

## USING NETWORKING EXAMPLES FOR LABS AND ENRICHMENT IN CS1

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### ABSTRACT

John Gage's maxim, "The network is the computer," is self-evident to our students. IM, email, Facebook, YouTube, etc. are all network applications. Labs involving network applications can therefore be very motivating. This workshop will provide participants with 1) techniques for making networking projects accessible to CS1 students without sacrificing time required to cover fundamental skills, 2) an understanding of protocols such as IMAP and AOL's instant messaging protocol sufficient to design network-based laboratories, 3) examples of specific labs that have been successfully used in a Java-based CS1, and 4) strategies for enriching CS1 by exploring networking technology.

### SUMMARY

The goal of this workshop will be to provide attendees with sufficient knowledge to incorporate lab exercises based on network applications in their introductory courses. In particular, the presenter will provide an overview of both the fundamentals of protocols used to implement common network services, and the library mechanisms used for network communications in Java. The protocols discussed will include those for email (SMTP, POP, and IMAP), web requests (HTTP) and IM Chat (TOC and FLAP). The workshop will explore both the network primitives provided in Java's standard libraries and by Squint, a library designed by the presenter[2].

The workshop will begin by focusing on email protocols and basic Java primitives needed to send and receive text through network connections. The connection between the protocols and the network primitives will be illustrated through examples including a simple client to read email messages from a standard POP server. Next, the participants will receive hands-on experience by constructing the other half of an email client --- a program that can send email messages through an SMTP server. After this, other protocols will be discussed to illustrate how the ideas encountered in the email applications generalize to other domains. Finally, we will explore how the use of such exercises in an introductory course can be used to stimulate classroom discussions of topics beyond programming.

The laboratory exercises that will be described in this workshop have been developed as part of a course described in [1]. Detailed examples of some of these labs can be found at <http://www.cs.williams.edu/~cs134/s07/labs.html>. Complete documentation for the Squint library can be found at <http://www.cs.williams.edu/~cs134/s07/doc/squintDoc/>.

### MATERIALS PROVIDED

Each participant will receive electronic copies of:

- 1) slides used during the lecture portions of the workshop,
- 2) laboratory handouts for the exercises discussed,
- 3) the Squint networking library in both .jar and source form, and
- 4) documentation of the Squint library.

Participants will also receive paper copies of the slides and a handout explaining the details of the hands-on exercise completed during the workshop.

### INTENDED AUDIENCE

Educators who are eager to incorporate compelling examples in the laboratory exercises they assign in CS1, or CS2.

### PRESENTER BIOGRAPHY

Thomas Murtagh, Professor of Computer Science at Williams College, holds a Ph.D. from Cornell and formerly taught at Purdue University. He has published on CS pedagogy and curricular design, including the text *Java: An Eventful Approach* and several papers presented at SIGCSE and ITiCSE. He has been a presenter at workshops

given at SIGCSE and regional CCSC conferences. His research interests and publications range from compiler optimization to operating system design.

#### **REFERENCES**

[1] Murtagh, T. P., Weaving CS into CS1: a doubly depth-first approach. In *Proceedings of the 38th SIGCSE Technical Symposium on Computer Science Education*. SIGCSE '07. ACM Press, New York, NY, 336-340.

[2] Murtagh, T. P., Squint: barely visible library support for CS1. In *Proceedings of the 38th SIGCSE Technical Symposium on Computer Science Education*. SIGCSE '07. ACM Press, New York, NY, 526-530.