Variability in mbeddr

Current State + Challenges

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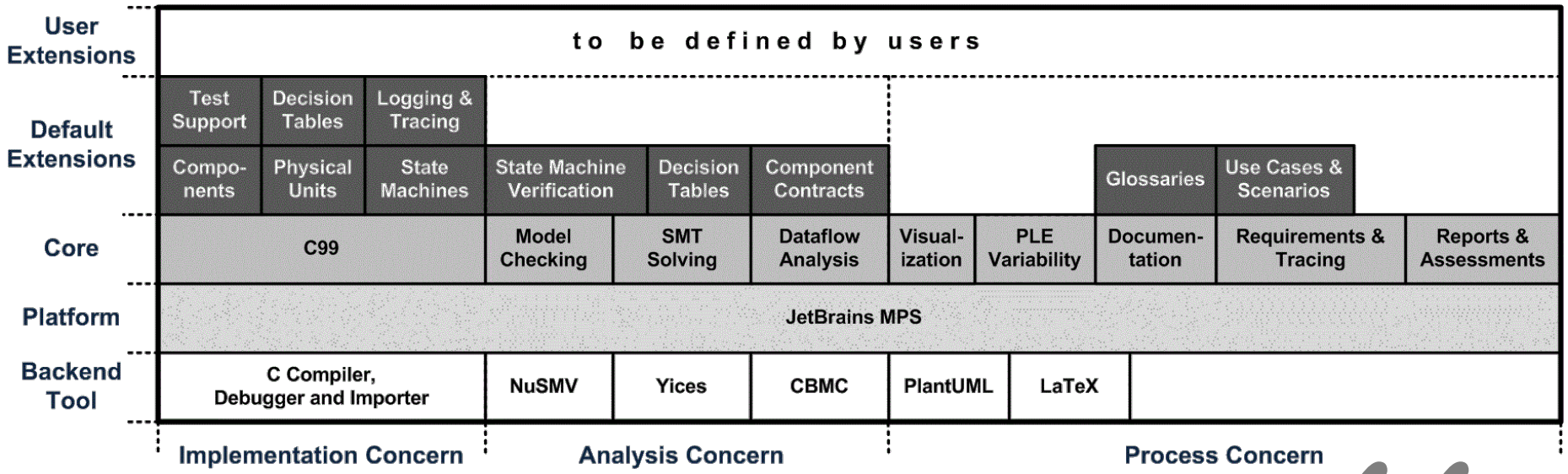
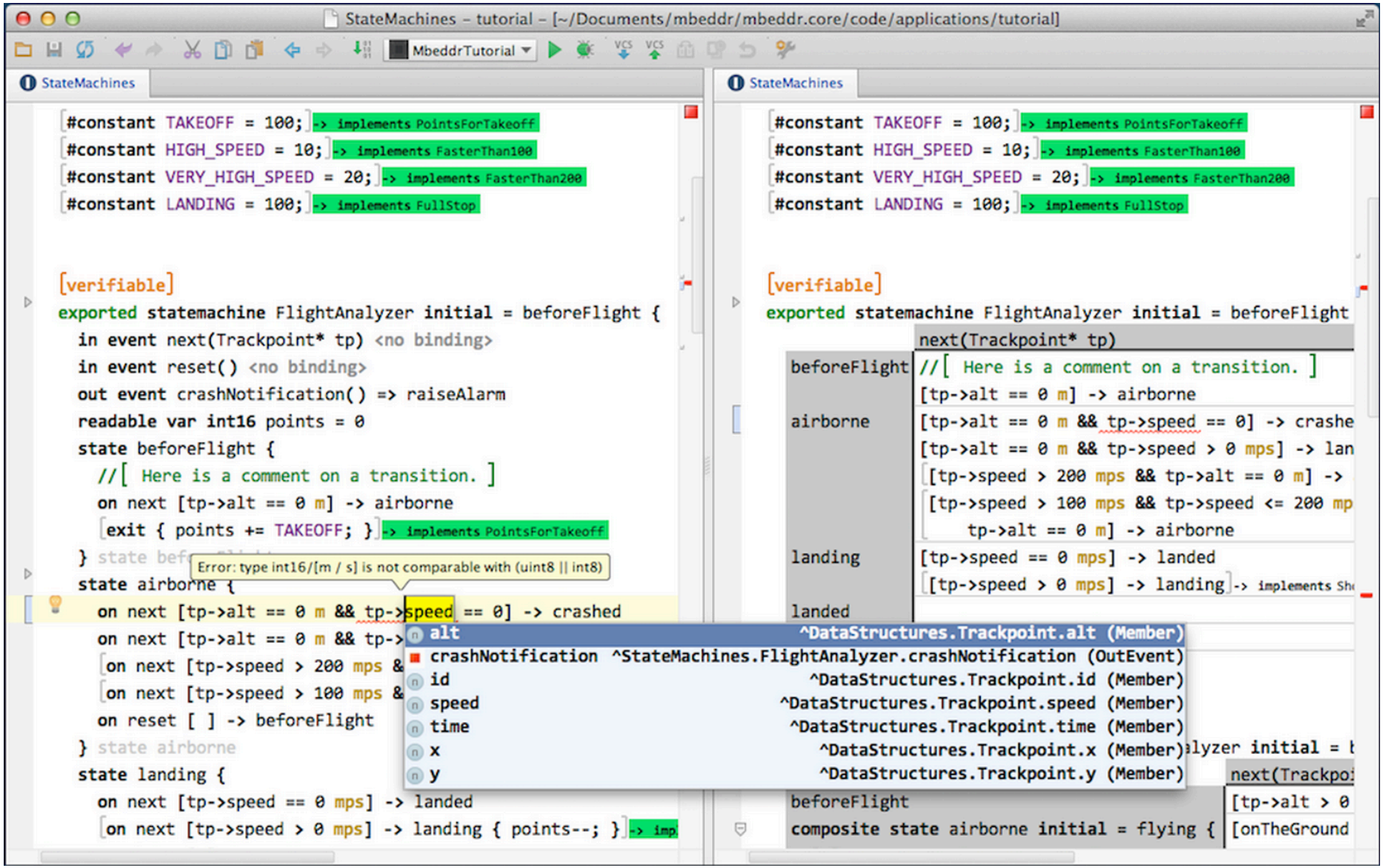
mbeddr

mbeddr

An extensible set of integrated languages for embedded software engineering.



“Specific Languages”


mbeddr
StateMachines – tutorial – [~/Documents/mbeddr/mbeddr.core/code/applications/tutorial]
MbeddrTutorial
StateMachines
#constant TAKEOFF = 100; -> implements PointsForTakeoff
#constant HIGH_SPEED = 10; -> implements FasterThan100
#constant VERY_HIGH_SPEED = 20; -> implements FasterThan200
#constant LANDING = 100; -> implements FullStop
[verifiable]
exported statemachine FlightAnalyzer initial = beforeFlight {
in event next(Trackpoint* tp) <no binding>
in event reset() <no binding>
out event crashNotification() => raiseAlarm
readable var int16 points = 0
state beforeFlight {
//[Here is a comment on a transition.]
on next [tp->alt == 0 m] -> airborne
exit { points += TAKEOFF; } -> implements PointsForTakeoff
} state bef
Error: type int16/[m / s] is not comparable with (uint8 || int8)
state airborne {
on next [tp->alt == 0 m && tp->speed == 0] -> crashed
on next [tp->alt == 0 m && tp->
on next [tp->speed > 200 mps &
on next [tp->speed > 100 mps &
on reset [ ] -> beforeFlight
} state airborne
state landing {
on next [tp->speed == 0 mps] -> landed
on next [tp->speed > 0 mps] -> landing { points--; } -> imp
alt ^DataStructures.Trackpoint.alt (Member)
crashNotification ^StateMachines.FlightAnalyzer.crashNotification (OutEvent)
id ^DataStructures.Trackpoint.id (Member)
speed ^DataStructures.Trackpoint.speed (Member)
time ^DataStructures.Trackpoint.time (Member)
x ^DataStructures.Trackpoint.x (Member)
y ^DataStructures.Trackpoint.y (Member)
StateMachines
next(Trackpoint* tp)
beforeFlight
//[Here is a comment on a transition.]
[tp->alt == 0 m] -> airborne
airborne
[tp->alt == 0 m && tp->speed == 0] -> crashe
[tp->alt == 0 m && tp->speed > 0 mps] -> lan
[tp->speed > 200 mps && tp->alt == 0 m] ->
[tp->speed > 100 mps && tp->speed <= 200 mp
tp->alt == 0 m] -> airborne
landing
[tp->speed == 0 mps] -> landed
[tp->speed > 0 mps] -> landing -> implements Sh
landed
beforeFlight
composite state airborne initial = flying {
[tp->alt > 0
[onTheGround

itemis

fortiss

BMW Car IT

Open Source @ eclipse.org
Eclipse Public License 1.0
http://mbeddr.com

Bundesministerium
für Bildung
und Forschung

itemis France: Smart Meter

First significant mbeddr project
ca. 100,000 LoC
about to be finished
great modularity due to components
uses physical units extensively
great test coverage due to special extensions

ACCEnT Control.Lab

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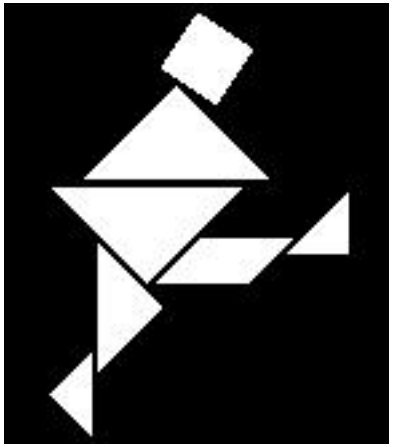
mbeddr

GPCE Tech Talk



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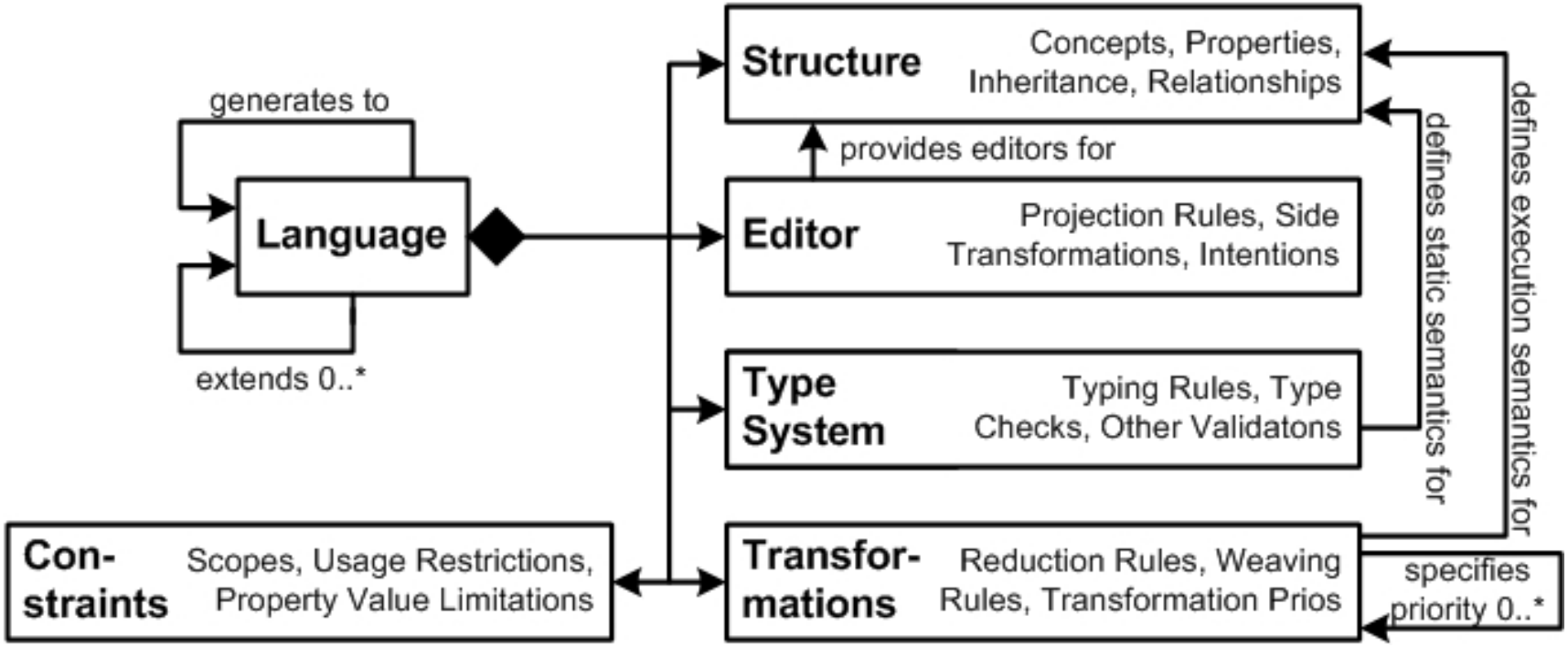
The Language Workbench

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

[Language Workbench]

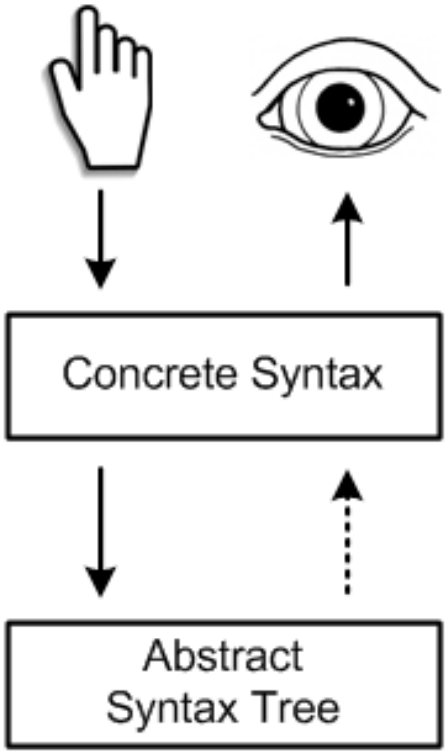


+ Refactorings, Find Usages, Syntax Coloring, Debugging, ...

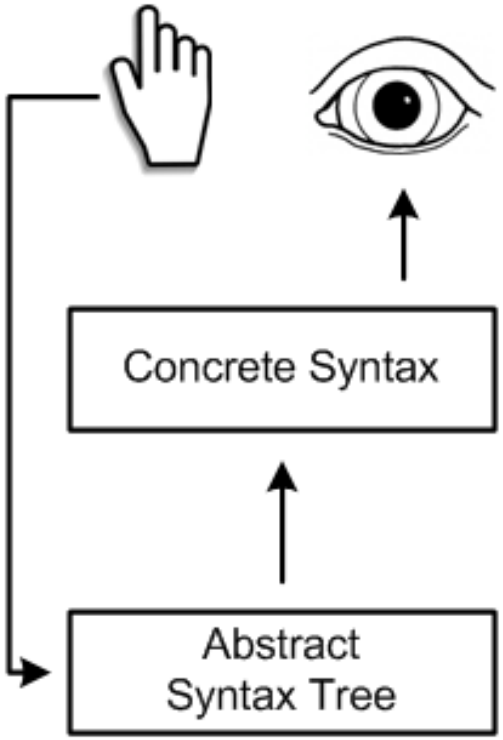
Projectional Editing

[Projectional Editing]

Parsing



Projectional Editing



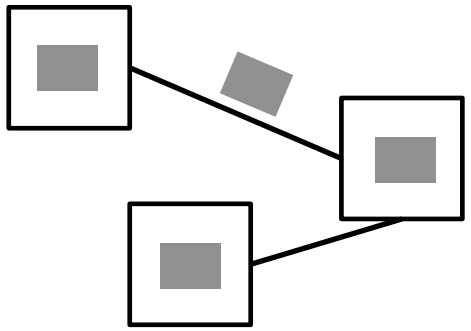
[Projectional Editing]
Syntactic Flexibility

Regular Code/Text

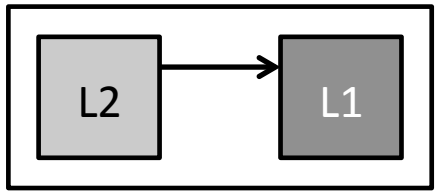
Mathematical

Tables

Graphical



[Projectional Editing]
Language Composition



Separate Files

Type System
Transformation
Constraints

In One File

Type System
Transformation
Constraints
Syntax
IDE

Version 3.1.2 released recently:

Better Performance, Graphical Editors
Better Tables, Tooltips, Better Console

SLE Paper

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Current State

[Feature Models]

Textual Notation
Graphical Visualization
SAT-based checking

[Feature Conditions]

Expressions over features in feature models

IDE-integration with feature models

SAT-checked for consistency

[Presence Conditions]

Static Variability – pimped #ifdef

Attachable to any program node, any language

IDE support to show the variant

Ref Checking for variable code

[Runtime Variability]

Special Variant-Switch Statement usable in C statement context

[Component Model]

Interfaces + Components acting as the the black boxes to be configured.

[Composition F/W]

Positive Variability

Merge Operators

Domain-Specific Extensions

experimental

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Challenges

Integration with Type System

Integration with Type System

NOT ref. integrity or name resolution.
This already works.

BUT arbitrary constraints such as
name uniqueness
and actual type calculations

Integration with Type System

Thank you!

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