Model Driven Architecture

Richard Mark Soley, Ph.D.
Chairman and CEO
OMG’s Vision

The Global Information Appliance
Heterogeneity is Permanent

- **Programming languages**
  - ~3 million COBOL programmers
  - ~1.6 million VB programmers
  - ~1.1 million C/C++ programmers

- **Operating systems**
  - Unix, MVS, VMS, MacOS, Windows (all 8!), PalmOS…
  - Windows 3.1: it’s still out there!
  - Embedded devices (mobile, set-top, etc.)

- **Networks**
  - Ethernet, ATM, IP, SS7, Firewire, USB
  - Bluetooth, 802.11b, HomeRF
Where Can We Agree?

- There will not be consensus on hardware platforms
- There will not be consensus on operating systems
- There will not be consensus on network protocols
- There will not be consensus on programming languages

- There must be consensus on interfaces and interoperability: BASED ON MODELS
OMG Made its Name in Middleware

• But middleware *itself* has proliferated:
  – CORBA®: Vendor, OS & language independent middleware
  – COM/DCOM/MTS
  – Java/EJB
  – XML/SOAP
  – C#/.Net
  – What will be *Next Best Thing*?

• You must preserve your software investment as the infrastructure landscape changes around it
How Can We Protect Software Investment?

• The problem remains
  – Tracking the *next best thing*
  – Protecting your investment in existing software base
  – Retaining qualified staff
  – Maintaining existing code base

• Integrating what you’ve built
  – With what you’re building, and
  – *With what you will build!*
OMG’s Model Driven Architecture (MDA™) initiative is aimed precisely at this problem.

- You have an opportunity to increase your bottom line by integrating your assets.
- Industry standards support that goal by future-proofing your application design.
- The MDA will help you integrate the mix you have today, and give you an architecture to support the unexpected.
- Focus on integrating legacy applications.
- Ensure smooth integration of COTS applications.
- Models are testable and simulatable.
- The aim: a 20-year software architecture.
What is Model Driven Architecture?

- A New Way to Specify and Build Systems
  - Based on modeling with UML
  - Supports full lifecycle: analysis, design, implementation, deployment, maintenance, evolution & integration with later systems
  - Builds in Interoperability and Portability
  - Lowers initial cost and maximizes ROI

- Applies directly to the mix you face:
  - Programming language
  - Operating system
  - Network
  - Middleware
Model Driven Architecture
Leveraging UML is Critical

- The Unified Modeling Language is the successor to the dozens of OO A&D notations of the early ’90s.
- Result of an OMG adoption begun in ’96 and completed in ’97
- Complemented with repository (MOF) and XML Metadata specs (XMI)
- Standardization primed the market
  - Over 100 books
  - Dozens of commercial tools
  - Widely available training
- Supported by an open process
  - UML 2.0 process under way now
Building an MDA Application

Start with a Platform-Independent Model (PIM) representing business functionality and behavior, undistorted by technology details.

Platform-Independent Model

A Detailed Model, stating Pre- and Post-Conditions in OCL, and Semantics in Action Language
MDA tool applies a standard mapping to generate *Platform-Specific Model (PSM)* from the PIM. Code is partially automatic, partially hand-written.
MDA tool applies an standard mapping to generate *Platform-Specific Model* (PSM) from the PIM. Code is partially automatic, partially hand-written.
Generating Implementations

MA Tool generates all or most of the implementation code for deployment technology selected by the developer.
Integrating Legacy & COTS

MDA Tools for reverse engineering automate discovery of models for re-integration on new platforms.
Automating Bridges

Bridge generation is simplified by common application models, simplifying creation of integrated applications both within and across enterprises.
The MDA promotes standards that are valuable across deployment technologies

- Applicable to large & small deployments, new applications, legacy and COTS
- Applicable to CORBA, DCOM, .Net, etc.
- Allows knowledge leverage for the long-term, standards that persist

MDA has been quickly adopted by OMG’s standardization groups

- Both PIM and PSM(s) adopted by process
- Standard model lasts decades
MDA in Practice

• Several excellent proofs-of-concept:
  – Wells Fargo (an architecture that has already been resilient through a decade of change)
  – Lockheed Martin Aeronautics
  – GCPR in US government

• These are “MDA-like”
  – Standards make it portable
OMG MDA Adoption Status

- Major direction agreed March ’01; overall architecture adopted September ’01.
- UML 1.4 complete; 2.0 in process.
- Mappings (“profiles”) underway:
  - EDOC (adopted)
  - CORBA (adopted)
  - EAI (in process)
  - EJB (adopted by JCP)
  - SOAP/XML (in process)
  - .Net (to be started)
OMG MDA Adoption Status

- More importantly, *vertical market groups* are thriving on MDA approach:
  - Electronic Commerce
  - Financial Services
  - Healthcare
  - Life Sciences Research
  - Manufacturing
  - Space & Ground Systems
  - Telecommunications
MDA Benefits

• Full support for your “20 year architecture” across the application lifecycle
• Smooth integration across intra- and inter-business boundaries (across deployment technologies)
• Reduced costs from beginning to end
• Reuse of applications, code, training and people
• Technology-independent representation of the business
• Scalability, robustness & security via generated code
• Stable model-based approach maximizes ROI
• Rapid inclusion of the next best thing

The CIO Problem Solver
Market Forecast

- Analysis by Paul Harmon, Cutter Consortium
- Assumes:
  - Driven by e-business integration
  - UML tools will become MDA tools
- UML growth was very rapid
  - Changed tool market in 3 years
Cutter Consortium Summary

- “Most exciting enterprise software initiative since UML”
- “Could take off very fast after the current economic slowdown is over”
- At least US$500 million market
  – Assumes 33% penetration
To Get More Information

- MDA Information Page
  - http://www.omg.org/mda/
- OMG General Information
  - http://www.omg.org/
- Contact the Author
  - soley@.omg.org