IBM

Enterprise IT Architectures
SOA Part 2

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Slot for Exercise Discussion

SOA Part 2 | Hans-Peter Hoidn

# Agenda

I.   Recap SOA Architecture and JKE's "Open Account" Process

II.   Business Process Modeling

III. Programming Models for Business Process Realization (Assembly)

IV.   Business Driven Development (BDD)

V.   Business Process Management – from end-to-end
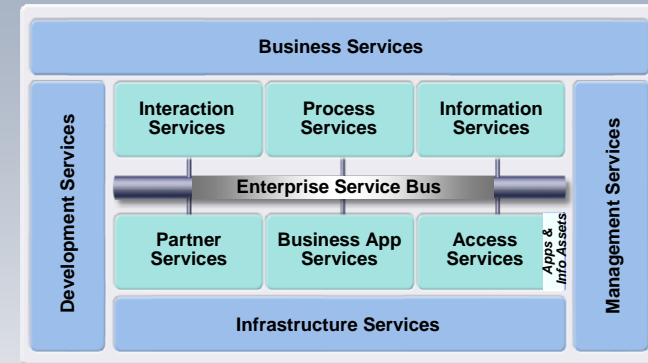
I. Recap SOA Architecture and JKE's Account Opening Process

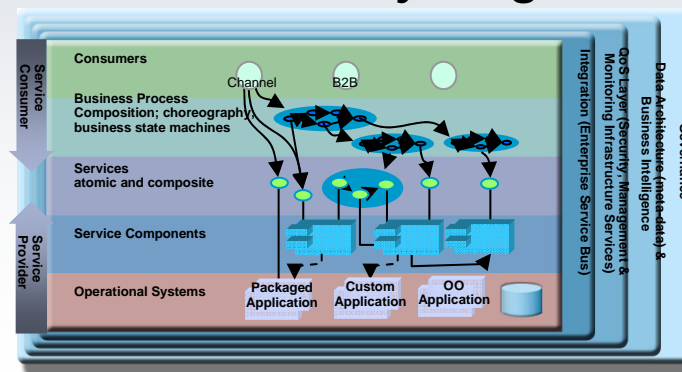# Key Models for SOA – Enabling Greater Flexibility in Enterprise IT Architectures

SOA Lifecycle
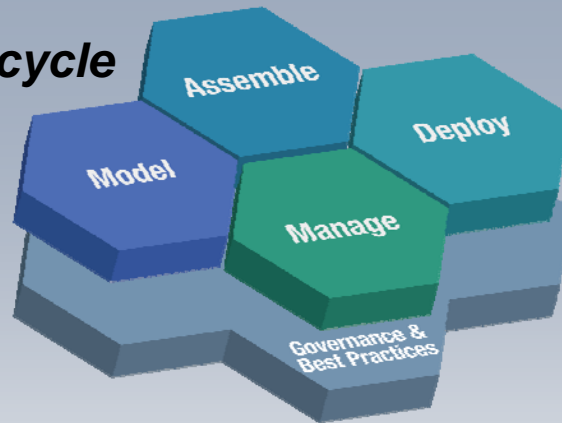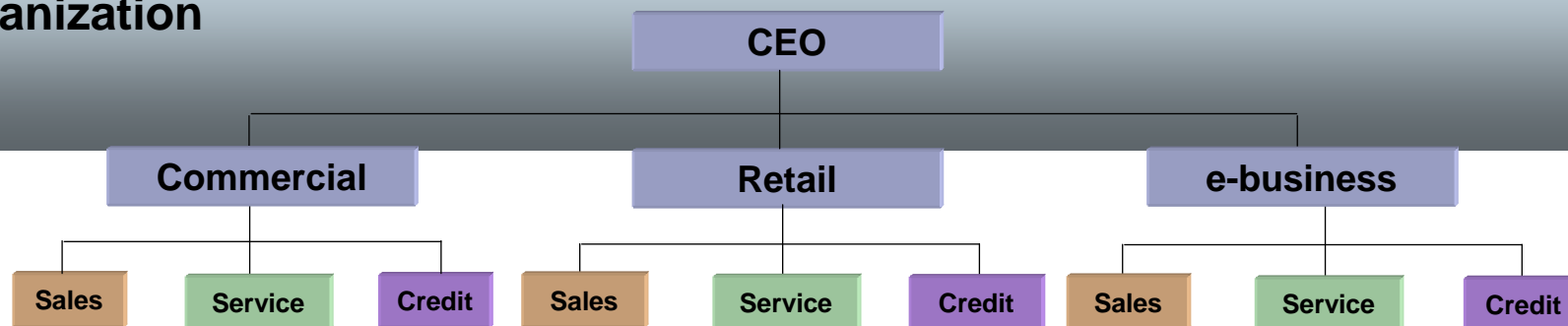

SOA Reference Architecture

SOA Solution Layering

Example for Business Process –
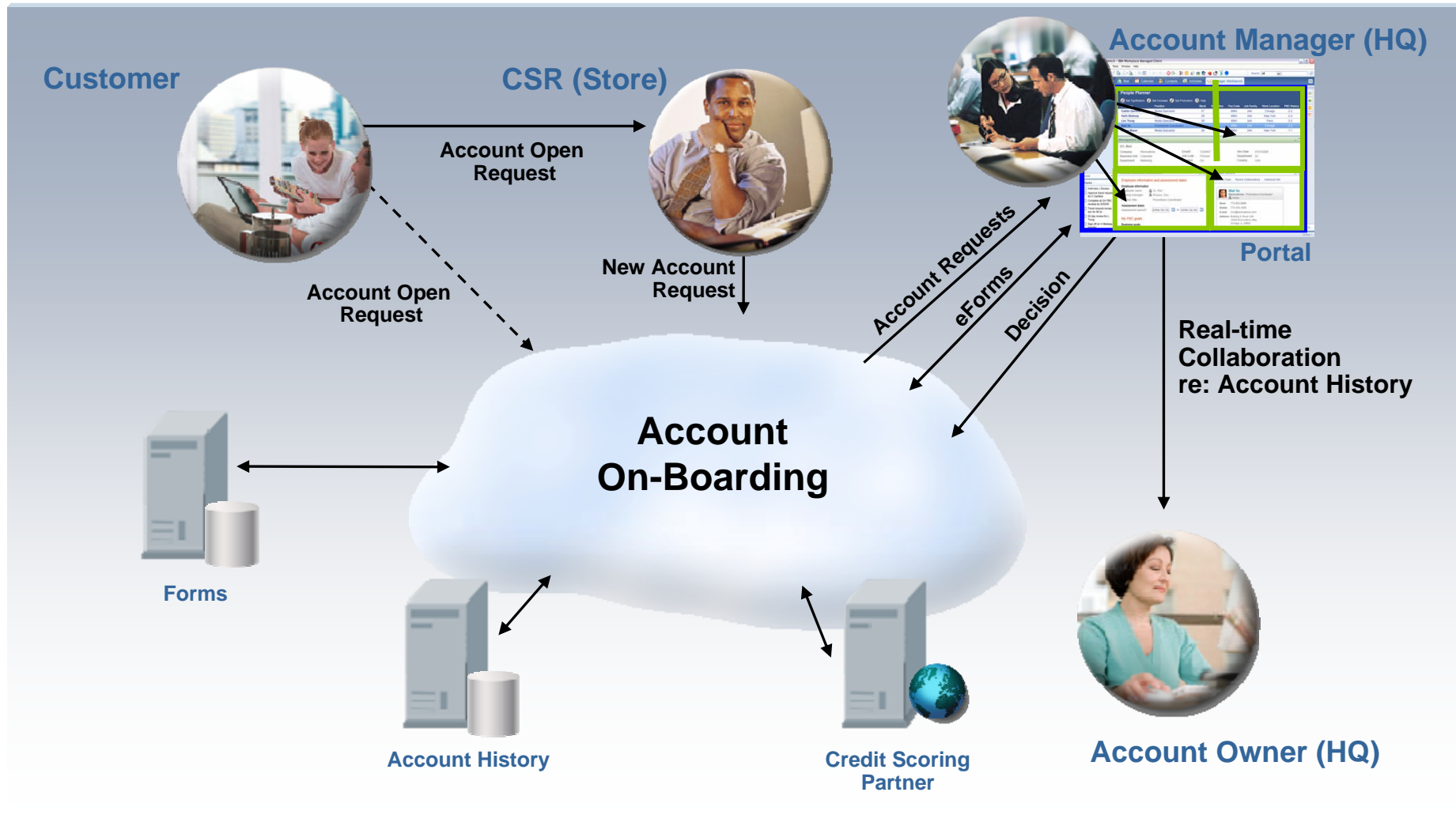## „Open Account" at JK Enterprises

- Virtual Company – a premier supplier to retail channel, small business channel, and corporate customers

- High-touch approach to our customers - now with customer centers around the world

- Customers of all types can interact with us in a way that suits their individual needs – corporate customers are true business partners
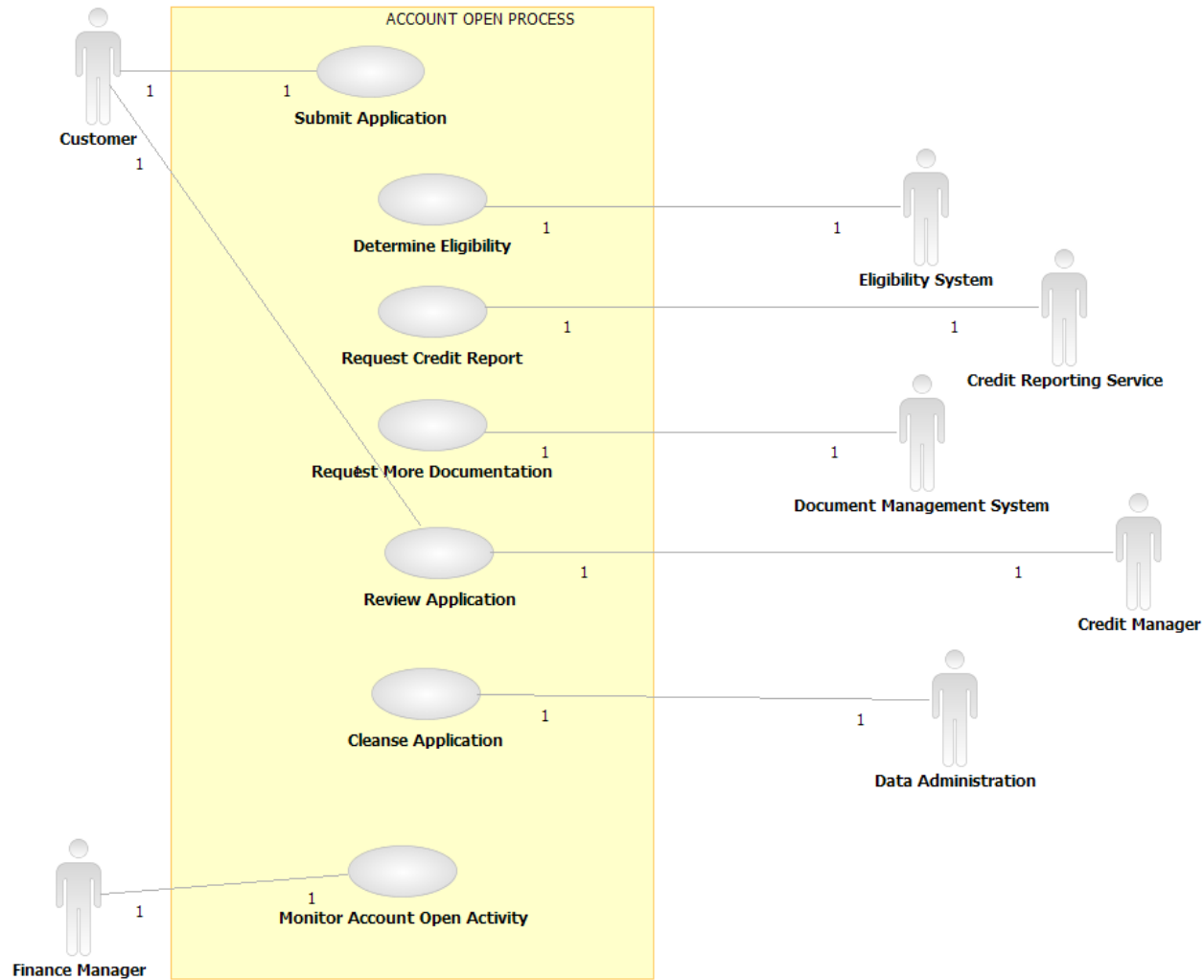
Line of Business Organization

```
                          CEO

     Commercial           Retail          e-business

Sales  Service  Credit  Sales  Service  Credit  Sales  Service  Credit
```

Defining Solution Scope
Business Context Diagram

Customer

CSR (Store)

Account Manager (HQ)

Account Open Request

Account Open Request

New Account Request

Account Requests

eForms

Decision

Portal

Account On-Boarding

Real-time Collaboration re: Account History

Forms

Account History

Credit Scoring Partner

Account Owner (HQ)

Use Case for "Open Account" Process

ACCOUNT OPEN PROCESS

- Customer
- Submit Application
- Determine Eligibility
- Eligibility System
- Request Credit Report
- Credit Reporting Service
- Request More Documentation
- Document Management System
- Review Application
- Credit Manager
- Cleanse Application
- Data Administration
- Monitor Account Open Activity
- Finance Manager

SOA Stack for "Open Account" Process

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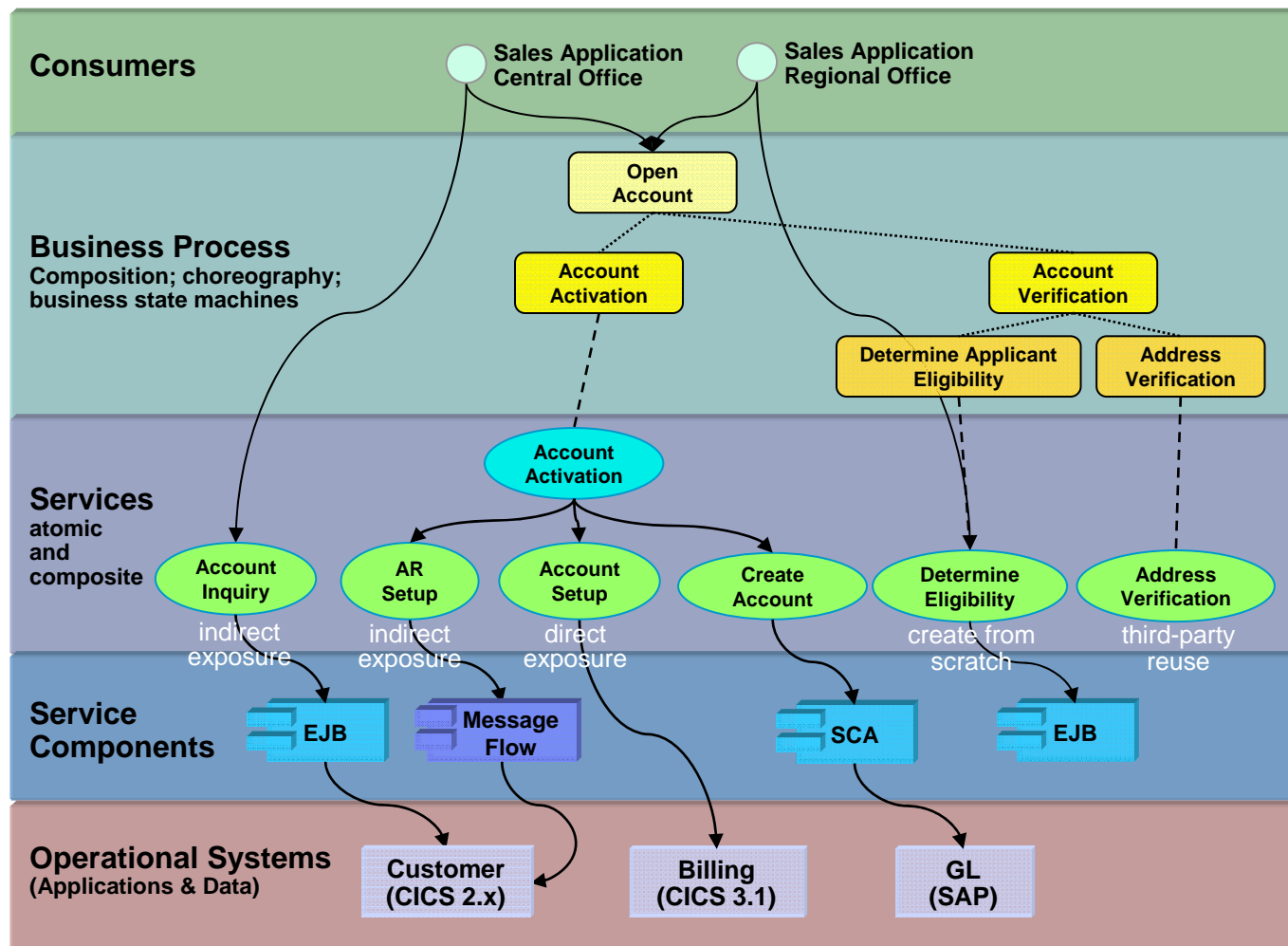
Reference Architecture and "Open Account" Process

Open Account

Approved

Integrated environment ... and creation ... tion

Development Services

Business Dashboard

Business Innovation & Optimization Services

Facilitates better decision-making with real-time business information

Interaction Services

Enables collaboration between people, processes & information

Portal

Process Services

Information Services

Manages diverse data ... ma...

Federated Query

IT Service Management

Manage and secure services, applications &

Partner Services

Community Manager

Business App Services

Build on a robust, scaleable and secure services environment

EJBs

Access Services

...ates interactions ... ... and ... ... on assets

CICS Access

Siebel Adapter

DB Access

D... Acc...

Infrastructure Services

Optimizes throughput, availability and performance

IT Management Console

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Overview of JKE's IT Environment
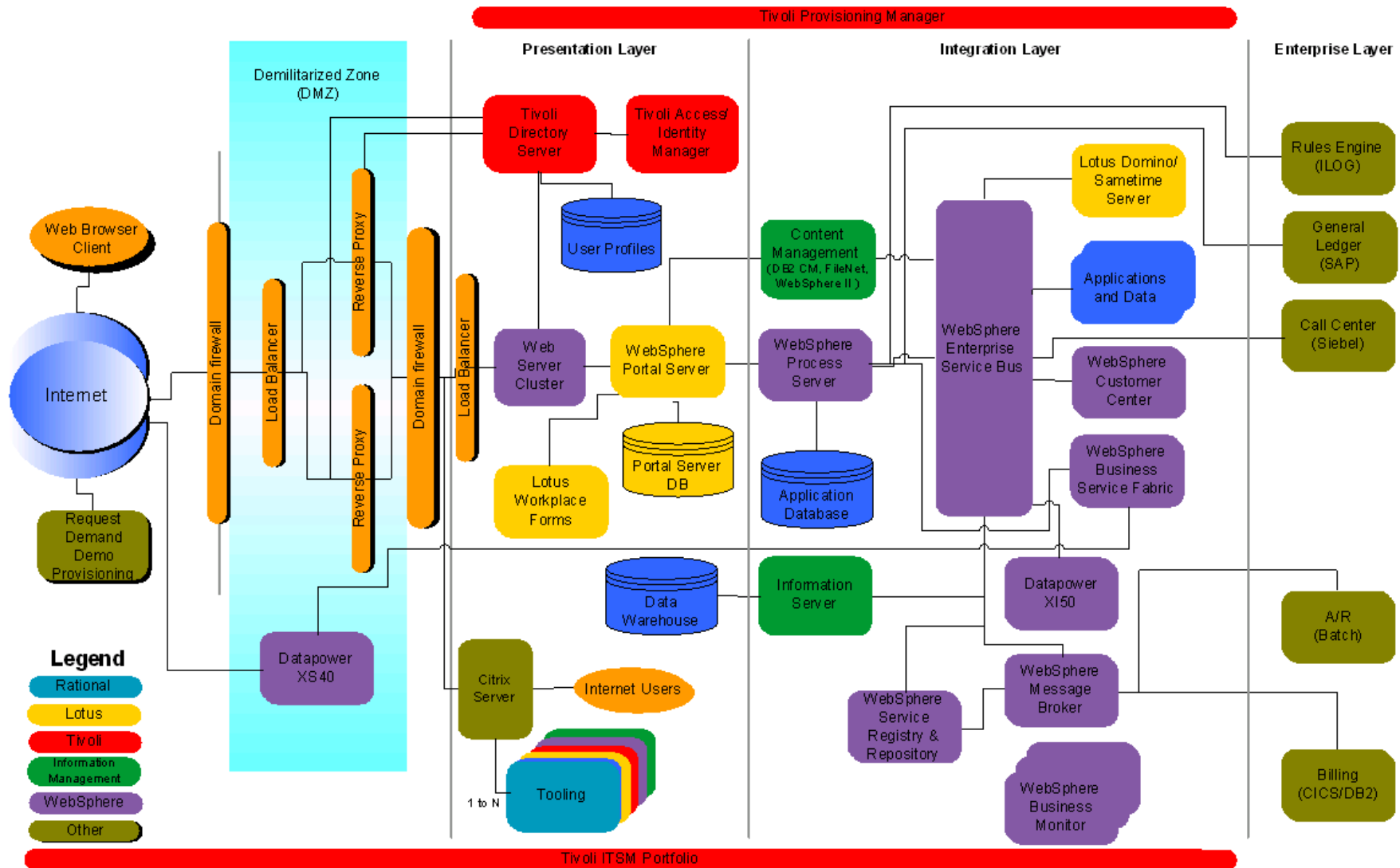
II. Business Process Modelling

Business Models are Changing…

"On such a flat earth, the most important attribute you can have is creative imagination – the ability to be the first on your block to figure out how all these enabling tools can be put together in new and exciting ways to create products, communities, opportunities, and profits.
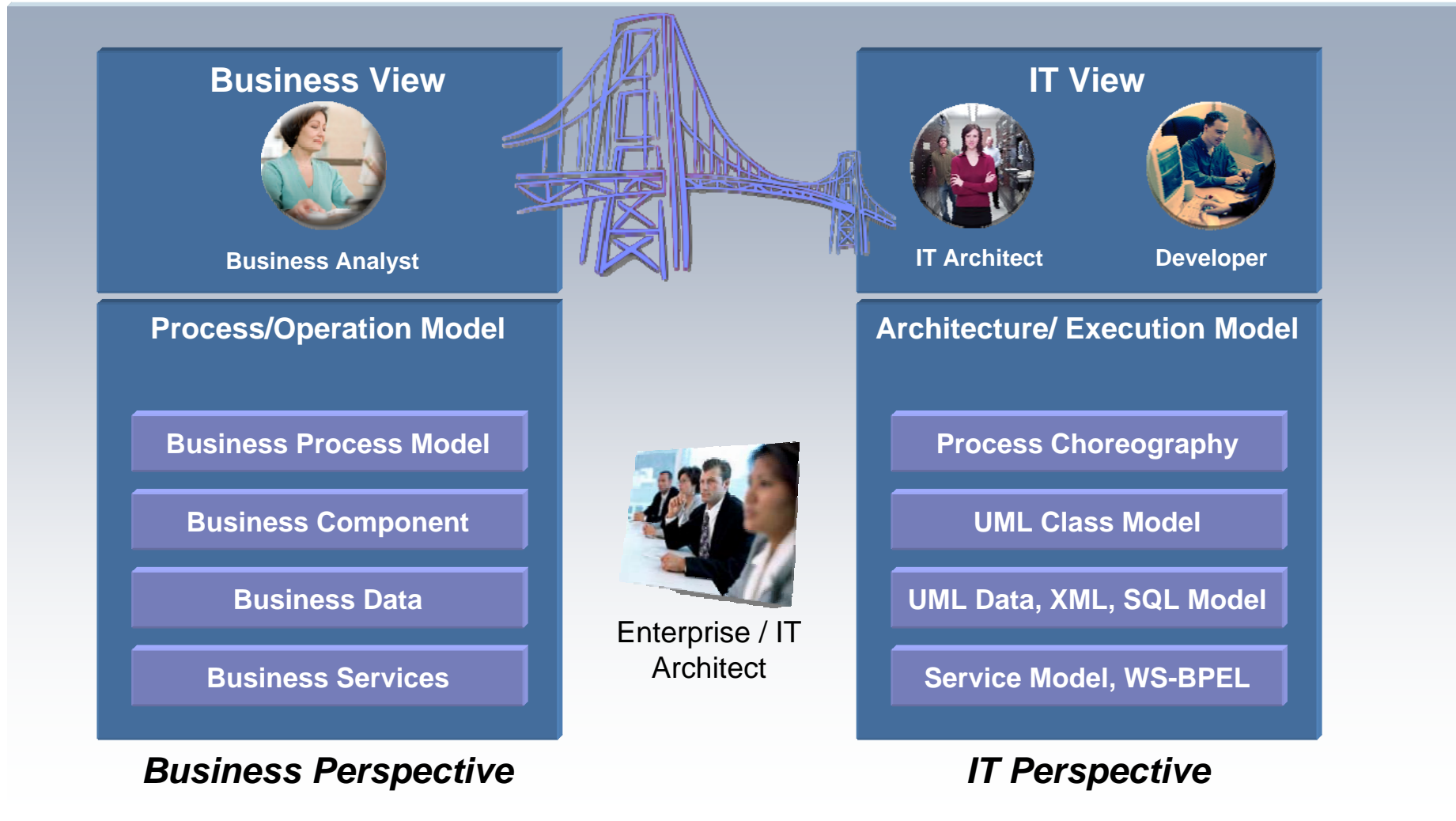
Thomas Friedman, The World is Flat
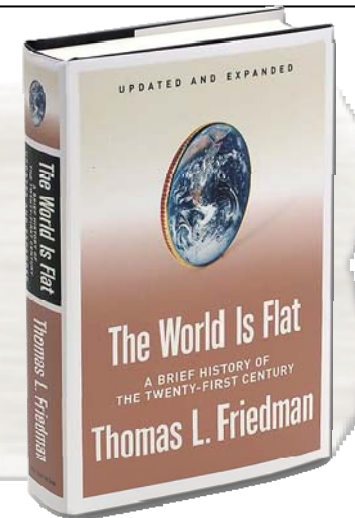
" Service orientation does not begin with technology; it begins with the mind-set of thinking about your business and the world around you in terms of functional components. Becoming more functionally service oriented allows organizations to quickly and economically rearrange the components that make up a business."

The Future of Business June 2007

Steve Mills, Senior Vice President and Group Executive
IBM Software Group

EA Provides Linkage Between Operational and IT Views
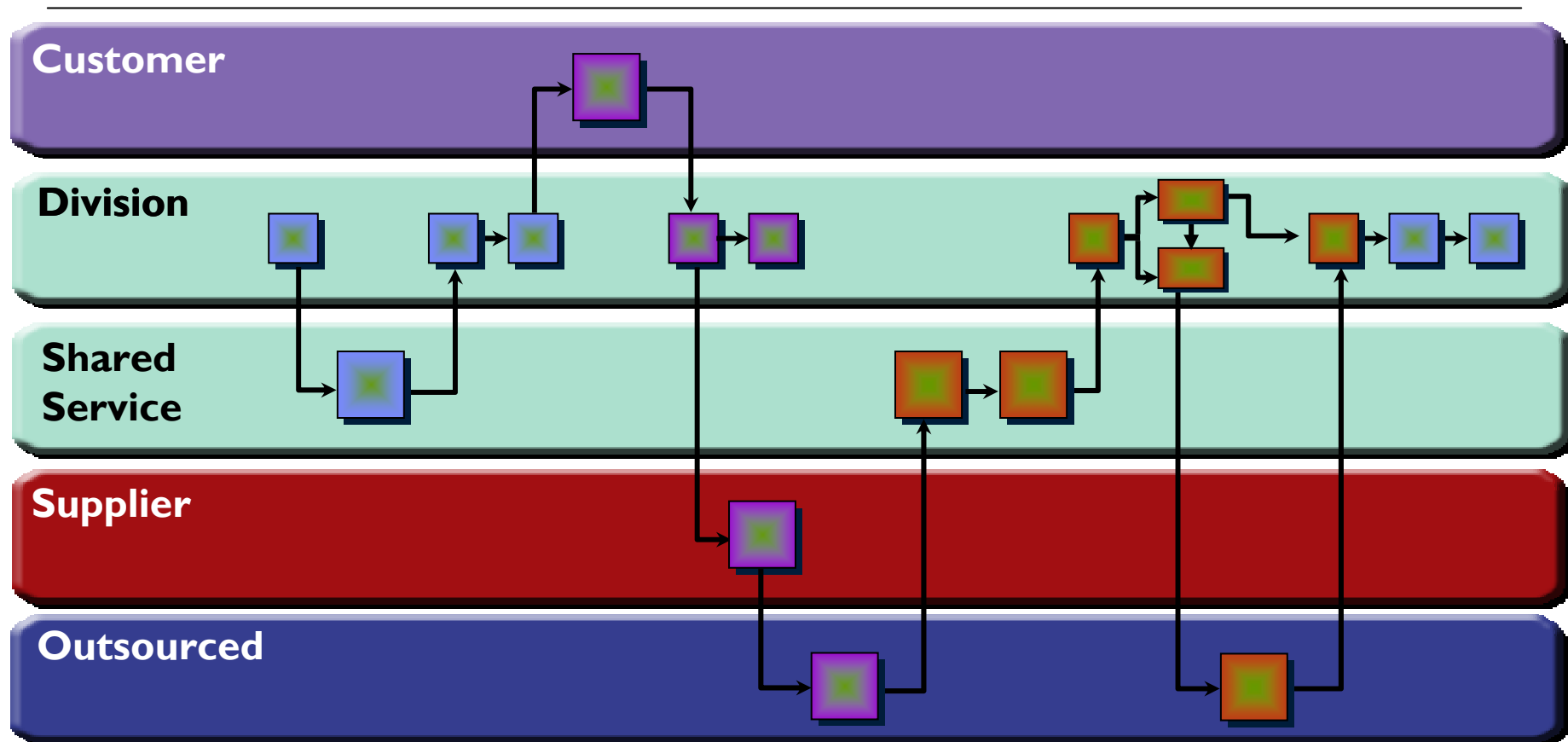## *Reconciling Business Perspectives and IT Perspectives*

Business View

Business Analyst

IT View

IT Architect   **Developer**

Process/Operation Model

Architecture/ Execution Model

Business Process Model

Business Component

Business Data

Business Services

Enterprise / IT
Architect

Process Choreography

UML Class Model

UML Data, XML, SQL Model

Service Model, WS-BPEL

Business Perspective

IT Perspective

Where We Are Heading – Start

Division
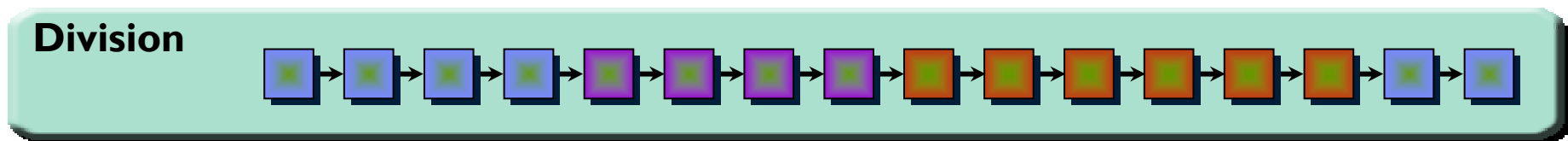
Case Study: Procure to Pay Process

Where We Are Heading – Goal

Customer

Division

Shared Service

Supplier

Outsourced

Case Study: Procure to Pay Process

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Business Process Modeling
Capture, Simulate, Analyze & Hand-off to Implementation

- **Graphically Model Processes**
  - Define: Goal, Scope, Perspective, Audience, Level-of-detail, Content
  - Introduce naming conventions for all process objects (costs, time, resources, decision points, actions, etc)
  - Agree on a maximum number of process levels (3-4) and number of activities per process diagram (15-20)
- **Simulate and Analyze**
  - Simulate execution with statistical analysis tools
  - Run "what if" scenarios to predict outcomes
  - Identify bottlenecks and workload imbalances
  - Isolate projects that will generate the greatest returns
- **Hand off to Implementation**
  - Export business and data models for use in IT deployment
  - Direct export of models to IT such as WS-BPEL for execution, XSD for data definitions, WSDL for services interfacing, UML for IT architect refinement
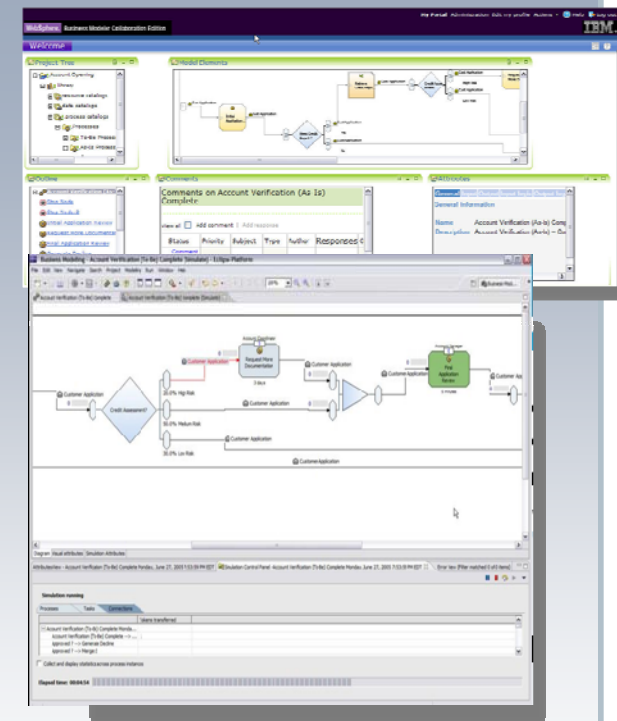
Architectural Benefit:
  - Business analysts provide top-down approach to service and process design
  - Enable coordination of process development across business stakeholders
  - Creation of artifacts to support down-stream implementation

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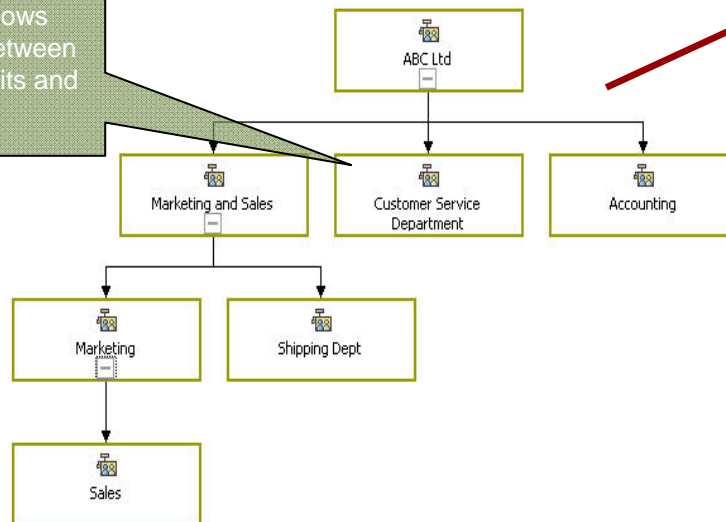# Business Process aspects of RUP : Business Modeling
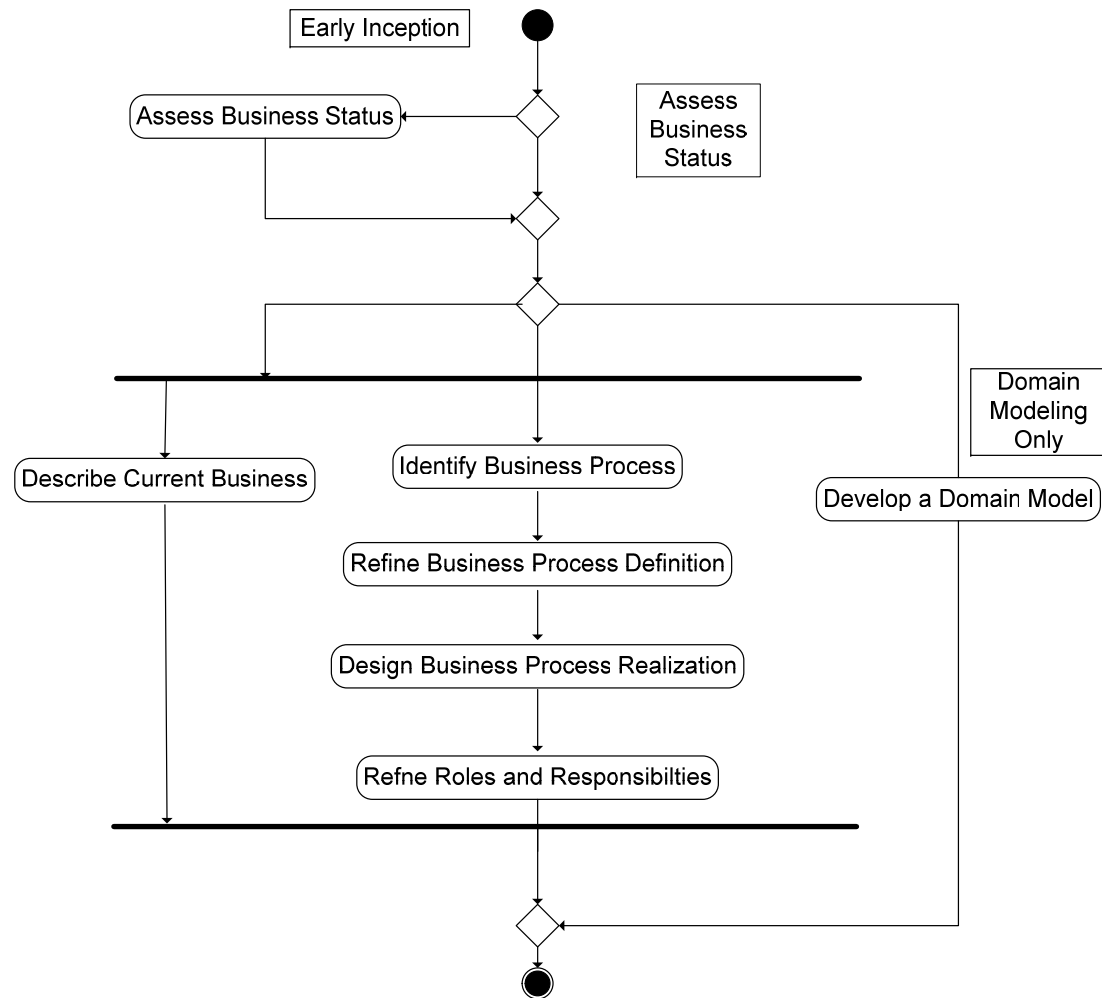
The Process Model
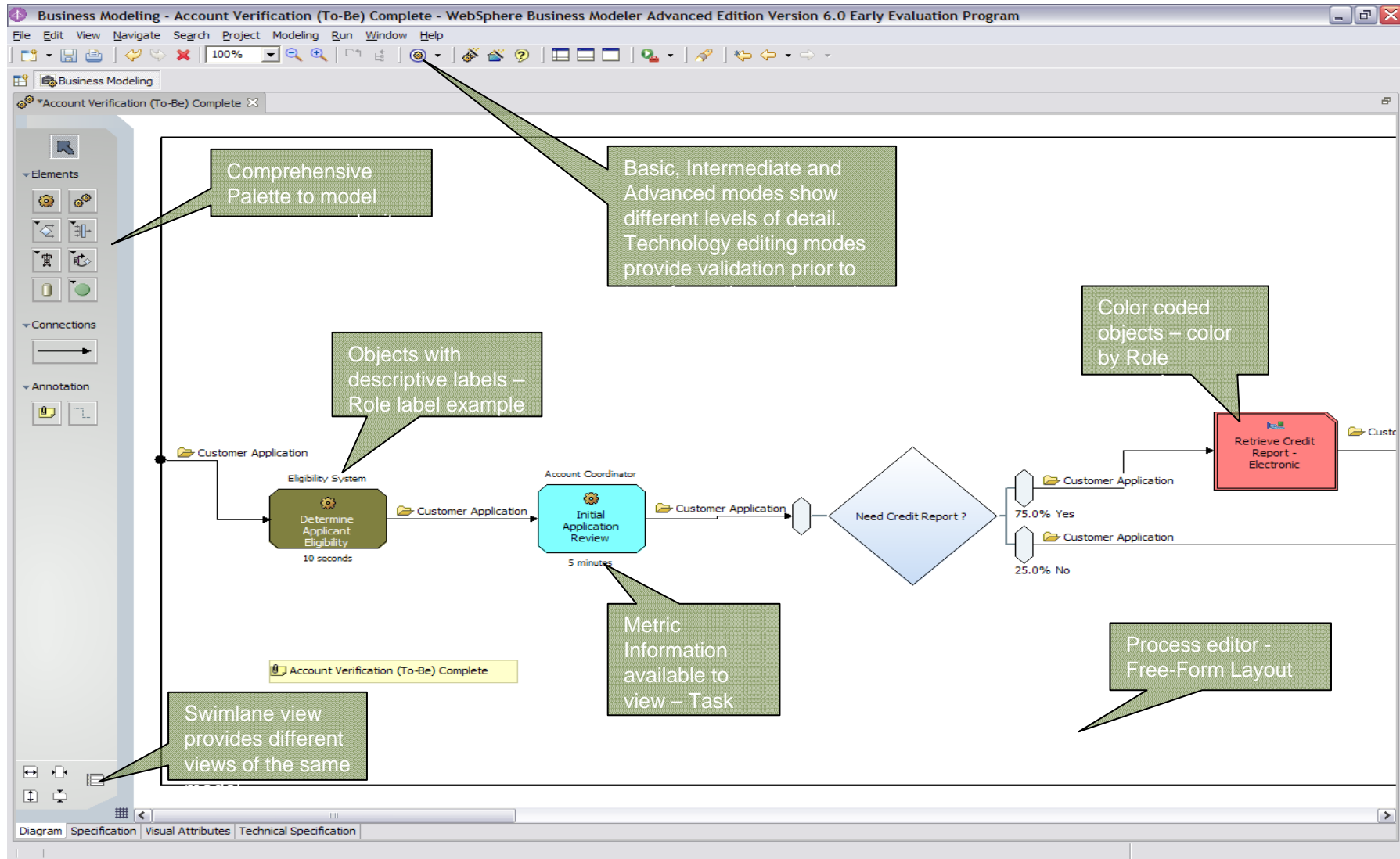
The Organization Model

- Defines the structure of organization units and locations
- Graphical organization trees allow for visibility into what the relationship between the organizations and the resources are in order to view hand-offs

Attributes of the organization units can be either user defined or adhere to the definitions of a specific runtime

Organization structures shows relationships between organization units and locations

The Business Measures (Observation) Model

Icons are added automatically showing Triggers, Metrics, Timers, Counters and KPIs, etc. as they are added to the model.

Observation Model

Business Measures, KPIs and their Attributes

SOA-Based Business Assembly and Execution

- Business Process Choreography orchestrates services to form *deployable* processes:
  - *Process model based on WS-BPEL*
  - *Choreography includes automated and human based services, business rules, service invocations and control of flow aspects*
  - *Processes support transactions and compensation*

- Service consumers can initiate as well as create SOA-based process solutions

- Mediation creation to transform/route service requests and responses

- Enables inter and intra-enterprise (B2B) service integration over the ESB framework
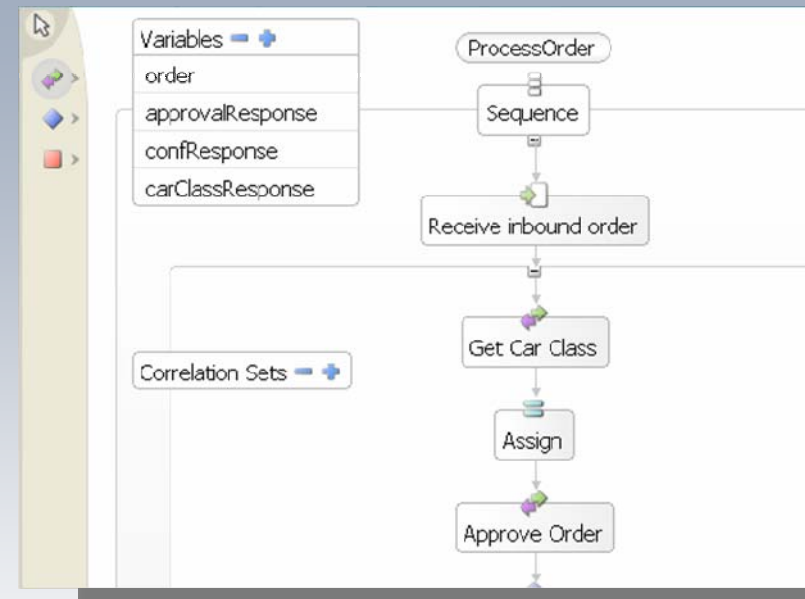
Architectural Benefit:
  - Simplified, standards-based business process development
  - Support for industry process and data models
  - Directly invoke mediations for routing/transforming requests between services

Developing the Process Model
Completing the "Account Open" Process Model

Design and Simulation of the "Account Open" Business Process Model

Collaborative Development of the "Account Open" Business Process Model

III. Programming Models for Business Process Realization (Assembly)

BPEL (Business Process Execution Language)

- Business Process Execution Language (or BPEL), is a business process modeling language that is executable. It is serialized in XML and aims to enable programming in the large. The concepts of programming in the large and programming in the small distinguish between two aspects of writing the type of long-running asynchronous processes that one typically sees in business processes.

- Industry standard (OASIS) for web services choreography that allows the assembly of process definitions and (web) services

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What is BPEL (Business Process Execution Language)

- Use the specification of a Business process
- Assemble the process and (web) services

As Web Services

Orchestrating Web services

WSDL
Port Type &
Operation
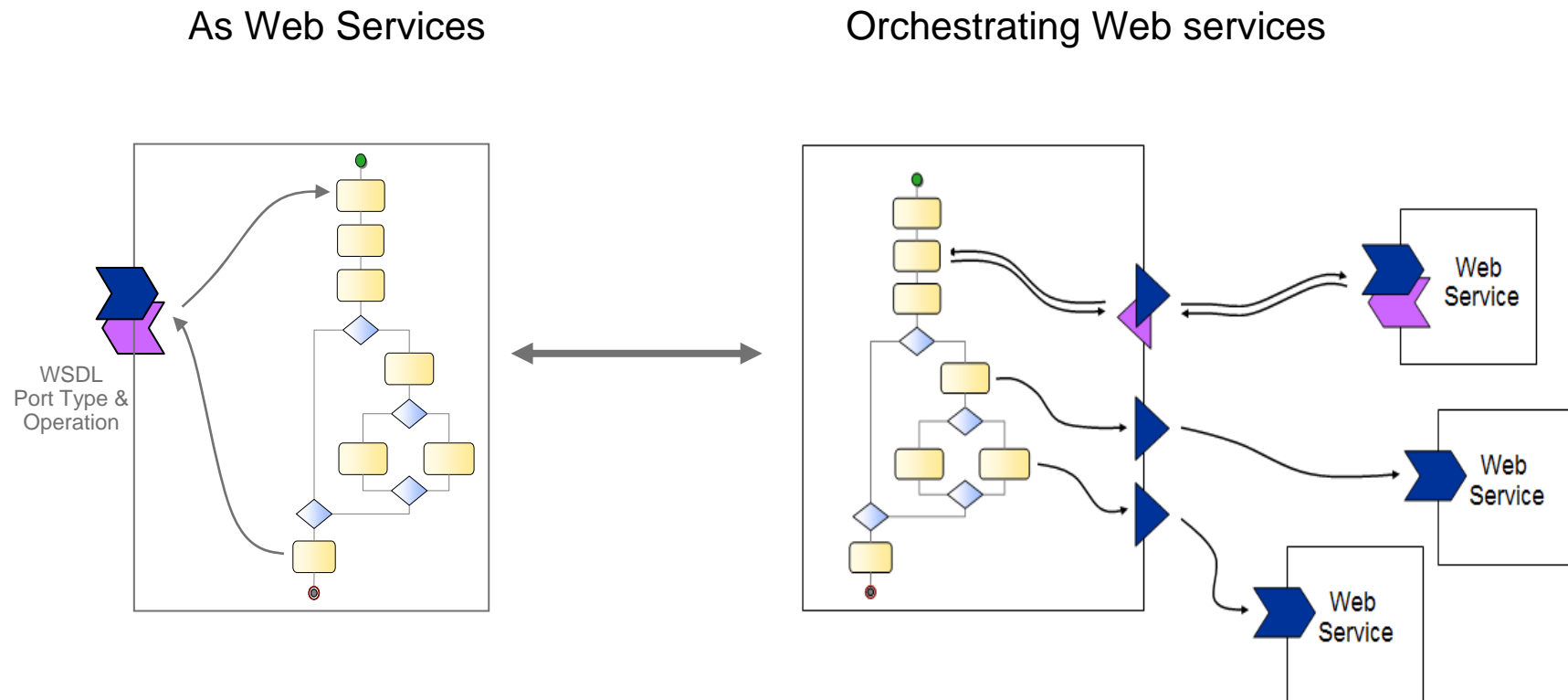
BPEL Activities

- Interact with people, other processes, business partners and services

Receive Data	Send Data	Invoke Operation	Wait for 1 out of n Events	Human Interaction

- Process-internal tasks

No-Op	Wait	Update Variables	Execute Java code *	Terminate/ Exit	Signal an Error	Handle an Error

- Define the control flow

Parallel Tasks	Sequential Tasks	Synchronize Tasks	Switch/ If	Loop

*   BPEL 2.0

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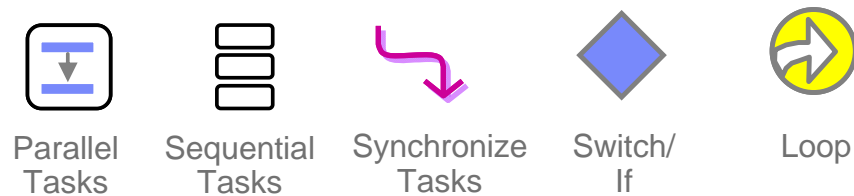
WS-BPEL Business Process: Microflows and Macroflows
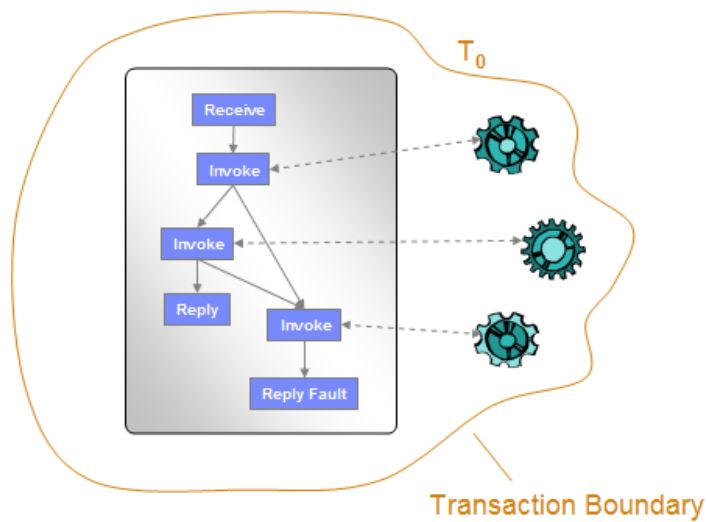
Microflows
One Transaction
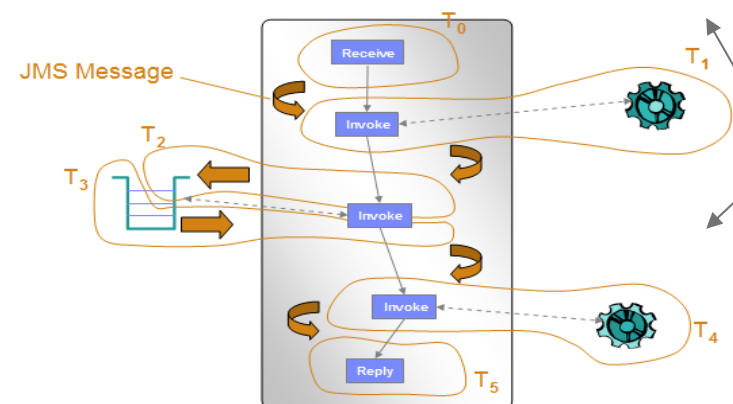
Macroflows
Multiple Transactions
And compensation transactions

BPEL Business Process: Compensation
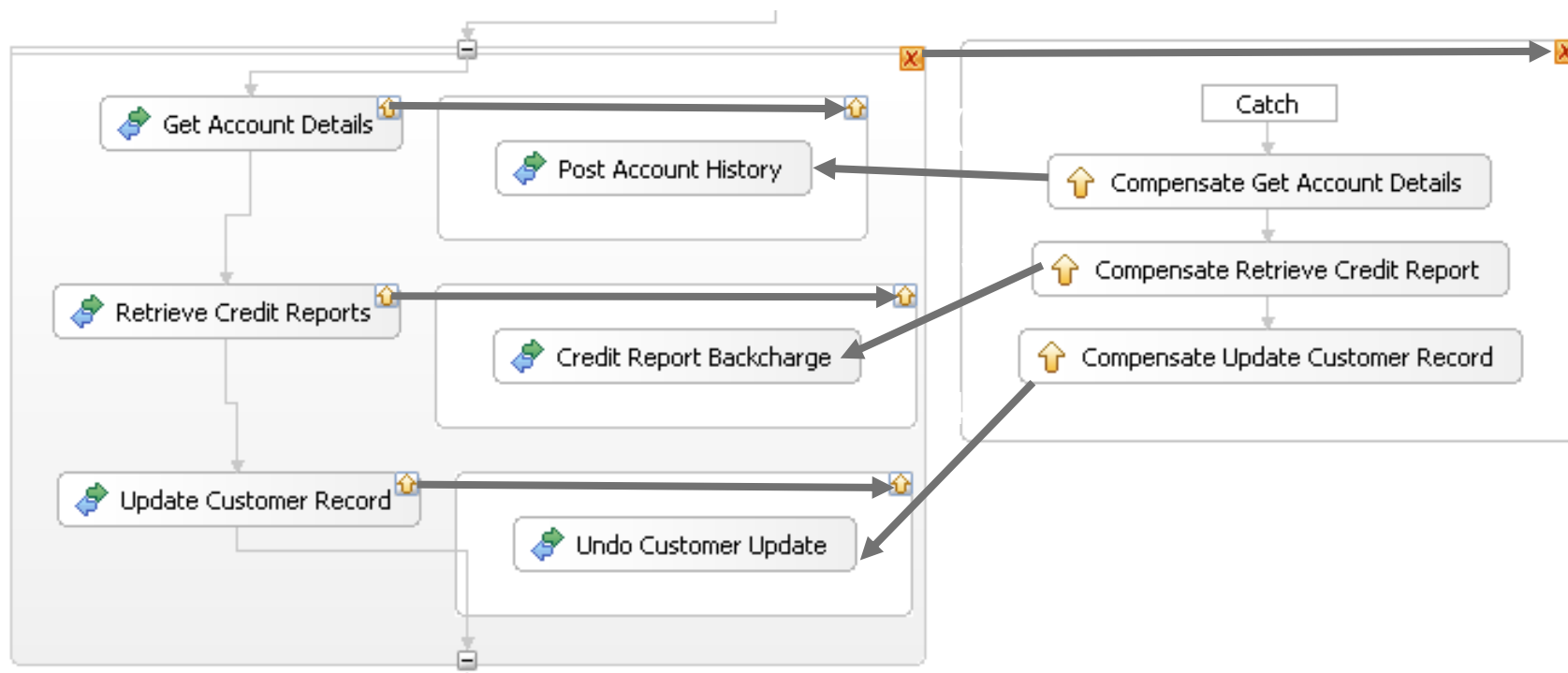
Working with BPEL through Graphical Editor (Eclipse Environment)

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Service Orchestration Assembly using Visual Tools for building Components

Defining human tasks

Human Task Editor

Assemble Service Components

Assembly Editor
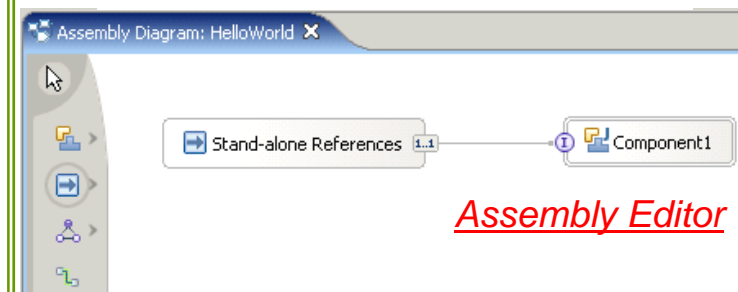
Defining business rules

Decision Table Editor
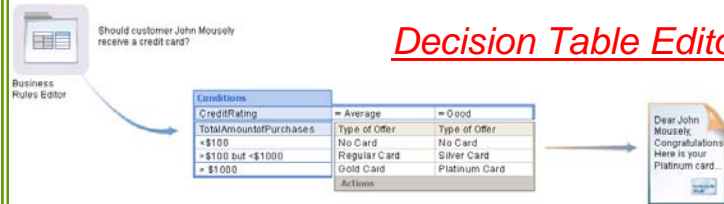
Creating Business Processes

BPEL Editor

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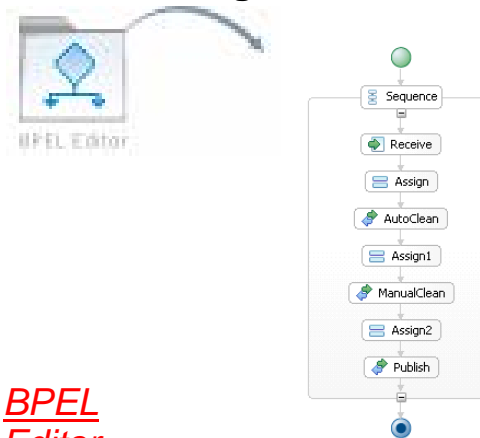
SCA (Service Component Architecture)

- **Service Component Architecture** (**SCA**) is a relatively new initiative advocated by major vendors of **Java EE** technology. Its proponents claim it is more natively suited for the delivery of applications that conform with the principles of service-oriented architecture. As such, SCA components are supposedly more **technologically agnostic**. (Wikipedia)

- SCA helps to define mediations in an ESB (Enterprise Service Bus)
  - **Modules** contain "wired" **Service Components**
  - Service Components use Business Objects/Service Data Objects for data
  - Modules have **port** to provide binding to other components
  - **Solutions** are a collections of Modules

SCA Programming Model

- Developer does NOT need to work about low level binding details or to provide code to support this function

Wires   Interfaces   References   Business Object
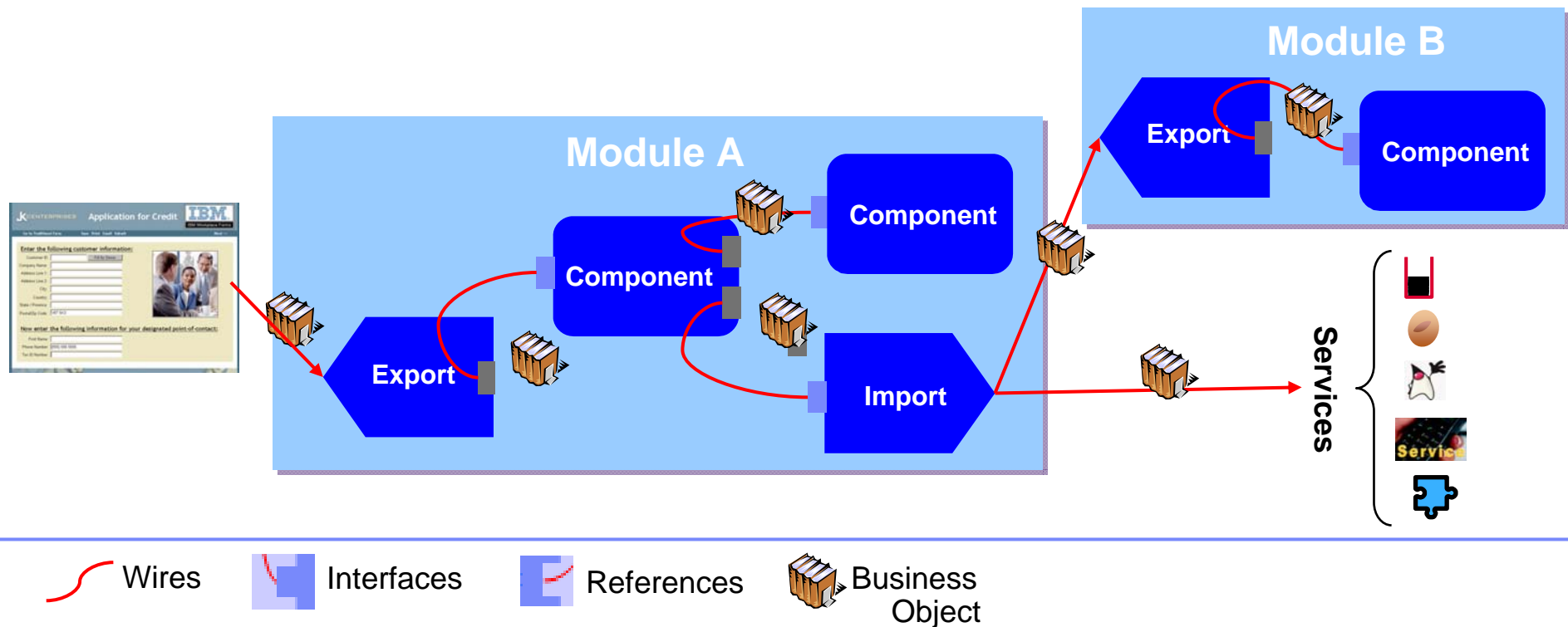
Using Modules for Encapsulation and Reuse
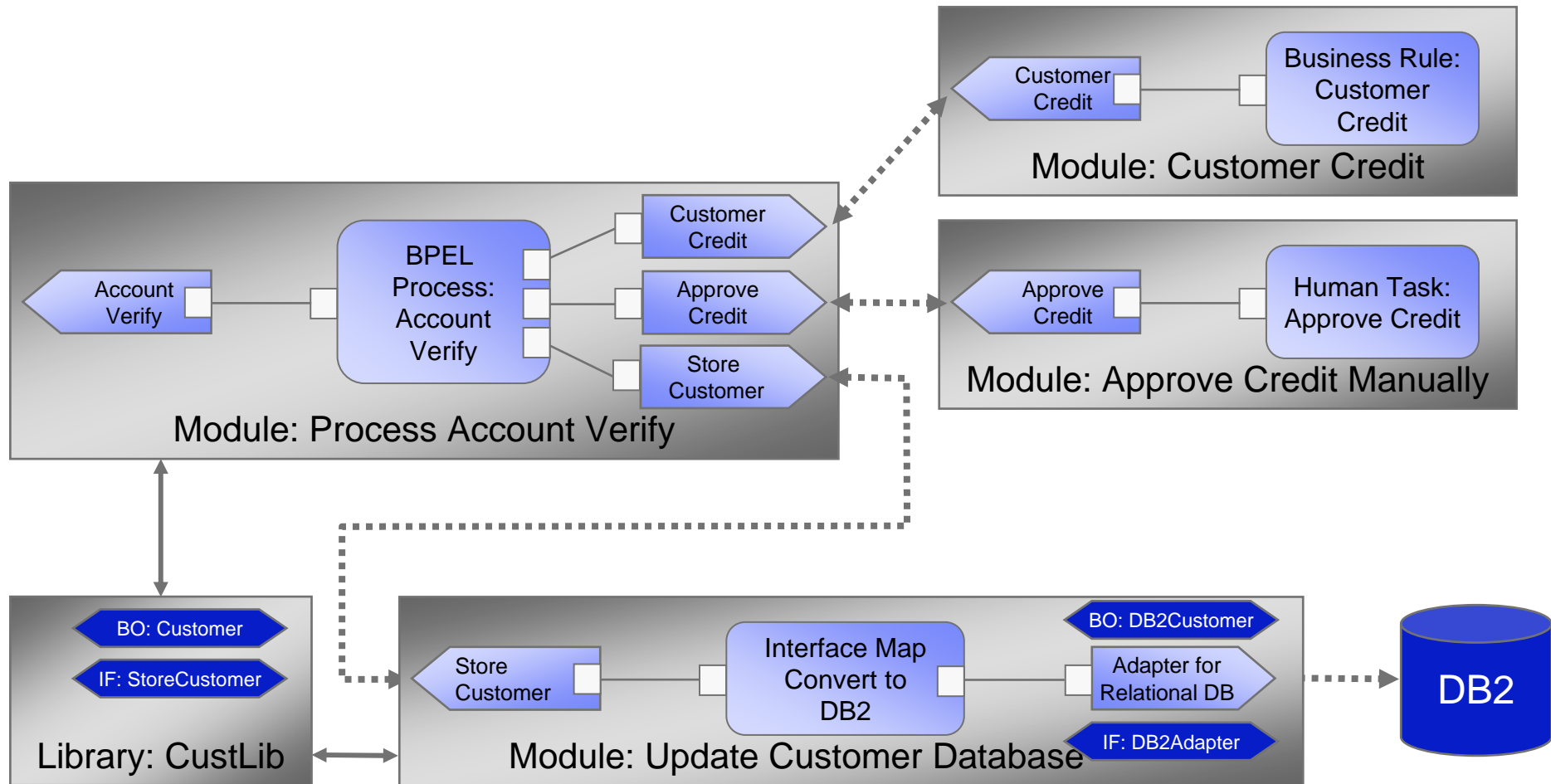
Using Modules for Encapsulation and Reuse – Change of Storing order (now SAP instead of DB2)
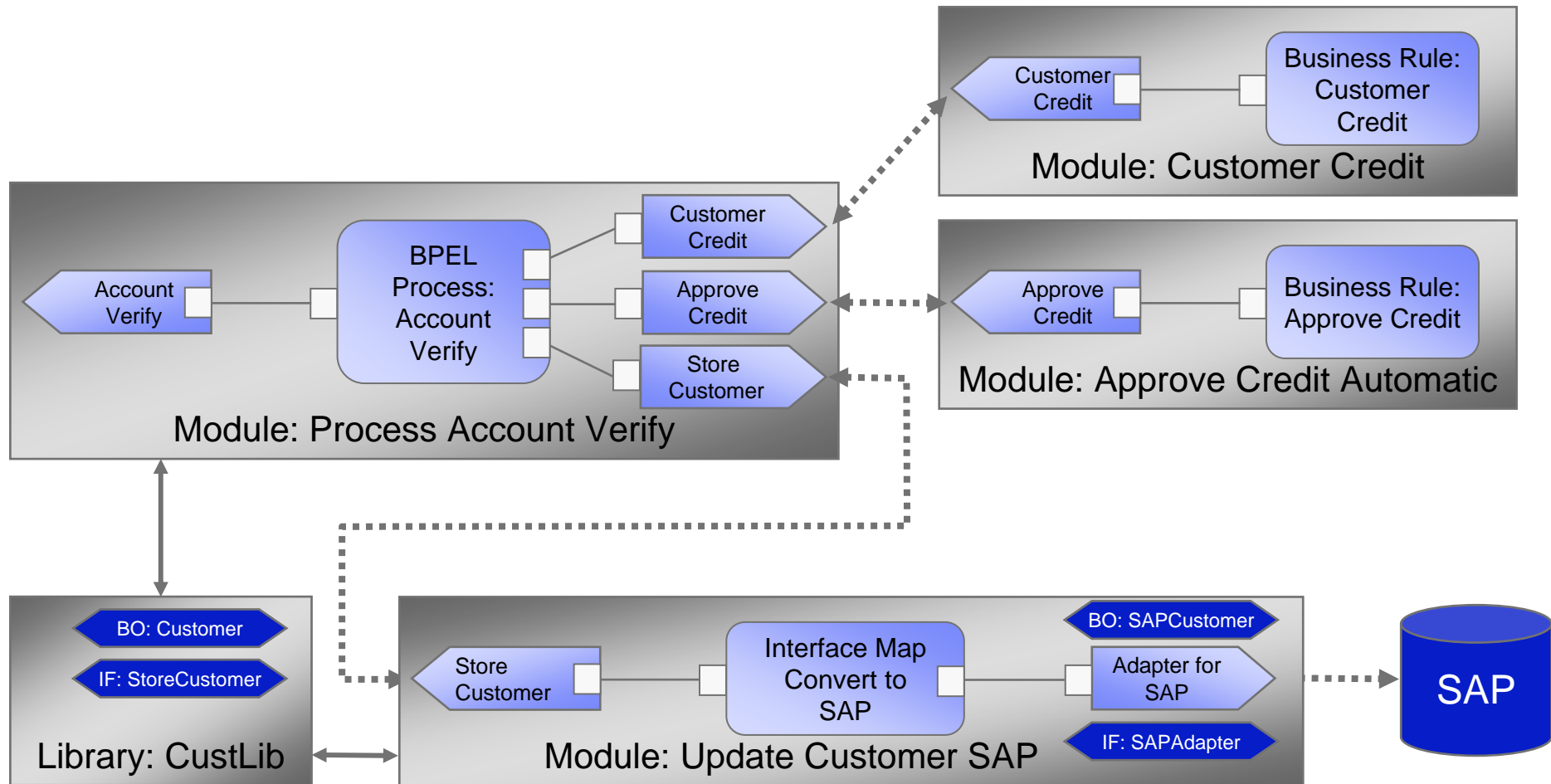
IV: Business Driven Development (BDD)

Enablement of Business Integration

- Business and IT are no longer separate tracks
- Choreography of services
  - The sequencing, selection, and execution of operations

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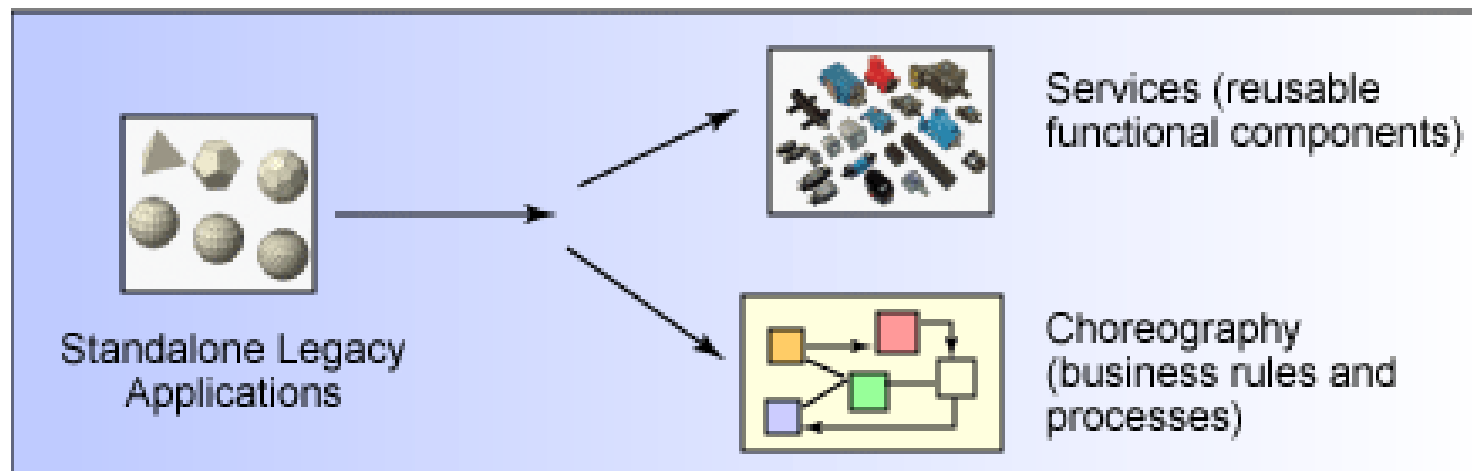
BDD Overview (including Legacy Applications)

Legacy application

BA Requirements

BA Use Cases

IT

IT Interface Specification

BA Business Process Model and Story Board

IT Services (reusable functional components)

BA IT Choreography (business rules and processes)

IT WSDL **Service Specification**

IT New Application
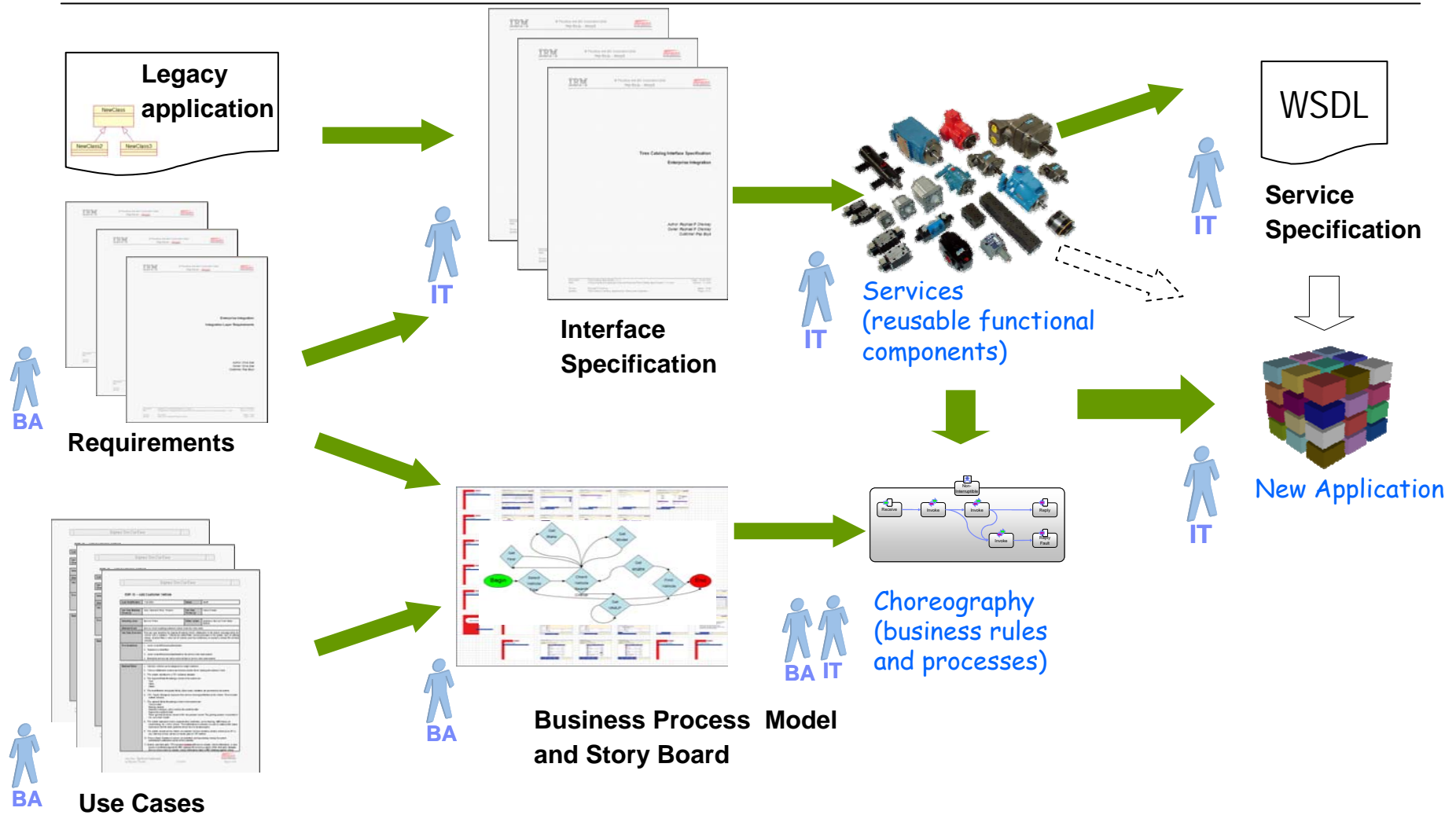
Roles to be taken within a Development Process

Analyst	**Architect**	**Developer**	**Tester**	**Deployment Manager**
Model, simulate, assemble, and monitor processes	Visually model applications and data	Construct, transform, integrate and generate code	Design, create, and execute tests	Provision, configure, tune and troubleshoot applications

Project Manager

- Follow a common process
- Manage and measure projects and portfolios
- Manage requirements
- Manage change and assets
- Manage quality

Executive

- Align investments with business objectives
- Analyze and monitor project portfolios

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Business Process Development Life Cycle Tools

Process
Requirements

Process Modeling

J2EE/Java
Services

Composite
App Devt/Assembly

Existing
Components

Participate

Process Execution/Choreography

Optimize

Manage
Execution

Monitor

Analysis
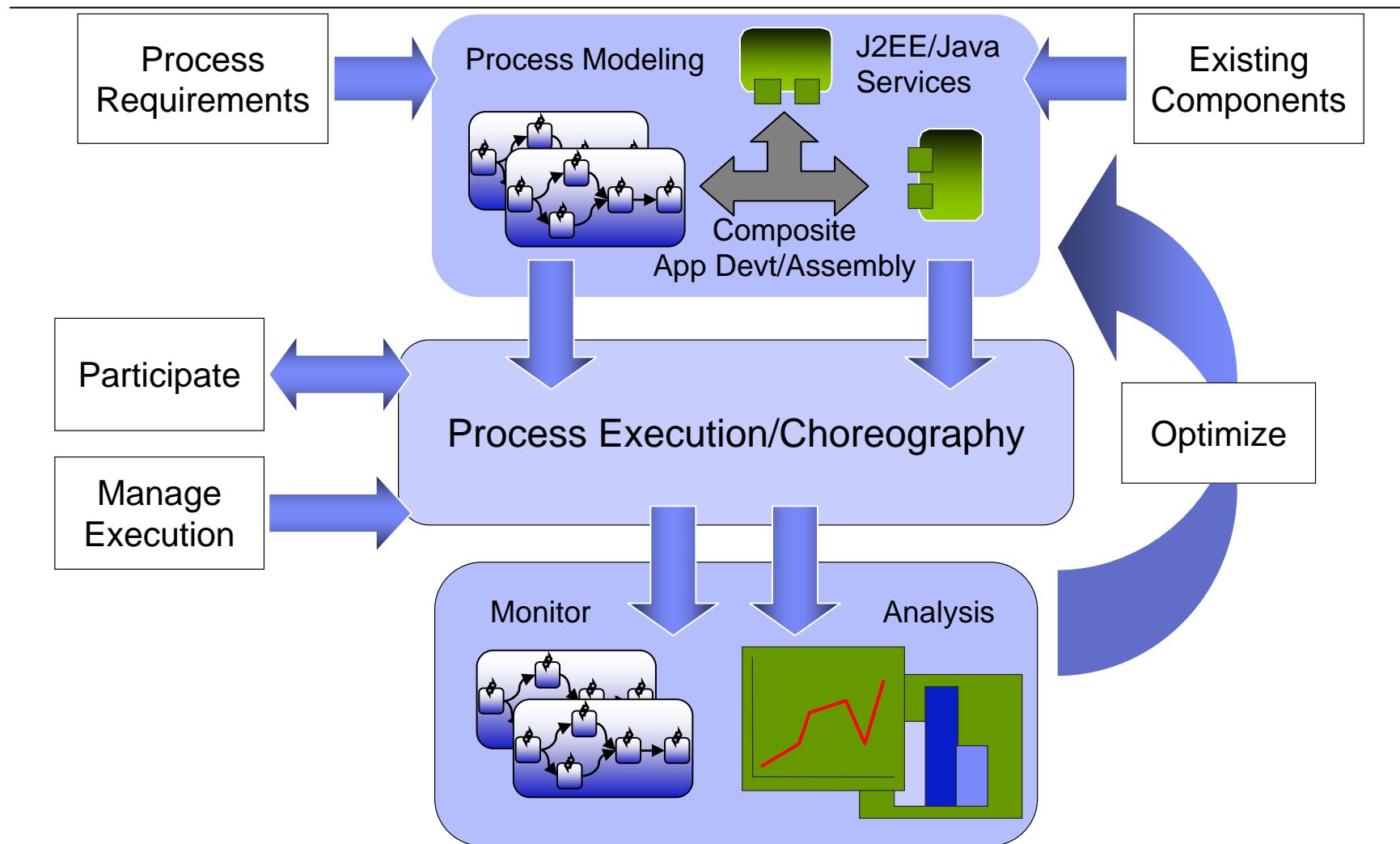
Areas for Business Driven Development

Rational RequisitePro

Rational Portfolio Manager

Executive

Project Manager

WebSphere Business Modeler

Business Analyst

WebSphere Integration Developer

Integration Developer

Rational Software Architect

Rational Functional & Performance Tester

Tester

Runtime
- **WebSphere Process Server**
- **WebSphere Portal**
- **WebSphere Business Monitor**

Architect

Java Developer

Portal Developer

IBM Rational Team Unifying Platform

BDD Details 1 – Governance & Capturing Requirements

- Prioritize proposed, existing and under-construction services based on business priority, risk and return
- Track service level financials
- Provide deep insight into SOA development
- Manage SOA project-team dependencies
- Forecast demand for service creation and updates
- Understand the cost of SOA creation, operations and maintenance

Rational Portfolio Manager

CIO

Project Manager

Understand Risk, Project Costs, and ROI

Identify and Manage Projects and Resources
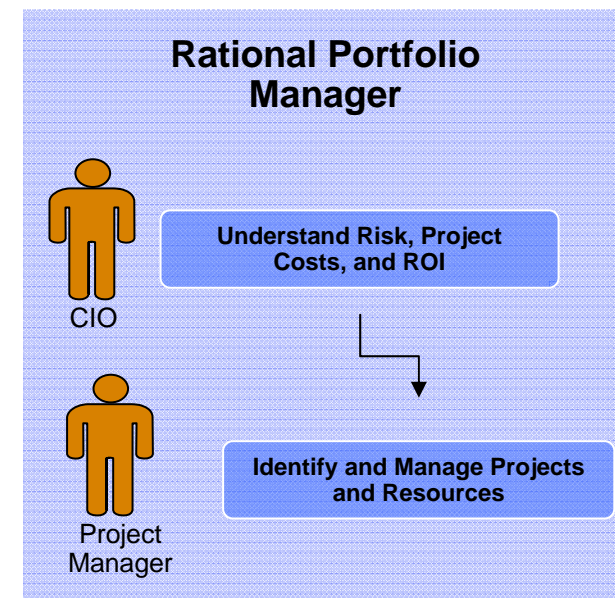
BDD Details 2 – Modeling Business Processes

- Discover and design key business processes

- Capture business data items exchanged between processes & tasks

- Assign tasks to roles that are responsible for their performance.

- Determine and allocate required resources

- Model the business organization & roles organizational units can play

- Determination of any other process/tasks (services) that must be provided by others

Create, Simulate & Analyze As-Is Business Model

Create Observation Model with KPIs & export to Monitor

Create, Simulate, Analyze and Optimize To-Be Business Model

Business Analyst

Create Financial Reports & ROI Estimates

WebSphere Business Modeler
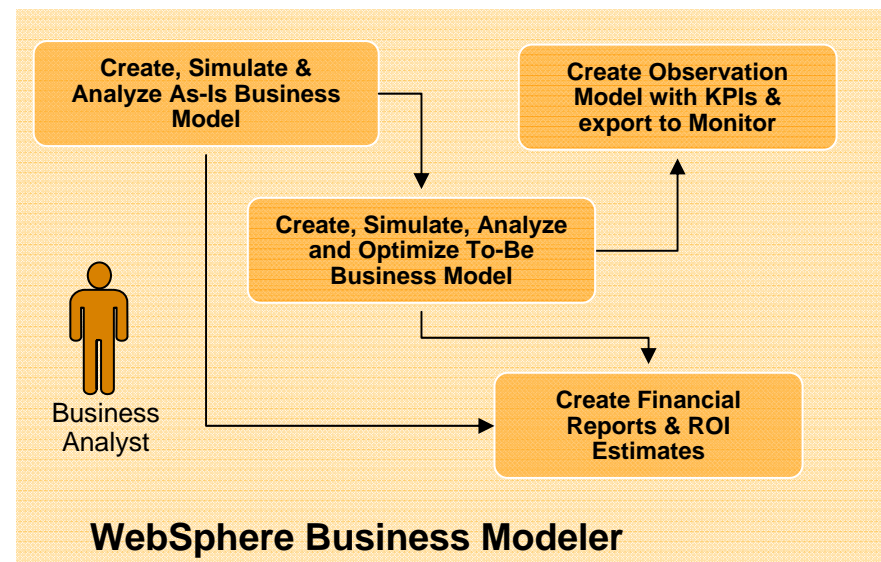
BDD Details 3 – Designing Services

- Architecture and design for service implementations

- Trace enterprise requirements to business processes and service implementations

- Define detailed system requirements or service implementations

- Modeling and architectural specification of services (using UML2)

- Discover and consume existing services

Rational Software Architect

Create & Manage System Requirements

Trace Requirements & Create System Use Case Realizations

Model Services and Service Architectures

Architect
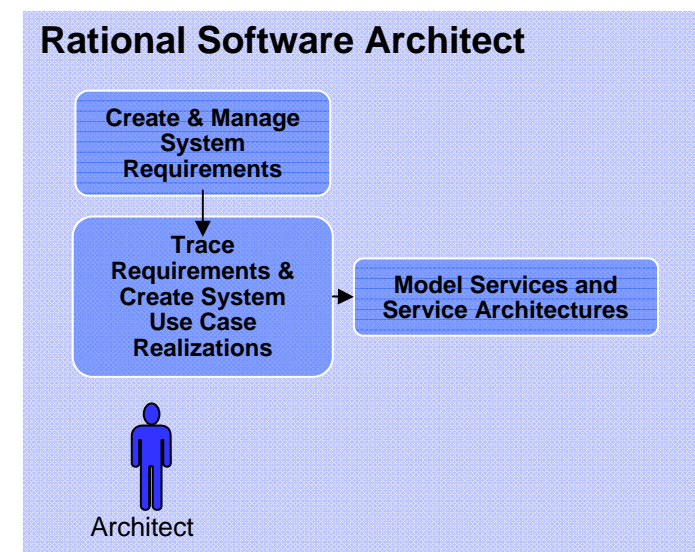
BDD Details 4 – Construct and Test the Services

- Build new services from scratch or enable existing applications for services
- Discover and consume existing services
- Test functionality
- Test performance
- Team development and life cycle integrations

Rational Functional & Performance Tester

Test

Tester

Implement Services, & expose as Web Services → Develop Portlets (App UI and Monitor)

Rational Application Developer

Java Developer

Portal Developer
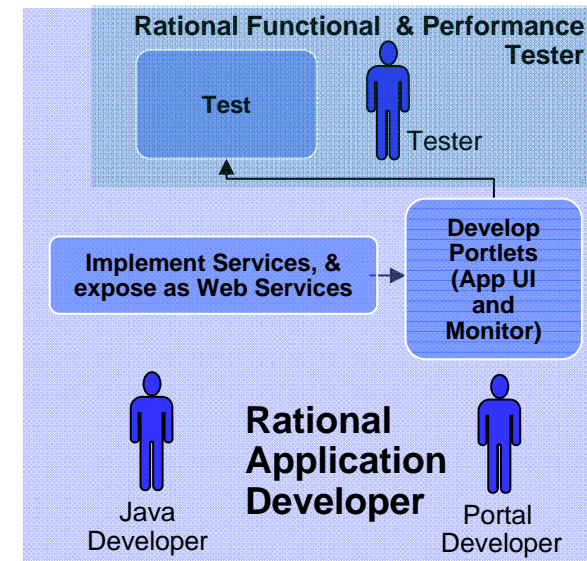
BDD Details 5 – Implementing Business Processes

- **Implement business processes designed by Business Analysts using BPEL**
  - Plug in Services
  - Plug in Human Activities (Staff)
- **Composition with services**
- **Deploy and test**
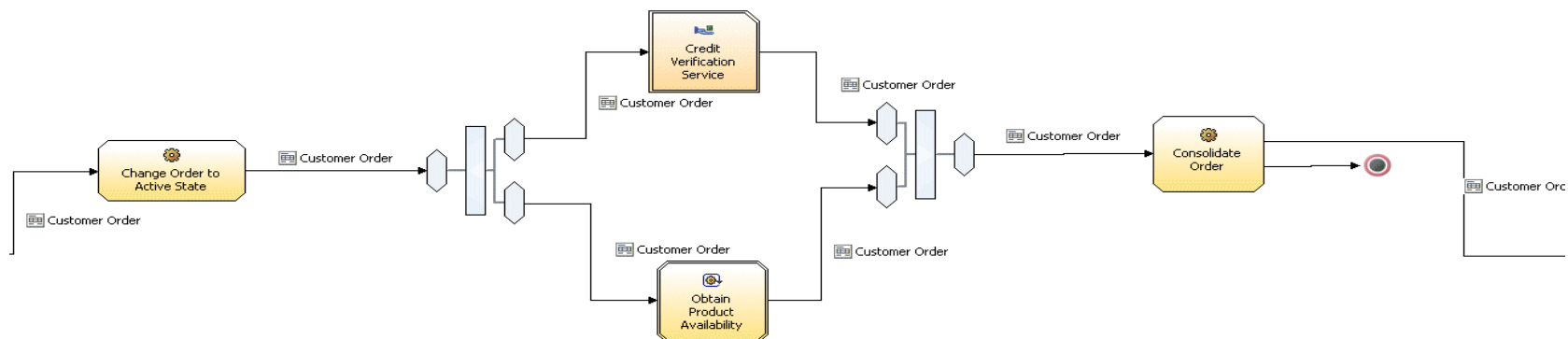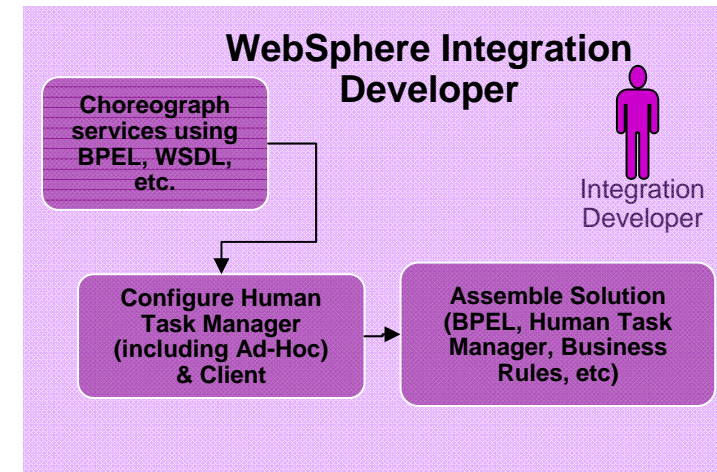
Big Picture of BDD for SOA

Rational RequisitePro

Rational Portfolio Manager

CIO

Understand Risk, Project Costs, and ROI

Project Manager

Identify and Manage Projects and Resources

WebSphere Business Modeler

Business Analyst

Create, Simulate & Analyze As-Is Business Model

Create, Simulate, Analyze and Optimize To-Be Business Model

Create Observation Model with KPIs & export to Monitor

Create Financial Reports & ROI Estimates

Run-time Statistics

Business Measures

WebSphere Integration Developer

Choreograph services using BPEL, WSDL, etc.

BPEL WSDL

Configure Human Task Manager (including Ad-Hoc) & Client

Assemble Solution (BPEL, Human Task Manager, Business Rules, etc)

UML

WSDL EAR

Rational Functional & Performance Tester

Tester

Test

Create & Manage System Requirements

Trace Requirements & Create System Use Case Realizations

Model & Implement Services (i.e. Web Services) and Application

If required develop Portlets

Runtime
WebSphere Process Server
WebSphere Portal
WebSphere Business Monitor

Deploy/Run

Business Operations Analyst

WSDL EAR

Monitor

DBA

Rational Software Architect

Architect

Java Developer

Portal Developer

IBM Rational Team Unifying Platform

V. Business Process Management – from end-to-end

Business Process Management

BPM is:

A discipline combining **software** capabilities and business **expertise** to **accelerate process improvement** and facilitate business innovation

BPM Solves:

1 Process aren't documented

2 Bottlenecks prevent efficiency

3 Limited visibility into performance

4 Complex integration across multiple processes

5 Process change is cumbersome

6 KPIs not defined
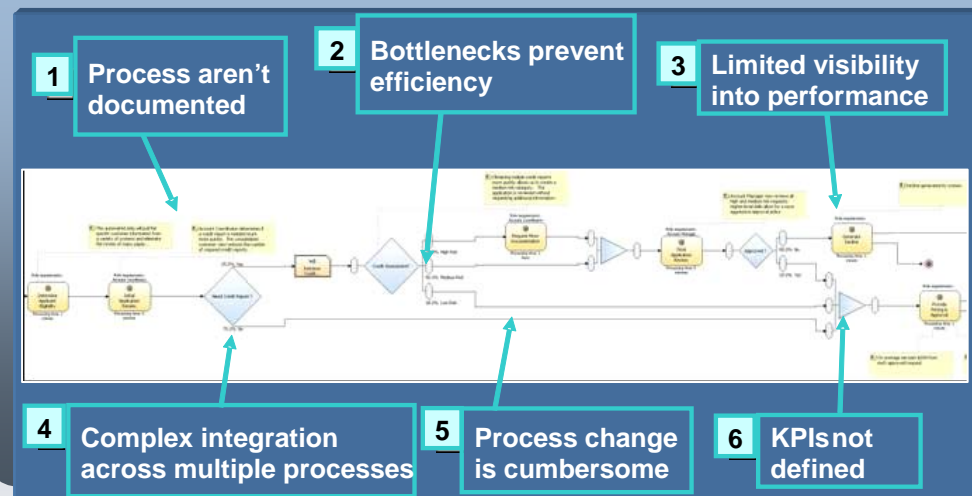
BPM Includes:

Integration   *Modeling*   *Monitoring*

Software that Enables BPM

Forms   *SOA*   *Workflow*

Models and Maps   *Process Knowledge*

Expertise that Delivers BPM

Policies   *Rules*   *Methodology*

Managing Your Business Processes

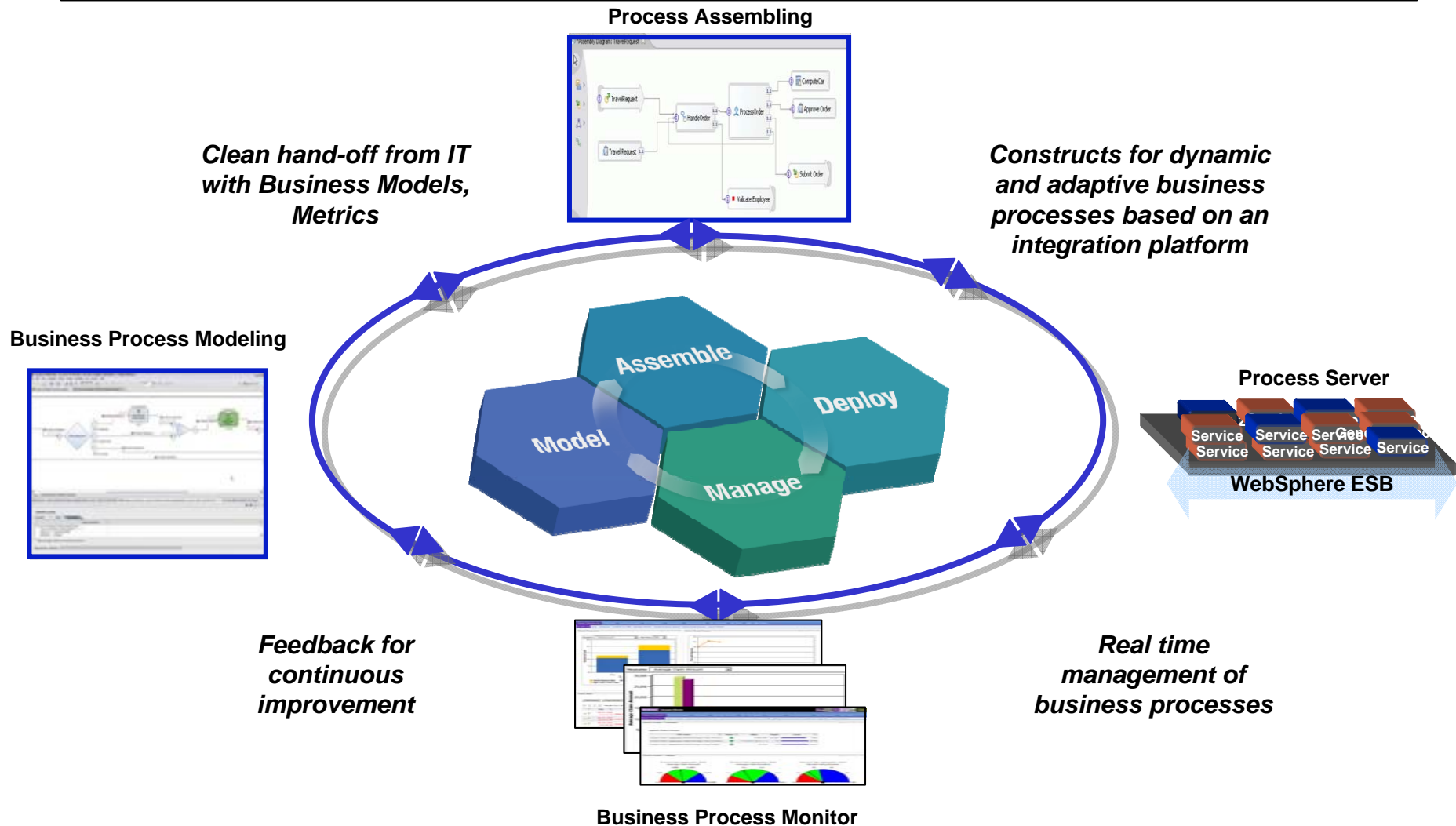**Process Assembling**

Clean hand-off from IT with Business Models, Metrics

Constructs for dynamic and adaptive business processes based on an integration platform

Business Process Modeling

Process Server

Service Service Service Service
Service Service Service Service

WebSphere ESB

Assemble

Deploy

Model

Manage

Feedback for continuous improvement

Real time management of business processes

Business Process Monitor

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The End-to-end Account Opening Solution

People

Information

Process

Internet/ Intranet Portal

Account History Service

Customer ▶ **Account History** ▶ Customer Orders

Account Opening Service

Customer Application ▶ **Account Status** ▶ Customer Application

Account Info Service

Customer ▶ **Account Info** ▶ Customer Account

Account Open Process

Receive Request

Credit Policy

Check Application

Create Account

Confirm Account

Building User Interaction Services

Developing and Deploying the "New Account" Application

Building Role-Specific Portlets and Dashboards

Deploying the Solution Architecture
Implementation Topology for JK Enterprises
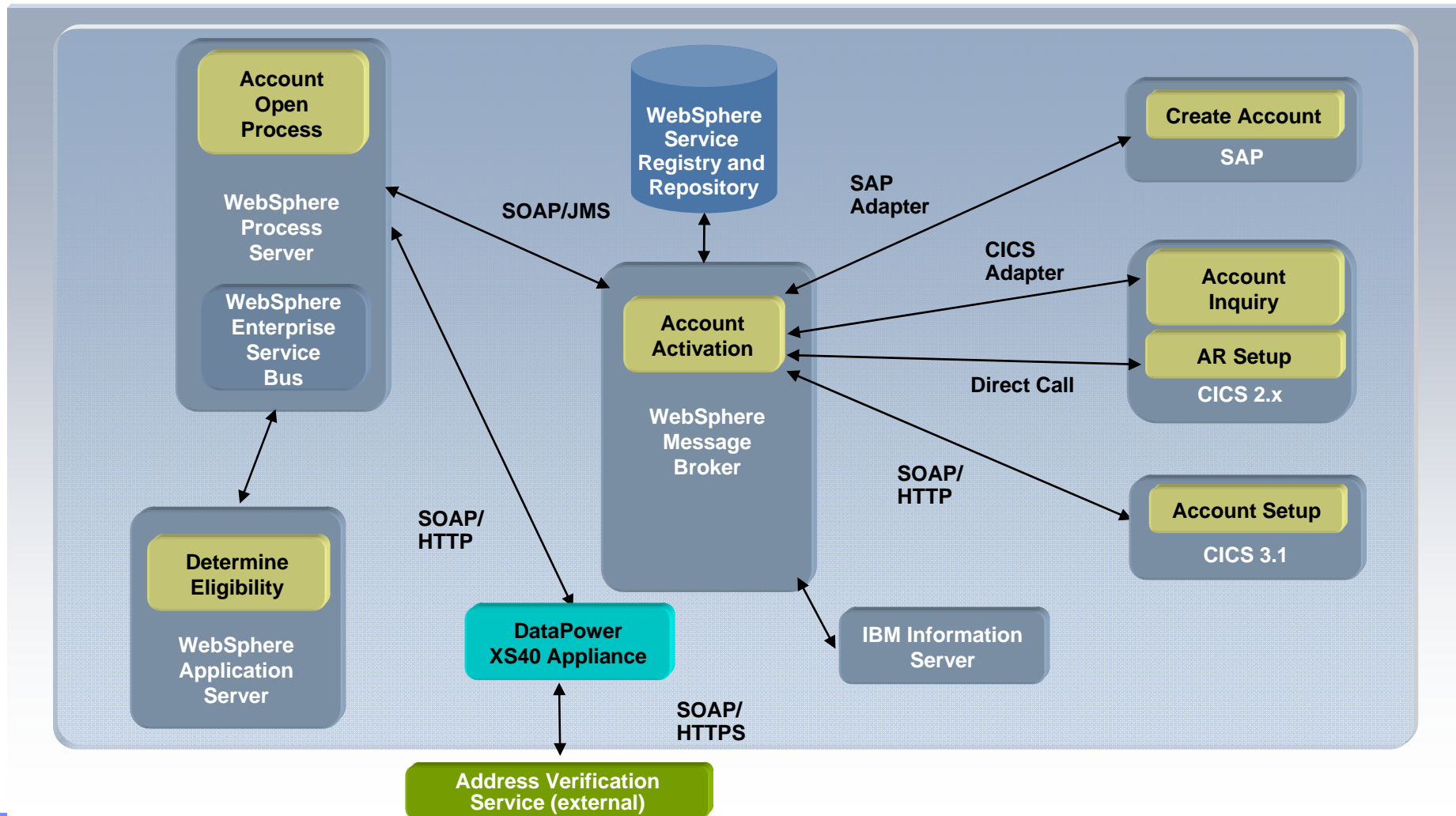
Overview Service Management

What's happening with the infrastructure?

- Infrastructure and application discovery
- Server monitoring
- Storage monitoring
- Network monitoring
- Data monitoring
- Application monitoring
- Service monitoring

How does this relate to the business service?

- Dashboard
- Application dependency mapping
- Business service management
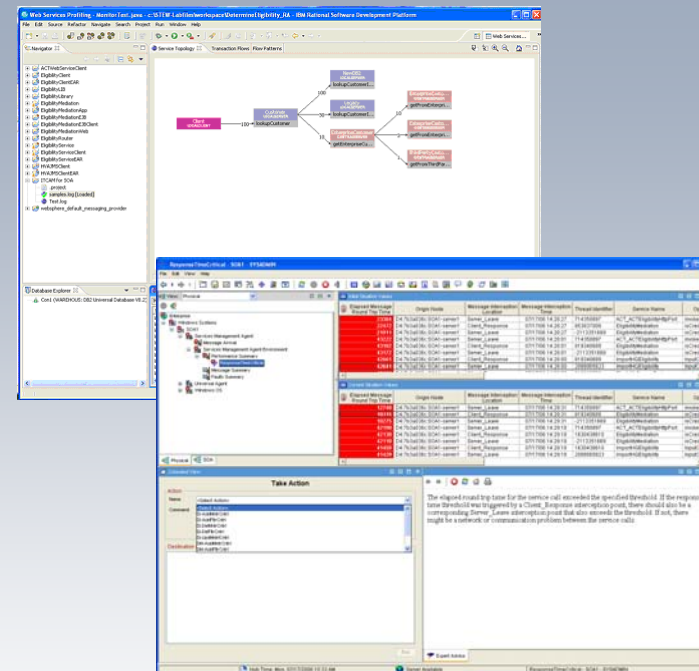- Service level management

What actions do we take?

- System reconfiguration
- Data restore
- User identity provisioning
- System and application restart
- Infrastructure deployment
- Service mediation

Infrastructure Architecture
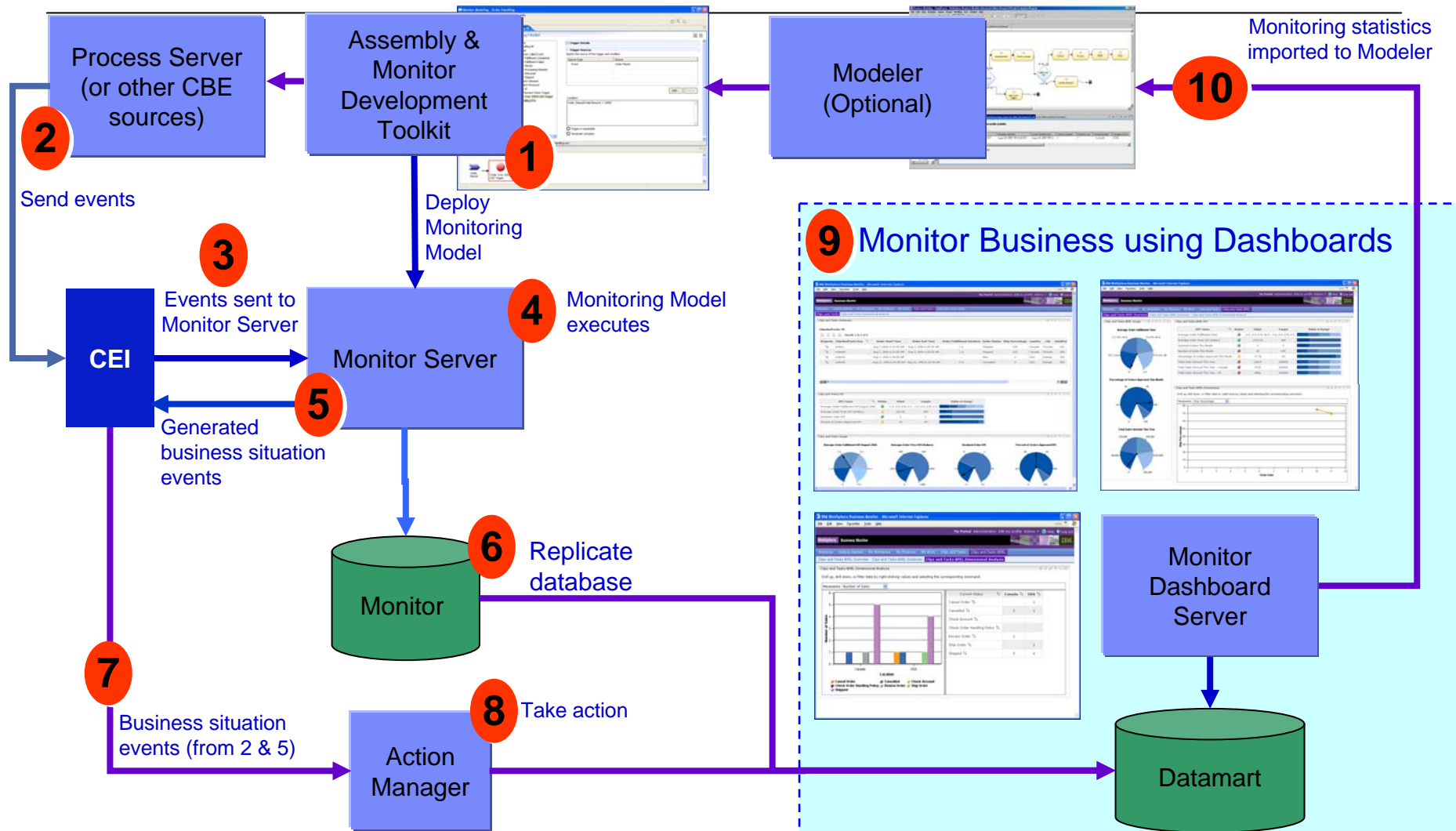# Composite Application Management
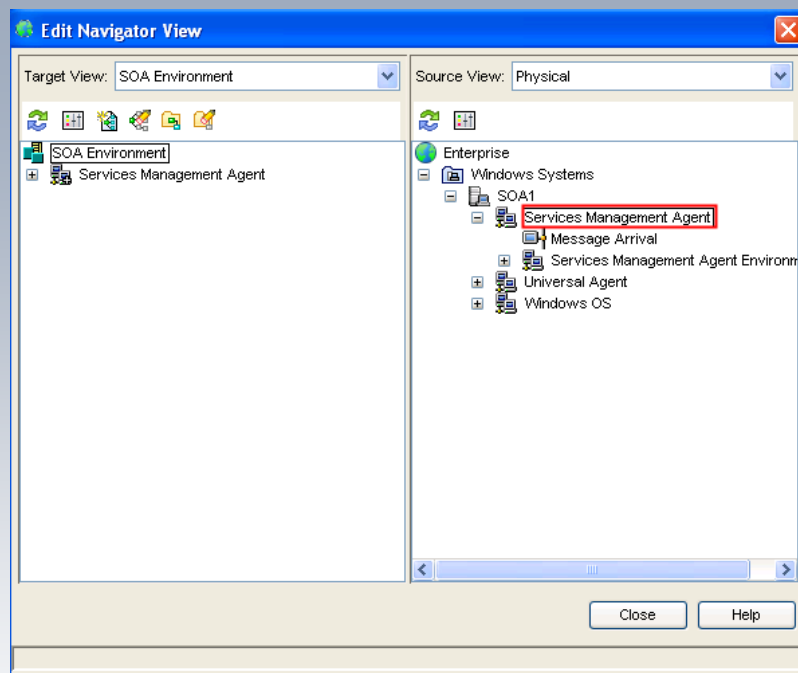
Configuring Service Management Agents

Monitoring Account Opening Performance and Availability

Logical Architecture for Business Activity Monitoring

Process Server (or other CBE sources)

Assembly & Monitor Development Toolkit

Modeler (Optional)

Monitoring statistics imported to Modeler

10

1

2

Send events

3

Deploy Monitoring Model

Events sent to Monitor Server

CEI

Monitor Server

4 Monitoring Model executes

5

9 Monitor Business using Dashboards

Generated business situation events

6 Replicate database

Monitor

7

Monitor Dashboard Server

Business situation events (from 2 & 5)

8 Take action

Action Manager

Datamart

Integrated Visibility of SOA Resources

Integrated Console

Service Consumer

Service Provider

Consume

Business
Composition
business sta

Services
atomic and

Service C

Operation

Service Management

Application Monitoring

Resource Monitoring

Resource Monitoring

Transaction Tracking

Integrated Reporting

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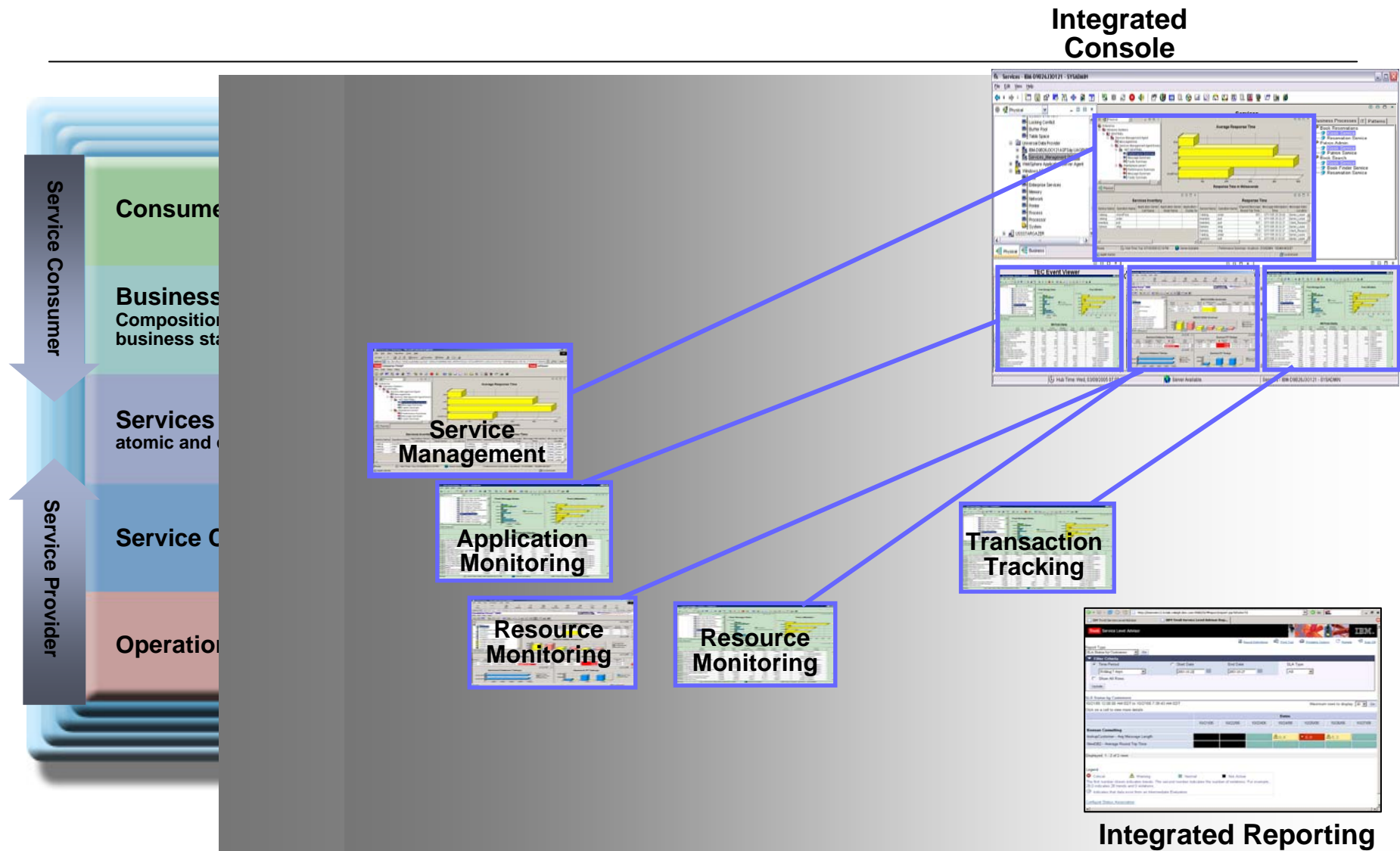
Process Monitoring and Management
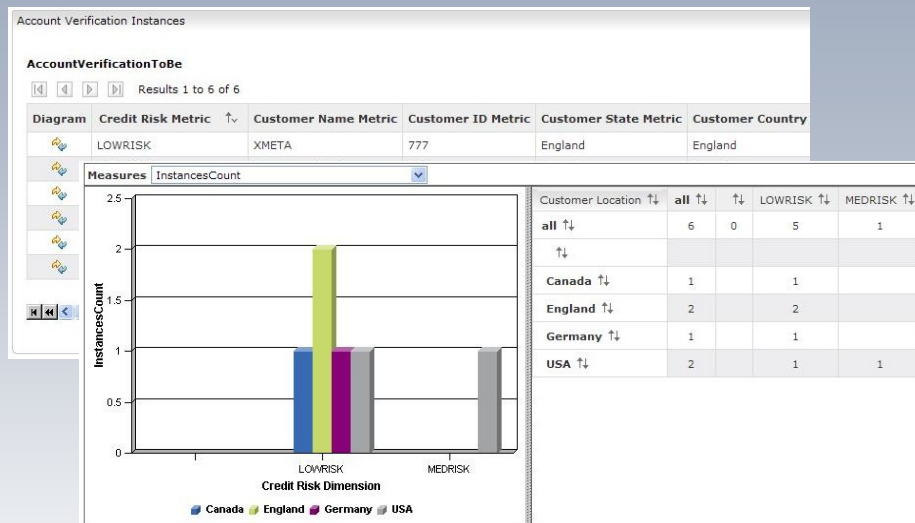
Monitoring Credit Risk

*Building Components to
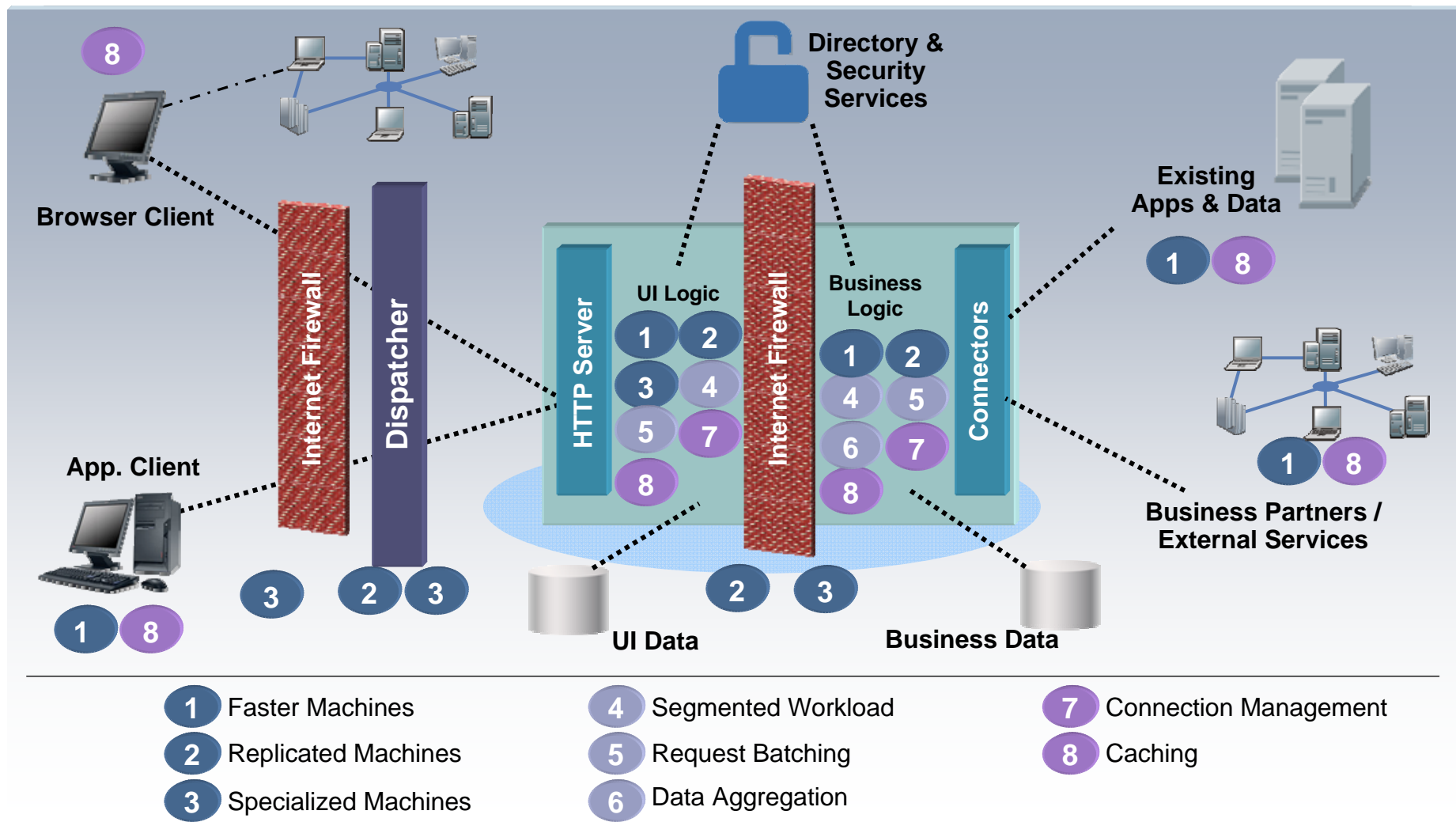Monitor Account Opening Duration*

A Representative Dashboard Solution

High Availability in the SOA World

- **An application may exist on multiple servers in different locations**
  - Applications need to be "availability" aware in case a service within the workflow is unavailable

- **SOA applications impact service availability levels**
  - SOA introduce new application dependencies, including externally provided services
  - Need to understand the end-to-end view

- **Monitoring, management and reporting is required to achieve predictable availability in an SOA environment**

- **Plan for the unexpected**
  - What are the non-functional requirements? What systems are you using? Distributed? Mainframe? Where are they located? How will they be accessed?
  - The more components in the transaction, the greater the risks for failure or human error

Techniques for High Availability and Scalability

1	Faster Machines	**4**	Segmented Workload	**7**	Connection Management
2	Replicated Machines	**5**	Request Batching	**8**	Caching
3	Specialized Machines	**6**	Data Aggregation		

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Closing Remark