Web Services - A Consultant's View
From IT Strategy to IT Architecture

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Agenda

Introduction

I. Motivation
II. Real World Situation
III. From Business to Architecture
IV. What an Architecture has to provide
V. From Architecture to running services
VI. Summary: Outstanding Issues

Conclusion
I. Motivation

- Consultant’s View:
  - Business processes span multiple departments and/or companies and each party has its own IT system
  - Coexistence and collaboration of existing applications and packaged systems (like ERP, CRM, SCM)
  - Integration plays an important role
- Promise Web Services
  - Bridging gaps among heterogeneous platforms
  - Faster Development
  - Easier collaboration of organizations
  - Enabling SOA (Service Oriented Architecture)
- Let’s perform a reality check
  - Actual business needs
  - Capabilities of web services

II. Real World Situation

- IBM carries out large projects with global customers:
  - New business processes must be implemented, e.g. for global operations, supply chain management
  - New governance procedures over heterogeneous business environments must be supported
  - Solutions crossing boundaries of divisions, companies must be provided
- Facets of integration solutions are:
  - Global or regional solutions
  - Regional / country / plant specific software components
  - Autonomous business units
  - Heterogeneous infrastructure (hardware and software)
Examples of Application Landscapes

- Examples – driven by globalization:
  - Operational systems in each country feed global FI/CO system, which provides controlling on the holding level
  - Production planning on the corporate layer drives production in local plants
  - Consolidation of planning across various legal entities
  - Central procurement system
- New IT Strategies and their implications:
  - Implementing new business processes for reporting
  - Replacement of local FI/CO systems by a global solution
  - Regional IT support instead of IT support per country
- The information system is a system of systems
Mix of platforms – a closer look

Business Processes spanning heterogeneous environments

IT Environment - Consequences

- Mix of technologies and paradigms to enable information flow (e.g. from and to ERP systems) among the „Extended Enterprise“
  - Close coupling (synchronic)
  - Loose coupling (Messaging and Web Services)
- Mix of technologies
  - J2EE
  - CORBA
  - .NET
  - WSDL
- Consequences:
  - The view of the business processes drive the use of technology
  - There is the need for a holistic approach
III. From Business to Architecture

- Key information items describing business processes:
  - Business function / service (not necessarily IT supported)
  - Business system (grouping of business functions)
  - Information flow (contains information objects)
  - Representation of business objects differ (e.g. identifiers are different in various systems).

- What do we need is a holistic view
  - of the business and its processes
  - over heterogeneous groups addressing multi-language, multi-culture, multi-company aspects
  - over heterogeneous platforms addressing multi-programming-language, multi-software-platform, multi-hardware aspects

Applications / Components and Information Flow

Source

Transformation

Loose coupling including reliability, security etc.

Transformation

Transformation to common semantics

Transformation to target specific semantics

Target
Requirements

- Holistic view of the business including common semantics of business terms
- An architecture that is independent of company boundaries and managing heterogeneous technology platforms (where platforms themselves will change)
- Coexistence of Components and Web Services, unified view of various kinds of services
- Concepts of transformations embedded in information flow and workflow concepts
- Information technology management requires less dependence on infrastructure

IV. An Architecture has to Provide Unified Views of

- Rules and Procedures
  - to capture business processes with the needed precision
- Semantics and ontologies
  - use the same terminology
- Service definitions
  - definitions of components and interfaces
  - access methods
- Separation of concerns
  - Tiers (logical distribution of functionality)
  - Layers (separation of logic - addressing different abstraction layers)
An Architecture has to cover various abstraction layers

A service architecture may consist of the following layers:

- **Application Logic**
- **Business Flow**
- **Service Discovery**
- **Service Publication**
- **Service Description**
- **XML Messaging**
- **Network**
- **Security**
- **Management**
- **Quality of Service**

- **UDDI**
- **WSDL**
- **SOAP**
- **HTTP, FTP, email, MQ etc.**

Elements of a Solution – Semantics and Ontologies

- *ebXML*: Standardization of business messages
  - However, ebXML emphasizes the Web Services approach, but the semantics are valid for a larger scope
  - Holistic view
- Different view points of „Services“
  - (SOA – Service Oriented Architecture)
  - „Business Services“ (e.g. enroll customer)
  - „Technical services“ (e.g. add_customer)
- *Ontology* is a classification of terms
  - Common vocabulary
  - Includes relationships between terms
  - Enabling expression of domain-specific knowledge
  - Is a pre-requisite for business-wide standardization
Elements of a Solution - Specifications

- **UML (Unified Modeling Language)**
  - Means to define rigorous specifications that are precise and sufficiently complete
  - Modeling of component view
- **Metamodels and Profiles**
  - *Components and Interfaces*: Providing specifications for the definition of collaboration (including composition and decomposition of components)

Example Precise Business Information Model

- **Context**
  - Account
    - inv:
      - The first character of the id must be the same as the first character of the customer name
        - `id->substring(1,1) = customer.name->substring(1,1)`
  - SavingsAccount
    - interestRate : Float
  - CheckingAccount
    - minBalance : Float
  - PreferredChecking
    - inv:
      - Cannot go below the minBalance
        - `balance >= minBalance`
Elements of a Solution – Modeling

Key Terms

- **Model**
  - A formal specification of the function, structure and/or behavior of a system (is not UML)
- **Platform**
  - Technological and engineering details that are irrelevant to the fundamental functionality of a software component (is not only hardware or operating system related)
- **PIM (Platform Independent Model)**
  - A formal specification of the structure and function of a system that abstracts away technical details (focus on business issues)
- **PSM (Platform Specific Model)**
  - The technical details (CORBA, SOAP; EJB, XML)

Models and Mappings

- Modeling of business processes by platform independent models
  - Using common constructs defined by appropriate metamodels
  - e.g. as provided by the Enterprise Collaboration Architecture (ECA – part of UML Profile for EDOC)
  - A standard way to model for multiple technologies
- Platform specific models
  - Using common constructs as defined by appropriate platform dependent metamodels
  - e.g. for CORBA as provided by the UML Profile for CORBA
- Mapping defined by
  - Used by code generators
  - Can be used implicitly when executing platform independent models
**Levels of Abstraction**

- **MDA**
  - **MOF**
  - **UML**
  - **CWM**

**Metamodels and Models**

**Mappings**

- **WSDL**
- **J2EE**
- **.NET**
- **etc.**

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**The MDA Promise – Bridging the Gaps**

- **Horizontally** – collaboration and tiers:
  - Business process execution and interoperation (some more standards needed)
  - Flow of information
  - Data transformations
  - Transactions

- **Vertically** – separation of logic:
  - Mappings to various platforms – from PIM to PSM (including Web services)
  - Generation of definitions and code (including WSDL descriptions)
  - Execution of models
The MDA Promise – Holistic View

- Isolation of information and processing logic from technology specifics
  - Consistent view of the business processes and information flow
  - Enabling crisply layered and tiered architectures
  - Using a “normal form” of interaction (“collaboration”)
- Mappings of technology independent models to platform specifics
  - Common modeling rules
  - Common definition for code generation
- Help to integrate the mix of today, an architecture framework to support the unexpected
  - Integration of assets
  - Flexibility

Web Services in this Picture

- Web Services
  - Support an application-to-application integration that is loosely-coupled over the web
  - Support information flow among heterogeneous platforms
  - Are based on well-defined technical standards (e.g. XML, SOAP, WSDL)
- MDA provides
  - Separation of concerns (vertically and horizontally by various abstraction levels)
  - Leveraging the technology mechanisms for business purposes
  - Positioning of Web Services within holistic view
- Support of Web Services design
V. From Architecture to Running Services

- Qualify Requirements: addresses business process requirements, scope, constraints
- Identify business services from business domains definitions and PIMs (Platform Independent Models)
- Model use cases based on business process definitions
- Define Service Implementation using PSM (Platform Specific Models), producing (technical) service definitions (e.g. WSDL, IDL, etc...), Design level class / interaction diagrams
- Build & Run the defined services
- Software development with iterations
VI. Summary and Outstanding Issues

- The influence of packaged applications:
  - Exposure of critical services
  - Support for Web Services
- Web Services is only a part of the picture:
  - Seamless integration of various technologies is required
  - We must still consider existing integration platforms
- Improvements of Web Services are required:
  - Security
  - Transaction management

Conclusion

A holistic view of an enterprises business services is required. Web Services promises to be technical enabler of seamless integration at the application layer.
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