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ALGORITHM FOR D. S. R. PROTOCOL TO BALANCE ROUTE LOAD WHILE USING MULTIPATH ROUTING

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Abstract— a Mobile Ad hoc Network (MANET) is a self establishing network of mobile nodes grouped by a wireless link without fixed infrastructure. In MANET each node takes a part in sending and receiving of data packets. These packet follows a single path to reach their destination , due to this quality of service is decreases and end to end delay of packet delivery is increases; hence QoS is inversely proportional to end to end delay. To overcome this problem multipath transmission may be a better option in this scenario. To achieve multipath transmission in MANET we propose some changes in existing DSR protocol. In this paper we propose multipath dynamic source routing along with balanced load, it has two data structure load Table (LT) and route cache (RC). The Source node maintains up to five paths in its RC which it receives as a result of Route Discovery process. While selecting the route it keeps track of load balancing by checking the count, it maintains in LT for the multiple paths available for the given target. To manage this "LT" is introduced which maintains the count of packets transmitted on a given route. Results shows that proposed approach improves Packet Delivery Ratio (PDR) and Through Put in network as compared with original DSR and decreases Average Delay.

Keyword — D.S.R., M.A.N.E.T., QoS, & Route Cache

Introduction

In the recent years there has been a tremendous expansion in the sales of laptops, notebooks, PDA and smart phones. These devices are outfitted with gigabytes of disk storage, high resolution color displays, pointing devices and wireless communications adapters with the facility to operate for hours with battery power, where users are free to move about without being constrained by wires. Among this technological growth many researchers are interested in exploring the field of Mobile Ad hoc Networks (MANETs) [2]. This type of network is a group of self-sufficient wireless mobile nodes which energetically forms an impermanent network without the use of any existing network infrastructure or centralized supervision. This dynamic nature of MANET can makes the scheme of getting connected "anywhere and at any time" into reality, since the applications of such network can be varied from establishing efficient, active communication for emergency/rescue operations and military operation where no communication services available to a stationary communication between different nodes during a conference or a business meeting. However, the active nature of this type of networks with its limited resources among battery life and available bandwidth makes routing to a great extent not easy, for that purpose many authors have been conducted to compare the performance of various routing protocols and explore different performance criterion under different simulation environment to provide diverse results for the routing protocols.

The Dynamic Source Routing protocol (DSR) [1] is one such efficient routing protocol designed for multi-hop wireless ad hoc networks. DSR does not need any network infrastructure. DSR allows the network to be completely self configuring and self-organizing without requiring any central network controller. DSR uses source routing method which avoids loops in routing paths. Further, it does not need to update the routing information periodically. DSR also requires promiscuous packet reception mode which allows intermediate nodes to cache the routing information for future use. The protocol consists of two mechanisms via Route Discovery and Route Maintenance, these work together allowing nodes to discover and maintain source routes to arbitrary destinations in the ad hoc network. Route Discovery mechanism consists of two phases i.e. Route request (RREQ) and Route reply (RREP) [3]. The source node broadcasts the route request packets over the network and requests the path to destination. When destination node receives these packets, it responds with route reply packet which contains the route to the destination. Also, if a communication link between any two nodes in the path fails then source node is able to detect the failure with the help of Route Error (RERR) packets. In such cases, source node can use the alternative path to the destination from the cache or it can reinitiate route discovery mechanism.

Background

Considering procedures for route establishment and update, MANET routing protocols are often classified into proactive, reactive and hybrid protocols. Proactive or table-driven protocols commit to maintain consistent up-to-date routing info from every node to each alternative node within the network. Each node maintains tables to store routing information, and any changes in configuration need to be mirrored by propagating updates throughout the network. Reactive

or on demand protocols are supported source-initiated on-demand reactive routing. This sort of routing creates routes only when a node needs a route to a destination. Then, it initiates a route discovery method, which ends once the route is found. Hybrid protocols combine proactive and reactive schemes.

A. The Ad hoc On Demand Distance Vector (AODV)
AODV routing approach initially is considered for wireless nodes network with capacity of tens to thousands of wireless nodes. It has the capability to deal with reasonably high nodes mobility rates, and can acquire a diversity of data stream levels. This type of protocol planned to diminish overhead on traffic stream, to enhance scalability and behavior [4, 6, 7]. AODV inherit the superior characteristics of both DSDV and DSR. It employs a reactive approach for finding out paths and the proactive mechanism for classifying the latest path. This kind of protocols may discover paths using the route finding process comparable to DSR and uses target sequence numbers to figure out new routes.

B. Ad hoc On Demand Multipath Distance Vector
Mobile Ad-hoc networks are mainly characterized by high mobility and frequent link failures that result in low throughput and high end-to-end delay. Current routing protocols use pre computed routes and are not sure if they would work if switched to them on failure of primary path. AOMDV shares several characteristics with AODV [5, 7]. It is based on the distance vector concept and uses hop-by-hop routing approach. Moreover, AOMDV also finds routes on demand using a route discovery procedure.

C. Dynamic Source Routing protocol (DSR)

This kind of routing Protocol [4, 6, 7] is an on demand algorithm considered to bind the bandwidth obsessed by control packets in this type of wireless networks, by getting rid of the interrupted table update messages needed in the table driven approach. The key remuneration that Distinguishes DSR protocol from other protocols that they are easily assured loop-free routing also it's very rapid healing when paths in the network are modified. This set of rules also benefits from Source routing algorithm since the transitional nodes do not require to preserve the updated routing data in order to direct the packets that they forward, also there is no need for any interrupted routing announcement messages. However, when the scope of the network rose, the routing overhead will also increase since each packet has to grasp the entire path to the target node. The usage of path caches is sufficient in order to minimize the propagation delay but excess usage of the cache may result in limited behavior.

Problem Statement

In a single-path routing infrastructure, only a single path exists between any two networks in the internetwork. While this may simplify the routing tables and the packet flow paths, single-path internetworks are not fault tolerant. A fault can be sensed with a dynamic router, but the networks across the failure are unreachable for the duration of the fault. A downed link or a downed router must be brought back up before packets can be delivered successfully across the downed link or router. In the existing DSR protocol, during route discovery the destination node after receiving first route request packet and replying to it, starts discarding other route request packets from the same source. The reason is that existing DSR is single path protocol and as soon as one route is discovered from source to destination, destination does not respond to other requests considering that a route is already successfully discovered and replied. We are the analyzing of DSR routing protocol is the biggest problem in ad hoc networks is due to mobility, as link break occurs very frequently. In the proposed work, a modification will be introduced in the existing DSR protocol by using multiple paths instead of a single path as used in the original DSR. By using multiple paths for transmission, this problem can be reduced.

Proposed Approach

Multipath routing is the routing technique of using multiple alternative paths through a network, which can yield a variety of benefits such as fault tolerance, increased bandwidth, or improved security. The multiple paths computed might be overlapped, edge-disjointed or node-disjointed with each other. For the MULTIPATH-DSR data structure it is an important part of routing protocols. There are two data structure Route Cache and Load Table.

A. **Route Cache**
For the Multipath-DSR we have introduced new route cache. There are four fields in new routing protocol. RouteID, Destination Address, Route and Time Out.

B. **Load Table**
For the Multipath-DSR we have introduced new Load Table, in the Load table there are two fields Route ID and Packet Count.

C. **Working of Multipath-DSR**
We discussed about the Multipath-DSR working for following nodes. Routing protocols have three nodes Source node, Intermediate nodes and Target node. These three nodes are working with different-different concepts.

Source Node
The source node maintains up to five paths in its RC it receives as a result of Route Discovery process. As in the original DSR, whenever source node is having packet for transmission to target node it checks for route in RC and transmits the packet to the next hop given by the selected route. But now, while selecting the route it keeps track of load balancing by checking the count it maintains in LT for the multiple paths available for the given target. To manage this, a new data structure called “LT” is introduced which

maintains the count of packets transmitted on a given route. Also, the RC is slightly modified by introducing a new field called "RID".

Intermediate Node and Target Node

The role of intermediate node is same as in original DSR. Whenever it receives the RREQ packet, it makes an entry in its ROUTE REQUEST TABLE and forwards it to all the neighbors. Target node will receive RREQ packets and send RREP packets for first five requests received. Currently it is replying to only first RREQ packet received and rejects the remaining.

Initialization

Step i: *Send RREQ packet with timer.*
Step ii: *If RREP not received go to Step iv*
Step iii: *Else go to step 7*
Step iv: *If (T>1)*
For (T= Value, T>1, T--)
{
T= T-1
Go to step 1
}
Step v: *Else*
Step vi: *Drop all packets for corresponding destination*
Step vii: *Put received information in route cache [Route ID, Destination Address, Route, time Out]*
Step viii: *Generate Load Table [Route ID, Packet Count]*
Step ix: *Exit*

Sending Data

Destination Address= DA
Route Cache= RC [I "destination IP Address"]
H= Hope Count
Step i: *IF DA = RC [i "destination IP address"]*
Step ii: *Apply "bubble sort" on hope count*
Step iii: *Select first five routes from left.*
Step iv: *put entries in load table.*
Step v: *Send data through five routes using "Round Robin Algorithm"*
Step vi: *Else*
Step vii: *Apply route discovery*
Step viii: *go to step i*
Step ix: *Exit*

Result Analysis

For analyzing original DSR and Multipath-DSR we use Network Simulator (NS2).

Table1:Simulation Scenarios

Number of nodes	50
Number of	20
Area	1000 x 1000
Mobility Model	Random
Bandwidth	2 Mbps
Velocity	0, 5, 10, 15 and
Pause Time	5 sec.
Buffer Size	100
Transmission	250 meters
Sensing Range	250 meters
Packet Size	512 bytes
Traffic Source	CBR
MAC Protocol	IEEE 802.11

The simulation runs for existing DSR and with same environment it again is run for Multipath-DSR or Modified DSR to see the comparison of performance on differences against Average Delay, Packet Delivery Ratio (PDR) and Throughput. The Modified DSR (MULTIPATH-DSR) is simulated using with following scenarios settings:

Average Delay Vs Velocity

Because of multiple path features in modified DSR, packets need not to wait for long. Also, packets are moving from 5 paths which means apart from shortest path some other paths are also followed. As a result, packet faced less queuing delay whereas original DSR followed shortest route which increases queuing delay.

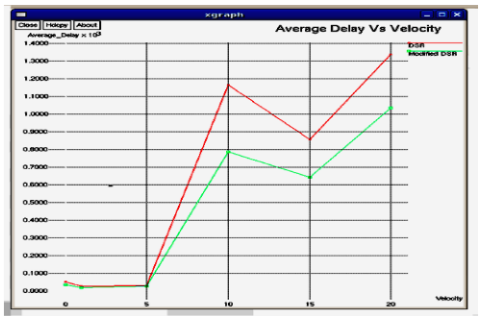

Figure 1 Average Delay Vs Velocity

Packet Delivery Ratio (PDR) Vs Velocity

Because of multiple paths used for transmission, packet delivery ratio increases as chances of packet loss due to path breaks reduces. Clearly, modified DSR performs better than the original one.

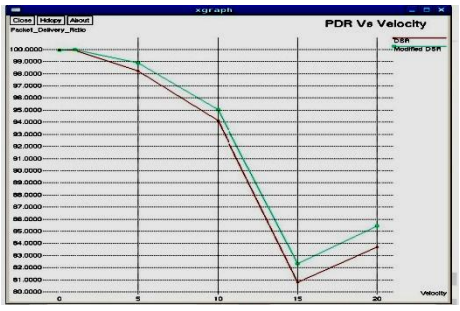

Figure 2 Packet Delivery Ratio (PDR) Vs Velocity

Figure 3 Throughput Vs Velocity

Conclusion

We are the analyzing of DSR routing protocol is the biggest problem in ad hoc networks is due to mobility,

as link break occurs very frequently. MANET is an autonomous system of mobile nodes with wireless transmitters and receivers without the aid of pre-established network infrastructure. In the paper a modification is introduced in the existing DSR protocol by using multiple paths instead of a single path as used in the original DSR. By using multiple paths for transmission we improve the performance of original DSR parameters Average Delay, Packet Delivery Ratio and Throughput.

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