

# MOBILE AD-HOC AND WIRELESS SENSOR NETWORKS

## Lesson 05

### Mobile Ad-hoc Network (MANET) Routing Algorithms— Part 2

# TEMPORALLY ORDERED ROUTING ALGORITHM (TORA)

- A reactive protocol
- Reacts to the changes and link reversals
- Employed for highly dynamic MANETs and provides an improved partial link reversal process

# TORA

- Discovers the network portions showing the link reversal(s)
- Has a feature that it stops the non-productive link reversals in a given portion of the network

# TORA

- Assumes addresses of the routers in the path and of source and destination for one set of input route
- Each node provides only one set of subsequent route addresses

# TORA

- Possesses network capacity such that many nodes can send packets to a given destination
- Guarantees loop-free routes and supports multicasting (from one source to multiple destinations)

# TORA

- Unlike AODV, but similar to DSR, TORA supports unidirectional links and also provides multiple routing paths
- It does not exchange hello messages periodically to listen to disconnected links as done by AODV

# TORA

- Phases 1, 2, and 3 in TORA are route creation, route maintenance, and productive (useful) link reversal(s) (vector discarding)

# CLUSTER-HEAD GATEWAY SWITCH ROUTING (CGSR)

- A hierarchical routing protocol
- proactive protocol
- When a source routes the packets to destination, the routing tables are already available at the nodes
- A cluster higher in hierarchy sends the packets to the cluster lower in hierarchy
- Each cluster can have several daughters and forms a tree-like structure in CGSR



# CGSR

- Forms a cluster structure
- The nodes aggregate into clusters using an appropriate algorithm
- The different clusters can be assigned to different band of frequencies in FDMA or different spreading CDMA codes

# CGSR ALGORITHM

- Defines a cluster-head, the node used for connection to other clusters
- Also defines a gateway node which provides switching (communication) between two or more cluster-heads

# THREE TYPES OF NODES IN CGSR

1. Internal nodes in a cluster which transmit and receive the messages and packets through a cluster-head

# THREE TYPES OF NODES IN CGSR

2. Cluster-head in each cluster such that there is a cluster-head which dynamically schedules the route paths. It controls a group of ad-hoc hosts, monitors broadcasting within the cluster, and forwards the messages to another cluster-head

# THREE TYPES OF NODES IN CGSR

3. Gateway node to carry out transmission and reception of messages and packets between cluster-heads of two clusters

# CLUSTER STRUCTURE

- A higher performance of the routing protocol as compared to other protocols because it provides gateway switch-type traffic redirections and clusters provide an effective membership of nodes for connectivity

# PHASES 1, 2, AND 3 OF CGSR

- Routing path discovery and caching, maintaining update, and distribution, respectively
- The basic processes of CGSR are cluster definitions and selection of clusters for routing
- Algorithms are used for both the processes

# FLAT ROUTING TABLE DRIVEN PROTOCOL

- Routing cache table used earlier was a routing table which builds by caching the RERP and RERR packets
- Flat routing table driven protocol is a proactive protocol
- This means that routing table will be available in advance at a node



# FLAT ROUTING TABLE DRIVEN PROTOCOL

- In the proactive protocol, the routing table is available at each node shows available routes from itself to target destination node, is dynamically modified to show available routes, and has rows for all destined targets irrespective of whether they will eventually be needed or not

# FLAT ROUTING TABLE DRIVEN PROTOCOL

- The packet does not specify route in the header and the routes need not be discovered after the demand is raised

# OPTIMIZED LINK STATE ROUTING PROTOCOL (OLSR)

- Characteristics similar to those of link state flat routing table driven protocol, but in this case, only required updates are sent to the routing database
- Reduces the overhead control packet size and numbers
- Further, there are multi-point nodes for relay of data

# OPTIMIZED LINK STATE ROUTING PROTOCOL (OLSR)

- A node selects independently a multi-point node which also relays the route tables
- The node provides bi-directional links such that the routes provided by the multi-point relay routing neighbouring node is also taken into account

# SUMMARY

- TORA— A reactive protocol, Reacts to the changes and link reversals, Employed for highly dynamic MANETs and provides an improved partial link reversal process

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# ...SUMMARY

- CGSR —A hierarchical routing protocol, proactive protocol, When a source routes the packets to destination, the routing tables are already available at the nodes

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# ...SUMMARY

- Flat Routing table based protocol
- Optimized Link State Reversal

**End of Lesson 05**  
**Mobile Ad-hoc Network (MANET) Routing  
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