embeddr

engineering the future of embedded software

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About mbeddr

Tool Extensibility is a Problem

Study Findings I

> The majority of our interviewees were very successful with MDE but all of them either **built their own** modeling tools, made **heavy adaptations** of off-the-shelf tools, or spent a lot of time finding ways to **work around** tools. The only accounts of easy-to-use, intuitive tools came from those who had developed tools themselves for bespoke purposes. Indeed, this suggests that current tools are a barrier to success rather than an enabler.

Jon Whittle, John Hutchinson, Mark Rouncefield, Hakan Burden, and Rogardt Heldal. Industrial Adoption of Model-Driven Engineering: Are the Tools Really the Problem? In *Proceedings of the 16th International Conference on Model Driven Engineering Languages and Systems (MODELS) 2013*. ACM, 2013.

Tool Extensibility is a Problem

Study Findings II

Complexity problems are typically associated with off-the- shelf tools. Of particular note is **accidental complexity** – which can be introduced due to [..] [the] lack of flexibility to adapt the tools to a company's own context [..]

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Tool Extensibility is a Problem

Study Findings III

Our interviews point to a **strong need for tailoring** of some sort: either tailor the tool to the process, tailor the process to the tool, or build your own tool that naturally fits your own process. Based on our data, it seems that, on balance, it is currently much easier to do the latter.

Jon Whittle, John Hutchinson, Mark Rouncefield, Hakan Burden, and Rogardt Heldal. Industrial Adoption of Model-Driven Engineering: Are the Tools Really the Problem? In *Proceedings of the 16th International Conference on Model Driven Engineering Languages and Systems (MODELS) 2013*. ACM, 2013.

Tool Extensibility is a Problem

Reasons?

Business
Domain Knowhow
Architecture
Approach

Functionality vs. Data

Tool Extensibility is a Problem

Reasons?

Data Extensibility is missing!

A differener Perspective

From Data Formats To Languages

Structure, Constraints, Semantics

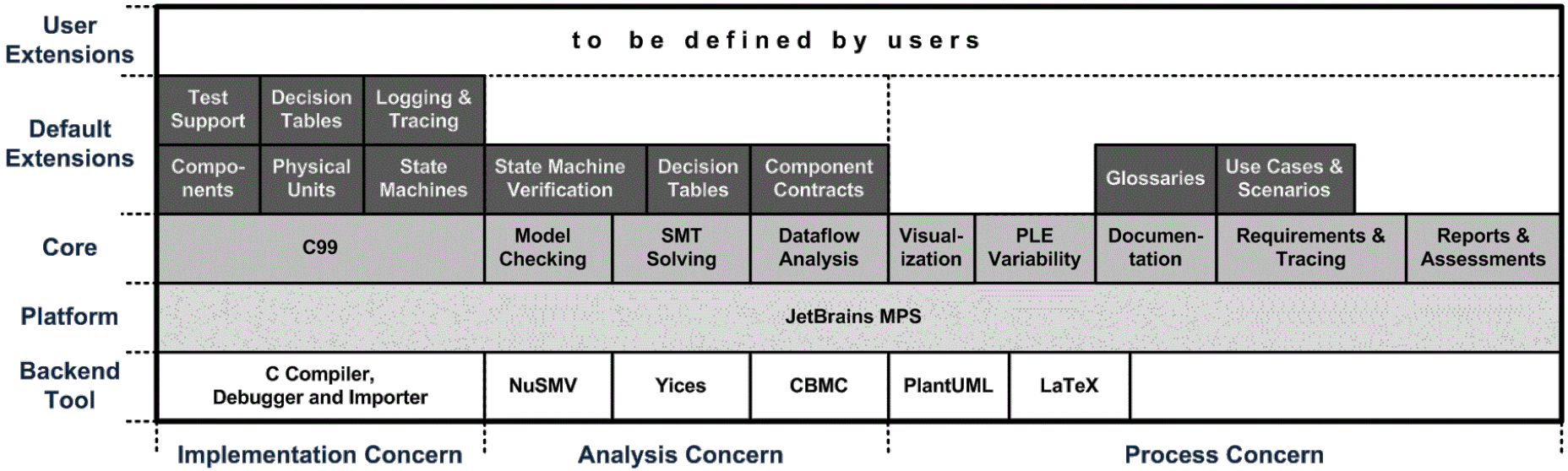
Data Format + *Syntax + IDE*

Language

About mbeddr

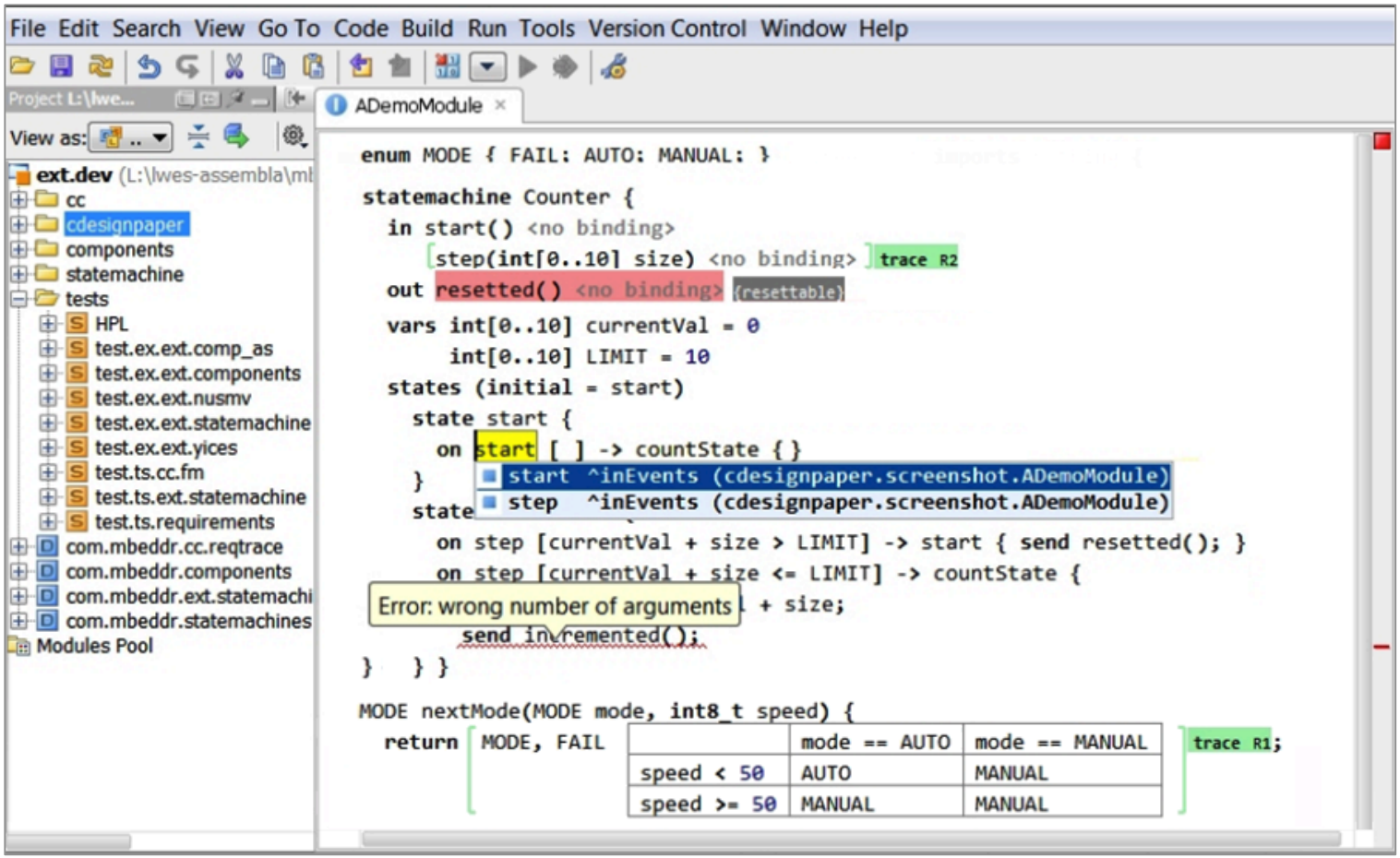
Language Engineering Embedded Software

An extensible collection of integrated languages for embedded software engineering.



About mbeddr

Language Engineering Embedded Software



An IDE + Debugger for all of them

About mbeddr

Language Engineering Embedded Software

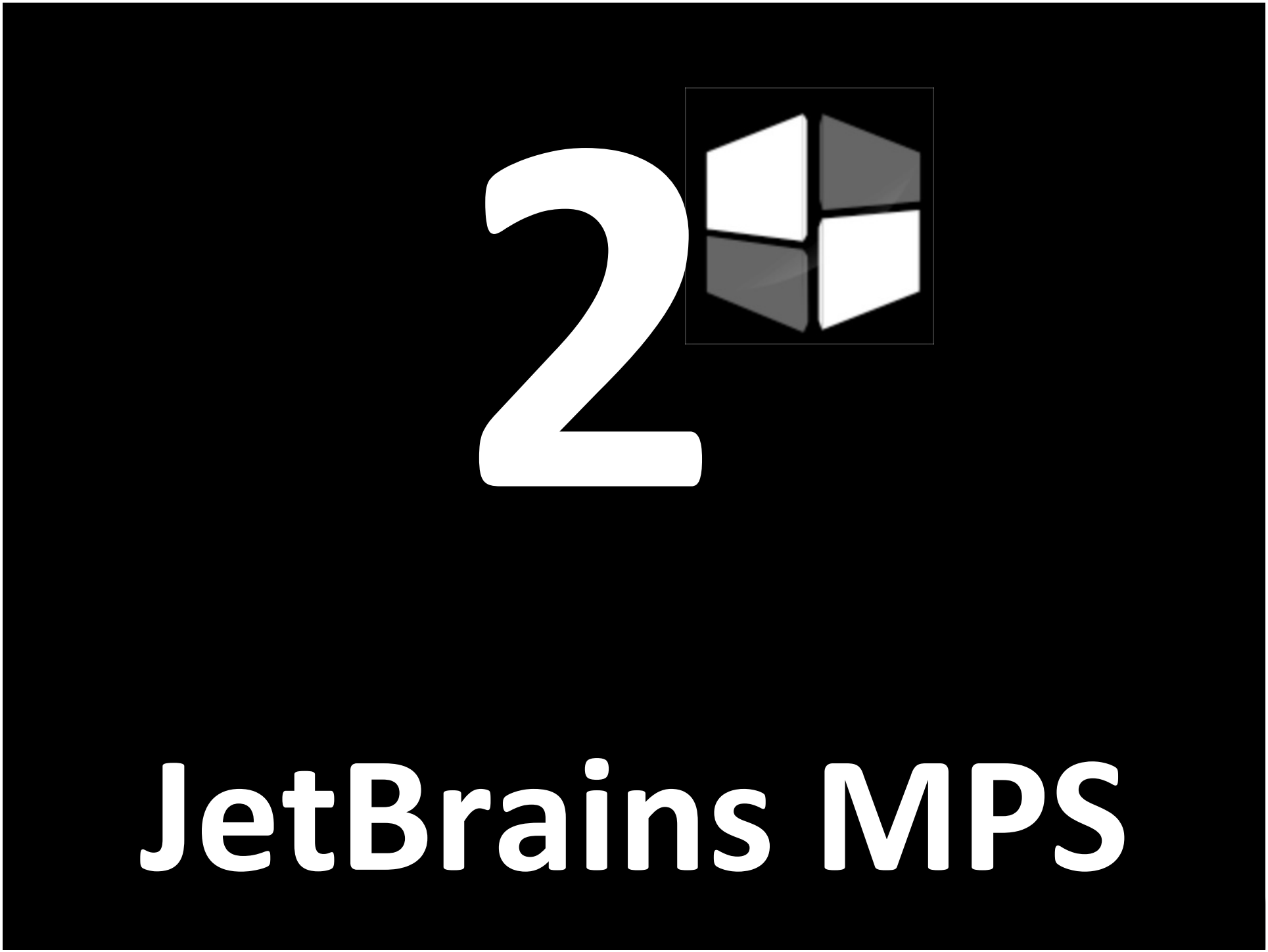
Open Source
Eclipse Public License

http://mbeddr.com

itemis fortiss

BMW Car IT

Bundesministerium
für Bildung
und Forschung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JetBrains MPS

A differener Perspective

From Data Formats To Languages

Structure, Constraints, Semantics

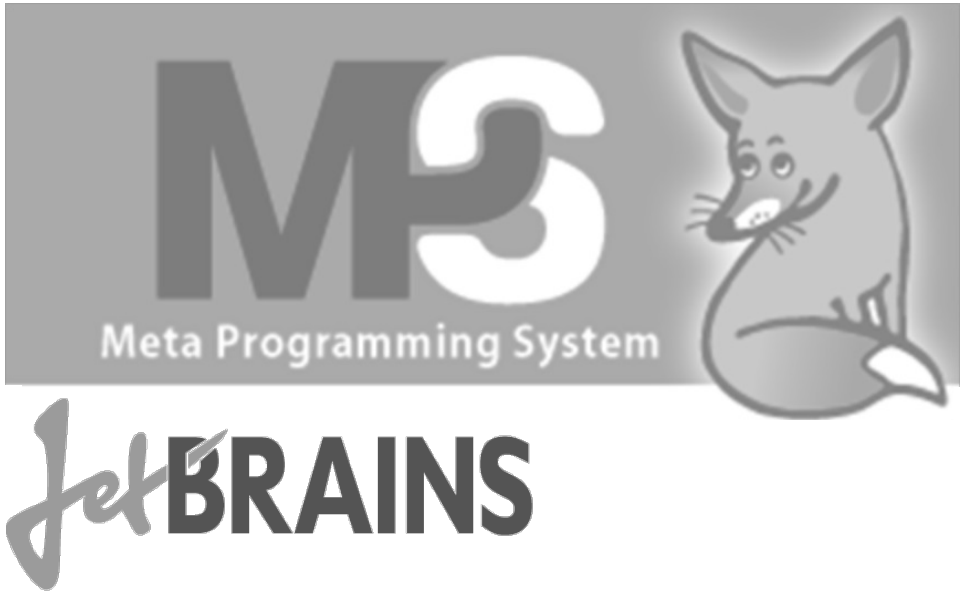
Data Format + *Syntax + IDE*

Language

Language Workbenches

About mbeddr

Built on JetBrains MPS



JetBRAINS

A Language Workbench

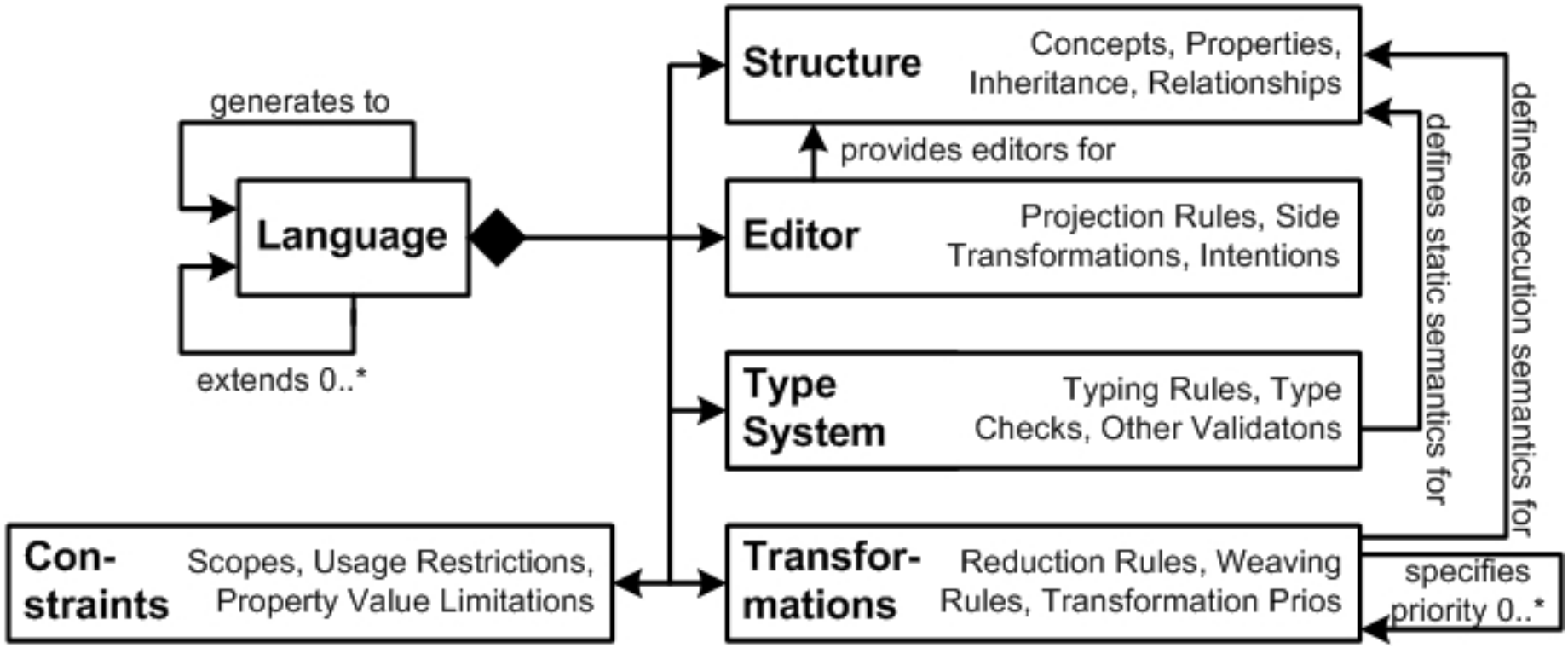
About mbeddr

Built on JetBrains MPS

Open Source
Apache 2.0
http://jetbrains.com/mps

About MPS

Rich Set of Language Aspects

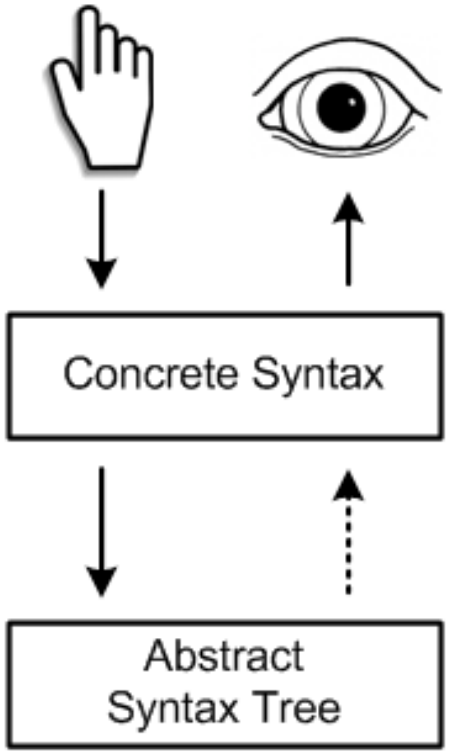


+ Refactorings, Find Usages, Syntax Coloring, Debugging, ...

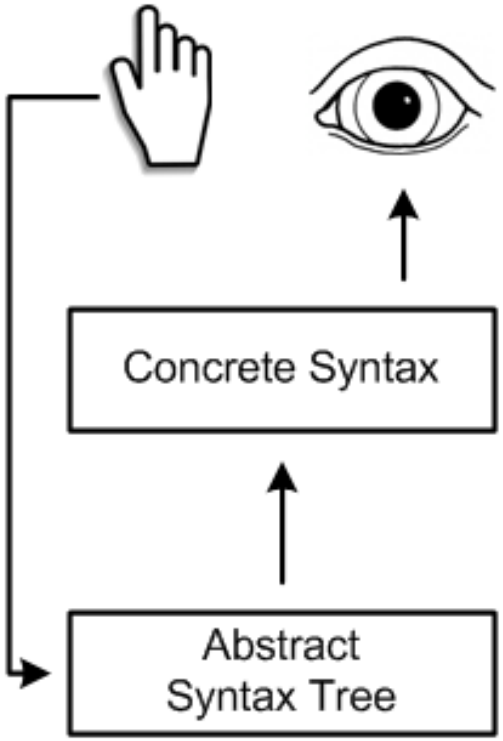
About MPS

Projectional Editing

Parsing



Projection



About MPS

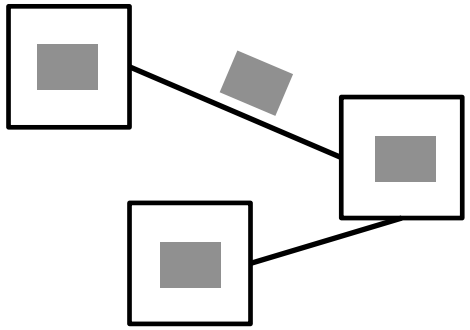
Notational Flexibility

Regular Code/Text

Mathematical

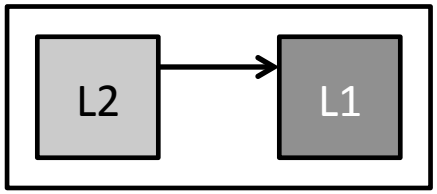
Tables

Graphical



About MPS

Language Composition



Separate Files

Type System
Transformation
Constraints

In One File

Type System
Transformation
Constraints
Syntax
IDE

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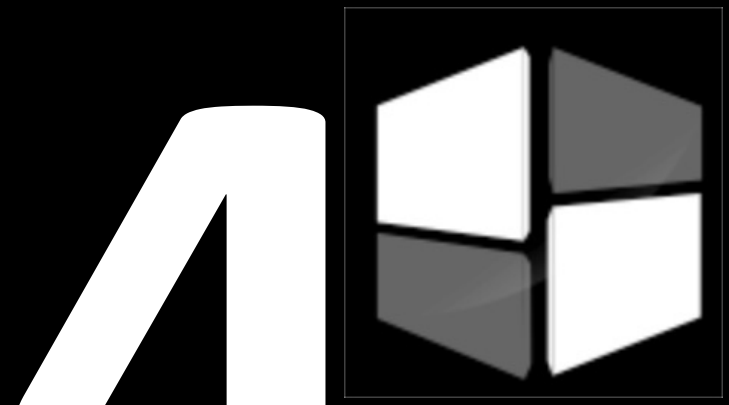
Demo



Recap

Tool Extensibility is a Problem

Study Findings

> … built their own modeling tools …
> … made heavy adaptations … work arounds …
> … accidental complexity …
> … strong need for tailoring …

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Problem Solved!

Generic Tools, Specific Languages

Extensions are first-class!

Fundamentally different from Today's State-of-the-Art in Tools

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Status

mbeddr Status

Used in Several Projects

itemis France: **Smart Meter**

BMW: **Autosar Component**

Modellwerkstatt: **ASIC Test Generator**

Fortiss: **Pacemaker Case Study**

Open Source: **Arduino Integration**

A colleague: **Synthesizer**

Evaluation ongoing by several big companies.

mbeddr Status

The Basis for a Commercial Product

ACCEnT

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The Bigger Picture

Same Approach In Other Domains

Current Project in Insurances.

Another Project in the Finanical Domain likely to start soon.

$$\text{local} = \left[A1 \Rightarrow \left(\frac{\sum_{i=1}^{NN} \left[(D(X + ANUI + i - 1) - D(X + ANUI + i)) * \left(1 - \frac{TM18[i]}{TM17}\right) \right]}{D(X + ANUI)} \right) \right]$$

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