MDA Overview
Applied MDA

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Tutorial: MDA, UML, and applicability to SOA
Agenda

- Business Imperatives Driving Change
  - Innovation
  - Integration
- Emerging Business Integration & Modeling Architectures
  - Service Oriented Architecture (SOA) : Integration Infrastructure
  - Model Driven Architecture (MDA) : Business & IT Modeling
  - Business Innovation & Optimization : Business Acceleration
- MDA Maps Requirements to Solutions
  - MDA concepts, process, components and standards
  - MDA benefits and challenges
- Accelerating Business Integration using Open Standards
Business Innovation & Optimization (aka Business Performance Management) is an emerging market.

Driven by the need for a holistic approach to managing performance, Business Innovation & Optimization will be realized through the confluence of several market initiatives and technologies.

Business Innovation & Optimization solutions enable businesses to respond timely to customers’ needs, competitors’ actions, and regulatory changes; to take action based on contextual insight; and to achieve a shared set of business goals.
Business Modelling & Integration are integral to Business Innovation & Optimization

- Set strategic goals (Business Motivation)
- Introduce Key Business Measurements
- Implement feedback and traceability
- Example: IBM Component Business Model, OMG Business Motivation Model

- Define architecture to realize processes and IT constraints
- Define the IT Artifacts – data and services
- Accelerate the IT development cycle
- Example: Service models, Object & Data models, ...

Corporate Modeling

Shared Artifacts

Business Modeling

IT and SOA Modeling

• Define business processes and rules to meet goals
  Validate through simulation
• Generate run-time code or execute processes directly
• Example: Business Process & Rule Model
Good old days: Businesses used to be simpler and internally focused

- Business get more complex as they do more to compete
- They use to control their critical processes
- Commoditization and globalization have reduced central control
- Now businesses have to focus on core competences
- And leverage competences of others for competitive advantage

*Case Study: Retail Store ➔ Multi Channel Retail*
Businesses: Complex & Globally Distributed

Case Study: Multi Channel Retail

Change: Process Optimization
Three Key Concepts

**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 business application development and integration based on open standards 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
The SOA Lifecycle (as defined by IBM)

- Discover
- Construct & Test
- Compose

- Integrate people
- Integrate processes
- Manage and integrate information

- Gather requirements
- Model & Simulate
- Design

- Financial transparency
- Business/IT alignment
- Process control

- Manage applications & services
- Manage identity & compliance
- Monitor business metrics
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 realize 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.
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

Source: OMG

MDA is a Standards Framework & an Open Modeling & Metadata Standards
What is the Model Driven Architecture™?

A New Way to Specify and Build Systems based on open standards from the OMG™ & W3C™

• Focus on Business Needs First
• Based on Modeling & Metadata
  • Business & IT Modeling
• Supports full lifecycle: Design, implementation, deployment, maintenance, and evolution
• Builds in Interoperability and Portability
• Integration with standards from W3C, OASIS, HL7…
• Lowers initial cost and maximizes ROI
• Applies directly to the mix of hardware and software that you face:
  • Programming language
  • Operating system
  • Network
  • Middleware
**Model-Driven Development Mission**

Increase the productivity, quality and predictability of software by providing a modeling environment for integration, generation, discovery and visualization of software artifacts across the software development lifecycle.

- **Assembler - Textual Development**
- **Pseudocode - 3GL Textual Modeling**
- **3GL Textual Development**
- **Visual Modeling**
- **Visual Editing**
- **Model-Driven Development**

**Increasing Levels of Abstraction**
The MDD process automates abstraction/refinement

OMG MDA focus on platform independence

The Business/IT Gap

abstraction

- Actual problem domain
- Scoped problem domain
- Requirements specification

define scope & boundary of IT system

OMG’s Model-Driven Architecture

refinement

- Platform-independent solution specification
- Platform-specific solution specification
- Source code
- Executable
- Actual solution
Model-Driven Style of Development (MDD)

- An approach to software development in which the focus and primary artifacts of development are models (as opposed to programs)
- Based on two time-proven methods

(1) ABSTRACTION

```c
SC_MODULE(producer)
{sc_inslave<int> in1;
 int sum; //
 void accumulate (){sum += in1;
  cout << "Sum = " <<
  sum << endl;}
```

(2) AUTOMATION

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Model-Driven Architecture (MDA)

- An OMG initiative to support model-driven development through a series of open standards

(1) ABSTRACTION  (2) AUTOMATION

MDA™

(3) OPEN STANDARDS

- Modeling languages
- Interchange standards
- Model transformations
- Software processes
- etc.
A new Paradigm for Model Driven Architecture

MDD is really about separating and bridging concerns

**MDA**

Architecture based Transformation
- How the concerns are addressed
- The parts involved
- Rules for how they relate

Recursively iterate
- Different domains
- Different levels of abstraction

Realization becomes specification for incorporating new concerns
An MDD Process

- Customize the Process
- Define the Problem
- Define the Platforms
- Choose a Mapping
- Test
- Generate Code

- «datastore» Platform Model
- «datastore» Code
- «datastore» Implementation Model
- «datastore» IT Services Model
- «datastore» Business Process Model
- «datastore» Mapping
- Define a Solution
- Create a Solution
OMG: Home of Business & IT Modeling standards

Enable Business Flexibility
(OMG BPMN*, BPDM*, SBVR, BMM*, OSM..)

Enable IT Flexibility
(OMG UML, MOF, XMI, RAS, CWM...)

Enable Interoperability
(W3C XML, HTTP, WSDL, OASIS BPEL..)

Modeling & Metadata Standards
Integrate with W3C, OASIS, HL7...

*Draft
Business Modeling Standards Landscape

- Simulation
  - simulator "overlays"
  - statistical distributions
- Governance
  - strategic goals, policies, capabilities
- Observation
  - events, metrics, KPIs, business situations
- Rules
  - Business rules
- Authorization
  - permissions and prohibitions
- Process
  - business tasks
- Resource
  - resources and roles
- Information
  - business artifacts
- Organization
  - hierarchical structures
  - organizations, locations
- User Interaction
  - user interfaces, dashboards
- Business Modeling Standards Landscape
  - Business Motivation (BMM)
  - Business Rules (BSBR/SBVR, PRR)
- Business Process Definition Metamodel (BPDM)
- Web Services Business Process Execution Language (WSBPEL)
- Business Process Modeling Notation (BPMN)
- Organizational Structure (OSM)
Business Modeling MDA Standards
Business Modeling & Integration Task Force

- **Semantics & Business Vocabulary for Rules– Final Voting**
  - Business Rule and Business Vocabulary modeling
- **Business Process Definition Metamodel (BPDM - Draft)**
  - Business Process modeling – semantics, notation and integration
  - Integration with XML Schema, WSDL & BPEL4WS
  - Integration with UML & BPMN
- **Business Process Modeling Notation (Draft)**
  - Fast track standardization of Process Modeling Notation
  - Result of OMG & BPMI.org merger of activities
- **Business Motivation Model (Draft)**
  - Fast track standardization of Business Goals & Strategy model
- **Organization Structure Metamodel (Draft)**
  - Modeling organizational structures and resources
- **Production Rule Representation (Draft)**
  - XML Interchange for Business Rules Engines & Tools
Business Semantics of Business Rules (BSBR/SBVR) – Breakout Session at the forum

- Declarative expression of intent
- Provides for levels of enforcement
- Model represents concepts independent of business vocabulary
- Alternative vocabularies support different communities (e.g., English, German)
- Rules expressed as structured natural language
- Actions depend on context of application

Rule: It is obligatory that each **driver** of a **rental** is a **qualified driver**.

Standard influenced by Business Rules Group, Unisys, Neumont University et al
Open Modeling Standards: MDA Foundation: Analysis & Design Platform Task Force

- **Unified Modeling Language (UML)**
  - For describing the problem domain and the solution architecture

- **Meta Object Facility (MOF)**
  - For describing and manipulating models and metadata, general purpose modeling languages or domain specific modeling languages (metamodels)

- **XML Model Interchange (XMI)**
  - For exchanging model & metadata information in XML format and generating XSD

- **Common Warehouse Model (CWM)**
  - For describing data mappings and database schemas

- **Reusable Asset Specification (RAS)**
  - Packaging, distributing and reusing software asset metadata

Many Eclipse.org members are driving the core MDA standards
Pragmatic integration of MDA, W3C and Java standards using Eclipse
Modeling for SOA and Web Services using standards

- **UML can be used to model Web Services**
  - Web Service Operations (WSDL Operations) are UML Operations
  - Groups of Web Service structures Requests (WSDL PortTypes) as UML Interfaces or Classes
  - XML Schemas using UML Class Diagrams
  - Web Services data structures using UML Class Diagrams
  - Web Services flow (E.g.:BPEL4WS) using UML Activity Diagrams
  - UML 2.0 Structured classes can be used to model services and service dependencies more directly

- **BPMN can be used to model business processes**
  - The semantics of process needs to nailed down – WSBPEL has executable process semantics

- **SBVR, PRR and BMM can be used to model, design and implement business rules within a motivating business context**

- **The OMG Business Process Definition Metamodel (BPDM) work is an example that integrates notation, semantics and technology mappings**

- **UML Profile for Software Services now on Developerworks**
  - Modeling and design for SOA
MDA – Two Benefit Areas

The Business Advantages:

- Architectural Viewpoint brings out how your applications work with each other, and with those on the outside
- Model changing business requirements and shifting enterprise boundaries
- Define the Business Functionality and Behavior of each application as a technology-independent model
- Focus your IT investment in your core business

- The Technological Advantages:
  - Interoperability and Portability are built into the MDA
  - MDA speeds development as it concentrates investment on the business side
  - Move easily to the “next best thing”, or interoperate with it, quickly and easily
MDD Risks

- Difficulty in specifying the requirements, domain and application models in the first place
- Balancing abstraction for business modeling vs. details necessary for model execution and translation
- Too much variability in the metamodel limiting reuse of PIM to PSM translators and increasing development cost.
- Availability of PMs and corresponding PIM to PSM translators
- Applicability of visual vs. text modeling to detailed processing instructions
- Infecting the business model with Platform Model (PM) information
- Reversible mappings and reconciling modifications of generated artifacts
- Transforming the culture to leverage MDA
- Complexity of UML2
Key Messages

- Business Innovation & Optimization takes a holistic view of Business & IT
- Modeling is foundational to Model Driven Architecture (MDA) & Service Oriented Architecture (SOA)
- Business Process & Business Rules are key enabling technologies to assist Business Flexibility
- Business Modeling Standards are finally arriving on the scene after years of hard work
- SOA Infrastructure standards are getting widely supported
- The ‘Flat Earth’ effect influences Business and IT at the core
- Individual businesses, tools & technologies become less interesting – Need to look at the supply chain that delivers business value
- Governance across the SOA life cycle will be a critical success factor
Questions?