

University of Cincinnati/ Ohio State University
Autumn 2007, 20-ECES 846-001: Advanced Mobile Computing

Monday, Wednesday 3:00 pm to 4:15 pm, 302 Zimmer Hall
Instructor: Dharma P. Agrawal (dpa@ececs.uc.edu) URL: <http://www.ececs.uc.edu/~dpa>
Prasun Sinha (prasun@cse.ohio-state.edu) URL: <http://www.cse.ohio-state.edu/~prasun>
Agrawal's Office: 833 Rhodes Hall, Phone: 513-556-4756
Sinha's office: 791 Dreese Hall, Phone: 614-292-1531

Agrawal's Office Hours: Monday, Wednesday, 2-3 pm, or by appointment

Prerequisite: Ad hoc and Sensor Networks (CS 831 at UC)

Course Contents:

- Lec 1: Week 1: Sep 19: WED Selfishness in Ad hoc networks (Dharma Agrawal)
- Lec 2: Week 2: Sep 24: MON Data Transport in Multihop Wireless Networks (Prasun Sinha)
Lec 3: Week 2: Sep 26: WED Data Aggregation in Sensor Networks (Dharma Agrawal)
- Lec 4: Week 3: Oct 1: MON Data Aggregation in Sensor Networks (Prasun Sinha)
Lec 5: Week 3: Oct 3: WED Power Management in Sensor Networks (Prasun Sinha)
- Lec 6: Week 4: Oct 8: MON: [Dharma and Prasun out of town] Mobile Sensor Network Deployment (Torsha Banerjee in place of Dharma Agrawal)
Lec 7: Week 4: Oct 10: WED MON Heterogeneous wireless networks (Bin Xie in place of Dharma Agrawal)
- Lec 8: Week 5: Oct 15: MON [Dharma out of town Tentative - External Speaker - Santosh Kumar: Memphis, (OSU Alumni, Torsha Banerjee to show slides)]
Lec 9: Week 5: Oct 17: WED Secured Key Generation in Sensor Networks (Dharma Agrawal)
- Lec 10: Week 6: Oct 22: MON Issues in Wireless Mesh Networks (Dharma Agrawal)
Lec 11: Week 6: Oct 24: WED Performance evaluation of Mesh Networks (Dharma Agrawal)
- Lec 12: Week 7: Oct 29: Low Power MAC for Sensor Networks (Prasun Sinha, Torsha to show slides)
Lec 13: Week 7: Oct 31: WED UC Students Presentations: Bhandaranayke and Dhekne
Lec 14: Week 8: Nov 5: MON OSU Students Presentations
Lec 15: Week 8: Nov 7: WED UC Students Presentations: Fu and Gaur (Dharma out of town: Bin Xie to evaluate Presentations)
- Lec --: Week 9: Nov 12: MON: VETERANS DAY: UC and OSU closed
Lec 16: Week 9: Nov 14: WED UC Students Presentations: Kripakaran and Louha
- Lec 17: Week 10: Nov 19: MON OSU Students Presentations
Lec 18: Week 10: Nov 21: WED UC Students Presentations Mostafa and Prakash
- Lec 19: Week 11: Nov 26: MON UC Students Presentations: Toshniwal and Vikram
Lec 20: Week 11: Nov 28: WED OSU Students Presentations
-

Grading:

Presentation: 25 %
Report of presentation: 10 % [due in class on the day of presentation]
Survey paper: 20% [due in class on Oct 29th 2007 so that after that they can focus on presentation/simulations]
Class interaction: 10%

Simulation and demonstration of presentation: 25% [tentative Nov 28th - Dec 1st, 2007 to be scheduled separately at each university]
Final Report of Simulations: 10% [hard copy and email to be submitted by Dec 1st, 2007]

In simulation project, students are expected to compare the paper's proposed approach with other existing approaches as given or referenced in the paper to one baseline. The students can use ns-2, Qualnet or Opnet simulator, or some other simulator or use C program or any other program. It is difficult to recreate the physical channel modes accurately; there may be some discrepancy from the reported results in the paper (often using ns-2). The report on presentation should be brief (about 5 –pages single space or 10 pages double space) and should identify central ideas, issues addressed and issues not addressed in the paper and some remarks on future directions (nor just a copy of paper's conclusion).

The survey paper (topic needs to be different from the presentation Topics) of 20-30 pages (hard and soft copy) should provide an overview of the topic, reflecting the state-of-the-art, having adequate references, and must clearly identifying which portion (including tables and figures) you have taken from where, including the web sites. You need to rewrite all stuff in your own words.

List of Presentation Topics + Simulation

01. 1. **Joint Optimal Access Point Selection and Channel Assignment in Wireless Networks** by Iordanis Koutsopoulos and Leandros Tassiulas, "*IEEE/ACM Transactions on Networking*", Vol.15, No.3, June 2007.
02. **Adaptive Triangular Deployment Algorithm for Unattended Mobile Sensor Networks** by Ming Ma and Yuanyuan Yang, "*IEEE Transactions on Computers*", Vol.56, No.7, July 2007.
03. **A Dynamic Clustering and Energy Efficient Routing Technique for Sensor Networks** by Ming Yu, Kin K. Leung, and Aniket Malvankar, "*IEEE Transactions on Wireless Communications*", Vol.6, No.8, August 2007.
04. **Combined Packet Scheduling and Call Admission Control with Minimum Throughput Guarantee in Wireless Networks** by Hyang-Won Lee and Song Chong, "*IEEE Transactions on Wireless Communications*", Vol.6, No.8, August 2007.
05. **NodeMD: Diagnosing Node-Level Faults in Remote Wireless Sensor Systems** by Veljko Krunić, Eric Trumpler, and Richard Han, "*Proceedings of the ACM MobiSys 2007*", June 2007.
06. **Energy-Efficient Opportunistic Topology Control in Wireless Sensor Networks** by Jian Ma, Qian Zhang, Chen Qian and Lionel M. Ni, "*Proceedings of the ACM MobiSys 2007*", June 2007.
07. **Architecture of Wireless Sensor Networks with Mobile Sinks: Multiple Access Case** by Liang Song and Dimitrios Hatzinakos, "*International Journal of Distributed Sensor Networks*", Vol.3, No.3, 2007.
08. **Estimation of the Hyperexponential Density with Applications in Sensor Networks** by Larry N. Singh and G.R. Dattatreya, "*International Journal of Distributed Sensor Networks*", Vol.3, No.3, 2007.
09. **Delay/Fault-Tolerant Mobile Sensor Network (DFT-MSN): A New Paradigm for Pervasive Information Gathering** by Yu Wang and Hongyi Wu, "*IEEE Transactions on Mobile Computing*", Vol.6, No.9, September 2007.
10. **Distributed Load Balancing Algorithm for Adaptive Channel Allocation for Cognitive Radios** by Simon Fischer, Marina Petrova, Petri Mahonen and Berthold Vocking, "*Proc. of the 2nd Conference on Cognitive Radio Oriented Wireless Networks and Communications (CrownCom 2007)*", August 2007.
11. **Distributed Scheduling and Resource Allocation for Cognitive OFDMA Radios** by Juan-Andres Bazerque and Georgios B. Giannakis, "*Proc. of the 2nd Conference on Cognitive Radio Oriented Wireless Networks and Communications (CrownCom 2007)*", August 2007.
12. **A Game Theoretic Approach for Medium Access of Open Spectrum in Cognitive Radios** by Madhusudhan R. Musku, Anthony T. Chronopoulos, Satis Penmasta and Dimitrie C. Popescu, "*Proc. of the 2nd Conference on Cognitive Radio Oriented Wireless Networks and Communications (CrownCom 2007)*", August 2007.
13. **Min-Max Congestion in Interference-Prone Wireless Mesh Networks** by Sonia Waharte, Arash Farzan and Raouf Boutaba, "*IEEE International Conference on Communication 2007 (ICC '07)*", June 2007.
14. **Admission Control with Load Balancing in IEEE 802.11-based ESS Mesh Networks** by Dongmei Zhao, Jun Zou and Terence D. Todd, "*Wireless Networks*", Vol.13, No.3, June 2007.
15. **Robust Detection of Selfish Misbehavior in Wireless Networks** by Alberto Lopez Toledo and Xiaodong

- Wang, "IEEE Journal on Selected Areas in Communications", Vol.25, No.6, August 2007.
16. **Maximizing Throughput of Cognitive Radio Networks with Limited Primary Users' Cooperation** by Anh Tuan Hoang, Ying-Chang Liang, and Md Habibul Islam, "IEEE International Conference on Communication 2007 (ICC '07)", June 2007.
 17. **Backup Routing for Multimedia Transmissions over Mesh Networks** by Chungui Liu, Yantai Shu, Lianfang Zhang, and Maode Ma, "IEEE International Conference on Communication 2007 (ICC '07)", June 2007.
 18. **Adaptive Coordination Protocol for Heterogeneous Wireless Networks** by Vamsi Paruchuri and Arjan Durrresi, "IEEE International Conference on Communication 2007 (ICC '07)", June 2007.
 19. **An Interference-Aware Channel Assignment Scheme for Wireless Mesh Networks** by Arunabha Sen, Sudheendra Murthy, Samrat Ganguly and Supept Bhatnagar, "IEEE International Conference on Communication 2007 (ICC '07)", June 2007.
 20. **A Novel Key Redistribution Scheme for Wireless Sensor Networks** by Chun-Fai Law, Ka-Shun Hung and Yu-Kwong Kwok, "IEEE International Conference on Communication 2007 (ICC '07)", June 2007.
 21. **Maximizing Broadcast and Multicast Traffic Load through Link-Rate Diversity in Wireless Mesh Networks** by Chun Tung Chou, Bao Hua Liu, Archan Misra, "IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (IEEE WoWMoM '07)", June 2007.
 22. **A Cut-Through MAC for Multiple Interface, Multiple Channel Wireless Mesh Networks** by Joo Ghee Lim, Chun Tung Chou, Alfandika Nyandoro and Sanjay Jha, "IEEE Wireless Communications and Networking Conference 2007 (WCNC 2007)", March 2007.
 23. **Distributed Protocols for Scheduling and Rate Control to Achieve Max-Min Fairness in Wireless Mesh Networks** by Shweta Jain, Samir R. Das and Himanshu Gupta, "IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (IEEE WoWMoM '07)", June 2007.
 24. **CSMA-Based MAC Protocol For Cognitive Radio Networks** by Mansi Thoppian, S.Venkatesan, and Ravi Prakash, "IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (IEEE WoWMoM '07)", June 2007.
 25. **Mesh Network Firewalling with Bloom Filters** by Leonardo Maccari, Romano Fantacci, P. Neira and R.M. Gasca, "IEEE International Conference on Communication 2007 (ICC '07)", June 2007.
 26. **Distributed Contention Window Control for Selfish Users in IEEE 802.11 Wireless LANs** by Youngmi Jin and George Kesidis, "IEEE Journal on Selected Areas in Communications", Vol.25, No.6, August 2007.
 27. **SENDROM: Sensor Networks for disaster relief operations management** by Erdal Cayirci and Tolga Coplu, "Wireless Networks", Vol.13, No.3, June 2007.
 28. **Provably Secure Authenticated Group Diffie-Hellman Key Exchange** by Emmanuel Bressen, Olivier Chevassut and David Pontcheval, "ACM Transactions on Information and System Security", Vol.10, No.3, July 2007.
 29. **Analytic, Simulation, and Empirical Evaluation of Delay/Fault-Tolerant Mobile Sensor Networks** by Hongyi Wu, Yu Wang, Ha Dang and Feng Lin, "IEEE Transactions on Wireless Communications", Vol.6, No.9, September 2007.
 30. **Anonymous and Authenticated Key Exchange for Roaming Networks** by Guomin Yang, Duncan S. Wong, and Xiaotie Deng, "IEEE Transactions on Wireless Communications", Vol.6, No.9, September 2007.
 31. **Adaptive Control of Duty Cycling in Energy-Harvesting Wireless Sensor Networks**, by Christopher Vigorito, Deepak Ganesan, Andrew Barto, *IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks (SECON) 2007*.
 32. **S4: Small State and Small Stretch Routing Protocol for Large Wireless Sensor Networks**, by Yun Mao, Feng Wang, Lili Qiu, Simon Lam, and Jonathan Smith, *NSDI 2007*
 33. **Resolving Collisions Via Incremental Redundancy: The ARQ Diversity Enhancement of the IEEE 802.15.4 MAC Protocol for Scalable Data Collection in Dense Sensor Network**, *INFOCOM 2007*
 34. **An Optimal Algorithm for Minimizing Energy Consumption while Limiting Maximum Delay in a Mesh Sensor Network**, *INFOCOM 2007*
 35. **Approximate Isocontours and Spatial Summaries for Sensor Networks**. Sorabh Gandhi, John Hersherberger, and Subhash Suri. (*Best Paper Award.*), *IPSN '07*
 36. **Probabilistic Detection of Mobile Targets in Heterogeneous Sensor Networks**, by Loukas Lazos, Radha Poovendran, and James A. Ritcey, *IPSN 2007*
 37. **Guaranteed-delivery Geographic Routing under Uncertain Location Information**, by Stefan Funke, Nikola Milosavljevic. *INFOCOM 2007*

38. **PPR: Partial Packet Recovery for Wireless Networks** by Kyle Jamieson, Hari Balakrishnan, *SIGCOMM* 2007
39. **RMAC: a Routing-Enhanced Duty-Cycle MAC Protocol for Wireless Sensor Networks**, *INFOCOM* 2007
40. **Oblivious Routing with Mobile Fusion Centers over a Sensor Network**, *INFOCOM* 2007
41. **Decentralized Scattering of Wake-up Times in Wireless Sensor Network**, *EWSN* 2007
42. **CountTorrent: Ubiquitous Access to Query Aggregates in Dynamic and Mobile Sensor Networks**. Abhinav Kamra, Vishal Misra, Dan Rubenstein, *SENSYS* 2007
43. **Flush: A Reliable Bulk Transport Protocol for Multihop Wireless Networks**. Sukun Kim, Rodrigo Fonseca, Prabal Dutta, Arsalan Tavakoli, David Culler, Philip Levis, Scott Shenker, Ion Stoica. *SENSYS* 2007
44. **Rate-Controlled Reliable Transport for Wireless Sensor Networks**, by Jeongyeup Paek, Ramesh Govinda. *SENSYS* 2007
45. **Data Forwarding in Extremely Low Duty-Cycle Sensor Networks with Unreliable Communication Links**, by Yu Gu, Tian H. *SENSYS* 2007
46. **Optimal Channel Probing and Transmission Scheduling for Opportunistic Spectrum Access**, by Nicholas Chang, Mingyan Liu, *MOBICOM* 2007
47. **Designing Localized Algorithms for Barrier Coverage**, by Ai Chen, Santosh Kumar, Ten-Hwang Lai, *MOBICOM* 2007
48. **Adaptive Network Coding and Scheduling for Maximizing Throughput in Wireless Networks**, by Prasanna Chaporkar, Alexandre Proutiere, *MOBICOM* 2007
49. **Beyond the Bits: Cooperative Packet Recovery Using PHY Information**, by Grace Woo, Pouya Kheradpour, Dawei Shen, Dina Katabi, *MOBICOM* 2007
50. **On Designing Collusion-Resistant Routing Schemes for Non-Cooperative Wireless Ad Hoc Networks**, by Sheng Zhong, Fan Wu, *MOBICOM* 2007

List of Survey Topics

1. Network coding techniques for wireless networks
2. MAC layer transmission rate control algorithms in WiFi networks
3. Coverage issues in wireless sensor network deployment
4. Power control algorithms for WiFi networks
5. Mesh network routing
6. P2P over wireless networks
7. Packet scheduling over time-varying wireless channels
8. Delay tolerant networking (DTN) for wireless networks
9. Networking Problems and Algorithms for RFIDsBREW (Binary Runtime Environment for Wireless) and J2ME (Java 2 Micro Edition): A comparison/Discussion
10. Distributed Firewalls for wireless networks
11. Capacity of Ad hoc Networks
12. Multimedia transmission in ad hoc wireless networks
13. What to expect from WiMax?
14. Integration of Wired and Wireless Networks
15. Optimization of Wireless Security
16. Wireless Gaming Services: Technological Challenges and Trends
17. Coexistence of Bluetooth and 802.11
18. Energy efficient MAC protocols for wireless mobile networks and sensor networks: SMAC, STEM, tradeoff between redundancy, delay and energy efficiency.
19. Energy/Throughput Tradeoffs of TCP Error Control Strategies
20. Open issues in TCP for mobile computing
21. Orthogonal Frequency Division Multiplexing (OFDM)
22. Biological and chemical sensors

23. Proxy Servers for wireless Multicasting
24. Unconventional medical applications of Wireless Networks
25. Integration of Voice and Data Services: impact of priority
26. Unconventional applications of sensor networks
27. Satellites:, limitations, power consumption, life span, coverage, routing
28. Databases for Wireless Networks: placement and retrieval
29. Wireless control of Robots and Tradeoffs
30. Wireless Web Access: Performance tradeoffs
31. Operating Systems for PDA's: Characteristics and limitations
32. E-commerce: security support and limitations
33. Highly scalable and robust multimedia services
34. Critical mass threat in wireless networks: incentives to collaborate
35. Rationale for presence of Unidirectional links in Ad Hoc networks
36. Platforms for emerging wireless technologies such as Pocket PC, Palm OS, Symbian, Lynux
37. Management of next generation wireless networks and services
38. Wearable networks
39. Underwater applications of wireless devices
40. OS for Palm
41. SMS support and usefulness
42. Capacity of wireless ad hoc networks: connectivity, maximum concurrent transmissions
43. Lifetime of wireless sensor networks: traffic model in sensors, connectivity and coverage, energy efficiency of each hop and energy efficiency of the whole network.
44. Efficient query broadcast in sensors.

Reference Material:

IEEE Transactions on Mobile Computing
 IEEE Transactions on Communications
 IEEE Transactions on Parallel and Distributed Systems
 IEEE/ACM Transactions on Networking
 IEEE Transactions on Vehicular Technology
 IEEE Transactions on Computers
 IEEE Transactions on Wireless Communications
 Mobile Networks & Applications, Balzer Science Publishers
 Computer Communication Review
 IEEE Communications Magazine
 Mobile Computing and Communications Review, ACM SIGMOBILE
 Proceedings of the Vehicular Technology Conference
 Proceedings of the MASS
 Proceedings of the MOBICOM
 Proceedings of the MOBIHOC
 Proceedings of the INFOCOM
 Proceedings of the GLOBECOM
 Proceedings of the WCNC
 Proceedings of the SUPERCOMM
 Other related ACM and IEEE Publications