

Electrical, Computer, and Systems Engineering
ECSE-6600: Internet Protocols
Spring 2002

Problem Set 1- Due Wednesday, February 21st, 2002

[Tape-delayed students ONLY: Due February 27th 2001]

NOTE:

1. BE BRIEF.
2. SUBMIT THIS HOMEWORK USING WEBCT DROP BOX ONLINE!
3. All paper readings are available from the backup course web page:

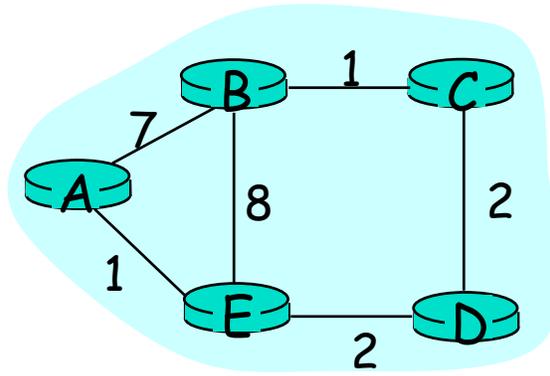
<http://www.ecse.rpi.edu/Homepages/shivkuma/teaching/sp2002/index.html#readings>

I. Reading assignments:

- **Reading:** Notes for Protocol Design, E2e Principle, IP and Routing: (esp Routing section 3.3)
- Chapters 4,5,8,10, 14, 16 in Comer's book
- **Reading:** Routing 101: Notes on Routing: (upto CIDR, qn 7)
- **Reading:** Khanna and Zinky, The revised ARPANET routing metric
- **Reading:** Alaettinoglu, Jacobson, Yu: "Towards Milli-Second IGP Convergence"

Questions based upon reading assignments:

- a) (10 pts) Why is routing different from bridging? Why is routing more scalable than bridging?
- b) (10 pts) Discuss the distinction between the notions of "completeness" and "consistency" in routing. Why do both of them lead to scalability limitations on routing protocols.
- c) (15 pts) What were the problems with the delay metric used in the original ARPANET routing? How do Khanna and Zinky propose to solve that problem? Why do you think the OSPF routing opts for relatively static values of metrics compared to the adaptive dynamic ARPANET metrics?
- d) (15 pts) What are the ways in which OSPF could be improved to achieve millisecond convergence (Alaettinoglu et al's paper)? What are the risks in such methods? What would be the advantages of milli-second convergence?



II. Routing computation: For the network shown above,

- [15 pts] Use the DV approach (Bellman Ford algorithm) to show the DVs at nodes A and B, after each iteration till they terminate. What would be the final set of next-hops to every distance at A and B respectively?
- [10 pts] Use the LS approach (Dijkstra's algorithm) and show the progression of steps to compute the shortest paths from node B to all other nodes.

III. Mapping OSPF to Broadcast LANs.

[15pts] Briefly explain the four central problems encountered when mapping OSPF to broadcast LANs (Dijkstra view of the LAN, LSA encoding, database synchronization, LSA and Hello transmission efficiency) and the solutions chosen by OSPFv2.

IV. Hierarchical OSPF:

[10 pts] Explain the differences between normal areas, stub areas and not-so-stubby areas in OSPFv2?