Meta-Model Transformation using OCL and Patterns

Compuware Corporation

Steve Schwartz
Senior Project Manager
Compuware Corporation

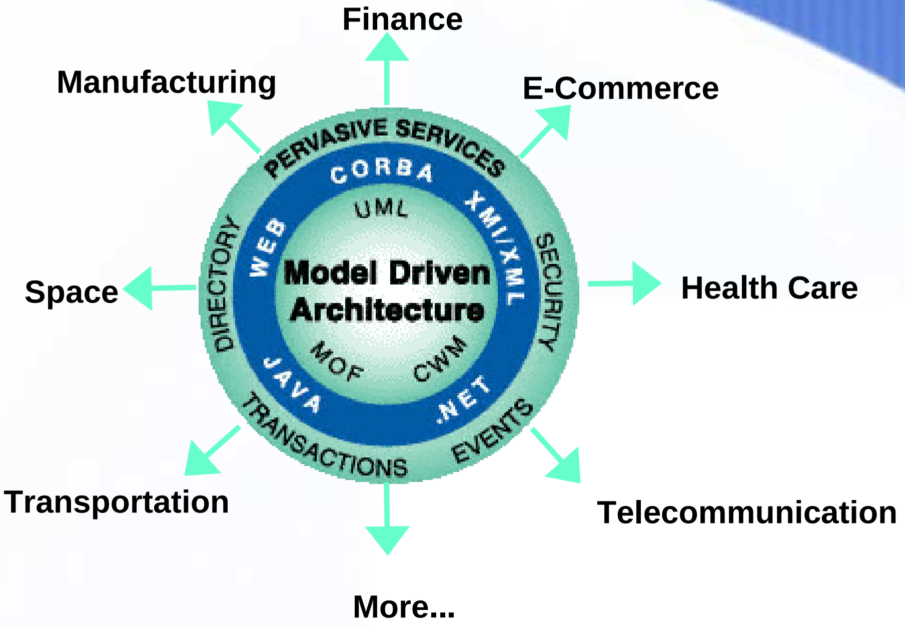
Agenda

- MDA promises
- Languages, transformations and refinement
- Raising the level of abstraction
- Types of transformations that do not constitute MDA
- MDA requirements summary

MDA Promises

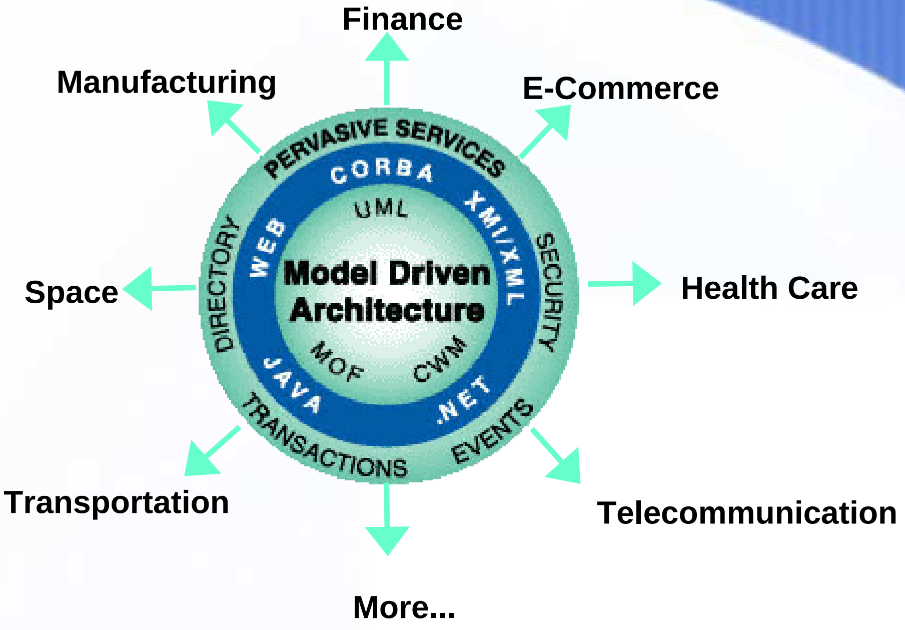
MDA Qualities

- Portability
- Cross-platform Interoperability
- Platform Independence
- Domain Specificity
- Productivity

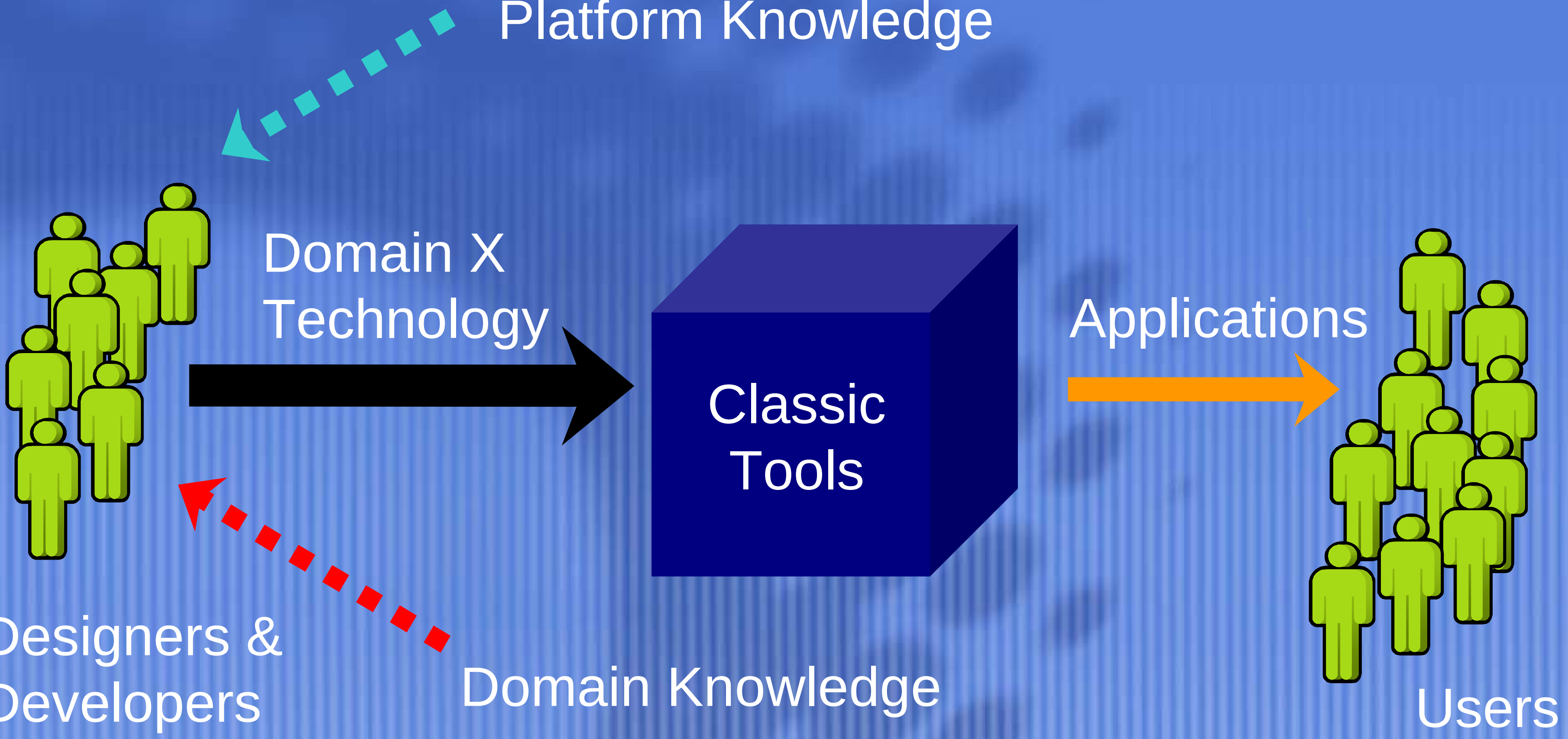


MDA Benefits

- Reduced cost
- Reduced development time
- Improved application quality
- Increased return on IT investments
- Rapid inclusion of emerging technologies



Classic Modeling and Development



Platform Knowledge

Domain X Technology

Classic Tools

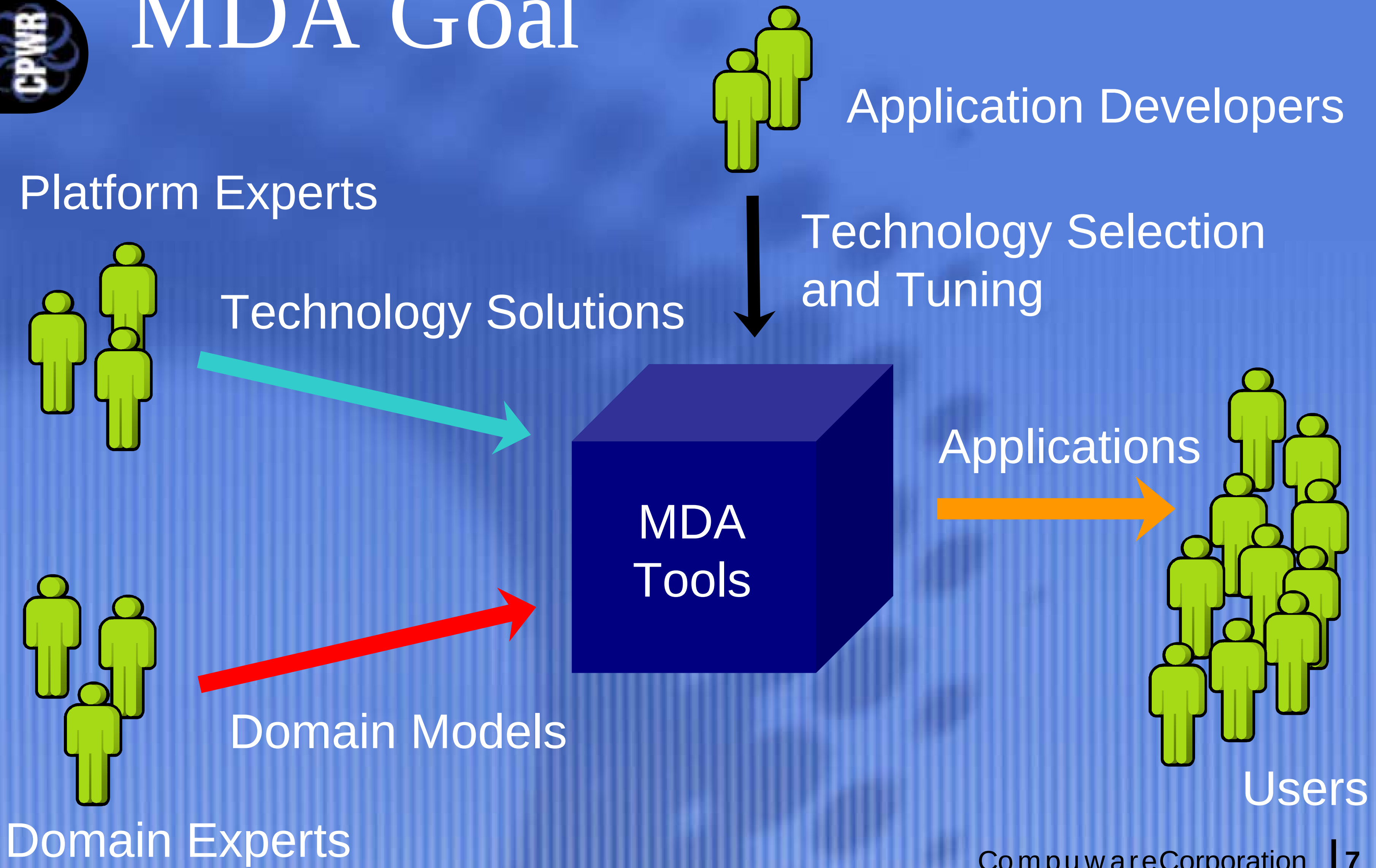
Applications

Designers & Developers

Domain Knowledge

Users

MDA Goal

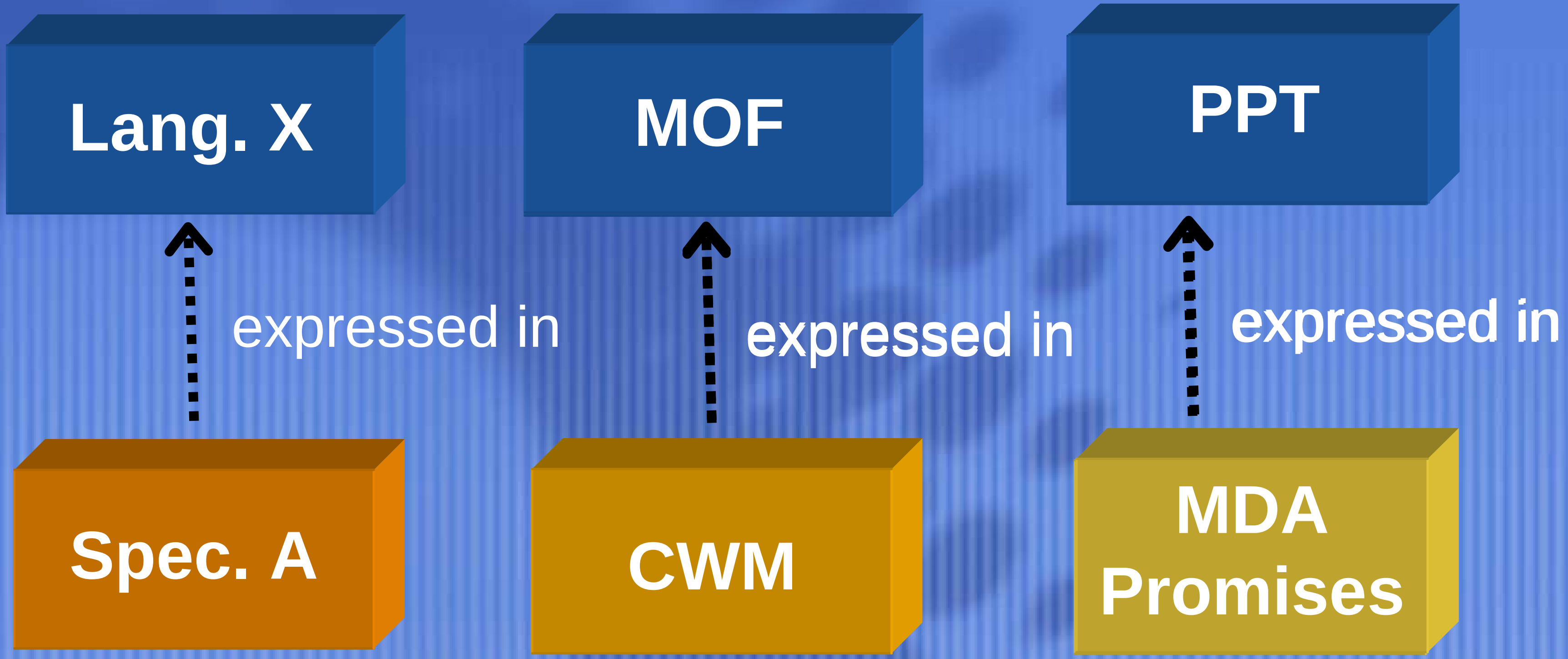

Application Developers
Platform Experts
Technology Selection and Tuning
Technology Solutions
MDA Tools
Applications
Domain Models
Users
Domain Experts

MDA Essentials

- Embrace and appreciate existing IT technologies
- Separation between, and reusability of, domain and platform expertise
- Quick adaptability of domain and technology changes
- Generation of working high-quality applications and integrations

Languages, Transformations and Refinement

Formal Languages



Lang. X

expressed in

Spec. A

MOF

expressed in

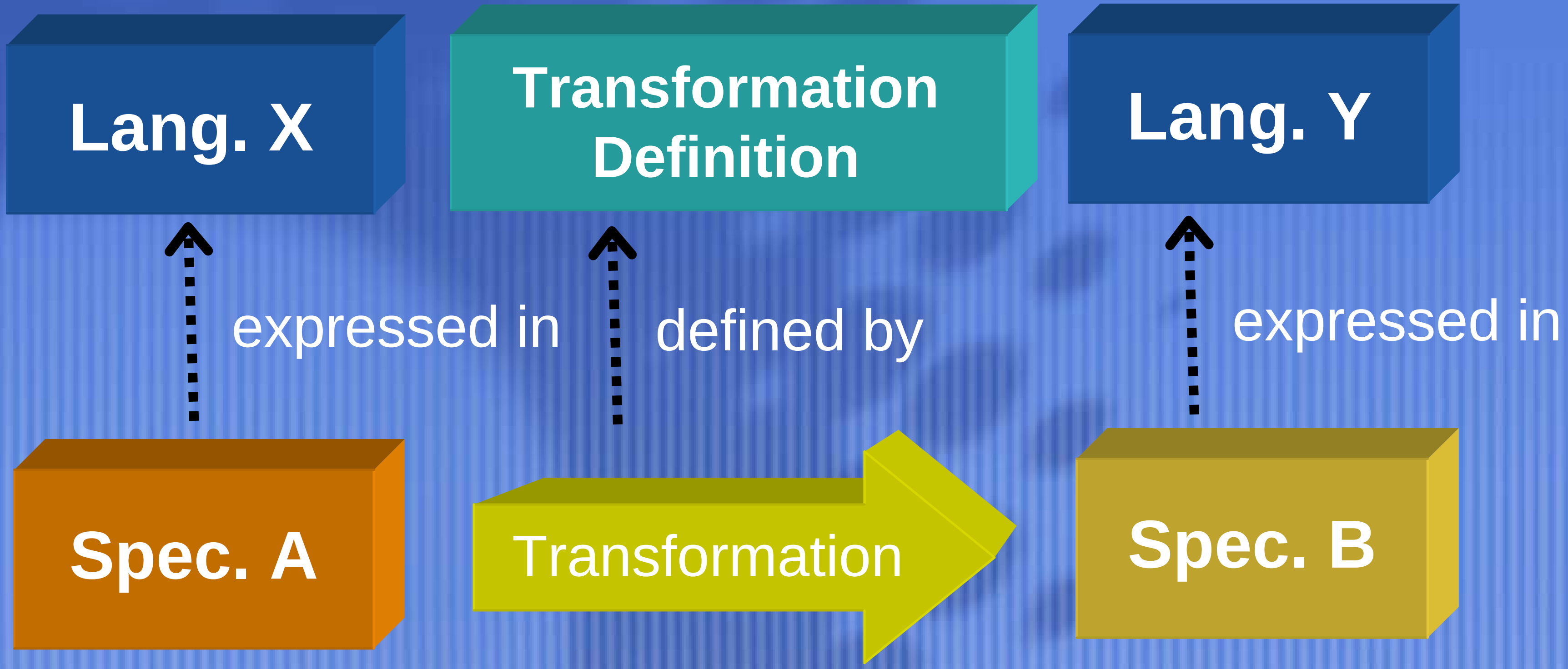
CWM

PPT

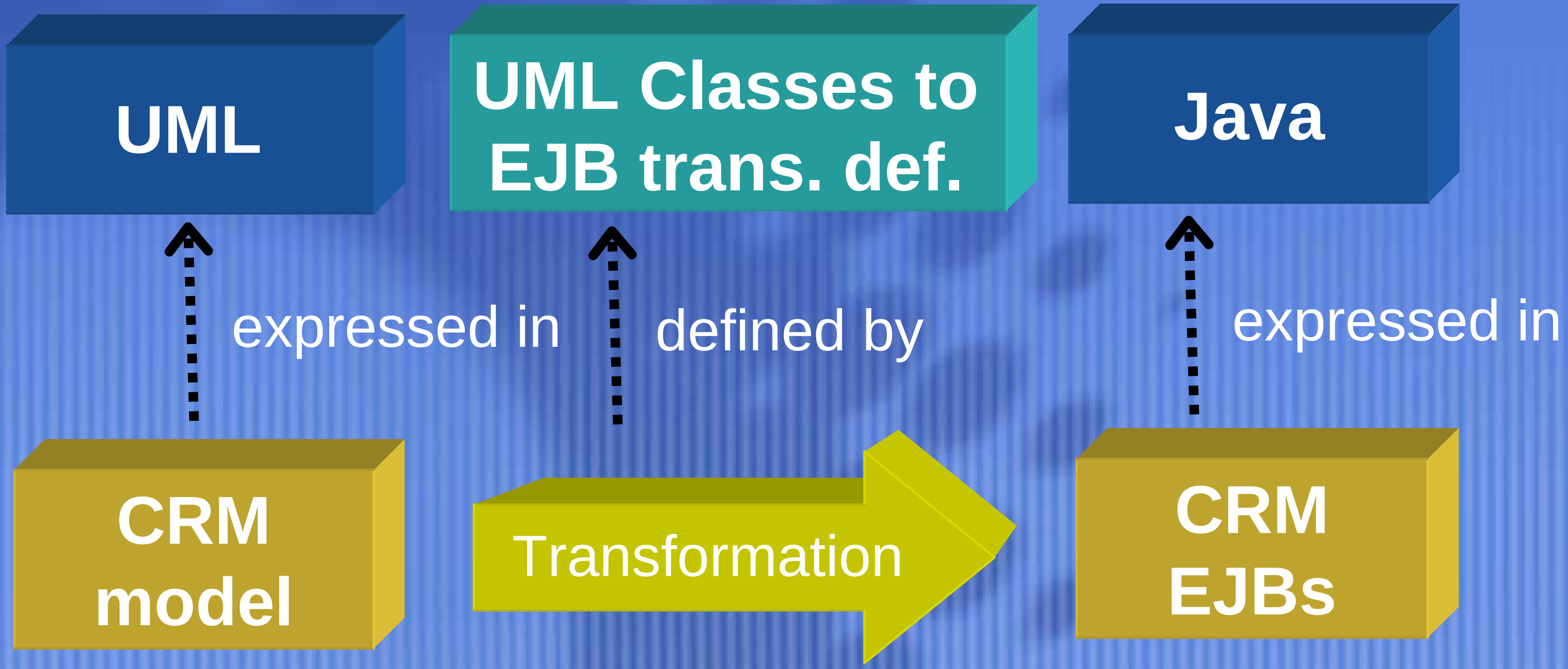
expressed in

MDA Promises

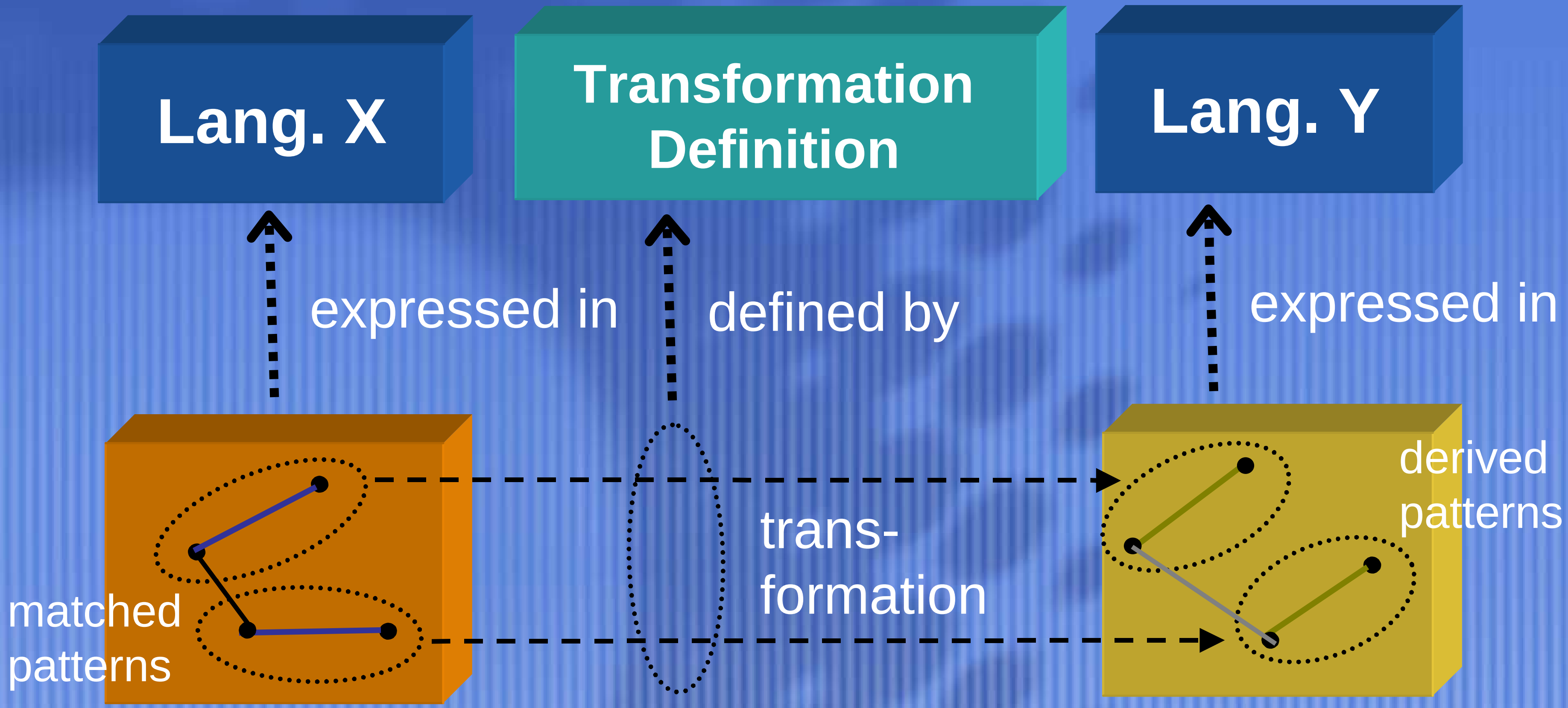
Transformations



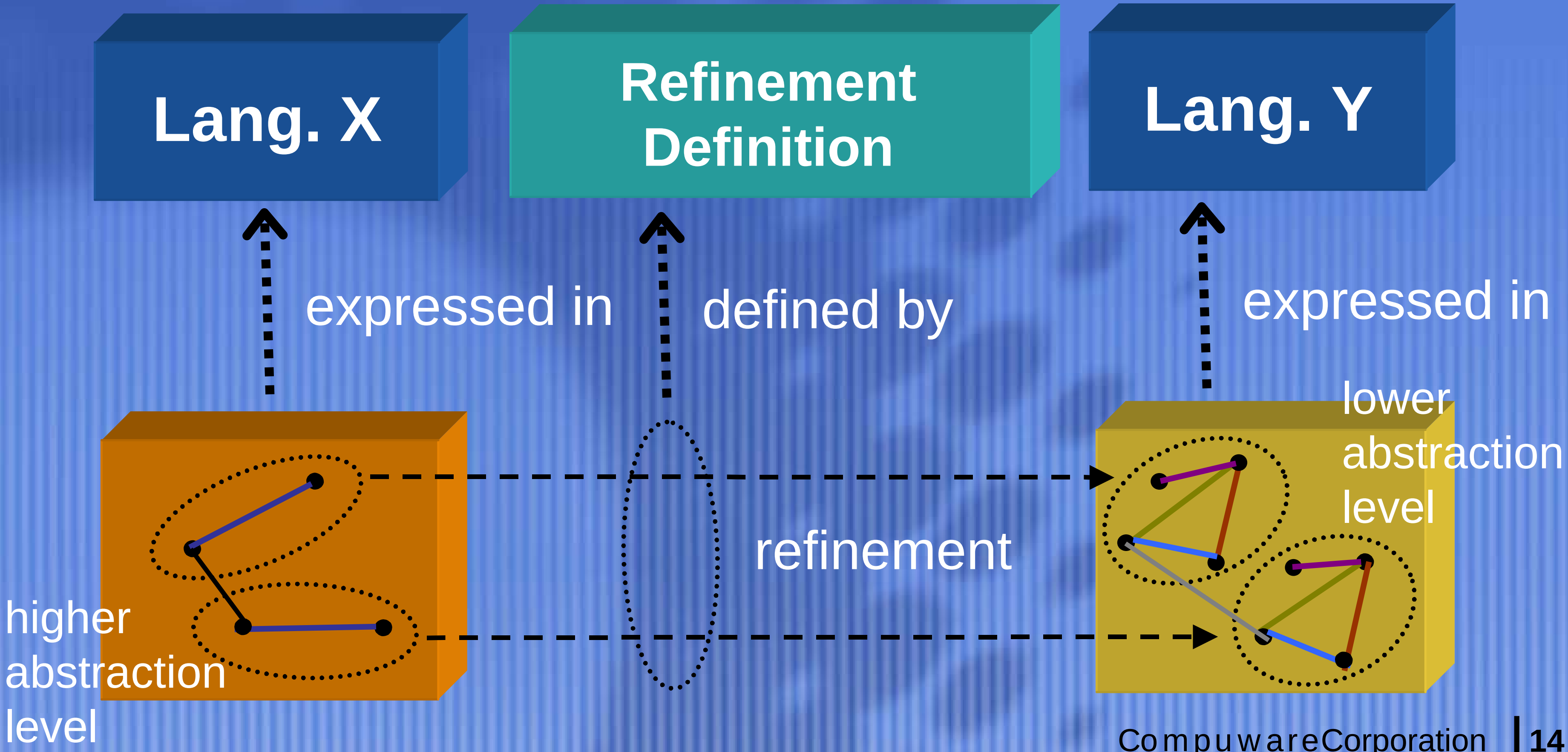
Example


UML
UML Classes to EJB trans. def.
Java
expressed in
defined by
expressed in
CRM model
Transformation
CRM EJBs

Transformation = Matching and Deriving Patterns



Refinement Preserves Meaning and Derives Complex Patterns



Transformations Conclusions

- Transformation = matching and deriving patterns
- The transformed languages can be equal or different
- Transformations can occur between different specifications or within one specification
- A refinement is a complete transformation that preserves meaning and derives more complex patterns than it matches

Raising the Level of Abstraction

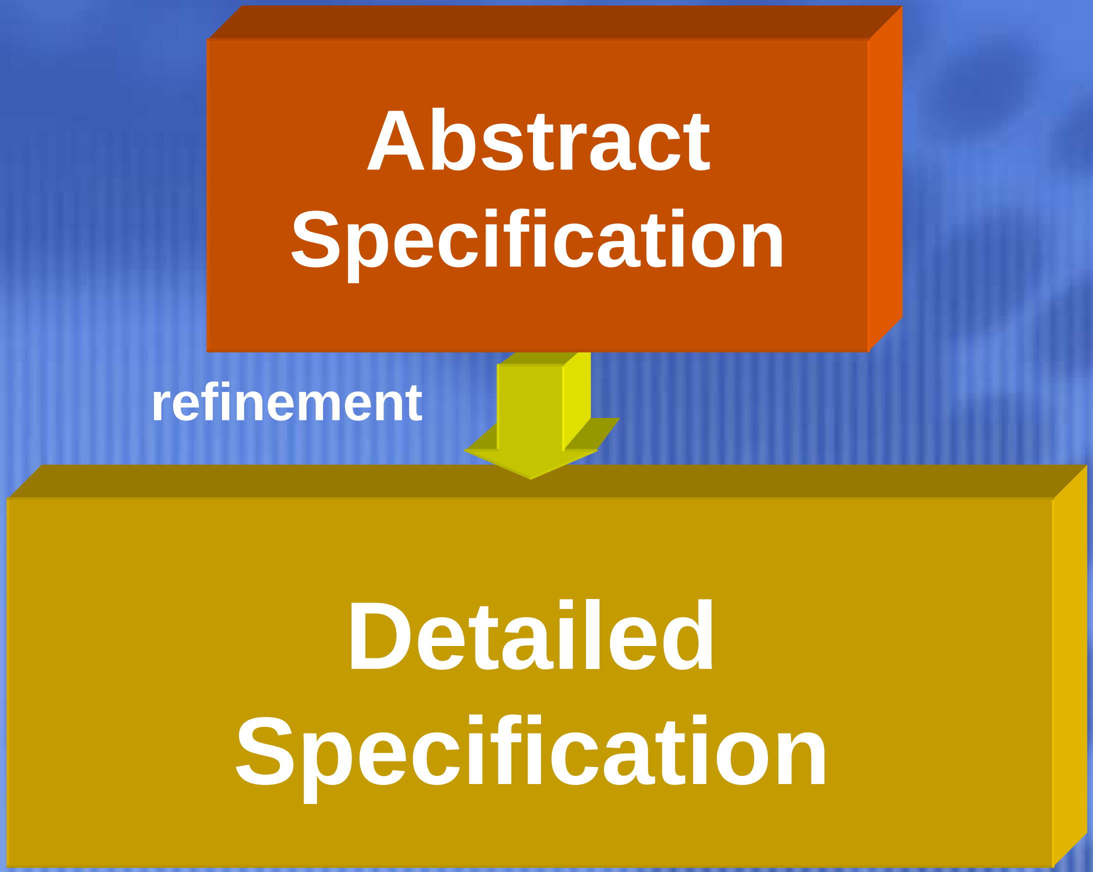
“The entire history of software engineering is that of the rise in levels of abstraction.”

Grady Booch

The Limits of Software

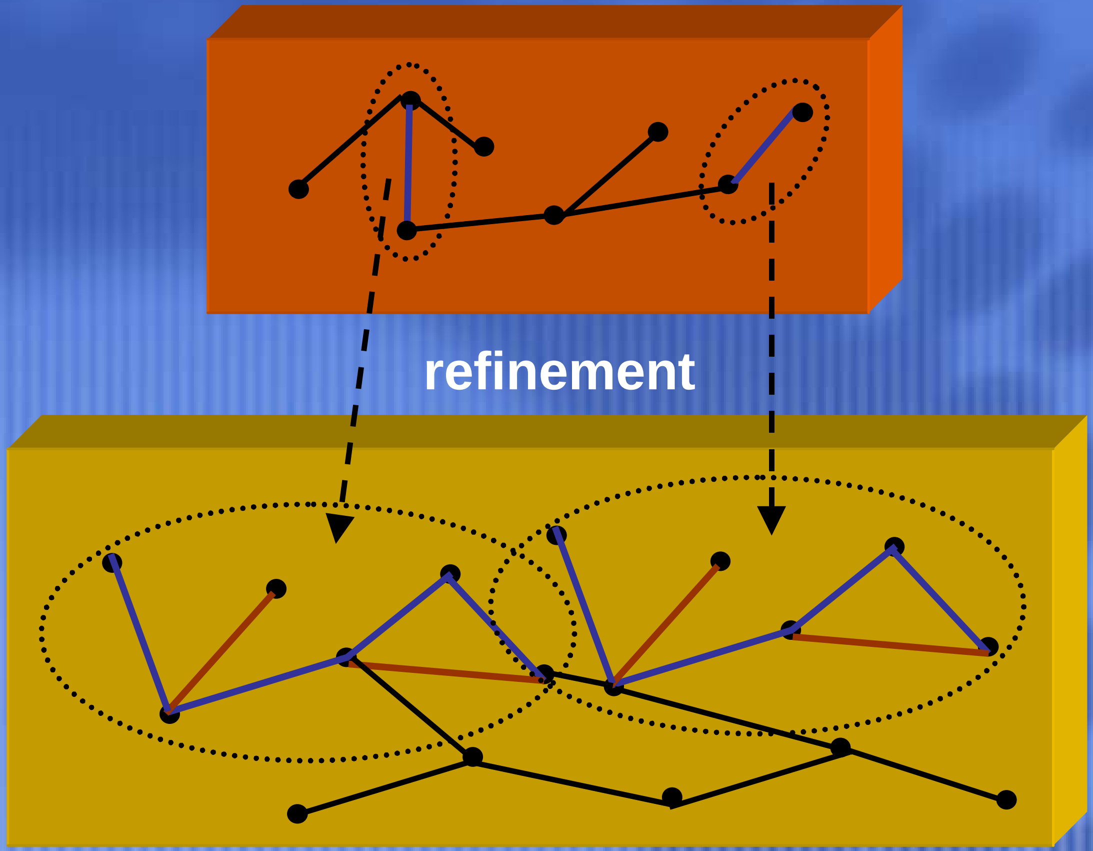
September 2002

Hiding Complexity



- Abstraction eases the specification effort by hiding complexity

Derivation of Intelligent Patterns



- Reuse of solutions
- Repeatable process

Coding Language Evolution

- Abstraction level has risen from 1GL to 4GL and back again to 3GL
- A 4GL is productive but lacks adaptability to realize specific requirements
- A current 3GL is mainly a set of standard libraries and frameworks, the coding syntax is less important

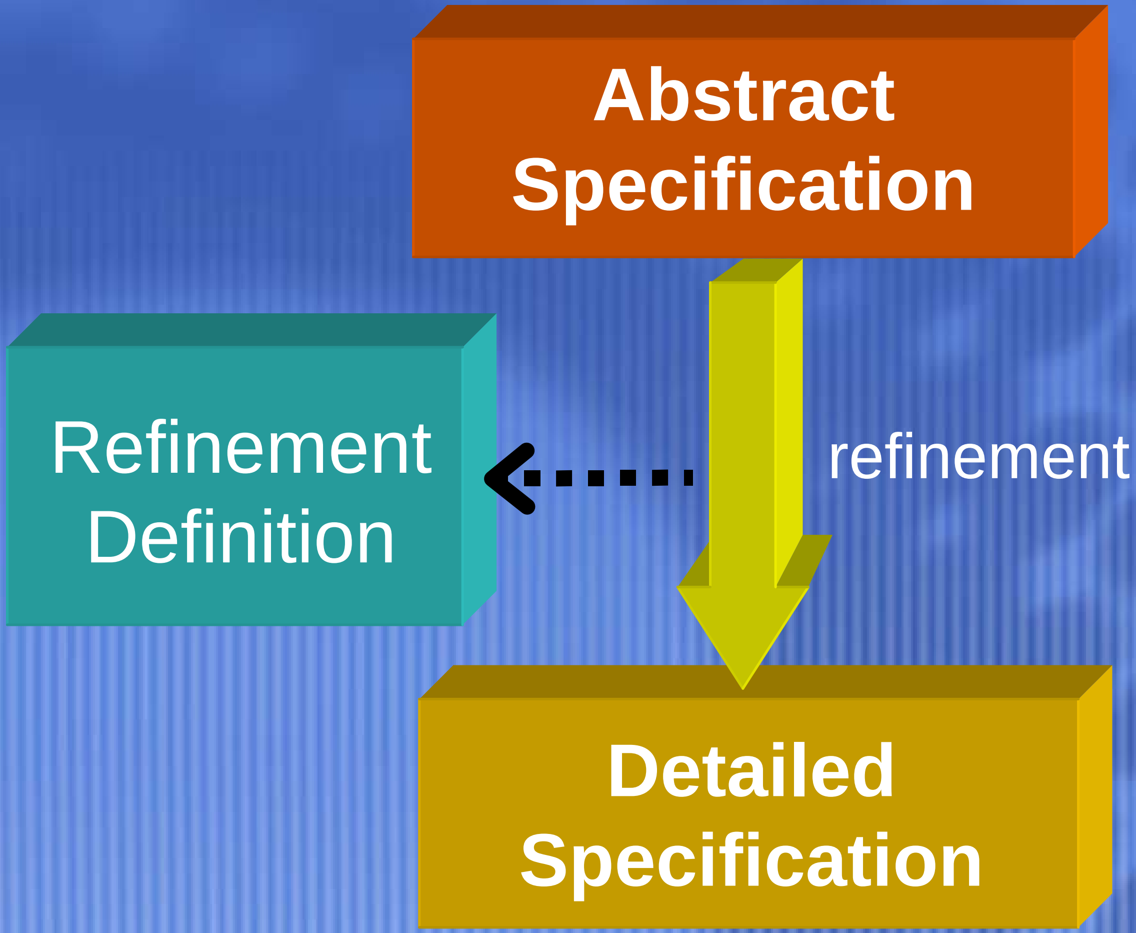
Modeling on Different Abstraction Levels

- In practice UML models are in different levels of abstraction
  - from analysis via design to implementation
- Translation vs. Elaboration ?
- Automated or Creative process ?

Productivity & Control

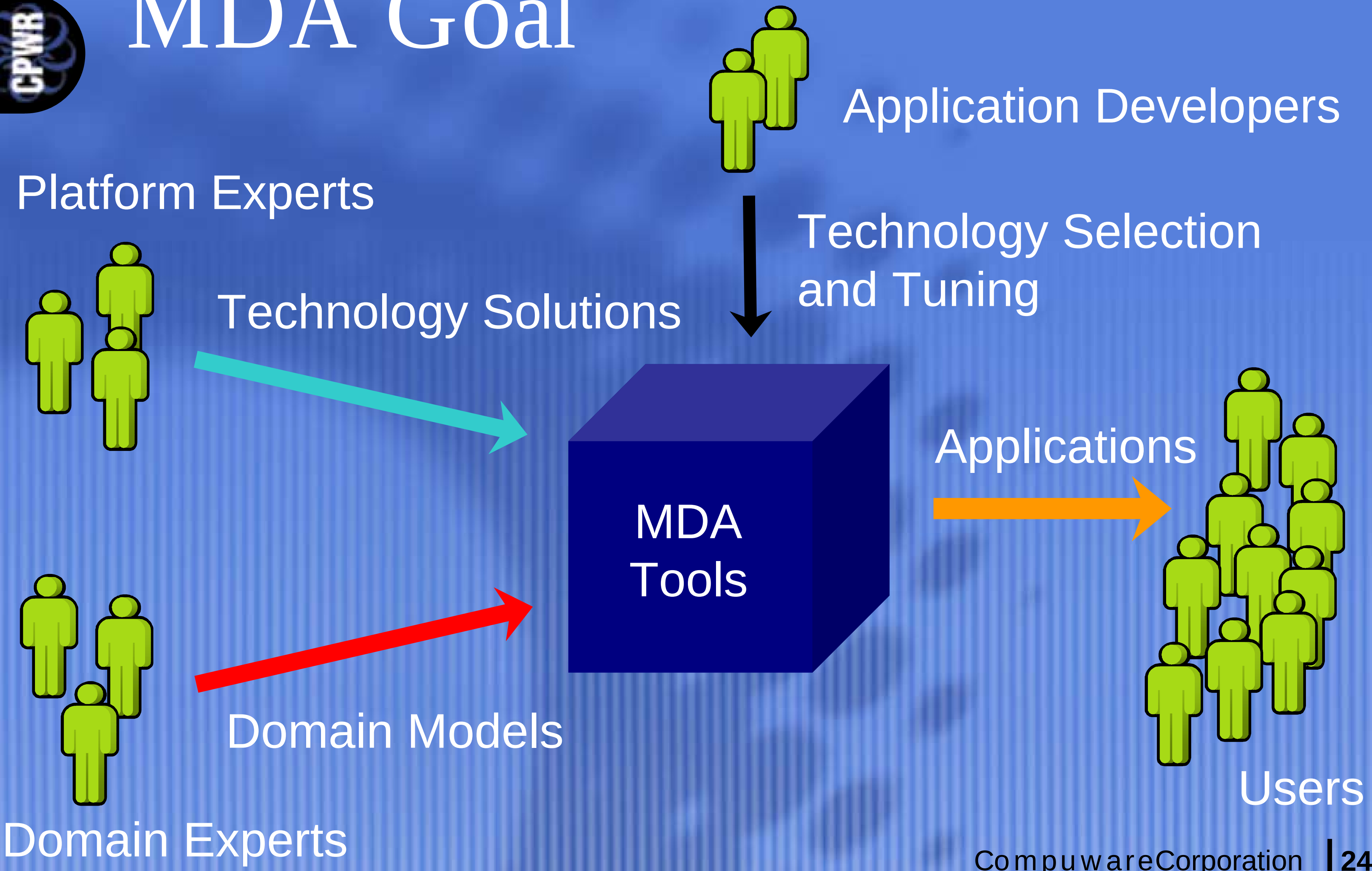
- Black-box automated refinement and hiding the detailed specification increases productivity but decreases fine-grained control
- Creative refinement and exposing the detailed specification increases fine-grained control but decreases productivity
- Law of preservation of misery ?

Iterative Refinement



- Maintainable Refinement Definition
- Tuneable Detailed Specification

MDA Goal



Application Developers

Platform Experts

Technology Selection and Tuning

Technology Solutions

MDA Tools

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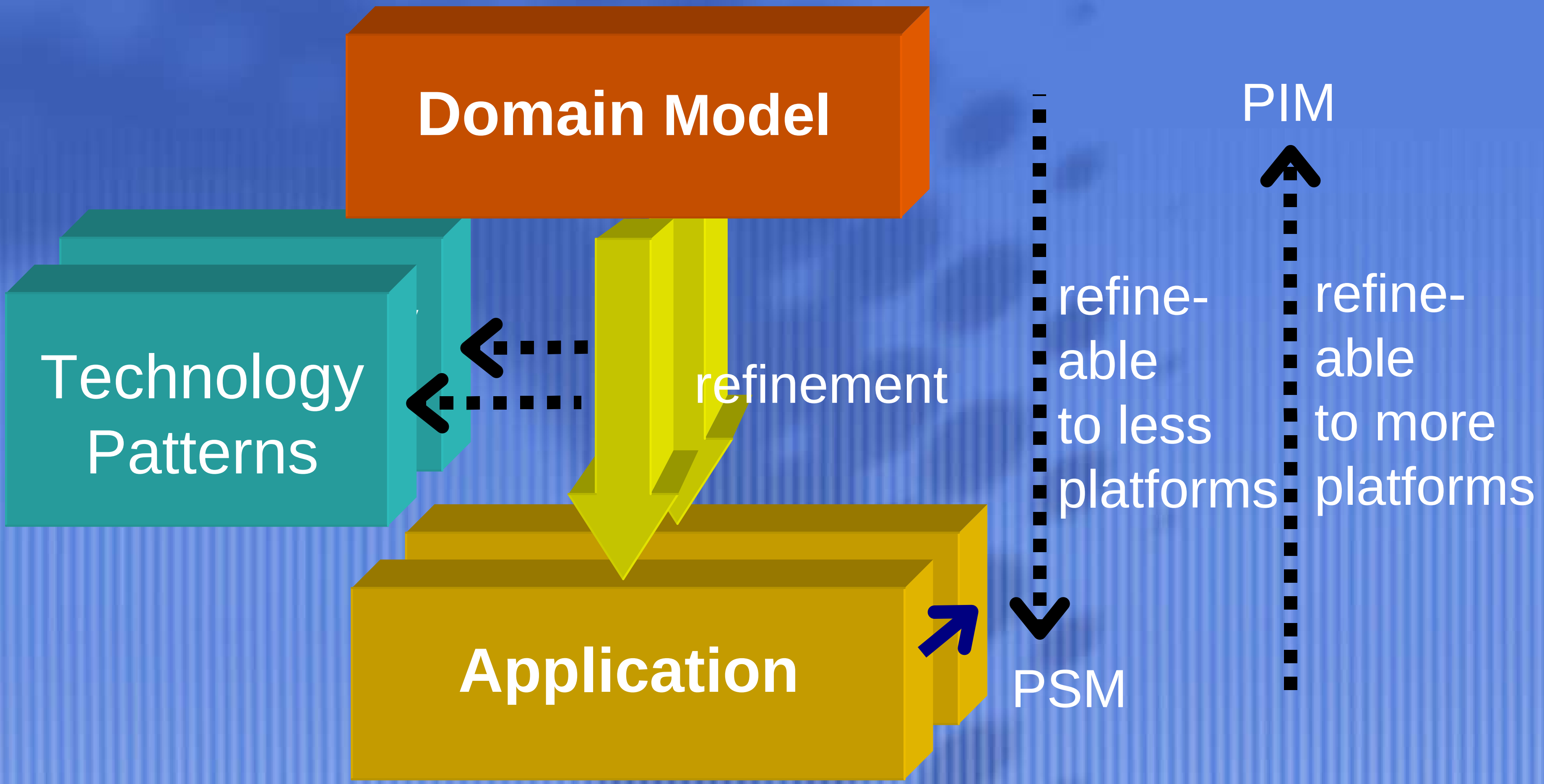
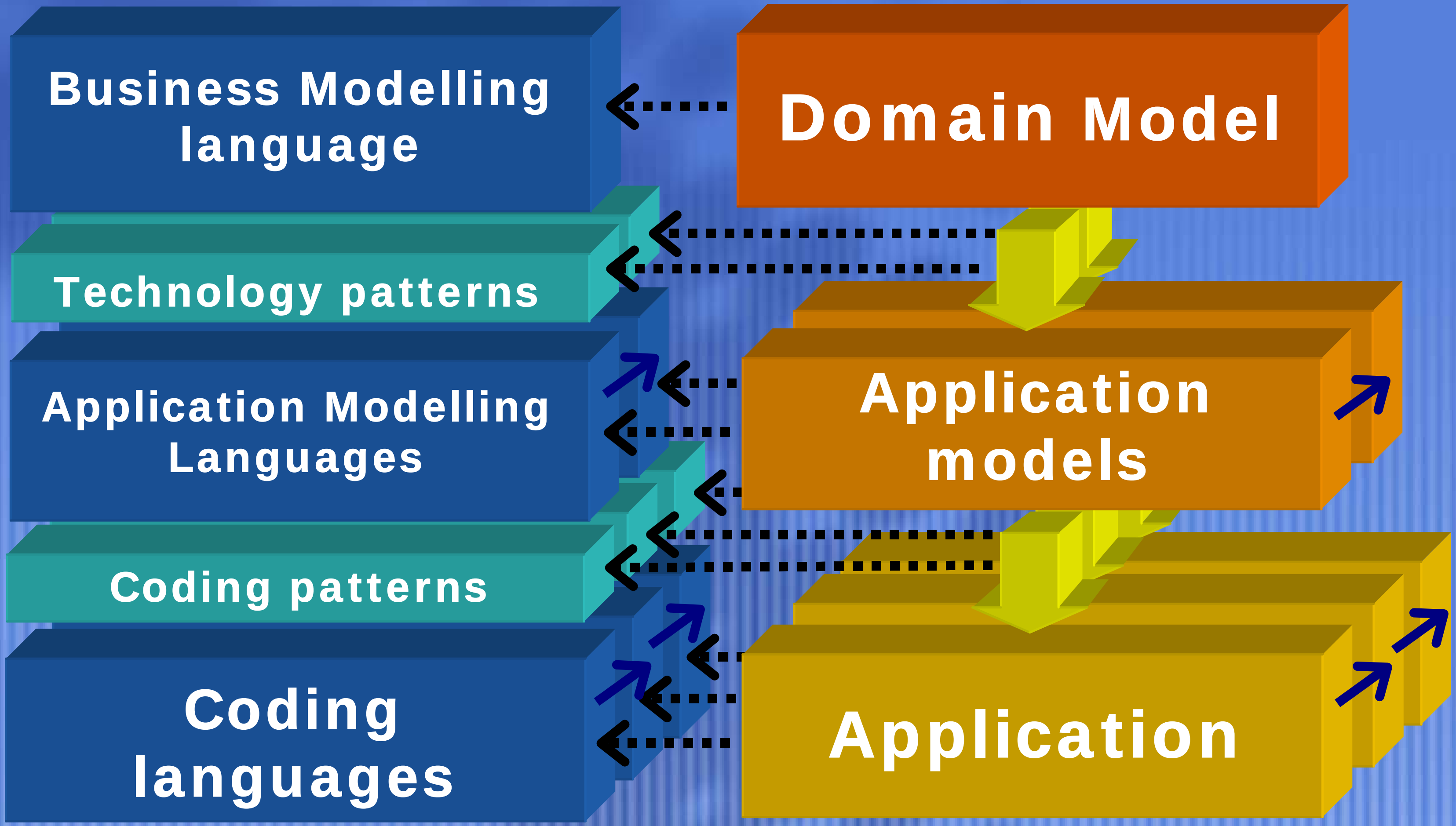
MDA’s PIM, PSM and Iterative Refinement



Different Abstraction Levels and Multiple PSMs



Business Modelling language

Domain Model

Technology patterns

Application Modelling Languages

Application models

Coding patterns

Coding languages

Application

Raising the Level of Abstraction is MDA

- Platform independent models
- Increased productivity because of automatically generated complexity
- Quality improvement because of enforcing intelligent patterns
- Separation between and reuse of domain and technology expertise
- Without loosing fine grained control

MDA Requirements Summary

MDA Requirements

- High level of abstraction of PIM
  - No platform specific details
  - Refineable to many technologies
- Maintainable technology details
  - Changeable and layered PSMs
  - Maintainable technology and coding patterns
- Intelligent automated PIM to PSM refinement
  - High quality of technology patterns
  - Complete executable results
  - Incremental refinement

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