MODEL DRIVEN DEVELOPMENT

AN INTRODUCTION

By Ashok Nare

Agenda

- Introduction
- Evolution of Languages
- What is Abstraction
- How can Models help us?
- Model Driven Development
- Demo
- Conclusions
- Q & A

Speaker Introduction

- Ashok Nare
  - Technology Advisor, Enterprise Architect & Consultant
  - Currently working with various Startups
  - Over 15 years of experience in technology in a variety of roles (hands-on, technical, managerial and executive)
- Core Competencies
  - Business & Technology Alignment
  - Enterprise Solution Architecture
  - Model Driven Development
  - Service Oriented Architecture
  - Emerging Technologies
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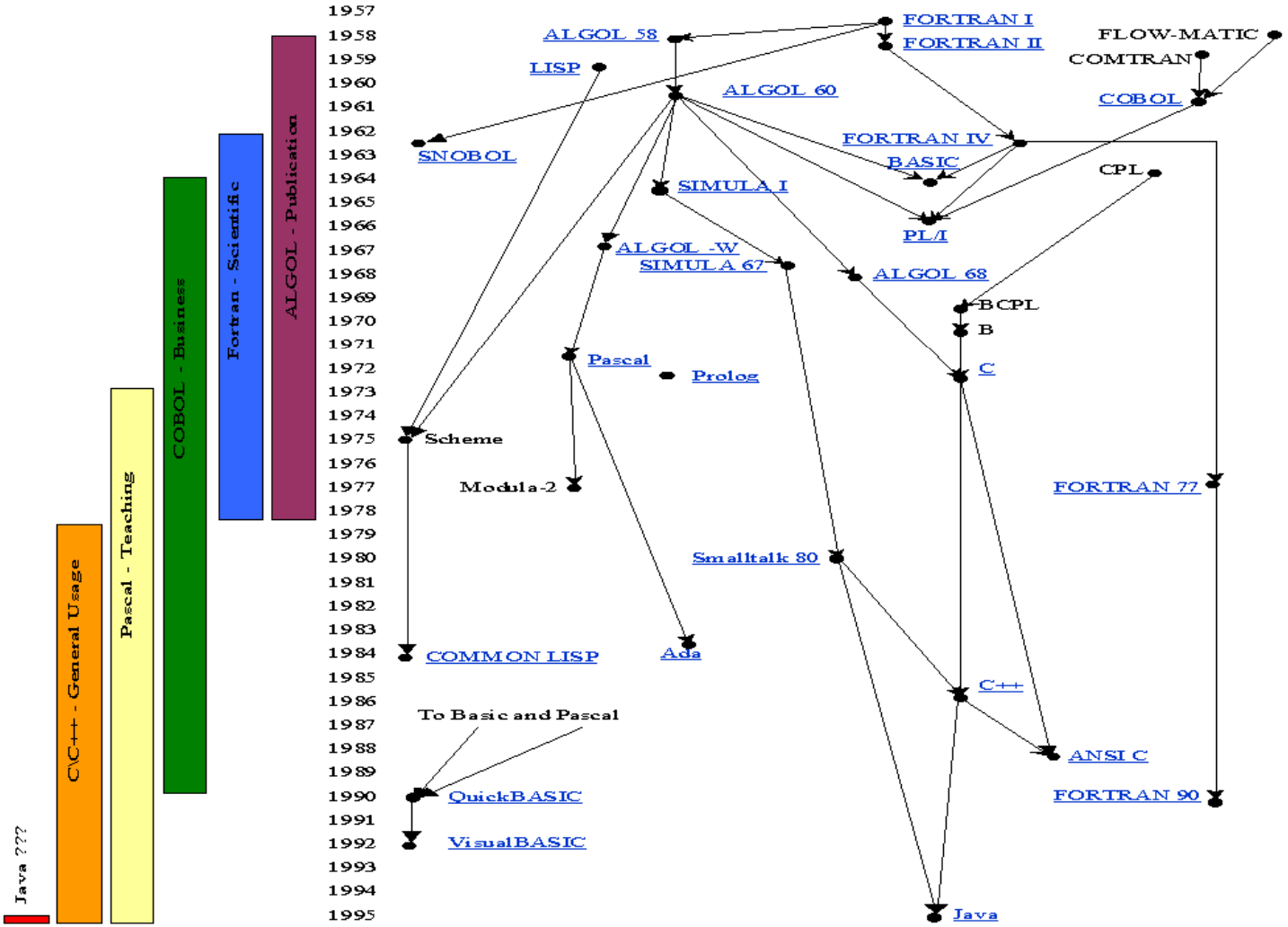
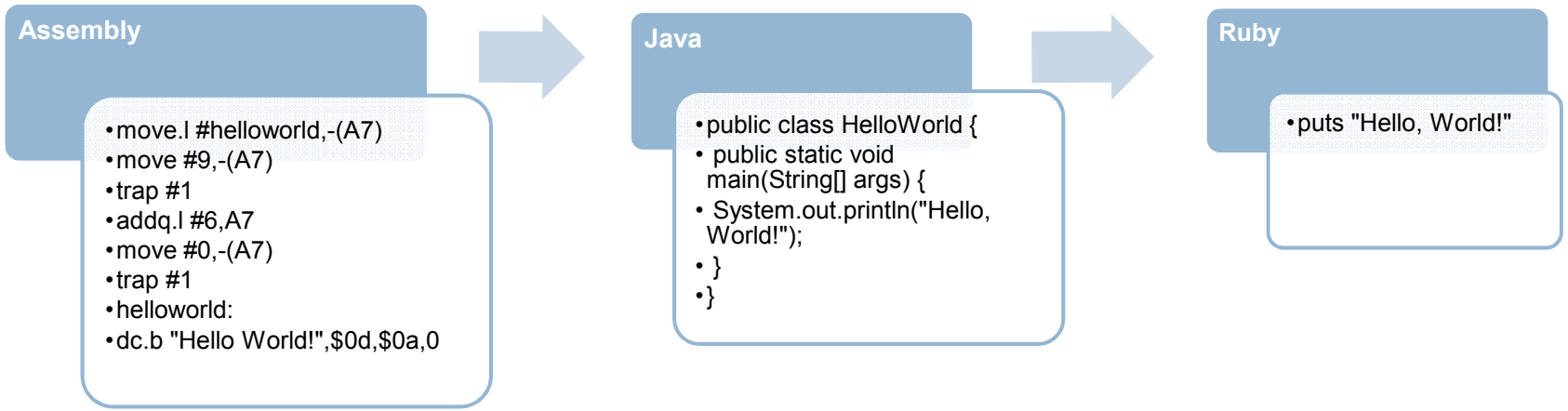
Evolution of Languages



Source: http://www.eecs.ucf.edu/~leavens/ComS541Fall97/hw-pages/history/

Evolution of Languages

- Evolution of programming languages
  - Machine language to Assembly language to higher level languages such as C++, Java, C#, Ruby, etc.
  - More time was spent on understanding “how” to solve the problem in early languages (understand the language)
- Evolution of tools, frameworks and application servers
  - Abstraction and reuse of common services
- Each language and framework raised the level of **Abstraction** by hiding low level details



What is Abstraction?

- What is Abstraction?
  - Abstraction is concentration on relevant aspects of the problem and ignoring those that are not important
  - Focus on solution to the problem by working with concepts and terms that are familiar to the problem space and ignoring the low level details
- Abstraction is the key to building modern complex software with multiple moving parts
- Model based development is the natural next step in the evolution of Abstraction

How can Models help us?

- Models provide a simplified abstraction of the complexity in the target domain
  - Models provide an abstraction layer that focuses on the higher level concepts of the domain and decouples “what” from “how”
  - Models can be Visual or non-visual
  - Different models provide different views of the problem domain
- Used in Daily Life, Science & Engineering
  - Ex: Maps, Engineering (CAD/CAM), Architecture (Structural Modeling)
- Used in software engineering primarily for white boarding, communication and analysis & design
- What if Models are 100% semantically complete instead of merely being design artifacts !

Model Driven Development (MDD)

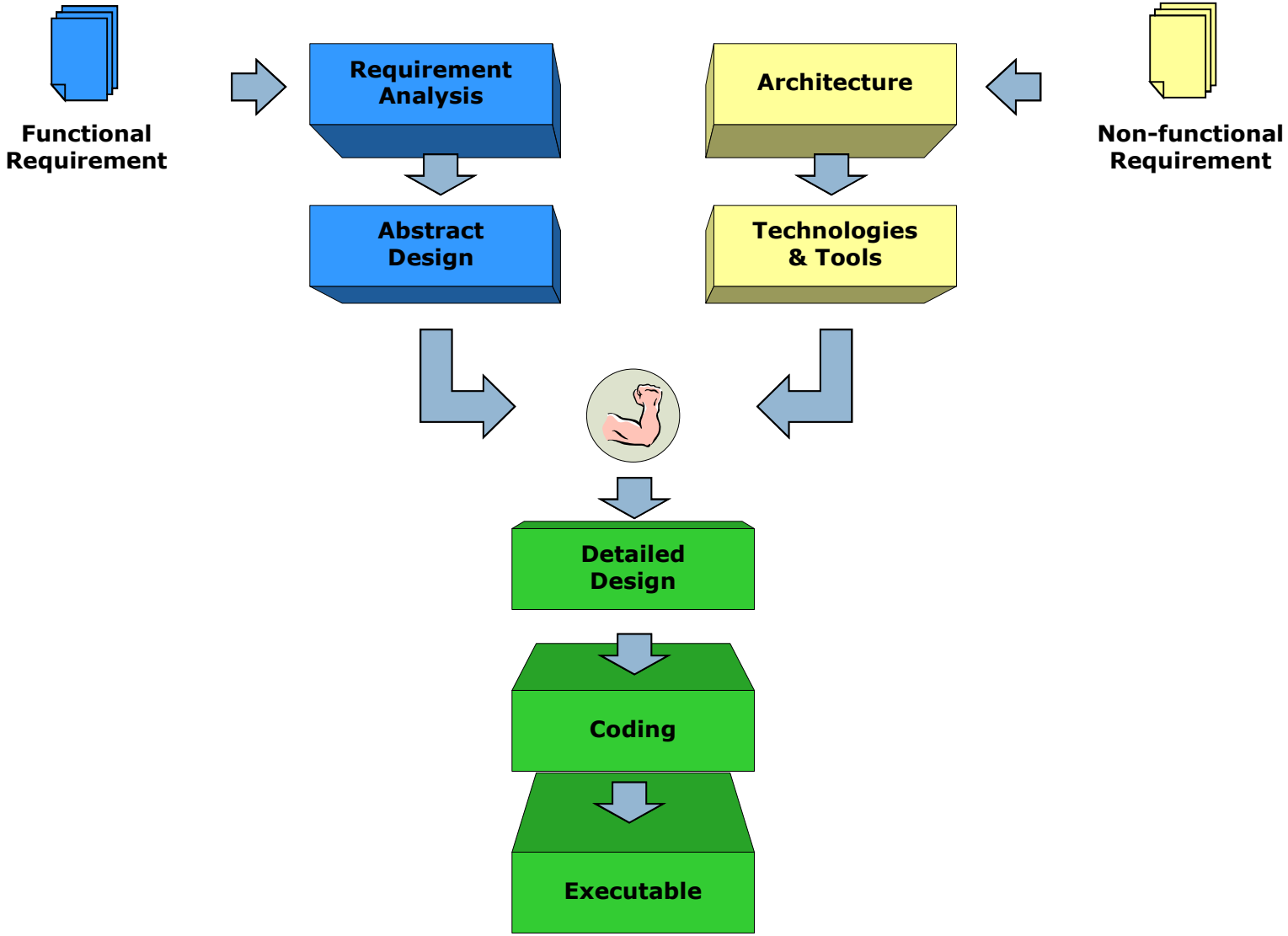
- What is MDD?
  - A software development approach that uses models to capture application logic during the development of end-to-end enterprise applications
  - Forrester's Definition:

    "An iterative approach to software development where models are the source of program execution with or without code generation."
- MDD Objectives
  - Raise the level of abstraction for application development
  - Reduce development time and improve application quality
  - Reduce maintenance cost and Total Cost of Ownership of enterprise applications

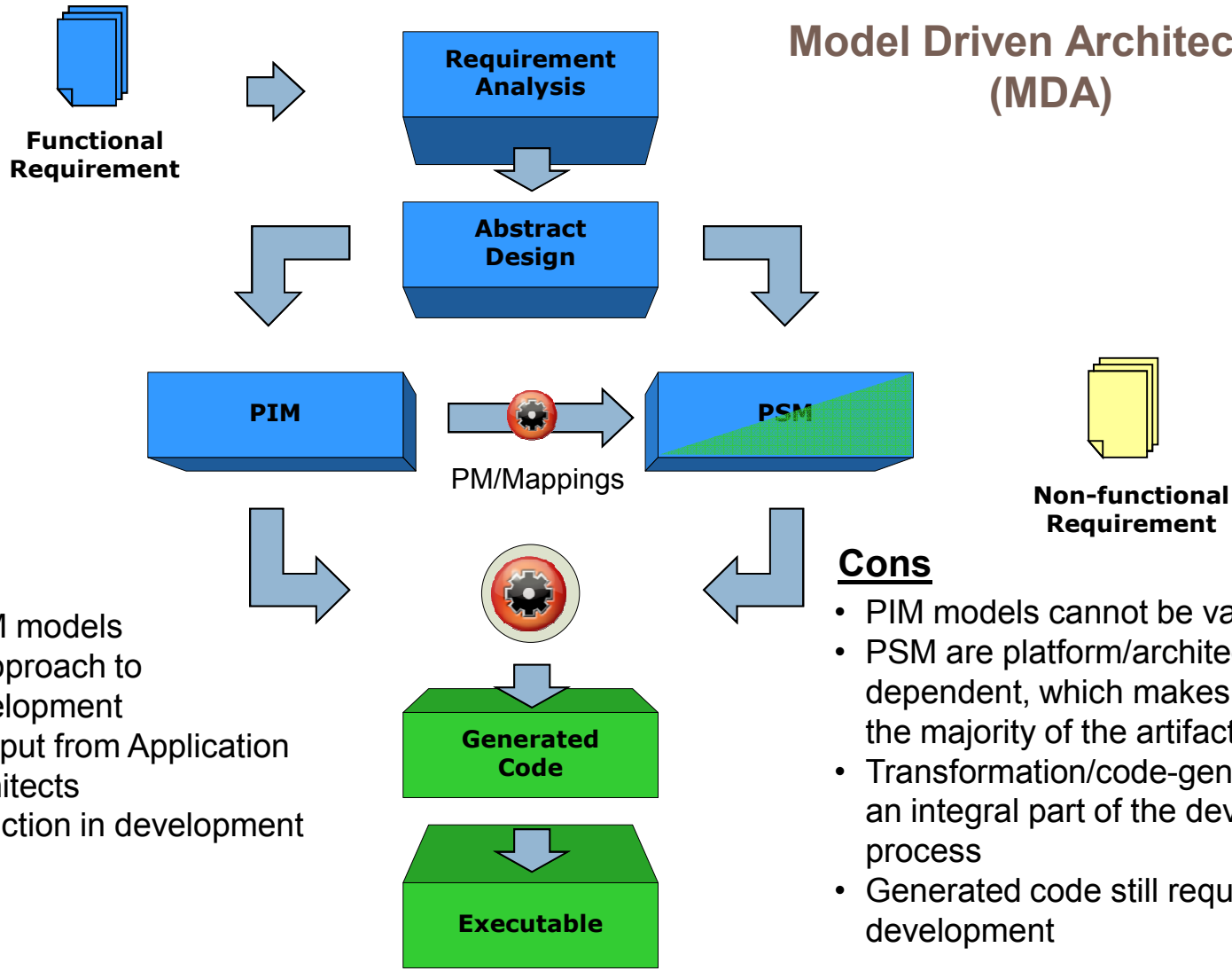
Model Driven Development

- How
  - Use models to implement application logic
  - The domain model (in Abstract Design) is the implementation model
  - Use automation to generate executables from the implementation model in runtime or build time
- Approaches
  - OMG Model-Driven Architecture (MDA)
  - Executable Models

Software Development



Model Driven Architecture (MDA)



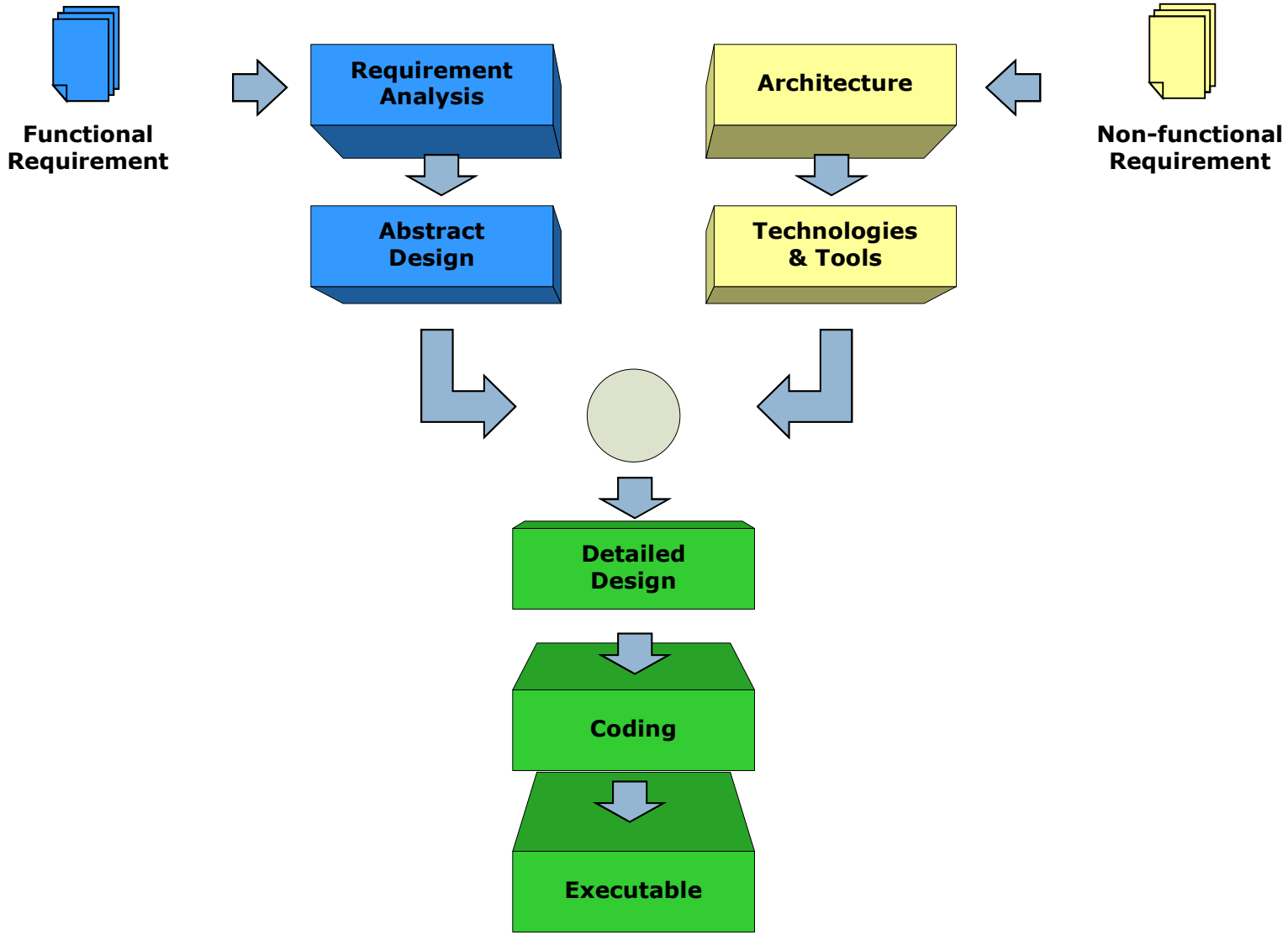
Pros

- Reusable PIM models
- Methodical approach to software development
- More direct input from Application Analysts/Architects
- Marginal reduction in development time

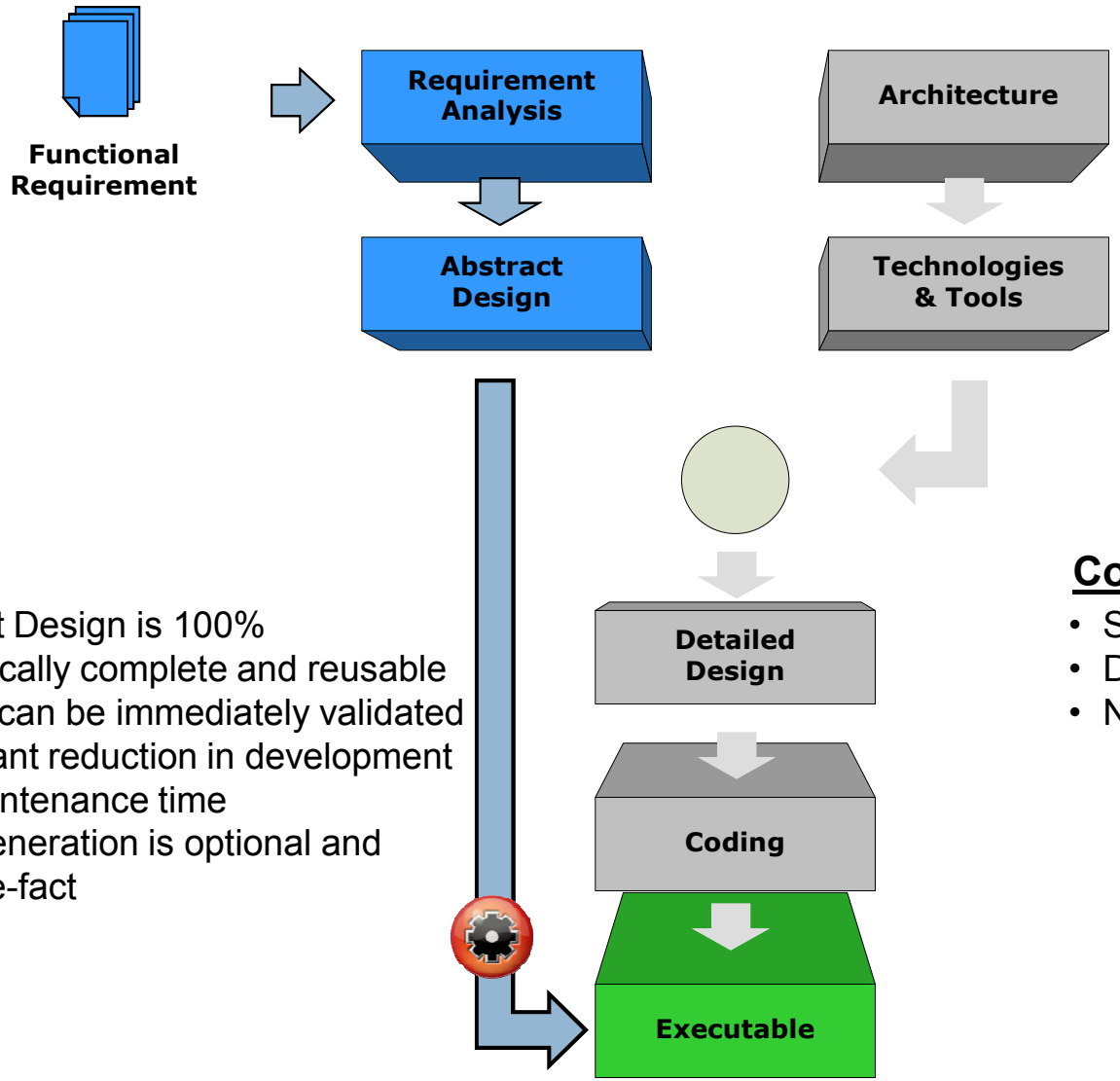
Cons

- PIM models cannot be validated
- PSM are platform/architecture dependent, which makes up for the majority of the artifacts
- Transformation/code-generation is an integral part of the development process
- Generated code still require further development

Executable Models (xUML)



Executable Models (xUML)



Executable Models

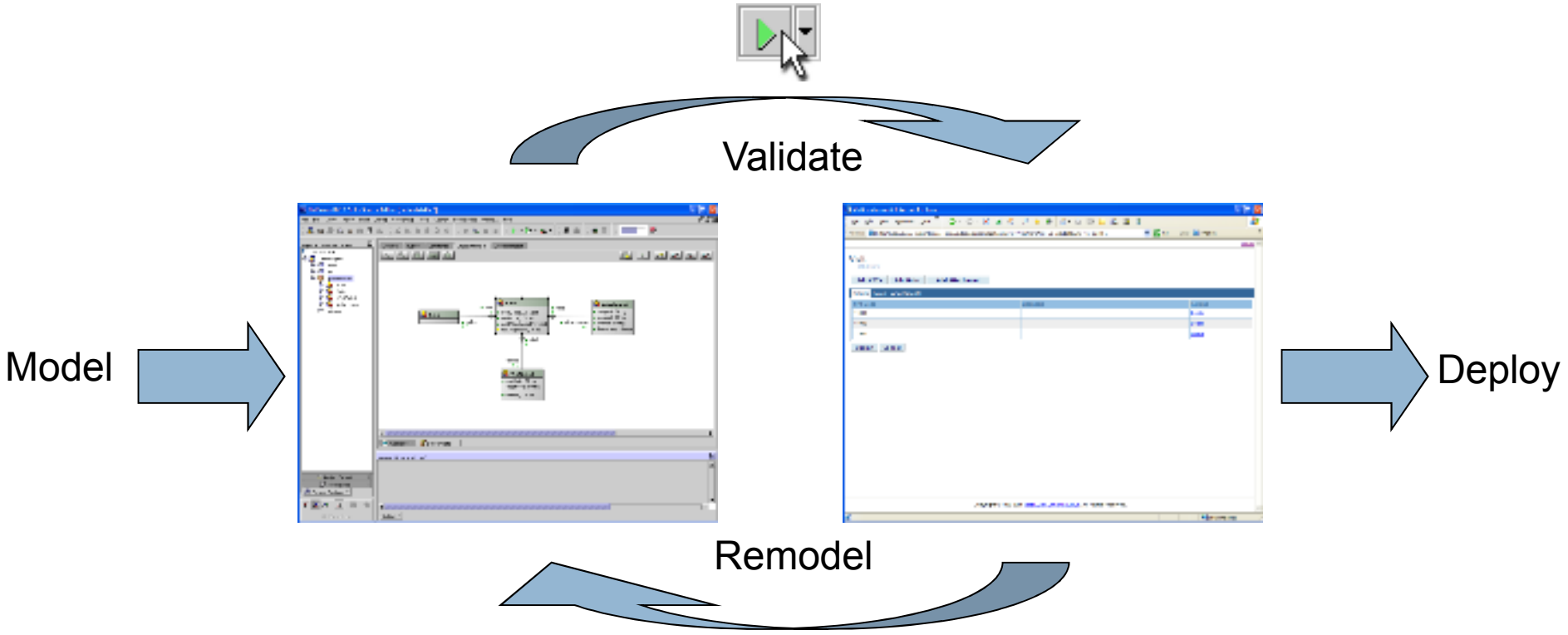
Pros

- Abstract Design is 100% semantically complete and reusable
- Models can be immediately validated
- Significant reduction in development and maintenance time
- Code generation is optional and after-the-fact

Cons

- Supports a single architecture
- Depends on runtime environment
- No access to generated code

Executable Models (xUML)



The Model is the Executable

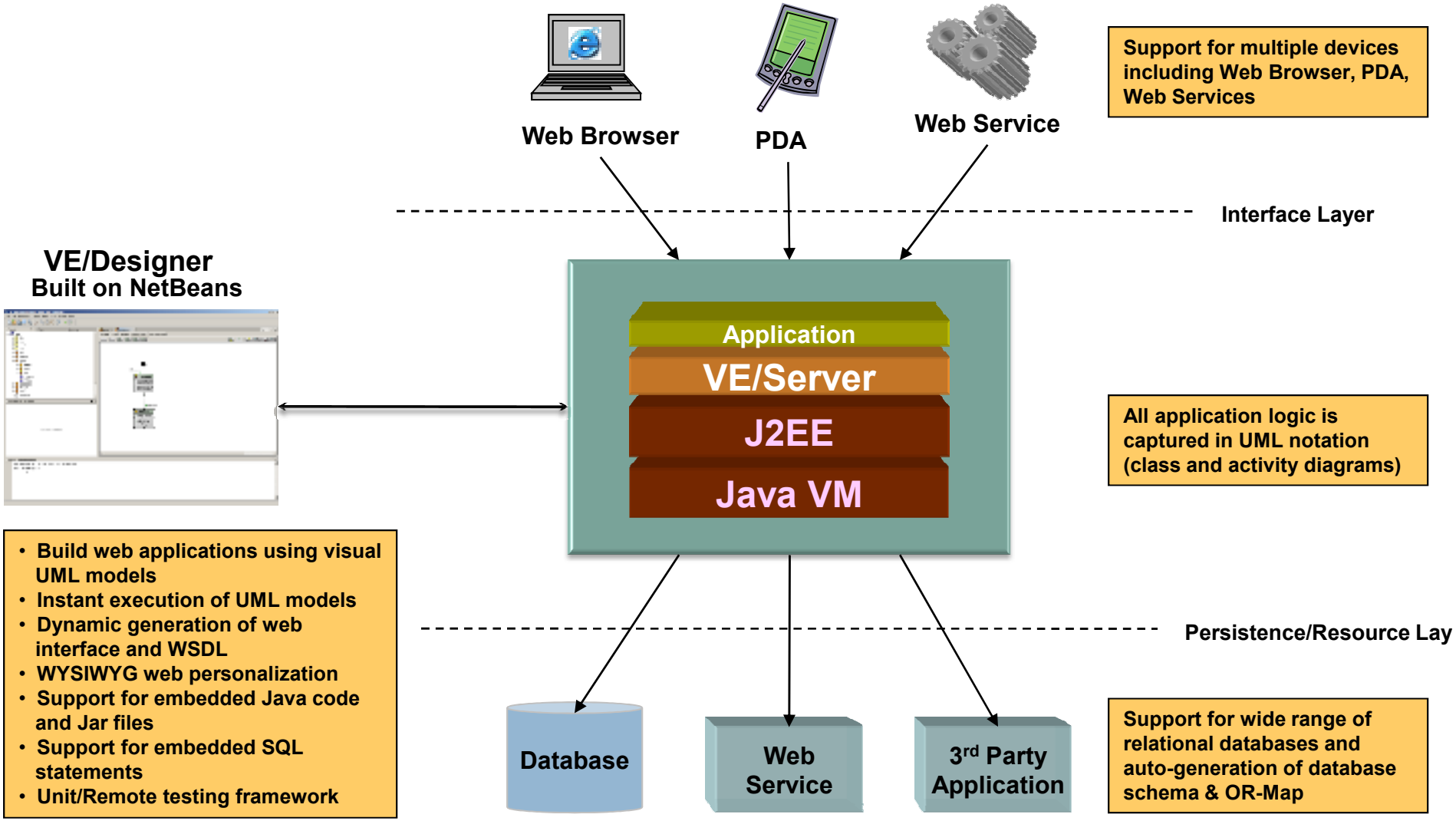
Advantages

- Captures application logic in platform independent UML models
- Simplifies application development by reducing the number of required skills in the underlying technologies, specifications and standards
- Provides Immediate validation of business requirements
- Improves communication among stake holders
- Protects business IP investments from evolving technologies
- Radically reduces the development, time, cost and effort of business applications and Web Services
- Increases application agility to better align with continuously changing business needs

MDD Vendors

- MDA
  - IBM's Rational Software Architect
  - Interactive Objects (ArcStyler)
- Executable UML
  - **Intelliun Corporation (The Virtual Enterprise)**
  - Kennedy Carter (iUML)
  - CARE Technologies (OLIVANOVA)
  - Mentor Graphics (BridgePoint UML Suite)
  - E2E Technologies, Ltd. (E2E Bridge)

The Virtual Enterprise (VE)



VE Features

VE/Designer

- Develop web applications using UML models
- Instant execution of UML models and validation of application logic
- Dynamic generation of the web interface and Web services
- WYSIWYG web personalization
- Dynamic generation of object-relational database mapping
- Formula auto-completion
- Support embedding Java code and JAR files
- Support embedding hand-coded SQL statements/stored procedures
- Unit/remote testing framework

VE/Server

- Runs on any J2EE web and/or application server
- Runs on a any Java supported platform including Unix, Linux, Windows and AS/400
- Supports wide range of relational databases including MS-SQL, Oracle, DB2/UDB, MySQL, Pervasive, and Sybase
- Supports SOAP and WSDL in both client and server scenarios
- Supports REST in both client and server scenarios
- Supports JMS for messaging and events
- Provides full localization

Demo

- Demonstration of Model Driven Development using Intelliun's Virtual Enterprise platform
- Web-based billing module
  - Submit Invoice
    - Capture line items with quantity, unit price and extended price
  - List Invoices
    - Edit, delete specific invoices

Approach Summary

- Application logic is captured in platform independent UML models
- Models are immediately executable as they're developed (no code generation, compilation, and deployment required)
- The development focus is always on the domain model, where interface and persistence is auto generated and can be later customized
- Code generation is optional and after-the-fact
- Code generation is done via templates that can be customized to control language, coding style, design patterns, and technology choices

Myths of MDD

- Modeling can only be used during the analysis and design phases
- Only objective of modeling is to generate code
- MDD is similar to CASE Tools
- Models are not sufficient to develop an enterprise application
- MDD tools are not mature and can only be used to for small apps and prototypes
- MDD tools are expensive

State of MDD

- Many active vendors and products
- Proven to work – Several MDD applications in production !
- MDD and SOA
  - Model Driven Service Development
- MDD and BPM
  - Model Driven Business Process Management
- MDD continues to build momentum
  - Increased interest and involvement of industry leaders
- Emerging standards for Executable UML
  - OMG's RFP for Concrete Syntax for a UML Action Language

Resources

- OMG's MDA Resources
  - MDA: http://www.omg.com/mda/
  - MDA Vendors: http://www.omg.com/mda/committed-products.htm
- Intelliun' Virtual Enterprise
  - Corporate : http://www.intelliun.com
  - Technical Overview: http://www.intelliun.com/Products/TheVirtualEnterprise
  - Free Download: http://www.intelliun.com/Developers/Downloads