

OLSR Protocol having a link reliability list in the MPR

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Abstract— In this paper we discuss and propose Optimized Link state Routing Protocol with reliability check function. This protocol is based on the link state algorithm such as Open Shortest Path First Routing Protocol. But it has a better advantage than OSPF routing protocols. OLSR has MPR to manage the flood message. It can reduce the flooding message significantly. But it has some flaws in the Mobile Ad hoc Network. Each node is connected wirelessly. It doesn't know which wireless path is broken or well working. In OLSR protocol, Link state is not considered. It is significantly important to care about this issue. We propose the way to increase the performance of OLSR protocol which cares about the link state in the wireless condition.

Keywords— OLSR; OSPF; link state; MANET; MPR

I. INTRODUCTION

These days Fixed Mobile Convergence (FMC) is a hot potato[1]. People want to search for the internet anywhere and anytime. There are big needs for people to communicate on the internet anywhere. But there is a limitation to meet this need. Wireless environment has some drawback unlike wired environment. Wireless node is movable. It's hard to predict the way to head for so that we can't transfer data like on the wired environment. There are a lot of protocols to communicate in the wireless environment. There are still a lot of protocols which have been proposing as well. As we can see, wireless environment is not optional. It is mandatory to support the wireless environment these days. Although there are so many protocols which have been proposed. There is no perfect wireless routing protocol to meet our all inquiries. Even though there are no perfect protocols to meet our requests, there is a routing protocol which is nearly ideal among existing wireless routing protocols.

It is Optimized Link State Routing protocol. It works better than other wireless routing protocols[2]. It has the regretful part which OLSR doesn't support like other do.

So we want to enhance some method to increase the performance of OLSR protocols through the link reliability list in the MPR. Each node receives the current state of the link state through the flooding message from MPR. So It can send packets to other mobile nodes by the recent information. We can get the good advantages from this method. We can get better performance than OLSR protocols.

This paper describes how to choose the data path before sending the packet. The rest of the paper will obtain this below. In Section 2, we will take a look about Routing protocols on the wireless environment. In Section 3, we describe how OLSR protocol works in detail. In Section 4, we explain OLSR protocol having a link reliability list in the MPR. Finally, we will conclude this paper.

II. WIRELESS ROUTING PROTOCOLS

There are so many routing protocols in MANET[3]. In the view of a scholar, there are several ways to divide the MANET routing protocols. Generally we categorize like the Figure 1[4]. It's Proactive Routing Protocol, Reactive Routing Protocol and Hybrid Routing Protocol. Proactive methods maintain routes to all nodes, including nodes to which no packets are sent. Such methods react to topological changes. Even though no traffics are affected by the changes. They are also called table-driven method. In other hands, Reactive methods are based on demand for data exchange. Route between hosts are determined only when they are explicitly needed to forward packets. Reactive ways are also called on-demand. They can significantly reduce routing overhead when the traffic is lightweight and the topology changes less dramatically, since they do not need to update route information periodically and do not need to find and maintain routes on which there is no traffic. Hybrid ways combine proactive and reactive methods to find efficient route, without much control overhead. Briefly, we will see how each MANET routing protocol works.

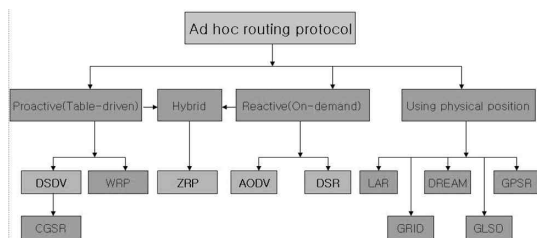


Figure 1 categorization of MANET Routing Protocol

A. Proactive Routing Protocol

As I mentioned earlier, Proactive Routing Protocols maintain routes to all destination, regardless of whether or not there routes are needed. In order to maintain correct route information, a node must send the control message periodically. Therefore, Proactive routing Protocols may waste bandwidth since control messages are sent out unnecessarily when there is no data traffic. The main advantage of this category of protocols is that hosts can quickly obtain route information and quickly establish a session. For example, GSR introduce below is a Proactive Routing Protocol.

1) Global State Routing: GSR is to design a routing scheme that MAC efficient in Ad-hoc Wireless radio network. That is, the control packet size should be able to achieve optimized MAC throughput, and the number of control packet should be controllable. In GSR, it maintain the knowledge of full network topology as in link state routing, but wish to avoid the efficient flooding mechanism. If it didn't use the concept of efficient flooding mechanism, it would cause delay to each of its neighbours. A node will know the whole topology. Unlike Link state routing, GSR doesn't flood link state packets, Instead every node maintain its link state table based up to date. It will periodically exchange its neighbour information with its only neighbours. It means it doesn't flood globally.

2) Destination-Sequenced Distance Vector Routing: Destination-sequenced Distance Vector Routing(DSDV) is also one of Proactive Routing Protocol. Each node maintains a routing table which are in exchange. It contains the list of all available destination list, number of distance to each destination, and the next hop to reach to the destination. If the node succeeds in transfer of data packet, it updates the table to get to the destination. Each Node periodically broadcasts its current estimate of the shortest distance to each available destination to all of its neighbours.

3) The Wireless Routing Protocol(WRP): The Wireless Routing is a table-based protocol with the goal of maintaining routing information among all nodes in the network as well. It is similar to DSDV and GSR. Each node in the network is responsible for maintaining four tables. Distance table, Routing table, Link-cost table and

Message Retransmission List(MRL) table. Each MRL contains the sequence number of the update message, a retransmission counter, an acknowledgement-required flag vector with one entry per neighbour, and a list of updates sent in the update message. The MRL records which updates in an update message need to be retransmitted and which neighbor should acknowledge the retransmission[5].

B. Reactive Routing Protocol

In a proactive routing protocol's case, when an originator node wants to send data packets to a target node and it doesn't have a valid route to this target node, it broadcasts a route request to its neighbours. These neighbours forward the route request packet to their neighbours and this process goes on until the target node or an intermediate node with a valid route to target node is located. Each node receiving a particular route request packet broadcasts it only once to its neighbours, and it discards the subsequent receptions of the same route request packet, to minimise routing overhead. It is really resource consuming process sometimes. So there are several routing protocols to overcome this shortcoming.

1) Ad hoc On Demand Distance Vector (AODV): GSR is to design a routing scheme that MAC efficient in Ad-hoc Wireless radio network. That is, the control packet size should be able to achieve optimized MAC throughput, and the number of control packet should be controllable. In GSR, it maintain the knowledge of full network topology as in link state routing, but wish to avoid the efficient flooding mechanism. If it didn't use the concept of efficient flooding mechanism, it would cause delay to each of its neighbours. A node will know the whole topology. Unlike Link state routing, GSR doesn't flood link state packets, Instead of that every node maintain its link state table based up to date. It will periodically exchange its neighbour information with its only neighbours. It means it doesn't flood globally.

2) Destination-Sequenced Distance Vector Routing: Destination-sequenced Distance Vector Routing(DSDV) is also one of Proactive Routing Protocol. Each node maintains a routing table which are in exchange. It contains the list of all available destination list, number of distance to each destination, and the next hop to reach to the destination. If the node succeeds in transfer of data packet, it updates the table to get to the destination. Each Node periodically broadcasts its current estimate of the shortest distance to each available destination to all of its neighbours.

C. Hybrid Routing Protocol[6]

It is well-known that proactive-protocols are not optimal for either MANETs that have rapidly changing topologies or sensor networks that require emission control (EMCON) modes-of-operation. However, purely reactive protocols are often inappropriate for several common MANET topologies such as cluster-based networks and relatively static networks. In addition, reactive protocols introduce additional latency (and possibly source-routing overhead) for real-time traffic.

As such, “hybrid” or “zone” routing protocols that use a mix of both proactive and reactive routing techniques at each network node have been proposed. Two examples are Cornell’s Zone Routing Protocol (ZRP). when an originator node wants to send data packets to a target node and it doesn’t have a valid route to this target node, it broadcasts a route request to its neighbours. These neighbours forward the route request packet to their neighbours and this process goes on until the target node or an intermediate node with a valid route to target node is located. Each node receiving a particular route request packet broadcasts it only once to its neighbours, and it discards the subsequent receptions of the same route request packet, to minimise routing overhead. It is really resource consuming process sometimes. So there are several routing protocols to overcome this shortcoming.

III.OPTIMIZED LINK STATE ROUTING PROTOCOL(OLSR)

Optimized Link State Routing Protocol(OLSR) is a proactive routing protocol for MANET(Mobile Ad hoc network). The protocol gets the stability of a link-state algorithm and has the advantage of having routes immediately available when it is needed. OLSR get a more advantages than the classical link state protocol which is in the MANET environment. OLSR is developed to work in a completely distributed manner and does not depend on any central node. OLSR performs a loop discovery on every path to connected path. Each node keeps a routing table which connects to the next hop in order to get to the destination. This path could be different and unique in the view of each node. . The protocol doesn’t require reliable transmission of control message because each node sends control messages periodically and could lose the message due to the connection of the link. The factor is from the wireless network. It could be serious factor in the wireless link. It will cause the flooding problem. So each node periodically broadcasts topological messages containing a list of Multipoint Relay Selector. This mechanism is to reduce the broadcast storm problem using a subset of nodes.

Let’s see how the MPR sets works. Node a’ has the empty MPR set. a’ choose the one hop neighbour nodes which are only neighbour of some two hop neighbour. It is added in the MPR sets. Secondly add the MPR set the neighbour node of a’ that covers the largest number of two hop neighbour of a’ that are not yet covered by the current MPR set[7]. In order to [8], they get the result that 75% of all MPRs were elected during the first step[8]. This is the important factor that the

first step is the majority of choosing the MPRs.

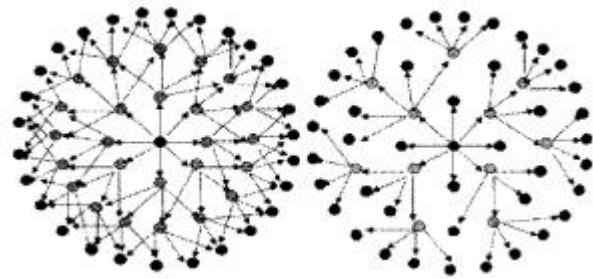


Figure 2 Comparison of Flooding mechanism and MPR

The figure 2 shows how it is efficient to have MRP to send the TC. The first picture is just the flooding the packet to the neighbour. The second picture is choosing the MPR to send the TC messages. It can reduce the TC significantly.

IV.OPTIMIZED LINK STATE ROUTING PROTOCOL(OLSR) HAVING A LINK RELIABILITY LIST IN THE MPR

As we mentioned earlier, OLSR protocol is outstanding above overall MANET routing Protocol. It has some drawback as well. In this section, we will propose the method which makes the performance of OLSR better.

Let’s suppose that there are wireless topologies like figure 3.

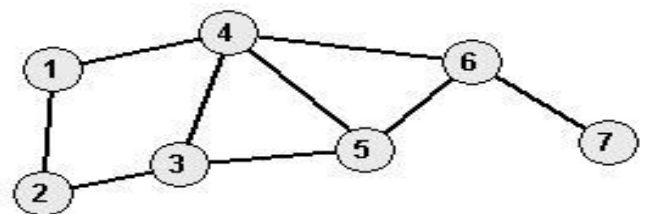


Figure 3 wireless topology

As we mention earlier, each node broadcasts message to the neighbour nodes. Before that, they need to know the topology of this network. They build the table to route. At first the node chooses the MPR in OLSR. In the view of each node, MPR sets are like Table 1[9].

MPR set	The node
MPR(1)	4
MPR(2)	3
MPR(3)	4
MPR(4)	3,6
MPR(5)	3,4,6
MPR(6)	4
MPR(7)	6

Table 1 MPR sets

In this information, Node 1 builds the table to send the packet to the destination. Figure 4 is the way in order to the MPR sets.

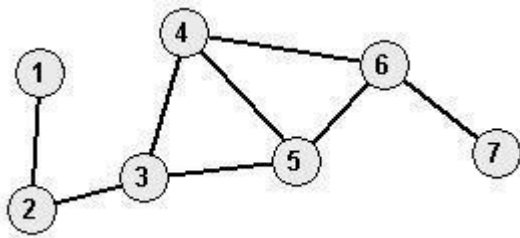


Figure 4 the TC route

Finally it builds the route to get to the destination.

But in this case there is the drawback. OLSR just consider the facts which are the number of hops and the connectivity between nodes. If nodes are so dynamic, the ratio of the success is so poor. We propose the history of link success ratio in the MPR. In our proposal, MPR sets get the table to save the history of link success ratio. This paper just proposes the method to choose the better route to get to the destination. There is no routing simulation in this paper.

Whenever the node sends the packet, it saves the packet's situation. It knows the result of the packet success to get to the destination. When this node sends the TC message to MPR, it sends the statue of the success ratio. The MPR collect all node's information around it. So MPR sends the arranged the information of topology. Each node follows this information before sending the packets.

V. CONCLUSIONS

Current OLSR protocol is hot issues to deploy. It is realistic among other MANET routing Protocol. It is very hard to get the performance like wired network. The original OLSR protocol doesn't include any method to sense the link state. It can be serious factor in the dynamic MANET.

With our proposal the result of performance will be increased significantly. We will have a furthermore simulation that this method is efficient.

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