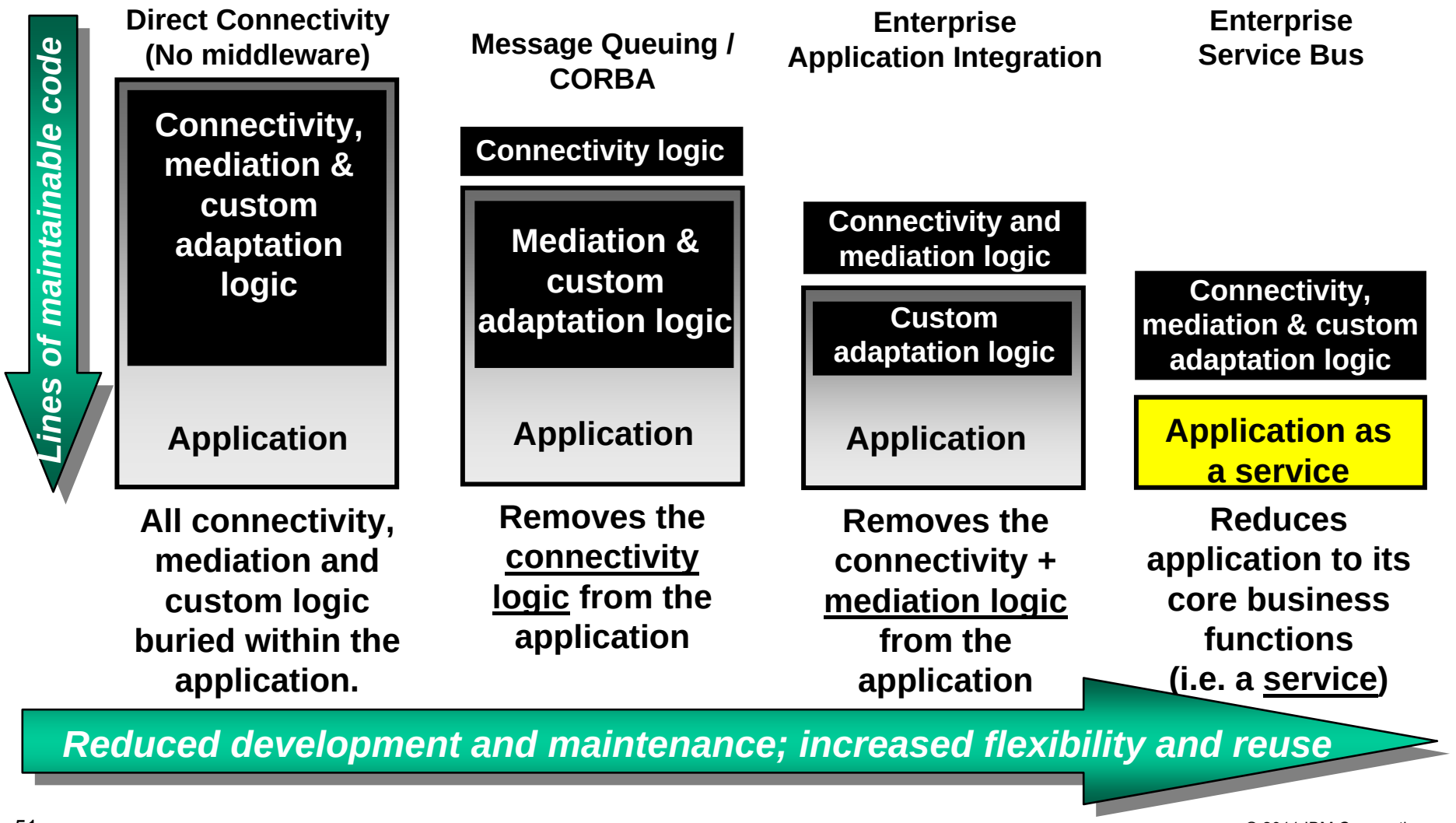
# ESB (Enterprise Service Bus) – Service Virtualization

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

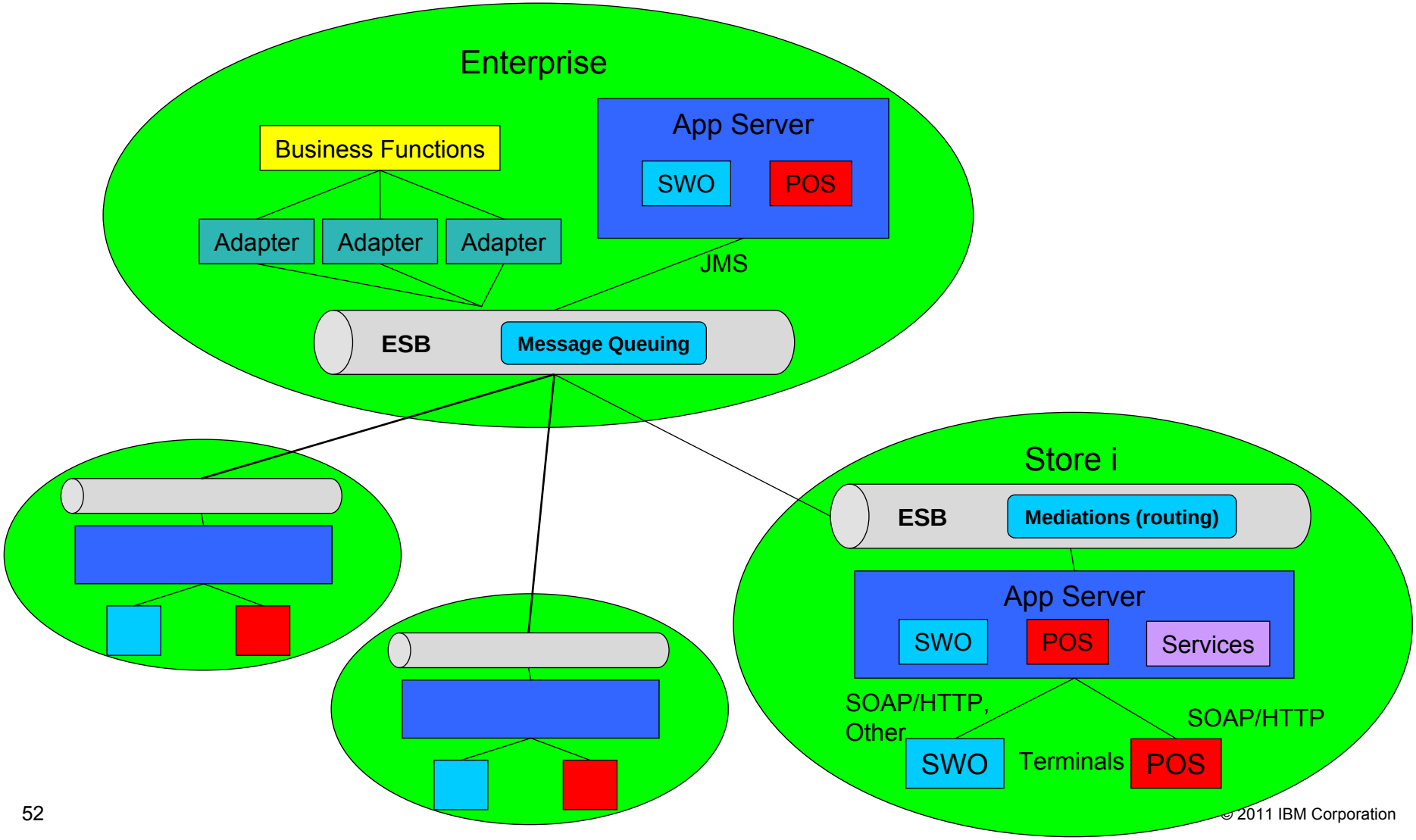



- **ESB provides *service virtualization* of**
  - ***Location and identity***
  - ***Interaction protocol***
  - ***Interface***
- **Interactions are *decoupled*, supporting *separation of concerns***

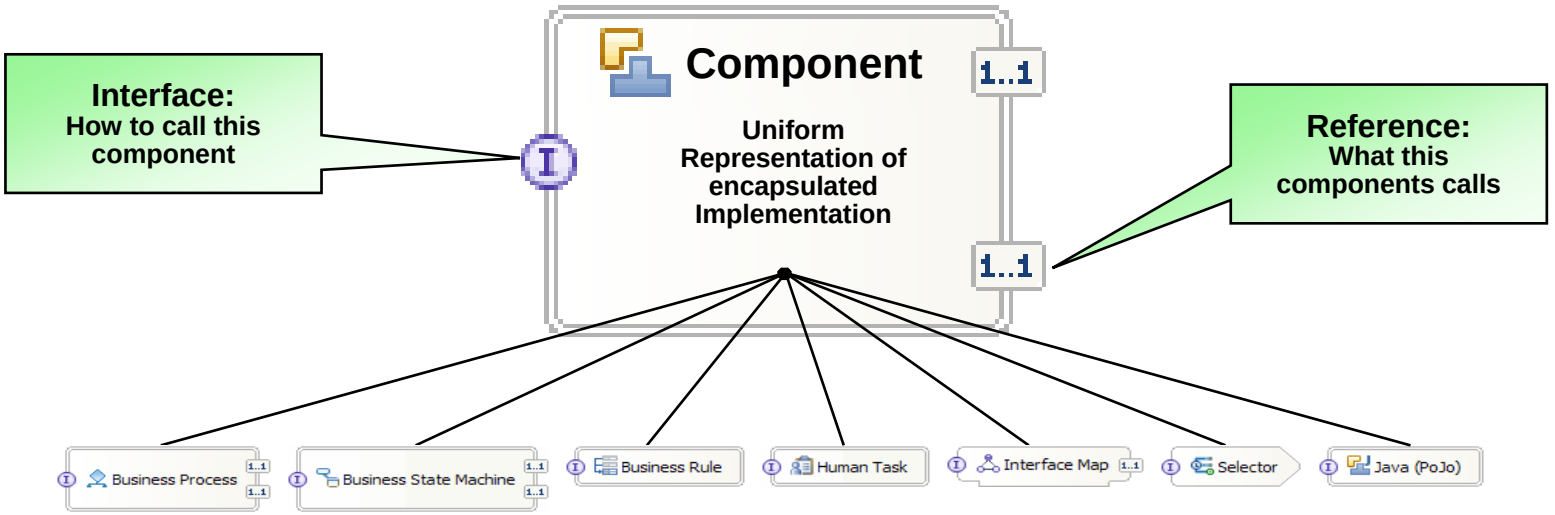
# ESB is today's technology



# ESB Pattern in Action – Retail Scenario



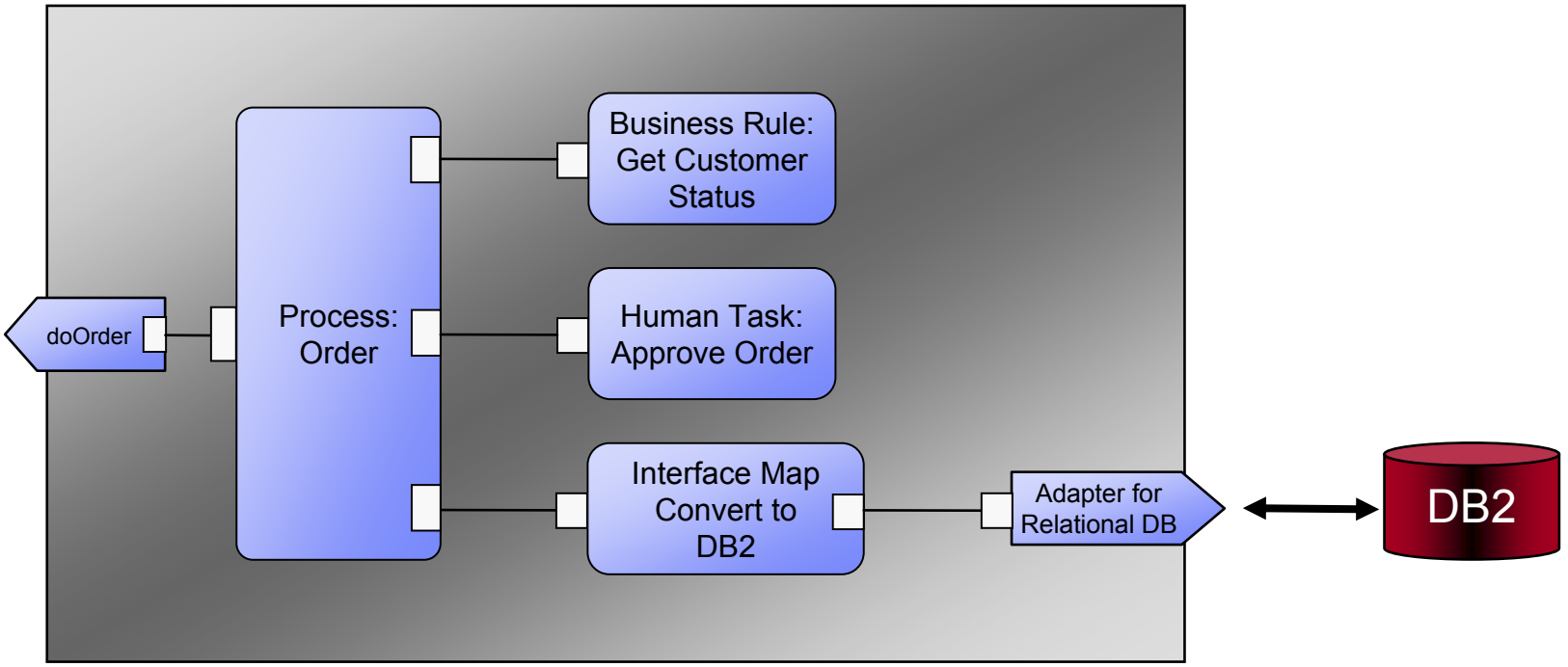
# Standard SCA (Service Component Architecture) for Common Invocation




**Encapsulate components for reuse**

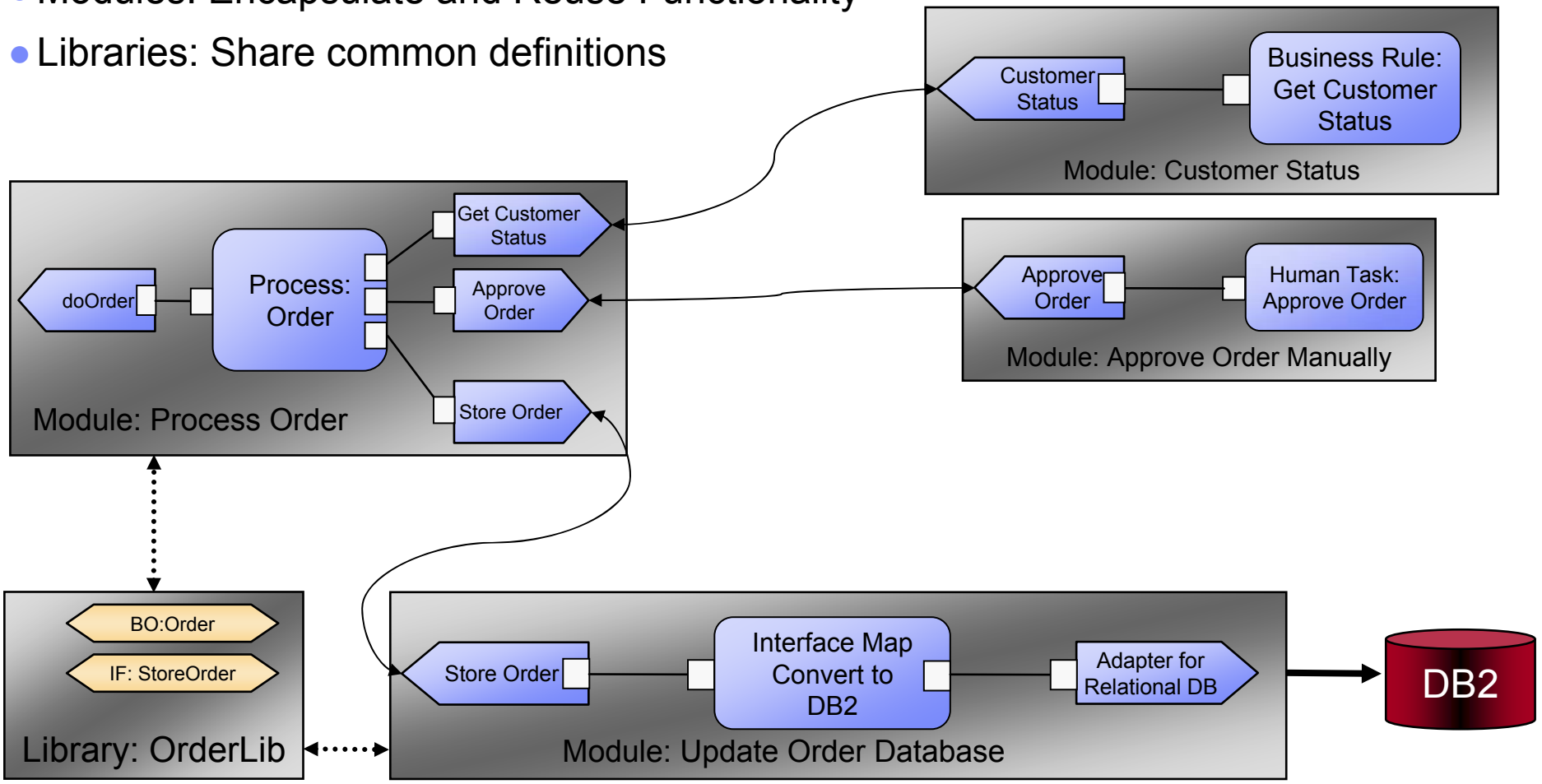
**All components (e.g., services, rules, human interactions) are represented consistently and invoked identically**

# Standard SCA (Service Component Architecture) – Component Assembly



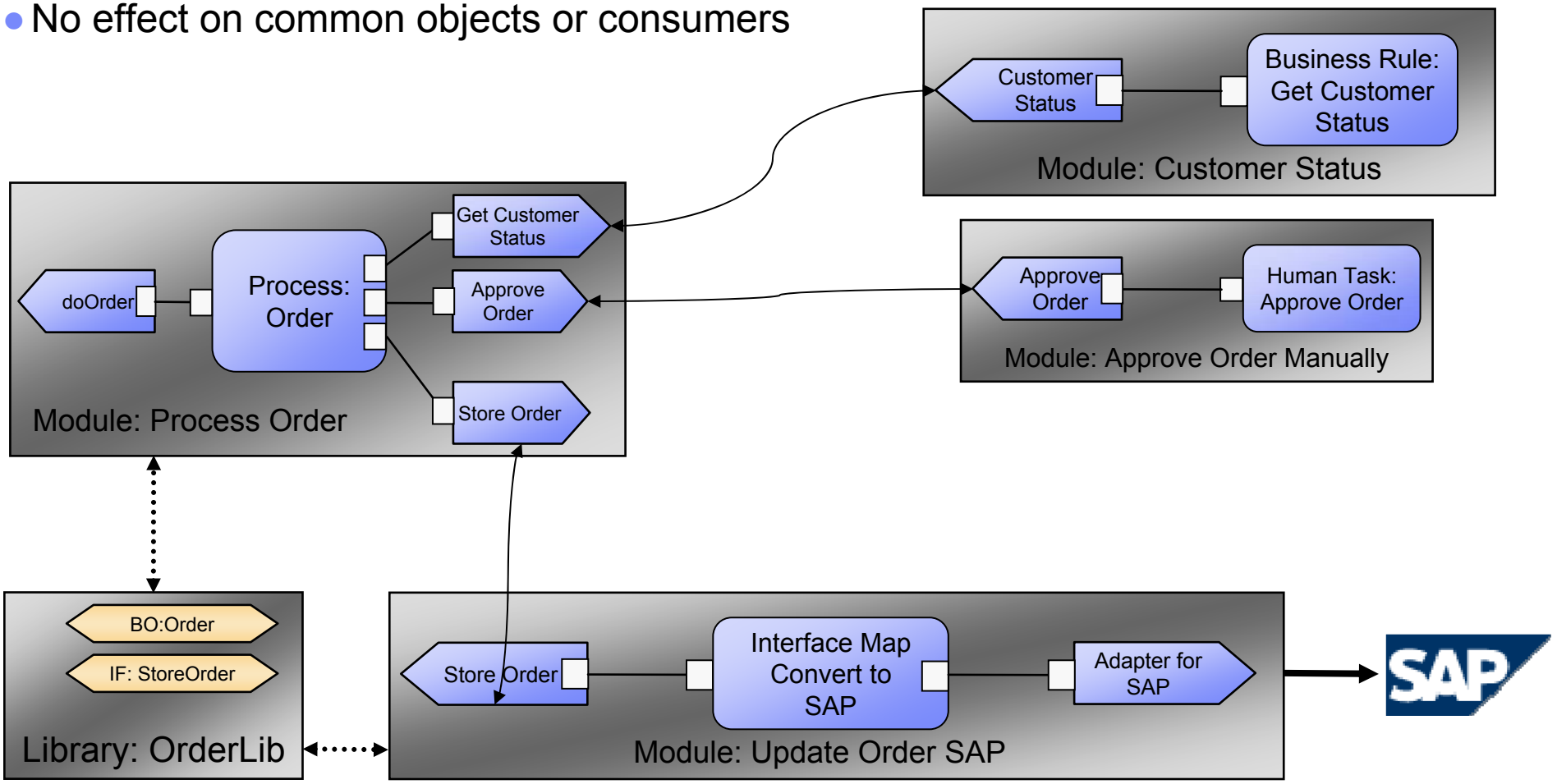
# SCA (Service Component Architecture) – Example Part 1

- Modules: Encapsulate and Reuse Functionality
- Libraries: Share common definitions

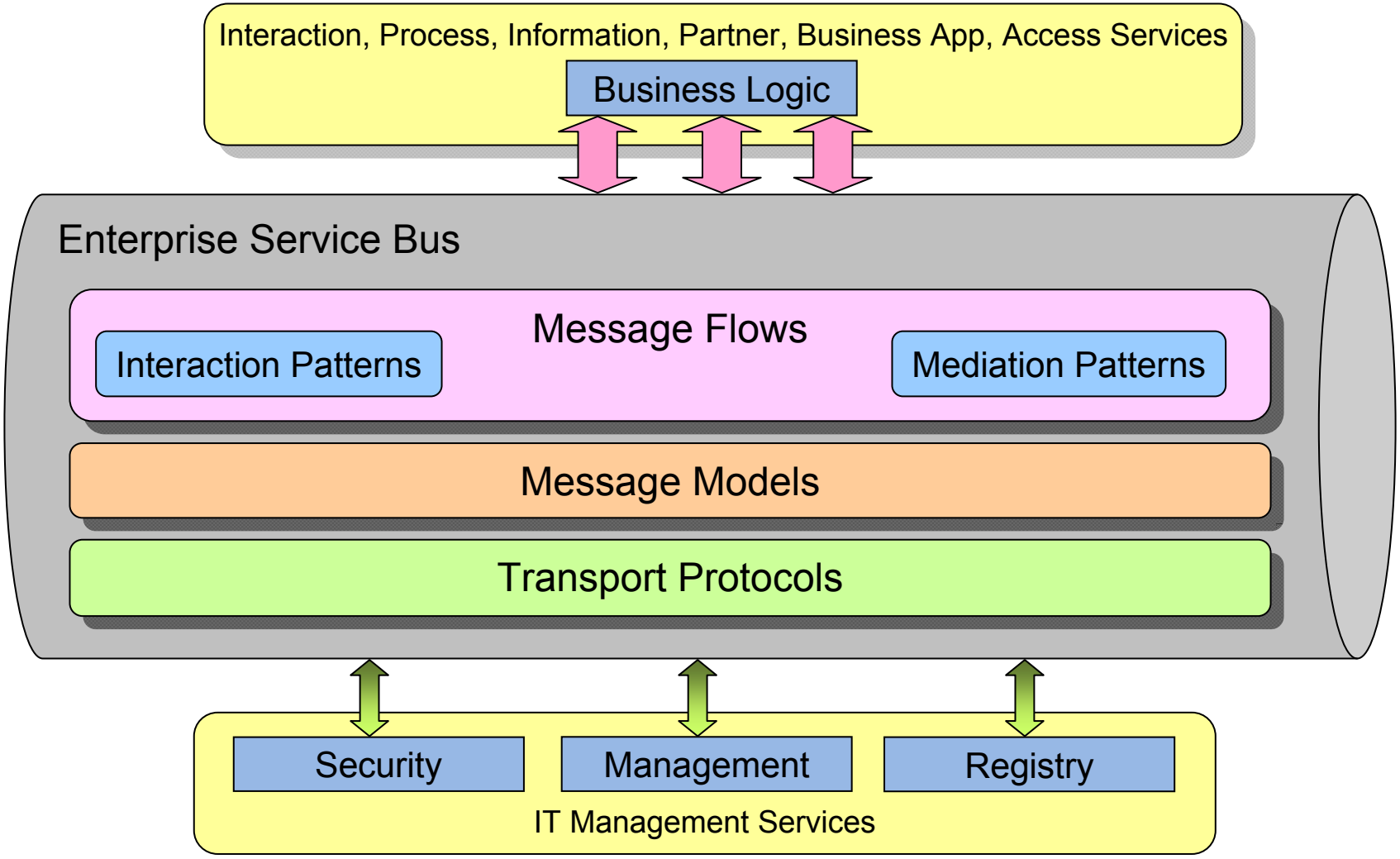


# SCA (Service Component Architecture) – Example Part 2

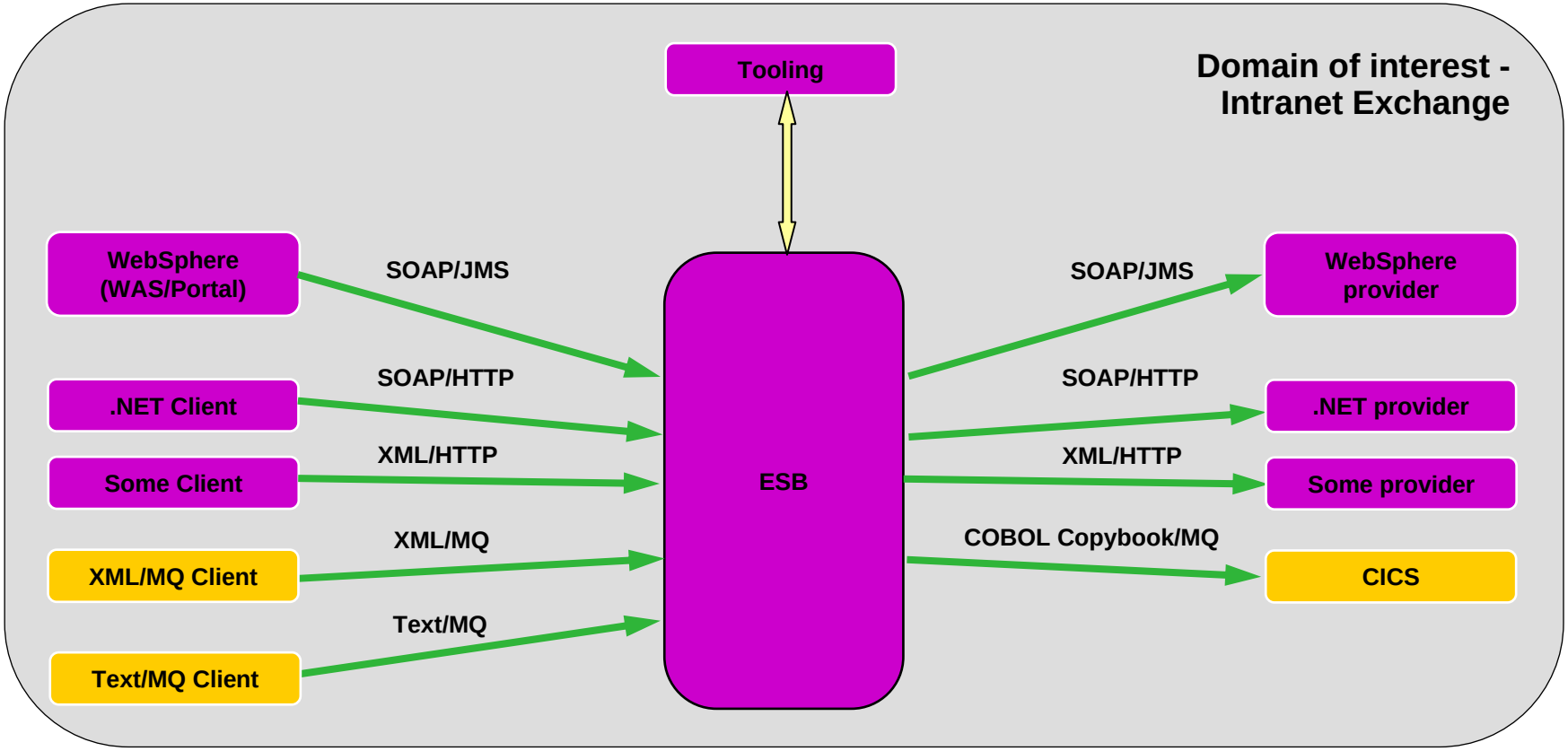
- Store Order in SAP instead of DB2
- No effect on common objects or consumers



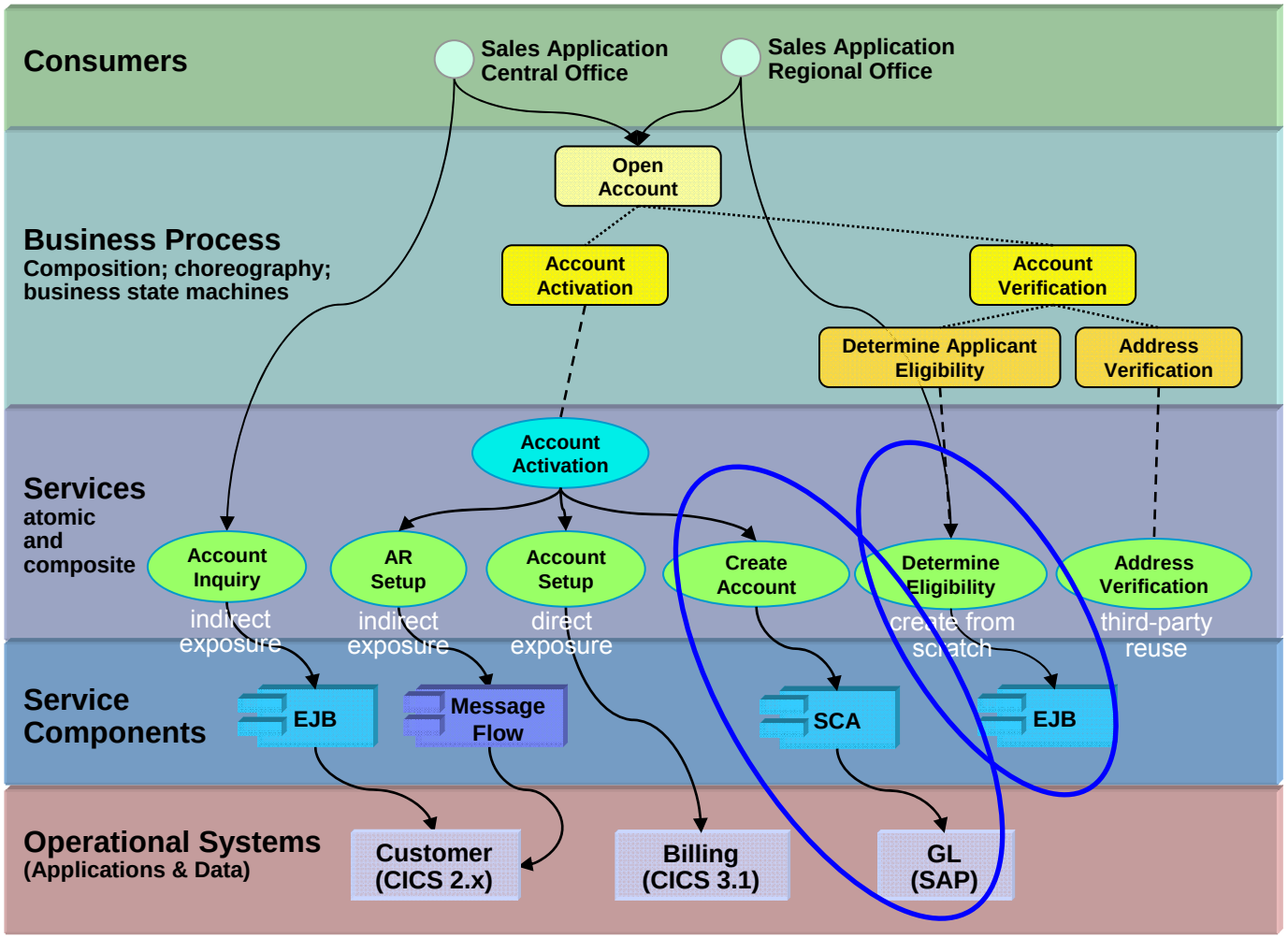
# Expanded View of the Enterprise Service Bus



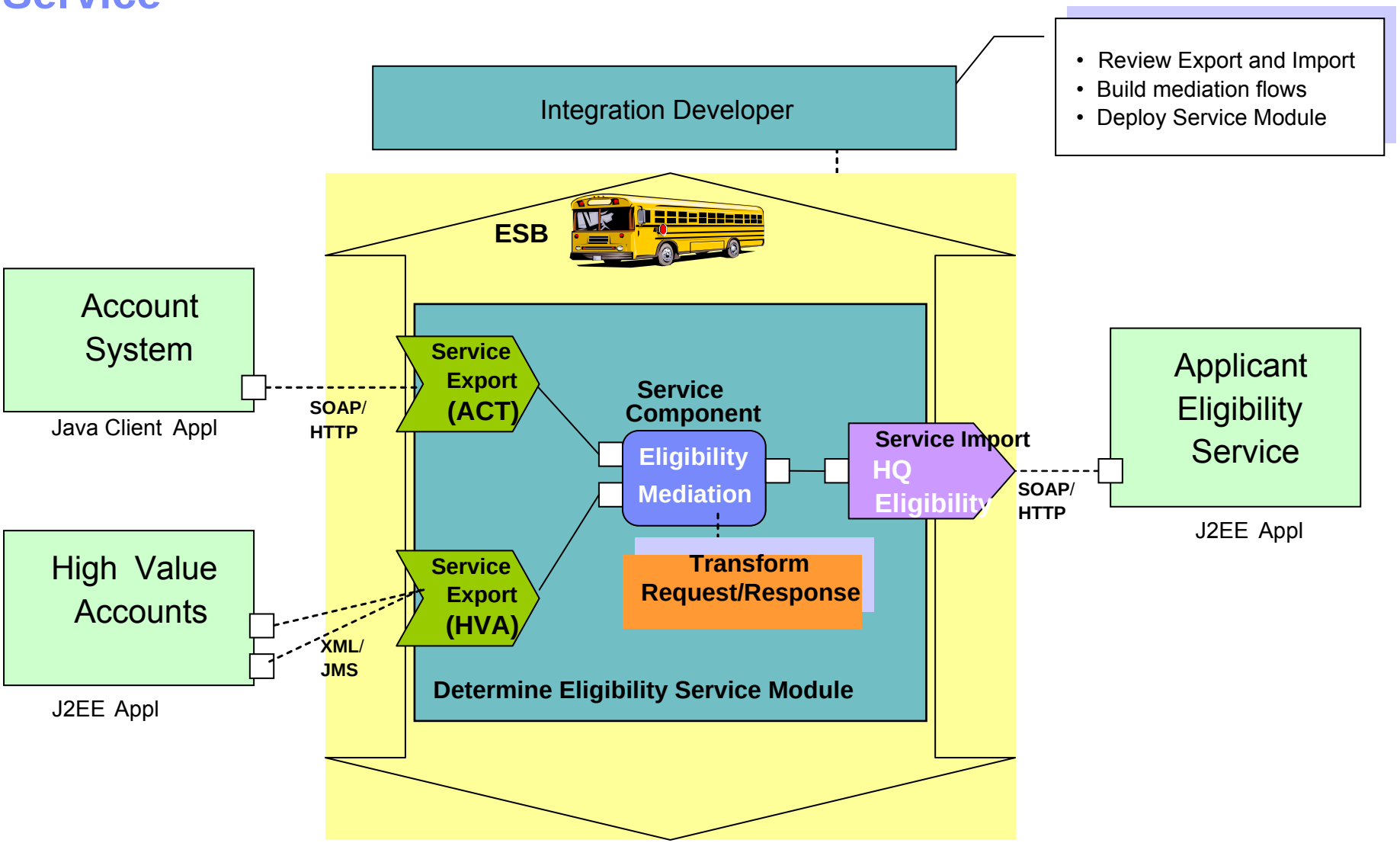
# ESB – Multi-protocol Exchange – Intermediary decoupling heterogeneous consumers and suppliers



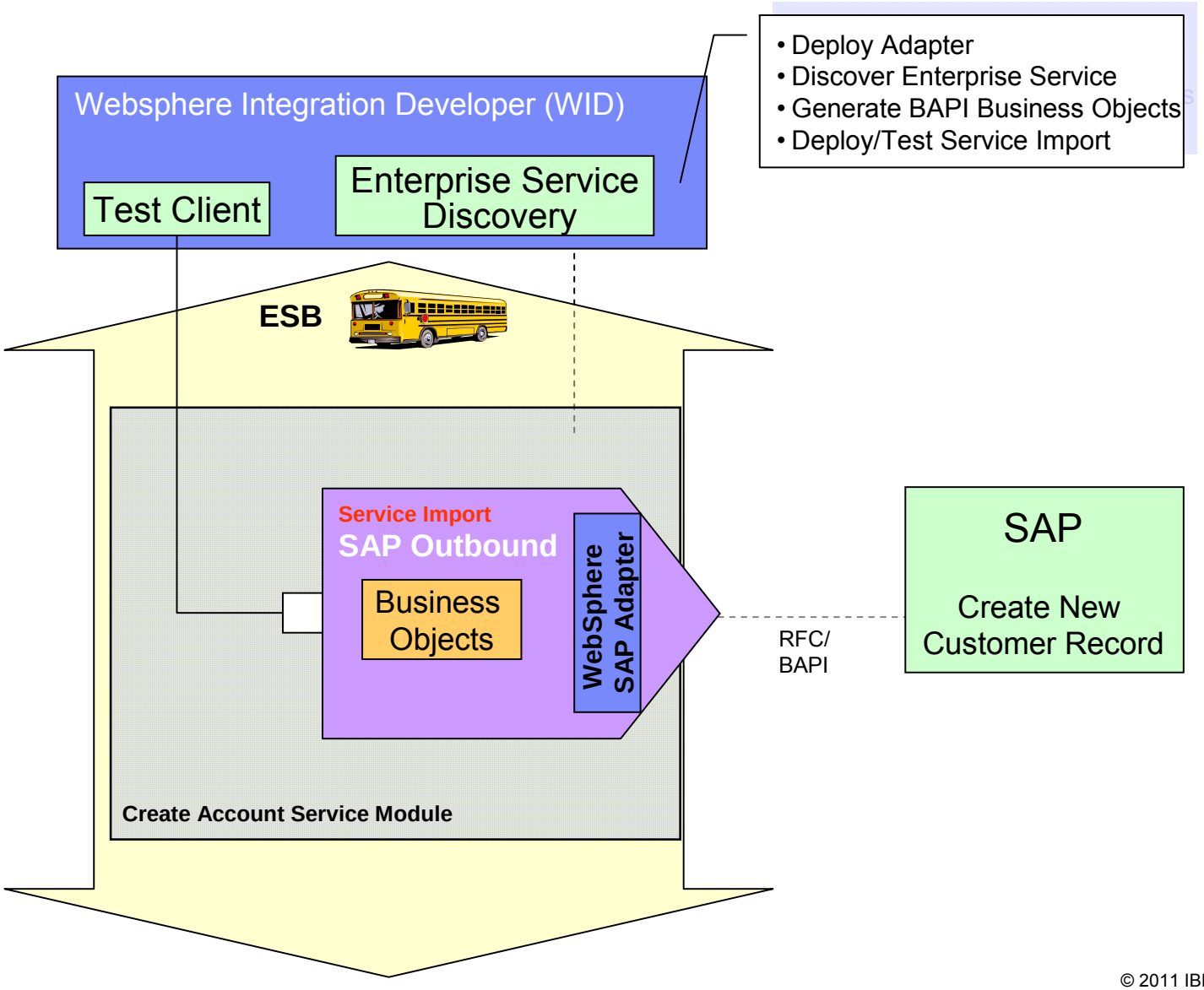
# Example of ESB use



# Example A of ESB use: Multiple Channel Access to Backend Service

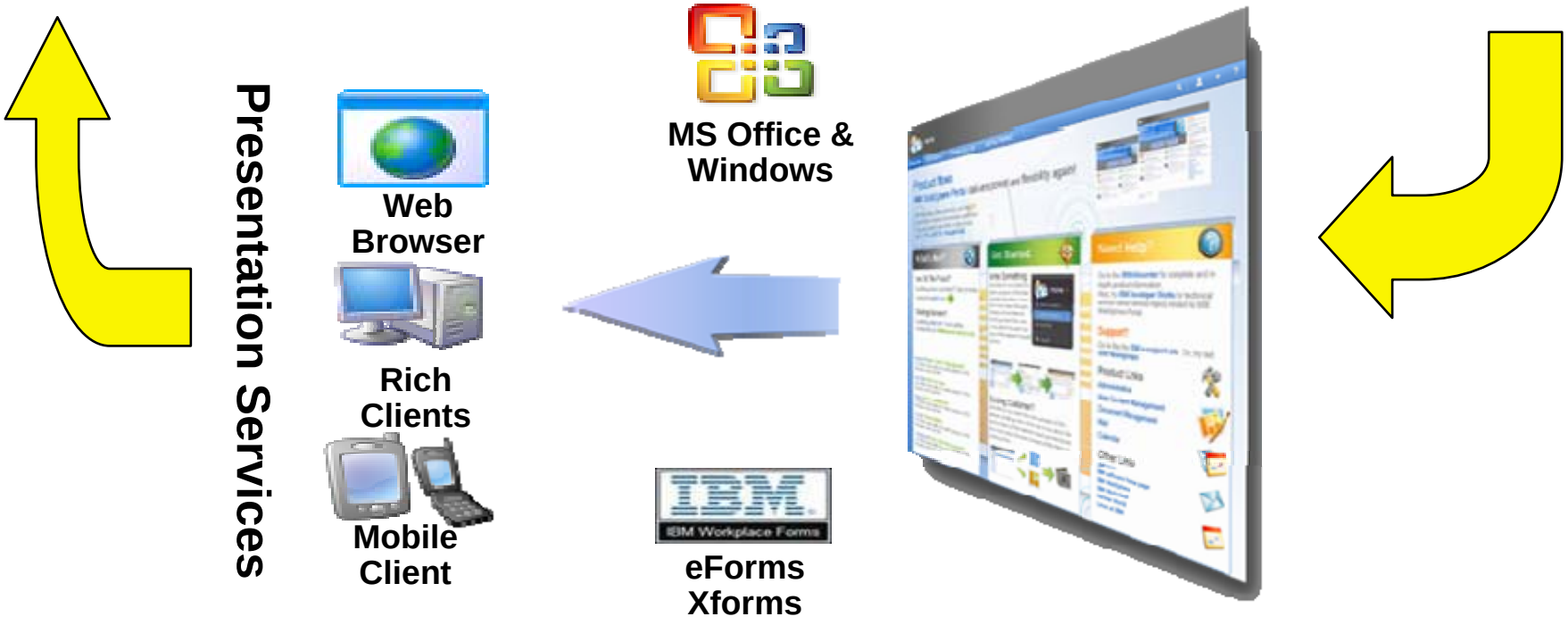


# Example B of ESB Use: Create SAP Service

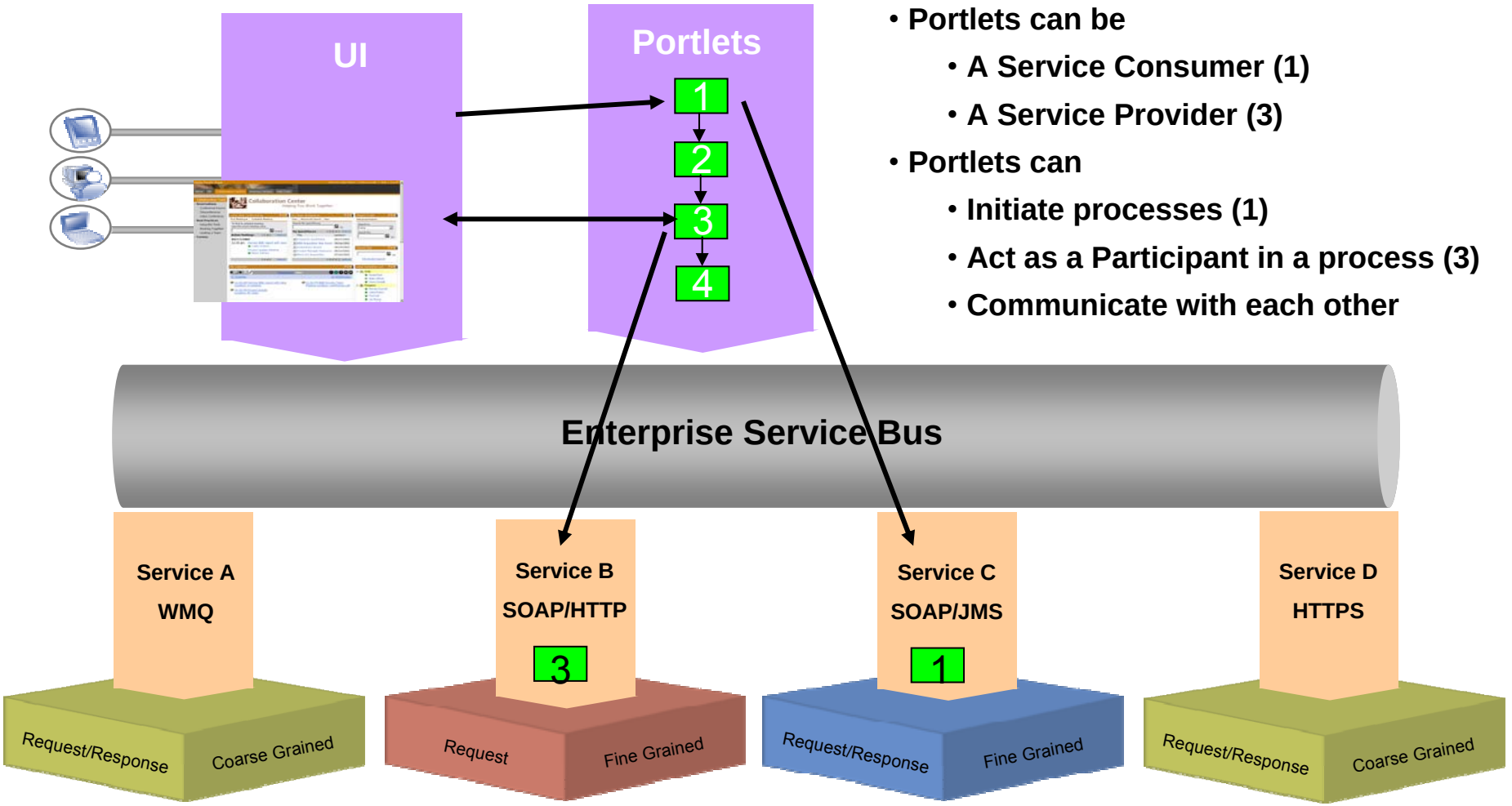


# Interaction Services

# *Interaction Services*: Using Portal As the "Front End" of SOA



# 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

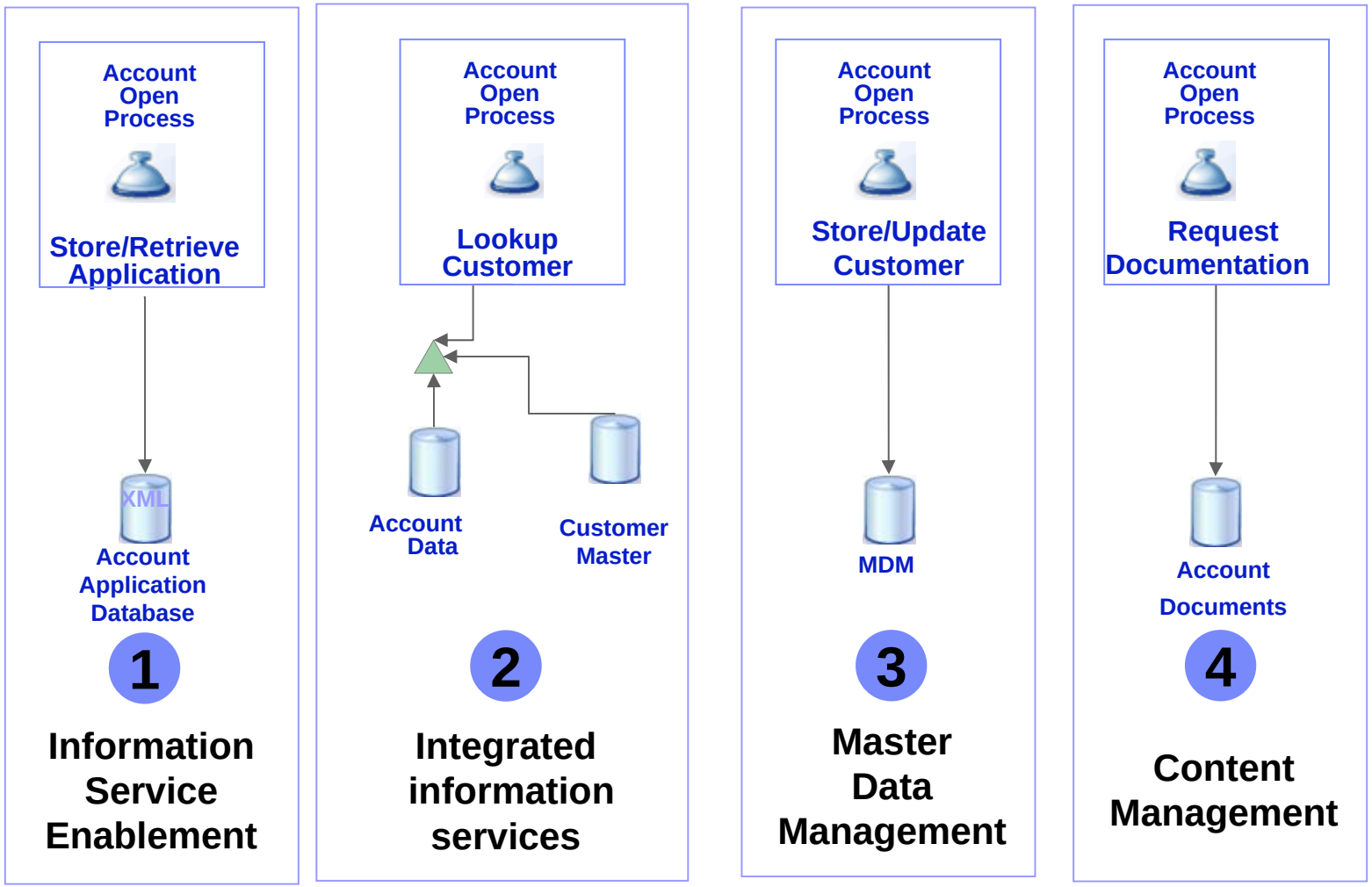
The Portal Framework Provides Service Aggregation

# Information Services

# *Information Services* in SOA Reference Architecture

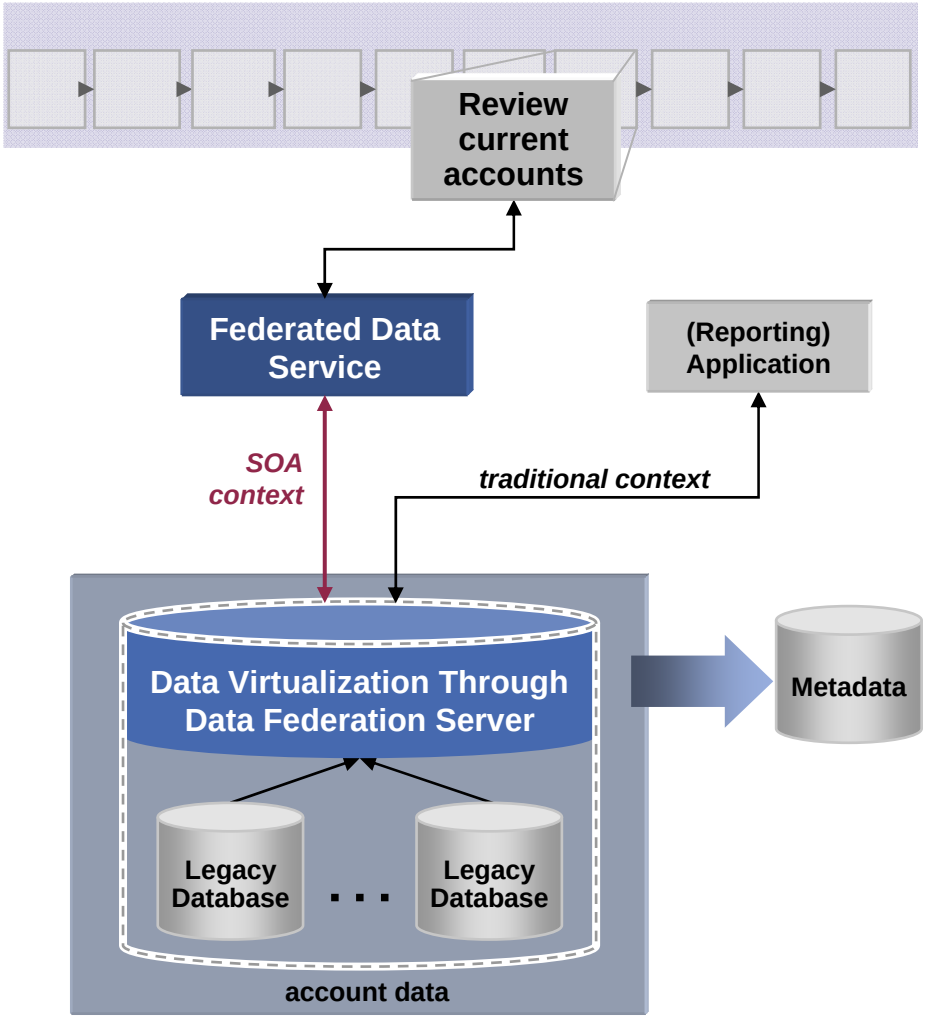
- **Delivering actionable information to people and processes**
- **Connect, enhance and deliver in-context information across diverse operating systems, applications and legacy systems through reusable services**
- **The Information Services enables consistent views and maintenance of data and content,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

# *Information Services:* Several Patterns



# *Information Services:* Pattern – 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

# Just remember – the future might bring more than you think

"I think there is a world market
for maybe five computers."
Thomas Watson, chairman of IBM, 1943

"Computers in the future may weigh
no more than 1.5 tons. "
Popular Mechanics, 1949

"There is no reason anyone would
want a computer in their home. "
Ken Olsen, founder of DEC,1977

"Prediction is difficult, especially
about the future"
Niels Bohr, 1957

"640K ought to be enough
for anybody. "
Bill Gates, 1981