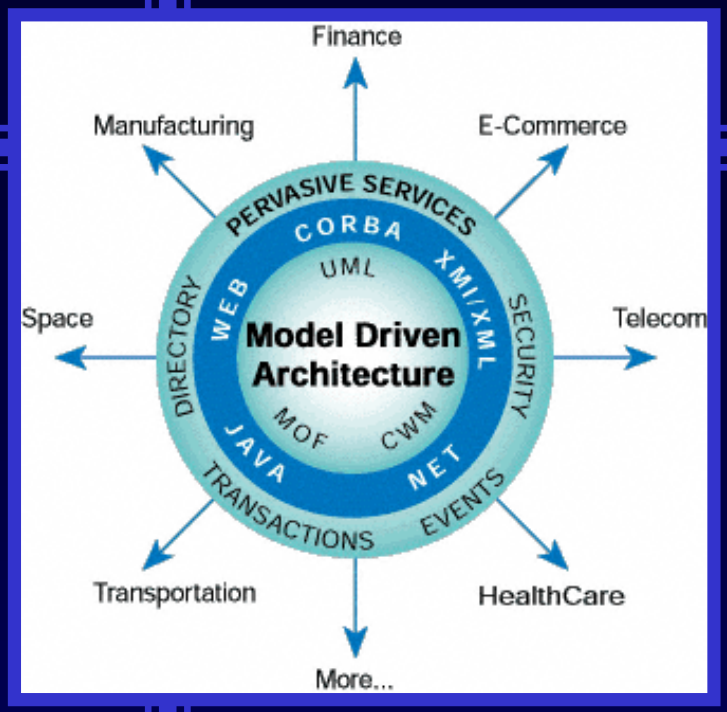

OBJECT MANAGEMENT GROUP

Using Modeling & OMG's Model Driven Architecture to Design & Build Distributed Applications

Updated November 2004

Written and Presented by

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Vice President, Technology Transfer

Object Management Group

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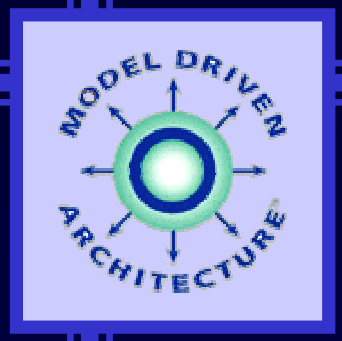
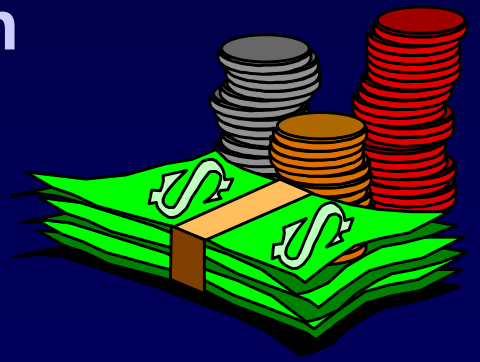
What is OMG?

- Object Management Group - 15-year-old not-for-profit Computer Industry Standards Consortium
- Home of UML, the Industry's Modeling Standard
- and the Model Driven Architecture (MDA)
- Open Membership and Adoption Process
  - One-member, One-vote
- Specifications Available Free on our Website
- Buy Implementing Products from Vendors
  - Vendors may be OMG members, or may not
- Over 500 members including Companies, Government Agencies, Universities

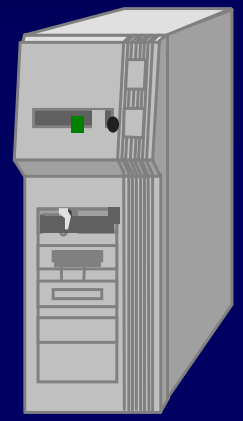


Enterprise IT Must Deal With

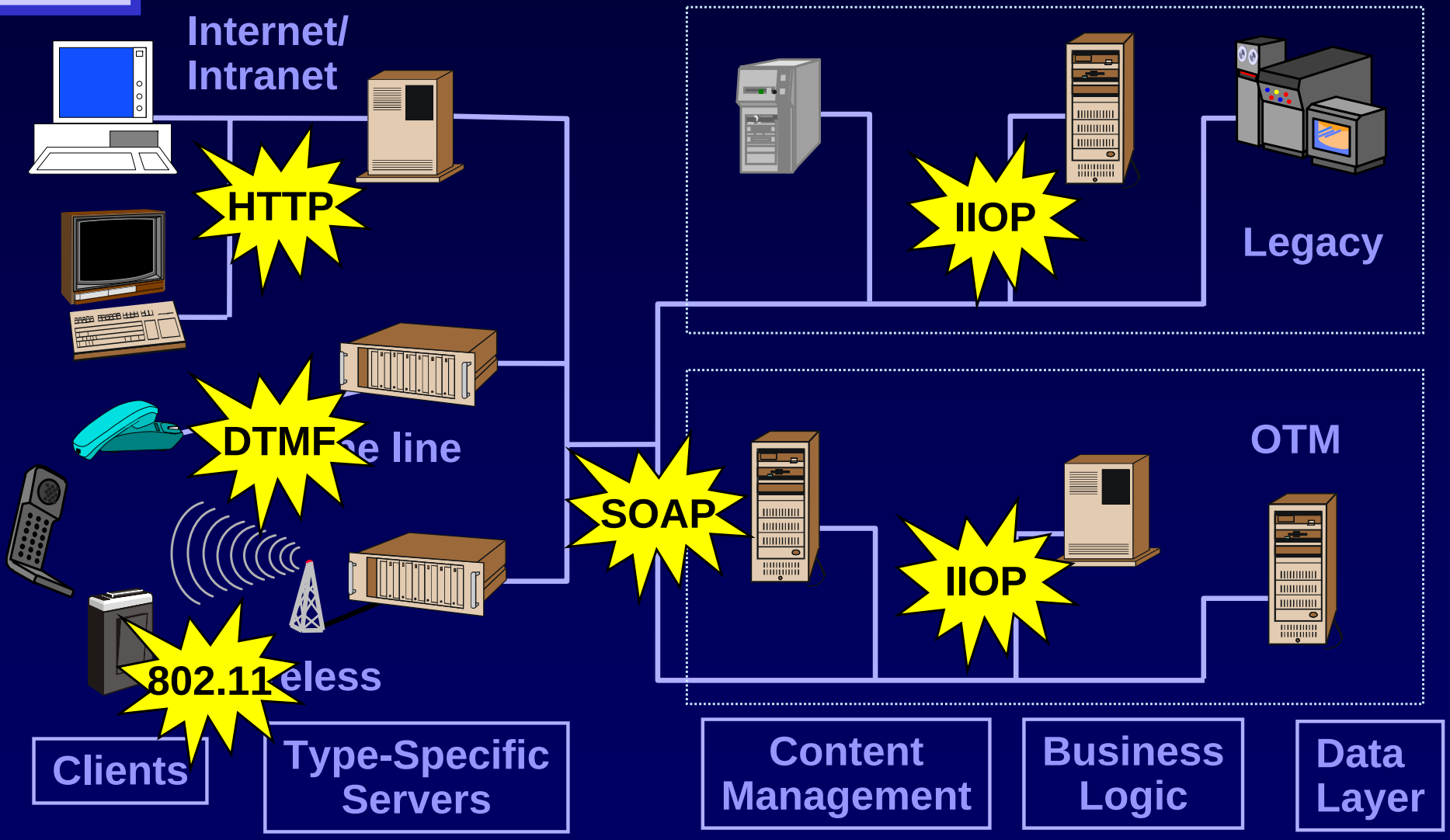
- **Business Factors:**
  - Defining/Meeting Business Requirements
  - Complex/Changing Business Processes
  - Shifting Enterprise/Application Boundaries
  - Semantic Integration with Customers/Suppliers/Partners



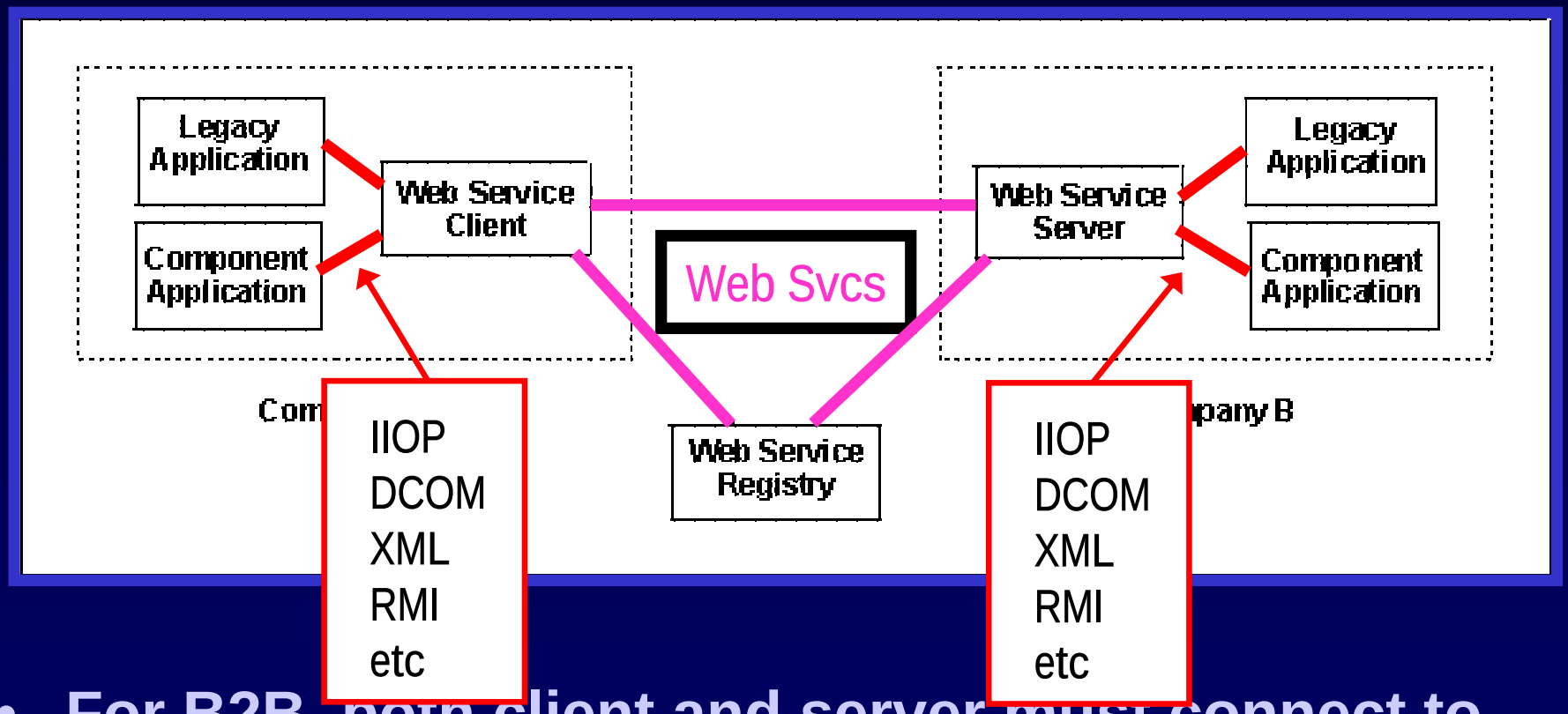
- **Technological Factors:**
  - Barriers to Interoperability/Integration
  - Development/Maintenance Obstacles
  - Evolving/Unstable Technology Suite



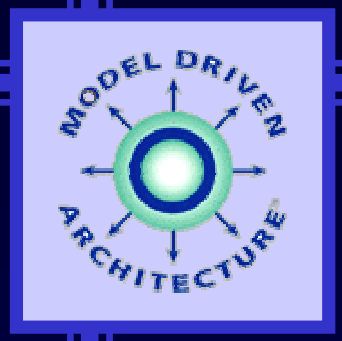
Today's Architecture



Behind the Scenes in WS

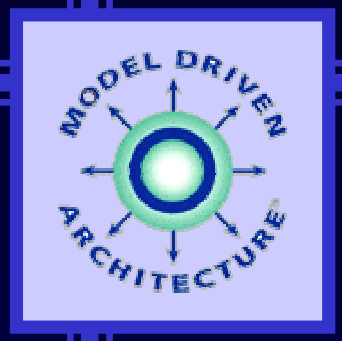


- For B2B, both client and server must connect to many legacy applications on many legacy middleware platforms



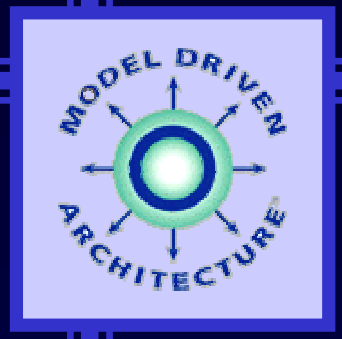
Why Focus on Modeling?

Because Modeling is the only way to ensure that enterprise IT systems deliver the functionality that a business requires, comprehensive and stable, yet able to evolve in a controlled manner as business needs change over time.



Why Focus on Modeling?

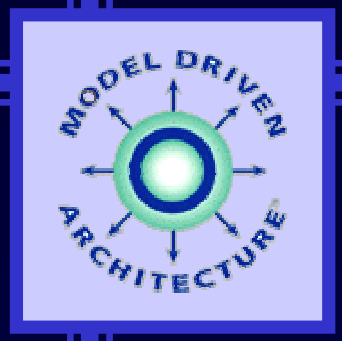
Models built in the Unified Modeling Language (UML) represent exactly what a business application - even a complex, multi-platform integrated application - can do, and record it with a clarity and stability that far exceeds that of the applications themselves.



Why Focus on Modeling?

Based on technology-independent representations of their business functionality and behavior, modeled applications last for decades and maximize IT return on investment.

Jon Siegel, OMG: www.sdtimes.com/news/064/special1.htm



From Design to Deployment

Modeling Environment:

- Data Model
- Appl Model
- Repos-itory

Applications

Domain Frameworks:

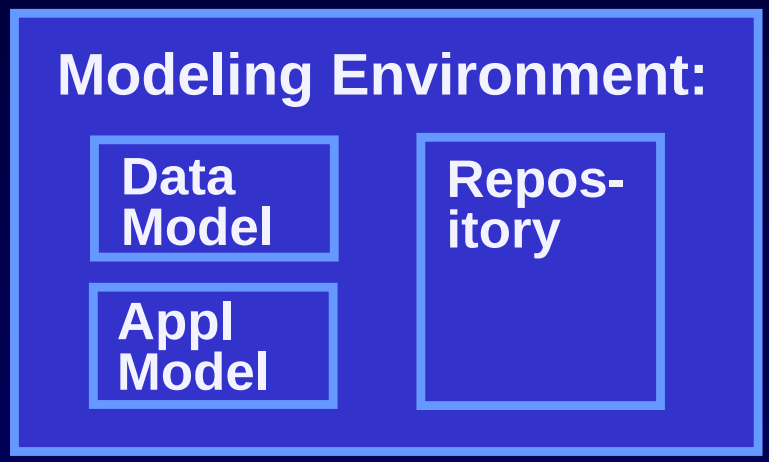
- Mfg: PDM
- Fin: Acctg

Distributed Infrastructure:

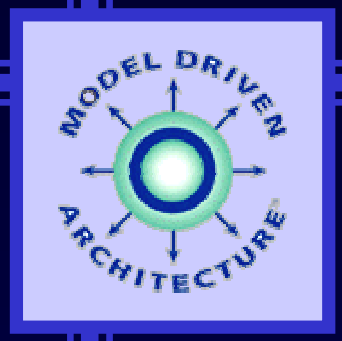
Platforms, Languages, Networks, Protocols, Middlewares, Messaging

Support for *All* your Business Computing

From Design to Deployment



Support for *All* your Business Computing

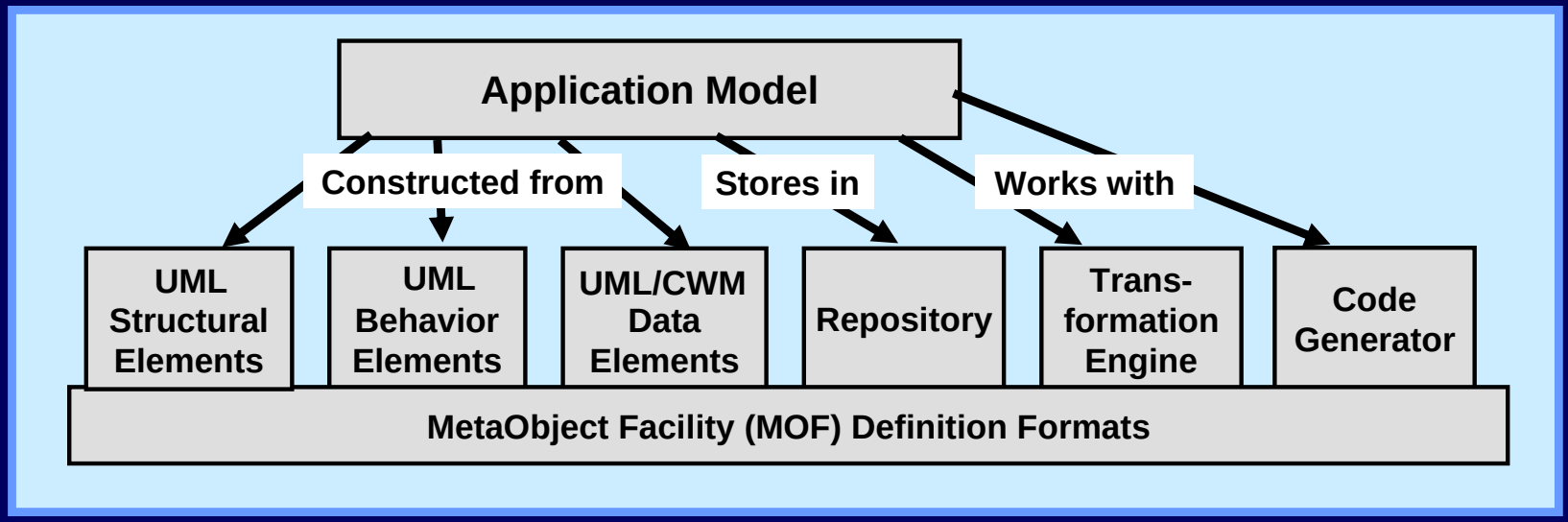


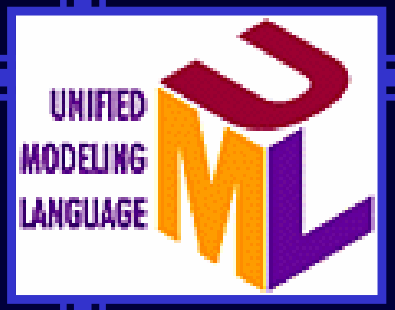
OMG Modeling Support

- **MOF: Meta-Object Facility 2.0**
  - Integrated Repository
  - Standard MetaModel
- **Unified Modeling Language UML 2.0**
  - World Standard for A&D
  - Representation for Structure, Dynamics, Deployment
- **XMI: XML Metadata Interchange**
  - Model & MetaModel Interchange
  - XML-Based Format, including DTDs
- **CWM: Common Warehouse Metamodel**
  - Data Warehousing Integration
  - Record, Table formats; Data Loading & Transformation

MOF - Foundation for Modeling

- MOF standardizes the basis for the elements that modeling languages define for you to model with
- Based on MOF, all of these diverse model elements can share repositories and interchange models among compliant tools:
  - Interchange of models and metamodels among toolsets
  - UML, MOF Itself, CWM, SPEM, XMI, UML Profiles
- And Especially, MOF supports the MDA!

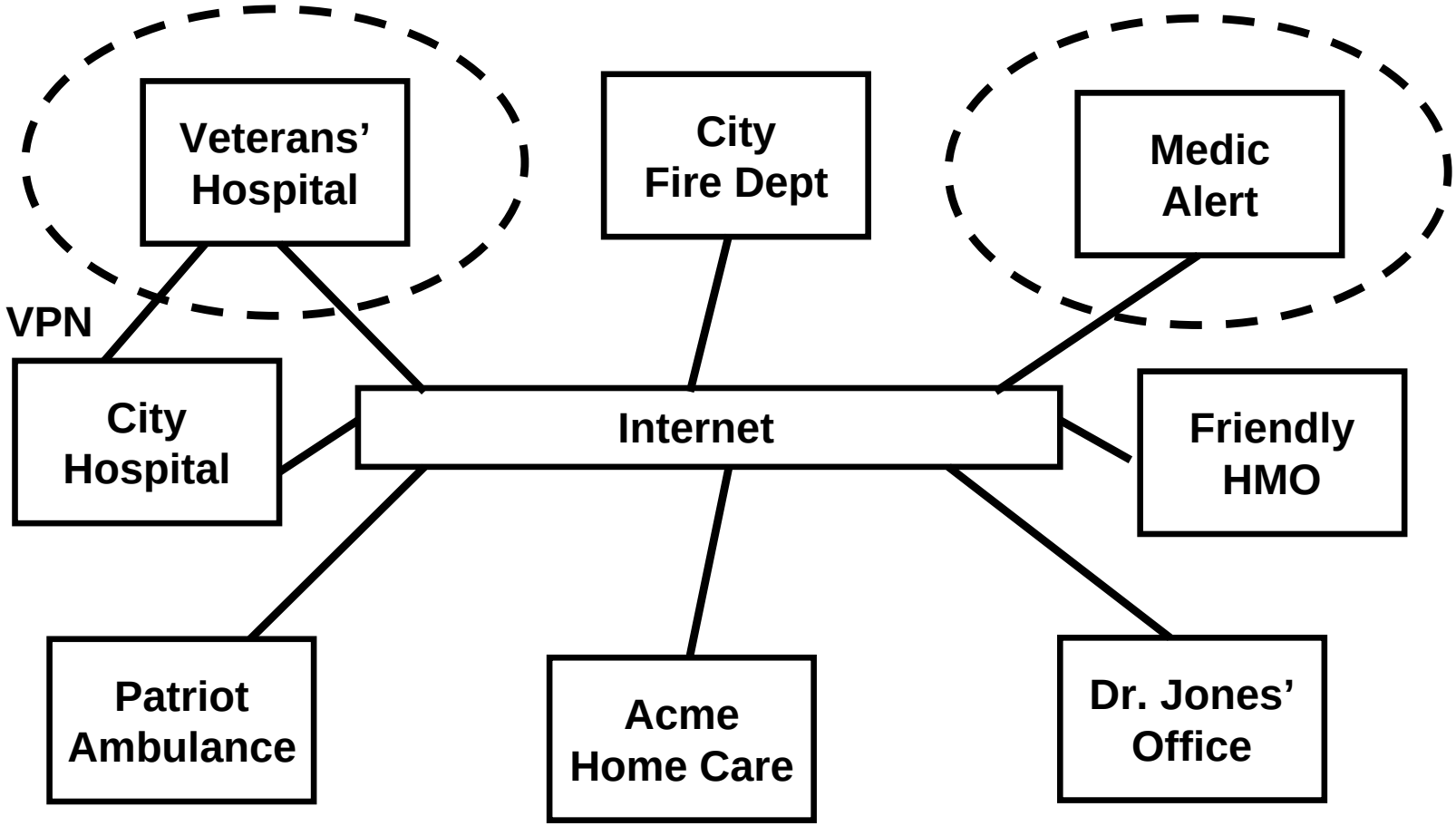




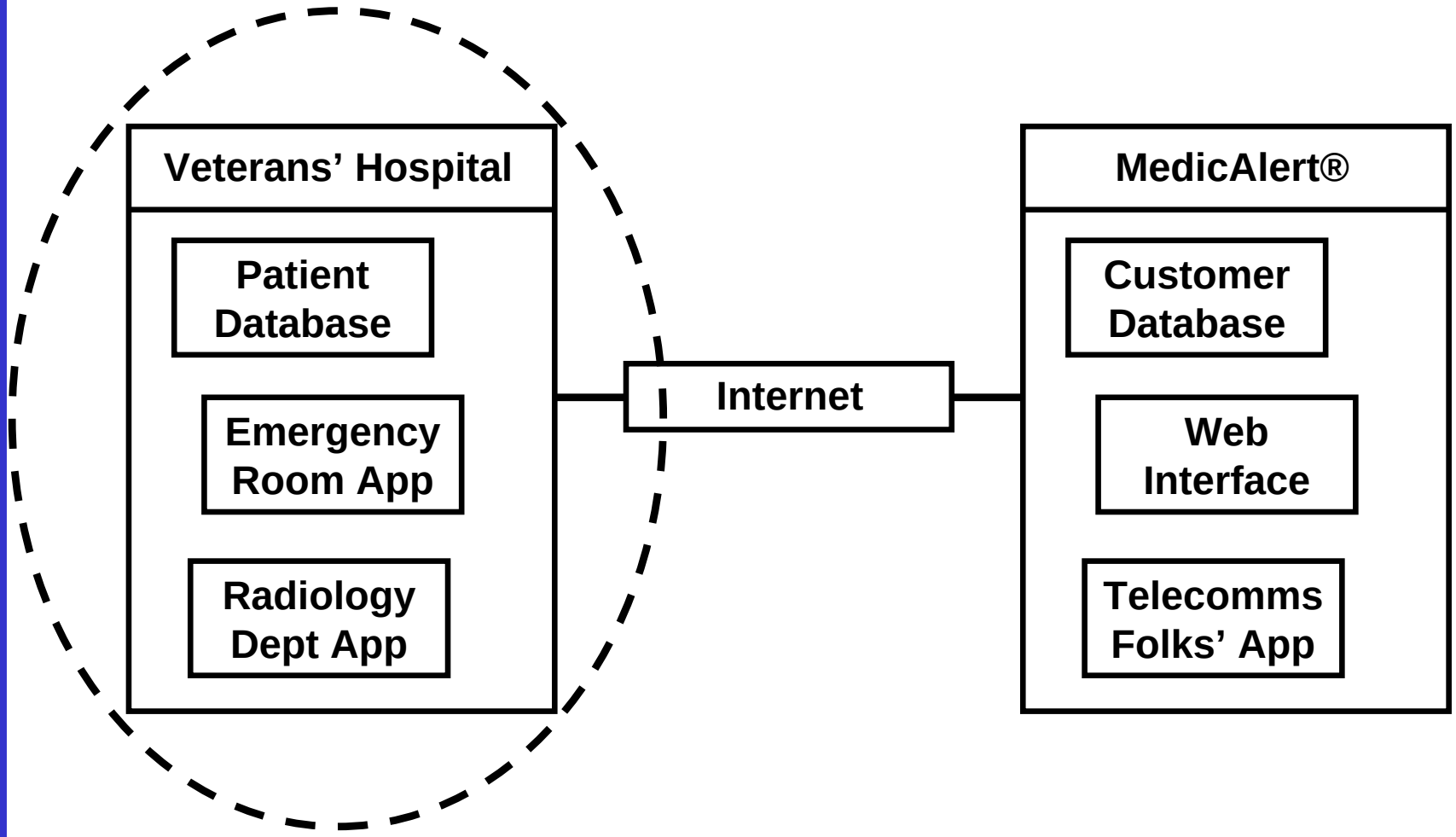
UML – The Modeling Standard

- Integrates all the modeling you need to do
  - Business Modeling
  - Architectural/Deployment Modeling
  - Application Structure and Behavior
  - Component-Based Applications
  - Classes and Objects
  - Data Structures
  - Behavior, as State Machines, Data and Control Flow, Use Cases, more
  - The Industry Standard for Modeling

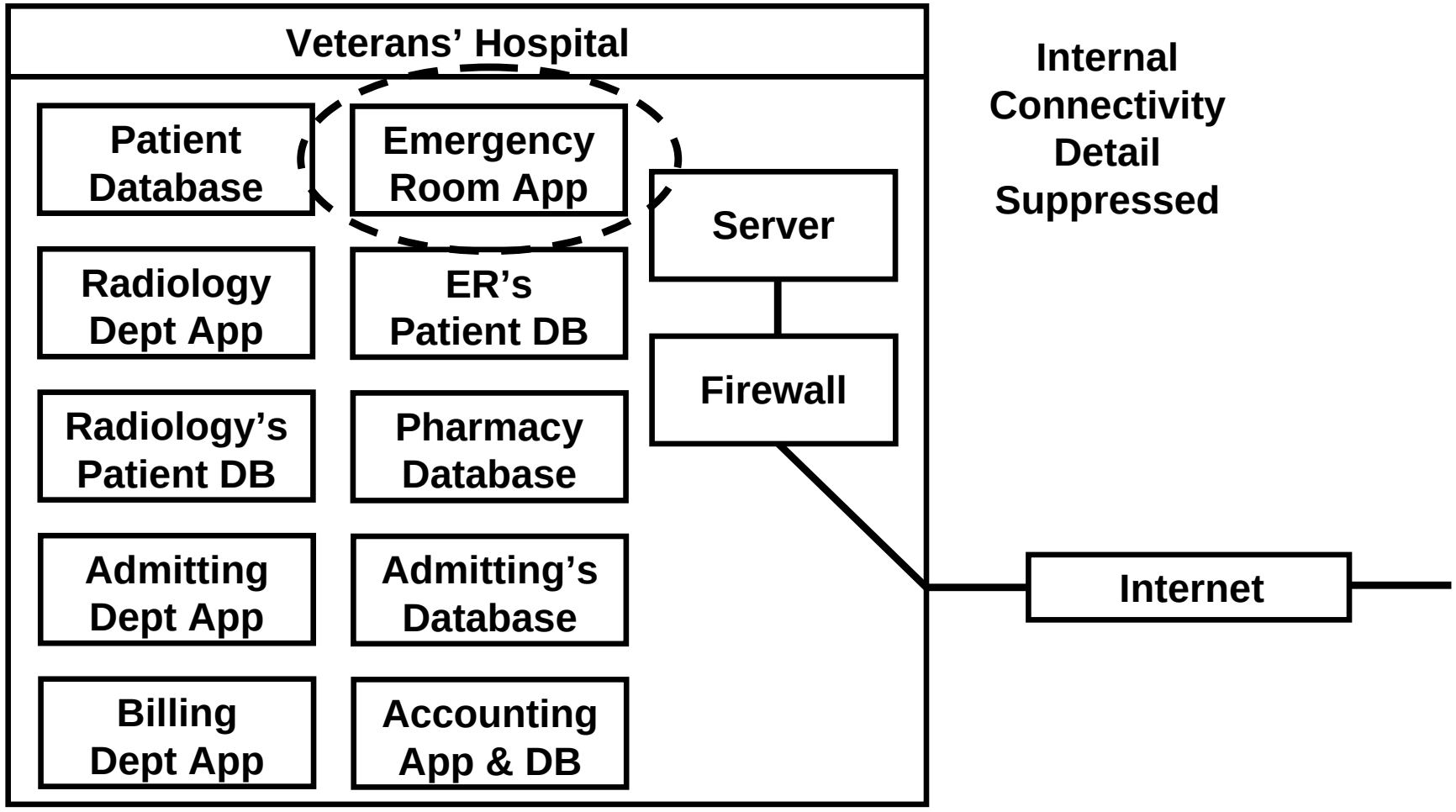
Architectural View



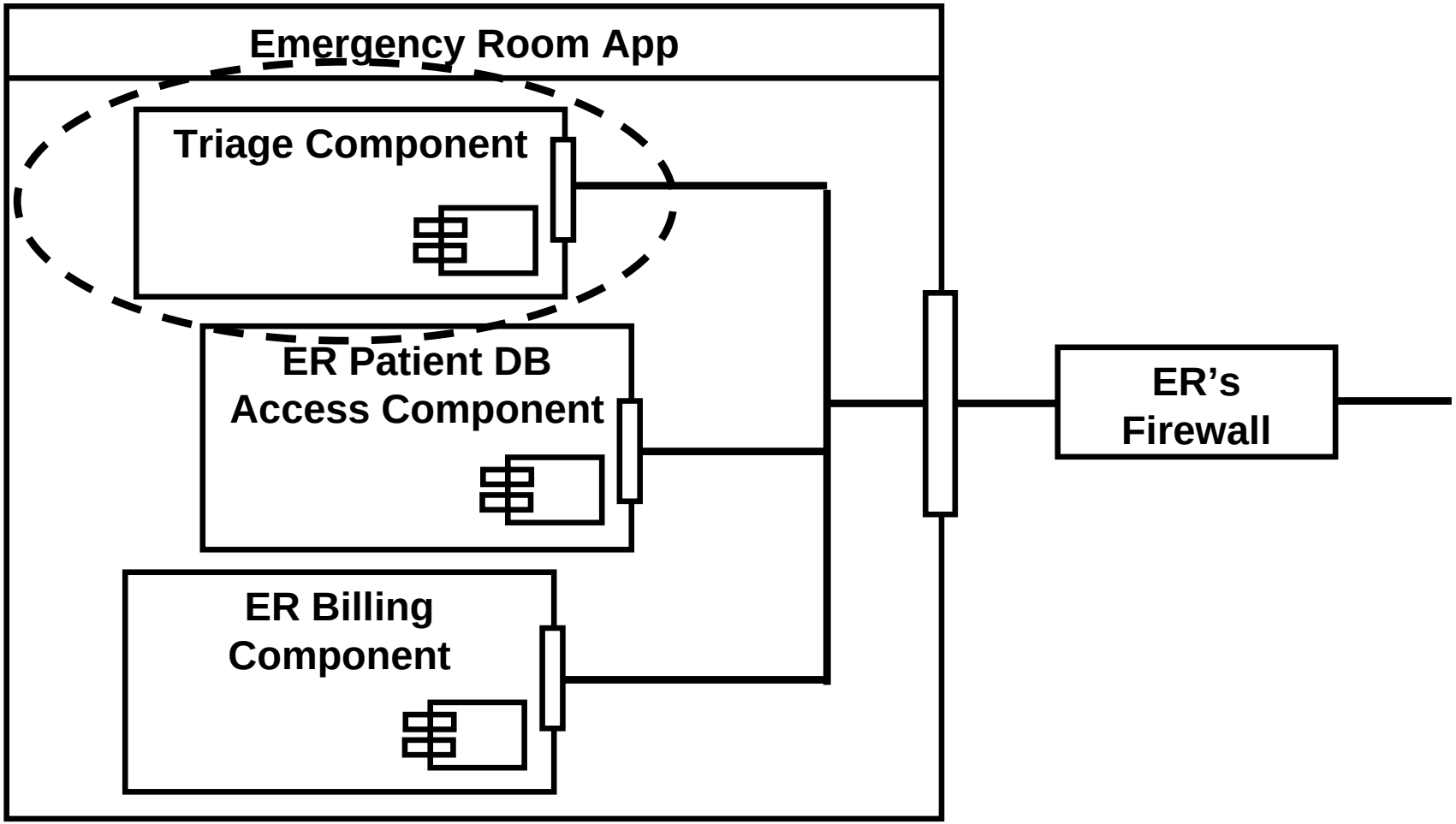
Zoomed In, Still Architectural



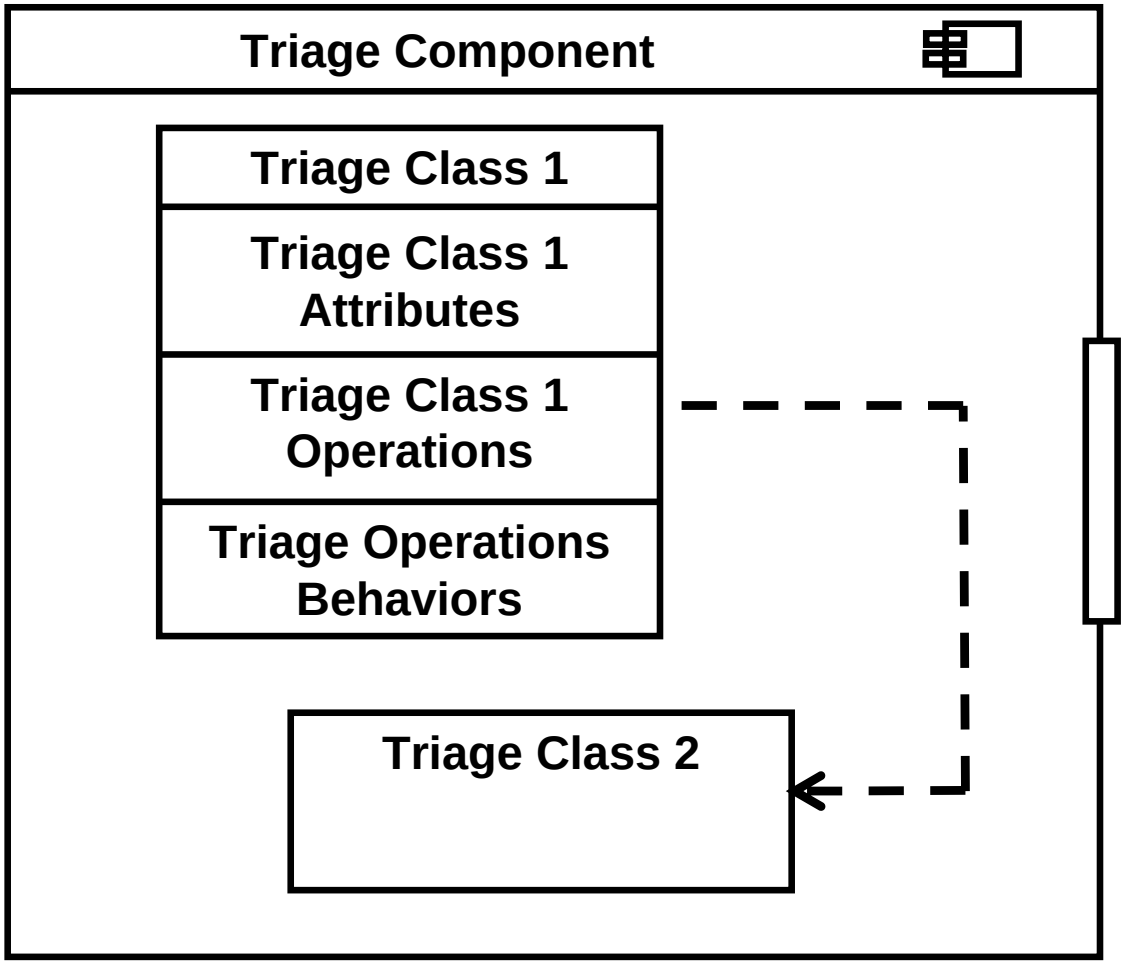
Enterprise Architecture View



Application Model

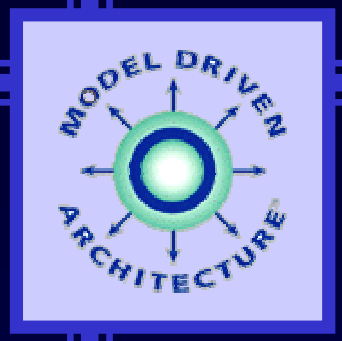


Component Model



Then MDA *Generates* the application *and its connectivity* from this detailed model

So you know that the application conforms to the model, connectivity works, and changes to any level model work in the real world

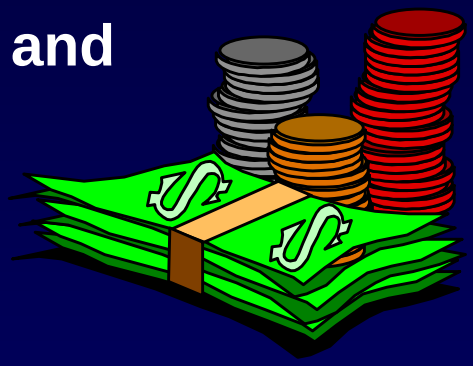


Work at Business Level

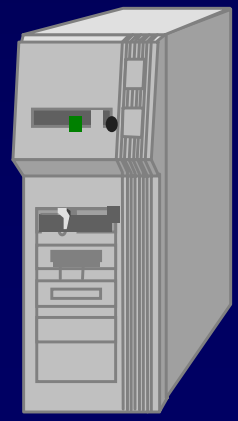
- MDA *Raises the Level of Abstraction* with full connection from modeling to development
- Start with an Architectural Viewpoint of all your networked applications, and zoom in to a single application
- Also work from Business Rules and Process Viewpoint
- Then, model structure and behavior
- MDA tools *generate* your applications from your detailed application models

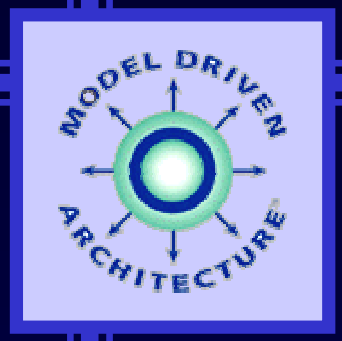
MDA – Two Benefit Areas

- **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



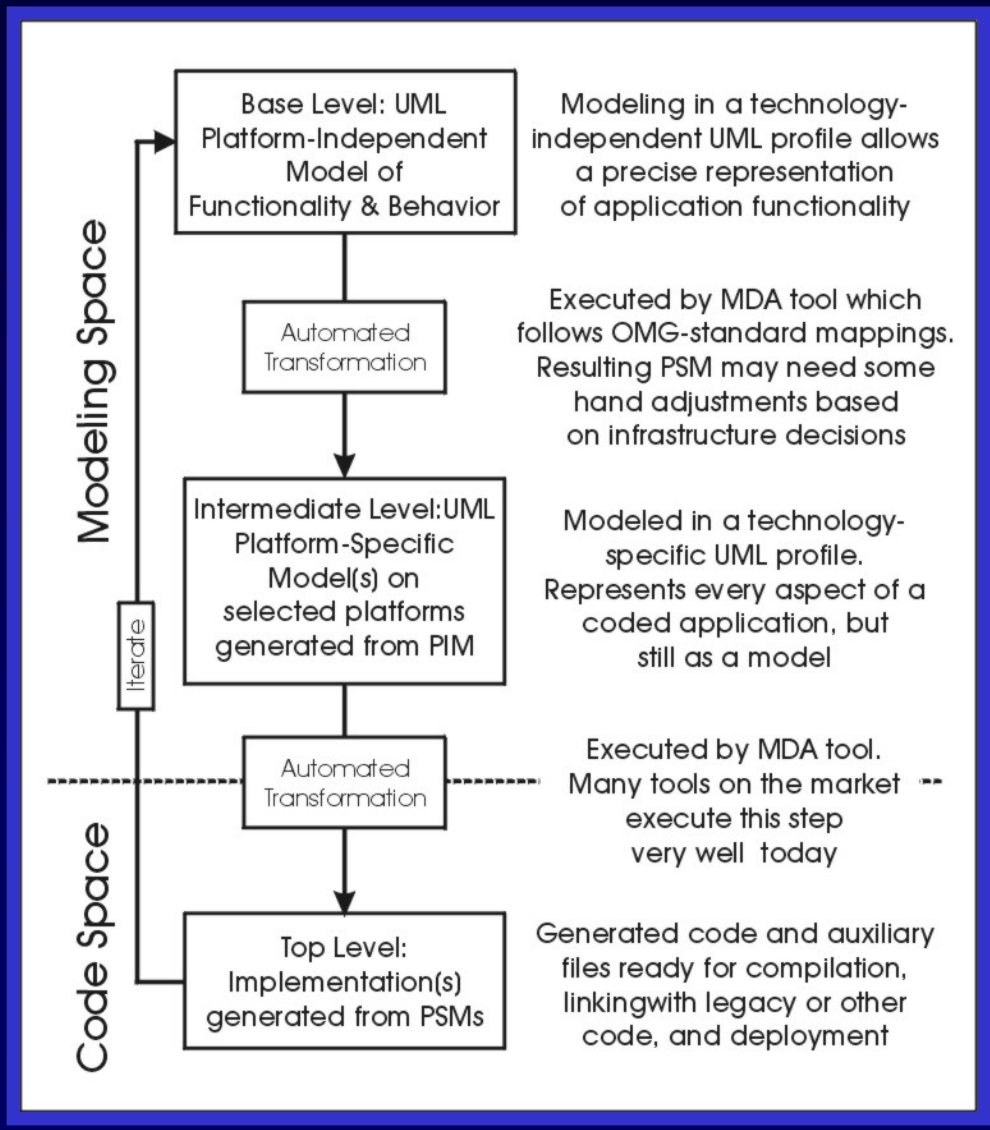


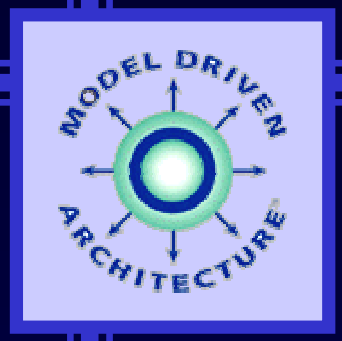
What is the Model Driven Architecture™?

- A New Way to Specify and Build Systems
  - Focus on Business Needs First
  - Based on Modeling and UML
  - Supports full lifecycle: A&D, implementation, deployment, maintenance, and evolution
  - Builds in Interoperability and Portability
  - Lowers initial cost and maximizes ROI
  - Applies directly to the mix of hardware and software that you face:
    - Programming language
    - Operating system
    - Network
    - *Middleware*

MDA: Designed for Efficiency

- **Structure is a Spectrum progressing from Modeling at the Top to Code development at the bottom**





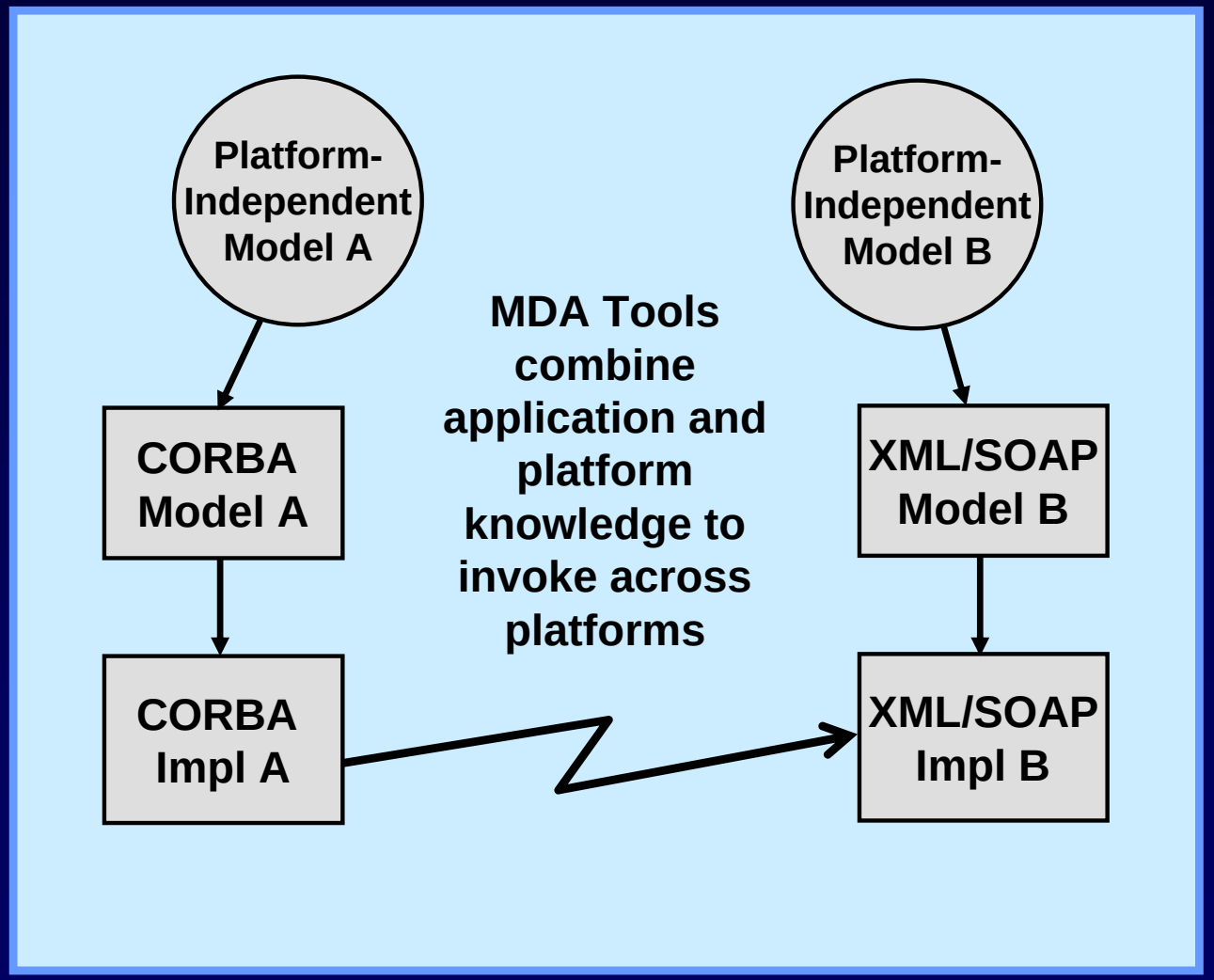
A Sensible Structure:

- Input and Investment concentrate at the business zone at the top
- Automated tools take over coding IT infrastructure towards the bottom
- Code draws from libraries written and assembled by the industry's best minds
- Remote invocations, hard to program but hardly creative, are programmed by machines, not people

MDA Applications Interoperate

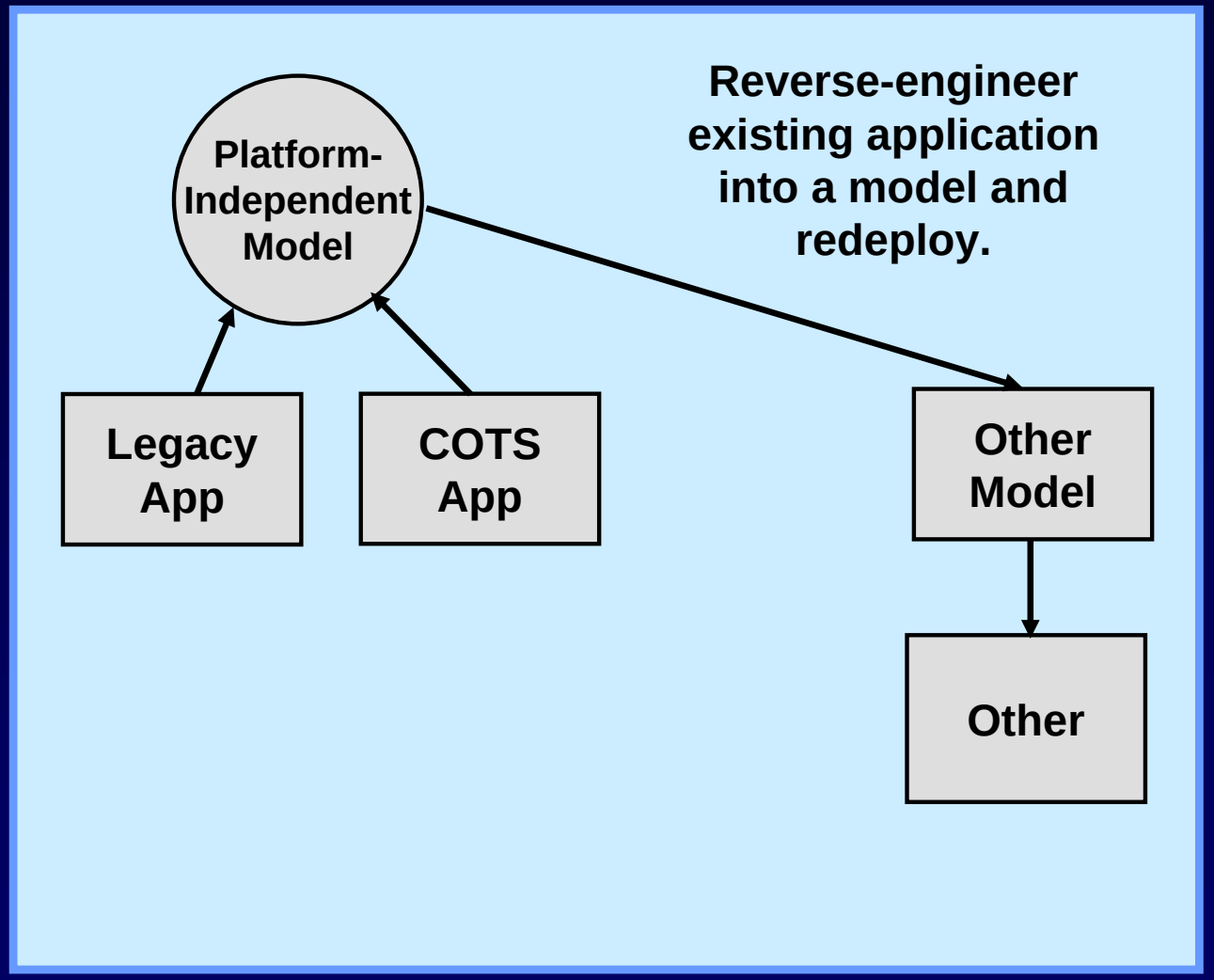
MDA Tools will generate cross-platform invocations connecting either instances of a single MDA application, or one application to another.

Standard *Pervasive Services* – directory, security, more – will also be accessed through cross-platform invocations where necessary.



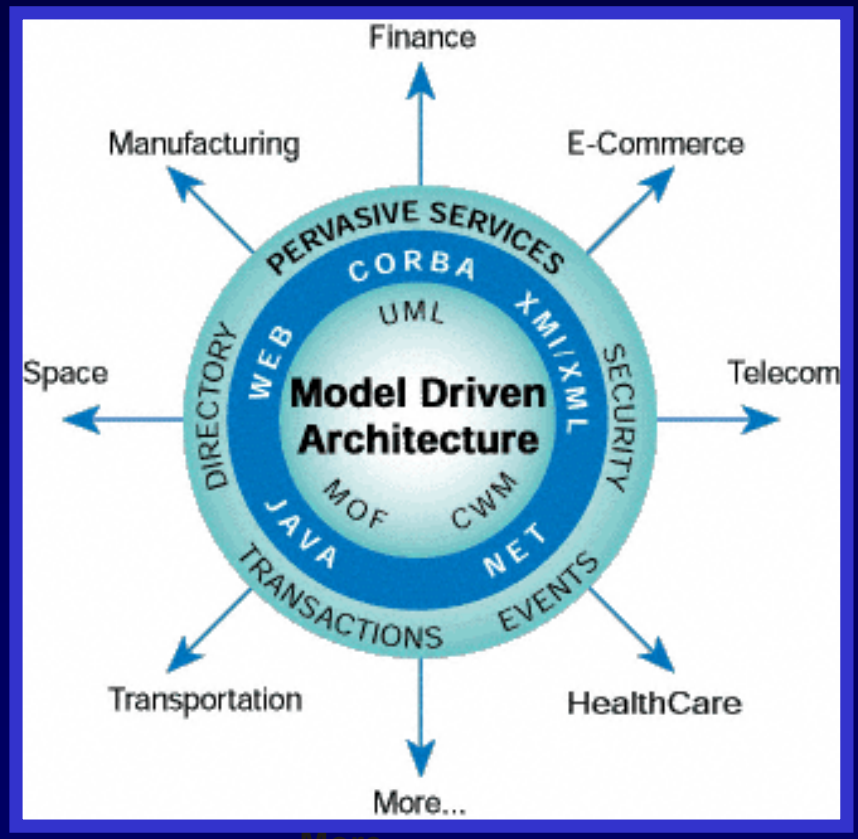
Integrating Legacy & COTS

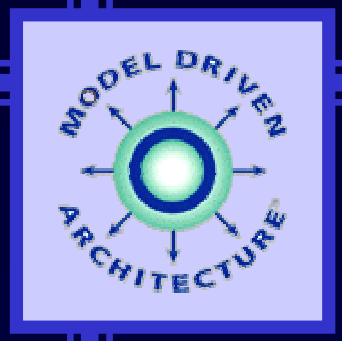
Tools for Reverse Engineering automate creation of models for re-integration on new platforms



MDA in Industry Standards

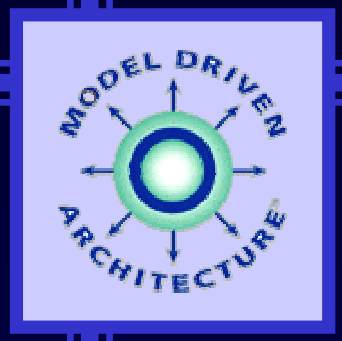
- OMG (and other) Task Forces standardize Domain (Industry-Specific) Facilities as PIMs.
- With implementations on multiple platforms, no technology or platform barriers prevent widespread adoption and use.
- Interoperate cross-platform with other standard applications.
- Both PIM and set of PSMs and interface code – on *every* mapped platform – become OMG standards.





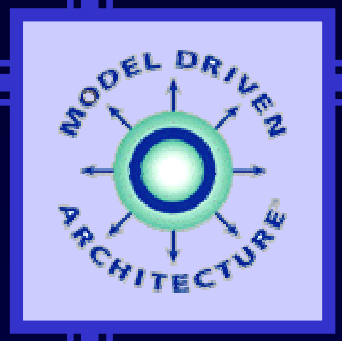
The Middleware Company Study

- Two parallel implementations of Sun's Pet Store example application
  - Typical 3-tier e-commerce application
  - Strictly specified for the study
- Two 3-person teams, "traditional" Java tools vs. MDA-based OptimalJ (Compuware)
- MDA team completed in 330 man-hours; traditional in 508
  - MDA team was 35% faster in spite of learning MDA tool
  - They estimated that their next effort would be 10-20% faster
- MDA version also had fewer bugs
- www.middleware-company.com/casestudy/mda.pdf



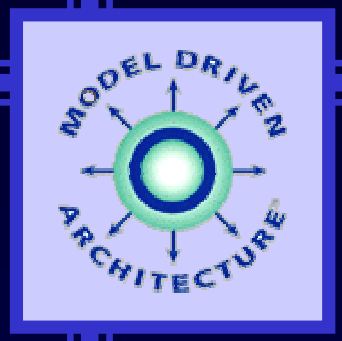
Middleware Co. Conclusions

"Based on the results of this case study, The Middleware Company is impressed by the productivity gains our MDA team experienced using the Model-Driven Architecture. We encourage organizations that wish to improve their developer productivity to evaluate MDA-based development tools for their projects, especially those involving enterprise-class applications and web services. While a short introduction to the MDA approach and tools might be necessary for development teams, the productivity benefits gained from the approach—especially for work on subsequent applications—make the effort significantly worthwhile."

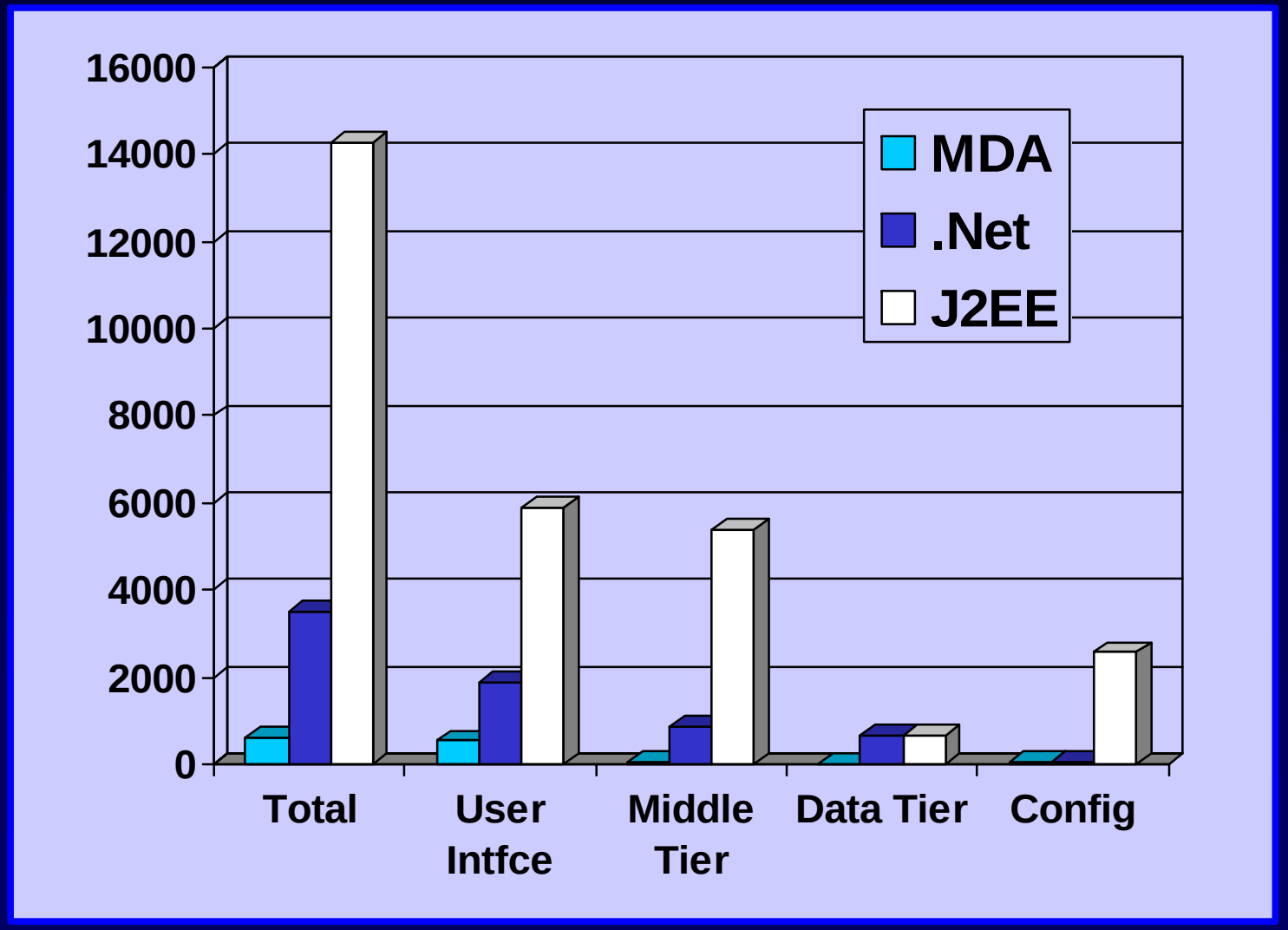


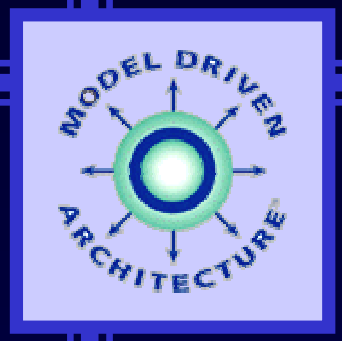
EDS MDA Study

- Also based on the Pet Store application
- Coded three ways:
  - J2EE using traditional hand-coding
    - 14,273 hand-coded lines
  - .Net/C#
    - 3,484 hand-coded lines
  - OptimalJ J2EE
    - 610 hand-coded lines, plus UML models
- Also converted MDA version from EJB 1.1 to EJB 2.0
  - Estimated several months by hand
  - Using MDA, took 30 minutes
- www.eds.com/thought/thought_leadership_agility_model_arch.pdf



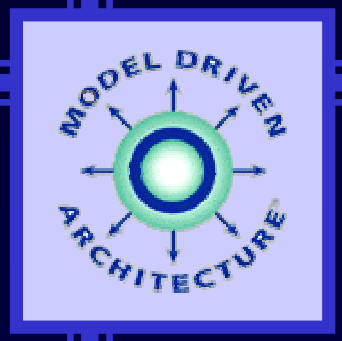
Lines of Code Detail





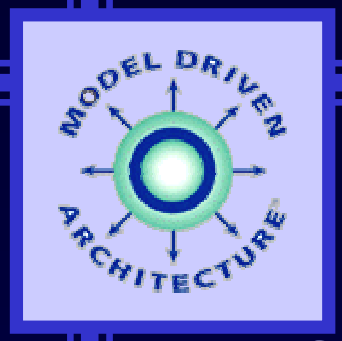
EDS Study Conclusions

- MDA helps organizations achieve agile and adaptable IT so they can overcome … business challenges. Through this evolutionary approach, collaborative teams can enjoy a wide range of compelling business benefits:
  - Reduced development time for new applications
  - Reduced cost throughout the application lifecycle
  - Improved application quality
  - Increased return on technology investments
  - Rapid inclusion of emerging technology benefits into existing systems



MDA Specifications

- MDA Architecture (June 2003)
- UML 2.0 and MOF 2.0
- UML Profiles (all complete):
  - Profile for EDOC
  - Profile for EAI
  - Profile for CORBA
  - More…
- Support from XMI, CWM (complete)
- Pervasive Services (coming)
- Domain Specifications



MDA Benefits

- Comprehensive architecture maximizes both business and technical advantages
- Technology-independent representation of business functionality and behavior
- Stable, model-based approach maximizes SW ROI
- Full support throughout the application life-cycle
- Reduced costs from beginning to end
- Reduced development time for new applications
- Optimized technical behavior - scalability, robustness, security – via generated code
- Smooth integration across middleware platform boundaries
- Rapid inclusion of emerging technologies into existing systems

OMG: Background

- About 500 member companies, world's largest software consortium.
- Founded April 1989 - Twelve Years Old
- Small staff (22 full time); no internal development. Representatives in Germany, Japan, U.K, Australia, India.
- Home of the Model Driven Architecture and MDA-Based Standards, Maximizing IT ROI by Extending Software and Infrastructure Lifetime Across Technology Transitions

Worldwide Scope

Alcatel	Computer Assocs	Fraunhofer Fokus	NEC	Siemens
Artisan	Compuware	HP	NIST	Software AG
BEA Systems	Daimler-Benz AG	Hitachi	Nokia	Sony
Bank of America	Deere & Co.	IBM	Northrup	Sun
Boeing Corp.	EDS	IONA	Osellus	Telelogic
Borland	Ericsson	Lockheed	PrismTech	Thales
BAE Systems	Fair Isaac	MetaMatrix	Raytheon	Unisys
CBOE	Fujitsu	Mitre	Sandia	W3C
Charles Schwab	GCHQ	Motorola	SAP AG	Workflow Mgmt

Meetings, Meetings!

- OMG Specifications are adopted at our meetings
- Held Five times a year, at member companies' sites around the world
- Lasts a week and attracts over 250 people
- Every subgroup meets; up to 30 simultaneous sessions on some days
- Dates, locations on the web at www.omg.org/news/schedule/upcoming.htm
- You're invited to come as an observer! Just let me know (email: info@omg.org)

Adoption Process

- RFI (Request for Information) to establish range of commercially available software.
- RFP (Request for Proposals) to gather explicit descriptions of available software.
- Letters of Intent to establish corporate direction.
- Submissions entered and revised.
- Task Force evaluation & recommendation; simultaneous Business Committee examination.
- Board decision based on TC and BC recommendations.

Availability

Innovative approach for selection of standard interfaces to adopt:

1. OMG adopts & publishes MDA PIMs and PSMs, and Implementation Interface Specifications.
2. Implementations of the Interface Specifications must be available commercially from OMG Platform, Domain, or Contributing member.
3. MDA PIMs and PSMs, and Interface Specifications, are freely available to members and non-members alike.
4. MDA PIMs and PSMs, and Interface Specifications chosen from existing products or prototypes in a competitive selection process.

OMG Links & Contacts

- OMG Homepage:
  - http://www.omg.org
- Download our specifications:
  - http://www.omg.org/specifications
- MDA Central:
  - http://www.omg.org/mda
- MDA Executive overview:
  - http://www.omg.org/mda/executive_overview.htm
- Find out about UML:
  - http://www/omg.org/uml
- Find out about CWM:
  - http://www.omg.org/cwm
- Contact OMG:
  - Email info@omg.org or siegel@omg.org