Overview

MBSE Market since 2008
- Advances & Challenges

Customer Experiences
- What our customers really think

The Road Ahead
- Future MBSE/SysML Opportunities
MBSE Market since 2008

Advances
- Early-adoption projects, technology evaluations
- Overall positive reception to MBSE/SysML
- Greater utilization
  - Interface definitions
  - Components Procurement ‘Library’
  - Parametric Modeling & Simulation
  - Integration with Requirements management, UML, Software

Education Outreach
- Strong support in US for MBSE courses & programs

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MBSE Market since 2008

Challenges

- Tool interoperability
  - Vendor support
  - Standards ‘maturation’
  - OMG MIWG – Working to address

- Outcomes of ‘early adoption’
  - Notational ‘quirks’ (Flows, Flowports)
  - ‘How much UML’ vs ‘How much SysML’

- Tool ‘Branding’
  - UML-centricity of tools (vs SysML-only tools)

- Education Outreach
  - Outside the US? (Australia New Zealand?)
Customer Experiences

Then and Now comparison…
The Customer - 2008

Customers – Demographics
- Trainers / Educators
- Contractors / Consultants (self-employed)
- RnD Engineers

Customers – Usage Behavior
- System Engineering
  - Modeling new, real-world designs, concepts
  - Capturing existing designs for documentation
  - Small-scale projects - <10 personnel
The Customer - 2011

**Customers – Demographics**
- Trainers / Educators
- Contractors / Consultants (self-employed)
- System Engineers, Architects, BA,

**Customers – Usage Behavior**
- Small-Medium Projects (<10, < 50 personnel)
- Onboard SysML into larger projects
- Capturing Existing Designs
- Capturing Organisation IP for reuse
  - Patterns and Templates
Customer Experiences - 2008

Customers – Usage Behavior...

- Value – Added Modeling
  - Using Sparx SysML to extend their own products/services
  - Training, product extensions
  - Many of these users are Sparx Registered Partners

- Evaluation
  - Evaluating our product (users are savvy in SysML, reviewing our product for procurement)
  - Evaluating the technology (users are savvy in Systems Engineering, reviewing SysML as a technology)
Customer Experiences - 2011

Customers – Usage Behavior...

- Value – Added Modeling
  - Requirements Management integration (eg: integration with Teamcenter SE)
  - Unification of Requirements, System Models, Software Models
  - Defining best practices, reusable assets (templates, patterns, workflows)

- Evaluation
  - Beyond the evaluation phase
  - Identifying real-world opportunities to apply best practice MBSE concepts
  - Improve and evolve SysML as a result - v1.4

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Customer Feedback - 2008

What they like
- Value-for-money
- Cost-effectiveness of EA + SysML
- Ease of Use
  - User Interface less imposing to the SysML-novice
- Scalable deployment
  - Multi-user capable using DBMS repositories

What they want improved
- SysML implementation is dated, needs updating (1.1)
- Interoperability with other SE tools *important*
Customer Feedback - 2011

What they like
- Value-for-money
- Cost-effectiveness of EA + SysML
- Ease of Use
- User Interface less imposing to the SysML-novice
- Turnkey Solution
- Enough essential tools to start using SysML

What they want improved
- SysML implementation will need updating (1.3)
- Interoperability with other SE tools still *important*
- Parametrics & simulation support
The Road Ahead

Future MBSE opportunities…
The Road Ahead

MBSE Methodologies
- Processes & workflows
- Industry-standard (OOSEM)
- Market opportunity for others to adapt to SysML (RuP, Iconix)

Testing
- Model-driven testbenches
- Test-driven-design
- Automated test regiments
  - Generate Test Cases
  - Generate Test ‘scripts’
The Road Ahead

- **Reporting Sophistication**
  - Architecture Completeness
  - Architecture Correctness
  - Design Rule Constraints
    - eg: Block X incompatible with Part Y

- **Architecture ‘fusion’**
  - UML, SysML, BPMN, UPDM, SMOF
  - Greater emphasis on dealing with design problem at hand in the ‘right perspective’ of problem focus

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Conclusion

Increased adoption
- <10% of total userbase
- Early Adopters, integrators, SEs ‘real customers using SysML in real projects’

Language Maturity
- UML - 10+ years to evolve to a ‘usable state’
- SysML - 6+ years to evolve to the same usable state

Impact of SysML to model industry/market
- ‘Real Test’ for model technology vendors, practitioners, contributors
- Unprecedented advancements in model technology evolution
- We all benefit in the end!

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MBSE and Enterprise Architect

Backup Slides
Who is Sparx Systems?

- Established in 2000
- Leading provider of UML modeling tools
  - Enterprise Architect for UML 2.3
  - Model Integration with 3rd Party tools
    - Visual Studio, Eclipse, DOORS, Visio, Teamcenter
- Support for other modeling standards
  - Business Process Modeling Notation (BPMN)
  - OMG Systems Modeling Language (SysML)
  - Architecture Frameworks (DoDAF/MoDAF, Zachman Framework, ToGAF)

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The Sparx Product Line

- ENTERPRISE ARCHITECT
  UML Modeling Platform
- MDG link™ for Visual Studio.NET
  Application Integration
- MDG integration for Visual Studio 2005
  Model Integration
- MDG technology™ for SysML™
  Domain Extensions (Value-Added UML)

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Enterprise Architect

**Our Flagship UML 2 Modeling Platform**
- All 13 diagrams supported
- Over 250,000 licenses worldwide

**Visual Requirements Modeling**
- One of the first providers to offer visual requirements
- UML 2 Extensions to model requirements
  - Requirements, Feature, Change, Issue
- Seamless traceability between formal specifications and system specifications within the model

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Execution / Simulation

**Enterprise Architect 9**
- Visual Execution Analyzer
- Generic execution framework
- Variables, breakpoints, stack
- Software debuggers (Native, .NET, Java, PHP)
- Model Simulator (Basic UML)

**Core Works**
- **Today**
  - Simple Activity, State Machine, Interactions
  - Verify semantics of behavior execution (conceptually)
- **Tomorrow**
  - Formal execution semantics, fUML
  - Business Process simulation
  - Parametrics

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Execution / Simulation
Execution / Simulation

- 3rd Party Addins
- AMUSE
  - Web: [http://lieberlieber.com/amuse](http://lieberlieber.com/amuse)
  - Advanced Modeling UML Simulation & Execution
  - Interactive Prototyping & Model Execution Environment
    - Supports UML & SysML models
    - Code Generation for Embedded Systems

[Web: http://lieberlieber.com/amuse](http://lieberlieber.com/amuse)

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Execution / Simulation

- 3rd Party Addins
- Solvea *new
  - Web: [http://www.intercax.com/solvea](http://www.intercax.com/solvea)
  - Advanced Parametric Solver & Integrator for Enterprise Architect
  - Connectivity to
    - Excel
    - Mathematica
    - MATLAB/Simulink
  - Available now as Beta

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Execution / Simulation

Wrap MATLAB/Simulink, and Mathematica Functions
Simulink model wrapped as a constraint block and connected to system variables

```
{cost = xtwExternal([matlab,scriptscii,demoscriptscii]simulink,row,col,outtemp,daycyc))
```

![Simulink model diagram](image)

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thank you for your attention!