



Model-Driven Engineering in a Large Industrial Context

- *A Motorola Case Study*

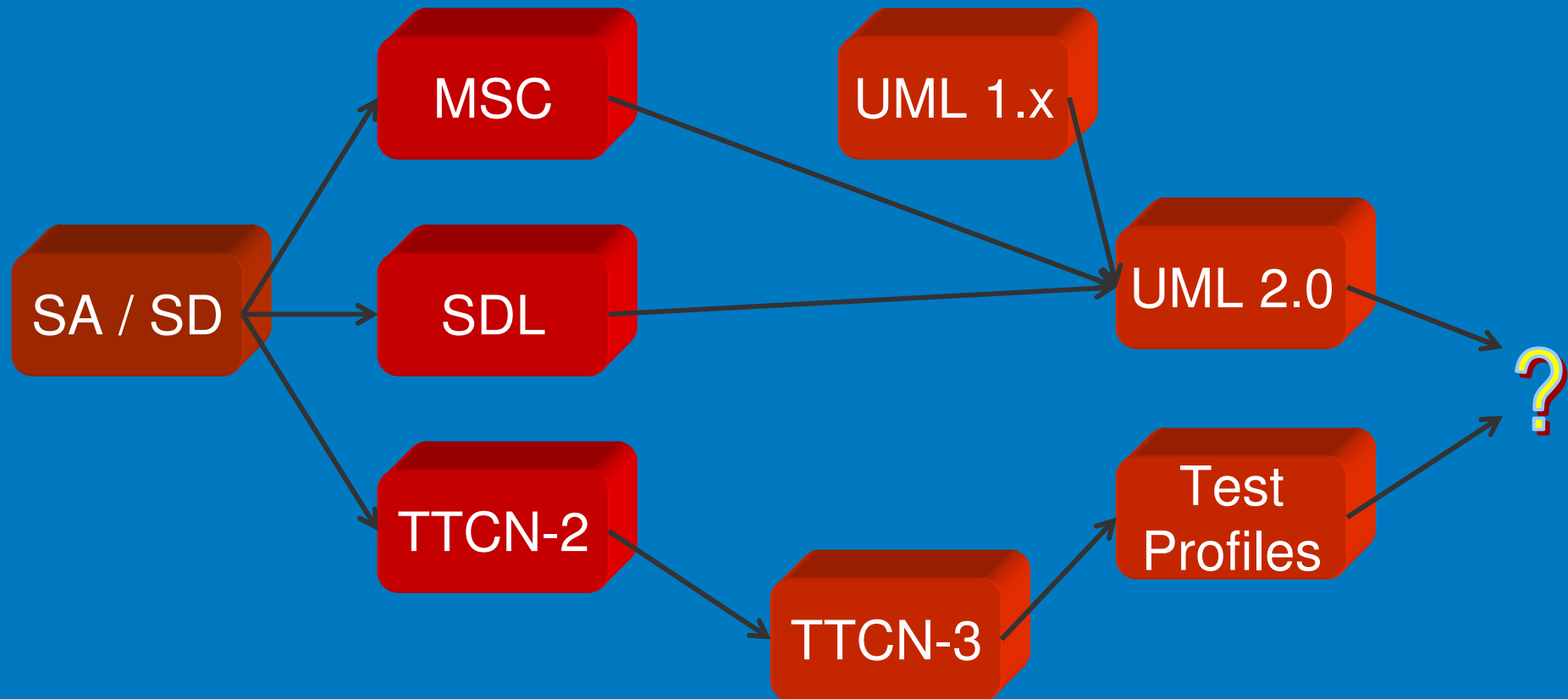
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Agenda

- Experience
- Issues Encountered
- Addressing the Issues

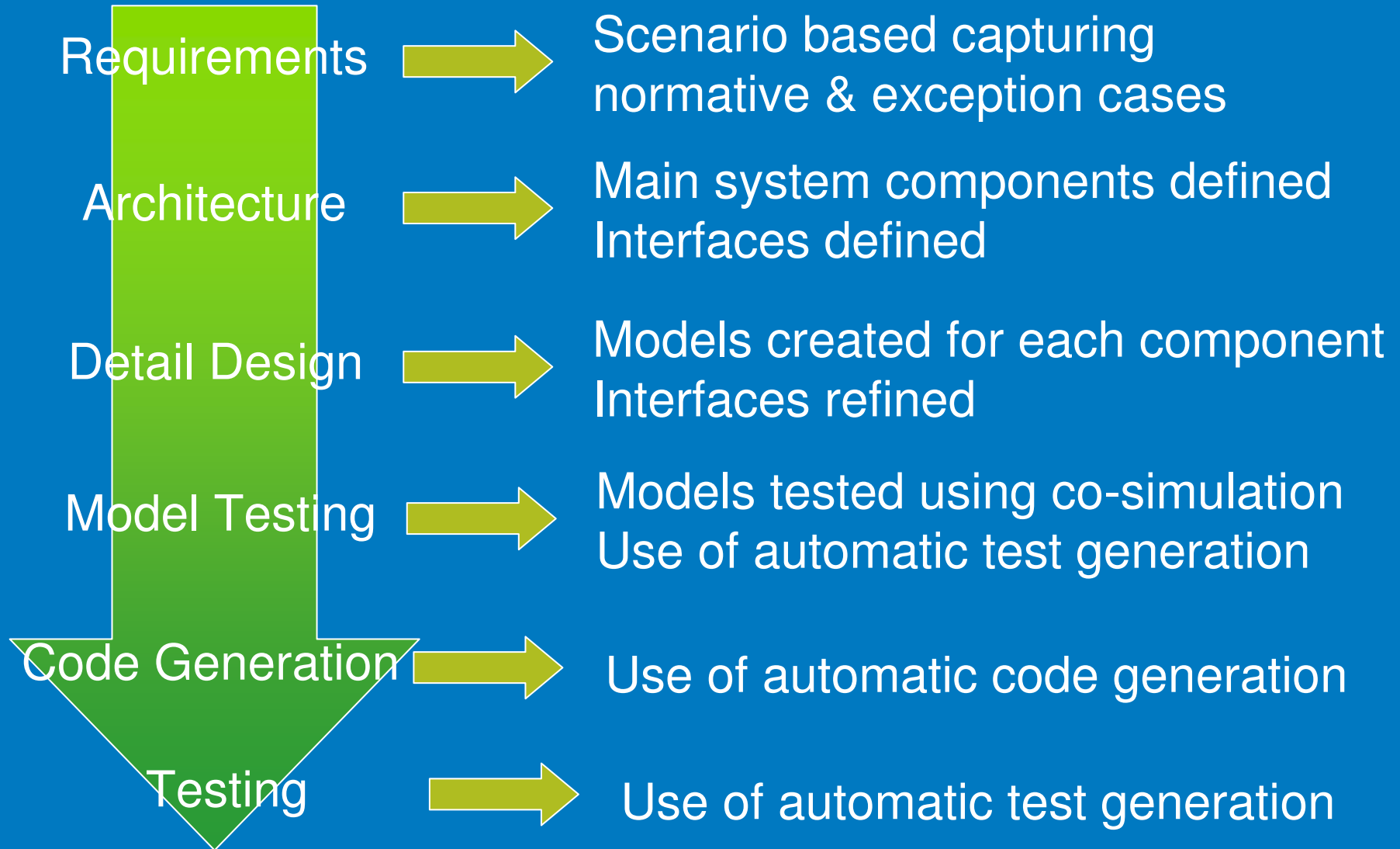
Experience

Languages and Standards




- **OMG Platform Technology Committee**
- **ITU-T SDL Committee (Study Group 17)**
 - Question 13/17: Unifying SDL and UML

Process



Automatic Code Generation

	Infrastructure	Subscriber
Behavior	Mousetrap 3 rd Party	3 rd Party
Marshaling (PDU Pack/Unpack)	Mousetrap	

Automatic Test Generation

- **Roadblocks**

- Lack of rigorous models for test generation
- Incorrectness of scenario-based models
- Test specification vs. test generation

- **Successes**

- Reduction of test-development effort
- Improvement of test coverage
- Reduction of defects introduced during test development

Successes & Impact

- **65% - 85%** code generation in some divisions
- **2.3x** reduction in effort on initial projects
- **2x – 8x** sustained productivity improvement
- **33%** reduction in test-development effort
- **30x – 70x** reduction in defect-fix time
- **1.2x – 4x** reduction in defects
- **3x** improvement in phase containment effectiveness
- **8x** in-process fault reduction

One “Failure”

- **Mixing legacy hand code with model-based automatic code generation**
- **Why did it fail?**
 - Hand code made no distinction between code for behavior and code for implied state machine
 - Effort to refactor outweighed potential benefits
 - Original informal models no longer corresponded to code

Issues

Unspoken Truth

It's not all about the technology! *

* It is a necessary condition, but far from sufficient

Issues Encountered (I)

- **Lack of common tools**
- **Lack of integrated tools**
- **Lack of common, well-defined semantics**
- **Coupling of data & behavior**
- **Platform specifics in the models**
- **Incompleteness of requirements**
- **Quality of requirements**

Issues Encountered (II)

- **Development team inexperience**
- **Poor performance of generated code**
- **Lack of migration tools**
- **Lack of scalability**
 - Distributed development
 - Information overload
 - Legacy software
 - Poor tool performance

Addressing the Issues

Addressing the Issues

- **UML 2.0 Profiles**
 - SDL Profile
 - Testing Profile (U2TP)
 - Test Generation Profile
 - System Engineering Profile (SysML)
 - Domain Specification Communication Constraints (CUP)
- **MDE Technical Advisory Board**
- **Corporate tool selection committee**
- **Corporate size metrics committee**

Addressing the Issues (II)

- **Modeling Challenge Levels**
 1. No Modeling
 2. Informal Modeling
 3. Formal Modeling
 4. Model-Centered Design
 5. Model-Driven Engineering
 6. Optimized Model-Driven Engineering
 - Activities, training, benefits, ...

Addressing the Issues (III)

- **MDE Qualifications**
 - Stage 1: Core training completed
 - Stage 2: Specialized training and some experience
 - Stage 3: Advanced training and experience
- **Upper management support**
 - Continued investment in MDE technology improvements
 - Roadmap and scorecard goals

Thank you