MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Electrical Engineering and Computer Science
Department of Aeronautics and Astronautics

6.263J / 16.37J   **Project Description**   Fall 2008

You are to select a topic from the list below[1] and write a 10 page (single column) report on the topic. In researching the topic that you have selected, you should study the papers from the list below (and possibly others if needed). Your report should summarize the papers and explain how they relate to each other. About 1/2 of your report should be devoted to identifying an open problem in the area and attempting to formulate and solve the problem. I will discuss this aspect of the project in class in more detail.

Project proposals (topic and paper selection) are due on September 30, 2008

Paper reports will be due December 4, 2008

In addition, you will need to prepare a 20-minute oral presentation on the paper (using PowerPoint or similar). Presentations will be scheduled during the week that the paper reports are due; probably in the evenings.

Topic List

1. TCP/IP

(i) Robert Durst, Gregory Miller, and Eric Travis, "TCP Extensions for Space Communications," ACM MobiCom, November 1996.

(ii) T. V. Lakshman and U. Madhow, "The performance of TCP/IP for networks with high bandwidth-delay products and random loss," *IEEE/ACM Trans. Networking,* 1997.

(iii) H. Balakrishnan, V.N. Padmanabhan, S.Seshan and R.H. Katz, "A comparison of mechanisms for improving TCP performance over wireless links," ACM/IEEE Trans. on Networking, December 1997.

2. Wireless Networks – multiple access

(i) Kleinrock, L.; Tobagi, F*., "*Packet Switching in Radio Channels: Part I--Carrier Sense Multiple-Access Modes and Their Throughput-Delay Characteristics," *IEEE Transactions on Communications,* Dec 1975.

(ii) G. Bianchi, "Performance analysis of the I E E E 802.11 distributed coordination function," IEEE J. Sel. Areas Commun., vol. 18, no. 3, pp. 535–547, Mar. 2000.

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[1] If you wish to research a topic that is not on the list, that would be ok, but you should seek my approval for your plan.

(iii) Guner D. Celik, Gil Zussman, Wajahat F. Khan, and Eytan Modiano , "MAC for Networks with Multipacket Reception Capability and Spatially Distributed Nodes," IEEE Infocom 2008.

3. Wireless Networks - scheduling

(i) B. Hajek and G. Sasaki, "Link Scheduling in Polynomial Time", IEEE Trans. Inf. Theory, Vol. 34, pp. 910–917, Sep. 1988.

(ii) X. Lin and N.B. Shroff, "The Impact of Imperfect Scheduling on Cross-Layer Rate Control in Wireless Networks", Proc. IEEE INFOCOM'05, Mar. 2005.

(iii) E. Modiano, D. Shah, and G. Zussman, "Maximizing throughput in wireless networks via gossiping," in Proc. ACM SIGMETRICS'06, June 2006.

4. Wireless networks – asymptotic analysis

(i) P. Gupta and P.R. Kumar. The capacity of wireless networks. *IEEE Transactions on Information Theory*, March 2000.

(ii) M. Grossglauser and D. Tse. Mobility increases the capacity of ad-hoc wireless networks. *IEEE/ACM Transactions on Networking,* August 2002.

(iii) Michael Neely and Eytan Modiano, "Capacity and Delay Tradeoffs for Ad Hoc Mobile Networks," *IEEE Transactions on Information Theory*, May 2005.

5. Wireless Networks – resource allocation

(i) L. Tassiulas and A. Ephremides, "Stability properties of constrained queueing systems and scheduling policies for maximum throughput in multihop radio networks," IEEE Trans. Automat. Contr., vol. 37, pp. 1936–1948, Dec. 1992.

(ii) Michael Neely, Eytan Modiano and Charlie Rohrs, "Dynamic Power Allocation and Routing for Time-Varying Wireless Networks," IEEE Journal of Selected Areas in Communication, January, 2005.

6. Wirelesss Networks – energy efficiency

(i) E. Uysal-Biyikoglu, B. Prabhakar, and A. El Gamal, "Energy-efficient packet transmission over a wireless link," *IEEE/ACM Trans. Networking*, vol. 10, pp. 487–499, Aug. 2002.

(ii) Murtaza Zafer and Eytan Modiano, "Murtaza Zafer and Eytan Modiano, "A Calculus Approach to Minimum Energy Transmission Policies with Quality of Service Guarantees," IEEE Infocom, March, 2005. Extended version, IEEE Transactions on Networking, 2008 (you can see me for this latest version).

(iii) Anand Srinivas and Eytan Modiano, "Minimum Energy Disjoint Path Routing in Wireless Ad Hoc Networks," *ACM MOBICOM*, Sept. 2003.

7. Switching and routing in high-speed networks

(i) M. J. Karol, M. G. Hluchyj, and S. P. Morgan, "Input versus Output Queueing on a Space-Division Packet Switch," *IEEE Transactions on Communications*, vol. 35, no. 12, pp. 1347-1356, December 1987.

(ii) M. G. Hluchyj and M. J. Karol, "Queueing in high-performance packet switching," *IEEE J. Select. Areas Commun.,* Dec. 1988.

(iii) McKeown, Mekkittikul, Anantharam, and Walrand, "Achieving 100% throughput in an input-queued switch," *IEEE Transactions on   Communications* , vol. 47, no. 8, pp. 1260-1267, 1999.

8. Optical Networks – lightpath routing

(i) I. Chlamtac, A. Ganz, and G. Karmi, "Lightpath communications: an approach to high bandwidth optical WANs," *IEEE Trans. Commun.*, vol. 40, pp. 1171–1182, July 1992.

(ii) R. Ramaswami and K. Sivarajan, "Design of logical topologies for wavelength routed optical networks," IEEE J. Select. Areas Commun., June 1996.

(iii) R. Ramaswami and K.N. Sivarajan, "Routing and wavelength assignment in all-optical networks," IEEE/ACM Trans. on Networking, vol. 3, no. 5, pp. 489-500, October 1995.

(iv) Z. Zhang and A.S. Acampora, "A heuristic wavelength assignment algorithm for multihop WDM networks with wavelength routing and wavelength reuse," IEEE/ACM Trans. on Networking, vol. 3, no. 3, pp. 281-288, June 1995.

9. Optical Networks – blocking probability

(i) R. Barry and P. Humblet, "Models of Blocking Probability in All-Optical Networks with and without Wavelength Changers," IEEE JSAC,Vol.14,pp.858-867, 1996.

(ii) A. Birman, "Computing Approximate Blocking Probabilities in a Class of All-Optical Networks," IEEE JSAC, June, 1996.

10. Network protection and restoration

(i) S. Ramamurthy and B. Mukherjee, "Survivable WDM mesh networks: Part I – Protection," in *Proc. INFOCOM*, NewYork, Mar. 1999, pp. 744–751.

(ii) S. Ramamurthy and B. Mukherjee, "SurvivableWDM mesh networks: Part II – Restoration," in *Proc. ICC*, Vancouver, BC, Canada, June 1999, pp. 2023– 2030.

(iii) M. H. MacGregor, R. R. Iraschko, and W. D. Grover, "Optimal capacity placement for path restoration in STM or ATM mesh-survivable networks," *IEEE/ACM Trans. Networking*, vol. 6, pp. 325–336, June 1988.

(iv) T.-H. Wu, "A passive protected self-healing mesh network architecture and applications," *IEEE/ACM Trans. Networking*, vol. 2, pp. 40–52, Feb.1994.

11. Overlay networks - reliability

(i) D. G. Andersen, H. Balakrishnan, M. F. Kaashoek, and R. Morris, "Resilient overlay networks," in the Proceedings of the 18th ACM SOSP, Oct. 2001.

(ii) M. Motiwala, N. Feamster, and S. Vempala, "Better interdomain path diversity with BGP path splicing," in PRESTO: Workshop on Programmable Routers for the Extensible Services of Tomorrow, May 2007.

(iii) X. Yang, D. Wetherall, "Source Selectable Path Diversity via Routing Deflections", ACM SIGCOMM 2006.

12. Queue Management

(i) A. K. Parekh, R. G. Gallager, A generalized processor sharing approach to flow control in integrated services networks: the single-node case ," *IEEE/ACM Transactions on Networking,* vol. 1, no. 3, pp. 344-357, June 1993,"

(ii) R. L. Cruz. A calculus for network delay. Part I. network elements in isolation. *IEEE Transactions on Information Theory*, vol. 37:1, Jan. 1991.

(iii) A. Demers, S. Keshav, and S. Shenker, "Analysis and Simulation of a Fair Queueing Algorithm," *In Proc. of ACM SIGCOMM '89*, pp. 1-12.