# CS8601 –MOBILE COMPUTING

**UNIT 3**

**MOBILE NETWORK LAYER**

## 3.5. REACTIVE PROTOCOLS (On-demand routing protocol)

They execute the path-finding process and exchange routing information only when a path is required by a node to communicate with a destination.

i.e., a route is discovered only when it is necessary.

Source initiates route discovery

Two step process

- Route Discovery
- Route Maintenance

Route discovery is expensive

Example: Dynamic Source Routing (DSR), Ad hoc On-demand Distance Vector (AODV)

## (a) DYNAMIC SOURCE ROUTING PROTOCOL (DSR)

DSR is a source initiated on-demand(or reactive) routing protocol for ad-hoc network. Designed to restrict the bandwidth consumed by packets by eliminating the periodic table-update messages i.e., the nodes do not need to exchange the routing information periodically, which helps to reduce the bandwidth overhead. Each mobile node participating in the protocol maintains a "routing cache" which contains the list of all routes that the node has learnt

DSR works in 2 phases:

### (a) Route Discovery:

• Allows any host to dynamically discover the route to any destination in the ad-hoc network.

Route Discovery Process takes place by :

***1. Broadcasting a route request (RREQ) packet to all its neighbours.***

The Route request (RREQ) packet contains the

i) Source address

ii) Request id

iii) Route Record, in which the sequence of hops traversed by the request packet before reaching the destination is recorded.

**2.** ***A node after receiving RREQ***

2.i. If the node is an intermediate node then

- If the message has the same ID i.e. has seen it before, then the node discards this message,
- If not, the node appends its own address to the route record in the ROUTE REQUEST message then propagates the message to the next hop neighbours.

2.ii. If the node is the Target (Destination) then

- Returns a Route Reply (RREP) message to the sender
- Copies the accumulated route record from RREQ into RREP

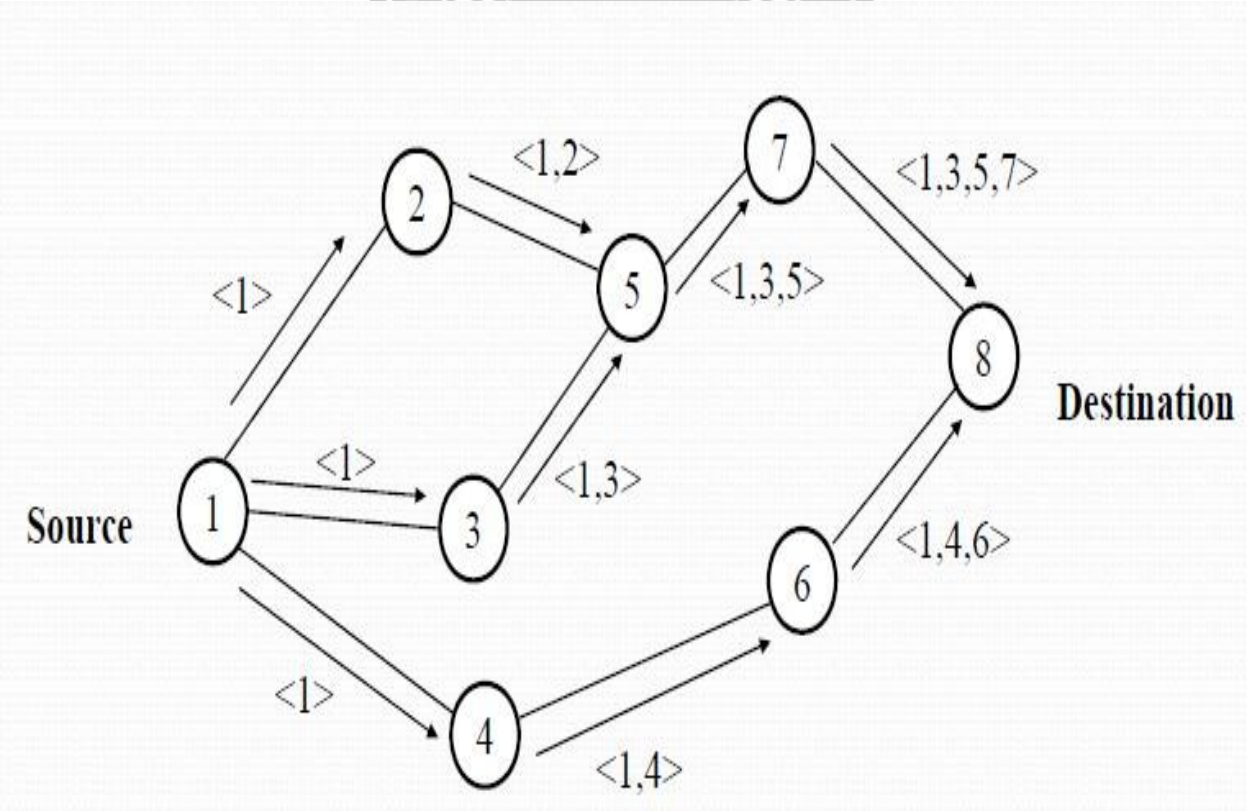



**Fig. Broadcasting the RREQ packets**

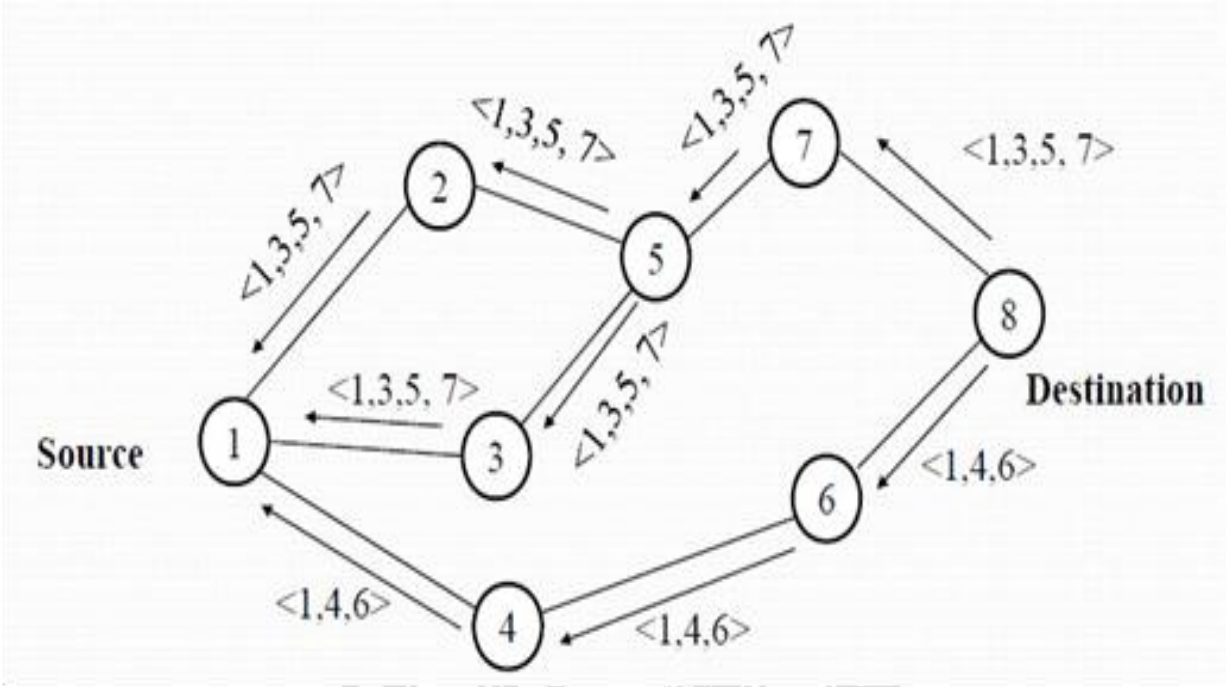



**Fig. Propagation of RREP packets back to source**

## (b) Route Maintenance:

A known route can get broken due to the movement of some node or the battery of a node getting exhaused.

***Route maintenance*** : The process of monitoring the correct operation of a route in use & taking corrective action when needed.

**Steps:**

1. When a node detects that one of its next hop neighbour node is not responding, it sends back a route error(RERR) packet containing its own address and the address of the hop that is not working

2. As Soon as source node receives the RERR message it deletes the broken link route from its cache.

3. If it has another route to the destination, it starts to retransmit the packet using the alternative route.

4. Otherwise it initiates the route discovery process again.

The basic message set consists of:

- RREQ – Route request
- RREP – Route reply
- RERR – Route error
- HELLO – For link status monitoring

**Advantages:**

• A perfect route is discovered always.

• Highly efficient.

• Low bandwidth Consumption.

**Drawback:**

• Packet header size (Non Uniform Packet Size) grows when intermediate node increases.

• Flood of route requests may potentially reach all nodes in the network

## (b) AD HOC ON-DEMAND DISTANCE VECTOR ROUTING (AODV)

It is based on Reactive method

**DSR vs AODV:**

Major problem of DSR is its non-uniform packet size because it includes source routes in its packet header which degrades the performance. If a packet is large, it has to be split into smaller packets. The packet size in AODV is uniform unlike DSR.AODV attempts to improve on DSR by maintaining routing tables at the nodes, so that data packets do not have to contain routes.

AODV holds the desirable feature of DSR that routes are maintained only between nodes which need to communicate. Route is established only when it is required by a source node for transmitting data packets .Make use of hop-by-hop routing, sequence numbers and beacons.

**Steps:**

1.The node that needs a route to a specific destination generates a route request(RREQ).

2.The route request(RREQ) is forwarded by intermediate nodes which also learn a reverse route from the source to themselves.

3.When the request reaches a node with route to destination, it generates a route reply(RREP) containing the number of hops required to reach the destination.

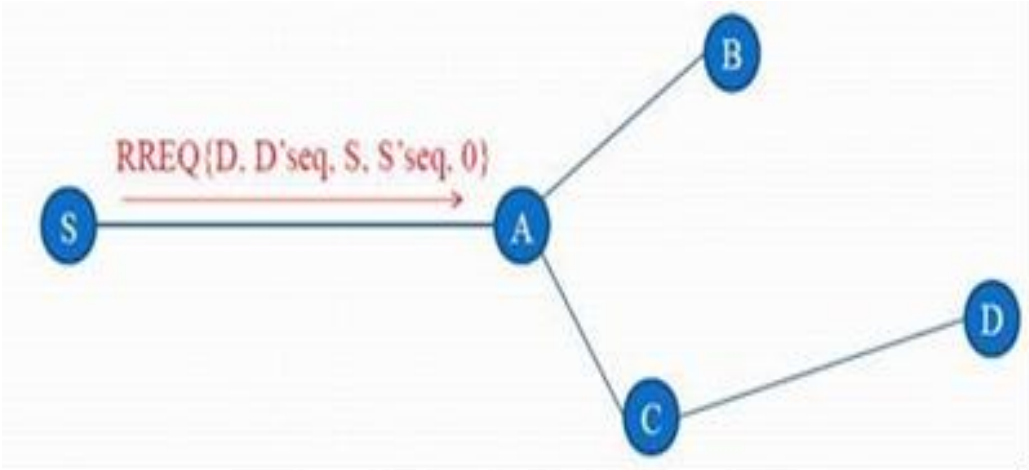
4.All nodes that participate in forwarding this reply to the source node create a forward route to destination.

5.This route created from each node from source to destination is a hop-by-hop route.

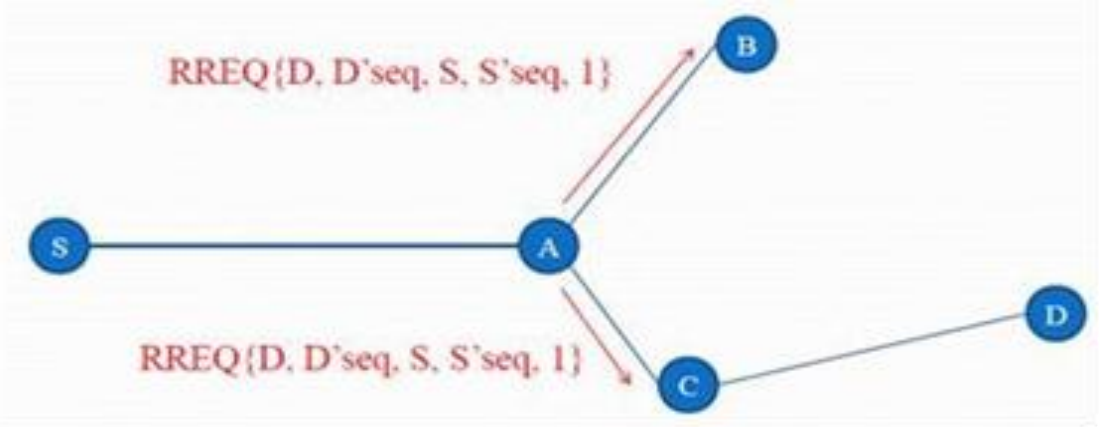
Example: Suppose Node S needs a routing path to Node D

1. Node S creates a RREQ packet & broadcasts to its neighbours.

RREQ [D's IP addr, Seq#, S's IP addr, hopcount]

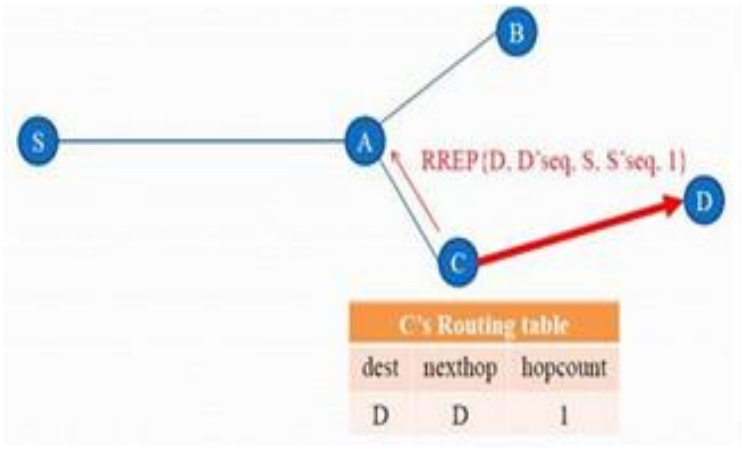



2. Node A rebroadcasts RREQ to all its neighbours.

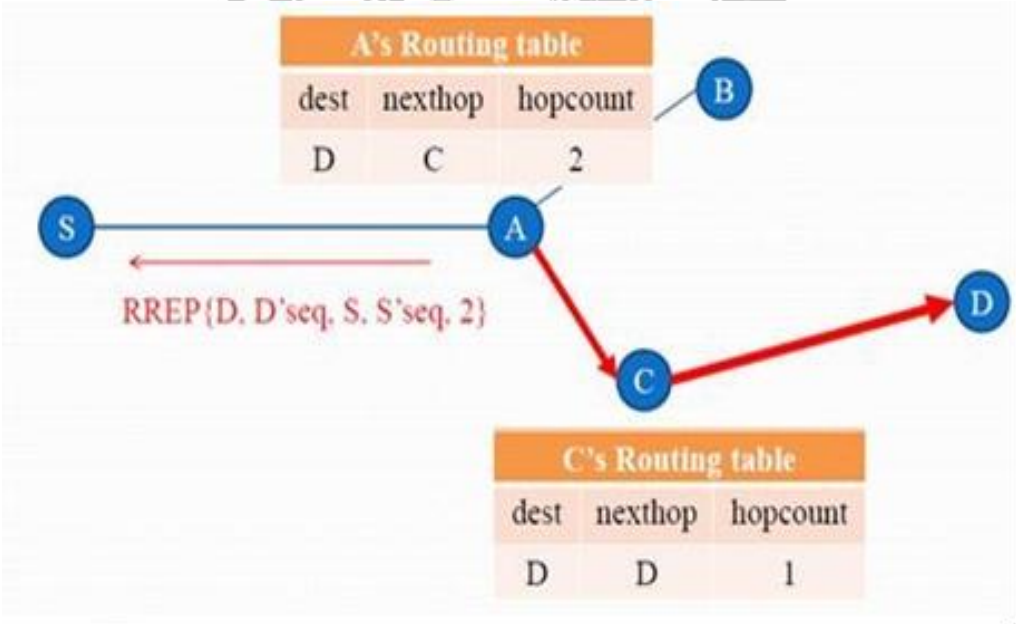



3. Since, Node C known a route to Node D

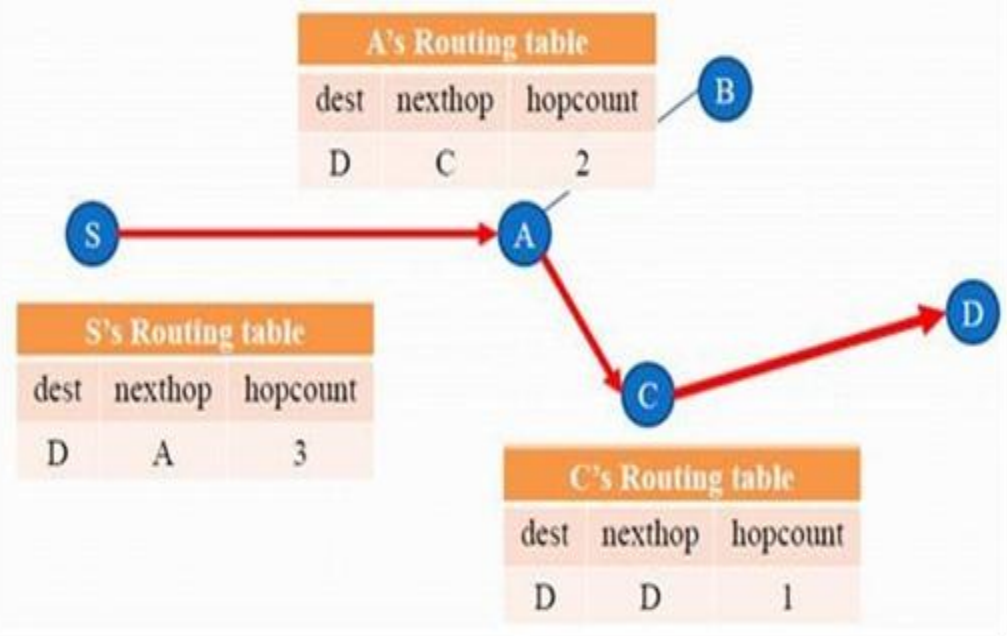
- Node C creates a RREP & unicasts RREP to A.
- Set forward path in C's routing table.




4. Node A creates a RREP & unicasts RREP to S
5. Set forward path in A's routing table




6. Set forward path in S's routing table




**Difference between DSR, DSDV & AODV**

| Property | DSR | DSDV | AODV |
|---|---|---|---|
| Loop Free | Yes | Yes | Yes |
| Multicast Routes | Yes | No | No |
| Unidirectional Link | Yes | No | No |
| Periodic Broadcast | No | Yes | Yes |
| Routes maintained | Route Cache | Route Table | Route Table |
| Reactive | Yes | No | Yes |