Survey of different metrics of link stability in MANETS

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Abstract—OLSR is a link state routing protocol in MANETS. In OLSR link state request packets are sent by multiple nodes which is acknowledged by link state update packet. Different techniques to measure link stability are summarized in this paper.

Keywords— MANETS, Energy, Link Stability, OLSR

I. OLSR (OPTIMIZED LINK STATE ROUTING)

OLSR is proactive routing protocol which works on the principal of MPR (Multi Point Relay) selection. Following are the main steps :-

Link State: In this routing protocol all the nodes keep sending link state information to MPR nodes. Each node periodically sends HELLO massages and TC (Topology Control) messages to give information about network topology. Each message has sequence number to avoid confusion between old and new routes. Routing table is maintained by every node to keep the information about the surrounding. Information is extracted from control messages which include information about 1- hop neighbors, 2- hop neighbors and MPR selectors.

Neighbor Sensing:-HELLO messages check whether the link between two nodes is unidirectional or bidirectional. It permits the nodes to learn about network topology up to two hops. Based upon the knowledge given by HELLO packets, nodes select its MPR (Multi Point Relay).



fig no. 1:MPR Selection in OLSR

II. STRUCTURE OF PACKET HEADERS

OLSR is a proactive routing protocol. There are five types of data packets in OLSR HELLO packets, database description packets, Link State request, Link State update and Link State Acknowledgement packet. Link State is layered protocol. Structure of Common Header is

| Version# | Type={ } | Packet length |
|----------|-----------|---------------|
| | Router Id | |

Packet format for HELLO protocol is

| HELLO Interval | Dead time Interval |
|----------------|--------------------|
| Neighbor list | z={ } |
| | |

All link state message share common header as

| Age | Sequence Number | | |
|---------------|-----------------|--|--|
| Link State Id | | | |
| Router Id | | | |

Link State Advertisement includes information about cost metric of link

| # links | |
|---------------------------------------|--|
| Link Id | |
| Link Data | |
| Metric=w1*Bandwidth+w2* cost+w3*delay | |

When router receives Link State Advertisements packets from multiple neighbors it sends back Link State Update, whose format is mentioned below:

| # LSAs | |
|--------------------------|--|
| Link State Advertisement | |
| Link State Advertisement | |

Different link metrics for improvement of routing protocol are tabulated as:-

- Expected Transmission Time
- Energy Aware
- Bandwidth Aware
- Time Metric
- MAC layer control
- Congestion Control
- Recovery of route
- Clustering Algorithm
- Security based routing

Another approach to improve routing efficiency is to use multi path in comparison to single path .More than one path is used to increase routing efficiency. Multiple path can be link disjoint or node disjoint. In link disjoint paths goal is to reduce delay and increase efficiency. Multipath AODV or Multipath OLSR are proposed to prove it.

III.MOBILITY MODELS

Topology of an Adhoc Network changes quickly because of mobility of nodes. There is limited transmission range and links break down frequently. So link stability plays an important role in maintaining QOS (quality of service) for any Adhoc network. Instead of selecting weak links which will break soon and will add to overhead we can select strong links with longer expected life. Movement of mobile nodes in a network can be categorized as:

- Random Walk
- Random Way Point
- Swarm Movement
- Random Movement

In Random Walk model nodes move randomly in any direction with random velocity. But in Random Way Point model there is pause time among nodes which are moving randomly in any direction.Swarm Movement means nodes move in a group and relative position will not change. In Random Movement nodes will move with arbitrary speed in any direction without considering past.

IV.RELATED WORK

Moussaoui, A(2014)[1] devised stability of nodes (SND) and fidelity of nodes (FND) parameters to elect MPR(Multi Point Relays)in case of OLSR. The author has proved via simulation that his selected method provides better QOS(Quality of Service) parameters than traditional method in OLSR for MPR selection which considers Expected Transmission Time metric(ETX). The limitation of using ETX is overestimating link delivery ratio when packet size is too large.

Gerharz et al(2002)[2] discussed method to select link with high probability in different scenarios under different mobility conditions. He devised that Random Way Point and Guass Markov scenarios give similar results. In Random Way point model large simulation area results in links of longer duration. The author has concluded that stability of link depends on the age of link. Then in 2003 [3] same author demonstrated statistical methods to compute path stability.

Gaurav Singal(2016)[4] has introduced multi-objective function to improve OLSR routing protocol. He has considered three routing objective i.e. to minimize end to end delay by **applying local queuing delay** model which is affected by congestion. Another routing objectives include to minimize residual battery energy in order to enhance network energy lifetime and to maximize PDR(Packet Delivery Ratio).Survey paper by Ali Moussaoui(2015) [5] has discussed all the techniques to discuss link stable routing protocol in Manets.

In [10] author proposed changes in AODV Routing Protocol by considering Pr, Tr. Where Pr represents probability that link will break which is calculated with the help of delay and jitter. Tr represents expected time duration of link.

In [12] author proposed various metrics for link selection such as Selecting the oldest link, Selecting the youngest link, Selecting the link with maximum expected residual lifetime, Selecting the link with Maximum 'Persistent Probability' or Selecting the link with lowest failure probability. The author further extended to the concept of **Path Stability**. He emphasized on avoiding instable links or minimizing the use of instable links. But there is reduced capacity due to increase in path length.

V. CONCLUSION

Link State routing protocols have lower convergence time. These are more scalable and internetworks converge easily without forming routing loops. But for larger networks maintenance of Link State updates as well as routing table entries require large amount of memory.

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