Seminar CS691M: Mobile and Pervasive Computing
Fall 2003

"Pervasive Computing Has Pervasive Problems" -Patrick Thibodeau

1 Basic Information

Time & Place: T, Th 2:30-3:45
Credits: 3 with the project, 1 without
Instructor: Mark Corner, 330 Computer Science Research Bldg
Instructor email address: **691m@cs.umass.edu**
Office Hours: T 3:45-4:45 or by appointment
Course web page: http://www.cs.umass.edu/~mcorner/courses/691M/

2 Course Overview

This course covers advanced topics and current issues in mobile and pervasive computing. The objective of the course is threefold. First, it will expose you to many of the important prior results in the field. Second, it will illustrate current trends in mobile and pervasive computing. Third, it will give you practical experience in the area through the design and execution of a modest research project.

2.1 Intended Audience

This is a graduate-level course; it is meant for CS graduate students, particularly those with a research interest in software systems. The prerequisite for the course is a strong undergraduate course in operating systems and also one in networking.

3 Course Requirements

The work of this course consists of:

- Critically reading, analyzing, and actively discussing papers.
- Leading a discussion of at least one of these papers,
- As part of a team, designing a semester-long project, carrying it out, and writing up the results.

Students have the option of completing all the requirements except the project. This earns the student one credit instead of three.

3.1 Paper Summaries and Discussion – 25%

This course has no textbook; instead, we will cover a number of original research papers. It is critically important that you read and digest each paper before it is discussed in class so that you can be an active participant in the discussion. You will need to email a short summary of each paper on the day it is due. Please email the summary to 691m@cs.umass.edu. Each summary should be no more than 10 sentences in length. These will be graded on a simple 0-2 scale (no effort, adequate, insightful). All papers are available on line.

Class participation is mandatory. The grade is subjective, so if you have any questions about how you are doing, please see the instructor.

3.2 Leading Paper Discussion – 20%

You are expected to present at least one of the papers from the class reading list. The instructor may assign you more than one depending on the complexity of the papers. You will not just be presenting the paper, but more importantly leading a discussion of the material. You are encouraged to make links to other published research works and background material. The presentations and discussions should last the length of one class; however some discussions may take longer than others.

3.3 Project – 55%

In addition to reading and presenting papers, you will design, carry out, and communicate the results of a small research project in the field. The best of these projects should lead to a published paper in peer-reviewed workshops and conferences. I can give you broad ideas for projects, but they will be purposefully vague — a question well asked is half answered. It is perfectly fine to work on a project that contributes to your own research agenda, but you must be able to convince me that your project has some relationship to mobile or pervasive computing. Some projects will require root access to one or more machines to compile and install experimental kernels. If you would like to propose such a project and you do not have access to machines, it might be possible to arrange something for the semester. I may also be able to obtain handheld devices or motes. You should see me early if you expect to need such access. Projects are carried out in teams, preferably of three people. Your project partners will have a substantial effect on your grade, so choose them wisely. There are four components to your project grade: a project proposal, a midterm status report, a final project report, and a project demo.

3.3.1 Project Proposal

Your proposal should explicitly state the problem your project will address, your project's goal and motivation, related work, the methodology and plan for your project, and the resources needed to carry out your project. Be sure to structure your plan as a set of incremental milestones, and include a schedule for meeting them.

3.3.2 Status Report

Your status report should contain enough implementation, data, and analysis to show that your project is on the right track. You should include your original proposal with my comments, along with any surprising results or changes in direction, schedule, etc. You should also have a refined version of the problem statement and goals, as well as a more developed related work section.

3.3.3 Final Report

Your final report should be in a form ready to submit to a relevant conference or workshop. **It must be well written**, and give convincing evidence of any conclusions you can draw from your project. It must contain the following:

- Concise abstract
- Problem motivation.
- Design goals or performance questions.
- Design architecture or performance metrics.
- Description of code or scripts: major data structures and control flows.
- Description of difficulties in coding or performance measurement and analysis: whether, why, and how the original goals, architecture, and/or metrics needed to be changed.
- Evaluation showing achievement of goals.
- Future work, related work, summary, and references.

The report should look and feel like a published paper. The easiest way to format the paper is using LaTeX, however the tools that you use are entirely up to you and your group. Please limit your submissions to 14 pages.

3.3.4 Project Demo

You must effectively demonstrate your project both through a live walk-through and a one-page, easily-digested description of the problem you addressed. The description should explain why your problem is important, how you solved it, and what evidence you have.

3.3.5 Project Milestones

- September 16: Declare your group membership.
- October 7: Project proposal due.
- November 4: Status report due.
- December 4 Final project demos
- December 11: Final project report.

3.4 Exams

There will be no exams in this course.

4 Reading List

The following lists the papers to be covered in this course sorted by topic and in the order they will be discussed in class. All papers are available electronically.

Basics (Instructor)
BA-1: Weiser: The Computer for the 21st Century
BA-2: Satyanarayanan: Pervasive Computing: Vision and Challenges

Naming and Service Discovery
SD-1: Adjie-Winoto: The Design and Implementation of an Intentional Naming System

Dealing with Location
LO-1: Spreitzer: Providing Location Information in a Ubiquitous Computing Environment
LO-1: Priyanatha: The Cricket Compass for Context-Aware Mobile Applications

Mobile Data Access
MD-1: Acharya: Balancing Push and Pull for Data Broadcast
MD-2: Joseph: Rover: A Toolokit for Mobile Information Access
MD-3: Noble: Agile Application-Aware Adaptation for Mobile Computing
MD-4: Swierk: The Roma Personal Metadata Service

Consistency Management
CM-1: Terry: Managing Update Conflicts in Bayou
CM-2: Gray: The Dangers of Replication and a Solution
CM-3 Yu: Design and Evaluation of a Continuous Consistency Model for Replicated Services

Mobile Networking
MN-1: Johnson: Scalable Support for Transparent Host Internetworking
MN-2: Balakrishnan: A Comparison of Mechanisms for Improving TCP Performance over Wireless Networks
MN-3: Snoeren: An End-to-End Approach to Host Mobility
MN-4: Zandy: Reliable Network Connections

Ad Hoc Networks
AH-1: Johnson: DSR: The Dynamic Source Routing Protocol for Multi-Hop Wireless Ad Hoc Networks
AH-2: Perkins: Highly Dynamic Destination-Sequenced Distance-Vector Routing (DSDV) for Mobile Computers
AH-3: Broch: A Performance Comparison of Multi-Hop Wireless Ad Hoc Network Routing Protocols

Distributed File Systems
DF-1: Mummert: Exploiting Weak Connectivity for Mobile File Access
DF-2: Kuenning: Automated Hoarding for Mobile Computers
DF-3: Wang: PersonalRAID: Mobile Storage for Distributed and Disconnected Computers

Energy Management
EM-1: Simunic: Dynamic Power Management for Portable Systems
EM-2: Flinn: Energy-Aware Adaptation for Mobile Applications
EM-3: Krashinsky: Minimizing Energy for Wireless Web Access with Bounded Slowdown

Sensor Networks
SN-1: Kahn: Mobile Networking for "Smart Dust"
SN-2: Heidemann: Building Efficient Wireless Sensor Networks with Low-Level Naming
SN-3: Elson: Fine-Grained Network Time Synchronization Using Reference Broadcasts

Security
SE-1: Stajano: The Resurrecting Duckling: Security Issues for Ad-Hoc Wireless Networks
SE-2: Corner: Zero-Interaction Authentication
SE-3: Perrig: SPINS: Security Protocols for Sensor Networks
SE-4: Monrose: Toward Speech-Generated Cryptographic Keys on Resource-Constrained Devices

Hot Topics (Potpourri)
HT-1: Cox: Pastiche: Making Backup Cheap and Easy
HT-2: Sapuntzakis: Optimizing the Migration of Virtual Computers

5 Course Schedule

Paper summaries are due on the day shown on this schedule, though we may not always complete (or even begin) discussion of a particular paper on its assigned day. This schedule is subject to change as the course develops; changes will be announced in class.

Week	Tuesday	Thursday	Deadlines
Aug. 31		Intro, BA-1,2	
Sept. 7	BA-1,2 continued	SD-1, LO-1	
Sept. 14	LO-2	MD-1	16th: Declare group
Sept. 21	MD-2	MD-3	
Sept. 28	MD-4	CM-1	
Oct. 5	CM-2	CM-3	7th: Project proposal
Oct. 12	MN-1	MN-2	
Oct. 19	No Class(SOSP)	MN-3	
Oct. 26	AH-1	AH-2	
Nov. 2	AH-3, DF-1	DF-3	4th: Status report
Nov. 9	No Class (Veteran's)	EM-1	
Nov. 16	EM-2, EM-3	SN-1, SN-2	
Nov. 23	SN-3	No Class (TG)	
Nov. 30	SE-1, SE-2	SE-3	4th: Demos
Dec. 7	Demos	HT-1, HT-2	11th: Reports
Dec. 14	No Class (Exams)	No Class (Exams)	

6 Late Work, Exam Conflicts

Paper summaries must be turned in via email 30 minutes prior to the beginning of class. No late summaries will be accepted.

All project deadlines are 6:00 PM on the day each component is due. Work submitted after 6:00 PM but before midnight is penalized 5%. Thereafter, each day is charged an additional 10%; weekend days count as "days". We are going by my clock, not yours, so leave yourself extra time for clock skew.

7 Policy on Collaboration and Cheating

Acts of cheating and plagiarism will be reported to the University Academic Honesty Board. You are responsible for knowing, and will be held to, the University Academic Honesty Policy. This policy is available online:

http://www.umass.edu/umhome/policies/honesty.html

Discussion of course material is not considered cheating and is strongly encouraged. If you receive substantial help from another person you must acknowledge them in your work. If you use any published or unpublished source in any of your own work, you must give full citation. If you have questions about these policies please see the instructor.

In keeping with this policy, I credit several professors, include Jason Flinn and Brian Nbole at the University of Michigan for the format and several passages in this syllabus.