Model and Assemble: Business Driven Development

From Business Objectives to Deployed SOA Solutions
Agenda

- Business Driven Development
  - A development process for deriving solutions from business objectives

- Software Development Platform for BDD and SOA

- Capture Business Goals and Objectives

- Analyze Business Processes to realize Business Goals

- Architect a Services Solution

- Assemble, Deploy & Test

- Summary
Complexity is Forcing Change

Actual Application Architecture for Consumer Electronics Company
The Business and IT have to address similar concerns

Innovating the business to capture new value.

- Complexity Management
- Respond to dynamic change
- Modularity
- Encapsulation
- Separation of concerns
- Deferred commitment
- Composition
- Adaptability
- Reuse

Improving the productivity of resources deployed.
Development process can bridge the gap

*Pave the Way for Successful Business Innovation*

- Drive development processes and delivered solutions from business goals and objectives
- Standards (including open source) for interoperability
- Model Driven Architecture (MDA)
- Self-defined, loosely coupled interfaces
- Tools to visualize and integrate existing assets
- Declarative specifications and languages
- Architecture is the key to successful business innovation
What is Business Driven Development?

**Business-driven development**
An integrated approach to software development that aligns line-of-business, development and operations teams to improve business performance

**Development as a business process**
- Align Technology and Business priorities
- Improve efficiency and responsiveness
- Create innovative products

Software development becomes a driver of competitive advantage
Three Key Concepts
To Adapt for Business Driven Development

**Business Innovation and Optimization**
--- Focus on Responsiveness and Optimization

- A monitoring and management approach that leverages integrated resources to achieve aligned, accountable, and action-oriented business operations

**Model Driven Architecture**
--- Focus on Efficiency and Quality

- A style of enterprise application development and integration based on using automated tools to build system independent models and transform them into efficient implementations.

**Service Oriented Architecture**
--- Focus on Flexibility and Reuse

- An approach for designing and implementing distributed systems that allows a tight correlation between the business model and the IT implementation
BDD enables business integration, optimization and verification

- Discover
- Construct & Test
- Compose

- Gather requirements
- Model & Simulate
- Design

- Integrate people
- Integrate processes
- Manage and integrate information

- Financial transparency
- Business/IT alignment
- Process control

- Manage applications & services
- Manage identity & compliance
- Monitor business metrics
The IBM Vision for Business Driven Development

*Business applications will be deployed, monitored and managed through the manipulation of multi-level models*

**Value:** Accurately and reliably capture and translate business intent into IT solutions
Unlock The Power Of SOA

Key Development Phases in Business Driven Development

- **Model**
  - Business Level Modeling
  - Service Oriented Modeling and Design

- **Assemble**
  - Construction of Services (User, Service, Information)
  - Assembly of services (new and existing)
  - Choreography of Services

- **End result:**
  - A deployed business process and associated services addressing business and IT concerns
BDD consists of Successive Realization

- What you are trying to accomplish, not how. Includes KPIs to measure achievement.
- Capture business requirements that realize goals and objectives from the perspective of key stakeholders in business use cases.
- Model as-is and to-be business processes that realize the business requirements. Use simulation to measure KPIs and verify business goals are met.
- Design a system architecture that realizes the business processes while addressing IT and QoS concerns captured in system use cases. View the business processes as business services models. Capture system use cases to specify implementation requirements.
- Implement the IT services based on the chosen architecture and realizing the system use case requirements.
- Integrate new, reused, and purchased services into a completed solution.
- Design and implement a deployment strategy that meets nonfunctional requirements for performance, security, availability, maintainability, etc.
Benefits of Business Driven Development (BDD)

*Accelerate development & delivery against Business Goals*

- **More relevant results – Alignment of Business & IT**
  - Deliver Results to the Business by focusing development on the Business’ highest priority projects based on quantifiable data (ReqPro & WBIM Simulation)
- **Better results – Improve Communication b/wn Business & IT**
  - Common language, framework, tools, data, (meta-) models & integrations (WBIM, RSA, ReqPro, WSADIE)
- **Accelerated results – Reduce Development & Deployment Time**
  - Re-use & Governance: Use the tools to leverage work previously done – shared (meta-) models & integrations (WBIM, RSA, ReqPro, WSADIE)
- **Lower TCO – Quickly identify & assess the impact of Business or System components need to Change**
  - Traceability (WBIM, RSA, ReqPro)
  - Don’t solve the same problem twice
    - Discover & create re-usable solutions to common problems (patterns) (RSA)
  - Don’t recreate common req’ts, business or system components
    - Share &/or Re-use (WBIM, RSA, ReqPro)
MDA: Open standards for Modeling & Development

OMG™ Model Driven Architecture (MDA™)

- An integration of best practices in Modeling, Middleware, Metadata, and Software Architecture

- Model Driven (Models at the core - UML, MOF, CWM, BPDM, SBVR, RAS…)
  - Computation Independent Models (CIM) – Typically Conceptual and Business Models
  - Platform Independent Models (PIM) – Technology or Domain Models – can have logic/computation
  - Platform Specific Models (PSM) - J2EE, .Net, SQL
  - Mappings: PIM<>PIM, PSM<>PSM, PIM<>PSM
  - Applies across the business software life cycle

- Key Benefits
  - Improved Productivity for Architects, Designers, Developers and Administrators
  - Lower cost of Application Development and Management
  - Enhanced Portability and Interoperability
  - Business Models and Technologies evolve at their own pace on platform(s) of choice

MDA is a Standards Framework & a Open Modeling & Metadata Standards
MDA Process in a Nutshell

1. Define the Platforms
2. «datastore» Platform Model
3. Choose a Mapping
4. Mapping
5. «datastore» IT Services Model
6. Define a Solution
7. Create a Solution
8. Implementation Model
9. Generate Code
10. Test
Moving to Services-Oriented Solutions

Unlock The Power Of SOA
SOA Programming Model

- **User Interaction**
  - Dynamic support for people integration into the business design

- **Business Components**
  - Composable and reusable services

- **Information**
  - Built-in access to service state, disconnected service-data exchange, information composition and transformation

- **Composition of Business-level Applications**
  - Wired assembly of services to form business-level applications, workflows, and business orchestration

- **Invocation**
  - Loosely-coupled call-style and event-driven interconnection of services with built-in support for topology transparency, mediation, and brokering featuring standards-based interoperability

- **Design**
  - Focus on business design modeling, simplification, and role-based collaboration
  - Use of declarative policy to control execution behavior and relationships
SOA Programming Model

- **JavaServer Faces**
  - Standard way to construct user interfaces for web applications, portlet applications, etc.
  - MVC based Architecture

- **Service Component Architecture (SCA)**
  - Component services programming model which provides a consistent framework for assembling solutions
  - Jointly developed/endorsed by IBM, BEA, IONA, Oracle, SAP, and Sybase
  - Apache Open Source Incubator Project

- **Service Data Objects (SDO)**
  - Uniform (technology independent) way to represent data
  - Provides *Single abstraction* (common API) across JDBC ResultSet, JCA Record, XML DOM, JAXB, Entity EJB, CMI (for MQ messages), and so on
  - Co-developed by IBM and BEA

- **Business Process Execution Language (WS-BPEL)**
  - Standard way to choreograph business processes
  - Standardization through OASIS
# Key Standards and Technologies

*Used in Business Driven Development*

<table>
<thead>
<tr>
<th>Semantic Standards</th>
<th>Infrastructure Standards</th>
<th>SOA and Web Service Standards</th>
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<td>Service Discovery (WSIL, UDDI, RAS)</td>
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<td>E</td>
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<td>Service Invocation &amp; Messaging (WS-I, SOAP)</td>
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<tr>
<td>E</td>
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<td>Service Description (WSDL, RAS)</td>
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<td>XML (Infoset, Namespace, Schema)</td>
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<tr>
<td>E</td>
<td></td>
<td>Network Protocol (HTTP, SMTP, Other)</td>
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</table>
Unlock The Power Of SOA

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The Business Driven Development lifecycle

- **Business**
  - Senior Executive
  - Define Requirements
  - Model the Business
  - Architect the Solution
  - Implement
  - Test
  - Deploy
  - Manage Change & Assets
  - Protect

- **Operations**
  - IT Operations Manager
  - Application Support
  - Deployment Manager
  - Project Manager
  - Operations

- **Development**
  - Analyst
  - Developer
  - Tester
  - Architect

Unlock The Power Of SOA
Unlock The Power Of SOA

The IBM Rational Software Development Platform

Analyst
Model the business & identify the business services

Architect
Design the services architecture
Analyze assets for reuse

Developer
Construct the services
Assemble & deploy the composite application

Tester
Test the individual services & composite application

Deployment Manager
Provision, configure, tune and troubleshoot composite applications

Project Manager
- Follow a service-oriented process
- Manage requirements
- Manage SOA assets
- Manage quality

IT Executive
- Align business strategy with IT execution
- Govern SOA – align, execute and control investments
The IBM Software Development Platform
A complete, open, modular, and proven solution
Business Driven Development Scenario

Business and Construction Focused Tools

IT Executive
- Business Performance Monitoring

Business Focused Tools
- Message Mediations
- Process Orchestration

Analyst

Integration Developer

Middleware Platform
- Process Server
- Portal Server
- Enterprise Service Bus
- Enterprise Application Server

IT Focused Tools
- Requirements Management
- Software Architecture

Architect
- Design & Assemble

Developer

Unlock The Power Of SOA
Example: JK Enterprises – Account Management Project

- Organization Description
  - Multiple Market Segments – Mass Market, SMB, Corporate
  - Multiple Channels – Web, Brick & Mortar, Remote Sales, Back Office
  - Struggling to grow uniformly at low cost and risk

- IT topology:
  - Mix of build vs. buy – SAP, Siebel, CICS, Batch
  - Legacy Applications – core accounting, order entry
  - Multiple Platforms - Windows, AIX, iSeries, zSeries
  - Heterogeneous topology
  - Very little reuse of components and skills

- Numerous Targets for BPO but no methodology and way forward

This scenario is based on work for real customers
JK Enterprises Account Open Process Overview

- Account Verification is one of four steps in the whole business process
- Use best practices to build out the solution
  - Use Rational RequisitePro to capture business goals and objectives
  - Use WebSphere Business Modeler to describe the business process
  - Use RSA to implement new services
  - Use WebSphere Integration Developer to integrate services
JK Enterprises Challenge #1 – Account Open

- **Account Sales:**
  - Latency – customers want to use their accounts right away
  - Incomplete Status available during setup process – can’t answer customer questions
  - Inconsistent response on completion or when issues arise
  - Lack of collaborative materials to ease pre-sale (chat, co-browsing, difficult to ‘find’ information)
  - Limited sales channels

- **Account Application:**
  - Complex application forms
  - Different applications for different products
  - Errors due to re-keying of information from paper application to screen
  - Lack of single customer view

- **Account Verification:**
  - Lack of digital imaging
  - Lack of single customer view
  - Declining too many customer requests
  - Lack of dynamic, rules-based pricing
  - Credit checks inconsistent, expensive, and time consuming

- **Account Activation:**
  - Prolonged process due to lack of digital signature
  - Manually entering information in various internal systems (CRM, ERP, etc.)
Account Open – Business Goals

- **Strategic Initiative - Optimize Account Setup**
  - Reduce Cost and Latency – grow efficiently and profitably
  - Improve sales and customer service through increased speed and responsiveness
  - Enhance productivity through reductions in total cost of ownership (TCO)
  - Increase the value and reach of services and products
  - Reduce risk and increase consistency via rules based Business Process Management
Account Open – IT Implementation

- **Today**
  - 200+ Developers
  - 20+ different development tools
  - No end-end methodology
  - Lacking governance model
  - About to embark on major development supporting BPO

- **Tomorrow**
  - Supporting methodology with artifacts and contracts defined
  - Supported and integrated tools
  - Role based
  - Business participates
Account Open – IT Solution Topology

- **Call Center (Siebel)**
- **WebSphere Business Monitor**
- **Customer ODS (DWL)**
- **General Ledger (SAP)**
- **WebSphere Partner Gateway**
- **Billing (CICS/DB2)**
- **WebSphere Information Integrator**
- **Data Warehouse**
  - Marketing (Oracle)
  - Collections (DB2)
  - Householding (SQL Server)

**Connections:**
- **WBI Server Foundation**
- **ESB**
- **WebSphere Monitor**
- **CEI Events**
- **SOAP via JMS**
- **XML via JMS Adapter**
- **Text via MQ**
- **Commarea via MQ**
- **XML via JDBC**
- **XML via JMS**
- **XML via JMS Adapter**
- **XML via JMS**
- **XML via JMS**
- **XML via JMS**
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**Processes:**
- **Web Client**
- **WebSphere Portal**
- **WebSphere Everyplace Access**
- **Account Managers**
- **Call Center Representatives**
- **Customers**
- **Sales Force**
- **Content Manager**
- **Email**
Account Open – Account Verification Process

- Customer information is verified
- Retrieve Credit Report if necessary
- If credit score is “bad”, additional documentation is required
- Based on customer profile (and credit score), pricing plan is calculated
- Manual application review, depending on score
- Generate decline or proceed to Account Activation step
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Capture Business Goals and Objectives

- **Understanding and using requirements**
  - Know what you want to accomplish and how to measure success
  - Centrally manage requirements located in many documents, charts, and models
  - Provide context for business value
  - Make available to designers, developers and testers

- **Organizing and reporting on requirements**
  - Assign priority, risk and level of effort
  - Support different requirement types

- **Managing changes to requirements**
  - Maintain record of relationships and origin
  - Communicate changes in a timely manner
  - Assess and understand change impact

*Unsolved RM Challenges ➔ Software Rework ➔ Cost, Delays, Quality Issues*
Capture Business Goals and Objectives and KPIs

Rational RequisitePro

Articulate Business Strategy

Capture Business Goals and Objectives

Determine Key Performance Indicators

Business Analyst

Business Goals

<table>
<thead>
<tr>
<th>Goal</th>
<th>Description</th>
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<tbody>
<tr>
<td>GOAL1</td>
<td>Cost Reduction of 10% by 2007</td>
</tr>
<tr>
<td>GOAL2</td>
<td>Increase Products Per Customer by 10% by 2007</td>
</tr>
<tr>
<td>GOAL3</td>
<td>Increase Availability of On-Line Presence to 99.999%</td>
</tr>
<tr>
<td>GOAL4</td>
<td>Reduce Risk of Regulatory Non-Compliance</td>
</tr>
<tr>
<td>GOAL5</td>
<td>Increase Customer Self-Service via Internet by 50% by 2006</td>
</tr>
<tr>
<td>GOAL6</td>
<td>Decrease Time to Market for New Products by 10% by 2007</td>
</tr>
</tbody>
</table>

Business Rules

1. Application Date is less than the Loan Date
2. If Customer is High Risk, the Loan Amount is less than $5000

Business Modeling and Simulation

BPO efforts include the development of as-is models of core business processes. These models are populated with business metrics and analyzed for improvement. BPO analysis highlights areas for improvement.
Trace Business Use Cases to Business Goals they Realize
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Analyze Business Processes to realize Business Goals

The project manager Pam selected a proposal for improving the Account Application and Verification process as one to pursue to achieve the business objectives. Pam reviewed the available resources, and assigned the work to the Business Analyst Bob.

Bob assesses the service automation opportunities within JK Enterprise’s existing Account Application and Account Verification process. Bob runs a simulation of the process using data provided by the BPO team. He finds that human-based tasks are the most expensive and the decline case is the most expensive of all – occurring nearly 25% of the time. Given the business goals and objectives that drove the work item request, Bob adds an automated step to the application review process to eliminate the manual review of many paper-based documents, as well as a new credit assessment category to steer a higher percentage of applications through the automated approval process (thereby reducing the number of decline cases).

Bob runs a simulation of the TO-BE process and compares the data from the AS-IS and TO-BE business processes. He sees dramatic improvements and identifies these as new business opportunities. Anticipating that these new business opportunities will be acted upon, Bob makes the modeling project and artifacts available for subsequent consumption.

Since generating declines results in the most cost for this business process, Bob will create a Key Performance Measure which will be used to track what percentage of requests are declined and ensure the rate of declines meets the business objectives.

- Review the process enhancement request work item
- Review the business goals and objectives that drives the process enhancement request
- Model the AS-IS process model and discovers service automation opportunities
- Create the TO-BE process model and ascertains the impact of these service automation opportunities
- Define Key Performance Indicators and other Business Measures.
- Creates new business opportunities
- Indicate the process enhancement work item is complete
Model Business Processes to realize goals and objectives

- Formally describe current business
- 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
- Verify business operational requirements
Model the business Operational Requirements

*Business processes that realize goals and objectives*

- Analyst models “as is” business process and explores alternative “to be” business processes
- Verify “to be” business processes through simulation

**IBM WebSphere Business Modeler**
Requirements Management

- Create Business Vision Documents
- Create Business Use Case Specifications
- Define/Document Business Rule, Business Goal Requirements
- Define detailed system requirements (use cases and supplementary requirements)
- Trace enterprise requirements to business processes and service implementations

Customer Benefit:
- Document and Capture Business Requirements
- Capture traceability relationships between elements in the application
Analyze Business Processes to realize goals and objectives

- 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
- Assign resource costs, location, and availability
- Determination of any other process or tasks (services) that must be provided by others
Examine existing scenarios for as-is business processes
Account Verification (As-Is) Business Process (cont)
Simulate as-is Business Process

<table>
<thead>
<tr>
<th>Case Name</th>
<th>Distribution</th>
<th>Success Status</th>
<th>Average Elapsed Duration</th>
<th>Average Throughput</th>
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<thead>
<tr>
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<th>Success Status</th>
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<th>Average Total Cost</th>
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<tbody>
<tr>
<td>Case 1</td>
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Opportunities for Improvement

- Lack of single customer view and business rules for credit process result in our ordering more credit reports than we need.
- Manual process for retrieving credit reports is highly inconsistent, expensive and time consuming.
- We decline too many customer requests, resulting in unhappy potential customers and dissatisfied Sales representatives.
- Although the rules for pricing and account are fairly straightforward the values change frequently. Since the procedure is manual it is difficult to implement the changes quickly.
- Average Elapsed Duration: 1 day 23 minutes.
- Weighted Average Profit: $51.44.
Re-engineer business processes to realize goals

- Shorter Process Duration
- More Automation
- Lower Process Cost
Account Verification (To-Be) Business Process (cont)

These are the business operational requirements
# Refine and simulate to-be Business Processes

<table>
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<tr>
<th>Case Name</th>
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</table>
Unlock The Power Of SOA

Compare results and see if objects are met

<table>
<thead>
<tr>
<th>Process Name</th>
<th>Weighted Average Elapsed Duration</th>
<th>Weighted Average Throughput</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verify Account (As-Is)</td>
<td>1 day 23 hours 18 minutes 35.237 seconds</td>
<td>0.021137 work item / hour</td>
</tr>
<tr>
<td>Verify Account (To-Be)</td>
<td>1 hour 8 minutes 43.117 seconds</td>
<td>0.873126 work item / hour</td>
</tr>
</tbody>
</table>

Difference

| Percentage Change | 1 day 22 hours 9 minutes 52.119 seconds | -0.851989 work item / hour | 97.579% | -4,030.74% |

<table>
<thead>
<tr>
<th>Process Name</th>
<th>Weighted Average Revenue</th>
<th>Weighted Average Total Cost</th>
<th>Weighted Total Cost</th>
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<tr>
<td>Verify Account (As-Is)</td>
<td>$78.00</td>
<td>$26,557.078</td>
<td>$51,442.922</td>
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<tr>
<td>Verify Account (To-Be)</td>
<td>$96.00</td>
<td>$1,017.518</td>
<td>$94,982.382</td>
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Difference

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<tr>
<th>Percentage Change</th>
<th>($18.00)</th>
<th>($43,539.46)</th>
<th>$25,539.46</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-23.077%</td>
<td>-84.636%</td>
<td>95.168%</td>
</tr>
</tbody>
</table>
Unlock The Power Of SOA

Agenda

- Business Driven Development
  - A development process for deriving solutions from business objectives
- Software Development Platform for BDD and SOA
- Capture Business Goals and Objectives
- Analyze Business Processes to realize Business Goals
- Architect a Services Solution
- Assemble, Deploy & Test
- Summary
 Architect a Services Solution

Business Analyst Bob modeled just enough detail to capture and verify business operational requirements necessary to realize the business objectives. This initial model is concerned only with the business and often has insufficient detailed for an IT solution.

Once the business requirements are known, Architect Al can elaborates the business processes to ensure the business requirements are sufficiently specified that services design can be created. Al is now ready to begin architecting a services solution to realize the business requirements in a manner that addresses the IT concerns. Al has chosen SOA as an architectural style for developing a solution that he thinks will meet the business and IT functional and non-functional requirements. He designs the services components, their provided and required interfaces, the service data exchanged, and develops activity models that specify the implementation details of some of the key services. In the process, Al has also developed a domain model that captures domain knowledge necessary to design the service implementations. Al uses a set of transformations to generate the initial solution implementation based on the chosen architectural patterns. This initial implementation is handed off to the developer to be completed, deployed, and tested.

Al must look across a number of possibly complex processes with overlapping roles that may need to be significantly refactored for an effective, maintainable services solution. Al must also deal with IT concerns such as availability, distribution, integrity, security and persistence as well as the nonfunctional characteristics of an acceptable solution. Al may:
Some things an Architect might to:

- Partition the solution by business functional areas in order to increase cohesion and reduce coupling.
- Fulfill a number of related contracts with a single component.
- Realize a complex process with a number of choreographed components.
- Use strict vs. loose contract fulfillment.
- Create components that provide services derived from refactoring and decoupling tasks in processes.
- Break up single tasks into multiple tasks.
- Combine sequences of tasks into a new service operation.
- Refactor interfaces by either combining highly related operations or separating out unrelated services into separate interfaces.
- Refactor services provided by roles that cross process boundaries.
- Use a state machine to model the realization of a business process.
- Refactor to deal with commonality and variability to support better reuse. Introduce templates and template instantiations for commonly recurring business services that need to be customizable.
Explore Business Requirements

The business analyst Bob focused on the sequences of tasks required to meet a business objectives. Bob finds a process model the best way to document these steps. Al wants to take a more services view of the business requirements in anticipation of using a service oriented solution. Al examines Bob’s business processes by exploring them through a business services model view that organizes the processes and tasks by the roles that perform them. Al examines each of the collaborations representing the business processes in order to begin laying out a set of components that realize the business functional and nonfunctional requirements. At this point, Al may discover missing information that is easier to see from the business services view than it was from the business process view of the business requirements.
A closer look at business processes

A business process specifies a sequence of tasks that must be complete to achieve some business objective.

Tasks can require resources for completion including roles responsible for performing the task.

A task represents something that is done in a business process. It can be an atomic action.

Or an invocation of a service provided by others.

Or the invocation of another process.

Flows, forks, merges and decisions control task sequencing.
A closer look at Collaborations

A collaboration says what we are trying to accomplish in the business

The realized interface specifies the provided business service

A role specifies who participates in the collaboration

The role’s type specifies its responsibilities as derived from the tasks assigned to the role

Connectors specify which roles interact

The owned activity specifies the rules for how the roles interact

The business use case defines the requirements that have to be met

The collaboration realizes the requirements specified in the business use case

Constraints specify what the collaboration must accomplish

This activity is a method for the verify Account operation

<<BusinessUseCase>>
Verify Account

<<interface>>
Account Verification

verify Account(application : Customer Application) : Approval Message

coordinator : Account Coordinator

manager : Account manager

(cost < 0.9 * Current Average Cost)

The business use case defines the requirements that have to be met

The collaboration realizes the requirements specified in the business use case
Select the Service Realization Architecture

Al decides that to meet the nonfunctional and IT requirements captured so far in the business services model, a SOA would be the best architectural style to use. He uses the AccountManagementDesign model he created to view the business services contracts to capture the design of the services components used in the solution. Al indicates a SOA architecture will be used by applying the Software Services Profile to the AccountManagementDesign model. This extends the model to support SOA design. Al may also instantiate a template model that creates the initial package structures and empty diagrams that JK Enterprises has standardized on for services development. Such a template model might contain standard packages for the functional areas in JK Enterprises and contain shortcuts to other commonly used models. Al instantiates the templates for the new business functional area he is designing.

Start with separating concerns and packaging to manage complexity and facilitate reuse
Create The EligibilitySystem Component

Al sees from the Account Verification business contract that he needs to provide components capable of playing a number of roles in order to fulfill the contract. Al has noticed that coordinating and managing accounts has a lot of variability so these required interfaces are obtained through ports that can be wired to different providers in different situations requiring account verification in JK Enterprise applications. However, the eligibility and risk assessment capabilities are internal to JK Enterprises and are stable. So Al decides he does not need to externalize these parts in order to allow them to be connected to different concrete service providers. Al also knows there’s an existing component he can easily reuse for accessing risk.
Develop the Business Domain Model

In the process of creating the activity realizing the provided services operations, Al realizes he needs some persistent business domain information. He needs information about customers, projects, accounts, addresses, and credit history in order to verify the account request. Some of this information is already available in existing databases that can be directly referenced in the services model, other information can be mined and adapted from existing data stores, but can't be used directly. And finally, some information is new and Al models it directly.

Al opens a model browser in an existing JK Enterprises database to access account information. These databases are displayed as logically related classes in Al's view since he is modeling the services implementations at that level of abstraction. Al uses the RDA tools to adapt the customer database to classes that represent the data he needs for customers and addresses. He then creates a new persistent entity class called Project to contain project data that is currently not maintained by any JK Enterprises database. This information can be used as data stores in the account verification activity as needed in order to complete the service implementation. The service implementation uses this domain data in order to update fields in the customer application service data.

The domain model not only describes the data structure, but may also provide operations and constraints that ensure data integrity and provide low-level business behavior that can be reused to implement many services. This business behavior is not expected to be exposed as services outside JK Enterprises, and because of its use in many services, it must be highly secure, accessed quickly, and have ensured integrity. Al decides as part of the system architecture how business capabilities are realized in order to meet all requirements.

Al may decide later that some domain functions need to be exposed as reusable services. He can do this by selecting the domain class and operations and use the development tools to automatically create a component that exposes that business domain function as an external service.
JK Enterprises Domain Model

Service Data

```xml
<BusinessEntity>
  Customer Application
  + applicationDate : String
  + companyName : String
  + customerAddress1 : String
  + customerAddress2 : String
  + customerCity : String
  + customerState : String
  + customerCountry : String
  + customerPostalCode : String
  + contactFirstName : String
  + contactLastName : String
  + contactPhoneNumber : String
  + requestAccountAmount : String
  + creditReportNeeded : Boolean
  + creditScore : Integer
  + productName : String
  + pricingCode : Integer
  + applicationDecision : Boolean
  + comments : String
</BusinessEntity>
```

Domain Data

```xml
<entity>
  Customer
  + id : String
  + firstName : String
  + lastName : String
  + phoneNumber : String
  + address1 : String
  + address2 : String
  + city : String
  + state : String
  + country : String
  + postalCode : String
  + customerId : String
</entity>

<entity>
  Address
  + customer : String
  + address : String
  + id : String
</entity>

<entity>
  AccountApplication
  + applicationDate : String
  + requestAccountAmount : String
  + creditReportNeeded : Boolean
  + creditScore : Integer
  + pricingCode : Integer
  + applicationDecision : Boolean
  + comments : String
  + accountId : String
</entity>

<entity>
  Product
  + id : String
</entity>

<entity>
  CreditItem
  + id : Integer
  + company : String
  + amount : Float
</entity>
```
Find and reuse an existing asset

AI remembers something about a existing component that provides services for calculating credit score. He realizes this is all he really needs to implement the Access Risk task. But he decides to adapt the existing service provider to provide exactly what the business analyst wanted. This is because he’s been told that there may be additional risk assessment requirements in the future, and he does not want introduce unnecessary maintenance problems by replacing the Assess Risk task with an existing service.

Unlock The Power Of SOA
Create a component for Account Verification

Next Al develops a SOA realization of the Account Verification business process. He creates an Account Verification component which has three ports for interfacing with clients, as well as the coordinator, manager, and creditor service providers. Al indicates the component provides the Account Verification service interface through his verifier port. This interface contains the Account Verification service operation which takes a Customer Application as its input and returns an Approval Message. Al also indicates that the coordinator port requires the Account Coordinator interface, the manager port requires the Account Manager interface, and the creditor port requires the Credit Management Service interface. This completes the external view of the component.
Develop the Account Verification internal structure

Next Al starts developing the internal structure of the Account Verification component. He selects the component and adds a composite structure diagram to it for this purpose. All sees all the ports from the external view in this internal structure diagram and adds two additional parts to the component. One part is called eligibilitySystem, and its type is the Eligibility System interface. This part provides access to a particular instance of that component. The second part is called assessor and is of type Risk Assessor. This part allows the component to assess the risk associated with a customer based on their credit history. Recall that Al did not feel that these providers needed to be exposed on ports because he felt there would be no need to be able to configure the Account Verification component for different providers of Eligibility System or Risk Assessor services.
Link the component to the business contract it fulfills

Al now ties the component's internal structure back to the business operational requirements it fulfills. He adds a collaboration use to the internal structure of the Account Verification component, and creates bindings from each of the parts of the component (including its ports for interacting with the outside world) to the roles they play in the business process. These bindings provide Al with the flexibility of fulfilling the business process requirements with a solution architecture that addresses other IT and reuse concerns while maintaining complete traceability between the requirements and services solution.

The internal structure of a component consists of its parts – ports and properties.

The binding indicates the part is capable of playing the role.

Binds parts to roles they play in the business contract.
Create the account Verification service implementation

Now Al is ready to deal with the details of implementing the Account Verification service operation provided by the AccountVerification component. He begins by creating an Account Verification activity in the component and sets its operation to the corresponding provided service operation. When selecting the service operation, the chooser shows only operations of interfaces provided by the component for selection. Setting the specification operation automatically creates the parameters for the activity, and the activity parameter nodes in the activity diagram. Al looks back at the activity specifying the rules for how the role interact in the business services specification, and creates an activity model that performs similar actions but using the services accessed through the coordinator, manager, and creditor ports, and the eligibility system and risk assessor properties. We know this activity is realizing the rules of the business process because of the binding between the provided port and the role in the business service contract.

Al also looks at the business service contract and sees that the collaboration contains a number of constraints that realize KPIs for the business goals and objectives. The component must provide detailed constraints that realize each of the constraints in the contract. He adds these constraints. There is no need to directly connect the realizing constraints to the specification constraints because this is already implicit in the fact that the component contains a collaboration use whose type is the business contract. These component constraints are used to specify the results expected of the component, and what should potentially be monitored to ensure the component implementation actually achieves its results. These constraints can then be traced up through the business services contracts to the KPIs they realize, all the way to the business goals and objectives JK Enterprises is trying to achieve.

Al has now completed the services design and is ready to create the initial solution implementation.
Account Verification implementation

The Account Verification activity is the method for the Account Verification operation provided by the component.
Assemble the Account Management Solution

AI is aware of existing components that provide the Account Coordinator, Account Management and Credit Management Service interfaces. To complete the solution development, he assembles these service providers into a complete, deployable solution for the AccountManagement application.
Generate the implementation based on the chosen architecture

Al has decided to use Web Services to realize his SOA solution. He selects the Web Services transform and configures the transform to generate the Web Services using the desired interchange styles and transformation options.

Selecting Web Services as an implementation target for the component adds another profile to the model and extends the component, its parts and provided and required interfaces with additional modeling detail required to perform the transformation. Al fills in this detail as best he can, but the developer may update this information in order to generate a better solution implementation (Notice this introduces a transition between the architect and developer where they have to share and update the design model).
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Assemble, Deploy & Test

Architect Al has completed a services design model that fulfills the business requirements and has generate the initial solution artifacts using UML to SOA transforms. Developer Dan now must complete the solution by assembling the parts, implementing the incomplete components, deploying the solution and testing to make sure it works. Specifically, Dan must:

- Review the architected solution generated by UML-toSOA
- Implement the persistence mechanisms to allow service implementations to access the persistent data sources
- Implement the eligibilityImpl.determineApplicationEligibility method
- Implement the riskAssessorImpl.assessRisk method by invoking the CreditRiskAssessor session bean
- Create UI portals for the human tasks.
- Assemble the AccountVerification model by binding to the AccountCoordinatorImpl, AccountManagementImpl, and CreditManagementServiceImpl
- Deploy to IBM WebSphere Process Server
- Test
Review the architected solution

A WID library is created for each model involved in the transformation. The libraries corresponding to the models implement the business objects and interfaces defined by classes and interfaces in the UML model. The business object and interfaces are contained in folders and have namespaces based on the package containment hierarchy in the model.

A WID module is created for each component in the transformed models.
AccountCoordinatorImpl

Provides an implementation of the AccountCoordinator interface required by the AccountVerification process. This component is implemented by a BPEL process containing an activity for each operation of the AccountCoordinator interface.
AccountManagementLib

This library contains the business objects and interfaces generated from the AccountManagement business services model. It also includes the business objects and interfaces from the AccountManagementDesign model since that model has the same name as the business services model. This was done to integrate the elements from the business services and architected solution models. This library is used by many of the other libraries for shared data and interfaces.
AccountManagerImpl

Provides an implementation of the AccountManager interface required by the AccountVerification process. This component is implemented using a human task.
AccountVerificationImpl

This module provides an implementation of the AccountVerification interface using a BPEL process. It is generated from the AccountVerification component in the solution architecture model.
CreditManagementLib, CreditManagementImpl

CreditManagementLib is an existing library that Al obtained from RAS and is used to implement risk assessment by adapting an existing service. CreditManagementImpl provides the service implementation using an existing EJB session bean.
CreditManagementServiceImpl

JK Enterprises maintains some credit history information on customers in its own databases. The EligibilitySystem determineApplicationEligibility operation fills in the credit history fields of the customer application in order to calculate the initial credit score. This service is used to retrieve a credit report from a credit agency that contains more complete, and up-to-date information. The retrieveCreditReport could be a service provided by others get the report, or a human task might be used to enter data from a printed report.

This module provides an implementation of the CreditManagementService interface required by the AccountVerification process. This service provides the access to a credit report while CreditManagementLib provides a service to calculate credit scores. The service is implemented in Java (and currently does nothing in this sample).

```java
/**
 * Method generated to support implementation of operation "retrieveCreditReport" defined for WSDL port type
 * named "interface.CreditManagementService".
 * The presence of commonj.sdo.DataObject as the return type and/or as a parameter
 * type conveys that its a complex type. Please refer to the WSDL Definition for more information
 * on the type of input, output and fault(s).
 */
public DataObject retrieveCreditReport(DataObject credappin) {
    //TODO Needs to be implemented.
    return null;
}
```
Implement EligibilitySystem determineApplicantEligibility

Architect Al decided the eligibility system would have a private implementation inside the AccountVerification Component. Dan provides the implementation for the component using Java.

```java
public DataObject determineApplicantEligibility(DataObject credappin) {
    boolean isEligible = true;
    // Get the Credit History for the applicant
    CreditReportFacadeRemote creditReportMediator = createCreditReportFacadeRemote();
    CreditReport creditReport = null;
    try {
        creditReport = creditReportMediator.getCreditReportByKey(new CreditReportKey(
            credappin.getString("contactFirstName"),
            credappin.getString("contactLastName"));
    } catch (FindException e1) {} catch (RemoteException e1) {
        e1.printStackTrace();
    } catch (RemoteException e1) {
        e1.printStackTrace();
    } credappin.createDataObject("creditHistory");
    creditReport2CreditHistory(creditReport, credappin.getDataObject("creditHistory"));
    // Ensure the necessary data has been provided:
    // customer last name must be provided
    isEligible = credappin.getString("contactLastName") != null
    && credappin.getString("contactLastName") != "**";
    // customer must live in the US in order to be automatically eligible
    isEligible = credappin.getString("customerCountry") == "USA";
    // the request amount must be specified and less than $5,000.
    try {
        isEligible = (new Double(credappin.getString("requestAccountAmount")))
            .doubleValue() < 5000.00;
    } catch (NumberFormatException e) {
        isEligible = false;
    } // last credit score must be known and less than 4
    int creditScore = credappin.getInt("creditScore");
    isEligible = creditScore != 0 && creditScore < 4;
    credappin.setBoolean("applicationDecision", isEligible);
    return credappin;
}
```
Implement the Risk Assessor `assessRisk` operation

The Risk Assessor interface is realized by an adapter on an existing J2EE session bean that provides a `getCreditScore` method. This implementation copies the credit history information from the customer application into the parameter for `getCreditScore`, invokes the session bean, and then scales the returned credit score to the range expected by the Risk Assessor interface.

```java
public DataObject assessRisk(DataObject credappin) {
    // Get an instance of the CreditRiskAssessor session bean.
    // It is this service we are adapting
    if (creditRiskAssessor == null) {
        creditRiskAssessor = createCreditRiskAssessor();
    }
    // Create a CreditReport that we can map to the
    // CustomerApplication CreditHistory property
    CreditReport report = SdoFactory.eINSTANCE.createCreditReport();
    // Copy the data from the CreditHistory to the CreditReport
    DataObject history = credappin.getDataObject("creditHistory");
    report.setFirstName(history.getString("firstName"));
    report.setLastName(history.getString("lastName"));
    for (Iterator items=history.getList("items").iterator(); items.hasNext();) {
        DataObject item = (DataObject) items.next();
        CreditLineItem lineItem = SdoFactory.eINSTANCE.createCreditLineItem();
        lineItem.setId(new Integer(item.getInt("id")));
        lineItem.setCompany(item.getString("company"));
        lineItem.setAmountOwed(item.getDouble("amountOwed"));
        report.getItems().add(lineItem);
    }
    // Get the credit score from the reused service
    try {
        // scale the credit score from 1..10 to 1..1000 which is
        // expected by the RiskAssessor interface
        credappin.setInt("creditScore", creditRiskAssessor.getCreditScore(report).intValue()*100);
    } catch (RemoteException e) {
        credappin.setInt("creditScore", 0); // means unknown
    }
    return credappin;
}
```
Implement the AccountCoordinator operations

The AccountCoordinator is responsible for a number of tasks. Although these tasks are all assigned to the AccountCoordinator role in the business process, developer Dan has decided that each of these responsibilities may need to be implemented different ways, and that these implementations may change over time. For example, the generateDecline operation could be implemented as a human task which displays an input field in which a person playing the AccountCoordinator role could type the refusal message. Alternatively Dan could decide to implement the generateDecline by automatically generating the decline message from the CustomerApplication data.

Dan could split up the AccountCoordinator operations into separate interfaces so that the interfaces for human tasks only contained a single operation, but this couples the external client interface design with the implementation style which Dan knows could easily change in the future. So Dan decides to leave all the operations in the AccountCoordinator interface as the business analyst and architect specified, and provide an implementation which supports different implementation types for each operation in the interface. To do this Dan creates an assembly for the AccountCoordinatorImpl which exports the AccountCoordinator interface and wires that interface to an AccountCoordinator long-running process to implement the operations.
Implementing the AccountCoordinator process

Inside the AccountCoordinator process, Dan creates a flow containing a receive activity for each operation in the provided interface. Each of these receive activities can create a new process instance. The initialApplicationReview receive activity is connected by a link to an initialApplicationReviewHT human task which is used to do the work. This is followed by a reply that returns the updated CustomerApplication. This completes the initialApplicationReview operation implementation. Dan creates similar implementations for the other operations. For generateDecline and providePricingApproval, Dan uses Java snippets activities to automatically generate the accept and decline messages based on information in the CustomerApplication.
Human Task and User Interface Development

- The WID Human Task editor configures the task
  - Sets task administrator, creator, potential owner, editor and reader
  - The client UI to use
  - Escalation settings

- A portal client provides the UI
  - The human task links to the portal client using a unique portlet name
  - The portlet knows the WSDL interface for the page
Test Early, Test Often

- Testing needs to occur across Business Driven Development:
  - Component
  - Service
  - Business Process
  - Composite Application
  - Functional
  - User Interface
  - Performance
  - Regression
  - System

- Integrated set of test tools (that support SOA) and an integrated test environment is important
Development-time Service Lifecycle

- At development time services are:
  - Identified, Produced, Consumed, and Managed
Governance for Business Driven Development

A governed lifecycle end to end

An approach and tools that effectively enable organizations to:

- Determine the business priorities
- Execute development against those priorities
- Measure their effectiveness

In the context of a secure / governed infrastructure:

- Supports complex sourcing models (including geographically disperse)
- Provides development compliance (audit trails and security that is transparent to the developers)
Doing Governance for Business Driven Development

- **Methods and best practices**
  - IBM SOA Governance & Management Method

- **Expertise and skills**
  - IBM Business Enablement Services for SOA
    - SOA Center of Excellence to help facilitate SOA adoption
    - SOA Assessment Services to determine current capabilities and gaps and develop SOA strategy
    - SOA Governance model to define roles and responsibilities, policies, measurements and controls mechanisms
  - IBM Organizational Design Services to help refine organizational model

- **Tools to document and help automate governance process**
  - IBM SOA Governance & Management Methods for IBM Rational Method Composer
  - IBM Rational Portfolio Manager
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Summary
Unlock The Power Of SOA

Key Products - Business Driven Development

- WebSphere Business Modeler
- Rational RequisitePro
- Rational Software Architect
- Rational Application Developer
- WebSphere Integration Developer

- Business Innovation & Optimization Services
  Facilitates better decision-making with real-time business information

- Interaction Services
  Enables collaboration between people, processes & information

- Process Services
  Orchestrate and automate business processes

- Information Services
  Manages diverse data in a unified manner

- Partner Services
  Connect with trading partners

- Business App Services
  Build on a robust, scaleable, and secure services environment

- Access Services
  Facilitates interactions with existing information and application assets

- Infrastructure Services
  Optimizes throughput, availability and performance
More Information

- IBM’s WebSphere Platform
  - [www.watchit.com/websphere](http://www.watchit.com/websphere)

- Business Integration

- Information on IBM WebSphere Software
  - [www.ibm.com/software/websphere](http://www.ibm.com/software/websphere)

- Information on IBM Rational Software

- IBM, Web Services and SOA

- IBM and Model-Driven Architecture (MDA)

- Business Innovation and Optimization
Thank You
Unlock The Power Of SOA

Patterns Accelerate Business Driven Development

**Systematic:**
- top-down approach to building systems

**Business**
- Business Model/Process Patterns
- Cross-Industry Business Patterns

**Operational Architecture**
- Patterns for e-Business (P4eb)
- Process integration patterns (P4eb)
- Data integration patterns (P4eb)
- SOA & Web Services patterns
- Enterprise integration patterns
- System management patterns (P4eb)
- Information integration patterns (P4eb)

**Application Architecture**
- Cross-industry business application patterns (P4eb)
- LWP templates
- SOA design patterns
- Design patterns (ISSW, ODSD)
- Data model & Grid patterns
- Legacy transformation patterns

**Deployment**
- PRiSM patterns
- Rainforest patterns
- Data management patterns
- Application & infrastructure deployment patterns
- Testing patterns

Opportunistic: start at any point
IBM Pattern Solutions

- IBM Pattern Solution Assets currently available:
  - Enterprise Patterns
    - J2EE Patterns
      - Session Façade, Business Delegate, Message Façade, etc.
  - WebSphere Platform Messaging Patterns
  - State Oriented Portlet Patterns
  - Tivoli System Automation Failover Configuration Pattern

- New patterns are being developed

Reusable Asset Specification (RAS)

- Reusable Asset Specification (RAS)
  - A standard way to package services & other assets
  - Services are Assets
  - Assets can contain other elements:
    - Design Models, Test Cases, Documentation, etc

- Three dimensions to consider for Asset Specification
  1. Variability
  2. Granularity
  3. Articulation (The degree of completeness of the artifacts providing the solution)
Unlock The Power Of SOA

Business Driven Development in the Larger Context

Capture Business Goals, Objectives and Requirements

Business Analyst

Create Business Objectives, Requirements & Create Business Use Case Outlines

Trace Business Objectives, Requirements & Create Business Use Case Outlines

Document Business Strategy

Run-time Statistics

Create Financial Reports & ROI Estimates

Create, Simulate & Analyze As-Is Business Model

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

Business Strategist

Identify and Manage Projects and Resources

Project Manager

Understand Risk, Project Costs, and ROI

Business Strategist

Create & Manage System Requirements and Use Cases

Class Diagram

Trace Requirements & Architect System Use Case Realizations

Develop Portlets (App UI and Monitor)

Model Services

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

Integration Developer

Choreograph services using BPEL, WSDL, etc.

Develop Services, & expose as Web Services

Implement Services, & expose as Web Services

Implement Services, & expose as Web Services

UML-to-SOA

Verify Quality

Rational Functional Tester

Rational Performance Tester

Database Developer

Deploy/Run

Business Operations Manager

Monitor

Run-time Statistics

UML

IBM Rational Team Unifying Platform