Bilkent University, Department of Computer Engineering
CS 514, Fall 2004, Wireless Ad Hoc and Sensor Networks
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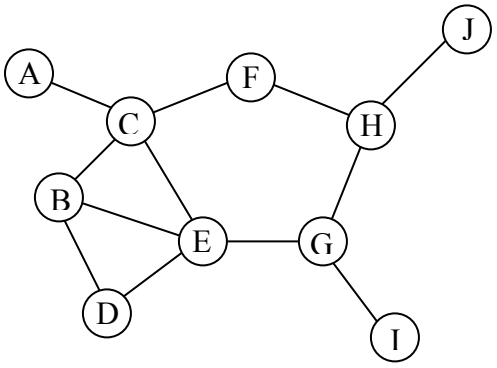
Development Project 2
Ad Hoc Wireless Network Routing Protocol Simulation

In this project, you will write a simulator that will simulate an ad hoc wireless network that is using DSR as the routing protocol. Then you will use your simulator to do a performance study of the routing protocol.

Your simulator has to be a multi-threaded simulator. You will create another thread for each node that you are simulating. The number of nodes the network consists of, *N*, should be an input parameter to your simulator. You can assume that *N* will be at most 50. You should have other parameters as input to your program. You will decide on them.

When you run a simulation, initially a random ad hoc network has to be generated consisting of *N* nodes. You will have a thread created for each node of the network. Considering the network as a graph with nodes as vertices and links as edges, you will keep the information about the current network topology (i.e. graph) somewhere in your program, may be in a global structure. The information maintained in this way will yield which node is reachable from which other node(s) at a given time (i.e. the neigbors of each node).

The figure below shows an initial random ad hoc network model. The information maintained about the topology of the network can be used, for example, when a node would like to broadcast a data or control packet. Then, using the topology information the simulator or the node can decide which nodes in the network will receive the broadcasted packet. For example, if node C broadcasts a control packet (like a *Route Request* packet), nodes A, B, E, and F should receive that packet.



It is upto you which mechanism of the programming language and system you will use to pass packets between threads to simulate the packet transmission between nodes in an ad hoc network. You also can simulate the broadcasting in several ways. In the simulation of broadcasting a packet, it is not problem, for example, if you repeat the transmission of the same packet for each neighbor. You may come up with efficient ways of simulating local broadcasts. But efficiency of local broadcasts is not a requirement in this project.

You can assume that the links will be always bidirectional. Also, you don't have to implement a MAC protocol. You can assume that a data packet will encounter a fixed non-zero delay while passing from one node to another one (no matter how many neighbors the nodes have). You can assume that all data packets transported through the network will have a fixed size.

You will assume that the number of nodes in one run of your simulation will remain fixed (i.e. *N*). This implies that, during one run of your simulation, you will not have any new nodes joining to the network, or any nodes leaving the network. But links can get broken and re-established, or nodes can move without getting disconnected from the network. You will make sure that the network will not be partioned for a long time, or indefinetely.

You will decide on the source traffic model that will used by each node while generating packets, and you will implement that model. You will decide about when a link breaks and for how long. You will decide when a node moves and to where.

You will decide what kind performance metrics you will look at in your performance study using your simulator. You will decide which parameters to vary (i.e. which parameters will be factors affecting the results). You can benefit from the papers that we have seen in the class. Think of the performance metrics, the parameters, and factors of your simulation study at the design stage of your simulator.

After you have implemented, verified, and validated your simulator program, you will run your simulator as many times as necessary to obtain performance graphs about the DSR protocol. How good are your results, what kind of results you will have, etc. will affect your final grade. What kind of experiments you will do, what kind of traffic and mobility models you will use, etc. will all be decided by you and will require your investigation. I don't suggest the use of too complex models.

At the end of the project, you will submit your program. You will also submit a report that includes your design, description of your implementation and experiments, your results and your interpretation of your results. You will also do a demo together with the demo of your first development project at a date after December 31, 2004.