CSSE 490 Model-Based Software Engineering: More on Domain Specific Languages

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Plan for the Day

- Plus/Delta Summary
- Watch Martin Fowler clip on DSLs
- DSL Reading Discussion
- Milestone 2 Discussion
- More on Domain Specific Language (DSL)

+/∂ Feedback: Lectures

Pace

- 0 – much too fast
- 4 – somewhat too fast
- 1 – Somewhat too slow
- 0 – much too slow

Working well

- Class slides and material
- Project will be very helpful
- Examples
- Group discussions
- Daily Quizzes
- Move to Conference/classroom

Improvements

- Make lectures less abstract/ more specific (2)
- On Target (1)
- More examples like video (1)
- More detailed explanation of terms (1)
- Slow down (1)
- More class time on project (1)

+/∂ Feedback: Quizzes

Quizzes

- 2 – Very helpful
- 3 – somewhat helpful
- 0 – somewhat unhelpful
- 0 – Very unhelpful

Working well

- Focuses lecture for me
- Questions work well
- Good study guide
- Indicates high points
- Question #'s on slides

Improvements

- Quizzes are fine (4)
- Don't know/NA

+/∂ Feedback: Reading and Homework

Reading

- 0 – all of it
- 5 – most of it
- 0 – little of it
- 0 – none of it

Homework Difficulty

- 0 – much too difficult
- 4 – a bit too difficult
- 1 – a bit too easy
- 0 – much too easy

+/∂ Feedback: Homework Helpfulness

Homework Helpfulness

- 0 – very helpful
- 3 – somewhat helpful
- 2 – somewhat unhelpful
- 0 – very unhelpful

Working well

- In-class discussions from readings
- Summaries relate information from class
- Summaries reinforce reading
- Interesting topics

Improvements

- With fairly difficult topics, more time for readings (1)
- Shorter papers (2)
- Target more clear or at least less abstract readings
- More concrete papers and assignments

+/∂ Feedback: Workload

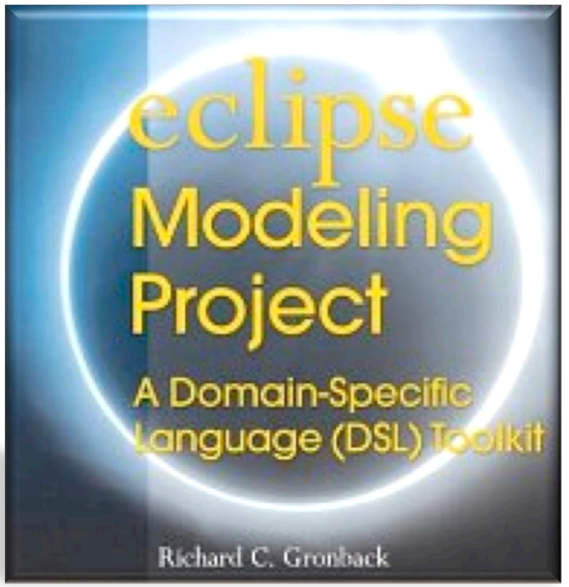
- Workload
  - 1 – much higher than average
  - 2 – somewhat higher than average
  - 3 – somewhat lower than average
  - 0 – much lower than average
- General Comments
  - Moving a bit fast
  - Not feeling ready for exam or implementing the project
  - Could use a middle option for questions 1, 9, & 12
  - While load is lower, the material is more difficult
  - Encouragement (4), Neutral (1) Discouragement (0) ☺

Summary of +/∂ Actions

- More concrete papers (where available) for case study assignments
- More examples in class
  - More time in class on project
- Slow the pace in class for more discussion
- Homework and projects due at 11:55pm

Recall: Domain Specific Languages

- Small language targeted at application domain
- Expressive in its domain
- Often declarative
- Examples
  - Textual: LaTeX, Graphical: Pic
  - Declarative: HTML, Imperative: VHDL
  - Document: SVG, Executable: Ant/Maven
  - Compiled: yacc, Interpreted: SQL
  - Embedded: LINQ of C#
  - Diesel, Groovy, …



Recall: DSL Development Activities

1. Identify problem domain of interest and gather the relevant knowledge in this domain
2. Capture domain knowledge in semantic notions and operations
3. Construct a library of components that implement the semantic notions and operations
4. Design a DSL that concisely describes applications in the domain
5. Develop a compiler (DSP) that translates DSL programs to a sequence of library calls
6. Write DSL programs (DSD) for all desired applications and compile them

Let's watch Martin Fowler clip…

- What did Martin Fowler have to say about the pervasiveness of DSLs?
- What difference between an internal and external DSL?
- What does he say about Language Workbenches?

Paper Discussion: DSL Paper

"When and How to Develop Domain-Specific Languages"

- What are the main thrusts of the paper?
- What are the controversial points and your positions?
- What did you get out of reading about Domain Specific Languages?

Let's talk about the project…

- How is the repository coming?
  - Basic component organization?
  - Metamodel for components?
- How is Albert's backup strategy coming?

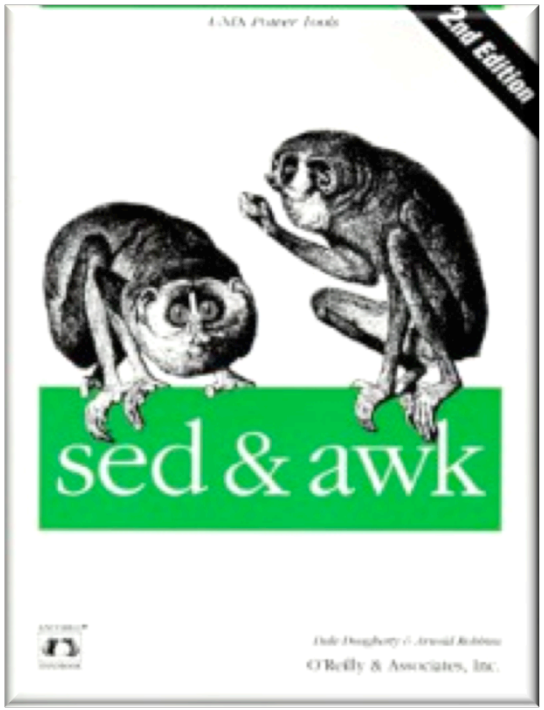
Mainstream DSL Approaches

- External DSL
- Internal DSL
- DSL Workbench

External DSLs

DSLs that use a different syntax to the main language that uses them

- **Examples**
  - **make, flex, yacc, bison**
  - **XPath, SQL, regexp**
  - **sed, awk**



External DSL Strengths / Limitations

Strengths

- Language Designer
  - Tools for compiler construction can be used
- Language User
  - Simpler to use than a GPL

Limitations

- Language Designer
  - Expensive to implement
- Language User
  - Weak tool support
  - Yet another language to learn
  - Often targeted towards a particular GPL
  - Often difficult to closely integrate with GPL

Internal DSLs

DSLs that *share the same* syntax to the main language that uses them

- A subset of the host language is used
- Examples
  - PetitParser (Smalltalk)
  - rake, rspec (Ruby)
  - jQuery (JavaScript)
  - RPython (Python)

Internal DSL Strengths / Limitations

Strengths

- Language Designer
  - No special tools
  - No new grammar
- Language User
  - Intermixable with GPL
  - Tools continue to work
  - No new language to learn

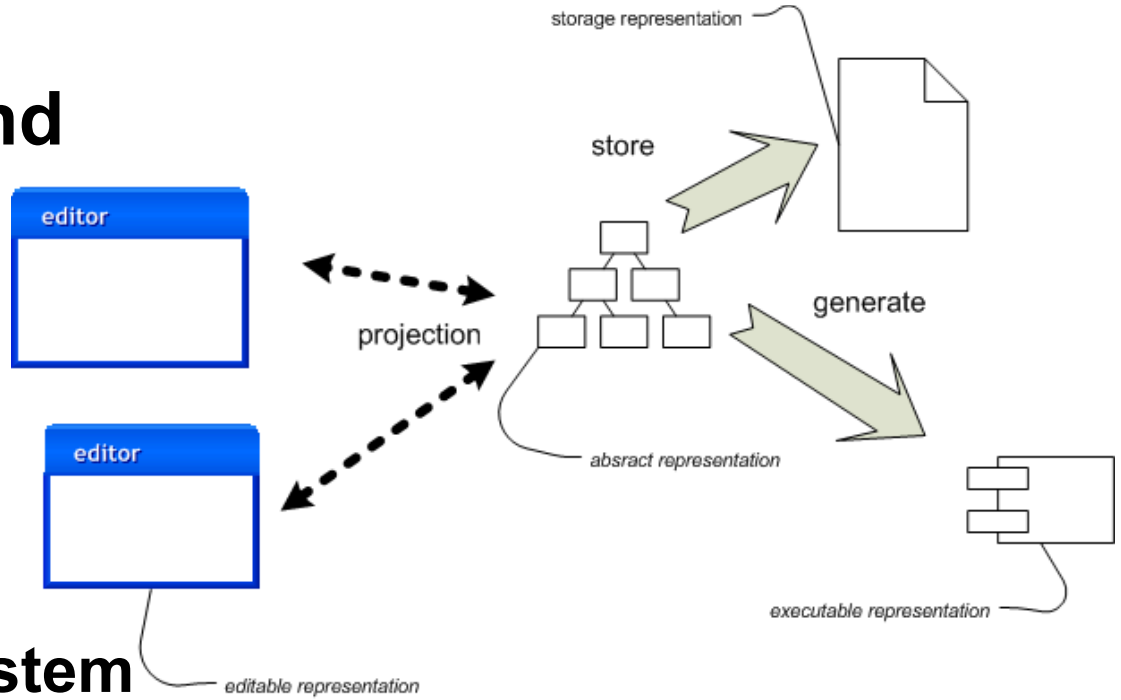
Limitations

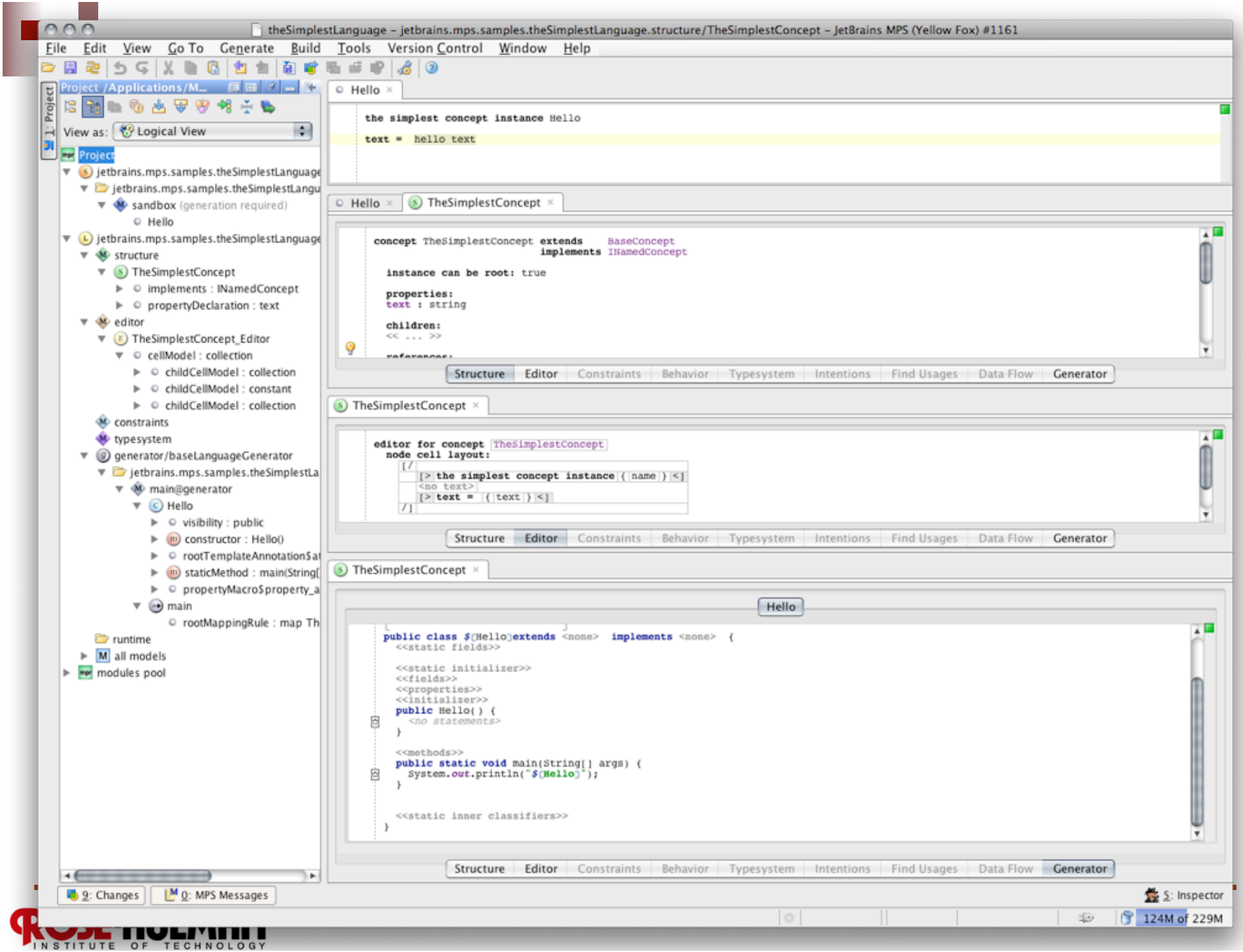
- Limited expressivity
- Unnecessary syntactic noise
- Constrained by host language

Language Workbenches

IDEs designed for building DSLs

- Common host and domain specific language representation
- Examples
  - JetBrains Meta Programming System (MPS)
  - openArchitectureWare





Homework and Milestone Reminders

- Take home examination tomorrow…
  - Review book and paper readings
  - Review class slides
- Milestone 2: Establish a repository and structure for assembling components for your FacePamphlet application
  - Due by 11:55pm Tuesday, April 5th, 2011