MANETS

Unit-IV

Manets Design Issues

- Network Size and Node Density
  - Network Size – Geographical coverage area
  - Node Density – No. of nodes per unit geographical area
  - Larger n/w clustering best option
  - Clustering solution depends on network size and density
- Connectivity
  - No of neighbors it has
  - Neighbors – nodes in their transmission range
  - Also called as Link
  - Link Capacity – bandwidth of the link capacity varies

Contd...

- Network Topology
  - Denotes connectivity among various nodes in n/w
  - Mobility affects n/w topology
  - Other reasons – battery discharge, hardware failure
  - Rate of change of topology should be considered
- User Traffic
  - Bursty traffic
  - Large packets send periodically
  - Combination of both

Contd...

- Operational Environment
  - Urban, Rural, Maritime
  - Line of Sight of communication
  - Based on area node density and mobility values differ
- Energy Constraint
  - Energy discharge due to store and forward, relaying
  - Overhead reduced by Sleep Mode

Routing

- Routing is complex in Adhoc due to dynamic topology, limited battery
- When destination node not in range, routes formed by intermediate nodes
- Routing purpose – find best path, store and forward packet
- Based on issues of Adhoc n/w:
  - Traditional routing cannot be applied to adhoc
  - For operational n/w each node should have routing capability

Process Needed

- Forward packet to next hop
- While forwarding ensure that
  - Packets moves towards destination
  - Hop / path length is minimized
  - Delay minimized
  - Packet loss minimized
  - No looping of packets

Traditional Routing Protocol

- Two important protocol
  - Link State Protocols (LSP)
  - Distance Vector (DV) Protocols
- Both determines next hop along shortest path towards destination
- Shortest path is computed based on specific Cost Metrics

Link State Protocols

- Based on connection to the neighboring Router
- Neighbor is direct communication without intermediate router
- Router determines its local link info and floods to n/w as link state advertisements
- Routers that receive LS ads stores it in Link State Packet Database (LSPDB)
- Each router receives such LS ads create graph using Djisktra's shortest path algorithm
- Based on graph, constructs routing table and use it for route decision making

Contd...

- Every node constructs graph based on the link ads collected from other routers
- Graph represented as tree with local node as root node
- It only exchange the link info, not the complete routes
- Exchanges to Router connected to neighbors using n/w interfaces
- Based on the reply, it computes link status using delay other characteristics
- LS ads is send by router whenever connectivity change occur

Contd...

- LS Advertisement contains the below info:
- ID of source router
- IDs of all neighbor routers
- Delays of links between various routers
- Unique Sequence. No. whenever new ads are send

LS Advertisement Process

- LS Ads sends a copy to all its neighbors it connected
- Check if sequence no. is same as last received packet seq. no against LSPDB
- If not same replace the last message with the current message
- Using this it constructs the graph by Djisktra's shortest path algorithm
- It constructs edge by edge
- If any inconsistency exists between a link info from routers it is should be resolved

Construction of Link State Tree

- LS ads stored in LSPDB
- Router maintains 2 Data Structure (DS)– tree containing nodes done, Candidates list
- Tree is a Shortest Path First (SPF) tree
- Initially, DS is empty
- Itself is added to tree as first node
- Greedy iterative algorithm based on Djisktra's shortest path is carried out using below 2 steps
- Routers connected directly to the node is added to tree, other nodes will be in the candidate list
- For each node in candidate list, every other node in the tree is compared and candidate node with shortest path is added as appropriate neighbor router

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- Above steps repeated until no more nodes in candidate list
- Inconsistency results in routing loops
- Reason, each router create tree without interacting with others
- Once entire tree is formed, routing table is constructed which is best route to any destination from that node
- 2 Widely used LS protocols are:
- Open Shortest Path First (OSPF)
- IS-IS (Intermediate System to Intermediate System)

Distance Vector Protocols

- Routing decision is based on no. of hops to the destination that packets travel
- Routes advertised as vector (distance, direction)
- distance – no. of hops btwn 2 nodes
- direction – next hop router
- Distance Vector Routing (DVR) protocol share its entire routing table to its neighbors
- But it advertises it according to its perspective
- As a router receives routing table from its neighbor it updates its routing table

Contd...

- Also called "Routing by Rumour" - no way to find the validity of info
- Routers in DV does not know the entire path to destination
- It knows, direction which it should forward, own distance from destination
- Cost of reaching destination is computed using various metrics
- Popular DV protocols are:
- Routing Information Protocol (RIP)
- Interior Gateway Routing Protocol (IGRP)

Contd...

- RIP uses hop count to compute distance
- RIP is cross platform
- IGRP uses node delay, bandwidth to calculate distance
- IGRP is CISCO Proprietary
- Cisco's EIGRP does not require periodic updates or do not advertise full routing table