# MDA™ Implementers' Workshop

## *Succeeding with Model Driven Systems*

**May 12-15, 2003**
**Orlando, FL, USA**

### Monday, May 12, 2003

0900 - 1230 ***Tutorial 1: The MDA Reference Model***
Allan Kennedy, Managing Director, Kennedy Carter Ltd.

Version 1 of the MDA Guide has recently become available and the responsible body, the bureaucratically named Object Reference Model Sub-committee (ORMSC) is already working on its successor. The current intention is that the scope and content on the MDA shall be formalized as a precise UML model that illuminates the central MDA themes of: Platform independence; Model interoperability; Model transformation; and Model integration. This tutorial will present a brief overview of the current MDA Guide and then present the MDA Reference Model as a formalization of the concepts in the guide. During the second half of the session, you will be invited to share your comments and opinions, in a structured "goldfish bowl" forum, about the MDA in general and the Reference Model in particular. All contributions will be minuted and formally incorporated as requirements (to be complied with or not) on the next version of the Reference Model.

0900 – 1230 ***Tutorial 2: Model-Driven Architecture Processes and Methodology from the Perspective of the "Modeling Discipline"***
Matthew K. Hettinger, President and Chief Architect, Mathet Consulting

The "Modeling Discipline" is shown to be a "cross-domain" discipline that emerges from the "aggregation" of other disciplines such as mathematics, semiotics, etc., and is based on theories associated with these disciplines (e.g. set theory, systems theory, and semiotics). The theoretical foundations and the principles, views, viewpoints, and processes derived from them are used to create and embed modeling systems, and systems modeled by the modeling systems, in enterprises, federations and the Internet. It is further shown how modeling systems (model construction, analysis, simulation, optimization, validation and verification, etc.), particularly ones with MDA concepts (CIM, PIM, etc.), tools, and standards (UML, MOF, etc.) embedded in it, are used to characterize problem and solution domains of interest that enable technology independence for the system using MDA based modeling systems. Limitations of current concepts, tools, and standards to adequately characterize more complex systems associated with such things as adaptation, emergent and competitive behaviors, are identified and suggestions are made as to how MDA might be extended to address these limitations.

1030 – 1045 Morning Refreshments

1230 – 1330 Lunch

1330 – 1700 **Tutorial 3*: Integration without Pollution: Achieving Interoperability of Platform Independent Models***
Chris Raistrick, Kennedy Carter Ltd.

A primary motivation for the MDA is to address the issue of model interoperability. The world is now awash with papers explaining how to specify components using UML. However, a critical issue for MDA is how to treat platform independent models as components that can be integrated, and tested as a system, prior to generation of the platform specific implementation. The rules for system developers have not changed much recently. In 1975, Larry Constantine and Edward Yourdon published a work in which they demonstrated, using empirical evidence, that high quality systems are built using modules that are: Highly cohesive, encapsulating a single aspect of the problem; Loosely coupled, having minimal (preferably no) knowledge of other components; Based on the "black box" principle, such that module internals are hidden behind a well-defined interface. This tutorial illustrates how these principles are preserved in the context of MDA, and the integration of components specified using UML. In particular, it explains: How a platform independent domain model provides a cohesive encapsulation of any subject matter; How to specify a PIM's interface without polluting it with knowledge of any other PIM, resulting in anonymous coupling; How counterpart relationships and bridge mappings are used to achieve interoperability without breaching the black box property of the PIMs.

1330 – 1700 **Tutorial 4*: Producing Executable Web Services using UML & ECA***
Cory Casanave, President, Data Access Technologies

The OMG has recently adopted the Enterprise Collaboration Architecture (ECA) as part of the UML for Enterprise Distributed Object Computing (EDOC) set of specifications. ECA describes how to model enterprise collaborations with UML and use model driven development to implement collaborative business processes using a variety of middleware technologies. This tutorial will cover enterprise collaboration modeling concepts, process and examples – showing how to go from abstract concepts of collaboration to precise specifications leveraging reusable components for Web Services as well as other middleware. We will also see how to use ECA as a technology independent model supporting web services and distributed objects. The result of applying these techniques can result in the enterprise being more agile, more efficient and better able to collaborate inside and outside the corporate boundary.

1530 – 1545 Afternoon Refreshments

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## Tuesday, May 13, 2003

0900 - 1230 ***Tutorial 5: Specifying UML Model Transformations with Executable UML and an UML Action Language***
Ian Wilkie, Technical Director, Kennedy Carter Ltd.

UML 1.5, incorporating the UML Action Semantics together with the principles of Model-Driven Architecture, provide an industry standard framework within which to specify the behaviour of a system in a platform independent manner. However, translating such models into performance-compliant target code by hand can be time-consuming and error-prone. Further, keeping the model and the code in step thereafter usually borders on impossible, with the result that the highly reusable Platform Independent Models fall into obsolescence. MDA anticipates that mappings to specific platforms will be standardized and automated. The technology with which this will be done in a standardized way is the subject of the MOF Query, Views, and Transformations RFP. While several vendors offer varying degrees of MDA-like model transformation and code generation based on "meta-programming" in 3GL's, this tutorial will show you how to specify sophisticated model transformations using an executable subset of UML 1.5 and an UML action language. Not everyone believes in the "100% code generation" that this application of OMG technology makes possible. But with it, MDA can become a lightweight process where everything – the application, the services and the design and coding techniques - is specified just once as PIMs, so that all the downstream deliverables are generated automatically and traceability is assured.

0900 – 1230 ***Tutorial 6: Advanced PIM Development for MDA***

Petter Graff & Vladimir Bacvanski, Vice Presidents, InferData Corporation

This hands-on tutorial gives a sneak preview of a software development method to be published later this year. The development method has proven effective in building high quality models and successfully applied in several Fortune-500 companies. This is an advanced tutorial covering advanced enterprise modeling constructs such as Aspects and Refinements. We'll also cover use of some MOF-based extensions required for high-quality code generation, use of OCL, action specification and combination of aspects. To illustrate the constructs, we will build a concrete application. We'll start by creating abstract domain models in UML. We will then refine the models at various steps until we end up with MDA-ready Platform Independent Models. Finally, we'll go on to show how use MDA to generate/build enterprise-level implementation in J2EE and .NET. The code generation will be performed using InferData's Model Component Compiler (MCC).

1030 – 1045 Morning Refreshments

1300 – 1830 ***Demonstration Area Open***

1230 – 1330 Lunch

1330 - 1345 ***Workshop Welcome and Opening Remarks***

**Program Committee Chair:**

Fred Waskiewicz, Director of Standards, Object Management Group

1345 – 1545 ***Session 1: Processes & Methodologies***

Chair: Fred Waskiewicz, Director of Standards, OMG

MDA is not simply an architecture or set of specifications - it is an approach to model-driven specification of enterprise applications and systems. This session offers insight into a process using the MDA approach to reduce duplicity in models and provide model verification; and discussion of a methodology formalism for application modeling and simulation prior to code implementation.

**Incorporating MDA into the Development Process**

Terry Merriman, VP of Professional Services, M2VP

MDA defines certain types of models to be created (PIM/PSM), but doesn't explain how to fit them into a development process nor how to partition business information between the models. Other industry standards, such as RUP, define a detailed development process, while RM-ODP provides guidance on separation of concerns in enterprise systems. This session will present a framework, following RM-ODP viewpoints, for fitting MDA's Platform Independent Models into the RUP development process to reduce duplication of effort within the various RUP models and verify requirements through traceability across the models. An example will illustrate the framework using Rational Rose.

**A Practical Approach to MDA**

Paul W. Styles, Chief Architect - Strategic Planning, Compuware

This presentation examines an automated approach for translating business models into the application code necessary to implement a business solution. Development projects frequently proceed from business definition directly to coding tasks. This ignores the intermediate application-specific layer of definition, and contributes to deviations from an organization's platform-specific architectural standards. The application model is where business requirements are architected to a platform-specific technology implementation. Lack of attention to this layer contributes to lack of continuity between architectural design and the implemented code. A model-driven and pattern-driven approach to development introduces this layer. The use of transformation patterns to change business requirements into a platform-specific model enforces J2EE architectural standards and assures the best coding standards.

**DSSV-generic approach applied to the MDA**
Emmanuelle de Gentili, Jean François Santucci, Université de Corse

Our work consists of defining a modeling methodology formalism to provide help in modeling software applications at a high level of abstraction. The originality of this approach is that it supports modeling and simulation of the specifications before implementation. This approach is readily adapted to the MDA environment because of the logical design of the model that is linked to a trade field. This model allows creation of DEVS models whose behaviours are simulated, providing assistance in software validation based on the specification at high abstraction level in the design model and in the management of the system. This approach has been applied in the field of telecommunications specifying CORBA and using the UML language notation.

1545 – 1600 Afternoon Refreshments

## 1600 – 1800 *Session 2: Patterns and Standards for MDA*

Chair: Fred Waskiewicz, Director of Standards, OMG

Software portability, interoperability and reusability are key goals of the MDA approach to model-driven specification. Employing software patterns and standards assures these goals will be met. The session explores a set of development patterns; explains how OMG's ECA specification is used with MDA to implement collaborative business processes using varying middleware; and offers insight on the proposals to the forthcoming UML 2.0 specification and its impact on MDA.

**Patterns and Process for Increasing Business Reactivity with MDA**
Birol Berkem, Consultant, GOObiz

We introduce in this presentation 6 patterns and a process for increasing business reactivity with MDA. Patterns aim to bring platform independence, interoperability and reusability to modeled specifications; they provide for Model-Driven Systems: evolutive specifications in face of changes at the CIM and PIM viewpoints; keeping validity of specifications by bridging the CIM and PIM levels, even inside of the PIM while transforming analysis to design level specifications; synchronization of IT with the business by allowing actors of the application use cases to use business behaviors as they are defined at the business level. The Goal-Driven Development Process, by bridging UML artifacts related to the CIM/PIM/PSM levels on a framework does contribute directly to the reactivity of the resulting model-driven business system.

**A Standard Model Driven Architecture for Enterprise Collaboration and Integration with Web Services**
Cory Casanave, President, Data Access Technologies

This session will cover enterprise collaboration modeling concepts, process and examples – showing how to go from abstract concepts of collaboration to precise specifications leveraging reusable components in a variety of technologies such as WSDL, Soap, ebXML, EJB and CORBA. We will see how to use ECA as a technology independent model supporting WebSservices and distributed objects. Applying these techniques can result in the enterprise being more agile, more efficient and better able to collaborate inside and outside the corporate boundary.

**UML 2.0 Support for MDA in Dynamic Models: How Practical is Execution from Behavioral Models?**
David Fado, Software Architect, Number Six Software

With UML 2.0 and MDA, architects can more easily abstract development tasks in way that will automatically produce key patterns and flag areas for custom coding. The proposed UML 2.0 specifications include a number of new behavioral features that remain theoretical. Will these find a practical application? Will behavioral models catch up to structural models in terms of compiling code? The answer appears to be no, but the models could still be useful.

## Wednesday, May 14, 2003

### 0900 – 1130 *Session 3: Meta-Model & Transformation Technology I*

Chair: Allan Kennedy, Managing Director, Kennedy Carter, Ltd.

**Meta-Object Programming for MDA**
Drs. Andy Evans & Tony Clark

In order for MDA to fully realize its potential, models and the environments that analyze, execute and transform them should be model once, run anywhere. The most efficient way of achieving this goal is to extend the MOF with execution. We present an implementation of such an extension, XMT: a self-contained meta-object programming environment upon which many different richly expressive modeling languages can be based. We will show how it achieves the model once, run anywhere philosophy, enabling all aspects of MDA (meta-models, models, instances, operations, mappings, language definitions and tools) to be unified in a common meta-object programming framework.

**Meta-Model Transformation using OCL and Patterns**
Steve Schwartz, Senior Project Manager, Compuware Corporation

MDA meta-models are defined using MOF. To effectively implement MDA, meta-model transformations must take place between the PIM and PSM, and the PSM and Code Model. The 'missing link' is a facility that supports definitions of transformations between meta-models. The presentation will discuss the use of OCL and Patterns to define transformations that allow models to be calculated based on other models.

### 1000 – 1030 Morning Refreshments

### 1000 - 1800 *Demonstration Area Open*

**Mapping from UML to the Business Process Execution Language for Web Service (BPEL4WS)**
Tracy Gardner, e-Business Integration Technologies, IBM Hursley

The Business Process Execution Language for Web Services (BPEL4WS) provides an XML notation and semantics for specifying business process behavior based on Web Services. A BPEL4WS process is defined in terms of its interactions with partners. A partner may provide services to the process, require services from the process, or participate in a two-way interaction with the process. This presentation describes a UML profile for automated business processes with a mapping to BPEL4WS. The design of the profile and the technology used to implement the automated mapping will also be covered.

### 1130 – 1230 **Sponsor Presentation** - *Realizing the Benefits of the MDA Using Compuware's OptimalJ Development Environment*

Chris Sirosky, Product Manager–OptimalJ, Compuware Corporation

Compuware's OptimalJ provides a comprehensive implementation of the OMG's MDA for J2EE application development. Through its use of extensible transformation patterns, OptimalJ effectively leverages an MDA approach to realize the benefits of a model driven development paradigm. This presentation will provide an overview of OptimalJ's MDA adherence, as well as a demonstration of its capabilities.

### 1230 – 1330 Lunch

1330 – 1530 ***Session 4: Meta-Model & Transformation Technology II***
Chair: Allan Kennedy, Managing Director, Kennedy Carter, Ltd.

**A Tool to Convert a PIM into a CORBA IDL Specification**
Thais Batista & Teresa Raquel Nascimento, Federal University of Rio Grande do Norte

In this presentation we will describe a tool that performs a transformation from a PIM model to a CORBA IDL specification. This tool receives a XMI file which contains the metamodel of the application PIM model, and makes the transformation, using conversion rules, to the IDL specification. The PIM model follows the syntax proposed by the UML profile to EDOC. ArgoUML is used as a support tool in the construction of the PIM metamodel. The conversion rules (PIM-IDL) are described in XSLT.

**RIVAL – an Open Modeling Infrastructure to Facilitate Model Centric Software Development**
Marc Born, Fraunhofer FOKUS & Olaf Kath, IKV++ Technologies AG

In this presentation we will introduce an open modeling infrastructure facilitating the development of distributed component-based software systems. This infrastructure is based on modeling standards, namely MOF, UML, OCL and EDOC. It is an open and extensible infrastructure but the focus is on telecommunication systems and the fulfillment of their special needs. With the help of this infrastructure, different modeling technologies and tools can be integrated, rather then using a single tool with a one stop code generation or the file based exchange of models between different tools using XMI.

**Implementing a PIM over a J2EE and .Net platform**
Yan Locas, Senior Product Specialist & Michel Brassard, Founder & CTO, Codagen Technologies Corp.

The goal of the presentation is to demonstrate how to use MDA to build a multi-platform application. The presentation shows how to use a platform independent model (PIM) to generate the same application on two platforms: .NET and J2EE. The PIM will be used to express the system in a technology-independent and platform-independent way. Mapping and translating the PIM to a platform specific model (PSM) entails tagging (extending) the PIM with values that are based on implementation issues defined at architecture time and automating the transformation process with a declarative approach based on XML templates.

1530 – 1600 Afternoon Refreshments

1600 – 1800 ***Panel: MDA Model Transformations***
***What do the Toolmakers Have Today?***
Moderator: Fred Waskiewicz, Director of Standards, OMG

Aspects of MDA have been implemented in robust, commercial tools for two years or even longer. Success stories have been written and there are more to come. How do the toolmakers position their MDA implementations? What artifacts, including code, are generated? What are the process implications in deploying specific MDA tool approaches? Is a graphical PSM produced or does the tool go directly to implementation code? This panel brings toolmakers and their customers together for a real-world, deployment look at the MDA.

Panelists: Allan Kennedy, Managing Director, Kennedy Carter Limited
Paul W. Styles, Chief Architect-Strategic Planning, Compuware
Jens-Hagen Syrbe, Architectural Cons., Interactive Objects Software
Jim Amsden, IBM/Rational

1830 – 2030 ***WORKSHOP RECEPTION hosted by*** COMPUWARE

## Thursday, May 15, 2003

0900 – 1100 ***Session 5: Project Management - ROI***
Chair: Sumeet Malhotra, Unisys

In order to make MDA successful in the market, it is important for everyone to understand the business drivers that make MDA important. It is also important to model the business value within the MDA framework itself. This session will deal with the real world business drivers that enrich the "go to market" strategy for MDA. The session's presenters will articulate the returns on any investment related to MDA, its business driven meta-models and relevant practical issues.

**Cost Aware MDA: Modeling to Assess Value and Return on Investment**
David Fado, Software Architect, Number Six Software

The business benefit of MDA reflects cost savings in software development. This presentation argues that MDA can help assess software cost and estimation. With "cost aware" mechanism, a model can include financial information that allows one to view not only the efficiency of the software project but also whether that software implementation actually brings about a more efficient work process.

**Architecture Independence and Code Generation Produce Real Cost Savings**
Aaron G. Daisley-Harrison, Director-Technology Consulting, Fujitsu Consulting

Fujitsu consulting was contracted to perform the design and construction phase of a three-tier Visual Basic .NET application. Customer constraints and economic circumstances required a fixed price contract. Scope and requirements were not sufficiently defined to allow us to apply a rigorous change control processes. Managing project resource consumption was problematic. Fujitsu's Macroscopeâ methods, (very compatible with the MDA approach), in concert with Codagen's Architect, and Microsoft products were the framework. Logical business object modeling in UML, architecture abstraction, and pattern templates were employed to drastically reduce the need for manual coding and increased the quality of code produced. This approach allowed us to reduce the impact of changing requirements, accommodate scope increase, and keep the scheduled delivery date under control.

**What MDA Tools are Right for You?**
Mike Rosen, CTO, M2VP Services

As MDA gains momentum, tool vendors are getting in line to claim support. Many tools offer full compliance with MDA and substantial generation capabilities, while others are just jumping on the marketing bandwagon. At the same time, different tools support different approaches and methodologies but few tools cover the entire gamut from business requirements to executable code. This session will explore the issues of methodology, model translation, traceability, generation capabilities, etc. to build a framework for evaluating MDA tools against your particular needs. It will also show how some of the leading tools stack up against these metrics.

1100 – 1115 Morning Refreshments

1115 – 1215 ***Session 6: Building Real Systems and Applications Using MDA***
Chair: Paul W. Styles, Chief Architect-Strategic Planning, Compuware

The intent of this session is to show attendees the opportunities that exist for using MDA in their own projects and point out the problems they may face. The business and technical objectives of MDA are exemplified through six, real-world case studies and experience reports on MDA-based projects and tools.

**How to Champion the First MDA Project Inside an Organization?**
Yan Locas, Senior Product Specialist & Michel Brassard, Founder & CTO, Codagen Technologies Corp. & David Bertrand, Director-Consulting, CGI Group, Inc.

The intent of this session is to present a successful implementation of the MDA approach with a development process based on the Rational Unified Process (RUP) methodology. It will demonstrate the real gains of productivity that the implementation of MDA brings through the development process. The MDA-based development strategy and the productivity gains presented are based on real case studies of projects that realized about 60%-70% code generation from UML models, providing an estimated 25% productivity gain and 30% cost savings. The project used Rational Rose for modeling; Codagen Architect tool for mapping and translating the model; and WebSphere Studio Application Developer and WebSphere Application Server for development and runtime

**Case Study at Deutsche Bank AG Illustrating Concepts, Application and ROI of Convergent Architecture with MDA**
Jens-Hagen Syrbe, Architectural Consultant, Interactive Objects Software

Convergent Architecture defines a holistic, architecture-centric approach to managing evolutionary and revolutionary changes in both, business design and technology. Based on models as the means of design expression, communication, automation and management, it is the logical next step in software engineering. Real-world projects repeatedly bear witness to significant advantages and high returns as demonstrated in this case study at Deutsche Bank Bauspar. The presentation gives insights into the approach taken and explains the steps from business object modeling, refinement to UML models, model verification to generating the source code and build and test environments.

1215 – 1315 Lunch

## 1315 – 1530 *Building Real Systems and Applications Using MDA (Cont'd.)*

**Model-Driven Architecture for Building Data Grids: the EGSO Experience**
Giacomo Piccinelli, Research Fellow, University College London

Beyond its core technology layer, the Grid is gaining momentum as reference model for the creation of Virtual Organizations. In the specific case of EGSO (European Grid for Solar Observations - http://www.egso.org), the objective is to recreate electronically the existing community of organizations operating in the domain of solar physics. Principles and methodology deriving from the MDA are currently being used to integrate different parts of the EGSO grid. The presentation reports on the initial experience with the MDA in EGSO.

**A Framework for Rapid Development of Model Compilers**
Paul Boocock, Software Architect, Ashridge Technologies Ltd

Using a model compiler to transform a PIM into a PSM and then code is a central part of MDA. However, even on one target platform, there are many possible system architectures, which makes it hard to find an existing tool that produces an appropriate PSM. The Jamda Project aims to provide an open-source Java framework to help developers quickly build a model compiler tailored to their system architecture. This presentation describes the principles behind the development of Jamda, the facilities it provides, and examples of its use.

1415 – 1430 Afternoon Refreshments

**MDA: Treating Patients Right, FHIE in the US Government**
Tony Mallia, Principal Consultant, CIBER Inc.

FHIE provides Veterans Health Administration clinicians, at over 170 facilities, access to patient records of over 1 million service personnel who separated from the Department of Defense. The project was initiated as a response to Gulf War Syndrome in 1997. The presentation covers transformation between healthcare protocols and message standards and how this has been facilitated using a Computation Independent Business Model (Domain Model) for healthcare records, a Platform Independent Component model for interactions over FHIE as well as a Java Platform Specific model for internal record representation.

## 1530 – 1545 *Closing Remarks*