MANET Routing

Unit-IV

Manet vs Traditional Routing

- 3 differences w.r.t. Traditional Routing (TR)
- In manet, Each node act as a router – in TR Router routes packet
- Topology is dynamic –routing table quickly become obselete
- IP addressing scheme not applicable – due to node mobility

Types of communication

- Unicast – message send to single destination node
- Multicast – message send to selected subset of nodes
- Broadcast – message send to all nodes in the network
- Exact routing depends on traffic
- Broadcast is not preferred due to high overhead

Classification of Unicast Manet Routing Protocol

- Classified into 2 types:
- Proactive (table-driven) Protocols
- Reactive (on-demand) Protocols
- Hybrid Routing Protocols

Proactive (table-driven) Protocols

- Each node maintains Routing Table (RT) info about every other node in the n/w
- RT periodically updated to include topology changes
- Ex. Destination Sequenced Distance Vector (DSDV) Protocol
- Each node know the topology of n/w using its local info
- Mobility and failures are updated periodically
- Disadvantage:
- Creates lots of control messages
- Not preferred for large n/w's and n/w with high node mobility – size of RT becomes large

Reactive (on-demand) Protocols

- Does not maintain upto date routes, new routes discovered when needed
- A node if does not know a route uses flooding technique
- Designed to overcome large message overhead by Proactive Routing Protocol
- Achieved by maintaining info only about active routes
- Example:
- Dynamic Source Routing (DSR)
- Adhoc On-demand Distance Vector Routing (AODV)

Hybrid Routing

- Combine good features of both proactive and reactive routing protocols
- To achieve scalability – node close to each other work together (also reduces route discovery overhead)
- Nearby nodes works proactively and far away nodes are discovered reactively
- Most hybrid protocol are zone based
- Example : Zone Routing Protocol

Features of Manet Routing Protocols

- Capability to identify n/w topology changes after mobility
  - Routing Protocol (RP) should know info about path
  - Also, link capacity, traffic along various routes, bandwidth usage, battery power of nodes, delay, transmission power required
- Topology maintenance
  - Failure happens due to battery discharge, h/w failure, environmental condition, Link disconnection – noise, signal propagation
  - RP must keep track of health of various links
  - Distributed algorithms are preferred than centralized
- Scheduling packet transmission and channel assignment
  - Effective packet scheduling and channel assignment algorithms should be used to utilize bandwidth efficiently

Destination-Sequenced Distance Vector Routing Protocol (DSDV)

- Proactive protocol
- Extends distance vector used for wired - that use Bellman-Ford routing algorithm
- Improvement – sequence number is added to avoid routing loops
- Each node maintains routes to all destinations
- RT is updated periodically even no changes in topology – nodes deprived of sleeping, large message overhead
- Improvisation – uses 2 types of packet – full dump, incremental broadcast

Contd...

- Full dump – contains full routing info and spans multiple NPDUs
- During occasional movement, incremental updates are send via normal NPDU – decreases n/w traffic
- New route broadcast contains – destination address, no. of hops to destination, unique sequence no.
- Upon getting multiple messages, a node choose best path
- Settling time for delaying routing updates are used to optimize routes

Operation of DSDV

- Each node collects route info from its neighbors
- Finds shortest path to destination
- New Routing Table is generated
- Broadcast RT to its neighbors
- Reply from neighbors updates its RT
- Process continues till routing info is stable
- DSDV Routing Table:

Destination	Next hop	Metric	Seq.No.	Install time
N1	N1	1	321	001
N3	N2	2	218	002

Dynamic Source Routing (DSR)

- DSR suitable for small diameter (5-10 hops), not fast move
- Reactive or on-demand routing protocol
- Source Routing – sender determines and record the travel path of packet
- Dynamic Source Routing – 2 packets same source but different path
- RT not exchanged periodically, uses Routing Cache
- Each node maintains Routing Cache – list of routes it learnt
- When find new routes add to the cache
- Each node has sequence counter to uniquely identify the last request (<source address, request id)
- Works on 2 phases:
- 1) Route Discovery 2) Route Maintenance

DSR 2 Phases

- Route Discovery
- A node to send a packet checks its routing cache, it uses if its finds
- Else, broadcast requests to all its neighbors
- Route Request (RReq) format: <source addr, req. id, route record path it travelled)
- RR initiates Route Reply (Rrep) by destination or intermediate node
- Destination node piggyback the recorded route in Rrep towards the source

DSR – Route Discovery (Phase I)

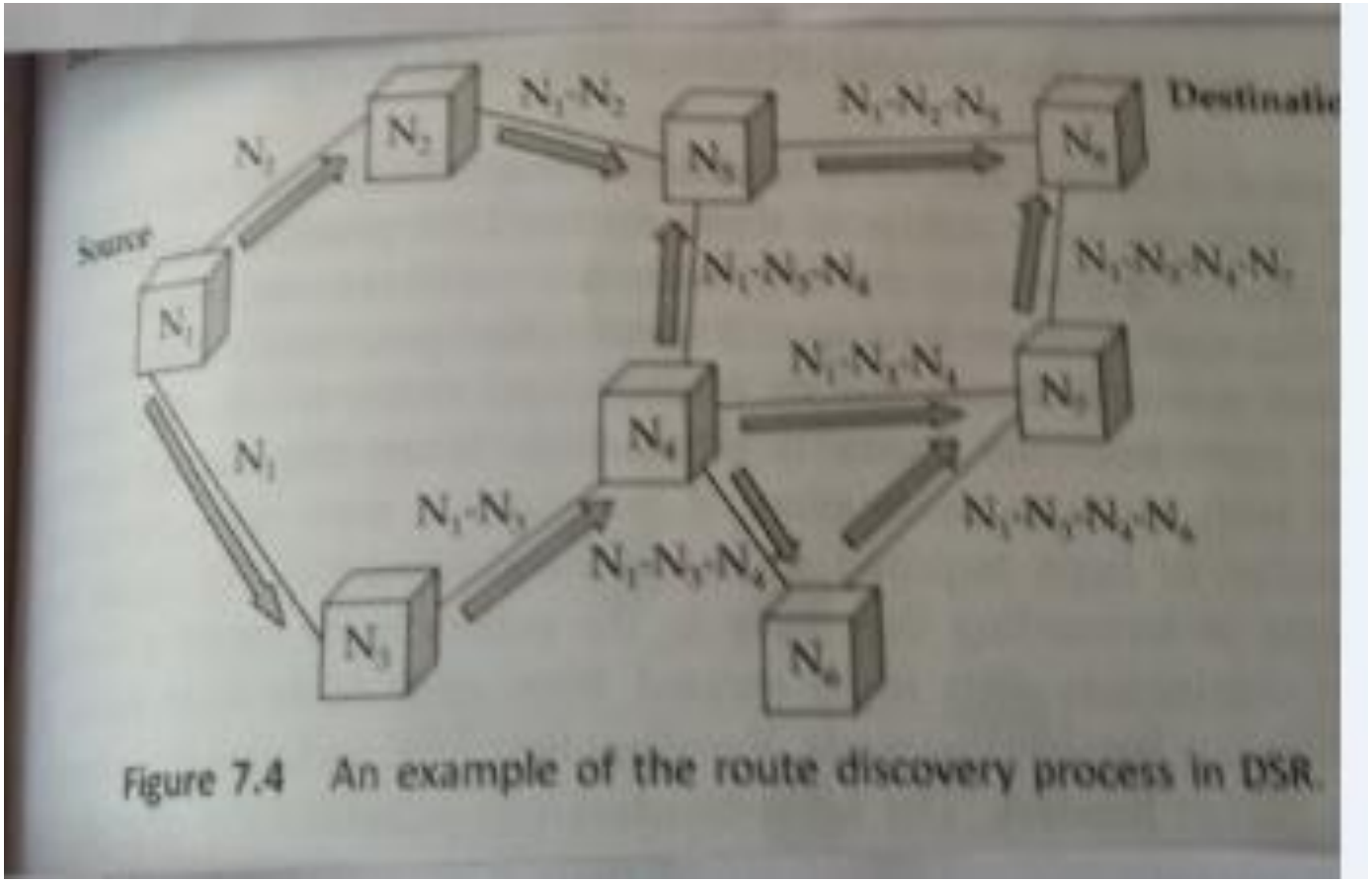

Figure 7.4 An example of the route discovery process in DSR.

DSR Route Reply (Phase – I)

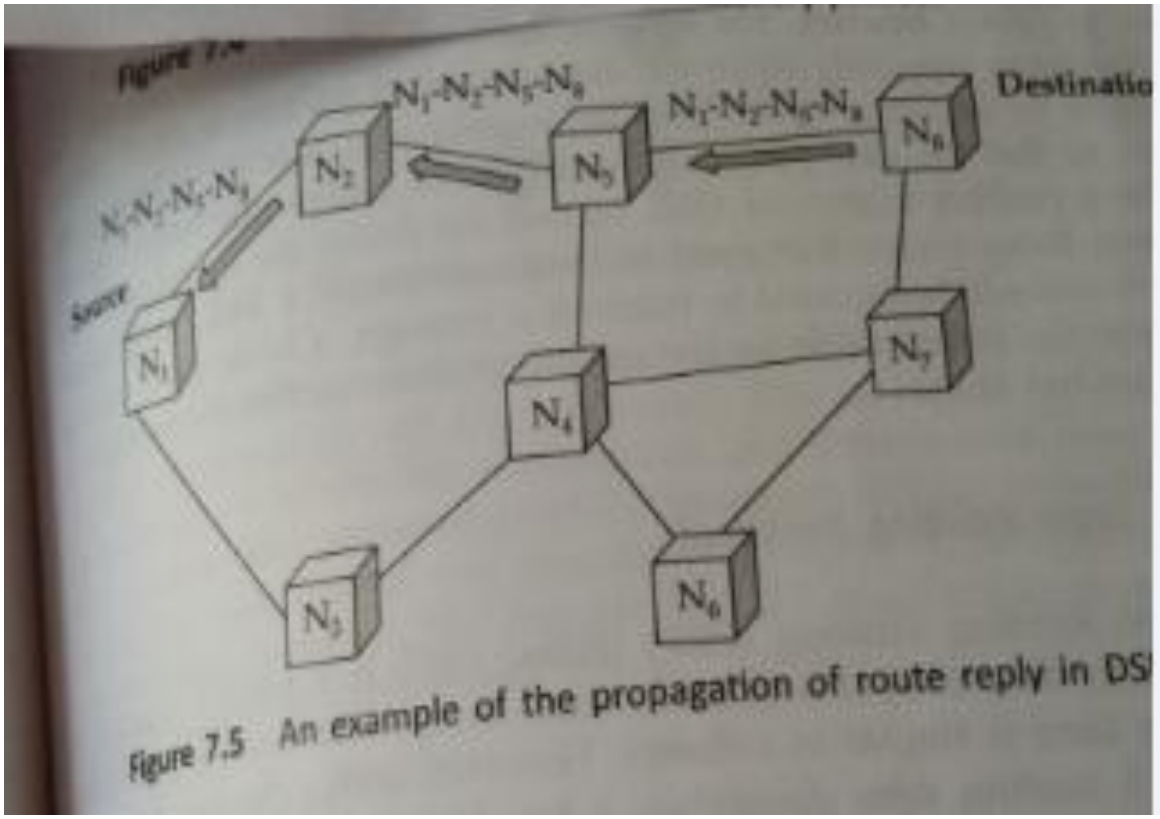

Figure 7.5 An example of the propagation of route reply in DS

Route Maintenance (RM)

- Known Route get broken - mobility, battery exhaust
- RM monitors – correct operation of route, take corrective action when needed
- Source node finds route inoperative initiates RM
- Node that relays data help source node with alternate route **if it knows**
- **Else,** if found next hop neighbor not responding send back "Route Error (RE)" to source node
- Route Error contains its id, neighbor's id
- Source Node upon receiving RE delete broken link from cache
- If has alternate path uses that else initiates Route Discovery again