Developing with DSLs MPS

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We don’t want to model, we want to program!
We don’t want to model, we want to program!

... at different levels of abstraction
... from different viewpoints
... integrated!

We don’t want to model, we want to program!

... with different degrees of domain-specificity
... with suitable notations
... with suitable expressiveness
We don’t want to model, we want to program!

And always: precise and tool processable
Programming Languages are not MODULAR enough.

Programming Languages are not COMPOSABLE enough.
Programming Languages are not CONFIGURABLE enough.

Programming Languages are not ADAPTABLE enough.
Programming Language Syntax is not FLEXIBLE enough.
Big Language?

with many first class concepts!

Small Language?

with a few, orthogonal and powerful concepts
Modular Language

with many optional, composable concepts

Modular Language

Like frameworks and libraries,
Modular Language

Like frameworks and libraries, but with syntax and IDE support
Language Workbench
(Martin Fowler)
Language Workbench
(Martin Fowler)

Freely define languages and integrate them

Language Workbench
(Martin Fowler)

use persistent abstract representation
Language Workbench
(Martin Fowler)

language ::= schema
+ editors
+ generators

Language Workbench
(Martin Fowler)

projectional editing
Language Workbench
(Martin Fowler)

persist
incomplete
or
contradictory
information

Language Workbench
(Martin Fowler)

powerful editing +
testing
refactoring
debugging
groupware

language definition implies IDE definition
Language Workbench
(Martin Fowler)
support for "classical" programming and modeling
Syntax primarily textual

with more symbols
think: mathematics
Syntax primarily textual sometimes box&line style

Syntax primarily textual sophisticated visualizations
Viewpoints

suitable abstractions and notations for each

Viewpoints

Integrated via symbolic references and seamless transitions
Custom Business

Custom purpose-built
create/include

Viewpoints

Custom Business

Custom Notations
real business expert integration
Viewpoints
Business

Custom
Notations

real
business
expert
integration

But that’s another talk...

Viewpoints
Technical

predefined
library

configure
Parser-based

**text**
... to tree
... to text
Projectional tree
... to text-lookalike (editor)
... to other trees ... [*]
... to text

Programming as Modeling
... (Mostly) Graphical Notations
... Abstract Syntax Storage
... Projecting Editors
... Different editable views for model
Programming as Modeling

... (Mostly) Graphical Any kind of Notations

... Abstract Syntax Storage

... Projecting Editors

... Different editable views for model
Custom Syntax

Graphical
Textual
Symbolic++

IDE Support

Teamwork
Debugging
Custom Editors
Complete Symbolic Integration

Language Composition

There's no parsing.
Unique Language Element Identity.
Unlimited language composition.
Flexible Notations

- Textual: like ASCII
- Graphical: box & line
- Semi-Graphical: mathematical

} treated the same can be mixed

Automatic IDE Extension

tool support is inherent for languages build with projectional tools

language definition implies IDE definition
Multiple Notations

... for the same concepts
e.g. in different contexts
or for different tasks

Partial Projections

... different views
... for different roles/people
... only a particular variant
Storage
! = Schema

... store arbitrarily meta data
  change log
  conflicting information
  variability annotations

... independent of language schema!

... „aspects“, overlay

Live
Programs

think: spreadsheet

a change to one part of program can lead to (dependent) changes in other parts
Tree Editing

... is different from editing text

... try to make it feel like text

... takes some getting used to

but: for more flexible notations
a more general editing paradigm is needed

Infrastructure
Integration

... storage is not text

... diff/merge must be in tool

... existing text tools don’t work
Proprietary Tools

... no standards
... no interop
also do...

IntelliJ IDEA
Resharper

released in
Q3 2009
currently
V 1.5.1
soon...
V 2.0
Open Source
licensed under
Apache 2.0

Build new standalone DSLs
Build new **standalone** DSLs
Build DSLs that **reuse** parts of other languages

(MPS comes with **BaseLanguage**)  
**extend** base language

Java++
Build new **standalone** DSLs
Build DSLs that **reuse** parts of other languages

(MPS comes with BaseLanguage)

**extend** base language
build DSLs that **reuse** parts of BaseLanguage

**Language Extension Example**
Language Extension Example

Old

```
ReadWriteLock l = ...
l.readLock().lock();
try {
    //code
} finally {
    l.readLock().unlock();
}
```

Language Extension Example

Old

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ReadWriteLock l = ...
l.readLock().lock();
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} finally {
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}
```

New

```
ReadWriteLock l = ...
lock (l) {
    //code
}
```
Structure ▶ Editor ▶ Typesystem ▶ Generator

code snippet:
```java
concept LockStatement extends Statement
  implements <name>

  instance can be root: false
  properties:
  <<...>>

  children:
  StatementBody ; specialist: <name>
  Expression ; LockExpression ; specialist: <name>

  references:
  <<...>>

  concept properties:
  alias = lock

  concept links:
  <<...>>

  concept property declarations:
  <<...>>

  concept link declarations:
  <<...>>
```
Structure ♦ Editor ♦ Typesystem ♦ Generator
What is planned to be in 2.0?

Tables + Matrixes in the Editor
Diagrams (Box & Line)
Several (separate) Editors per Concept
A Rich Text documentation language
   (with embeddable model elements)
Better Build Framework
Stand-Alone DSL Editors
Many Many Fixes :-)

What is planned to be in 2.0?

See also
blogs.jetbrains.com/mps/2010/12/the-mps-future-series-part-1-the-editor
Resources

Website - http://www.jetbrains.com/mps/
Support Forum - http://devnet.jetbrains.net/community/mps

mps-source-code-repository-is-publicly-available-now/
Issue Tracker - http://youtrack.jetbrains.net/dashboard

The End.

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