Wireless Networks

Homework 09 Solutions

p.13.2

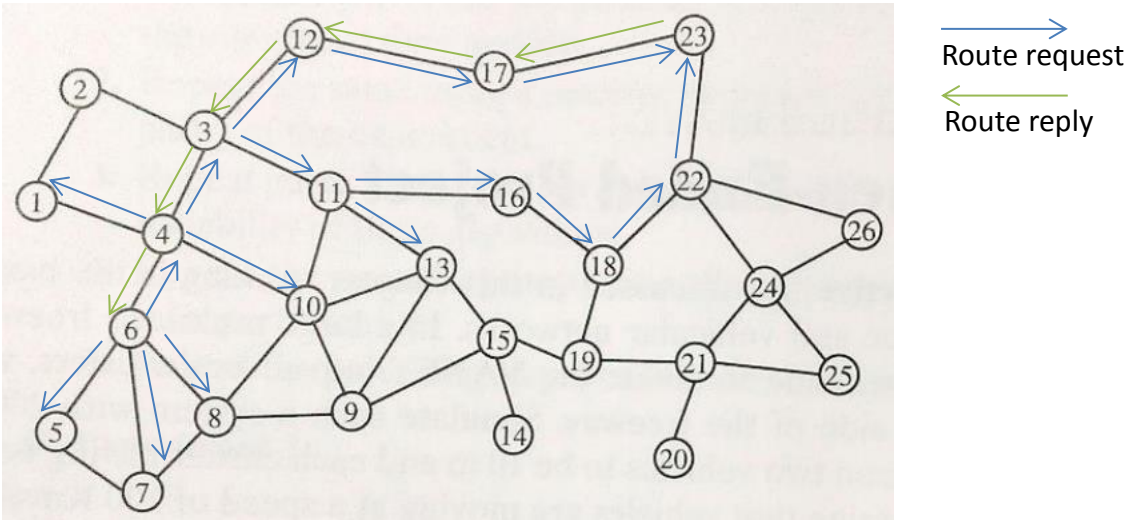
Circuit-switched is a type of network in which a physical path is obtained for and dedicated to a single connection between two end-points in the network for the duration of the connection.

Ad hoc networks are basically peer-to-peer multi-hop mobile wireless networks where information packets are transmitted in a store-and-forward manner from a source to an arbitrary destination.

Due to variations in link qualities and nodes joining and leaving the network, the network topology changes at a much higher pace than in wired networks. Therefore it is not possible to use circuit switching in ad hoc networks.

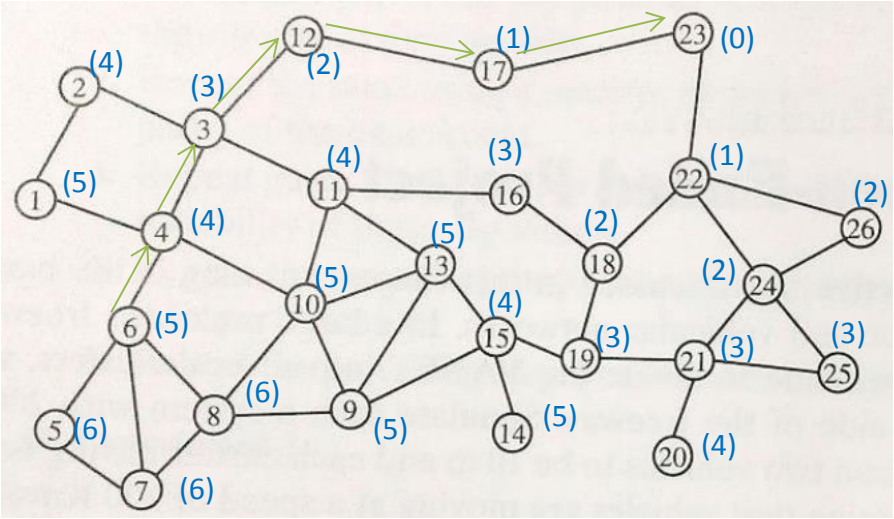
p.13.7

(a) By using DSR algorithm to create a route from 6 to 23, node 6 at first checks its route cache to determine whether it already has a route to the destination 23, if it has, it will use this route. If it does not have such a route, it initiates route discovery by broadcasting a route request packet. This route request contains the address of node 23. A reply is generated when the route request reaches either node 23, or an intermediate node whose route cache contains an unexpired route to the destination.



A route from node 6 to node 23 using the DSR algorithm is [6-4-3-12-17-23].

(b) For TORA, when node 6 needs a route to node 23, node 6 broadcasts a query packet containing the address of node 23. This packet propagates through network until it reaches either node 23, or a node having a route to the node 23. The recipient of the query then broadcasts an update packet propagates through the network; each node that receives the update sets its height to a value greater than the height of the neighbor from which the update message has been received.



(Height)

A route from node 6 to node 23 using TORA algorithm is [6-4-3-12-17-23].

(c) DSR uses source routing in which a data packet carries the complete path to traverse.

AODV uses forwarding tables at each node to stores the next-hop information corresponding to each flow for data packet transmission.

p.13.12

There are three kinds of multipath routing mentioned in class, TORA with multipath capability, On-Demand Multipath Routing (course slides ch13 p.62) and AODV-BR (course slides ch13 p.64).

- TORA

  With the direction of routing height, data packets can flow from source to destination with multipath.
- On-Demand Multipath Routing (2 extensions of DSR)
  - Destination responds to a set of query packets (source has multiple routes)
  - Destination replies to all intermediate nodes along primary paths giving alternate disjoint routes to all those nodes.
- AODV-BR

  When a node that is not part of the primary route overhears a RREP packet not directed to it, it records the sending neighbor as the next hop to the destination in its alternate route table.

TORA is beneficial for multipath routing form node 1 to node 26 of problem p.13.7.
We know there are only two non-overlapping routes from node 1 to node 26, because of node 1 and node 26 only having two neighbors.
Examples of non-overlapping routes:

Route [1-2-3-12-17-23-22-26] and route [1-4-10-13-15-19-21-24-26]

Advantages:

- TORA

  TORA has best connectivity among three algorithms.

Disadvantages:

- On-Demand Multipath Routing (2 extensions of DSR)
  - The route maintenance mechanism does not locally repair a broken link.
  - It is not possible to find alternate disjoint routes for all intermediate nodes in this case.
- AODV-BR

  If we choose route [1-4-10-…] as the primary route but the link 1-4 is break. Then AODV-BR is useless, because of no multiple complete routes available.