CIS 640 – Advanced Topics in Computer Systems: Mobile Computing[1]

Spring 1998

Instructor: Insup Lee, 262 Moore, 898-3532, lee@central.cis.upenn.ed

Time: TTh 1:30-3:00

Place: Towne 321

Office Hours: TTh 4:15-5

Description: This course will cover selected topics on mobile computing, from operating systems issues such as network protocols, file systems, file systems, performance, to programming issues such as programming languages, specification and analysis techniques, mobile programs, security and protection, to applications such as wireless X, Web browser. Students will be expected to participate in class discussion and to do class projects. Each project requires the critical evaluation of a specific approach, technique or tool environment.

Grading: The grades will be based on the following: class participation, a series of short critiques on selected papers, one or two class presentations, and term projects.

Prerequisites: Operating Systems such as CSE 380 and Programming Languages such as CIS 500.

Reading Material: A collection of papers will be distributed in class.

Suggested Textbook:

- *Mobile Computing*, edited by Tomasz Imielinski and Henry F. Korth, Kluwer Academic Publishers, Boston, 1997

[1]It was previously announced as CIS 642 – Seminars in Distributed and Real-time Computing. It can registered as either CIS 640 or CIS 642. This course can be used as TCOM 670 for this semester only.

Tentative Reading List

Introduction and Overview

1. D. Duchamp. Issues in Wireless Mobile Computing. *Proceedings of the 3rd workshop on Workstation operating systems*, pages 1–7, April 1992.

2. G. H. Forman and J. Zahorjan. The Challenges of Mobile Computing. *IEEE Computer*, 27(4):38–47, April 1994.

3. M. Satyanarayanan. Fundamental challenges in mobile computing. In *Proceedings of the 15th Annual ACM Symposium on Principles of Distributed Computing*, pages 1–7, May 1996.

4. T. Imielinski and B. R. Badrinath. Wireless Mobile Computing : Challenges in Data Management. *Communications of the ACM*, 37(10):19–27, Oct. 1994.

5. D. C. Cox. Wireless Personal Communications: What Is It? *IEEE Personal Communications*, 2(20-35):20–35, April 1995.

6. M. Weiser. Some Computer Science Issues in Ubiquitous Computing. *Communications of the ACM*, 36(7):74–84, July 1993.

Network protocols/Mobile IP

1. C. E. Perkins. Mobile IP. *IEEE Communications Magazine*, 35(5):84–99, May 1997.

2. F. Teraoka, K. Uehara, H. Sunahara, and J. Murai. VIP: A Protocol Providing Host Mobility. *Communications of the ACM*, 37(8):67–75, 113, August 1994.

3. T. Blackwell and et al. Secure Short-Cut Routing for Mobile IP. In *Proceedings of USENIX Summer 1994 Conference*, pages 305–316, June 1994.

4. C. E. Perkins and D. B. Johnson. Mobility Support in IPv6. In *Proceedings of MobiCom '96*, pages 27–37, June 1996.

Measurement and Analysis

1. D. Duchamp and N. F. Reynolds. Measured Performance of a Wireless LAN. In *Proceedings of the 17th Conference on Local Computer Networks*, pages 494–499, July 1992.

2. R. Cácers and L. Iftode. The Effects of Mobility on Reliable Transport Protocols. In *Proceedings of the 14th International Conference on Distributed Computing Systems*, pages 12–20, June 1994.

3. D. Eckhardt and P. Steenkiste. Measurement and Analysis of the Error Characteristics of an In-Building Wireless Network. *Computer Communication Review*, 26(4):243–254, Oct. 1996.

Programming Supports and Programming Languages

1. B. Noble, M. Satyanarayanan, D. Narayanan, J. E. Tilton, J. Flinn, and K. Walker. Agile Application-Aware Adaptation for Mobility. In *Proceedings of the 16th ACM Symposium on Operating System Principles*, Oct. 1997.

2. G. Welling and B. R. Badrinath. A Framework for Environment Aware Mobile Applications. In *Proceedings of the 17th International Conference on Distributed Computing Systems*, pages 384–391, May 1997.

3. T. Thorn. Programming Language for Mobile Code. *ACM Computing Survey*, 3(3):213–239, Sept. 1997.

4. A.-R. Adl-Tabatabai, G. Langdale, S. Lucco, and R. Wahbe. Efficient and Language-independent Mobile Programs. In *Proceedings of ACM SIGPLAN '96: Programming Language Design and Implementation*, pages 127–136, May 1996.

5. R. S. Gray. Agent Tcl: A flexible and secure mobile-agent system. *Dr. Dobbs Journal*, 22(3):18–27, March 1997.

6. A. Carzaniga, G. P. Picco, and G. Vigna. Designing Distributed Applications with Mobile Code Paradigms. In *Proceedings of the 19th International Conference on Software Engineering*, 1997.

7. M. Hicks, P. Kakkar, J. T. Moore, C. A. Gunter, and S. Nettles. PLAN: A Programming Language for Active Networks.

Data Management and File Systems

1. N. Shivakumar, J. Jannink, and J. Widom. Per-User Profile Replication in Mobile Environments: Algorithms, Analysis, and Simulation Results. To appear in ACM-Balzer Journal of Wireless Networks.

2. P. Xuan, S. Sen, O. González, J. Fernandez, and K. Ramamritham. Broadcast on Demand: Efficient and Timely Dissemination of Data in Mobile Environments. In *Proceedings of Real-Time Technology and Applications Symposium*, pages 38–48, June 1997.

3. A. Bestavros. AIDA-based Real-Time Fault-Tolerant Broadcast Disks. In *Proceedings of Real-Time Technology and Applications Symposium*, pages 49–58, June 1996.

4. S. Acharya, R. Alonso, M. Franklin, and S. Zdonik. Broadcast Disk Data Management for Asymmetric Communication Environments. *SIGMOD Record*, 24(2):199–210, June 1995.

5. T. Imielinski and S. Viswanathan. Adaptive Wireless Information Systems. In *Proceedings of SIGDBS Conference*, Oct. 1994.

6. M. A. Butrico, H. Chang, A. Cocchi, N. H. Cohen, D. G. Shea, and S. E. Smith. Gold Rush: Mobile Transaction Middleware with Java-Object Replication. In *Proceedings of the 3rd USENIX Conference on Object-Oriented Technologies (COOTS)*, pages 91–101, June 1997.

Security and Protection

1. T. Jaeger and A. Prakash. Building Systems That Flexibly Download Executable Content. In *Proceedings of the 6th USENIX Security Symposium*, 1996.

2. D. Hagimont and L. Ismail. A Protection Scheme for Mobile Agents on Java . In *Proceedings of MOBICOM 97*, pages 215–222, Sept. 1997.

3. B. Patel and J. Crowcroft. Ticket Based Service Access for the Mobile User. In *Proceedings of MOBICOM 97*, pages 223–233, Sept. 1997.

4. K. R. Sollins and N. V. Mehta. Expanding and Extending the Security Features of Java. In *Proceedings of the 7th USENIX Security Symposium*, Jan. 1998.

Formal Models for Specification and Analysis

1. R. Milner, J. Parrow, and D. Walker. A Calculus of Mobile Processes I. *Information and Computation*, 100(1):1–40, 1992.

2. R. Milner, J. Parrow, and D. Walker. A Calculus of Mobile Processes II. *Information and Computation*, 100(1):41–77, 1992.

3. L. Cardelli and A.D. Gordon. Mobile Ambients. http://www.luca.demon.co.uk/.

4. C. D. Wilcox and G.-C. Roman. Reasoning about places, times, and actions in the presence of mobility. *IEEE Transactions on Software Engineering*, 22(4):225–247, April 1996.

5. G.-C. Roman, P. J. McCann, and J. Y. Plun. Mobile UNITY: Reasoning and Specification in Mobile Computing. *ACM Transactions on Software Engineering and Methodology*, 6(3):250–282, July 1997.

6. R. M. Amadio and S. Coupet-Grimal. Modelling IP Mobility. Technical Report Rapport Interne 245, Laboratoire d'Informatique de Marseill, Oct. 1997.

Application Structure

1. C. K. Kantarjiev, A. Demers, R. Frederick, R. T. Krivacic, and M. Weiser. Experiences with X in a Wireless Environment. In *Proceedings of the 1st USENIX Symposium on Mobile and Location-Independent Computing*, pages 117–128, August 1993.

2. B. N. Schilit. Customizing Mobile Applications. In *Proceedings of the 1st USENIX Symposium on Mobile and Location-Independent Computing*, pages 129–138, Agusut 1993.

3. B. C. Housel and D. B. Lindquist. WebExpress: a system for optimizing Web browsing in a wireless environment. In *Proceedings of MobiCom '96*, June 1996.

4. A. D. Joseph, J. A. Tauber, and M. F. Kaashoek. Mobile computing with the Rover toolkit. *IEEE Transactions on Computers*, 46(3):337–352, March 1997.

Relevant Web sites:

- http://www.cs.auc.dk/mobility/
- http://www.cs.indiana.edu/hyplan/pierce/common/prof/Mobility.html
- http://www.cs.umd.edu/projects/mcml/mcothers.html
- http://www-sor.inria.fr/ aline/
- http://mosquitonet.stanford.edu/mobile/