DrJava Development

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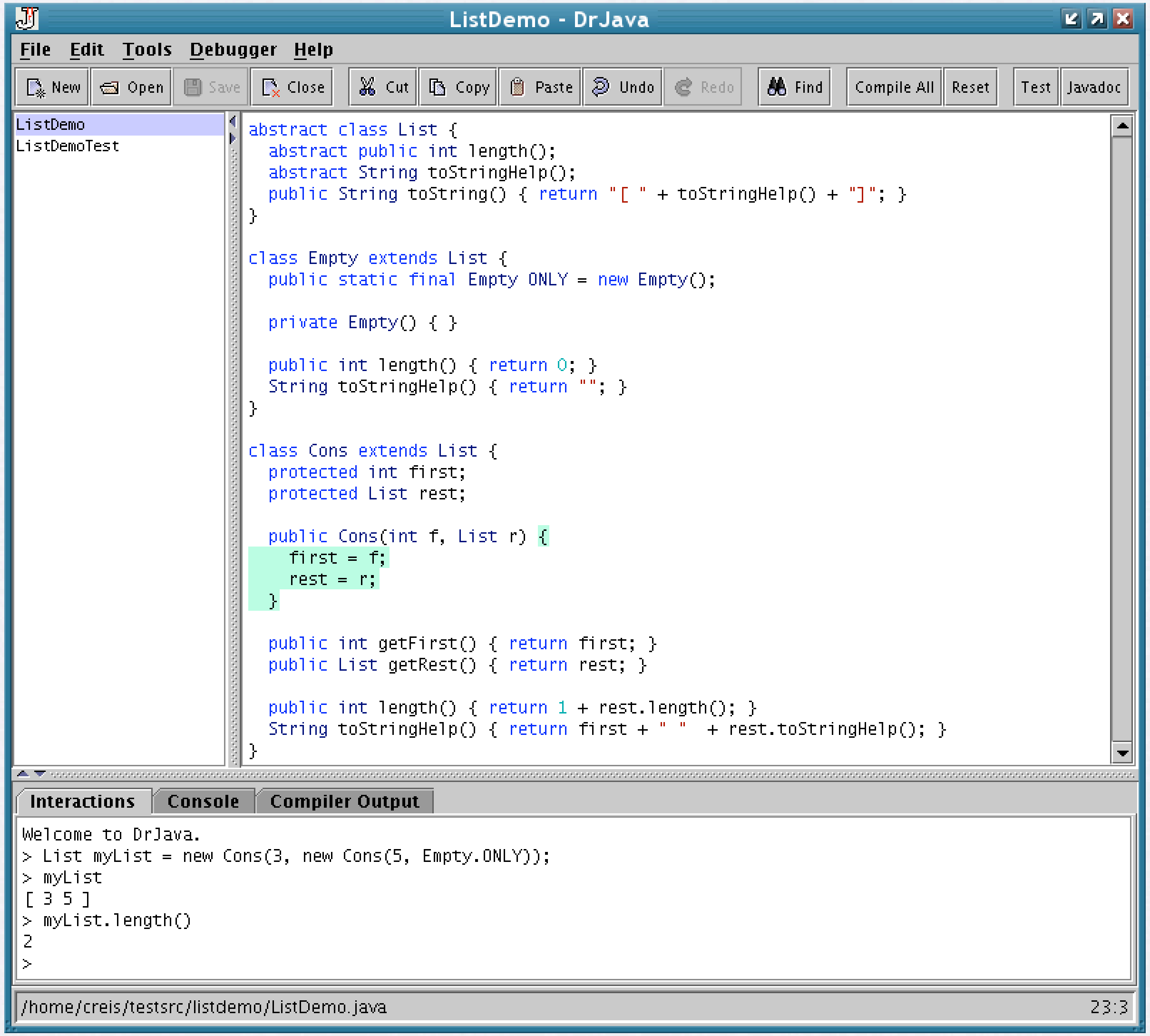
CSE 403 Guest Lecture

DrJava


ListDemo - DrJava
File Edit Tools Debugger Help
New Open Save Close Cut Copy Paste Undo Redo Find Compile All Reset Test Javadoc
ListDemo
ListDemoTest
Interactions Console Compiler Output
/home/creis/testsrc/listdemo/ListDemo.java
23:3

```
abstract class List {
  abstract public int length();
  abstract String toStringHelp();
  public String toString() { return "[ " + toStringHelp() + "]"; }
}

class Empty extends List {
  public static final Empty ONLY = new Empty();

  private Empty() { }

  public int length() { return 0; }
  String toStringHelp() { return ""; }
}

class Cons extends List {
  protected int first;
  protected List rest;

  public Cons(int f, List r) {
    first = f;
    rest = r;
  }

  public int getFirst() { return first; }
  public List getRest() { return rest; }

  public int length() { return 1 + rest.length(); }
  String toStringHelp() { return first + " "  + rest.toStringHelp(); }
}
```

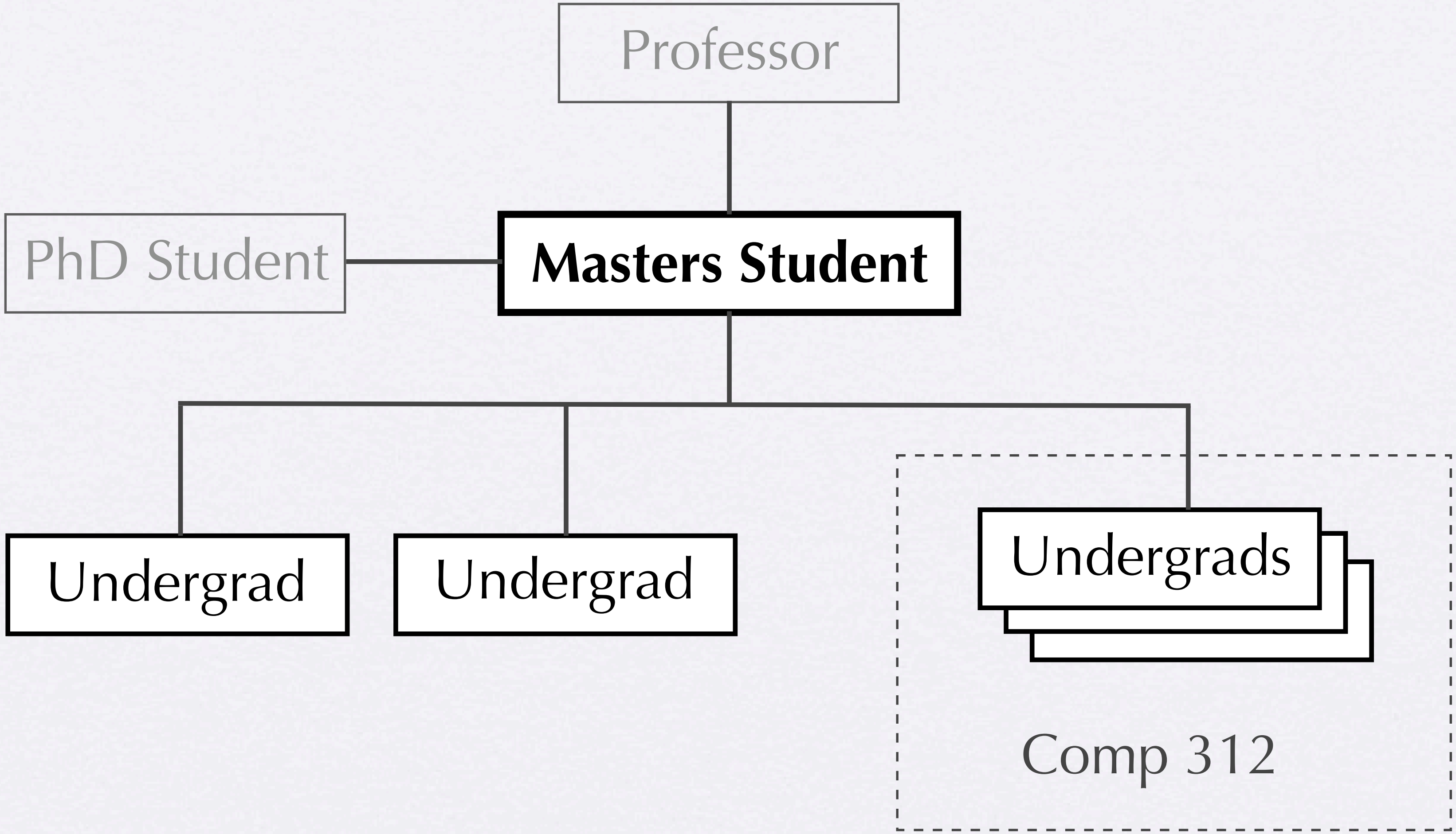
```
Welcome to DrJava.
> List myList = new Cons(3, new Cons(5, Empty.ONLY));
> myList
[ 3 5 ]
> myList.length()
2
>
```

- Pedagogic Java IDE
  - Simple, Interactive
- Used at dozens of schools around the world
- Freely Available

Development Overview

- **Written by students** at Rice University
  - Graduate, Undergraduate
  - High rate of turnover
- **Open Source**
- **Extreme Programming**

Development Team



On the Inside

- Java with generics (`List<String>`)
- ~400 classes, 50,000 lines of code
- **Complex** (*unit tests are critical!*)
    - Two JVMs, plus multithreaded GUI
    - RMI, JDI, Custom Classloaders
    - Backward compatibility

Benefits of Open Source

- Freely available
- Tool and Management Support
- Incorporate existing code
- Educational value
- Word of mouth, Credibility?

Tools and Management

- **Sourceforge.net**
  - Free hosting for 80,000 projects
  - Professional management tools
    - Track features, bugs, tasks, support
- **Ant, JUnit, CVS**

Use Existing Code

- **Dynamic Java**
  - Java source code interpreter
  - Critical to DrJava's quick maturity
- **JUnit Integration**

Educational Value

- Source code available for students, tinkerers
- Credible use of undergrads in Comp 312
- Building block for research tools (DrScala)

Complications

- Choice of License is tricky
  - **GPL**: true "free software"
    - All incorporated/derivative works GPL'd
  - **BSD**: more flexible, fewer guarantees
    - Allows us to use JUnit

Extreme Programming

- Simple practices that work well together
  - Pair Programming
  - Unit Testing
  - Continuous Refactoring
  - Incremental Development
  - On-site Customer

Typical Activity

- Prioritize bug reports
- Write test to exhibit bug
- Pair program to fix bug
- "Commit" (update, compile, test, commit)
- Release

Releases

- **Theory**: repository can always be released
- **Practice**: not exactly...

- Development releases (weekly/monthly)
- Stable releases (a few each year)

Life Cycle

- Peak development in spring and summer (Comp 312, summer interns)
  - 3-4 large features, many small fixes
  - Masters Theses
- Maintenance in "off-season"

Lessons Learned

- Unit tests are essential to stability
- Work incrementally
- XP is effective for high turnover
- Much to be gained from open source, even without many external developers

Difficulties

- Hard to test (and design) GUIs
  - Hard to enforce good test coverage
- Concurrency can be a mess
- Java isn't *really* platform independent...
- Tough to keep documentation up to date
- Maintenance/support is a full time job

Closing Thoughts

- Immensely satisfying to work on a widely used product
- Open source is a great fit for academia (perhaps elsewhere as well)
- XP can work very well for small teams

More Info

- http://drjava.org
- creis@cs.washington.edu