CS 653 Mobile Computing *Spring 2014*

Problem Set 3 **Due: Mar 20 (in class)**

Instructions

1. Submit hand-written answers. No soft copies. No printouts.
2. Clearly mention your name and roll number on the answer sheet.
3. Write down all the steps in your solution. Providing the final answer alone is not enough.
4. You may discuss the problems with your classmates, but you must write up the final solution yourself, without looking at the answers of anyone else. Also, please list the names of your collaborators on the first page of your answer sheet.

Problem 1 [1 mark]

Consider a multihop chain of N nodes, 1, 2, …, N. Every node is within radio range of its immediately adjacent nodes on the chain, and data is routed and forwarded along the chain from node 1 to node N. Every node has a single half duplex radio that can only send or receive (but not both) on a single channel. Every node interferes with nodes up to F hops away. What is the maximum long term data transfer throughput (in packets per second) that this chain of nodes can sustain, under the following conditions:

a. The physical layer throughput of any link in the chain is R packets per second.
b. The physical layer throughput of the link between nodes i and i+1 is R/i packets per second, for i = 1 to N-1.

Your answers should be in terms of N, F, and R.

Problem 2 [2 marks]

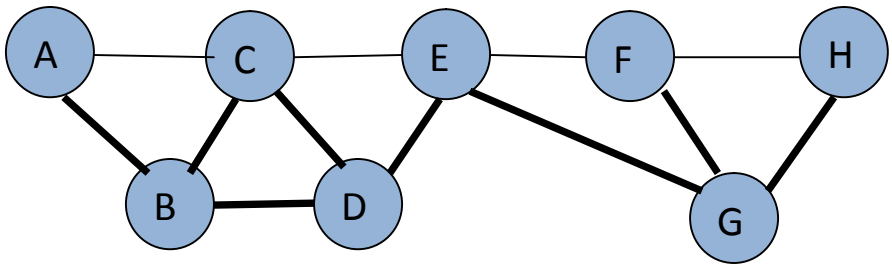
In which of the following situations is Mobile IP useful in maintaining network connectivity during mobility? If useful, please explain **how** Mobile IP is useful in the said situation.

a. A client who only initiates TCP connections moves from one location to another and obtains a new IP address. It does not have any outstanding TCP connections during the move.
b. A client who only initiates TCP connections moves from one location to another and obtains a new IP address. It has an ongoing TCP connection during the move that it does not want to disrupt.
c. A server that accepts TCP connections moves from one location to another and obtains a new IP address. It updates it's DNS entries very quickly (with almost zero delay, during which no connections arrive at the server) after the move.

d. A server that accepts TCP connections moves from one location to another and obtains a new IP address. However, updating DNS to reflect the new IP address takes a long time, during which the server may potentially receive incoming connections.

Problem 3 [2 marks]

Consider the following multihop topology of 8 nodes, A through H.



The links shown with then lines have a metric 1 and the links with thick lines have a metric 3. Nodes that do not have a link between them are not within radio range of each other. The nodes use a DSDV like routing protocol. For the sake of simplicity, assume that H is the only possible destination in the routing and forwarding tables. For this destination H, each node maintains a set of routes, which are tuples of the form (next-hop, metric). The node then picks one of these routes as its best route, and periodically advertises it to neighbors using DSDV-like routing messages. For each case below**, list all known routes (next-hop, metric) to the destination H at nodes A and E.** Also indicate which of these is the **best route** used by the node for forwarding. You may provide the answers assuming the routing and forwarding information has converged to a steady state after any changes.

a. When the topology is static as shown in the figure above.
b. When the links C-E and E-F go down.
c. When nodes C and F go down.
d. When node E goes down.