Which MDA Tools are Right for You?

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Model Driven Architecture

- A set of standards defining the scope, content, creation and usage of models
- An architecture-based process for integrating models into the development process
- Core Technologies
  - UML + OCL
  - MOF + XMI
  - CWM
Agenda

- MDA context
- Development process
- Where tools fit in the process
- Requirements for tools
- Integration between tools
- Advanced Topics
- ROI
MDA Distilled

Business Analyst

Business Model (CIM)

Architect / Designer

Platform Independent Analysis Model (PIM)

Developer / Tester

Platform Specific Design Model (PSM)

Code
MDA Mappings

Computation Independent Business Model

PIM $\rightarrow$ PIM Mapping

Platform Independent Analysis Model

PIM $\rightarrow$ PSM Mapping

Platform Specific Design Model

PSM $\rightarrow$ PSM Mapping

PSM $\rightarrow$ Code Mapping

Code
Technology Independence

- Applications are “Future-Proof” against technology churn
- When technology evolves, a new PSM can be generated rather than rewriting it
- Artifacts can be generated for multiple platforms from the same design

Business Analyst

Business Model

Platform Independent Model

EJB 1.1 Design Model

EJB 2.0 Design Model

.NET Design Model

Developer

Architect / Designer
Generation Tools

- Tools are standards based, not proprietary
- Resulting code base doesn’t require a specific runtime infrastructure
- 70-80% of the structural code can be generated
- Test Cases can be generated from OCL
M²VP 4 Stage MDA Process

1. Define the approach
   - Integrate enterprise architecture and standards into the development process.
     - Create meta-models and profiles

2. Define the problem
   - Create Business Models (Domain, CIM, System)

3. Define the solution
   - Refine into PIMs and PSMs

4. Leverage the solution
   - Integrate assets into a corporate reuse program and repository
   - Architecture and design accommodates: reuse, customization, enhancements, versioning…
MDA Profiles

- **Computational Independent Model**
  - Simplified UML subset appropriate for business analysts. Incorporates GRM

- **Platform Independent Model**
  - Custom profiles for enterprise architecture and standards
  - Standard based profiles (EDOC, EAI)

- **Platform Specific Model**
  - Standards based profiles (CORBA, EJB, .NET)
MDA Process Review

Business Model

Platform Independent Model

Platform Specific Model

Code, Test, Doc Generation

Code

Model Transformation

Meta & Modeling

MDA Architect

Application Architect

Developer / Tester

Business Analyst
Meta and Modeling Concerns

- Ability to create models and meta-models in UML
  - Formally define model constructs and constraints
- Ability to create profiles in UML
  - Since most modeling tools don’t support MOF directly, profiles extend standard UML tools
- Ability to validate correctness of model against meta-model
- Ability to import / export meta-models and models in standard XMI format
Transformation Concerns

- Ability to formally define mapping between models
- Ability to customize standard mappings
- Ability to parameterize mappings
- Ability to modify transformation result
- Ability to trace elements in one model to the elements they were derived from in another model
Generation Concerns

- Preserves separation of concerns
  - Platform specific info is not required in PIM
  - Platform independent info in not required in PSM
- Can generate to multiple technologies and platforms
- Generation can be parameterized and modified
- Generation based on standard and custom patterns
- Completeness
  - Structural code (stubs, etc.)
  - Procedural code
  - OCL can be compiled, generate run-time code
- Can be integrated into an automatic build process (command driven)
More About Generation

- **Procedural code**
  - Some code can be generated from OCL, but
  - Requires support for Action Semantics and Language
  - Generally necessitates reducing scope of target and environment

- **Tests**
  - Can be generated from OCL and (Action Language)
  - Can be integrated into a framework (e.g. JTEST, JRUN)

- **Documentation**
  - Ability to create analysis and design documentation from information in all levels of models
  - Ability to customized document and report generation
  - Ability to create some form of user documentation
Advanced Capabilities

- Model correctness can be validated against meta-model
- Model can execute in a simulation environment
- Support for versioning of models
- Support for model synchronization
  - Reverse or Round-Trip engineering
- Support for XMI/JMI programming
- MOF Repository
- Support for CWM
Metadata in the MDA Process

- Business Model
- Platform Independent Model
- Platform Specific Model

Profiles → Mappings → CIMs PIMs PSMs → Asset Descriptors

Profiles → Mappings → CIMs PIMs PSMs → Deploy. Descr. + Declarative

Profiles → Mappings → CIMs PIMs PSMs → Source Code

Profiles → Mappings → CIMs PIMs PSMs → Docs

MOF
MOF/UML
UML/RAS
XML
scms
dms
Tools in the MDA Process

- Business Model
- Business Analyst
- Modeling, Validation & Simulation
- Application Architect
- Platform Independent Model
- MDA Architect
- Model Transformation
- MetaModeling
- Profiles & Mappings

- Platform Specific Model
- Code Generation
- Developer / Tester
- Code
- Test Generation
- Documentation Generation
- Repositories + Metadata Management

MOF
MOF/UML
UML/RAS
XML
scms
dms
Documentation
Generation
Repositories + Metadata
Management
MDA Tool Integration

Business Model

Business Modeling Tool

XMI

Software Modeling Tool

XMI

Transformation Tool

XMI

Platform Independent Model

Platform Specific Model

Code and Test Generation Tool

Code

XMI

Repository and Metadata Mgmt. Tool

XMI

Business Analyst

Application Architect

Developer / Tester

MDA Architect

Meta-Modeling Tool
Hard Criteria

- Meets *YOUR* criteria
- Addresss Full Lifecycle
  - Meta-models, transformations, generation
- Generation
  - SOC, Customization, Completeness
- Advanced Capabilities
  - Synchronization, Versioning, Validation, Simulation, MOF
- Integration with other tools
  - Modeling
  - IDE
  - Repository
- Standards Conformance
Soft Criteria

- Cost
- Product Architecture
  - Evolvability with the market
  - Support for future platforms
- Documentation, samples, training
- Ease of Use
- Company
  - Support, enhancements
  - Future looks bright
  - Product line is integral
  - Easy to work with
MDA ROI Opportunities

- By reduced production and operation costs
  - Development automation
  - Improved quality
  - Improve utilization through reuse initiatives
- For MDA to deliver ROI
  - We must make models first class development artifacts. Tools must support all aspects of this.
- Code generation is currently biggest focus
- Profiles, transformations, etc.
  - Less perceived value, less understood
  - No metrics to determine relative importance
Conclusion

- No one tool does it all!
- Enterprises have different requirements
- Integration and customization important
- Standards and tools are critical to MDA success

- Lot’s of advancements in the future
  - Action Semantics, MOF 2.0, CWM, RT Engineering
- The market is still young. Expect…
- Continued expansion of MDA tools…
- … and then contraction of market
What’s Wrong with ROI?

- Latest buzzword
- Gimmicky “calculator” on web site
- Encourages short term measurement, within the scope of a single project
- IT value needs to be measured based on total cost of ownership (TCO) and less tangible measures such as efficiency, strategic impact, risk, etc.
Return on Assets

- **Return On Assets** is a *strategic* alternative which focuses on building value by increasing productivity of assets
- IT focus shifts from improved transaction capability to improved business processes to improved strategic initiatives
- Focus shifts from costs containment to opportunity capture
Questions